Technical Paper

Operational transport

1

Sydney Metro West

Rail infrastructure, stations, precincts and operations

Environmental Impact Statement

Technical Paper 1: Operational Transport

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Glossary of terms and abbreviations

Term	Meaning
Average delay	Duration, in seconds, of the average vehicle waiting time at an intersection
DDA	Disability Discrimination Act 1992
DoS	Degree of Saturation – the ratio between traffic volumes and capacity of the intersection used to measure how close to capacity an intersection is operating.
ETCM	Enhanced Train Crowding Model
LGA	Local Government Area
Level of service	An index of the operational performance of traffic on a given traffic lane, carriageway or road when accommodating various traffic volumes under different combinations of operating conditions.
PCU	Passenger Car Unit
PTPM	Public Transport Projects Model
PTV Viswalk	PTV Viswalk is a planning tool for simulating pedestrian and crowd dynamics
SA2	Statistical Area Level 2 (SA2s) are functional areas that represent a community that interacts together socially and economically.
SCATS	Sydney Coordinated Adaptive Traffic System - An urban traffic control system that optimises traffic flow. SCATS responds automatically to fluctuations in traffic flow through the use of vehicle detectors.
SEARs	Secretary's environmental assessment requirements
SIDRA	SIDRA Intersection is a computer-based modelling package that calculates intersection performance. The commonly used measure of intersection performance is vehicle delay. SIDRA determines the average delay that vehicles encounter and provides a measure of the level of service. The Version used for the purpose of this EIS assessment is SIDRA Intersection 9.
TMAP	Transport Modelling Analytics Platform
VHT	Vehicle Hours Travelled
VKT	Vehicle Kilometres Travelled

Executive Summary

Project overview

Sydney is expanding and the NSW Government is working hard to deliver an integrated transport system that meets the needs of customers now and in the future. Sydney Metro is Australia's biggest public transport program.

Sydney Metro West is a new 24-kilometre metro line that will connect Greater Parramatta with the Sydney CBD. Confirmed stations include Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and Hunter Street (Sydney CBD). This infrastructure investment will double the rail capacity of the Greater Parramatta to Sydney CBD corridor with a travel time target between the two centres of about 20 minutes.

The delivery of Sydney Metro West is critical to keeping Sydney moving and is identified in a number of key strategic planning documents including the Greater Sydney Region Plan: A Metropolis of Three Cities – connecting people (Greater Sydney Commission, 2018a), Building Momentum: State Infrastructure Strategy 2018-2038 (Infrastructure NSW, 2018) and Future Transport Strategy 2056 (Transport for NSW, 2018).

Sydney Metro West is being assessed as a staged infrastructure application under section 5.20 of the *Environmental Planning & Assessment Act 1979* (EP&A Act).

The proposal would involve:

- Fit-out of tunnels including systems for metro train operations
- Construction, fit-out and operation of:
    - metro station buildings and the surrounding metro precincts
    - a services facility and traction substations
    - a control centre, test track and stabling and maintenance facility at Clyde
- Space for non-station uses at metro stations (e.g. retail, commercial and/or community facilities)
- Provisions for over and/or adjacent developments within metro precincts
- Rail interchange support works, including work to the existing T1 Western Line at Westmead and T9 Northern Line at North Strathfield
- Transport network modifications, such as new interchange facilities and changes to public transport networks to serve metro stations
- Subdivision of sites
- Operation and maintenance of the Sydney Metro West line.

Components of the proposal are subject to further design development, and changes may be made during the ongoing design which take into account the outcomes of community and stakeholder engagement and environmental investigations.

Further details of the proposal are provided in Chapter 5 (Proposal description – operation) and Chapter 6 (Proposal description – construction) of the Environmental Impact Statement.

This operational transport assessment

This technical paper is one of several technical documents that forms part of the Environmental Impact Statement. The purpose of this technical paper is to provide the operational transport assessment which addresses the Secretary's environmental assessment requirements.

This technical paper identifies the baseline transport environment, provides an assessment of the potential operational benefits and impacts of the proposal on the surrounding transport network, as well as development of performance outcomes and mitigation measures to address potential impacts.

Approach to transport assessment

The study area for the operational transport assessment was determined based on the potential impacts of the proposal on the existing and future transport network during operation. It includes intersections and road links likely to be affected by the proposal, proposed station precincts and associated transport infrastructure, as well as transport interchange infrastructure within the study area.

The scope of this technical paper includes the following:

- Identification of baseline transport conditions in the study area
- Assessment of the potential traffic and transport impacts and benefits resulting from operation of the proposal, including assessment of cumulative impacts
- Development of performance outcomes and identification of potential mitigation measures to avoid, minimise and manage impacts associated with the proposal.

While the proposal would commence operations in 2030, the operational assessment has been undertaken for 2036, which provides the benefit of demand ramp-up within station precincts and coincides with census years and available future year strategic transport modelling forecasts.

As the proposal is primarily underground, the assessment focusses on the local transport network in the vicinity of the proposed station precincts, as well as in the vicinity of the Clyde stabling and maintenance facility and the service facility at Rosehill.

Both qualitative and quantitative assessment of the operation of the proposal has been carried out. The integration of proposed stations and facilities with the existing transport network has been assessed, and the potential operational transport impacts and benefits are discussed. This technical paper also discusses upgrades to the transport network identified in the vicinity of proposed stations to enable the proposal to satisfactorily operate.

Where permanent intersection upgrades, or changes to the transport network are proposed as part of the proposal, a quantitative assessment of potential impacts has been carried out using appropriate traffic modelling tools, including the Public Transport Projects Model (PTPM), Enhanced Train Crowding Model (ETCM), SIDRA Intersection software and PTV Viswalk for pedestrian modelling purposes.

Overview of potential operational benefits and impacts

Sydney Metro West would more than double rail capacity from Parramatta to the Sydney CBD with the delivery of a new high capacity rail connection. By providing additional rail services and opportunities for interchange with the suburban rail network, Sydney Metro West would assist in reducing train crowding on parts of the T1 Western Line and the T9 Northern Line, which would help improve the reliability of Sydney Trains services.

The introduction of new metro rail services and infrastructure would also reduce congestion and help alleviate platform and station crowding at existing Sydney Trains suburban line stations.

The proposal would substantially improve public transport network accessibility to key economic centres across the Greater Parramatta to Sydney CBD corridor and would increase the reach and use of Sydney's public transport network. This would be achieved through provision of new stations at localities not serviced by the existing suburban rail network, including Burwood North, Five Dock, The Bays and Pyrmont.

Another benefit would be the opportunity to improve travel times by providing more direct routes between areas with existing rail services, access to rail services in areas that currently do not have train stations, and through provision of a high-frequency service, with customers able to 'turn-up-and-go' and no longer having to rely on timetables.

The proposal would provide an additional, high-capacity public transport link in the corridor between Greater Parramatta and Sydney CBD. This would provide an alternative route for customers during planned and unplanned events on the suburban rail network that impact on customer service provision and access to key destinations, improving overall network resilience.

The additional mass transit accessibility and amenity provided by the proposal would also provide an opportunity to optimise the bus network. This could include additional feeder services to Sydney Metro West stations and re-deployment of existing parallel bus services that would otherwise duplicate parts of the Sydney Metro West alignment.

By encouraging people to use the metro network, the proposal would provide the opportunity for mode shift from car to public transport. This would create benefits, including travel time savings and a reduction in environmental impacts to communities such as air pollution, greenhouse gas, noise and water pollution. It would also improve reliability for remaining car users who do not shift modes.

Projected traffic growth in the study area is expected to be mainly from future growth in urban development, including over and/or adjacent station development, rather than from the proposal. While this future development is dependent on the provision of a high quality public transport facility, any additional road-based traffic, including kiss and ride, taxi, and bus movements generated by the proposal itself would be minimal compared to expected future year background traffic.

Performance outcomes and mitigation

The approach to environmental management during operation of the proposal involves:

- design – measures which are inherent in the design of the proposal to avoid and minimise impacts
- operational performance outcomes and mitigation measures for the proposal
- operational environmental management – the approach to environmental management during operation would be defined in an operational environmental management plan or system.

Performance outcomes have been developed consistent with the requirements of the Secretary's environmental assessment requirements for the proposal and proposed mitigation measures have been developed to avoid, minimise and manage potential operational transport related impacts, where required. Proposed performance outcomes and mitigation measures are detailed in Sections 6.2 and 6.3 respectively.

1 Introduction

1.1 Context and overview

Sydney is expanding and the NSW Government is working hard to deliver an integrated transport system that meets the needs of customers now and in the future. Sydney Metro is Australia's biggest public transport program.

Sydney Metro West is a new 24-kilometre metro line that will connect Greater Parramatta with the Sydney CBD. Confirmed stations include Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and Hunter Street (Sydney CBD). This infrastructure investment will double the rail capacity of the Greater Parramatta to Sydney CBD corridor with a travel time target between the two centres of about 20 minutes.

The delivery of Sydney Metro West is critical to keeping Sydney moving and is identified in a number of key strategic planning documents including the Greater Sydney Region Plan: A Metropolis of Three Cities – connecting people (Greater Sydney Commission, 2018a), Building Momentum: State Infrastructure Strategy 2018-2038 (Infrastructure NSW, 2018) and Future Transport Strategy 2056 (Transport for NSW, 2018).

Sydney Metro West is being assessed as a staged infrastructure application under section 5.20 of the *Environmental Planning & Assessment Act 1979* (EP&A Act). The previous Sydney Metro West planning applications included:

- The Concept and major civil construction work for Sydney Metro West between Westmead and The Bays (Stage 1 of the planning approval process, application number SSI-10038), was approved by the Minister for Planning and Public Places on 11 March 2021.
- Stage 2 of the planning approval process includes all major civil construction between The Bays and Sydney CBD. An Environmental Impact Statement for major civil construction between The Bays and Sydney CBD was exhibited between 3 November 2021 and 15 December 2021.

Stage 3 of the planning approval process is seeking planning approval to enable the approved Concept to be realised by carrying out the tunnel fit-out, construction of stations, ancillary facilities and station precincts, and operation and maintenance of the Sydney Metro West line (this proposal).

Major civil construction including station excavation and tunnelling work associated with the previous Sydney Metro West planning applications does not form part of this proposal. This proposal includes the activities required to complete construction ready for operations of Sydney Metro West.

The main elements of Sydney Metro West are shown in Figure 1.

Figure 1 Sydney Metro West

1.2 Key features of this proposal

This proposal would involve:

- Fit-out of tunnels including systems for metro train operations
- Construction, fit-out and operation of:
    - metro station buildings and the surrounding metro precincts
    - a services facility and traction substations
    - a control centre, test track and stabling and maintenance facility at Clyde
- Space for non-station uses at metro stations (e.g. retail, commercial and/or community facilities)
- Provisions for over and/or adjacent station development within metro precincts
- Rail interchange support works, including work to the existing T1 Western Line at Westmead and T9 Northern Line at North Strathfield
- Transport network modifications such as new interchange facilities and changes to public transport networks to serve metro stations
- Subdivision of sites
- Operation and maintenance of the Sydney Metro West line.

Components of this proposal are subject to further design development, and changes may be made during the ongoing design which take into account the outcomes of community and stakeholder engagement and environmental investigations.

Further details of the proposal are provided in Chapter 5 (Proposal description – operation) and Chapter 6 (Proposal description – construction) of the Environmental Impact Statement.

1.3 Purpose and scope of this report

This technical paper, Technical paper 1: Operational transport is one of a number of technical papers that form part of the Environmental Impact Statement. The purpose of this technical paper is to identify and assess the potential impacts of the proposal in relation to operational transport. It responds directly to the Secretary's environmental assessment requirements outlined in Section 1.3.1.

1.3.1 Secretary's environmental assessment requirements

The Secretary's environmental assessment requirements for the proposal were issued on 16 August 2021. The requirements specific to operational transport, and where these requirements are addressed in this technical paper, are outlined in Table 1.

The Secretary's environmental assessment requirements also makes reference to the Sydney Metro West Scoping Report – Rail infrastructure, stations, precincts and operations (Sydney Metro, 2021), which identified the proposed scope of investigations and assessment. How this technical paper addresses these matters is outlined in Table 2.

Table 1 Secretary's environmental assessment requirements – operational transport

Secretary's environmental assessment requirements	Where addressed
(a) performance of key interchanges and intersections around station precincts by undertaking a level of service analysis at key locations;	Chapter 3 – Baseline transport environment and Chapter 4 – Operational benefits and impacts
(b) performance of key interchanges and intersections around station precincts and ancillary facilities for people walking or cycling within and through the station precinct and surrounds, or to and from the metro station and other forms of transit;	Chapter 4 – Operational benefits and impacts
(c) wider transport interactions (local and regional roads, cycling, public and freight transport);	Chapter 4 – Operational benefits and impacts
(d) induced traffic and operational implications for public transport (particularly with respect to strategic bus corridors and bus routes) and consideration of opportunities to improve other forms of public transport; and	Chapter 4 – Operational benefits and impacts
(e) property and business access and on-street parking (including loading, servicing, and drop off and pick up).	Chapter 4 – Operational benefits and impacts

Table 2 Scoping report investigations and assessment – operational transport

Scoping report investigations and assessment	Where addressed
Consideration of operational maintenance access requirements	Chapter 4 – Operational benefits and impacts
Assessment of how the transport network supports placemaking outcomes	Chapter 4 – Operational benefits and impacts
Assessment of potential benefits and impacts on other transport modes and interchange opportunities during operation (including during event mode at Sydney Olympic Park)	Chapter 4 – Operational benefits and impacts
Assessment of intersection performance during operation at locations where changes are required to facilitate access to new stations	Chapter 4 – Operational benefits and impacts
Consideration of opportunities to improve public transport links to stations	Chapter 4 – Operational benefits and impacts
Consideration of opportunities to integrate cycling and pedestrian elements with surrounding networks during operation	Chapter 4 – Operational benefits and impacts
Assessment of potential cumulative operational traffic impacts	Chapter 5 – Cumulative operational traffic impacts

1.4 Structure of this report

This paper is structured as follows:

- Chapter 1 provides an introduction, including overview and background to the proposal
- Chapter 2 addresses the methodology adopted for the operational transport assessment, including key data sources, assumptions and assessment criteria
- Chapter 3 describes the baseline environment in the vicinity of the proposal, including consideration of land use, existing travel patterns, including direction of travel and mode, the active transport network and public transport network. The performance of the road network is also assessed, including parking arrangements and impacts on property and business access in the vicinity of proposed stations, maintenance, stabling and service facilities
- Chapter 4 addresses strategic transport benefits and impacts, it provides an overview of the integration strategy adopted, future passenger demands, integration of the proposal with the active and public transport networks, as well as with the public road network. The chapter also presents an assessment of the operational performance and impacts of the proposal for the future year of 2036
- Chapter 5 addresses cumulative operational benefits and impacts associated with the proposal
- Chapter 6 addresses the approach to management and mitigation, including development of performance outcomes and identification of mitigation measures to address impacts
- Chapter 7 provides reference documents used in the preparation of this paper.

2 Methodology

2.1 Overview

This technical paper provides an assessment of the potential operational transport benefits and impacts of the proposal within the study area and addresses the relevant assessment requirements of the Secretary's environmental assessment requirements (see Section 1.3).

The scope of this technical paper includes the following:

- Identification of the baseline transport conditions in the study area
- Assessment of the potential transport benefits and impacts resulting from operation of the proposal, including assessment of cumulative impacts
- Development of performance outcomes and identification of mitigation measures to avoid, minimise and manage impacts associated with the proposal.

While the proposal would commence operations in 2030, the operational assessment has been undertaken for 2036, which provides the benefit of demand ramp-up within station precincts and coincides with census years and available future year strategic transport modelling forecasts.

As the proposal is primarily underground and encourages a shift in travel demand away from road-based transport modes, the assessment focusses on the local transport network in the vicinity of the proposed stations, the Clyde stabling and maintenance facility, as well as at the Rosehill services facility.

The integration of proposed stations and facilities with the existing transport network has been assessed, and the potential operational transport benefits and impacts are addressed. This technical paper also addresses upgrades to the transport network identified in the vicinity of proposed stations to enable the proposal to satisfactorily operate.

A qualitative approach has been adopted for assessment of the Clyde stabling and maintenance facility, as well as for the services facility at Rosehill. Preliminary assessment indicates minimal impacts from the operation of these facilities on the surrounding road network, therefore more detailed quantitative assessment was not necessary.

Where permanent intersection upgrades, or changes to the transport network are proposed as part of the proposal, a quantitative assessment of impacts has been carried out using appropriate traffic/transport modelling tools, including the Public Transport Projects Model (PTPM), Enhanced Train Crowding Model (ETCM), SIDRA Intersection software and PTV Viswalk for pedestrian modelling purposes.

2.2 Baseline transport environment

A review of the regional transport environment, including active transport, public transport (suburban rail, light rail, bus and ferry), as well as for the regional road network has been carried out.

A more focussed assessment of baseline transport conditions is then provided for each station location, as well as for the Clyde stabling and maintenance facility and the service facility at Rosehill.

This assessment includes consideration of land use context, existing travel patterns and demands, including direction of travel and mode, the active transport network (walking and cycling), public transport services, as well as an overview of existing parking arrangements.

Performance of the existing road network has been assessed through analysis of existing traffic volumes and patterns on the road network surrounding each of the stations. In this regard, traffic surveys were undertaken in March and June 2021.

Assessment of existing intersection performance in the vicinity of proposed station precincts has been undertaken using SIDRA Intersection 9 software for which base year traffic models were developed to replicate existing traffic conditions. A base year of 2021 was adopted for the purposes of the impact assessment. The base year assessments have been carried out for a morning and evening peak hour. No weekend (Saturday) SIDRA analysis has been undertaken as part of the assessment.

In regard to assessment of existing road network performance in the vicinity of the proposed Clyde stabling and maintenance facility, as well as the services facility at Rosehill, a qualitative rather than quantitative approach has been adopted due to the anticipated minimal impacts from the operation of these facilities on the surrounding road network.

To account for the impact of the Covid-19 pandemic and the reduction in traffic levels on the road network during the pandemic, the March and June 2021 observed traffic volumes were increased by an amount equivalent to the average monthly reductions for March and June between 2019 (pre-Covid) and 2021. These reduction percentages were identified from NSW permanent traffic counter sites.

Analysis of traffic flow data from NSW permanent traffic counter sites at Hawkesbury Road, Centenary Drive, Western Distributor and Cahill Expressway indicates that in the AM peak there was an average reduction of three per cent and nine per cent in March and June peak hour flows respectively between 2019 (pre-Covid) and 2021, while in the PM peak there was an average reduction of three per cent and four per cent in March and June peak hour flows respectively between 2019 (pre-Covid) and 2021. The March and June 2021 observed traffic volumes were therefore increased accordingly to account for the reduction of traffic levels during the Covid-19 pandemic in 2021. The adjusted flows were used for purposes of the baseline performance assessment.

2.3 Review of operational benefits and impacts

A review of the operational strategic transport benefits has been carried out. This includes increased public transport network capacity, reduced train crowding, reduced station crowding, increased accessibility to key centres, increased public transport network reach and use, travel time savings, improved network resilience, bus network benefits, as well as improved conditions for road users as a result of mode shift towards public transport.

To inform the study, PTPM 2036 future year strategic transport model runs with and without the proposal have been used to assess the potential impacts in the vicinity of station precincts. The model runs with the proposal include additional land use growth that would not be possible without the proposal and associated induced traffic demands.

An overview of the modal access hierarchy and integration strategy applied to the design of Sydney Metro West stations is provided. The objective of the hierarchy is to ensure that the design of stations and their integration with other transport modes gives the highest priority to the most efficient and sustainable access modes including walking and cycling, public transport, taxis, and kiss and ride.

Integration of the proposal with the proposed station precincts is discussed, including consideration of safe and efficient integration of the pedestrian network, cycle network, public transport network and surrounding road network.

A more focussed assessment of potential transport benefits and impacts resulting from operation of proposed infrastructure is then provided for each station location, as well as for the Clyde stabling and maintenance facility and the service facility at Rosehill.

Passenger operational demands for each station, sourced from 2036 PTPM strategic transport model outputs, have been extracted using the Transport Modelling Analytics Platform (TMAP) tool to determine the number of customers entering and leaving proposed stations during the morning peak. Forecast mode of arrival has been used to inform infrastructure requirements, such as the need for bus infrastructure, kiss and ride facilities and footpath widening.

Station access and egress mode share data has also been used to assess the potential impact of the proposal on suburban rail patronage and overall public transport mode share at interchange stations, such as Westmead, North Strathfield and Sydney CBD, where passengers would transfer between existing Sydney Trains suburban rail stations and proposed metro stations.

Assessment of the pedestrian network and integration of the proposal with existing infrastructure has been carried out using pedestrian modelling to identify design features required to safely accommodate future pedestrian demands, as well as to achieve appropriate levels of customer comfort and experience in the use of proposed facilities. It is intended that all new walking infrastructure provided at station precincts and interchanges as part of the proposal inside and outside the station would aim to achieve a minimum Fruin level of service C. Pedestrian infrastructure performance assessment criteria are provided in Section 2.7.

To facilitate integration of proposed infrastructure with the existing cycle network, design features such as cycle parking have been investigated.

Interchange opportunities with the surrounding public transport network have also been investigated. In this regard, forecast 2036 PTPM[1] mode share has been used to inform the scale of potential interchange and customer transfers from other modes, including suburban rail and bus.

The need for seamless public transport integration at the proposed metro stations has been considered to cater for forecast demands and the need for altered, or enhanced bus infrastructure has been assessed so that appropriate infrastructure is provided.

Integration of proposed infrastructure with the surrounding road network, including assessment of impacts and operational performance of intersections has been carried out. This includes potential impacts on parking and consideration of impacts on property and business access in the vicinity of station precincts.

[1] PTPM Model Run R20305, 9-station Sydney Metro West with land use uplift for all 9 stations

The operational impacts of the proposal were assessed to test how the road network and key intersections surrounding proposed station precincts would operate in accordance with the performance criteria detailed in Table 5. The future year traffic impact assessment considered two scenarios, including:

- 2036 future year without the proposal
- 2036 future year with the proposal. This scenario includes additional land use growth that would not be possible without the proposal and associated induced traffic demands.

Whilst Sydney Metro West commencement of operations would be in 2030, the 2036 assessment year provides the benefit of demand ramp-up, representing a worst case assessment, which coincides with census years and available future year strategic transport modelling forecasts.

The assessment of the future operational year without the proposal was informed using Public Transport Projects Model (PTPM) outputs provided by Transport for NSW. This included estimates of future year demands likely to access precinct areas without the proposal being operational.

For the future operational year with the proposal, traffic volume forecasts were also informed using PTPM strategic transport model runs provided by Transport for NSW. These model runs consider the broader mode-shift from private transport to the proposed metro during this future operational year, as well as reflecting future population and employment growth.

A summary of traffic growth factors derived from PTPM strategic transport model outputs provided by Transport for NSW to expand 2021 traffic survey flows (adjusted to account for the impacts of the Covid-19 pandemic) to future year 2036 traffic flows with and without Sydney Metro West is provided in Table 3.

Table 3 Traffic growth factors – 2021 to 2036 with and without Sydney Metro West

Station location	Without Sydney Metro West	With Sydney Metro West
Westmead	1.23	1.34
Parramatta	1.14	1.18
Olympic Park	1.03	1.07
North Strathfield	0.91	0.93
Burwood North	0.86	0.86
Five Dock	0.89	0.89
The Bays	0.96	1.13
Pyrmont	1.11	1.13
Hunter Street (Sydney CBD)	1.27	1.26

The change in future year traffic demands with and without the proposal was applied at an intersection level on the road network surrounding station precincts and operational performance assessed using SIDRA Intersection 9 analysis software, which was also used to identify mitigations to meet and manage future demands, where appropriate.

2.4 Mitigation measures

The approach to management and mitigation of impacts is discussed in Chapter 6 and performance outcomes have been developed consistent with the Secretary's environmental assessment requirements for the proposal.

The performance outcomes identify measurable, performance-based standards for environmental management. Mitigation measures have been developed to avoid, reduce and manage the potential operational transport impacts of the proposal.

2.5 Data sources

The data in Table 4 was used to inform this operational transport assessment.

Table 4 Data sources

Data	Source
2021 AM and PM traffic and pedestrian flows	Traffic and pedestrian surveys commissioned by Sydney Metro
Global Traffic Statistics for each Station Precinct (Link Traversal Volumes, SA2 Volumes, VHT, VKT) – 2017 AM peak hour – 2036 AM peak hour without Sydney Metro West – 2036 AM peak hour with Sydney Metro West	PTPM
Station Access & Egress Mode Share – 2036 AM Peak without Sydney Metro West (Westmead, North Strathfield, Sydney CBD) – 2036 AM Peak with Sydney Metro West	PTPM
Station Pedestrian Movements by Direction – 2036 AM peak with Sydney Metro West	PTPM
Station Transfer, Entry and Exit movements for each SMW station – 2036 AM Peak Hour	ETCM
Departing Line Load, Boarding & Alighting movements for each Sydney Metro West station – 2036 AM Peak Hour	ETCM
Station Demand Matrices for each interchange station (Westmead, North Strathfield, Sydney CBD) – 2036 AM Peak Hour Station Matrices	ETCM

2.6 Assumptions

Assessment of base and future year operational traffic modelling scenarios was based on the following assumptions:

- Intersection geometries for unsignalised and signalised intersections were based on available aerial photography and site observations. In addition, Traffic Control Signal (TCS) plans were used to inform SIDRA modelling of signalised intersections
- SIDRA modelling has also been carried out for un-signalised intersections where required
- Existing base year modelling assumes observed pedestrian crossing volumes, while future base year modelling assumes future year pedestrian volumes calculated by applying a growth factor derived from future land use projections to existing pedestrian volumes. The future year with proposal scenario assumes the future year base pedestrian volumes in addition to station pedestrian volumes estimated from PTPM and ETCM strategic transport model outputs
- Phasing and timings for signalised intersections were based on information from TCS plans and Sydney Coordinated Adaptive Traffic System (SCATS) data
- Intersections were either assessed as standalone sites, alternatively as a network of intersections using SIDRA Intersection 9 analysis software
- Calibration of existing base year models was completed based on available aerial photography, site observations and SCATS data. Queue length survey data, as well as on-site observations were used to validate the performance of the base models
- Future year traffic movements for the 2036 without proposal scenario were informed by outputs from PTPM strategic transport model runs
- Future year traffic movements for the 2036 future year with proposal scenario were informed by outputs from PTPM strategic transport model runs
- PTPM demand forecast data by mode for each station, including walk, bus, light rail, kiss and ride, as well as park and ride was used to understand future arrivals and departures and modal breakdown at proposed stations
- Strategic model outputs used for future demands are forecasts based on assumed future land use and employment predictions. Should land use and employment assumptions used not eventuate, actual passenger arrivals and departure from stations would differ from those predicted.

2.7 Assessment criteria

Traffic operational performance was assessed at an intersection level. The performance of intersections was assessed in terms of degree of saturation and average vehicle delay (seconds). The latter was used to categorise performance into level of service categories ranging from A (good) to F (unsatisfactory).

The criteria adopted in this technical paper for intersection performance assessment are outlined in the following section.

2.7.1 Intersection performance

The operation of key intersections within the study area have been assessed using SIDRA Intersection 9 analysis software.

The commonly used measure of intersection performance, as defined by Transport for NSW, is vehicle delay. SIDRA Intersection determines the average delay that vehicles encounter and provides a measure of the level of service.

Table 5 shows the criteria that SIDRA Intersection adopts in assessing the level of service.

Table 5 SIDRA Intersection level of service criteria

Level of service	Average delay per Vehicle (sec/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity, requires other control mode
F	>70	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing

Source: Roads and Traffic Authority (2002) Guide to Traffic Generating Developments

2.7.2 Pedestrian infrastructure performance

In order to assess the performance of pedestrian infrastructure, the Fruin[2] level of service was assessed. The level of service describes the density of people walking in different situations and the level of comfort they experience. The Fruin walking level of service criteria are provided in Table 6.

[2] Fruin, John J. Pedestrian Planning and Design. New York: Metropolitan Association of Urban Designers and Environmental Planners, Inc., 1971

Table 6 Fruin walking level of service criteria

Level of service	Pedestrian volume (people/m/min)	Average area (m^2/person)	Description
A	23 or less	3.3 or more	Threshold of free flow. Convenient passing, conflicts avoidable.
B	23-33	2.3-3.3	Minor conflicts, passing and speed restrictions.
C	33-49	1.4-2.3	Crowded but fluid movement, passing restricted, cross and reverse flows difficult.
D	49-66	0.9-1.4	Significant conflicts, passing and speed restrictions, intermittent shuffling.
E	66-82	0.5-0.9	Shuffling walk: reverse, passing and cross flows very difficult; intermittent stopping.
F	82 or more	0.5 or less	Critical density, flow sporadic, frequent stops, contacts with others.

3 Baseline transport environment

3.1 Regional transport environment

3.1.1 Regional active transport network

The regional active transport network in the vicinity of the proposal consists of footpaths, shared paths, signalised road crossings and cycle networks. Recreational cycle and pedestrian facilities are located:

- In Parramatta Park
- In Sydney Olympic Park
- Along Parramatta River
- Along the foreshores of Iron Cove (known as the Bay Run), Rozelle Bay, Blackwattle Bay and Jones Bay.

Key off-road cycle corridors include:

- Rouse Hill to Parramatta via the North-West Transitway
- Liverpool to Parramatta running parallel to the rail line
- Parramatta to Sydney Olympic Park running parallel to the M4 Western Motorway
- Drummoyne to Sydney CBD via Victoria Road and ANZAC Bridge.

3.1.2 Regional public transport network

Rail services

Rail services are operated by Sydney Trains and NSW TrainLink, providing connections throughout Sydney, regional NSW and interstate. Major interchanges between rail lines are located at Parramatta, Lidcombe, Strathfield, Redfern, Central, Town Hall and Wynyard.

A map of the Sydney rail network, including all lines and destinations within the Sydney Metropolitan area is provided in Figure 2.

Figure 2 Sydney rail network

Light rail

The following light rail lines are within the vicinity of the proposal:

- The L1 Dulwich Hill Line operates between Dulwich Hill and Central via Lilyfield and Pyrmont. Light rail stops in Pyrmont are located in the vicinity of the proposed Pyrmont Station
- The L2 Randwick Line and L3 Kingsford Line operate from Randwick and Kingsford respectively to the Sydney CBD. A number of stops are in the vicinity of the proposal within the Sydney CBD
- Stage 1 of the Parramatta light rail is currently under construction and will connect Westmead to Carlingford via the Parramatta CBD and Camellia. Once complete, there will be light rail stops in the vicinity of the proposed Westmead and Parramatta metro stations
- On 15 June 2021 the NSW Government announced a commitment of $50 million for planning and development of Stage 2 of Parramatta Light Rail, which would connect Parramatta Light Rail Stage 1 and Parramatta CBD to Ermington, Melrose Park, Wentworth Point and Sydney Olympic Park, where it would connect to Sydney Metro West and the Sydney Trains rail network.

Sydney Metro

Sydney Metro City & Southwest (currently under construction) is located in the vicinity of the proposed Hunter Street Station.

Bus network

The bus network generally consists of cross-regional services, services that connect to metropolitan centres and strategic centres, local services that connect to rail stations, shopping centres, schools and hospitals, as well as on-demand services.

Major bus corridors in the vicinity of the proposal include:

- North-West Transitway
- Liverpool to Parramatta Transitway
- Windsor Road
- Parramatta Road
- Victoria Road.

Major bus interchanges are located at Parramatta CBD, Strathfield, Burwood and various locations throughout the Sydney CBD.

Many Sydney Metropolitan bus services run through the Sydney CBD in a north-south direction on Kent Street, Clarence Street, York Street, Castlereagh Street and Elizabeth Street, and in an east-west direction on Park Street and Druitt Street. Some bus services have also been redirected away from the core of the Sydney CBD to minimise congestion.

Key bus interchanges within the Sydney CBD are located at Wynyard Station, Martin Place Station, Town Hall Station and Central Station.

Ferry services

Ferry services operate along the Parramatta River, including the F3 Parramatta River Line between Parramatta and Circular Quay via Sydney Olympic Park and Balmain. Ferry stops located in the vicinity of the proposal include Parramatta and Sydney Olympic Park, as well as The Bays, which is served by a Captain Cook ferry that operates on cruise ship days from the city (King Street Wharf, Barangaroo).

3.1.3 Regional road network

Most major roads in the vicinity of the proposal carry high traffic volumes and experience congestion, particularly during peak periods. Motorways and principal arterial roads include:

- The M4 Western Motorway, which is the major east-west high-capacity and high-speed corridor linking the Blue Mountains and Western Sydney with Sydney CBD
- The A4/A44 corridor consisting of Great Western Highway, Parramatta Road, City West Link and ANZAC Bridge, which is an alternative east-west corridor linking Western Sydney with Sydney CBD
- The A40 corridor consisting of Old Windsor Road, parts of James Ruse Drive and Victoria Road, which links Parramatta with the Hills District and Sydney CBD
- The A6 corridor, including Silverwater Road, which is a major north-south corridor linking Heathcote and Carlingford via Bankstown and Silverwater
- The A3 corridor, including Homebush Bay Drive, which is a major north-south corridor linking Blakehurst and Mona Vale via Hurstville, Ryde, Macquarie Park and Pymble
- WestConnex M4-M5 Link and Rozelle Interchange (currently under construction) which will link the M4 and M5, along with connections to other major arterial roads such as the City West Link and Victoria Road.

Key transport initiatives currently planned for within or adjacent to the proposal include the Western Harbour Tunnel and Beaches Link.

3.2 Location context

Sydney Metro West would comprise a new 24-kilometre metro line with stations at Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont and Hunter Street (Sydney CBD), as shown in Figure 3.

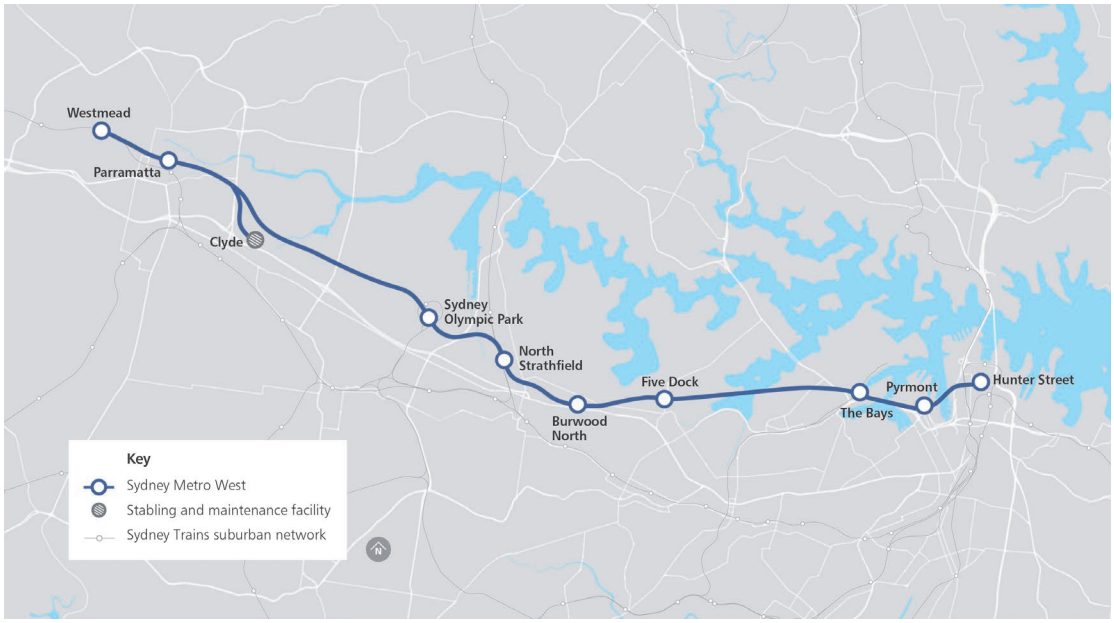


Figure 3 Location plan - Sydney Metro West

The following sections provide a description of the baseline transport environment at each of the station locations, as well as for the proposed Clyde stabling and maintenance facility and the service facility at Rosehill.

3.3 Westmead metro station

3.3.1 Introduction

Westmead metro station would be located immediately south of the existing Westmead Station, running parallel with the existing station, as shown in Figure 4. The existing rail corridor is the boundary between the Cumberland City Council Local Government Area (LGA) and the City of Parramatta LGA.

Westmead metro station would connect to the existing station providing interchange with the T1 Western Line and the T5 Cumberland Line. The station would also provide interchange with light rail and buses, including the North-West Transitway.

Westmead metro station is positioned within the heart of Westmead providing increased accessibility to major growth areas, including the Westmead health and education precinct, a significant cluster of health, research and education uses.

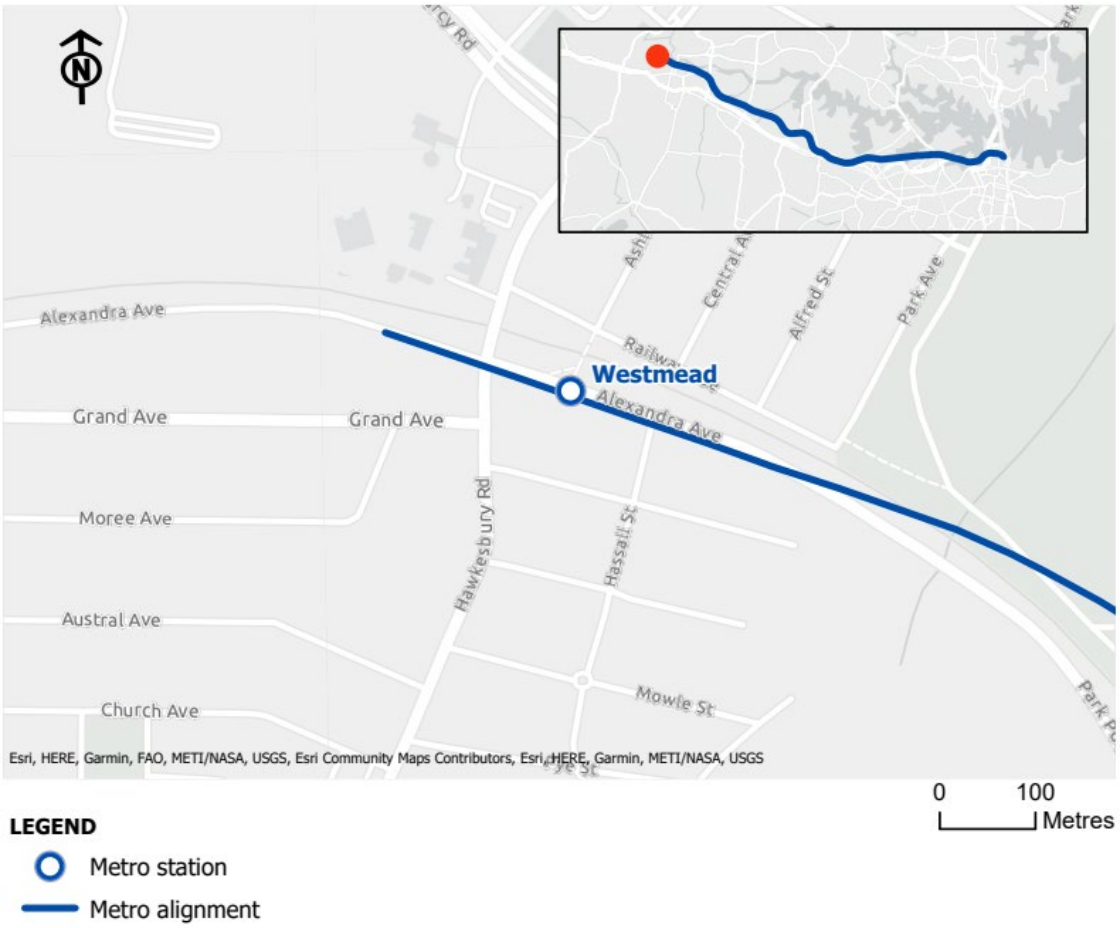


Figure 4 Station location - Westmead

3.3.2 Land use context

Westmead metro station would be an origin, destination and interchange station, providing accessibility to a major employment, health and education hub, as well as residential areas experiencing growth and renewal.

Westmead metro station is in an area of low and medium density residential development and includes local retail and business premises.

Land uses surrounding the Westmead metro station include the following:

- North of the existing Westmead Station is the Westmead town centre and the health and education precinct, including Westmead Hospital. Westmead town centre includes a range of businesses providing commercial and retail services. Many of the businesses are focussed on medical services, such as medical centres, consulting rooms, specialist health services, and health offices, and interspersed with retail, such as cafes
- North-east of the site, beyond the existing rail corridor, is a medium density residential area with apartments of three to four storeys
- North-west of the site is Western Sydney University's Westmead Campus, a tertiary education area which is currently under development. There are also primary and high schools in this area

- East of the site predominantly includes medium density residential apartments, with Parramatta Park beyond the residential area
- South of the site is a largely residential area, which includes mostly medium density residential buildings
- West of the site is lower density housing, with the Westmead Public School immediately to the south-west of the site.

Land uses within and surrounding the future station are shown in Figure 5.

Figure 5 Land zoning map – Westmead

3.3.3 Modes of travel/ key origins and destinations of trips

Journey to Work (2016) census data has been analysed to establish primary modes of travel for inbound and outbound workers for travel zones within 800 metres of the proposed station, which are presented in Figure 6.

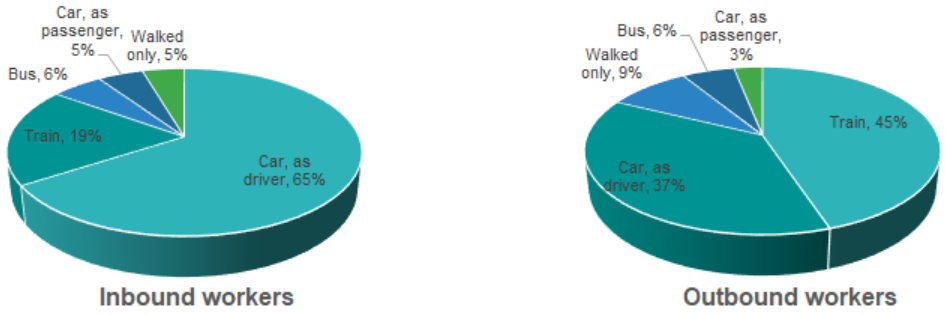


Figure 6 Existing mode share - Westmead

The Journey to Work (2016) census data has also been interrogated to extract the top five origins and destinations for inbound and outbound trips associated with an 800 metre station catchment, which are summarised in Table 7.

Table 7 Top five origins and destinations for inbound and outbound trips

Inbound	Outbound
18% - Parramatta	26% - Parramatta
9% - Blacktown	24% - Sydney Inner City
8% - Baulkham Hills	5% - North Sydney/ Mosman
7% - Merrylands - Guildford	5% - Auburn
6% - Blacktown - North	4% - Ryde/ Hunters Hill

Westmead is at a confluence of a number of major transport networks in Western Sydney, including train, bus and light rail (under construction). It is therefore well connected to most major regional destinations, such as Parramatta, Sydney CBD and areas to the north-west of Sydney. The location of the existing station and the surrounding transport network are shown on Figure 7.

Figure 7 Existing transport network – Westmead

3.3.4 Active transport network

Walking

Footpaths are provided along the majority of roads in the vicinity of the proposed metro station. Controlled crossings are provided at:

- Two of the three approaches of the Alexandra Avenue/ Hassall Street intersection
- Three of the four approaches of the Hawkesbury Road/ Alexandra Avenue intersection
- Across all approaches of the Hawkesbury Road/ Priddle Street, Hawkesbury Road/ Railway Parade and Hawkesbury Road/ Darcy Road intersections.

A staged pedestrian crossing is provided on the western approach of the Hawkesbury Road/ Darcy Road intersection. This crossing accommodates North-West Transitway buses which travel in dedicated bus lanes in the middle of the road and pick-up and drop-off passengers at bus stops located near the intersection.

Closer to the site, a zebra crossing is provided on Railway Parade, facilitating movements to and from the northern side of the existing Westmead Station. A raised zebra crossing is provided on Grand Avenue, accommodating movements to and from Westmead Public School.

Pedestrian counts were collected in 2021 at footpaths and signalised intersections in the vicinity of the proposed station precinct, which are summarised in Figure 8 and Figure 9 for the AM and PM peaks respectively.

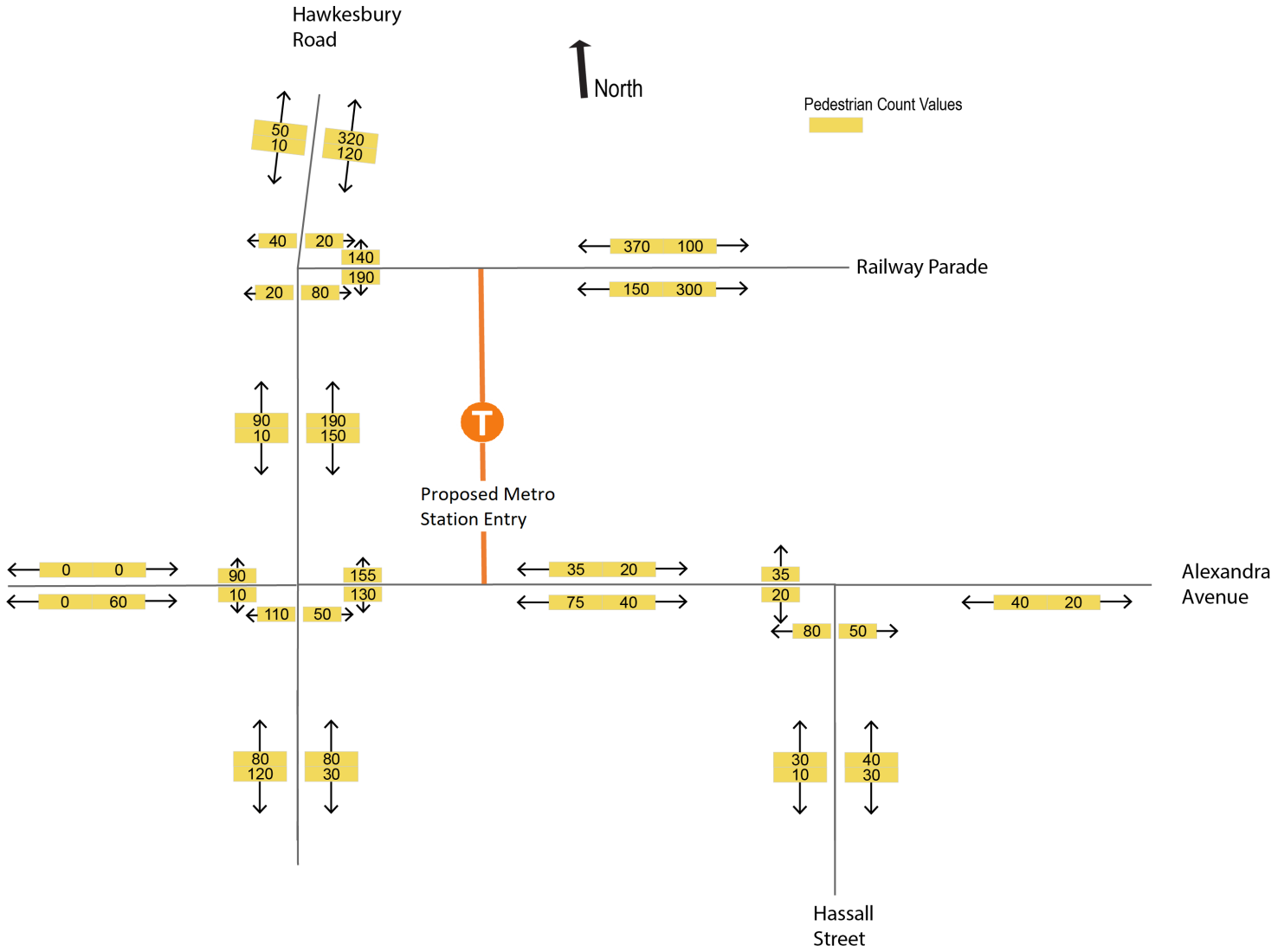


Figure 8 Existing AM peak hour pedestrian counts - Westmead (June 2021)

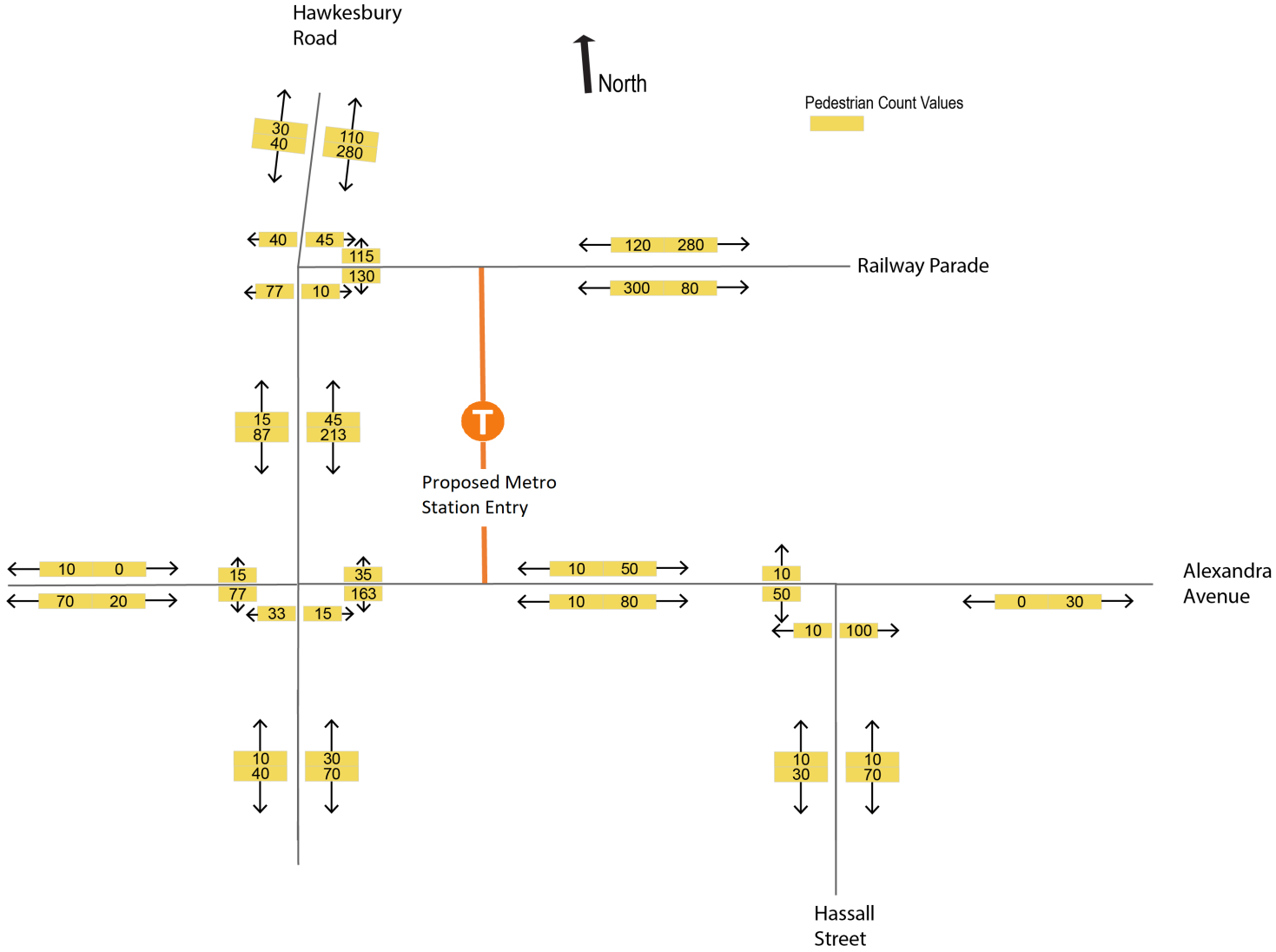


Figure 9 Existing PM peak hour pedestrian counts – Westmead (June 2021)

High levels of pedestrian activity occur around the existing Westmead Station and the health and education precinct located north of the rail line, with key pedestrian desire lines along Hawkesbury Road and Darcy Road. Darcy Road is a signposted high pedestrian activity area between east of Bridge Road and Hawkesbury Road.

Land use south of the rail line is predominately residential, with moderate pedestrian activity near the existing Westmead Station entrances and school, with typically higher hourly pedestrian volumes in the AM peak near the station than in the PM peak.

The busiest intersection (with respect to pedestrian activity) is the intersection of Hawkesbury Road/ Priddle Street with pedestrian volumes exceeding 600 pedestrians/ hour at a single crossing in the PM peak due to its close proximity to the school.

Pedestrian volumes are high on the east and west footpaths of Hawkesbury Road, at crossings on Hawkesbury Road and at side-streets north of Austral Avenue (especially at Priddle Street). Pedestrian refuge islands and zebra crossings along with traffic calming devices, such as speed humps feature throughout to accommodate these local trips.

Cycling

The cycle network surrounding Westmead metro station is shown in Figure 7 and consists of a low-difficulty on-road route along Queens Road and within Parramatta Park, as well as off-road shared paths on Darcy Road and Hawkesbury Road.

The off-road shared paths and cycle lanes provide east-west connectivity between Parramatta Park, the Westmead health and education precinct, and towards the north-western suburbs. Cyclists can cross Hawkesbury Road using a marked cycle path on the zebra crossing located north of Queens Road.

Cycle racks are located at the existing Westmead Station north and south entrances on Railway Parade and Alexandra Avenue, respectively. Cycle lockers are also provided about 100 metres east of the station on Railway Parade and Alexandra Avenue.

3.3.5 Public transport services

Bus services

Westmead is served by 14 bus routes operated by Transit Systems and Hillsbus, including two NightRide bus routes. Major bus stops are located in close proximity to the existing Westmead Station and Westmead health and education precinct along Darcy Road, Hawkesbury Road, Alexandra Avenue and Park Parade.

These roads form part of the North-West Transitway, which is a bus rapid transit route between Parramatta and Rouse Hill consisting of bus-only lanes and dedicated bus roadways.

Local buses also operate on the North-West Transitway and the local road network, providing connections to Wentworthville, Seven Hills, Blacktown and Merrylands.

Within the immediate surrounds of the station, bus stops on local roads are provided on Church Avenue, Pye Street and Good Street. The area is also served by 17 school bus routes.

A summary of key services stopping at the existing bus stops on Alexandra Avenue (IDs 214557 and 214511) is provided in Table 8.

Table 8 Existing bus services – Westmead (2021)

		Number of services	
Route	**Description**	**Weekday AM 7:00 – 9:00**	**Weekday PM 4:00 – 6:00**
660	Castlewood Dr – Parramatta Station	7	5
660	Parramatta Station -Castlewood Dr	2	8
661	Blacktown Station – Parramatta Station	4	4
661	Parramatta Station -Blacktown Station	2	6
662	Castle Hill Station – Parramatta Station	7	5
662	Parramatta Station – Castle Hill Station	2	6
663	Rouse Hill Station – Parramatta Station	8	7
663	Parramatta Station – Rouse Hill Station	0	10
664	Rouse Hill Station – Parramatta Station	5	12
664	Parramatta Station – Rouse Hill Station	2	6
665	Rouse Hill Station – Parramatta Station	19	8
665	Parramatta Station -Rouse Hill Station	7	15
705	Blacktown Station – Parramatta Station	5	4
705	Parramatta Station - Blacktown Station	3	4
711	Westpoint Bus Interchange – Parramatta Station	6	4
711	Parramatta Station - Westpoint Bus Interchange	2	6
712	Westmead Children's Hospital – Parramatta Station	1	4
712	Parramatta Station - Westmead Children's Hospital	0	1

Rail services

The existing Westmead Station is located directly adjacent to the proposed metro station. The station is served by the Blue Mountains Line operated by NSW TrainLink, the T1 North Shore and Western Line, as well as the T5 Cumberland Line on the Sydney Trains suburban network, which provide direct connections to Parramatta, Leppington and the Sydney CBD. Table 9 lists the number of services during weekday peak periods.

The station includes facilities like cycle racks, cycle lockers, taxi zone and commuter parking.

Table 9 Existing Blue Mountains Line and Sydney Trains suburban rail network services – existing Westmead Station

Line	Direction	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00– 6:00
T1	City to Emu Plains or Richmond	18	20
	Emu Plains or Richmond to City	17	21
T5	Richmond to Leppington	4	4
	Leppington to Richmond	5	2
BMT	Bathurst to Central	1	0
	Central to Lithgow and Bathurst	0	1

In addition to the Blue Mountains Line and suburban rail line services, the proposed metro station precinct would be serviced by the future Parramatta Light Rail. Light rail services will run along Hawkesbury Road with a new terminus stop currently under construction located at the corner of Hawkesbury Road and Railway Parade, north of the station.

3.3.6 Road network

The road network in the Westmead area is formed by two key roads, Hawkesbury Road in the north-south direction and Alexandra Avenue in the east-west direction. Hawkesbury Road north of Alexandra Avenue to Darcy Road is generally a four-lane regional road with a posted speed limit of 50km/h. The section of Hawkesbury Road south of Alexandra Avenue is a local road. At the intersection with Alexandra Avenue and across the rail line, Hawkesbury Road provides two lanes in each direction.

On the rail overbridge, there is a dedicated southbound bus lane separated by a raised median on the overbridge. This bus lane feeds directly into the bus lane on Alexandra Avenue. A school zone applies to Hawkesbury Road and its intersections north of Austral Avenue and south of Alexandra Avenue.

Hawkesbury Road is a major activity spine that connects the northern and southern areas of the catchment. The road runs along a ridge line and many of the east-west streets that connect into it feature steeply sloping topography. The bridge at Hawkesbury Road crosses over the existing rail corridor which divides the area in a cutting. Between Pitt Street in Parramatta and Wentworthville Station to the west, there is only one other north-south road connection across the rail corridor at Bridge Road, making Hawkesbury Road an important link within the Westmead precinct.

East of Hawkesbury Road, Alexandra Avenue is generally a two-lane regional road with a posted speed limit of 50 km/h and serves as the main Transitway (T-way) connection for bus routes connecting to Parramatta CBD via Park Parade. In the eastbound carriageway an existing bus stop and shelter is located opposite the entrance of Westmead Station, and the kerbside area is a 24-hour bus zone. In the westbound carriageway, a portion of the kerbside lane at the existing bus stop near the intersection of Hassall Street is dedicated as a 24-hour bus zone. West of Hawkesbury Road, Alexandra Avenue is a local road.

Hassall Street, Bailey Street, Priddle Street, Austral Avenue, Mowle Street and Pye Street are local roads with single traffic lanes per direction and posted speed limits of 50 km/h.

Railway Parade, to the north of the station, is a local road with single lane in each direction with a posted speed limit of 40 km/h providing access to the existing station and connecting Hawkesbury Road with Parramatta Park to the east. It features a substantial amount of commuter parking as well as a taxi zone.

The Great Western Highway, approximately one kilometre south of the proposed station, is an arterial (state) road that carries a high volume of traffic and connects into the Parramatta Outer Ring Road.

Table 10 provides AM and PM peak hour link volumes for major roads forming the precinct's road network based on traffic counts conducted in 2021.

Table 10 Existing peak hour traffic volumes by direction – Westmead (2021)

Road	Location	AM peak volume (vehicles per hour)		PM peak volume (vehicles per hour)	
		Light	Heavy[1]	Light	Heavy[1]
Hawkesbury Road	North of Railway Parade Northbound	792	44	351	45
Hawkesbury Road	North of Railway Parade Southbound	454	45	544	37
Hawkesbury Road	Mid-block along bridge Northbound	971	42	519	43
Hawkesbury Road	Mid-block along bridge Southbound	611	49	846	41
Hawkesbury Road	Between Alexandra Avenue and Grand Avenue Northbound	567	10	339	3
Hawkesbury Road	Between Alexandra Avenue and Grand Avenue Southbound	370	11	651	10
Alexandra Avenue	Between Hassall Street and Hawkesbury Road – Eastbound	483	40	322	33
Alexandra Avenue	Between Hassall Street and Hawkesbury Road – Westbound	402	32	386	41
Alexandra Avenue	West of Hawkesbury Road – Eastbound	386	3	228	2
Alexandra Avenue	West of Hawkesbury Road – Westbound	118	3	312	0
Hassall Street	Between Alexandra Avenue and Bailey Street – Northbound	377	4	104	1
Hassall Street	Between Alexandra Avenue and Bailey Street – Southbound	133	4	344	5
Railway Parade	East of Hawkesbury Road – Eastbound	275	4	250	2
Railway Parade	East of Hawkesbury Road – Westbound	255	10	392	9

Source: TfNSW Traffic surveys, June 2021

[1]Buses are included as heavy vehicles in the table

During the morning peak hour, higher traffic volumes are experienced eastbound on Alexandra Avenue and northbound on Hawkesbury Road and Hassall Street with the opposite occurring in the evening peak.

Baseline network performance for the AM and PM peak hours for key intersections in the vicinity of the proposed metro station is provided in Table 11. Note that observed traffic volumes for baseline intersection performance assessment have been adjusted as described in Section 2.2 to account for the impacts of the Covid-19 pandemic.

Table 11 Existing intersection performance – Westmead (2021)

Intersection	AM peak		PM peak	
	Average delay (sec)	LOS	Average delay (sec)	LOS
Hawkesbury Road/ Railway Parade	23	B	34	C
Hawkesbury Road/ Alexandra Avenue	53	D	42	C
Alexandra Avenue/ Hassall Street	16	B	17	B

In the morning peak the intersection at Hawkesbury Road/ Alexandra Avenue shows highest average delays of approximately 53 seconds, resulting in level of service D. Similar delay is experienced in the PM peak with approximately 42 seconds of average delay, resulting in level of service C. The performance is due to high existing demands and the fact that the intersections at both ends of the bridge operate as a single signalised intersection.

The intersection at Hawkesbury Road/ Railway Parade shows level of service C in the PM peak due to high levels of demand from the northern approach.

3.3.7 Parking arrangements

The existing parking arrangements in the proposed metro precinct include on-street restricted and unrestricted parking spaces, as well as commuter parking on Railway Parade. Figure 10 shows the location of the existing parking areas.

Timed ¼P, 1P and 2P parking restrictions are between 8:30 – 6:00 PM Monday-Friday and 8:30 – 12:30 PM Saturday (permit holders excepted). ½P parking spaces are restricted between 8:00 – 4:00 PM on school days.

Most of Hawkesbury Road has ‘No Stopping’ restrictions at all times. The exception is Hawkesbury Road, between Alexandra Avenue and Bailey Street, which only has ‘No Stopping’ restrictions between 8:30 – 9:30 AM and 3:30 – 6:30 PM.

Alexandra Avenue east of Hawkesbury Road is ‘No Stopping’ at all times while Alexandra Avenue west of Hawkesbury Road has a combination of restricted and unrestricted parking.

On Railway Parade a substantial amount of kerbside on-street parking is provided. Near the existing station entrance, a combination of ¼P restricted parking and taxi zone is provided on the northern side. Two accessible parking spaces and around 110 commuter parking spaces are provided on Railway Parade east of the station entrance.

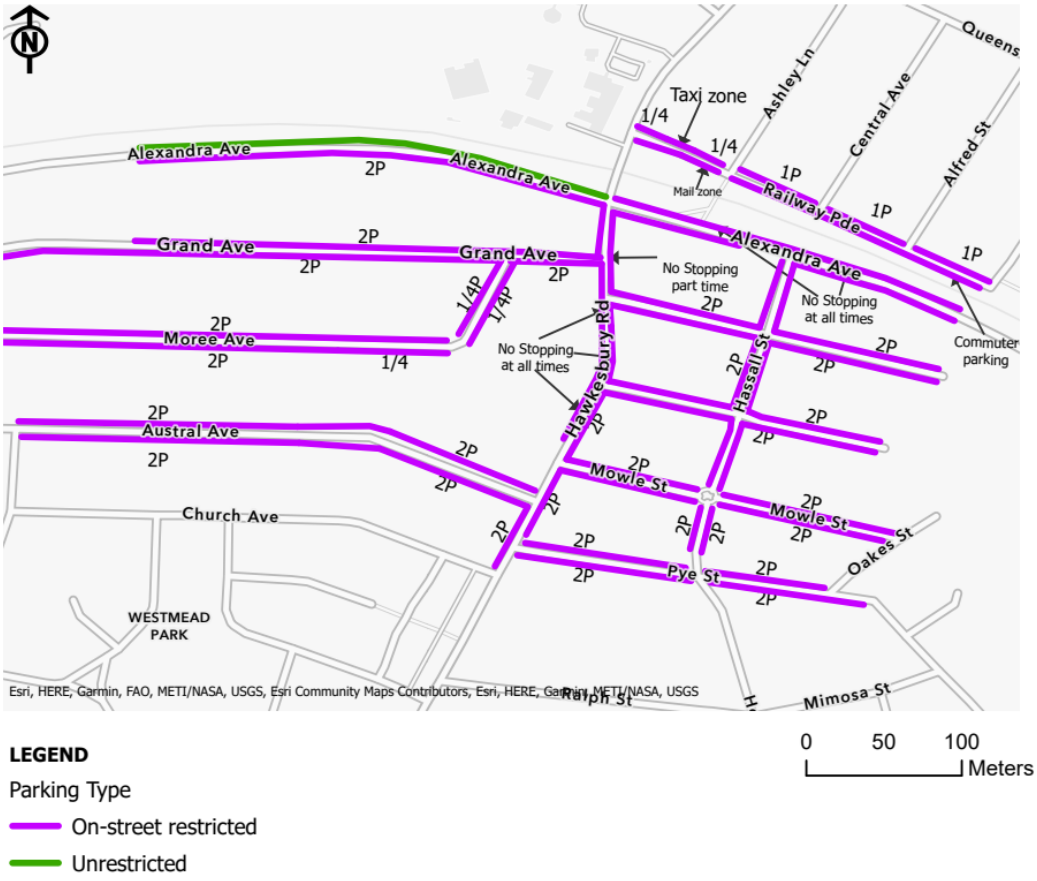


Figure 10 Existing parking locations – Westmead

3.3.8 Permanent changes to transport infrastructure under previous Sydney Metro West planning applications

There are no permanent changes to transport infrastructure as part of the previous Sydney Metro West planning application.

3.4 Parramatta metro station

3.4.1 Introduction

Parramatta metro station would be located within the City of Parramatta LGA in the Parramatta CBD. The proposed station precinct is positioned to the north of the existing Parramatta Station and is bounded by George Street to the north, Smith Street to the east, Macquarie Street to the south and Church Street to the west, as shown in Figure 11.

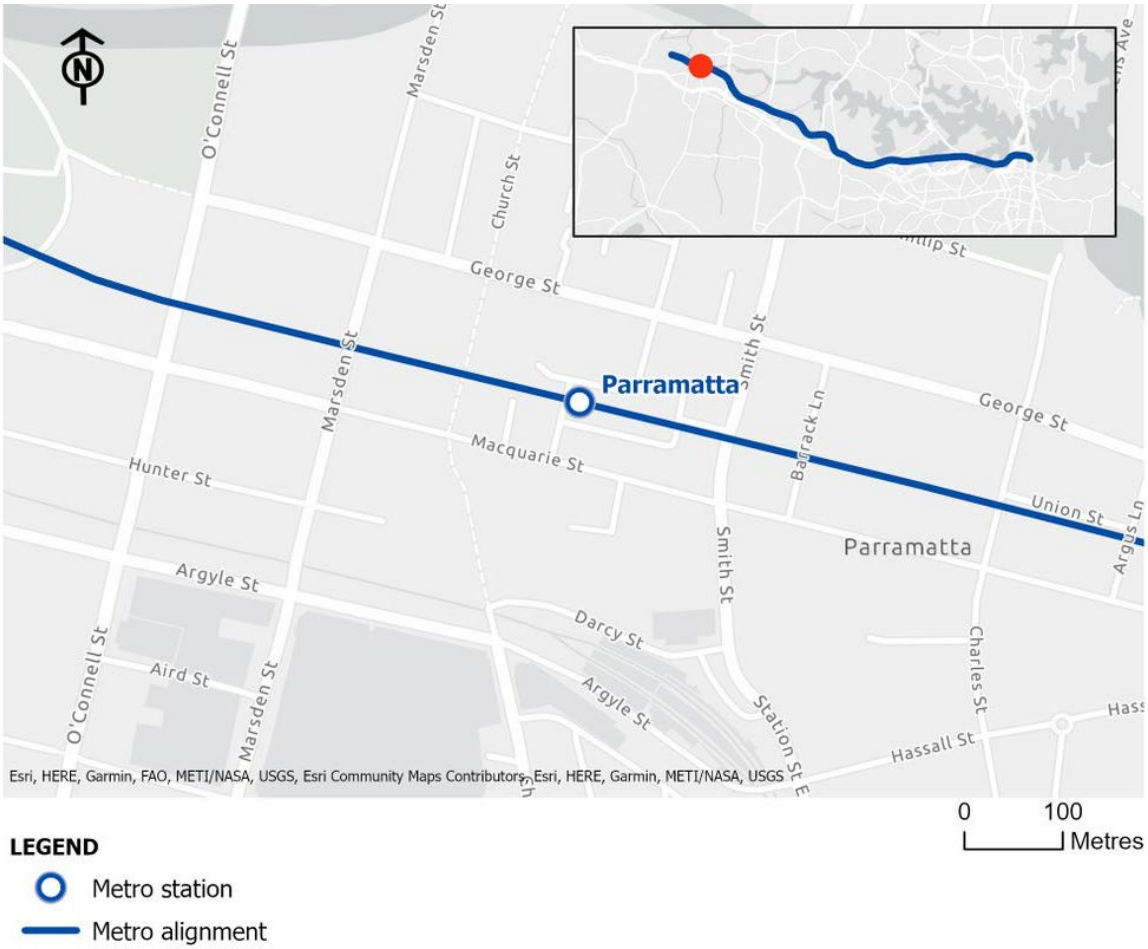


Figure 11 Station location – Parramatta

3.4.2 Land use context

The land within this area is zoned as commercial and mixed use with medium and high-density residential areas located to the east and north east of the Parramatta CBD. Public recreation areas are located mainly to the north along the Parramatta River in addition to other pockets scattered around the area, as shown in Figure 12.

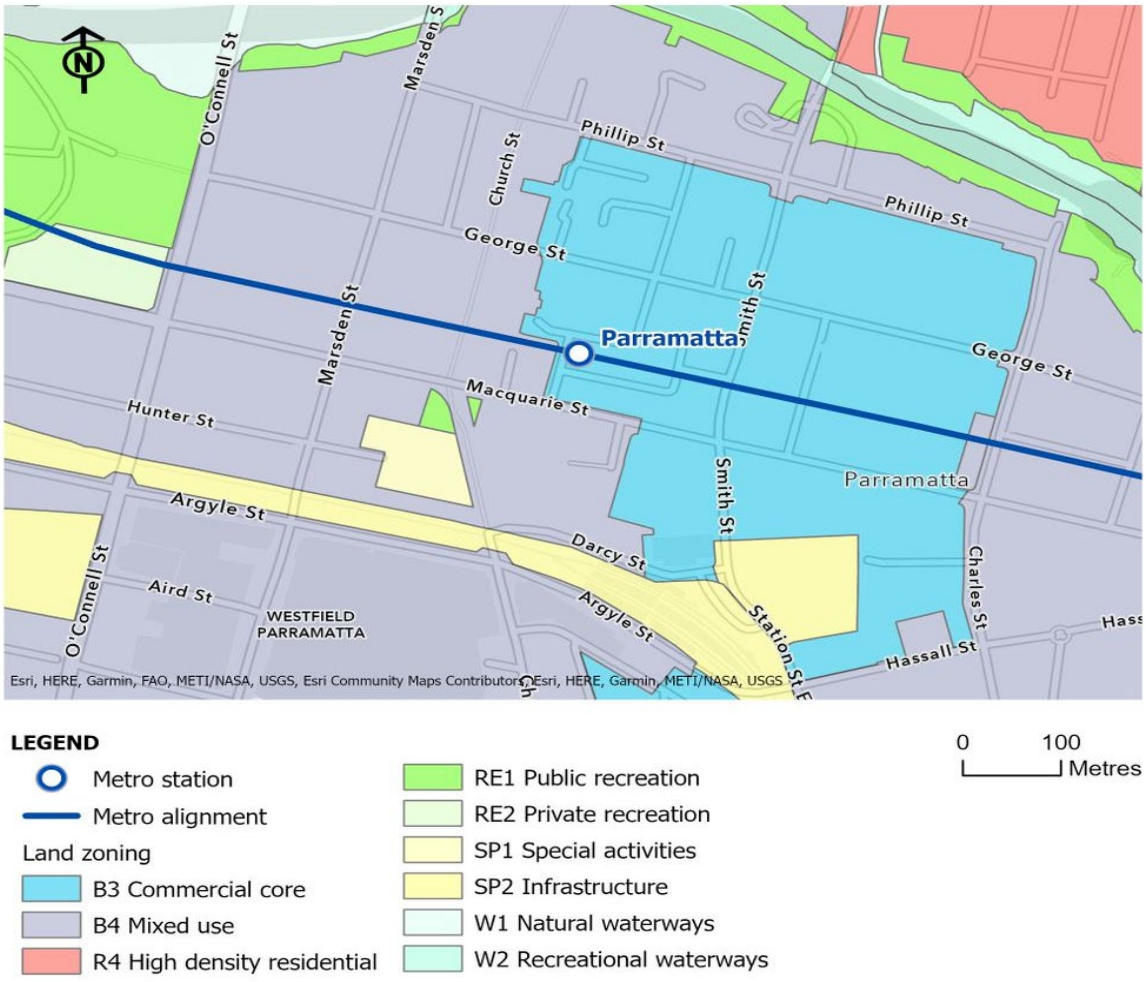


Figure 12 Land zoning map – Parramatta

The current land use and characteristics within the vicinity of the proposed station precinct are as follows:

- A mixture of commercial, community and retail premises in addition to emerging high-density residential developments
- Under construction or planned commercial and mixed-use developments that would increase the density and activity in the Parramatta CBD
- Parramatta Square, which is a new mixed-use development, is located to the south of the proposed station and is currently under construction. The site is located over 3 hectares of land and is due for completion in 2022
- Church Street 'Eat Street' which is a retail, food and beverage, and recreation area, is located within the Parramatta CBD and to the west of the proposed metro station. This road will include a pedestrianised zone when Parramatta Light Rail is operational and will be one of the key pedestrian desire lines within the precinct
- Several heritage buildings around Parramatta CBD, with several located in the vicinity of the proposed station, including the Roxy Theatre and Kia Ora Cottage
- World heritage listed Parramatta Park and the newly completed Bankwest Stadium are located to the west and north-west of the Parramatta CBD

- The Parramatta River which provides amenities, recreation, and active transport connections to the Parramatta CBD is located to the north of the Parramatta CBD
- A number of schools and educational institutes are located in the vicinity of the proposed station and in the wider station precinct, including Western Sydney University, Sydney Technical Institute, Parramatta Public School, and Arthur Philip High School.

3.4.3 Modes of travel/ Key origins and destinations of trips

Journey to Work (2016) census data has been analysed to establish primary modes of travel for inbound and outbound workers for travel zones within 800 metres of the proposed station, which are presented in Figure 13.

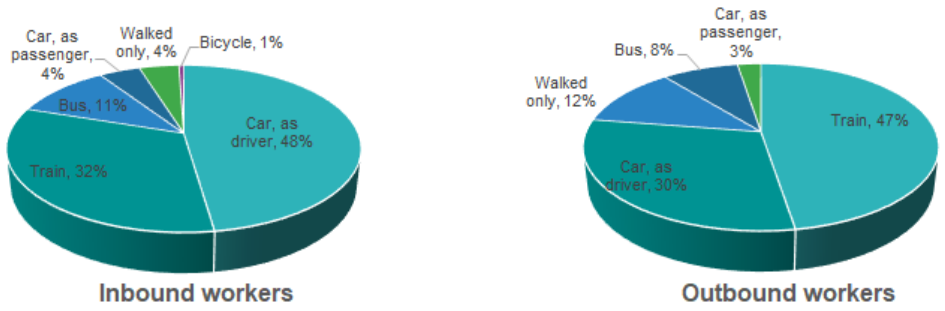


Figure 13 Existing mode share – Parramatta

The Journey to Work (2016) census data has also been interrogated to extract the top five origins and destinations for inbound and outbound trips associated with an 800 metre station catchment, which are summarised in Table 12 .

Table 12 Top five origins and destinations for inbound and outbound trips

Inbound	Outbound
14% - Parramatta	27% - Sydney Inner City
8% - Merrylands - Guildford	21% - Parramatta
6% - Blacktown	5% - Auburn
6% - Baulkham Hills	5% - North Sydney - Mosman
6% - Blacktown - North	5% - Ryde - Hunters Hill

Figure 14 shows the existing transport network within the proposed station precinct.

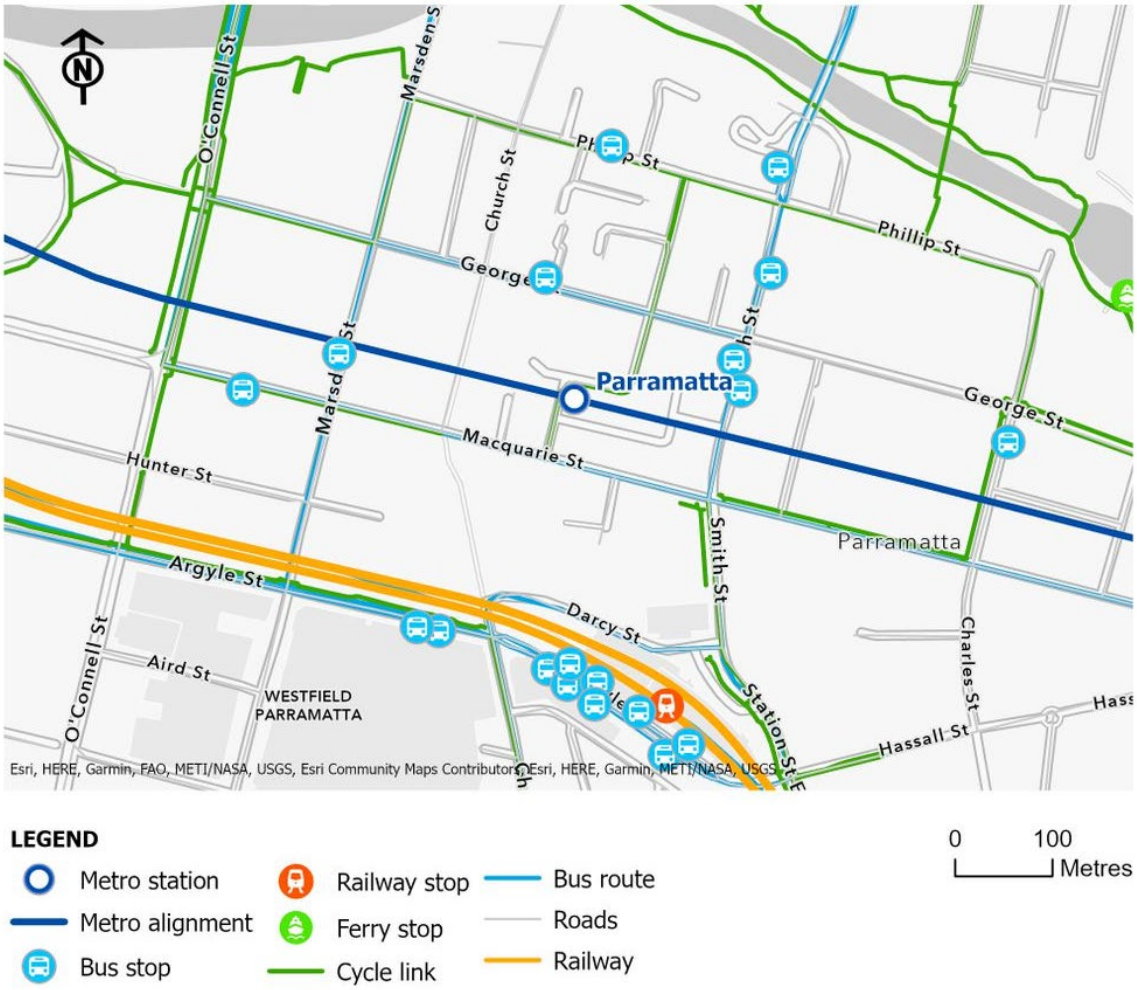


Figure 14 Existing transport network – Parramatta

3.4.4 Active transport network

Walking

The pedestrian network within the Parramatta CBD and around the proposed station precinct is well developed. Some roads, such as Church Street, Philip Street, Charles Street and Horwood Place are signposted as roads with high pedestrian activity.

According to City of Parramatta's Parramatta CBD Pedestrian Strategy (2017), 10 per cent of residents walk to their place of employment. The strategy also highlights that the Parramatta CBD pedestrian volumes are heavy around the train station, the bus interchange in addition to active streets, such as Church Street (Eat Street).

Pedestrian counts were collected in 2021 at footpaths and signalised intersections in the vicinity of the station precinct, which are summarised in Figure 15 and Figure 16 for the AM and PM peaks respectively.

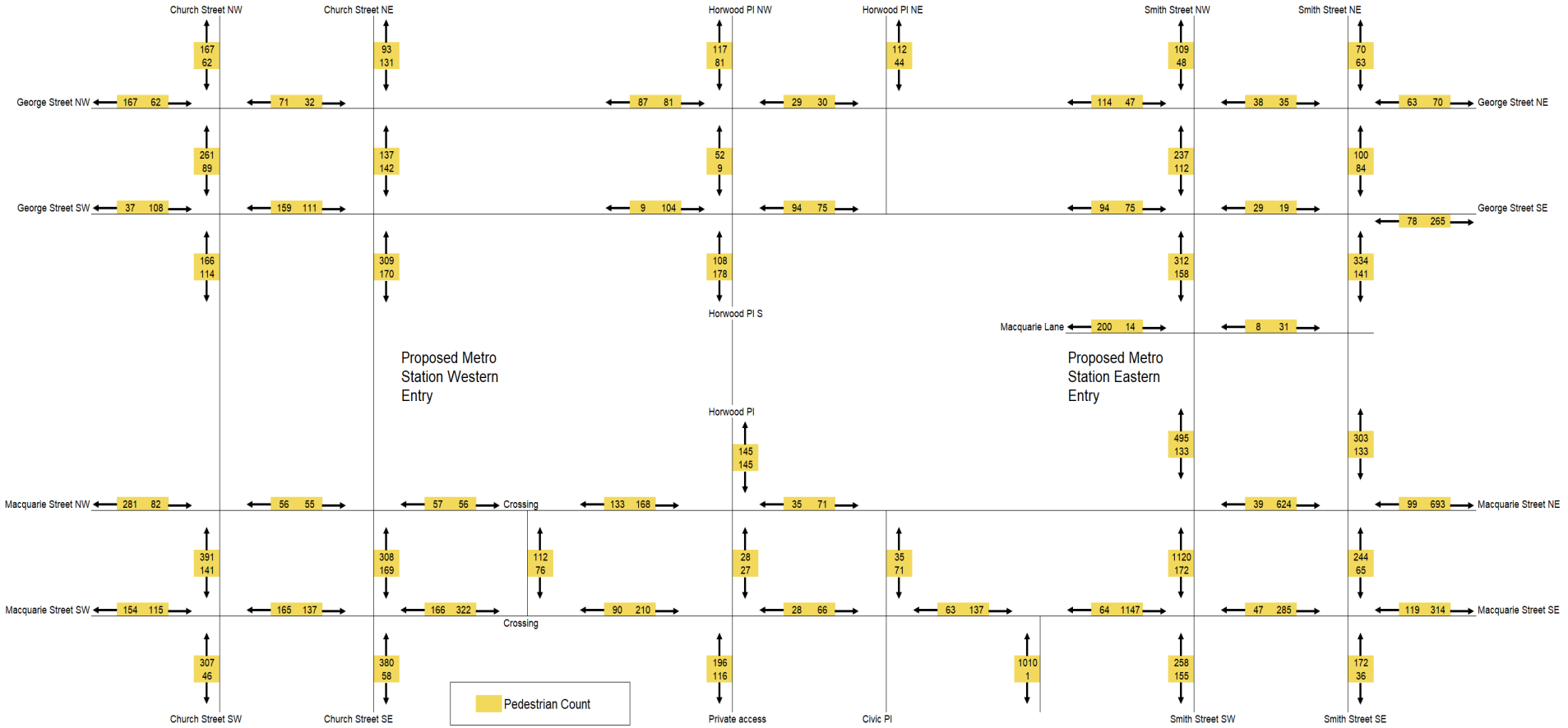


Figure 15 Existing AM peak hour pedestrian counts – Parramatta (March 2021)

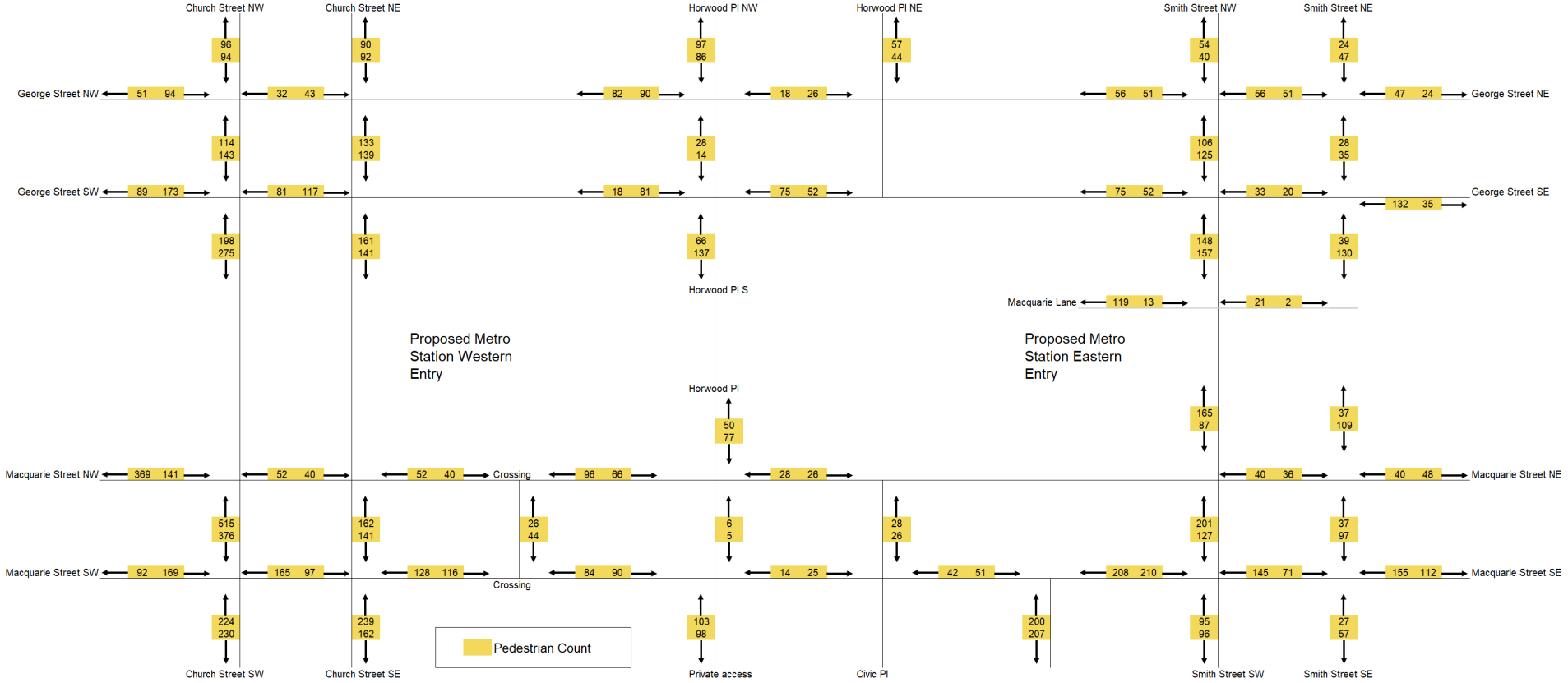


Figure 16 Existing PM peak hour pedestrian counts – Parramatta (March 2021)

Footpaths are provided along both sides of all roads around the station precinct. Some footpath closures are in place on Church Street and Macquarie Street due to Parramatta Light Rail construction and those footpaths are not used by pedestrians.

Signalised pedestrian crossings are provided at the intersections of Smith Street/ Macquarie Street, George Street/Smith Street, and Church Street/George Street. Current Parramatta Light Rail construction has restricted some footpath access in Macquarie Street and at the intersection with Church Street. Similarly, the mid-block signalised crossing on Macquarie Street west of United Lane is closed.

When Parramatta Light Rail is operational, it is expected that Church Street, being a major activity road, will act as the main north-south pedestrian link within the Parramatta CBD.

Cycling

The existing formal cycling network around the proposed station precinct is limited to the following routes, as shown in Figure 14.

- A shared path on O'Connell Street, north of Argyle Street
- An off-road cycling path along the Parramatta River.

The above facilities are referenced in the City of Parramatta Bike Plan for 2017 and the NSW Principal Bicycle Network, which also indicates proposed cycling links on Civic Link, George Street and Marsden Street.

The NSW cycleway finder highlights cycleways with high difficulty on Philip Street and Macquarie Street, in addition to a moderate difficulty route on Horwood Place (although the section of this cycleway between Macquarie Street and George Street would be closed as part of work under the previous Sydney Metro West planning application). Cycle use would be discouraged on Macquarie Street when light rail testing commences in 2022 to avoid cycle and light rail conflicts.

3.4.5 Public transport services

Bus services

The main existing bus interchange in Parramatta known as 'Parramatta Interchange' is located at Argyle Street near the existing Parramatta Station. It is a major transport hub allowing customers to easily transfer between the suburban rail network, intercity rail network, regional rail network, bus network, and the future Parramatta Light Rail. Bus stops are also located around the proposed station site on Smith Street and George Street, as shown in Figure 14. Dedicated bus lanes are provided on Smith Street in both directions.

There are 36 bus routes operating within the vicinity of the proposed metro station, which are listed in Table 13. In addition to the below listed services, there are around 40 school bus services and a number of night and off-peak services.

Table 13 Existing bus services – Parramatta (2021)

Route	Description	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
501	Central Pitt St to Parramatta via Victoria Rd	12	10
501	Parramatta to Central Pitt St via Victoria Rd	13	14
521	Eastwood to Parramatta	2	3
521	Parramatta to Eastwood	5	2
523	West Ryde to Parramatta	4	4
523	Parramatta to West Ryde	4	4
524	Ryde to Parramatta via West Ryde	4	5
524	Parramatta to Ryde via West Ryde	3	4
525	Strathfield to Parramatta via Sydney Olympic Park	4	5
525	Parramatta to Strathfield via Sydney Olympic Park	5	6
546	Epping to Parramatta via North Rocks & Oatlands	5	3
546	Parramatta to Epping via Oatlands & North Rocks	4	4
549	Epping to Parramatta via North Rocks	6	4
549	Parramatta to Epping via North Rocks	4	4
550	Macquarie Park to Parramatta via Epping	11	11
550	Parramatta to Macquarie Park via Epping	12	12
600	Hornsby to Parramatta	15	11
600	Parramatta to Hornsby	13	17
601	Rouse Hill Station to Parramatta via Hills Showground	7	8

Route	Description	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
601	Parramatta to Rouse Hill Station via Hills Showground	9	9
603	Rouse Hill Station to Parramatta via Glenhaven	5	3
603	Parramatta to Rouse Hill Station via Glenhaven	3	4
604	Dural to Parramatta via Castle Hill	3	4
604	Parramatta to Dural via Castle Hill	3	4
606	Winston Hills to Parramatta	7	4
606	Parramatta to Winston Hills	5	5
609	Parramatta to North Parramatta (Loop Service)	5	5
625	Pennant Hills to Parramatta	4	4
625	Parramatta to Pennant Hills	4	4
706	Blacktown to Parramatta via Winston Hills	2	1
706	Parramatta to Blacktown via Winston Hills	2	4
900	Parramatta Free Shuttle	10	10

Rail services

The existing Parramatta Station is located around 200 metres to the south of the proposed metro station and is served by services listed in Table 14. The station is accessible and compliant under the *Disability Discrimination Act 1992* (DDA compliant) and includes facilities like cycle racks, cycle lockers, taxi zone and a kiss and ride area.

Table 14 Existing Sydney Trains suburban rail network rail services – existing Parramatta Station

Line	Direction	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
T	Emu Plains or Richmond to City	24	38
	City to Emu Plains or Richmond	33	45
T2	Parramatta to City	8	8
	City to Parramatta	8	8
T5	Leppington to Richmond	5	4
	Richmond to Leppington	4	4

In addition to Sydney Trains suburban rail services, the proposed metro station precinct will be served by the future Parramatta Light Rail with services running on Macquarie Street and Church Street. A new stop “Parramatta Square Stop”, which is located on Macquarie Street, is currently under construction.

Ferry services

Parramatta ferry wharf is located around 600 metres north-east of the proposed metro station and provides ferry services as part of the Parramatta River Line F3 that connects Parramatta with Circular Quay. Details of ferry services are provided in Table 15.

Table 15 Ferry services - Parramatta (2021)

Line/ Direction	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
F3 – Parramatta River		
Parramatta River to Circular Quay	2	2
Circular Quay to Parramatta River	2	2

3.4.6 Road network

The proposed metro station precinct is bounded by the following roads:

- George Street to the north
- Macquarie Street to the south
- Smith Street to the east
- Church Street to the west.

George Street is a single carriageway street with two lanes in each direction and a posted speed limit of 40 km/h. A local road, George Street runs east-west with the kerb-side lanes on each side used for parking. The road operated as one way (in the eastbound direction) till the end of 2019, when it was converted to two way. The Parramatta free shuttle service stops near the corner of George Street and Church Street and has a frequency of 10 services during each of the AM and PM peak periods. When Parramatta Light Rail becomes operational in 2023, George Street will intersect with light rail operations running on Church Street.

Macquarie Street, a local road, operates as a one-way road (eastbound) between O'Connell Street and Pitt Street. It also operates as a one-way road (westbound) to the east of O'Connell Street with a posted speed of 50 km/h. A section of the road is closed for general traffic due to Parramatta Light Rail construction, except for a small number of vehicles accessing surrounding developments in addition to construction vehicles.

When Parramatta Light Rail is operational in 2023, sections of Macquarie Street between Church and Smith Street will be a shared pedestrian and light rail zone. A westbound and eastbound traffic lane will be maintained to provide access to Parramatta Square development west of Smith Street. Also, an eastbound traffic lane will be provided between Marsden Street and Horwood Place to provide access to surrounding developments. Arrangements for infrequent ceremonial vehicles east of Horwood Place will also be provided.

Smith Street is a local road and is a single carriageway south of George Street and a dual carriageway to the north of George Street. It generally has two lanes in each direction, of which large sections of the kerb-side lane between Darcy Street and Victoria Road is a dedicated bus lane and the other lane is a general traffic lane with storage lanes for right turning vehicles. The road has a posted speed limit of 40 km/h and parking is not allowed along this road. The road is a major bus link with a number of bus stops provided on both sides and serving many bus routes.

Church Street is a north-south local road that is currently closed to traffic and active transport due to Parramatta Light Rail construction. When Parramatta Light Rail is operational, it is expected that Church street will operate as an active street, that is referred to as "Eat Street". The road will be pedestrianised, except for light rail movements, with pedestrian crossings provided at intersections with George Street and Macquarie Street.

In addition to the above roads, Horwood Place dissects the proposed station precinct running north-south providing access to surrounding developments and off-street parking. It also provides on-street parking and acts as a cycling link connecting George Street and Macquarie Street; however, the southern end is currently closed due to Parramatta Light Rail construction. The section of Horwood Place between Macquarie Street and George Street would be closed as part of work under the previous Sydney Metro West planning application.

Macquarie Lane is an access road that connects the station's precinct with Smith Street and the wider road network. It provides rear access to surrounding developments and off-street parking spaces, as well as exit from the existing multi-storey car park, which will be demolished as part of work under the previous Sydney Metro West planning application.

Table 16 below provides AM and PM peak hour link volumes for major roads forming the precinct's road network based on traffic counts conducted in March 2021.

Table 16 Existing peak hour traffic volumes by direction - Parramatta (2021)

		AM peak volume (vehicles per hour)		PM peak volume (vehicles per hour)	
Road	**Location**	**Light**	**Heavy[3]**	**Light**	**Heavy[3]**
George Street	Eastbound- mid-block between Smith Street and Church Street	421	9	295	9
George Street	Westbound- mid-block between Smith Street and Church Street	237	16	308	10
Church Street	Northbound- mid-block between George Street and Macquarie Street	N/A[1]	N/A	N/A	N/A
Church Street	Southbound- mid-block between George Street and Macquarie Street	N/A[1]	N/A	N/A	N/A
Smith Street	Northbound- mid-block between George Street and Macquarie Street	350	65	271	69
Smith Street	Southbound- mid-block between George Street and Macquarie Street	300	79	207	69
Macquarie Street	Eastbound- mid-block between Horwood Pl and Marsden Street	N/A[2]	N/A	N/A	N/A
Macquarie Street	Westbound- mid-block between Horwood Pl and Marsden Street	N/A[2]	N/A	N/A	N/A
Macquarie Street	Eastbound- mid-block between Horwood Pl and Smith Street	4	0	13	0
Macquarie Street	Westbound- mid-block between Horwood Pl and Smith Street	24	9	18	2

Source: TfNSW Traffic surveys, March 2021

[1]Church Street is closed in both directions for Parramatta Light Rail construction.

[2]Maquarie Street is closed in both directions for Parramatta Light Rail construction except for maintained access to developments between Church Street and Marsden Street.

[3]Buses are included as heavy vehicles in the table

Baseline network performance for the AM and PM peak hours for key intersections in the vicinity of the proposed metro station is provided in Table 17. Note that observed traffic volumes for baseline intersection performance assessment have been adjusted as described in Section 2.2 to account for the impacts of the Covid-19 pandemic.

Table 17 Existing intersection performance - Parramatta (2021)

Intersection	AM peak		PM peak	
	Average delay (sec)	LOS	Average delay (sec)	LOS
George Street/Marsden Street	18	B	20	B
George Street/ Church Street[1]	11	A	10	A
George Street/Smith Street	38	C	36	C
Macquarie Street/Marsden Street[2]	11	A	13	A
Macquarie Street/Smith Street[3]	14	A	14	A
Smith Street/Macquarie Lane[4]	4	A	4	A
George Street/Horwood Place[4]	5	A	5	A
Macquarie Street/Horwood Place[4]	5	A	5	A

[1]Church Street north-south movements are closed.

[2]Marsden Street eastern approach movements are very low and negligible due to Parramatta Light Rail construction.

[3]Macquarie Street eastbound movements are closed. Westbound movement is limited to one lane used by local and Parramatta Light Rail construction traffic.

[4]The worst movement delay is reported as the overall delay for priority (un-signalised) intersections.

Modelled intersection performance indicates that all intersections perform at level of service C or better during the AM and PM peak hours. The current intersection layouts of several intersections will change when Parramatta Light Rail is operational in 2023.

3.4.7 Parking arrangements

Existing parking arrangements in the vicinity of the proposed metro station include both on-street and off-street parking. On-street parking consists of free and paid parking. There are some paid on-street parking spaces along Horwood Place (although these will be removed as part of work under the previous Sydney Metro West planning application. On-street paid parking is also provided on sections of George Street, particularly near Horwood Place. Parking is not allowed on Smith Street.

In addition to on-street parking, there are a number of off-street facilities within the precinct. Figure 17 shows the location of on street and off-street parking areas within the proposed station precinct.

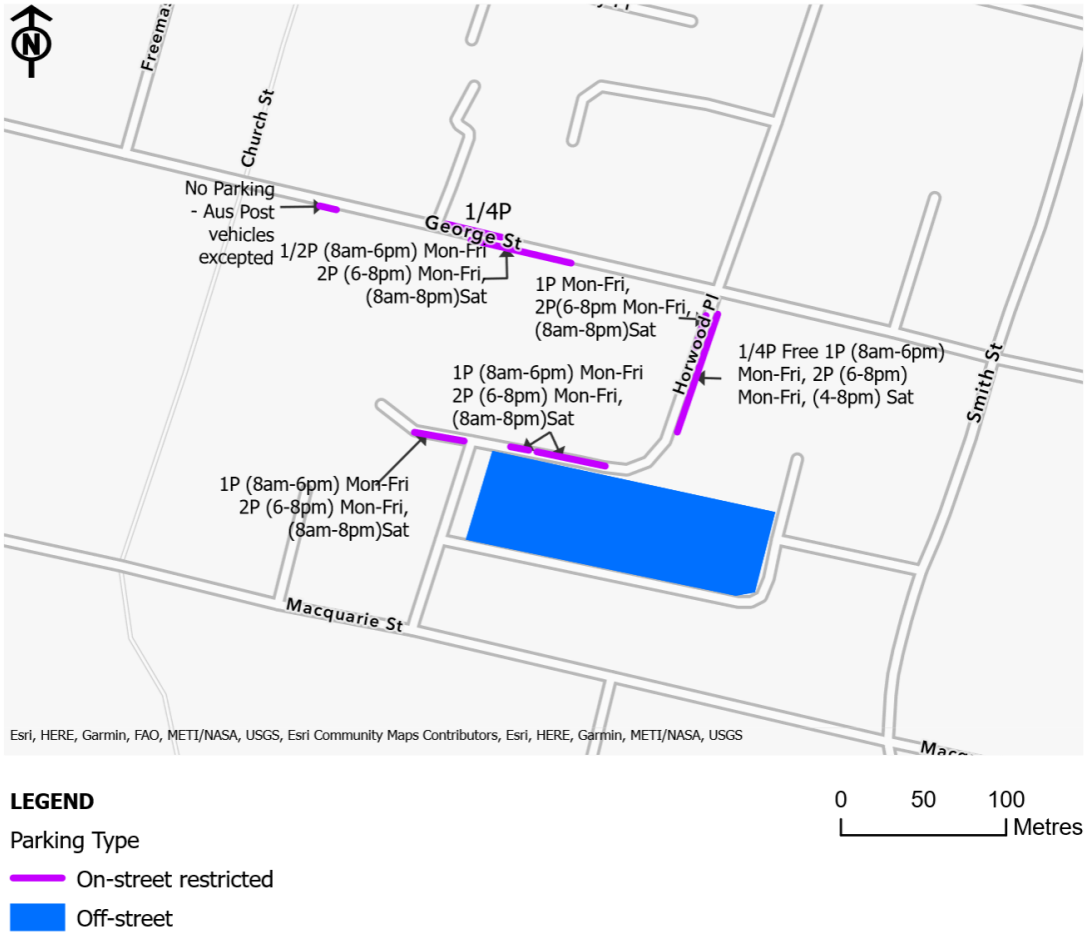


Figure 17 Existing Parking locations – Parramatta

The existing multi-storey car park that is located within the proposed station precinct that includes around 768 spaces will be demolished as part of work under the previous Sydney Metro West planning application. This multi-storey car park is currently accessed through Horwood Place with an exit into Macquarie Lane and Smith Street.

3.4.8 Permanent changes to transport infrastructure under previous Sydney Metro West planning applications

The following permanent changes to transport infrastructure will occur as part of the previous Sydney Metro West planning application:

- Permanent removal of all on-street parking on Horwood Place (up to 30 spaces)
- Permanent removal of around 768 parking spaces as part of the multi-level off-street car park in Horwood Place.

3.5 Sydney Olympic Park metro station

3.5.1 Introduction

Sydney Olympic Park metro station would be located in the central precinct of Sydney Olympic Park, a suburb within the City of Parramatta LGA that is managed by the Sydney Olympic Park Authority. A nationally significant event precinct catering for large sports, music, arts, cultural and civic events, the area is characterised by large venues and iconic stadia set along wide avenues and forecourts.

The precinct in which the station is located is situated south of the existing Olympic Park Station and is bounded by Herb Elliott Avenue to the north, Olympic Boulevard to the west and Figtree Drive to the south, as shown in Figure 18.

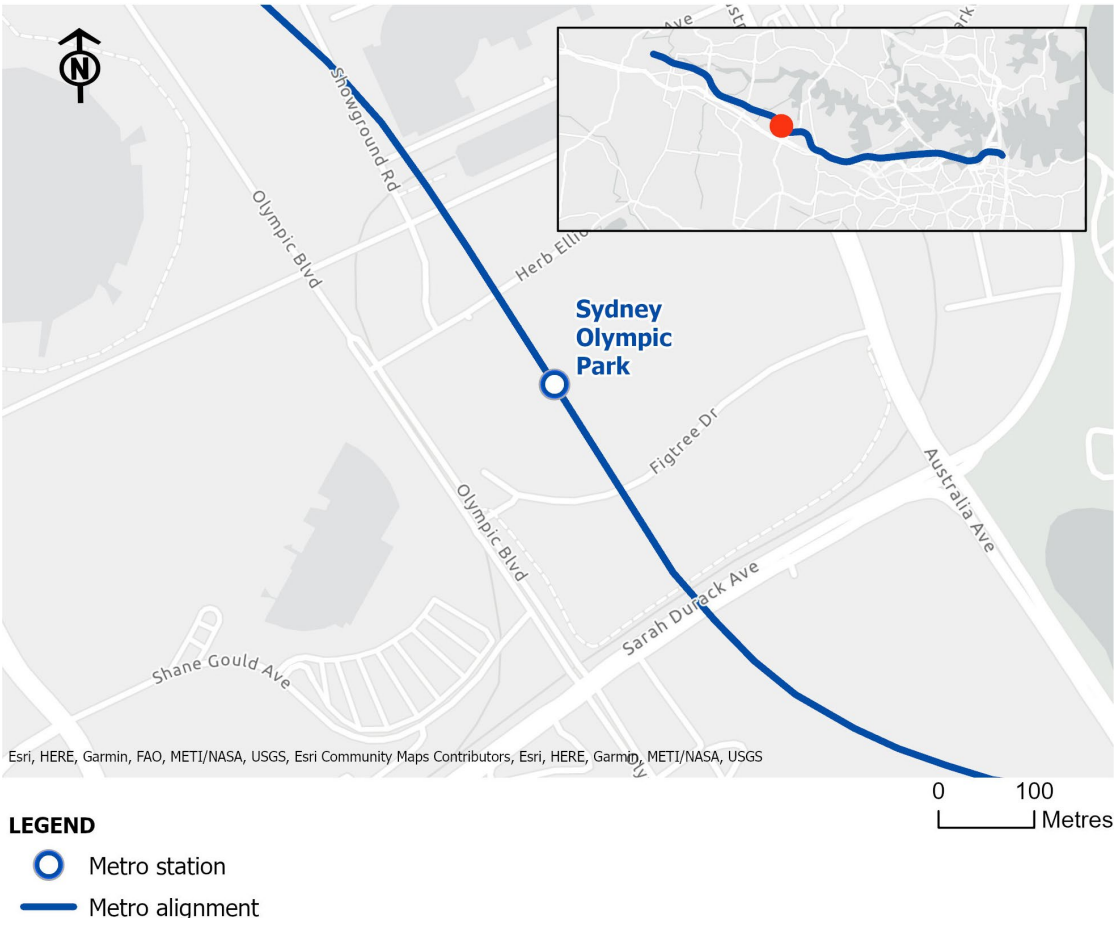


Figure 18 Station location – Sydney Olympic Park

3.5.2 Land use context

Land uses within the station precinct and surrounding area are primarily zoned as mixed use, with public recreation and environmental conservation and management lands to the east of the central precinct, as shown in Figure 19.

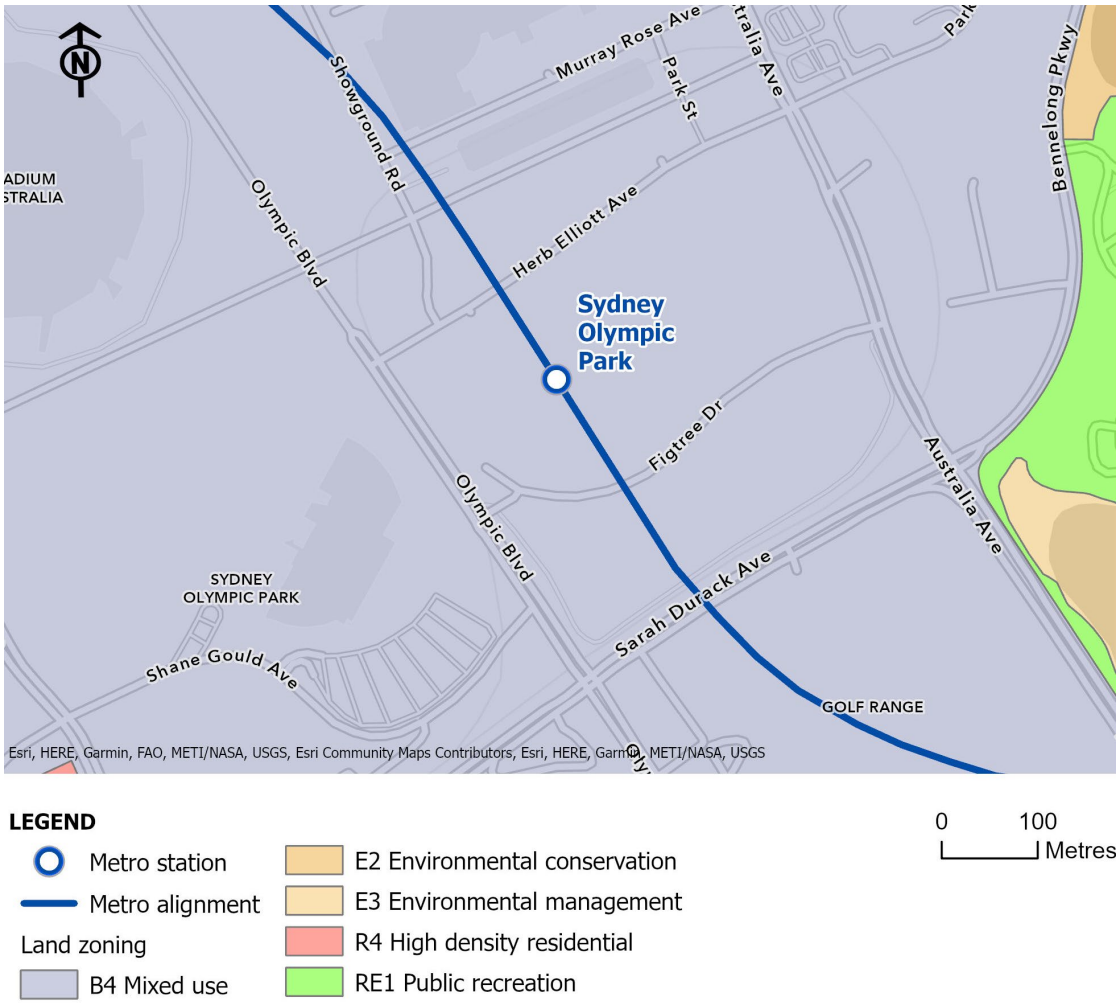


Figure 19 Land zoning map - Sydney Olympic Park

The current land use and characteristics of Sydney Olympic Park and the lands within the vicinity of the proposed station precinct are as follows:

- Mixed use zoning within the station precinct, extending further to the north, east, south and west to Stadium Australia and Sydney Olympic Park
- Public recreation zoning east of the station precinct, with environmental conservation and management land uses within this zoning parcel.

The existing environment and future development of Sydney Olympic Park is guided by a range of strategic plans:

- Sydney Olympic Park was designated as a separate suburb in 2009 and later identified as a key strategic centre within the Central City District in the 2018 Greater Sydney Regional Plan
- The future growth of Sydney Olympic Park is guided by The Master Plan 2030, developed by the Sydney Olympic Park Authority with the vision to reinvigorate the area into a great place to live and work, built sustainably on its Olympic Legacy
- The Sydney Olympic Park metro station is centred on a large open space between Herb Elliott Avenue and Figtree Drive that will serve as a vibrant mixed-use town centre for Sydney Olympic Park
- The centre has been identified to accommodate a further 10,000 dwellings (23,000 residents) and 34,000 workers by 2030.

3.5.3 Modes of travel/key origins and destinations of trips

Journey to Work (2016) census data has been analysed to establish primary modes of travel for inbound and outbound workers for travel zones within 800 metres of the proposed station, which are presented in Figure 20.

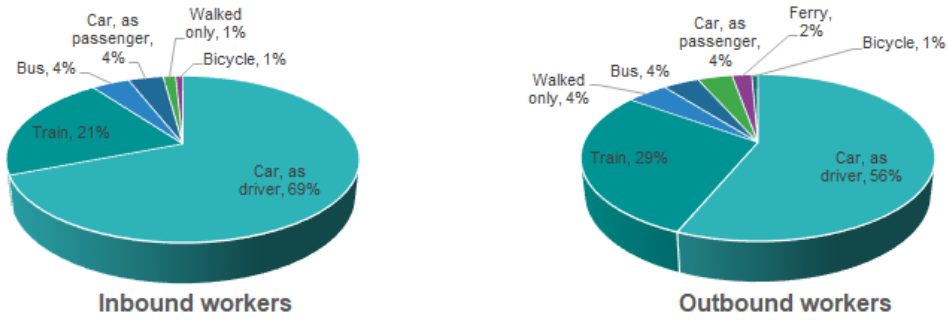


Figure 20 Existing mode share - Sydney Olympic Park

The Journey to Work (2016) census data has also been interrogated to extract the top five origins and destinations for inbound and outbound trips associated with an 800 metre station catchment, which are summarised in Table 18.

Table 18 Top five origins and destinations for inbound and outbound trips

Inbound	Outbound
7% - Parramatta	26% - Sydney Inner City
7% - Auburn	18% - Auburn
7% - Strathfield, Burwood, Ashfield	6% - Ryde, Hunters Hill
4% - Merrylands, Guildford	6% - Strathfield, Burwood, Ashfield
4% - Baulkham Hills	5% - Parramatta

Figure 21 shows the existing traffic and transport network within the proposed station precinct.

Figure 21 Existing transport network – Sydney Olympic Park

3.5.4 Active transport network

Walking

The pedestrian network around the Sydney Olympic Park metro station site is well established, with wide footpaths and large, paved pedestrian areas for the movement and storage of large crowds during event mode. These open spaces typically lack enclosure or vibrancy that might be expected in a traditional town centre, with little activation or programming in non-event mode to stimulate the area.

There are no signalised intersections or pedestrian crossing facilities surrounding the precinct area. A single staged crossing through the median on Olympic Boulevard provides refuge for pedestrians between the precinct area and nearby stadiums.

The surrounding local roads of Herb Elliott Avenue, Showground Road and Figtree Drive carry low vehicle volumes and have 40 km/h signposted speed limits. In addition, vehicle movements and speeds are restricted through the precinct area by a traffic management plan during event modes.

From the wider network, the proposed station can be accessed from signalised pedestrian crossings at the intersections of Sarah Durack Avenue/Olympic Boulevard, Sarah Durack Avenue/Australia Avenue and Australia Avenue/Herb Elliott Avenue. However, distances between crossings are more than 400 metres, increasing the likelihood of pedestrians attempting to cross at unprotected locations.

South of the proposed site, pedestrian activated signals are located on the Homebush Bay Drive ramps at the Homebush Bay Drive/Australia Avenue/Underwood Road roundabout.

Pedestrian counts were collected in 2021 at footpaths and signalised intersections within the vicinity of the precinct area and are summarised in Figure 22 and Figure 23 for the AM and PM peaks.

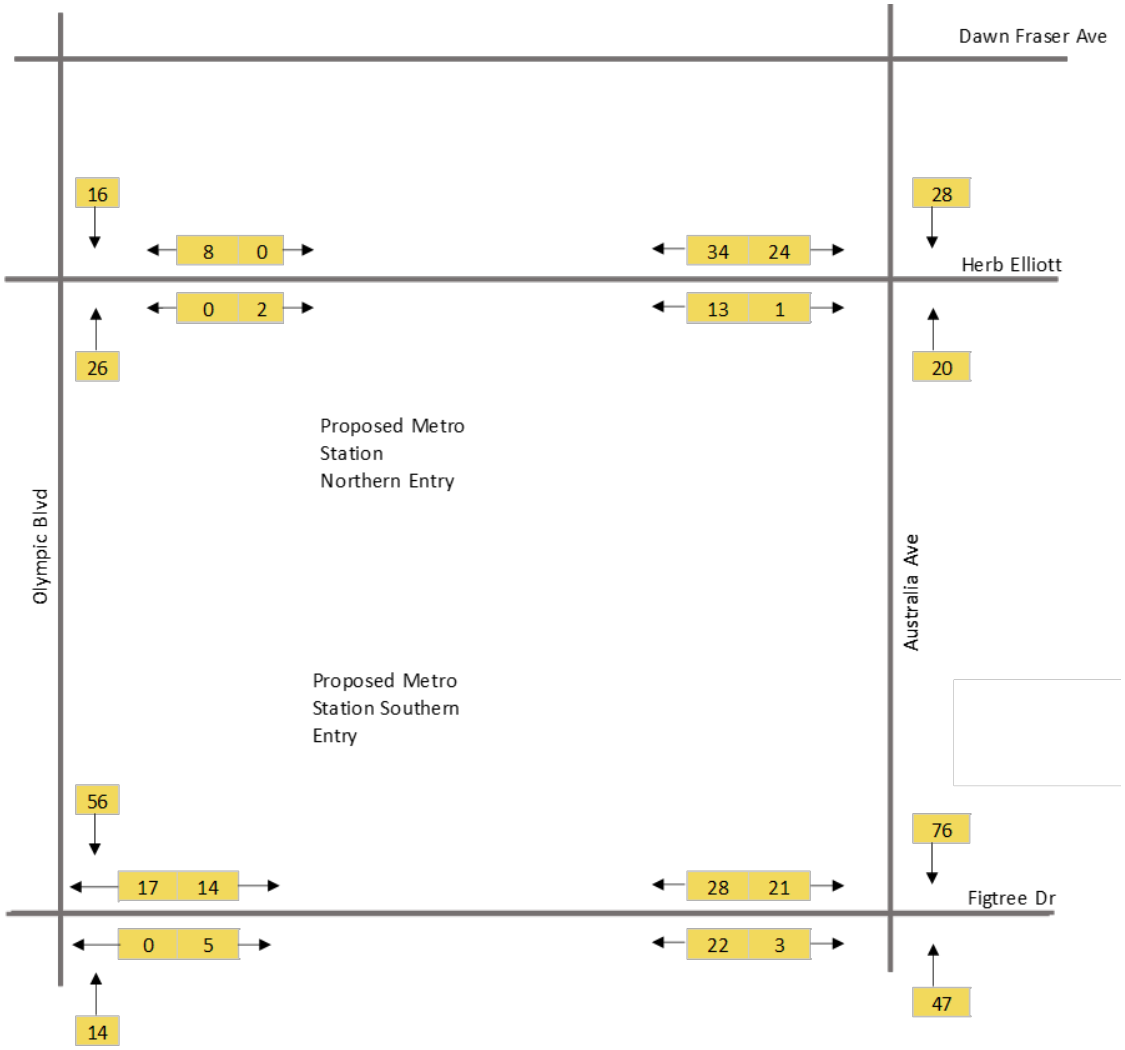


Figure 22 Existing AM peak hour pedestrian counts – Sydney Olympic Park (March 2021)

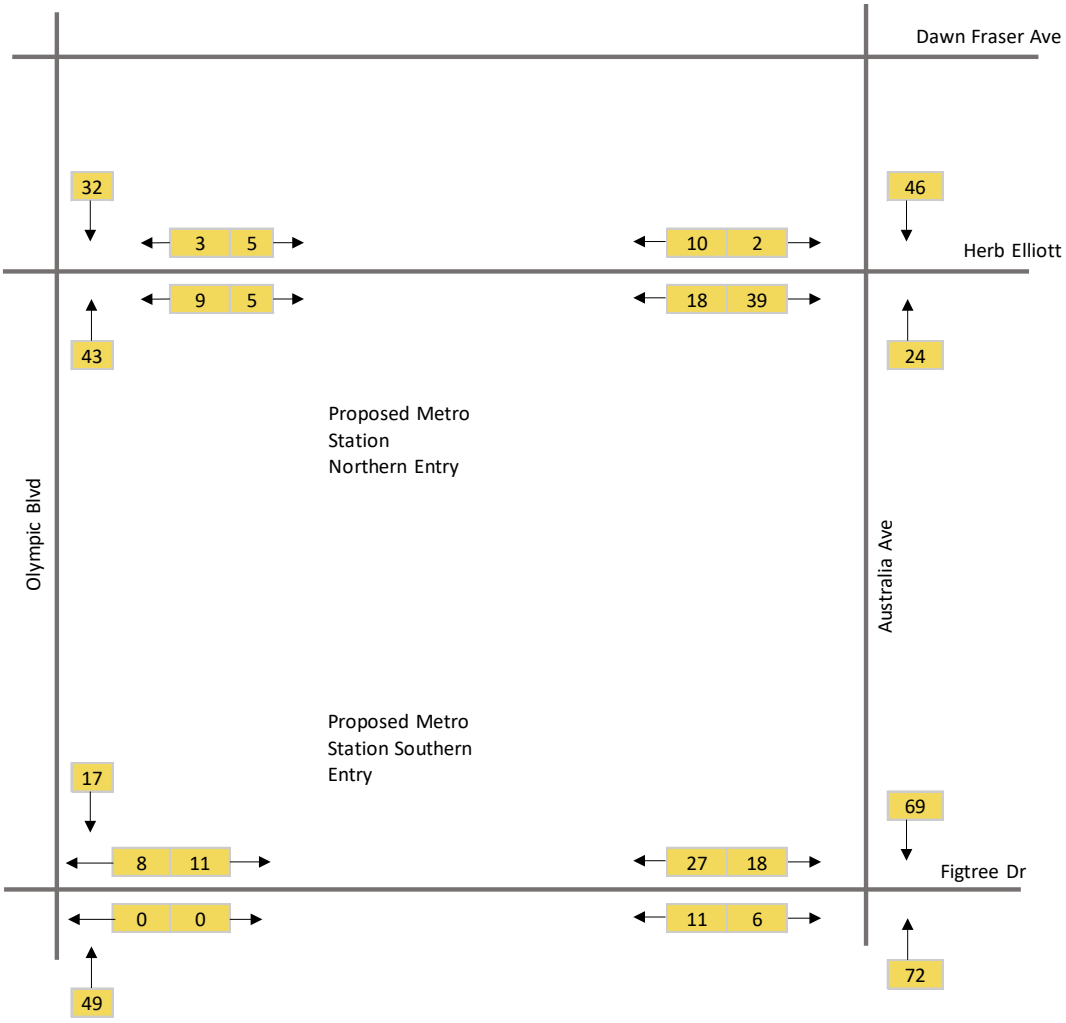


Figure 23 Existing PM peak hour pedestrian counts – Sydney Olympic Park (March 2021)

Major pedestrian desire lines in the Sydney Olympic Park precinct are generally orientated between the existing Olympic Park Station and the various stadiums and arenas located throughout, particularly during special events, such as concerts or sporting events. There is also an east-west pedestrian desire line along Dawn Fraser Avenue where numerous businesses operate along the southern frontage.

Cycling

The cycle network surrounding the Sydney Olympic Park metro station site is shown in Figure 21 and is well developed, consisting of on-road and off-road cycle routes. Marked cycle lanes of moderate difficulty are provided in the shoulder of both sides of the following roads:

- Australia Avenue
- Sarah Durack Avenue
- Edwin Flack Avenue
- Dawn Fraser Avenue
- Bennelong Parkway.

On-road cycle routes of low difficulty are located along Shirley Strickland Avenue and Rod Laver Drive. Off-road shared paths also feature from the precinct to the wider cycle network, including areas east of Australia Avenue and west of Olympic Boulevard. The non-direct alignment of these routes typically serves recreational users, though commuters may use connecting on-road cycle lanes that link to the regional cycle network, including the M4 cycleway and the Cooks River cycleway, a 30 kilometre shared path that follows the Cooks River between Ryde and Kyeemagh.

Three cycle circuits exist within the Sydney Olympic Park precinct including the Olympic Circuit, River Heritage Circuit and Parklands Circuit. These circuits comprise both on-road and off-road cycle paths already discussed, as well as other cycle paths located north of Bicentennial Park and Dawn Fraser Avenue.

Cycle racks are provided throughout the Sydney Olympic Park precinct. Within the immediate vicinity of the proposed Sydney Olympic Park metro station site, these are located on Herb Elliott Avenue, Olympic Boulevard and Dawn Fraser Avenue.

3.5.5 Special Events

Hundreds of events varying in size are held each year at Sydney Olympic Park, with the existing Sydney Olympic Park Station being a major transport focus for access to and from events.

Between 2017 and 2018, 34 events were attended by audiences of 20,000 or greater, with 12 events exceeding 50,000. Typical mode share split for regular (10,000-20,000) and major events (>50,000) are detailed in Table 19.

Table 19 Regular and major event scenario mode splits

Event	Train	Parking (car)	Bus	Taxi/Share ride	Walk
Regular	8,000	10,700	500	800	50
Major	50,000	20,000	10,000	3,400	100

Large calendar events held within the precinct are shown in Table 20.

Table 20 Major special events in Sydney Olympic Park

Indicative Month	Event	Location
January	The Sydney International	Sydney Olympic Park Tennis Centre
January	Sydney Festival	Sydney Olympic Park
April	Sydney Royal Easter Show	Sydney Showground
June	Supanova Comic Con and Gaming	Sydney Showground
Year-round	Music concerts	Various stadiums, arenas and centres
Year-round	Football matches (Rugby Union, Rugby League, Australian Football League, Soccer)	ANZ Stadium
Year-round	Other sporting events	Various stadiums, arenas and centres

3.5.6 Public transport services

Bus services

Buses provide the primary form of public transport for Sydney Olympic Park. Three bus routes service six bus stops within interchanging distance of the proposed station on Dawn Fraser Avenue, Park Street and Australia Avenue. Bus services operating in Sydney Olympic Park are shown below in Table 21.

Buses in the local area are facilitated by a number of operators, including Sydney Buses, Transit Systems, and a NightRide bus route operated by Hillsbus. These buses provide connections to Parramatta, Burwood, Chatswood, Macquarie Park and Sydney CBD. Demand Responsive Transit (DRT) services platform BRIDJ (operated by Transit Systems) connects Sydney Olympic Park to the nearby suburbs of North Strathfield, Concord, Cabarita and Mortlake.

Bus customers are able to transfer to the Sydney Trains network at the existing Olympic Park Station, with bus stops located on Dawn Fraser Avenue providing access to the station at its western end, and bus stops on Park Avenue providing access to the station at its eastern end. Another bus route operated by Transit Systems serves the Lidcombe local area, with the closest bus stops located on Carter Street about 800 metres away from the site access point.

On Demand bus services operated by Transit Systems are directly accessible from the site, connecting Sydney Olympic Park to adjacent suburbs, including Concord, Cabarita, Mortlake, Homebush and North Strathfield.

During major events held at Sydney Olympic Park, nine additional bus services operate. Four services arrive and depart from bus stands at the Aquatic Terminal, located on Olympic Drive between Figtree Drive and Herb Elliott Avenue. The other five bus services arrive and depart from bus stands at the Plaza Terminal, located on Olympic Drive between Barrier Street and Kevin Coombs Avenue.

School buses also service the area, with two school bus routes (760S and 761S) in operation on weekdays.

Table 21 Existing bus services – Sydney Olympic Park (2021)

		Number of services	Number of services
Route	**Description**	**Weekday AM 7:00 – 9:00**	**Weekday PM 4:00 – 6:00**
525	Strathfield to Parramatta via Sydney Olympic Park	5	3
	Parramatta to Strathfield via Sydney Olympic Park	7	8
526	Burwood to Rhodes Shopping Centre	6	7
	Rhodes Shopping Centre to Burwood	7	6
533	Chatswood to Sydney Park via Rhodes and North Ryde	8	10
	Sydney Olympic Park via Rhodes and North Ryde	11	8

Rail services

The existing Olympic Park Station is located 200 metres north of the proposed metro station as shown in Figure 21 and is served by the T7 Olympic Park Line on the Sydney Trains suburban rail network, which operates as a shuttle between Olympic Park and Lidcombe.

During major special events held at the Sydney Olympic Park precinct, direct trains run between Olympic Park and Central. In addition, some westbound services extend past Lidcombe to Blacktown, Leppington and Campbelltown. Details of services are provided in Table 22.

Table 22 Existing Sydney Trains suburban rail network services – existing Olympic Park Station

		Number of services	Number of services
Line	**Direction**	**Weekday AM 7:00 – 9:00**	**Weekday PM 4:00 – 6:00**
T1	City to Emu Plains or Richmond	Event Days only	Event Days only
T3	Liverpool or Lidcombe to City via Bankstown	Event Days only	Event Days only
T7	Lidcombe to Olympic Park	12	12
	Olympic Park to Lidcombe	12	12

3.5.7 Road network

The proposed station is bounded by the following roads:

- Figtree Drive to the south
- Olympic Boulevard to the west
- Herb Elliott Avenue to the north.

Figtree Drive is a two-lane, two-way undivided local road with a posted speed limit of 40 km/h. It provides a through connection for traffic between Australia Avenue and Olympic Boulevard, though is primarily used to access a number of high-density residential dwellings and commercial businesses.

Olympic Boulevard is a four-lane, two-way divided local road with a posted speed limit of 40 km/h. Olympic Boulevard provides access to the Sydney Olympic Park Aquatic Centre and Stadium Australia and is frequently closed during major events. As a major north-south road through the suburb of Sydney Olympic Park, it is highly utilised by several public transport bus services, with frequency and volume of services increasing on event days.

Herb Elliott Avenue is a two-lane, two-way undivided local road with a posted speed limit of 40 km/h. It provides access to off-street parking, recreational, commercial, and retail land uses.

Table 23 provides AM and PM peak hour link volumes for major roads that form the surrounding precinct road network, based on traffic counts conducted in March 2021. Survey data indicates that the peak hour periods on the road network are between 8:00-9:00AM and 5:00-6:00PM.

Table 23 Existing peak hour traffic volumes by direction – Sydney Olympic Park (2021)

		AM peak volume (vehicles per hour)		PM peak volume (vehicles per hour)	
Road	**Direction**	**Light**	**Heavy[1]**	**Light**	**Heavy[1]**
Figtree Drive	Westbound	106	0	100	2
	Eastbound	91	0	95	1
Olympic Boulevard	Northbound	126	13	199	8
	Southbound	136	7	159	6
Australia Avenue	Northbound	678	17	523	22
	Southbound	600	31	861	26
Herb Elliot Avenue	Westbound	175	7	138	3
	Eastbound	135	10	218	5
Sarah Durack Avenue	Westbound	509	25	636	15
	Eastbound	399	17	522	10
Dawn Fraser Avenue	Westbound	84	11	147	9
	Eastbound	127	9	110	9
Park Street	Northbound	18	16	19	3
	Southbound	47	7	58	4

Source: TfNSW Traffic surveys, March 2021

[1]Buses are included as heavy vehicles in the table

Baseline network performance for the AM and PM peak hours for key intersections in the vicinity of the proposed metro station are provided in. Note that observed traffic volumes for baseline intersection performance assessment have been adjusted as described in Section 2.2 to account for the impacts of the Covid-19 pandemic.

Table 24 Existing intersection performance – Sydney Olympic Park (2021)

	AM peak		PM peak	
Intersection	**Average delay (sec)**	**LOS**	**Average delay (sec)**	**LOS**
Australia Avenue / Sarah Durack Avenue	42	C	61	E
Olympic Boulevard / Sarah Durack Avenue	20	B	21	B
Olympic Boulevard / Figtree Drive[1]	1	A	1	A
Olympic Boulevard / Herb Elliott Avenue[1]	2	A	2	A
Australia Avenue / Herb Elliott Avenue	34	C	30	C
Australia Avenue / Figtree Drive[1]	14	A	12	A

[1]LOS of worst movement

Baseline intersection performance indicates that most intersections would operate at level of service of C or better in the AM and PM peak hours, except the Australia Avenue/ Sarah Durack Avenue intersection, which would operate at level of service E in the PM peak hour, representing reasonable operations with slightly restricted manoeuvrability and free-flow speeds across the local network. Vehicle volumes at these locations during peak periods generally do not experience notable delays or impact driver ability to make mid-block lane changes on surrounding roads and intersections.

Congestion at the intersection of Australia Avenue/Sarah Durack Avenue during the PM peak may severely impact performance, potentially leading to a breakdown of flow. This is typically as a result of vehicle volumes exceeding the capacity of the intersection to clear traffic.

3.5.8 Parking arrangements

Free, time-limited on street parking spaces are available along Olympic Boulevard, Murray Rose Avenue, Dawn Fraser Avenue, Figtree Drive, Herb Elliott Avenue, Showground Road, Grand Parade and Parkview Drive. There are also paid on-street parking spaces available along Herb Elliott Avenue, Dawn Fraser Avenue and Showground Road. During major special events, on-street parking may not be available due to road closures in place around the Sydney Olympic Park precinct.

A number of other on-street parking arrangements exist on Herb Elliott Avenue and include parking for motorbikes, a loading zone on the northern side about 90 metres east of Showground Road, a kiss and ride zone near Olympic Boulevard and a taxi zone on the southern side near Park Street. In addition, there is a mail zone on the western side of Showground Road. A loading zone is also located on the southern side of Dawn Fraser Avenue between Showground Road and Park Street.

In addition to on-street parking, off-street parking is provided by the Sydney Olympic Park P8 in the precinct area. A multi-storey facility on Herb Elliott Avenue, the parking facility offers hourly, long-term and event mode parking options for drivers.

Figure 24 shows the location of on-street and off-street parking areas within the proposed station precinct.

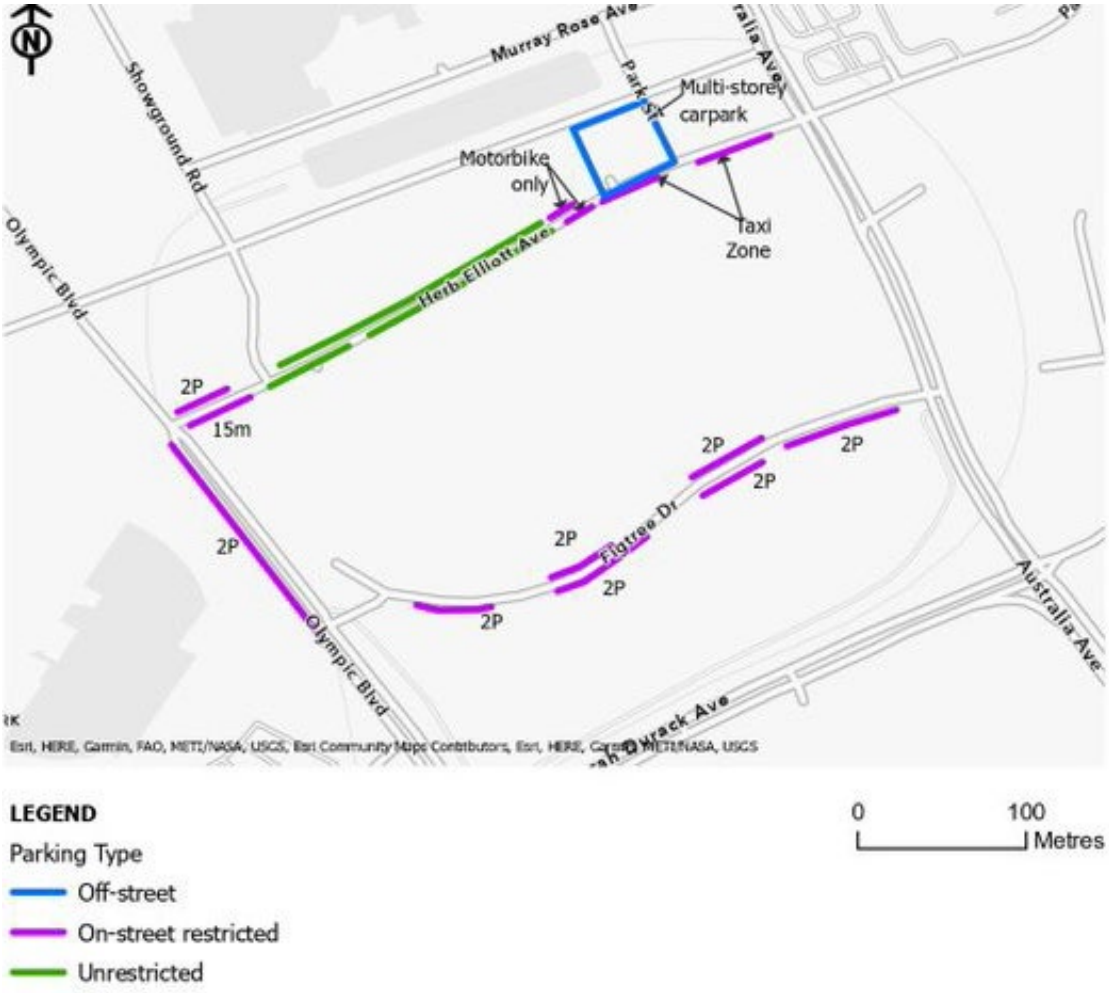


Figure 24 Existing parking locations – Sydney Olympic Park

There are a number of existing off-street parking facilities throughout Sydney Olympic Park, though these are located outside of the Sydney Olympic Park metro station area.

3.5.9 Permanent changes to transport infrastructure under previous Sydney Metro West planning applications

There are no permanent changes to transport infrastructure as part of the previous Sydney Metro West planning application.

3.6 North Strathfield metro station

3.6.1 Introduction

North Strathfield metro station would be located within the City of Canada Bay LGA. The precinct at which the station is located is positioned immediately east of the existing North Strathfield Station and northern freight corridor and is bounded by the existing rail corridor to the west, Queen Street to the east, Pomeroy Street to the north and Wellbank Street to the south, as shown in Figure 25.

Figure 25 Station location – North Strathfield

3.6.2 Land use context

North Strathfield metro station falls within the boundaries of the existing rail corridor zoned SP2 Infrastructure (Railway) and includes part of Queen Street and the landscaped area adjacent to the current station entrance. Most of the site comprises an existing maintenance and service storage area for the rail corridor and station.

Land uses surrounding the North Strathfield metro station include the following:

- North of the site are residential dwellings of various densities
- East of the site are residential dwellings and the commercial centre of North Strathfield, comprising properties which are used for commercial, retail, and business uses including a number of local restaurants
- South of the site is further residential development, including new higher density residential developments to the south-west. A small collection of businesses, including a childcare centre are located to the south-west
- To the west of the site, beyond the existing rail corridor is Our Lady of the Assumption Catholic Primary School and McDonald College. Beyond this is low density residential housing.

Land uses within and surrounding the North Strathfield metro station are shown in Figure 26.

Figure 26 Land zoning map – North Strathfield

3.6.3 Modes of travel/ key origins and destinations of trips

Journey to Work (2016) census data has been analysed to establish primary modes of travel for inbound and outbound workers for travel zones within 800 metres of the proposed station, which are presented in Figure 27.

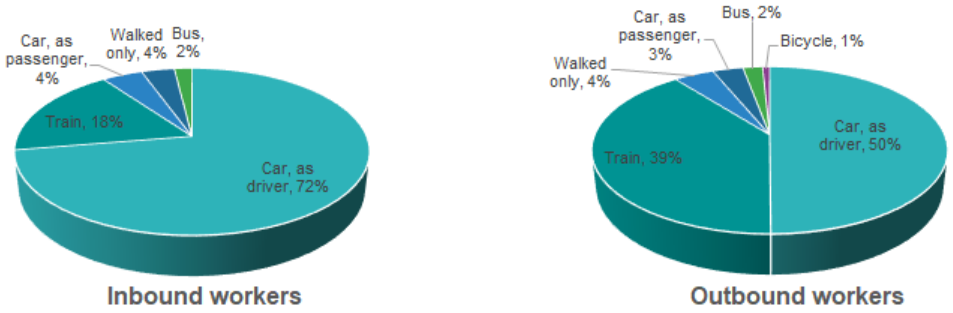


Figure 27 Existing mode share – North Strathfield

The Journey to Work (2016) census data has also been interrogated to extract the top five origins and destinations for inbound and outbound trips associated with an 800 metre station catchment, which are summarised in Table 25.

Table 25 Top five origins and destinations for inbound and outbound trips

Inbound	Outbound
15% - Canada Bay	31% - Sydney Inner City
10% - Strathfield – Burwood – Ashfield	15% - Canada Bay
5% - Auburn	10% - Strathfield – Burwood – Ashfield
4% - Merrylands – Guildford	5% - Auburn
4% - Ryde – Hunters Hill	5% - Ryde – Hunters Hill

Figure 28 shows the existing transport network in the vicinity of the proposed station precinct.

Figure 28 Existing transport network – North Strathfield

3.6.4 Active transport network

Walking

The existing station located immediately adjacent to the future metro station is the pedestrian generator in the area. The pedestrian activity at the frontage of the existing station reflects a typical commuter and school profile resulting from primarily residential and education land uses surrounding the station.

The key desire lines to and from the existing station and along the key routes are generally via Queen Street, Wellbank Street, Concord Road and Waratah Street that connect to schools, commercial and residential areas.

Footpaths exist on both sides of most streets near the existing station although the footpath on the western side of Queen Street between Pomeroy Street and the existing station entry would be temporarily closed as part the work carried out under the previous Sydney Metro West planning application.

Pedestrian crossing facilities are limited and provided at the following locations:

- A pedestrian bridge across the T9 Northern Line at the existing North Strathfield Station between Queen Street and Hamilton Street East/ Pomeroy Street. There are three short footpaths near the Queen Street/ Wellbank Street intersection which converge at the pedestrian overbridge, providing access to the existing North Strathfield Station and the western side of the rail line
- Signalised crossings along Concord Road and at the Pomeroy Street/ George Street intersection
- A raised zebra crossing at the Queen Street/ Wellbank Street intersection. Signalisation of this intersection will be undertaken as part of work under the previous Sydney Metro West planning application.

Pedestrian counts were collected in 2021 at footpaths and signalised intersections in the vicinity of the station precinct, which are summarised in Figure 29 and Figure 30 for AM and PM peaks respectively.

The study area has moderate pedestrian activity near the station entrances, with typically higher hourly pedestrian volumes in the AM peak (than in the PM). The busiest intersection is that of Queen Street/ Wellbank Street with pedestrian volumes exceeding 100 pedestrians per hour.

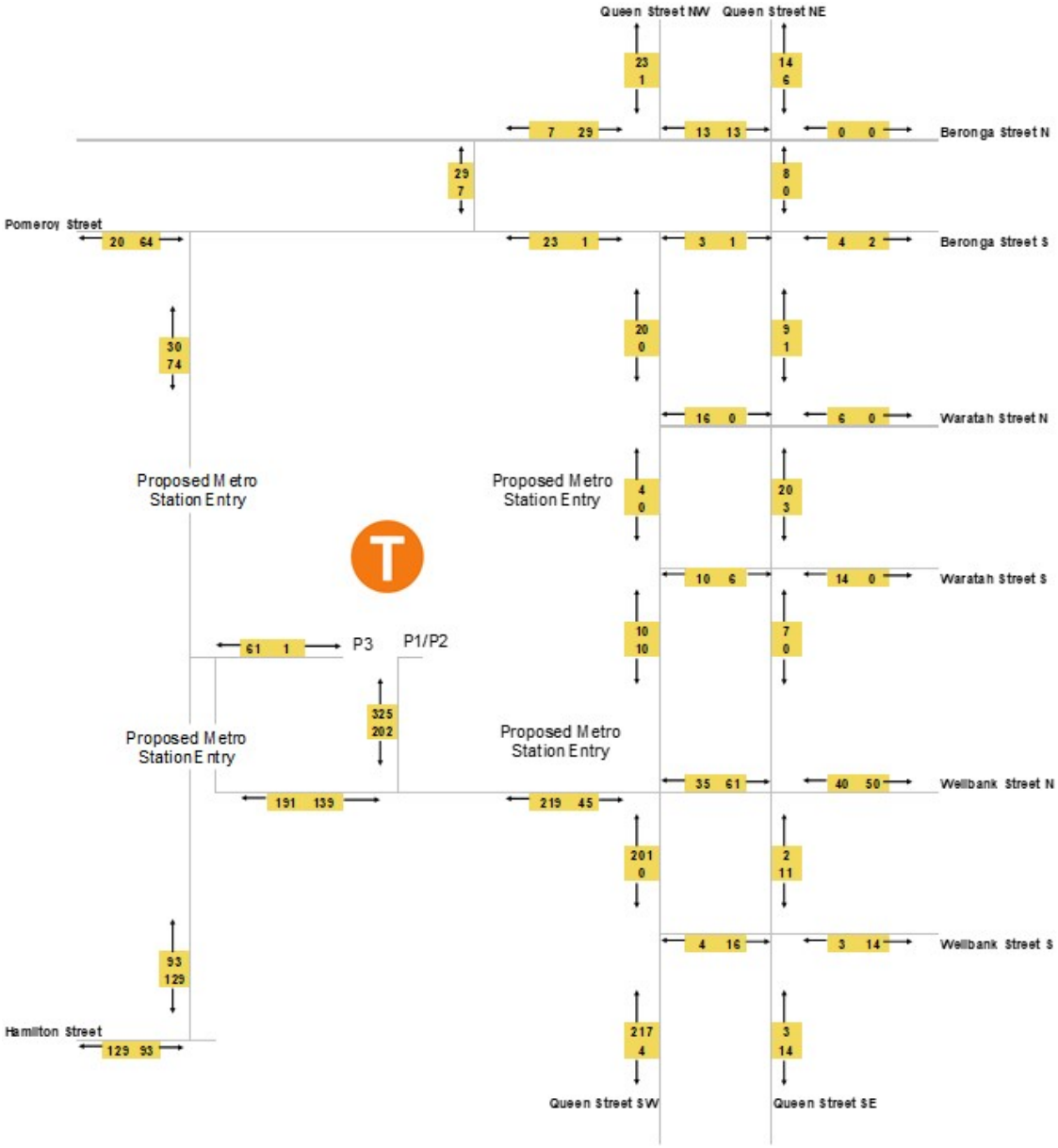


Figure 29 Existing AM peak hour pedestrian counts – North Strathfield (March 2021)

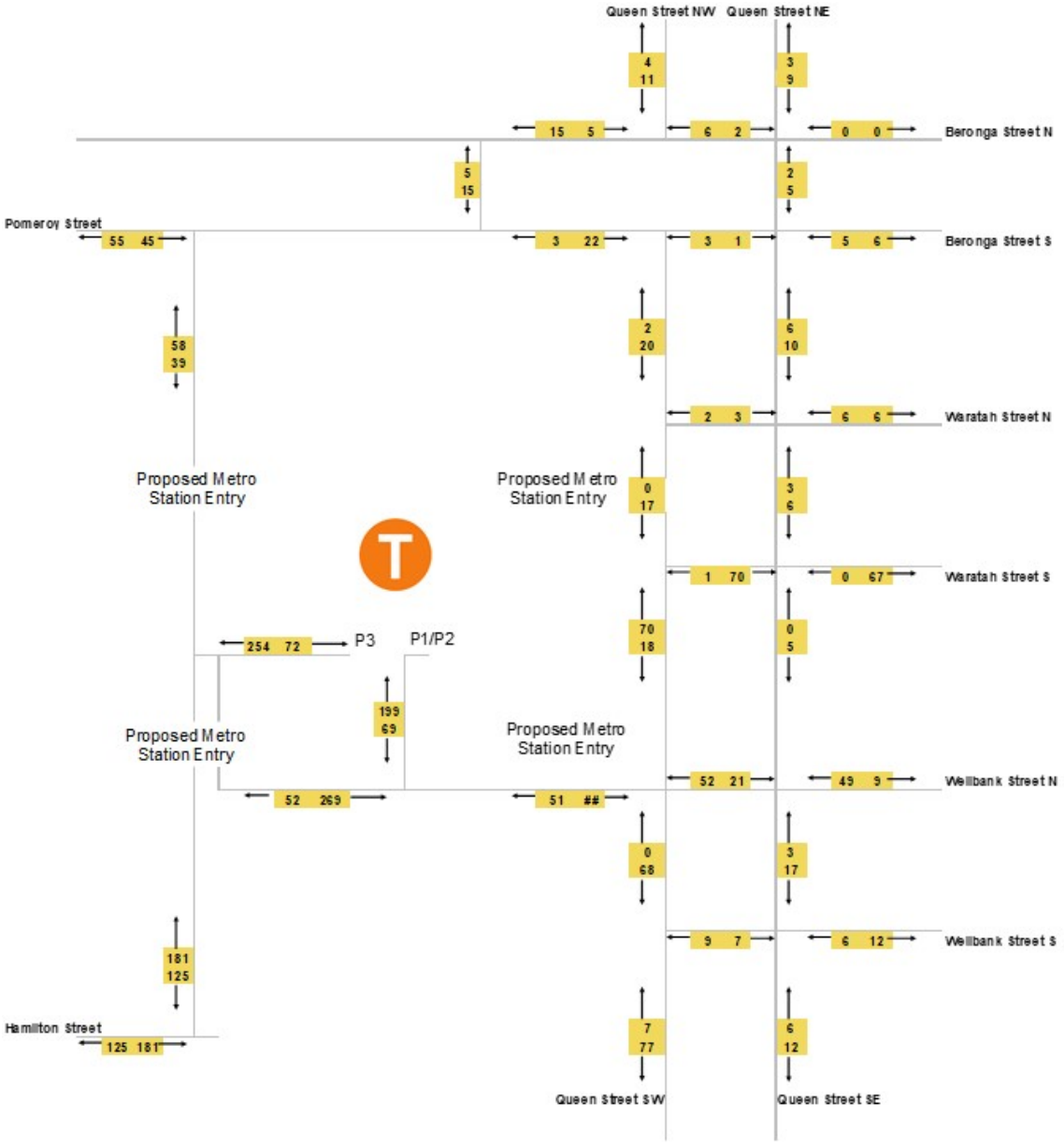


Figure 30 Existing PM peak hour pedestrian counts – North Strathfield (March 2021)

Cycling

There is no established cycling network, except a recently built extension of the Powell's Creek shared path that crosses Pomeroy Street just west of Powell's Creek bridge. On-road cycle facilities are also provided along Underwood Road, the western portion of Pomeroy Street and Patterson Street, east of Concord Road (Figure 28).

The western side of the Powells Creek Reserve forms an important part of the Bay to Bay cycleway, however it is poorly connected to the eastern side of the creek in North Strathfield. The Homebush Urban Amenity Improvement Plan, part of the Parramatta Road Corridor Urban Transformation project, proposes to construct three pedestrian bridges spanning Powells Creek to assist with east-west active transport connections.

Cycle count data collected in March 2021 shows that, overall, cyclist volumes are low, with primary routes via Wellbank Street, Queen Street and Pomeroy Street.

3.6.5 Public transport services

Bus services

Regular bus services operate along Concord Road and Underwood Road, while school bus and on-demand services utilise key corridors along Wellbank Street, Queen Street and Pomeroy Street.

Key bus stops located directly adjacent to the boundary of the proposed station include:

- North Strathfield Station, Queen Street (Stop ID 213711) – located approximately 30 metres north on the departure side of the Wellbank Street and Queen Street intersection. Existing facilities include tactile ground indicators and a bus stop sign
- Queen Street opposite North Strathfield Station (Stop ID 213712) – located approximately 15 metres north on the approach to the Wellbank Street and Queen Street intersection. The facilities at the stop include bench seating positioned under the building awning, tactile ground indicators and a bus stop sign.

These bus stops would be temporarily relocated to Wellbank Street as part of work under the previous Sydney Metro West planning application.

There are no scheduled routes that service these bus stops. Two scheduled buses operate along Underwood Road on the western side of the rail line. Four bus routes travel along Concord Road and Wellbank Street (east of Concord Road) on the eastern side of the rail line.

The main bus services along Queen Street, Concord Road and Wellbank Street North are listed in Table 26.

Table 26 Existing bus services – North Strathfield (2021)

Route	Description	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
School bus services on Queen Street and Wellbank Street West (Stops ID 213711, 213712, 2137111, 2137114)			
674S	Domremy College – Concord W Station	2	2
575S	Domremy College	1	
760S	Concord High School	1	
761S	Concord High School	1	
713S	Homebush Boys High School	1	
574S	Rosebank College – Homebush Station		1
711S	Rosebank College – Homebush Station		1

Route	Description	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
710S	Homebush Boy High School – Concord Hospital		1
Regular bus services on Concord Road (Stops ID 213718, 2137112)			
458	Church Street – Westfield Burwood	11	7
N80	Hornby Station – Townhall Station	1	
Regular bus services on Wellbank Street East (Stops ID 2137115, 213710)			
410	Waterloo Park – Hurstville Station	23	20
D402*	Concord Fire Station – Shoreline Dr	5	8

*On-demand service

Rail services

The existing North Strathfield Station is located directly adjacent to the proposed metro station, as shown in Figure 28. This station is served by the T9 Northern Line on the Sydney Trains suburban network, providing direct connections to Epping, Strathfield, Sydney CBD, Chatswood and Hornsby. Table 27 below provides the route description in addition to the number of services in the peak periods.

The station is DDA compliant and includes facilities including cycle racks, cycle lockers, and a kiss and ride zone.

Table 27 Existing Sydney Trains suburban rail network services – existing North Strathfield Station

Line	Direction	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
T9	North Shore to Hornsby via City	8	8
	Hornsby to North Shore via City	8	8

3.6.6 Road network

The M4 Western Motorway, Parramatta Road and Concord Road are arterial roads that carry high volumes of traffic on the road network surrounding the metro station. The Wellbank Street- Queen Street- Pomeroy Street link is a regional classified link between Concord Road and Homebush Bay Drive.

Queen Street, between Beronga Street and Wellbank Street, is a two-lane, two-way regional road. There is no speed restriction signage and, as such, the road is restricted to 50 km/h. The carriageway includes central linemarking with intermittent edge line and on street parking markings. There is both unrestricted and time restricted kerbside parking, kiss and ride facilities, mail zone and bus stops. Queen Street forms part of the route for school bus services and the M4 on-road cyclist diversion during special events. Pedestrian footpath facilities are provided on both roadside verges with a raised pedestrian crossing located directly north of the intersection with Wellbank Street

Wellbank Street, between Concord Road and Queen Street, is a two-way regional road. There is no speed restriction signage and, as such, the road is restricted to 50 km/h. The carriageway is unmarked, with unrestricted kerbside parking available in both directions along the majority of Wellbank Street. Wellbank Street caters for school bus services and has pedestrian footpath facilities on both roadside verges. Load restrictions (3 tonne or over, 9pm – 5am) are signposted along Wellbank Street.

Beronga Street is a two-way, two-lane local road with a posted speed of 50 km/h. The carriageway is unmarked, with unrestricted kerbside parking available in both directions. Pedestrian footpath facilities are present on both roadside verges. A speed hump is located east of the intersection with Queen Street for local traffic management. This will be converted to a raised zebra crossing as part of work under the previous Sydney Metro West planning application.

Pomeroy Street, between Queen Street and Underwood Road, is a two-lane, two-way regional road with a posted speed of 50 km/h. The carriageway is delineated with both unrestricted and time restricted kerbside parking available in both directions as well as school bus stops. Pomeroy Street forms part of the route for school bus services and the M4 on-road cyclist diversion during special events. Pedestrian footpath facilities are present on both roadside verges.

Table 28 provides AM and PM peak hour link volumes for the main roads forming the precinct's road network based on traffic counts conducted in March 2021.

Table 28 Existing peak hour traffic volumes by direction – North Strathfield (2021)

		AM peak volume (vehicles per hour)		PM peak volume (vehicles per hour)	
Road	Location	Light	Heavy[1]	Light	Heavy[1]
Queen Street	South of Wellbank – Northbound	86	1	106	0
Queen Street	Between Wellbank and Waratah Street – Northbound	446	8	460	3
Queen Street	Between Wellbank and Waratah Street – Southbound	470	13	496	3
Queen Street	Between Waratah and Beronga Street – Northbound	443	7	473	4
Queen Street	Between Waratah and Beronga Street – Southbound	470	11	490	1

Road	Location	AM peak volume (vehicles per hour)		PM peak volume (vehicles per hour)	
		Light	Heavy[1]	Light	Heavy[1]
Wellbank Street	Wellbank Street - Westbound	382	7	398	3
Waratah Street	Waratah Street - Westbound	45	3	50	0
Pomeroy Street	Pomeroy Street - Eastbound	795	16	907	4
Queen Street North	Queen Street North -Southbound	209	1	123	0
Beronga Street	Beronga Street - Westbound	395	1	324	1

Source: TfNSW Traffic surveys, March 2021
[1]Buses are included as heavy vehicles in the table

Baseline network performance during the AM and PM peak hours for key intersections in the vicinity of the proposed metro station are shown in Table 29. Note that observed traffic volumes for baseline intersection performance assessment have been adjusted as described in Section 2.2 to account for the impacts of the Covid-19 pandemic.

Table 29 Existing intersection performance – North Strathfield (2021)

Intersection	AM peak		PM peak	
	Average delay (sec)	LOS	Average delay (sec)	LOS
Queen Street / Pomeroy Street / Beronga Street[1]	44	D	11	A
Queen Street / Waratah Street[2]	8	A	9	A
Queen Street / Wellbank Street[2]	11	A	12	A

[1] The weighted average delay is reported for the roundabout intersection
[2] The worst movement delay is reported as the overall delay for priority (un-signalised) intersections

Modelled intersection performance indicates that the three main intersections in the immediate vicinity of the station perform at level of service D or better during both the AM and PM peak hour, representing reasonable operations with slightly restricted manoeuvrability and free-flow speeds across the local network. Delays are experienced in the Queen Street southern approach to Pomeroy Street in the AM peak.

3.6.7 Parking arrangements

A mix of time-restricted and unrestricted on-street parking is provided on roads around the station site, including on Queen Street, Beronga Street, Waratah Street, Wellbank Street and Shipley Avenue. On-street parking spaces close to the existing North Strathfield Station are generally time-restricted. Weekday peak period clearways operate on Concord Road, with on-street parking available on the western side only, outside of these periods.

Parking on the western side of Queen Street between Wellbank Street and Pomeroy Street would be temporarily removed as part of work under the previous Sydney Metro West planning application.

A kiss and ride zone is located on the western side of Queen Street near Wellbank Street and a mail zone is located on the eastern side of Queen Street near Wellbank Street.

Figure 31 shows a summary of existing parking conditions around the station.

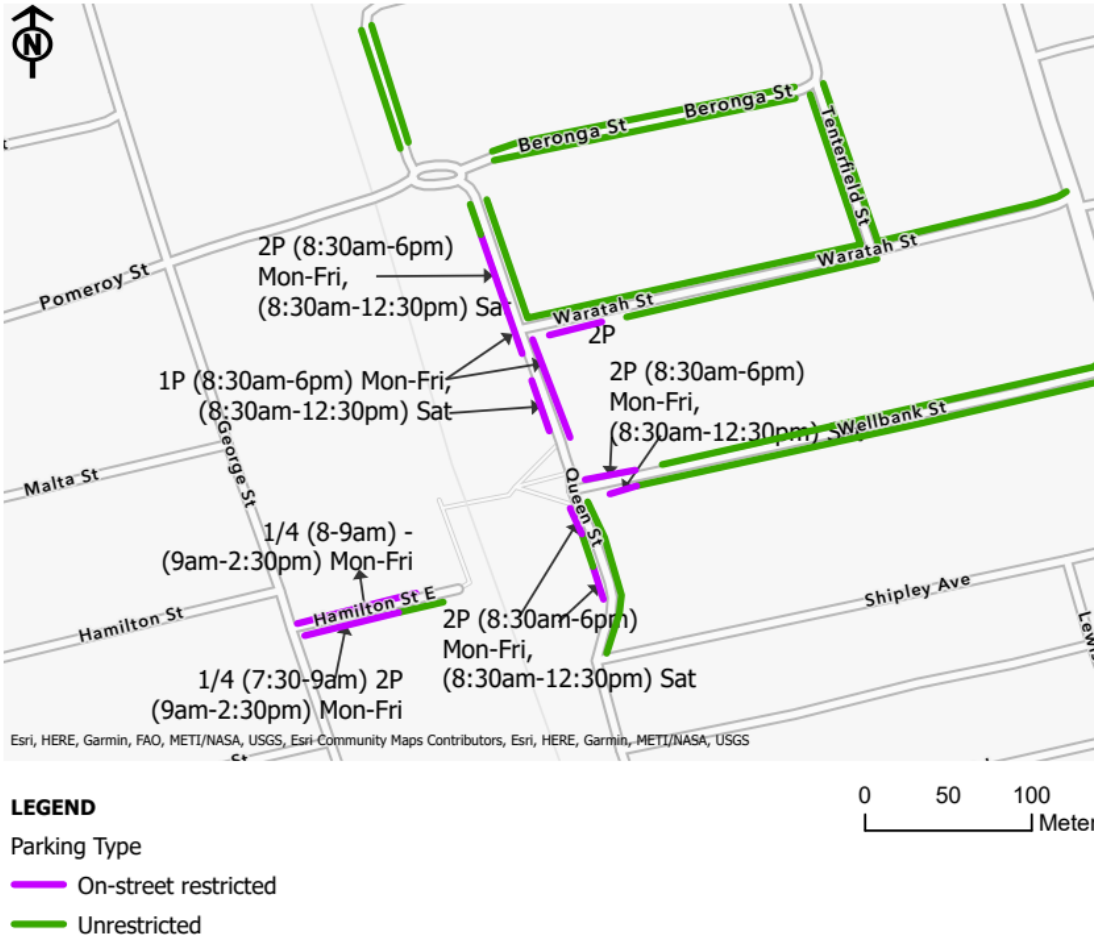


Figure 31 Existing parking locations – North Strathfield

3.6.8 Permanent changes to transport infrastructure under previous Sydney Metro West planning applications

The following permanent changes to transport infrastructure will occur as part of work under the previous Sydney Metro West planning application:

- Conversion of the Wellbank Street and Queen Street intersection from priority to signalised control with provision of pedestrian crossings on all arms.

3.7 Burwood North Station

3.7.1 Introduction

Burwood North Station would be located within the City of Canada Bay LGA (northern side of Parramatta Road) and the Burwood LGA (southern side of Parramatta Road). Paramatta Road is an arterial road that separates the station into northern and southern sites.

The northern site is bound by Parramatta Road, Loftus Street, Burwood Road and Burton Street and is located within the boundaries of the City of Canada Bay LGA. The southern site is located on the corner of Parramatta Road and Burwood Road and is also bordered by Esher Lane towards south, falling within the boundaries of Burwood LGA. The proposed station location is shown in Figure 32.

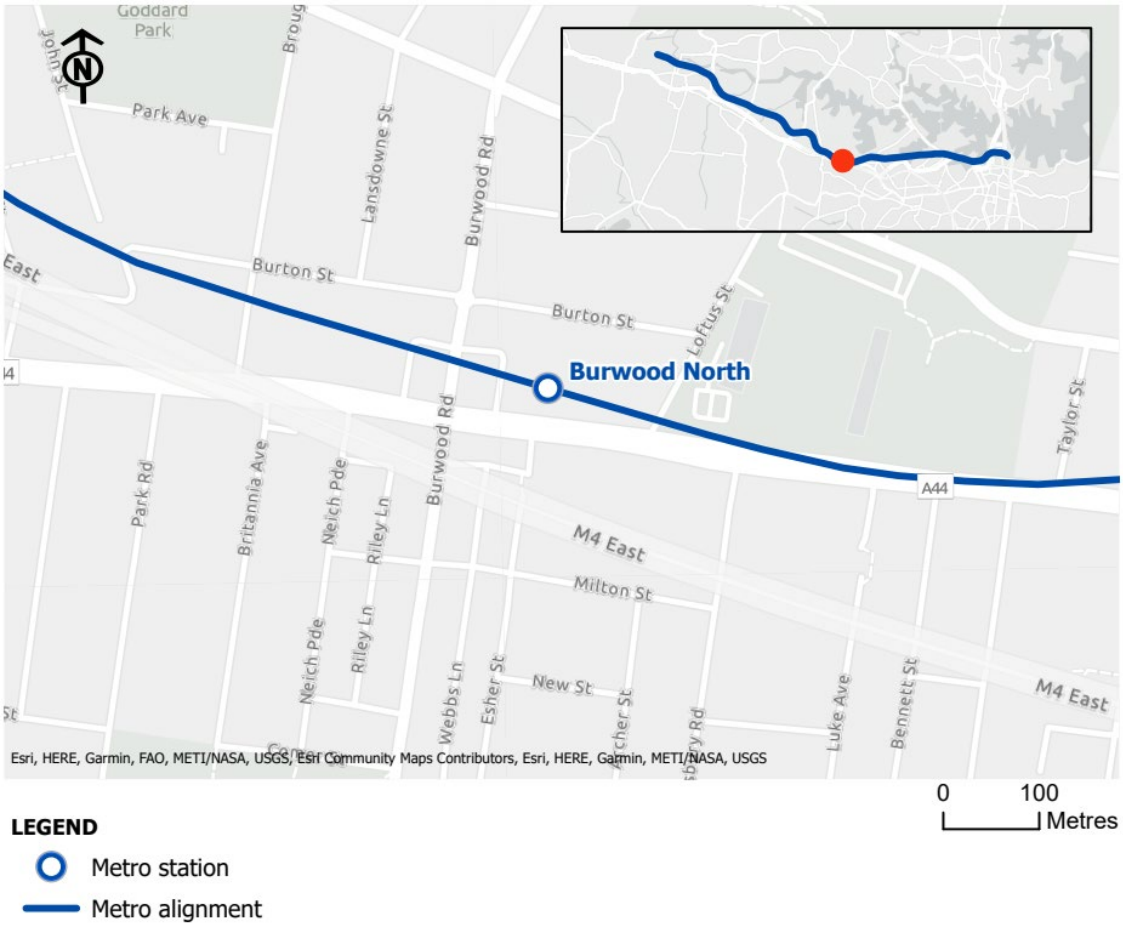


Figure 32 Station location – Burwood North

3.7.2 Land use context

The lands within this area are zoned as enterprise corridor and mixed use, with medium and low-density residential areas located radially outwards in all directions. Public recreation areas are located to the north and east on either side of Gipps Street, with a recreation area also located off Burwood Road in the south, as shown in Figure 33.

Figure 33 Land zoning map – Burwood North

The current land use characteristics within and around the Burwood North Station precinct (northern and southern sites) are as follows:

- Enterprise corridor zoning on Parramatta Road that consists of various commercial, community and retail premises on both sides of the corridor
- Mixed-use zoning on Burwood Road that contains commercial, retail, health and medium to high-density residential dwellings. Westfield Burwood is also located within this area, approximately 500 metres south of the metro station southern entry
- Medium and low-density residential zoning on Burton Street, Loftus Street and Milton Street

- Public recreation zones that include Concord Oval, St Lukes Oval, St Luke Park and Burwood Park
- Low density residential zoning extending further from Burwood Road on both sides of the corridor.

3.7.3 Modes of travel/ key origins and destinations of trips

Journey to Work (2016) census data has been analysed to establish primary modes of travel for inbound and outbound workers for travel zones within 800 metres of the proposed station, which are presented in Figure 34.

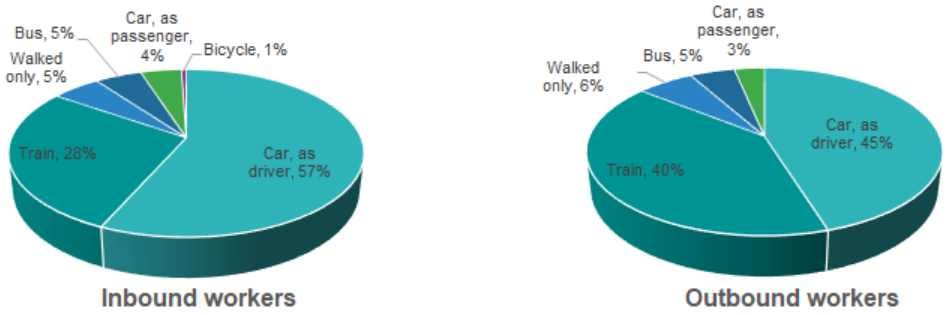


Figure 34 Existing mode share – Burwood North

The Journey to Work (2016) census data has also been interrogated to extract the top five origins and destinations for inbound and outbound trips associated with an 800 metre station catchment, which are summarised in Table 30.

Table 30 Top five origins and destinations for inbound and outbound trips

Inbound	Outbound
20% - Strathfield - Burwood - Ashfield	29% - Sydney Inner City
12% - Canada Bay	17% - Strathfield - Burwood - Ashfield
6% - Canterbury	11% - Canada Bay
4% - Bankstown	5% - Ryde - Hunters Hill
4% - Auburn	4% - Parramatta

Figure 35 shows the existing transport network in the vicinity of the station precinct.

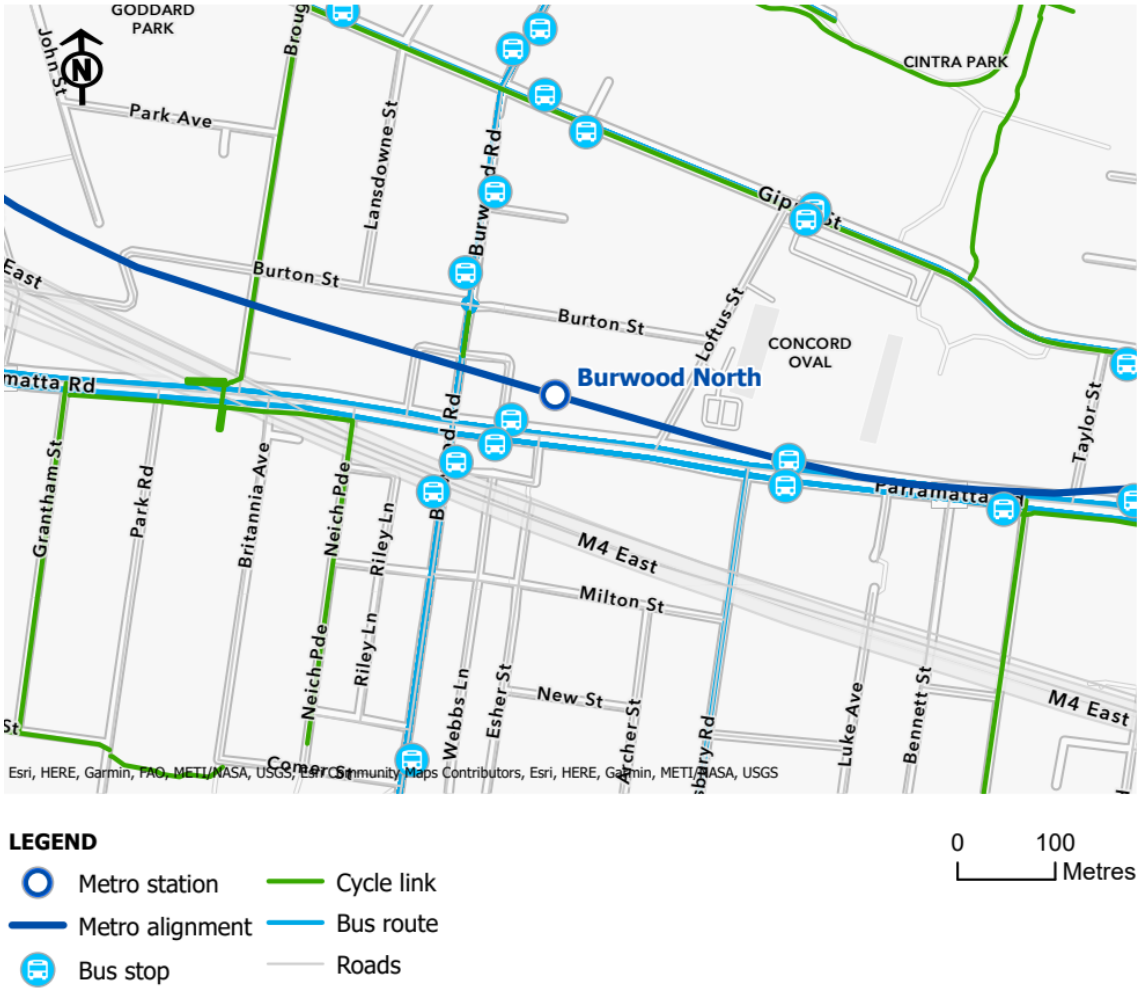


Figure 35 Existing transport network – Burwood North

3.7.4 Active transport network

Walking

Footpaths provide access in all directions around the station, providing adequate pedestrian connectivity. High levels of pedestrian activity are generated on Parramatta Road and Burwood Road by retail and commercial businesses. When the station is operational, it is expected that these locations would continue to act as the main east-west and north-south pedestrian links in the local area.

Access in the immediate vicinity of the sites is provided by footpaths on both verges of Burwood Road, Loftus Street, Burton Street and Esher Street. Pedestrian safety at the Burwood Road and Burton Street roundabout is poor however, with no pedestrian refuge islands to provide respite.

Pedestrian counts were collected in March 2021 at footpaths and at intersections in the vicinity of the proposed station precinct, which are summarised in Figure 36 and Figure 37 for AM and PM peaks respectively.

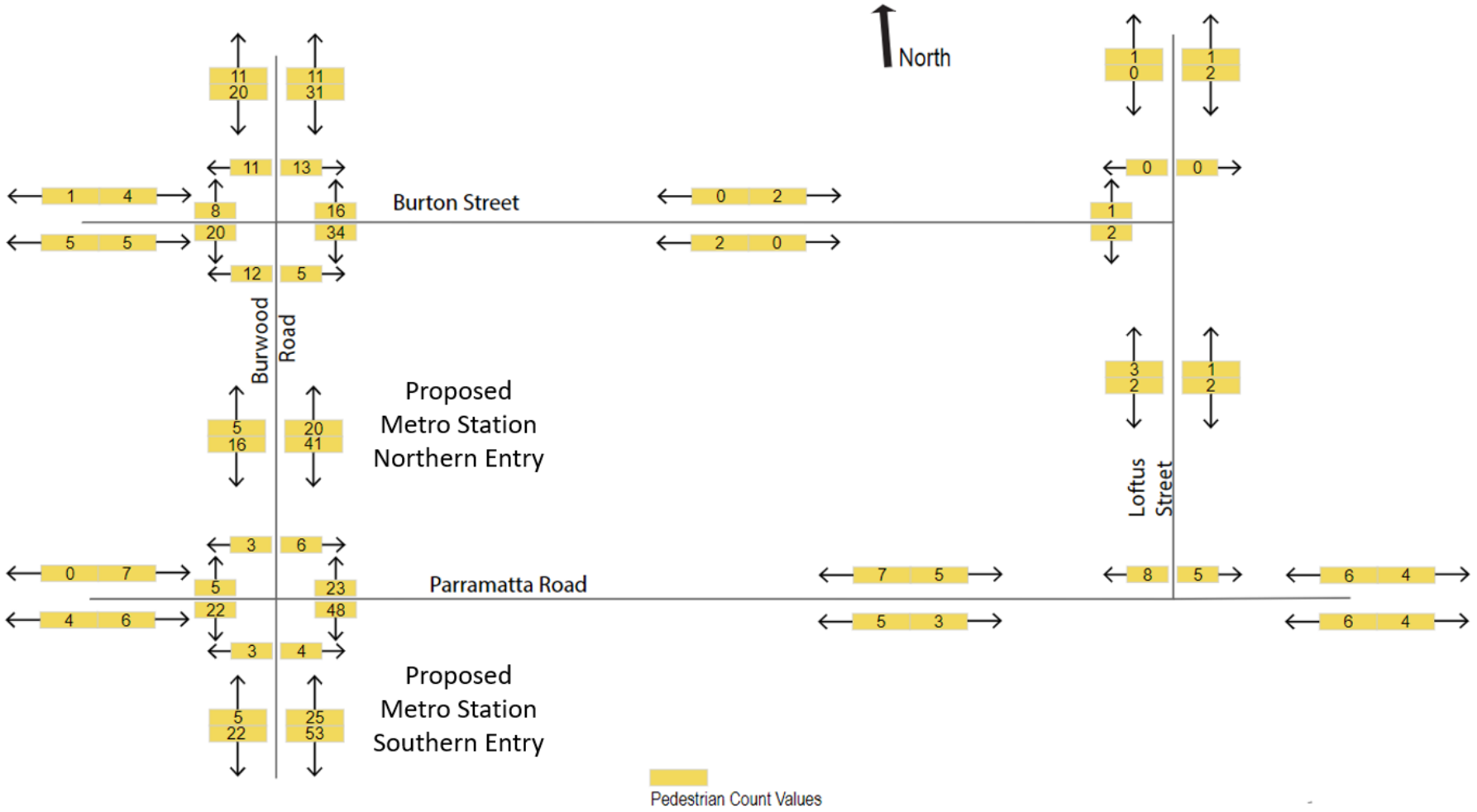


Figure 36 Existing AM peak hour pedestrian counts – Burwood North (March 2021)

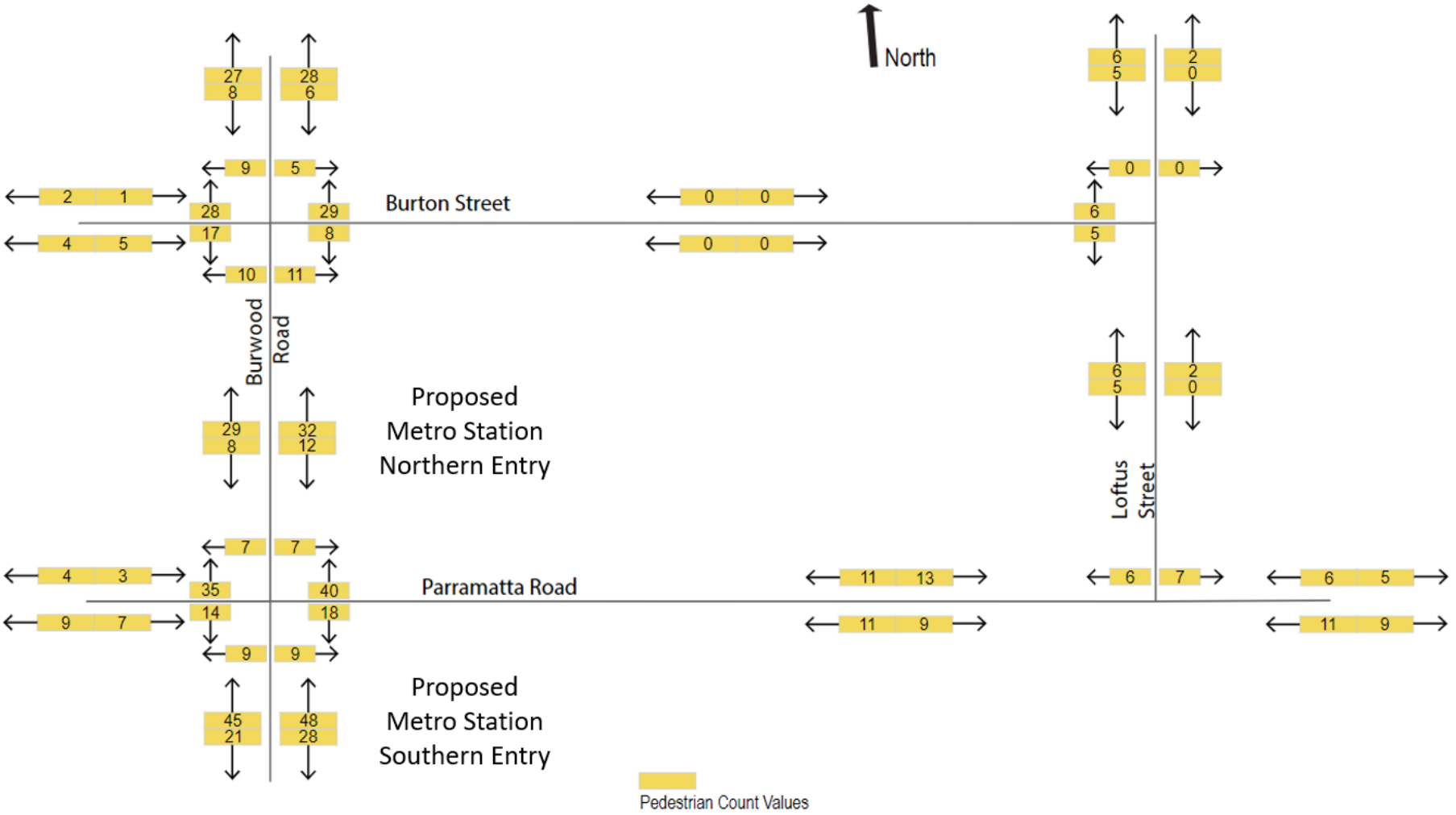


Figure 37 Existing PM peak hour pedestrian counts – Burwood North (March 2021)

North-south pedestrian connections are limited across Parramatta Road, with opportunities for pedestrians to cross either at signalised crossings at intersections or through grade-separated crossing facilities.

Signalised pedestrian crossing facilities are provided at the intersection of Parramatta Road/ Burwood Road and at the intersection of Parramatta Road/ Shaftesbury Road (280 metres east from proposed sites). A pedestrian overbridge at Broughton Street provides opportunity for pedestrians to cross Parramatta Road around 220 metres west of Burwood Road.

Cycling

The cycle network surrounding the proposed station consists primarily of on-road cycle lanes, with off-road cycle paths limited to Broughton Street, Neich Parade and segments of shared paths on the southern verge of Parramatta Road, as shown in Figure 35. The overbridge across Parramatta Road at Broughton Street provides connectivity between Queen Elizabeth Park and Burwood Park through the above mentioned streets.

Generally, the connectivity of the cycling network around the proposed station site is reasonable, with the majority of existing cycling infrastructure orientated to provide east-west connections from the surrounding suburbs of Concord and Canada Bay. East-west connectivity is provided along Gipps Street, Stanley Street and shared paths located within recreational areas, linking Burwood and Concord to the Inner West. North-south connectivity to the regional cycling network is provided via the Broughton Street overbridge and Walker Street (low difficulty) towards the Cooks River cycleway.

Traffic survey data indicates low cycling utilisation within the local area. Gipps Street supports most of the cycling traffic in both peak periods, with this traffic passing through Burwood North towards Concord or Five Dock. The preference for cyclists to use Gipps Street instead of Parramatta Road for east-west trips may be attributed to the absence of cycling infrastructure and the perception of risk associated with higher volumes of traffic and heavy vehicles.

North-south cycling volumes within the local area are low, with traffic data indicating the majority of these trips continue either north or south on Burwood Road to the wider network. Cycling volumes decline significantly in the PM peak period across the entire local network.

3.7.5 Public transport services

Bus services

Public transport surrounding the proposed station is primarily provided by bus services on Paramatta Road and Burwood Road. Four bus stops are located within interchanging distance of the proposed station. The local area is serviced by seven routes, as shown in Table 31. All bus services stop on Parramatta Road and Burwood Road, which are established bus corridors.

One westbound bus stop located on the southern kerb of Parramatta Road between Burwood Road and Esher Street would be temporarily relocated as part of work under the previous Sydney Metro West planning application.

These corridors are used by routes between the wider Greater Sydney area and Burwood from the Sydney CBD, Hurstville, Macquarie Park, Chatswood, Cabarita, Campsie, Mortlake and Ashfield. All seven services currently stop at the existing Burwood Station.

There are an additional six bus stops in the local area on Parramatta Road (one), Broughton Street (two) and Gipps Street (three), though these are only serviced by school buses. A number of night buses also operate along Parramatta Road.

Table 31 Existing bus services – Burwood North (2021)

Route	Description	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
410	Hurstville to Macquarie Park	11	12
410	Macquarie Park to Hurstville	11	10
415	Campsie to Chiswick	6	4
415	Chiswick to Campsie	4	4
461X	City Domain to Burwood	7	12
461X	Burwood to City Domain	11	10
464	Ashfield to Mortlake	11	13
464	Mortlake to Ashfield	12	12
466	Burwood to Cabarita	3	5
466	Cabarita to Burwood	7	4
526	Burwood to Rhodes Shopping Centre	4	5
526	Rhodes Shopping Centre to Burwood	5	3
530	Chatswood to Burwood	4	5
530	Burwood to Chatswood	5	6

Rail services

The existing Burwood Station, which is located about one kilometre to the south, is the nearest suburban rail station to the metro station. The catchment area for this station includes residents of Burwood and southern areas of Concord.

Burwood Station provides eastbound (city) and westbound (Parramatta) services for four lines. Rail services at the existing Burwood Station are detailed in Table 32.

Table 32 Existing Sydney Trains suburban rail network rail services – existing Burwood Station

Line	Direction	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
T1	Emu Plains or Richmond to City	9	8
T1	City to Emu Plains or Richmond	9	8
T2	Parramatta or Leppington to City	23	16
T2	City to Parramatta or Leppington	18	23
T9	Hornsby to North Shore via City	9	15

Interchange opportunities exist at this station between bus and rail. There are a total of 38 bus routes which serve eight bus stops on Railway Parade and Burwood Road outside the station entrance.

3.7.6 Road network

The proposed northern site precinct is bounded by the following roads:

- Parramatta Road to the south
- Burwood Road to the west
- Burton Street to the north.

The proposed southern site precinct is bounded by the following roads:

- Parramatta Road to the north
- Burwood Road to the west
- Esher Lane to the south.

Parramatta Road is a six-lane, two-way divided arterial (state) road, with a posted speed limit of 60 km/h. It accommodates high traffic volumes from the Sydney CBD and western suburbs, connecting to higher order routes that include the Great Western Highway and M4 Western Motorway M4 toll road.

Burwood Road is a two-lane, two-way undivided local road (south of Parramatta Road) with a posted speed limit of 50 km/h. Burwood Road provides access to Westfield Burwood and Burwood Station.

Gipps Street is a four-lane, two-way undivided state road that merges into a two-lane, two-way undivided road east of the Concord Community Centre. The posted speed limit in both sections is 60 km/h. Gipps Street provides access between the suburbs of Concord and Five Dock and is aligned adjacent to Parramatta Road.

Burton Street is a two-lane, two-way undivided local road with a posted speed limit of 50 km/h. Burton Street connects a number of low-density residential dwellings to higher order roads (such as Burwood Road) in the network.

Loftus Street is a two-lane, two-way undivided local road with a posted speed limit of 50 km/h. Loftus Street provides access to Concord Oval and allows north-south connections between Gipps Street and Parramatta Road.

Table 33 provides AM and PM peak hour link volumes for major roads forming the precinct's road network based on traffic counts conducted in March 2021. Survey data indicates that the peak hour periods on the road network around proposed Burwood North Station site occur between 7:30-8:30 AM and 4:00-5:00 PM.

Table 33 Existing peak hour traffic volumes by direction – Burwood North (2021)

		AM peak volume (vehicles per hour)		PM peak volume (vehicles per hour)	
Road	**Direction**	**Light**	**Heavy[1]**	**Light**	**Heavy[1]**
Parramatta Road	Westbound	1,547	104	1,613	81
	Eastbound	1,883	153	1,701	60
Burwood Road	Northbound	406	26	490	19
	Southbound	602	26	464	22
Gipps Street	Westbound	641	18	862	11
	Eastbound	1,030	32	845	9
Burton Street	Westbound	46	1	69	1
	Eastbound	42	2	54	0
Loftus Street	Northbound	31	2	46	3
	Southbound	148	6	127	3

Source: TfNSW Traffic surveys, March 2021

[1]Buses are included as heavy vehicles in the table

Baseline network performance for the AM and PM peak hours for key intersections in the vicinity of the proposed station is provided in Table 34. Note that observed traffic volumes for baseline intersection performance assessment have been adjusted as described in Section 2.2 to account for the impacts of the Covid-19 pandemic.

Table 34 Existing intersection performance – Burwood North (2021)

Intersection	AM peak		PM peak	
	Average delay (sec)	LOS	Average delay (sec)	LOS
Burton Street / Burwood Road	22	B	11	A
Parramatta Road / Burwood Road	27	B	25	B
Parramatta Road / Loftus Street	11	A	8	A
Burton Street / Loftus Street	5	A	5	A
Parramatta Road / Shaftesbury Road	30	C	33	C

Baseline intersection performance indicates that all intersections perform at level of service C or better during the AM and PM peak hours, representing reasonable operations with slightly restricted free-flow speeds and manoeuvrability across the local network.

Vehicle volumes in peak periods are generally not causing notable delays or impacting driver's ability to make mid-block lane changes on surrounding roads and intersections. However, travellers on Parramatta Road experience delays along the wider network.

3.7.7 Parking arrangements

Figure 38 shows the location of on-street parking arrangements around the proposed Burwood North Station sites, which are described as follows:

- On-street parking allocations on Parramatta Road are limited and parking restrictions are in place daily during daylight hours (6am-7pm, Monday to Friday and 8am-8pm, Saturday-Sunday) to provide a clearway for traffic operations
- Parking on both sides of Burwood Road is restricted during weekday peak periods (6:30am-9:30am and 3:30pm-6:30pm), with 30-minute time-restricted parking available outside of these hours and on Saturdays between 8:30am-12:30pm. On-street parking spaces provided on the western side of Burwood Road between Burton Street and Gipps Street are not time-restricted. Some parking along the eastern kerb of Burwood Road between Parramatta Road and Burton Street would be temporarily removed as part of work under the previous Sydney Metro West planning application
- On-street parking on Loftus Street is 3-hour time-restricted within weekday business hours (Monday to Friday, 8:30am-6:00pm) and between 8:30-12:30pm on Saturdays adjacent to the site boundary. Other parking along Loftus Street is unrestricted. Seven parking spaces including five restricted spaces along the western kerb of Loftus Street between Parramatta Road and Burton Street would be temporarily removed, and two parking spaces along the eastern kerb of Loftus Street would be temporarily removed as part of work under the previous Sydney Metro West planning application.
- Parking is provided on both sides of Burton Street, with no time-based restrictions in place. All parking along the southern kerb of Burton Street would be removed as part of work under the previous Sydney Metro West planning application. Some of these spaces would be removed permanently as part of this proposal

- On-street parking is prohibited on both sides of Gipps Street west of Burwood Road during weekday peak periods to allow for free-flow of two trafficable lanes in each direction.

Concord Oval is located east of Loftus Street opposite the proposed northern station site. The redevelopment of Concord Oval is currently underway. After redevelopment, Concord Oval parking lots would contain a total of 326 parking spaces. It is anticipated that these will not be available for general public use, because they would either be short term parking spaces and/or would be available during sports events and would be actively monitored by the council staff.

While there are no off-street parking facilities within the immediate vicinity of the proposed station sites for commuters, there are parking options within walking distance. The Meryla Street carpark is located approximately 550 metres south of Parramatta Road, with 32 available spaces. Westfield Burwood has 3,014 spaces and is located 650 metres south, though high hourly fees are likely to deter use. No kiss and ride or taxi zones are currently provided within the local area.

Figure 38 Existing parking arrangements – Burwood North

3.7.8 Permanent changes to transport infrastructure under previous Sydney Metro West planning applications

The following permanent changes to transport infrastructure will occur as part of the previous Sydney Metro West planning application:

- Permanent removal of off-street private parking for properties fronting Burwood Road and Parramatta Road within the Burwood North Station construction site

3.8 Five Dock Station

3.8.1 Introduction

Five Dock Station would be located in the City of Canada Bay LGA and is divided into western and eastern sites. The western site is located off Great North Road between East Street and Garfield Street and is intended to provide the only station entrance at Fred Kelly Place. The eastern site is located at the southwest corner of Second Avenue and Waterview Street intersection and would be a service building with no public access to the station. The proposed station location is shown Figure 39.

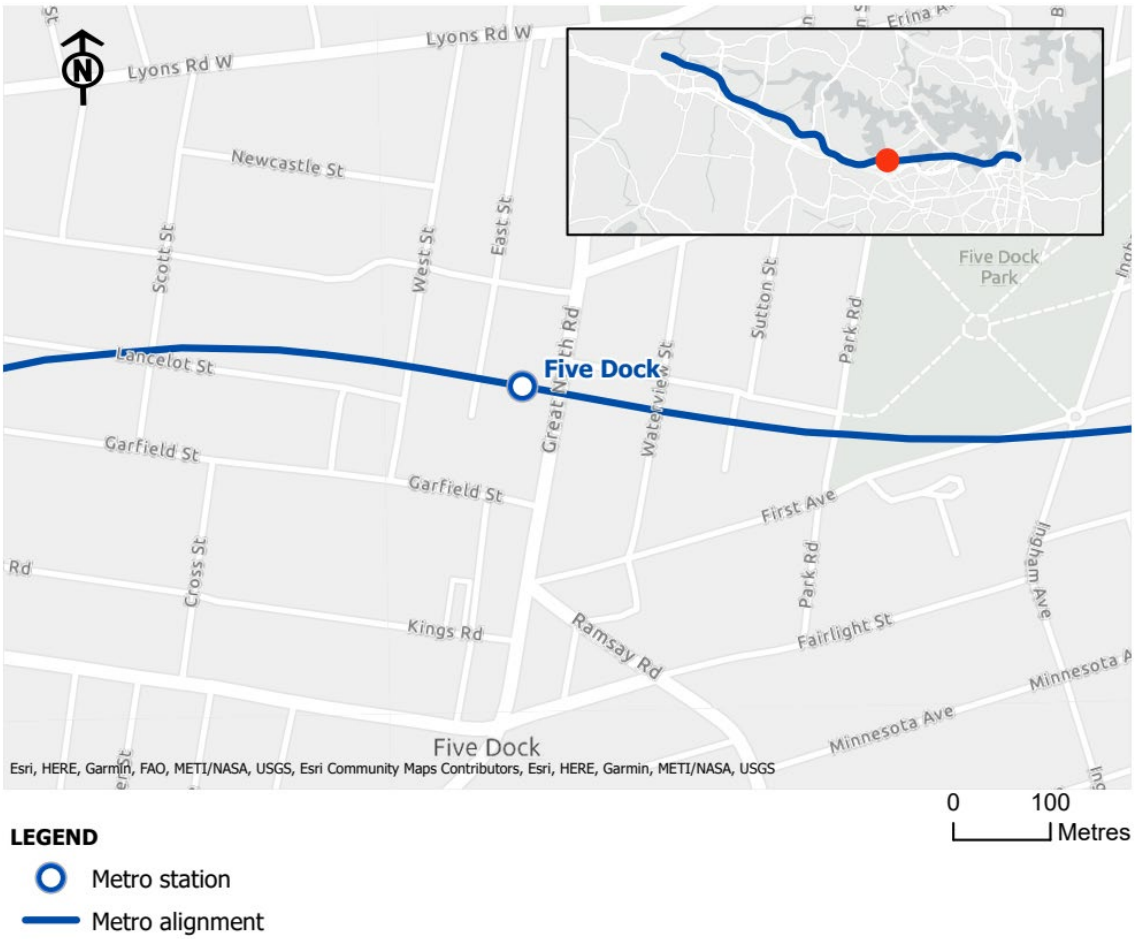


Figure 39 Station location – Five Dock

3.8.2 Land use context

The lands within both station areas are zoned as mixed use, with a public recreation area also falling within the western site boundary. Medium and low-density residential areas cover the majority of the local area, branching out in all directions. A large public recreation area (Five Dock Park) is located east of the proposed sites, as shown in Figure 40.

Figure 40 Land zone map – Five Dock

The current land use characteristics within and around the Five Dock Station precinct are as follows:

- Mixed-use zoning on Great North Road that consists of various commercial, community and retail premises on both sides of the corridor
- Medium density residential zoning on First Avenue, Second Avenue, Barnstaple Road, Kings Road, Garfield Street and Lyons Road that surround the Great North Road mixed-use zoning precinct
- Low density residential zoning extending further from the medium density residential zoning
- Public recreation zones that include Five Dock Park, Fred Kelly Place and Stevenson's Reserve.

3.8.3 Modes of travel/ key origins and destinations of trips

Journey to Work (2016) census data has been analysed to establish primary modes of travel for inbound and outbound workers for travel zones within 800 metres of the proposed station, which are presented in Figure 41.

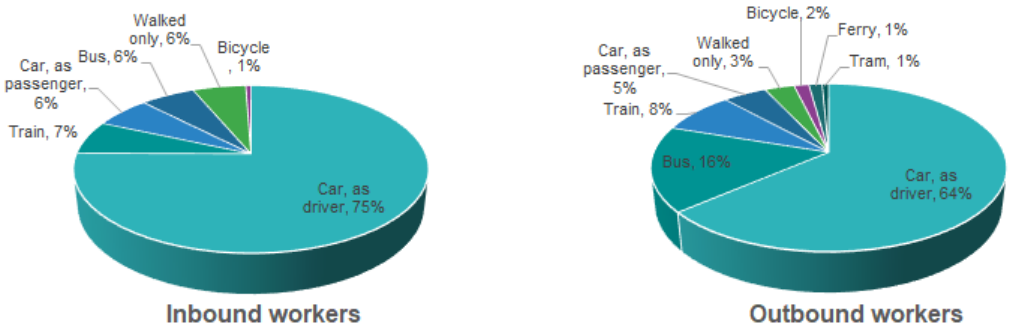


Figure 41 Existing mode share – Five Dock

The Journey to Work (2016) census data has also been interrogated to extract the top five origins and destinations for inbound and outbound trips associated with an 800 metre station catchment, which are summarised in Table 35.

Table 35 Top five origins and destinations for inbound and outbound trips

Inbound	Outbound
29% - Canada Bay	32% - Sydney Inner City
22% - Strathfield - Burwood - Ashfield	17% - Canada Bay
6% - Canterbury	10% - Strathfield - Burwood - Ashfield
4% - Ryde - Hunters Hill	6% - Leichhardt
3% - Bankstown	5% - Ryde - Hunters Hill

Figure 42 shows the existing transport network in the vicinity of the station precinct.

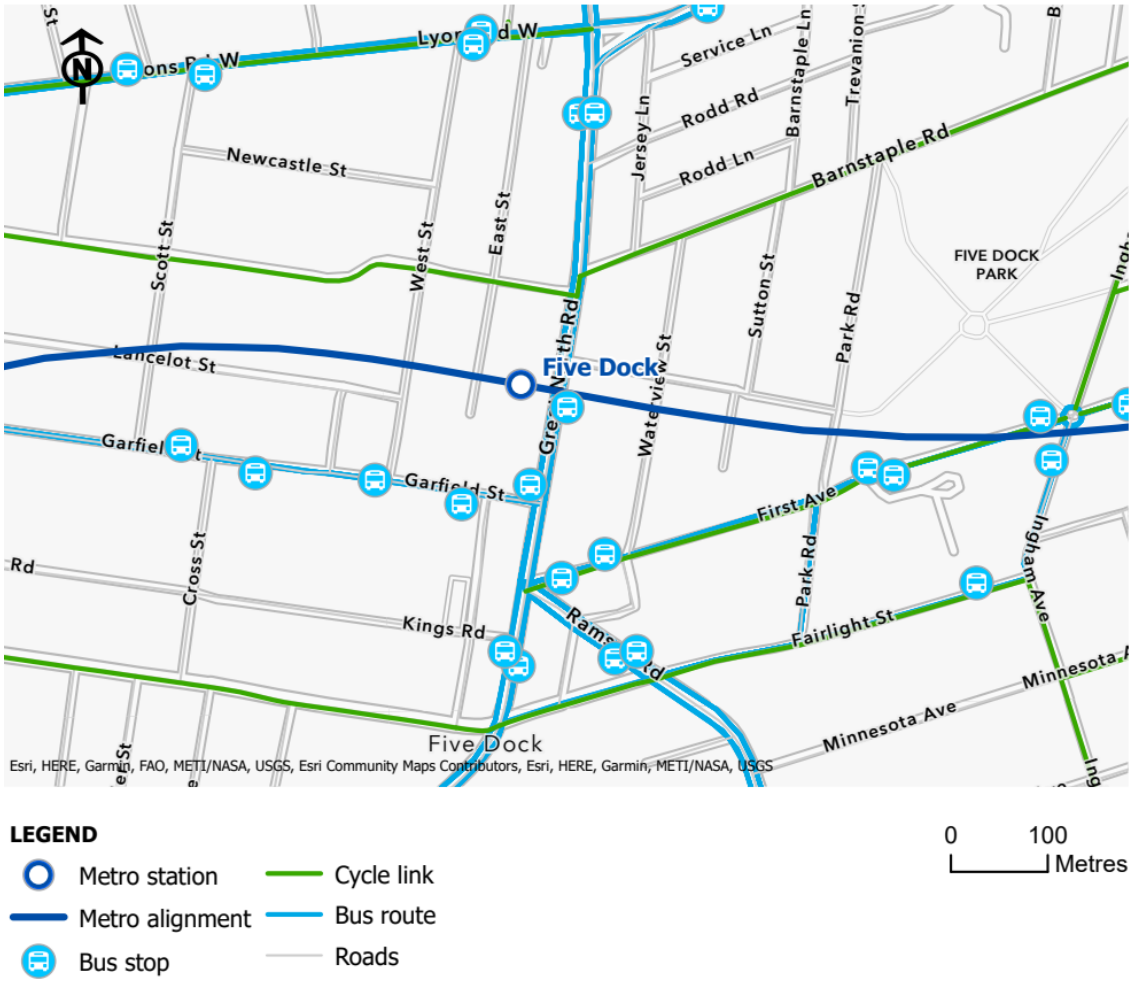


Figure 42 Existing transport network – Five Dock

3.8.4 Active transport network

Walking

Pedestrian connectivity around the station site is well established, with footpaths providing access in all directions. High levels of pedestrian activity are generated on Great North Road by retail and commercial businesses.

Access in the immediate vicinity of the proposed sites is good, though footpath widths are confined at a number of locations due to the narrow alignment of the road reserve. Footpaths are present on both verges of First Avenue, Second Avenue, Garfield Street, Kings Road, Henry Street and Barnstaple Road.

Pedestrian counts were collected in March 2021 at footpaths and signalised intersections in the vicinity of the station precinct, which are summarised in Figure 43 and Figure 44 for the AM and PM peaks respectively.

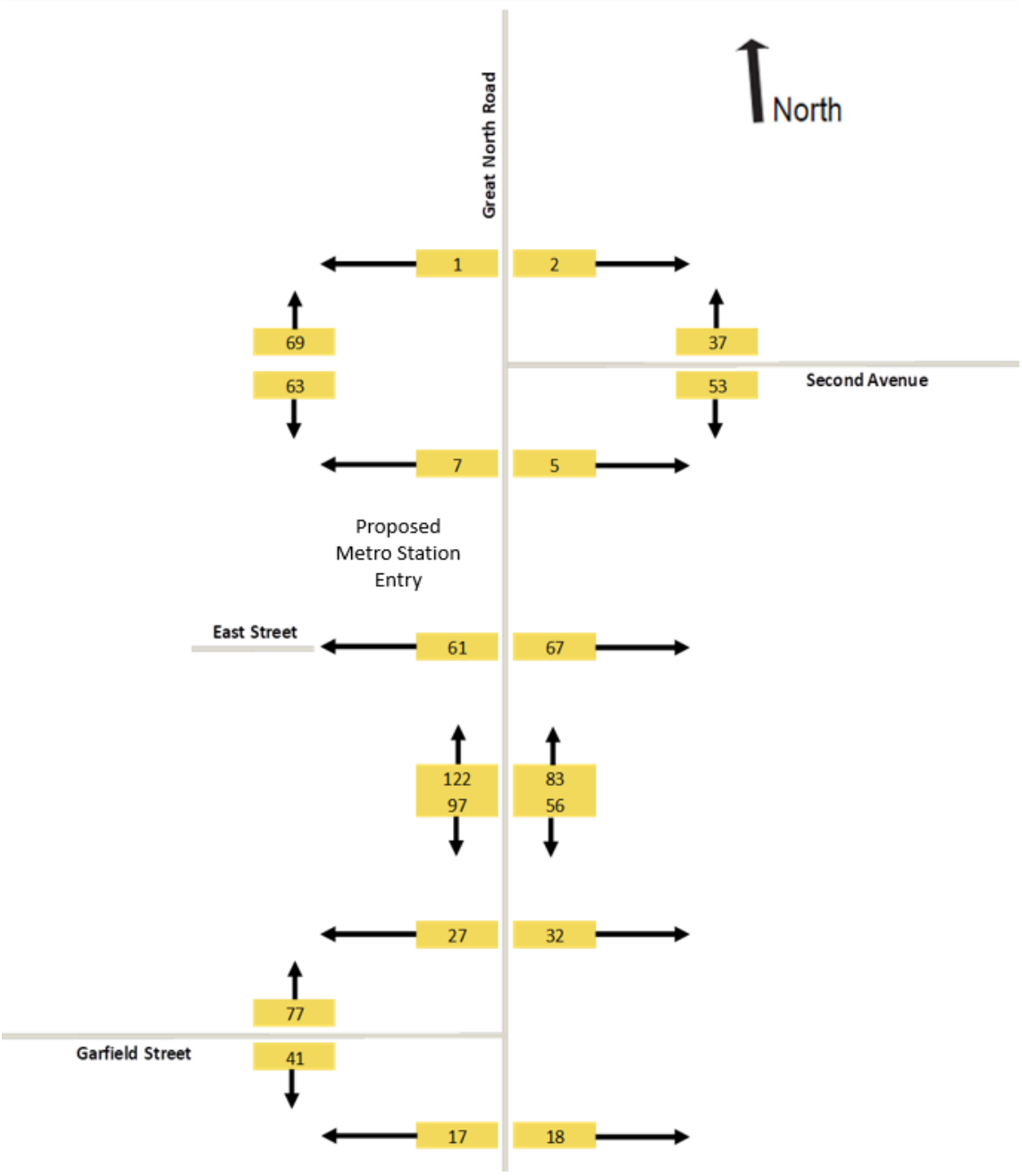


Figure 43 Existing AM peak hour pedestrian counts – Five Dock (March 2021)

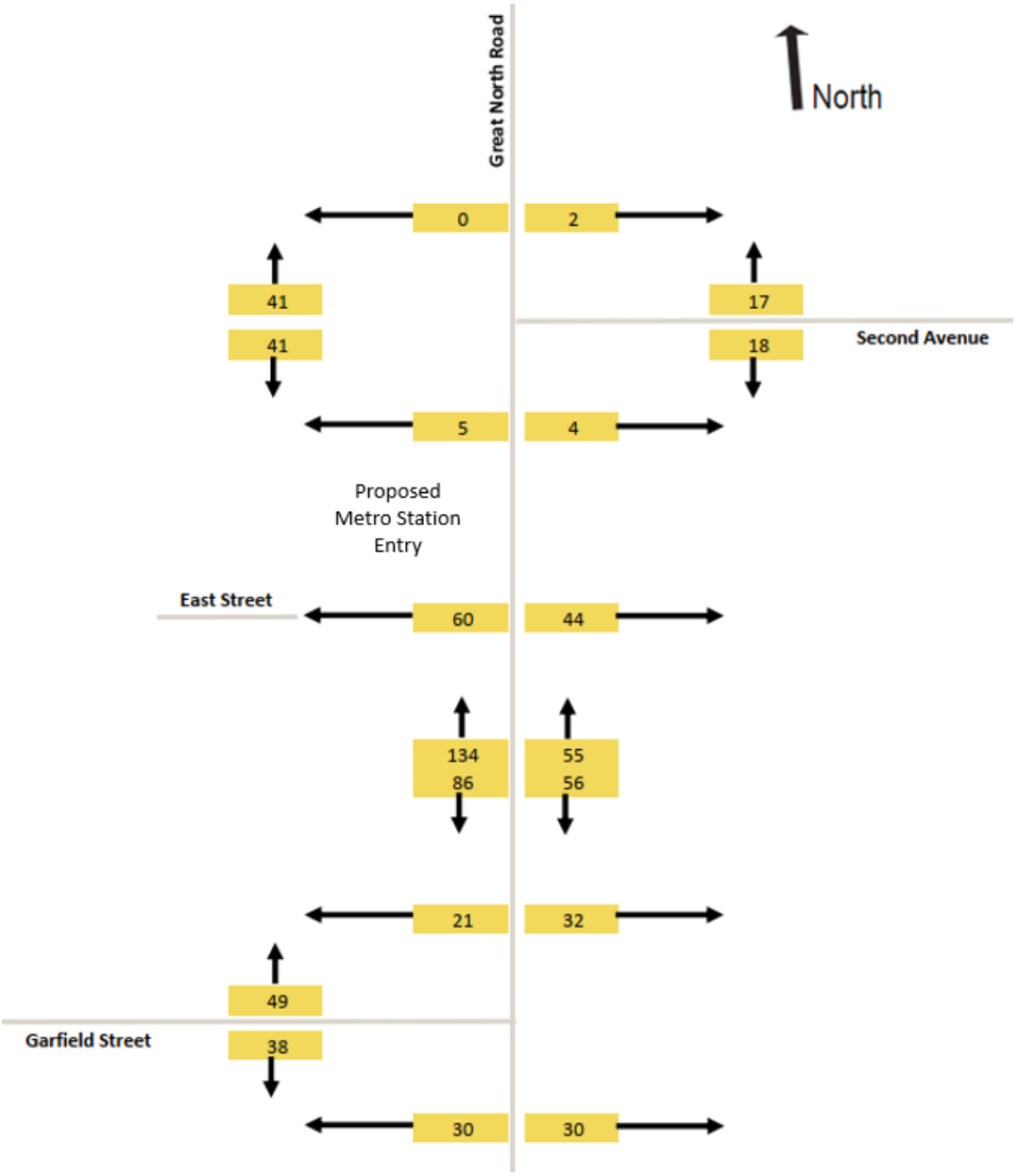


Figure 44 Existing PM peak hour pedestrian counts – Five Dock (March 2021)

Pedestrian crossing facilities provide several opportunities for pedestrians to safely travel east-west across Great North Road. The high active transport user environment on Great North Road however provides opportunities for pedestrians to cross at unprotected locations, potentially increasing the risk of pedestrian-vehicle conflicts.

Signalised crossing facilities are provided at the intersections of Great North Road/ Ramsay Road/ First Avenue, Great North Road/ Garfield Street, Great North Road/ Lyons Road, Great North Road/ Queens Road/ Fairlight Street and Great North Road at Fred Kelly Place. In addition to signalised crossings, a raised zebra crossing is also present at Great North Road between Barnstaple Road and Henry Street approximately 80 metres north of the metro station site.

Cycling

The cycle network surrounding the Five Dock Station primarily consists of a series of east-west on-road cycle lanes as shown in Figure 42. North-south connectivity within the local area and at the proposed station sites is limited, with no cycle infrastructure on Great North Road. There is no off-road cycle path to segregate cyclists from vehicles in the area surrounding the site.

East-west connectivity to the regional cycle network is provided via cycle lanes on Barnstaple Road and First Avenue (medium difficulty) towards the Henley Marine Drive cycleway, and on Queens Road towards Concord (medium difficulty).

Traffic survey data indicates that the majority of cycling trips are on Barnstaple Road and First Avenue, with cyclists travelling between residential areas east of Great North Road and the Henley Marine Drive cycleway. Queens Road supports the majority of through traffic from the wider network west of Great North Road to the Henley Marine Drive Cycleway.

Declining cycling demand north of Barnstaple Road and south of Queens Road indicates that the commercial, community and retail premises on Great North Road may be end of trip destinations for cyclists.

Cycling traffic declines significantly in the PM peak period, particularly on Barnstaple Road and First Avenue.

3.8.5 Public transport services

Bus services

Bus services provide the only form of public transport in the area surrounding the proposed station. Paired bus stops on both Great North Road and Garfield Street are serviced by eight bus routes that are within immediate walking distance of the station entrance at Fred Kelly Place, as shown in Figure 42. The local area is serviced by eight routes, details of which are provided in Table 36.

These routes also service six additional bus stops on Great North Road, Garfield Street and First Avenue.

In addition to the services listed in Table 36, all bus stops within this area are serviced by school routes, with a pre-bookable accessible service (D401) operating between Great North Road and Burwood.

Table 36 Existing bus services – Five Dock (2021)

Route	Description	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
406	Five Dock to Hurlstone Park	4	4
	Hurlstone Park to Five Dock	3	4
415	Campsie to Chiswick	4	4
	Chiswick to Campsie	4	4
437	City QVB to Five Dock via City West Link	5	8
	Five Dock to City QVB via City West Link	9	8
438X	City Martin Place to Abbotsford	7	22
	Abbotsford for City Martin Place	30	12
490	Drummoyne to Hurstville	4	4
	Hurstville to Drummoyne	3	4
492	Drummoyne to Rockdale	3	3
	Rockdale to Drummoyne	3	4
502	City Town Hall and Drummoyne to Cabarita Wharf	5	7
	Cabarita Wharf to Drummoyne and City Town Hall	5	4
530	Chatswood to Burwood	5	5
	Burwood to Chatswood	3	6

Rail services

The nearest rail station is Croydon Station, located approximately 2.6 kilometres south of the station. At this distance, many public transport users from Five Dock would likely consider bus services more accessible.

There are no opportunities for public transport users from Five Dock to interchange to rail at Croydon Station, though current bus services do allow for interchanging at Burwood Station (Routes 490, 492 and 530) and Ashfield Station (Route 406).

3.8.6 Road network

The Five Dock western site precinct is bounded by the following roads:

- Great North Road to the east
- Garfield Street to the south
- East Street to the west.

The Five Dock eastern site precinct is bounded by the following roads:

- Great North Road to the west
- Second Avenue to the north
- Waterview Street to the east.

Great North Road is a two-lane, two-way undivided state road (between Lyons Road and Parramatta Road), with bus zones between Queens Road and Kings Road and a posted speed limit of 50 km/h. Great North Road is a collector road that supports the highest volumes of traffic in the local area. It provides access to the site from Parramatta Road and the wider network of Five Dock, Wareemba, Abbotsford and Chiswick.

Barnstaple Road and First Avenue are two-lane, two-way undivided local roads with posted speed limits of 50 km/h. Both roads provide access from low density residential areas to Great North Road and Henley Marine Drive.

Second Avenue is a two-lane, two-way undivided local road with a posted speed limit of 50 km/h. Second Avenue provides access from low and medium density residential dwellings to Great North Road. Parking of vehicles on both sides of the road reduces the ability for vehicles to pass concurrently, requiring one direction to give way. Temporary road network modifications proposed as part of work under the previous Sydney Metro West planning application include:

- Second Avenue is proposed to be temporarily converted to one-way westbound operation between Waterview Street and Great North Road
- Waterview Street is proposed to be temporarily converted to one-way northbound operation north of the First Avenue car park and Second Avenue.

Garfield Street is a two-lane, two-way undivided local road with a posted speed limit of 50 km/h. Garfield Street connects a number of low and medium density residential dwellings to Great North Road.

Queens Road is a two-way state road (being the western section of Gipps Road), with a posted speed limit of 60 km/h. Queens Road provides east-west access between the suburbs of Five Dock and Concord.

Table 37 provides AM and PM peak hour link volumes for major roads forming the precinct’s road network based on traffic counts conducted in March 2021.

Table 37 Existing peak hour traffic volumes by direction – Five Dock (2021)

Road	Direction	AM peak volume (vehicles per hour) Light	AM peak volume (vehicles per hour) Heavy[1]	PM peak volume (vehicles per hour) Light	PM peak volume (vehicles per hour) Heavy[1]
Great North Road	Northbound	646	45	626	25
	Southbound	551	46	653	22
Barnstaple Road	Westbound	197	1	213	1
	Eastbound	262	6	164	1
First Avenue	Westbound	162	18	138	14
	Eastbound	383	13	306	5
Second Avenue	Westbound	58	7	65	1
	Eastbound	114	4	97	1
Garfield Street	Westbound	249	13	299	11
	Eastbound	270	14	266	9
Queens Road	Westbound	613	14	770	4
	Eastbound	651	8	539	2

Source: TfNSW Traffic surveys, March 2021

[1]Buses are included as heavy vehicles in the table

Baseline network performance during AM and PM peak hours for key intersections in the vicinity of the proposed station is provided in Table 38. Note that observed traffic volumes for baseline intersection performance assessment have been adjusted as described in Section 2.2 to account for the impact of the Covid-19 pandemic.

Table 38 Existing intersection performance – Five Dock (2021)

Intersection	AM peak Average delay (sec)	AM peak LOS	PM peak Average delay (sec)	PM peak LOS
Second Avenue / Great North Road	16	B	19	B
Great North Road Mid-Block crossing	3	A	3	A
Garfield Street / Great North Road	19	B	24	B
Great North Road / First Ave / Ramsay Road	31	C	30	C
Second Avenue / Waterview Street	10	A	8	A
First Avenue / Waterview Street	8	A	7	A

Modelled intersection performance indicates that all intersections perform at level of service C or better during the AM and PM peak hours, representing reasonable operations, with slightly restricted manoeuvrability and free-flow speeds across the local network. Vehicle volumes in these locations during peak periods are generally not causing notable delays or impacting driver's ability to make mid-block lane changes.

3.8.7 Parking arrangements

Figure 45 shows the location of on-street and off-street parking arrangements around the Five Dock Station sites, which are described as follows:

- On-street parking is provided on both sides of Great North Road, with bus zones restricting kerbside space periodically on either side. All parking spaces are 30-minute time-restricted within weekday business hours (Monday to Friday, 8:30am-6:00pm) and between 8:30-12:30pm on Saturdays. Around 12 spaces on the western side of Great North Road would be temporarily removed as part of work under the previous Sydney Metro West planning application.

- Parking on Garfield Street is limited to one hour on weekday business hours (Monday to Friday, 8:30am-6:00pm) and between 8:30-12:30pm on Saturdays. A taxi-zone limits the availability of parking on the northern side of Garfield Street west of Great North Road.

- Two-hour parking restrictions are enforced on First Avenue during weekday business hours (Monday to Friday, 8:30am-6:00pm). The bus zone restricts available parking to five spaces on the northern side between Great North Road and Waterview Street. Parking is available on both sides east of Waterview Street.

- Parking on Second Avenue contains 30 minute and one-hour time restricted spaces on weekday business hours (Monday to Friday, 8:30am-6:00pm) and between 8:30-12:30pm on Saturdays. Some of these spaces would be temporarily removed as part of work under the previous Sydney Metro West planning application.

- Most parking spaces on Waterview Street are untimed, except for four two-hour parking spaces (Monday to Friday, 8:30am-6:00pm) outside the Waterview Street carpark. Some of these spaces would be temporarily removed as part of work under the previous Sydney Metro West planning application.

In addition to on-street parking, there are a number of off-street facilities within the area, including:

- The Waterview Street carpark, which contains 88 car spaces and is unmetered with two-hour time restrictions between Monday to Thursday, 8:30am-6:00pm

- The Kings Road carpark, which contains 77 car spaces and is unmetered with two-hour time restrictions between Monday to Thursday, 8:30am-6:00pm

- The Second Avenue carpark, which contains 12 car spaces and is unmetered with two-hour time restrictions between Monday to Saturday, 8:30am-6:00pm. These spaces would be permanently removed as part of work under the previous Sydney Metro West planning application

- In addition to above designated parking lots for public use, a private car park for Coles supermarket is also located in close vicinity to the eastern station site which contains 163 basement carparking spaces and has access through Garfield Street. These parking spaces have free parking for up to three hours.

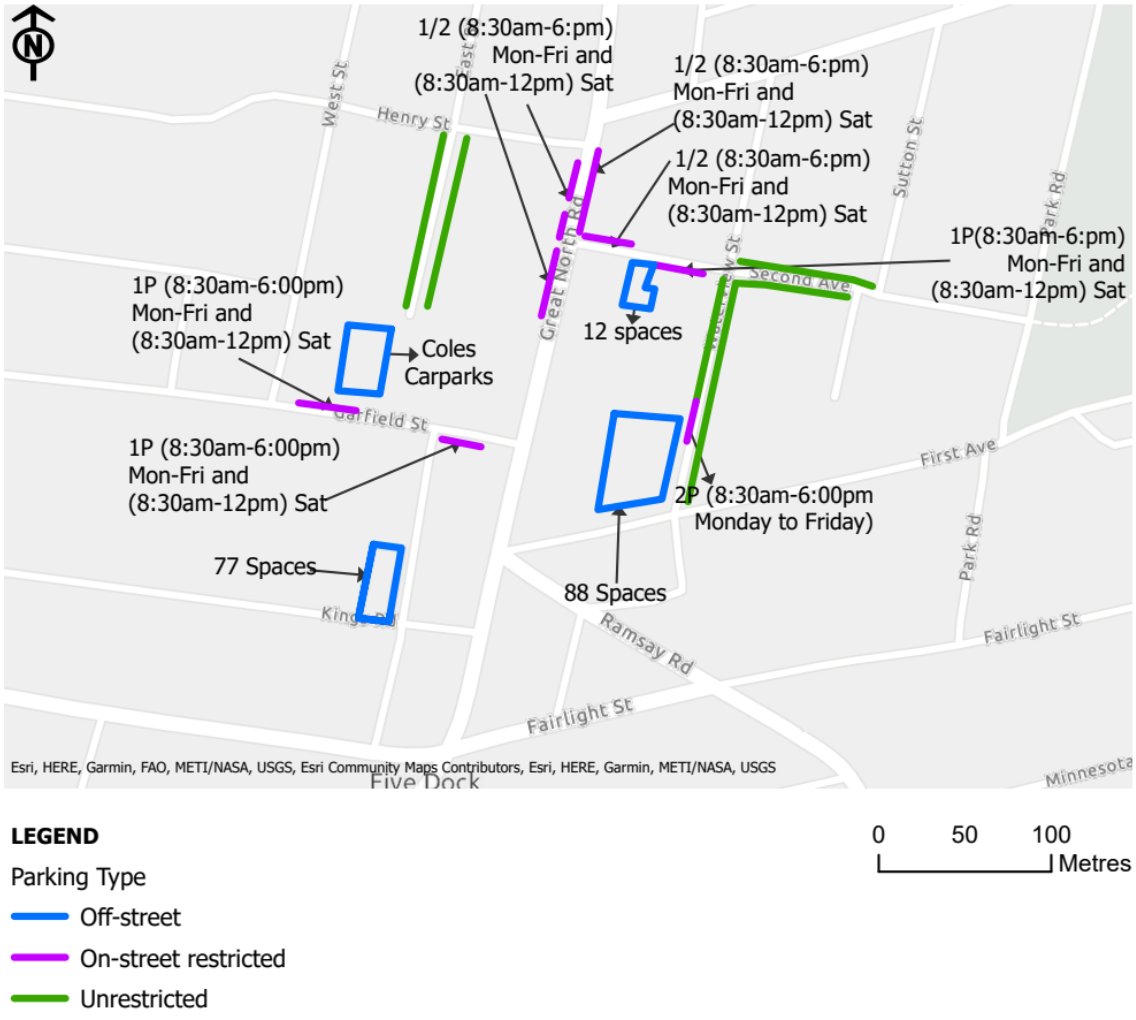


Figure 45 Existing parking arrangements – Five Dock

3.8.8 Permanent changes to transport infrastructure under previous Sydney Metro West planning applications

The following permanent changes to transport infrastructure will occur as part of the previous Sydney Metro West planning application:

- Permanent removal of the Second Avenue carpark, which contains 12 car spaces with two-hour time restrictions Monday to Saturday, 8:30am-6:00pm

3.9 The Bays Station

3.9.1 Introduction

The Bays Station would be located within the Inner West LGA at White Bay between Glebe Island and the White Bay Power Station. The surrounding suburbs are Balmain, Rozelle, Annandale and Glebe. Pyrmont will be accessible with the future connection via the Glebe Island Bridge (or new bridge).

Currently the precinct has limited pedestrian and vehicular access and is managed by the Port Authority of NSW. The Port Access Road provides access to cruise passengers from James Craig Road travelling to the White Bay Cruise Terminal on cruise days, as well as for Cruise Terminal functions. Scheduled cruise ships depart from the terminal during cruise days. The precinct is connected to several arterial roads including Victoria

Road, City West Link and Anzac Bridge. The location of the metro station is shown in Figure 46.

Figure 46 Station location – The Bays

3.9.2 Land use context

The Bays West precinct is currently zoned as a mixture of port-related function and employment. Light industrial buildings are located along Robert Street. It also includes waterfront and recreation uses. The surrounding areas of the precinct are predominantly residential, as illustrated below in Figure 47.

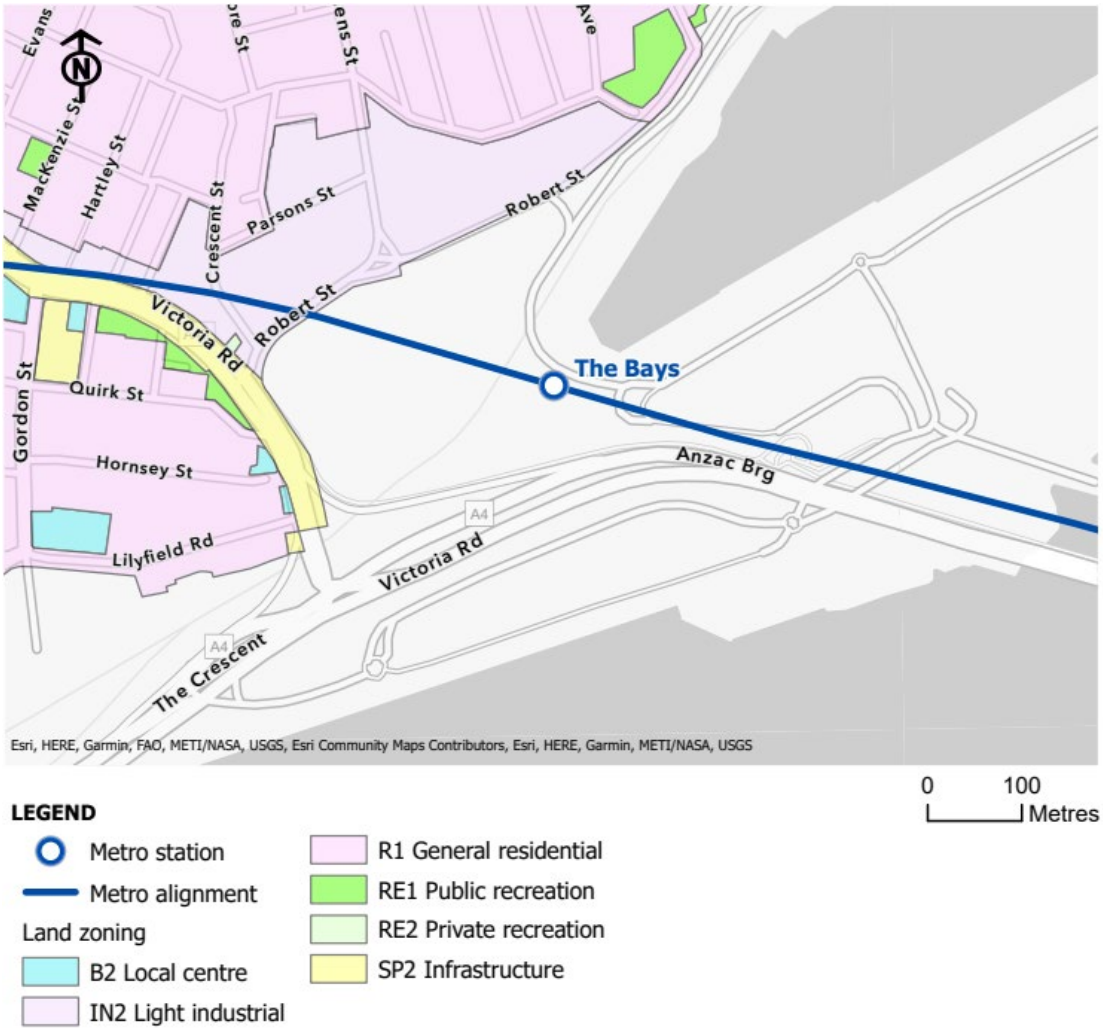


Figure 47 Land zoning map – The Bays

3.9.3 Modes of travel/ key origins and destinations of trips

Journey to Work (2016) census data has been analysed to establish primary modes of travel for inbound and outbound workers for travel zones within 800 metres of the proposed station, which are presented in Figure 48.

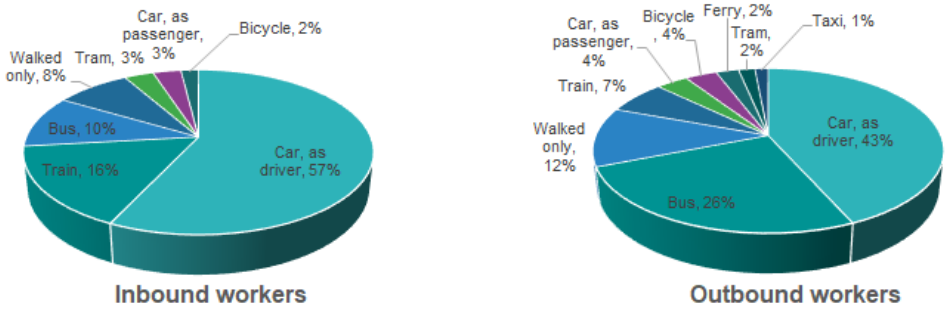


Figure 48 Existing mode share – The Bays

The Journey to Work (2016) census data has also been interrogated to extract the top five origins and destinations for inbound and outbound trips associated with an 800 metre station catchment, which are summarised in Table 39.

Table 39 Top five origins and destinations for inbound and outbound trips

Inbound	Outbound
20% - Leichhardt	52% - Sydney Inner City
15% - Sydney Inner City	15% - Leichhardt
5% - Strathfield – Burwood – Ashfield	5% - North Sydney – Mosman
5% - Canada Bay	4% - Ryde – Hunters Hill
5% - Ryde – Hunters Hill	4% - Chatswood – Lane Cove

Figure 49 shows the existing transport network in the vicinity of the station precinct. Further details are discussed below.

Figure 49 Existing transport network – The Bays

3.9.4 Active transport network

Walking

The precinct has low pedestrian activity due to the existing land use and the limited extent of existing infrastructure. This is expected to change when the proposed station opens. The number of pedestrians recorded is less than 20 at Robert Street/ Mullens Street. The number is slightly higher along Victoria Road, in the order of 20-40 pedestrians during the peak hour, as shown in Figure 50 and Figure 51.

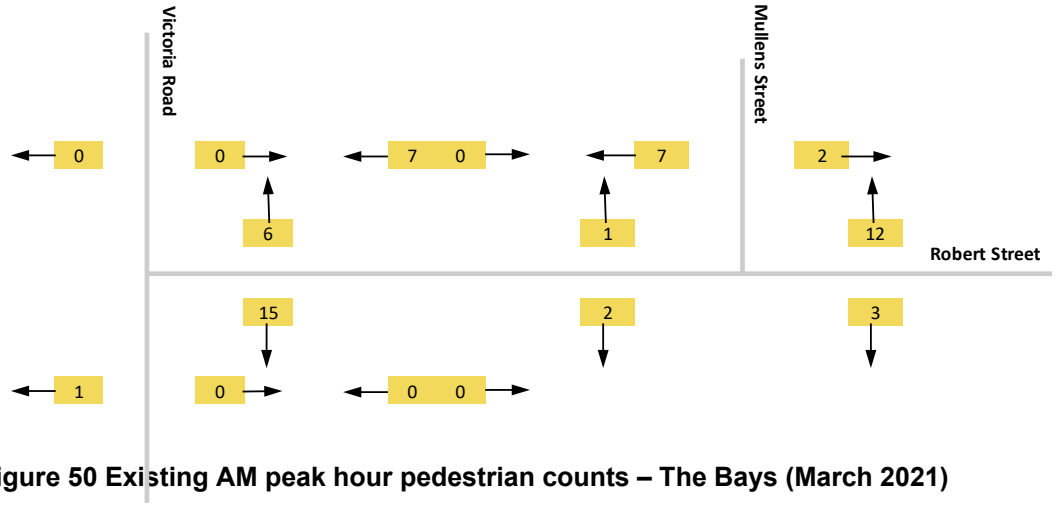


Figure 50 Existing AM peak hour pedestrian counts – The Bays (March 2021)

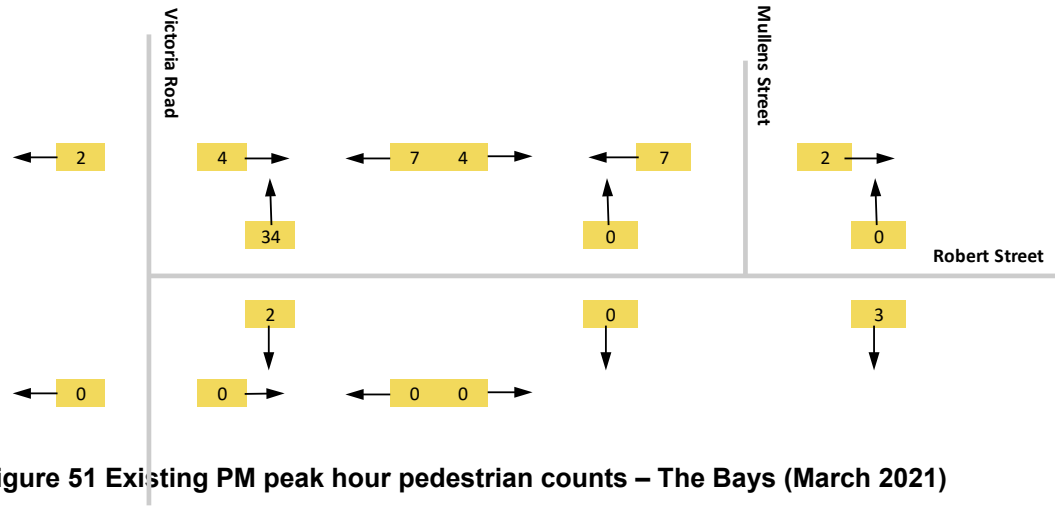


Figure 51 Existing PM peak hour pedestrian counts – The Bays (March 2021)

Cycling

A comprehensive active transport network is provided around the precinct, including a shared path that connects to surrounding areas, namely to:

- Anzac Bridge on the east via Victoria Street
- Balmain via Robert Street
- The west via The Crescent.

Cycle lanes (a mixture of on-street cycle lanes and mixed traffic) are provided on Robert Street, Buchanan Street and Lilyfield Road.

A number of changes to cycle facilities have taken place due to construction of WestConnex at Rozelle Interchange, including the crossing at Victoria Road / The Crescent where the footbridge (Beatrice Bush Bridge) was demolished to make room for the new configuration. The shared user path on the eastern side of Victoria was also removed. An alternative shared user path on the western side of Victoria Road connects Lilyfield Road to James Craig Road, which provides a connection to a new active transport network within the Rozelle Rail Yards.

3.9.5 Public transport services

A number of high frequency bus services are provided along Robert Street and Victoria Road. Cruise ships may be accessed via the White Bay Cruise Terminal.

Other public transport services may be found in the vicinity of the precinct, but may require transit due to a walking distance of more than two kilometres, including the following:

- Ferry at Balmain East
- Light rail at Rozelle Bay.

Bus services

Bus service along Victoria Road comprises 23 bus routes that connect the Sydney CBD, the Inner West, as well as northern and southern suburbs. Bus lanes are provided along the eastern side of Victoria Road (inbound to the city). A short section of the bus priority lane is provided at Victoria Road/ The Crescent for outbound buses to queue jump at this intersection. Bus services during the peak hour are summarised in Table 40.

Table 40 Existing bus services – The Bays (2021)

Route	Description	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
441	City Art Gallery to Birchgrove via QVB (Loop Service)	11	12
442	City QVB to Balmain East Wharf (Loop Service)	40	38
433	Central Pitt St to Balmain Gladstone Park	6	13
433	Balmain Gladstone Park to Central Pitt St	13	9
500X	City Hyde Park to West Ryde (Express Service)	11	22
500X	West Ryde to City Hyde Park (Express Service)	40	12
501	Central Pitt St to Parramatta via Victoria Rd	8	14
501	Parramatta to Central Pitt St via Victoria Rd	14	12
502	City Town Hall and Drummoyne to Cabarita Wharf	0	8
502	Cabarita Wharf to Drummoyne and City Town Hall	11	0
503	City Town Hall to Drummoyne (Loop Service)	18	18

Route	Description	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
504	City Domain to Chiswick	6	10
504	Chiswick to City Domain	18	8
504X	City Town Hall to Chiswick (Express Service)	0	7
506	City Domain to Macquarie University via East Ryde	4	13
506	Macquarie University to City Domain via East Ryde	16	7
507	City Hyde Park & Gladesville to Meadowbank	0	11
507	Meadowbank to Gladesville & City Hyde Park	11	0
431	City Martin Place to Glebe Point	7	14
431	Glebe Point to City Martin Place	24	8
437	City QVB to Five Dock via City West Link	5	8
437	Five Dock to City QVB via City West Link	12	8

Light rail services

Light rail services are accessible approximately 500 metres south of the precinct at the Rozelle Bay stop in Annandale. The travel time by foot from Robert Street is approximately 20 minutes including crossing both Victoria Road and the Crescent intersections. The light rail service runs every eight minutes during peak hours in both directions. Further details are provided in Table 41.

Table 41 Light rail services and frequency – Annandale / The Bays

Line/ Direction	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
Line L1		
Central to Dulwich Hill	7	7
Dulwich Hill to Central	7	7

Rail services

There are currently no Sydney Trains suburban rail services available in the vicinity of the precinct.

Ferry services

There are two ferry terminals in the vicinity of the precinct, however these may require transit due to a walking distance of more than two kilometres. The ferry services include:

- Ferry service F4 Pyrmont Bay stops at Balmain East
- Ferry service F8 Cockatoo Island that stops at Balmain Wharf.

Details of ferry services, including route and number of services are included in Table 42.

Table 42 Weekday ferry services – The Bays

Route	Description	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
F4	Circular Quay to Pyrmont Bay	6	7
F8	Cockatoo Island to Circular Quay	4	2

Cruise ship services

Cruise ship services are available at the White Bay Cruise Terminal located northeast of the precinct. Cruise ships typically arrive at the Terminal between 6-7am and depart between 4-5pm. Private vehicles, taxis and coaches access the Terminal via the Port Access Road during cruise days.

3.9.6 Road network

The Port Access Road to the White Bay Cruise Terminal only opens to the public on cruise days or during functions at the Terminal. Traffic volumes are low on non-cruise/ function days, when the road is mainly used by terminal staff. The White Bay Cruise Terminal however does have separate function and special event facilities which generate traffic on non-cruise days.

James Craig Road, a local road, provides access from The Crescent (A4) to the Port Access Road, the Waterfront Rozelle Bay and Glebe Island.

Immediately to the northern side of the precinct, Robert Street/ Mullens Street is a priority-controlled intersection that connects the precinct to the Balmain peninsula. Robert Street (Mullens Street to Victoria Road) and Mullens Street have regional road classifications. Mullens Street and Robert Street both have 40 km/hr posted speed limits.

Arterial (state) roads including City-West Link Road, Victoria Road and the Western Distributor carry high traffic volumes and connect the precinct to the Sydney CBD, Sydney west and Parramatta. Peak hour volumes for the existing road network are tabulated in Table 43.

James Craig Road and the roads servicing the Glebe Island port are approved 25/ 26 metre long B-Double routes.

Table 43 Existing peak hour traffic volumes by direction – The Bays (2021)

Road	Location	AM peak volume (vehicles per hour)		PM peak volume (vehicles per hour)	
		Light	Heavy[1]	Light	Heavy[1]
Port Access Road	North of Solomons Way (cruise ship day)	54	20[2]	48	8[2]
Robert Street	East of Mullens St	195	6	204	3
Mullens Street	North of Robert St	539	55	500	21
Victoria Road	North of The Crescent	3491	199	2575	97
City West Link	West of James Craig Road	3110	176	3035	101
James Craig Road	South of The Crescent	36	43	131	18

Source: TfNSW Traffic surveys, March 2021

[1]Buses are included as heavy vehicles in the table

[2] Primarily coaches moving between the Terminal and James Craig Road

Baseline network performance was assessed, the results of which are provided in Table 44. Note that observed traffic volumes for baseline intersection performance assessment have been adjusted as described in Section 2.2 to account for the impacts of the Covid-19 pandemic.

Most arterial roads in the vicinity of the precinct operate at reasonable levels of service (level of service D or better). The exception is The Crescent / Victoria Road, which operates at level of service F in the PM peak.

Table 44 Existing intersection performance – The Bays (2021)

Intersection	AM peak		PM peak	
	Average delay (sec)	LOS	Average delay (sec)	LOS
Robert Street / Mullens Street[1]	36	C	20	B
Victoria Road / Robert Street	55	D	31	C
The Crescent / Victoria Road	26	B	80	F
James Craig Road / The Crescent	15	B	7	A

[1]The worst movement delay is reported as the overall delay for priority (un-signalised) intersections.

3.9.7 Parking arrangements

There are 124 unrestricted parking spaces along Robert Street east of Mullens Street. Parking in the Balmain suburb has a two hour time restriction with an exemption for resident vehicles.

Parking along the eastern side of Mullens Street is restricted only outside the morning peak (6:30 - 9:30am, Monday to Friday). A similar restriction applies to the evening peak (3 - 7pm, Monday to Friday) along the northern side of Robert Street, west of Mullens Street. No parking is allowed on the nearby arterial (state) roads, or on James Craig Road.

Existing parking locations and restrictions are shown in Figure 52.

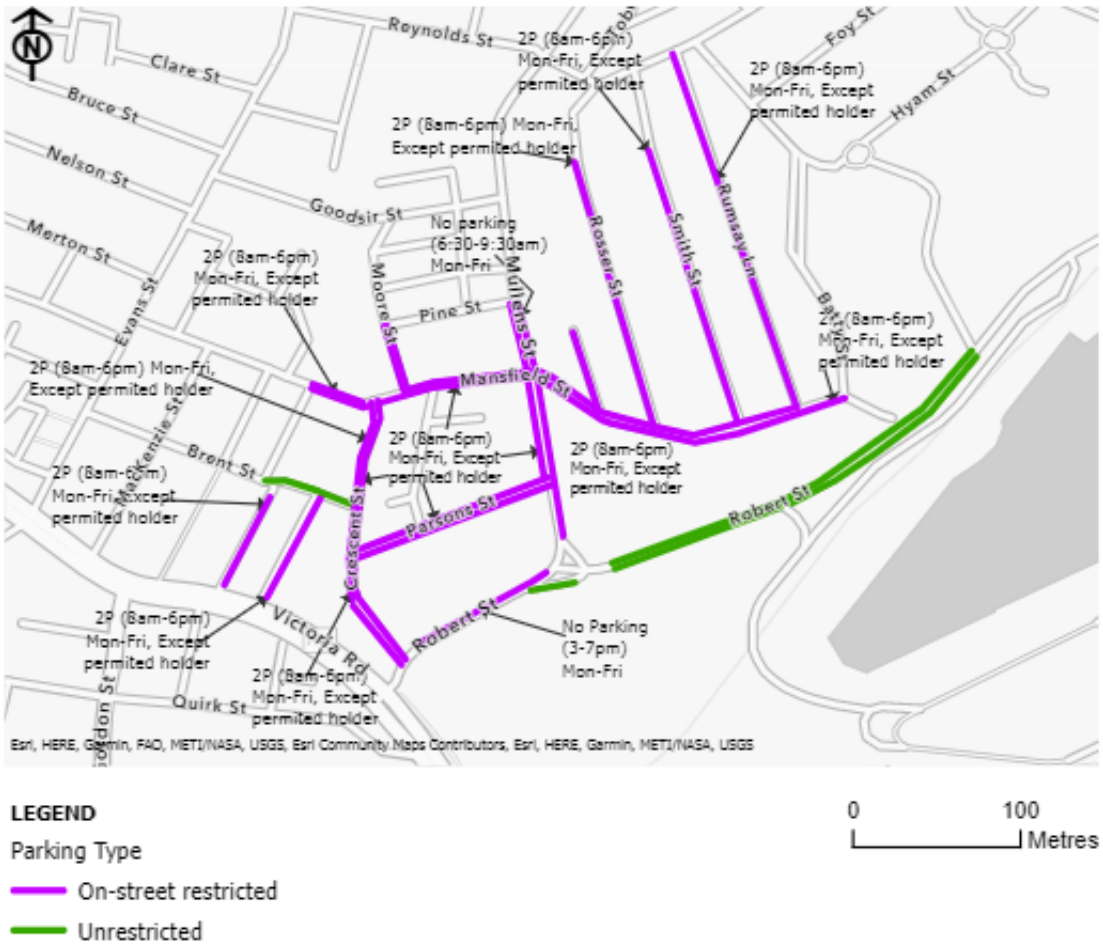


Figure 52 Existing parking arrangements – The Bays

3.9.8 Permanent changes to transport infrastructure under previous Sydney Metro West planning applications

There are no permanent changes to transport infrastructure as part of the previous Sydney Metro West planning approvals.

3.10 Pyrmont Station

3.10.1 Introduction

Pyrmont Station would be located within the City of Sydney LGA, in the heart of the Pyrmont peninsula and is bounded by Union Street, Pyrmont Street, and Pyrmont Bridge Road, as shown in Figure 53. The station comprises two sites, including an eastern and western site.

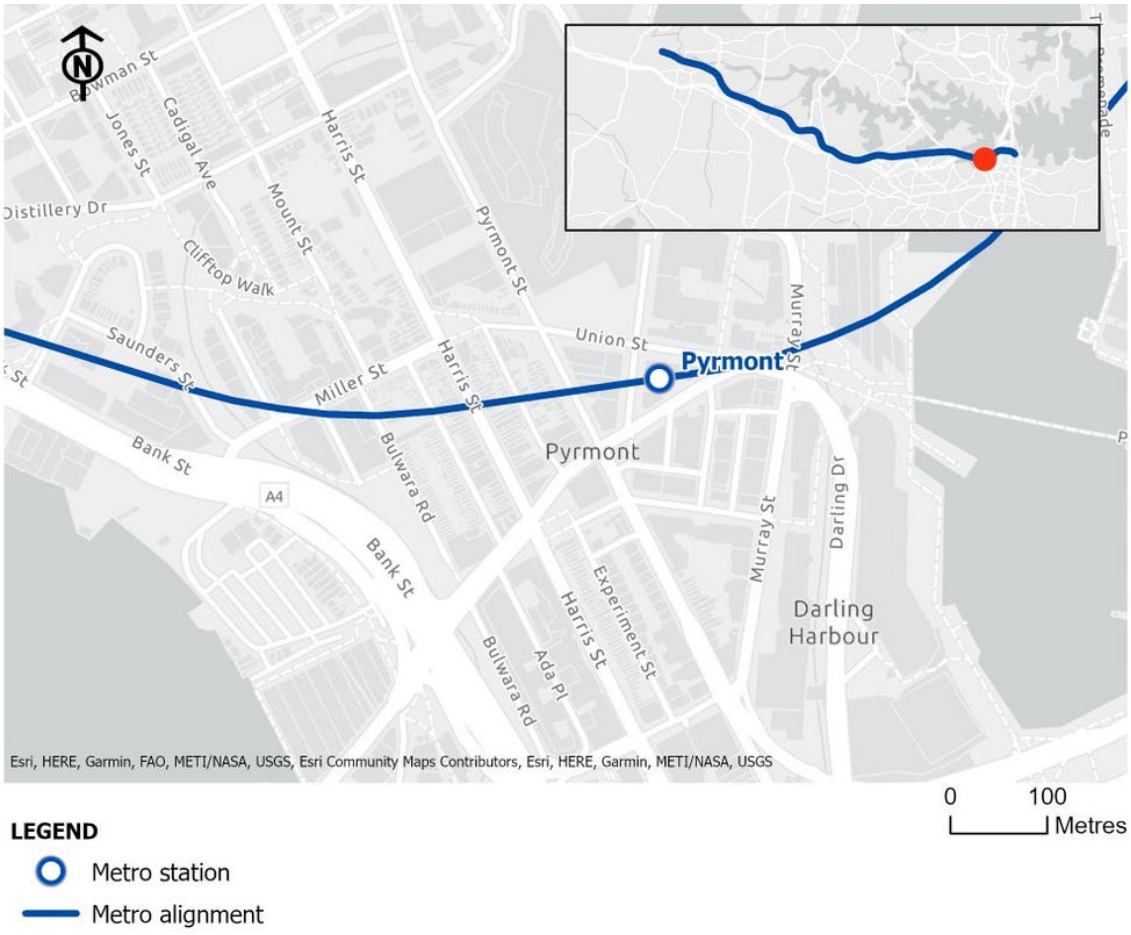


Figure 53 Station location – Pyrmont

3.10.2 Land use context

Pyrmont peninsula has transformed over time into a high density, mixed use community with a significant number of entertainment and cultural attractions. The area in which the station would be located is zoned as mixed use with commercial land use to the north and far south-east, as shown in Figure 54.

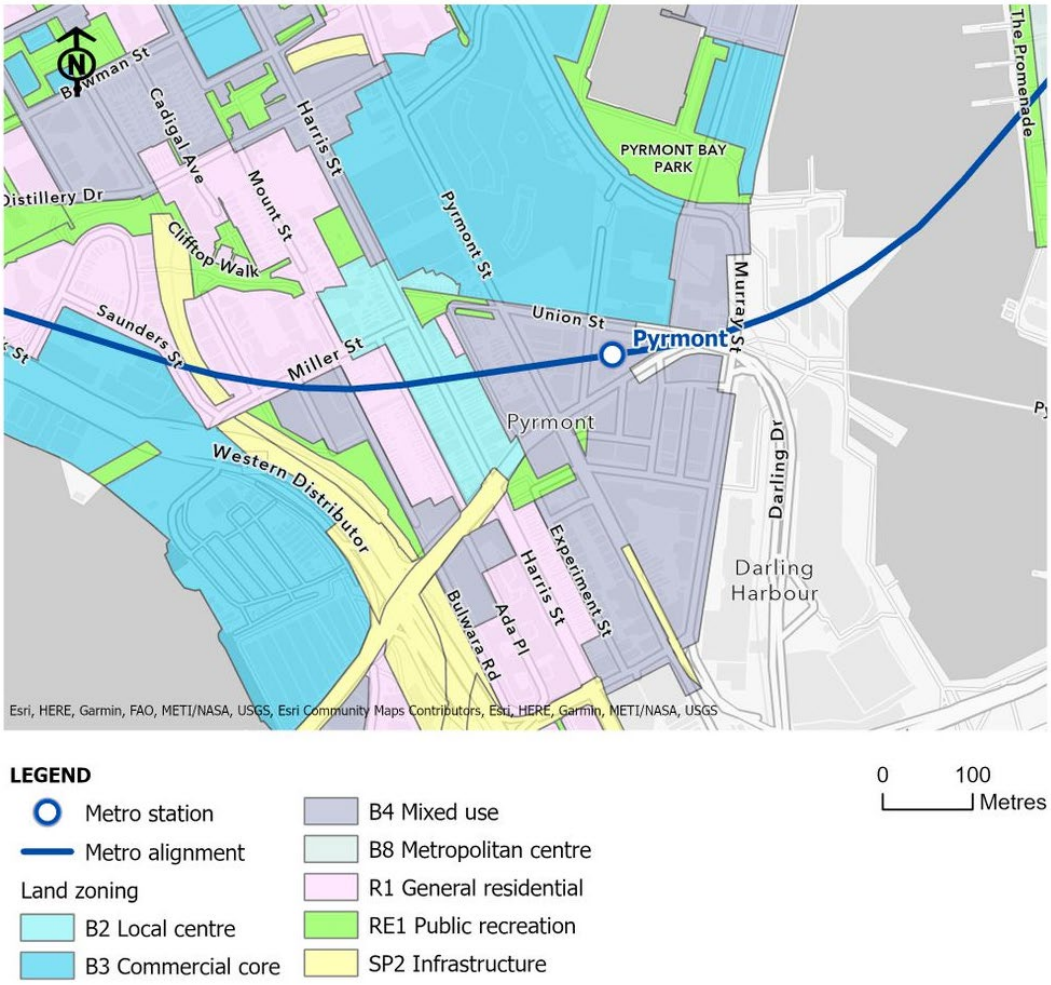


Figure 54 Land zoning map - Pyrmont

The current land use characteristics around the Pyrmont Station are as follows:

- A mixture of residential, mixed use, community, entertainment and retail premises
- Darling Harbour waterfront and Harbourside Shopping Centre are located to the east, with proposals by Mirvac to redevelop the shopping centre
- Sydney's CBD is located to the far east with a direct link through Pyrmont Bridge. The bridge provides a main active transport link between the two areas
- The Star Casino is located to the north of the eastern station site, with proposals by the Star Entertainment Group to redevelop its site in Darling Island
- The existing Sydney Fish Market is located to the west. This area and its surrounds will witness a major transformation including the new Fish market and the adjacent sites at Blackwattle Bay
- A series of small parks and open spaces are located on the waterfront and around the peninsula
- A number of educational institutes including Ultimo University of Technology Sydney (UTS), and its plans to expand to provide new teaching and complimentary spaces into Ultimo.

3.10.3 Modes of travel/ key origins and destinations of trips

Journey to Work (2016) census data has been analysed to establish primary modes of travel for inbound and outbound workers for travel zones within 800 metres of the proposed station, which are presented in Figure 55.

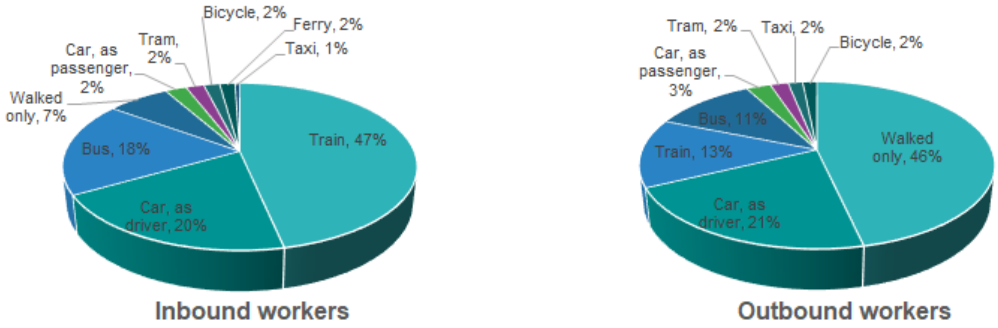


Figure 55 Existing mode share – Pyrmont

The Journey to Work (2016) census data has also been interrogated to extract the top five origins and destinations for inbound and outbound trips associated with an 800 metre station catchment, which are summarised in Table 45.

Table 45 Top five origins and destinations for inbound and outbound trips

Inbound	Outbound
15% - Sydney Inner City	71% - Sydney Inner City
6% - Eastern Suburbs - North	5% - North Sydney - Mosman
5% - Strathfield - Burwood - Ashfield	3% - Ryde - Hunters Hill
5% - North Sydney - Mosman	3% - Chatswood - Lane Cove
4% - Chatswood - Lane Cove	3% - Eastern Suburbs - North

Figure 56 shows the existing transport network within the vicinity of the station.

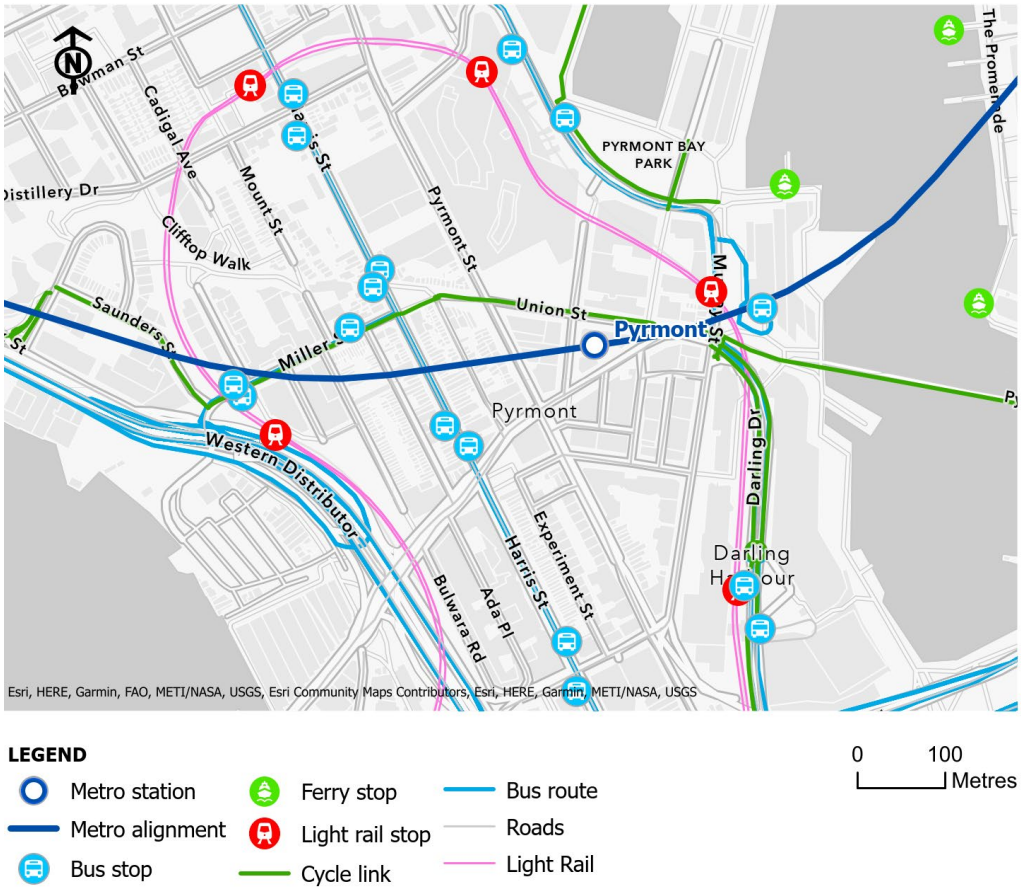


Figure 56 Existing transport Network - Pyrmont

3.10.4 Active transport network

Walking

The station precinct area is a vibrant one with a number of desire lines for pedestrians, including:

- Union Street and Miller Street being the main east-west link connecting Sydney's CBD to Pyrmont's Peninsula and providing pedestrian linkage to the waterfront and the light rail stops. The western end of Union Street that connects with Miller Street is a shared zone with a posted speed of 10 km/h. The footpath on the southern side of Union Street between Edward Street and Pyrmont Bridge Road would be temporarily closed as part of work under the previous Sydney Metro West planning application

- Harris Street is another north-south link that connects the northern end of the peninsula with Broadway in the south. This road also serves as a major bus corridor of the peninsula

- Pyrmont Bridge Road is an east-west route that supports a high level of pedestrian movement across the peninsula and is expected to accommodate pedestrians linked to the future developments in the west, including the new Sydney Fish Market and Blackwattle Bay.

Pedestrian counts were collected in 2021 at footpaths and signalised intersections in the vicinity of the proposed station precinct, which are summarised in Figure 57 and Figure 58 for the AM and PM peaks respectively.

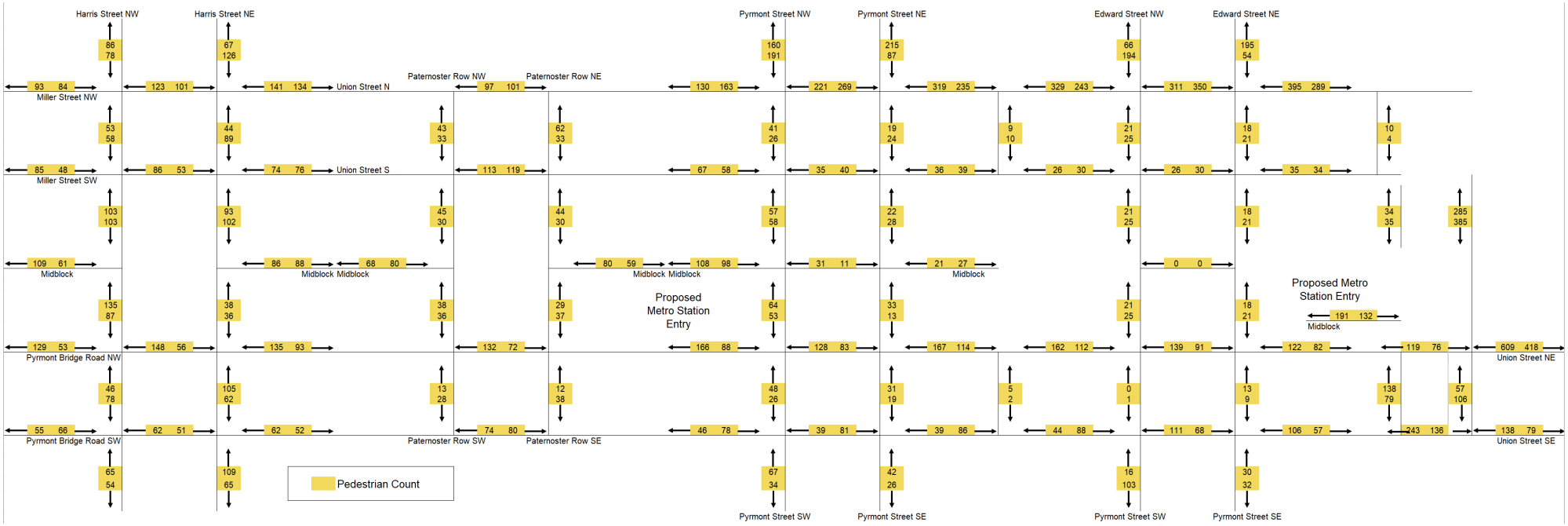


Figure 57 Existing AM peak hour pedestrian counts – Pyrmont (March 2021)

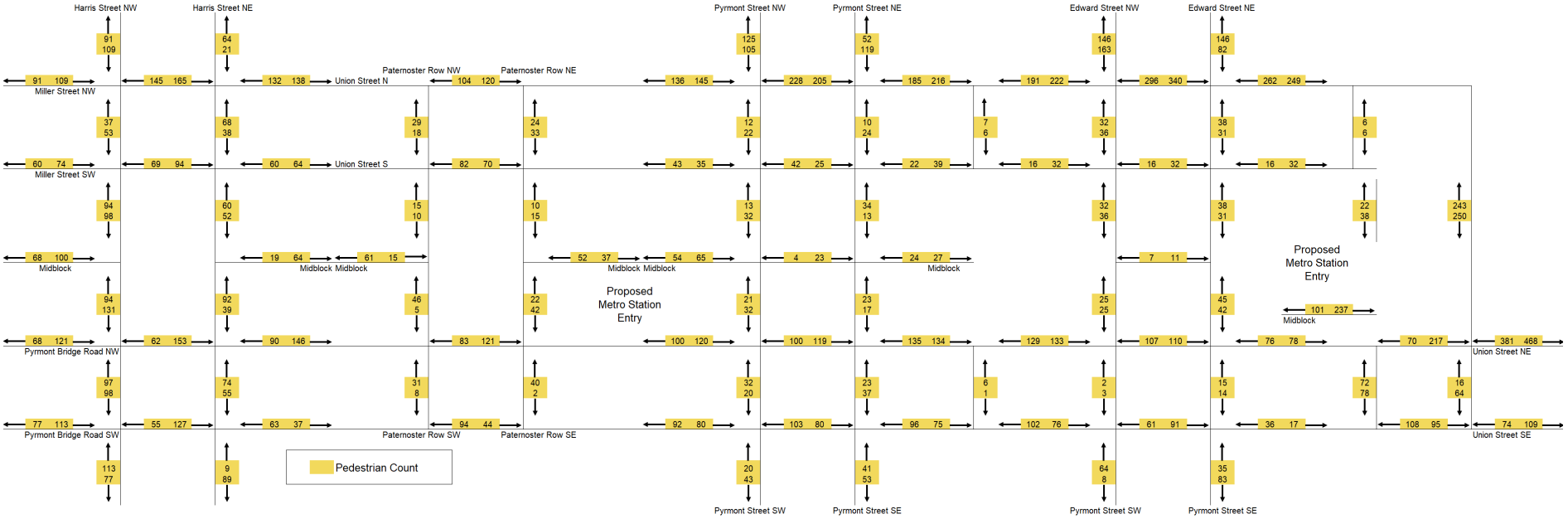


Figure 58 Existing PM peak hour pedestrian counts – Pyrmont (March 2021)

Footpaths are provided along both sides of all roads around the proposed station precinct.

Pedestrian crossing is possible at multiple intersections under traffic signal control within the station precinct. Additionally, a raised pedestrian crossing is provided on Union Street and provides linkage to Pyrmont Bridge Road and transfers to/ from the eastern light rail stop at Pyrmont Bay.

Cycling

The existing formal cycle network around the station precinct is limited to the following cycle links, as shown in Figure 56:

- A physically separated cycle lane on Union Street
- A physically separated cycle lane on Miller Street
- A separated off-road cycleway on a section of Darling Drive at the southern end of Pyrmont Peninsula.

The above is in line with the City of Sydney cycling map and NSW Principal Bicycle Network. Both also indicate proposed cycle routes on Pyrmont Bridge Road between Wattle Street and Union Street, Murray Street, Bulwara Road, and a section of Darling Drive that connects to Union Street.

The NSW cycleway finder highlights cycleways with moderate difficulty on Miller Street and the northern section of Darling Drive. Union Street is also indicated as an off-street cycle route with low difficulty.

3.10.5 Public transport services

Bus services

Existing bus stops are located on Harris Street, as shown in Figure 56 with bus services that connect to Bondi Junction, Sydney CBD, and Parramatta.

Table 46 details existing bus services in the vicinity of the station.

Table 46 Existing bus services – Pyrmont (2021)

Route	Description	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
501	Parramatta to Central Pitt St via Victoria Rd	17	11
501	Central Pitt St to Parramatta via Victoria Rd	8	15
389	Pyrmont to Bondi Junction	17	18
389	Bondi Junction to Pyrmont	14	12

The bus zone in the northbound direction on Harris Street is indented and therefore does not impact or obstruct traffic movement. In the southbound direction, however, the bus zone is located in the through lane, obstructing traffic travelling in this direction.

Light rail services

Pyrmont Peninsula is served by light rail that runs between Central and Dulwich Hill with a number of stops located within walking distance of the proposed metro station. The Pyrmont Bay stop is located around 200 metres from the station in the north-east direction. Table 47 below provides the route description in addition to the number of services in the peak periods.

Table 47 Light rail services - Pyrmont

Line/ Direction	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
L1 – Dulwich Hill Line		
Central to Dulwich Hill	15	15

Rail services

There are currently no Sydney Trains suburban rail services available in the vicinity of the precinct.

Ferry services

Pyrmont Bay Wharf is located approximately 350 metres from the proposed station in the north-east direction and provides ferry services between Pyrmont Wharf and Circular Quay.

Table 48 provides details of these services in the peak periods.

Table 48 Ferry services - Pyrmont

Line/ Direction	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
F4 – Pyrmont Bay		
Pyrmont Bay to Circular Quay	7	7
Circular Quay to Parramatta River	7	7

3.10.6 Road network

The road network in the vicinity of the station includes Union Street, Miller Street, Pyrmont Bridge Road, Pyrmont Street and Harris Street.

Both Union Street and Miller Street are single carriageway local roads with generally two lanes in each direction with kerb-side lanes used for parking. The posted speed limit for both roads is 40 km/h with a section of Union Street (western end) signposted as a shared zone with a posted speed of limit 10 km/h. Both Union Street and Miller Street have physically separated cycle lanes.

Pyrmont Street is a single carriageway local road with a posted speed limit of 40 km/h. The road has two lanes in each direction north of Pyrmont Bridge Road with sections of the kerb-side lanes used for parking. The road is one way in the southbound direction, south of Pyrmont Bridge Road and provides direct connection to Sydney's CBD and ramps that connect to the Western Distributor.

Harris Street runs parallel to Pyrmont Street and is a single carriageway road with one lane in each direction to the north of Pyrmont Bridge Road with parallel parking and indented bus stops. Harris Street is a local road north of Allen Street. South of Pyrmont Bridge Road, the road has two lanes in each direction, where some sections of the kerb-side lanes are used for parking. Harris Street is considered the existing main bus interchange in Pyrmont with bus stops located on both sides serving a number of routes, as discussed in section 3.10.5.

Pyrmont Bridge Road is an east-west state road (west of Harris Street) and a local road (east of Harris Street). The road has a posted speed limit of 50 km/h and is generally two lanes in each direction with additional storage lanes for right turning traffic at intersections located on this road. Parking is restricted on this road.

In addition to the above main roads, the proposed eastern station site is also bounded by Edward Street, which connects Pyrmont Bridge Road with the waterfront area. The road is a single carriageway local road and has a posted speed limit of 40 km/h. It has two lanes in each direction with the kerb-side lanes used for parking.

Paternoster Row, which bounds the western metro station site from the west, is a shared zone with a posted speed of 10 km/h and does not carry significant traffic volumes.

Table 49 provides AM and PM peak hour link volumes for major roads forming the precinct's road network based on traffic counts conducted in March 2021.

Table 49 Existing peak hour traffic volumes by direction – Pyrmont (2021)

Road	Location	AM peak volume (vehicles per hour)		PM peak volume (vehicles per hour)	
		Light	Heavy[1]	Light	Heavy[1]
Union Street	Eastbound - midblock between Edward St and Pyrmont Bridge Rd	39	7	68	6
Union Street	Westbound - midblock between Edward St and Pyrmont Bridge Rd	14	0	36	0
Pyrmont Street	Northbound - midblock between Union St and Pyrmont Bridge Rd	241	10	227	0
Pyrmont Street	Southbound - midblock between Union St and Pyrmont Bridge Rd	276	19	484	8
Harris Street	Northbound - midblock between Miller St and Pyrmont Bridge Rd	467	53	375	30
Harris Street	Southbound - midblock between Miller St and Pyrmont Bridge Rd	221	44	276	25

Road	Location	AM peak volume (vehicles per hour)		PM peak volume (vehicles per hour)	
		Light	Heavy[1]	Light	Heavy[1]
Pyrmont Bridge Road	Eastbound - east of Harris St	1094	34	726	9
Pyrmont Bridge Road	Westbound - east of Harris St	280	37	346	7
Edward Street	Northbound - midblock between Union St and Pyrmont Bridge Rd	181	1	167	1
Edward Street	Southbound - midblock between Union St and Pyrmont Bridge Rd	17	0	41	1

Source: TfNSW Traffic surveys, March 2021

[1]Buses are included as heavy vehicles in the table

Baseline network performance for the AM and PM peak hours for key intersections in the vicinity of the proposed metro station is provided in Table 50. Note that observed traffic volumes for baseline intersection performance assessment have been adjusted as described in Section 2.2 to account for the impacts of the Covid-19 pandemic.

Table 50 Existing intersection performance - Pyrmont (2021)

Intersection	AM peak		PM peak	
	Average delay (sec)	LOS	Average delay (sec)	LOS
Union Street/Harris Street	26	B	27	B
Union Street/ Pyrmont Street	24	B	29	C
Union Street/Edward Street	16	B	17	B
Union Street/Darling Drive	28	B	32	C
Pyrmont Bridge Road/Harris Street	22	B	22	B
Pyrmont Bridge Road/Pyrmont Street	24	B	24	B
Pyrmont Bridge Road/Edward Street[1]	5	A	5	A
Pyrmont Bridge Road/Union Street[1]	5	A	7	A

[1]The worst movement delay is reported as the overall delay for priority (un-signalised) intersections.

Baseline intersection performance indicates that all intersections perform at level of service C or better during the AM and PM peak hours.

3.10.7 Parking arrangements

Existing parking arrangements in the vicinity of the metro precinct include on-street parking. These parking spaces are generally time restricted and are located on Pyrmont Street, Union Street, Miller Street, Harris Street, Edward Street and Paternoster Row, as shown in Figure 59. Parking is restricted on Pyrmont Bridge Road.

On-street parking spaces on Union Street between Edward Street and Pyrmont Bridge Road would be temporarily removed as part of work under the previous Sydney Metro West planning application.

There are also around 20 off-street parking spaces linked to existing development on the eastern station site, although these would be permanently removed as part of work under the previous Sydney Metro West planning application.

A number of loading zones are also provided within the precinct on Union Street, Miller Street, Edward Street and Harris Street.

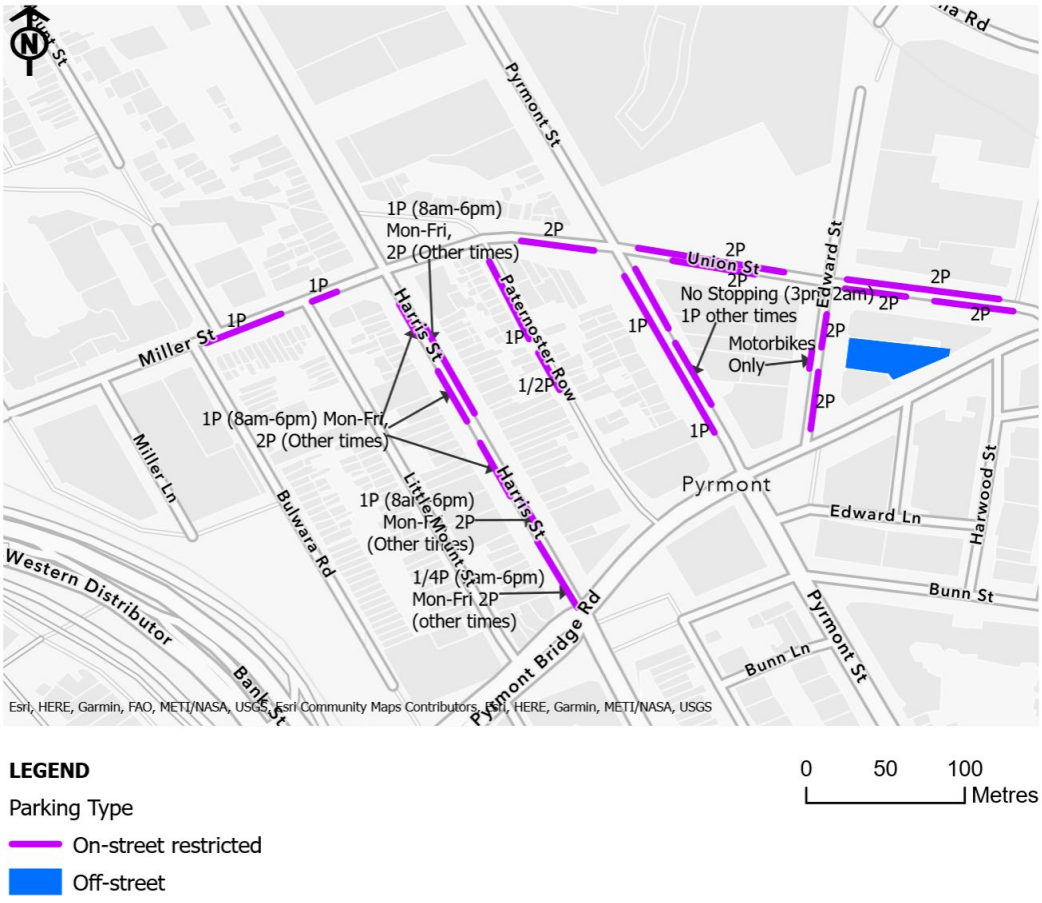


Figure 59 Existing parking locations – Pyrmont

3.10.8 Permanent changes to transport infrastructure under previous Sydney Metro West planning applications

The following permanent changes to transport infrastructure would occur as part of the previous Sydney Metro West planning application:

- Permanent removal of the off-street parking spaces (around 20 spaces) linked to existing development on the eastern station site.

3.11 Hunter Street (Sydney CBD) Station

3.11.1 Introduction

Hunter Street Station would be located within Sydney's CBD, situated within the City's commercial centre on Hunter Street. The station would provide direct access into the commercial core, civic precincts, as well as key recreational and tourist destinations of the Sydney CBD.

Divided into western and eastern sites, the western site is bound by Hunter Street, George Street and De Mestre Place, with the eastern site bound by Hunter Street, Bligh Street and O'Connell Street. Both sites are located within the City of Sydney Council LGA. The proposed station location is shown in Figure 60.

Figure 60 Station location – Hunter Street (Sydney CBD)

3.11.2 Land use context

The lands within this area are zoned primarily as metropolitan centre, with public recreation and infrastructure zones located sporadically in all directions. A parcel of general residential land use area is located to the north of the station, with a large mixed-use zone located to the north-west, as shown in Figure 61.

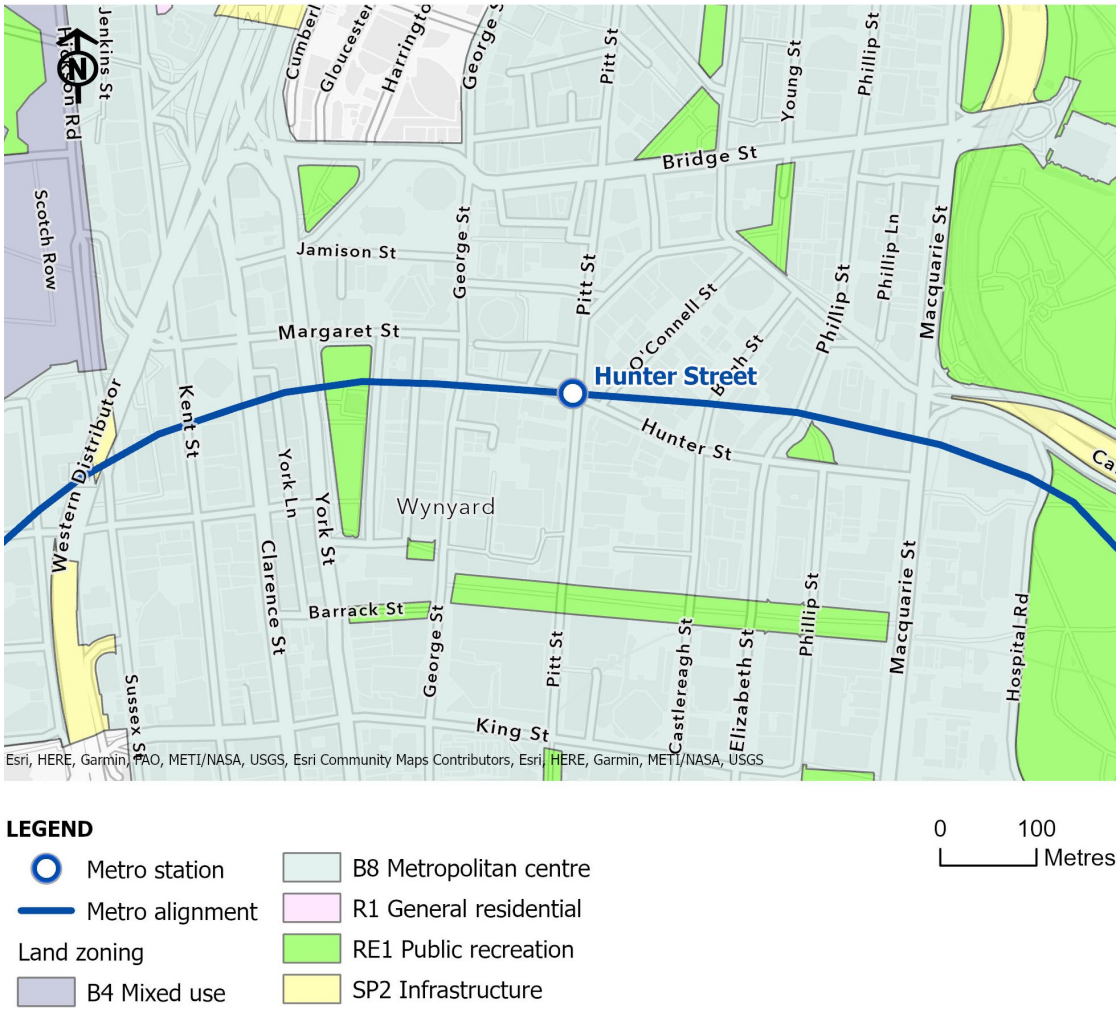


Figure 61 Land use zoning - Hunter Street (Sydney CBD)

The current land use characteristics within and around the proposed Hunter Street Station precinct (western and eastern sites) are as follows:

- Metropolitan centre zoning surrounding the station precinct, that consist of various commercial premises, with some retail on both sides of Hunter Street, O'Connell Street and Bligh Street
- Tower Cluster Area zoning on Hunter Street (including the western and eastern sites), Pitt Street, O'Connell Street and Bligh Street as part of the Sydney Local Environmental Plan 2012
- Zoning of the Royal Botanic Garden Sydney as public recreation east of the station precinct
- Mixed use zoning of Barangaroo north-west of the station precinct that contains a range of commercial, retail and entertainment premises
- Small public recreational zoning to the north, east, south and west of the station precinct, including Macquarie Place Park, Wynyard Park and Lang Park
- Zoning of Martin Place, Barrack Street and Angel Place as public recreation land use.

3.11.3 Modes of travel/key origins and destinations of trips

Journey to Work (2016) census data has been analysed to establish primary modes of travel for inbound and outbound workers for travel zones within 800 metres of the proposed station, which are presented in Figure 62.

Walking is the primary form of access and egress for workers to and from the station. Inbound workers are more likely to use active or public transport modes to complete their trip, whereas outbound workers are more likely to transfer to a car (as driver or passenger) or another train service.

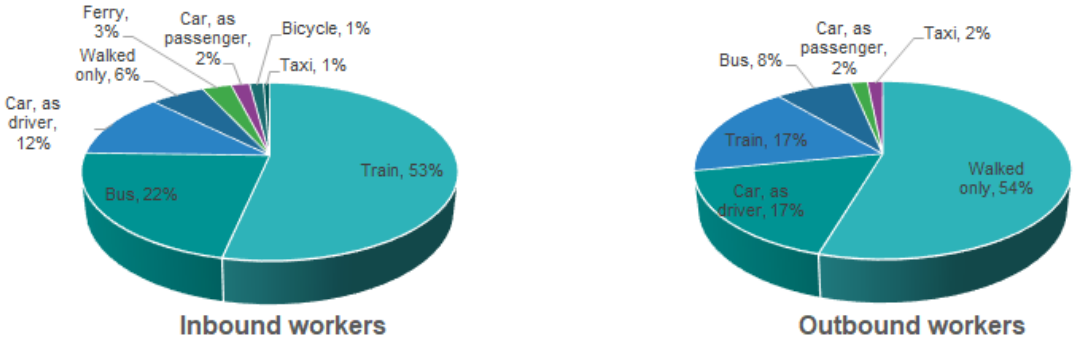


Figure 62 Existing mode share – Hunter Street (Sydney CBD)

The Journey to Work (2016) census data has also been interrogated to extract the top five origins and destinations for inbound and outbound trips associated with an 800 metre station catchment, which are summarised in Table 51.

Table 51 Top five origins and destinations for inbound and outbound trips

Inbound	Outbound
13% - Sydney Inner City	72% - Sydney Inner City
7% - Eastern Suburbs – North	5% - North Sydney – Mosman
6% - North Sydney - Mosman	3% - Ryde – Hunters Hill
5% - Chatswood-Lane Cove	3% - Eastern Suburbs – North
5% - Eastern Suburbs - South	2% - Chatswood – Lane Cove

Figure 63 shows the existing transport network in the vicinity of the station precinct.

Figure 63 Existing transport network - Hunter Street (Sydney CBD)

3.11.4 Active transport network

Walking

Pedestrian connectivity around the station precinct is satisfactory, with footpaths on both sides of all roads. Accessibility on Hunter Street is however constrained by high pedestrian volumes on the footpath, restricting flow and causing crowding, particularly around the intersection of Pitt Street.

Several roads in the surrounding area are pedestrianised, including George Street (south of Hunter Street), Martin Place, Angel Place, Ash Street and De Mestre Place. High levels of pedestrian activity are generated in north-south and east-west directions on Hunter Street, Bligh Street, Pitt Street and George Street by a range of commercial and retail businesses.

Pedestrian movements within the pedestrianised area of George Street are not uniform and have been observed to be omnidirectional. When the station is operational it is expected that these routes will remain heavily utilised for destination and through pedestrian movements.

Pedestrian counts were collected in 2021 at footpaths and signalised intersections within the vicinity of the proposed station precinct and are summarised in Figure 64 and Figure 65 for AM and PM peaks respectively.

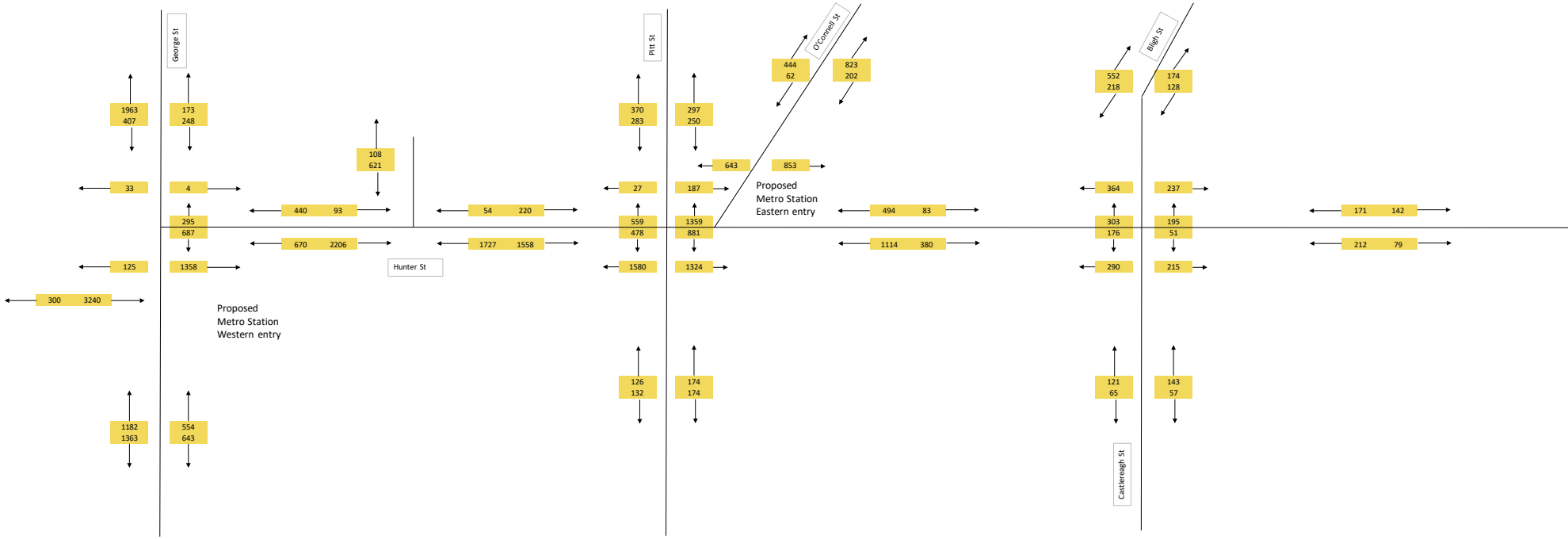


Figure 64 Existing AM peak hour pedestrian counts – Hunter Street (Sydney CBD) (March 2021)

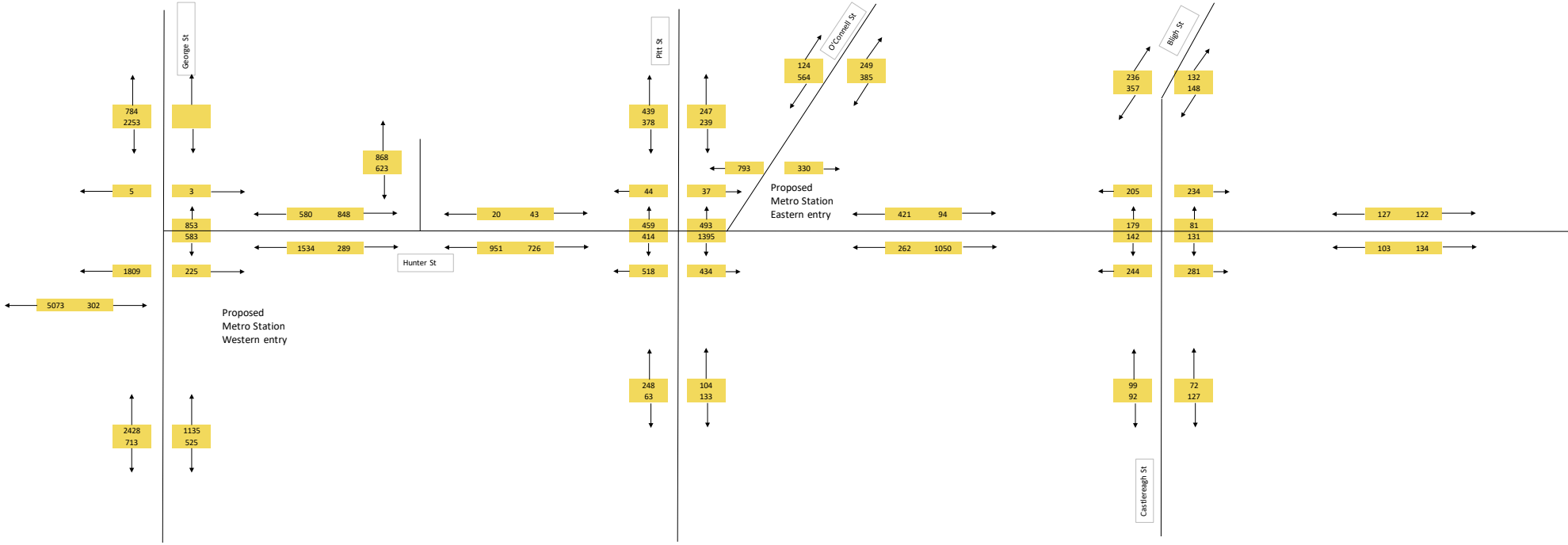


Figure 65 Existing PM peak hour pedestrian counts – Hunter Street (Sydney CBD) (March 2021)

Cycling

Cycling infrastructure surrounding the station precinct is sparse, as road space within the Sydney CBD is primarily orientated around the movement of pedestrians on footpaths and vehicles on the roadway. This means that cyclists are required to share road space with vehicles, or non-compliant movement on footpaths with pedestrians.

The Pitt Street cycleway is the main cycle route and the only existing cycle infrastructure that may be used by cyclists to access the proposed station location. Currently, the north-south alignment of this route provides the main cycle connection to and from the station precinct to the wider cycle network on King Street.

3.11.5 Public transport services

Bus services

Existing bus stands on Carrington Street and York Street outside Wynyard Station form the largest and nearest bus interchange near the station location, servicing bus routes to and from Gore Hill, Chatswood, Mascot, Walsh Bay and Mona Vale. Bus stops are also located around the proposed site on Castlereagh Street and Elizabeth Street, servicing routes to and from North Bondi, Little Bay, Coogee, South Maroubra and Kingsford. Bus stops in the wider precinct area can be found in Figure 63.

As a major transport hub, the bus stands at Wynyard Station are serviced by 74 bus routes. A number of these services include school routes and express peak hour services or operate outside of peak hour periods, such as night only services. High frequency routes that service the Wynyard Station bus interchange during weekday AM and PM peaks are listed in Table 52.

Table 52 Existing bus services – Hunter Street (Sydney CBD) (2021)

Route	Description	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
Wynyard Station (Carrington Street and York Street)			
B-Line	City Wynyard to Mona Vale	15	18
	Mona Vale to City Wynyard	18	14
100	Taronga Zoo to City QVB (Loop Service)	16	25
120	Chatswood to City QVB (Loop Service)	24	14
246	City Wynyard to Balmoral Heights	-	16
	Balmoral Heights to City Wynyard	21	-
251	City Wynyard to Lane Cove West via Freeway	-	8
	Lane Cove West to City Wynyard via Freeway	12	-

Route	Description	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
288	City Erskine St to Epping	6	12
	Epping to City Erskine St	5	5
292	City Erskine St to Marsfield via Macquarie Park	4	12
	Marsfield to City Erskine St via Macquarie Park	14	3
320	Gore Hill to Mascot	12	14
	Mascot to Gore Hill	14	11
324	City Walsh Bay to Watsons Bay via Old South Head Rd	5	7
	Watsons Bay to City Walsh Bay via Old South Head Rd	5	3

Light rail services

Light rail services operate on George Street. Two stops provide access within interchanging distance, to the north at the intersection at Bridge Street and south of the proposed station at Wynyard. Both stops are within 150 metres of the station access points and can be seen in Figure 63. Light rail services to Wynyard Station are listed below in Table 53.

Table 53 Light rail services – Wynyard Light Rail Station

Line	Direction	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
L2	Circular Quay to Randwick	14	15
	Randwick to Circular Quay	14	15
L3	Circular Quay to Kingsford	15	15
	Kingsford to Circular Quay	14	15

Rail services

Wynyard Station is located 120 metres west of the metro station, as shown in Figure 63 and is served by rail services listed in Table 54. The station is DDA compliant from the York Street entrance, with lifts providing platform access. There are no cycle racks or facilities for cyclists to securely store cycles.

Table 54 Existing Sydney Trains suburban rail network services – Wynyard Station

Line	Direction	Number of services Weekday AM 7:00 – 9:00	Number of services Weekday PM 4:00 – 6:00
T1	Berowra to City via Gordon	34	23
	City to Berowra via Gordon	37	33
	Emu Plains or Richmond to City	36	32
	City to Emu Plains or Richmond	33	37
T2	Parramatta or Leppington to City	33	23
	City to Parramatta or Leppington	4	4
T3	Liverpool or Lidcombe to City via Bankstown	12	12
	City to Liverpool or Lidcombe via Bankstown	12	12
T8	Macarthur to City via Airport or Sydenham	24	24
	City to Macarthur via Airport or Sydenham	17	25
T9	Hornsby to North Shore via City	9	9
	North Shore to Hornsby via City	9	8

3.11.6 Road network

The western site is bounded by the following roads:

- Hunter Street to the north
- George Street to the west.

The eastern site is bounded by the following roads:

- O'Connell Street to the north-west
- Bligh Street to the south-east
- Hunter Street to the south.

Hunter Street is currently a four-lane, two-way undivided local road with a posted speed limit of 40 km/h. Parking and loading zones are provided on both kerbside lanes, reducing capacity to a two-lane, two-way road during weekday business hours. Although classified as a local road, Hunter Street supports high volumes of through traffic between George Street and Pitt Street. The configuration and movements on Hunter Street have changed over recent years with the development of the light rail.

George Street is a north-south road with a posted speed limit of 40 km/h. North of the intersection of Hunter Street, it is a two-way, two-lane road with light rail infrastructure and services running through the centre of the roadway, dividing opposing directions of general traffic travel. South of this intersection, George Street is a shared road environment for pedestrians and light rail services. General traffic is not permitted to travel on this section of the road.

O'Connell Street is a four-lane, one-way undivided local road with a posted speed limit of 40 km/h. A bus layover facility, coach drop-off zone (for surrounding hotels), parking zone and loading zone occupy kerbside space on both kerbside lanes, reducing capacity to a two-lane, one-way road during weekday business hours. O'Connell Street is used by several public transport bus services and through traffic from the M1.

Bligh Street is a one-lane, one-way undivided local road with a posted speed limit of 40 km/h. Parking and loading zones are provided on both shoulders, though the wide cross section of the roadway does not impact general traffic flow. Bligh Street is used by several public transport bus services and as a layover for terminating bus routes.

Table 55 provides AM and PM peak hour link volumes for roads forming the precinct's surrounding road network based on traffic counts conducted in March 2021. Survey data indicates that the peak hour periods on the road network are between 8:00-9:00am and 5:00-6:00pm.

Table 55 Existing peak hour traffic volumes by direction – Hunter Street (Sydney CBD) (2021)

		AM peak volume (vehicles per hour)		PM peak volume (vehicles per hour)	
Road	**Location**	**Light**	**Heavy[1]**	**Light**	**Heavy[1]**
Hunter Street	Westbound	480	9	408	4
	Eastbound	244	15	277	21
Bond Street	Westbound	188	11	73	21
	Eastbound	9	5	48	0
Spring Street	Westbound	289	9	259	16
	Eastbound	30	9	121	11
O'Connell Street	Northbound	0	0	0	0
	Southbound	152	9	124	37
Pitt Street	Northbound	0	0	1	0
	Southbound	217	19	304	21

Source: TfNSW Traffic surveys, March 2021

[1]Buses are included as heavy vehicles in the table

[2]Northbound vehicle movements on O'Connell Street and Pitt Street are prohibited through the one-way alignment of the roadway.

Baseline network performance for the AM and PM peak hours for key intersections in the vicinity of the proposed metro station is provided in Table 56. Note that observed traffic volumes for baseline intersection performance assessment have been adjusted as described in Section 2.2 to account for the impacts of the Covid-19 pandemic.

Table 56 Existing intersection performance – Hunter Street (Sydney CBD) (2021)

Intersection	AM peak		PM peak	
	Average delay (sec)	LOS	Average delay (sec)	LOS
George Street / Hunter Street	24	B	23	B
Pitt Street / O'Connell Street / Hunter Street	55	D	34	C
Bligh Street / Hunter Street	39	C	30	C

Baseline intersection performance indicates that most intersections perform at level of service D or better during the AM and PM peak hours, suggesting higher density traffic flow that may restrict speed and freedom to manoeuvre, although flow is likely to remain stable.

Vehicle volumes in peak periods are generally not causing notable delays or impacting driver's ability to make mid-block lane changes on surrounding roads and intersections. Drivers on Hunter Street between Pitt Street and Bligh Street may experience unstable and irregular flows that cause delays in the AM peak.

3.11.7 Parking arrangements

Existing parking arrangements around the station are primarily on-street, with off-street parking outside the station precinct within walking distance to the north. Figure 66 shows existing parking arrangements, which are also described below.

On-street parking arrangements around the proposed Hunter Street station precinct are as follows:

- On-street parking on Hunter Street are primarily allocated as loading zones to service commercial and retail businesses. General traffic parking is restricted during weekday daylight hours and Saturday mornings. Parking spaces on the southern side of Hunter Street adjacent to the Hunter Street Station western site would be temporarily removed as part of work under the previous Sydney Metro West planning application. Parking spaces on the southern side of Hunter Street adjacent to the Hunter Street Station western site would be temporarily removed as part of work under the previous Sydney Metro West planning application.

- On-street parking on the northern shoulder of O'Connell Street is restricted daily between 7am-7pm, with parking permitted for a maximum of five minutes at all other times. Parking on the southern shoulder is allocated as loading zone only during weekday daylight hours and on Saturday mornings, with this changing to 4-hour restricted parking at all other times. Parking spaces on the eastern side of O'Connell Street adjacent to the Hunter Street Station eastern site would be temporarily removed as part of work under the previous Sydney Metro West planning application. Parking spaces on the eastern side of O'Connell Street adjacent to the Hunter Street Station eastern site would be temporarily removed as part of work under the previous Sydney Metro West planning application.

- On-street parking is only permitted on the eastern shoulder of Pitt Street, with 2-hour limited accessible parking near the intersection of Hunter Street. Parking to the south is allocated as loading zone during weekday daylight hours and Saturday mornings, with this changing to a taxi zone at all other times

- Parking is provided for motorcycles only on the southern shoulder of Curtin Place.

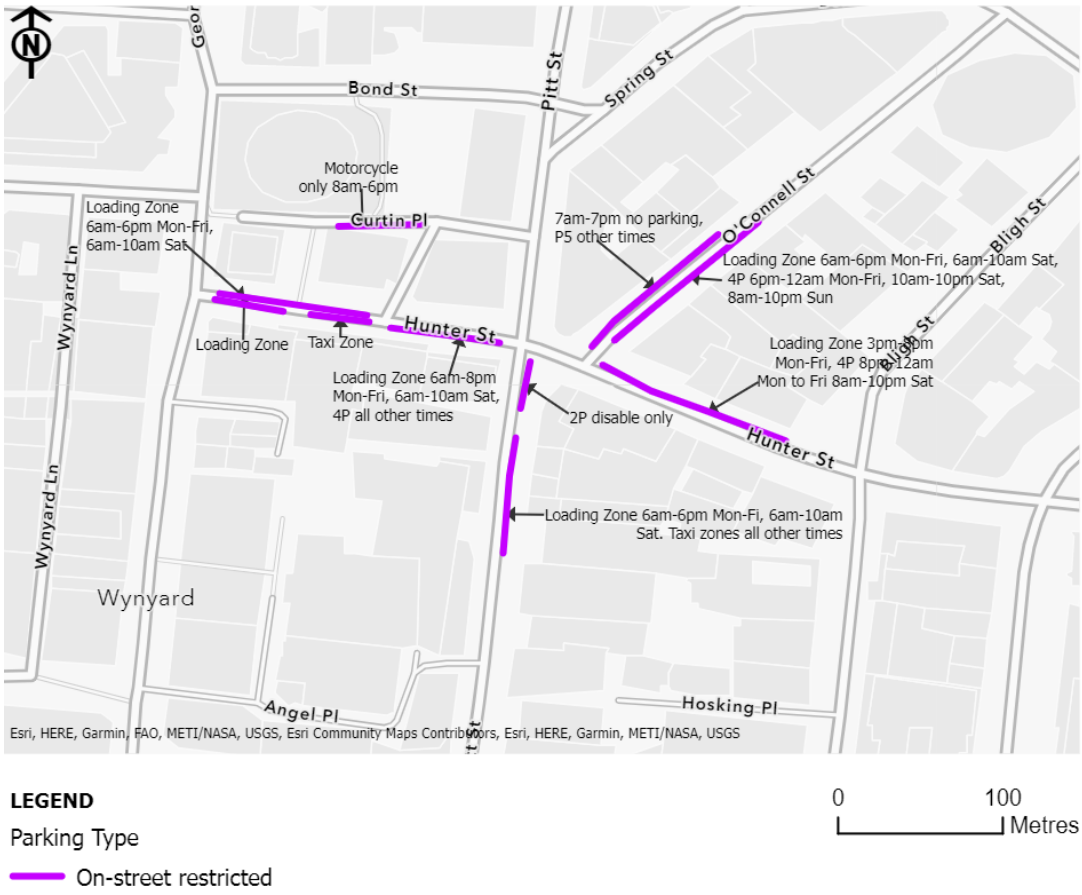


Figure 66 Existing parking arrangements – Hunter Street (Sydney CBD)

3.11.1 Permanent changes to transport infrastructure under previous Sydney Metro West planning applications

There are no permanent changes to transport infrastructure as part of the previous Sydney Metro West planning application.

3.12 Clyde stabling and maintenance facility

3.12.1 Introduction

The Clyde stabling and maintenance facility would be located within the City of Parramatta LGA, across the suburbs of Clyde and Rosehill.

The purpose of the Clyde stabling and maintenance facility is to provide Sydney Metro West with an integrated facility that supports the day-to-day operations and long-term maintenance requirements of the train fleet.

The Clyde stabling and maintenance facility would have two entrances, including a primary entrance at Wentworth Street and a secondary entrance at Unwin Street.

The Clyde stabling and maintenance facility is bound by Shirley Street to the east, James Ruse Drive to the west, Unwin Street to the north and the M4 Western Motorway to the south. The location of the proposed Clyde stabling and maintenance facility is shown on Figure 67.

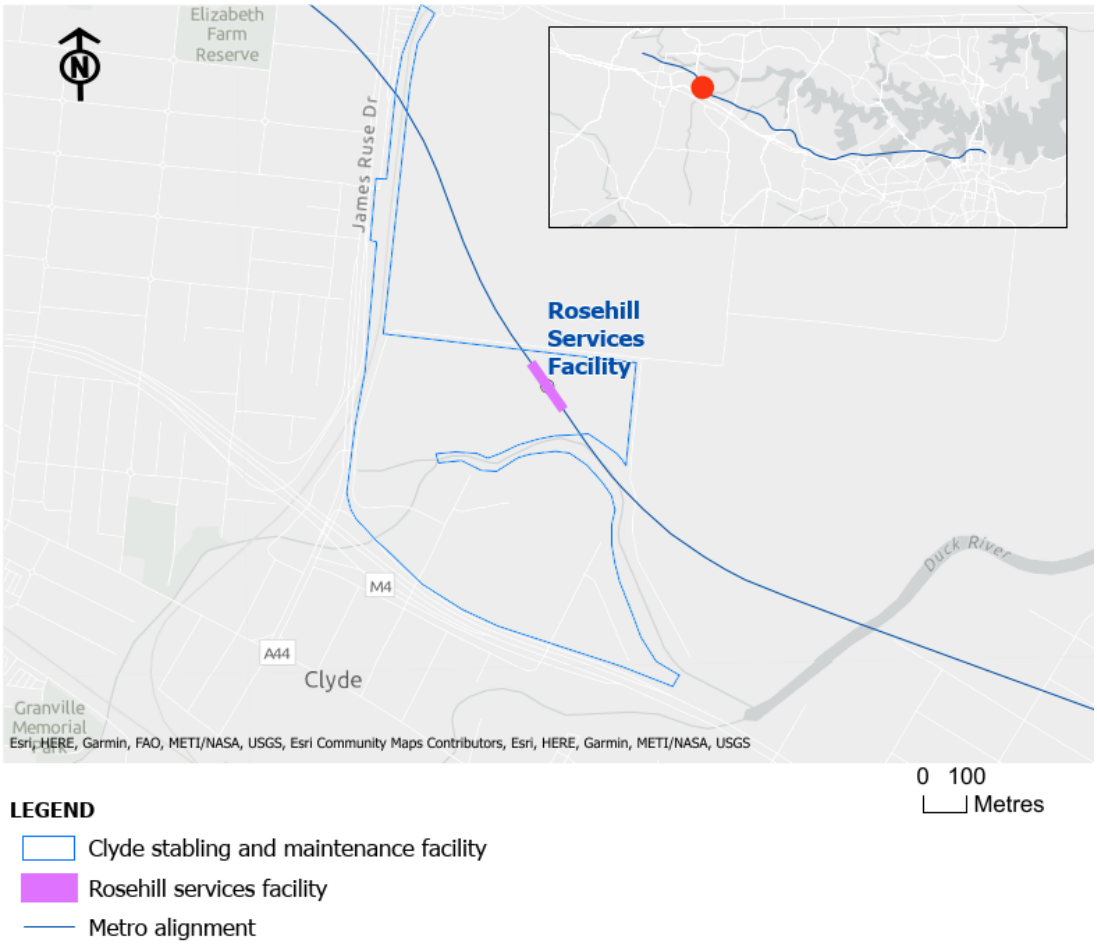


Figure 67 Stabling and maintenance facility - Clyde

3.12.2 Land use context

The site of the Clyde stabling and maintenance facility is characterised by industrial uses and major recreational facilities and is bisected by Duck Creek and A'Becketts Creek. Land uses surrounding the site include the following:

- North of the site is the Rosehill Gardens racecourse, where major events such as the Golden Slipper and the Caravan and Camping show are held
- East of the site is Duck Creek and Shirley Street, beyond which are large warehouses, and the Viva Energy site that was formerly used as part of the Clyde oil refinery
- South of the site is the M4 Western Motorway, beyond which the Clyde industrial area continues
- West of the site is a corridor containing James Ruse Drive and the now closed T6 Carlingford Line. Further west are low density residential areas in Rosehill and Granville.

Land uses within and surrounding the site are shown in Figure 68.

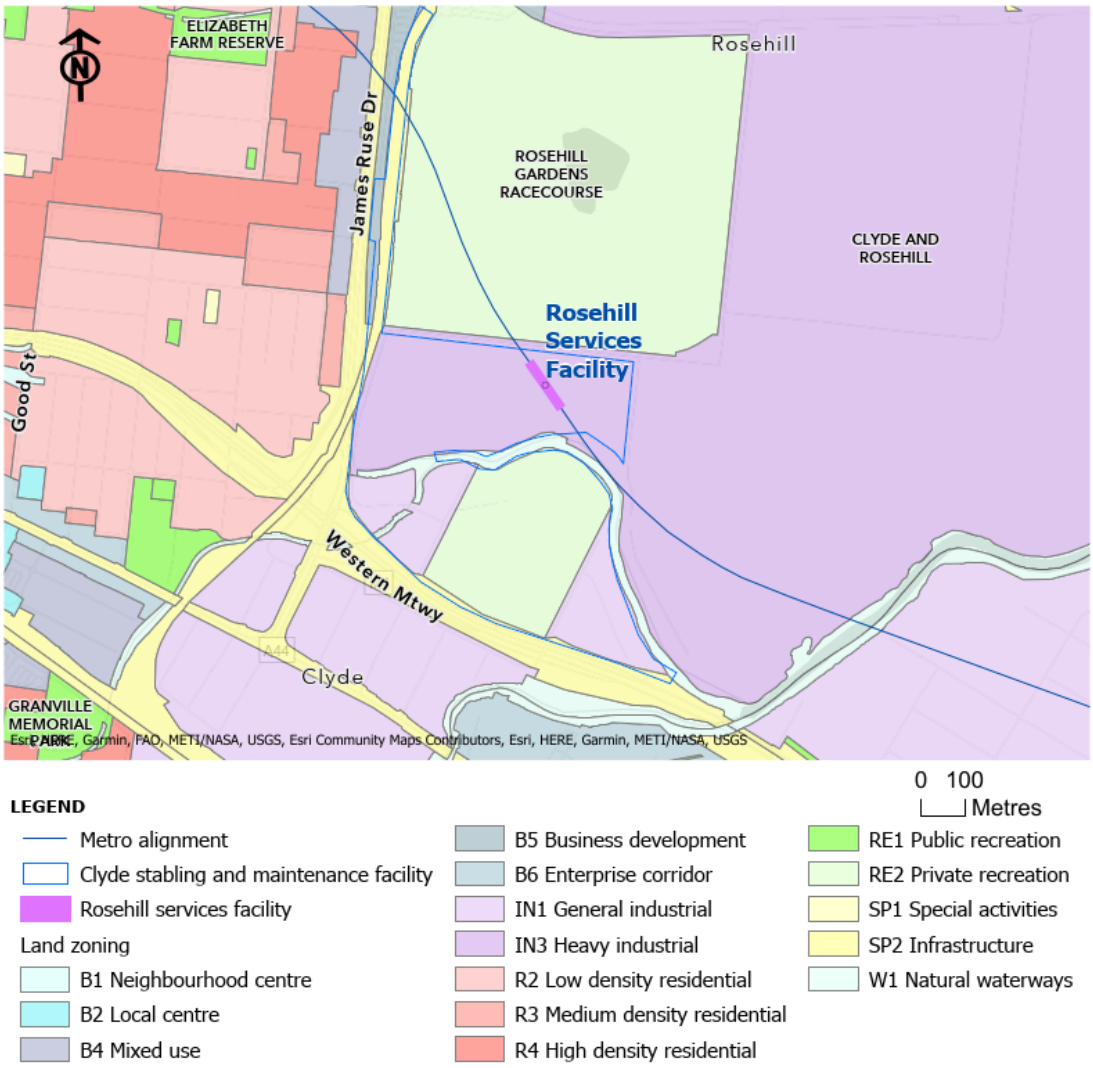


Figure 68 Land zoning map – Clyde

3.12.3 Modes of travel

The transport network in the vicinity of the Clyde stabling and maintenance facility, including active modes of transport, public transport services and the surrounding road network, is shown on Figure 69.

In general, active transport facilities and travel to the site by public transport is limited given the nature, current use and location of the site, with a focus on access by private vehicle.

Further details concerning the active transport network, public transport services, the surrounding road network and existing parking arrangements are discussed in the following sub-sections.

Figure 69 Existing transport network - Clyde

3.12.4 Active transport network

The pedestrian network around the Clyde stabling and maintenance facility is limited given the industrial land uses to the east of Rosehill Gardens racecourse and north of Duck River. Formal pedestrian crossings are limited and are generally a considerable distance from the proposed facility.

Pedestrian volumes near the Clyde stabling and maintenance facility are low. Crossings are provided at the following locations:

- Signalised crossings at the Parramatta Road/ Wentworth Street intersection
- Signalised crossings at Parramatta Road/ James Ruse Drive intersection
- Pedestrian footbridge over James Ruse Drive near the now closed Rosehill Station.

The cycle network surrounding the proposed facility includes:

- M4 cycleway located near the southern boundary of the site
- Off-road shared path along the northern side of Parramatta Road
- On-road route along Kendall Street, Martha Street, Alfred Street, Prospect Street and Virginia Street.

3.12.5 Public transport services

The public transport network around the facility is limited to bus services with major bus stops on Alfred Street, James Ruse Drive and Parramatta Road. The closest train station is Clyde Station, a 12-minute walk from the primary entrance to the site.

3.12.6 Road network

A review of traffic volumes and patterns on key roads surrounding the Clyde stabling and maintenance facility has been carried out.

Parramatta Road is a major arterial road that carries high traffic volumes ranging between 1,600 and 2,110 vehicles during the peak hour in each direction. West of Wentworth Street, Parramatta Road westbound volumes are higher than eastbound volumes, with comparatively higher volumes experienced in both directions during the morning peak hour compared to the evening peak hour.

To a lesser extent, traffic volumes on James Ruse Drive north of Parramatta Road are also high ranging between 1,110 and 1,500 vehicles in each direction during the peak hour. This section of James Ruse Drive has a southbound morning peak direction and a northbound evening peak direction.

Due to the industrial land uses east of James Ruse Drive, relatively low traffic volumes are experienced on the local road network at Unwin Street, Kay Street and Wentworth Street with fewer than 280 vehicles per hour observed in each direction during both peak periods.

Wentworth Street, Kay Street and Unwin Street are approved 25/26 metre long B-Double routes. Kay Street and Unwin Street will be realigned as part of work under the previous Sydney Metro West planning application.

3.12.7 Parking arrangements

Unrestricted on-street parking is available on Kay Street, Unwin Street and Wentworth Street, although some of these would be permanently removed as part of work under the previous Sydney Metro West planning application. Parking is prohibited on Parramatta Road and James Ruse Drive, with clearways in operation seven days a week during daylight hours (6am to 7pm Monday to Friday, 8am to 8pm Saturday and Sunday).

There are no kiss and ride, loading zone or taxi transport service zones on roads immediately surrounding the site.

3.12.8 Permanent changes to transport infrastructure under previous Sydney Metro West planning applications

The following proposed permanent changes to transport infrastructure will occur as part of work under the previous Sydney Metro West planning application:

- Realignment of Kay Street and Unwin Street around and over the site
- Removal of a number of on-street parking spaces on roads within the stabling and maintenance facility.

3.13 Rosehill services facility

The Rosehill services facility would be located within the Parramatta LGA. Additional services facilities are required at Rosehill (near the Clyde stabling and maintenance facility) to support ventilation systems for fire and life safety and operational scenarios (such as heat build-up), as well as for emergency egress. A traction substation would also be located within the services facility site. Access to the Rosehill services facility would be via Unwin Street.

As the Rosehill services facility is located immediately adjacent to the Clyde stabling and maintenance facility, the existing traffic and transport environment for the Rosehill services facility is described in Section 3.12.

4 Operational benefits and impacts

4.1 Strategic operational transport benefits and impacts

The design of the proposal would aim to avoid or reduce impacts associated with operational transport. It would improve overall road network traffic conditions by providing a convenient and efficient travel alternative to the use of the private car.

The transport related benefits and impacts of the operation of Sydney Metro West are outlined below.

4.1.1 Increased transport network capacity

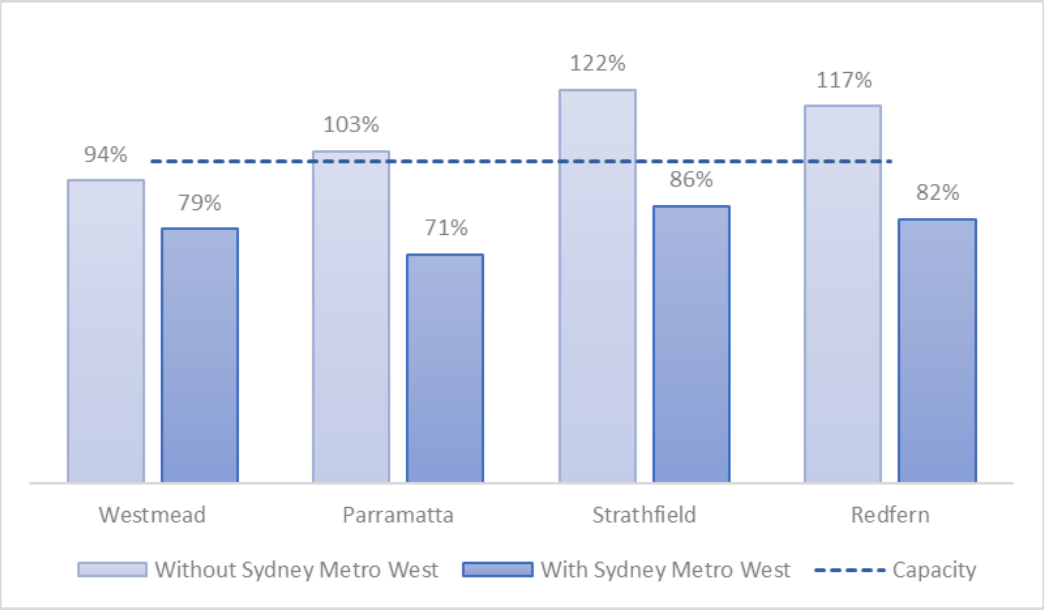
Sydney Metro West would more than double rail capacity from Parramatta to the Sydney CBD with the delivery of a new high capacity rail connection and would be able to move more than 40,000 customers an hour in each direction complementing the suburban and intercity services between Parramatta and the Sydney CBD.

4.1.2 Reduced train crowding

By providing additional rail services and quicker travel times, Sydney Metro West would assist in reducing train crowding on the T1 Western Line and the T9 Northern Line. This would help improve the reliability of Sydney Trains services and improve customer comfort.

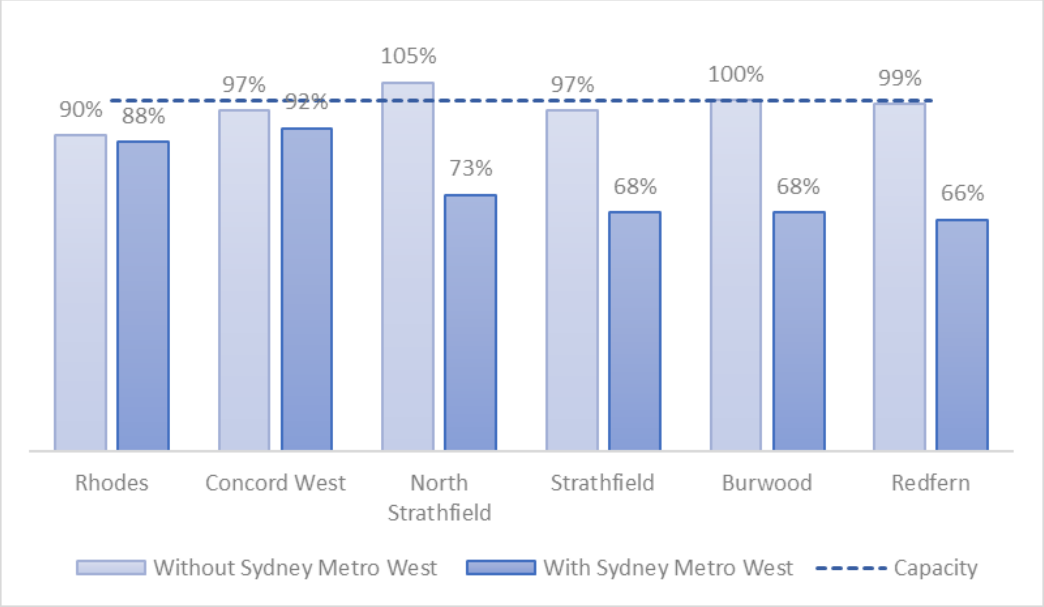
Relief of train crowding would occur on parts of the T1 Western Line and T9 Northern Line due to direct interchange with Sydney Metro West, as well as on the T2 Inner West and Leppington Line services. This also means more efficient Sydney Trains services in the west, outer west and regional areas like the Blue Mountains due to resulting improved reliability on the T1 Western Line.

Based on modelling carried out by Sydney Metro, the expected passenger volumes (line loads) compared to the capacity of the T1 Western Line and T9 Northern Line, with and without Sydney Metro West at key locations along each line, is shown in Figure 70 and Figure 71 respectively.



Source: Sydney Metro

Figure 70 T1 Western Line passenger volume (line loads) compared to capacity – 2036



Source: Sydney Metro

Figure 71 T9 Northern Line passenger volume (line loads) compared to capacity - 2036

4.1.3 Reduced station crowding at existing Sydney Trains stations

The introduction of new rail services and infrastructure, including new stations in the Parramatta and Sydney CBDs, would reduce congestion and help alleviate platform and station crowding at existing Sydney Trains stations. Reduced platform and station crowding would shorten the time spent by customers in heavily crowded platform conditions and improve network performance by reducing station dwell times (and therefore improve travel times).

Sydney Metro West would help to reduce crowding at:

- The busiest existing CBD stations, including Central, Town Hall and Wynyard
- The existing Burwood Station
- The existing Strathfield Station
- The existing Parramatta Station due to the delivery of a new metro station in Parramatta
- The existing Westmead station due to the delivery of a new metro station in Westmead.

Westmead and North Strathfield stations would become key interchanges as part of Sydney Metro West and would be designed to accommodate an increase in customers.

4.1.4 Increased accessibility to key centres

Sydney Metro West would substantially improve the public transport network accessibility to key economic centres across the Greater Parramatta to Sydney CBD corridor. It would:

- Provide direct rail access to the future planned centre at The Bays, which is not currently serviced by the existing suburban rail network
- Provide rail access via the proposed Metro station at Pyrmont to the nearby Blackwattle Bay development precinct
- Increase rail services and overall rail capacity to Westmead, Parramatta, Sydney Olympic Park and the Sydney CBD.

4.1.5 Increased public transport network reach and use

Sydney Metro West would increase the reach (the catchments from which customers access the public transport network) and use of Sydney's public transport network by:

- Providing new stations at localities not serviced by the existing Sydney Trains suburban rail network, including Burwood North, Five Dock, The Bays and Pyrmont
- Increasing the number of customers who are able to access the Parramatta and Sydney CBDs by rail
- Providing a more direct connection to Sydney Olympic Park. Customers on the T7 Olympic Park Line are currently required to transfer at Lidcombe to travel to or from the Parramatta or Sydney CBDs
- Providing additional interchange capability at Westmead, North Strathfield and in the Sydney CBD.

The reach of Sydney Metro West would also be expanded by:

- Providing the opportunity for bus network optimisation, which would increase the frequency and directness of feeder services to new metro stations
- Integration with the future Parramatta Light Rail Stage 1 (and consideration of the proposed Parramatta Light Rail Stage 2). Light rail would be complementary to Sydney Metro West by serving local demand across Greater Parramatta and improving the quality of feeder services
- Provision of a new rail interchange at North Strathfield would enable T9 Northern Line customers to more directly access locations to the east or west via Sydney Metro West
- Linking into key active transport (walking and cycling) networks along the corridor.

4.1.6 Travel time savings

Sydney Metro West would create a significant opportunity to improve travel times by providing:

- More direct routes between areas with existing rail services
- Access to rail services in areas that currently do not have train stations
- Reduced crowding on trains and at some stations, leading to improved service reliability
- A high-frequency service, with customers able to ‘turn-up-and-go’ and no longer rely on timetables.

The largest travel-time savings would be experienced in areas where:

- New stations are provided in areas currently not serviced by the existing suburban rail network, such as Burwood North, Five Dock, The Bays and Pyrmont
- More direct routes are provided, such as trips from Parramatta to the Sydney CBD and to and from Sydney Olympic Park
- Customers could more efficiently transfer between services at new stations – including at Westmead and North Strathfield.

Sydney Metro West would also improve connections between key employment centres, enabling journeys between centres such as Parramatta to Chatswood and Sydney Olympic Park to North Sydney to take less time. Based on an interchange between Sydney Metro West and Sydney Metro City & Southwest in the Sydney CBD, there would also be improved travel times between Greater Parramatta and other parts of Sydney including the North Shore and the Northern Suburbs.

Table 57 illustrates forecast public transport travel time savings based on a comparison of existing travel times without Sydney Metro West and future travel times with Sydney Metro West from operational modelling carried out by Sydney Metro.

Table 57 Travel time savings between key locations

Locations	Without/ with Sydney Metro West	Approximate travel time	Approximate travel time savings
In the corridor			
Parramatta to Sydney CBD	Without Sydney Metro West	31 minutes	
	With Sydney Metro West	20 minutes	11 minutes
Sydney Olympic Park to Parramatta	Without Sydney Metro West	25 minutes	
	With Sydney Metro West	5 minutes	20 minutes
Sydney Olympic Park to Sydney CBD	Without Sydney Metro West	42 minutes	
	With Sydney Metro West	15 minutes	27 minutes
Burwood North to Parramatta	Without Sydney Metro West	29 minutes	
	With Sydney Metro West	10 minutes	19 minutes
Five Dock to Sydney CBD	Without Sydney Metro West	47 minutes	
	With Sydney Metro West	8 minutes	39 minutes
The Bays to Sydney CBD	Without Sydney Metro West	21 minutes	
	With Sydney Metro West	4.5 minutes	16.5 minutes
Pyrmont to Sydney CBD	Without Sydney Metro West	15 minutes	
	With Sydney Metro West	2.5 minutes	12.5 minutes
Connecting Western Sydney			
Blacktown to Sydney Olympic Park	Without Sydney Metro West	38 minutes	
	With Sydney Metro West	20 minutes	18 minutes
Parramatta to Rhodes	Without Sydney Metro West	27 minutes	
	With Sydney Metro West	22 minutes	5 minutes
Parramatta to Epping	Without Sydney Metro West	35 minutes	

Locations	Without/ with Sydney Metro West	Approximate travel time	Approximate travel time savings
	With Sydney Metro West	28 minutes	7 minutes
Parramatta to Macquarie Park	Without Sydney Metro West	46 minutes	
	With Sydney Metro West	39 minutes	7 minutes

Notes:

- Travel times without Sydney Metro West have been obtained from NSW Trip Planner and latest timetable information.
- With Sydney Metro West travel times are based on modelling undertaken by Sydney Metro for 2036.
- Journey times are given for the AM peak (8-9AM) for a typical weekday.
- Journey times do not account for future Sydney Trains, Sydney Buses or Light Rail timetable changes.
- Fastest travel routes using public transport have been assumed
- Includes in-vehicle, interchange and waiting times, where appropriate.

Sydney Metro West would also attract some customers from further west of the Sydney Metro West corridor, who would use Sydney Metro West for part of their journey by interchanging at Westmead instead of using the suburban rail service the whole way to reach their destinations.

For trips originating from Penrith to the Sydney CBD, it is expected that Sydney Metro West would attract around 41 percent of these customers due to substantial travel time savings of around 20 minutes for passengers using the Sydney Trains suburban line service, assuming an allowance of five minutes for interchange at Westmead.

4.1.7 Improved network resilience

Shutdowns on the suburban rail network during unplanned and planned events (including periodic maintenance) impact on customer service provision and access to key destinations.

Sydney Metro West would provide an additional, high-capacity public transport link in the corridor between Greater Parramatta and Sydney CBD, which would be separated from the suburban rail network. This would provide an alternative route for customers during these planned and unplanned events.

Sydney Metro West would also enable additional connectivity with interchange opportunities to the wider rail and public transport network. This would reduce the impact on customers during major incidents and increase the resilience of the network.

4.1.8 Bus network opportunities

The additional mass transit accessibility and amenity provided by Sydney Metro West would provide the opportunity to optimise the bus network. This could include additional ‘feeder services’ (services which generally connect customers to rail stations) to Sydney Metro West stations and re-deployment of existing parallel bus services that would duplicate parts of the Sydney Metro West alignment. This would maintain the level of bus services across the network, while providing the potential opportunity to:

- Reduce the number of buses on roads leading to key centres, such as Sydney CBD and Parramatta, including a reduction in the number of buses on Park Parade on the bus corridor between Westmead and Parramatta

- Increase bus services on other parts of the network with lower levels of mass transit accessibility and amenity.

There would also be the opportunity to improve bus travel times to major destinations along and surrounding the Sydney Metro West corridor. A number of examples include:

- At Sydney Olympic Park, bus routes servicing catchments north of the Parramatta River, including Dundas Valley, Denistone West and Ermington would experience significant travel time savings to Sydney CBD with a transfer to Sydney Metro West
- Bus links from areas south of Sydney Olympic Park, North Lidcombe, Auburn and Homebush West would experience significant travel time savings to both Sydney CBD and Parramatta with a transfer to Sydney Metro West at Sydney Olympic Park
- Parramatta would become much more accessible from locations outside the Sydney Metro West corridor, such as the Eastern Suburbs and North Shore, where customers could travel by bus then transfer to Sydney Metro West via the proposed metro station at Hunter Street (Sydney CBD) to achieve significant travel time savings
- For travel to Sydney CBD, locations in the central-west and south-western Sydney would experience travel time savings by travelling by bus and transferring to proposed metro stations at Westmead or Parramatta
- Customers travelling to Sydney CBD from the Holroyd/ Fairfield area near to the Liverpool-to-Parramatta Transitway would experience travel time savings with direct interchange at Westmead metro station, while customers using existing bus connections from the North West T-Way/ Windsor Road corridor would also experience travel time savings to Sydney CBD via Westmead metro station.

4.1.9 Improved conditions for road users

By encouraging people to use the metro network, Sydney Metro West would provide the opportunity for mode shift from car to public transport. This could result in road user travel time savings by reducing the numbers of vehicles on the road network.

Analysis undertaken by Sydney Metro shows that total Sydney network wide car trips could be reduced by about 83,000 weekday trips per day by 2036. The potential reduction in private vehicle car use could create benefits including:

- Car use travel time savings and improved reliability for remaining car users who do not shift modes
- Reduction in environmental impacts to communities such as air pollution, greenhouse gas, noise and water pollution
- Deferring road related upgrades.

4.2 Integration with other transport modes

4.2.1 Overview

Safe and convenient connections to and from Sydney Metro West stations are an important part of the customer journey and experience of the station precinct. Connectivity between different transport modes, including walking, cycling, rail, light rail, buses, taxis and kiss and ride must be legible and easy, acknowledging that Sydney Metro is part of an integrated transport system.

This also includes recognising relevant accessibility guidelines and standards (including the *Disability Discrimination Act 1992* and Disability Standards for Access to Public Transport), which provide good access for people with disabilities, the elderly and passengers with prams or luggage.

4.2.2 Modal access hierarchy

A modal access hierarchy, shown in Figure 72, has been applied in the design of Sydney Metro West stations.

The objective of the hierarchy is to ensure that the design of stations and their integration with other transport modes gives the highest priority to the most efficient and sustainable access modes. This influences the design of stations and interchanges, as well as highlights the need to balance transport integration with 'place' elements, such as the needs of people shopping, dining, exercising, or waiting for a bus.

The hierarchy prioritises walking and cycling connections to provide for the safety and wellbeing of customers and users of station precincts.

Figure 72 Sydney Metro modal access hierarchy

Walking and cycling

Walking and cycling are identified as the highest priority access modes to rail, as they are the most sustainable, cost-effective, equitable and accessible modes. Pedestrians and cyclists have the lowest environmental impact and (typically) spatial requirements, whilst they also contribute to personal safety, urban and commercial viability. As the stations are all located within established urban areas, walking and cycling access would predominantly be along existing paths and routes around stations.

Public transport

Public transport is the second highest priority in station planning and is typically focussed on facilitating interchange to other public transport modes. These services expand the effective catchment area of the suburban rail system, and seamless interchange is required in order to maximise the uptake of linked trips within the public transport network.

Taxis

Taxis are the highest ranked of all the car-based modes, supplementing the public transport system for access to destinations separated from the public transport network.

Kiss and ride

The preferred mode of those accessing the station by private vehicle, but a relatively low priority, kiss and ride supports the concept of car sharing and trip chaining, reducing the number of single-occupant trips and in some instances parking demand.

Park and ride

Park and ride is the lowest priority of all modes. Given the high accessibility to sustainable transport modes in Sydney, formal parking facilities are only considered outside of major centres. No park and ride facilities have therefore been considered at any of the proposed stations.

4.2.3 Transport integration principles

Sydney Metro West aims to provide transport services which meet the needs of customers, integrate with the broader transport network, and support future housing and employment growth in the corridor.

Sydney Metro would work with relevant stakeholders (such as other transport operators and local councils) to:

- Provide direct, legible, safe and accessible pedestrian routes to and from stations
- Provide cycling access that is consistent with local government and State Government plans for cycling routes
- Maximise connectivity with metro, suburban rail, light rail and intercity rail networks to provide shorter journey times, better connectivity and congestion relief
- Where beneficial to customers, work with Transport for NSW to improve bus connections with Sydney Metro West stations, providing feeder service functionality and extending the catchment from which customers can access stations
- Work with Transport for NSW to reduce service duplication by rationalising bus operations to, from and within major centres and along major congested corridors
- Work with Transport for NSW to realign services to major centres in line with customer travel patterns, aiming to minimise the need to transfer between services
- Minimise, where possible, the impact on customers of transferring between services at interchanges, for example by minimising the distance between transport nodes and providing legible wayfinding between nodes
- Provide for short-term private vehicle access, rather than long-term access, at stations through kiss and ride and taxi facilities.
- Work with local councils to minimise the extent and impacts of any parking on local streets in the vicinity of the Sydney Metro West stations.

4.3 Westmead metro station

4.3.1 Location and key features

The proposed transport integration and access plan for Westmead Station shown in Figure 73 sets out the transport and urban design approach to the proposed station and its immediate context.

The key features of the proposed transport integration and access at Westmead include:

- Single aerial concourse with a consolidated entrance on Hawkesbury Road bridge for Sydney Metro and Sydney Trains customers. Sydney Metro is continuing to investigate the potential for additional entrances to support metro operations
- Underground concourse beneath Alexandra Avenue and the existing rail corridor, connecting the aerial concourse, Sydney Metro and Sydney Trains services via lifts and escalators
- Bus interchange located on Alexandra Avenue
- Upgrade to Hawkesbury Road bridge to the west
- Widening of the eastern footpath of Hawkesbury Road bridge to the station entry and aerial concourse
- An underground paid concourse to facilitate interchange between metro and suburban rail services
- Cycle parking on Railway Parade near the entrance
- Kiss and ride and taxi zones located on Railway Parade
- Provision of open spaces in the vicinity of the station.

Sydney Metro is continuing to investigate the use and layout of Alexandra Avenue between Hawkesbury Road and Hassall Street, including the potential for this link to be restricted to buses, taxis and emergency vehicles only. If progressed, this would result in general traffic being diverted via Hassall Street, Bailey Street and/or Priddle Street, and Hawkesbury Road. This may also include localised regrading of Alexandra Avenue to provide an accessible pathway between the bus stops and the station entry.

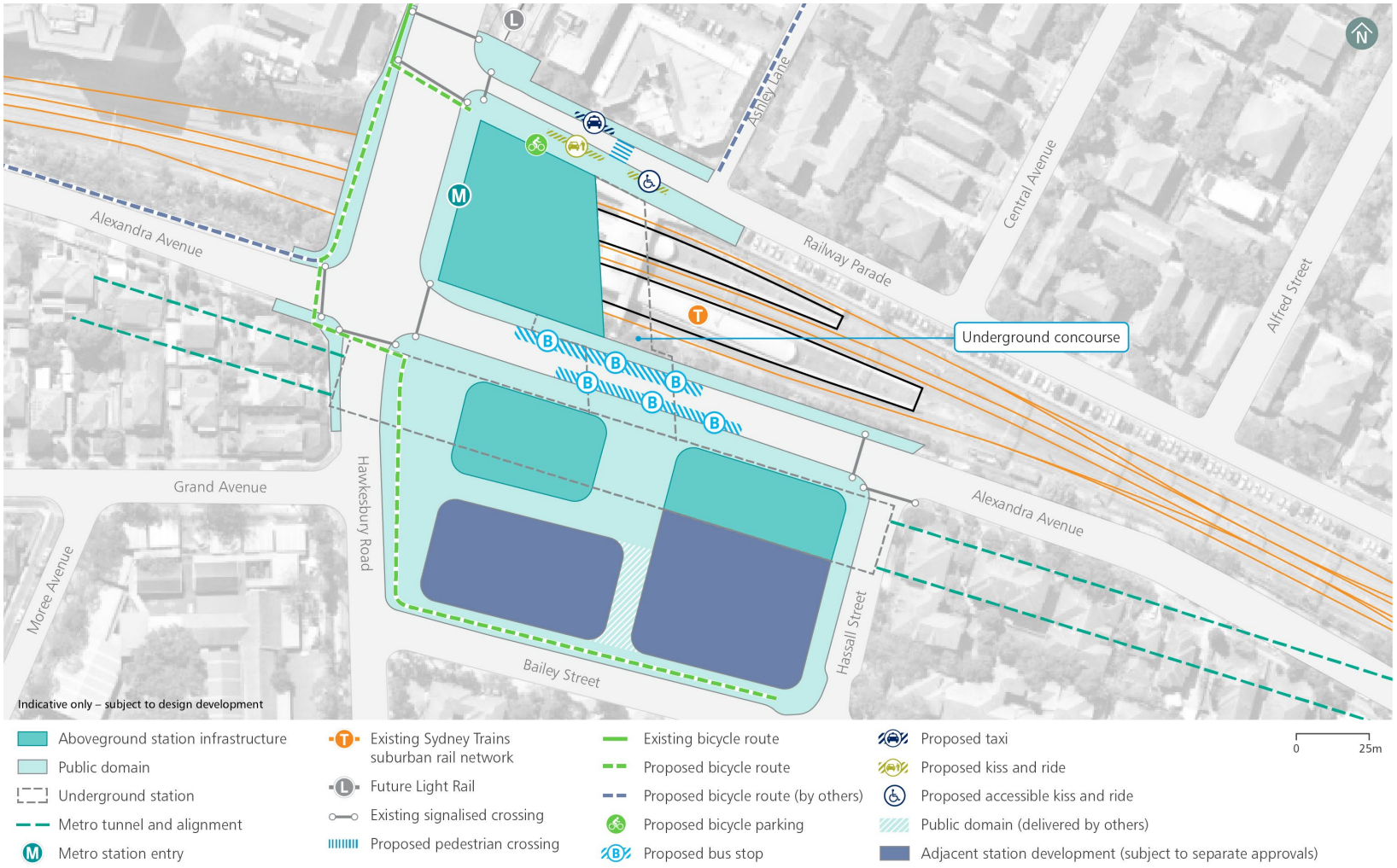


Figure 73 Station transport integration and access plan – Westmead

4.3.2 Passenger demand

Station passenger demand has been forecast for the 2036 AM peak hour. The demand indicates approximately 3,000 customers accessing the station and 3,300 customers exiting, with nearly 3,000 customers transferring services between Sydney Metro and suburban rail services. The numbers reflect that the station is considered both an origin and a destination station, as well as serving a substantial interchange function. The 2036 modal breakdown of arrival and departure during the AM peak hour is presented in Table 58.

Table 58 Forecast mode of arrival and departure – Westmead (2036)

Mode	Walk	Cycle	Bus	Kiss and ride	Light rail	Park and ride
Access	45%	1%	37%	6%	6%	6%
Egress	89%	0%	9%	0%	2%	0%

Source: PTPM data

It is anticipated that the majority of access and egress trips would be by foot. Almost all exits (89 per cent) would be walking trips to the health and education precinct, with some transfer to bus and light rail. Around 37 per cent of access trips would be transfers from buses in addition to six per cent transfers from light rail.

The estimated distribution of customers boarding and alighting in the AM peak hour is shown below in Figure 74.

Figure 74 Station boarding and alighting passenger distribution – AM

Key observations from Figure 74 are:

- Rail and bus transfers are large, while light rail is substantially lower
- Walk egress outweighs access
- Walk trips are heavily weighted towards the north via Hawkesbury Road
- Alexandra Avenue west is another approach with significant demand.

4.3.3 Integration with pedestrian network

Walking is expected to be the primary mode of access at Westmead metro station, therefore integration with the pedestrian network is a key consideration. The entrance to the station is through the eastern side of Hawkesbury Road bridge, which would provide a direct connection to the station concourse to the south, and light rail to the north.

East of Hawkesbury Road bridge and outside the station concourse a generous public space would be provided to facilitate all pedestrian movements, as well as access to the station. The existing footpath on the western side of the Hawkesbury Road bridge would also be upgraded to complement north-south connections and to accommodate an active modes link.

In the vicinity of the proposed metro station, the pedestrian network would allow for good connectivity within the station precinct, create safe and walkable streets designed for people and would provide easy access for all customers including those with disabilities.

Pedestrian connections around the station would be through wide footpaths and through-site links that facilitate pedestrian movements and permeability. Where applicable, regraded footpaths would be constructed to provide accessible paths from and to the key transport modes. Footpath widening or upgrade is proposed by Sydney Metro in the following locations around the precinct:

- Southern side of Railway Parade
- Both sides of Hawkesbury Road bridge
- Both sides of Alexandra Avenue, between Hassall Street and Hawkesbury Road
- Upgrades to footpaths in the block bound by Hawkesbury Road, Alexandra Avenue, Bailey Street and Hassall Street.

In addition to pedestrian footpaths, consideration has been given to pedestrian crossings including changes to existing crossings by Sydney Metro at Hawkesbury Road/ Railway Parade to accommodate the large number of pedestrians expected to use these facilities and to tie in with the light rail north of the station.

Appropriate treatments to Railway Parade, between Hawkesbury Road and Ashley Lane would be implemented to provide a low speed environment that would facilitate pedestrian movements and connections between light rail and the proposed Westmead metro station.

A new public space is proposed on land immediately south of the station. This space would serve as a buffer between the busy Hawkesbury Road and the site and would create a place for people to dwell and rest.

Patronage forecasts for the future indicate that the station would substantially increase pedestrian flows in the local precinct. Pedestrian precinct modelling has been undertaken for the year 2036 and results are presented in Figure 75 and Figure 76 for both AM and PM peaks respectively.

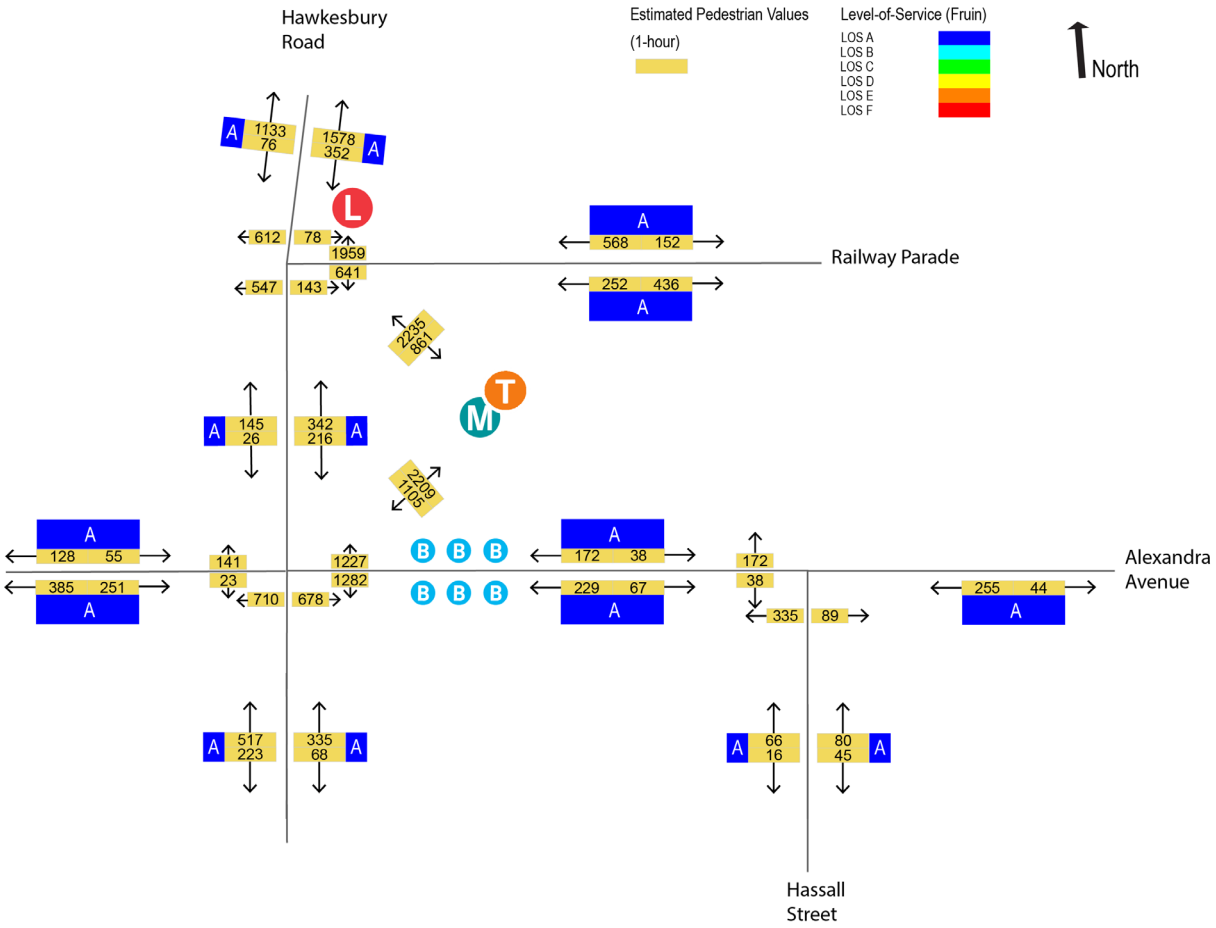


Figure 75 2036 Precinct pedestrian modelling results – AM peak

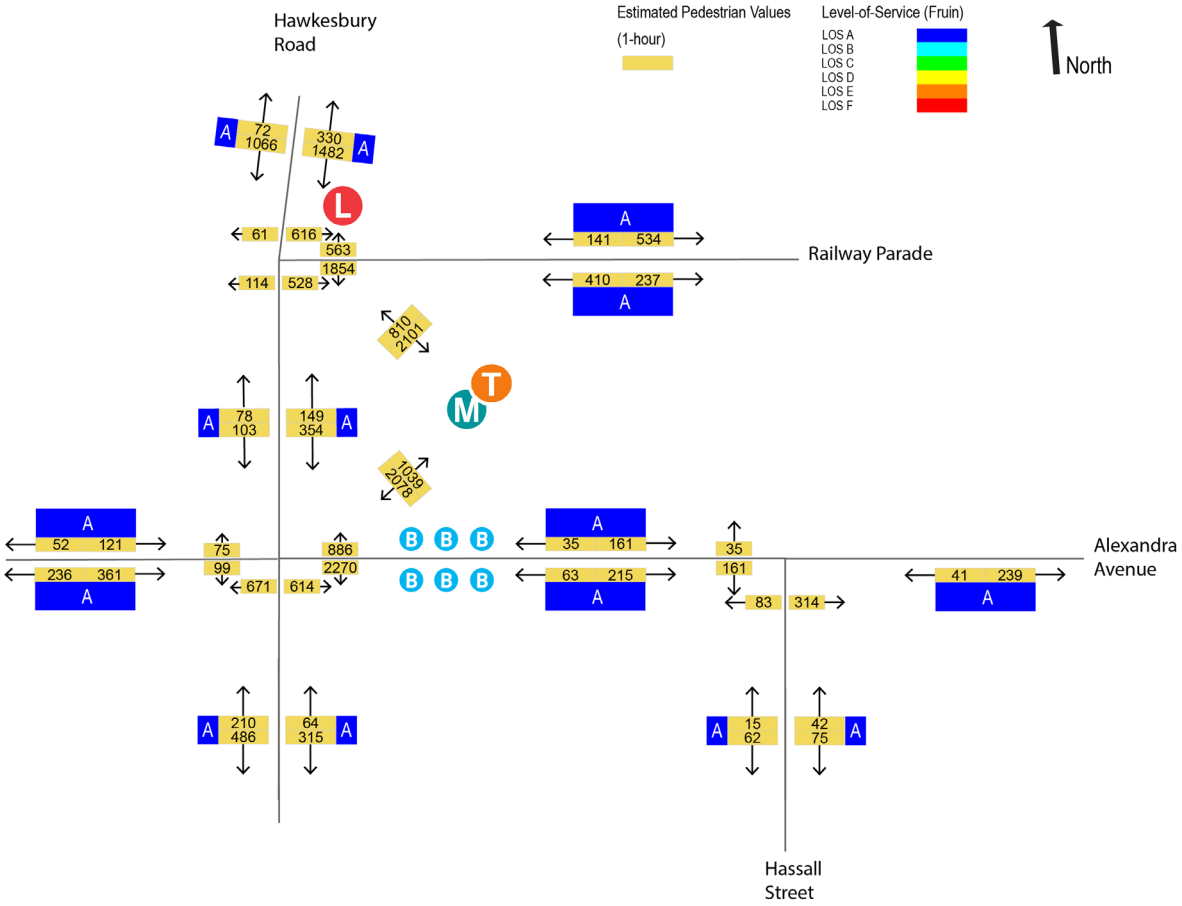


Figure 76 2036 Precinct pedestrian modelling results – PM peak

Pedestrian modelling of the precinct indicates that there would be minimal impacts to pedestrians due to the presence of the metro station. All the proposed footpaths in the area would operate at a level of service A in both the AM and PM peak periods. The most heavily used footpaths and crossings to access the station would include:

- The southern and eastern crossings of Hawkesbury Road/ Railway Parade intersection
- The southern and eastern crossings of Hawkesbury Road/ Alexandra Avenue intersection
- The eastern footpath of Hawkesbury Road bridge including the corners around the intersections.

4.3.4 Integration with cycle network

A smaller proportion of the station access and egress trips are expected to be by cycle (less than 1%). Cycle links are proposed within the vicinity of the station to enable cycle trips through the precinct and facilitate connections with the wider strategic cycle network. Cycle connections to be implemented by Sydney Metro as part of the Westmead metro station precinct include:

- An active modes link across the upgraded Hawkesbury Road bridge . This would connect with the existing shared path on the western side of Hawkesbury Road to the north and through to the existing cycle network on Darcy Road and Queens Road
- A dedicated cycle path along the northern side of Bailey Street between Hawkesbury Road and Hassall Street and on the eastern side of Hawkesbury Road between Alexandra Avenue and Bailey Street. This cycleway would provide east-west connections between Parramatta Park and the station and would connect with the proposed active modes link across the bridge.

To facilitate easy interchange, cycle parking facilities would be provided near the station entrance on Railway Parade.

Within the station precinct, provision would be made at upgraded intersections to provide safe cyclist crossing and access.

4.3.5 Integration with public transport network

Westmead metro station would create an integrated transport hub with direct interchange between metro and suburban rail services, and safe, equitable and legible connections with buses and light rail.

After walking, bus trips represent the second highest mode share for passengers accessing and egressing the interchange, with light rail accounting for only a small portion of the access/ egress mode share.

The bus interchange would be located on Alexandra Avenue and in a slightly relocated position from where the existing bus stops are located. Three bus stands are proposed in each direction to cater for the estimated demand. Further investigations into the potential localised regrading of Alexandra Avenue would be required as the design progresses, to enable an accessible path of travel between the relocated bus stops and the metro station entrances.

Customers would be able to transfer between modes using widened footpaths along Alexandra Avenue and Hawkesbury Road bridge and widened crossings at the Railway Parade intersection.

Appropriate signage and wayfinding would be provided to enable easy customer transfer through improved provision of information.

4.3.6 Integration with road network

A relatively small percentage (around six per cent) of trips to the station would be kiss and ride, which are not expected to have a high impact on road network performance. Kiss and ride facilities would be provided to support this demand. In addition, a small number of vehicles would be associated with maintenance and servicing of the station.

No formal provision would be made to accommodate customers who intend to park and ride at the proposed station. Passengers who opt to drive to the station would need to rely on available street parking. Sydney Metro would discuss with key stakeholders the need to develop a parking strategy, if required. The purpose of this would be to maintain smooth parking turnover at/ near stations and also to minimise the impact of park and ride customers in surrounding residential streets.

The current road network north of the precinct would experience several upgrades and changes in the near future. The main contributor would be the construction and operation of Parramatta Light Rail with a terminus located north of Westmead metro station.

Sydney Metro is continuing to investigate the use and layout of Alexandra Avenue between Hawkesbury Road and Hassall Street, including the potential for this link to be restricted to buses, taxis and emergency vehicles only, to improve bus service reliability along the transitway. If progressed, this would result in general traffic being diverted via Hassall Street, Bailey Street and/or Priddle Street, and Hawkesbury Road. This would be subject to further investigation and assessment during design development in consultation with key stakeholders

A low-speed environment would be provided on Railway Parade to create a safer pedestrian environment across both sides of the street and between light rail and the Westmead metro station.

Kiss and ride and taxi zones, including accessible spaces, are proposed on Railway Parade near the entrance.

The right turn movement out of Railway Parade is proposed to be banned from the intersection in order to reduce the number of approach lanes, extend the footpaths and improve the operation of the intersection. This movement can be rerouted through the local network without major impacts.

Several crossing points would be provided within the road network to provide safe interaction with traffic for other road users, which are discussed in the above sections.

4.3.7 2036 future year road network performance

Network performance was modelled for the future year 2036. Observed traffic counts were adjusted to account for the impact of the Covid-19 pandemic and growth factors applied to expand adjusted 2021 traffic flows to 2036 (with and without the proposal), which were calculated using outputs extracted from the PTPM strategic transport model.

Signal phasings were adopted from SCATS data and future intersection layouts were coded in accordance with provided future year TCS plans.

Modelled network performance for 2036 during the AM and PM peak hours for key intersections in the vicinity of the metro station is shown in Table 59.

Table 59 Future intersection performance – Westmead (2036)

	AM Peak				PM Peak			
	Without Sydney Metro West		With Sydney Metro West		Without Sydney Metro West		With Sydney Metro West	
Intersection	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS
Hawkesbury Road / Railway Parade	25	B	47	D	64	E	42	C
Hawkesbury Road / Alexandra Avenue	171	F	339	F	44	D	46	D
Alexandra Avenue / Hassall Street	98	F	135	F	17	B	20	B

A number of intersections across the local network are expected to perform at level of service F in the AM peak without the proposed station and performance is forecast to decline further with the proposed station in both AM and PM peaks. This is most apparent at the intersections of Hawkesbury Road/ Alexandra Avenue and Alexandra Avenue/ Hassall Street. Hawkesbury Road/ Alexandra Avenue intersection would reach level of service F and up to 171 seconds of average delay without Sydney Metro West and 339 seconds of average delay with Sydney Metro West during the AM peak. Alexandra Avenue / Hassel Street intersection would reach level of service F and up to 98 seconds of average delay without Sydney Metro West, and 135 seconds of average delay with Sydney Metro West during the AM peak.

Current congestion issues on this part of the network during peak hours are well known and only expected to increase with higher vehicular demands expected. Increased delays associated with the project are caused by the forecast increase in pedestrian volumes crossing the intersection to reach the station and the slightly higher growth factor applied to the with Sydney Metro West scenario.

Sydney Metro is continuing to work with stakeholders to manage congestion issues in the area and is considering options for the use and layout of Alexandra Avenue between Hawkesbury Road and Hassall Street, including the potential for this link to be restricted to buses, taxis and emergency vehicles only in order to improve bus service reliability along the transitway.

4.3.8 Parking impacts

Approximately four parking spaces would be removed in total in Railway Parade as part of the proposal to accommodate the kiss and ride and taxi zones, as shown in Figure 77 below.

Measures to address potential impacts arising from the loss of on-street parking in the vicinity of the station precinct would be developed, where required, in consultation with the relevant local council.

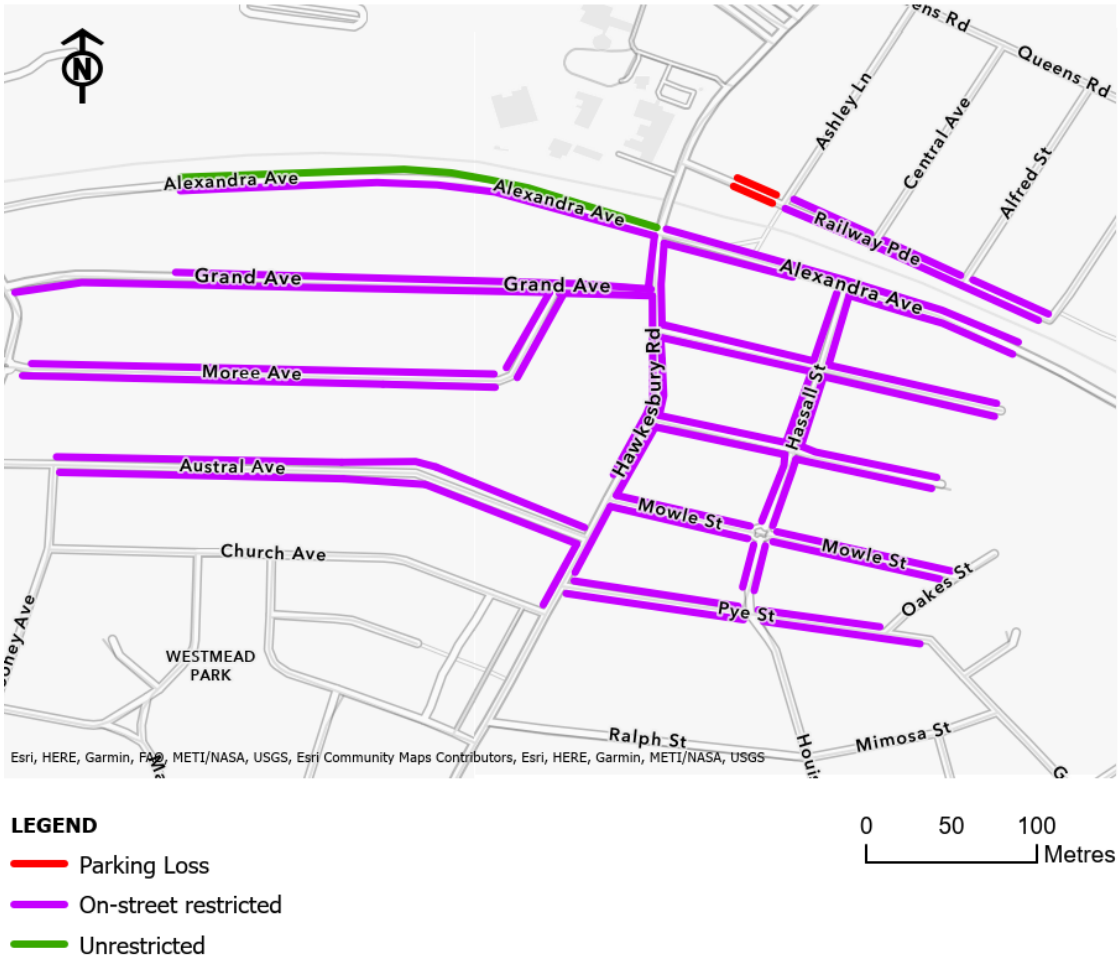


Figure 77 Station precinct parking impacts – Westmead

4.3.9 Property and access impacts

No adjustments to adjacent properties are required as part of the Westmead metro station and property access would be maintained in a similar manner to existing.

4.4 Parramatta metro station

4.4.1 Location and key features

Parramatta metro station would be located in Parramatta's CBD to the north of the existing Parramatta Station and Parramatta Square. It is bounded by George Street to the north, Smith Street to the east, Macquarie Street to the south, and Church Street to the west. The proposed metro station entries are as follows:

- An eastern entry fronting the Civic Link
- A western entry off Church Street.

The station transport integration and access plan is provided in Figure 78.

The key features of the proposed transport integration and access at Parramatta include:

- Bus interchange located on Smith Street between George Street and Macquarie Street to provide direct interchange between metro and buses
- Accessible kiss and ride located on the new Horwood Place
- Taxi zone located on George Street, east of the Civic Link
- Potential cycle parking close to the station entrance
- Provision of open spaces in the vicinity of the station
- A mid-block crossing is being investigated across Smith Street to facilitate access from the bus interchange.

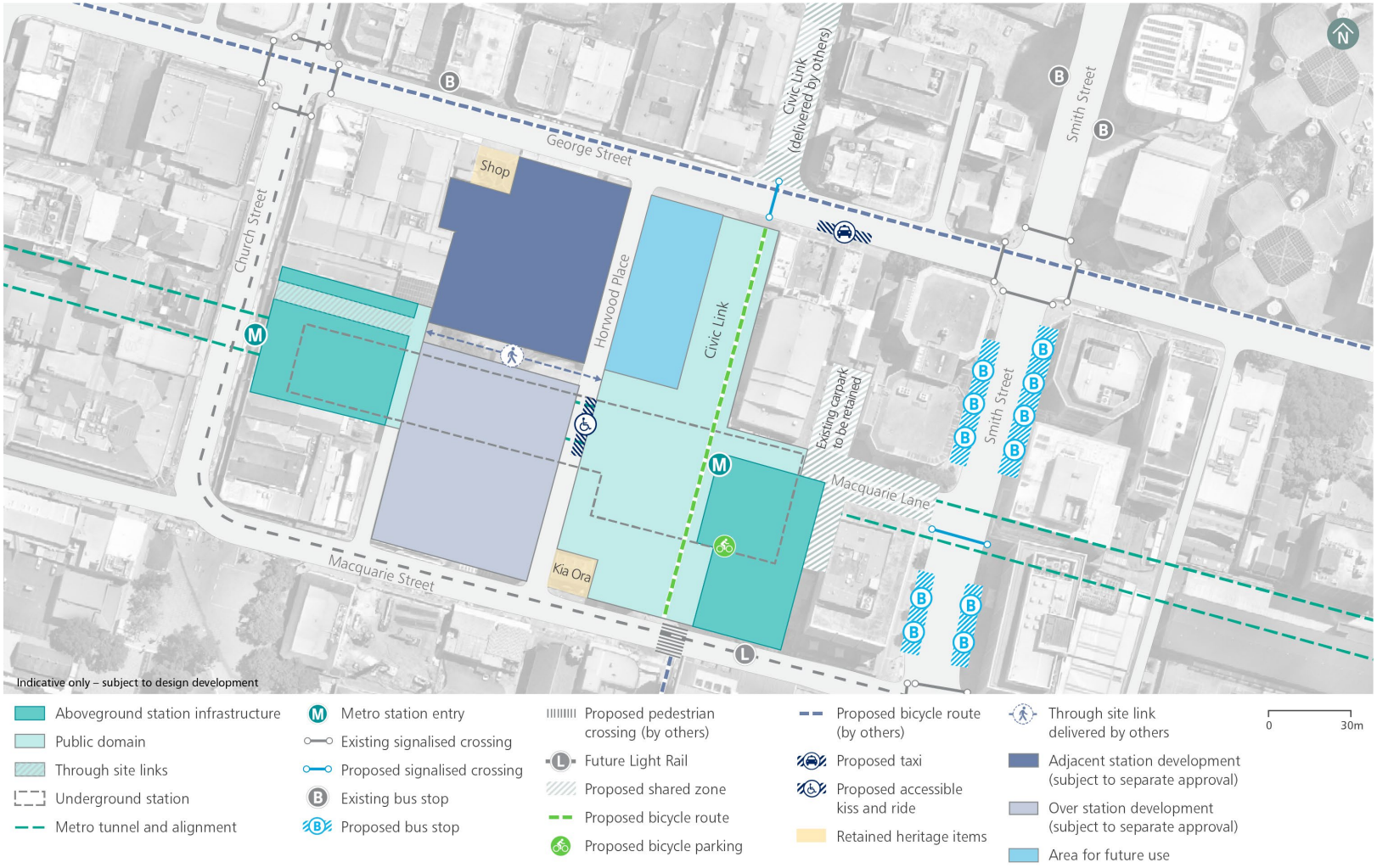


Figure 78 Station transport integration and access plan – Parramatta

4.4.2 Passenger demand

Station passenger demand has been forecast for the 2036 AM peak hour. The demand forecasts indicate approximately 4,700 customers accessing the station and 3,100 customers exiting. The numbers reflect that the station is considered both an origin and a destination station. The 2036 modal breakdown of arrival and departure during the AM peak hour is presented in Table 60.

Table 60 Forecast mode of arrival and departure – Parramatta (2036)

Mode	Walk	Cycle	Bus	Kiss and ride	Light rail
Access	42%	2%	21%	1%	34%
Egress	88%	2%	6%	-	4%

Source: PTPM data

It is anticipated that the majority of access and egress trips would be by foot. Almost all exits would be walking trips to local commercial land uses, with some transfer to bus and light rail. Around 34 per cent of access trips would be transfers from light rail in addition to 21 per cent transfers from buses.

The distribution of customers boarding and alighting in the AM peak hour is shown below in Figure 79.

Figure 79 Station boarding and alighting passenger distribution – AM

Key observations from Figure 79 are:

- Transfers from light rail, bus, and rail are the highest after walking trips
- Access walk trips are heavily weighted towards the south, south east, and south west, via Macquarie Street
- Demand in the north is evenly spread between Church Street, George Street and Smith Street.

4.4.3 Integration with pedestrian network

Walking is expected to be the primary mode of access at Parramatta metro station and integration with the pedestrian network is a key consideration. One of the proposed entrances to the station would be through the Civic Link and a new public domain that would provide a direct connection to the station concourse and would have sufficient space to accommodate expected demand. Similarly, the second station entry would be off Church Street, which will be a major pedestrian link referred to as “Eat Street”.

As described in City of Parramatta Council’s Draft Parramatta Integrated Transport Plan (April 2021), the Civic Link will be a green, shared pedestrian cyclist spine, a public space and cultural spine that connects public life from the heart of Parramatta CBD to the River. The proposed Civic Link extends across four city blocks through the heart of the Parramatta CBD, connecting Parramatta Square and the transport interchange to River Square, the Museum of Applied Arts and Sciences (MAAS) and the broader foreshore precinct.

The proposed pedestrian network in the vicinity of the metro station would allow for good connectivity within the station precinct following all desire lines (east-west and north-south). It would create safe and walkable streets that are designed for people.

Both Macquarie Lane and United Lane would be designed to prioritise pedestrians, while allowing access for vehicles accessing surrounding developments.

In addition to Church Street, sections of Macquarie Street would also be pedestrianised as part of the Parramatta Light Rail project, which would provide an additional pedestrian friendly link for passengers interchanging between light rail and suburban rail. Macquarie Street is also expected to be the main pedestrian link for pedestrians walking to/from Parramatta Square and developments to the south.

In addition to pedestrian footpaths, consideration has been given to pedestrian crossings at several locations within the precinct including:

- A mid-block crossing of George Street at the Civic Link – through the conversion of construction phase signals
- A mid-block crossing across Smith Street to facilitate access from the bus interchange.

Signalised pedestrian crossings would also be maintained at all surrounding signalised intersections including:

- The intersection of Macquarie Street/ Smith Street
- The intersection of George Street/ Smith Street
- The intersections of Church Street/ George Street
- The intersection of Church Street/ Macquarie Street.

Pedestrian precinct modelling has been carried out for the year 2036 and results are presented in Figure 80 and Figure 81 for both AM and PM peaks respectively.

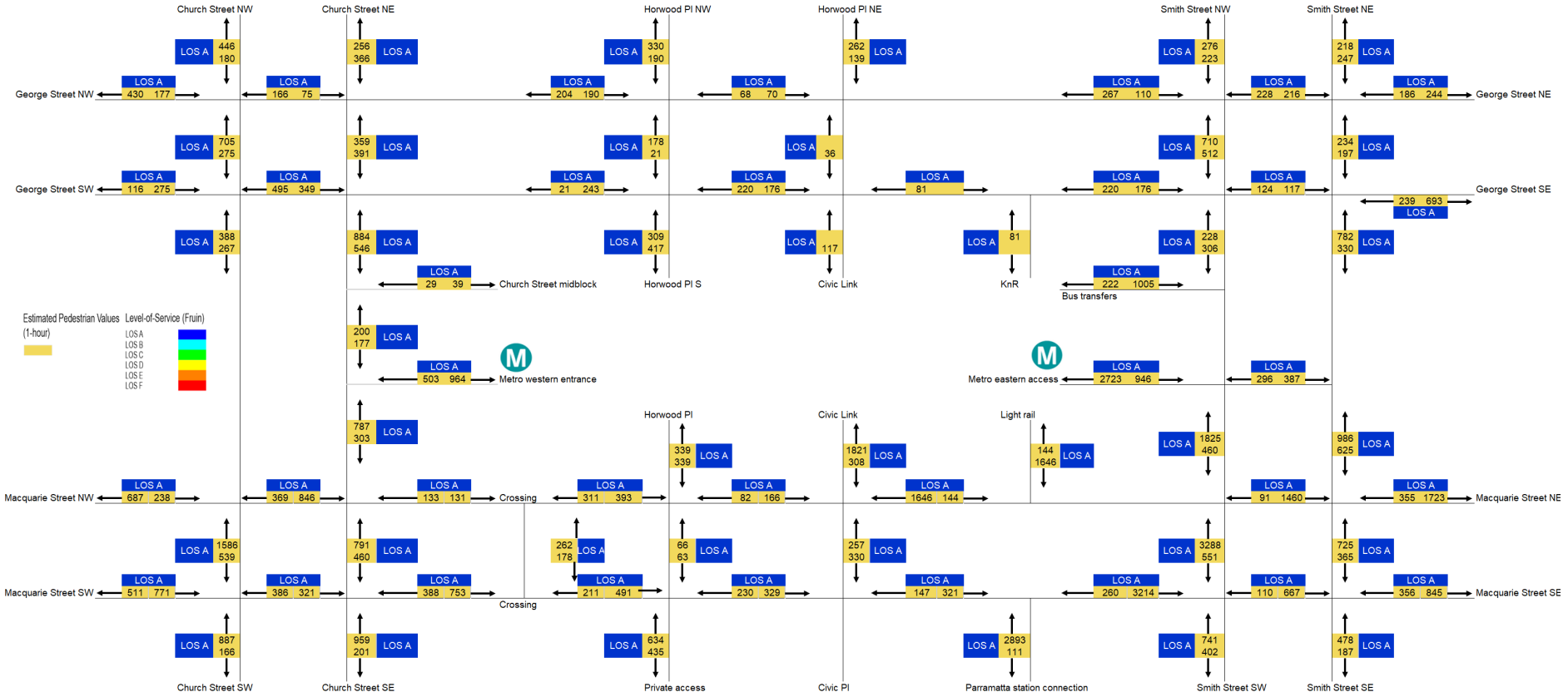


Figure 80 2036 Precinct pedestrian modelling results – AM peak

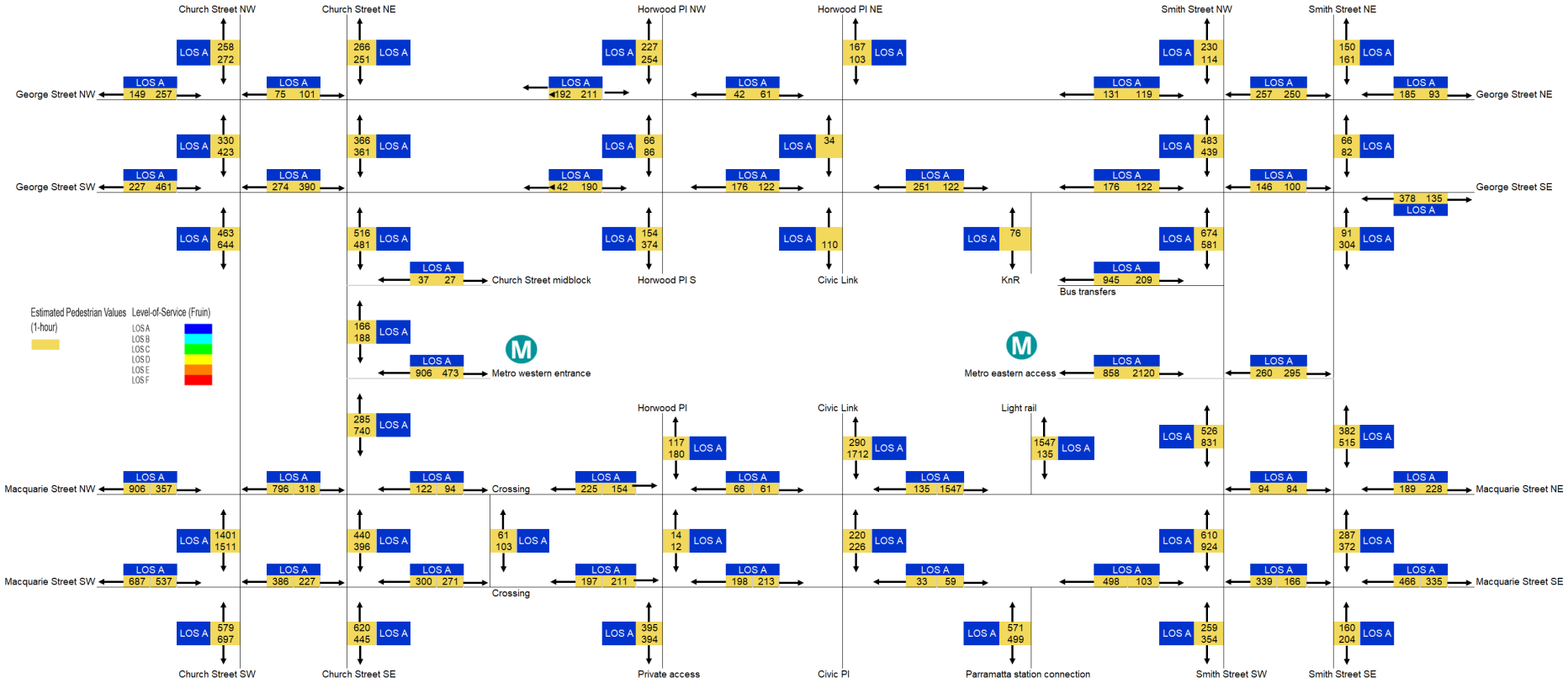


Figure 81 2036 Precinct pedestrian modelling results – PM peak

Future precinct pedestrian modelling indicates that the pedestrian network would continue to perform at good levels of service with both AM and PM scenarios reporting level of service A for all footpaths, mid-block crossings and signalised crossings around the metro station.

4.4.4 Integration with cycle network

Around two per cent of the station access and egress trips are expected to be by cycle. Both the City of Parramatta Bike Plan and the NSW Principal Bicycle Network show a future cycling link at George Street.

An active transport link would be provided on the Civic Link in line with the Council's vision. The proposed Civic Link is expected to provide linkage to the existing cycle route along the Parramatta River to the north and Parramatta Square to the south, in addition to the future planned east-west link at George Street (by others).

To facilitate easy interchange, a number of cycle parking facilities would be provided near the station entry on the eastern station plaza.

Within the proposed station precinct, cyclists would be able to cross safely at signalised intersections including:

- Existing intersection of George Street/ Church Street
- Existing intersection of George Street/ Smith Street
- Existing intersection of Macquarie Street/ Smith Street
- Existing intersection of Macquarie Street/ Church Street
- Proposed signalised mid-block crossing of George Street at the Civic Link.

4.4.5 Integration with public transport network

Parramatta metro station would provide a major transport interchange supporting the key principles of providing an indirect connection with Sydney Trains, maintain the '5-minute interchange' principle and promote a walkable pedestrian friendly precinct supporting cycling and direct interchange with light rail, buses and taxi/ on-demand services.

Light Rail

Based on the future mode share forecast for the station, more than 30 per cent of station access trips would be by light rail. A future light rail stop would be located on Macquarie Street a short distance east of the Civic Link. The following would provide an efficient and safe transfer for customers between light rail and metro:

- A section of Macquarie Street between Horwood Place and Smith Street would be pedestrianised when Parramatta Light Rail is operational in 2023, providing safe access for pedestrians and accommodating the light rail stop
- Civic Link would provide direct access to the metro station entrance and is located only a short distance away from the light rail stop.

Bus

Following walking and light rail, bus trips represent the third highest mode share for passengers accessing the Parramatta metro station in 2036.

Smith Street would provide the main bus interchange for the metro station. In addition to the existing bus stops on Smith Street north of George Street, a number of bus stops would be provided to cater for the future estimated bus services in the precinct. Additional bus stops would be provided along the section of Smith Street between George Street and Macquarie Street.

Customers would be able to transfer between bus stops at metro station entries using walkways and crossing points. These would be designed to provide appropriate visibility between buses and crossing points. To provide improved pedestrian connectivity from these bus stops of the metro station, a new mid-block signalised pedestrian crossing of Smith Street would be provided in the vicinity of the bus stops.

Existing crossings that could also be utilised by bus customers include:

- Pedestrian crossings at signalised intersections, including the intersections of George Street/ Smith Street and Macquarie Street/ Smith Street
- Footpaths along each side of Smith Street and Macquarie Lane.

Appropriate signage and wayfinding would be provided to ensure easy customer transfer through improved provision of information.

4.4.6 Integration with road network

Park and ride facilities would not be provided as part of the proposal and traffic generation by customers travelling to and from the metro station would be minimal. There would be some traffic associated with kiss and ride (one per cent of forecast station trips), taxi, maintenance and service vehicle activity. These trips would not impact road network and intersection performance.

The current road network within the precinct and surrounding the metro station will experience several upgrades and changes in the near future. The main contributor is the construction and operation of the Parramatta Light Rail.

Church Street, which is currently closed to traffic due to construction of Parramatta Light Rail, will be maintained as a pedestrianised street, except for light rail movements once this is operational, with pedestrian crossings provided at intersections with George Street and Macquarie Street.

As part of the Sydney Metro works, Horwood Place would be relocated to the west of its existing location, while maintaining connections to George Street and Macquarie Street, as in the current situation. The road would be positioned between the Civic Link to the east and United Lane to the west and would be one way northbound between Macquarie Street and George Street. The purpose of this road is mainly to provide access to surrounding developments in the precinct. It would also have a number of parallel parking spaces on the eastern side, of which two spaces would be designated for accessible kiss and ride.

Both Macquarie Lane and United Lane would be designed as low speed traffic environments that prioritise pedestrians, while allowing access for vehicles accessing surrounding developments.

A large section of Macquarie Street is currently closed for general traffic due to Parramatta Light Rail construction, except for a small number of vehicles accessing surrounding developments in addition to construction vehicles. When Parramatta Light

Rail is operational in 2023, sections of the road between Church and Smith Street will be pedestrianised, specifically between Horwood Place and the light rail stop. A westbound traffic lane will be maintained between Smith Street and the light rail stop to provide access to Parramatta Square. Also, an eastbound traffic lane will be provided between Church Street and Horwood Place to provide access to surrounding developments.

George Street will continue to operate as a two-way road when Parramatta Light Rail is operational. With Macquarie Street closed for through traffic, it is expected that George Street will be the main east-west traffic link. A taxi zone would be located on George Street east of Horwood Place.

As discussed in section 4.4.5, Smith Street would continue to operate as a bus link for the precinct, with additional proposed bus stops located along both sides of the road between George Street and Macquarie Street.

Physical and operational specifications of surrounding intersections are expected to change to reflect changes in the surrounding road network, including at the following locations:

- Intersection of Macquarie Street/ Church Street
- Intersection of Smith Street/ Macquarie Street
- Intersection of Macquarie Lane/ Smith Street
- Intersection of Horwood Place/ George Street.

Several crossing points would be provided within the road network to provide safe interaction with traffic for other road users, which have been discussed above in section 4.4.3.

4.4.7 2036 future year road network performance

Network performance was modelled for the future year 2036. Observed traffic counts were adjusted to account for the impact of the Covid-19 pandemic and growth factors applied to expand adjusted 2021 traffic flows to 2036 (with and without the proposal), which were calculated using outputs extracted from the PTPM strategic transport model.

Signal phasings were adopted from SCATS data and future intersection layouts were coded in accordance with future TCS plans provided (including the current TCS plan design with light rail operational).

Modelled network performance for 2036 during the AM and PM peak hours for key intersections in the vicinity of the metro station is provided in Table 61.

Table 61 Future intersection performance – Parramatta (2036)

Intersection	AM Peak				PM Peak			
	Without Sydney Metro West		With Sydney Metro West		Without Sydney Metro West		With Sydney Metro West	
	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS
George St/Marsden St	20	B	21	B	24	B	27	B
George St/Church St	10	A	11	A	10	A	10	A
George St/Horwood Place[1]	5	A	5	A	5	A	5	A
George St/Smith St	42	C	43	D	38	C	40	C
Smith St/Macquarie Lane[1]	4	A	4	A	4	A	4	A
Macquarie St/Marsden St	17	B	17	B	14	A	16	B
Macquarie St/Church St	18	B	21	B	19	B	23	B
Macquarie St/Horwood Place	5	A	6	A	5	A	5	A
Macquarie St/Smith St	29	C	29	C	29	C	28	B

[1]The worst movement delay is reported as the overall delay for priority (un-signalised) intersections.

Results of intersection modelling indicate that all modelled intersections in the vicinity of the proposed station would perform at level of service D and C or better in the AM and PM peaks respectively when the metro station is operational.

4.4.8 Parking impacts

On-street and off-street parking spaces would be removed as part of the proposal as shown in Figure 82. Parking loss associated with this proposal would include around seven on-street parking spaces on George Street, as a result of the new Horwood Place alignment.

Measures to address potential impacts arising from the loss of on-street parking in the vicinity of the station precinct would be developed, where required, in consultation with the relevant local council.

Figure 82 Station precinct parking impacts – Parramatta

4.4.9 Property and access impacts

Access to properties located to the south of Macquarie Street would be maintained via westbound and eastbound traffic lanes on Macquarie Street (provided as part of Parramatta Light Rail Stage 1). Access to existing developments at the corner of Church and Macquarie Street would be maintained via United Lane.

Access to properties on the north-west corner near the intersection of George Street and Church Street would be retained, the format and nature of which would be subject to further investigation.

4.5 Sydney Olympic Park metro station

4.5.1 Location and key features

Sydney Olympic Park metro station would be located within Sydney Olympic Park, east of Olympic Boulevard and south-east of Stadium Australia. It is bounded by Herb Elliott Avenue to the north, a proposed precinct street to the east, Figtree Drive to the south and Olympic Boulevard to the west. The key features of proposed transport integration and access at Sydney Olympic Park station are:

- An eastern entry south of Herb Elliott Avenue
- An eastern entry north of Figtree Drive
- Two station entrances (north and south) within the public domain area that would be open to public use during event mode only
- A six-bay bus interchange on Figtree Drive with interim property access south of the southern station entry with westbound and eastbound bus stands
- A large public domain area, known as ‘Forest Plaza’ that connects the station precinct to Olympic Boulevard and is able to support demand from pedestrian movements during event ingress and egress
- Provision of northbound bus-only right turn bay from Olympic Boulevard into Figtree Drive, subject to stakeholder consultation with Transport for NSW and Sydney Olympic Park Authority
- Provision of a southbound right turn bay from Australia Avenue into Figtree Drive, subject to stakeholder consultation with Transport for NSW and Sydney Olympic Park Authority
- Provision of off-road through site active transport links along the north-south promenade corridor and east-west Forest Plaza
- Provision of a break in the central median of Olympic Boulevard at its intersection with Forest Plaza to facilitate event crowd access to the station. Subject to stakeholder consultation with Transport for NSW and Sydney Olympic Park Authority
- Two precinct streets, that would provide vehicle access to future residential, commercial and retail precincts whilst also improving active travel connections. This includes Precinct Street A (to be delivered by others), which is accessible from Figtree Drive and Precinct Street B, accessible from either Herb Elliott Avenue or Figtree Drive
- Provision of mid-block pedestrian crossings at Figtree Avenue (south) and Herb Elliott Avenue (north), opposite the north-south promenade
- Cycle parking
- Accessible kiss and ride parking, located on Herb Elliott Avenue
- Taxi zone located by the northern station entrance on Herb Elliott Avenue.

The station transport integration and access plan is provided in Figure 83.

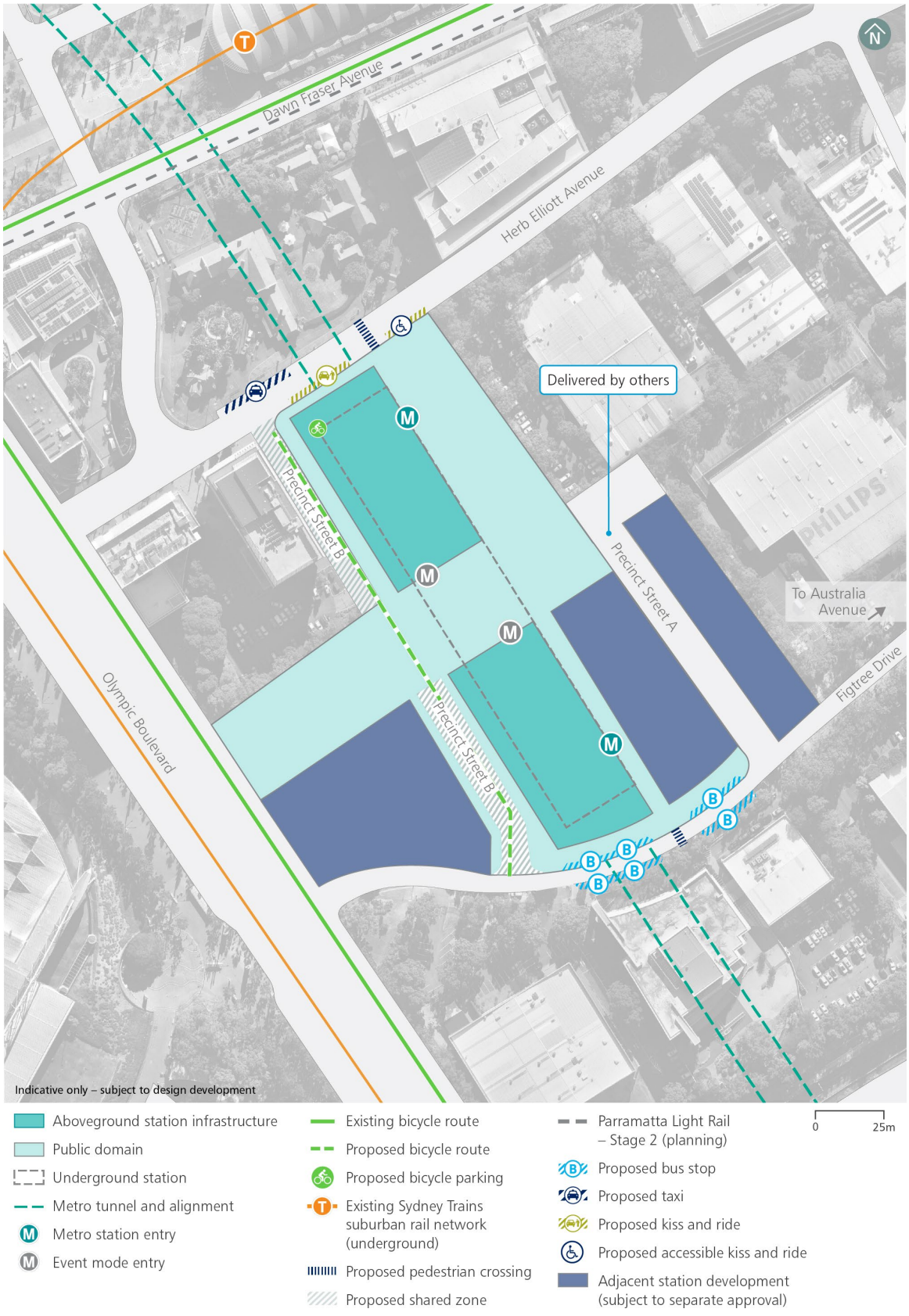


Figure 83 Station transport integration and access plan – Sydney Olympic Park

4.5.2 Passenger demand

Station passenger demand for the 2036 AM peak was forecast using PTPM strategic transport model outputs provided by Transport for NSW. The demand indicates approximately 2,700 customers would access the station and 3,810 customers would egress during the morning peak hour. The numbers reflect that the station would operate as both an origin and destination.

Access to the station is anticipated to occur from local residential areas and passengers interchanging from bus services, whilst egress from the station is likely to be walking trips to places of work. The 2036 modal breakdown of arrival and departure during the AM peak hour is presented in Table 62.

Table 62 Forecast mode of arrival and departure – Sydney Olympic Park (2036)

Mode	Walk	Cycle	Bus	Kiss and ride	Park and ride
Access	52%	2%	39%	5%	1%
Egress	93%	1%	6%	0%	0%

Source: PTPM data

A small number of passengers are anticipated to travel to suburbs in the wider area by transferring to bus services after egressing from the station, likely to the nearby suburbs of Newington and Silverwater that do not currently have access to a train station within reasonable walking distance.

Nearly five per cent of access trips to the station are kiss and ride, hence sufficient kerbside space north of the station precinct has been allocated to accommodate for this demand.

Demand for access to the station by private vehicle is not likely to be a major generator of traffic during peak hour periods. Relatively low numbers of park and ride trips are forecast and no additional parking capacity for passengers would be provided as part of the proposal.

The distribution of customers entering and leaving the precinct in the 2036 AM peak hour is shown in Figure 84.

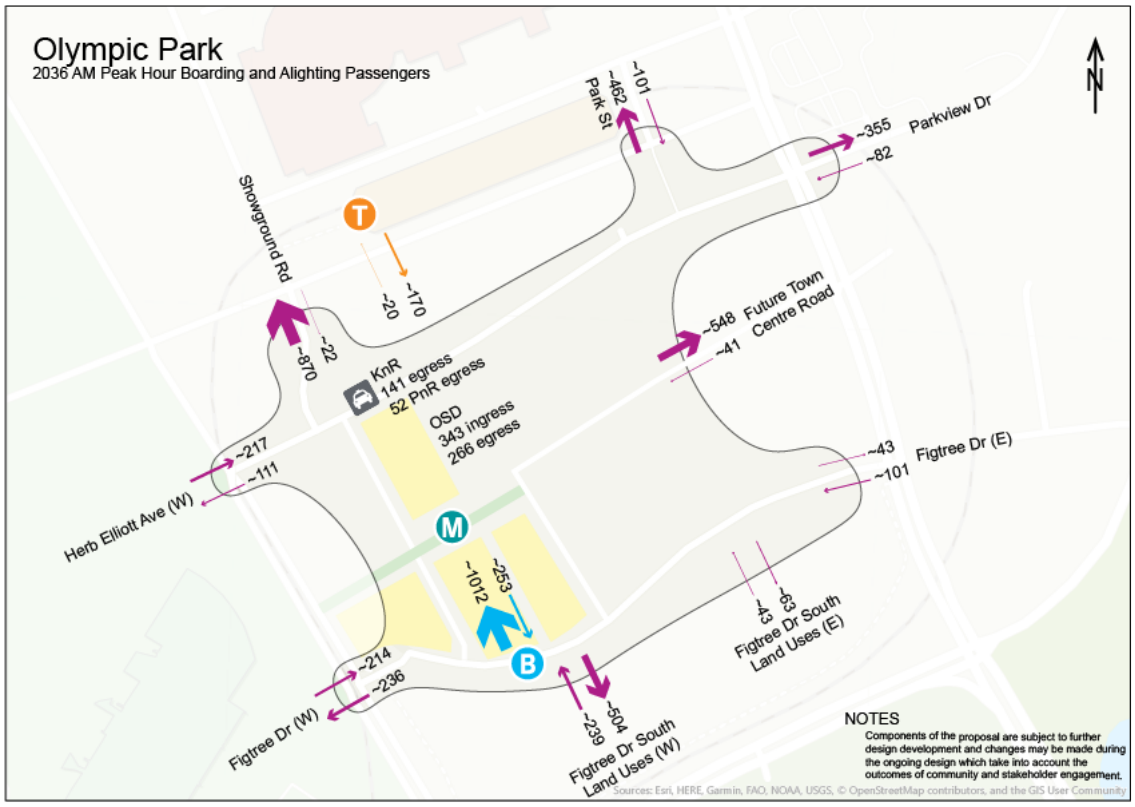


Figure 84 Station boarding and alighting passenger distribution – AM

Key observations from Figure 84 are:

- Transfers from bus services on Figtree Drive are large, while rail is substantially lower
- Walk egress outweighs access
- Most customers egressing the station on foot would head north via Showground Road
- Demand is evenly distributed for egress on foot to the north east (Park Street), the east (future road connection) and the south (Figtree Drive).

4.5.3 Integration with pedestrian network

The station would integrate with the adjacent pedestrian network in two distinctly different ways, which relate to its dual role as a day-to-day access and access to Olympic Park event venues.

Day to day access to the precinct would be via two eastern station entries (in the north and south of the precinct) connecting to a new north-south pedestrian promenade linking Figtree Drive to Herb Elliott Avenue. It would also provide access to the future east-west pedestrian spine through the future town centre proposed in the Sydney Olympic Park Master Plan. Day-to-day access has been segregated from event access so that event crowds do not impact on local access arrangements.

During precinct events, the station would have separate, more direct, event access in and out of the station to the surface within the Forest Plaza. This plaza would extend west from the station away from the town centre towards Olympic Boulevard. This is the major approach route for all bump-out crowds during major events. The area has

historically had roads closed on event days where pedestrian demand warrants increased safety measures to reduce the likelihood and severity of pedestrian-vehicle conflicts.

Walking is the primary access mode to and from the station. The north-south promenade and the east-west Forest Plaza provide the primary connections to the external footpath network and to the bus and kiss and ride interchange facilities. The external network is well established. Forecast pedestrian movements along the north-south promenade are expected to be up to around 2,000 pedestrians per hour.

Mid-block pedestrian crossing facilities would be provided at either end of the promenade at Herb Elliott Avenue and Figtree Drive to accommodate pedestrian crossing movements. The Herb Elliott Avenue crossing would provide access to Dawn Fraser Avenue via an existing pedestrian link through the Abattoir Heritage Precinct. This pedestrian link would provide direct and convenient access for metro customers, however it includes stairs and is not DDA compliant. The crossing of Figtree Drive to the south provides the major link between the two sides of the bus interchange. The type of crossing facilities to be provided would be developed in consultation with key stakeholders including Sydney Olympic Park Authority and Transport for NSW.

Pedestrian access to the precinct from the east is restricted by the existing rail track alignment to a single underpass on Australia Avenue. From here, pedestrians either use Herb Elliott Avenue or Figtree Drive to access the precinct or stadiums. To improve access, a west-east pedestrian connection would be implemented between the precinct area and beyond the rail tracks to improve accessibility through this area. This connection is not expected to be finalised until after the completion of surrounding development east of the precinct and would be delivered by Sydney Olympic Park Authority and other relevant stakeholders.

Pedestrian precinct modelling has been undertaken for the year 2036, assessing mid-block network performance in both AM and PM peaks using Fruin Outdoor Footway density criteria, to understand footpath performance. This assessment shows the local network in Sydney Olympic Park to be operating at level of service B or better.

Dynamic pedestrian modelling was also undertaken to assess queuing issues at key interface points between the road and footpath networks. The dynamic modelling confirmed that the intersections of Herb Elliott Avenue and Figtree Drive with Olympic Boulevard are forecast to operate at level of service A in the AM peak hour.

Pedestrian crossing facilities on both Herb Elliott Avenue and Figtree Drive, at either end of the north-south pedestrian promenade, were also assessed. The dynamic modelling suggested that zebra crossing facilities would operate at level of service C or better, with a maximum traffic queue of 88 metres experienced on the western approach of the Figtree Drive crossing. Further investigations into the potential for these crossings to be further upgraded to signalised crossings should the delays to traffic flows warrant, would be undertaken during design development

During major events, Olympic Boulevard would be closed between Dawn Fraser Avenue and Figtree Drive, and bump-out crowds accessing the metro station would be directed south down Olympic Boulevard to the Forest Plaza. To facilitate pedestrian entry from Olympic Boulevard into Forest Plaza, a small break would be provided in the central median of Olympic Boulevard, directly opposite the Forest Plaza entry.

Pedestrian precinct modelling has been carried out for the year 2036 and results are presented in Figure 85 and Figure 86 for both AM and PM peaks respectively.

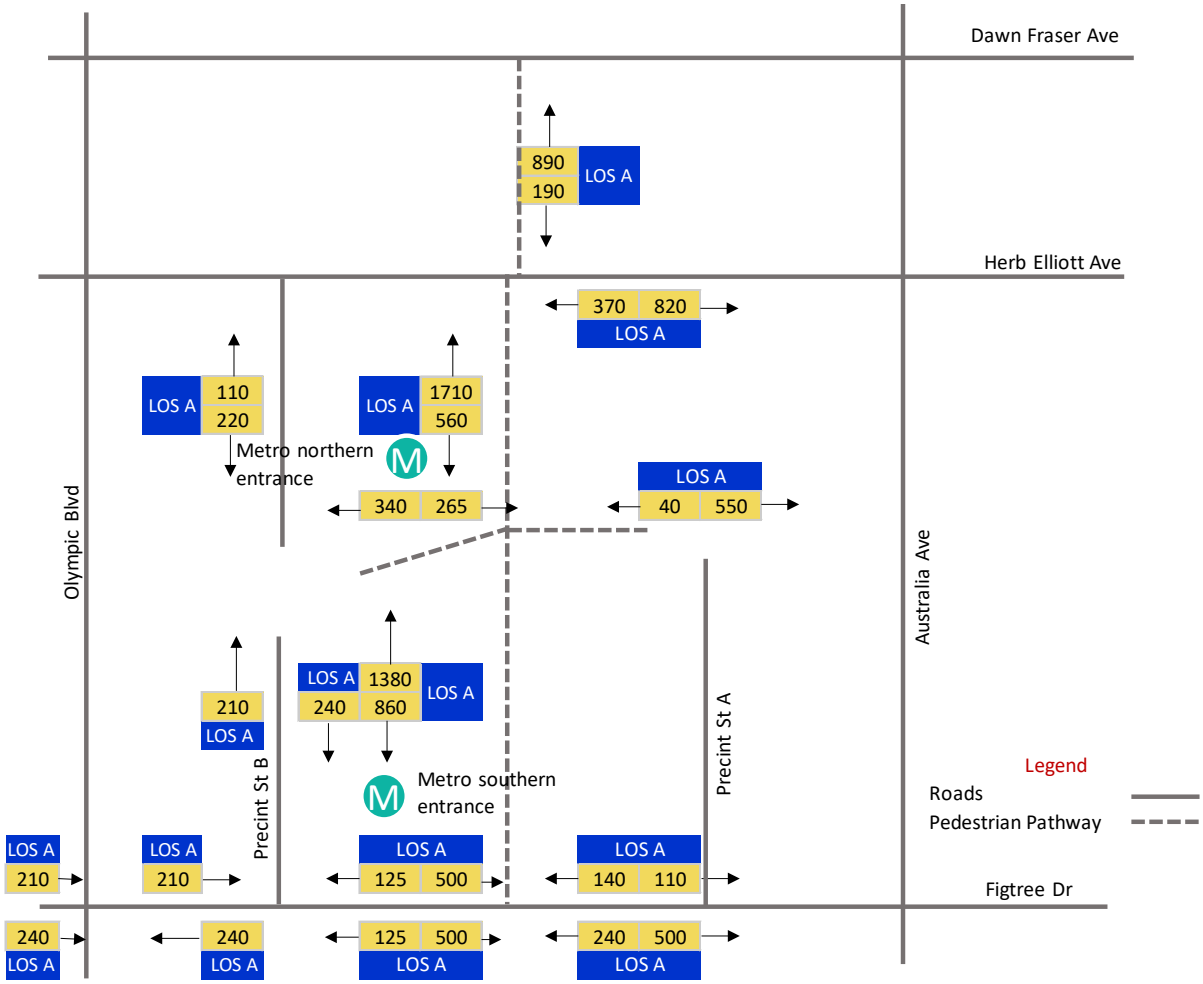


Figure 85 2036 Precinct pedestrian modelling results – AM peak

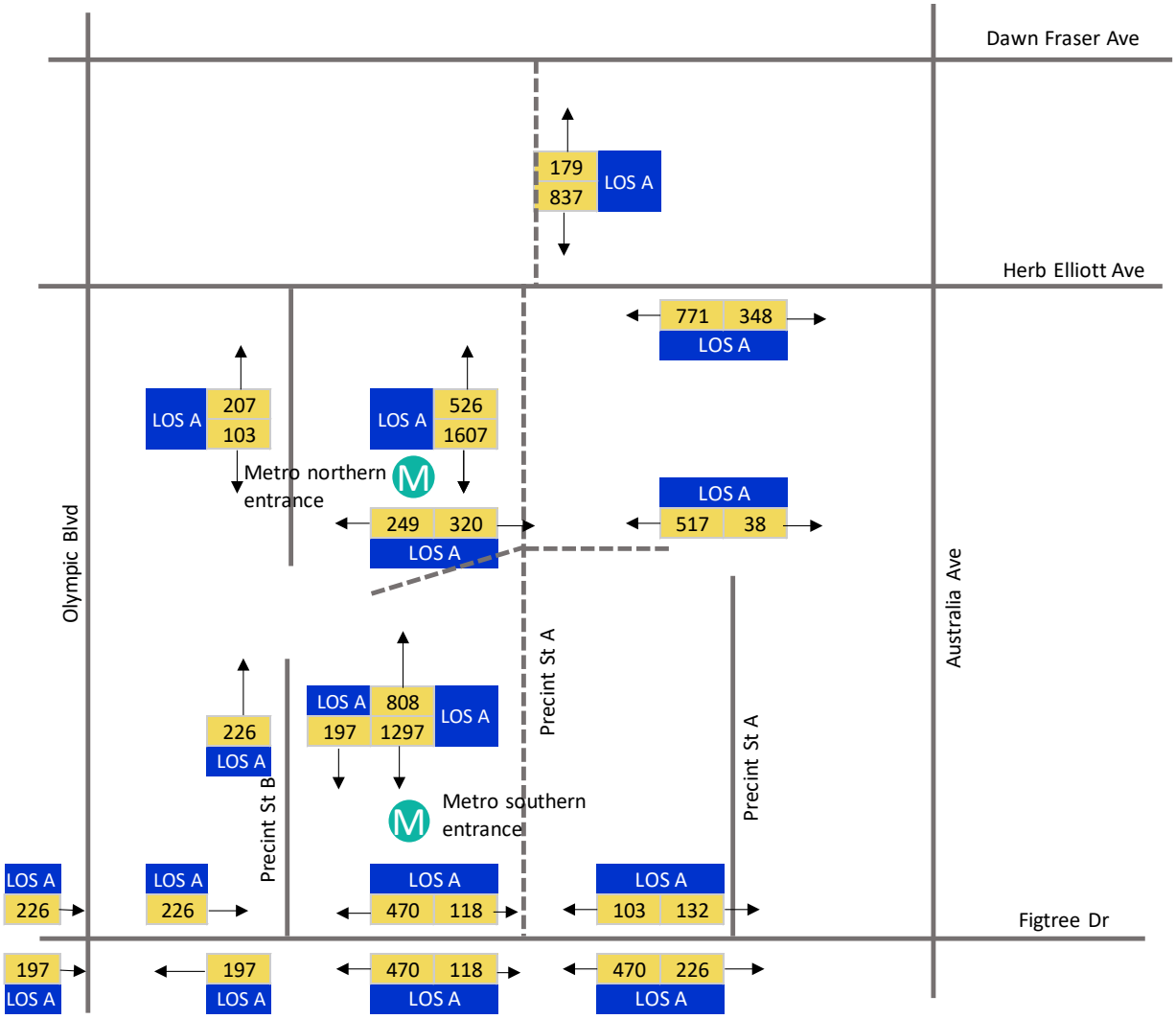


Figure 86 2036 Precinct pedestrian modelling results – PM peak

4.5.4 Integration with cycle network

Around two per cent of station access and egress trips are expected to be by cycle. Within the precinct, the north-south promenade and east-west Forest Plaza would provide off-road connectivity from the metro station to the adjacent road and cycle networks, provided by Sydney Olympic Park Authority.

Existing infrastructure consists primarily of on-road cycle lanes, at moderate difficultly, with wide off-road shared paths around stadium areas. Roads that surround the proposed station precinct, including Herb Elliott Avenue, Olympic Boulevard, Showground Road and Figtree Drive have no dedicated cycle infrastructure, but are low speed environments that typically carry low volumes of vehicles, and are likely to be used by cyclists comfortable with sharing road space with vehicles.

To facilitate easy interchange, cycle parking facilities would be provided adjacent to the proposed precinct Street B on the western side of the northern station site, south of Herb Elliott Avenue. Existing cycle racks on Herb Elliott Avenue, Olympic Boulevard and Dawn Fraser Avenue would remain, and would add to the capacity of the station facilities.

No additional formalised crossing facilities are proposed, however cyclists travelling north-south through the public domain would be able to use the mid-block pedestrian crossings provided on Herb Elliott Avenue and Figtree Drive.

Existing connectivity in the wider local area is reasonable, with a series of north-south and east-west cycle links providing access to the wider network and the suburbs of Concord and Newington. Access south is limited to two off-road crossings on Birnie Avenue and Hill Road, as the M4 Western Motorway limits accessibility.

4.5.5 Integration with public transport network

Bus services

The Sydney Olympic Park metro station would be designed to facilitate interchange from bus services at Sydney Olympic Park and it is anticipated that 39 per cent of AM peak access trips in 2036 would transfer from bus to metro. Improvements through the new interchange, new routes and route alterations to existing services are anticipated to result in reduced travel times to key destinations. Residents in suburbs north of Sydney Olympic Park are expected to have reduced travel times to Sydney CBD, with residents in suburbs south of Sydney Olympic Park having reduced travel time to Parramatta and Sydney CBD.

The Sydney Olympic Park metro station bus interchange would be located on Figtree Drive on the southern side of the station precinct. It would ultimately include six new bus stands, enhancing the customer experience and enabling passengers to transfer between bus and metro services with ease. The new interchange on Figtree Drive would be supported by existing paired bus stops on Park Street, Dawn Fraser Avenue and Australia Avenue. Appropriate signage and wayfinding would be provided to ensure an easy customer transfer through improved provision of information.

The interchange on Figtree Drive would be implemented in two stages. Kerb works would be installed for the ultimate bus interchange configuration. However, in the interim, the head of the westbound bus stand would not be available to buses, as it needs to remain clear to maintain driveway access to an adjacent property (6a Figtree Drive). Sydney Metro would work with Sydney Olympic Park Authority and other relevant stakeholders to seek the removal of this driveway when the site is redeveloped at which time the bus stands would be extended.

To enable bus services to access the metro station, intersection upgrades may be implemented at the Olympic Boulevard / Figtree Avenue and the Australia Avenue / Figtree Drive intersections. This would be subject to further stakeholder consultation with Sydney Olympic Park Authority and Transport for NSW.

Rail services

The metro station would be located approximately 200 metres south of the existing Olympic Park Station, which would enable rail passengers to interchange within suitable walking distance. Interchange opportunities are limited however, with daily services currently operating as a shuttle service on the spur line between Olympic Park Station and Lidcombe.

This station is primarily utilised for major events, enabling the mass movement of crowds during ingress and egress.

Light rail

If approved, future implementation of the Parramatta Light Rail Stage 2 would enable additional opportunities to interchange between modes. The future proposed light rail (if approved) would enable transfer between light rail and metro services via Showground Road, north of the station precinct.

4.5.6 Integration with road network

No formal provisions would be made to accommodate passengers who intend to park and ride at the proposed metro station. Existing parking capacity would need to be utilised within the wider Sydney Olympic Park precinct. As the station primarily operates as a destination, or as an interchange with bus services, road network performance is not expected to be impacted by relatively low levels of customers parking before accessing the station.

Approximately five per cent of trips during the 2036 AM peak to the Sydney Olympic Park metro station are forecast to be kiss and ride. Two kiss and ride zones on Herb Elliott Avenue are proposed to support this demand, though network performance on Herb Elliott Avenue is unlikely to be impacted by this low volume.

The road network is expected to be upgraded in the near future, with two new proposed roads within the station precinct that would connect to the existing local road network. This includes Precinct Street A (between Figtree Drive and a new road east of the station precinct) and Precinct Street B (between Herb Elliot Avenue and Figtree Drive). Precinct Street A is a new road on the eastern side of the station precinct and is designed to provide vehicle access from Figtree Drive to the precinct and repurposed land east. Precinct Street A would be delivered by others as part of the future development of the precinct. Precinct Street B to be delivered as part of this proposal has been designated as a shared zone for vehicles, cyclists and pedestrians and is divided into two sections of road by a passenger thoroughfare from the station to Olympic Boulevard. Vehicles can access this street from Herb Elliott Avenue to the north or Figtree Drive to the south.

4.5.7 2036 future year road network performance

Network performance was modelled for the future year 2036. Observed traffic counts were adjusted to account for the impact of the Covid-19 pandemic and growth factors applied to expand adjusted 2021 traffic flows to 2036 (with and without the proposal), which were calculated using outputs extracted from the PTPM strategic transport model. Signal phasings were adopted from SCATS data.

Modelled network performance for 2036 during the AM and PM peak hours for key intersections in the vicinity of the metro station is provided in Table 63.

Table 63 Future intersection performance – Sydney Olympic Park (2036)

	AM Peak				PM Peak			
	Without project		With project		Without project		With project	
Intersection	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS
Australia Avenue and Sarah Durack Avenue	53	D	46	D	60	E	72	F
Olympic Boulevard and Sarah Durack Avenue	22	B	22	B	26	B	27	B
Olympic Boulevard and Figtree Drive[1]	1	A	4[2]	A	1	A	4[2]	A
Olympic Boulevard and Herb Elliott Avenue[1]	2	A	2	A	2	A	2	A
Australia Avenue and Herb Elliott Avenue	34	C	48	D	33	C	39	C
Australia Avenue and Figtree Drive[1]	12	A	13[2]	A	12	A	14[2]	A

[1] Level of service of worst movement
[2] Buses for approval included

Future intersection performance across the local network is similar with and without the metro station. The most notable impacts from the inclusion of the station are increased delays at the intersections of Australia Avenue/Sarah Durack Avenue and Australia Avenue/Herb Elliott Avenue during the PM peak. Increased delays are being caused by the anticipated kiss and ride trips needing to travel through the intersection twice (pick up and return trip).

Sydney Metro and Transport for NSW would continue to monitor intersection performance of Australia Avenue/Sarah Durack Avenue prior to and during operations to identify intersection improvements as a result of this proposal where required. Sydney Metro would continue to engage with Sydney Olympic Park Authority around the review of transport arrangements for the Australia Avenue/Herb Elliott Avenue intersection.

4.5.8 Parking impacts

Over 33 on-street and off-street parking spaces would be removed as part of the proposal as shown in Figure 87, including:

- About 18 on-street car parking spaces to be removed on Herb Elliott Avenue:
  - About six on-street car parking spaces to be replaced by a taxi stand
  - About six on-street car parking spaces to be replaced for a pedestrian crossing
  - one on-street car parking space and one motorcycle parking space to be removed to be replaced with a relocated loading zone
  - about four on-street car parking spaces to be reallocated as kiss and ride bays.
- About 11 on-street car parking spaces to be removed on Figtree Drive to accommodate the six bus stands that form the new interchange.
- A number of parking spaces would be removed on Herb Elliott Avenue near the proposed Precinct Street B and replaced with a no stopping zone. This is to reduce potential risks associated with unattended vehicles.

Measures to address potential impacts arising from the loss of on-street parking in the vicinity of the station precinct would be developed, where required, in consultation with key stakeholders.

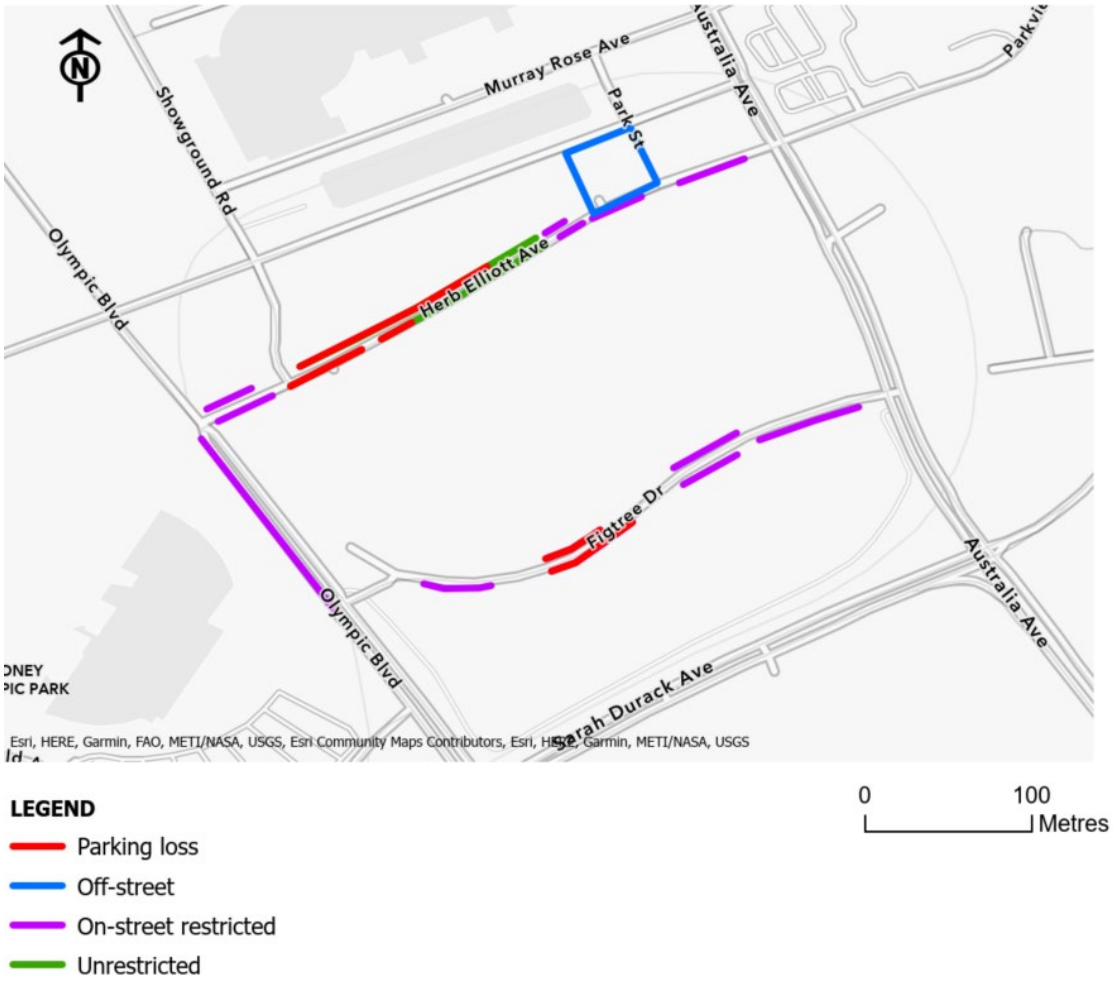


Figure 87 Station precinct parking impacts – Sydney Olympic Park

4.5.9 Property access impacts

Aside from the previously mentioned staged removal and relocation of the existing driveway at 6a Figtree Drive (refer to Section 4.5.5) to accommodate bus stands as part of the new bus interchange, there are no other impacts to parking or private property access.

4.5.10 Major special events

As the premier sports and entertainment precinct of Sydney, the metro station would play a key role in the movement of passengers to and from Sydney Olympic Park on event days. The highest capacity and most frequently held events are at Stadium Australia, Sydney Showground and Qudos Bank Arena.

The Sydney Olympic Park Master Plan was enacted to facilitate the redevelopment of Sydney Olympic Park into a world-class multi-use precinct and ensures all development can accommodate changes to access, whilst maintaining its function in event modes through the Event Access Plan.

The Master Plan indicates that the preferred access strategy is to enter the site from the west along Olympic Boulevard.

To understand the change in patron access to stadiums and venues when Sydney Metro West is operational, two future scenarios were considered:

- Regular events (assumed 10,000 - 20,000 attendees)
- Major events (assumed in excess of 50,000 attendees and maximum stadium capacity of 83,500).

A forecast of mode share for regular and major event scenarios is provided in Table 64.

Table 64 Forecast event scenarios – Sydney Olympic Park (2036)

Event	Walk	Bus	Taxi/Share Ride	Car	Train	Metro
Regular	50	500	800	5,200	3,300	10,200
Major	200	10,000	3,400	20,000	23,800	26,300

Source: Sydney Olympic Park Stadia Precinct Transport Review, 2020

In regular and major event modes, Sydney Olympic Park metro station is expected to move the highest percentage of passengers accessing the precinct area by 2036.

The metro station would provide a substantial improvement in public transport options and clearance times following major events at Sydney Olympic Park.

4.6 North Strathfield metro station

4.6.1 Location and key features

North Strathfield metro station would be located between the existing North Strathfield Station and Queen Street.

The key features of proposed transport integration and access at North Strathfield are:

- Two station entrances on the east along Queen Street, one opposite Waratah Street and the other opposite Wellbank Street
- Two station entrances on the west along the walkway that connects Pomeroy Street with Hamilton Street East
- A new aerial pedestrian footbridge across the railway corridor to provide interchange between metro and suburban rail services
- Bus interchange located along Queen Street with northbound/ southbound bus stands
- An upgrade to the Pomeroy Street/ Beronga Street/ Queen Street intersection
- Changes to Queen Street/ Waratah Street intersection to facilitate pedestrian crossing movements
- Signalised intersection with crossing on all arms on Queen Street/ Wellbank Street (delivered as part of work under the previous Sydney Metro West planning application)

- A dedicated cycleway connection along Queen Street
- Cycle parking located near the station entrances on Queen Street and on Hamilton Street East
- Kiss and ride zones located on Queen Street South and Hamilton Street East. Sydney Metro would investigate opportunities for an additional kiss and ride zone on Waratah Street

Sydney Metro is continuing to investigate the potential for an additional southern concourse (i.e. by upgrading the existing southern footbridge) to provide additional customer interchange capacity, and a revised cross corridor connection.

The proposed station transport integration and access plan for North Strathfield is shown in Figure 88.

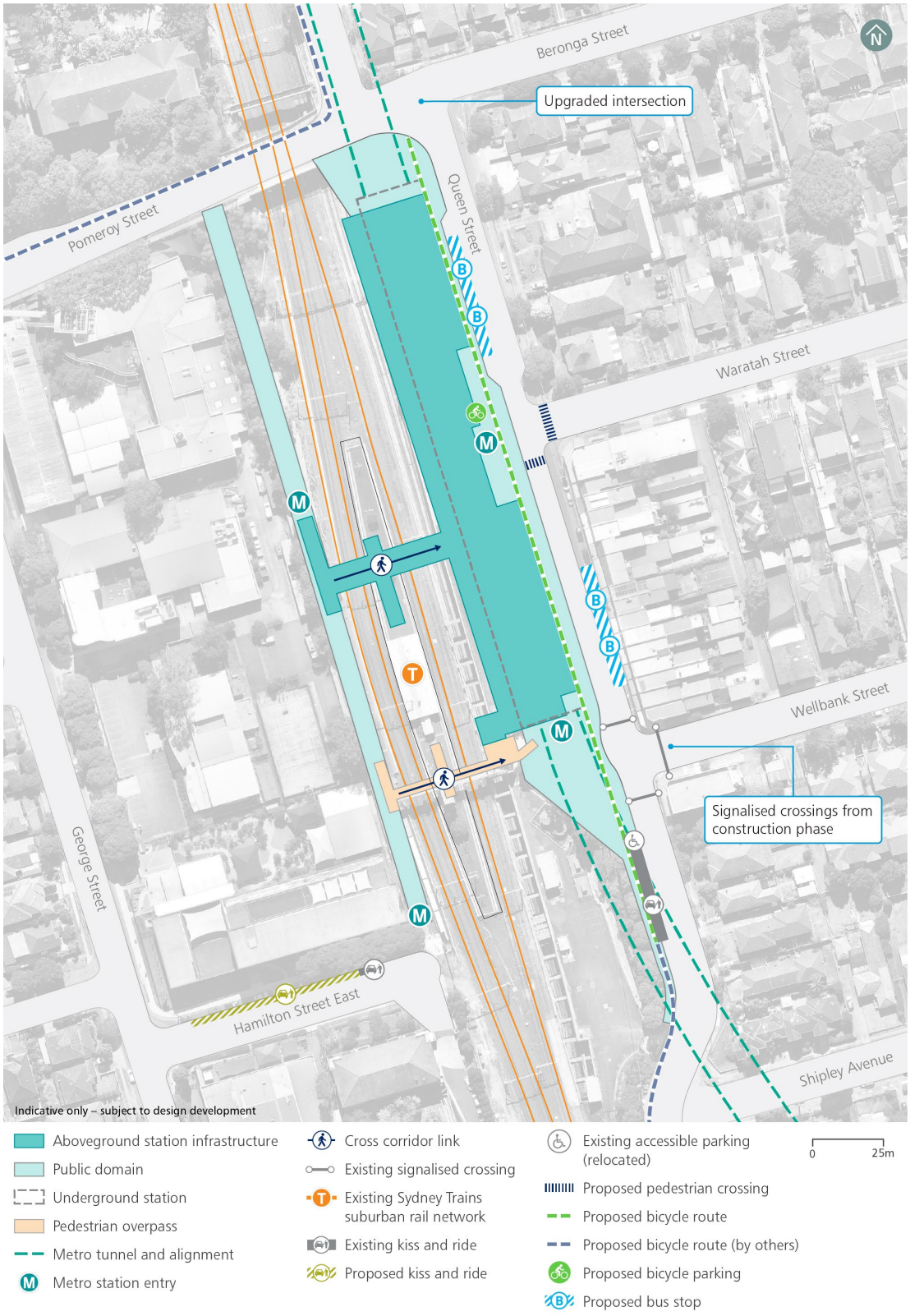


Figure 88 Station transport integration and access plan – North Strathfield

4.6.2 Passenger demand

Station passenger demand has been forecast for the 2036 AM peak hour. The demand indicates approximately 4,000 customers accessing the station and 900 customers exiting, with nearly 5,000 customers transferring services between Sydney Metro and Sydney Trains within the station. The numbers reflect that the station is primarily used as an interchange, but also as a point of origin. The 2036 modal breakdown of arrival and departure during the AM peak hour is presented in Table 65 below.

Table 65 Forecast mode of arrival and departure – North Strathfield (2036)

Mode	Walk	Cycle	Bus	Kiss and ride	Park and ride
Access	57%	1%	22%	9%	11%
Egress	83%	1%	16%	0%	0%

Source: PTPM data

It is anticipated that the majority of access and egress trips would be by foot, although a significant portion of trips also account for transfer from and to buses. The majority of egress trips would be walking trips to destinations around the precinct, with some transferring to buses.

The distribution of customers boarding and alighting in the AM peak hour is shown below in Figure 89.

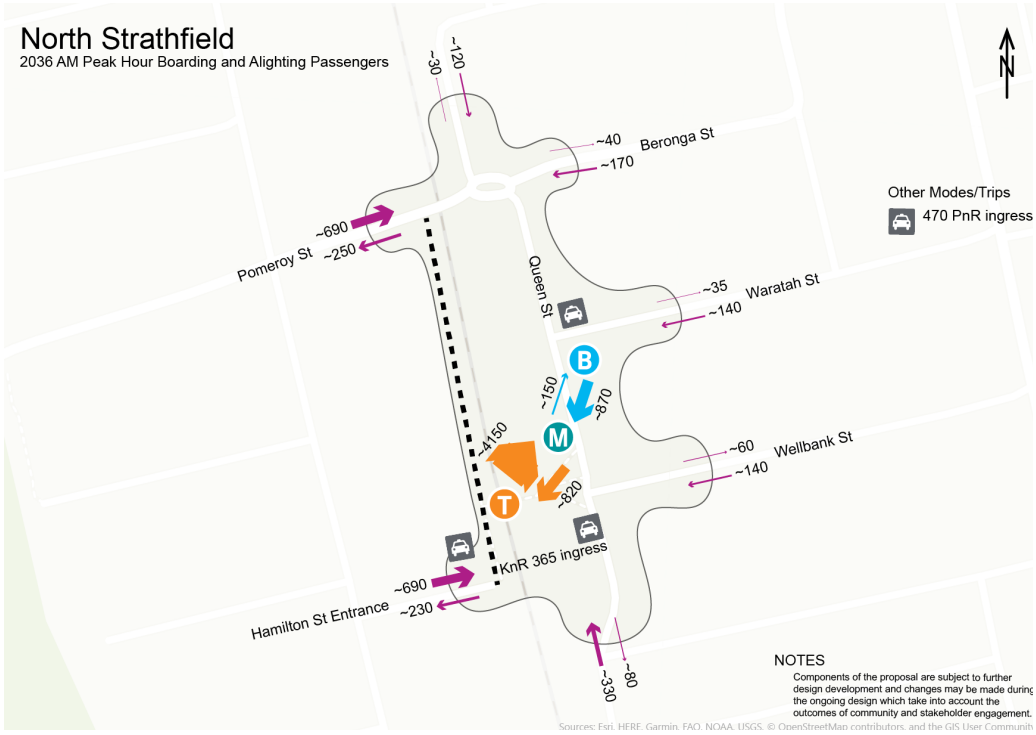


Figure 89 Station boarding and alighting passenger distribution – AM

Key observations from Figure 89 are:

- Rail transfer is the single largest demand
- Bus transfer is also substantial

- Number of access walk trips is larger than egress walk trips
- Walk trips are heavily weighted towards the west, Pomeroy Street and Hamilton East Street
- Queen Street south represents a substantial walking catchment
- Demand from the east is evenly spread between Beronga Street, Waratah Street and Wellbank Street.

4.6.3 Integration with pedestrian network

Walking is expected to be the primary mode of access at North Strathfield metro station and integration with the pedestrian network is a key consideration. The eastern station entrances are off Queen Street, which is the main activity link in the precinct.

The first entrance is directly opposite Waratah Street providing access for customers from the northern and eastern catchments.

A second entrance to the south on Queen Street would be provided through a redeveloped southern plaza area with direct connections from Wellbank Street and Queen Street to the south.

The existing pedestrian link over the railway corridor, which provides a key east-west connection and DDA accessibility to the existing railway station, would be maintained to perform the same function.

Appropriate treatments to the road surface and kerb lines of Queen Street would be provided to accommodate the bus stops, facilitate pedestrian and cycle priority movements, as well as changes to sign posted speed limits. This would reinforce Queen Street as the main pedestrian desire line and would facilitate safe pedestrian movements between the bus stops, existing retail areas, the station and potential new retail areas on the station frontage.

Safe pedestrian movement along streets surrounding the proposed station would be facilitated by extending the kerbs on some parts of the network where possible and by increasing the station building setback at ground level to improve pedestrian accessibility. A wide footpath and active modes link would be provided on the station side of Queen Street with kerb extensions on the intersections to shorten crossing distances.

An upgraded walkway from Pomeroy Street to the station entry would also be provided to facilitate access from the west.

In addition to pedestrian footpaths, consideration has been given to the provision of pedestrian crossings at several locations within the precinct, including:

- Signalised crossings on all arms of the Queen Street/ Wellbank intersection (delivered as part of work under the previous Sydney Metro West planning application)
- New and upgraded pedestrian crossings on the Queen Street/ Waratah Street intersection
- Upgraded intersection at the Pomeroy Street/ Beronga Street/ Queen Street intersection including pedestrian crossings.

Patronage forecasts for the future indicate that the station would substantially increase pedestrian flows in the local precinct. Pedestrian precinct modelling has been carried out for the year 2036 and results are presented below in Figure 90 and Figure 91 for both AM and PM peaks respectively.

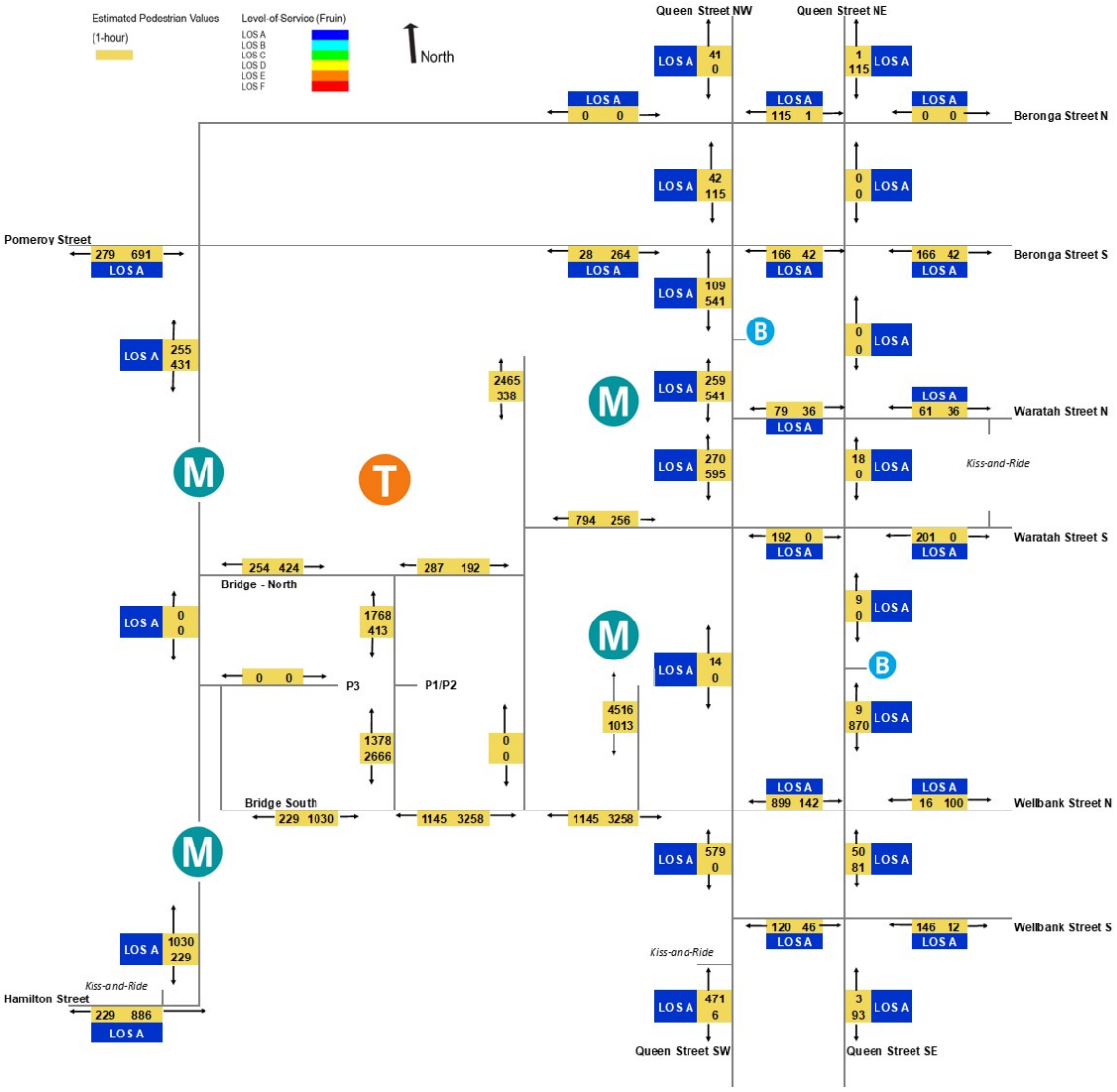


Figure 90 2036 Precinct pedestrian modelling results – AM peak

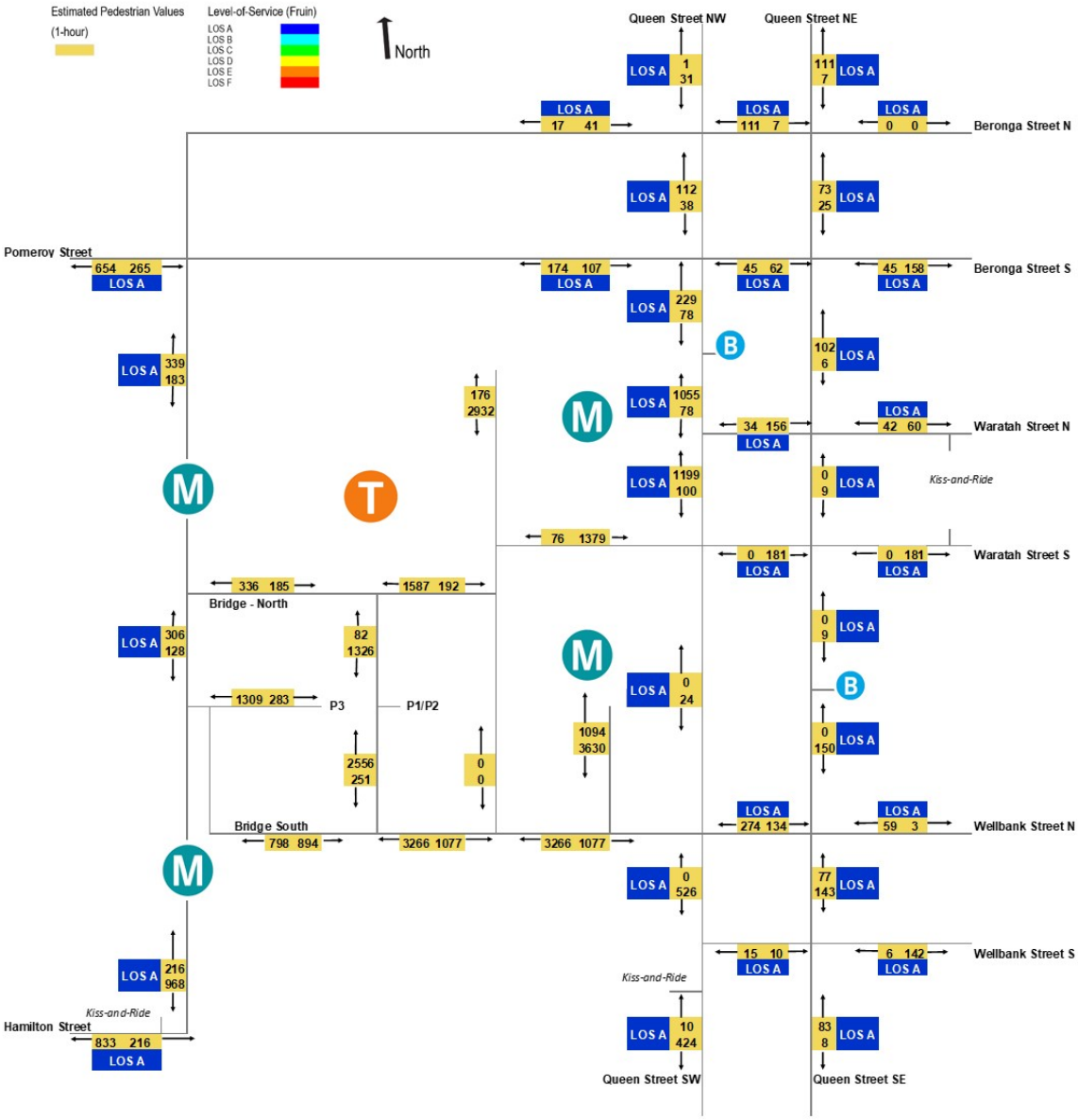


Figure 91 2036 Precinct pedestrian modelling results – PM peak

Pedestrian modelling of the precinct indicates that there would be minimal impacts to pedestrian level of service due to the presence of the metro station. All the footpaths in the area would continue to operate at level of service A in both the AM and PM peak periods. The most heavily used footpaths and crossings to access the station would include:

- The western footpath of Queen Street adjacent to the station
- The Hamilton Street East section of the station walkway
- The footpath on Pomeroy Street near the station walkway
- The northern crossing of Queen Street/ Wellbank Street intersection.

4.6.4 Integration with cycle network

Although only one per cent of the station access trips are expected to be by bike, the station precinct is located in a focal point to facilitate cycling connections across the

area. As part of the transport integration and access plan for North Strathfield, Sydney Metro would provide a cycleway connection along Queen Street to facilitate cycle access to the station and to the cycle parking facilities. The proposed cycleway along Queen Street would provide connections to the following future cycling routes identified in City of Canada Bay Council's plans:

- Pomeroy Street – Queen Street – Princess Avenue route. Main Route 3 identified by Canada Bay Bike Plan providing regional east-west connectivity between Sydney Olympic Park and Five Dock and connecting to the Principal Bicycle Network
- Pomeroy Street – Beronga Street – Tenterfield Street – Correys Avenue route providing additional east-west connectivity to the Concord area.

To facilitate easy interchange, cycle parking facilities would be provided near the station entrances on Queen Street and on Hamilton Street East.

Within the proposed station precinct, cyclists would be able to safely cross at signalised intersections.

4.6.5 Integration with public transport network

Bus represents the second highest access mode share at North Strathfield metro station after walking, with a share of between 16 per cent to 22 per cent of all customers.

At present, there are no regular bus services serving the existing station at North Strathfield. The delivery of the proposed metro station provides the opportunity to re-route bus services or provide new bus routes to provide interchange with the station.

To accommodate this potential future demand, a two bus stand bus interchange is proposed along Queen Street in the vicinity of the metro station entry.

Access for buses to the metro precinct using the local road network would require further investigation and consultation with relevant stakeholders, including City of Canada Bay Council and Transport for NSW.

Customers would be able to transfer between bus stops and metro station entries using footpaths and crossing points across Queen Street. These would be designed to provide appropriate visibility between buses and the crossing points. The proposed zebra crossing at the Queen Street / Waratah Street intersection would support safe transfers to and from proposed bus stops and the station.

Appropriate signage and wayfinding would enable easy customer transfer through improved provision of information.

4.6.6 Integration with road network

Around nine per cent of station access trips are expected to be kiss and ride trips, however these are not expected to impact road network performance. Kiss and ride facilities would be provided to support this demand. In addition, a small number of vehicles would be associated with maintenance and servicing of the station.

No formal provision would be made to accommodate customers who intend to park and ride at the proposed station. Passengers who opt to drive to the station would need to rely on available street parking. Sydney Metro would discuss with local councils the need to develop a parking strategy, if required. The purpose of this would be to maintain smooth parking turnover at/ near stations and also to minimise the impact of park and ride customers in surrounding residential streets.

Upgrades to the current road network within the precinct and surrounding network are anticipated in the near future. The Wellbank Street / Queen Street intersection would be signalised and delivered as part of work under the previous Sydney Metro West planning application.

To facilitate easy, direct and safe walking and cycling connections between surrounding streets, an upgraded intersection at Pomeroy Street / Queen Street / Beronga Street is being investigated. The nature of this intersection upgrade would be determined in consultation with relevant stakeholders, including City of Canada Bay Council and Transport for NSW.

Kiss and ride zones, including accessible spaces, are proposed on Queen Street south of Wellbank Street and on Hamilton Street East near the station entrances. Sydney Metro would investigate opportunities for an additional kiss and ride zone on Waratah Street.

4.6.7 2036 future year road network performance

Network performance was modelled for the future year 2036. Observed traffic counts were adjusted to account for the impacts of the Covid-19 pandemic and growth factors applied to expand adjusted 2021 traffic flows to 2036 (with and without the proposal), which were calculated using outputs extracted from the PTPM strategic transport model.

Signal phasings were adopted from SCATS data and future intersection layouts were coded in accordance with provided future year TCS plans.

Modelled network performance for 2036 during the AM and PM peak hours for key intersections in the vicinity of the proposed metro station is provided in Table 66.

Table 66 Future intersection performance – North Strathfield (2036)

Intersection	AM Peak				PM Peak			
	Without Sydney Metro West		With Sydney Metro West		Without Sydney Metro West		With Sydney Metro West	
	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS
Pomeroy St/ Queen St/ Beronga St	13	A	36	C	10	A	8	A
Queen St/Waratah St[1]	7	A	10	A	8	A	10	A
Queen St/ Wellbank St	31	C	33	C	31	C	33	C

[1]The worst movement delay is reported as the overall delay for priority (un-signalised) intersections.

From Table 66, the following key observations can be made relating to changes in intersection performance:

- Intersections assessed are expected to operate at level of service C or better during the weekday AM and PM peak periods with and without Sydney Metro West and therefore would operate satisfactorily
- Network changes proposed by Sydney Metro West are not expected to have a significant impact on network performance, the only notable increase in average delays being at the Pomeroy Street / Queen Street/ Beronga Street intersection in the AM peak compared to the without Sydney Metro West scenario
- Longest queues with Sydney Metro West changes are expected on the Beronga Street approach during the AM peak and on the Wellbank Street approach during the PM peak.

4.6.8 Parking impacts

A number of on-street parking spaces would be removed as part of the proposal as shown in Figure 92 below, including:

- About 24 parking spaces (11 unrestricted and 13 restricted) on the western side of Queen Street between Pomeroy Street and Wellbank Street to accommodate the bus stops, the proposed cycleway, widened footpath spaces and potential retail activity, as well as street trees and vegetation near the station frontage (noting these will have been temporarily removed as part of work under the previous Sydney Metro West planning application).
- About 17 parking spaces (nine unrestricted and eight restricted) on the eastern side of Queen Street between Beronga Street and Wellbank Street, to accommodate the bus stops and proposed network changes (noting these would also have been removed to facilitate construction of this proposal)
- About four parking spaces (two unrestricted and two restricted) on the Waratah Street approach would be converted to kiss and ride spaces during peak periods
- About two parking spaces (restricted) on Hamilton Street East, which would be converted to kiss and ride spaces
- About 12 parking spaces on the approaches to the upgraded intersections to provide safe operation and efficient use for all road users. A number of these spaces will have been temporarily removed as part of work under the previous Sydney Metro West planning application.

Measures to address potential impacts arising from the loss of on-street parking in the vicinity of the station precinct would be developed, where required, in consultation with the relevant local council.

Figure 92 Station precinct parking impacts – North Strathfield

4.6.9 Property and access impacts

During operation, access would be maintained for all nearby properties.

4.7 Burwood North Station

4.7.1 Location and key features

Burwood North Station would be located in the suburb of Concord, with the secondary southern station entry in Burwood. The northern site is bounded by Burton Street to the north, Loftus Street to the east, Parramatta Road to the south and Burwood Road to the west. The southern site is bounded by Parramatta Road to the north, Esher Lane to the south and Burwood Road to the west. The key features of proposed transport integration and access at Burwood North Station are:

- A northern entry from Burwood Road (north of Parramatta Road)
- A southern entry from Burwood Road (south of Parramatta Road)
- An unpaid pedestrian underpass beneath Parramatta Road to connect both station entries, open during station operating hours
- Bus interchange located along Burwood Road outside the northern station entry with northbound and southbound bus stands. This includes widening of existing footpaths behind bus stops where possible to accommodate the interchange

- A secondary bus interchange with eastbound and westbound bus stands along Parramatta Road adjacent to both station entries, through the retention of existing bus stops
- A network of laneways through the site to activate the future retail and commercial precincts and to access the loading docks and car parks associated with future developments
- Conversion of the existing roundabout at Burwood Road and Burton Street to a signalised intersection with signalised pedestrian crossings across all legs
- Cycle parking located near the station entrances on and at the pedestrian plaza near the northern entry
- Kiss and ride zone including accessible kiss and ride located on Burton Street. Provision of kiss and ride zones at two locations along Burwood Road to serve both station entries
- Taxi zone located near southern station entry.

The station transport integration and access plan is provided in Figure 93.

Figure 93 Station transport integration and access plan – Burwood North

4.7.2 Passenger demand

Station passenger demand has been forecast for the 2036 AM peak hour. The demand indicates around 2,600 customers accessing the station and 850 customers egressing during the morning peak hour. The numbers reflect that this station would operate mainly as an origin, or bus to metro interchange location, where most passengers would be using the station to get to work.

Future development around the new station and access to the Burwood town centre may however subsequently increase the surrounding area as a destination. The 2036 modal breakdown of arrivals and departures during the AM peak hour is presented in Table 67.

Table 67 Forecast mode of arrival and departure - Burwood North (2036)

Mode	Walk	Cycle	Bus	Kiss-and-ride	Park-and-ride
Access	56%	1%	21%	12%	10%
Egress	97%	-	3%	-	-

Source: PTPM data

It is anticipated that the majority of the trips in the morning peak would be walking trips from the nearby catchment of Concord, Burwood and Canada Bay suburbs, which do not currently have access to a train station within walking distance with buses representing the second largest mode share.

During the AM peak, around 12 per cent of trips are estimated to be kiss and ride, with adequate provision proposed to be implemented near both station entries to provide for this demand. This would also be a contributing factor to local traffic generation around nearby intersections.

No formal provision is made to accommodate park and ride mode share at the proposed metro station with customers having to rely on available street parking. Customers accessing the station by cycle constitute a very minor share.

The distribution of customers boarding and alighting in the AM peak hour is shown in Figure 94.

Figure 94 Station boarding and alighting passenger distribution – AM

It can be observed from Figure 94 that:

- Most customers would access the station by foot
- Majority of the walking trips are likely to be using the southern station entry
- Demand from east and west is almost evenly spread for walking trips
- Bus transfer is also substantial
- Total access trips are roughly three times more than the egress trips in AM peak
- Park and ride trips are likely to be using available side streets on both sides of Parramatta Road
- Kiss and ride trips are more likely to use the northern station entry due to the location of kiss and ride zones.

4.7.3 Integration with pedestrian network

Walking is expected to be the primary mode to and from Burwood North Station and for this reason integration with the pedestrian network is a key consideration. The main entrance to the station on the northern side of Parramatta Road would provide a direct connection to the station entry from Burwood Road and a safe environment, in addition to sufficient space to accommodate expected customer demand.

Just under half (44 per cent) of pedestrian demand for the station is expected to be from Burwood Road, south of Parramatta Road. To avoid lengthy waiting times crossing Parramatta Road, it is anticipated that most of these pedestrians would access the southern station entrance and use the pedestrian underpass to reach the station platforms (during operating hours only).

Proposed setbacks of buildings on Parramatta Road and implementation of an urban boulevard in the vicinity of the station would provide safe and walkable streets. This would reinforce pedestrianisation of the area and improve connectivity within the station precinct.

Pedestrian crossings would be provided across all legs at the proposed signalised intersection of Burwood Road and Burton Street that would improve pedestrian safety by replacing the existing roundabout. The proposed signalised pedestrian crossing at Burton Street/ Burwood Road intersection and the existing signalised crossing at the Parramatta Road/ Burwood Road intersection would be the key crossing locations for pedestrians to access the proposed station from the bus stops located along the western kerb of Burwood Road.

Pedestrian precinct modelling has been carried out for the year 2036 and results are presented in Figure 95 and Figure 96 for both AM and PM peaks respectively.

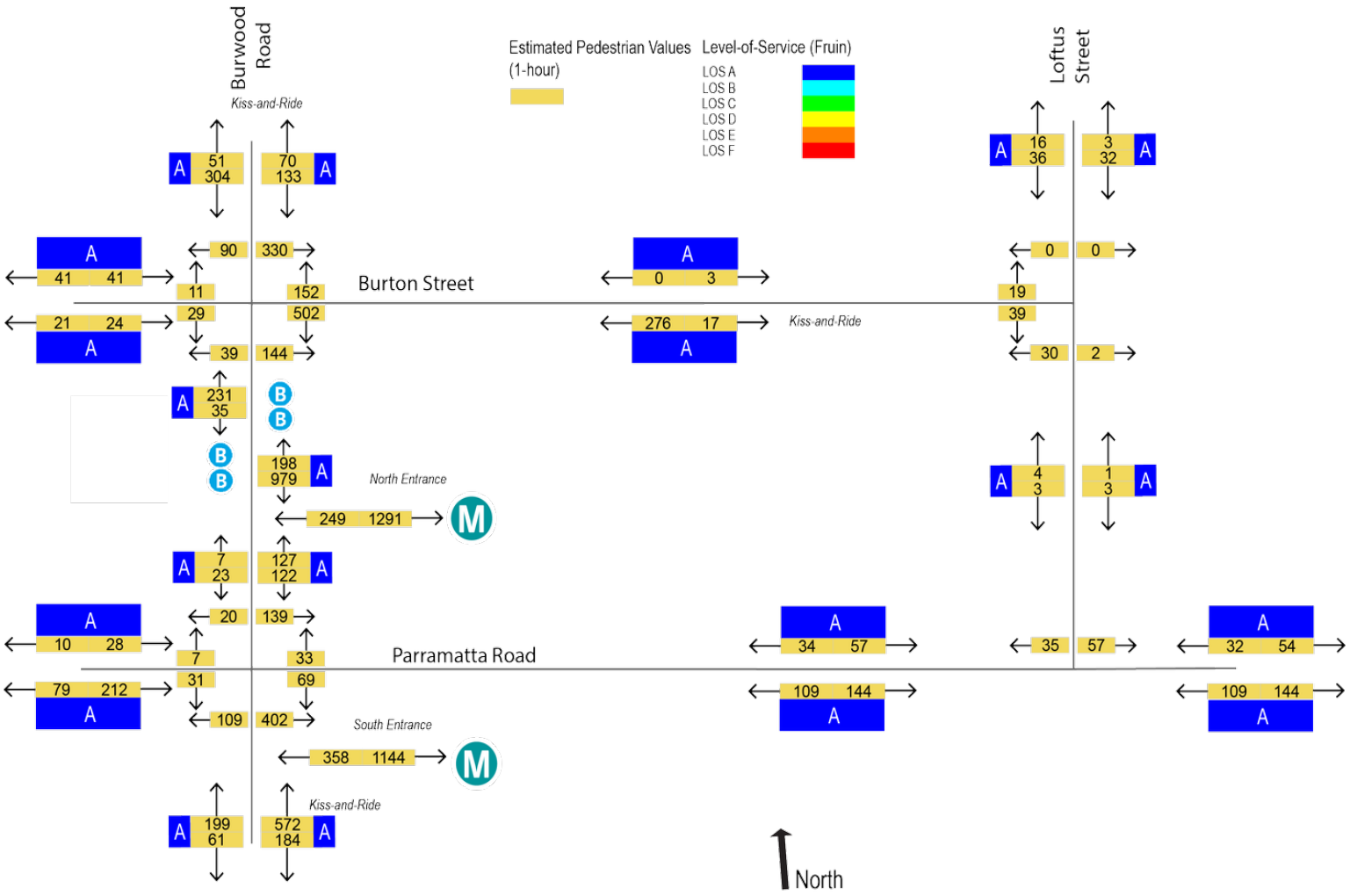


Figure 95 2036 Precinct pedestrian modelling results – AM peak

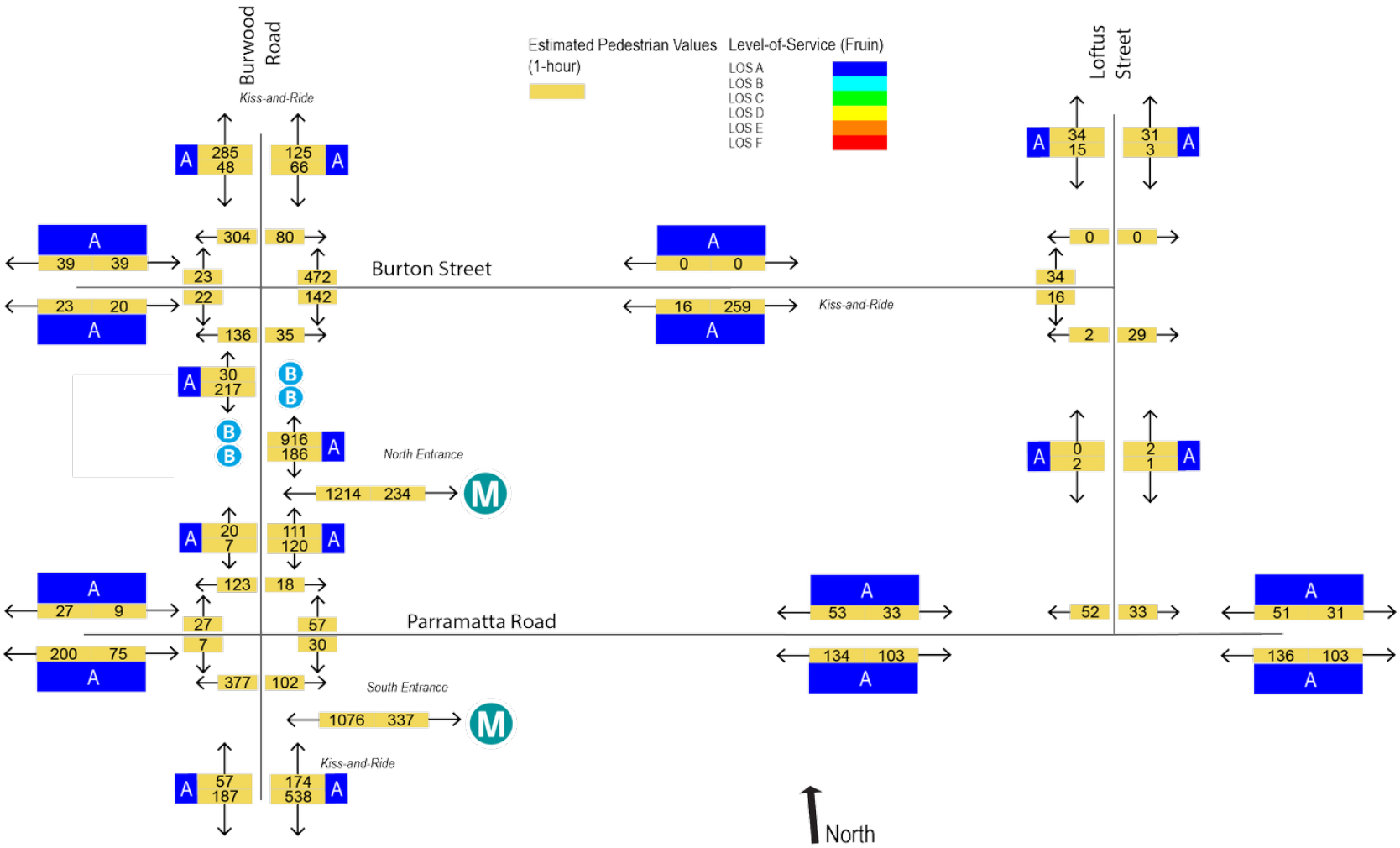


Figure 96 2036 Precinct pedestrian modelling results – PM peak

Future precinct pedestrian modelling indicates that the impacts of increased pedestrian flows as a result of the metro station would be minimal, as the proposed footpath infrastructure is sufficient to cope with the additional demand. The footpaths within the precinct would continue to operate at a level of service A in both AM and PM peak periods.

The footpaths with the greatest forecast pedestrian demands are the ones directly outside the station entrances and around the proposed bus interchange. There is an overall increase in the pedestrian flow, which is distributed along the pedestrian network throughout the precinct.

4.7.4 Integration with cycle network

Around one per cent of access and egress trips are expected to be by cycle. Sydney Metro would deliver the cycling connections within and adjacent to the boundary of the Burwood North Station. Sydney Metro would further discuss the opportunities to connect the Burwood North Station to the existing and planned City of Canada Bay Council and Burwood Council cycle routes with the respective Councils and other relevant stakeholders.

A cycle parking facility is proposed on the eastern side of the northern station entrance. This aims to reduce the need for cyclists to travel through highly pedestrianised areas around the northern station entrance and kerbside bus stops on Burwood Road. In addition, cycle racks would also be provided within open space at suitable locations close to both station entries.

4.7.5 Integration with public transport network

The implementation of four new bus stops to be used by regular services on Burwood Road would enhance the customer experience and enable customers to transfer between bus and metro services immediately outside the northern station entrance. This would function as the main bus interchange for the proposed station.

The new bus stops on Burwood Road would also be supported by existing paired bus stops on Parramatta Road. Appropriate signage and wayfinding would be provided to enable easy customer transfer through improved provision of information.

Providing customers with the option to interchange from bus at the Burwood North Station is important, given 21 per cent of AM peak access trips in 2036 are anticipated to transfer from bus to metro. When Sydney Metro West is operational, there would be the opportunity for substantial bus service uplifts to support transfer at the station. This would include enhanced frequency and modifications to existing bus routes to better connect with the metro station, which would be the subject of future bus service planning.

Given the one kilometre distance between the existing Burwood Station and the proposed Burwood North Station, passengers are unlikely to alight and travel between these locations (via walking or bus) to interchange between rail services.

4.7.6 Integration with road network

The current road network within the precinct and surrounding network would experience proposed upgrades, including signalisation of the Burton Street /Burwood Road intersection, which would be delivered by Sydney Metro.

No formal provision would be made to accommodate customers who intend to park and ride at the proposed station. Passengers who opt to drive to the station would need to rely on available street parking.

Sydney Metro would discuss with local councils the need to develop a parking strategy, if required. The purpose of this would be to maintain smooth parking turnover at/ near stations and also to minimise the impact of park and ride customers in surrounding residential streets. Modelling data for 2036 forecasts that around 10 per cent of AM peak hour access to the station would be park and ride.

Kiss and ride trips are forecast to make up around 12 per cent of trips to the station (by 2036) during the AM peak, with kiss and ride zones proposed on Burton Street and Burwood Road near the northern station entry to support this demand. One kiss and ride zone is also proposed near the southern station entry.

4.7.7 2036 future year road network performance

Network performance was modelled for the future year 2036. Observed traffic counts were adjusted to account for the impact of the Covid-19 pandemic and growth factors applied to expand adjusted 2021 traffic flows to 2036 (with and without the proposal), which were calculated using outputs extracted from the PTPM strategic transport model.

Existing signal phasing arrangements and network cycle timings were adopted from 2021 SCATS data.

Modelled network performance for 2036 during the AM and PM peak hours for key intersections in the vicinity of the proposed metro station is provided in Table 68.

Table 68 Future intersection performance – Burwood North (2036)

Intersection	AM Peak				PM Peak			
	Without Sydney Metro West		With Sydney Metro West		Without Sydney Metro West		With Sydney Metro West	
	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS
Burton Street/ Burwood Road[1]	14	A	28	B	11	A	21	B
Parramatta Road/ Burwood Road	23	B	30	C	22	B	23	B
Parramatta Road/ Loftus Street[2]	9	A	9	A	8	A	7	A
Burton Street/ Loftus Street	5	A	5	A	5	A	5	A
Parramatta Road/ Shaftesbury Road	30	C	30	C	33	C	33	C

[1]Burton Street/Burwood Road intersection has been modelled as roundabout in 'without Sydney Metro' scenario and modelled as traffic signals in 'with Sydney Metro' scenario

[2]The worst movement delay is reported as the overall delay for priority (un-signalised) intersections

Negative growth in traffic is forecast by the PTPM strategic transport model around Burwood North Station. This is potentially due in part to the opening of M4 WestConnex, which may be impacting on the way traffic travels in the vicinity of the station precinct. The negative growth factor may also be attributed to a modal switch from private car trips to public transport trips due to the addition of Sydney Metro West.

The substantial increase in pedestrian flows around the metro station precinct would result in minor impacts on traffic signal performance, although the analysis assumes the traffic signal phasing remains unchanged.

From Table 68 it is observed that:

- Intersections assessed as part of this study are expected to operate at level of service C or better during the weekday AM and PM peak periods with and without Sydney Metro West and therefore would operate satisfactorily
- Network changes proposed as part of Sydney Metro West are not expected to have major impact on network performance. Rather, pedestrian and road safety would be enhanced by the introduction of traffic signals at the intersection of Burton Street and Burwood Road, as well as due to other minor road network upgrades
- Delays at intersections along Parramatta Road are likely to remain similar for both with and without metro scenarios and are also comparable with existing situation
- Difference in level of service observed at the Burwood Road/ Burton Street intersection between with and without Sydney Metro West scenarios is due to the introduction of traffic signals
- Minor drop in level of service at Burwood Road/ Parramatta Road intersection in the AM peak is potentially due to the increased flow of pedestrians. Due to the increase in pedestrian flows, pedestrian protection of six seconds has been adopted at all traffic signals in the ‘with Sydney Metro West’ scenario.

4.7.8 Parking impacts

A number of on-street parking spaces would be removed as part of the proposal, as shown in Figure 97 and include:

- Around 2 spaces on Burton Street along northern kerb to accommodate statutory No Stopping requirements and kerb setbacks
- Around 10 spaces on the western side of Burwood Road between Parramatta Road and Burton Street to accommodate two northbound bus stops
- Around 5 spaces on the eastern side of Burwood Road between Parramatta Road and Burton Street to accommodate two southbound bus stops (noting these will have been temporarily removed as part of work under the previous Sydney Metro West planning application)
- Around 7 spaces along the western side of Loftus Street between Parramatta Road and Burton Street for the access and egress to the new laneway (noting these will have been temporarily removed as part of work under the previous Sydney Metro West planning application)
- Around 7 spaces along the southern side of Burton Street to accommodate the kiss and ride zones (noting these will have been temporarily removed as part of work under the previous Sydney Metro West planning application).

Measures to address potential impacts arising from the loss of on-street parking in the vicinity of the station precinct would be developed, where required, in consultation with the relevant local council.

Figure 97 Station precinct parking impacts – Burwood North

4.7.9 Property and access impacts

During operation, access would be maintained for all nearby properties.

4.8 Five Dock Station

4.8.1 Location and key features

Five Dock Station would be located in the heart of the Five Dock town centre. The main station building (western site) is bounded by Great North Road to the east, East Street towards the west and Fred Kelly Place to the south. St Alban's Anglican Church heritage building is located at the northern side of the station.

The second station building (eastern site) is located at the corner of Second Avenue and Waterview Street and is designated for station services only. This eastern building would not provide access/ egress to the station. The key features of proposed transport integration and access at Five Dock station are:

- A single station entrance from the western site at Fred Kelly Place west of Great North Road
- Bus interchange located along Great North Road outside the western site with northbound and southbound bus stands. This includes widening of existing footpaths behind bus stops to accommodate the interchange
- Relocation of the existing signalised midblock crossing across Great North Road closer to the proposed station entrance
- Cycle parking located north of the station site with access from Great North Road and East Street
- Kiss and ride zones located on Waterview Street, Second Avenue and Garfield Street and provision of an accessible kiss and ride zone at East Street
- Taxi zone located at Garfield Street.

The station transport integration and access plan is provided in Figure 98.

Figure 98 Station transport integration and access plan – Five Dock

4.8.2 Passenger demand

Station passenger demand has been forecast for the 2036 AM peak hour. The demand indicates approximately 2,000 customers accessing the station and 520 customers egressing during the morning peak hour. The numbers reflect that this station would operate mainly as an origin station, where most of the passengers would use the station to travel to work. The 2036 modal breakdown of arrivals and departures during the AM peak hour is presented in Table 69 below.

Table 69 Forecast mode of arrival and departure – Five Dock (2036)

Mode	Walk	Cycle	Bus	Kiss and ride	Park and ride
Access	42%	2%	32%	17%	7%
Egress	77%	2%	21%	-	-

Source: PTPM data

The data indicates that the majority of trips in the morning peak are walking trips from the nearby residential catchment, which does not have access to a train station within reasonable walking distance with buses representing the second largest mode share.

During the AM peak, around 17 per cent of trips are estimated as kiss and ride mode share. Adequate provision is proposed for kiss and ride mode share near the station entry on nearby streets to accommodate this demand.

No formal provision is made to accommodate park and ride mode share at the proposed metro station and customers would have to rely on available street parking. Customers accessing the station via cycle constitute a very minor proportion of overall mode share.

The distribution of customers boarding and alighting in the AM peak hour is shown in Figure 99.

Figure 99 Station boarding and alighting passenger distribution – AM

The following observations can be made:

- Most of the customers would access the station on foot
- Customer demand is spread to/ from all locations with the southern side being slightly dominant due to the presence of dense retail and commercial precinct
- Bus transfer is substantial, especially for customers accessing the station
- Total access trips are roughly four times more than the egress trips in the AM peak
- Park and ride trips are likely to use available side streets for parking on both sides of Great North Road
- Kiss and ride trips are more likely to use Second Avenue and Waterview Street kiss and ride zones for quicker access to the station.

4.8.3 Integration with pedestrian network

Walking is expected to be the primary mode of access to Five Dock Station and integration with the pedestrian network is a key consideration. Access to the station in the AM peak by foot would be evenly distributed from both the north and south.

There are reasonable existing crossing opportunities across Great North Road via a signalised pedestrian crossing at Garfield Street intersection and at a mid-block crossing close to the station entrance. There is also an existing raised zebra crossing near Henry Street north of the station site.

Footpaths are generally over four metres wide at all locations close to the station entry and would be further widened where possible adjacent to the bus stands. With the potential increase in bus services due to the introduction of the metro and growth in bus patronage, a higher demand of pedestrians would be generated associated with access to the station.

The existing signalised midblock crossing across Great North Road at Fred Kelly Place is proposed to be moved around 20 metres towards the north closer to the station entry. This would provide a more direct and safe crossing point to and from the bus interchange and would align the crossing with any proposed eastern extension of Fred Kelly Place, which would be delivered by City of Canada Bay Council. As part of this work, the crossing may also be widened.

Pedestrian precinct modelling has been carried out for the year 2036 and results are presented in Figure 100 and Figure 101 for both AM and PM peaks respectively.

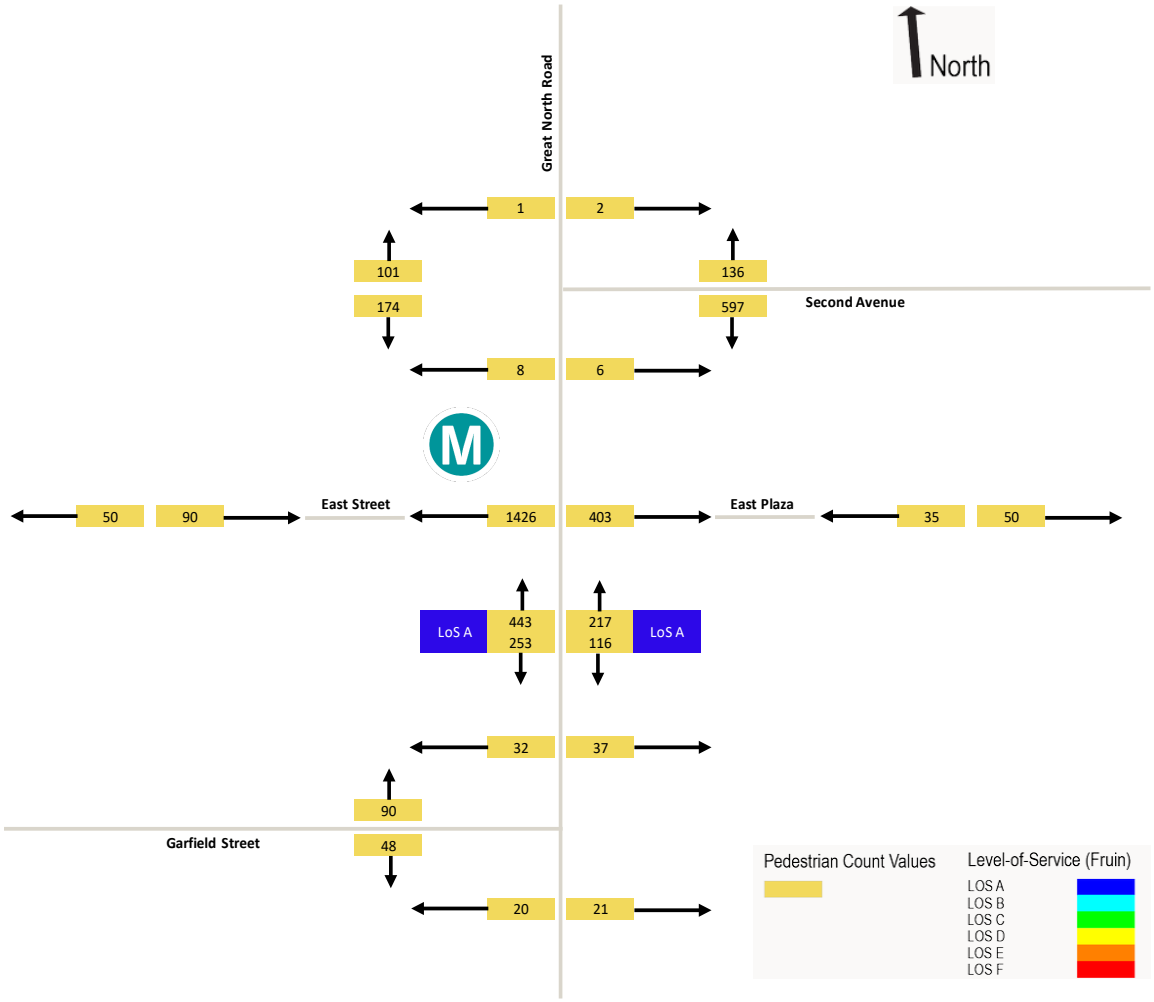


Figure 100 2036 Precinct pedestrian modelling results – AM peak

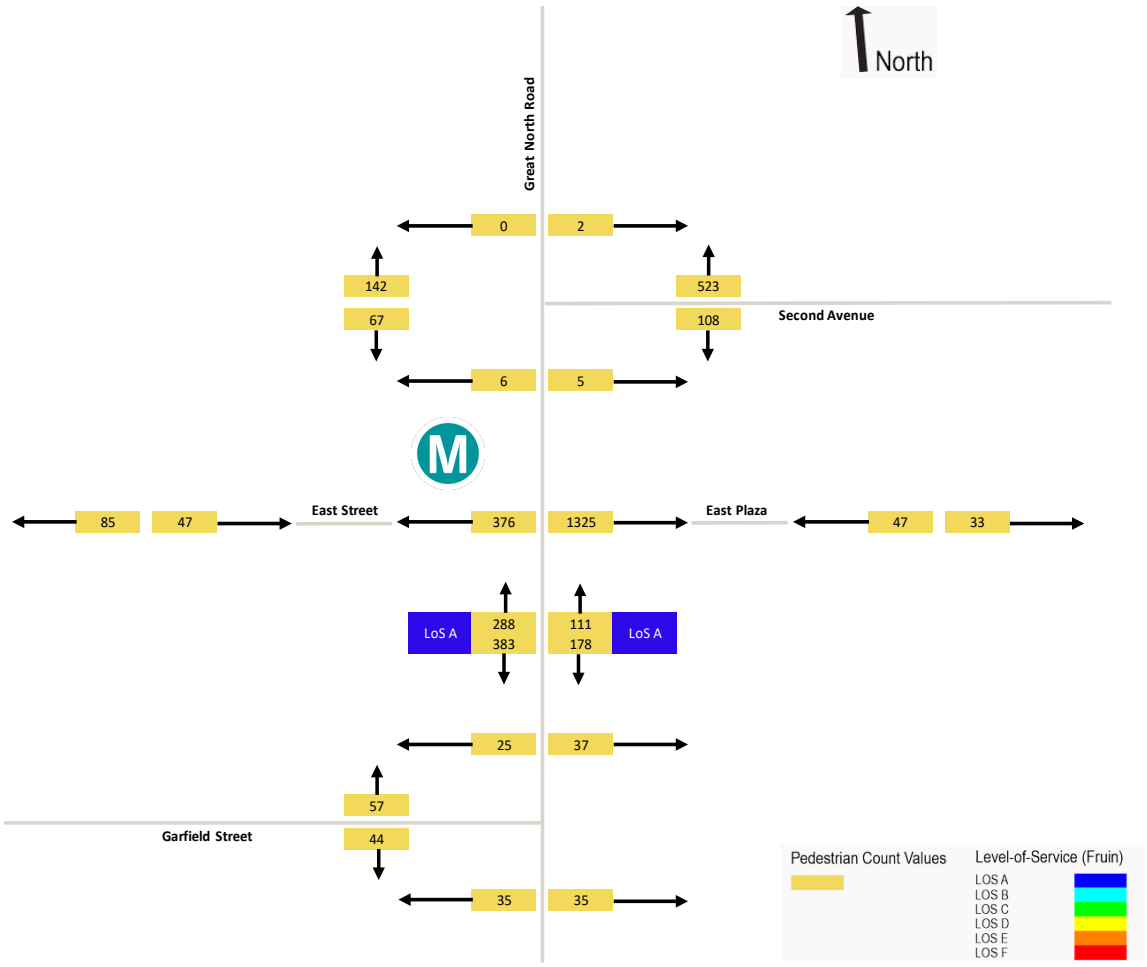


Figure 101 2036 Precinct pedestrian modelling results – PM peak

Future precinct pedestrian modelling indicates that the impacts of increased pedestrian flows as a result of the metro station would be minimal, as proposed infrastructure is sufficient to cope with expected additional demands. The footpaths within the precinct would continue to operate at a level of service A in both the AM and PM peak periods.

The most significant increase in pedestrian flows would occur at the midblock crossing of Great North Road outside the station entrance, which serves as the key crossing point for pedestrians coming from the eastern precinct, as well as for customers who would interchange from the bus stops across Great North Road, opposite the station entry.

4.8.4 Integration with cycle network

Cycling is forecast to account for around two per cent of access and egress trips during the AM peak period. Connectivity near the station precinct via the cycle network is reasonable, with east-west routes providing access to the local area from the wider network. There are gaps in north-south cycle links, including access to the station on Great North Road.

Most routes are indicated to be of moderate difficulty and are non-segregated from general traffic. Since road space is constrained at the majority of intersections, there is limited opportunity to implement dedicated or off-road cycle infrastructure.

Sydney Metro would deliver the cycle parking facilities within the proposed station precinct to facilitate customers who wish to interchange to metro.

Further consultation would be carried out in relation to the opportunity to connect the Five Dock Station with the existing and planned City of Canada Bay cycle routes (such as MR3) and other local attractions like Five Dock Park. Sydney Metro would discuss these opportunities with City of Canada Bay Council and other relevant stakeholders.

4.8.5 Integration with public transport network

The implementation of one new bus stop in each direction (in addition to the existing stops) to be used by regular services on Great North Road would enhance the customer experience and enable transfer between bus and metro services. Integration of the metro station with the bus network is ideal due to its proximity to the station entry and Fred Kelly Place. Footpaths are proposed to be widened with provision of bus shelters and other infrastructure.

Six bus stops would function as the main bus interchange outside the station, with three paired bus stops on each side of Great North Road. Appropriate signage and wayfinding would enable easy customer transfer through improved provision of information. All six bus stops would be provided between Second Avenue and Garfield Street.

Providing customers with the option to interchange from bus at the Five Dock Station is important, given that bus is expected to represent 32 per cent of AM peak access trips and 21 per cent of AM peak egress trips in 2036. When Sydney Metro West is operational, there is the opportunity for bus service uplifts to support transfer at the station. This includes enhanced frequency of existing routes and modifications to existing bus routes to better connect with the metro station.

4.8.6 Integration with road network

Changes to the current road network within the precinct and surrounding network are minimal, with several minor upgrades in the near future. These upgrades include modifications in kerb returns at Second Avenue intersection, modification to footpaths to accommodate bus infrastructure and narrowing the existing signalised crossing length around the proposed bus interchange.

The potential to provide a raised marked pedestrian crossing across Second Avenue at its intersection with Great North Road would be discussed with City of Canada Bay Council and other relevant stakeholders. This would provide a safer crossing point along this main pedestrian desire line.

There are no formal provisions made to accommodate customers who intend to park and ride at the proposed station. Customers who opt to drive to the station would need to rely on available street parking. Sydney Metro would discuss with City of Canada Bay Council the need to develop a parking strategy, if required. The purpose of the parking strategy would be to maintain smooth parking turnover near the station and also to minimise the impact of park and ride customers in surrounding residential streets.

Kiss and ride trips are anticipated to make up around 17 per cent of trips to the station (by 2036) during the AM peak, with three kiss and ride zones on Second Avenue, Waterview Street and Garfield Street proposed to support this demand.

4.8.7 2036 future year road network performance

Network performance was modelled for the future year 2036. Observed traffic counts were adjusted to account for the impacts of the Covid-19 pandemic and growth factors applied to expand adjusted 2021 traffic flows to 2036 (with and without the proposal), which were calculated using outputs extracted from the PTPM strategic transport model.

Existing signal phasing arrangements and network cycle times were adopted from 2021 SCATS data.

Modelled network performance for 2036 during the AM and PM peak hours for key intersections in the vicinity of the proposed station is provided in Table 70.

Table 70 Future intersection performance – Five Dock (2036)

Intersection	AM Peak				PM Peak			
	Without Sydney Metro West		With Sydney Metro West		Without Sydney Metro West		With Sydney Metro West	
	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS
Second Ave / Great North Rd[1]	14	A	14	A	15	B	16	B
GNR Mid-Block crossing	3	A	5	A	3	A	5	A
Garfield St / Great North Rd	16	B	17	B	18	B	18	B
Great N Rd / First Ave / Ramsay Rd	24	B	25	B	40	C	40	C
Second Ave / Waterview St[2]	9	A	10	A	8	A	8	A
First Ave / Waterview St	8	A	8	A	7	A	7	A

[1]The worst movement delay is reported as the overall delay for all priority (un-signalised) intersections.

[2]Second Avenue and Waterview Street have been modelled as two-way streets in both with and without Sydney Metro scenarios as per the existing conditions.

Negative traffic growth is forecast by the PTPM strategic transport model around Five Dock Station. This is potentially due in part to the opening of M4 WestConnex, which may be impacting on the way traffic travels in the vicinity of the station precinct. The negative growth factor may also be attributed to a modal switch from private car trips to public transport trips due to the addition of Sydney Metro West.

The substantial increase in pedestrian flows around the metro station precinct would result in minor impacts on traffic signal performance.

From Table 70 it can be observed that:

- All intersections assessed are expected to operate at level of service C or better during the weekday AM and PM peak periods with and without Sydney Metro West and would therefore operate satisfactorily
- Network changes proposed as part of Sydney Metro West are not expected to have a major impact on overall network performance. Rather, pedestrian and road safety is enhanced by the introduction of wider footpaths, addition of road safety initiatives and other minor road network upgrades
- The forecast minor delay in both peaks at the signalised mid-block crossing on Great North Road is a result of the substantial increase in pedestrian flows even though the level of service remains the same

- The delay at most intersections remains the same. Due to the increase in pedestrian flows, pedestrian protection of six seconds has been adopted at all traffic signals in the 'with Sydney Metro West' scenario.

4.8.8 Parking impacts

Several on-street and off-street parking spaces would be removed as part of the proposal, as shown in Figure 102.

This includes:

- Around three spaces, including one accessible parking space on East Street, to accommodate access to the station loading dock
- Around 12 spaces along the western side of Great North Road between the midblock crossing and Second Avenue to accommodate the new bus stops (noting that these will be temporarily removed as part of work under the previous Sydney Metro West planning application)
- Around 2 spaces along the southern side of Second Avenue west of Waterview Street to accommodate new kiss and ride zone (noting that these will be temporarily removed as part of work under the previous Sydney Metro West planning application).

A number of parking spaces would be converted into kiss and ride spaces and are considered as a parking loss. There is however a possibility that some of these spaces may be used as short term parking during off-peak times, including:

- Around five spaces on Second Avenue (between Great North Road and Waterview Street)
- Around three spaces on Waterview Street (noting that these will be temporarily removed as part of work under the previous Sydney Metro West planning application)
- Around two spaces on Garfield Street.

Measures to address potential impacts arising from the loss of on-street parking in the vicinity of the station precinct would be developed, where required, in consultation with the relevant local council.

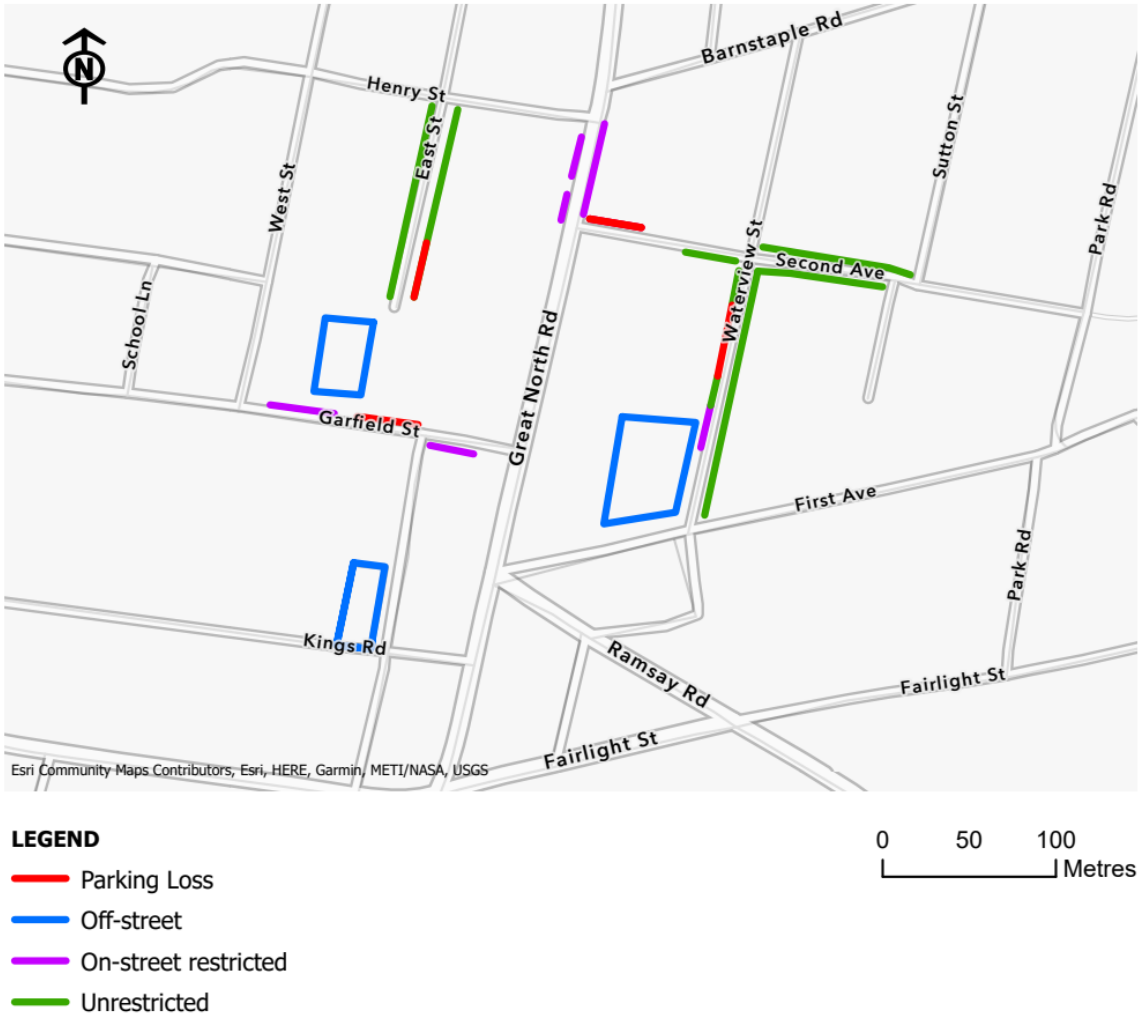


Figure 102 Station precinct parking impacts – Five Dock

4.8.9 Property and access impacts

During operation, access to all nearby properties would be maintained.

4.9 The Bays Station

4.9.1 Location and key features

The Bays Station would be located in Rozelle with two vehicular accesses, one from Robert Street and the other from James Craig Road. The station transport integration and access plan is provided in Figure 103.

The key features of proposed transport integration and access at The Bays Station are:

- Single station entry for customers located at the centre of the site
- Bus interchange at the south of the precinct with bus services accessing the precinct from Robert Street
- A new precinct street (realigned port access road) around the perimeter of the site that intersects at an upgraded intersection with Robert Street

- Taxi and kiss and ride bays located on the western side of the precinct
- Cycle parking located north of the station entry
- Key crossing locations for pedestrians provided by zebra crossings to promote safety and priority for users
- A raised zebra crossing at the promenade provided for the crossing amenity of pedestrians and cyclists
- A shared user path on the eastern part of the precinct network that connects Balmain and WestConnex active transport network below Victoria Road
- Traffic calming measures along the realigned port access road near crossing points
- The eastern part of the precinct would connect to the existing road network at the proposed Sommerville Road/ Solomon Way roundabout.

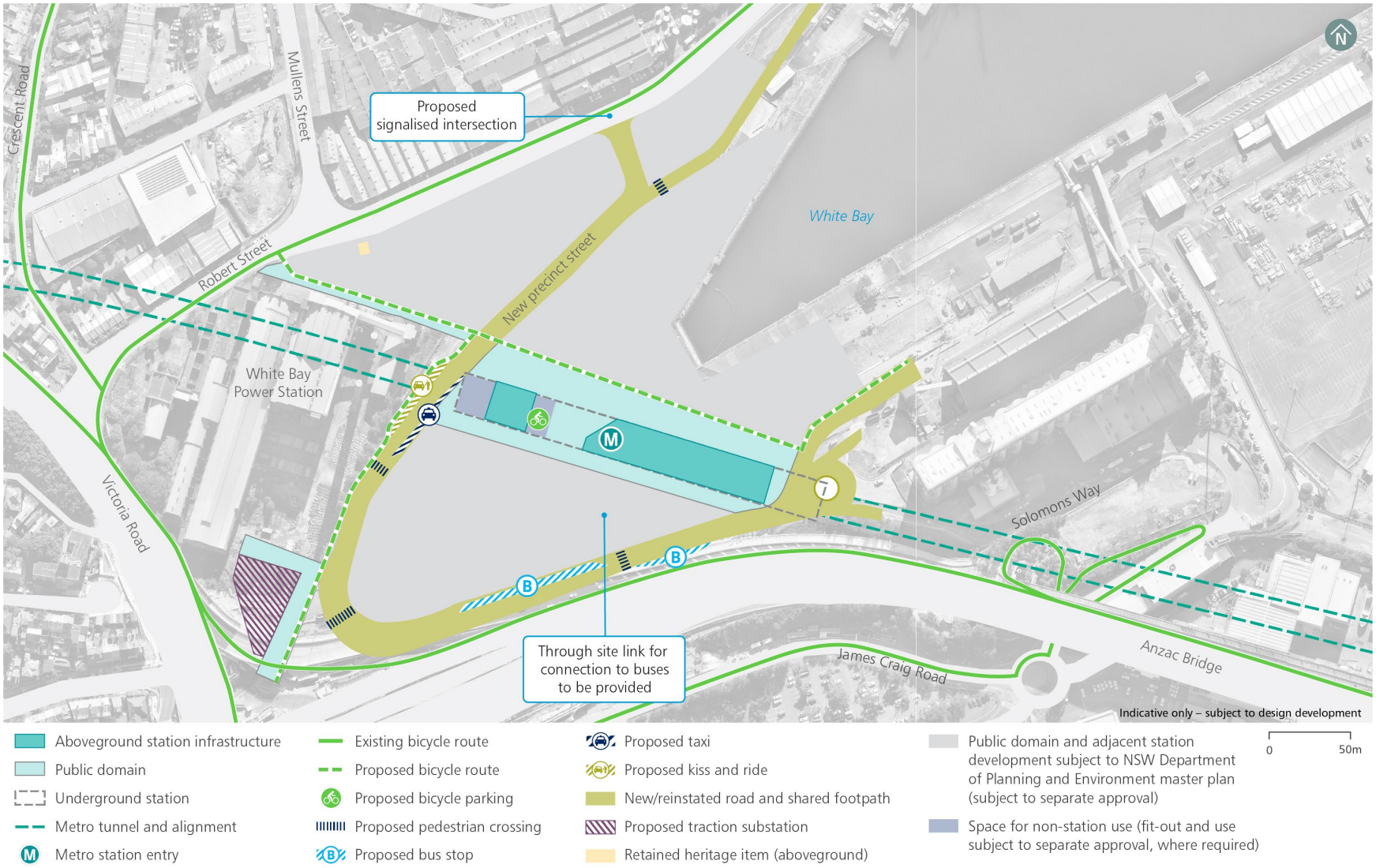


Figure 103 Station transport integration and access plan – The Bays

4.9.2 Passenger demand

Station passenger demand has been forecast for the 2036 AM peak hour. The demand indicates approximately 1,299 customers accessing the station and 1,842 customers exiting the station.

Access to the station is mainly from local residential areas followed by passengers interchanging from bus services. The majority of the egressing passengers from the station are likely to be walking trips to work within The Bays precinct. There is no park and ride facility proposed at The Bays Station. The potential for a ferry interchange would be further investigated by other stakeholders.

The 2036 modal breakdown of arrivals and departures during the AM peak hour is presented in Table 71.

Table 71 Forecast mode of arrival and departure – The Bays (2036)

Mode	Ferry	Bus	Cycling	Kiss and ride	Walk	Park and ride
Access	2%	24%	3%	13%	58%	0%
Egress	0%	4%	0%	0%	96%	0%

Source: PTPM data

Figure 104 shows the forecast pedestrian movements in the 2036 morning peak. The three main origins that pedestrians access from include:

- Mullens Street, connection to Balmain and Rozelle north of the precinct
- Robert Street, connection to Balmain East, northeast of the precinct
- “East Port”, with high egress to East Port from the station due to future development at Glebe Island.

Figure 104 also shows high egress relating to the future commercial area and the White Bay Power Station.

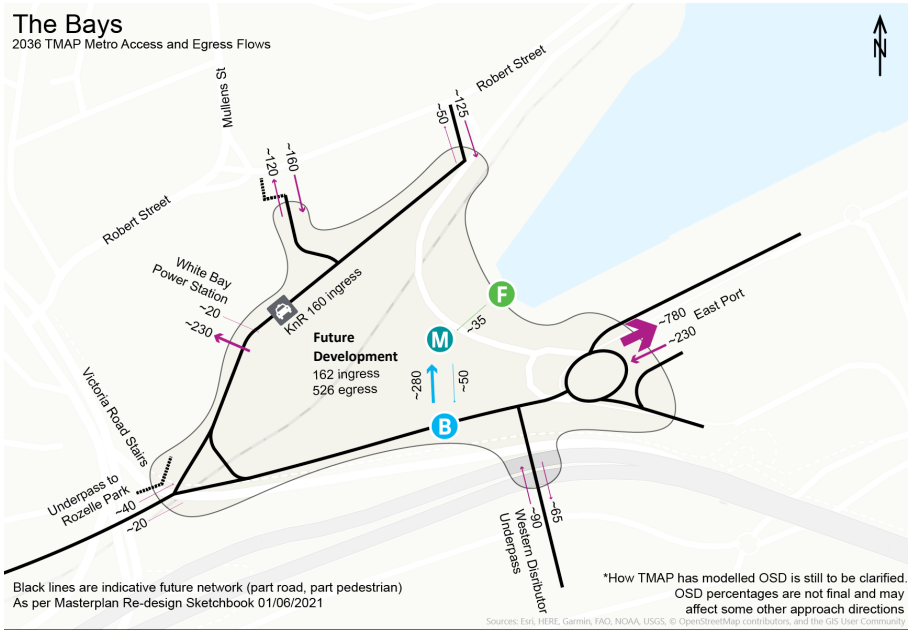


Figure 104 Station boarding and alighting passenger distribution – AM

4.9.3 Integration with pedestrian network

The pedestrian network of the precinct would provide access to key services in the precinct such as kiss and ride, taxi and bus interchange.

The pedestrian network would connect the precinct to the surrounding area, including Robert Street, Rozelle Rail Yards Parkland and Victoria Road shared user path. A shared user path is proposed within the precinct along the western side of the new precinct road which connects the facilities at Mullens Street/ Robert Street and Rozelle Rail Yards Parkland.

Pedestrian precinct modelling has been carried out for the year 2036 and results are presented in Figure 105 and Figure 106 for both AM and PM peaks respectively. The figures show the Fruin level of service of the precinct footpath with an assumed width of three metres with the exception of a five-metre wide promenade. The promenade runs along the immediate north side of the station which connects the station entry to the new precinct street on the western side. All the footpaths would perform at level of service A with no crowding expected.

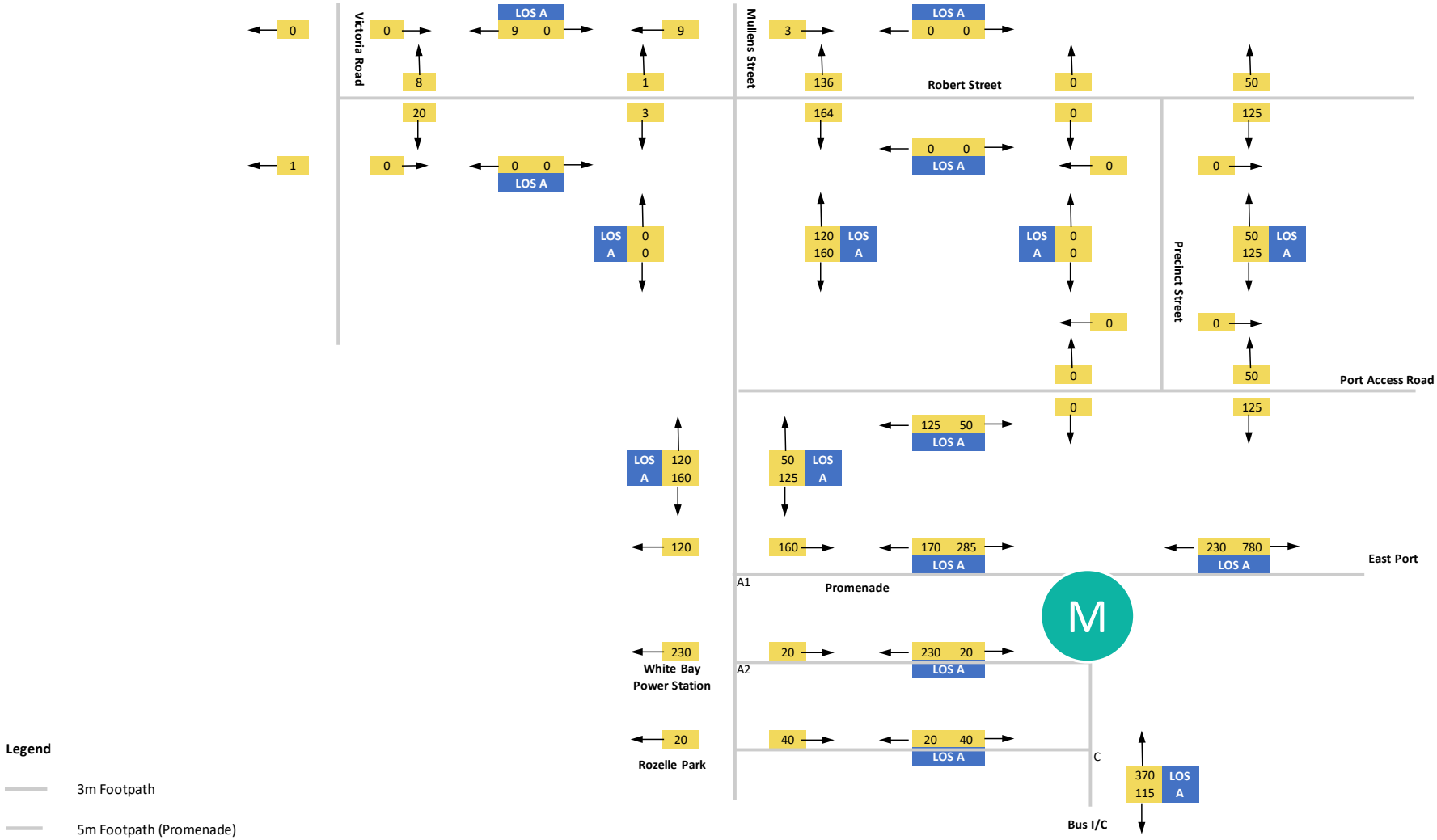


Figure 105 Future year precinct pedestrian modelling results – AM

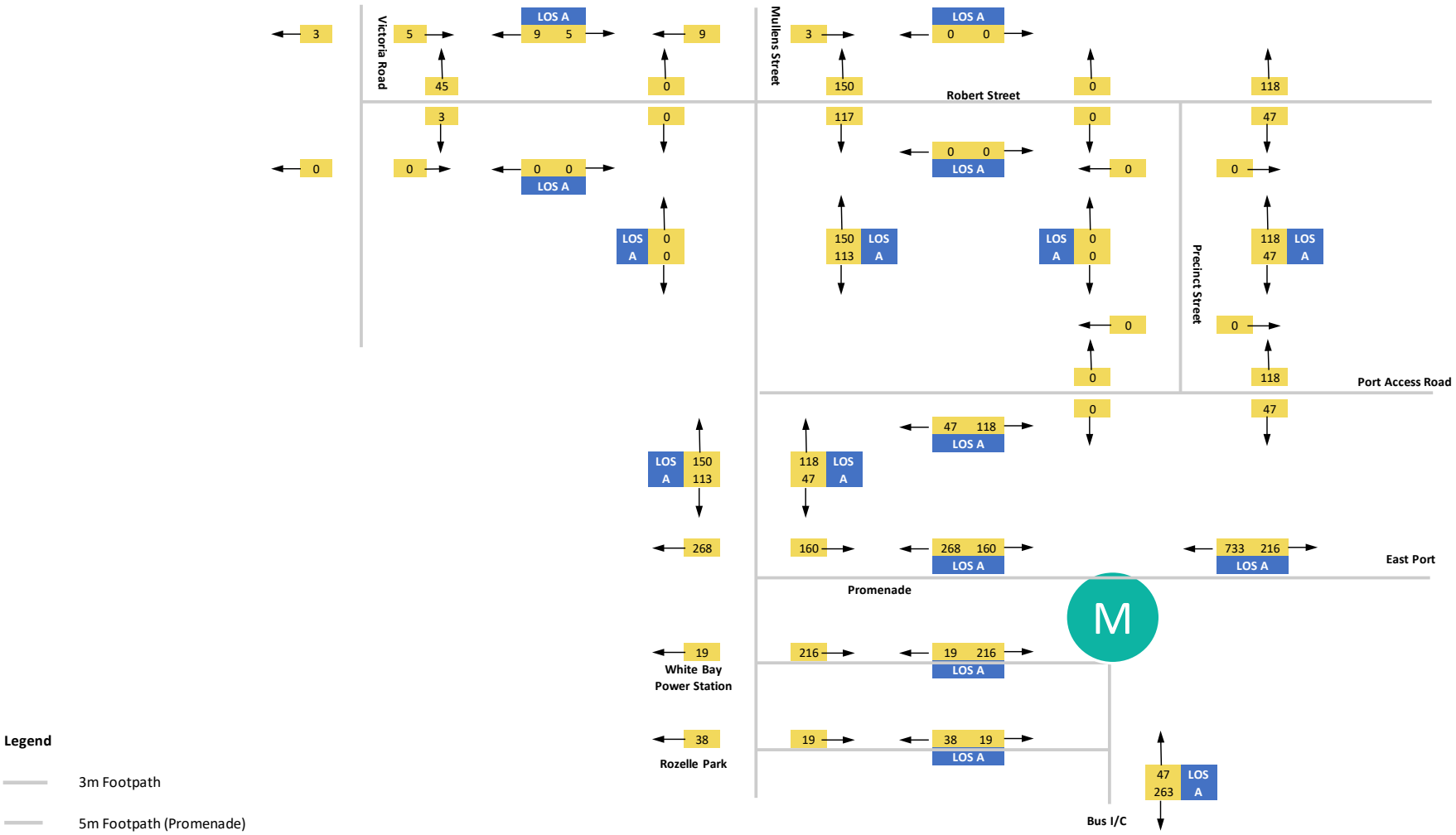


Figure 106 Future year precinct pedestrian modelling results – PM

4.9.4 Integration with cycle network

The proposed cycle network would include a bi-directional shared user path along the western side of the precinct. A separated cycle and pedestrian raised zebra crossing would be provided at the new precinct street in the vicinity of the promenade to promote the priority of cyclists and pedestrians within the precinct.

The precinct cycle network would link to the following key external connections:

- To the north of the precinct to Balmain. The shared user path from the precinct would be connected near the Robert Street/ Mullens Street intersection
- To Rozelle Rail Yards Parkland and Victoria Road shared user path at the Rozelle Interchange. The connection would be established from the precinct to the WestConnex active transport network at the underpass below Victoria Road
- To the Sydney CBD by connecting the precinct network to the existing shared user path on Anzac Bridge. A new shared user path would be added from the Promenade to the existing network on Sommerville Road
- To Pyrmont by way of an active travel connection across Johnstons Bay by reinstating the Glebe Island bridge or provision of a new bridge.

Cycle parking spaces that align with expected demand would be provided adjacent to the station entry.

4.9.5 Integration with public transport network

Bus stops would be provided along the new precinct street to the south of the metro station. A raised crossing would be provided across the new precinct street in the vicinity of the bus stops and a pedestrian connection through the future development areas to the station entry. The buses would enter and exit via Robert Street and u-turn at the Solomons Way/ Sommerville Road roundabout.

4.9.6 Integration with road network

The major arterial (state) roads in the vicinity of the station are being upgraded as part of the Westconnex motorway scheme. This includes additional lanes at The Crescent/ James Craig Road and Victoria Road/ The Crescent intersections.

The population in the Balmain peninsula is expected to grow. Together with precinct traffic, Robert Street is expected to experience high congestion during peak periods. This has led to the need to explore alternative access for the precinct via James Craig Road.

The precinct network would be connected via a new intersection on Robert Street. Public transport, kiss and ride vehicles, and taxis would enter and exit the precinct network via Robert Street. Provision of kiss and ride facilities on Robert Street would reduce the number trips into and out of the precinct and would be investigated in consultation with Inner West Council.

The eastern part of the precinct would connect to the existing network at the proposed Sommerville Road/ Solomon Way roundabout. Exiting traffic would have the option to exit via James Craig Road when the Port Access Road (Sommerville Road and Solomon Way) is open to the public. Traffic calming measures are proposed along the realigned port access road near crossing points where high pedestrian volumes are expected. The precinct network would operate with a 40 km/hr posted speed limit, which would align with current operations along Robert Street and Mullens Street.

4.9.7 2036 future year road network performance

Future vehicular traffic associated with kiss and ride, taxis, and buses would access the precinct network at the new intersection at Robert Street. Exiting traffic would require access to James Craig Road as an alternative route to the already congested Robert Street. It is assumed that 40 per cent of traffic would exit via James Craig Road; 60 per cent would u-turn back to Robert Street, as James Craig Road is not expected to be a preferred route for the majority of traffic.

The future scenario adopts the highest demand from the White Bay Cruise Terminal during cruise ship days. The traffic would travel within the precinct network between the Port Access Road and James Craig Road.

Network performance was modelled for the future year 2036. Observed traffic counts were adjusted to account for the impact of the Covid-19 pandemic and growth factors applied to expand adjusted 2021 traffic flows to 2036 (with and without the proposal), which were calculated using outputs extracted from the PTPM strategic transport model.

Table 72 provides future year intersection performance. The Robert Street/ Mullens Street priority intersection would operate at level of service C and B (worse movement) in the AM and PM peaks respectively in the ‘without Sydney Metro West’ scenario. The operational performance is forecast to fall to level of service F and E in the ‘with Sydney Metro West’ scenario in the AM and PM peaks respectively. In this scenario, the delay for the right turn movement into Mullens Street would be 159 and 62 seconds for the AM and PM peaks respectively. As such, bus services would experience high delays if required to make this manoeuvre.

Potential mitigation to address performance issues would be the signalisation of the intersection and the removal of parking on Robert Street east of Victoria Road. This would be investigated in consultation with key stakeholders to improve capacity for future demand and to provide safe crossing for pedestrians and cyclists between Balmain and the metro station. Signalisation of the Robert Street/ Mullens Street intersection would also provide a level of priority for buses in and out of Robert Street. This is captured in Table 78 Mitigation measures for operational transport impacts.

The proposed new intersections would perform satisfactorily in the ‘with Sydney Metro West’ scenario. Both the Robert Street/ new precinct street and new precinct street/ Port Access Road intersections would operate at level of service A during the AM and PM peaks. Further investigation would be undertaken regarding the need for pedestrian crossing facilities at these intersections where pedestrian crossing movements are expected to increase.

All three zebra crossings in the precinct network would perform at level of service A. The raised zebra crossing at the promenade would improve the crossing amenity for pedestrians and cyclists. The average vehicular delays at the promenade and White Bay Power Station pedestrian crossing are expected to be low with five seconds or less for both peaks. The average delay is higher at the pedestrian crossing located at the bus interchange where delays of eight seconds in the AM peak would be experienced. The pedestrian demand at the crossing would be almost double compared to other crossings.

The Sommerville Road/ Solomon Way roundabout would perform with an average three seconds delay. The roundabout is a key intersection for buses returning to Robert Street.

Table 72 Future intersection performance – The Bays (2036)

	AM Peak				PM Peak			
	Without Sydney Metro West		With Sydney Metro West		Without Sydney Metro West		With Sydney Metro West	
Intersection	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS
Robert St / Mullens St[1]	31	C	159	F	20	B	62	E
The Crescent / James Craig Rd	9	A	18	B	12	A	23	B
Robert St / new precinct St[1]	-	-	3	A	-	-	3	A
New precinct St / Port Access Rd[1]	-	-	4	A	-	-	4	A
Pedestrian Crossing at Promenade	-	-	5	A	-	-	5	A
Pedestrian Crossing at White Bay Power Station	-	-	5	A	-	-	3	A
Pedestrian Crossing at Bus Interchange	-	-	8	A	-	-	4	A
Sommerville Road/Solomon Way	-	-	3	A	-	-	3	A

[1]The worst movement delay is reported as the overall delay for all priority (un-signalised) intersections.

4.9.8 Parking impacts

With road layout changes proposed on Robert Street, east of Mullens Street, it is expected that unrestricted parking numbers would reduce from around 124 to around 52. This parking removal is to accommodate the proposed new precinct street/ Robert Street intersection. Impacts on parking are shown in Figure 107.

Measures to address potential impacts arising from the loss of on-street parking in the vicinity of the station precinct would be developed, where required, in consultation with the relevant local council.

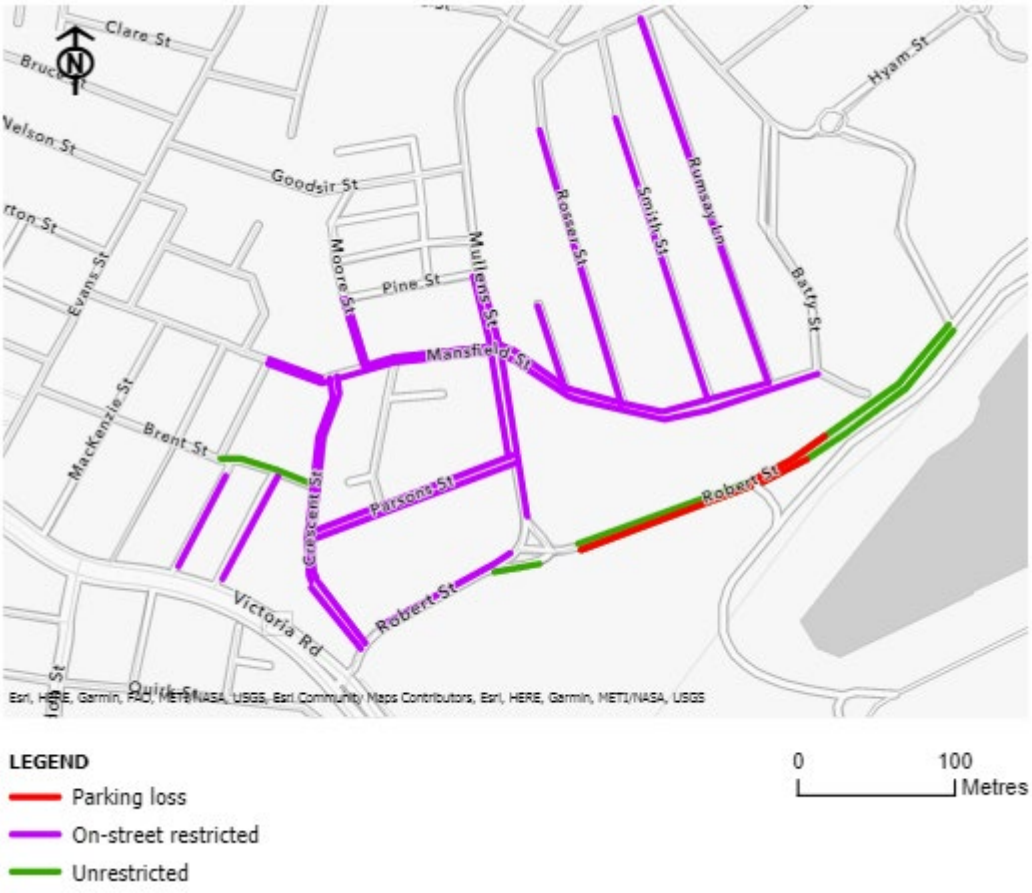


Figure 107 Station precinct parking impacts – The Bays

4.9.9 Property and access impacts

The proposed Robert Street/ new precinct street intersection would be located at the access of 48-50 Robert Street. The access would be maintained however a safety assessment would be carried out. An adequate sight distance would be provided in response to the higher traffic activity anticipated at the vicinity of the access.

4.10 Pyrmont Station

4.10.1 Location and key features

Pyrmont Station would be located at the centre of Pyrmont Peninsula with station entries over two sites. The first site (referred to as the eastern site) is located between Union Street, Edward Street and Pyrmont Bridge Road. The second site (referred to as the western site) is bounded by Pyrmont Street, Pyrmont Bridge Road and Paternoster Row.

The entry to the eastern site would be through Union Street. The entry to the western site would be from Pyrmont Bridge Road.

The station transport integration and access plan is shown in Figure 108. The key features of proposed transport integration and access at Pyrmont station are:

- Provision of accessible kiss and ride space on Pyrmont Street near the western station entrance
- Cycle parking located at both eastern and western station sites.

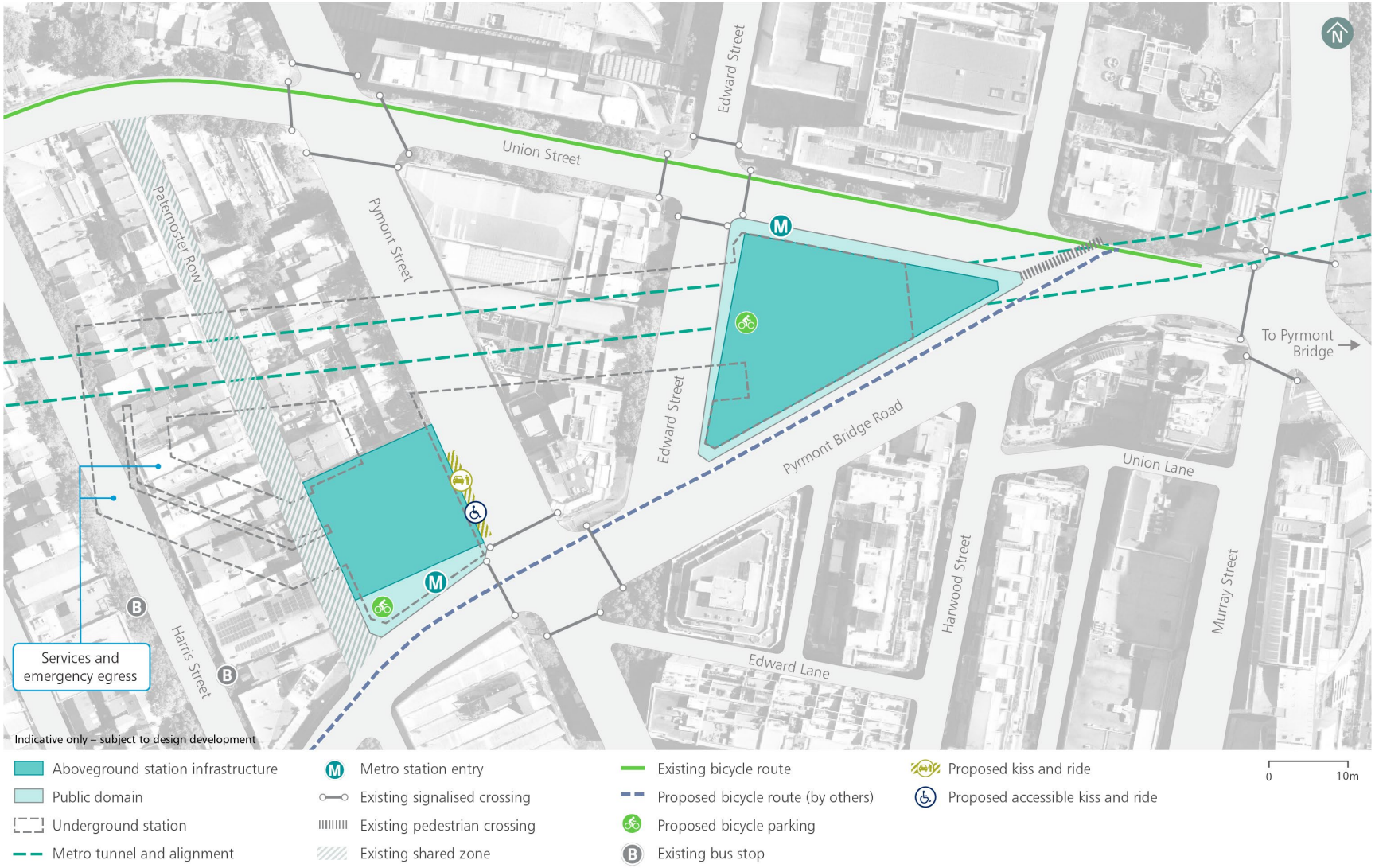


Figure 108 Station transport integration and access plan – Pyrmont

4.10.2 Passenger demand

Station passenger demand has been forecast for the 2036 AM peak hour. The demand indicates approximately 1,026 customers accessing the station and 3,944 customers exiting.

The forecast demand reflects that the station is considered both an origin and a destination station, while primarily catering to the latter in the AM peak hour. The 2036 modal breakdown of arrival and departure during the AM peak hour is presented in Table 73 below.

Table 73 Forecast mode of arrival and departure – Pyrmont (2036)

Mode	Walk	Cycle	Bus	Kiss and ride	Light rail
Access	55%	3%	19%	4%	19%
Egress	99%	-	-	-	1%

Source: PTPM data

It is forecast that the majority of access and egress trips would be by foot. Almost all exits would be walking trips to local commercial land uses. Around 19 per cent of access trips would be transfers from light rail in addition to 19 per cent transfers from buses, three per cent of access trips by cycle and an additional four per cent by kiss and ride.

The distribution of customers boarding and alighting in the AM peak hour is shown below in Figure 109.

Figure 109 Station boarding and alighting passenger distribution – AM

Key observations from Figure 109 are:

- Egress walk trips are substantially higher than access walk trips
- Transfers from buses and light rail are balanced, but lower compared to walking
- The highest egress walking trips are towards Pyrmont Bridge Road, Union Street and Pyrmont Street.

4.10.3 Integration with pedestrian network

Walking is expected to be the primary mode of access at Pyrmont Station and integration with the pedestrian network is a key consideration. The eastern station entrance is off Union Street, which is the main east-west active transport link in the precinct.

The second station entry is off Pyrmont Bridge Road, which is within walking distance of the existing bus stops located on Harris Street and also provides a safe connection to the proposed kiss and ride facilities on Pyrmont Street.

The proposed pedestrian network in the vicinity of the station would allow for good connectivity within the station precinct following all desire lines (east-west and north-south). It would create safe, walkable streets and would provide easy access for all customers.

Consideration has been given to provision of pedestrian crossings at several locations within the precinct. The existing signalised crossings at surrounding intersections will be maintained, as well as the zebra crossing of Union Street at Pyrmont Bridge Road.

Pedestrian precinct modelling has been carried out for the year 2036 and results are presented in Figure 110 and Figure 111 for both AM and PM peaks respectively.

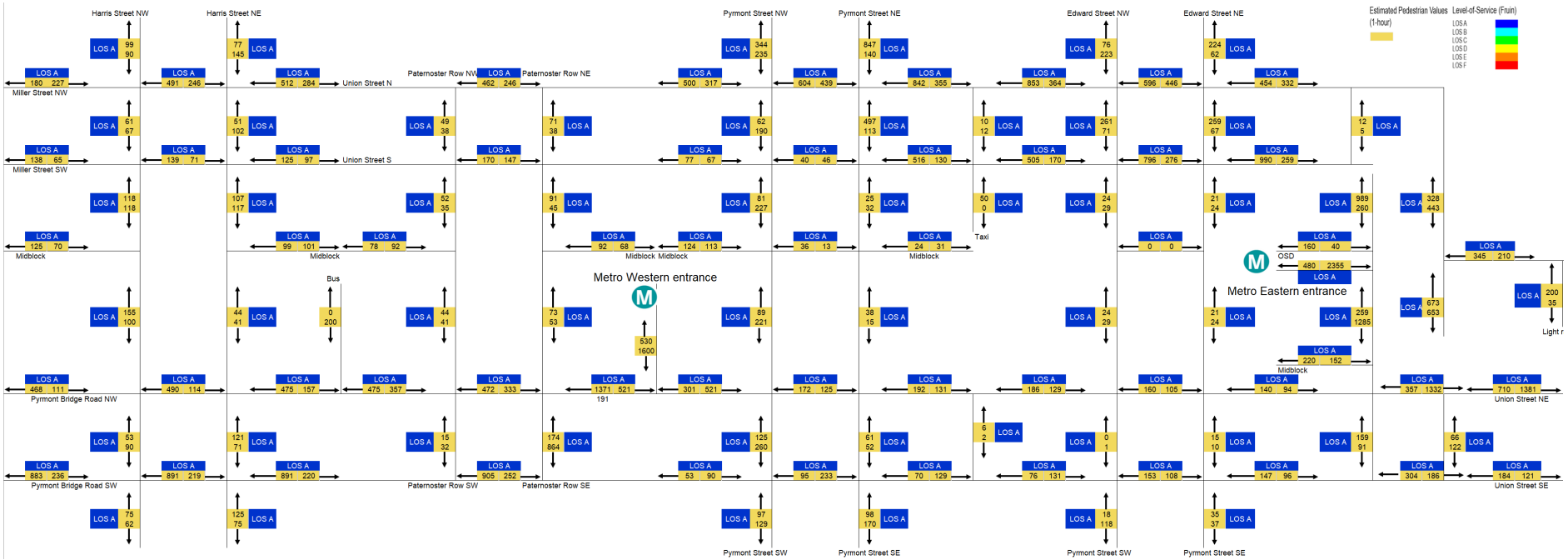


Figure 110 2036 Precinct pedestrian modelling results – AM peak

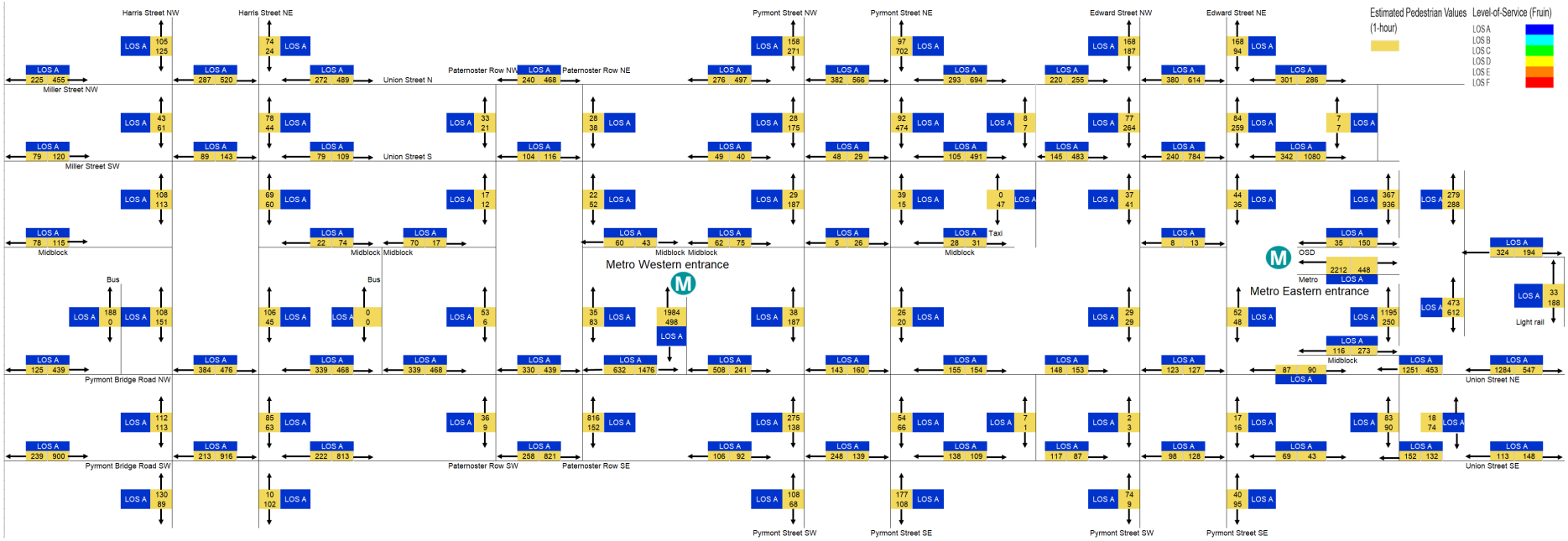


Figure 111 2036 Precinct pedestrian modelling results – PM peak

Future precinct pedestrian modelling indicates that the pedestrian network is forecast to continue to perform at good levels of service with both AM and PM scenarios reporting a level of service A for all footpaths, mid-block crossings and signalised crossings around the metro station.

4.10.4 Integration with cycle network

Around three per cent of station access trips are expected to be by cycle in the AM peak hour. There are existing cycling lanes on Union Street and Miler Street that would provide direct access to the eastern station entry. In addition, a potential cycle link on Pyrmont Bridge Road is identified in both City of Sydney plans and the NSW Principal Bicycle Network. This potential link would provide direct access to the western station entry (to be delivered by others). To facilitate easy interchange, cycle parking would be provided at both eastern and western station entrance sites.

Within the proposed station precinct, cyclists can safely cross at existing signalised intersections and zebra crossings on Union Street.

Sydney Metro would continue to work with the Department of Planning and Environment to identify opportunities to connect to potential future cycle links identified in the Pyrmont Peninsula Place Strategy Urban Design Report and the Infrastructure Delivery Plan.

4.10.5 Integration with public transport network

Light rail and buses represent the second highest access mode share at Pyrmont after walking at around 19 per cent each.

Based on the current bus network, Harris Street would continue to act as the main bus interchange for the station.

Transport for NSW is currently investigating potential changes to the bus network in Pyrmont, including potential bus routes along Pyrmont Bridge Road, with associated bus stops in the vicinity of the metro station entries. These potential changes, if progressed, would enhance bus interchange with the metro station.

Customers would be able to transfer between bus stops at metro station entries using walkways and crossing points. These would be designed to provide appropriate visibility between buses and the crossing points.

Appropriate signage and wayfinding would provide an easy customer transfer through improved provision of information.

4.10.6 Integration with road network

No park and ride facilities would be implemented as part of the proposal and no additional traffic associated with the station is expected, except for low volumes of maintenance and service vehicles. Around four per cent of station access trips are expected to be kiss and ride, which are not expected to impact road network performance.

One accessible kiss and ride space is proposed on Pyrmont Street close to the western station entry.

Several crossing points exist within the road network to provide safe interaction with traffic for other road users, which are discussed in Section 4.10.3.

4.10.7 2036 future year road network performance

Network performance was modelled for the future year 2036. Observed traffic counts were adjusted to account for the impact of the Covid-19 pandemic and growth factors applied to expand adjusted 2021 traffic flows to 2036 (with and without the proposal), which were calculated using outputs extracted from the PTPM strategic transport model. Signal phasings were adopted from SCATS data.

Modelled network performance for 2036 during the AM and PM peak hours for key intersections in the vicinity of the proposed station is shown in Table 74.

Table 74 Future intersection performance – Pyrmont (2036)

	AM Peak				PM Peak			
	Without Sydney Metro West		With Sydney Metro West		Without Sydney Metro West		With Sydney Metro West	
Intersection	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS
Union Street/Harris Street	27	B	27	B	28	B	30	C
Union Street/ Pyrmont Street	24	B	25	B	30	C	30	C
Union Street/Edward Street	16	B	18	B	17	B	19	B
Union Street/Darling Drive	28	B	32	C	32	C	32	C
Pyrmont Bridge Road/Harris Street	23	B	23	B	26	B	26	B
Pyrmont Bridge Road/Pyrmont Street	23	B	23	B	28	B	28	B
Pyrmont Bridge Road/Edward Street[1]	5	A	6	A	5	A	6	A
Pyrmont Bridge Road/Union Street[1]	5	A	200+	F	8	A	200+	F

[1]The worst movement delay is reported as the overall delay for priority (un-signalised) intersections.

The above results indicate that all intersections are forecast to operate at level of service C or better with the station, except for the intersection of Pyrmont Bridge Road and Union Street, which is forecast to operate at level of service F. This is due to high pedestrian demands at Union Street resulting in insufficient gaps for vehicles causing the failure of the intersection.

Discussion with stakeholders is ongoing to determine suitable mitigation to improve overall intersection performance for both pedestrians and vehicles. Potential solutions could involve:

- Restricting eastbound movements on Union Street between Pyrmont Bridge Road and Edward Street, eliminating vehicles queuing at the intersection in the eastbound direction
- Pedestrianisation of Union Street between Pyrmont Bridge Road and Edward Street.
- Signalisation of the intersection of Union Street and Pyrmont Bridge Road.

These options would require further investigation and analysis to determine their feasibility.

4.10.8 Parking impacts

A number of on-street and off-street parking spaces would be impacted as part of the proposal, as shown in Figure 112 below, which include:

- Around two on-street spaces located on Pyrmont Street to accommodate the proposed accessible kiss and ride space
- One on-street space located on Union Street, fronting the proposed eastern station entry to provide additional pedestrian space near the station entry
- Around four on-street spaces located on Edward Street, where the proposed loading entry/ exit would be located.

Measures to address potential impacts arising from the loss of on-street parking in the vicinity of the station precinct would be developed, where required, in consultation with the relevant local council.

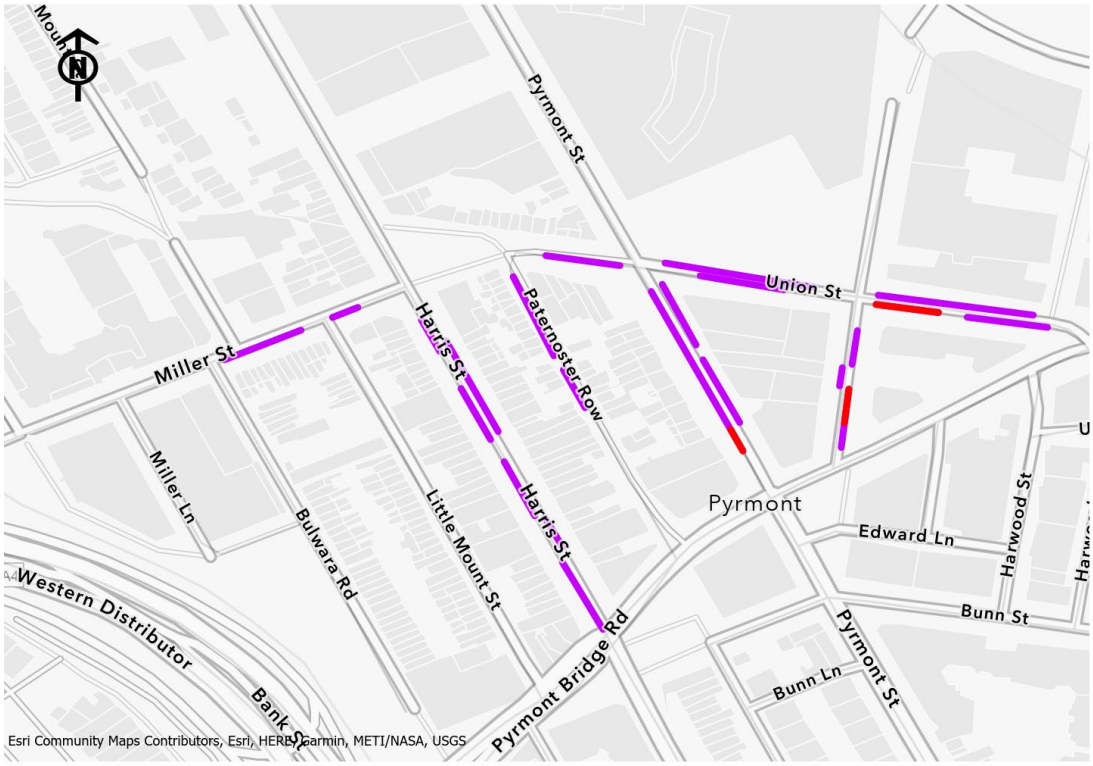


Figure 112 Station precinct parking impacts – Pyrmont

4.10.9 Property and access impacts

Access to nearby properties would be maintained.

4.11 Hunter Street Station (Sydney CBD)

4.11.1 Location and key features

Hunter Street Station (Sydney CBD) would be located in the centre of Sydney's CBD, east of the renewed entrance at Wynyard Station on George Street and west of Martin Place Station currently under construction as part of Sydney Metro City & Southwest.

Two station entries are proposed, a western and eastern site. The western site is bounded by George Street to the west and Hunter Street to the north. The eastern site is bounded by O'Connell Street to the north-west, Hunter Street to the south and Bligh Street to the east. The key features of proposed transport integration and access at Hunter Street station are:

- The main western entry onto George Street with additional surface access through to Hunter Street. The station would also connect to an existing unpaid underground connection, under George Street, through to Wynyard Station. Through-site links would also connect to potential future pedestrian links to Pitt Street.
- The main eastern entry onto O'Connell Street, with a through site connection to Bligh Street. A paid underground connection is also proposed, under Hunter Street, to the City & Southwest metro station.

Sydney Metro would continue to investigate footpath upgrades and widening on O'Connell Street, Hunter Street and at Richard Johnson Square (corner of Bligh Street and Hunter Street) in response to increased pedestrian demand associated with the proposed metro station.

The station transport integration and access plan is provided in Figure 113.

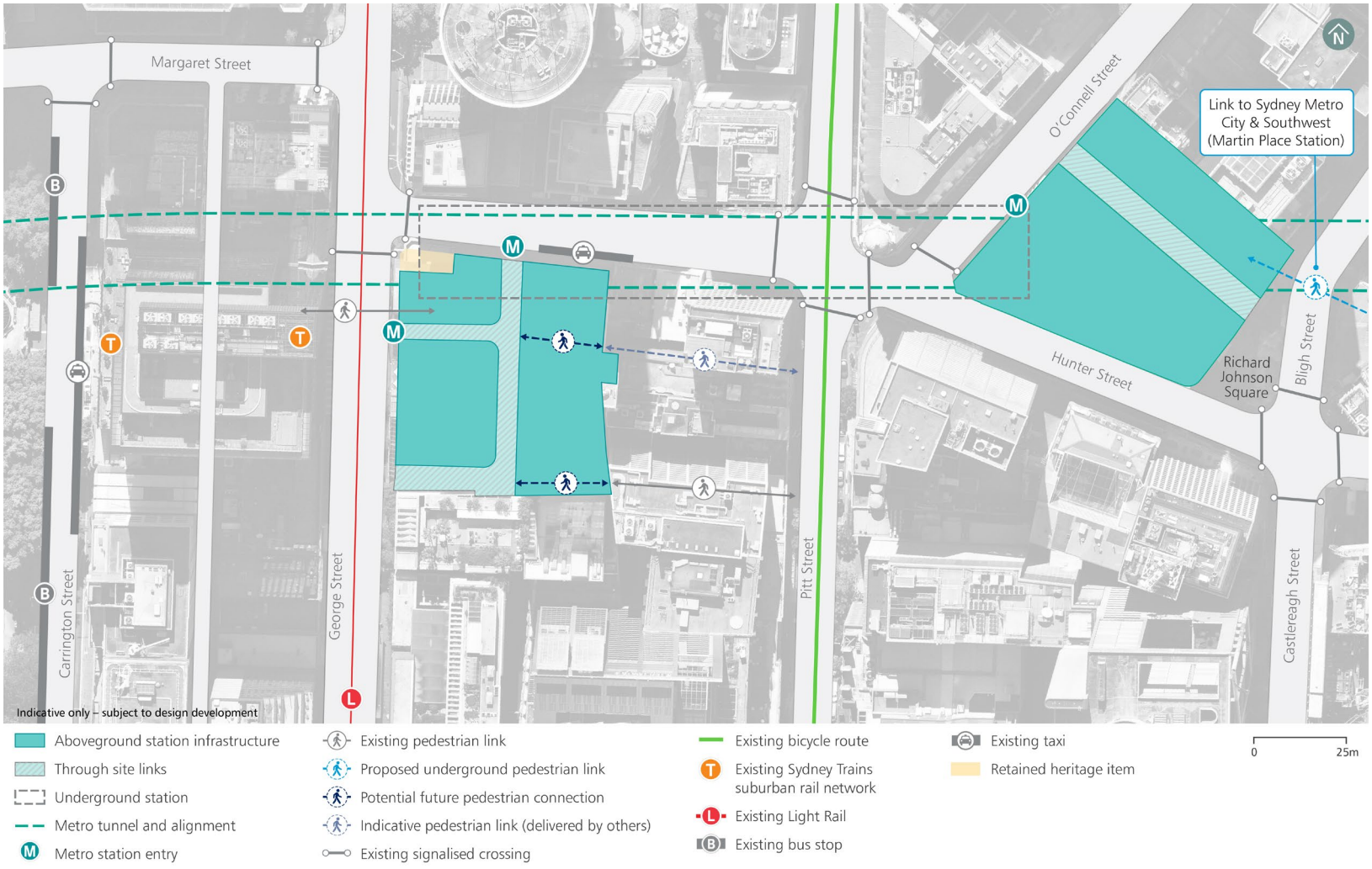


Figure 113 Station transport integration and access plan – Hunter Street (Sydney CBD)

4.11.2 Passenger demand

Station passenger demand for the 2036 AM peak was forecast using PTPM strategic transport model outputs provided by Transport for NSW. The demand indicates approximately 940 passengers entering the station and 9,560 passengers egressing during the morning peak hour. The forecast demand reflects that the station would operate primarily as a destination for commuters reaching places of work in the Sydney CBD.

Access to the station is forecast to come from a variety of public and active transport modes, likely due to the range of transport options available to passengers in the Sydney CBD. Egress trips from the station are likely to be walking trips to places of work. The 2036 modal breakdown of arrivals and departures during the AM peak hour is presented in Table 75.

Table 75 Forecast mode of arrival and departure – Hunter Street (Sydney CBD) (2036)

Mode	Walk	Cycle	Bus	Light rail	Ferry
Access	35%	2%	20%	16%	27%
Egress	97%	-	2%	1%	-

Source: PTPM data

The distribution of customers boarding and alighting in the AM peak hour is shown in Figure 114.

Figure 114 Station boarding and alighting passenger distribution – AM

Key observations from Figure 114 are:

- Transfers between rail services at Martin Place are significant, with transfers between Wynyard substantially lower
- Walk egress outweighs access
- Most customers would egress the station on foot and head south via George Street, or west through the Wynyard connections
- Transfers between customers egressing from metro services to light rail are minimal.

4.11.3 Integration with pedestrian network

Walking is forecast to be the primary mode of both access and egress at the Hunter Street Station (Sydney CBD). For this reason, integrating legible station access points with the existing footpath network is a key consideration.

Entrances to the metro station include:

- The main western entry onto George Street with additional surface access through to Hunter Street. There is also an unpaid underground connection, under George Street, through to Wynyard Station
- The main eastern entry onto O'Connell Street, with a through site connection to Bligh Street. There is also a paid underground connection, under Hunter Street, to the City & Southwest metro station.

The pedestrian network surrounding the metro station is extensive, providing active travel connectivity to interchangeable transport modes and high-quality footpath connections to local destinations in all directions.

Footpath density assessments have been carried out using the Fruin Outdoor Walkway density criteria, for the year 2036 and results are presented in Figure 115 and Figure 116 for both AM and PM peaks respectively.

Additionally, pedestrian modelling using Vizwalk was used to assess the performance of interfaces between road and pedestrian networks.

The Sydney CBD is an area with high pedestrian and traffic flows and the modelling indicates that in 2036, flows will remain high. Key locations of congestion are forecast to be at pedestrian crossings and the footpaths on approach to these crossings, including:

- George Street/Hunter Street intersection: footpath on west side and pedestrian crossing on east arm of Hunter Street
- Pitt Street/O'Connell Street/Hunter Street intersection: pedestrian crossing on Hunter Street, pedestrian crossing on south arm of Pitt Street, pedestrian crossing on O'Connell Street
- Bligh Street/Castlereagh Street/Hunter Street: all pedestrian crossings show congestion.

The areas in the immediate vicinity of Hunter Street station are not showing significant congestion due to the plaza space in front of the station entrances and the availability of connections to other parts of the CBD. Additionally, footpaths between the intersections are generally showing level of service A to C, indicating that pedestrians generally have sufficient space available for movement.

As the existing CBD area already experiences high flows of pedestrians and vehicles, it is anticipated that for the passengers forecast for Hunter Street station in 2036 will add to the high flows. Due to current constraints, there is limited scope for significantly changing signal timings or increasing the footpath widths to improve walking experience in the CBD. Any improvements to the surrounding pedestrian network would be investigated in consultation with key stakeholders such as City of Sydney and Transport for NSW. All intersections within the precinct area have wide crossings (greater than seven metres), with the exception of Bligh and Hunter Street (typical crosswalk width of three metres). High pedestrian demands are forecast at this intersection, with 7,620 movements in the AM peak and 6,920 movements in the PM peak. Widening of the pedestrian crossing at the Bligh Street/ Hunter Street signalised intersection to accommodate future pedestrian demands would be investigated in consultation with City of Sydney Council and Transport for NSW.

Sydney Metro would also continue investigating the potential for minor footpath upgrades (such as localised footpath widening) on O'Connell Street, Hunter Street and at Richard Johnson Square (corner of Bligh Street and Hunter Street) with key stakeholders, in response to increased pedestrian demand associated with the metro station.

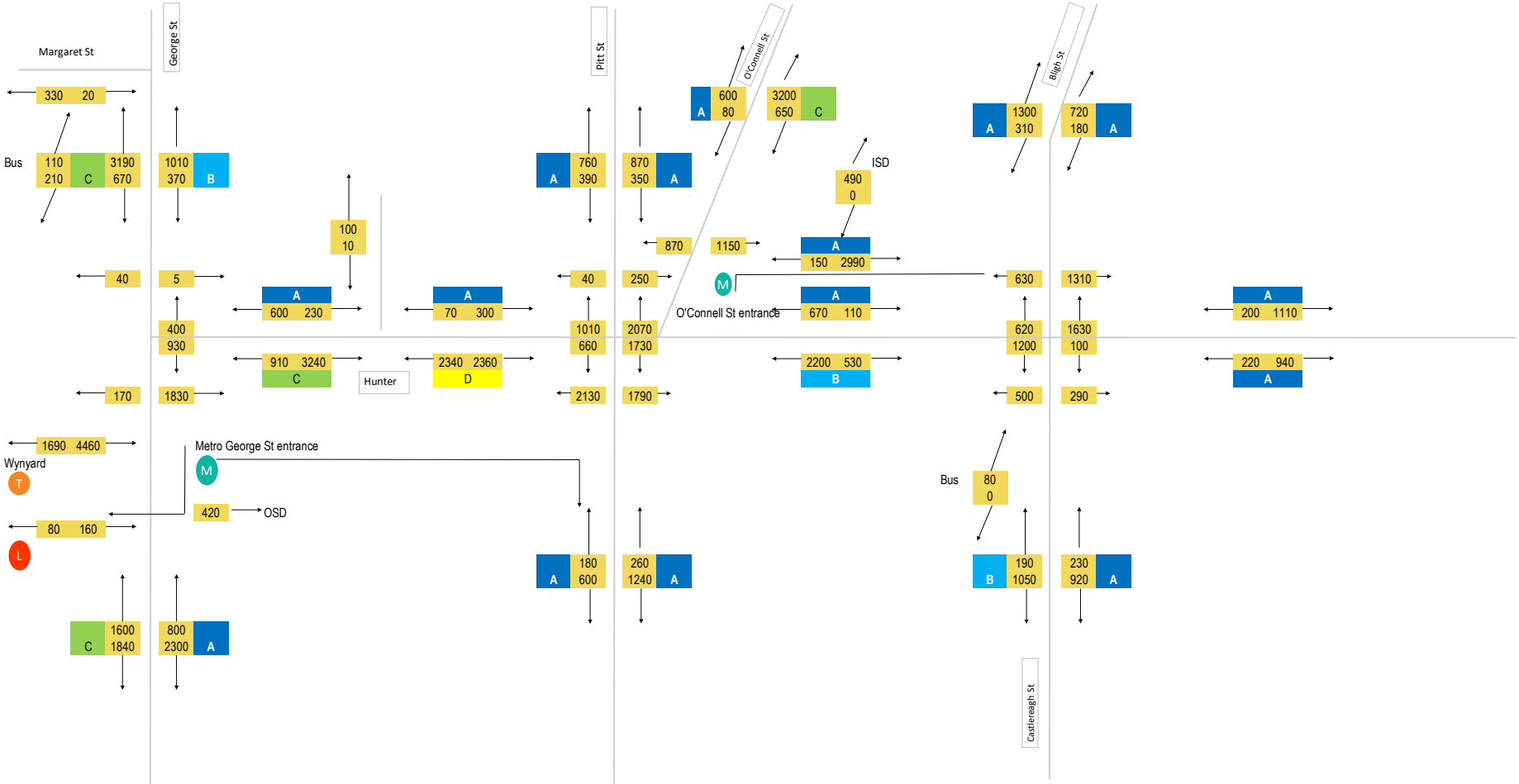


Figure 115 Future year precinct pedestrian modelling results – AM

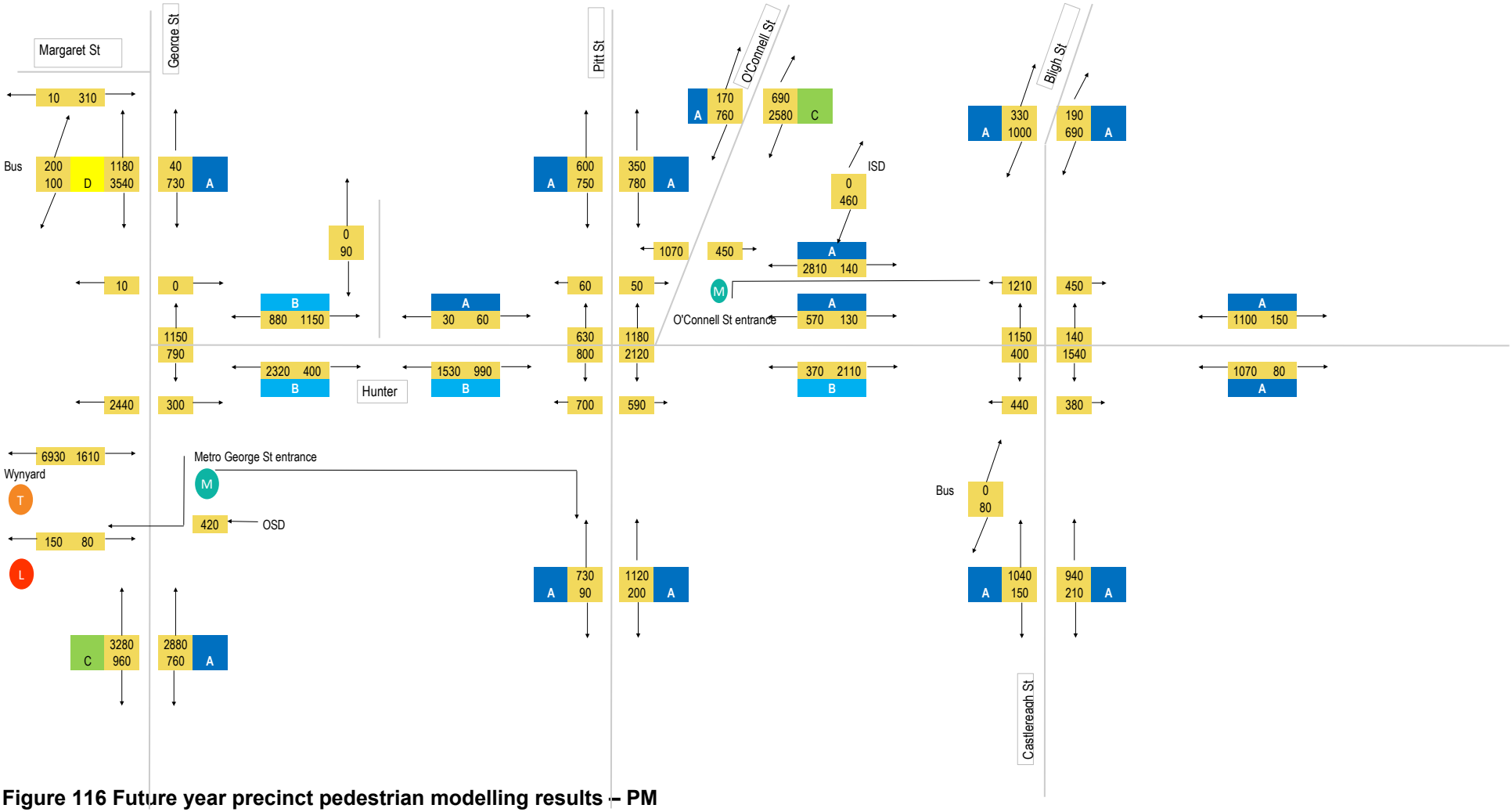


Figure 116 Future year precinct pedestrian modelling results – PM

4.11.4 Integration with cycle network

Cycling trips account for approximately two per cent of access and egress trips during the AM peak. Connectivity around the station via the cycle network is adequate, with several cycleways and cycle links providing access for cyclists around the Sydney CBD. All cycling routes in the Sydney CBD are off-road, two-way cycleways to segregate cyclists from pedestrians on footpaths and vehicles in the roadway. Since road space is constrained and kerbside space is highly contested in the Sydney CBD, opportunities to implement dedicated cycle infrastructure is limited in certain corridors.

The Pitt Street cycle link provides a north-south cycle link through the middle of the precinct. This is a 'Pop-Up Cycle Route' which is planned for integration as a permanent route in the cycle network by Council. This cycle link has turning facilities at its signalised intersection with Hunter Street, which would facilitate access to the O'Connell Street entrance to the metro station. The pedestrian boulevard on George Street can also be used be used by cyclists to access the western station entrance on George Street.

Cycle parking facilities would be provided at the metro station to meet expected demands.

4.11.5 Integration with public transport network

The centralised location of the Hunter Street Station (Sydney CBD) between Wynyard Station and the future City & Southwest metro station fronting Hunter Street, presents a unique opportunity to create an effortless and seamless interchange experience for customers. The station precinct design aims to create an effortless interchange experience between several modes of public transport through existing above and below ground connections, including:

- Connecting the western entry to Wynyard Station via an unpaid below ground connection to Wynyard Station, using an existing tunnel under George Street
- A paid below ground connection to link the eastern entry to the Martin Place Station platform level via a new pedestrian link
- Connecting two existing street level pedestrian links from Pitt Street to the western entry.

Collectively, these pedestrian links would improve public amenity, extend existing east-west connections between Barangaroo and Martin Place and facilitate efficient transfer between Sydney Metro lines, the suburban rail network, light rail and bus services.

No changes are proposed to other public transport infrastructure or services within the local area.

A PTPM review of future bus service catchments interchanging with this metro station, revealed the following patterns in the 2036 AM peak:

- Bus transfers to metro originate evenly from Wynyard and Martin Place interchanges
- Nearly all metro transfers to bus were destined for the Wynyard bus interchange.

4.11.6 Integration with road network

The proposal does not include additional park and ride or kiss and ride infrastructure, and except for low volumes of maintenance and service vehicles, minimal additional general traffic is expected to be generated by the station.

No changes are proposed to the current road network or intersections, both within the station precinct and in the surrounding area.

4.11.7 2036 future year road network performance

Network performance was modelled for the future year 2036. Observed traffic counts were adjusted to account for the impacts of the Covid-19 pandemic and growth factors applied to expand adjusted 2021 traffic flows to 2036 (with and without the proposal), which were calculated using outputs extracted from the PTPM strategic transport model. Signal phasings were adopted from SCATS data.

Modelled network performance for 2036 during the AM and PM peak hours for key intersections in the vicinity of the proposed station is shown in Table 76.

Table 76 Future intersection performance – Hunter Street (Sydney CBD) (2036)

	AM Peak				PM Peak			
	Without project		With project		Without project		With project	
Intersection	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS	Average delay (s)	LOS
George Street and Hunter Street	35	C	33	C	37	C	40	C
Pitt Street, O'Connell Street and Hunter Street	131	F	125	F	50	D	58	E
Bligh Street and Hunter Street	54	D	57	E	90	F	82	F

Future intersection performance in the AM peak is forecast to be similar with or without the inclusion of the metro station.

Intersection performance in the PM peak shows minor increased delays (8 seconds) at Pitt Street, O'Connell Street and Hunter Street with and without the metro station, whilst at George Street and Hunter Street, delays are similar with and without the metro station. Vehicle flows here are forecast to be unstable, causing flows to become irregular.

4.11.8 Parking impacts

There would be no impacts to parking.

4.11.9 Property access impacts

There would be no impacts to property access.

4.12 Clyde stabling and maintenance facilities

4.12.1 Location

The proposed Clyde stabling facility is located within the City of Parramatta LGA and is bound by Shirley Street to the east, James Ruse Drive to the west, Unwin Street to the north and the M4 Western Motorway to the south.

There would be two accesses to the Clyde stabling and maintenance facility site, including a primary access via Wentworth Street on the south side for contractors, deliveries, staff and visitors, as well a secondary access via Unwin Street on the north side primarily for staff. The indicative layout of the Clyde stabling and maintenance facility is shown in Figure 117.

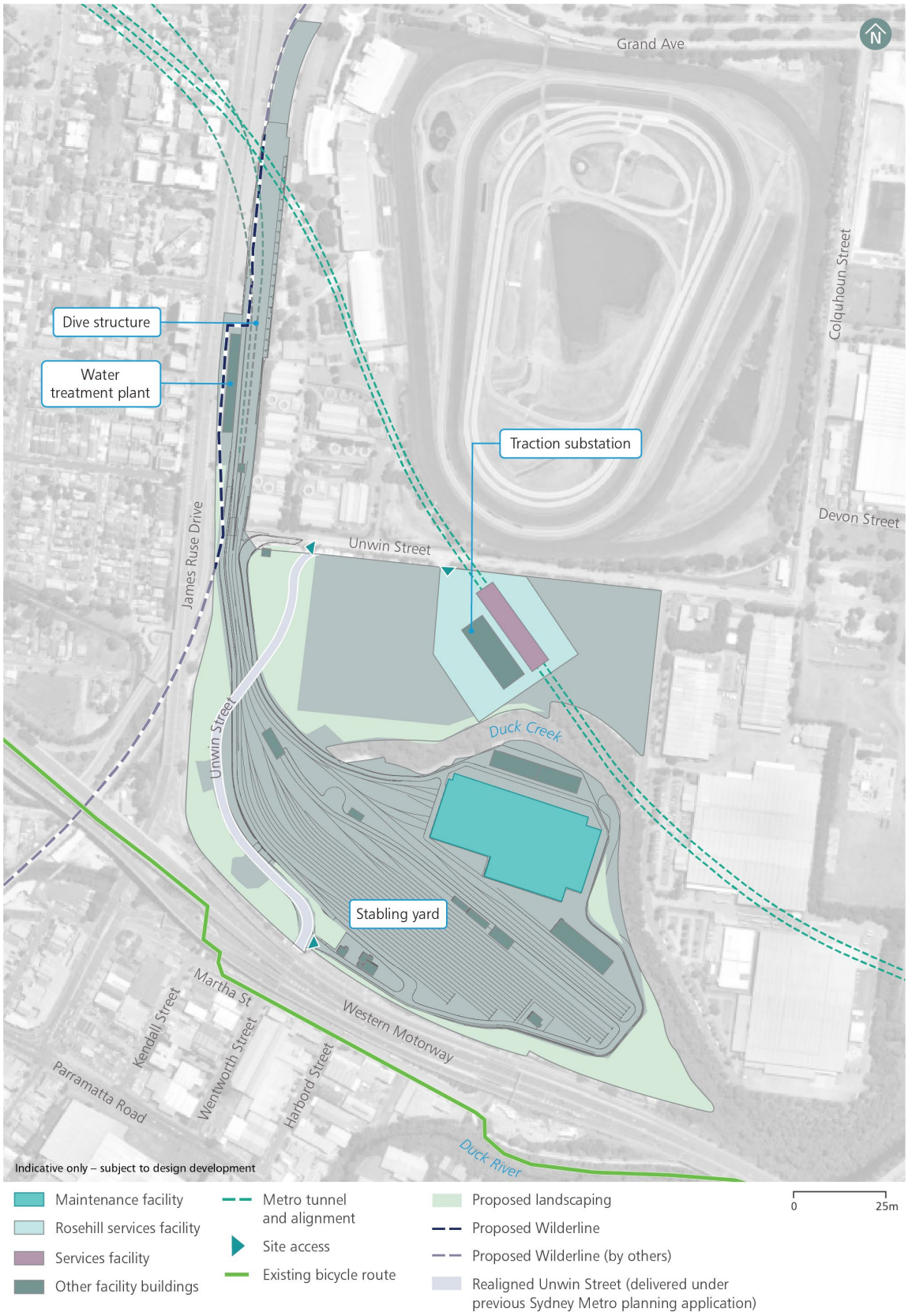


Figure 117 Clyde Stabling and maintenance facility – indicative layout

4.12.2 Key features

The Clyde stabling and maintenance facility would include an area for the storage of trains that are not in operation outside of peak periods. This area would allow staff to perform cleaning activities and keep the trains in a low power state ready for service.

Trains would enter into the site from a dive portal located adjacent to James Ruse Drive, located in the former T6 Carlingford Line rail corridor, which connects the facility into the main running tunnels.

The main maintenance building accommodates tracks where maintenance and repair of trains can be carried out, with supporting workshops and storage space. Adjacent would be the main administration and operations control centre, which accommodates the main control room and management functions for the railway.

Several ancillary and rail-centred equipment buildings are distributed across the site, serving the main stabling yard where trains would be stored and maintained. A water treatment plant would be located at the north end of the site.

4.12.3 Integration with pedestrian and cycle network

The proposal would provide active transport connectivity and integration with nearby active transport facilities.

Pedestrians travelling to the Clyde stabling and maintenance facility from Clyde Station, or from bus stops on Parramatta Road, or James Ruse Drive would use existing pedestrian facilities and infrastructure to access the site.

The proposal acknowledges the City of Parramatta Council's plan to provide an active transport corridor along the former Carlingford line, referred to as the Wilderline.

The proposal would deliver the section of the Wilderline within the Sydney Metro site, connecting to the proposed Wilderline from the north of the site along the western boundary to the former Carlingford line to the west. Potential other active transport connections under investigation include a cross site connection to the Wilderline, as well as to the Rosehill Gardens racecourse.

In addition, new permanent pedestrian access would be provided to Rosehill Gardens racecourse from James Ruse Drive to replace the previous access over the former Rosehill Station footbridge (which would be removed as part of work under the previous Sydney Metro West planning application). This permanent access would likely be located to the north of the Sydney Metro West infrastructure, potentially through the formalisation of the temporary construction phase access point.

A shared pathway is also being investigated through the site utilising the Unwin Street overpass (to be delivered under a previous Sydney Metro West planning application), including a potential connection to the Wilderline.

Additional active transport connectivity would also be investigated under the stabling yard, as well as potential bridge connections to Shirley Street and over Duck Creek linking into the surrounding existing active transport network.

Assuming 10 per cent of staff use active transport modes to travel to site, which is considered to be high for this type of facility, this represents 7 – 10 journeys to site by active transport modes spread across 24 hours (see Section 4.12.4 below for further information on staffing).

Preliminary assessment of the proposal on the performance of the surrounding road network and key intersections based on the above referred number of journeys to site by active transport users indicates minimal impacts.

4.12.4 Staffing

The site would be permanently staffed throughout the day and night. A total of around 70-100 shift staff would work at the site, anticipated to be spread across three shifts over 24 hours. Additionally, around 33 office based staff would work 9am – 5pm at the site.

4.12.5 Trip generation

Based on the above, it is anticipated there would be around 66 staff arriving or departing in the morning. However, about half of these staff arrivals and departures (shift workers) are likely to be prior to the morning network peak and are not likely to coincide with the arrivals associated with the office-based workers. Staff arrivals and departures would be spread across the primary and secondary site accesses.

There would also be random deliveries and visitor arrivals, as well as an estimated five to 10 heavy vehicle arrivals via the primary access throughout the day.

The total morning network peak hour demand would be around 33 vehicle movements spread between the primary and secondary accesses to the south and north of the site respectively.

4.12.6 Traffic impacts

Prior to commencement of the construction of Sydney Metro West, the site was used for light and heavy industrial purposes, accommodating a range of business, including, but not limited to, concrete and aggregate suppliers, equipment suppliers, distribution and logistics businesses and storage buildings.

Given the current and former use of the site for multiple light and heavy industrial purposes, low traffic volumes are experienced on roads in the vicinity of the site, including Unwin Street, Kay Street and Wentworth Street, with fewer than 280 vehicles per hour observed in each direction during peak periods.

Preliminary assessment of the surrounding road network, including impacts on nearby intersections, indicates that replacing the existing and former use of the site with the Clyde stabling and maintenance facility would result in minimal impacts on the surrounding road network.

Given the low number of vehicles required to access the Clyde stabling and maintenance facility during operation and the minimal impacts on the surrounding road network, detailed intersection performance assessment was not necessary.

4.12.7 Parking impacts

On-street parking has been observed associated with existing and former site use, however parking facilities would be provided on site as part of the proposal at a number of locations, including at the entrance security buildings, the administration and operations control centre building, maintenance building and cleaning building.

Given the proposed change of use of the site and the fact that all vehicular traffic generated by the stabling and maintenance facility would park within the site, there would be no impacts associated with parking on the surrounding road network.

4.13 Rosehill services facility

4.13.1 Introduction

A services facility is proposed at Rosehill to the north of Duck Creek and to the north of the stabling and maintenance facility. This would include a services facility building and traction substation building. Unwin Street is located to the north of the facility and Shirley Street is located to the east.

The Rosehill services facility would provide fresh air ventilation systems for fire and life safety, as well as for operational scenarios (such as heat build-up). The services facility buildings would be located directly above the tunnel alignment and typically include tunnel ventilation plant rooms and associated air distribution equipment.

4.13.2 Access requirements

Access to the services facility, which would not be permanently staffed, would only be required from time to time for maintenance purposes and would be via Unwin Street.

Details concerning maintenance access requirements, including vehicle types and frequency are provided in Table 77.

Preliminary assessment of the surrounding road network, including impacts on nearby intersections has been considered, however, given the low number and frequency of vehicles and active transport users required to access the services facility for maintenance purposes, impacts on the surrounding road network would be minimal and more detailed intersection performance assessment was not necessary.

Table 77 Services facility maintenance access requirements – Rosehill

Access requirements	Vehicle types	Frequency
General inspection maintenance Static Frequency Converter replacement Static Frequency Converter transformer replacement Bulk Power incoming transformers Tunnel ventilation fan maintenance/equipment replacement/inspection	Car/ute 12.5m heavy vehicle size The largest vehicle accessing the site would be 19m semi-trailer or a HIAB crane heavy vehicle truck type	Assume once a day light vehicle general access (via car/ute up to 12.5m heavy vehicle) 19m Semi-trailer once in 3-6 months

5 Cumulative operational benefits and impacts

5.1 Introduction

Cumulative benefits and impacts can occur when benefits and impacts from a project interact or overlap with benefits and impacts from other projects and can potentially result in a larger overall effect on the environment, businesses or local communities.

Projects with potential to generate cumulative operational traffic benefits and impacts can be broadly categorised as:

- Major transport infrastructure projects, including public transport and road projects
- Large-scale urban development and other infrastructure projects.

5.2 Cumulative operational benefits

5.2.1 Parramatta light rail

Parramatta Light Rail is a key project that will provide cumulative benefits to the proposal. Stage 1 of Parramatta Light Rail is currently under construction and is expected to open in 2023. Once complete, there will be stops in the vicinity of Westmead and the Parramatta metro station locations.

The NSW Government recently announced a commitment for the planning and development of Stage 2 of Parramatta Light Rail, which would connect Stage 1 and the Parramatta CBD to Ermington, Melrose Park, Wentworth Point and Sydney Olympic Park, where it would connect to the Sydney Metro West and the Sydney Trains network.

This proposal would allow for transfers with Parramatta Light Rail Stage 1 at Westmead and Parramatta, as well as with the planned Parramatta Light Rail Stage 2 at Sydney Olympic Park.

Parramatta Light Rail would provide cumulative operational benefits to Sydney Metro West by serving local demand across Greater Parramatta and improving the quality of feeder services, thus expanding the public transport catchment within the corridor and beyond.

5.2.2 Sydney Metro City & Southwest

The Chatswood to Sydenham component of Sydney Metro City & Southwest involves the construction and operation of a 15.5 kilometre metro line from Chatswood, under Sydney Harbour and through Sydney's CBD out to Sydenham, which is expected to be complete by 2024.

The City & Southwest Martin Place Station would be about 50 metres from the proposed Hunter Street Station (Sydney CBD), allowing easy connectivity and transfer between the two stations, as well as between metro and Sydney Trains suburban rail network services.

5.3 Cumulative operational impacts

The assessment of future year road network operational performance in Sections 4.3.7 – 4.11.7 of this technical paper uses traffic volumes derived from strategic transport model outputs for 2036.

The strategic transport model outputs are reflective of future growth in population and employment associated with large scale urban development, as well as major future road upgrades and other key projects that will be operational within the transport study area in 2036.

Key future roads projects included in the 2036 future year assessment scenarios include:

- WestConnex – Stages 1, 2, 3
- Western Harbour Tunnel
- Beaches Link
- F6 Extension – Stage 1
- Sydney Gateway
- M12
- Northern Road widening.

The future year road network operational performance in Sections 4.3.7 – 4.11.7 of this technical paper therefore also represents the cumulative operational assessment of the proposal, which also accounts for permanent changes to the future road network that will be delivered as part of work carried out under previous Sydney Metro West planning applications.

6 Management and mitigation measures

6.1 Approach to management and mitigation

This chapter describes the environmental management approach and framework for this proposal during operation. Further details on the environmental management approach are included in the Environmental Impact Statement.

The approach to environmental management during operation involves:

- Design – measures which are inherent in the design to avoid and minimise impacts
- Operational performance outcomes and mitigation measures
- Operational environmental management – the approach to environmental management during operation would be defined in an operational environmental management plan or system.

The operational environmental management plan or system would detail how the performance outcomes and mitigation measures would be implemented and achieved during operation and specifies the environmental management practices and procedures to be followed.

This chapter includes a compilation of performance outcomes, as well as operational transport mitigation measures, which are detailed in the following sections.

6.2 Mitigation measures

Mitigation measures have been developed to avoid, minimise and manage operational transport related impacts, where possible. Operational transport mitigation measures are detailed in Table 78.

Table 78 Mitigation measures for operational transport impacts

Reference	Mitigation measure	Applicable locations
EIS-TT1	Access would be maintained to neighbouring properties	All
EIS-TT2	Potential opportunities to connect active transport measures with the wider active transport network would be further investigated in consultation with key stakeholders	All
EIS-TT3	Measures to address potential parking impacts arising from a loss of on-street parking in the vicinity of station precincts, as well due to potential park and ride in residential streets would be developed, where required, in consultation with relevant local councils	Westmead, Parramatta, Sydney Olympic Park, North Strathfield, Burwood North, Five Dock, The Bays, Pyrmont.

Reference	Mitigation measure	Applicable locations
EIS-TT4	Measures to manage congestion issues in the area and improve bus service reliability along the T-way would be investigated including the potential for Alexandra Avenue, between Hawkesbury Road and Hassall Street, to be restricted to buses, taxis and emergency vehicles only	Westmead
EIS-TT5	Appropriate intersection upgrades to enable bus access to the station precinct would be investigated in consultation with Sydney Olympic Park Authority and Transport for NSW.	Sydney Olympic Park
EIS-TT6	The upgrade of the Pomeroy Street/ Queen Street/ Beronga Street intersection would be determined in consultation with City of Canada Bay Council and Transport for NSW.	North Strathfield
EIS-TT7	Provision of kiss and ride facilities on Robert Street to reduce the number of vehicle movements into and out of the precinct would be investigated in consultation with Inner West Council.	The Bays
EIS-TT8	The need for pedestrian crossing facilities at the Robert Street/ new precinct street and new precinct street/ Port Access Road intersections would be investigated in consultation with Inner West Council and Department of Planning and Environment	The Bays
EIS-TT9	The potential signalisation of the Robert Street/ Mullens Street intersection to improve future year level of service would be investigated in consultation with Inner West Council and Department of Planning and Environment	The Bays
EIS-TT10	Further investigation, including a safety assessment, would be carried out so that safe access is maintained to 48-50 Robert Street.	The Bays
EIS-TT11	Measures to improve overall performance for both pedestrians and vehicles at the intersection of Pyrmont Bridge Road/ Union Street would be investigated in consultation with City of Sydney Council and Transport for NSW	Pyrmont
EIS-TT12	Widening of selected pedestrian crossings at the Bligh Street/ Hunter Street intersection to accommodate future pedestrian demands would be investigated in consultation with City of Sydney Council and Transport for NSW	Hunter Street (Sydney CBD)
EIS-TT13	The potential for minor footpath upgrades on O'Connell Street, Hunter Street and at Richard Johnson Square (corner of Bligh Street and Hunter Street) would be investigated in consultation with key stakeholders, in response to increased pedestrian demand associated with the metro station	Hunter Street (Sydney CBD)

6.3 Performance outcomes

Performance outcomes for Sydney Metro West were established as part of the concept assessment in the Sydney Metro West Environmental Impact Statement – Westmead to The Bays and Sydney CBD (Sydney Metro, 2020). The performance outcomes related to operational transport are:

- The modal access hierarchy is implemented at stations
- Sufficient customer capacity in stations and station plazas is provided to limit crowding or queuing in accordance with Fruin's Level of Service C (for 2056 demand)
- Stations and interchanges are fully accessible and compliant with the *Disability Discrimination Act 1992* (Cth) and the Disability Standards for Accessible Public Transport (Australian Government, 2002).

Further details regarding how this proposal would achieve the performance outcomes is provided in Chapter 20 (Synthesis) of the Environmental Impact Statement.

7 References

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Transport for NSW 2018, Future Transport Strategy 2056.

Transport for NSW 2020, Walking Space Guide: Towards Pedestrian Comfort and Safety