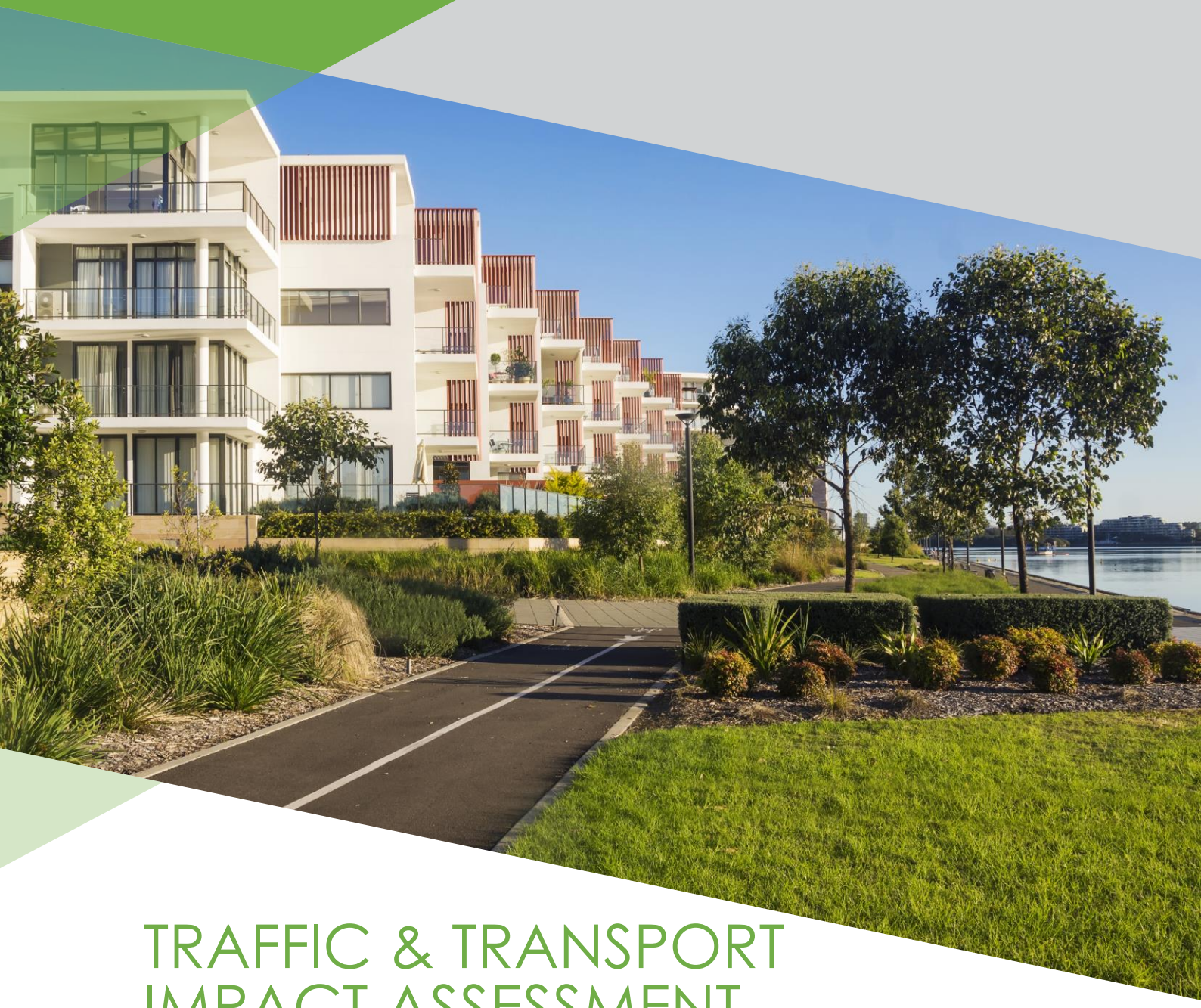
TRAFFIX
TRAFFIC AND TRANSPORT PLANNERS



TRAFFIC & TRANSPORT IMPACT ASSESSMENT

Planning Proposal
9 Albert Street & 31 O'Connell Street, North Parramatta

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TRAFFIX

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1. INTRODUCTION

TRAFFIX has been commissioned by Peterose Pty Ltd to undertake a traffic and transport impact assessment (TTIA) in support of a Planning Proposal for a mixed-use development at 9 Albert Street and 31 O'Connell Street, North Parramatta. It is proposed to vary the floor space ratio and height controls for the site under the Parramatta Local Environmental Plan (LEP) 2011.

For the purposes of the planning proposal, an indicative development concept has been formulated by DKO Architecture comprising retail, childcare, and residential components. This report assesses the traffic impacts and parking requirements arising from this scheme, which is considered to be representative of the site being developed to its full potential when incorporating the proposed planning controls.

The site is located within the City of Parramatta Council Local Government Area (LGA) and the concept scheme has been assessed under that the relevant Council controls.

This report documents the findings of our investigations and should be read in the context of the Planning Proposal Justification Report prepared separately. The development will require referral to Transport for NSW (TfNSW) under Schedule 3 Chapter 2 of the State Environmental Planning Policy (Transport and Infrastructure) 2021.

The report is structured as follows:

- Section 2: Describes the site and its location
- Section 3: Documents existing traffic conditions
- Section 4: Describes the concept development
- Section 5: Assesses the parking requirements
- Section 6: Assesses traffic impacts
- Section 7: Discusses access and internal design aspects
- Section 8: Presents the overall study conclusions

2. LOCATION AND SITE

The subject site is known as 9 Albert Street and 31 O'Connell Street, North Parramatta (Lot 1 of DP 1143431), and is located at the south-western corner of the intersection of Albert Street and O'Connell Street. It is also located approximately 1-kilometre north of the Parramatta Central Business District and approximately 340 metres northwest of the future Fennell Street Light Rail Stop.

The site has a total site area of 8,921m^2 and historically accommodated a community facility development. It is bound to the east by O'Connell Street and to the north by Albert Street for approximately 143 metres and 78 metres, respectively. It is bound to the west and south by an aged care facility and a crisis accommodation development.

Vehicular access to 9 Albert Street is currently provided via Albert Street along the northern boundary of the site, and vehicular access to 31 O'Connell Street is via O'Connell Street along the eastern boundary of the site.

A Location Plan is presented in **Figure 1**, with a Site Plan presented in **Figure 2** which provides an appreciation of the general character of roads and other key attributes in proximity to the site.

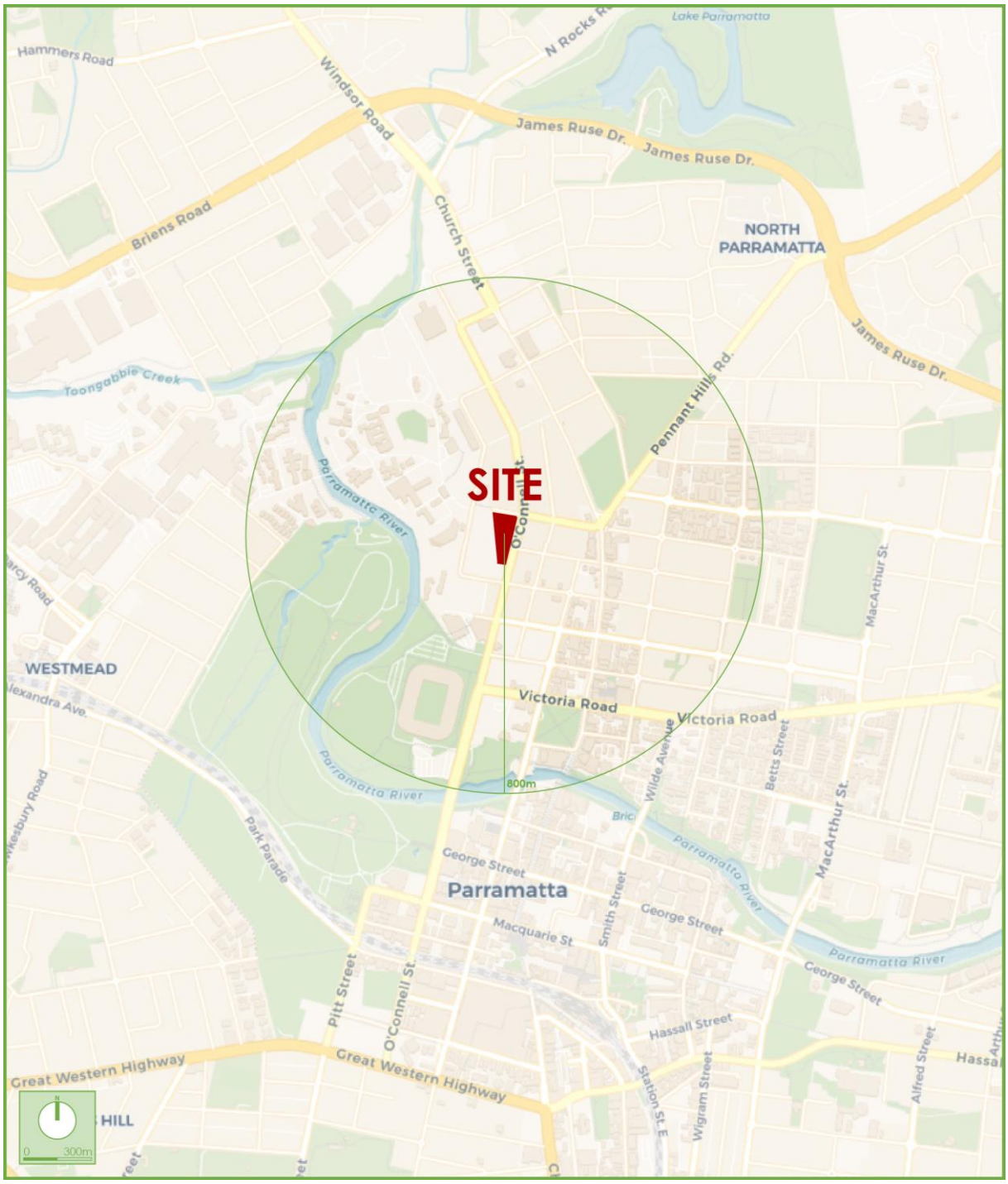


Figure 1: Location Plan

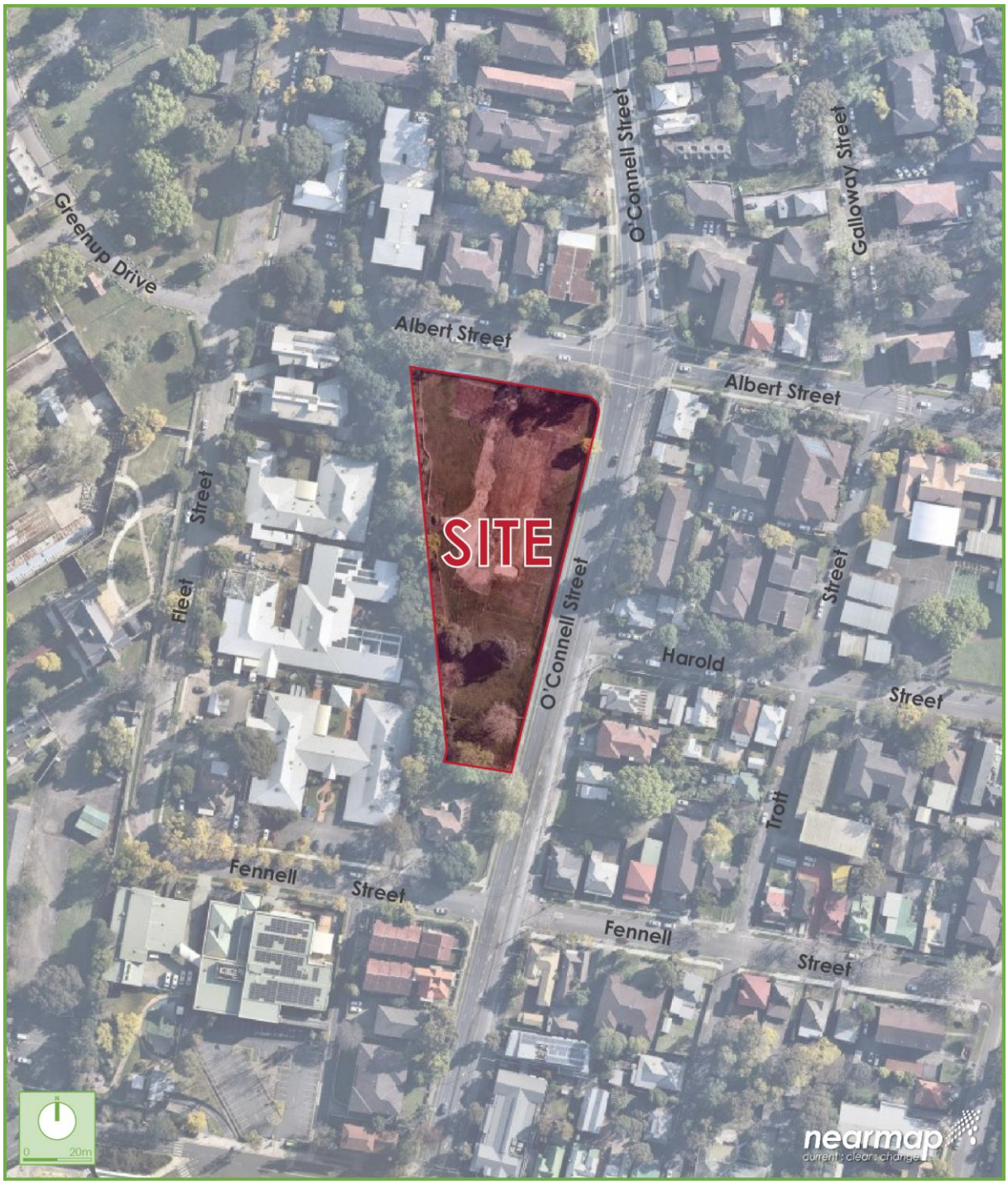


Figure 2: Site Plan

3. EXISTING TRAFFIC CONDITIONS

3.1 Road Network

The road hierarchy in the vicinity of the site is shown in **Figure 3** with the following roads of particular interest:

- Church Street: part of a TfNSW Main Road (MR 184), Church Street generally traverses north to south between North Rocks Road in the north and Darcy Street in the south. Within the vicinity of the site, Church Street accommodates a single traffic lane in either direction. The Parramatta Light Rail runs along Church Street between Factory Street in the north and Macquarie Street in the south. Kerbside parking is not permitted along either side of the road.
- O'Connell Street: part of a TfNSW Secondary Road (2066), O'Connell Street generally traverses north to south between Board Street in the north and the Great Western Highway in the south. Within the vicinity of the site, O'Connell Street is subject to a 60km/h speed limit and carries two (2) lanes of traffic in each direction within a divided carriageway. Kerbside parking is not permitted along either side of the road.
- Pennant Hills Road: part of an Unclassified Regional Road (7273) (between James Ruse Drive and Church Street), Pennant Hills Road generally traverses east to west between the Pacific Highway in the east and Church Street in the west. Within the vicinity of the site, Pennant Hills Road is subject to a 60km/h speed limit and carries two (2) lanes of traffic in each direction within an undivided carriageway. The kerbside lanes are subject to "Clearway" restrictions between 6:00am - 10:00am and 3:00pm – 7:00pm Monday to Friday and kerbside parking is permitted along sections of this road outside of these restrictions.

- Albert Street: part of an Unclassified Regional Road (7273) (between Church Street and O'Connell Street) and a local road west of O'Connell Street, Albert Street generally traverses east to west between Buller Street in the east and terminates 130m west of O'Connell Street in the west. It generally accommodates a single lane of traffic in either direction and is subject to a 50km/ speed limit. "School Zone" restrictions are applicable east of O'Connell Street between 8:00-9:30am and 2:30-4:00pm on school days. Kerbside parking is permitted along either side of the road west of O'Connell Street, subject to timed restrictions.
- Harold Street: a local road that generally traverses east to west between Brickfield Street in the east and O'Connell Street in the west. Harold Street carries a single lane of traffic in either direction and is subject to a 50km/h speed limit. Kerbside parking is permitted along either side of the road, subject to timed restrictions.

Figure 3: Road Hierarchy

3.2 Key Intersections

The key intersections in the vicinity of the site are shown below and provide an understanding of the existing road geometry and alignment in the locality.

3.2.1 Intersection of Albert Street, Church Street and Pennant Hills Road

Figure 4: Intersection of Albert Street, Church Street and Pennant Hills Road

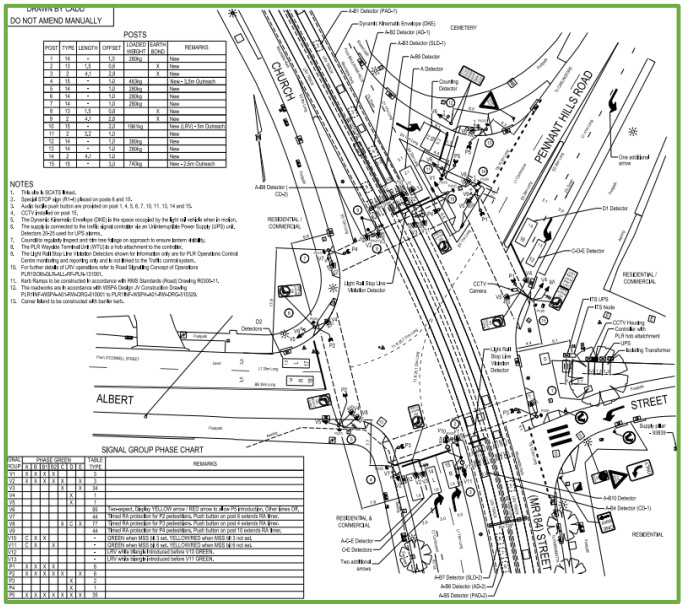


Figure 5: Intersection of Albert Street, Church Street and Pennant Hills Road (Ultimate Layout)

It can be seen from **Figures 4** and **5** that the intersection of Albert Street, Church Street and Pennant Hills Road is a four-legged signalised intersection. All legs of the intersection provide signalised pedestrian crossings. The main attributes of each approach in the ultimate layout are outlined below.

- Church Street (north and south legs)
  - The southbound approach provides a single through lane from which vehicles can use a slip lane to turn left onto Pennant Hills Road. Right turn movements are banned for this approach.
  - The northbound approach provides a shared through/left turn lane and two (2) dedicated short right turn lanes.
  - Church Street accommodates the route for the Parramatta Light Rail. A northbound light rail line and a southbound light rail line are accommodated in the centre of the roadway.
- Pennant Hills Road (east leg):
  - The westbound approach provides a dedicated left turn lane and a through lane. Right turn movements are banned for this approach
- Albert Street (west leg):
  - The eastbound approach provides two (2) through lanes. Right turn movements are banned for this approach. Left turns are permitted from the kerbside lane.

3.2.2 Intersection of Albert Street and O'Connell Street

Figure 6: Intersection of Albert Street and O'Connell Street

It can be seen from **Figure 6** that the intersection of Albert Street and O'Connell Street is a four-legged signalised intersection. All legs of the intersection provide signalised pedestrian crossings. The main attributes of each approach are outlined below.

- O'Connell Street (north and south legs)
  - The southbound approach provides two (2) through lanes. Right turn movements are banned for this approach.
  - The northbound approach provides a dedicated right turn lane and two (2) through lanes.
- Albert Street (east and west legs):
  - The eastbound approach provides a single through lane from which left and right turns are permitted.
  - The westbound approach provides a dedicated left turn lane and a single through/right turn lane.

3.3 Public Transport

The existing public transport services that operate in the locality are presented in **Figure 7** and are summarised as follows:

3.3.1 Bus Services

The subject site is within optimal walking distance (400 metres) of several bus services. These services and destinations are summarised in **Table 1** below:

Table 1 – Bus Routes and Services

No.	Route	No.	Route
546	Parramatta to Epping	606	Winston Hills to Parramatta
552	Oatlands to Parramatta	706	Parramatta to Blacktown
549	Parramatta to Epping	550	Parramatta to Macquarie Park
600	Hornsby to Parramatta	625	Pennant Hills to Parramatta
601	Rouse Hill Station to Parramatta	609	Parramatta to North Parramatta
603	Rouse Hill Station to Parramatta	900	Parramatta Free Shuttle
604	Dural to Parramatta		

3.3.2 Future Light Rail Services

In addition, three (3) stops along the future Parramatta Light Rail are located within 400 metres of the subject site. These stops are outlined below:

- Ngara Light Rail Stop;
- Benaud Oval Stop; and
- Fennell Street Stop.

Stage 1 of the Parramatta Light Rail is currently under construction and is anticipated to be opened in 2024, well before the subject site is fully developed. This will provide a future connection between Westmead and Carlingford via the Parramatta CBD.

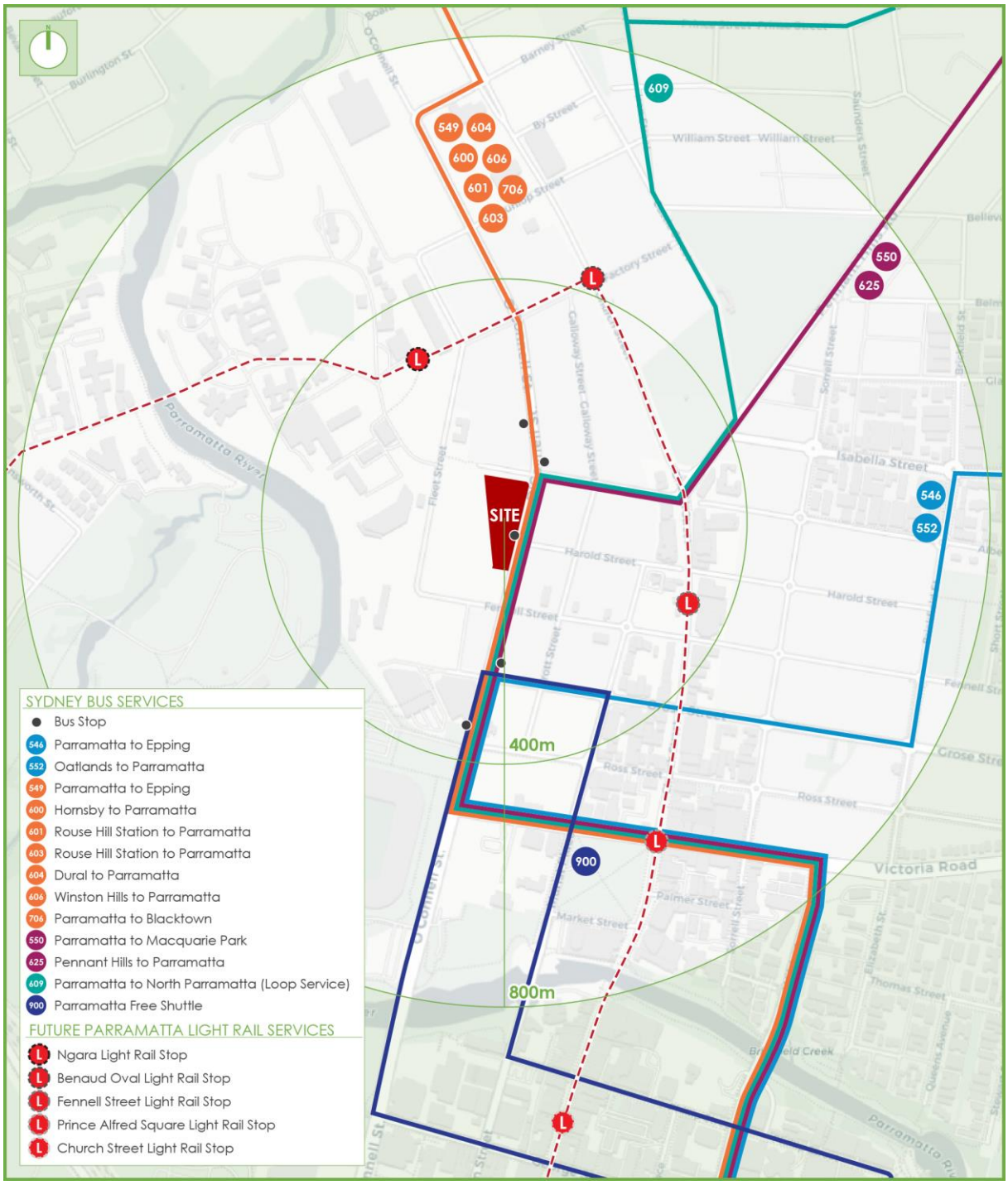


Figure 7: Public Transport

3.4 Walking and Cycling

3.4.1 Walking Facilities

The site is ideally placed with several pedestrian facilities available in the locality. There are existing pedestrian footpaths surrounding the site, with footpaths provided along both sides of O'Connell Street and the northern side of Albert Street adjacent to the site. The signalised intersection of Albert Street and O'Connell Street provides signalised pedestrian crossings on all four (4) legs.

3.4.2 Cycling Infrastructure

The site is also located within proximity to separated bicycle lanes, off-road shared paths and bicycle friendly roads available throughout the area. These cycleways can be used concurrently with other bicycle routes to provide connections to various areas around Parramatta. The existing cycling facilities are presented in **Figure 8**, with the cycleways summarised as follows:

- On-Road Cycle Routes: O'Connell Street north of Albert Street, Grose Street and Albert Street east of O'Connell Street accommodate on-street cycling routes. These routes provide access towards the town centres within North Parramatta and Northmead.
- Off-Road Cycle Routes: O'Connell Street south of Albert Street and the Parramatta River foreshore accommodates off-road cycling routes. These routes provide access to the Parramatta CBD and Westmead.
- Regional Cycle Routes: O'Connell Street in the vicinity of the site and the Parramatta River foreshore accommodate regional cycle routes. O'Connell Street south of Albert Street and the Parramatta River cycle route are classified as off-road cycle routes and are shared paths.

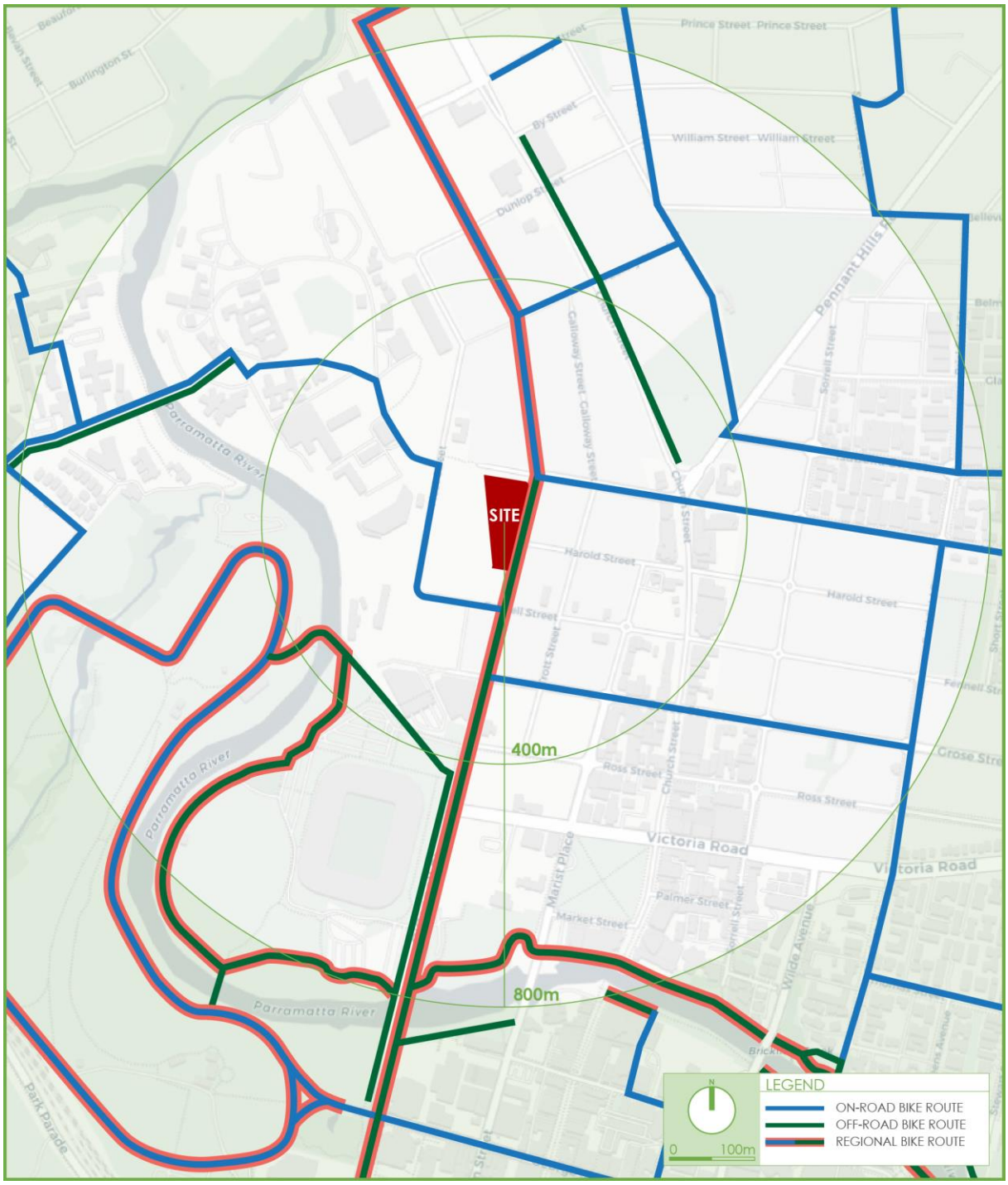


Figure 8: Existing Cycle Infrastructure

3.4.3 Car Share Services

The site is also within 400 metres of two (2) GoGet car pods located in the North Parramatta area. This scheme allows share cars to be rented for short-term trips. The existing GoGet car pods in the locality are presented in **Figure 9** below. Other car share providers are also available within walking distance of the site.

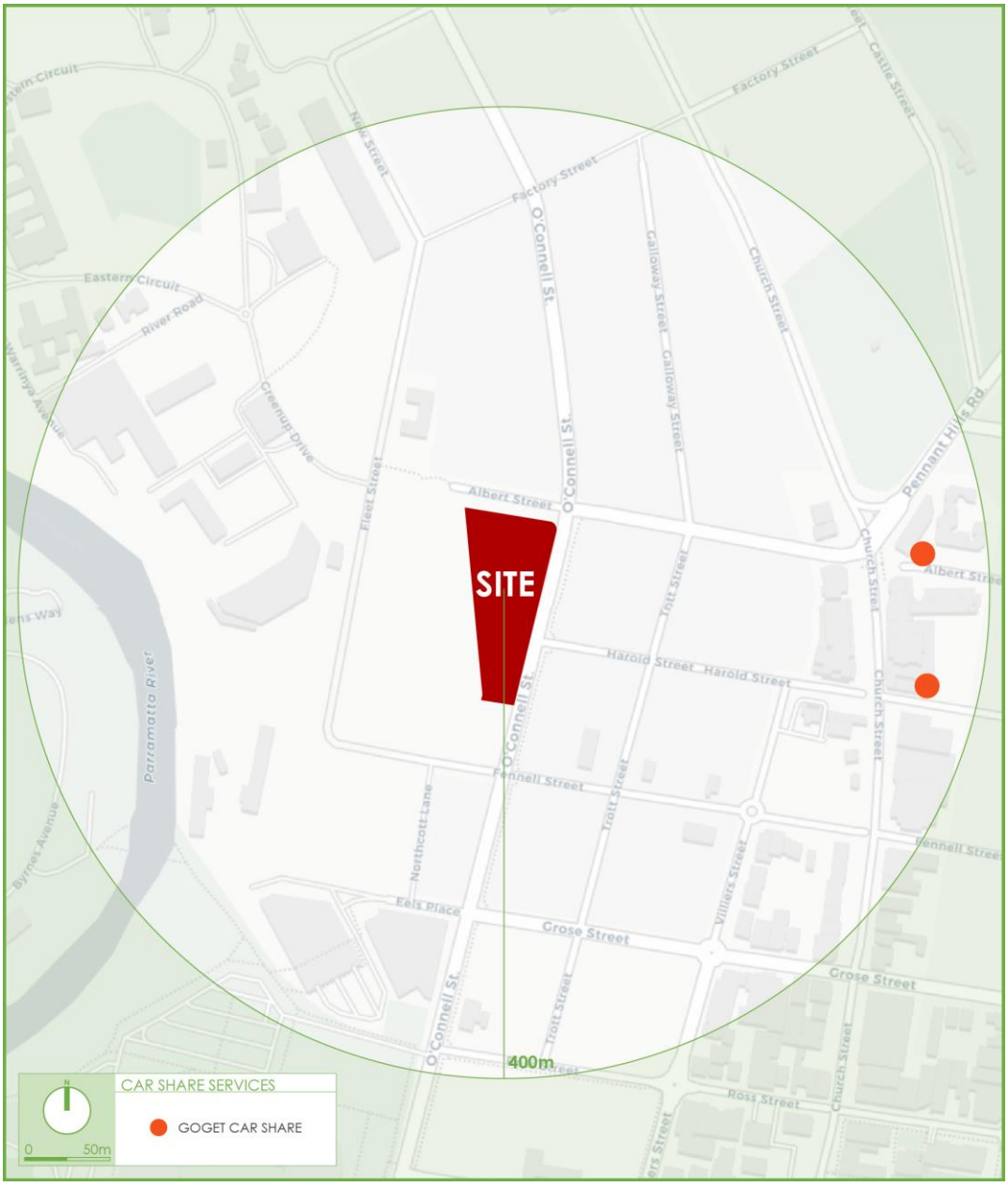


Figure 9: GoGet Pods

3.5 Existing Travel Behaviours

To analyse the existing travel mode behaviours of the locality, 2016 ABS Census data was obtained for the 'North Parramatta' Statistical Area (SA2). This is summarised in **Table 2** below for residents and in **Table 3** for staff that work within North Parramatta.

Table 2 – Resident Travel Mode Behaviours

Travel Mode	Percentage (%)
Train	23.3%
Bus	7.5%
Ferry	0%
Tram	0%
Taxi	0.4%
Car, as driver	50.1%
Car, as passenger	4.0%
Truck	0.5%
Motorbike/ Scooter	0.5%
Bicycle	0.9%
Walked Only	9.4%
Other mode	0.5%
Worked At Home	2.9%

The Journey to Work data shows that 50.1% of residents from the North Parramatta Statistical Area (SA2) travel to work by car as a driver, 23.3% of residents travel to work by train and 7.5% of residents travel to work by bus. There is a moderate uptake in active transport consisting of 10.3% of residents, this includes 0.9% cyclists and 9.4% walking. It is expected that once the Parramatta Light Rail is operational, there will be move away from private vehicle trips to/from the site.

Table 3 – Staff Travel Mode Behaviours

Travel Mode	Percentage (%)
Train	8.9%
Bus	4.0%
Ferry	0%
Tram	0%
Taxi	0.2%
Car, as driver	73.2%
Car, as passenger	4.7%
Truck	0.4%
Motorbike/ Scooter	0.3%
Bicycle	0.3%
Walked Only	4.0%
Other mode	0.4%
Worked At Home	3.5%

The Journey to Work data shows that 73.2% of staff working in the North Parramatta Statistical Area (SA2) travel to work by car as a driver, 8.9% of staff travel to work by train and 4% of staff travel to work by bus. In addition, 4.3% of staff travel to work by active transport, this consists of 0.3% cyclists and 4.0% walking only. It is expected that once the Parramatta Light Rail is operational, there will be move away from private vehicle trips to/from the site.

4. DESCRIPTION OF CONCEPT DEVELOPMENT

A detailed description of the concept development adopted for the purpose of assessing the planning Proposal impacts is provided in the Planning Proposal Justification Report prepared separately. In summary, the concept development is a mixed-use development comprising of the following components:

- Construction of a mixed-use development comprising:
  - 780m^2 of retail GFA;
  - A childcare centre accommodating for 120 children; and
  - 370 residential apartments made up of the following:
    - 92 x one-bedroom apartments;
    - 227 x two-bedroom apartments;
    - 50 x three-bedroom apartments; and
    - 1 x four-bedroom apartment.
- Two (2) basement levels accommodating approximately 440 parking spaces.

The parking and traffic impacts arising from the concept development are discussed in **Section 5** and **Section 6**. Reference should be made to the Urban Design Report submitted separately to the Council/Department of Planning and Environment which is presented in **Appendix A**.

It is emphasised that further analysis will be provided at development application stage, based on a confirmed development yield.

5. PARKING REQUIREMENTS

5.1 Car Parking

The subject site falls within the boundaries of the City of Parramatta LGA and is located within 800m of the future Fennell Street Light Rail Stop. The State Environmental Planning Policy No 65 (SEPP 65) states that an application or the carrying out of development to which this policy applies satisfies the following design criteria, the consent authority must not refuse the application because of those matters:

> *(a) If the car parking for the building will be equal to, or greater than, the recommended minimum amount of car parking specified in Part 3J of the Apartment Design Guide.*

Objective 3J-1 of the Apartment Design Guide specifies that for developments on sites that are within 800 metres of a light rail stop in the Sydney Metropolitan area, the minimum car parking requirement for residents and visitors is set out in the TfNSW Guide to Traffic Generating Developments (TfNSW Guide), or the car parking requirement prescribed by the relevant council, whichever is less. It is noted that lesser rate of the two is the TfNSW Guide rates for residential flat buildings. As such, the TfNSW Guide rates have been adopted for the residential components of the site. This is consistent with Council's advice regarding parking.

In relation to the other land uses of the concept development, the Parramatta Development Control Plan 2023 is applicable for the site.

The minimum required parking provisions in accordance with the above are summarised in **Table 4** below.

Table 4 – Parking Rates and Provision

Type	Area / Units	Minimum Parking Rates	Minimum Spaces Required	Spaces Provided
Retail				
Retail	780m²	1 space per 30m² GFA	26*	0
		Sub-Total	**26***	**0**
Childcare				
Childcare centres	120 children	1 space for every 4 children in attendance	30	30
		Sub-Total	**30**	**30**
Residential				
One Bedroom	92	0.6 spaces per dwelling	331	336
Two Bedrooms	227	0.9 spaces per dwelling		
Three/Four Bedrooms	51	1.4 spaces per dwelling		
Residential Visitor	370	1 space per 5 dwellings	74	74
		Sub-Total	**405**	**410**
		Total	**435**	**440**

* 40% of residential visitor parking (30 spaces) to be shared with retail as per Council advice.

It is evident from Table 4 that the concept development is required to provide a minimum of 435 parking spaces under the SEPP and DCP requirements, noting that 30 residential visitor spaces are to be shared with the retail component.

The concept development currently proposes 440 car parking spaces over two (2) levels of basement car parking. It is concluded that the site is sufficiently large enough to accommodate the required parking provision for any future development permissible under the Planning Proposal.

5.2 Accessible Parking

Council's DCP specifies that for a residential development with more than 20 dwellings, 10% of the dwellings are required to be adaptable. The Building Code of Australia requires that each adaptable dwelling is provided with an adaptable parking space. This results in a requirement for 37 residential accessible parking spaces. The BCA does not specify a minimum rate for accessible parking for residential visitor parking.

For the retail use within the site, the BCA requirements stipulate 1 accessible parking space for every 50 car parking spaces or part thereof. The retail accessible parking provision will be further developed at a future DA stage.

In relation to the childcare use on site, the BCA requirements stipulate 1 space for every 50 carparking spaces or part thereof. The childcare accessible parking provision will be further developed at a future DA stage.

It is concluded that the site is sufficiently large enough to accommodate the required accessible parking provision for any future development permissible under the Planning Proposal.

5.3 Refuse Collection and Servicing

Council's DCP does not provide loading bay requirements for retail, childcare, or residential developments, and references the TfNSW Guide to Traffic Generating Developments (TfNSW Guide). However, service bays requirements discussed in TfNSW Guide are based on City of Sydney's surveys undertaken in 1972. Hence, we refer to the City of Sydney DCP 2012 Schedule 7, which states the following regarding the parking provision for service vehicles within a mixed-use development:

> *"The total number of service vehicle spaces for mixed-use developments are to be calculated on a pro-rata basis of spaces required for the relative proportions of different uses within the building".*

In this regard, the service vehicle requirement for different components is calculated as outlined below:

5.3.1 Retail Component

The City of Sydney DCP Schedule 7, states the following rates for shops and shopping centres:

- 1 space per 350m^2, or part thereof, up to 2,000m^2; then
- 1 space per 8,000 m^2 GFA thereafter.

Application of the above rates to the proposed 780m^2 of retail GFA, results in the minimum requirement for three (3) service vehicle spaces.

5.3.2 Childcare Component

The childcare component is considered to have minor servicing requirements and can be undertaken with light vehicles in a childcare parking space outside of peak drop-off and pick-up periods.

5.3.3 Residential Component

The City of Sydney DCP Schedule 7, states the following rates for the residential buildings:

- 1 space for the first 50 dwellings or serviced apartments; plus
- 0.5 spaces for every 50 dwellings/serviced apartments or part thereafter.

Application of the above rates to the proposed 370 residential dwellings, results in the minimum requirement for five (5) service vehicle spaces.

5.3.4 Overall Service Vehicle Requirements

In summary, the minimum service vehicle parking requirement for the mixed-use development is outlined in **Table 5** below.

Table 5 – Overall Service Vehicle Requirement

Type	GFA/ No of Units[1]	Service Bay Rate	Requirement
Retail (shops)	780m²	1 space per 350m² GFA, or part thereof, for the first 2,000m²; then 1 space per 8,000m² GFA Thereafter.	3
Residential	370	1 space for the first 50 dwellings or serviced apartments; plus 0.5 spaces for every 50 dwellings/serviced apartments of part thereafter	5
		Total	**8**

[1]*Yeilds are indicative and are subject to change at a later DA stage.*

The above requirement assumes independent provision for each land use component (a cumulative assessment) and therefore takes no account of a 'managed approach', with shared loading arrangements subject to a loading dock management plan. It also does not reflect the likely operational requirements of the proposed uses.

As such, it is concluded that the site is sufficiently large enough to accommodate sufficient loading/servicing spaces (in conjunction with a loading dock management plan) for any future development permissible under the Planning Proposal.

5.4 Bicycle Parking

Council's DCP specifies the following rates for bicycle parking:

- Retail developments: 1 space per 250m² GFA for employees.
  1 space per 500m² of GFA for visitors.
- Childcare: 0.2 spaces per parking space.
- Residential flat developments: 1 space per dwelling for residents.
  1 space per 10 dwellings for visitors.

Accordingly, the bicycle parking required under the DCP is a total of 418 parking spaces.

It is concluded that the site is sufficiently large enough to accommodate the required bicycle parking provision for any future development permissible under the Planning Proposal.

5.5 Motorcycle Parking

Council's DCP does specify a minimum motorcycle parking rate in relation to the uses contained within the concept development. Accordingly, motorcycle parking will be addressed at a future DA stage.

5.6 Car Wash Bay

The DCP does not specify a minimum requirement for car wash bays, however, it states that a car wash bay may also be a visitor space. This provision can be addressed at a future DA stage.

6. TRAFFIC AND TRANSPORT IMPACTS

6.1 Development Trip Generation

The concept development includes retail, childcare, and residential components and would be classified as a mixed-use development. As such, each use has been assessed individually to determine the combined traffic generation of the concept development in accordance with the requirements of the TfNSW Guideline to Traffic Generating Developments 2002 (TfNSW Guide). The result of this assessment is summarised below.

6.1.1 Retail Component

The TfNSW Guide specifies the following trip rates for speciality retail shops that are not primary attractors to the centre. Whilst the Guide does not provide an AM trip rate, it is estimated to be 30% of the PM rate, representing staff arrivals:

- 1.4 vehicle trips per 100m^2 GLFA during the AM peak period;
- 4.6 vehicle trips per 100m^2 GLFA during the PM peak period; and
- 10.7 vehicle trips per 100m^2 GLFA during the Weekend peak period.

Based on the surveyed rates outlined above, the 585m^2 of retail GLFA (75% of GFA) the following trip generation results:

- 8 vehicle trips per hour during the AM peak (8 in, 0 out);
- 27 vehicle trips per hour during the PM peak (14 in, 13 out); and
- 63 vehicle trips per hour during the Weekend peak (32 in, 31 out).

6.1.2 Childcare Component

The TfNSW Guide provides traffic generation rates for the childcare centre (long-day care) at a recommended rate of 0.8 and 0.7 vehicle trips per child during the morning and evening peak periods, respectively. Application of these rates to the proposed 120 children and adopting an 50/50 directional split, results in the following traffic generation:

- 96 vehicle trips per hour during the AM peak (48 in, 48 out); and

- 84 vehicle trips per hour during the PM peak (42 in, 42 out).

Furthermore, based on TfNSW Guidelines it is noted that trips to childcare centres are typically 'linked trips' whereby a driver already accounted for on the network (travelling to a destination such as work or a school for an older sibling) will simply divert to the centre either to drop-off or pick-up a child. It would also be expected that a portion of enrolments live within the 370 residential dwellings within the development. As such, a 10% reduction is adopted for the above trips, resulting in the following:

- 86 vehicle trips per hour during the AM peak (43 in, 43 out); and
- 76 vehicle trips per hour during the PM peak (38 in, 38 out).

6.1.3 Residential Component

The TfNSW Technical Direction (TDT) 2013/04a provides traffic generation rates for high density residential flat buildings. It is noted that the surveys included a residential site in Parramatta (Site 5 of survey) and this data will be utilised for the purpose of this assessment. The traffic generation rates for the Parramatta site are as follows:

- 0.27 vehicle trips per unit during the AM peak period;
- 0.12 vehicle trips per unit during the PM peak period; and
- 0.22 vehicle trips per unit during the Weekend peak period.

Application of the above trip rates to the proposed 370 residential units, and adopting an 80/20 directional split, results in the following traffic generation:

- 100 vehicle trips per hour during the AM peak period (20 in, 80 out);
- 44 vehicle trips per hour during the PM peak period (35 in, 9 out); and
- 81 vehicle trips per hour during the Weekend peak (16 in, 65 out).

6.1.4 Combined Generation

The combined generation of the mixed-use development can be summarised as follows:

Weekday

- 204 vehicle trips per hour during the AM peak period (76 in, 128 out); and
- 155 vehicle trips per hour during the PM peak period (91 in, 64 out).

Weekend

- 144 vehicle trips per hour during the Weekend peak (48 in, 96 out).

6.2 Trip Distribution

The Albert Street vehicular access is restricted to left-in and right-out movements. Accordingly, the above combined vehicle trips were distributed at the following key intersections, taking into consideration turn restrictions at each intersection:

Departures

- 33% of vehicles depart towards the north along O'Connell Street;
- 33% of vehicles depart towards the east along Albert Street. These vehicles will continue east onto Pennant Hills Road; and
- 33% of vehicles depart towards the south along O'Connell Street.

Arrivals

- 33% of vehicles arrive from the south along O'Connell Street;
- 67% of vehicles arrive from the east along Albert Street. 33% of these vehicles arrived via Pennant Hills Road.

6.3 Base Traffic Volumes

It should be noted that the Parramatta Light Rail is still under construction at the time of preparing this report, and as such, in order to undertake SIDRA Modelling, the following traffic volume data sources were utilised:

- The *Parramatta Light Rail Operational Traffic and Transport Technical Assessment Report (2017)* prepared by GTA Consultants. The 2026 post construction intersection volumes were utilised for the weekday base case, noting they also included forecasted light rail movements. The forecasted future traffic demands were reviewed by a multi-agency working group and endorsed by the Greater Sydney Commission.
- Intersection vehicle counts undertaken on Saturday 26 November 2022 were utilised for the weekend base case. It is noted that the GTA report did not considered weekend volumes.

6.4 Scenarios

In order to assess the potential traffic impacts of a proposed development, the following scenarios were identified:

- 2026 Weekday Base Case;
- 2026 Weekday Base Case + Development;
- 2022 Weekend Base Case; and
- 2022 Weekend Base Case + Development.

6.5 SIDRA Intersection Analysis

The surveys were analysed using the SIDRA Intersection 9.1 computer program to determine their performance characteristics under existing traffic conditions. The SIDRA model produces a range of outputs, the most useful of which are the Degree of Saturation (DoS) and Average Vehicle Delay per vehicle (AVD). The AVD is in turn related to a level of service (LoS) criteria. These performance measures can be interpreted using the following explanations:

DoS the DoS is a measure of the operational performance of individual intersections. As both queue length and delay increase rapidly as DoS approaches 1, it is usual to attempt to keep DoS to less than 0.9. When DoS exceeds 0.9 residual queues can be anticipated, as occurs at many major intersections throughout the metropolitan area during peak periods. In this regard, a practical limit at 1.1 can be assumed. For intersections controlled by roundabout or give way / stop control, satisfactory intersection operation is generally indicated by a DoS of 0.8 or less.

AVD the AVD for individual intersections provides a measure of the operational performance of an intersection. In general, levels of acceptability of AVD for individual intersections depend on the time of day (motorists generally accept higher delays during peak commuter periods) and the road system being modelled (motorists are more likely to accept longer delays on side streets than on the main road system).

LoS this is a comparative measure which provides an indication of the operating performance of an intersection as shown in **Table 6**.

Table 6 – Intersection Performance Indicators (TfNSW)

Level of Service (LoS)	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	less than 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 and accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode	At capacity and requires other control mode
F	More than 70	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires other control mode or major treatment.

A summary of the modelled results is provided in **Table 7** and **Table 8** for the 2026 weekday and 2022 weekend scenarios, respectively. Reference should also be made to the SIDRA outputs provided in **Appendix B** which provide detailed results for each movement.

Table 7 – Intersection Performance for 2026 Weekday Scenario

Intersection	Control Type	Scenario	Period	Degree of Saturation (DoS)	Intersection Delay	Level of Service
Albert Street and O'Connell Street	Signalised	2026 Base	AM	0.516	21.0	B
			PM	0.630	22.5	B
		2026 Base + Development	AM	0.569	24.2	B
			PM	0.638	24.2	B
Albert Street, Church Street and Pennant Hills Road	Signalised	2026 Base	AM	0.716	23.1	B
			PM	0.842	23.3	B
		2026 Base + Development	AM	0.733	23.2	B
			PM	0.855	21.7	B

Table 8 – Intersection Performance for 2022 Weekend Scenario

Intersection	Control Type	Scenario	Period	Degree of Saturation (DoS)	Intersection Delay	Level of Service
Albert Street and O'Connell Street	Signalised	2022 Base	Peak	0.497	19.6	B
		2022 Base + Development		0.498	21.5	B
Albert Street, Church Street and Pennant Hills Road	Signalised	2022 Base	Peak	0.368	18.9	B
		2022 Base + Development		0.388	19.3	B

6.5.1 2026 Weekday Base Case + Development Performance

It can be seen from Table 7 that the Albert Street and O'Connell Street intersection experiences no reduction in Level of Service (LoS) as a result of the proposed concept development. The AM and PM peak periods see a minor increase in average delay in both peaks.

The Albert Street, Church Street and Pennant Hills Road intersection will continue to operate at a LoS 'B' during both peak periods, with minimal changes to intersection delay. This is considered acceptable, with both intersections operating good with acceptable delays and spare capacity, hence no external improvements are required to support the proposed concept development.

6.5.2 2022 Weekend Base Case + Development Performance

It can be seen from Table 8 that the Albert Street and O'Connell Street intersection experiences no reduction in LoS as a result of the proposed concept development. The peak period will experience a minor increase in average delay of 1.9 seconds.

The Albert Street, Church Street and Pennant Hills Road intersection will continue to operate at a LoS 'B' during the weekend peak period. The peak period will experience a minor increase in average delay of 0.4 seconds. Again, this is considered acceptable, with both intersections operating good with acceptable delays and spare capacity, hence no external improvements are required to support the proposed concept development.

6.5.3 Signal Phasing

In light of the above, this SIDRA assessment and associated outputs are considered conservative and a worse case snapshot of actual conditions occurring at the sites, given that these intersections are 'SCATS' linked, thus are capable of 'live' signal adjustments to further optimise traffic flows along O'Connell Street and Church Street. Accordingly, no external road upgrades or changes to signal phasing are required to support the proposed development.

6.6 Sustainable Transport

The Parramatta City Council Development Control Plan (DCP) 2011; Part 3.6.1 Sustainable Transport, outlines the strategic goal of increasing sustainable transport. The encouragement of these alternative modes of transport will assist in reducing private vehicle trips, thus decreasing congestion, time, money, and environmental impacts. Due to this, the aim of the proposed development is to encourage and support the existing and future sustainable transport services available within the vicinity of the site. This can be achieved by providing the residents/workers of the proposed developments car share parking, bicycle parking, end of trip facilities and travel plans.

6.6.1 Green Travel Plan

In accordance with the DCP 2011 Part 3.6.1 (P.1), a Green Travel Plan (GTP) will be prepared for new developments, since the proposed development is within 800 meters of a railway station or 400 meters of a bus stop with a regular service frequency. This GTP will provide a site-

specific set of measures and initiatives to promote sustainable transport options such as walking, cycling, car sharing and public transport. It will assist in encouraging the residents/workers of the proposed development to use these options to replace all or part of their car journeys. The implementation of the GTP is expected to create a number of social, economic, environmental and health benefits for the residents. This GTP will comprise of the following:

- Targets – generally includes the reduction of single occupant car trips to and/or from the proposed development for journey to work.
- Travel Data – a prior estimate of the amount and types of trips to the proposed development is required, as well as an annual travel survey and review in order to estimate the change in travel behaviour of the residents.
- Measures – an outline of specified tools and methods to achieve goals.

Noting the above requirements, reference is made to the Preliminary Green Travel Plan prepared by TRAFFIX (Ref: 21.564r02v01) which outlines the initiatives and strategies to reduce private vehicle trips and encourage alternative modes of transport.

7. ACCESS AND INTERNAL DESIGN ASPECTS

7.1 Light Vehicle Access

The development proposes a total of 445 parking spaces with access to Albert Street, a local access road. Under AS 2890.1 (2004) the concept development will nominally require a Category 4 access, being a separated entry of width 6.0-8.0m and an exit width of 6.0-8.0m separated by a median providing a minimum width of 1.0-3.0m. It should be noted that the 6.0-8.0m entry and exit widths are to provide simultaneously vehicle movements for left/right movements to/from the site. Albert Street terminates west of the access and as such, no vehicles can approach or leave the site from this direction. As such a single lane for both entry and exit separated by a median is considered suitable and appropriate in this instance.

7.2 Heavy Vehicle Access

The development proposes a loading dock area with access to Albert Street, a local access road. This access driveway will accommodate vehicles up to a 12.5m heavy rigid vehicle, and as such, will be designed to accommodate this vehicle at a future DA stage.

7.3 Internal Design

The internal car park will comply with the requirements of AS 2890.1 (2004), AS 2890.2 (2018) and AS 2890.6 (2009), and the following characteristics are noteworthy:

7.3.1 Parking Modules

- All residential car parking spaces are to be designed in accordance with AS 2890.1 (2004) User Class 1A, being a minimum width of 2.4m, a minimum length of 5.4m and a minimum aisle width of 5.8m.
- All retail and childcare parking spaces are to be designed in accordance with AS 2890.1 (2004) User Class 3, being a minimum width of 2.6m, a minimum length of 5.4m and a minimum aisle width of 5.8m.

- All accessible parking spaces are to be designed in accordance with AS 2890.6 (2022), being 2.4m wide, 5.4m long and located adjacent to a dedicated shared area of the same dimensions.
- All spaces located adjacent to obstructions of greater than 150mm in height are to be provided with an additional width of 300mm.
- Dead-end aisles are to be provided with the required 1.0m aisle extension in accordance with AS 2890.1 (2004).

7.3.2 Vehicle Ramps

- All vehicle ramps accessed by retail visitors to have a maximum gradient of 20% (1 in 5) for up to 20m, with a minimum 2.0m transition at 12.5% (1 in 8), in accordance with the public car park requirements of AS 2890.1 (2004).
- All vehicle ramps accessed by residents/employees to have a maximum gradient of 25% (1 in 4) for up to 20m, with a minimum 2.0m transition at 12.5% (1 in 8), in accordance with the residential car park requirements of AS 2890.1 (2004).
- The access driveway is to have a maximum gradient of 1:20 (5%) extending from the property boundary line for at least 6.0m in accordance with AS 2890.1 (2004).

7.3.3 Clear Head Heights

- A minimum clear head height of 2.2m is to be provided for all areas within the basement car park as required by AS 2890.1 (2004).
- A minimum clear head height of 2.5m is to be provided above all accessible spaces in accordance with AS 2890.6 (2022).
- Head height clearances for roadways/loading docks accessed by service vehicles are to be provided in accordance with Table 2.1 of AS 2890.2 (2018).

7.3.4 Other Considerations

- All columns are to be located outside of the parking space design envelope shown in Figure 5.2 of AS 2890.1 (2004).
- Visual splays are to be provided at the access driveway in accordance with Figure 3.3 of AS 2890.1 (2004).

7.4 Summary

In summary, the internal configuration of the car park/loading bays should be designed in accordance with AS 2890.1 (2004), AS 2890.2 (2018) and AS 2890.6 (2022). The car parking and service bay arrangements can be further optimised during future DA stage/s.

8. CONCLUSIONS

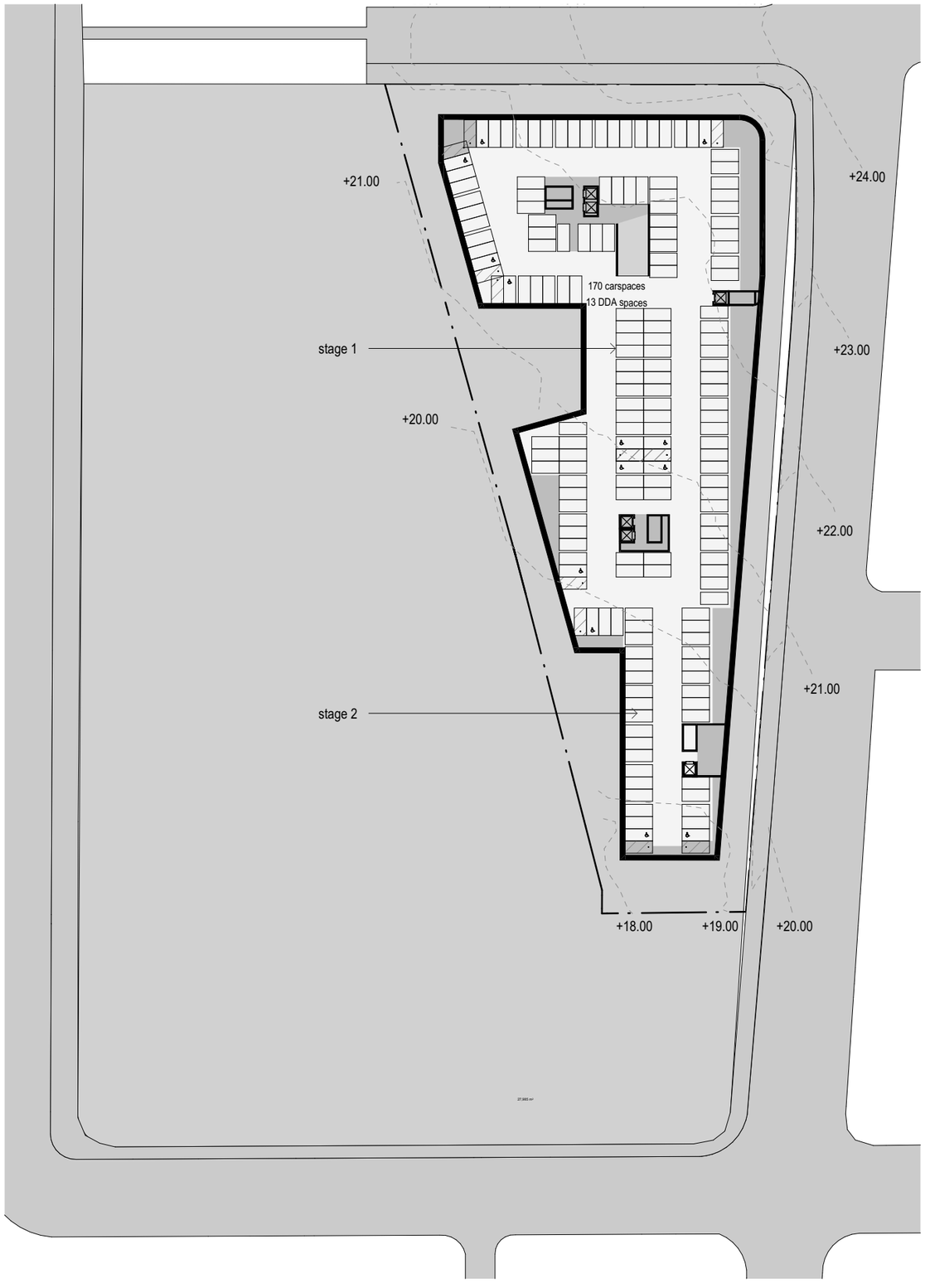
The following matters are noteworthy:

- The planning proposal seeks approval to vary the floor space ratio and height controls for the site at 9 Albert Street and 31 O'Connell Street, North Parramatta. A concept scheme has been assessed which is representative of the site being developed to its full potential with these proposed changes, comprising a 780m^2 GFA retail, a childcare centre accommodating 120 children, 370 residential apartments, and two (2) levels of basement carparking accommodating approximately 440 car parking spaces.
- The subject site is well connected to the public transport network with reliable access to regular bus and future light rail services. These, along with existing pedestrian and cycle links, ensure the site is ideally situated for a mixed-use development as it provides a good opportunity to encourage future tenants, customers, and staff to use sustainable transport modes.
- The concept scheme has been assessed to require 435 parking spaces under the SEPP 65 and Paramatta DCP 2023. In response, concept plans indicate provision for 440 parking spaces within two (2) basements levels, thus demonstrating that the site is sufficiently large enough to accommodate the parking demands for a future development.
- The traffic generation arising from the development has been assessed as a net increase over existing conditions and equates to an additional 204 vehicle trips during the weekday morning peak period and 155 vehicle trips during the weekday evening peak period. Notwithstanding, SIDRA modelling of the intersections of Albert Street/O'Connell Street and Albert Street/Church Street/Pennant Hills Road demonstrate negligible increases in delays. Accordingly, these intersections will continue to operate at a satisfactory level of service with spare capacity.

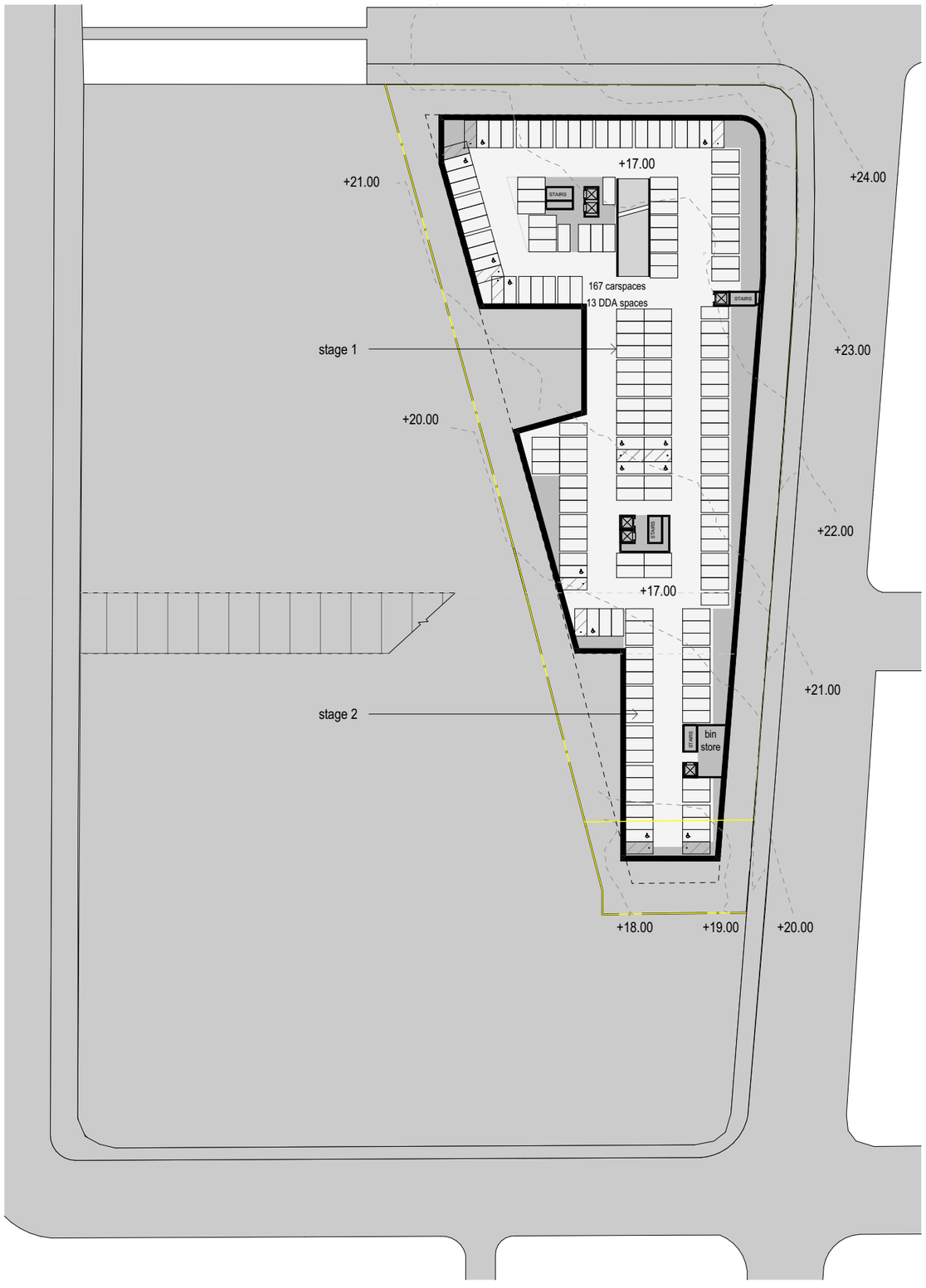
This traffic impact assessment therefore demonstrates that the subject Planning Proposal is supportable on traffic planning grounds. TRAFFIX anticipates an ongoing involvement during the planning proposal approval process.

APPENDIX A

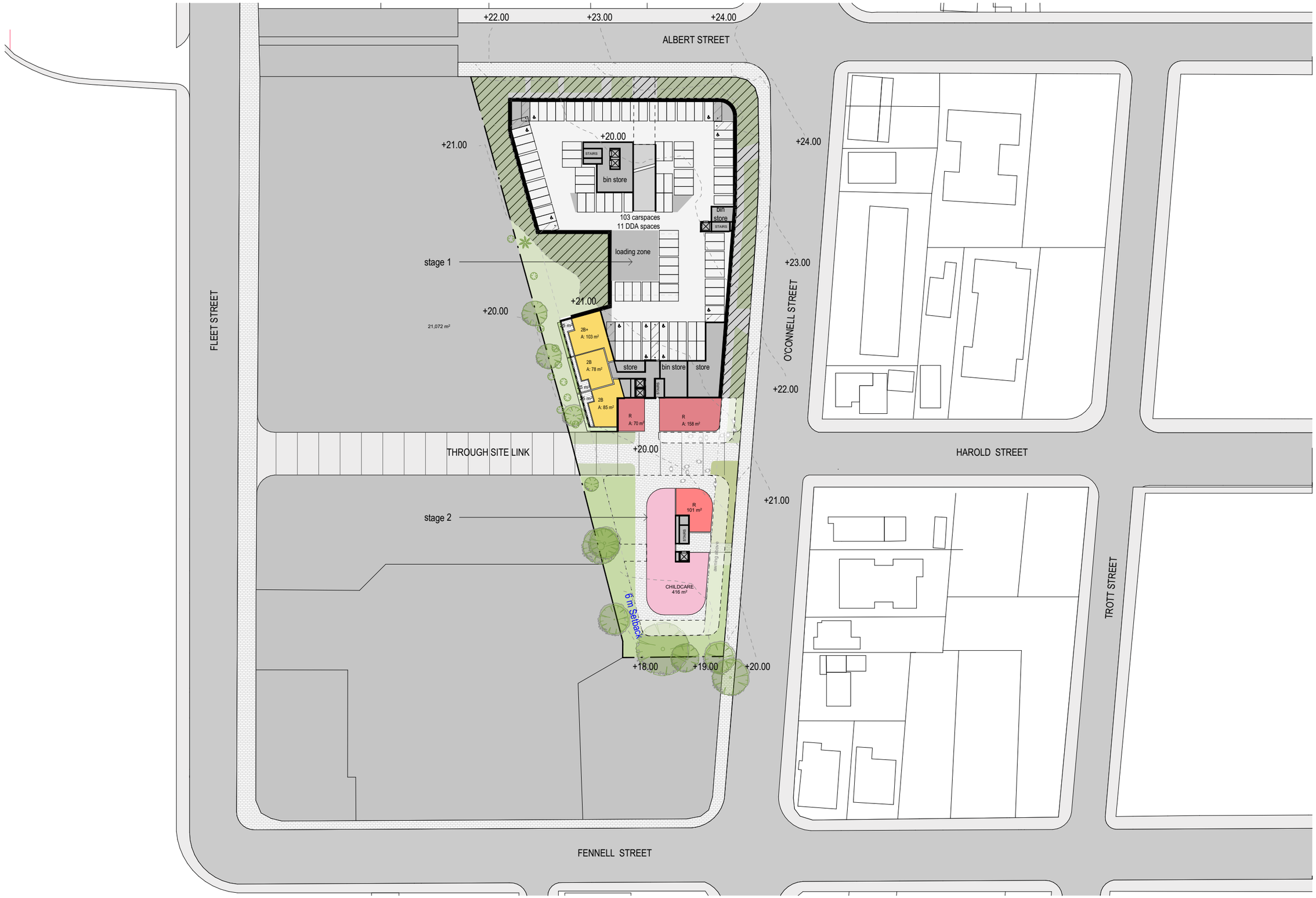
Urban Design Report



BASEMENT 02



BASEMENT 01



LOWER GROUND FLOOR


ALBERT STREET
FLEET STREET
O'CONNELL STREET
HAROLD STREET
FENNELL STREET
Site Boundary
6 m Setback
THROUGH SITE LINK BELOW
32,975 m²
+22.00
+23.00
+24.00
+22.50
+21.00
+20.00
+19.00
+18.00
awning above
awning below
Lobby
STAIRS
LIFT
2B+ A: 88 m²
2B+ A: 83 m²
2B+ A: 104 m²
2B+ A: 93 m²
4B A: 143 m²
2B+ A: 88 m²
R A: 74 m²
R A: 140 m²
2B A: 87 m²
R A: 76 m²
2B+ A: 93 m²
3B+ A: 121 m²
R A: 136 m²
1B A: 50 m²
1B+ A: 59 m²
1B+ A: 59 m²
1B A: 52 m²
2B A: 83 m²
2B A: 82 m²
1B+ A: 74 m²
1B+ A: 79 m²
2B+ A: 98 m²
2B+ A: 97 m²
3B+ A: 100 m²
2B A: 78 m²
2B+ A: 85 m²
2B+ A: 90 m²
2B+ A: 85 m²
2B A: 73 m²
2B A: 75 m²
2B+ A: 90 m²

APPENDIX B

SIDRA Outputs

USER REPORT FOR SITE

Project: 21.564m01v03 **Template: Layouts**

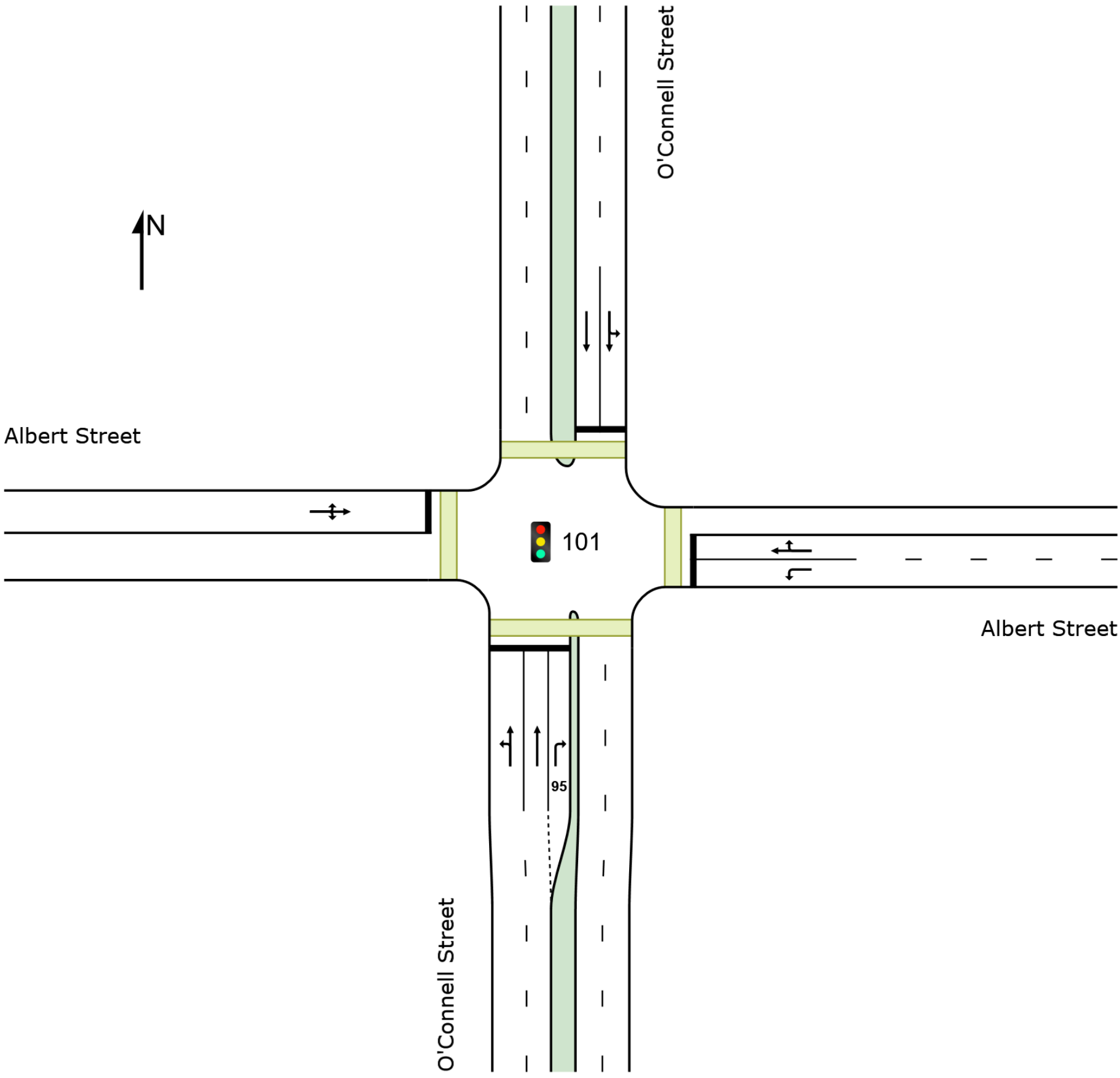
Site: 101 [Existing AM - Albert St / O'Connell St (Site Folder: Weekday Existing 2026 Scenario)]

Albert Street & O'Connell Street Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: TCS
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C
Reference Phase: Phase A

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Site: 101 [Existing AM - Albert St / O'Connell St (Site Folder: Weekday Existing 2026 Scenario)]

Albert Street & O'Connell Street Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 130 seconds (Site Optimum Cycle Time - Minimum Delay)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: TCS
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C
Reference Phase: Phase A

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: O'Connell Street															
1	L2	All MCs	2	0.0	2	0.0	0.248	10.6	LOS A	6.7	49.9	0.33	0.29	0.33	45.6
2	T1	All MCs	691	8.1	691	8.1	0.248	5.1	LOS A	6.7	49.9	0.33	0.29	0.33	53.9
3	R2	All MCs	264	9.2	264	9.2	* 0.516	31.7	LOS C	13.5	101.6	0.88	0.88	0.88	28.5
Approach			957	8.4	957	8.4	0.516	12.4	LOS A	13.5	101.6	0.48	0.45	0.48	45.1
East: Albert Street															
4	L2	All MCs	299	4.6	299	4.6	0.413	34.5	LOS C	13.5	98.2	0.77	0.78	0.77	27.0
5	T1	All MCs	2	0.0	2	0.0	* 0.241	53.1	LOS D	3.2	23.0	0.92	0.75	0.92	14.0
6	R2	All MCs	55	1.9	55	1.9	0.241	57.7	LOS E	3.2	23.0	0.92	0.75	0.92	22.6
Approach			356	4.1	356	4.1	0.413	38.2	LOS C	13.5	98.2	0.79	0.78	0.79	26.1
North: O'Connell Street															
7	L2	All MCs	27	30.8	27	30.8	0.516	28.6	LOS C	20.3	149.6	0.72	0.65	0.72	34.4
8	T1	All MCs	947	4.8	947	4.8	* 0.516	22.6	LOS B	20.3	149.6	0.72	0.64	0.72	39.8
Approach			975	5.5	975	5.5	0.516	22.8	LOS B	20.3	149.6	0.72	0.64	0.72	39.6
West: Albert Street															
10	L2	All MCs	3	0.0	3	0.0	0.044	55.3	LOS D	0.6	4.0	0.88	0.66	0.88	20.9
11	T1	All MCs	3	0.0	3	0.0	0.044	50.7	LOS D	0.6	4.0	0.88	0.66	0.88	14.8
12	R2	All MCs	4	0.0	4	0.0	0.044	55.3	LOS D	0.6	4.0	0.88	0.66	0.88	18.4
Approach			11	0.0	11	0.0	0.044	53.9	LOS D	0.6	4.0	0.88	0.66	0.88	18.2
All Vehicles			2298	6.5	2298	6.5	0.516	21.0	LOS B	20.3	149.6	0.63	0.58	0.63	38.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Site: 101 [Existing PM - Albert St / O'Connell St (Site Folder: Weekday Existing 2026 Scenario)]

Albert Street & O'Connell Street Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: TCS
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C
Reference Phase: Phase A

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: O'Connell Street															
1	L2	All MCs	3	0.0	3	0.0	0.329	11.4	LOS A	9.5	68.7	0.38	0.34	0.38	44.4
2	T1	All MCs	915	3.9	915	3.9	0.329	5.9	LOS A	9.5	68.7	0.38	0.34	0.38	53.0
3	R2	All MCs	346	4.9	346	4.9	* 0.498	31.0	LOS C	13.8	100.6	0.80	0.91	0.80	28.8
Approach			1264	4.2	1264	4.2	0.498	12.8	LOS A	13.8	100.6	0.49	0.49	0.49	44.8
East: Albert Street															
4	L2	All MCs	267	6.7	267	6.7	0.277	20.3	LOS B	8.3	61.4	0.58	0.72	0.58	33.6
5	T1	All MCs	4	0.0	4	0.0	* 0.338	48.6	LOS D	4.7	32.8	0.93	0.77	0.93	14.9
6	R2	All MCs	84	0.0	84	0.0	0.338	53.2	LOS D	4.7	32.8	0.93	0.77	0.93	23.7
Approach			356	5.0	356	5.0	0.338	28.5	LOS B	8.3	61.4	0.66	0.73	0.66	30.0
North: O'Connell Street															
7	L2	All MCs	43	4.9	43	4.9	0.630	39.9	LOS C	20.1	149.9	0.89	0.78	0.89	29.5
8	T1	All MCs	785	7.8	785	7.8	* 0.630	34.3	LOS C	20.1	149.9	0.89	0.78	0.89	33.8
Approach			828	7.6	828	7.6	0.630	34.6	LOS C	20.1	149.9	0.89	0.78	0.89	33.6
West: Albert Street															
10	L2	All MCs	1	0.0	1	0.0	0.027	49.9	LOS D	0.3	2.2	0.86	0.64	0.86	22.1
11	T1	All MCs	1	0.0	1	0.0	0.027	45.3	LOS D	0.3	2.2	0.86	0.64	0.86	15.8
12	R2	All MCs	4	0.0	4	0.0	0.027	49.9	LOS D	0.3	2.2	0.86	0.64	0.86	19.5
Approach			6	0.0	6	0.0	0.027	49.1	LOS D	0.3	2.2	0.86	0.64	0.86	19.4
All Vehicles			2455	5.4	2455	5.4	0.630	22.5	LOS B	20.1	149.9	0.65	0.63	0.65	37.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [Existing + Development AM - Albert St / O'Connell St (Site Folder: Weekday Existing (2026) + Development Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

Albert Street & O'Connell Street Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: O'Connell Street															
1	L2	All MCs	28	0.0	28	0.0	0.274	12.2	LOS A	7.7	57.1	0.39	0.37	0.39	43.0
2	T1	All MCs	691	8.1	691	8.1	0.274	6.7	LOS A	7.7	57.1	0.39	0.36	0.39	52.0
3	R2	All MCs	264	9.2	264	9.2	* 0.569	36.4	LOS C	12.8	96.6	0.92	0.92	0.92	26.6
Approach			983	8.1	983	8.1	0.569	14.8	LOS B	12.8	96.6	0.53	0.51	0.53	43.0
East: Albert Street															
4	L2	All MCs	299	4.6	299	4.6	0.389	30.0	LOS C	11.9	86.9	0.74	0.77	0.74	28.8
5	T1	All MCs	56	0.0	56	0.0	0.406	46.8	LOS D	5.9	41.8	0.94	0.77	0.94	15.2
6	R2	All MCs	55	1.9	55	1.9	0.406	56.3	LOS D	5.9	41.8	0.94	0.77	0.94	24.1
Approach			409	3.6	409	3.6	0.406	35.8	LOS C	11.9	86.9	0.79	0.77	0.79	26.1
North: O'Connell Street															
7	L2	All MCs	27	30.8	27	30.8	0.566	30.0	LOS C	20.8	153.1	0.77	0.69	0.77	33.6
8	T1	All MCs	974	4.6	974	4.6	* 0.566	24.1	LOS B	20.8	153.1	0.77	0.69	0.77	38.9
Approach			1001	5.4	1001	5.4	0.566	24.2	LOS B	20.8	153.1	0.77	0.69	0.77	38.8
West: Albert Street															
10	L2	All MCs	48	0.0	48	0.0	0.547	53.1	LOS D	8.1	56.5	0.97	0.80	0.97	20.9
11	T1	All MCs	48	0.0	48	0.0	* 0.547	48.6	LOS D	8.1	56.5	0.97	0.80	0.97	14.8
12	R2	All MCs	49	0.0	49	0.0	0.547	59.3	LOS E	8.1	56.5	0.97	0.80	0.97	18.4
Approach			146	0.0	146	0.0	0.547	53.7	LOS D	8.1	56.5	0.97	0.80	0.97	18.2
All Vehicles			2540	5.8	2540	5.8	0.569	24.2	LOS B	20.8	153.1	0.69	0.64	0.69	36.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: O'Connell Street												
P1	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
East: Albert Street												
P2	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
North: O'Connell Street												
P3	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
West: Albert Street												
P4	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
All Pedestrians		200	211	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Project: T:\Synergy\Projects\21\21.564\Modelling\21.564m01v04.sip9

MOVEMENT SUMMARY

Site: 101 [Existing + Development PM - Albert St / O'Connell St (Site Folder: Weekday Existing (2026) + Development Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

Albert Street & O'Connell Street Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: O'Connell Street															
1	L2	All MCs	36	0.0	36	0.0	0.341	11.5	LOS A	9.9	71.8	0.38	0.37	0.38	43.9
2	T1	All MCs	915	3.9	915	3.9	0.341	6.0	LOS A	9.9	71.8	0.38	0.36	0.38	52.7
3	R2	All MCs	346	4.9	346	4.9	* 0.510	32.1	LOS C	14.0	102.1	0.81	0.92	0.81	28.4
Approach			1297	4.1	1297	4.1	0.510	13.1	LOS A	14.0	102.1	0.50	0.51	0.50	44.4
East: Albert Street															
4	L2	All MCs	267	6.7	267	6.7	0.281	20.9	LOS B	8.5	62.6	0.59	0.72	0.59	33.2
5	T1	All MCs	68	0.0	68	0.0	* 0.588	50.8	LOS D	8.5	59.7	0.98	0.80	0.98	14.6
6	R2	All MCs	84	0.0	84	0.0	0.588	57.4	LOS E	8.5	59.7	0.98	0.80	0.98	23.4
Approach			420	4.3	420	4.3	0.588	33.1	LOS C	8.5	62.6	0.73	0.75	0.73	27.1
North: O'Connell Street															
7	L2	All MCs	43	4.9	43	4.9	0.638	39.3	LOS C	20.8	154.8	0.89	0.78	0.89	29.7
8	T1	All MCs	817	7.5	817	7.5	* 0.638	33.7	LOS C	20.8	154.8	0.89	0.78	0.89	34.1
Approach			860	7.3	860	7.3	0.638	34.0	LOS C	20.8	154.8	0.89	0.78	0.89	33.9
West: Albert Street															
10	L2	All MCs	23	0.0	23	0.0	0.305	53.3	LOS D	3.9	27.2	0.93	0.75	0.93	21.0
11	T1	All MCs	23	0.0	23	0.0	0.305	48.7	LOS D	3.9	27.2	0.93	0.75	0.93	14.9
12	R2	All MCs	26	0.0	26	0.0	0.305	57.2	LOS E	3.9	27.2	0.93	0.75	0.93	18.5
Approach			73	0.0	73	0.0	0.305	53.3	LOS D	3.9	27.2	0.93	0.75	0.93	18.3
All Vehicles			2649	5.0	2649	5.0	0.638	24.2	LOS B	20.8	154.8	0.67	0.64	0.67	36.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: O'Connell Street												
P1	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
East: Albert Street												
P2	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
North: O'Connell Street												
P3	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
West: Albert Street												
P4	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
All Pedestrians		200	211	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Site: 101 [Existing PM - Albert St / O'Connell St (Site Folder: Weekend Existing 2022 Scenario)]

Albert Street & O'Connell Street Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: TCS
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C
Reference Phase: Phase A

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: O'Connell Street															
1	L2	All MCs	1	0.0	1	0.0	0.245	11.0	LOS A	6.5	47.1	0.35	0.31	0.35	45.1
2	T1	All MCs	684	3.2	684	3.2	0.245	5.5	LOS A	6.5	47.1	0.35	0.31	0.35	53.5
3	R2	All MCs	236	2.7	236	2.7	* 0.348	22.8	LOS B	8.8	62.7	0.70	0.78	0.70	32.7
Approach			921	3.1	921	3.1	0.348	9.9	LOS A	8.8	62.7	0.44	0.43	0.44	47.4
East: Albert Street															
4	L2	All MCs	225	2.8	225	2.8	0.250	23.3	LOS B	7.5	53.9	0.62	0.73	0.62	32.0
5	T1	All MCs	1	0.0	1	0.0	* 0.142	46.7	LOS D	1.9	13.1	0.89	0.72	0.89	15.2
6	R2	All MCs	36	0.0	36	0.0	0.142	51.2	LOS D	1.9	13.1	0.89	0.72	0.89	24.2
Approach			262	2.4	262	2.4	0.250	27.2	LOS B	7.5	53.9	0.66	0.73	0.66	30.4
North: O'Connell Street															
7	L2	All MCs	22	0.0	22	0.0	0.497	33.7	LOS C	16.6	119.2	0.79	0.70	0.79	32.2
8	T1	All MCs	746	3.0	746	3.0	* 0.497	28.1	LOS B	16.6	119.2	0.79	0.70	0.79	36.7
Approach			768	2.9	768	2.9	0.497	28.3	LOS B	16.6	119.2	0.79	0.70	0.79	36.6
West: Albert Street															
10	L2	All MCs	3	0.0	3	0.0	0.018	49.3	LOS D	0.3	1.8	0.86	0.63	0.86	22.2
11	T1	All MCs	1	0.0	1	0.0	0.018	44.8	LOS D	0.3	1.8	0.86	0.63	0.86	15.9
12	R2	All MCs	1	0.0	1	0.0	0.018	49.3	LOS D	0.3	1.8	0.86	0.63	0.86	19.7
Approach			5	0.0	5	0.0	0.018	48.4	LOS D	0.3	1.8	0.86	0.63	0.86	20.6
All Vehicles			1957	2.9	1957	2.9	0.497	19.6	LOS B	16.6	119.2	0.61	0.57	0.61	39.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [Existing + Development PM - Albert St / O'Connell St (Site Folder: Weekend Existing + Development Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

Albert Street & O'Connell Street Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: O'Connell Street															
1	L2	All MCs	18	0.0	18	0.0	0.251	11.0	LOS A	6.7	48.4	0.35	0.33	0.35	44.7
2	T1	All MCs	684	3.2	684	3.2	0.251	5.5	LOS A	6.7	48.4	0.35	0.32	0.35	53.3
3	R2	All MCs	236	2.7	236	2.7	* 0.355	23.1	LOS B	8.9	63.6	0.71	0.78	0.71	32.6
Approach			938	3.0	938	3.0	0.355	10.0	LOS A	8.9	63.6	0.44	0.43	0.44	47.2
East: Albert Street															
4	L2	All MCs	225	2.8	225	2.8	0.255	24.0	LOS B	7.7	54.8	0.63	0.73	0.63	31.6
5	T1	All MCs	35	0.0	35	0.0	0.290	47.7	LOS D	3.7	26.1	0.92	0.74	0.92	15.2
6	R2	All MCs	36	0.0	36	0.0	0.290	55.1	LOS D	3.7	26.1	0.92	0.74	0.92	24.2
Approach			296	2.1	296	2.1	0.290	30.5	LOS C	7.7	54.8	0.70	0.73	0.70	28.2
North: O'Connell Street															
7	L2	All MCs	22	0.0	22	0.0	0.498	33.0	LOS C	16.8	120.6	0.79	0.70	0.79	32.5
8	T1	All MCs	763	2.9	763	2.9	* 0.498	27.5	LOS B	16.8	120.6	0.79	0.69	0.79	37.1
Approach			785	2.8	785	2.8	0.498	27.6	LOS B	16.8	120.6	0.79	0.69	0.79	36.9
West: Albert Street															
10	L2	All MCs	37	0.0	37	0.0	0.403	53.2	LOS D	5.7	39.9	0.94	0.77	0.94	21.3
11	T1	All MCs	35	0.0	35	0.0	* 0.403	48.6	LOS D	5.7	39.9	0.94	0.77	0.94	15.1
12	R2	All MCs	35	0.0	35	0.0	0.403	55.1	LOS D	5.7	39.9	0.94	0.77	0.94	18.7
Approach			106	0.0	106	0.0	0.403	52.3	LOS D	5.7	39.9	0.94	0.77	0.94	18.6
All Vehicles			2125	2.7	2125	2.7	0.498	21.5	LOS B	16.8	120.6	0.63	0.59	0.63	38.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: O'Connell Street												
P1	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
East: Albert Street												
P2	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
North: O'Connell Street												
P3	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
West: Albert Street												
P4	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
All Pedestrians		200	211	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Project: T:\Synergy\Projects\21\21.564\Modelling\21.564m01v04.sip9

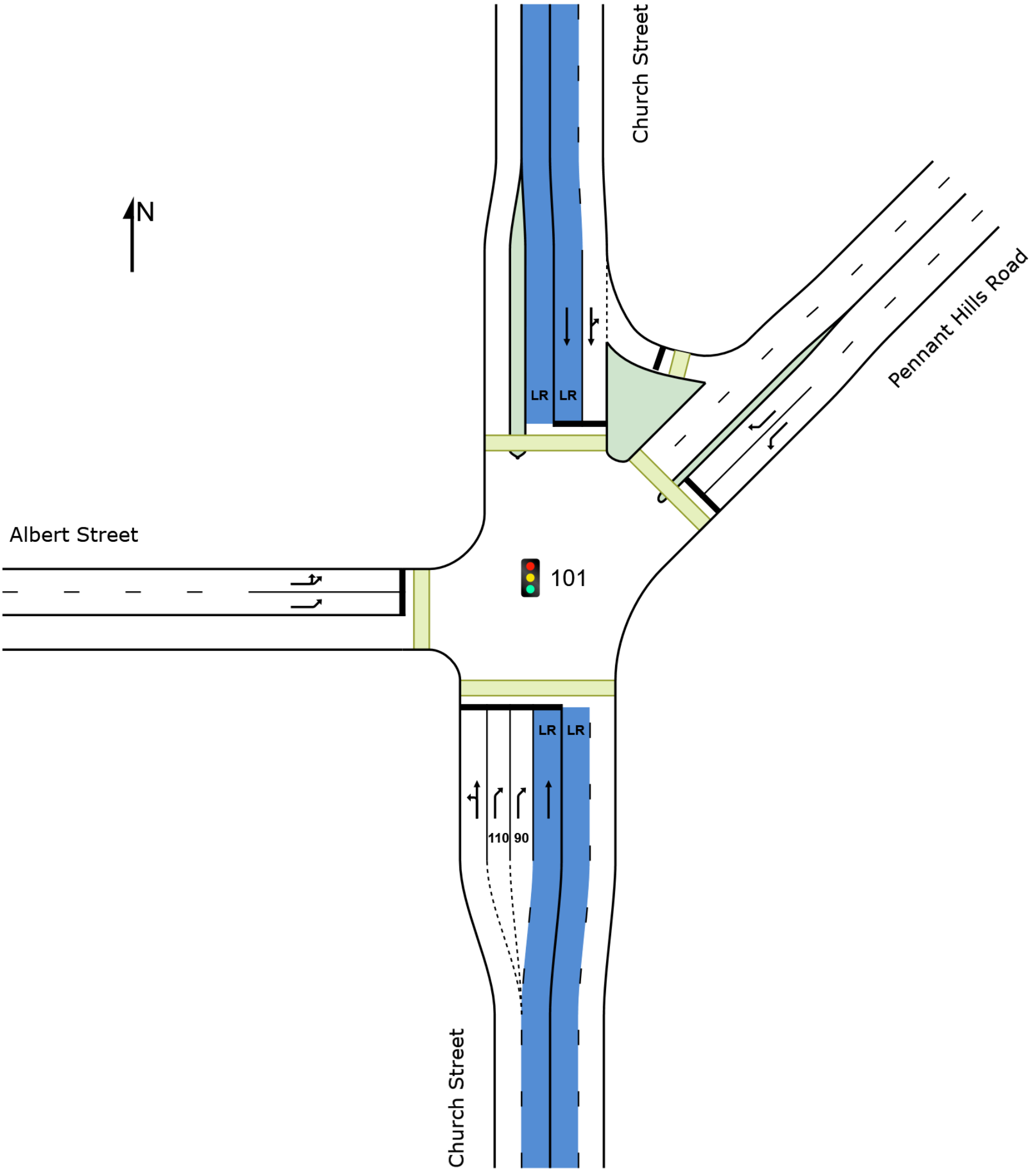
Site: 101 [Existing AM - Church St / Pennant Hills Rd / Albert St (Site Folder: Weekday Existing 2026 Scenario)]

Church Street & Pennant Hills Road & Albert Street Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Assumed Phasing
Input Phase Sequence: A, B, B1*, B2*, C, D, E*
Output Phase Sequence: A, C, D
Reference Phase: Phase A
(* Variable Phase)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Organisation: TRAFFIX PTY LTD | Licence: NETWORK / 1PC | Created: Monday, 5 February 2024 4:51:09 PM
Project: T:\Synergy\Projects\21\21.564\Modelling\21.564m01v03.sip9

Site: 101 [Existing AM - Church St / Pennant Hills Rd / Albert St (Site Folder: Weekday Existing 2026 Scenario)]

Church Street & Pennant Hills Road & Albert Street Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Assumed Phasing
Input Phase Sequence: A, B, B1*, B2*, C, D, E*
Output Phase Sequence: A, C, D
Reference Phase: Phase A
(* Variable Phase)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Church Street															
1	L2	All MCs	29	0.0	29	0.0	0.708	11.3	LOS A	11.2	84.7	0.37	0.35	0.37	43.0
2	T1	All MCs	540	10.8	540	10.8	* 0.708	6.3	LOS A	11.2	84.7	0.38	0.36	0.38	50.4
3a	R1	All MCs	266	2.7	266	2.7	0.462	44.9	LOS D	6.4	45.7	0.84	0.75	0.84	36.8
Approach			836	7.8	836	7.8	0.708	18.8	LOS B	11.2	84.7	0.53	0.48	0.53	42.4
NorthEast: Pennant Hills Road															
24a	L1	All MCs	34	25.4	34	25.4	0.031	11.6	LOS A	0.6	5.4	0.35	0.60	0.35	50.5
26a	R1	All MCs	632	0.1	632	0.1	* 0.716	31.6	LOS C	29.3	205.5	0.86	0.84	0.86	40.6
Approach			665	1.4	665	1.4	0.716	30.6	LOS C	29.3	205.5	0.84	0.83	0.84	41.0
North: Church Street															
7b	L3	All MCs	122	0.0	122	0.0	0.307	7.8	LOS A	2.1	15.9	0.32	0.57	0.32	51.7
8	T1	All MCs	56	46.2	56	46.2	0.307	20.9	LOS B	2.1	15.9	0.40	0.57	0.40	41.8
Approach			178	14.5	178	14.5	0.307	11.9	LOS A	2.1	15.9	0.35	0.57	0.35	49.8
West: Albert Street															
10	L2	All MCs	20	0.0	20	0.0	0.295	25.6	LOS B	9.1	64.9	0.66	0.70	0.66	32.5
10a	L1	All MCs	487	3.0	487	3.0	0.295	24.1	LOS B	9.1	65.1	0.66	0.69	0.66	43.3
Approach			507	2.9	507	2.9	0.295	24.1	LOS B	9.1	65.1	0.66	0.69	0.66	43.0
All Vehicles			2186	5.3	2186	5.3	0.716	23.1	LOS B	29.3	205.5	0.64	0.64	0.64	42.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Site: 101 [Existing PM - Church St / Pennant Hills Rd / Albert St (Site Folder: Weekday Existing 2026 Scenario)]

Church Street & Pennant Hills Road & Albert Street Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Assumed Phasing
Input Phase Sequence: A, B, B1*, B2*, C, D, E*
Output Phase Sequence: A, C, D
Reference Phase: Phase A
(* Variable Phase)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Church Street															
1	L2	All MCs	57	0.0	57	0.0	0.842	6.7	LOS A	6.3	45.5	0.12	0.15	0.13	49.0
2	T1	All MCs	839	5.1	839	5.1	* 0.842	1.5	LOS A	6.3	45.5	0.13	0.16	0.14	57.0
3a	R1	All MCs	462	2.2	462	2.2	0.660	41.3	LOS C	11.4	81.1	0.87	0.79	0.88	37.9
Approach			1358	3.9	1358	3.9	0.842	15.2	LOS B	11.4	81.1	0.38	0.37	0.39	44.9
NorthEast: Pennant Hills Road															
24a	L1	All MCs	36	28.1	36	28.1	0.039	16.0	LOS B	0.9	7.6	0.45	0.63	0.45	48.1
26a	R1	All MCs	535	0.0	535	0.0	* 0.827	47.4	LOS D	30.5	213.8	0.99	0.92	1.06	35.5
Approach			571	1.8	571	1.8	0.827	45.4	LOS D	30.5	213.8	0.95	0.90	1.02	36.1
North: Church Street															
7b	L3	All MCs	291	0.0	291	0.0	0.375	6.8	LOS A	0.4	2.6	0.03	0.54	0.03	54.3
8	T1	All MCs	53	58.0	53	58.0	0.375	5.9	LOS A	0.4	9.3	0.14	0.54	0.14	46.5
Approach			343	8.9	343	8.9	0.375	6.7	LOS A	0.4	9.3	0.05	0.54	0.05	53.6
West: Albert Street															
10	L2	All MCs	72	0.0	72	0.0	0.291	35.4	LOS C	7.8	55.1	0.77	0.74	0.77	27.9
10a	L1	All MCs	299	0.7	299	0.7	0.291	33.9	LOS C	7.9	55.7	0.77	0.74	0.77	39.4
Approach			371	0.6	371	0.6	0.291	34.2	LOS C	7.9	55.7	0.77	0.74	0.77	37.9
All Vehicles			2642	3.6	2642	3.6	0.842	23.3	LOS B	30.5	213.8	0.52	0.56	0.53	42.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [Existing + Development AM - Church St / Pennant Hills Rd / Albert St (Site Folder: Weekday Existing (2026) + Development Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

Church Street & Pennant Hills Road & Albert Street Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Church Street															
1	L2	All MCs	29	0.0	29	0.0	0.721	12.2	LOS A	12.7	95.4	0.42	0.39	0.42	41.9
2	T1	All MCs	540	10.8	540	10.8	* 0.721	7.2	LOS A	12.7	95.4	0.42	0.39	0.42	49.3
3a	R1	All MCs	266	2.7	266	2.7	0.462	44.9	LOS D	6.4	45.7	0.84	0.75	0.84	36.8
Approach			836	7.8	836	7.8	0.721	19.4	LOS B	12.7	95.4	0.56	0.51	0.56	42.0
NorthEast: Pennant Hills Road															
24a	L1	All MCs	34	25.4	34	25.4	0.031	11.2	LOS A	0.6	5.3	0.34	0.60	0.34	50.7
26a	R1	All MCs	658	0.1	658	0.1	* 0.733	31.3	LOS C	30.7	215.2	0.87	0.85	0.87	40.7
Approach			692	1.3	692	1.3	0.733	30.4	LOS C	30.7	215.2	0.84	0.84	0.84	41.1
North: Church Street															
7b	L3	All MCs	122	0.0	122	0.0	0.316	7.9	LOS A	2.1	15.7	0.33	0.57	0.33	51.7
8	T1	All MCs	56	46.2	56	46.2	0.316	20.7	LOS B	2.1	15.7	0.40	0.57	0.40	41.8
Approach			178	14.5	178	14.5	0.316	11.9	LOS A	2.1	15.7	0.35	0.57	0.35	49.8
West: Albert Street															
10	L2	All MCs	20	0.0	20	0.0	0.315	25.2	LOS B	9.8	70.4	0.66	0.70	0.66	32.7
10a	L1	All MCs	533	2.7	533	2.7	0.315	23.7	LOS B	9.9	70.6	0.66	0.70	0.66	43.4
Approach			553	2.6	553	2.6	0.315	23.8	LOS B	9.9	70.6	0.66	0.70	0.66	43.2
All Vehicles			2258	5.1	2258	5.1	0.733	23.2	LOS B	30.7	215.2	0.65	0.66	0.65	42.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Church Street												
P1	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
NorthEast: Pennant Hills Road												
P6	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
North: Church Street												
P3	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
P3B	Slip/Bypass	50	53	30.9	LOS D	0.1	0.1	0.90	0.90	184.7	200.0	1.08
West: Albert Street												
P4	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
All Pedestrians		250	263	49.6	LOS E	0.2	0.2	0.94	0.94	203.4	200.0	0.98

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Organisation: TRAFFIX PTY LTD | Licence: NETWORK / 1PC | Processed: Monday, 12 February 2024 5:03:00 PM
Project: T:\Synergy\Projects\21\21.564\Modelling\21.564m01v04.sip9

MOVEMENT SUMMARY

Site: 101 [Existing + Development PM - Church St / Pennant Hills Rd / Albert St (Site Folder: Weekday Existing (2026) + Development Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

Church Street & Pennant Hills Road & Albert Street Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Church Street															
1	L2	All MCs	57	0.0	57	0.0	0.855	7.1	LOS A	7.0	50.8	0.13	0.16	0.14	48.4
2	T1	All MCs	839	5.1	839	5.1	* 0.855	1.9	LOS A	7.0	50.8	0.14	0.17	0.15	56.4
3a	R1	All MCs	462	2.2	462	2.2	0.759	26.7	LOS B	7.0	50.0	0.94	0.81	0.97	43.3
Approach			1358	3.9	1358	3.9	0.855	10.5	LOS A	7.0	50.8	0.41	0.39	0.43	48.5
NorthEast: Pennant Hills Road															
24a	L1	All MCs	36	28.1	36	28.1	0.037	14.3	LOS A	0.8	7.0	0.41	0.62	0.41	49.0
26a	R1	All MCs	566	0.0	566	0.0	* 0.855	49.6	LOS D	33.6	235.2	1.00	0.94	1.10	34.9
Approach			602	1.7	602	1.7	0.855	47.5	LOS D	33.6	235.2	0.96	0.93	1.06	35.5
North: Church Street															
7b	L3	All MCs	291	0.0	291	0.0	0.420	6.8	LOS A	0.4	3.2	0.04	0.54	0.04	54.3
8	T1	All MCs	53	58.0	53	58.0	0.420	6.5	LOS A	0.4	9.8	0.15	0.54	0.15	46.0
Approach			343	8.9	343	8.9	0.420	6.8	LOS A	0.4	9.8	0.05	0.54	0.05	53.6
West: Albert Street															
10	L2	All MCs	72	0.0	72	0.0	0.301	34.8	LOS C	8.3	58.0	0.77	0.74	0.77	28.2
10a	L1	All MCs	321	0.7	321	0.7	0.301	33.3	LOS C	8.3	58.6	0.77	0.74	0.77	39.7
Approach			393	0.5	393	0.5	0.301	33.6	LOS C	8.3	58.6	0.77	0.74	0.77	38.2
All Vehicles			2696	3.5	2696	3.5	0.855	21.7	LOS B	33.6	235.2	0.54	0.58	0.57	42.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Church Street												
P1	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
NorthEast: Pennant Hills Road												
P6	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
North: Church Street												
P3	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
P3B	Slip/Bypass	50	53	39.1	LOS D	0.1	0.1	0.90	0.90	192.9	200.0	1.04
West: Albert Street												
P4	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
All Pedestrians		250	263	51.2	LOS E	0.2	0.2	0.94	0.94	205.1	200.0	0.98

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Project: T:\Synergy\Projects\21\21.564\Modelling\21.564m01v04.sip9

Site: 101 [Existing PM - Church St / Pennant Hills Rd / Albert St (Site Folder: Weekend Existing 2022 Scenario)]

Church Street & Pennant Hills Road & Albert Street Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Timings based on settings in the Site Phasing & Timing dialog
Phase Times determined by the program
Phase Sequence: Assumed Phasing
Input Phase Sequence: A, B, B1*, B2*, C, D, E*
Output Phase Sequence: A, B, C, D
Reference Phase: Phase A
(* Variable Phase)

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Church Street															
1	L2	All MCs	12	0.0	12	0.0	0.198	8.5	LOS A	1.0	7.2	0.11	0.13	0.11	46.5
2	T1	All MCs	172	5.5	172	5.5	0.198	4.1	LOS A	1.0	8.7	0.14	0.14	0.14	53.2
3a	R1	All MCs	1	0.0	1	0.0	* 0.006	60.8	LOS E	0.0	0.2	0.91	0.56	0.91	32.5
Approach			184	5.1	184	5.1	0.198	4.7	LOS A	1.0	8.7	0.14	0.14	0.14	52.4
NorthEast: Pennant Hills Road															
24a	L1	All MCs	67	0.0	67	0.0	0.066	18.1	LOS B	1.8	12.8	0.50	0.65	0.50	47.1
26a	R1	All MCs	303	2.1	303	2.1	* 0.368	28.1	LOS B	11.7	83.3	0.71	0.75	0.71	42.0
Approach			371	1.7	371	1.7	0.368	26.3	LOS B	11.7	83.3	0.67	0.73	0.67	42.8
North: Church Street															
7b	L3	All MCs	43	2.4	43	2.4	0.361	7.1	LOS A	4.5	31.7	0.37	0.39	0.37	51.8
8	T1	All MCs	213	4.5	213	4.5	* 0.361	11.9	LOS A	4.5	31.7	0.38	0.40	0.38	45.5
Approach			256	4.1	256	4.1	0.361	11.1	LOS A	4.5	31.7	0.38	0.40	0.38	47.4
West: Albert Street															
10	L2	All MCs	20	0.0	20	0.0	0.193	26.2	LOS B	5.5	39.5	0.65	0.68	0.65	32.1
10a	L1	All MCs	295	2.5	295	2.5	0.193	24.7	LOS B	5.5	39.6	0.65	0.67	0.65	43.0
Approach			315	2.3	315	2.3	0.193	24.8	LOS B	5.5	39.6	0.65	0.67	0.65	42.5
All Vehicles			1125	3.0	1125	3.0	0.368	18.9	LOS B	11.7	83.3	0.51	0.54	0.51	44.2

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

MOVEMENT SUMMARY

Site: 101 [Existing + Development PM - Church St / Pennant Hills Rd / Albert St (Site Folder: Weekend Existing + Development Scenario)]

Output produced by SIDRA INTERSECTION Version: 9.1.5.224

Church Street & Pennant Hills Road & Albert Street Intersection
Site Category: (None)
Signals - EQUISAT (Fixed-Time/SCATS) Coordinated Cycle Time = 120 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Vehicle Movement Performance

Mov ID	Turn	Mov Class	Demand Flows [Total veh/h	HV] %	Arrival Flows [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	95% Back Of Queue [Veh. veh	Dist] m	Prop. Que	Eff. Stop Rate	Aver. No. of Cycles	Aver. Speed km/h
South: Church Street															
1	L2	All MCs	12	0.0	12	0.0	0.198	8.5	LOS A	1.0	7.2	0.11	0.13	0.11	46.5
2	T1	All MCs	172	5.5	172	5.5	0.198	4.1	LOS A	1.0	8.7	0.14	0.14	0.14	53.2
3a	R1	All MCs	1	0.0	1	0.0	0.006	60.8	LOS E	0.0	0.2	0.91	0.56	0.91	32.5
Approach			184	5.1	184	5.1	0.198	4.7	LOS A	1.0	8.7	0.14	0.14	0.14	52.4
NorthEast: Pennant Hills Road															
24a	L1	All MCs	67	0.0	67	0.0	0.066	18.1	LOS B	1.8	12.8	0.50	0.65	0.50	47.1
26a	R1	All MCs	320	2.0	320	2.0	0.388	28.4	LOS B	12.5	88.8	0.72	0.76	0.72	41.9
Approach			387	1.6	387	1.6	0.388	26.6	LOS B	12.5	88.8	0.68	0.74	0.68	42.7
North: Church Street															
7b	L3	All MCs	43	2.4	43	2.4	* 0.360	7.1	LOS A	4.5	31.7	0.37	0.39	0.37	51.8
8	T1	All MCs	213	4.5	213	4.5	0.360	11.9	LOS A	4.5	31.7	0.38	0.40	0.38	45.5
Approach			256	4.1	256	4.1	0.360	11.1	LOS A	4.5	31.7	0.38	0.39	0.38	47.4
West: Albert Street															
10	L2	All MCs	20	0.0	20	0.0	0.213	26.5	LOS B	6.2	44.0	0.65	0.68	0.65	32.0
10a	L1	All MCs	328	2.2	328	2.2	0.213	25.0	LOS B	6.2	44.2	0.65	0.68	0.65	42.9
Approach			348	2.1	348	2.1	0.213	25.0	LOS B	6.2	44.2	0.65	0.68	0.65	42.5
All Vehicles			1176	2.9	1176	2.9	0.388	19.3	LOS B	12.5	88.8	0.52	0.55	0.52	44.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Options tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Delay Model: SIDRA Standard (Control Delay: Geometric Delay is included).
Queue Model: SIDRA queue estimation methods are used for Back of Queue and Queue at Start of Green.
Gap-Acceptance Capacity Formula: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Arrival Flows used in performance calculations are adjusted to include any Initial Queued Demand and Upstream Capacity Constraint effects.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance

Mov ID	Crossing	Input Vol. ped/h	Dem. Flow ped/h	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Ped ped	Dist] m	Prop. Que	Eff. Stop Rate	Travel Time sec	Travel Dist. m	Aver. Speed m/sec
South: Church Street												
P1	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
NorthEast: Pennant Hills Road												
P6	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
North: Church Street												
P3	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
P3B	Slip/Bypass	50	53	25.4	LOS C	0.1	0.1	0.90	0.90	179.2	200.0	1.12
West: Albert Street												
P4	Full	50	53	54.3	LOS E	0.2	0.2	0.95	0.95	208.1	200.0	0.96
All Pedestrians		250	263	48.5	LOS E	0.2	0.2	0.94	0.94	202.3	200.0	0.99

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

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Project: T:\Synergy\Projects\21\21.564\Modelling\21.564m01v04.sip9