TRAFFIC IMPACT ASSESSMENT

MIXED USE DEVELOPMENT

LOT 1 IN DP 826956
309 KING STREET, NEWCASTLE

PREPARED FOR: THE WESTS GROUP

MAY 2019

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TRAFFIC IMPACT ASSESSMENT
THE WESTS GROUP

MIXED USED DEVELOPMENT – WESTS CITY
LOT 1 IN DP 826956
309 KING STREET NEWCASTLE

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Issue	Date	Description	By
A	18/08/18	Draft	PA
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This document has been authorised by

Date 14th June 2019

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1.0 INTRODUCTION

Intersect Traffic Pty Ltd (Intersect Traffic) has been engaged by The Wests Group to prepare a Traffic Impact Assessment for the development of part of the Wests City Club (NEX). The land subject to this development application includes the western covered and uncovered carparking areas. The development includes two multi-storey buildings with Residential Aged Care Facilities, 'Seniors Living' and Residential Apartments, Medical and Retail tenancies with communal and recreational facilities on part of Lot 1 in DP 826956 - 309 King Street, Newcastle. Under a separate development application, Lot 1 is to be subdivided to allow for the existing NEX Club to remain and operate in a manner independent of the proposed mixed-use development. This will result in quality facilities for residential aged care with 103 rooms, seniors living with 82 apartments, residential living with 166 apartments, related commercial and medical businesses and associated car parking on two basement levels and one ground level on the site.

Vehicular access to the site development is proposed via a new combined entry / exit via King Street approximately 60 metres east of Ravenshaw Street. The existing access to the basement car park will be removed. A separate development application is to be made to provide a new access to the NEX club basement car park and a new 41 space at-grade car park. This will provide for the long-term car parking needs for the NEX club. The proposed development plans are shown in ***Attachment A***.

This report is required to support a development application to Newcastle City Council for the proposal and allow the Council to assess the proposal regarding its impact on the local and state road network. This report presents the findings of the traffic assessment and includes the following:

1. An outline of the existing situation near the site.
2. An assessment of the traffic impacts of the proposed development including the predicted traffic generation and its impact on existing road and intersection capacities.
3. Determines any triggers for the provision of additional infrastructure.
4. Reviews parking, public transport, pedestrian and cycle way requirements for the proposed development, including assessment against Council's DCP and Australian Standard requirements.
5. Presentation of conclusions and recommendations.

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2.0 SITE DESCRIPTION

The development site currently contains the Wests City Club (NEX) covered and uncovered parking station. The site is enclosed by King Street to the north, Bull Street to the south, Ravenshaw Street to the west and the NEX building to the east. It is located within the Newcastle CBD. Its location within the context of surrounding mixed use, commercial use and residential land and buildings is shown in the location plan provided as ***Figure 1***, below. The site of the development is the old Hunter Water Board (HWB) car park which was acquired by the NEX club when the HWB moved its offices to Honeysuckle Drive

Figure 1 – Site Location

The site contains the following property descriptors:

- Formal land title of Lot 1 DP 826956;
- Postal address of - 309 King Street, Newcastle;
- Total site area of approximately 12,968 m^2; with the area of the site on which the proposed mixed-use development, the subject of this development application, being 6,631 m^2, and
- Land zoning of B4 – Mixed Use in accordance with Newcastle LEP (2012).

The development part of the site currently has road frontage to King Street, Bull Street and Ravenshaw Street. It has 4 currently used combined entry / exit vehicular accesses at Bull Street. The site access at King Street currently has the right turn out of the site prevented through a grass infilled concrete median in the centre of the King Street carriageway that divides the two directions of traffic flow in King Street. This directs all exiting traffic at King Street to the King Street / Ravenshaw and King Street / Steel Street intersections west of the site.

Photographs 1 – 4 show some of the existing development on the site and some of the existing vehicular accesses to the site.

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Photograph 1 – Covered carpark and current NEX access at King Street

Photograph 2 – Development site – western wall of NEX Club and its access

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Photograph 3 – Development site and carpark access at Bull Street

Photograph 4 – Existing NEX Club east of development site

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3.0 EXISTING ROAD NETWORK

3.1 King Street

King Street is major urban local collector road in the Newcastle area and is a classified regional road (MR188). It runs east - west connecting the Newcastle East area to the sub-arterial road network (Pacific Highway / Stewart Avenue) and provides connection to the inner suburbs of Hamilton and Cooks Hill. It also provides a connection to the Newcastle beaches and from the beachside suburbs of Bar Beach and Merewether south of Newcastle.

In the vicinity of the site it is a four-lane two-way sealed road with adjacent parking lanes. King Street has a 30-metre-wide carriageway (approx.), with two travel lanes in each direction separated by a grassed / concrete median island of various widths and has concrete kerb and gutter and longitudinal drainage along its edges. Travel lane widths vary between 3.6 and 3.1 metres in width whilst parking lanes are approximately 1.8 metres wide with marked cycleways approximately 1.2 metres wide running in between the parking lane and the travel lane.

On-street parking along King Street and surrounding streets is 'pay for parking' time restricted 2-hour periods between 9am – 5pm Monday to Friday and 9am – 12pm Saturday. A 60 km/h speed limit applies to this section of road. At the time of inspection King Street was observed to be in good condition. ***Photograph 5*** shows the east to west (southern) carriageway of King Street fronting the site.

Photograph 5 – King Street west bound carriageway fronting the site

3.2 Union Street

Union Street is a major local road in the Newcastle area. It also connects the suburbs of Cooks Hill, The Junction and Merewether to the Newcastle CBD. Under a functional hierarchy it is a collector road and therefore is under the care and control of Newcastle City Council. In the vicinity of the site it is a two lane two way sealed urban road with adjacent parking lanes. Union Street has a 12.8-metre-wide carriageway with concrete kerb and gutter and longitudinal drainage along its edge with a travelling lane and parking lane each approximately 3.2 metres wide each in each direction.

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A 60 km/h local area speed limit applies to the section of road between Hunter Street and Bull Street although a variable 40 km/h speed limit 120 metres either side of Bull Street operates during morning and afternoon drop off and pick up periods of school days. On-street parking from Union Street is generally time restricted to 2-hour periods. At the time of inspection Union Street was observed to be in good condition. ***Photograph 4*** shows Union Street in the near the site.

Photograph 6 – Union Street near the site

3.3 Bull Street

Bull Street near the site is an urban local road under the care and control of Newcastle City Council. Under a functional road hierarchy, it would function as a local street with its primary function being to provide vehicular access to adjoining commercial and residential properties. Near the site it is a two-lane two-way sealed road with a carriageway width of 12.5 metres. 1 hr parking limits mainly apply in the street during business hours. East of Union Street a 40 km/h LATM speed limit applies while to the west of Union Street a 60 km/h speed limit applies except during morning and afternoon drop off and pick up periods of school days when the 40 km/h variable speed zone applies. At the time of inspection Bull Street was observed to be in good condition (***Photograph 7***).

Photograph 7 – Bull Street near the site

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3.4 Ravenshaw Street

Ravenshaw Street near the site is an urban local road under the care and control of Newcastle City Council. Under a functional road hierarchy, it would function as a local road with its primary function being access to properties between King Street and Parry Street. In the vicinity of the site it is a two-lane two-way sealed road with a carriageway width of 12.5 metres with restricted parking on both sides of the road.

A 50 km/h speed limit applies to this section of road and at the time of inspection Ravenshaw Street was observed to be in good condition. ***Photograph 8*** shows Ravenshaw Street at the Bull Street intersection looking north towards King Street.

Photograph 8 – Ravenshaw Street near the site

4.0 ROAD NETWORK IMPROVEMENTS

There have been recent road upgrades in the vicinity of the site that will improve the capacity of the local road network in the near future. These were identified by GHD in their 2015 report 'Newcastle Light Rail Technical Paper 1 - Traffic, transport and access assessment' and have been constructed as part of the light rail construction and include:

- Provide new two-lane two-way road connection of Steel Street between Hunter Street and Honeysuckle Drive,
- Upgrading of Stewart Avenue / King Street / Parry Street signalised intersection; and
- 'No Stopping' zones in the peak directions on King Street between Darby Street and Union Street eastbound in the AM peak period and westbound in the PM peak period.

These works are now completed, and the light rail has been operating since February 2019.

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5.0 TRAFFIC VOLUMES

Intersect Traffic engaged Northern Transport Planning and Engineering (NTPE) to carry out manual traffic counts at the King Street / Union Street signalised 4-way cross intersection and the Union Street / Bull Street stop sign controlled 4-way cross intersection which were undertaken on 15th March 2018. The counts revealed that the AM and PM peak hour traffic occurred between 8:00 am and 9:00 am and 4:45 pm to 5:45 pm, respectively.

The mid-block traffic volumes calculated from these traffic counts have been utilised to represent current 2019 volumes. The predicted 2029 volumes have been calculated using an annual background growth rate factor of 1.5% per annum for all roads and are as shown in ***Table 1*** below. The tally sheets for the manual traffic counts carried out by NTPE are provided within ***Attachment B***.

Table 1 – Mid-block 2019 and 2029 traffic volumes

Road	Section	2019 AM peak vtph	2019 PM peak vtph	2029 AM peak vtph	2029 PM peak vtph
King Street	West of King Street	1557	1869	1807	2169
King Street	East of King Street	1467	1732	1703	2010
Union Street	North of King Street	560	630	650	731
Union Street	South of King Street	702	847	815	983
Union Street	North of Bull Street	818	960	949	1114
Union Street	South of Bull Street	736	888	854	1031
Bull Street	West of Union Street	215	240	250	279
Bull Street	East of Union Street	313	420	363	487

Ravenshaw Street traffic volumes were not counted for this assessment however they are low and based on site observations during peak times are estimated to be similar to traffic volumes in Bull Street.

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6.0 ROAD CAPACITY

The capacity of the road network is generally determined by the capacity of intersections. However, the *RTA's Guide to Traffic Generating Developments* provides some guidance on mid-block capacities and likely levels of service. For urban roads *Tables 4.3 and 4.4* of the *RTA's Guide to Traffic Generating Developments*, reproduced below, provides some guidance on mid-block capacities and likely levels of service.

Table 4.3
Typical mid-block capacities for urban roads with interrupted flow

Type of Road	One-Way Mid-block Lane Capacity (pcu/hr)	
Median or inner lane:	Divided Road	1,000
	Undivided Road	900
Outer or kerb lane:	With Adjacent Parking Lane	900
	Clearway Conditions	900
	Occasional Parked Cars	600
4 lane undivided:	Occasional Parked Cars	1,500
	Clearway Conditions	1,800
4 lane divided:	Clearway Conditions	1,900

Table 4.4
Urban road peak hour flows per direction

Level of Service	One Lane (veh/hr)	Two Lanes (veh/hr)
A	200	900
B	380	1400
C	600	1800
D	900	2200
E	1400	2800

Source: - RTA's Guide to Traffic Generating Developments (2002).

Based on Table 4.3 it is noted that King Street being a divided road with two lanes per direction of travel and a parking lane is likely to have a one-way mid-block capacity of 1,900 vtph therefore would have a two-way mid-block capacity of 3,800 vtph.

Similarly, Union Street, Bull Street and Ravenshaw Street near the site, as two-way two-lane undivided urban roads with parking lanes would each have a one-way mid-block road capacity of 900 vtph or a two-way mid-block capacity of 1,800 vtph.

Therefore, two-way mid-block road capacities of 3,800 vtph for King Street and 1,800 vtph for Union Street, Bull Street and Ravenshaw Street have been adopted for this assessment.

From the traffic data collected in ***Section 5*** and noting the likely technical road capacities of King Street, Union Street, Bull Street and Ravenshaw Street are in excess of the existing traffic volumes it is considered that King Street, Union Street, Bull Street and Ravenshaw Street adjacent to the development site are operating within their technical capacities and have scope to cater for additional traffic generated by the new development.

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7.0 ALTERNATE TRANSPORT MODES

Newcastle Transport runs public transport (bus) services providing access close to the site. A review of the route maps and timetables for the service indicates that the site is well serviced by public transport with bus services along King Street, Hunter Street, Steel Street and Union Street near the site as shown in the bus route extract in ***Figure 2*** below. Bus routes 11 (Charlestown to Newcastle via Jesmond) and 13 (Glendale to Newcastle via Cardiff and John Hunter Hospital) run near the site along Hunter, Union and King Street. The site is also serviced by the Newcastle Light Rail with the Honeysuckle stop within convenient walking distance of the site.

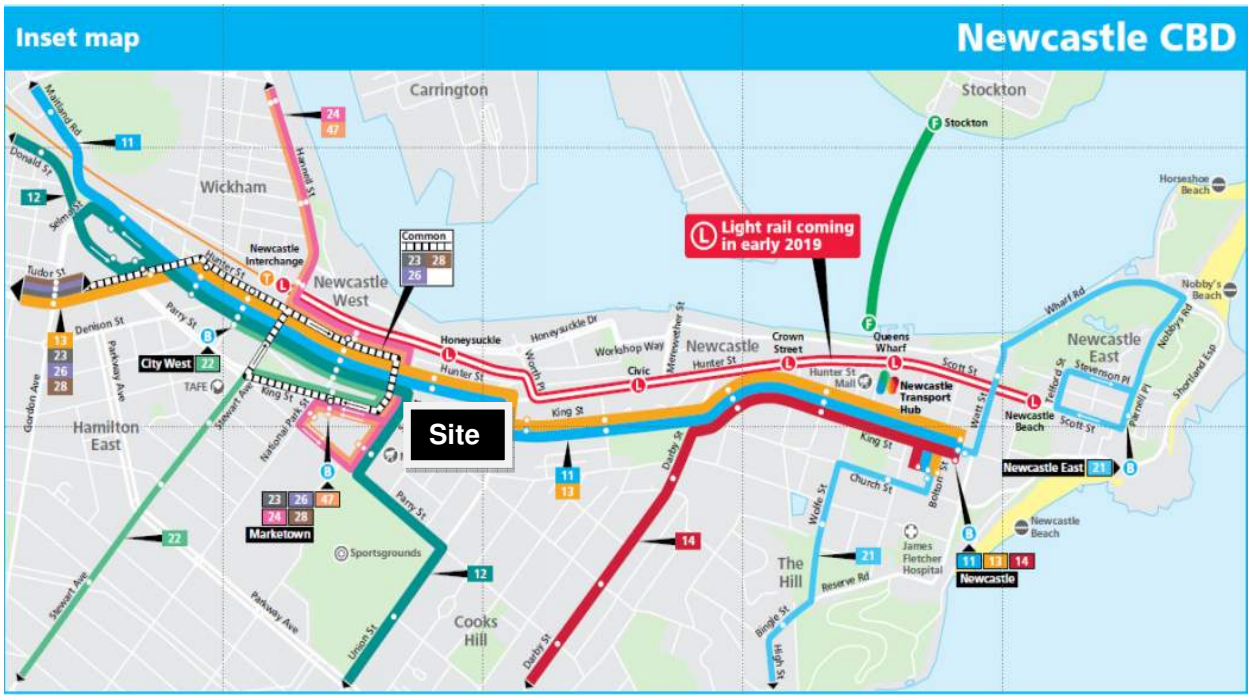

Figure 2 – Bus routes

The nearest bus stops are within convenient walking distance of the site and are approximately 270 metres east on King Street and 200 metres north in Hunter Street. The bus shelter and bus stop fronting the site is not currently utilised.

The bus service is convenient for use by future residents of the seniors living and residential development and visitors / staff to the aged care facility. The services connect to the bus interchanges at Newcastle, Charlestown, Jesmond, Wallsend and others providing connection to other bus services to Newcastle, Lake Macquarie, Port Stephens and Maitland suburbs, the Newcastle airport and railway stations including connection to local railway stations on the Hunter line and to adjoining regions.

The heavy rail line into Newcastle has been terminated and a transport interchange facility has been recently constructed at Hannell Street Wickham. A light rail line is running along the heavy rail corridor and Hunter Street connecting Wickham to the Newcastle CBD area and Nobby's Beach. The light rail also connects to the Stockton Ferry wharf providing residents and visitors the opportunity to park in the public car parking areas in Stockton and utilise the ferry to access the development site.

A full width (3.7 metres) paving brick, asphalt or concrete pedestrian footpath network exists on both sides of the road along the entire length of King Street, Union, Bull Street and Ravenshaw Street adjacent to the site providing pedestrian access to bus stops and adjacent on-street parking

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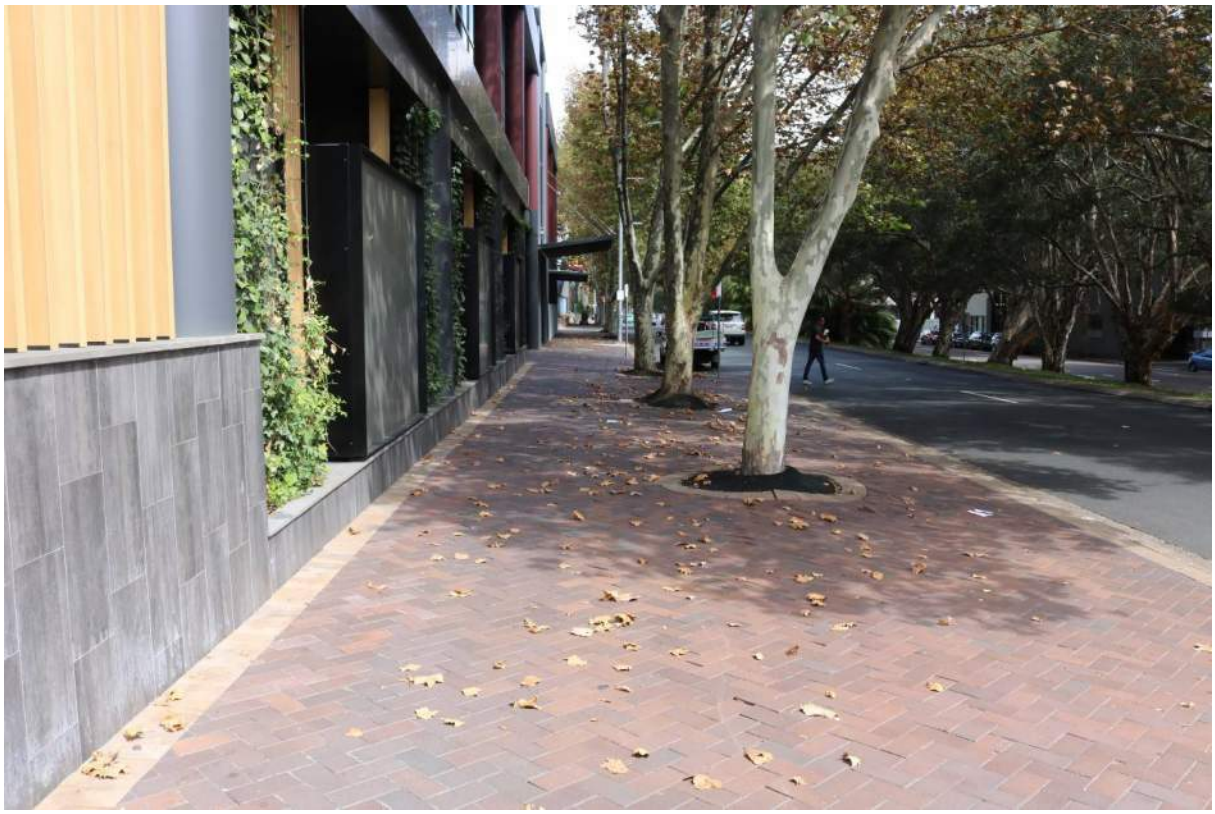
areas. ***Photograph 9*** shows the paving brick pedestrian footpath adjacent to the development fronting the NEX Club.



Photograph 9 – Footpath at NEX building frontage in King Street

Pedestrian crossing facilities on King Street are provided at the signalised intersection at King Street and Union Street approximately 130 metres to the east of the site and the signalised intersection at King Street and Steel Street approximately 270 metres to the west of the site and a pedestrian refuge exists at the intersection of King Street and Ravenshaw Street at the western end of the site and two pedestrian crossings exist at the intersection of Union and Laman Street. Devonshire Street laneway provides direct access for the development site between King Street and Hunter Street to bus and future light rail services. ***Photographs 10 - 13*** show some of the pedestrian facilities adjoining the development site.

As stated in ***Section 3.0***, on-road cycleways approximately 1.2 metres wide, exist adjoining the near lane and parking lane on both sides of King Street east and west of Union Street. 300 metres to the northwest of the development site, via Steel Street across Hunter Street, an off-road shared cycle / pedestrian path runs along the foreshore area running west to Throsby Creek and the Hunter River and the Newcastle beaches to the east. This major cycle / pedestrian pathway connects many cycleways throughout the Newcastle cycleway network.

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Photograph 10 – Signalised Pedestrian Crossings King Street / Union Street intersection

Photograph 11 – Devonshire Street access to Hunter Street opposite development

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Photograph 12 – Pedestrian refuge at west end of development

Photograph 13 – Pedestrian crossings - Union / Laman Street intersection

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8.0 DEVELOPMENT PROPOSAL

The development proposal involves the development of the City Wests Club (NEX) above ground western carpark to include two multi-storey buildings with carparking at basement and ground levels. The proposal includes medical and commercial tenancies, residential aged car facilities as well as seniors' living apartments and residential apartments over 13 levels on part of Lot 1 in DP 826956 - 309 King Street, Newcastle. The development plans are provided within ***Attachment A.*** Specifically, the development will include the following works:

- Demolition of the existing open and covered carpark on the development site;
- Construction of two 14 storey above ground buildings and roof top facilities containing as follows;
- A new aged care administration room (134 m^2), lobby (165 m^2) and kitchen (215 m^2), a lobby / café 133 m^2), a restaurant (148 m^2), a salon (39 m^2 GFA), a medical centre (242 m^2) containing 6 consulting rooms with tables, 1 examination / treatment room with 2 tables, administration and reception areas, a waiting area as well as a laundry, amenities and staff facilities at ground level;
- A new 103 room residential aged care facility with 92 one-bedroom rooms and 11 two-bedroom rooms (Levels 1 – 4 – Building 2);
- Construction of 82 new seniors living residential apartments comprising 48 - three bedroom and 34 – two bedroom units over levels 5 – 13 of Building 2;
- Construction of 166 new residential apartments comprising 27 - three bedroom, 70 – two or two+ bedroom, and 69 – studio or one-bedroom units over levels 1 – 13 within Building 1;
- Construction of 286 covered carparking spaces including 11 accessible car parking spaces and 17 motorcycle parks over basement 1, basement 2 and ground levels;
- Construction of new internal roadways and driveways;
- Removal of 1 vehicular access at King Street and 1 unused and 3 used vehicular accesses at Bull Street at the development site;
- Bike Storage room at ground level with capacity for 168 bicycles (189 m^2 GFA);
- Provision of two short term drop-off zones on King Street including one to be used for waste collection and two short term drop off zones in Bull Street near the building entry points;
- Construction of a new left-in left-out entry / exit vehicular access at King Street; and
- Provision of associated site drainage structures and landscaping.

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9.0 TRAFFIC GENERATION

The NSW RMS' *Guide to Traffic Generating Development's* Version 2.2 October 2002 provides specific advice on the traffic generation potential of various land uses. It is noted that due to the location of the site within the Newcastle City Centre area and excellent access to alternate transport facilities a cross-use and passing traffic concession of 50 % is considered reasonable for all the commercial and medical tenancies.

In regard to medical centres the extended hours medical centres are considered the most appropriate land-use with available data the following advice is provided:

Extended Hours Medical Centre

AM Weekday peak hour vehicle trips = 10.4 vehicles per 100m² GFA
PM Weekday peak hour vehicle trips = 8.8 vehicles per 100m² GFA

The following daily weekday and peak hour traffic generation can be estimated for the medical centre part of development as follows:

AM Weekday peak hour	= 10.4 / 100 x 242 x 0.5	= 12.6 vtph.
PM Weekday peak hour	= 8.8 / 100 x 242 x 0.5	= 10.6 vtph

Based on these figures, daily vehicle trips of 126 vtpd have been assumed in this assessment.

Café / Restaurants / Commercial (worst case scenario)

Weekday daily vehicle trips = 60 per 100 m² GFA
Weekday peak hour vehicle trips = 5 per 100 m² GFA

Daily vehicle trips	= 60 / 100 x (281) x 0.5 = 84 vtpd.
Weekday AM & PM peak hour	= 5 / 100 x (281) x 0.5 = 7.1 vtph

However, residential aged care, seniors living and residential flat buildings, the RMS issued a Technical Direction TDT 2013/04 in May 2013 that provided updated traffic generation rates for these commercial and residential categories. The relevant land use traffic generation rates applying to these in this assessment and the calculated daily weekday and peak hour generation traffic for the various components part of development are as follows:

Aged Care (Housing for Aged)

Weekday daily vehicle trips = 1 - 2 per dwelling
Weekday peak hour vehicle trips = 0.1 to 0.2 per dwelling
(Note that morning site peak hour does not generally coincide with the network peak hour)

Daily vehicle trips	= 1 x 103	= 103 vtpd.
Weekday AM & PM peak hour	= 0.1 x 103	= 10.3 vtph.

Seniors Housing

Weekday daily vehicle trips = 2.1 per dwelling
Weekday peak hour vehicle trips = 0.4 per dwelling
(Note that morning site peak hour does not generally coincide with the network peak hour)

Daily vehicle trips	= 2.1 x 82	= 172.2 vtpd.
Weekday AM & PM peak hour	= 0.4 x 82	= 32.8 vtph.

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Residential Flat Buildings

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

The rates for the residential flats are calculated using the above Table's Regional Average trips per bedroom, i.e. 0.21 AM and 0.15 PM peak hours and 1.93 daily per based on the site being within the Newcastle City Centre area with excellent access to existing and future public transport.

Therefore, the following daily weekday and peak hour traffic generation can be estimated (rounded up) for the proposed development mixed use development as follows:

Daily vehicle trips = (69 x 1 + 70 x 2 + 27 x 3) x 1.93
= 290 x 1.93 = 559.7 vtpd
Weekday AM peak hour = 290 x 0.21 = 60.9 vtph
Weekday PM peak hour = 290 x 0.15 = 43.5 vtph

Therefore, the total weekday daily and peak hour, AM and PM, traffic generated from the entire new development (rounded up) is:

Daily vehicle trips = 126 + 84 + 103 +172.2 + 559.7
= 1,045 vtpd.

Weekday AM peak hour = 12.6 + 7.1 + 10.3 + 32.8 + 60.9
= 124 vtph.

Weekday PM peak hour = 10.6 + 7.1 + 10.3 + 32.8 + 43.5
= 105 vtph.

The total traffic generated from the development used in this assessment is therefore **1,045 vtpd, 124 vtph AM and 105 vtph PM**.

10.0 TRIP DISTRIBUTION

Before carrying out any traffic assessment the additional peak hour traffic generated by the development needs to be distributed through the adjoining road network. This involves making assumptions as to distribution patterns to and from the development. In distributing the peak hour traffic through the adjacent road network, the following assumptions have been made for this site.

- 100% of the new development traffic will access via left turn in left turn out at the new King Street vehicular access to the site;
- In the AM and PM trips exiting will be split 70% west past Ravenshaw Street on King Street and 30% south on Ravenshaw Street;

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- In the AM and PM, the 30% of trips exiting via Ravenshaw Street will be split 20% south past Bull Street and 10% east on Bull Street and then north on Union Street;
- In the AM and PM, the 10% of trips exiting the site on Union Street will be split 5% on Union Street north of King Street and 5% on King Street east of Union Street;
- In the AM and PM trips entering the site will have origins 60% Union Street south, 35% Union Street north and 5% King Street east;

There may be other traffic movements that have not been considered above which will be very small, however their impact on the network will be insignificant. These assumptions will result in the trip distributions shown in ***Figure 3*** for the relevant traffic movements.

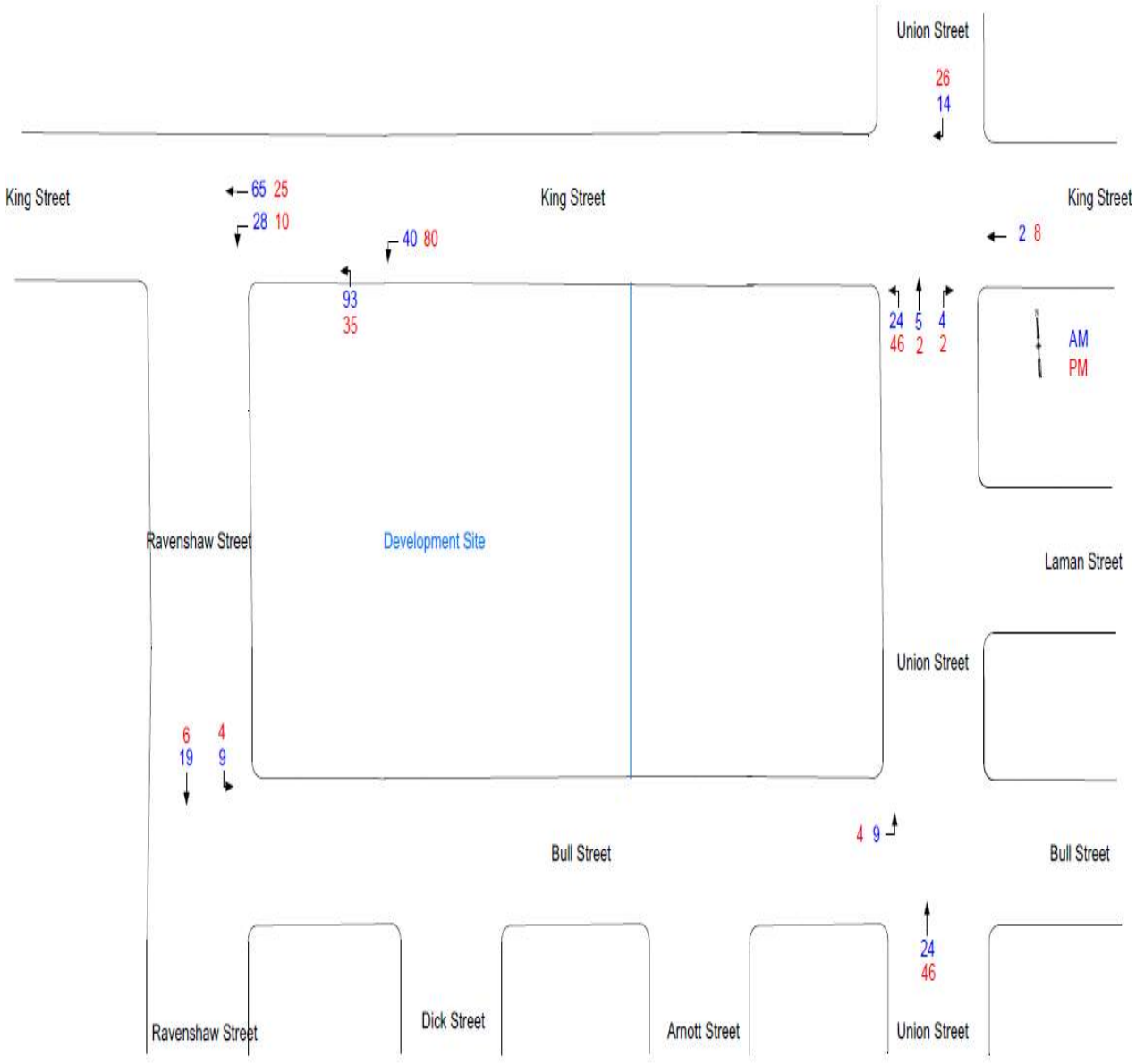

Figure 3 – Development Trip Distribution

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11.0 TRAFFIC IMPACTS OF DEVELOPMENT

11.1 Road Network Capacity

It has previously been shown in ***Section 6*** of this report that the local and state road network is currently operating within its technical mid-block capacity. The proposed development of the site is likely to generate the following maximum additional traffic on the local road network based on the trip distributions shown in ***Figure 3***:

- King Street – 93 vtph in the AM and 80 vtph in the PM peak,
- Union Street – 33 vtph in the AM peak and 50 in the PM peak,
- Bull Street – 9 vtph in the AM peak and 4 vtph in the PM peak, and
- Ravenshaw Street – 28 vtph in the AM peak and 10 in the PM peak.

The addition of this traffic onto the existing traffic volumes determined in ***Section 5*** will not result in the capacity thresholds for King Street, Union Street, Bull Street and Ravenshaw Street determined in ***Section 6*** to be reached. Even with 1.5% per annum background traffic growth over a ten-year period these road capacity thresholds are not reached. This is demonstrated in ***Table 1*** below. It is noted that by 2029 average daily traffic volumes in King Street are likely to be in the order of 20,000 vtpd or just above based on the assumption that peak hour traffic volumes are 10 % of average daily traffic volumes.

Table 2 - Road Capacity Assessment

Road	Section	Capacity vtph	2019 AM peak vtph	2019 PM peak vtph	2029 AM peak vtph	2029 PM peak vtph	Development	
							AM	PM
King Street	West of Union Street	3800	1650	1949	1900	2249	93	80
King Street	East of Union Street	3800	1473	1742	1709	2020	6	10
Union Street	North of King Street	1800	579	658	669	759	19	28
Union Street	South of King Street	1800	735	897	848	1033	33	50
Union Street	North of Bull Street	1800	851	1010	982	1164	33	50
Union Street	South of Bull Street	1800	760	934	878	1077	24	46
Bull Street	West of Union Street	1800	224	244	259	283	9	4
Bull Street	East of Union Street	1800	313	420	363	487	0	0

Therefore, it can be concluded that the local and state road network subject to suitable intersection controls being in place has spare capacity to cater for the proposed development.

11.2 Intersection Capacity

In assessing intersection performance, the main intersections to be impacted by the development will be the King Street / Union Street Signalised 4 Way Cross intersection and the Union Street / Bull Street 4 Way Cross intersection. For this assessment it needs to be determined whether the intersections as currently constructed can cater for the additional traffic generated by this development or whether any upgrading works are necessary.

The impacts of the development are best assessed using the SIDRA INTERSECTION modelling software. This software package predicts likely delays, queue lengths and thus levels of service

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that will occur at intersections. Assessment is then based on the level of service requirements of the RMS shown below in Table 4.2 below. Assumptions made in this modelling were:

- The intersection layouts will remain as per current conditions.
- Traffic volumes used in the modelling were as collected by NTPE in 2018.
- A peak flow period of 60 minutes has been utilised as the traffic volumes are very consistent over the four 15-minute intervals.
- Traffic generated by the development is distributed as per ***Figure 3.***
- Future traffic growth predicted using a 1.5% per annum background traffic growth rate.

Table 4.2
Level of service criteria for intersections

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way & Stop Signs
A	< 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

Source: - RTA's Guide to Traffic Generating Developments (2002).

The summarised 'all vehicles' results of the modelling of the intersections are provided in ***Tables 3 & 4*** below. For the signalised intersection the average LoS is provided in the summary whilst for the non-signalised intersections the worst movement LoS is provided. The Sidra Movement Summary Tables for each of the modelled intersection scenarios are provided in ***Attachment C***.

Table 3 – King Street / Union Street Signalised T-intersection – Sidra Results Summary

Modelled Peak	Degree of Saturation (v/c)	Average Delay (s)	Average Level of Service	95% back of queue length (cars)
2019AM	0.845	37	C	13.3
2019 PM	0.913	40.0	C	18.7
2019 AM with development	0.845	37.3	C	13.5
2019 PM with development	0.925	42.3	C	19.3
2029AM	0.912	37.8	C	15.4
2029 PM	0.912	49.6	D	28.1
2029 AM with development	0.895	42.3	C	18.3
2029PM with development	0.911	57.1	E	35.0

The modelling and the summarised results in ***Table 3*** above show that the King Street / Union Street Signalised T-intersection currently operates satisfactorily during both the AM and PM peak periods and would continue to do so post development in 2019 and with 10 years traffic growth to 2029 with and without development. Average delays, LoS and 95% back of queue lengths all remain at acceptable levels based on the RMS assessment criteria listed above. The impact of the development on the intersection performance is however negligible and the additional delays for right turning traffic would not be sufficient to require an upgrade of the intersection.

Table 4 – Union Street / Bull Street Stop Sign Cross Intersection – Sidra Results Summary

Modelled Peak	Degree of Saturation (v/c)	Average Delay (s)	Worst Leg Level of Service	95% back of queue length (cars)
2019AM	0.293	5.1	B	1.1
2019 PM	0.484	6.4	C	2.0
2019 AM with development	0.310	5.2	B	1.2
2019 PM with development	0.529	6.7	D	2.3
2029 AM	0.430	6.0	B	1.7
2029 PM	0.827	10.4	F	4.3
2029 AM with development	0.460	6.2	B	1.8
2029 PM with development	0.954	14.5	F	7.0

The modelling shows that the Union Street / Bull Street stop sign controlled four-way cross-intersection currently operates satisfactorily during both the AM and PM peak periods and would continue to do so post development in 2019 with and without development and with 10 years traffic growth to 2029 in all cases as shown in ***Table 4*** above. Average delays, worst LoS and 95% back of queue lengths all remain at acceptable levels based on the RMS assessment criteria listed above. Some delays particularly to right turning traffic do occur and Council have raised this as an issue in pre-DA consultation. With Council advising it is an existing problem it is the responsibility of the road authority to undertake suitable traffic management measures to resolve any issues. Also, it is considered there is no nexus for this development to contribute to these measures as it will generate little if any right turning traffic at the Union Street / Bull Street intersection. A suitable upgrade would be to prohibit the right turn movement out of Bull Street and divert this traffic to Parry Street so it could utilise the roundabout at Union Street to head south along Union Street in a safe and convenient manner.

The additional traffic at other intersections north, south, east and west of the development is not expected to have significant impact as the traffic will be distribute out over a large number of intersections. Access to the site via King Street will need to be designed for the 2029 worst case of 1227 vtph west bound plus and 80 left turn in and 35 left turn out but as the access is left in left out this will not generate queueing implications on King Street.

It can be concluded therefore that the proposed new development vehicular access at King Street will operate with uninterrupted flow conditions and as such can be constructed as a normal private property urban access subject to Australian Standards *AS2890.1-2004 Parking facilities – Part 1 - Off-street car parking* requirements described below.

11.3 Access

Access to the site via King Street will need to be designed for the 2029 worst case of 1227 vtph west bound and 80 left turn in and 35 left turn out but as the access is left in left out this will not generate queueing implications on King Street with the security gate within the car park set well back from King Street providing at least 4 queueing queuing spaces.

In assessing the site accesses compliance with Australian Standard *AS2890.1-2004 Parking facilities – Part 1 - Off-street car parking* the following is noted for the existing and proposed accesses.

- Vehicular sight distance from the proposed accesses has been observed to be suitable to meet the requirements as shown in *Figure 3.2* of the Standard, i.e. minimum 65 metres for a 60 km/h speed zone;
- Pedestrian sight lines as required in *Figure 3.2* of the Standard is achieved with the construction of driveways via the appropriate design of landscaping and fencing around the access;

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- The new access at King Street will support 286 car spaces of Class 1A parking (residential, domestic and employee). *Table 3.1* of the Standard thus requires a minimum Class 2 access facility to be constructed for Class 1A parking. *Table 3.2* of the Standard then designates a Class 2 access facility as a combined entry and exit 6.0 metres to 9.0 metres wide or if separated each is to be a minimum 3.0 metres wide.
- As a minimum 6-metre-wide driveway is proposed for the combined entry / exit driveway at King Street the proposal complies with the standard.
- The proposal removes two existing accesses to Bull Street resulting in improved on-street parking availability for the public use.

The proposed internal circulation aisles need to comply with the requirements of Australian Standard *AS2890.1-2004 Parking facilities – Part 1 - Off-street car parking* which requires the minimum width of the internal two-way aisles to be 5.5 metres. The access design and internal road dimensions have not been provided on the plans however scale to comply with this requirement. This will need to be confirmed at CC stage.

It is concluded that the proposed access arrangements provide a safe and suitable site access to all components of the development and would comply with Newcastle City Council and Australian Standard *AS2890.1-2004 Parking facilities – Part 1 - Off-street car parking* requirements.

11.4 Off-Street Parking

On-site parking and manoeuvrability should comply with Australian Standard *AS2890.1-2004 Parking facilities – Off-street car parking* and *State Environmental Planning Policy (SEPP) (Housing for Seniors and People with a Disability) 2004*. The SEPP states the following in Part 7 Development Standards that cannot be used as grounds to refuse a consent within Division 4 Self-contained units (Clause 50):

(h) Parking: if at least the following is provided:

(i) 0.5 car spaces for each bedroom where the development application is made by a person other than a social housing provider, or

(ii) 1 car space for each 5 dwellings where the development application is made by, or is made by a person jointly with, a social housing provider.

and the SEPP also states the following in Part 7 Development Standards that cannot be used as grounds to refuse a consent within Division 2 Residential Care Facilities (Clause 48 (d) that:

(d) **parking for residents and visitors:** if at least the following is provided:

(i) 1 parking space for each 10 beds in the residential care facility (or 1 parking space for each 15 beds if the facility provides care only for persons with dementia), and

(ii) 1 parking space for each 2 persons to be employed in connection with the development and on duty at any one time, and

(iii) 1 parking space suitable for an ambulance.

Note. The provisions of this clause do not impose any limitations on the grounds on which a consent authority may grant development consent.

Source: - SEPP (Housing for seniors or people with a disability) 2004.

The proposal is to provide 212 bedrooms within the seniors living apartments on the site and, as the development is proposed by a private entity and not a social housing provider, the seniors living component would need to provide a total of 106 on-site car parks. The proposal also provides a 114-bed aged care facility with 10 staff requiring the provision of a total of 17 car parking spaces and one ambulance space.

For the commercial and medical components of the development on-site parking and manoeuvrability should comply with Australian Standard *AS2890.1-2004 Parking facilities – Part 1 - Off-street car parking* and Newcastle City Council's DCP (2012).

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The car parking provision rates from the DCP for the City Centre area applicable for the development for non-residential uses i.e. café (133 m^2), restaurant (148 m^2), medical centre (242 m^2) and salon (39 m^2 GFA) is 1 space 60 m^2 GFA which equates to (562 / 60) = 10 car spaces.

For the residential premises pursuant to Clause 30(1)(a) of SEPP 65, the consent authority must not refuse consent based on car parking provision, if proposed provision will be equal to or greater than the recommended amount specified in Part 3J of the Apartment Design Guide (ADG). The ADG provides the following relevant advice in relation to car parking supply "*On land zoned, and sites within 400m of land zoned B3 Commercial Core, B4 Mixed Use or equivalent in a nominated regional centre; the minimum car parking requirement for residents and visitors is set out in the Guide to Traffic Generating Developments (GTTGD), or the car parking requirement prescribed by the relevant Council, whichever is less".* Therefore, the relevant car parking rate for the residential component of the development is those in accordance with the RTA Guide, which provides the lesser car parking requirements for Metropolitan Regional (CBD) areas of:

- *0.4 spaces per 1-bedroom unit;*
- *0.7 spaces per 2-bedroom unit;*
- *1.2 spaces per 3-bedroom unit;*
- *1 space per 7 units (visitor parking).*

The residential component of the development is therefore only required to provide 134 car spaces including 24 visitor car parks under SEPP 65 and the total development is required to provide a total of 267 spaces plus 1 ambulance bay to meet the requirements of SEPP 65, Newcastle DCP 2012 and SEPP *(Housing for Seniors and People with a Disability) 2004*. The provision of 286 car spaces within the development is therefore concluded to be sufficient on-site car parking to meet the statutory requirements of the development.

Other parking provisions include noting bicycle and motorcycle parking is not required for the seniors living and aged care facilities in the development:

- Bicycle parking for retail (shops) - 1 space per 200 m^2 GFA - split 50 / 50 Class 2 & Class 3;
- Bicycle parking for commercial (office) - 1 space per 200 m^2 GFA (Class 2);
- Bicycle parking for residential dwelling – 1 space per dwelling unless provided elsewhere, and
- Motorcycle parking - 1 space per 20 car parks.

Bicycle Storage Retail	= 281 / 200
	= **2** bicycle spaces (1 Class 2 staff / 1 Class 3 visitors)
Bicycle Storage Office	= 134 / 200
	= **1** bicycle space (Class 2 staff)
Bicycle Storage Residential	= 166
	= **166** bicycle spaces (Storage)
Motorbike spaces	= 267 / 20
	= **14** motorcycle spaces

Noting it is not realistic to expect all residential apartments to have a bicycle particularly when bicycle hire hubs are provided in the CBD the provision of a bicycle storage room with 168 bicycle capacity and 17 motorcycle spaces within the development is considered suitable and compliant with the objectives of the DCP.

Australian Standards *AS 2890.1 2004* requires the following for 90° angle parking as a minimum:

- Class 1A facility - 2.4m wide x 5.4m long bays with a 5.8m aisle width, and
- All classes with 1.0 metre blind aisle extensions.

Whilst the current concept plan is not suitably detailed with dimensions there appears to be sufficient compliant parking spaces and manoeuvring areas could comply with the requirements of both Australian Standard *AS2890.1-2004 Parking facilities – Off-street car parking* and *State Environmental Planning Policy (SEPP) (Housing for Seniors and People with a Disability) 2004*.

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Therefore, it is concluded that the provision of the proposed car parking would comply with the requirements for the development specified by the Australian Standard *AS2890.1-2004 Parking facilities – Off-street car parking*, the State Environmental Planning Policy *(SEPP) (Housing for Seniors and People with a Disability) 2004 Part 7 Development Standards* and *Section 7.03 Traffic, Parking and Access* of Newcastle City Council DCP 2012, subject to verification of the car parking layout dimensions at Construction Certificate stage.

11.5 Servicing

The key servicing for the development will be regular weekly waste collection. This will be undertaken by a private contractor using a suitably sized SRV (6.4 m) collection vehicle requiring only 2 metres clearance (*source – SUEZ*) that will enter the site and collect waste from bins within the site within the loading / servicing area at ground level. Normal waste and recyclables will be collected separately. Whilst the concept plan at this stage is not detailed enough to provide swept turning paths there is sufficient room on site for this servicing to occur and swept turning paths can be provided at Construction Certificate stage. Servicing of the new development would be undertaken from the proposed loading / service bay area within the site and the proposed set down area / ambulance area for the aged care facility. Overall it is concluded that the proposed servicing arrangements of the site are suitable with all servicing undertaken on site with forward entry and exit from the site.

12.0 PEDESTRIAN & CYCLE FACILITIES

It is considered that the external pedestrian and bicycle traffic generated by the development would not be significant enough as to provide a nexus for the provision of additional external pedestrian and bicycle paths (on or off road) to the site and the existing infrastructure is considered satisfactory for the scale of development proposed noting a significant amount of pedestrian traffic will be contained to within the site. Suitable internal pedestrian linkages exist on the site and these will be extended to service both the residential care facility and the independent living units proposed on the site.

13.0 PUBLIC TRANSPORT FACILITIES

Hunter Street and Union Street near the site is currently serviced by public transport (bus) services provided by Newcastle Transport (Keolis Downer) providing suitable access to all necessary services, facilities and locations near the site. Therefore, suitable public transport services already exist near the site and no additional services or infrastructure is required.

The proposed development may generate additional public transport usage and under *State Environmental Planning Policy (SEPP) (Housing for Seniors and People with a Disability) 2004* the site residents must have access to a bus with a minimum capacity of 10 persons. The above bus services that run near the site is frequent, very convenient to the site, has a bus shelter and therefore provides a satisfactory public transport service to the development thereby satisfying the requirements of the SEPP.

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14.0 CONCLUSIONS

This traffic impact assessment for a proposed Seniors Living, Residential Aged Care facility, residential and commercial development on part of Lot 1 in DP 826956 - 309 King Street, Newcastle which is to provide 82 Seniors Living apartments, 103 room Residential Aged Care facility, 166 residential apartments and commercial tenancies within 2 buildings has concluded:

- Existing traffic volumes on the local road network are within the technical capacity standards determined by Austroads and the NSW Roads and Maritime Services (RMS).
- The local road network is currently operating satisfactorily with good levels of service and acceptable delay for motorists and has capacity to cater for additional traffic associated with new development in the area.
- The proposed development is likely to generate up to an additional 124 vehicle trips per hour during the AM peak and 105 vehicle trips per hour in the PM peak traffic periods.
- The local road network will cater for the development traffic generated by this development in 2019 through to 2029 without adversely impacting on current levels of service experienced by motorists on the road.
- Sidra modelling of the King Street / Union Street Signalised four-way cross intersection shows that it currently operates satisfactorily during both the AM and PM peak periods and would continue to do so post development and with 10 years traffic growth. Average delays, LoS and 95 % back of queue lengths all remain at acceptable levels based on the RMS assessment criteria.
- Sidra modelling of the Union Street / Bull Street stop sign controlled four-way cross intersection has shown that it currently operates satisfactorily during both the AM and PM peak periods and would continue to do so post development and with 10 years traffic growth to 2029 without and with development models. It is understood Council's concerns with this intersection are generally associated with right turning and straight through movements from Bull Street. As this development will not generate any additional such movements no nexus exists for this development to contribute to any works proposed by Council at the intersection.
- The site access at King Street will operate with uninterrupted flow conditions as a left in and left out access to King Street mirroring the existing access to the site.
- The proposed site access would comply with Newcastle City Council and Australian Standard *AS2890.1-2004 Parking facilities – Part 1 - Off-street car parking* thereby providing safe and suitable vehicular access to the site.
- The proposed development can provide sufficient and suitable on-site car parking to meet the requirements of both Australian Standard *AS2890.1-2004 Parking facilities – Off-street car parking*, *SEPP Housing for Seniors and People with a Disability 2004 - Part 7 Development Standards - Division 4 Self Contained Units* and *Division 2 Residential Care Facilities, SEPP 65 and Newcastle DCP (2012).* Compliance of the car parking with Australian Standard *AS2890.1-2004 Parking facilities – Off-street car parking* will need to be confirmed at Construction Certificate stage.
- The site can be suitably serviced for waste collection via a private contractor. It is proposed to collect waste on-site within the proposed loading area using a special SRV (6.4m) collection vehicle requiring only 2 metres clearance (*source: - SUEZ*).
- The proposed development will not generate significant enough external pedestrian and cycle traffic to require additional external facilities particularly as the majority of pedestrian movements will be contained within the site.

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- The existing public bus service that services the site is frequent, very convenient to the site, and provides a satisfactory public transport service to the development thereby satisfying the public transport requirements of the SEPP.

15.0 RECOMMENDATION

Having carried out this traffic and parking assessment for a proposed Seniors Living, Residential Aged Care facility, residential and commercial development on part of Lot 1 in DP 826956 - 309 King Street, Newcastle it is recommended that the proposal can be supported from a traffic impact perspective as it will not adversely impact on the local and state road network and can comply with all relevant Newcastle City Council, Austroads, *State Environmental Planning Policy (SEPP) Housing for Seniors and People with a Disability 2004 Part 7 Development Standards - Division 4 Self Contained Units* and *Division 2 Residential Care Facilities, SEPP 65* and NSW Roads and Maritime Services (RMS) traffic and parking related requirements.

JR Garry BE (Civil), Masters of Traffic
Director
Intersect Traffic Pty Ltd

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ATTACHMENT A
Development Plans

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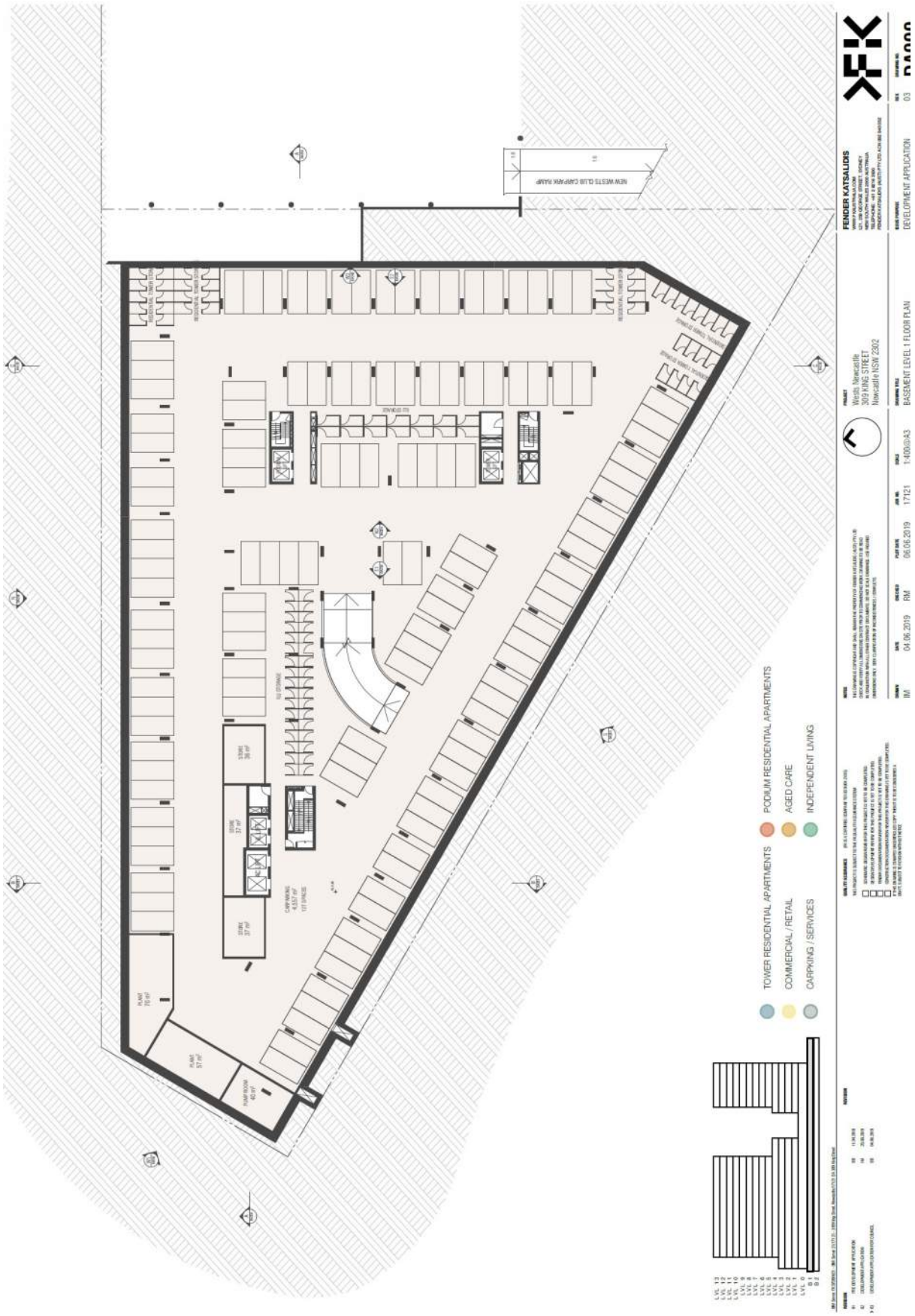

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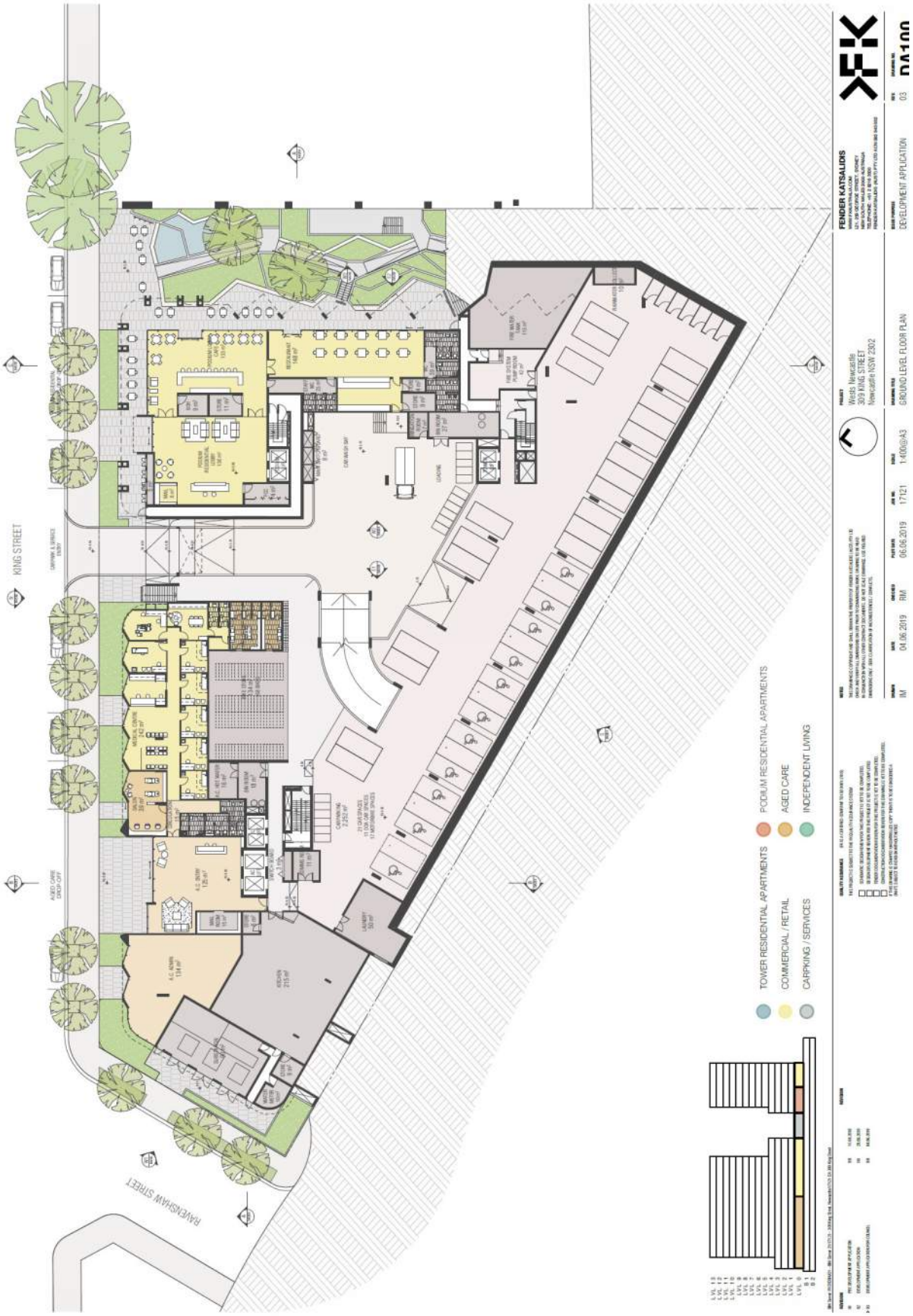

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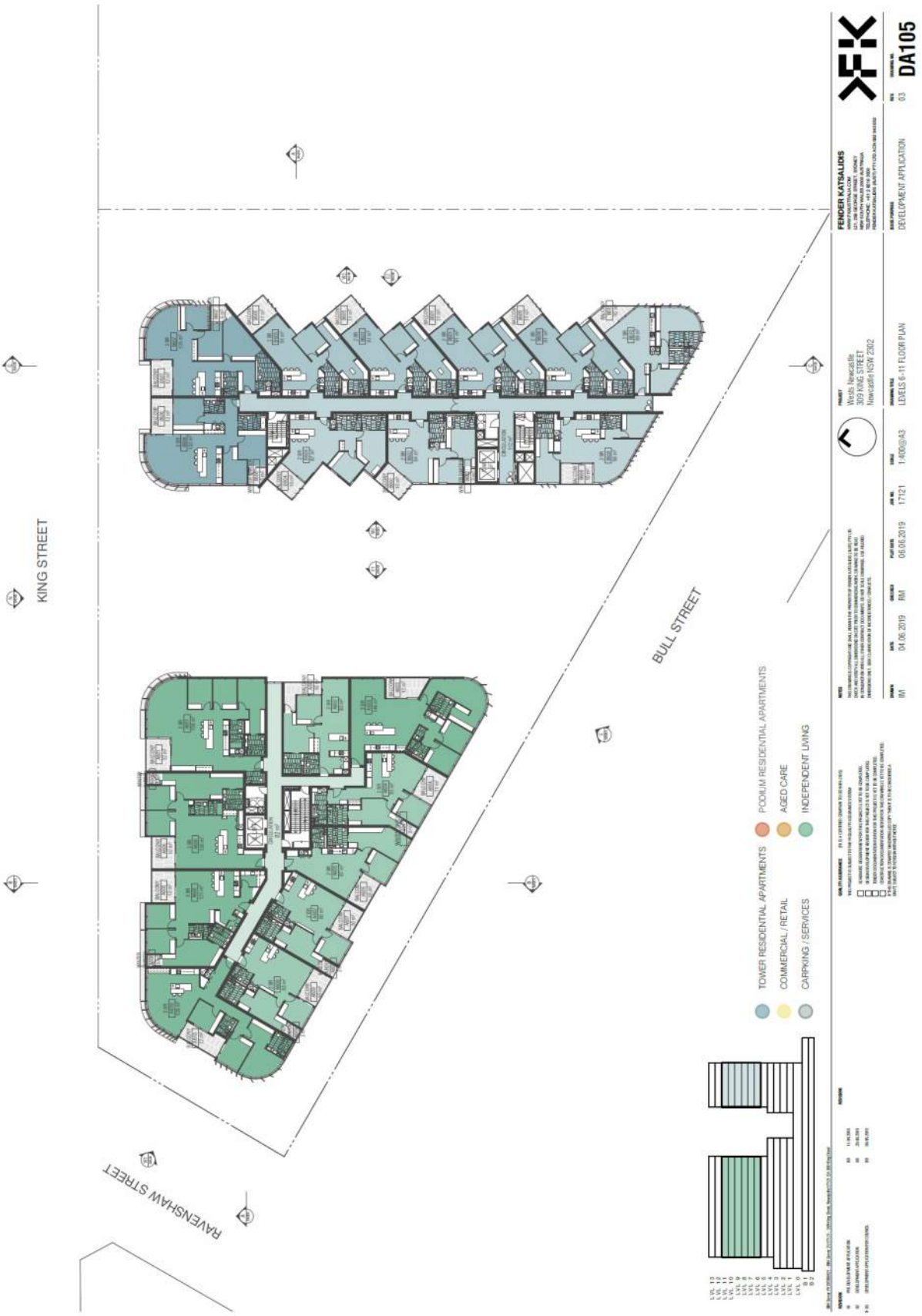

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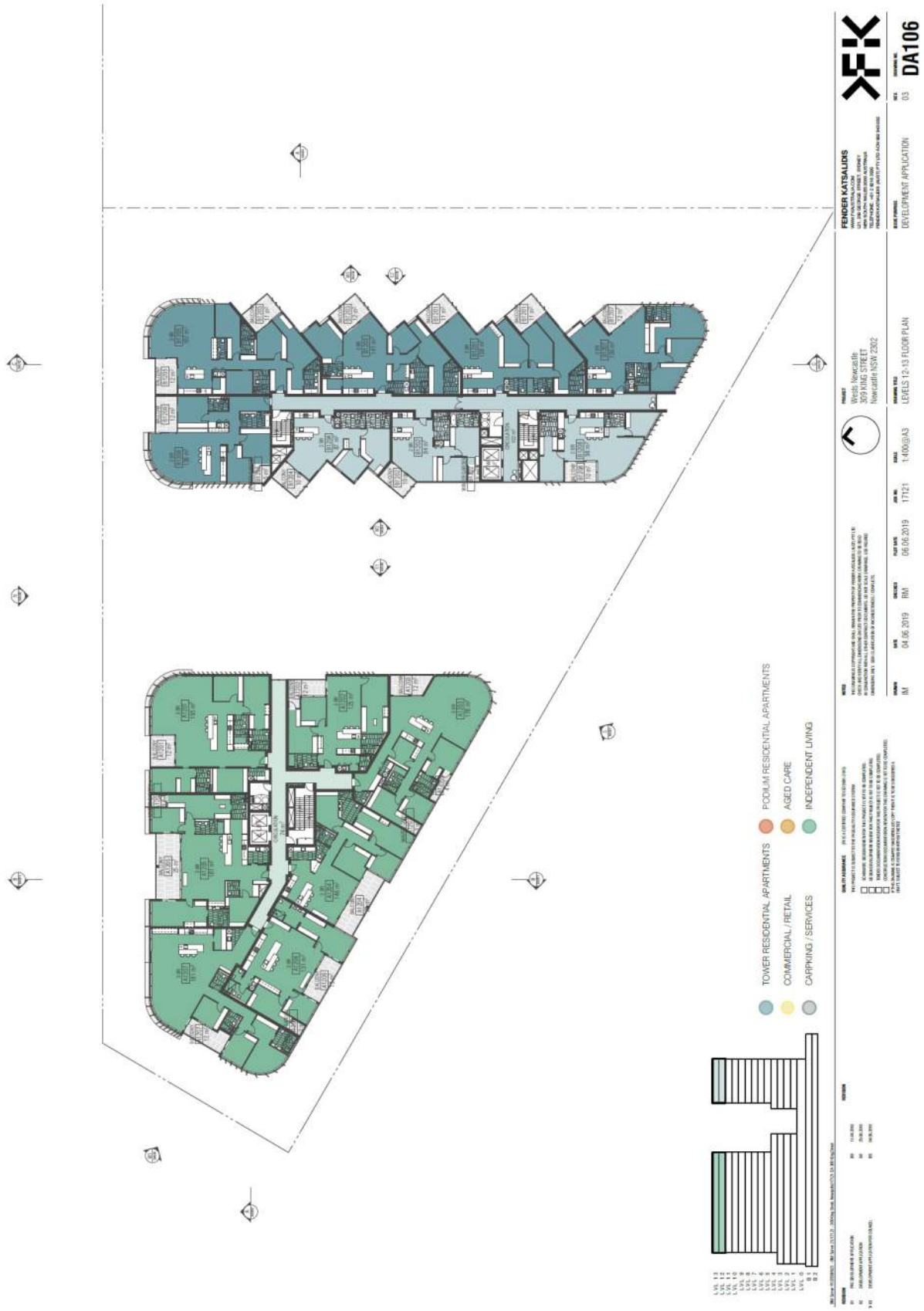

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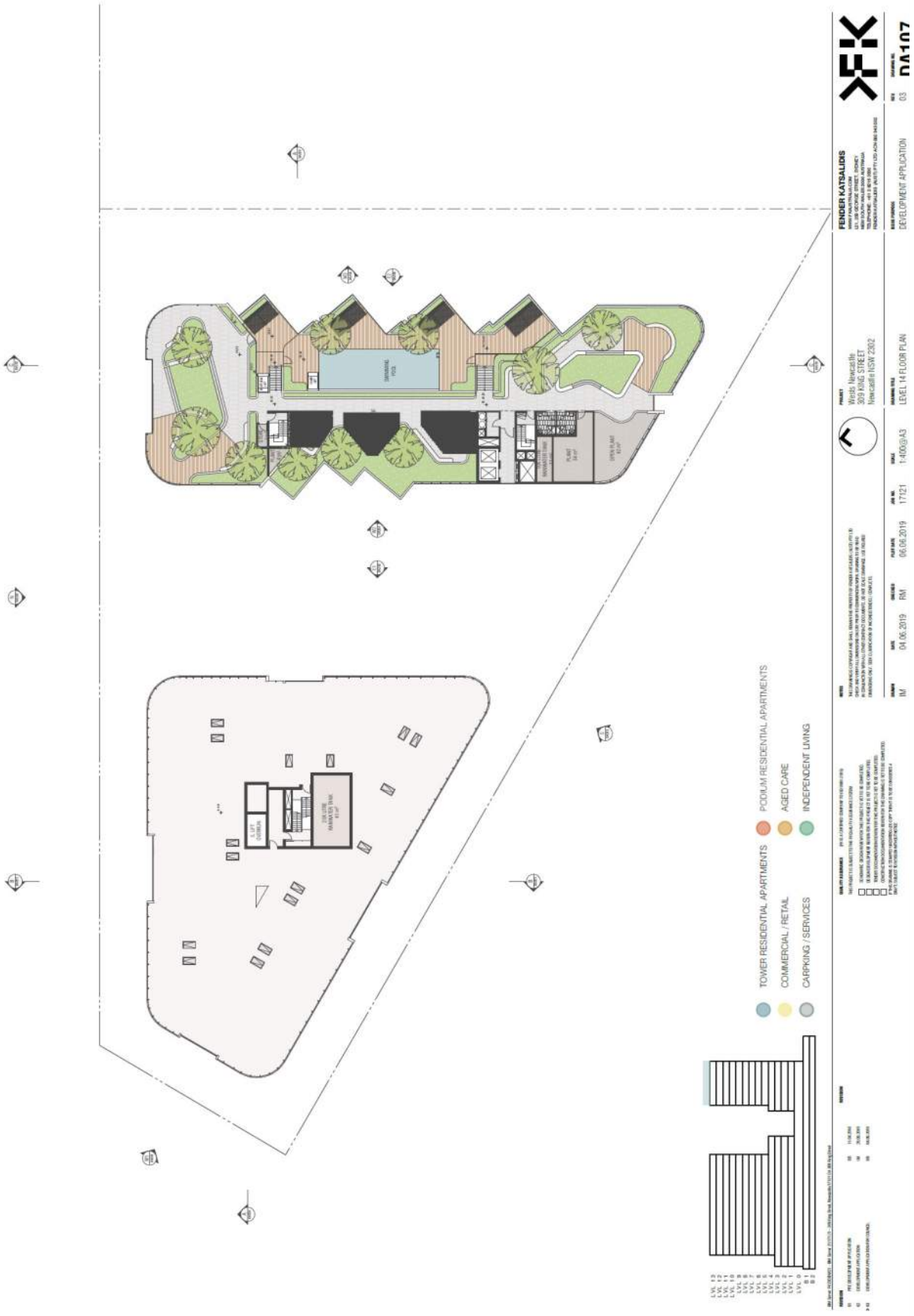

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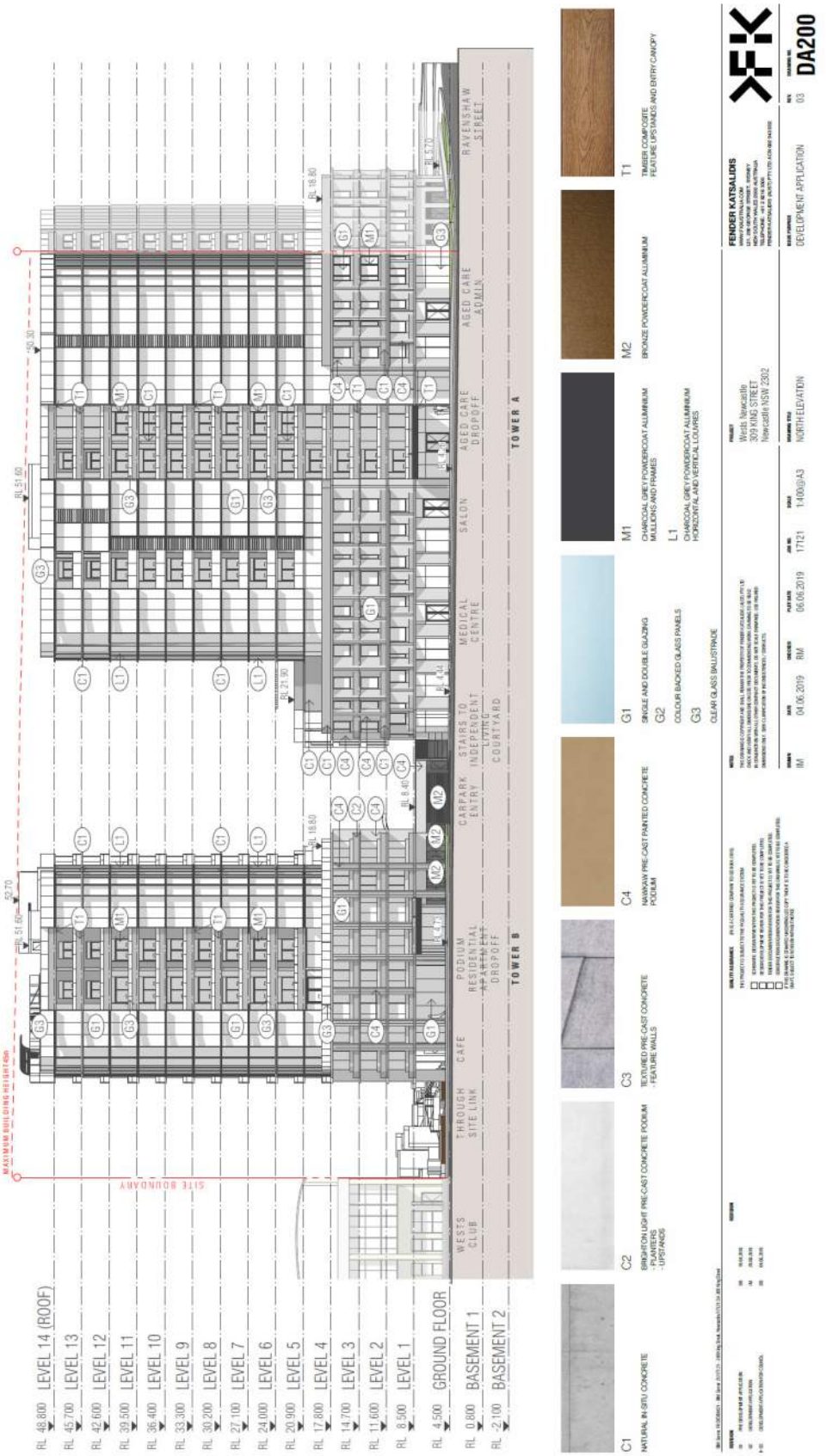

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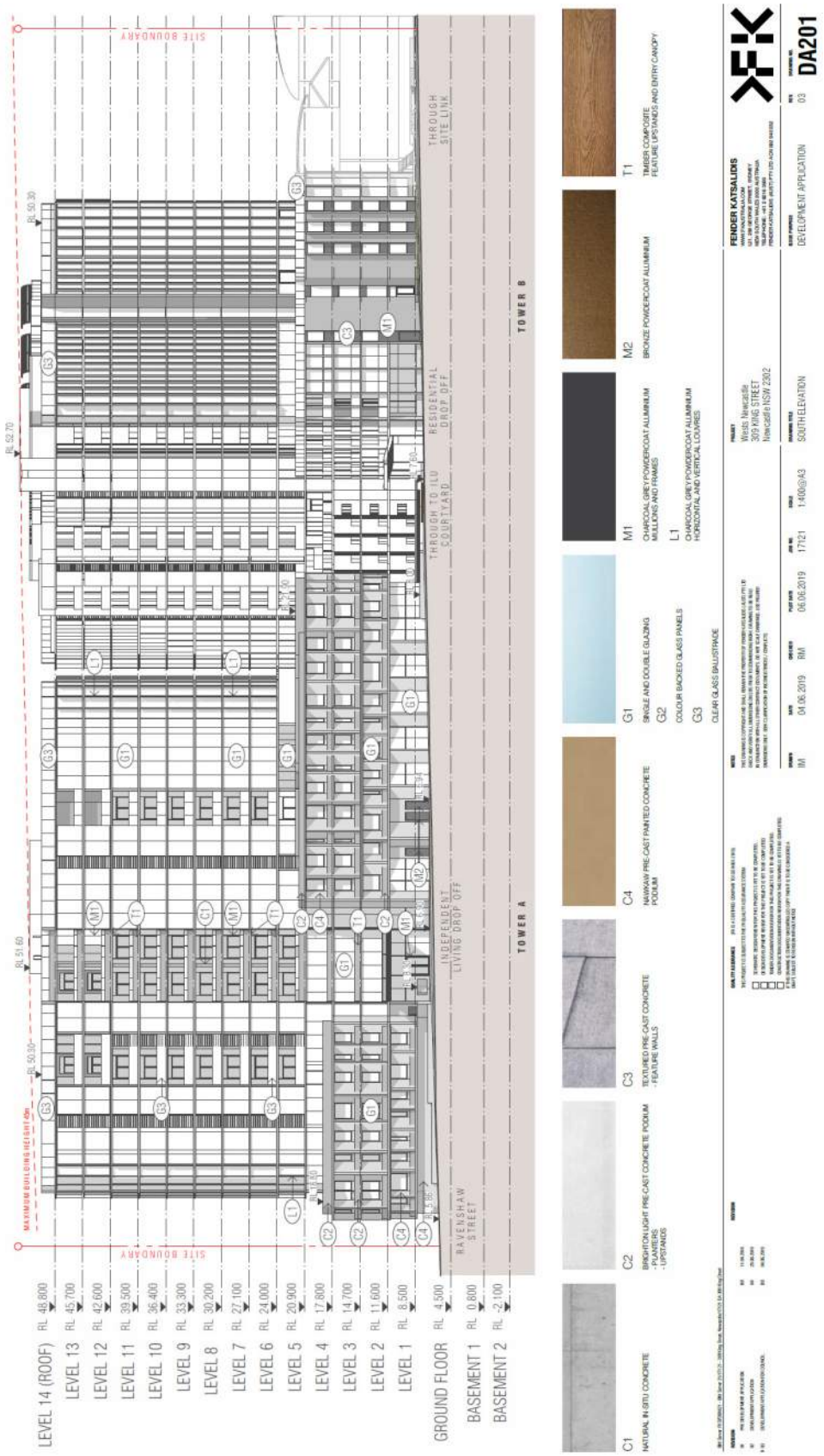

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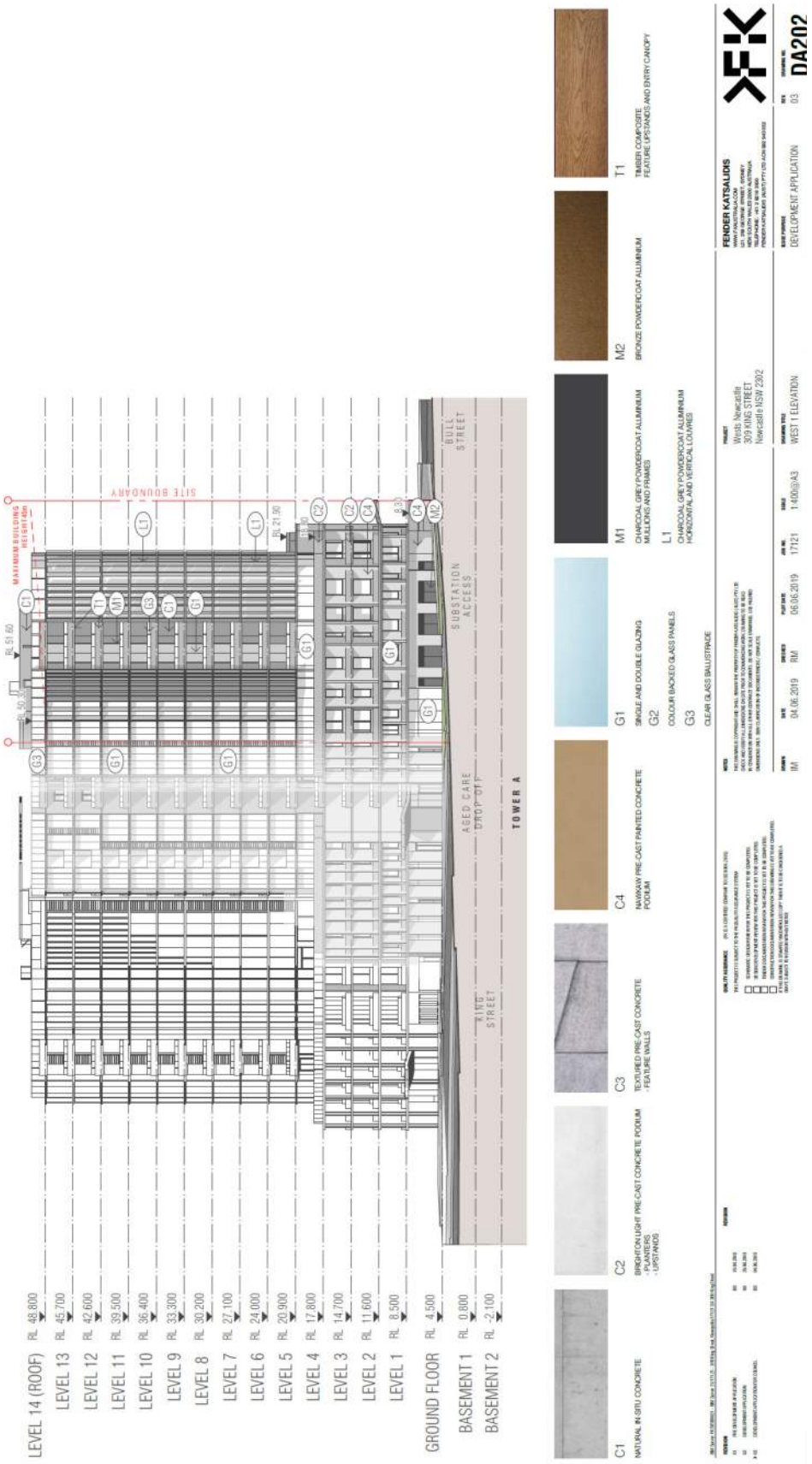

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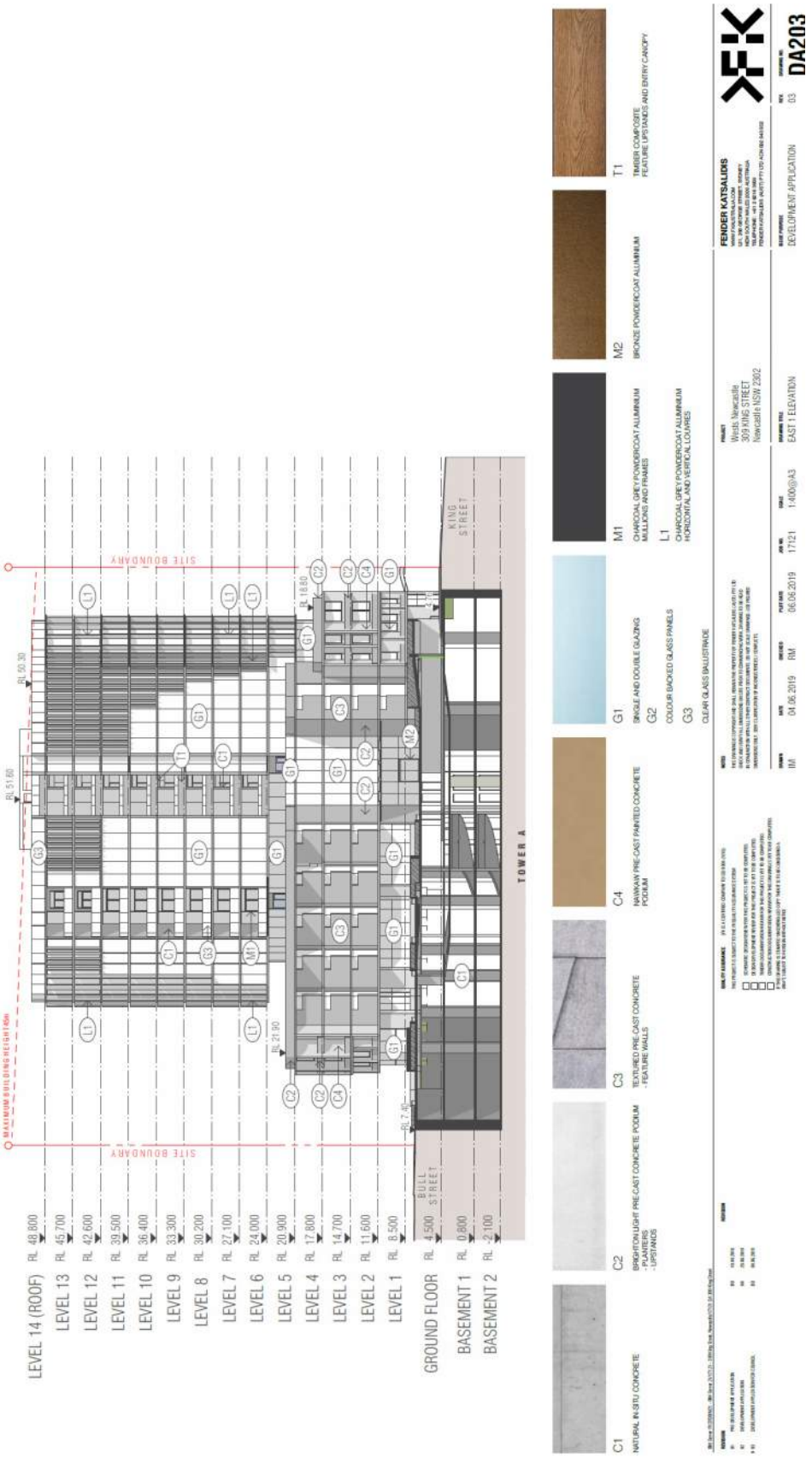

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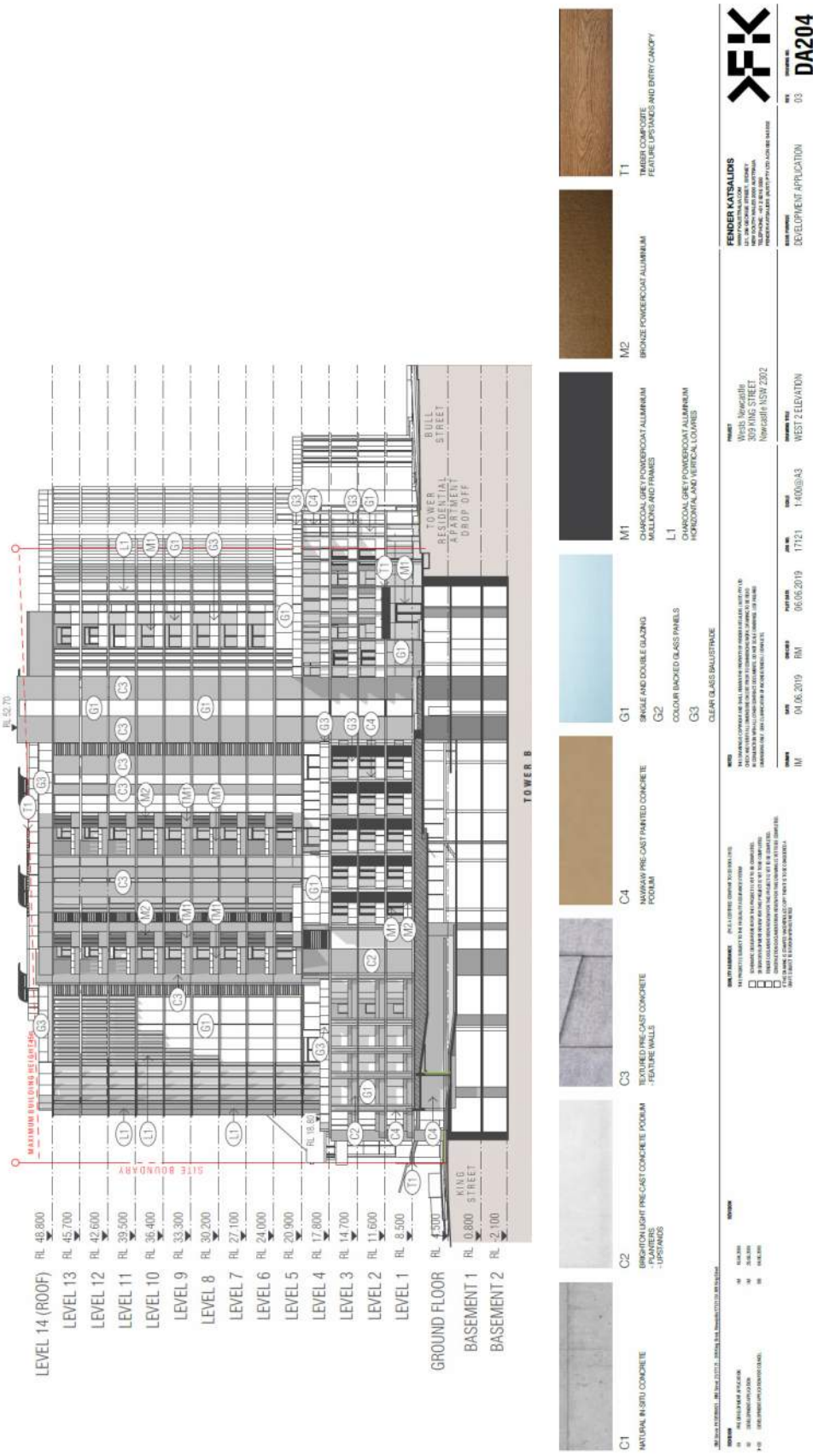

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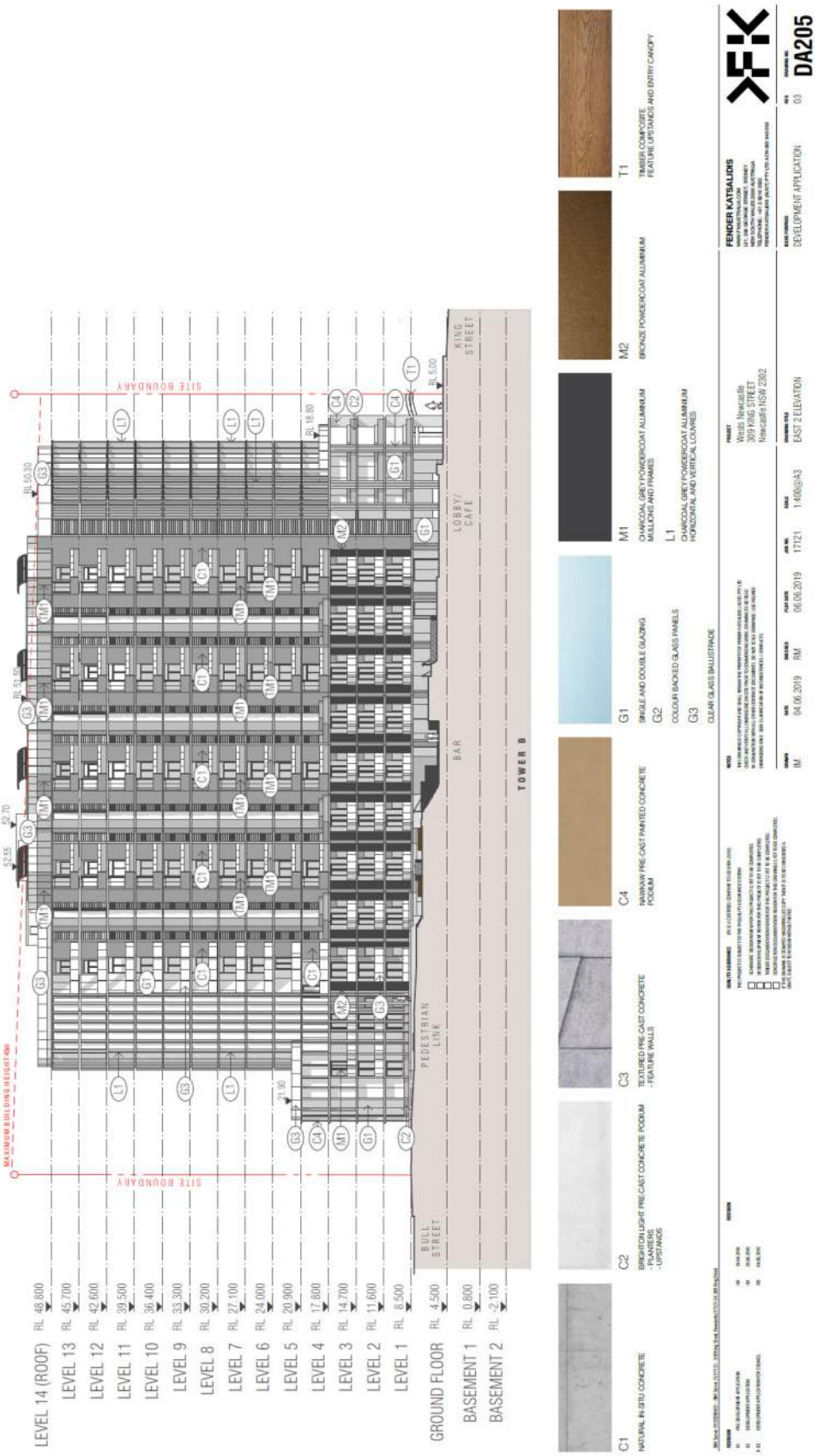

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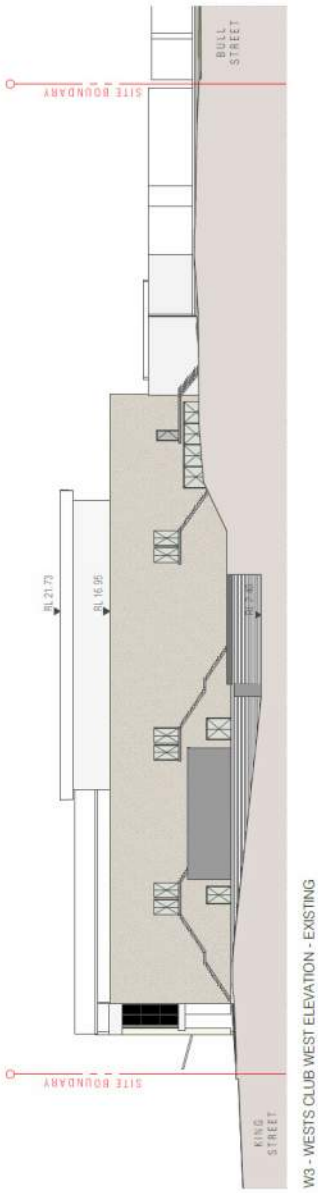
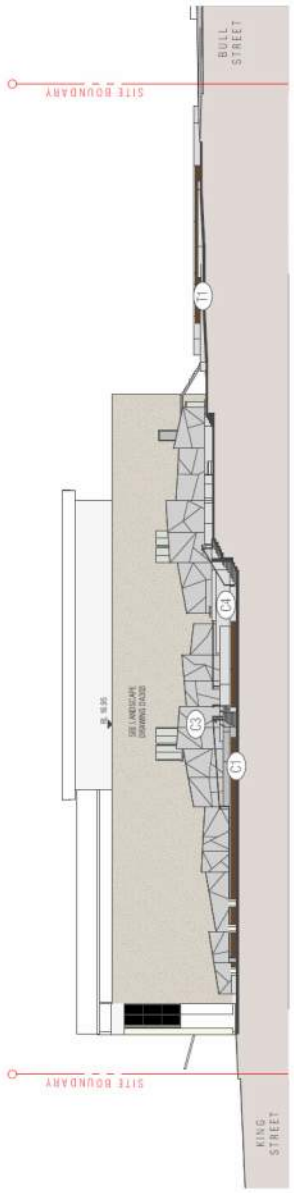


W3 - WESTS CLUB WEST ELEVATION - EXISTING



W3 - WESTS CLUB WEST ELEVATION - PROPOSED

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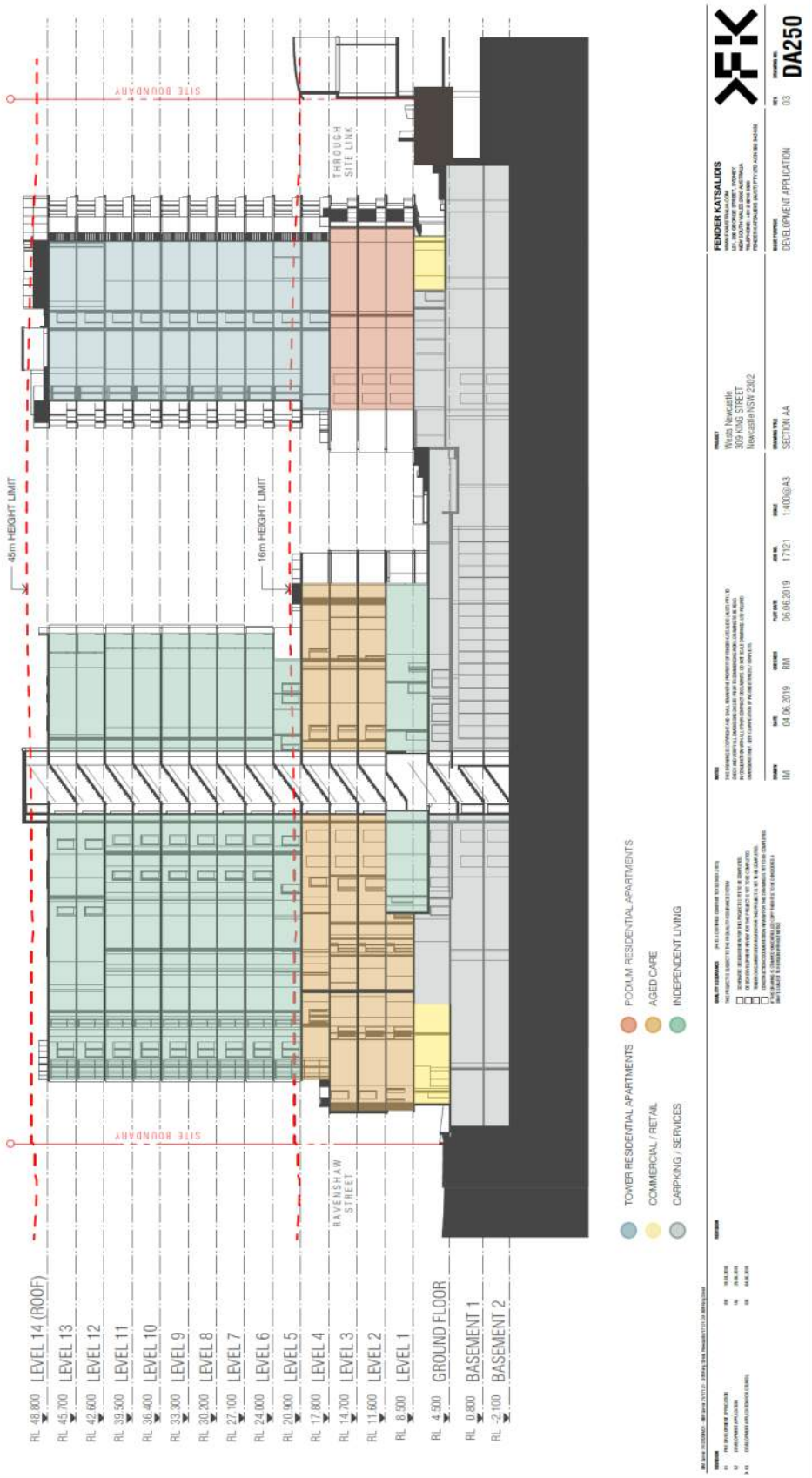

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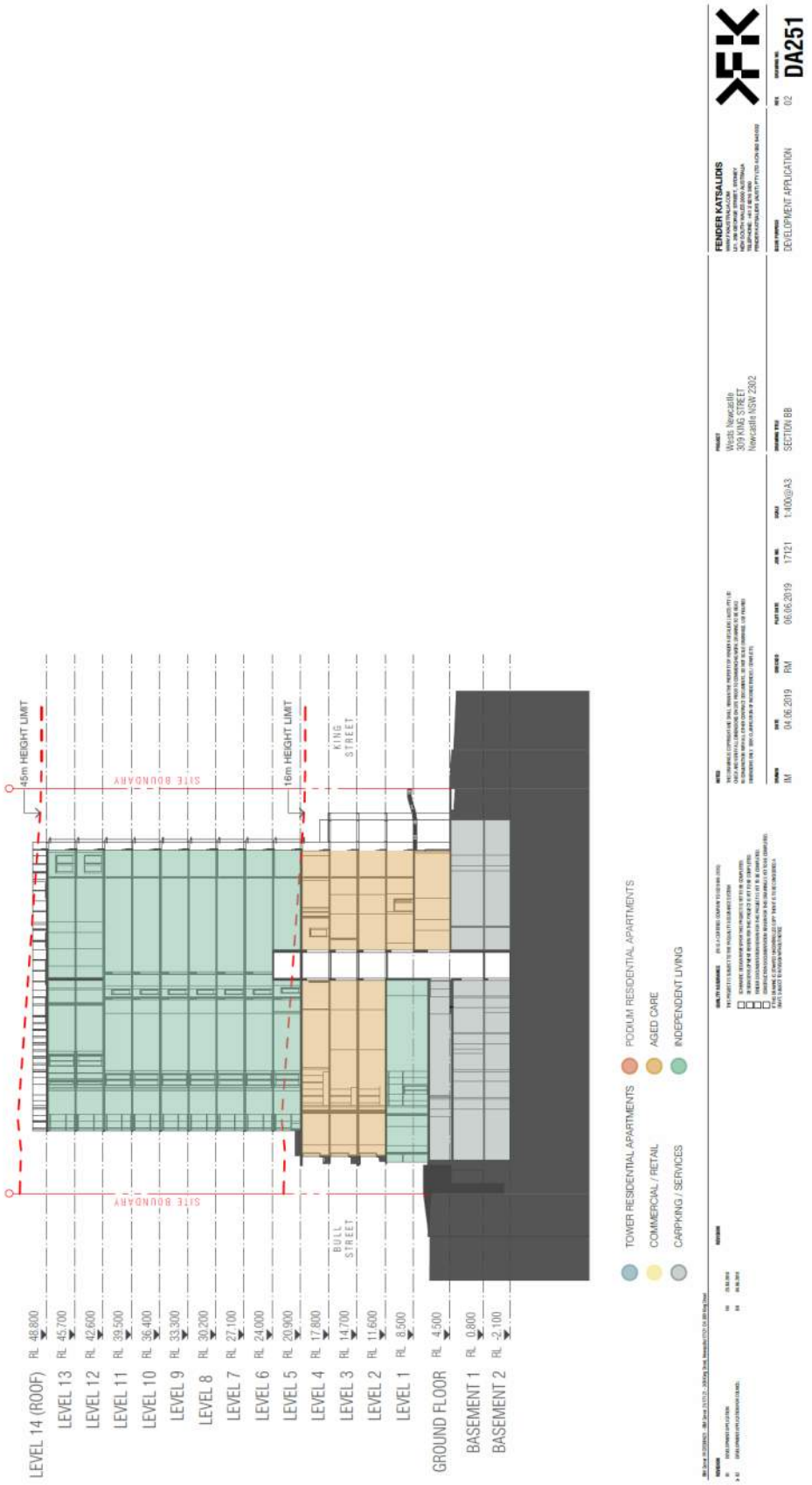

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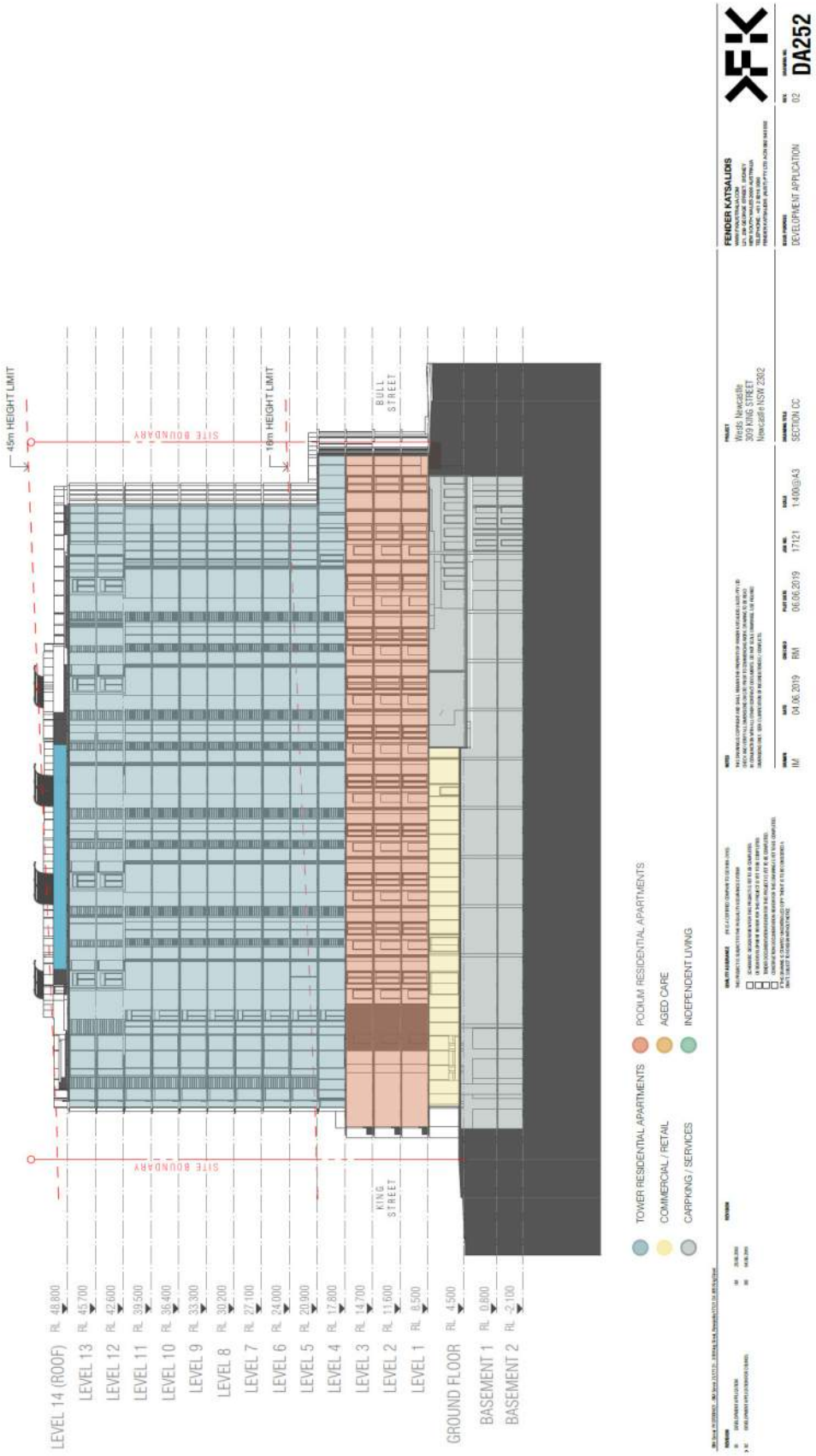

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ATTACHMENT B

Traffic Count Data

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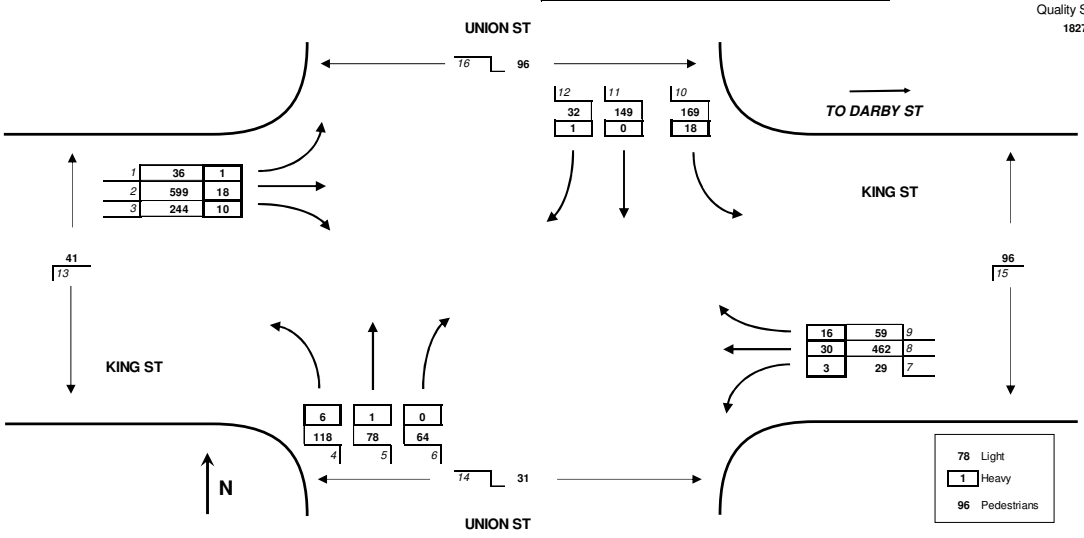
15/3/2018 - UNION ST / KING ST, NEWCASTLE

09:00 <<< HOUR ENDING **Thursday**

Summary:	UNION ST / KING ST
2039	Total Light Vehicles
104	Total Heavy Vehicles
264	Total Pedestrians

Quality Surveys
182788



15/3/2018 - UNION ST / KING ST, NEWCASTLE

Light Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
07:15	1	108	20	6	7	6	5	100	9	28	11	5	306	
07:30	2	111	33	20	7	5	6	103	8	32	21	4	352	
07:45	5	134	42	23	15	14	4	113	8	28	28	7	421	
08:00	7	126	54	18	13	9	3	116	6	38	38	6	434	1513
08:15	9	182	47	31	20	12	2	118	15	29	39	8	512	1719
08:30	3	134	63	33	18	15	10	99	18	47	38	8	486	1853
08:45	14	134	80 <	27	13	16	11	113	11	47	40 <	10 <	516	1948
09:00	10 <	149 <	54 <	27 <	27 <	21 <	6 <	132 <	15 <	46 <	32	6 <	525	2039 <

Heavy Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
07:15	1	7	0	1	0	0	2	5	4	1	0	0	21	
07:30	0	4	1	1	0	1	1	6	2	3	0	0	19	
07:45	0	4	3	0	0	0	0	5	5	1	0	0	18	
08:00	0 <	3	0	0	1	0 <	0 <	6	2	2	0	0	14	72
08:15	0	3	4	2	0	0 <	0	9	2	6	0	0	26	77
08:30	0	6	2	0	0	0	1	7	4	5	0	1 <	26	84
08:45	0	7 <	1	3	1 <	0	1	9 <	5	4	0	0 <	31	97
09:00	1 <	2	3 <	1 <	0	0	1 <	5	5 <	3 <	0	0 <	21	104 <

All Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
07:15	2	115	20	7	7	6	7	105	13	29	11	5	327	
07:30	2	115	34	21	7	6	7	109	10	35	21	4	371	
07:45	5	138	45	23	15	14	4	118	13	29	28	7	439	
08:00	7	129	54	18	14	9	3	122	8	40	38	6	448	1585
08:15	9	185	51	33	20	12	2	127	17	35	39	8	538	1796
08:30	3	140	65	33	18	15	11	106	22	52	38	9	512	1937
08:45	14	141	81	30	14	16	12	122	16	51	40 <	10 <	547	2045
09:00	11 <	151 <	57 <	28 <	27 <	21 <	7 <	137 <	20 <	49 <	32	6 <	546	2143 <

Pedestrians

13	14	15	16
1	3	2	7
6	2	3	3
3	4	10	6
14	7	17	12
9	4	18	21
10	8	23	19
15 <	11	31	18
7	8 <	24 <	38 <

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

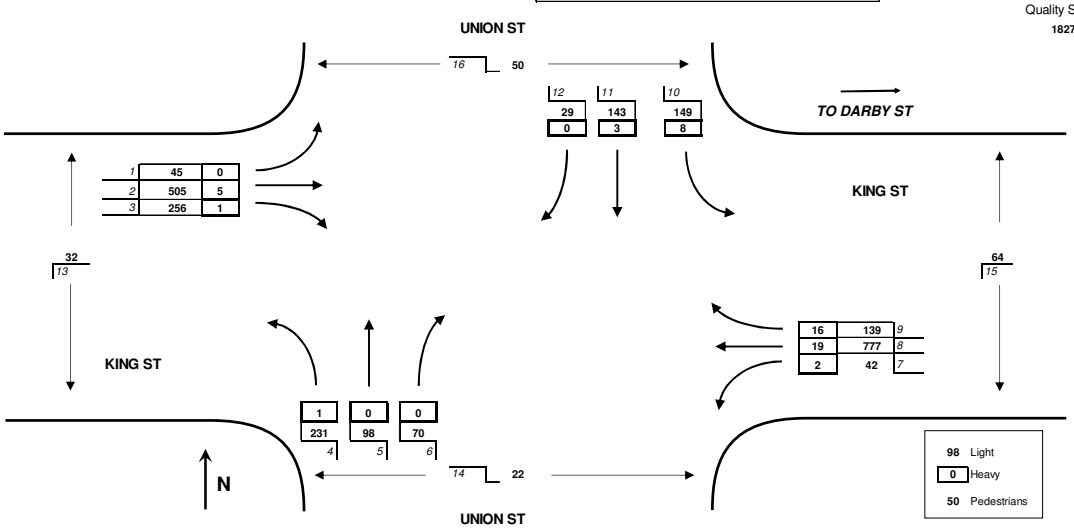
Document Set ~~ID: 6157175~~
Version: 1, Version Date: 29/10/2019

15/3/2018 - UNION ST / KING ST, NEWCASTLE

17:45 <<< HOUR ENDING **Thursday**

Summary:	UNION ST / KING ST
2484	Total Light Vehicles
55	Total Heavy Vehicles
168	Total Pedestrians

Quality Surveys
182788



15/3/2018 - UNION ST / KING ST, NEWCASTLE

Light Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
15:15	4	91	42	38	16	12	12	160	12	33	19	6	445	
15:30	8	82	41	46	15	12	10	163	20	37	26	8	468	
15:45	3	132	57	27	12	16	8	186	19	32	17	10	519	
16:00	12	105	42	39	16	11	10	136	14	36	28	5	454	1886
16:15	14	113	56	42	12	12	10	165	20	40	27	14	525	1966
16:30	10	109	54	42	17	19	15	180	19	32	37	10 <	544	2042
16:45	13	144	62	38	19	7	17	187	24	37	27	5	580	2103
17:00	7	128	73	58	21	20	9	188	26	29	35	5	599	2248
17:15	17	111	62	54	15	17	14 <	190	35	35	34	9	593	2316
17:30	15 <	119	54	64	41	19	10	200	38	41	34	9	644	2416
17:45	6	147 <	67 <	55 <	21	14 <	9	199 <	40 <	44	40 <	6	648	2484 <
18:00	10	122	65	36	25 <	8	7	169	16	48 <	35 <	6	547	2432

Heavy Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
15:15	0	5	0	1	0	0	1	3	6	3	0	1	20	
15:30	0	1	1	0	0	0	1	9	4	2	0	0	18	
15:45	0	3	0	0	0	2	1	5	4	2	0	1	18	
16:00	0	2 <	0 <	0 <	0	0 <	0	5	3	3	1	0	14	70 <
16:15	0	1	0 <	0	0	0 <	0	8 <	1	4	0	1	15	65
16:30	0	0	0	0	0	0 <	0	6	2	2	0	1 <	11	58
16:45	0	1	1 <	1 <	1 <	0	3	3	4	3 <	0	0	17	57
17:00	0	1	0 <	0 <	0 <	0	0	6	3	2	0	0	12	55
17:15	0	2	0 <	0 <	0 <	0	0	2	3	1	0	0	8	48
17:30	0	0	0 <	0 <	0 <	0	2 <	7	3	4	2	0	18	55
17:45	0	2	1 <	1 <	0	0	0	4	7	1	1 <	0	17	55
18:00	0	0	0 <	0 <	1 <	0	0	7	5 <	2	0 <	0	15	58

All Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
15:15	4	96	42	39	16	12	13	163	18	36	19	7	465	
15:30	8	83	42	46	15	12	11	172	24	39	26	8	486	
15:45	3	135	57	27	12	18	9	191	23	34	17	11	537	
16:00	12	107	42	39	16	11	10	141	17	39	29	5	468	1956
16:15	14	114	56	42	12	12	10	173	21	44	27	15	540	2031
16:30	10	109	54	42	17	19	15	186	21	34	37	11 <	555	2100
16:45	13	145	63	39	20	7	20	190	28	40	27	5	597	2160
17:00	7	129	73	58	21	20	9	194	29	31	35	5	611	2303
17:15	17	113	62	54	15	17	14 <	192	38	36	34	9	601	2364
17:30	15 <	119	54	64	41	19	12	207	41	45	36	9	662	2471
17:45	6	149 <	68 <	56 <	21	14 <	9	203 <	47 <	45	41 <	6	665	2539 <
18:00	10	122	65	36	26 <	8	7	176	21	50 <	35 <	6	562	2490

Pedestrians

	13	14	15	16
	7	5	12	27
	7	5	16	14
	6	10	25	19
	5	11	12	14
	7	7 <	14	30 <
	9	3	7	10
	6	8	15	8
	9	2	13	7
	8 <	9	32	15
	5	5	13 <	12
	10 <	6	6	16
	4	2	21	8

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

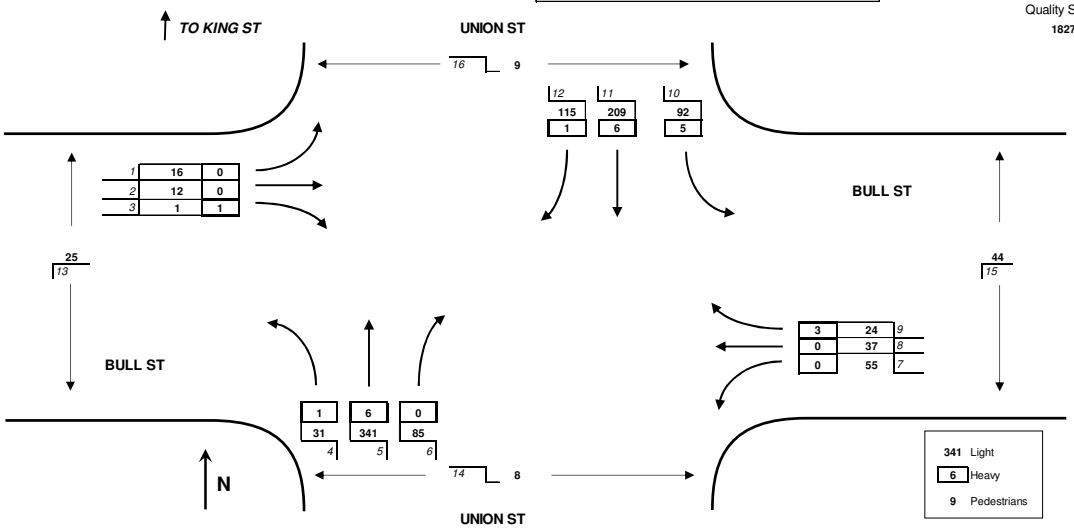
Document Set ID: 6157175
Version: 1, Version Date: 29/10/2019

15/3/2018 - UNION ST / BULL ST, NEWCASTLE

09:00 <<< HOUR ENDING Thursday

Summary:	UNION ST / BULL ST
1018	Total Light Vehicles
23	Total Heavy Vehicles
86	Total Pedestrians

Quality Surveys
182788



15/3/2018 - UNION ST / BULL ST, NEWCASTLE

Light Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
07:15	2	1	1	1	27	7	4	9	2	8	22	6	90	
07:30	0	1	1	4	36	14	7	7	2	16	28	16	132	
07:45	6	5	2	6	44	13	12	9	3	18	33	21	172	
08:00	3	1	1 <	4	59	16	7	6	2	21	50	26	196	590
08:15	3	3	0	3	68	16	13	10	11	26	50	40	243	743
08:30	6 <	3 <	0	10	81	29	14	7	3	21	53	24	251	862
08:45	3	3	1	7	89	29 <	11	11	4	32 <	63 <	25 <	278	968
09:00	4	3 <	0	11 <	103 <	11	17 <	9 <	6 <	13	43	26 <	246	1018 <

Heavy Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
07:15	0	0	0	0	1	0	0	0	0	0	2	1	4	
07:30	0	0	0	0	2	0	0	0	1	0	1	2	6	
07:45	0	1	0	0	1	0	0	0	0	0	2	0	4	
08:00	0	0 <	0	1	1	0	0	0	0	0	0	0 <	2	16
08:15	0	0 <	0	0	2	0	0	0	1	1	1	1 <	6	18
08:30	0	0 <	0	1 <	0	0	0	0	0	1	2	0	4	16
08:45	0	0	0	0 <	4 <	0	0	0	1	1	2	0	8	20
09:00	0	0	1 <	0	0	0	0	0	1 <	2 <	1 <	0	5	23 <

All Vehicles

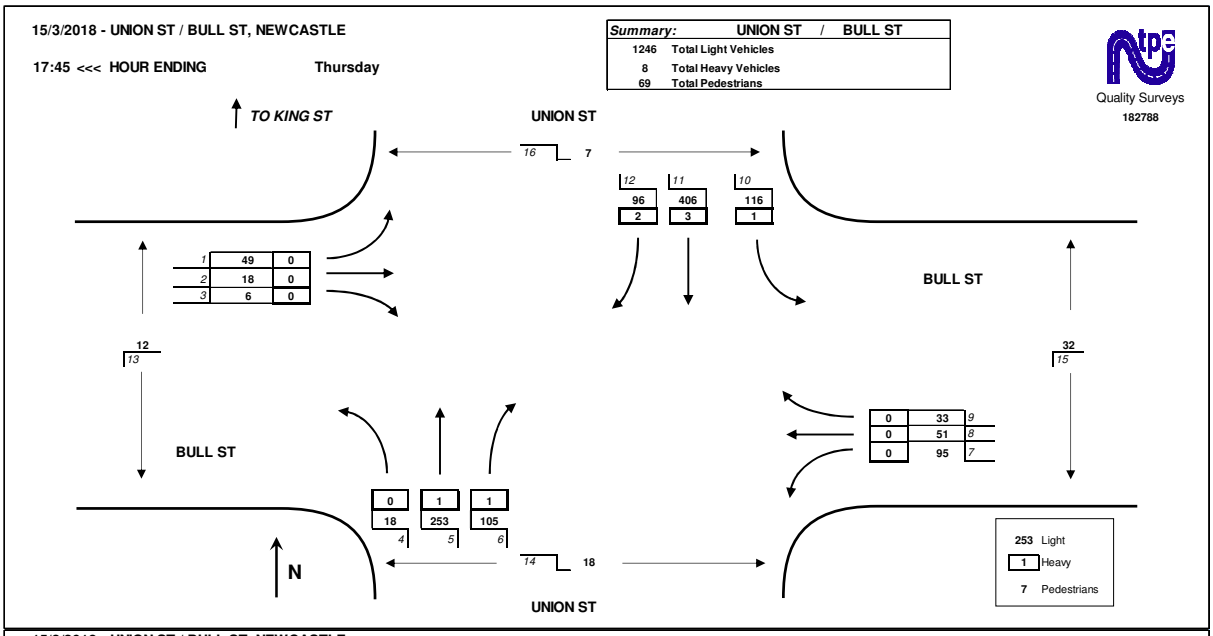
	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
07:15	2	1	1	1	28	7	4	9	2	8	24	7	94	
07:30	0	1	1	4	38	14	7	7	3	16	29	18	138	
07:45	6	6	2	6	45	13	12	9	3	18	35	21	176	
08:00	3	1	1 <	5	60	16	7	6	2	21	50	26	198	606
08:15	3	3	0	3	70	16	13	10	12	27	51	41	249	761
08:30	6 <	3 <	0	11	81	29	14	7	3	22	55	24	255	878
08:45	3	3	1	7	93	29 <	11	11	5	33 <	65 <	25 <	286	988
09:00	4	3	1	11 <	103 <	11	17 <	9 <	7 <	15	44	26 <	251	1041 <

Pedestrians

	13	14	15	16	
	1	0	4	8	
	4	1	12	2	
	4	1	13	5	
	4	3	15	2 <	
	4	3	9	4	
	6	3	15 <	4	
	9	2 <	9	1	
	6 <	0	11	0	

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

Document Set ID: 6157175
Version: 1, Version Date: 29/10/2019



15/3/2018 - UNION ST / BULL ST, NEWCASTLE

Light Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
15:15	5	3	4	2	56	14	13	7	8	20	48	10	190	
15:30	4	4	0	1	47	12	11	10	4	15	65	22	195	
15:45	4	1	2	8	42	19	17	7	5	14	78	26	223	
16:00	2	0	1	3	47	21	15	12	5	19	77	19	221	829
16:15	7	4	2	6	44	23	10	11	12	19	90	25	253	892
16:30	10	6	1	3 <	50	18	15	10	8	24	110	22	277	974
16:45	5	3	3	2	37	21	17	10	7	26	105	22	258	1009
17:00	6	6	1	6	66	21	15	16	10 <	36	94	32 <	309	1097
17:15	9	5 <	3 <	6	55	18	33	11	6	18	111 <	25 <	300	1144
17:30	26	5	0	3	78	31	29	10	9	26	107	22 <	346	1213
17:45	8 <	2	2	3	54 <	35	18 <	14 <	8	36 <	94	17	291	1246 <
18:00	4	2	2	1	38	26 <	13	8	5	31	65	22	217	1154

Heavy Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
15:15	0	0	0	0	1	1	0	0	1	0	1	0	4	
15:30	0	0	0	0	0	0	0	0	0	1	1	0	2	
15:45	0	0	1	0	2	0	0	0	0	0	1	0	4	
16:00	0	0	0 <	0	0 <	0 <	0	0	0 <	0 <	1 <	0	1	11 <
16:15	0	0	0 <	0	0	0	0	0	0	0 <	0	0	0	7
16:30	0	0	0 <	0	0	0	0	1 <	0	0	0	0	1	6
16:45	0	0	0	1 <	1	0	0	0 <	0	1 <	1	2	6	8
17:00	0	0	0	0 <	0	1 <	0	0 <	0	0 <	0	0	1	8
17:15	0	0	0	0 <	0	0 <	0	0 <	0	0 <	0	0	0	8
17:30	0	0	0	0 <	0	0 <	0	0	0	0 <	3 <	1 <	4	11 <
17:45	0	0	0	0	1	0 <	0	0	0	1 <	0	1	3	8
18:00	1 <	0	0	0	0	0	0	0	0	0 <	0	0	1	8

All Vehicles

	1	2	3	4	5	6	7	8	9	10	11	12	Total Vehicles 15 MIN HOUR	
15:15	5	3	4	2	57	15	13	7	9	20	49	10	194	
15:30	4	4	0	1	47	12	11	10	4	16	66	22	197	
15:45	4	1	3	8	44	19	17	7	5	14	79	26	227	
16:00	2	0	1 <	3	47	21	15	12	5	19	78	19	222	840
16:15	7	4	2	6	44	23	10	11	12	19	90	25	253	899
16:30	10	6	1	3 <	50	18	15	11	8	24	110	22	278	980
16:45	5	3	3	3	38	21	17	10	7	27	106	24	264	1017
17:00	6	6	1	6	66	22	15	16	10 <	36	94	32	310	1105
17:15	9	5 <	3 <	6	55	18	33	11	6	18	111 <	25	300	1152
17:30	26	5	0	3	78	31	29	10	9	26	110 <	23 <	350	1224
17:45	8 <	2	2	3	55 <	35	18 <	14 <	8	37 <	94	18	294	1254 <
18:00	5	2	2	1	38	26 <	13	8	5	31	65	22	218	1162

Pedestrians

	13	14	15	16
	1	4	9	1
	3	2	4	4
	3	6	6	0
	7	2	3	0
	4	5	5	4
	5 <	8	8	3
	3 <	7 <	14	0
	0	0	5	1
	7	4	12	3
	5	9	11 <	2
	0	5	4	1
	2	3	10	3 <

Note : Arrows "<" indicate the end time for the peak hour for each turning movement.

Document Set ID: 6157175
Version: 1, Version Date: 29/10/2019

ATTACHMENT C

SIDRA Movement Summary Tables

Document Set ~~ID: 6157175~~
Version: 1, Version Date: 29/10/2019

MOVEMENT SUMMARY

Site: 101 [2019AM]

Wests Newcastle Mixed Use Development
King Street / Union Street Signalised 4 way Cross Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 77 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	124	4.8	0.445	32.7	LOS C	6.6	47.7	0.89	0.78	0.89	34.0
2	T1	79	1.3	0.445	27.1	LOS B	6.6	47.7	0.89	0.78	0.89	28.5
3	R2	64	0.0	0.442	45.0	LOS D	2.5	17.4	0.99	0.75	0.99	29.1
Approach		267	2.6	0.445	34.0	LOS C	6.6	47.7	0.92	0.77	0.92	31.3
East: King Street												
4	L2	32	9.4	0.094	33.6	LOS C	1.0	7.6	0.85	0.71	0.85	32.9
5	T1	492	6.1	0.673	32.8	LOS C	9.0	66.6	0.98	0.84	1.04	32.7
6	R2	75	21.3	0.276	37.1	LOS C	2.6	21.2	0.91	0.76	0.91	22.9
Approach		599	8.2	0.673	33.4	LOS C	9.0	66.6	0.96	0.83	1.01	31.6
North: Union Street												
7	L2	187	9.6	0.746	36.2	LOS C	12.6	92.1	0.98	0.90	1.09	24.4
8	T1	149	0.0	0.746	31.7	LOS C	12.6	92.1	0.98	0.90	1.09	26.8
9	R2	33	3.0	0.233	43.1	LOS D	1.2	9.0	0.97	0.72	0.97	21.0
Approach		369	5.1	0.746	35.0	LOS C	12.6	92.1	0.98	0.89	1.08	25.0
West: King Street												
10	L2	37	2.7	0.104	33.6	LOS C	1.2	8.3	0.85	0.72	0.85	23.6
11	T1	617	2.9	0.845	39.6	LOS C	13.3	95.2	1.00	1.02	1.31	29.9
12	R2	254	3.9	0.833	46.0	LOS D	10.7	77.3	1.00	0.96	1.32	28.0
Approach		908	3.2	0.845	41.1	LOS C	13.3	95.2	0.99	0.99	1.30	29.2
All Vehicles		2143	4.9	0.845	37.0	LOS C	13.3	95.2	0.97	0.90	1.13	29.5

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	31	32.8	LOS D	0.1	0.1	0.92	0.92
P2	East Full Crossing	96	32.9	LOS D	0.2	0.2	0.93	0.93
P3	North Full Crossing	96	32.9	LOS D	0.2	0.2	0.93	0.93
P4	West Full Crossing	41	32.8	LOS D	0.1	0.1	0.92	0.92
All Pedestrians		264	32.8	LOS D			0.93	0.93

Document Set ID: 6157175
Version: 1, Version Date: 29/10/2019

MOVEMENT SUMMARY

Site: 101 [2019AM + DEV]

Wests Newcastle Mixed Use Development
King Street / Union Street Signalised 4 way Cross Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 77 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	152	4.8	0.519	33.3	LOS C	7.9	56.7	0.91	0.79	0.91	33.6
2	T1	84	1.3	0.519	27.7	LOS B	7.9	56.7	0.91	0.79	0.91	28.1
3	R2	68	0.0	0.470	45.1	LOS D	2.6	18.5	1.00	0.75	1.00	29.0
Approach		304	2.8	0.519	34.4	LOS C	7.9	56.7	0.93	0.78	0.93	31.2
East: King Street												
4	L2	32	9.4	0.094	33.6	LOS C	1.0	7.6	0.85	0.71	0.85	32.9
5	T1	494	6.1	0.676	32.9	LOS C	9.1	67.0	0.98	0.85	1.04	32.7
6	R2	75	21.3	0.276	37.1	LOS C	2.6	21.2	0.91	0.76	0.91	22.9
Approach		601	8.2	0.676	33.4	LOS C	9.1	67.0	0.96	0.83	1.01	31.6
North: Union Street												
7	L2	201	9.6	0.778	37.6	LOS C	13.5	99.1	0.99	0.93	1.14	23.8
8	T1	149	0.0	0.778	33.1	LOS C	13.5	99.1	0.99	0.93	1.14	26.2
9	R2	33	3.0	0.233	43.1	LOS D	1.2	9.0	0.97	0.72	0.97	21.0
Approach		383	5.3	0.778	36.3	LOS C	13.5	99.1	0.99	0.92	1.12	24.5
West: King Street												
10	L2	37	2.7	0.104	33.6	LOS C	1.2	8.3	0.85	0.72	0.85	23.6
11	T1	617	2.9	0.845	39.6	LOS C	13.3	95.2	1.00	1.02	1.31	29.9
12	R2	254	3.9	0.833	46.0	LOS D	10.7	77.3	1.00	0.96	1.32	28.0
Approach		908	3.2	0.845	41.1	LOS C	13.3	95.2	0.99	0.99	1.30	29.2
All Vehicles		2196	4.9	0.845	37.3	LOS C	13.5	99.1	0.98	0.90	1.14	29.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	31	32.8	LOS D	0.1	0.1	0.92	0.92
P2	East Full Crossing	96	32.9	LOS D	0.2	0.2	0.93	0.93
P3	North Full Crossing	96	32.9	LOS D	0.2	0.2	0.93	0.93
P4	West Full Crossing	41	32.8	LOS D	0.1	0.1	0.92	0.92
All Pedestrians		264	32.8	LOS D			0.93	0.93

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Version: 1, Version Date: 29/10/2019

MOVEMENT SUMMARY

Site: 101 [2029AM]

Wests Newcastle Mixed Use Development
King Street / Union Street Signalised 4 way Cross Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 79 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	143	4.8	0.476	32.4	LOS C	7.7	55.7	0.89	0.78	0.89	34.1
2	T1	91	1.3	0.476	26.8	LOS B	7.7	55.7	0.89	0.78	0.89	28.6
3	R2	74	0.0	0.522	46.5	LOS D[11]	3.0	20.7	1.00	0.76	1.02	28.6
Approach		307	2.6	0.522	34.1	LOS C	7.7	55.7	0.92	0.78	0.92	31.2
East: King Street												
4	L2	37	9.4	0.119	35.8	LOS C	1.2	9.3	0.87	0.72	0.87	32.0
5	T1	566	6.1	0.851	42.0	LOS C	12.4	91.1	1.00	1.02	1.34	29.0
6	R2	86	21.3	0.704	49.2	LOS D[11]	3.7	30.2	1.00	0.86	1.23	19.3
Approach		689	8.2	0.851	42.6	LOS D[11]	12.4	91.1	0.99	0.99	1.31	28.0
North: Union Street												
7	L2	215	9.6	0.796	38.2	LOS C	15.4	113.0	0.99	0.95	1.15	23.6
8	T1	171	0.0	0.796	33.6	LOS C	15.4	113.0	0.99	0.95	1.15	26.0
9	R2	38	3.0	0.275	44.4	LOS D[11]	1.5	10.6	0.98	0.73	0.98	20.6
Approach		424	5.1	0.796	36.9	LOS C	15.4	113.0	0.99	0.93	1.13	24.3
West: King Street												
10	L2	43	2.7	0.084	28.4	LOS B	1.2	8.7	0.77	0.71	0.77	25.9
11	T1	710	2.9	0.682	28.2	LOS B	12.9	92.3	0.94	0.82	0.97	35.0
12	R2	292	3.9	0.912	56.0	LOS D[11]	14.3	103.6	1.00	1.08	1.60	25.2
Approach		1044	3.2	0.912	36.0	LOS C	14.3	103.6	0.95	0.89	1.14	31.1
All Vehicles		2464	4.9	0.912	37.8	LOS C	15.4	113.0	0.97	0.91	1.16	29.2

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	37	33.8	LOS D	0.1	0.1	0.93	0.93
P2	East Full Crossing	115	33.9	LOS D	0.2	0.2	0.93	0.93
P3	North Full Crossing	115	30.3	LOS D	0.2	0.2	0.88	0.88
P4	West Full Crossing	49	33.8	LOS D	0.1	0.1	0.93	0.93

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MOVEMENT SUMMARY

Site: 101 [2029AM + DEV]

Wests Newcastle Mixed Use Development
King Street / Union Street Signalised 4 way Cross Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 83 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	171	4.8	0.601	36.4	LOS C	9.8	71.0	0.94	0.81	0.94	32.3
2	T1	96	1.3	0.601	30.8	LOS C	9.8	71.0	0.94	0.81	0.94	26.7
3	R2	78	0.0	0.581	49.3	LOS D	3.3	23.3	1.00	0.79	1.07	27.7
Approach		345	2.8	0.601	37.8	LOS C	9.8	71.0	0.95	0.81	0.97	29.8
East: King Street												
4	L2	37	9.4	0.098	34.1	LOS C	1.2	9.2	0.83	0.72	0.83	32.7
5	T1	568	6.1	0.698	34.2	LOS C	11.2	82.3	0.98	0.86	1.04	32.1
6	R2	86	21.3	0.295	38.6	LOS C	3.1	25.9	0.91	0.76	0.91	22.4
Approach		691	8.2	0.698	34.7	LOS C	11.2	82.3	0.96	0.84	1.01	31.1
North: Union Street												
7	L2	215	9.6	0.877	48.3	LOS D	18.3	134.0	1.00	1.06	1.35	20.4
8	T1	171	0.0	0.877	43.8	LOS D	18.3	134.0	1.00	1.06	1.35	22.4
9	R2	52	3.0	0.396	47.3	LOS D	2.2	15.6	0.99	0.74	0.99	19.7
Approach		438	5.1	0.877	46.4	LOS D	18.3	134.0	1.00	1.03	1.31	21.1
West: King Street												
10	L2	43	2.7	0.109	34.0	LOS C	1.4	10.1	0.84	0.72	0.84	23.4
11	T1	710	2.9	0.880	44.8	LOS D	17.3	124.5	1.00	1.08	1.38	28.1
12	R2	292	3.9	0.894	54.6	LOS D	14.3	103.8	1.00	1.04	1.49	25.6
Approach		1045	3.2	0.894	47.1	LOS D	17.3	124.5	0.99	1.05	1.39	27.2
All Vehicles		2519	4.8	0.894	42.3	LOS C	18.3	134.0	0.98	0.95	1.21	27.5

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.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	31	33.0	LOS D	0.1	0.1	0.89	0.89
P2	East Full Crossing	96	35.9	LOS D	0.2	0.2	0.93	0.93
P3	North Full Crossing	96	35.9	LOS D	0.2	0.2	0.93	0.93
P4	West Full Crossing	41	35.8	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		264	35.5	LOS D			0.93	0.93

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MOVEMENT SUMMARY

Site: 101 [2019PM]

Wests Newcastle Mixed Use Development
King Street / Union Street Signalised 4 way Cross Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 74 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	232	0.4	0.866	45.6	LOS D	13.9	97.4	1.00	1.05	1.38	28.8
2	T1	98	0.0	0.866	40.1	LOS C	13.9	97.4	1.00	1.05	1.38	23.1
3	R2	70	0.0	0.465	43.4	LOS D	2.6	18.3	0.99	0.75	0.99	29.6
Approach		400	0.3	0.866	43.9	LOS D	13.9	97.4	1.00	1.00	1.31	27.8
East: King Street												
4	L2	44	4.5	0.106	30.2	LOS C	1.3	9.3	0.82	0.72	0.82	34.4
5	T1	796	2.4	0.913	46.0	LOS D	18.7	133.7	1.00	1.17	1.54	27.7
6	R2	155	10.3	0.553	37.9	LOS C	5.4	41.2	0.97	0.80	0.97	22.7
Approach		995	3.7	0.913	44.0	LOS D	18.7	133.7	0.99	1.10	1.42	27.3
North: Union Street												
7	L2	157	5.1	0.807	40.2	LOS C	11.8	85.3	1.00	0.97	1.23	23.0
8	T1	146	2.1	0.807	35.7	LOS C	11.8	85.3	1.00	0.97	1.23	25.2
9	R2	29	0.0	0.193	41.1	LOS C	1.0	7.3	0.97	0.71	0.97	21.6
Approach		332	3.3	0.807	38.3	LOS C	11.8	85.3	1.00	0.95	1.21	23.9
West: King Street												
10	L2	45	0.0	0.105	30.1	LOS C	1.3	9.1	0.82	0.72	0.82	25.1
11	T1	510	1.0	0.577	28.0	LOS B	8.5	59.8	0.94	0.78	0.94	35.1
12	R2	257	0.4	0.856	46.5	LOS D	10.7	75.1	1.00	0.99	1.40	27.9
Approach		812	0.7	0.856	34.0	LOS C	10.7	75.1	0.95	0.85	1.08	31.9
All Vehicles		2539	2.2	0.913	40.0	LOS C	18.7	133.7	0.98	0.98	1.27	28.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	22	29.5	LOS C	0.0	0.0	0.89	0.89
P2	East Full Crossing	64	31.3	LOS D	0.1	0.1	0.92	0.92
P3	North Full Crossing	50	31.3	LOS D	0.1	0.1	0.92	0.92
P4	West Full Crossing	32	31.3	LOS D	0.1	0.1	0.92	0.92
All Pedestrians		168	31.1	LOS D			0.92	0.92

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MOVEMENT SUMMARY

Site: 101 [2019PM + DEV]

Wests Newcastle Mixed Use Development
King Street / Union Street Signalised 4 way Cross Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 81 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	280	0.4	0.893	50.9	LOS D	18.1	127.2	1.00	1.08	1.43	27.1
2	T1	100	0.0	0.893	45.4	LOS D	18.1	127.2	1.00	1.08	1.43	21.4
3	R2	72	0.0	0.523	47.7	LOS D	3.0	20.8	1.00	0.76	1.02	28.2
Approach		452	0.3	0.893	49.2	LOS D	18.1	127.2	1.00	1.03	1.36	26.2
East: King Street												
4	L2	44	4.5	0.104	32.1	LOS C	1.4	10.0	0.82	0.72	0.82	33.6
5	T1	804	2.4	0.907	47.6	LOS D	20.1	143.9	1.00	1.15	1.47	27.2
6	R2	155	10.3	0.558	41.0	LOS C	5.9	45.0	0.97	0.80	0.97	21.7
Approach		1003	3.7	0.907	45.9	LOS D	20.1	143.9	0.99	1.07	1.36	26.7
North: Union Street												
7	L2	157	5.1	0.697	36.8	LOS C	11.5	83.1	0.97	0.86	1.02	24.3
8	T1	146	2.1	0.697	32.3	LOS C	11.5	83.1	0.97	0.86	1.02	26.6
9	R2	57	0.0	0.414	46.2	LOS D	2.3	16.2	0.99	0.75	0.99	20.1
Approach		360	3.1	0.697	36.5	LOS C	11.5	83.1	0.97	0.84	1.02	24.5
West: King Street												
10	L2	45	0.0	0.103	32.0	LOS C	1.4	9.9	0.82	0.72	0.82	24.3
11	T1	510	1.0	0.569	30.1	LOS C	9.2	65.2	0.93	0.78	0.93	34.0
12	R2	257	0.4	0.865	50.6	LOS D	11.7	82.4	1.00	0.99	1.40	26.7
Approach		812	0.7	0.865	36.7	LOS C	11.7	82.4	0.95	0.84	1.08	30.8
All Vehicles		2627	2.1	0.907	42.3	LOS C	20.1	143.9	0.98	0.96	1.23	27.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	22	31.1	LOS D	0.0	0.0	0.88	0.88
P2	East Full Crossing	64	34.8	LOS D	0.1	0.1	0.93	0.93
P3	North Full Crossing	50	33.9	LOS D	0.1	0.1	0.92	0.92
P4	West Full Crossing	32	34.8	LOS D	0.1	0.1	0.93	0.93
All Pedestrians		168	34.0	LOS D			0.92	0.92

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MOVEMENT SUMMARY

Site: 101 [2029PM]

Wests Newcastle Mixed Use Development
King Street / Union Street Signalised 4 way Cross Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 105 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	267	0.4	0.912	64.8	LOS E[11]	23.5	164.8	1.00	1.08	1.41	23.6
2	T1	113	0.0	0.912	59.3	LOS E[11]	23.5	164.8	1.00	1.08	1.41	18.2
3	R2	81	0.0	0.759	64.5	LOS E[11]	4.5	31.6	1.00	0.86	1.27	23.9
Approach		460	0.3	0.912	63.4	LOS E[11]	23.5	164.8	1.00	1.04	1.39	22.5
East: King Street												
4	L2	51	4.5	0.095	34.3	LOS C	1.9	13.6	0.76	0.72	0.76	32.6
5	T1	915	2.4	0.895	51.6	LOS D[11]	28.2	201.1	0.99	1.08	1.29	26.0
6	R2	178	10.3	0.569	49.1	LOS D[11]	8.6	65.3	0.96	0.81	0.96	19.4
Approach		1144	3.7	0.895	50.4	LOS D[11]	28.2	201.1	0.97	1.02	1.22	25.4
North: Union Street												
7	L2	181	5.1	0.790	48.9	LOS D[11]	18.0	129.9	1.00	0.92	1.11	20.3
8	T1	168	2.1	0.790	44.4	LOS D[11]	18.0	129.9	1.00	0.92	1.11	22.3
9	R2	33	0.0	0.314	59.4	LOS E[11]	1.8	12.3	0.99	0.72	0.99	16.9
Approach		382	3.3	0.790	47.8	LOS D[11]	18.0	129.9	1.00	0.91	1.10	20.8
West: King Street												
10	L2	52	0.0	0.094	34.2	LOS C	1.9	13.4	0.76	0.72	0.76	23.4
11	T1	587	1.0	0.531	33.2	LOS C	13.1	92.2	0.88	0.75	0.88	32.5
12	R2	296	0.4	0.882	62.5	LOS E[11]	17.4	122.1	1.00	0.99	1.35	23.7
Approach		934	0.7	0.882	42.5	LOS D[11]	17.4	122.1	0.91	0.82	1.02	28.6
All Vehicles		2920	2.2	0.912	49.6	LOS D[11]	28.2	201.1	0.96	0.95	1.17	25.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	26	32.8	LOS D	0.1	0.1	0.79	0.79
P2	East Full Crossing	77	44.9	LOS E[12]	0.2	0.2	0.93	0.93
P3	North Full Crossing	60	35.3	LOS D	0.1	0.1	0.82	0.82
P4	West Full Crossing	38	44.9	LOS E[12]	0.1	0.1	0.93	0.93

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MOVEMENT SUMMARY

Site: 101 [2029PM + DEV]

Wests Newcastle Mixed Use Development
King Street / Union Street Signalised 4 way Cross Intersection
Site Category: (None)
Signals - Fixed Time Isolated Cycle Time = 127 seconds (Site Practical Cycle Time)
Variable Sequence Analysis applied. The results are given for the selected output sequence.

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	315	0.4	0.893	65.5	LOS E	29.5	206.8	0.99	1.00	1.25	23.4
2	T1	115	0.0	0.893	60.0	LOS E	29.5	206.8	0.99	1.00	1.25	18.0
3	R2	83	0.0	0.709	73.7	LOS F	5.5	38.2	1.00	0.83	1.15	22.0
Approach		513	0.3	0.893	65.6	LOS E	29.5	206.8	1.00	0.97	1.23	22.1
East: King Street												
4	L2	51	4.5	0.095	39.8	LOS C	2.3	16.4	0.75	0.72	0.75	30.6
5	T1	923	2.4	0.911	62.9	LOS E	35.0	249.8	0.99	1.09	1.28	23.1
6	R2	178	10.3	0.568	57.7	LOS E	10.3	78.1	0.96	0.81	0.96	17.4
Approach		1152	3.7	0.911	61.1	LOS E	35.0	249.8	0.97	1.03	1.21	22.6
North: Union Street												
7	L2	181	5.1	0.703	49.9	LOS D	19.6	141.4	0.96	0.84	0.96	20.0
8	T1	168	2.1	0.703	45.3	LOS D	19.6	141.4	0.96	0.84	0.96	22.0
9	R2	61	0.0	0.695	74.9	LOS F	4.1	28.5	1.00	0.81	1.17	14.3
Approach		410	3.1	0.703	51.7	LOS D	19.6	141.4	0.97	0.84	0.99	19.7
West: King Street												
10	L2	52	0.0	0.094	39.7	LOS C	2.3	16.1	0.75	0.72	0.75	21.4
11	T1	587	1.0	0.529	39.5	LOS C	15.8	111.4	0.88	0.75	0.88	30.0
12	R2	296	0.4	0.883	72.2	LOS F	20.6	144.7	1.00	0.97	1.29	21.8
Approach		935	0.7	0.883	49.8	LOS D	20.6	144.7	0.91	0.82	1.00	26.3
All Vehicles		3010	2.1	0.911	57.1	LOS E	35.0	249.8	0.96	0.93	1.12	23.3

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate
P1	South Full Crossing	22	37.8	LOS D	0.1	0.1	0.77	0.77
P2	East Full Crossing	64	47.8	LOS E	0.2	0.2	0.87	0.87
P3	North Full Crossing	50	40.2	LOS E	0.1	0.1	0.80	0.80
P4	West Full Crossing	32	46.0	LOS E	0.1	0.1	0.85	0.85
All Pedestrians		168	43.9	LOS E			0.83	0.83

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MOVEMENT SUMMARY

Site: 101 [2019AM]

Newcastle Wests Mixed Use Development
Union Street / Bull Street Stop Sign 4 Way Cross Intersection
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	32	3.1	0.047	5.6	LOS A	0.0	0.0	0.00	0.22	0.00	55.0
2	T1	347	1.7	0.233	0.6	LOS A	0.9	6.1	0.20	0.16	0.20	54.5
3	R2	85	0.0	0.233	7.2	LOS A	0.9	6.1	0.24	0.15	0.24	43.0
Approach		464	1.5	0.233	2.1	NA	0.9	6.1	0.19	0.16	0.19	50.7
East: Bull Street												
4	L2	55	0.0	0.059	7.8	LOS A	0.2	1.5	0.32	0.88	0.32	38.7
5	T1	37	0.0	0.293	22.7	LOS B	1.1	8.3	0.82	1.05	0.96	35.4
6	R2	27	11.1	0.293	29.4	LOS C	1.1	8.3	0.82	1.06	0.96	29.1
Approach		119	2.5	0.293	17.3	LOS B	1.1	8.3	0.59	0.97	0.67	35.3
North: Union Street												
7	L2	97	5.2	0.054	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	50.4
8	T1	215	2.8	0.233	1.3	LOS A	1.1	8.1	0.37	0.24	0.37	51.7
9	R2	116	0.9	0.233	7.7	LOS A	1.1	8.1	0.37	0.24	0.37	52.1
Approach		428	2.8	0.233	4.0	NA	1.1	8.1	0.29	0.32	0.29	51.5
West: Bull Street												
10	L2	16	0.0	0.020	9.9	LOS A	0.1	0.5	0.41	0.87	0.41	46.7
11	T1	12	0.0	0.069	21.7	LOS B	0.2	1.7	0.80	1.00	0.80	36.5
12	R2	2	50.0	0.069	43.9	LOS D	0.2	1.7	0.80	1.00	0.80	34.2
Approach		30	3.3	0.069	16.9	LOS B	0.2	1.7	0.59	0.93	0.59	40.2
All Vehicles		1041	2.2	0.293	5.1	NA	1.1	8.3	0.29	0.34	0.30	46.9

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

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MOVEMENT SUMMARY

Site: 101 [2019AM + DEV]

Newcastle Wests Mixed Use Development
Union Street / Bull Street Stop Sign 4 Way Cross Intersection
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	32	3.1	0.049	5.6	LOS A	0.0	0.0	0.00	0.21	0.00	55.1
2	T1	371	1.7	0.243	0.5	LOS A	0.9	6.3	0.19	0.15	0.19	54.8
3	R2	85	0.0	0.243	7.2	LOS A	0.9	6.3	0.23	0.14	0.23	43.1
Approach		488	1.5	0.243	2.0	NA	0.9	6.3	0.19	0.15	0.19	51.0
East: Bull Street												
4	L2	55	0.0	0.062	7.8	LOS A	0.2	1.5	0.33	0.88	0.33	38.6
5	T1	37	0.0	0.310	24.0	LOS B	1.2	8.7	0.82	1.06	0.98	34.9
6	R2	27	11.1	0.310	31.8	LOS C	1.2	8.7	0.84	1.06	1.00	28.4
Approach		119	2.5	0.310	18.3	LOS B	1.2	8.7	0.60	0.98	0.68	34.9
North: Union Street												
7	L2	97	5.2	0.054	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	50.4
8	T1	215	2.8	0.237	1.4	LOS A	1.2	8.4	0.39	0.25	0.39	51.5
9	R2	116	0.9	0.237	7.9	LOS A	1.2	8.4	0.39	0.25	0.39	52.0
Approach		428	2.8	0.237	4.1	NA	1.2	8.4	0.30	0.32	0.30	51.4
West: Bull Street												
10	L2	25	0.0	0.032	10.1	LOS A	0.1	0.8	0.43	0.89	0.43	46.6
11	T1	12	0.0	0.073	22.7	LOS B	0.2	1.8	0.81	1.00	0.81	36.1
12	R2	2	50.0	0.073	46.5	LOS D	0.2	1.8	0.81	1.00	0.81	33.7
Approach		39	2.6	0.073	15.8	LOS B	0.2	1.8	0.56	0.93	0.56	41.0
All Vehicles		1074	2.2	0.310	5.2	NA	1.2	8.7	0.29	0.34	0.30	46.9

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

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MOVEMENT SUMMARY

Site: 101 [2029AM]

Newcastle Wests Mixed Use Development
Union Street / Bull Street Stop Sign 4 Way Cross Intersection
Site Category: (None)
Stop (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	37	3.1	0.054	5.6	LOS A	0.0	0.0	0.00	0.21	0.00	55.0
2	T1	399	1.7	0.272	0.7	LOS A	1.1	7.7	0.23	0.16	0.23	54.2
3	R2	98	0.0	0.272	7.6	LOS A	1.1	7.7	0.27	0.15	0.27	42.9
Approach		534	1.5	0.272	2.3	NA	1.1	7.7	0.22	0.16	0.22	50.5
East: Bull Street												
4	L2	63	0.0	0.086	8.0	LOS A	0.3	2.1	0.39	0.89	0.39	38.2
5	T1	43	0.0	0.430	31.6	LOS C	1.7	12.6	0.85	1.09	1.12	32.6
6	R2	31	11.1	0.430	41.9	LOS C	1.7	12.6	0.89	1.10	1.18	25.7
Approach		137	2.5	0.430	23.0	LOS B	1.7	12.6	0.65	1.00	0.79	33.0
North: Union Street												
7	L2	112	5.2	0.062	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	50.4
8	T1	247	2.8	0.278	1.7	LOS A	1.5	10.5	0.42	0.26	0.42	51.0
9	R2	133	0.9	0.278	8.2	LOS A	1.5	10.5	0.42	0.26	0.42	51.7
Approach		492	2.8	0.278	4.4	NA	1.5	10.5	0.32	0.33	0.33	51.1
West: Bull Street												
10	L2	18	0.0	0.025	10.3	LOS A	0.1	0.6	0.44	0.88	0.44	46.4
11	T1	14	0.0	0.107	27.0	LOS B	0.3	2.6	0.85	1.00	0.85	34.2
12	R2	2	50.0	0.107	60.1	LOS E[11]	0.3	2.6	0.85	1.00	0.85	31.4
Approach		35	3.3	0.107	20.3	LOS B	0.3	2.6	0.63	0.94	0.63	38.4
All Vehicles		1197	2.2	0.430	6.0	NA	1.7	12.6	0.32	0.35	0.34	45.9

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

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.

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MOVEMENT SUMMARY

Site: 101 [2029AM + DEV]

Newcastle Wests Mixed Use Development
Union Street / Bull Street Stop Sign 4 Way Cross Intersection
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	37	3.1	0.057	5.6	LOS A	0.0	0.0	0.00	0.21	0.00	55.1
2	T1	423	1.7	0.283	0.7	LOS A	1.1	7.9	0.22	0.15	0.22	54.4
3	R2	98	0.0	0.283	7.7	LOS A	1.1	7.9	0.26	0.14	0.26	43.0
Approach		558	1.5	0.283	2.2	NA	1.1	7.9	0.21	0.16	0.21	50.7
East: Bull Street												
4	L2	63	0.0	0.092	8.0	LOS A	0.3	2.3	0.40	0.89	0.40	38.0
5	T1	43	0.0	0.460	34.0	LOS C	1.8	13.4	0.85	1.09	1.14	31.8
6	R2	31	11.1	0.460	46.1	LOS D	1.8	13.4	0.90	1.11	1.22	24.8
Approach		137	2.5	0.460	24.8	LOS B	1.8	13.4	0.66	1.00	0.82	32.4
North: Union Street												
7	L2	112	5.2	0.063	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	50.4
8	T1	247	2.8	0.282	1.9	LOS A	1.5	11.0	0.43	0.26	0.45	50.6
9	R2	133	0.9	0.282	8.5	LOS A	1.5	11.0	0.43	0.26	0.45	51.5
Approach		492	2.8	0.282	4.5	NA	1.5	11.0	0.33	0.33	0.34	50.8
West: Bull Street												
10	L2	27	0.0	0.037	10.5	LOS A	0.1	0.9	0.46	0.90	0.46	46.2
11	T1	14	0.0	0.110	28.2	LOS B	0.4	2.6	0.86	1.00	0.86	33.9
12	R2	2	50.0	0.110	64.1	LOS E	0.4	2.6	0.86	1.00	0.86	31.0
Approach		43	2.3	0.110	18.8	LOS B	0.4	2.6	0.61	0.94	0.61	39.2
All Vehicles		1230	2.2	0.460	6.2	NA	1.8	13.4	0.32	0.35	0.35	45.7

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

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MOVEMENT SUMMARY

Site: 101 [2019PM]

Newcastle Wests Mixed Use Development
Union Street / Bull Street Stop Sign 4 Way Cross Intersection
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	18	0.0	0.045	5.5	LOS A	0.0	0.0	0.00	0.12	0.00	56.2
2	T1	254	0.4	0.225	1.6	LOS A	1.2	8.5	0.33	0.23	0.33	51.7
3	R2	106	0.9	0.225	8.8	LOS A	1.2	8.5	0.45	0.27	0.45	41.5
Approach		378	0.5	0.225	3.8	NA	1.2	8.5	0.35	0.24	0.35	47.1
East: Bull Street												
4	L2	95	0.0	0.128	9.3	LOS A	0.5	3.2	0.47	0.94	0.47	38.0
5	T1	51	0.0	0.480	32.8	LOS C	2.0	14.2	0.90	1.13	1.25	32.0
6	R2	33	0.0	0.480	41.2	LOS C	2.0	14.2	0.90	1.13	1.25	26.0
Approach		179	0.0	0.480	21.9	LOS B	2.0	14.2	0.67	1.03	0.84	33.4
North: Union Street												
7	L2	117	0.9	0.063	5.6	LOS A	0.0	0.0	0.00	0.58	0.00	50.7
8	T1	409	0.7	0.303	0.5	LOS A	1.1	7.5	0.21	0.12	0.21	55.2
9	R2	98	2.0	0.303	7.1	LOS A	1.1	7.5	0.21	0.12	0.21	54.1
Approach		624	1.0	0.303	2.5	NA	1.1	7.5	0.17	0.21	0.17	53.7
West: Bull Street												
10	L2	49	0.0	0.054	9.3	LOS A	0.2	1.3	0.35	0.88	0.35	47.2
11	T1	18	0.0	0.141	27.2	LOS B	0.5	3.3	0.85	1.00	0.85	35.0
12	R2	6	0.0	0.141	34.3	LOS C	0.5	3.3	0.85	1.00	0.85	35.4
Approach		73	0.0	0.141	15.8	LOS B	0.5	3.3	0.51	0.92	0.51	41.3
All Vehicles		1254	0.6	0.480	6.4	NA	2.0	14.2	0.31	0.38	0.34	45.2

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

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MOVEMENT SUMMARY

Site: 101 [2019PM + DEV]

Newcastle Wests Mixed Use Development
Union Street / Bull Street Stop Sign 4 Way Cross Intersection
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	18	0.0	0.050	5.5	LOS A	0.0	0.0	0.00	0.11	0.00	56.3
2	T1	302	0.4	0.248	1.5	LOS A	1.3	9.1	0.32	0.21	0.32	52.2
3	R2	106	0.9	0.248	8.9	LOS A	1.3	9.1	0.43	0.24	0.43	41.8
Approach		426	0.5	0.248	3.5	NA	1.3	9.1	0.33	0.21	0.33	47.9
East: Bull Street												
4	L2	95	0.0	0.128	9.3	LOS A	0.5	3.2	0.47	0.94	0.47	38.0
5	T1	51	0.0	0.529	37.4	LOS C	2.3	15.8	0.91	1.15	1.33	30.6
6	R2	33	0.0	0.529	47.1	LOS D	2.3	15.8	0.91	1.15	1.33	24.6
Approach		179	0.0	0.529	24.3	LOS B	2.3	15.8	0.68	1.04	0.88	32.5
North: Union Street												
7	L2	117	0.9	0.073	5.6	LOS A	0.0	0.0	0.00	0.51	0.00	51.4
8	T1	409	0.7	0.363	0.7	LOS A	1.2	8.6	0.22	0.15	0.24	54.5
9	R2	98	2.0	0.363	7.5	LOS A	1.2	8.6	0.23	0.13	0.25	53.9
Approach		624	1.0	0.363	2.7	NA	1.2	8.6	0.18	0.21	0.20	53.6
West: Bull Street												
10	L2	53	0.0	0.062	9.7	LOS A	0.2	1.5	0.39	0.89	0.39	46.9
11	T1	18	0.0	0.155	29.2	LOS C	0.5	3.5	0.86	1.00	0.86	34.3
12	R2	6	0.0	0.155	37.4	LOS C	0.5	3.5	0.86	1.00	0.86	34.4
Approach		77	0.0	0.155	16.4	LOS B	0.5	3.5	0.54	0.92	0.54	40.9
All Vehicles		1306	0.6	0.529	6.7	NA	2.3	15.8	0.32	0.37	0.35	45.0

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

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MOVEMENT SUMMARY

Site: 101 [2029PM]

Newcastle Wests Mixed Use Development
Union Street / Bull Street Stop Sign 4 Way Cross Intersection
Site Category: (None)
Stop (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	21	0.0	0.055	5.5	LOS A	0.0	0.0	0.00	0.12	0.00	56.3
2	T1	292	0.4	0.273	2.1	LOS A	1.7	11.9	0.36	0.25	0.40	50.6
3	R2	122	0.9	0.273	9.8	LOS A	1.7	11.9	0.51	0.30	0.56	40.9
Approach		435	0.5	0.273	4.5	NA	1.7	11.9	0.38	0.26	0.42	46.3
East: Bull Street												
4	L2	109	0.0	0.165	10.0	LOS A	0.6	4.3	0.53	0.97	0.53	37.6
5	T1	59	0.0	0.827	79.7	LOS F[11]	4.3	30.3	0.96	1.43	2.22	22.3
6	R2	38	0.0	0.827	93.9	LOS F[11]	4.3	30.3	0.96	1.44	2.25	16.8
Approach		206	0.0	0.827	45.3	LOS D[11]	4.3	30.3	0.73	1.19	1.33	26.3
North: Union Street												
7	L2	135	0.9	0.089	5.6	LOS A	0.0	0.0	0.00	0.47	0.00	51.8
8	T1	470	0.7	0.446	0.9	LOS A	1.7	11.8	0.23	0.16	0.27	54.1
9	R2	113	2.0	0.446	7.8	LOS A	1.7	11.8	0.24	0.14	0.29	53.7
Approach		718	1.0	0.446	2.8	NA	1.7	11.8	0.19	0.21	0.23	53.4
West: Bull Street												
10	L2	56	0.0	0.065	9.6	LOS A	0.2	1.6	0.38	0.89	0.38	47.0
11	T1	21	0.0	0.227	37.5	LOS C	0.7	5.2	0.90	1.02	0.97	31.4
12	R2	7	0.0	0.227	49.6	LOS D[11]	0.7	5.2	0.90	1.02	0.97	30.5
Approach		84	0.0	0.227	19.8	LOS B	0.7	5.2	0.55	0.93	0.57	38.9
All Vehicles		1442	0.6	0.827	10.4	NA	4.3	30.3	0.35	0.41	0.46	41.4

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
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SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

11 Level of Service is worse than the Level of Service Target specified in the Parameter Settings dialog.

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MOVEMENT SUMMARY

Site: 101 [2029PM + DEV]

Newcastle Wests Mixed Use Development
Union Street / Bull Street Stop Sign 4 Way Cross Intersection
Site Category: (None)
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed km/h
South: Union Street												
1	L2	21	0.0	0.058	5.5	LOS A	0.0	0.0	0.00	0.11	0.00	56.3
2	T1	340	0.4	0.292	2.1	LOS A	1.9	13.1	0.35	0.23	0.40	50.8
3	R2	122	0.9	0.292	10.0	LOS A	1.9	13.1	0.48	0.27	0.55	41.1
Approach		483	0.5	0.292	4.2	NA	1.9	13.1	0.37	0.23	0.42	46.9
East: Bull Street												
4	L2	109	0.0	0.191	10.0	LOS A	0.7	4.8	0.55	0.98	0.55	37.3
5	T1	59	0.0	0.954	140.9	LOS F	7.0	49.1	0.95	1.82	3.39	16.1
6	R2	38	0.0	0.954	163.5	LOS F	7.0	49.1	0.98	1.88	3.59	11.3
Approach		206	0.0	0.954	75.8	LOS F	7.0	49.1	0.74	1.39	1.93	20.5
North: Union Street												
7	L2	135	0.9	0.094	5.6	LOS A	0.0	0.0	0.00	0.45	0.00	52.0
8	T1	470	0.7	0.469	1.1	LOS A	1.9	13.2	0.25	0.17	0.32	53.4
9	R2	113	2.0	0.469	8.3	LOS A	1.9	13.2	0.27	0.15	0.35	53.2
Approach		718	1.0	0.469	3.1	NA	1.9	13.2	0.20	0.22	0.26	53.0
West: Bull Street												
10	L2	60	0.0	0.073	10.0	LOS A	0.3	1.8	0.42	0.90	0.42	46.7
11	T1	21	0.0	0.256	41.6	LOS C	0.8	5.9	0.91	1.02	1.00	30.2
12	R2	7	0.0	0.256	55.3	LOS D	0.8	5.9	0.91	1.02	1.00	29.0
Approach		88	0.0	0.256	21.1	LOS B	0.8	5.9	0.57	0.94	0.60	38.1
All Vehicles		1495	0.6	0.954	14.5	NA	7.0	49.1	0.35	0.43	0.56	38.0

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
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Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
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