

Proposed Mixed Use Development 12 Hassall Street, Parramatta

Rezoning Traffic and Parking Assessment Report

Prepared for: GQ Hassall Street Pty Ltd

May 2022

Report No: PT21104r01_V3

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1. Introduction

This report has been prepared on behalf of GQ Hassall Street Pty Ltd to present findings of a traffic and parking assessment of the proposed mixed-use development at the site known as 12 Hassall Street, Parramatta

The study has assessed existing traffic conditions, parking demands, access arrangements, future traffic conditions and design compliance.

The remainder of the report is set out as follows:

- Section 2 describes the existing traffic and parking conditions;
- Section 3 summarises the proposed development;
- Section 4 reviews the potential traffic impacts of the proposal;
- Section 5 reviews the design for compliance with relevant standards; and
- Section 6 presents the conclusions



2. Existing Development / Conditions

The following presents a summary of existing site and traffic conditions.

2.1 Site Location

The development site has been subject to a number of historical planning studies including a Planning Proposal that resulted in an increase to the FSR to 16:1 and increase in the height to 192 metres. Subsequently an Architectural design competition was held with the winning scheme prepared by PTW now proceeding to a DA.

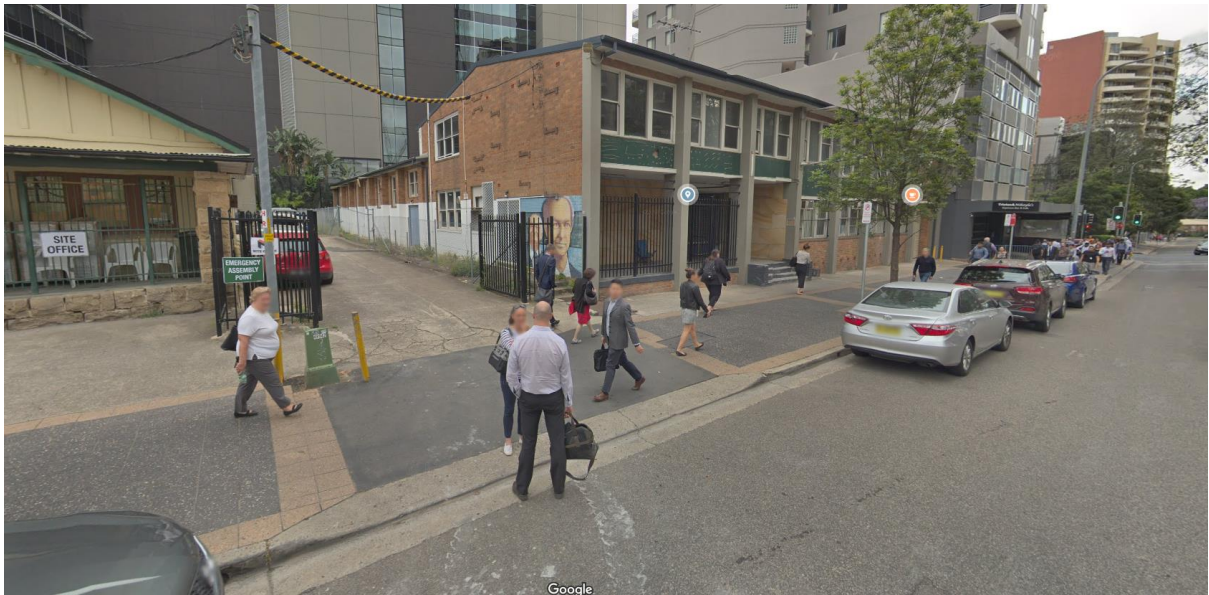
The location of the development site at No.12 Hassall Street is shown below in [Figure 1](#).

Figure 1 - 12 Hassall Street, Parramatta - Site Location



The existing site includes a single dwelling house with open air car park at the rear and a two-storey mixed use development. The existing general / service vehicle access arrangements includes a single entry / exit driveway serving both properties as shown below in [Figure 2](#).

Figure 2 - 12 Hassall Street, Parramatta – Existing Central Entry / Exit Access Driveway



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A further lower order single lane driveway providing access to a garage is located adjacent to the eastern boundary of the site as shown below in [Figure 3](#). As noted below the adjacent site which shares the common eastern boundary of the development site at No.12 Hassall Street has been redeveloped and includes an entry / exit driveway immediately adjacent to its western boundary.

Figure 3 - 12 Hassall Street, Parramatta – Existing Eastern Boundary Single Lane Entry / Exit Access Driveway



It was noted at the time of preparing this report that the building at No.14 Hassall Street includes a building envelope / overhang which is positioned closer to the Hassall Street kerbline and which has required the provision of fencing / garden to guide crossing pedestrians away from the vehicle entry for their safety and around the outdent wall on the sites eastern boundary. This is shown below in [Figure 4](#).

Figure 4 - 12 / 14 Hassall Street, Parramatta – Garden / Fencing Separator Island to Redirect Pedestrians for their safety



The existing entry / exit driveway is located approximately **47m** from the hold lines in Hassall Street of the signalised intersection of Hassall Street / Charles Street.

On the common western boundary with site, a wide three (3) lane entry / exit driveway is provided to serve the NSW Police Force Headquarters Building.

The Site is located at the eastern end of the Parramatta CBD and is in close proximity to the Parramatta Rail Station and Transport Interchange (100m to the west) and the Parramatta Square urban renewal precinct (250m to the north west).

It is observed that the site to the west (2-6 Hassall street) has recently been subject to a significant redevelopment to provide the Western Sydney Innovation Hub which has now been completed. This development included:

- 15,337m² of tertiary education GFA;
- 12981m² of commercial tenancy GFA;
- 211m² of retail GFA
- Basement / Lower Ground level including 14 car parking spaces
- Entry / exit vehicle access from Hassall Street

2.2 Classification Criteria

It is usual to classify roads according to a road hierarchy in order to determine their functional role within the road network. Changes to traffic flows on the roads can then be assessed within the context of the road hierarchy. Roads are classified according to the role they fulfil and the volume of traffic they should appropriately carry. The RTA has set down the following guidelines for the functional classification of roads.

- Arterial Road – typically a main road carrying over 15,000 vehicles per day and fulfilling a role as a major inter-regional link (over 1,500 vehicles per hour)
- Sub-arterial Road – defined as secondary inter-regional links, typically carrying volumes between 5,000 and 20,000 vehicles per day (500 to 2,000 vehicles per hour)
- Collector Road – provides a link between local roads and regional roads, typically carrying between 2,000 and 10,000 vehicles per day (250 to 1,000 vehicles per hour). At volumes greater than 5,000 vehicles per day, residential amenity begins to decline noticeably.
- Local Road – provides access to individual allotments, carrying low volumes, typically less than 2,000 vehicles per day (250 vehicles per hour).

2.3 Existing Road Network

Hassall Street - is a local road which becomes an RMS secondary road (SR2049) from the intersection of Parkes Street to James Ruse Drive. Across the frontage of the site Hassall Street includes a single travel lane in each direction with time restricted parallel parking. However, to the immediate west of the driveway access to NSW Police Force Headquarters, Hassall Street operates as a single travel lane westbound with parallel parking on both sides of the street. The street includes a posted speed limit of 50 km.hr.

Charles Street - is a local street running north – south east of the development site and forms a signalised four way intersection with Hassall Street. The street generally includes one to two travel lanes in each direction with time restricted parallel parking on both sides of the street. A 40km/hr school zone is located to the north of Charles Street with a bus staging area to the south.

2.4 Existing Traffic Flows

2.4.1 Pre Covid Pandemic Counts 2019

Having regard to the marked changes in commuter travel behaviour during and now post the Covid pandemic, reference is made to the traffic impact assessment report¹ undertaken for the site immediately to the west (Western Sydney Innovation Hub at 2 to 6 Hassall Street) which did include intersection counts beyond any restrictions to travel in 2019.

The traffic report included counts between the hours of 6:00am – 10:00am and 3:00pm – 7:00pm on a weekday at the following locations:

- Station Street / Hassall Street / Argyle Street; and

¹ Western Sydney Innovation Hub 2-6b Hassall Street Parramatta Traffic Impact Assessment Report – ASON Group April 2019

- Hassall Street / Charles Street

These counts found the following flows by movement at each intersection surveyed.

Figure 5 – 2019 ASON Group Traffic Report, 2-6b Hassall Street – AM Peak Hour Recorded Flows

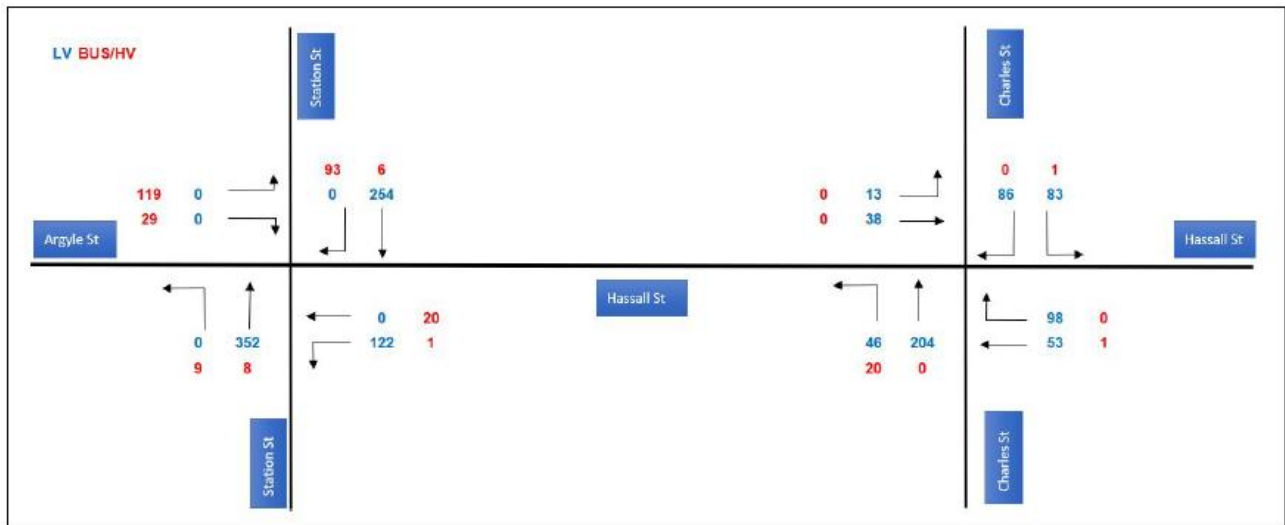
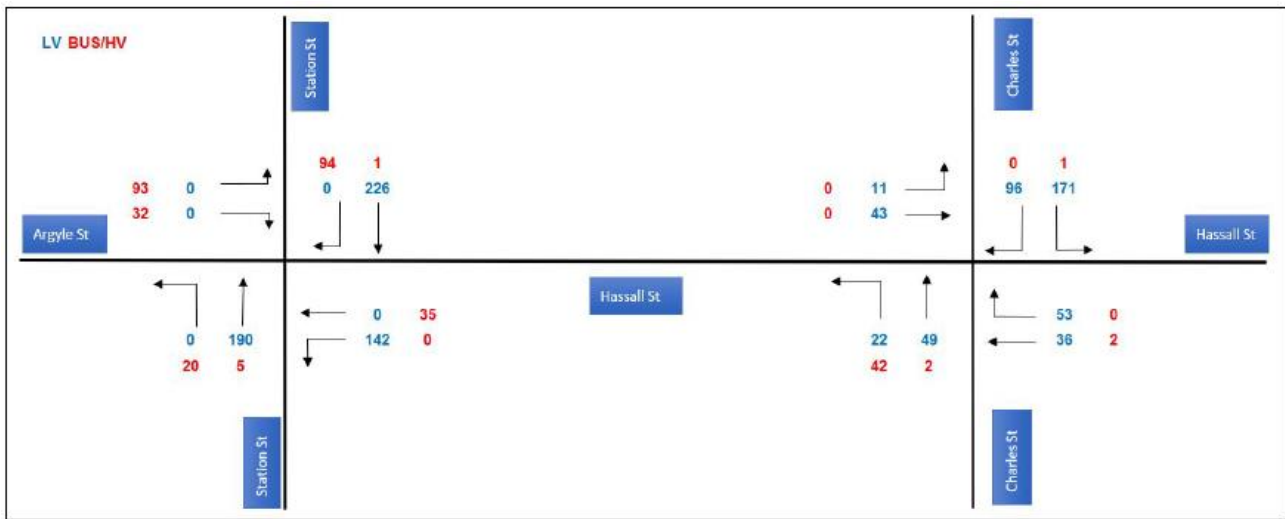


Figure 6 – 2019 ASON Group Traffic Report, 2-6b Hassall Street – PM Peak Hour Recorded Flows



From **Figure 5** and **Figure 6** above it is observed that despite being located in a large town centre, traffic flows in Hassall Street were somewhat below the maximum environmental capacity of the street.

2.4.2 2022 Counts

To provide an indication of potential changes to traffic volumes in the immediate area, intersection counts were undertaken at the same locations described above in March 2022. The resulting light vehicle / heavy vehicle volumes for each movement at each intersection is shown below in **Figure 7** and **Figure 8**.

Figure 7 – 2022 AM Peak Hour Recorded Flows

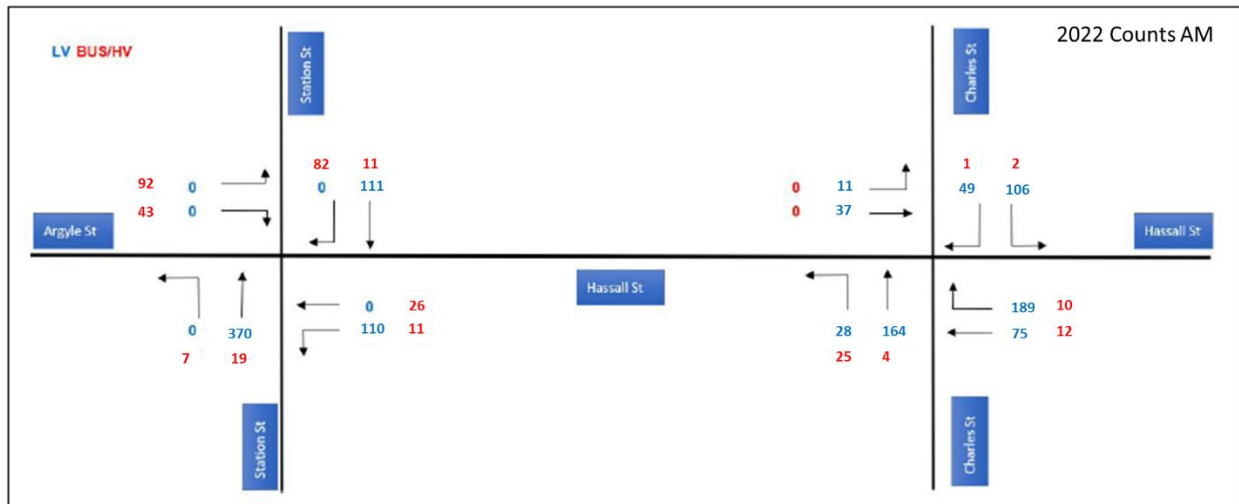
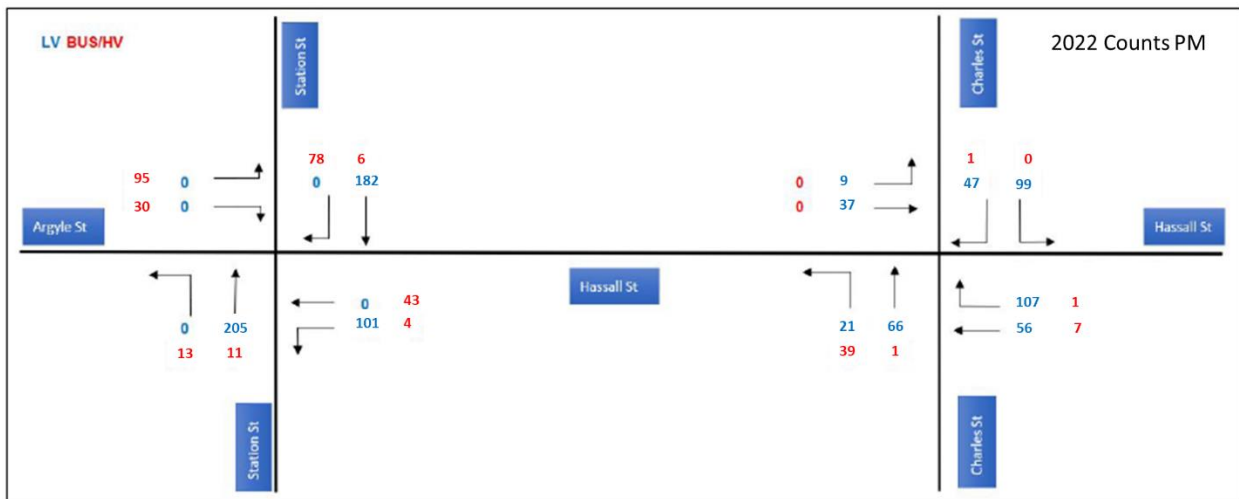


Figure 8 – 2022 PM Peak Hour Recorded Flows



The following observations were made comparing counts undertaken in 2019 versus those undertaken in 2022:

- Overall traffic flows at each intersection were *lower* in 2022 compared to those volumes recorded in 2019.
- Southbound traffic volumes in Station Street at Hassall Street have reduced markedly.
- Outbound bus demands from Argyle Street interchange into Station Street to head north were less.
- Right turn movements in Hassall Street to head north in Charles Street were greater in 2022 compared to 2019.
- AM northbound volumes in Charles Street at Hassall Street had reduced by some 12.5%.
- Westbound volumes in Hassall Street at Charles Street were slightly higher in 2022 versus 2019.

2.5 Intersection Operating Conditions

Sidra Intersection determines the average delay that vehicles encounter, the degree of saturation of the intersection, and the level of service. The degree of saturation is the ratio of the arrival rate of vehicles to the capacity of the approach. Sidra Intersection provides analysis of the operating conditions which can be compared to the performance criteria set out in [Table 1](#).

Table 1 – Level of Service Criteria

Level of Service	Average Delay per Vehicle (secs/veh)	Signals & Roundabouts	Give Way & Stop Signs
A	less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays & spare capacity	Acceptable delays & Spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity & accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode
F	> 70	Extra capacity required	Extreme delay, traffic signals or other major treatment required

Adapted from RTA Guide to Traffic Generating Developments, 2002.

For roundabouts and priority intersections, the reported average delay is for the individual movement with the highest average delay per vehicle. At signalised intersections, the reported average delay is over all movements.

2.5.1 2019 Intersection Operating Conditions

The intersections surveyed above in the ASON Group traffic report² were analysed using the Sidra Intersection analysis program. The two intersections surveyed have been modelled as a network given their close proximity to each other. The 2019 AM and PM weekday peak hour intersection operating conditions are presented in [Table 2](#). Average delay is expressed in seconds per vehicle. It should be noted that given their close proximity the intersections have been modelled as a network within SIDRA.

² Western Sydney Innovation Hub 2-6b Hassall Street Parramatta Traffic Impact Assessment Report – ASON Group April 2019

Table 2 – Existing Weekday AM / PM Intersection Operating Conditions

Intersection	Control Type	Period	Degree of Saturation	Average Delay	LOS
Station Street / Hassall Street / Argyle Street	Signals	AM	0.568	26.0	B
		PM	0.544	27.4	B
Hassall Street / Charles Street	Signals	AM	0.712	31.1	C
		PM	0.497	28.1	B

Avg Delay (sec/veh) is over all movements at signals, and for worst movement at priority and roundabouts

From **Table 2** it is noted that the traffic report found intersections in close proximity to the subject development site operated at acceptable levels of service during both the AM and PM peak hour weekday periods.

2.5.2 2022 Intersection Operating Conditions

Despite less overall traffic demands at each intersection recorded in 2022, a SIDRA intersection assessment of 2022 conditions were undertaken and is presented below.

Table 3 – 2022 Weekday AM / PM Intersection Operating Conditions

Intersection	Control	Morning Peak		Evening Peak	
		Av Delay	LOS	Av Delay	LOS
Station St / Hassall St	Signals	27.7	B	25.9	B
Charles St / Hassall St	Signals	12.9	A	12.7	A

Avg Delay (sec/veh) is over all movements at signals, and for worst movement at priority and roundabouts

From **Table 3** it is noted that 2022 intersection operating conditions were *markedly* improved compared to those conditions modelled in 2019 pre covid pandemic for the intersection of Hassall Street / Charles Street. AM / PM intersection operating conditions at Hassall Street / Station Street / Argyle Street were unchanged over the three (3) year period between assessments.

2.6 Public Transport - Buses

Access to public transport for the subject development is significant with the site located only approximately 300m from the Parramatta Rail Interchange which accommodates a large volume of rail and bus service options.

- 521 To Eastwood
- 523 To West Ryde via Ermington
- 524 To West Ryde via Melrose Park
- 525 To Burwood via Newington
- 545 To Chatswood via Macquarie University
- 546 To Epping via Oatlands
- 549 To Epping via North Rocks
- 550 To Chatswood via Eastwood
- 552 To Oatlands
- 600, M60 To Hornsby via Castle Hill

- 601 To Rouse Hill via Baulkham Hills, Kellyville
- 604 To Castle Hill
- 606 To Winston Hills via Old Toongabbie
- 609 To North Parramatta
- 625 To Pennant Hills
- 706 To Blacktown via Winston Hills
- T60, T62 To Castle Hill
- T61 To Blacktown
- T63 – T66 To Rouse Hill
- T80 T-Way to Liverpool
- M91 To Hurstville via Bankstown
- M92 To Sutherland via Menai

In terms of rail services, Parramatta Railway Station serves the following railway lines:

Intercity Trains Services:

- BMT – Blue Mountain Line
- Western NSW

Sydney Trains Services:

- T1 North Shore, Northern & Western Line
- T2 Inner West & Leppington Line
- T5 Cumberland Line

In addition to the existing public transport options available, the Parramatta Light Rail (now under construction for Stage 1) is due for completion in 2023. This new light rail network will provide two (2) light rail stops to the north of the subject site in Macquarie Street within a 400m radius. Stage 1 works include a light rail link between Westmead to Carlingford providing services every 7.5 minutes in the AM and PM peak periods.



3. The Proposed Development

The key components of the proposed development are summarised below

- Demolition of existing on-site buildings.
- A 61-storey mixed use building comprising of
 - 5 levels of basement parking (not including the B1 mezzanine and a pit maintenance level) containing 175 car parking spaces.
 - A 4-storey podium providing commercial floor space and residents' amenities.
 - Level 4 will provide residential amenities including a podium terrace with a swimming pool.
 - A residential tower (levels 5 to 59) providing 391 build-to-rent apartments.
 - Level 60 will provide residential amenities including a rooftop terrace, pool and lounge.
 - 3781 m² of commercial / retail floorspace
- A total of 391 apartments include:
 - 97 studio apartments
 - 116 one-bedroom apartments
 - 158 two-bedroom apartments
 - 20 three-bedroom apartments
- Multi-level basement car park with a total parking provision for **175** spaces which would include the following:
 - 165 resident parking spaces
 - 4 parking spaces for retail / commercial including two (2) accessible spaces
 - 2 EV charging parking space
 - 1 car share spaces
 - 1 loading dock space to accommodate full sized garbage truck
 - 2 light vehicle service / delivery vehicle parking bays
 - 2 valet parking spaces on mid ground level
- Entry / exit driveway access from Hassall Street adjacent to western site boundary
- 214 bicycle parking spaces for residents / commercial uses
- End of trip facilities including showers / toilets for commercial / retail components
- 5 motorcycle parking spaces

Plans of the proposed development can be found in **Appendix A** of this report.

4. Potential Traffic Impacts

4.1 Introduction

The following presents an assessment of the potential traffic impacts of the proposal using the Roads and Traffic Authority Guide to Traffic Generating Developments standard approach.

4.2 Development Traffic Generation

4.2.1 Residential Dwellings

It is noted that the proposal includes 'build to rent' residential units instead of purchased units and thus it is expected that the transient nature of the occupiers of the units would take advantage of the high public transport accessibility of the location and have less car ownership overall compared to a Torrens title purchased unit. However, on a conservative basis the standard RTA rate has been applied.

The Roads and Maritime Service Technical Direction TDT 2013/04a provides updated traffic generation rates for high density development. These are:

- 0.19 trips per unit in the AM peak
- 0.15 trips per unit in the PM peak

The following is noted from the surveys undertaken to underpin the new RTA high density rates:

Ten surveys were conducted in 2012, eight within Sydney, and one each in the Hunter and Illawarra. All developments were

- (i) close to public transport,*
- (ii) greater than six storeys and*
- (iii) almost exclusively residential in nature.*

The weekday trip generation rates were as follows:

Weekday Rates	Sydney Average	Sydney Range	Regional Average	Regional Range
AM peak (1 hour) vehicle trips per unit	0.19	0.07-0.32	0.53	0.39-0.67
AM peak (1 hour) vehicle trips per car space	0.15	0.09-0.29	0.35	0.32-0.37
AM peak (1 hour) vehicle trips per bedroom	0.09	0.03-0.13	0.21	0.20-0.22
PM peak (1 hour) vehicle trips per unit	0.15	0.06-0.41	0.32	0.22-0.42
PM peak (1hour) vehicle trips per car space	0.12	0.05-0.28	0.26	0.11-0.40
PM peak (1 hour) vehicle trips per bedroom	0.07	0.03-0.17	0.15	0.07-0.22
Daily vehicle trips per unit	1.52	0.77-3.14	4.58	4.37-4.78
Daily vehicle trips per car space	1.34	0.56-2.16	3.22	2.26-4.18
Daily vehicle trips per bedroom	0.72	0.35-1.29	1.93	1.59-2.26

Applying the Parramatta site of TDT 2013/04a of 0.12 – 0.27 trips per unit, the residential component of the site has the potential to generate some **59-75 trips** in the AM and PM peak periods. However, having regard to the maximum parking rates applicable to the site which are generally low, a more appropriate estimate of traffic generation would be application of TDT 2013/04a recorded peak hour traffic generation per parking space of 0.09-.0.20 trip. This in turn would equate to a potential AM / PM peak hour traffic generation of **16-35 trips**.

Overall, the expected traffic generation rate of the residential component is expected to be generally low.

4.2.2 Commercial

It is observed the commercial floorspace proposed includes ground floor / first floor and second floor areas which are not expected to be significant traffic generators in their own right.

Further, of note the total parking provision for the 3781m² of commercial floorspace on-site would be five (5) car spaces likely set aside for owners of businesses which may operate from the commercial floorspace areas.

Commercial / retail parking provision is calculated as follows in the DCP:

Commercial: $M = (G \times A) / (50 \times T)$

Where:

- M = maximum number of parking spaces;
- G = GFA of all office/business premises in the building (m²);
- A = Site Area (m²);
- T = Total GFA of all buildings on the site (m²).

Applying the above rate to the commercial / retail components would permit a total of **5 spaces** allocated to commercial / retail uses at the site.

Application of the traffic generation rate for an office building as detailed in TDT 2013/04a of 1.2 – 1.6 vehicle trips per 100m² GFA (equating to some 49-66 peak hour trips) is not considered reflective of the ancillary nature the commercial / retail / café / gymnasium areas proposed within the development.

Thus, the traffic generation of the commercial component of the development is expected to be negligible.

4.3 Commentary on Potential Traffic Impacts

As confirmed above, traffic demands in the immediate area have reduced generally post Covid pandemic due to the marked changes in commuting travel behaviour where work from home arrangements have become the norm for the majority of industries.

The proposal which includes a rent only arrangement for occupiers is also expected to result in less car ownership compared with similar types of developments where units are sold under Torrens title.

However, to provide an indication of post development 2022 traffic conditions, a conservative approach by adopting the traffic generation per unit (59-75 trips) has been added to the immediate surrounding network having regard to the existing distribution of trips in Hassall Street.

The resulting post development 2022 intersection operating conditions are presented below in **Table 4**.

Table 4 – 2022 + Development Weekday AM / PM Intersection Operating Conditions

Intersection	Control	Morning Peak		Evening Peak	
		Av Delay	LOS	Av Delay	LOS
Station St / Hassall St	Signals	29.5	C	26.4	B
Charles St / Hassall St	Signals	13.0	A	12.8	A

Avg Delay (sec/veh) is over all movements at signals, and for worst movement at priority and roundabouts

From **Table 4** it is observed that on the basis that the site would generate the full AM / PM peak hour traffic generation applying the RTA traffic generation per unit (ignoring the low overall parking provision), intersection operating conditions surrounding the site would have minimal change to current conditions.

Overall, the potential traffic impacts of the proposal are considered acceptable.

SIDRA outputs of all modelling are provided in **Appendix E** of this report.

4.4 Commentary on Potential Queueing / Driveway Locations

The provision of a driveway on the western boundary as proposed or on the eastern boundary as indicated in the DCP does not change in any way the potential traffic generation or trip distribution assumptions of the site.

One matter of consideration is the potential queueing eastbound in Hassall Street in the future at the existing signalised intersection with Charles Street and whether such queueing has a bearing on the driveway location.

The 95th percentile queue at this signalised intersection including the traffic generated by the development during the AM and PM peak periods is presented below.

Figure 9 – 2022 + Development AM Peak 95th Percentile Queues – Hassall St / Charles St

VEHICLE QUEUE (PERCENTILE)

Largest 95% Back of Queue for any lane on the approach (vehicles)

 **Site: 101 [Hassall_Charles_AM_2022 + Dev (Site Folder: General)]**

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)

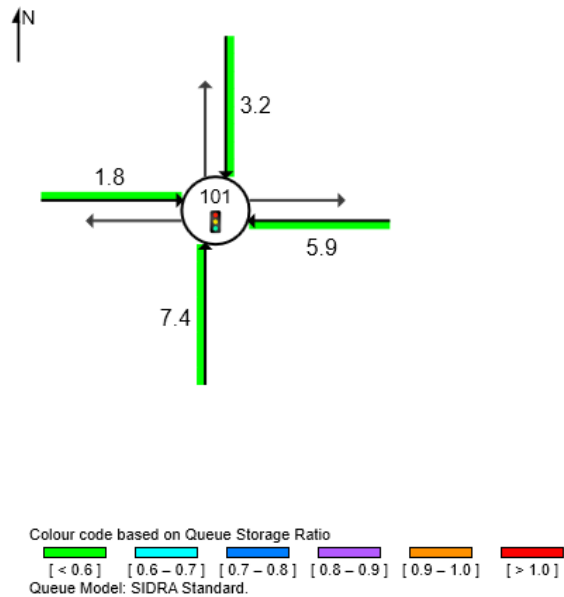


Figure 10 – 2022 + Development PM Peak 95th Percentile Queues – Hassall St / Charles St

VEHICLE QUEUE (PERCENTILE)

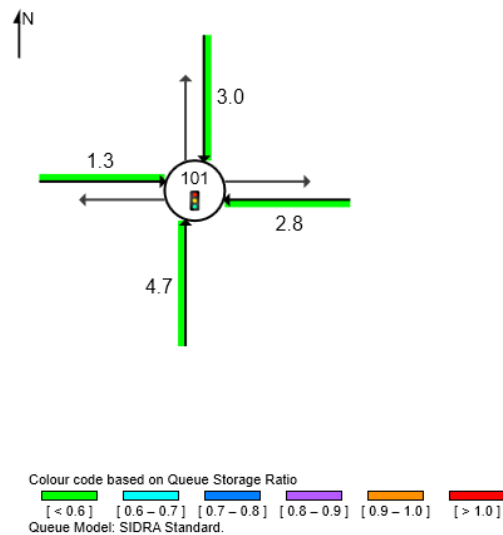
Largest 95% Back of Queue for any lane on the approach (vehicles)

 **Site: 101 [Hassall_Charles_PM_2022 + Dev (Site Folder: General)]**

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 90 seconds (Site Optimum Cycle Time - Minimum Delay)



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As confirmed above the 95th percentile queue for eastbound traffic in Hassall Street (queuing which may affect the driveway access to No.12 Hassall Street) was 1.3 – 1.8 vehicles (8-11m) and thus the potential 95th percentile queue would have no impact on the driveway access to No.12 Hassall Street irrespective of its location. As stated above the existing driveway on the eastern boundary of the site is some **47m** from the hold lines in Hassall Street for eastbound traffic at Charles Street.



5. Parking and Access Review

5.1 Parramatta Council LEP

5.1.1 Residential Component

The following *maximum* parking rates apply to the residential component of the development.

- One bedroom: 0.3 spaces per dwelling
- Two bedroom: 0.7 spaces per dwelling
- Three bedroom: 1.0 spaces per dwelling

Therefore, applying the above maximum parking rates to the residential dwellings proposed would equate to a permitted maximum of **194 spaces**.

As the development includes a total of **165** residential parking spaces, the parking provision complies with the requirements of the LEP and are considered acceptable.

5.1.2 Commercial / Retail Component

The Technical Paper 3 - Parking Review (2017) of the Parramatta CBD Strategic Transport Study recommended the following parking provision for commercial developments which has now been adopted by Council:

Commercial: $M = (G \times A) / (50 \times T)$

Where:

- M = maximum number of parking spaces;
- G = GFA of all office/business premises in the building (m²);
- A = Site Area (m²);
- T = Total GFA of all buildings on the site (m²).

Applying the above rate to the commercial / retail components would permit a total of **5 spaces** allocated to commercial / retail uses at the site.

As the total parking provision for commercial / retail uses includes no more than 5 spaces, the parking provision for these components complies with the requirements of Council and is considered satisfactory.

Overall, the parking provision of the proposed development complies with the minimum requirements of Council and is considered satisfactory.

5.2 Bicycle Parking Provision

Council's DCP Part 3.6.2 requires the following bicycle parking requirements for the site:

Residential Component

- 1 space per two dwellings

Commercial / Retail

- 1 bicycle space per 200m² of office and business premises.

Applying the above rates would require a total bicycle parking provision of **192 spaces** for residents and **19 spaces** for the commercial component. As the development includes bicycle parking provision of **214 spaces** for residents / commercial premises the bicycle parking provision complies with the requirements of Council and is considered satisfactory.

5.3 Motorcycle Parking Provision

Council's DCP (Part 4, Section C.6) requires motorcycle parking to be provided at one motorcycle space per 50 car parking spaces (or part thereof), and motorcycle parking space area is to be equal to one car parking space.

Thus, the development would require 4 motorcycle spaces which have been provided within the basement parking areas.

The motorcycle parking provision of 5 spaces complies with the requirements of Council and is considered satisfactory.

5.4 Car Park Compliance Assessment

All areas of the proposed car park have been reviewed for compliance with the Australian Standard for Off Street Car Parking Facilities – AS2890.1, AS2890.2 and AS2890.6 and were found to be satisfactory.

Turning path assessments of Basement Level 1 for the largest vehicle expected to access the site, a Parramatta Council Waste Vehicle have been undertaken which confirm that such a vehicle can enter the site in a forward direction, gain access to the waste loading bay without impeding car park access and exit the site in a forward direction.

The proposed arrangements provide adequate manoeuvring areas for Council's Waste Vehicle and thus are considered satisfactory.

These turning paths are provided in **Appendix B** of this report.

For the lower basement levels which would only include light vehicles (residents), the proposed ramp arrangements to confirm that an 85th and 99th percentile vehicle can pass in accordance with the requirements of AS2890.1 is provided in **Appendix C** of this report. This turning path assessment found the proposed design of the ramps of the basement car park provide adequate manoeuvring space for these two vehicles to pass and thus complies with the requirements of AS2890.1.

The proposed ramp grades within the basement levels of the car park have been reviewed for their compliance with AS2890.1 and were found to be compliant in all aspects.

Overall, the design of the car park is considered satisfactory.

5.5 Access Assessment - Location

On the matter of car parking and access, the following is noted from the site specific DCP:

1.1.4 Car Parking and Access

The access and movement throughout the site is characterised by both pedestrian and vehicular movement. It is vital to minimise conflict to maintain pedestrian safety.

Public and private access should be clearly defined and direction provided.

Objectives

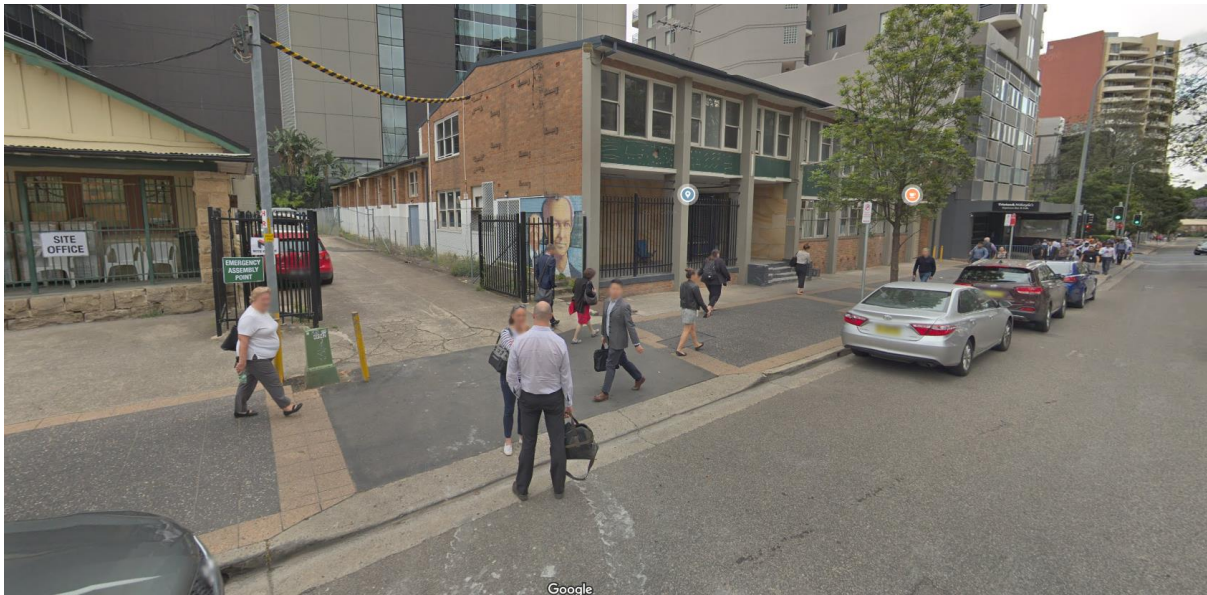
- *Minimise conflict between pedestrians and vehicle movements.*
- *Activate shared spaces and the public domain.*
- *Provide alternate private access for future residents directly to private open space.*

Controls

- *C1. All vehicle/service vehicle access is to be via a driveway at the eastern end of the Hassall Street frontage;*
- *C2. Vehicle and service access widths to be minimised and integrated into the building design;*
- *C3. Where possible, car parking, loading and garbage areas are to be located within the basement levels;*
- *C4. The shared area along the eastern boundary shall ensure that the vehicular and private pedestrian accesses are suitably separated to avoid conflict and maintain safety;*

The existing site includes a single dwelling house with open air car park at the rear and a two-storey mixed use development. The existing general / service vehicle access arrangements includes a single entry / exit driveway serving both properties as shown below in **Figure 11**.

Figure 11 - 12 Hassall Street, Parramatta – Existing Central Entry / Exit Access Driveway



© Google

A further lower order single lane driveway providing access to a garage is located adjacent to the eastern boundary of the site as shown below in **Figure 12**. As noted below the adjacent site (No.14 Hassall Street) which shares the common eastern boundary of the development site at No.12 Hassall Street has been redeveloped and includes an entry / exit driveway immediately adjacent to its western boundary.

Figure 12 - 12 Hassall Street, Parramatta – Existing Eastern Boundary Single Lane Entry / Exit Access Driveway



Further, the redeveloped building at No.14 Hassall Street includes a building envelope / overhang which is positioned closer to the Hassall Street kerbline and which has required the provision of fencing / garden to guide crossing pedestrians away from the vehicle entry for their safety and around the outdent wall on the site's eastern boundary. This is shown below in **Figure 13**.

Figure 13 - 12 / 14 Hassall Street, Parramatta – Garden / Fencing Separator Island to Redirect Pedestrians for their safety



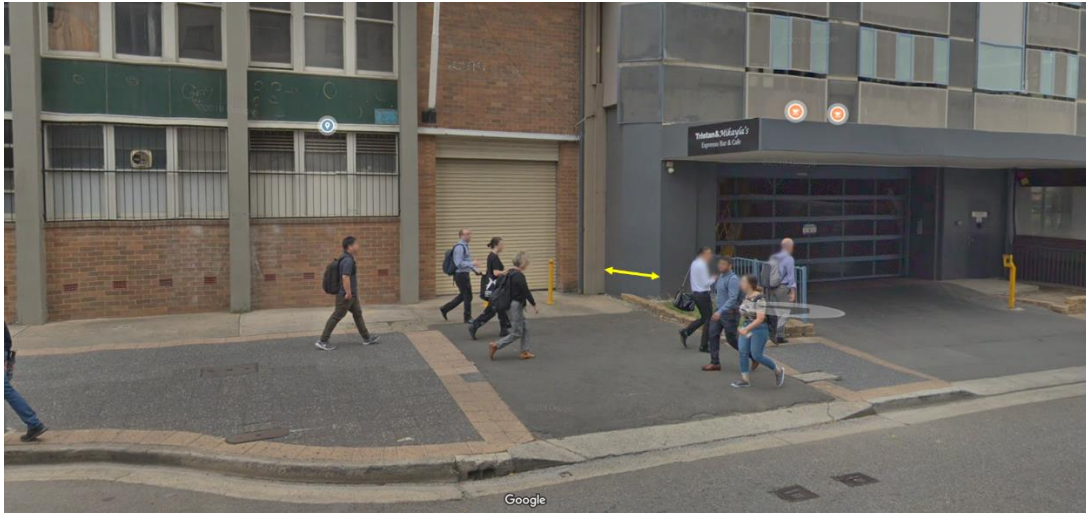
The existing entry / exit driveway is located approximately **18m** from the hold lines in Hassall Street of the signalised intersection of Hassall Street / Charles Street.

On the common western boundary with site, a wide three (3) lane entry / exit driveway is provided to serve the NSW Police Force Headquarters Building.

Whilst the site specific DCP indicates that *all* access to the development site should be via an entry / exit driveway at the eastern end of the Hassall Street frontage, this would not be an ideal location given its impact on safety for pedestrians.

With the outdent of the adjacent building at No.14 Hassall Street, compliance with the pedestrian sight line requirements of Figure 3.2 of the Australian Standard for Off Street Car Park Facilities AS2890.1 are unlikely to be met as noted below in **Figure 14**.

Figure 14 – Outdent Wall of No.14 Hassall Street, Parramatta Impacting on Exit Vehicle Sight Lines



A further potential impact of an entry / exit driveway at the eastern boundary of the site would be its closer proximity to the signalised intersection of Hassall Street / Charles Street which in turn may be impacted upon by vehicles waiting to turn right into the driveway compared if an entry / exit driveway was located further away from the intersection.

Noting the 95th percentile queue eastbound in Hassall Street presented in Section 4.4 above ranging from 8-11m, this would indicate that a further vehicle queued eastbound beyond the 95th percentile queue would potentially block a driveway located on the eastern boundary. The proposed driveway located on the western boundary would provide a further separation from the intersection by an additional **45m** or 5-6 additional queued vehicles eastbound.

Overall, the provision of an entry / exit driveway adjacent to the western boundary is considered a more appropriate and safe location to access the site as it would ensure adequate sight lines to crossing pedestrians are achieved and would provide greater separation to the signalised intersection of Hassall Street / Charles Street should westbound delays occur from vehicles waiting to turn right into the driveway.

5.6 Access Assessment - Grades

Given the relatively small area of the site and the need to accommodate a full sized Paramatta Council waste vehicle, the proposed grades of the access driveway from Hassall Street vary from those recommended by AS2890.2 for a vehicle representative of Parramatta Council's Waste Vehicle.

However, the standard permits variations from the recommended grades following confirmation that the resulting ramp arrangements do not result in any vehicle scrapping of the design vehicle.

The proposed grades seek to mirror the recommended grade and transition arrangements as detailed in the Sydney City Council Waste Code where a large number of developments have occurred with basement servicing by large waste vehicles.

These recommended arrangements include provision of grade transitions 4.0m in length compared with 7.0m in length as indicated by AS2890.2.

In addition, whilst the Sydney City Waste Code permits a height clearance of 4.0m, the proposed design seeks to comply with the requirements of AS2890.2 (following consultation with representatives of Parramatta City Council) of 4.5m height clearance within Basement Level 1.

The vehicle clearance assessment provided in [Appendix D](#) of this report confirms the proposed grades of the driveway would not result in any vehicle scrapping of a Parramatta Council Waste Vehicle and thus are considered satisfactory.



6. Conclusions

This report has reviewed the potential traffic impacts of the proposed mixed-use development at the site known as No.12 Hassall Street, Parramatta. The findings of this assessment are presented below:

1. The proposed development has been subject to extensive planning investigation studies to inform the design of the site including a formal design competition.
2. The proposed development is located within a convenient walking distance to a significant number of public transport options including heavy rail, bus and future light rail services.
3. The potential traffic generation of the development would not impact on the surrounding road network to a point of detriment.
4. Intersections in the immediate vicinity of the development would operate at a satisfactory level of service in the future at full development without any need for capacity improvements.
5. The proposed on-site parking provision complies with the requirements of Parramatta Council and thus is considered satisfactory.
6. The bicycle parking provision for residents / commercial uses complies with the minimum requirements of the DCP and is considered satisfactory.
7. The design of the basement car park areas, ramps and access driveway complies with the requirements of the Australian Standard for Off Street Car Parking Facilities AS2890.1.
8. Access to the site by a Parramatta Council Waste Vehicle is achieved by both entering and exiting the site in a forward direction.
9. The proposed ramp grades from Hassall Street do not result in any vehicle scrapping of the expected largest vehicle to access the site (Parramatta Council Waste Vehicle).
10. The design of the access ramps to the basement levels comply with the requirements of AS2890.1 and are considered satisfactory.

Overall the traffic impacts of the proposal are considered acceptable.



7. Appendix A – Plans of Proposed Development



STATE SIGNIFICANT DEVELOPMENT
APPLICATION

12 HASSALL STREET
PARRAMATTA

NEW MIXED USE BUILD TO RENT
DEVELOPMENT

Key Plan:

HASSALL STREET

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12 Hassall St
12 Hassall St, Parramatta

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Title
A-GENERAL INFORMATION
COVER PAGE

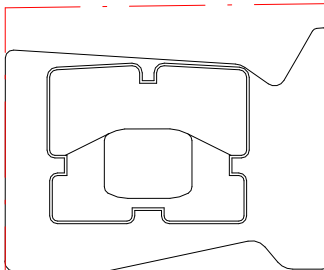
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DA-00-0000

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01 ARCHITECTURAL DRAWINGS

DRAWING NUMBER	DRAWING NAME	REVISION	DRAWING NUMBER	DRAWING NAME	REVISION
A-GENERAL INFORMATION			C-FACADE DETAILS		
DA-00-0000	COVER PAGE	A			
DA-00-0200	ARCHITECTURAL DRAWING LIST	A	DA-40-1100	PODIUM ELEVATION SOUTH (HASSALL ST)	A
DA-00-0300	VIEW FROM BARRACK PLACE	A	DA-40-1200	PODIUM ELEVATION NORTH	A
DA-00-0400	LOCATION PLAN	A	DA-40-1300	PODIUM ELEVATION WEST	A
DA-05-1000	SITE PLAN	A	DA-40-1500	PODIUM FACADE DETAILS	A
DA-05-1100	SITE ANALYSIS PLAN	A	DA-40-1600	TOWER FACADE DETAILS - NORTH	A
DA-05-1200	BUILDING CONTROL ENVELOPE DIAGRAM	A	DA-40-1601	TOWER FACADE DETAILS - SOUTH	A
DA-07-1000	DEVELOPMENT DATA SHEET	A	D-SECTIONS		
DA-07-1100	UNIT SCHEDULE	A	DA-30-1000	SECTION A & B 1-500	A
DA-07-1200	UNIT STORAGE SCHEDULE	A	DA-30-1200	SECTION A 1-300	A
			DA-30-1300	SECTION B 1-300	A
B-GENERAL ARRANGEMENT PLANS			DA-30-1400	SECTION C 1-300	A
DA-10-0300	BASEMENT LEVEL 6 FLOOR PLAN	A	G-ADAPTABLE APARTMENTS		
DA-10-0400	BASEMENT LEVEL 5 FLOOR PLAN	A	DA-80-1000	ADAPTABLE STUDIO APARTMENT PLANS	A
DA-10-0500	BASEMENT LEVEL 4 FLOOR PLAN	A	DA-80-1100	ADAPTABLE 1B APARTMENT PLANS	A
DA-10-0600	BASEMENT LEVEL 3 FLOOR PLAN	A	DA-80-1200	ADAPTABLE 2B APARTMENT PLANS	A
DA-10-0700	BASEMENT LEVEL 2 FLOOR PLAN	A	N-GROSS FLOOR AREA PLANS		
DA-10-0800	BASEMENT LEVEL 1 FLOOR PLAN	A	DA-91-1000	GFA DIAGRAMS (SHEET 1)	A
DA-10-0900	BASEMENT LEVEL 1M FLOOR PLAN	A	DA-91-1100	GFA DIAGRAMS (SHEET 2)	A
DA-10-1000	LEVEL 00 GROUND FLOOR PLAN	A	DA-91-1200	GFA DIAGRAMS (SHEET 3)	A
DA-10-1100	LEVEL 01 FLOOR PLAN	A	DA-91-1300	GFA DIAGRAMS (SHEET 4)	A
DA-10-1200	LEVEL 02 FLOOR PLAN	A	DA-91-1400	GFA DIAGRAMS (SHEET 5)	A
DA-10-1300	LEVEL 03 FLOOR PLAN	A	DA-91-1500	GFA DIAGRAMS (SHEET 6)	A
DA-10-1400	LEVEL 04 FLOOR PLAN	A	R1-SHADOW DIAGRAMS (PLANS)		
DA-10-1500	LEVELS 05-08 FLOOR PLAN	A	DA-93-1000	SHADOW DIAGRAMS PLAN (WINTER SOLSTICE 9AM)	A
DA-10-1900	LEVELS 09-14 FLOOR PLAN	A	DA-93-1001	SHADOW DIAGRAMS PLAN (WINTER SOLSTICE 10AM)	A
DA-10-2000	LEVELS 15-27 FLOOR PLAN	A	DA-93-1002	SHADOW DIAGRAMS PLAN (WINTER SOLSTICE 11AM)	A
DA-10-2500	LEVEL 28 FLOOR PLAN (PLANT)	A	DA-93-1003	SHADOW DIAGRAMS (WINTER SOLSTICE 12PM)	A
DA-10-3000	LEVELS 29-38 TYPICAL FLOOR PLAN	A	DA-93-1004	SHADOW DIAGRAMS PLAN (WINTER SOLSTICE 1PM)	A
DA-10-4600	LEVELS 39-51 TYPICAL FLOOR PLAN	A	DA-93-1005	SHADOW DIAGRAMS PLAN (WINTER SOLSTICE 2PM)	A
DA-10-4900	LEVELS 52 FLOOR PLAN (PLANT)	A	DA-93-1006	SHADOW DIAGRAMS (WINTER SOLSTICE 3PM)	A
DA-10-5500	LEVELS 53-58 TYPICAL FLOOR PLAN	A	R1-SOLAR ACCESS DIAGRAMS		
DA-10-5900	LEVEL 59 FLOOR PLAN	A	DA-93-1500	SOLAR ACCESS COMPLIANCE DIAGRAMS L4-L15	A
DA-10-6000	LEVEL 60 FLOOR PLAN (AMENITIES)	A	DA-93-1600	SOLAR ACCESS COMPLIANCE DIAGRAMS L16-L27	A
DA-10-6101	PLANT ROOM PLAN	A	DA-93-1700	SOLAR ACCESS COMPLIANCE DIAGRAMS L28-L39	A
DA-10-6102	LIFT MACHINE ROOM	A	DA-93-1800	SOLAR ACCESS COMPLIANCE DIAGRAMS L40-L51	A
DA-10-6200	ROOF PLAN	A	DA-93-1900	SOLAR ACCESS COMPLIANCE DIAGRAMS L52-L60	A
C-ELEVATIONS			R1-SUN EYE VIEWS		
DA-20-1000	HASSALL STREET ELEVATION 1-500	A	DA-93-2000	SUN EYE VIEWS (SHEET 1)	A
DA-20-1100	NORTH AND EAST ELEVATIONS 1-500	A	DA-93-2001	SUN EYE VIEWS (SHEET 2)	A
DA-20-1200	SOUTH AND WEST ELEVATIONS 1-500	A	R2-CROSS VENTILATION DIAGRAMS		
DA-20-1300	NORTH ELEVATION 1-300	A	DA-94-1000	NATURAL CROSS VENTILATION DIAGRAMS	A
DA-20-1400	SOUTH ELEVATION (HASSALL STREET) 1-300	A	R3-DEEP SOIL & COS		
DA-20-1500	EAST ELEVATION 1-300	A	DA-95-1500	COMMUNAL OPEN SPACE DIAGRAM	A
DA-20-1600	WEST ELEVATION 1-300	A	SITE SURVEY: H RAMSAY & CO 31/01/2022		
C-EXTERNAL MATERIALS FINISHES					
DA-50-1000	EXTERNAL MATERIAL FINISHES + COLOURS BOARD	A			
DA-50-1100	PODIUM EXTERNAL MATERIAL FINISHES + COLOURS	A			
DA-50-1200	TOWER EXTERNAL MATERIALS FINISHES + COLOURS	A			
DA-50-1300	TOWER EXTERNAL MATERIALS FINISHES + COLOURS	A			

Key Plan:



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12 Hassall St
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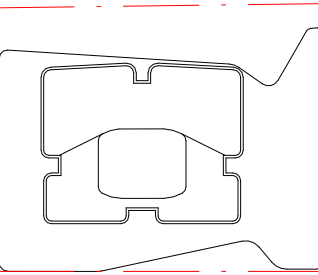
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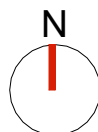
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HASSALL STREET



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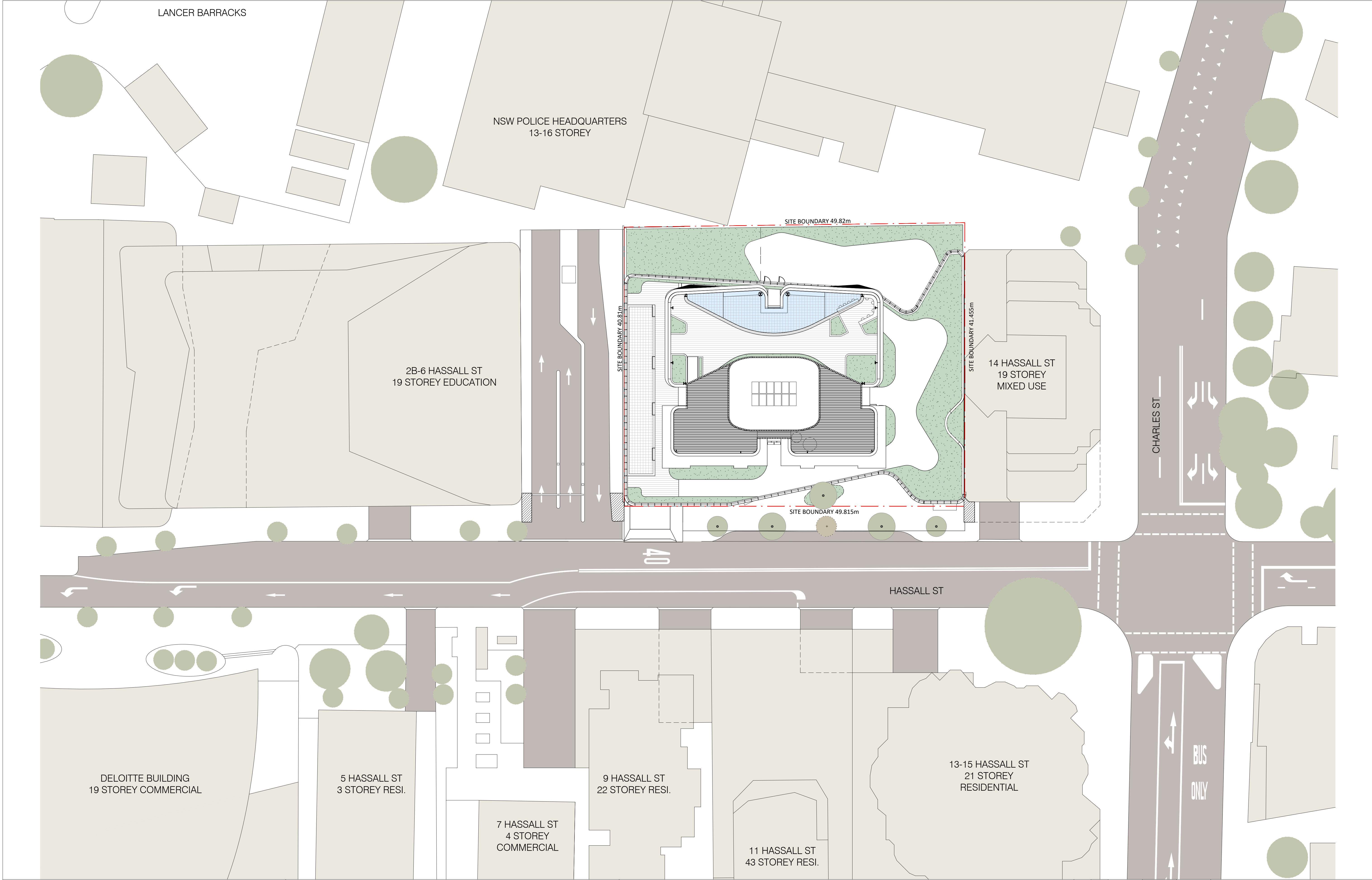
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Title
A-GENERAL INFORMATION
SITE PLAN

Drawing Number
DA-05-1000

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Status
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SITE AREA: 2055 m²

TARGET GFA		
TYPE	AREA	FSR
Residential	28,770m²	14:1
Non Residential	2,055m² MAX	1:1
Commercial	2,055m² MIN	1:1
Total	32,880m²	16:1

PROPOSED SCHEME

GFA		
	AREA	FSR
Residential	28770 m²	14.0 :1
Non-Residential	1275 m²	0.6 :1
Commercial	2503 m²	1.2 :1
Total	32548 m²	15.9

TOTAL YIELD		
APARTMENT TYPE	NO. OF APARTMENTS	YIELD
1B	38	10%
1B+M	58	15%
1B+S	20	5%
2B	60	15%
2B+M	90	23%
2B+S	8	2%
3B	20	5%
S	97	25%
TOTAL	391	100%

30%

40%

ADAPTABLE UNITS

APARTMENT
APARTMENT: 46
Total: 46

ADAPTABLE APARTMENTS REQUIRED (10%) 40

LIVABLE UNITS

APARTMENT
APARTMENT: 94
Total: 94

LIVABLE APARTMENTS REQUIRED (20%) 79

COMMUNAL OPEN SPACE

LEVEL	AREA	%
L04	892.77 m²	44%
L60	233.75 m²	11%
L60	327.85 m²	16%
		71%

SOLAR ACCESS			TARGET
SOLAR ACCESS	NO. OF APARTMENTS	%	
0HRS	33	8%	MAX. 15%
<2HRS	70	18%	
>2HRS	288	74%	MIN. 70%
Total: 391			

NATURAL CROSS VENTILATION			TARGET
CROSS VENTILATION	NO. OF APARTMENTS	%	
NO	8	33%	
YES	16	67%	MIN. 60%

BICYCLE PARKING VERTICAL

LEVEL	NUMBER	
B5	68	
B4	40	
B3	40	
B2	40	RETAIL/COMMERCIAL 19
B1	26	RESIDENTIAL 195
Total	214	TOTAL BICYCLES 214

MOTORBIKE PARKING

LEVEL	NUMBER
B1	4
Total	4

PARKING SCHEDULE

B5	ADAPTABLE	10
B5	CAR WASH BAY	1
B5	RESIDENTIAL	33
B5: 44		44
B4	ADAPTABLE	10
B4	RESIDENTIAL	30
B4: 40		40
B3	ADAPTABLE	10
B3	RESIDENTIAL	30
B3: 40		40
B2	ADAPTABLE	10
B2	RESIDENTIAL	30
B2: 40		40

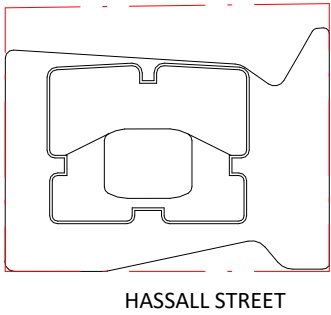
PARKING SCHEDULE

B1	CAR SHARE	1
B1	COMMERCIAL	1
B1	COMMERCIAL ACCESSIBLE	1
B1	DELIVERY	2
B1	ELECTRICAL VEHICLE	2
B1	RETAIL	1
B1	RETAIL ACCESSIBLE	1
B1: 9		9
B1 M	VALET	2
B1 M: 2		2
Total		175

MAX. PARKING RATE SCHEDULE

TYPE	MAX. CARPARK RATE	NO./GFA	ACCESSIBLE PARKING RATE
Residential			
Studio (97)	0	0	One accessible car parking space is to be provided for every adaptable residential unit.
1B (38)	0.3	12	
2B (138)	0.7	197	
3B (20)	1.0	20	
Carwash Bay	1	1	
Sub Total		230	
Non-Residential			
Retail	M = (G x A) / (50 x T)	2.5	One accessible car parking space for every 50 spaces or part thereof. One accessible car parking space for every 100 spaces or part thereof.
Commercial Premises	M = (G x A) / (50 x T)	2.5	
Sub Total		5	
Grand Total		235	
Residential Carshare		1	
Delivery Vehicle		1	Parramatta DCP 2011
Motorbike Parking	motorcycle parking 1 per 50 spaces	5	
Bicycle Parking			
Residential	1 per 2 dwellings	195	Parramatta DCP 2011
Retail/ Commercial	1 per 200m² GFA	19	
Bicycle Total		214	

Key Plan:



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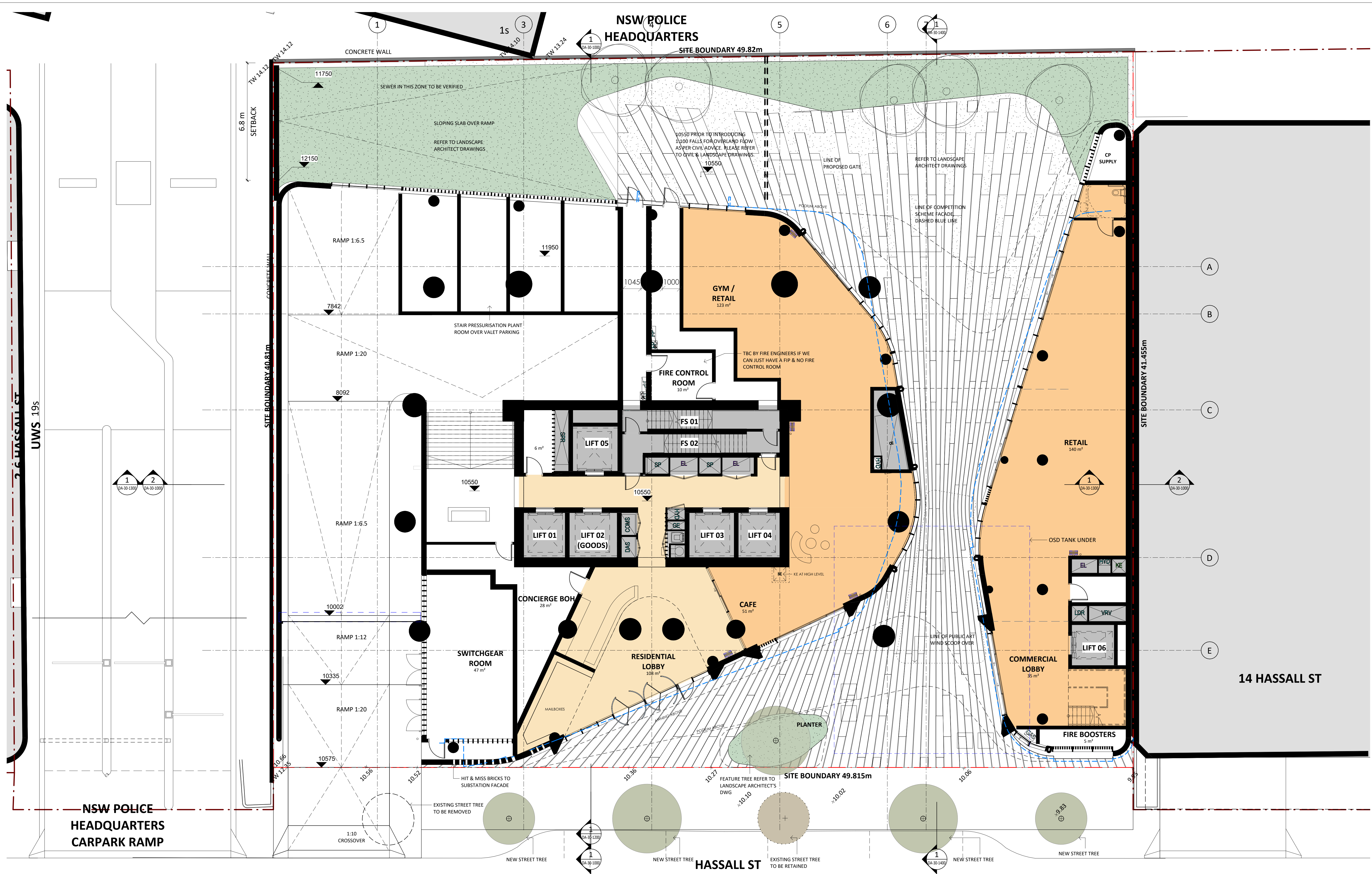
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DEVELOPMENT DATA SHEET

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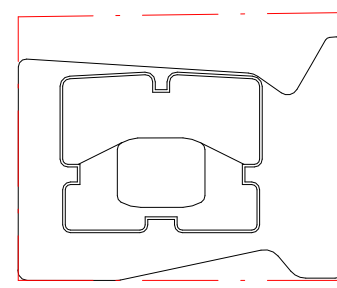
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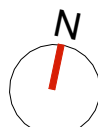
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Key Plan:



HASSALL STREET



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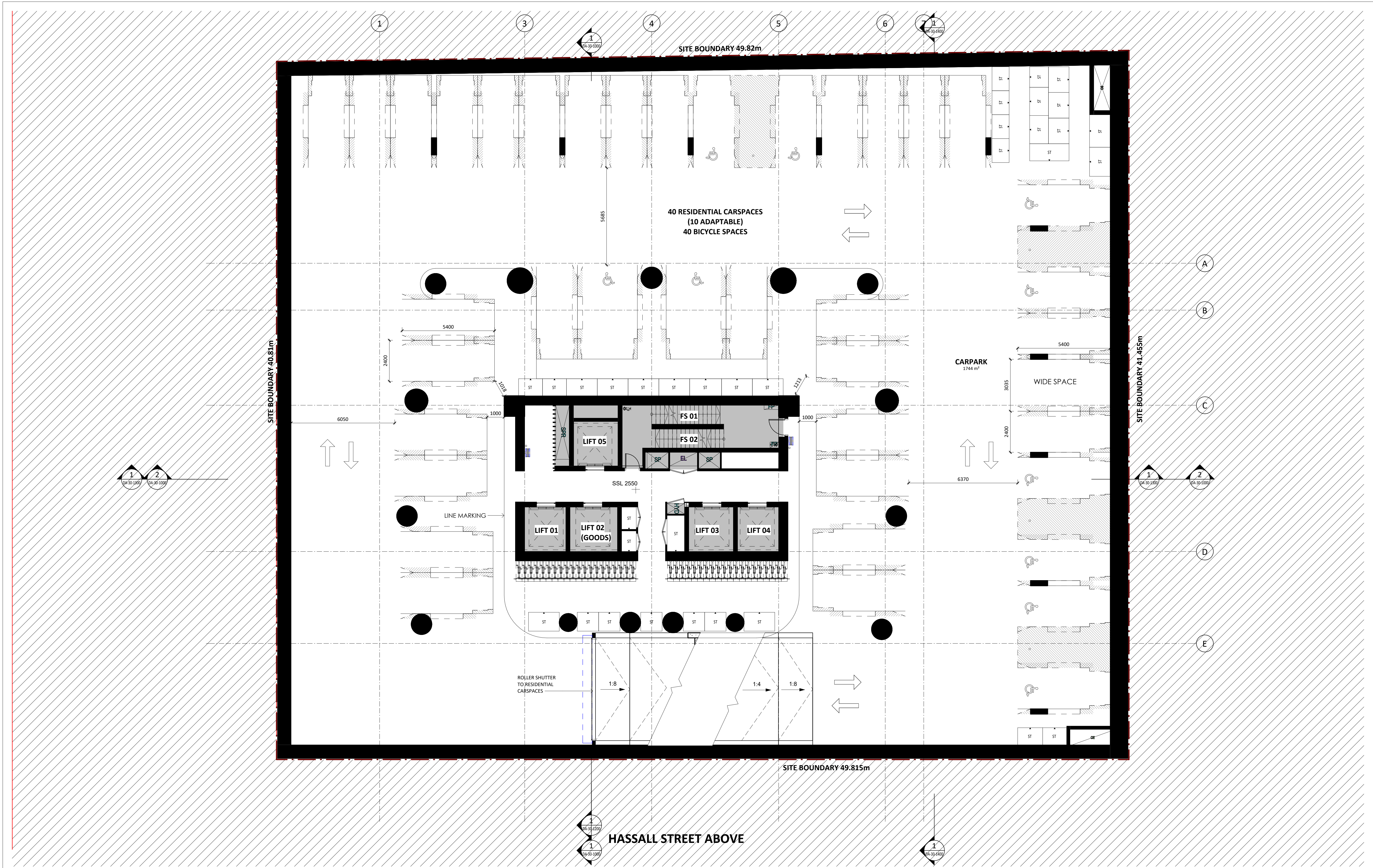
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B-GENERAL ARRANGEMENT PLANS
LEVEL 00 GROUND FLOOR PLAN

Drawing Number

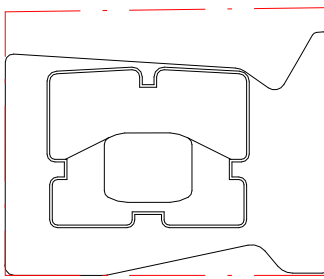
DA-10-1000

Revision

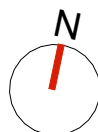
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Key Plan:



HASSALL STREET



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D Jones Architect No.4778

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Project PA030501
12 Hassall St
12 Hassall St, Parramatta

Status
DEVELOPMENT APPLICATION

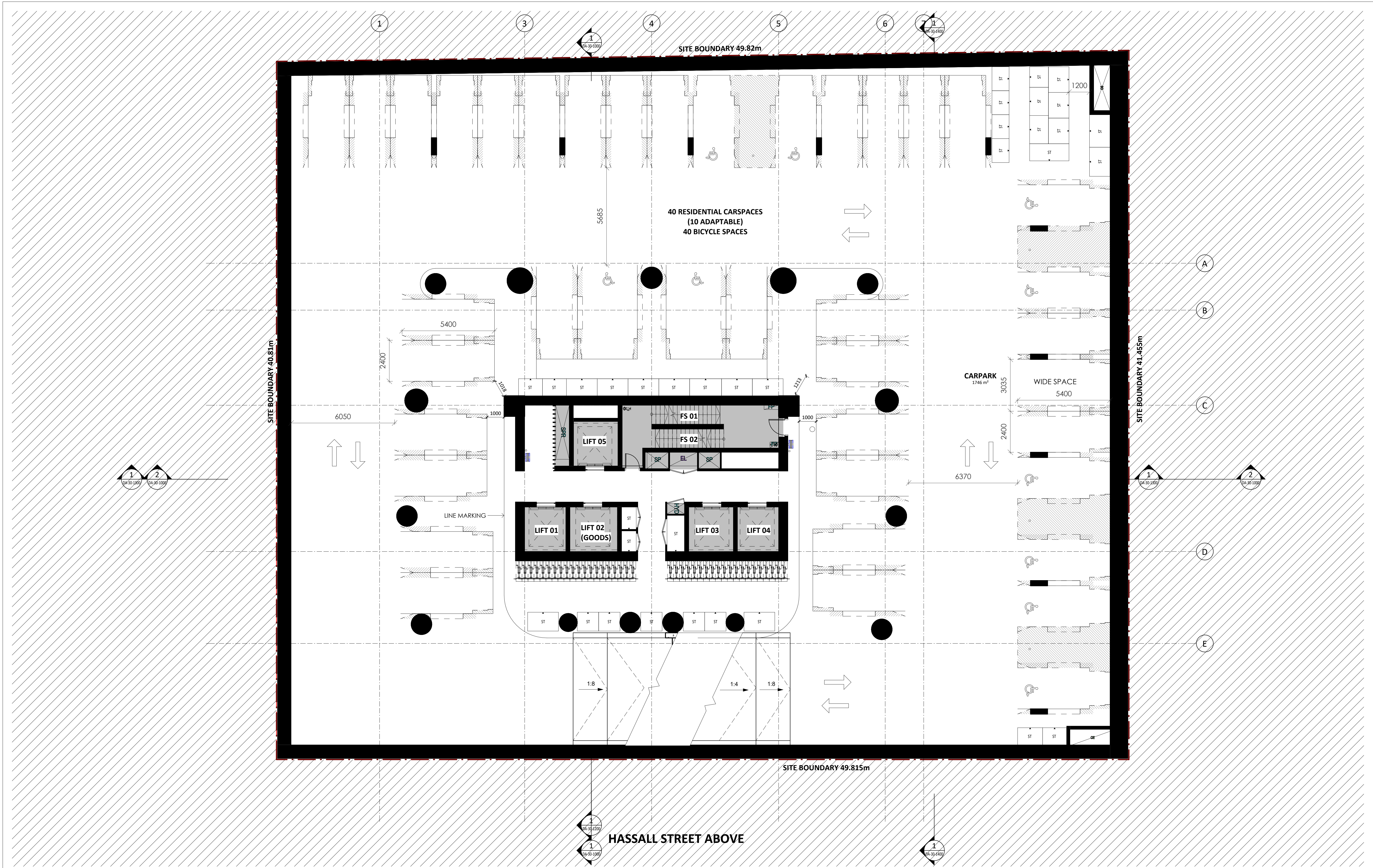
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BASEMENT LEVEL 2 FLOOR PLAN

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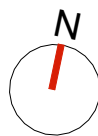
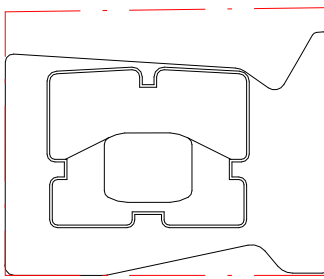
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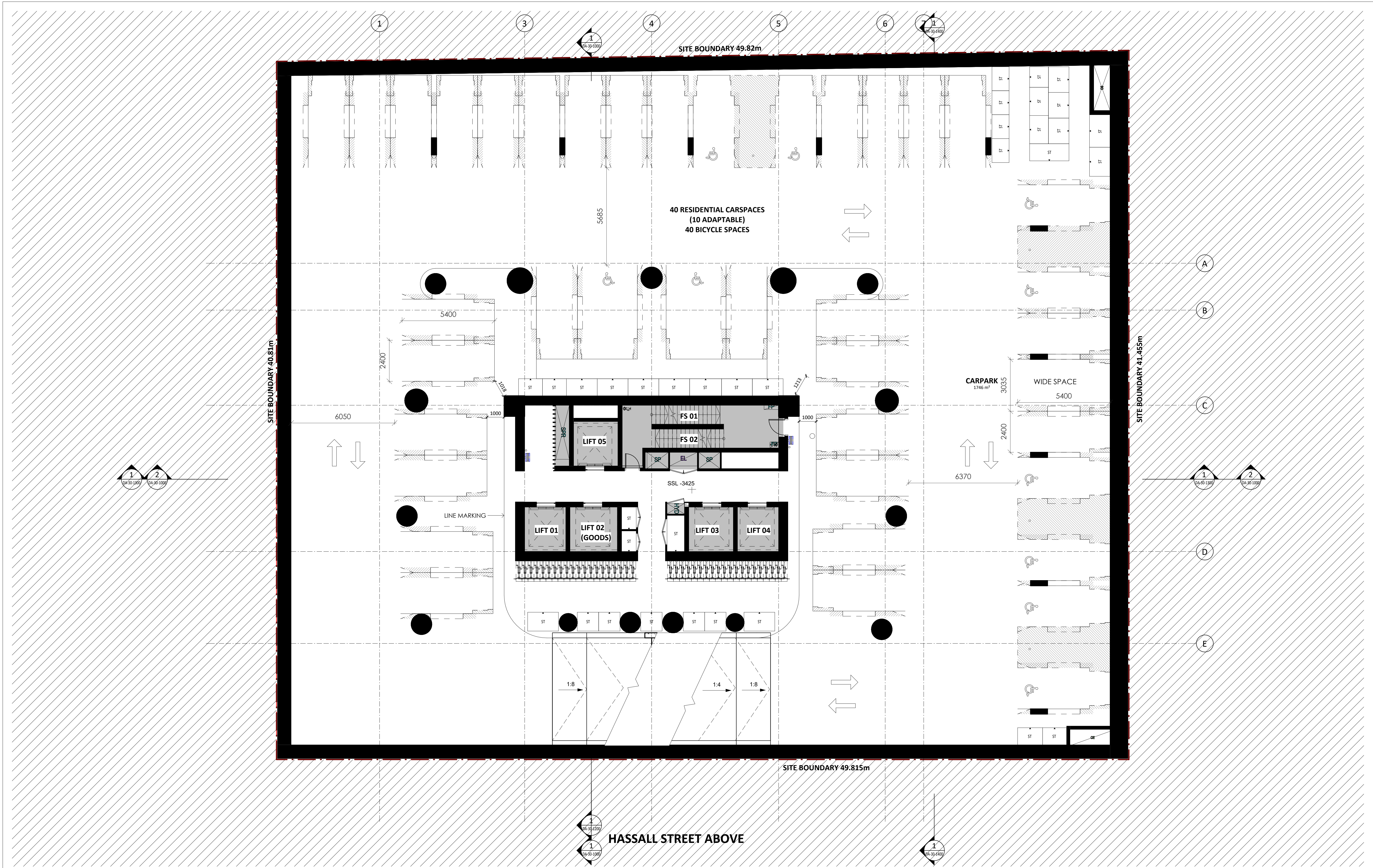
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BASEMENT LEVEL 3 FLOOR PLAN

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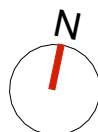
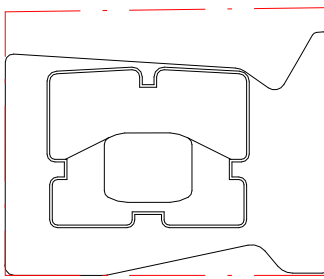
DA-10-0600

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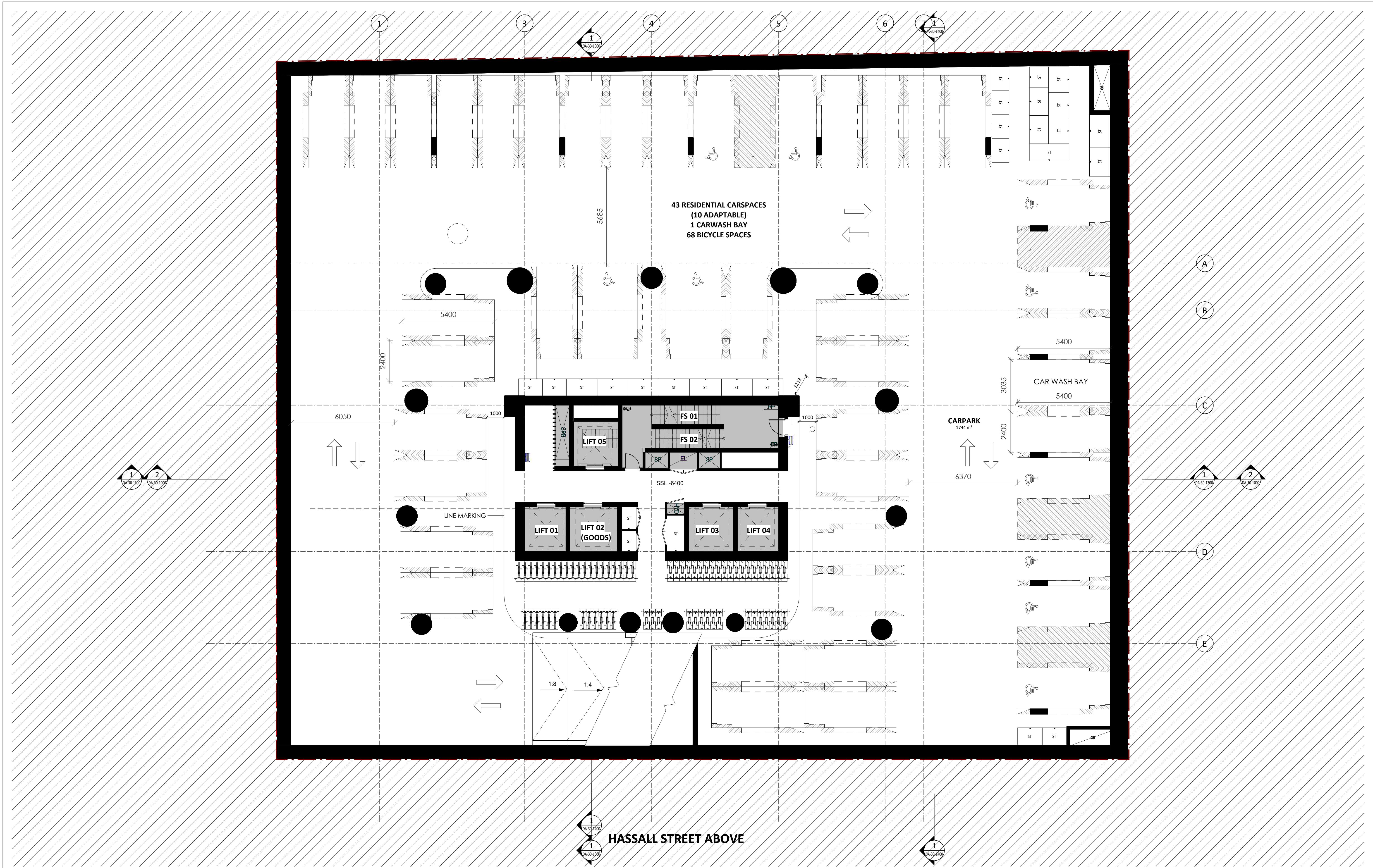
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BASEMENT LEVEL 4 FLOOR PLAN

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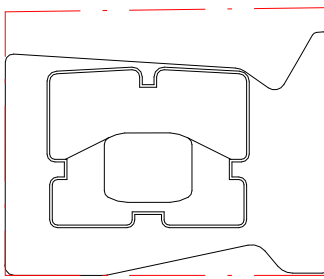
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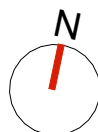
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Key Plan:



HASSALL STREET



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Title
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BASEMENT LEVEL 5 FLOOR PLAN

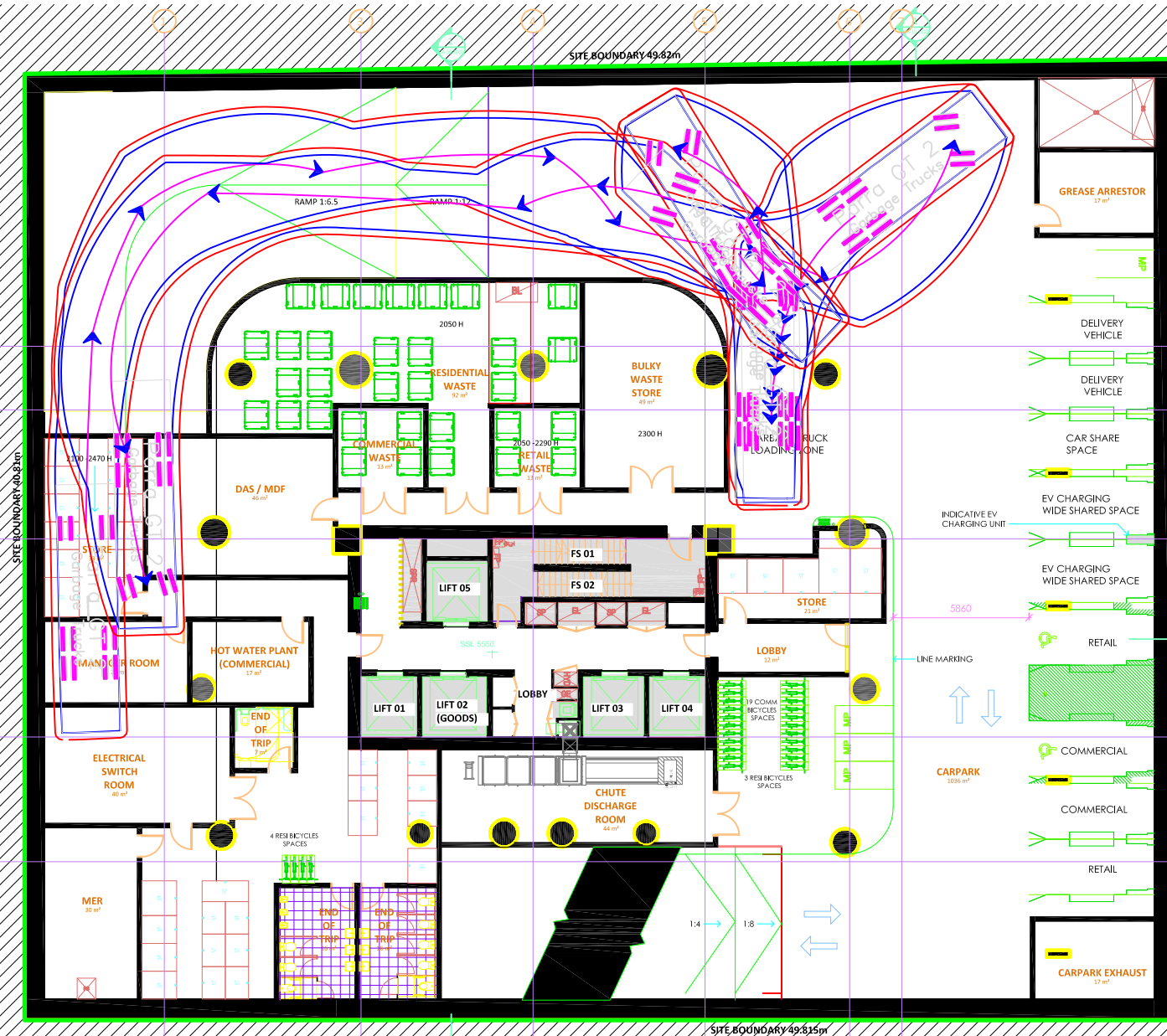
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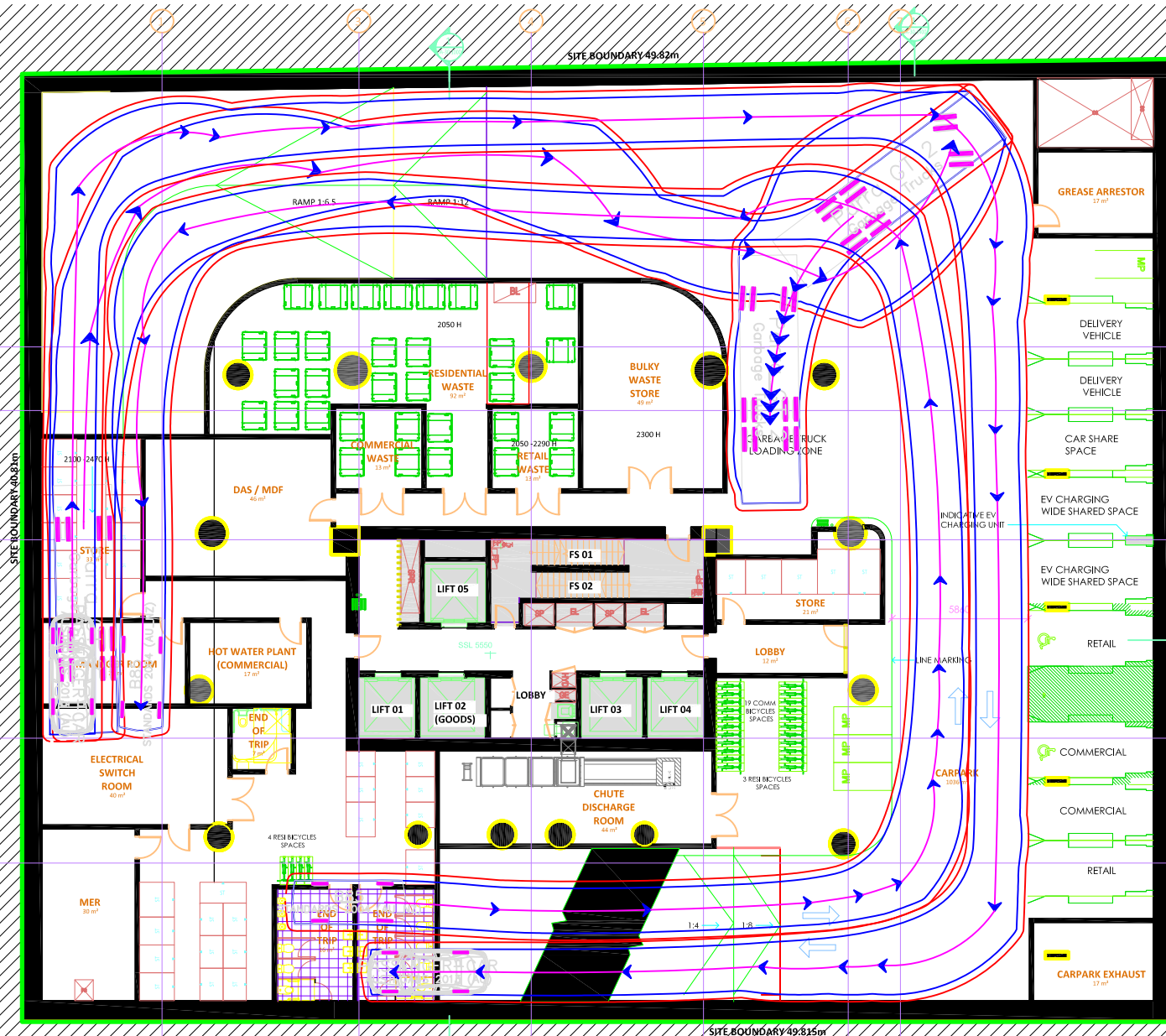
Revision

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8. Appendix B – Parramatta Waste Vehicle Turning Path Assessment

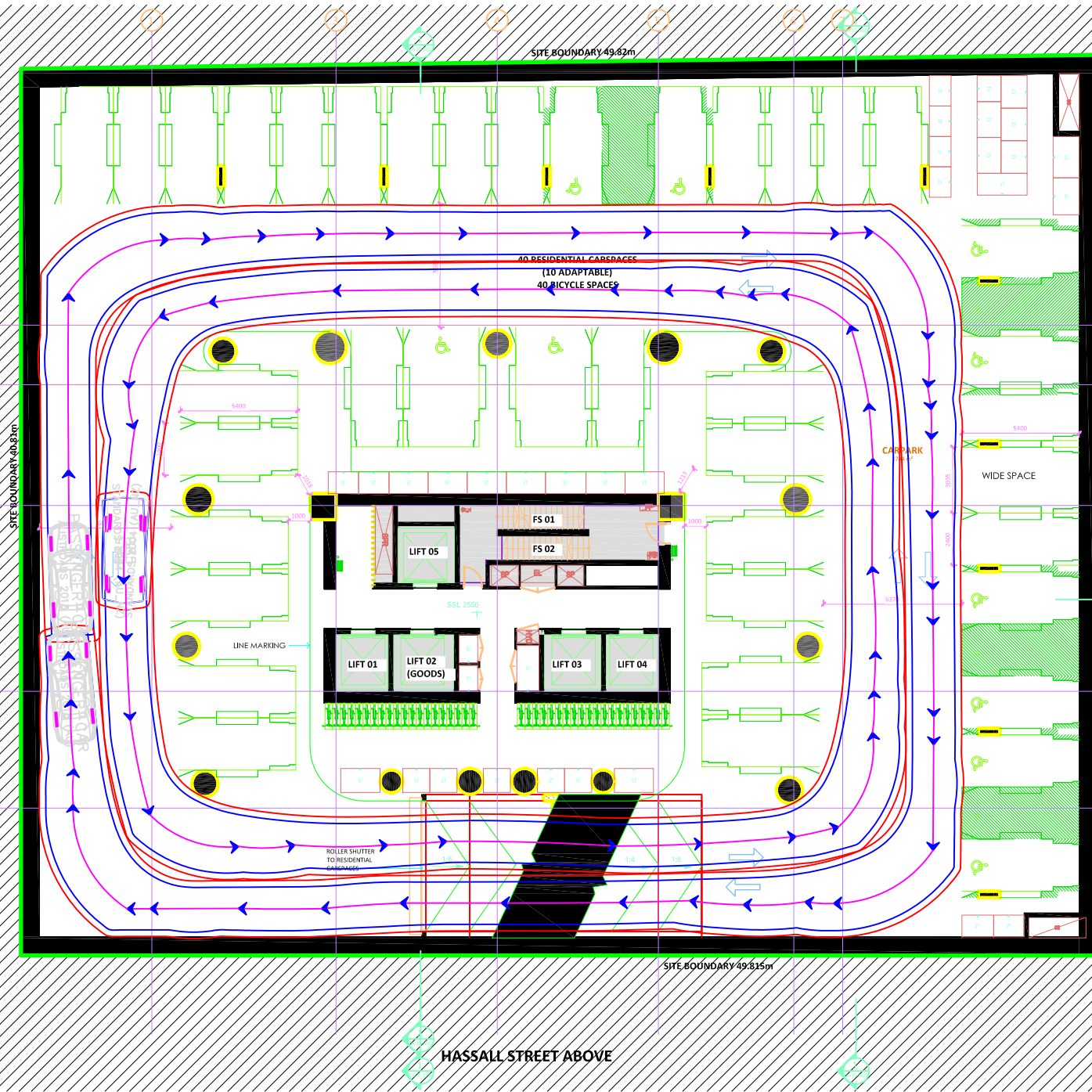


HASSALL STREET ABOVE

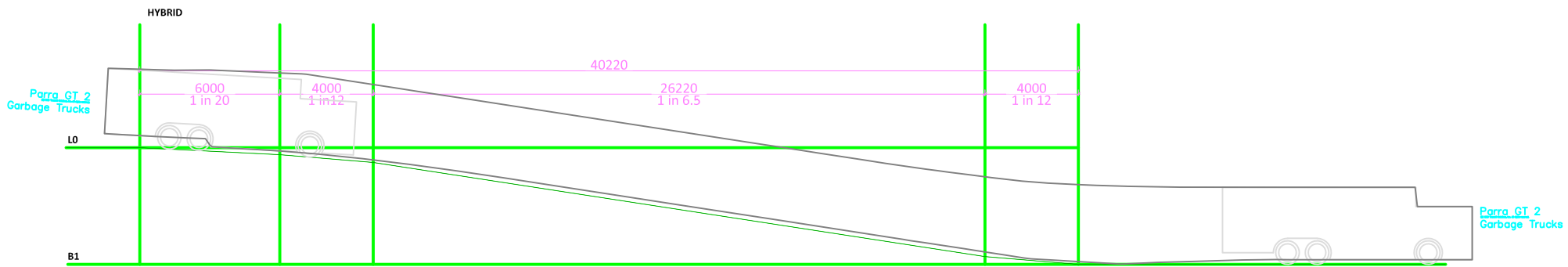


HASSALL STREET ABOVE

9. Appendix C - Basement Ramp 85th / 99th Percentile Vehicle Turning Path Assessment



10. Appendix D – Access Ramp Parramatta Council Waste Vehicle Clearance Assessment



Ground Clearance (units: mm)

Part #	Front	Wheelbase	Rear
#1	200	200	500

11. Appendix E – SIDRA Outputs

MOVEMENT SUMMARY

 Site: 101 [Hassall_Station_PM_2022 + Dev (Site Folder: General)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Practical Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Station St														
1	L2	13	13	14	100.0	0.832	34.9	LOS C	6.9	52.5	1.00	1.01	1.44	37.8
2	T1	216	11	227	5.1	* 0.832	28.2	LOS B	6.9	52.5	1.00	1.01	1.44	40.8
Approach		229	24	241	10.5	0.832	28.6	LOS C	6.9	52.5	1.00	1.01	1.44	40.6
East: Hassall St														
4	L2	113	4	119	3.5	* 0.866	37.5	LOS C	5.0	43.8	1.00	1.06	1.68	37.0
5	T1	43	43	45	100.0	0.866	31.9	LOS C	5.0	43.8	1.00	1.06	1.68	37.7
Approach		156	47	164	30.1	0.866	36.0	LOS C	5.0	43.8	1.00	1.06	1.68	37.2
North: Station St														
8	T1	188	6	198	3.2	0.699	16.7	LOS B	4.5	45.1	0.81	0.70	0.91	46.2
9	R2	78	78	82	100.0	* 0.699	30.9	LOS C	4.5	45.1	0.99	0.90	1.20	38.0
Approach		266	84	280	31.6	0.699	20.9	LOS B	4.5	45.1	0.87	0.76	0.99	43.4
West: Argyle St														
10	L2	95	95	100	100.0	0.256	19.5	LOS B	1.8	23.6	0.74	0.74	0.74	41.7
12	R2	30	30	32	100.0	* 0.243	30.8	LOS C	0.8	10.2	0.94	0.73	0.94	36.5
Approach		125	125	132	100.0	0.256	22.2	LOS B	1.8	23.6	0.79	0.74	0.79	40.3
All Vehicles		776	280	817	36.1	0.866	26.4	LOS B	6.9	52.5	0.92	0.89	1.23	40.7

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Station St												
P1	Full	50	53	19.4	LOS B	0.1	0.1	0.88	0.88	179.9	208.6	1.16
East: Hassall St												
P2	Full	50	53	19.4	LOS B	0.1	0.1	0.88	0.88	177.3	205.3	1.16
North: Station St												
P3	Full	50	53	19.4	LOS B	0.1	0.1	0.88	0.88	182.4	211.9	1.16
West: Argyle St												
P4	Full	50	53	19.4	LOS B	0.1	0.1	0.88	0.88	182.4	211.9	1.16

All Pedestrians	200	211	19.4	LOS B	0.1	0.1	0.88	0.88	180.5	209.4	1.16
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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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INTERSECTION SUMMARY

 **Site: 101 [Hassall_Charles_AM_2022 (Site Folder: General)]**

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	48.7 km/h	4.4 km/h	33.3 km/h
Travel Distance (Total)	762.8 veh-km/h	44.1 ped-km/h	959.5 pers-km/h
Travel Time (Total)	15.7 veh-h/h	10.0 ped-h/h	28.8 pers-h/h
Desired Speed (Program)	60.0 km/h		
Speed Efficiency	0.81		
Travel Time Index	7.90		
Congestion Coefficient	1.23		
Demand Flows (Total)	753 veh/h	211 ped/h	1114 pers/h
Percent Heavy Vehicles (Demand)	7.8 %		
Degree of Saturation	0.441	0.022	
Practical Spare Capacity	104.2 %		
Effective Intersection Capacity	1708 veh/h		
Control Delay (Total)	2.70 veh-h/h	0.56 ped-h/h	3.80 pers-h/h
Control Delay (Average)	12.9 sec	9.6 sec	12.3 sec
Control Delay (Worst Lane)	17.0 sec		
Control Delay (Worst Movement)	17.0 sec	9.6 sec	17.0 sec
Geometric Delay (Average)	3.3 sec		
Stop-Line Delay (Average)	9.6 sec		
Idling Time (Average)	6.1 sec		
Intersection Level of Service (LOS)	LOS A	LOS A	
95% Back of Queue - Vehicles (Worst Lane)	2.9 veh		
95% Back of Queue - Distance (Worst Lane)	23.0 m		
Ave. Queue Storage Ratio (Worst Lane)	0.03		
Total Effective Stops	540 veh/h	169 ped/h	817 pers/h
Effective Stop Rate	0.72	0.80	0.73
Proportion Queued	0.82	0.80	0.82
Performance Index	33.4	10.9	44.3
Cost (Total)	715.63 \$/h	275.54 \$/h	991.17 \$/h
Fuel Consumption (Total)	87.4 L/h		
Carbon Dioxide (Total)	209.3 kg/h		
Hydrocarbons (Total)	0.017 kg/h		
Carbon Monoxide (Total)	0.218 kg/h		
NOx (Total)	0.596 kg/h		

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Site Model Variability Index (Iterations 3 to N): 0.0 %

Number of Iterations: 2 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Main (Timing-Capacity) Iterations: 0.0% 0.0% 0.0%

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	361,263 veh/y	101,053 ped/y	534,569 pers/y
Delay	1,295 veh-h/y	270 ped-h/y	1,824 pers-h/y
Effective Stops	259,109 veh/y	81,020 ped/y	391,951 pers/y
Travel Distance	366,154 veh-km/y	21,163 ped-km/y	460,547 pers-km/y
Travel Time	7,521 veh-h/y	4,792 ped-h/y	13,817 pers-h/y
Cost	343,501 \$/y	132,261 \$/y	475,762 \$/y
Fuel Consumption	41,964 L/y		
Carbon Dioxide	100,469 kg/y		
Hydrocarbons	8 kg/y		
Carbon Monoxide	104 kg/y		
NOx	286 kg/y		

MOVEMENT SUMMARY

 Site: 101 [Hassall_Charles_AM_2022 (Site Folder: General)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Charles St														
1	L2	53	25	56	47.2	0.441	15.9	LOS B	2.9	23.0	0.85	0.72	0.85	48.2
2	T1	168	4	177	2.4	* 0.441	9.8	LOS A	2.9	23.0	0.85	0.72	0.85	51.1
Approach		221	29	233	13.1	0.441	11.2	LOS A	2.9	23.0	0.85	0.72	0.85	50.4
East: Hassall St														
5	T1	87	12	92	13.8	0.171	8.8	LOS A	1.0	8.2	0.77	0.60	0.77	52.4
6	R2	201	12	212	6.0	* 0.431	15.4	LOS B	2.7	19.8	0.85	0.78	0.85	46.5
Approach		288	24	303	8.3	0.431	13.4	LOS A	2.7	19.8	0.82	0.73	0.82	48.1
North: Charles St														
7	L2	108	2	114	1.9	0.207	14.5	LOS B	1.3	9.4	0.78	0.74	0.78	47.3
9	R2	50	1	53	2.0	0.145	17.0	LOS B	0.7	4.9	0.86	0.72	0.86	45.4
Approach		158	3	166	1.9	0.207	15.3	LOS B	1.3	9.4	0.80	0.73	0.80	46.7
West: Hassall St														
10	L2	11	0	12	0.0	0.087	14.0	LOS A	0.6	3.9	0.75	0.59	0.75	50.5
11	T1	37	0	39	0.0	0.087	8.5	LOS A	0.6	3.9	0.75	0.59	0.75	51.7
Approach		48	0	51	0.0	0.087	9.8	LOS A	0.6	3.9	0.75	0.59	0.75	51.4
All Vehicles		715	56	753	7.8	0.441	12.9	LOS A	2.9	23.0	0.82	0.72	0.82	48.7

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Charles St												
P1	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	167.5	205.3	1.23
East: Hassall St												
P2	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	172.6	211.9	1.23
North: Charles St												
P3	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	172.6	211.9	1.23
West: Hassall St												
P4	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	170.1	208.6	1.23

All Pedestrians	200	211	9.6	LOS A	0.0	0.0	0.80	0.80	170.7	209.4	1.23
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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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INTERSECTION SUMMARY

 **Site: 101 [Hassall_Charles_AM_2022 + Dev (Site Folder: General)]**

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	48.6 km/h	4.4 km/h	33.8 km/h
Travel Distance (Total)	801.3 veh-km/h	44.1 ped-km/h	1005.6 pers-km/h
Travel Time (Total)	16.5 veh-h/h	10.0 ped-h/h	29.8 pers-h/h
Desired Speed (Program)	60.0 km/h		
Speed Efficiency	0.81		
Travel Time Index	7.89		
Congestion Coefficient	1.23		
Demand Flows (Total)	791 veh/h	211 ped/h	1159 pers/h
Percent Heavy Vehicles (Demand)	7.5 %		
Degree of Saturation	0.448	0.022	
Practical Spare Capacity	100.7 %		
Effective Intersection Capacity	1763 veh/h		
Control Delay (Total)	2.86 veh-h/h	0.56 ped-h/h	3.99 pers-h/h
Control Delay (Average)	13.0 sec	9.6 sec	12.4 sec
Control Delay (Worst Lane)	17.0 sec		
Control Delay (Worst Movement)	17.0 sec	9.6 sec	17.0 sec
Geometric Delay (Average)	3.4 sec		
Stop-Line Delay (Average)	9.6 sec		
Idling Time (Average)	6.2 sec		
Intersection Level of Service (LOS)	LOS A	LOS A	
95% Back of Queue - Vehicles (Worst Lane)	3.0 veh		
95% Back of Queue - Distance (Worst Lane)	23.4 m		
Ave. Queue Storage Ratio (Worst Lane)	0.03		
Total Effective Stops	570 veh/h	169 ped/h	852 pers/h
Effective Stop Rate	0.72	0.80	0.74
Proportion Queued	0.82	0.80	0.82
Performance Index	35.0	10.9	45.9
Cost (Total)	750.06 \$/h	275.54 \$/h	1025.60 \$/h
Fuel Consumption (Total)	90.7 L/h		
Carbon Dioxide (Total)	217.0 kg/h		
Hydrocarbons (Total)	0.018 kg/h		
Carbon Monoxide (Total)	0.227 kg/h		
NOx (Total)	0.599 kg/h		

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Site Model Variability Index (Iterations 3 to N): 0.0 %

Number of Iterations: 2 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Main (Timing-Capacity) Iterations: 0.0% 4.5% 0.0%

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	379,453 veh/y	101,053 ped/y	556,396 pers/y
Delay	1,371 veh-h/y	270 ped-h/y	1,916 pers-h/y
Effective Stops	273,412 veh/y	81,020 ped/y	409,114 pers/y
Travel Distance	384,614 veh-km/y	21,163 ped-km/y	482,699 pers-km/y
Travel Time	7,913 veh-h/y	4,792 ped-h/y	14,287 pers-h/y
Cost	360,028 \$/y	132,261 \$/y	492,289 \$/y
Fuel Consumption	43,537 L/y		
Carbon Dioxide	104,160 kg/y		
Hydrocarbons	8 kg/y		
Carbon Monoxide	109 kg/y		

MOVEMENT SUMMARY

 Site: 101 [Hassall_Charles_AM_2022 + Dev (Site Folder: General)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Charles St														
1	L2	57	25	60	43.9	0.448	15.9	LOS B	3.0	23.4	0.85	0.72	0.85	48.2
2	T1	168	4	177	2.4	* 0.448	9.8	LOS A	3.0	23.4	0.85	0.72	0.85	51.0
Approach		225	29	237	12.9	0.448	11.3	LOS A	3.0	23.4	0.85	0.72	0.85	50.3
East: Hassall St														
5	T1	91	12	96	13.2	0.178	8.9	LOS A	1.1	8.6	0.77	0.60	0.77	52.4
6	R2	201	12	212	6.0	* 0.448	15.5	LOS B	2.7	19.9	0.85	0.79	0.85	46.4
Approach		292	24	307	8.2	0.448	13.4	LOS A	2.7	19.9	0.83	0.73	0.83	48.1
North: Charles St														
7	L2	108	2	114	1.9	0.207	14.5	LOS B	1.3	9.4	0.78	0.74	0.78	47.3
9	R2	54	1	57	1.9	0.158	17.0	LOS B	0.7	5.3	0.86	0.73	0.86	45.4
Approach		162	3	171	1.9	0.207	15.3	LOS B	1.3	9.4	0.81	0.74	0.81	46.7
West: Hassall St														
10	L2	35	0	37	0.0	0.133	14.2	LOS A	0.9	6.0	0.76	0.65	0.76	49.4
11	T1	37	0	39	0.0	0.133	8.7	LOS A	0.9	6.0	0.76	0.65	0.76	50.6
Approach		72	0	76	0.0	0.133	11.4	LOS A	0.9	6.0	0.76	0.65	0.76	50.0
All Vehicles		751	56	791	7.5	0.448	13.0	LOS A	3.0	23.4	0.82	0.72	0.82	48.6

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Charles St												
P1	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	167.5	205.3	1.23
East: Hassall St												
P2	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	172.6	211.9	1.23
North: Charles St												
P3	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	172.6	211.9	1.23
West: Hassall St												
P4	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	170.1	208.6	1.23

All Pedestrians	200	211	9.6	LOS A	0.0	0.0	0.80	0.80	170.7	209.4	1.23
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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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INTERSECTION SUMMARY

 **Site: 101 [Hassall_Charles_PM_2022 (Site Folder: General)]**

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	48.8 km/h	4.4 km/h	29.4 km/h
Travel Distance (Total)	523.9 veh-km/h	44.1 ped-km/h	672.8 pers-km/h
Travel Time (Total)	10.7 veh-h/h	10.0 ped-h/h	22.9 pers-h/h
Desired Speed (Program)	60.0 km/h		
Speed Efficiency	0.81		
Travel Time Index	7.93		
Congestion Coefficient	1.23		
Demand Flows (Total)	517 veh/h	211 ped/h	831 pers/h
Percent Heavy Vehicles (Demand)	10.0 %		
Degree of Saturation	0.259	0.022	
Practical Spare Capacity	247.7 %		
Effective Intersection Capacity	1997 veh/h		
Control Delay (Total)	1.82 veh-h/h	0.56 ped-h/h	2.75 pers-h/h
Control Delay (Average)	12.7 sec	9.6 sec	11.9 sec
Control Delay (Worst Lane)	15.5 sec		
Control Delay (Worst Movement)	15.5 sec	9.6 sec	15.5 sec
Geometric Delay (Average)	3.7 sec		
Stop-Line Delay (Average)	8.9 sec		
Idling Time (Average)	5.7 sec		
Intersection Level of Service (LOS)	LOS A	LOS A	
95% Back of Queue - Vehicles (Worst Lane)	1.5 veh		
95% Back of Queue - Distance (Worst Lane)	13.6 m		
Ave. Queue Storage Ratio (Worst Lane)	0.02		
Total Effective Stops	357 veh/h	169 ped/h	597 pers/h
Effective Stop Rate	0.69	0.80	0.72
Proportion Queued	0.78	0.80	0.78
Performance Index	21.0	10.9	32.0
Cost (Total)	501.14 \$/h	275.54 \$/h	776.68 \$/h
Fuel Consumption (Total)	64.7 L/h		
Carbon Dioxide (Total)	156.1 kg/h		
Hydrocarbons (Total)	0.012 kg/h		
Carbon Monoxide (Total)	0.157 kg/h		
NOx (Total)	0.518 kg/h		

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Site Model Variability Index (Iterations 3 to N): 0.0 %

Number of Iterations: 2 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Main (Timing-Capacity) Iterations: 0.0% 0.0% 0.0%

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	248,084 veh/y	101,053 ped/y	398,754 pers/y
Delay	873 veh-h/y	270 ped-h/y	1,318 pers-h/y
Effective Stops	171,324 veh/y	81,020 ped/y	286,609 pers/y
Travel Distance	251,467 veh-km/y	21,163 ped-km/y	322,923 pers-km/y
Travel Time	5,153 veh-h/y	4,792 ped-h/y	10,976 pers-h/y
Cost	240,548 \$/y	132,261 \$/y	372,809 \$/y
Fuel Consumption	31,057 L/y		
Carbon Dioxide	74,947 kg/y		
Hydrocarbons	6 kg/y		
Carbon Monoxide	75 kg/y		
NOx	249 kg/y		

MOVEMENT SUMMARY

 **Site: 101 [Hassall_Charles_PM_2022 (Site Folder: General)]**

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Charles St														
1	L2	60	39	63	65.0	0.259	14.7	LOS B	1.5	13.6	0.77	0.68	0.77	48.1
2	T1	67	1	71	1.5	* 0.259	8.4	LOS A	1.5	13.6	0.77	0.68	0.77	51.7
Approach		127	40	134	31.5	0.259	11.4	LOS A	1.5	13.6	0.77	0.68	0.77	50.0
East: Hassall St														
5	T1	63	7	66	11.1	0.137	9.6	LOS A	0.8	6.0	0.79	0.60	0.79	51.8
6	R2	108	1	114	0.9	* 0.248	15.5	LOS B	1.4	9.9	0.82	0.75	0.82	46.6
Approach		171	8	180	4.7	0.248	13.3	LOS A	1.4	9.9	0.81	0.70	0.81	48.4
North: Charles St														
7	L2	99	0	104	0.0	0.168	13.5	LOS A	1.1	7.9	0.74	0.73	0.74	48.0
9	R2	48	1	51	2.1	0.109	14.2	LOS A	0.6	4.1	0.75	0.72	0.75	47.1
Approach		147	1	155	0.7	0.168	13.7	LOS A	1.1	7.9	0.74	0.72	0.74	47.7
West: Hassall St														
10	L2	9	0	9	0.0	0.094	14.9	LOS B	0.6	3.9	0.78	0.61	0.78	50.0
11	T1	37	0	39	0.0	0.094	9.4	LOS A	0.6	3.9	0.78	0.61	0.78	51.2
Approach		46	0	48	0.0	0.094	10.5	LOS A	0.6	3.9	0.78	0.61	0.78	51.0
All Vehicles		491	49	517	10.0	0.259	12.7	LOS A	1.5	13.6	0.78	0.69	0.78	48.8

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Charles St												
P1	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	167.5	205.3	1.23
East: Hassall St												
P2	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	172.6	211.9	1.23
North: Charles St												
P3	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	172.6	211.9	1.23
West: Hassall St												
P4	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	170.1	208.6	1.23

All Pedestrians	200	211	9.6	LOS A	0.0	0.0	0.80	0.80	170.7	209.4	1.23
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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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INTERSECTION SUMMARY

 **Site: 101 [Hassall_Charles_PM_2022 + Dev (Site Folder: General)]**

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	48.7 km/h	4.4 km/h	30.8 km/h
Travel Distance (Total)	596.4 veh-km/h	44.1 ped-km/h	759.8 pers-km/h
Travel Time (Total)	12.3 veh-h/h	10.0 ped-h/h	24.7 pers-h/h
Desired Speed (Program)	60.0 km/h		
Speed Efficiency	0.81		
Travel Time Index	7.90		
Congestion Coefficient	1.23		
Demand Flows (Total)	588 veh/h	211 ped/h	917 pers/h
Percent Heavy Vehicles (Demand)	8.8 %		
Degree of Saturation	0.279	0.022	
Practical Spare Capacity	222.2 %		
Effective Intersection Capacity	2107 veh/h		
Control Delay (Total)	2.09 veh-h/h	0.56 ped-h/h	3.08 pers-h/h
Control Delay (Average)	12.8 sec	9.6 sec	12.1 sec
Control Delay (Worst Lane)	16.5 sec		
Control Delay (Worst Movement)	16.5 sec	9.6 sec	16.5 sec
Geometric Delay (Average)	3.8 sec		
Stop-Line Delay (Average)	9.1 sec		
Idling Time (Average)	5.8 sec		
Intersection Level of Service (LOS)	LOS A	LOS A	
95% Back of Queue - Vehicles (Worst Lane)	1.7 veh		
95% Back of Queue - Distance (Worst Lane)	14.6 m		
Ave. Queue Storage Ratio (Worst Lane)	0.02		
Total Effective Stops	411 veh/h	169 ped/h	662 pers/h
Effective Stop Rate	0.70	0.80	0.72
Proportion Queued	0.78	0.80	0.79
Performance Index	24.1	10.9	35.1
Cost (Total)	565.40 \$/h	275.54 \$/h	840.95 \$/h
Fuel Consumption (Total)	70.9 L/h		
Carbon Dioxide (Total)	170.4 kg/h		
Hydrocarbons (Total)	0.014 kg/h		
Carbon Monoxide (Total)	0.174 kg/h		
NOx (Total)	0.523 kg/h		

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Site Model Variability Index (Iterations 3 to N): 0.0 %

Number of Iterations: 2 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Main (Timing-Capacity) Iterations: 0.0% 2.7% 0.0%

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	282,442 veh/y	101,053 ped/y	439,983 pers/y
Delay	1,006 veh-h/y	270 ped-h/y	1,477 pers-h/y
Effective Stops	197,441 veh/y	81,020 ped/y	317,949 pers/y
Travel Distance	286,292 veh-km/y	21,163 ped-km/y	364,714 pers-km/y
Travel Time	5,884 veh-h/y	4,792 ped-h/y	11,852 pers-h/y
Cost	271,394 \$/y	132,261 \$/y	403,655 \$/y
Fuel Consumption	34,014 L/y		
Carbon Dioxide	81,816 kg/y		
Hydrocarbons	7 kg/y		
Carbon Monoxide	84 kg/y		

MOVEMENT SUMMARY

 Site: 101 [Hassall_Charles_PM_2022 + Dev (Site Folder: General)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 30 seconds (Site Practical Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Charles St														
1	L2	80	39	84	48.8	0.266	13.7	LOS A	1.7	14.6	0.74	0.68	0.74	48.7
2	T1	67	1	71	1.5	* 0.266	7.6	LOS A	1.7	14.6	0.74	0.68	0.74	51.7
Approach		147	40	155	27.2	0.266	10.9	LOS A	1.7	14.6	0.74	0.68	0.74	50.0
East: Hassall St														
5	T1	83	7	87	8.4	0.203	10.7	LOS A	1.1	8.3	0.84	0.65	0.84	51.0
6	R2	108	1	114	0.9	* 0.279	16.5	LOS B	1.5	10.4	0.86	0.75	0.86	46.0
Approach		191	8	201	4.2	0.279	14.0	LOS A	1.5	10.4	0.85	0.71	0.85	48.0
North: Charles St														
7	L2	99	0	104	0.0	0.153	12.7	LOS A	1.1	7.5	0.70	0.72	0.70	48.5
9	R2	68	1	72	1.5	0.145	14.3	LOS A	0.8	5.8	0.76	0.73	0.76	47.0
Approach		167	1	176	0.6	0.153	13.3	LOS A	1.1	7.5	0.73	0.72	0.73	47.9
West: Hassall St														
10	L2	17	0	18	0.0	0.127	16.0	LOS B	0.7	4.9	0.82	0.65	0.82	48.9
11	T1	37	0	39	0.0	0.127	10.4	LOS A	0.7	4.9	0.82	0.65	0.82	50.0
Approach		54	0	57	0.0	0.127	12.2	LOS A	0.7	4.9	0.82	0.65	0.82	49.6
All Vehicles		559	49	588	8.8	0.279	12.8	LOS A	1.7	14.6	0.78	0.70	0.78	48.7

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Charles St												
P1	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	167.5	205.3	1.23
East: Hassall St												
P2	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	172.6	211.9	1.23
North: Charles St												
P3	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	172.6	211.9	1.23
West: Hassall St												
P4	Full	50	53	9.6	LOS A	0.0	0.0	0.80	0.80	170.1	208.6	1.23

All Pedestrians	200	211	9.6	LOS A	0.0	0.0	0.80	0.80	170.7	209.4	1.23
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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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INTERSECTION SUMMARY

 **Site: 101 [Hassall_Station_AM_2022 (Site Folder: General)]**

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site Practical Cycle Time)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	40.2 km/h	4.1 km/h	30.2 km/h
Travel Distance (Total)	942.2 veh-km/h	44.1 ped-km/h	1174.7 pers-km/h
Travel Time (Total)	23.4 veh-h/h	10.8 ped-h/h	38.9 pers-h/h
Desired Speed (Program)	60.0 km/h		
Speed Efficiency	0.67		
Travel Time Index	6.34		
Congestion Coefficient	1.49		
Demand Flows (Total)	929 veh/h	211 ped/h	1326 pers/h
Percent Heavy Vehicles (Demand)	33.0 %		
Degree of Saturation	0.824	0.044	
Practical Spare Capacity	9.2 %		
Effective Intersection Capacity	1127 veh/h		
Control Delay (Total)	7.16 veh-h/h	1.42 ped-h/h	10.01 pers-h/h
Control Delay (Average)	27.7 sec	24.4 sec	27.2 sec
Control Delay (Worst Lane)	43.0 sec		
Control Delay (Worst Movement)	43.0 sec	24.4 sec	43.0 sec
Geometric Delay (Average)	2.5 sec		
Stop-Line Delay (Average)	25.2 sec		
Idling Time (Average)	19.5 sec		
Intersection Level of Service (LOS)	LOS B	LOS C	
95% Back of Queue - Vehicles (Worst Lane)	12.8 veh		
95% Back of Queue - Distance (Worst Lane)	94.6 m		
Ave. Queue Storage Ratio (Worst Lane)	0.12		
Total Effective Stops	803 veh/h	190 ped/h	1154 pers/h
Effective Stop Rate	0.86	0.90	0.87
Proportion Queued	0.91	0.90	0.91
Performance Index	68.1	11.9	80.0
Cost (Total)	1257.55 \$/h	299.32 \$/h	1556.87 \$/h
Fuel Consumption (Total)	214.3 L/h		
Carbon Dioxide (Total)	542.8 kg/h		
Hydrocarbons (Total)	0.043 kg/h		
Carbon Monoxide (Total)	0.482 kg/h		
NOx (Total)	3.087 kg/h		

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Site Model Variability Index (Iterations 3 to N): 0.0 %

Number of Iterations: 2 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Main (Timing-Capacity) Iterations: 0.0% 13.7% 0.0%

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	446,147 veh/y	101,053 ped/y	636,430 pers/y
Delay	3,436 veh-h/y	684 ped-h/y	4,807 pers-h/y
Effective Stops	385,665 veh/y	91,147 ped/y	553,945 pers/y
Travel Distance	452,251 veh-km/y	21,163 ped-km/y	563,864 pers-km/y
Travel Time	11,239 veh-h/y	5,206 ped-h/y	18,692 pers-h/y
Cost	603,623 \$/y	143,675 \$/y	747,298 \$/y
Fuel Consumption	102,844 L/y		
Carbon Dioxide	260,537 kg/y		
Hydrocarbons	21 kg/y		
Carbon Monoxide	231 kg/y		
NOx	1,482 kg/y		

MOVEMENT SUMMARY

 Site: 101 [Hassall_Station_AM_2022 (Site Folder: General)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site Practical Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %	v/c	sec		[Veh. veh	Dist] m				km/h
South: Station St														
1	L2	7	7	7	100.0	0.789	32.2	LOS C	12.8	94.6	0.98	0.95	1.16	39.0
2	T1	389	19	409	4.9	* 0.789	25.5	LOS B	12.8	94.6	0.98	0.95	1.16	42.2
Approach		396	26	417	6.6	0.789	25.7	LOS B	12.8	94.6	0.98	0.95	1.16	42.1
East: Hassall St														
4	L2	121	11	127	9.1	* 0.824	40.4	LOS C	5.3	44.9	1.00	0.99	1.46	35.7
5	T1	26	26	27	100.0	0.824	34.8	LOS C	5.3	44.9	1.00	0.99	1.46	36.5
Approach		147	37	155	25.2	0.824	39.4	LOS C	5.3	44.9	1.00	0.99	1.46	35.8
North: Station St														
8	T1	122	11	128	9.0	0.144	9.3	LOS A	2.1	15.8	0.59	0.47	0.59	52.0
9	R2	82	82	86	100.0	* 0.796	43.0	LOS D	3.0	39.4	1.00	0.99	1.53	32.7
Approach		204	93	215	45.6	0.796	22.8	LOS B	3.0	39.4	0.75	0.68	0.97	42.1
West: Argyle St														
10	L2	92	92	97	100.0	0.282	24.1	LOS B	2.2	29.1	0.79	0.75	0.79	39.6
12	R2	44	43	46	97.7	* 0.423	37.5	LOS C	1.4	18.5	0.98	0.75	0.98	34.6
Approach		136	135	143	99.3	0.423	28.4	LOS B	2.2	29.1	0.85	0.75	0.85	37.9
All Vehicles		883	291	929	33.0	0.824	27.7	LOS B	12.8	94.6	0.91	0.86	1.12	40.2

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.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Station St												
P1	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	184.8	208.6	1.13
East: Hassall St												
P2	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	182.3	205.3	1.13
North: Station St												
P3	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	187.4	211.9	1.13
West: Argyle St												
P4	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	187.4	211.9	1.13

All Pedestrians	200	211	24.4	LOS C	0.1	0.1	0.90	0.90	185.4	209.4	1.13
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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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INTERSECTION SUMMARY

 **Site: 101 [Hassall_Station_AM_2022 + Dev (Site Folder: General)]**

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site Practical Cycle Time)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	39.5 km/h	4.1 km/h	29.9 km/h
Travel Distance (Total)	967.8 veh-km/h	44.1 ped-km/h	1205.5 pers-km/h
Travel Time (Total)	24.5 veh-h/h	10.8 ped-h/h	40.3 pers-h/h
Desired Speed (Program)	60.0 km/h		
Speed Efficiency	0.66		
Travel Time Index	6.20		
Congestion Coefficient	1.52		
Demand Flows (Total)	955 veh/h	211 ped/h	1356 pers/h
Percent Heavy Vehicles (Demand)	32.1 %		
Degree of Saturation	0.838	0.044	
Practical Spare Capacity	7.4 %		
Effective Intersection Capacity	1139 veh/h		
Control Delay (Total)	7.81 veh-h/h	1.42 ped-h/h	10.80 pers-h/h
Control Delay (Average)	29.5 sec	24.4 sec	28.7 sec
Control Delay (Worst Lane)	43.0 sec		
Control Delay (Worst Movement)	43.0 sec	24.4 sec	43.0 sec
Geometric Delay (Average)	2.6 sec		
Stop-Line Delay (Average)	26.9 sec		
Idling Time (Average)	20.8 sec		
Intersection Level of Service (LOS)	LOS C	LOS C	
95% Back of Queue - Vehicles (Worst Lane)	13.8 veh		
95% Back of Queue - Distance (Worst Lane)	101.9 m		
Ave. Queue Storage Ratio (Worst Lane)	0.12		
Total Effective Stops	861 veh/h	190 ped/h	1223 pers/h
Effective Stop Rate	0.90	0.90	0.90
Proportion Queued	0.92	0.90	0.92
Performance Index	72.9	11.9	84.8
Cost (Total)	1301.64 \$/h	299.32 \$/h	1600.96 \$/h
Fuel Consumption (Total)	217.7 L/h		
Carbon Dioxide (Total)	550.8 kg/h		
Hydrocarbons (Total)	0.044 kg/h		
Carbon Monoxide (Total)	0.490 kg/h		
NOx (Total)	3.094 kg/h		

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Site Model Variability Index (Iterations 3 to N): 0.0 %

Number of Iterations: 2 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Main (Timing-Capacity) Iterations: 0.0% 11.8% 0.0%

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	458,274 veh/y	101,053 ped/y	650,981 pers/y
Delay	3,750 veh-h/y	684 ped-h/y	5,184 pers-h/y
Effective Stops	413,381 veh/y	91,147 ped/y	587,204 pers/y
Travel Distance	464,568 veh-km/y	21,163 ped-km/y	578,645 pers-km/y
Travel Time	11,764 veh-h/y	5,206 ped-h/y	19,323 pers-h/y
Cost	624,785 \$/y	143,675 \$/y	768,460 \$/y
Fuel Consumption	104,510 L/y		
Carbon Dioxide	264,391 kg/y		
Hydrocarbons	21 kg/y		
Carbon Monoxide	235 kg/y		

MOVEMENT SUMMARY

 Site: 101 [Hassall_Station_AM_2022 + Dev (Site Folder: General)]

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 60 seconds (Site Practical Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %				[Veh. veh	Dist] m				
South: Station St														
1	L2	7	7	7	100.0	0.838	35.8	LOS C	13.8	101.9	1.00	1.03	1.29	37.5
2	T1	389	19	409	4.9	*0.838	29.1	LOS C	13.8	101.9	1.00	1.03	1.29	40.5
Approach		396	26	417	6.6	0.838	29.2	LOS C	13.8	101.9	1.00	1.03	1.29	40.5
East: Hassall St														
4	L2	145	11	153	7.6	*0.823	39.6	LOS C	6.1	50.6	1.00	0.99	1.43	36.0
5	T1	26	26	27	100.0	0.823	34.0	LOS C	6.1	50.6	1.00	0.99	1.43	36.7
Approach		171	37	180	21.6	0.823	38.8	LOS C	6.1	50.6	1.00	0.99	1.43	36.1
North: Station St														
8	T1	122	11	128	9.0	0.149	9.9	LOS A	2.2	16.3	0.60	0.49	0.60	51.6
9	R2	82	82	86	100.0	*0.796	43.0	LOS D	3.0	39.4	1.00	0.99	1.53	32.7
Approach		204	93	215	45.6	0.796	23.2	LOS B	3.0	39.4	0.76	0.69	0.98	41.9
West: Argyle St														
10	L2	92	92	97	100.0	0.268	23.2	LOS B	2.2	28.3	0.77	0.75	0.77	40.0
12	R2	44	43	46	97.7	*0.423	37.5	LOS C	1.4	18.5	0.98	0.75	0.98	34.6
Approach		136	135	143	99.3	0.423	27.8	LOS B	2.2	28.3	0.84	0.75	0.84	38.1
All Vehicles		907	291	955	32.1	0.838	29.5	LOS C	13.8	101.9	0.92	0.90	1.18	39.5

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.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Station St												
P1	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	184.8	208.6	1.13
East: Hassall St												
P2	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	182.3	205.3	1.13
North: Station St												
P3	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	187.4	211.9	1.13
West: Argyle St												
P4	Full	50	53	24.4	LOS C	0.1	0.1	0.90	0.90	187.4	211.9	1.13

All Pedestrians	200	211	24.4	LOS C	0.1	0.1	0.90	0.90	185.4	209.4	1.13
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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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INTERSECTION SUMMARY

 **Site: 101 [Hassall_Station_PM_2022 (Site Folder: General)]**

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Practical Cycle Time)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	41.0 km/h	4.2 km/h	29.7 km/h
Travel Distance (Total)	819.6 veh-km/h	44.1 ped-km/h	1027.6 pers-km/h
Travel Time (Total)	20.0 veh-h/h	10.6 ped-h/h	34.6 pers-h/h
Desired Speed (Program)	60.0 km/h		
Speed Efficiency	0.68		
Travel Time Index	6.47		
Congestion Coefficient	1.46		
Demand Flows (Total)	808 veh/h	211 ped/h	1181 pers/h
Percent Heavy Vehicles (Demand)	36.5 %		
Degree of Saturation	0.832	0.037	
Practical Spare Capacity	8.2 %		
Effective Intersection Capacity	972 veh/h		
Control Delay (Total)	5.81 veh-h/h	1.13 ped-h/h	8.11 pers-h/h
Control Delay (Average)	25.9 sec	19.4 sec	24.7 sec
Control Delay (Worst Lane)	33.9 sec		
Control Delay (Worst Movement)	35.5 sec	19.4 sec	35.5 sec
Geometric Delay (Average)	2.6 sec		
Stop-Line Delay (Average)	23.3 sec		
Idling Time (Average)	17.0 sec		
Intersection Level of Service (LOS)	LOS B	LOS B	
95% Back of Queue - Vehicles (Worst Lane)	6.9 veh		
95% Back of Queue - Distance (Worst Lane)	52.5 m		
Ave. Queue Storage Ratio (Worst Lane)	0.06		
Total Effective Stops	711 veh/h	186 ped/h	1039 pers/h
Effective Stop Rate	0.88	0.88	0.88
Proportion Queued	0.92	0.88	0.91
Performance Index	52.5	11.6	64.1
Cost (Total)	1109.03 \$/h	291.33 \$/h	1400.36 \$/h
Fuel Consumption (Total)	198.4 L/h		
Carbon Dioxide (Total)	500.1 kg/h		
Hydrocarbons (Total)	0.038 kg/h		
Carbon Monoxide (Total)	0.432 kg/h		
NOx (Total)	2.958 kg/h		

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Site Model Variability Index (Iterations 3 to N): 0.0 %

Number of Iterations: 2 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Main (Timing-Capacity) Iterations: 0.0% 11.9% 0.0%

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	388,042 veh/y	101,053 ped/y	566,703 pers/y
Delay	2,791 veh-h/y	545 ped-h/y	3,894 pers-h/y
Effective Stops	341,143 veh/y	89,122 ped/y	498,494 pers/y
Travel Distance	393,391 veh-km/y	21,163 ped-km/y	493,232 pers-km/y
Travel Time	9,604 veh-h/y	5,067 ped-h/y	16,591 pers-h/y
Cost	532,335 \$/y	139,839 \$/y	672,174 \$/y
Fuel Consumption	95,224 L/y		
Carbon Dioxide	240,070 kg/y		
Hydrocarbons	18 kg/y		
Carbon Monoxide	207 kg/y		
NOx	1,420 kg/y		

MOVEMENT SUMMARY

 **Site: 101 [Hassall_Station_PM_2022 (Site Folder: General)]**

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Practical Cycle Time)

Vehicle Movement Performance														
Mov ID	Turn	INPUT VOLUMES		DEMAND FLOWS		Deg. Satn	Aver. Delay	Level of Service	95% BACK OF QUEUE		Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed
		[Total veh/h	HV] veh/h	[Total veh/h	HV] %				[Veh. veh	Dist] m				
		v/c					sec							km/h
South: Station St														
1	L2	13	13	14	100.0	0.832	34.9	LOS C	6.9	52.5	1.00	1.01	1.44	37.8
2	T1	216	11	227	5.1	* 0.832	28.2	LOS B	6.9	52.5	1.00	1.01	1.44	40.8
Approach		229	24	241	10.5	0.832	28.6	LOS C	6.9	52.5	1.00	1.01	1.44	40.6
East: Hassall St														
4	L2	105	4	111	3.8	* 0.829	35.5	LOS C	4.5	40.4	1.00	1.01	1.54	37.8
5	T1	43	43	45	100.0	0.829	29.9	LOS C	4.5	40.4	1.00	1.01	1.54	38.6
Approach		148	47	156	31.8	0.829	33.9	LOS C	4.5	40.4	1.00	1.01	1.54	38.0
North: Station St														
8	T1	188	6	198	3.2	0.699	16.7	LOS B	4.5	45.1	0.81	0.70	0.91	46.2
9	R2	78	78	82	100.0	* 0.699	30.9	LOS C	4.5	45.1	0.99	0.90	1.20	38.0
Approach		266	84	280	31.6	0.699	20.9	LOS B	4.5	45.1	0.87	0.76	0.99	43.4
West: Argyle St														
10	L2	95	95	100	100.0	0.256	19.5	LOS B	1.8	23.6	0.74	0.74	0.74	41.7
12	R2	30	30	32	100.0	* 0.243	30.8	LOS C	0.8	10.2	0.94	0.73	0.94	36.5
Approach		125	125	132	100.0	0.256	22.2	LOS B	1.8	23.6	0.79	0.74	0.79	40.3
All Vehicles		768	280	808	36.5	0.832	25.9	LOS B	6.9	52.5	0.92	0.88	1.20	41.0

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.

Intersection and Approach LOS values are based on average delay for all vehicle movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

* Critical Movement (Signal Timing)

Pedestrian Movement Performance												
Mov ID	Crossing	Input Vol.	Dem. Flow	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Prop. Que	Effective Stop Rate	Travel Time	Travel Dist.	Aver. Speed
		ped/h	ped/h	sec		[Ped ped	Dist] m			sec	m	m/sec
South: Station St												
P1	Full	50	53	19.4	LOS B	0.1	0.1	0.88	0.88	179.9	208.6	1.16
East: Hassall St												
P2	Full	50	53	19.4	LOS B	0.1	0.1	0.88	0.88	177.3	205.3	1.16
North: Station St												
P3	Full	50	53	19.4	LOS B	0.1	0.1	0.88	0.88	182.4	211.9	1.16
West: Argyle St												
P4	Full	50	53	19.4	LOS B	0.1	0.1	0.88	0.88	182.4	211.9	1.16

All Pedestrians	200	211	19.4	LOS B	0.1	0.1	0.88	0.88	180.5	209.4	1.16
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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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INTERSECTION SUMMARY

 **Site: 101 [Hassall_Station_PM_2022 + Dev (Site Folder: General)]**

New Site

Site Category: (None)

Signals - EQUISAT (Fixed-Time/SCATS) Isolated Cycle Time = 50 seconds (Site Practical Cycle Time)

Intersection Performance - Hourly Values			
Performance Measure	Vehicles	Pedestrians	Persons
Travel Speed (Average)	40.7 km/h	4.2 km/h	29.7 km/h
Travel Distance (Total)	828.1 veh-km/h	44.1 ped-km/h	1037.8 pers-km/h
Travel Time (Total)	20.3 veh-h/h	10.6 ped-h/h	35.0 pers-h/h
Desired Speed (Program)	60.0 km/h		
Speed Efficiency	0.68		
Travel Time Index	6.43		
Congestion Coefficient	1.47		
Demand Flows (Total)	817 veh/h	211 ped/h	1191 pers/h
Percent Heavy Vehicles (Demand)	36.1 %		
Degree of Saturation	0.866	0.037	
Practical Spare Capacity	3.9 %		
Effective Intersection Capacity	943 veh/h		
Control Delay (Total)	5.99 veh-h/h	1.13 ped-h/h	8.32 pers-h/h
Control Delay (Average)	26.4 sec	19.4 sec	25.2 sec
Control Delay (Worst Lane)	36.0 sec		
Control Delay (Worst Movement)	37.5 sec	19.4 sec	37.5 sec
Geometric Delay (Average)	2.7 sec		
Stop-Line Delay (Average)	23.7 sec		
Idling Time (Average)	17.3 sec		
Intersection Level of Service (LOS)	LOS B	LOS B	
95% Back of Queue - Vehicles (Worst Lane)	6.9 veh		
95% Back of Queue - Distance (Worst Lane)	52.5 m		
Ave. Queue Storage Ratio (Worst Lane)	0.06		
Total Effective Stops	728 veh/h	186 ped/h	1060 pers/h
Effective Stop Rate	0.89	0.88	0.89
Proportion Queued	0.92	0.88	0.91
Performance Index	53.7	11.6	65.3
Cost (Total)	1122.09 \$/h	291.33 \$/h	1413.42 \$/h
Fuel Consumption (Total)	199.5 L/h		
Carbon Dioxide (Total)	502.6 kg/h		
Hydrocarbons (Total)	0.039 kg/h		
Carbon Monoxide (Total)	0.435 kg/h		
NOx (Total)	2.962 kg/h		

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Intersection LOS value for Vehicles is based on average delay for all vehicle movements.

Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Queue Model: SIDRA Standard.

Site Model Variability Index (Iterations 3 to N): 0.0 %

Number of Iterations: 2 (Maximum: 10)

Largest change in Lane Degrees of Saturation for the last three Main (Timing-Capacity) Iterations: 0.0% 11.9% 0.0%

Intersection Performance - Annual Values			
Performance Measure	Vehicles	Pedestrians	Persons
Demand Flows (Total)	392,084 veh/y	101,053 ped/y	571,554 pers/y
Delay	2,875 veh-h/y	545 ped-h/y	3,995 pers-h/y
Effective Stops	349,577 veh/y	89,122 ped/y	508,614 pers/y
Travel Distance	397,497 veh-km/y	21,163 ped-km/y	498,159 pers-km/y
Travel Time	9,758 veh-h/y	5,067 ped-h/y	16,777 pers-h/y
Cost	538,603 \$/y	139,839 \$/y	678,442 \$/y
Fuel Consumption	95,737 L/y		
Carbon Dioxide	241,251 kg/y		
Hydrocarbons	19 kg/y		
Carbon Monoxide	209 kg/y		