7.0 Additional construction period effects considered

7.1 Major Special Events

The RMS 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
- 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).

Examples of class 1 events that would occur during the construction of the project include New Year's Eve, Mardi Gras Parade and City 2 Surf.

An example of a class 2 event that would occur during the operation of the project include game days for the Canterbury Bulldogs at Belmore Oval.

There is an off-road dedicated shared path adjacent to the railway corridor, between Bridge Road/Tobruk Avenue and Edison Lane. Bridge works on the pedestrian access oval underbridge near the Belmore Sports Ground would potentially require closure intermittent full of the shared pathway and bridge. Local diversions would be put in place when required; however, impacts in this area would not coincide with games days at Belmore Oval or other busy periods along the shared path (refer to **Section 6.22**).

Event specific CTMPs and/or TTPs would be prepared, in consultation with event organisers, where construction impacts may impact on the ability for customers to travel to these events, either due to possessions or road closures. These plans would include measures tailored to managing event transport demands while minimising disruption to background demand. This may involve measures such as temporary adjustment to construction haulage routes, working hours or potentially stopping works for the duration of the event. Where possible travel options would be communicated directly to event attendees via the event organisers' existing marketing channels.

7.2 Emergency Vehicles

As identified in the above sections, the introduction of TTS is anticipated to result in significant impacts to intersection performance in a number of areas and some partial and full road closures would be required during construction activities. Ongoing consultation would be carried out with emergency service providers in relation to changed traffic conditions and appropriate diversion routes for emergency services would be planned in conjunction with the providers in advance of closures.

Construction compounds and the wider project worksite would be arranged to ensure emergency vehicle access to nearby buildings and precincts is maintained and that emergency services can access stations during construction works. Construction compounds may also be made available for emergency vehicle passage if required.

The appropriate emergency service providers would be consulted ahead of works to ensure impacts are minimised during works. This would be part of the process that is used to develop CTMPs.

7.3 Power Supply Routes

The project includes the construction of a new 33kV feeder cable along a number of streets located between Campsie Station and the Ausgird Canterbury Substation located at Earlwood. The works for the installation of the cable would require trenching activities within road reserves which has the potential to result in impacts on the operation of these roads. Roads which are likely to be impacted by the construction of the power supply routes are identified in Chapter 8 of the EIS (Project description – construction). This trenching work would result in temporary changes to traffic arrangements potentially including the occupation of traffic lanes, parking areas or the footpath.

Where major roads are crossed by the route, alternative construction methods would be used such as under boring in order to avoid impacts to the road network. For example, these measures are being considered where the cable crosses Canterbury Road.

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 depending on the preferred construction method and the nature of the street to be impacted. These are most likely to occur at night when traffic volumes are lower. The community would be made aware of any changes to both the road or pedestrian networks as a result of the installation of the cable and appropriate traffic management would be put in place.

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. Alternate access would be provided where practicable, this could include for example the use of road plates to cross the trench when a particularly section is not being worked on. Consultation with adjacent property owners would be undertaken to confirm the impacts to their access and to discuss any specific access arrangements and the measures which are to be implemented to minimise impacts.

7.4 Cumulative Construction Impacts

The project is being delivered in a constantly changing landscape, with multiple concurrent projects being planned, constructed and coming into use. This includes changes to land use, transport networks for both car and other modes, and commercial developments. The timescales of many of these are unknown at this time, and the overall duration of the project construction is such that there are many interdependencies and opportunities that would require management as the program evolves.

As with all construction activities, co-ordination with other temporary works, events and planned maintenance would be required as part of the mitigation of effects, and this would include known projects such as WestConnex, and the Chatswood to Sydenham component of the Sydney Metro. These cumulative effects are considered in more detail in Chapter 10 of this Technical Paper.

8.0 Operational Assessment

8.1 Operational Transport Assessment Methodology

This chapter provides an assessment of the effects of the project on the local transport network once operational and considers:

- pedestrian routes to stations, including accessibility for the mobility impaired
- cycle routes to the stations and the provision of bike parking
- interchange amenity for bus passengers
- interaction with the local and wider road network, including any modifications to pedestrian crossings and road intersections
- changes to dedicated commuter parking and loading zones, provision of kiss and ride facilities and the provision for vehicle parking spaces at the stations.

An overview of the transport hierarchy is provided, which aims to encourage changes in mode share towards the higher order modes of walking, cycling and public transport. This, in conjunction with the expected land use intensification causing an increase in the overall travel demand, would result in impacts in and around stations. As a result of the project there would potentially be alterations to the road network conditions arising from the changes in mode share and therefore the forecast changes in people who access and egress Sydney Metro between Bankstown and Sydenham.

Both qualitative and quantitative assessments of the operation of the project have been carried out, including a description of the transport integration of each station and assessment of the potential traffic and transport impacts.

The basis for the assessment of operational effects is the patronage forecast produced by the Sydney Public Transport Planning Model (PTPM) for 2026, prepared specifically for the purpose of assessing the project. This strategic transport model is able to forecast patronage numbers, and especially relevant to this study, the multi-modal journey chains that form a journey which would include the Metro. Any Metro journey includes at least three journey legs, a journey to the station where a passenger boards the Metro; the Metro journey; and then the journey from the station at which they alight to the passenger's destination. The first and last journey legs could be as a pedestrian, bus passenger, other light or heavy passenger or driver using a vehicle which is parked at a station.

The strategic transport model forecasts the anticipated daily station patronage and the mode of access and egress to the station. The access and egress modes are limited to Walking, Vehicle (parking), Vehicle (drop off), Bus, and Light Rail. However the use of a cycle is not a modelled mode.

The model has in some cases forecast that the mode share for walking decreases in the future. However, this is a proportion reduction on of an overall increased patronage, and therefore still reflects an increase in the total number of passengers who are walking to stations. There are several factors that lead to the reduction in walk mode share, including significant increases in other public transport services feeding into the Metro, increased kiss and ride which is potentially related to trips being undertaken by shared car and Metro in place of a fully car mode journey, and increases in passengers transferring from the Sydney Trains network outside of Sydenham to Bankstown onto Metro as the overall journey becomes quicker and more convenient.

It is recognised that there are trips being undertaken using bicycles from the stations currently as part of journeys using the Sydney Trains services. In the future, cycling as an access mode is likely to be an increasingly important mode as discussed in Chapter 2 and Chapter 3. However, also as shown in Chapter 3, the current baseline for cycling is still very much the smallest cohort of mode choice, with the patronage ranging from 0.1% to 0.4% share.

For the purposes of the assessment, the observed mode share from cycling has been used and the number of cyclists increased in proportion to the increased station patronage. This yields an increase in forecast cycling trips to a station of more than 50% by 2026 compared to the observed 2016 data.

Despite this rapid projected growth in cycling, there are many reasons to consider that this may be an underestimate. In addition to the cycling infrastructure at stations delivered through this project, and discussed within this chapter, further investment in cycle infrastructure in the project area is proposed, most of which connects to the stations directly or indirectly. Furthermore, there is a growing amenity for cyclists at workplaces (such as the access to showers, lockers, secure storage, etc) and so overall this offers significant potential for the growth in cycling as a means of accessing the Metro.

However, in terms of the assessment of the impacts of the project, a relatively conservative approach to the growth has been taken. Firstly, a growth in cycling does not necessarily result in greater trips linking to the Metro. The investment in cycle routes that run parallel to the Metro could conceivably see some people cycling further and not interchanging with Metro. In addition, with the exception of bike parking, the cycle infrastructure is not capacity constrained in the way that driving, parking or bus services are. The opportunities to address any localised cycle parking issues within the precincts are much greater than those required to address issues related to other modes. As such the operational assessment, as with the construction phase assessment, has been undertaken on a 'worst case' basis.

Having forecast the cycling patronage using this method, the data for station data entry and exits (AM peak) was used to calculate the number of users who would arrive by each mode to allow assessment of the proposed infrastructure to support walking, cycling (racks), bus stop locations and for car trips taxi/drop off zones and commuter parking. The model is only available for the AM peak. However, the approach was to 'mirror' the data for the PM peak, in order to provide daily data.

In undertaking this assessment we have used the station designs as available at July 2017. It is recognised that the detailed design of the stations would continue to evolve prior to implementation which may result in some minor details of the assessment changing. The dimensions between parking bays, pedestrian crossings and station entrances are provided to give context in this assessment, but are subject to minor changes as the designs are refined.

8.2 Strategic Traffic and Transport Benefits

8.2.1 Sydney Train and Metro

The project would see the upgrade of 13 km of existing railway along the T3 Bankstown Line to Metro, providing a more frequent service and removing the bottleneck which currently occurs downstream of Sydenham towards Sydney CBD. Through the provision of faster and more frequent metro services it is expected that the proportion of travellers who chose train compared to car would increase. As a result this would improve traffic conditions for those journeys made by road, and facilitate increased population within the Metro catchment.

The Sydney Metro City & Southwest Business Case estimates a growth in passenger demand of 58 percent by 2026 on the T3 Bankstown Line including 20,000 trips in the AM peak transferred from road bound travel. The upgraded Metro network would provide twice as many trains per hour in peak periods. This would reduce waiting time at Metro stations for passengers and provides the ability to "turn up and go", as opposed to pre-planning to co-ordinate with a specific train.

As well as reduced wait times, the project would reduce on board travel times by up to 10 minutes on a train journey from Bankstown to Central compared to the current journey on Sydney Trains. However these passenger benefits would be further realised through an increased reliability which arises from the segregation of the Metro from the Sydney Trains network.

The upgrade of the Bankstown Line would enable a direct connection to the Chatswood to Sydenham section of the Sydney Metro City and Southwest project. Connections would also extend further to major CBD stations such as Pitt Street and employment hubs such as North Sydney, St Leonards and Macquarie Park.

Travel time savings would be experienced by existing rail service passengers (who would directly benefit from shorter travel times), new Metro passengers (who would transfer from road-based transport such as buses and cars to rail) and road users (who would potentially experience less congestion).

The proposed conversion to Metro from Sydney Trains includes the introduction of single deck carriages. Whilst this marginally reduces the number of passengers who can be accommodated on each train, the doubling of the frequency results in an increase in the total capacity of the line of approximately 30 percent.

In addition to the increased service frequency, improved amenity and accessibility for customers between Sydenham and Bankstown stations, the removal of the T3 Bankstown Line services from the City Circle would:

- release train paths and facilitate extra services to operate on the T2 Airport Line and T2 Inner West and South Line, therefore improving capacity to meet demand and alleviate crowding on trains
- eliminating several merges that currently occur with the T2 Airport Line and T2 Inner West and South Line services, thus reducing operational complexity and the risk of service unreliability
- potentially reduce the number of different service types/patterns operating through City Circle stations, improving service legibility and reducing the risk of platform congestion due to passengers having to dwell at these stations to wait for their desired service in the PM.

8.2.2 Changes to station servicing arrangements

Sydney Metro trains would operate between Bankstown and Cudgegong Road stations, via the Sydney CBD and Chatswood. Between Sydenham and Chatswood, Sydney Metro trains would service Central Station (via new platforms), and the following new stations to be constructed as part of the Chatswood to Sydenham project:

- Pitt Street Station
- Martin Place Station
- Barangaroo Station
- Victoria Cross Station (in North Sydney)
- Crows Nest Station.

The project would result in changes to service patterns for some stations along the T3 Bankstown Line and the City Circle. Proposed arrangements with the operation of the project as part of Sydney Metro City & Southwest are shown in **Figure 8.1** and summarised in **Table 8.1**, **Table 8.2** and **Table 8.3.**

As shown in the tables and figure, Sydney Metro customers would be able to change between Sydney Metro and Sydney Trains services at Sydenham, Bankstown, and Central stations.

West of Bankstown, the T3 Bankstown Line would continue to be operated by Sydney Trains between Liverpool, Lidcombe, and Bankstown. Sydney Trains would no longer operate on the T3 Bankstown Line between Sydenham and Bankstown stations.

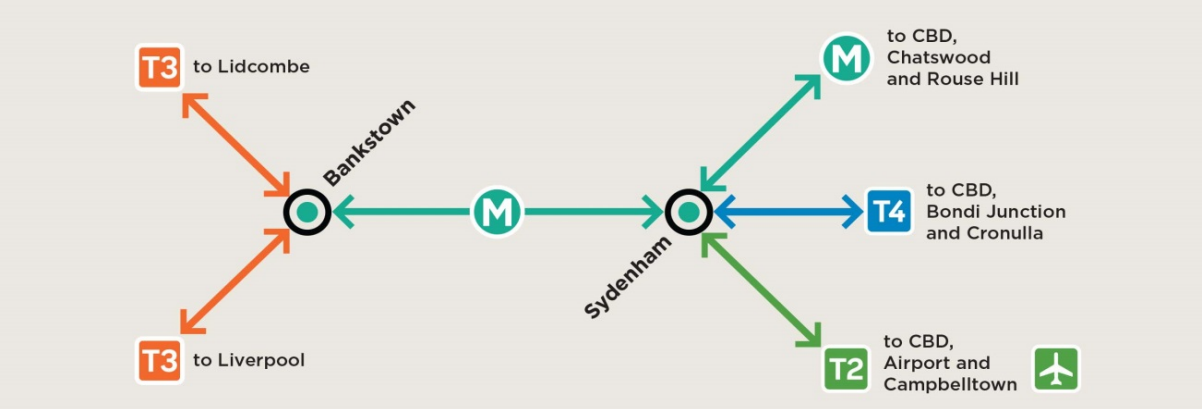


Figure 8.1 Interchanging with Sydney Trains services

Table 8.1 Proposed service arrangements for travel from existing stations on the T3 Bankstown Line

Existing station - origin	Service availability
Stations east of Sydenham: St Peters, Erskineville and Redfern Stations on the City Circle	St Peters, Erskineville and Redfern would continue to be serviced by Sydney Trains, operating on the T2 Airport Line or the T4 Illawarra Line. City Circle Stations would continue to be served by T2 services Customers needing to access Sydney Metro services could change at Sydenham or Central stations.
Stations between Sydenham and Bankstown	Stations would be serviced by Sydney Metro. Customers needing to access Sydney Trains services could change at Bankstown, Sydenham, or Central stations.
Stations west of Bankstown: Yagoona, Birrong, Regents Park, Berala Sefton, Chester Hill, Leightonfield, Villawood, Carramar.	Stations would continue to be serviced by Sydney Trains, via trains operating between Liverpool, Bankstown, and Lidcombe stations on the truncated T3 Bankstown Line. Customers wishing to access Sydney Metro services would be able to change at Bankstown Station. Customers wishing to travel via Sydney Trains to other destinations could change at: • Lidcombe Station, for travel via the T1 Western Line or the T2 Inner West and South Line • Cabramatta Station, for travel via the T2 South Line or the T5 Cumberland Line.
Lidcombe	Lidcombe Station would continue to be serviced by Sydney Trains, operating on the existing T1 and T2 lines, and the truncated T3 Bankstown Line. Customers wishing to access Sydney Metro services would be able to change at Bankstown Station.
Cabramatta	Cabramatta would continue to be serviced by Sydney Trains, operating on the T2 South Line, the T5 Cumberland Line, and the truncated T3 Bankstown Line. Customers wishing to access Sydney Metro services would be able to change at Bankstown Station.
Warwick Farm and Liverpool	Stations would continue to be serviced by Sydney Trains, operating on the T2 Inner West and South Line and the T5 Cumberland Line. Customers wishing to access Sydney Metro services would need to change at Cabramatta to Sydney Trains services to Bankstown Station.

Table 8.2 Proposed service arrangements for travel to existing stations on the T3 Bankstown Line and City Circle

Existing station – destination	Service availability
Stations east of Sydenham	
Central Station	Sydney Metro customers would have direct access to Central Station. New metro platforms, below the existing Central platforms 13, 14 and 15, will be constructed at Central Station as part of the Chatswood to Sydenham project. Central Station would continue to be serviced by Sydney Trains operating on the T1 North Shore, Northern & Western Line, the T2 Airport, Inner West and South Line, and the T4 Eastern Suburbs & Illawarra Line.

Existing station – destination	Service availability
Town Hall Station	Sydney Metro customers would need to change at either Sydenham or Central stations to access Town Hall Station via Sydney Trains services. The closest Sydney Metro station to Town Hall would be the new Pitt Street Station, to be located about 150 metres east of Town Hall Station. Town Hall Station would continue to be serviced by Sydney Trains operating on the T1, T2, and T4 lines.
Wynyard Station	Sydney Metro customers would need to change at either Sydenham or Central stations to access Wynyard Station via Sydney Trains services. The closet Sydney Metro station to Wynyard would be the new Martin Place and Barangaroo stations, to be located about 400 metres east and 650 metres north-west of Wynyard, respectively. Wynyard Station would continue to be serviced by Sydney Trains operating on the T1, T2, and T4 lines.
Other City Circle stations (Circular Quay, St James and Museum)	These stations would continue to be serviced by Sydney Trains via trains operating on the T2 Line. Sydney Metro customers would need to change at either Sydenham or Central stations to access these stations via Sydney Trains services.
Sydenham	Customers would access Sydenham via Sydney Metro, or Sydney Trains services operating on the T2 and T4 lines.
Erskineville, St Peters, Redfern	These stations would continue to be serviced by Sydney Trains, via trains operating on either the T2 or T4 lines. Sydney Metro customers would need to change at either Sydenham or Central stations to access these stations via Sydney Trains services.
Stations west of Bankstown	
Yagoona, Birrong, Regents Park, Berala, Sefton, Chester Hill, Leighton Field, Villawood, Carramar and Cabramatta	Sydney Metro customers would access these stations by changing at Bankstown to Sydney Trains services. Sydney Trains customers could travel between these stations via services operating on the truncated T3 Bankstown Line. Other Sydney Trains customers could access these stations by changing at Lidcombe or Cabramatta to Sydney Trains services.
Lidcombe	Sydney Metro customers would access Lidcombe station by changing at Bankstown to Sydney Trains services. Sydney Trains customers could access Lidcombe Station directly via services operating on the T1 and T2 lines, or (for local customers) the truncated T3 line.
Liverpool and Warwick Farm	Sydney Metro customers would access these stations by changing at Bankstown to Sydney Trains services. Sydney Trains customers would access these stations directly via services operating on the T1 and T5 lines, or via the truncated T3 line by changing at Cabramatta Station.

Table 8.3 Potential travel patterns for travel to key centres from existing stations on the T3 Bankstown Line

	Servicing patterns to key centres				
Origin	**Sydney CBD**	**Liverpool**	**Parramatta**	**Chatswood**	**Macquarie Park**
Stations east of Sydenham (St Peters, Erskineville and Redfern)	Travel directly via Sydney Trains services	Travel via Sydney Trains and Sydney Metro services by changing trains at Sydenham and Bankstown	Travel via Sydney Trains, changing trains at Redfern Station	Travel via Sydney Trains and then Sydney Metro, by changing at Central or Sydenham, or by Sydney Trains only, changing at Redfern	Travel via Sydney Trains and then Sydney Metro, by changing at Central, Sydenham or Chatswood
Stations between Sydenham and Bankstown	Travel directly via Sydney Metro	Travel via Sydney Metro and Sydney Trains services, by changing trains at Bankstown	Travel via Sydney Metro and Sydney Trains, by changing trains at Bankstown and Lidcombe, or at Sydenham and Redfern	Travel directly via Sydney Metro	Travel directly via Sydney Metro
Yagoona, Birrong, Regents Park, Berala, Sefton, Chester Hill, Leightonfield, Villawood, Carramar	Travel via Sydney Trains and Sydney Metro, changing trains at Bankstown, or by Sydney Trains only, changing at Lidcombe/Cabramatta	Travel via Sydney Trains	Travel via Sydney Trains, by changing trains at Lidcombe or Cabramatta	Travel via Sydney Trains and then Sydney Metro, by changing at Bankstown	Travel via Sydney Trains and then Sydney Metro, by changing at Bankstown
Cabramatta, Warwick Farm	Travel via by Sydney Trains only on the T2 line, or by Sydney Trains and Sydney Metro, changing trains at Bankstown	Travel directly via the Sydney Trains on the T2 line	Travel directly via the Sydney Trains on the T5 line	Travel via Sydney Trains and then Sydney Metro, by changing at Bankstown, or by Sydney Trains only, changing at Central	Travel via Sydney Trains and then Sydney Metro, by changing at Bankstown, or by Sydney Trains only, changing at Central

As a result of the upgrade to Metro the journey times for passengers would improve. As shown in in **Figure 8.2** overleaf, there would be an improvement of some 15 to 16 minutes for a journey from Campsie to Macquarie Park, and this journey can be achieved without interchange. In the existing situation the fastest journey requires two interchanges, and the most direct, but slower journey still requires an interchange at Central Station.

Transport for NSW would provide further details on changes to the wider transport network, when the design of future suburban rail timetables is confirmed.

8.2.3 Bus network benefits

The project is a component of an integrated public transport network which includes the bus network. By providing passengers with a high level of amenity for mode changes this would enable a significant increase to the effective catchment of the project, and correspondingly would increase the accessibility of a much larger population.

The project may provide benefits to bus patrons through:

- integrating with existing bus routes to provide connections between bus and rail services
- potentially reducing crowding on buses by bus customers transferring to Metro
- optimising connections between bus and rail services where possible including locating bus stops as close as practical to station entries.

8.2.4 Road network benefits

The demand for road travel is expected to increase into the future, including as a result of population growth and urban renewal initiatives outlined in the draft *Sydenham to Bankstown Urban Renewal Strategy*. The travel time savings resulting from the project are one of the factors that would encourage more people to use the rail network. TfNSW is seeking to encourage rail patrons to access a station using active or public transport modes. Providing the necessary infrastructure such as readily visible bus stops and bike storage close to station entrances would encourage a more seamless transfer to rail. The specific measures are discussed later in this chapter for each station.

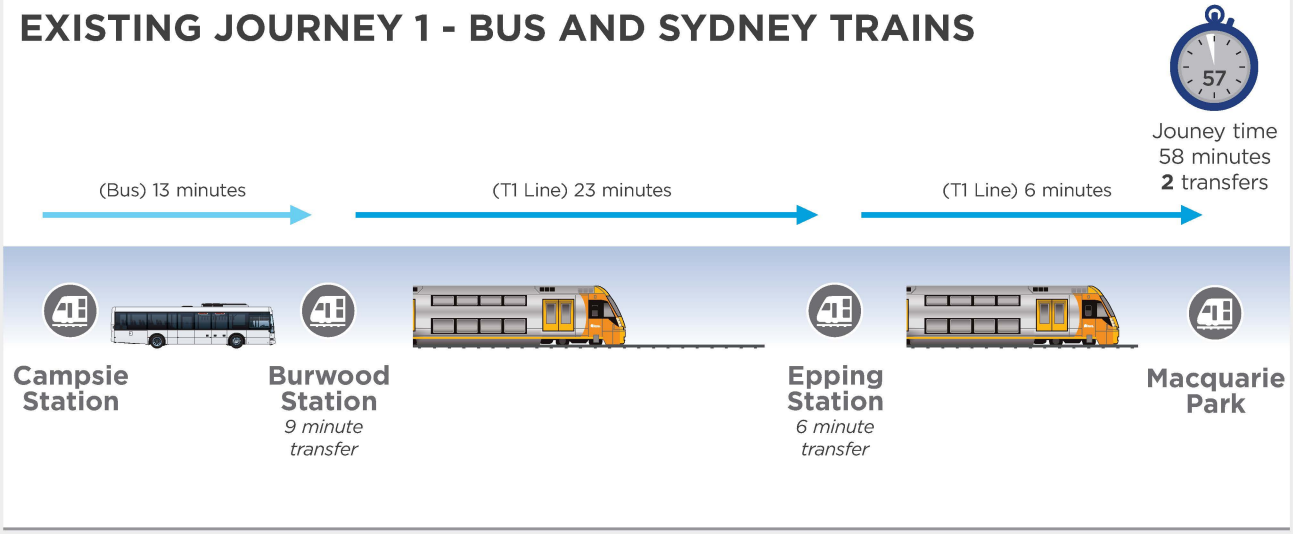
This may assist in encouraging a mode shift towards rail, and a reduction in the proportion of car to rail linked journeys, allowing a growth in total travel without the corresponding increase in delays on the road network.

8.2.5 The transport hierarchy

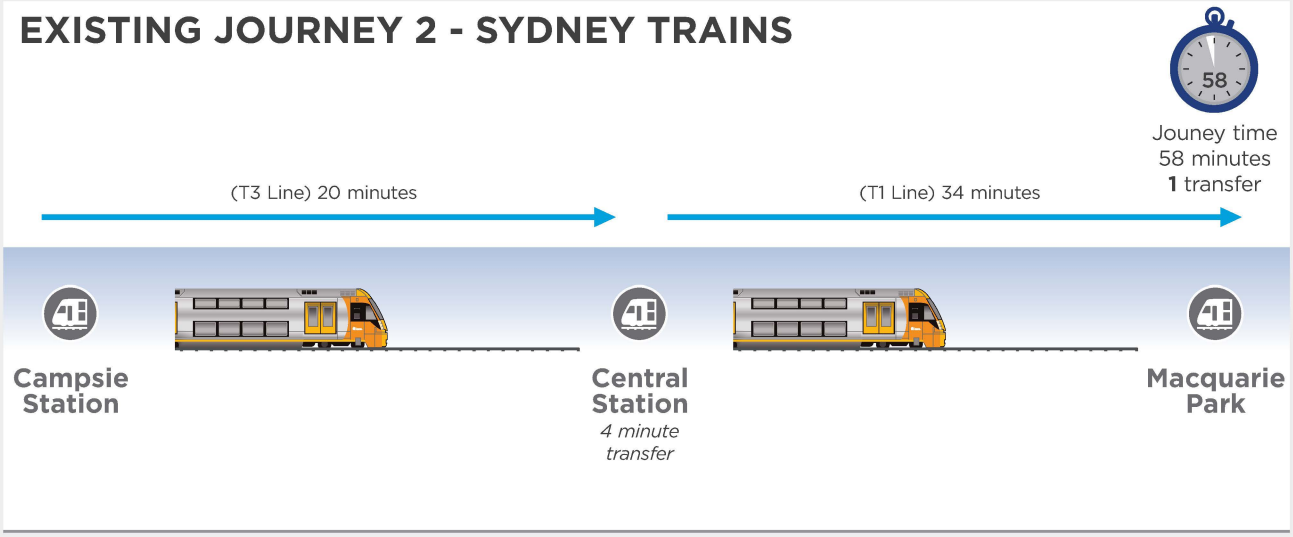
Customers require a seamless, well integrated and safe journey when using multiple travel modes to access their destination. Transport for NSW's modal hierarchy aims to ensure that station plans give highest priority to the most efficient and sustainable access modes. Pedestrians and cyclists are the highest priority access modes, followed by buses and taxis, kiss-and-ride, and lastly park-and-ride.

Figure 8.3 below shows a diagrammatic representation of the modal hierarchy and **Figure 8.4** shows the integration of the project with other modes.

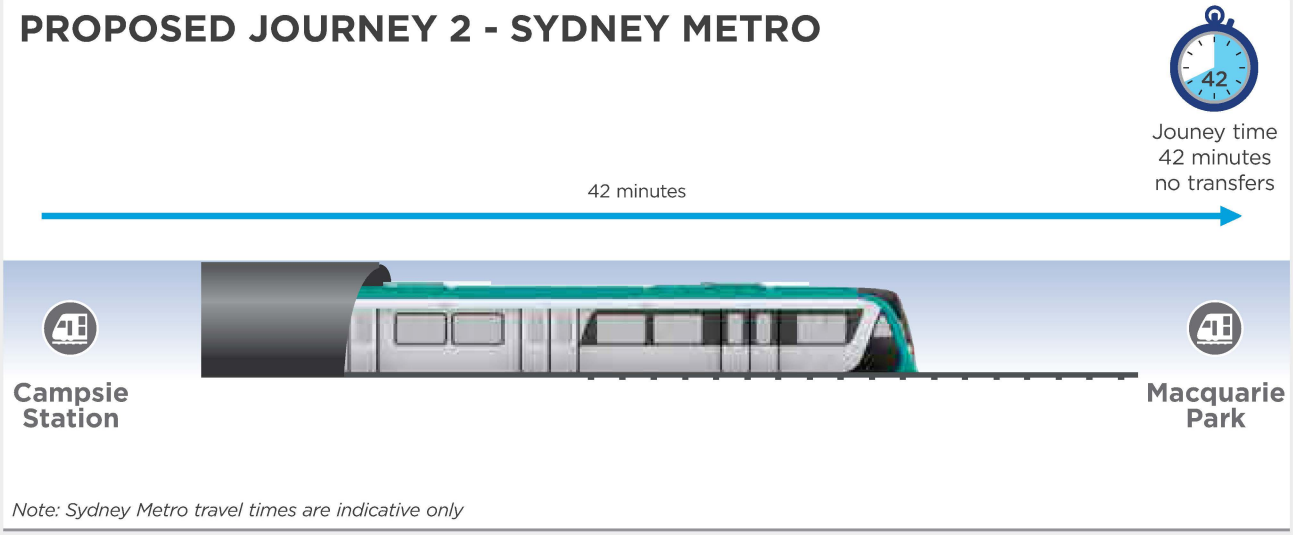
EXISTING JOURNEY 1 - BUS AND SYDNEY TRAINS



EXISTING JOURNEY 2 - SYDNEY TRAINS



PROPOSED JOURNEY 2 - SYDNEY METRO



Note: Sydney Metro travel times are indicative only

sydney METRO | city & southwest

Indicative journey time changes between Campsie and Macquarie Park

FIGURE 8.2

Figure 8.3 Modal hierarchy

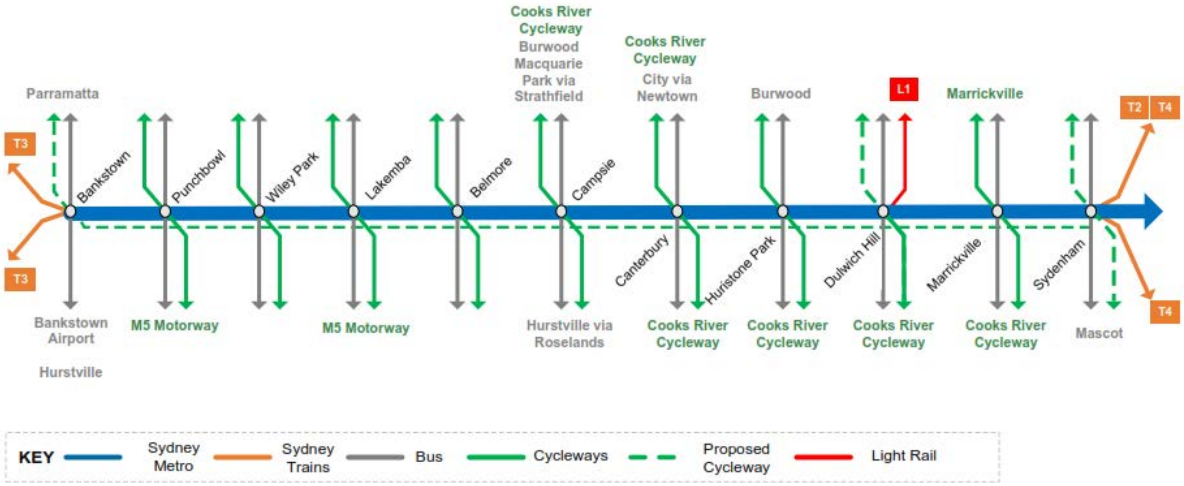


Figure 8.4 Metro integration with other travel modes

Walking and cycling: The modal hierarchy recognises transfers from sustainable modes, such as walking and cycling, as the most important modes. These modes are cost-effective, equitable and accessible, while typically requiring the least amount of space.

The project design would safeguard for an Active Transport Corridor. Components of walking and cycling infrastructure within the Active Transport Corridor may be delivered as part of station precinct work. Other parts, such as in areas between stations, may be staged as funding becomes available through development activity associated with the Department of Planning and Environment's Sydenham to Bankstown Urban Renewal Corridor investigations.

An Active Transport Corridor would facilitate strategic walking and cycling connections to a number of important destinations, including linking public transport interchanges between Sydenham and Bankstown, residential areas, schools, and retail and commercial precincts.

As a major east-west spine, the corridor would link to existing and future local walking and cycling networks. The corridor could allow for the following elements:

- footpaths
- separated cycleways
- shared zones
- designated pedestrian and cyclist road crossings.

The Active Transport Corridor has been incorporated within the Sydney Metro station precinct and rail corridor designs as well as existing and known future local infrastructure (such as parks and transport networks), with the view to these being delivered should funding be available.

The Active Transport Corridor has been designed to generally be along existing routes as the stations are in well-established urban areas.

Where practicable, appropriate footpath widths and gradients would be provided outside of station exits and throughout the public domain to link transport modes and provide safe and equitable pedestrian access. Vision and mobility impaired customers would be considered in the pavement designs, for example by keeping one side of the travel path clear of fittings and fixtures and providing tactile ground surface indicators on travel paths to warn of hazards and assist wayfinding where required.

Cycling connections would also be provided where practicable linking customers with the stations. These works would include local improvements within the interchange area of the station and provisioning for a cycling route that links the project length adjacent or near the railway corridor.

Planning for cyclists at Metro stations, and joining Metro stations via an Active Transport Corridor, provides an opportunity to improve traffic congestion, reduce greenhouse gas emissions and provide opportunities to partake in healthier lifestyle pursuits. The cycling catchment for a rail station is generally taken to be up to 2.5 kilometres, or approximately 10 minutes travel time.

It is proposed to increase the provision of bike parking spaces at stations as part of the project the type of bike parking provided at stations would be based on the NSW Government Bike and Ride Program, as stated within *Sydney's Cycling Future* (TfNSW, 2013). The facilities are likely to be upgraded from the current facilities to be similar to those being introduced at several Sydney Trains stations, including those currently at Blacktown and Campbelltown.

For all stations, the day one supply would meet current demands with additional spaces safeguarded to support increases in cycling mode share above that which has been forecasted. The number of bike parking spaces would reflect forecast passenger demand at each station. Indicatively this is likely to be around one to two per cent of station entries.

At each station, a mixture of secure OPAL access Bike Sheds and undercover bike racks are likely to be provided which allow train customers to leave their bikes and transfer to train. For each station, the bike parking facility would be located at a reasonable distance from the gate line to encourage use. Where practicable, the bike parking would connect with the local cycle network so customers can safely leave their bikes and catch a train.

The design of the Active Transport Corridor would be completed in consultation with local councils, local community groups, bike user groups as well as RMS and relevant utility providers.

Given the importance of active transport for the first and last mile of passengers' journeys, walking and cycling modes are discussed with specific details for each station below in **Sections 8.3** to **8.13**.

Public Transport: Sufficient and convenient customer transfer between Sydney Trains and Metro services at Bankstown and Sydenham would be assisted by the provision of clear and intuitive wayfinding and signage. Customers connecting to other services at the remaining stations along the T3 Bankstown Line would be required to exit the station and use existing footpaths.

Other public transport modes are the third most important mode on the hierarchy. Public transport services enable the Sydney Metro catchment area to expand its reach. Connections between Metro and other public transport services would be provided via safe and accessible paths.

Taxis: Taxis enhance the public transport network by providing access to areas which would not be possible via public transport. Taxis are therefore given the highest priority of the car-based modes. Parking and access with shelters and seating would be provided where practicable at stations.

Kiss and ride: Kiss and ride is prioritised above Park and Ride because it reduces the number of single-occupant vehicles accessing stations. Spaces for Kiss and Ride vehicles would be provided if high vehicle turnover and safe and efficient vehicle access is available.

Park and Ride: Although 'park and ride' is the lowest priority in the TfNSW modal hierarchy, the project has been designed to result in a 'no net loss' of dedicated commuter car parking spaces across the project. This commitment applies to parking that is not currently time restricted and is on RailCorp land or formally line marked and/or signposted as a dedicated commuter car parking area. It is assumed that people who intend to park and ride would use both dedicated commuter parking and other unrestricted parking within the station catchment area.

The proposed parking infrastructure for day one operational state is summarised in **Table 8.4**. Belmore and Bankstown have a potential 58 parking space decrease as a result of reconstruction following the use of the carpark during construction.

In some cases these changes may result in the provision of an increased number of commuter parking spaces, such as at Campsie Station where 80 dedicated commuter parking spaces would be added as a result of changes to associated rail facilities.

There would be some loss of on-street spaces (short-term and long-term) and off-street (short-term) spaces at some stations due to expanded and improved station interchanges. There would also be a change to the nature of some on-street parking at some stations to enable the Metro station interchange to provide accessible parking, kiss and ride and taxi spaces, where short-term parking spaces may currently exist.

Overall, the loss of these spaces is considered to be minor in a traffic and transport context due to the current levels of available parking. It is also noted that the project objective of no net loss of dedicated commuter spaces on Rail Corp land can be achieved and is aimed at facilitating access for existing users with a focus on customers with accessibility needs.

Transport for NSW would work with local councils to minimise adverse impacts from adjustments to parking and other kerbside uses (e.g. taxi ranks, accessible parking and kiss and ride facilities) in local streets.

Table 8.4 Parking infrastructure for day one operational state

Station	Existing on-street parking	Existing off-street parking	Increase / decrease in day one carpark spaces on-street	Increase / decrease in day one carpark spaces off-street	Increase / decrease in dedicated commuter parking	Approximate total number of spaces on-street	Approximate total number of spaces off-street	Total number of spaces	Demand for spaces (2026)*	Net surplus/ deficit
Marrickville	1,519	0	-1	0	0	1,518	0	1,518	1,365	153
Dulwich Hill	1,332	57	-5	0	0	1,270	57	1,327	1,209	118
Hurlstone Park	1,208	23	0	0	0	1,185	23	1,208	821	387
Canterbury	849	233	0	0	0	616	233	849	707	142
Campsie	1,539	494	-20	0	80	1,025	494	1,599	1,818	-219
Belmore	1,220	142	0	-48	0	1,078	94	1,172	1,325	-153
Lakemba	1498	537	0	0	0	961	537	1,498	1,648	-150
Wiley Park	746	25	0	0	0	721	25	746	537	209
Punchbowl	1123	285	0	0	0	838	285	1,123	1,345	-222
Bankstown	1696	1108	0	-10	0	588	1,098	1,686	2,479	-793
Grand Total	**12,730**	**2,904**	**-26**	**-58**	**80**					**-526**

*Note 1: The 2026 demand to for parking spaces has been calculated using the current utilisation of spaces and adding the change in park and ride customers. This does not allow for any increases in demand from residential intensification, population growth etc.

*Note 2: The numbers above are approximate and indicative for assessment purposes only and subject to detailed design and consultation.

Existing parking areas would be managed in such a way that there would be no disruption to walking connections between stations and town centres. Clearly marked pedestrian circulation would be provided in all of the carparks. As limited additional car parking is to be provided at the Metro stations, there is a constraint on induced traffic demand once the project is in the operational phase.

More sustainable modes of travel (i.e. not private passenger vehicle) would be promoted to absorb some of the demand forecast to be generated by park and ride users. Well planned interchanges and service provisions would be provided to assist the sustainable travel modes. Transport for NSW would also investigate opportunities for 'shared use parking' whereby rail patrons could use nearby commercial and industrial car parking facilities in the vicinity of the stations for commuter parking, where this does not conflict with business times.

8.2.6 Accessibility to Stations

Upgraded stations and platforms would comply as far as practicable with the objectives of the *Disability Discrimination Act 1992* (i.e. DDA compliant) and *Disability Standards for Accessible Public Transport 2002* including:

- stations, plazas, interchanges, walkways, fixtures and fittings and retail precincts would be designed to meet DDA requirements.
- Interchanges would incorporate accessible facilities and accessible paths of travel between the station and other transport modes, and resting seats would be provided along pathways.

The Disability Standards for Accessible Public Transport requires a maximum distance of 60m between interchange points, or where this is not possible seating must be provided every 60m. In addition, the Sydney Metro City and Southwest System Requirements Specification has a requirement for bus stops to be within 100m of the gateline.

As a result of the grade of the rail corridor, stations are located mostly in cuttings. The associated road overbridges generally grade sharply up to negotiate the minimum clearance height above rail. This results in non-DDA compliant grades on most of the footpaths on overbridges, which generally also serve as access paths to stations. At some stations, adjacent steep topography heightens this issue. Providing a design that complies with accessibility standards is challenging at many of the stations. In certain instances, this may not be achievable, for instance, provision of an accessible path of travel from station entries to bus stops on Canterbury Road at Canterbury Station.

Where the existing terrain does not allow for DDA compliant grading of paths, the following features have been incorporated in the design:

- adjustment to surface levels to achieve full or partial compliance
- reviewing station and precinct arrangements to locate accessible facilities in areas with acceptable gradients.

8.3 Marrickville Station

The Marrickville Station interchange plan is provided in **Figure 8.5**.

8.3.1 Metro Patronage and Access Mode to Station

The current and future travel modes to/from the station per day for Marrickville Station are shown in **Table 8.5**. These mode share increases are discussed in the relevant sections following.

Table 8.5 Current and future volumes of travel to/from Marrickville Station

Travel Mode to the Station	Entry			Exit			Mode Share 2016	Mode Share 2026
	2016	2026	Change	2016	2026	Change		
Walking	3,931	5,730	+1,799	3,727	5,730	+2,003	85.6%	83.0%
Cycling	13	21	+8	13	21	+8	0.3%	0.3%
Park and Ride	232	258	+26	220	258	+38	5.1%	3.7%
Kiss and Ride	186	651	+465	176	651	+475	4.0%	9.5%
Bus	232	240	+8	220	240	+20	5.1%	3.5%
Total	4,594	6,900		4,356	6,900		100.0%	100.0%

Source: Transport for NSW and extrapolated data

The overall walking mode share is forecast to decline slightly between 2016 and 2026, however this is set against a backdrop of increasing patronage therefore the total number of passengers walking to the station is forecast to increase.

The 2016 cycling trip data was unavailable for Marrickville Station. Therefore to calculate the cyclist mode share for Marrickville, the average cyclist mode share was taken from across all stations. This equated to 0.3% of total trips, and was assumed to equate to the cyclist trips at Marrickville station.

8.3.2 Integration with Walking Network

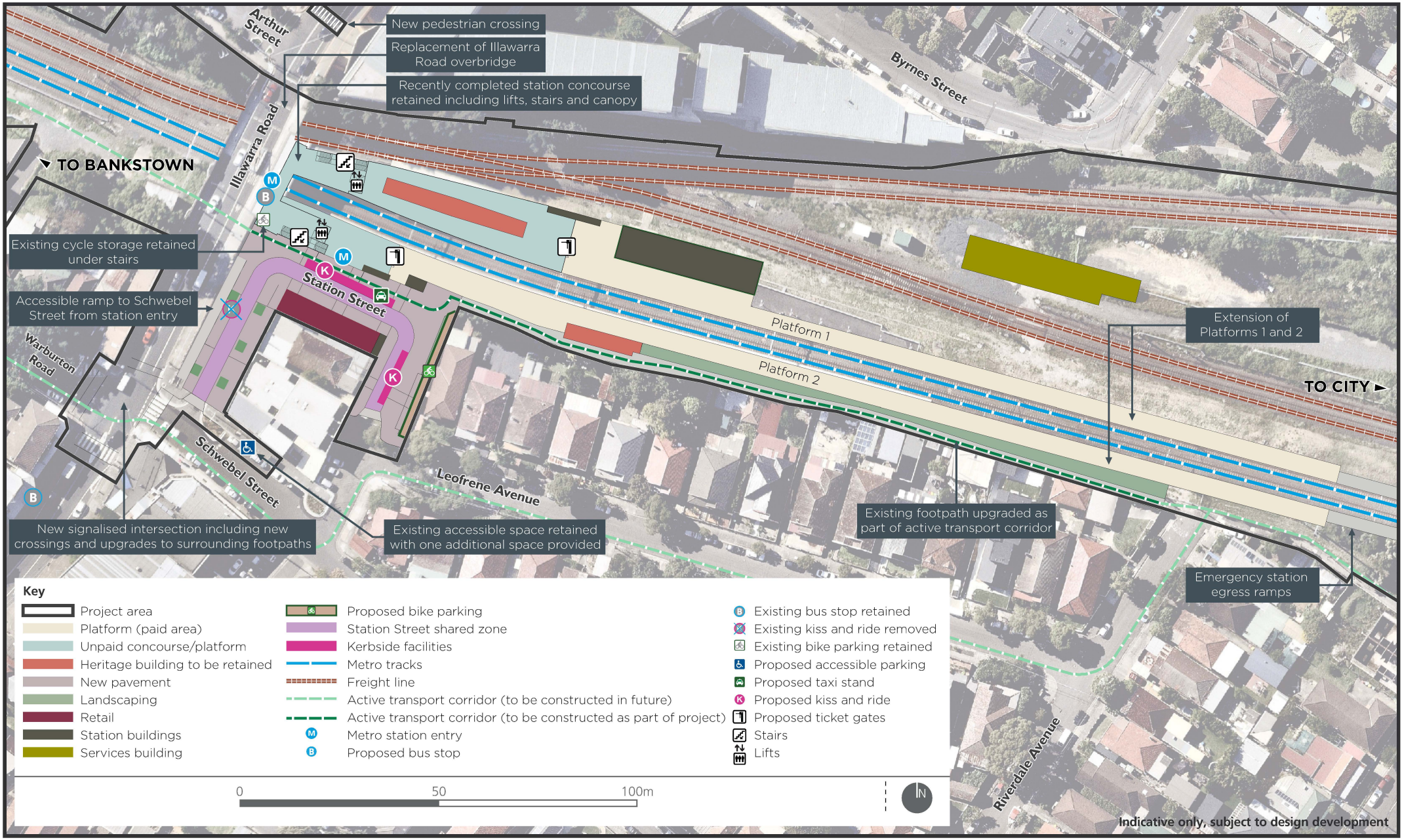
Table 8.5 shows a large increase in pedestrian demand at Marrickville Station as well as a very high proportion overall. The expected total increase in demand would be 1,799 additional entries and 2,003 additional exits for Metro passengers walking to the station. The growth in passenger demand would increase the need for accessibility and increase the potential for pedestrian/ vehicle conflict in the area surrounding the station. The proposed upgrades to Marrickville Station address a number of the issues of accessibility and provide a zebra crossings to aid the safe movement of pedestrians across Illawarra Road.

A shared zone is to be constructed on Station Street with a compliant access ramp for pedestrian connections to the northbound bus stop on Illawarra Road and proposed accessible bays on Schwebel Street. This would improve the pedestrian experience by providing greater accessibility for customers.

There is currently a signalised crossing for pedestrians on Illawarra Road Overbridge. This is to be removed and replaced with a fully signalised intersection at Illawarra Road and Schwebel/Warburton Streets that accounts for pedestrians and vehicles. The change to a fully signalised intersection would achieve the following:

- a safe and accessible path to the northbound bus stop on Illawarra Road
- a safe crossing of Illawarra Road for cyclists.

The removal of the signalised crossing on Illawarra Road Overbridge creates a potential access issue for pedestrians walking from the northwest to the station which is some 150m from the station entry. The proposed zebra crossing at Arthur Street/Illawarra Road would deliver an alternative route on the primary desire line.



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Marrickville Station interchange plan

FIGURE 8.5

Whilst the pedestrian volumes to and from the station are set to rise by over 3800 people per day, the adjacent footpaths provide adequate capacity for these volumes. Flows of up to 8000 pedestrians per hour can be accommodated immediately adjacent to the station and as the distance from the station increases, the pedestrian volumes would become more disperse. The southbound bus stop would provide a potential constraint to the flows, however the expected demand would be well below capacity and it is considered that the footpath network in the area would be able to cater for the increased pedestrian flows associated with the project. Overall the new Metro station layout would facilitate safe and direct access to the Metro from existing and potential new urban areas and the new entrance on Station Street would provide a more seamless transition to the village beyond.

8.3.3 Integration with Cycle Network

There are currently eight bike rails at Marrickville Station. At least 40 additional bike parking spaces would be provided, including a mix of secure and sheltered spaces. It is proposed that the bike parking facilities would be provided at the Illawarra Road station entrance, as well as on Station Street (**Figure 8.5**). Both of these facilities are adjacent to an existing cycle route.

8.3.4 Integration with Buses

Table 8.5 shows a total increase in demand of eight entries and 20 exits for Metro passengers travelling by bus to the station.

Bus routes 423 and L23 service the Marrickville precinct, arriving approximately every 10 minutes in peak periods (Sydney Buses 2016). These routes travel along Illawarra Road, past Marrickville Station and turn onto Marrickville Road connecting Kingsgrove to Marrickville Station and the city centre.

There is currently no accessible path from Marrickville Station to the northbound bus stop. The upgrade works at Marrickville Station do not propose any changes to the locations of bus stops, but the connectivity would be improved with an accessible ramp from Station Street to the Schwebel Street / Illawarra Road intersection.

The northbound bus stop would be approximately 180m from the platform 1 gate line and 140m from the platform 2 gate line which exceeds the City and Southwest Metro Project system requirements by 80 and 40m respectively. The southbound bus stop conforms to the system requirements with a distance of approximately 80m from the platform 1 gate line and 40m from the platform 2 gate line. For both stops, seating would be provided on the route to the station where practicable to enhance accessibility.

8.3.5 Integration with Road Network

Park and Ride and Kiss and Ride currently account for 9% of the modal share collectively. **Table 8.5** shows an increase in demand for Park and Ride passengers of 26 entries and 38 exits, and an increase in Kiss and Ride passenger entries of 465 and 475 exits.

The introduction of the fully signalised intersection at Illawarra Road and Schwebel/Warburton Streets would achieve the following:

- allowance for the anticipated increase in vehicle traffic from increased taxi and Kiss and Ride activity on Station Street
- allowance for heavy vehicles on Warburton Street during the construction period.

Marrickville Station currently has a taxi bay on Station Street West. The proposed layout allows for two taxi bays on Station Street North opposite the Station Street entry. The taxi bays would be clearly visible and accessible from the Station Street entry.

Three Kiss and Ride bays are currently available on Station Street. These bays are not compliant with the TfNSW requirements for accessibility. The proposed design would increase the number of spaces to five and, where practicable, create space in areas with flatter grades so that the Kiss and Ride bays would be visible and accessible from Station Street close to the station southern entry. Some of the spaces proposed would potentially not meet accessibility standards due to the gradient of Station Street.

No dedicated commuter parking spaces facilities are currently available or proposed in the Marrickville Station future design. The 5% of Metro passengers who drive to the station and park their car use one of the 1257 on street unrestricted car parks or the 262 on street time restricted car parks (AECOM 2016). These car parking areas are currently operating at 82% and 76% utilisation respectively. This provides spare on street capacity for the further 26 passengers that are expected to drive to the station by 2026, assuming population growth and intensification do not provide a further demand for these spaces.

There is a single accessible parking bay currently provided on Schwebel Street which would be retained. The steep gradient on Station Street is non-compliant, making it difficult to walk from the accessible bay to Station Street. A ramp is to be provided as part of the Project and would link Station Street West to Schwebel Street.

It is not anticipated that loading zones would be impacted by the project design.

8.4 Dulwich Hill Station

The Dulwich Hill Station interchange plan is provided in **Figure 8.6**.

8.4.1 Metro Patronage and Access Mode to Station

The current and future travel modes to/from the station per day for Dulwich Hill Station are shown in **Table 8.6** below. These mode share increases are discussed in the relevant sections following.

Table 8.6 Current and future volumes of travel to/from Dulwich Hill Station

Travel Mode to the Station	Entry			Exit			Mode Share 2014	Mode Share 2026
	2014	2026	Change	2014	2026	Change		
Walking	2,057	4,899	+2,842	1,872	4,899	+3,027	76.0%	72.0%
Cycling	10	27	+17	10	27	+17	0.4%	0.4%
Park and Ride	389	377	-12	354	377	+23	14.4%	5.5%
Kiss and Ride	167	537	+370	152	537	+385	6.2%	7.9%
Bus	83	282	+199	76	282	+206	3.1%	4.1%
LRT[52]	-	678		-	678		-	10.0%
Total	2,706	6,800		2,464	6,800		100.0%	100.0%

Source: Transport for NSW and extrapolated data

8.4.2 Integration with Walking Network

Table 8.6 shows a total increase in demand of 2,842 entries and 3,027 exits for Metro passengers walking to the station. The growth in passenger demand would increase the need for accessibility in the area surrounding the station.

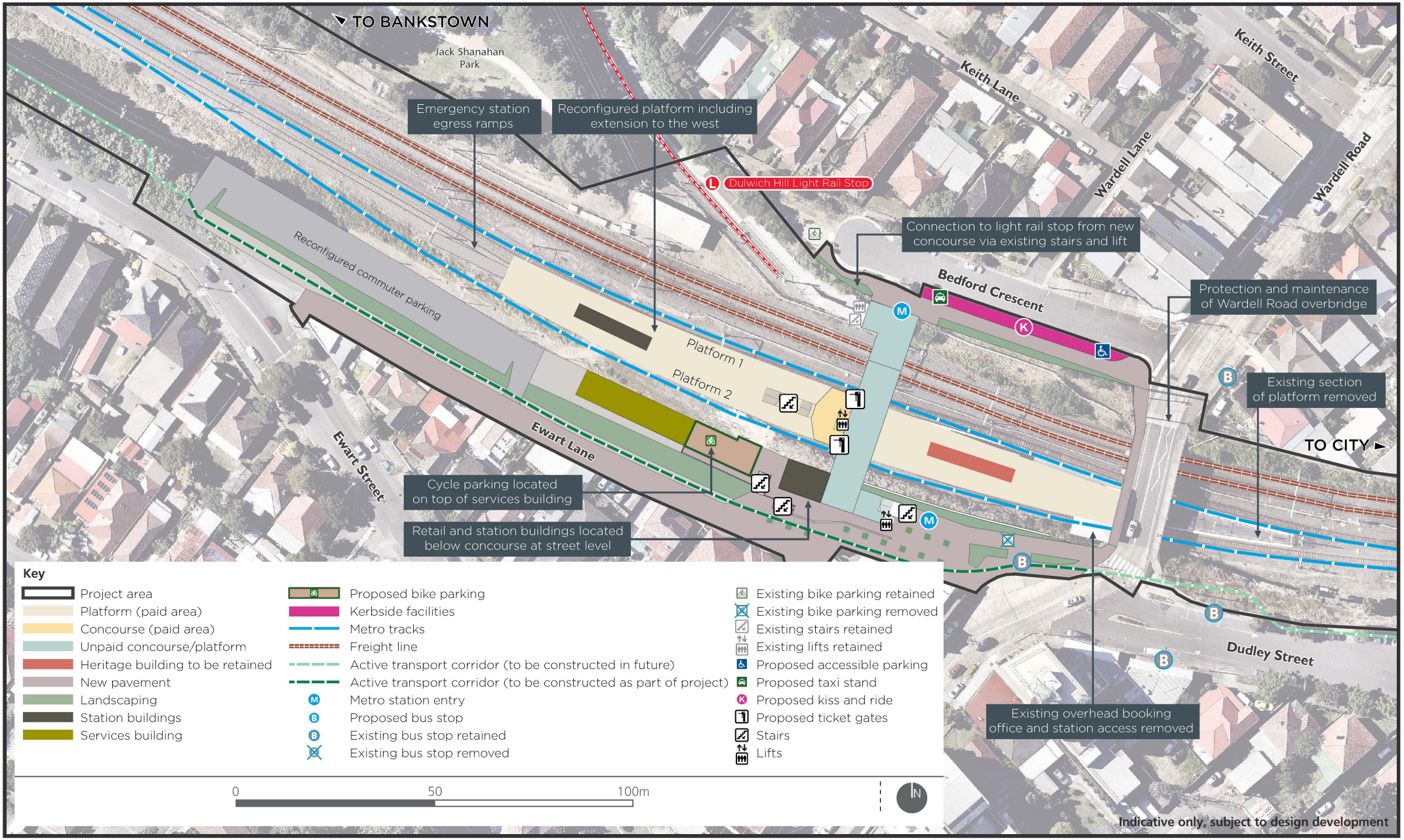
No further pedestrian or signalised crossings are proposed at Dulwich Hill Station. The southern plaza provides an accessible connection between the station and the pedestrian crossing at Wardell Road and the village beyond and would provide a legible entrance, easily visible to pedestrians. The location of proposed taxi bays and Kiss and Ride facilities on Bedford Crescent enable better access for pedestrians transferring from these modes to the station. The Bedford Crescent entry would also be clearly visible from the northern section of Wardell Road.

Whilst the pedestrian volumes to and from the station are set to rise by over 5,800 people per day, the adjacent footpaths provide adequate capacity for these volumes. Flows of up to 4,000 pedestrians per hour can be accommodated immediately adjacent to the station on Wardell Road Overbridge. As the distance from the station increases the increased pedestrian volumes would become more disperse. The southbound bus stop would provide a potential constraint to the flows, however the expected demand would be well below capacity and it is considered that the footpath network in the area would be able to cater for the increased pedestrian flows associated form the project.

8.4.3 Integration with Cycle Network

There are currently 20 bike rails (up to 20 spaces) in Dulwich Hill (Bedford Crescent and Wardell Road). It is proposed that bike parking provision at this station would be tripled with the addition of around 60 spaces, some covered and some secured. It is proposed that the bike parking facilities would be provided south of the station, west of the station entrance (**Figure 8.6**). This location is adjacent to the existing cycle route on Ewart Lane.

[52] *The 2014 trip count survey was conducted prior to the introduction of LRT, as a result these values are not available.*



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Dulwich Hill Station interchange plan

FIGURE 8.6

8.4.4 Integration with Buses

Table 8.6 shows a total increase in demand of 199 entries and 206 exits from Metro passengers busing to the station. Dulwich Hill centre is serviced by bus route 412. Three further bus routes travel along the northern section of the precinct.

The eastbound and westbound bus stops for the bus 412 route are located adjacent to the station on Dudley Street. Bus stops immediately north and south of Wardell Road overbridge service school buses. There are no planned changes to any of these bus stops.

The eastern bus stops on Dudley Street are accessible from the station as the southern plaza connects the station to the existing pedestrian crossing at Wardell Road. The bus stop is approximately 120m from the gate line. This exceeds the system requirements by 20m.

The westbound bus stop is not easily accessible as there is no pedestrian crossing across Dudley Street. The bus stop is approximately 145m from the gate line which exceeds the system requirements by 45m. For both stops, seating would be provided on the route to the station where practicable to enhance accessibility. Bus stops would be visible from the southern station entry and the plaza.

8.4.5 Integration with Road Network

Park and Ride and Kiss and Ride currently account for a fifth of the modal share collectively. **Table 8.6** shows negligible change in demand for Park and Ride passengers, and an increase in Kiss and Ride passenger entries of 370 entries and 385 exits.

Dulwich Hill Station does not currently have any taxi facilities. One taxi space is to be provided, in accordance with the system requirements, on Bedford Crescent adjacent to the northern entry. This would ensure compliant access from the taxi bay to the station. The taxi bay is clearly visible from the Bedford Crescent entry.

Three Kiss and Ride spaces are currently available on Bedford Crescent. A further two spaces are to be provided on Bedford Crescent to comply with the system requirements. The location of the extra two spaces is proposed adjacent to the northern entry to ensure compliant access to the station. The Kiss and Ride bays would be clearly visible from the Bedford Crescent entry.

Dulwich Hill Station currently has 55 dedicated commuter parking spaces on RailCorp land on Ewart Lane. Five short term on-street parking bays would also be lost on Bedford Crescent as a result of the station interchange zone.

The 14% of Metro passengers who drive to the station and park their car use one of the 55 dedicated commuter spaces, one of the 1202 unrestricted on-street spaces, or one of the 73 on-street time restricted spaces (AECOM 2016). These car parks are currently operating at 100%, 72% and 86% of capacity respectively. This provides spare capacity for the further 30 passengers that are expected to drive to the station, assuming population growth and intensification do not provide a further demand for these spaces.

It is not anticipated that loading zones would be impacted by the project design.

8.5 Hurlstone Park Station

The Hurlstone Park Station interchange plan is provided in **Figure 8.7**.

8.5.1 Metro Patronage and Access Mode to Station

The current and future travel modes to/from the station per day for Hurlstone Park Station are shown in **Table 8.7**. These mode share increases are discussed in the relevant sections below.

Table 8.7 Current and future volumes of travel to/from Hurlstone Park Station

Travel Mode to the Station	Entry			Exit			Mode Share 2016	Mode Share 2026
	2016	2026	Change	2016	2026	Change		
Walking	1,239	3,189	+1,950	1,061	3,189	+2,128	80.9%	67.9%
Cycling	2	5	+3	2	5	+3	0.1%	0.1%
Park and Ride	153	457	+304	131	457	+326	10.0%	9.7%
Kiss and Ride	92	246	+154	79	246	+167	6.0%	5.2%
Bus	46	802	+756	39	802	+763	3.0%	17.1%
Total	1,532	4,700		1,312	4,700		100.0%	100.0%

Source: Transport for NSW and extrapolated data

8.5.2 Integration with Walking Network

Table 8.7 shows a total increase in demand of 1,950 entries and 2,128 exits for Metro passengers walking to the station. The growth in passenger demand would increase the need for accessibility in the area surrounding the station.

Pedestrian crossings are proposed at Hurlstone Park Station. The unpaid concourse area and adjacent pavements provide connections between the station and the pedestrian crossings at Crinan Street and Duntroon Street.

Whilst the pedestrian volumes to and from the station are set to rise by over 4,000 people per day, the adjacent footpaths provide adequate capacity for these volumes. Flows of approximately 7,500 pedestrians per hour can be accommodated within the proposed unpaid plaza and adjacent Crinan Street Overbridge. It is considered that the footpath network in the area would be able to cater for the increased pedestrian flows associated from the project.

8.5.3 Integration with Cycle Network

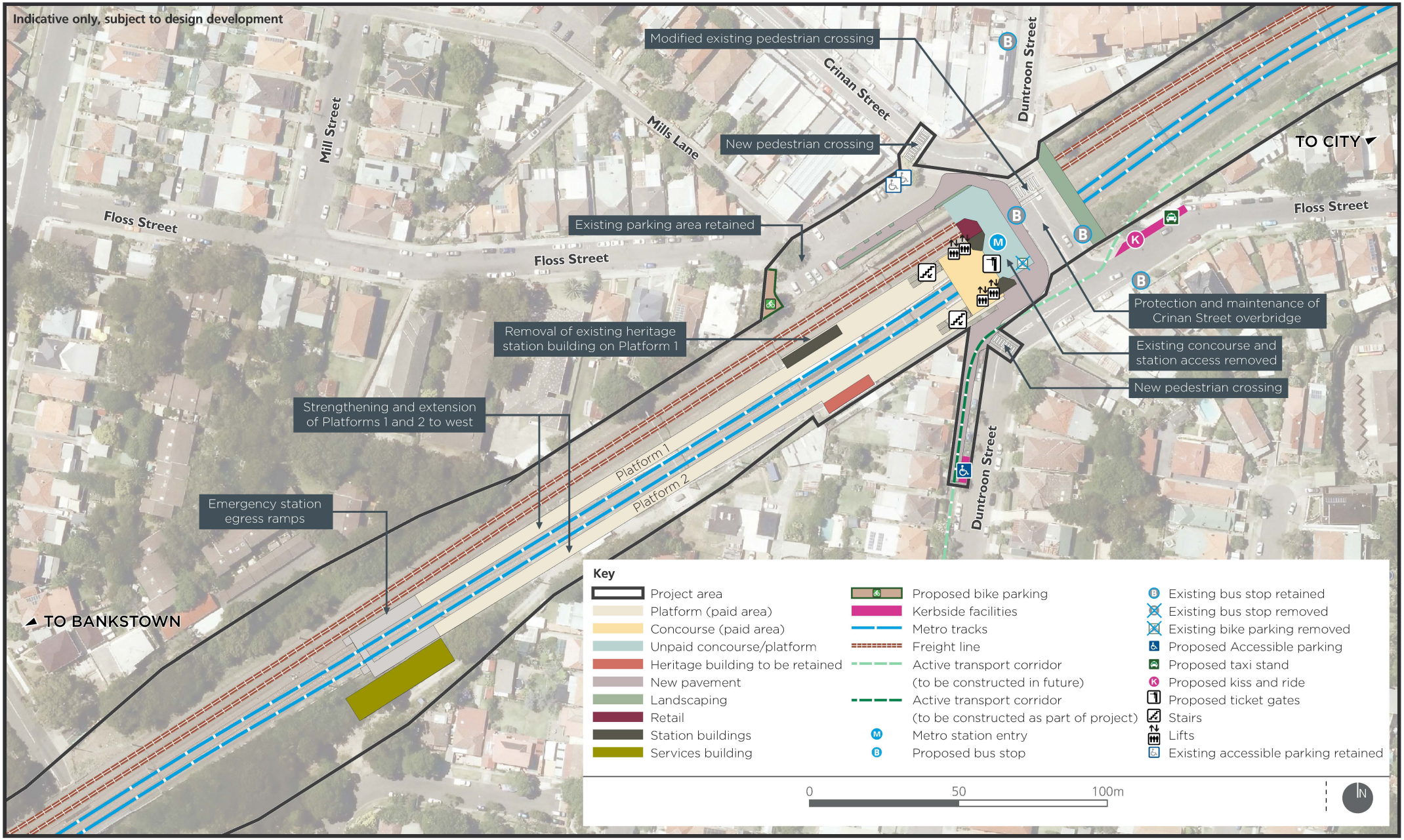
There are currently 12 bike parking spaces located at the entry of Hurlstone Park Station. It is proposed to provide around 60 bike parking spaces at this station, some of which would be secure. It is proposed that the bike parking facilities would be provided north of the station, west of the station entrance (**Figure 8.7**). These facilities can be access from the existing cycle route on Crinan street, via Floss Street.

8.5.4 Integration with Buses

Table 8.7 shows a total increase in demand of 756 entries and 763 exits for Metro passengers busing to the station.

Hurlstone Park is serviced by two bus routes that provide access to surrounding suburbs including Five Dock, Burwood, Mascot and Bondi Junction. These bus routes stop on the Crinan Street Overbridge which provides access to Hurlstone Park Station. The location of this bus stop is not proposed to change, however the unpaid concourse and kerb buildout improves the sight line issues from the station to the bus stop and the pedestrian crossing.

The northbound and southbound stops are both visible from the station entry. The northbound stop is 50m from the gate line and the southbound stop is just over 100m from the gate line. For the southbound stop, seating would be provided on the route to the station where practicable to enhance accessibility.



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Hurlstone Park Station interchange plan

FIGURE 8.7

8.5.5 Integration with Road Network

Park and Ride and Kiss and Ride currently account for 16% of the modal share collectively. **Table 8.7** shows an increase in demand for park and ride passenger entries of 304 and 326 exits. There is also an increase in demand for kiss and ride passenger entries of 154 and 167 exits.

There are currently no taxi spaces at Hurlstone Park Station. One bay is to be added on Floss Street. This taxi bay would displace an unrestricted on-street parking space.

There are no existing kiss and ride spaces. Two bays are proposed on Floss Street adjacent to the southern entry, replacing unrestricted on-street parking. The Kiss and Ride bays are clearly visible from the southern entry.

The 10% of Metro passengers who drive to Hurlstone Park Station and park their car use one of the 1135 unrestricted car parks or the 73 on street time restricted car parks (AECOM 2016). These car parks are currently operating at 53% and 74% utilisation respectively. This provides spare on street capacity for the further 304 passengers that are expected to drive to the station by 2026, assuming population growth and intensification do not provide a further demand for these spaces.

There are currently two accessible parking bays in the Floss Street carpark and one accessible bay on Duntroon Street. None of these parking bays have an accessible path to the station entry. One untimed accessible bay would be provided on Duntroon Street adjacent to the southern entry adjacent to a footpath providing a clear accessible path of travel to the station entry.

It is not anticipated that loading zones would be impacted by the project design.

8.6 Canterbury Station

The Canterbury Station interchange plan is provided in **Figure 8.8**.

8.6.1 Metro Patronage and Access Mode to Station

The current and future travel modes to/from the station per day for Canterbury Station are shown in **Table 8.8**. These mode share increases are discussed in the relevant sections following.

Table 8.8 Current and future volumes of travel to/from Canterbury Station

Travel Mode to the Station	Entry			Exit			Mode Share 2016	Mode Share 2026
	2016	2026	Change	2016	2026	Change		
Walking	2,033	4,710	+2,677	1,814	4,710	+2,896	83.8%	66.3%
Cycling	5	14	+9	5	14	+9	0.2%	0.2%
Park and Ride	218	718	+500	194	718	+524	9.0%	10.1%
Kiss and Ride	97	745	+648	86	745	+659	4.0%	10.5%
Bus	73	913	+840	65	913	+848	3.0%	12.9%
Total	2,426	7,100		2,164	7,100		100.0%	100.0%

Source: Transport for NSW and extrapolated data

8.6.2 Integration with Walking Network

Table 8.8 shows a total increase in demand of 2,677 entries and 2,896 exits for Metro passengers walking to the station. The growth in passenger demand would increase the need for accessibility in the area surrounding the station.

Accessibility to bus infrastructure, taxi bays, Kiss and Ride bays and accessible parking bays would be improved in the area by providing paths and constructing infrastructure closer to the station. Two new entrances on, Broughton Street and Canterbury Road would provide connections to surrounding residential areas and interchange areas, replacing the current entrance on the corner of Canterbury Road and Broughton Street. The design also provides for the future provision of a further entrance on Charles Street.

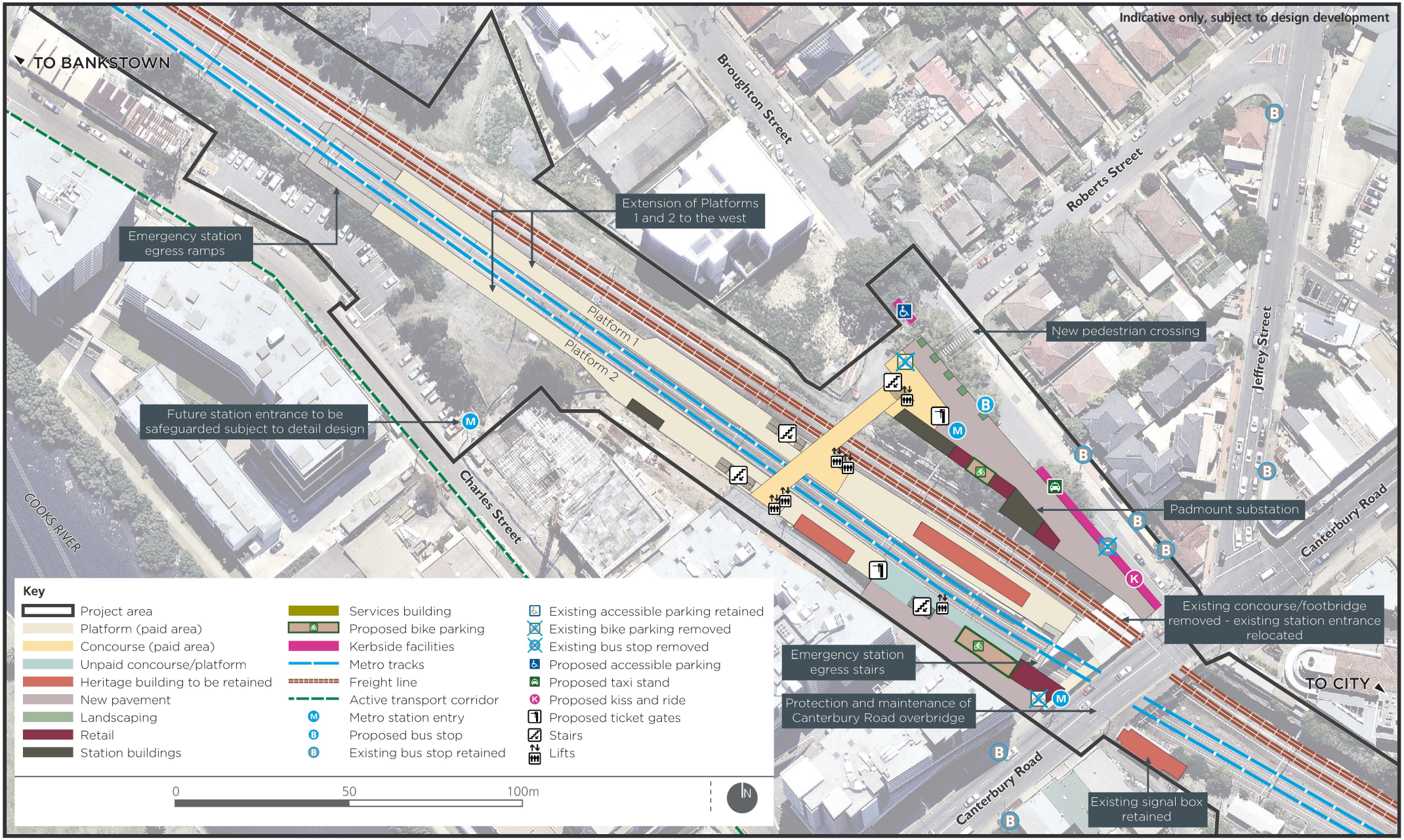
A signalised intersection at Broughton Street – Canterbury Road provides pedestrian access to the station. A pedestrian crossing is proposed on Broughton Street in line with the concourse.

Whilst the pedestrian volumes to and from the station are set to rise by over 5,500 people per day, the adjacent footpaths provide adequate capacity for these volumes. Flows of up to 9,000 pedestrians per hour can be accommodated on the footpaths immediately adjacent to the station exits on Canterbury Road Overbridge and Broughton Street. As the distance from the station increases, the pedestrian volumes would become more disperse.

The signalised crossing at Broughton Street / Jeffrey Street would provide a potential constraint to the flows as pedestrians heading north from the station would need to wait for the pedestrian phase. However the expected pedestrian demand would be well below the footpath capacity and it is considered that the footpath network in the area, including the new pavement area to be installed, would be able to cater for the increased pedestrian flows associated form the project.

8.6.3 Integration with Cycle Network

There are currently four bike parking spaces in a shed at Canterbury Station. It is proposed to increase this provision with the addition of approximately 60 spaces, some of which would be secure. Facilities can be accessed from the existing cycle route on Broughton Street. Cyclists using the existing cycle route along Crooks River can access bike parking facilities via Canterbury Road.



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Canterbury Station interchange plan

FIGURE 8.8

8.6.4 Integration with Buses

Table 8.8 shows a total increase in demand of 840 entries 848 exits for Metro passengers busing to the station.

Canterbury Station is serviced by a number of bus routes, including high frequency routes from Sydney CBD, Campsie and Hurstville. Routes 428, L28 and 487 stop on Broughton Street, and routes 415, 444, 445 and 491 stop on Canterbury Road. The northbound bus stop on Broughton Street is proposed to be relocated closer to the station exit. No changes are proposed to the other bus stops.

The Broughton Street bus stops would have an accessible path to the northern station entry. These stops are between 20m and 100m from the central concourse gate line, conform to the system requirements. The stops would be visible from the northern station entrance only.

The Canterbury Road bus stops would also now have an accessible path to the station. The stops are approximately 180m from the central concourse gate line which exceeds the system requirements by 80m. For both stops, seating would be provided on the route to the station where practicable to enhance accessibility.

8.6.5 Integration with Road Network

Park and Ride and Kiss and Ride currently account for 13% of the modal share collectively. **Table 8.8** shows an increase in demand for Park and Ride passenger entries of 500 and 524 exits. There is also an increase in demand for Kiss and Ride passenger entries of 648 and 659 exits.

There are currently no taxi bays at Canterbury Station. The proposed design includes three taxi spaces on Broughton Street and one space on Charles Street. The bays would be clearly visible and accessible from the station.

Canterbury Station does not have any Kiss and Ride facilities. The proposed design includes approximately four spaces on Broughton Street and two spaces on Charles Street. The bays would be clearly visible and accessible from the station.

The 9% of Metro passengers who drive to Canterbury Station and park their cars use one of 704 unrestricted carparks or the 145 time restricted carparks (AECOM 2016). These carparks are currently operating at 64% and 90% capacity respectively. This provides spare on street capacity for the further 500 passengers that are expected to drive to the station by 2026, assuming population growth and intensification do not provide a further demand for these spaces.

It is not anticipated that loading zones would be impacted by the project design.

8.7 Campsie Station

The Campsie Station interchange plan is provided in **Figure 8.9**.

8.7.1 Metro Patronage and Access Mode to Station

The current and future travel modes to/from the station per day for Campsie Station are shown in **Table 8.9**. These mode share increases are discussed in the relevant sections below.

Table 8.9 Current and future volumes of travel to/from Campsie Station

Travel Mode to the Station	Entry			Exit			Mode Share 2016	Mode Share 2026
	2016	2026	Change	2016	2026	Change		
Walking	5,969	6,942	+973	5,825	6,942	+1,117	72.5%	64.9%
Cycling	28	32	+4	28	32	4	0.3%	0.3%
Park and Ride	747	1,090	+343	729	1,090	+361	9.1%	10.2%
Kiss and Ride	912	769	-143	890	769	-121	11.1%	7.2%
Bus	581	1,867	+1,286	567	1,867	+1,300	7.1%	17.5%
Total	8,237	10,700		8,039	10,700		100.0%	100.0%

Source: Transport for NSW and extrapolated data

8.7.2 Integration with Walking Network

Table 8.9 shows a total increase in demand of 973 entries and 1,117 exits for Metro passengers walking to the station. The existing pedestrian facilities and proposed upgrades to Campsie Station address a number of the accessibility issues.

The new shared zone on Lillian Lane between Beamish Street and Dewar Street would improve pedestrian and cyclist amenity and safety. The proposed widening of the public domain/plaza at the station entry between South and North Parade, and the retention of the at-grade station entry on Beamish Street with an additional (lift and stair) entry on North Parade, would improve accessibility and provide more direct, safe routes to the station for passengers. The station would be easily seen from the town centre and pedestrian focussed infrastructure would contribute to the pedestrian amenity of surrounding streets.

Whilst the pedestrian volumes to and from the station are set to rise by just over 2,000 people per day, the adjacent footpaths provide adequate capacity for these volumes. Flows of approximately 7,000 pedestrians per hour can be accommodated on the footpaths immediately adjacent to the station exit on Beamish Street.

The signalised crossing at Beamish Street / South Parade would provide a potential constraint to the flows as pedestrians heading south from the station would need to wait for the pedestrian phase, however the expected demand would be well below capacity. It is considered that the footpath network in the area would therefore be able to cater for the increased pedestrian flows associated from the project.

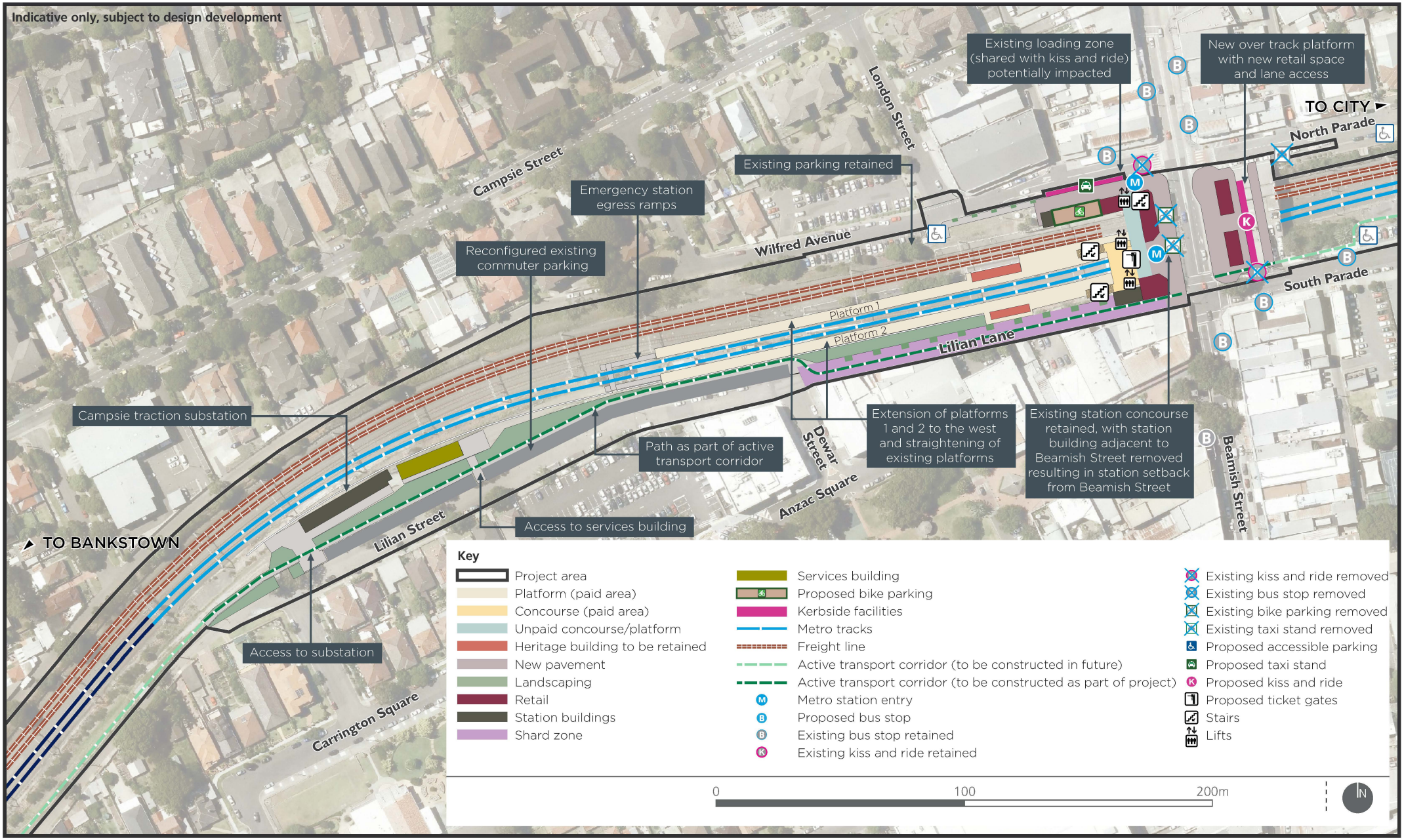
8.7.3 Integration with Cycle Network

There are currently ten bike parking spaces at Campsie Station. It is proposed that this provision would be increased to around 80 spaces, some of which would be secure spaces. It is proposed that the bike parking facilities would be provided north of the station, west of the station entrance (Figure 8.9). There are no existing cycle routes adjacent to Campsie station. Cyclists using existing routes on Campsie Street and Evaline Street can access the station via Beamish Street.

8.7.4 Integration with Buses

Table 8.9 shows a total increase in demand of 1,286 entries and 1,300 exits for Metro passengers busing to the station.

Bus routes 400, 412, 415, 444, 445, 473, 487, 490, and 492 services the Campsie precinct, arriving approximately every 15 minutes in peak periods (Sydney Buses 2016). These routes provide connections to Macquarie Park.



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Campsie Station interchange plan

FIGURE 8.9

The bus stop arrangements would remain in the same locations (**Figure 8.9**).

The bus stops on South Parade and Beamish Street, south of the station have accessible paths of travel to the station entry.

The bus stops on North Parade, on the western side of Beamish Street, north of the station, would have accessible paths of travel to the station entry as a result of the additional lift from the station concourse to North Parade. The stop on the eastern side of Beamish Street has an indirect accessible path due to the lack of a Beamish Street crossing immediately north of the station.

All bus stops are generally visible from the public domain on Beamish Street or North Parade at station entries. South of the station: South Parade bus stops are between 95m and 120m from the gate line while the southbound Beamish Street stop is 95m from the gate line and north bound stop approximately 110m.

North of the station: North Parade bus stop is 85m from the gate line, northbound Beamish Street stop 100m and the southbound stop approximately 170m. For both stops, opportunities to provide seating would be considered in detail design where practicable to enhance accessibility.

8.7.5 Integration with Road Network

Park and Ride and Kiss and Ride currently account for a fifth of the modal share collectively. **Table 8.9** shows an increase in demand for Park and Ride passenger entries of 343 and 361 exits. There is also a decrease in demand for Kiss and Ride passenger entries of 143 and exits of 121.

A number of changes have been incorporated into the proposed station design to address the issues of increased road traffic and increased demand for pick up / drop off facilities.

The current one signalised crossing for South Parade and two on Beamish Street are retained. Pedestrian crossings on North Parade would also be retained.

The taxi spaces on North Parade (east) are to be relocated to North Parade (west). The taxi bays would be adjacent and visible to the North Parade station entry and more prominent being only 10m from the entry.

Currently, the station has two five minute bays on North Parade and two five minute bays on South Parade as Kiss and Ride facilities. The proposed design would relocate these bays to provide approximately 5-6 Kiss and Ride Bays in a one-way northbound service lane on the eastern side of Beamish Street. These bays have a direct, accessible path of travel to and from the station and are 50m from the station entry.

Campsie Station currently has four parking areas. The 9% of Metro passengers who drive to the station and park their cars use one of the 1045 on-street car parks and 494 off-street car parks (AECOM 2016). These car parks are currently operating at 85% and 100% utilisation respectively. A dedicated off-street commuter parking area for approximately 80 cars is proposed, although this is subject to design resolution in relation to drainage infrastructure, services and sub-station buildings. There is also expected to be loss of 20 on-street car parks. This provides spare on street capacity for the further 343 passengers that are expected to drive to the station by 2026, assuming population growth and intensification do not provide a further demand for these spaces.

The two existing accessible parking bays on North Parade and the two off-street car parks on South Parade have accessible paths of travel from them to station entries. Two bays on North Parade only have an indirect accessible path due to the lack of a Beamish Street crossing immediately north of the station. These six accessible bays are proposed to remain.

There is one loading zone on North Parade, west of Beamish Street, which may be impacted by the new proposed kerbside facilities (taxi zone). This impact would be confirmed and mitigated as part of the detailed design of the project. A potential outcome could be to relocate the loading bay slightly east or west of the proposed taxi zone, or during detailed design refine the extent of the taxi bay to avoid impacts on this zone.

8.8 Belmore Station

The Belmore Station interchange plan is provided in **Figure 8.10**.

8.8.1 Metro Patronage and Access Mode to Station

The current and future travel modes to/from the station per day for Belmore Station are shown in **Table 8.10**. These mode share increases are discussed in the relevant sections following.

Table 8.10 Current and future volumes of travel to/from Belmore Station

Travel Mode to the Station	Entry			Exit			Mode Share 2016	Mode Share 2026
	2016	2026	Change	2016	2026	Change		
Walking	1,952	4,150	+2,198	1,837	4,150	+2,313	64.5%	63.8%
Cycling	4	7	+3	4	7	+3	0.1%	0.1%
Park and Ride	641	1,121	+480	603	1,121	+518	21.2%	17.2%
Kiss and Ride	336	582	+246	316	582	+266	11.1%	9.0%
Bus	92	641	+549	87	641	+554	3.0%	9.9%
Total	3,025	6,500		2,847	6,500		100.0%	100.0%

Source: Transport for NSW and extrapolated data

8.8.2 Integration with Walking Network

Table 8.10 shows a total increase in demand of 2,198 entries and 2,313 exits for Metro passengers walking to the station. The growth in passenger demand would increase the need for an accessible pedestrian environment.

Tobruk Avenue/ Bridge Road/ Burwood Road intersection would be upgraded to be a signalised intersection, including works to improve footpaths. This would improve accessibility and provide more direct, safe routes to the station for passengers. The shared zone and plaza on Tobruk Avenue would provide a clear legible entry to the station easily visible for pedestrians from Burwood Road.

An additional station entry would be included on the northern side of the station, into the existing dedicated commuter car park to improve accessibility and movement to the station in this area.

Whilst the pedestrian volumes to and from the station are set to rise by nearly 4,500 people per day, the adjacent improved footpaths and station plaza provide adequate capacity for these volumes. Flows of some 8,000 pedestrians per hour would be accommodated on the footpaths immediately adjacent to the station exits on Burwood Road Overbridge. The expected demand would be well below capacity and as a result the footpath network in the area would be able to cater for the increased pedestrian flows associated form the project.

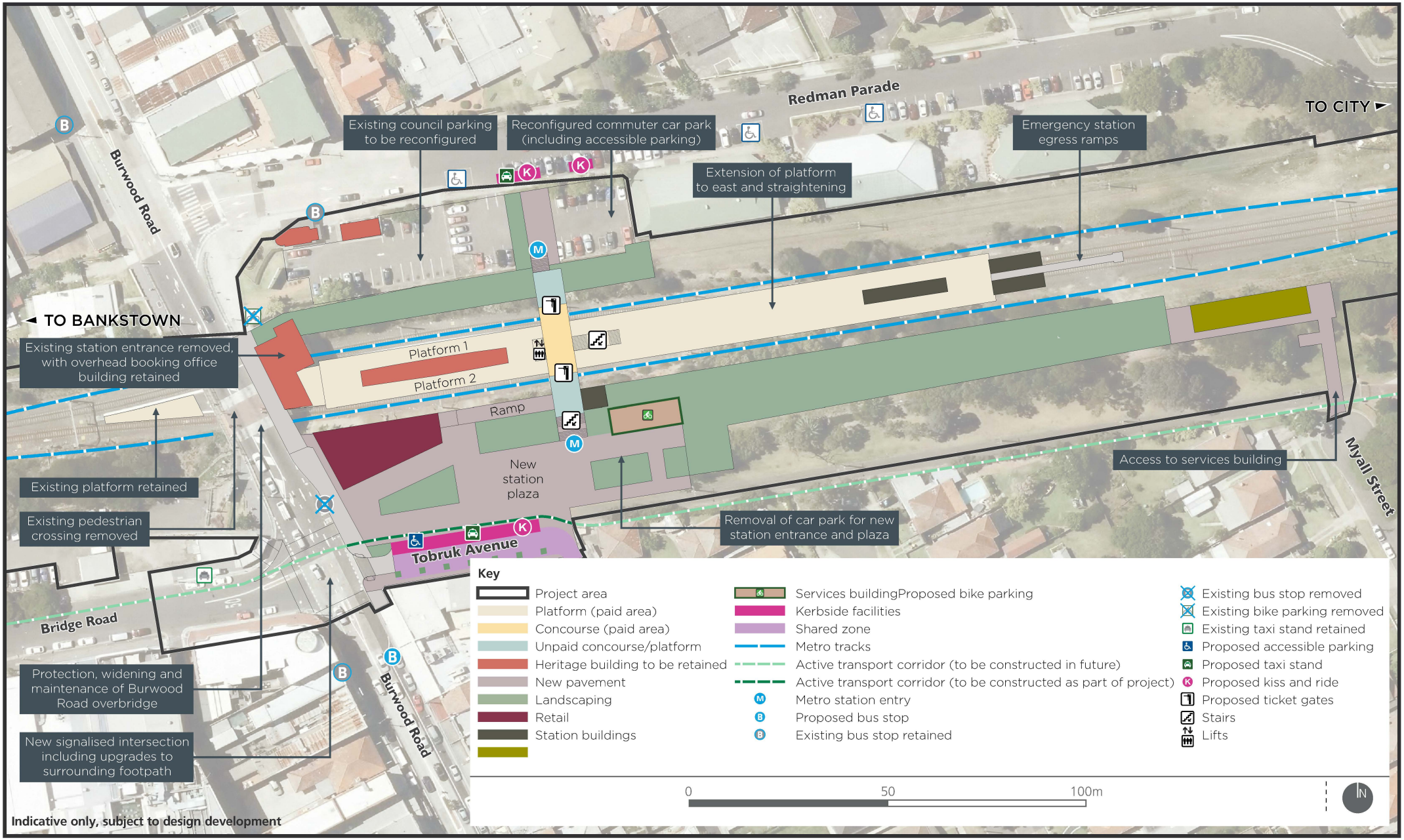
8.8.3 Integration with Cycle Network

There are currently five bike parking spaces at Belmore Station. It is proposed to increase this provision by approximately 60 additional spaces, some of which would be secure spaces. It is proposed that the bike parking facilities would be provided in the new station plaza south of the station (**Figure 8.10**). These facilities can be accessed from the existing cycle route on Bridge Road.

8.8.4 Integration with Buses

Table 8.10 shows a total increase in demand of 549 entries and 554 exits for Metro passengers travelling by bus to the station.

Bus routes 415 and 942 service the Belmore precinct, arriving approximately every 30 minutes (Sydney Buses 2016). These routes connect the precinct to Haberfield, Burwood, Strathfield, Campsie and Roselands.



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Belmore Station interchange plan

FIGURE 8.10

The southbound stop (routes 415 and 942) on Burwood Road would be moved south of Tobruk Avenue on the departure side of the proposed signalised intersection. There would be no change to the northbound stop. Bus stops would be visible from the southern station plaza but not from the station entry. The northbound and southbound bus stops would be approximately 150m from the Metro gate line and would have accessible paths to connect the stops to the station entry. For both stops, seating would be provided on the route to the station where practicable to enhance accessibility.

8.8.5 Integration with Road Network

Park and Ride and Kiss and Ride currently account for almost a third (32%) of the modal share collectively. **Table 8.10** shows an increase in demand for Park and Ride passenger entries of 480 and 518 exits. There is also an increase in demand for Kiss and Ride passenger entries of 246 and 266 exits.

Changes including the full signalisation of the intersection of Tobruk Avenue/ Bridge Road/ Burwood Road have been incorporated into the proposed station design to address the issues of increased road traffic.

Currently there are four Taxi spaces on Bridge Road immediately west of Burwood Road. It is proposed that these spaces be retained however; they may be affected by changes to Bridge/Burwood Road intersection when the detailed design occurs. One additional bay would be provided on Tobruk Avenue. This new bay would be visible and accessible from the station entry; at a distance of 60m.

Currently, the station has no Kiss and Ride parking facilities. The proposed design would provide four bays on Tobruk Avenue. Kiss and ride bays would be visible and accessible from the station. These Kiss and Ride bays would be approximately 60m from the station entry. Further new kerbside facilities would be provided outside the new station entrance to the north, on Redman Parade, including a taxi bay and Kiss and Ride facilities. These facilities would require alterations to the layout of on-street parking, and are therefore subject to further discussion with Council in order to minimise the potential impacts on parking.

The project would affect the existing council car park located off Tobruk Avenue, with a total of 48 spaces lost permanently lost as a result of the projectThis car park is timed and primarily services the retail area located along Burwood Road. The loss of these spaces are considered to be offset by capacity in surrounding streets with only about 80 per cent of spaces within 400 metres of the station utilised currently. This includes about 14 per cent of on-street timed parking in the vicinity of the station which would assist in offsetting the loss of the timed spaces within the car park.

Belmore Station currently has four parking areas. The 21% of Metro passengers who drive to the station and park their cars use one of the 914 on-street unrestricted car parks, 164 on-street time restricted car parks, 63 off-street unrestricted car parks, or one of the 79 off-street time restricted car parks (AECOM 2016). These car parks are currently operating at 75%, 84%, 82% and 100% utilisation respectively. This provides spare on street capacity for the further 480 passengers that are expected to drive to the station by 2026, assuming population growth and intensification do not provide a further demand for these spaces.

One accessible parking bay is proposed on Tobruk Avenue. It is not anticipated that loading zones would be impacted by the project design.

8.9 Lakemba Station

The Lakemba Station interchange plan is provided in **Figure 8.11**.

8.9.1 Metro Patronage and Access Mode to Station

The current and future travel modes to/from the station per day for Lakemba Station are shown in **Table 8.11**. These mode share increases are discussed in the relevant sections following.

Table 8.11 Current and future volumes of travel to/from Lakemba Station

Travel Mode to the Station	Entry			Exit			Mode Share 2016	Mode Share 2026
	2016	2026	Change	2016	2026	Change		
Walking	3,103	4,980	+1,877	2,979	4,980	+2,001	72.1%	67.3%
Cycling	8	15	+7	8	15	+7	0.2%	0.2%
Park and Ride	638	1,357	+719	612	1,357	+745	14.8%	18.3%
Kiss and Ride	425	534	+109	408	534	+126	9.9%	7.2%
Bus	128	514	+386	123	514	+391	3.0%	6.9%
Total	4,302	7,400		4,130	7,400		100.0%	100.0%

Source: Transport for NSW and extrapolated data

8.9.2 Integration with Walking Network

Table 8.11 shows a total increase in demand of 1,877 entries and 2,001 exits for Metro passengers walking to the station. The growth in passenger demand would increase the need for accessibility. The existing pedestrian facilities and proposed upgrades to Lakemba Station address a number of the issue of accessibility.

The current pedestrian crossing facilities are sufficient for safe crossing of pedestrians. However, improved permeability, re-grading and reconstruction of the southern plaza as part of the project would improve accessibility and provide more direct, safe routes to the station for passengers. An Opal card would be required to cross the concourse from The Boulevarde to Railway Parade. Whilst the pedestrian volumes to and from the station are set to rise by just over 3,800 people per day, the adjacent footpaths provide adequate capacity for these volumes. Flows of up to 13,000 pedestrians per hour can be accommodated on the footpaths immediately adjacent to the station exits on The Boulevarde and Railway Parade.

The signalised crossing at Haldon Street / The Boulevarde would provide a potential constraint to the flows as pedestrians heading south from the station would need to wait for the pedestrian phase; however the expected demand would be well below capacity. It considered that the footpath network in the area would be able to cater for the increased pedestrian flows associated form the project.

8.9.3 Integration with Cycle Network

There are currently eight bike parking spaces at Lakemba Station. It is proposed to increase bike parking capacity with approximately 60 additional spaces, some of which would be secure spaces. It is proposed that the bike parking facilities would be provided on either side of the station (**Figure 8.11**). Facilities to the south of the station can be accessed from the existing cycle route on The Boulevard.

8.9.4 Integration with Buses

Table 8.11 shows a total increase in demand of 386 entries and 391 exits for Metro passengers travelling by bus to the station.

Bus routes 450, 942, and 946 service the Lakemba precinct, arriving approximately every 15 minutes in peak periods (Sydney Buses 2016). Frequent services are provided to Roselands, Greenacre, Bankstown, Hurstville, Burwood and Strathfield.

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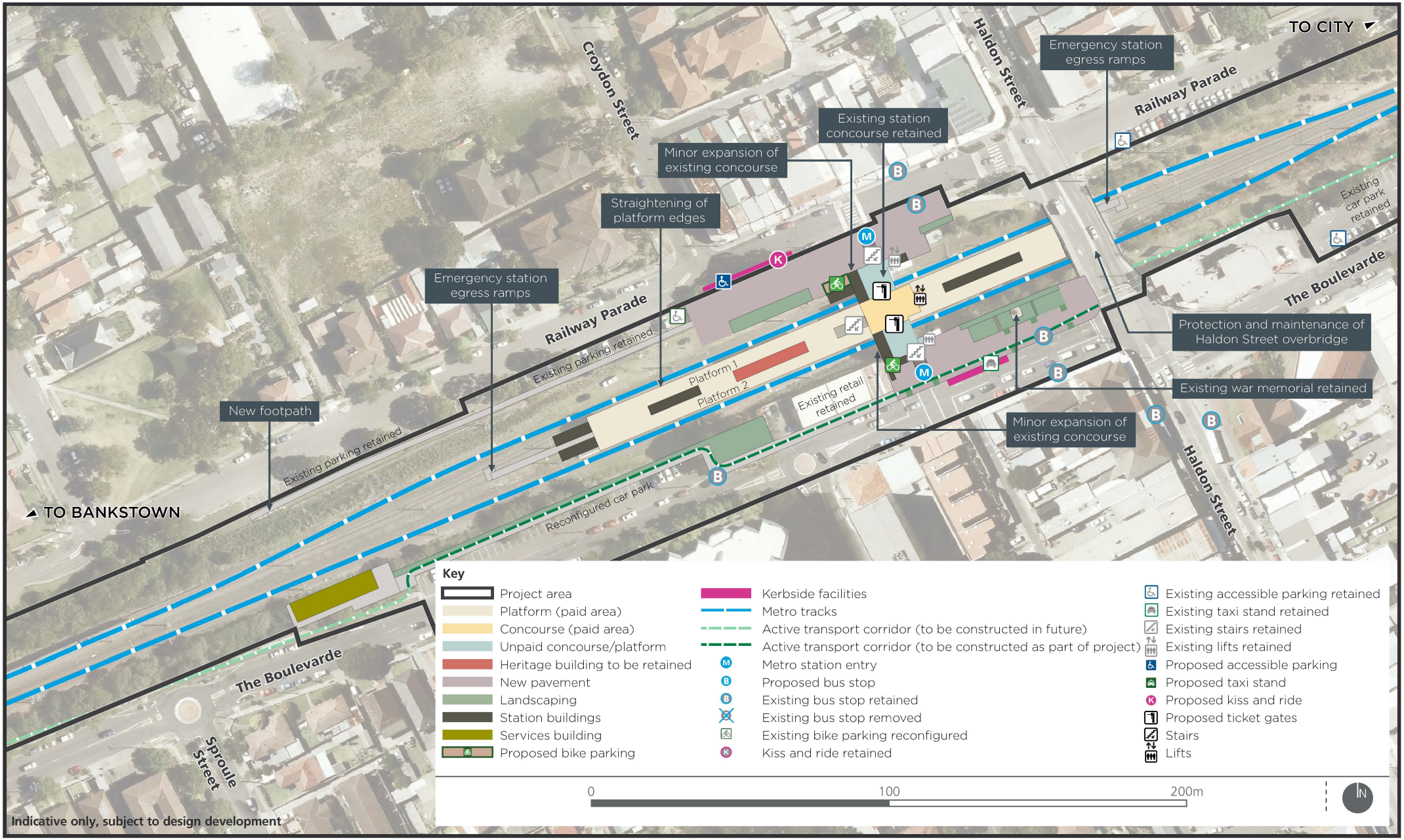

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Lakemba Station interchange plan

FIGURE 8.11

The Railway Parade (northern side) does not have an accessible path from the station entry. The Railway Parade (southern side) and The Boulevarde bus stops would be directly visible from the station plazas and entries. Accessible paths would connect the station entries to these bus stops. The Boulevarde (S14 stop) would be 50m from Metro gate line; Railway Parade bus stops (942 westbound) would be 40m from the Metro gateline; Haldon Street northbound bus stops (450, 946) would be 115m form the Metro gate line and Haldon Street southbound bus stops (450, 946) would be 140m from the Metro gate line. Where stops are more than 60m from the gatelines, seating would be provided on the route to the station where practicable to enhance accessibility.

8.9.5 Integration with Road Network

Park and Ride and Kiss and Ride currently account for a quarter of the modal share collectively. **Table 8.11** shows an increase in demand for Park and Ride passenger entries of 719 and 745 exits. There is also an increase in demand for Kiss and Ride passenger entries of 109 and 126 exits.

It is proposed that three Kiss and Ride spaces on Railway Parade, directly next to a new pavement area, would be provided as part of the project.

There are currently three signalised crossings for pedestrians to cross The Boulevarde and one on Haldon Street. In addition two pedestrian crossings on Railway Parade, one on Haldon Street, and one on Quigg Street North provide access to the footpath network around the station. The current pedestrian crossings are sufficient and no changes are proposed for the station.

Currently there are three taxi spaces on The Boulevarde. These spaces would be retained. The taxi facilities would be visible and accessible from the station entrance.

Lakemba Station currently has four parking areas. The 15% of Metro passengers who drive to the station and park their cars use one of the 775 on-street unrestricted car parks, 186 on-street time restricted car parks, 190 off-street unrestricted car parks, or one of the 347 off-street time restricted car parks (AECOM 2016). These car parks are currently operating at 86%, 83%, 100% and 77% utilisation respectively. This provides spare on street capacity for the further 719 passengers that are expected to drive to the station by 2026, assuming population growth and intensification do not provide a further demand for these spaces.

There are currently two existing accessible bays on Railway Parade, east of Haldon Street and two bays west of Haldon Street. However, neither location has an accessible path. There are two further bays off-street on The Boulevarde, east of Haldon Street. One additional accessible bay is proposed in Railway Parade adjacent to the Kiss and Ride spaces.

It is not anticipated that loading zones would be impacted by the project design.

8.10 Wiley Park Station

The Wiley Park Station interchange plan is provided in **Figure 8.12**.

8.10.1 Metro Patronage and Access Mode to Station

The current and future travel modes to/from the station per day for Wiley Park Station are shown in **Table 8.12.** These mode shares are discussed in the sections that follow.

Table 8.12 Current and future volumes of travel to/from Wiley Park Station

Travel Mode to the Station	Entry			Exit			Mode Share 2016	Mode Share 2026
	2016	2026	Change	2016	2026	Change		
Walking	1,800	4,440	+2,640	1,620	4,440	+2,820	89.7%	77.9%
Cycling	6	17	+11	6	17	+11	0.3%	0.3%
Park and Ride	120	534	+414	108	534	+426	6.0%	9.4%
Kiss and Ride	80	655	+575	72	655	+583	4.0%	11.5%
Bus	0	53	+53	0	53	+53	0.0%	0.9%
Total	2,006	5,700		1,806	5,700		100.0%	100.0%

Source: Transport for NSW and extrapolated data

8.10.2 Integration with Walking Network

Table 8.12 shows a total increase in demand of 2,640 entries and 2820 exits for Metro passengers walking to the station. The existing pedestrian facilities and proposed upgrades to Wiley Park Station address a number of the issue of accessibility.

Improved permeability at the station entry, including through the secondary entries south to The Boulevarde and north to Stanlea Parade which would provide direct access to the aerial concourse, would improve accessibility and provide more direct routes to the station for pedestrians.

Whilst the pedestrian volumes to and from the station are set to rise by over 5,400 people per day, the adjacent footpaths provide adequate capacity for these volumes. Flows of up to 5,000 pedestrians per hour can be accommodated on the footpath immediately adjacent to the station exit on King Georges Road.

The signalised crossing at The Boulevarde / King Georges Road would provide a potential constraint to the flows as pedestrians heading south from the station would need to wait for the pedestrian phase which may reduce the available footpath width due to crowding at certain times. However the expected demand would be well below the capacity and so it is considered that the footpath network in the area would be able to cater for the increased pedestrian flows associated form the project.

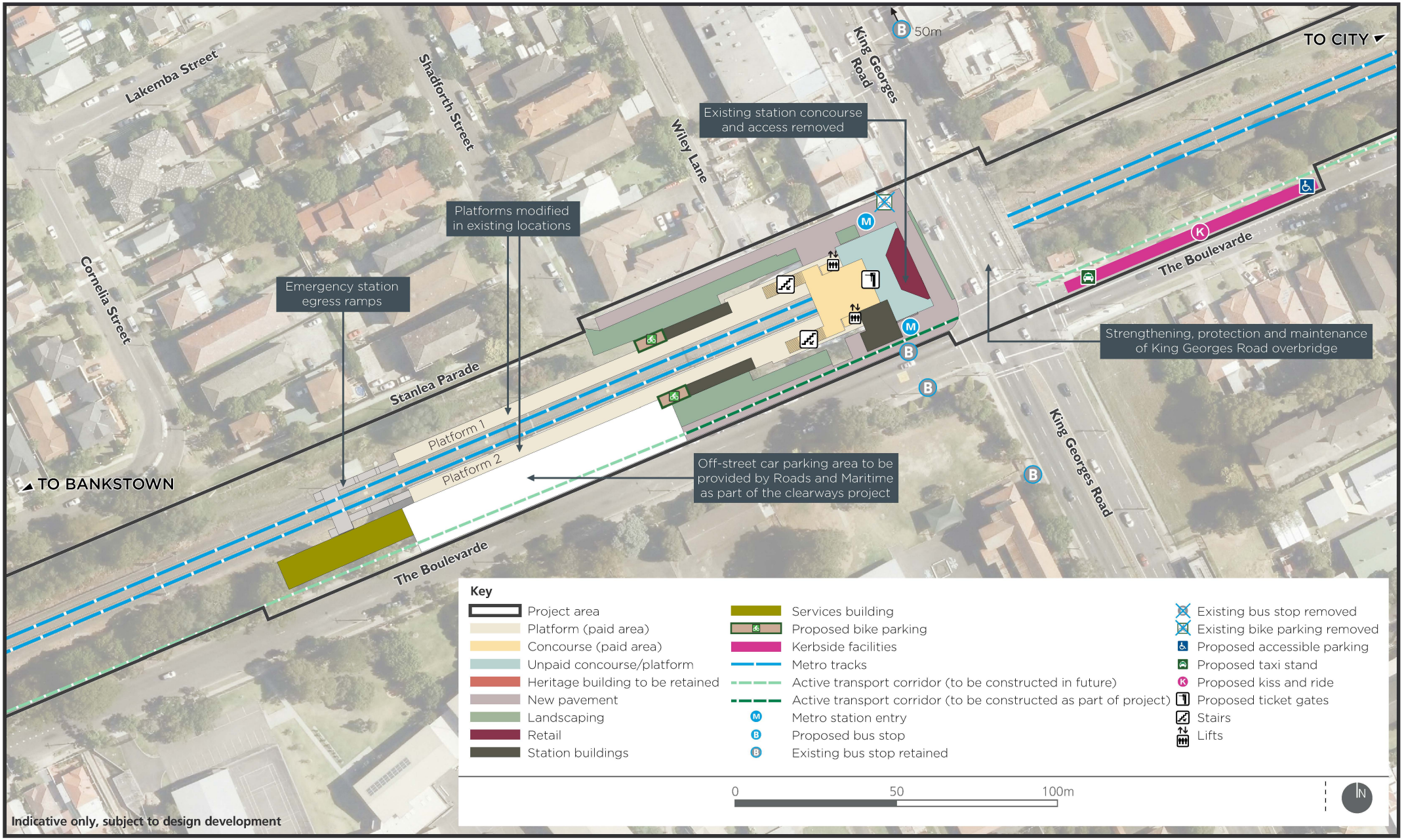
8.10.3 Integration with Cycle Network

Four bike parking spaces are provided at Wiley Park Station. It is proposed to increase this provision with approximately 30 additional spaces, some of which would be secure spaces. The bike parking facilities would be provided at platform level. These facilities can be accessed from the existing cycle route on The Boulevard and the south entrance.

8.10.4 Integration with Buses

Wiley Park is serviced by two local bus routes that provide access to Campsie, Roselands and Riverwood. Although bus route 942 travels directly past Wiley Park Station and there is a bus stop near the station on King Georges Road, Arup (2015) found that no commuters used the bus to connect to the station.

No changes are to be made to the current bus stop arrangement on The Boulevarde or King Georges Road. The King Georges Road (942) stops are not clearly visible from the station entry but are accessible. The northbound stop is approximately 75m from the station entry; the southbound stop is approximately 160m. For both stops, seating would be provided on the route to the station where practicable to enhance accessibility.



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Wiley Park Station interchange plan

FIGURE 8.12

8.10.5 Integration with Road Network

Park and Ride and Kiss and Ride currently account for 10% of the modal share collectively. **Table 8.12** shows an increase in demand for Park and Ride passenger entries of 414 and 426 exits. There is also an increase in demand for Kiss and Ride passenger entries of 575 and 583 exits.

Improved permeability at the station entry with entries south to The Boulevarde and north to Stanlea Parade, both providing direct access to an aerial concourse has been incorporated into the proposed station design to address the issues of increased road traffic and increased demand for pick up / drop off facilities.

There are currently two signalised crossings for pedestrians to cross The Boulevarde and two on King Georges Road. No additional pedestrian crossings are proposed.

Currently there are no Taxi spaces at the Station. One Taxi space would be provided on The Boulevarde east of King Georges Road. The taxi facilities would be accessible from the station entrance but not easily visible.

No Kiss and Ride bays are currently available at the station. The proposed design would provide five spaces on The Boulevarde east of King Georges Road. Kiss and ride bays would be accessible from the station although not easily visible. These Kiss and Ride bays would be approximately 90m from the station entry.

Wiley Park Station currently has no dedicated commuter parking areas. The 6% of Metro passengers who drive to the station and park their cars use one of the 693 on-street unrestricted car parks, 28 on-street time restricted car parks, or one of the 25 off-street unrestricted car parks (AECOM 2016). These car parks are currently operating at 64%, 32%, and 60% utilisation respectively. This provides spare on street capacity for the further 414 passengers that are expected to drive to the station by 2026, assuming population growth and intensification do not provide a further demand for these spaces.

It is proposed to provide one accessible bay on The Boulevarde, east of King Georges Road.It is not anticipated that loading zones would be impacted by the project design.

8.11 Punchbowl Station

The Punchbowl Station interchange plan is provided in **Figure 8.13**.

8.11.1 Metro Patronage and Access Mode to Station

The current and future travel modes to/from the station per day for Punchbowl Station are shown in **Table 8.13**. These mode share increases are discussed in the relevant sections following.

Table 8.13 Current and future volumes of travel to/from Punchbowl Station

Travel Mode to the Station	Entry			Exit			Mode Share 2016	Mode Share 2026
	2016	2026	Change	2016	2026	Change		
Walking	1,645	3,612	+1,967	1,573	3,612	+2,039	56.1%	55.6%
Cycling	3	7	+4	3	7	+4	0.1%	0.1%
Park and Ride	688	1,089	+401	658	1,089	+431	23.4%	16.8%
Kiss and Ride	509	991	+482	486	991	+505	17.3%	15.2%
Bus	90	801	+711	86	801	+715	3.1%	12.3%
Total	2,935	6,500		2,806	6,500		100.0%	100.0%

Source: Transport for NSW and extrapolated data

8.11.2 Integration with Walking Network

Table 8.13 shows a total increase in demand of 1,967 entries and 2,039 exits for Metro passengers walking to the station. The growth in passenger demand increases the need for accessible pedestrian links.

There are a number of improvements as part of the project including a new path connection and new pedestrian crossing on Punchbowl Road, an accessible ramp and path connection to Urunga Parade, relocated concourse and new entry plazas. These upgrades would improve accessibility and station legibility and provide more direct routes to the station for passengers from the nearby town centre and residential areas.

Whilst the pedestrian volumes to and from the station are set to rise by just over 4,000 people per day, the adjacent footpaths provide adequate capacity for these volumes. Flows of over 11,000 pedestrians per hour can be accommodated on the multiple footpaths which radiate from both sides of the station on Punchbowl Road (via pedestrian bridge) and The Boulevarde. Demand would be well below the footpath capacity and it is considered that the footpath network in the area would be well able to cater for the increased pedestrian flows expected.

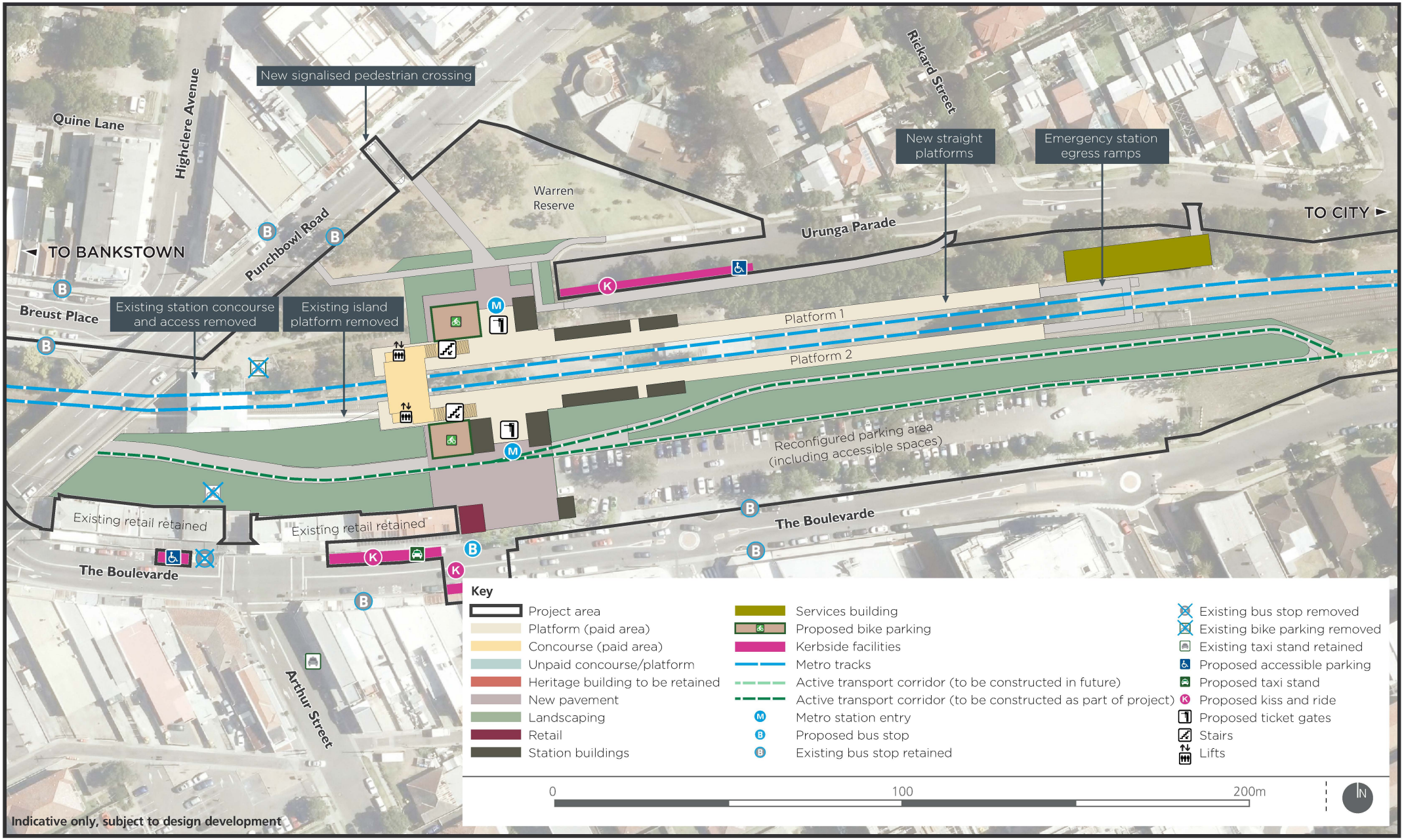
8.11.3 Integration with Cycle Network

There are currently 12 bike parking spaces at Punchbowl Station. It is proposed that this provision would be increased with approximately 60 additional spaces, some of which would be secure spaces. It is proposed that the bike parking facilities would be provided in the two station plazas, north and south of the station (**Figure 8.13**). These facilities can be accessed from the existing cycle route on The Boulevarde to the south and Urunga Parade to the north.

8.11.4 Integration with Buses

Table 8.13 shows a total increase in demand of 711 entries and 715 exits for Metro passengers travelling by bus to the station.

Bus routes 487, 940, 941, 944, and S14 service the Punchbowl precinct, arriving approximately every 20 minutes in peak periods (Sydney Buses 2016). These routes connect Punchbowl to Bankstown, Roselands, Riverwood and Hurstville.



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Punchbowl Station interchange plan

FIGURE 8.13

Only one change is proposed to be made to the current bus stop arrangement which involves the eastbound bus stop on The Boulevarde which is proposed to be moved slightly east to align it with the new station plaza. The stops would be visible from the southern station plaza and the station entry. Punchbowl Road stops would not necessarily be clearly visible from the northern station entry, requiring wayfinding signage which would be provided. Accessible paths of travel to bus stops from the station entry would be available. Bus stops on Punchbowl Road are between 65m and 115m from the Metro gate line and the bus stops on The Boulevarde are 38m and 130m from the Metro gate line. For both stops, seating would be provided on the route to the station where practicable to enhance accessibility.

8.11.5 Integration with Road Network

Park and Ride and Kiss and Ride currently account for 40% of the modal share collectively. **Table 8.13** shows an increase in demand for Park and Ride passenger entries of 401 and 431 exits. There is also an increase in demand for Kiss and Ride passenger entries of 482 and 505 exits.

A number of changes have been incorporated into the proposed station design to address the issues of increased road traffic and increased demand for pick up / drop off facilities.

There are currently three signalised crossings for pedestrians to cross The Boulevarde and one on Punchbowl Road. There is an additional signalised crossing proposed on Punchbowl Road closer to the station than the existing crossing.

Two existing Taxi spaces on Arthur Street would be retained at Punchbowl Station. An additional Taxi space would be provided on The Boulevarde. The taxi facilities would be accessible from the southern station entrance but not visible.

No Kiss and Ride bays are currently available at the station. The proposed design would provide additional spaces on The Boulevarde and Urunga Parade. The spaces on The Boulevarde would be visible from the southern station plaza. None of the spaces on Urunga Parade would be clearly visible from the station entry and therefore wayfinding signs would be needed. Accessible paths of travel to all bays would be available.

Punchbowl Station currently has four car parking areas. The 23% of Metro passengers who drive to the station and park their cars use one of the 626 on-street unrestricted car parks, 212 on-street time restricted car parks, 197 off-street unrestricted car parks, or one of the 88 off-street time restricted car parks (AECOM 2016). These car parks are currently operating at 79%, 78%, 100%, and 100% utilisation respectively. This provides spare on street capacity for the further 401 passengers that are expected to drive to the station by 2026, assuming population growth and intensification do not provide a further demand for these spaces.

It is proposed to provide two accessible bays on Urunga Parade and one bay on The Boulevarde.

It is not anticipated that loading zones would be impacted by the project design.

8.12 Bankstown Station

The Bankstown Station interchange plan is provided in **Figure 8.14**.

8.12.1 Metro Patronage and Access Mode to Station

The current and future travel modes to/from the station per day for Bankstown Station are shown in **Table 8.14**. These mode share increases are discussed in the relevant sections following.

Table 8.14 Current and future volumes of travel to/from Bankstown Station

Travel Mode to the Station	Entry			Exit			Mode Share 2016	Mode Share 2026
	2016	2026	Change	2016	2026	Change		
Walking	4,444	6,041	+1,597	4,621	6,041	+1,420	49.4%	50.8%
Cycling	13	18	+5	13	18	+5	0.1%	0.2%
Park and Ride	1,361	754	-607	1,415	754	-661	15.1%	6.3%
Kiss and Ride	1,724	1,751	+27	1,792	1,751	-41	19.2%	14.7%
Bus	1,451	3,337	+1,886	1,509	3,337	+1,828	16.1%	28.0%
Total	8,993	11,900		9,350	11,900		100.0%	100.0%

Source: Transport for NSW and extrapolated data

8.12.2 Integration with Walking Network

Table 8.14 shows a total increase in demand of 1,597 entries and 1,420 exits for Metro passengers walking to the station. The existing pedestrian facilities and proposed upgrades to Bankstown Station address a number of the issue of accessibility.

An introduction of a secondary concourse to the east with separate gate lines to Sydney Metro and Sydney trains platforms, in addition to the modifications and extension to existing southern and northern plazas to create new station entries, would improve accessibility and provide more direct routes to the station for passengers.

Whilst the pedestrian volumes to and from the station are set to rise by nearly 3,000 people per day, the wide footpaths adjacent to the station provide adequate capacity for these volumes. Flows of up to 16,000 pedestrians per hour can be accommodated on the footpaths immediately adjacent to the station exits.

It is considered that the footpath network in the area would be able to cater for the increased pedestrian flows associated form the project. To facilitate movement there are currently five signalised crossings for pedestrians on South Terrace and two on North Terrace. There is also a pedestrian crossing on Bankstown City Plaza and one on North Terrace.

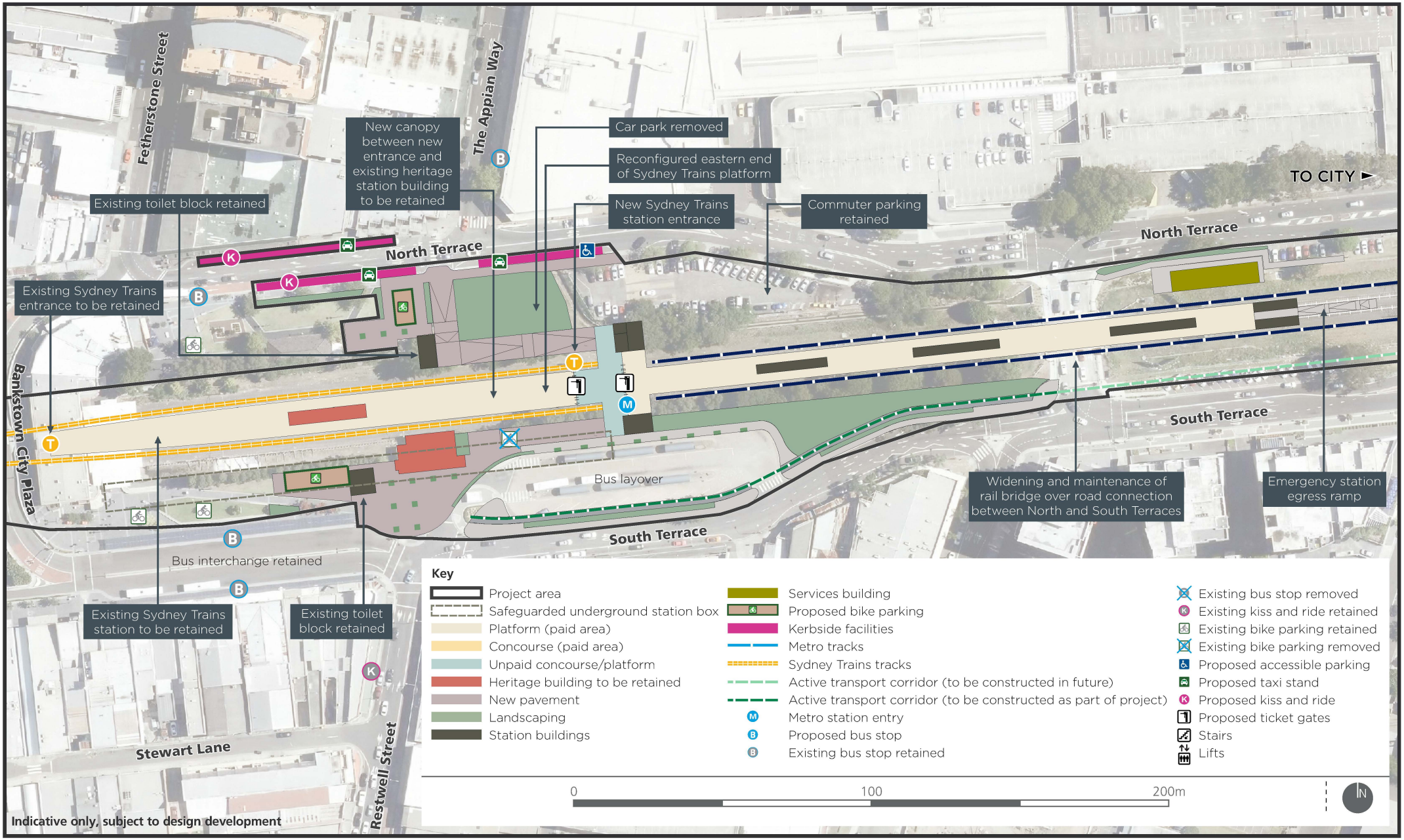
8.12.3 Integration with Cycle Network

There are currently 32 bike parking spaces at Bankstown Station. It is proposed to increase this provision with approximately 70 additional spaces, some of which would be secure spaces. It is proposed that the bike parking facilities would be provided in the two station plazas, north and south of the station entrances (**Figure 8.14**). These facilities can be accessed from the existing cycle route on South Terrace to the south and North Terrace to the north.

8.12.4 Integration with Buses

Table 8.14 shows a total increase in demand of 1,886 entries and 1,828 exits for Metro passengers travelling by bus to the station.

Bus routes 907, 908, 909, 911, 913, 922, 923, 924, 925, 926, 945, 962, M90, M91, and M92 service the Bankstown precinct, arriving approximately every ten minutes in peak periods (Sydney Buses 2016). Bankstown is serviced by a large number of buses as it is the main hub for buses serving the station on the Bankstown Line. These bus routes connect Bankstown to Parramatta, Lidcombe, Burwood, Liverpool, Fairfield, Hurstville and Sutherland.



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Bankstown Station interchange plan

FIGURE 8.14

No changes are proposed to the arrangement of bus stops. The current bus stops on South Terrace are between 120m and 200m from the Metro gate line and the current bus stop on North Terrace is 180m from the Metro gate line. There are accessible paths of travel to all bus stops. For both stops, seating would be provided on the route to the station where practicable to enhance accessibility. The South Terrace interchange would be visible from the southern station approach ramp and plaza, if not from the gate line. The North Terrace bus stop would be less visible from the station approach ramp, plaza and gate line.

8.12.5 Integration with Road Network

Park and Ride and Kiss and Ride currently account for 34% of the modal share collectively. **Table 8.14** shows a decrease in demand for Park and Ride passenger entries of 607 and for exits of 661. There is also an increase in demand for Kiss and Ride passenger entries of 27 and a decrease for passenger exits of 41.

A number of changes have been incorporated into the proposed station design to address the issues of increased road traffic and increased demand for pick up / drop off facilities.

There are currently five signalised crossings for pedestrians on South Terrace and two on North Terrace. There is currently a pedestrian crossing on Bankstown City Plaza and one on North Terrace.

Ten existing Taxi spaces would be retained and provided at Bankstown. The taxi facilities would be easily and visible accessible from the station entrance.

Four Kiss and Ride bays are currently available on North Terrace. The proposed design would increase the number of spaces to approximately 13. These Kiss and Ride bays would be easily and visibly accessible from the Station entrance.

Bankstown Station currently has four car parking areas. The 15% of Metro passengers who drive to the station and park their cars use one of the 58 on-street unrestricted car parks, 530 on-street time restricted car parks, 20 off-street unrestricted car parks, or one of the 1088 off-street time restricted car parks (AECOM 2016). These car parks are currently operating at 98%, 93%, 100%, and 100% utilisation respectively.

The car parking area adjacent to the station would probably require reconstruction following use as a construction compound, and this could result in approximately 15% loss of parking spaces (12 spaces). With the reduction in demand of 607 passengers expected to drive to the station by 2026, there is sufficient spare capacity at Bankstown Station, assuming population growth and intensification do not provide a further demand for these spaces.

Approximately one additional accessible bay is proposed on North Terrace.

It is not anticipated that loading zones would be impacted by the project design.

9.0 Mitigation Measures

9.1 Introduction

This chapter outlines the potential mitigation measures for the construction or operational phase of the project. Recognising the very different impacts between the temporary nature of the predominantly traffic based construction phase assessed in Chapter 5 and Chapter 6, and the multi-modal long term effects assessed in Chapter 8, this Mitigation Chapter considers these separately.

As described in previous chapters the specific construction mitigations would be developed as the details of the construction methodology and program evolve prior to, and during the construction phase. This chapter contains a suite of potential complementary mitigations that would be deployed following the more detailed assessment of the impacts as part of the development of the Construction Traffic Management Plans (CTMPs) when greater detail of the mode share during possessions is available.

9.2 Construction

Consideration of the construction haulage traffic, specifically the haulage of materials, shows that across all of the stations and intersections modelled, there is only one intersection which is forecast to become oversaturated as a result of the construction haulage traffic, and in that case, it is by a relatively small degree. In reality changes in commuter behaviour would potentially lead to the delays being managed (people travelling earlier or later, avoiding peak periods etc.) without the need for specific mitigation over and above basic communications.

However, the assessment undertaken in Chapters 5 and 6 addressing the impacts of the diversions to facilitate bridge works, and during the periods of the 'possessions' to allow station and track upgrades to be undertaken, shows that these activities would potentially lead to some more significant delays.

In order to support the mitigation of the temporary suspension of the rail services to current train users during construction, TfNSW has developed a Temporary Transport Strategy (TTS) to provide an overarching framework for Temporary Transport Plans (TTP) for the multi – modal transport network which would operate during each possession of the Bankstown line. This is provided in **Appendix E** and discussed further below.

9.2.1 Temporary Transport Strategy

The TTS is an overarching document that outlines how Sydney Metro would plan and deliver an integrated, multi-modal transport network during possession periods to allow the upgrade of the stations to Metro standards and to improve accessibility. A Temporary Transport Plan (TTP), or a suite of TTPs would be developed for each possession. Each TTP would define the initiatives that would be implemented for that possession.

Each TTP would consider the following initiatives:

Temporary Rail Services

- providing additional train services on the parallel rail lines to the north (T2 South and Inner West Line), and the south (T2 Airport Line) of the Bankstown Line to accommodate anticipated increases in demand
- providing altered train services on the sections of the Bankstown Line that are not being converted to Metro operations (west of Bankstown to Lidcombe and Liverpool, and from Sydenham east to the Sydney CBD).

Temporary Bus Services

- providing temporary bus services that travel along the Bankstown Line which offer optimised stopping patterns to serve customer needs, which may be different to existing train stopping patterns

- providing temporary bus services between Bankstown Line stations and stations on other rail lines, to provide faster travel times
- considering potential additional stops for temporary bus services (i.e. in addition to railway stations) as a means of improving customer access to the temporary bus services
- providing additional frequency on regular bus routes which may offer customers a more attractive alternative to the temporary bus services
- providing specialised services for customers with impaired mobility who may not be able to use the temporary bus services.

Supporting Infrastructure

- providing bus stops, shelters and seating for customers waiting to catch temporary bus services. Stops would be designed to be safe, accessible and well-lit. Shelters could either be temporary or permanent, depending on the location
- identifying improvements to the station facilities on the other rail lines that Bankstown Line customers may be diverted to
- identifying and implementing bus priority measures to improve travel times for temporary bus services
- identifying and implementing road network improvements to mitigate increased road network demand, such as adjustments to traffic signals.

Walking and Cycling

- identifying and implementing walking and cycling connectivity and amenity improvements along the Bankstown Line to support temporary bus services
- identifying and implementing walking and cycling improvements at stations on other rail lines to enhance customer experience connecting to alternate train services at unfamiliar locations
- improving bicycle parking facilities at stations on other rail lines to retain existing customers and attract new customers who choose cycling to access rail stations
- identifying measures that encourage affected customers to cycle and walk as an alternative means of commuting.

Customer Engagement and Information

- working with stakeholders including Councils and community organisations to better understand and communicate with our different types of customers, including those with special needs or from non-English speaking backgrounds
- developing and delivering comprehensive customer information and notifications before and during the possessions
- providing wayfinding and information signage at affected stations and TTP bus stops to assist customers to use temporary transport services provided
- supporting travel demand management initiatives, such as encouraging car-pooling for customers who choose to drive instead of using the other modes available.

9.2.2 Temporary Transport Plan Assessment

For the purposes of assessment, a Baseline TTP and a Refined Baseline TTP have been developed. The Baseline TTP closely emulates the rail replacement services that are provided during scheduled weekend possessions which occur several times each year to enable maintenance works (refer **Section 4.4).** On the other hand, the Refined Baseline TTP includes a reduced number of buses (and changes to potential service patterns) in recognition of the potential impact of the complimentary measures set out above.

The TTP assessment found that the combination of construction haulage traffic and Baseline TTP and Refined Baseline TTP services led to over saturation of some intersections resulting in poor performance (LoS E and F). While the lower bus numbers associated with the Refined Baseline TTP helped to reduce the impacts, it was generally insufficient to significantly improve intersection performance. The intersections forecast to experience poor performance in the Refined Baseline TTP assessment are identified in **Table 5.50**.

The five worst performing intersections were identified and mitigation measures were tested. The outcomes of this are displayed in **Table 9.1**

Table 9.1 Intersection Mitigation Summary

Intersection	Mitigation Measure Tested	Outcome
Marrickville Road / Victoria Road	Changes to traffic signal phasing	AM peak performance remains at LoS F PM Peak performance increased to LoS D. Further options such as increasing the cycle time are available to improve the AM Peak performance.
Wardell Road / Ewart Street	Reconfiguration of and designations and changing traffic signal phasing.	AM and PM Peak performance increased to LoS D.
Marrickville Road / Wardell Road	Reconfiguration of approach lanes and lane designations and changes to traffic signal phasing.	AM Peak performance increased to LoS D PM Peak performance increased to LoS C
Burwood Road / Bridge Road	Banning the through and right turn movement from Bridge Road west *or* Early implementation of the signalled intersection that would be provided for the operational phase.	The AM and PM Peak performance remains at LoS F (as in the existing situation and TTP assessment). The degree of saturation and vehicle delays are significantly reduced. The AM and PM intersection performance would be LoS B and C respectively under the refined TTS scenario.
Burwood Road / Lakemba Street	Reconfiguration of lanes and lane designations and changes to traffic signal phase times. Removal of two parking spaces on Lakemba Street west to allow more vehicles to queue without impacting right turning vehicles.	AM and PM peak performance increased to LoS B
Haldon Street / Railway Parade	Signalisation of the intersection.	The intersection performance would be improved to a level which is significantly better than the existing situation. AM Peak performance increased to LoS B PM Peak performance increased to LoS A

9.2.3 Construction Mitigation

Travel Demand Management

One of the key opportunities for mitigating the impacts of the project would be to manage the traffic demand on the road network. This approach is known as Travel Demand Management (TDM). A TDM campaign informs the public of works and then their anticipated effect on the transport network, and highlights the opportunities for those travellers with flexibility to travel earlier or later than the peak to reduce their travel time. As a result of this spreading of the peak period, there is a reduction in the demand, and therefore delays at the height of the main peak period.

A TDM approach would also typically include measures to support the use of alternate modes of travel to the private car, including walking, cycling and public transport where appropriate. In this case the modal aspect of the TDM would be focussed on supporting existing train passengers to make use of other modes, including those rail replacement bus services detailed in the TTP, to walk and cycle to stations on alternate lines or to use scheduled bus services.

Mitigation measures

Mitigation measures to avoid, reduce and manage the potential impacts are identified in **Table 9.2**. These have been developed with the aim of minimising impacts where practicable to the travelling public by providing alternative travel options, prompt and up to date information, management of construction workforce travel and construction haulage routes, incident management and regular auditing of performance of the measures proposed. In line with the TfNSW modal hierarchy careful consideration has been given to safeguarding access for pedestrians and cyclists during bridge closures, route diversions and in the vicinity of worksites.

Table 9.2 Recommended mitigation measures during construction

Reference	Recommended Mitigation Measures	Applicable location (s)
1	Ongoing consultation would be carried out (as relevant) with Roads and Maritime Services, Sydney Trains, NSW Trains, local councils, emergency services and bus operators for the duration of the construction period.	All stations, worksites, construction haulage routes and TTS routes
2	Temporary Transport Plans (TTP) would be developed in accordance with the Temporary Transport Strategy (TTS) for the T3 Bankstown Line possession periods. As described in detail in **Section 9.2.1** each TTP would include consideration of the following: • provision of temporary bus services to help to transport displaced passengers • increasing the frequency of existing bus services at specific locations • improving cycle facilities at stations on other lines • potential road network enhancements and/or bus interchange improvements to support temporary bus service operations • reviewing the facilities and commuter parking at stations on other lines that customers may need to use. The performance of each TTP would be reviewed on a regular basis to enable continuous improvement.	All stations and extended to include Sydenham Station, Regents Park Station, Lidcombe Station, Birrong Station and Yagoona Station

Reference	Recommended Mitigation Measures	Applicable location (s)
3	Possession periods would where practicable be scheduled during school break periods when the road network is less busy. This would be a priority for the following bridges where lower levels of background network demand during school break periods would help to mitigate the impacts of closures: • Charlotte Avenue Underbridge • Illawarra Road Overbridge • Burwood Road Overbridge • Haldon Street Overbridge • King Georges Road Overbridge • Stacey Street Overbridge. The durations of all indicative closures would be reviewed and refined in consultation with key stakeholders, with additional assessment undertaken as required.	All stations affected by construction as part of this project
4	Adequate wayfinding signage would be provided during implementation of the TTP to facilitate passenger transfers to bus/ train. This would direct and guide passengers to and from temporary bus stops, station entrances, bike racks and storage, taxis, kiss and ride, park and ride facilities etc. Wayfinding would be delivered by a combination of temporary signage and additional staff to provide assistance.	All stations, including Sydenham Station, Regents Park, Lidcombe Station, Birrong Station and Yagoona Station
5	Traffic signals would be optimised to improve intersection performance at locations worst affected by the addition of construction haulage vehicles, TTP buses, diverted traffic or expected traffic growth. Optimisation measures would include: • modifying signal phase times • modifying signal sequences.	Intersections on construction or TTS routes which are identified as being worse than 'LoS E' as assessed in the CTMP's developed in advance of construction
6	Minor intersection upgrades would be considered in the detailed design to improve intersection performance at the locations most affected by the addition of construction haulage vehicles, TTS scenario buses and diverted traffic. These improvements include: • changing lane designations (line markings and signage) • removing parking or implementing no standing zones at peak times to expand lane capacity • minor kerb cut-backs to enable large vehicles to navigate through intersections • restricting specific turning movements where existing volumes are low • signalising intersections.	Intersections on construction haulage or TTS routes

Reference	Recommended Mitigation Measures	Applicable location (s)
7	A construction traffic, transport and access management plan would be prepared as part of the Construction Environmental Management Plan including a detailed list of the measures that would be implemented during construction to minimise the potential impacts on traffic, transport and access. The sub-plan would include consideration of: *Reducing the Impact of Construction Haulage Traffic on the local Road Network* • managing hours of work and deliveries • worker transport and parking • provision of on-site tool storage. *Safe Access and Egress for Construction Haulage Traffic* • road safety audits at construction sites and key locations on construction haulage routes • minimise / eliminate reversing movements into and out of sites. *Efficient Access for Construction Haulage Traffic* • directional signage and line markings in the immediate vicinity of construction sites. *Advising the Public of Potential Disruption* • variable Message Signs on the wider road network to advise of potential delays, traffic diversions, speed restrictions or alternate routes • provision of real-time information on traffic conditions on TTP routes. *Advising of Diversion Routes* • alternative routes developed and signed for pedestrians, cyclists, buses and general traffic for the periods when partial or full bridge closures are in place. The alternative routes would be developed in consultation with key stakeholders. *Bridge Construction Programming* • where feasible, design of the construction program to restrict works from being carried out simultaneously on adjacent bridges. This would reduce the number of traffic diversions required at the same time. The sub-plan would be informed by consultation with relevant organisations such as Sydney Co-ordination Office, Roads and Maritime Services, Sydney Trains, NSW Train Link, RailCorp, Police, taxi operators (as appropriate), emergency services and bus operators.	All stations affected by construction as part of this project

Reference	Recommended Mitigation Measures	Applicable location (s)
8	Construction sites would be managed to minimise the number of construction workers parking on surrounding streets by: • encouraging workers to use public or active transport • encouraging ride sharing • provision of alternative parking locations and shuttle bus transfers where feasible and reasonable.	Project as a whole
9	Minor road improvements would be considered in the detailed design to enable bus operations to occur while diversions are in place for TTS scenarios, construction scenarios and bridge works. These improvements may include: • removing or trimming trees where buses are proposed to operate in the kerbside lanes and trees currently overhang the operating envelope • extended or new clearways by removing on street parking • enabling right turn movements at intersections that currently ban the movement • traffic signal phase changes	Roads and intersections that have traffic diversions or additional buses operating
10	The closure of Illawarra Road, Canterbury Road and Beamish Street during bridge works would be assessed in detail in consultation with Roads and Maritime Services, the Sydney Co-ordination Office and the Inner West and Canterbury-Bankstown Councils to confirm impacts and mitigation measures, with the aim of minimising the impacts of bridge closures.	Illawarra Road, Canterbury Road and Beamish Street
11	Any modifications to existing bus stops and services would be undertaken in consultation with the Sydney Co-ordination Office, Roads and Maritime Services, the Inner West and Canterbury-Bankstown councils, and bus operators. Planning for during partial or full bridge closures would consider bus rerouting and timetabling, with the intention of minimising impacts to bus users.	All stations affected by construction as part of this project
12	The community would be advised in advance of proposed road and pedestrian network changes through appropriate forms of community notification. Information on route changes, delays and incidents would be provided to enable passengers to change travel plans and make alternative arrangements.	All stations, including Sydenham Station, Regents Park, Lidcombe Station, Birrong Station and Yagoona Station
13	In the event of a traffic related incident, co-ordination would be carried out with the Sydney Coordination Office and Transport Management Centre's Operations Manager.	All stations, Construction haulage routes and TTS routes

Reference	Recommended Mitigation Measures	Applicable location (s)
14	Pedestrian, cyclists and motorist safety in the vicinity of the construction compounds and work sites would be managed by: • use of speed awareness signs in conjunction with Variable Message Signs near construction sites to provide alerts to drivers • manual supervision and /or physical barriers (as appropriate) • community educational events • specific construction driver training to understand route constraints, expectations, safety issues, human error and its relationship with fitness for work, and chain of responsibility duties, and to limit the use of compression braking • use of in vehicle monitoring systems (telematics) to monitor vehicle location and driver behaviour • safety devices on construction haulage 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. • time restrictions for site vehicle movements near schools where practicable (such as near Wiley Park and Punchbowl stations) to ensure they are not occurring during school start and finish times.	Project as a whole
15	Where existing footpath routes used by pedestrians and / or cyclists are affected by construction, a condition survey would be carried out to confirm that alternative routes are of adequate width, are safe and accessible and are suitable for use (e.g. suitably paved and lit), with any necessary modifications to be carried out in consultation with the relevant local council.	All stations affected by construction as part of this project
16	Where existing cyclist facilities (eg bike parking) would be temporarily unavailable at a station, suitable replacement facilities would be provided for this duration.	All stations affected by construction as part of this project
17	Access to neighbouring properties would be maintained during construction, where possible. Where impacts are identified, consultation would be undertaken with the occupants of neighbouring properties, to confirm their access requirements and to discuss alternatives.	Project as a whole
18	Access to stations and surrounding properties for emergency vehicles would be provided at all times. Emergency service providers (i.e. police and ambulance) would be consulted during construction to ensure they are aware of changes to access including lane, bridge or road closures.	Project as a whole

Reference	Recommended Mitigation Measures	Applicable location (s)
19	Opportunities to reduce the impact on car parking would be reviewed during detailed design and construction planning, and where practicable, construction sites impacting on dedicated commuter parking would be reduced in size during non-possession periods.	All stations affected by construction as part of this project
20	Where existing parking needs to be removed to facilitate construction, alternative parking would be provided wherever feasible and reasonable. This would include consideration of other privately owned (or vacant) land within close proximity to affected stations.	All stations affected by construction as part of this project
21	Specific traffic management plans would be prepared for special events. These would be developed in conjunction with the relevant stakeholders and event organisers and would provide safe and efficient pedestrian, cycle, public transport and traffic flows during occasional events to minimise disruption to the community throughout construction.	All stations, (including Sydenham Station, Regents Park, Lidcombe Station, Birrong Station and Yagoona Station during possession periods)
22	The potential cumulative effects of construction traffic from multiple construction sites, road modifications and rail replacement buses would be further considered during the development of the construction traffic management plan. Where there is potential for cumulative impacts across the project or with other projects, these issues would be addressed by the Traffic and Transport Liaison Group.	Project as a whole

Within Chapter 5 several of the intersections that were assessed to be most likely to result in significant delays had mitigation plans developed and were then retested. These mitigation plans focussed on providing capacity enhancements, as opposed to the Travel Demand Management options that are also outlined in the above tables. As a result of these sample mitigation strategies, it was demonstrated that with realistic temporary mitigation strategies, it was possible to mitigate the effects of the construction and the Refined Baseline TTP.

These demonstrate that whilst the detailed and specific mitigations required would be identified through a detailed assessment of the impacts as part of the preparation of the individual CTMPs, the 'toolkit' of measures contained in the table above would enable impacts to be mitigated. The development of the selected mitigations presented in Chapter 5 are evidence of the feasibility of this approach.

9.3 Operational Phase

As identified in Chapter 8, the stations have been designed to integrate with other transport modes, including the following:

- walking and cycling
- rail and bus
- park and ride.

In addition to the measures which have already been applied to the project, mitigation measures to avoid, reduce and manage potential operation traffic and transport effects are identified in **Table 9.3**.

Table 9.3 Recommended mitigation measures during operation

Reference	Recommended Mitigation Measures	Applicable location (s)
23	Regular review and monitoring of existing pedestrian and cycle crossing facilities and connections, and implement safety and amenity related upgrades as required during initial operational years	All stations
24	Review and updating scheduled bus services adjacent to stations as required	All stations
25	Advisory and way finding signage to and from station precincts	All stations
26	Regular review and monitoring of commuter car and bike parking and kiss & ride facilities during the first few operational years, and implementing additional parking facilities / parking management as required	All stations

10.0 Cumulative Project Assessment

An assessment was undertaken of cumulative impacts from major projects being constructed or becoming operational with overlapping areas of influence including TfNSW and RMS major projects and those listed on the DP&E Major Projects Register.

10.1 Sydney Metro City & Southwest, Chatswood to Sydenham

The Chatswood to Sydenham component of the Sydney Metro City & Southwest project is to be constructed at the northern extent of the project. Whilst in operation there would be by definition cumulative impacts from the two components of the one project, the construction periods of the schemes would also overlap with potential cumulative impacts on the local and wider road network.

As previously discussed in Chapter 5**,** the extent of works that would occur in the project area includes both station upgrades and track works to enable the rail line upgrade. Designated construction haulage routes have been nominated to service the entire project area from Marrickville to Bankstown. Following a comparison of the haulage routes of the construction haulage traffic for both components of the Sydney Metro City & Southwest project; the station works for Sydenham Station and the Sydney Metro Trains Facility South were identified as the only sites which could provide cumulative impacts to the Sydenham to Bankstown component.

10.1.1 Construction Haulage Routes

From the indicative project timeline below in **Figure 10.1** below, it can be seen that there would be the potential for sequencing both the station works at Sydenham Station and the tunnel work at Sydney Metro Trains Facility South in parallel with the track and station works for the Sydenham to Bankstown component.

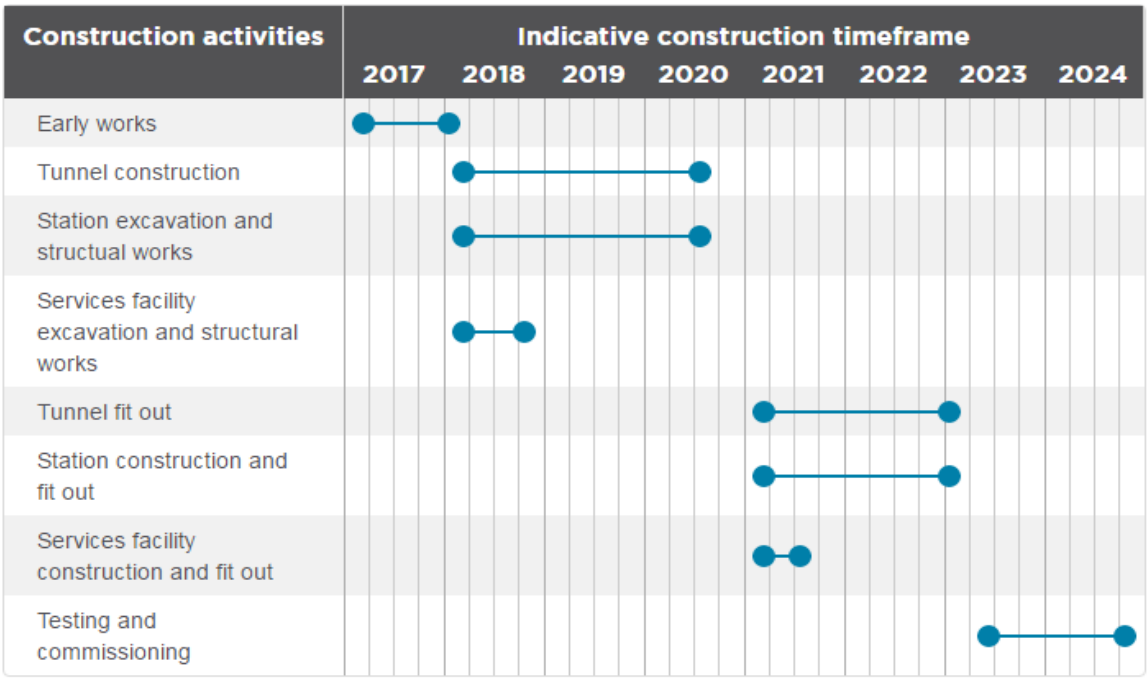
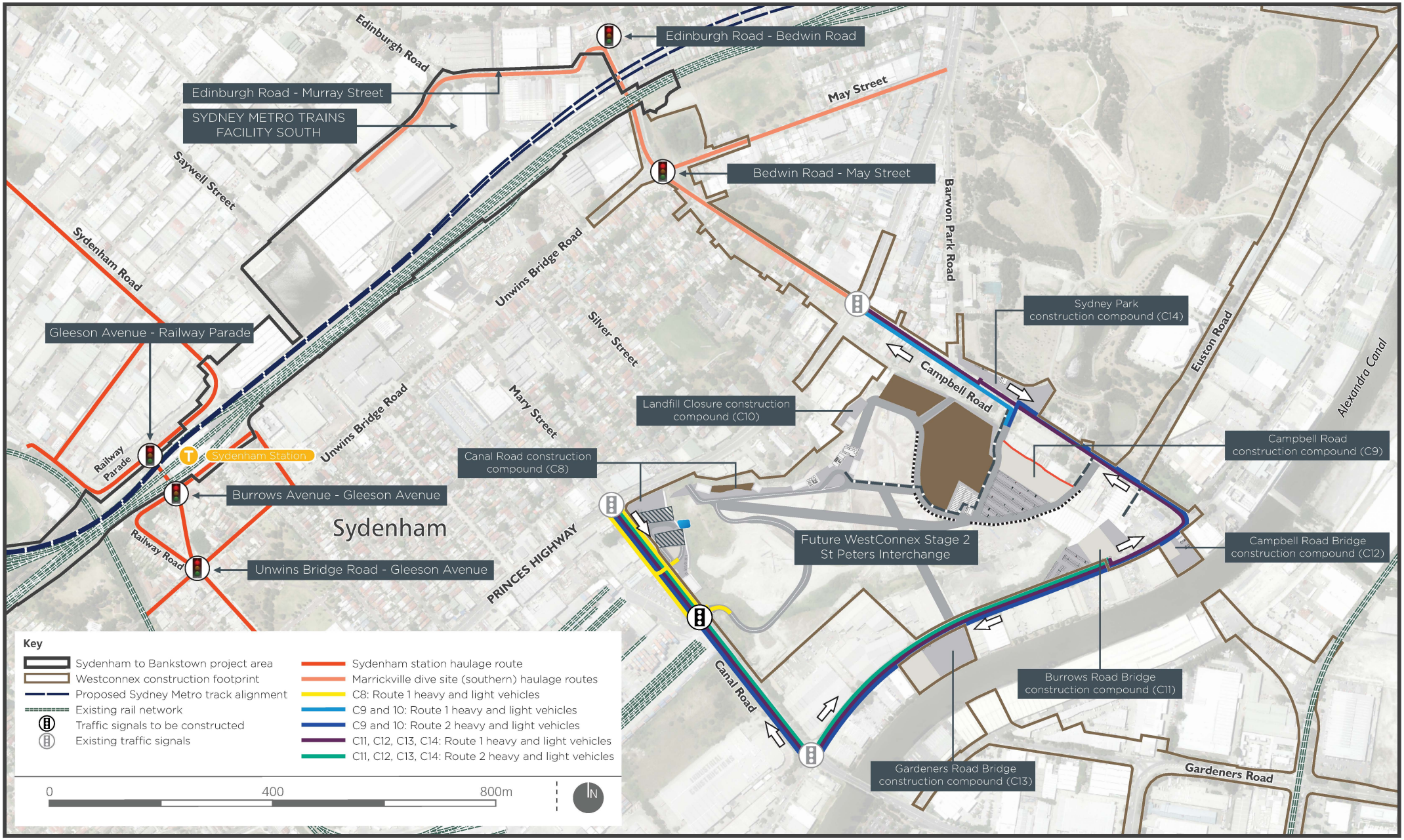


Figure 10.1 Sydney Metro City & Southwest Indicative Project Timeline

However, although the works adjacent to the C2S component are in close proximity to Marrickville Station, the designated construction haulage routes would not impact or overlap between the components. The major east-west movement for Marrickville Station uses Marrickville Road, whereas heavy vehicles at Sydenham Station would use the parallel Sydenham Road. The designated construction haulage routes for the two components are shown in **Figure 10.2** and **Figure 10.3** overleaf.



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WestConnex, Sydenham Station and Marrickville dive site (south) - haulage routes

FIGURE 10.2

Marrickville Station modelled intersections and heavy vehicle haulage routes

FIGURE 10.3

As can be seen in **Figure 10.2** above, the designated construction haulage routes for the Sydney Metro Trains Facility South do not overlap with those of the Sydenham to Bankstown component either.

As there would be no overlap of haulage routes, there would be no cumulative impacts for the project arising from the track and station works for Sydenham Station and the Sydney Metro trains Facility South.

10.1.2 Temporary Transport Strategy

As discussed above, the upgrade of Sydenham Station and the corresponding track works could occur in parallel with the project. As such, the proposed temporary transport strategy would operate with replacement buses at the same time as the works at Sydenham Station as part of the Chatswood to Sydenham component. As the designated construction haulage routes at Sydenham Station and the TTS routes overlap (as shown in **Figure 10.4** below)**,** it would be expected that there would be a cumulative impact on the project.

The discussion below outlines this cumulative impact of the construction haulage vehicles at the previously assessed intersections at Sydenham Station with the Refined Baseline TTP volumes.

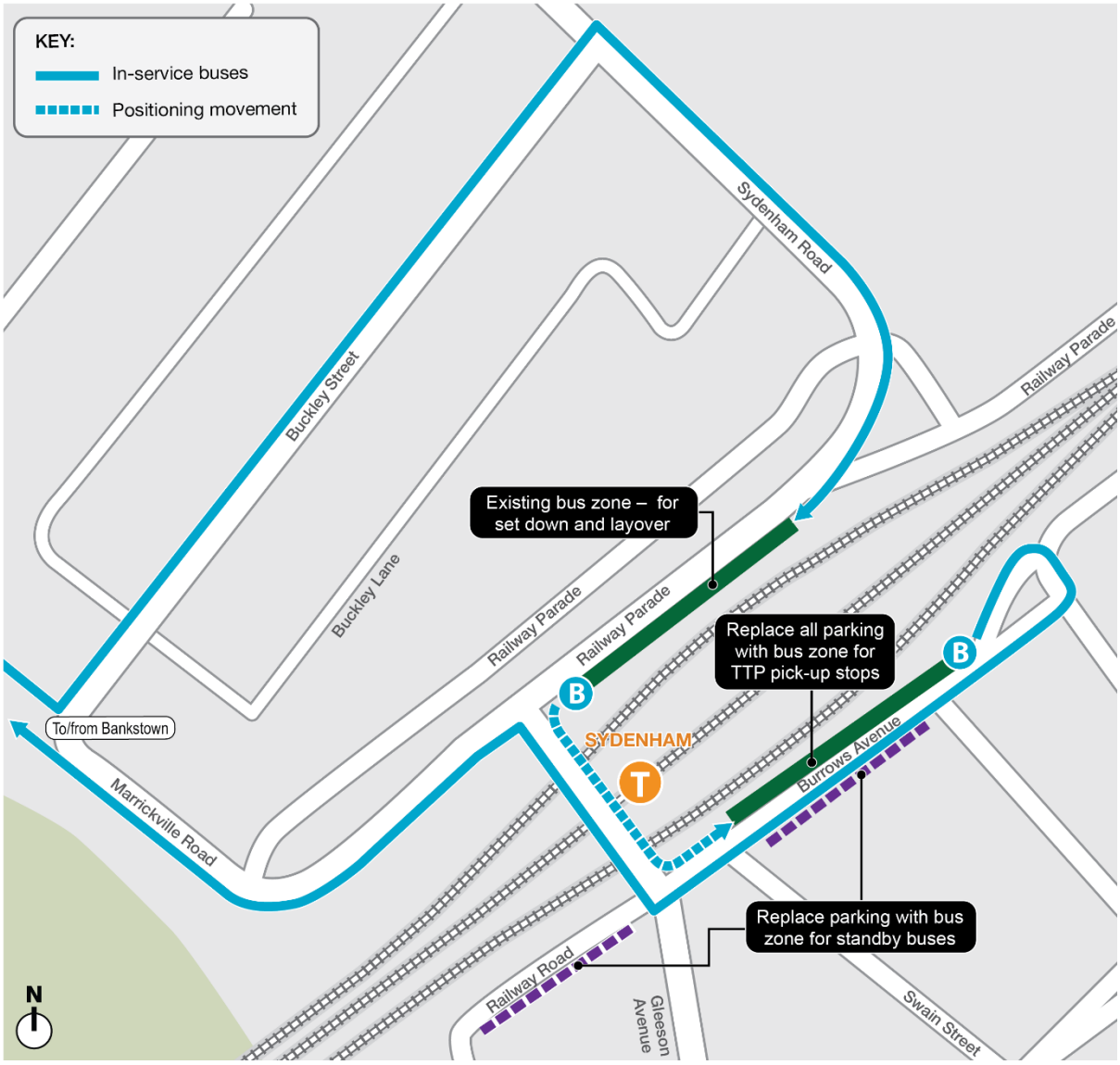


Figure 10.4 Temporary Transport Strategy - Sydenham (Sydney Metro 2016)

Road Network Performance - AM Peak

As can be seen from **Table 10.1** below, the addition of the construction haulage vehicles at Sydenham Station does not have a significant cumulative impact on the Refined Baseline TTP scenario for the key intersections assessed. All intersections maintain their LoS with the addition of the construction haulage vehicles onto the Refined Baseline TTP scenario and there would be no more than four seconds of additional delay which would be observed at the Gleeson Avenue / Unwins Bridge Road intersection.

The intersections do not decrease in amenity with the additional construction haulage vehicles as the additional volumes are low. The additional construction haulage vehicles would add a further 28 movements per hour, being approximately 1% of the background traffic and TTP flows.

Table 10.1 Sydenham Station Intersection Assessment - AM Peak Cumulative Construction Haulage Vehicles

Sydenham Station – AM Peak					
Scenario	**Existing**	**Future**	**Baseline TTP**	**Refined Baseline TTP**	**Refined Baseline TTP + construction**
B.19 Gleeson Avenue / Burrows Road (Signals)					**Year Capped: 2023**
Demand Flow (veh)	1962	2155	2363	2268	2291
Average Delay per Vehicle (Average over all arms in seconds)	16	15	20	17	18
LoS (Overall)	B	B	B	B	B
DoS (Worst Movement)	0.67	0.67	0.89	0.76	0.90
H.23 Gleeson Avenue / Railway Parade (Signals)					**Year Capped: 2023**
Demand Flow (veh)	2413	2650	2856	2762	2788
Average Delay per Vehicle (Average over all arms in seconds)	5	5	7	5	6
LoS (Overall)	A	A	A	A	A
DoS (Worst Movement)	0.49	0.54	0.80	0.58	0.75
H.24 Gleeson Avenue / Unwins Bridge Road (Signals)					**Year Capped: 2023**
Demand Flow (veh)	2082	2286	2286	2286	2313
Average Delay per Vehicle (Average over all arms in seconds)	29	37	37	37	41
LoS (Overall)	B	C	C	C	C
DoS (Worst Movement)	0.78	0.92	0.92	0.92	0.97

Road Network Performance - PM Peak

The impacts of the addition of the construction haulage vehicles to the Refined Baseline TTP scenario would be similar to those in the AM peak and it can be seen from **Table 10.2** below that there would be little to no cumulative impact on the key intersections assessed. All intersections would maintain their LoS with the addition of the construction haulage vehicles onto the Refined Baseline TTP scenario and there it would be expected that there would be no additional delays to these intersections.

The intersections do not decrease in performance with the additional construction haulage vehicles as their relative volumes are low, approximately 1% of the previously assessed traffic volumes with 27 additional movements per hour.

Table 10.2 Sydenham Station Intersection Assessment - PM Peak Cumulative Construction Haulage Vehicles

Sydenham Station – PM Peak					
Scenario	**Existing**	**Future**	**Baseline TTP**	**Refined Baseline TTP**	**Refined Baseline TTP + construction**
B.19 Gleeson Avenue / Burrows Road (Signals)					**Year Capped: 2023**
Demand Flow (veh)	2357	2605	2811	2717	2744
Average Delay per Vehicle (Average over all arms in seconds)	28	29	35	32	32
LoS (Overall)	B	C	C	C	C
DoS (Worst Movement)	0.80	0.66	0.84	0.77	0.77
H.23 Gleeson Avenue / Railway Parade (Signals)					**Year Capped: 2023**
Demand Flow (veh)	2661	2940	3148	3054	3079
Average Delay per Vehicle (Average over all arms in seconds)	4	4	4	5	5
LoS (Overall)	A	A	A	A	A
DoS (Worst Movement)	0.45	0.50	0.57	0.54	0.55
H.24 Gleeson Avenue / Unwins Bridge Road (Signals)					**Year Capped: 2023**
Demand Flow (veh)	2433	2688	2688	2688	2716
Average Delay per Vehicle (Average over all arms in seconds)	28	33	33	33	33
LoS (Overall)	B	C	C	C	C
DoS (Worst Movement)	0.60	0.79	0.79	0.79	0.79

As a result of this assessment, it is considered that any cumulative effect that arose from the two components would be negligible.

10.1.3 Gleeson Avenue Overbridge

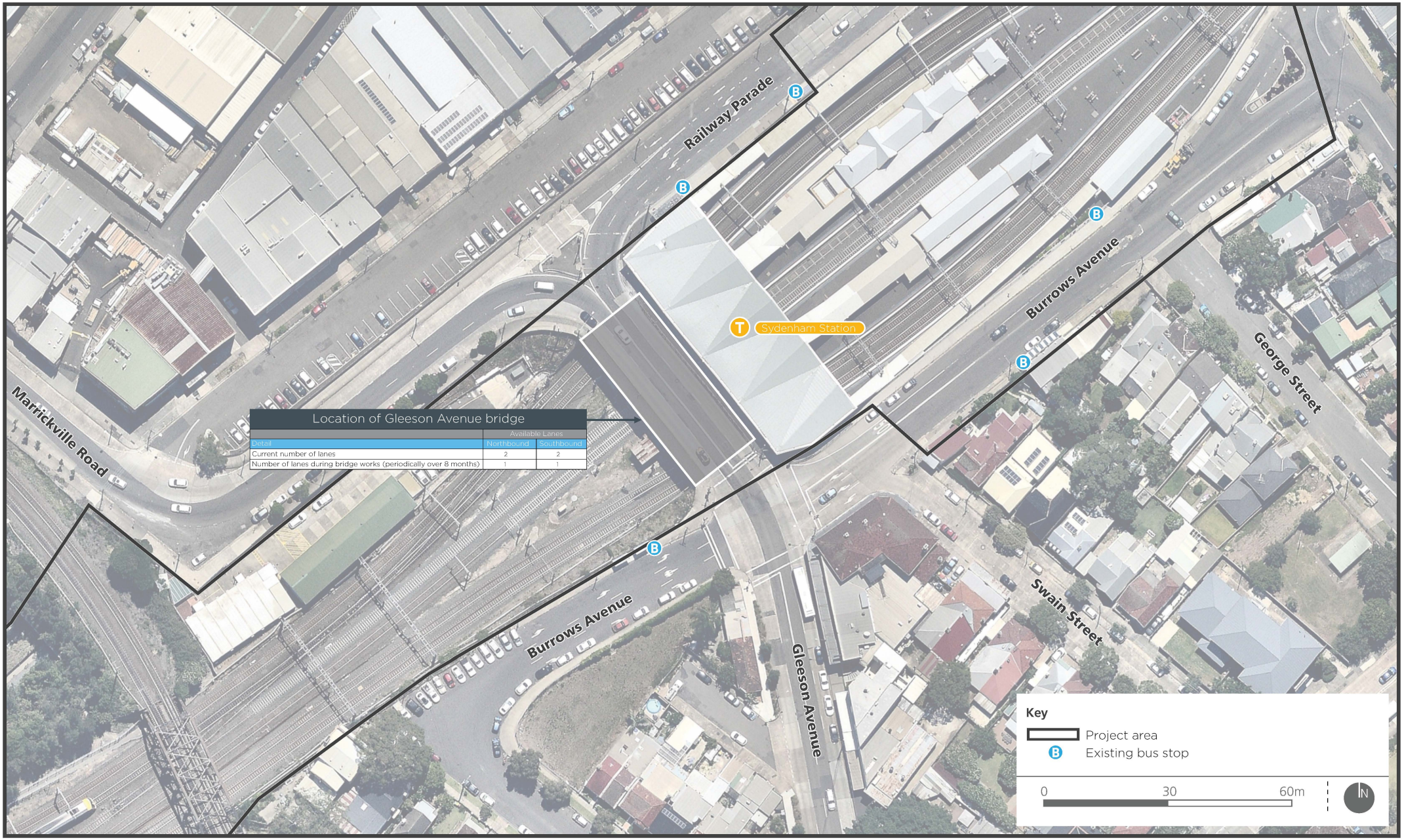
To facilitate the construction of the Chatswood to Sydenham component of the Sydney Metro City and Southwest project, Gleeson Avenue Overbridge at Sydenham Station would undergo half lane closures for eight months during weekends and night works to upgrade the bridge (refer to **Figure 10.5**).

The bridge carries two way general traffic with two lanes in each direction and hosts traffic volumes of approximately 40,800 vehicles per day.

The bridge is critical to the local road network as it provides a link between Sydenham industrial area in the north and the suburban streets in the south. The bridge is adjacent to Sydenham Station which provides links to the T2 Airport, Inner West & South Line, T3 Bankstown Line and T4 Eastern Suburbs and Illawarra Line.

The northern end of the bridge connects to a one-way loop on Railway Parade which limits the potential diversion routes. Due to the one-way restrictions and the importance of the bridge, lane closure would be restricted to one lane in each direction, while still retaining contra-flow. A diversion route is therefore not required.

As no diversion is required for the works at Gleeson Avenue Overbridge, there is no interaction with the traffic, construction or TTS buses at Marrickville Station (the nearest station to Gleeson Avenue Overbridge) or any other location within the extent of the project. Even though, at the time of reporting, sequencing of construction is subject to detailed design, as there is no diversion occurring, no cumulative impacts from these bridge works are expected to impact the project.



sydney METRO | city & southwest

Location of the Gleeson Avenue overbridge

FIGURE 10.5

10.1.4 Chatswood to Sydenham Cumulative Conclusion

Overall, from the cumulative impacts assessments discussed above, only the TTS scenario from the project would be impacted by the Chatswood to Sydenham component of the Sydney Metro City & Southwest project. However, this cumulative impact would only affect the Gleeson Avenue / Unwins Bridge Road intersection in the AM peak period, which increases the expected average delay at the intersection by four seconds. For both the AM and PM peak periods the key intersections assessed maintain their LoS with the addition of the construction haulage vehicles.

10.2 WestConnex Assessment

WestConnex is a 33 km motorway scheme which is part of an integrated transport plan to keep Sydney moving. It encompasses the widening and extension of the M4 Western Motorway, a new inner western bypass of the CBD connecting the M4 and the M5, and a new section for the M5 South Western Motorway. These main four projects are in **Figure 10.6** below:

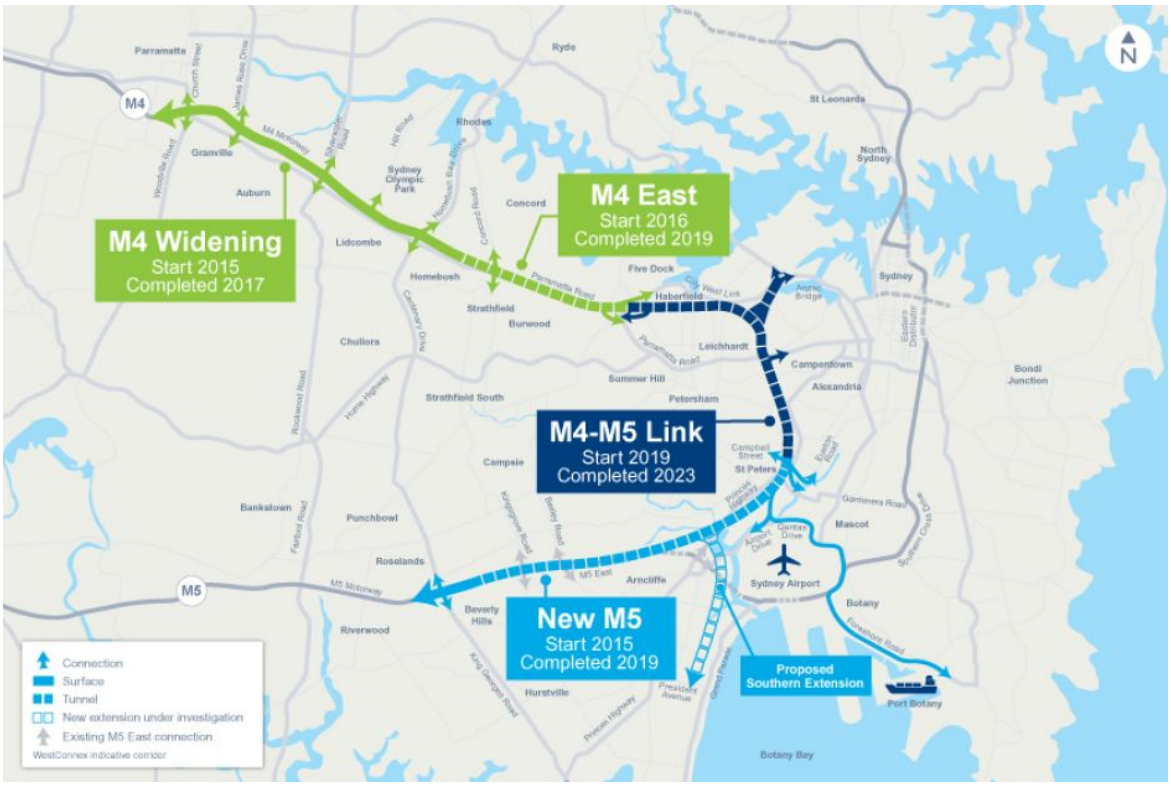


Figure 10.6 WestConnex Project Extent (from westconnex.com.au)

The M4 Widening and M4 East projects are unlikely to have any interdependencies on the Sydenham to Bankstown upgrade component as they are outside the area of influence.

The M4 – M5 Link is currently progressing through the planning phase. It is therefore assumed that the cumulative effects of the Sydenham to Bankstown component would be considered within the M4 – M5 project assessment. Furthermore, currently there are no details of the construction staging, likely construction volumes or haulage routes to enable inclusion within this cumulative assessment.

The New M5 project implementation program would be scheduled to overlap in time with the project by one year at its nearest location to Sydenham to Bankstown upgrade component. The northern end of the M5 project is around St Peters with works along Princes Highway from Campbell Road to Railway Road prior to the tunnel entry. However, this is some 2km away at the closest extent of the Sydenham to Bankstown upgrade component worksite. The WestConnex construction compounds closest to the project extent are C8 to C14 which use the routes outlined below in **Table 10.3** and shown above in **Figure 10.2**.

As can be seen from **Figure 10.3** above, the designated construction haulage routes required to facilitate the station and track works at Marrickville Station and the WestConnex works would not overlap. Therefore, there would be no expected cumulative impacts from the WestConnex project.

Table 10.3 WestConnex Construction Compound Access and Egress Points at St Peters

Construction Compound	Access and Egress Points	Roads used as part of construction compound haulage routes
Canal Road (C8)	Canal Road at a new signalised intersection (left in, left out).	Canal Road Princes Highway
Campbell Road (C9)	Campbell Road (left and right in, left and right out).	Campbell Road Burrows Road Canal Road Princes Highway
Burrows Road (C11)	Burrows Road (left and right in, left and right out).	Campbell Road Burrows Road Canal Road Princes Highway
Campbell Road Bridge (C12)	Burrows Road (right in, left out).	Campbell Road Burrows Road Princes Highway
Gardeners Road Bridge (C13)	Burrows Road (left and right in, left and right out).	Canal Road Princes Highway

10.3 RMS and NSW Government Planning & Environment Major Projects

Table 10.4 and **Table 10.5** below outline the known major RMS projects and those listed on the DP&E Major projects Register which have been assessed for any cumulative impact with the project. Given the location of the projects and their potential range of influence, it is evident that the projects listed would not contribute to the cumulative traffic impact.

Table 10.4 RMS Major Projects - Traffic Effects

Cumulative Scheme	Description	Traffic Effects	Construction Start	Construction End
Roberts Road & King Georges Road - Greenacre to Beverly Hills	• it is proposed to provide extended clearways on Roberts Road and King Georges Road from 6am to 7pm on weekdays and from 9am to 6pm in weekends. • the existing weekday clearway is from 6am – 10am and 3pm – 7pm.	This cumulative scheme would install new and extended clearways on Roberts Road and King Georges Road in both directions. Alternative parking arrangements have been outlined by RMS including: • converting existing parking on Lakemba Street and The Boulevarde at Wiley Park, to accommodate loading zones and timed parking restrictions. • a new dedicated commuter car park on The Boulevarde near Wiley Park. Although the parking is impacted, clearways at Wiley Park Station would improve the traffic through the station.	No timeframe available	No timeframe available

Cumulative Scheme	Description	Traffic Effects	Construction Start	Construction End
Gateway to the South – Pinch Point Program	The Gateway to the South Pinch Points program focuses on short to medium term solutions to improve travel time and reliability for all road traffic including buses and freight. Works could include lengthening or widening turning bays or implementing turning restrictions. Twenty intersections have been identified for further investigation and potential upgrades, which are all still in the planning stage. No additional updates have been provided.	The project would improve the performance of the following intersections which are in close proximity to the Sydenham to Bankstown upgrade component: • Stacey Street, Stanley Street & Salvia Avenue, Bankstown • Stacey Street between Stanley Street & Macauley Avenue, Bankstown • Princes Highway & King Georges Road, Blakehurst (including improvements between Torrens Street and King Georges Road) • Princes Highway & Railway Road, Sydenham	No timeframe available	No timeframe available
$246 million Pinch Point and Clearways Program	The Pinch Point and Clearways Program aims to reduce traffic delays, manage congestion and improve travel times on Sydney's major roads, particularly during weekday peak periods. Current projects: • Bigge Street and Hume Highway, Warwick Farm • Boundary Street, Roseville VMS on Cumberland Highway, Wentworthville • Cumberland Highway	No traffic impacts are expected – The Sydenham to Bankstown upgrade component is outside of the influence of this cumulative scheme.	No timeframe available	No timeframe available

Cumulative Scheme	Description	Traffic Effects	Construction Start	Construction End
	and Cabramatta Road, Cabramatta • Henry Lawson Drive and Bullecourt Avenue, Milperra • Hume Highway and Miller Road, Bass Hill • VMS on James Ruse Drive, Parramatta • Milperra Road and The River Road, Revesby • Parramatta Road and Great North Road, Five Dock • Parramatta Road and Shaftesbury Road, Five Dock • Pennant Hills Road, Pennant Hills Rooty Hill Road and Luxford Road, Oakhurst • Rooty Hill Road North, Plumpton • VMS on Windsor Road, Baulkham Hills			

Cumulative Scheme	Description	Traffic Effects	Construction Start	Construction End
$300 million Urban Roads Pinch Point Program	In February 2015, the NSW Government committed $300 million to ease congestion on 32 of Sydney's busiest road corridors over the next 10 years. Current projects include: • Bexley Road and Canterbury Road, Campsie • VMS on Burns Bay Road, Penrose • VMS on Heathcote Road, Lucas Heights • Hoxton Park Road & Hill Road, Lurnea • Hume Highway and Memorial Avenue, Liverpool • Pacific Highway & Mona Vale/Ryde Road Pymble • VMS on Pacific Highway, Gordon • VMS on Willoughby Road, Willoughby	No traffic impacts are expected – The Sydenham to Bankstown upgrade component is outside of the influence of this cumulative scheme.	No timeframe available	No Timeframe available

Table 10.5 Department of Planning & Environmental Major Projects Register - Traffic Effects

Cumulative Scheme	Description	Traffic Effects	Construction Start	Construction End
Western Sydney Stadium (Stage 2 Design & Construction)	The Western Sydney Stadium Project will provide the community of Western Sydney with a first class precinct comprising of a brand new 30,000 seat stadium and an activated public realm. The venue will have the ability to service major sporting and entertainment events.	No traffic impacts are expected – The Sydenham to Bankstown upgrade component is outside of the influence of this cumulative scheme.	2017	2019
Modification 2 to MP 10_0229 - Concept Plan - Mixed Use Development, Cronulla Sharks	Residential and hotel development - Captain Cook Drive Wooloware	No traffic impacts are expected – The Sydenham to Bankstown upgrade component is outside of the influence of this cumulative scheme.	Not applicable	Not applicable
The University of Sydney, Darlington Campus	The development will comprise of approximately 15,205sqm of new mixed-use development. The student accommodation component will include up to 656 single dorm style bedrooms and 2 x 2 bedroom apartments	From the Transport Impact Assessment: *"Against existing traffic volumes in the vicinity of the site, any additional traffic generated by the proposal would be negligible and would not be expected to compromise the safety or function of the surrounding road network."*	Not applicable	Not applicable
Regiment Mixed Use Redevelopment				
Berry and Walker Street, North Sydney	Private development	No traffic impacts are expected – The Sydenham to Bankstown upgrade component is outside of the influence of this cumulative scheme.	Not applicable	Not applicable
Modification to MP08_0238 - Commercial and Hotel development Berry/Walker Street MOD 7				

Cumulative Scheme	Description	Traffic Effects	Construction Start	Construction End
Berry and Walker Street, North Sydney	Private development	No traffic impacts are expected – The Sydenham to Bankstown upgrade component is outside of the influence of this cumulative scheme.	Not applicable	Not applicable
Modification to MP08_0238 - Commercial and Hotel development Berry/Walker Street MOD 6				
Wild Mouse Tenancy Fitout, Luna Park	Retail development	No traffic impacts are expected – The Sydenham to Bankstown upgrade component is outside of the influence of this cumulative scheme.	Not applicable	Not applicable
Lighthouse Fitout & External Alterations, Luna Park	Retail development	No traffic impacts are expected – The Sydenham to Bankstown upgrade component is outside of the influence of this cumulative scheme.	Not applicable	Not applicable
M2 Motorway Signage	Converting exiting signage to digital signage	No traffic impacts are expected – The Sydenham to Bankstown upgrade component is outside of the influence of this cumulative scheme.	Not applicable	Not applicable
Conversion of Existing Signage to Digital Signage - M2 Motorway - Ryde LGA				

Cumulative Scheme	Description	Traffic Effects	Construction Start	Construction End
SSD 7246, Foreshore and Public Domain Improvements, Campbell's Cove	The proposal seeks approval for public domain improvements and associated works to the area known as Campbell's Cove, The Rocks, including: • a new 10-metre-wide promenade, designed to improve drainage and accessibility; • a new waterfront leisure area and amphitheatre for public events; • a shared plaza / pedestrian square with existing levels lowered to allow better drainage, pedestrian circulation and truck access to the new Overseas Passenger Terminal wharf extension; • new east-west connections from the Campbell's Cove promenade to Hickson Road and The Rocks.	No traffic impacts are expected – The Sydenham to Bankstown upgrade component is outside of the influence of this cumulative scheme.	Not applicable	Not applicable

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