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Concord West, 1 King Street Transport Study Report

PwC on behalf of Billbergia

March 2024

pwc

Strictly private and confidential

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Version Control

Revision	Date	Description	Prepared by
Rev01	2-Dec-2022	Working draft for client discussion / review	PwC
Rev02	12-Dec-2022	Draft for client review	PwC
Rev03	01-Jun-2023	Final incorporating TfNSW information on OPAL bus and rail data	PwC
Rev04	12-Feb-2024	Final incorporating Council/Stantec peer review comments	PwC
Rev05	13-Mar-2024	Updated final to incorporate client comment	PwC

Contents

1 Introduction

1.1 Background

This Transport Study Report is submitted to the Council of the City of Canada Bay (**Council**) to support a request for a Planning Proposal relating to land at 1 King Street, Concord West (t**he site**). The Planning Proposal report prepared by Ethos Urban outlines the proposed amendments to the Canada Bay Local Environmental Plan (CBLEP) 2013. The Planning Proposal is supported by a concept master plan prepared by GroupGSA. The Planning Proposal is supported by a concept master plan* prepared by GroupGSA which will facilitate the following:

- 10 buildings, ranging from 4-12 storeys accommodating approximately 600 dwellings in a range of 1, 2, 3 and 4 bedroom apartments and townhouses.
- New loop road through the site connecting King Street and George Street.
- A total of approximately 69,982m2 of gross floor area which equates to a floor space ratio of 2.23:1. The gross floor area comprises approximately:
  - 65,641m2 residential floor area
  - 4,229m2 non-residential floor area
- A green connection of approximately 2,500m2 to provide pedestrian and cycle access north-south through the site and including a neighbourhood park.
- A new civic precinct – the 'station precinct' – focused along the active spine and community plaza accommodating a range of non-residential uses (i.e.: retail, food and beverage, gym, health and childcare) at street level.

** Note that the land use assumptions used for the traffic modelling in this report is based on a previous masterplan for this site. Section 5.2.2 outlines the assumptions adopted (approximately 700 dwellings, over 6,000m^2 non-residential area and a 120 child capacity childcare centre), which is greater than what is currently proposed. At this stage of the planning proposal process, the previous yields have been retained, with the traffic analysis in this report likely to represent an overestimation of traffic that would be generated by the site.*

1.2 Purpose of this Assessment

This transport assessment takes on-board stakeholder feedback received by Billbergia during the initial pre-lodgement phase (the scoping study) of the planning proposal process. The stakeholder groups include Council, Transport for NSW (**TfNSW**), School Infrastructure NSW (**SINSW**) and Sydney Metro[2].

A copy of the scoping study feedback is presented in Appendix A. They include the following documents:

- 'ATTACHMENT D: 1 King Street – TfNSW Methodology for Transport Assessment'.
- 'ATTACHMENT E: 1 King Street – SINSW Response to Scoping Proposal'.

The purpose of this transport assessment is to:

- Establish a strategic planning context for the site based on a review of existing and relevant planning documents.
- Establish an existing transport and land use context, assessing the current transport network and travel characteristics near the site and its surroundings.
- Undertake an assessment of how the proposed development complements the desired future character of the place and the views of the community.
- Estimate future traffic generation, both site-generated and background traffic.

[2] Please note,Sydney Metro were identified as a stakeholder group and consulted during the latter stages of the planning proposal process, post-submission of the scoping study to Council.

- Assess the future transport impacts (site accessibility, circulation and network performance), with and without the proposed development.
- Provide recommendations for improvements, where necessary, to accommodate future traffic demand and staging requirements.

1.3 Report Structure

This report is structured as follows:

- **Section 1:** Introduction and Summary (this section).
- **Section 2:** Site Description.
- **Section 3:** Strategic Planning Context.
- **Section 4:** Existing Condition Assessment.
- **Section 5:** Projected Traffic.
- **Section 6:** Transportation Analysis.
- **Section 7:** Findings and Recommendations.

Council Peer Review (December 2023)
Stantec reported dated 12 October 2023, as appended to Council Meeting Agenda dated 5 December 2023.

In 2023, Council commissioned an external traffic consultant (Stantec) to undertake a peer review of this transport assessment paper (version reviewed 'Rev03'). This report incorporates the peer reviewer's comments. See Appendix B for copy of the peer review comments register with reviewer comments and response.

2 Site Description

The site is located at 1 King Street, Concord West. It is legally described as Lot 101 DP791908, approximately 31,390m2 in area and is the largest landholding in Concord West under single ownership. It is irregular in shape and has frontages to King Street to the north and George Street to the west. The site is currently accessed from King Street at its southern termination point and is primarily occupied by a large footprint office building, previously used as a call centre facility by Westpac. It also accommodates a multistorey carpark, a childcare centre and tennis court.

An aerial photo of the site is shown at Figure 2-1.

Figure 2-1 Site aerial

Source: Nearmap / Ethos Urban

3 Existing Condition Assessment

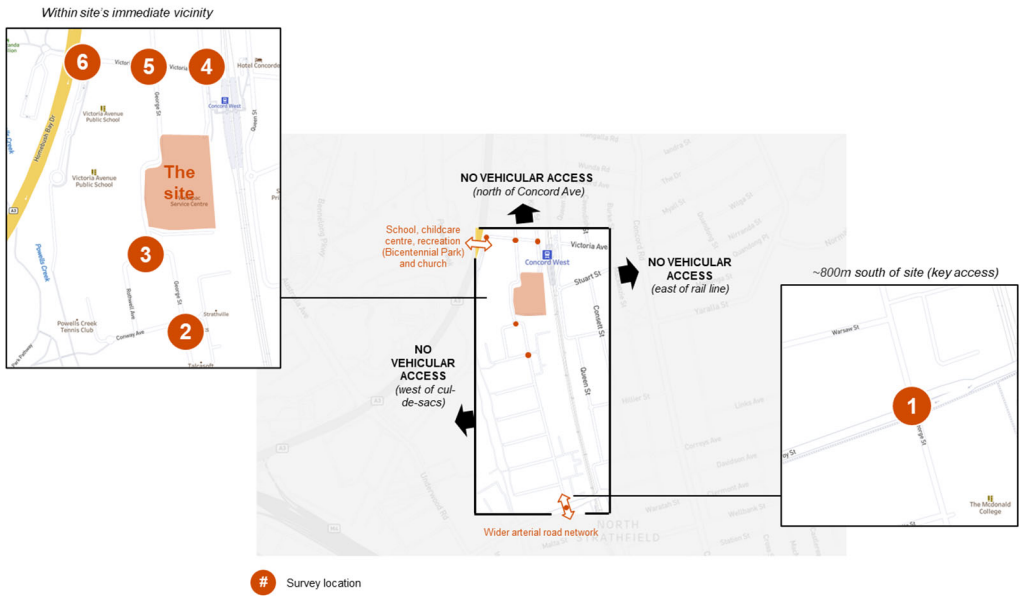
3.1 Study Area and Traffic Survey Details

The site is located adjacent to an existing mixed residential and general industrial area within an enclave in the Concord West Precinct. To provide an understanding of the existing traffic conditions, six key intersections within the site surrounds have been selected for analysis.

Figure 3-1 below shows the locations of the intersections. These include the following:

1. George Street / Pomeroy Street.
2. George Street / Conway Avenue.
3. George Street / Rothwell Avenue.
4. King Street / Victoria Avenue.
5. George Street / Victoria Avenue.
6. Victoria Avenue / access road to Victoria Avenue Public School and Powells Creek Reserve.

Figure 3-1 Concord West study area - key intersections and survey location ID



Traffic surveys were undertaken on Tuesday 20-September, with details of the data collection described as follows:

- **Time period:** 6-10am and 3-7pm.
- **Intersection turning movement counts:** Collected for car, heavy vehicles, pedestrian and cyclist for all intersections (as listed above).
- **Queue length surveys**: Collected for George Street / Pomeroy Street only. For rationale and subsequent TfNSW feedback with respect to the queue length survey location, please refer to the traffic projection methodology in Section 5.1 of this report and attached modelling methodology paper

A site visit was also undertaken on the same day by PwC personnel during the peak hours to observe site conditions. These included, but were not limited to, the following site observations; (1) existing traffic operations at key intersections, (2) movement and access to/from Concord West Station, the site, Victoria Avenue Public School, Bicentennial Park and Powells Creek Reserve, and (3) other public transport and active transport facilities.

3.2 Study Area Land Use

3.2.1 Existing zoning and land uses

The site is currently zoned as IN1 General Industrial, with a Floor Space ratio (**FSR**) of 1.1 and Height of Building restricted to 8.5m. The area surrounding the site are generally low density residential, with some medium density, general industrial and warehouse properties. There are some retail land uses, however, these are mostly located on Concord Road to the east of the site over the rail line.

Major land uses near the site include the Victoria Avenue Primary School, Bicentennial Park, Powells Creek Reserve and Concord West Station. These are further described as follows:

Victoria Avenue Community Precinct

Located approximately 300m north of the site in Victoria Avenue, this Community Precinct was developed in 2015 as part of a joint initiative between NSW Department of Education, Council and Sydney Local Health District.

The Community Precinct includes *"a 47 place Child Care Centre catering for children from birth to school age, an Early Childhood Health Centre, an Outside School Hours Care Centre, shared community use of playing fields and communal hall*[3]*".* It also includes the new Victoria Avenue Public School that provides for capacity of up to 600 students.

Victoria Avenue Community Precinct, view from Victoria Ave

Source: PwC

Relevance to site:

Based on the traffic surveys, the Victoria Avenue Public School is currently the one of the key generators of vehicle and pedestrian trips in the area. The following peak hour volumes were observed (total trips travelling ***towards and away*** from school via Victoria Avenue – Survey Location ID #6):

Mode	AM Peak	PM Peak	Notes
Car	**213 vehicles** *8.15-9.15am*	86 vehicles *5-6pm*	• Morning peak coincides with school drop-off times. • Afternoon peak hour trips represent after school care and teachers/employees from the school leaving work. • While not the peak hour volumes, the afternoon school pick-up times (3-4pm) generates similar volumes of 77 car trips.
Cycle	20 cyclists *8.45-9.45am*	16 cyclists *5-6pm*	• Given the time of travel recorded for these peak hour volumes, these trips are likely to represent school or recreational trips.
Walking	**150 pedestrians** *8.30-9.30am*	**136 pedestrians** *3-4pm*	• Pedestrian volumes coincide with the school start and end times. • Data was recorded at the pedestrian crossing located directly outside the school entrance, with counts taken in both directions. Based on site observations at ~8.45-9am, some students were observed walking from the school to the park via this crossing.

[3] *'Victoria Avenue Public School'* (NSW Department of Education - School Infrastructure). Last accessed 1-Oct-22. Retrieved from: https://www.schoolinfrastructure.nsw.gov.au/schools/4/4655.html

Bicentennial Park - Sydney Olympic Park

With approximately 40ha of scenic parklands, Bicentennial Park is a significant open space that contributes to the local character of the area. The park is operated by the Sydney Olympic Park Authority and offers visitors several facilities, including (not not limited to) car parking, playgrounds, cycle and walking paths, BBQ facilities and pavilions.

There are currently two entrances to Bicentennial Park; (1) main park entrance via Australia Avenue, and (2) Victoria Avenue for local access via the underpass ~400m north of the site **- see image adjacent**.

From the Victoria Avenue entrance, the underpass provides for access to the Powells Creek Reserve, Bessington Park and Mason Park, which connects to the wider regional cycle network.

Bicentennial Park entrance, view from Victoria Ave

Source: PwC

Relevance to site:

Based on the traffic surveys, the park is currently one of the key generators of cycling trips in the area, particularly during the morning peak. The following peak hour volumes were observed (total trips travelling ***towards and away*** from Bicentennial Park entrance via Victoria Avenue - Survey Location ID #6):

Mode*	AM Peak	PM Peak	Notes
Car	37 vehicles *9-10am*	27 vehicles *3-4pm*	• Not a major generator of car trips during the weekday peak hours. • Vehicle volumes represent recreational trips to the park. It is noted that the afternoon peak coincides with the same school peak pick-up hours.
Cycle	**76 cyclists** *6.45-7.45am*	32 cyclists *5.45-6.45pm*	• Based on 2021 Census data, 15 people in Concord West indicated that they travel to work using bike[4]. Cyclists travelling to and from the park may consist of some commuter trips connecting to the regional cycle network, however, most are likely to be recreational in nature. • Morning peak cycling trips occurs outside the typical peak school and commuter peak hours.

** Please note that pedestrian movement data was recorded for trips travelling across the road reserve only at the intersection of 'Victoria Avenue / access road to Victoria Avenue Public School and Powells Creek Reserve' (Survey Location ID #6). Pedestrian counts along the footpath outside the Bicentennial Park entrance at Victoria Avenue were not recorded and hence have not been included in the above table.*

[4] '*Concord West – Method of Travel to Work' (*City of Canada Bay). Last accessed 7-Dec-2022. Retrieved from: https://profile.id.com.au/canada-bay/travel-to-work?WebID=150

Concord West Station

Concord West Station is located adjacent to the site (within 50m) and is part of the T9 Northern Line. The station can be accessed via Victoria Avenue and King Street from the western side of the rail line near the site, and via Queen Street from the eastern station entrance.

Station facilities were upgraded in 2014 and includes limited street parking, bike racks and a kiss and ride stopping area on King Street.

Relevance to site:

Concord West Station currently generates maximum **~30 veh/hr** during the morning and afternoon peak via the King Street entrance near the site. Most trips travelling to the station are undertaken via walking by pedestrians.

Concord West Station, view from King Street (west of rail line near site)

Source: PwC,

The following peak hour volumes were observed (total trips travelling ***towards and away*** from Concord West Station at intersection of King Street and Victoria Avenue - Survey Location ID #4):

Mode	AM Peak	PM Peak	Notes
Car	25 vehicles *7.15-8.15am*	31 vehicles *4.45-5.45pm*	• Not a major generator of car trips during the weekday peak hours. This aligns with the limited station parking that is currently available.
Cycle	5 cyclists *7.45-8.45am*	9 cyclists *5-6pm*	• Not a major generator of cycling trips during the weekday peak hours.
Walking	**168 pedestrians** *8-9am*	**113 pedestrians** *5-6pm*	• High volumes of people walking towards / away from station during typical commuter hours.

3.2.2 Anticipated future development

Table 3-1, Figure 3-4 and Figure 3-5 provides a comparison of the Concord West land use forecasts. Over a 10-year horizon, the study area's population is set to grow by **5.4% p.a.** between 2026 and 2036, higher than the City of Canada Bay LGA's (1.8% p.a) and Sydney GMA's (1.4%) population forecasts.

Over the same period, the study area projects a modest increase in employment, with an annual growth of **1.0% p.a**., in-line with the City of Canada Bay LGA's (1.3% p.a) and Sydney GMA's (1.3%) forecasts.

It should be noted that:

- Council's *Concord West Precinct Master Plan* identifies a number of developments for future rezoning. This includes the 1 King Street, Concord West site (see Figure 3-2 overpage), and other industrial zoned sites west of the T9 Northern rail line.
- The majority of the available jobs within Concord West's employment projections are classed as "Financial and Insurance Services". This is likely to have included the employment offered by the existing Westpac building in the site.

  - The site masterplan proposes to convert the existing Westpac building and other existing land uses to provide new residential and retail/commercial opportunities. This is expected to, in part, offset the loss in employment from the Westpac building. However, as the total traffic for the study area includes both site-generated and background traffic growth (as informed by TfNSW's standard land use projections), these may also include some commuting trips that would have been generated by the Westpac building.
  - No assumptions have been made to discount these defunct trips. As such, the trips generated for this transport assessment in the study area may be higher than forecasted, reflecting a more conservative estimate.
- The second highest job type by industry is "Construction", which aligns with the current zoning for the study area.

Figure 3-2 Concord West Master Plan 2014 – future development sites

Table 3-1 Population (no. persons) and employment (no. jobs available) projections

Population Projections	2016	2026	2036	2056	AAGR 2016-26	AAGR 2026-36	AAGR 2036-56
Concord West Station (TZ16 717)	1,540	2,135	3,298	4,736	3.9%	5.4%	2.2%
City of Canada Bay LGA	91,639	104,070	123,243	148,460	1.4%	1.8%	1.0%
Sydney GMA	6,086,371	7,293,772	8,333,949	10,142,701	2.0%	1.4%	1.1%
Employment Projections	**2016**	**2026**	**2036**	**2056**	**AAGR 2016-26**	**AAGR 2026-36**	**AAGR 2036-56**
Concord West Station (TZ16 717)	1,728	1,862	2,045	2,313	0.8%	1.0%	0.7%
City of Canada Bay LGA	39,067	45,678	51,631	60,343	1.7%	1.3%	0.8%
Sydney GMA	3,036,053	3,660,913	4,127,297	4,910,739	2.1%	1.3%	0.9%

Notes:

- *The site is located within Travel Zone 2016 (**TZ16**) 717, zone name 'Concord West Station). See zonal boundaries outlined in figure overpage.*
- *Projections based on TfNSW's Travel Zone Projections 2019 (**TZP19**) for Population, Workforce & Employment in New South Wales. It is noted that a more recent Travel Zone Projections 2022 (**TZP22**) was released by TfNSW in November 2022. However, for the purposes of this assessment, TZP19 has been as the basis of for comparisons to align with the underlying land use assumptions that are used for the traffic demand forecasts outlined in Section 5.3.*
- ***AAGR** is the Annual Average Growth Rate (%). GMA is the Greater Metropolitan Area as determined by TfNSW's TZP19 Technical Guide's spatial definitions.*
- *Population projections for Concord West Station TZ16 717 and City of Canada Bay LGA calculated based on population in occupied private dwellings. Population projections for Sydney GMA calculated based on estimated resident population.*

Figure 3-3 Concord West Station TZ16 717 - zonal boundaries

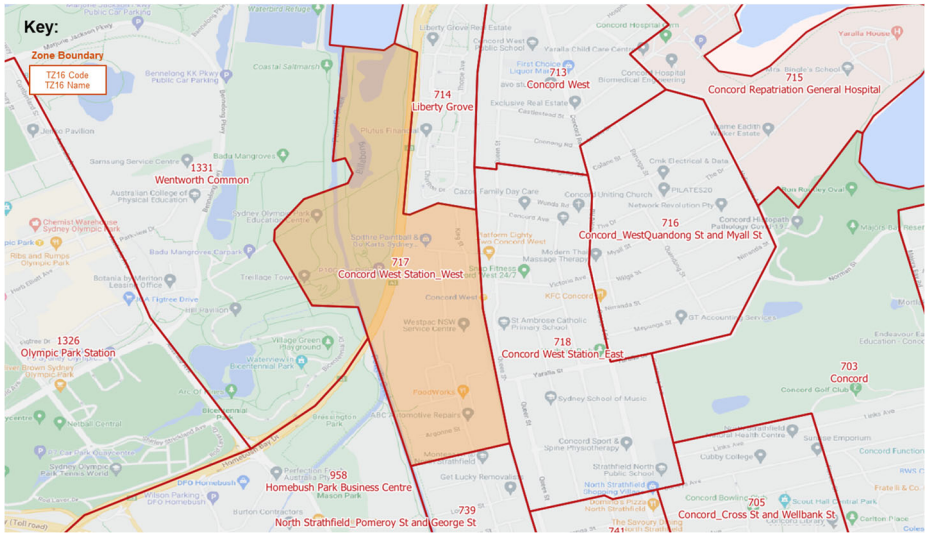


Figure 3-4 Concord West vs. City of Canada Bay LGA projections - population

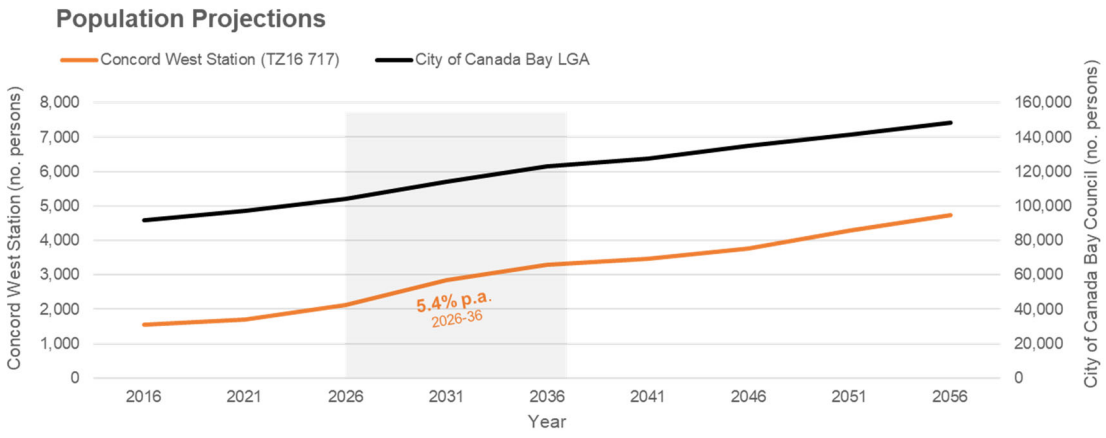
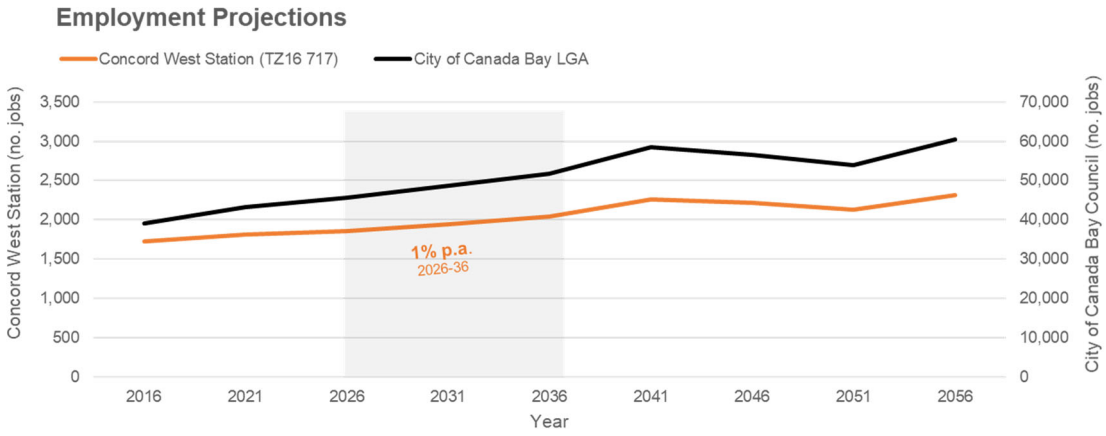


Figure 3-5 Concord West vs. City of Canada Bay LGA projections - employment



3.3 Site Accessibility

3.3.1 Road network

The site is bounded by the T9 (Northern Line) rail line to the east and George Street to the west. The properties of 33 George Street and 2 King Street form the northern boundary of the site. Similarly, the southern extents are bounded by the property at 31 George Street (North Strathfield).

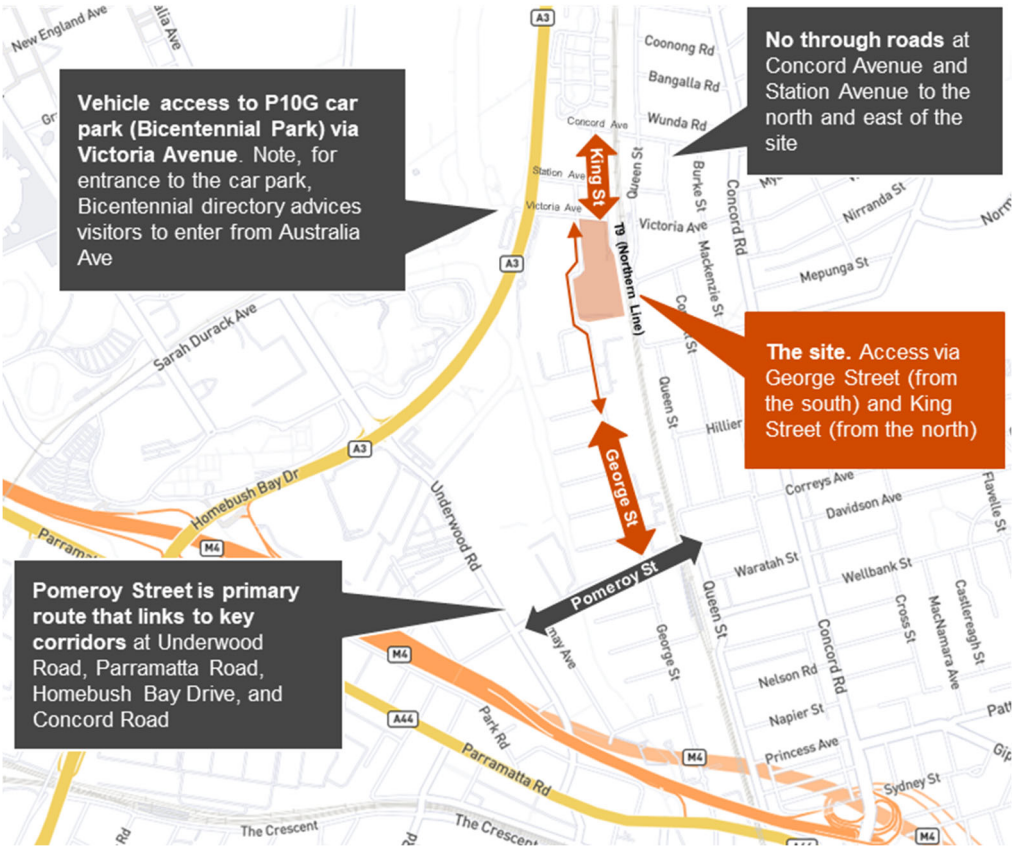
Figure 3-6 below illustrates the key vehicle access points. George Street and King Street currently provides direct access via Pomeroy Street, linking the site to key routes from:

- Underwood Road and Parramatta Road to the south.
- Homebush Bay Drive and Australia Avenue to the north and west.
- Concord Road to the east.

George Street and King Street are single carriageways with one lane in each direction, street parking provided on either side of the road, and a speed limit of 50km/hr. Victoria Avenue, located immediately north of the site, is within a school zone that operates at 40km/hr speed limit at 8-9.30am and 2.30-4pm during school days.

North, east and west of the site, there are no external connections to the wider road network outside of the local area. It is noted that Victoria Avenue provides vehicle access to the P10G car park at Bicentennial Park, which offers 2-hour free parking on weekdays and all-day parking on weekend. However, for access to the P10G car park, the Bicentennial Park directory advises visitors to enter from the main park entrance at Australia Avenue.

Figure 3-6 Existing road network



3.3.2 Traffic volumes and conditions

Figure 3-7 and Figure 3-8 overpage provides a summary of the vehicles counts over the morning and afternoon peak periods. Taken as an aggregate across the local road network, the overall peak hours are **8-9am** and **5-6pm**.

Summary of key observed findings are described as follows:

- The intersection of George Street and Pomeroy make up the majority total network traffic movements within the study area (over 60% of total movements surveyed – see Table 3-2 below for peak hour intersection volume summary), with through traffic travelling east-west along the Pomeroy Street corridor the dominant flow.
- Based on the peak hour surveyed flow diagrams illustrated in Figure 3-11 and Figure 3-12:
  - A key generator of traffic to the local area are trips to / from the Victoria Avenue Victoria Avenue Community Precinct (school) and existing employment (industrial / construction / commercial).
  - Morning southbound and afternoon northbound trips along the George Street corridor also consists of residents leaving / travelling back home via George Street and Pomeroy intersection.
- Heavy vehicles comprise of less than 2% of total traffic across the study area.
- Afternoon peak period traffic experiences a 'spike' in traffic increase at 3-3.15pm. This coincides with school pick-up hours and construction/industrial workers leaving the area.
- Based on SIDRA intersection analysis (see Section 6.3 for full traffic modelling details) and site observations:
  - All intersections within vicinity of the site currently perform at acceptable levels of (**LoS**); no significant levels of congestion and queuing were observed.
  - Substantial levels of delays were observed at the intersection of George Street and Pomeroy Street, with eastbound and westbound queues extending to adjacent intersections at Beronga Street / Queen St and Underwood Road. Downstream blockages from these intersections were also observed, reducing the effective green time, traffic discharge rates and overall intersection performance at George Street / Pomeroy Street.

Table 3-2 Peak hour intersection volumes (light and heavy vehicles)

#	Survey Location	Existing Control Type	Total Intersection Volume – All Movements (vehicles)		Proportion of Total Volume (All Survey Locations)	
			8-9am	5-6pm	8-9am	5-6pm
1	George Street / Pomeroy Street	Signal	2,136	2,171	62%	68%
2	George Street / Conway Avenue	Priority	436	380	13%	12%
3	George Street / Rothwell Avenue	Priority	332	265	10%	8%
4	King Street / Victoria Avenue	Priority	64	80	2%	3%
5	George Street / Victoria Avenue	Priority	320	240	9%	8%
6	Victoria Avenue / Public School Access	Priority	124	33	4%	1%
		Total	**3,412**	**3,169**	***100%***	***100%***

Figure 3-7 Morning period survey count summary

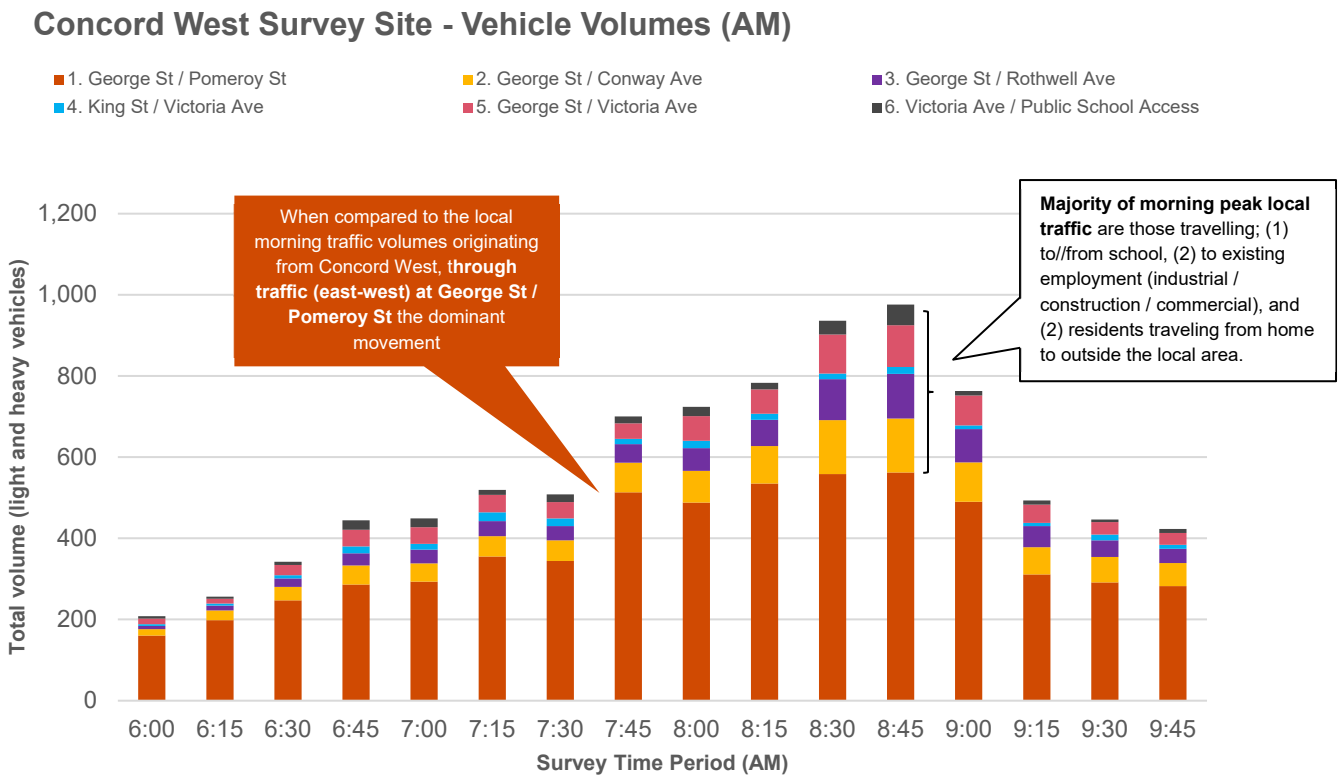


Figure 3-8 Evening period survey count summary

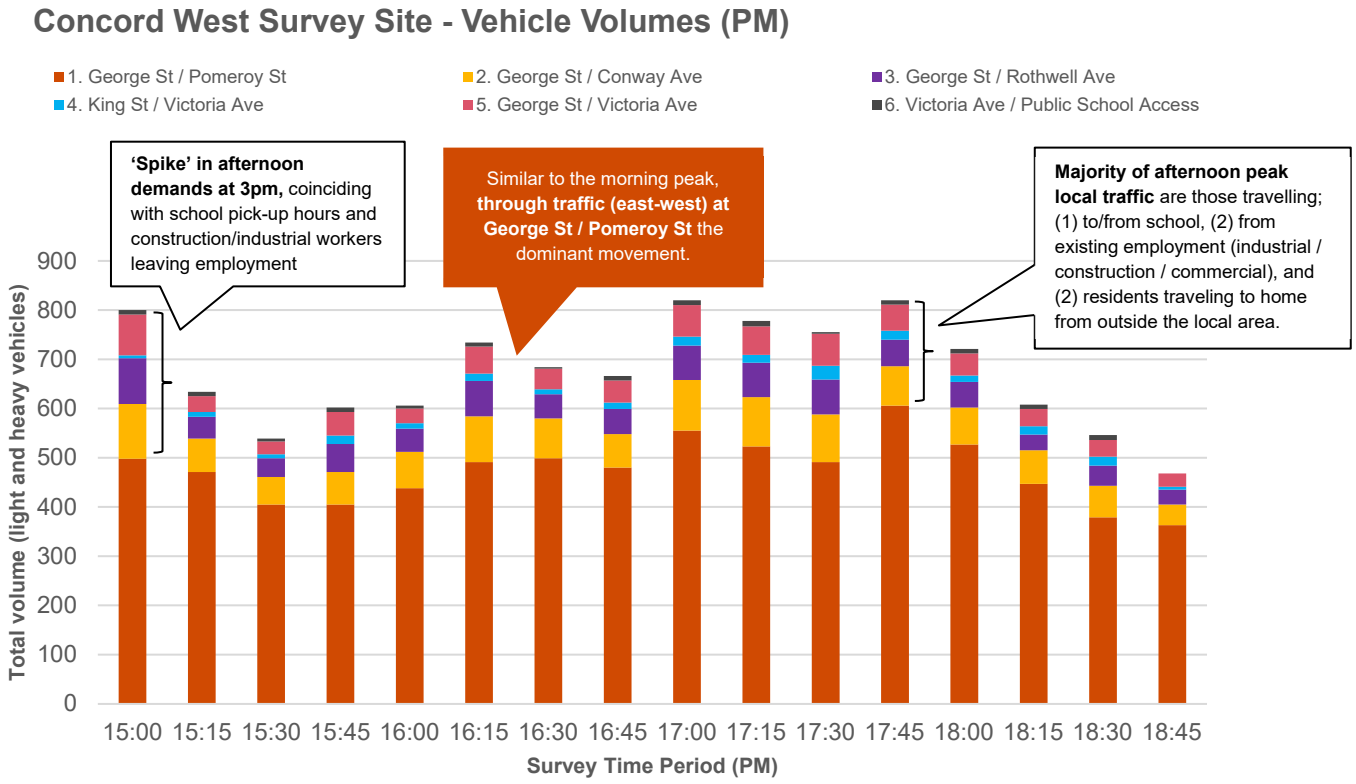


Figure 3-9 Morning peak hour (8-9am) count summary – survey location IDs #2 to #6, flow diagram (light and heavy vehicles)

Light and heavy vehicle volumes
8-9am

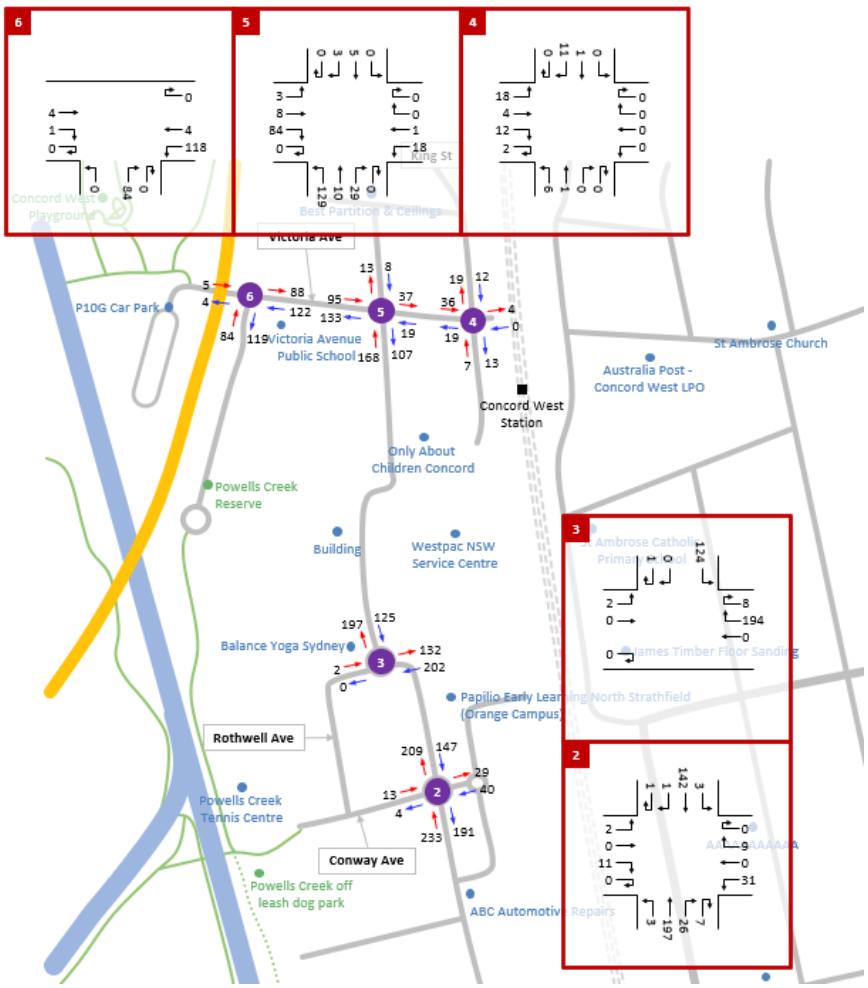


Figure 3-10 Morning peak hour (8-9am) count summary – survey location ID #1, flow diagram (light and heavy vehicles)

Light and heavy vehicle volumes
8-9am

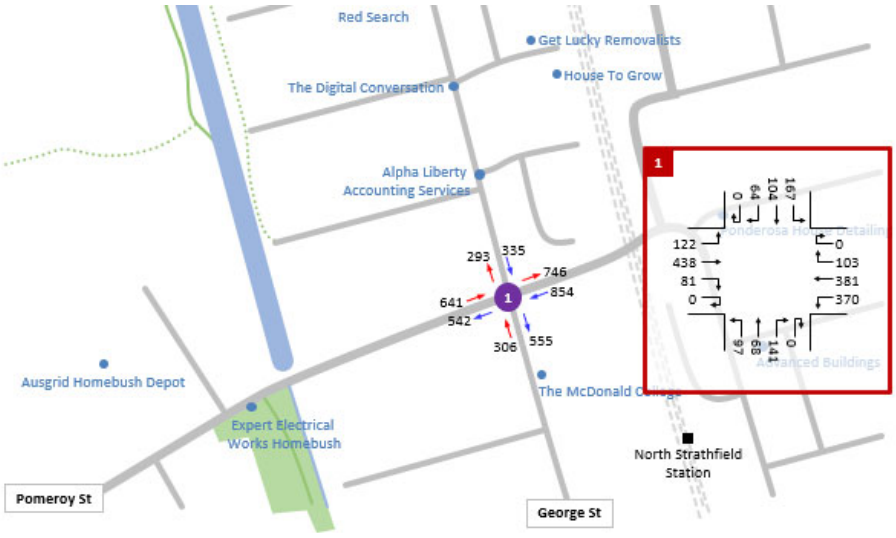


Figure 3-11 Afternoon peak hour (5-6pm) count summary – survey location IDs #2 to #6, flow diagram (light and heavy vehicles)

Light and heavy vehicle volumes
5-6pm

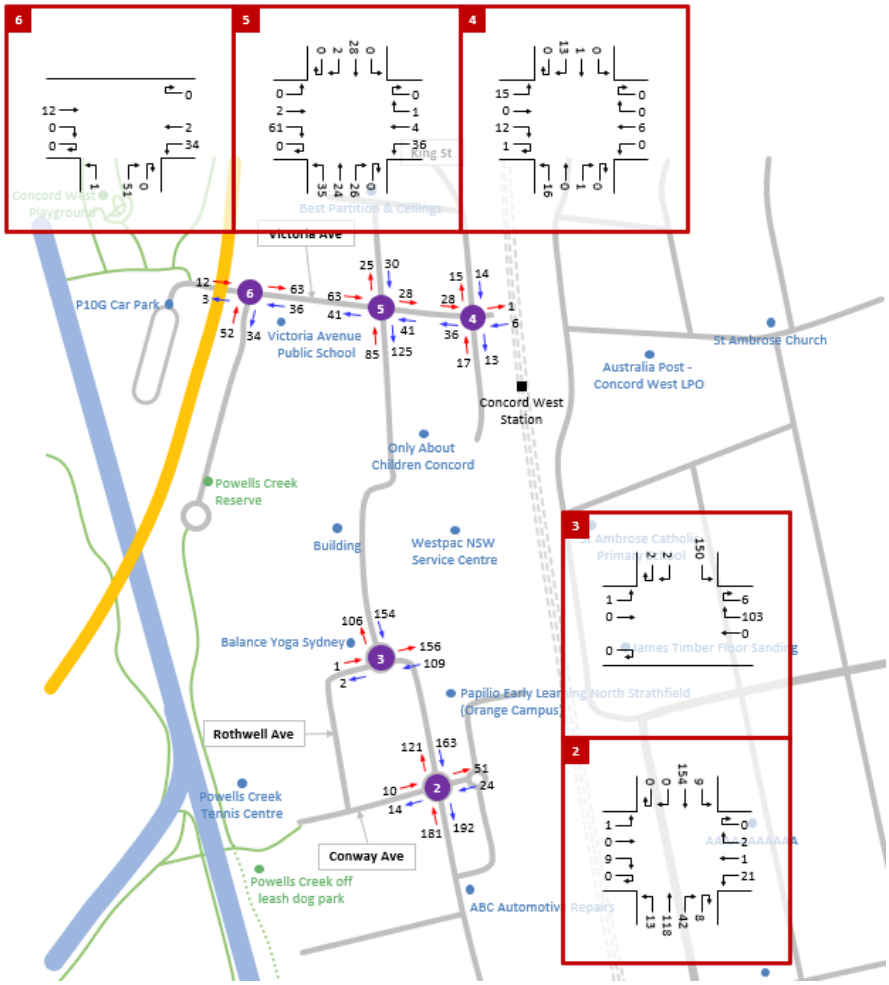
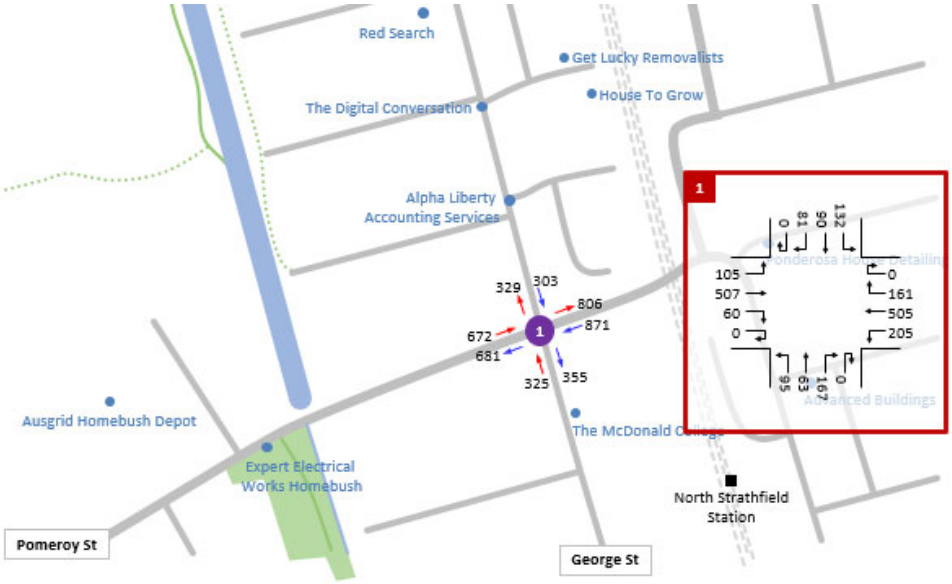


Figure 3-12 Afternoon peak hour (5-6pm) count summary – survey location ID #1, flow diagram (light and heavy vehicles)

Light and heavy vehicle volumes
5-6pm

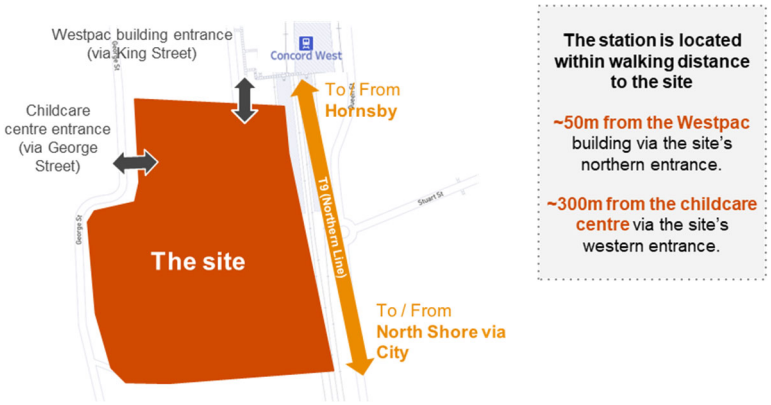


3.3.3 Existing rail network

The T9 Northern Line provides direct services to the North Shore via the City and the north-eastern suburbs travelling to / from Hornsby. It operates with services every 15-min in both directions, all day (weekdays, weekends and public holidays). Workers and visitors to the site currently access the T9 Northern Line from Concord West Station.

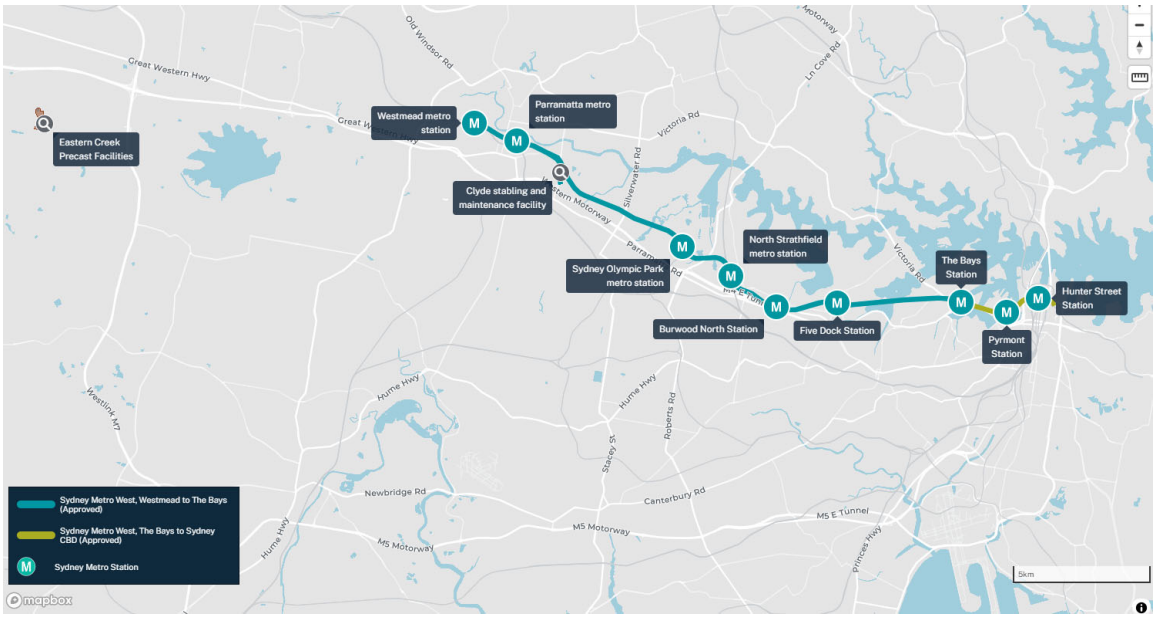
Figure 3-13 adjacent illustrates the closest site entrances relative to Concord Road Station, which shows a high level of accessibility to the rail network.

Figure 3-13 Site access via Concord West station



The site is also located approximately 1.1km away from the North Strathfield Station, which is the site for the planned North Strathfield Metro Station as part of the new Sydney Metro West (**SMW**). North Strathfield Station is within bicycle distance or about 20-min walk away from the site. Figure 3-14 presents the overview map of the SMW rail alignment, which shows the new alternate connections to / from the Sydney CBD that this new public transport infrastructure provides.

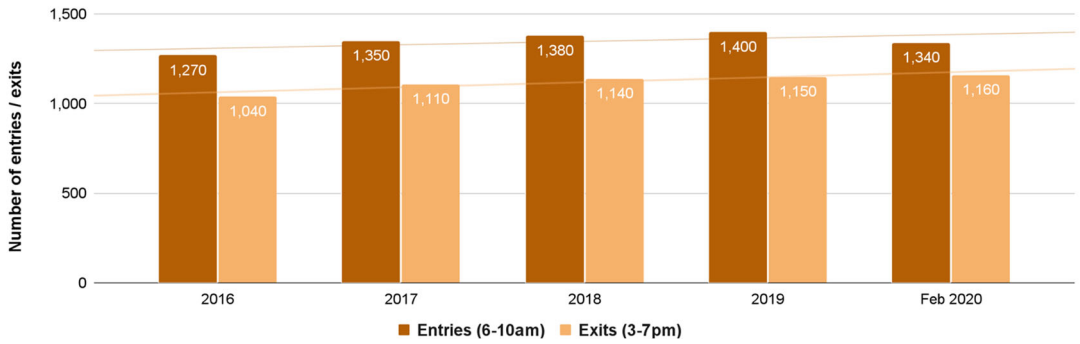
Figure 3-14 Overview map of the SMW rail alignment



Source: Image extracted from 'Sydney Metro West – Interactive Map' (Sydney Metro). Last accessed: 8-December-2022. Retrieved from: https://caportal.com.au/tfnsw/sydmetrowest/map

Based on historic Opal 'tap-on' and 'tap-off' data there has been an up to 12% growth in demand at Concord West Station between 2016 and 2020. Figure 3-15 shows the number of customer entries (morning peak periods 6-10am) and the exits (afternoon peak periods 3-7pm). The Opal data that has been collected represents a 'typical day' of customer entries and exits at Concord West Station, noting that no Opal data is available for the years preceding 2016.

Figure 3-15 Concord West Station, Opal 'tap-on' and 'tap-off' entries and exits (2016-2020)



Data source: TfNSW Open Data Hub

To assess the existing rail capacity at Concord West Station, a formal request for 2022 OPAL data was put forward to TfNSW. Table 3-3 summarises the proportion of services that are under, at or above capacity for all trains stopping at Concord West Station. Based on the rail capacity analysis, it shows the majority of services operating under capacity across all time periods. Note that:

- The information provided is based on data already processed by TfNSW, with each capacity and time classification ('Under Capacity', 'At or Above Capacity' and 'Capacity Unknown', and 'AM Peak', 'Early Morning', 'Interpeak', 'PM Peak' and 'Late Night') as per the descriptions in the raw dataset.

- The Opal data was collected over two separate periods; 19-21 July, and 8-10 November 2022. This information has been averaged to represent a typical weekday (Tuesday to Thursday).

Table 3-3 Existing rail capacity (Concord West Station)

Capacity	Proportion of Services (%)				
	Early Morning	AM Peak	Interpeak	PM Peak	Late Night
Under Capacity	92%	98%	97%	95%	99%
At or Above Capacity	0%	0%	0%	0%	0%
Capacity Unknown	8%	1%	3%	5%	1%

Data source: Supplied by TfNSW.

3.3.4 Existing bus network

Bus stops within 500m walking catchment from the site are currently provided on Concord Road, located on the eastern side of the T9 Northern Line. Access from the site is primarily undertaken via active transport from King Street for the following bus services:

- 410 (Macquarie Park - Hurstville).
- 458 (Ryde - Burwood).
- N80 (Hornsby - City Town Hall via Strathfield (Night Service)).
- N81 (Parramatta - City Town Hall via Sydney Olympic Park (Night Service)).

Figure 3-16 provides the maps of the existing bus network for the services listed above.

Figure 3-16 Existing Bus Network: Inner West and Southern Region Network (left), Sydney NightRide Bus Network (right)

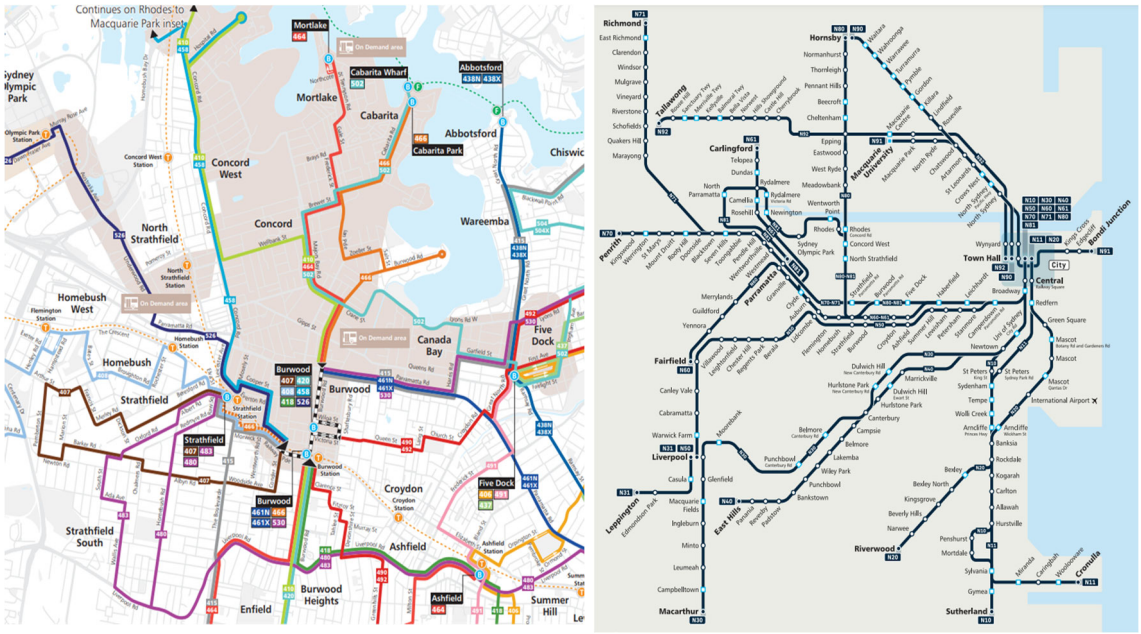


Image source (left): 'Inner West and Southern region network effective 5 December 2021' (TfNSW, Dec 2021)
Image source (right): 'Sydney NightRide Buses Network' (TfNSW, 2020)

Table 3-3 summarises the proportion of bus services with either seating available, seating capacity exceed, or total capacity exceed at key bus stops along Concord Road. The information is based on OPAL data supplied by TfNSW, which shows all bus services operating with seating capacity available across each time period. Note that:

- The information provided is based on data already processed by TfNSW, with each capacity and time classification as per the descriptions in the raw dataset.
- The Opal data was collected over two separate periods: 19-21 July, and 8-10 November 2022. This information has been averaged to represent a typical weekday (Tuesday to Thursday).

Table 3-4 Existing bus capacity (select bus stops on Concord Road)

Bus Stop (transit stop number - name of stop)	Proportion of services		
	Seating Available	Seating Capacity Exceeded	Total Capacity Exceeded
213826 - Concord Rd at Colane St, CONCORD WEST	100%	0%	0%
213835 - Concord Rd before Victoria Ave, CONCORD WEST	100%	0%	0%
213837 - Concord Rd at Coonong Rd, CONCORD WEST	100%	0%	0%

Data source: Supplied by TfNSW.

3.3.5 Existing active transport network

The site is situated within 300m distance from several existing and future on-road and off-road cycle facilities in Concord West. Figure 3.11 illustrates the location of the cycle facilities relative to the site, which shows:

- **Existing on-road (purple highlighted)** cycle path on Victoria Avenue, Station Avenue and George Street. The on-road facilities currently connects to the Sydney Olympic Park Bike Network.
- **Existing off-road (green highlighted)** cycle path on Powells Creek Reserve, with access via the on-road cycle path on Victoria Avenue. The off-road facilities currently connects to the Sydney Olympic Park and Strathfield Bus Network.
- **Future (blue highlighted)** cycle paths on Queen Road and Pomeroy Street, which will provide better opportunities for connections to existing cycle facilities in Liberty Grove and Rhodes to the north, eastern suburbs within the City of Canada Bay LGA to the east and the Burwood Bike Network to the south.

Figure 3-18 to Figure 3-21 illustrates the morning (6-10am) and afternoon (3-7pm) peak period cyclist movements, which shows the majority of existing trips occurring at the on-road cycle path on Victoria Avenue.

The site masterplan proposes to provide a new shared path from King Street to George Street through the new revitalised precinct. This has potential to increase the permeability of the site and active transport accessibility between Queen Street (located on the other side of the rail line where the future cycle connections have been planned) and Powells Creek Reserve.

Figure 3-17 Existing Cycle Network (City of Canada Bay LGA)

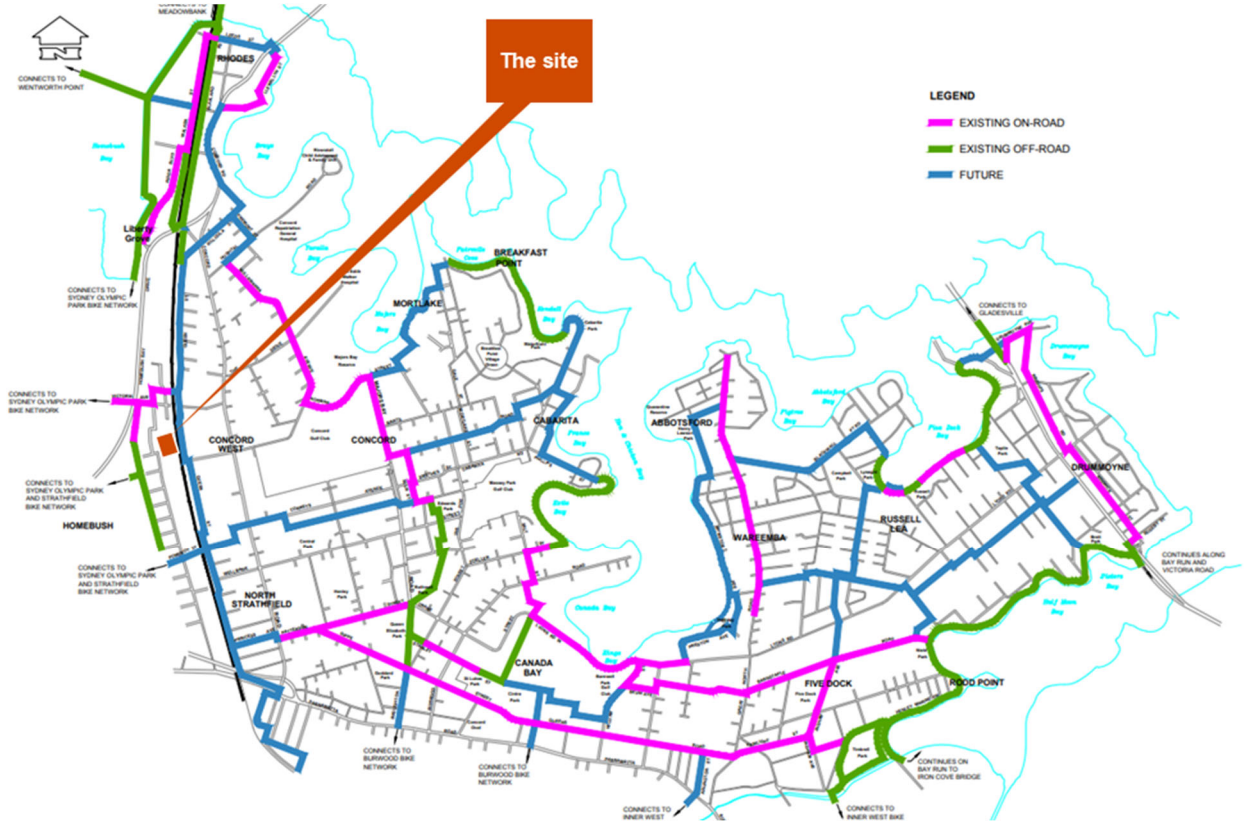


Image source (base map): 'Interim Bike Network Map' (Council, Jan 2019)

Figure 3-18 Morning peak period (6-10am) count summary – survey location IDs #2 to #6, flow diagram (cyclist)

Cyclist volumes
6-10am

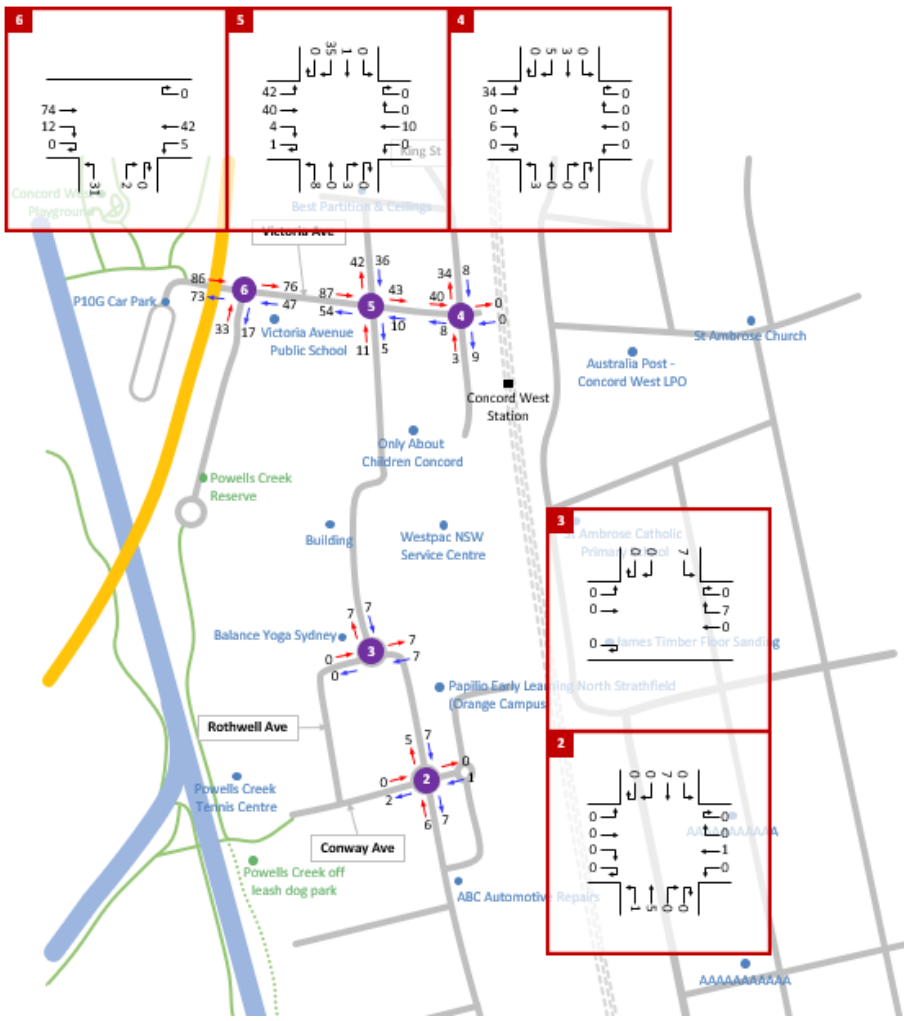


Figure 3-19 Morning peak period (6-10am) count summary – survey location ID #1, flow diagram (cyclist)

Cyclist volumes
6-10am

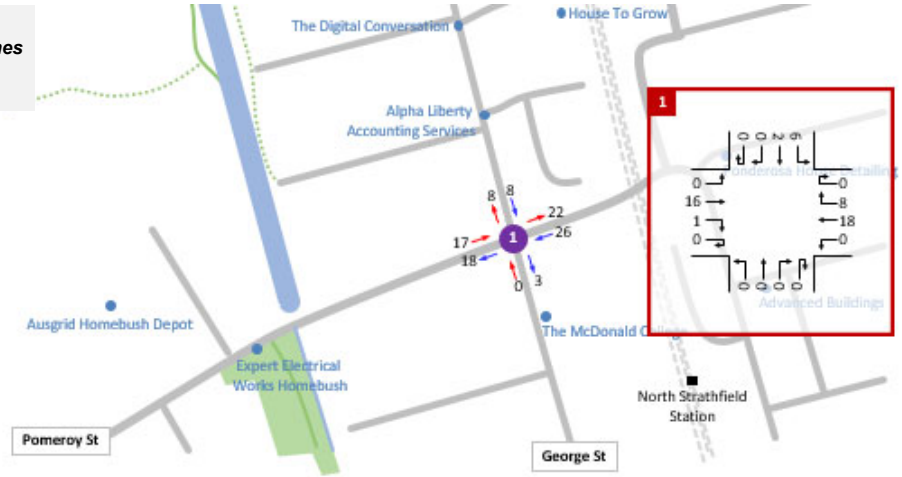


Figure 3-20 Afternoon peak period (3-7pm) count summary – survey location IDs #2 to #6, flow diagram (cyclist)

Cyclist volumes
3-7pm

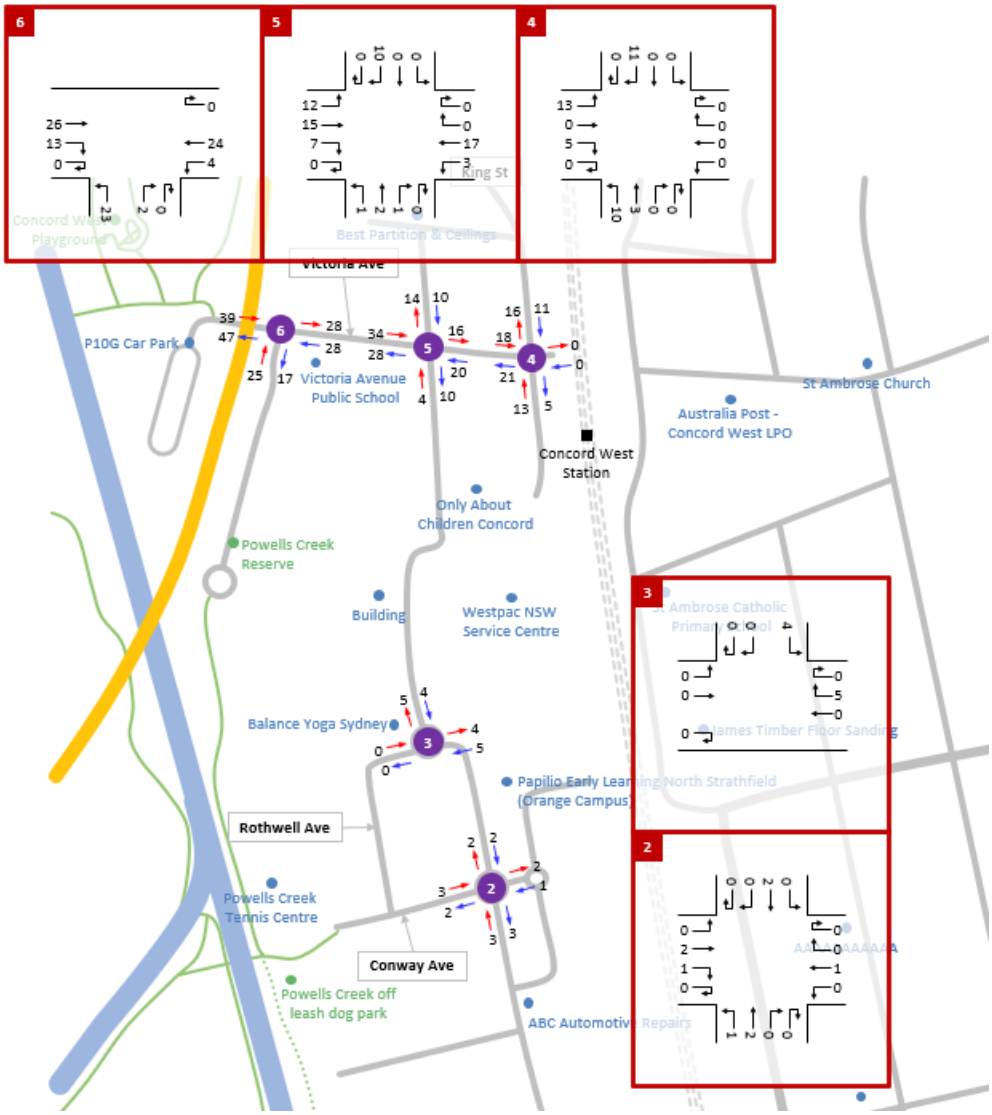
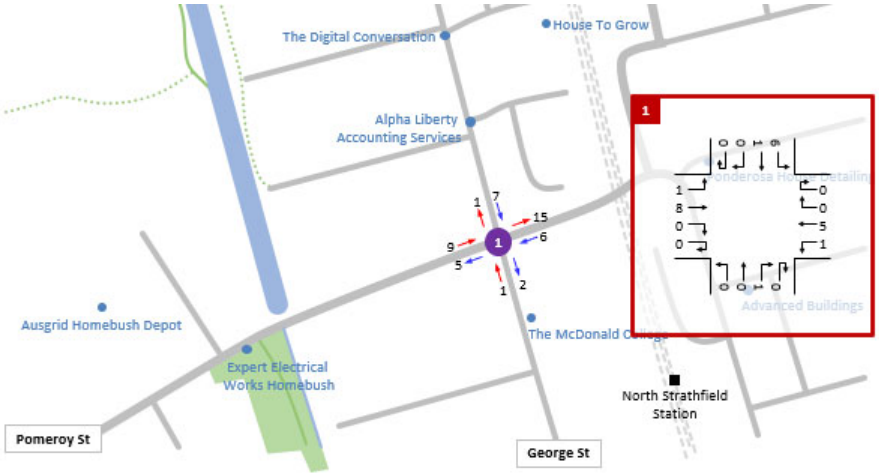


Figure 3-21 Afternoon peak period (3-7pm) count summary – survey location ID #1, flow diagram (cyclist)

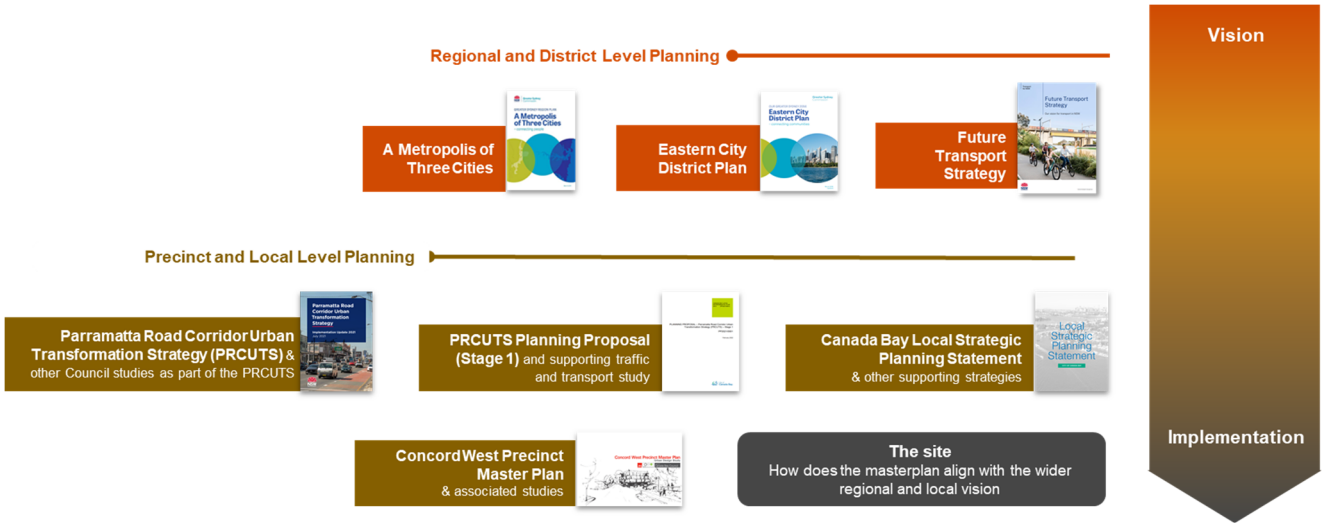
Cyclist volumes
3-7pm



4 Strategic Planning Context

The planning context for the site is informed by; (1) regional and district level planning that sets out the land use and transport vision for the wider region, and (2) precinct and local level planning that governs the implementation strategy for the site. Figure 4-1 below presents the overview of the relevant strategic documents that are further detailed in this section.

Figure 4-1 Overview of strategic plans and strategies relevant to the site



4.1 Regional & District Planning

4.1.1 Greater Sydney Region Plan - A Metropolis of Three Cities

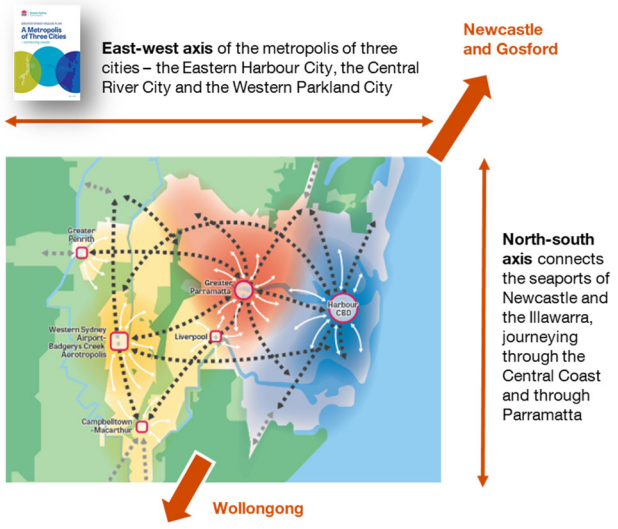
From a metropolis of three cities to a city region of six cities[5], the Greater Sydney Region Plan sets out the 40-year strategic land use plan for Sydney.

Figure 4-2 adjacent illustrates the overarching view of the plan, where:

- The **east-west axis** connects the two airports (Sydney Airport and the planned Western Sydney Airport) as part of the metropolis of three cities, which consists of the Eastern Harbour City, the Central River City and the Western Parkland City.
- The city region's **north-south axis** links the seaports of Newcastle and the Illawarra, connecting the Central Coast and Parramatta to build important foundations that will enable the region to generate more jobs in future-facing industries, close to where people choose to live. It consists of the Lower Hunter and Greater Newcastle City, Central Coast City, and Illawarra-Shoalhaven City

The plan was developed in close collaboration with the Future Transport Strategy (2022). One of the key objectives for the plans is to provide transport connections that will enable people to reach their nearest metropolitan or strategic centre within 30 minutes (or 15-min neighbourhoods) by public or active transport.

Figure 4-2 Overview of the Six Cities Region



Base map source: 'A Metropolis of Three Cities - Greater Sydney Region Plan' (Greater Sydney Commission, March 2018)

[5] Source: *'From a metropolis of three cities to a city region of six cities'* (Greater Sydney Commission, December 2021). Retrieved from: https://www.greater.sydney/news/three-cities-to-six-cities

4.1.2 Eastern City District Plan

The Eastern City District Plan is a 20-year strategic planning document that outlines the directions, planning priorities and actions needed to achieve the vision set out in the Greater Sydney Regional Plan for the Eastern Harbour City. Concord West is located within the Eastern Harbour City, close to the strategic centres at Sydney Olympic Park, Burwood and Rhodes.

The following have been identified as being relevant to the site:

Dwellings located within 30 minutes travel time by active or public transport of a metropolitan or strategic centre.

The site is located directly adjacent to the Concord West Station for access to the T9 Northern Line. The provision of more dwellings close to the station will; (1) enable more efficient access to workplaces, services and community facilities via the existing T9 Northern Line, and (2) promote greater levels of self-containment within the Eastern Harbour City.

The site is also located close to Sydney Olympic Park, with connections via an extensive active transport network through Bicentennial Park. Within the adjacent district in the Central District City Plan, Sydney Olympic Park has been identified as a key employment centre and the site of significant public transport investment to improve connectivity to Greater Parramatta.

Opportunities for housing in Concord West have been realised through urban renewal and local infill developments, providing more dwellings in existing neighbourhoods where housing capacity exists for the site.

Improved access open space.

The Eastern City District Plan will provide walking and cycling links that connects Concord West, North Strathfield, Homebush and Strathfield to Parramatta Road, Bicentennial Park and the Parramatta River foreshore via Powells Creek and Mason Park, Strathfield.

The site is located within 400m from Powells Creek. The site masterplan proposes a new shared access for pedestrians and cyclists through the site that links King Street from Concord West Station to George Street. This new shared access link will improve accessibility to / from Powells Creek and Bicentennial Park via the site.

Record investment in public transport infrastructure.

The management of population and employment growth within the Eastern Harbour City will be supported by a number of new public transport initiatives. This is outlined below in the Future Transport Strategy (2022).

4.1.3 Future Transport Strategy (2022)

The Future Transport Strategy (2022) is a 40-year transport strategy for Sydney and Regional NSW. Within the Eastern Harbour City, the plan identifies a number of regional initiatives to improve transport connectivity '*through stronger*

investment in public transport, and walking and cycling networks, supported with travel demand management and improved digital connectivity."[6]

Key transport initiatives relevant to the site are:

- **Sydney Metro**. SMW is a 24km new metro line that will link Westmead, Parramatta and Sydney CBD. The NSW Government has committed to an opening date by 2030 and a new metro station at North Strathfield located 1.1km south of the site. SMW is part of the Sydney Metro infrastructure, Australia's biggest public transport project that is currently being delivered by the NSW Government. The new Sydney Metro will provide fast, safe and reliable services across the Sydney metropolitan area which, in addition to SMW, will include Sydney Metro Northwest, Sydney Metro City & Southwest and Sydney Metro Western Sydney Airport.

  SMW has potential to alleviate forecast rail patronage demand on the existing T9 Northern Line due to the new connections on the Sydney Metro services at Epping, which provides additional travel options to the North Shore stations and Sydney CBD. Coupled with the new metro station planned for North Strathfield, about 20-min walking or a short cycle distance from the site, this will provide an additional public transport option for people living in Concord West.

- **Parramatta Light Rail Stage 2 (PLR2).** Together with the Stage 1 works, PLR2 is proposed to link Parramatta CBD to Ermington, Melrose Park, Wentworth Point and Sydney Olympic Park. It will also provide connections to SMW, Parramatta Station and ferry services at Rydalmere and Sydney Olympic Park. The NSW Government has committed $602.4 million to commence the detailed PLR2 planning process, including early works associated with the bridge connection across the Parramatta River between Wentworth Point to Melrose Park[7].

- **Macquarie Park to Hurstville via Rhodes mass transit / train link.** This is a potential rail link that is currently under investigation that will provide important cross city connectivity from Macquarie Park on the Sydney Metro to the T9 Northern Line connection at Rhodes and Hurstville.

- **WestConnex**. WestConnex is a motorway project delivered over four majors stages; (1) the completed M4 Widening and M4 East. The M4 East is a new underground connection that links Haberfield to Parramatta and the M4, (2) the completed M8, consisting of twin tunnels that connects the M5 at Kingsgrove to a new interchange at St Peters, (3) the M4-M5 Link Tunnels opening in 2023 which will connect the M4 East at Haberfield with the M8 at St Peters, with connections to the Anzac and Iron Cove bridges via the Rozelle Interchange, and (4) the Rozelle Interchange, which is scheduled for completion in 2023.

  The completed WestConnex will also have potential to shift more cross-regional car trips away from Parramatta Road, one of the key north-south arterial connections that currently provides vehicle access to the site via the road network.

4.2 Precinct & Local Planning

4.2.1 PRCUTS[8]

The Parramatta Road Corridor Urban Transformation Strategy (**PRCUTS**) is a 30-year strategy that sets out the vision and land use and transport planning principles for the renewal and transformation of the the Parramatta Road corridor. The overall vision for the Parramatta Road Corridor is '*a high quality multi-use corridor with improved transport choices, better amenity and balanced growth of housing and jobs'* that is able to '*accommodate 27,000 new homes and 50,000 jobs in a range of industries across the [Parramatta] Corridor over the next 30 years'* [9].

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[6] Source: '*Future Transport Strategy – Our Vision for Transport in NSW '* (TfNSW, 2022). Retrieved from: https://www.future.transport.nsw.gov.au/sites/default/files/2022-09/Future_Transport_Strategy_lowres_2.pdf

[7] Source: '*Parramatta Light Rail - Parramatta CBD to Sydney Olympic Park' (*NSW Government). Last accessed: 8-December-2022. Retrieved from: https://www.parramattalightrail.nsw.gov.au/parramatta-olympic-park

[8] Original strategy released by Landcom in November 2016). Some parts of the strategy has since been superseded by *the 'PRCUTS Implementation Update 2021'* released by the NSW Department of Planning and Environment (**DPE**) in July 2021.

[9] Source*: 'Parramatta Road Corridor Urban Transformation Strategy -Fact Sheet'* (Landcom, November 2016). Retrieved from: https://www.landcom.com.au/assets/Publications/Parramatta/eb21635a29/parramatta-road-rrban-transformation-strategy-fact-sheet-november-2016.pdf

The strategy is government-endorsed and given statutory weight through a Section 117 Ministerial Direction (Environmental Planning and Assessment Act 1979). DPE has been managing delivery of precinct traffic studies to support the realisation of PRCUTS, including precinct traffic studies and additional analysis of the upgrades proposed on state roads since mid-2020.

Figure 4-3 shows the boundary locations for the eight precincts located along the Parramatta Road Corridor. Each precinct has been planned to cater for a mix of housing, jobs and public spaces that matches the precincts' character and heritage.

The site is located within the Homebush-North Precinct (see map item number 3 in the PRCUTS boundaries shown below). While the strategy sets out the overall vision and planning framework for the revitalisation of the Parramatta Road corridor, the rezoning of the land within the PRCUTS area are actioned via planning proposals prepared by the relevant local councils and proponents.

A PRCUTS Planning Proposal was submitted by Council earlier this year supported by various documents and studies, including a precinct-wide traffic and transport study. This is further described in the following section.

Figure 4-3 PRCUTS Precinct Boundaries

Image source: 'PRCUTS Precinct Transport Report' (Landcom, Nov 2016)

4.2.2 Planning Proposal - PRCUTS (Stage 1)

In February 2022, Council exhibited a Planning Proposal to deliver Stage 1 (the 2016-2023 release areas) of the PRCUTS. The Planning Proposal seeks to amend the Canada Bay Local Environmental Plan 2013 (**LEP**) for three precincts within the City of Canada Bay LGA; (1) Homebush North, (2) Burwood-Concord and (3) Kings Bay. Community feedback has been received and Council is currently finalising the PRCUTS Planning Proposal to commence implementation of the plan

The PRCUTS Planning Proposal contains several design masterplans, a precinct-wide traffic and transport study (see following section) and local character assessments in support of Council's proposal. Within the Homebush North precinct this includes a proposal to change the zoning from mostly 'IN1 General Industrial' or 'R2 Low Density Residential' to 'R3 Medium Density Residential'.

While site is located within the Homebush North precinct, it does not form part of the PRCUTS Planning Proposal. Any proposed legislative amendments to the site is subject to the Canada Bay Local Strategic Planning Statement, which

specifically identifies the site as "*likely to experience renewal within the short to medium term"* and that "*any proposals for land use change will also need to address site/precinct specific requirements."* [10]

The PRCUTS Planning proposal identifies Homebush North as being *a "residential precinct centred on George Street, which will be a Places for People. The precinct will comprise diverse housing typologies, mainly terrace houses, and characterised by footpaths and cycle ways*".[11]

Although the site has been specifically excluded from the PRCUTS Planning Proposal, the site masterplan is consistent with the objectives set out for the Homebush North Precinct, primarily through (1) the addition of more dwellings and housing types within the existing residential precinct along George Street and (2) provision of a new cycle and walking links through the site that provides connections between Concord West Station near King Street to George Street.

4.2.3 Parramatta Road Corridor - Traffic and Transport Strategy

Council in partnership with Burwood Council and Strathfield Council commissioned a traffic and transport study to support the planning proposal put forward by the councils to rezone land within the Homebush, Burwood-Concord and Kings Bay precinct. This was completed in December 2021.

The key scope items of the traffic and transport study included; (1) a review of the each precincts' visions and objectives within the context of the existing planning policies and framework established as part of the PRCUTS, (2) the development of an operational traffic simulation model to assess the potential impacts to the road network performance, and (3) provide recommendations for network improvements that would be required to support the planning proposal.

The traffic modelling identifies high delays on Parramatta Road due to the increase in forecast traffic demand. Within the surrounding road network, the traffic assessment also identified the following intersections as forecast to experience high levels of congestion:

- Parramatta Road / Concord Road / Leicester Avenue.
- Parramatta Road / George Street.
- Parramatta Road / Underwood Road.
- Underwood Road / Pomeroy Street.
- George Street / Pomeroy Street.

Specifically, for the intersection of George Street / Pomeroy Street which is the key access location to / from the site, the report states that there is forecast to be extensive queueing on all approaches caused by:

- Downstream congestion at Underwood Road / Pomeroy Street, with westbound morning peak queues on Pomeroy Street that extends past this intersection to George Street.
- Majority of filter right turning vehicles unable complete their movement due to high opposing traffic flows.

This is illustrated in Figure 4-4 which shows the simulated vehicle plots at the George Street / Pomeroy Street intersection.

[10] Source*: 'City of Canada Bay Local Strategic Planning Statement'* (Council, March 2020). Retrieved from: https://canadabay.t1cloud.com/T1Default/CiAnywhere/Web/CANADABAY/API/CMIS/PUB/content/?id=folder-6641087&streamId=streampdf-6641087

[11] Source: '*PLANNING PROPOSAL – Parramatta Road Corridor Urban Transformation Strategy (PRCUTS) – Stage 1'* (Council, February 2022). Retrieved from: https://www.canadabay.nsw.gov.au/sites/default/files/Strategic%20Planning/2.%20PLANNING%20PROPOSAL_PRCUTS%20(Stage%201).pdf

Figure 4-4 Parramatta Road Corridor - Traffic and Transport Strategy: George Street / Pomeroy Street Pinch Point - 2036 with Development Traffic

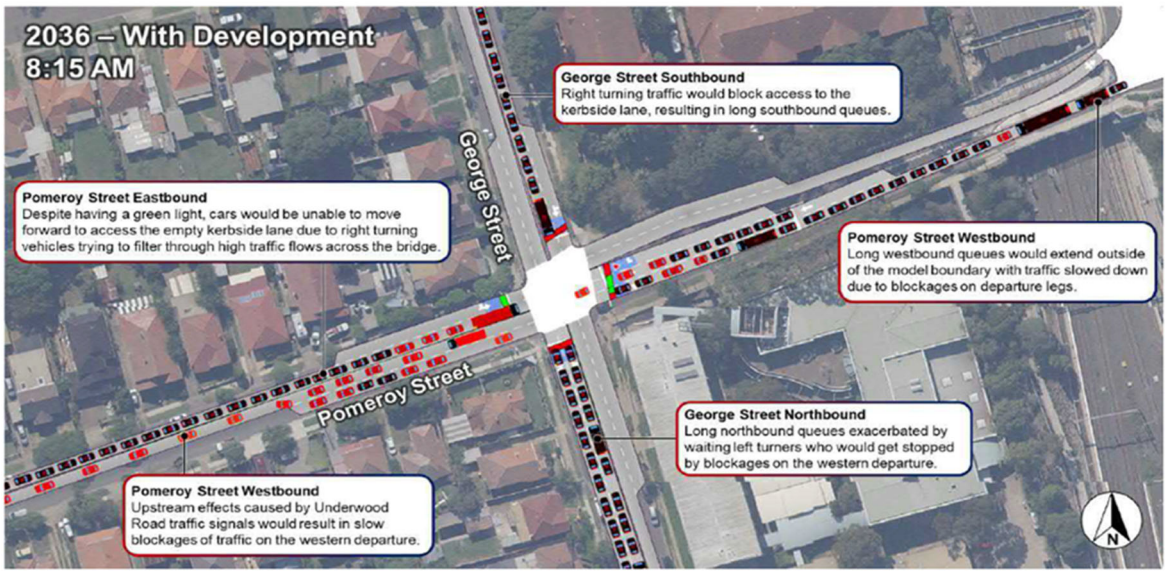


Image source: 'Parramatta Road Corridor - Traffic and Transport Strategy' (Bitzios on behalf of Council, Dec 2021)
Note. 'Development traffic' refers to the rezoning that that been proposed by Council as part of the PRCUTS.

Figure 4-5 Parramatta Road Corridor - Traffic and Transport Strategy: 2036 traffic congestion and pinch point map

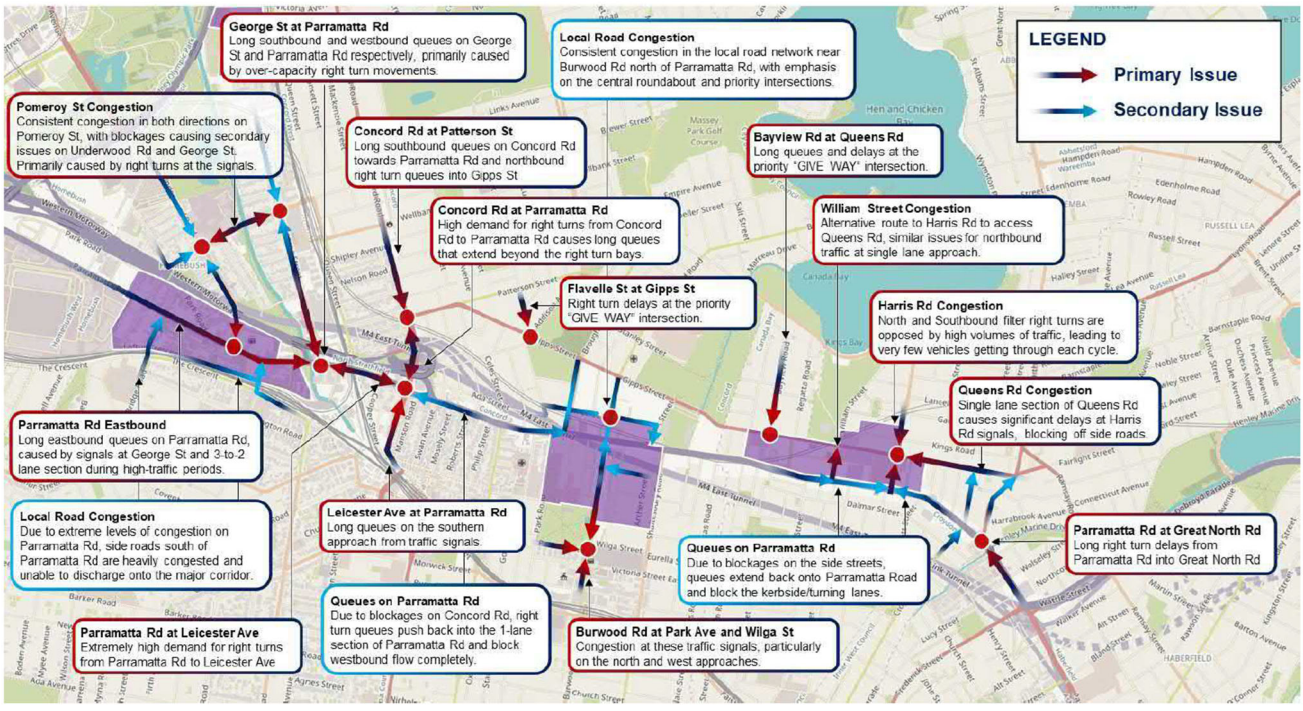


Image source: 'Parramatta Road Corridor - Traffic and Transport Strategy' (Bitzios on behalf of Council, Dec 2021)

4.2.4 Canada Bay Local Strategic Planning Statement

The Canada Bay Local Strategic Planning Statement is a 20-year statement that sets out Council's future direction and vision for land use in the LGA. The purpose of the document is to provide guidance and reasoning for any future changes to Council's planning controls through amendments to Council's LEP and development control plans (**DCP**).

The document is intended to align with the objectives set out for the Eastern Harbour City in the Greater Sydney Region Plan – A Metropolis of Three Cities and lists out 84 Actions required to achieve Council's Land Use Vision.

Action 6.5 relates specifically to the site, which states that*: "Prior to land use change occurring on the site known as 1-7 King Street, Concord West, the Concord West Socio Economic Study is to be updated by Council to respond to:*

- *the Eastern City District Plan.*
- *the PRCUTS.*
- *any outcomes arising from the Burwood, Strathfield, Homebush Planned Precinct.*
- *any commitment by the NSW Government in relation to a metro station in North Strathfield.*
- *any other matter of material importance.*

The Study is to provide a recommendation on the preferred land use outcome for the site having regard to the above plans, strategies and considerations."[12]

The plan is also supported by various strategies that help to inform Council's planning priorities. This includes the Canada Bay Local Movement Strategy. Figure 4-6 below presents the proposed Movement and Place extracted from the strategy, which classifies the future road network surrounding the site in Concord West as combination of 'Places for People' and 'Local Streets'.

Figure 4-6 Proposed Movement and Place for Canada Bay

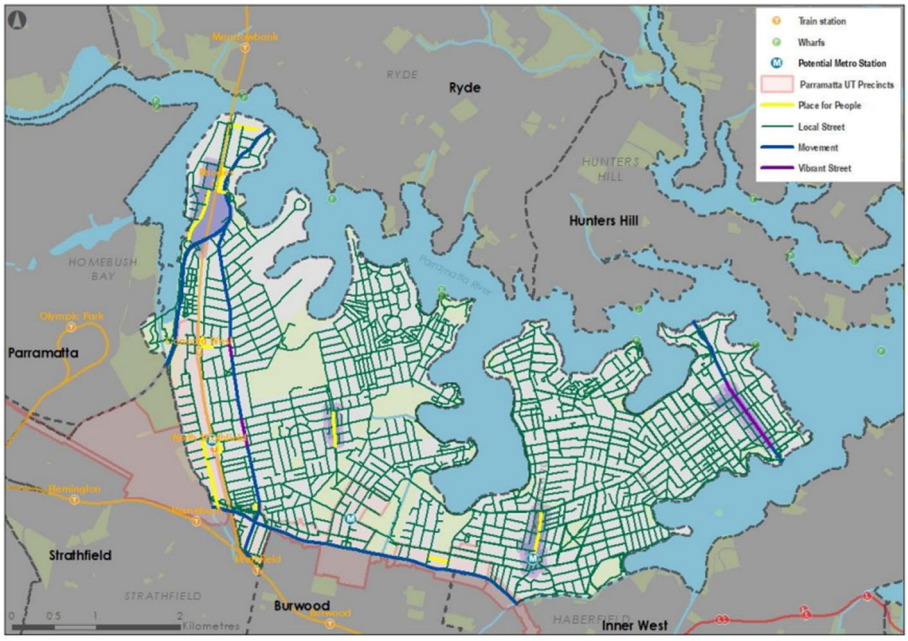


Image source: 'City of Canada Bay Local Movement Strategy' (GTA Consultants, Nov 2019)

[12] Source: '*City of Canada Bay Local Strategic Planning Statement*' (Council, March 2020). Retrieved from: https://canadabay.t1cloud.com/T1Default/CiAnywhere/Web/CANADABAY/API/CMIS/PUB/content/?id=folder-6641087&streamId=streampdf-6641087

4.2.5 Concord West Precinct Master Plan

Developed in 2014, the Concord West Precinct Master Plan provides guidance for the future development of industrial zoned sites located west of the T9 Northern Line in Concord West. The purpose of the Concord West Precinct Master Plan is to create new planning controls based on the objectives set out for the wider region and the community views. These include, but are not limited to:

- Mitigating impacts that relate to private vehicle usage.
- Promoting higher uptake of public and active transport modes.
- Identifying opportunities for public domain improvements, accessibility and connectivity.

The site is located within the Central Precinct of the Concord West Precinct Master Plan (refer to Figure 4-7 below, 'Site 4'). It identifies the following development principles as being specific to the site:

- **Green link:** Create an east-west linear park connecting the site to Powell's Creek Reserve.
- **King Street Extension**: Provide new connections between George Street and Concord West station.
- **Gradation of height:** Built form to intensify towards the centre and rear of the site.

From a traffic and transport perspective, the new connections that are proposed as part of the site aligns with the abovementioned development principles for the 'Green link' and 'King Street Extension'.

Figure 4-7 Central Precinct (Sites 4-5) Development Principles

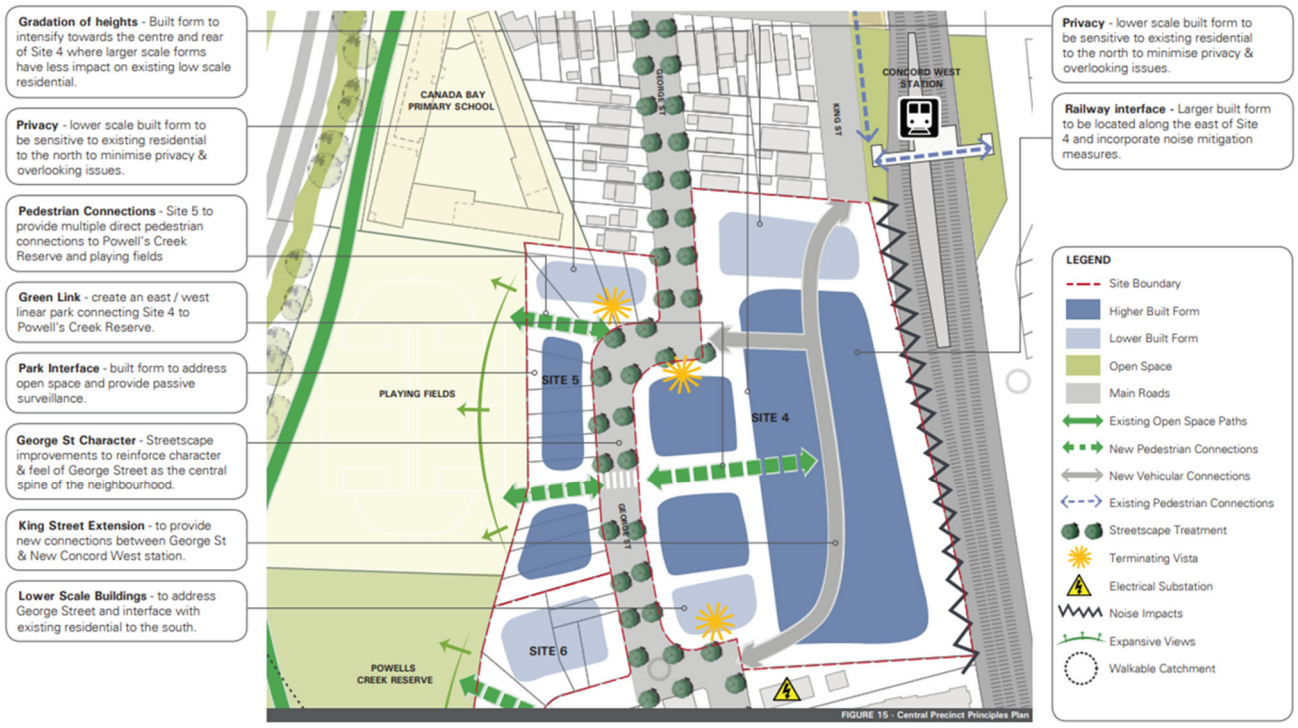


Image source: 'Concord West Master Plan 2014' (JBA and GTA Consultants, May 2014)

5 Projected Traffic

5.1 Modelling methodology

Between September 2022 and October 2022, two separate workshops were undertaken with key stakeholders (Council, TfNSW and Sydney Metro) to discuss the proposed modelling approach. A copy of the workshop presentation material and meeting minutes are provided in Appendix C.

Following stakeholder consultation, TfNSW requested Billbergia and PwC submit a Modelling Methodology Report, outlining the proposed modelling framework, model extents, scenario definitions and key inputs assumptions. For full details of the traffic projection methodology, including TfNSW feedback and comments register, please refer to Appendix D.

Table 5-1 provides an overview of the scenario definitions, which includes one base year scenario and three future year scenarios. The future year scenarios are based on modelling horizon year 2036, consistent with the *'Parramatta Road Corridor - Traffic and Transport Strategy'* (Bitzios on behalf of Council, December 2021).

The modelling framework consists of strategic transport and operational traffic modelling to assess the site impacts on the surrounding road network. Strategic modelling (STFM) is used to generate the background traffic growth (demand forecasts provided by TfNSW). Operational assessment has been undertaken using SIDRA intersection analysis, calibrated to existing traffic surveys.

Table 5-1 Scenario definitions

#	Scenario	Year	Traffic Demand			Network Coding
			Surveyed Data	Background Traffic Growth	Development Traffic Growth	
1	Base Year	2022	Yes	-	-	Existing road network
2	Future Reference Case	2036	Yes	Yes	-	Existing road network
3	Future Development Case	2036	Yes	Yes	Yes	Existing road network plus *two new intersections for site access points and conversion of existing roundabout to priority control.*

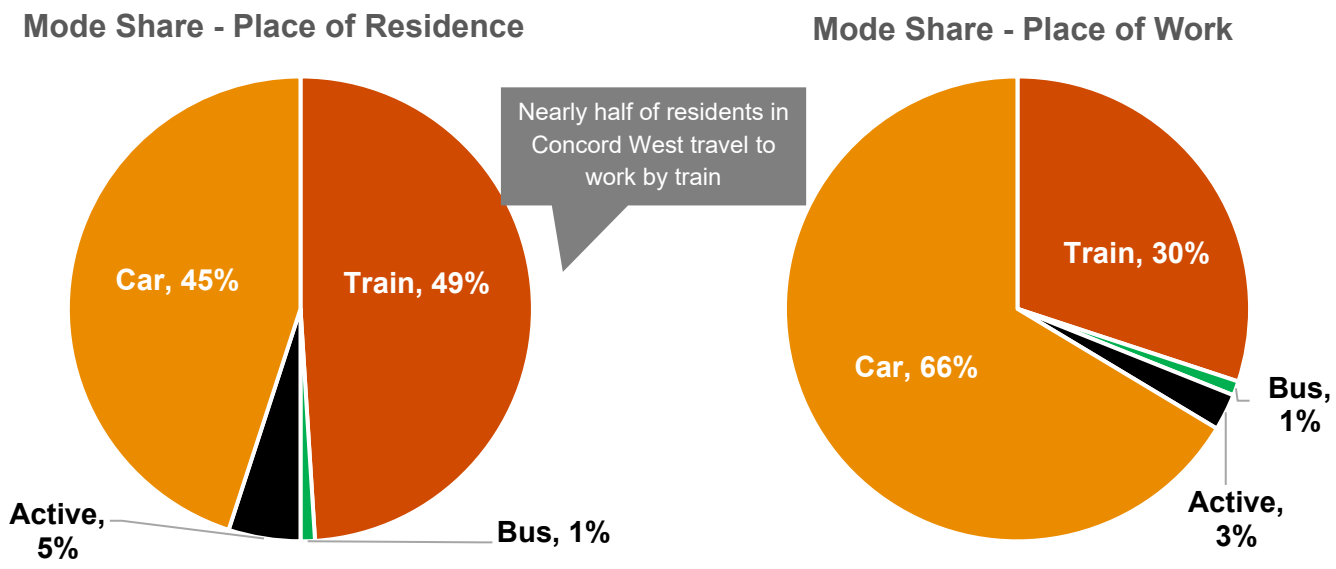
5.2 Site Traffic

5.2.1 Mode share targets

Within the site surrounds, the area is mainly occupied by low and medium density residents. Figure 5-1 provides the existing mode shares based on Journey to Work 2016 (**JTW16**) data. It shows that the resident trips in the travel zone is highly dependent on train, accounting for 49% of total residence trips.

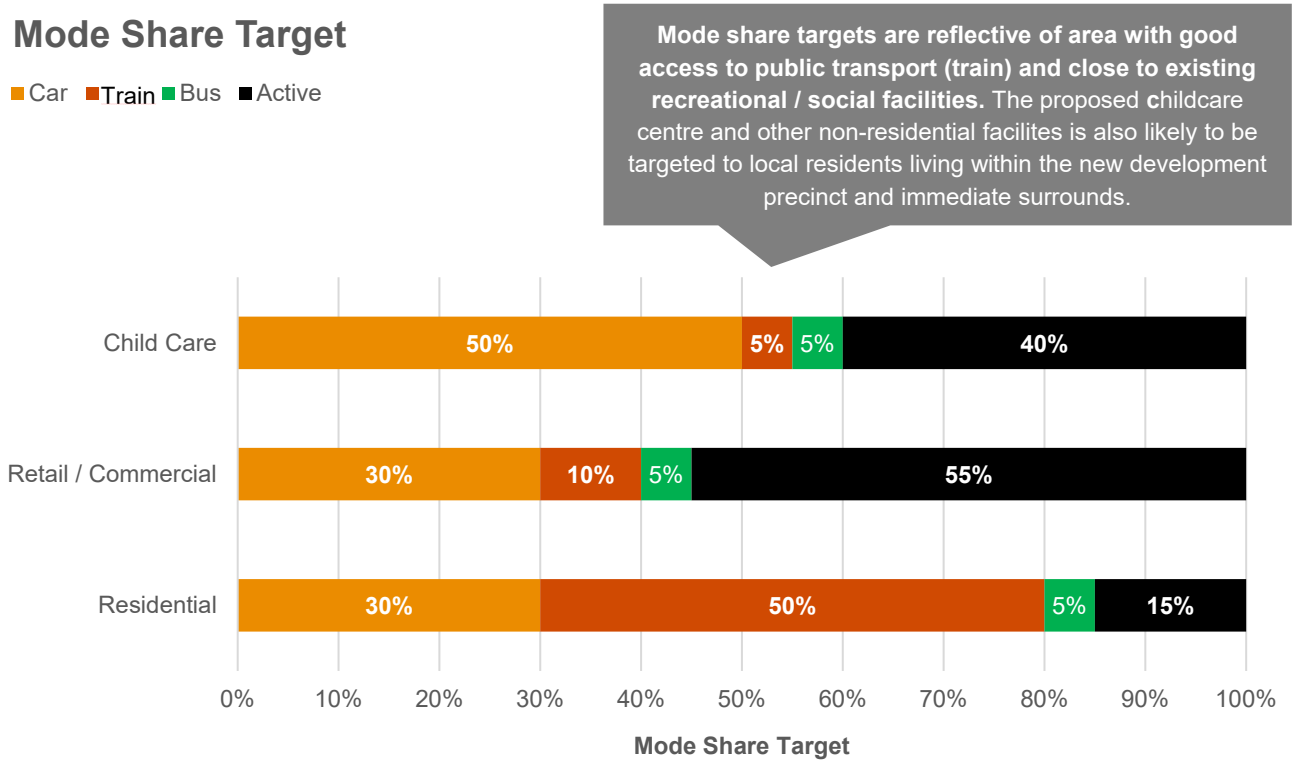
The site is located directly adjacent to Concord West Station. It is proposed to be high density mix used, comprising residential, retail/commercial and childcare. It has opportunities to increase the dependence on public transport and active transport. The proposed future mode share target is shown in Figure 5-7, with **30% car mode** for resident/retail/commercial and **50% car mode for childcare.**

Figure 5-1 Mode share for travel to work at place of residence (left) and place of work (right) in study area



Data source: JTW16 for TZ16 717 (Concord West Station West)

Figure 5-2 Proposed site mode share target by land use



5.2.2 Trip generation

The assumptions for the trips rates have been derived from various sources based on specific trip generation studies, as advised by TfNSW:

- **Residential trip rate** is based on the average of high density residential in Sydney Metropolitan Area sourced from the *'High Density Residential Trip Generation Surveys'* (GHD 2012). The average car mode share in the reference cases is approximately 30%.
- **Retail/Commercial trip rate** is based on the average rate of the reference cases with similar Gross Leasable Floor Area (**GLFA**) (5,000m^2 to 7,000m^2) from *'[TfNSW] Trip Generation Surveys NSW Small Suburban Shopping Centres Data Report*' (Bitzios, 2018). The average car mode share in the references is approximately 90%. As the proposed site car mode share target is 30%, a revised correlation coefficient of 0.33 (30%/90%) was applied to the vehicle trip rates.
- **Childcare trip rate** is based on the average of childcare centre with similar surrounding land uses (Commercial/Retail) sourced from*'[TfNSW] Validation Trip Generation Surveys'* (TEF Consulting, 2015).

Both vehicle and person trip rate were calculated to reflect the modal share target for the site. Table 5-2 and Table 5-3 below presents a breakdown of the site trips using vehicle trip rate and person trip rate. Using the same car mode target / assumptions, both vehicle trip rate and person trip rate methods generate similar car trips volumes. To facilitate other mode analysis, such as train trip generation in Table 5-4, the person trip generation outcome was used in this study.

Table 5-2 Estimated peak hour site traffic generation by vehicle trip rate method

Land Use	Quantum	Metric	Vehicle Rate		Total Car trips		AM Car Trips		PM Car Trips	
			AM	PM	AM	PM	IN	OUT	IN	OUT
Residential	716	per Unit	0.19	0.15	136	108	27	109	86	22
Retail / Commercial	6,660	100m^2 GFA	1.84	2.60	123	173	61	61	87	87
Child Care	120	per child	0.30	0.20	36	24	18	18	12	12
Total					**290**	**306**	**105**	**185**	**295**	**305**

Note:
1. The Retail/Commercial GLA to GLFA conversion rate 0.8 already applied onto trip rate.
2. The original retail trip rate sourced are 6.97 and 9.86 per 100m^2 GLFA. The mode coefficient 0.33 and GLFA/GFA factor 0.8 was applied onto it.

Table 5-3 Estimated peak hour site traffic generation by person trip rate method (Car)

Land Use	Quantum	Metric	Person Trip Rate		Total Car trips		AM Car Trips		PM Car Trips	
			AM	PM	AM	PM	IN	OUT	IN	OUT
Residential	716	per Unit	0.66	0.55	118	99	24	95	79	20
Retail / Commercial	6,660	100m^2 GFA	7.81	11.04	130	184	65	65	92	92
Child Care	120	per child	0.70	0.50	35	25	18	18	13	13
Total					**283**	**308**	**106**	**177**	**183**	**124**

Note:
1. The Retail/Commercial GLA to GLFA conversion rate 0.8 already applied onto trip rate.
2. Car occupancy is assumed to be 1.2
3. Car mode shares as per targets outlined in Section 5.2.1 of this report.
4. Car trips calculated as (quantum x person trip rate x mode share target) / car occupancy rate. In/out distribution 80%/20% (AM) and 20%/80% (PM) for residential, and 50%/50% (AM and PM) for retail/commercial and child care.

Table 5-4 Estimated peak hour site traffic generation by person trip rate method (Rail)

Land Use	Quantum	Metric	Person Trip Rate		Total Rail trips		AM Rail Trips		PM Rail Trips	
			AM	PM	AM	PM	IN	OUT	IN	OUT
Residential	718	per Unit	0.66	0.55	237	197	47	190	158	39
Retail / Commercial	6,660	100m^2 GFA	7.81	11.04	52	74	26	26	37	37
Child Care	120	per child	0.70	0.50	4	3	2	2	2*	2*
Total					**293**	**274**	**75**	**218**	**197**	**78**

Note:
1. The Retail/Commercial GLA to GLFA conversion rate 0.8 already applied onto trip rate.
s. Rail mode shares as per targets outlined for the site in Section 5.2.1 of this report.
4. Rail trips calculated as (quantum x person trip rate x mode share target) / car occupancy rate. In/out distribution 80%/20% (AM) and 20%/80% (PM) for residential, and 50%/50% (AM and PM) for retail/commercial and child care.

**Numbers rounded up*

5.2.3 Trip distribution

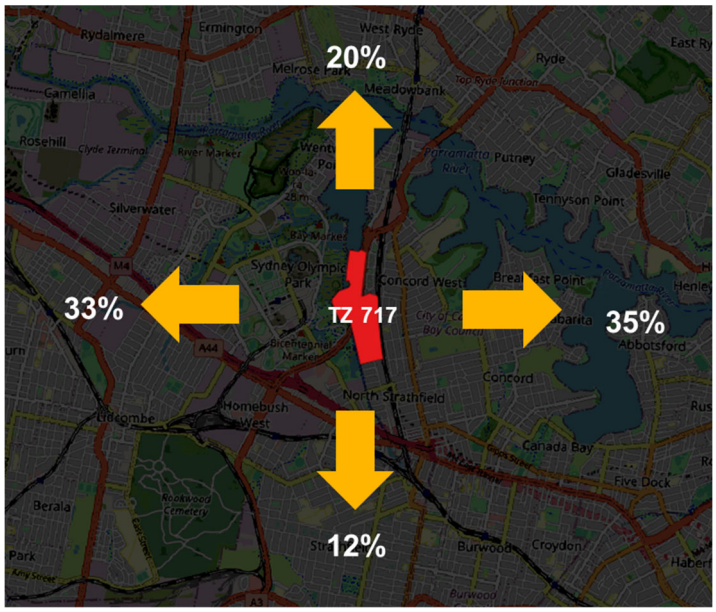
Figure 5-3 illustrates the trip distribution of existing commuting trips within the site surrounds, which shows the **majority of the trips occurring in the east-west direction**, to/from Sydney's West, inner west and Sydney CBD. Travel along this direction occurs along the M4 Motorway, Pomeroy Street, Parramatta Road and T9 Northern Line.

In terms of the future trip distribution, the modelled demand outputs provide an indication of how car trips are forecast to travel to/from George Street via Pomeroy Street (see Figure 5-4).

- Nearly half (52% / 48%) of inbound trips to Concord West in the morning and evening peak are forecast to be generated from Pomeroy Street west.
- The forecast outbound trips would be more evenly distributed on all three directions, particularly in the morning peak.

These trip distributions have been applied to the future traffic growth in the study area.

Figure 5-3 Existing directional distribution of traffic



Data source: JTW16 for TZ16 717 (Concord West Station West)

Figure 5-4 Peak directional distribution Pomeroy Street/George Street to/from the site surrounds - 2036 AM (left) and PM (right)

Data source: STFM for TZ16 717 (Concord West Station West) in 2036, select link analysis. Data supplied by TfNSW

A

~50% of inbound trips to Concord West from Pomeroy Street west

B

Outbound trips from Concord West more evenly distributed across all directions

5.2.4 Trip assignment

Figure 5-5 below shows the path for vehicle trips that currently travel through King Street / Victoria Avenue. With the development, these trips are assumed to divert from George Street to the new north-south road connection through the site.

While the new road connection is not intended as a 'rat-run' for through traffic in the area, for the purposes of this traffic assessment it is assumed that resident / workers / visitors north of the site on King Street would utilise this route.

Figure 5-5 Trip re-assignment with new connection between King Street and George Street

Note, path alignment through site indicative only

5.3 Background Traffic

Table 5-5 provides a summary of the forecast background demand growth, as supplied by TfNSW. As STFM is a strategic model, the demand forecasts only provide details for Pomeroy Street and George Street only. Traffic growth for other minor roads not listed in STFM are assumed to be the same proportions as the existing traffic flows. Figure 5-6 illustrates the flow diagram for the estimated background traffic growth.

- **Pomeroy Street (west of George Street)** background traffic is forecast increase by 26% and 29% during morning and evening periods, respectively
- **George Street (north of Pomeroy Street**) background traffic is forecast to increase by 42% and 48% during morning and evening periods, respectively

Table 5-5 Background traffic growth from base year (2022) to 2036 – 1-hour peak STFM

Road Name	Direction	AM 1-hour peak			PM 1-hour peak		
		Base Year	Growth (veh)	Growth (%)	Base Year	Growth (veh)	Growth (%)
Pomeroy Street (west of George Street)	**Eastbound**	641	+207	+32%	672	+188	+28%
	Westbound	542	+105	+19%	681	+211	+31%
	Sub-Total	**1,183**	**+312**	**+26%**	**1353**	**+399**	**+29%**
George Street (north of Pomeroy Street)	**Northbound**	293	+94	+32%	329	+178	+54%
	Southbound	335	+167	+50%	303	+125	+41%
	Sub-Total	**628**	**+261**	**+42%**	**632**	**+303**	**+48%**
Total		**1,811**	**+573**	**+32%**	**1985**	**+702**	**+35%**

Figure 5-6 Estimated background traffic increase – 2036 AM (left), 2036 PM (right) 1-hour peak link flows

5.4 Total Traffic

Figure 5-7 illustrates the total estimated increase in traffic with the development in 2036 based on the assumptions discussed above, including:

- Background growth and site-generated traffic
- Trip reassignment (see green arrows)
- Directional distributions.

It assumes that 70% of the site-generated traffic would enter/exit the development via the new southern access, and 30% via the new western access.

For full breakdown of the base year (surveyed data), future reference case (background traffic growth per STFM outputs) and future development case (site-generated traffic) by intersection and turning movement, please see Appendix E.

Figure 5-7 Estimated total future traffic increase - 2036 AM (left), 2036 PM (right) 1-hour peak link flows

6 Transportation Analysis

6.1 Site Access

Figure 6-1 below illustrates the site access at new intersections #7 and #8. The walking route between the station and site is also shown, which includes a main pedestrian- and cyclist-friendly vehicular corridor through the site, as well as an open space and green connector route for cyclists and pedestrians only. It is expected that the main access will occur at the southern entrance of the site.

Figure 6-1 Site access

6.2 Movement and Place

To assist in the understanding of where movement and place interacts, the internal street structure has been mapped according to TfNSW's Movement and Place classification. Figure 6-2 shows the four street environments for analysing movement and place in NSW. The street environment descriptions (as extracted from the *'Practitioners Guide to Movement and Place'* (NSW Government, March 2020)) are outlined as follows:

Figure 6-2 : Four street environments for analysing movement and place in NSW

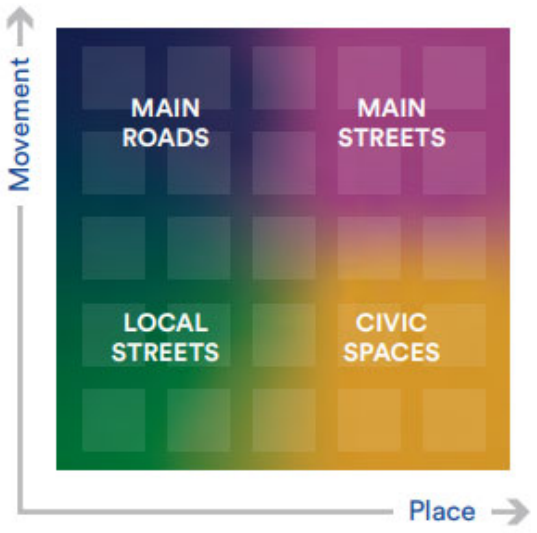


Image source: Practitioners Guide to Movement and Place (NSW Government, March 2020)

- **Civic spaces** are streets at the heart of our communities and have a significant meaning, activity function, or built environment. They are often in our major centres, our tourist and leisure destinations, and our community hubs. These streets are often pedestrian priority, shared spaces.
- **Local streets** are the majority of streets within our transport networks and often have important local place qualities. Activity levels are less intense, however, these streets can have significant meaning for local people.
- **Main streets** have both significant movement functions and place qualities. Balancing the functions of these streets is a common challenge.
- **Main roads** are routes central to the efficient movement of people and freight. They include motorways, primary freight corridors, major public transport routes, the principal bicycle network, and key urban pedestrian corridors. Place activity levels are less intense, however, these roads and routes can have significant meaning to local people.

Figure 6-3 shows the classification of the internal street structure. Its classification ('Civic Spaces') considers the built form, activity function and intended place-making aspects of the site masterplan, as well as the guiding principles set out in 'Beyond the Pavement 2020' (TfNSW, August 2020) and 'Movement and Place - Network Planning in Precincts Guide' (NSW Government, May 2022).

Note that George Street is retained as 'Local streets', as per the proposed movement and place for Canada Bay in Council's 'Canada Bay Local Strategic Planning Statement'.

As part of the movement and place classification, SINSW requires the use of the Built Environment Performance Indicators 'Amenity and Use' and 'Primary Schools' to evaluate any impacts on walkability and public transport accessibility of public schools in an area. Figure 6-4 shows the current walkable and public transport access to primary schools in the area, with markups indicating the new connections through site.

Figure 6-3 Site masterplan – movement and place hierarchy

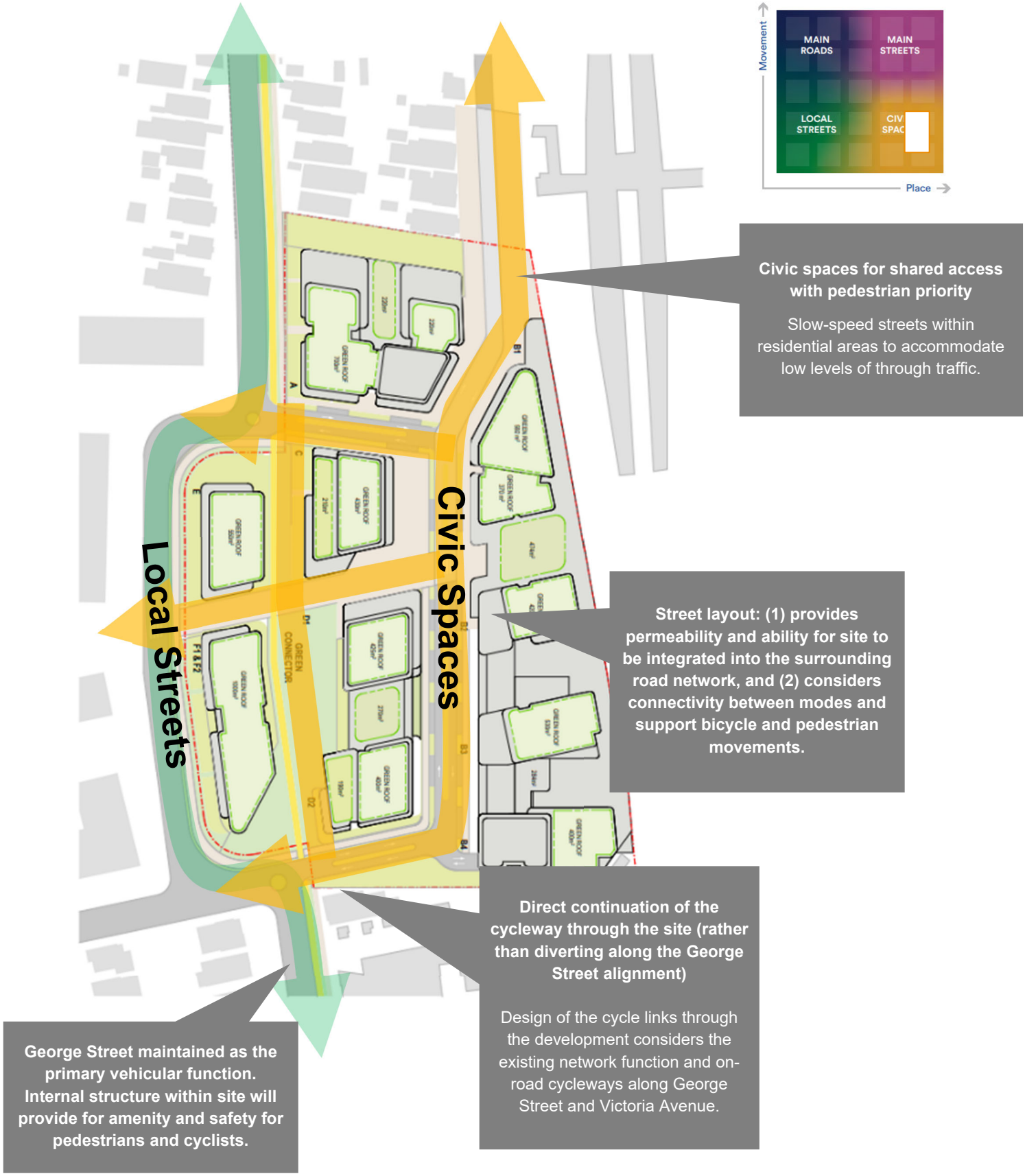
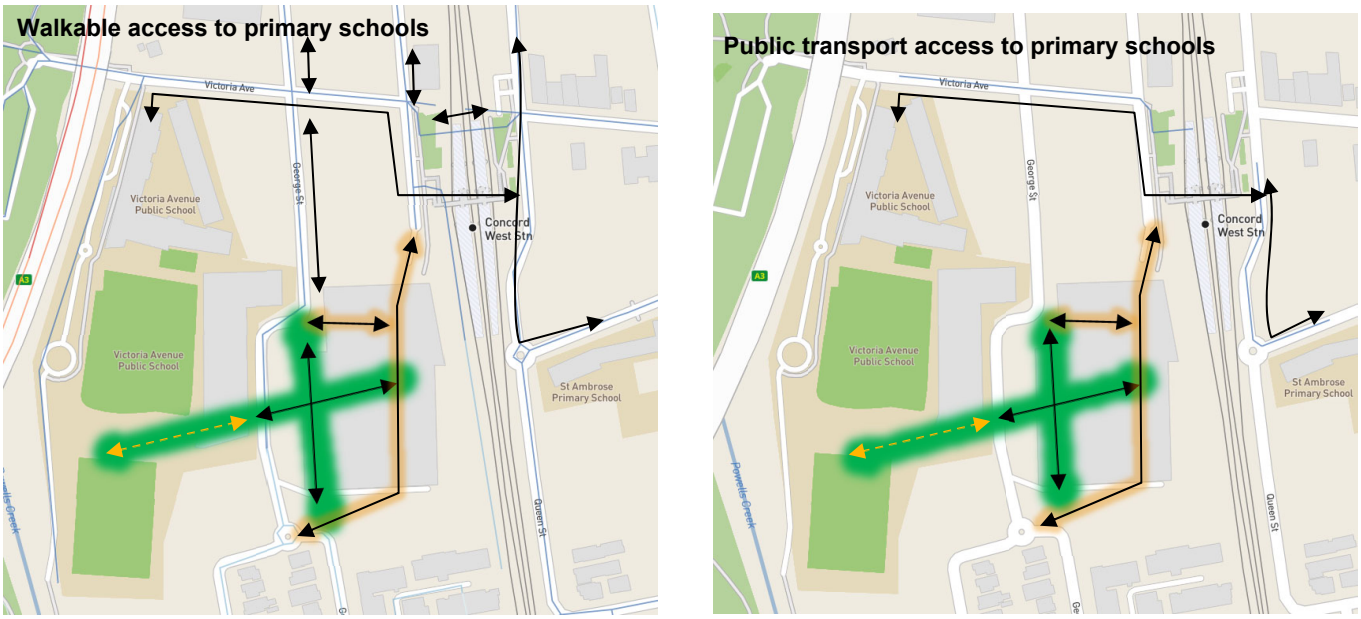


Figure 6-4 Current walkable (left) and public transport access (right) to primary schools in the area – overlaid with new connections through site



Site is currently less than 400m walkable access to Victoria Avenue Public school and St Ambrose Primary School. Primary schools are also within 400m of Concord West Station.

Existing school access by walking and train via George Street, King Street and Victoria Avenue. East of the rail line, access via Queen Street and station overpass or Station Avenue.

Site does not impede on the existing walkable and public transport access to the primary schools. Majority of traffic generated travel south of the site. New pedestrian and cycleway link through site forms part of the proposed 'Green Link', with provision in Council's Concord West Masterplan (2014) for extension through to Powells Creek Reserve.

Base image extracted from map 'Primary schools - Measure the walkable access to primary schools and nearby public transport' (NSW Government). Last accessed 2-December-2022. Retrieved from: https://www.movementandplace.nsw.gov.au/place-and-network/built-environment-indicators/primary-schools

6.3 Road Capacity and Level of Service

This section provides the traffic analysis for the base year (existing), Future Reference Case and Future Development Case scenarios. It also details other input assumptions adopted as part of the SIDRA Intersection Version 9 (SIDRA) base year calibration and validation process. The traffic analysis, performance assessment and reported outcomes are based on intersection delay time and LoS. For full details of the intersection performance summary, please refer to the SIDRA modelling outputs shown in Appendix F.

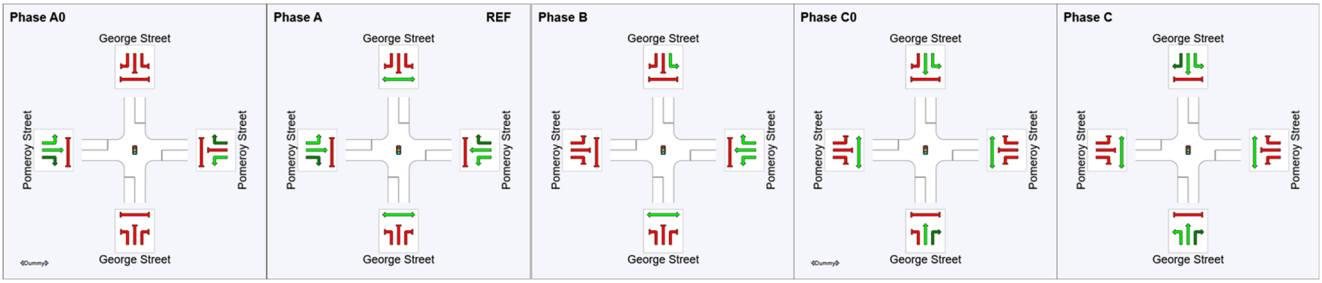
6.3.1 Existing conditions

Six intersections were modelled in the base year (2022) using SIDRA with demand inputs from the traffic survey and SCATS signal data. During the site observation, all intersections except George Street / Pomeroy Street performed well with low traffic volumes.

On George Street / Pomeroy Street, a noticeable westbound downstream blockage was observed in the morning peak hour caused by queue spillage from Underwood Road / Pomeroy Street. To account for this, the westbound effective green times were reduced by eight seconds and five seconds in Phases A and C, respectively, for the morning peak hour in the SIDRA model. Figure 6-5 shown the signal phase plan on George Street / Pomeroy Street, where:

- Phases A, B and C were modelled as typical phases for the intersection.
- Phase A0 and C0 (without movement to the departure lanes at the western approach) were modelled as 'dummy phases' with fixed eight seconds and five second phase times to account for the reduction in the effective green time. This setting has been carried through to the future models.

Figure 6-5 George Street / Pomeroy Street morning peak phase plan



The SIDRA base model was calibrated and validated at the key intersection of George Street / Pomeroy Street:

- The SIDRA signal time was set as program-optimised and used to calibrate against the recorded SCATS history time. Table 6-1 compares the observed SCATS history and modelled signal times, which shows differences of less than 10 seconds for each phase.

Table 6-1 Signal phase time calibration at George Street / Pomeroy Street

George Street / Pomeroy Street		Phase Time (sec)		
		Phase A	Phase B	Phase C
Morning Peak Hour (8-9am)	SCATS history	68	17	55
	Modelled	71	15	54
	Difference	3	-2	-1
Afternoon Peak Hour (5-6pm)	SCATS history	48	19	43
	Modelled	56	12	42
	Difference	8	-7	-1

- The maximum queue length observed on site was used to validate the modelled '95% Back of Queue' at each approach. Figure 6-6 maps the extents of the queue lengths based on the surveyed data, with images at two observations points collected during site observations during the morning peak hour.

  A comparison of the modelled vs. surveyed queue lengths is provided in Table 6-2, which shows a maximum vehicles difference of 10.

Table 6-2 Maximum queue length validation at George Street / Pomeroy Street

George Street / Pomeroy Street		Approach - Queue length (veh)			
		South	East	North	West
Morning Peak Hour (8-9am)	Surveyed	19	21	10	32
	Modelled	16	17	14	31
	Difference	-3	-4	4	-1
Afternoon Peak Hour (5-6pm)	Surveyed	15	14	8	37
	Modelled	14	17	9	27
	Difference	-1	3	1	11

Figure 6-6 George Street / Pomeroy site observation map (surveyed queue lengths)

Overall, modelled results are consistent with the surveyed data at George Street / Pomeroy Street. Other modelled intersections, local road roundabout or priority intersections, were reviewed during the site visit with minimal delay observed.

The performance is measured by intersection LoS based on the '*RTA Guide to Traffic Generating Developments*' (RTA, 2002*)* criteria. Table 6-3 shows the intersection LoS bands, which are based on average delay per vehicle. Intersections that are LoS A to D are generally considered to be operating satisfactorily to near capacity. LoS E and F corresponds to intersections that are operating at or over capacity.

Table 6-3 Intersection LoS criteria

LoS	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabouts	Give Way and Stop Signs
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity, at signals, incidents will cause excessive delays	At capacity, requires other control mode
F	>70	Roundabouts require other control modes	Over capacity unstable operation.

Source: RTA Guide to Traffic Generating Developments (RTA, 2002)

Note: (1) The average daily assessed for signalised intersection is overall movements, (2) For roundabouts and priority control intersections (with Stop and Give Way signs or operating under the T-junction rule), the critical criterion for assessment is the movement with the highest delay per vehicle. Average daily is expressed in seconds per vehicle.

Table 6-4 and Table 6-5 presents the base year intersection performance in the morning and evening peak hours. Apart from George Street / Pomeroy Street, all other intersections perform at LoS A owing to low traffic volumes. George Street / Pomeroy Street operates at LoS D in the morning and afternoon peak hours. These were consistent with observations made during the site visit.

Table 6-4 Base year intersection performance – morning peak hour (8-9am)

#	Intersection Name	Intersection Type	Volume	Average Delay (sec)	LoS
1	George Street / Pomeroy Street	Signal	2,136	47	D
2	George Street / Conway Avenue	Roundabout	429	5	A
3	George Street / Rothwell Avenue	Roundabout	323	6	A
4	King Street / Victoria Avenue	Priority	58	4	A
5	George Street / Victoria Avenue	Priority	292	6	A
6	Victoria Avenue / Access Road	Priority	253	5	A

Table 6-5 Base year intersection performance – afternoon peak hour (5-6pm)

#	Intersection Name	Intersection Type	Volume	Average Delay (sec)	LoS
1	George Street / Pomeroy Street	Signal	2,171	33	C
2	George Street / Conway Avenue	Roundabout	372	5	A
3	George Street / Rothwell Avenue	Roundabout	258	5	A
4	King Street / Victoria Avenue	Priority	69	4	A
5	George Street / Victoria Avenue	Priority	221	5	A
6	Victoria Avenue / Access Road	Priority	131	4	A

6.3.2 Background conditions (existing plus background growth)

Table 6-6 and Table 6-7 presents the Future Reference Case intersection performance in the morning and afternoon peak hours. George Street / Pomeroy Street would further deteriorate to LoS F in both peaks while other intersections remain at LoS A.

Table 6-6 2036 Future Reference Case intersection performance – morning peak hour (8-9am)

#	Intersection Name	Intersection Type	Volume	Average Delay (sec)	LoS
1	George Street / Pomeroy Street	Signal	2,671	227	F
2	George Street / Conway Avenue	Roundabout	658	5	A
3	George Street / Rothwell Avenue	Roundabout	504	6	A
4	King Street / Victoria Avenue	Priority	91	4	A
5	George Street / Victoria Avenue	Priority	472	7	A
6	Victoria Avenue / Access Road	Priority	399	5	A

Table 6-7 2036 Future Reference Case intersection performance – afternoon peak hour (5-6pm)

#	Intersection Name	Intersection Type	Volume	Average Delay (sec)	LoS
1	George Street / Pomeroy Street	Signal	2,825	235	F
2	George Street / Conway Avenue	Roundabout	645	5	A
3	George Street / Rothwell Avenue	Roundabout	455	5	A
4	King Street / Victoria Avenue	Priority	128	4	A
5	George Street / Victoria Avenue	Priority	416	5	A
6	Victoria Avenue / Access Road	Priority	233	4	A

6.3.3 Total traffic (existing plus background and site-generated growth)

Table 6-8 and Table 6-9 presents the Future Development Case intersection performance in the morning and afternoon peak hours. It includes the new southern and western accesses at the site (location IDs #7 and 8). Similar to the Future Reference Case, George Street / Pomeroy Street would further deteriorate to LoS F in both peaks while other intersections would perform at LoS A.

Table 6-8 2036 Future Development Case intersection performance – morning peak hour (8-9am)

#	Intersection Name	Intersection Type	Volume	Average Delay (sec)	LoS
1	George Street / Pomeroy Street	Signal	2,954	371	F
2	George Street / Conway Avenue	Roundabout	941	5	A
3	George Street / Rothwell Avenue	Priority (modified)	533	5	A
4	King Street Victoria Avenue	Priority	65	4	A
5	George Street / Victoria Avenue	Priority	416	6	A
6	Victoria Avenue / Access Road	Priority	399	5	A
7	George Street / Site North Access	Roundabout (new)	802	7	A
8	George Street / Site West Access	Roundabout (new)	501	5	A

Table 6-9 2036 Future Development Case intersection performance – afternoon peak hour (5-6pm)

#	Intersection Name	Intersection Type	Volume	Average Delay (sec)	LoS
1	George Street / Pomeroy Street	Signal	3,133	389	F
2	George Street / Conway Avenue	Roundabout	947	5	A
3	George Street / Rothwell Avenue	Priority (modified)	460	5	A
4	King Street Victoria Avenue	Priority	79	4	A
5	George Street / Victoria Avenue	Priority	330	5	A
6	Victoria Avenue / Access Road	Priority	233	4	A
7	George Street / Site North Access	Roundabout (new)	769	7	A
8	George Street / Site West Access	Roundabout (new)	440	5	A

6.3.4 Traffic volume impact of proposal to other intersections

This section addresses peer review comment (item #8, 'Transport Assessment Review') and request for additional commentary from Council with respect to traffic impact of proposal on the following intersections:

- George Street/Parramatta Road.
- Pomeroy Street/Underwood Road.
- Queen Street/Pomeroy Street/Beronga Street.

The breakdown of the site-generated peak hourly (AM and PM), inbound (towards the site) and outbound trips (away from the site) travelling through the intersections are detailed as follows.

Table 6-10 Traffic volume impact of proposal to other intersections

Peak Hour	Intersection	Vehicles generated by site travelling through intersection	
		Inbound Trips *(travelling towards site)*	**Outbound Trips** *(travelling away from site)*
AM	Pomeroy Street / Underwood Road	55	55
	George Street / Parramatta Road	21	67
	Queen Street / Pomeroy Street / Beronga Street	30	55
PM	Pomeroy Street / Underwood Road	88	53
	George Street / Parramatta Road	37	40
	Queen Street / Pomeroy Street / Beronga Street	59	31

The above estimates are calculated based on the following assumptions:

- **Trip distribution** as per Section 5.2.3, with all site-generated traffic assumed to travel through the identified intersections based on the directional splits shown in Figure 5-4.
- **Number of trips generated** by the site as per Section 5.2.2.

Based on the previous traffic and transport study undertaken by Council as part of the Parramatta Road Corridor Urban Transformation Strategy (PRCUTS), and following consultation with key stakeholders, it is understood that:

- Sydney Metro are investigating potential upgrade works at the intersection of Queen Street / Pomeroy Street / Beronga Street (advice current as of September 2022).
- Without further intervention measures (e.g. intersection upgrades along Pomeroy Street), and with background traffic growth alone, these intersections are forecast to experience high levels of congestion (*Source: Parramatta Road Corridor - Traffic and Transport Strategy' (Bitzios on behalf of Council, Dec 2021*).

6.4 Infrastructure Staging

Intersection performances have been modelled in 2027, 2028 and 2030 for the Future Development Cases for the following horizon years:

- Stage 1: 2027 – 200 dwellings total
- Stage 2: 2028 – 400 dwellings total
- Stage 3: 2030 – 798 dwellings total

The staging horizon years for the Future Reference Cases have also been modelled for comparison. Based on the morning and afternoon peak hour intersection performances reported in Table 6-11 to Table 6-14:

- By 2027, George Street / Pomeroy Street would continue to operate at unacceptable levels in the Future Reference Case, with LoS F and E in the morning and evening peak hours, respectively. With the Stage 1 development, the delays of the intersection in development case would increase by ~30 seconds, resulting in LoS F in both peaks.
- By 2028 and 2030, with background growth, traffic performance at George Street / Pomeroy Street would continue to deteriorate, even without the site-generated traffic.
- All other intersections would perform satisfactorily, operating at LoS A due to low traffic volumes.

Table 6-11 2027 to 2030 Future Reference Case intersection performance – morning peak hour (8-9am)

#	Intersection Name	2027			2028			2030		
		Volume	Average Delay (sec)	LoS	Volume	Average Delay (sec)	LoS	Volume	Average Delay (sec)	LoS
1	George Street / Pomeroy Street	2,350	78	F	2,386	147	F	2,457	115	F
2	George Street / Conway Avenue	520	8	A	535	8	A	566	8	A
3	George Street / Rothwell Avenue	395	7	A	408	7	A	432	7	A
4	King Street / Victoria Avenue	71	5	A	73	5	A	78	5	A
5	George Street / Victoria Avenue	364	7	A	376	7	A	400	7	A
6	Victoria Avenue / Access Road	312	7	A	321	7	A	341	7	A

Table 6-12 2027 to 2030 Future Reference Case intersection performance – afternoon peak hour (5-6pm)

#	Intersection Name	2027			2028			2030		
		Volume	Average Delay (sec)	LoS	Volume	Average Delay (sec)	LoS	Volume	Average Delay (sec)	LoS
1	George Street / Pomeroy Street	2,433	70	E	2,476	82	F	2,564	102	F
2	George Street / Conway Avenue	481	7	A	500	7	A	536	8	A
3	George Street / Rothwell Avenue	337	7	A	350	7	A	376	7	A
4	King Street / Victoria Avenue	93	5	A	96	5	A	104	5	A
5	George Street / Victoria Avenue	299	8	A	312	8	A	338	8	A
6	Victoria Avenue / Access Road	172	7	A	179	7	A	192	7	A

Table 6-13 2027 to 2030 Future Development Case intersection performance – morning peak hour (8-9am)

#	Intersection Name	2027			2028			2030		
		Volume	Average Delay (sec)	LoS	Volume	Average Delay (sec)	LoS	Volume	Average Delay (sec)	LoS
1	George Street / Pomeroy Street	2,432	119	F	2,547	291	F	2,740	200	F
2	George Street / Conway Avenue	602	8	A	697	8	A	849	9	A
3	George Street / Rothwell Avenue	398	5	A	430	5	A	483	5	A
4	King Street / Victoria Avenue	61	4	A	61	4	A	62	4	A
5	George Street / Victoria Avenue	342	7	A	350	7	A	366	7	A
6	Victoria Avenue / Access Road	312	7	A	321	7	A	341	7	A
7	George Street / Site North Access	492	8	A	583	8	A	729	8	A
8	George Street / Site West Access	366	7	A	398	7	A	451	7	A

Table 6-14 2027 to 2030 Future Development Case intersection performance – morning peak hour (8-9am)

#	Intersection Name	2027			2028			2030		
		Volume	Average Delay (sec)	LoS	Volume	Average Delay (sec)	LoS	Volume	Average Delay (sec)	LoS
1	George Street / Pomeroy Street	2,522	96	F	2,652	136	F	2,871	281	F
2	George Street / Conway Avenue	568	8	A	672	8	A	840	9	A
3	George Street / Rothwell Avenue	328	5	A	362	5	A	416	5	A
4	King Street / Victoria Avenue	73	4	A	74	4	A	75	4	A
5	George Street / Victoria Avenue	264	8	A	272	8	A	286	8	A
6	Victoria Avenue / Access Road	172	7	A	179	7	A	192	7	A
7	George Street / Site North Access	436	8	A	534	8	A	692	9	A
8	George Street / Site West Access	309	7	A	342	7	A	396	7	A

6.5 Parking

Council's Development Control Plan (**DCP**) sets out the design controls for various types of development, including the desired parking rates. Table 6-15 estimates the desired car parking for the site based on Council's DCP, noting that:

- The site is located within 'Category C' in Council's Residential Car Parking Rates Map, as shown overpage in Figure 6-7.
- Parking rates have been derived for areas where the General Controls apply. This site does not fall within the precinct boundaries for Council's 'Special Precinct' in Concord West.

Figure 6-7 Council Residential Car Parking Rates Map

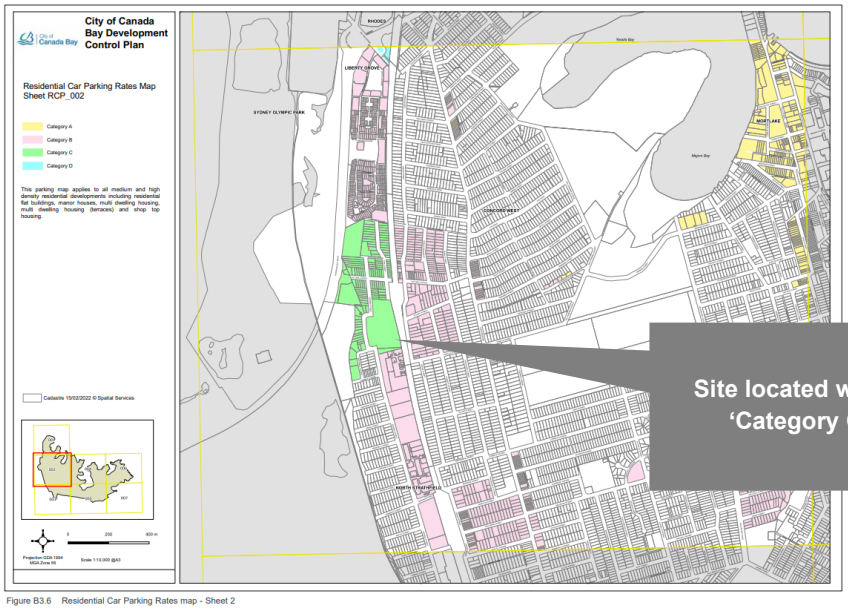


Image source: 'Part B – General Controls' (Council, November 2022). Retrieved from: https://canadabay.t1cloud.com/T1Default/CiAnywhere/Web/CANADABAY/API/CMIS/PUB/content/?id=folder-7719476&streamId=streampdf-7719476

Table 6-15 Required site car parking based on Council's DCP

Land Use	Rate		Metric	Quantum	Car Parking Spaces	DCP Source**
Resident Parking	1-bedroom	0.5	Per dwelling	171	86	Part G General Controls, Residential Parking Category C. Townhouse assumed same rates as 3-bedroom unit.
	2-bedroom	0.9	Per dwelling	275	248	
	3-bedroom	1.2	Per dwelling	252	302	
	Townhouse	1.2	Per dwelling	18	22	
Visitor Parking	Any no. of dwellings	1	Per five dwellings	716	143	
Retail	1		Per 40 m^2 GLFA	5,148	103*	Part G General Controls, Table B-E Parking Requirements: Development in mixed use areas and Neighbourhood Centres
Gym	7.5		Per 100 m^2 GFA	616	46	
Childcare	1		per four children	120	30	
Total					**979**	-

* *Assumed retail GFA to GLFA conversion rate of 0.8 applied onto trip rate.*

** *'Part B – General Controls' (Council, November 2022). Retrieved from: https://canadabay.t1cloud.com/T1Default/CiAnywhere/Web/CANADABAY/API/CMIS/PUB/content/?id=folder-7719476&streamId=streampdf-7719476*

The site masterplan proposes approximately 1,025 total car parking spaces. This is 46 parking spaces or 5% more than Council's DCP. It is noted that Council's DCP sets out to limit car parking in locations with good access to public transport. Recent traffic surveys and studies undertaken by PwC on behalf of Billbergia for similar high-density residential sites near Rhodes Station suggests that there is little correlation between the provision of car parking and vehicle trips generated.

Table 6-16 shows the vehicle trip generation rates per carpark spaces for the recent traffic surveys. Compared with the TfNSW Guide to Traffic Generating Developments, this is 0.32 (AM) and 0.42 (PM) lower than the average trip rates (per carpark space) for other high-density residential sites. Given this, it is recommended that considerations be provided for potential increase in the parking rates as outlined in the site masterplan.

Table 6-16 Site Vehicle Trip Generation (per carpark space) – Benchmarking (High density residential - weekdays)

Benchmarks	Site	Vehicle Generation Rates (per carpark space)	
		Peak AM Hour	Peak PM Hour
'*Technical Direction - Guide to Traffic Generating Developments Updated traffic surveys*' – Appendix B3 – High Density Residential – Generation Rates (TfNSW, 2013)	St Leonards	0.39	0.54
	Chatswood	0.51	0.82
	Cronulla	0.22	0.14
	Rockdale	0.47	0.53
	Parramatta	0.50	0.65
	Liberty Grove	0.62	0.91
	Strathfield	0.43	0.42
	Pyrmont	0.30	0.46
	Average	**0.43**	**0.56**
November 2022 Rhodes Traffic Surveys	Rhodes West	0.12	0.14

Table 6-17 shows the bicycle parking and storable facility for residents, visitors and retail usage, as set out by the DCP.

Table 6-17 Bicycle parking rate required by DCP

Land Use	Rates		Site Requirements (minimum)	
	Resident/Staff Bicycle Storage Facility	Visitor Bicycle Parking Facility	Resident/Staff Bicycle Storage Facility	Visitor Bicycle Parking Facility
Residential	2 per dwelling	2 per 10 dwellings	1,432	143
Retail	2 per 250 m^2 GFA	2 per unit + 2 per 100 m^2 GFA	46	115

Notes:
- Number of retail units not currently know. This has been excluded from the estimates.
- Retail includes GFA for the gym.

6.6 Railway Transport Capacity Analysis

A high-level capacity analysis for the T9 Northern Line has been undertaken to provide an understanding of the future performance of the rail network. This section outlines and assumptions used and outcomes of the analysis, noting that the information presented are based on data sourced from TfNSW's Open Data Hub to estimate the potential mode shift from rail to Sydney Metro. This analysis has been undertaken for the purposes of this transport study only.

The calculation process is briefly described as follows:

1. **Estimate theoretical spare capacity for train services** at Concord West Station based on existing train occupancy levels. It is assumed that this is carried forward to the future and that the background rail demand growth along the T9 Northern Line is offset by capacity increases to the rail network as part of the initiatives set out in the NSW Government's Future Transport Strategy (2022).
2. **Calculate future rail patronage** based on:
    a. Background rail patronage growth (%) based on population increase in catchment within walking distance of Concord West Station.
    b. Estimated mode shift from T9 Northern Line to Metro based on existing trip distribution (for travel to / from Sydney CBD) and population increase (%) in overlapping catchments within walking distance of the Concord West Station and new North Strathfield Metro Station.
    c. Number of additional rail users generated by the site, as estimated using the directional splits and mode share targets for the development.
3. **Assess rail network performance** on the basis of rail patronage (demand) to capacity ratio

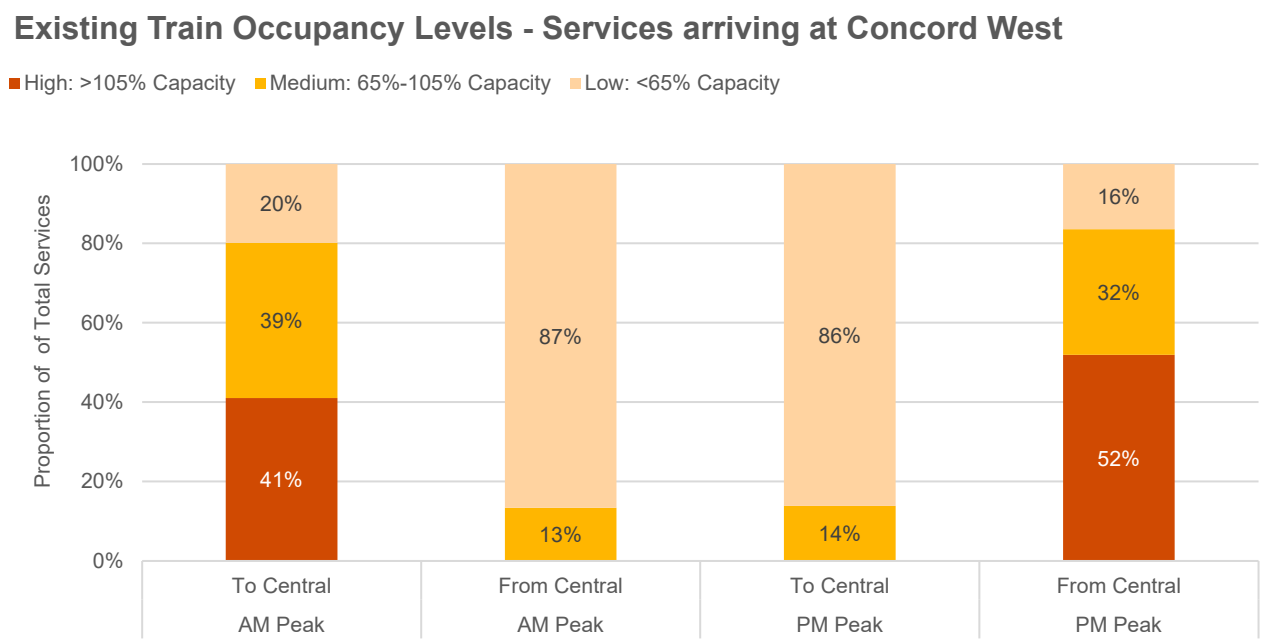
6.6.1 Rail capacity

Figure 6-8 provides a summary of the 2019 train occupancy travelling through Concord West Station during the peak hours.

- During peak hours, T9 Northern Line comprises of two types of trains: 25% Type A train with 894 seats and 75% Type T with 840 seats, which is on average, is 850 seats. Four trains per hour each direction operates through Concord West station, providing **railway seated capacity of 3,400 passenger/hour/direction**. Note that this does not include additional capacity associated with standing room. As such, the analysis presented in this section is representative of seated capacity levels only for the rail services, not crush capacity (i.e. maximum level of passenger load).

- In the morning peak, **41% trains to Central were fully occupied** while the opposite direction trains were below medium occupancy. In the evening peak **52% train from Central were fully occupied** while the opposite direction trains were below medium occupancy.

Figure 6-8 Existing Train Occupancy on Concord West Station (2019)



Data source: TfNSW Open Data Hub

Table 6-18 details the theoretical spare capacity (passengers/hour/direction) for train services travelling to Concord West Station during in peak directions. Based on the assumptions used, it estimates a total theoretical capacity of **658 passengers/hour/direction** and **530 passengers/hour/direction** in the morning and afternoon peak hours, respectively.

Table 6-18 Existing theoretical spare capacity for trains at Concord West Station

Peak Direction and Hour	Train Services at Concord West Station			Passengers/ hour/direction		% of Total Rail Capacity
	Occupancy Level	% of Total Services	Assumed Spare Capacity Level	Theoretical Seated Spare Capacity***	Total	
To Central (AM Peak Hour)	Trains at medium capacity	39%	15%*	199	**658**	**19%**
	Trains at low capacity	20%	67.5%**	459		
From Central (PM Peak Hour)	Trains at medium capacity	32%	15%*	163	**530**	**16%**
	Trains at low capacity	16%	67.5%**	367		

** 100% minus average of trains with medium occupancy level ((65% + 105%) / 2)*
***100% minus average of trains with low occupancy levels ((0% + 65%) / 2)*
**** (Rail Capacity of 3,400 passengers/hour/direction) x (% of Total Services) x (Assumed Spare Capacity Level)*
Note that these assumptions have been made as high-level analysis for the purposes of this study only.

6.6.2 Rail patronage

Figure 6-9 shows the travel zones located within 10-minute walking distance from Concord West Station. It includes TZ16 714, 716, 717, 718 and 739. Based on TZP19 population forecast, **by 2036 the population would increase 40%.** For the purposes of this analysis, the train patronage is assumed to grow at a similar rate.

With the opening of SMW, it is assumed that **30% of rail users in** TZ16 717, 718 and 739 would shift from the T9 Northern Line to Metro. These zones are located within 10 minutes' walk distance from North Strathfield Metro Station and Concord West Station, and corresponds to the distribution of trips that currently travelling towards Sydney CBD (refer to Section 5.2.3 – please note that a more conservative estimate of 30% was adopted, rather than 35%).

Table 6-19 shows the adjusted rail patronage growth with opening of SMW (using population as a proxy) at Concord West Station, which is **assumed to grow by 15% from 2019 to 2036 .**

Figure 6-9 Concord West and North Strathfield Station 10 minutes' walking distance (800m) catchment

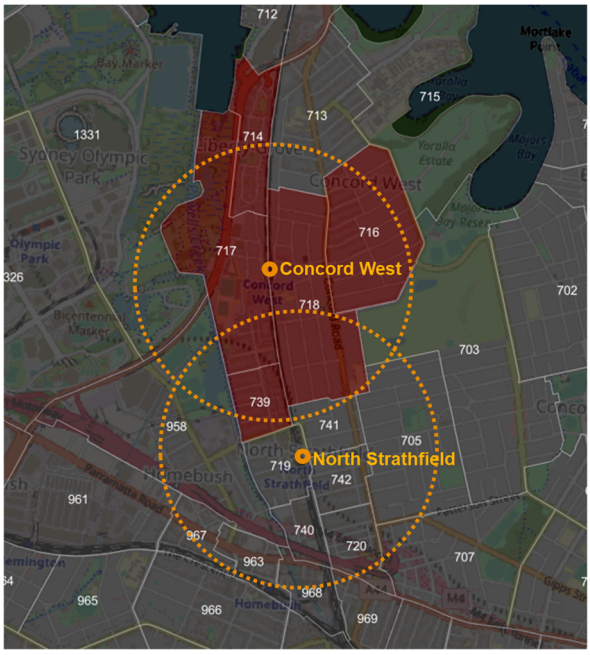


Table 6-19 Concord West Station population coverage

Travel Zone (TZ16)	2019 population	2036 population catchment (with no shift to SMW)	Adjusted 2036 population catchment (with shift to SMW)***
714	2,518	3,042	3,042
716	1,975	2,435	2,435
717	1,636	3,298	2,309*
718	2,428	3,506	2,454*
739	1,420	1,712	1,198*
Total	9,977	13,993	11,438
Growth from 2019		**40%**	**15%**

**Assumed 30% would shift from rail (T9 Northern Line) to Metro*

6.6.3 Rail performance

Table 6-20 shows the future rail demand to capacity ratio for the peak directions based on the rail mode share targets presented in Section 5.2.1 and the assumed train patronage and theoretical spare capacity estimated above. With the site-generated rail demand, rail services at Concord West Station are estimated to operate at seated capacity in the peak morning and afternoon directions.

Note that this assessment does not include the additional capacity for standing room on the rail services. Given this, this analysis suggests that there would be sufficient capacity in the future rail network to accommodate the site-generated rail trips.

Table 6-20 Future Train Capacity Analysis on Concord Station West

Concord West Station	Railway Demand (passenger/hr)	
	To Central (AM peak hour)	From Central (PM peak hour)
2019 Demand [1]	2,742	2,870
2019 to 2036 Background Growth [2]	410	429
Site-generated Demand [3]	103	92
Total Demand	3,255	3,391
Demand/Capacity Ratio	0.96	1.0

(1) Seated rail capacity of 3,400 passengers/hour/direction minus theoretical spare capacity – see Table 6-18.
(2) 15% growth from 2019 - see Table 6-19.
(3) Site-generated peak hour rail trips: (AM trips out) x (35% + 12% = 47% travelling in the south and eastern direction), (PM trips in) x (35% + 12% = 47% travelling from the south and eastern direction).

7 Summary

This report details the transport assessment undertaken for the proposed development located at 1 King Street, Concord West (the site). The key outcomes and conclusions are summarised as follows:

- **The planning context for the site is informed by regional and district level planning that sets out the land use and transport vision for the wider region, as well as precinct and local level planning that governs the implementation strategy for the site.**
  - Concord West is located in the Eastern Harbour City, which aims to provide liveable communities where more people work within 30 minutes of where they live. The masterplan aligns with the visions set out in the Eastern Harbour City, providing new dwellings directly adjacent to Concord West Station, which will (1) enable more efficient access to workplaces, services and community facilities via the existing T9 Northern Line, and (2) promote greater levels of self-containment within the Eastern Harbour City.
  - Within the Canada Bay Local Strategic Planning Statement, the local movement strategy adopts a people-centric view for Concord West, with the road network surrounding the site identified as a mix of 'Places for People' (now 'Civic Places') and 'Local Street'.
  - The Concord West Precinct Master Plan identifies two transport initiatives relevant to the site; (1) creation of an east-west linear park connecting the site to Powells Creek Reserve, and (2) provide new connections between George Street and Concord West station. These aligns with the transport initiatives set out in the masterplan.
- **Major land uses near the site include the Victoria Avenue Primary School, Bicentennial Park, Powells Creek Reserve and Concord West Station**
  - The area surrounding the site are generally low density residential, with some medium density, general industrial and warehouse properties.
  - Victoria Avenue Public School is currently the one of the key generators of vehicle and pedestrian trips in the area, with ~210 vehicle trips (in and out) generated during the peak morning hour during school drop-off hours (8.15-9.15am).
  - Bicentennial Park attracts ~75 cycling trips during the morning peak (6.45-7.45am) via the Victoria Avenue entrance where the underpass provides for access to the Powells Creek Reserve, Bessington Park and Mason Park, which connects to the wider regional cycle network.
  - Concord West Station is not a major generator of vehicle trips (maximum ~30 vehicles during the peak hours). Most trips travelling to the station are undertaken via walking by pedestrians.
- **George Street and King Street provides direct access to the site via Pomeroy Street from the south, which links to key routes at Underwood Road, Parramatta Road, Homebush Bay Drive and Concord Road.**
  - There is also a high level of public transport accessibility, with the site located approximately; (1) 50m from the Concord West Station and (2) 1.1km away from North Strathfield Station, which is the site for the planned metro station.
  - There are bus stops on Concord Road to the east of the site for services travelling to Macquarie Park, Hurstville, Ryde, Hornby, Sydney Olympic Park, Parramatta and Sydney CBD.
  - The site is located near existing on-road and off-road cycle facilities that currently connects to the Sydney Olympic Park and Strathfield Bike Network.
- **The modelling framework consists of strategic transport (STFM) and operational (SIDRA) traffic modelling to assess the site impacts on the surrounding road network.**
  - The future mode share target for the site proposes 30% car mode for resident/retail/commercial and 50% car mode for childcare. The mode share targets are reflective of area with good access to public transport (train) and close to existing recreational / social facilities.
  - The assumptions for the trips generation rates have been derived from various sources supplied by TfNSW.

  - Background traffic growth is based on STFM demand forecasting outputs supplied by TfNSW, which shows 32% and 35% demand increase in the morning and afternoon peak hours, respectively.

- **George Street is maintained as the primary vehicular function. The internal network structure within the site will provide for amenity and safety for pedestrians and cyclists, designated as 'Civic Spaces' as part of TfNSW's Movement and Place framework.**
  - All intersections except George Street / Pomeroy Street would operate with minimal delay at LoS A in 2036 during the morning and afternoon peak hours, with and without the site-generated traffic.
  - By 2027, without any intervention measures and background traffic growth alone, George Street / Pomeroy Street would operate at LoS F.

Appendices

Appendix A Scoping Study Feedback

This section presents a copy of the following documents, as received by Billbergia from Council as part of the scoping study feedback:

- ATTACHMENT D: 1 King Street – TfNSW Methodology for Transport Assessment.
- ATTACHMENT E: 1 King Street – SINSW Response to Scoping Proposal.

Attachment A – Methodology for Transport Assessment

It is suggested that a comprehensive Transport Study be undertaken to assess the impact of the proposal on public transport services, transport infrastructure and regional road network.
The study should include reference to (but not limited to) the following documents:

- Future Transport Strategy 2056
- A Metropolis of Three Cities
- Eastern City District Plan
- NSW Freight and Ports Plan
- State Infrastructure NSW Design Policy (Better Placed)
- Greater Sydney Region Plan
- Parramatta Road Corridor Urban Transformation Strategy (PRCUTS)
- Canada Bay Local Strategic Planning Statement
- Concord West Precinct Master Plan
- Practitioner's Guide to Movement and Place
- Beyond the Pavement

The following methodology is suggested for the Transport Study which should be undertaken in consultation with TfNSW and Sydney Trains.

Existing conditions assessment

- Define the existing conditions of the transport system serving the proposed development site, addressing the levels of performance for all transport modes, including walking, cycling and freight.

Connections

- Assess the impacts and opportunities arising from the proposal on travel demands and operation of the rail and bus networks and future Metro.
- Define a clear, permeable and accessible precinct network of walking and cycling connections to help achieve a sustainable transport system to accommodate the proposal.

Traffic Generation and Parking Rates

- Application of agreed trip generation rate previously modelled as part of the PRCUTS traffic and transport modelling assessment for the Homebush precinct. Journey to work data for the proposed development travel zone should be considered for future trip distribution.
- It is suggested to adopt maximum parking rates to reduce the number of trips generated by the development.

Traffic Count Surveys

- A traffic count surveys should be undertaken at the key intersections, including but not limited to, George Street/Pomeroy Street intersection, George Street/Victoria Avenue and King Street/Victoria Avenue to assess the existing road network performance as well as to assess future performance. The traffic surveys should be undertaken during

a typical weekday for both AM and PM peak hours (avoiding any public holidays and school holidays).

Transport Modelling

- Strategic transport modelling using existing model resources (i.e. STM and STFM) to identify travel demands, patterns and mode splits. Critically review the strategic modelling outputs to ensure that they adequately reflect future travel behaviours, including travel patterns and travel demands.
- Based on the information obtained from above modelling exercise and traffic surveys, a SIDRA intersection model should be developed to assess the performance of the key intersections.
- The above modelling approach should include a base year model, future years base case (without the proposal), and a separate model with full development proposal and background traffic growth. It is recommended to undertake an early consultation with TfNSW and Council to agree on the year for the future base, as well as to define the study area.

Identified Road and Transport Infrastructure

- Based on the above modelling outputs, identify transport and road infrastructure requirements to support the proposed increase in floor space and changes to land use. Staging based on trigger points linked to GFA/masterplan stages should be identified.
- The applicant's traffic consultant will be required to work in collaboration with Council and TfNSW to develop a precinct network of walking and cycling connection.

Noise Attenuation Measures

- Future development on the site should consider appropriate noise attenuation measures through design measures, architectural treatments, setbacks, durable materials and landscaping particularly along the site's frontage to the heavy train line to mitigate future residents against rail passenger noise generated by Concord West station. Council should be satisfied that any noise mitigation controls throughout the relevant DCP is appropriately aligned with this requirement.

Funding of transport and road network infrastructure

- High level strategic/concept engineering plans overlayed on an aerial to scale should be developed to determine feasibility including any third party land components.
- Strategic cost estimates of any identified walking, cycling, and road infrastructure required in support of the planning proposal should be prepared. These costs should align with the NSW Global Rates.
- In consultation with Council, DPIE and TfNSW, identify a planning/funding mechanism to deliver the identified transport infrastructure.

Overshadowing

As per DoE's '*Educational Facilities Standards and Guidelines'* (EFSG), SINSW aim to ensure that that at least 70% of school spaces, including outdoor school play spaces, receive direct sunlight between 9am and 3pm in mid-winter. SINSW seek to prevent any reductions in amenity to Victoria Avenue Public School and request that the proponent consider how sunlight will be maximised on this school site as the precinct is developed in future.

Pedestrian Linkages

The Concept Masterplan provided as part of the scoping package notes a potential pedestrian link through to Powells Creek Reserve as per the Homebush North Masterplan (refer section 2.6, page 15). SINSW currently leases this area as play-space for the adjacent Public School and public access is restricted via security fencing.

Any proposed future access to this area will be subject to consultation with the SINSW Asset Activations Team.

Active Transport and Access

The scoping report notes that a preliminary transport analysis has been undertaken by PWC which considers the intersections surrounding the subject site. This report was not included within the scoping package and as a result, it is unknown whether this included consideration of active transport opportunities and pedestrian prioritisation measures for the draft Proposal. As a result, SINSW request that a robust Transport Impact Assessment be undertaken which outlines the proposals cumulative impact on the surrounding transport network and identifies active transport links to existing school travel paths.

In addition, SINSW request that transport planning for the proposal be guided by the NSW Governments Movement and Place Framework (MAPF) and its Built Environment Performance Indicators. These indicators are based on qualities that contribute to a well-designed built environment and should be used by proponents in the formulation of transport concepts.

The MAPF's core 'Amenity and Use' and 'Primary Schools' indicators are of particular importance to SINSW, as these encourage urban designers to consider the impact on adjacent places/uses, as well as emphasising movement that supports place. The 'Primary Schools' indicator provides two specific metrics to judge the effect of infrastructure on the accessibility of public schools in an area; these being walkability and public transport access. These metrics require designers to assess whether proposed infrastructure facilitates access to primary school facilities (or public transport connections to schools) or whether it exacerbates gaps in the network.

The primary school-focused MAPF amenity indicator can be accessed via the link below:

https://www.movementandplace.nsw.gov.au/place-and-network/built-environment-indicators/primary-schools

Social Infrastructure Assessment

SINSW request that the proposal be accompanied by a social infrastructure report, which considers the impact of population and enrolment growth on school infrastructure.

Appendix B Council Peer Review Comments Register (December 2023)

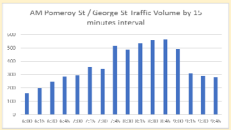
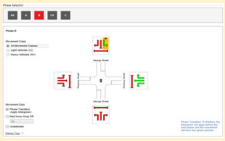
This section provides a copy of the peer review comments and responses. Comments based on a peer review commissioned by Council to external traffic consultant (Stantec) for version Rev03 of this transport paper.

Note that as part of the peer review and subsequent responses to the comments, references to a potential upgrade (termed as 'Project Case Option 2 in the comments register') at George Street and Pomeroy Street intersection was made. Following advice from Council and Billbergia in February/March 2024, this upgrade is no longer being pursued. Information pertaining to this intersection upgrade has been retained for record-keeping purposes only.

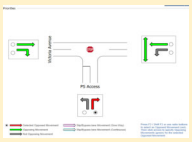
Transport Assessment Review

Item	Item Topic	Comment	Priority	Response
1	Trip Generation	The trip generation rates used for the purpose of traffic assessment are based on some recent survey data for the specific land use type. The report shall also include trip generation estimation for the proposal based on RMS Guides to Traffic Generating Developments (2002) and RMS Updated Traffic Surveys (TDT 2013/04) for comparison purposes. In addition, besides located near the Concord West Train Station, a significant proportion of retail/commercial trips are anticipated to be internal. As such, consideration of a lower trip generation rate for retail/commercial can also be supported.	Minor	Noted with respect to the retail/commercial trip, further noting that the trip generation estimation was initially discussed with input from TfNSW following confirmation of the traffic assessment methodology. A copy of the methodology approach paper was sent to key stakeholders prior to commencing the traffic assessment, and is appended to this report.
2	Movement and Place	All internal roads are assumed to be 'Civic Spaces', which aligns with the wider vision of the area. Given that such road environment encourages activities and pedestrian movements, all internal roads are to be designed to address such activities and to ensure safe environment for all road users.	Note	Noted.
3	Parking	Whie the proposed number of parking spaces exceeds the parking requirements as per the DCP parking rates, it is recommended to provide further breakdown of parking spaces for each land use type, including provision for visitors' and staff parking spaces and access strategy at later stage.	Note	Noted.
4	New Link (King Street to Rothwell Avenue)	It is noted that the purpose of this new link would be to provide access to the proposed development and not int ended to be used as 'rat run' for through traffic. Further consideration and investigation shall be undertaken at later stage to ensure that George Street remains main road for north-south movements and not the new link road.	Note	Noted.
5	New Intersection at George Street/Rothwell Avenue	It is proposed to convert the existing roundabout at George Street/Rothwell Avenue to priority intersection. It is noted that Rothwell Avenue is a local road, however it is noticed that there are few commercial/business centres located on this road which may require access for larger vehicles. It is suggested to investigate further to understand the accessibility need for Rothwell Avenue prior to converting the roundabout to priority intersection. As a minimum, this stop controlled intersection shall be considered at George Street/Rothwell Avenue to enhance safety given close proximity to the new proposed roundabout.	Moderate	Noted, this may further considered at the next stage of project (based on the traffic surveys undertaken there is currently low traffic volumes at this intersection)
6	George Street/Pomeroy Street (Figure 7-1)	It is noticed that no on-street parking is coded on south approach of George Street in proposed upgrade layout. Please confirm if on-street parking is proposed to be retained in future upgrade scenario.	Minor	Based on the geometries and new lane configurations at the southern approach for the future scenario, the design proposal will retain the on-street parking. However, this will be further discussed/confirmed with Council at the next stage of the project design.
7	Cumulative traffic assessment (future traffic growth)	Section 5.3 of the Transport Study Report notes that STFM has been used to establish future traffic growth, however there is no indication that this has been validated against Concord West Master Plan 2014 and subsequent DAs in the precinct to ensure that the strategic modelling adequately captures the likely precinct yields and associated traffic.	Moderate	Noted. Prior to undertaking the traffic assessment, a workshop was undertaken with key stakeholders (Council, TfNSW and Sydney Metro) to discuss the modelling methodology, which was formed based on the recommended traffic assessment methdology received from TfNSW (See Appendix A of report). STFM outputs received from TfNSW for the non-site generated trips (i.e. background traffic) are based on a version of the model representing a future 'base case'. It is not clear what land use assumptions/level of validation has been undertaken by TfNSW in Concord West for this version of the STFM.
8	George Street/ Parramatta Road intersection	A significant amount of future traffic is assigned to George Street, south of Pomeroy Street, the majority of which will access Parramatta Road. This intersection is not discussed in the report.	Moderate	Actioned. New section Section 6.3.4 added to the report to detail traffic volume impact to other intersections.
9	George Street/Pomeroy Street intersection design	The proposed new left turn lane is particularly short and would only allow two vehicles to queue clear of through traffic. The taper area could be adjusted to provide a longer lane and provide greater queuing capacity (when the lane is entered at a low speed).	Minor	Noted. At this stage of the proposal submission the taper lengths were based on initial estimates to balance allowable space vs. acceptable traffic operations (note that further updates to the SIDRA have been made following the peer reviewer's recommendations in this comments register, with DoS now at <1.0)
10	George Street/Pomeroy Street intersection design	The pedestrian crossing of the western leg is long and across six lanes of traffic. A preliminary TCS design should be prepared to confirm that all required traffic infrastructure can be provided, in compliance with TfNSW traffic signal guidance.	Moderate	Noted. To be considered at the next stage of the project design.
11	George Street/Pomeroy Street intersection design	The Pomeroy Street eastbound approach and departure lanes do not appear to align. Intersection geometry should be reviewed in order to confirm that the proposed design solution is feasible and does not result in additional works outside the expectation of the applicant.	Moderate	Intersection geometries have been reviewed (eastbound through movements aligned as best as possible to the departure lanes).

SIDRA Model Review

Item	Topic	Comment	Significance	Response
General Comments – All models				
1	Traffic Flows	The TIA report provides traffic flow diagrams in the flow of increased traffic along links at Figure 5-6 (background traffic) and Figure 5-7 (total increase, post-development). It is not possible to determine the increase at individual movements at intersections. Therefore, it is not possible to determine if traffic volumes have been entered into the SIDRA models correctly (including heavy vehicle percentages). A TIA report should include a logical sequence of traffic flow diagrams, showing how the transport engineer has dealt with the progression of traffic flow changes, from existing conditions through to the ultimate traffic volumes being assessed.	Moderate	Actioned. New Appendix E provide in report detailing full breakdown of the turning volumes by scenario, time period and intersection. STFM volume plots has also been appended for reference.
2	Passenger Car Equivalents (PCE)	The SIDRA model is shown to use the default PCU factor for Heavy Vehicles (1.65). It is recommended this PCU value be changed to 2.0 to be in accordance with the TfNSW transport modelling guidelines.	Minor	Actioned. PCU has been updated to 2.0
3	Peak Flow Period and Peak Flow Factor	The PFP and PFF parameters are the SIDRA defaults. The subject is located next to a school. The traffic flow profile shows a sharp peak during the AM peak hour. This should ideally be reflected in the models.	Minor	The figure below shows the AM traffic profile for Pomeroy St / George St (the most critical intersection for this assesessment), which shows a relatively flat profile distributed across the 15-min time intervals between 8-9am. Given this, and for the purposes of this traffic assessment, the PFP and PFF parameters have been retained using the SIDRA defaults. Note that; (1) the PM time profile also shows a relatively flat profile, and (2) this graph is based on same data inputs as Figure 3-7, extracted for Pomeroy St / George St intersection. 
4	Lane geometry	Lane widths in all models are 3.3m, which is the SIDRA default. These are different on the ground and should ideally be updated in the models.	Minor	Actioned. Most lane widths are generally around ~3m so have retained the SIDRA default values, except George St/Victoria Ave and George St/Conway Ave (updated to ~5m).
Street (4-way signalised intersection)				
5	Phase Sequencing	"Existing" and Project Case "Option 2" models have been reviewed. The existing TCS Plan and SCATS traffic signal timing arrangements should be provided for checking and comparison. It is noted that the adopted existing phase sequence with a lagging right turn phase (B phase) after filter right turn movements (in A Phase) creates a "right turn trap" safety issue for the west approach filtering right turn. The proposed traffic signal phasing with partially controlled right turns on both the east and west approaches maintains the "right turn trap" safety issue for the west approach right turn. This should be reviewed along with crash stats before considering mitigation measures to ensure that existing issues are not carried into the future. If TfNSW or crash history identify a problem and there is sufficient room within the intersection for the right turns to operate simultaneously, then it is recommended that diamond right turn phasing arrangement is proposed. It is noted that under this sequence, the right turns could filter in A Phase. If simultaneous right turns is not possible, then it would be recommended that the west approach right turn (which has the lower demand in both peaks) is fully controlled.	Major	For George St/ Pomeroy St, the following data was obtained; interpreted SCATS history files (5min interval), TCS graphics plots and SCATS Region LX file. The exisiting phasing arrangements were adopted using the above data, which were then verified using on-site observations and the below information provided by another traffic study that was commissioned by Council in December 2021 (Image source: 'Parramatta Road Corridor - Traffic and Transport Strategy', Bitzios on behalf of Council, Dec 2021. Retrieved from: https://issuu.com/cityofcanadabay/docs/updated_-_attachment_20_strathfield_burwood_canada)  A copy of the interpreted SCATS history files (5min interval), TCS graphics plots and SCATS Region LX file is provided in ATTACHMENT A. With respect to an alternate phasing arrangment (e.g. lagging right turn vs. diamond right turn phasing) this may be considered in the next stage in the project design, alongside review of the crash data and whether there is enough room for the right turns to operate simultaneously.
6	Pedestrian Protection	It is common for pedestrian protection to be applied at intersections within NSW, with the late starts for vehicles reducing the capacity for movements. There is potential that pedestrian protection applies at the intersection of George Street / Pomeroy Street given the site s proximity to a school full pedestrian protection is typically ' applied if any significant number of school children use the crossing). It is recommended that information is sought from TfNSW to understand if applicable. If applicable it is applied using the Gap Acceptance – Opposing Peds (Signals) parameter. It is important that this is included in models as it will reduce the amount of green time provided for the left and right turn movements and represent the likely queue lengths more accurately.	Moderate	Noted and actioned. Left turns priority to pedestrains have been added to the SIDRA model, however further consideration to pedestrian late starts can be considered at the next stage of the project design.
7	Phasing	A Phase Transition should be applied to the north approach left turn movement in B phase so that the left turn comes to a stop before the operation of the east approach pedestrian movement. Failure to include this overestimates the green time available for left turn vehicles and can overestimate the capacity, thereby reducing queues and delays.	Minor	Actioned. This has been updated in the SIDRA models now to apply phase transition at north approach left turn. 
8	Phasing	AM peak models adopt a specific phase sequence that includes dummy movements in phases "A0" and "C0". This is noted in the TIA report to be for calibration purposes due to westbound movements being blocked by downstream queuing, however no information has been provided on how the 5 second and 8 second delay has been determined.	Major	The reductions in the effective green times were based on initial measurements from on-site obervations to approximate (general estimates only) how queues from upstream intersection would causes delays at George St/Pomeroy St per cycle. The exact figures (5 seonds and 8 seconds) were later adopted during the model calibration stage.
		This calibration factor has been applied in the existing and future modelling scenarios. This introduces a limitation that is likely to prove optimistic for capacity as blocking is likely to increase as traffic grows, which would lead to a need to increase the "blocked time". While the reviewer is not familiar with the operation of this road network, it may be worthwhile directly modelling the downstream effects to directly compute the capacity constraint and how this increases in future. This has historically been achieved with microsimulation modelling, but SIDRA network modelling could be used to a similar effect.		Noted. At the time of consulation with key stakeholders it was understood that the existing micosimulation model that was developed as part of Council's work for the PRCUTS would not be available for this traffic assessment, with Sydney Metro also investigating potential upgrade works at Queen Street/Pomeroy Street/Beronga Street. No further feedback or information was received following confirmation of the modelling approach paper.
9		There are minor differences between the "Existing" and "Option 2" models, including: • "A0" introduces both east west pedestrian models in the "Option 2" models, -whereas these pedestrian movements did not run in the "Existing" model. It is expected that this is in error and recommend that the existing conditions phasing should be changed to include the operation of pedestrians in A0. • Existing Phase B and new Phase D are designated as variable phases in the "Option 2" models, whereas they were static phases in the "Existing" sequence. These should be static phases in Option 2.	Minor	Actioned. (1) the A0 phase in the "Existing" models have been updated to include pedestrian movements, and (2) Phase B and new Phase D updated to static phases in the "Option 2" models.
10	Cycle Times	The existing models have adopted a User Given Cycle time of 110 seconds and 140 seconds in the AM and PM peak respectively. The Project Case models have adopted Optimal Cycle Times which result in a time of 110 seconds and 100 seconds in the AM and PM peak respectively. This does not allow for a like for like comparison of results. Furthermore, in the AM peak Project Case scenario, the Optimal Cycle time operation returns a cycle time of 110s and a DOS of 1.09. However, running a "user-given" phase time of 140s (per existing conditions) returns a DOS of 0.84 and a delay of 38s. Whilst a shorter cycle length can sometimes provide a more efficient operation in the peak periods (although not in this case), consideration should be given to whether the existing cycle times are operating because of corridor linking. It is recommended that TfNSW are consulted on this to identify limitations on changing cycle length.	Major	Actioned. 140s / 110s are now used consistently across all AM / PM periods.
11	Model Results	Both of the existing conditions models have a DOS which exceeds 1.00. TfNSW modelling guidelines specifically requires existing models to have a DOS under 1.00 so that the demand does not exceed the capacity. In this regard, further calibration is required to the base case and to be carried forward to the future case models. This is important because when intersections exceed a DOS of 1.0 the queues and delays can increase exponentially and as such the models are likely to be sensitive to small changes in the parameters that affect capacity. Furthermore it is important to confirm that the suitability of the proposed changes to the road network will have the reported benefit.	Major	SIDRA models have been now been updated as per recommendations / other advice in this comments register from peer reviewer, with the resulting intersection operations at DoS < 1.
12	Model Results	Table 6.2 of the TIA details that the calibration of the west approach in the Existing Conditions AM peak hour model is poor, with the model suggesting a maximum queue length 22 vehicles (approximately 130m) longer than the surveys. It is noted that SIDRA has reduced the capacity of the through and right turn lane due to the short lane effect of the through and left turn lane, resulting in a DOS greater than 1.0. Furthermore, the lane utilisation of the through and right turn is significantly higher than the through and left turn. To assist in improving calibration of this approach, consideration could be given to reviewing the SCATS Detector Counts to determine lane utilisation and implementing adjustments in SIDRA if appropriate. Furthermore, the short lane capacity adjustment factor in the Lane Geometry tab could be reviewed. We note that if the Short Lane Capacity adjustment is not applied to the through and right turn lane, then the queue length would reduce to 29.5vehicles compared to 32vehicles in the survey, and the DOS would improve to be under 1.0.	Major	SIDRA models have been now been updated as per recommendations / other advice in this comments register from peer reviewer, with the resulting intersection operations at DoS < 1.
13	Project Mitigations	The general principals applied to develop the mitigation measure and provide dedicated lanes for all right turn movements is sound. However it is noted that the proposed mitigated model in the future case still has a DOS over 1.0 and that this represents unacceptable operation. It is noted that there are a number of issues raised in this review which would change the operation of the intersection, both under the existing and future project scenarios and therefore it is not possible to completely understand if the proposed mitigations will have the desired effect. Specifically, the reviewer questions how effective a 12m long dedicated left turn lane on the west approach would be rather than providing a shared through and left turn lane. This may be more useful if pedestrian protection is required and therefore, it is recommended that a comparison scenario is assessed in SIDRA to demonstrate any benefits.	Major	SIDRA models have been now been updated as per recommendations / other advice in this comments register from peer reviewer, with the resulting intersection operations at DoS < 1.
way Avenue (4-way roundabout)				
14	Lane geometry	Lane widths are 4.0m, which is the SIDRA default. These are different on the ground and would ideally be updated in the model.	Minor	Actioned. This has been updated in the SIDRA models now to reflect on-ground estimates (entry width ~ 5m at roundabout) .
15	Roundabout Data	The circulating width and island diameter have been changed to 5m each, which reflects existing conditions. All other parameters are the SIDRA default. These are different on the ground and would ideally be updated in the model.	Minor	Actioned. This has been updated in the SIDRA models now to reflect on-ground estimates (entry radius updated to ~9m).
16	Pedestrians	Pedestrian crossings and volumes are included for the south arm in the Existing PM model but for no others. It is not clear why this is the case. The reason should be clarified, made consistent across all models, or removed.	Minor	Actioned. This has been updated in the model to remove the pedestrian volumes
way roundabout, proposed 3-way unsignalised intersection)				

SIDRA Model Review

Item	Topic	Comment	Significance	Response
17	Lane geometry	Lane widths are 4.0m, which is the SIDRA default. These are different on the ground and would ideally be updated in the model.	Minor	Actioned. This has been updated in the SIDRA models now to reflect on-ground estimates (entry width ~ 5m at roundabout)
18	Roundabout Data	The circulating width and island diameter have been changed to 8m each. This does not exactly reflect existing conditions for these parameters, which range from 6.5m to 7.5m. All other parameters are the SIDRA default. These are different on the ground and would ideally be updated in the model.	Minor	Actioned. This has been updated in the SIDRA models now to reflect on-ground estimates (circulating width and island diameter ~7.5m at roundabout)
19	Change to unsignalised intersection	No comments.	-	-
Access (3-way unsignalised intersection)				
20	Priorities	The right turn exiting the school (south arm) is not set to give way to the major road east to west through movement.	Minor	Actioned. This has been updated in the SIDRA models now to set priority for the east-west movement from the right-turn at the southern approach. 
h Site Access (3-way roundabout)				
21	Layout	A proposed intersection layout should be provided to enable the model geometry to be audited.	Minor	A SIDRA site layout is provided as appendix to the report, however noting that a detailed design for this intersection has yet to be developed as this stage of the project design.
h Site Access (3-way roundabout)				
22	Layout	A proposed intersection layout should be provided to enable the model geometry to be audited.	Minor	A SIDRA site layout is provided as appendix to the report, however noting that a detailed design for this intersection has yet to be developed as this stage of the project design.

Appendix C Stakeholder Consultation (Modelling Approach Workshop)

This section provides a copy of the presentation material for the Modelling Approach Workshop, which outlines the proposed modelling framework, inputs and assumptions, as well as various preliminary George Street / Pomeroy St intersection upgrade designs that Billbergia are currently investigating*.

Please note:

- The stakeholder consultation was undertaken over two separate sessions using the same presentation material.
  - **15-September-2022**: Meeting with Council only.
  - **10-October-2022**: Meeting with TfNSW and Sydney Metro only; minutes and notes captured at this meeting attached.
- The proposed approach as outlined in the presentation material have now been superseded by updated advice following TfNSW feedback from the above consultation process. The documents presented in Appendix are provided for reference only.

**Note that as part of the stakeholder consultation, references to a potential upgrade at George Street and Pomeroy Street intersection was made. Following advice from Council in February-March 2024, this upgrade is no longer being pursued. Information pertaining to this intersection upgrade has been retained for record-keeping purposes only.*

Concord West, 1 King Street Traffic Impact Assessment

Modelling Approach - Discussion

PwC (on behalf of Billbergia)
15 September 2022

pwc

Agenda

1	Proposed Modelling Framework
2	Inputs and Assumptions
3	George Street and Pomeroy Street intersection upgrade
4	Questions

Agenda

Purpose of meeting
Discussion on modelling approach, confirmation of input assumptions and any issues / feedback.

1

Proposed Modelling Framework

TfNSW Scoping Study Feedback (extracts)

- **Strategic transport modelling** using existing model resources (i.e. Sydney Strategic Travel Model (**STM**) and Strategic Traffic Forecasting Model (**STFM**)) to identify travel demands, patterns and mode splits.
- Based on the information obtained from above modelling exercise and traffic surveys, a **SIDRA intersection model** should be developed to assess the performance of the key intersections.
- The above modelling approach should include a **base year** model, **future years base case** (without the proposal), and a separate model with **full development proposal** and background traffic growth.
- It is recommended to undertake an early consultation with TfNSW and Council to agree on the **year** for the future base, as well as to define the **study area.**
- Assess the impacts and opportunities arising from the proposal on travel demands and operation of the rail and bus networks and **future Metro.**

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- Assess the impacts and opportunities arising from the proposal on travel demands and operation of the rail and bus networks and **future Metro.**

Proposed Modelling Framework- STM, Public Transport Project Model (PTPM) and SIDRA

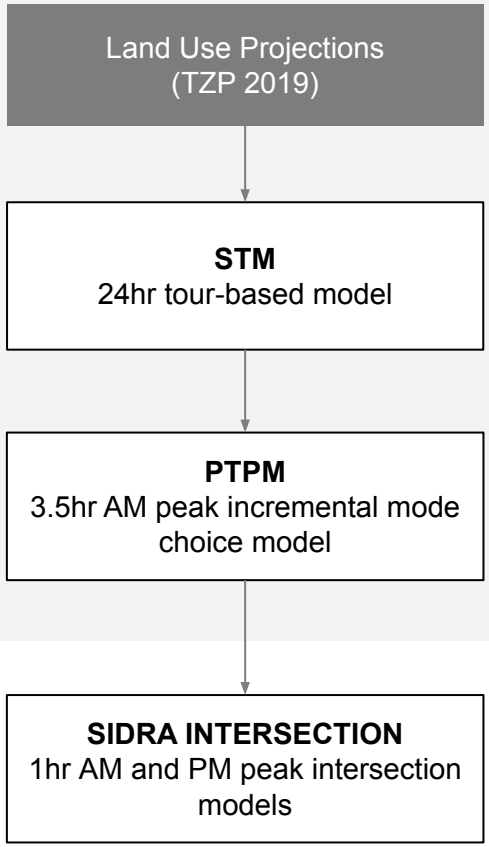
Demand Models

Sydney GMA

1. Trip Generation
2. Trip Distribution
3. Mode Choice
4. Network Assignment

Model purpose:

- Generate background traffic growth
- Assess future public transport capacity (T9 Northern Line, impact of Sydney Metro)



TfNSW permission required to access these tools

Selected intersections near the development site (Concord West)

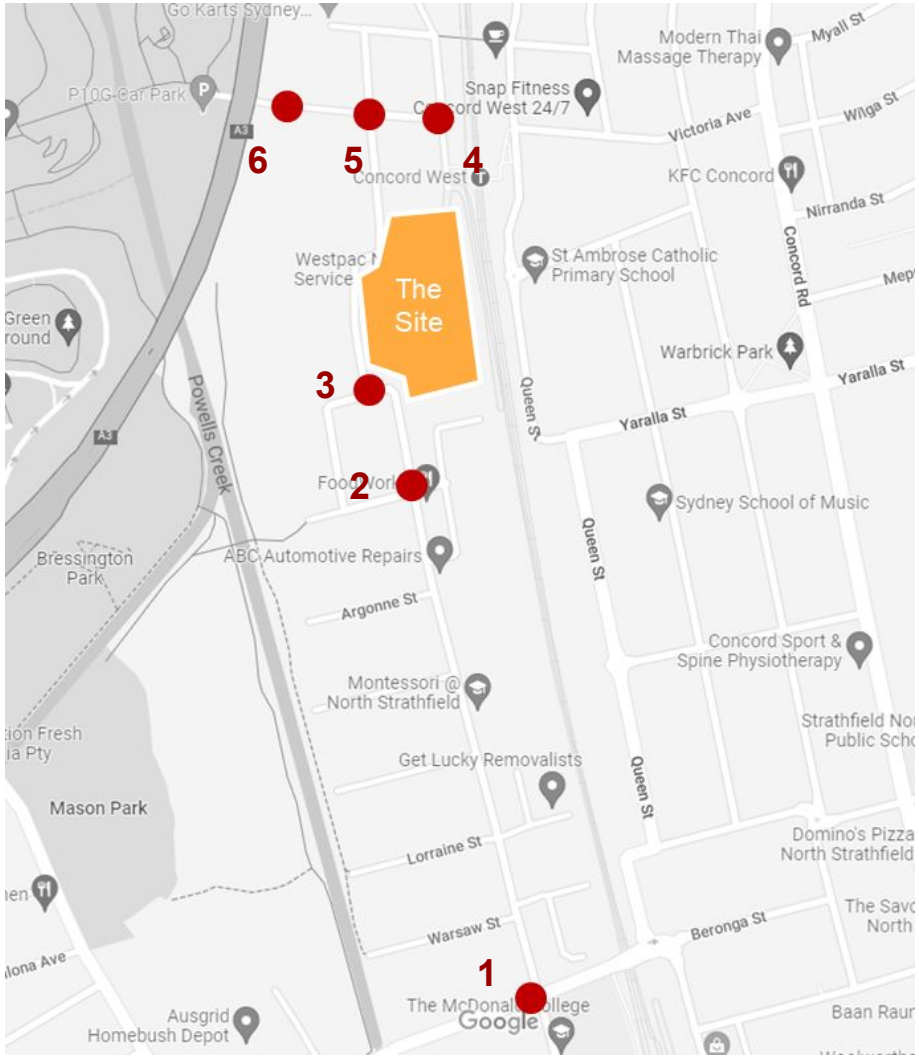
2

Inputs and Assumptions

Inputs and Assumptions

Input	Assumption (requires confirmation)
Demand model versions	• STM version 3.8 • PTPM version 5 *Same model versions used from the previous demand modelling undertaken for the Wentworth Point Transport Study.*
Study Area	Key intersections: • George St / Pomeroy St. • George Street/Rothwell Avenue. • George Street/Conway Avenue. • King Street / Victoria Avenue. • George Street / Victoria Avenue. • Victoria Avenue / access road to Victoria Avenue Public School and Powells Creek Reserve. *See map over-page*

Key Areas of Focus



Key Intersections

1. George St / Pomeroy St.
2. George Street/Conway Avenue.
3. George Street/Rothwell Avenue.
4. King Street / Victoria Avenue.
5. George Street / Victoria Avenue.
6. Victoria Avenue / access road to Victoria Avenue Public School and Powells Creek Reserve.

Traffic surveys

Data collection scheduled for next Tuesday (20-Sep)

- 6-10am and 3-7pm
- Car, heavy vehicles, pedestrian and cyclist turning movement counts
- Queue length surveys for George St / Pomeroy St only.

Inputs and Assumptions

Input	Assumption (requires confirmation)
Modelling scenarios and horizon years	Demand models: ● Base year model, ● Future year base case (without the site, **with Metro**) Intersection models: ● Base year model ● Future year base case (without the site, **with Metro**) ● Future year development model (with the site) and background traffic growth **with Metro.** Modelling horizon year: 2036
Development Traffic Assumptions	Trip Distribution: Based on 2016 / 2021 Journey to work data Trip Generation: ● TfNSW Scoping Study feedback advises: *"Application of agreed trip generation rate previously modelled as part of the PRCUTS traffic and transport modelling assessment for the Homebush precinct."*

Trip Generation

5. HOMEBUSH NORTH PRECINCT

5.1 Uplift Development Summary

The proposed redevelopment in Homebush North precinct would result in:

- 479 medium density residential dwellings
- 517m² GFA of retail development
- 30,763m² GFA of commercial development.

Figure 5-2: Homebush North Precinct - STFM Zones

The total traffic generation estimated in the STFM for the zones within the Homebush North catchment is summarised in Table 5-1. Due to the coarseness of the STFM zoning system, these numbers include additional catchments and their respective but relatively minor future growth from just outside of the precinct.

Table 5-1: Homebush North Traffic Generation and Growth from 2019

Scenario	Traffic OUT (veh)	Traffic IN (veh)	Total TWO-WAY (veh)
AM 2-Hour			
2019 AM	820	843	1,663
2026 AM No Dev	755	627	1,382 (-281)
2026 AM with Dev	938	719	1,657 (-6)
2036 AM No Dev	772	617	1,389 (-274)
2036 AM with Dev	1,542	979	2,521 (+858)
PM 2-Hour			
2019 PM	673	1,341	2,014
2026 PM No Dev	509	1,207	1,716 (-298)
2026 PM with Dev	591	1,498	2,089 (+75)
2036 PM No Dev	521	1,225	1,746 (-268)
2036 PM with Dev	868	2,294	3,162 (+1,148)

Extract from the PRCUT transport study include mix of land use assumptions within the Homebush North Precinct.

Does not provide trip generation rate. What was the agreed assumption?

**'Parramatta Road Corridor - Traffic and Transport Strategy' (Bitzios on behalf of Council, Dec 2021)*

3

George Street and Pomeroy Street intersection upgrade

Based on previous modelling presented to Council in May ‘22. Analysis will be revised with updated modelling.

Six design options have been assessed based on input assumptions derived from observed data (April 2022) and Council information

Design Source	Scenarios (AM)**	Network Assumption	Demand Assumption	Signal Settings	Pedestrian Volumes
N/A	Existing	Existing	Traffic survey count (April 2022) **Total intersection volume:** 2,303 veh/hr	Existing phasing based on Council's *"Parramatta Road Corridor - Traffic and Transport Strategy"* Cycle and green times based on SIDRA "Site Optimum Cycle Time - Minimum Delay"	50 pedestrian per hour each approach*
Billbergia	Option 1	Additional left-turning slip lanes at western and northern approaches	Traffic survey count (April 2022) plus Council traffic growth assumption* **Total intersection volume**: 2,950 veh/hr (+647)	As above	As above
	Option 2	Additional dedicated right turn and left turn bays at western approach			
	Option 3	'Option 2' plus additional left-turning slip lane at northern approach			
Council*	Original	Additional left-turning slip lane at northern approach			
	Mitigation 1	Additional left-turning slip lane and dedicated right turn bay at northern approach			
	Mitigation 2	'Mitigation 1' plus removal of eastern departure lane and conversion of shared through and right to dedicated right turn lane			

* Based on information provided by Council: *"POMEROY STREET / GEORGE STREET INTERSECTION UPGRADE SIDRA MODELLING OPTION TESTING"* (Cardno on behalf of Council, Feb 2020)
**Traffic growth assumptions have been provided for the AM peak hour only

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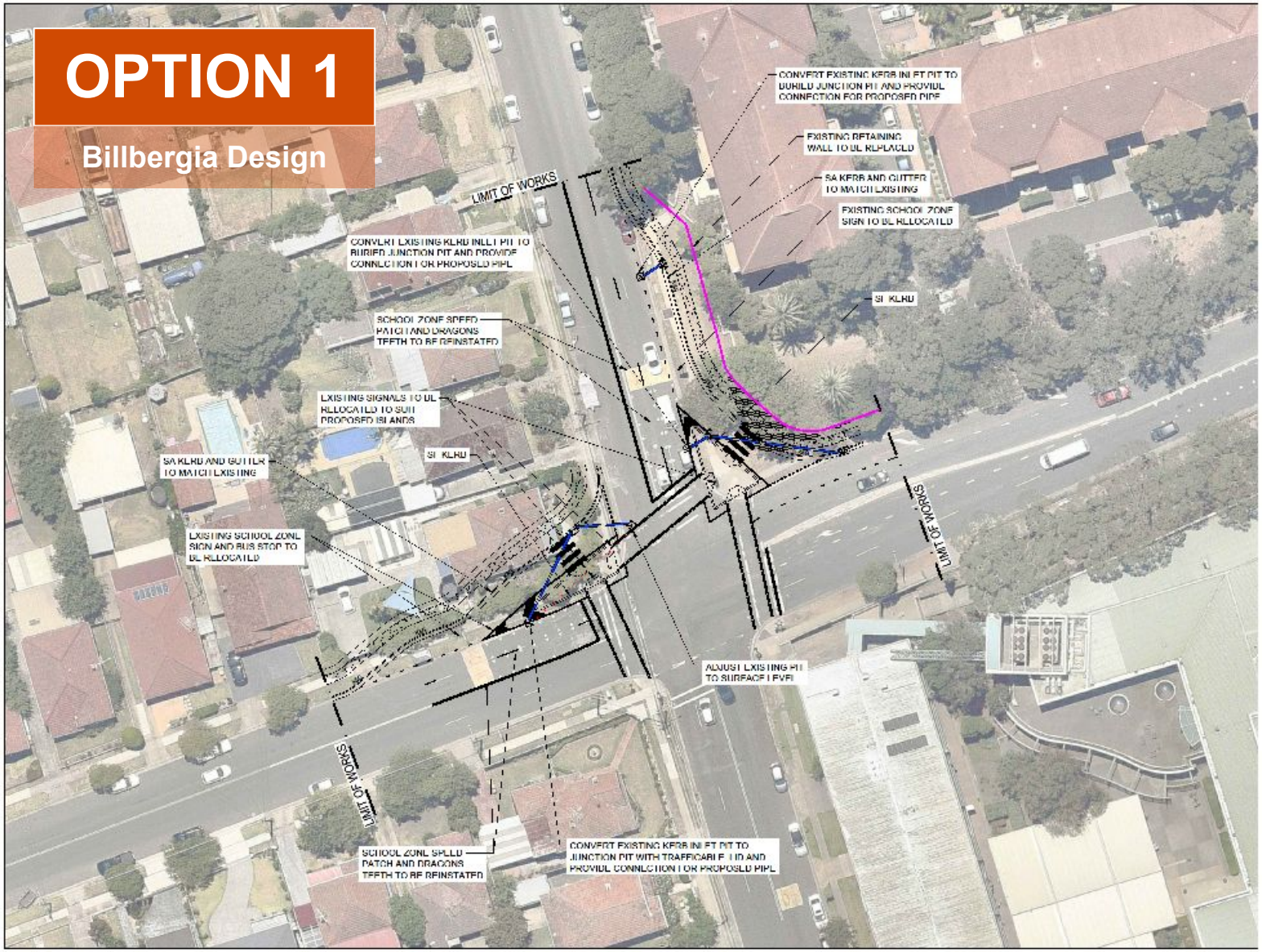
OPTION 1

Billbergia Design



Sydney Office

POMERY ST INTERSECTION
INT POMEROY ST & GEORGE ST

ISSUED FOR INFORMATION

POMEROY STREET AND GEORGE STREET INTERSECTON OPTION 2

S18035 | SKE-0060 | A

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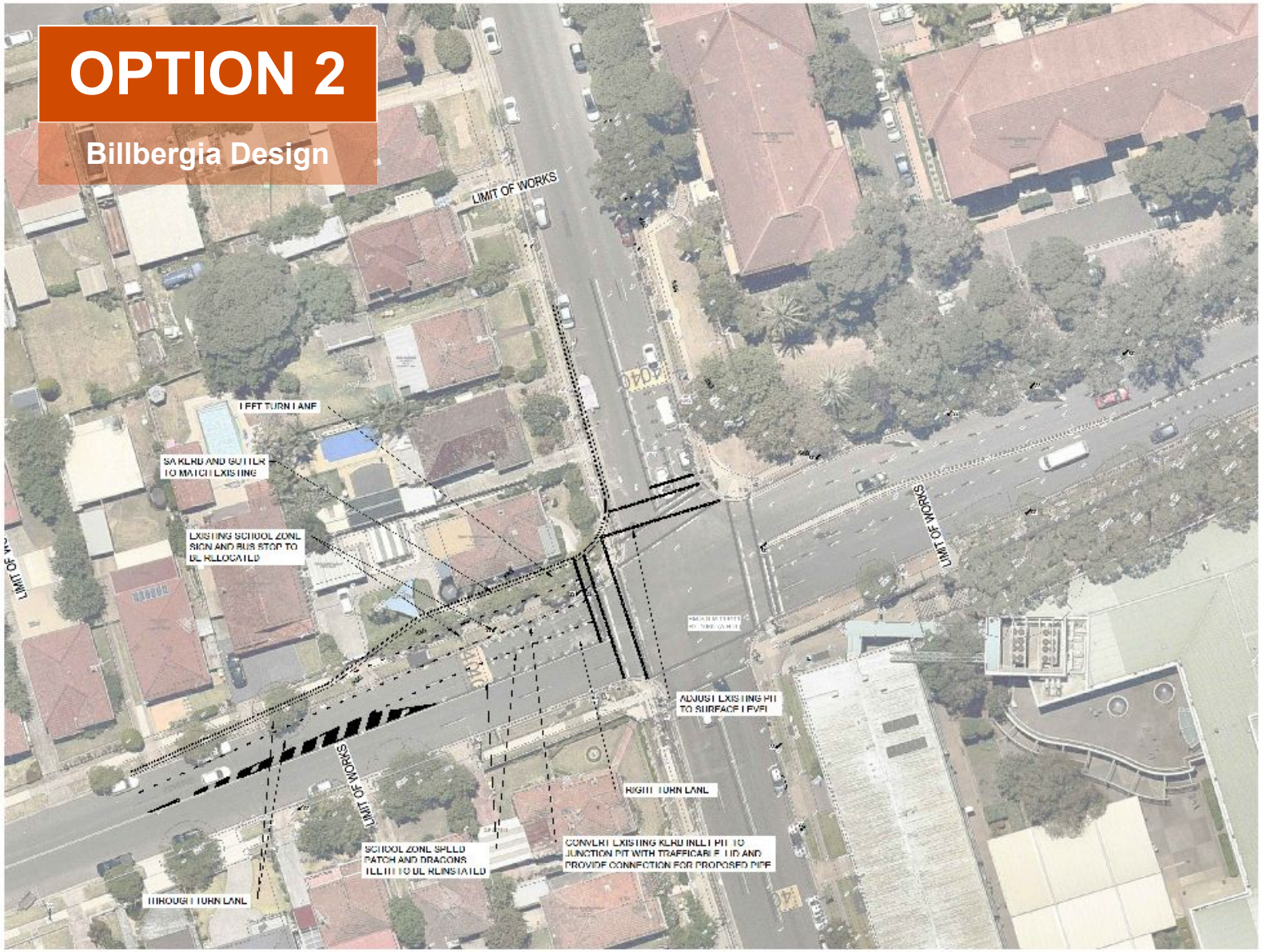
OPTION 2

Billbergia Design



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SUBDIVISION WORKS CERTIFICATE

POMEROY STREET AND GEORGE STREET INTERSECTON OPTION 3

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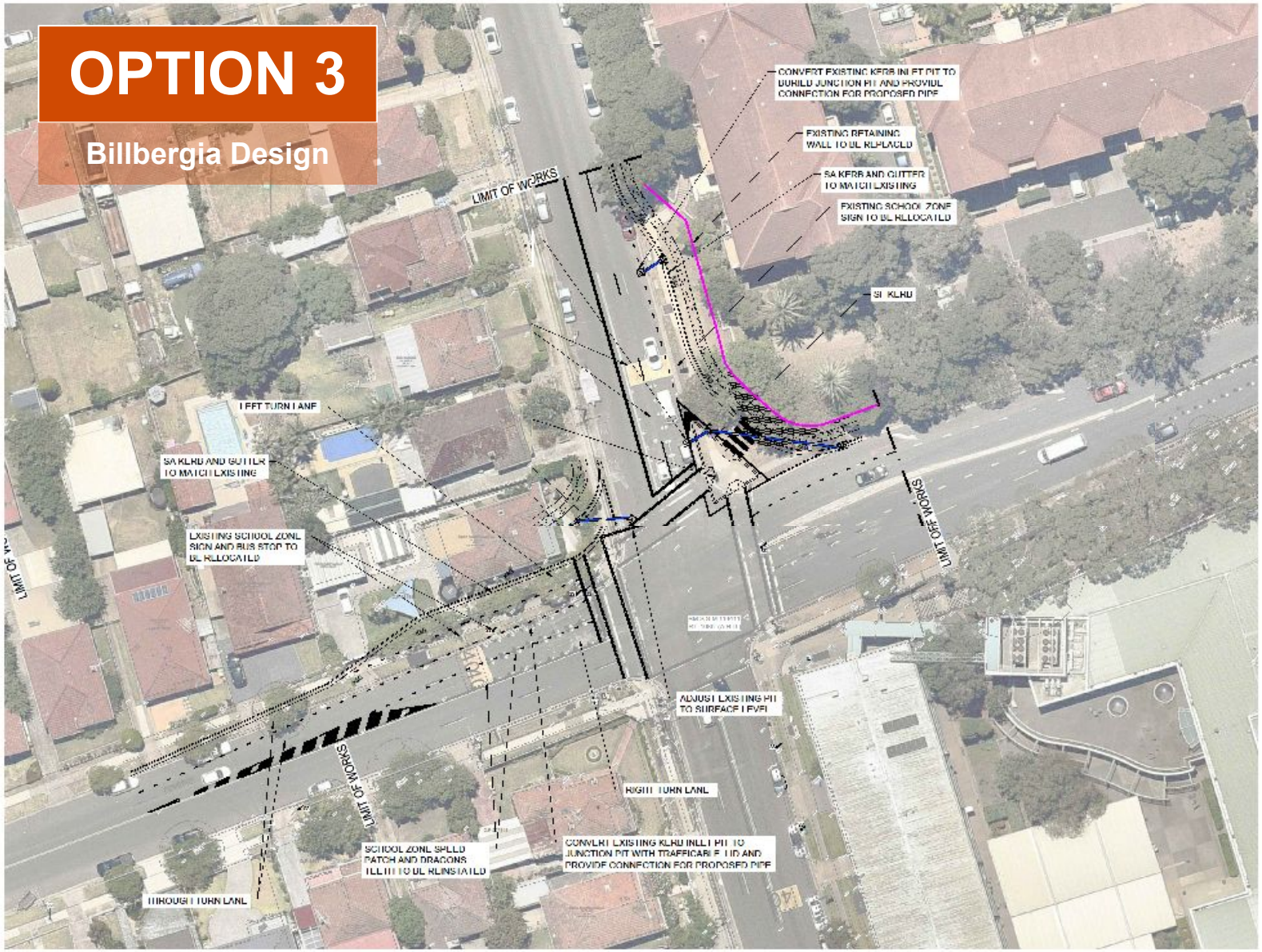
OPTION 3

Billbergia Design



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SUBDIVISION WORKS CERTIFICATE

POMEROY STREET AND GEORGE STREET INTERSECTON OPTION 3

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Original

Council Design

Proposed intersection design by Council

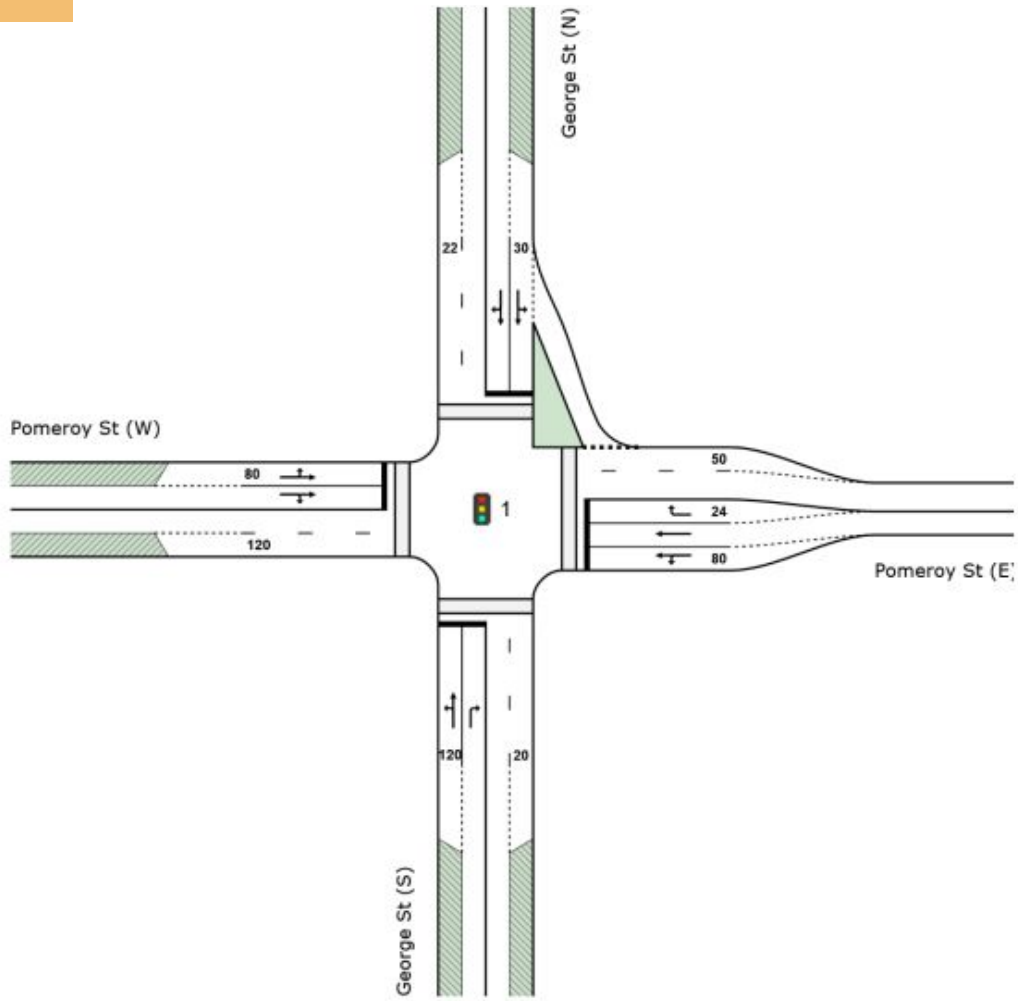

Image source: "POMEROY STREET / GEORGE STREET INTERSECTION UPGRADE SIDRA MODELLING OPTION TESTING" (Cardno on behalf of Council, Feb 2020)

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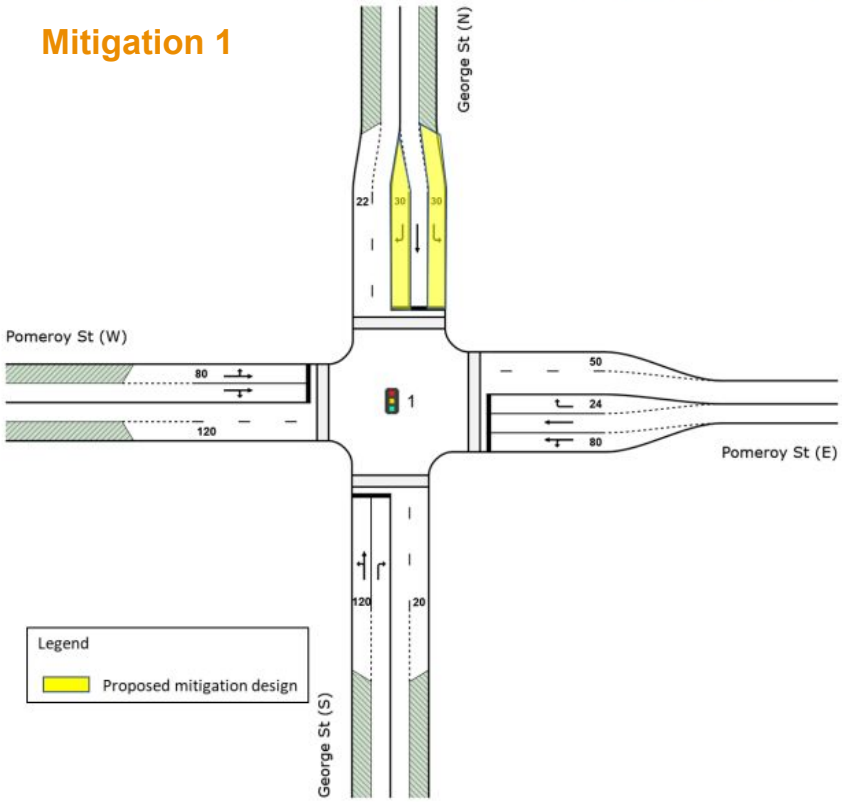
Mitigation

Council Design

Viability of the left turn slip lane in the "Original" design is impacted by a number of constraints (i.e. existing utilities, property boundary). These design options aims to lower the impact on existing utilities.

Mitigation 1



Mitigation 2

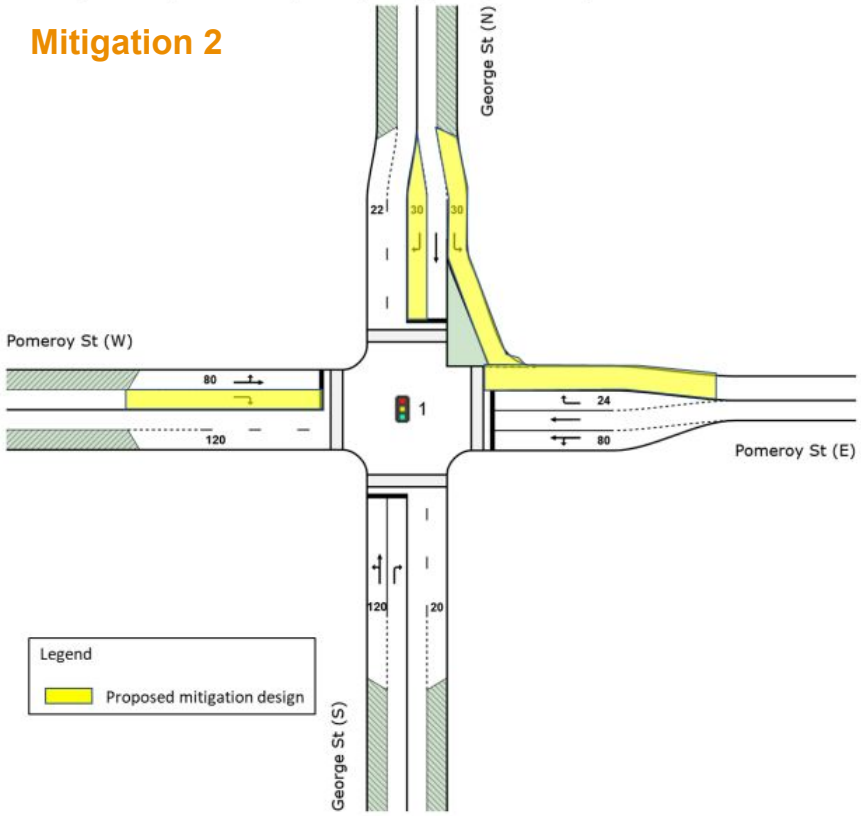


Image source: "POMEROY STREET / GEORGE STREET INTERSECTION UPGRADE SIDRA MODELLING OPTION TESTING" (Cardno on behalf of Council, Feb 2020)

Based on SIDRA analysis, Bilbergia's Option 2 and 3, and Council's Mitigation Design 2 would all perform at acceptable intersection LoS

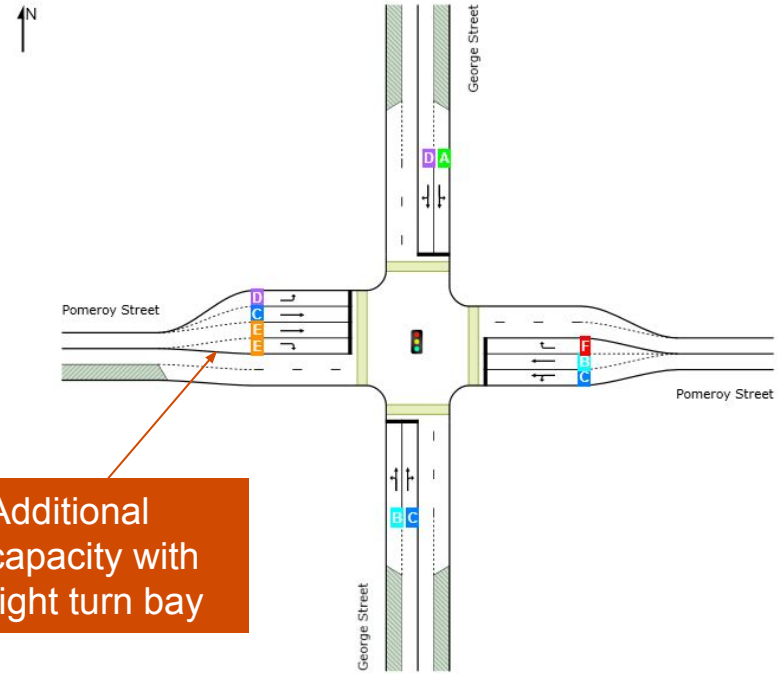
Note, some inconsistencies exists in the assumed traffic volumes* and signal phasings between Council intersection and PwC's assumptions. Notwithstanding these differences, the general viability (i.e. acceptable / unacceptable LoS) of the "Mitigation" design options remain the same.

Design Source	Scenarios (AM)**	Intersection LoS	Average Delay Time (sec)	Viable Design? (i.e. acceptable LoS)	Intersection LoS based on Council's SIDRA (2020)*
N/A	Existing	D	48	-	
N/A	Future with no Upgrade	F	223	-	
Billbergia	Option 1	E	61		
	Option 2	C	40	***YES***	
	Option 3	B	24	***YES***	
Council	Original	F	110		F
	Mitigation 1	E	60		F
	Mitigation 2	C	36	***YES***	B

** Council's base year demands are based on 2020 traffic volume counts. PwC base year demands are based on recent traffic survey counts collected in April 2022.*

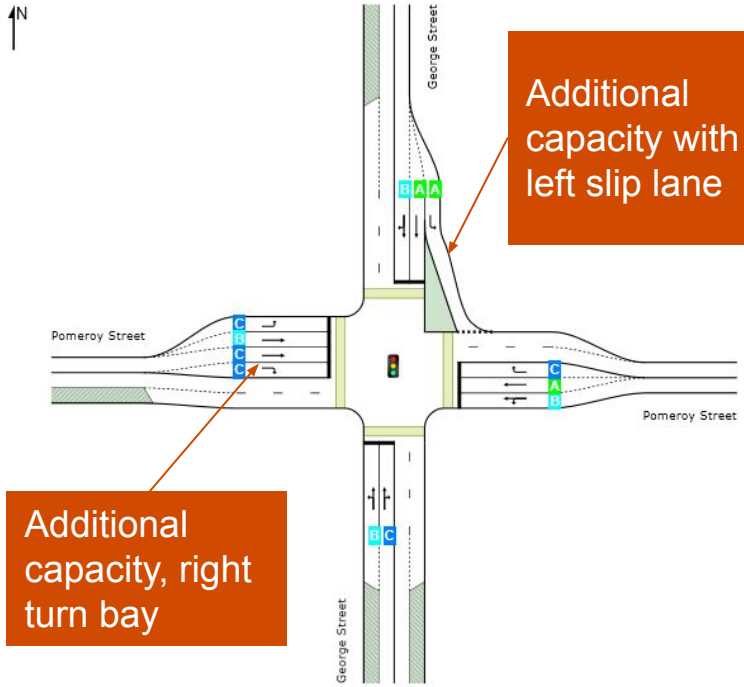
For Billbergia's Option 2 and 3, the proposed design provides additional lane capacity at the northern and and western legs, allowing traffic to clear and more time to be be allocated at the other approaches

	Approaches				Intersection
	South	East	North	West	
LOS	B	C	C	D	C



Additional capacity with right turn bay

	Approaches				Intersection
	South	East	North	West	
LOS	C	B	B	C	B

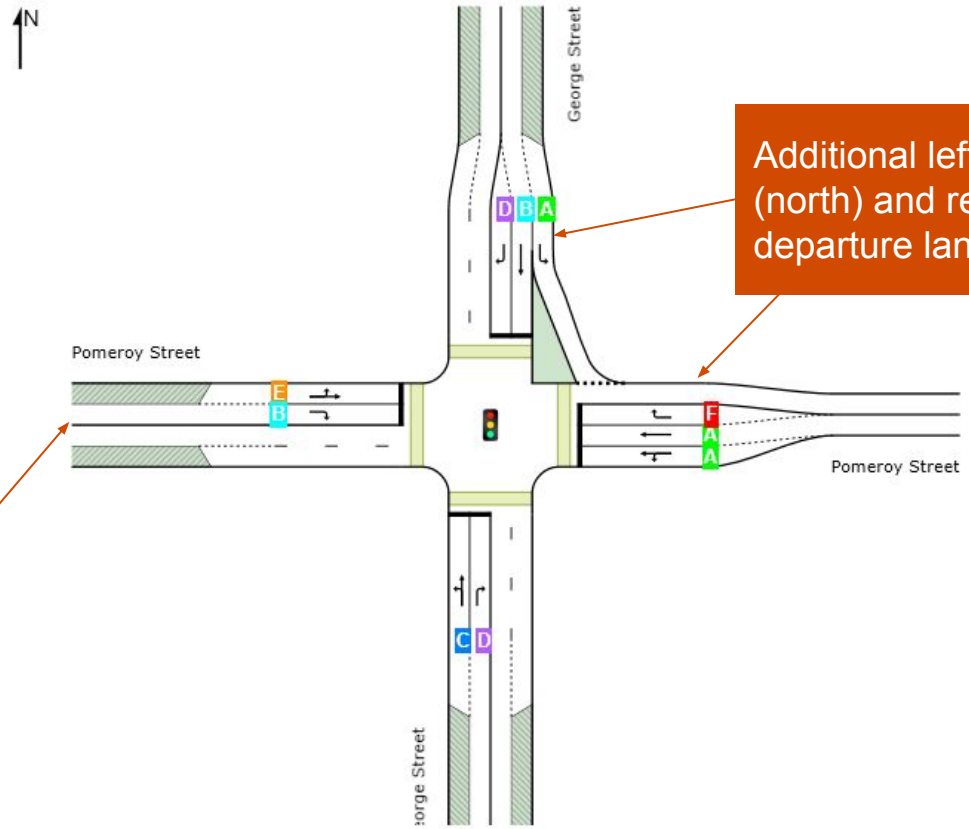


Additional capacity with left slip lane

Additional capacity, right turn bay

Council's Mitigation Design #2 would have less impact on existing road reserve, while remaining within acceptable LoS

	Approaches				Intersection
	South	East	North	West	
LOS	C	B	B	E	C



Additional left slip lane (north) and removal of departure lane (east)

Conversion of through and left to dedicated left turn bay

4

Questions

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Concord West, 1 King Street Transport Impact Assessment
Meeting Minutes – Modelling Approach Workshop

Date: Monday 10 October 2022, 1-2pm
Location: Microsoft Teams Meeting
Attendees:

- Thomas Gregg (TG) - Billbergia
- Bayzid Khan (BK) - TfNSW
- David Potter (DP) - Sydney Metro
- David Leahy (DL) - PwC
- Helen Young (HY) - PwC

Agenda

1. Proposed Modelling Framework
2. Inputs and Assumptions
3. George Street and Pomeroy Street intersection upgrade
4. Questions and Next Step

Notes/Minutes

1. **Proposed Modelling Framework**
    - A brief overview of the project background was presented to TfNSW and Sydney Metro.
        - In June 2022, a scoping study was submitted to the City of Canada Bay Council (Council) for consideration. The scoping study was prepared by Billbergia for the proposed development site at Concord West, 1 King Street.
        - Billbergia have since received feedback on the scoping study and are now moving forward with the next stages of works for the development submission.
        - PwC has been commissioned by Billbergia to undertake a transport assessment of the site, taking on-board the Council, TfNSW and School Infrastructure NSW (SINSW) scoping study feedback.
        - PwC have commenced preliminary discussion with Council regarding the proposed modelling approach, inputs and assumptions, as well as the George Street / Pomeroy St intersection upgrade designs that Billbergia are currently investigating.
        - Following this meeting in September 2022, Council have provided their initial feedback:
            - Council has advised that all traffic modelling-related queries, clarifications and assumptions be submitted and/or discussed with TfNSW.

- Council have suggested that representative/s from Sydney Metro be involved in future discussions as their investigation site for the intersection at Pomeroy Street / Queen Street / Beronga Street is likely to impact traffic operations at George Street / Pomeroy Street (note, the location of Sydney Metro investigation site was confirmed on 26-Sept., post-discussion with Council).

- TfNSW have provided feedback on the modelling framework and have advised that the workflow be undertaken as follows:
  - PwC to submit a Modelling Methodology report to TfNSW for review, incorporating STFM in the modelling framework to produce the demand growth. The report should contain (as a minimum):
    - Traffic growthing approach (i.e. base year SIDRA models using traffic survey data. The traffic growth extracted from the demand model to be pivoted off the base year model).
    - Model scenarios and horizon years.
    - Study area (i.e. key intersections for SIDRA analysis).
    - Development traffic assumptions (i.e. trip generation rates and trip distribution).

  - Following TfNSW endorsement of the Modelling Methodology report, PwC to develop base and future year SIDRA models.
    - STFM traffic growth will be provided by TfNSW.
    - TfNSW have requested that PwC build a SIDRA network model. No microsimulation modelling is required.

  - PwC to submit a combined 'Base Year Model Calibration and Validation' and "Future Option Assessment' Report, as well as the SIDRA model files to TfNSW for review.
    - The base year SIDRA model for George Street / Pomeroy Street will be calibrated and validated using the queue length surveys.
    - Should a follow-up workshop or discussion be required, the standard procedure is that PwC/Billbergia submit a request after the reporting the SIDRA models are submitted.

2. Inputs and Assumptions

- Proposed demand model versions (i.e. STM3.8 and PTPM5) in the presentation slide pack are now obsolete, based on the above TfNSW feedback.

- TfNSW will review the key intersection as part of the Modelling Methodology Report, including the three additional intersections provided by Council for consideration.
    - TfNSW and Sydney Metro to check if there are any available traffic count data at (1) Underwood Rd / Pomeroy St, (2) George St / Parramatta Rd, and (3) Beronga St / Pomeroy St / Queen St.

- The TfNSW scoping study feedback advises that the trip generation assumptions be based on the PRCUTS transport study. However, based on the publicly available information on Council's portal, the reporting does not provide any specific references to trip generation rates.
    - TfNSW to confirm what trip generation assumptions were adopted for the PRCUTS transport study.
    - In the event that TfNSW are unable to confirm the trip generation rates for the PRCUTS transport study, PwC will adopt the rates as outlined in the RMS Guide to Traffic Generating Developments. TfNSW notes that the site is directly adjacent to the Concord West station. Any assumed future mode shares for public transport should be reflected in the traffic generation rates.

- Other TfNSW feedback:
    - The transport assessment for the site should include a qualitative analysis for any existing, committed and proposed active transport facilities.
    - Future public transport capacity to be also based on a combined qualitative and quantitative analysis, noting that existing train and bus usage can be based on other existing datasets:
        - PwC to nominate bus stops and train stations for OPAL tap on/tap off data analysis as part of the Modelling Methodology Report.
        - TfNSW to provide OPAL tap on/tap off data.

3. **George Street and Pomeroy Street intersection upgrade**
    - Early investigation works were undertaken by PwC and Billbergia for three 'Billbergia' design options. These intersections were benchmarked against three proposed 'Council' design options.
        - The SIDRA analyses are based on preliminary traffic assumptions, which will be updated based on the updated traffic survey data and STFM demand growth assumptions.
        - Billbergia is currently investigating 'Billbergia Design Option 2' as the preferred design.

- TfNSW notes that queue lengths (particularly in any overflow lanes) should be recorded in the Options Assessment Report.

4. **Questions and Next Step**
   - A recap of next steps and actions captured during the meeting was discussed.
   - Minutes of the meeting will be distributed by PwC.

Actions

Task	Who	Status/notes
PwC to submit Modelling Methodology report to TfNSW for review	PwC	
TfNSW and Sydney Metro to check if there are any available traffic count data at; (1) Underwood Rd / Pomeroy St, (2) George St / Parramatta Rd, and (3) Beronga St / Pomeroy St / Queen St.	TfNSW, Sydney Metro	
TfNSW to check trip generation assumptions used for the PRCUTS transport study	TfNSW	
TfNSW to review Modelling Methodology report and provide feedback	TfNSW	Pending Modelling Methodology report
TfNSW to provide OPAL tap-on tap-off data	TfNSW	Pending Modelling Methodology report
TfNSW to provide STFM demand outputs	TfNSW	Pending Modelling Methodology report

Appendix D Modelling Methodology Report and TfNSW Comments Register

Please note that at the time of writing this Transport Study Report, and in reference to the attached Modelling Methodology Report:

- SCATS data were procured separately by PwC / Billbergia.
- SCATS count data was not used for this transport study; demand inputs for the base year SIDRA models are based on surveyed intersection count data.
- SIDRA network modelling for adjacent intersections near the site was initially proposed. However, for these adjacent intersections, little to no queues were observed in the existing and future SIDRA models (based on the isolated intersection analysis). As such, the SIDRA modelling was kept as-is using isolated intersection analysis.

As part of the modelling methodology (developed as part of the stakeholder consultation), references to a potential upgrade at George Street and Pomeroy Street intersection was made. Following advice from Council in February-March 2024, this upgrade is no longer being pursued. Information pertaining to this intersection upgrade has been retained for record-keeping purposes only.

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Concord West Modelling Methodology Report

PwC on behalf of Billbergia

November 2022

pwc

Strictly private and confidential

Disclaimer

This report is not intended to be read or used by anyone other than Billbergia, Transport for NSW (**TfNSW**) and City of Canada Bay Council (**Council**).

We prepared this report solely for Billbergia's use and benefit in accordance with and for the purpose set out in our engagement letter to Billbergia dated 02 September 2022. In doing so, we acted exclusively for Billbergia and considered no-one else's interests.

We accept no responsibility, duty or liability:

- to anyone other than Billbergia in connection with this report
- to Billbergia for the consequences of using or relying on it for a purpose other than that referred to above.

We make no representation concerning the appropriateness of this report for anyone other than Billbergia. If anyone other than Billbergia chooses to use or rely on it they do so at their own risk.

This disclaimer applies:

- to the maximum extent permitted by law and, without limitation, to liability arising in negligence or under statute; and
- even if we consent to anyone other than Billbergia receiving or using this report.

Liability limited by a scheme approved under Professional Standards legislation

Version Control

Revision	Date	Description	Prepared by
Rev01	13-Oct-2022	Draft for client review	PwC
Rev02	17-Oct-2022	Final report	PwC
Rev03	1-Nov-2022	Final Report updated with TfNSW comments	PwC

Contents

1 Introduction

1.1 Background

Figure 1-1 provides a map of the 1 King Street, Concord West property (**the site**). The site is approximately 3.1ha and currently houses a Westpac building and multi deck car park within a large warehouse and commercial property.

Billbergia (the owners of the site) are exploring plans to revitalise the site. This includes a proposal to provide more dwellings and commercial spaces, expanding the existing childcare facilities to offer local residents better housing, retail and business opportunities.

In June 2022, a scoping study was submitted to the City of Canada Bay Council (**Council**) as part of the pre-lodgement stage of the planning proposal process. Billbergia have since received feedback on the scoping study and are now moving forward with the next stages of works for the development submission.

Figure 1-1 Site Location

1.2 Purpose of this Report

PwC has been commissioned by Billbergia to undertake a transport assessment of the site, taking on-board the Council, Transport for NSW (**TfNSW**) and School Infrastructure NSW (**SINSW**) scoping study feedback. A copy of the scoping study feedback is presented in Appendix A. They include the following documents:

- 'ATTACHMENT D: 1 King Street – TfNSW Methodology for Transport Assessment'.
- 'ATTACHMENT E: 1 King Street – SINSW Response to Scoping Proposal'.

Between September 2022 and October 2022, two separate workshops were undertaken with key stakeholders (Council, TfNSW and Sydney Metro) to discuss the proposed modelling approach. A copy of the workshop presentation material and meeting minutes are provided in Appendix B.

Following stakeholder consultation, TfNSW have requested Billbergia and PwC submit a Modelling Methodology Report, outlining the proposed modelling framework, model extents, scenario definitions and key inputs assumptions.

The purpose of this report is to document the proposed model development process for TfNSW endorsement. PwC have since received feedback from TfNSW (31-October 2022) on the Modelling Methodology Report (October 2022, Rev02). This report version incorporates the feedback received, with a copy of the TfNSW review comments register attached in Appendix C.

1.3 Structure of this Report

This report is structured as follows:

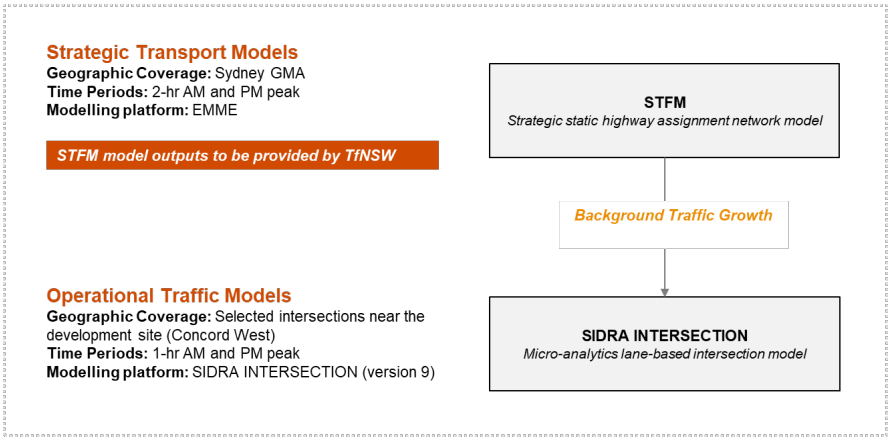
- Section 1: Introduction (this section).
- Section 2: Modelling Methodology and Framework.
- Section 3: Data Request.

2 Modelling Methodology and Framework

2.1 Modelling Framework

Strategic transport and operational traffic modelling will be used to assess the site impacts on the surrounding road network. Figure 2-1 shows the proposed modelling framework, which is further described in the following sections.

Figure 2-1 Proposed Modelling Framework



2.1.1 Strategic Traffic Forecasting Model (STFM)

Owned and maintained by the TfNSW Advanced Analytics & Insights (**AAI**), STFM is a strategic static highway assignment model that covers the wider Sydney Greater Metropolitan Area (**GMA**). As advised by TfNSW, STFM demand forecasts will be provided by TfNSW. The demand forecasts will be used to inform the background demand growth for the site surrounds

2.1.2 SIDRA Intersection (SIDRA)

SIDRA is a micro-analytics lane-based model that will be used to provide intersection performance analysis for selected intersections in Concord West. SIDRA network models will be developed for the adjacent intersection identified in Section 2.3. However, due to the location of George Street / Pomeroy Street, this intersection will be developed as an isolated intersection model.

The approach to developing the base and future SIDRA models is described as follows:

- **Build and validate base year SIDRA models:**
  - The existing road layout, signal phasing and peak hourly car, heavy vehicle and pedestrian volumes will be based on intersection turning count surveys and site observations.
  - The base year model will be validated against the queue length surveys collected on-site, noting that this will be undertaken for one intersection only at George Street / Pomeroy Street. No significant queues / delays were observed for the other key intersections. These are priority junctions located within the local streets, away from the main corridor (Pomeroy Street), and currently do not experience high volumes of traffic.
- **Generate future demand and build future year SIDRA models:**
  - Future year demand will be generated by applying the background traffic growth (extracted from STFM) and site-generated development traffic to the base year demand, as per the scenarios listed in Section 2.2.

- Any identified road upgrades required to support the development traffic will also be reflected in the network coding for the future SIDRA models.
- Future year signal phasings and timings will be optimised using SIDRA's in-built functions, noting the minimum green times that are required to allow for pedestrians to cross. Where required, the future year pedestrian flows will be updated to reflect any additional pedestrian movements that may be generated from the new development.

2.2 Scenario Definition and Model Horizon Year

Table 2-1 provides an overview of the scenario definitions, which includes one base year scenario and three future year scenarios. The future year scenarios are based on modelling horizon year 2036, consistent with the *'Parramatta Road Corridor - Traffic and Transport Strategy'* (Bitzios on behalf of Council, December 2021).

Table 2-1 Scenario definitions

#	Scenario	Year	Traffic Demand			Network Coding
			Surveyed Data	Background Traffic Growth	Development Traffic Growth	
1	Base Year	2022	Yes	-	-	Existing road network
2	Future Reference Case	2036	Yes	Yes	-	Existing road network
3	Future Development Case	2036	Yes	Yes	Yes	Existing road network
4	Future Development Case (with upgrades)	2036	Yes	Yes	Yes	Existing road network plus upgrades*

**As identified for any road upgrades that is required to support the development within the study area*

2.3 Study Area

Figure 2-2 adjacent shows the location of the key intersections that are located within the site surrounds. These include the following intersections:

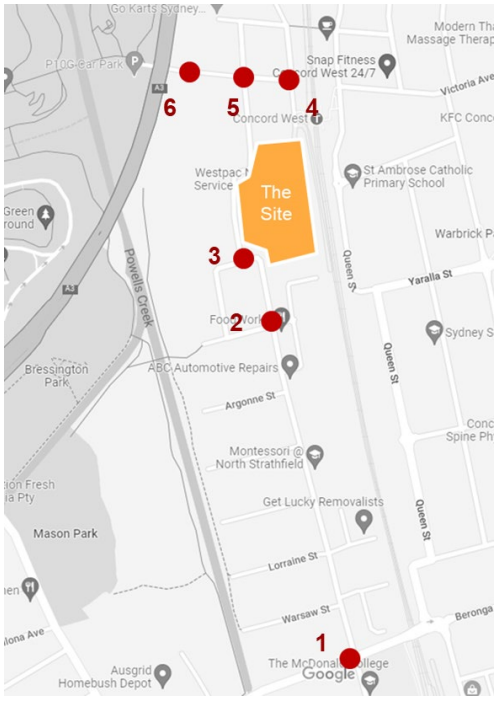
1. George Street / Pomeroy Street.
2. George Street / Conway Avenue.
3. George Street / Rothwell Avenue.
4. King Street / Victoria Avenue.
5. George Street / Victoria Avenue.
6. Victoria Avenue / access road to Victoria Avenue Public School and Powells Creek Reserve.

Following consultation with Council, the following additional intersections were nominated for potential assessment:

- Underwood Road / Pomeroy Street.
- George Street. / Parramatta Road.
- Beronga Street / Pomeroy Street / Queen Street.

Please note, the current assumptions for the key intersections *do not yet include the above optional intersections.* This is subject to advice from TfNSW.

Figure 2-2 Concord West - Key Intersections



2.4 Site Surveys and On-site Observations

Traffic surveys were undertaken on Tuesday 20-September, with details of the data collection described as follows:

- Time period: 6-10am and 3-7pm.
- Intersection turning movement counts: Collected for car, heavy vehicles, pedestrian and cyclist for all intersections.
- Queue length surveys: Collected for George Street / Pomeroy Street only.

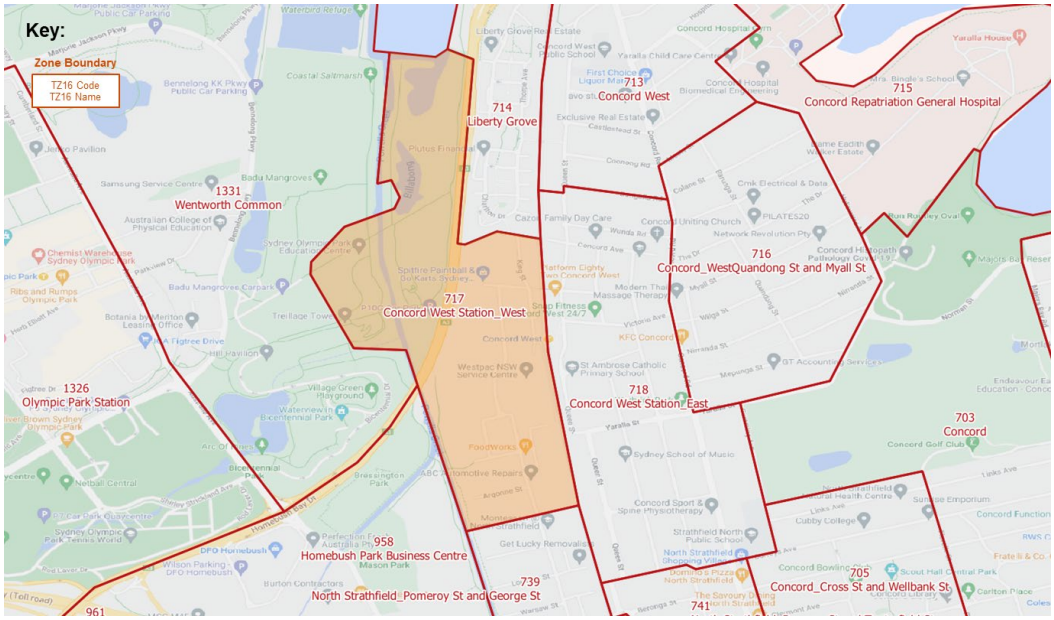
A site visit was also undertaken on the same day by PwC personnel during the peak hours to observe site conditions. These included, but were not limited to, the following site observations; (1) existing traffic operations at key intersections, (2) movement and access to/from Concord West Station, the site, Victoria Avenue Public School, Bicentennial Park and Powells Creek Reserve, and (3) other public transport and active transport facilities.

2.5 Traffic Growth Process

The traffic growth process that will be undertaken is described as follows:

- **Background traffic growth:**
  - Convert 2-hourly peak traffic flows from STFM (7-9am and 4-6pm) to 1-hour flows using the same time profiles as the surveyed data.
  - Calculate absolute growth from STFM base year to STM future year (2036) traffic demand. If the STFM base year is not 2022, the traffic growth from 2022 will be calculated via interpolation for the intervening year from the STFM base year to 2036.
  - Split STFM traffic growth to light and heavy vehicles using the same proportions as the surveyed data; STFM produces demand forecasts for one vehicle class only (total vehicles).
  - Apply traffic growth to the SIDRA base year (2022) to generate the SIDRA future demand (2036). It is noted that STFM may not provide the required level of detail for the road network in Concord West.
    - If the intersection exists in STFM, the absolute traffic growth will be applied directly to the SIDRA model based on intersection turning movement volumes.
    - If the intersections *do not* exist in STFM, the percentage growth for Travel Zone 2016 (**TZ16**) 717 will be applied for the whole intersection, noting that the site is located within this travel zone (see Figure 2-3). The trip distribution will be based on Journey to Work 2016 (**JTW16**) data for Concord West.

Figure 2-3 TZ16 zone boundaries (Concord West)



- **Development traffic growth:**
  - Generate development traffic using trips rates for the following land uses[1]:
    - **High residential development.** Morning and afternoon peak hour trip rates to be provided by TfNSW.
    - **Childcare centre**. Morning and afternoon peak hour trip rates to be provided by TfNSW.
    - **Supermarket** (less than 7,700 sqm gross floor area (**GFA**)). Based on advice received from TfNSW on 13 October 2022 (please refer to Appendix D).

    Where relevant, trip rates may be adjusted based on Metro mode share. Any reduction in vehicle trips will be converted to person trips and added to other mode shares (public or active transport).
  - Discount trips generated based on the following assumptions for self-containment, subject to approval by TfNSW:
    - Within the site, it is assumed that the majority of trips generated would be parents walking their child to the childcare centre. For the *'Proposed Mixed-Use Development, VRS Site: 657-661 Victoria Road & 4-6 Wharf Road, Melrose* Park', Parramatta Council approved the ASON Traffic Impact Assessment, which assumes:
      - > 20% of the trips would be external and generate traffic.
      - > 80% of the trips generated by the childcare centre would be internal trips from parents living in the units within the site (i.e. walking their child to the centre or pick-up/drop-off on the way from/to work).
    - A similar approach is also proposed to be applied to the supermarket, which is intended to serve the residents that live within walking distance.
  - Apply directional splits
    - For high density residential:
      - > 80% of traffic generated travelling *away* from the site and 20% *towards* from the site during the morning peak hour.
      - > 20% of traffic generated travelling *away* from the site and 80% *towards* from the site during the afternoon peak hours.
    - For the childcare centre:
      - > 50% of traffic generated travelling *away* from the site and 50% *towards* from the site during the morning peak hour.
      - > 50% of traffic generated travelling *away* from the site and 50% *towards* from the site during the afternoon peak hours.
    - For the supermarket:
      - > 50% of traffic generated travelling *away* from the site and 50% *towards* from the site during the morning peak hour.
      - > 50% of traffic generated travelling *away* from the site and 5% *towards* from the site during the afternoon peak hours.
  - Distribute traffic based on 2016 JTW data.

[1] Note, the scoping study feedback advises that the trip generation assumptions be based on the PRCUTS transport study. However, based on the publicly available information on Council's portal, the reporting for the PRCUTS transport study does not provide any specific references to trip generation rates. Following stakeholder consultation TfNSW have since provided suggested trip generation rates for retail (email sent to Billbergia and PwC on 13 October 2022). In the event that TfNSW are unable to confirm the childcare and residential trip generation rates, TfNSW have advised that rates outlined in the RMS Guide to Traffic Generating Developments would be suitable for use.

3 Data Request

Table 3-1 summarises the data request for TfNSW, noting that confirmation of the modelling methodology (as outlined in this document) and the STFM demand forecast are the core items required to commence the modelling activities.

Table 3-1 Data Request for TfNSW

#	Data Request	Purpose
1	STFM demand outputs (base year and 2036) covering the intersections within the study area outlined in Section 2.2: • Intersection turning movement volumes. • Link volume plots.	To generate background traffic growth and understand traffic growth at the road link-level.
2	STFM demand outputs (base year and 2036) for TZ16 717, 714, 713, 718, 739 and 741, and aggregate across the whole model area.	To understand traffic growth for the site, surrounding suburbs and the whole Sydney GMA.
3	STFM origin-destination trips (base year and 2036) travelling to/from TZ16 717 from/to all other zones, aggregated to Statistical Area 2 (**SA2**) level.	To verify JTW16 trip distribution.
4	STFM select link analysis for TZ16 717 (base year and 2036),	To verify JTW16 trip distribution. To understand existing and future travel patterns for the site.
5	If available, relevant information that documents the STFM inputs and assumptions. For example: • Confirmation of the source of underlying land use forecasts (e.g. TfNSW's standard Travel Zone Projection 2019 (**TZP19**)). • Upstream demand models (e.g. Sydney Strategic Travel Model (**STM**) only, or STM and the Public Transport Project Model (**PTPM**)). • Does the STFM demand forecast account for mode shift associated with Sydney Metro?	For input to reporting as background information.
6	Trip generation rates for high density residential and childcare centre	To calculate development traffic
7	If required and available, traffic count data at; (1) Underwood Rd / Pomeroy St, (2) George St / Parramatta Rd, and (3) Beronga St / Pomeroy St / Queen St.	To inform SIDRA base year demand (if additional intersections are required).
8	OPAL tap-on tap-off data at the following locations: • Concord West Train Station. • Bus stop: Concord Rd at Coonong Rd (Stop ID: 213837). • Bus stop: Concord Rd at Colane St (Stop ID: 213826). • Bus stop: Concord Rd before Victoria Ave (Stop ID: 213835).	To understand current public transport usage.
9	SCATS data at George St / Pomeroy St (collected on same day as surveyed data on Tuesday 20-September-2022, if possible): • SCATS counts • SCATS signal timings • SCATS plots detailing phasing arrangement	To verify existing conditions and surveyed data

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Modelling Methodology Report (October 2022, Rev02) | TfNSW Review Notes and Comments

Item	Reviewer	Materia	Section	TfNSW Review Comments (received 31-Oct-2022)	Priority	PwC Response Date	PwC Response	PwC Action
1	TfNSW AAI	Report	2.1.2	"The existing road layout, signal phasing and peak hourly car, heavy vehicle and pedestrian volumes" Will the signal timings also be used for the existing model?	Minor	11/1/2022	The signal timings for the existing models (base year) will be optimised using SIDRA's in-built function, adjusted to balance out the surveyed/observed data (input traffic flows, signal phasings and the queue length surveys). ***Based on TfNSW Review Comment #6, we will also review the timings based on the SCATS signal data.***	No further action
2	TfNSW AAI	Report	2.1.2	"The base year model will be validated against the queue length surveys collected on-site, noting that this will be undertaken for one intersection only at George Street / Pomeroy Street" What information will the rest of the network use for validation?	Medium	11/1/2022	No further information has been put forward to validate the rest of the network. The remaining intersections were identified as priority junctions which currently do not experience congestion / queuing (based on video surveys and on-site observations during the peak hours). As such, the default SIDRA settings will be kept as-is for these non-signalised intersections.	No further action
3	TfNSW AAI	Report	2.1.2	"The future year pedestrian flows are assumed to be the same as the base year volumes." Are pedestrian flows likely to remain the same given the proposed development?	Minor	11/1/2022	Noted, we will revise the future pedetrians flows based on the agreed trip rates and mode shares for the development trips	Section 2.1.2 of report updated.
4	TfNSW AAI	Report	2.5	"divide 2-hour traffic flows by two to obtain 1-hour flows" It may be more accurate to use the portion calculated from the traffic surveys. Otherwise 55% of 2 hours STFM traffic flow should be used.	Medium	11/1/2022	Noted, we will apply the same time profiles as the surveyed data to convert the STFM 2-hourly flows (7-9am and 4-6pm) to 1-hour peak flows.	Section 2.5 of report updated
5	TfNSW AAI	Report	2.5	Taking this approach may result in unbalanced traffic volumes between adjacent intersections. Will balancing be undertaken afterwards?	Minor	11/1/2022	For the base year SIDRA models, no further balancing of the traffic flows will be required. The adjacent intersection counts have been surveyed on the same day. We can confirm that the counts are balanced for those locations, with no readjustments needed. For the future year SIDRA models, should the traffic growth applied result in unbalanced flows (e.g. combination of absolute and percentage growths for adjacent intersections), some adjustment may be necessary. Should this be required, we will undertake a comparison of the traffic flows differences to determine the appropriate adjustments, which will be documented in the traffic assessment report.	No further action
6	TfNSW AAI	Report	3	Would recommend SCATS data at the existing George St / Pomeroy St signalised intersection too.	Minor	11/1/2022	Noted, we will incorporate the SCATS signal and counts data as part of the data request list.	Table 3-1 updated
7	TfNSW AAI	Report	3	STM 3.8 already included Metro West in 2031 model onward, ie STFM demand also associated with Metro	Note	11/1/2022	Noted	No further action
8	TfNSW AAI	Report	Appendix B	Why are there no PM results shown? The documentation is all based on AM results. Based on local observation, PM queues at Pomeroy/George are extensive which should be included for analysis.	Minor	11/1/2022	The preliminary analysis presented in Appendix B were based initial demand forecasts containing growthing assumptions for the AM period only. The growthing assumptions (which has since been outdated following discussion with Council in May '22) were sourced from information provided by Council. ***The updated transport traffic (i.e. this report and modelling) will contain reported analysis for both the AM and PM peak hours.***	No further action

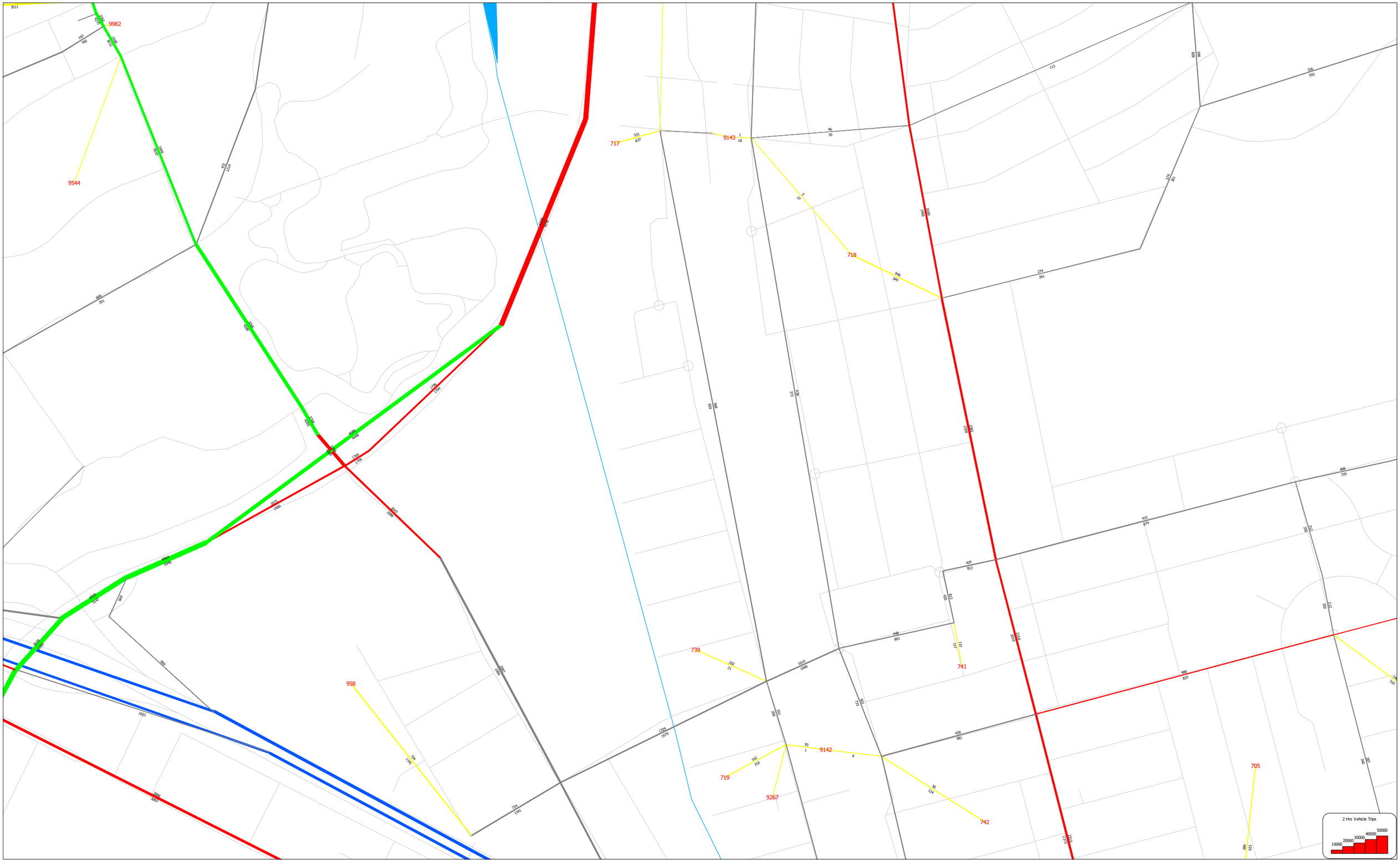
Appendix E Intersection Turning Volume Breakdown and STFM Outputs

Traffic growth based on STFM outputs (provided by TfNSW) and existing turn %. **See following pages for STFM volume plots.**

Site-generated traffic applied to relevant turns travelling to/from site.

Intersection	Approach	Movement	Time Period	EXISTING					FUTURE REFERENCE (Background Traffic)					FUTURE REFERENCE (Background Traffic)					
				Peak Hourly Flow			HV %	Turn % (as proprtion of total at approach)	Peak Hourly Flow			HV %	Turn % (as proprtion of total at approach)	Peak Hourly Flow			HV %	Turn % (as proprtion of total at approach)	Site-Generated Traffic
				All Vehicle	Light Vehicle (LV)	Heavy Vehicle (HV)			All Vehicle	Light Vehicle (LV)	Heavy Vehicle (HV)			All Vehicle	Light Vehicle (LV)	Heavy Vehicle (HV)			
George St/Pomeroy St	South: George Street	Left	AM	97	96	1	1.0%	32%	120	119	1	0.8%	32%	120	119	1	0.8%	30%	0
George St/Pomeroy St	South: George Street	Through	AM	68	65	3	4.4%	22%	90	87	3	3.3%	24%	113	110	3	2.7%	29%	23
George St/Pomeroy St	South: George Street	Right	AM	141	141	0	0.0%	46%	163	163	0	0.0%	44%	163	163	0	0.0%	41%	0
George St/Pomeroy St	East: Pomeroy Street	Left	AM	370	368	2	0.5%	43%	410	408	2	0.5%	43%	410	408	2	0.5%	42%	0
George St/Pomeroy St	East: Pomeroy Street	Through	AM	381	375	6	1.6%	45%	425	419	6	1.4%	45%	425	419	6	1.4%	43%	0
George St/Pomeroy St	East: Pomeroy Street	Right	AM	103	102	1	1.0%	12%	115	114	1	0.9%	12%	148	147	1	0.7%	15%	33
George St/Pomeroy St	North: George Street	Left	AM	167	165	2	1.2%	50%	236	234	2	0.8%	47%	305	303	2	0.7%	42%	69
George St/Pomeroy St	North: George Street	Through	AM	104	103	1	1.0%	31%	166	165	1	0.6%	33%	250	249	1	0.4%	35%	84
George St/Pomeroy St	North: George Street	Right	AM	64	62	2	3.1%	19%	100	98	2	2.0%	20%	168	166	2	1.2%	23%	68
George St/Pomeroy St	West: Pomeroy Street	Left	AM	122	120	2	1.6%	19%	182	180	2	1.1%	21%	243	241	2	0.8%	27%	61
George St/Pomeroy St	West: Pomeroy Street	Through	AM	438	430	8	1.8%	68%	551	543	8	1.5%	65%	551	543	8	1.5%	61%	0
George St/Pomeroy St	West: Pomeroy Street	Right	AM	81	81	0	0.0%	13%	114	114	0	0.0%	13%	114	114	0	0.0%	13%	0
George Street / Conway Avenue	South: George Street	Left	AM	4	4	0	0.0%	2%	4	4	0	0.0%	1%	4	4	0	0.0%	1%	0
George Street / Conway Avenue	South: George Street	Through	AM	197	194	3	1.5%	87%	267	264	3	1.1%	88%	384	381	3	0.8%	91%	117
George Street / Conway Avenue	South: George Street	Right	AM	26	22	4	15.4%	11%	34	30	4	11.8%	11%	34	30	4	11.8%	8%	0
George Street / Conway Avenue	East: Access Road	Left	AM	31	31	0	0.0%	76%	60	60	0	0.0%	86%	60	60	0	0.0%	86%	0
George Street / Conway Avenue	East: Access Road	Through	AM	1	1	0	0.0%	2%	1	1	0	0.0%	1%	1	1	0	0.0%	1%	0
George Street / Conway Avenue	East: Access Road	Right	AM	9	9	0	0.0%	22%	9	9	0	0.0%	13%	9	9	0	0.0%	13%	0
George Street / Conway Avenue	North: George Street	Left	AM	3	3	0	0.0%	2%	3	3	0	0.0%	1%	3	3	0	0.0%	1%	0
George Street / Conway Avenue	North: George Street	Through	AM	142	139	3	2.1%	97%	253	250	3	1.2%	98%	474	471	3	0.6%	99%	221
George Street / Conway Avenue	North: George Street	Right	AM	2	1	1	50.0%	1%	2	1	1	50.0%	1%	2	1	1	50.0%	0%	0
George Street / Conway Avenue	West: Conway Avenue	Left	AM	2	1	1	50.0%	14%	2	1	1	50.0%	8%	2	1	1	50.0%	8%	0
George Street / Conway Avenue	West: Conway Avenue	Through	AM	1	1	0	0.0%	7%	1	1	0	0.0%	4%	1	1	0	0.0%	4%	0
George Street / Conway Avenue	West: Conway Avenue	Right	AM	11	11	0	0.0%	79%	21	21	0	0.0%	88%	21	21	0	0.0%	88%	0
George Street / Rothwell Avenue	East: George Street	Through	AM	1	1	0	0.0%	1%	1	1	0	0.0%	0%	1	1	0	0.0%	0%	0
George Street / Rothwell Avenue	East: George Street	Right	AM	194	191	3	1.5%	99%	264	261	3	1.1%	100%	268	265	3	1.1%	100%	4
George Street / Rothwell Avenue	North: George Street	Left	AM	124	122	2	1.6%	99%	234	232	2	0.9%	100%	209	207	2	1.0%	75%	-25
George Street / Rothwell Avenue	North: George Street	Right	AM	1	1	0	0.0%	1%	1	1	0	0.0%	0%	67	67	0	0.0%	24%	66
George Street / Rothwell Avenue	West: Rothwell Avenue	Left	AM	2	2	0	0.0%	67%	2	2	0	0.0%	50%	2	2	0	0.0%	50%	0
George Street / Rothwell Avenue	West: Rothwell Avenue	Through	AM	1	1	0	0.0%	33%	2	2	0	0.0%	50%	2	2	0	0.0%	50%	0
King Street / Victoria Avenue	South: King Street	Left	AM	6	6	0	0.0%	75%	12	12	0	0.0%	86%	3	3	0	0.0%	16%	-9
King Street / Victoria Avenue	South: King Street	Through	AM	1	1	0	0.0%	13%	1	1	0	0.0%	7%	15	15	0	0.0%	79%	14
King Street / Victoria Avenue	South: King Street	Right	AM	1	1	0	0.0%	13%	1	1	0	0.0%	7%	1	1	0	0.0%	5%	0
King Street / Victoria Avenue	East: Access	Left	AM	1	1	0	0.0%	33%	1	1	0	0.0%	33%	1	1	0	0.0%	33%	0
King Street / Victoria Avenue	East: Access	Through	AM	1	1	0	0.0%	33%	1	1	0	0.0%	33%	1	1	0	0.0%	33%	0
King Street / Victoria Avenue	East: Access	Right	AM	1	1	0	0.0%	33%	1	1	0	0.0%	33%	1	1	0	0.0%	33%	0
King Street / Victoria Avenue	North: King Street	Left	AM	1	1	0	0.0%	8%	1	1	0	0.0%	4%	1	1	0	0.0%	4%	0
King Street / Victoria Avenue	North: King Street	Through	AM	1	1	0	0.0%	8%	1	1	0	0.0%	4%	17	17	0	0.0%	74%	16
King Street / Victoria Avenue	North: King Street	Right	AM	11	11	0	0.0%	85%	21	21	0	0.0%	91%	6	6	0	0.0%	26%	-15
King Street / Victoria Avenue	West: Victoria Avenue	Left	AM	18	18	0	0.0%	53%	24	24	0	0.0%	47%	10	10	0	0.0%	53%	-14
King Street / Victoria Avenue	West: Victoria Avenue	Through	AM	4	4	0	0.0%	12%	4	4	0	0.0%	8%	2	2	0	0.0%	11%	-2
King Street / Victoria Avenue	West: Victoria Avenue	Right	AM	12	12	0	0.0%	35%	22	22	0	0.0%	43%	7	7	0	0.0%	37%	-15
George Street / Victoria Avenue	South: George Street	Left	AM	129	129	0	0.0%	77%	179	179	0	0.0%	75%	179	179	0	0.0%	86%	0
George Street / Victoria Avenue	South: George Street	Through	AM	10	9	1	10.0%	6%	13	12	1	7.6%	5%	13	12	1	7.6%	6%	0
George Street / Victoria Avenue	South: George Street	Right	AM	29	29	0	0.0%	17%	46	46	0	0.0%	19%	15	15	0	0.0%	7%	-31
George Street / Victoria Avenue	East: Victoria Ave	Left	AM	18	18	0	0.0%	90%	34	34	0	0.0%	94%	10	10	0	0.0%	83%	-24
George Street / Victoria Avenue	East: Victoria Ave	Through	AM	1	1	0	0.0%	5%	1	1	0	0.0%	3%	1	1	0	0.0%	8%	0
George Street / Victoria Avenue	East: Victoria Ave	Right	AM	1	1	0	0.0%	5%	1	1	0	0.0%	3%	1	1	0	0.0%	8%	0
George Street / Victoria Avenue	North: George Street	Left	AM	1	1	0	0.0%	11%	1	1	0	0.0%	7%	1	1	0	0.0%	7%	0
George Street / Victoria Avenue	North: George Street	Through	AM	5	5	0	0.0%	56%	10	10	0	0.0%	71%	10	10	0	0.0%	71%	0
George Street / Victoria Avenue	North: George Street	Right	AM	3	3	0	0.0%	33%	3	3	0	0.0%	21%	3	3	0	0.0%	21%	0
George Street / Victoria Avenue	West: Victoria Ave	Left	AM	3	3	0	0.0%	3%	3	3	0	0.0%	2%	3	3	0	0.0%	2%	0
George Street / Victoria Avenue	West: Victoria Ave	Through	AM	8	8	0	0.0%	8%	8	8	0	0.0%	4%	8	8	0	0.0%	4%	0
George Street / Victoria Avenue	West: Victoria Ave	Right	AM	84	84	0	0.0%	88%	173	173	0	0.0%	94%	173	173	0	0.0%	94%	0
Victoria Avenue / Public School Access	South: PS Access	Left	AM	12	12	0	0.0%	12%	12	12	0	0.0%	7%	12	12	0	0.0%	7%	0
Victoria Avenue / Public School Access	South: PS Access	Right	AM	85	85	0	0.0%	88%	166	166	0	0.0%	93%	166	166	0	0.0%	93%	0
Victoria Avenue / Public School Access	East: Victoria Avenue	Left	AM	124	119	5	4.0%	86%	131	126	5	4.0%	68%	131	126	5	4.0%	68%	0
Victoria Avenue / Public School Access	East: Victoria Avenue	Through	AM	20	20	0	0.0%	14%	63	63	0	0.0%	32%	63	63	0	0.0%	32%	0
Victoria Avenue / Public School Access	West: Victoria Avenue	Through	AM	10	10	0	1.0%	83%	19	19	0	1.0%	68%	19	19	0	1.0%	68%	0
Victoria Avenue / Public School Access	West: Victoria Avenue	Right	AM	2	2	0	0.0%	17%	9	9	0	0.0%	32%	9	9	0	0.0%	32%	0
George St/Pomeroy St	South: George Street	Left	PM	95	95	0	0.0%	29%	133	133	0	0.0%	30%	133	133	0	0.0%	27%	0
George St/Pomeroy St	South: George Street	Through	PM	63	63	0	0.0%	19%	113	113	0	0.0%	25%	157	157	0	0.0%	32%	44
George St/Pomeroy St	South: George Street	Right	PM	167	167	0	0.0%	51%	200	200	0	0.0%	45%	200	200	0	0.0%	41%	0
George St/Pomeroy St	East: Pomeroy Street	Left	PM	205	205	0	0.0%	24%	240	240	0	0.0%	22%	240	240	0	0.0%	21%	0
George St/Pomeroy St	East: Pomeroy Street	Through	PM	505	502	3	0.6%	58%	636	633	3	0.5%	58%	636	633	3	0.5%	55%	0
George St/Pomeroy St	East: Pomeroy Street	Right	PM	161	161	0	0.0%	18%	215	215	0	0.0%	20%	286	286	0	0.0%	25%	71
George St/Pomeroy St	North: George Street	Left	PM	132	132	0	0.0%	44%	180	180	0	0.0%	42%	214	214	0	0.0%	38%	34
George St/Pomeroy St	North: George Street	Through	PM	90	90	0	0.0%	30%	126	126	0	0.0%	29%	168	168	0	0.0%	30%	42
George St/Pomeroy St	North: George Street	Right	PM	81	81	0	0.0%	27%	123	123	0	0.0%	29%	180	180	0	0.0%	32%	57
George St/Pomeroy St	West: Pomeroy Street	Left	PM	105	105	0	0.0%	16%	178	178	0	0.0%	21%	283	283	0	0.0%	29%	105
George St/Pomeroy St	West: Pomeroy Street	Through	PM	507	503	4	0.8%	75%	600	596	4	0.7%	70%	600	596	4	0.7%	62%	0
George St/Pomeroy St	West: Pomeroy Street	Right	PM	60	60	0	0.0%	9%	82	82	0	0.0%	10%	82	82	0	0.0%	8%	0
George Street / Conway Avenue	South: George Street	Left	PM	13	13	0	0.0%	8%	26	26	0	0.0%	8%	26	26	0	0.0%	5%	0
George Street / Conway Avenue	South: George Street	Through	PM	118	118	0	0.0%	68%	224	224	0	0.0%	67%	444	444	0	0.0%	80%	220
George Street / Conway Avenue	South: George Street	Right	PM	42	42	0	0.0%	24%	85	85	0	0.0%	25%	85	85	0	0.0%	15%	0
George Street / Conway Avenue	East: Access Road	Left	PM	21	21	0	0.0%	88%	35	35	0	0.0%	92%	35	35	0	0.0%	92%	0
George Street / Conway Avenue	East: Access Road	Through	PM	1	1	0	0.0%	4%	1	1	0	0.0%	3%	1	1	0	0.0%	3%	0
George Street / Conway Avenue	East: Access Road	Right	PM	2	2	0	0.0%	8%	2	2	0	0.0%	5%	2	2	0	0.0%	5%	0
George Street / Conway Avenue	North: George Street	Left	PM	9	9	0	0.0%	5%	9	9	0	0.0%	4%	9	9	0	0.0%	2%	0
George Street / Conway Avenue	North: George Street	Through	PM	154	154	0	0.0%	94%	244	244	0	0.0%	96%	373	373	0	0.0%	97%	129
George Street / Conway Avenue	North: George Street	Right	PM	1	1	0	0.0%	1%	1	1	0	0.0%	0%	1	1	0	0.0%	0%	0
George Street / Conway Avenue	West: Conway Avenue	Left	PM	1	1	0	0.0%	9%	1	1	0	0.0%	6%	1	1	0	0.0%	6%	0
George Street / Conway Avenue	West: Conway Avenue	Through	PM	1	1	0	0.0%	9%	1	1	0	0.0%	6%	1	1	0	0.0%	6%	0
George Street / Conway Avenue	West: Conway Avenue	Right	PM	9	9	0	0.0%	82%	15	15	0	0.0%	88%	15	15	0	0.0%	88%	0
George Street / Rothwell Avenue	East: George Street	Through	PM	1	1	0	0.0%	1%	2	2	0	0.0%	1%	1	1	0	0.0%	0%	-1
George Street / Rothwell Avenue	East: George Street	Right	PM	103	103	0	0.0%	99%	208	208	0	0.0%	99%	227	227	0	0.0%	100%	19
George Street / Rothwell Avenue	North: George Street	Left	PM	150	150	0	0.0%	99%	240	240	0	0.0%	99%	201	201	0	0.0%	83%	-39
George Street / Rothwell Avenue	North: George Street	Right	PM	2	2	0	0.0%	1%	2	2	0	0.0%	1%	42	42	0	0.0%	17%	40
George Street / Rothwell Avenue	West: Rothwell Avenue	Left	PM	1	1	0	0.0%	50%	1	1	0	0.0%	33%	1	1	0	0.0%	33%	0
George Street / Rothwell Avenue	West: Rothwell Avenue	Through	PM	1	1	0	0.0%	50%	2	2	0	0.0%	67%	2	2	0	0.0%	67%	0
King Street / Victoria Avenue	South: King Street	Left	PM	16	16	0	0.0%	89%	32	32	0	0.0%	94%	8	8	0	0.0%	25%	-24
King Street / Victoria Avenue	South: King Street	Through	PM	1	1	0	0.0%	6%	1	1	0	0.0%	3%	23	23	0	0.0%	72%	22
King Street / Victoria Avenue	South: King Street	Right	PM	1	1	0	0.0%	6%	1	1	0	0.0%	3%	1	1	0	0.0%	3%	0
King Street / Victoria Avenue	East: Access	Left	PM	1	1	0	0.0%	13%	1	1	0	0.0%	13%	1	1	0	0.0%	13%	0
King Street / Victoria Avenue	East: Access	Through	PM	6	6	0	0.0%	75%	6	6	0	0.0%	75%	6	6	0	0.0%	75%	0
King Street / Victoria Avenue	East: Access	Right	PM	1	1	0	0.0%	13%	1	1	0	0.0%	13%	1	1	0	0.0%	13%	0
King Street / Victoria Avenue	North: King Street	Left	PM	1	1	0	0.0%	7%	1	1	0	0.0%	4%	1	1	0	0.0%	4%	0
King Street / Victoria Avenue	North: King Street	Through	PM	1	1	0	0.0%	7%	1	1	0	0.0%	4%	16	16	0	0.0%	67%	15
King Street / Victoria Avenue	North: King Street	Right	PM	13	13	0	0.0%	87%	22	22	0	0.0%	92%	7	7	0	0.0%	29%	-15
King Street / Victoria Avenue	West: Victoria Avenue	Left	PM	15	15	0	0.0%	54%	30	30	0	0.0%	48%	8	8	0	0.0%	53%	-22
King Street / Victoria Avenue	West: Victoria Avenue	Through	PM	1	1	0	0.0%	4%	1	1	0	0.0%	2%	1	1	0	0.0%	7%	0
King Street / Victoria Avenue	West: Victoria Avenue	Right	PM	12	12	0	0.0%	43%	31	31	0	0.0%	50%	6	6	0	0.0%	40%	-25
George Street / Victoria Avenue	South: George Street	Left	PM	35	35	0	0.0%	41%	81	81	0	0.0%	43%	81	81	0	0.0%	57%	0
George Street / Victoria Avenue	South: George Street	Through	PM	24	24	0	0.0%	28%	49	49	0	0.0%	26%	49	49	0	0.0%	34%	0
George Street / Victoria Avenue	South: George Street	Right	PM	26	26	0	0.0%	31%	60	60	0	0.0%	32%	13	13	0	0.0%	9%	-47
George Street / Victoria Avenue	East: Victoria Ave	Left	PM	36	36	0	0.0%	88%	60	60	0	0.0%	92%	22	22	0	0.0%	81%	-38
George Street / Victoria Avenue	East: Victoria Ave	Through	PM	4	4	0	0.0%	10%	4	4	0	0.0%	6%	4	4	0	0.0%	15%	0
George Street / Victoria Avenue	East: Victoria Ave	Right	PM	1	1	0	0.0%	2%	1	1	0	0.0%	2%	1	1	0	0.0%	4%	0
George Street / Victoria Avenue	North: George Street	Left	PM	1	1	0	0.0%	3%	1	1	0	0.0%	2%	1	1	0	0.0%	2%	0
George Street / Victoria Avenue	North: George Street	Through	PM	28	28	0	0.0%	90%	47	47	0	0.0%	94%	47	47	0	0.0%	94%	0
George Street / Victoria Avenue	North: George Street	Right	PM	2	2	0	0.0%	6%	2	2	0	0.0%	4%	2	2	0	0.0%	4%	0
George Street / Victoria Avenue	West: Victoria Ave	Left	PM	1	1	0	0.0%	2%	1	1	0	0.0%	1%	1	1	0	0.0%	1%	0
George Street / Victoria Avenue	West: Victoria Ave	Through	PM	2	2	0	0.0%	3%	2	2	0	0.0%	2%	2	2	0	0.0%	2%	0
George Street / Victoria Avenue	West: Victoria Ave	Right	PM	61	61	0	0.0%	95%	107	107	0	0.0%	97%	107	107	0	0.0%	97%	0
Victoria Avenue / Public School Access	South: PS Access	Left	PM	10	10	0	0.0%	16%	10	10	0	0.0%	11%	10	10	0	0.0%	11%	0
Victoria Avenue / Public School Access	South: PS Access	Right	PM	51	51	0	0.0%	84%	85	85	0	0.0%	89%	85	85	0	0.0%	89%	0
Victoria Avenue / Public School Access	East: Victoria Avenue	Left	PM	38	36	2	5.3%	81%	47	45	2	4.2%	51%	47	45	2	4.2%	51%	0
Victoria Avenue / Public School Access	East: Victoria Avenue	Through	PM	9	9	0	0.0%	19%	46	46	0	0.0%	49%	46	46	0	0.0%	49%	0
Victoria Avenue / Public School Access	West: Victoria Avenue	Through	PM	18	18	0	0.0%	78%	30	30	0	0.0%	68%	30	30	0	0.0%	68%	0
Victoria Avenue / Public School Access	West: Victoria Avenue	Right	PM	5	5	0	0.0%	22%	14	14	0	0.0%	32%	14	14	0	0.0%	32%	0

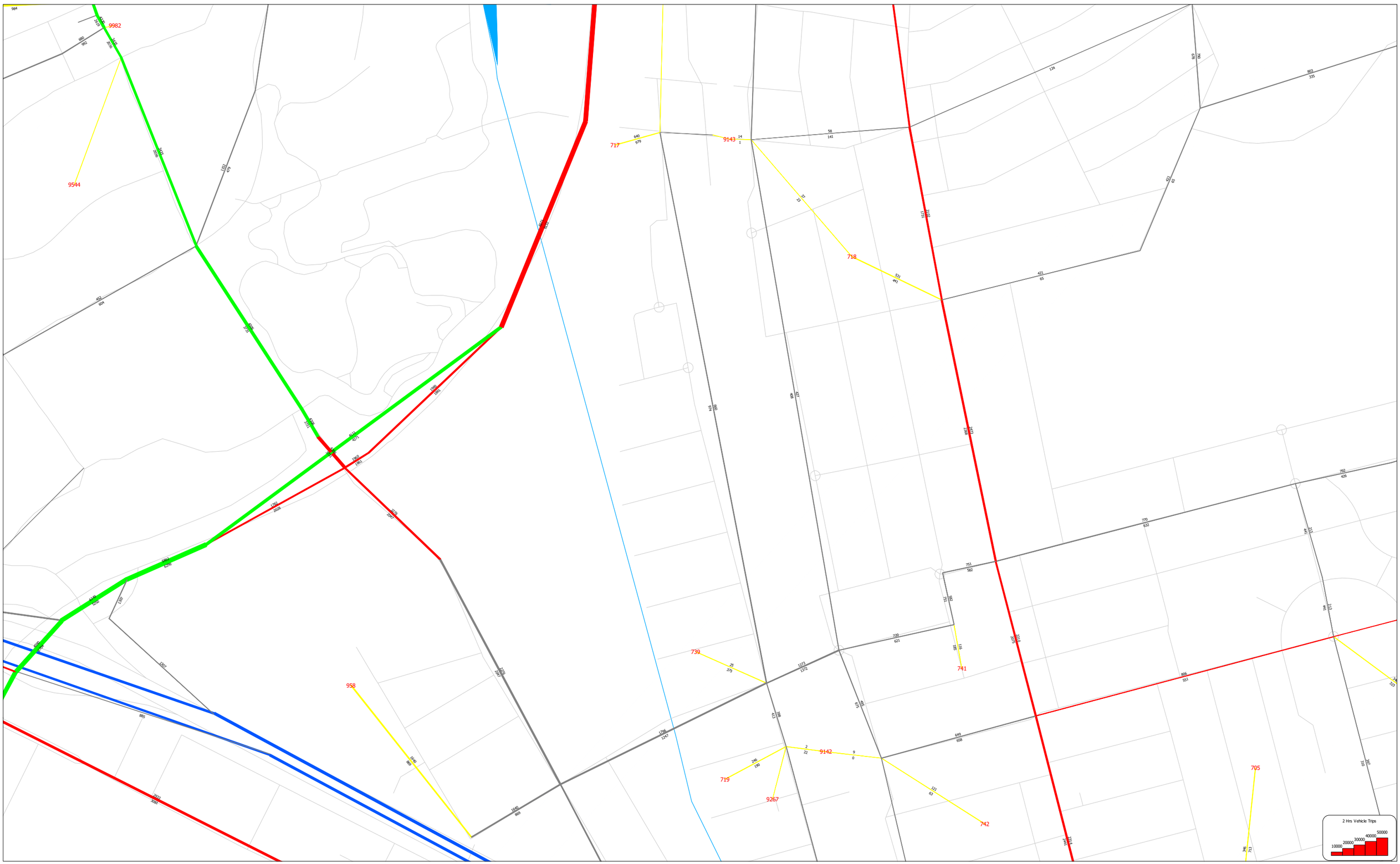
TRAFFIC VOLUMES_STFM_STD



SYDNEY GMA STRATEGIC TRAFFIC FORECASTING MODEL(STFM)
Scenario 2021: 2021_STFM_STD(TZP19STMV3.8FMMV7.1)-7-9AM(mf33)
2022-11-21 14:47

LANE (1WAY):
1
2
3
4
5

TRAFFIC VOLUMES_STFM_STD



SYDNEY GMA STRATEGIC TRAFFIC FORECASTING MODEL(STFM)
Scenario 20210: 2021_STFM_STD(TZP19STMV3.8FMMV7.1)-4-6PM(mf53)
2022-11-21 14:48

LANE (1WAY):
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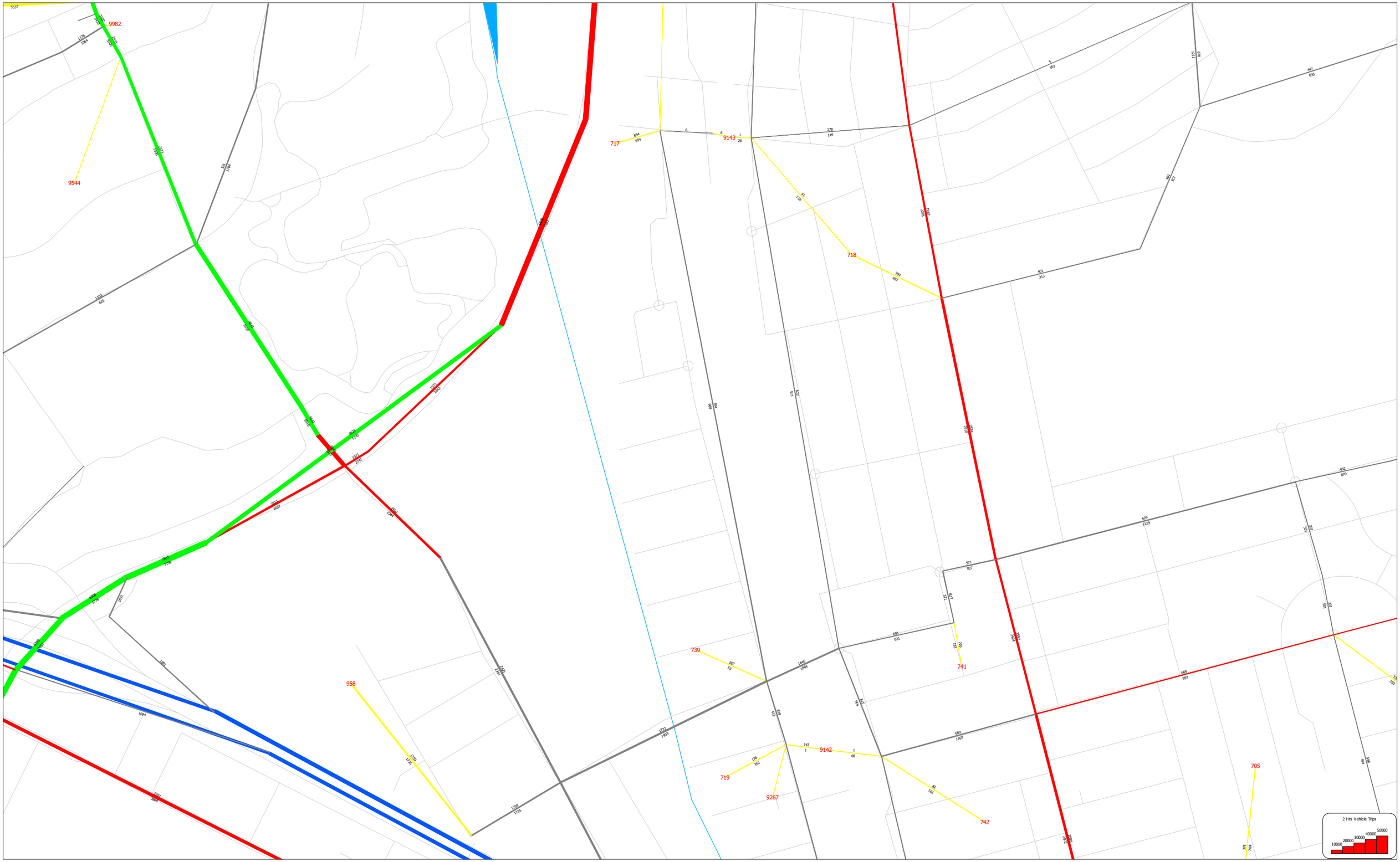
2
3
4
5

TRAFFIC VOLUMES_STFM_STD



SYDNEY GMA STRATEGIC TRAFFIC FORECASTING MODEL(STFM)
Scenario 2036: 2036_STFM_STD(TZP19STMV3.8FMMV7.1)-7-9AM(mf36)
2022-11-21 14:49

LANE (1WAY):
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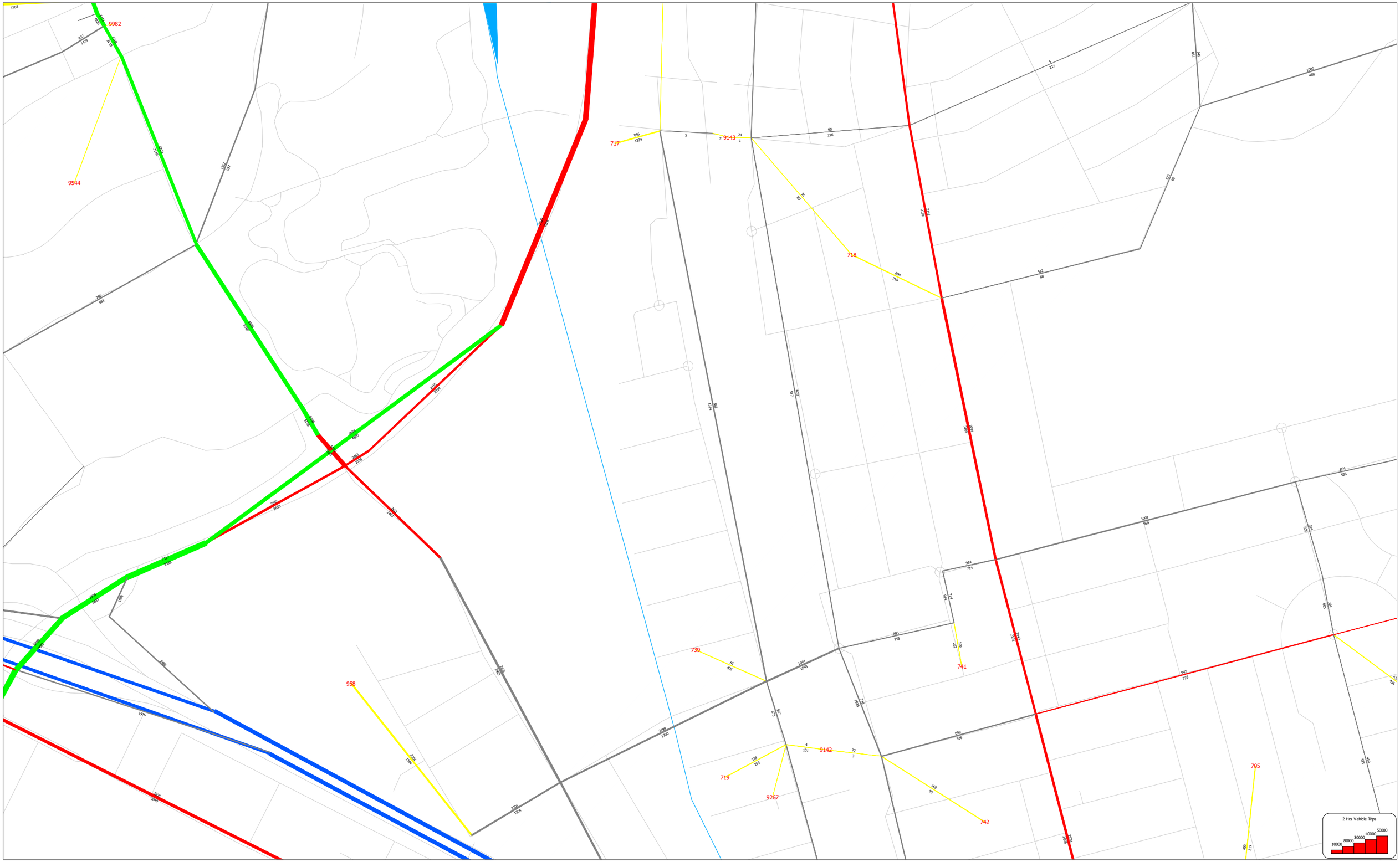
2
3
4
5

TRAFFIC VOLUMES_STFM_STD



SYDNEY GMA STRATEGIC TRAFFIC FORECASTING MODEL(STFM)
Scenario 20360: 2036_STFM_STD(TZP19STMV3.8FMMV7.1)-4-6PM(mf56)
2022-11-21 14:48

LANE (1WAY):
1
2
3
4
5

Appendix F SIDRA Outputs (Base Year, Future Reference Case and Future Development Case) – all intersections

Provided as separate attachment.