

Traffic Impact and Parking Report

Block 2, Section 180, Phillip, Building 3 DA


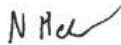


Prepared for Doma Group

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Block 2 Section 180 Traffic Impact And Parking Report.Docx

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1. Introduction

In May 2021, AECOM prepared a Traffic Impact and Parking Assessment (TIPA) for Doma Group to support the Development Application (DA) of the proposed development within Block 2, Section 180 Phillip (B2S180). The development on this site consisted of four buildings.

Since the submission of the original TIPA, Doma Group have developed specific plans for Building 3 on this site and require a site specific TIPA to support the DA submission for just Building 3. Calibre was engaged by Doma Group in November 2021 to prepare the Building 3 site-specific report.

1.1 Site of Works

The development site is located on Phillip Block 2, Section 180, found approximately 350m north of the Westfield Woden Shopping Centre and 300m northwest of the current Woden Bus Interchange. The currently vacant site is bounded by Garth Close to the north, Furzer Street to the east, Corinna Street to the south, and Melrose Drive to the west.

The location of the proposed development site can be seen in Figure 1.1.

Within this site location, four separate buildings have been proposed. The layout of the buildings within the site can be seen in Figure 1.2. Of these buildings, Building 3 is the focus of this assessment.



Figure 1.1 Site Location



Figure 1.2 Site Layout Masterplan

1.2 Scope of Investigation

This report seeks to investigate the traffic and parking impact the proposed Building 3 development is expected to have on the network. This report expands from the original AECOM report for Phillip Block 2, Section 180 development (Appendix A), providing a focussed assessment on a single building (Building 3) as opposed to the broad assessment initially completed. The scope of works covered within this report include:

- Active travel links within and adjacent to the site
- Changes to the assumptions and development yields for the development site
- Traffic impacts on the surrounding road network due to the changes in the development
- Vehicle and bicycle parking requirements for the new development and suitability of the proposed / existing parking
- Commentary on the suitability and constraints around the selected driveway location

Regarding the traffic yields for the site, it is understood that the yields generated for Building 1 and 4 within the original AECOM traffic assessment are acceptable for the Building 3 submission, and that the changes to Building 2 are minor and not expected to adversely impact performance. As such, review of the generation rates for these buildings has not been completed and no additional traffic modelling has been undertaken as part of this assessment. Instead, a quantitative assessment on the traffic generation and expected performance impacts has been undertaken through comparison of current plan generation rates to the previous assessments assumed traffic yields.

2. Existing Conditions

The existing conditions of the site have not changed significantly since the completion of the previous report. A summary of the key site conditions is provided in the sections below. For detailed information on the current site conditions, refer to Section 2 of the *AECOM B2S180 Phillip Traffic Impact Assessment* (Appendix A).

2.1 Current Land Use

The full Block 2 Section 180 Phillip site is currently a vacant site, with no uses associated with it. The site is zoned under the Territory Plan as CZ2: Business Zone. Previous to being made vacant, the site was used as an at-grade carpark.

2.2 Surrounding Road Network

Melrose Drive is an arterial road which runs alongside the western edge of Phillip, extending between Athllon Drive to the south and the Yarra Glen Roundabout to the north. The road consists of two carriageways, with the northbound carriageway operating three lanes of traffic for the majority of its length. The southbound carriageway only operates two lanes for the majority of its length, but does have a section with three lanes of traffic directly north of the Site. The full length of road has a speed environment posted at 60km/h.

Corinna Street operates as a minor collector road, extending between Melrose Drive to the west, and Furzer Street to the east. This section of road consists of two carriageways, each containing a mixture of one and two lanes to allow for turning. It is noted that works were completed along this road in early 2021 to allow for left turn movements only at the Furzer Street intersection. On-street parallel parking is provided along the outside edge of each carriageway, while two zebra crossings facilitate pedestrian movement at the eastern end of the road. The speed environment of this road is posted at 40km/h to improve safety of pedestrians in the area.

Furzer Street is an access street that between Launceston Street to the north and Corinna Street to the south. The road consists of a single carriageway with one traffic lane in each direction. It is noted that works were completed along this road in early 2021 to limit movements within the southbound lane to right only at the intersection with Corinna Street. Also, during these works, a dual lane on-road cycle path was constructed along the full length of the road. This path runs along the eastern edge of the road for the majority of its length, only crossing the road at the pedestrian crossing to the south of Corinna Street. The cycle path is separated from the main road carriageway by barrier kerb, which increases safety for cyclists. Due to the heavy presence of pedestrian and active travel infrastructure, the speed environment for the road is posted at 40km/h, and interrupted by numerous raised zebra crossings along its length.

Garth Close is an access street which extends off Furzer Street to provide access to Section 9 Block 10 Phillip. This road is a no-through road, ending before it connects in with Melrose Drive. The road consists of a single carriageway with one traffic lane in each direction. The speed environment is posted at 40km/h due to the high pedestrian volumes in the area. A pedestrian crossing is also provided across the road where it connects into Furzer Street.

2.3 Existing Parking Facilities

The existing parking facilities have not changed since the completion of the previous traffic report from AECOM. Further details of the parking supply and locations can be found in Section 2.6 of the AECOM TIA report (Appendix A). A summary of the parking is provided below.

2.3.1 Off-Street Parking

There are a number of off-street parking facilities located within Phillip between the Yarra Glen roundabout and Hindmarsh Drive, which are considered acceptable for use by the site. A summary of the existing carparks and their restrictions is shown in Table 2.1.

Table 2.1 Off-Street Car Parking Summary

Parking Restrictions	Number of Spaces Provided
Accessible Parking	7 spaces
Accessible Parking (Time Limited)	2 spaces
Free Parking (Hellenic Club Guests)	245 spaces
Weekday 8:30AM-5:30PM Pay Parking	824 spaces
Weekday 8:30AM-5:30PM Pay Parking (Time Limited)	724 spaces
Pay Parking (Full-time Operation)	940 spaces
Westfield Woden Pay Parking	2,402 spaces
Private Parking / Restricted Access	232 spaces
Total	5,376 spaces

2.3.2 On-Street Parking

On-street parking is available within close proximity to the site along several nearby or adjacent streets. Details of the existing parking provisions along each street is outlined in Table 2.2.

Table 2.2 On-Street Car Parking Summary

Street Name	Parking Restrictions	Number of Spaces Provided
Furzer Street	Weekday 8:30AM-5:30PM Pay Parking (Time Limited)	9 spaces
Worgan Street	Weekday 8:30AM-5:30PM Pay Parking (Time Limited)	20 spaces
Corinna Street	Weekday 8:30AM-5:30PM Pay Parking (Time Limited)	28 spaces
Total		57 spaces

2.4 Public Transport

The proposed site lies within close proximity of the Woden Bus Interchange, with the walking distance approximately 400m. The interchange operates as a hub for many different local and rapid bus routes, providing frequent and reliable public transport options to and from the site. The rapid routes from this location provide reliable connection to all main town centres within the Canberra region, while the local routes provide travel between the nearby suburbs. The route map for the Woden area can be seen in Figure 2.1.

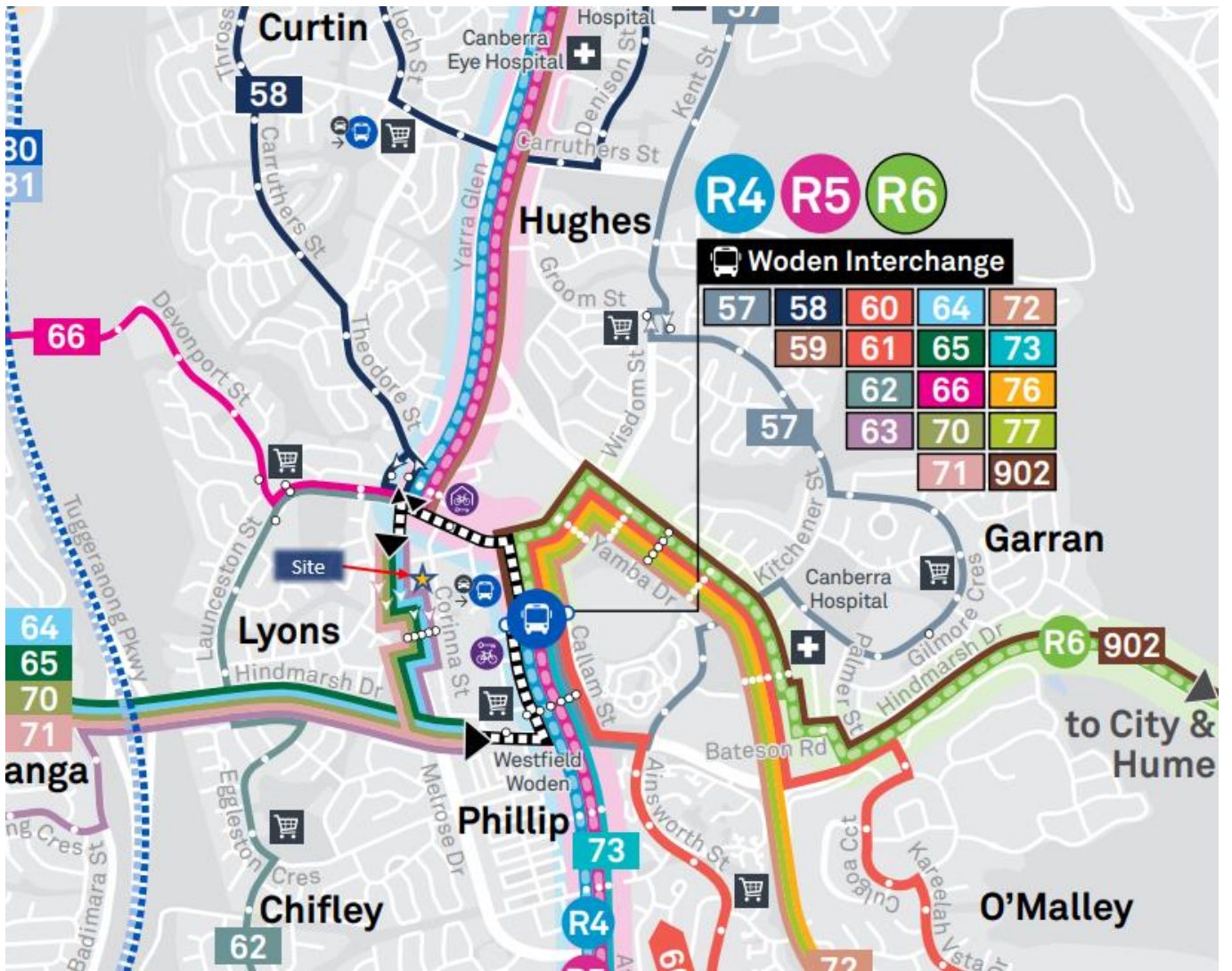


Figure 2.1 Woden Region Weekday Bus Network Map

2.5 Active Travel

Due to the close proximity of the bus station along with high pedestrian attractors within the area, active travel is currently well supported surrounding the site. Wide (6m) pedestrian areas are present along both sides of Corinna Street, Furzer Street, and Garth Close. These wide paved areas persist throughout much of the Woden Town Centre area and allow for safe pedestrian movements between many of the local attractors throughout the area. Crossing of the non-arterial roads is facilitated by numerous zebra crossings. For pedestrians travelling south from the site, two at-grade crossings are located along Corinna Street, spaced approximately 30m apart. Another at-grade crossing is located across the entrance of Garth Close where it intersects with Furzer Street, which allows for northbound pedestrian movements to safely cross the road. For eastbound pedestrian movements, travel across Furzer Street is facilitated by a raised zebra crossing directly adjacent to the site. Additional raised crossings are present along Furzer Street, with other crossings present 90 metres south and 150 metres north of the site crossing.

For pedestrian movements along Melrose Drive, the wide pedestrian areas are replaced with a 1.5m wide footpath which runs between Hindmarsh Drive to the south and Launceston Street to the north. For pedestrians from the site, crossing of Melrose Drive is facilitated by the actuated pedestrian crossings present at the Corinna Street signalised intersection and the Worgan Street signalised intersection. Further south of the Corinna Street intersection, an underpass is also present which would provide safe crossing of the road.

Cycling to and from the site is supported by cyclist specific infrastructure present along both Melrose Drive and Furzer Street. Along Melrose Drive, a 1.5m on-road cycle lane is present along both carriageways and runs the full length of the road. This provides connection to Civic and Tuggeranong, and to the wider cycle network throughout Canberra.

A recent addition to the cycle network within the area is a new cycle path present along Furzer Street and Corinna Street (north-south). This new cycle path was constructed in mid-2021, and is present directly adjacent to road, but is separated from vehicular traffic by a raised kerb. The kerb separation between cyclist movements and the traffic lanes provides additional safety to cyclists compared to traditional on-road cycle lanes. The cycle lanes extend from Launceston Street to the north along Furzer Street to where it ends at Corinna Street, then continues along Corinna Street to the Callam Street intersection. This provides safe cyclist movement through the Woden Town Centre, supporting active travel near the site.

3. Proposed Site Development

3.1 Currently Proposed Layout

3.1.1 Land Use

Phillip Block 2, Section 180 is currently zoned as CZ2: Business Zone and has an area of 11,212m². The proposed use for the land consists of approximately 480 residential dwellings and 11,870m² GFA of mixed-use space, distributed across 4 buildings. As it is understood, the majority of the mixed-use space is provided in Building 1 and Building 4, while most of the residential dwellings are provided within Building 2 and Building 3.

In isolation, Building 3 is proposed to have a footprint of approximately 2,400m² and include 207 residential dwellings across 20 floors. In addition to the residential component, approximately 125m² of retail land use is proposed on the ground floor. Also proposed within Building 3 is 2 levels of basement parking, as well as parking allowances on the ground and podium floors which allows for 278 parking spaces in total. These car parks are intended to help provide the required parking spaces for residents and visitors.

3.1.2 Access Locations

Currently, vehicular access to the Building 3 development is only available through a single driveway off Corinna Street. This driveway provides access to both Building 2 and Building 3 developments, and is proposed as a left-in / left-out (LILLO) access only. As such, vehicles entering the site are required to come from the Melrose Drive / Corinna Street intersection while vehicles exiting the site are required to turn left onto Furzer Street before joining the network either from Worgan Street or via left turn onto Launceston Street.

As per Section 2.3.2 (d) of the Parking and Vehicular Access General Code (PVAGC), the location of the access driveway is expected to be acceptable. Clearance to the upstream high-angle free left turn movement is approximately 60m (minimum required is 20m), while clearance to the downstream left turn movement is approximately 45m (minimum required is 8m). Although in relatively close proximity to adjacent intersections, the low speeds and shared use environment is expected to mitigate potential traffic conflicts along this road.

In addition to the clearances, sight distances for this driveway are clear from obstructions and meet the required distances specified within Austroads documents.

A potential risk that has been identified for this driveway location is that it is in line with the southbound one-way section of Corinna Street, which is not proposed to be accessible from the site. Given the location of the driveway, it is a possible risk that drivers exiting from the site will attempt to shorten travel times by ignoring the left-only requirement of this driveway and instead use the gap in the median to travel either south along Corinna Street or turn right to reach Melrose Drive. Mitigation for this risk has already been proposed, with adjustment of the median extents to further obstruct through movements from the site detailed as part of the proposed works. Installation of "No Entry" or "Left-turn Only" signage may be beneficial at this location to further reinforce the expected behaviour.

3.2 Changes to Traffic Assumptions from the Previous Traffic Assessment

3.2.1 Development Yields and Traffic Generation

Since the completion of the previous AECOM report, the Building 3 plans have been developed further, resulting in changed yields for the site. Buildings 1, 2 and 4 are assumed to have remained consistent with what was previously modelled, and so the impact of these developments will remain the same in the model.

The key changes to the Building 3 development include the addition of a gym within the ground floor which removes a dwelling, inclusion of two retail land uses on the ground floor, and inclusion of two additional dwellings and floors 15-19 in the place of the previously included shared area. The other key change from the previous plan is by having a reduced number of floors, with the current plan only showing 19 floors for residential dwelling use per building, while the previous plan showed 20 floors. The loss of the top floor results in the reduction of dwellings 6 units for Building 3. The total changes to development yields for Building 3 can be seen in Table 3.1.

Table 3.1 Phillip Block 2 Section 180 Development Yield Comparison for Building 3 – Previous vs. Current

Land Use	Development Yield (Current)	Development Yield (Previous)	Difference
Residential Dwellings	207 units	204 units	+3 units
Retail	125m ²	0m ²	+125m ²

The traffic generation for each of the development land uses was determined based upon the rates from the Environmental and Planning Directorate (EPD) Estate Development Code, RTA Guide to Traffic Generating Developments version 2.2, and TCCS Engineering Advisory Note 14.

For the residential dwellings, a peak hour trip rate of 0.337 vehicles per dwelling was adopted, as per the Engineering Advisory Note 14. This rate is considered suitable for all high-density residential dwellings (HDRD) within town centres, regardless of the number of rooms. It is noted that this rate is consistent with what was used during the previous assessment.

For the retail component of the development, it is assumed that these sites will function as either restaurants or cafés. As such, the rate for restaurants as advised in the RTA Guide to Traffic Generating Developments has been used. This results in a peak hour rate of 5 vehicles per 100m² GFA being adopted. As the operation times of the retail uses are not presently known, this generation has been assumed to occur during both AM and PM peak periods. The traffic generated by Building 3 is summarised in Table 3.2.

Table 3.2 Traffic Generation – Building 3

Land Use	Development Yield	Traffic Generation Rate	Peak Hour Generation
Current Plan			
Residential Dwellings	207 units	0.337 veh/h/unit	70 veh/h
Retail	125m ²	0.05 veh/h/m ²	6 veh/h
Total			76 veh/h
Previous Plan			
Residential Dwellings	204 units	0.337 veh/h/unit	69 veh/h
Retail	0m ²	0.05 veh/h/m ²	0 veh/h
Total			69 veh/h
Difference			+7 veh/h

It is noted that the other land use types within Building 3 that do not correlate to residential or retail land uses are considered ancillary to the function of the residential dwellings and are not expected to be used by the general public. As such, no traffic generation is attributed to these uses. Examples of these land uses include the gym, pool, and communal lounge which are located on the podium floor.

3.2.2 Expected Impact to Traffic Performance

As shown in Table 3.2, the expected traffic volumes generated in the peak hour period for Building 3 is 76 vehicles per hour. This is an increase of 7 vehicles per hour over what was allowed within the previously undertaken traffic analysis for the adjacent Phillip road network. This increase in vehicle trips is considered negligible in terms of the traffic modelling, being equivalent to one additional vehicle every 8.5 minutes, and would have minimal impact on the queuing or delays experienced at any of the intersections within the road network. As such, it is considered that the results of the previously undertaken traffic modelling would still be applicable for the current Building 3 plan.

To summarise the results of the previously undertaken traffic modelling, assessment was completed for six different traffic demand scenarios over the road network extent seen in Figure 3.1. The scenarios were as follows:

1. 2019 Base
2. 2021 without development
3. 2031 without development
4. 2031 with B2S180 development only
5. 2031 with all developments
6. 2031 with all developments – Signal Adjustments

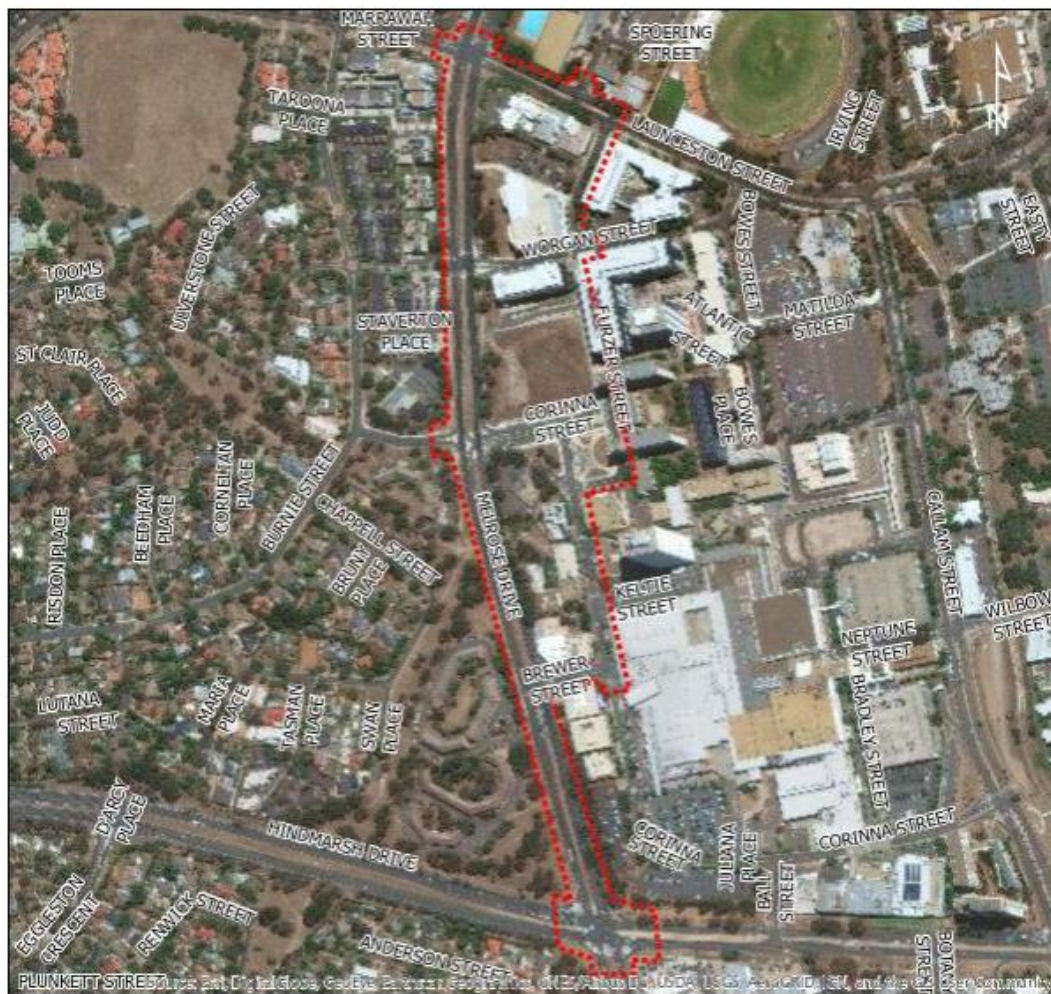


Figure 3.1 Extent of Previously Conducted Aimsun Modelling

The modelling results identified that the background growth within the model between 2019 and 2031 had a sizable impact on the performance of the network as a whole, with approximately 600 additional vehicle trips attributed to this growth. This extra traffic demand is expected to increase the overall network delay from 55 seconds to 91 seconds in the AM peak and from 55 seconds to 78 seconds in the PM peak. In comparison, the addition of the B2S180 site volumes to the 2031 no development scenario (scenario 4) is expected to increase delays by between 5 and 12 seconds. A graph showing the changes in network delay between the six scenarios can be seen in Figure 3.2.

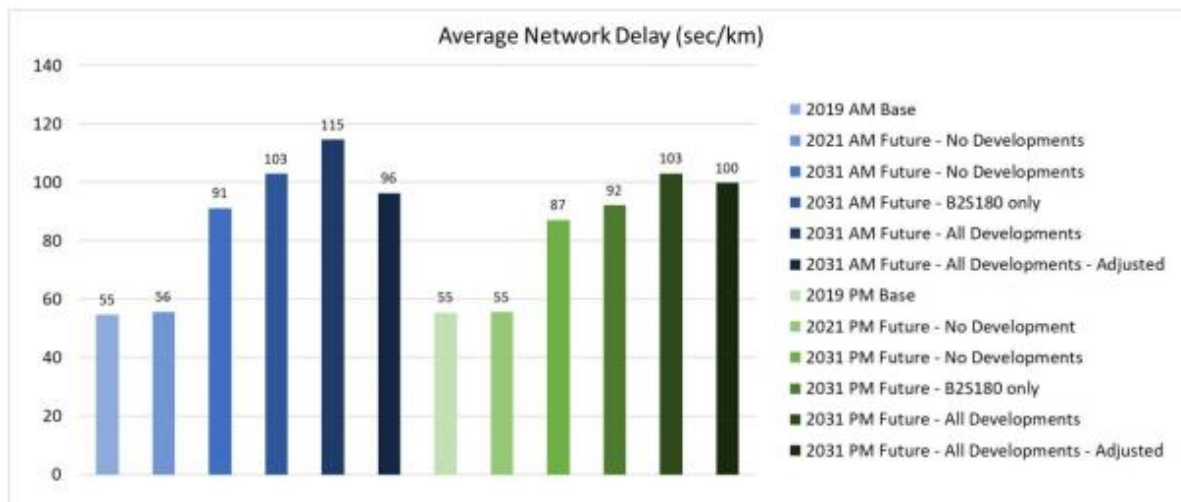


Figure 3.2 Average Network Delays Comparison

For the individual intersection performance within the network, it was found that the addition of the B2S180 traffic volumes to the 2031 no development scenario had only a minor impact on the operation of the intersection. Increases to the delays within both peaks tended to vary between 2 seconds and 7 seconds, which is considered a minor impact. The intersections of Melrose Drive / Launceston Street and Melrose Drive / Hindmarsh Drive are operating with significant delays in all 2031 scenarios, with average delays at LOS E or higher. Both these intersections were seen to be operating at this level prior to the addition of the B2S180 site traffic volumes and so the development is not viewed as the cause of this poor performance. The remaining intersections in the network were all seen to operate with acceptable delays, with none exceeding LOS D.

In summary, the findings of the previous traffic modelling suggested that the addition of the B2S180 development would have a low impact on the performance of the road network, and not result in significant worsening to any of the roads and intersections. Further details into the original modelling outputs and results can be found in Section 4 of the previous AECOM report (Appendix A).

3.3 Parking Requirements and Provision

This assessment is focussed on the parking requirements of Building 3 alone. The parking requirements for the other 3 buildings within the site were accounted for within the previous parking assessment undertaken by AECOM, and parking requirements are assumed to be satisfied with the parking allocations provided within each of these sites.

3.3.1 Car Parking Requirement

To determine the car parking requirements for the Building 3 development, the Parking and Vehicular Access General Code (PVAGC) (ACTPLA, 2014) was referenced. This document details the required parking rates for numerous land uses depending on their zoning under the Territory Plan.

As detailed in Section 2.1 of this report, the land zoning for the whole site, including Building 3, under the Territory Plan is CZ2: Business Zone. The site is also considered as being located within the Woden Town Centre, as identified within the Phillip Precinct Map and Code. With this information, the car parking requirements listed within Section 3.2 of the PVAGC were used to calculate the expected parking generation of Building 3. From this document, the following parking rates were identified.

Residential

- No minimum requirement for residents or visitors

Restaurant

- 5 spaces per 100m² GFA up to 500m²
- 10 spaces per 100m² GFA over 500m²

Using these rates, the parking requirements for the Building 3 development were calculated and can be seen in Table 3.3.

Table 3.3 Building 3 Car Parking Requirements

Land Use	Development Yield (Current)	Parking Rate	Total Parking Spaces
Residential Dwellings	207 units	Nil	0 spaces
Retail	125m ²	5 spaces / 100m ² GFA	7 spaces
Total			7 spaces

3.3.2 Car Parking Provision and Adequacy

Vehicle Parking for Building 3 is provided across 5 floors of the development, with parking available within both basement levels, both upper and lower ground floors, and on the podium floor. The breakdown of these parking spaces can be seen in Table 3.4.

Table 3.4 Building 3 Proposed Parking Space Provision

Parking Level	Parking Space Numbers
Basement 02	37 spaces
Basement 01	79 spaces
Lower Ground	71 spaces
Upper Ground	47 spaces
Podium Level	44 spaces
Total	278 Car Spaces

As can be seen from comparing Table 3.3 and Table 3.4, the parking spaces provided for the site are far in excess of the required parking spaces for the site. An additional 271 parking spaces are included within the development then are required as per the PVAGC.

It is assumed that the excess parking spaces will be provided for use by the residents of the building. As Building 3 contains a total of 207 residential dwellings, an average of 1.3 parking spaces will be available for use by each dwelling, with greater usages expected for the larger dwellings. This rate is noted to be comparable to the residential parking requirement rate for CZ3 zones, and is as such is considered appropriate for resident use.

3.3.3 Accessible Car Parking Requirements

As per Section 2.2.4 of the PVAGC, accessible parking spaces for people with disabilities must at minimum comprise of 3% of the total number of public use parking spaces. It is noted that there is no requirement for accessible parking for resident parking as it is subject to adaptable housing requirements.

As such, none of the 271 parking spaces provided for resident use are required to conform with accessible parking. One (1) of the seven (7) parking spaces required for the retail development is required to be an accessible parking space.

3.3.4 Motorcycle Car Parking Requirements

As per Section 2.4 of the PVAGC, motorcycle parking needs to be provided within carparks which have over 30 parking spaces. The rate of motorcycle parking is 3 per 100 car spaces, with a minimum of 1 per 30 car spaces. It is noted that the motorcycle parking spaces are required in addition to any car spaces required for the development.

For the provided residential parking on site, each dwelling has been allowed dedicated parking spaces which could be utilised for storing either a car or a motorcycle. For the retail component, the number of parking spaces do not meet the required minimum to provide motorcycle parking. As such, dedicated motorcycle parking is not viewed as required for either land use in addition to the current proposed parking spaces.

3.3.5 Bicycle Parking Requirements and Provision

Bicycle parking requirements for Building 3 were determined from the Bicycle Parking General Code (BPGC) (ACTPLA, 2014). The rates for each of the development types is as follows:

Residential (Apartments)

- 1 space per apartment for residents
- 1 space per 12 apartments after the first 12 apartments for visitors

Retail (Restaurant)

- 1 space per 400m² GFA after the first 400m² GFA
- 1 space per 200m² GFA after the first 200m² GFA (min. 2)

Using these rates, the parking requirements seen in Table 3.5 were calculated.

Table 3.5 Building 3 Bicycle Parking Requirements

Land Use	Yield	Resident & Staff			Visitors & Guests		
		Rate	Class	Spaces	Rate	Class	Spaces
Residential Dwellings	207 units	1 per unit	1,2	207 spaces	1 per 12 units after 1 st 12 units	3	17 spaces
Retail	125m ²	1/400m ² after 1 st 400m ²	1,2	0 spaces	1 per 200m ² after 1 st 200m ²	3	2 spaces
Total				207 spaces			19 spaces

As per Section 3.2.2 of the BPGC, dedicated bicycle parking is not required if apartments provide secured, suitably shaped, and accessible bicycle storage spaces. This requirement can be met by the storage cages provided within the car park. Within the current plan, 223 storage cages are available for use by residents. This accounts for all the required resident bicycle parking and as such, no additional secure bicycle parking is required.

To comply with the bicycle visitor parking required within the site, 19 convenient bicycle spaces will require installation at locations near Building 3. To provide this, it is recommended that 10 bicycle parking rails be installed within the landscaped areas surrounding Building 3.

4. Conclusion

In May 2021, AECOM prepared a TIPA to support the DA submission for Block 2, Section 180, Phillip. To allow for the DA submission for Building 3 located within this block, Calibre was engaged by Doma Group to prepare a site specific TIPA for this development which expands upon the findings from the initial AECOM report.

The existing site is currently a vacant lot, with no use allocated to it. The block is classified as CZ2: Business zone under the Territory Plan. The site is within close proximity to a number of existing on and off-street parking facilities. These surrounding sites allow for a total of 5,376 off-street parking spaces and 57 on-street parking spaces accessible off the adjacent streets to the site. The current usage of these parking facilities is however not known and so their usage by the site should not be assumed.

The site is noted to be within close proximity to the Woden Bus Interchange, with a 400m walk between the two sites. From the Woden Bus Interchange, there are a number of public transport options available, with bus routes connecting to all major town centres within Canberra from here. The site is also well set up for active travel, having wide pedestrian areas along all adjacent streets to the site, excepting Melrose Drive. Pedestrian crossings are present along Corinna Street, Furzer Street, and Garth Close, facilitating safe pedestrian movements between the site and the wider Woden Town Centre area. For crossing of Melrose Drive, actuated pedestrian crossings are present across both signalised intersections either side of the site, and an underpass is also located to the south which allows safe crossing. Bicycle movements are facilitated around the site through the on-road cycle lanes along Melrose Drive and the new two-lane cycle path that runs adjacent to Furzer Street and Corinna Street. These routes provide connection with the other major hubs in Canberra, and through the Woden Town Centre respectively.

The Building 3 development lies within the south-east corner of the site, and has a footprint of approximately 2,400m² within the block. The proposed land uses for Building 3 consist of 207 residential dwellings and 125m² of retail GFA.

Building 3 is accessible only from a single driveway access off Corinna Street, which is set out as a LILLO turn movement. One potential concern noted with the driveway location is its alignment, which coincides with the southbound through lane of Corinna Street. This one-way through lane should not be accessible from the site, but given its near straight-through alignment with the site driveway, it is considered a risk that drivers may enter this lane in the attempt to shorten travel times. Installation of appropriate signage and adjustment of the median are recommended to mitigate this risk.

The changes in traffic generation between the previous AECOM modelling activity and the current site plans shows that an additional 7 vehicles are expected to be generated by the site per hour. This equates to an additional vehicle on the network every 8.5 minutes, and as such is not viewed as a major impact. Given this, additional traffic modelling has not been undertaken for the Building 3 traffic assessment, with it being assumed that performance will closely resemble what was observed within the AECOM traffic assessment.

Car parking provisions for Building 3 are expected to be adequate compared to the requirements of the development site. Given the location of the site within the Woden Town Centre, there is no minimum required parking rate for residential dwellings. As such, they provide parking spaces are only technically required for the retail component, which is easily met. It is assumed that the excess parking spaces are intended for use by the residential dwellings, and averages out to approximately 1.3 parking spaces per dwelling. This rate is noted to be comparable to the residential parking rates for CZ3 zones, and as such is viewed as appropriate for this development.

Bicycle requirements for the residential components of the development are expected to be met through the provision of secure storage cages which are available for use by the residential dwellings. 223 storage cages are provided as part of the Building 3 development, while only 207 secure bicycle parking spaces are required, which allows for 16 excess spaces than required. For the visitor parking for both the residential developments and retail developments, a total of 19 class 3 bicycle parking spaces are required. To meet this requirement, it is recommended that 10 bicycle rails be installed surrounding the building.



Block 2 Section 180 Traffic Impact and Parking Report.docx

Appendix A **AECOM B2S180 Phillip Traffic
Impact Assessment Report**

B2S180 Phillip Traffic Impact Assessment

May 2021

Traffic Impact Assessment

Block 2 Section 180 Phillip

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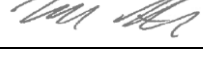
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Acronyms List

Acronym	Definition
ABS	Australian Bureau of Statistics
ACTPLA	ACT Planning and Land Authority (now Environment and Planning Directorate)
ACT PVAGC	ACT Parking and Vehicular Access General Code
CSTM	Canberra Strategic Transport Model
CZ	Commercial Zone
EPD	Environment and Planning Directorate
GEH	Geoffrey E. Havers formula
GFA	Gross Floor Area
HCM	Highway Capacity Manual
LOS	Level of Service
OD Matrix	Origin-destination Matrix
RMS	Roads and Maritime Services
RTA	Road Transport Authority (now Transport for NSW)
SLA	Suburban Land Agency
TCCS	Transport Canberra and City Services
VHT	Vehicle Hours Travelled
VKT	Vehicle Kilometres Travelled

Executive Summary

The proposed development of B2S180 Phillip is a mixed used development consisting mainly of residential dwellings and retail space. The development site is located in Phillip, ACT and is bounded by Melrose Drive, Corinna Street, Garth Close and Furzer Street.

A summary of the key findings of the following report are detailed below:

Adequacy of Car Parking

- The existing on-street (~61) and off-street (~5,376) parking supply for the Woden Town Centre has been outlined in the report. This equates to a total supply of ~5,437 parking spaces for the Woden Town Centre.
- Car parking for the proposed mixed-use development of B2S180 will require 119 spaces for office use, 8 spaces for retail, plus residential parking for the development. There is no minimum residential parking requirement for the development site and no requirement to provide visitor parking within the development site. If visitor parking is not provided within the development site, visitor parking may be catered for within the existing parking supply for Woden Town Centre.
- The proposed parking supply is 627 residential parking spaces, 136 office parking spaces, and 8 retail parking spaces.

Accessible, Motorcycle and Bicycle Parking

- The ACT Parking and Vehicular Access General Code requires that 3% of public car spaces applicable to the office and retail uses must be compliant for disabled parking. This amounts to four disabled parking spaces required for the proposed office and retail uses for the development site.
- The Bicycle Parking General Code for the ACT was used to determine the required supply of bicycle parking spaces. According to the code a supply of 503 bicycle parking spaces should be provided for residents and 52 bicycle parking spaces should be provided for visitors and guests (typically on-street).

Site Access and Service Vehicles

- Four vehicular access locations are proposed on Garth Close (two accesses), Furzer Street and Corinna Street. The provision of four access locations will disperse the development traffic from the previously proposed singular access point on Garth Close and result in reduced vehicle-pedestrian conflicts, improving overall safety for all road-users.
- Service and emergency vehicles access is proposed to be provided from Garth Close, with a turnaround facility present on the western end of the road (to the northern boundary of the development).
- On-site circulation will be facilitated through internal driveways connecting each of the four proposed car parking locations.

Impact on Traffic Operations

- The results from the existing peak hour Aimsun traffic models (2019) has estimated the network operates at a satisfactory level of service in the weekday peak hours and all of the key study area intersections operate at LOS D or better. Although the Launceston Street west approach to Melrose Drive is estimated to operate at LOS F in the AM peak, overall the intersections at Melrose Drive / Launceston Street and Melrose Drive / Hindmarsh Drive both operate with the highest levels of delay with an overall LOS D in both peaks.
- The Aimsun traffic modelling has estimated that the increase in demand from 2019 to 2031 may have an impact on vehicular travel times and delays in the Woden Town Centre road network. The estimated growth calculations for the Town Centre used conservative growth rates and included the impact of all known planned developments in the study area.
- The analysis of future intersection delays and operations has estimated that there could be minor increases in average approach delays at key intersections adjacent to the proposed development.

In the 2031 Aimsun modelling scenario produced to assess the impact of the proposed development alone, in general all of the key intersections in the study area are estimated to operate at overall LOS D or better, with minor overall increases in delay compared to the 'No Development' scenario. The Melrose Drive / Launceston Street intersection (in the AM peak) and the Melrose Drive / Hindmarsh drive intersection (in both peaks) operate at a LOS E or LOS F; however both these intersections operate very close to LOS E or LOS F thresholds in the No Development scenarios This indicates that the proposed development is not likely to have a detrimental impact on the overall road network operation.

- In light of the traffic impact analysis, it is recommended that road network upgrades are not required to facilitate the proposed development traffic.
- Additional scenarios were produced to assess the likely impacts of other planned development in the area, in addition to the proposed development. These scenarios estimated modest impacts at Melrose Drive / Hindmarsh Drive (in the AM peak) and for the northbound right turns from Melrose Drive into Brewer Street, Corinna Street and Worgan Street (in the PM peak). The modelling has identified that these modest impacts in the 'All Developments' scenario could be mitigated through minor signal optimisations at the impacted intersections without additional infrastructure upgrade required.

Active Travel and Public Transport

- Pedestrian and cycle demand growth was applied to the pedestrian crossings and Furzer Street cycle lanes in the 2031 models. There were no notable impacts as a result of the increase in pedestrian and cyclist demand in the study area.
- No significant impacts to the operation of the public transport network were observed as part of this study.

1.0 Introduction

1.1 Background

Doma Group (ABN 74 127 417 574) have engaged AECOM Australia Pty Ltd (ABN 20 093 846 925) to prepare a traffic impact assessment for Block 2, Section 180 in Phillip to support the Development Application (DA) for this proposed development.

1.2 Purpose of this Report

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

- i. Existing traffic and parking conditions surrounding the development site.
- ii. Suitability of the proposed parking in terms of supply (quantum) and layout.
- iii. Service vehicle requirements.
- iv. Pedestrian and bicycle requirements.
- v. The traffic generating characteristics of the proposed development.
- vi. Suitability of the proposed access arrangements for the development site.
- vii. The transport impact of the development proposal on the surrounding road network.

1.3 References

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

- An inspection of the development site and its surrounds.
- Australian Standard/ New Zealand Standard, Parking Facilities, Part 1: Off-Street Car Parking AS/NZS 2890.1:2004.
- Australian Standard, Parking Facilities, Part 2: Off-Street Commercial Vehicle Facilities AS 2890.2:2002.
- Australian Standard / New Zealand Standard, Parking Facilities, Part 6: Off-Street Parking for People with Disabilities AS/NZS 2890.6:2009.
- Environment and Planning Directorate (EPD) Parking and Vehicular Access Code (formerly ACTPLA).
- Environment and Planning Directorate (EPD) Bicycle Parking General Code (formerly ACTPLA).
- EPD (formerly ACTPLA) Residential Subdivision Development Code.
- National Construction Code of Australia (NCC).
- RMS NSW Guide to Traffic Generating Developments (October 2002 Version 2.2).
- Traffic and car parking observations undertaken and as referenced in the context of this report.
- Other documents and data as referenced in this report.
- Transport Canberra And City Services Standard Drawings.
- Transport Canberra And City Services Microsimulation Modelling Guidelines.

2.0 Existing Conditions

2.1 The Development Site

The development site is located on the existing Block 2, Section 180 in Phillip. It is bounded by Garth Close to the north, Furzer Street to the east, Corinna Street to the South and Melrose Drive to the west. The location of the development site is highlighted in Figure 1 with the blue boundary.



Figure 1 Site location (Source: ACTMapi, 2019)

2.1.1 Current Land Use

The development site is currently unoccupied. Under the Territory Plan, the development site is currently zoned as CZ2: Business Zone which implies the following objectives:

- a. Provide for office and business sites that are accessible to public transport and convenience retailing and services.
- b. Provide a diverse range of accommodation sizes and locations for offices close to the retail core.
- c. Encourage provision of convenient outlets for goods, services and facilities to meet the needs of the workforce.
- d. Create vibrant lively pedestrian routes and public spaces.
- e. Ensure a high-quality urban environment through use of sustainable design and materials and maintain a high level of amenity for employees and the public.

2.2 Road Network

2.2.1 Adjoining Roads

2.2.1.1 Melrose Drive

Melrose Drive functions as an arterial road forming a major connection to Yarra Glen and hence to North Canberra and the City. It is primarily configured as two 3-lane carriageways approximately 9.6m in width. On road cycling lanes are provided in both directions in the vicinity of the development site.

2.2.1.2 Corinna Street

Corinna Street functions as a minor collector and has been recently reconfigured. Near the development site, Corinna Street runs in an east to west direction. It is configured with one traffic lane in each direction and has two zebra and one signalised pedestrian crossing on Corinna Street in the vicinity of the development site. Corinna Street provides on-street parallel parking on either side of the road.

2.2.1.3 Furzer Street

Furzer Street functions as an access street and runs in a north to south direction. It is configured with one traffic lane in each direction. Near the subject site, Furzer Street currently facilitates on street parallel parking. There are two raised zebra crossings and one at-grade zebra crossing along Furzer Street.

2.2.1.4 Garth Close

Garth Close is an access street providing access to Section 9 block 10 Phillip. It is a “no-through” road connecting only to Furzer Street. An at-grade zebra crossing is provided across Garth Close at the intersection with Furzer Street.

2.2.2 Existing Site Access

The existing development site has no formal vehicle accesses as there is no current development on the site. Prior to this it was an at-grade carpark providing approximately 525 spaces.

2.2.3 Surrounding Intersections

The relevant intersections to this study (included in the traffic modelling) are:

- Hindmarsh Drive – Melrose Drive
- Melrose Drive – Launceston Street
- Melrose Drive – Worgan Street
- Melrose Drive – Corinna Street
- Melrose Drive – Brewer Street
- Corinna Street – Brewer Street
- Furzer Street – Worgan Street
- Launceston Street – Furzer Street
- Corinna Street – Corinna Street
- Furzer Street – Corinna Street (N)
- Furzer Street – Corinna Street (S)
- Launceston Street – Irving Street
- Brewer Street – Keltie Street
- Furzer Street – Garth Close.

2.2.4 Network Extents

The network extents align with the study area and are shown in Figure 2.



Figure 2 Network extents

2.3 Traffic Volumes

Classified intersection count surveys were undertaken at the locations shown in Figure 3 and listed below. These surveys were conducted on Tuesday, 24 September 2019 during the AM (7:00am to 10:00am) and PM (4:00pm to 6:00pm) peak periods. Counts were also undertaken on Saturday, 21 September 2019 between 11:00am and 2:00pm to determine the level of traffic during the Saturday peak period. A comparison between the weekday AM and PM peak periods and Saturday peak traffic flows was undertaken (refer to Figure 4), which determined the Saturday peak period traffic flows were below both the AM and PM peak periods, and was therefore not considered critical in this assessment.

The following intersections were included in the surveys:

1. Hindmarsh Drive and Melrose Drive
2. Launceston Street and Melrose Drive
3. Worgan Street and Melrose Drive

4. Corinna Street and Melrose Drive
5. Brewer Street and Melrose Drive
6. Brewer Street and Corinna Street
7. Worgan Street and Furzer Street
8. Launceston Street and Furzer Street
9. Corinna Street and Corinna Street
10. Corinna Street and Furzer Street
11. Furzer Street and Corinna Street
12. Launceston Street and Irving Street
13. Keltie Street and Corinna Street.



Figure 3 Classified Intersection Survey Locations

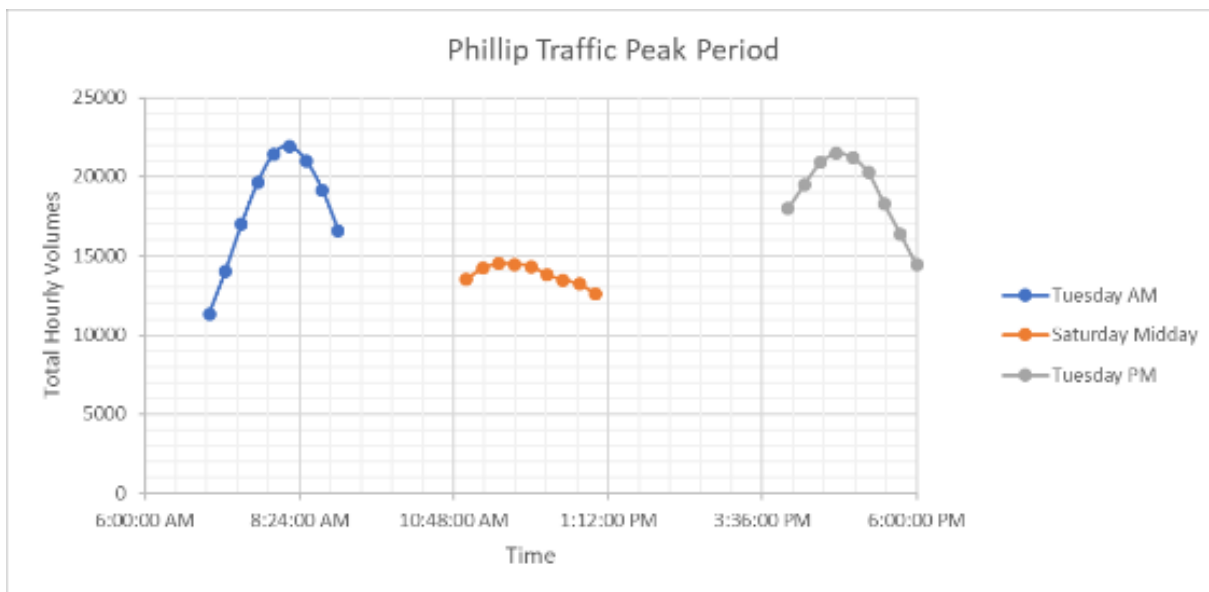


Figure 4 Phillip Traffic Peak Period

The traffic volumes at midblock locations as per the count data are shown in Table 1.

Table 1 Midblock volumes

Midblock Location	AM Peak Hour Two-way Volumes (vph)	PM Peak Hour Two-way Volumes (vph)
Melrose Drive between Launceston Street and Worgan Street	2,867	2,155
Melrose Drive between Worgan Street and Launceston Street	1,279	1,954
Melrose Drive between Worgan Street and Corinna Street	3,553	2,475
Melrose Drive between Corinna Street and Worgan Street	1,003	1,974
Melrose Drive between Corinna Street and Brewer Street	3,562	2,484
Melrose Drive between Brewer Street and Corinna Street	854	1,893
Melrose Drive between Brewer Street and Hindmarsh Drive	3,801	2,559
Melrose Drive between Hindmarsh Drive and Brewer Street	949	2,086
Brewer Street between Melrose Drive and Corinna Street	214	463
Brewer Street between Corinna Street and Melrose Drive	358	333
Corinna Street between Keltie Street and Brewer Street	340	358
Corinna Street between Brewer Street and Keltie Street	308	440
Corinna Street between Furzer Street and Keltie Street	252	286
Corinna Street between Keltie Street and Furzer Street	304	408
Corinna Street between Corinna Street and Furzer Street	237	252

Midblock Location	AM Peak Hour Two-way Volumes (vph)	PM Peak Hour Two-way Volumes (vph)
Corinna Street between Furzer Street and Corinna Street	327	354
Furzer Street between Corinna Street and Corinna Street	23	67
Corinna Street between Furzer Street and Furzer Street	23	48
Corinna Street between Melrose Drive and Corinna Street	96	230
Corinna Street between Corinna Street and Melrose Drive	502	413
Corinna Street between Corinna Street and Furzer Street	129	217
Corinna Street between Furzer Street and Corinna Street	445	292
Furzer Street between Worgan Street and Corinna Street	347	361
Furzer Street between Corinna Street and Worgan Street	190	309
Worgan Street between Melrose Drive and Furzer Street	219	370
Worgan Street between Furzer Street and Melrose Drive	618	590
Furzer Street between Launceston Street and Worgan Street	140	352
Furzer Street between Worgan Street and Launceston Street	395	393
Launceston Street between Irving Street and Furzer Street	970	1,225
Launceston Street between Furzer Street and Irving Street	1,826	1,504
Launceston Street between Melrose Drive and Irving Street	888	1,220
Launceston Street between Irving Street and Melrose Drive	1,972	1,464

2.4 Operational Speeds

AECOM undertook site visits to the study area during the AM and PM peak periods on Thursday 19 September 2019. It was observed on-site that vehicles generally travel faster than the posted speed limit (60km/h east of Melrose Drive and 50km/h west of Melrose Drive) along Launceston Street.

Vehicles along Furzer Street operate at low speeds which is partly attributed to the current construction work during the site observations; however, slow speeds is considered typical of Furzer Street due to the presence of on-street parallel parking, high pedestrian activity and raised zebra pedestrian crossings along the road. In other areas within the study area, vehicles generally operate at or below the posted speed limit.

2.5 Crash Analysis

2.5.1 Road Crashes

Road crash data of the study area has been analysed to identify potential crash hotspots in the area. Figure 5 shows the most recent 5-year period of recorded road crash data, with the data covering the period from 1st January 2014 to 31st December 2018.

Figure 5 indicates that crashes within the study area are typically clustered around the major signalised intersections of Melrose Drive / Launceston Street and Melrose Drive / Hindmarsh Drive. Smaller clusters are present at the signalised Melrose Drive / Corinna Street and Melrose Drive / Brewer Street intersections as well as the priority-controlled intersections at Launceston Street and Irving Street / Furzer Street intersections. Each of these intersections typically feature high vehicle flows and a high number of potential vehicle-vehicle, vehicle-cyclist and vehicle-pedestrian conflicts.

The intersection of Melrose Drive / Hindmarsh Drive has the highest density of crashes within the study area, with 180 recorded crashes over the 5-year period. There are also high number of crashes along Corinna Street despite the comparatively low traffic volumes. Corinna Street is a high-conflict zone; with high pedestrian activity, numerous zebra crossings traversing the road, on-street parallel parking and relatively high bus frequencies.

Of the 811 total crashes captured, 766 were property damage only (approximately 94%), 45 resulted in injury (approximately 6%) and zero resulted in fatalities. This indicates that the crash severity is generally minor, potentially due to the relatively low speed environment through much of the study area.

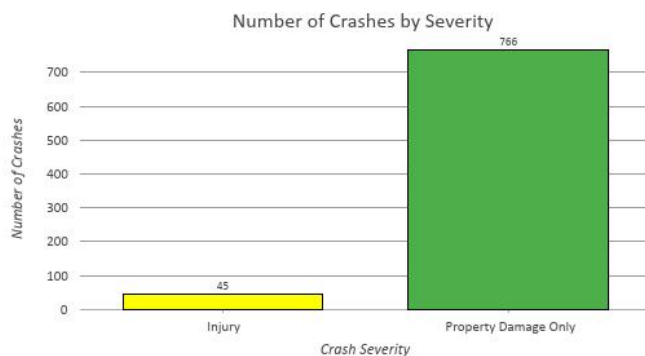
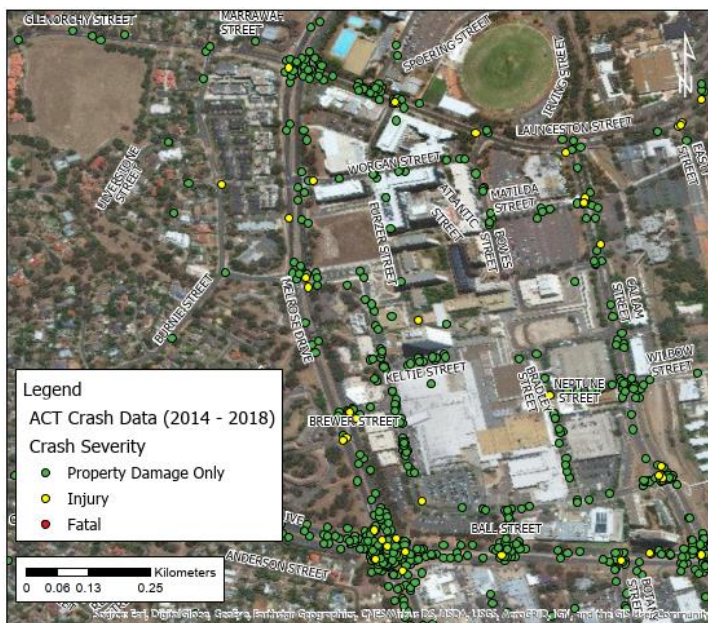


Figure 5 Phillip road crashes (2014-2018)

2.5.2 Pedestrian Crashes

Pedestrian crash data for the study area has been analysed to identify potential pedestrian safety issues and crash hotspots. Figure 6 shows the most recent 5-year period of recorded pedestrian crash data, with the data covering the period from 1st January 2014 to 31st December 2018.

In total, there were 14 pedestrian crashes recorded, with seven of these being injury level crashes. Within the vicinity of the Woden town centre, where there is a lot of pedestrian activity, there were four

injury level crashes. These occurred along Furzer Street, Corinna Street, Neptune Street and Callam Street. At the intersections of Launceston Street / Melrose Drive and Hindmarsh Drive / Melrose Drive there were also injury level pedestrian crashes recorded. These intersections tend to accommodate larger volumes of vehicles that travel at higher speeds due to the arterial function of these roads.

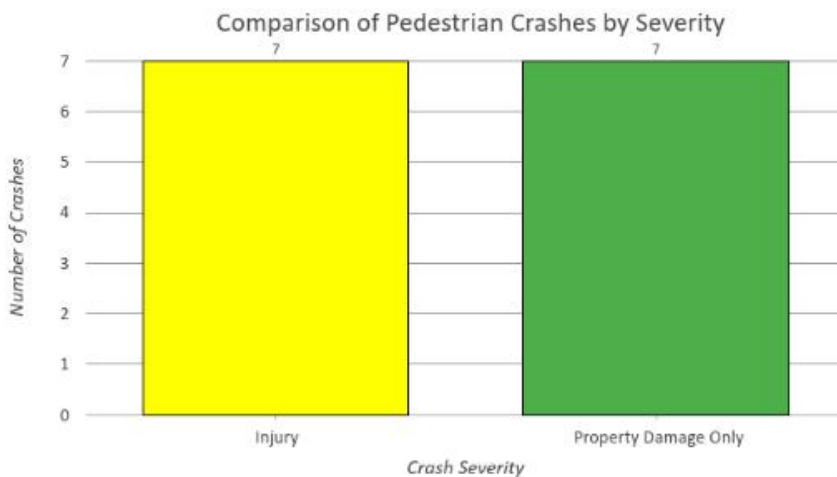


Figure 6 Phillip pedestrian crashes (2014-2018)

2.6 Car Parking

2.6.1 Off-street car parking

Table 2 summarises the off-street parking in the area around the development site, with the parking locations shown in Figure 7.

Table 2 Off-street car parking

Identifier	Parking Location	Number of carparks	Carparking Restrictions
1	Block 19 and 20, Section 23 Phillip	188	Restricted Access
2	Block 1, Section 104 Phillip	411	2-hour limit pay parking – 8.30AM-5.30PM, Mon-Fri
3	Block 17, Section 3 Phillip	104	Pay parking – 8.30AM-5.30PM, Mon-Fri
4	Block 16, Section 3 Phillip	940	Pay parking – Mon -Sun, All day
5	Block 21, Section 6 Phillip	245	Free parking for Hellenic Club members and guests
6	Block 1, Section 7 Phillip	393	4-hour limit pay parking – 8.30AM-5.30PM, Mon-Fri
7	Block 13, 14,15, Section 15 Phillip	70	Pay parking – 8.30AM-5.30PM, Mon-Fri
8	Block 17, 18, Section 15 Phillip	192	Pay parking – 8.30AM-5.30PM, Mon-Fri
9	Keltie St Road Reserve	7	Accessible parking
		4	Permit zone
		5	30 min limit pay parking – 8.30AM-5.30PM, Mon-Thur 8.30AM-9PM, Fri 8.30AM-12PM, Sat
		15	1-hour limit pay parking – 8.30AM-5.30PM, Mon-Fri
		2	1-hour limit accessible parking
10	Block 2, Section 64 Phillip	798	Westfield Woden Pay Parking
11	Block 10, Section 19 Phillip	897	Westfield Woden Pay Parking
12	Block 11, Section 19 Phillip	118	Westfield Woden Pay Parking
13	Block 14, Section 19 Phillip	48	Pay parking – 8.30AM-5.30PM, Mon-Fri
14	Block 7, Section 17 Phillip	100	Pay parking – 8.30AM-5.30PM, Mon-Fri
15	Block 2, Section 105 Phillip	210	Pay parking – 8.30AM-5.30PM, Mon-Fri
16	Block 2, Section 13 Phillip	589	Westfield Woden Pay Parking
17	Block 17, Section 12 Phillip	40	Woden Senior Citizens Club Private Parking

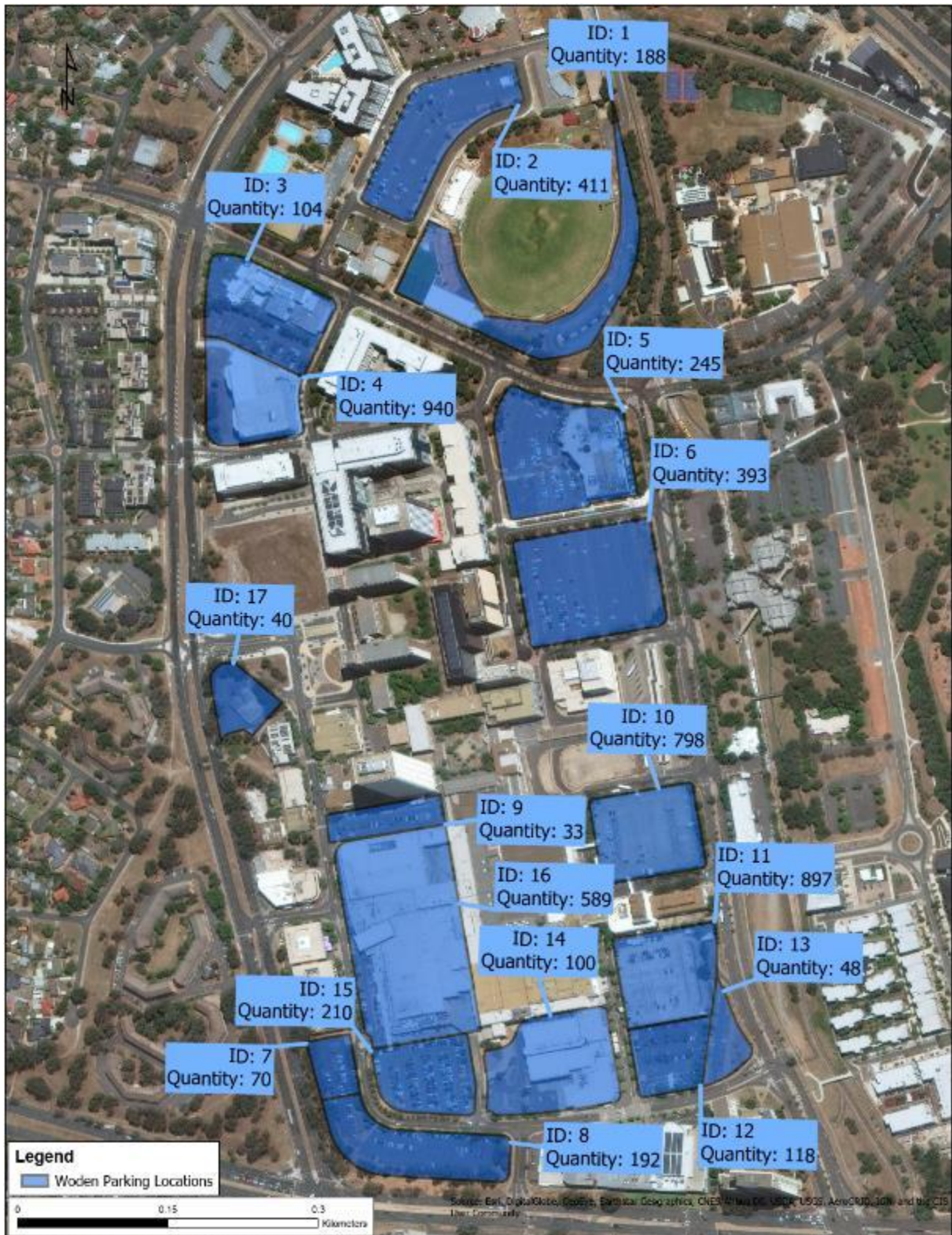


Figure 7 Phillip parking locations

2.6.2 On-street car parking

Table 3 summarise the on-street parking available in the area surrounding around the development site.

Table 3 On-street car parking

Parking Location	Number of carparks	Carparking Restrictions
Furzer Street (between Garth Cl and Corinna St)	9	2-hour limit pay parking - 8.30AM-5.30PM, Mon-Fri 8.30AM-12PM, Sat
Worgan St (between Furzer St and Bowes St)	15	1-hour limit pay parking – 8.30AM-5.30PM, Mon-Fri
	2	Pick-up / set-down bays
	2	Taxi rank
Worgan St (between Furzer St and Melrose Dr)	5	2-hour limit pay parking – 8.30AM-5.30PM, Mon-Fri
Corinna St (between Furzer St and Melrose Dr)	4	30 min limit pay parking – 8.30AM-5.30PM, Mon-Fri
	10	2-hour limit pay parking – 8.30AM-5.30PM, Mon-Fri
Corinna St (between Corina St and Furzer St)	5	2-hour limit pay parking – 8.30AM-5.30PM, Mon-Fri 8.30AM-12PM, Sat
Corinna St (between Furzer St and Keltie St)	3	30 min limit pay parking – 8.30AM-5.30PM, Mon-Thur 8.30AM-9PM, Fri 8.30AM-12PM, Sat
	3	1-hour limit pay parking – 8.30AM-5.30PM, Mon-Thur 8.30AM-9PM, Fri 8.30AM-12PM, Sat
Corinna St (between Brewer St and Westfield Carpark access)	3	1-hour limit pay parking – 8.30AM-5.30PM, Mon-Thur 8.30AM-9PM, Fri 8.30AM-12PM, Sat

2.7 Public Transport

Figure 8 shows the weekday bus network map for the Woden region, with the Woden Interchange bus map shown in Figure 9. The development site is well-served by a frequent and reliable public transport network. Rapid routes provide links to the City, Belconnen, Tuggeranong and the Barton area. These generally operate every 5 to 10 minutes, commencing around 5.30am and ending at midnight.

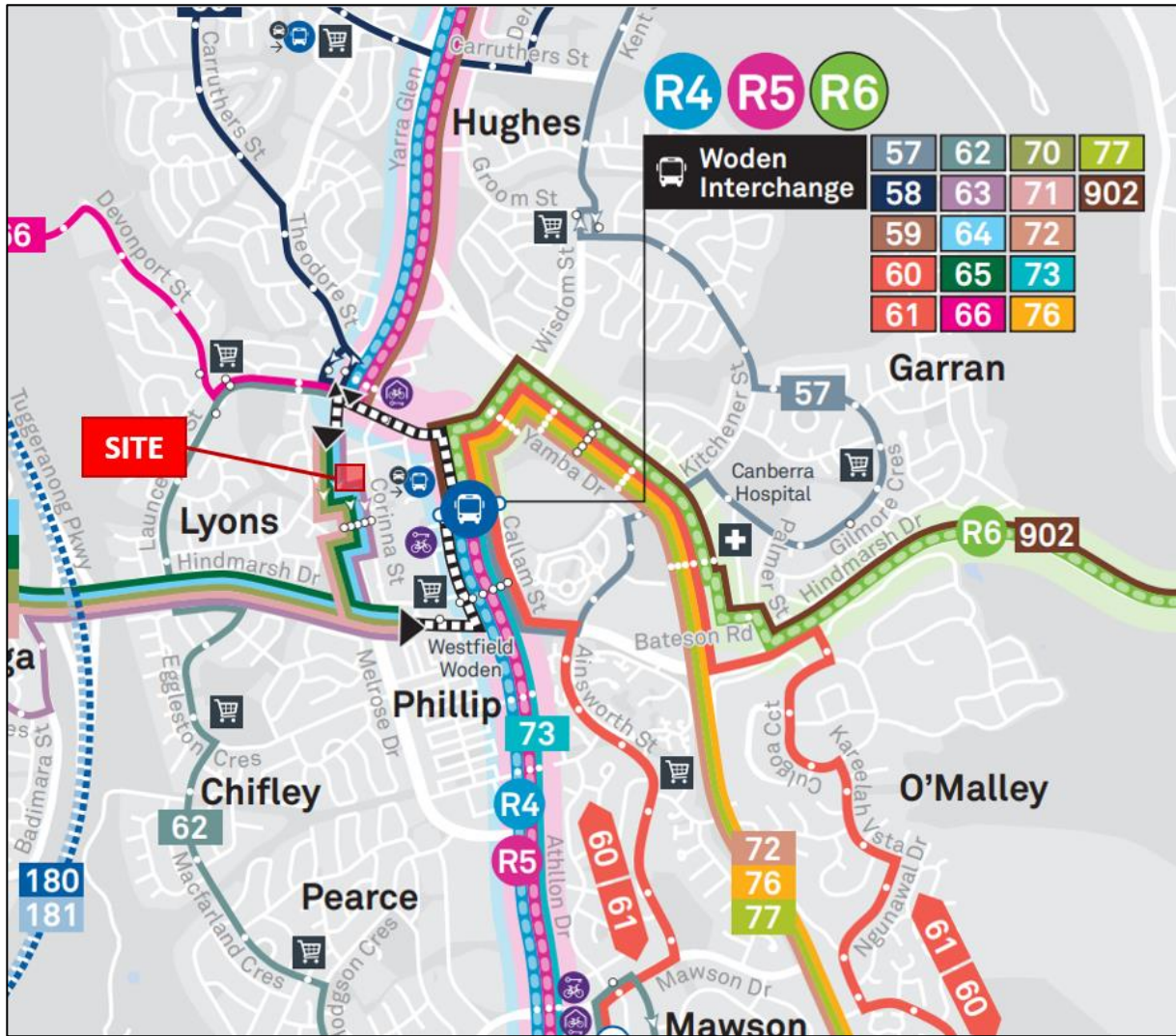


Figure 8 Woden region weekday bus network map (source: Transport Canberra)

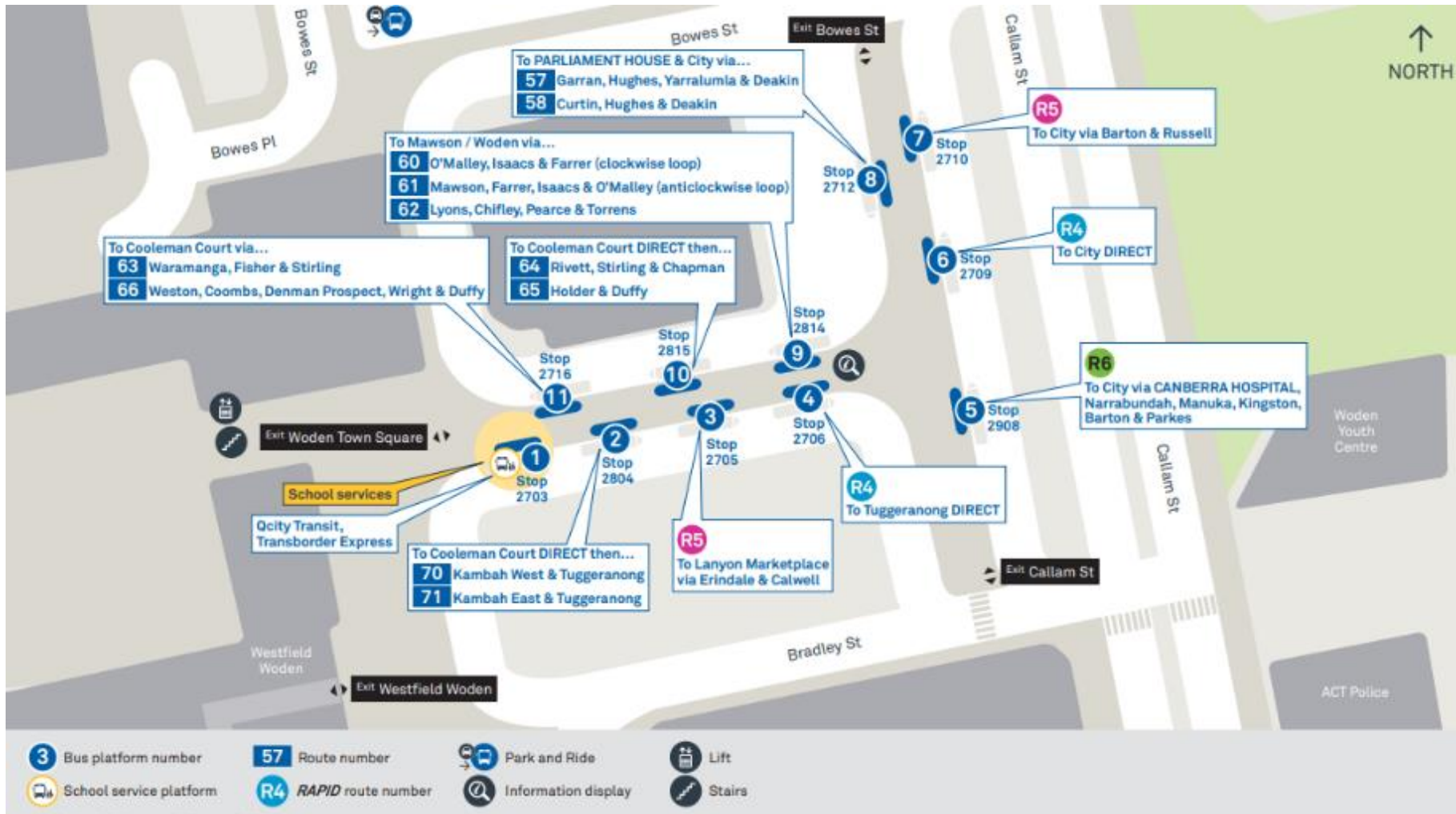


Figure 9 Woden Interchange bus map (source: Transport Canberra)

2.8 Pedestrian and Cyclist Facilities

2.8.1 Attractors

Figure 10 shows the key attractors in the Woden Town Centre. These include:

- A. Phillip Pool
- B. Phillip Ice Skating Rink
- C. Phillip Oval
- D. Skypark Carpark
- E. Furzer Street Offices
- F. Woden Library
- G. Westfield Woden Shopping Centre
- H. Hellenic Club
- I. Koomarri Centre
- J. Smith's Family Centre
- K. Woden Bus Interchange
- L. Chemist Warehouse and Restaurants
- M. Woden Specialist Medical Centre
- N. Southern Cross Club
- O. Bowes Street Offices/Shops
- P. Cricket ACT Centre.

There is a high level of pedestrian activity around the bus interchange, which links to the nearby offices, Westfield Shopping Centre and library. Furzer Street is heavily pedestrianised with links to the major carparks, cafes and offices. There is also a pedestrian thoroughfare accessed from Furzer Street near the development site, which links to the office buildings, library and shopping centre.

There are a number of carparks that generate pedestrian traffic, as shown in Figure 11. Pedestrian links and pedestrian crossing facilities are provided to most of these locations. The section of Corinna Street between Brewer Street and Bradley Street provides limited formal pedestrian crossings across Corinna Street despite the car parks through this section providing 262 car parks, generating major pedestrian movements to / from the retail and commercial centres. There is currently 420m between formal pedestrian crossings on Corinna Street between Brewer Street and Bradley Street (refer Figure 12), with vehicles parking in the south-west corner of the development site likely to cross at undesignated locations; or walk several hundred metres to the formalised crossing locations, which would still require pedestrians to cross intersections without any formal pedestrian priority.

There are limited pedestrian crossing facilities along Launceston Street between Melrose Drive and Callam Street towards the town centre. It is understood, however, that the Irving Street intersection will be upgraded to signals, which would provide an additional crossing location for pedestrians crossing Launceston Street.



Figure 10 Phillip attractors



Figure 11 Woden parking and pedestrian facilities



Figure 12 Pedestrian crossing locations on Corinna Street

2.8.2 Pedestrian and Cycle Routes

Figure 13 shows the existing pedestrian and cyclist facilities as per the ACT Government Open Data Portal. Public footpaths follow the verges of most streets and allow access for both pedestrians and cyclists. Areas such as Furzer Street, Worgan Place and Corinna Street are highly pedestrianised as these streets provide access to office buildings, the library and the Westfield Woden Shopping Centre. The footpaths in this area are well-established and in good condition. On-road cycle lanes are available on both sides of Melrose Drive, Launceston Street and Hindmarsh Drive.



Figure 13 Pedestrian and cyclist facilities (source: ACT Government Open Data Portal)

2.8.3 Gap Analysis

AECOM undertook a site visit on Thursday 19 September 2019 to identify potential gaps and deficiencies in the existing active transport network within the study area. The gaps and deficiencies identified during the site observations are described below and presented graphically in Figure 14.

1. Several sections of the footpath along Melrose Drive between Corinna Street and Brewer Street are in poor condition, with frequent cracking and uneven surfaces. Figure 15 demonstrates the typical condition of the footpath through this section. The footpath along Melrose Drive narrows at the Melrose Drive underpass (refer Figure 16) resulting in a pinch point. It is unlikely this section of the footpath would allow a pram or mobility impaired individual to continue along the footpath without encroaching onto the road reserve.
2. Several sections of the footpath along Melrose Drive between Brewer Street and Hindmarsh Drive are poor condition, with frequent cracking and uneven surfaces. Figure 15 demonstrates the typical condition of the footpath through this section.
3. The area surrounding the Melrose Drive underpass is disjointed and uninviting. Several pedestrian paths are very narrow, covered by foliage or have cracked and uneven surfaces. Lighting also appears to be insufficient. Figure 17 and Figure 18 show the typical conditions surrounding the underpass.
4. Access to Bowes Street from the stairs is also uninviting and is need of revitalisation (Figure 19).
5. The link from Furzer Street to the Westfield Shopping Centre, library and bus interchange needs to be upgraded in terms of the quality of path and stairs. There is also a trip hazard at the stairs near the drain (Figure 20).
6. There are several desire paths surrounding the Melrose Drive underpass where pedestrians take short cuts over the grass and through the trees (refer Figure 21).

As these are Territory assets it is recommended they are repaired by TCCS as they could pose a safety risk to the general public. Images and locations of these deficiencies are outlined in Figure 14.



Figure 14 Phillip gap analysis (mapping source: Google Earth)



Figure 15 Melrose Drive footpaths



Figure 16 Narrow footpath on Melrose Drive at underpass



Figure 17 Melrose Drive underpass



Figure 18 Pedestrian connections at Melrose Drive underpass



Figure 19 Bowes Street access



Figure 20 Furzer Street and Westfield link



Figure 21 Desire path towards the Woden Town Centre

3.0 Proposed Development

3.1 Land Use

Phillip B2 S180 is currently zoned as CZ2: Business Zone and has an area of 11,212m². The proposed land used for the development site is 480 residential dwellings and 11,870 m² GFA of mixed-use space. Any non-residential and non-office land uses will be ancillary and are assumed to be non-traffic generating. A 3D model of the proposed development can be seen below in Figure 22.



Figure 22 Proposed Development 3D Model

3.2 Traffic Generation

The traffic generation for the development was determined based upon rates from the Environmental and Planning Directorate (EPD) Estate Development Code, RTA Guide to Traffic Generating Developments version 2.2 and TCCS' Engineering Advisory Note 14.

A trip rate of 0.337 vehicles per dwelling in a peak hour was applied to residential units as per the EPD Estate Development Code.

A trip rate of 2 vehicles per 100 m² GFA in a peak hour was applied to the office GFA as per the RTA Guide to Traffic Generating Developments.

A summary of the estimated peak hour trip generation for the development is as follows:

Table 4 Traffic Generation – Development Site

Land Use	Yield	Units	Vehicle Trips per Peak Hour	Peak Hour Generation
Residential	480	units	0.337	162
Office	11,870	m ² GFA	0.02	237
TOTAL				399 veh/hr

In addition to trips for the proposed Phillip B2 S180 development, forecast traffic generation for other proposed developments in the model area was included as agreed with TCCS at the commencement of the traffic analysis. The demands for these other developments was determined using previously agreed rates / yields from other traffic reports, assumptions on land uses and using the Environmental

and Planning Directorate (EPD) Estate Development Code and RTA Guide to Traffic Generating Developments version 2.2. A summary of the trips generated for these other development sites is outlined below in Table 5.

Table 5 Estimated traffic generation from nearby developments

Development			AM Traffic Rate	PM Traffic Rate	AM Trips Generated	PM Trips Generated
B2 S64 - GRAND CENTRAL TOWERS (B8 S35)						
Residential	429	apartments	0.337	0.337	145	145
Mixed-use (assumed)	3,377	GFA	0.02	0.02	68	68
B50/52 S172 - DOMA A&A (B91 S8)						
Residential	186	units	0.337	0.337	63	63
Allambie Development						
Residential (assumed)	100	dwellings	0.337	0.337	34	34
B9 S53						
Residential	704	dwellings	0.337	0.337	237	237
B17S3 – WOVA						
Residential	800	apartments	0.337	0.337	270	270
Retail	357	m2 GFA	0.02	0.02	7	7
Food and Bev	1,653	m2 GFA	0.02	0.02	33	33
Commercial	404	m2 GFA	0.02	0.02	8	8
B16 S3						
Residential	120	dwellings	0.337	0.337	40	40
GRAND TOTAL					904	904

3.3 Parking Provision

3.3.1 Car Parking Requirement

The car parking requirements for various types of developments in the ACT are detailed in the EPD (formerly ACTPLA) Parking and Vehicular Access General Code (PVAGC). The code indicates the following rates for residential and office based on the zoning of the site. The proposed development is in the CZ2 business zone and is located within the Woden town centre.

- No minimum requirement for residential units
- 1 space per 100 m² GFA for office spaces
- 5 spaces per 100 m² GFA for retail / restaurant

The following table outlines the parking requirement, given the assumption outlined in Section 3.1 regarding the office land use.

Table 6 Car parking requirement

Use	Yield	Units	Provision Rate	Parking Requirement
Residential	480	units	No minimum requirement	0
Offices	11,870	m2 GFA	0.01	119
Retail	160	m2 GFA	0.05	8
TOTAL				127

3.3.2 Accessible Parking Requirement

The ACT Parking and Vehicular Access General Code requires that 3% of public car spaces applicable to the office and retail uses must be compliant for disabled parking. This amounts to four disabled parking spaces required for the proposed office and retail uses for the site.

3.3.3 Bicycle Parking Requirement

The Bicycle Parking General Code for the ACT was used to determine the required supply of bicycle parking spaces.

According to the code the following supply of bicycle parking spaces must be provided for visitors and guests:

For residential units:

- 1 space per unit for residents; and
- 1 space per 12 units after the first 12 units for visitors.

For office areas:

- 1 space per 250 m² GFA after the first 250 m² GFA for employees; and
- 1 space per 950 m² GFA after the first 400 m² GFA

Table 7 summarises the bicycle parking requirement as per the Code.

Table 7 Bicycle parking requirement

Land Use	Yield	Employees			Visitors and Guests			Total
		Spaces per unit	Class	Subtotal	Spaces per unit	Class	Subtotal	
Residents	480 units	1 per unit	1, 2	480	1/12 units after 1st 12 units	3	39	519
Office	11,870 m ²	1/250 m ² after 1st 250 m ²	1,2	23	1/950 m ² after 1st 400 m ²	3	13	36
TOTAL				503			52	555

3.3.4 Parking Supply

3.3.4.1 Car Parking

The proposed car parking supply against the required parking is presented in Table 8

Table 8 Proposed Car Parking Supply Against Requirements

Land Use	Car Park Requirement	Car Park Supply	Difference
Residential	0	627	+627
Office	119	136	+17
Retail	8	8	0
Total	127	771	+644

As shown in Table 8, there would be

- 627 car parks supplied for the residential units, noting the requirement is 0 car parks;
- an excess of 17 car parks supplied for the office spaces; and
- an excess of 0 car parks for the retail spaces.

3.3.4.2 Bicycle Parking

The proposed bicycle parking supply against the required parking is presented in Table 9.

Table 9 Proposed Bicycle Parking Supply Against Requirements

Land Use	Bicycle Parking Requirement	Bicycle Parking Supply	Difference
Residential	519	520	+1
Office	36	70	+34
Total	555	590	+135

As shown in Table 9, there would be

- an excess of 1 bicycle parks supplied for the residential units; and
- an excess of 34 bicycle parks supplied for the office spaces.

3.4 Site Access Locations

3.4.1 Vehicular Access

Four ingress and egress vehicular access points are proposed for the development site, with one access located on Corinna Street, one on Furzer Street and two on Garth Close (refer to Figure 23). It is assumed that the access on Corinna Street will be left-in / left-out only, with the accesses along Furzer Street and Garth Close allowing all movements.

The provision of four vehicular access points allows for vehicle trips to be distributed amongst the four access points as each building will use their own access point/points and hence spread the overall development traffic to / from the surrounding road network. The additional access points will also decrease the strain on the Furzer Street / Garth Close intersection and the access points on Corinna Street and Furzer Street will also reduce vehicle-pedestrian conflicts, with the Corinna Street access allowing vehicles to potentially bypass up to four pedestrian crossings, improving overall network safety outcomes for all users.

Building 1 can be accessed from the two accesses on Garth Close; Building 2 and Building 3 will have a shared access from Corinna Street; and Building 4 can be accessed from the main access on Garth Close. Ancillary-use access will be provided to a small number (37) of car parking spaces only via Furzer Street.

It is important to note that the Furzer Street access would service only a limited number of ancillary trips.

The location of the Furzer Street development access was discussed and agreed with TCCS on Tuesday 4th May 2021 on the understanding that provision of a passing bay within the development block boundary (so that a one-way arrangement on the verge can be achieved) is considered at the Design Review stage.

Sight lines for all four vehicular access points are clear from any obstructions as determined from the site inspection. Although the Corinna Street and Furzer Street accesses are located within close proximity to adjacent intersections, the low speed, shared use environment is likely to mitigate potential traffic conflict issues.

Traffic volumes forecast to utilise each access point are shown in Section 4.3.1.1. Section 4.4.1 includes analysis and commentary on access intersection performance, controls and possible queuing.

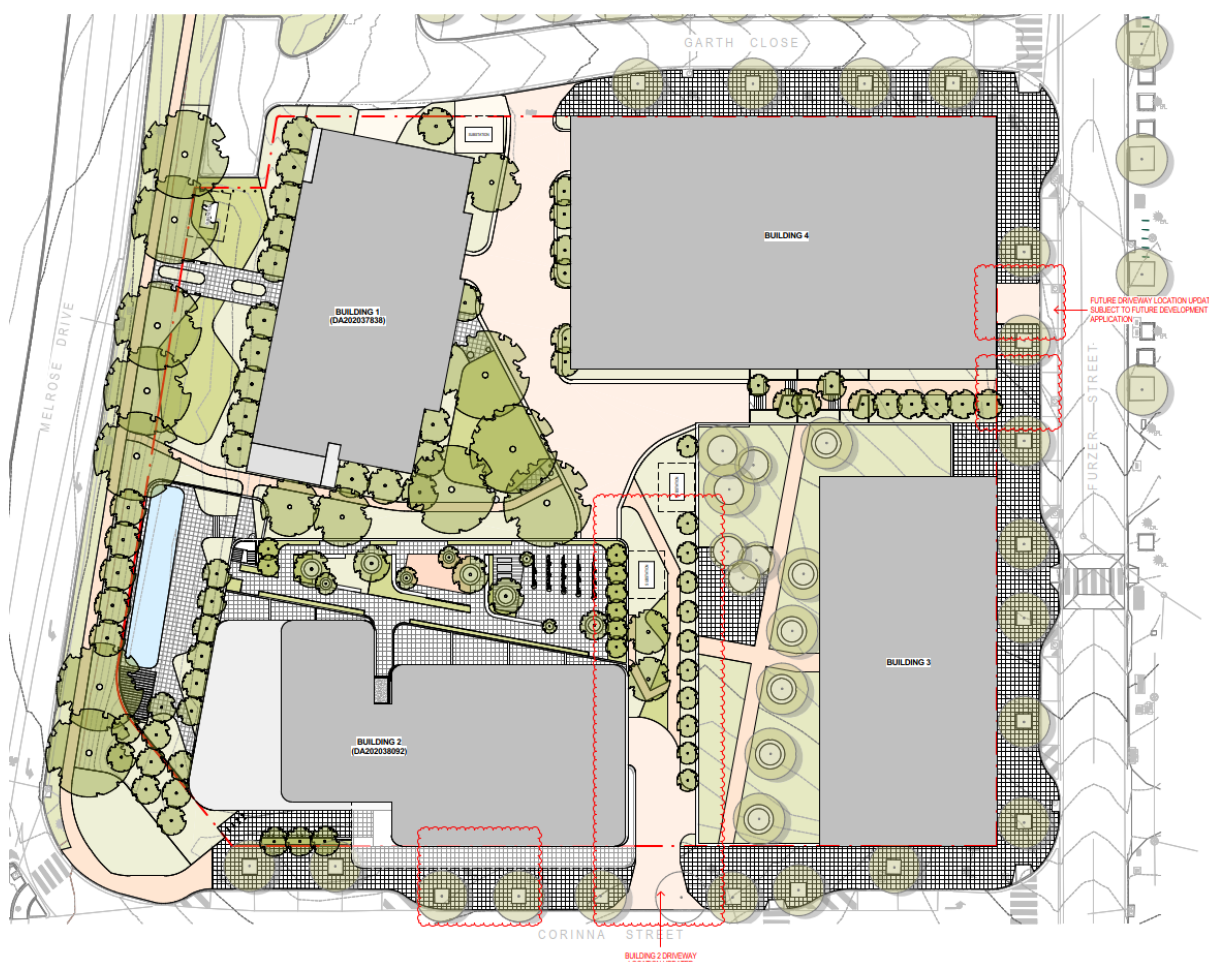


Figure 23 Indicative location for site access

3.4.2 Service/Emergency Vehicle Access

Service / emergency vehicle access is facilitated at the end of Garth Close, with a turnaround facility provided on the western side of Garth Close to allow service / emergency vehicle access / egress from the site.

The driveway will be designed to discourage non-local vehicle movements and minimise potential impact to all pedestrians and cyclists through the implementation of design approaches such as low vehicle speeds, localized road narrowing, speed humps, and pavement treatments as required.

3.5 On-Site Circulation

On-site circulation has been designed to align with the relevant Australian Standards. These include *AS/NZS 2890.1 Parking Facilities – Off-street parking* and *AS/NZS 2890.2 Parking Facilities – Off-street Commercial Vehicle Facilities*. Figure 23 above indicates that circulation between each of the four proposed car parking areas is facilitated through internal access roads.

4.0 Network Analysis

4.1 Study Area Definition

The Aimsun modelling extents were determined based on the location of the site (B2S180 Phillip) and traffic distribution through the existing road network. The extents of the Aimsun model network is shown in Figure 24 as the red boundary.

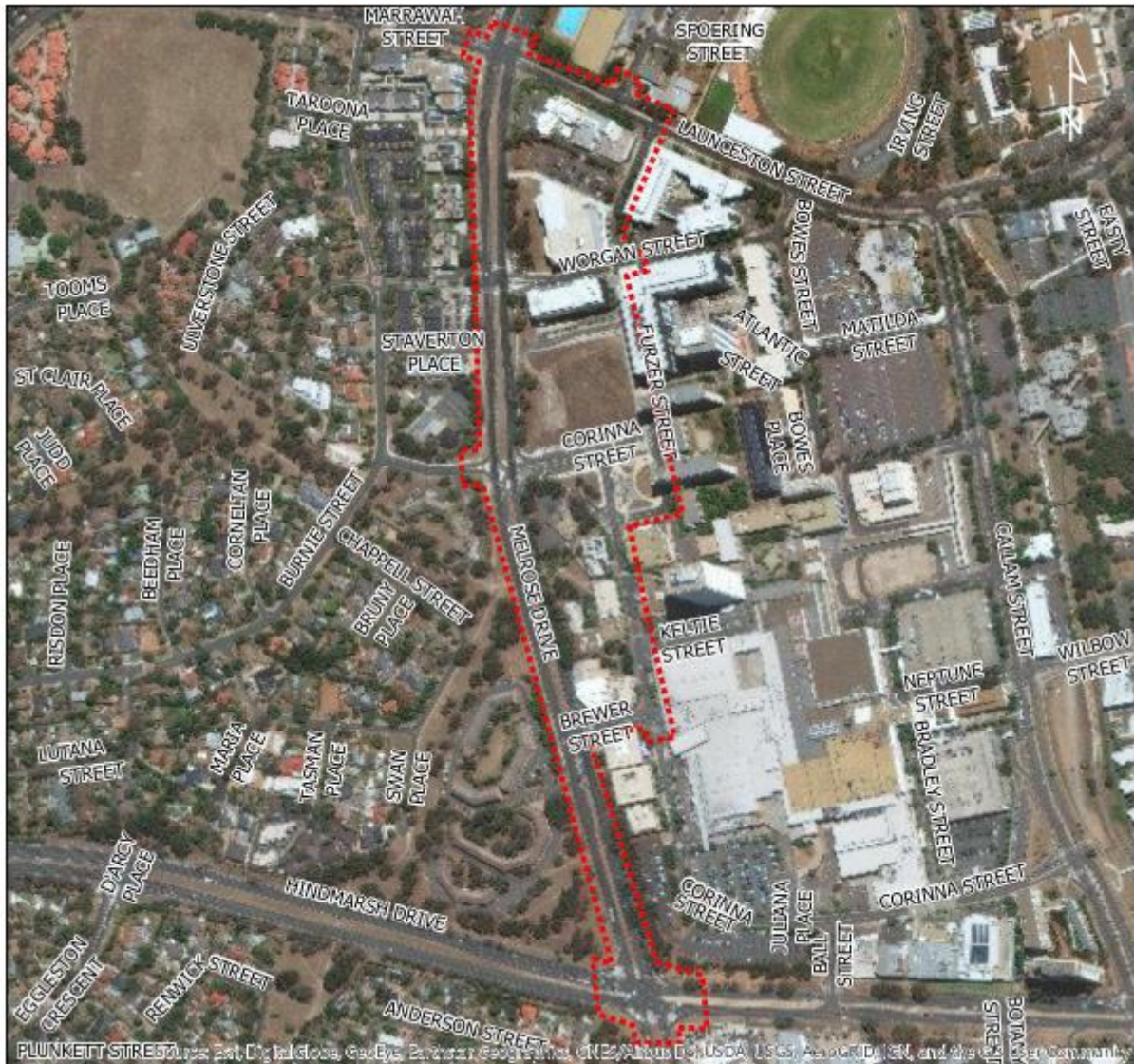


Figure 24 Phillip Aimsun Modelling Area

The Aimsun model network is shown in Figure 25; which depicts the intersection layouts, network extents and centroid (zone) locations for the Aimsun model. The model network was developed using a combination of aerial imagery, GIS network data and site observations.

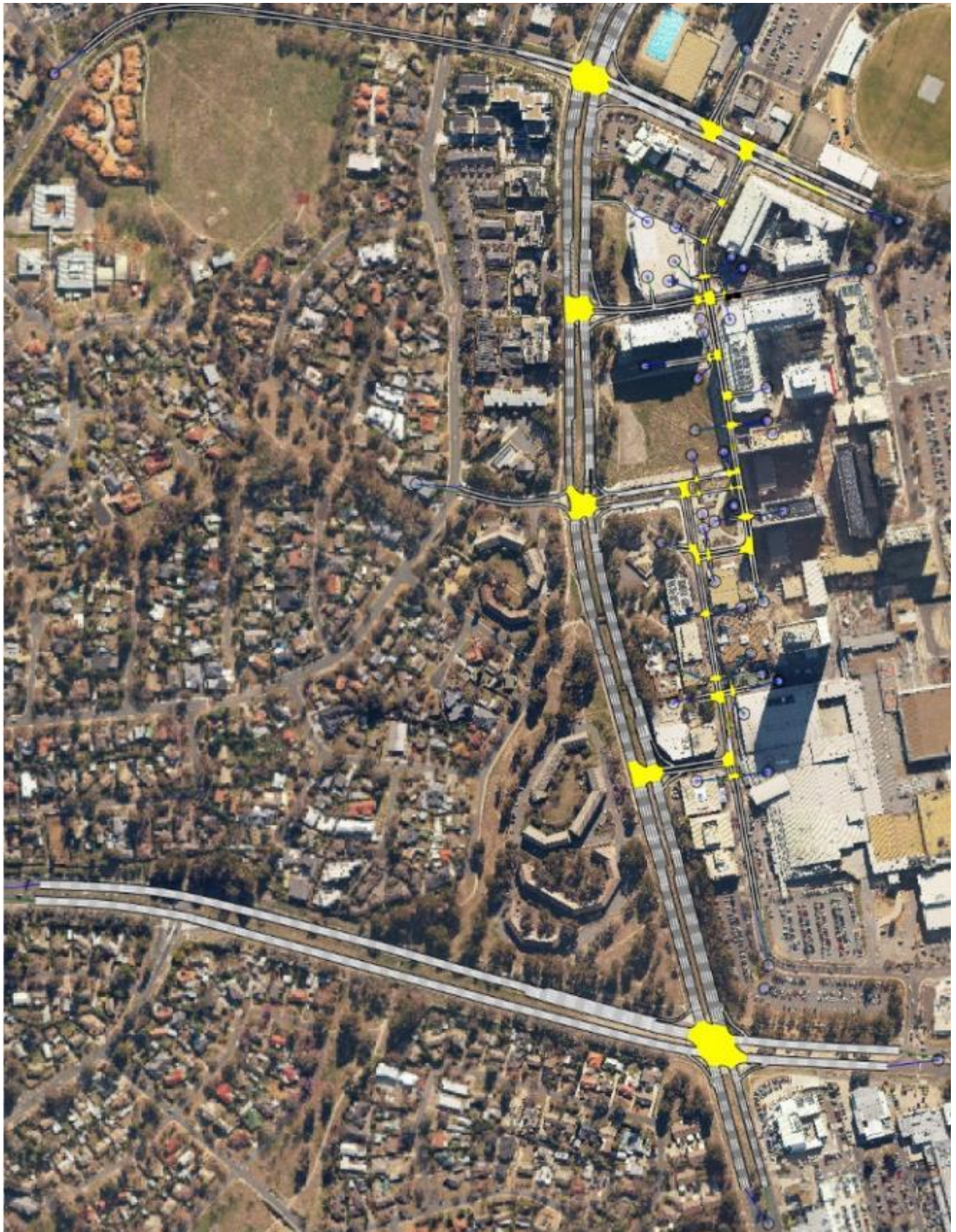


Figure 25 Phillip Aimsun Network

4.2 Future Transport Network Demand

Forecast traffic generation for the site and surrounding developments is outlined in Section 3.2. Other key input details for the Aimsun traffic model developed for the network traffic analysis are summarised in the sections below.

4.2.1 Background Traffic Growth – 2016 to 2031

Growth Outputs from the Canberra Strategic Transport Model (CSTM) were used as a starting point to determine the future background traffic growth within the study area. The CSTM growth outputs were provided for the 2016, 2021 and 2031 years.

A review of the traffic growth outputs from the CSTM showed that growth forecasts at several locations within the study area were unsuitable for the purposes of detailed microsimulation modelling. Strategic models are typically coarse and focus on major road corridors and arterial roads as opposed to local roads within town centres, where growth is primarily driven by localised development. As such, the CSTM does not provide a sufficient level of granularity to accurately determine the traffic growth within the Woden Town Centre. As a result, the forecast background traffic growth was determined by:

- Applying the CSTM growth to the major road zones within the study area (i.e. Melrose Drive, Hindmarsh Drive and Launceston Street)
- Applying growth based on the proposed future developments in the area for zones within the Woden Town Centre.

The resultant base growth assumptions were as follows:

- Growth on major road corridors between 2016 and 2021 in Phillip varied between 4.35% (AM peak) and -3.44% (PM peak). This corresponds to growth rates of 0.87% per annum and -0.67% per annum in the AM and PM peaks respectively.
- Growth on major road corridors between 2016 and 2031 in Phillip varied between 19.87% (AM peak) and 6.15% (PM peak). This corresponds to growth rates of 1.32% in the AM peak and 0.41% in the PM peak.

The growth rates calculated above from the CSTM show an unusual trend, as typically growth in the AM and PM peak periods are reasonably comparable – whereas this analysis indicates a difference of 7.79% between the peak periods from 2016 to 2021 and 13.72% between the peak periods from 2016 to 2031. It is understood the existing 2021 CSTM assumes strong public transport demand as a result of the introduction of the Canberra light rail. However, it is also understood that the light rail is not expected to be operational in Woden until ~2027¹.

Given the anomalies outlined above, a growth rate of 0.5% per annum was applied along the major roads for the 2021 and 2031 base scenarios, which is a rounded average of the AM / PM growth rates between 2016-2021 and 2016-2031. This growth methodology was previously agreed with Transport Canberra City Services (TCCS).

It should be noted that the growth assumptions adopted for the Aimsun modelling are more conservative overall than what is forecast in the CSTM.

4.2.2 Matrix Development

The 2019 base year demand matrices were developed based on the 2019 traffic counts, with the base year origin-destination matrices developed based on a cordoned sub-area of the 2016 CSTM. The process for the development of the base year demand matrices is described below:

1. Dis-aggregate the 2016 CSTM sub-area matrices to match the Aimsun zoning system, with splits based on parking supply in each of the Aimsun zones.
2. Use the disaggregated sub-area matrices as the initial “seed” or starting matrices for static OD matrix adjustment (inbuilt Aimsun matrix adjustment process).

¹ https://www.transport.act.gov.au/_data/assets/pdf_file/0018/1412505/Stage-2-of-Light-Rail-Building-Light-Rail-to-Woden.pdf
\\AUCBR1FP001\Projects\CBR\60614627\500_DELIV\501_Draft Reports\Phillip\Doma Update\Phillip Section 180 TIA_Rev4_FINAL DRAFT.docx
Revision 4 – 05-May-2021
Prepared for – Doma Group – ABN: 74 127 417 574

3. Profile the seed matrix into 15-minute input matrices based on the peak demand profile for the peak hours. The 15-minute profiled demand matrices were adjusted using static OD adjustment based on the real data set inputs from the survey turning counts.
4. The adjusted 15-minute matrices were combined to create a peak one-hour traffic demand for the AM and PM peak hours.
5. The peak one-hour traffic demands were then used as the input for the Dynamic User Equilibrium (DUE), which iteratively assigns traffic to specific routes based the 'lowest cost' path.

For the future year demand scenarios, the following process was adopted:

1. Apply the background traffic growth to the 2019 base year demand matrices as described in Section 4.2.1.
2. Apply the development traffic growth for the zones within the Woden Town Centre. The trip distribution for the new developments was based on the 2016 Australian Bureau of Statistics (ABS) journey to work data. The ABS data resulted in the percentage splits shown in Table 10. The distributions were only applied to the major arterial and distributor external centroids which represent key travel movements.

Table 10 Future trip distribution splits

Entrance/ Exit	Launceston Street (West)	Launceston Street (East)	Melrose Drive (North)	Melrose Drive (South)	Hindmarsh (West)	Hindmarsh Drive (East)
AM Inbound	6.0%	7.6%	29.7%	31.1%	8.4%	17.2%
AM Outbound	7.6%	3.6%	27.0%	43.3%	15.8%	2.7%
PM Inbound	7.6%	3.6%	27.0%	43.3%	15.8%	2.7%
PM Outbound	6.0%	7.6%	29.7%	31.1%	8.4%	17.2%

4.2.3 Model Calibration and Validation

The final peak hour matrix demands were firstly run in a Dynamic User Equilibrium (DUE) assignment and considering a maximum of 3 paths during dynamic assignment (3 paths are considered acceptable for a model of this size with limited route choice). Following the DUE assignment, the demands were run as one-shot assignments over the five NSW RMS seed values, with model results taken as an average over the five seed runs.

The peak hour models were calibrated against turning count surveys and validated against observed queue data and travel times. The ACT modelling guidelines indicate that microsimulation models must meet the following GEH model calibration criteria:

- 85% of modelled turn flows with GEH < 5
- 100% of modelled turn flows with GEH < 10

The turn movement calibration results for the weekday AM and PM peak hour models are shown below in Table 11. The results show that both peak periods achieve more than 85% of turn movements within GEH 5 and 100% within GEH 10 exceeding the ACT modelling calibration criteria. This indicates the model is adequately calibrated.

Table 11 GEH model results output

Model Peak Hour	GEH < 5	GEH < 10
Weekday AM peak (8:15-9:15)	88%	100%
Weekday PM peak (16:45-17:45)	94%	100%

The model's queues were checked at a high-level against the observed queues from the traffic survey results and were found to be representative of observed queues in more than 90% of locations observed.

For travel times, The ACT Traffic Microsimulation Modelling Guidelines states that average modelled travel times should be within 15% or one minute (whichever is greater) of the journey time recorded during the survey.

Along Melrose Drive northbound and southbound, where the travel times were validated, five out of six travel time sections fit within the 15% threshold.

The detailed calibration/validation technical note for the development of this base model is included in Appendix A.

4.2.4 Planned Transport Network Changes

Furzer Street and Corinna Street Cycleway

The 2031 future scenarios were assessed to include the addition of dedicated cycle lanes along Furzer Street and Corinna Street as per the Cardno *Woden Pedestrian and Cycle Path Improvement* drawings dated April 2019, which was the latest design available at the commencement of the traffic analysis. The proposed upgrades include:

- Two-way cycle lanes from the Launceston Street / Furzer Street intersection through to Corinna Street, via Furzer Street.
- One-way road sections near the intersections of Furzer Street / Corinna Street and Corinna Street / Corinna Street (east of the Melrose Drive / Corinna Street intersection).
- One-way road from the Brewer Street / Corinna Street intersection to the intersection at Phillip Kelties Road and Corinna Street.

The existing and future layouts of the proposed modifications as per the Aimsun model are shown in Figure 26 and Figure 27 respectively.



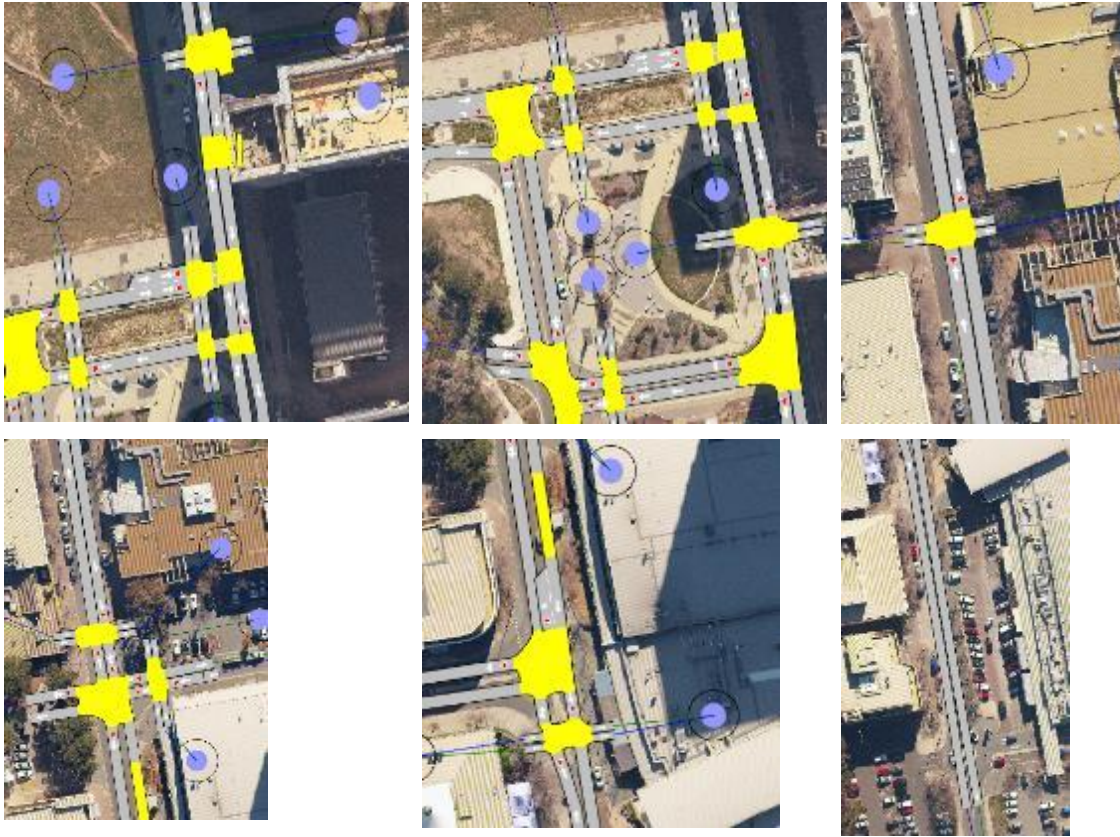


Figure 26 Existing Furzer Street and Corinna Street configuration





Figure 27 Future proposed Furzer Street and Corinna Street configuration

Launceston Street / Furzer Street and Launceston Street / Irving Street Upgrade

The proposed future upgrades at the Launceston Street / Furzer Street and Launceston Street / Irving Street intersections are based on a plan received by AECOM through TCCS. This design is currently not finalised, with some key aspects yet to be confirmed. Hence, the future intersection upgrades included in the Aimsun model are based on the current design provided and include:

- Signalisation of Launceston Street / Irving Street intersection, with the Irving Street left turn maintained as priority-controlled slip lane.
- Additional right-turn pocket on the Launceston Street east approach.
- Left-in/left-out arrangement at the intersection of Furzer Street / Launceston Street.
- Signalised pedestrian crossing times.

The existing and future intersection layouts for the Furzer Street and Irving Street intersections included in the Aimsun model are shown in Figure 28 and Figure 29 respectively.

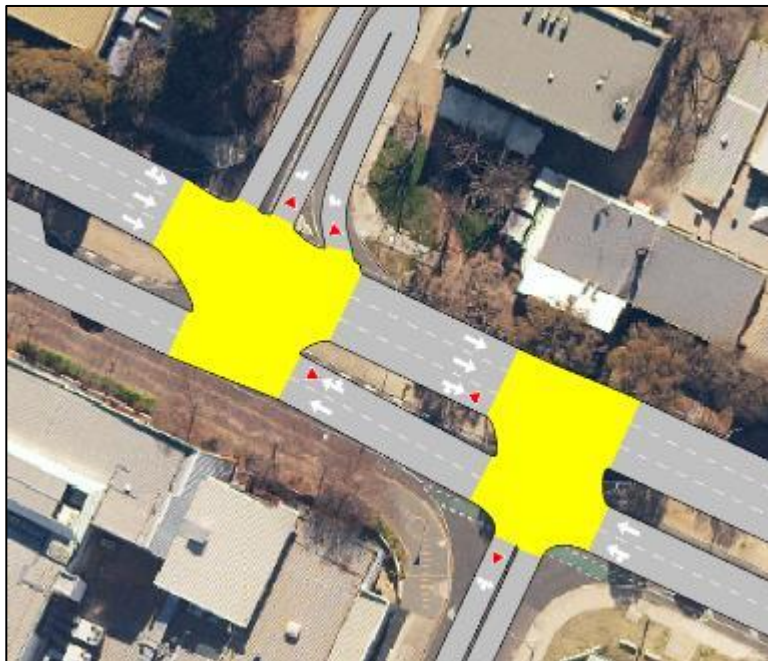


Figure 28 Existing Launceston Street /Furzer Street and Launceston Street / Irving Street layout



**Figure 29 Future proposed Launceston Street /Furzer Street and Launceston Street / Irving Street layout
WOVA Block 17, Section 3 Phillip Access**

Access to the WOVA development (Block 17, Section 3) were included in the future 2031 scenarios to align with the WOVA development application plans dated July 2018. The proposed configuration includes:

- Left-in access from Melrose Drive with an extended turn lane.
- A second two-way access point from Furzer Street.

The existing and future layouts included in the Aimsun model are shown in Figure 30 and Figure 31 respectively.



Figure 30 Existing Block 17, Section 3 Phillip Access



**Figure 31 Future proposed Block 17, Section 3 Phillip Access
A&A Woden Block 91, Section 8 Phillip Access**

An access point to the A&A DOMA development (Block 91, Section 8) from Furzer Street was included in the future 2031 Aimsun models as shown in Figure 33. The existing layout is shown in Figure 32.



Figure 32 Existing Block 91, Section 8 Phillip Access

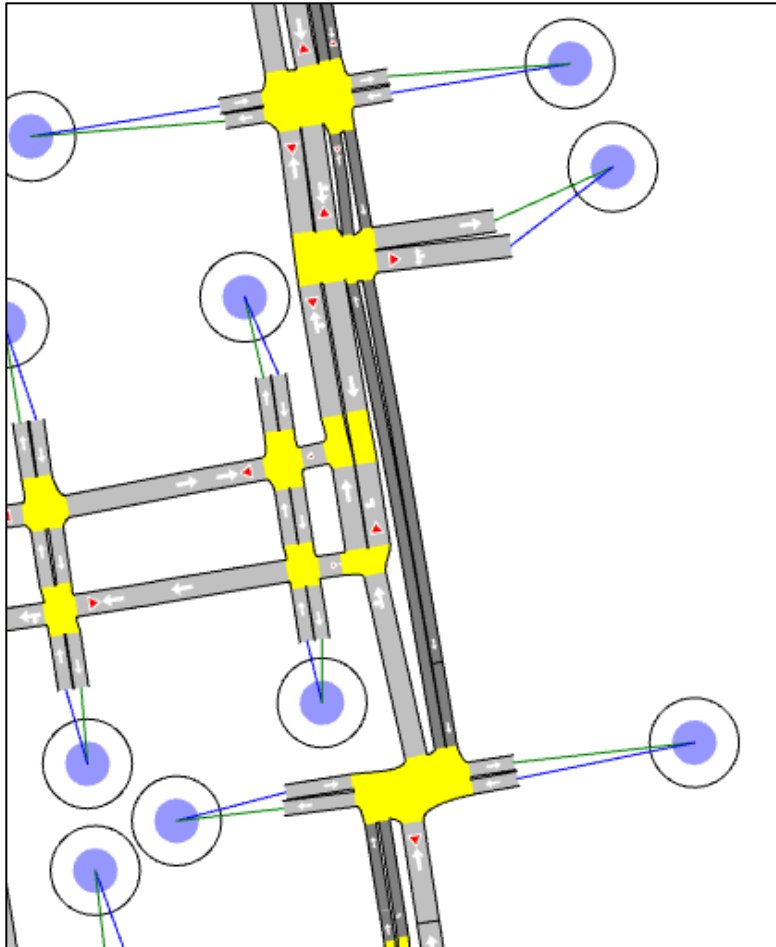


Figure 33 Future proposed Block 91, Section 8 Phillip Access

Internal Access Roads

Circulation between the proposed car parking areas will be facilitated through internal roads.

4.2.5 Active Travel Movements

Pedestrian and cycle demand growth was based on the employment growth rate in the CSTM for zones within the subject site area. The linear annual employment growth rate between 2016 and 2021 was calculated as 3%. Between 2016 and 2031, the linear annual employment growth rate was 2%. For a conservative assessment, an annual growth rate of 3% per annum was applied to the existing pedestrian and cyclist data.

Active travel movements have been included in the Aimsun model by coding specific user classes for cyclist and pedestrian demands. Lane restrictions have been applied to the cyclist lanes in the Aimsun model to ensure only cyclists are able to utilise these lanes.

Pedestrian crossing facilities have been coded to include the detailed interaction and appropriate priority with vehicular traffic. On approach to the priority controlled pedestrian crossings a slower road section speed of 10 km/h has been coded to simulate vehicles slowing down on approach to the crossing.

4.3 Network Performance

To assess network performance, the base model and five traffic demand scenarios were tested for AM and PM weekday peaks:

1. 2019 Base
2. 2021 without development
3. 2031 without development
4. 2031 with B2S180 development only
5. 2031 with all developments
6. 2031 with all developments - Signal Adjustments.

It should be noted that the outputs presented in this section are not directly comparable with the outputs provided in the previous traffic impact assessment for this site. The traffic modelling undertaken for this assessment has been refined and updated to a greater level of detail than previous assessments.

Additionally, the latest iteration of the traffic modelling has removed the previously considered left-in / left-out access point from the carpark at Block 13, Section 15 Phillip to Melrose Drive in the 2031 future year models, as agreed with TCCS. The removal of this upgrade in addition to the changes associated with the Corinna Street cycleway results in there being no access from the existing Corinna Street south zone to the remainder of the model network in the 2031 scenarios.

To ensure this demand is still captured in the 2031 scenarios, it has been conservatively assumed that this demand would all re-distribute to Hindmarsh Drive via either Ball Street / Hindmarsh Drive or Callam Street / Hindmarsh Drive intersections. Both of those intersections are not included in the Aimsun model network, so the re-distributed trips are loaded into the model network via the Hindmarsh Drive east zone.

4.3.1 Network Demand

The total network demand (inclusive of pedestrians and cyclists) for each of the Aimsun scenarios listed above is shown below in Figure 34. The figure indicates that the largest increase in network demand in 2031 for both peak periods arises in the all development scenarios, with approximately 650 additional vehicles in the all development scenarios relative to the B2S180 scenario. This indicates the large amount of other developments within the area are likely to be the primary drivers of increased traffic demand.

The latent demand, or the number of vehicles waiting to enter the model network at the end of the peak periods is shown in Figure 35. The latent demand is relatively low for most scenarios, with generally only minor increases between the No Development scenarios and the B2S180 scenarios. The signal optimisation in the 2031 All Developments – Adjusted scenarios reduces the latent demand to below the No Development scenarios.

The latent demand in the AM and PM peak scenarios primarily occurs on the eastern approach to the Melrose Drive / Hindmarsh Drive intersection, due to the re-distribution of traffic from Corinna Street south. The increased right-turn demand in the development scenarios results in additional increases in latent demand. The right-turn is over capacity in the 2031 No Development scenario, with even small increases in right-turn demand in the development scenarios causing right-turn queues to extend off the end of the model. This latent demand is significantly reduced in the Adjusted scenario, with signal optimisations mitigating the impacts of the right-turn.

The Hindmarsh Drive eastern approach is a short section in the Aimsun model due to the location of the adjacent Bowes Street / Hindmarsh Drive signalised intersection. The latent demand in the AM and PM peak is therefore representative of the queue length which extends through and beyond the Ball Street intersection.

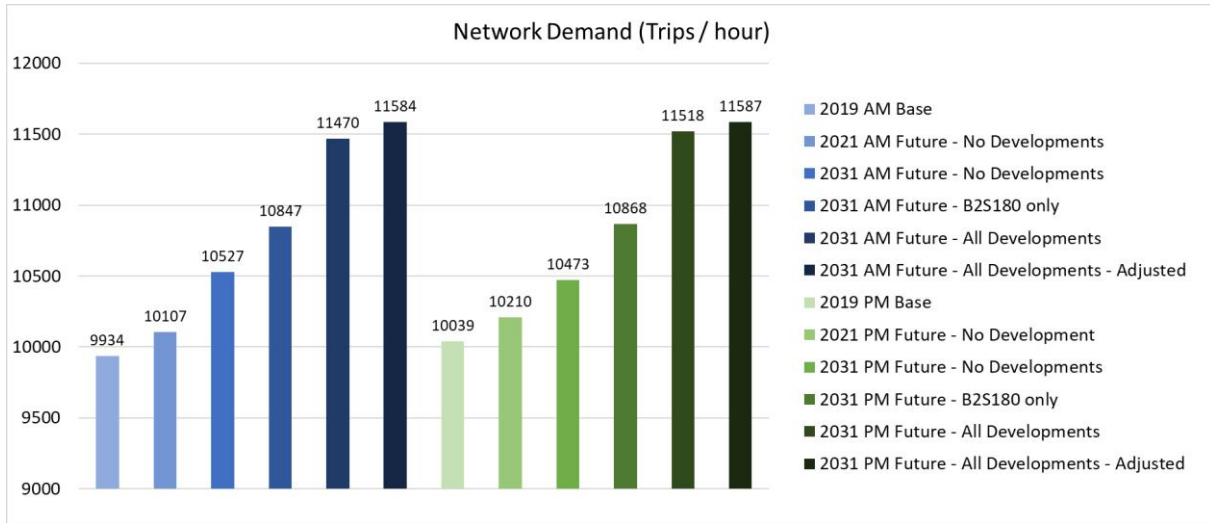


Figure 34 Average network demand

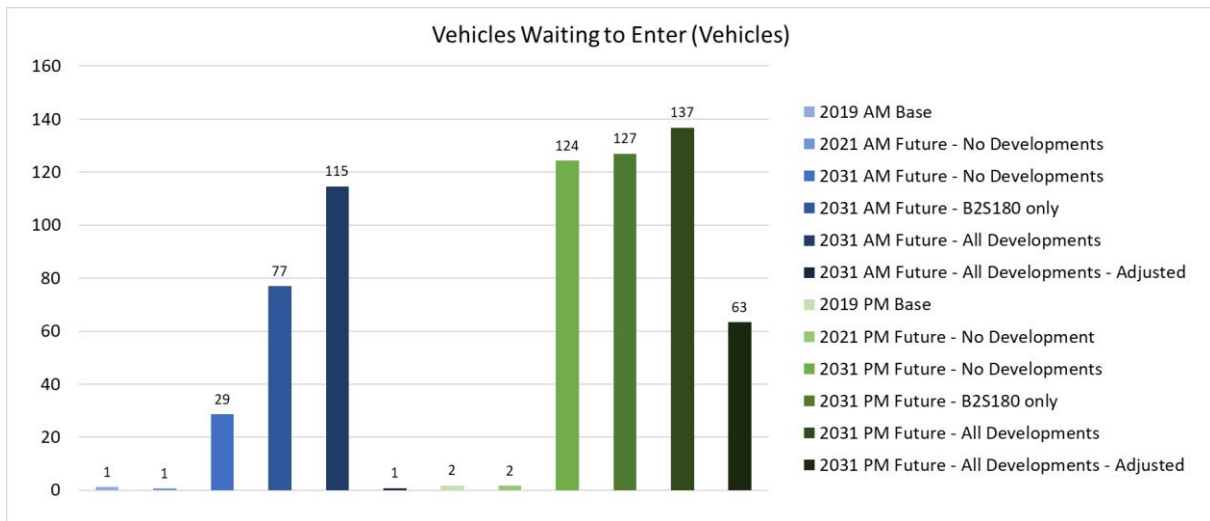


Figure 35 Vehicles waiting to enter the network

4.3.1.1 Site Access Demand

The traffic demand utilising each of the four development accesses is proportionally split based on the proposed land use and trip generation of each of the four individual buildings contained within the site and the proposed site accesses described in Section 3.4.1.

It should also be noted that Garth Close is an existing access which generates / attracts over 200 vehicles /hour in the peak periods which are included in the Furzer Street / Garth Close volumes.

The total demand accessing each of the three key access locations to the development are shown in Table 12 for the AM and PM peak periods.

Table 12 Site Access Demand - 2031

Intersection	Approach	Movement	Volume (veh / hour)	
			AM Peak	PM Peak
Corinna Street / Development Access	North	LT	113	32
	West	LT	20	99
	Total		134	131
Furzer Street / Garth Close	North	RT	237	121
	South	LT	96	21
	West	LT	67	120
		RT	23	74
	Total		422	336
Furzer Street / Development Access	North	RT	20	16
	East	LT	6	16
		RT	8	17
	South	LT	31	16
	Total		65	65

4.3.2 Network Results

Overall network statistics for each of the model scenarios are summarised in Figure 36 to Figure 39. The network statistics presented include:

- Average network delay (seconds per kilometre) (Figure 36)
- Average bus network delay (seconds per kilometre) (Figure 37)
- Total vehicle hours travelled (VHT) (Figure 38)
- Total vehicle kilometres travelled (VKT) (Figure 39).

The network performance outputs indicate that the background growth between 2019 to 2031 has a sizable impact on the overall network performance, with approximately 600 additional trips between the 2019 Base and 2031 No Development scenarios. This extra demand increases the overall network delay for all traffic from approximately 55 seconds to 91 seconds in the AM peak and 55 seconds to 78 seconds in the PM peak between the 2019 and 2031 No Development scenarios.

Between the 2031 No Development and 2031 B2S180 Only scenarios, average network delay increases by a modest 5 to 12 seconds overall. Overall network bus delay is relatively consistent between each of the 2031 scenarios.

VHT and VKT is estimated to increase between 2019 and 2031, and between the 2031 No Development and Development scenarios. These changes are mostly due to increasing levels of demand, which generate more VHT and VKT. Increases in network delay will account for a small proportion of the VHT increases in the Development scenarios, in line with the average network delay trends.

Average network delay and VHT is notably higher in the 2031 All Developments scenarios compared to the 2031 No Developments scenario. This deterioration in performance is mainly related to increases in delay for the northbound right turn movements from Melrose Drive into Brewer Street, Corinna Street and Worgan Street. Through minor re-allocation of green time at those intersection signals and the intersection at Hindmarsh Drive, it was possible to reduce overall delay and VHT, as shown by the outputs for the 2031 All Developments – Adjusted scenarios. This indicates that the network likely has sufficient capacity to manage the additional All Development traffic through signal optimisation.

Additional network performance plots, including simulated density and average delay, are provided in Appendix B.

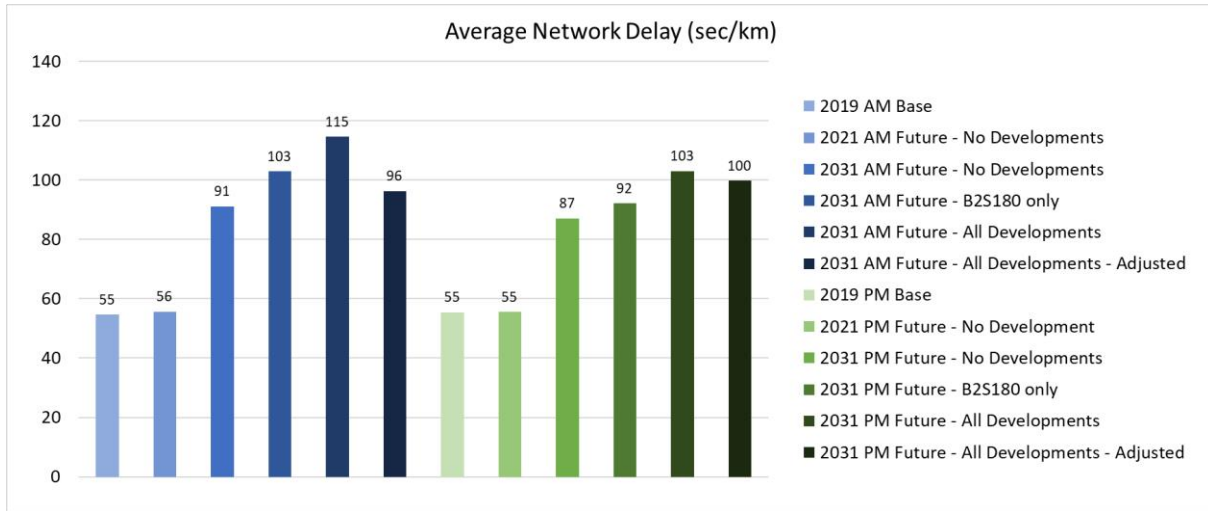


Figure 36 Average network delay – all traffic

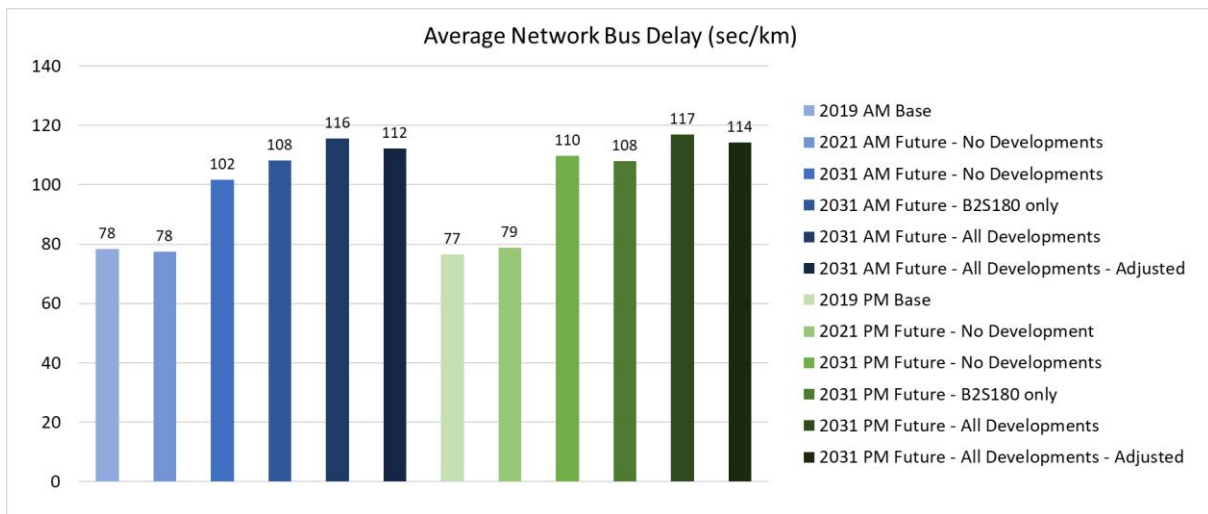


Figure 37 Average network delay - buses

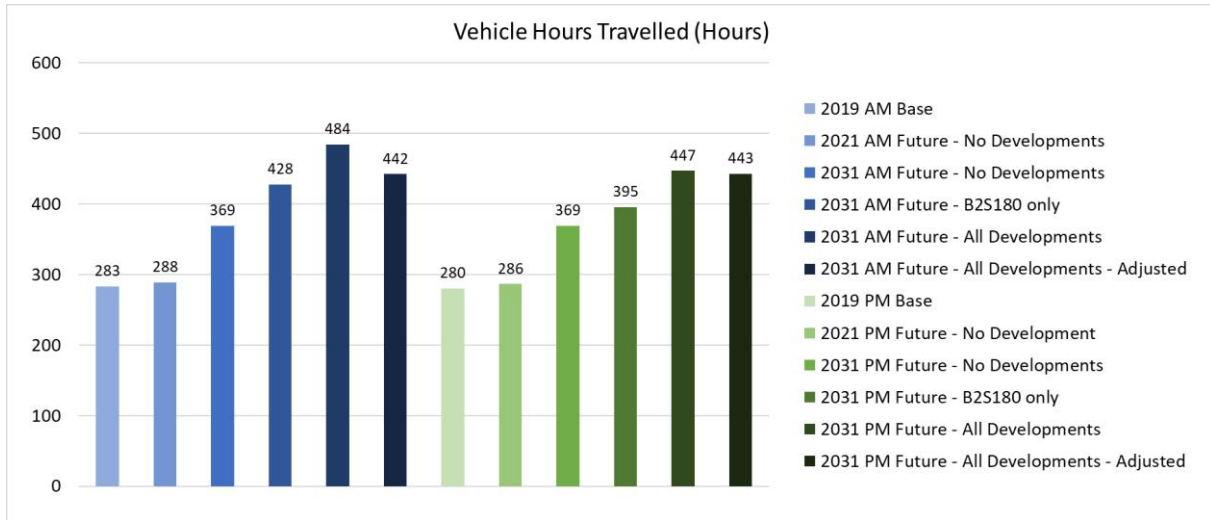


Figure 38 Vehicle hours travelled

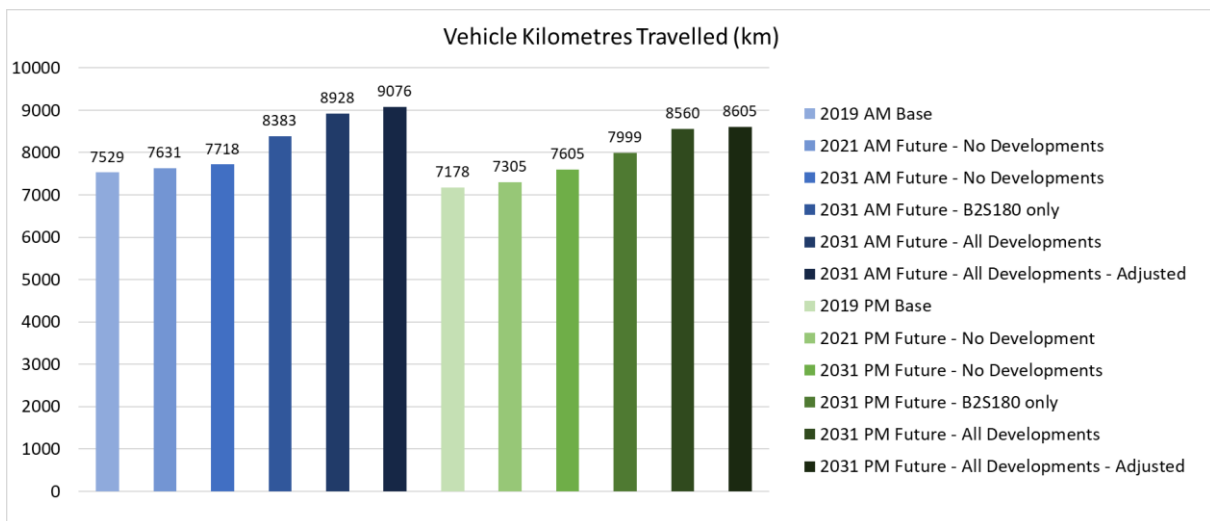


Figure 39: Vehicle kilometres travelled

4.4 Intersection Performance

Average overall intersection delay results for the key intersections in the study area are provided in Figure 40 to Figure 45.

Intersection and movement level of service (LOS) are based on the LOS thresholds provided in the Highway Capacity Manual (HCM), which are shown in Table 13.

Table 13 LOS criteria (Source: Highway Capacity Manual – Volume 3: Interrupted Flow - Chapter 19 Signalised Intersections)

LOS	Average control delay per vehicle in seconds (d)	
	Signalised Intersection	Priority Controlled Intersection
A	0-10	0-10
B	10-20	10-15
C	20-35	15-25
D	35-55	25-35
E	55-80	35-50
F	80+	50+

It should be noted that the outputs presented in this section are not directly comparable with the outputs provided in the previous traffic impact assessment for this site. The traffic modelling undertaken for this assessment has been refined and updated to a greater level of detail than previous assessments.

Delay outputs by intersection movement are provided in Appendix C. The outputs indicate the following key findings when comparing the 2031 B2S180 Only scenarios to the 2031 No Development scenarios:

- Melrose Drive / Launceston Street: overall intersection delay increases by six seconds in the AM and increases by two seconds in the PM. The intersection operates at LOS E in the AM peak and LOS D in the PM peak for the 2031 B2S180 Only scenario.
- Melrose Drive / Worgan Street: overall intersection delay remains consistent in the AM peak and increases by two seconds in the PM peak. The intersection operates at LOS B in both scenarios.
- Worgan Street / Furzer Street: overall intersection delay increases by two seconds in the AM and increases by six seconds in the PM. The increase in delay in the PM peak is attributable to the location of the Furzer Street development access, which results in some development traffic coming from the north via Melrose Drive using Worgan Street rather than Corinna Street to access the development via Furzer Street. As this intersection already has a high number of conflicting vehicle and pedestrian movements, a small increase in traffic can result in increases in delay. The intersection operates at LOS B and LOS D overall in the 2031 B2S180 Only scenario for the AM and PM peak periods respectively.
- Melrose Drive / Corinna Street: overall intersection delay remains reasonably consistent in the AM and PM peak periods. The intersection operates at LOS B in the AM and LOS A in the PM, in both scenarios.
- Melrose Drive / Brewer Street: overall intersection delay increases by two seconds in the AM and remains consistent in the PM. The intersection operates at LOS B in the AM and LOS C in the PM, in both scenarios.
- Melrose Drive / Hindmarsh Drive: overall intersection delay increases by seven seconds in the AM and remains consistent in the PM. The intersection operates at LOS F in the AM and at LOS E in the PM, in both scenarios.

Overall, the outputs show that performance in the B2S180 Only scenario at the key intersections is estimated to be at an acceptable LOS (LOS D or better); with the exception of Melrose Drive / Hindmarsh Drive, which already operates at LOS E in the No Development scenario. In many cases, increases in overall delay in the B2S180 scenario are negligible – this is because vehicles continue to traverse the intersections mostly within a single signal cycle, so only minor delay is incurred despite the increases in development traffic. The other exception is the Melrose Drive / Launceston Street intersection in the AM peak, which operates on the threshold of LOS E in the No Development scenario (1 second less than LOS E), with the minor increase in delay in the B2S180 pushing the overall intersection delay to a LOS E.

Similar to the trend shown in the overall network delay and VHT outputs, there are notable increases in delays at the key intersections in the All Developments scenario. In the AM peak, delay increases are recorded at Melrose Drive / Brewer Street and Melrose Drive / Hindmarsh Drive. In the PM peak, the northbound right turns from Melrose Drive into Corinna Street and Brewer Street are impacted. These impacts are mitigated through minor signal optimisation and re-allocation of phase green times.

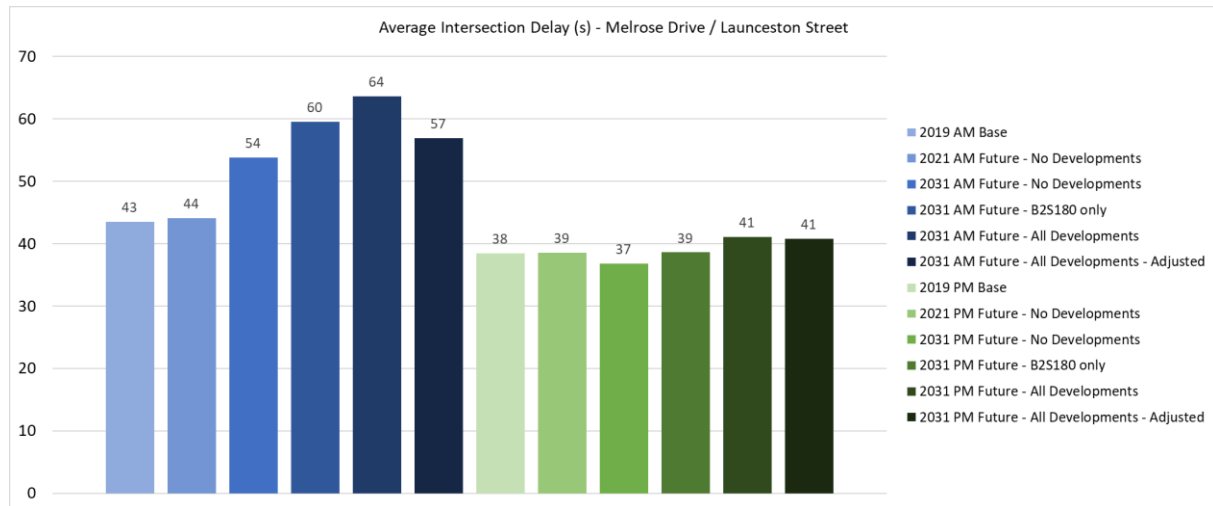


Figure 40 Average intersection delay – Melrose Drive / Launceston Street

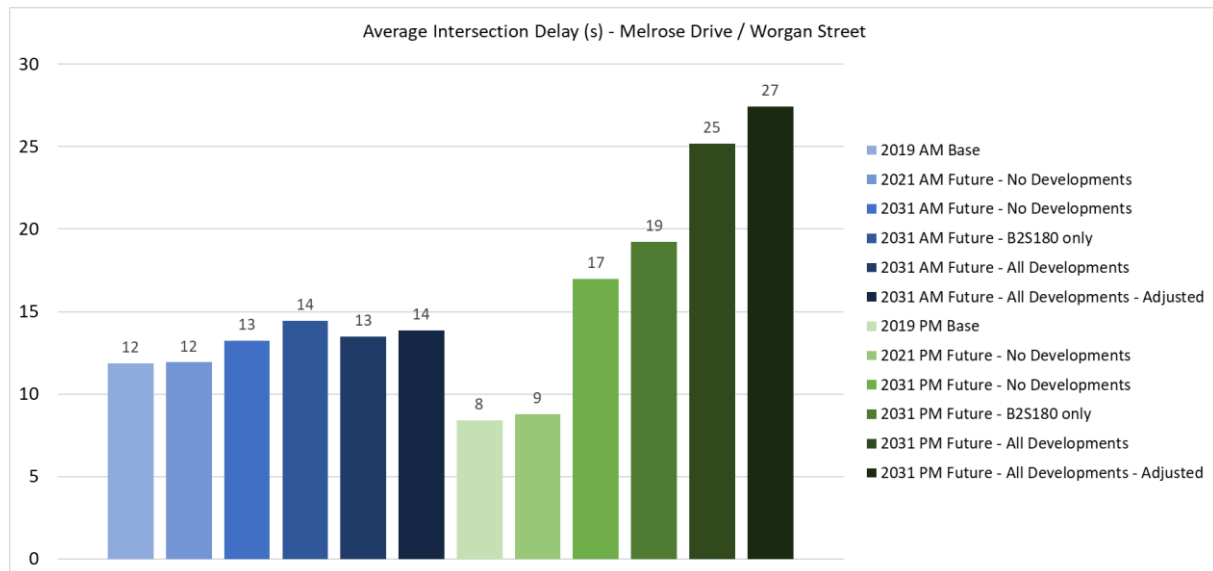


Figure 41 Average intersection delay – Melrose Drive / Worgan Street

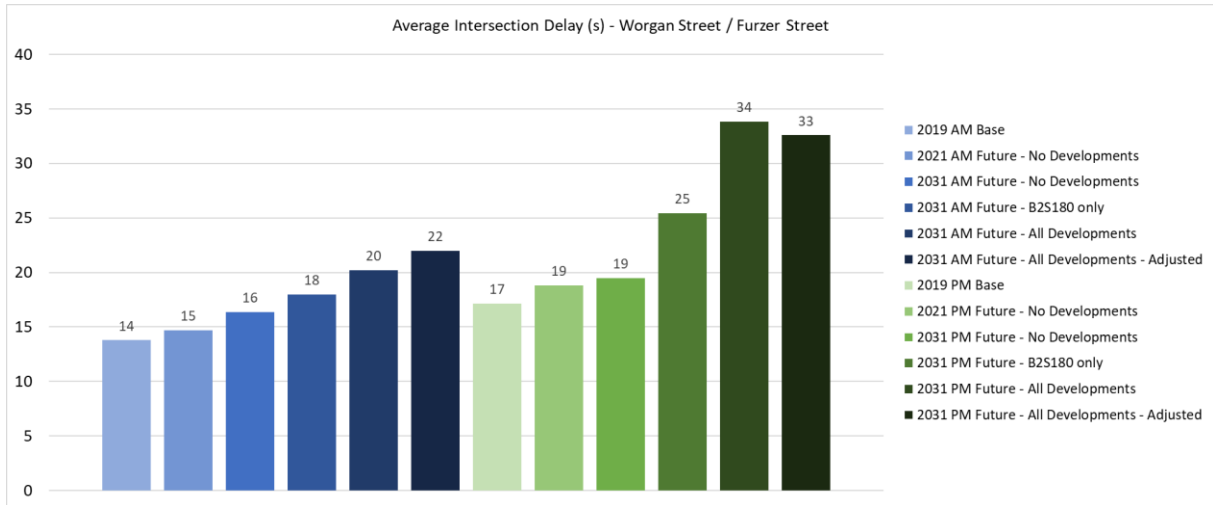


Figure 42 Average intersection delay – Worgan Street / Furzer Street

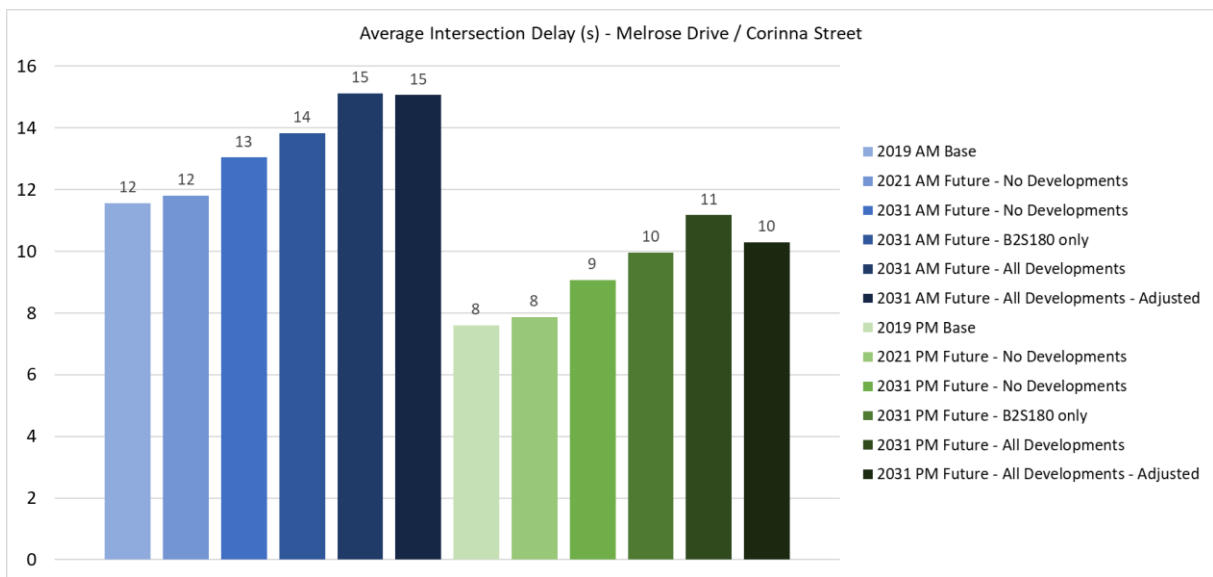


Figure 43 Average intersection delay – Melrose Drive / Corinna Street

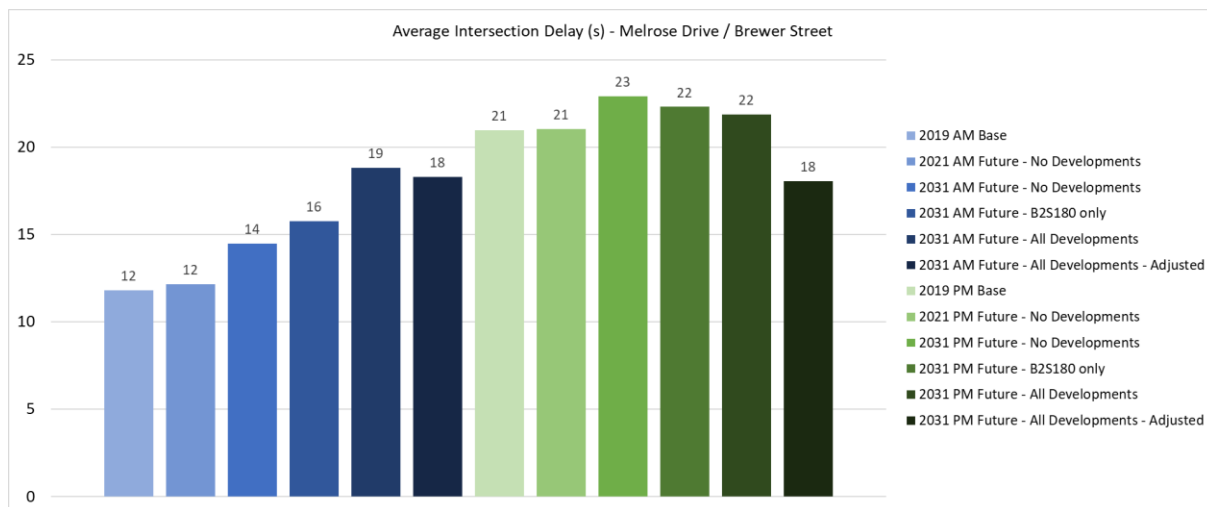


Figure 44 Average intersection delay – Melrose Drive / Brewer Street

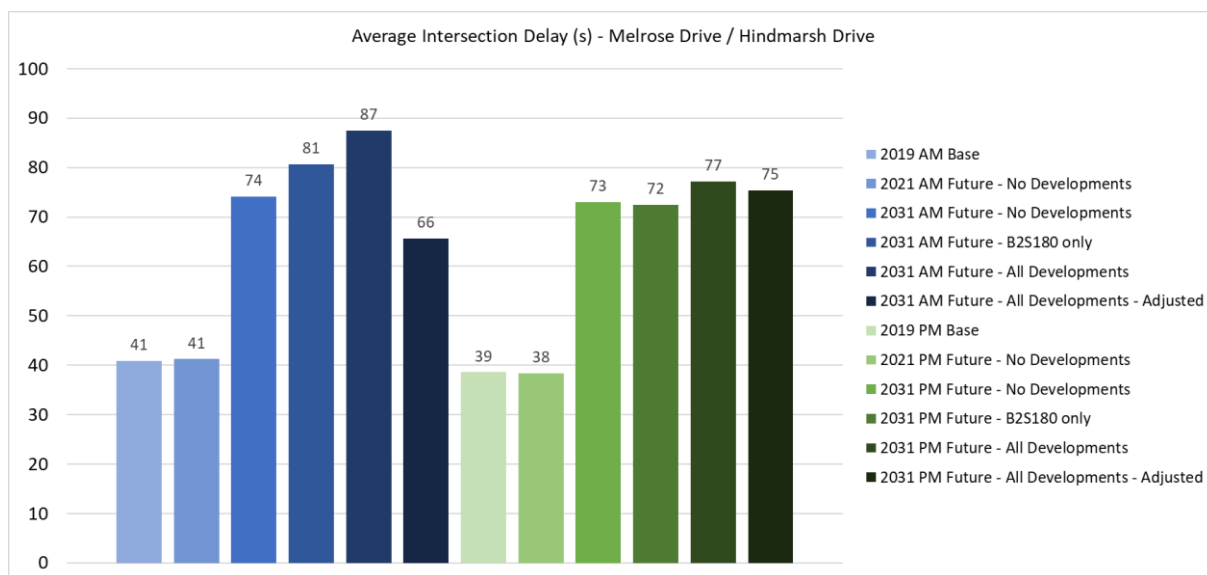


Figure 45 Average intersection delay – Hindmarsh Drive / Melrose Drive

4.4.1 Site Access Intersection Performance

The overall intersection performance for the Corinna Street development access, the intersection of Furzer Street / Garth Close and the Furzer Street development access are shown in Figure 46, Figure 47 and Figure 48 respectively. All three intersection are priority-controlled.

The results for the intersection of Furzer Street / Garth Close are presented as opposed to the development accesses on Garth Close as the Aimsun model doesn't explicitly model the accesses on Garth Close as it is a through road.

The outputs indicate that there are negligible differences in overall intersection delay at each of the three access locations in all scenarios, with all locations and scenarios operating with less than six seconds of delay in both peak periods. The low intersection delay results in any potential queuing impacts for vehicles entering / exiting the development being relatively minor.

Minimal delay is experienced at each of the three intersections as overall intersection volumes are typically relatively low; and the low speed shared-use environment generally allows yielding vehicles to find safe gaps to complete their turn movement with minimal delay.

Delay outputs by intersection movement are provided in Appendix C.

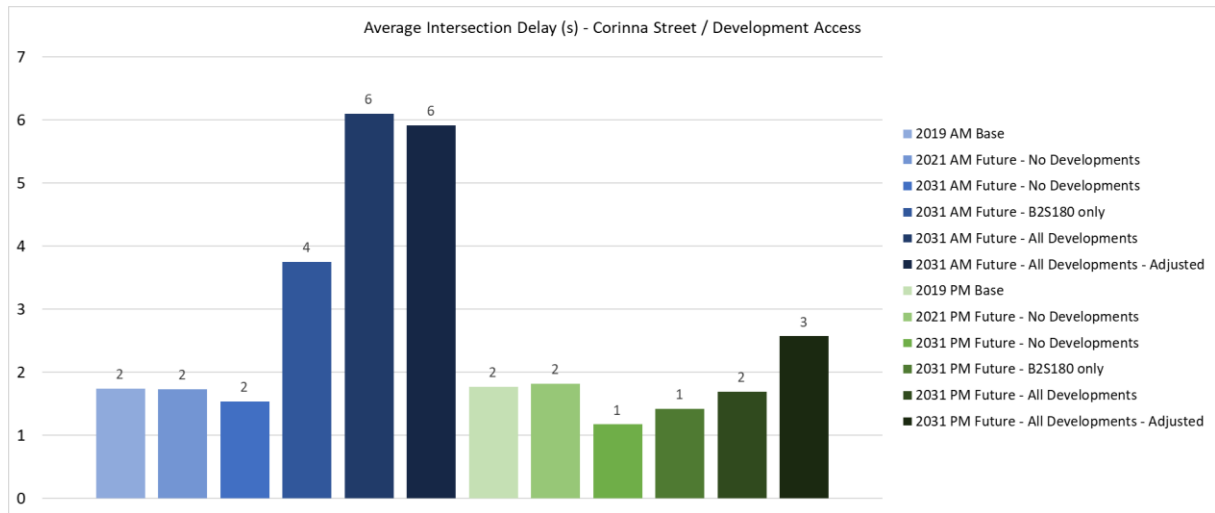


Figure 46 Average intersection delay – Corinna Street / Development Access

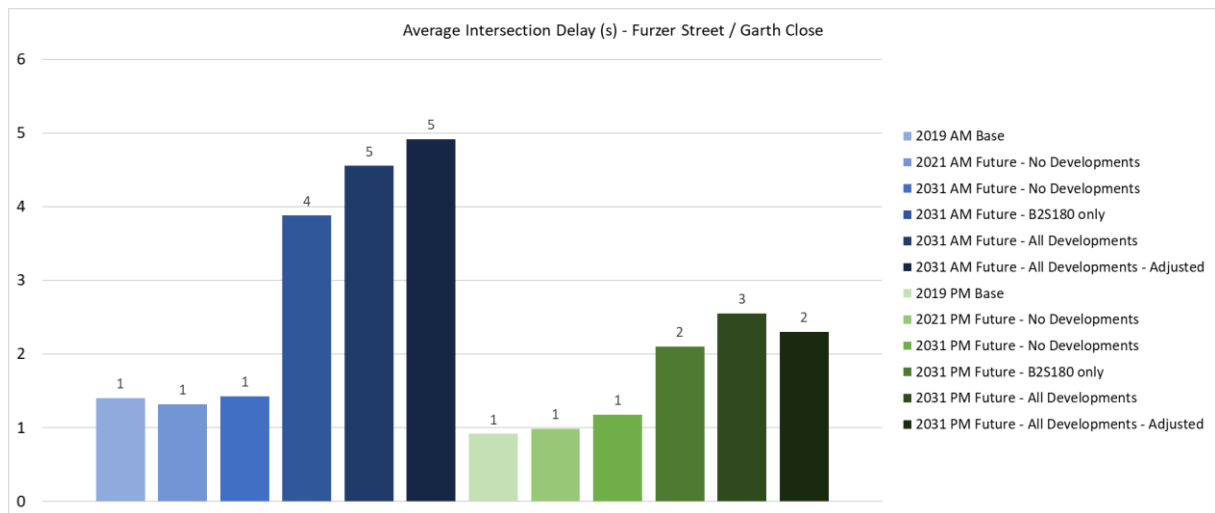


Figure 47 Average intersection delay – Furzer Street / Garth Close

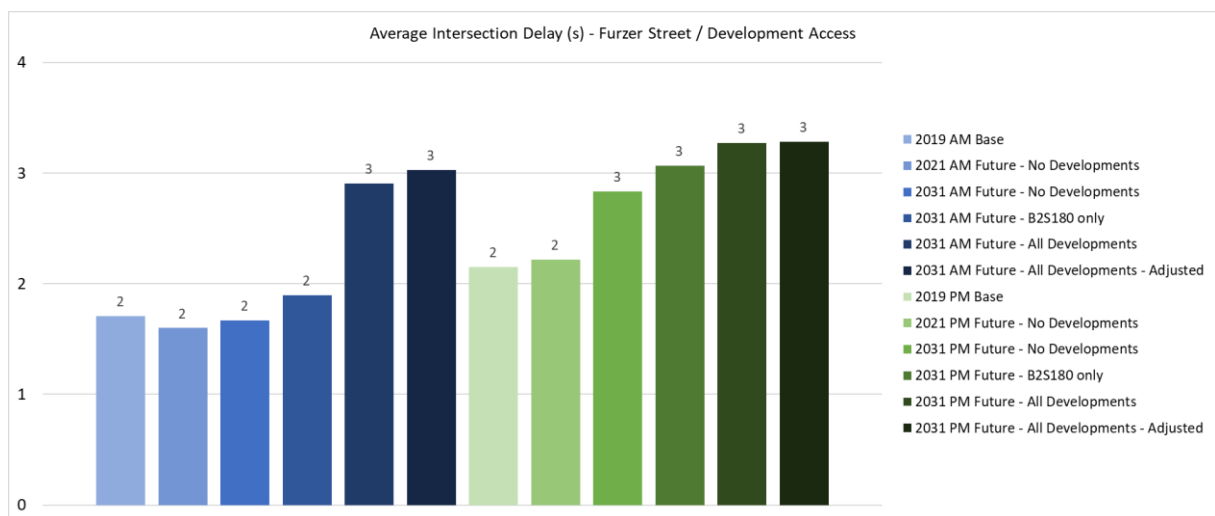


Figure 48 Average intersection delay – Furzer Street / Development Access

4.5 Network Issues and Mitigation Measures

The analysis of results in Sections 4.3 and 4.4 indicate that there is a notable increase in network delay as a result of the background growth and proposed developments in the Woden Town Centre through to 2031 in both the AM and PM peak periods.

AECOM has not undertaken a thorough review of the suitability of the committed future road network upgrades nor have we provided recommendations on whether it is the best approach to meet the objectives of the works. The committed future road upgrades and network extents are as per TCCS's requirements for the future Phillip Aimsun model network coding.

The primary focus of this report is to identify the individual impact on the future road network from the development of the B2S180 Phillip. The traffic distributions outlined in Section 4.2.2 indicate that the majority of traffic travelling to / from the site are entering / exiting via Worgan Street, through both the Worgan Street / Furzer Street and Melrose Drive / Worgan Street intersections. Some traffic also travels via the intersections at Melrose Drive / Corinna Street and Melrose Drive / Brewer Street. This can also be seen in Figure 49.



Figure 49 2031 AM – B2S180 Distribution

The intersection outputs presented in Section 4.4 indicate a relatively modest increase in overall delay at the intersection of Worgan Street / Furzer Street, largely due to the delays caused at the pedestrian crossings in this location. The LOS of the pedestrian crossings adjacent to that intersection in the “All Development” PM scenario are LOS B and LOS C due to the high pedestrian demand and delays as a result of these pedestrian movements.

Impacts of the proposed development at the other key intersections in 2031 are estimated to be minor. The modelling has shown that the northbound right turn movements from Melrose Drive into Worgan Street, Corinna Street and Brewer Street will see increases in demand, however these increases can be managed through signal optimisation.

AECOM also undertook some sensitivity testing on the right turn movement from Worgan Street into Melrose Drive northbound. The test involved the addition of a secondary right turn lane in this location approximately 15m in length. The testing found that the additional capacity provided little improvement to the operation of the intersection, as delays for this movement were largely related to the signal phase timing being particularly favourable to the northbound and southbound movements on Melrose Drive, with a short phase time for the Worgan Street right turn movement.

4.6 Network Analysis Summary

In summary, the analysis undertaken as part of this study has estimated the operational impacts that may occur within the study area in 2031 in the peak AM and PM periods as a result of background growth and all known proposed developments in the study area.

It has been determined that the proportional impact to the traffic network that can be attributed to the future development of B2S180 Phillip is not significant in terms of increases in delay or level of service operation at key intersections or throughout the study area. Increases in overall network and key intersection delay due to the B2S180 development alone are estimated to be minor.

Overall delay and congestion do increase in some areas of the network when other planned development traffic is added to the network, as shown in the outputs for the All Developments modelling. The modelling has estimated that this extra demand can be managed through signal optimisation, with a focus on operation at Melrose Drive / Hindmarsh Drive (AM peak) and the northbound right turns from Melrose Drive into Brewer Street, Corinna Street and Worgan Street (PM peak).

5.0 Conclusions and Recommendations

A summary of the key findings of the following report are detailed below:

Adequacy of Car Parking

- The existing on-street (~61) and off-street (~5376) parking supply for the Woden Town Centre has been outlined in the report. This equates to a total supply of ~5437 parking spaces for the Woden Town Centre.
- Car parking for the proposed mixed-use development of B2S180 will require 119 spaces for office use, 8 spaces for retail, plus residential parking for the development. There is no minimum residential parking requirement for the development site and no requirement to provide visitor parking within the development site. If visitor parking is not provided within the development site, visitor parking may be catered for within the existing parking supply for Woden Town Centre.
- The proposed parking supply is 627 residential parking spaces, 136 office parking spaces, and 8 retail parking spaces

Accessible, Motorcycle and Bicycle Parking

- The ACT Parking and Vehicular Access General Code requires that 3% of public car spaces applicable to the office and retail uses must be compliant for disabled parking. This amounts to four disabled parking spaces required for the proposed office and retail uses for the site.
- The Bicycle Parking General Code for the ACT was used to determine the required supply of bicycle parking spaces. According to the code a supply of 503 bicycle parking spaces should be provided for residents and 52 bicycle parking spaces should be provided for visitors and guests (typically on-street).

Site Access and Service Vehicles

- Four vehicular access locations are proposed on Garth Close (two accesses), Furzer Street and Corinna Street. The provision of four access locations will disperse the development traffic from the previously proposed singular access point on Garth Close and result in reduced vehicle-pedestrian conflicts, improving overall safety for all road-users.
- Service and emergency vehicles access is proposed to be provided from Garth Close, with a turnaround facility present on the western end of the road (to the northern boundary of the development).
- On-site circulation will be facilitated through internal driveways connecting each of the four proposed car parking locations.

Impact on Traffic Operations

- The results from the existing peak hour Aimsun traffic models (2019) has estimated the network operates at a satisfactory level of service in the weekday peak hours and all of the key study area intersections operate at LOS D or better. The intersections at Melrose Drive / Launceston Street and Melrose Drive / Hindmarsh Drive operate with the highest levels of delay and at overall LOS D in both peaks. The Launceston Street west approach to Melrose Drive is estimated to operate at LOS F in the AM peak.
- The Aimsun traffic modelling has estimated that the increase in demand from 2019 to 2031 may have an impact on vehicular travel times and delays in the Woden Town Centre road network. The estimated growth calculations for the Town Centre used conservative growth rates and included the impact of all known planned developments in the study area.
- The analysis of future intersection delays and operations has estimated that there could be minor increases in average approach delays at key intersections adjacent to the proposed development. In the 2031 Aimsun modelling scenario produced to assess the impact of the proposed development alone, in general all of the key intersections in the study area are estimated to operate at overall LOS D or better, with minor overall increases in delay compared to the 'No Development' scenario.

The Melrose Drive / Launceston Street intersection (in the AM peak) and the Melrose Drive / Hindmarsh drive intersection (in both peaks) operate at a LOS E or LOS F; however both these intersections operate very close to LOS E or LOS F thresholds in the No Development scenarios. This indicates that the proposed development is not likely to have a detrimental impact on the overall road network operation.

- In light of the traffic impact analysis, it is recommended that road network upgrades are not required to facilitate the proposed development traffic.
- Additional scenarios were produced to assess the likely impacts of other planned development in the area, in addition to the proposed development. These scenarios estimated modest impacts at Melrose Drive / Hindmarsh Drive (in the AM peak) and for the northbound right turns from Melrose Drive into Brewer Street, Corinna Street and Worgan Street (in the PM peak). The modelling has estimated that these impacts in the All Developments scenario could be mitigated through minor signal optimisations at the impacted intersections without additional infrastructure upgrade required.

Active Travel and Public Transport

- Pedestrian and cycle demand growth was applied to the pedestrian crossings and Furzer Street cycle lanes in the 2031 models. There were no notable impacts as a result of the increase in pedestrian and cyclist demand in the study area.
- No significant impacts to the operation of the public transport network were observed as part of this study.

Appendix A

Calibration / Validation
Technical Note

Memorandum

To	Chris Bunnik	Page	1
CC	Tristan Lee-Murphy, Mark Overton, Rama Paluri, Gilbert Ortiz		
Subject	Phillip Base Model Calibration Validation Technical Note		
From	Brendan Hogan, Tim Heffernan, Nethmei Senarath		
File/Ref No.	60614627	Date	07-Nov-2019

As per the requirement of the ACT Traffic Microsimulation Modelling Guidelines, AECOM has prepared the following Base Model Calibration/Validation Technical Note which outlines the details of the Phillip microsimulation model calibration and validation criteria and results.

1.0 Study Area

The study area, as initially outlined in our proposal, is shown in Figure 1.



Figure 1: Extent of Phillip Aimsun Model

2.0 Traffic Surveys

Classified intersection and turning movement count surveys in the study area were taken at the locations listed below. These surveys were conducted on Tuesday, 24 September 2019 and Saturday, 21 September 2019.

The survey data was used to identify the peak traffic period as shown in Figure 2. As seen, the Tuesday AM and PM peak periods are both greater in terms of traffic volumes than the Saturday midday peak. Hence, only the weekday AM (8.15 am to 9.15 am) and PM (4.45 pm to 5.45 pm) peak periods were modelled.

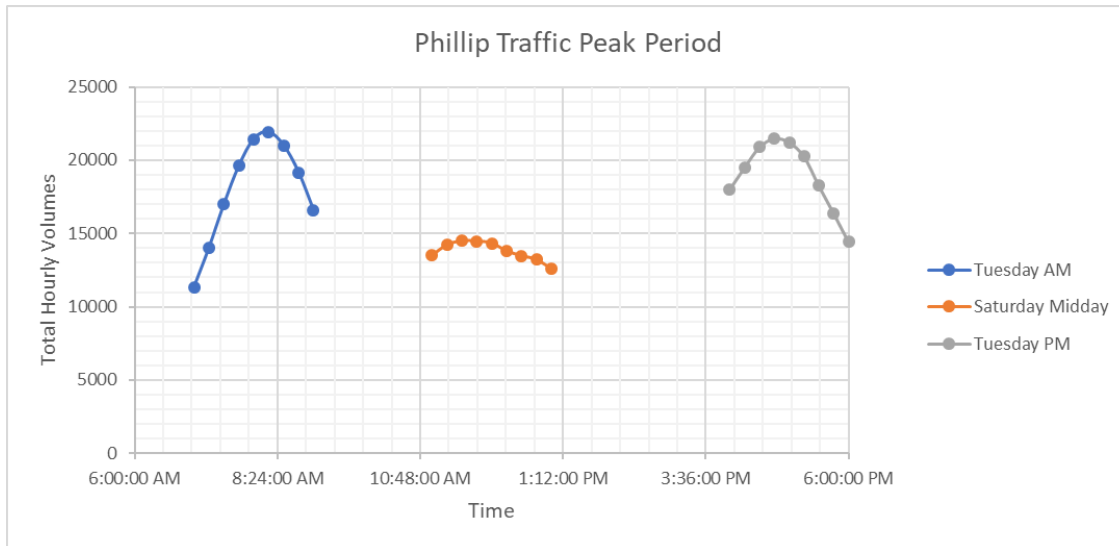


Figure 2 Phillip Traffic Peak Period

1. Hindmarsh Drive – Melrose Drive
2. Melrose Drive – Launceston Street
3. Melrose Drive – Worgan Street
4. Melrose Drive – Corinna Street
5. Melrose Drive – Brewer Street
6. Corinna Street – Brewer Street
7. Furzer Street – Worgan Street
8. Launceston Street – Furzer Street
9. Corinna Street – Corinna Street
10. Furzer Street – Corinna Street (N)
11. Furzer Street – Corinna Street (S)
12. Launceston Street – Irving Street
13. Brewer Street – Keltie Street

Queue length surveys were only taken at the major intersections which include:

- Hindmarsh Drive – Melrose Drive
- Melrose Drive – Launceston Street
- Melrose Drive – Worgan Street
- Melrose Drive – Corinna Street
- Melrose Drive – Brewer Street
- Launceston Street – Irving Street

3.0 Random Seed Values

As per the ACT Traffic Microsimulation Modelling Guidelines, the seed values outlined in Table 1 were run in the order shown. The average outputs of the five seed runs were used to see if the base model meets the validation and calibration criteria.

Table 1 Random seed values

Seed Run No.	Seed Value
1	560
2	28
3	7771
4	86524
5	2849

4.0 Calibration and Validation Results

4.1 AM Base

4.1.1 GEH

A summary of the GEH results for the average outputs of the AM Peak Base Model is outlined in Table 2. Detailed turn movement results are shown in Appendix A. The ACT Traffic Microsimulation Modelling Guidelines require that 100% of GEH values are less than 10 and 85% of the GEH values is less than 5. As shown, the GEH values achieves the calibration targets outlined in the guidelines with an 88% of turn volumes having GEH results less than 5 and a 100% of turn volumes with a GEH less than 10.

The maximum GEH value was 9.35 which is a difference of 57 more vehicles in the model during peak hour period for the north right movement from Worgan Street to Furzer Street south.

The next worst movement is the south right movement at the intersection of Corinna Street and Corinna Street, with a GEH of 9.12. There is a difference of 70 less vehicle in the model undertaking this movement compared to the data from the traffic survey. This results in less vehicles heading along Furzer Street from the west left movement at the Furzer Street / Corinna Street intersection. These vehicles seem to be using the alternate route via Melrose Avenue in the model.

Table 2 AM peak GEH results

GEH	Turns	GEH < 5	GEH < 10
	142	124	142
		88%	100%

The AM peak hour calibration diagram using the dynamic assignment is shown in Figure 3. As seen, the difference between the real data and modelled outputs are satisfactory throughout the model.

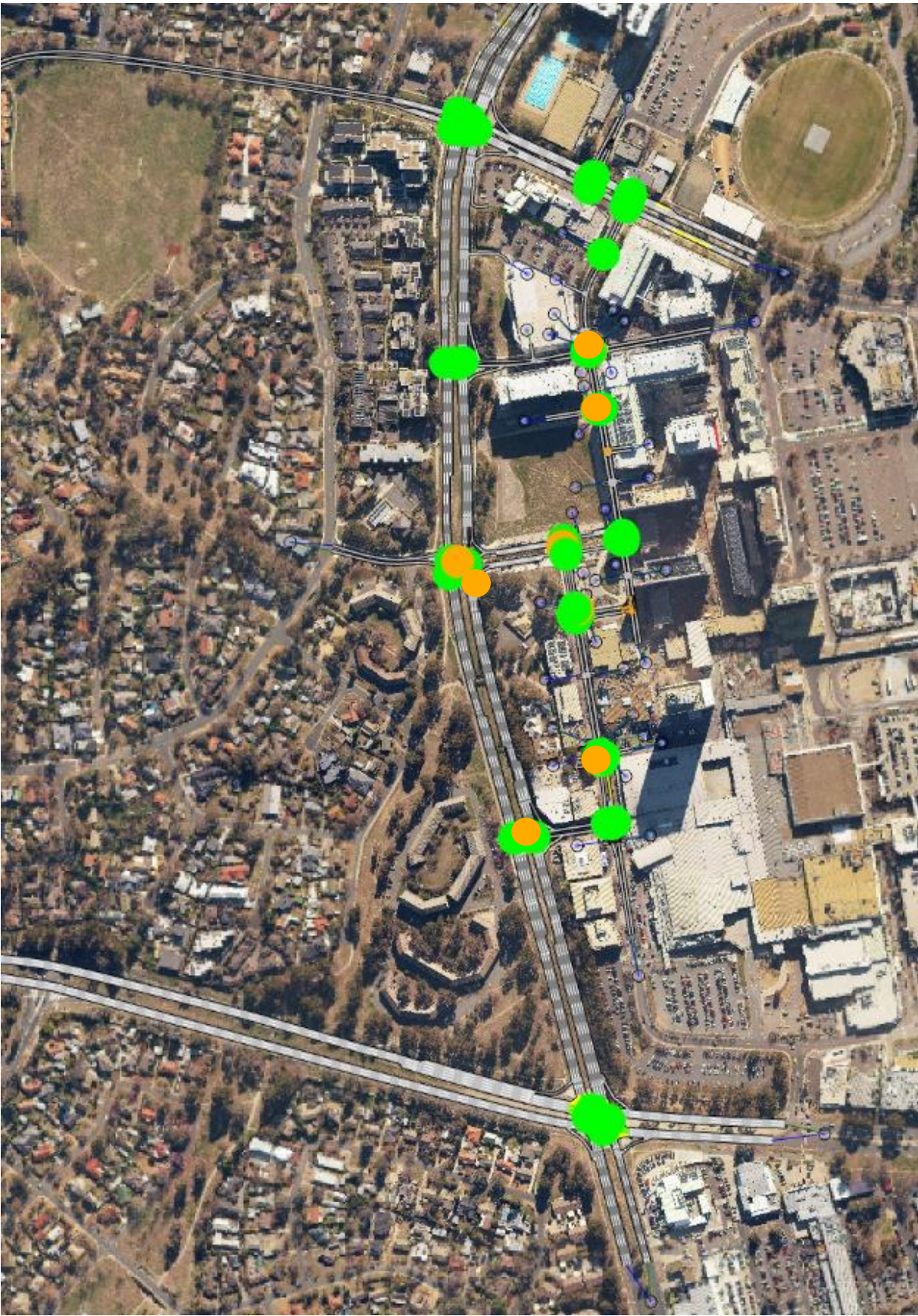


Figure 3 AM peak calibration diagram

4.1.2 R² Value

The AM Base r-squared value is 0.991 which implies little variation between the real data and modelled values. This also meets the r-squared target in the outlined in the ACT Traffic Microsimulation Guidelines where the required value is greater than 0.95.

AM – Phillip Calibration

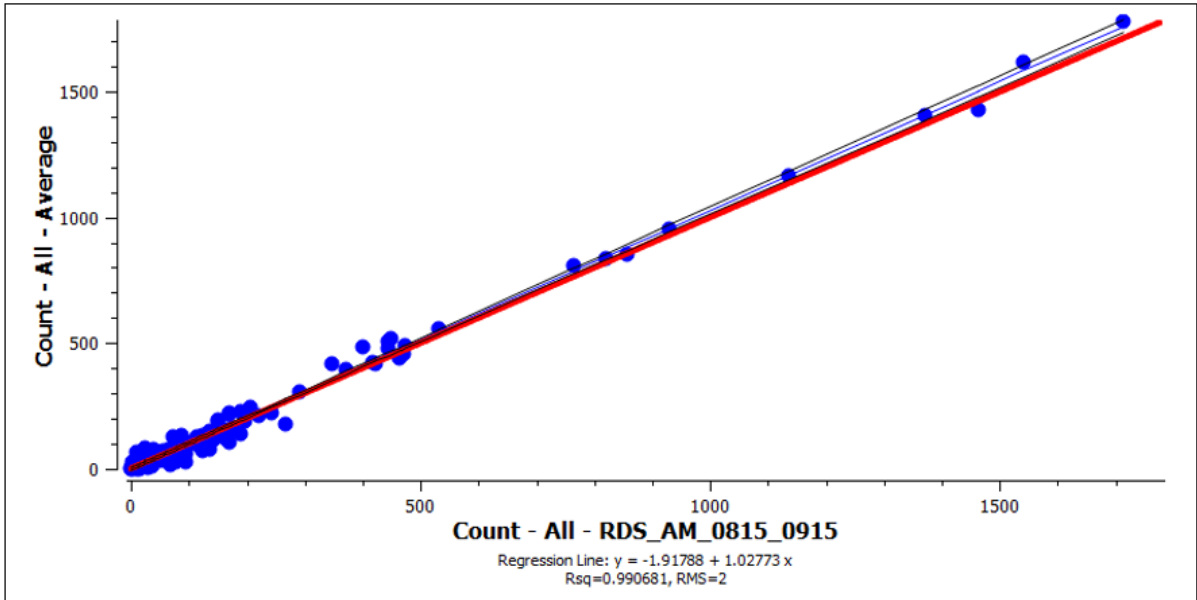


Figure 4 AM base R² plot

4.1.3 Queue Lengths

The average and maximum queue lengths recorded during the traffic survey for the 8:15 am to 9:15 am period is shown in Figure 5. The queue length locations chosen for validation were based on the data collected and the significance of the queues, other locations in the study area did not have significant enough queues to warrant inclusion in this analysis. The average and maximum values represent the number of vehicles in each lane.

The maximum modelled queue lengths for the chosen intersections are shown in Figure 6 to Figure 8. A visual inspection of the modelled queue lengths shows a reasonable correlation with the real data.

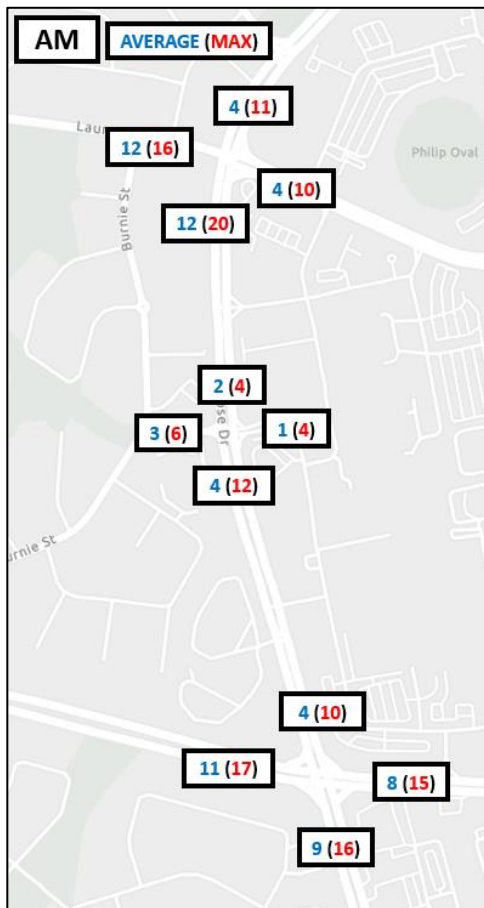


Figure 5 AM peak hour queue lengths

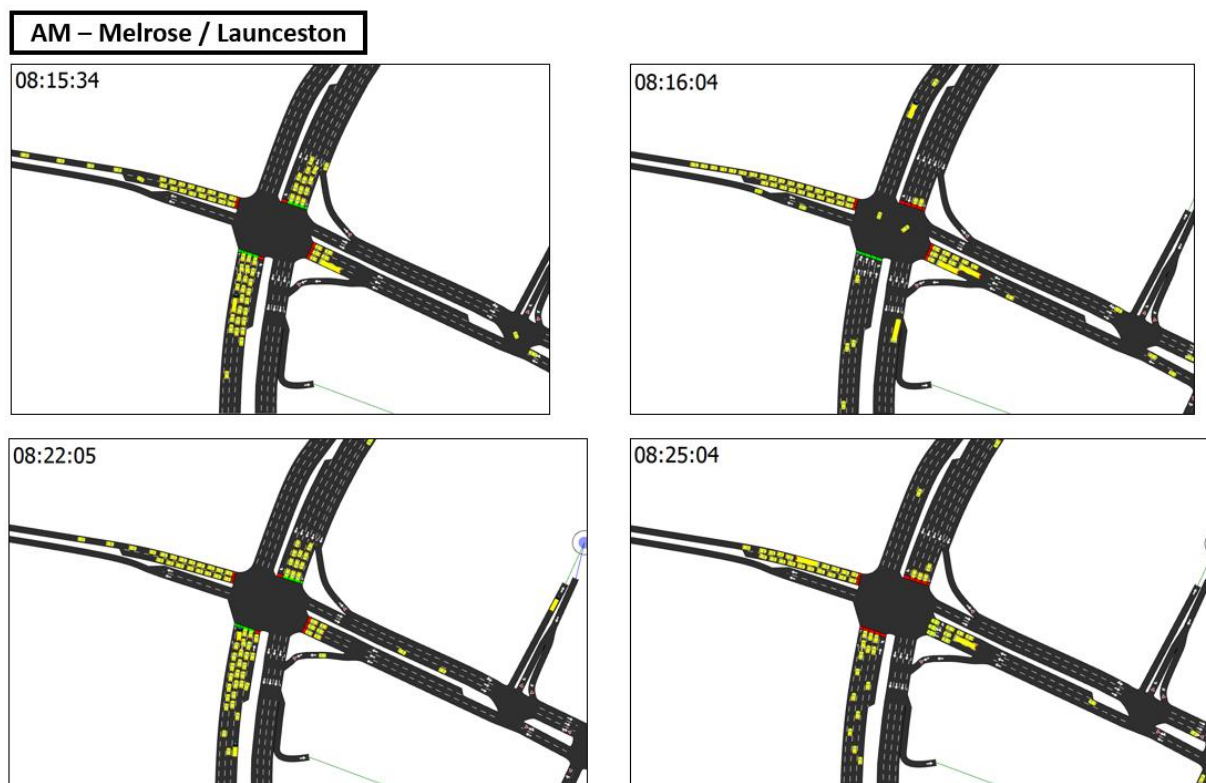


Figure 6 AM peak queue lengths – Melrose Dr / Launceston Street

AM – Melrose / Corinna

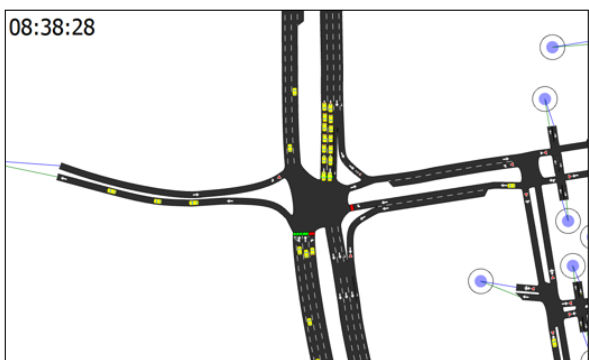
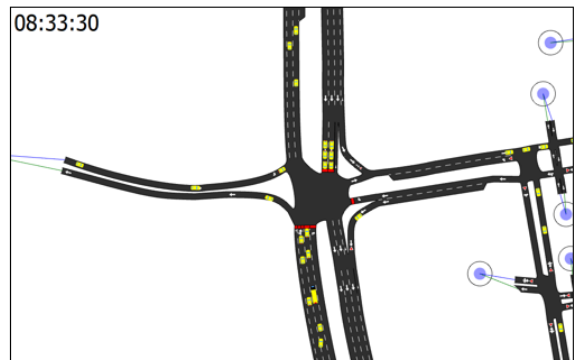
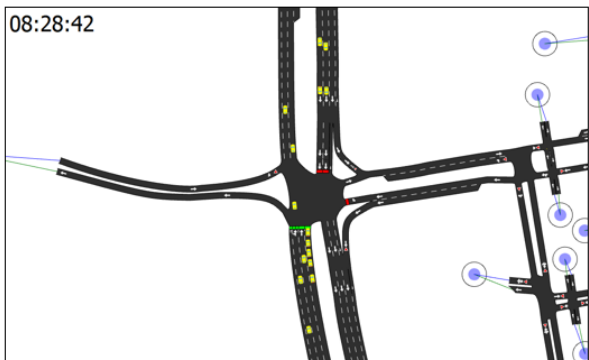


Figure 7 AM peak queue lengths – Melrose Drive / Corinna Street

AM – Melrose / Hindmarsh

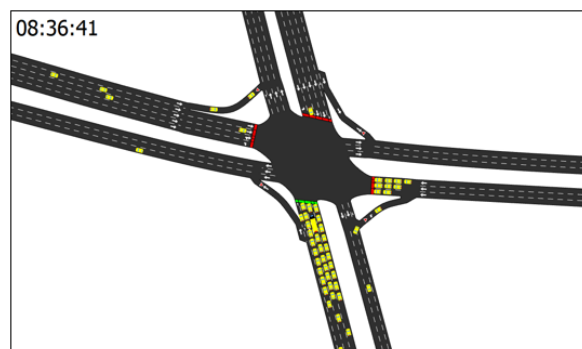
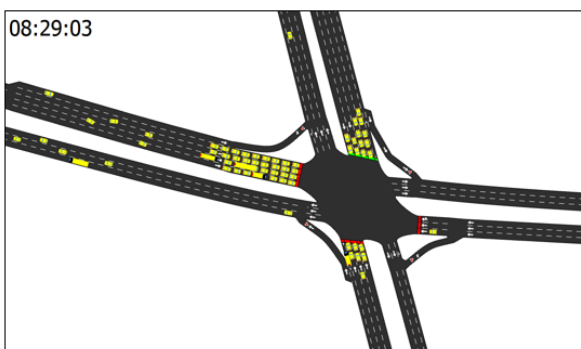
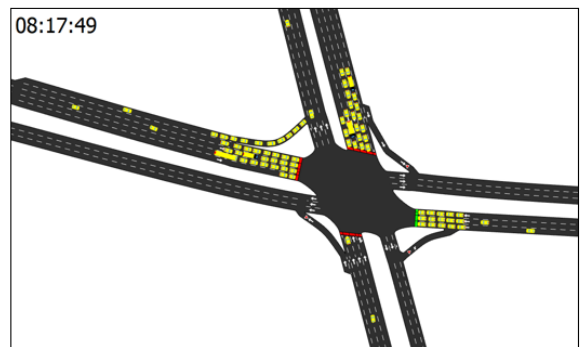
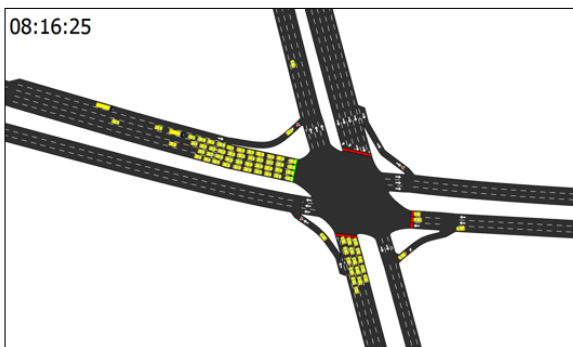


Figure 8 AM peak queue lengths – Melrose Drive / Hindmarsh Drive

4.1.4 Travel Times

The AM peak travel times for Melrose Drive northbound and Melrose Drive southbound are shown in Figure 9 and Figure 10 respectively. The travel time route points as referenced in the graphs are shown in Figure 11.

The ACT Traffic Microsimulation Modelling Guidelines states that average modelled travel times should be within 15% or one minute (whichever is greater) of the journey time recorded during the survey. To be conservative, this analysis has been based on the 15% target.

For the northbound direction along Melrose Drive from the intersection of Melrose Drive / Hindmarsh Drive to Melrose Drive / Launceston Street, the modelled travel times fit closely to the recorded data and are within the 15% threshold.

The southbound direction shows a significant variance between the modelled data and the recorded survey data from Melrose Drive / Launceston Street to Melrose Drive / Worgan Street. The modelled data shows a travel time of 13 seconds between the two intersections, whereas the recorded data outlines a travel time of 55 seconds. Calculation of the distance between the two intersection and a travel speed of 60 km/h shows that it should take approximately 13.2 s to travel (see below calculation). It is likely that when the survey was conducted, the survey car was caught in the back of the queue at the Melrose Drive / Launceston Street intersection and likely got held by the red signal at the intersection of Melrose Drive / Worgan Street, and hence took a longer time to clear the intersection.

For both directions, it should be noted that the total travel time between the first point to the last point is the same. Additionally, 5 out of 6 travel time sections fit within the 15% threshold.

$$time = \frac{distance}{speed} = \frac{0.22km}{60 km/h} \times 3600 s = 13.2 s$$

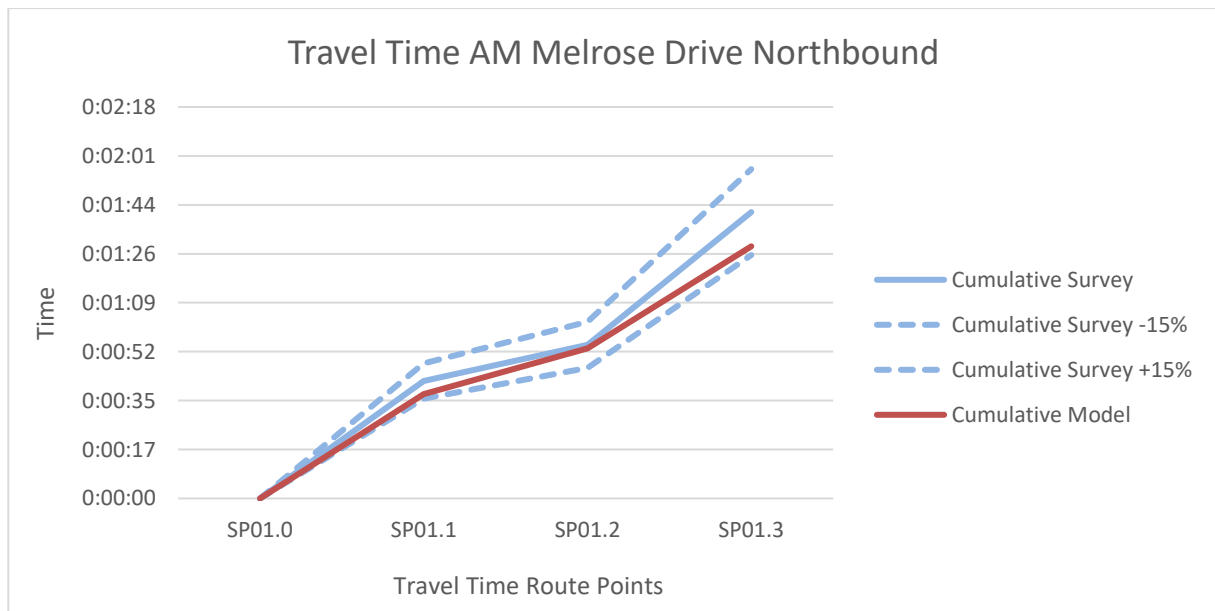


Figure 9 AM travel time – Melrose Drive northbound

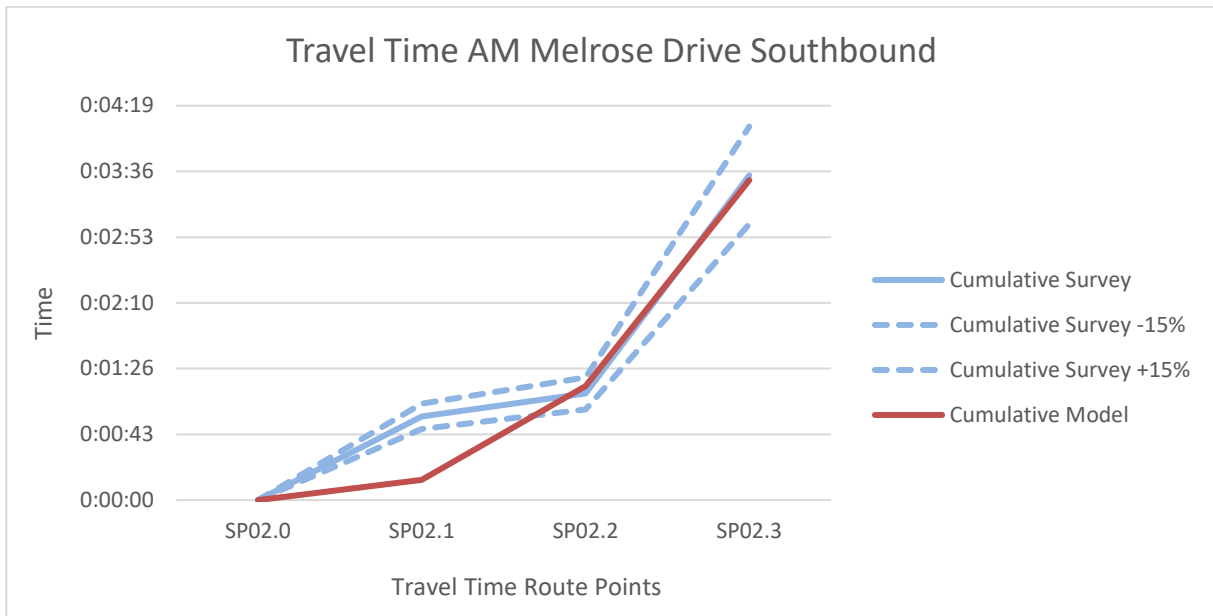


Figure 10 AM travel time – Melrose Drive southbound

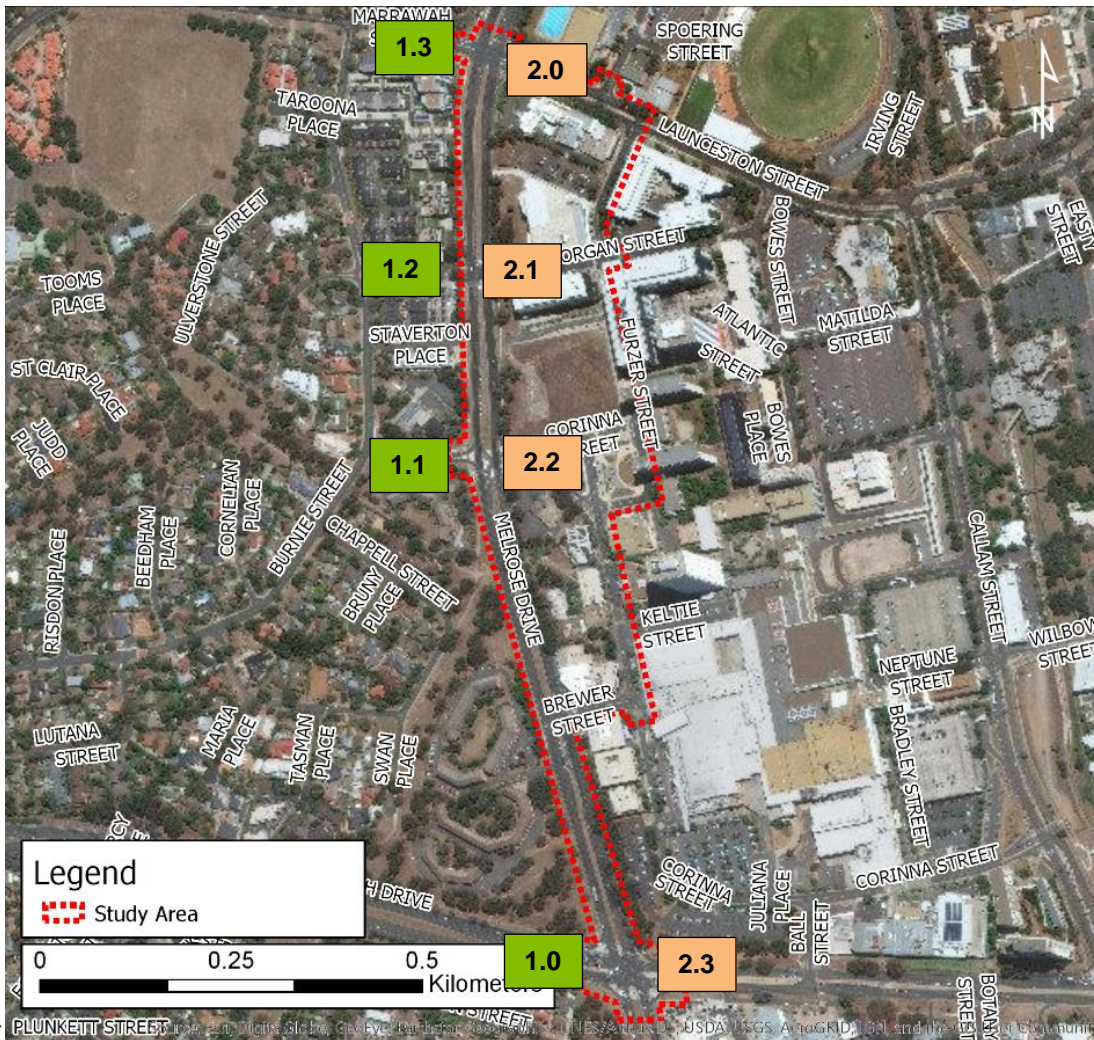


Figure 11 Travel time route points

4.2 PM Base

4.2.1 GEH

A summary of the GEH results for the PM peak is shown in Table 3, with detailed turn movement results available in Appendix A. The results indicate that the GEH values for all movements are under 10 and 94% of the values are under 5. These results meet the GEH targets in the ACT Traffic Microsimulation Modelling Guidelines.

Table 3 PM peak GEH results

GEH	Turns	GEH < 5	GEH < 10
	142	133	142
		94%	100%

The PM peak hour calibration diagram using the dynamic assignment is shown in Figure 12. The maximum GEH value recorded was 6.38 which is at the right-turn movement from into Furzer Street from the Keltie Street car park. There is a difference of 40 more vehicles undertaking this movement in the model compared to the survey data.

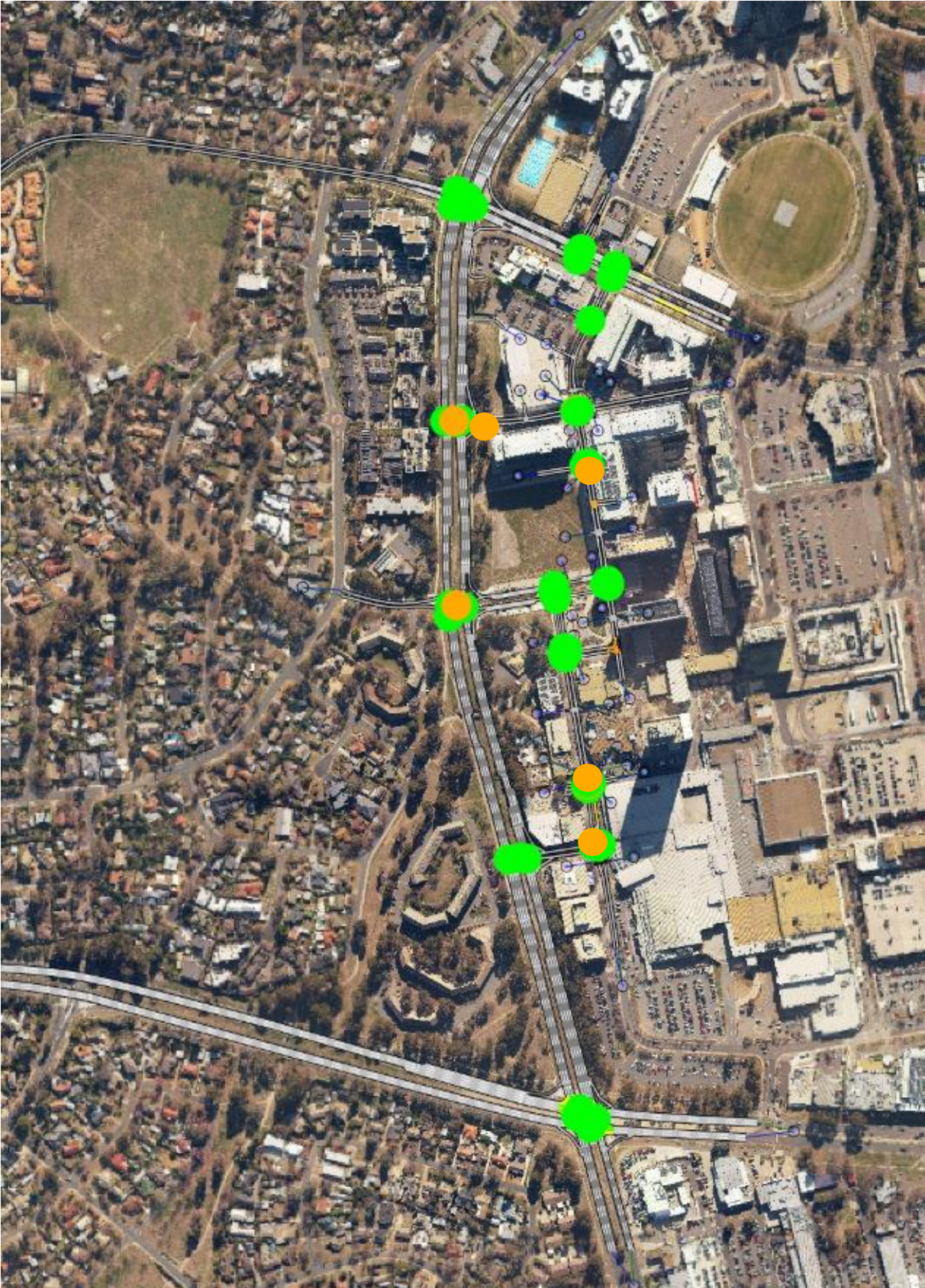


Figure 12 PM peak calibration diagram

4.2.2 R² Value

The PM Base r-squared value is 0.992 and shows little variation between the real data and modelled values (Figure 13). This also meets the r-squared target as outlined in the ACT Traffic Microsimulation Guidelines where the required value is greater than 0.95.

PM – Phillip Calibration

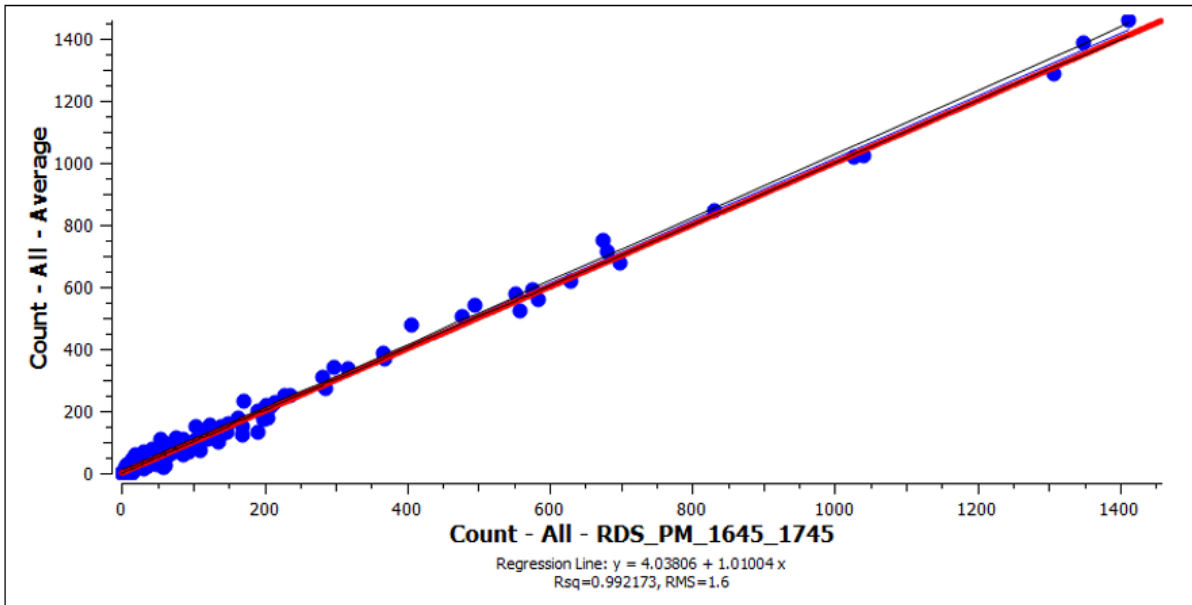


Figure 13 PM base R² plot

4.2.3 Queue Lengths

The average and maximum queue lengths recorded during the traffic survey from 4.45 pm to 5.45 pm is shown in Figure 14.

The maximum modelled queue lengths for the PM peak are shown in Figure 15 to Figure 17. A visual inspection of the modelled queue lengths is similar to the real data.

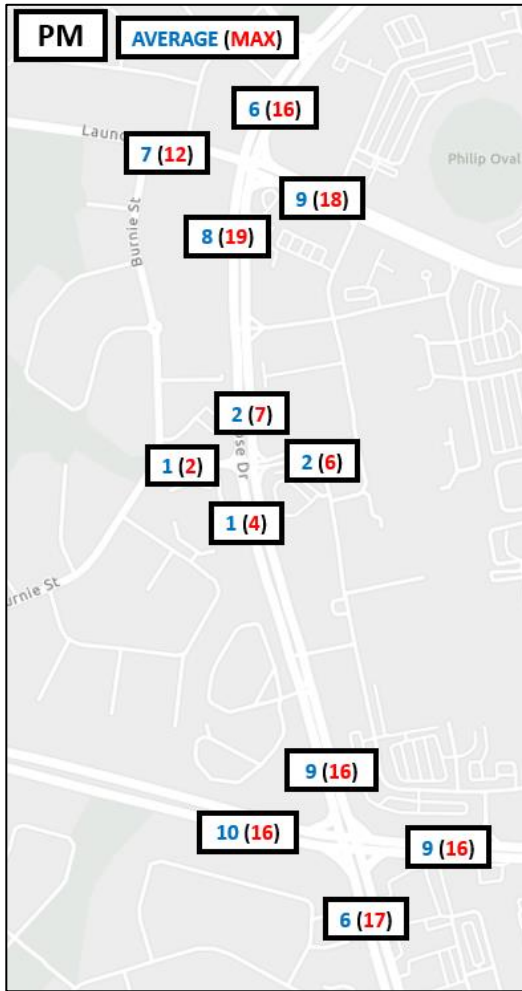


Figure 14 PM peak hour queue lengths

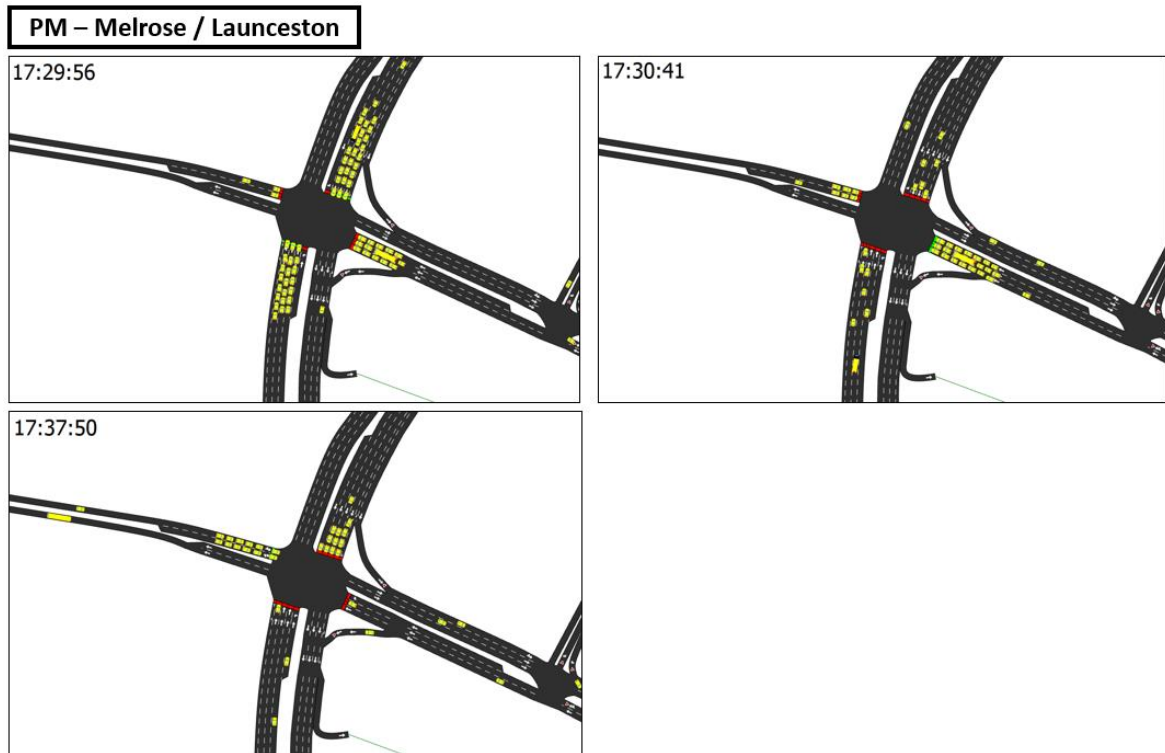


Figure 15 PM peak queue lengths – Melrose Drive / Launceston St

PM – Melrose / Corinna

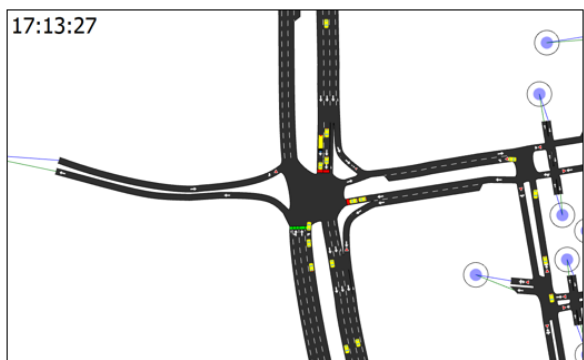
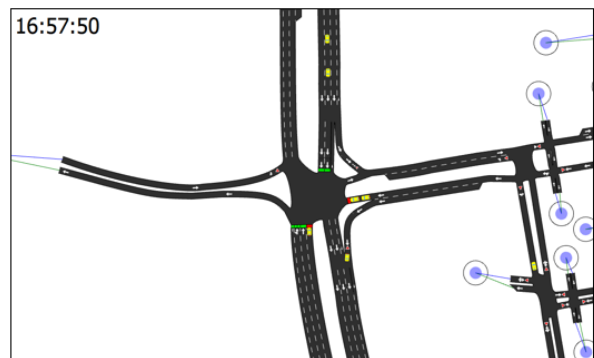
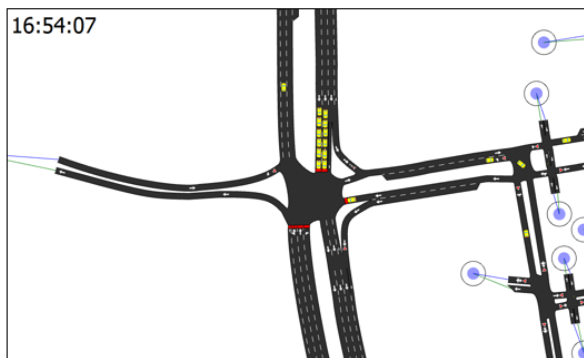


Figure 16 PM peak queue lengths – Melrose Drive / Corinna Street

PM – Melrose / Hindmarsh

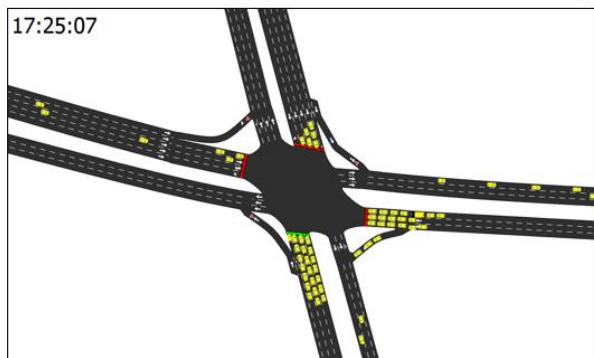
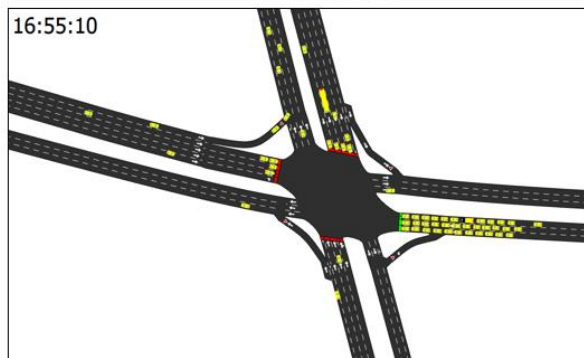
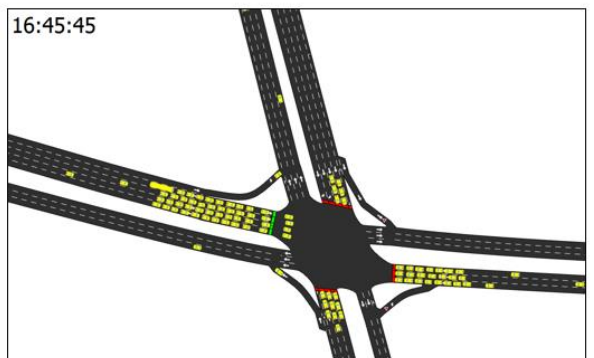


Figure 17 PM peak queue lengths – Melrose Drive / Hindmarsh Drive

4.2.4 Travel Times

The PM peak travel times for Melrose Drive northbound and Melrose Drive southbound are shown in Figure 18 and Figure 19 respectively. The travel time route points as referenced in the graphs are shown in Figure 11 above.

The modelled travel times for the northbound direction in the PM averages slightly faster from Melrose Drive / Corinna Street to Melrose Drive / Worgan Street. The modelled average is then slower from Melrose Drive / Worgan Street to Melrose Drive / Launceston Street compared to the survey data. However, the data still fits within the 15% threshold as outlined in the ACT Traffic Microsimulation Modelling Guidelines.

The average modelled travel times for the southbound direction are generally slower than the recorded data. This data strongly correlates within the 15% maximum deviance outlined in the ACT Traffic Microsimulation Modelling Guidelines.

For both directions, it should be noted that the total travel time between the first point to the last point is the same. Additionally, 5 out of 6 travel time sections fit within the 15% threshold.

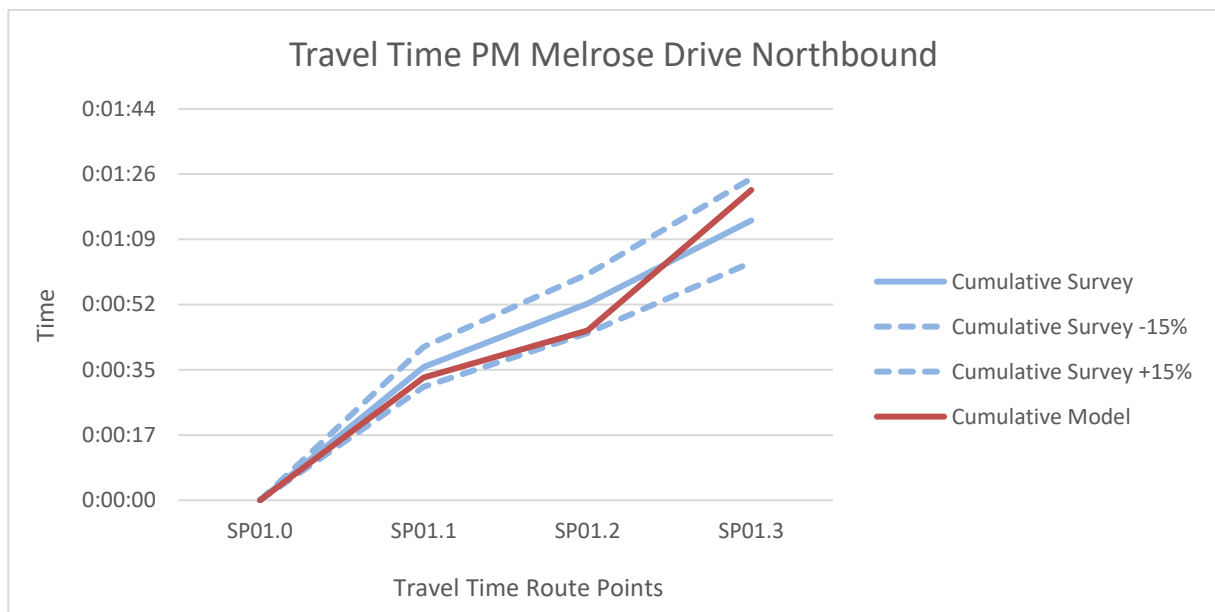


Figure 18 PM travel time – Melrose Drive northbound

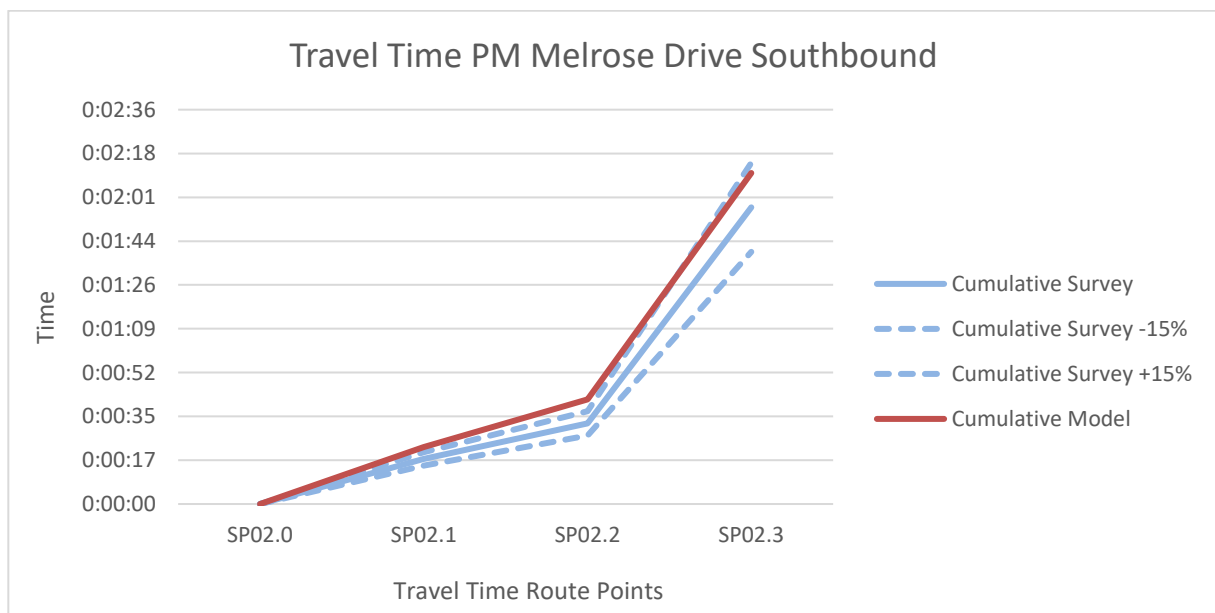


Figure 19 PM travel time – Melrose Drive southbound

Appendix A

Site Numbers:

1. Hindmarsh Drive – Melrose Drive
2. Melrose Drive – Launceston Street
3. Melrose Drive – Worgan Street
4. Melrose Drive – Corinna Street
5. Melrose Drive – Brewer Street
6. Corinna Street – Brewer Street
7. Furzer Street – Worgan Street
8. Launceston Street – Furzer Street
9. Corinna Street – Corinna Street
10. Furzer Street – Corinna Street (N)
11. Furzer Street – Corinna Street (S)
12. Launceston Street – Irving Street
13. Brewer Street – Keltie Street

AM BASE:

Object	Count - All - RDS_AM_0815_0915	Count - All - Average	Absolute Difference	Relative Difference (%)	GEH
997: 3_EL1 (3_EL1)	51	33.6	-17.4	-34.1176	2.68
996: 3_ER2 (3_ER2)	30	10	-20	-66.6667	4.47
982: 12_NL (12_NL)	90	86.2	-3.8	-4.22222	0.40
981: 12_NR (12_NR)	48	48	0	0	0.00
979: 12_WL (12_WL)	196	189.6	-6.4	-3.26531	0.46
978: 12_WT (12_WT)	819	835.8	16.8	2.05128	0.58
977: 12_ER (12_ER)	98	95.4	-2.6	-2.65306	0.26
976: 12_ET (12_ET)	401	486.2	85.2	21.2469	4.05
968: 8_SR (8_SR)	15	17	2	13.3333	0.50
967: 8_SL (8_SL)	49	61.6	12.6	25.7143	1.69
966: 8_ET (8_ET)	449	520	71	15.8129	3.23
965: 8_EL (8_EL)	78	41.4	-36.6	-46.9231	4.74
964: 8_WT (8_WT)	765	807	42	5.4902	1.50
963: 8_WR (8_WR)	143	116	-27	-18.8811	2.37
961: 2_NL2 (2_NL2)	372	394.4	22.4	6.02151	1.14
924: 2_WL (2_WL)	85	82.4	-2.6	-3.05882	0.28
923: 2_WT (2_WT)	423	415.4	-7.6	-1.79669	0.37
922: 2_WR (2_WR)	135	148.8	13.8	10.2222	1.16
921: 2_NR (2_NR)	57	57.8	0.8	1.40351	0.11
919: 2_NT (2_NT)	473	491.4	1.84E+01	3.89E+00	0.84
918: 2_ET (2_ET)	155	155.6	0.6	0.387097	0.05
917: 2_ER (2_ER)	206	242.8	36.8	17.8641	2.46
915: 2_SL (2_SL)	43	54.2	11.2	26.0465	1.61
914: 2_ST (2_ST)	1135	1164.2	29.2	2.57269	0.86
913: 2_SR (2_SR)	220	209.6	-10.4	-4.72727	0.71
3700: 8_N (8_N)	64	78.6	14.6	22.8125	1.73
3697: 8_S (8_S)	175	157.4	-17.6	-10.0571	1.37
3679: 4_EL2 (4_EL2)	25	79	54	216	7.49

AM BASE:

Object	Count - All - RDS_AM_0815_0915	Count - All - Average	Absolute Difference	Relative Difference (%)	GEH
3155: 4_EL1 (4_EL1)	25	78.6	53.6	214.4	7.45
3154: 4_ER2 (4_ER2)	28	4.6	-23.4	-83.5714	5.80
2619: 4_WL2 (4_WL2)	151	190.2	39.2	25.9603	3.00
2586: 4_SL2 (4_SL2)	40	71	31	77.5	4.16
1938: 13_NR (13_NR)	10	14.2	4.2	42	1.21
1934: 13_WR (13_WR)	22	51.6	29.6	134.545	4.88
1933: 13_WT (13_WT)	2	0	-2	-100	2.00
1932: 13_WL (13_WL)	13	0	-13	-100	5.10
1931: 13_ET (13_ET)	0	0	0	0	0.00
1930: 13_SL (13_SL)	36	44.6	8.6	23.8889	1.35
1927: 11_WT (11_WT)	0	0	0	0	0.00
1926: 11_ET (11_ET)	0	0	0	0	0.00
1909: 4_NL1 (4_NL1)	123	130.4	7.4	6.01626	0.66
1905: 5_NL1 (5_NL1)	44	45.8	1.8	4.09091	0.27
1817: 1_WL (1_WL)	857	852.6	-4.4	-0.513419	0.15
1813: 1_SL (1_SL)	242	222	-20	-8.26446	1.31
1805: 1_EL (1_EL)	105	102.4	-2.6	-2.47619	0.26
1778: 3_NL1 (3_NL1)	169	218	49	28.9941	3.52
1771: 2_NL1 (2_NL1)	372	394	22	5.91398	1.12
1412: 5_EL2 (5_EL2)	70	81.4	11.4	16.2857	1.31
1391: 1_NL (1_NL)	43	39.4	-3.6	-8.37209	0.56
1379: 2_EL (2_EL)	88	129.4	41.4	47.0455	3.97
1300: 103_WR (103_WR)	4	10.6	6.6	165	2.44
1299: 101_WR (101_WR)	7	3.2	-3.8	-54.2857	1.68
1298: 101_WL (101_WL)	11	8.4	-2.6	-23.6364	0.83
1297: 101_NR (101_NR)	32	22	-10	-31.25	1.92
1296: 101_NT (101_NT)	189	135.4	-53.6	-28.3598	4.21
1295: 101_SL (101_SL)	18	16.2	-1.8	-10	0.44
1294: 101_ST (101_ST)	56	70.2	14.2	25.3571	1.79
1286: 103_NR (103_NR)	100	98	-2	-2	0.20
1285: 103_NT (103_NT)	82	108	26	31.7073	2.67

AM BASE:

Object	Count - All - RDS_AM_0815_0915	Count - All - Average	Absolute Difference	Relative Difference (%)	GEH
1283: 103_WL (103_WL)	4	12.8	8.8	220	3.04
1282: 103_SL (103_SL)	118	84.8	-33.2	-28.1356	3.30
1278: 103_ST (103_ST)	135	74.4	-60.6	-44.8889	5.92
1246: 1_WT (1_WT)	1462	1428	-34	-2.32558	0.89
1245: 1_WR (1_WR)	470	458	-12	-2.55319	0.56
1244: 1_NR (1_NR)	190	226.2	36.2	19.0526	2.51
1242: 1_NT (1_NT)	290	305.4	15.4	5.31034	0.89
1241: 1_ET (1_ET)	417	422.2	5.2	1.247	0.25
1240: 1_ER (1_ER)	97	85	-12	-12.3711	1.26
1237: 1_ST (1_ST)	930	954	24	2.58065	0.78
1236: 1_SR (1_SR)	91	87.4	-3.6	-3.95604	0.38
1219: 7_WL (7_WL)	15	12.2	-2.8	-18.6667	0.76
1218: 7_WT (7_WT)	48	49.2	1.2	2.5	0.17
1217: 7_WR (7_WR)	9	66.4	57.4	637.778	9.35
1216: 7_NR (7_NR)	67	12.6	-54.4	-81.194	8.62
1215: 7_NL (7_NL)	18	23.4	5.4	30	1.19
1214: 7_NT (7_NT)	110	103.2	-6.8	-6.18182	0.66
1213: 7_ET (7_ET)	54	45.6	-8.4	-15.5556	1.19
1212: 7_ER (7_ER)	15	27	12	80	2.62
1211: 7_EL (7_EL)	32	36.4	4.4	13.75	0.75
1210: 7_SL (7_SL)	37	8.6	-28.4	-76.7568	5.95
1209: 7_ST (7_ST)	44	41.6	-2.4	-5.45455	0.37
1208: 7_SR (7_SR)	58	36.6	-21.4	-36.8966	3.11
1200: 102_ER (102_ER)	77	23	-54	-70.1299	7.64
1199: 102_ET (102_ET)	81	43.6	-37.4	-46.1728	4.74
1193: 102_WL (102_WL)	443	508.2	65.2	14.7178	2.99
1192: 102_WT (102_WT)	72	126.2	54.2	75.2778	5.44
1187: 13_ST (13_ST)	123	70.4	-52.6	-42.7642	5.35
1186: 13_SR (13_SR)	28	27	-1	-3.57143	0.19
1185: 13_NT (13_NT)	125	80.6	-44.4	-35.52	4.38
1184: 13_NL (13_NL)	18	29.8	11.8	65.5556	2.41
1183: 13_EL (13_EL)	23	47.6	24.6	106.957	4.14
1182: 13_ER (13_ER)	9	0	-9	-100	4.24
1178: 6_ST (6_ST)	110	101.4	-8.6	-7.81818	0.84
1177: 6_SL (6_SL)	66	68.6	2.6	3.93939	0.32
1176: 6_NT (6_NT)	132	104.4	-27.6	-20.9091	2.54
1175: 6_NR (6_NR)	39	76.4	37.4	95.8974	4.92

AM BASE:

Object	Count - All - RDS_AM_0815_0915	Count - All - Average	Absolute Difference	Relative Difference (%)	GEH
1174: 6_WR (6_WR)	135	107.6	-27.4	-20.2963	2.49
1173: 6_WL (6_WL)	78	41.2	-36.8	-47.1795	4.77
1161: 9_ET (9_ET)	24	37.8	13.8	57.5	2.48
1160: 9_EL (9_EL)	58	49.2	-8.8	-15.1724	1.20
1159: 9_WT (9_WT)	174	156.6	-17.4	-10	1.35
1158: 9_WR (9_WR)	113	128	15	13.2743	1.37
1157: 9_SR (9_SR)	93	23.4	-69.6	-74.8387	9.12
1156: 9_SL (9_SL)	25	44.4	19.4	77.6	3.29
1153: 11_SL (11_SL)	3	0.2	-2.8	-93.3333	2.21
1152: 11_ST (11_ST)	94	57.6	-36.4	-38.7234	4.18
1151: 11_SR (11_SR)	24	10.4	-13.6	-56.6667	3.28
1150: 11_WR (11_WR)	2	0	-2	-100	2.00
1149: 11_WL (11_WL)	1	2	1	100	0.82
1147: 11_NT (11_NT)	161	122.6	-38.4	-23.8509	3.22
1146: 11_NR (11_NR)	6	24.4	18.4	306.667	4.72
1145: 11_NL (11_NL)	3	27.2	24.2	806.667	6.23
1144: 11_EL (11_EL)	2	2.4	0.4	20	0.27
1142: 11_ER (11_ER)	22	8.4	-13.6	-61.8182	3.49
1124: 10_NR (10_NR)	79	86.6	7.6	9.62025	0.84
1123: 10_NT (10_NT)	3	5.4	2.4	80	1.17
1122: 10_WL (10_WL)	267	177.4	-89.6	-33.5581	6.01
1121: 10_WR (10_WR)	0	0	0.00E+00	0.00E+00	0.00
1120: 10_ST (10_ST)	0	4.4	4.4	inf	2.97
1119: 10_SL (10_SL)	3	0.8	-2.2	-73.3333	1.60
1107: 5_EL1 (5_EL1)	70.00	81.40	11.40	16.29	1.31
1106: 5_ER2 (5_ER2)	35.00	63.40	28.40	81.14	4.05
1103: 5_ST (5_ST)	1714.00	1777.40	63.40	3.70	1.52
1102: 5_SR1 (5_SR1)	169.00	102.00	-67.00	-39.65	5.76
1100: 5_NT (5_NT)	443.00	477.60	34.60	7.81	1.61
1099: 5_ER1 (5_ER1)	35.00	64.60	29.60	84.57	4.19
1096: 5_NL2 (5_NL2)	44.00	46.60	2.60	5.91	0.39

AM BASE:

Object	Count - All - RDS_AM_0815_0915	Count - All - Average	Absolute Difference	Relative Difference (%)	GEH
1095: 5_SR2 (5_SR2)	169.00	102.00	-67.00	-39.65	5.76
1071: 3_NT (3_NT)	530.00	555.60	25.60	4.83	1.10
1070: 3_ER1 (3_ER1)	30.00	9.80	-20.20	-67.33	4.53
1068: 3_ST (3_ST)	1370.00	1407.80	37.80	2.76	1.01
1067: 3_SR1 (3_SR1)	346.00	415.80	69.80	20.17	3.58
1050: 4_WL1 (4_WL1)	151.00	190.80	39.80	26.36	3.04
1047: 4_SL1 (4_SL1)	40.00	71.00	31.00	77.50	4.16
1046: 4_ST (4_ST)	1541.00	1616.60	75.60	4.91	1.90
1045: 4_SR1 (4_SR1)	168.00	155.20	-12.80	-7.62	1.01
1042: 4_NT (4_NT)	462.00	436.80	-25.20	-5.45	1.19
1040: 4_ER1 (4_ER1)	28.00	4.60	-23.40	-83.57	5.80
1037: 4_NL2 (4_NL2)	123.00	130.40	7.40	6.02	0.66
1036: 4_SR2 (4_SR2)	168.00	155.20	-12.80	-7.62	1.01
1005: 3_NL2 (3_NL2)	169.00	218.60	49.60	29.35	3.56
1003: 3_SR2 (3_SR2)	346.00	415.80	69.80	20.17	3.58
Mean	178.29	181.32	3.03	1.70	2.44

PM BASE:

Object	Count - All - RDS_PM_1645_1745	Count - All - Average	Absolute Difference	Relative Difference (%)	GEH
997: 3_EL1 (3_EL1)	171	231.8	60.8	35.5556	4.28
996: 3_ER2 (3_ER2)	58	19.2	-38.8	-66.8966	6.25
982: 12_NL (12_NL)	208	213.6	5.6	2.69231	0.39
981: 12_NR (12_NR)	103	105.6	2.6	2.52427	0.25
979: 12_WL (12_WL)	86	65.4	-20.6	-23.9535	2.37
978: 12_WT (12_WT)	366	386.8	20.8	5.68306	1.07
977: 12_ER (12_ER)	56	75.4	19.4	34.6429	2.39
976: 12_ET (12_ET)	681	714	33	4.84581	1.25
968: 8_SR (8_SR)	44	60.6	16.6	37.7273	2.30
967: 8_SL (8_SL)	237	249.6	12.6	5.31646	0.81
966: 8_ET (8_ET)	495	540	45	9.09091	1.98
965: 8_EL (8_EL)	27	28.6	1.6	5.92593	0.30
964: 8_WT (8_WT)	478	503.2	25.2	5.27197	1.14
963: 8_WR (8_WR)	91	97.2	6.2	6.81319	0.64
961: 2_NL2 (2_NL2)	202	219.6	17.6	8.71287	1.21
924: 2_WL (2_WL)	35	31.2	-3.8	-10.8571	0.66
923: 2_WT (2_WT)	164	175.4	11.4	6.95122	0.88
922: 2_WR (2_WR)	100	101	1	1	0.10
921: 2_NR (2_NR)	91	91.4	0.4	0.43956	0.04
919: 2_NT (2_NT)	1026	1016.4	-9.6	-0.935673	0.30

PM BASE:

Object	Count - All - RDS_PM_1645_1745	Count - All - Average	Absolute Difference	Relative Difference (%)	GEH
918: 2_ET (2_ET)	317	336.6	19.6	6.18297	1.08
917: 2_ER (2_ER)	297	341	44	14.8148	2.46
915: 2_SL (2_SL)	85	76.2	-8.8	-10.3529	0.98
914: 2_ST (2_ST)	585	560.4	-24.6	-4.20513	1.03
913: 2_SR (2_SR)	86	59.2	-26.8	-31.1628	3.15
5216: 107_WR (107_WR)	54	85.8	31.8	58.8889	3.80
5215: 107_WL (107_WL)	170	121	-49	-28.8235	4.06
3700: 8_N (8_N)	281	310.2	29.2	10.3915	1.70
3697: 8_S (8_S)	141	125.8	-15.2	-10.7801	1.32
3679: 4_EL2 (4_EL2)	123	151.8	28.8	23.4146	2.46
3155: 4_EL1 (4_EL1)	123	151.6	28.6	23.252	2.44
3154: 4_ER2 (4_ER2)	61	24	-37	-60.6557	5.68
2619: 4_WL2 (4_WL2)	48	59	11	22.9167	1.50
2586: 4_SL2 (4_SL2)	57	94.4	37.4	65.614	4.30
1938: 13_NR (13_NR)	23	16.4	-6.6	-28.6957	1.49
1934: 13_WR (13_WR)	31	68.8	37.8	121.935	5.35
1933: 13_WT (13_WT)	5	0.6	-4.4	-88	2.63
1932: 13_WL (13_WL)	24	19.8	-4.2	-17.5	0.90
1931: 13_ET (13_ET)	2	0.2	-1.8	-90	1.72
1930: 13_SL (13_SL)	42	76	34	80.9524	4.43
1927: 11_WT (11_WT)	0	0	0	0	0.00
1926: 11_ET (11_ET)	0	0	0	0	0.00
1909: 4_NL1 (4_NL1)	141	136.6	-4.4	-3.12057	0.37
1905: 5_NL1 (5_NL1)	60	66.8	6.8	11.3333	0.85
1817: 1_WL (1_WL)	191	197.6	6.6	3.4555	0.47
1813: 1_SL (1_SL)	559	522.2	-36.8	-6.58318	1.58
1805: 1_EL (1_EL)	123	112.6	-10.4	-8.45528	0.96
1793: 3_EL2 (3_EL2)	171	232	61	35.6725	4.30
1778: 3_NL1 (3_NL1)	13	14.8	1.8	13.8462	0.48
1771: 2_NL1 (2_NL1)	202	219.2	17.2	8.51485	1.19
1412: 5_EL2 (5_EL2)	215	224.8	9.8	4.55814	0.66
1391: 1_NL (1_NL)	120	110.6	-9.4	-7.83333	0.88
1379: 2_EL (2_EL)	170	151	-19	-11.1765	1.50
1300: 103_WR (103_WR)	49	28.8	-20.2	-41.2245	3.24

PM BASE:

Object	Count - All - RDS_PM_1645_1745	Count - All - Average	Absolute Difference	Relative Difference (%)	GEH
1299: 101_WR (101_WR)	34	23.8	-10.2	-30	1.90
1298: 101_WL (101_WL)	78	74.8	-3.2	-4.10256	0.37
1297: 101_NR (101_NR)	23	19	-4	-17.3913	0.87
1295: 101_SL (101_SL)	10	22.6	12.6	126	3.12
1286: 103_NR (103_NR)	29	35.6	6.6	22.7586	1.16
1285: 103_NT (103_NT)	118	123.8	5.8	4.91525	0.53
1283: 103_WL (103_WL)	55	79.6	2.46E+01	4.47E+01	3.00
1282: 103_SL (103_SL)	15	0	-15	-100	5.48
1278: 103_ST (103_ST)	73	98.6	25.6	35.0685	2.76
1246: 1_WT (1_WT)	553	575.2	22.2	4.01447	0.93
1245: 1_WR (1_WR)	368	367.6	-0.4	-0.108696	0.02
1244: 1_NR (1_NR)	676	752	76	11.2426	2.84
1242: 1_NT (1_NT)	831	844	13	1.56438	0.45
1241: 1_ET (1_ET)	1040	1024.6	-15.4	-1.48077	0.48
1240: 1_ER (1_ER)	78	74.6	-3.4	-4.35897	0.39
1237: 1_ST (1_ST)	406	475.4	69.4	17.0936	3.31
1236: 1_SR (1_SR)	72	68.8	-3.2	-4.44444	0.38
1219: 7_WL (7_WL)	7	2.8	-4.2	-60	1.90
1218: 7_WT (7_WT)	24	15.6	-8.4	-35	1.89
1217: 7_WR (7_WR)	6	17.6	11.6	193.333	3.38
1216: 7_NR (7_NR)	67	58.6	-8.4	-12.5373	1.06
1215: 7_NL (7_NL)	49	67	18	36.7347	2.36
1214: 7_NT (7_NT)	75	91.4	16.4	21.8667	1.80
1212: 7_ER (7_ER)	15	44.8	29.8	198.667	5.45
1211: 7_EL (7_EL)	50	52.2	2.2	4.4	0.31
1210: 7_SL (7_SL)	26	39.4	13.4	51.5385	2.34
1209: 7_ST (7_ST)	62	89.8	27.8	44.8387	3.19
1208: 7_SR (7_SR)	42	48	6	14.2857	0.89
1200: 102_ER (102_ER)	6	3.6	-2.4	-40	1.10
1199: 102_ET (102_ET)	229	250.8	21.8	9.51965	1.41
1193: 102_WL (102_WL)	7	6.6	-0.4	-5.71429	0.15
1192: 102_WT (102_WT)	37	36.4	-0.6	-1.62162	0.10
1187: 13_ST (13_ST)	110	73.8	-36.2	-32.9091	3.78
1186: 13_SR (13_SR)	36	57.2	21.2	58.8889	3.11
1185: 13_NT (13_NT)	191	130.8	-60.2	-31.5183	4.75
1184: 13_NL (13_NL)	36	48	12	33.3333	1.85
1183: 13_EL (13_EL)	57	95	38	66.6667	4.36

PM BASE:

Object	Count - All - RDS_PM_1645_1745	Count - All - Average	Absolute Difference	Relative Difference (%)	GEH
1182: 13_ER (13_ER)	19	58.8	39.8	209.474	6.38
1178: 6_ST (6_ST)	135	99.4	-35.6	-26.3704	3.29
1177: 6_SL (6_SL)	286	272.2	-13.8	-4.82517	0.83
1176: 6_NT (6_NT)	204	177	-27	-13.2353	1.96
1175: 6_NR (6_NR)	77	114.6	37.6	48.8312	3.84
1174: 6_WR (6_WR)	108	108.2	0.2	0.185185	0.02
1173: 6_WL (6_WL)	55	108.4	53.4	97.0909	5.91
1161: 9_ET (9_ET)	94	67.6	-26.4	-28.0851	2.94
1160: 9_EL (9_EL)	74	65.6	-8.4	-11.3514	1.01
1159: 9_WT (9_WT)	36	24.2	-11.8	-32.7778	2.15
1158: 9_WR (9_WR)	140	148.2	8.2	5.85714	0.68
1157: 9_SR (9_SR)	54	67.8	13.8	25.5556	1.77
1156: 9_SL (9_SL)	87	107.8	20.8	23.908	2.11
1153: 11_SL (11_SL)	9	23.2	14.2	157.778	3.54
1152: 11_ST (11_ST)	119	116.6	-2.4	-2.01681	0.22
1151: 11_SR (11_SR)	31	11.2	-19.8	-63.871	4.31
1150: 11_WR (11_WR)	3	0.6	-2.4	-80	1.79
1149: 11_WL (11_WL)	7	25.6	18.6	265.714	4.61
1147: 11_NT (11_NT)	198	173.6	-24.4	-12.3232	1.79
1146: 11_NR (11_NR)	9	24.4	15.4	171.111	3.77
1145: 11_NL (11_NL)	7	15.8	8.8	125.714	2.61
1144: 11_EL (11_EL)	37	20.8	-16.2	-43.7838	3.01
1142: 11_ER (11_ER)	15	32.4	17.4	116	3.57
1124: 10_NR (10_NR)	148	133	-15	-10.1351	1.27
1123: 10_NT (10_NT)	29	20	-9	-31.0345	1.82
1122: 10_WL (10_WL)	75	92	17	22.6667	1.86
1121: 10_WR (10_WR)	2	0	-2	-100	2.00
1120: 10_ST (10_ST)	13	14.4	1.4	10.7692	0.38
1119: 10_SL (10_SL)	7	0	-7	-100	3.74
1107: 5_EL1 (5_EL1)	215	225.8	10.8	5.02326	0.73
1106: 5_ER2 (5_ER2)	149	159.6	10.6	7.11409	0.85
1103: 5_ST (5_ST)	576	589.8	13.8	2.39583	0.57
1102: 5_SR1 (5_SR1)	104	151	47	45.1923	4.16
1100: 5_NT (5_NT)	1411	1459.4	48.4	3.43019	1.28

PM BASE:

Object	Count - All - RDS_PM_1645_1745	Count - All - Average	Absolute Difference	Relative Difference (%)	GEH
1099: 5_ER1 (5_ER1)	149	159.4	10.4	6.97987	0.84
1096: 5_NL2 (5_NL2)	60	66.8	6.8	11.33333	0.85
1095: 5_SR2 (5_SR2)	104	151	47	45.1923	4.16
1071: 3_NT (3_NT)	1308	1285	-23	-1.75841	0.64
1070: 3_ER1 (3_ER1)	58	19	-39	-67.2414	6.29
1068: 3_ST (3_ST)	698	678.4	-19.6	-2.80802	0.75
1067: 3_SR1 (3_SR1)	31	28.2	-2.8	-9.03226	0.51
1050: 4_WL1 (4_WL1)	48	58.8	10.8	22.5	1.48
1047: 4_SL1 (4_SL1)	57	94.4	37.4	65.614	4.30
1046: 4_ST (4_ST)	630	620	-10	-1.5873	0.40
1045: 4_SR1 (4_SR1)	38	35	-3	-7.89474	0.50
1042: 4_NT (4_NT)	1348	1386.2	38.2	2.83383	1.03
1040: 4_ER1 (4_ER1)	61	24.4	-36.6	-60	5.60
1037: 4_NL2 (4_NL2)	141	136.8	-4.2	-2.97872	0.36
1036: 4_SR2 (4_SR2)	38	35	-3	-7.89474	0.50
1005: 3_NL2 (3_NL2)	13	14.8	1.8	13.8462	0.48
1003: 3_SR2 (3_SR2)	31	28.2	-2.8	-9.03226	0.51
Mean	170.599	176.349	5.7507	3.3709	1.98

Appendix B

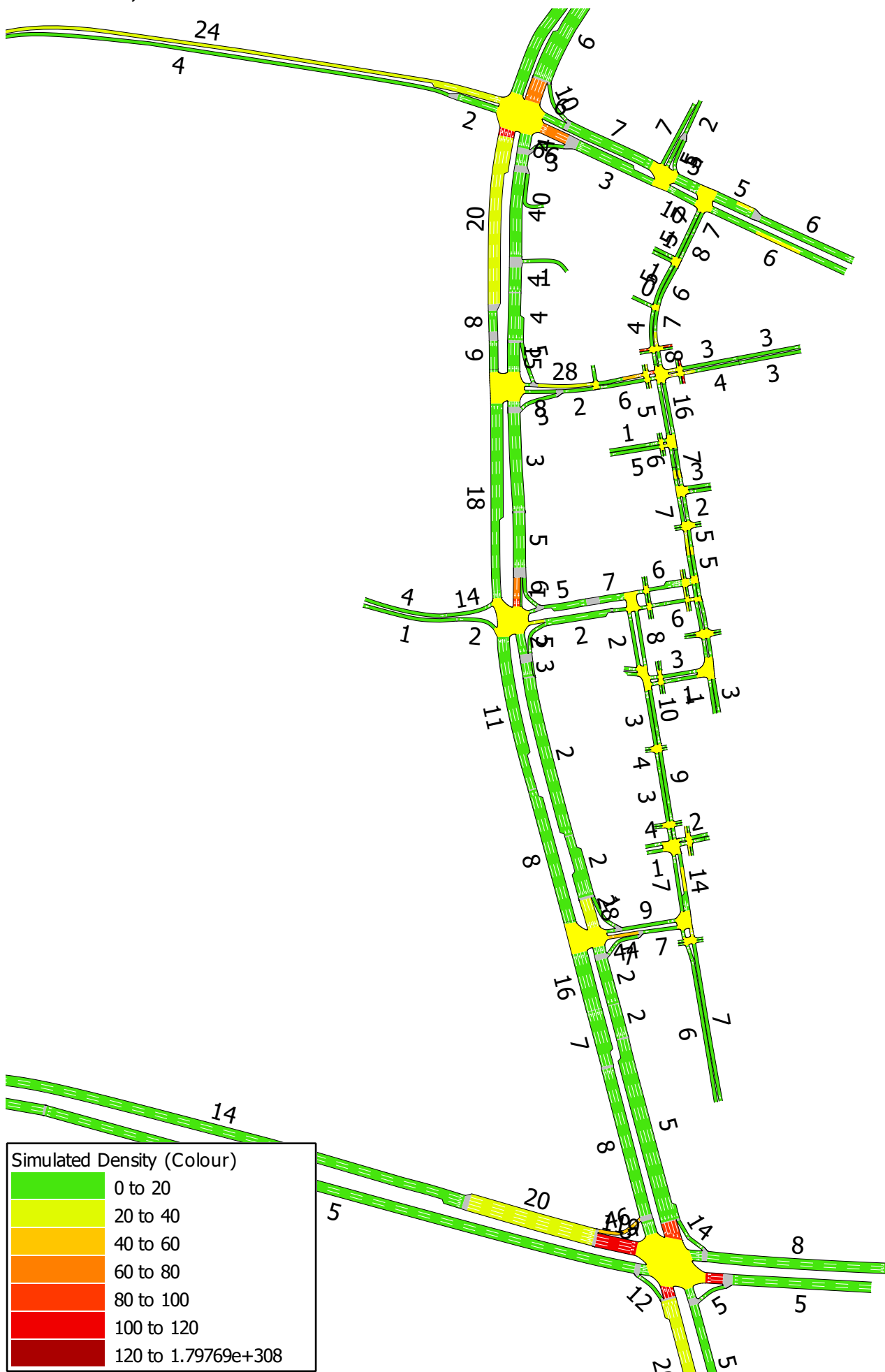
Aimsun Network Plots

PHILLIP B2 S180 AIMSUN MODELLING

DENSITY (VEH/KM)

2019 Future AM-SRC

AECOM, 23/3/21

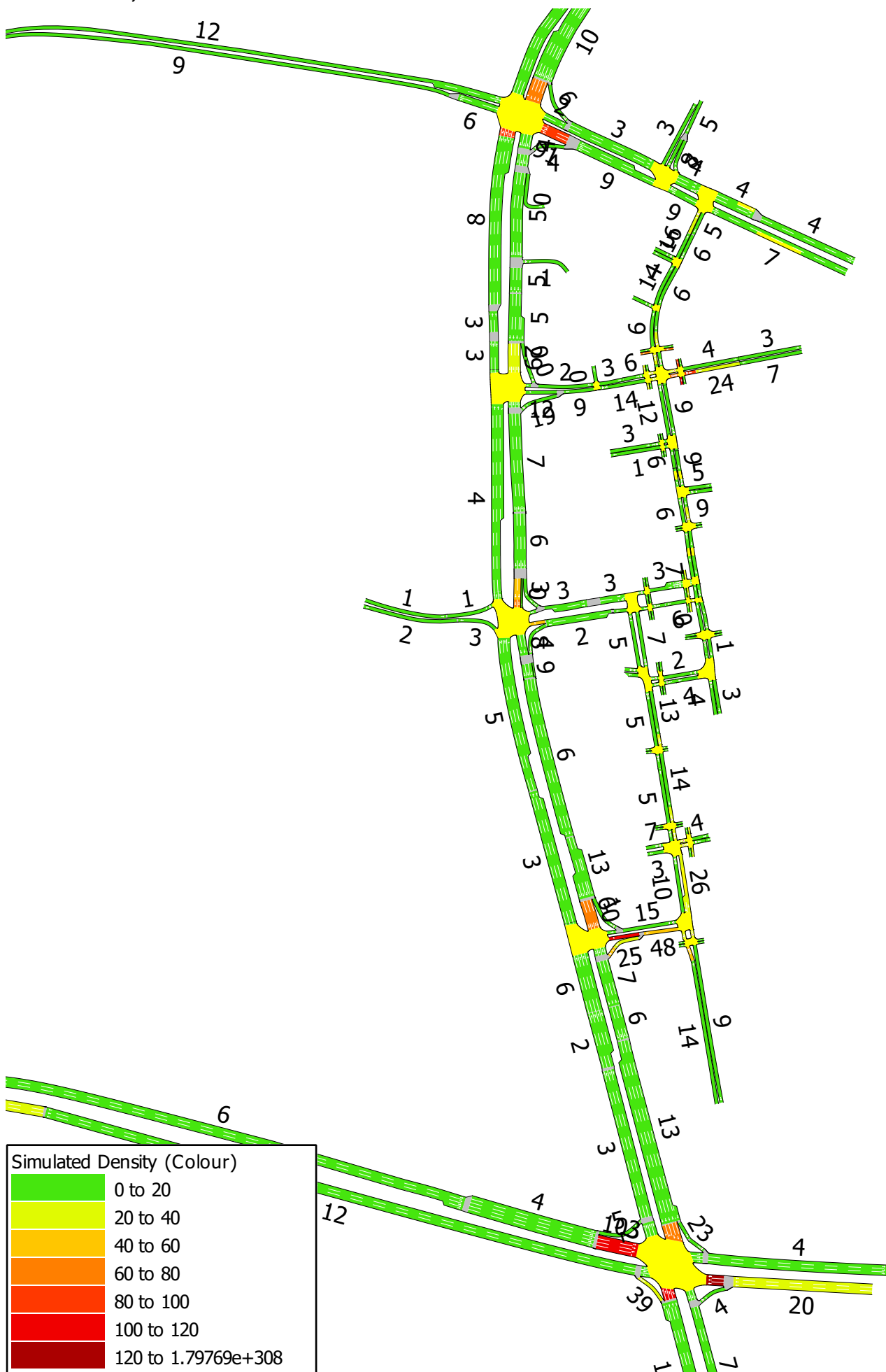


PHILLIP B2 S180 AIMSUN MODELLING

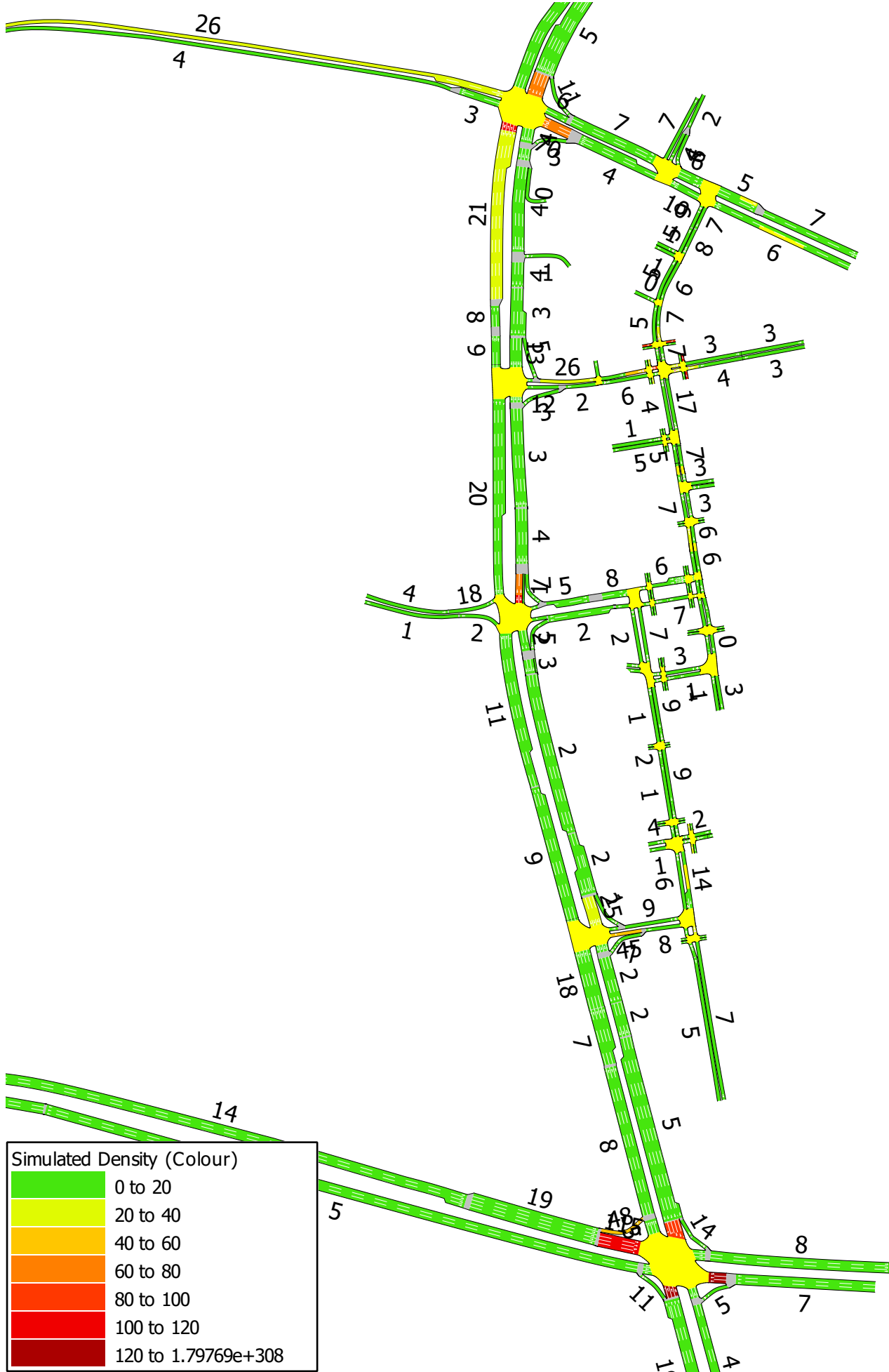
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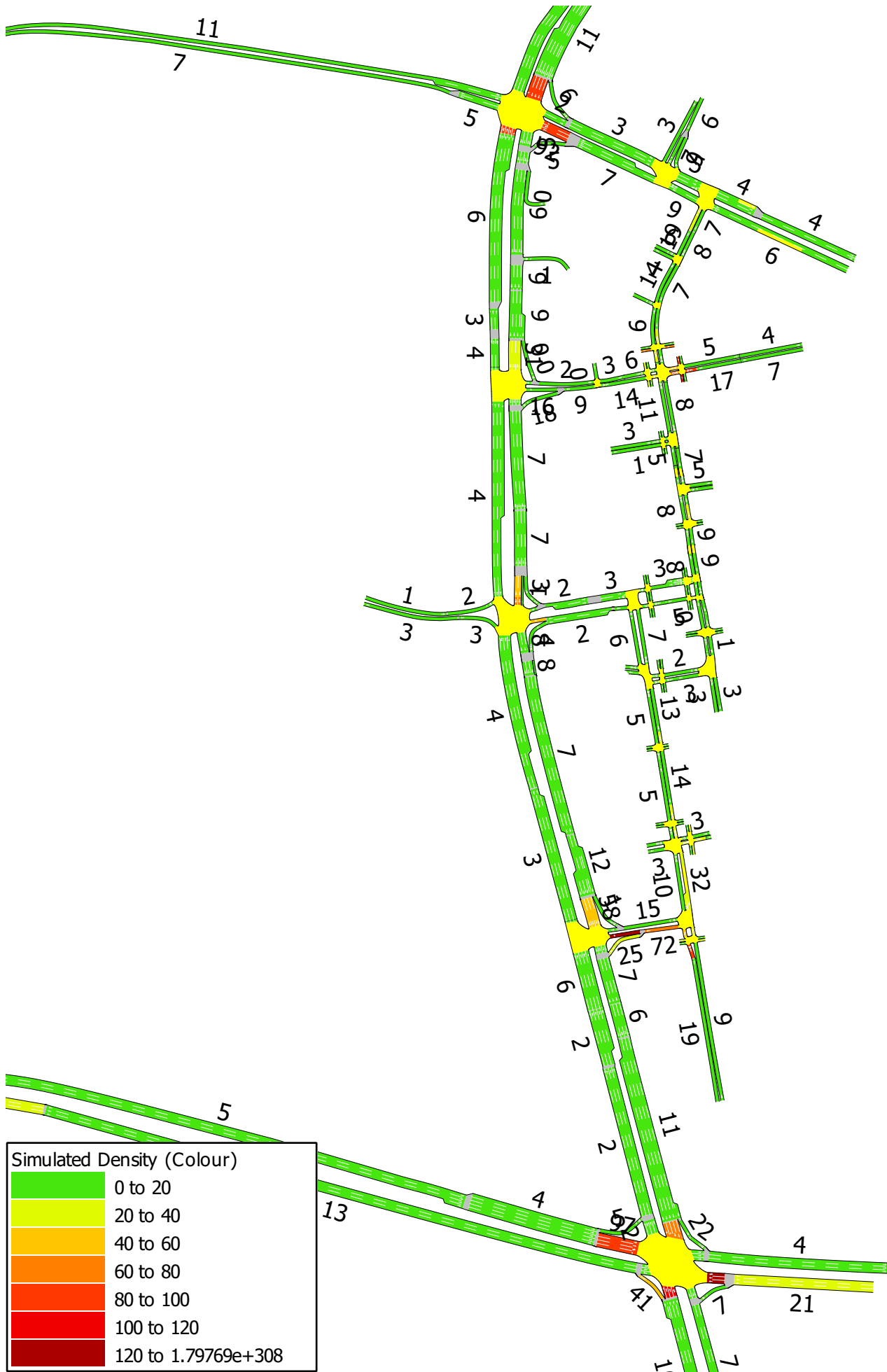
AECOM, 23/3/21



PHILLIP B2 S180 AIMSUN MODELLING
 DENSITY (VEH/KM)
 2021 Future AM - No developments-SRC
 AECOM, 23/3/21



PHILLIP B2 S180 AIMSUN MODELLING
 DENSITY (VEH/KM)
 2021 Future PM - No developments-SRC
 AECOM, 23/3/21

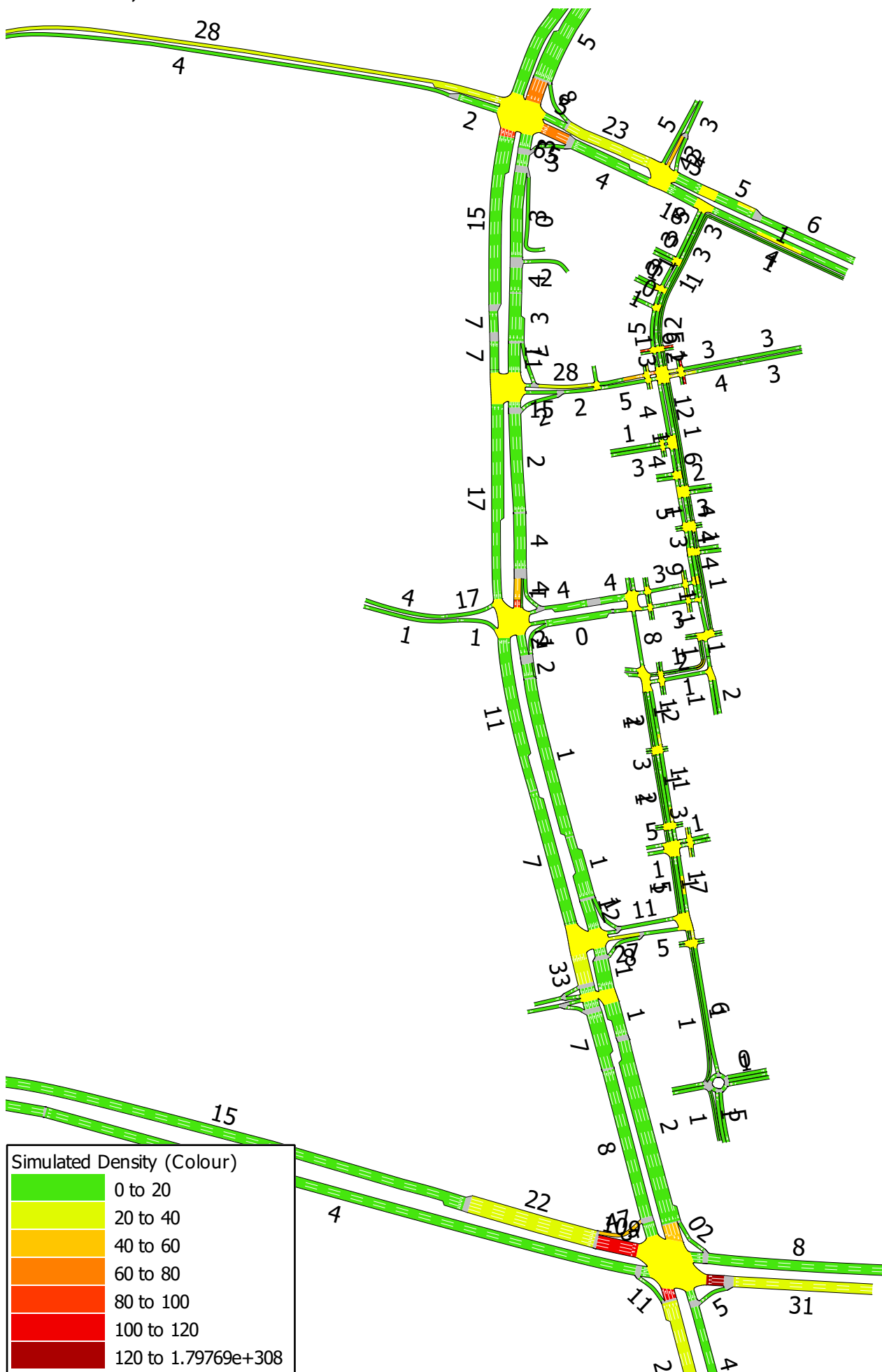


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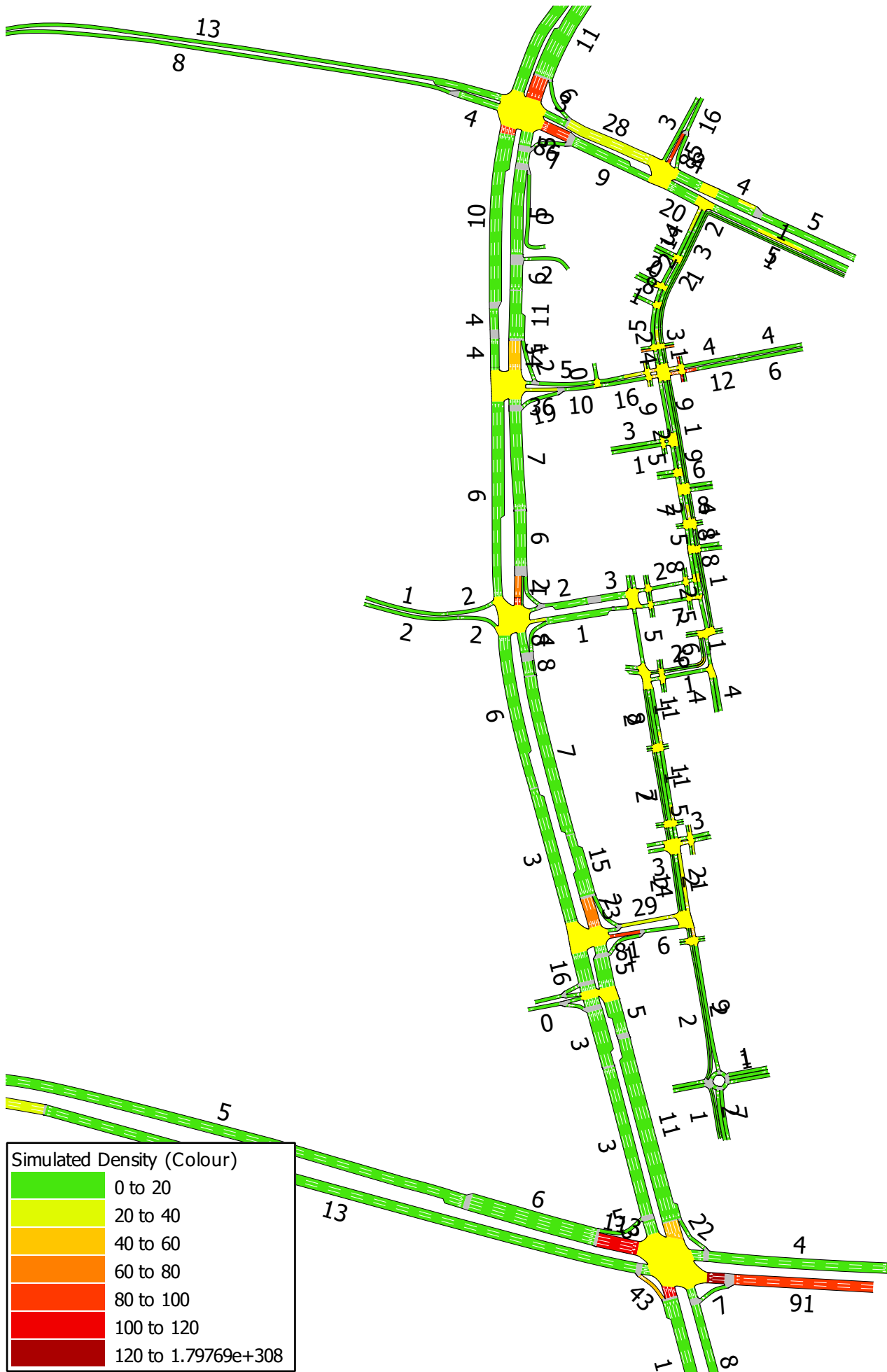
Simulated Density (VEH/KM)

2031 Future AM - No developments-SRC

AECOM, 05/05/2021



PHILLIP B2 S180 AIMSUN MODELLING
 Simulated Density (VEH/KM)
 2031 Future PM - No developments-SRC
 AECOM, 05/05/2021

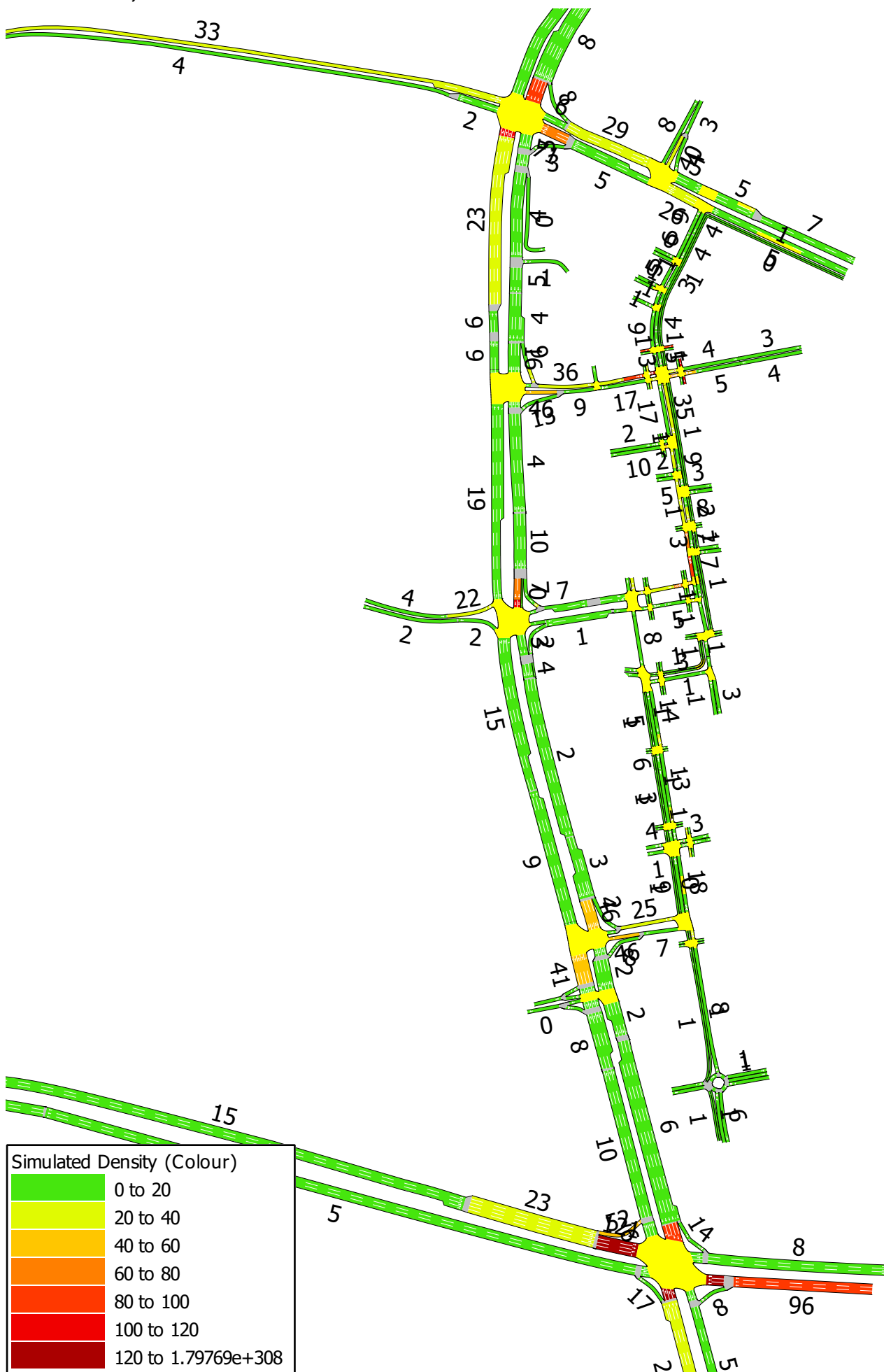


PHILLIP B2 S180 AIMSUN MODELLING

Simulated Density (VEH/KM)

2031 Future AM - B2S180-SRC

AECOM, 05/05/2021

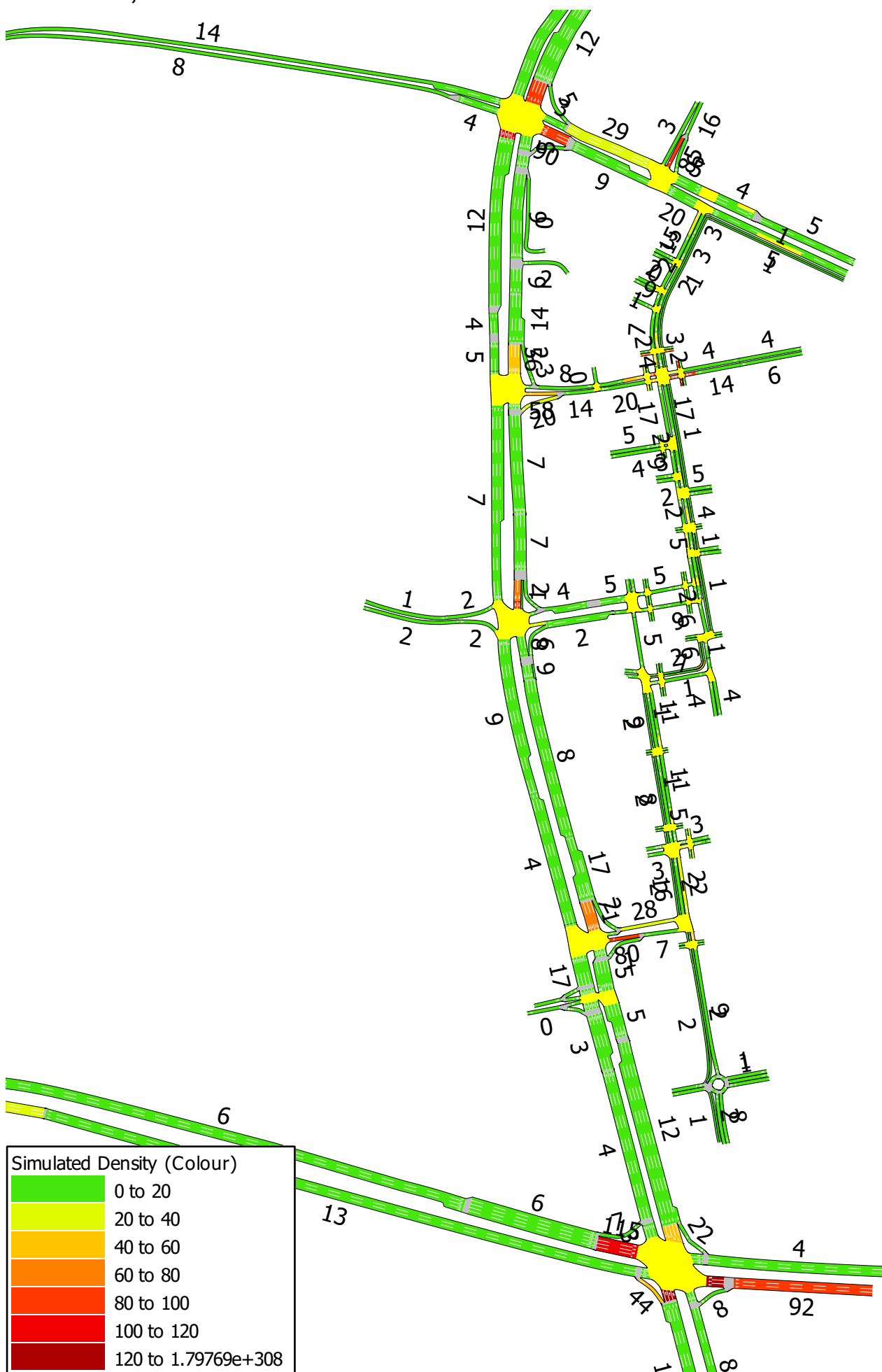


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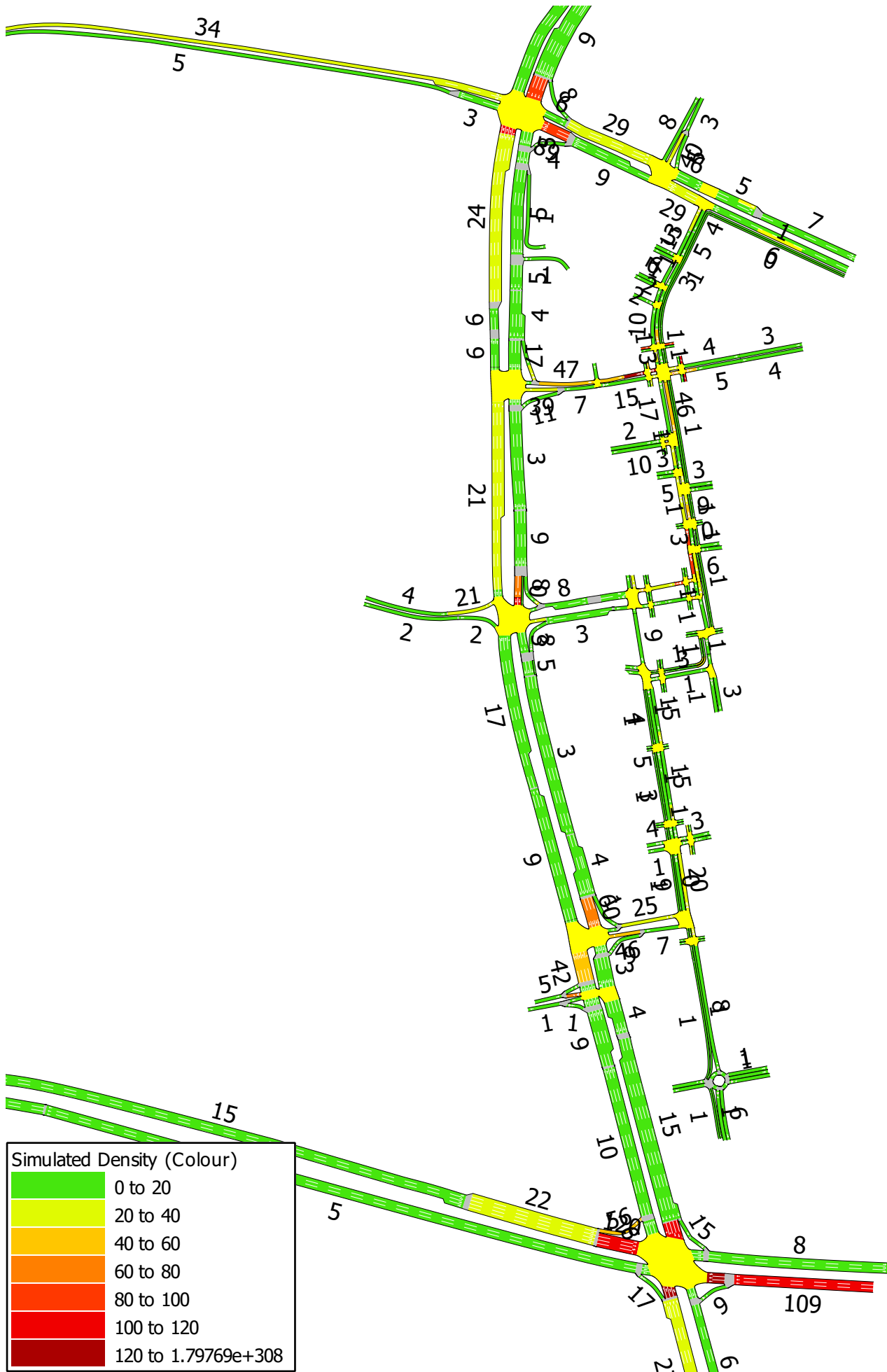
Simulated Density (VEH/KM)

2031 Future PM - B2S180-SRC

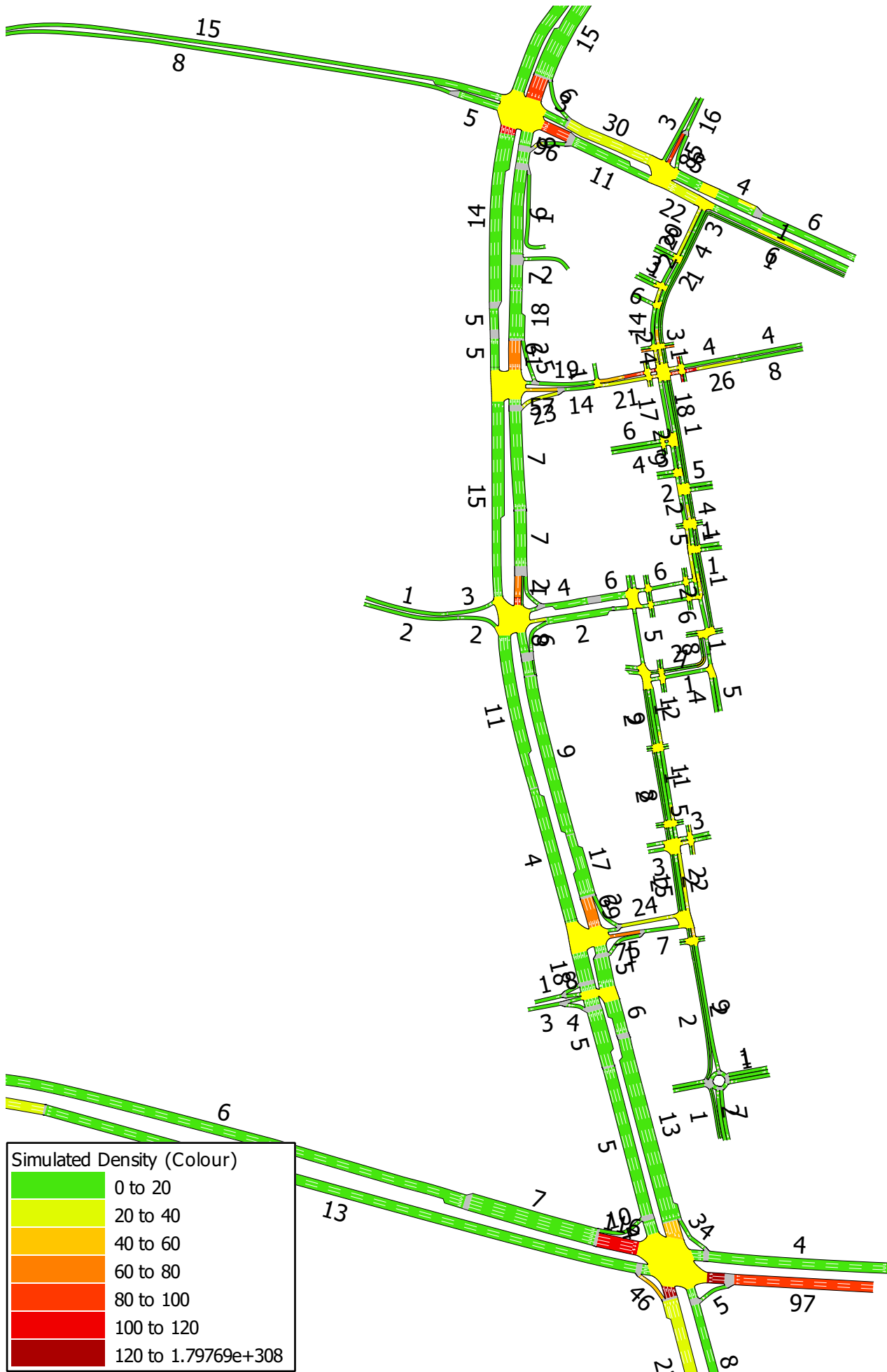
AECOM, 05/05/2021



PHILLIP B2 S180 AIMSUN MODELLING
 Simulated Density (VEH/KM)
 2031 Future AM - all developments-SRC
 AECOM, 05/05/2021



PHILLIP B2 S180 AIMSUN MODELLING
Simulated Density (VEH/KM)
2031 Future PM - all developments-SRC
AECOM, 05/05/2021

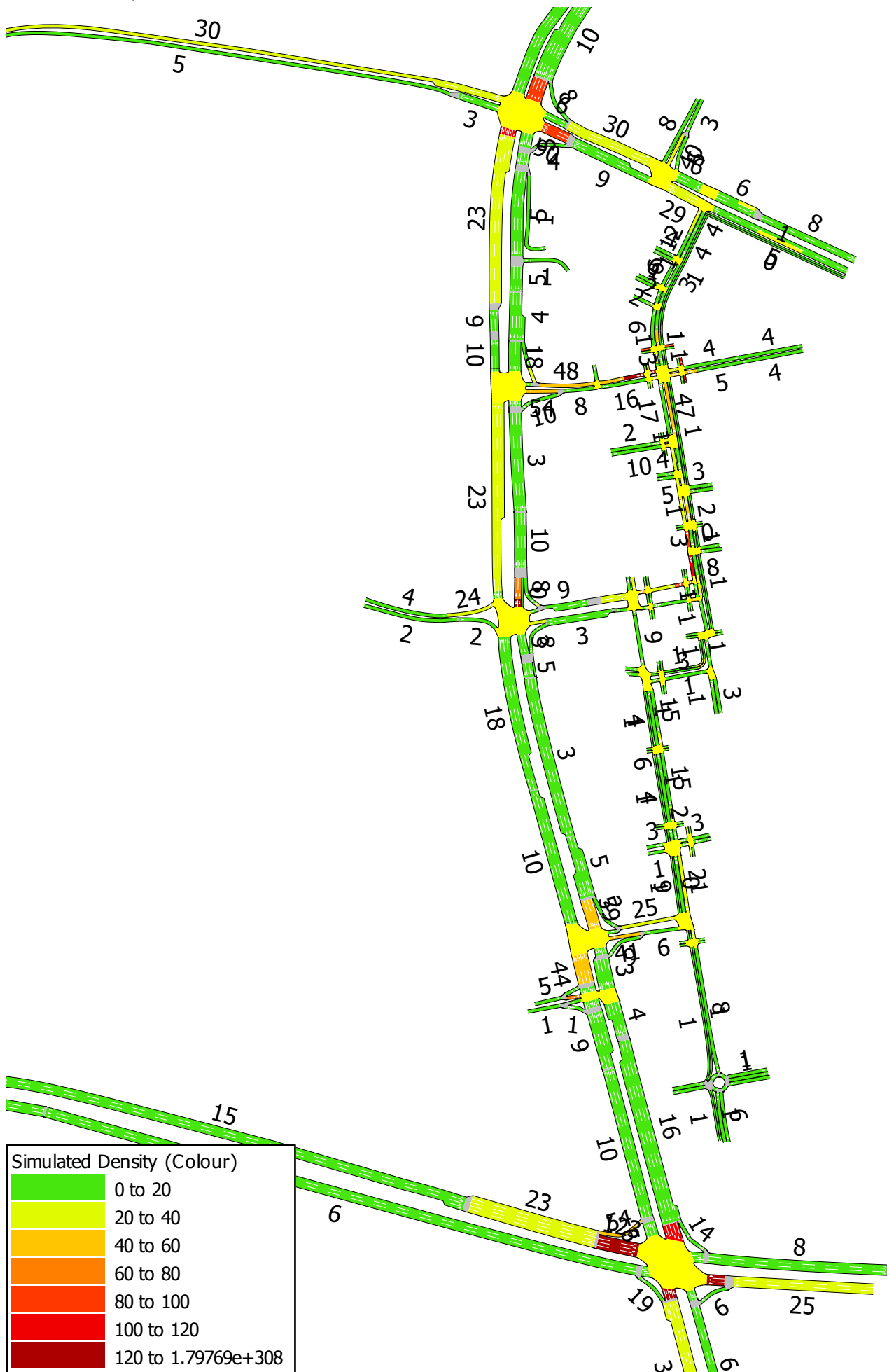


PHILLIP B2 S180 AIMSUN MODELLING

Simulated Density (VEH/KM)

2031 Future AM - all developments-SRC - Worgan_Melrose_adj

AECOM, 05/05/2021

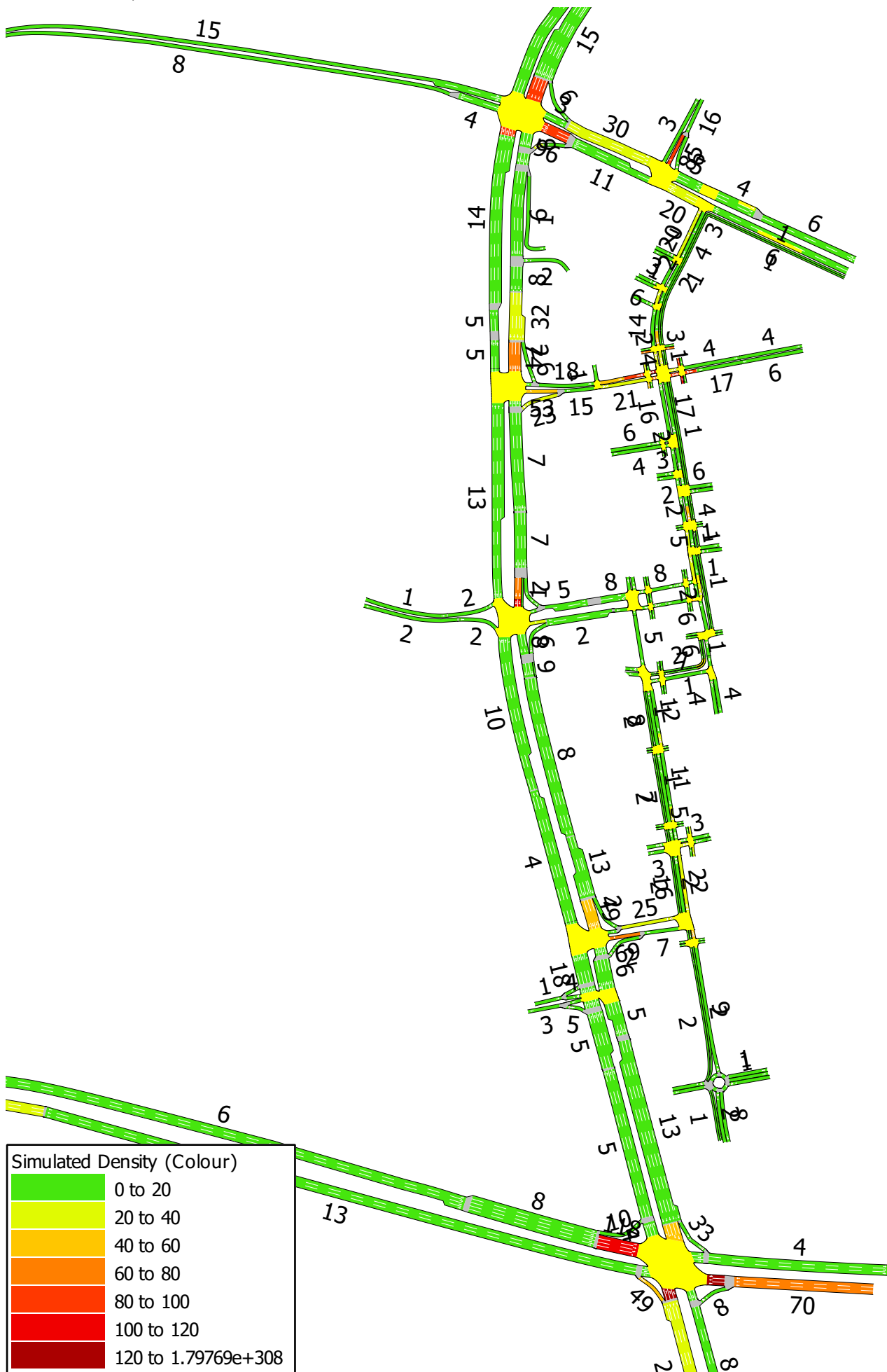


PHILLIP B2 S180 AIMSUN MODELLING

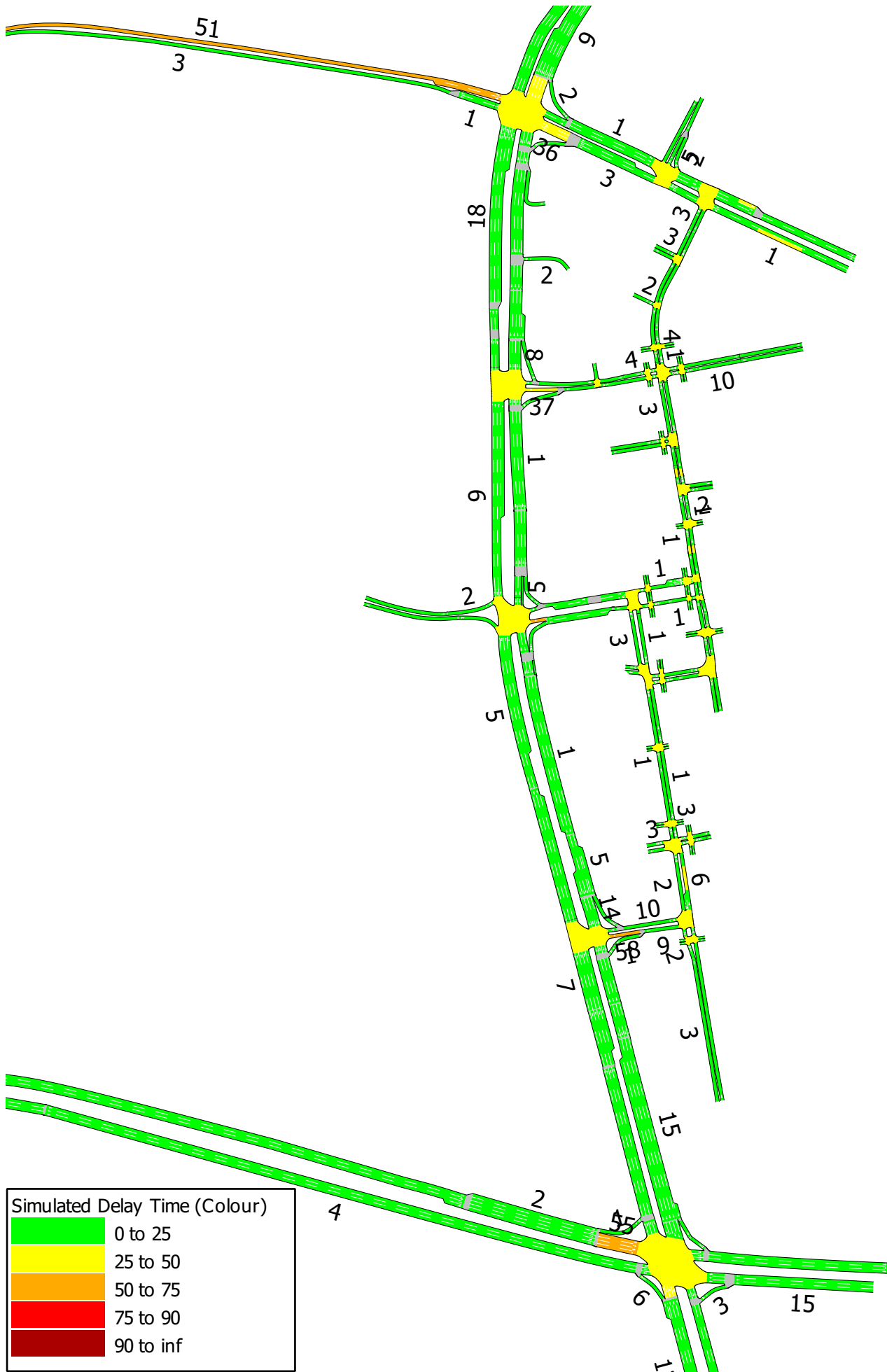
Simulated Density (VEH/KM)

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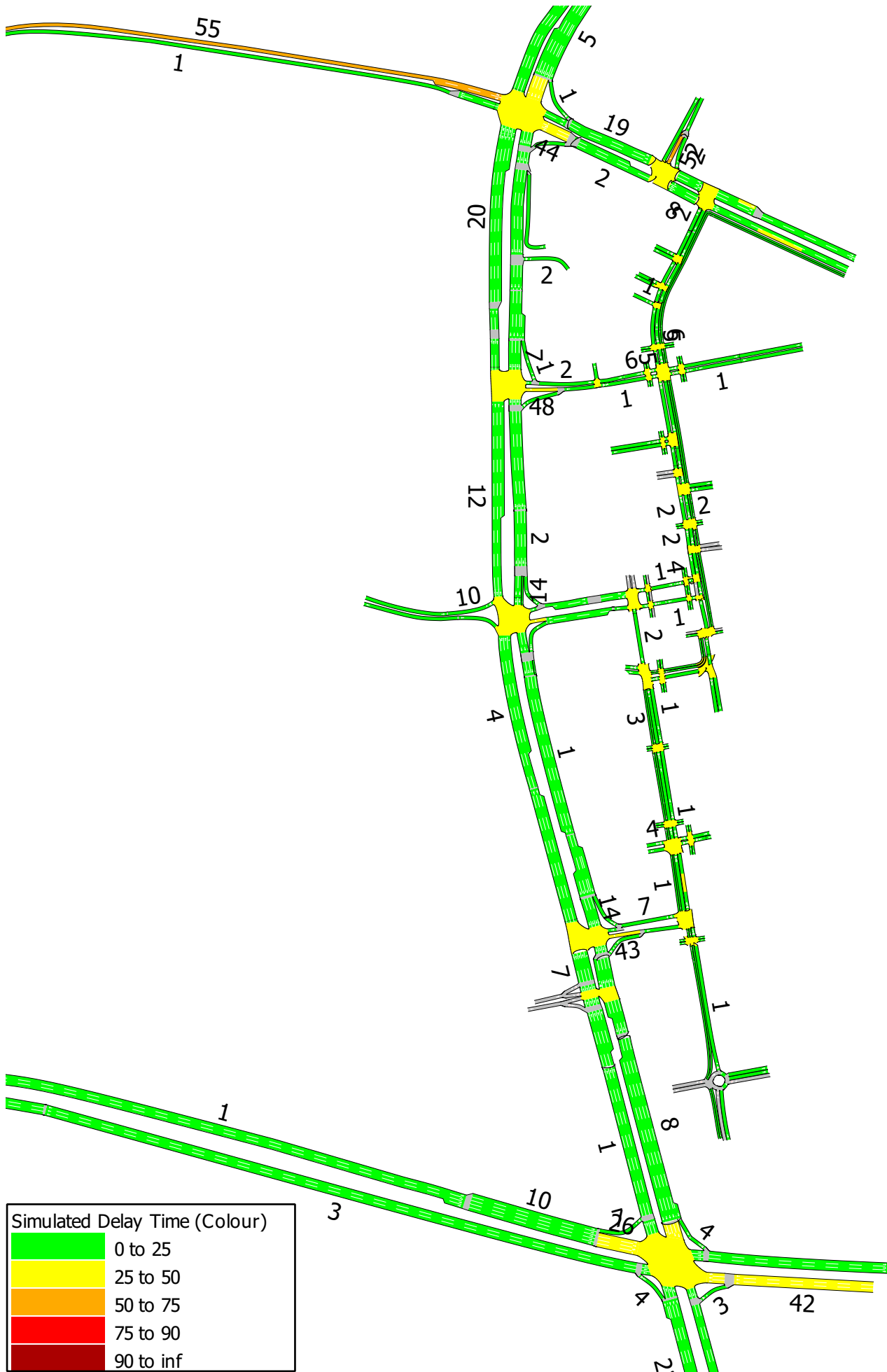
AECOM, 05/05/2021



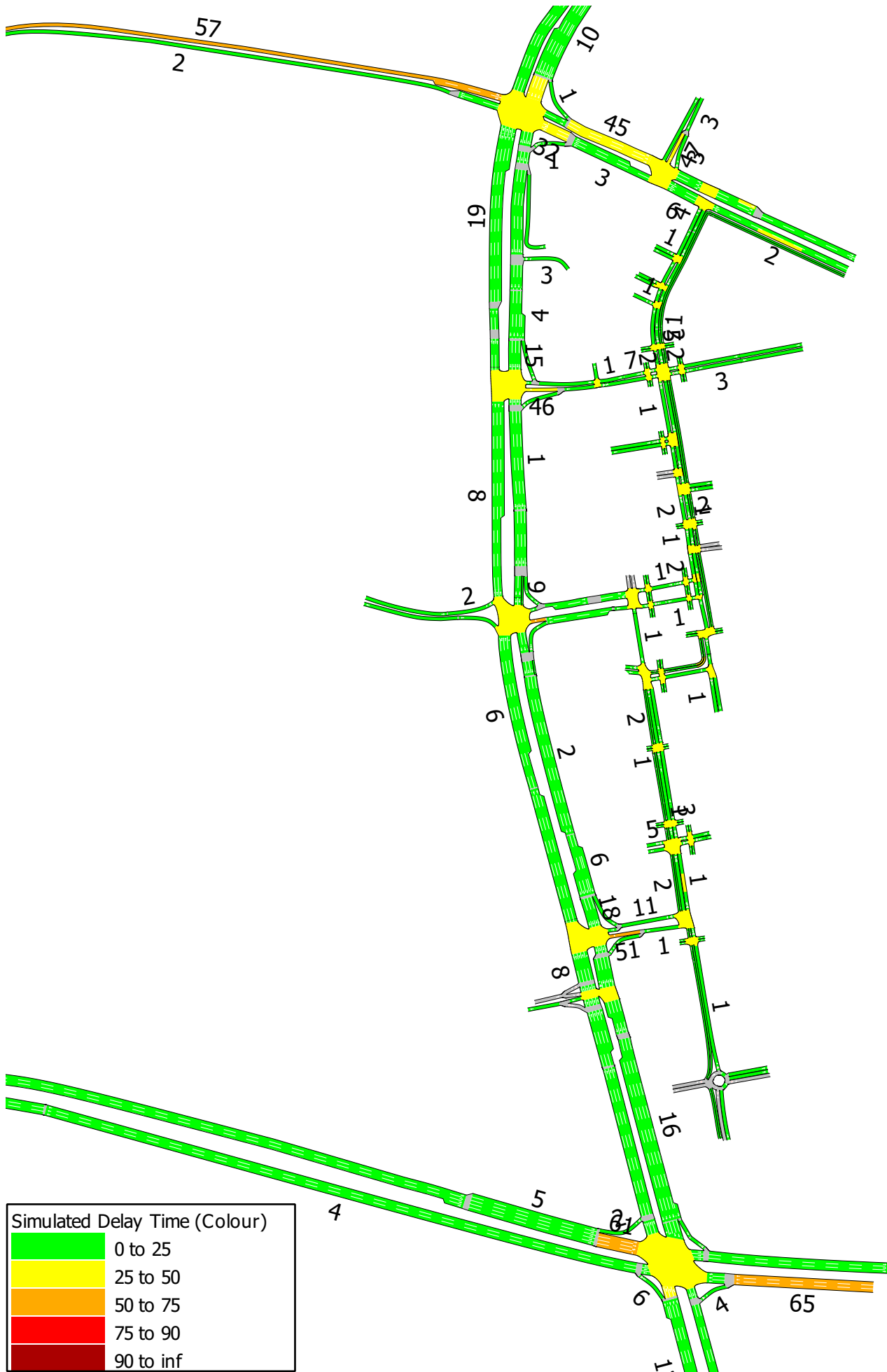
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 AVERAGE DELAY (SECONDS)
 2019 Future PM-SRC
 AECOM, 23/3/21



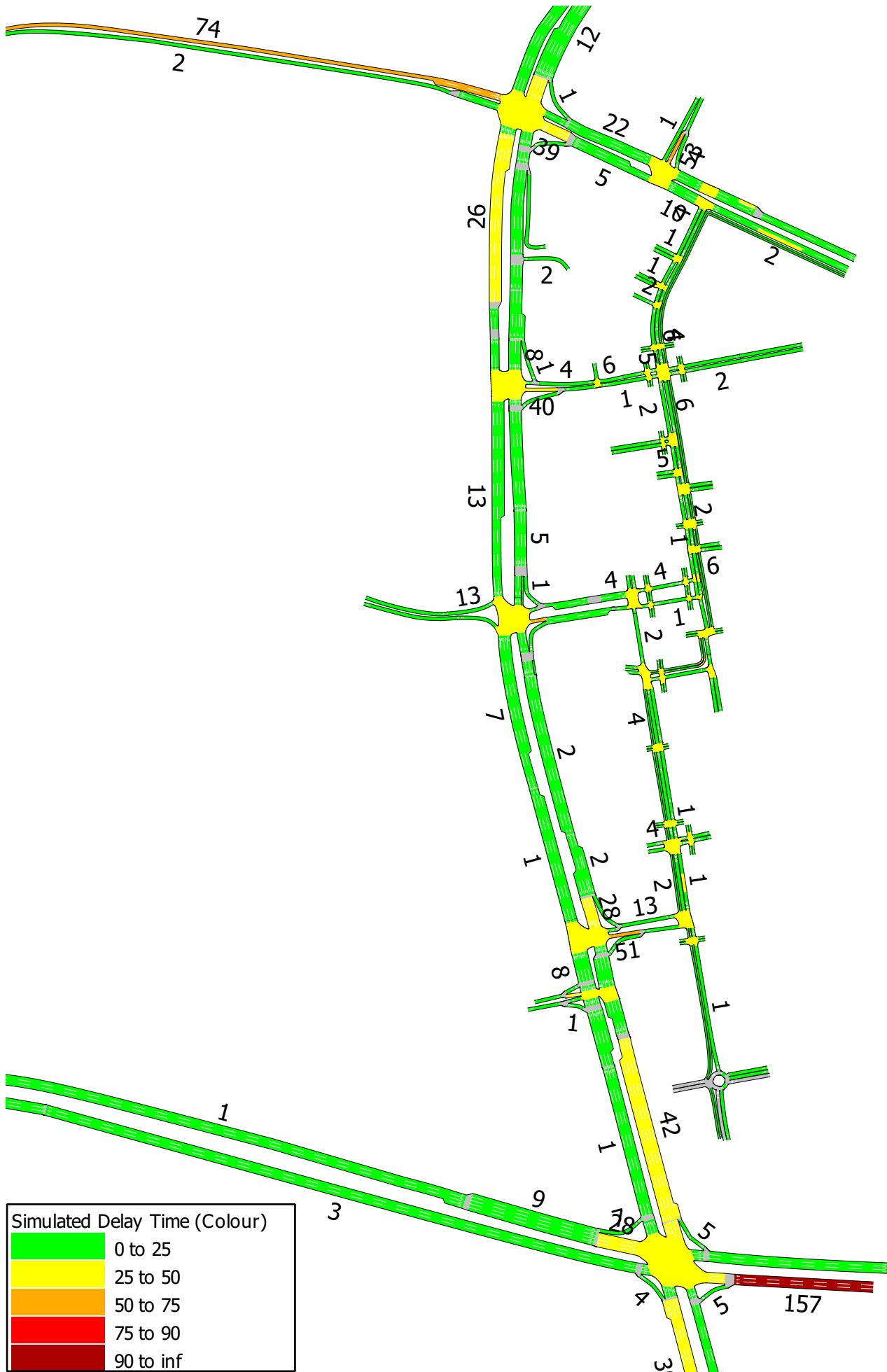
PHILLIP B2 S180 AIMSUN MODELLING
 AVERAGE DELAY (SECONDS)
 2031 Future AM - No developments-SRC
 AECOM, 05/05/2021



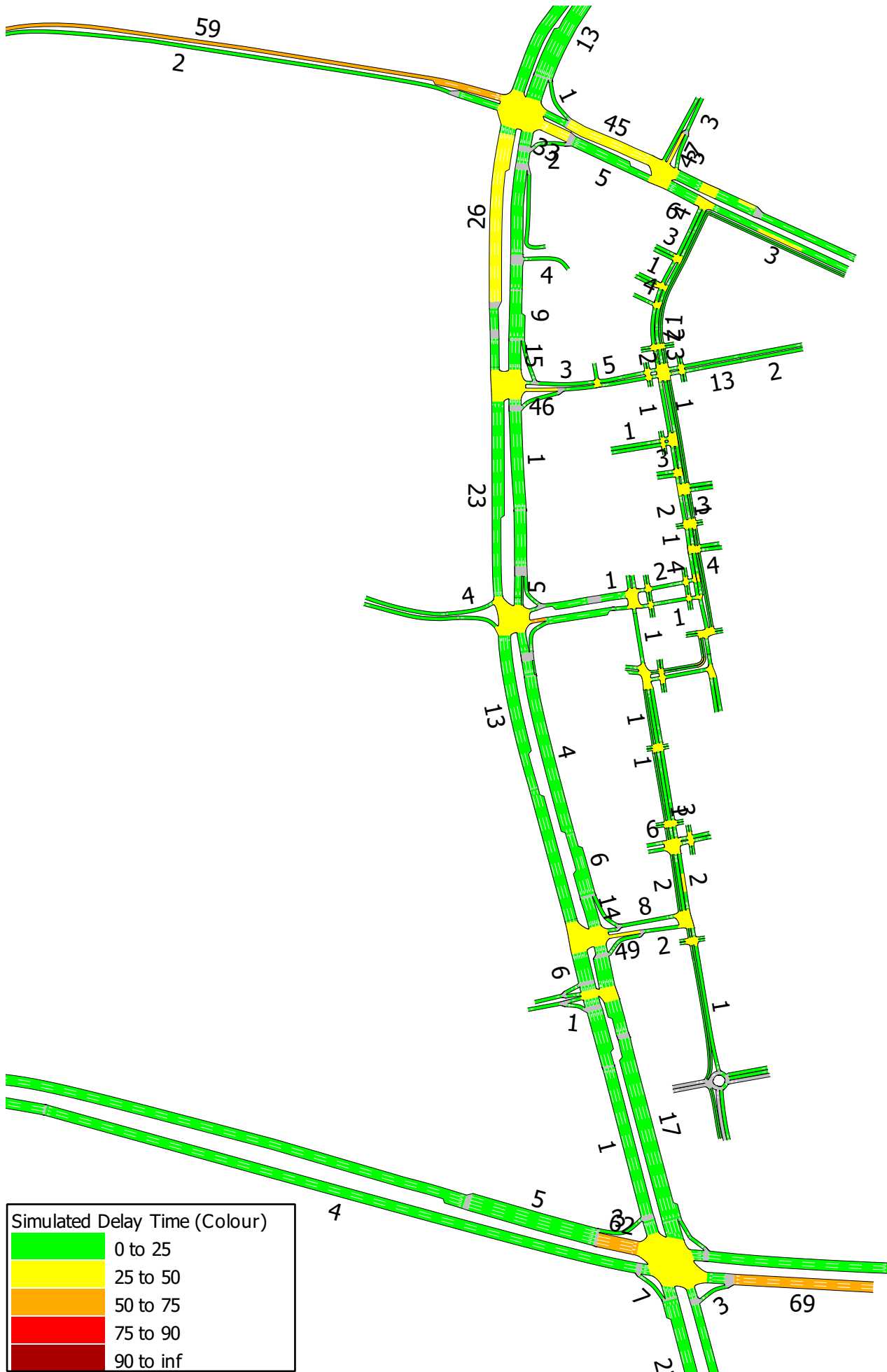
PHILLIP B2 S180 AIMSUN MODELLING
 AVERAGE DELAY (SECONDS)
 2031 Future PM - No developments-SRC
 AECOM, 05/05/2021



PHILLIP B2 S180 AIMSUN MODELLING
 AVERAGE DELAY (SECONDS)
 2031 Future AM - all developments-SRC
 AECOM, 05/05/2021



PHILLIP B2 S180 AIMSUN MODELLING
 AVERAGE DELAY (SECONDS)
 2031 Future PM - all developments-SRC
 AECOM, 05/05/2021

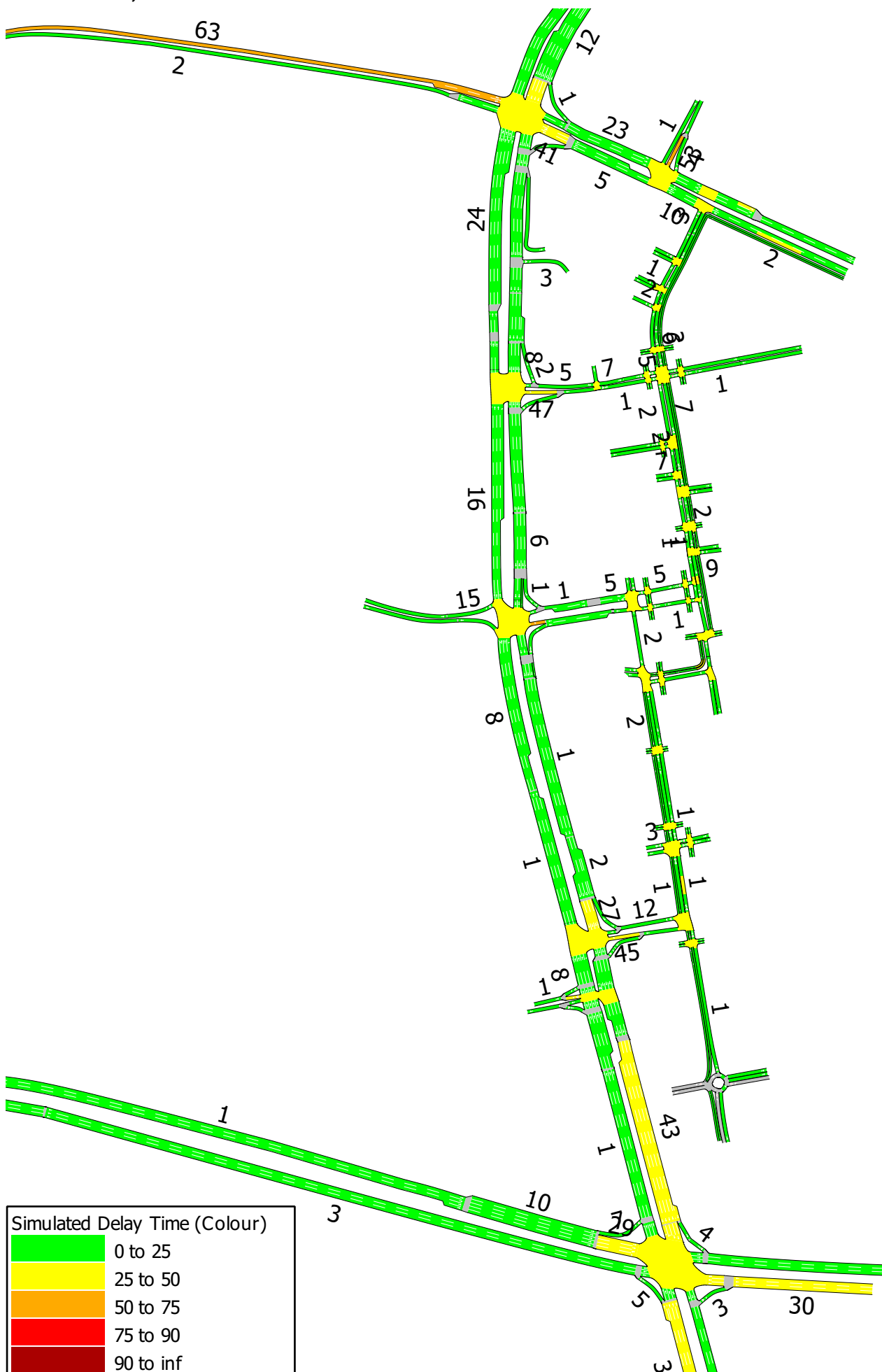


PHILLIP B2 S180 AIMSUN MODELLING

AVERAGE DELAY (SECONDS)

2031 Future AM - all developments-SRC - Worgan_Melrose_adj

AECOM, 05/05/2021

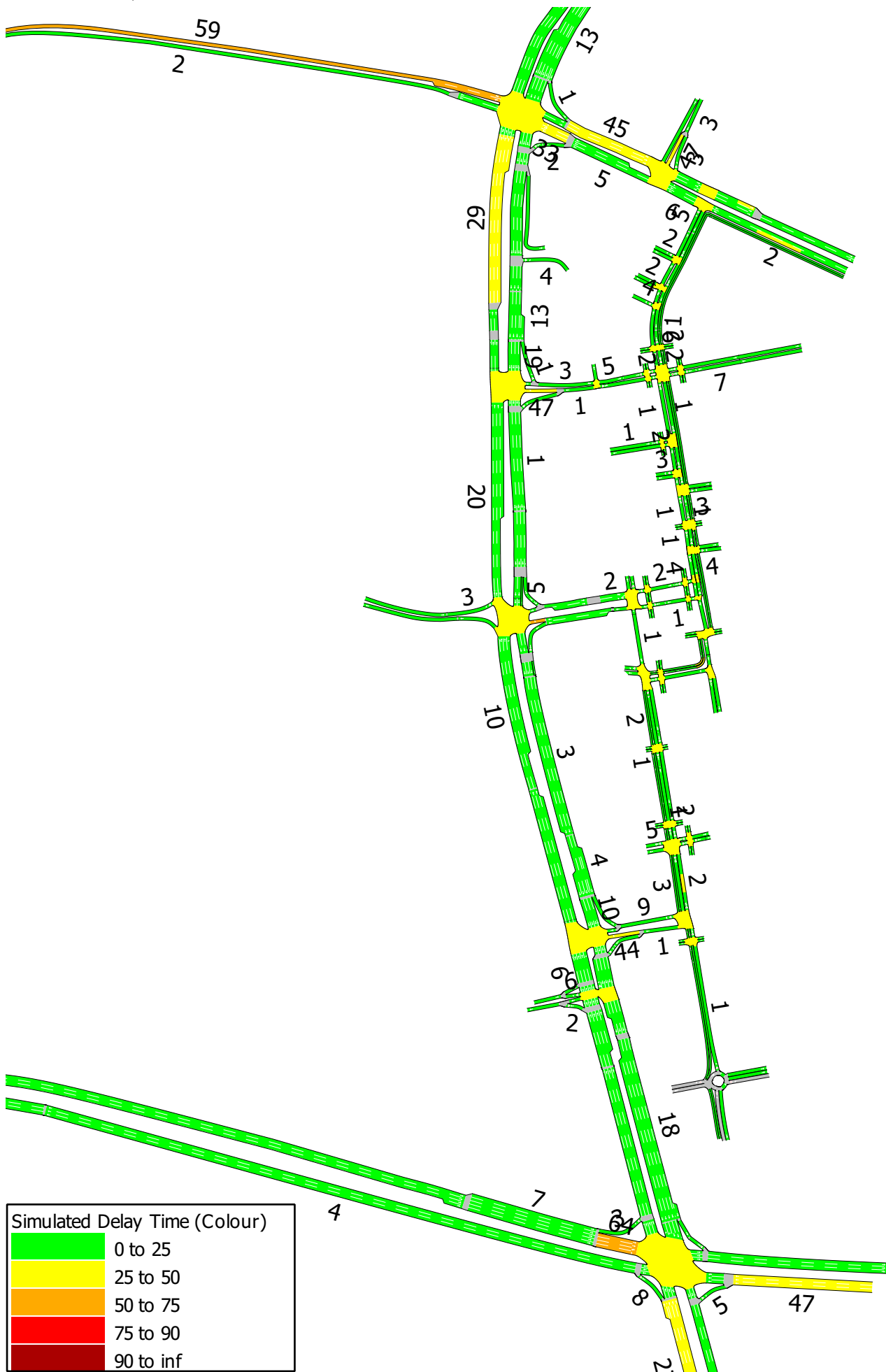


PHILLIP B2 S180 AIMSUN MODELLING

AVERAGE DELAY (SECONDS)

2031 Future PM - all developments-SRC - Worgan_Melrose_adj

AECOM, 05/05/2021



Appendix C

Aimsun Movement Delay Outputs

			AM Peak (8:15 - 9:15AM)																	
Intersection	Approach	Movement	2019 - No Development			2021 - No Development			2031 - No Development			2031 - BS2180			2031 - All Development			2031 - All Development Adj		
			Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS
Melrose Drive / Launceston Street	North	LT	413	6s	A	389	6s	A	342	5s	A	354	5s	A	354	6s	A	355	7s	A
		TH	486	53s	D	512	53s	D	568	54s	D	648	60s	E	690	65s	E	688	88s	F
		RT	53	55s	E	57	56s	E	60	56s	E	60	58s	E	61	60s	E	62	79s	E
	East	LT	115	4s	A	124	3s	A	135	3s	A	137	3s	A	163	4s	A	155	4s	A
		TH	157	46s	D	152	47s	D	163	46s	D	170	47s	D	199	51s	D	200	55s	D
		RT	229	47s	D	229	46s	D	232	54s	D	270	53s	D	372	54s	D	368	55s	E
	South	LT	50	29s	C	59	27s	C	61	33s	C	71	35s	D	80	34s	C	80	32s	C
		TH	1,166	34s	C	1,182	34s	C	1,201	36s	D	1,265	36s	D	1,304	36s	D	1,310	35s	D
		RT	222	35s	C	233	36s	D	221	38s	D	245	37s	D	265	38s	D	275	39s	D
	West	LT	75	89s	F	87	87s	F	84	128s	F	82	158s	F	81	181s	F	84	113s	F
		TH	388	88s	F	408	91s	F	416	129s	F	409	161s	F	402	185s	F	419	114s	F
		RT	165	88s	F	142	89s	F	169	130s	F	185	155s	F	192	181s	F	201	114s	F
Intersection			3,519	43s	D	3,575	44s	D	3,650	54s	D	3,897	60s	E	4,162	64s	E	4,197	57s	E
Melrose Drive / Worgan Street	North	LT	233	1s	A	219	1s	A	299	2s	A	355	2s	A	366	2s	A	376	2s	A
		TH	520	10s	A	547	9s	A	558	8s	A	607	8s	A	645	9s	A	634	9s	A
	East	LT	33	3s	A	33	3s	A	38	2s	A	130	3s	A	109	3s	A	109	3s	A
		RT	16	62s	E	18	54s	D	41	58s	E	80	54s	D	72	53s	D	72	55s	E
	South	TH	1,418	7s	A	1,450	7s	A	1,453	7s	A	1,495	8s	A	1,571	8s	A	1,583	8s	A
		RT	434	35s	C	460	35s	C	469	42s	D	496	47s	D	472	43s	D	480	45s	D
Intersection			2,656	12s	B	2,727	12s	B	2,858	13s	B	3,163	14s	B	3,234	13s	B	3,255	14s	B
Worgan Street / Furzer Street	North		21	14s	B	21	17s	C	12	16s	C	13	15s	C	13	17s	C	13	17s	C
			110	6s	A	92	7s	A	25	6s	A	46	5s	A	191	8s	A	198	8s	A
			10	13s	B	8	7s	A	3	8s	A	4	12s	B	14	13s	B	14	13s	B
	East		37	17s	C	40	17s	C	39	16s	C	39	20s	C	44	23s	C	43	24s	C
			46	17s	C	50	20s	C	55	18s	C	57	23s	C	47	25s	D	48	26s	D
			23	18s	C	23	19s	C	21	18s	C	23	22s	C	27	23s	C	27	25s	C
	South		6	3s	A	6	2s	A	19	3s	A	113	4s	A	106	4s	A	105	4s	A
			28	1s	A	25	1s	A	14	1s	A	38	2s	A	71	3s	A	66	3s	A
			18	12s	B	17	11s	B	16	12s	B	26	12s	B	30	15s	C	24	15s	B
	West		12	15s	B	16	16s	C	27	18s	C	26	25s	C	47	33s	D	56	37s	E
			57	22s	C	67	23s	C	74	23s	C	69	31s	D	63	41s	E	73	43s	E
			136	17s	C	118	16s	C	177	18s	C	272	23s	C	236	34s	D	231	37s	E
Intersection			504	14s	B	482	15s	B	481	16s	C	726	18s	C	889	20s	C	898	22s	C
Melrose Drive / Corinna Street	North	LT	205	2s	A	220	2s	A	189	1s	A	259	3s	A	218	4s	A	228	5s	A
		TH	343	51s	D	353	52s	D	398	52s	D	469	47s	D	527	48s	D	507	48s	D
	East	LT	144	0s	A	128	0s	A	51	0s	A	71	0s	A	257	0s	A	252	0s	A
		RT	11	70s	E	11	72s	E	6	54s	D	9	57s	E	22	56s	E	22	53s	D
	South	LT	79	15s	B	78	15s	B	78	16s	B	81	17s	B	81	17s	B	82	17s	B
		TH	1,646	4s	A	1,686	4s	A	1,728	4s	A	1,771	5s	A	1,808	5s	A	1,830	5s	A
	West	RT	119	29s	C	111	29s	C	119	36s	D	207	35s	C	282	36s	D	298	37s	D
LT		189	11s	B	206	12s	B	202	13s	B	206	14s	B	206	16s	B	206	16s	B	
Intersection			2,737	12s	B	2,793	12s	B	2,771	13s	B	3,074	14s	B	3,402	15s	B	3,425	15s	B
Melrose Drive / Brewer Street	North	LT	42	2s	A	37	2s	A	61	2s	A	68	2s	A	52	2s	A	52	2s	A
		TH	449	22s	C	449	22s	C	382	26s	C	481	32s	C	738	36s	D	715	35s	C
	East	LT	79	2s	A	76	3s	A	73	2s	A	112	2s	A	63	2s	A	88	2s	A
		RT	92	46s	D	90	47s	D	70	52s	D	73	51s	D	73	49s	D	73	46s	D
	South	TH	1,755	7s	A	1,786	7s	A	1,862	8s	A	1,986	9s	A	2,032	10s	A	2,068	10s	A
		RT	86	36s	D	85	39s	D	143	59s	E	148	58s	E	146	59s	E	161	56s	E
Intersection			2,503	12s	B	2,523	12s	B	2,591	14s	B	2,869	16s	B	3,104	19s	B	3,156	18s	B
Melrose Drive / Hindmarsh Drive	North	LT	41	6s	A	38	7s	A	29	7s	A	37	8s	A	50	38s	D	51	33s	C
		TH	302	73s	E	308	75s	E	284	58s	E	387	63s	E	592	117s	F	592	110s	F
		RT	196	66s	E	197	68s	E	148	60s	E	185	62s	E	266	73s	E	266	71s	E
	East	LT	100	15s	B	106	14s	B	116	181s	F	115	223s	F	112	230s	F	134	37s	D
		TH	437	58s	E	427	56s	E	435	249s	F	432	296s	F	419	305s	F	497	76s	E
		RT	83	58s	E	92	61s	E	172	318s	F	190	386s	F	204	400s	F	260	152s	F
	South	LT	249	8s	A	244	8s	A	254	10s	A	266	12s	B	266	14s	B	267	21s	C
		TH	926	47s	D	944	46s	D	971	48s	D	1,047	49s	D	1,094	51s	D	1,095	62s	E
		RT	92	44s	D	94	45s	D	102	45s	D	96	47s	D	96	49s	D	96	62s	E
	West	LT	841	10s	B	845	11s	B	886	16s	B	914	16s	B	923	17s	B	922	20s	B
		TH	1,431	46s	D	1,462	47s	D	1,510	65s	E	1,512	64s	E	1,510	64s	E	1,511	75s	E
		RT	470	43s	D	485	43s	D	489	50s	D	495	51s	D	495	50s	D	496	55s	E
Intersection			5,168	41s	D	5,241	41s	D	5,395	74s	E	5,678	81s	F	6,029	87s	F	6,186	66s	E

			AM Peak (8:15 - 9:15AM)																	
Intersection	Approach	Movement	2019 - No Development			2021 - No Development			2031 - No Development			2031 - BS2180			2031 - All Development			2031 - All Development Adj		
			Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS
Corinna Street / Development Access	North	LT										113	5s	A	113	10s	A	113	9s	A
	East	LT	38	0s	A	48	0s	A	0	0s	0	54	1s	A	63	1s	A	75	1s	A
		TH	135	0s	A	122	1s	A	57	0s	A	80	0s	A	281	1s	A	275	1s	A
	South	LT	20	4s	A	17	4s	A	0	0s	0									
		RT	16	7s	A	15	7s	A	0	0s	0									
	West	LT										20	6s	A	20	14s	B	22	13s	B
		TH	163	2s	A	172	2s	A	117	2s	A	223	7s	A	297	12s	B	304	12s	B
	RT	160	2s	A	158	1s	A	191	1s	A	221	2s	A	179	4s	A	195	4s	A	
Intersection			533	2s	A	532	2s	A	365	2s	A	712	4s	A	952	6s	A	984	6s	A
Furzer Street / Garth Close	North	TH	143	1s	A	119	1s	A	109	1s	A	121	4s	A	275	5s	A	288	6s	A
		RT	139	3s	A	130	2s	A	131	3s	A	237	8s	A	196	10s	A	185	11s	B
	South	LT	52	1s	A	46	1s	A	44	1s	A	96	1s	A	137	1s	A	156	1s	A
		TH	52	0s	A	48	0s	A	49	0s	A	183	0s	A	212	1s	A	200	1s	A
	West	LT	15	1s	A	14	1s	A	21	1s	A	67	2s	A	51	2s	A	51	2s	A
		RT	6	2s	A	7	4s	A	6	2s	A	23	6s	A	39	9s	A	39	8s	A
Intersection			408	1s	A	365	1s	A	359	1s	A	726	4s	A	910	5s	A	918	5s	A
Furzer Street / Development Access	North	LT	50	2s	A	48	2s	A	50	2s	A	39	2s	A	38	3s	A	44	3s	A
		TH	99	1s	A	78	1s	A	65	1s	A	85	1s	A	253	3s	A	260	3s	A
		RT										20	4s	A	22	5s	A	21	5s	A
	East	LT	24	3s	A	25	1s	A	25	2s	A	25	3s	A	23	8s	A	23	7s	A
		RT	47	3s	A	44	4s	A	46	3s	A	47	9s	A	48	14s	B	48	15s	B
	South	LT										31	1s	A	29	0s	A	31	1s	A
		TH	57	0s	A	50	0s	A	47	0s	A	226	0s	A	295	0s	A	301	0s	A
		RT	67	3s	A	67	2s	A	66	2s	A	80	2s	A	80	4s	A	80	4s	A
	West	LT										6	3s	A	6	4s	A	6	4s	A
RT											8	6s	A	8	13s	B	8	14s	B	
Intersection			344	2s	A	312	2s	A	298	2s	A	566	2s	A	801	3s	A	823	3s	A
Furzer Street / Doma Development Access	North	LT													1	1s	A	1	2s	A
		TH	121	0s	A	103	0s	A	89	0s	A	118	0s	A	282	1s	A	290	1s	A
	South	TH	125	6s	A	117	5s	A	114	7s	A	337	11s	B	397	14s	B	405	13s	B
		RT													14	15s	B	15	14s	B
	West	LT													45	7s	A	44	8s	A
		RT													6	26s	D	6	24s	C
Intersection			246	3s	A	220	3s	A	203	4s	A	455	8s	A	745	8s	A	761	8s	A

			PM Peak (16:45 - 17:45PM)																	
Intersection	Approach	Movement	2019 - No Development			2021 - No Development			2031 - No Development			2031 - BS2180			2031 - All Development			2031 - All Development Adj		
			Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS
Melrose Drive / Launceston Street	North	LT	210	6s	A	214	6s	A	236	6s	A	236	6s	A	236	7s	A	236	7s	A
		TH	975	39s	D	1,018	39s	D	1,060	39s	D	1,129	40s	D	1,245	41s	D	1,245	41s	D
		RT	91	59s	E	90	60s	E	92	62s	E	92	63s	E	91	64s	E	91	64s	E
	East	LT	166	9s	A	171	10s	A	224	7s	A	236	8s	A	240	10s	A	242	10s	A
		TH	347	44s	D	339	46s	D	355	43s	D	356	45s	D	363	50s	D	363	50s	D
		RT	342	43s	D	352	45s	D	367	42s	D	389	43s	D	442	50s	D	446	49s	D
	South	LT	73	43s	D	76	39s	D	71	44s	D	80	49s	D	85	46s	D	85	49s	D
		TH	572	40s	D	573	40s	D	621	32s	C	640	36s	D	645	38s	D	643	36s	D
		RT	65	48s	D	65	45s	D	105	56s	E	119	60s	E	131	61s	E	133	66s	E
	West	LT	32	56s	E	34	52s	D	37	54s	D	37	54s	D	37	54s	D	37	54s	D
		TH	169	49s	D	168	50s	D	186	53s	D	186	54s	D	186	54s	D	186	54s	D
		RT	106	49s	D	104	49s	D	104	52s	D	123	53s	D	157	54s	D	157	54s	D
Intersection			3,147	38s	D	3,203	39s	D	3,458	37s	D	3,623	39s	D	3,858	41s	D	3,866	41s	D
Melrose Drive / Worgan Street	North	LT	10	0s	A	10	0s	A	81	0s	A	135	1s	A	126	1s	A	131	4s	A
		TH	1,239	10s	B	1,279	11s	B	1,302	24s	C	1,349	25s	C	1,443	26s	C	1,444	38s	D
	East	LT	191	2s	A	198	2s	A	224	2s	A	251	4s	A	287	4s	A	289	5s	A
		RT	32	44s	D	28	43s	D	80	52s	D	124	55s	E	112	55s	E	110	55s	E
	South	TH	682	4s	A	688	4s	A	722	5s	A	725	7s	A	763	11s	B	768	13s	B
		RT	29	56s	E	30	58s	E	55	48s	D	107	47s	D	228	91s	F	193	44s	D
Intersection			2,183	8s	A	2,234	9s	A	2,464	17s	B	2,690	19s	B	2,958	25s	C	2,935	27s	C
Worgan Street / Furzer Street	North	LT	59	14s	B	57	15s	B	40	14s	B	40	13s	B	40	15s	C	40	17s	C
		TH	86	6s	A	86	7s	A	36	7s	A	50	8s	A	61	9s	A	57	9s	A
		RT	28	12s	B	28	13s	B	71	13s	B	55	17s	C	112	18s	C	113	20s	C
	East	LT	41	23s	C	45	27s	D	38	28s	D	39	38s	E	39	45s	E	38	42s	E
		TH	173	29s	D	175	31s	D	190	29s	D	188	40s	E	182	46s	E	188	44s	E
		RT	29	30s	D	32	29s	D	24	28s	D	27	38s	E	34	48s	E	27	45s	E
	South	LT	7	3s	A	3	3s	A	18	3s	A	45	4s	A	42	4s	A	39	5s	A
		TH	63	2s	A	59	2s	A	45	1s	A	50	2s	A	87	4s	A	97	4s	A
		RT	19	10s	A	23	10s	A	26	9s	A	25	9s	A	26	9s	A	27	10s	B
	West	LT	2	9s	A	5	11s	B	31	21s	C	34	35s	D	138	55s	F	129	53s	F
		TH	18	16s	C	17	17s	C	40	23s	C	41	32s	D	39	54s	F	40	50s	E
		RT	16	13s	B	18	15s	B	62	19s	C	164	27s	D	141	45s	E	121	46s	E
Intersection			541	17s	C	546	19s	C	622	19s	C	758	25s	D	941	34s	D	917	33s	D
Melrose Drive / Corinna Street	North	LT	138	0s	A	139	0s	A	124	0s	A	158	0s	A	197	1s	A	189	1s	A
		TH	1,339	10s	A	1,376	10s	A	1,441	11s	B	1,481	11s	B	1,568	10s	B	1,567	10s	B
	East	LT	115	0s	A	110	0s	A	114	0s	A	162	0s	A	190	0s	A	189	0s	A
		RT	32	55s	D	33	57s	E	22	56s	E	22	57s	E	26	56s	E	26	55s	E
	South	LT	99	3s	A	101	3s	A	107	4s	A	107	4s	A	107	4s	A	107	4s	A
		TH	627	2s	A	633	2s	A	698	2s	A	750	3s	A	903	3s	A	868	3s	A
	RT	43	57s	E	43	58s	E	74	53s	D	162	57s	E	193	77s	E	244	51s	D	
West	LT	52	4s	A	51	4s	A	54	4s	A	54	5s	A	55	6s	A	55	6s	A	
Intersection			2,445	8s	A	2,485	8s	A	2,634	9s	A	2,896	10s	A	3,239	11s	B	3,246	10s	B
Melrose Drive / Brewer Street	North	LT	74	5s	A	64	6s	A	103	8s	A	103	9s	A	95	10s	A	101	7s	A
		TH	1,356	22s	C	1,394	22s	C	1,414	29s	C	1,499	29s	C	1,621	30s	C	1,617	23s	C
	East	LT	232	17s	B	244	17s	B	15	7s	A	15	7s	A	17	8s	A	16	6s	A
		RT	179	74s	E	177	74s	E	163	56s	E	163	55s	E	145	54s	D	149	50s	D
	South	TH	590	2s	A	601	3s	A	716	2s	A	855	3s	A	1,028	4s	A	1,043	4s	A
		RT	93	43s	D	91	42s	D	192	35s	C	198	34s	C	214	36s	D	206	36s	D
Intersection			2,524	21s	C	2,571	21s	C	2,604	23s	C	2,832	22s	C	3,120	22s	C	3,133	18s	B
Melrose Drive / Hindmarsh Drive	North	LT	124	11s	B	123	10s	A	104	17s	B	129	22s	C	151	31s	C	148	30s	C
		TH	818	31s	C	843	30s	C	860	34s	C	900	44s	D	942	69s	E	936	74s	E
		RT	682	30s	C	714	31s	C	518	22s	C	533	22s	C	557	26s	C	553	26s	C
	East	LT	120	27s	C	126	27s	C	143	106s	F	143	103s	F	142	106s	F	148	80s	F
		TH	1,014	45s	D	1,014	46s	D	1,169	129s	F	1,169	128s	F	1,163	131s	F	1,216	101s	F
		RT	86	46s	D	76	44s	D	234	130s	F	240	130s	F	250	131s	F	264	106s	F
	South	LT	568	9s	A	591	10s	A	598	11s	B	597	11s	B	597	20s	B	592	32s	C
		TH	419	59s	E	428	58s	E	468	54s	D	573	54s	D	795	65s	E	792	85s	F
		RT	77	58s	E	69	61s	E	70	50s	D	70	51s	D	70	65s	E	70	90s	F
	West	LT	188	3s	A	194	3s	A	209	3s	A	246	4s	A	318	5s	A	317	5s	A
		TH	570	64s	E	565	64s	E	581	124s	F	581	119s	F	582	113s	F	583	115s	F
		RT	390	62s	E	387	61s	E	388	113s	F	387	110s	F	390	105s	F	390	106s	F
Intersection			5,055	39s	D	5,129	38s	D	5,341	73s	E	5,567	72s	E	5,956	77s	E	6,010	75s	E

			PM Peak (16:45 - 17:45PM)																	
Intersection	Approach	Movement	2019 - No Development			2021 - No Development			2031 - No Development			2031 - BS2180			2031 - All Development			2031 - All Development Adj		
			Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS	Vol	Delay (s)	LOS
Corinna Street / Development Access	North	LT										32	1s	A	32	2s	A	32	3s	A
	East	LT	68	1s	A	69	1s	A	0	0s	0	87	1s	A	91	1s	A	86	1s	A
		TH	81	1s	A	77	1s	A	136	1s	A	183	1s	A	215	1s	A	215	1s	A
	South	LT	66	4s	A	66	4s	A	0	0s	0									
		RT	60	5s	A	73	5s	A	0	0s	0									
	West	LT										99	2s	A	98	2s	A	98	3s	A
		TH	23	1s	A	25	1s	A	54	2s	A	88	3s	A	156	3s	A	198	6s	A
RT		159	1s	A	157	1s	A	144	1s	A	133	2s	A	134	2s	A	137	2s	A	
Intersection			455	2s	A	467	2s	A	334	1s	A	622	1s	A	728	2s	A	766	3s	A
Furzer Street / Garth Close	North	TH	110	0s	A	113	0s	A	103	0s	A	130	1s	A	124	1s	A	126	1s	A
		RT	33	2s	A	35	2s	A	32	2s	A	121	4s	A	116	4s	A	90	5s	A
	South	LT	1	1s	A	1	1s	A	2	1s	A	21	1s	A	26	1s	A	51	1s	A
		TH	90	0s	A	84	0s	A	89	0s	A	136	0s	A	171	0s	A	179	0s	A
	West	LT	61	2s	A	66	2s	A	59	1s	A	120	3s	A	106	3s	A	109	3s	A
		RT	45	2s	A	41	3s	A	47	3s	A	74	5s	A	88	6s	A	85	6s	A
Intersection			339	1s	A	341	1s	A	332	1s	A	603	2s	A	631	3s	A	641	2s	A
Furzer Street / Development Access	North	LT	104	2s	A	105	2s	A	108	3s	A	110	3s	A	95	3s	A	103	3s	A
		TH	50	1s	A	48	1s	A	42	1s	A	78	1s	A	104	2s	A	98	2s	A
		RT										16	1s	A	13	2s	A	10	3s	A
	East	LT	113	2s	A	114	2s	A	109	2s	A	108	4s	A	108	5s	A	108	5s	A
		RT	80	3s	A	72	4s	A	78	3s	A	79	5s	A	78	7s	A	78	8s	A
	South	LT										16	1s	A	20	0s	A	23	1s	A
		TH	11	0s	A	13	0s	A	13	0s	A	64	1s	A	104	0s	A	138	0s	A
		RT	74	3s	A	89	3s	A	83	4s	A	81	4s	A	95	4s	A	86	4s	A
	West	LT										16	1s	A	15	2s	A	16	2s	A
		RT										17	5s	A	17	7s	A	17	8s	A
Intersection			432	2s	A	441	2s	A	432	3s	A	584	3s	A	649	3s	A	677	3s	A
Furzer Street / Doma Development Access	North	LT													2	1s	A	2	3s	A
		TH	161	0s	A	163	0s	A	150	1s	A	202	1s	A	227	1s	A	221	1s	A
	South	TH	85	3s	A	102	3s	A	96	4s	A	162	5s	A	220	6s	A	248	8s	A
		RT													44	7s	A	43	9s	A
	West	LT													15	8s	A	14	7s	A
		RT													0	11s	B	0	21s	C
Intersection			247	1s	A	265	1s	A	246	2s	A	364	3s	A	507	4s	A	529	5s	A

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