Chapter 8

Construction traffic and transport

January 2020

8 Construction traffic and transport

This chapter considers the potential traffic and transport impacts from the construction of the Western Harbour Tunnel and Warringah Freeway Upgrade (the project) and identifies measures to address these impacts.

A detailed traffic and transport assessment has been carried out for the project and is included in Appendix F (Technical working paper: Traffic and transport).

The Secretary's environmental assessment requirements as they relate to construction traffic and transport and where in the environmental impact statement these have been addressed, are detailed in Table 8-1.

The proposed environmental management measures relevant to construction traffic and transport are included in Section 8.5.

Table 8-1 Secretary's environmental assessment requirements – construction traffic and transport

Secretary's requirements	Where addressed
Transport and traffic	
1. The Proponent must assess construction transport and traffic (vehicle, marine, pedestrian and cyclists) impacts, including, but not necessarily limited to: a. a considered approach to route identification and scheduling of marine and land transport movements, particularly outside standard construction hours;	Construction traffic routes are discussed in **Section 8.4**. Construction traffic movements are shown in **Chapter 6** (Construction work).
b. the number, frequency and size of construction related vehicles (passenger, marine, commercial and heavy vehicles, including spoil management movements);	Information on construction traffic movements is presented in **Chapter 6** (Construction work). **Section 6.8** outlines number, frequency and size of construction vehicles.
c. construction worker parking;	Construction worker parking is detailed in **Section 8.4**. Construction support site layouts, including provision of construction worker parking, are presented in **Chapter 6** (Construction work).
d. the nature of existing traffic (types and number of movements) on construction access routes (including consideration of peak traffic and sensitive road users and parking arrangements including internal Port roads and land if utilised during construction);	The nature of existing traffic is detailed in **Section 8.3**. The assessment of potential traffic impacts during construction are detailed in **Section 8.4.**
e. access constraints and impacts on public transport, pedestrians and cyclists;	Access constraints and impacts on public transport, pedestrians and cyclists are described in **Section 8.4**.

Secretary's requirements	Where addressed
f. how construction of the project affects the capacity of, and the need to close, divert or otherwise reconfigure elements of, the road, cycle and pedestrian network;	Impacts during construction on the road, cycle and pedestrian networks are detailed in **Section 8.4**.
g. details of how construction and scheduling of works are to be coordinated in regard to public events and cumulative traffic impacts resulting from concurrent work on the project and other major projects, under or preparing for or commencing construction in the vicinity of the proposal;	Coordination in regard to public events is discussed in **Section 8.4.7**. Cumulative construction impacts are also assessed in **Section 8.4.5**.
h. alternatives to road transport of construction spoil including marine and rail options as well as potential re-use in existing land reclamation areas or in association with Resource Recovery Exceptions (if obtained from the EPA) to minimise traffic impacts on the road network;	Impacts from marine spoil transport are discussed in **Section 8.4.2**. Potential reuse of spoil is addressed in **Chapter 24** (Resource use and waste management). Alternatives to road transport of construction spoil including marine and rail options are discussed in **Chapter 4** (Project development and alternatives).
i. the likely risks of the project to public safety, paying particular attention to pedestrian safety and users of Sydney Harbour; and	The assessment of potential traffic impacts during construction for pedestrians and users of Sydney Harbour are detailed in **Section 8.4**. **Chapter 23** (Hazard and risk) (**Section 23.2** and **Section 23.3)** assess the interactions between maritime traffic and tunnel infrastructure.
j. impacts to water based traffic and shipping channels on Sydney Harbour.	Impacts to water based traffic and shipping channels during construction are assessed in **Section 8.4.2**.

8.1 Strategic transport planning context

Details regarding the project's compatibility with key Commonwealth and State strategic planning and transport policies are provided in Chapter 3 (Strategic context and project need). More specific transport strategies relevant to the project are discussed in Chapter 9 (Operational traffic and transport).

8.2 Assessment methodology

8.2.1 Overview

The assessment methodology for construction traffic and transport impacts considered five core components:

- Road traffic
- Local roads and parking
- Public transport
- Pedestrian and cyclists (active transport)
- Maritime traffic.

The method and outputs of assessment for each of these components is summarised in Table 8-2. The construction traffic and transport assessment conservatively focused on the impacts during peak construction activities, to reflect the greatest potential impact of the project. For example, the quantitative assessment of road network performance is for the highest potential construction site traffic generation per hour. These peak construction activities are likely to be short in duration and would only occur for a small proportion of the overall construction program. Generally, typical site traffic generated per hour would be lower than the peak site traffic numbers assessed.

Table 8-2 Overview of approach to the construction traffic and transport assessment

Project impacts	Method of assessment	Assessment output
Road traffic	Analysis of road network performance based on strategic traffic forecasting and operational traffic modelling.	Quantitative assessment of road network performance with and without the project.
Local roads and parking	Analysis of changes to local road access arrangements, loss of parking spaces and availability of comparable alternative parking in nearby locations.	Qualitative assessment of local road changes. Estimate of number of lost parking spaces. Qualitative assessment of the impact of parking overflow to parking in nearby locations.
Public transport	Analysis of changes to public transport routes and stops, and service timeliness and efficiency.	Qualitative assessment of impacts on public transport performance (increase or decrease in travel times).
Pedestrians and cyclists (active transport)	Analysis of changes to shared user paths, cycle ways, footpaths and pedestrian crossings.	Qualitative assessment of impacts on pedestrian and cycling networks and accessibility.

Project impacts	Method of assessment	Assessment output
Maritime traffic	Analysis of proposed occupation of the waterway including the number, type, frequency and duration of marine construction traffic. Simulation of marine vessels and transport of immersed tube tunnel elements.	Qualitative assessment of impacts on existing waterway navigation and commercial and recreational usage. Simulation report showing the paths of marine vessels and the area required for the transport of immersed tube tunnel elements in Sydney Harbour.

The assessment methodology for road traffic is described in more detail below.

8.2.2 Road traffic assessment methodology

The potential impacts of the project on road network performance were assessed through strategic traffic demand forecasting and operational traffic modelling. The assessment included both regional and local scale modelling, which enabled existing and future traffic and transport conditions and road network performance to be characterised, both with and without the project. An overview of the modelling methodology used in the assessment of the project is provided in Figure 8-1

Strategic Travel Model (STM)

- **General description**
  Forecasts travel patterns across the Sydney, Newcastle and Illawarra regions under various land use, multi-modal transport and transport pricing scenarios
- **Project context**
  Provides forecast road traffic demands for more detailed modelling using SMPM

Sydney Motorway Planning Model (SMPM)

- **General description**
  Forecasts strategic traffic patterns for Sydney motorway projects
- **Project context**
  Provides strategic road traffic forecasts to inform project definition and evaluation, and as an input into more detailed operational traffic modelling

Operational traffic modelling

- **General description**
  Provides detailed operational road network performance modelling for more complex local and regional components of the road network relevant to the project
- **Project context**
  Predicts road network performance with and without the project

Figure 8-1 Overview of transport modelling approach

Construction traffic modelling scenarios

Based on the planned construction activities, the worst case construction traffic scenario was assumed to occur during the period of spoil removal from tunnel construction during 2022.

Models were developed for the AM peak (between 7am and 9am on a normal working weekday) and PM peak (between 4pm and 6pm on a normal working weekday) to assess the future performance of the road network during construction. Forecast traffic growth was taken from the Sydney Motorways Planning Model (SMPM) to derive background traffic demand. Construction traffic was then added to the background traffic. This was based on the proposed construction methodology as described in Chapter 6 (Construction work) including vehicle types, volumes and construction traffic routes. The performance of the roads and intersections in the vicinity of the construction support sites was then calculated.

The scenarios modelled to assess the impacts of construction on the road network are listed in Table 8-3. In addition, key intersections were modelled based on 2016 travel demands to characterise existing intersection performance.

Table 8-3 Construction traffic modelling scenarios

Model year	Without project	With project	Modelling scenario	Description
2022	✓		Base case 2022	The existing road network with no new projects or upgrades.
2022		✓	Construction 2022	Peak tunnelling for the project. The current road network with no new projects or upgrades, with construction traffic movements for the project in combination with Sydney Metro City & Southwest and M4–M5 Link projects.
2024		✓	Cumulative construction 2024	Peak construction year for the Western Harbour Tunnel and Beaches Link program of works. The current road network with no new projects or upgrades, with construction traffic movements for the project and the Beaches Link and Gore Hill Freeway Connection project.

8.2.3 Assessment criteria

The criteria used to assess road network performance were as follows:

- At an intersection level, showing changes to traffic flow (expressed in vehicles per hour), average delay (expressed in seconds per vehicle), level of service (as defined in the *Guide to Traffic Generating Developments Version 2.2* (RTA, 2002)) and degree of saturation (expressed as the ratio of traffic volumes at an intersection to its overall capacity (V/C ratio))
- At a midblock level showing changes on traffic volumes, volume to capacity ratio (ratio of traffic volumes at a midblock road to its overall capacity) and level of service (as defined in the *Guide to Traffic Generating Developments Version 2.2* (RTA, 2002))
- At a network level for cumulative assessments, showing changes to overall traffic demand and average speeds within the modelled areas, travel times along key routes, and changes to stopping frequencies.

8.2.4 Intersection and midblock performance

Level of service (LoS) is a measure to describe the operational conditions and efficiency of a road or intersection. The definition of level of service generally outlines the operating conditions in terms of speed and travel time, freedom to manoeuvre, traffic interruptions, comfort and convenience, and road safety. It is a qualitative measure describing operational conditions within a roadway or intersection, as perceived by motorists and passengers. Average delay is commonly used to assess the operational performance of intersections, with level of service used as an index.

The performance of roads can also be defined by the midblock level of service. The midblock level of service is based on the degree of saturation, which is the ratio between traffic volume and the road capacity (V/C ratio). Satisfactory operations usually occur with a degree of saturation below 0.9. As degree of saturation approaches one, both queue length and delays increase rapidly. The level of service for freeways and motorways is calculated from vehicle density, which is the traffic

volume divided by the average passenger car speed. Density is measured in passenger car units (PCU) per kilometre per lane. Passenger car units account for the amount of road space various vehicle types use. Heavy vehicles and buses use more road space than cars or light commercial vehicles and therefore have a PCU greater than one.

A description of the level of service scale for intersection and midblock performance is shown in Table 8-4. There are six levels of service; LoS A to LoS F. LoS A represents the best operating conditions and LoS F the poorest operating conditions. For the purposes of this assessment, LoS E and LoS F are considered unsatisfactory.

Table 8-4 Level of service criteria for intersection and midblock performance

LoS	Intersection criteria	Midblock criteria
A	Good operation	A condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.
B	Good with acceptable delays and spare capacity	In the zone of stable flow where drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is a little less than with LoS A.
C	Satisfactory	In the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.
D	Operating near capacity	Close to the limit of stable flow and approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow would generally cause operational problems.
E	Unsatisfactory. At capacity; at signals, incidents will cause delays. Roundabouts require other control mode	Traffic volumes are at or close to capacity and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream would cause breakdown.
F	Unsatisfactory. Extra capacity required	In the zone of forced flow, where the amount of traffic approaching a point exceeds that which can pass it. Flow breakdown occurs, and queuing and delays result.

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

8.2.5 Assessment of temporary closure of the Warringah Freeway

Due to the safety risks associated with working adjacent to live traffic, full closure of some carriageways of the Warringah Freeway (primarily at night) would be beneficial for short periods, allowing for construction activities that would be carried out more efficiently and with less disruption to traffic. These activities include resheeting, installation of bridge spans and demolition of kerbs and medians. These closures would be carried out during off-peak periods generally during the evening and night.

Likely increases in traffic on surrounding roads from Warringah Freeway closures have been determined using SMPM traffic forecasts. Modelled flow differences were calculated based on observed traffic flows surveyed on the Warringah Freeway during the busiest hour of the proposed closure period (10pm to 11pm) to estimate the potential increased traffic demands on key roads impacted.

8.3 Existing environment

The existing traffic and transport environment for the project within the context of the broader road network is outlined below, along with more detailed analysis across the following local areas:

- Rozelle and surrounds
- Birchgrove to Waverton (Sydney Harbour crossing)
- Warringah Freeway and surrounds
- Gore Hill Freeway and Artarmon.

8.3.1 Broader road network

Travel times and speed along key corridors

A summary of 2016 travel times and average speeds for trips for key road corridors across Sydney Harbour in the AM peak (between 7am and 9am on a normal working weekday) and PM peak (between 4pm and 6pm on a normal working weekday) is provided in Figure 8-2 and Figure 8-3. These centres are connected by motorways and major arterial roads with posted speeds between 60 and 80km/h. Typical operating speeds during peak periods are shown to be in the range of 20 to 40km/h, indicating these corridors are operating at capacity, and resulting in congestion and delays.

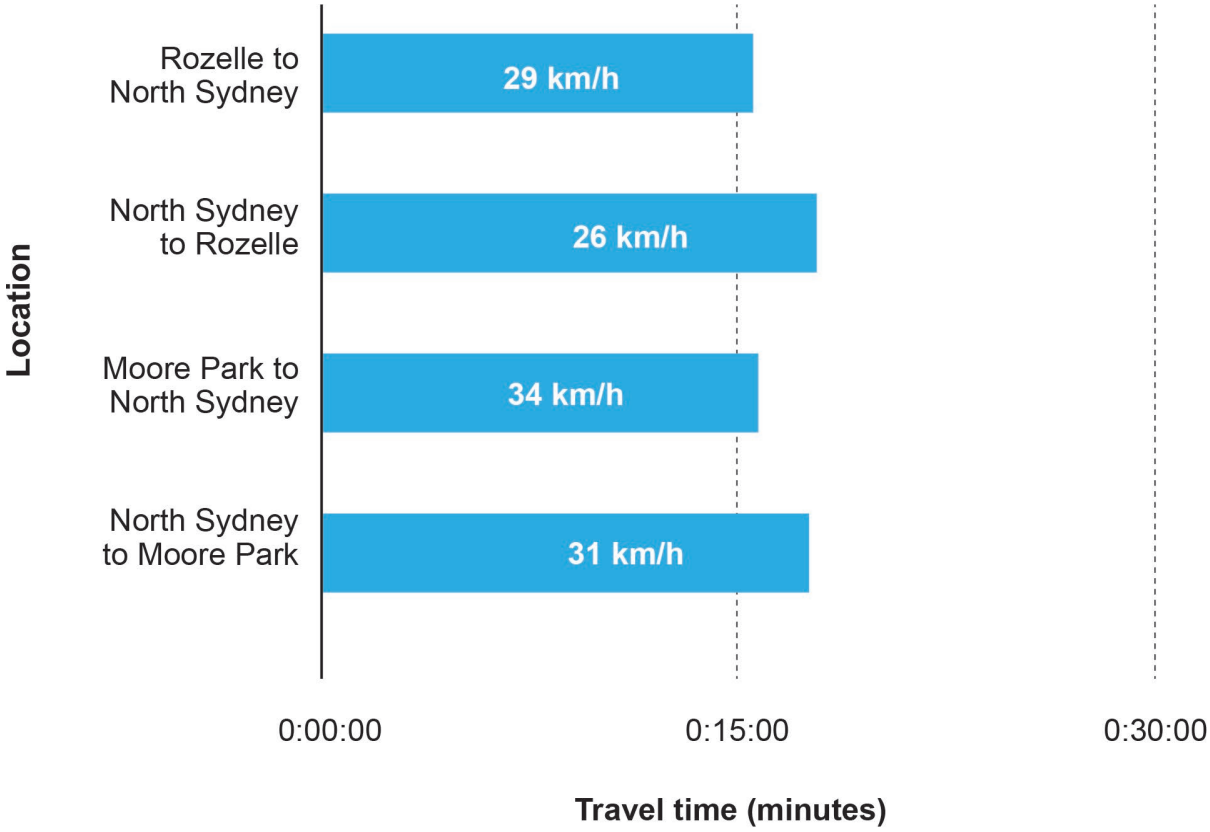


Figure 8-2 2016 AM peak travel times and average speeds along key corridors

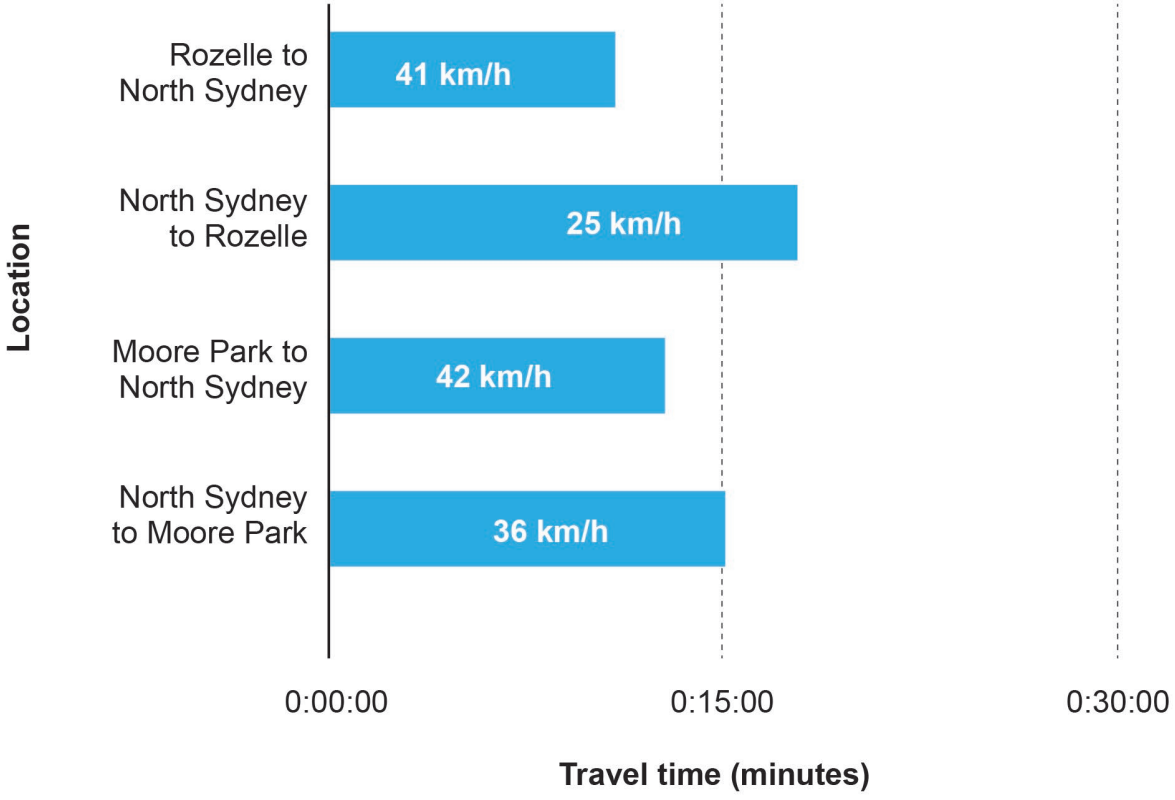


Figure 8-3 2016 PM peak travel times and average speeds along key corridors

Heavy vehicles and freight

The movement of heavy vehicles across Sydney Harbour is limited by capacity constraints and congestion, particularly during peak periods. Current freight across Sydney Harbour is limited to the following motorway and arterial roads:

- Sydney Harbour Bridge
- Sydney Harbour Tunnel
- ANZAC Bridge
- Victoria Road corridor (including the Iron Cove Bridge, Gladesville Bridge and Fig Tree Bridge).

Truck movements across Sydney Harbour in 2016 were relatively evenly distributed across the existing crossings. However, B-doubles are not permitted to travel on the Sydney Harbour Bridge and dangerous goods vehicles are not permitted through the Sydney Harbour Tunnel. Gladesville Bridge is an unrestricted B-double alternative route to these crossings. Partially due to the high traffic delays on the Sydney Harbour Bridge and through the Sydney Harbour Tunnel, the majority of heavy vehicle travel across both these routes occurs outside peak periods.

8.3.2 Rozelle and surrounds

Description

Transport network

The existing transport network within Rozelle and the surrounding areas is shown in Figure 8-4 and includes the suburbs of Balmain, Birchgrove and Rozelle.

Traffic volumes and patterns

A summary of existing peak hour traffic volumes for Rozelle and surrounds in the AM peak (between 7am and 9am on a normal working weekday) and PM peak (between 4pm and 6pm on a normal working weekday) is provided in Table 8-5.

Table 8-5 Existing peak hour traffic volumes – Rozelle and surrounds

Road	Direction	AM peak		PM peak	
		Volume (vehicles)	Heavy vehicle percentage	Volume (vehicles)	Heavy vehicle percentage
Rozelle and surrounds					
City West Link west of The Crescent	Eastbound	2630	4%	2350	3%
	Westbound	1660	7%	2140	6%
James Craig Road south of The Crescent	Eastbound	260	5%	120	3%
	Westbound	140	5%	140	3%
The Crescent west of Victoria Road	Eastbound	3590	5%	2950	3%
	Westbound	2390	6%	3090	5%
Victoria Road north of The Crescent	Northbound	2090	6%	3710	5%
	Southbound	4060	6%	2930	5%

Public transport network

A summary of the public transport network that services Rozelle and surrounding areas is provided in Table 8-6.

Table 8-6 Public transport network in Rozelle and surrounding suburbs

Public transport mode	Description of services in Rozelle and surrounds
Light rail	The L1 Dulwich Hill Line provides direct connections to Pyrmont, Leichhardt, and Central and Dulwich Hill stops. The Rozelle Bay light rail stop is located near the intersection of City West Link and The Crescent. The Lilyfield light rail stop is located adjacent to the intersection of the City West Link and Catherine Street.
Ferry	Ferry services are provided from wharves located in Balmain, Balmain East and Birchgrove. These wharves are served by the F3 Parramatta River Line that provides direct connections to Circular Quay, Barangaroo, McMahons Point, Milsons Point and locations along the Parramatta River. Balmain East wharf is also served by the F4 Cross Harbour Line that provides direct connections to Circular Quay, Barangaroo, McMahons Point, Milsons Point, Pyrmont Bay, Rose Bay and Watsons Bay.
Bus	Within Rozelle and surrounding suburbs, there are 26 unique routes and about 1700 individual timetabled bus services on weekdays, 1000 services on Saturdays and 800 services on Sundays and public holidays. Bus services are operated by Sydney Buses and Transit Systems Sydney. Victoria Road and ANZAC Bridge are major bus corridors for services to the Sydney CBD, the Inner West, Ryde, Macquarie Park and Parramatta.

Legend

Road classification

- Motorway
- Major arterial road
- Sub-arterial road
- Collector road
- Local road

Public transport infrastructure

- Heavy rail
- Light rail
- Sydney Metro City & Southwest – Chatswood to Sydenham (under construction)
- Train station
- Light rail stop
- Ferry wharf
- Bus stops on key routes

Figure 8-4 Existing transport network within Rozelle and surrounds

Active transport network

The pedestrian network in the Rozelle area is well developed with footpaths provided along most of the roads and controlled crossings at signalised intersections. High pedestrian activity associated with the Rozelle and Balmain local town centres occurs along Victoria Road and Darling Street, respectively. Two active transport bridges span Victoria Road; one about 90 metres north of The Crescent and the other about 70 metres east of The Crescent.

The cycle network in the Rozelle area consists of a mixture of off-road shared pedestrian and cyclist paths and on-road cycle routes on local and collector roads. The regional strategic cycle network provides connections between the area surrounding Rozelle and the Sydney CBD, North Sydney, Redfern, Green Square, Sydney Airport, Pyrmont, Surry Hills, Haberfield and Summer Hill.

Off-road shared user paths are provided at the following locations:

- Victoria Road between The Crescent and Drummoyne
- ANZAC Bridge
- Along the foreshores of Iron Cove, Rozelle Bay and Blackwattle Bay.

A shared user bridge connecting Lilyfield Road and Victoria Road with Brenan Street at Lilyfield and The Crescent at Annandale would also be provided as part of the approved M4–M5 Link.

Existing road performance

Road network performance

City West Link and Victoria Road through Rozelle are two of the busiest road corridors in Sydney, providing access to and from the Sydney CBD for people living and working in Sydney's West, Inner West and Lower North Shore. Most of the traffic travelling through this corridor is to and from the Sydney CBD or to the Lower North Shore and Northern Beaches via ANZAC Bridge, Western Distributor and the Sydney Harbour Bridge.

Due to the high traffic volumes and highly directional nature of traffic flow along Victoria Road and City West Link during peak periods, the Victoria Road corridor has active traffic management infrastructure to change traffic capacities inbound and outbound during peak periods.

Key features of the tidal flow traffic facilities along the Victoria Road corridor include:

- A moveable central median between Seymour Street in Drummoyne and Iron Cove Bridge
- A kerbside bus lane during the AM peak period between Seymour Street in Drummoyne and Iron Cove Bridge, as well as between Iron Cove Bridge and Darling Street in Rozelle
- Dynamic lane management of right turn lanes at Darling Street and The Crescent
- A right turn ban from Robert Street to Victoria Road in the AM peak.

Congestion and delays on Victoria Road and City West Link are highest during the AM peak period, with the key constraints to traffic flows headed to the Sydney CBD on Victoria Road at Terry Street, Darling Street and Robert Street in Rozelle where right turns are not permitted, and on City West Link at Balmain Road, Catherine Street and The Crescent. The two-lane grade-separated eastbound movement on The Crescent at Victoria Road is also a major constraint along with the merge arrangement for these two lanes into the accompanying two lane eastbound movement from Victoria Road, which limits the volume of eastbound traffic on the ANZAC Bridge. East of ANZAC Bridge, merging and weaving activity over a short distance to Pyrmont Bridge Road, Bathurst Street and Western Distributor results in congestion and reduced speeds.

In the PM peak, the main constraint for westbound traffic is the right turn movement from ANZAC Bridge to Victoria Road, where queues are frequently observed across the ANZAC Bridge and onto the Western Distributor. Westbound congestion and queuing is also observed on the approaches to Evans Street in Rozelle, where steep grades slow down buses travelling in the kerbside lane,

and at Darling Street. Northbound traffic on The Crescent also experiences high delays due to the limited capacity of the intersection of Johnston Street and The Crescent.

East of Rozelle, ANZAC Bridge and the Western Distributor form the main motorway network on the western side of the Sydney CBD, facilitating high traffic demands for travel both into and through the Sydney CBD and further north across Sydney Harbour to North Sydney and the Northern Beaches. The ANZAC Bridge operates close to capacity in both directions during peak periods with a high degree of weaving, merging and diverging activity occurring on the Western Distributor around the Bathurst Street and King Street exits and the weave movement from the Western Distributor to the Bradfield Highway which occurs over a short 200 metre distance, all of which generate delay and reduce capacity through this section of the motorway.

Intersection performance

Modelled intersection performance under 2016 travel demands is provided in Table 8-7. The assessment indicates that the following intersections perform at an unsatisfactory level of service (LoS E or F):

- Victoria Road and Darling Street
- Victoria Road and Gordon Street
- Victoria Road and Robert Street
- Victoria Road and The Crescent
- The Crescent and Johnson Street
- City West Link and Balmain Road.

These intersections reflect the key constraints along Victoria Road and City West Link, where high through-traffic volumes conflict with right turning or cross-street traffic. The majority of major intersections along Victoria Road are at or close to their capacity during peak periods.

Table 8-7 Modelled intersection performance in Rozelle and surrounds (AM and PM peaks in 2016)

Intersection	AM peak (8am–9am) LoS (average delay in seconds)	PM peak (5pm–6pm) LoS (average delay in seconds)
Victoria Road/Darling Street	F (85)	F (75)
Victoria Road/Evans Street	D (43)	D (48)
Victoria Road/Gordon Street	B (21)	E (63)
Victoria Road/Robert Street	D (49)	F (>100)
Victoria Road/The Crescent	B (27)	F (88)
The Crescent/James Craig Road	A (10)	B (25)
The Crescent/City West Link	B (21)	D (55)
The Crescent/Johnston Street	C (42)	F (89)
City West Link/Catherine Street	C (38)	B (15)
City West Link/Balmain Road	F (72)	D (52)

Note: Cells shaded in grey denote an unsatisfactory LoS E or F.

8.3.3 Birchgrove to Waverton (Sydney Harbour crossing)

The project includes the crossing of Sydney Harbour, extending from Birchgrove in the south to Waverton in the north. The two maritime areas which have been assessed for the project include the inner and outer parts of Sydney Harbour and are described as follows:

- Outer Sydney Harbour: a wide waterway between Sydney Heads, the Opera House at Bennelong Point and Admiralty House at Kirribilli Point
- Inner Sydney Harbour: a high traffic area between outer Sydney Harbour, Yurulbin Point and Manns Point. The harbour includes Circular Quay, Darling Harbour and the Bays Precinct.

The outer harbour is deep and wide with water depths exceeding 15 metres below chart datum (the zero-reference point from which tidal heights and chart soundings are calculated) between South Head and North Head, and about eight metres below chart datum between Grotto Point and Middle Head. The inner harbour is generally narrower with more variable depths. Water depths are typically between 12 and 14 metres below chart datum.

The crossing location is within a well-defined channel with relatively steep banks. The water depths along the crossing average about 15 metres below chart datum. The navigable width from Yurulbin Point to Balls Head Reserve is about 620 metres.

Balls Head Bay, Berrys Bay and Snails Bay are generally about five to 10 metres below chart datum, and increase in depth towards the head of the bays. Gore Bay provides deep-water access close to the shoreline with water depths about 10 to 15 metres below chart datum.

Users of Sydney Harbour can be divided into three main groups: recreational users, community groups and clubs; commercial operators; and government organisations. The user groups are discussed in more detail below and shown in Figure 8-5 and Figure 8-6.

Recreational users, community groups and clubs

Sydney Harbour supports a wide range of water based recreational activities. Key community groups and clubs using Sydney Harbour include:

- Paddle craft clubs
- Fishing clubs
- Sailing and yacht clubs
- Scout and guide groups
- Marine Rescue NSW.

Facilities supporting recreational activities include destination marinas with high quality access to services and amenities for recreational boat users, boat ramps and dry dock facilities. Key facilities are shown in Table 8-8.

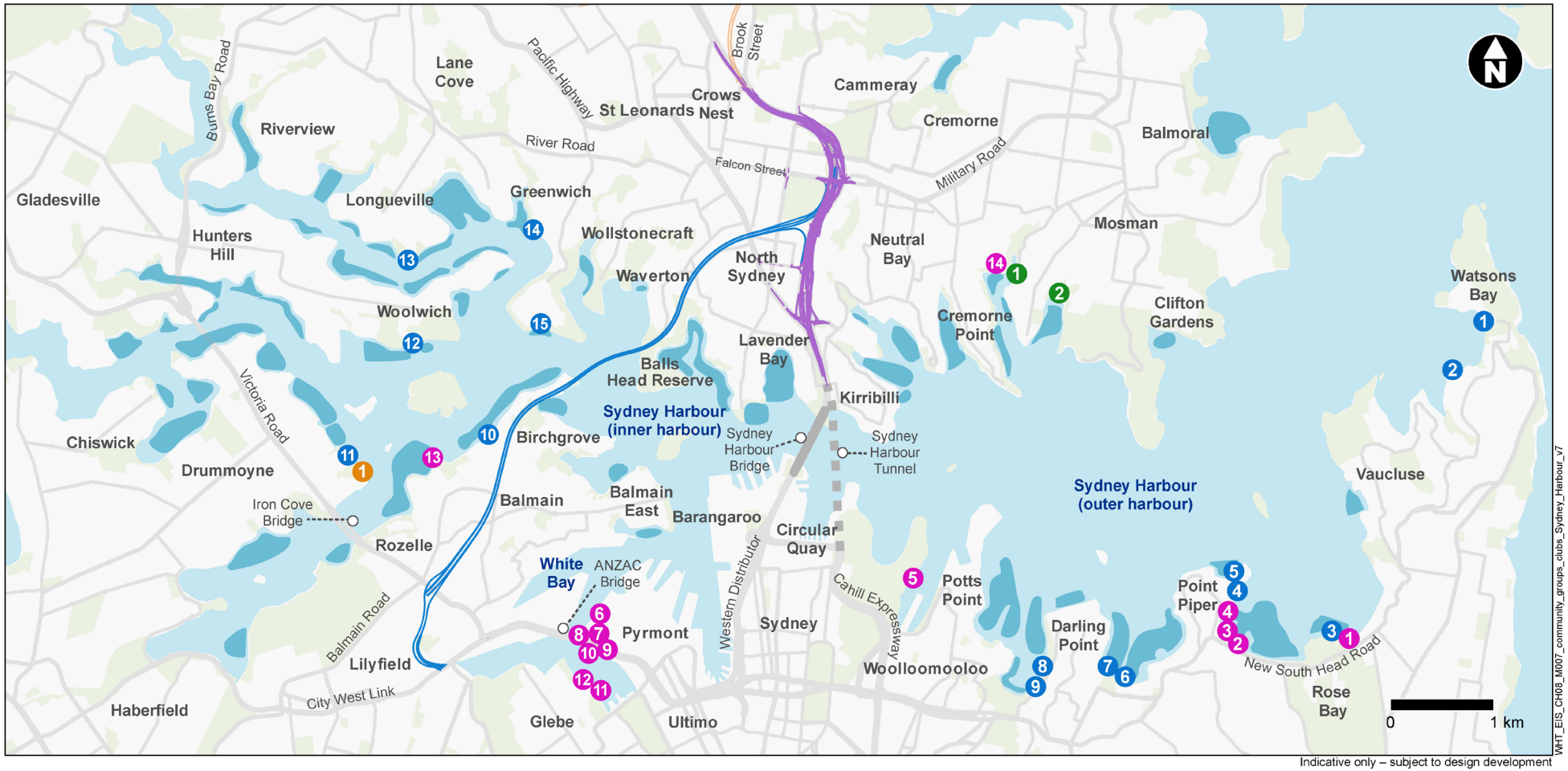
Table 8-8 Marinas, boat ramps and dry dock facilities within Sydney Harbour

Facility	Location
Marinas	• Private marinas in Birchgrove, Rozelle and Wollstonecraft • Balmain Marina and Camerons Marina in Balmain • Birkenhead Point Marina in Birkenhead • Gladesville Bridge Marina in Drummoyne • D'Albora Marinas Cabarita Point in Cabarita • Pulpit Point Marina in Hunters Hill • Woolwich Marina in Woolwich • Sydney Superyacht Marina in Rozelle • Mosman Bay Marina in Mosman • Rose Bay Marina in Rose Bay • Point Piper Marina and Royal Yacht Club Marina in Point Piper • Double Bay Marina in Double Bay • D'Albora Marina and Cruising Yacht Club of Australia (CYCA) Marina in Darling Point.
Boat ramps and dry dock facilities	• Small boat ramps in Lilyfield, Cabarita Park and Greenwich • Taplin Park boat ramp in Drummoyne • Bayview Park boat ramp in Concord • Blaxland Road boat ramp in Rhodes • Silverwater Park boat ramp in Silverwater • Wharf Road boat ramp in Ermington • Kissing Point boat ramp in Putney • Woolwich boat ramp in Woolwich • Burns Bay Reserve boat ramp in Riverview • Lyne Park boat ramp in Rose Bay • Sydney Boathouse dry boat storage in Rozelle • Sydney Harbour Boat Storage in Balmain.

Moorings are also available for recreational users as shown in Figure 8-5.

A number of major paddling, sailing and swimming events are carried out annually in Sydney Harbour and include:

- Yacht races such as the Sydney to Hobart Yacht Race on Boxing Day, Sydney Harbour Regatta, Sail Sydney and JJ Giltinan 18 foot skiff regatta
- Open water swimming events in late January including the Optus Swim Sydney Harbour and Sydney Harbour Splash
- Paddling events in late February including the Ocean Paddler and Outrigger Race.



Indicative only – subject to design development

Legend

Operational features

- Western Harbour Tunnel
- Warringah Freeway Upgrade

Connecting projects

- Beaches Link

Sailing and yacht clubs

1. Vaucluse Yacht Club
2. Vaucluse Amateur 12ft Sailing Club
3. Woollahra Sailing Club
4. Royal Motor Yacht Club of NSW
5. Royal Prince Edward Yacht Club
6. 18 Footers Sailing Club, Double Bay
7. Double Bay Sailing Club
8. RAN Sailing Association
9. Cruising Yacht Club of Australia (CYCA)
10. Balmain Sailing Club
11. Drummoyne Sailing Club
12. Hunters Hill Sailing Club
13. Lane Cove 12 Foot Skiff Sailing Club
14. Greenwich Flying Squadron
15. Greenwich Sailing Club
16. Royal Sydney Yacht Squadron
17. Sydney Flying Squadron
18. Sydney Amateur Sailing Club

Paddle craft clubs, tours and hire centres

1. OzPaddle Rose Bay
2. Bondi Outrigger Canoe Club
3. Kayaking Tours Sydney
4. Point Piper Kayak Centre
5. OzPaddle Woolloomooloo Bay
6. Blackwattle Bay Dragon Boat Club
7. Acca Dragon Boat Racing Team
8. Sydney Tsunami Dragon Boat Club Inc.
9. NAGA Spirit Dragon Boat Club
10. Sloths Dragon Boat Club
11. Glebe Rowing Club
12. Sydney University Boat Club
13. Balmain Rowing Club
14. Mosman Rowing Club

Sea scout and guide groups

1. Mosman Sea Scouts
2. Clifton Gardens Sea Scouts

Marine rescue

1. Marine Rescue Port Jackson

Mooring locations

Figure 8-5 Community groups and clubs in Sydney Harbour

Commercial operations within Sydney Harbour

Cruise and tanker traffic

Sydney Harbour is an important destination for cruise ships and is the only port in Australia with two dedicated cruise facilities; the Overseas Passenger Terminal at Circular Quay and White Bay Cruise Terminal in Balmain. The Overseas Passenger Terminal is Sydney's primary cruise ship terminal and is supported by the White Bay Cruise Terminal when fully occupied. The White Bay Cruise Terminal also services small cruise ships that can pass under the Harbour Bridge.

Berths are also provided at Glebe Island, White Bay and Gore Cove (private facilities). The Sydney Harbour port precinct focused around Glebe Island and White Bay accommodates dry bulk imports, general cargo, the cruise industry and common user berth movements. Common user berth movements include refuelling activities, servicing marine construction, emergency and planned maintenance, and facilitating major harbour events and functions. There is also a fuel terminal at Gore Cove which is an important importation facility supplying fuel to the Sydney and NSW markets. The facility also fuels bunkering barges that service White Bay (including the cruise terminal), Glebe Island and the Overseas Passenger Terminal. About 80 tanker movements are expected at the terminal each year; however, numerous additional movements of bunkering barges may occur. Gore Bay fuel terminal has a restricted area, which includes all water within 100 metres from the wharf or 50 metres from a tanker berthed at the terminal.

White Bay and Glebe Island form part of the Bays Precinct. This precinct consists of the waterways and foreshores of Johnstons Bay, White Bay, Rozelle Bay and Blackwattle Bay. The Bays Precinct plays an important role in supporting Sydney Harbour as a working harbour, and accommodates maritime uses from the public and private sectors. These include Sydney Fish Markets, Transport for NSW, and the Sydney Superyacht Marina. All vessels access Rozelle Bay and Blackwattle Bay through the swing section of Glebe Island Bridge and underneath the ANZAC Bridge.

Captain Cook Cruises operates a Lane Cove to City ferry service, which stops at Birchgrove Wharf during private school terms only; twice in the morning and twice in the evening. This line operates within the inner harbour Monday to Friday, with six services operating in the morning and three services in the evening.

Commercial fishing

Commercial fishing is banned in Sydney Harbour, including the Parramatta River and connected tidal waterways. The commercial fishing fleet in Sydney is primarily located in Blackwattle Bay and would generally fish offshore.

Water taxis, charter companies and boat storage facilities

Water taxi and fishing charter companies operate in Sydney Harbour and its estuaries. Blackwattle Bay is a designated berthing area for a large number of charter vessels. A number of boat storage (moorings, dry dock facilities and marinas) and boat launching facilities are located around Sydney Harbour and its estuaries.

Government operations within Sydney Harbour

Harbour City Ferries

Harbour City Ferries is the operator of Sydney Ferries on behalf of the NSW Government. Two ferry routes traverse Sydney Harbour close to the proposed immersed tube tunnel crossing. Route F3 travels between Circular Quay and Parramatta, and route F8 travels between Circular Quay and Cockatoo Island. The ferries operate between 6am and 8pm, seven days a week. The F3 route (Parramatta to Circular Quay) completes 100 trips during weekdays, and the F8 route (Cockatoo Island to Circular Quay) completes 50 trips during the same period.

Royal Australian Navy

HMAS Waterhen is located on the western side of Balls Head in the inner harbour. The facility is the Royal Australian Navy's lead establishment for Mine Warfare including Australia's Mine Countermeasures Force and Clearance Diving Branch. The facility includes two wharves, a small boat jetty and boat ramp, with numerous berthed vessels. HMAS Waterhen has a restricted area demarcated by yellow buoys within Balls Head Bay.

Water Police, Transport for NSW and Department of Planning, Industry and Environment (Regions, Industry, Agriculture & Resources)

The NSW Police Marine Area Command is located in Camerons Cove, immediately east of White Bay. The Marine Area Command is the primary facility in Port Jackson and services Port Jackson and NSW waters up to 200 nautical miles from the coast.

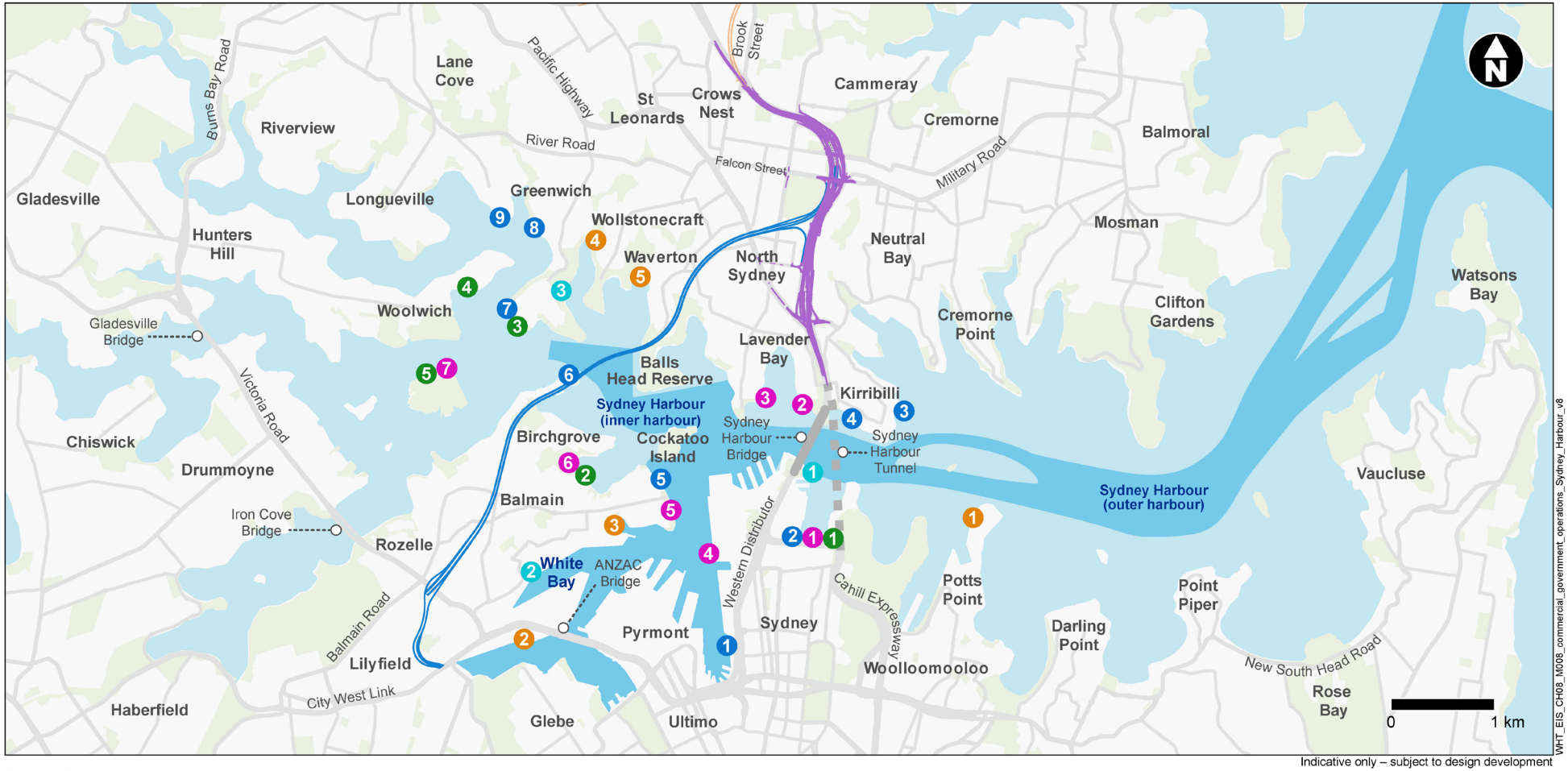
The maritime division of Transport for NSW is based at Rozelle Bay. Transport for NSW Boating Safety Officers are employed to patrol discrete regions throughout NSW to ensure compliance of waterway users with relevant legislation. The Department of Planning, Industry and Environment (Regions, Industry, Agriculture & Resources) office for the Sydney North Region is located in Wollstonecraft, on the eastern side of Gore Bay. The facility comprises a hardstand area and two small finger jetties.

Figure 8-6 shows the Sydney Harbour port precinct, the main shipping channels through the harbour and the commercial and government operations within Sydney Harbour.

Navigation restrictions

Navigation restrictions that apply to vessels travelling in the vicinity of the project include:

- Gore Cove fuel terminal – Vessels must be at least 100 metres from the wharf face or 50 metres from a tanker berthed at the terminal
- HMAS Waterhen – Vessels are required to keep clear of the facility by staying outside the marked area by yellow buoys
- All land and structures including moorings and dolphin berths at Snails Bay – Vessels travelling at more than six knots are required to maintain a distance of 30 metres from vessels, land or structures
- Sydney Harbour Bridge transit zone between Millers Point and Blues Point to the west, extending to between Kirribilli Point and Bennelong Point to the east – Vessels must not exceed 15 knots in the transit zone and they are not permitted to stop, anchor or drift
- Darling Harbour speed limit area, upstream of a line between Barangaroo Point and Balmain East Ferry Wharf – A speed limit of eight knots is imposed and is reduced to four knots upstream of ANZAC Bridge and upstream of King Street Wharf
- Waters between a line from Inner South Head to Inner North Head – A speed limit of 12 knots is imposed for vessels exceeding 30 metres
- Waters between a line from the stone pillar at Bradleys Head to Hermit Point – A speed limit of 12 knots is imposed for vessels exceeding 30 metres
- Waters between a line from Balls Head to Ballast Point – A speed limit of 10 knots is imposed for vessels exceeding 30 metres
- Waters upstream of a line between Balls Head and Ballast Point – A speed limit of six knots is imposed for vessels exceeding 30 metres
- Aquatic events – Additional restrictions may be imposed by an aquatic event such as a race, competition or exhibition, and an aquatic licence issued by Transport for NSW may be required for organised activities on navigable waters that restrict the availability of those waters for normal use by the public. Transport for NSW may elect to establish an exclusion zone around the activity.



Legend

Operational features
- Warringah Freeway Upgrade
- Western Harbour Tunnel

Connecting projects
- Beaches Link

Captain Cook Cruises Lane Cove to city ferry service wharves
1. Darling Harbour
2. Circular Quay
3. Kirribilli
4. North Sydney
5. Balmain East Wharf
6. Birchgrove
7. Greenwich Point
8. Greenwich Wharf
9. Northwood

Harbour City Ferries (F3) Parramatta River ferry service wharves
1. Circular Quay
2. Milsons Point
3. McMahons Point
4. Barangaroo
5. Balmain East
6. Balmain
7. Cockatoo Island

Harbour City Ferries (F8) Cockatoo Island Ferries
1. Circular Quay
2. Balmain
3. Greenwich Point
4. Woolwich
5. Cockatoo Island

Cruise tanker and bulk shipping terminals
1. Overseas Passenger Terminal
2. White Bay and Glebe Island
3. Gore Bay Terminal

Government organisations
1. H.M.A.S Kuttabul (Garden Island)
2. Transport for NSW
3. NSW Police Marine Area Command
4. Department of Planning, Industry and Environment (Regions, Industry, Agriculture & Resources)
5. H.M.A.S Waterhen

Shipping channel

Figure 8-6 Commercial and government operations in Sydney Harbour

8.3.4 Warringah Freeway and surrounds

Description

Transport network

The existing transport network within the Warringah Freeway and surrounds area is shown in Figure 8-7 and includes the suburbs of Cammeray, Neutral Bay, North Sydney and Waverton.

Traffic volumes and patterns

A summary of existing peak hour traffic volumes for the Warringah Freeway and surrounds in the AM peak (between 7am and 9am on a normal working weekday) and PM peak (between 4pm and 6pm on a normal working weekday) is provided in Table 8-9.

Table 8-9 Existing peak hour traffic volumes – Warringah Freeway and surrounds

Road	Direction	AM peak		PM peak	
		Volume (vehicles)	Heavy vehicle percentage	Volume (vehicles)	Heavy vehicle percentage
Warringah Freeway and surrounds					
Pacific Highway south of Walker Street	Northbound	2100	4%	1410	11%
	Southbound	380	13%	580	6%
Pacific Highway south of Bay Road	Northbound	690	8%	800	7%
	Southbound	1100	7%	950	3%
Bay Road west of Pacific Highway	Eastbound	230	2%	260	1%
	Westbound	380	4%	280	2%
Berry Street east of Walker Street	Eastbound	1650	7%	2390	4%
	Westbound	-	-	-	-
Falcon Street east of Miller Street	Eastbound	1250	2%	1350	6%
	Westbound	1170	6%	1110	5%
Ridge Street east of Miller Street	Eastbound	330	5%	130	2%
	Westbound	160	9%	260	4%
Miller Street north of Ernest Street	Northbound	470	6%	730	8%
	Southbound	1050	4%	1060	3%

Road	Direction	AM peak		PM peak	
		Volume (vehicles)	Heavy vehicle percentage	Volume (vehicles)	Heavy vehicle percentage
Ernest Street east of Miller Street	Eastbound	1070	4%	1380	4%
	Westbound	1050	1%	870	2%
Ernest Street west of Merlin Street	Eastbound	650	3%	2000	1%
	Westbound	2070	1%	990	1%
Blue Street south of Pacific Highway	Northbound	330	3%	500	1%
	Southbound	290	3%	220	1%
Arthur Street north of Pacific Highway	Northbound	800	2%	610	1%
	Southbound	-	-	-	-
Alfred Street north of Mount Street	Northbound	40	9%	30	0%
	Southbound	1420	1%	730	3%
Falcon Street west of Merlin Street	Eastbound	2330	7%	2910	5%
	Westbound	3140	6%	2110	8%
Walker Street north of Pacific Highway	Northbound	830	3%	650	2%
	Southbound	290	2%	360	3%
Brook Street south of Merrenburn Avenue	Northbound	720	9%	1660	2%
	Southbound	2070	2%	1020	6%

Public transport network

The Warringah Freeway and surrounds area is readily accessible via public transport.

Heavy rail services are provided at Milsons Point, North Sydney, Waverton and Wollstonecraft railway stations, which are located on the T1 North Shore, and T9 Northern Lines. A new station as part of Sydney Metro City & Southwest is under construction in North Sydney (Victoria Cross station) and is expected to be operational in 2024.

The Warringah Freeway and surrounds area is a major thoroughfare for buses including services operating along the Warringah Freeway, Military Road, Miller Street and the Pacific Highway.

The area is also serviced by ferry, with ferry wharves located at McMahons Point, Milsons Point, Kirribilli, North Sydney, Neutral Bay and Kurraba Point.

Active transport network

The pedestrian network in the Warringah Freeway and surrounds area is well developed with footpaths provided along most roads and controlled crossings at signalised intersections. Pedestrians are prohibited from walking along the Warringah Freeway. High pedestrian activity associated with retail and commercial activities occurs within North Sydney CBD, with schools located west of the Pacific Highway and along Miller Street, and people carrying out leisure and exercise activities in and near Balls Head Reserve.

The cycle network in the Warringah Freeway and surrounds area consists mostly of on-road cycle routes on local, collector and sub-arterial roads.

The Warringah Freeway presents a significant barrier to east–west movements for pedestrians and cyclists, with crossings available at select locations. Based on pedestrian and cyclist surveys carried out for the project, Mount Street was identified as the most used crossing for pedestrians due to its proximity to North Sydney CBD, while West Street was the most used crossing for cyclists. The Falcon Street underpass was identified as being under-utilised by pedestrians and cyclists during the week and on weekends.

Legend

Road classification

- Motorway
- Major arterial road
- Sub-arterial road
- Collector road
- Local road

Public transport infrastructure

- Heavy rail
- Tunnel
- Sydney Metro City & Southwest – Chatswood to Sydenham (under construction)
- Train stations
- Ferry wharves
- Bus stops on key routes

Figure 8-7 Existing transport network within the Warringah Freeway and surrounds area

Existing road performance

Road network performance

The Warringah Freeway is the busiest section of motorway in NSW, with congestion and delays highest during the AM peak period, particularly for southbound traffic with queues extending as far north as the Miller Street interchange. During the PM peak, queuing and congestion is frequently observed on the northbound off ramp to Falcon Street eastbound.

Queuing and congestion are also frequently observed on connecting roads within the North Sydney CBD area, to the west of the Warringah Freeway.

Intersection performance

Modelled intersection performance under 2016 travel demands is provided in Table 8-10. The assessment indicates that the following intersections perform at an unsatisfactory level of service (LoS F) during the AM peak:

- Mount Street and Arthur Street
- Clark Road and High Street.

The intersection of Mount and Arthur Street is the primary western access to the motorway network, where traffic heading to the Sydney Harbour Bridge main deck (Bradfield Highway) and Cahill Expressway lanes converges from Berry Street and Pacific Highway during the AM peak.

The intersection of Clark Road and High Street is the primary eastern access to the Sydney Harbour Bridge Cahill Expressway lane where traffic from Kirribilli and Neutral Bay converge. Queues from the intersection of High Street and Alfred Street North occasionally extend back through this intersection.

Table 8-10 Modelled intersection performance in the Warringah Freeway and surrounds area (AM and PM peaks in 2016)

Intersection	AM peak (8am–9am) LoS (average delay in seconds)	PM peak (5pm–6pm) LoS (average delay in seconds)
Willoughby Road/Gore Hill Freeway interchange	A (11)	B (20)
Brook Street/Warringah Freeway on ramp	C (31)	B (16)
Brook Street/Warringah Freeway off ramp	C(30)	B (22)
Brook Street/Merrenburn Avenue	C (31)	A (12)
Amherst Street/West Street	A (6)	A (10)
Amherst Street/Miller Street	B (19)	B (15)
Miller Street/Warringah Freeway on ramp	A (<5)	A (6)
Miller Street/Warringah Freeway off ramp	A (13)	A (13)
Miller Street/Ernest Street	C (34)	C (31)
Miller Street/Falcon Street	C (35)	E (69)

Intersection	AM peak (8am–9am) LoS (average delay in seconds)	PM peak (5pm–6pm) LoS (average delay in seconds)
Ernest Street/Warringah Freeway on ramp	A (<5)	B (15)
Ernest Street/Warringah Freeway off ramp (off ramp in PM, on ramp in AM)	A (<5)	B (18)
Falcon Street/Warringah Freeway ramps (off ramp in PM, on ramp in AM)	C (38)	D (46)
Watson Street/Military Road	B (16)	C (29)
Military Road/Ben Boyd Road	A (13)	B (20)
Falcon Street/Merlin Street	B (17)	C (38)
Berry Street/Walker Street	C (32)	D (50)
Berry Street/Miller Street	C (30)	B (27)
Mount Street/Arthur Street	F (84)	C (32)
Mount Street/Walker Street	D (43)	C (31)
Pacific Highway/High Street/Arthur Street	D (53)	B (19)
Pacific Highway/Walker Street/Blue Street	D (53)	D (48)
Pacific Highway/Miller Street/Mount Street	D (52)	C (41)
Pacific Highway/Berry Street	A (9)	A (11)
Pacific Highway/Bay Road	B (21)	B (14)
Miller Street/McLaren Street	B (24)	B (17)
Miller Street/Ridge Street	C (39)	B (26)
Miller Street/Carlow Street	B (14)	C (29)
High Street/Clark Road	F (>100)	C (36)
High Street/Alfred Street	E (60)	B (18)
Mount Street/Alfred Street	B (24)	A (11)
Ernest Street/Ben Boyd Road	A (11)	B (16)
Pedestrian crossing at Military Road	A (<5)	B (20)

Note: Cells shaded in grey denote an unsatisfactory LoS E or F

8.3.5 Gore Hill Freeway and Artarmon

Description

Transport network

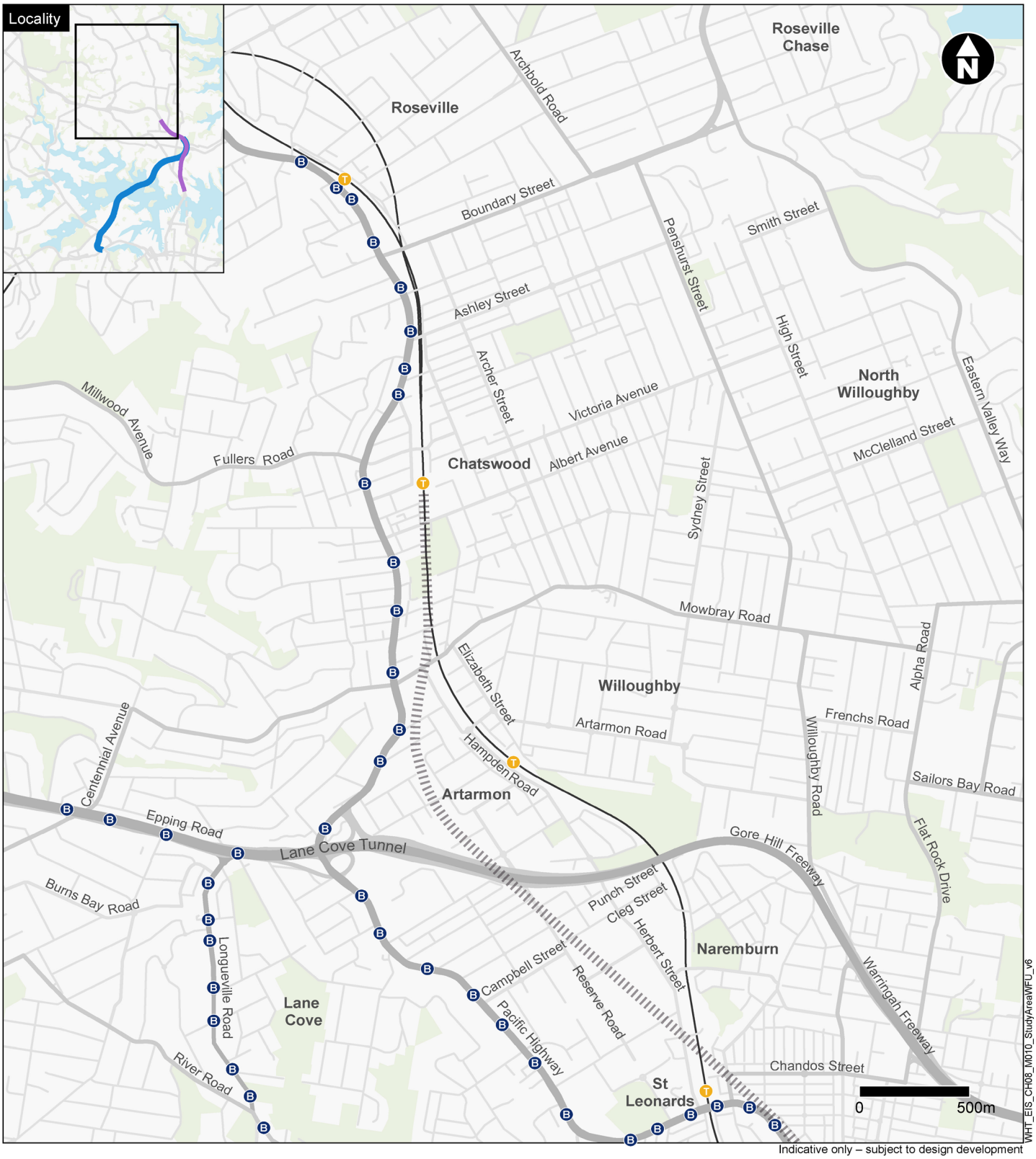
The existing transport network within the Gore Hill Freeway and Artarmon area is shown in Figure 8-8 and includes the suburbs of Artarmon, Crows Nest, St Leonards, Cammeray, Lane Cove, Naremburn and Willoughby.

Traffic volumes and patterns

A summary of existing peak hour traffic volumes for the Gore Hill Freeway and Artarmon in the AM peak (between 7am and 9am on a normal working weekday) and PM peak (between 4pm and 6pm on a normal working weekday) is provided in Table 8-11.

Table 8-11 Existing peak hour traffic volumes – Gore Hill Freeway and Artarmon

Road	Direction	AM peak		PM peak	
		Volume (vehicles)	Heavy vehicle percentage	Volume (vehicles)	Heavy vehicle percentage
Gore Hill Freeway and Artarmon					
Reserve Road north of Dickson Avenue	Northbound	520	8%	1140	1%
	Southbound	1210	3%	610	2%
Reserve Road north of Frederick Street	Northbound	320	10%	670	3%
	Southbound	690	3%	490	1%
Frederick Street east of Reserve Road	Eastbound	440	5%	560	1%
	Westbound	360	8%	420	5%
Herbert Street north of Frederick Street	Northbound	250	3%	440	1%
	Southbound	530	3%	500	2%
Cleg Street east of Herbert Street	Eastbound	110	1%	190	1%
	Westbound	120	2%	180	2%
Dickson Avenue east of Reserve Road	Eastbound	250	3%	150	0%
	Westbound	130	5%	30	2%
Reserve Road south of Barton Road	Northbound	350	3%	640	1%
	Southbound	470	2%	410	1%



Legend

Road classification

- Motorway
- Major arterial road
- Sub-arterial road
- Collector road
- Local road

Public transport infrastructure

- Heavy rail
- Sydney Metro City & Southwest – Chatswood to Sydenham (under construction)
- Train stations
- Bus stops on key routes

Figure 8-8 Existing transport network within the Gore Hill Freeway and Artarmon area

Public transport network

The Gore Hill Freeway and Artarmon area is readily accessible by public transport. Heavy rail services are provided at Artarmon and St Leonards railway stations, which are located on the T1 North Shore and T9 Northern Lines. A new station as part of Sydney Metro City & Southwest is under construction in Crows Nest and is expected to be operational in 2024.

The Gore Hill Freeway and Artarmon area is also a major thoroughfare for buses, including services operating along the Warringah Freeway, Gore Hill Freeway/Lane Cove Tunnel and the Pacific Highway.

Active transport network

The pedestrian network in the Gore Hill Freeway and Artarmon area is well-developed with footpaths provided along most roads and controlled crossings provided at signalised intersections. Pedestrians are prohibited from walking along the Gore Hill Freeway and Lane Cove Tunnel. However, a shared user path is provided adjacent to the southern side of the Gore Hill Freeway. High pedestrian activity occurs along Hampden Road within the vicinity of Artarmon railway station, around the commercial area of Artarmon, and around the health, educational and commercial land uses in St Leonards.

The cycle network in the Gore Hill Freeway and Artarmon area consists of a mix of off-road shared user paths and on-road cycle routes on local and collector roads.

Based on pedestrian and cyclist surveys carried out for the project, the shared user path adjacent to the southern side of the Gore Hill Freeway near Hampden Road in Artarmon was identified as being used by a high number of cyclists during the week, with lower volumes recorded on weekends. This can be attributed to the path forming part of a regional cycle route connecting Naremburn, Lane Cove and Macquarie Park, with the majority of cyclists likely to be commuting to and from work. Pedestrian volumes were low both during the week and at weekends.

Existing road performance

Road network performance

The Gore Hill Freeway connects the M2 Motorway corridor with the M1 Motorway corridor through Artarmon and Willoughby. Traffic volumes are highest heading southbound in the AM peak and northbound in the PM peak, as a result of trips heading into and out of central Sydney as well as local traffic from Lane Cove and Ryde.

The majority of traffic on Reserve Road travels to and from the Gore Hill Freeway, limiting capacity for the off ramps that often operate at or close to capacity during the AM peak. The intersection of Longueville Road and Epping Road is the primary surface road constraint in the corridor due to the high volumes of traffic travelling to and from Lane Cove and Riverview.

Bus priority is provided on Epping Road west of Longueville Road in the form of signal priority for westbound traffic at Longueville Road and continuous bus lanes on Epping Road. Signal priority for buses is also provided for eastbound buses on Longueville Road at Pacific Highway while eastbound buses on the Gore Hill Freeway use the 24-hour T2 transit lane that extends to Willoughby Road.

Intersection performance

Modelled intersection performance under 2016 travel demands is provided in Table 8-12. The assessment indicates that the intersection of Epping Road, Longueville Road and Parklands Avenue intersection is currently performing at an unsatisfactory level of service (LoS E) in the PM peak. This intersection has limited capacity due to the high volume of eastbound traffic that conflicts with right turn traffic from Longueville Road south. Delays on the eastern approach of this intersection are also exacerbated by buses stopping at the Lane Cove interchange, which block traffic turning left into Longueville Road.

Table 8-12 Modelled intersection performance in the Gore Hill Freeway and Artarmon area (AM and PM peaks in 2016)

Intersection	AM peak (8am–9am) LoS (average delay in seconds)	PM peak (5pm–6pm) LoS (average delay in seconds)
Epping Road/Longueville Road/Parklands Avenue	D (48)	E (63)
Longueville Road/Pacific Highway	C (42)	C (36)
Pacific Highway/Howarth Road/Norton Lane	A (7)	A (7)
Pacific Highway/Gore Hill Freeway interchange	B (23)	B (23)
Reserve Road/Gore Hill Freeway interchange	D (47)	C (29)
Reserve Road/Dickson Road	A (14)	B (19)
Reserve Road/Barton Road	A (11)	A (6)

Note: Cells shaded in grey denote an unsatisfactory LoS E or F

8.4 Assessment of potential impacts

During construction, the project would affect the surrounding road network as a result of the following:

- Construction vehicles using the surface road network, especially heavy vehicles transporting spoil
- Surface road works requiring temporary traffic, cyclist and/or pedestrian diversions, road occupation and temporary road closures
- Temporary changes to speed limits.

Construction impacts related to maritime traffic and transport are discussed in Section 8.4.2. Details of construction activities and the location and timing of construction works, including construction support site layouts and provision of construction worker parking, are presented in Chapter 6 (Construction work).

8.4.1 Rozelle and surrounds

Road network impacts

The anticipated routes to and from the construction support sites at Rozelle Rail Yards (WHT1), Victoria Road (WHT2), White Bay (WHT3) and Yurulbin Point (WHT4) are summarised in Chapter 6 (Construction work), along with the respective daily maximum construction vehicle volumes. Access to the Yurulbin Point construction support site (WHT4) would be via Sydney Harbour only, and would generate no land based construction traffic.

Intersection and midblock performance with construction traffic

The performance of intersections during AM and PM peaks within the Rozelle and surrounds area with the introduction of construction traffic would generally remain the same as under existing conditions. The following intersections would experience a temporary change in level of service:

- The Crescent/James Craig Road intersection would operate at capacity with or without construction vehicles during the AM peak. In the PM peak, the intersection operation would deteriorate from LoS D to LoS E with an increase in average vehicle delay of 13 seconds. Similar to the AM peak, the intersection is already at capacity without construction vehicles and this would experience a marginal decrease in performance with additional construction traffic
- Construction vehicles and provision of site access at Victoria Road/Wellington Street for the Victoria Road construction support site (WHT2) would have minimal impact on the overall performance of the intersection and would operate at a satisfactory level of service.

The intersection performance results for the road network operating under the worst case construction traffic scenario (2022) during the AM and PM peak periods are summarised in Table 8-13.

Table 8-13 Modelled intersection performance in Rozelle and surrounds (AM peak (8am-9am) and PM peak (5pm-6pm) during construction in 2022)

Intersection/peak period	Base case 2022 (without construction traffic)				Base case 2022 (with construction traffic)			
	Demand flow (vehicles per hour)	Average delay (seconds)	LoS	V/C	Demand flow (vehicles per hour)	Average delay (seconds)	LoS	V/C
City West Link/The Crescent								
AM peak	6720	90	F	>1	6860	>100	F	>1
PM peak	6380	24	B	0.8	6630	24	B	0.84
The Crescent/James Craig Road								
AM peak	6870	>100	F	>1	7000	>100	F	>1
PM peak	6270	48	D	1	6520	61	E	>1
Victoria Road/Wellington Street/Victoria Road construction support site access (WHT2)								
AM peak	5620	12	A	0.69	5660	13	A	0.69
PM peak	6180	14	A	0.67	6230	15	B	0.67

Note: Cells shaded in grey denote an unsatisfactory LoS E or F.

The midblock performance (level of service) during construction would be unchanged to the midblock performance under the base case at all locations except James Craig Road south of The Crescent in the eastbound direction, where the level of service would deteriorate during the AM and PM peaks, but would still operate with spare capacity and at a satisfactory level of service during construction. The midblock performance results for the road network operating under the worst-case construction traffic scenario (2022) during the AM and PM peak periods are summarised in Table 8-14.

Table 8-14 Modelled midblock performance in Rozelle and surrounds (AM peak (8am-9am) and PM peak (5pm-6pm) during construction in 2022)

Location/ direction	Capacity (PCU)	AM peak						PM Peak					
		Base case 2022 (without construction traffic)			Construction 2022 (with construction traffic)			Base case 2022 (without construction traffic)			Construction 2022 (with construction traffic)		
		Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS
City West Link west of The Crescent													
Eastbound	1900	2830	>1	F	2950	>1	F	2440	>1	F	2630	>1	F
Westbound	1900	1940	>1	F	2030	>1	F	2330	>1	F	2470	>1	F
James Craig Road south of The Crescent													
Eastbound	900	300	0.34	B	390	0.43	C	120	0.14	A	260	0.29	B
Westbound	1900	170	0.09	A	250	0.13	A	150	0.08	A	280	0.15	A
The Crescent west of Victoria Road													
Eastbound	1900	4420	>1	F	4460	>1	F	3110	>1	F	3170	>1	F
Westbound	1900	2970	>1	F	2970	>1	F	3280	>1	F	3280	>1	F
Victoria8-32 Road north of The Crescent													
Northbound	2900	2580	0.89	E	2640	0.91	E	3990	>1	F	4060	>1	F
Southbound	3900	4600	>1	F	4660	>1	F	3220	0.83	E	3290	0.84	E

Note: Cells shaded in grey denote an unsatisfactory LoS E or F.

Impacts on local roads and parking

James Craig Road is a local road that is accessible to general traffic from The Crescent and via Robert Street for authorised vehicles only. About 270 light vehicles and 350 heavy vehicles per day would access the White Bay construction support site (WHT3) from James Craig Road and Port Access Road, with haulage vehicles travelling on the internal road network within the Sydney Ports precinct. These traffic volumes would have a minor impact, and James Craig Road would continue to operate with spare capacity during construction as shown in Table 8-14.

The Victoria Road/Wellington Street intersection would be modified during construction, with an additional approach allowing vehicles to exit the Victoria Road construction support site (WHT2) onto Victoria Road southbound. This additional traffic would have minimal impact on Wellington Street as construction vehicles would be required to give way to vehicles turning left from Wellington Street when exiting the Victoria Road construction support site (WHT2) and would not conflict with vehicles turning right.

Car parking areas for construction workers would be provided at the White Bay construction support site (WHT3). Where on-site parking is not provided or where provision of on-site parking cannot accommodate the full construction workforce, the workforce would be required to park on the surrounding road network. The construction workforce would be encouraged to use public transport where feasible and reasonable to minimise the potential parking impacts on the road network, with key bus corridors including Victoria Road and ANZAC Bridge. In addition, the construction sites are close to the Rozelle Bay light rail stop.

The Yurulbin Park car park would be temporarily closed due to the operation of the Yurulbin Point construction support site (WHT4), resulting in the loss of about ten parking spaces. The surrounding local road network, including Louisa Road, could accommodate these lost parking spaces and therefore parking impacts would be minor and manageable.

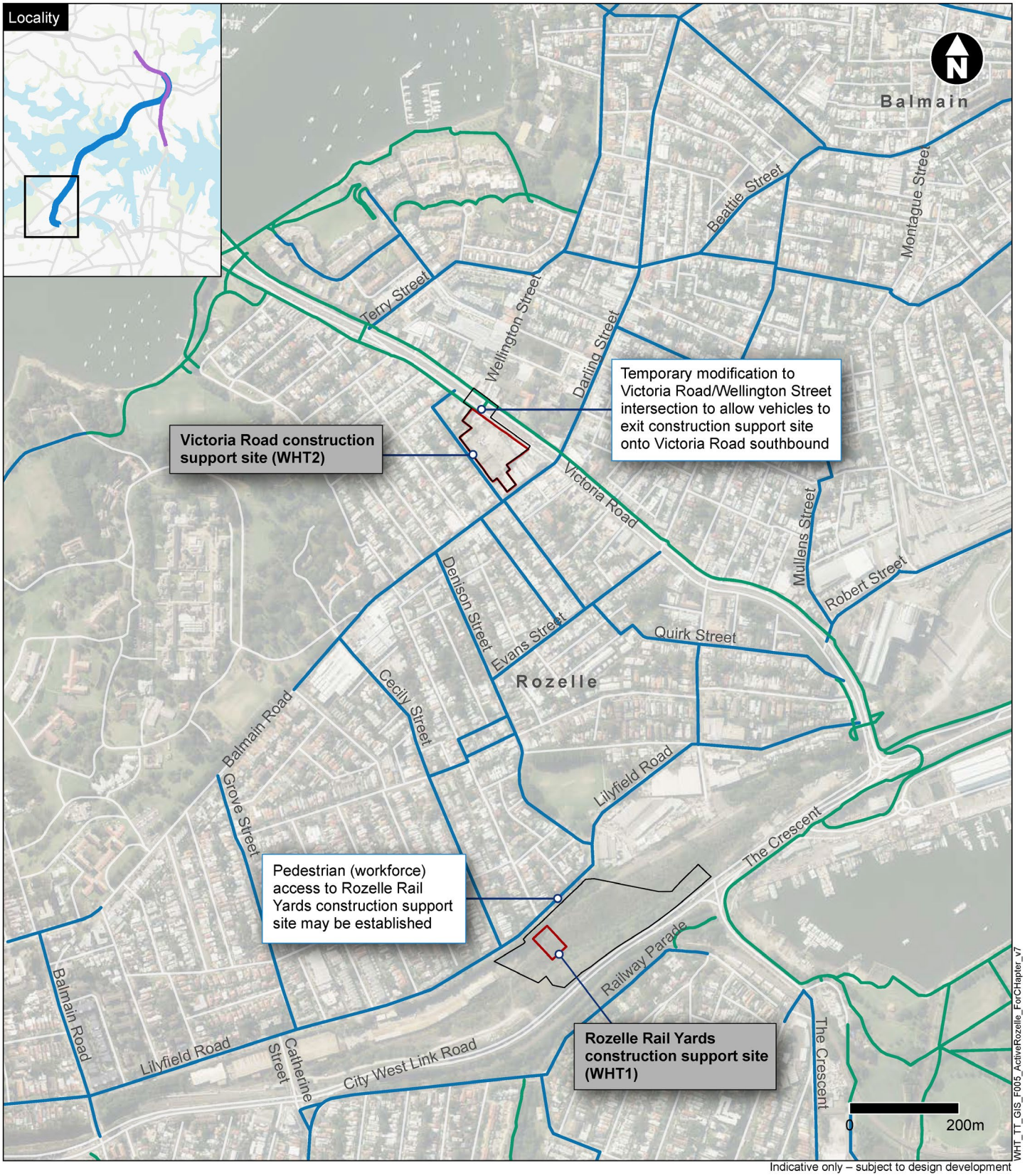
Impacts on public transport

Project construction would result in additional construction vehicles travelling on the road network around Rozelle which could increase bus travel times given the congested nature of networks in these areas. No direct or indirect impacts on light rail services are expected during construction.

Impacts on active transport

Potential impacts on the active transport network during construction are summarised in Figure 8-9.

The shared user paths on Victoria Road within the vicinity of the Victoria Road construction support site (WHT2) would be maintained throughout construction. Construction vehicles entering and exiting the site would give way to pedestrians and cyclists using the shared user path on the western side of Victoria Road. This would be facilitated through the modification of the traffic signals at the Victoria Road/Wellington Street intersection with a new south approach for construction vehicles, and controlled pedestrian and cyclist crossings across the site exit.



Legend

Construction features

- Construction support site boundary
- Construction footprint

Active transport infrastructure

- Existing off-road shared user path
- Existing on-road cycle path

Figure 8-9 Active transport impacts within Rozelle and surrounds during construction

8.4.2 Birchgrove to Waverton (Sydney Harbour crossing maritime movements and activities)

Overview of maritime movements and activities

During construction of the immersed tube tunnel, and establishment and operation of the construction support sites at White Bay (WHT3), Yurulbin Point (WHT4), Sydney Harbour south cofferdam (WHT5), Sydney Harbour north cofferdam (WHT6) and Berrys Bay (WHT7), there would be an increase in maritime traffic in the inner harbour. Daily maximum construction maritime traffic volumes and routes are summarised in Chapter 6 (Construction work).

The construction vessels would primarily include:

- Construction barges (including barges with cranes) for delivering material and removing tunnel spoil and dredged material, or for other construction activities
- Tugboats for manoeuvring barges
- Transport vessels for workers.

Construction vessel movements would be managed such that they would not interfere with port operations or the navigation of seagoing ships and ferries within Sydney Harbour, unless prior approval has been obtained from the Harbour Master.

Movement of spoil barges would also be controlled by the Port Authority NSW's Vessel Traffic Service, which provides continuous monitoring of marine vessels within Sydney Harbour.

The construction activities within Sydney Harbour would require the establishment of maritime speed restrictions around construction equipment. Changes to maritime speeds would result in increased transit time for recreational, commercial and government vessels which would need to pass through the construction works area in Sydney Harbour. The increased transit time would be relatively minor and unavoidable.

Maritime navigation impacts

Construction activities that would impact navigation in the inner harbour are shown in Figure 8-10 and include the following:

- Temporary closure of access to Birchgrove Ferry Wharf
- Provision of temporary moorings at Snails Bay
- Establishment and operation of the Yurulbin Point (WHT4) and Berrys Bay (WHT7) construction support sites
- Installation of Sydney Harbour south cofferdam (WHT5) and Sydney Harbour north cofferdam (WHT6)
- Dredging activities in preparation for the installation of immersed tube tunnels
- Up to seven partial closures of Sydney Harbour between Birchgrove and Berrys Bay for a period of up to 48 hours
- Barge movements to and from the project construction support sites
- Boat movements transporting the construction workforce.

Exclusion zones would be set up around the cofferdams at Birchgrove and Balls Head, thereby temporarily reducing navigation width. These zones would be marked by lit yellow buoys as specified by the Harbour Master, to clearly identify the exclusion zones and facilitate the safe passage of all vessels travelling within the vicinity of the cofferdams. Dredging activities would also restrict navigational movements. Impacts on vessels using Gore Cove would be minimised by ensuring that dredgers do not impede the channel during scheduled inbound and outbound trips.

The establishment of exclusion zones would reduce the operating width of Sydney Harbour at the construction location. Navigation impacts in the outer harbour would not be substantial, given the lower frequency of construction vessel movements and the increased space the outer harbour provides for manoeuvrability.

Simulation model

A model was prepared to simulate the transportation of the immersed tube tunnel elements and to identify any restrictions and towage requirements for the safe movement of vessels to and from berths in Glebe Island, White Bay and Gore Cove, past the project work areas in Glebe Island and White Bay, and between Birchgrove and Waverton. The model found that the transportation and placement of immersed tube tunnel elements in Sydney Harbour would be feasible and could be carried out safely based on the current methodology (refer to Chapter 6 (Construction works)). The model also found that the movement of vessels to and from berths in Glebe Island, White Bay and Gore Cove, past project work areas in Glebe Island and White Bay, and between Birchgrove and Waverton would be feasible and could be carried out safely.

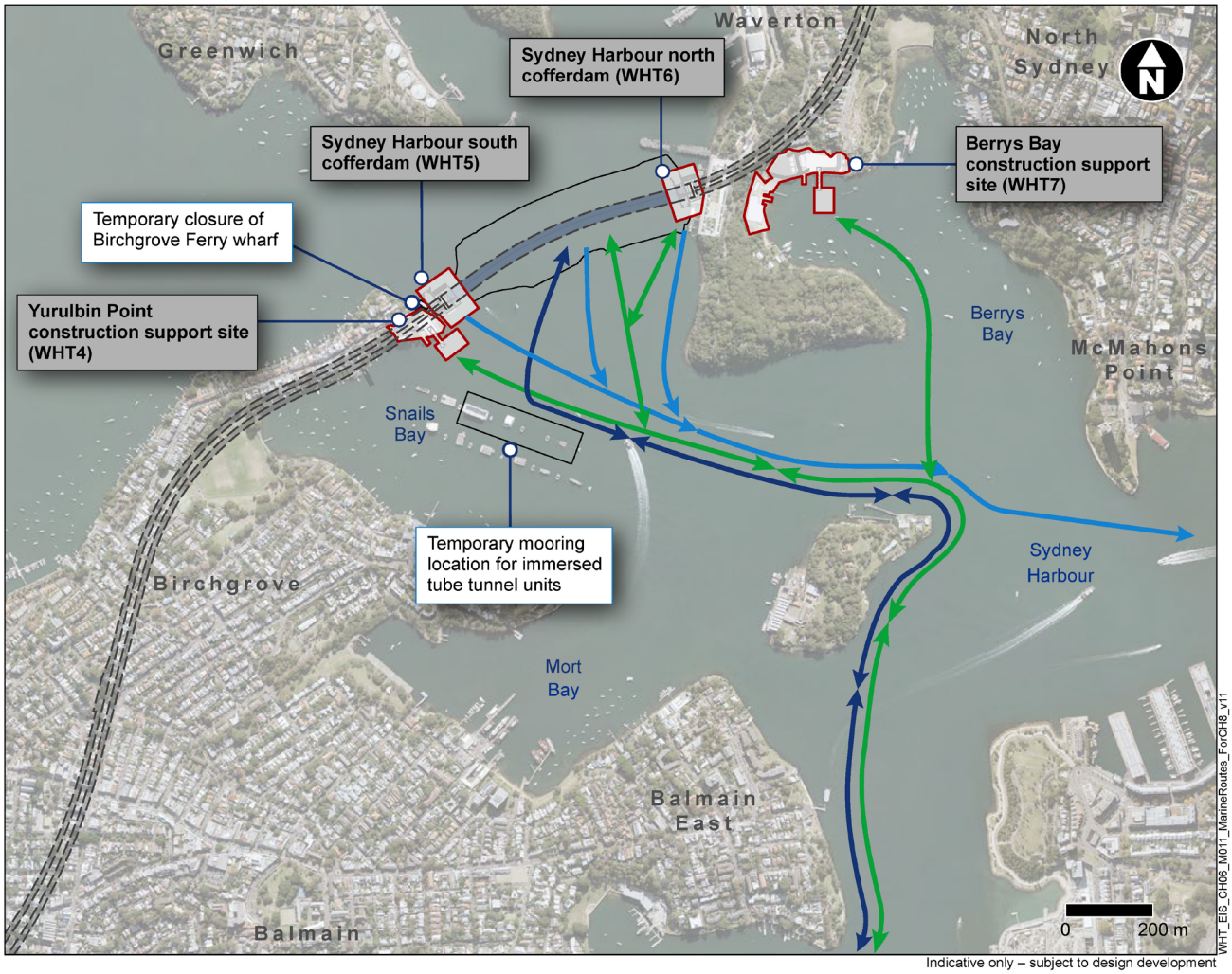
Impacts on recreational users, community groups and clubs

Community groups and clubs most likely to be impacted by the proposed construction activities include sailing clubs and Marine Rescue NSW.

The inner harbour (between Birchgrove and Waverton) would not be closed to community groups and clubs other than during the placement of the immersed tube tunnel. Navigation restrictions posed by construction equipment such as dredgers and cofferdams combined with the proximity and frequency of marine construction traffic, which may have limited manoeuvrability, could result in unfavourable sailing conditions. It would be possible for sailing clubs to alter their courses to maintain a competitive outcome while construction activities are underway. Sailing clubs impacted by the proposed works would be consulted and encouraged to alter sail racing courses that would be impacted by the works.

Sydney Harbour is highly congested on most weekends during summer, particularly between 12pm and 5pm when a number of clubs hold their weekly sailing races. Events held in Sydney Harbour such as paddling events in February and yacht races including the Sydney to Hobart in December generally occur in the outer harbour. Marine construction traffic in the outer harbour on weekends would be limited to the dredge transiting to and from the offshore disposal grounds about every four to five hours. This would not have any substantial impact on other outer harbour users.

Marine Rescue NSW would not be directly impacted by the construction activities. However, the construction activities may increase its emergency response time in the outer harbour or offshore. Marine Rescue NSW operates a facility at Middle Harbour in addition to Birkenhead Point. Marine Rescue NSW would be consulted about increasing patrols operating out of Middle Harbour that could service the outer harbour and offshore during periods when construction activities may impact the response time of Marine Rescue NSW located at Birkenhead Point.



Legend

Construction features

- Driven tunnel
- Immersed tube tunnel
- Construction footprint
- Construction support site

Maritime traffic routes

- Immersed tube tunnel transportation route (to and from White Bay)
- Marine construction traffic routes for dredging, tunnel spoil, cofferdams and permanent structures (to and from White Bay)
- Route for offshore disposal

Figure 8-10 Maritime navigation impacts during construction

Impacts on commercial operations within Sydney Harbour

Cruise and tanker traffic

With the exception of White Bay Berth 3, which would be used for handling dredged material, the remaining berths at White Bay (2, 4, and 5 (Cruise Terminal and Baileys Marine Fuels)) and Glebe Island (1, 2, 7 and 8) would not be impacted by the construction activities.

Dredging of the shipping channel would result in restrictions to vessel movements. Impacts on vessels accessing Gore Cove would be minimised by ensuring that dredgers do not impede the channel during scheduled inbound and outbound trips. The delay to dredging would be about two to three hours during each movement. It would be a requirement that larger vessels accessing Gore Cove limit their maximum speed to two to three knots until the locking fill has been installed and stabilised.

Installation of the immersed tube tunnel would result in increased travel times for large vessels due to the partial closure of the inner harbour between Birchgrove and Waverton. Operators of large vessels would be consulted and notified of the planned closures to ensure that they complete their journey prior to or following the closure period. Scheduling of the partial harbour closures would be carried out in consultation with the Port Authority of NSW, Transport for NSW and all other relevant stakeholders. Construction equipment associated with the immersed tube tunnel would give way to large vessels approaching or departing White Bay and Glebe Island in the outer harbour or offshore. Harbour Master directions including the requirement that vessels would not pass between an escort vessel and a seagoing vessel, or within 30 metres of the seagoing vessel would apply to construction equipment.

Captain Cook Cruises Lane Cove to City ferry service would be directly impacted by construction activities. During construction, a speed limit of four knots would be imposed and a detour of about 300 metres may be required to avoid construction plant and equipment. Ferries would be able to pass during the 48 hour navigation restrictions with controls including escorts and speed restrictions. Impacts would include increased transit times due to speed restrictions and altered transit routes in the vicinity of construction plant and equipment. The increase in travel time is anticipated to be minor (less than a five minute increase compared to normal travel times).

Commercial fishing

Due to the primary mooring location of the commercial fishing fleet in Blackwattle Bay and the permitted fishing grounds being located offshore, there would not be a substantial impact on the commercial fishing fleet. Construction equipment associated with the immersed tube tunnel and commercial fishing vessels transiting the inner and outer harbour, would give way to one another in accordance with standard navigation rules.

Water taxis, charter companies and boat storage facilities

With the exception of increased transit time in and around the inner harbour resulting from speed restrictions in the vicinity of dredgers, construction plant and equipment, and the requirement to give way to construction plant and equipment, water taxis, charter companies and boat storage facilities are unlikely to be impacted by the proposed construction activities.

Due to the additional marine traffic anticipated during construction, charter companies would be consulted with and advised on the frequency and duration of construction activities in the harbour. Although a relatively high number of construction vessel movements are expected, the inner harbour would be maintained as a working harbour and the impact on navigation in the outer harbour is not expected to be substantial.

Impacts on government operations within Sydney Harbour

Harbour City Ferries

The temporary closure of access to Birchgrove Ferry Wharf and partial closure of the harbour between Birchgrove and Berrys Bay would impact ferry services, specifically the F3 Parramatta River line and the F8 Cockatoo Island line. Ferries would be able to pass during the 48 hour partial closure of the harbour with controls including escorts and speed restrictions. Impacts would include altered routes and an increase in travel time due to speed restrictions within the vicinity of construction plant and equipment in the inner harbour. The increase in travel time is anticipated to be minor (less than a five minute increase compared to normal travel times). In addition, ferry customers have suitable alternatives available such as the Balmain Ferry Wharf which serves the same ferry lines, as well as bus route 441, accessible from Grove Street and providing connections to Sydney CBD, and other bus services operating along Victoria Road. Opportunities to relocate the Birchgrove Ferry Wharf will be investigated during construction planning.

Royal Australian Navy

The immersed tube tunnel crosses immediately south of HMAS Waterhen defence site. The impacts of the works may include increased transit time (as a result of reduced speed limits and partial closures) past the works area. Construction vessel movements would be managed so that they would minimise interference with larger navy ship operations. The likelihood that navy vessels at HMAS Waterhen would be required for emergency deployment would be low, given that there are a number of naval bases throughout Sydney Harbour with similar capabilities.

Water Police, Transport for NSW and Department of Planning, Industry and Environment (Regions, Industry, Agriculture & Resources)

Impacts on government users would be limited to a minor increase in travel times resulting from imposed speed restrictions during construction. Speed restrictions would not apply to Water Police in an emergency.

Impacts on swing moorings and marina berths

Moorings within the vicinity of the Berrys Bay construction support site (WHT7) would require temporary relocation. These moorings would be relocated elsewhere in Sydney Harbour in consultation with the lease holders and therefore the impact on boat users due to the displaced moorings would be minor. Some of the Transport for NSW moorings at Snails Bay would be used to facilitate the placement of immersed tube tunnels. Given that moorings are already in use at Snails Bay, minor impacts on maritime activities are likely and would be limited to the additional construction vessel movements within Snails Bay.

Impacts on local roads and parking

The Yurulbin Park car park would be temporarily closed due to the Yurulbin Point construction support site (WHT4), resulting in the loss of about ten parking spaces. The surrounding local road network, including Louisa Road, would accommodate these lost parking spaces and therefore parking impacts would be minor and manageable.

8.4.3 Warringah Freeway and surrounds

Road network impacts

The anticipated routes to and from the construction support sites at Berrys Bay (WHT7), Berry Street north (WHT8), Ridge Street north (WHT9), Cammeray Golf Course (WHT10 and WFU8), Blue Street (WFU1), High Street south (WFU2), High Street north (WFU3), Arthur Street east (WFU4), Berry Street east (WFU5), Ridge Street east (WFU6), Merlin Street (WFU7), and Rosalind Street east (WFU9) within the Warringah Freeway and surrounds area are summarised in Chapter 6 (Construction work) along with the respective daily maximum construction vehicle volumes.

Intersection and midblock performance with construction traffic

The performance of intersections (level of service) within the Warringah Freeway and surrounds area with the introduction of construction traffic would remain the same as under existing conditions. The Ernest Street/Merlin Street signalised intersection would be modified to include a north approach, providing access to the Cammeray Golf Course construction support sites (WHT10 and WFU8). This modification would minimally impact the performance of the intersection, with average delays to increase by up to two seconds per vehicle, however level of service would not be expected to decrease. The intersection performance results for the road network operating under the worst-case construction traffic scenario (2022) during the AM and PM peak periods are summarised in Table 8-15.

Table 8-15 Modelled intersection performance in the Warringah Freeway and surrounds area (AM peak (8am-9am) and PM peak (5pm-6pm) during construction in 2022)

Intersection/peak period	Base case 2022 (without construction traffic)				Base case 2022 (with construction traffic)			
	Demand flow (vehicles per hour)	Average delay (seconds)	LoS	V/C	Demand flow (vehicles per hour)	Average delay (seconds)	LoS	V/C
Miller Street/Falcon Street								
AM peak	3710	50	D	0.94	3750	53	D	0.94
PM peak	3500	90	F	>1	3530	>100	F	>1
Warringah Freeway/Falcon Street interchange[1]								
AM peak	13,250	N/A	F	>1	13,310	N/A	F	>1
PM peak	13,760	N/A	F	>1	13,810	N/A	F	>1
Warringah Freeway/Ernest Street interchange[1]								
AM peak	6280	N/A	C	0.6	6550	N/A	C	0.62
PM peak	5820	N/A	D	0.57	6110	N/A	D	0.6
Ernest Street/Merlin Street - Cammeray Golf Course (WHT10 and WFU8) construction support sites secondary access (main access from Warringah Freeway)								
AM peak	2900	7	A	0.49	3090	9	A	0.5
PM peak	3180	9	A	0.77	3370	11	A	0.83
Ernest Street/Miller Street								
AM peak	3280	20	B	0.63	3380	20	B	0.68
PM peak	3530	31	C	0.76	3530	31	C	0.76
Warringah Freeway/Miller Street interchange[1]								
AM peak	5200	N/A	C	0.82	5330	N/A	C	0.88
PM peak	5110	N/A	D	0.89	5120	N/A	D	0.89

Note: Cells shaded in grey denote an unsatisfactory LoS E or F.
Note 1: Interchanges have been modelled as a network, where LoS is based on speed efficiency and not average delay.

The midblock performance (level of service) during construction would be unchanged from existing conditions at all locations except for:

- Falcon Street east of Miller Street in the westbound direction, where midblock performance would reduce from LoS B to LoS C during the AM and PM peaks
- Ridge Street east of Miller Street in the eastbound direction, where midblock performance would reduce from LoS B to LoS C during the AM peak
- Ridge Street east of Miller Street in the westbound direction, where midblock performance would reduce from LoS A to LoS B during the AM peak.

All midblock locations listed above would continue to operate with spare capacity and at a satisfactory level of service during construction.

The midblock performance results for the road network operating under the worst-case construction traffic scenario (2022) during the AM and PM peak periods are summarised in Table 8-16.

Table 8-16 Modelled midblock performance in the Warringah Freeway and surrounds area (AM peak (8am-9am) and PM peak (5pm-6pm) during construction in 2022)

Location/ direction	Capacity (PCU)	AM peak						PM Peak					
		Base case 2022 (without construction traffic)			Construction 2022 (with construction traffic)			Base case 2022 (without construction traffic)			Construction 2022 (with construction traffic)		
		Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS
Pacific Highway south of Walker Street													
Northbound	4900	2380	0.49	C	2440	0.5	C	1660	0.34	B	1690	0.35	B
Southbound	2900 (AM), 1900 (PM)	490	0.17	A	510	0.18	A	660	0.35	B	670	0.35	B
Pacific Highway south of Bay Road													
Northbound	2900	850	0.29	B	880	0.3	B	1110	0.38	B	1130	0.39	B
Southbound	1900	1210	0.64	D	1220	0.65	D	1040	0.55	C	1050	0.55	C
Bay Road west of Pacific Highway													
Eastbound	900	260	0.29	B	300	0.33	B	280	0.31	B	300	0.33	B
Westbound	900	420	0.47	C	460	0.51	C	320	0.35	B	340	0.37	B

Location/ direction	Capacity (PCU)	AM peak						PM Peak					
		Base case 2022 (without construction traffic)			Construction 2022 (with construction traffic)			Base case 2022 (without construction traffic)			Construction 2022 (with construction traffic)		
		Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS
Berry Street east of Walker Street													
Eastbound	3900	1790	0.46	C	1830	0.47	C	2530	0.65	D	2540	0.65	D
Falcon Street east of Miller Street													
Eastbound	1900	1380	0.72	D	1400	0.74	D	1580	0.83	E	1600	0.84	E
Westbound	2900	1180	0.41	B	1210	0.42	C	1190	0.41	B	1210	0.42	C
Ridge Street east of Miller Street													
Eastbound	900	360	0.4	B	390	0.43	C	150	0.17	A	170	0.19	A
Westbound	900	200	0.24	A	250	0.27	B	300	0.34	B	330	0.36	B
Miller Street north of Ernest Street													
Northbound	900 (AM) 1900 (PM)	660	0.73	D	670	0.74	D	830	0.44	C	830	0.44	C
Southbound	2900 (AM) 1900 (PM)	1190	0.41	C	1320	0.45	C	1260	0.66	D	1260	0.66	D

Location/ direction	Capacity (PCU)	AM peak						PM Peak					
		Base case 2022 (without construction traffic)			Construction 2022 (with construction traffic)			Base case 2022 (without construction traffic)			Construction 2022 (with construction traffic)		
		Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS
Ernest Street west of Merlin Street													
Eastbound	1900	790	0.41	C	900	0.47	C	2100	>1	F	2220	>1	F
Westbound	2900	2100	0.72	D	2210	0.76	D	1040	0.36	B	1160	0.4	B
Blue Street south of Pacific Highway													
Northbound	900	190	0.21	A	220	0.24	A	350	0.39	B	360	0.4	B
Southbound	900	250	0.28	B	280	0.31	B	420	0.47	C	430	0.48	C
Arthur Street north of Pacific Highway													
Northbound	1900	880	0.46	C	910	0.48	C	640	0.33	B	650	0.34	B
Alfred Street north of Mount Street													
Northbound	900	40	0.04	A	40	0.05	A	30	0.03	A	30	0.04	A
Southbound	2900	1470	0.51	C	1470	0.51	C	750	0.26	A	750	0.26	A

Location/ direction	Capacity (PCU)	AM peak						PM Peak					
		Base case 2022 (without construction traffic)			Construction 2022 (with construction traffic)			Base case 2022 (without construction traffic)			Construction 2022 (with construction traffic)		
		Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS
Falcon Street west of Merlin Street													
Eastbound	3900	2520	0.64	D	2520	0.64	D	3120	0.8	D	3120	0.8	D
Westbound	5900	3440	0.58	C	3440	0.58	C	2320	0.39	B	2330	0.39	B
Walker Street north of Pacific Highway													
Northbound	1900	920	0.48	C	930	0.49	C	700	0.37	B	700	0.37	B
Southbound	900	320	0.36	B	320	0.36	B	370	0.42	C	370	0.42	C

Note: Cells shaded in grey denote an unsatisfactory LoS E or F.

Impacts on local roads and parking

A summary of potential impacts on local roads and on-street parking during construction of the project is summarised in Table 8-17.

Table 8-17 Impacts on local roads and parking during construction in the Warringah Freeway and surrounds area

Local road	Description of use during construction	Description of potential impacts
Bay Road and Balls Head Road	Construction vehicle access route in and out of the Berrys Bay construction support site (WHT7)	Tunnel spoil haulage from the Berrys Bay construction support site (WHT7) would be carried out via marine transport to reduce the number of heavy vehicle movements along the narrow Balls Head Road. Under a worst case, up to 210 light vehicle movements and 55 heavy vehicle movements per day would access this construction support site. Construction traffic is not expected to substantially impact Bay Road or Balls Head Road. There would be no loss in parking on Bay Road or Balls Head Road during construction.
Ridge Street (west of Warringah Freeway)	Primary construction vehicle access routes in and out of the Ridge Street east construction support site (WFU6). Secondary construction vehicle access route in and out of the Ridge Street north construction support site (WHT9)	About 12 parking spaces on Ridge Street at the eastern end would be removed to provide suitable access to the construction support sites. There are alternatives for parking elsewhere on local roads within North Sydney which would mitigate the loss of parking at this location. Ridge Street would be the primary construction vehicle access route in and out of the Ridge Street east construction support site (WFU6) although this site is not a major construction support site. Ridge Street would be used by construction vehicles accessing the Ridge Street north construction support site (WHT9) during early works and site establishment construction stages only. There would be limited use of this access once the site is established. Under a worst case scenario, this site would temporarily generate up to 70 light vehicle and 20 heavy vehicle movements per day. Once early works and site establishment construction stages are completed, the primary site access would be provided directly from the Warringah Freeway, so impacts on the traffic performance of Ridge Street would be low. Impacts from construction vehicles are anticipated to be minor given that Ridge Street would operate with spare capacity during construction (refer to Table 8-16).
Ernest Street/Merlin Street intersection	Secondary construction vehicle access route in and out of the Cammeray Golf Course construction support sites (WHT10 and	The Ernest Street/Merlin Street intersection would be modified during construction, with an additional north approach to enable secondary access to the Cammeray Golf Course construction support sites (WHT10 and WFU8). The intersection's modification would not impact the level of service as shown in Table 8-16. Cammeray Golf Course construction support sites (WHT10 and WFU8) primary access for heavy vehicles would be provided directly from the Warringah Freeway. Up to ten parking spaces on Ernest Street would be removed to provide suitable access to the Cammeray Golf Course

Local road	Description of use during construction	Description of potential impacts
	WFU8)	construction support site. Clearways operate on Ernest Street during peak periods, so any closure of the kerbside lane associated with the construction support site would only result in loss of parking outside of peak periods and would be mitigated by parking on nearby local roads such as Ernest Street (east of Merlin Street), Oaks Avenue and Park Avenue.
Merlin Street	Merlin Street construction support site (WFU7)	Under a worst case scenario, the site would generate up to 150 light vehicle movements per day on Merlin Street south of Falcon Street. The number of daily light vehicle movements on Merlin Street south of Falcon Street is low, so performance impacts on Merlin Street are anticipated to be minor. There would be temporary removal of up to 10 parking spaces along Merlin Street in the vicinity of the Merlin Street construction support site (WFU7). The impact of any lost parking spaces would be minor given that other local roads nearby would provide suitable alternatives.
Warringah Freeway	Various construction support sites	Up to 10 parking spaces would be removed to provide suitable access to other construction support sites established for the Warringah Freeway Upgrade such as the Rosalind Street east construction support site (WFU9). The impact of any lost parking spaces would be minor given that other local roads nearby would provide suitable alternatives.
Alfred Street North between Rose Avenue and Kurraba Road	Loss of parking spaces during works associated with the Ridge Street pedestrian bridge, Alfred Street North widening, and Mount Street interchange	Works would result in the permanent removal of about 47 parking spaces on Alfred Street North between Wyagdon Street and Ridge Street; and about 49 parking spaces on Alfred Street North between Ridge Street and Whaling Road. These would be replaced with about 23 new parking spaces following completion of works. These are on-street metered parking spaces (up to nine hours) serving commuters working in North Sydney. Their removal would result in a net loss of on-street parking in North Sydney and Neutral Bay given that there are no nearby alternatives. In addition, temporary long-term closure of sections of Alfred Street North would be required during construction. Access to properties along Alfred Street North would be maintained throughout construction via existing U-turn facilities or alternative routes on the local road network.

Car parking areas for construction workers would be provided at the Berrys Bay (WHT7), Berry Street north (WHT8), Ridge Street north (WHT9), Cammeray Golf Course (WHT10 and WFU8), Blue Street (WFU1), High Street south (WFU2), High Street north (WFU3), Arthur Street east (WFU4), Berry Street east (WFU5), Merlin Street (WFU7) and Rosalind Street east (WFU9) construction support sites. Where on-site parking is not provided or where provision of on-site parking cannot accommodate the full construction workforce, the workforce would be required to park on the surrounding road network. The construction workforce would be encouraged to use public transport where feasible and reasonable to minimise the potential parking impacts on the

road network. There are key bus corridors including Pacific Highway, Warringah Freeway, Miller Street, Falcon Street and Military Road. In addition, the T1 North Shore and T9 Northern Line are accessible from North Sydney and Waverton railway stations.

Impacts of the temporary closure of the Warringah Freeway

Forecasts of maximum detoured traffic volumes during night closures of the Warringah Freeway are detailed in Appendix F (Technical working paper: Traffic and transport) for five potential scenarios:

- Full closure
- Full northbound closure
- Outer northbound lane closure only
- Full southbound lane closure
- Outer south bound lane closure only.

Almost all roads that would be impacted by diverted traffic form part of the regional and state road network or are signposted as recommended routes to key destinations and would have sufficient capacity to accommodate additional traffic resulting from closure detours, even under a full closure scenario. For those few roads where detour volumes could exceed capacity, demand through the area could be reduced through demand management, which would also minimise additional volumes on local and collector roads. Traffic and demand management would be consistent with management measures that are currently employed to mitigate the impacts of regular closures to the Warringah Freeway and Bradfield Highway/Cahill Expressway as part of scheduled maintenance works for the Sydney Harbour Bridge. Partial or full closures of Warringah Freeway would be carried out in consultation with the Sydney Coordination Office.

Impacts on public transport

Impacts on public transport are shown in Figure 8-11.

Bus priority infrastructure and the capacity of layover facilities on the Warringah Freeway in the southbound direction would be maintained during construction. Potential strategies to be implemented include the use of temporary routes on approach to the Sydney Harbour Bridge, the utilisation of temporary bus layover facilities within Cammeray Golf Course, and a new layover facility within the existing Sydney Harbour Bridge Northern Toll Plaza area.

Potential modifications to existing bus lanes may be required for short periods during construction of the Warringah Freeway Upgrade, including:

- Temporary closure of the Mount Street on ramp bus lane
- Temporary closure of the Falcon Street on ramp bus lane
- Temporary closure of the Falcon Street off ramp bus lane.

During these short-term closures, buses would be required to use the adjacent general traffic lanes available. Impacts due to the temporary closure of the bus lanes would be minor and managed during the short periods that these bus lanes would not be in operation.

Adjustment to bus stops within the construction zone on High Street (serving bus route 263), Pacific Highway (serving bus route 200), Miller Street and Falcon Street (serving up to 20 unique bus routes) would be required. Any adjustments to these bus stops would be determined as the project progresses, with advance notification provided to affected bus customers of the changes to stopping sequences and location of bus stops. Disruption to bus customers would be minimised by relocating the bus stops to the closest practical alternative. In some instances, bus stop relocation could require some existing parking spaces to be removed. Given the potential small increase in travel distance to a relocated bus stop, impacts are anticipated to be negligible.

Given the large amount of works on existing roads on the Warringah Freeway and North Sydney road network, extensive community and stakeholder engagement would be carried out in conjunction with other Transport for NSW projects and the Sydney Coordination Office. This is likely to include a Community and Road User Campaign which would be implemented before the start of works to inform all road users including bus operators of the upcoming network changes and proposed detour routes.

Impacts on active transport

Impacts on the active transport network are shown in Figure 8-12.

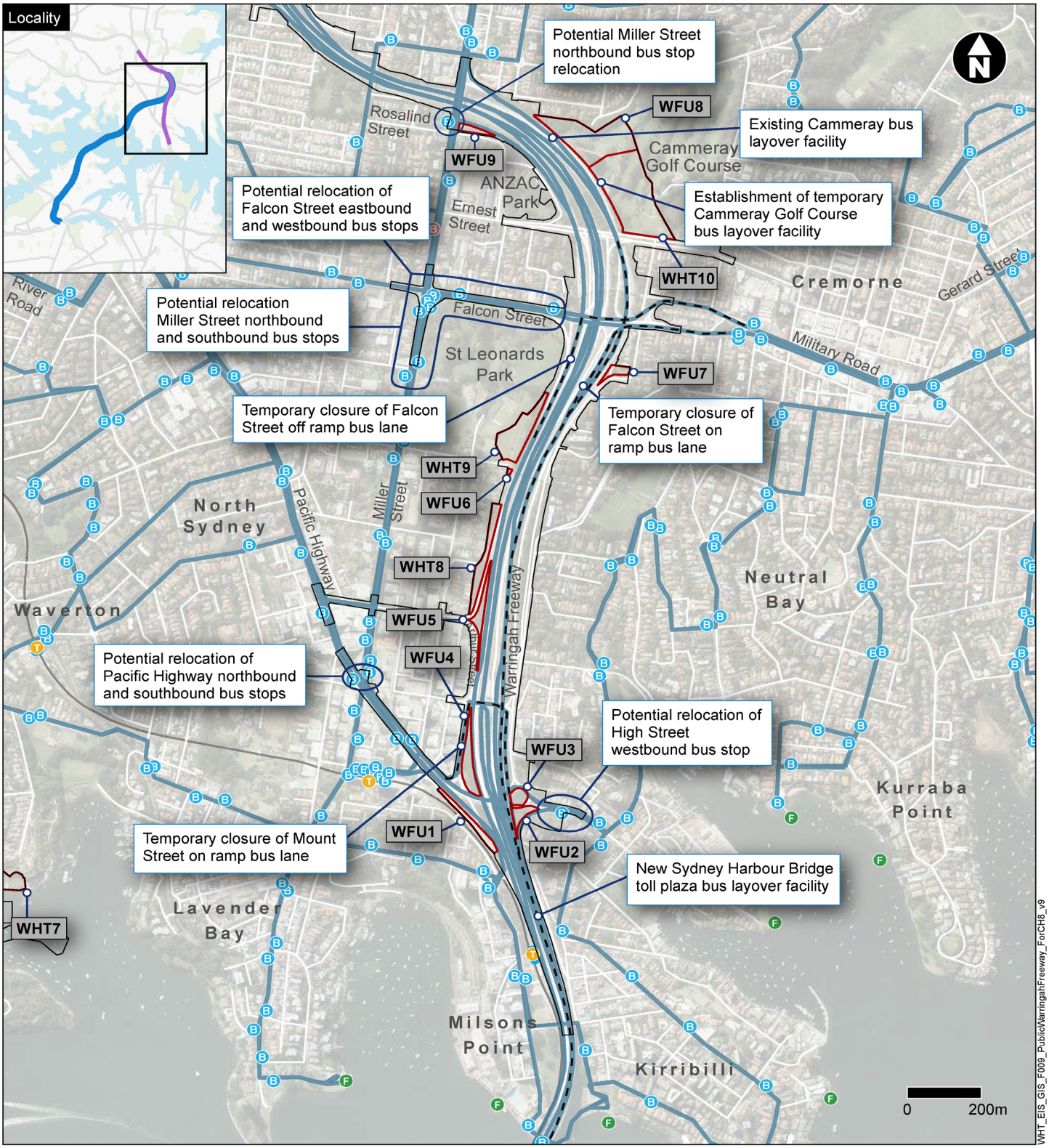
Limited vehicular access to and from the Berrys Bay construction support site (WHT7) would be provided, with about 210 light vehicle and 55 peak heavy vehicle movements per day. The construction vehicle route to this site would be via Bay Road/Balls Head Road. Bay Road/Balls Head Road provides access to Balls Head Reserve which is used by cyclists and pedestrians. Pedestrians would be separated from construction traffic along Bay Road/Balls Head Road up to Waterhen Drive, where there is a footpath provided on each side of the road. Most pedestrians and cyclists access Balls Head Reserve via Waterhen Drive and their interaction with construction traffic would be negligible.

A secondary access point to the Cammeray Golf Course construction support sites (WHT10 and WFU8) would be provided at the Ernest Street/Merlin Street intersection. Impacts on the shared user path on the northern side of Ernest Street would be minimised by directing heavy vehicles to access the site from the Warringah Freeway where feasible and reasonable, and controlling pedestrian and cyclist movements via a signalised crossing spanning the Ernest Street site entry/exit. The existing traffic lights at the Ernest Street/Merlin Street intersection would minimise interaction between pedestrians and cyclists and construction traffic.

The shared user path along Warringah Freeway near Cammeray Golf Course would be temporarily realigned to travel along the rear of the support site to the Ernest Street/Merlin Street intersection. Minor impacts on pedestrians and cyclists are anticipated given that existing connectivity would be maintained with a short additional travel distance of up to 100 metres.

Access to the Ridge Street north construction support site (WHT9) would be via the Warringah Freeway. However, during early works and site establishment, access may be required on the northern side of Ridge Street adjacent to the Ridge Street shared user bridge until the Warringah Freeway site access is operational. Given that there is no footpath on the northern side of Ridge Street, impacts on pedestrians are not expected. Pedestrian access across the Warringah Freeway would be maintained via the existing Ridge Street shared user bridge, until the new crossing is completed. Ridge Street is a difficult on-road cycle environment, and construction vehicles may interact with cyclists accessing the Ridge Street shared user bridge. Construction vehicle movements to and from the construction support site would be managed through active traffic management to control construction vehicle movements and reduce the potential interactions between these vehicles and cyclists. Impacts on sports and recreational users at St Leonards Park would also be minimal.

A new shared user bridge over the Warringah Freeway would replace the existing shared user bridge at Falcon Street. Pedestrian access across the Warringah Freeway would be maintained via the existing bridge, until the new crossing is completed. Temporary adjustments would also be required on the shared user path in Jeaffreson Jackson Reserve to accommodate the construction of the new shared user bridge. These adjustments would be short in duration and would not coincide with the temporary adjustments required to the shared user path on Ernest Street. Up to 45 pedestrians and cyclists per hour during peak periods would be detoured via Ernest Street and the existing Falcon Street shared user bridge, resulting in an additional travel distance of up to 400 metres. Impacts are anticipated to be moderate and manageable given the short-term duration of the shared user path adjustments and the low number of pedestrians and cyclists currently using this path. Advance warning signs would notify users of the temporary adjustments to the Jeaffreson Jackson Reserve shared user path and the recommended detour route.



Legend

Construction features

- Construction support site boundary
- Construction footprint

Public transport infrastructure

- Bus route
- Bus lane
- Rail
- Bus stop
- Train station
- Ferry wharf

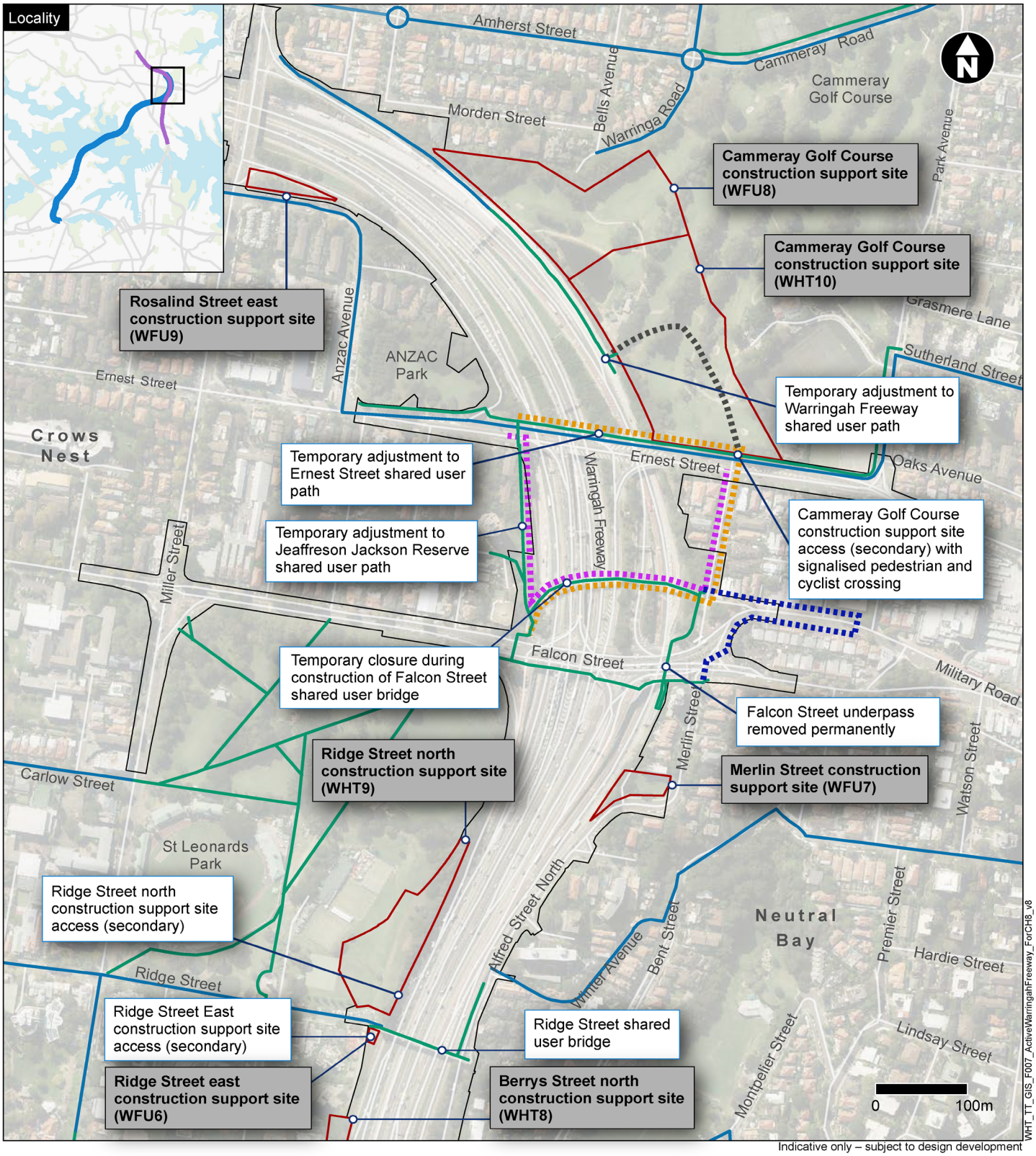
Warringah Freeway Upgrade construction support sites

Blue Street (WFU1)
High Street (WFU2)
High Street north (WFU3)
Arthur Street east (WFU4)
Berry Street east (WFU5)
Ridge Street east (WFU6)
Merlin Street (WFU7)
Cammeray Golf Course (WFU8)
Rosalind Street east (WFU9)

Western Harbour Tunnel construction support sites

Berrys Bay (WHT7)
Berrys Street north (WHT8)
St Leonards Park (WHT9)
Cammeray Golf Course (WHT10)

Figure 8-11 Public transport impacts within the Warringah Freeway and surrounds area



Legend

Construction features

- Construction support site boundary
- Construction footprint

Active transport infrastructure

- Existing off-road shared user path
- Existing on-road cycle path
- Ernest Street shared user path detour
- Falcon Street underpass alternative route
- Jeaffreson Jackson Reserve shared user path detour
- Warringah Freeway shared user path detour

Figure 8-12 Active transport impacts within the Warringah Freeway and surrounds area

The cycleway underpass beneath the eastern side of the Falcon Street Bridge would be permanently removed during the initial stages of the Warringah Freeway Upgrade. Removal of the underpass would require pedestrians and cyclists to either travel an additional 380 metres via existing zebra and signalised pedestrian crossings on Falcon Street and Military Road, or travel across the Falcon Street Bridge, resulting in increased travel times. The underpass is currently under-utilised with less than 12 pedestrians and cyclists recorded using the facility during weekday and weekend peak hours. Due to the low volumes of pedestrians and cyclists using the underpass, the impact would be minor.

Temporary adjustments to the shared user path on the northern side of Ernest Street would be required during the Warringah Freeway Upgrade. Pedestrians and cyclists would be detoured via the Falcon Street pedestrian bridge, located about 140 metres south of Ernest Street. These users may be required to travel an additional 400 metres. Given the additional travel distance and possible requirement for pedestrians and cyclists to cross Ernest Street to access the Falcon Street pedestrian bridge, advance warning signs would be provided to notify these users of the temporary adjustment to the shared user path and the recommended detour route. Due to the short duration of the adjustment to the shared user path, the impact on the active transport network would be moderate and manageable.

Construction traffic volumes at all other construction support sites established for the Warringah Freeway Upgrade are also low, with minimal impacts expected to the active transport network.

8.4.4 Gore Hill Freeway and Artarmon

Road network impacts

The anticipated routes to and from the Waltham Street construction support site (WHT11) are summarised in Chapter 6 (Construction work) along with the respective daily maximum construction vehicle volumes.

Intersection and midblock performance with construction traffic

The performance of intersections (level of service) near Waltham Street construction support site (WHT11) would not change during the site operation given the low volumes of construction vehicles generated (maximum 180 light vehicles and 65 heavy vehicles per day).

The midblock performance (level of service) during construction would be unchanged from the midblock performance under existing conditions at all locations except Dickson Avenue east of Reserve Road in the westbound direction, where the level of service would deteriorate during the PM peak, but would still operate with spare capacity and at a satisfactory level of service during construction.

The midblock performance results for the road network operating under the worst-case construction traffic scenario (2022) during the AM and PM peak periods are summarised in Table 8-18.

Table 8-18 Modelled midblock performance in Gore Hill Freeway and Artarmon (AM peak (8am-9am) and PM peak (5pm-6pm) during construction in 2022)

Location/ direction	Capacity (PCU)	AM peak						PM Peak					
		Base case 2022 (without construction traffic)			Construction 2022 (with construction traffic)			Base case 2022 (without construction traffic)			Construction 2022 (with construction traffic)		
		Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS	Volume (PCU)	V/C	LoS
Reserve Road north of Dickson Avenue													
Northbound	1900	580	0.3	B	610	0.32	B	1150	0.61	D	1180	0.62	D
Southbound	1900	1280	0.68	D	1310	0.69	D	660	0.34	B	690	0.36	B
Dickson Avenue east of Reserve Road													
Eastbound	900	260	0.29	B	290	0.32	B	170	0.19	A	200	0.22	A
Westbound	900	140	0.15	A	160	0.18	A	230	0.25	A	260	0.29	B

Impacts on local roads and parking

Reserve Road, Dickson Avenue and Waltham Street are local roads that form part of the construction vehicle route associated with the works to be carried out at the Waltham Street construction support site (WHT11). Up to 180 light vehicles and 65 heavy vehicles per day would access the Waltham Street construction support site (WHT11) from Reserve Road. These traffic volumes would have a negligible impact as Reserve Road would operate with spare capacity and at a satisfactory level of service during construction as shown in Table 8-18.

Up to ten parking spaces may be removed temporarily on Dickson Avenue or Waltham Street to provide suitable access to the Waltham Street construction support site (WHT11). If parking spaces are lost, impacts would be minor given the low number of spaces removed and the availability of other local roads nearby to accommodate these lost parking spaces.

A car parking area for construction workers would be provided at the Waltham Street construction support site (WHT11). Where required, shuttle bus transfers between construction support sites may also be provided. Where provision of on-site parking cannot accommodate the full construction workforce, the workforce would be required to park on the surrounding road network. The construction workforce would be encouraged to use public transport where feasible and reasonable to minimise the potential parking impacts on the road network, with key bus corridors including Pacific Highway, Warringah Freeway, Gore Hill Freeway and Epping Road. In addition, the T1 North Shore and T9 Northern Lines are accessible from Artarmon and St Leonards railway stations.

Impacts on public transport

No material direct or indirect impacts on public transport in the Gore Hill Freeway and Artarmon area are expected during the operation of the Waltham Street construction support site (WHT11).

Impacts on active transport

No material direct or indirect impacts on the active transport network in the Gore Hill Freeway and Artarmon area are expected during the operation of the Waltham Street construction support site (WHT11).

8.4.5 Cumulative impacts of the project and the Beaches Link and Gore Hill Freeway Connection project (Warringah Freeway and surrounds)

Peak cumulative construction traffic is expected in 2024 if construction of the Western Harbour Tunnel and Warringah Freeway Upgrade project and the Beaches Link and Gore Hill Freeway Connection project (if approved) are carried out concurrently. Peak construction activity for the project is not anticipated to overlap with peak construction activities for other major infrastructure projects including Sydney Metro City & Southwest, M4–M5 Link, and Bays Precinct Urban Renewal project. At the time of preparing this document, the program for Metro West has not been confirmed. However, the project has been working collaboratively with Metro West on this issue, through the Cumulative Traffic Working Group (refer to Section 8.4.6).

Road network performance

Analysis of network performance in the AM and PM peak periods with the project and the Beaches Link and Gore Hill Freeway Connection project indicate that when compared to forecast 2024 peak

period conditions without the project, cumulative construction activities in the Warringah Freeway and surrounds area have the potential to:

- Increase traffic demand by about one per cent
- Create less than one additional stop per trip
- Reduce average trip speeds by about four per cent.

These overall network impacts are considered minor and manageable.

General travel times

Modelled travel times during AM and PM peaks for key routes relevant to the project are presented in Table 8-19.

Under the cumulative construction 2024 scenario, travel times would increase by less than one minute for the majority of routes. Predicted travel time increases between one and three minutes are expected for the following routes:

- Warringah Freeway: Gore Hill Freeway to Sydney Harbour Bridge (AM peak)
- Warringah Freeway: Gore Hill Freeway to Sydney Harbour Tunnel (AM peak)
- Warringah Freeway: Falcon Street to Sydney Harbour Bridge (PM peak)
- Miller Street: Amherst Street to Berry Street (AM peak)
- Miller Street: Berry Street to Amherst Street (PM peak).

Table 8-19 Modelled AM and PM peak traffic travel times for key routes through Warringah Freeway and surrounds

Route/peak period	Direction	Base case 2024 (without construction traffic) (minutes : seconds)	Cumulative construction 2024 (with construction traffic) (minutes : seconds)
Sydney Harbour Bridge to Warringah Freeway/Falcon Street interchange			
AM peak	Northbound	04:42	04:39
	Southbound	04:02	04:01
PM peak	Northbound	03:43	03:45
	Southbound	04:16	05:32
Sydney Harbour Tunnel to Warringah Freeway/Falcon Street interchange			
AM peak	Northbound	03:51	03:57
	Southbound	04:06	04:03
PM peak	Northbound	03:36	03:42
	Southbound	14:27	15:05

Route/peak period	Direction	Base case 2024 (without construction traffic) (minutes : seconds)	Cumulative construction 2024 (with construction traffic) (minutes : seconds)
Sydney Harbour Bridge to Gore Hill Freeway/Pacific Highway interchange			
AM peak	Northbound	06:13	06:13
	Southbound	08:48	10:53
PM peak	Northbound	05:31	05:59
	Southbound	16:15	16:13
Sydney Harbour Tunnel to Gore Hill Freeway/Pacific Highway interchange			
AM peak	Northbound	05:22	05:28
	Southbound	08:50	11:21
PM peak	Northbound	05:19	06:01
	Southbound	19:51	20:20
Berry Street to Amherst Street via Miller Street			
AM peak	Northbound	04:10	04:05
	Southbound	07:48	09:22
PM peak	Northbound	04:34	05:36
	Southbound	13:45	10:39

Intersection performance

The intersection performance results for the road network under the base case 2024 (without construction vehicles) and cumulative construction 2024 (with construction vehicles and proposed intersection modifications during construction) scenarios are summarised in Appendix F (Technical working paper: Traffic and transport) for the AM and PM peak periods.

The assessment indicates that the addition of construction traffic for both projects would impact the level of service at the following intersections:

- Willoughby Road/Gore Hill Freeway interchange would reduce from LoS E to LoS F during the AM peak, and from LoS C to LoS D during the PM peak
- Brook Street/Warringah Freeway off ramp would reduce from LoS E to LoS F during the AM peak
- Amherst Street/West Street would reduce from LoS A to LoS B during the PM peak
- Amherst Street/Miller Street would reduce from LoS B to LoS C during the PM peak
- Miller Street/Warringah Freeway off ramp would reduce from LoS A to LoS C during the AM peak
- Miller Street/Falcon Street would reduce from LoS D to LoS E during the AM peak

- Military Road/Ben Boyd Road would reduce from LoS C to LoS D during the PM peak
- Mount Street/Arthur Street would reduce from LoS E to LoS F during the PM peak
- Pacific Highway/Berry Street would reduce from LoS B to LoS C during the PM peak
- Pacific Highway/Bay Road would reduce from LoS E to LoS F during the AM peak
- High Street/Alfred Street would reduce from LoS A to LoS B during the AM peak
- Ernest Street/Ben Boyd Road would reduce from LoS C to LoS D during the AM peak, and from LoS A to LoS B during the PM peak.

During the AM peak, intersections which would experience a substantial increase in average vehicle delay (around 30 to 40 seconds) during construction include Willoughby Road/Gore Hill Freeway interchange, Brook Street/Warringah Freeway ramps and Brook Street/Merrenburn Avenue.

During the PM peak, some intersections within the North Sydney area would experience a relatively minor increase in average vehicle delay.

Full intersection performance results are provided in Appendix F (Technical working paper: Traffic and transport).

Road network changes and access arrangements

The Cammeray Golf Course would be used as construction support sites for both the Western Harbour Tunnel and Warringah Freeway Upgrade project (WHT10 and WFU8) and the Beaches Link and Gore Hill Freeway Connection project (subject to separate assessment and approval) and would result in cumulative traffic volumes generated to and from this site. The potential for cumulative traffic impacts associated with these projects, including haulage roads and intersections traversed by construction vehicles during concurrent works, has been assessed in this section.

Impacts on public transport

In relation to bus times, cumulative construction activities in the Warringah Freeway and surrounding area have the potential to impact corridor travel times by less than one minute for the majority of routes. The results indicate that, when compared to forecast 2024 peak period base conditions, there would be an increase in travel times between one and three minutes for the following routes:

- Southbound via Miller Street to the Sydney Harbour Bridge (AM peak)
- Northbound via the Warringah Freeway and Military Road to Ben Boyd Road (PM peak).

The most substantial potential impact would be on southbound travel times via the Warringah Freeway. For Warringah Freeway routes, increased traffic demand, including potential additional traffic movements across the southbound bus lane south of Falcon Street, could increase congestion, which could impact bus travel times. This issue would be mitigated by considered and tailored construction traffic planning based on actual traffic conditions and confirmed cumulative activities at the time of construction.

Impacts on active transport and maritime activities

Impacts on active transport and maritime activities would be similar to those discussed in each of the sections above given the minimal overlap in construction activities associated with the Western Harbour Tunnel and Warringah Freeway Upgrade project, and the Beaches Link and Gore Hill Freeway Connection project.

8.4.6 Cumulative impacts of the project and M4–M5 Link and Sydney Metro City & Southwest projects (Rozelle and surrounds)

Sydney Metro City & Southwest and M4–M5 Link construction programs would potentially overlap with the project construction in 2022. The Rozelle Rail Yards (WHT1), Victoria Road (WHT2) and White Bay (WHT3) construction support sites may be operational at the same time as construction for the M4–M5 Link and Sydney Metro City & Southwest projects. Although use of the Rozelle Rail Yards construction support site (WHT1) commences in 2023, and therefore outside of the 2022 assessment year, construction traffic volumes at this site have been included in the assessment to present a worst-case cumulative construction scenario.

Overall, the cumulative impacts in Rozelle and surrounds are moderate and manageable. The potential impacts would be mitigated by considered and tailored cumulative construction traffic planning, based on confirmed cumulative activities at the time of construction.

Cumulative Traffic Working Group

A cumulative traffic working group was established in July 2018 to investigate the potential cumulative traffic impacts associated with the concurrent traffic generating activities in the Glebe Island and White Bay area due to construction of the Rozelle Interchange, Western Harbour Tunnel and Sydney Metro West, along with an expansion of existing operations at Glebe Island by the Port Authority of NSW.

The working group includes the following stakeholders:

- Other Transport for NSW divisions and projects, including:
  - Transport for NSW (Sydney Division)
  - Transport for NSW (Rozelle Interchange project)
  - Transport for NSW (Western Harbour Tunnel)
- Urban Growth (now Infrastructure NSW)
- Sydney Coordination Office
- Sydney Metro West project
- Port Authority of NSW.

The cumulative traffic working group carried out traffic modelling to predict the potential impact of these projects and operations on the traffic network in and around the Rozelle precinct and developed a range of mitigation measures to be implemented, including:

- Implementation and incentivising bus services to transport suitable project personnel to and from site
- Avoiding tunnelling shift changeovers occurring between 7am and 9am and 4pm and 6pm Monday to Friday, to reduce peak period traffic impacts
- Offshore disposal of tunnel spoil, which is primarily crushed sandstone, when generated at harbourside construction support sites to reduce heavy haulage.

The project would adopt the first two of the aforementioned mitigation measures. An application for offshore disposal of suitable dredged material has been submitted to the Commonwealth Department of the Environment and Energy to implement offshore disposal where appropriate.

Road network performance

Analysis of network performance in the AM and PM peak periods with the project, the M4–M5 Link and Sydney Metro City & Southwest projects indicates that when compared to forecast 2022 peak

period conditions without the project, cumulative construction activities in Rozelle and surrounds area have the potential to:

- Increase traffic demand by up to three per cent
- Create up to three additional stops per trip
- Reduce average trip speeds between five per cent (during AM peaks) and 14 per cent (during PM peaks).

General travel times

Modelled travel times during AM and PM peaks for City West Link and Western Distributor and Victoria Road are presented in Table 8-20. The results show cumulative project impacts could result in:

- Travel times on City West Link westbound slowed by up to five minutes during AM peaks
- Travel times on Victoria Road northbound slowed by up to 3.5 minutes during AM peaks
- Travel times in the PM peak slowed by up to two minutes on City West Link and Victoria Road.

Table 8-20 Modelled AM and PM peaks traffic travel times for City West Link and Western Distributor and Victoria Road

Route / Peak period	Direction	Base case 2024 (without construction traffic) (minutes: seconds)	Cumulative construction 2024 (with construction traffic) (minutes : seconds)
City West Link and Western Distributor (Balmain Road to Druitt Street ramp)			
AM peak	Eastbound	14:36	12:44
	Westbound	10:29	15:50
PM peak	Eastbound	05:34	06:53
	Westbound	11:23	13:21
Victoria Road (Evans Street to ANZAC Bridge)			
AM peak	Northbound	11:00	14:24
	Southbound	03:19	03:13
PM peak	Northbound	04:54	05:50
	Southbound	04:07	03:56

Intersection performance

The intersection results for the road network under the base case 2022 (without construction vehicles) and cumulative construction 2022 (with construction vehicles) scenarios are summarised in Appendix F (Technical working paper: Traffic and transport) for the AM and PM peak periods.

The assessment indicates that the addition of construction traffic associated with the project and the M4–M5 Link and Sydney Metro City & Southwest projects on the road network would impact the level of service at the following intersections:

- Victoria Road/Evans Street would reduce from LoS E to LoS F during the PM peak
- Victoria Road/Gordon Street would reduce from LoS E to LoS F during the PM peak
- Victoria Road/Robert Street would reduce from LoS E to LoS F during the AM peak
- Victoria Road/The Crescent would reduce from LoS D to LoS E during the AM peak
- The Crescent/James Craig Road would reduce from LoS B to LoS C during the PM peak
- The Crescent/City West Link would reduce from LoS E to LoS F during the PM peak
- City West Link/Catherine Street would reduce from LoS B to LoS C during the PM peak
- City West Link/Balmain Road would reduce from LoS E to LoS F during the PM peak.

The impact to level of service at the above intersections would be primarily due to the increased demand generated by construction traffic at key capacity constrained intersections.

Full intersection performance results are provided in Appendix F (Technical working paper: Traffic and transport).

Impacts on public transport

Traffic modelling indicates that cumulative construction activities would have the potential to impact northbound bus travel times on the ANZAC Bridge-Victoria Road corridor by between 1.5 and 2.5 minutes.

Impacts on active transport and maritime activities

Impacts on active transport and maritime activities would be similar to those discussed in each of the sections above given the minimal overlap in construction activities associated with the project and the M4–M5 Link and Sydney Metro City & Southwest projects.

8.4.7 Special events impacts

The majority of construction works would have minimal impacts on special events as the construction support sites and associated construction traffic routes would not be located in proximity to venues that regularly schedule events that require traffic or public transport event plans. Potential exceptions to this may include:

- **North Sydney Oval** – Events at North Sydney Oval typically do not require active traffic management or changes in network operation to accommodate visitors. Construction routes travelling along Miller Street would have no substantial impact on events at North Sydney Oval, however the availability of car parking, particularly at Ridge Street, would be temporarily reduced during the construction period
- **Balls Head Reserve** – Balls Head Road is typically closed to traffic during New Year's Eve. This would restrict access for light vehicles to the Berrys Bay construction support site (WHT7). Construction activity would be scheduled to avoid any conflict with special events
- **Yurulbin Park** – A popular vantage point for New Year's Eve celebrations on Sydney Harbour. After 3pm on New Year's Eve, access to Birchgrove peninsula from Victoria Road is restricted to residents, buses, taxis and authorised vehicles. The closure of the park during construction would require members of the public to seek alternative vantage points, potentially increasing pressure at other locations. Barge movements generated at the Yurulbin Point construction support site (WHT4) would be scheduled to avoid conflict with New Year's Eve celebrations
- **ANZAC Park** - Temporary occupation (about six months) of land within ANZAC Park would be required to support construction activities. Consideration of community events such as the

ANZAC Day Dawn Service at the memorial statue during the planning of major construction activities would be important to minimise potential construction impacts.

8.5 Environmental management measures

Environmental management measures relating to construction traffic and transport impacts are outlined in Table 8-21. Environmental management measures relating to cumulative impacts, including coordination of haulage routes and road occupancy, are detailed in Chapter 27 (Cumulative impacts).

Table 8-21 Environmental management measures for construction traffic and transport impacts

Ref	Phase	Impact	Environmental management measure	Location
CTT1	Pre-construction	Construction traffic	A road dilapidation report will be prepared, in consultation with relevant councils and road owners, identifying existing conditions of local roads and mechanisms to repair damage to the road network caused by heavy vehicle movements associated with the project.	WHT/WFU
CTT2	Pre-construction	Maritime construction	Moorings impacted during construction will be relocated elsewhere in Sydney Harbour in consultation with the lease holders.	WHT
CTT3	Pre-construction	Maritime construction	Opportunities to relocate the Birchgrove Ferry Wharf will be investigated during construction planning.	WHT
CTT4	Construction	Construction traffic	Ongoing consultation will be carried out with (as relevant to the location) the Sydney Coordination Office, the Port Authority of NSW, local councils, emergency services and bus operators to minimise traffic and transport impacts during construction.	WHT/WFU
CTT5	Construction	Construction traffic	The community will be notified in advance of proposed transport network changes, and maritime restrictions through appropriate media and other appropriate forms of community liaison.	WHT/WFU
CTT6	Construction	Construction traffic	Construction road traffic will be managed to minimise movements during peak periods	WHT/WFU
CTT7	Construction	Construction traffic	Vehicle access to and from construction sites will be managed to ensure pedestrian, cyclist and motorist safety. Depending on the location, this may require manual supervision, physical barriers, temporary traffic signals and modifications to existing signals or, on occasion, police presence.	WHT/WFU

Ref	Phase	Impact	Environmental management measure	Location
CTT8	Construction	Construction traffic	Directional signage and linemarking will be used to direct and guide drivers, cyclists and pedestrians past construction sites and on the surrounding network. This will be supplemented by Variable Message Signs to advise drivers of potential delays, traffic diversions, speed restrictions, or alternative routes.	WHT/WFU
CTT9	Construction	Construction traffic	Where provision of construction on-site parking cannot accommodate the full construction workforce, feasible and reasonable management measures that minimise impacts on parking on local roads will be identified and implemented. Depending on the location, management measures may include workforce shuttle buses and the use of public transport.	WHT/WFU
CTT10	Construction	Construction traffic	Any adjustments to existing bus stops will be determined in consultation with relevant stakeholders including other divisions of Transport for NSW and advanced notification will be provided to affected bus customers. Relocations will be as close as feasible and reasonable to their existing position.	WHT/WFU
CTT11	Construction	Construction traffic	Truck marshalling areas will be identified and used where feasible and reasonable, to minimise potential queueing and traffic and access disruptions in the vicinity of construction support sites.	WHT/WFU
CTT12	Construction	Construction traffic	Activities requiring partial and full road closures will occur outside of peak periods and/or during night time to minimise the impact of these activities on the road network where feasible and reasonable.	WHT/WFU
CTT13	Construction	Construction traffic	Partial or full closures of Warringah Freeway will be carried out in consultation with the Sydney Coordination Office.	WFU
CTT14	Construction	Construction traffic	Haulage of spoil by barge will be considered as an alternative to road based haulage.	WHT
CTT15	Construction	Maritime construction traffic	Construction vessels will be required to operate in a manner that minimises wash to areas of shoreline.	WHT

Ref	Phase	Impact	Environmental management measure	Location
CTT16	Construction	Maritime construction traffic	Construction marine traffic activities will be scheduled to avoid times and locations of high recreational marine traffic where feasible and reasonable.	WHT
CTT17	Construction	Maritime construction traffic	Harbour closures scheduling will be carried out in consultation with Port Authority of NSW, other divisions of Transport for NSW and other relevant stakeholders.	WHT
CTT18	Construction	Maritime construction	Construction vessel movements will be managed so that they will not interfere with port operations or the navigation of seagoing ships and ferries, unless prior approval has been obtained from the Harbour Master.	WHT

WHT = Western Harbour Tunnel, WFU = Warringah Freeway Upgrade

RMS 19.1441
ISBN 978-1-922338-08-2