GTAconsultants

Memorial Avenue, Liverpool
Transport Impact Assessment

Client // Il Capitano Investments Pty Ltd
Office // NSW
Reference // N141480
Date // 25/02/19

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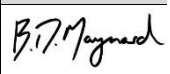
Quality Record

Issue	Date	Description	Prepared By	Checked By	Approved By	Signed
A	25/02/19	Final	Syed Ali	Brett Maynard	Brett Maynard	

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1. Introduction

1.1 Background

It is understood that a development application is to be lodged with Liverpool City Council (Council) for a proposed mixed use development over several properties located at 77-79 Bathurst Street and 84-94 Castlereagh Street, Liverpool.

GTA Consultants (GTA) was commissioned by Il Capitano Investments to prepare a transport impact assessment for the proposed development.

1.2 Purpose of this Report

This report sets out an assessment of the anticipated transport implications of the proposed development, including consideration of the following:

i existing traffic and parking conditions surrounding the site
ii suitability of the proposed parking in terms of supply (quantum) and layout
iii service vehicle requirements
iv pedestrian and bicycle requirements
v the traffic generating characteristics of the proposed development
vi suitability of the proposed access arrangements for the site
vii the transport impact of the development proposal on the surrounding road network.

1.3 References

In preparing this report, reference has been made to the following:

- an inspection of the site and its surrounds
- Liverpool Local Environmental Plan (LEP) 2008
- Liverpool Development Control Plan (DCP) 2008
- Australian Standard/ New Zealand Standard, Parking Facilities, Part 1: Off-Street Car Parking AS/NZS 2890.1:2004
- Australian Standard, Parking Facilities, Part 2: Off-Street Commercial Vehicle Facilities AS 2890.2:2002
- Australian Standard/ New Zealand Standard, Parking Facilities, Part 6: Off-Street Parking for People with Disabilities AS/NZS 2890.6:2009
- traffic and car parking surveys undertaken for Liverpool CBD Study (used with the permission of Liverpool City Council)
- Traffic and Parking Assessment Report for 7-13 Norfolk Street, Liverpool, prepared by Varga Traffic Planning Pty Ltd, dated November 2015
- Section 96(2) Modification for 100 Castlereagh Street, Liverpool (DA-454/2006), 2016
- plans for the proposed development prepared by ALLEN JACK+COTTIER, Drawing Number DA2000, Revision 1, dated 15 November 2018.
- other documents and data as referenced in this report.

2. Existing Conditions

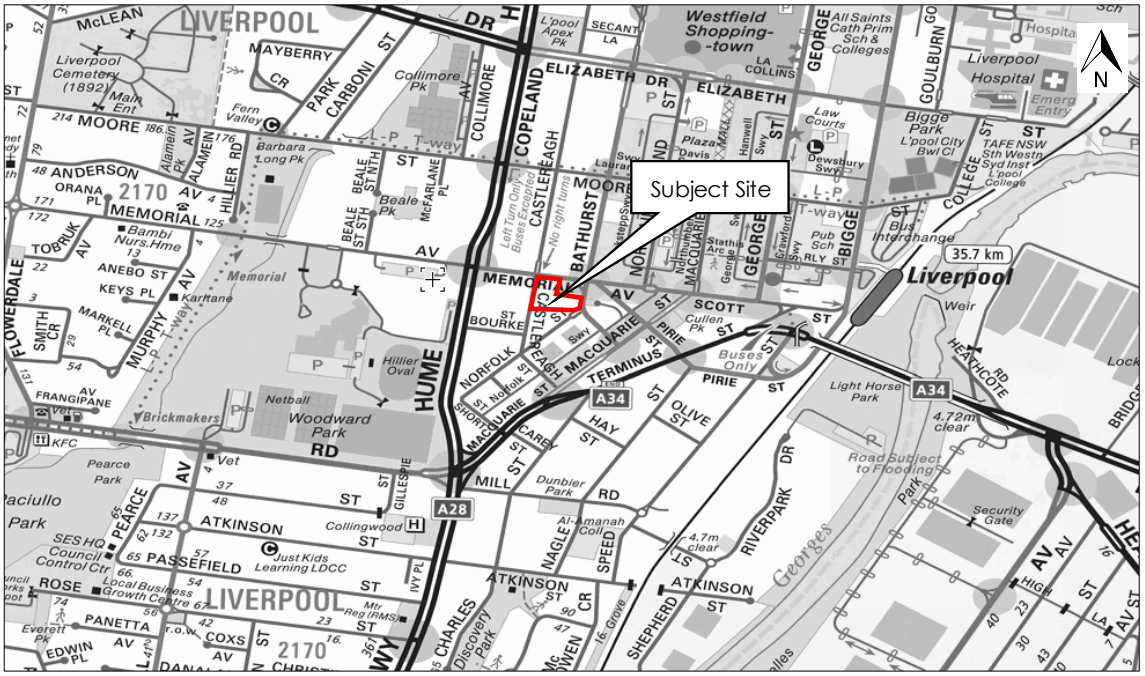
The site is located in the south-west of Liverpool City Centre between Memorial Avenue and Norfolk Street.

The site of approximately 4,333 square metres has frontages of approximately 60 metres to Castlereagh Street, 45 metres to Memorial Avenue and 25 metres to Bathurst Street. The land currently has a land use classification of B4 Mixed Use under the Liverpool Local Environmental Plan (LEP) 2008. The site is currently occupied by retail/ commercial premises including a service station on the northern side of the site.

The surrounding properties predominantly include commercial, retail and high density residential uses.

The location of the subject site and its surrounding environs is shown in Figure 2.1.

Figure 2.1: Subject site and its environs



Basemap source: Sydway Publishing Pty Ltd

2.1 Road Network

2.1.1 Adjoining Roads

Memorial Avenue

Memorial Avenue functions as a collector road and in the vicinity of the site is aligned in an east-west direction, connecting Liverpool Railway Station to the Hume Highway. It is a two-way road configured with two traffic lanes in each direction, set within an approximately 20 metre wide road reserve. The posted speed limit is 50 km/h and limited kerbside parking is permitted outside of peak periods.

Memorial Avenue is shown in Figure 2.2 and Figure 2.3.

Figure 2.2: Memorial Avenue (looking east)

Figure 2.3: Memorial Avenue (looking west)

Castlereagh Street

Castlereagh Street is a local road and in the vicinity of the site is aligned in a north-south direction. It is a two-way road configured with one traffic lane in each direction, set within an approximately 20 metre wide road reserve. Kerbside parking is generally permitted, subject to time restrictions.

Castlereagh Street is shown in Figure 2.4 and Figure 2.5.

Figure 2.4: Castlereagh Street (looking north)

Figure 2.5: Castlereagh Street (looking south)

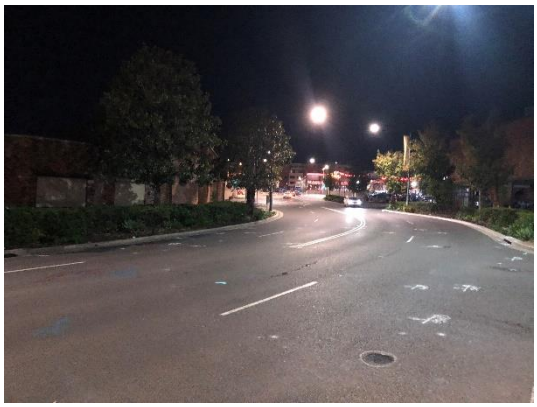
Bathurst Street

Bathurst Street functions as a collector road and in the vicinity of the site is aligned in a north-south direction. It is a two-way road configured with two traffic lanes in each direction, set within an approximately 20 metre wide road reserve. The posted speed limit is 50 km/h. In the vicinity of the site, limited kerbside parking is permitted outside of peak periods on the eastern side of Bathurst Street.

Bathurst Street is shown in Figure 2.6 and Figure 2.7.

Figure 2.6: Bathurst Street (looking north)

Figure 2.7: Bathurst Street (looking east)



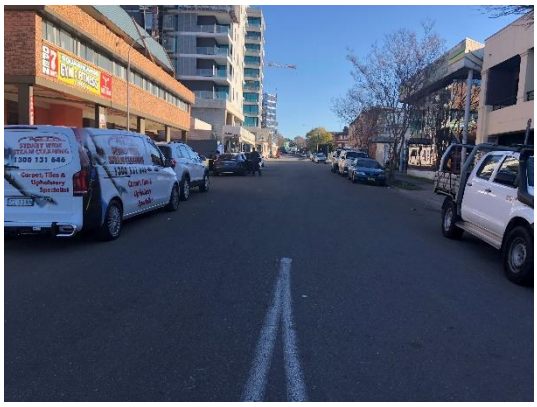
Norfolk Street

Norfolk Street is a local road and in the vicinity of the site is aligned in a northeast-southwest direction. It is a two-way road configured with one traffic lane in each direction, set within an approximately 17 metre wide road reserve. Kerbside parking is permitted, subject to time restrictions.

Norfolk Street is shown in Figure 2.8 and Figure 2.9.

Figure 2.8: Norfolk Street (north east)

Figure 2.9: Norfolk Street (south west)



2.1.2 Surrounding Intersections

The following intersections currently exist in the vicinity of the site and have been assessed to identify the impact of the proposed development:

- Bathurst Street/ Memorial Avenue (signalised)
- Castlereagh Street/ Memorial Avenue (unsignalised)
- Castlereagh Street/ Norfolk Street (unsignalised)
- Memorial Avenue/ Hume Highway (signalised).

Figure 2.10 shows the location of surrounding intersections in the vicinity of site.

Figure 2.10: Surrounding intersections

Base map source: Google maps

2.2 Traffic Volumes

GTA commissioned traffic movement counts on 1 May 2018 at the following intersections between 7am to 9am and 4pm to 6pm during morning and afternoon peak hours:

- Castlereagh Street/ Memorial Avenue (unsignalised)
- Castlereagh Street/ Norfolk Street (unsignalised).

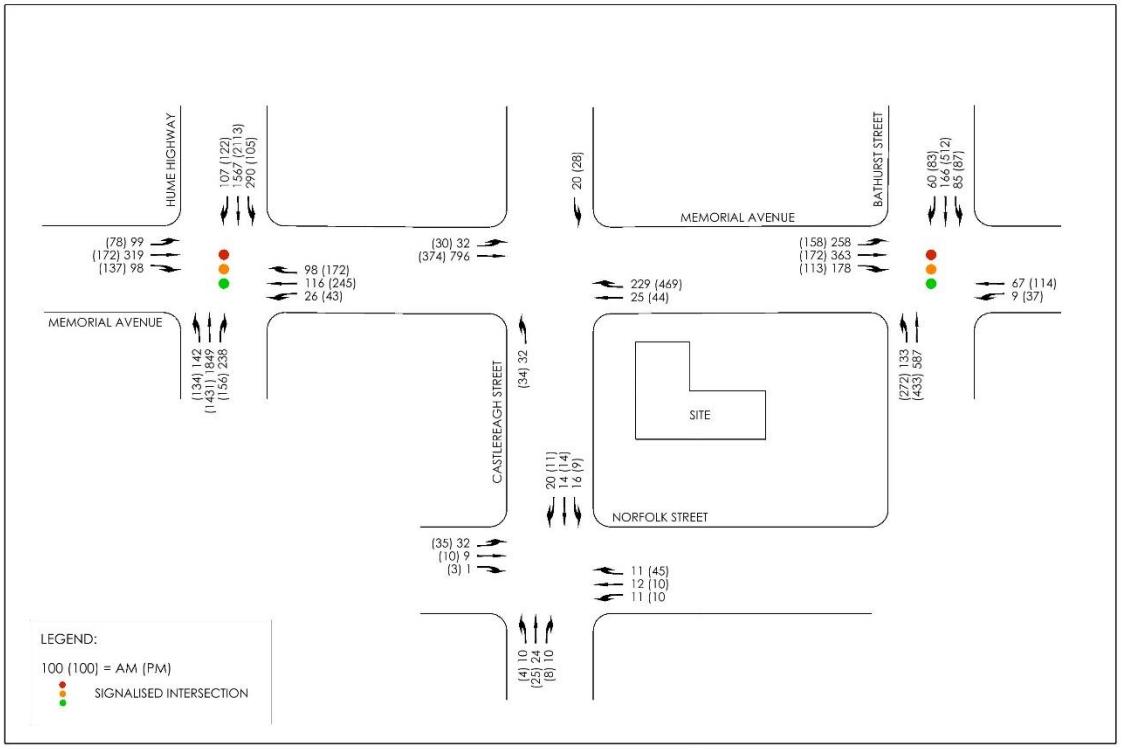
Traffic movement counts at the following intersections were sourced from the Liverpool CBD Study completed by GTA for Council in 2016:

- Bathurst Street/ Memorial Avenue (signalised)
- Bathurst Street/ Macquarie St (signalised)
- Memorial Avenue/ Hume Highway (signalised).

To account for traffic growth between 2016 and 2018, a growth factor was applied to the 2016 data based on the combination of 2018 Sydney Coordinated Adaptive Traffic System (SCATS) traffic volume data and the above 2018 traffic counts. It is noted that due to changes in phase timings at the intersection of Memorial Avenue/ Bathurst Street to accommodate traffic demand, the existing westbound traffic during peak hours passing through the intersection is higher than would otherwise be estimated from a basic growth factor. As such, intersection approaches were considered separately and the volumes adopted are reflective of 2018 traffic conditions.

The AM and PM peak hour traffic volumes are summarised in Figure 2.11.

Figure 2.11: Existing AM / PM Peak Hour Traffic Volumes



2.3 Intersection Operation

The operation of the key intersections within the study area have been assessed using SIDRA INTERSECTION[1], a computer based modelling package which calculates intersection performance.

The commonly used measure of intersection performance, as defined by the Roads and Maritime Services (Roads and Maritime), is vehicle delay. SIDRA INTERSECTION (SIDRA) determines the average delay that vehicles encounter and provides a measure of the level of service.

Table 2.1 shows the criteria that SIDRA adopts in assessing the level of service.

Table 2.1: SIDRA INTERSECTION Level of Service Criteria

Level of Service (LoS)	Average Delay per vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Sign
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	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	Greater than 70	Extra capacity required	Extreme delay, major treatment required

[1] Program used under license from Akcelik & Associates Pty Ltd.

Table 2.2 presents a summary of the existing operation of the intersection, with full results presented in Appendix B of this report.

Table 2.2: Existing intersection operating conditions

Intersection	Peak	Leg	Degree of Saturation (DoS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LoS)
Hume Highway/ Memorial Avenue (signalised)	AM	South	0.96	29	268	C
		East	0.66	82	69	F
		North	0.91	36	283	C
		West	0.84	71	144	F
		Overall	**0.96**	**39**	**284**	**C**
	PM	South	0.97	47	268	D
		East	0.97	98	160	F
		North	0.90	39	397	C
		West	0.62	62	95	E
		Overall	**0.97**	**49**	**397**	**D**
Memorial Avenue/ Castlereagh Street (priority controlled)	AM	South	0.03	8	1	A
		East	0.07	1	0	A
		North	0.02	10	1	A
		West	0.23	1	0	A
		Overall	**0.02**	**10**	**1**	**A**
	PM	South	0.01	7	0	A
		East	0.01	2	0	A
		North	0.01	7	0	A
		West	0.02	4	0	A
		Overall	**0.01**	**7**	**0**	**A**
Memorial Avenue/ Bathurst Street (signalised)	AM	South	0.72	26	86	B
		East	0.05	12	6	A
		North	0.36	24	48	B
		West	0.30	10	45	A
		Overall	**0.72**	**19**	**86**	**B**
	PM	South	0.49	19	54	B
		East	0.10	16	13	B
		North	0.70	23	84	B
		West	0.33	12	37	A
		Overall	**0.70**	**19**	**84**	**B**
Castlereagh Street/ Norfolk Street (priority controlled)	AM	South	0.03	3	0	A
		East	0.03	8	0	A
		North	0.03	4	0	A
		West	0.03	8	0	A
		Overall	**0.03**	**8**	**0**	**A**
	PM	South	0.02	2	0	A
		East	0.07	8	2	A
		North	0.02	3	0	A
		West	0.04	8	1	A
		Overall	**0.07**	**8**	**2**	**A**

On the basis of the above assessment following observations are noted:

- The Hume Highway/ Memorial Avenue intersection currently experiences notable queuing and delays on the north and south approaches. At times the north approach queues during both peak hours extend back to the intersection of Hume Highway/ Moore Street.
- The east approach of the Hume Highway/ Memorial Avenue intersection shows notable queuing during the PM peak hour.
- The east and west approaches of the Hume Highway/ Memorial Avenue intersection experience significant delays during peak periods, given that the Hume Highway approaches are prioritised.
- Overall, the Hume Highway/ Memorial Avenue intersection operates at an acceptable level of service, with an average delay of less than 50 seconds during the peak hours assessed.
- Other intersections within the study area operate satisfactorily, with acceptable queues and minimal delays on all approaches.
- The delays and vehicle queuing observed from the SIDRA analysis is consistent with on-site observations.

2.4 Car Parking

Surrounding the site, on-street parking is generally paid and subject to a one or two hour time restriction, with the exception of Castlereagh Street where parking is unrestricted and Memorial Avenue between Bathurst Street and the Hume Highway where parking is not permitted. Figure 2.12 highlights the locations of available on-street parking and associated restrictions. GTA observed an approximate 90 per cent occupancy rate of all available on-street parking immediately surrounding the site during the weekday PM peak site inspection.

Figure 2.12: On-street parking availability near the site

Base map source: https://maps.six.nsw.gov.au/ (accessed 12/07/2018)

2.5 Public Transport

The site is located approximately 700 metres walking distance from Liverpool Railway Station. Liverpool station is a key interchange on the Sydney Train network and is regularly serviced by the T2-Inner West and South Line, T3-Bankstown line and T5-Cumberland Line. These train services link Liverpool directly with the Sydney CBD, Sydney Airport, western suburbs and eastern suburbs, with a peak hour frequency of approximately five minutes in each direction.

Several regular route bus services are also available within a five minute walking distance from the site, providing local connections as well as direct services to Casula, Holsworthy and Burwood.

The available public transport near the site is summarised in Table 2.3.

Table 2.3: Public Transport Provision

Service	Route #	Route Description	Location of Stop	Distance to Nearest Stop	Frequency On/ Off Peak
Bus	866	Liverpool to Casula	George Street	100m	15minutes peak/ 30minutes off peak
	901	Liverpool to Holsworthy via Wattle Grove			30 minutes peak/hourly off peak
	902	Liverpool to Holsworthy via Moorebank and Hammondville			30 minutes peak/hourly off peak
	903	Liverpool to Chipping Norton			30 minutes peak/ hourly off peak
	M90	Liverpool to Burwood			10 minutes peak/ 15 minutes off peak
Train	T5	Cumberland line - Campbelltown to Schofields	Liverpool station	400m	30 minutes peak/ off-peak
	T3	Liverpool to City via Bankstown			30 minutes peak/ off-peak
	T2	Airport line – Campbelltown or Leppington to City			5-10minutes peak/ 30 minutes off-peak

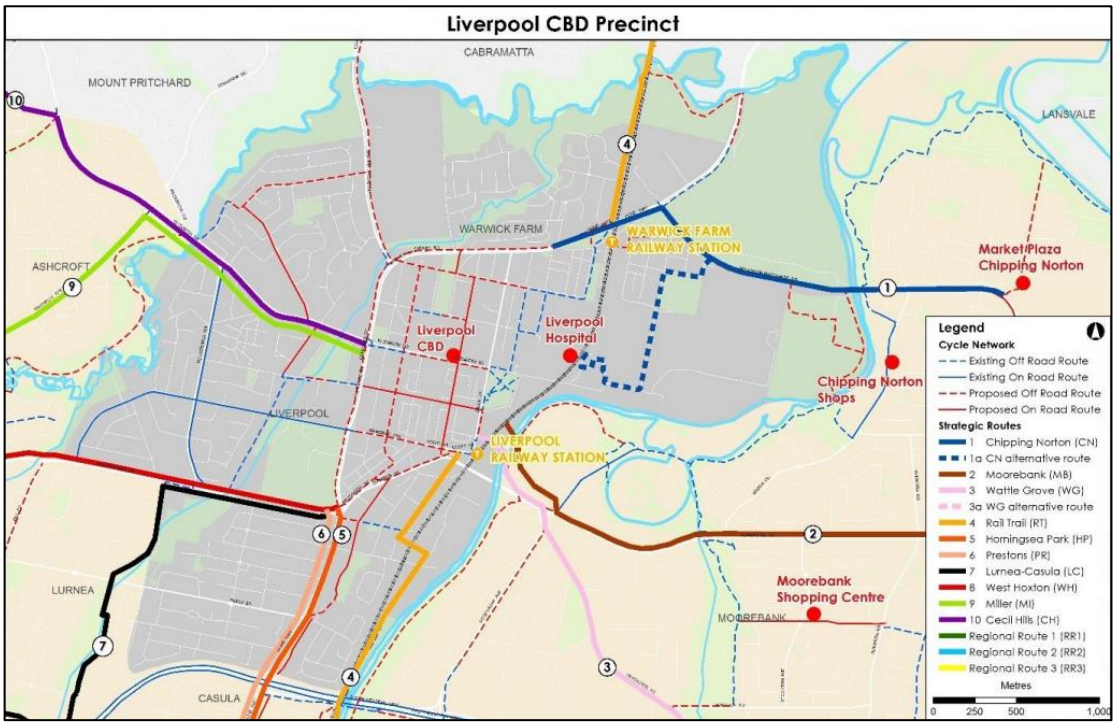
2.6 Walking

Pedestrian paths are available on both sides of all surrounding roads near the site. Memorial Avenue provides a key pedestrian link between the site and Liverpool Railway Station (as well as west to the Whitlam Leisure Centre), while Bathurst Street provides a pedestrian link between the site and Liverpool CBD core including Westfield Shopping Centre. Pedestrian crossing facilities are available on all legs of the Memorial Avenue/ Bathurst Street intersection adjacent to the site.

2.7 Cycling

There is limited dedicated bicycle infrastructure near the site. Figure 2.13 shows the extent of bicycle network within the Liverpool CBD Precinct and highlights Council's draft future bike network plan. Key initiatives of this plan include connecting Liverpool City Centre with surrounding suburban areas as well as suburban shopping centres. This includes the provision of an off-road bike path along Terminus Street and Bathurst Street, connecting with other routes in the CBD as well as strategic regional routes.

Figure 2.13: Draft Liverpool Bike Plan (existing and proposed routes)



Source: Draft Liverpool Bike Plan 2017-2022

2.8 Crash Data

Roads and Maritime provided GTA with recorded crash history data for the key intersections near the site detailed in Section 2.1.2. The data provided was for the most recent 5-year period available (1 January 2012 – 31 December 2016) as well as any provisional data since (1 January 2017 – 23 April 2018).

Detailed GIS analysis of the data was completed to identify any potential road safety deficiencies near the site.

A summary of crash history is as follows, with a graphical illustration is shown in Figure 2.14:

- A total of 67 crashes have occurred since January 2012, with 43 resulting in injury and 24 resulting in non-casualty (towaway) collisions. No fatalities were recorded.
- Out of 18 crashes on Bathurst Street, approximately 60 per cent of crashes occurred at the Memorial Avenue/ Bathurst Street intersection and 40 per cent of crashes occurred at the Bathurst Street/ Norfolk Serviceway intersection. No particular crash trends are evident.
- 16 crashes were recorded at the priority controlled intersection of Castlereagh Street/ Memorial Avenue, with most of them occurring due to vehicles approaching Memorial Avenue from Castlereagh Street.
- No specific safety issues have been identified from the crash data.

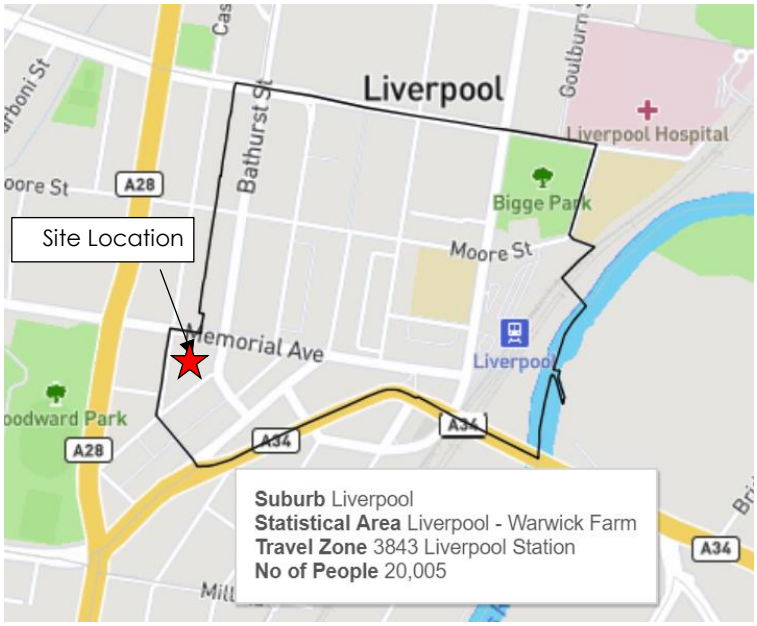
Figure 2.14: Crash history data surrounding the site

2.9 Travel Patterns

Journey to Work (JTW) 2011 data information was gathered from the Bureau of Transport Statistics (BTS) for the travel zone in Liverpool which contains the site (TZ 3843). The Travel Zone (TZ) is the smallest geographical area for which JTW data is available.

The travel zone with proposed development is shown in Figure 2.15.

Figure 2.15: Analysed JTW travel zone (TZ 3843)



Source: NSW Government Bureau of Transport Statistics, JTW Explorer

Residents

The JTW data indicates that there are approximately 817 residents within the selected travel zone, of which 297 are employed. Approximately 61 per cent of employed residents travelled to work by private vehicle (either as the driver or passenger) whereas 26 per cent utilised public transport. Residents commute to the following key destinations:

- 30 per cent travel within the Liverpool area
- 10 per cent travel to the Fairfield area
- 8 per cent travel to the Sydney Inner City area
- 6 per cent travel to the Bankstown area
- 6 per cent travel to the Bankstown area
- 6 per cent travel to the Auburn area
- 4 per cent travel to the Campbelltown area
- 30 per cent to other areas.

The higher number of vehicle trips are to Liverpool, Fairfield and Bankstown. Most of the trips to Sydney inner city are made by public transport.

Employees

The JTW data indicates that 6,019 persons work in the selected travel zone. Approximately 83 per cent of employees travelled to work by private vehicle (either as the driver or passenger) and 13 per cent utilised public transport.

Employees commute to Liverpool from the following key origins:

- 20 per cent travel from within the Liverpool area
- 13 per cent travel from the Campbelltown area
- 12 per cent travel from the Fairfield area
- 12 per cent travel from the Bringelly - Green Valley area
- 6 per cent travel from the Camden area
- 4 per cent travel from the Bankstown area
- 4 per cent travel from the Merrylands – Guildford area
- 28 per cent from other areas.

JTW Travel Mode Summary

The JTW data for the selected travel zone is presented in Table 2.4.

Table 2.4: JTW 2011 travel mode splits for selected TZ (TZ 413, TZ 415)

Mode of travel	Residents living in selected travel zone	Employees working in selected travel zone
Car driver	55%	77%
Car passenger	6%	6%
Train	24%	9%
Bus	2%	4%
Walked only	9%	3%
Other / Not stated	4%	1%

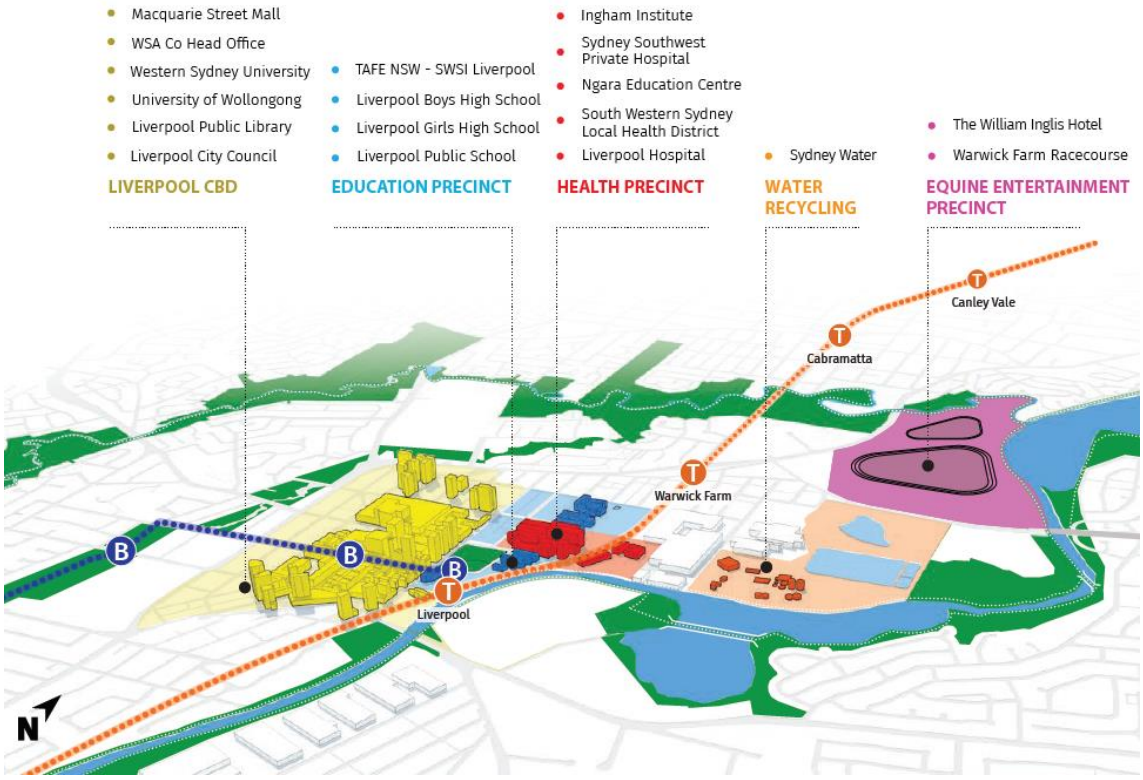
Source: NSW Government Bureau of Transport Statistics

2.10 Planning Context and Transport Studies

2.10.1 Regional context

Liverpool is identified in Greater Sydney Region Plan as a metropolitan cluster serving the Western Parkland City. Liverpool centre will comprise a strong retail and economic core, supported by a broad health, community and education precinct, as shown in Figure 2.16.

Figure 2.16: Liverpool Centre



Source: Greater Sydney Region Plan, 2018, Sydney Greater Commission

Liverpool is part of Western Sydney City Deal which includes the following commitments that will benefit Liverpool:

- Build a rail link to the new Western Sydney Airport by the time it opens in 2026.
- Establish an education precinct at North Bringelly, with trade training, a specialist science and maths high school and a new university.
- Open a Federal-State-Local Industry Attraction Office in Liverpool to attract jobs and industry.
- Create a $150 million Liveability Fund to support major community projects.
- Open an Indigenous Opportunity Hub in Liverpool to support Aboriginal employment and businesses.

In addition, the Liverpool Collaboration has been created to deliver coordinated planning to support growth in the area and foster increased productivity, innovation and attractivity. It will produce a Place Strategy and Infrastructure Plan. The Liverpool Collaboration Area Stakeholder Group has identified issues including transport and traffic constraints, the need to improve local amenity and the quality of shared public space, and the need to attract industry and create jobs in the area.

2.10.2 Local Context

Liverpool City Council submitted a planning proposal (Amendment No 52) to rezone portions of the City Centre from B3 to B4 to facilitate mixed use development comprising, amongst other land uses, 7,000 residential units. It is noted that the proposed development at Memorial Avenue is outside of the area but adjacent to it.

A Transport Strategy was developed to support the intended changes to land use. The strategy included a package of multimodal transport interventions to encourage and support a modal shift towards the use of more sustainable modes of transport. This shift is required in order for Liverpool City Centre to grow and develop into an economically successful and vibrant regional centre as intended. A 10% reduction in the car driver mode share has been identified as a mode shift target.

The strategy also included mesoscopic traffic modelling for the years 2026 and 2031, which identified future recommended infrastructure upgrades in the Liverpool City Centre. An overall 10% reduction was applied to future vehicle demand in 2031 as per the mode share target.

2.11 Other Developments in Surrounding Area

Considering the rapid construction pattern in and around Liverpool CBD, a review of Council's e-planning portal has been completed to identify other planned or approved developments in the surrounding area. The following developments have either been approved or under construction:

- 10 Norfolk Street (DA-454/2006)
- 7-13 Norfolk Street (DA-496/2016).

10 Norfolk Street (under construction)

The approved development at 10 Norfolk Street is a mixed use development located to the south of proposed development. It comprises of two residential towers providing 338 residential units and 355 square metres of retail and commercial land uses including a child care facility.

7-13 Norfolk Street (approved DA)

This approved development is located to the south of the proposed development. The development consists of a 25 storey mixed use residential and commercial building, comprising 132 residential apartments and 1,024 square metres of commercial land use.

The two sites are shown in Figure 2.17.

Figure 2.17: Approved developments surrounding the site

Basemap source: Nearmap

3. Development Proposal

3.1 Land Uses

The proposal comprises a mixed-use development that includes 264 residential apartments in the east and west towers along with retail and commercial floor area located on ground and first floor. The proposal also includes three levels of basement car park. The development schedule is summarised in Table 3.1.

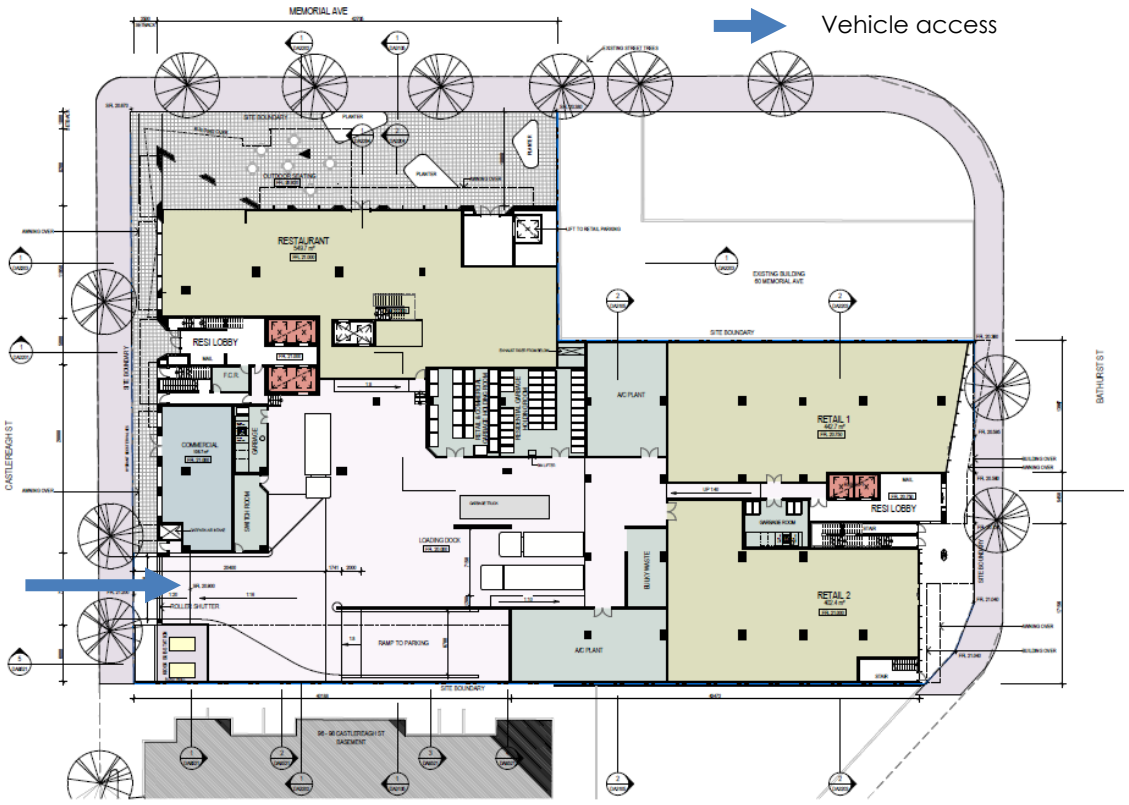
Table 3.1: Development Schedule

Use	Size
Residential	264 units
Commercial	111 m^2 GFA
Retail	844 m^2 GFA
Restaurant	1,009 m^2 GFA

3.2 Access

The proposed development would provide a single consolidated vehicle access to basement parking and loading area via a crossover on Castlereagh Street. Pedestrian accesses will be provided from Castlereagh Street, Memorial Avenue and Bathurst Street. The location of the vehicle access is shown in Figure 3.1.

Figure 3.1: Proposed vehicle access to the site



Source: ALLEN JACK+COTTIER, Drawing Number DA2000, Revision 1, dated 12 November 2018

3.3 Car Parking

The proposed development would provide a total of 318 car parking spaces within three levels of basement car park. The breakdown of car parking spaces is:

- residential – 306 spaces including 27 visitor spaces
- retail, commercial and restaurant – 12 spaces.

In addition, 16 motorcycle parking spaces are also proposed within the basement car park.

The suitability of the car parking provision and layout is discussed in Section 4 of this report.

3.4 Bicycle Facilities

The development plans show parking for 182 bicycles, including 156 bicycle spaces (in 78 double stacked lockers) for residents and 26 bicycle spaces for visitors and retail. These bicycle spaces are distributed within each basement level.

3.5 Loading Areas

The development would provide a dedicated loading area located on the ground floor adjacent to the access ramp to the basement. The loading area would be accessed via Castlereagh Street through the proposed entry/exit crossover to the site. Waste collection would also occur in this loading area. The loading area can accommodate up to four Medium Rigid Vehicles (MRVs), including one garbage truck up to 10.6 metres long.

The current layout of the loading area could allow for an additional loading bay for a vehicle up to 6.4m x 3.5m SRV east of the northern loading bay and next to the garbage room of the proposed commercial use.

The loading area had been designed to cater trucks to enter and exit in a forward direction.

4. Parking and Loading Facilities

4.1 Car Parking Requirements

The car parking requirements for different development types are set out in the Liverpool Development Control Plan (DCP) – Part 4 Development in Liverpool City Centre (2008) and Liverpool LEP (2008). A review of the car parking rates and the floor area schedule results in DCP and LEP parking requirement for the proposed development as summarised in Table 4.1.

Table 4.1: Car parking requirements

Description	Use	Size	Liverpool DCP (2008) or LEP (2008) Parking Rate	Parking Requirement
Residential	One-bedroom apartment	28 units	1 space per apartment	28 spaces
	Two-bedroom apartment	206 units	1 space per apartment	206 spaces
	Three or more-bedroom apartment	30 units	1.5 spaces per apartment	45 spaces
	Visitor	264 units	0.1 spaces per apartment	27 spaces
			Subtotal	**306 spaces**
All Other Development	Commercial	111 m^2 GFA	1 space per 200 m^2 (ground floor) + 1 space per 150 m^2 (other levels)	1 space
	Retail	844 m^2 GFA (ground floor)	1 space per 200 m^2 (ground floor)	5 spaces
	Restaurant	562 m^2 GFA (ground floor) 447 m^2 GFA (other levels)	1 space per 200 m^2 (ground floor) + 1 space per 150 m^2 (all other levels)	6 spaces
			Subtotal	**12 spaces**
			Total	**318 spaces**

Table 4.1 identifies that the proposed development is required to provide a minimum of 318 car parking spaces. The Liverpool Council DCP (2008) requires minimum two per cent of total parking demand to be provided as accessible parking spaces. Therefore, the proposed development is required to provide a minimum of seven (7) accessible parking spaces.

4.2 Motorcycle and Bicycle Parking Requirements

The proposed development is required to provide motorcycle and bicycle parking facilities in accordance with the requirements set out in the DCP 2008. Table 4.2 summarises the DCP 2008 bicycle and motorcycle parking requirements for the proposed development.

Table 4.2: Motorcycle and bicycle parking provisions

Description	Liverpool DCP (2008) Parking Rate	Size	Liverpool DCP (2008) Parking Requirement
Motorcycle Parking	1 space per 20 car spaces	318 car spaces	16 spaces
Bicycle Parking	1 space per 200 m^2 GFA. (15 per cent accessible to visitors)	25,998 m^2 GFA	130 spaces (including 20 visitor spaces)

The proposed development is required to provide the following:

- 16 motorcycle parking spaces
- 130 bicycle parking spaces, including 20 visitor spaces.

DCP 2008 also recommends that bicycle parking is secure and in accessible locations with weather protection. The commercial and retail components would also need to provide adequate shower and change facilities for cyclists should they employ a combined 20 or more staff. Any such facilities should be located close to the bicycle parking facilities.

4.3 Loading Requirements

Given the provision of commercial, retail, residential apartments and other land uses, the Liverpool DCP requires loading areas be provided. The DCP requirements for loading are summarised in Table 4.3.

Table 4.3: Service vehicle requirements (Liverpool DCP 2008)

Land Use	Size	Liverpool DCP (2008) Service Vehicle Parking Rate	Liverpool DCP (2008) Service Vehicle Parking Requirement
Residential	264	1 space per 40 units, including removalist vans and car washing bays, up to a maximum of 4 spaces per building.	4 spaces
All Other	Sufficient service and delivery vehicle parking adequate to provide for the needs of the development		

4.4 Adequacy of Parking Supply

The development proposes a total of 318 car parking spaces and therefore complies with the Liverpool LEP and DCP car parking requirements of a minimum 318 spaces.

The proposed parking provision is based on three levels of basement car park with the following breakdown:

- residential – 306 spaces including 27 visitor spaces
- retail, commercial and restaurant – 12 spaces.

The development would also provide 24 accessible parking spaces spread across the three levels of basement car park, in compliance with the Liverpool DCP 2008 parking requirement for people with disabilities and in line with the provision made for adaptable dwellings.

In addition, the development proposes 16 motorcycle and 182 bicycle parking spaces within the basement car park and therefore complies with the relevant Liverpool DCP 2008 requirements. The bicycle parking provision includes 26 spaces for retail and residential visitors.

On the basis of this assessment, the on-site parking provision is expected to be capable of accommodating the parking demands associated with the proposed development.

4.5 Adequacy of Proposed Loading Arrangements

The proposed loading provision would accommodate four loading bays for MRV and one loading bay for SRV and therefore complies with Liverpool DCP 2008 loading requirements.

The loading provision breakdown is as follows:

- One bay for vehicles up to a 10.6 metre garbage truck
- Three bays for vehicles up to an 8.8 metre MRV
- One bay for vehicles up to a 6.4 metre SRV.

This provision is appropriate considering the scale of the development. Efficiencies would be achieved through the mixed-use nature of the development with differing timing requirements for service vehicle activity. Many of the service vehicles are expected to deliver small loads with a short duration of stay. It is expected that many of these vehicles will likely be cars/ utes/ vans and small rigid trucks considering the site location within the Liverpool City Centre. Any further requirements for maintenance and trade vehicles could be accommodated by the available public (visitor) parking.

It is recommended that a loading dock/service bay management plan be prepared to assist the understanding and operational efficiency of these facilities.

Swept path analysis has been completed to demonstrate compliance with AS 2890.2:2002 and is provided in Appendix E.

4.6 Car Parking Area Layout Review

The car park layout has been reviewed against the requirements of the Liverpool Development Control Plan (DCP)*and* the Australian Standard for Off Street Car Parking (AS/NZS2890.1:2004 and AS/NZS2890.6:2009). This assessment included a review of the following:

- bay and aisle width (including motorcycles)
- adjacent structures
- turnaround facilities
- circulation roads and ramps
- ramp grades
- height clearances
- internal queuing
- parking for persons with disabilities.

This review indicates that the proposed car parking layout is expected to operate satisfactorily. The residential parking would be secured by a remote-controlled gate. Access to the loading dock and the basement car park is proposed via a crossover to/from Castlereagh Street. The proposed access would operate safely and efficiently, however noting that street trees have the potential to restrict sight lines.

Swept path analysis has been completed and is provided in Appendix E.

5. Trip Generation and Distribution

5.1 Trip Generation

5.1.1 Person-Trips (all modes)

Trip generation estimates for the proposal have been sourced from Roads and Maritime *Guide to Traffic Generating Developments (2002)* and Roads and Maritime Technical Direction *Updated traffic surveys* (TDT 2013/04a). *Guide to Traffic Generating Developments* has historically been referenced when assessing the future trip generation for a given development. TDT 2013/04a provides updated guidance based on more recent surveys.

All modes have been considered in the trip generation, and the adopted person-trip generation rates for the AM and PM peak (1-hour period) are set out in Table 5.1.

Table 5.1: Weekday peak trip generation rates

Land use	Area/ dwellings	Trip generation rate (person-trips)		Source
		AM	PM	
High density residential	264 dwellings	0.67 trip/unit	0.62 trip/unit	TDT 2013/04a (average all sites)
Commercial	111m^2 GFA[3]	2.26 trips per 100 m^2 GFA	1.72 trips per 100 m^2 GFA	TDT 2013/04a (average all sites)
Retail	633m^2 GLFA[1]	12 trips per 100 m^2 GFLA [2]	24 trips per 100 m^2 GFLA	RMS 2002[4] and TDT 2013/04a GTA Research
Restaurant	1,009 m^2 GFA	0 trip per 100 m^2 GFA	13 trips per 100 m^2 GFA	RMS 2002 [5]

[1] based on a 75 per cent ratio for GFA to GLFA
[2] based on a 50% ratio for morning to evening peak hour generation
[3] restaurant opening hours are outside of AM peak period
[4] RMS 2002 indicates peak hour generation rate of 12 vehicle trips per 100m2 GFLA for the 0-10,000m2 GLFA range, based on a car driver mode split of 49%, which gives a total 24 person trips for all modes of transport.
[5] RMS 2002 indicates peak hour generation rate of 5 vehicle trips per 100m2 GFA based on a car driver mode split of 39%, which gives a total of 13 person trips for all modes of transport

First-principles trip generation analysis has also been conducted for the residential component in order to check the appropriateness of selected rates. The analysis is presented in Appendix A and shows that selected rates are appropriate.

Based on the above trip generation rates, estimates of peak hour person-trip volumes generated by the proposed development are set out in Table 5.2.

Table 5.2: Peak hour trip generation (all modes)

Land Use	Area/ dwellings	Generated Trips (person-trips)	
		AM	PM
High density residential	264 dwellings	177	164
Commercial	111m^2 GFA[3]	3	2
Retail	633m^2 GLFA[1]	76	152
Restaurant	1,009 m^2 GFA	0	131
Total		**256**	**449**
Existing site (trips to be removed)		-35	-42
Total net		**221**	**407**

Table 5.2 indicates that the site could potentially generate 256 person-trips (all modes) in the AM peak hour and 449 person-trips in the PM peak hour.

By way of comparison, the current site uses would have typically generated in the order of 35 and 42 person-trips in the AM and PM peak hour respectively, based on counts realised at entry and exit points on Tuesday 1 May 2018.

As such, the net trip generation for the site is 221 person-trips in the AM peak and 407 in the PM peak. This includes linked trips, which are discussed in the next section.

5.2 Linked Trips

Considering the location of the site within the Liverpool City Centre and the limited scale of retail and community uses within the proposed mixed-use development, it is expected that a proportion of trips will be linked trips or multi-purpose trips between land uses within the site or in close proximity.

In particular, it is expected that the non-residential uses would complement the residential use on-site as well as the residential and commercial uses in the vicinity. For example, residents of the proposed development or staff and residents of adjacent sites would access the retail proposed within the site for convenience and easy access. As such, the retail component would not be generating significant new or additional trips during the morning and evening peak hours.

In addition, it is expected that the restaurant would also partially cater for residents and employees of the site and vicinity. It would however also attract external trips.

Based on these considerations, the following assumptions have been developed for trip generation:

- Retail: 60% of the retail activity would be trips linked to other trips or self-contained trips, and only 40% would be new trips to be considered in this assessment.
- Restaurant: 20% of the trips generated by the restaurant are expected to be linked with other trips or self-contained trips, and only 80% would be new trips to be considered in this assessment.

5.3 Mode Share

5.3.1 Existing (Baseline)

The existing mode shares for the site for each land use are presented in Table 5.3 and based on the following:

- Residential use: existing JTW mode share of employed residents living in Liverpool CBD, corrected to incorporate other purposes (i.e. other than commuting) based on the analysis of the mode share of Liverpool residents sourced from the Household Travel Survey 2016/17 (based on SA3 boundary). More details are presented in Appendix A.
- Commercial use: existing JTW mode share of employees working in Liverpool CBD.
- Retail use: HTS 12/13 Sydney average for shopping purpose trips (also consistent with RMS 2002 *Guide to Traffic Generating Developments* mode share).
- Restaurant: HTS 12/13 Sydney average for social/ recreation purpose trips (also consistent with RMS 2002 *Guide to Traffic Generating Developments* mode share).

Table 5.3: Existing mode share for the site by land use

Mode share	Residential	Commercial	Retail	Restaurant
Car driver	47%	77%	53%	36%
Car passenger	15%	6%	13%	27%
Train	12%	9%	3%	3%
Bus	4%	4%	4%	4%
Walked or cycled	22%	4%	27%	30%
Total	100%	100%	100%	100%

5.3.2 Future Mode Share

The mode share for the site and more generally in Liverpool CBD is expected to change towards an increased use of sustainable modes of transport due to the following:

- reduced parking supply as required by the DCP
- growth in the number of residents and jobs enabling a higher local catchment for the different uses
- ongoing development surrounding the site and more generally within the City Centre, and associated change in the urban environment, with higher density and less reliance on the private car
- future improved walkability and cycling connectivity within the City Centre
- commitments to green travel planning to encourage a change in travel behaviours.

As presented in section 2.10, the target set by the City of Liverpool is a 10% reduction in the mode share of "car driver" for the CBD area. This reduction has been applied for all land uses. As such, the future expected mode share for the site per land use is shown in Table 5.4.

Table 5.4: Future mode share for the site per land use

Mode share	Residential	Commercial	Retail	Restaurant
Car driver	37%	67%	43%	26%
Car passenger	12%	6%	11%	20%
Train	15%	12%	3%	3%
Bus	6%	6%	4%	4%
Walked or cycled	30%	9%	39%	47%
Total	**100%**	**100%**	**100%**	**100%**

Based on the above and the reduction factors due to linked and self-contained trips, the trip generation rates per mode for the proposed site for the different land uses are summarised in Table 5.5 and Table 5.6.

Table 5.5: Trip generation rates per mode – AM Peak

Land Use	Person-trip rate	Vehicle-trip rate	Person Train-trip rate	Person Bus-trip rate	Person Active transport-trip rate
High density residential	0.67	0.25	0.10	0.04	0.20
Commercial	2.26	1.51	0.27	0.14	0.20
Retail (supermarket)	4.80	2.06	0.14	0.19	1.87
Restaurant	0.00	0.00	0.00	0.00	0.00

Table 5.6: Trip generation rates per mode – PM Peak

Land Use	Person-trip rate	Vehicle-trip rate	Person Train-trip rate	Person Bus-trip rate	Person Active transport-trip rate
High density residential	0.62	0.23	0.09	0.04	0.19
Commercial	1.72	1.15	0.21	0.10	0.15
Retail (supermarket)	9.60	4.13	0.29	0.38	3.74
Restaurant	10.40	2.70	0.31	0.42	4.89

It is noted that the vehicle-trip rates obtained in Table 5.5 and Table 5.6 for the residential and commercial uses are similar to those recommended by RMS which are:

- 0.24 vehicle trips/ unit for high density residential development within metropolitan regional centres (TDT 2013/14a)
- 1.6 and 1.2 vehicle trips/ 100 sqm for office blocks for the AM and PM peak respectively (TDT 2013/14a).

The vehicle-trip rates for the retail and restaurant uses are lower due to the discount applied for linked and self-contained trips and due to a higher proportion of active mode trips, in-line with the vision for Liverpool CBD and the limited provision of parking on site (provision of only 14 spaces for the retail and the restaurant).

Council's lower parking requirements for retail and commercial uses in the Liverpool City Centre seek to minimise the reliance on private motor vehicle usage. As such, it is expected that vehicle-trip generation rates would be lower for those uses.

5.4 Traffic Generation Summary

Based on the above information, Table 5.7 and Table 5.8 set out the resultant trip generation for both the morning/ evening peak hour periods respectively, after deduction of linked and self-contained trips.

Table 5.7: Generated trips per mode – AM Peak

Land Use	Person-trips	Vehicle trips	Train trips	Bus trips	Active transport trips
High density residential	156	66	26	11	53
Commercial	2	2	0	0	0
Retail (supermarket)	27	13	1	1	12
Restaurant	0	0	0	0	0
Total	**185**	**81**	**27**	**12**	**65**
Existing site (trips to be removed)	-35	-31	-4	0	0
Total net impact	**150**	**50**	**23**	**12**	**65**

Table 5.8: Generated trips per mode – PM Peak

Land Use	Person-trips	Vehicle trips	Train trips	Bus trips	Active transport trips
High density residential	146	61	24	11	50
Commercial	1	1	0	0	0
Retail (supermarket)	54	26	2	2	24
Restaurant	83	27	3	4	49
Total	**284**	**115**	**29**	**17**	**123**
Existing site (trips to be removed)	-42	-37	-5	0	0
Total net impact	**242**	**78**	**24**	**17**	**123**

The tables indicate that the site could generate:

- additional 150 person-trips during the AM peak hour and 241 person-trips during the PM peak hour
- additional 50 vehicle-trips during the AM peak hour and 78 vehicle-trips during the PM peak hour
- additional 35 public transport trips during the AM peak hour and 41 public transport trips during the PM peak hour
- additional 65 active transport trips during the AM peak hour and 123 active transport trips during the PM peak hour.

5.5 Distribution and Assignment

The directional distribution and assignment of traffic generated by the proposed development will be influenced by a number of factors, including the:

i configuration of the arterial road network in the immediate vicinity of the site
ii existing operation of intersections providing access between the local and arterial road network
iii distribution of households in the vicinity of the site
iv surrounding employment centres, retail centres and schools in relation to the site
v likely distribution of employee's residences in relation to the site
vi configuration of access points to the site.

Having consideration for the above, the assumed directional distributions for the site are shown in Figure 5.1 and Figure 5.2.

Figure 5.1: Trip distribution in the AM peak

Figure 5.2: Trip distribution in the PM peak

In addition, the directional split of traffic (i.e. the ratio between inbound and outbound traffic movements) is summarised in Table 5.9 for weekday AM and PM peaks.

Table 5.9: Weekday peak directional traffic split (external trips)

Land use type	AM Directional split		PM Directional split	
	In	Out	In	Out
High density residential	20%	80%	80%	20%
Commercial	80%	20%	20%	80%
Retail	50%	50%	50%	50%
Restaurant	-	-	50%	50%

6. Traffic Impact Assessment

6.1 Future Base Case

6.1.1 Assumptions

Future traffic volumes without the development were estimated considering:

- Overall increase in background traffic volumes in the CBD area: a 2 per cent per annum background traffic growth rate had been applied for all roads in the CBD area based on recent trends (SCATS detector traffic volume data).
- Additional traffic due to completion of adjacent sites currently being constructed:
  - 10 Norfolk Street: estimated additional 100 vehicles trips during the peak hour
  - 7-13 Norfolk Street: estimated additional 38 vehicles trips during the peak hour.

More information on these two sites and the assumptions made for the traffic estimates is discussed below.

The distribution of the traffic generated by adjacent developments is assumed to be the same as the proposed site generated traffic.

10 Norfolk Street

The site at 10 Norfolk Street is a mixed-use development comprising 298 residential units, as well as retail/commercial areas including:

- Child care centre: 480 m^2
- Convenience store: 314 m^2
- Coffee Shop: 220 m^2.

Using the same traffic generation rates as those selected for the proposed development, the traffic generated by the site is expected to be approximatively 100 trips in the AM and PM peak, as shown in Table 6.1.

Table 6.1: Proposed traffic generation

Land use	Size	Traffic Generation Rate	Traffic Generation Estimate
Residential	298 units	0.24 per unit	72
Retail	236 m^2 GLFA[1]	2-4* per 100 m^2 GFA	5-10
Cafe	220 m^2 GFA	2.75* per 100 m^2 GFA	6
Child Care	480 m^2 GFA	2.6* per 100 m^2 GFA	12
Traffic generated			**95-100 trips**

Note: rates are those obtained after discounting linked trips and self-contained trips. Given the small size and local nature of the proposed land uses, the following discounts have been applied: retail (convenience store): 60% discount, café:60% discount, child care: 60% discount.
[1] based on a 75 per cent ratio for GFA to GLFA
Source for GFA: Public Determination Documents for DA-454 2006 B 100 Castlereagh Street Liverpool

While the previous uses of the site could potentially generate a similar number of trips and offset the number of trips generated by the new use, the estimated 100 trips generated by the 10 Norfolk Street development should be added in the future base case scenario since

the site is currently under construction and there are no trips generated by the site in the existing conditions (with the exception of construction traffic).

7-13 Norfolk Street (DA-496/2016)

The site at 7-13 Norfolk Street is a 25-storey mixed use development comprising 132 residential apartments and 1,024sqm of commercial area.

The traffic report accompanying the development application estimated the net impact of the site in terms of trip generation (after discounting existing trips) to be 39 vehicle trips during any peak hour.

6.1.2 Intersection Operation

The surrounding intersections were assessed for the Future Base Case (2021) using SIDRA INTERSECTION. Table 6.2 presents a summary of the anticipated operation of the study intersections for the Future Base Case, with full results presented in Appendix C of this report.

It is noted that intersections were analysed with optimised cycle lengths, given the background growth in traffic would generally change the demand and SCATS will adjust the phase times for efficient traffic signal operation.

Table 6.2: Future Base Case intersection operating conditions

Intersection	Peak	Leg	Degree of Saturation (DoS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LoS)
Hume Highway/ Memorial Avenue (signalised)	AM	South	0.94	32	341	C
		East	0.96	93	98	F
		North	0.95	56	414	D
		West	0.94	79	164	F
		Overall	**0.96**	**50**	**414**	**D**
	PM	South	0.95	51	310	D
		East	0.94	89	169	F
		North	0.97	52	519	D
		West	0.92	86	132	F
		Overall	**0.97**	**58**	**519**	**E**
Memorial Avenue/ Castlereagh Street (priority controlled)	AM	South	0.07	8	1	A
		East	0.08	1	0	A
		North	0.02	10	1	A
		West	0.24	1	0	A
		Overall	**0.24**	**10**	**1**	**A**
	PM	South	0.10	9	0	A
		East	0.15	4	17	A
		North	0.02	8	0	A
		West	0.12	4	0	A
		Overall	**0.15**	**9**	**17**	**A**
Memorial Avenue/ Bathurst Street (signalised)	AM	South	0.37	12	60	A
		East	0.19	35	12	C
		North	0.22	12	33	A
		West	0.35	29	80	C
		Overall	**0.72**	**20**	**80**	**B**
	PM	South	0.72	23	69	B

Intersection	Peak	Leg	Degree of Saturation (DoS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LoS)
		East	0.38	36	23	C
		North	0.54	17	78	B
		West	0.50	19	54	B
		Overall	**0.72**	**21**	**78**	**B**
Castlereagh Street/ Norfolk Street (priority controlled)	AM	South	0.03	3	0	A
		East	0.04	8	0	A
		North	0.06	3	0	A
		West	0.03	8	0	A
		Overall	**0.06**	**8**	**0**	**A**
	PM	South	0.03	2	0	A
		East	0.09	8	2	A
		North	0.04	3	0	A
		West	0.04	8	1	A
		Overall	**0.09**	**8**	**2**	**A**

The analysis results suggest the following:

- The Hume Highway/ Memorial Avenue intersection would experience notable queuing and would operate with an average delay of less than 60 seconds (LoS E) during the AM and PM peak hours. The 95th percentile queue on the north and south approaches is between 350 metres and 420 metres, such that the vehicle queues on the north approach are likely to extend through the intersection of Hume Highway/ Moore Street.
- The east and west approaches of the Hume Highway/ Memorial Avenue intersection would experience similar delays and queuing to existing intersection operation conditions.
- With background growth of two per cent and additional traffic from the other new developments identified, some operational constraints are evident at the Hume Highway/ Memorial Avenue intersection. However, the intersection is not expected to exceed capacity (i.e. degree of saturation less than 1).
- The Memorial Avenue/ Bathurst Street intersection would operate with an average delay of less than 25 seconds (LoS C) during AM and PM peak hours.
- Other intersections within the study area would operate satisfactorily, with acceptable queues and minimal delays on all approaches.

6.2 Future Project Case

6.2.1 Generated traffic

Based on the assumptions presented above, Figure 6.1 and Figure 6.2 have been prepared to show the estimated marginal increase in turning movements at key intersections, following full site development.

Figure 6.1: AM Peak Hour Site Generated Traffic Volumes

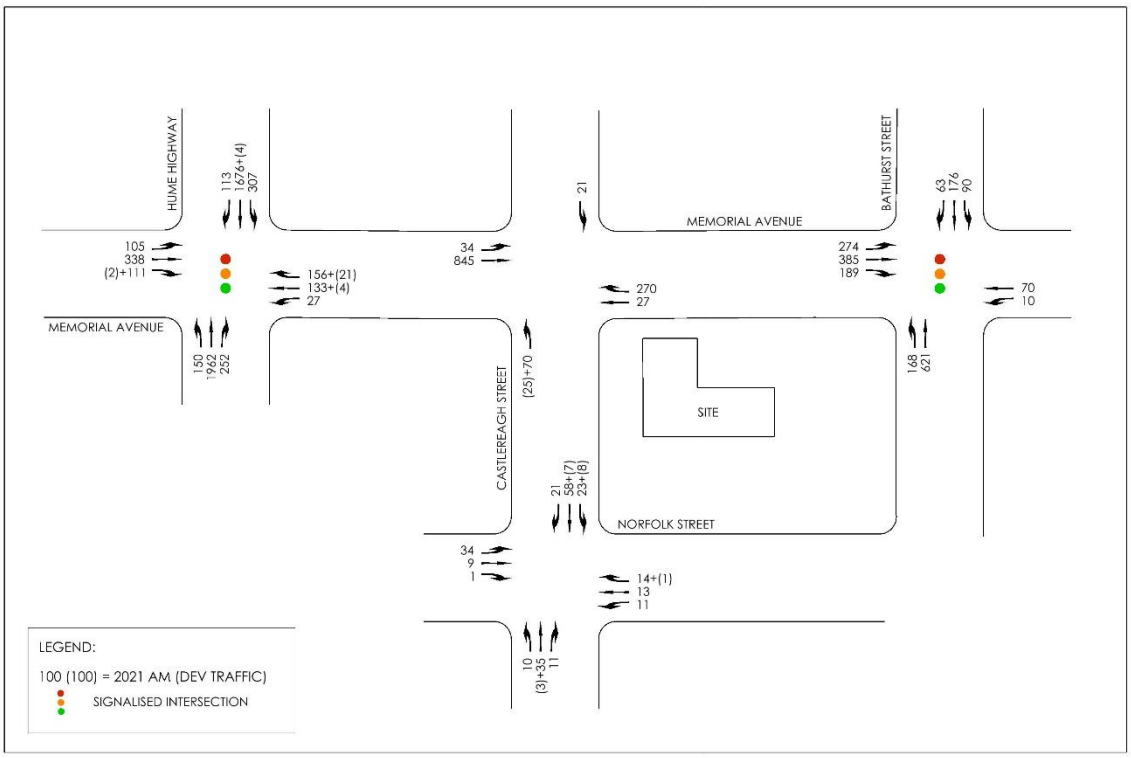
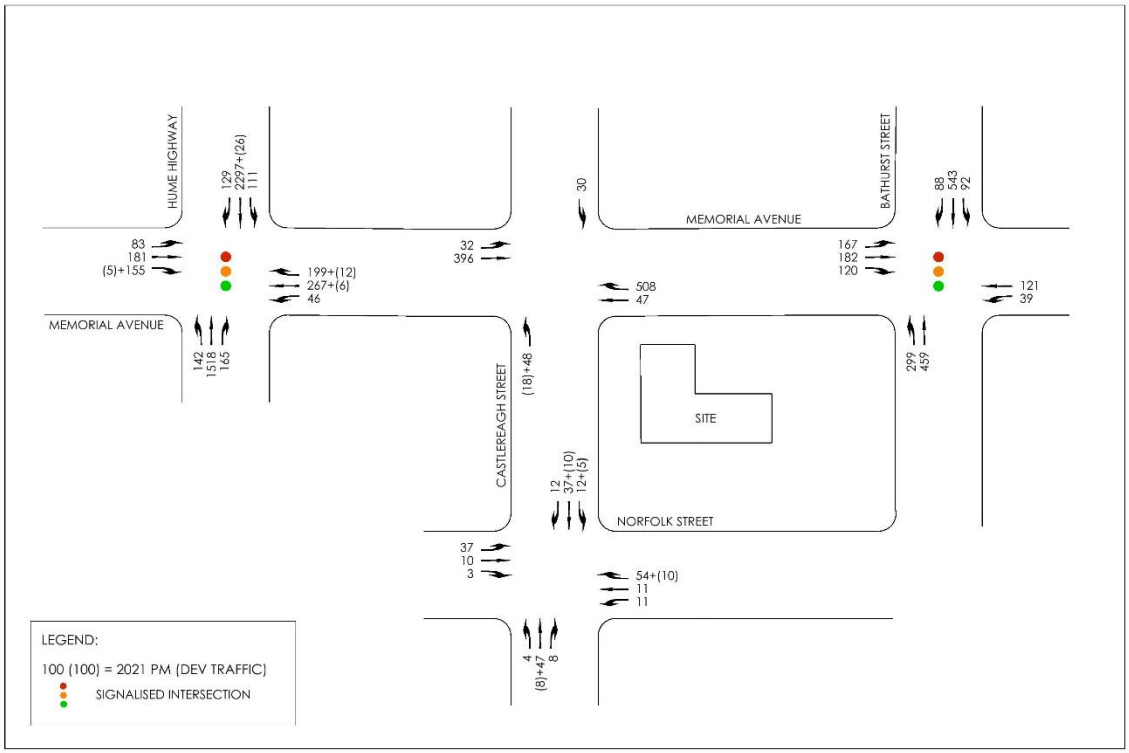


Figure 6.2: PM Peak Hour Site Generated Traffic Volumes



6.2.2 Intersection Operation

Based on the anticipated vehicle trips from the proposed development, the traffic impact on the surrounding intersections has been assessed using SIDRA INTERSECTON. Table 6.3 presents a summary of the anticipated operation of the study intersections following the full site development, with full results presented in Appendix D of this report.

Table 6.3: Future project case intersection operating conditions

Intersection	Peak	Leg	Degree of Saturation (DoS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LoS)
Hume Highway/ Memorial Avenue (signalised)	AM	South	0.94	33	363	C
		East	0.96	98	118	F
		North	0.95	56	417	D
		West	0.94	87	174	F
		Overall	**0.96**	**52**	**417**	**D**
	PM	South	0.95	41	273	C
		East	0.97	97	183	F
		North	0.98	56	541	D
		West	0.93	88	136	F
		Overall	**0.98**	**58**	**541**	**E**
Memorial Avenue/ Castlereagh Street (priority controlled)	AM	South	0.07	8	1	A
		East	0.08	1	0	A
		North	0.02	10	1	A
		West	0.24	1	0	A
		Overall	**0.24**	**10**	**1**	**A**
	PM	South	0.10	9	0	A
		East	0.15	4	17	A
		North	0.02	8	0	A
		West	0.12	4	0	A
		Overall	**0.15**	**9**	**17**	**A**
Memorial Avenue/ Bathurst Street (signalised)	AM	South	0.37	12	57	A
		East	0.19	35	11	C
		North	0.22	12	31	A
		West	0.72	29	75	C
		Overall	**0.72**	**20**	**75**	**B**
	PM	South	0.72	23	69	B
		East	0.38	36	23	C
		North	0.54	17	78	B
		West	0.50	19	54	B
		Overall	**0.72**	**21**	**78**	**B**

Intersection	Peak	Leg	Degree of Saturation (DoS)	Average Delay (sec)	95th Percentile Queue (m)	Level of Service (LoS)
Castlereagh Street/ Norfolk Street (priority controlled)	AM	South	0.03	3	0	A
		East	0.04	8	0	A
		North	0.06	3	0	A
		West	0.03	8	0	A
		Overall	**0.06**	**8**	**0**	**A**
	PM	South	0.03	2	0	A
		East	0.09	8	2	A
		North	0.04	3	0	A
		West	0.04	8	1	A
		Overall	**0.09**	**8**	**2**	**A**

Based on the analysis results in Table 6.3, the proposed development would not generate any significant impact on the operation of the surrounding intersections. Intersections are anticipated to operate at a similar level of service to the Future Base Case (without development).

Given the proximity of the proposed development to Liverpool Railway Station and connections to public transport system, the proposed development is likely to generate more multimodal trips and is not expected to materially alter the surrounding intersection operations.

6.3 Mitigation Measures

As described in Section 2.11.2, Council developed a transport strategy in 2016-2017 where a package of multimodal transport interventions was identified to cater for the proposed growth within the Liverpool CBD. This included road infrastructure upgrades and changes in the road network that would result in a redistribution of traffic within the CBD, with significant improvements of traffic conditions in the future.

It is expected that with the implementation of these measures, queues and delays at the Hume Highway/ Memorial Avenue intersection would be reduced and the intersection would operate at acceptable levels of service in both the Future Base Case (without development) and Project Case (with development).

6.4 Impact on the Broader Network

GTA has not received authorisation from Council to use the existing Aimsun model to assess possible wider impacts on the broader road network. However, considering the scale of the development and SIDRA analysis results, it is not expected that the site will significantly impact the wider road network.

7. Sustainable Transport Infrastructure

7.1 Walking

The site is well connected to the existing pedestrian network, with pedestrian paths provided on both sides of all roads in the immediate vicinity of the site. The site is connected to a number of key local trip attractors. The train station is within eight minutes walking distance and is easily accessed via Memorial Avenue. Westfield Liverpool shopping centre is within an eight-minute walk and is easily accessed through Bathurst Street.

The existing pedestrian infrastructure is considered appropriate, and footpaths are wide enough to cater for the additional pedestrian demand generated by the proposed development.

7.2 Cycling

The proposed development would cater for a future increase in cycling trips through providing 182 bicycle parking spaces, which is significantly higher than the expected generated demand based on current mode share.

The development would also provide end-of-trip facilities (shower and change facilities) for staff of the commercial and retail components of the development.

There is limited dedicated cycle infrastructure near the site, however the site will benefit from future initiatives as part of Liverpool Council 's bike plan. No additional bicycle infrastructure is required for the proposed development.

7.3 Public Transport

The site is easily accessible by public transport services, with buses frequently servicing stops and interchanges within an 5-10 minute walk of the site, including the Liverpool to Parramatta Transitway buses. Liverpool Railway Station is also within easy walking distance to the east, with train services linking Liverpool with local suburbs in south-west Sydney, Inner West, Parramatta, Sydney Airport, Sydney CBD and the Eastern Suburbs.

The proximity to high frequency public transport services will encourage utilisation and discourage the use of the private car.

In addition, it is expected that the existing public transport infrastructure would easily accommodate the trips generated by the proposed development, estimated to be up to 24 train trips and 17 bus trips per hour in the PM peak (the estimated volumes in the AM peak are lower).

8. Conclusion

Based on the analysis and discussions presented within this report, the following conclusions are made:

i The proposed development generates a parking requirement of 318 spaces, for the proposed uses with nominated rates. The proposed supply of 318 spaces is higher than the minimum requirements and meets the relevant requirements.

ii The proposed parking layout is consistent with the dimensional requirements as set out in the Australian/New Zealand Standard for Off Street Car Parking (AS/NZS2890.1:2004 and AS/NZS2890.6:2009) and is expected to operate satisfactorily.

iii The proposed development requires 130 bicycle parking spaces (including 20 for visitors). The proposed supply is 182 including 26 spaces for retail and residential visitors, therefore meeting the minimum requirements.

iv The proposed development provides 16 motorbike parking spaces meeting the requirement of 16 spaces.

v The proposed development provides 5 loading bays, including 4 for MRV and meets the relevant requirements. It is recommended that a loading dock/ service bay management plan be prepared to assist the understanding and operational efficiency of these facilities.

vi The site is expected to generate up to 50 and 78 net vehicle movements in the AM and PM peak hours respectively.

vii The proposed development is expected to have a minor impact on the surrounding road network

viii The Hume Highway/ Memorial Avenue intersection would operate at level of service E in the future, with or without the development, however Council already has plans to implement measures to improve traffic operations in the CBD which would benefit this intersection.

ix The Bathurst Street/Memorial Avenue intersection would operate at an acceptable level of service in both the Future Base Case (without development) and Project Case (with development).

x Provision is made for the proposed access from Castlereagh Street to operate safely and efficiently, however noting that street trees have the potential to restrict sight lines.

xi A construction traffic management plan should be prepared for the development prior to commencement of work.

Appendix A

First Principle Trip Generation Assessment

Trip Generation

An analysis based on first-principle trip generation was undertaken for the proposed development to estimate future generated trips and compare the resulting vehicle-trip generation rates with the ones from Roads and Maritime guidelines, including *Guide to Traffic Generating Developments (2002)* and Roads and Maritime Technical Direction *Updated traffic surveys* (TDT 2013/04a).

Table A.1: First-principle trip generation assessment

Trips and mode share	High density Residential Trip Generation
(A) People per flat or apartment (source ABS 2016 for Liverpool SSC12361)	2.55 persons per apartment
(B) Daily trips per person (HTS 2016/17 for Liverpool SA3)	3.28 trips per person (all modes)
(B) Proportion of home-based trips[1]	70%
(B) Daily trips per person starting or finishing home	2.30 trips per person (all modes)
(C)% trips during the 1-hour peak AM or PM (source HTS 2012/13 for Greater Sydney)	10% daily trips made during the 1-hour peak
(D) trips per person during the 1-hour peak AM or PM (D) = (B) x (C)	0.23 peak hour trips/person (all modes)
(E) Peak hour person-trips per dwelling (1 hour), as per first-principle trip generation (E) = (D) x (A)	0.59 peak hour person-trips/unit (all modes)
(F) Vehicle Driver Mode share for Liverpool CBD	47% vehicle driver
(G) Peak hour trip generation rate per dwelling (1 hour) per mode as per first-principle trip generation (G) = (E) x (F)	0.27 peak hour vehicle-trip per unit

[1] based on data presented in Australian Transport Research Forum 2010 Proceedings, Comparison of Trip and Tour Analysis of Sydney Household Travel Data, Frank Millthorpe and Andrew Daly, 2010

The first principle assessment conducted in Table A.1 gives a person-trip generation rate of 0.59 person-trips per unit and 0.27 vehicle-trip per unit during the peak hour.

This rate can be compared to the RMS rate to check appropriateness of selected rates. It is observed that the two rates are slightly different since the first principle assessment doesn't include trips made by visitors to/ from the site.

Mode Share Analysis

The mode share for residents of the proposed site has been assessed based on the existing mode share, assuming that there will be no increase in the use of public transport or sustainable modes of transport in the short-term. The JTW 2011 mode share was used as a primary reference and compared to the mode share from the HTS, which includes all trip purposes but is only available at the SA3 level. Mode share for the future residents of the site was estimated based on:

- JTW mode share of residents of Liverpool CBD area
- Liverpool SA3 HTS mode share
- Wider analysis of the difference of travel patterns by purpose at the metropolitan level.

The aim was to incorporate other purposes of trips that are made during the peak hour, such as trips to school in the morning peak and trips to the shopping centre or to social activities in the evening peak. Vehicle occupancy was also adjusted to consider that the other purpose trips generally have a higher vehicle occupancy than the JTW trips[2].

Table A.2: Expected future mode share for Liverpool CBD residents

Mode share	HTS 2016/17 Liverpool SA3	JTW 2011 Liverpool SA3	JTW 2011 Liverpool CBD area	Estimated mode share for the site (residential component)
	Daily (all trips)	Daily (commute trips only)	Daily (commute trips only)	AM and PM peaks (all trips)
Vehicle driver	52%	73%	55%	47%
Vehicle passenger	24%	6%	6%	15%
Train	5%	14%	24%	12%
Bus	5%	2%	2%	4%
Walk only	13%	4%	9%	20%
Other/ not stated	1%	1%	4%	2%
Total	**100%**	**100%**	**100%**	**100%**
Total private vehicle	**76%**	**79%**	**61%**	**62%**
Vehicle occupancy	1.45	1.08	1.11	1.33

Source: NSW Government Bureau of Transport Statistics, HTS 2016/17, JTW 2011

[2] Vehicle occupancy observed from the high-density residential dwellings trip generation surveys vary from 1.0 to 1.6, with an average of 1.28 in the AM peak and 1.40 in the PM peak. 1.33 is within the average and is conservative considering that vehicle occupancy from the Household Travel Survey is 1.45 for the 3-hours AM peak (based on linked trips arriving at their destination between 6.31 am and 9.30 am).

Appendix B

SIDRA Results - Existing

MOVEMENT SUMMARY

Site: 4 [Castlreagh Street & Memorial Avenue - AM Existing]

Existing-Base 2018 - AM Peak
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	100% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Castlereagh Street (S)												
1	L2	34	3.1	0.032	8.1	LOS A	0.1	1.0	0.21	0.89	0.21	36.0
Approach		34	3.1	0.032	8.1	LOS A	0.1	1.0	0.21	0.89	0.21	36.0
East: Norfolk Street (E)												
4	L2	26	0.0	0.071	4.6	LOS A	0.0	0.0	0.00	0.11	0.00	46.3
5	T1	241	5.2	0.071	0.0	LOS A	0.0	0.0	0.00	0.05	0.00	48.7
Approach		267	4.7	0.071	0.5	NA	0.0	0.0	0.00	0.05	0.00	48.3
North: Castlereagh Street (N)												
7	L2	16	6.7	0.022	10.1	LOS A	0.1	0.7	0.45	0.89	0.45	36.2
Approach		16	6.7	0.022	10.1	LOS A	0.1	0.7	0.45	0.89	0.45	36.2
West: Norfolk Street (W)												
10	L2	34	0.0	0.227	4.6	LOS A	0.0	0.0	0.00	0.04	0.00	48.0
11	T1	838	1.9	0.227	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	49.4
Approach		872	1.8	0.227	0.2	NA	0.0	0.0	0.00	0.02	0.00	49.3
All Vehicles		1188	2.6	0.227	0.6	NA	0.1	1.0	0.01	0.06	0.01	48.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 4 [Castlreagh Street & Memorial Avenue - PM Existing]

Existing-Base 2018 - PM Peak
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	100% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Castlereagh Street (S)												
1	L2	4	0.0	0.004	7.4	LOS A	0.0	0.0	0.00	1.00	0.00	36.3
Approach		4	0.0	0.004	7.4	LOS A	0.0	0.0	0.00	1.00	0.00	36.3
East: Norfolk Street (E)												
4	L2	11	0.0	0.006	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	39.9
5	T1	11	0.0	0.005	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
Approach		21	0.0	0.006	2.3	NA	0.0	0.0	0.00	0.26	0.00	43.6
North: Castlereagh Street (N)												
7	L2	9	0.0	0.008	7.4	LOS A	0.0	0.0	0.00	1.00	0.00	38.2
Approach		9	0.0	0.008	7.4	LOS A	0.0	0.0	0.00	1.00	0.00	38.2
West: Norfolk Street (W)												
10	L2	37	0.0	0.020	4.6	LOS A	0.0	0.0	0.00	0.53	0.00	41.8
11	T1	11	20.0	0.006	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	50.0
Approach		47	4.4	0.020	3.5	NA	0.0	0.0	0.00	0.41	0.00	42.8
All Vehicles		82	2.6	0.020	3.9	NA	0.0	0.0	0.00	0.47	0.00	41.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Hume & Memorial - AM Existing]

Existing-Base 2018 - AM Peak
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 150 seconds (Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Hume Hwy (S)												
1	L2	149	3.5	0.778	28.1	LOS B	35.9	265.2	0.72	0.70	0.72	39.0
2	T1	1946	7.1	0.778	21.7	LOS B	36.1	268.2	0.68	0.63	0.68	39.7
3	R2	251	0.8	0.969	83.6	LOS F	17.1	120.8	1.00	1.05	1.58	17.2
Approach		2346	6.2	0.969	28.7	LOS C	36.1	268.2	0.71	0.68	0.78	35.6
East: Memorial Ave (E)												
4	L2	27	7.7	0.666	90.6	LOS F	9.5	69.2	1.00	0.91	1.62	16.7
5	T1	122	3.4	0.666	84.2	LOS F	9.5	69.2	1.00	0.90	1.55	16.6
6	R2	103	6.1	0.666	77.5	LOS F	8.8	64.5	1.00	0.82	1.05	13.3
Approach		253	5.0	0.666	82.2	LOS F	9.5	69.2	1.00	0.87	1.35	15.4
North: Hume Hwy (N)												
7	L2	305	2.4	0.246	6.6	LOS A	1.0	7.3	0.06	0.57	0.06	44.7
8	T1	1649	10.5	0.822	37.9	LOS C	37.2	283.7	0.83	0.77	0.86	31.9
9	R2	113	0.9	0.916	93.2	LOS F	9.2	65.0	1.00	0.91	1.30	18.4
Approach		2067	8.8	0.916	36.3	LOS C	37.2	283.7	0.73	0.74	0.76	31.3
West: Memorial Ave (W)												
10	L2	104	2.0	0.840	71.6	LOS F	20.2	143.0	1.00	0.97	1.28	21.9
11	T1	336	1.3	0.840	69.5	LOS E	20.3	143.7	1.00	0.95	1.22	18.7
12	R2	103	1.0	0.840	76.5	LOS F	20.3	143.7	1.00	0.94	1.15	24.6
Approach		543	1.4	0.840	71.2	LOS F	20.3	143.7	1.00	0.95	1.22	20.6
All Vehicles		5209	6.7	0.969	38.8	LOS C	37.2	283.7	0.76	0.74	0.84	30.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	32.7	LOS D	0.1	0.1	0.66	0.66
P3	North Full Crossing	53	50.5	LOS E	0.2	0.2	0.82	0.82
P4	West Full Crossing	53	25.9	LOS C	0.1	0.1	0.59	0.59
All Pedestrians		158	36.4	LOS D			0.69	0.69

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.

MOVEMENT SUMMARY

Site: 101 [Hume & Memorial - PM Existing]

Existing-Base 2018 - PM Peak
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 150 seconds (Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Hume Hwy (S)												
1	L2	141	2.2	0.819	47.8	LOS D	36.0	264.9	0.91	0.84	0.93	31.6
2	T1	1506	7.0	0.819	41.8	LOS C	36.2	268.5	0.88	0.81	0.90	30.3
3	R2	164	2.6	0.965	98.6	LOS F	14.0	100.4	1.00	0.96	1.34	15.3
Approach		1812	6.2	0.965	47.4	LOS D	36.2	268.5	0.89	0.82	0.94	28.4
East: Memorial Ave (E)												
4	L2	45	0.0	0.973	99.9	LOS F	22.4	159.5	1.00	1.10	1.36	15.6
5	T1	258	2.4	0.973	95.5	LOS F	22.4	159.5	1.00	1.09	1.36	15.3
6	R2	182	7.5	0.973	100.7	LOS F	20.7	152.7	1.00	1.06	1.37	10.9
Approach		485	4.1	0.973	97.9	LOS F	22.4	159.5	1.00	1.08	1.37	13.8
North: Hume Hwy (N)												
7	L2	111	1.0	0.078	5.9	LOS A	0.1	1.0	0.02	0.56	0.02	45.9
8	T1	2225	3.4	0.907	40.5	LOS C	55.1	396.9	0.88	0.87	0.96	30.9
9	R2	128	3.3	0.531	40.6	LOS C	5.0	35.6	0.95	0.78	0.95	29.1
Approach		2464	3.3	0.907	38.9	LOS C	55.1	396.9	0.84	0.85	0.92	31.0
West: Memorial Ave (W)												
10	L2	82	0.0	0.619	59.9	LOS E	13.4	95.1	0.97	0.85	1.13	24.3
11	T1	180	2.3	0.619	57.4	LOS E	13.4	95.1	0.98	0.84	1.09	20.8
12	R2	144	0.7	0.619	67.7	LOS E	13.2	93.5	0.98	0.82	0.98	25.9
Approach		406	1.3	0.619	61.6	LOS E	13.4	95.1	0.98	0.83	1.06	23.6
All Vehicles		5167	4.2	0.973	49.2	LOS D	55.1	396.9	0.88	0.86	0.98	27.1

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	27.7	LOS C	0.1	0.1	0.61	0.61
P3	North Full Crossing	53	46.5	LOS E	0.2	0.2	0.79	0.79
P4	West Full Crossing	53	35.4	LOS D	0.2	0.2	0.69	0.69
All Pedestrians		158	36.5	LOS D			0.69	0.69

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.

MOVEMENT SUMMARY

Site: 2870 [Memorial & Bathurst - AM Existing]

Existing-Base 2018 - AM Peak
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 77 seconds (Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Bathurst St (S)												
1	L2	141	6.0	0.102	4.9	LOS A	0.5	3.3	0.14	0.53	0.14	40.0
2	T1	617	1.2	0.726	31.3	LOS C	12.1	85.7	0.97	0.87	1.05	25.0
Approach		758	2.1	0.726	26.4	LOS B	12.1	85.7	0.81	0.81	0.88	26.3
East: Memorial Ave (E)												
4	L2	9	0.0	0.045	15.8	LOS B	0.8	5.8	0.55	0.48	0.55	30.2
5	T1	72	5.9	0.045	11.3	LOS A	0.8	5.9	0.55	0.44	0.55	27.8
Approach		81	5.2	0.045	11.8	LOS A	0.8	5.9	0.55	0.45	0.55	28.1
North: Bathurst St (N)												
7	L2	89	2.4	0.356	24.0	LOS B	6.7	48.4	0.78	0.70	0.78	26.8
8	T1	175	3.6	0.356	20.7	LOS B	6.7	48.4	0.80	0.70	0.80	29.0
9	R2	65	8.1	0.356	34.0	LOS C	2.9	21.8	0.94	0.75	0.94	21.7
Approach		329	4.2	0.356	24.2	LOS B	6.7	48.4	0.82	0.71	0.82	26.9
West: Memorial Ave (W)												
10	L2	276	3.1	0.225	9.7	LOS A	3.9	28.2	0.41	0.66	0.41	35.5
11	T1	382	0.3	0.301	8.6	LOS A	6.4	45.2	0.54	0.49	0.54	31.1
12	R2	187	3.4	0.301	12.9	LOS A	4.1	29.5	0.59	0.67	0.59	30.9
Approach		845	1.9	0.301	9.9	LOS A	6.4	45.2	0.51	0.59	0.51	32.8
All Vehicles		2014	2.5	0.726	18.5	LOS B	12.1	85.7	0.68	0.69	0.70	28.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	16.3	LOS B	0.1	0.1	0.65	0.65
P2	East Full Crossing	53	22.7	LOS C	0.1	0.1	0.77	0.77
P3	North Full Crossing	53	16.3	LOS B	0.1	0.1	0.65	0.65
P4	West Full Crossing	53	31.0	LOS D	0.1	0.1	0.90	0.90
All Pedestrians		211	21.5	LOS C			0.74	0.74

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.

MOVEMENT SUMMARY

Site: 2870 [Memorial & Bathurst - PM Existing]

New Site
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 78 seconds (Site User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Bathurst St (S)												
1	L2	287	5.5	0.227	5.3	LOS A	1.4	10.2	0.22	0.57	0.22	39.5
2	T1	455	2.3	0.487	27.9	LOS B	7.6	54.4	0.91	0.75	0.91	26.4
Approach		742	3.5	0.487	19.1	LOS B	7.6	54.4	0.64	0.68	0.64	29.3
East: Memorial Ave (E)												
4	L2	39	0.0	0.104	19.7	LOS B	1.9	13.3	0.65	0.60	0.65	26.2
5	T1	122	4.3	0.104	15.2	LOS B	1.9	13.7	0.65	0.54	0.65	24.0
Approach		161	3.3	0.104	16.3	LOS B	1.9	13.7	0.65	0.56	0.65	24.6
North: Bathurst St (N)												
7	L2	92	3.4	0.700	24.7	LOS B	10.9	77.1	0.80	0.74	0.84	26.8
8	T1	539	0.2	0.700	22.1	LOS B	11.8	83.9	0.86	0.77	0.90	28.7
9	R2	89	5.9	0.700	28.8	LOS C	11.8	83.9	0.92	0.81	0.97	24.9
Approach		720	1.3	0.700	23.3	LOS B	11.8	83.9	0.86	0.77	0.90	28.0
West: Memorial Ave (W)												
10	L2	171	5.6	0.146	10.1	LOS A	2.5	18.0	0.41	0.65	0.41	35.1
11	T1	181	1.2	0.325	11.2	LOS A	5.2	36.5	0.61	0.56	0.61	26.8
12	R2	119	0.9	0.325	16.6	LOS B	5.2	36.5	0.67	0.65	0.67	28.9
Approach		471	2.7	0.325	12.2	LOS A	5.2	36.5	0.55	0.61	0.55	30.7
All Vehicles		2094	2.6	0.700	18.8	LOS B	11.8	83.9	0.70	0.69	0.71	28.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	20.1	LOS C	0.1	0.1	0.72	0.72
P2	East Full Crossing	53	30.6	LOS D	0.1	0.1	0.89	0.89
P3	North Full Crossing	53	20.1	LOS C	0.1	0.1	0.72	0.72
P4	West Full Crossing	53	33.3	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		211	26.0	LOS C			0.81	0.81

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.

Appendix C

SIDRA Results – Future Base Case

MOVEMENT SUMMARY

Site: 4 [Castlreagh Street & Memorial Avenue - AM]

Future Case 2021-Without Development-AM Peak
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	100% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Castlereagh Street (S)												
1	L2	74	1.4	0.071	8.1	LOS A	0.3	2.2	0.24	0.89	0.24	36.1
Approach		74	1.4	0.071	8.1	LOS A	0.3	2.2	0.24	0.89	0.24	36.1
East: Memorial Avenue (E)												
4	L2	28	0.0	0.083	4.6	LOS A	0.0	0.0	0.00	0.10	0.00	46.4
5	T1	284	4.8	0.083	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	48.7
Approach		313	4.4	0.083	0.4	NA	0.0	0.0	0.00	0.05	0.00	48.5
North: Castlereagh Street (N)												
7	L2	17	6.3	0.024	10.3	LOS A	0.1	0.7	0.46	0.89	0.46	36.1
Approach		17	6.3	0.024	10.3	LOS A	0.1	0.7	0.46	0.89	0.46	36.1
West: Memorial Avenue (W)												
10	L2	36	0.0	0.241	4.6	LOS A	0.0	0.0	0.00	0.04	0.00	48.0
11	T1	889	1.9	0.241	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	49.4
Approach		925	1.8	0.241	0.2	NA	0.0	0.0	0.00	0.02	0.00	49.3
All Vehicles		1328	2.5	0.241	0.8	NA	0.3	2.2	0.02	0.09	0.02	47.5

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 4 [Castlreagh Street & Memorial Avenue - PM]

Future Case 2021-Without Development-PM Peak
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	100% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Castlereagh Street (S)												
1	L2	51	2.1	0.055	8.8	LOS A	0.2	1.7	0.34	0.88	0.34	35.5
Approach		51	2.1	0.055	8.8	LOS A	0.2	1.7	0.34	0.88	0.34	35.5
East: Memorial Avenue (E)												
4	L2	49	0.0	0.153	4.6	LOS A	0.0	0.0	0.00	0.09	0.00	46.6
5	T1	535	2.6	0.153	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	48.8
Approach		584	2.3	0.153	0.4	NA	0.0	0.0	0.00	0.05	0.00	48.6
North: Castlereagh Street (N)												
7	L2	15	0.0	0.015	8.3	LOS A	0.1	0.4	0.29	0.86	0.29	37.9
Approach		15	0.0	0.015	8.3	LOS A	0.1	0.4	0.29	0.86	0.29	37.9
West: Memorial Avenue (W)												
10	L2	34	0.0	0.117	4.6	LOS A	0.0	0.0	0.00	0.08	0.00	47.5
11	T1	417	1.8	0.117	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	49.0
Approach		451	1.6	0.117	0.3	NA	0.0	0.0	0.00	0.04	0.00	48.8
All Vehicles		1100	2.0	0.153	0.9	NA	0.2	1.7	0.02	0.09	0.02	47.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 4 [Castlreagh Street & Norfolk Street - AM]

Future Case 2021-With Development-AM Peak
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	100% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Castlereagh Street (S)												
1	L2	11	20.0	0.033	5.6	LOS A	0.1	0.7	0.10	0.25	0.10	41.7
2	T1	37	0.0	0.033	0.5	LOS A	0.1	0.7	0.10	0.25	0.10	51.7
3	R2	12	9.1	0.033	5.5	LOS A	0.1	0.7	0.10	0.25	0.10	41.9
Approach		59	5.4	0.033	2.4	NA	0.1	0.7	0.10	0.25	0.10	47.7
East: Norfolk Street (E)												
4	L2	12	27.3	0.041	9.0	LOS A	0.2	1.3	0.21	0.94	0.21	33.3
5	T1	14	0.0	0.041	8.1	LOS A	0.2	1.3	0.21	0.94	0.21	36.5
6	R2	15	0.0	0.041	8.2	LOS A	0.2	1.3	0.21	0.94	0.21	38.2
Approach		40	7.9	0.041	8.4	LOS A	0.2	1.3	0.21	0.94	0.21	36.2
North: Castlereagh Street (N)												
7	L2	24	4.3	0.058	5.7	LOS A	0.2	1.3	0.07	0.25	0.07	48.4
8	T1	61	0.0	0.058	0.0	LOS A	0.2	1.3	0.07	0.25	0.07	52.3
9	R2	22	0.0	0.058	5.6	LOS A	0.2	1.3	0.07	0.25	0.07	48.2
Approach		107	1.0	0.058	2.5	NA	0.2	1.3	0.07	0.25	0.07	50.4
West: Norfolk Street (W)												
10	L2	36	2.9	0.038	8.1	LOS A	0.2	1.3	0.11	0.96	0.11	40.0
11	T1	9	11.1	0.038	8.9	LOS A	0.2	1.3	0.11	0.96	0.11	36.3
12	R2	1	100.0	0.038	11.5	LOS A	0.2	1.3	0.11	0.96	0.11	32.5
Approach		46	6.8	0.038	8.4	LOS A	0.2	1.3	0.11	0.96	0.11	39.1
All Vehicles		253	4.2	0.058	4.5	NA	0.2	1.3	0.11	0.49	0.11	44.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 4 [Castlreagh Street & Norfolk Street - PM]

Future Case 2021-With Development-PM Peak
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	100% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Castlereagh Street (S)												
1	L2	4	0.0	0.033	5.5	LOS A	0.1	0.5	0.05	0.12	0.05	48.1
2	T1	49	0.0	0.033	0.0	LOS A	0.1	0.5	0.05	0.12	0.05	55.3
3	R2	8	0.0	0.033	5.4	LOS A	0.1	0.5	0.05	0.12	0.05	46.2
Approach		62	0.0	0.033	1.1	NA	0.1	0.5	0.05	0.12	0.05	53.5
East: Norfolk Street (E)												
4	L2	12	0.0	0.085	8.0	LOS A	0.4	2.5	0.20	0.92	0.20	35.9
5	T1	12	0.0	0.085	8.1	LOS A	0.4	2.5	0.20	0.92	0.20	36.9
6	R2	57	0.0	0.085	8.3	LOS A	0.4	2.5	0.20	0.92	0.20	38.6
Approach		80	0.0	0.085	8.2	LOS A	0.4	2.5	0.20	0.92	0.20	38.0
North: Castlereagh Street (N)												
7	L2	13	0.0	0.034	5.6	LOS A	0.1	0.7	0.07	0.22	0.07	49.4
8	T1	39	0.0	0.034	0.0	LOS A	0.1	0.7	0.07	0.22	0.07	52.7
9	R2	13	0.0	0.034	5.6	LOS A	0.1	0.7	0.07	0.22	0.07	48.5
Approach		64	0.0	0.034	2.2	NA	0.1	0.7	0.07	0.22	0.07	51.0
West: Norfolk Street (W)												
10	L2	39	0.0	0.043	8.1	LOS A	0.2	1.4	0.14	0.94	0.14	40.5
11	T1	11	20.0	0.043	9.2	LOS A	0.2	1.4	0.14	0.94	0.14	35.5
12	R2	3	0.0	0.043	8.1	LOS A	0.2	1.4	0.14	0.94	0.14	36.2
Approach		53	4.0	0.043	8.3	LOS A	0.2	1.4	0.14	0.94	0.14	39.2
All Vehicles		259	0.8	0.085	5.0	NA	0.4	2.5	0.12	0.56	0.12	44.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 635 [Hume & Memorial - AM]

Future Case 2021-Without Development-AM Peak
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 150 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Hume Hwy (S)												
1	L2	158	3.3	0.857	34.1	LOS C	45.8	338.2	0.84	0.81	0.86	36.4
2	T1	2065	7.1	0.857	28.2	LOS B	46.0	341.8	0.79	0.75	0.81	36.0
3	R2	265	0.8	0.937	55.7	LOS D	13.3	93.9	1.00	0.93	1.24	22.5
Approach		2488	6.2	0.937	31.5	LOS C	46.0	341.8	0.81	0.77	0.86	34.3
East: Memorial Ave (E)												
4	L2	28	7.4	0.849	98.8	LOS F	12.9	93.4	1.00	1.02	1.76	15.7
5	T1	140	3.0	0.849	94.2	LOS F	12.9	93.4	1.00	1.02	1.76	15.5
6	R2	164	3.8	0.908	90.9	LOS F	13.6	98.1	1.00	0.98	1.31	11.7
Approach		333	3.8	0.908	93.0	LOS F	13.6	98.1	1.00	1.00	1.54	13.8
North: Hume Hwy (N)												
7	L2	323	2.3	0.266	7.1	LOS A	1.6	11.4	0.08	0.58	0.08	43.9
8	T1	1764	10.4	0.955	62.5	LOS E	54.3	414.1	0.93	0.99	1.12	24.5
9	R2	119	0.9	0.879	89.3	LOS F	9.5	66.8	1.00	0.89	1.24	18.9
Approach		2206	8.7	0.955	55.8	LOS D	54.3	414.1	0.81	0.92	0.98	24.9
West: Memorial Ave (W)												
10	L2	111	1.9	0.902	79.4	LOS F	23.2	164.3	1.00	1.02	1.37	20.6
11	T1	356	1.2	0.902	76.8	LOS F	23.2	164.3	1.00	1.01	1.30	17.6
12	R2	117	0.9	0.902	83.6	LOS F	23.1	163.5	1.00	1.00	1.23	23.4
Approach		583	1.3	0.902	78.7	LOS F	23.2	164.3	1.00	1.01	1.30	19.5
All Vehicles		5611	6.5	0.955	49.6	LOS D	54.3	414.1	0.84	0.87	0.99	26.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	35.4	LOS D	0.2	0.2	0.69	0.69
P3	North Full Crossing	53	50.5	LOS E	0.2	0.2	0.82	0.82
P4	West Full Crossing	53	24.1	LOS C	0.1	0.1	0.57	0.57
All Pedestrians		158	36.7	LOS D			0.69	0.69

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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MOVEMENT SUMMARY

Site: 635 [Hume & Memorial - PM]

Future Case 2021-Without Development-PM Peak
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 150 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Hume Hwy (S)												
1	L2	149	2.1	0.868	52.6	LOS D	41.7	306.0	0.95	0.90	1.01	30.2
2	T1	1598	7.0	0.868	46.5	LOS D	41.8	310.3	0.92	0.87	0.98	28.7
3	R2	174	2.4	0.951	95.6	LOS F	14.6	104.4	1.00	0.95	1.31	15.7
Approach		1921	6.2	0.951	51.4	LOS D	41.8	310.3	0.93	0.88	1.01	27.2
East: Memorial Ave (E)												
4	L2	48	0.0	0.940	91.0	LOS F	23.8	169.3	1.00	1.06	1.29	16.7
5	T1	281	2.2	0.940	86.6	LOS F	23.8	169.3	1.00	1.05	1.29	16.3
6	R2	209	7.0	0.940	91.9	LOS F	22.1	162.7	1.00	1.02	1.30	11.7
Approach		539	3.9	0.940	89.1	LOS F	23.8	169.3	1.00	1.04	1.30	14.7
North: Hume Hwy (N)												
7	L2	117	0.9	0.083	5.9	LOS A	0.2	1.1	0.02	0.56	0.02	45.8
8	T1	2418	3.3	0.973	55.4	LOS D	72.1	519.3	0.93	1.00	1.11	26.2
9	R2	136	3.1	0.510	39.5	LOS C	5.2	37.2	0.94	0.78	0.94	29.4
Approach		2671	3.2	0.973	52.4	LOS D	72.1	519.3	0.89	0.97	1.06	26.6
West: Memorial Ave (W)												
10	L2	87	0.0	0.920	85.0	LOS F	18.6	132.0	1.00	1.05	1.47	19.8
11	T1	191	2.2	0.920	81.7	LOS F	18.6	132.0	1.00	1.04	1.43	16.8
12	R2	163	0.6	0.920	90.5	LOS F	17.1	120.7	1.00	1.00	1.30	22.0
Approach		441	1.2	0.920	85.6	LOS F	18.6	132.0	1.00	1.03	1.39	19.5
All Vehicles		5572	4.1	0.973	58.3	LOS E	72.1	519.3	0.92	0.95	1.09	24.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	27.1	LOS C	0.1	0.1	0.60	0.60
P3	North Full Crossing	53	49.7	LOS E	0.2	0.2	0.82	0.82
P4	West Full Crossing	53	35.4	LOS D	0.2	0.2	0.69	0.69
All Pedestrians		158	37.4	LOS D			0.70	0.70

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.

MOVEMENT SUMMARY

Site: 2870 [Memorial & Bathurst - AM]

Future Case 2021-Without Development-AM Peak
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 76 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	100% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Bathurst St (S)												
1	L2	178	4.7	0.139	5.4	LOS A	0.8	6.1	0.24	0.57	0.24	39.4
2	T1	654	1.1	0.372	14.3	LOS A	8.5	59.9	0.69	0.59	0.69	34.3
Approach		832	1.9	0.372	12.4	LOS A	8.5	59.9	0.59	0.59	0.59	35.0
East: Memorial Ave (E)												
4	L2	11	0.0	0.194	38.6	LOS C	1.6	11.6	0.94	0.70	0.94	17.9
5	T1	76	5.6	0.194	34.1	LOS C	1.6	11.7	0.94	0.70	0.94	14.9
Approach		86	4.9	0.194	34.6	LOS C	1.6	11.7	0.94	0.70	0.94	15.3
North: Bathurst St (N)												
7	L2	95	2.2	0.222	12.8	LOS A	4.5	32.5	0.51	0.54	0.51	35.0
8	T1	185	3.4	0.222	9.0	LOS A	4.5	32.5	0.54	0.56	0.54	36.9
9	R2	68	7.7	0.222	16.6	LOS B	2.4	17.9	0.65	0.64	0.65	31.2
Approach		348	3.9	0.222	11.5	LOS A	4.5	32.5	0.56	0.57	0.56	35.3
West: Memorial Ave (W)												
10	L2	293	2.9	0.421	23.4	LOS B	8.5	61.2	0.78	0.78	0.78	25.7
11	T1	405	0.3	0.720	29.2	LOS C	11.3	79.4	0.94	0.87	1.07	16.5
12	R2	199	3.2	0.720	35.6	LOS C	11.0	78.3	0.97	0.96	1.26	18.6
Approach		897	1.8	0.720	28.7	LOS C	11.3	79.4	0.90	0.86	1.02	20.1
All Vehicles		2163	2.3	0.720	19.9	LOS B	11.3	79.4	0.73	0.70	0.78	27.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	32.3	LOS D	0.1	0.1	0.92	0.92
P2	East Full Crossing	53	11.6	LOS B	0.1	0.1	0.55	0.55
P3	North Full Crossing	53	32.3	LOS D	0.1	0.1	0.92	0.92
P4	West Full Crossing	53	17.1	LOS B	0.1	0.1	0.67	0.67
All Pedestrians		211	23.3	LOS C			0.77	0.77

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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MOVEMENT SUMMARY

Site: 2870 [Memorial & Bathurst - PM]

Future Case 2021-Without Development-PM Peak
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 76 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Bathurst St (S)												
1	L2	316	5.3	0.260	5.8	LOS A	1.8	12.9	0.30	0.60	0.30	39.0
2	T1	483	2.4	0.721	33.9	LOS C	9.6	68.3	0.99	0.88	1.10	24.0
Approach		799	3.6	0.721	22.8	LOS B	9.6	68.3	0.71	0.77	0.78	27.1
East: Memorial Ave (E)												
4	L2	41	0.0	0.381	39.7	LOS C	3.1	21.8	0.96	0.75	0.96	17.2
5	T1	129	4.1	0.381	35.1	LOS C	3.1	22.4	0.96	0.75	0.96	14.5
Approach		171	3.1	0.381	36.2	LOS C	3.1	22.4	0.96	0.75	0.96	15.2
North: Bathurst St (N)												
7	L2	97	3.3	0.541	18.0	LOS B	8.8	61.9	0.68	0.63	0.68	31.2
8	T1	572	0.2	0.541	16.2	LOS B	10.9	77.5	0.75	0.69	0.82	32.1
9	R2	95	5.6	0.541	23.4	LOS B	10.9	77.5	0.82	0.75	0.95	27.7
Approach		763	1.2	0.541	17.3	LOS B	10.9	77.5	0.75	0.69	0.82	31.4
West: Memorial Ave (W)												
10	L2	180	5.3	0.153	9.9	LOS A	2.5	18.4	0.40	0.65	0.40	35.4
11	T1	192	1.1	0.495	21.5	LOS B	7.7	54.4	0.82	0.71	0.88	19.5
12	R2	126	0.8	0.495	28.2	LOS B	7.7	54.4	0.89	0.81	0.98	21.8
Approach		498	2.5	0.495	19.0	LOS B	7.7	54.4	0.69	0.71	0.73	25.4
All Vehicles		2231	2.5	0.721	21.1	LOS B	10.9	77.5	0.74	0.73	0.80	27.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	32.3	LOS D	0.1	0.1	0.92	0.92
P2	East Full Crossing	53	32.3	LOS D	0.1	0.1	0.92	0.92
P3	North Full Crossing	53	32.3	LOS D	0.1	0.1	0.92	0.92
P4	West Full Crossing	53	32.3	LOS D	0.1	0.1	0.92	0.92
All Pedestrians		211	32.3	LOS D			0.92	0.92

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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Appendix D

SIDRA Results – Future Project Case

MOVEMENT SUMMARY

Site: 4 [Castlreagh Street & Memorial Avenue - AM]

Future Case 2021-With Development-AM Peak
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	100% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Castlereagh Street (S)												
1	L2	100	1.1	0.096	8.1	LOS A	0.4	3.0	0.25	0.89	0.25	36.1
Approach		100	1.1	0.096	8.1	LOS A	0.4	3.0	0.25	0.89	0.25	36.1
East: Memorial Avenue (E)												
4	L2	28	0.0	0.083	4.6	LOS A	0.0	0.0	0.00	0.10	0.00	46.4
5	T1	284	4.8	0.083	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	48.7
Approach		313	4.4	0.083	0.4	NA	0.0	0.0	0.00	0.05	0.00	48.5
North: Castlereagh Street (N)												
7	L2	23	4.5	0.033	10.3	LOS A	0.1	1.0	0.46	0.90	0.46	36.2
Approach		23	4.5	0.033	10.3	LOS A	0.1	1.0	0.46	0.90	0.46	36.2
West: Memorial Avenue (W)												
10	L2	36	0.0	0.241	4.6	LOS A	0.0	0.0	0.00	0.04	0.00	48.0
11	T1	889	1.9	0.241	0.0	LOS A	0.0	0.0	0.00	0.02	0.00	49.4
Approach		925	1.8	0.241	0.2	NA	0.0	0.0	0.00	0.02	0.00	49.3
All Vehicles		1361	2.4	0.241	1.0	NA	0.4	3.0	0.03	0.11	0.03	47.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 4 [Castlreagh Street & Memorial Avenue - PM]

Future Case 2021-With Development-PM Peak
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	100% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Castlereagh Street (S)												
1	L2	69	1.5	0.076	8.8	LOS A	0.3	2.3	0.35	0.89	0.35	35.5
Approach		69	1.5	0.076	8.8	LOS A	0.3	2.3	0.35	0.89	0.35	35.5
East: Memorial Avenue (E)												
4	L2	49	0.0	0.153	4.6	LOS A	0.0	0.0	0.00	0.09	0.00	46.6
5	T1	535	2.6	0.153	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	48.8
Approach		584	2.3	0.153	0.4	NA	0.0	0.0	0.00	0.05	0.00	48.6
North: Castlereagh Street (N)												
7	L2	15	0.0	0.015	8.3	LOS A	0.1	0.4	0.29	0.86	0.29	37.9
Approach		15	0.0	0.015	8.3	LOS A	0.1	0.4	0.29	0.86	0.29	37.9
West: Memorial Avenue (W)												
10	L2	34	0.0	0.117	4.6	LOS A	0.0	0.0	0.00	0.08	0.00	47.5
11	T1	417	1.8	0.117	0.0	LOS A	0.0	0.0	0.00	0.04	0.00	49.0
Approach		451	1.6	0.117	0.3	NA	0.0	0.0	0.00	0.04	0.00	48.8
All Vehicles		1119	2.0	0.153	1.0	NA	0.3	2.3	0.03	0.11	0.03	46.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 4 [Castlreagh Street & Norfolk Street - AM]

Future Case 2021-With Development-AM Peak
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	100% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Castlereagh Street (S)												
1	L2	11	20.0	0.033	5.6	LOS A	0.1	0.7	0.10	0.25	0.10	41.7
2	T1	37	0.0	0.033	0.5	LOS A	0.1	0.7	0.10	0.25	0.10	51.7
3	R2	12	9.1	0.033	5.5	LOS A	0.1	0.7	0.10	0.25	0.10	41.9
Approach		59	5.4	0.033	2.4	NA	0.1	0.7	0.10	0.25	0.10	47.7
East: Norfolk Street (E)												
4	L2	12	27.3	0.041	9.0	LOS A	0.2	1.3	0.21	0.94	0.21	33.3
5	T1	14	0.0	0.041	8.1	LOS A	0.2	1.3	0.21	0.94	0.21	36.5
6	R2	15	0.0	0.041	8.2	LOS A	0.2	1.3	0.21	0.94	0.21	38.2
Approach		40	7.9	0.041	8.4	LOS A	0.2	1.3	0.21	0.94	0.21	36.2
North: Castlereagh Street (N)												
7	L2	24	4.3	0.058	5.7	LOS A	0.2	1.3	0.07	0.25	0.07	48.4
8	T1	61	0.0	0.058	0.0	LOS A	0.2	1.3	0.07	0.25	0.07	52.3
9	R2	22	0.0	0.058	5.6	LOS A	0.2	1.3	0.07	0.25	0.07	48.2
Approach		107	1.0	0.058	2.5	NA	0.2	1.3	0.07	0.25	0.07	50.4
West: Norfolk Street (W)												
10	L2	36	2.9	0.038	8.1	LOS A	0.2	1.3	0.11	0.96	0.11	40.0
11	T1	9	11.1	0.038	8.9	LOS A	0.2	1.3	0.11	0.96	0.11	36.3
12	R2	1	100.0	0.038	11.5	LOS A	0.2	1.3	0.11	0.96	0.11	32.5
Approach		46	6.8	0.038	8.4	LOS A	0.2	1.3	0.11	0.96	0.11	39.1
All Vehicles		253	4.2	0.058	4.5	NA	0.2	1.3	0.11	0.49	0.11	44.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 4 [Castlreagh Street & Norfolk Street - PM]

Future Case 2021-With Development-PM Peak
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	100% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Castlereagh Street (S)												
1	L2	4	0.0	0.033	5.5	LOS A	0.1	0.5	0.05	0.12	0.05	48.1
2	T1	49	0.0	0.033	0.0	LOS A	0.1	0.5	0.05	0.12	0.05	55.3
3	R2	8	0.0	0.033	5.4	LOS A	0.1	0.5	0.05	0.12	0.05	46.2
Approach		62	0.0	0.033	1.1	NA	0.1	0.5	0.05	0.12	0.05	53.5
East: Norfolk Street (E)												
4	L2	12	0.0	0.085	8.0	LOS A	0.4	2.5	0.20	0.92	0.20	35.9
5	T1	12	0.0	0.085	8.1	LOS A	0.4	2.5	0.20	0.92	0.20	36.9
6	R2	57	0.0	0.085	8.3	LOS A	0.4	2.5	0.20	0.92	0.20	38.6
Approach		80	0.0	0.085	8.2	LOS A	0.4	2.5	0.20	0.92	0.20	38.0
North: Castlereagh Street (N)												
7	L2	13	0.0	0.034	5.6	LOS A	0.1	0.7	0.07	0.22	0.07	49.4
8	T1	39	0.0	0.034	0.0	LOS A	0.1	0.7	0.07	0.22	0.07	52.7
9	R2	13	0.0	0.034	5.6	LOS A	0.1	0.7	0.07	0.22	0.07	48.5
Approach		64	0.0	0.034	2.2	NA	0.1	0.7	0.07	0.22	0.07	51.0
West: Norfolk Street (W)												
10	L2	39	0.0	0.043	8.1	LOS A	0.2	1.4	0.14	0.94	0.14	40.5
11	T1	11	20.0	0.043	9.2	LOS A	0.2	1.4	0.14	0.94	0.14	35.5
12	R2	3	0.0	0.043	8.1	LOS A	0.2	1.4	0.14	0.94	0.14	36.2
Approach		53	4.0	0.043	8.3	LOS A	0.2	1.4	0.14	0.94	0.14	39.2
All Vehicles		259	0.8	0.085	5.0	NA	0.4	2.5	0.12	0.56	0.12	44.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 635 [Hume & Memorial - AM]

Future Case 2021-With Development-AM Peak
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 150 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Hume Hwy (S)												
1	L2	158	3.3	0.873	38.7	LOS C	45.2	333.6	0.84	0.82	0.88	34.7
2	T1	2065	7.1	0.873	30.9	LOS C	49.0	363.9	0.80	0.77	0.84	34.7
3	R2	265	0.8	0.937	66.8	LOS E	14.8	104.3	1.00	0.99	1.39	20.1
Approach		2488	6.2	0.937	35.2	LOS C	49.0	363.9	0.82	0.79	0.90	32.7
East: Memorial Ave (E)												
4	L2	28	7.4	0.819	98.1	LOS F	13.2	95.0	1.00	1.00	1.74	15.8
5	T1	144	2.9	0.819	93.4	LOS F	13.2	95.0	1.00	1.00	1.74	15.6
6	R2	186	3.4	0.963	100.0	LOS F	16.3	117.5	1.00	1.03	1.38	10.9
Approach		359	3.5	0.963	97.2	LOS F	16.3	117.5	1.00	1.01	1.56	13.3
North: Hume Hwy (N)												
7	L2	323	2.3	0.265	7.4	LOS A	1.8	13.1	0.10	0.58	0.10	43.6
8	T1	1768	10.4	0.957	63.1	LOS E	54.7	417.3	0.93	0.99	1.13	24.3
9	R2	119	0.9	0.879	89.3	LOS F	9.5	66.8	1.00	0.89	1.24	18.9
Approach		2211	8.7	0.957	56.4	LOS D	54.7	417.3	0.81	0.93	0.98	24.8
West: Memorial Ave (W)												
10	L2	111	1.9	0.943	87.5	LOS F	24.6	174.0	1.00	1.07	1.44	19.4
11	T1	356	1.2	0.943	84.7	LOS F	24.6	174.0	1.00	1.06	1.37	16.5
12	R2	119	0.9	0.943	91.3	LOS F	24.4	172.1	1.00	1.05	1.29	22.2
Approach		585	1.3	0.943	86.5	LOS F	24.6	174.0	1.00	1.06	1.37	18.3
All Vehicles		5643	6.5	0.963	52.8	LOS D	54.7	417.3	0.85	0.89	1.02	25.7

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	35.4	LOS D	0.2	0.2	0.69	0.69
P3	North Full Crossing	53	50.5	LOS E	0.2	0.2	0.82	0.82
P4	West Full Crossing	53	24.1	LOS C	0.1	0.1	0.57	0.57
All Pedestrians		158	36.7	LOS D			0.69	0.69

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: GTA CONSULTANTS | Processed: Tuesday, 20 November 2018 5:44:26 PM
Project: \\gta.com.au\projectfiles\ProjectFilesSyd\N14100-14199\N141480 Liverpool Memorial Avenue Sites\Modelling\SIDRA\3-Future Case-2021-With Development\180801Sid - Future Case 2021-With Development-network.sip8

MOVEMENT SUMMARY

Site: 635 [Hume & Memorial - PM]

Future Case 2021-With Development-PM Peak
Site Category: (None)
Signals - Fixed Time Coordinated Cycle Time = 150 seconds (Site Optimum Cycle Time - Minimum Delay)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Hume Hwy (S)												
1	L2	149	2.1	0.802	46.7	LOS D	33.0	242.0	0.87	0.81	0.88	31.9
2	T1	1598	7.0	0.802	35.0	LOS C	36.9	273.5	0.82	0.75	0.83	32.9
3	R2	174	2.4	0.951	95.6	LOS F	14.6	104.4	1.00	0.95	1.31	15.7
Approach		1921	6.2	0.951	41.4	LOS C	36.9	273.5	0.84	0.77	0.88	30.4
East: Memorial Ave (E)												
4	L2	48	0.0	0.973	98.6	LOS F	25.7	183.0	1.00	1.10	1.35	15.8
5	T1	287	2.2	0.973	94.2	LOS F	25.7	183.0	1.00	1.10	1.35	15.4
6	R2	222	6.6	0.973	99.5	LOS F	23.9	175.5	1.00	1.05	1.36	11.0
Approach		558	3.8	0.973	96.7	LOS F	25.7	183.0	1.00	1.08	1.35	13.8
North: Hume Hwy (N)												
7	L2	117	0.9	0.083	5.9	LOS A	0.2	1.1	0.02	0.56	0.02	45.8
8	T1	2445	3.3	0.983	58.7	LOS E	75.2	541.5	0.94	1.02	1.14	25.4
9	R2	136	3.1	0.801	47.9	LOS D	6.2	44.3	1.00	0.84	1.14	26.9
Approach		2698	3.2	0.983	55.9	LOS D	75.2	541.5	0.90	0.99	1.09	25.7
West: Memorial Ave (W)												
10	L2	87	0.0	0.932	87.7	LOS F	19.2	136.0	1.00	1.07	1.49	19.4
11	T1	191	2.2	0.932	84.2	LOS F	19.2	136.0	1.00	1.06	1.45	16.5
12	R2	168	0.6	0.932	92.6	LOS F	17.6	123.9	1.00	1.01	1.32	21.7
Approach		446	1.2	0.932	88.1	LOS F	19.2	136.0	1.00	1.04	1.41	19.2
All Vehicles		5623	4.1	0.983	57.5	LOS E	75.2	541.5	0.90	0.93	1.07	24.8

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P2	East Full Crossing	53	27.1	LOS C	0.1	0.1	0.60	0.60
P3	North Full Crossing	53	49.7	LOS E	0.2	0.2	0.82	0.82
P4	West Full Crossing	53	30.1	LOS D	0.1	0.1	0.63	0.63
All Pedestrians		158	35.6	LOS D			0.68	0.68

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: GTA CONSULTANTS | Processed: Tuesday, 20 November 2018 5:45:20 PM
Project: \\gta.com.au\projectfiles\ProjectFilesSyd\N14100-14199\N141480 Liverpool Memorial Avenue Sites\Modelling\SIDRA\3-Future Case-2021-With Development\180801Sid - Future Case 2021-With Development-network.sip8

MOVEMENT SUMMARY

Site: 2870 [Memorial & Bathurst - AM]

Future Case 2021-With Development-AM Peak
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 76 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Bathurst St (S)												
1	L2	178	4.7	0.139	5.4	LOS A	0.8	5.8	0.24	0.57	0.24	39.4
2	T1	654	1.1	0.372	14.3	LOS A	8.0	56.6	0.69	0.59	0.69	34.3
Approach		832	1.9	0.372	12.4	LOS A	8.0	56.6	0.59	0.59	0.59	35.0
East: Memorial Ave (E)												
4	L2	11	0.0	0.194	38.6	LOS C	1.5	10.9	0.94	0.70	0.94	17.9
5	T1	76	5.6	0.194	34.1	LOS C	1.5	11.1	0.94	0.70	0.94	14.9
Approach		86	4.9	0.194	34.6	LOS C	1.5	11.1	0.94	0.70	0.94	15.3
North: Bathurst St (N)												
7	L2	95	2.2	0.222	12.8	LOS A	4.3	30.8	0.51	0.54	0.51	35.0
8	T1	185	3.4	0.222	9.0	LOS A	4.3	30.8	0.54	0.56	0.54	36.9
9	R2	68	7.7	0.222	16.6	LOS B	2.3	16.9	0.65	0.64	0.65	31.2
Approach		348	3.9	0.222	11.5	LOS A	4.3	30.8	0.56	0.57	0.56	35.3
West: Memorial Ave (W)												
10	L2	293	2.9	0.421	23.4	LOS B	8.1	57.9	0.78	0.78	0.78	25.7
11	T1	405	0.3	0.720	29.2	LOS C	10.7	75.1	0.94	0.87	1.07	16.5
12	R2	199	3.2	0.720	35.6	LOS C	10.4	74.0	0.97	0.96	1.26	18.6
Approach		897	1.8	0.720	28.7	LOS C	10.7	75.1	0.90	0.86	1.02	20.1
All Vehicles		2163	2.3	0.720	19.9	LOS B	10.7	75.1	0.73	0.70	0.78	27.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	32.3	LOS D	0.1	0.1	0.92	0.92
P2	East Full Crossing	53	11.6	LOS B	0.1	0.1	0.55	0.55
P3	North Full Crossing	53	32.3	LOS D	0.1	0.1	0.92	0.92
P4	West Full Crossing	53	17.1	LOS B	0.1	0.1	0.67	0.67
All Pedestrians		211	23.3	LOS C			0.77	0.77

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.

Case-2021-With Development\180801Sid - Future Case 2021-With Development-network.sip8

MOVEMENT SUMMARY

Site: 2870 [Memorial & Bathurst - PM]

Future Case 2021-With Development-PM Peak
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 76 seconds (Site Optimum Cycle Time - Minimum Delay)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Bathurst St (S)												
1	L2	316	5.3	0.260	5.8	LOS A	1.8	12.9	0.30	0.60	0.30	39.0
2	T1	483	2.4	0.721	33.9	LOS C	9.6	68.3	0.99	0.88	1.10	24.0
Approach		799	3.6	0.721	22.8	LOS B	9.6	68.3	0.71	0.77	0.78	27.1
East: Memorial Ave (E)												
4	L2	41	0.0	0.381	39.7	LOS C	3.1	21.8	0.96	0.75	0.96	17.2
5	T1	129	4.1	0.381	35.1	LOS C	3.1	22.4	0.96	0.75	0.96	14.5
Approach		171	3.1	0.381	36.2	LOS C	3.1	22.4	0.96	0.75	0.96	15.2
North: Bathurst St (N)												
7	L2	97	3.3	0.541	18.0	LOS B	8.8	61.9	0.68	0.63	0.68	31.2
8	T1	572	0.2	0.541	16.2	LOS B	10.9	77.5	0.75	0.69	0.82	32.1
9	R2	95	5.6	0.541	23.4	LOS B	10.9	77.5	0.82	0.75	0.95	27.7
Approach		763	1.2	0.541	17.3	LOS B	10.9	77.5	0.75	0.69	0.82	31.4
West: Memorial Ave (W)												
10	L2	180	5.3	0.153	9.9	LOS A	2.5	18.4	0.40	0.65	0.40	35.4
11	T1	192	1.1	0.495	21.5	LOS B	7.7	54.4	0.82	0.71	0.88	19.5
12	R2	126	0.8	0.495	28.2	LOS B	7.7	54.4	0.89	0.81	0.98	21.8
Approach		498	2.5	0.495	19.0	LOS B	7.7	54.4	0.69	0.71	0.73	25.4
All Vehicles		2231	2.5	0.721	21.1	LOS B	10.9	77.5	0.74	0.73	0.80	27.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site 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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

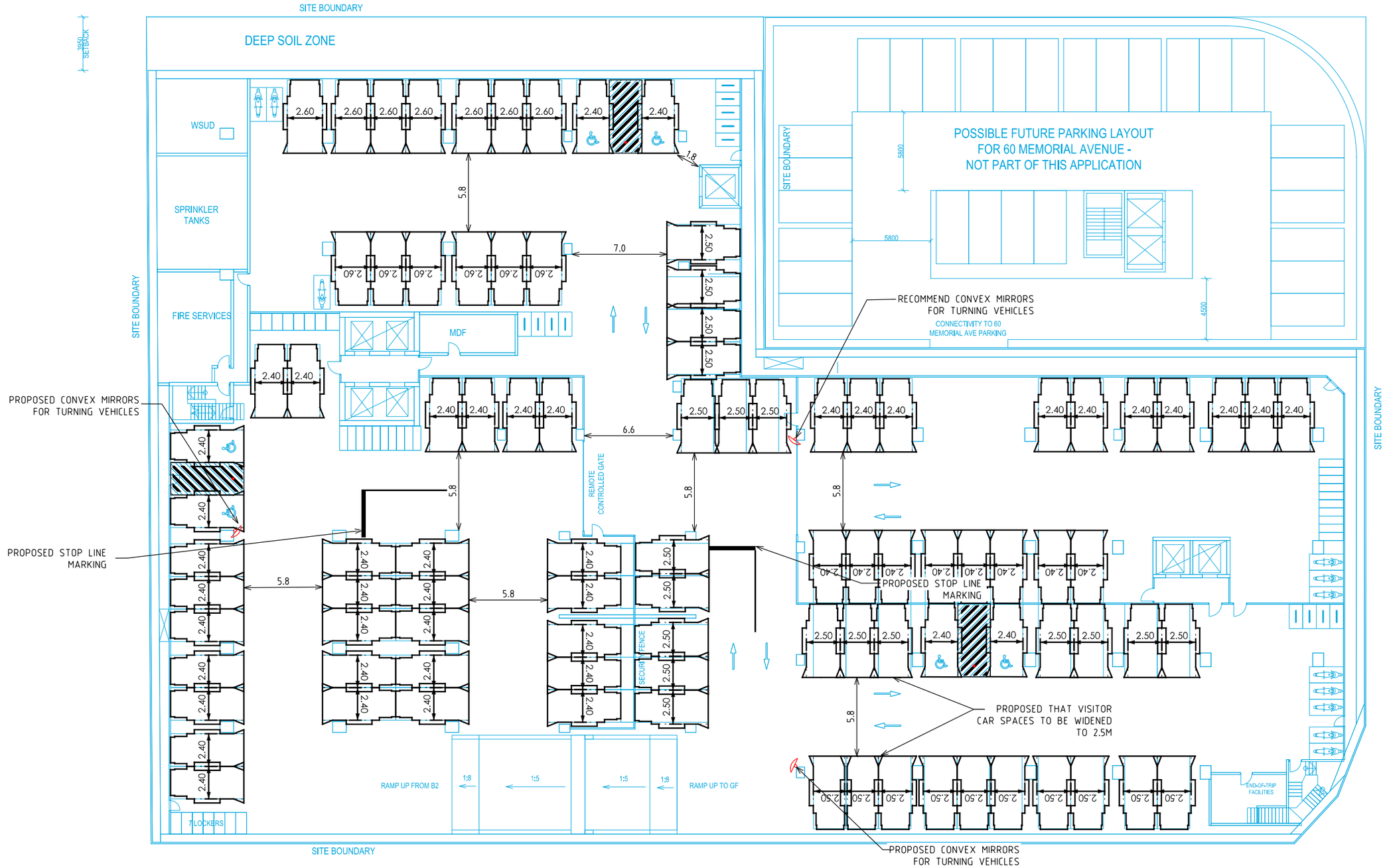
Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	53	32.3	LOS D	0.1	0.1	0.92	0.92
P2	East Full Crossing	53	32.3	LOS D	0.1	0.1	0.92	0.92
P3	North Full Crossing	53	32.3	LOS D	0.1	0.1	0.92	0.92
P4	West Full Crossing	53	32.3	LOS D	0.1	0.1	0.92	0.92
All Pedestrians		211	32.3	LOS D			0.92	0.92

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.

Case-2021-With Development\180801Sid - Future Case 2021-With Development-network.sip8

Appendix E

Swepth Path Analysis



PLOTTED BY : Rodney.Wong ON 11/12/2018 AT 11:22:56 AM

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Sydney	02 8448 1800
Brisbane	07 3113 5000
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Perth	08 6169 1000

PRELIMINARY PLAN
FOR DISCUSSION PURPOSES
ONLY SUBJECT TO CHANGE
WITHOUT NOTIFICATION

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

DESIGNED R.WONG
DESIGN CHECK D.CHOI
APPROVED BY D.CHOI
DATE ISSUED 11 DECEMBER 2018

SCALE A3 0 3 6 1:300
CAD FILE NO. N141480-04-P1.dgn

PROPOSED MIXED USE DEVELOPMENT
79 BATHURST STREET, LIVERPOOL
BASEMENT 1 LEVEL
COMPLIANCE REVIEW

DRAWING NO. N141480-04-01 SHEET 01 OF 11 ISSUE P1

BICYCLE LOCKERS CAN BE ACCESSED FROM SHARED ZONE SIDE ONLY

FURTHER MANUFACTURER SPECIFICATIONS TO BE PROVIDED

PROPOSED CONVEX MIRRORS FOR TURNING VEHICLES

PROPOSED STOP LINE MARKING

SITE BOUNDARY

SITE BOUNDARY

SITE BOUNDARY

SITE BOUNDARY

3850 SETBACK

12 BIKE LOCKERS

24 BIKE LOCKERS

20 BIKE LOCKERS

104 RESIDENTIAL SPACES
8 ADAPTABLE SPACES
56 BICYCLE LOCKERS
54 STORAGE LOCKERS
SFL 14.000

CONTROLLED GATE

PROPOSED CONVEX MIRRORS FOR TURNING VEHICLES

PROPOSED STOP LINE MARKING

13 STORAGE LOCKERS

RAMP UP FROM B3

RAMP UP TO B1

RECOMMEND CONVEX MIRRORS FOR TURNING VEHICLES

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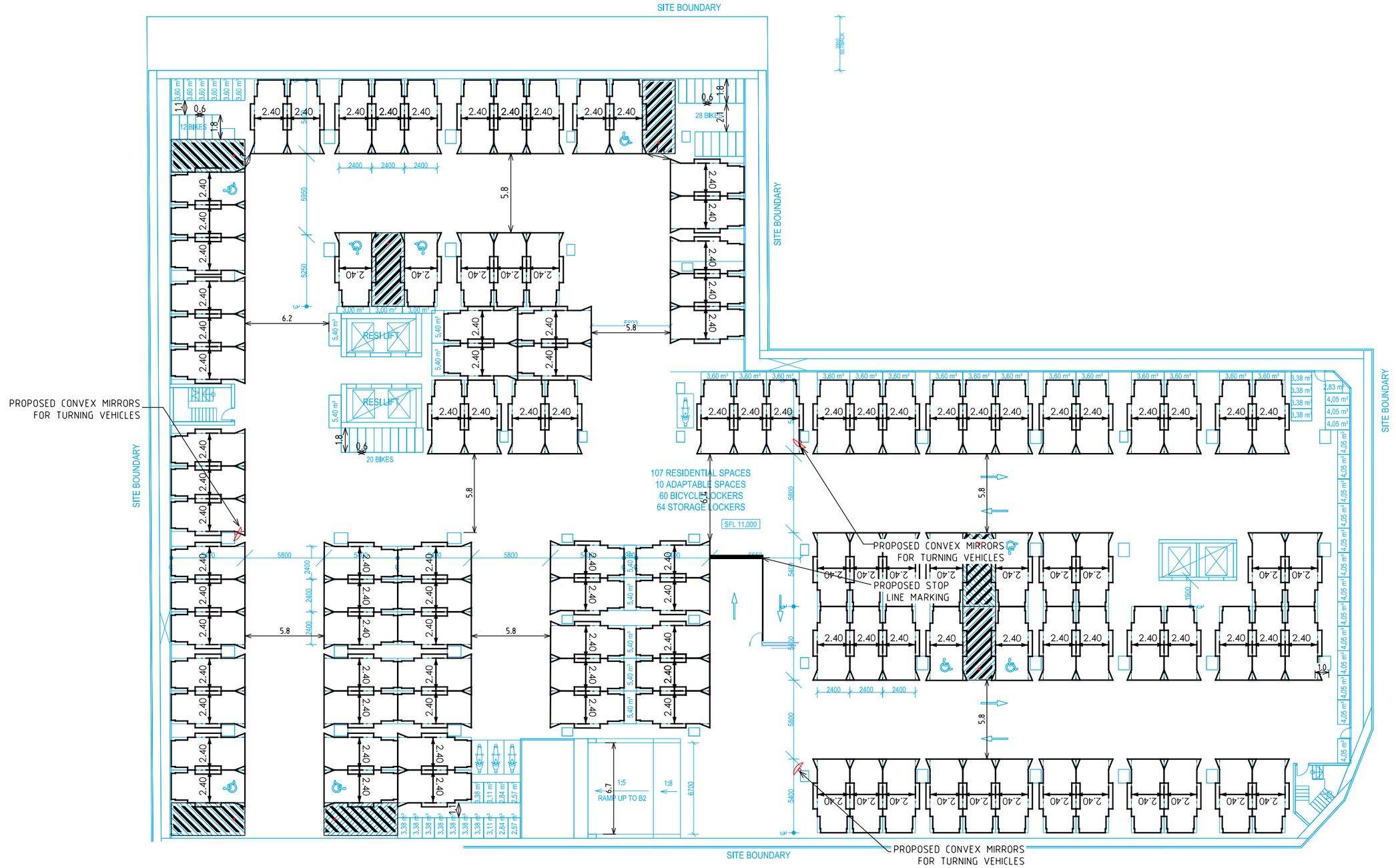
CAD FILE NO. N141480-04-P1.dgn

PROPOSED MIXED USE DEVELOPMENT
79 BATHURST STREET, LIVERPOOL
BASEMENT 2 LEVEL
COMPLIANCE REVIEW

DRAWING NO. N141480-04-02 SHEET 02 OF 11 ISSUE P1



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PRELIMINARY PLAN
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DESIGN CHECK	D.CHOI
APPROVED BY	D.CHOI
DATE ISSUED	11 DECEMBER 2018
SCALE	A3
CAD FILE NO.	N141480-04-P1.dgn

0 3 6 1:300

PROPOSED MIXED USE DEVELOPMENT
79 BATHURST STREET, LIVERPOOL
BASEMENT 3 LEVEL
COMPLIANCE REVIEW

DRAWING NO. N141480-04-03 SHEET 03 OF 11 ISSUE P1

MEMORIAL AVENUE

CASTLEREAGH STREET

CASTLEREAGH ST

SITE BOUNDARY

BUILDING OVER

PLANTER

OUTDOOR SEATING
FFL 20.920

AWNING OVER

RESTAURANT
549.7 m²
FFL 21.000

RESI LOBBY

MAIL

F.C.R.

FFL 21.000

COMMERCIAL
108.7 m²
FFL 21.000

GARBAGE

SWITCH ROOM

RETAIL & COMMERCIAL GARBAGE HOLDING ROOM

RESIDENTIAL GARBAGE

EXHAUST RISE

HYDRANT BOOSTER VALVES

MRV
STANDARDS (AU)

GARBAGE TRUCK

CARPARK AIR INTAKE

LOADING DOCK
FFL 20.000

SFL 20.900

FFL 21.200

ROLLER SHUTTER

SUB-STATION

KIOSK SUB-STATION

BLAST WALL

EDGE OF BUILDING OVER

RAMP TO PARKING

1:8

1:16

1:20

TPZ

TREE 7

TREE 8

TREE 9

SFL 20,670

FGL 21,200

96 - 98 CASTLEREAGH ST
BASEMENT

DA3203

DA3201

DA3204

DA8521

DA3202

DA3105

8.80

1.50 5.00

MRV

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 500mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h

DN 11/12/2018 AT 11:22:57 AM

PLOTTED BY : Rodney.Wong

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Adelaide	08 8334 3600
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PRELIMINARY PLAN
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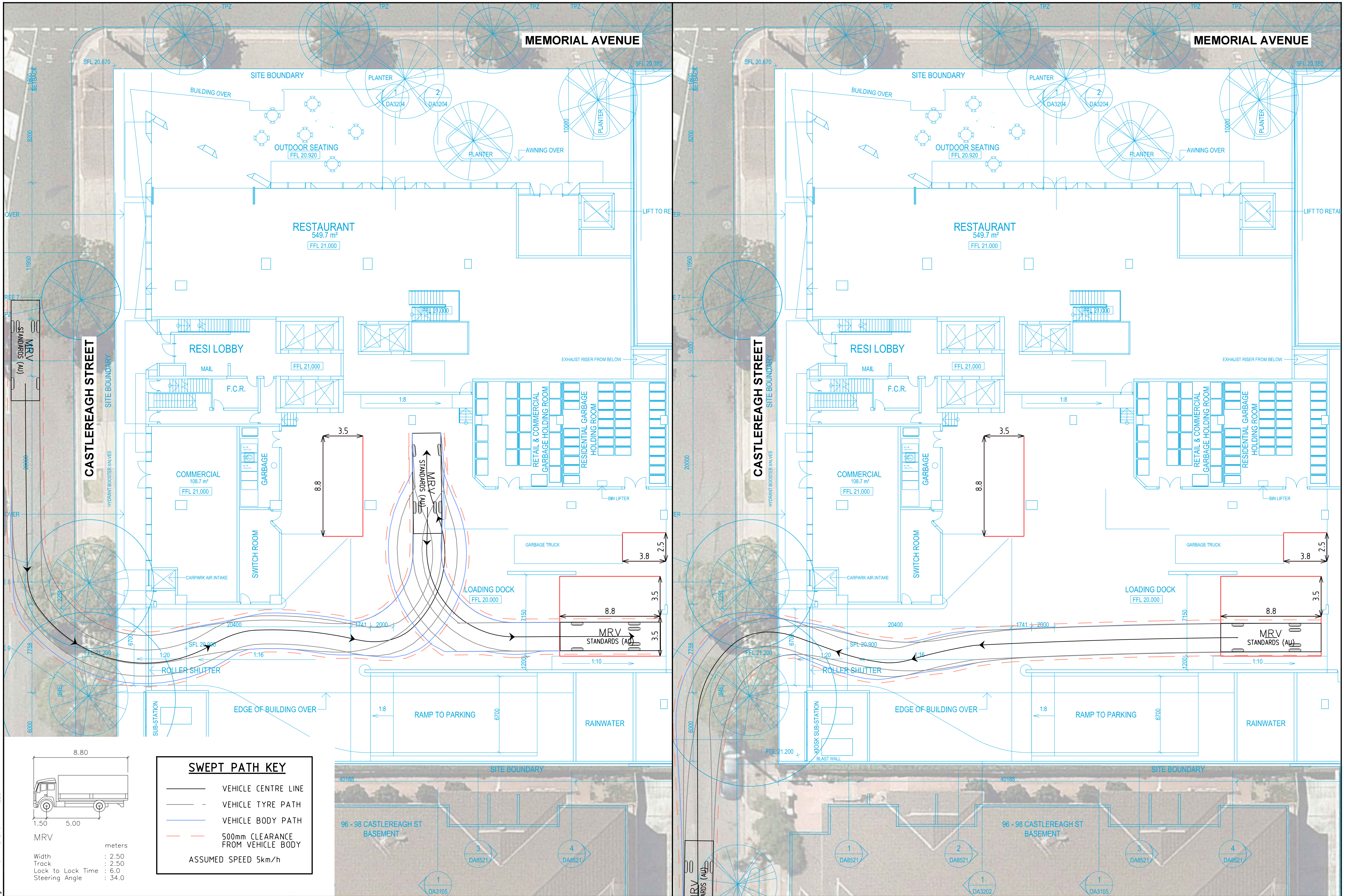
DESIGN CHECK D. CHOI
APPROVED BY D.CHOI
DATE ISSUED 11 DECEMBER 2018

SCALE A3 0 3 6 1:300
CAD FILE NO. N141480-04-P1.dgn

PROPOSED MIXED USE DEVELOPMENT
79 BATHURST STREET, LIVERPOOL
GROUND LEVEL
SWEPT PATH ASSESSMENT

DRAWING NO. N141480-04-04 SHEET 04 OF 11 ISSUE P1



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PRELIMINARY PLAN
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DESIGN CHECK D.CHOI
APPROVED BY D.CHOI
DATE ISSUED 11 DECEMBER 2018
SCALE A3 0 3 6 1:300
CAD FILE NO. N141480-04-P1.dgn

PROPOSED MIXED USE DEVELOPMENT
79 BATHURST STREET, LIVERPOOL
GROUND LEVEL
SWEPT PATH ASSESSMENT

DRAWING NO. N141480-04-05 SHEET 05 OF 11 ISSUE P1

MEMORIAL AVENUE

CASTLEREAGH STREET

SITE BOUNDARY

BUILDING OVER

OUTDOOR SEATING
FFL 20,920

PLANTER

AWNING OVER

RESTAURANT
549.7 m²
FFL 21.000

RESI LOBBY

MAIL

F.C.R.

FFL 21.000

EXHAUST RISER FROM BELOW

1:8

RETAIL & COMMERCIAL GARBAGE HOLDING ROOM

RESIDENTIAL GARBAGE HOLDING ROOM

BIN LIFTER

COMMERCIAL
108.7 m²
FFL 21.000

GARBAGE

SWITCH ROOM

CARPARK AIR INTAKE

GARBAGE TRUCK

LOADING DOCK
FFL 20.000

MRV
STANDARDS (AU)

ROLLER SHUTTER

SFL 20,900

FFL 21.200

EDGE OF BUILDING OVER

RAMP TO PARKING

RAINWATER

SUB-STATION

HYDRANT BOOSTER VALVES

96 - 98 CASTLEREAGH ST
BASEMENT

SITE BOUNDARY

8.80

1.50 5.00

MRV

	meters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 500mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h

DN 11/12/2018 AT 11:23:00 AM

PLOTTED BY : Rodney.Wong

GTA consultants
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Melbourne	03 9851 9600
Sydney	02 8448 1800
Brisbane	07 3113 5000
Adelaide	08 8334 3600
Perth	08 6169 1000

PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY SUBJECT TO CHANGE WITHOUT NOTIFICATION

WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

DESIGNED	R.WONG
DESIGN CHECK	D.CHOI
APPROVED BY	D.CHOI
DATE ISSUED	11 DECEMBER 2018
SCALE	A3 — 1:300
CAD FILE NO.	N141480-04-P1.dgn

PROPOSED MIXED USE DEVELOPMENT
79 BATHURST STREET, LIVERPOOL
GROUND LEVEL
SWEPT PATH ASSESSMENT

DRAWING NO. N141480-04-06 SHEET 06 OF 11 ISSUE P1

MEMORIAL AVENUE

CASTLEREAGH STREET

SITE BOUNDARY

BUILDING OVER

OUTDOOR SEATING
FFL 20,920

PLANTER

AWNING OVER

RESTAURANT
549.7 m²
FFL 21.000

RESI LOBBY

MAIL

F.C.R.

FFL 21.000

EXHAUST RISER FROM BELOW

1:8

RETAIL & COMMERCIAL GARBAGE HOLDING ROOM

RESIDENTIAL GARBAGE HOLDING ROOM

BIN LIFTER

COMMERCIAL
108.7 m²
FFL 21.000

GARBAGE

SWITCH ROOM

CARPARK AIR INTAKE

LOADING DOCK
FFL 20.000

SFL 20,900

FFL 21,200

ROLLER SHUTTER

1:20

1:16

1:10

EDGE OF BUILDING OVER

SUB-STATION

KIOSK SUB-STATION

BLAST WALL

FGL 21,200

RAMP TO PARKING

RAINWATER

HYDRANT BOOSTER VALVES

SFL 20,670

SFL 20,380

1800 SETBACK

10000

20400

1741

2000

3.5

8.8

2.5

3.8

BUCHER URBIN II 10.6m
GTA-NSW

96 - 98 CASTLEREAGH ST
BASEMENT

40188

DA3204

DA8521

DA3105

DA3202

TPZ

10.61

1.67

5.50

BUCHER URBIN II 10.6m

meters

Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.0
Steering Angle	: 38.5

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 500mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h

ON 11/12/2018 AT 11:23:01 AM

PLOTTED BY : Rodney.Wong

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Brisbane	07 3113 5000
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Perth	08 6169 1000

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PRELIMINARY PLAN
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APPROVED BY D.CHOI	DATE ISSUED 11 DECEMBER 2018
SCALE A3	0 3 6 1:300
CAD FILE NO. N141480-04-P1.dgn	

PROPOSED MIXED USE DEVELOPMENT
79 BATHURST STREET, LIVERPOOL
GROUND LEVEL
SWEPT PATH ASSESSMENT

DRAWING NO. N141480-04-07 SHEET 07 OF 11 ISSUE P1

SITE BOUNDARY
SFL 20,670
SFL 20,380
BUILDING OVER
PLANTER
1 DA3204
2 DA3204
OUTDOOR SEATING
FFL 20.920
AWNING OVER
RESTAURANT
549.7 m²
FFL 21.000
LIFT TO RETAIL PARKING
1 DA3203
EXISTING BUILDING
60 MEMORIAL AVE
2 DA3105
2 DA3203
SITE BOUNDARY
FFL 20,360
RESI LOBBY
MAIL
F.C.R.
FFL 21,000
SPIRE 27.000
EXHAUST RISER FROM BELOW
1:8
RETAIL & COMMERCIAL GARBAGE HOLDING ROOM
RESIDENTIAL GARBAGE HOLDING ROOM
BIN LIFTER
A/C PLANT
RETAIL 1
442.7 m²
FFL 20,750
COMMERCIAL
108.7 m²
FFL 21.000
GARBAGE
SWITCH ROOM
CARPARK AIR INTAKE
GARBAGE TRUCK
LOADING DOCK
FFL 20.000
UP 1:40
MAIL
RESI LIFT
RESI LOBBY
GARBAGE ROOM
STAIR
FFL 20,595
BUILDING OVER
AWNING OVER
FFL 20,560
FFL 20,390
SITE BOUNDARY
FFL 21,040
AWNING OVER
BUILDING OVER
FFL 21,040
RETAIL 2
402.4 m²
FFL 21,000
ROLLER SHUTTER
SFL 20.900
1:20
1:16
1:10
EDGE OF BUILDING OVER
RAMP TO PARKING
KIOSK SUB-STATION
BLAST WALL
FGL 21,200
RAINWATER
A/C PLANT
BULKY WASTE
SITE BOUNDARY
96 - 98 CASTLEREAGH ST
BASEMENT
CASTLEREAGH ST
SITE BOUNDARY
SETBACK
AWNING OVER
TREE 7
TPZ
TREE 8
TREE 9
TREE 5
TREE 6
HYDRANT BOOSTER VALVES
B99 STANDARDS 2004 (AU_NZ)

5.20
0.95 3.05

B99 6.3mR metres

Width	: 1.94
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 300mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h

PLOTTED BY : Rodney.Wong ON 11/12/2018 AT 11:23:03 AM

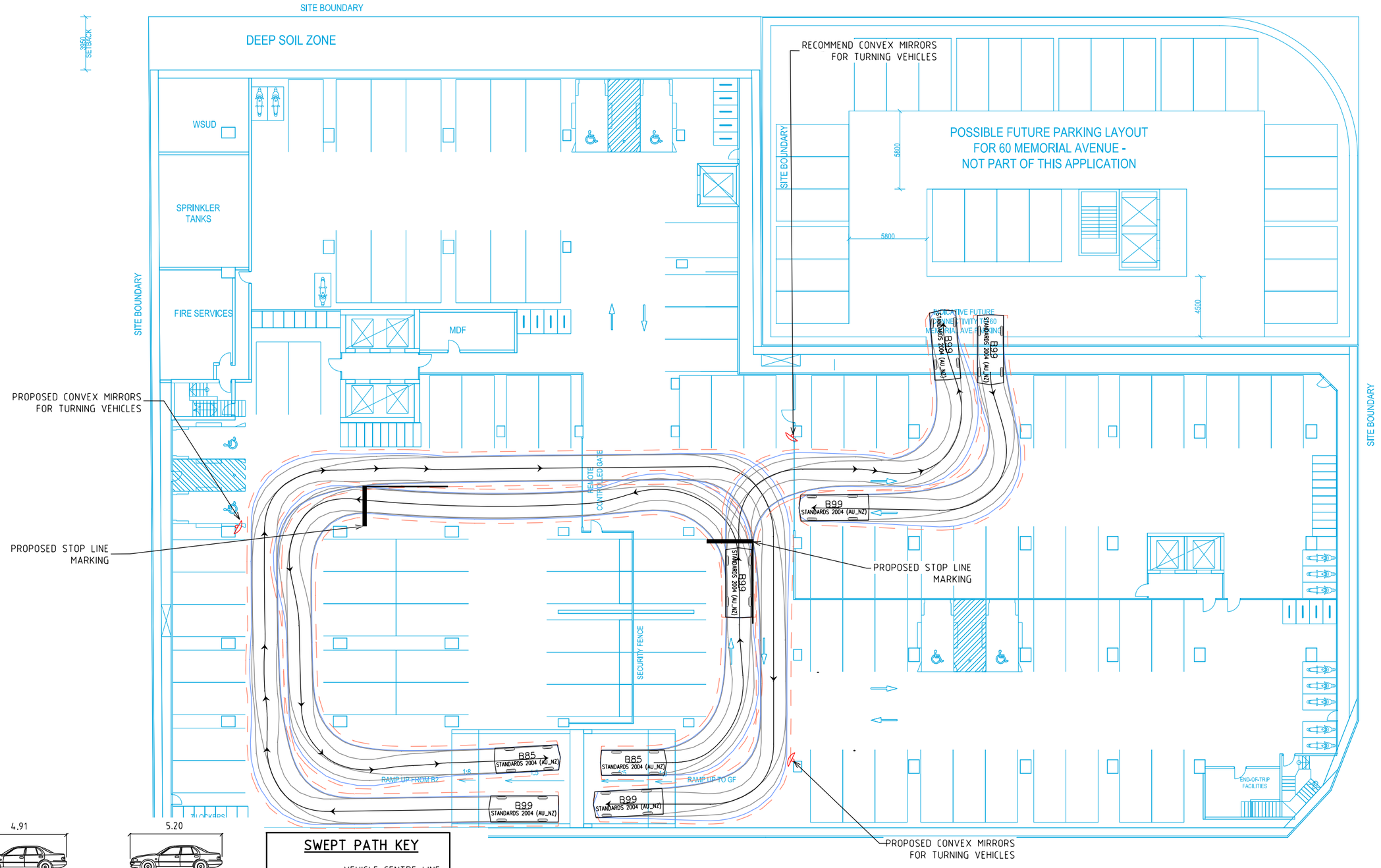
GTA consultants
www.gta.com.au

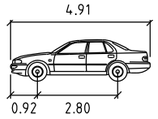
Melbourne	03 9851 9600
Sydney	02 8448 1800
Brisbane	07 3113 5000
Adelaide	08 8334 3600
Perth	08 6169 1000

DESIGNED	R.WONG
DESIGN CHECK	D.CHOI
APPROVED BY	D.CHOI
DATE ISSUED	11 DECEMBER 2018
SCALE	A3 — 0 3 6 — 1:300
CAD FILE NO.	N141480-04-P1.dgn

PROPOSED MIXED USE DEVELOPMENT
79 BATHURST STREET, LIVERPOOL
GROUND LEVEL
SWEPT PATH ASSESSMENT

DRAWING NO. N141480-04-08 SHEET 08 OF 11 ISSUE P1





B85	metres
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

B99 6.3mR	metres
Width	: 1.94
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 300mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h

PLOTTED BY : Rodney.Wong ON 11/12/2018 AT 11:23:03 AM

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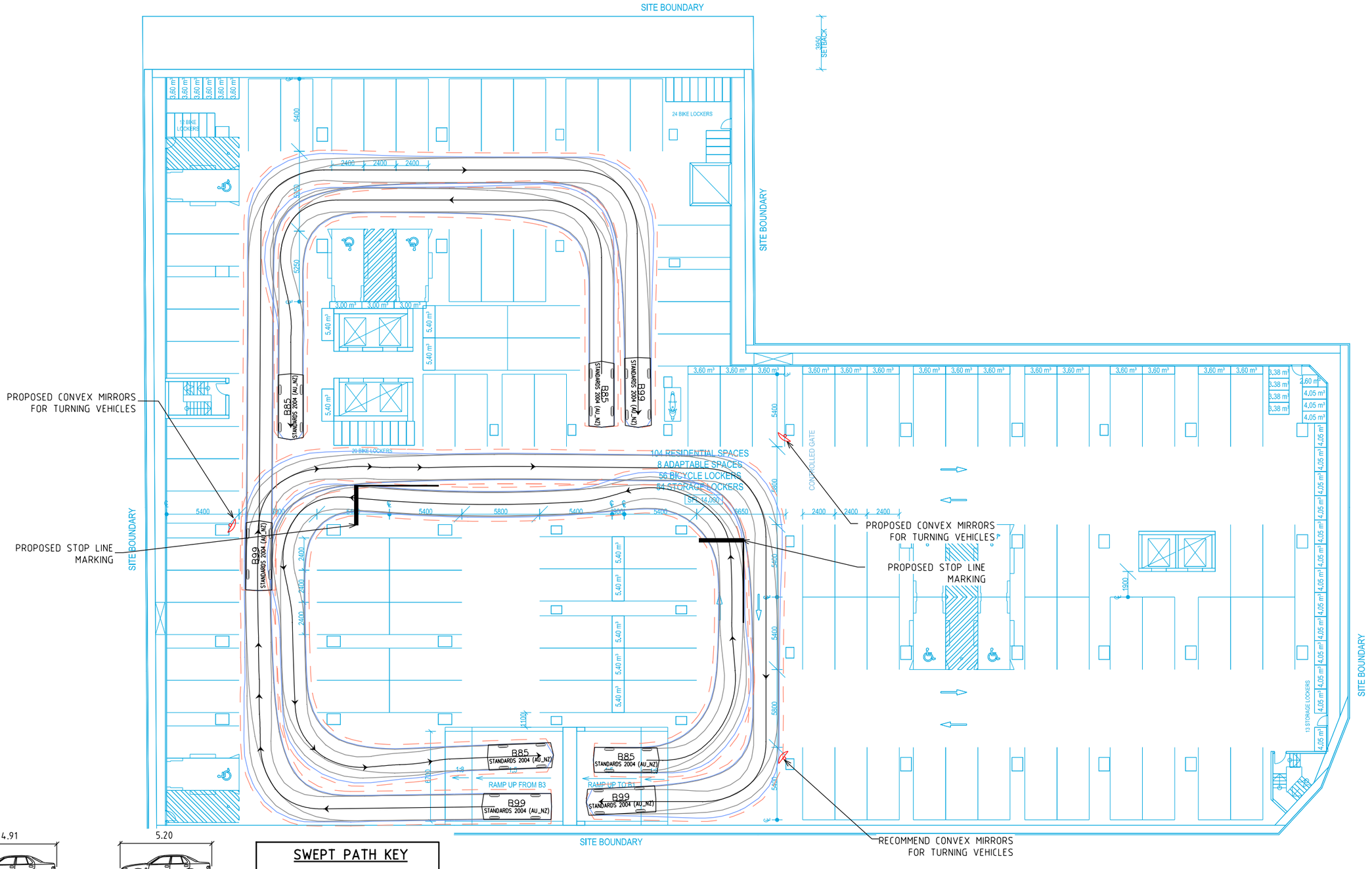
PRELIMINARY PLAN
FOR DISCUSSION PURPOSES ONLY SUBJECT TO CHANGE WITHOUT NOTIFICATION

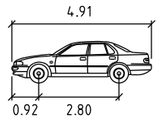
WARNING
BEWARE OF UNDERGROUND SERVICES
THE LOCATIONS OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THEIR EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL EXISTING SERVICES ARE SHOWN.

DESIGNED	R.WONG
DESIGN CHECK	D.CHOI
APPROVED BY	D.CHOI
DATE ISSUED	11 DECEMBER 2018
SCALE	A3 — 0 3 6 — 1:300
CAD FILE NO.	N141480-04-P1.dgn

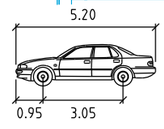
PROPOSED MIXED USE DEVELOPMENT
79 BATHURST STREET, LIVERPOOL
BASEMENT 1 LEVEL
SWEPT PATH ASSESSMENT

DRAWING NO. N141480-04-09 SHEET 09 OF 11 ISSUE P1





B85	metres
Width	: 1.87
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.0



B99 6.3mR	metres
Width	: 1.94
Track	: 1.77
Lock to Lock Time	: 6.0
Steering Angle	: 34.0

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 300mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h

PLOTTED BY : Rodney.Wong ON 11/12/2018 AT 11:23:03 AM

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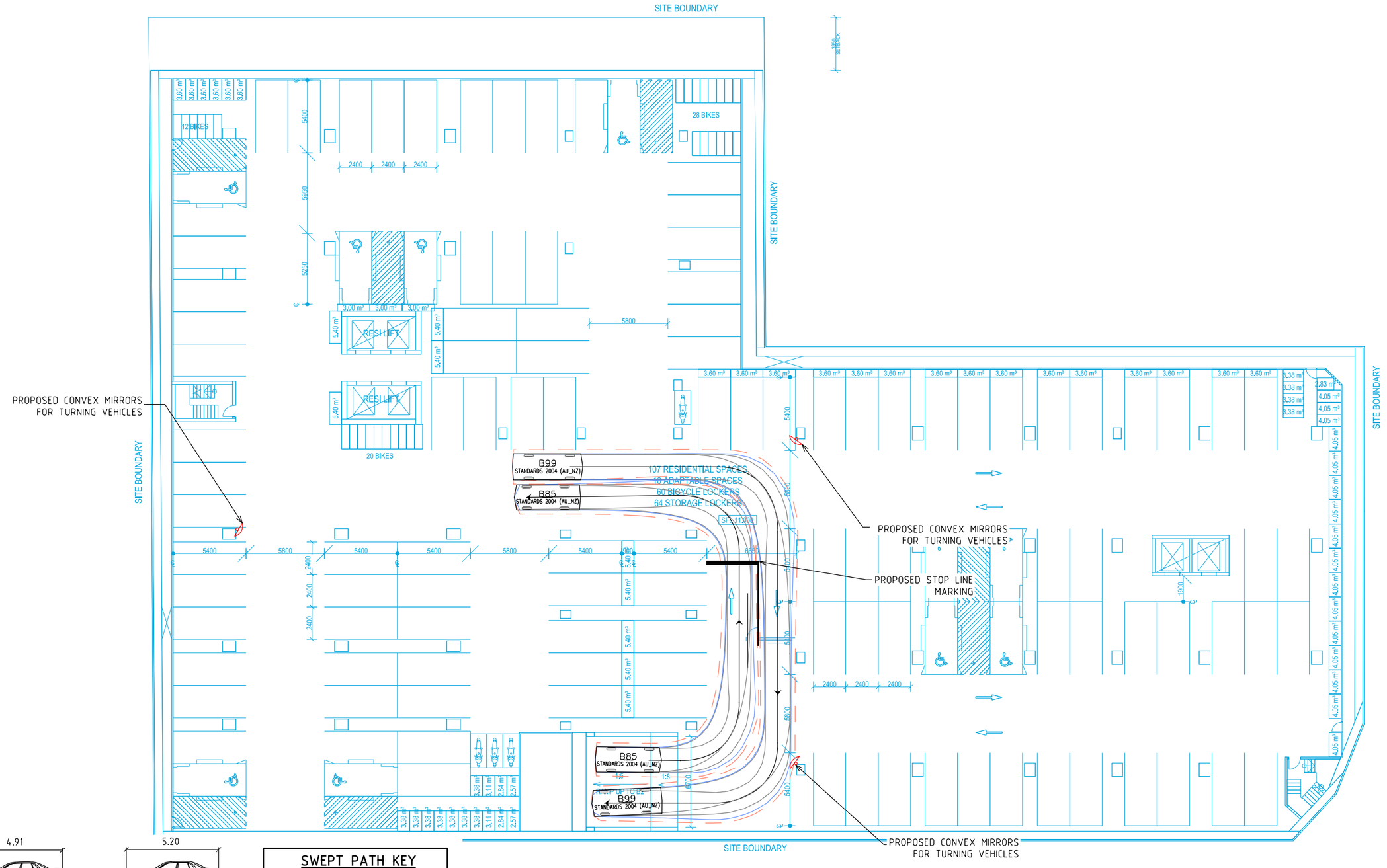
DESIGNED R.WONG	DESIGN CHECK D.CHOI
APPROVED BY D.CHOI	DATE ISSUED 11 DECEMBER 2018

SCALE A3 — 0 3 6 — 1:300

CAD FILE NO. N141480-04-P1.dgn

PROPOSED MIXED USE DEVELOPMENT
79 BATHURST STREET, LIVERPOOL
BASEMENT 2 LEVEL
SWEPT PATH ASSESSMENT

DRAWING NO. N141480-04-10 SHEET 10 OF 11 ISSUE P1



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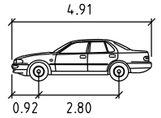
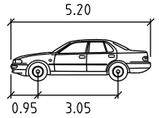


0.92 2.80

5.20



0.95 3.05

B85	metres	B99 6.3mR	metres
Width	: 1.87	Width	: 1.94
Track	: 1.77	Track	: 1.77
Lock to Lock Time	: 6.0	Lock to Lock Time	: 6.0
Steering Angle	: 34.0	Steering Angle	: 34.0

SWEPT PATH KEY

- VEHICLE CENTRE LINE
- VEHICLE TYRE PATH
- VEHICLE BODY PATH
- 300mm CLEARANCE FROM VEHICLE BODY

ASSUMED SPEED 5km/h

PLOTTED BY : Rodney.Wong
ON 11/12/2018 AT 11:23:04 AM

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PRELIMINARY PLAN
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DESIGNED R.WONG	DESIGN CHECK D.CHOI
APPROVED BY D.CHOI	DATE ISSUED 11 DECEMBER 2018

SCALE A3 — 0 3 6 — 1:300

CAD FILE NO. N141480-04-P1.dgn

PROPOSED MIXED USE DEVELOPMENT
79 BATHURST STREET, LIVERPOOL
BASEMENT 3 LEVEL
SWEPT PATH ASSESSMENT

DRAWING NO. N141480-04-11 SHEET 11 OF 11 ISSUE P1

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