

# **CONSTRUCTION TRAFFIC AND TRANSPORT**

CHAPTER EIGHT

# 8 Construction traffic and transport

This chapter assesses the potential impact on traffic and transport during the construction stage of the project. It describes the existing traffic and transport environment and identifies the potential nature and extent of impacts to traffic and transport services. Measures to address the potential impacts are also identified. Technical paper 1 – Traffic and transport provides further details.

## 8.1 Secretary environmental assessment requirements

The Secretary’s environmental assessment requirements relating to construction traffic and transport, and where these requirements are addressed in this Environmental Impact Statement, are outlined in Table 8-1.

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

Ref.	Secretary’s environmental assessment requirements	Where addressed
<b>13 Traffic and transport</b>		
13.1	The Proponent must assess construction transport and traffic (vehicle, pedestrian and cyclists) impacts, including, but not necessarily limited to:	
13.1(a)	a considered approach to route identification and scheduling of transport movements;	Factors considered in determining haul routes are identified in Section 8.2.5. Haul routes for each sites are identified in Section 8.4.
13.1(b)	the number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements);	Construction vehicles are addressed in Section 8.4.
13.1(c)	the capacity of or need to upgrade roads proposed as construction vehicle routes including Bedwin Road;	Construction vehicle routes are addressed in Section 8.4.
13.1(d)	changes to existing local and regional road networks including access to and around the proposed Chatswood tunnelling site;	Road network changes are addressed in Section 8.4.
13.1(e)	construction worker parking;	Construction worker parking is addressed in Section 8.4.4.
13.1(f)	the nature of existing traffic (type and number of movements) on construction access routes (including consideration of peak traffic times and sensitive road users and parking arrangements), including access to the Overseas Passenger Terminal for deliveries and passenger coaches;	Existing traffic and transport environment is described in Section 8.3. Potential access impacts to the Overseas Passenger Terminal are identified in Section 8.4.13.
13.1(g)	details of how construction and scheduling of works are to be coordinated in regard to public events; cumulative traffic impacts resulting from concurrent work on WestConnex, Barangaroo, Sydney Light Rail and other key construction projects in the Sydney CBD;	Coordination with public events is addressed in Section 8.4.3. Cumulative traffic impacts area addressed in Chapter 26 (Cumulative impacts).

Ref.	Secretary's environmental assessment requirements	Where addressed
13.1(h)	alternatives to road transport of construction spoil;	Construction spoil is addressed in Section 8.2.3.
13.1(i)	access constraints and impacts to public transport, pedestrian access and cyclists;	Public and active transport is addressed in Section 8.4.
13.1(j)	the need to close, divert or otherwise reconfigure elements of the road and cycle network associated with construction of the project;	Road network impacts are addressed in Section 8.4.
13.1(k)	assess the likely risks of the project to public safety, paying particular attention of pedestrian safety and users of Sydney Harbour;	Safety is addressed in Section 8.4.1.
13.1(l)	impacts to water based traffic and shipping channels on users of Sydney Harbour with particular reference to the channel between Blues Point and Millers Point for passage to and from White Bay, Glebe Island and Gore Cove.	Maritime traffic is addressed in Section 8.4.11.
<b>10. Socio-economic, Land Use and Property</b>		
10.2	The Proponent must assess impacts from construction and operation on potentially affected properties, approved development applications, businesses, public open space, recreational users and land and water users (for example, recreational and commercial fishers, oyster farmers), including property acquisitions/adjustments, access, amenity and relevant statutory rights.	Access is addressed in Section 8.4.
10.3	Assess the likely risks of the project to public safety, paying particular attention to subsidence risks, bushfire risks and the handling and use of dangerous goods.	Public safety relating to construction traffic and transport is addressed in Section 8.4.1.

## 8.2 Assessment methodology and assumptions

### 8.2.1 Traffic assessment

The construction traffic impact assessment is based on the analysis of existing traffic movements on the road network near each construction site to determine the current operational performance. Construction traffic from the project is then added to the existing network and analysed to identify potential impacts. The approach to traffic modelling carried out for this assessment aligns with the Traffic Modelling Guidelines (Roads and Maritime, 2013).

For the purposes of this assessment, it has been assumed that all spoil would be transported from the construction site by truck. The use of other methods of transport, such as train or barge, may be possible subject to further investigation. This would reduce the potential road traffic impacts as described in this chapter. As such, this assessment provides a potential worst-case assessment of road based traffic.

Consistent with the standard approach for traffic assessments on major infrastructure projects, the traffic modelling carried out is of the AM and PM peak periods only. These peak traffic periods represent a ‘worst case scenario’ as during these periods the road network experiences the maximum background traffic demand and the available spare capacity of the road network is at its most limited. In order to minimise impacts to the road network, construction vehicle volumes have been planned to be higher outside the AM and PM weekday peak periods; however, the number movements would remain relatively low and would be within the range of daily variations in traffic volumes on the road network when compared to background traffic.

To assess the impact of the construction activities on the road network performance, intersections along the proposed construction routes between construction sites and the arterial road network have been assessed using Linsig 3.2 modelling software. Linsig 3.2 is used for the analysis of a corridor or a small transport network. The main performance indicators for Linsig 3.2 include:

- Degree of Saturation (DoS) – the ratio between traffic volumes and capacity (v/c) of the intersection, used to measure how close to capacity an intersection is operating. The Degree of Saturation is a direct measure of the congestion level at the intersection. As Degree of Saturation approaches 1.0, both queue length and delays increase rapidly. Satisfactory operations usually occur with a Degree of Saturation range between 0.8-0.9 or below
- Average Delay – duration, in seconds, of the average vehicle waiting time at an intersection
- Level of Service (LoS) – a measure of the overall performance of the intersection. For this purpose, average delay from Roads and Maritime Services LoS calculations has been used. Criteria for these performance indicators are provided in Table 8-2.

**Table 8-2 Level of Service criteria**

Level of service	Average delay (seconds per vehicle)	Traffic signals and roundabout operations
A	Less than 14	Good operation
B	15 to 28	Good with acceptable delays and spare capacity
C	29 to 42	Satisfactory
D	43 to 56	Operating near capacity
E	57 to 70	At capacity; at signals incidents will cause excessive delays
F	Greater than 70	Exceeds capacity; roundabouts require other control mode

The Sydney CBD is undergoing major changes in travel patterns and traffic behavior due to the construction of the CBD and South East Light Rail and the associated closure of George Street to vehicular traffic. The traffic survey data used to develop the traffic models for this assessment was collected at a point in time when George Street was open to all traffic. Therefore, in order to replicate the road network arrangements that would be in place during construction, the traffic data collected has been redistributed within the Sydney CBD in line with the preferred Sydney CBD driving routes (Transport for NSW, 2015a), and in consultation with the CBD Coordination Office. It is anticipated that the closure of George Street would be completed and the preferred driving routes fully in operation at the time the project commences construction.

The CBD Coordination Office has been established as a central point of leadership and authority on all traffic and transport in the Sydney CBD including:

- Ensuring urgent and coordinated responses by the Transport Management Centre and Roads and Maritime Services to traffic incidents
- Oversight of approvals for traffic management plans, and the allocation of areas and times for parking, loading zones and taxi ranks
- Coordination of permits to hold major events
- Sydney CBD related customer information and communications.

The CBD Coordination Office and Roads and Maritime Services have been consulted during the development of the traffic and transport assessment.

### 8.2.2 Transport assessment

A qualitative assessment has been carried out on the potential impacts to transport services during construction. This includes consideration of the active transport network (pedestrian and cyclist facilities) and public transport services (suburban rail, buses and ferries).

### 8.2.3 Spoil transport options

There are a number of transport options available for removing spoil from the station excavation and dive sites. Spoil haulage options that have been considered for the project are outlined in Table 8-3.

**Table 8-3 Spoil transport options**

Transport option	Discussion
<b>Road</b>	Considered feasible for all sites due to their location directly adjacent to the existing road network, in particular the proximity to the motorway and arterial road network.
<b>Rail</b>	<p>Rail transport options were investigated for the Chatswood dive site, Central Station and the Marrickville dive site due to their proximity to the rail network.</p> <p><b>Chatswood dive site</b></p> <p>The T1 North Shore Line is not currently rated for freight transport and includes steep grades and tight curves. The addition of spoil transport on this line would more than likely impact passenger rail operations. As such, rail transport is not considered feasible at this site.</p> <p><b>Central Station construction site</b></p> <p>Some rail siding space is available on the former Darling Harbour freight line, located on the western side of Central Station. The length of the siding is currently insufficient to accommodate a spoil train and additional infrastructure would be required to transport the spoil from the main construction site to the siding location. Train paths for spoil trains would also need to be secured which may impact passenger rail operations at Central Station. As such, rail transport is not considered feasible at this site.</p> <p><b>Marrickville dive site</b></p> <p>Track that could be used for a siding is potentially available on the southern side of the rail corridor. This track also provides ready access to the Metropolitan Freight Network. The use of this track would require the transport of spoil material across the suburban rail lines which may result in safety risks and impacts to passenger rail operations. Rail transport of spoil may be feasible at this site subject to further investigations regarding rail safety risks and the identification of a suitable destination for unloading spoil in proximity to a reuse or disposal site.</p>

Transport option	Discussion
Barge	<p>Barge transport options were investigated for the Blues Point temporary site and the Barangaroo Station construction site due to their proximity to Sydney Harbour.</p> <p><b>Blues Point temporary site</b></p> <p>The site has ready access to potential barge loading facilities via the existing wharf at the end of Blues Point Road. The use of a barge from this location may require strengthening works to the wharf and potentially dredging of the harbour bed to ensure sufficient depth. Additionally, the volume of spoil proposed to be transport from this site is relatively minor and the establishment of barging facilities at this site may not be a feasible solution. Barge transport of spoil may be feasible at this site subject to further investigations.</p> <p><b>Barangaroo Station construction site</b></p> <p>Barging of spoil at this site could potentially be achieved by using existing wharf areas at Barangaroo (to the south of the newly created ‘Northern Cove’) or to the north at Moore’s Wharf (a Port Authority of NSW facility to the east of Barangaroo Reserve).</p> <p>The use of wharf space at Barangaroo could result in disruption to the construction of the adjacent Barangaroo development. However, barge transport of spoil from this location may be feasible subject to further investigation and agreement with Barangaroo Delivery Authority.</p> <p>The use of Moore’s Wharf would require the transport of spoil from the Barangaroo Station construction site to the wharf through the use of a conveyor system or by road. Moore’s Wharf is currently used by the Port Authority of NSW for various functions including emergency response. Barge transport of spoil may be feasible at this site subject to further investigations, agreement of the Port Authority of NSW and the development of a solution which ensured the existing functions supported by Moore’s Wharf are not impacted.</p>

The investigation found that, subject to further feasibility analysis, rail transport may be possible from the Marrickville dive site and barge transport may be possible from the Barangaroo Station construction site and from the Blues Point temporary site. However, as there are substantial constraints to these options that would need to be overcome, this traffic and transport assessment has assumed that all spoil would be transported by road.

Further consideration of rail and barge options would be carried out during the detailed design phase of the project. In the event that either or both of these options are adopted this is likely to result in a reduction to the road based construction traffic impacts described in this chapter.

## 8.2.4 Hours of truck operation

As identified in Chapter 7 (Project description – construction), tunnelling and station excavation activities would be carried out up to 24 hours per day and seven days per week. These activities would require support construction vehicles for material supply and spoil removal, to also occur up to 24 hours per day and seven days per week.

The proposed timing of vehicle movements throughout the day for each site is identified in Section 8.4. The development of these truck movements has aimed to minimise movements during the AM and PM peak traffic periods and during the night-time period. Section 8.2.1 provides further discussion regarding the hours of heavy vehicle operations that have been assessed in the traffic model.

## 8.2.5 Haul routes

Haul routes to and from the construction site have been developed in consultation with Roads and Maritime Services and the CBD Coordination Office, and with the following aims:

- Minimise the use of local or residential streets and maximise the use of arterial roads
- Minimise potential safety implications for pedestrians, cyclists and other road users
- Avoid the need to pass through or under the Sydney CBD for the construction sites external to the Sydney CBD
- Exit the Sydney CBD as efficiently as possible for the Sydney CBD construction sites
- Minimise the cumulative use of roads by trucks accessing different Sydney CBD construction sites.

The proposed haul routes for all construction sites are provided in the respective sections of this chapter.

## 8.2.6 Spoil generation

Based on the concept design, it is envisaged that excavation would generate about 2.4 million cubic metres of spoil. Table 8-4 identifies the expected spoil volumes and truck type that is likely to be used at each construction site.

**Table 8-4 Anticipated spoil generation by construction site and likely truck type**

Site	Volume of spoil (m <sup>3</sup> )	Truck type <sup>1</sup>
Chatswood dive site – dive excavation	60,000	Truck and dog
Chatswood dive site – tunnelling	460,000	Truck and dog
Artarmon substation	2,000	Tipper truck
Crows Nest Station	150,000	Tipper truck
Victoria Cross Station	175,000	Tipper truck
Blues Point temporary site	8,000	Tipper truck
Barangaroo Station – station excavation	145,000	Tipper truck
Barangaroo Station – tunnelling	90,000	Tipper truck
Martin Place Station	175,000	Tipper truck
Pitt Street Station	160,000	Tipper truck
Central Station	230,000	Tipper truck
Waterloo Station	115,000	Tipper truck
Marrickville dive site – dive excavation	70,000	Truck and dog
Marrickville dive site – tunnelling	560,000	Truck and dog
<b>TOTAL</b>	<b>2,400,000</b>	

<sup>1</sup> A truck and dog is the common term for a tipper truck and trailer.

## 8.3 Existing environment

### 8.3.1 Regional traffic environment

The regional transport environment is described in Chapter 9 (Operational traffic and transport). This section describes the regional road network.

#### Regional road network

North of Sydney Harbour, the road network is dominated by the key motorways – the Warringah Freeway / Gore Hill Freeway, the Lane Cove Tunnel and the Hills M2 Motorway. The Warringah Freeway / Gore Hill Freeway, connects to the Sydney Harbour Bridge and the Sydney Harbour Tunnel. As the main route to and from the Sydney CBD from the north, it carries large volumes of traffic that progressively increase to the south and on the approaches to the crossing of Sydney Harbour.

The main arterial roads relevant to the project north of Sydney Harbour are:

- The Pacific Highway, which is the key arterial road to the north. It passes through North Sydney, Crows Nest, St Leonards and Chatswood. Traffic volumes on the Pacific Highway generally increase to the north, especially between North Sydney and the connection to the Warringah Freeway around Artarmon
- Mowbray Road, which provides an important east–west connection between Lane Cove, Chatswood and Willoughby. It intersects with Epping Road, the Pacific Highway, Penshurst Street and Willoughby Road.

Numerous arterial and sub-arterial roads provide connections from the surrounding areas to the Pacific Highway and Military Road. North–south arterial roads such as Eastern Valley Way and Willoughby Road are also used as alternative routes to the Pacific Highway. The majority of the arterial and sub-arterial road network experiences significant traffic volumes and congestion, especially during the peak traffic periods.

South of Sydney Harbour, the motorway network provides regional through routes primarily located on the periphery of the Sydney CBD or within tunnels beneath the Sydney CBD providing access for motorists whose origin or destination is not within the Sydney CBD. These roads include the Western Distributor, Eastern Distributor, Cahill Expressway and Cross City Tunnel.

The arterial road network within the Sydney CBD generally forms a grid pattern. Key north–south roads include Elizabeth, York and Clarence streets. Key east–west roads include Park, Market, King, Bathurst, Liverpool and Goulburn streets. Many roads within the Sydney CBD are one-way and experience high traffic volumes and congestion, especially during the peak periods. Pressure on key north–south roads is expected to increase following the closure and subsequent pedestrianisation of George Street between Hunter and Bathurst streets as part of the CBD and South East Light Rail project.

South of the Sydney CBD, the road network is dominated by the Eastern Distributor (providing a connection to the M5 Motorway) and the key arterial roads of King Street, the Princes Highway and Regent Street.



### **Changing CBD traffic and transport environment**

The Sydney CBD traffic and transport environment is complex and characterised by generally high volumes of traffic, high levels of congestion, numerous one-way streets and significant pedestrian volumes especially at peak travel times. This environment is currently undergoing changes through the implementation of the Sydney City Centre Access Strategy (Transport for NSW, 2013a) including major transport projects such as the CBD and South East Light Rail, the pedestrianisation of George Street between Hunter Street and Bathurst Street, the new CBD Bus Strategy and the cycleway program. Construction of these projects, and other changes to the traffic and transport environment within the Sydney CBD would be occurring concurrently with the construction of Sydney Metro. The Sydney City Centre Access Strategy will be progressively updated to reflect the changing Sydney CBD.

The CBD and South East Light Rail will run along George Street from Circular Quay to Central Station. *Sydney's Light Rail Future* (Transport for NSW, December 2012a) states that it expects that once the CBD and South East Light Rail is operational in 2020, it would remove 180 buses from the Sydney CBD while additional bus network changes would bring this to a total of about 220 fewer buses entering the city centre in the morning peak.

The CBD Coordination Office has been established to oversee all traffic and transport in the Sydney CBD including decisions, directions and approvals affecting all road and traffic arrangements in the Sydney CBD. Sydney Metro would liaise closely with the CBD Coordination Office during detailed construction planning and throughout construction phase to minimise the potential construction traffic impacts within the Sydney CBD, including potential cumulative impacts with other projects or special events.

### 8.3.2 Chatswood dive site (northern) and northern surface works

The Chatswood dive site would be bounded by Nelson Street to the north, the Pacific Highway to the west, Mowbray Road to the south and the T1 North Shore Rail Line to the east. The northern surface works would extend along the existing rail corridor from south of Chatswood Station to around Brand Street, Artarmon. The location of the construction site and the surrounding road network are shown on Figure 8-1.

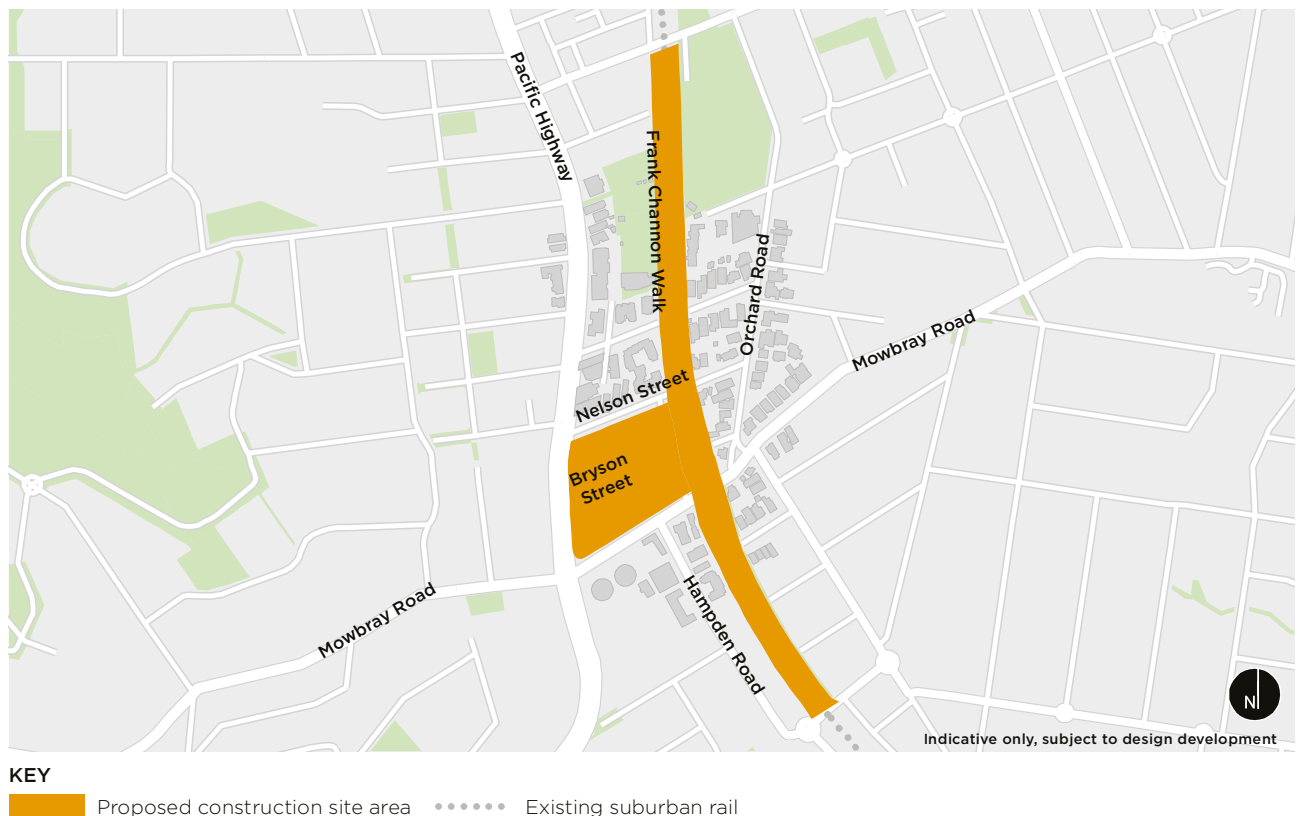


Figure 8-1 Chatswood dive site (northern) and northern surface works road network

#### Active transport network

Footpaths are located on all sides of the Pacific Highway, Nelson Street and Mowbray Road. Signalised crossing facilities are located on all arms of the intersection of the Pacific Highway and Mowbray Road. There are few crossing opportunities along the Pacific Highway with the nearest signalised crossings being located 600 metres north at the Pacific Highway / Albert Avenue intersection and 680 metres south at the Pacific Highway / Gore Hill Freeway intersection.

Nelson Street is part of a key active transport route that provides a link between the Pacific Highway and Frank Channon Walk, a shared path running along the western side of the rail corridor from Nelson Street to Chatswood Station and the Chatswood commercial centre. Nelson Street also provides east-west connectivity across the T1 North Shore Rail Line, along with Mowbray Road to the south and Albert Avenue to the north. Surveys carried out in December 2015 identified in the AM peak hour a total of 16 pedestrians and five cyclists crossing Nelson Street bridge in both directions and in the PM peak hour 22 pedestrians and five cyclists were observed.

### Public transport services

Frequent bus services currently operate along the Pacific Highway with a bus stop located between Bryson Street, Chatswood and Mowbray Road, Chatswood in the southbound direction serving five routes to destinations such as Manly, the Sydney CBD, Ryde and Castle Hill. These services generally operate every five minutes during peak periods and every 10 minutes at other times. Additional routes also operate past the proposed construction site.

The Epping to Chatswood Rail Conversion Temporary Transport Project will be providing rail replacement bus services for six to seven months from the end of 2018. An additional 30 bus services will arrive and depart Chatswood in the AM and PM peak hours. Buses would travel from North Ryde, via Fullers Road and use Victoria Avenue, Help Street, Brown Street and Railway Street in Chatswood. The replacement bus services would operate to the north of the Chatswood dive site and be temporary in nature.

### Traffic volumes and patterns

The existing traffic volumes on the surrounding road network are provided in Table 8-5. This table shows a typical Sydney commuter peak pattern with the Pacific Highway experiencing heavier flows in the southbound direction (towards the city) in the AM peak and in the northbound direction (away from the city) in the PM peak. Traffic volumes on the Pacific Highway are higher to the south of Mowbray Road. On Mowbray Road, traffic volumes are marginally higher in the eastbound direction in the AM peak and in the westbound direction in the PM peak. Current traffic volumes on Nelson Street are very low.

Intersections on the Pacific Highway and Mowbray Road currently experience long delays due to high through volumes and conflicting right-turn movements. The following intersections currently perform at level of service E or F:

- Pacific Highway / Fullers Road / Help Street (AM peak)
- Pacific Highway / Victoria Avenue (AM and PM peaks)
- Pacific Highway / Mowbray Road (AM and PM peaks)
- Pacific Highway / Gore Hill Freeway ramps (AM peak).

Currently, the southbound right turn movement from the Pacific Highway into Mowbray Road westbound is prohibited for all vehicles with the exception of buses. Motorists wishing to undertake this movement are required to turn left into Nelson Street, right into Orchard Road and then right into Mowbray Road (a 'G' turn) before proceeding straight across the Pacific Highway.

Table 8-5 Chatswood dive site (northern) existing traffic volumes

Road	Direction	AM peak hour (vehicles per hour)	PM peak hour (vehicles per hour)
Pacific Highway Between Fullers Road and Victoria Avenue	Southbound	2,320	1,710
	Northbound	1,550	2,470
Pacific Highway Between Albert Avenue and Nelson Street	Southbound	2,020	1,760
	Northbound	1,880	2,430
Pacific Highway Between Mowbray Road and Howarth Road	Southbound	2,180	2,020
	Northbound	1,920	2,570
Mowbray Road Between Pacific Highway and Orchard Road	Eastbound	1,340	1,130
	Westbound	1,050	1,420

### 8.3.3 Artarmon substation

The Artarmon substation would be located adjacent to the Gore Hill Freeway and bounded by Butchers Lane and Barton Road. The location of the construction site and the surrounding road network are shown on Figure 8-2.

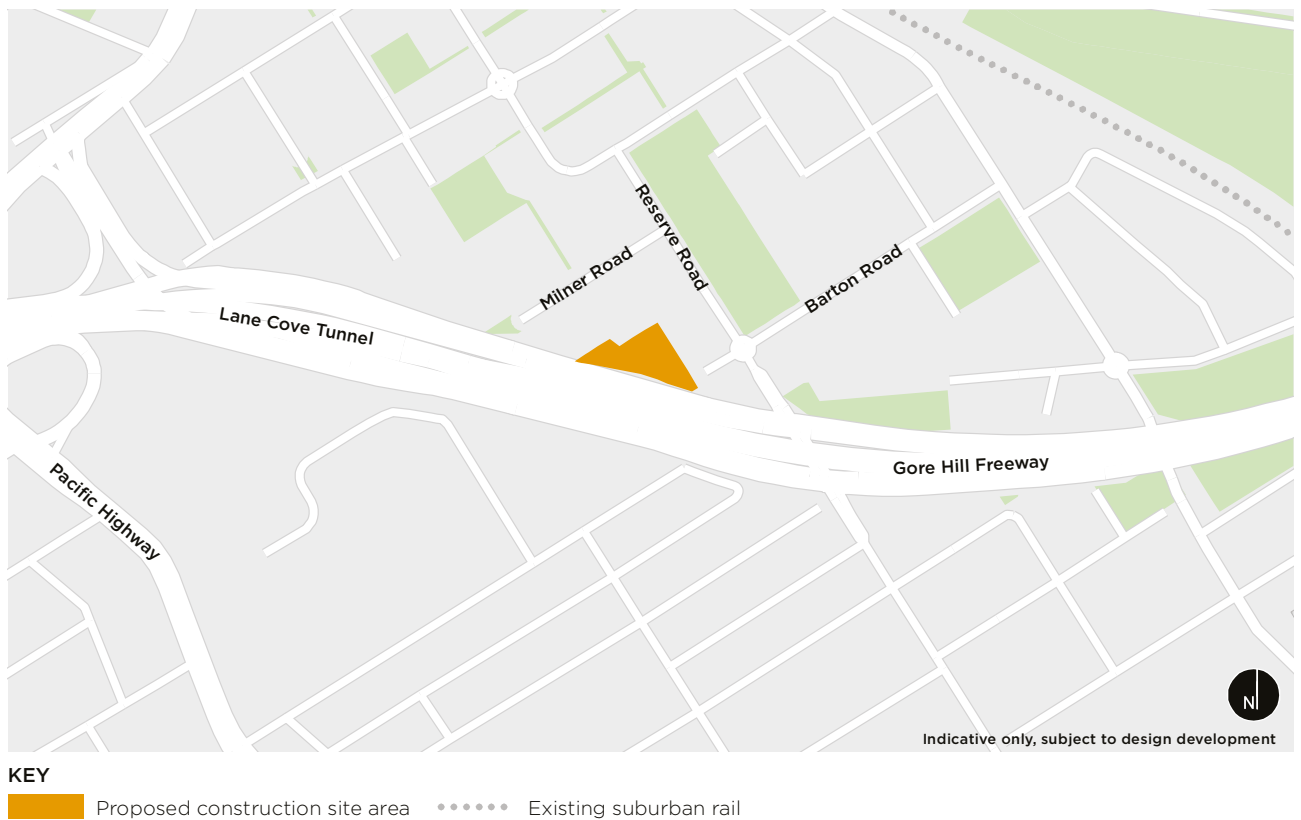


Figure 8-2 Artarmon substation road network

### Active transport network

Footpaths are located along Reserve Road, Barton Road and Milner Road. Pedestrian facilities are not provided on Butchers Lane which is primarily used for residential parking and access to driveways of properties fronting Milner Road. A combination of marked and signalised pedestrian crossings exist at the Gore Hill Freeway / Reserve Road interchange.

A shared path runs along the southern side of the Gore Hill Freeway and provides facilities for cyclists. There are no dedicated cycle facilities in the vicinity of the proposed site.

### Public transport services

Public transport services do not operate near the proposed site. The nearest rail service is the T1 North Shore Rail Line accessible from Artarmon Station, around 700 metres from the site. The nearest bus services are at least 800 metres from the site and operate along the Pacific Highway and Campbell Street towards destinations such as Chatswood, Manly and the Sydney CBD.

The Artarmon Loop (a free shuttle service operated by Willoughby Council) runs along Reserve Road in the vicinity of the site providing a link between St Leonards and Artarmon. Services run every 30 minutes between 10 am and 2:30 pm.

### Traffic volumes and patterns

The existing traffic volumes on the surrounding road network are provided in Table 8-6. The table shows that traffic volumes are relatively low to the north of the Gore Hill Freeway. Reserve Road south of the Gore Hill Freeway has higher traffic volumes, particularly southbound in the AM peak. Butcher's Lane and Barton Road west of Reserve Road are 'no through' roads and record low traffic volumes.

Currently, all intersections in the vicinity of Artarmon substation operate at level of service B or better in both the AM and PM peak periods.

**Table 8-6 Artarmon substation existing traffic volumes**

Road	Direction	AM peak hour (vehicles per hour)	PM peak hour (vehicles per hour)
Reserve Road Between Butchers Road and Barton Road	Southbound	430	280
	Northbound	300	520
Reserve Road Between Barton Road and Gore Hill Freeway	Southbound	530	320
	Northbound	450	610
Reserve Road South of Gore Hill Freeway	Southbound	1,270	520
	Northbound	530	1,170

### 8.3.4 Crows Nest Station

Crows Nest Station would be located on the Pacific Highway in the vicinity of Oxley Street and Hume Street. The location of the construction site and the surrounding road network are shown on Figure 8-3.

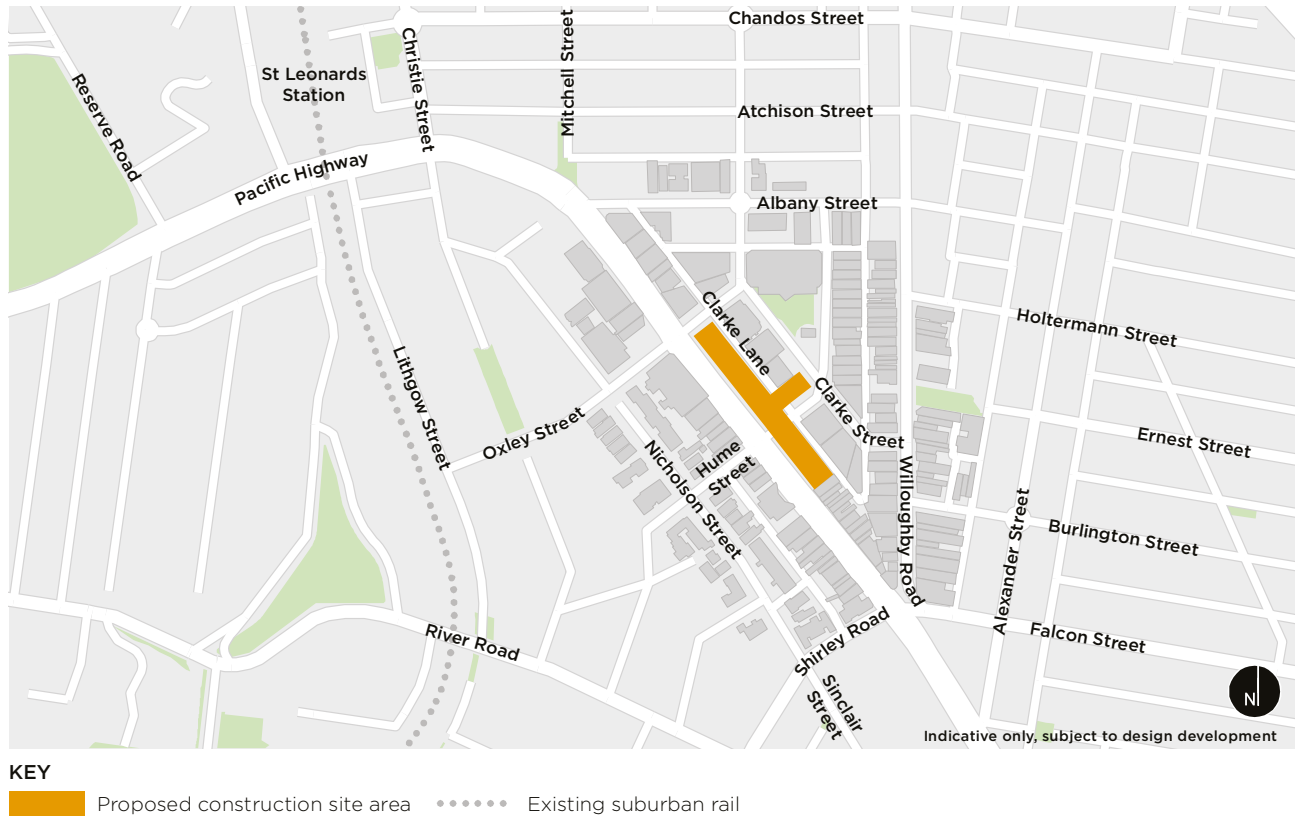


Figure 8-3 Crows Nest Station road network

#### Active transport network

The pedestrian network immediately surrounding the proposed site is well served by an existing network of footpaths. Connections can be made to surrounding land uses including residential, commercial and retail. Away from the Pacific Highway pedestrian crossing facilities are currently limited with no formal facilities provided on Hume Street, Clarke Street, Clarke Lane or Oxley Street in the vicinity of the site. The existing key pedestrian desire lines are towards St Leonards Station and the St Leonards commercial core, and towards the Crows Nest retail and leisure precinct on Willoughby Road.

On-road marked bicycle routes near the proposed site run parallel to the eastern side of Pacific Highway along Alexander Street, Burlington Street, Willoughby Road, Clarke Street and Oxley Street, as well as Nicholson Street and Sinclair Street on the western side of Pacific Highway. On-road marked cycle routes are also provided on Shirley Road and Nicholson Street on the southern side of the Pacific Highway. In St Leonards, on-road marked bicycle routes run east-west parallel to the Pacific Highway along Atchinson Street (between Christie Street and Mitchell Street).

### Public transport services

Crows Nest is currently served by a number of buses operated by Sydney Buses and Hillsbus, with 21 bus routes passing through the area. Major bus stops within the vicinity of the proposed site are located along the Pacific Highway, Willoughby Road and Falcon Street. During the morning peak period the majority of routes passing through Crows Nest along the Pacific Highway are generally bound for North Sydney or the Sydney CBD. Routes servicing the Crows Nest town centre tend to travel along Willoughby Road, Alexander Street and Falcon Street. Bus service frequencies in Crows Nest run regularly throughout the day, with around 300 services during the weekday morning peak (6 am to 10 am) and 360 services during the evening peak (3 pm to 7 pm).

### Traffic volumes and patterns

Crows Nest currently experiences low to moderate levels of traffic congestion during peak periods. The intersection of Pacific Highway, Falcon Street, Willoughby Road and Shirley Street has been observed to operate at capacity during peak periods, with subsequent queuing along Falcon Street and the Pacific Highway.

The existing traffic volumes on the surrounding road network are provided in Table 8-7. In Crows Nest, traffic on the Pacific Highway does not exhibit strong tidal characteristics (ie there is no strong directional preference in the AM or PM peak period). This section of the Pacific Highway has at least two lanes available in each direction at all times. There is an additional T3 lane, and associated clearway restrictions, in the southbound direction during the AM peak and in the northbound direction during the PM peak.

Currently, the intersections at Pacific Highway / Oxley Street and Pacific Highway / Hume Street operate at level of service B or better, and the intersection at Pacific Highway / Falcon Street / Shirley Road operates at level of service D and experience longer delays during both peak periods. These delays are primarily experienced by vehicles on side streets (Falcon Street and Shirley Road).

**Table 8-7 Crows Nest Station existing traffic volumes**

Road	Direction	AM peak hour (vehicles per hour)	PM peak hour (vehicles per hour)
Pacific Highway Between Oxley Street and Hume Street	Southbound	1,340	1,360
	Northbound	1,480	1,410
Pacific Highway Between Hume Street and Falcon Street	Southbound	1,290	1,290
	Northbound	1,480	1,400
Hume Street East of the Pacific Highway	Westbound	150	190
	Eastbound	140	140
Oxley Street East of the Pacific Highway	Westbound	225	145
	Eastbound	145	150

### 8.3.5 Victoria Cross Station

Victoria Cross Station would be located on Miller Street in North Sydney in the vicinity of Berry Street and McLaren Street. The location of the construction site and the surrounding road network are shown on Figure 8-4.



#### KEY

Proposed construction site area     Existing suburban rail

Figure 8-4 Victoria Cross Station road network

#### Active transport network

The area around the site forms the commercial core of the North Sydney CBD and, as such, generates high pedestrian volumes, particularly during the commuter peak hours. At busy times, formal pedestrian crossing facilities within the North Sydney CBD become congested with pedestrians due to the lack of footpath space provided at some intersections (such as the Pacific Highway / Miller Street intersection and Pacific Highway / Walker Street intersection). Locally there are key pedestrian desire lines crossing the Pacific Highway at both Walker Street and Miller Street as pedestrians move from North Sydney Station to the commercial precincts of the North Sydney CBD.

Underground pedestrian connections are provided through Greenwood Plaza in the vicinity of the existing North Sydney Station, providing connections to nearby commercial developments.

In the immediate vicinity of the site, a pedestrian bridge across Denison Street provides a connection between the retail areas of Tower Square and Berry Square.

School children also use pedestrian footpaths and crossing facilities in the vicinity of the site between Monte Sant' Angelo Mercy College and public transport services.



### Public transport services

North Sydney is a major thoroughfare for buses with 44 bus routes passing through the area. Bus services are currently provided by Sydney Buses, Hillsbus and Forest Coach Lines. Major outbound bus stops are located on Miller Street, Pacific Highway and Blue Street, with services connecting North Sydney with the Northern Beaches and lower North Shore, including Mosman, Northbridge and Chatswood. The majority of inbound routes operating within the area terminate in North Sydney, Milsons Point or the Sydney CBD. Most routes run regularly throughout the day, with approximately 420 services during the weekday morning peak (6 am to 10 am) and 450 services during the evening peak (3 pm to 7 pm).

North Sydney is also served by the existing North Sydney Station located on Blue Street south of the construction site. North Sydney Station is on the T1 North Shore Rail Line, providing connections towards Hornsby, Chatswood and Macquarie Park in the north, the Sydney CBD to the south, and Parramatta, Blacktown and Penrith to the west.

### Traffic volumes and patterns

The existing traffic volumes on the surrounding road network are provided in Table 8-8. During the AM peak hour, the Pacific Highway carries a large number of vehicles southbound between McLaren Street and Berry Street. South of this intersection vehicle numbers drop significantly due to the large left turn movement into Berry Street for vehicles heading towards the Sydney Harbour Bridge and the Warringah Freeway. As a result, Berry Street also experiences high traffic volumes. Miller Street generally has lower traffic volumes with a relatively even split in each direction.

All intersections currently operate at a level of service C or better. However, at some intersections, vehicles performing minor conflicting movements experience delays. These intersections are:

- Berry Street / Walker Street (AM peak)
- Falcon Street / Miller Street (AM and PM peaks)
- Falcon Street / Warringah Freeway ramps (AM and PM peaks).

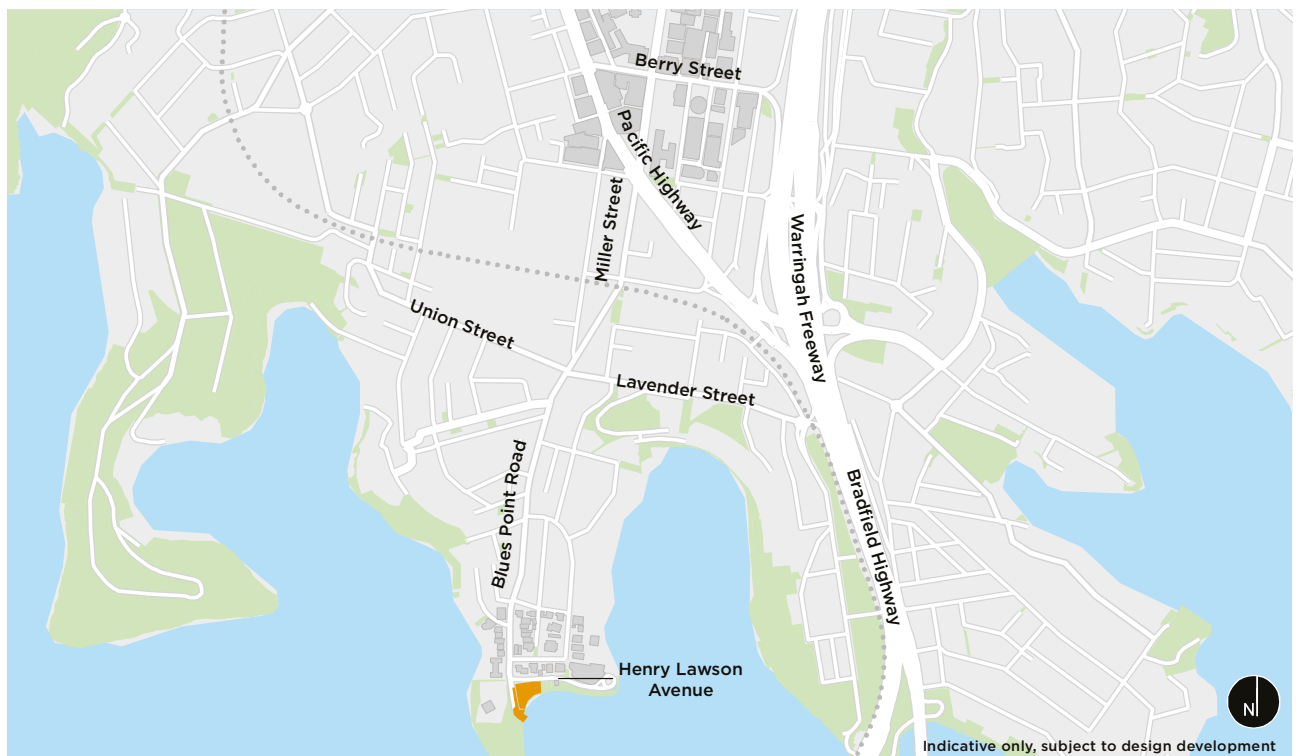
**Table 8-8 Victoria Cross Station existing traffic volumes**

Road	Direction	AM peak hour (vehicles per hour)	PM peak hour (vehicles per hour)
Pacific Highway Between McLaren Street and Berry Street	Southbound	1,390	1,060
	Northbound	1,000	790
Pacific Highway Between Berry Street and Miller Street	Southbound	520	620
	Northbound	1,210	1,160
Miller Street Between McLaren Street and Berry Street	Southbound	630	530
	Northbound	470	500
Miller Street Between Berry Street and Pacific Highway	Southbound	540	370
	Northbound	550	640
McLaren Street Between Pacific Highway and Miller Street	Eastbound	240	190
	Westbound	290	250
Berry Street Between Pacific Highway and Miller Street	Eastbound	1,220	940

Road	Direction	AM peak hour (vehicles per hour)	PM peak hour (vehicles per hour)
Berry Street Between Miller Street and Walker Street	Eastbound	1,280	1,700
Walker Street Between Arthur Street and Mount Street	Southbound	160	100
	Northbound	1,170	940

### 8.3.6 Blues Point temporary site

The Blues Point temporary site would be located at the end of Blues Point Road, near the intersection with Henry Lawson Drive. The location of the construction site and the surrounding road network are shown on Figure 8-5.



**KEY**  
 Proposed construction site area   
  Existing suburban rail

Figure 8-5 Blues Point temporary site road network

#### Active transport network

Henry Lawson Avenue acts as a pedestrian and cyclist desire line between McMahons Point Wharf and the foreshore reserve, access to parking at Blues Point Reserve and residential areas surrounding Blues Point Road. There is a footpath on the southern side of Henry Lawson Avenue and on both sides of Blues Point Road. There is a marked on-road cycle route on Blues Point Road south of Lavender Street and on Henry Lawson Avenue.

Informal pedestrian paths also exist through Blues Point Reserve, providing Sydney Harbour foreshore access.

### Public transport services

Bus services currently operate along Blues Point Road and Henry Lawson Avenue, performing a U-turn at the roundabout at the eastern end of Henry Lawson Avenue. There is a bus stop located in the westbound direction on Henry Lawson Avenue and buses currently operate at this bus stop on average every 30 minutes.

McMahons Point Wharf is located at the eastern end of Henry Lawson Avenue; the wharf is used by ferries on the F3 Parramatta River and F4 Darling Harbour routes, with six services in peak periods, services every 30 minutes during weekdays and every 20 minutes during weekend.

### Traffic volumes and patterns

The existing traffic volumes on the surrounding road network are provided in Table 8-9. Blues Point Road has relatively low traffic volumes and does not exhibit strong tidal flow patterns.

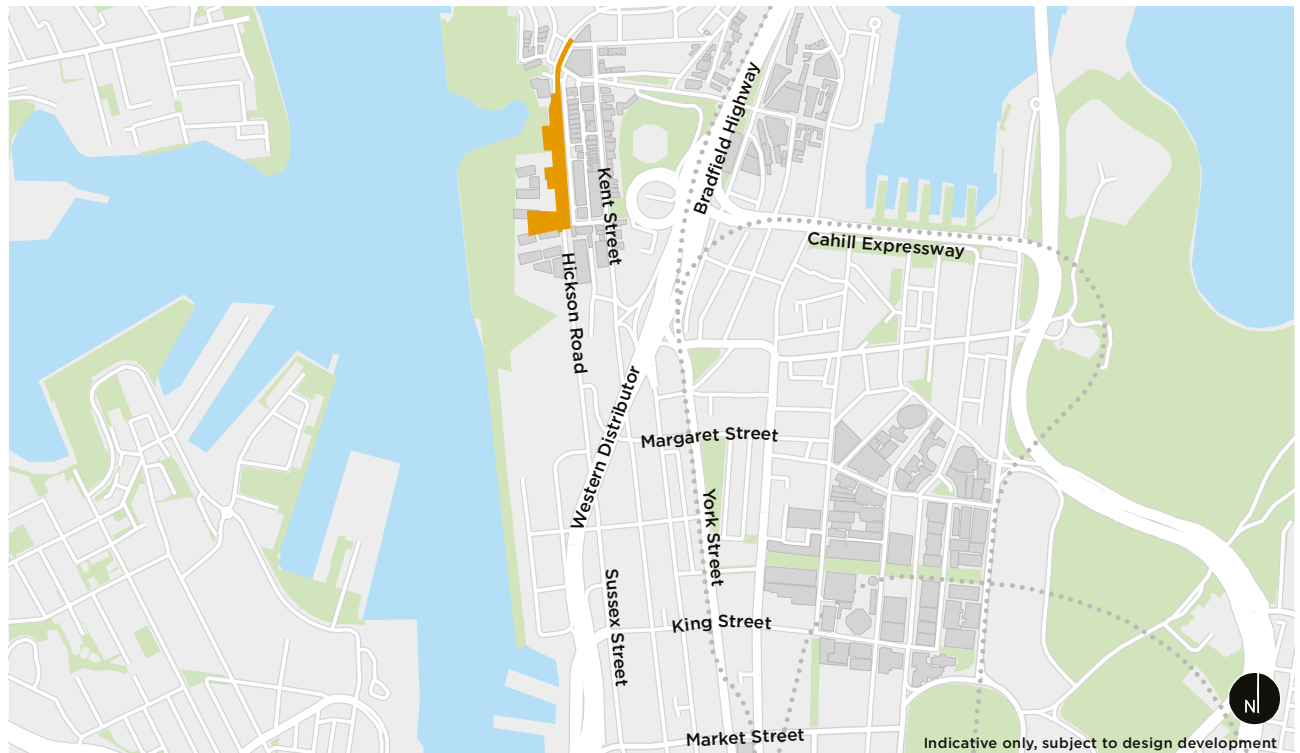
Currently, intersections along Blues Point Road show good performance with a level of service B, except for the Blues Point Road / Union Street / Lavender Street intersection during the AM peak which operates at a level of service C.

**Table 8-9 Blues Point temporary site existing traffic volumes**

Road	Direction	AM peak hour (vehicles per hour)	PM peak hour (vehicles per hour)
Blues Point Road Between Blues Street and Union Street	Southbound	440	440
	Northbound	400	460
Blues Point Road South of Union Street	Southbound	320	300
	Northbound	360	360

### 8.3.7 Barangaroo Station

Barangaroo Station would be located adjacent to the Central Barangaroo precinct alongside Hickson Road. The location of the construction site and the surrounding road network are shown on Figure 8-6.



#### KEY

Proposed construction site area Existing suburban rail

Figure 8-6 Barangaroo Station road network

#### Active transport network

Hickson Road currently has a pedestrian footpath on both its eastern and western sides. An on-road marked cycle route is also provided on Hickson Road, offering connections to the Sydney Harbour Bridge and the dedicated cycle path along Kent Street.

Walking and cycling facilities in the area are expected to be improved as part of the Barangaroo development. This is expected to include improved connectivity to the Sydney CBD via improvements to the Sydney Steps, a continuous foreshore walk and new public open space. In addition to Wynyard Walk, pedestrian connections to Martin Place and Town Hall are planned to be enhanced as well as improvements to the foreshore connectivity linking Darling Harbour and Circular Quay.

### Public transport services

Bus services currently operate to and from Barangaroo along Hickson Road, with three routes servicing the area, the 311, 324 and 325. These routes are regular, with 60 services operating during the morning peak period (6am to 10am), and 70 services operating during the evening peak period (3 pm to 7 pm).

Wynyard Station is located approximately 850 metres southeast of the proposed site and serves the T1 North Shore, Northern and Western Line, T2 Airport, Inner West and South Line and T3 Bankstown Line. The new ferry hub at Barangaroo, expected to be open to customers in 2016, would provide interchange opportunities to ferry services from Parramatta River and Inner Harbour, as well as direct access to and from the eastern suburbs at Double Bay, Rose Bay and Watsons Bay.

### Traffic volumes and patterns

The existing traffic volumes on the surrounding road network are provided in Table 8-10. Sussex Street shows a stronger southbound movement in both peak periods, with particularly high volumes in the PM peak. Conversely Kent Street shows a stronger northbound movement associated with vehicles accessing the Harbour Bridge.

All intersections near the proposed Barangaroo Station construction site currently operate at a level of service C or better except for the Kent Street / Clarence Street / Sydney Harbour Bridge entry ramp intersection which is currently operating at capacity. At this intersection the majority of vehicles perform right-turn movements from either Kent Street (northbound) or Clarence Street (westbound). Conflict between these major movements causes delays, particularly in the AM peak.

Access to the Overseas Passenger Terminal at Circular Quay for delivery trucks and coaches on days that a ship is docked is gained via Hickson Road. These movements typically occur over a short duration associated with the arrival and departure times for cruise ships (typically early morning and evening).

**Table 8-10** Barangaroo Station existing traffic volumes

Road	Direction	AM peak hour (vehicles per hour)	PM peak hour (vehicles per hour)
Hickson Road North of Napoleon Street	Southbound	190	430
	Northbound	420	410
Kent Street Between Clarence Street and Margaret Street	Southbound	230	270
	Northbound	610	820
Sussex Street Between Napoleon Street and Erskine Street	Southbound	400	500
	Northbound	570	480
Sussex Street Between Erskine Street and King Street	Southbound	810	1,020
	Northbound	380	320
Sussex Street Between King Street and Market Street	Southbound	840	1,200

### 8.3.8 Martin Place Station

The Sydney Metro Martin Place Station would be located to the north and south of Martin Place, bounded by Castlereagh Street to the west and Elizabeth Street to the east. The location of the construction site and the surrounding road network are shown on Figure 8-7.



#### KEY

Proposed construction site area     Existing suburban rail

Figure 8-7 Martin Place Station road network

#### Active transport network

Martin Place is pedestrian-only between George Street and Macquarie Street. As part of the CBD and South East Light Rail project, George Street in the vicinity of Martin Place, will also be pedestrianised enhancing the pedestrian environment from what is currently available. Surveys were carried out in December 2015 of the Martin Place / Castlereagh Street and Martin Place / Elizabeth Street pedestrian crossings. These surveys showed:

- Around 44,300 pedestrians crossed at Castlereagh Street throughout the day, with around 20,950 travelling eastbound and 23,350 travelling westbound. In the AM period the dominant pedestrian movement was westbound towards commercial buildings and George Street, whilst in the PM period the dominant movement was eastbound towards the Sydney Trains Martin Place Station
- Around 33,900 pedestrians crossed at Elizabeth Street throughout the day, with around 13,700 travelling eastbound and 17,200 travelling westbound. As with Castlereagh Street, the majority of pedestrians travel westbound in the AM period and eastbound in the PM period.

Within the immediate vicinity of Martin Place, a number of bicycle parking facilities are currently available, however, there is no provision or planned provision of on-road separated or shared bicycle paths.

### Public transport services

The Martin Place precinct experiences high volumes of bus traffic during peak and off-peak times, particularly along Elizabeth Street and Castlereagh Street which, since the closure of George Street, are the main north-south bus corridors through the Sydney CBD. Buses from all over Sydney converge and diverge at bus stops located adjacent to and near the proposed station.

Martin Place Station on the T4 Eastern Suburbs and Illawarra Line and the South Coast Line provides a key Sydney CBD access point for customers travelling from the eastern suburbs and southern regions of Sydney.

### Traffic volumes and patterns

The existing traffic volumes on the surrounding road network are provided in Table 8-11. Elizabeth Street northbound experiences heavy traffic volumes during both peak periods. There is a strong movement from Macquarie Street (southbound) in the east to Castlereagh Street (southbound) via Hunter Street, which contributes to relatively heavy westbound traffic on Hunter Street.

Currently, the Macquarie Street / Bent Street / Eastern Distributor ramps intersection is extremely congested during the AM and PM peaks with the intersection performing above its theoretical capacity at level of service F. Long delays are caused by conflict between high volumes of traffic on the Eastern Distributor ramps (westbound) and Macquarie Street (southbound).

All other intersections near the Martin Place Station construction sites currently operate at level of service B or better. However, at the Elizabeth Street / Phillip Street / Hunter Street intersection, signal coordination along Elizabeth Street causes delays for conflicting right turn movements and vehicles on side-streets.

**Table 8-11 Martin Place Station existing traffic volumes**

Road	Direction	AM peak hour (vehicles per hour)	PM peak hour (vehicles per hour)
Castlereagh Street Between King Street and Hunter Street	Southbound	380	510
Elizabeth Street Between King Street and Hunter Street	Southbound	1,130	1,110
	Northbound	410	590
Hunter Street Between Castlereagh Street and Elizabeth Street	Eastbound	190	190
	Westbound	790	630

### 8.3.9 Pitt Street Station

Pitt Street Station would be located between the existing Town Hall Station and Museum Station. The station access would be at two locations, one at the intersection of Pitt Street and Park Street to the north and one on Bathurst Street to the south. The location of the construction site and the surrounding road network are shown on Figure 8-8.



#### KEY

Proposed construction site area     Existing suburban rail

Figure 8-8 Pitt Street Station road network

#### Active transport network

The Pitt Street / Park Street intersection currently experiences high volumes of pedestrian traffic, predominantly in the east-west direction along Park Street. The pedestrian demand in this direction is driven by bus passengers with some additional movements from Town Hall and Museum station and general circulation.

Bicycle parking facilities are located throughout the Sydney CBD and the City of Sydney provides free bicycle parking at its Goulburn Street carpark. A marked cycle lane exists on Park Street, however this currently stops at its intersection with Elizabeth Street.

#### Public transport services

A number of bus routes operate within the vicinity of the proposed Pitt Street Station, particularly those that run north-south along Elizabeth Street and Castlereagh Street and services running east-west along Park Street. These routes primarily serve the east and southeast continuing towards Oxford Street or Central Station, services which pass through Broadway, and also the Metrobus Network. Bus services operating along Victoria Road also use Park and Druiett streets. Bus stops associated with these routes are located adjacent to the site on Park Street and nearby on Castlereagh and Elizabeth streets.



Town Hall Station located near the proposed Sydney Metro Pitt Street Station is currently the second-busiest railway station in the Sydney Trains network during the morning peak (behind Central Station). Town Hall also serves as a significant interchange station that is traversed by all train lines through the Sydney CBD.

Museum Station is located around the Elizabeth Street / Liverpool Street intersection. Trains on the T2 Airport, Inner West and South Line, T3 Bankstown Line and the Southern Highlands Line operate through Museum Station.

### Traffic volumes and patterns

The existing traffic volumes on the surrounding road network are provided in Table 8-12. Traffic movement was observed to be generally congested along Park Street during peak periods, due to the close proximity of intersections, particularly George Street, and the competing heavy traffic demands on the north south corridors. Bathurst Street shows high volumes of traffic in both the morning and evening peak hours, with higher volumes observed in the evening peak. Park Street (westbound) also experiences relatively high volumes, particularly during the morning peak hour.

Currently, all intersections perform at a level of service C or better except for the following:

- Bathurst Street / Harbour Street (level of service D in both the AM and PM peaks)
- Bathurst Street / Day Street (level of service F in the AM peak).

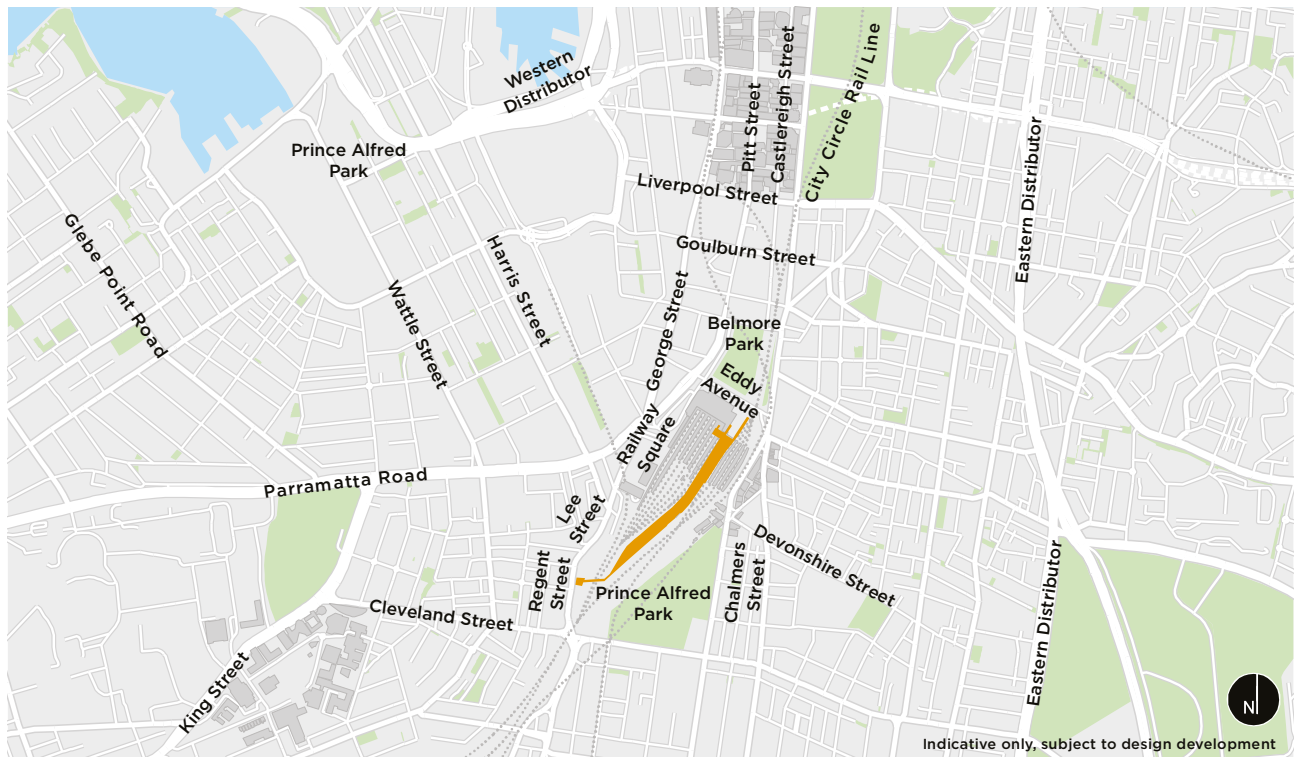
The Bathurst Street / Day Street intersection operates with a degree of saturation of greater than 1.0, therefore, this intersection is currently operating above its theoretical capacity.

**Table 8-12 Pitt Street Station existing traffic volumes**

Road	Direction	AM peak hour (vehicles per hour)	PM peak hour (vehicles per hour)
Castlereagh Street Between Park Street and Bathurst Street	Southbound	300	490
Pitt Street Between Bathurst Street and Park Street	Northbound	530	480
Park Street Between Castlereagh Street and Pitt Street	Eastbound	170	270
	Westbound	610	530
Bathurst Street Between Castlereagh Street and Pitt Street	Eastbound	1,110	1,120

### 8.3.10 Central Station platforms

The new metro underground platforms at Central Station would be located within the existing Central Station below intercity rail service platforms 13, 14 and 15. The location of the construction site and the surrounding road network are shown on Figure 8-9.

**KEY**

Proposed construction site area
  Existing suburban rail

**Figure 8-9 Central Station road network**

### Active transport network

Pedestrian access to Central Station via Eddy Avenue has wide footpaths on both sides. Pedestrian access is also available from Lee Street to the northwest and Devonshire Street to the southeast, which are connected by the Devonshire Street Tunnel, providing subsurface access to the station from its southern approaches. Surveys of Devonshire Street Tunnel were carried out in November 2015. This survey showed:

- The total number of pedestrians using Devonshire Street Tunnel throughout the day was around 25,440 in the eastbound direction and 22,330 in the westbound direction
- In the AM peak period around 1,400 pedestrians travelled eastbound and 4,500 pedestrians travelled westbound
- The majority of users of the Devonshire Street Tunnel passed through the ticket gates at the southern end of Central Station.

The Central Station precinct currently has a shared off-road cycle path along Chalmers Street and throughout Prince Alfred Park and Belmore Park. As part of the City Centre Access Strategy, a new cycle path on Castlereagh Street, connecting to Chalmers Street and Liverpool Street has recently opened. Free bicycle parking is available at the Goulburn Street car park operated by the City of Sydney.

### Public transport services

Central Station is located at the southern end of the Sydney CBD, and is the busiest station in NSW. Central Station is the primary destination for intercity services with the majority of these services terminating at Central Station. Central Station is a major interchange hub between rail, light rail, bus and coach services. Eddy Avenue, Chalmers and Elizabeth streets, and Railway Square experience high volumes of bus traffic throughout the day.

Central Station currently provides a number of underground pedestrian connections, running mainly east-west, providing interchange connectivity between platforms. These underground pedestrian connections currently experience high pedestrian volumes.

### Traffic volumes and patterns

The existing traffic volumes on the surrounding road network are provided in Table 8-13. Currently there are very high volumes on all nearby major roads including on George Street and Regent Street. In the evening peak, Elizabeth Street (southbound) experiences similarly high volumes.

Cleveland Street is a major east-west arterial route that allows vehicles to by-pass George Street and the Sydney CBD. As such, a large number of vehicles currently travel from Cleveland Street (eastbound) to Elizabeth Street (northbound) via Chalmers Street. A corresponding movement is evident in the southbound direction as vehicles turn right from Elizabeth Street (southbound) into Cleveland Street.

Currently, a number of intersections near the Central Station construction sites operate near, at or over capacity particularly in the AM peak period. These include:

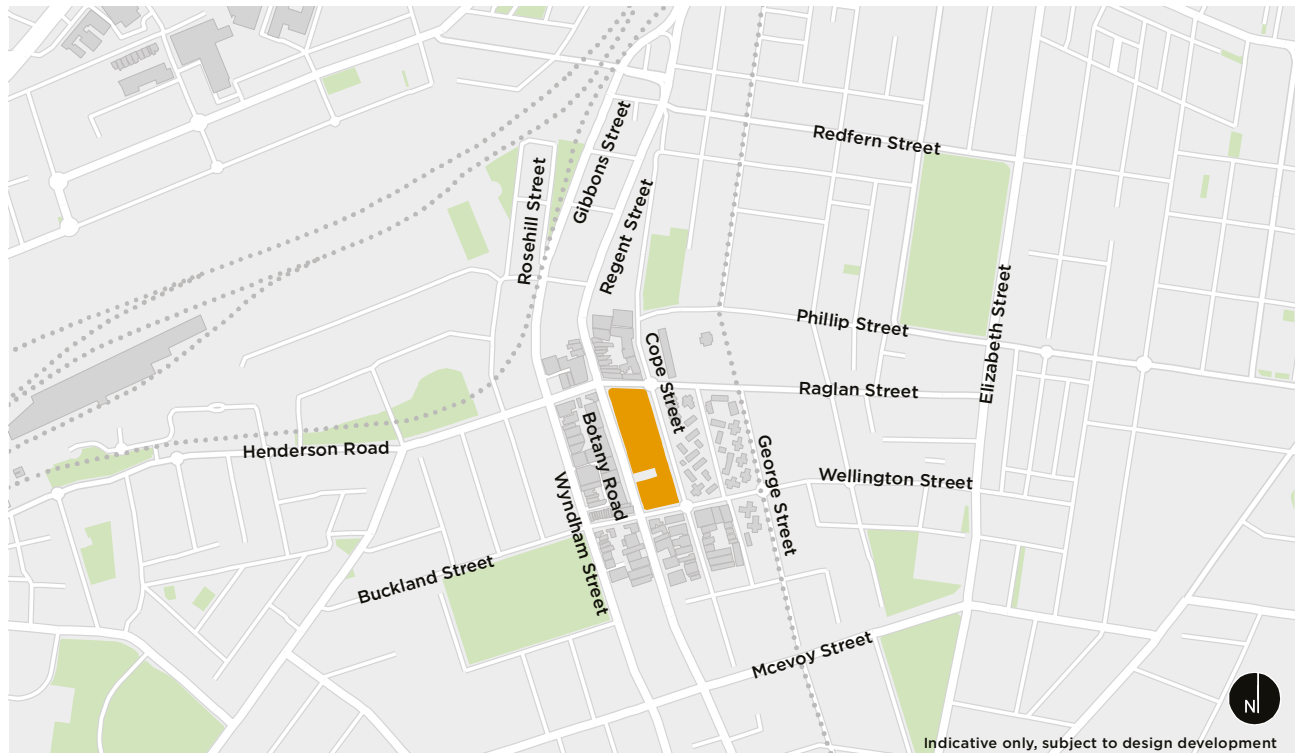
- George Street / Pitt Street / Lee Street / Quay Street (AM peak)
- Pitt Street / Eddy Avenue / Rawson Parade (AM peak)
- Chalmers Street / Cleveland Street (AM peak and PM peak)
- Regent Street / Cleveland Street (AM peak and PM peak)
- Cleveland Street / South Dowling Street (AM peak and PM peak).

**Table 8-13 Central existing traffic volumes**

Road	Direction	AM peak hour (vehicles per hour)	PM peak hour (vehicles per hour)
George Street Between Pitt Street and Harris Street	Northbound	1,730	1,340
	Southbound	890	1,480
Regent Street Between Kensington Street and Lee Street	Northbound	780	550
	Southbound	1,560	2,000
Cleveland Street Between Regent Street and Chalmers Street	Eastbound	1,190	1,200
	Westbound	1,350	1,540
Chalmers Street Between Devonshire Street and Foveaux Street	Northbound	1,160	1,100
Elizabeth Street Between Devonshire Street and Foveaux Street	Southbound	1,040	1,520
Pitt Street Between George Street and Eddy Avenue	Northbound	1,410	1,150

### 8.3.11 Waterloo Station

Waterloo Station would be located on Cope Street between Raglan and Wellington Streets, Waterloo. The location of the construction site and the surrounding road network are shown on Figure 8-10.



#### KEY

Proposed construction site area       Existing suburban rail

Figure 8-10 Waterloo Station road network

#### Active transport network

Footpaths are located on all streets in the vicinity of the station location. Pedestrian refuges are located on all arms of the roundabouts at Cope and Raglan streets and Cope and Wellington streets and signalised crossing facilities are located at the intersections of Botany Road and Raglan Street and Botany Road and Wellington Street.

There is a short dedicated cycleway on Buckland Street between Botany Road and Wyndham Street in the westbound direction and a two-way dedicated cycleway on George Street. Cyclists may link these sections via Wellington Street on the southern boundary of the site.

#### Public transport services

Bus services currently operate along Cope Street, Wellington Street and Botany Road serving the Sydney CBD, Marrickville, Bondi Junction, Mascot, Matraville and Eastgardens.

There are bus stops located nearby on Botany Road, Cope Street, Raglan Street and Wellington Street.

#### Traffic volumes and patterns

The existing traffic volumes on the surrounding road network are provided in Table 8-14.

High traffic volumes are experienced during both AM and PM peak periods on Botany Road, Henderson Road and McEvoy Street. Botany Road and Wyndham Street operate as a north-south one-way pair between Cleveland Street and Henderson Road and provides a key link between

Sydney Airport and its surrounding suburbs to the Sydney CBD and inner west. High southbound volumes are currently experienced during AM and PM peak hours. McEvoy Street and Henderson Road both run east-west, providing a major link between the inner west and the Sydney CBD or eastern suburbs.

Currently, intersections to the north of the Waterloo Station construction site operate at a level of service C or better, except for:

- Regent Street / Lawson Square / Redfern Street (level of service D in the AM peak)
- Cleveland Street / Regent Street (level of service D in the AM peak)
- City Road / Cleveland Street (level of service F in the AM peak).

Three intersections to the south of the Waterloo Station construction site currently operate over capacity and with a level of service F. These are:

- Botany Road / Bourke Street / Bourke Road / O’Riordan Street (AM and PM peak)
- Botany Road / Coward Street (PM peak)
- Botany Road / Wentworth Avenue (AM peak).

A number of other intersections along Botany Road, as well as the General Holmes Drive / Mill Pond Road intersection are also operating near or at capacity.

**Table 8-14 Waterloo existing traffic volumes**

Road	Direction	AM peak hour (vehicles per hour)	PM peak hour (vehicles per hour)
Botany Road Between Mandible Street and McEvoy Street	Northbound	870	840
	Southbound	1,030	1,070
Botany Road Between McEvoy Street and Wellington Street	Northbound	810	780
	Southbound	1,140	1,210
Botany Road Between Wellington Street and Raglan Street	Northbound	670	640
	Southbound	1,140	1,080
Wyndham Street Between Henderson Road and Buckland Street	Northbound	470	420
	Southbound	190	190
Henderson Road Between Wyndham Street and Botany Road	Eastbound	230	180
	Westbound	1,520	1,760
Henderson Road West of Wyndham Street	Eastbound	680	650
	Westbound	610	830
Buckland Street Between Wyndham Street and Botany Road	Eastbound	140	110
McEvoy Street Between Wyndham Street and Botany Road	Eastbound	790	730
	Westbound	960	1,200
Bourke Road Between Wyndham Street and Botany Road	Eastbound	360	410
	Westbound	400	390

### 8.3.12 Marrickville dive site (southern)

The Marrickville dive site would be located to the north of the T3 Bankstown Line; and adjacent to Murray Street, Edinburgh Road and Sydney Steel Road in Marrickville. The location of the construction site and the surrounding road network are shown on Figure 8-11.



#### KEY

Proposed construction site area Existing suburban rail

Figure 8-11 Marrickville dive site (southern) road network

#### Active transport network

The area around the proposed site has well developed pedestrian connections. Edinburgh Road, Murray Road, Sydney Steel Road and Bedwin Road have paved footpaths on both sides of the street. Nearby Smidmore Street provides a pedestrian access route to Marrickville Metro Shopping Centre, while Lord Street provides access to St Peters Station. The nearest signalised pedestrian crossing is at Edinburgh Road / Smidmore Street to the west.

Edinburgh Road is also used as a cycle route to access St Peters Station from residential areas in Marrickville or to access Marrickville Metro Shopping Centre from St Peters, however heavy traffic, on-street parking and a large number of driveways to vehicle workshops make it less suitable than alternative direct routes on nearby Llewellyn Street and Leicester Street.

#### Public transport services

Several bus routes operate within the immediate vicinity of the site. These buses travel along Edinburgh Road and Edgware Road, servicing Marrickville Metro Shopping Centre and terminating at Bondi Junction or the Sydney CBD. Services run every 20 to 30 minutes throughout the day on weekdays and weekends.

### Traffic volumes and patterns

The existing traffic volumes on the surrounding road network are provided in Table 8-15.

The Princes Highway between May Street and Campbell Street experiences heavy traffic volumes southbound during the morning and evening peak periods. Bedwin Road also experiences high traffic volumes in both directions during the morning and evening peak hours.

Low traffic volumes were recorded on Campbell Street between Princes Highway and May Street since only a single lane is provided in each direction. Similarly, low traffic volumes were observed on Edinburgh Road between Edgeware Road and Murray Street.

Currently, all intersections in the vicinity of the Marrickville dive site operate at level of service D or better and the unsignalised intersections operate at level of service A. The worst performing are:

- Bedwin Road / Unwins Bridge Road / Campbell Street / May Street (level of service D in the AM peak and level of service C in the PM peak)
- Princes Highway / Campbell Street (level of service C in the AM and PM peak)
- Princes Highway / May Street (level of service C in the AM peak).

The signalised intersections of Princes Highway / Campbell Street and Bedwin Road / Unwins Bridge Road / Campbell Street / May Street currently operates at or over capacity.

The WestConnex project is located in close proximity to the Marrickville dive site and would involve the construction of a major road interchange at St Peters and associated local road upgrade works. This includes the proposed upgrade of Campbell Street between the Princes Highway and May Street. Construction of WestConnex is likely to occur concurrently with construction of this project. The potential cumulative traffic impacts associated with WestConnex are addressed in Chapter 26 (Cumulative impacts).

**Table 8-15 Marrickville dive site existing traffic volumes**

Road	Direction	AM peak hour (vehicles per hour)	PM peak hour (vehicles per hour)
Princes Highway Between May Street and Campbell Street	Southbound	570	1,840
	Northbound	1,520	940
Campbell Street Between Princes Highway and May Street	Eastbound	390	390
	Westbound	170	270
May Street Between Princes Highway and Campbell	Eastbound	730	510
	Westbound	420	990
Bedwin Road Between May Street and Edinburgh Road	Southbound	830	870
	Northbound	890	1,060
Edinburgh Road Between Murray Street and Edgeware Road	Eastbound	330	380
	Westbound	400	570

## 8.4 Potential impacts

Potential construction traffic and transport impacts would primarily relate to the addition of trucks and cars to the road network surrounding the construction sites. The establishment and use of construction sites would also result in some direct and indirect impacts to pedestrian and cyclist facilities, public transport services and existing car parking.

### 8.4.1 Pedestrian, cyclist and motorist safety

The introduction of additional heavy vehicles to the network has the potential to result in safety impacts to pedestrians, cyclists and other motorists, especially where there is an increased likelihood for interaction with pedestrians and cyclists.

Key locations where pedestrian and cyclist safety issues may arise include:

- Construction site access and egress points where construction vehicles would interface with pedestrians using surrounding footpaths. This would be especially important in the Sydney CBD where high volumes of pedestrians are expected
- Construction sites where access and egress points, or haul routes would interface with marked cycle routes. This would occur at Chatswood dive site, Victoria Cross, Crows Nest, Blues Point, Barangaroo, Pitt Street, Central, Waterloo and Marrickville dive site
- Locations where footpath widths are reduced around the construction sites
- At Victoria Cross Station construction site where the haul route or haul routes would be located near the Monte Sant' Angelo Mercy College and could interface with school drop off and pick up points, or the route for school children from nearby bus stops. Further information on potential construction traffic issues around this school are provided in Section 8.4.9.

Access and egress arrangements at construction sites have been developed with consideration for pedestrian, cyclist and motorist safety. For example, the need for construction vehicles to turn right to or from arterial roads to access construction sites has been avoided where possible.

Appropriate controls would be established where vehicles are required to cross footpaths to access construction sites. This may include manual supervision, physical barriers or temporary traffic signals as required. Safety audits would be carried out at each of the construction site traffic access and egress points.

In addition, the Sydney Metro project is currently investigating options to further enhance pedestrian, cyclist and motorist safety in the vicinity of construction sites. This would include measures such as:

- Use of speed awareness signs in conjunction with variable message signs near construction sites to provide alerts to drivers
- Shared experience educational events that allow pedestrians, cyclists or motorists to sit in trucks and understand the visibility restrictions of truck drivers, and for truck drivers to understand the visibility from a bicycle
- Specific construction driver training to understand route constraints, expectations, safety issues and to limit the use of compression braking
- Safety devices on construction vehicles that warn drivers of the presence of a vulnerable road user located in the vehicles' blind spots and warn the vulnerable road user that a vehicle is about to turn.



## 8.4.2 Emergency services access

As identified in the following sections, the introduction of construction traffic is anticipated to result in minor to negligible impacts to surrounding intersection performance. As such, there is not anticipated to be any substantial change to emergency vehicle access during the construction period. Further, construction sites would be arranged to ensure emergency vehicle access to nearby buildings and precincts is maintained. Construction sites may also be made available for emergency vehicle passage if required.

Ongoing consultation would be carried out with emergency service providers in relation to changed traffic conditions around the construction sites.

## 8.4.3 Major special events

The Sydney CBD hosts a number of major special events as identified in Table 8-16.

**Table 8-16 Major special events in the Sydney CBD**

Indicative month	Event	Location
December / January	New Year's Eve celebrations	Primarily Circular Quay, Blues Point and Barangaroo areas. Whole Sydney CBD would be affected.
January	Field Day	The Domain
January	Sydney Festival	Sydney CBD
January	Australia Day celebrations	Primarily Sydney Harbour foreshore areas
February	Opera in The Domain	The Domain
February	Tropfest	The Domain
March	Mardi Gras Parade / Party	Oxford Street and Hyde Park area
April	ANZAC Day Parade	Martin Place, Pitt Street, George Street, Bathurst Street, Elizabeth Street and Hyde Park
May	Mother's Day Classic	Martin Place, Hyde Park and The Domain
May / June	Vivid Festival	Sydney CBD and Chatswood
June	Sydney Film Festival	Sydney CBD
July	Reserve Forces Day	Macquarie Street
August	City 2 Surf	Hyde Park, Park Street and William Street
September	Sydney Marathon	Milsons Point, Circular Quay, Sussex Street, Macquarie Street, Phillip Street, The Domain, Hyde Park, Oxford Street and Darling Harbour
October	Sydney Spring Cycle	Milsons Point, Barangaroo, Cahill Expressway and Sussex Street
November	Sydney to Gong	Sydney Park
December	Carols in The Domain	The Domain

In addition, there are various events within the Moore Park Entertainment precinct throughout the year (such as sporting events and music concerts) with Central Station being a major transport focus for access to and from these events. Where there would be a forecast attendance of over 25,000 people within the Moore Park Entertainment precinct, these events would also be included within construction planning and management.

The Roads and Maritime special events management guidelines identify the following classes of special events:

- Class 1: an event that impacts major traffic and transport systems and there is significant disruption to the non-event community. For example, an event that affects a principal transport route in Sydney such as the Mardi Gras Parade and City 2 Surf
- Class 2: is an event that impacts local traffic and transport systems and there is low scale disruption to the non-event community. For example, an event that blocks off the main town street or shopping centre but does not impact a principal transport route
- Class 3: is an event with minimal impact on local roads and negligible impact on the non-event community
- Class 4: is an event conducted entirely under Police control (but is not a protest or demonstration).

Liaison would occur with event organisers of Class 1 and 2 events, and (as relevant) the CBD Coordination Office and Roads and Maritime Services to provide appropriate management of construction vehicle movements to manage potential impacts to event goers, the general public and the construction works. This may involve measures such as temporary adjustment to haul routes, working hours or potentially stopping works for the duration of the event.

#### **8.4.4 Construction worker parking**

Due to the generally constrained nature of the construction sites, car parking for construction workers would not be provided at the majority of the sites. With the exception of the Chatswood and Marrickville dive sites, each construction site would typically provide between four to ten parking spaces intended to be used by engineers and other construction management staff.

The majority of the construction sites are located in close proximity to public transport services and construction workers would be encouraged to use these services. This may include incentive systems. The Chatswood dive site and the Marrickville dive site would each provide about 300 car parking spaces. These facilities may be used to provide worker parking and shuttle bus transfers to other nearby construction sites.

In addition, consideration would be given to remote car parking in existing under-used car parks and shuttle bus transfers to the construction sites. For the Sydney CBD construction sites these car parks could include The Domain, Goulburn Street and Darling Harbour.

### **8.4.5 Power supply routes**

The majority of the power supply routes would be constructed by trenching within the road reserve. Roads which are likely to be impacted by the construction of the power supply routes are identified in Chapter 7 (Project description – construction). Where major roads are crossed by the route (such as Mowbray Road for the Chatswood dive site power supply), alternative construction methods would be used such as under boring in order to avoid impacts to the road network.

This trenching work would result in temporary changes to traffic arrangements potentially including the occupation of traffic lanes, parking areas or the footpath.

For the majority of the construction period two-way traffic would be maintained, however there may be some periods when full road or lane closures are required. These are most likely to occur at night when traffic volumes are lower. Where pedestrian footpaths are impacted, a suitable alternative route around the work area would be provided and signposted.

In addition, the work may result in reduced access to some properties for short periods of time (typically less than one day). In this event, suitable alternative arrangements would be discussed with the land owner.

As the works would progress along the power supply route alignment, the potential impacts in a particular location would be short-lived, typically occurring for up to two weeks.

### **8.4.6 Chatswood dive site (northern) and northern surface works**

#### **Vehicle movement forecasts and routes**

The anticipated vehicle numbers (heavy and light vehicles) at the Chatswood dive site over a typical day are provided in Figure 8-12. This graph shows that the peak heavy vehicle movements in the AM peak period (7am to 10am) would be six heavy vehicles per hour during the demolition, dive excavation and tunnel excavation phases.

The proposed haul routes are shown in Figure 8-13. Access to and egress from the site would be right in from Nelson Street; and left in, right out via Mowbray Road at a new signalised intersection.

In addition, access to the northern surface track works site (metro tracks and the adjustments to the T1 North Shore Line) would be provided by existing access points on Hopetoun Avenue, Chatswood and Drake Street, Artarmon as well as a proposed new access point at Brand Street, Artarmon. It is anticipated that there would be about six vehicles per hour using these access and egress points on an occasional basis to carry out construction of the northern surface works. This volume is relatively minor and would not result in impacts to the performance of the surrounding road network.

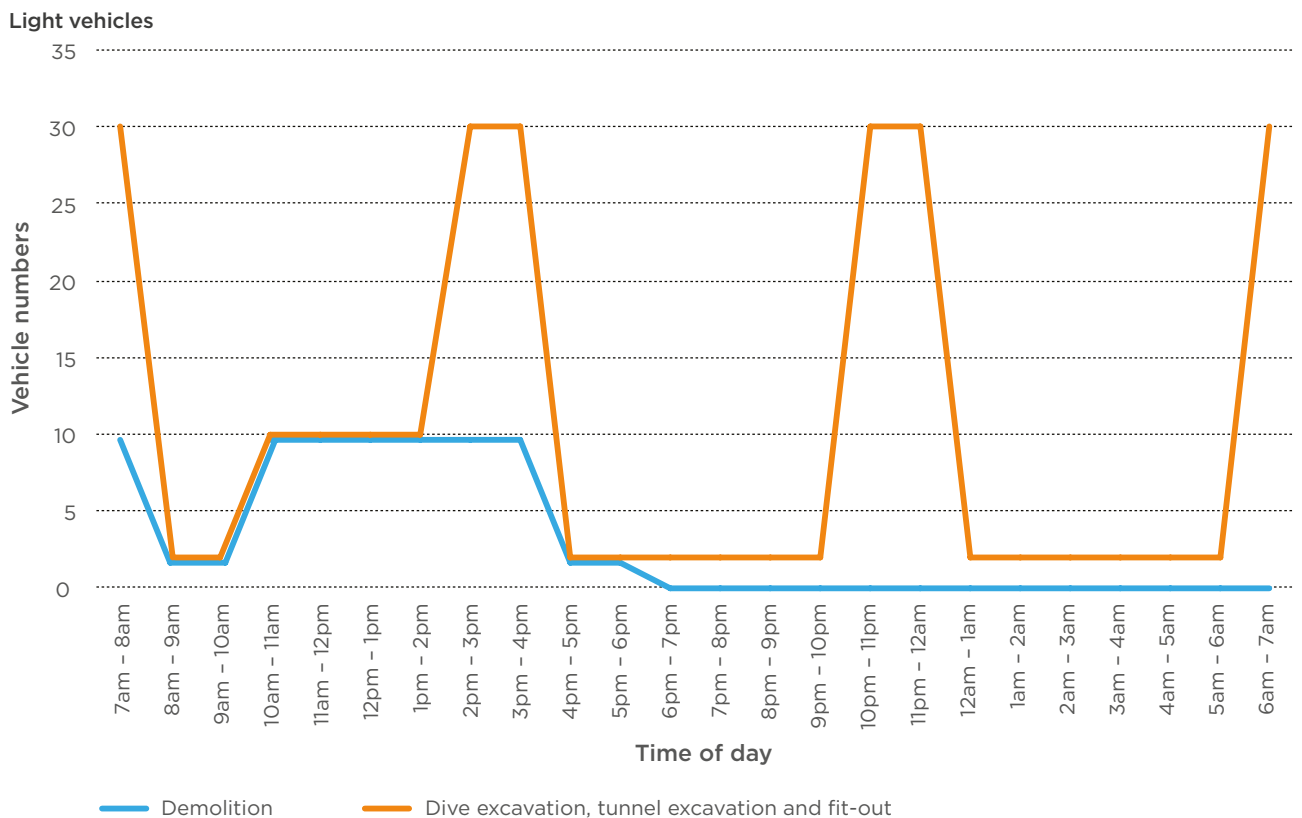
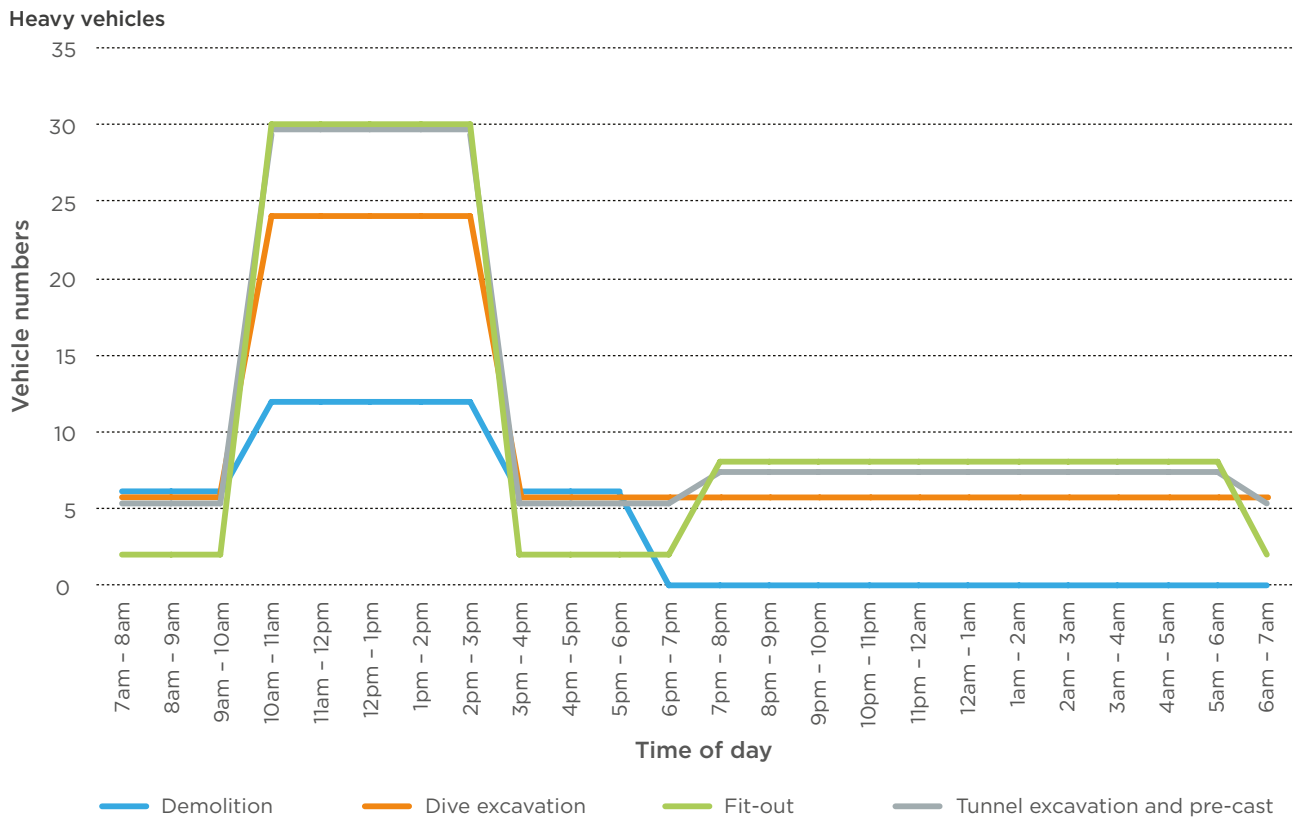


Figure 8-12 Chatswood dive site (northern) construction vehicle movements



Figure 8-13 Chatswood dive site (northern) haul routes

### Active transport network

The closure of the Nelson Street bridge would remove the east-west cyclist and pedestrian connections across the T1 North Shore Rail Line. Pedestrians and cyclists would be able to use Mowbray Road to cross the rail line or Frank Channon Walk (a shared path connecting Chatswood Station and Nelson Street) and the underpass adjacent to Chatswood Oval. For a pedestrian or cyclist travelling between Chatswood Station and residential areas to the south, this would result in an additional travel distance of around 50 to 100 metres.

Short-term temporary closures of Frank Channon Walk would be required to safely carry out construction of the northern surface track works. These closures would typically occur over several weekends associated with work carried out during track possessions. During these periods, pedestrians and cyclists would need to use either the Pacific Highway or Orchard Road to access Chatswood Station from areas to the south. Alternative pedestrian and cyclist routes during the temporary closures of Frank Channon Walk are shown on Figure 8-14.

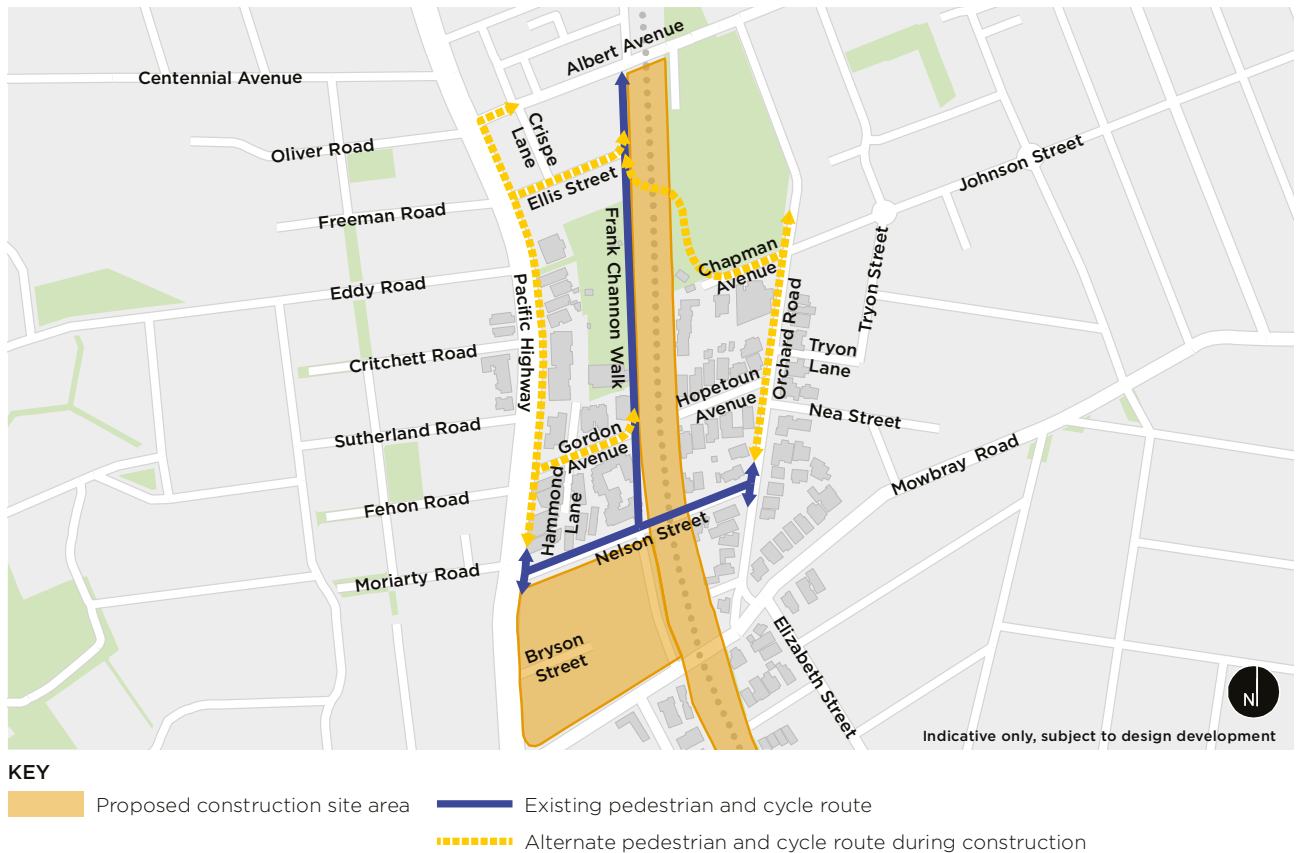


Figure 8-14 Chatswood dive site (northern) - alternative pedestrian and cyclist routes

**Public transport services**

The southbound bus stop located on the Pacific Highway between Bryson Street and Mowbray Road may need to be relocated during the construction phase. The relocation of this bus stop would be carried out by Transport for NSW in consultation with the bus operators, Roads and Maritime Services and Willoughby Council. The relocation of this bus stop would not impact on the operation of any bus services, however it may result in some passengers having to walk a short distance further to access an alternative bus stop.

The surface track works (adjustment to the T1 North Shore Line and the metro tracks) would require some works to be carried out during rail track possessions. These works would be coordinated with the Sydney Trains rail track possession schedule and possessions required for the conversion of the Epping to Chatswood Rail Line to reduce impacts to customers and alternative bus services would be provided during these possession works.

### **Parking and taxis**

The Chatswood dive site and the northern surface track works are not anticipated to result in any loss of parking or impacts to taxi facilities.

### **Road network performance**

As described in Chapter 7 (Project description – construction), the project would require the permanent demolition of the Nelson Street bridge over the T1 North Shore Rail Line. Nelson Street's primary role is for motorists travelling southbound on the Pacific Highway to access Mowbray Road westbound via Orchard Road. Nelson Street also provides local vehicle access to residents of Nelson Street. To maintain the primary movement, it is proposed to construct an all vehicle right-turn movement from the Pacific Highway southbound to Mowbray Road westbound. For the purposes of the traffic assessment, two right turn lanes have been assumed, however the exact nature of this right turn provision would be determined during detailed construction planning. This would also require the localised widening of the Pacific Highway to the north of the Mowbray Road intersection and changes to the traffic signal phasing.

Roads and Maritime are currently investigating further upgrades to the Pacific Highway / Mowbray Road intersection. Sydney Metro would continue to consult with Roads and Maritime Services in relation to coordination of these works and any opportunities to carry out these works concurrently.

Table 8-17 and Figure 8-15 shows the existing performance and the anticipated performance of key intersections during construction. This shows that a number of intersections currently experience long delays and a poor level of service due to high through traffic volumes and conflicting right-turn movements. With construction traffic, there would be a minor increase in the degree of saturation and the average delay at some intersections, but no change to the level of service in the peak periods. Overall, the addition of construction traffic would not have any major impacts on surrounding intersection performance.

Table 8-17 Chatswood dive site (northern) intersection performance

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Pacific Highway / Fuller Road / Help Street</b>						
AM	83	F	1.14	83	F	1.14
PM	39	C	0.93	41	C	0.95
<b>Pacific Highway / Victoria Avenue</b>						
AM	101	F	0.90	101	F	0.90
PM	87	F	0.77	83	F	0.78
<b>Pacific Highway / Centennial Avenue</b>						
AM	17	B	0.89	18	B	0.89
PM	23	B	0.89	21	B	0.89
<b>Pacific Highway / Albert Avenue / Oliver Road</b>						
AM	24	B	0.75	23	B	0.74
PM	29	C	0.94	29	C	0.94
<b>Pacific Highway / Mowbray Road</b>						
AM	72	F	1.06	81	F	1.07
PM	119	F	1.14	142	F	1.18
<b>Pacific Highway / Howarth Road / Norton Lane</b>						
AM	5	A	0.59	6	A	0.62
PM	8	A	0.75	8	A	0.75
<b>Pacific Highway / Gore Hill Freeway ramps</b>						
AM	77	F	1.12	76	F	1.12
PM	74	F	1.13	75	F	1.13
<b>Pacific Highway / Longueville Road</b>						
AM	31	C	0.83	32	C	0.80
PM	27	B	0.77	27	B	0.75
<b>Mowbray Road / Orchard Road / Elizabeth Street</b>						
AM	49	D	1.02	49	D	1.02
PM	45	D	0.84	44	D	0.84
<b>Mowbray Road / Hampden Road / Site Access</b>						
AM	25	B	0.80	25	B	0.79
PM	25	B	0.71	25	B	0.69



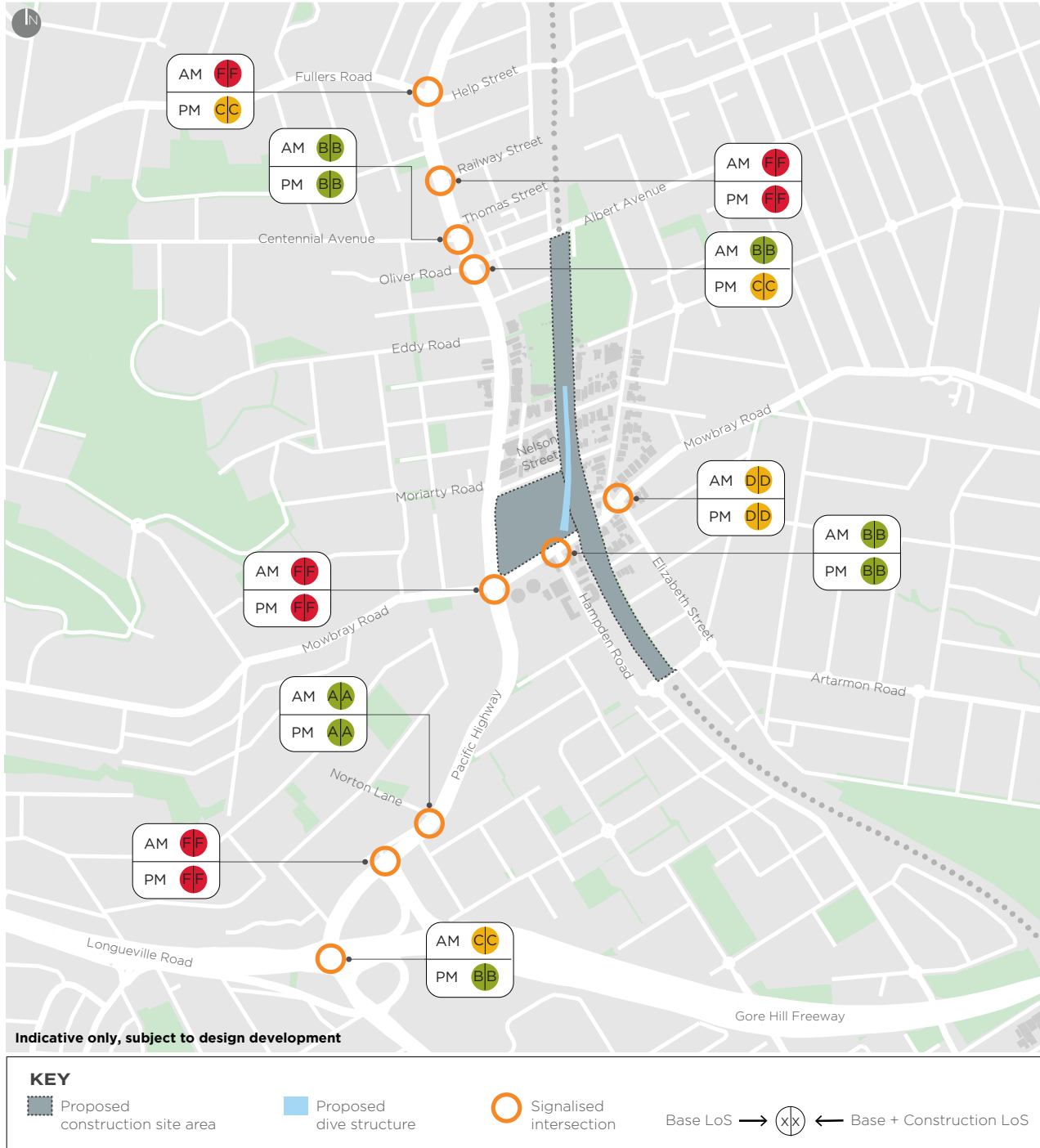


Figure 8-15 Chatswood dive site (northern) intersection performance

### **8.4.7 Artarmon substation**

#### **Vehicle movement forecasts and routes**

The anticipated vehicle numbers (heavy and light vehicles) at the Artarmon substation construction site over a typical day are provided in Figure 8-16. This graph shows that the peak heavy vehicle movements in the AM peak period (7am to 10am) would be four heavy vehicles per hour during the site establishment and excavation phases.

The proposed haul routes are shown in Figure 8-17. Access to and egress from the site would be via Barton Road.

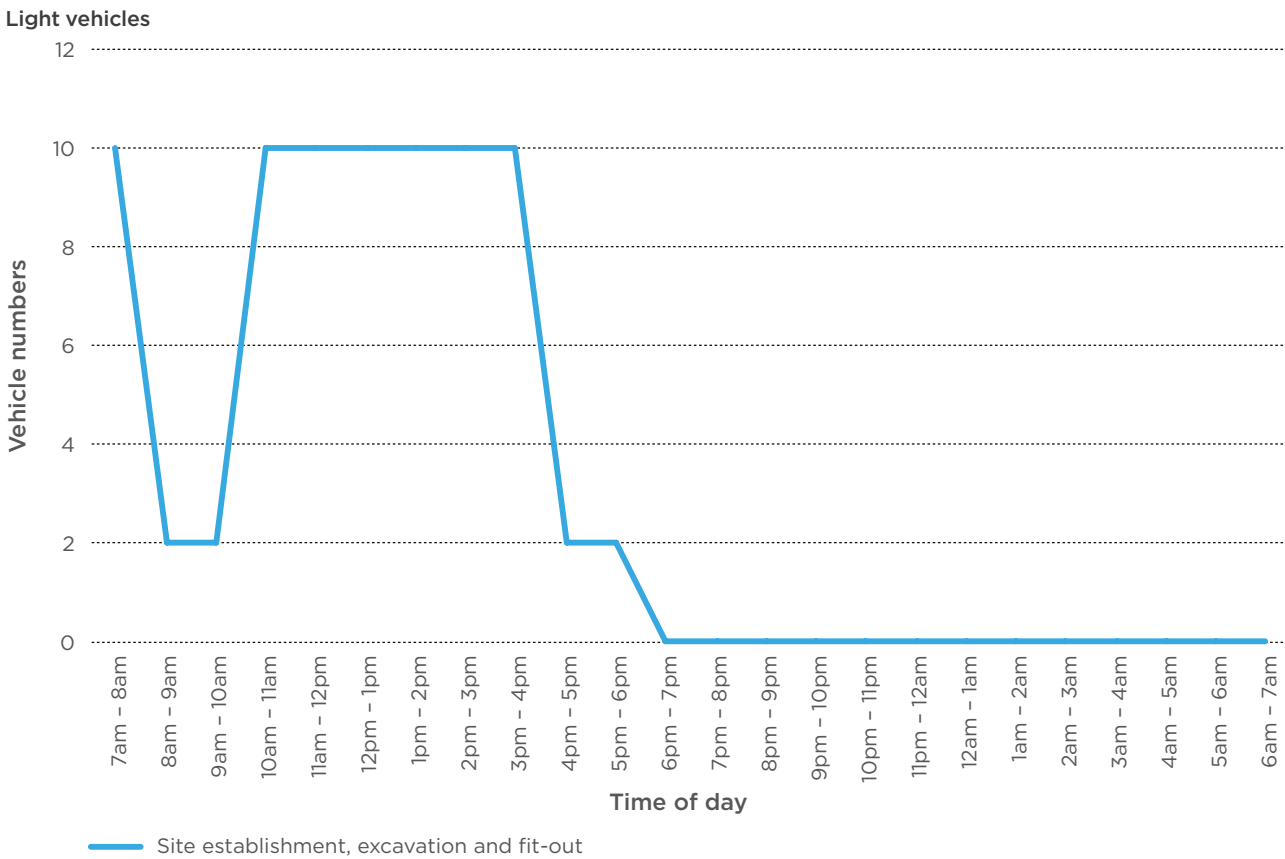
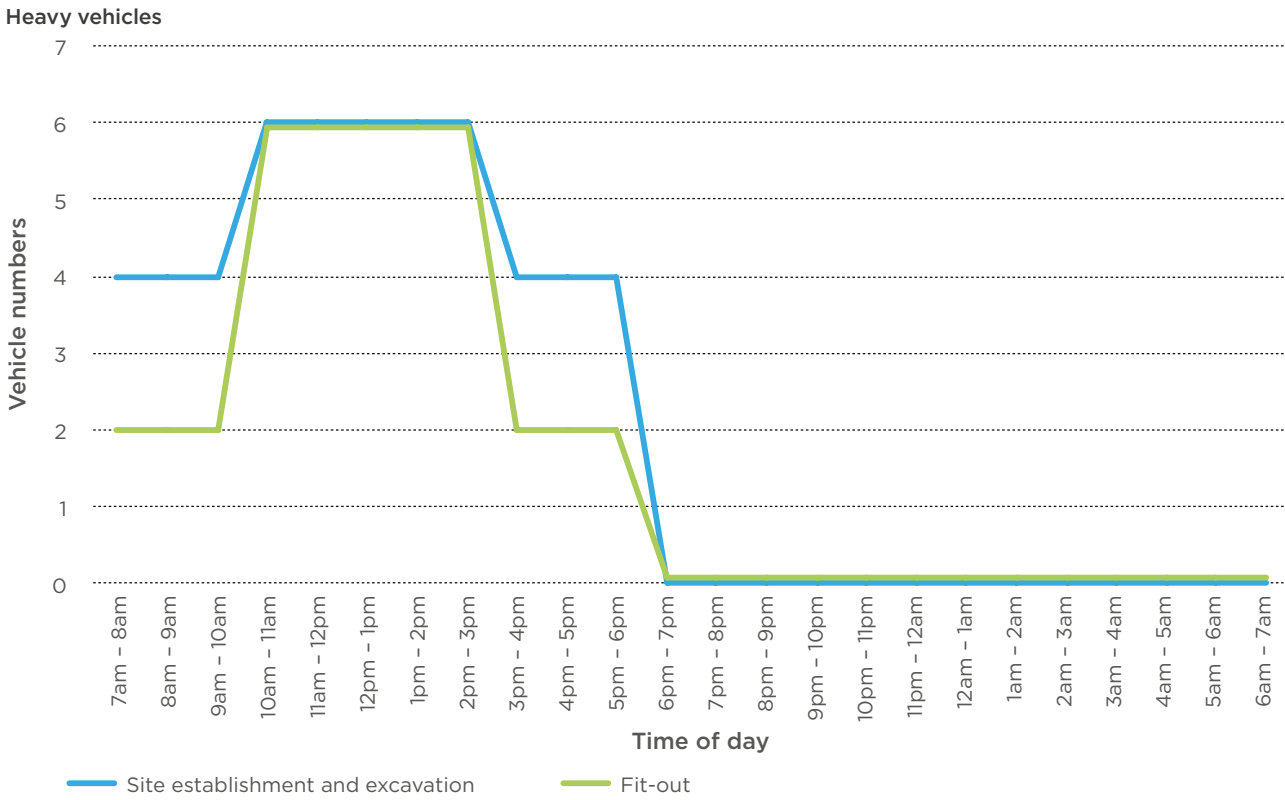


Figure 8-16 Artarmon substation construction vehicle movements



Figure 8-17 Artarmon substation construction site haul route

### Active transport network

The Artarmon substation construction site is not anticipated to result in any impacts to nearby pedestrian footpaths or crossings. There are no cyclist facilities in the vicinity of the site.

### Public transport services

As the Artarmon Loop only provides services every 30 minutes and the impact of construction vehicles at Artarmon substation is anticipated to be minor, any impacts to this service would be negligible.

### Parking and taxis

The Artarmon substation construction site is not anticipated to result in any loss of parking or impacts to taxi facilities.

### Road network performance

Table 8-18 and Figure 8-18 shows the existing performance and the anticipated performance of key intersections during construction. The intersection of Reserve Road / Gore Hill Freeway is expected to deteriorate from level of service B to level of service C in the PM peak period however the deterioration in the average delay and degree of saturation would be minimal therefore no significant impact is expected at this location. All other intersections maintain their without construction level of service.

**Table 8-18 Artarmon substation construction site intersection performance**

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Reserve Road / Gore Hill Freeway ramps</b>						
AM	25	B	0.93	25	B	0.93
PM	28	B	0.93	31	C	0.98
<b>Reserve Road / Barton Road</b>						
AM	4	A	0.51	4	A	0.51
PM	6	A	0.63	6	A	0.65
<b>Reserve Road / Butchers Lane</b>						
AM	3	A	0.01	3	A	0.01
PM	4	A	0.01	4	A	0.01

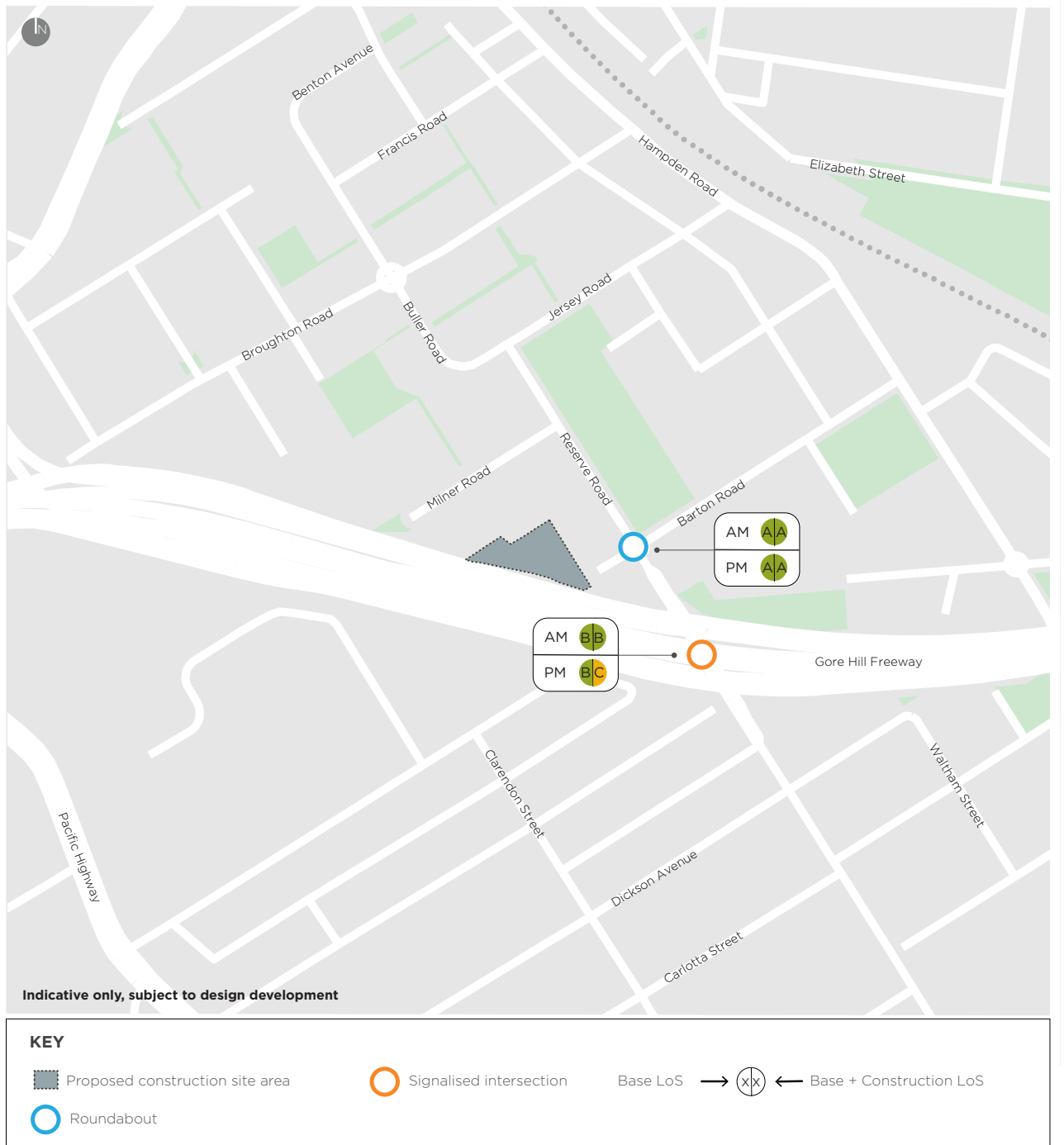


Figure 8-18 Artarmon substation intersection performance

### **8.4.8 Crows Nest Station**

#### **Vehicle movement forecasts and routes**

The anticipated vehicle numbers (heavy and light vehicles) at the Crows Nest Station construction site over a typical day are provided in Figure 8-19. This graph shows that the peak heavy vehicle movements in the AM peak period (7am to 10am) would be five heavy vehicles per hour during the demolition and excavation phases.

The proposed haul routes are shown in Figure 8-20. Access to and egress from the site would be via Hume Street and Clarke Lane.

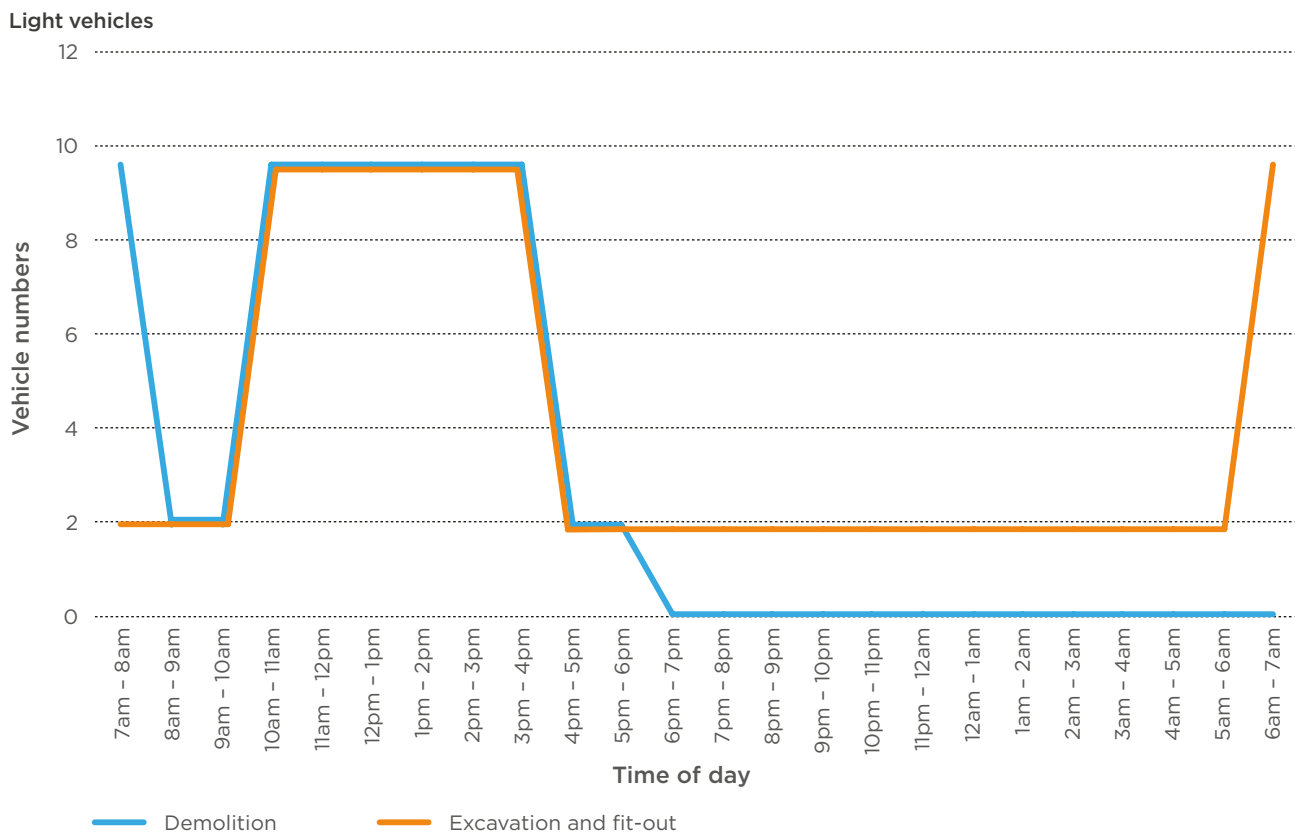
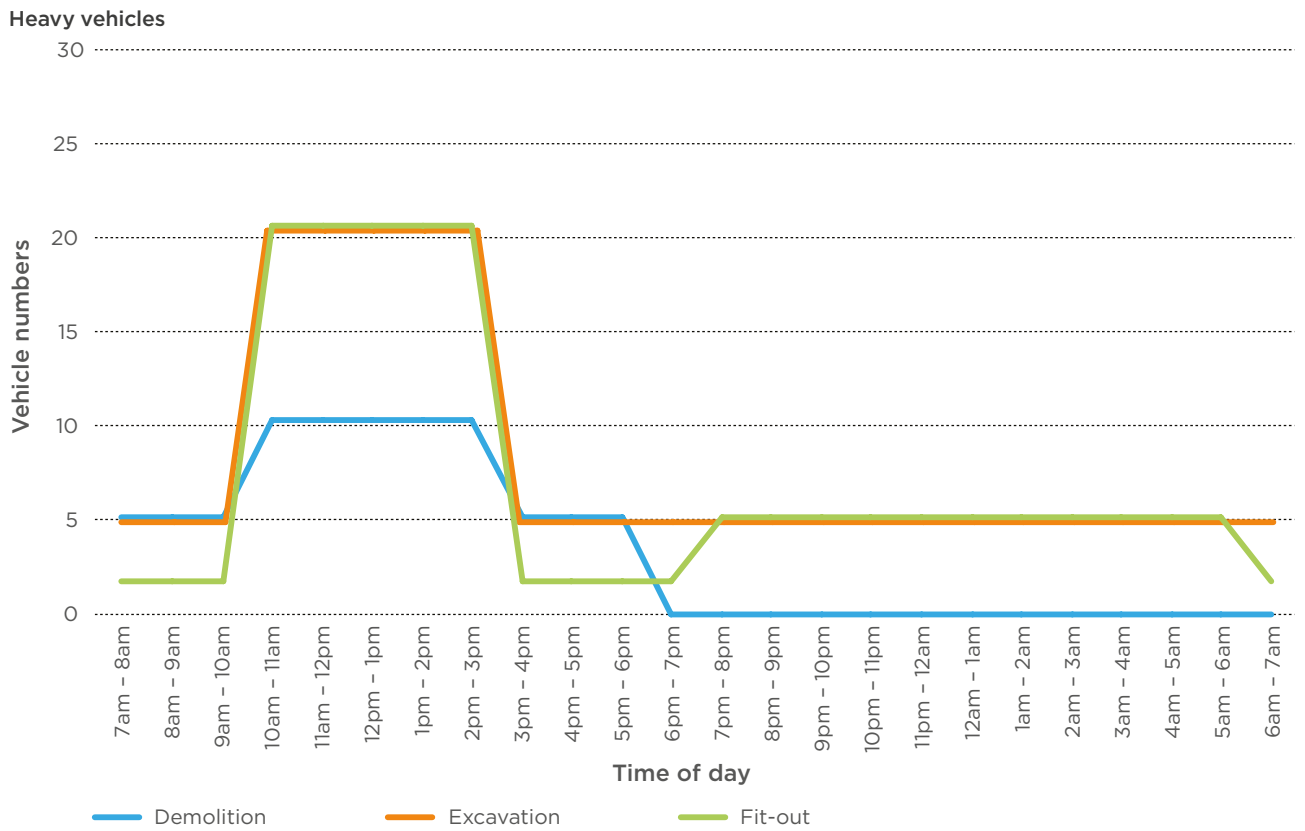


Figure 8-19 Crows Nest Station construction vehicle movements





Figure 8-20 Crows Nest Station construction site haul routes

**Active transport network**

Excavation of the station would involve the temporary closure of Hume Street (around six months) to carry out the cut-and-cover works. During this stage of the works, an alternate safe pedestrian and cyclist access would be provided to the south of Hume Street across the site of the previously demolished building. Alternative pedestrian and cyclist routes during the temporary closure of Hume Street are shown on Figure 8-21.

Additionally, footpaths surrounding the site on the Pacific Highway and Hume Street would be reduced in width by around 600 millimetres during the construction works. The existing footpath width is greater than three metres (building frontage to kerb), however, the footpath includes street furniture such as lighting poles and parking metres. A 2.4 metre footpath would be able to be maintained, in line with Austroads guidelines however some street furniture may need to be relocated.

**KEY**

- Proposed construction site area
- Existing pedestrian and cycle route
- Alternate pedestrian and cycle route during construction

**Figure 8-21 Crows Nest Station construction site – alternative pedestrian and cyclist route**

### Public transport services

A bus stop on the eastern side of the Pacific Highway north of Hume Street would need to be relocated during the construction works. The relocation of this bus stop would be carried out by Transport for NSW in consultation with the bus operators, Roads and Maritime Services and North Sydney Council. The relocation of this bus stop would not impact the operation of any bus services, however it may result in some passenger having to walk a short distance further to access the bus stop.

One bus service, route 265, may be impacted by delays due to construction activity and vehicle movements. This route currently runs along Oxley Street and continues to Willoughby Road, and operates on an hourly basis for most of the weekday, and every 30 minutes between 2:30 pm and 4:30 pm. Due to the limited frequency of the service, the construction traffic impact on this service would be negligible.

### Parking and taxis

Around two to four on street car parking spaces on Hume Street would be removed for the duration of the construction phase. The temporary loss of up to four spaces would not have any major impacts on parking considering the proximity and availability of other spaces.

There is not anticipated to be any impacts to formal taxi facilities in the vicinity of Crows Nest Station construction site.

### Road network performance

Excavation of the station would involve the temporary closure of Hume Street (around six months) to carry out the cut-and-cover works. During this period, vehicle access to Clarke Street and the remaining portion of Hume Street would be possible via Oxley Street. To maintain the movements available at the Hume Street an additional phase would be added to the Pacific Highway / Oxley Street intersection to allow a right turn movement from Oxley Street to the Pacific Highway northbound.

Construction works at this station would also require the closure of Clarke Lane in the area immediately to the north of its intersection with Hume Street. The remaining section of Clarke Lane would remain open and be converted to two way flow to retain access to the remaining properties on Clarke Street.

Table 8-19 provides the worst-case performance of nearby key intersections during the construction phase. This shows that all intersections would continue to function at a similar level as existing with construction activities.

**Table 8-19 Crows Nest Station construction site intersection performance**

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Pacific Highway / Falcon Street / Shirley Road</b>						
AM	51	D	0.86	51	D	0.86
PM	51	D	0.92	50	D	0.92
<b>Pacific Highway / Hume Street</b>						
AM	13	A	0.59	13	A	0.61
PM	12	A	0.61	13	A	0.64
<b>Pacific Highway / Oxley Street</b>						
AM	17	B	0.74	18	B	0.71
PM	21	B	0.74	22	B	0.77

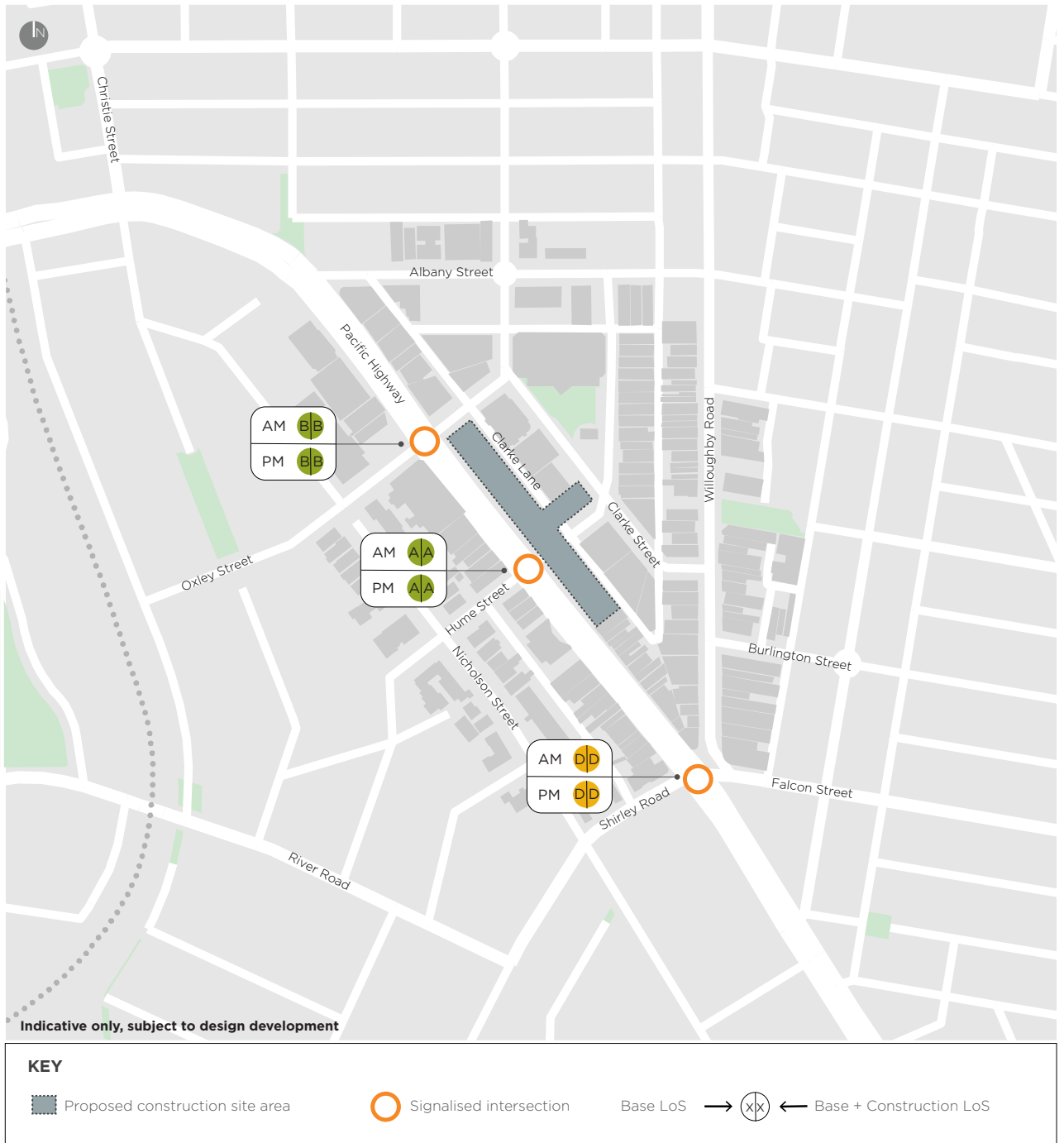


Figure 8-22 Crows Nest Station intersection performance

### **8.4.9 Victoria Cross Station**

#### **Vehicle movement forecasts and routes**

The anticipated vehicle numbers (heavy and light vehicles) at the Victoria Cross Station construction site over a typical day are provided in Figure 8-23. This graph shows that the peak heavy vehicle movements in the AM peak period (7am to 10am) would be six heavy vehicles per hour during the demolition and excavation phases.

The proposed haul routes are shown in Figure 8-24. Access to and egress from the Victoria Cross north site would be left in, left out via Miller Street. Access to and egress from the Victoria Cross south site would be left in from Miller Street and left out to Denison Street.

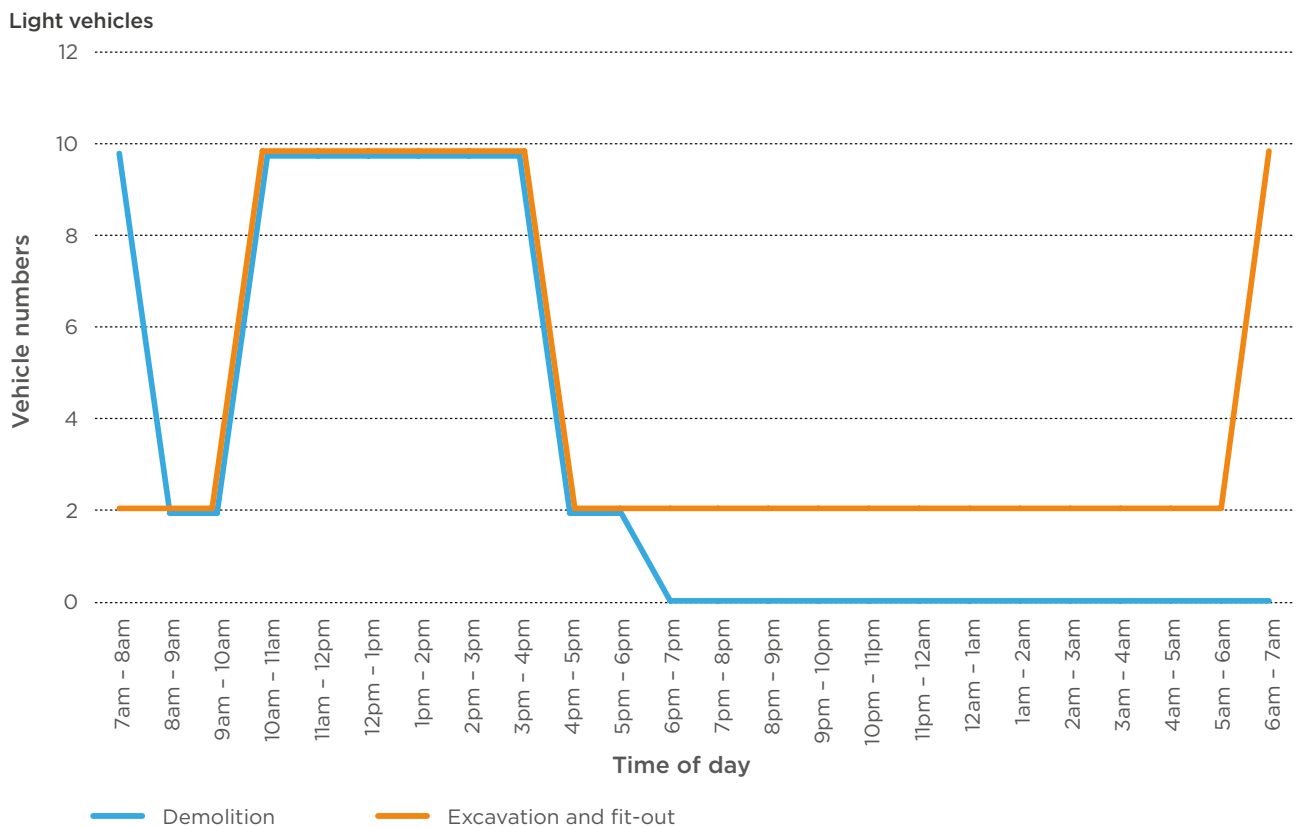


Figure 8-23 Victoria Cross Station construction vehicle movements

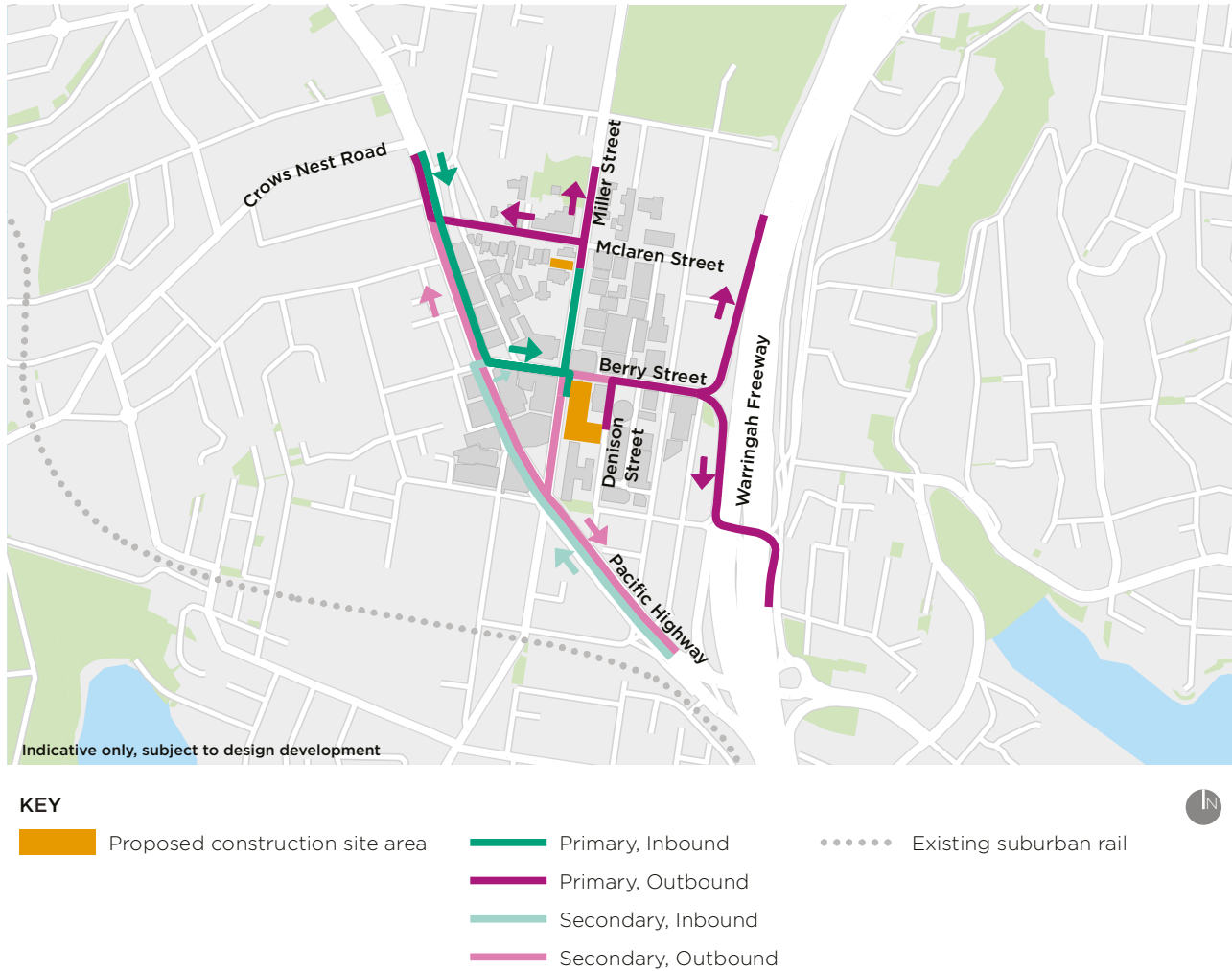


Figure 8-24 Victoria Cross Station construction site haul routes

**Active transport network**

The on-road amenity for cyclists along Miller Street and Berry Street would be reduced during the construction phase due to the introduction of heavy vehicle movements, although cyclists currently using this route share the road with vehicles and buses. Alternative cycle paths in the area include Mount and Edward streets on the western side of the Pacific Highway.

Pedestrian footpaths on Miller Street in the vicinity of each of the construction sites would be reduced in width by around 600 millimetres during the construction works. Miller Street, between the Pacific Highway and Berry Street, has a footpath width greater than three metres (building frontage to kerb), however, the footpath includes street furniture such as lighting poles and parking metres. A 2.4 metre footpath would be able to be maintained, in line with Austroads guidelines however some street furniture may need to be relocated. In the vicinity of the Victoria Cross north construction site, the existing footpath is around 3.6 metres wide and includes trees, street furniture and a bus stop. As this bus stop would be temporarily relocated as part of the construction works, a footpath width of 2.4 metres would be maintained.

Monte Sant’ Angelo Mercy College is located close to the proposed construction sites on Miller Street. School children currently use footpaths around the sites to travel between public transport services and the school. School drop off area are also located close to the sites on Berry and Miller streets. Sydney Metro would consult with Monte Sant’ Angelo Mercy College to ensure safe pedestrian and drop off arrangements are provided for school children during construction. In addition, haulage of materials to and from the construction site would be scheduled to minimise movements during school pick up and drop off times.

**Public transport services**

The bus stop on the south western corner of the Miller Street / McLaren Street intersection adjacent to the Victoria Cross north site would need to be relocated during the construction works. This bus stop is used by students attending Monte Sant’ Angelo Mercy College. The relocation of this bus stop would be carried out by Transport for NSW in consultation with the bus operators, Roads and Maritime Services, North Sydney Council and Monte Sant’ Angelo Mercy College. The relocation of this bus stop would not impact the operation of any bus services, however it may result in some passenger having to walk a short distance further to access the bus stop.

The addition of construction vehicles on Berry and Miller streets may result in some minor delays for bus services.

**Parking and taxis**

Around two to four on street car parking spaces on Miller Street would be removed during the construction phase. The temporary loss of up to four spaces would not have any major impacts on parking considering the proximity and availability of other spaces.

There is not anticipated to be any impacts to formal taxi facilities in the vicinity of the Victoria Cross Station construction sites.

**Road network performance**

Table 8-20 and Figure 8-25 shows the impacts of construction of nearby key intersections. In summary, this shows that the level of service at each intersection modelled does not deteriorate with the addition of the construction vehicles. Minor improvements in the average delay or degree of saturation are evident for some intersections which are likely to be the result of the model optimising the operation of the intersection with the additional construction traffic on certain movements.

**Table 8-20 Victoria Cross Station construction site intersection performance**

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Pacific Highway / McLaren Street</b>						
AM	17	B	0.85	16	B	0.85
PM	13	A	0.77	13	A	0.77
<b>McLaren Street / Miller Street</b>						
AM	25	B	0.75	25	B	0.78
PM	26	B	0.84	26	B	0.84



Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Pacific Highway / Berry Street</b>						
AM	7	A	0.71	14	A	0.74
PM	11	A	0.80	11	A	0.79
<b>Berry Street / Miller Street</b>						
AM	27	B	0.81	24	B	0.78
PM	23	B	0.57	23	B	0.56
<b>Pacific Highway / Miller Street</b>						
AM	25	B	0.74	26	B	0.77
PM	27	B	0.78	27	B	0.78
<b>Berry Street / Walker Street</b>						
AM	31	C	0.84	31	C	0.85
PM	27	B	0.75	27	B	0.75
<b>Pacific Highway / Walker Street</b>						
AM	22	B	0.74	23	B	0.74
PM	21	B	0.65	21	B	0.65
<b>Mount Street / Walker Street</b>						
AM	19	B	0.64	19	B	0.65
PM	26	B	0.60	26	B	0.56
<b>Arthur Street / Mount Street</b>						
AM	10	A	0.68	10	A	0.66
PM	25	B	0.78	25	B	0.78
<b>Miller Street / Ridge Street</b>						
AM	15	B	0.44	16	B	0.50
PM	19	B	0.45	19	B	0.45
<b>Miller Street / Carlow Street</b>						
AM	27	B	0.79	26	B	0.79
PM	28	B	0.72	28	B	0.72
<b>Falcon Street / Miller Street</b>						
AM	30	C	0.93	31	C	0.82
PM	32	C	0.95	32	C	0.95
<b>Falcon Street / Warringah Freeway ramps</b>						
AM	32	C	0.90	32	C	0.90
PM	31	C	0.92	31	C	0.92

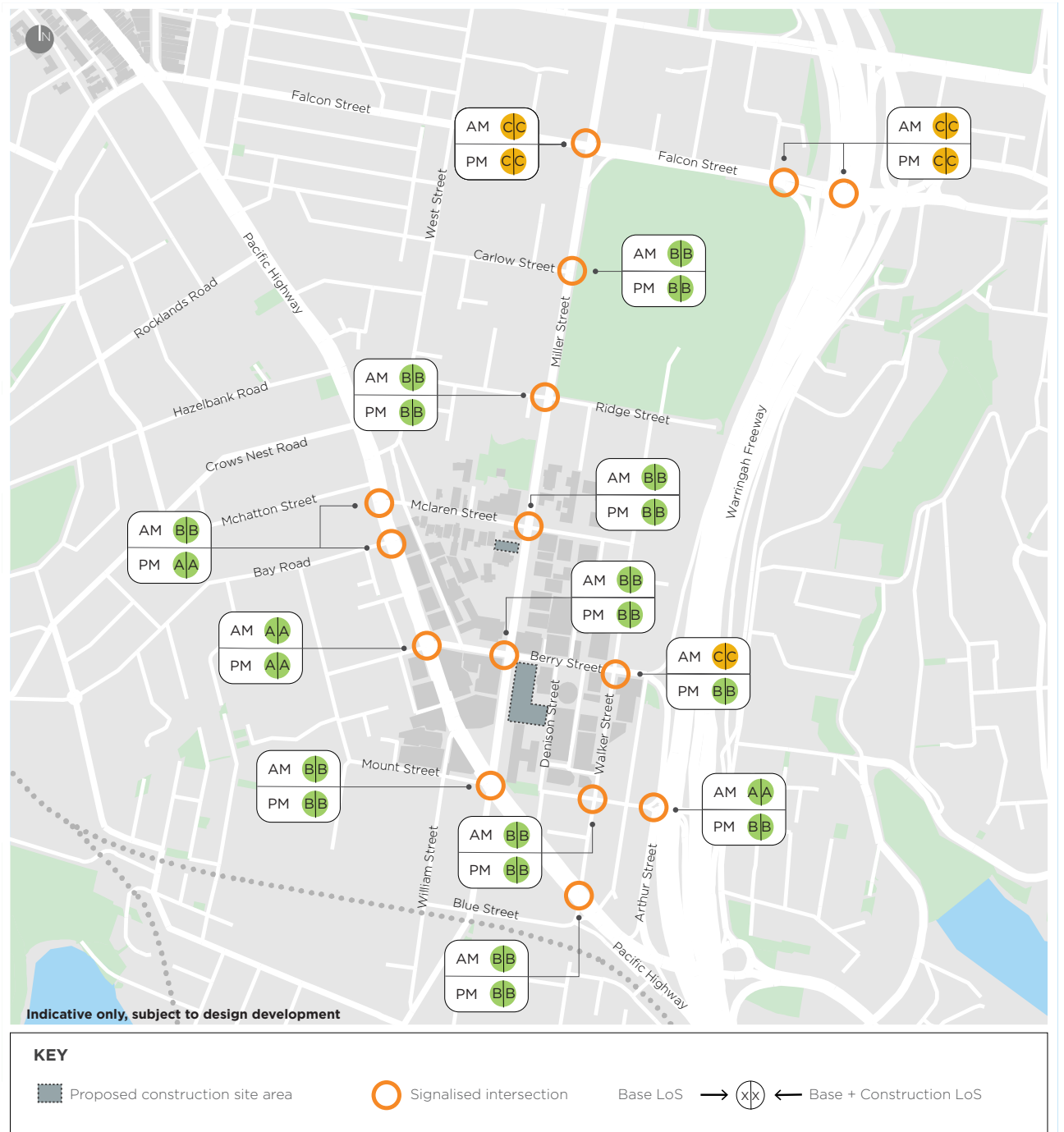


Figure 8-25 Victoria Cross Station intersection performance

#### **8.4.10 Blues Point temporary site**

As described in Chapter 7 (Project description – construction) the Blues Point temporary site would be used intermittently – firstly for site establishment and excavation of the shaft, and then on occasions for the retrieval of the cutter heads of tunnel boring machines. Site establishment and shaft excavation works would occur over a period of about 12 months and then the site would remain inactive until retrieval is required. Each retrieval would take about four weeks.

For each retrieval, construction vehicle numbers would be less and over a shorter duration compared to the site establishment and shaft excavation stage. As such, the traffic impacts associated with the site establishment and shaft excavation stage are considered to represent the worst-case at this site.

In addition, oversize vehicle movements would be required to transport the cutter heads of the tunnel boring machines away from the site. This is likely to occur mostly overnight to minimise the potential impacts to traffic on Blues Point Road.

##### **Vehicle movement forecasts and routes**

The anticipated vehicle numbers (heavy and light) at the Blues Point temporary site over a typical day are provided in Figure 8-26. This graph shows that the peak heavy vehicle movements in the AM peak period (7am to 10am) would be four heavy vehicles per hour during the shaft excavation phase.

The proposed haul routes are shown in Figure 8-27. Access to and egress from the Blues Point temporary site would be left in from Blues Point Road and left out to Henry Lawson Drive.

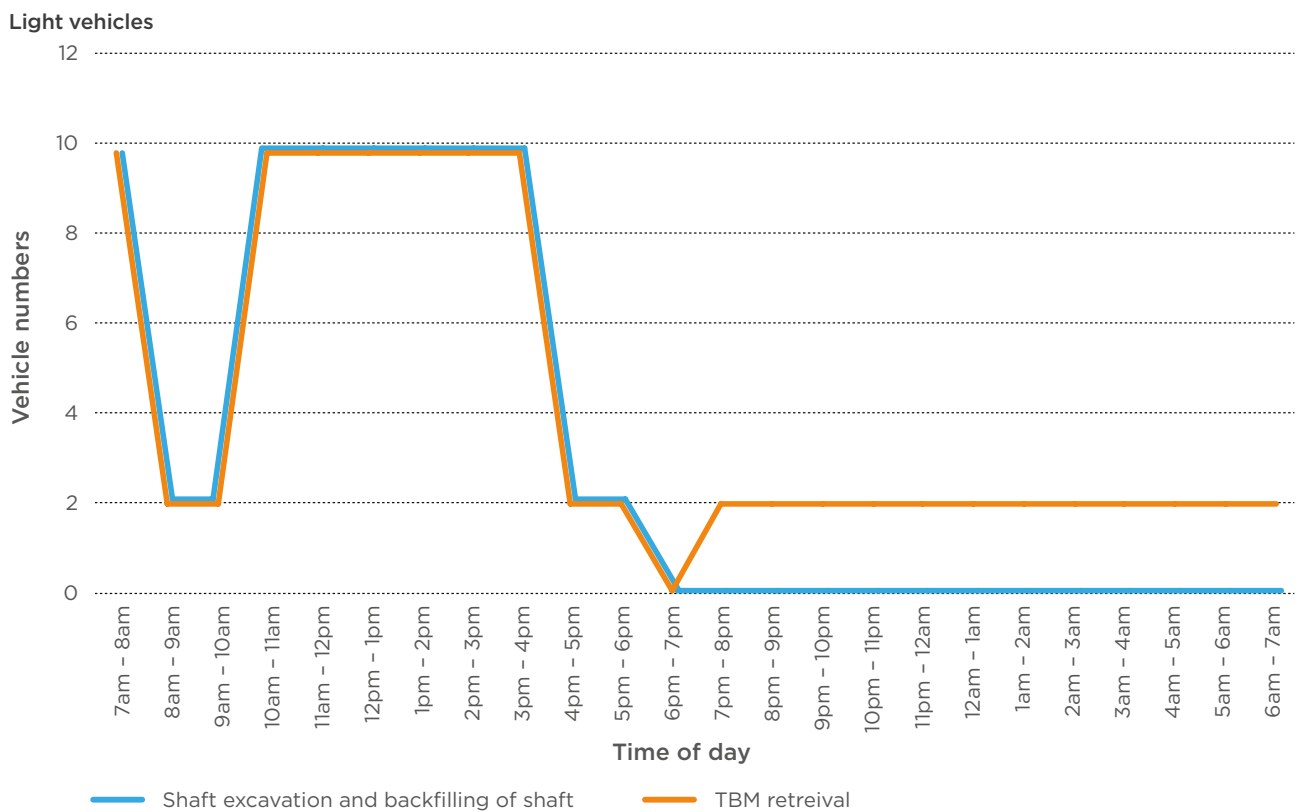
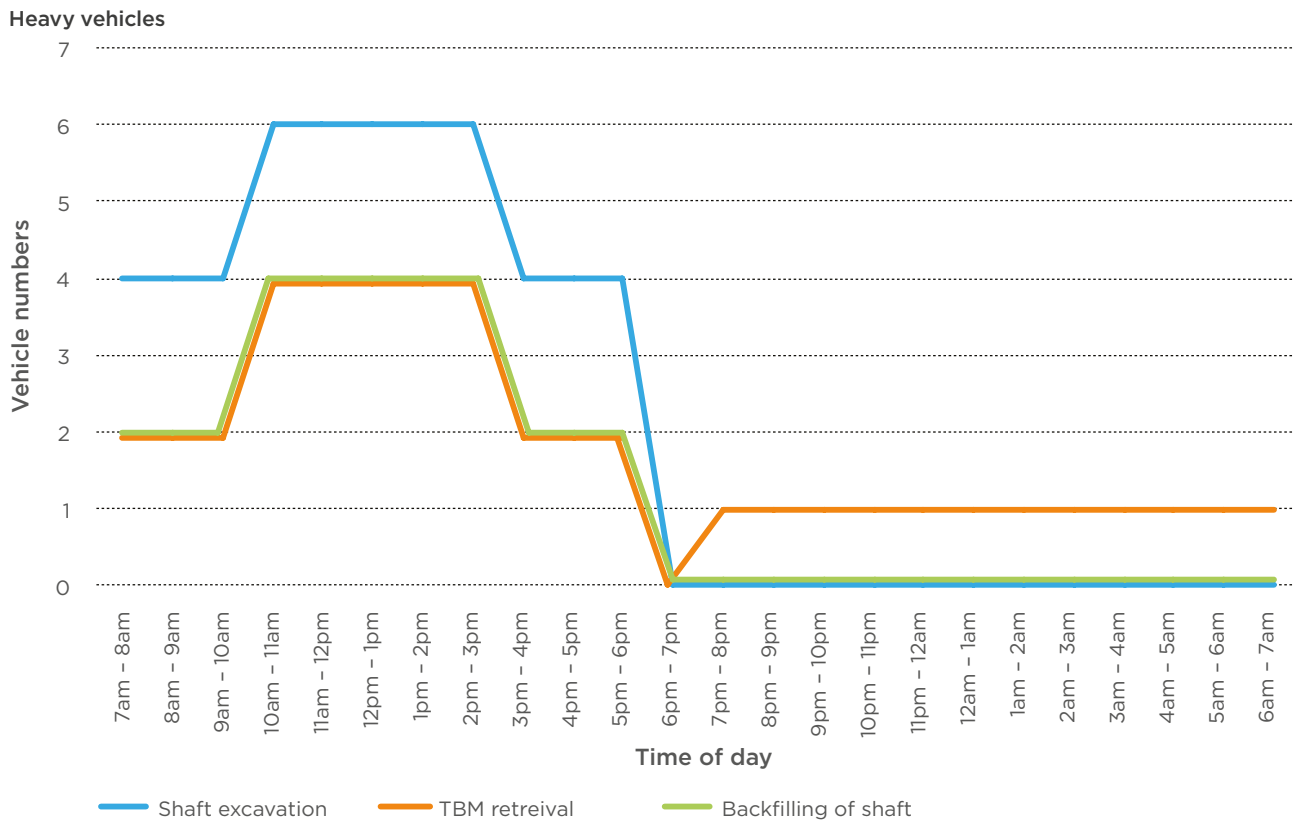


Figure 8-26 Blues Point temporary site vehicle movements

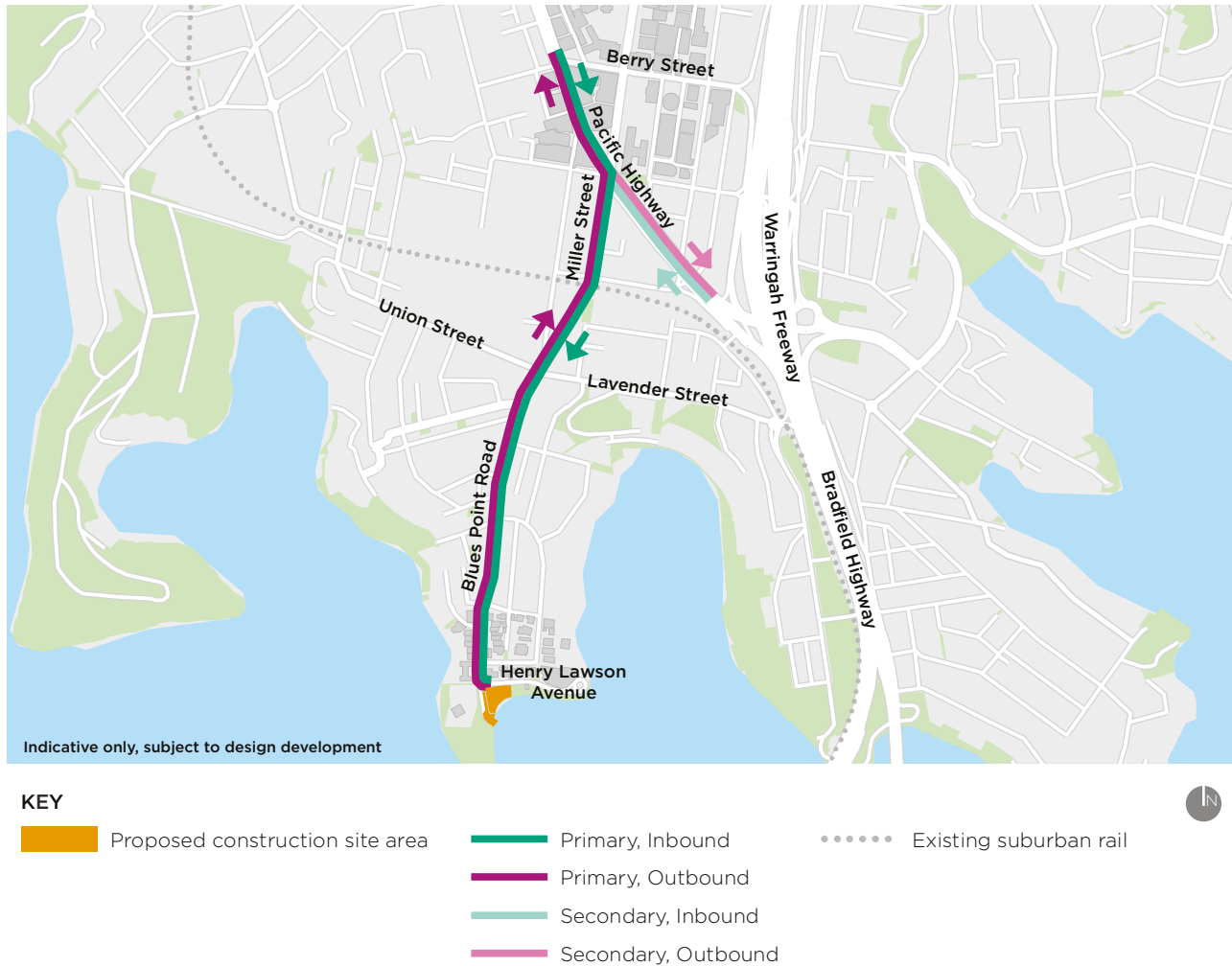


Figure 8-27 Blues Point temporary site haul routes

**Active transport network**

The footpaths around the site would generally be maintained during construction. During the tunnel boring machine retrieval, the footpath along Blues Point Road adjacent to the site would be temporarily closed. During these periods, safe alternative pedestrian arrangements or detours would be provided.

A five metre wide zone would be maintained within the park along the foreshore and along the eastern side of the site from Henry Lawson Drive to the foreshore. This would maintain the existing pedestrian access to the harbour foreshore.

**Public transport services**

The bus stop located on the southern side of Henry Lawson Avenue would need to be relocated during the construction works. The temporary relocation of this bus stop would be carried out by Transport for NSW in consultation with the bus operators, Roads and Maritime Services and North Sydney Council. The temporary relocation of this bus stop would not impact on the operation of any bus services, however it may result in some passenger having to walk a short distance further to access the bus stop.

### Parking and taxis

Around four on street car parking spaces on Blues Point Road would be removed during the site establishment and shaft excavation stage. During each tunnel boring machine retrieval, all on street car parking spaces (around 23 spaces in total) on the eastern side of Blues Point Road adjacent to the site would also need to be removed. This loss of parking would be for a period of around four weeks and on four occasions. It is recognised that this temporary loss of parking would impact the ability for some visitors to access this area. Alternative on-street parking (around eight spaces) is available on the opposite side of Blues Point Road and about 50 metres further north of Blues Point Road. Options to retain some car parking at the end of Blues Point Road, including a disabled parking space, would be investigation during detailed design.

### Road network performance

Table 8-21 and Figure 8-28 shows the impact of construction on nearby key intersections.

In summary, it shows that the level of service observed at each intersection in the base scenario is maintained once the construction traffic is included on the network. Any minor improvements in the average delay or degree of saturation are likely to be the result of the model optimising the operation of the intersection with the additional construction traffic on certain movements.

The removal of the tunnel boring machine components is anticipated to be via Blues Point Road however the option of transporting these large components by barge using the existing wharf facilities at the end of Blues Point Road would be further investigated during detailed construction planning. The removal of the tunnel boring machine components via Blues Point Road would occur on four occasions and require oversized truck movements. This would involve the temporary short-term closure of the road (most likely overnight) and the temporary removal of street furniture, such as signage, pedestrian islands and bollards. During these closures, access to properties would be provided however delays may be experienced.

**Table 8-21 Blues Point temporary site intersection performance**

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Blues Point Road / Union Street / Lavender Street</b>						
AM	33	C	0.70	33	C	0.68
PM	24	B	0.67	24	B	0.67
<b>Blues Point Road / Miller Street / Blue Street</b>						
AM	19	B	0.67	18	B	0.64
PM	15	B	0.59	15	B	0.59

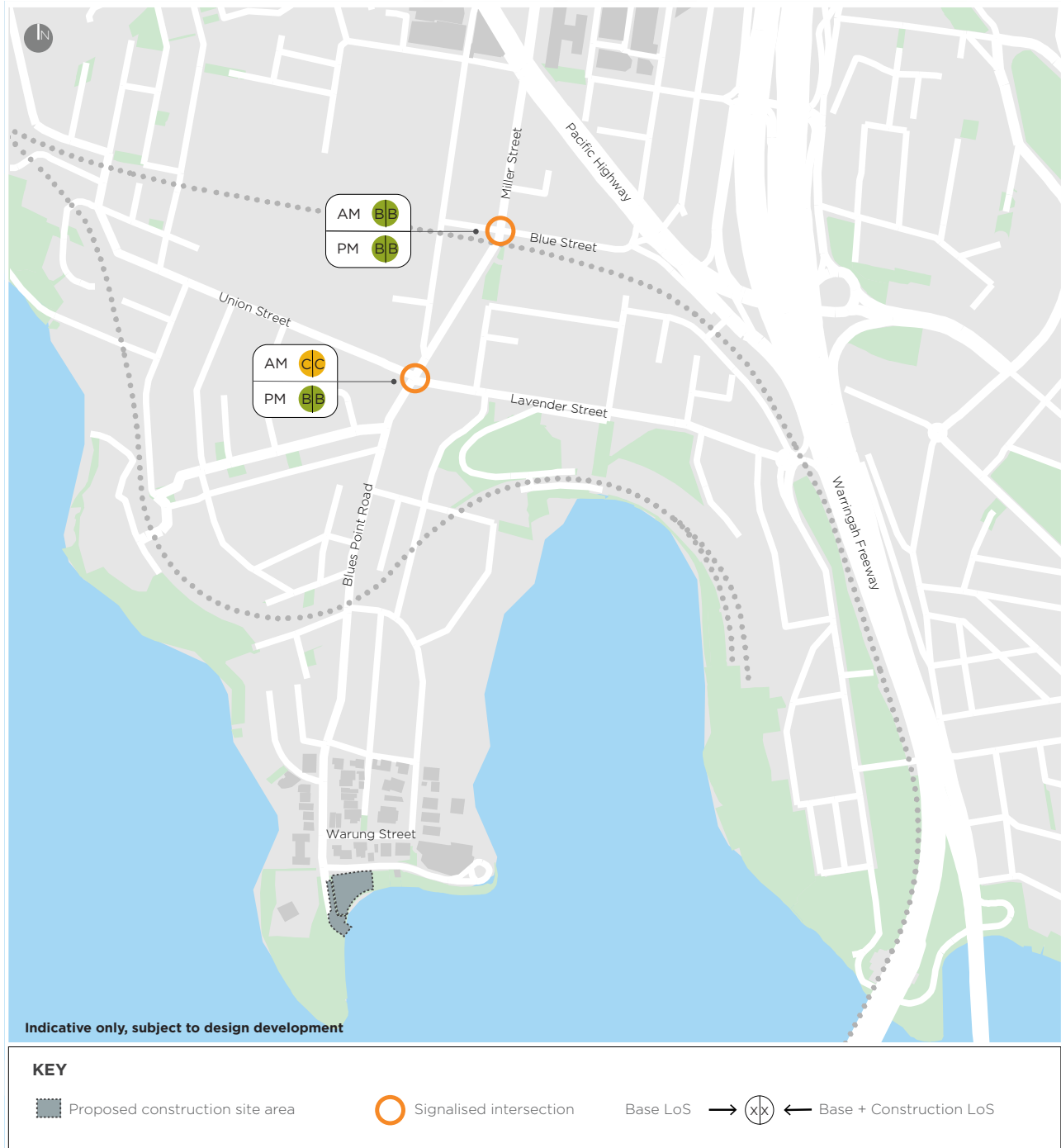


Figure 8-28 Blues Point temporary site intersection performance

### 8.4.11 Sydney Harbour ground improvement works

Ground improvement works, as described in Chapter 7 (Project description – construction), are likely to be required across Sydney Harbour prior to excavation of the tunnels.

The location of the ground improvement works is located in one of the narrowest sections of the harbour. Important maritime movements occur through this section of the harbour including cruise ships access the White Bay Cruise Passenger Terminal, tankers access the Viva Energy facilities at Gore Bay and Clyde, Sydney Ferries services and recreational boating activities.

The current preferred method of ground improvement works is a jet grouting approach. The grout would be delivered to the barges from an on-shore facility and would be injected from the barge via a crane and drilling lead. This would be achieved through the use of three barges on the harbour. One barge would be used to carry out the grout works which would generally remain in the harbour for the duration of the works. The other two barges would be used to transport grout to and spoil from the works area to an on-shore facility (likely to occur once per day). In addition, tug boats would be required to move the barges and small boats would transport construction workers as required. The anticipated boat movements associated with the harbour ground improvement work include:

- Jet grouting barge would travel back to the on-shore facility once per week
- Grout delivery and spoil barges would travel to and from the on-shore facility once per day
- Small boats would transfer workers between the on-shore facility and the jet grout barge multiple times per day.

This relatively small number of boat movements, compared to existing movements within the operational harbour, is not anticipated to result in any impacts to recreational, commercial or transport related maritime movements.

The physical presence of the barges within the harbour could result in impacts to shipping channels, especially large tankers accessing Viva Energy's facilities at Gore Bay and Clyde, or pose a navigational safety hazard. The proposed method for the ground improvement work has been subject to ongoing discussions with the Harbour Master. This consultation has determined that the two grout blocks would be carried out at separate times in order to keep shipping channels open. At this stage it is expected that the southern grout block would be carried out first, followed by the northern grout block. This would allow sufficient navigational space around the barges to permit safe passage of these tankers.

In relation to potential navigational safety impacts, appropriate warning signals and demarcation would be provided for all harbour activity. The nature of these warning signals would be determined in consultation with the Harbour Master to ensure harbour safety is not affected.

Consultation prior to and during the ground improvement work would continue to be carried out with the Port Authority of NSW (Harbour Master), Roads and Maritime Services and Sydney Ferries in relation to maintaining open shipping channels and ensuring the proposed work does not impact the safety of other harbour users.



### 8.4.12 Sydney CBD

The project would include four construction sites within the Sydney CBD. The combined haul routes for these sites are shown on Figure 8-29. These haul routes have been defined with the aim of exiting the Sydney CBD as efficiently as possible and minimising the combined use of roads by trucks accessing each construction site. The potential traffic impacts of construction at each of these sites are described in the following sections.

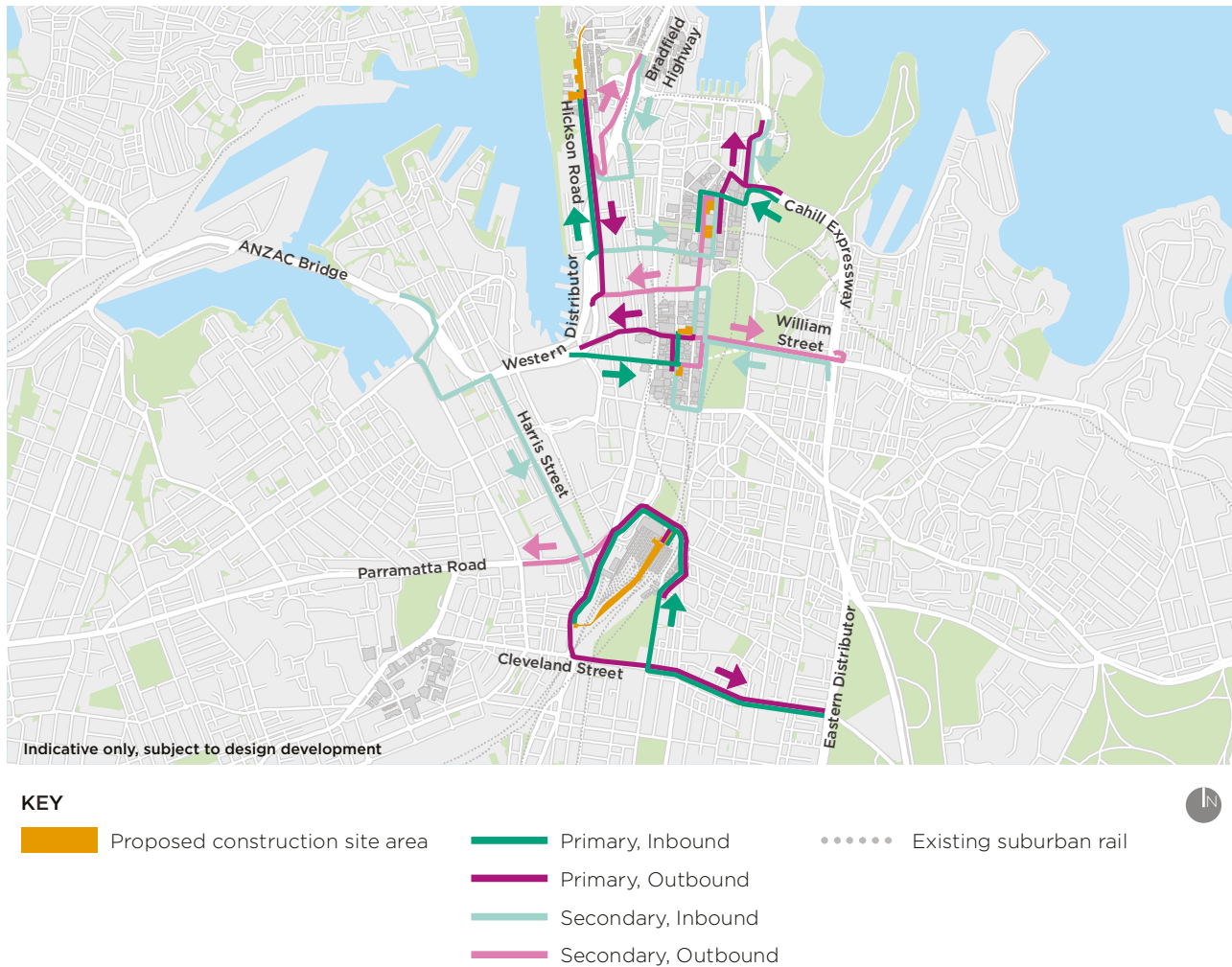


Figure 8-29 Sydney CBD combined haul routes

### 8.4.13 Barangaroo Station Vehicle movement forecasts and routes

The anticipated vehicle numbers (heavy and light vehicles) at the Barangaroo Station construction site over a typical day are provided in Figure 8-30. This graph shows that the peak heavy vehicle movements in the AM peak period (7am to 10am) would be six heavy vehicles per hour during the station excavation and tunnel excavation phases.

The proposed haul routes are shown in Figure 8-31. Access to and egress from the Barangaroo Station construction site would be via Hickson Road.

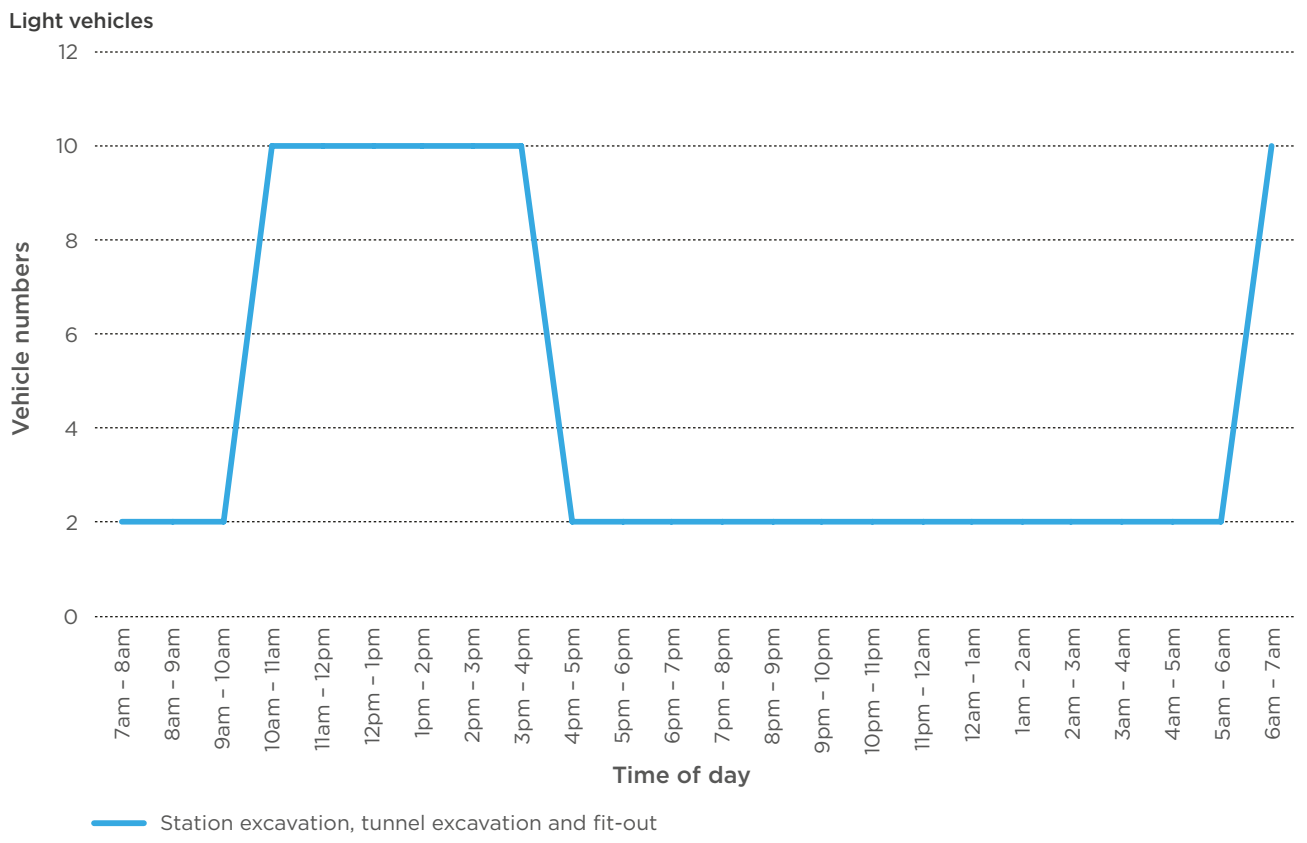
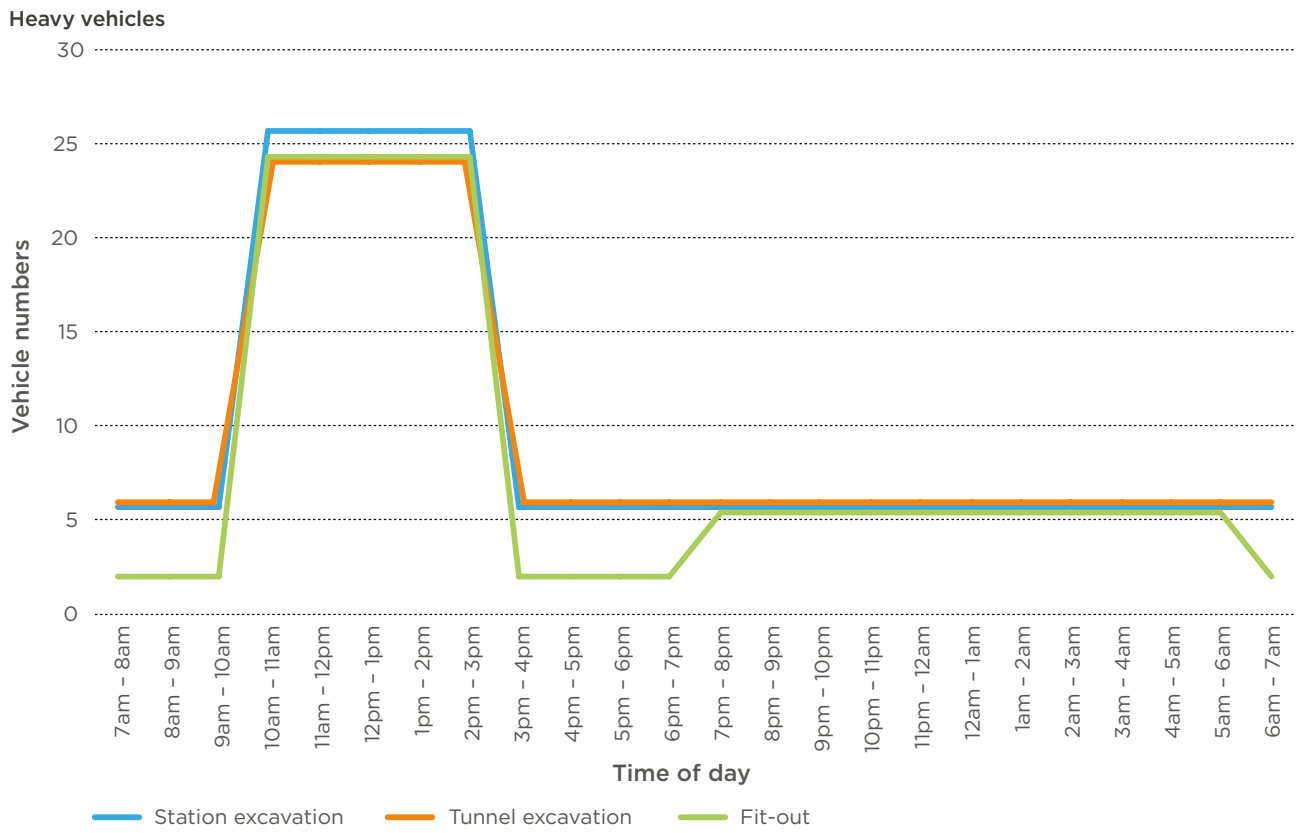


Figure 8-30 Barangaroo Station construction vehicle movements



Figure 8-31 Barangaroo Station construction site haul routes

**Active transport network**

The construction works would result in temporary closures of the footpaths along Hickson Road. The construction would be staged to generally maintain one footpath open to pedestrians at all times. Full overnight closures may be required during tunnel boring machine launch and retrieval works. In the event that closure of both footpaths are required, alternative pedestrian facilities or detours would be provided.

Cyclists using Hickson Road currently share it with high numbers of construction vehicles from the Barangaroo development. The construction would be staged to generally maintain one lane in each direction, providing access for cyclists. Any full closures are anticipated to occur at night when cycle numbers are expected to be negligible. As a result, the addition of Sydney Metro construction vehicles is not anticipated to further impact on cyclists.

### Public transport services

Bus services would continue to operate along Hickson Road during the construction period. Some bus stops on Hickson Road may need to be temporarily relocated. The relocation of any bus stops would be carried out by Transport for NSW in consultation with the bus operators, Roads and Maritime Services, the CBD Coordination Office and the Barangaroo Delivery Authority. Any relocation of bus stops would not impact the operation of any bus services, however it may result in some passengers having to walk a short distance further to access bus stops.

### Parking and taxis

Around 125 on-street car parking spaces on Hickson Road would be removed during the construction phase. The main users of these car parking spaces are currently construction workers at the adjacent Barangaroo development, although some spaces may be used by local residents and visitors. Sydney Metro would consult with the Barangaroo Delivery Authority to identify locations for alternative car parking spaces, or to implement alternative strategies to reduce the demand for parking by construction workers across the two projects.

### Road network performance

Barangaroo Station is proposed to be constructed using a cut-and-cover technique below Hickson Road. This would be carried out in a staged manner to generally maintain one traffic lane in each direction. Traffic arrangements in this location would be coordinated with works being carried out by Barangaroo Delivery Authority. There may also be a requirement for temporary full closures of Hickson Road during launch and retrieval of the tunnel boring machines. This would be coordinated with the CBD Coordination Office and Barangaroo Delivery Authority and is likely to occur at night when traffic volumes are expected to be very low.

Table 8-22 and Figure 8-32 shows the impact of construction on nearby key intersections. In summary, this shows that all intersections would maintain their pre-construction level of service with the addition of the construction traffic.

With regard to the coaches and delivery vehicles using Hickson Road to access the Overseas Passenger Terminal at Circular Quay, these vehicle movements are expected occur over a short duration when a ship is either arriving or departing, which is typically early morning and evening. Construction movements during these periods of the day have been minimised in order to manage potential traffic impact during the AM and PM peak traffic periods. The Port Authority of NSW would be consulted throughout the construction phase, particularly with regard to the launch and retrieval of the tunnel boring machines (when full closures of Hickson Road are likely to be required) to ensure access to the Overseas Passenger Terminal via Hickson Road is maintained.

Table 8-22 Barangaroo Station construction site intersection performance

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Shelley Street / Sussex Street</b>						
AM	14	A	0.61	14	A	0.63
PM	12	A	0.35	12	A	0.37
<b>Sussex Street / Napoleon Street</b>						
AM	22	B	0.70	22	B	0.68
PM	18	B	0.55	18	B	0.55
<b>Kent Street / Napoleon Street / Margaret Street</b>						
AM	20	B	0.52	20	B	0.52
PM	15	B	0.37	15	B	0.37
<b>Kent Street / Clarence Street / Harbour Bridge on-ramp</b>						
AM	63	E	1.00	63	E	1.00
PM	47	D	0.93	47	D	0.93
<b>Sussex Street / Erskine Street</b>						
AM	34	C	0.80	34	C	0.77
PM	28	B	0.59	28	B	0.59
<b>Sussex Street / King Street</b>						
AM	35	C	0.90	36	C	0.92
PM	25	B	0.72	25	B	0.73
<b>Sussex Street / Market Street</b>						
AM	23	B	0.82	23	B	0.83
PM	20	B	0.76	20	B	0.77

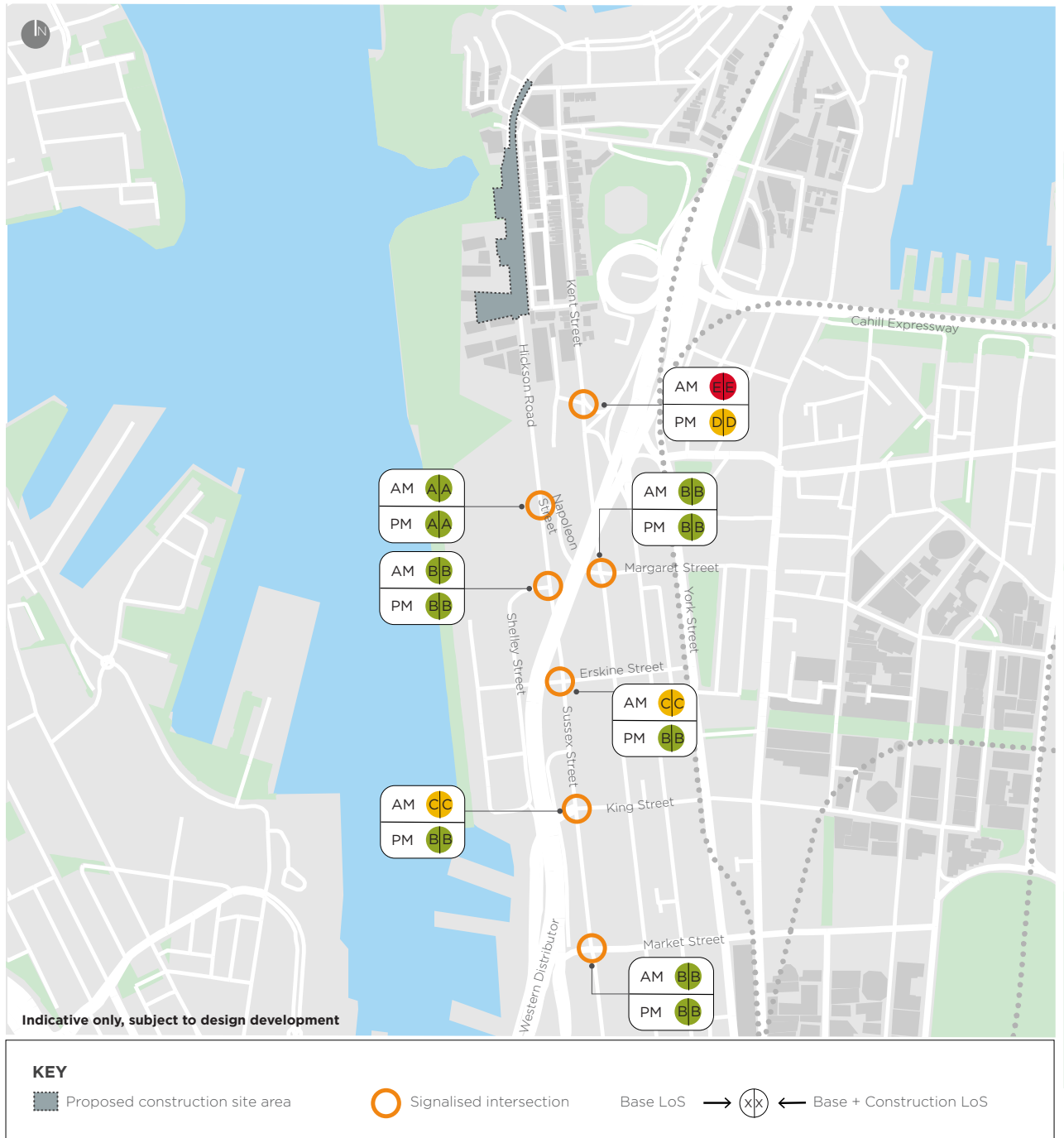


Figure 8-32 Barangaroo Station intersection performance

#### **8.4.14 Martin Place Station**

##### **Vehicle movement forecasts and routes**

The anticipated vehicle numbers (heavy and light vehicles) at the Martin Place Station construction site over a typical day are provided in Figure 8-33. This graph shows that the peak heavy vehicle movements in the AM peak period (7am to 10am) would be six heavy vehicles per hour during the demolition and excavation phases.

The proposed haul routes are shown in Figure 8-34. Access to and egress from the two Martin Place Station construction sites would be left in from Castlereagh Street (from the east via Hunter Street) and left out to Elizabeth Street.

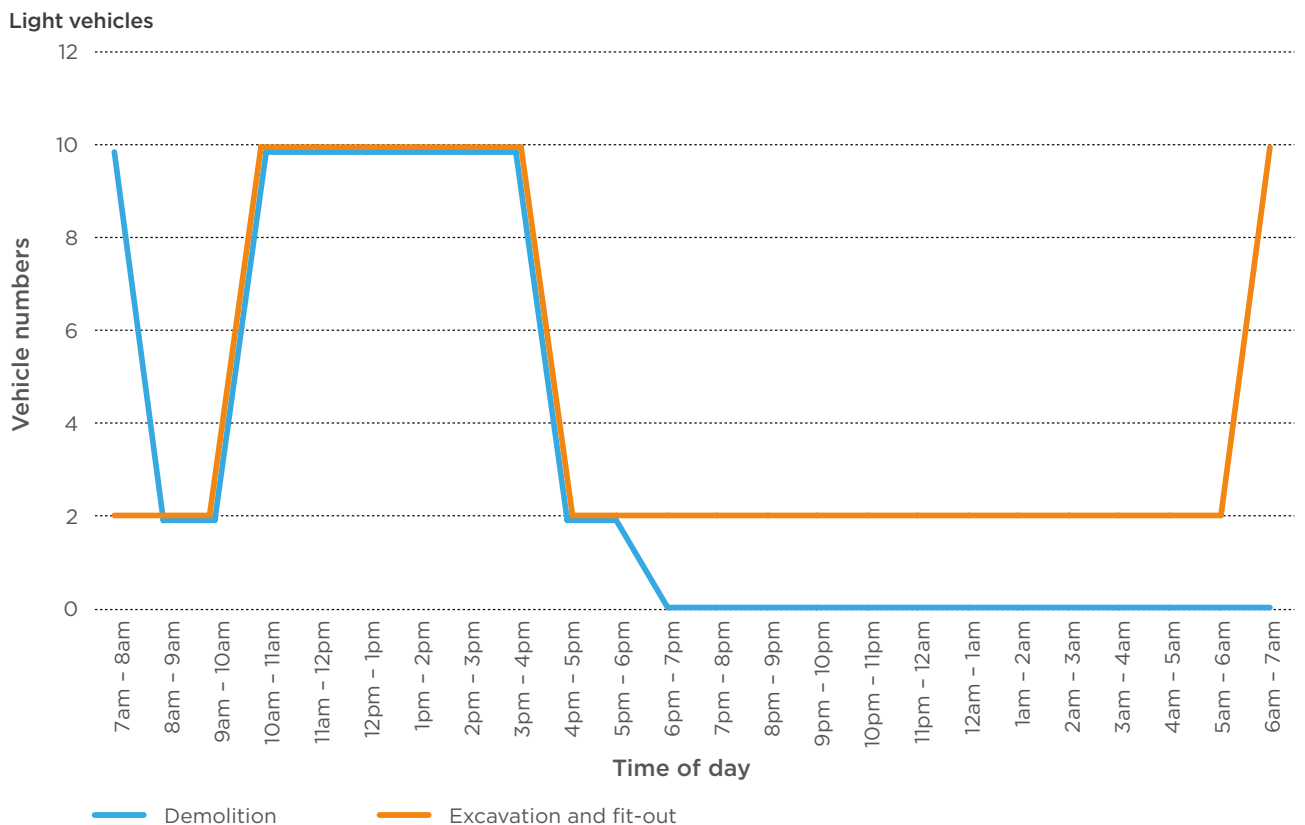
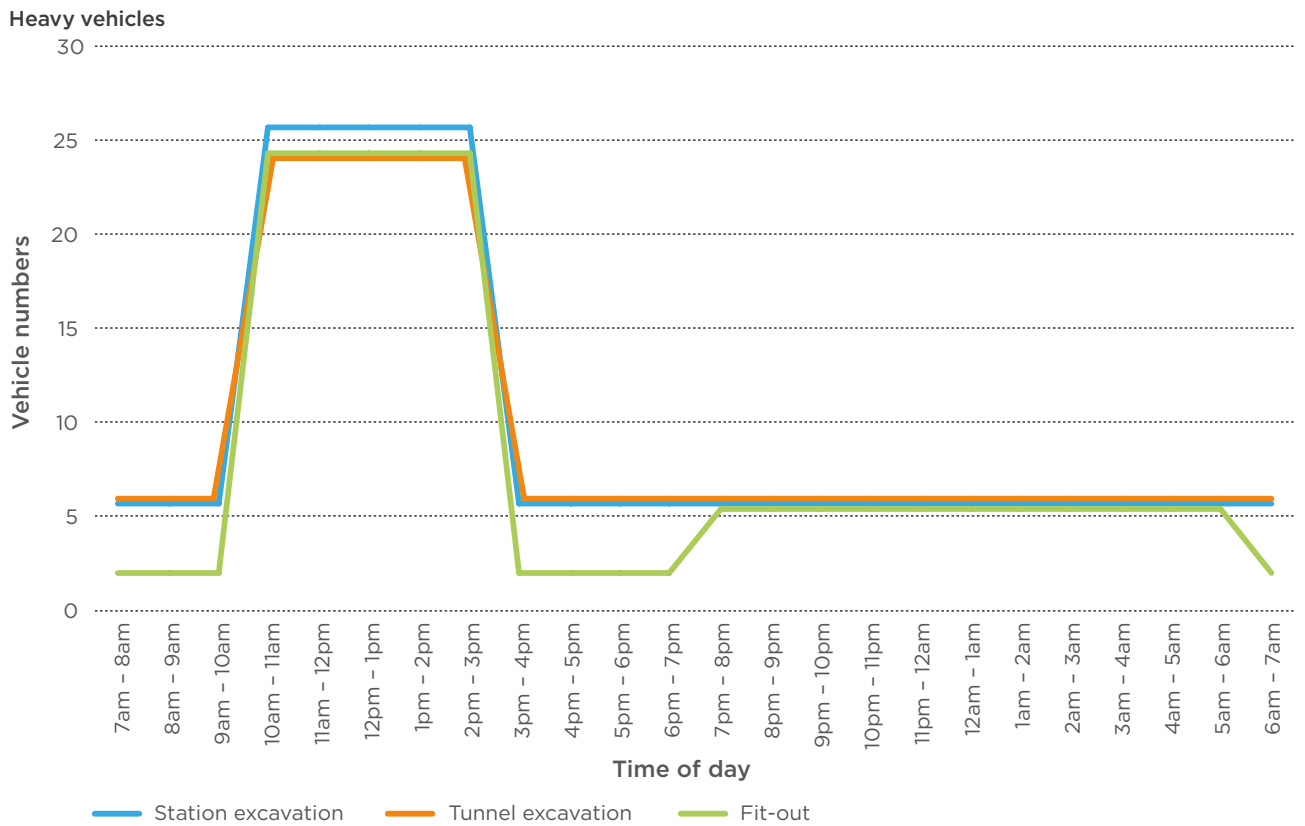


Figure 8-33 Martin Place Station construction vehicle movements



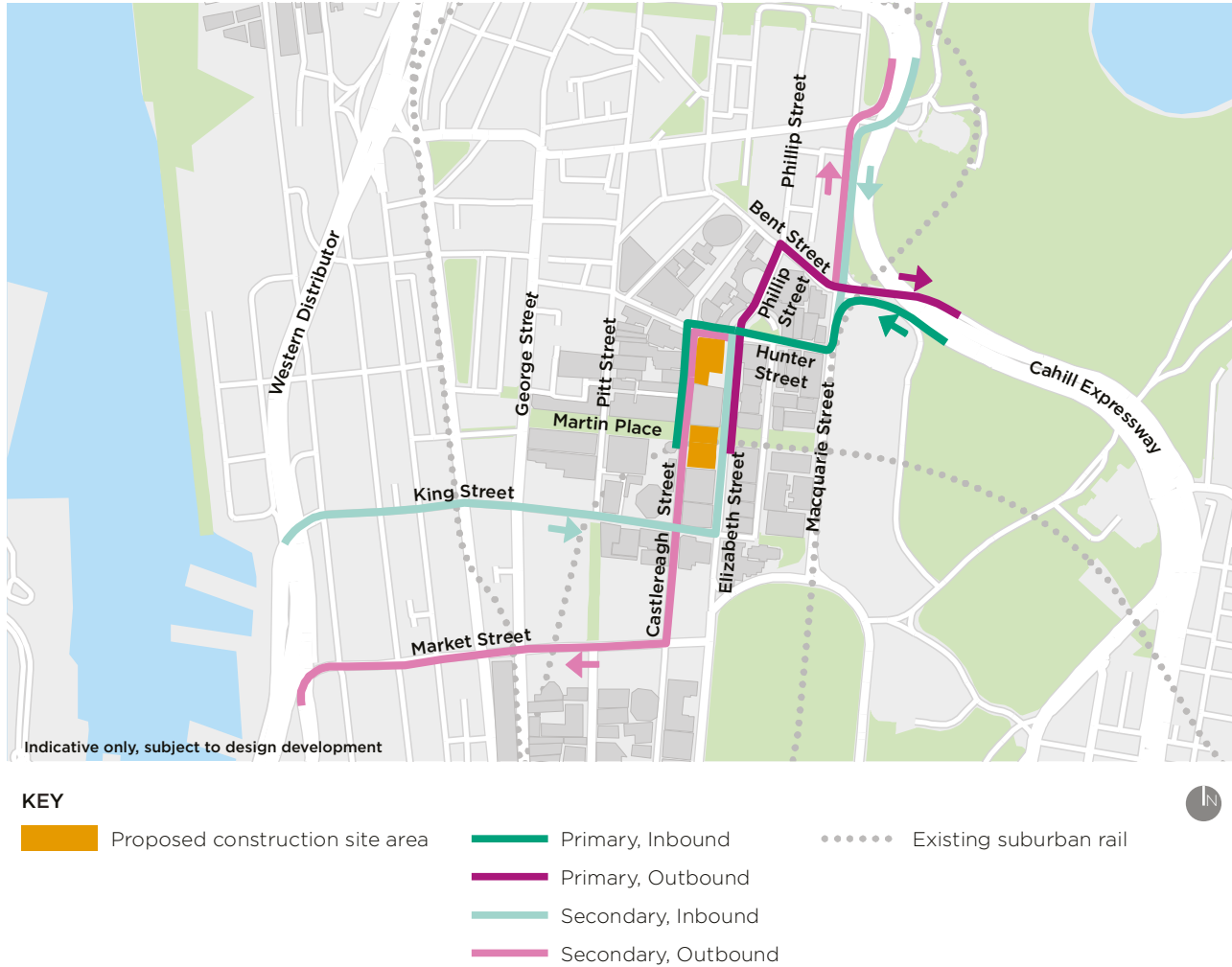
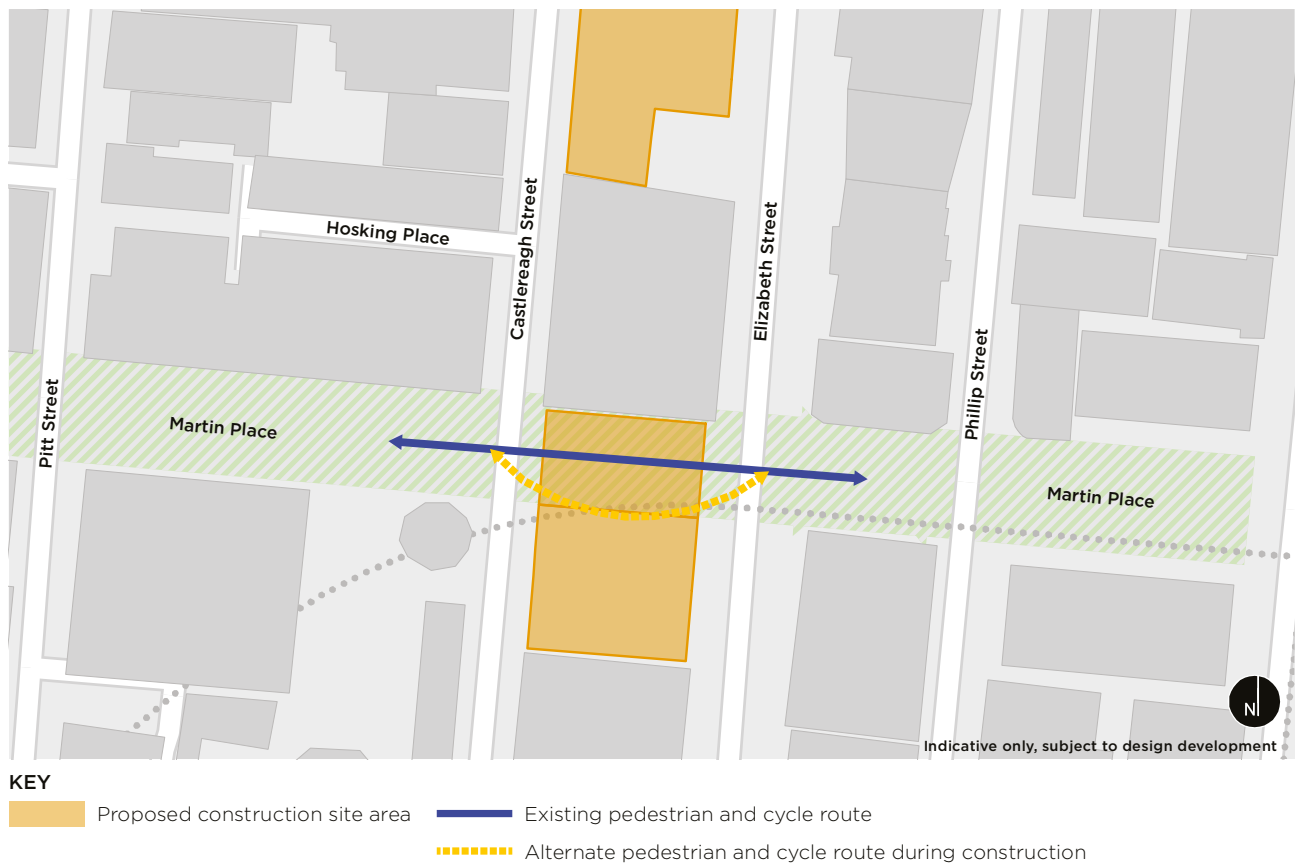


Figure 8-34 Martin Place Station haul routes

**Active transport network**

Martin Place, between Castlereagh and Elizabeth streets, would be closed to pedestrians and cyclists for a period of around six months. Alternative surface pedestrian and cyclist access would be provided to the south through the site of the previously demolished building. The width of this access would be sufficient to cater for the anticipated peak pedestrian and cyclist movements through Martin Place. Alternative pedestrian and cyclist routes during the temporary partial closure of Martin Place are shown on Figure 8-35.



**Figure 8-35 Martin Place Station construction site – alternative pedestrian and cyclist route**

The existing underground pedestrian concourse between Castlereagh and Elizabeth streets, and the associated connections to Martin Place would also be closed during these cut-and-cover works. The primary function of the underground concourse is to provide access to the existing Martin Place Station. During this period, suburban rail customers would be able to use the existing Martin Place Station entry points to the east of Elizabeth Street and the east of Phillip Street. This would result in additional pedestrians using the pedestrian crossing facilities at Castlereagh and Elizabeth streets. There is sufficient pedestrian storage space within Martin Place to accommodate these additional peak pedestrian movements. The pedestrian access points which would be closed during this construction period are shown on Figure 8-36. During the construction period, 60 Martin Place will also be undergoing redevelopment resulting in the Martin Place Station staircase adjacent to 60 Martin Place (east of Phillip Street) also being closed for a three year period.

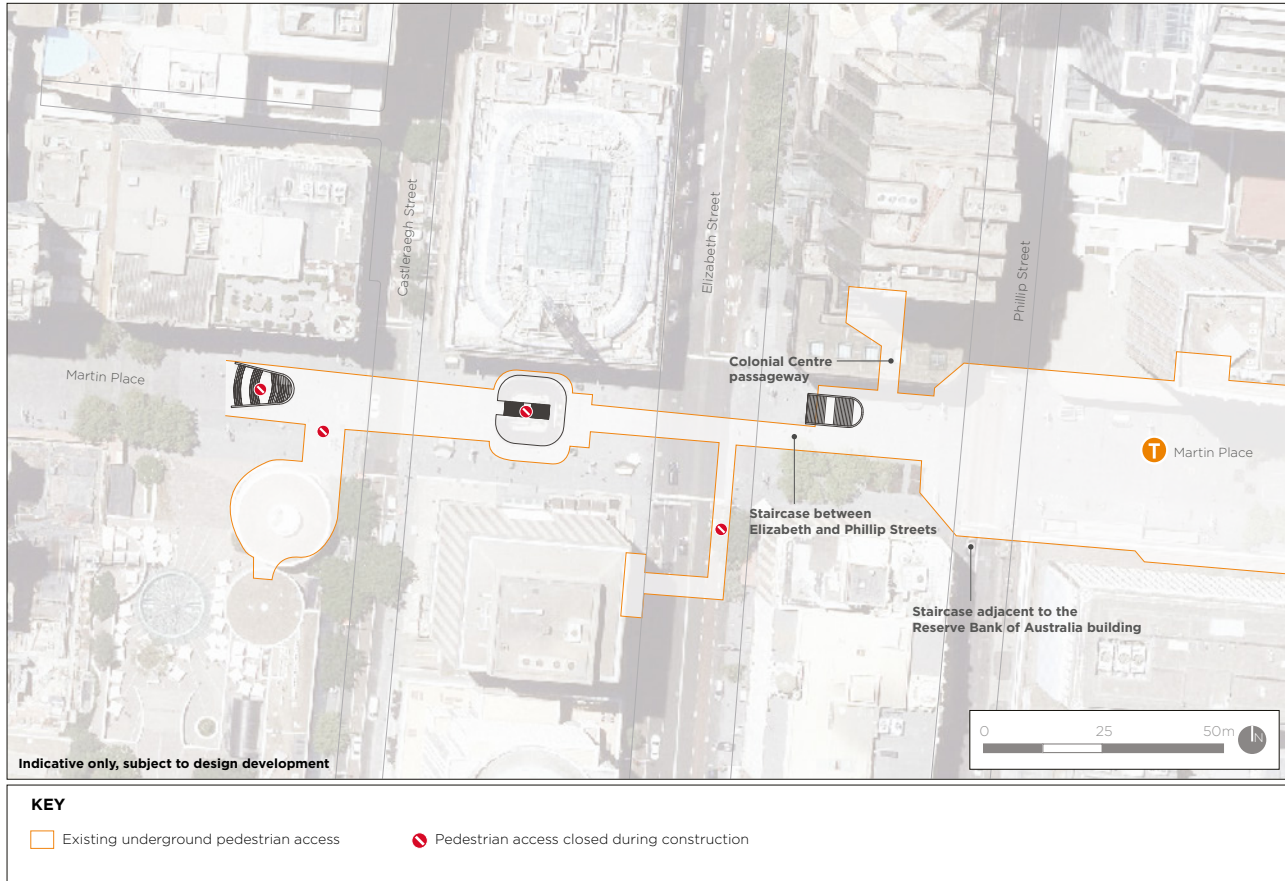


Figure 8-36 Martin Place Station construction pedestrian access arrangements

Using pedestrian survey data collected in November 2015, the level of service for pedestrians at each remaining access point has been calculated for this stage of construction. The peak minute (representing a worst case scenario) pedestrian level of service is presented in Table 8-23.

Table 8-23 Martin Place construction pedestrian level of service

Location	AM peak minute		PM peak minute	
	Base	Construction	Base	Construction
Staircase adjacent to the Reserve Bank of Australia building	C	F	A	D
Colonial Centre passageway	A	B	A	B
Staircase between Elizabeth and Phillip streets	D	F	A	F

During construction work, guidance recommends maintaining a level of service D or better for staircases and passageways. The modelling shows that one access point maintains a level of service D or better and therefore operate within an acceptable level of service during construction. However the staircase in Martin Place between Elizabeth and Phillip Streets would operate at level of service F in the AM and PM peak minute and the staircase adjacent to the Reserve Bank of Australia would also operate at a LOS F in the AM peak minute. A level of service F represents a breakdown in pedestrian flow with many stoppages. This result represents the peak minute and the average minute during the AM and PM peak period is predicted to have a better performance. This impact would also only be temporary, for around six months, whilst the four western access points are closed.

During the closure of existing entrances to Martin Place Station, Marshalls would be provided during the AM and PM peak periods to direct customers to available access and egress points.

The closure of these access and egress points to and from Martin Place Station may also necessitate changes to the emergency evacuation procedures for Martin Place Station. Transport for NSW would work with Sydney Trains in the planning of emergency evacuation procedures for Martin Place Station.

Martin Place provides an important function during certain major events in the Sydney CBD. As outlined in Section 8.4.3, liaison would occur with the CBD Coordination Office, Roads and Maritime Services and the event organisers regarding appropriate management of pedestrians in and around Martin Place Station during these events.'

Footpaths surrounding the site on Elizabeth and Castlereagh streets would be reduced in width by around 600 millimetres during the construction works. The existing footpaths are greater than three metres wide and, therefore, a 2.4 metre wide footpath would be maintained. Street furniture such as post boxes, parking metres and street signs may need to be relocated.

### **Public transport services**

Elizabeth and Castlereagh streets form the main north-south route for bus services through the Sydney CBD. The addition of construction vehicles and site access points on these streets may result in impacts on bus services including minor delays to travel times. To minimise these potential impacts, the Martin Place construction sites would be arranged to ensure construction vehicles are loaded and unloaded off the street.

In the event that any bus stops on Castlereagh or Elizabeth streets are required to be temporarily relocated during the construction works, this would be carried out by Transport for NSW in consultation with the bus operators and the CBD Coordination Office. The temporary relocation of any bus stops would not impact the operation of any bus services, however it may result in some passengers having to walk a short distance further to access bus stops.

The underground platform to platform connection between the existing Martin Place Station and the Sydney Metro Martin Place Station would mainly be carried out by excavating new pedestrian tunnels from the Sydney metro construction site. During the final connection to the existing Martin Place Station, occupation of some space at the western end of the Sydney Trains and NSW Trains platforms would be required. Hoarding would be established to provide a separated work zone for the breakthrough works. These works are likely to be carried out without the need for rail possessions and without impacting on any suburban and intercity rail services. Sufficient space for pedestrian circulation would be maintained on the Sydney Trains Martin Place platforms during this work.

### **Parking and taxis**

The Martin Place Station construction sites would not result in any loss of parking or impacts to taxi facilities.

## Road network performance

Table 8-24 and Figure 8-37 shows the impacts of construction on nearby key intersections. This shows a minor deterioration in performance at the Castlereagh Street / Hunter Street / Blight Street in the AM peak from level of service A to level of service B. However, the average delay and degree of saturation at the intersection does not change with the addition of the construction traffic and, therefore, the overall impact on the performance of the intersection would be negligible.

The remaining intersections maintain their base level of service during the construction of the project and therefore the impact of the construction traffic on these intersections would not be significant.

**Table 8-24 Martin Place Station construction site intersection performance**

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Elizabeth Street / Phillip Street / Hunter Street</b>						
AM	23	B	0.84	23	B	0.83
PM	26	B	0.79	23	B	0.81
<b>Elizabeth Street / Martin Place</b>						
AM	5	A	0.42	7	A	0.42
PM	4	A	0.40	7	A	0.41
<b>Elizabeth Street / King Street</b>						
AM	26	B	0.73	26	B	0.73
PM	24	B	0.73	25	B	0.71
<b>Hunter Street / Macquarie Street</b>						
AM	20	B	0.83	21	B	0.86
PM	20	B	0.82	20	B	0.83
<b>Macquarie Street / Bent Street / Eastern Distributor ramps</b>						
AM	155	F	1.27	156	F	1.27
PM	161	F	1.19	167	F	1.29
<b>Castlereagh Street / Hunter Street / Bligh Street</b>						
AM	15	A	0.45	15	B	0.45
PM	16	B	0.52	16	B	0.50
<b>Castlereagh Street / Martin Place</b>						
AM	6	A	0.23	6	A	0.24
PM	6	A	0.28	6	A	0.28
<b>Castlereagh Street / King Street</b>						
AM	21	B	0.50	21	B	0.50
PM	22	B	0.61	21	B	0.64
<b>Bent Street / Phillip Street</b>						
AM	17	B	0.74	17	B	0.74
PM	18	B	0.63	25	B	0.71

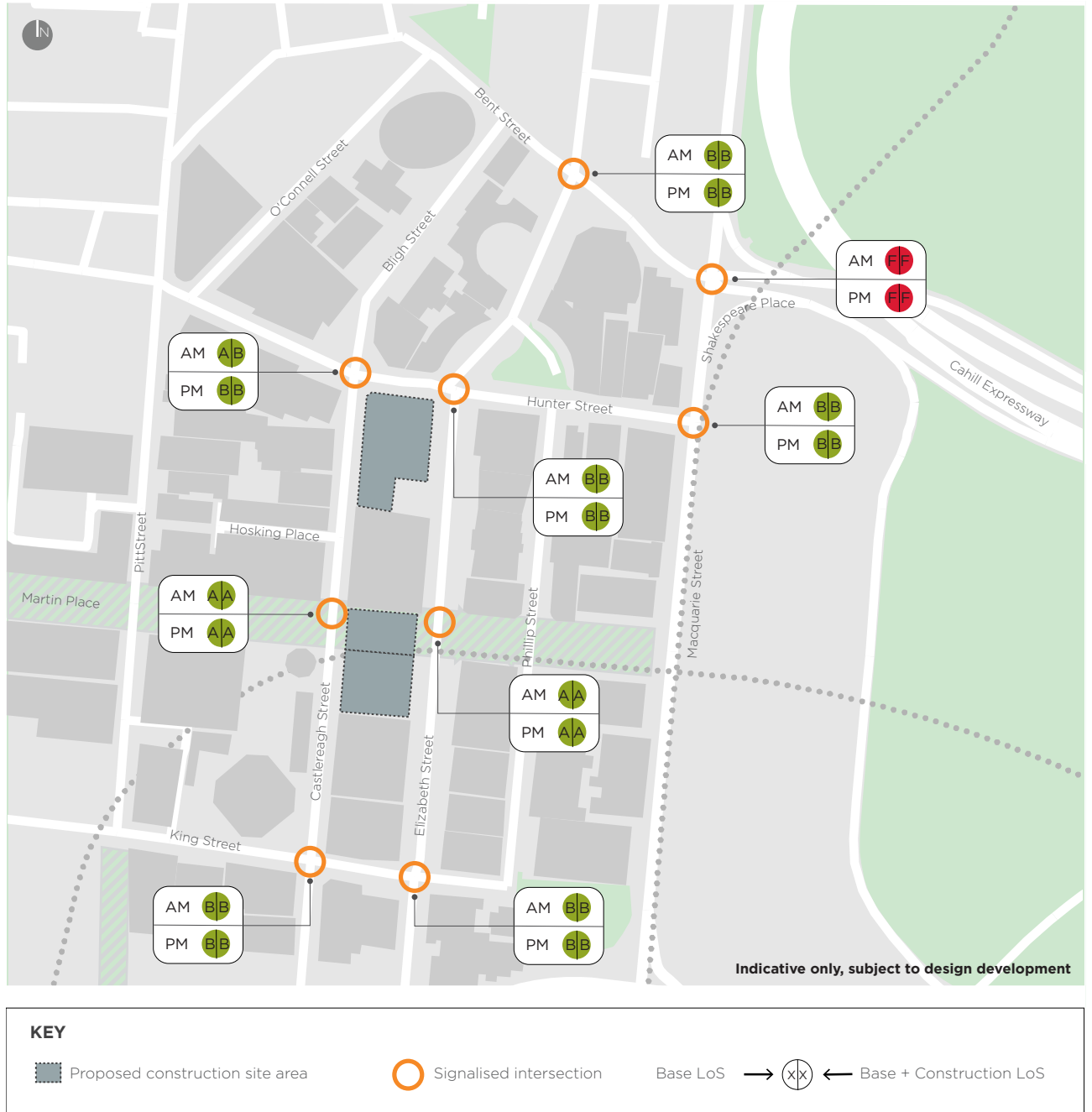


Figure 8-37 Martin Place Station intersection performance

### **8.4.15 Pitt Street Station**

#### **Vehicle movement forecasts and routes**

The anticipated vehicle numbers (heavy and light vehicles) at the Pitt Street Station construction site over a typical day are provided in Figure 8-38. This graph shows that the peak heavy vehicle movements in the AM peak period (7am to 10am) would be six heavy vehicles per hour during the demolition and excavation phases.

The proposed haul routes are shown in Figure 8-39. Access and egress to and from the Pitt Street north site would be right in from Pitt Street, and right in, right out via Castlereagh Street. Access and egress to and from the Pitt Street south site would be right in from Bathurst Street, and right out to Pitt Street.

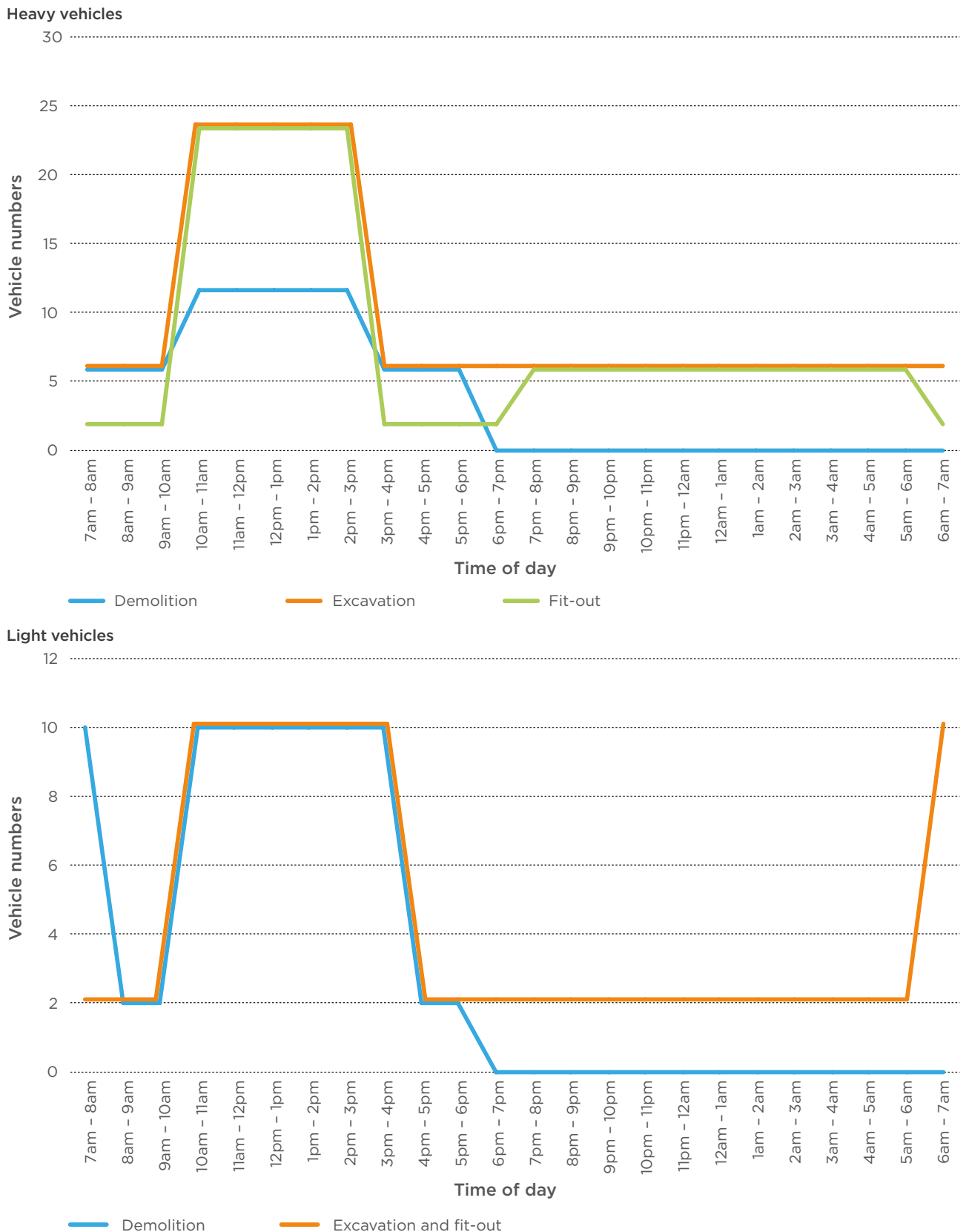


Figure 8-38 Pitt Street Station construction vehicle movements



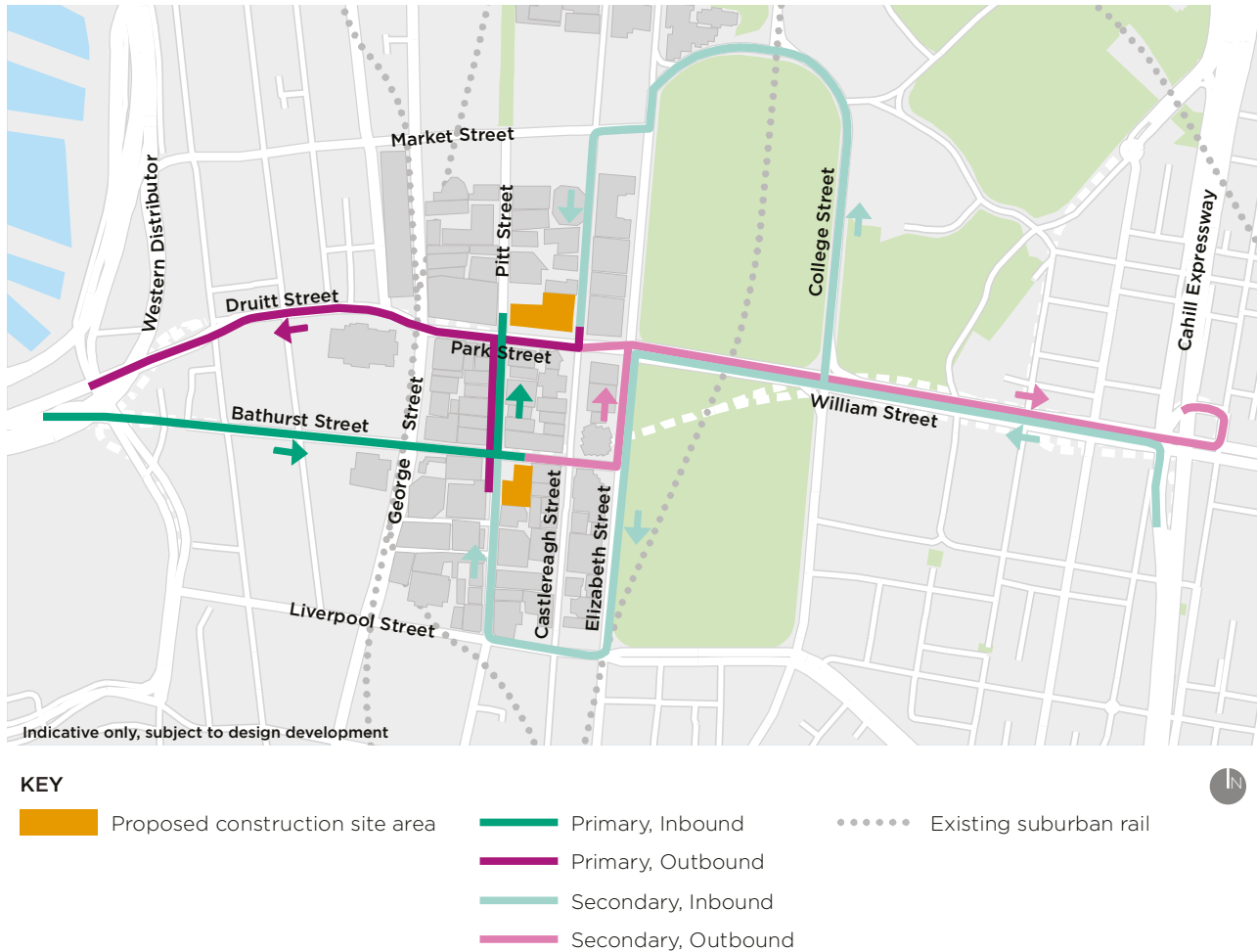


Figure 8-39 Pitt Street Station construction site haul routes

### Active transport network

The City Centre Access Strategy (Transport for NSW, 2013a) identifies Castlereagh Street as a future strategic cycle route. Depending on the timing of the implementation of this cycle facility, Sydney Metro would liaise with the CBD Coordination Office and the City of Sydney Council to manage the potential impacts to cyclists on this section of the cycle route, and the provision of any alternative facilities should they be necessary.

Footpaths surrounding the sites on Pitt, Bathurst and Castlereagh streets would be reduced in width by around 600 millimetres during the construction works. These footpaths are currently greater than three metres wide and, therefore, a 2.4 metres wide footpath would be maintained, in line with the width requirements for footpaths set out in the Austroads guidelines

### Public transport services

Elizabeth, Castlereagh and Park streets provide part of the major routes for bus services through the Sydney CBD. The addition of construction vehicle routes on these streets may result in impacts to these bus services such as minor delays to travel times. In order to minimise these potential impacts, the Pitt Street construction sites would be arranged to ensure construction vehicles are loaded and unloaded off the street. Additionally, the Pitt Street Station north site has been arranged to avoid an access or egress point via Park Street to reduce the potential for impacts to bus services.

In the event that any bus stops around the Pitt Street construction sites are required to be temporarily relocated during the construction works, this would be carried out by Transport for NSW in consultation with the bus operators and the CBD Coordination Office. The temporary relocation of any bus stops would not impact the operation of any bus services, however it may result in some passenger having to walk a short distance further to access bus stops.

### Parking and taxis

The Pitt Street Station construction sites would not result in any loss of parking or impacts to taxi facilities.

### Road network performance

Table 8-25 and Figure 8-40 shows the impact of construction on nearby key intersections during construction. In summary, this shows that the intersection performance is maintained at all intersections during the construction phase of the project except for the Bathurst Street / Day Street intersection. At this intersection, the level of service deteriorates from C to D in the PM peak. This is likely due to the intersection currently operating close to its theoretical capacity (at a degree of saturation 0.93). The average delay only deteriorates from 41 to 46 seconds per vehicle and the degree of saturation deteriorates from 0.93 to 0.95. It is therefore considered that the impact of the construction traffic on the operational performance of this intersection would be minimal.

The Pitt Street Station and Barangaroo Station construction sites would both use the Western Distributor as their primary haul route. However, given the low volumes of anticipated hourly heavy and light vehicles generated by each site, the combined impact of vehicles travelling to and from both sites is not considered to cause a material impact on the performance of the Western Distributor.

**Table 8-25 Pitt Street Station construction site intersection performance**

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Druitt Street / Sussex Street</b>						
AM	22	B	0.51	22	B	0.52
PM	26	B	0.70	26	B	0.69
<b>Druitt Street / Kent Street</b>						
AM	17	B	0.67	17	B	0.65
PM	14	A	0.65	14	A	0.65
<b>Druitt Street / Clarence Street</b>						
AM	20	B	0.87	18	B	0.87
PM	15	B	0.77	15	B	0.77
<b>Druitt Street / Park Street / George Street / York Street</b>						
AM	18	B	0.80	18	B	0.79
PM	15	B	0.67	15	B	0.67
<b>Park Street / Pitt Street</b>						
AM	18	B	0.63	18	B	0.63
PM	15	A	0.50	15	A	0.51

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Park Street / Castlereagh Street</b>						
AM	23	B	0.67	23	B	0.67
PM	30	C	0.72	30	C	0.72
<b>Park Street / Elizabeth Street</b>						
AM	35	C	0.72	35	C	0.72
PM	38	C	0.82	38	C	0.82
<b>Bathurst Street / Harbour Street</b>						
AM	49	D	0.93	50	D	0.93
PM	43	D	0.93	44	D	0.93
<b>Bathurst Street / Day Street</b>						
AM	307	F	1.19	324	F	1.20
PM	41	C	0.93	46	D	0.95
<b>Bathurst Street / Sussex Street</b>						
AM	14	A	0.75	14	A	0.61
PM	16	B	0.76	16	B	0.74
<b>Bathurst Street / Kent Street</b>						
AM	21	B	0.78	20	B	0.79
PM	22	B	0.72	22	B	0.71
<b>Bathurst Street / George Street</b>						
AM	10	A	0.45	10	A	0.45
PM	10	A	0.47	10	A	0.49
<b>Bathurst Street / Pitt Street</b>						
AM	20	B	0.54	20	B	0.54
PM	26	B	0.55	27	B	0.57
<b>Bathurst Street / Castlereagh Street</b>						
AM	22	B	0.55	22	B	0.55
PM	10	A	0.54	10	A	0.54
<b>Bathurst Street / Elizabeth Street</b>						
AM	27	B	0.73	27	B	0.73
PM	18	B	0.64	17	B	0.66



Figure 8-40 Pitt Street Station intersection performance

### **8.4.16 Central Station platforms**

#### **Vehicle movement forecasts and routes**

The anticipated vehicle numbers (heavy and light vehicles) at the Central Station construction site over a typical day are provided in Figure 8-41. This graph shows that the peak heavy vehicle movements in the AM peak period (7am to 10am) would be six heavy vehicles per hour during the demolition and excavation phases.

The proposed haul routes are shown in Figure 8-42. Access and egress to and from the Central Station Sydney Yard site would initially be provided as a left in, left out arrangement via Eddy Avenue. Once the road bridge from Regent Street to Sydney Yard is constructed, access would be left in and left out via Regent Street (between Queen and Meagher streets).

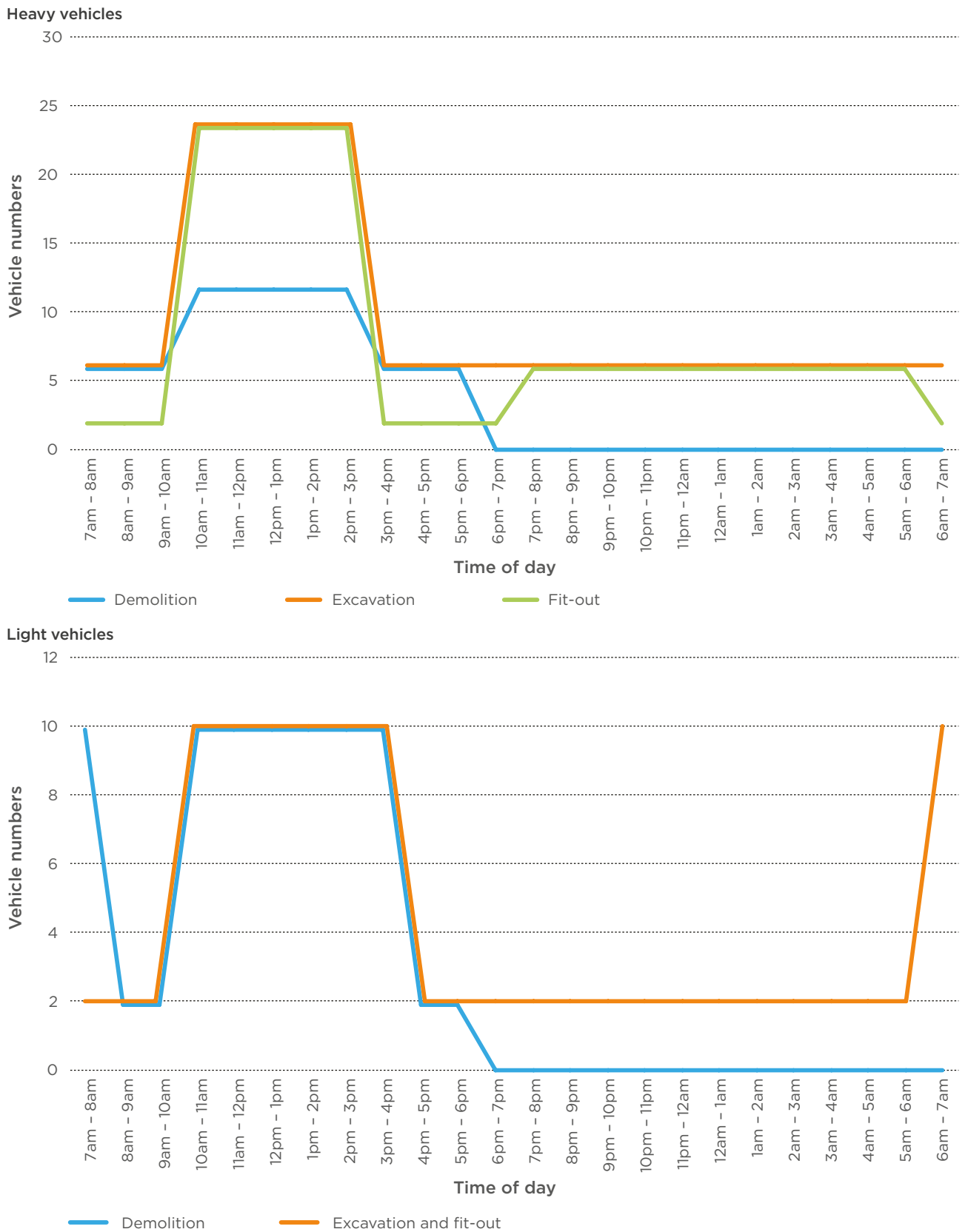


Figure 8-41 Central Station construction vehicle movements

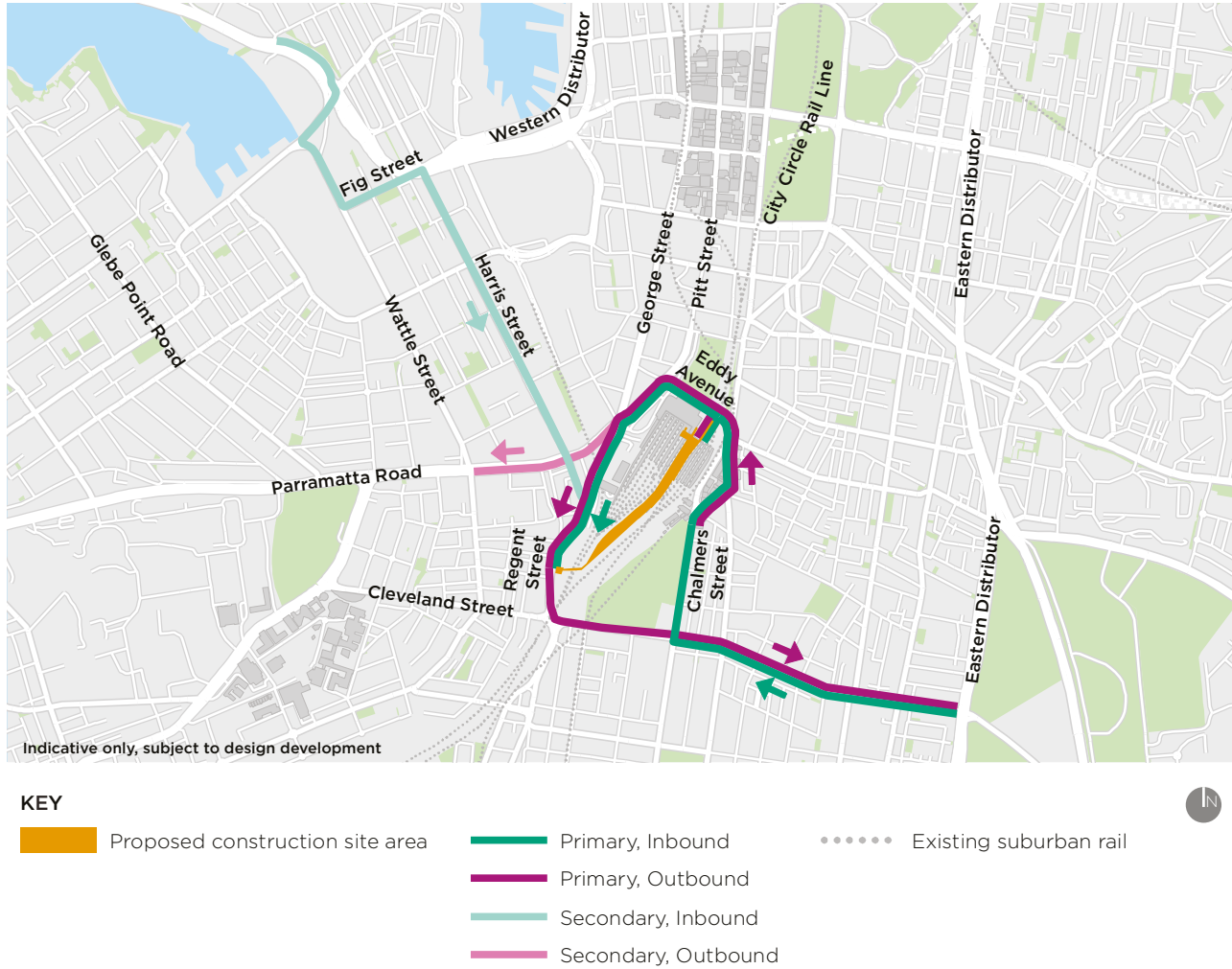


Figure 8-42 Central Station construction sites haul routes

**Active transport network**

Construction of the platforms at Central Station would require the closure of the Devonshire Street pedestrian tunnel for a period of around two weeks. During this closure, east-west pedestrian connectivity would be provided via Eddy Avenue, the northern station concourse or Cleveland Street. The shortest alternative route around Central Station for pedestrians would be to the south via Eddy Avenue, which would require a pedestrian to walk around 320 metres further. Alternative pedestrian and cyclist routes during the temporary closure of Devonshire Street tunnel are shown on Figure 8-43.



**Figure 8-43 Central Station construction sites – alternative pedestrian and cyclist route**

The construction of the platforms would also result in the temporary closure of the existing underground pedestrian connections within Central Station. These underground pedestrian connections are used by customers to interchange at Central Station. To provide for this interchange functionality, a temporary pedestrian overbridge would be provided between platforms 4 and 23 with stair connections to each platform. This is shown in Figure 8-44. The existing lift access at the northern concourse at Central Station would be maintained.



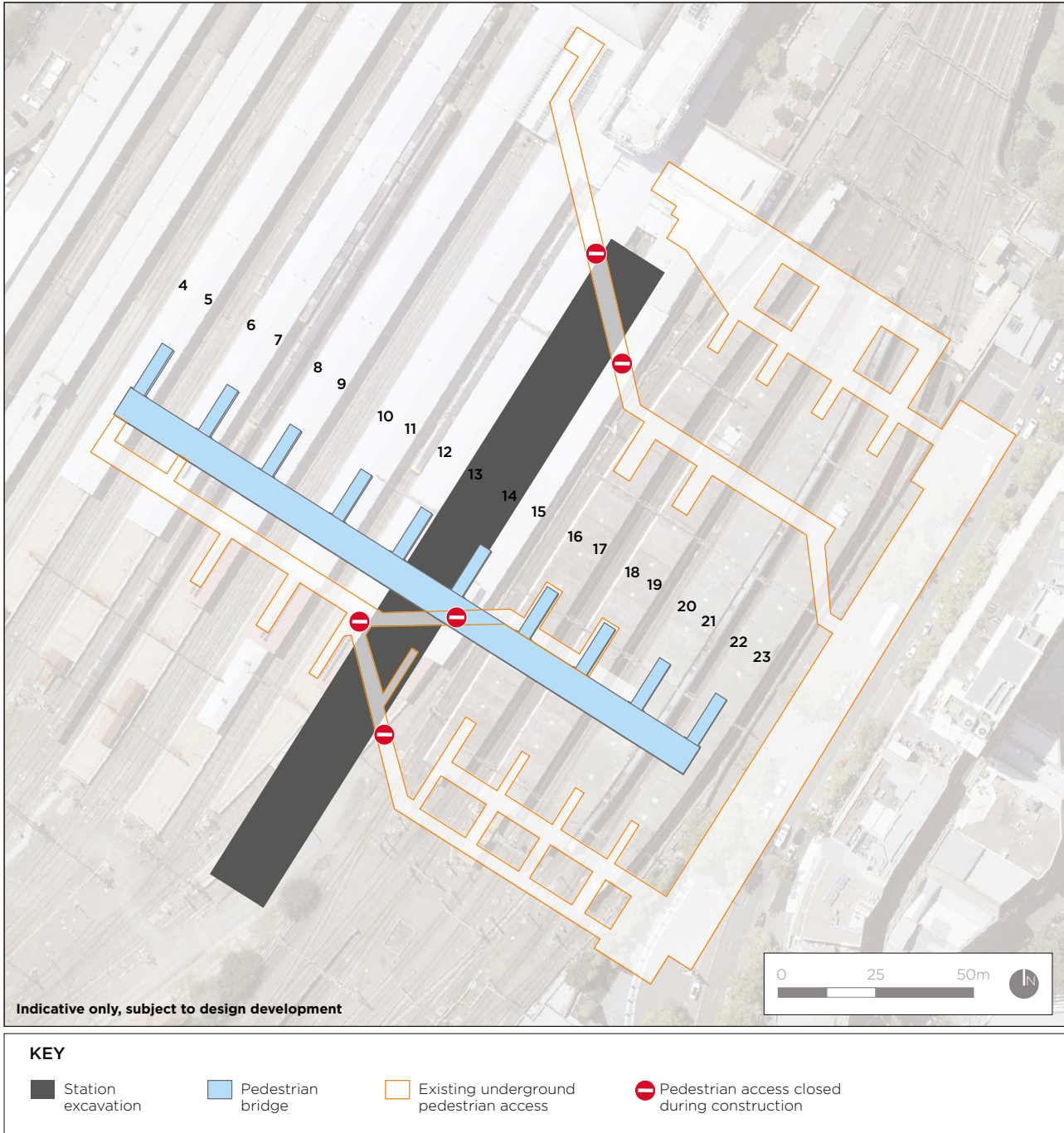


Figure 8-44 Central Station construction pedestrian arrangement

### Public transport services

The construction of the platforms at Central Station is likely to result in alterations to the Sydney Trains and NSW Trains timetable due to the closure of platforms 13, 14 and 15 for the duration of construction. Transport for NSW would liaise with Sydney Trains and NSW Trains in relation to the necessary timetable alterations. Customers would be advised of any timetable changes.

A number of rail track possessions would be required to carry out the works at Central Station, including for:

- Construction of the access bridge from Regent Street to Sydney Yard and associated adjustments to existing rail systems
- Construction of the temporary pedestrian overbridge
- Adjustments to rail systems around platforms 13, 14 and 15 to facilitate cut-and-cover construction of the station
- Adjustments to rail systems around platforms, the paid underground pedestrian connections and Devonshire Street tunnel to facilitate cut-and-cover construction of the station.

Wherever possible, these works would be carried out within the standard Sydney Trains track possession schedule. However additional possessions, potentially including some extended track possessions, are likely to be required to facilitate these works. Alternative bus services would be provided during these possession works.

### Parking and taxis

The Central Station construction sites are not anticipated to result in any loss of parking or impacts to taxi facilities.

### Road network performance

Table 8-26 and Figure 8-45 shows the impact of construction to nearby key intersections.

With the construction traffic included on the network, the majority of intersections maintain their base level of service. The exceptions are:

- Chalmers Street / Cleveland Street intersection which deteriorates from level of service E to level of service F in the AM peak and from level of service D to level of service E in the PM peak. This intersection is already operating at or over capacity and therefore is sensitive to the minor addition of the construction traffic
- Cleveland Street / Crown Street / Baptist Street intersection deteriorates from a level of service B to level of service C in the AM peak. The degree of saturation at the intersection however remains unchanged and, therefore this impact would be minimal.

The Cleveland Street / Wilton Street / Walker Street intersection was seen to improve its level of service from B to A in the AM peak. This is likely due to the model being able to optimise this intersection to improve its operation.

The proposed Central Station haul route includes a number of intersections that are already operating at or over capacity. The addition of construction traffic to the network results in a marginal deterioration in the performance of those intersections currently experiencing congestion during the AM and PM peak periods.

Table 8-26 Central Station construction site intersection performance

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Regent Street / Harris Street / Broadway / George Street</b>						
AM	26	B	0.79	26	B	0.79
PM	24	B	0.85	24	B	0.85
<b>Regent Street / Lee Street</b>						
AM	17	B	0.76	17	B	0.75
PM	16	B	0.78	17	B	0.75
<b>George Street / Pitt Street / Lee Street / Quay Street</b>						
AM	122	F	1.20	122	F	1.20
PM	29	C	0.89	37	C	0.97
<b>Pitt Street / Eddy Avenue / Rawson Parade</b>						
AM	89	F	1.13	88	F	1.13
PM	31	C	0.82	33	C	0.87
<b>Eddy Avenue / Elizabeth Street / Foveaux Street</b>						
AM	31	C	0.87	30	C	0.88
PM	37	C	0.96	39	C	0.96
<b>Elizabeth Street / Devonshire Street</b>						
AM	7	A	0.50	7	A	0.50
PM	8	A	0.77	9	A	0.77
<b>Elizabeth Street / Cleveland Street</b>						
AM	31	C	0.83	32	C	0.81
PM	33	C	0.82	34	C	0.82
<b>Chalmers Street / Cleveland Street</b>						
AM	62	E	1.11	75	F	1.22
PM	51	D	0.99	59	E	1.04
<b>Chalmers Street / Devonshire Street</b>						
AM	13	A	0.78	13	A	0.79
PM	9	A	0.51	9	A	0.49
<b>Regent Street / Cleveland Street</b>						
AM	53	D	1.00	52	D	1.00
PM	48	D	0.98	49	D	0.98
<b>Regent Street / Kensington Street</b>						
AM	6	A	0.44	6	A	0.44
PM	5	A	0.48	5	A	0.48

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Cleveland Street / George Street</b>						
AM	8	A	0.57	8	A	0.57
PM	9	A	0.57	8	A	0.57
<b>Cleveland Street / Pitt Street</b>						
AM	10	A	0.64	8	A	0.61
PM	10	A	0.62	10	A	0.62
<b>Cleveland Street / Wilton Street / Walker Street</b>						
AM	15	B	0.61	9	A	0.49
PM	7	A	0.45	16	B	0.62
<b>Cleveland Street / Marlborough Street / Young Street</b>						
AM	9	A	0.51	7	A	0.45
PM	9	A	0.51	8	A	0.47
<b>Cleveland Street / Crown Street / Baptist Street</b>						
AM	27	B	0.88	32	C	0.88
PM	24	B	0.71	27	B	0.83
<b>Cleveland Street / Bourke Street</b>						
AM	19	B	0.75	18	B	0.71
PM	20	B	0.63	17	B	0.67
<b>Cleveland Street / South Dowling Street</b>						
AM	46	D	0.97	47	D	0.97
PM	44	D	0.95	48	D	0.95



### **8.4.17 Waterloo Station**

#### **Vehicle movement forecasts and routes**

The anticipated vehicle numbers (heavy and light vehicles) at the Waterloo Station construction site over a typical day are provided in Figure 8-46. This graph shows that the peak heavy vehicle movements in the AM peak period (7am to 10am) would be six heavy vehicles per hour during the demolition and excavation phases.

The proposed haul routes are shown in Figure 8-47. Access and egress to and from the Waterloo Station construction site would be left in, left out via Botany Road; and right in, left in, left out via Raglan Street. To provide flexibility, this assessment has included all construction vehicles using the northern haul route and all construction vehicles using the southern haul route. As such, the assessment is considered to be conservative.

Heavy vehicles



Light vehicles

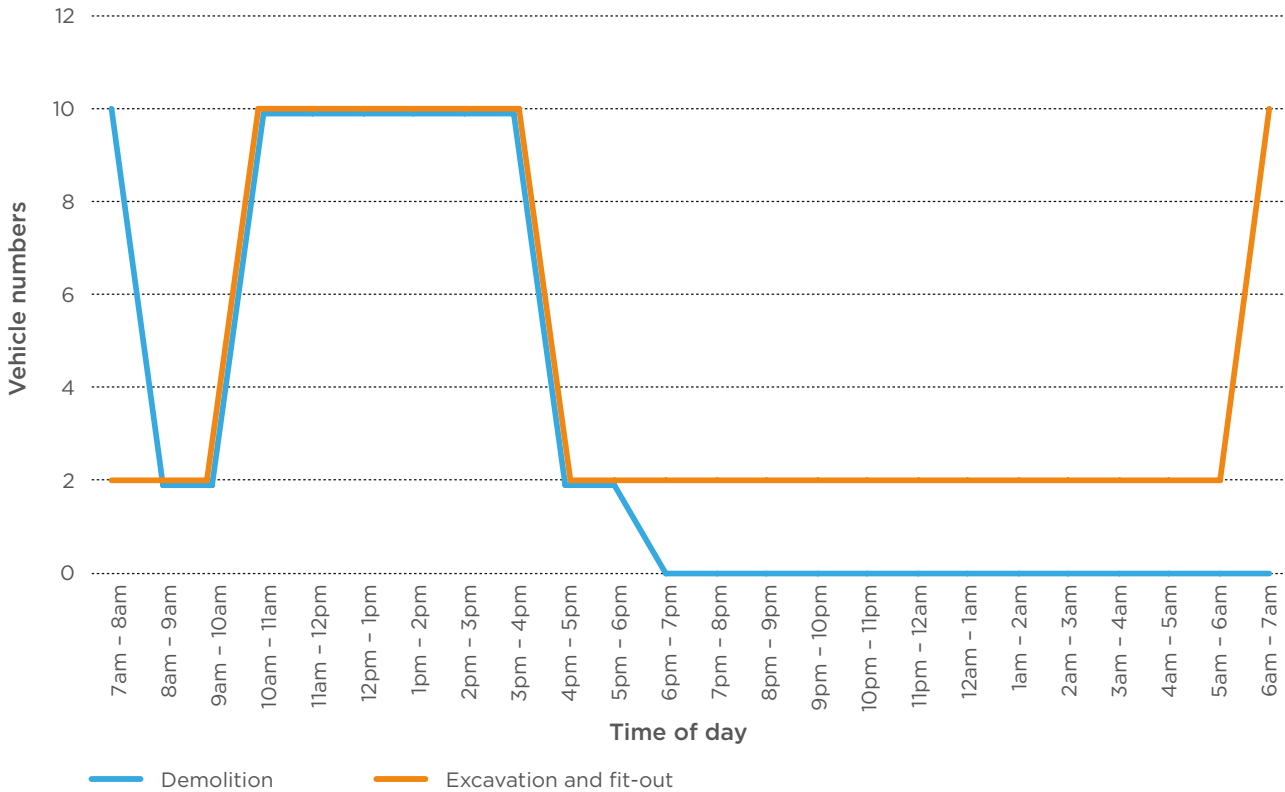
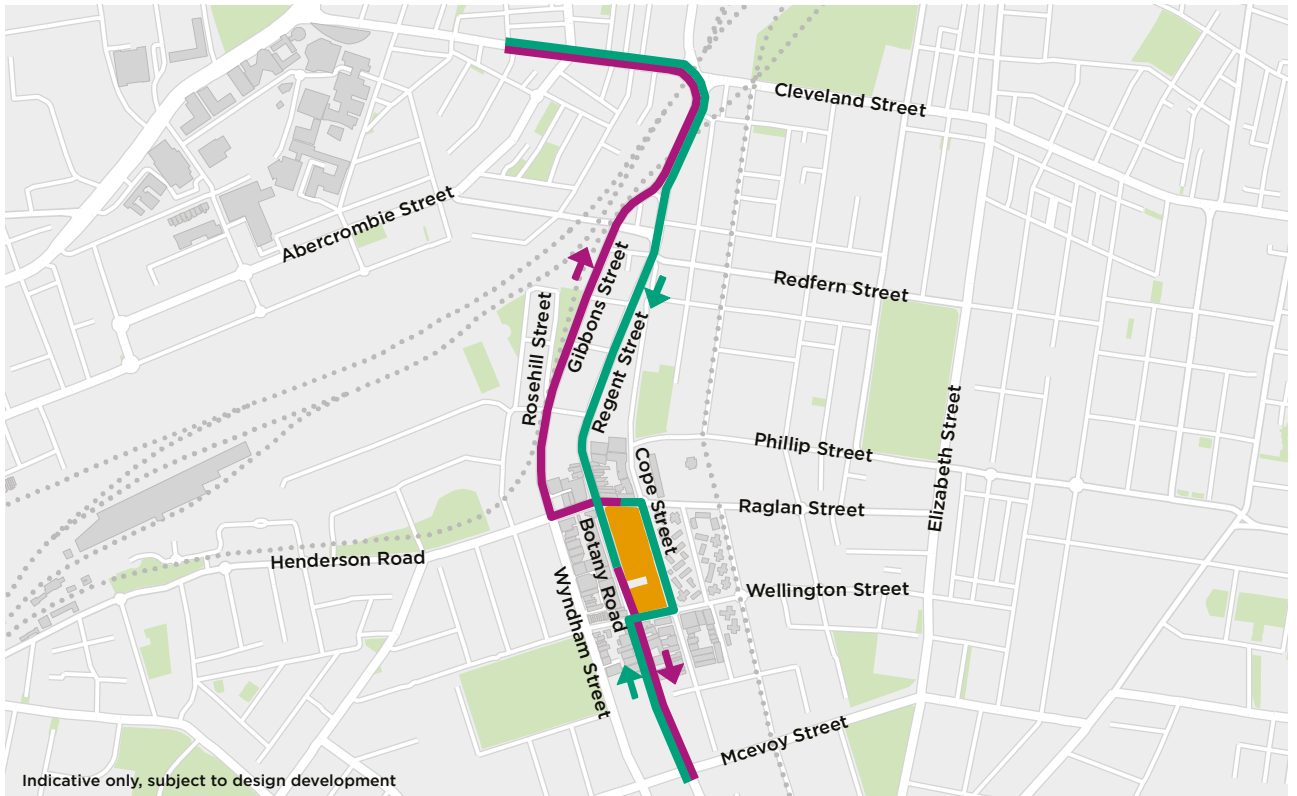


Figure 8-46 Waterloo Station construction vehicle movements



Indicative only, subject to design development

**KEY**

- Proposed construction site area
- Primary, Inbound
- Existing suburban rail
- Primary, Outbound
- Secondary, Inbound
- Secondary, Outbound

Figure 8-47 Waterloo Station construction site haul routes



### Active transport network

Existing footpaths along Botany Road, Cope Street, Raglan Street and Wellington Street (bounding the construction site) would be reduced by around 600 millimetres adjacent to the proposed construction site. Footpaths along Botany Road, Raglan Street and Cope Street are currently greater than three metres wide, within which there are various items of street furniture such as trees, a rubbish bin and road signs. Therefore, a 2.4 metre wide footpath would be maintained, in line with Austroads guidelines, however some items of street furniture may need to be temporarily relocated. The footpath on Wellington Street is around 1.9 metres wide with a grass verge of around 1.6 metres wide giving a combined width of around 3.5 metres. An appropriate footpath width (of up to 2.9 metres) would be maintained along Wellington Street.

Existing cycle facilities on Botany Road (south of Wellington Street), Buckland Street and George Street in the vicinity of the site would not be impacted.

### Public transport services

The bus stop currently located near 103 Botany Road may need to be temporarily relocated during the construction works. The relocation of this bus stop would be carried out by Transport for NSW in consultation with the bus operators, Roads and Maritime Services and City of Sydney Council. The temporary relocation of the bus stop would not impact the operation of any bus services however it may result in some passengers having to walk a short distance further to access bus stops.

### Parking and taxis

Around two to four on street car parking spaces on Raglan Street would be removed for the duration of the construction phase. On-street car parking spaces along Cope and Wellington streets would also be temporarily removed during the demolition works. The temporary loss of these parking spaces would not have any major impacts on parking considering the proximity and availability of other spaces.

There is not anticipated to be any impacts to formal taxi facilities in the vicinity of Waterloo Station construction site.

### Road network performance

Table 8-27 and Figure 8-48 shows the impact of construction on nearby key intersections for the northern haul route. This shows that during construction the majority of intersections maintain their current level of service except for the Cleveland Street / Regent Street intersection which deteriorates from a level of service D to E in the AM peak and level of service C to D in the PM peak. This intersection is already operating close to its theoretical capacity. However, the deterioration of the degree of saturation in both the AM and PM peaks is minor and, therefore, the overall operational impact on the network would be minimal.

The operational performance of the Cleveland Street / Shepherd Street intersection was seen to improve from level of service B to A in the AM peak. Any minor improvements in the average delay or degree of saturation are likely to be the result of the model optimising the operation of the intersection with the additional construction traffic on certain movements.

If the northern haul route is adopted, construction vehicles from the Waterloo Station and Central Station construction sites would both use the Regent Street / Cleveland Street intersection. Given the low construction vehicles anticipated during the morning peak hour, this combined impact is not considered to have a material impact on the performance of the intersection.

Table 8-27 Waterloo Station construction site intersection performance – northern haul route

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Wyndham Street / Gibbons Street / Boundary Street</b>						
AM	18	B	0.63	18	B	0.63
PM	6	A	0.48	5	A	0.48
<b>Gibbons Street / Lawson Street</b>						
AM	20	B	0.87	20	B	0.87
PM	17	B	0.79	17	B	0.79
<b>Regent Street / Lawson Square / Redfern Street</b>						
AM	47	D	1.03	45	D	1.03
PM	25	B	0.98	28	B	0.99
<b>Cleveland Street / Regent Street</b>						
AM	56	D	1.06	63	E	1.08
PM	42	C	0.94	44	D	0.96
<b>Cleveland Street / Abercrombie Street</b>						
AM	33	C	0.85	32	C	0.85
PM	29	B	0.77	29	B	0.77
<b>Cleveland Street / Boundary Street / Beaumont Street</b>						
AM	6	A	0.44	4	A	0.46
PM	3	A	0.43	4	A	0.44
<b>Cleveland Street / Shepherd Street</b>						
AM	19	B	0.54	13	A	0.51
PM	14	A	0.54	14	A	0.57
<b>City Road / Cleveland Street</b>						
AM	92	F	1.16	99	F	1.19
PM	31	C	0.91	33	C	0.93
<b>City Road / Parramatta Road / Broadway / Bay Street</b>						
AM	34	C	0.92	34	C	0.92
PM	35	C	0.92	36	C	0.94

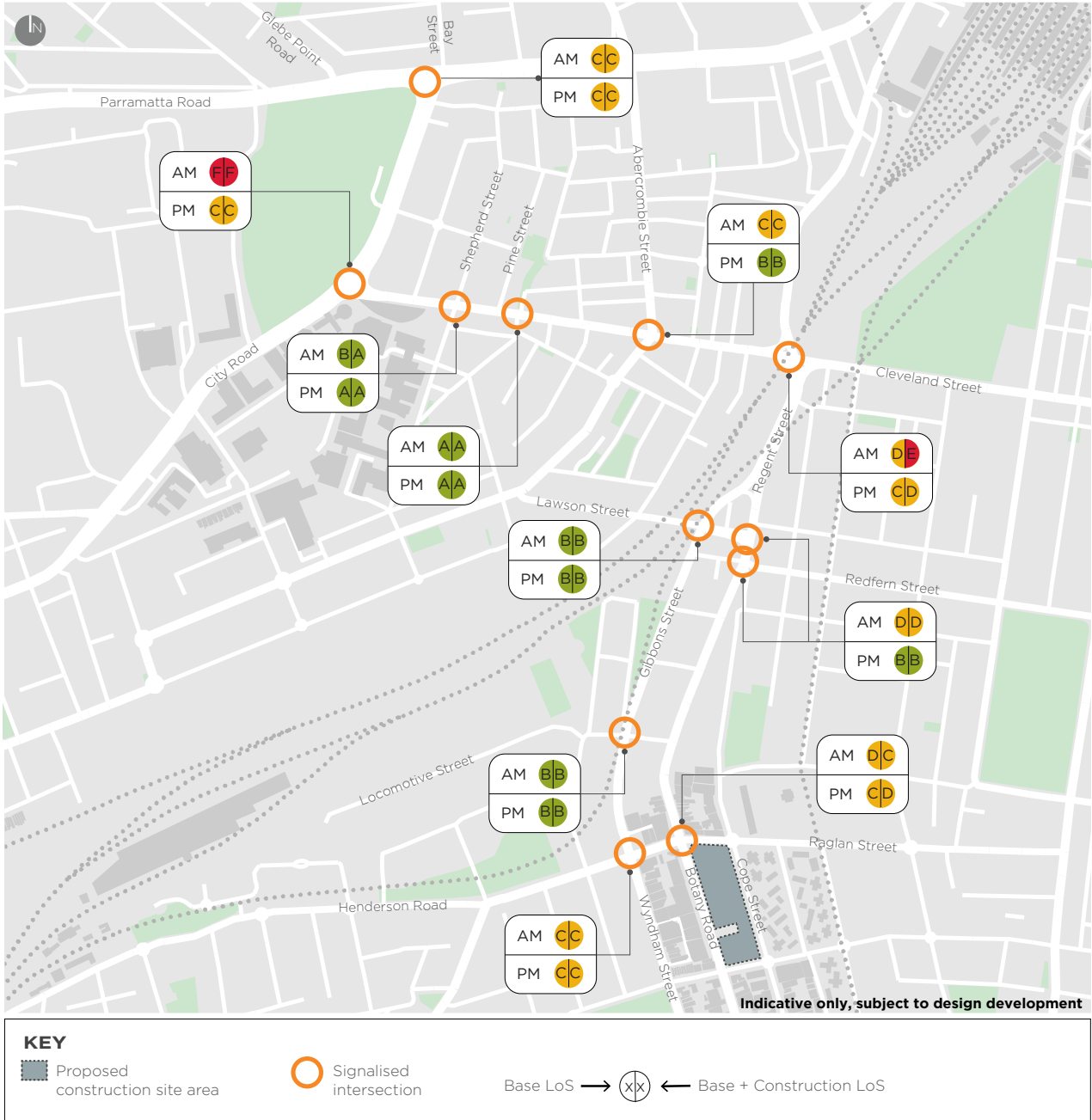


Figure 8-48 Waterloo Station intersection performance - northern haul route

Table 8-28 and Figure 8-49 shows the impact of construction on nearby key intersections for the southern haul route. The addition of the construction traffic results in the level of service of five intersections deteriorating, namely:

- Botany Road / Mandible Street from C to D in the AM peak
- Botany Road / Henderson Road / Raglan Street from C to D in the PM peak
- Botany Road / King Street from B to C in the AM peak and A to B in the PM peak
- Botany Road / Mill Pond Road / Southern Cross Drive ramps from C to D in the PM peak
- General Holmes Drive / Mill Pond Road from E to F in the AM peak.

Most of these intersections were operating at or near capacity and the increase in the degree of saturation was either zero or minimal and therefore the impact on the operation of the intersection would be minimal. Further, this assessment assumes that all construction vehicles would use the southern haul route. In reality, it is likely that there would be a split of vehicles between the two haul routes and, as such, this represents a worst-case assessment.

At two intersections, Botany Road / Henderson Road / Raglan Street and Botany Road / Mill Pond Road / Southern Cross Drive ramps, the operational performance was observed to improve in the AM peak. Any minor improvements in the average delay or degree of saturation are likely to be the result of the model optimising the operation of the intersection with the additional construction traffic on certain movements.

**Table 8-28 Waterloo Station construction site intersection performance – southern haul route**

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Wyndham Street / Mandible Street</b>						
AM	21	B	0.42	20	B	0.42
PM	21	B	0.42	21	B	0.44
<b>Botany Road / Mandible Street</b>						
AM	35	C	1.03	55	D	1.09
PM	6	A	0.56	6	A	0.58
<b>Wyndham Street / McEvoy Street</b>						
AM	22	B	0.63	24	B	0.68
PM	25	B	0.77	24	B	0.77
<b>Botany Road / McEvoy Street</b>						
AM	46	D	0.95	46	D	0.96
PM	38	C	0.92	39	C	0.94
<b>Wyndham Street / Buckland Street</b>						
AM	13	A	0.46	13	A	0.46
PM	11	A	0.46	11	A	0.46

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Botany Road / Buckland Street</b>						
AM	10	A	0.55	12	A	0.49
PM	13	A	0.53	13	A	0.55
<b>Wyndham Street / Henderson Road</b>						
AM	36	C	0.86	35	C	0.86
PM	30	C	0.81	30	C	0.81
<b>Botany Road / Henderson Road / Raglan Street</b>						
AM	44	D	0.89	39	C	0.91
PM	42	C	0.92	43	D	0.92
<b>Raglan Street / Cope Street</b>						
AM	8	A	0.34	7	A	0.34
PM	4	A	0.38	4	A	0.38
<b>Wellington Street / Cope Street</b>						
AM	3	A	0.30	3	A	0.30
PM	3	A	0.31	3	A	0.31
<b>Wyndham Street / O'Riordan Street</b>						
AM	8	A	0.42	8	A	0.42
PM	7	A	0.38	7	A	0.40
<b>Wyndham Street / Bourke Road</b>						
AM	19	B	0.40	19	B	0.40
PM	19	B	0.40	19	B	0.42
<b>Botany Road / Bourke Street / Bourke Road / O'Riordan Street</b>						
AM	109	F	1.14	115	F	1.14
PM	130	F	1.11	130	F	1.11
<b>Botany Road / Epsom Road</b>						
AM	30	C	0.87	30	C	0.89
PM	32	C	0.87	32	C	0.87
<b>Botany Road / Collins Street</b>						
AM	16	B	0.76	16	B	0.79
PM	19	B	0.81	19	B	0.81
<b>Botany Road / Shirley Street</b>						
AM	15	B	0.60	15	B	0.61
PM	19	B	0.82	19	B	0.82

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Botany Road / Harcourt Parade</b>						
AM	47	D	0.96	53	D	0.98
PM	38	C	0.76	38	C	0.78
<b>Botany Road / Gardeners Road</b>						
AM	37	C	0.97	38	C	0.97
PM	35	C	0.99	35	C	0.99
<b>Botany Road / Coward Street</b>						
AM	57	D	0.96	54	D	0.97
PM	71	F	1.02	75	F	1.01
<b>Botany Road / King Street</b>						
AM	25	B	0.82	33	C	0.90
PM	15	A	0.62	16	B	0.59
<b>Botany Road / High Street</b>						
AM	11	A	0.75	11	A	0.78
PM	4	A	0.39	3	A	0.40
<b>Botany Road / Robey Street</b>						
AM	17	B	0.69	14	A	0.82
PM	16	B	0.65	10	A	0.62
<b>Botany Road / General Holmes Drive</b>						
AM	19	B	0.77	18	B	0.67
PM	17	B	0.73	18	B	0.70
<b>Botany Road / Wentworth Avenue</b>						
AM	112	F	1.18	110	F	1.16
PM	39	C	0.90	32	C	0.93
<b>Botany Road / Mill Pond Road / Southern Cross Drive ramps</b>						
AM	62	E	1.03	55	D	1.01
PM	43	C	0.97	44	D	0.98
<b>General Holmes Drive / Mill Pond Road</b>						
AM	67	E	1.04	80	F	1.07
PM	41	C	0.93	42	C	0.95

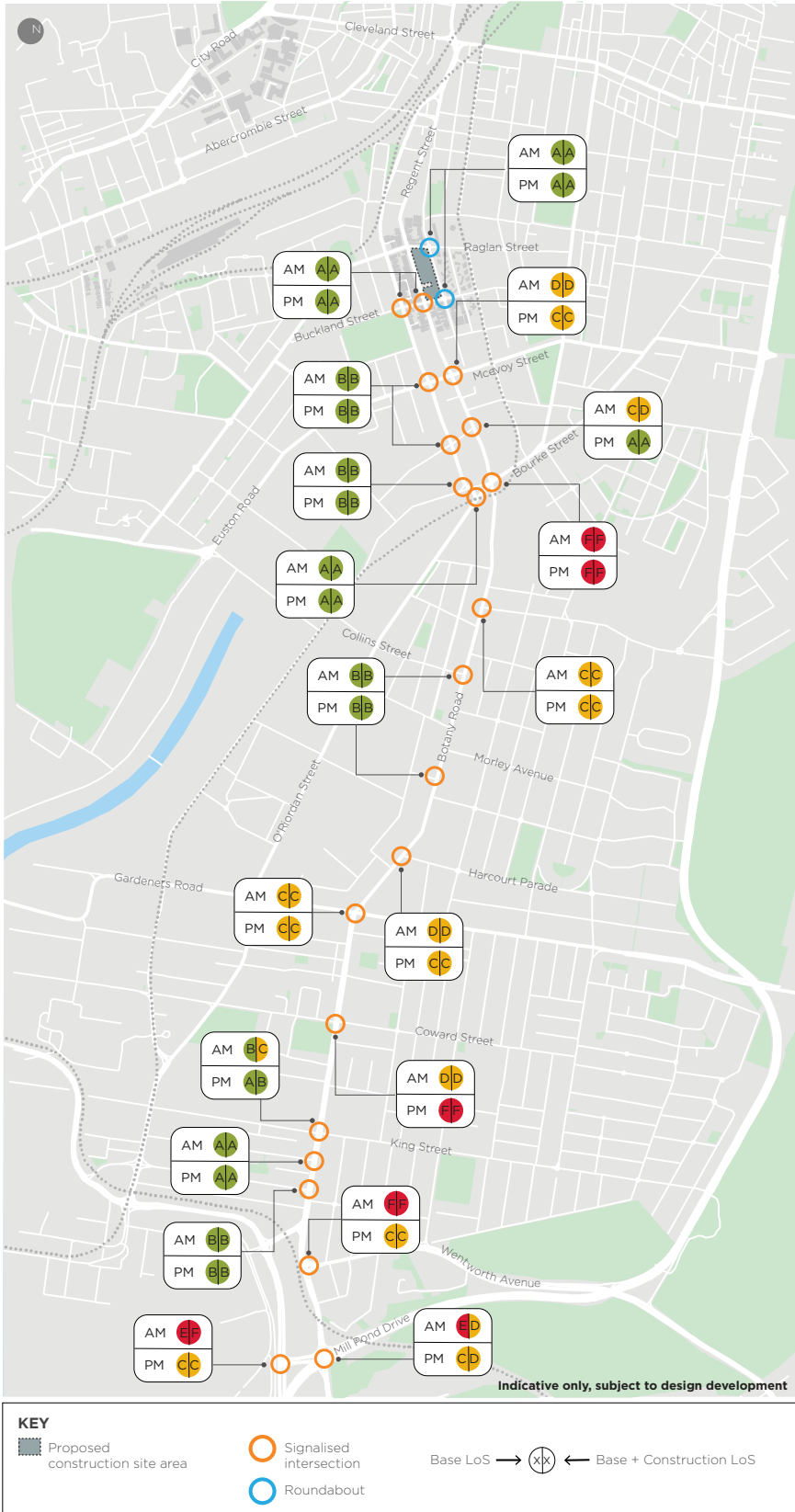


Figure 8-49 Waterloo Station intersection performance – southern haul route

### **8.4.18 Marrickville dive site (southern)**

#### **Vehicle movement forecasts and routes**

The anticipated vehicle numbers (heavy and light vehicles) at the Marrickville dive site over a typical day are provided in Figure 8-50. This graph shows that the peak heavy vehicle movements in the AM peak period (7am to 10am) would be 18 heavy vehicles per hour during the tunnel excavation and pre-cast facility phase.

The proposed haul routes are shown in Figure 8-51. Access and egress to and from the Marrickville dive site would be left in, right out via Murray Road; left in, right out via Sydney Steel Road.

The potential cumulative construction traffic impacts associated with WestConnex are addressed in Chapter 26 (Cumulative impacts).



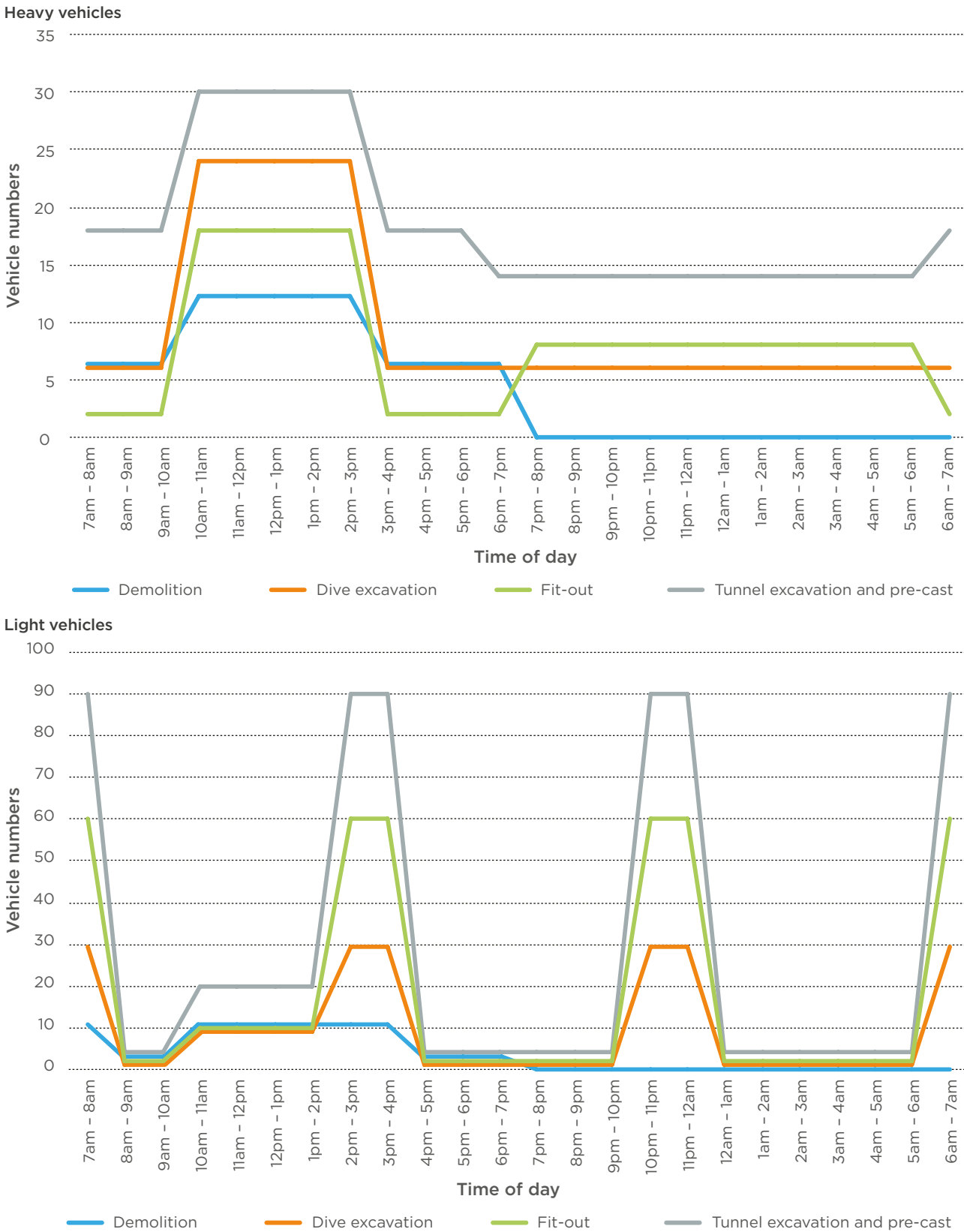


Figure 8-50 Marrickville dive site (southern) construction vehicle movements



Figure 8-51 Marrickville dive site (southern) haul routes

**Active transport network**

There would be no direct impacts to pedestrian or cyclist facilities at the Marrickville dive site.

**Public transport services**

Minimal disruption would be expected to bus services operating along Edinburgh Road due to the low number of heavy vehicles trips generated due to construction works. No major track works would occur at this site however there is the potential for rail possessions which would be negotiated with Sydney Trains.

**Parking and taxis**

Up to four on street car parking spaces on Edinburgh Road would be removed during the construction phase. The temporary loss of up to four spaces would not have any major impacts on parking considering the proximity and availability of other parking spaces.

## Road network performance

In order to provide safe egress of construction vehicles, the Edinburgh Road / Edgeware Road intersection is proposed to be signalised as part of the project. The design of this signalised intersection would also consider the need for advance traffic signal warning lights on Edgeware Road to further improve safety. No other upgrades to surrounding roads, including Bedwin Road, are required.

Table 8-29 and Figure 8-52 shows the impact of construction on nearby key intersections. In summary, this shows that all intersections maintain their existing level of service with the construction traffic added onto the network except for the Bedwin Road / Unwins Bridge Road / Campbell Street / May Street intersection which deteriorates from a level of service C to level of service D in the PM peak. However, the increase in the average vehicle delay and degree of saturation is relatively minor. Therefore, the deterioration in the performance of the intersection is not considered to have a material impact on the overall operation of the road network.

**Table 8-29 Marrickville dive site (southern) intersection performance**

Peak period	Without construction			With construction		
	Average delay (second per vehicle)	Level of Service	Degree of saturation	Average delay (second per vehicle)	Level of Service	Degree of saturation
<b>Edinburgh Road / Murray Street</b>						
AM	4	A	0.48	4	A	0.52
PM	6	A	0.66	6	A	0.71
<b>Edinburgh Road / Edgeware Road</b>						
AM	3	A	0.38	4	A	0.43
PM	3	A	0.40	4	A	0.45
<b>Edinburgh Road / Bedwin Road / Edgeware Road</b>						
AM	11	A	0.55	13	A	0.58
PM	11	A	0.66	13	A	0.69
<b>Bedwin Road / Unwins Bridge Road / Campbell Street / May Street</b>						
AM	45	D	1.01	51	D	1.03
PM	42	C	1.01	47	D	1.03
<b>Princes Highway / Campbell Street</b>						
AM	34	C	1.00	35	C	1.00
PM	30	C	0.86	30	C	0.86
<b>Princess Highway / May Street</b>						
AM	33	C	0.83	35	C	0.80
PM	25	B	0.81	29	C	0.86



Figure 8-52 Marrickville dive site (southern) intersection performance

## 8.5 Mitigation measures

The mitigation measures that would be implemented to address potential construction traffic and transport impacts are listed in Table 8-30.

**Table 8-30 Mitigation measures – construction traffic and transport**

Ref	Mitigation measure	Applicable location(s) <sup>1</sup>
T1	Ongoing consultation would be carried out with (as relevant to the location) the CBD Coordination Office, Roads and Maritime Services, Sydney Trains, NSW Trains, local councils, emergency services and bus operators in order to minimise traffic and transport impacts during construction.	All except metro rail tunnels
T2	Road Safety Audits would be carried out at each construction site. Audits would address vehicular access and egress, and pedestrian, cyclist and public transport safety.	All except metro rail tunnels
T3	Directional signage and line marking would be used to direct and guide drivers and pedestrians past construction sites and on the surrounding network. This would be supplemented by Variable Message Signs to advise drivers of potential delays, traffic diversions, speed restrictions, or alternate routes.	All except metro rail tunnels
T4	In the event of a traffic related incident, co-ordination would be carried out with the CBD Coordination Office and / or the Transport Management Centre's Operations Manager.	All except metro rail tunnels
T5	The community would be notified in advance of proposed road and pedestrian network changes through media channels and other appropriate forms of community liaison.	All except metro rail tunnels
T6	Vehicle access to and from construction sites would 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 occasions, police presence.	All except metro rail tunnels
T7	Additional enhancements for pedestrian, cyclist and motorist safety in the vicinity of the construction sites would be implemented during construction. This would include measures such as: <ul style="list-style-type: none"> <li>● Use of speed awareness signs in conjunction with variable message signs near construction sites to provide alerts to drivers</li> <li>● Shared experience educational events that allow pedestrians, cyclists or motorists to sit in trucks and understand the visibility restrictions of truck drivers, and for truck drivers to understand the visibility from a bicycle</li> <li>● Specific construction driver training to understand route constraints, expectations, safety issues and to limit the use of compression braking</li> <li>● Safety devices on construction vehicles that warn drivers of the presence of a vulnerable road user located in the vehicles' blind spots and warn the vulnerable road user that a vehicle is about to turn.</li> </ul>	All except metro rail tunnels
T8	Access to existing properties and buildings would be maintained in consultation with property owners.	All except metro rail tunnels
T9	All trucks would enter and exit construction sites in a forward gear, where feasible and reasonable.	All except metro rail tunnels
T10	Any relocation of bus stops would be carried out by Transport for NSW in consultation with Roads and Maritime Services, the CBD Coordination Office (for relevant locations), the relevant local council and bus operators. Wayfinding and customer information would be provided to notify customers of relocated bus stops.	All except metro rail tunnels

Ref	Mitigation measure	Applicable location(s) <sup>1</sup>
T11	For special events that require specific traffic measures, those measures would be developed in consultation the CBD Coordination Office (for relevant locations), Roads and Maritime Services, and the organisers of the event.	BN, MP, PS, CS
T12	Construction sites would be managed to minimise construction staff parking on surrounding streets. The following measures would be implemented: <ul style="list-style-type: none"> <li>○ Encouraging staff to use public or active transport</li> <li>○ Encouraging ride sharing</li> <li>○ Provision of alternative parking locations and shuttle bus transfers where feasible and reasonable.</li> </ul>	All except metro rail tunnels
T13	Construction site traffic would be managed to minimise movements in the AM and PM peak periods.	All except metro rail tunnels
T14	Construction site traffic immediately around construction sites would be managed to minimise movements through school zones during pick up and drop off times.	All except metro rail tunnels
T15	Pedestrian and cyclist access would be maintained at Crows Nest during the temporary closure of Hume Street, and at Martin Place during the temporary partial closure of Martin Place. Wayfinding and customer information would be provided to guide pedestrians and cyclists to alternative routes.	CN, MP
T16	Timing for the temporary closure of the Devonshire Street tunnel would avoid periods of peak pedestrian demand. Wayfinding and customer information would be provided to guide pedestrians to alternative routes.	CS
T17	Consultation would occur with the Harbour Master, Roads and Maritime Services and Sydney Ferries to ensure shipping channels are maintained during the Sydney Harbour ground improvement works.	GI
T18	During the closure of existing entrances to Martin Place Station, marshalls would be provided during the AM and PM peak periods to direct customers to available access and egress points.	MP
T19	Where existing parking is removed to facilitate construction activities, alternative parking facilities would be provided where feasible and reasonable.	All except metro rail tunnels
T20	Alternative pedestrian routes and property access would be provided where these are affected during the construction of the power supply routes.	PSR

<sup>1</sup> STW: Surface track works; CDS: Chatswood dive site; AS: Artarmon substation; CN: Crows Nest Station; VC: Victoria Cross Station; BP: Blues Point temporary site; GI: Ground improvement works; BN: Barangaroo Station; MP: Martin Place Station; PS: Pitt Street Station; CS: Central Station; WS: Waterloo Station; MDS: Marrickville dive site; Metro rail tunnels: Metro rail tunnels not related to other sites (eg TBM works); PSR: Power supply routes.

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