

asongroup



Transport Assessment

Edmondson Park South - MOD 12

Ed.Square – Town Centre West

17/11/2021

P0818r06v4



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APPENDICES

Appendix A. Options Assessment Report

Glossary

Acronym	Description
CC	Construction Certificate
CCP	Commuter Car Park
CRU	Campbelltown Road Upgrade
CRU REF	Campbelltown Road Upgrade Review of Environmental Factors
Council	Liverpool City Council
DA	Development Application
DCP	Development Control Plan
DoS	Degree of Saturation
DPIE	Department of Planning, Industry and Environment
EPFTC	Edmondson Park Frasers Town Centre, otherwise known as Ed.Square
EPS	Edmondson Park South
GFA	Gross Floor Area
HRV	Heavy Rigid Vehicle (as defined by AS2890.2:2018)
LEP	Local Environmental Plan
LOS	Level of Service
MOD	Section 4.55 Modification (also referred as a S4.55)
MRV	Medium Rigid Vehicle (as defined by AS2890.2:2018)
OAR	Options Assessment Report
RMS Guide	Transport for NSW (formerly Roads and Traffic Authority), Guide to Traffic Generating Developments, 2002
RP	Residential Precinct
RPW	Residential Precinct West
S4.55	Section 4.55 Modification (also referenced as MOD)
S75W	Section 75W Modification
S96	Section 96 Modification (former process terminology for an S4.55)
SRV	Small Rigid Vehicle (as defined by AS2890.2:2018)
TCS	Town Centre South
TCNW	Town Centre North-West
TCNE	Town Centre North-East
TDT 2013/04a	TfNSW Technical Direction, Guide to Traffic Generating Developments – Updated traffic surveys, August 2013
TfNSW	Transport for New South Wales
TIA	Transport Impact Assessment
TIS	Transport Impact Statement
veh/hr	Vehicles per hour

1 Introduction

1.1 Overview

1.1.1 Purpose of Report

Ason Group has been engaged by Frasers Property Australia (FPA) to prepare a Transport Assessment (TA) to support the proposed Section 75W modifications (MOD 12) to the Edmondson Park South (EPS) Concept Plan (MP 10_0118). Edmondson Park South is also known as Ed.Square.

MOD 12 mainly relates to the changes within EPS following the change to the Concept Plan of a portion of proposed residential development to a 2,000-place high school (plus ground floor retail) in the NW quadrant of the Town Centre. This portion of residential development is proposed to be relocated to the RP3 development area (highlighted in yellow below in **Figure 1**).

It should be noted that this report does not provide an application for development of the school itself. The proposed school development will be subject to a separate SSDA approval process.

1.1.2 Study Objectives

The objective of this study is to assess the implications of the net changes to the development, as opposed to assessing the full development as is generally the case at the DA stage. In this regard, the following is assessed:

- Establish that the trip generation of the Proposal can appropriately be accommodated by completed / committed upgrades to the local road network.
- Demonstrate that there is an appropriate and sustainable provision of car parking across the Site for the Proposal.
- Confirm the adequacy of public and active transport infrastructure within the vicinity of the Site, in order to ensure that future demand of the development can be met.
- Confirm that the proposed access driveways, internal roads, car parks and service facilities can provide a design that can meet the relevant Australian Standards.

Notwithstanding, it is expected that any detailed design review shall form part of the individual DA / SSDA process, which is expected to occur later. This review is part of a S75W and there is relatively high level only.

1.2 Summary of Proposed Development

The proposed modification will enable the following development:

1. Proposed High School for 2,000 Students (the Proposed School development is subject to a separate SSDA approval process),
2. The relocation of approximately 409 high-density residential dwellings development site within the broader Town Centre, and
3. Proposed mid-block signalised crossing on MacDonald Road, between Henderson Lane and General Boulevard.
4. Amendments to Henderson Lane, being:

- a. One-way in the westbound direction only,
- b. Proposed kerbside parking and Kiss and Ride along Henderson Lane,
- c. Introduction of a shared zone type local area traffic management treatment (to be confirmed at a later date as part of an SSDA).

The yield provisions for the parts of this application are provided within the Options Assessment Report (OAR) located within **Appendix A** of this report. Notwithstanding the proposed Site context and yields have been provided below for context.

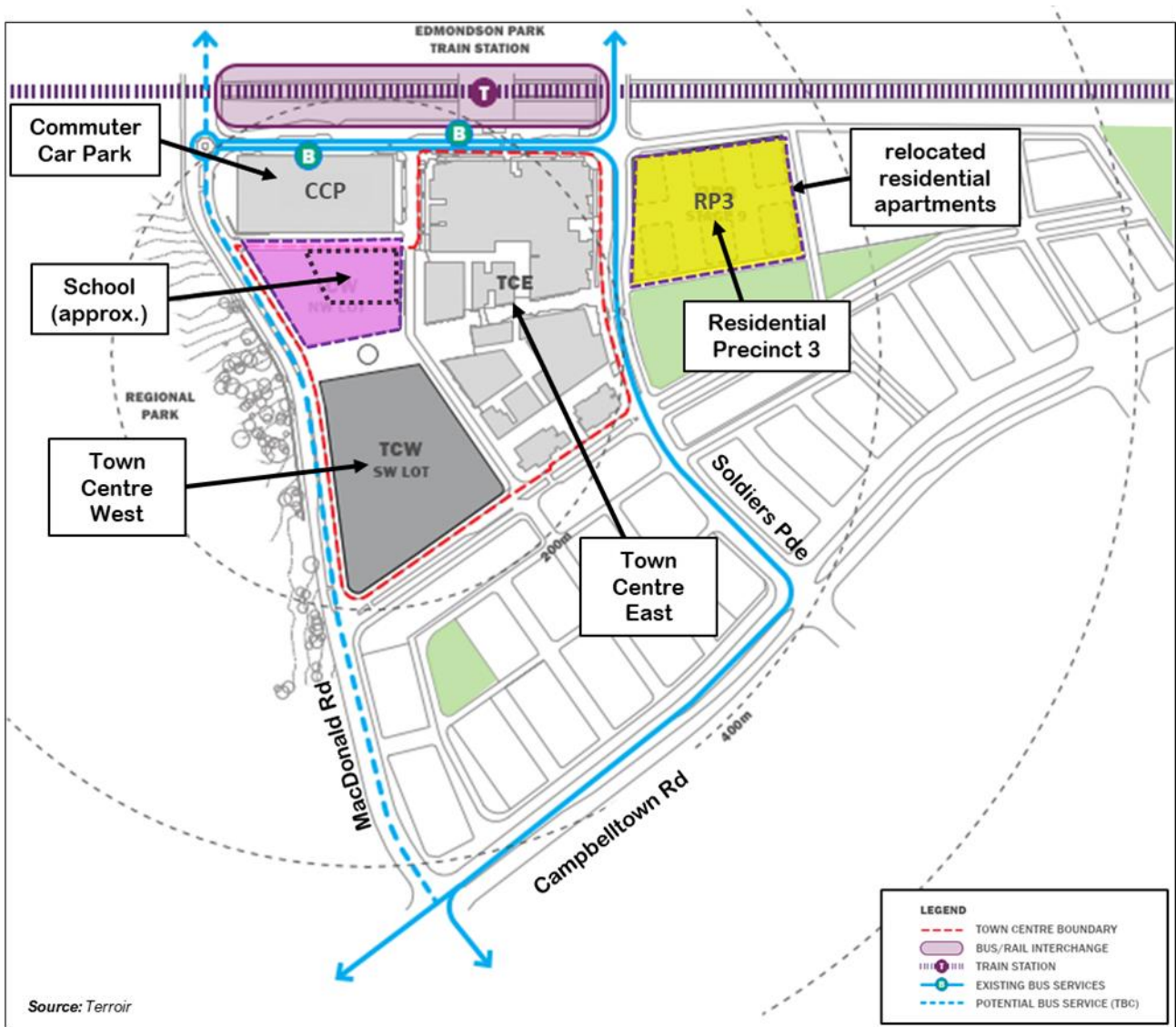


Figure 1: Site Context

TABLE 1: DEVELOPMENT YIELD

Area ¹	Land Use Type	Unit	Scenario 1	Scenario 3 / 3a	Difference
RP1	Medium-density Dwelling	No of units	348	348	-
RP2	Medium-density Dwelling	No of units	307	207	-
RP3	Medium-density Dwelling	No of units	237	93	-144
	High-density Dwelling	No of units		409	+409
TCS	High-density Dwelling	No of units	992	827	-165
	Retail GFA	m ²	35,000	34,662	-338
	Medical	m ²	8,000		-8,000
	High School	no of students		2,000	+2,000
CCP	n/a - veh/hr specified		AM = 420 in, PM = 350 out		-
RPW	Medium-density units	No of units	270	270	-
TCNW	High-density units	No of units	257	257	-
	Retail GFA	m ²			-
TCNE	High-density units	No of units	164	164	-
	Retail GFA	m ²			-
Buchan Ave	Medium-density units	No of units	396	396	-
	High-density units	No of units			-
	Primary school (students)	no of students	1,500	1,500	-
	High school (students)	no of students			-

Note: 1) All area names are outlined within the Glossary

2) Scenario 1 is the Approved MOD 6 yields, while Scenario 3/3a is the proposed development as part of this report.

3) Scenario 3a is Scenario 3 with the addition of a signalised pedestrian crossing.

4) Scenario 3/3a incorporate changes included in MOD 11 (under assessment by DPIE).

1.2.1 Access Arrangements

The proposed vehicular access to the school's basement parking, and Interim Town Centre Core access are illustrated below in **Figure 2**.



Figure 2: Access Arrangements

Source: AECOM, 2016

It is noted that the design of site-specific access points from the public road network will be subject to separate detailed assessment as part of subsequent Development Application (DA) submissions.

1.3 References

In preparing this TIA, Ason Group has referenced key planning documents, these include:

- AECOM, Edmondson Park South - Concept Plan MOD 5 - Transport Management and Accessibility Plan, dated on 14 August 2018 (MOD 5 TMAP)
- AECOM, Edmondson Park South Part 3A - Concept Plan Application – Transport Management and Accessibility Plan, dated 09 September 2010 (Concept Plan TMAP)
- Ason Group, Traffic Impact Assessment Report – Edmondson Park Frasers Town Centre – Section 75W Modification, dated 05 February 2017 (MOD 4 RtS TIA Report)
- Futurerail, Edmondson Park South Commuter Car Park - Traffic, Transport and Access Impact Assessment, dated on 15 May 2020 (EPS Commuter Car Park TTAIA)
- JBA, Edmondson Park Frasers Town Centre Design Guidelines, Revision 5, dated March 2019 (EPFTC Design Guidelines)
- Liverpool Development Control Plan 2018 (LDCP)

- Ason Group, Traffic Impact Assessment Report – Edmondson Park South – MOD 11, dated 28 May 2021 (MOD 11 TIA Report)

This TA also references general access, traffic and parking guidelines, including:

- RMS Guide to Traffic Generating Developments, Version 2.2, October 2002 (RMS Guide)
- RMS Guide to Traffic Generating Developments - Updated traffic surveys, August 2013, TDT2013/04a (RMS Guide Update)
- Australian Standard 2890.1 – 2004: Parking Facilities – Off Street Car Parking (AS 2890.1)
- Australian Standard 2890.2 – 2018: Parking Facilities – Off Street Commercial Vehicle Facilities (AS 2890.2)
- Australian Standard 2890.3 – 2015: Parking Facilities – Bicycle Parking (AS2890.3)
- Australian Standard 2890.5 - 2020: Parking Facilities – On-street parking (AS2890.5)
- Australian Standard 2890.6 – 2009: Parking Facilities – Off Street Parking for People with Disabilities (AS 2890.6)

2 Planning Context

2.1 Project History

The Edmondson Park South Concept Plan was originally approved on 18 August 2011, followed by several subsequent modifications. A summary of those modifications is provided below.

TABLE 2: EPS CONCEPT PLAN (MP 10_0118) – MODIFICATION HISTORY

Modifications	Descriptions	Traffic / Transport Related	Status
MOD 1	Amend the timing for approval of a vegetation rehabilitation plan associated with remediation works.	No	Approved
MOD 2	Modification in relation to the sales and information centre within Edmondson Park	No	Approved
MOD 3	Modification in relation to Sewerage Treatment Plan, Decommissioning and Remediation	No	Approved
MOD 4	Modifications in relation to maximum Gross Floor Area (GFA), maximum building height, number of dwellings, maximum parking rates etc.	Yes	Approved
MOD 5	Revision to the Concept Plan boundary to include land owned by Landcom and the Office of Strategic Lands (OSL) and other modifications relating to school zone, road layout, dwelling yield and mix, building height and bushfire asset protection zones.	Yes	More information required
MOD 6	Redistribute GFA within the Town Centre Core to reflect the further design development that has occurred since the original indicative scheme was developed. It will NOT result in any increase in the total GFA, height or number of dwellings for the Frasers Town Centre.	No	Approved
MOD 7	Modification to include a high school in the Edmondson Park Town Centre	Yes	Withdrawn
MOD 8	Amendment to the Ed.Square Guidelines to reduce the car park rate for 2-bedroom dwellings in the Town Centre Core	Yes	Approved (L&E Court) ¹
MOD 9	Modification to amend the Ed.Square Guidelines to reduce the car parking rate for two-bedroom dwellings within residential flat buildings in the Town Centre Core from 1.2 spaces per dwelling to 1 space per dwelling.	Yes	Withdrawn
MOD 10	Modification to the Concept Plan, as it relates to Precinct 3 to increase dwelling numbers by 350 to a maximum of 600 (a total of 4,852 dwellings across the Concept Plan) and alter the road network hierarchy.	Yes	SEARs Issued

MOD 11	Modification to the Concept Plan, as it relates to the Residential Precincts 2 & 3 (within the Ed Park Town Centre), to amend and update road network and road typologies.	Yes	Lodged
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Notes: 1) L&E Court file number [2020/38830](#)

It is noted that MOD 4 is the most recently approved modification of relevance to traffic and transport considerations. As such, MOD 12 implications have been assessed against the 'benchmark' conditions detailed in the MOD 4 traffic and transport study, given that these conditions have inherently been considered and validated by the key consent authorities, including the Department of Planning, Industry and Education (DPIE) and Transport for NSW (TfNSW).

Having regard to the above, this TA provides an assessment of the traffic characteristics of this proposed MOD 12 development, compared to the approved characteristics.

3 Existing Conditions

3.1 Study Area & Site Context

Edmondson Park is approximately 8 kilometres southwest from the Liverpool CBD and approximately 34 kilometres from the Sydney CBD. The overall EPFTC Concept Plan area is located within both Liverpool Council and Campbelltown Council LGAs. It forms the southern sub-precinct within the Edmondson Park Release Area.

The rezoned area (where the proposed school will be located) forms the north-western part of the overall EPFTC Core, as shown in **Figure 3** below. The Site is located on the northern side of Campbelltown Road within the suburb of Edmondson Park and is located solely within the Liverpool Council LGA. Investigations into a signalised pedestrian crossing has also been undertaken within this report.



Figure 3: Site Context of Ed.Square (EPFTC)

3.2 Road Hierarchy

Surrounding roads of particular interest include.

TABLE 3: ROAD HEIRARCHY

Road	Descriptions
Campbelltown Road	A Classified arterial road that traverses in an east-west direction to the south of the site. TfNSW is upgrading 5.4 kilometres of Campbelltown Road between Camden Valley Way, Casula and Brooks Road, Denham Court (Campbelltown Road Upgrade). The project is being jointly funded by the NSW Government Housing Acceleration Fund and Landcom (previously known as Urban Growth NSW). Detailed discussion regarding the Campbelltown Road Upgrade is provided in Section 3.1.
MacDonald Road	Previously referred as Bernera Road. It is a primary north-south vehicular connector road that traverses the western edge of the Frasers Town Centre area in the future, effectively by-passing the Town Centre Core. It forms a major signalised intersection with Campbelltown Road at the south-west corner of the RP 1.
Soldiers Parade	A secondary north-south connection that traverses through the Ed.Square and separates the Town Centre Core and RP 1 from the remaining residential precincts to the east. It currently forms signalised intersections with Henderson Road and Campbelltown Road.
General Boulevard	Previously referred as Greenway. It is currently a local collector road nearing completion that traverses the centre of Ed.Square between MacDonald Road and Soldiers Parade. It is expected that General Boulevard will be extended to further east to provide main access to the future RP 2 & 3.
Henderson Road	A local road running in an east-west direction to the south of Edmondson Park Station. It forms a signalised intersection with Soldiers Parade, with a roundabout provided at MacDonald Road. It currently provides a local bus interchange and also serves the southern commuter car park, situated on the south-east corner of the Henderson Road / MacDonald Road intersection.

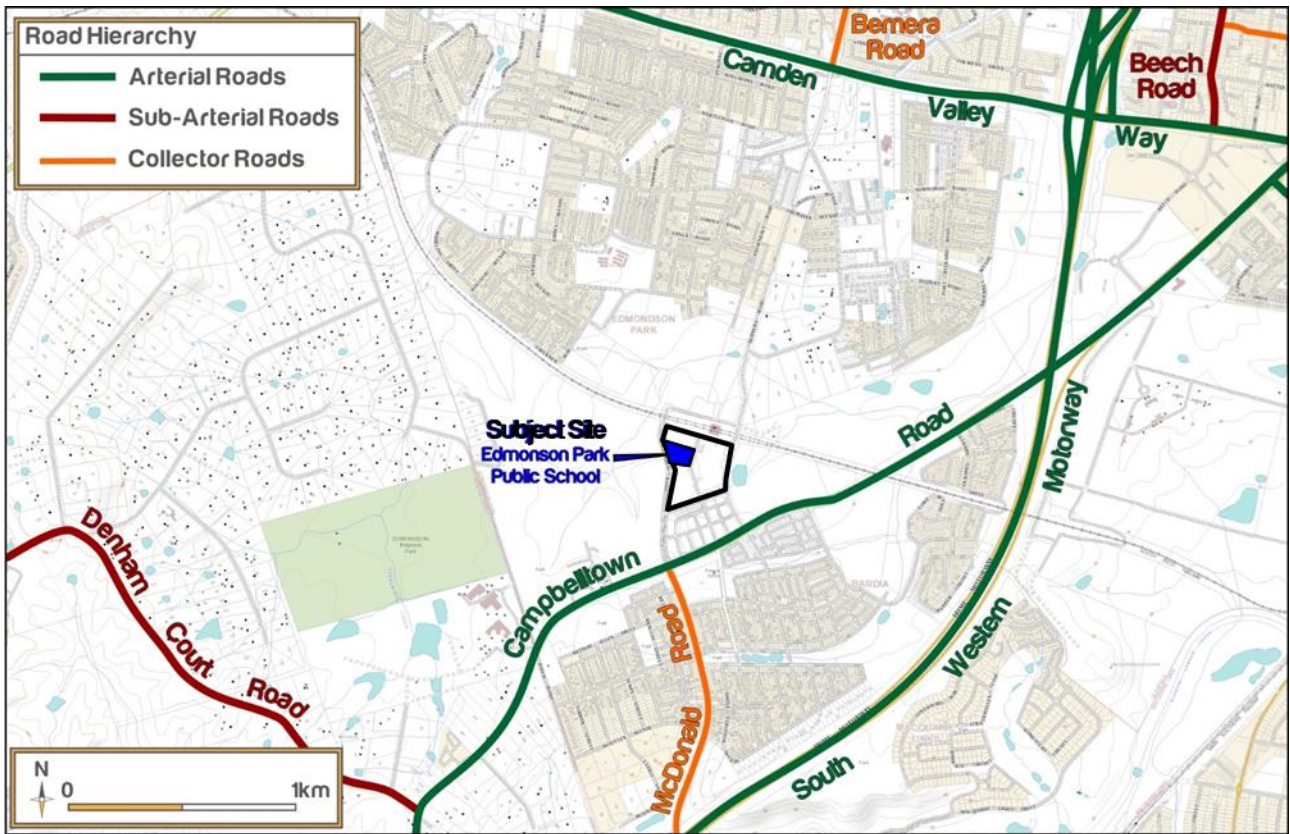


Figure 4: Site Context & Road Hierarchy

3.3 School Catchment Analysis

The location of the proposed school is situated within the Town Centre. Based on analysis completed by School Infrastructure NSW, there is significant demand for a High School within the general locality of Edmondson Park to service the local catchment area as a result of increases in the local population growth and forecasted future population growth associated with further residential development. Whilst the actual enrolment catchment is yet to be determined and will typically be formalised closer to when the School commence acceptance of enrolments, Figure 5 below demonstrates the likely enrolment catchment areas for the school and provide details of the existing catchment boundaries of local high schools within the area as informed by School Infrastructure NSW.

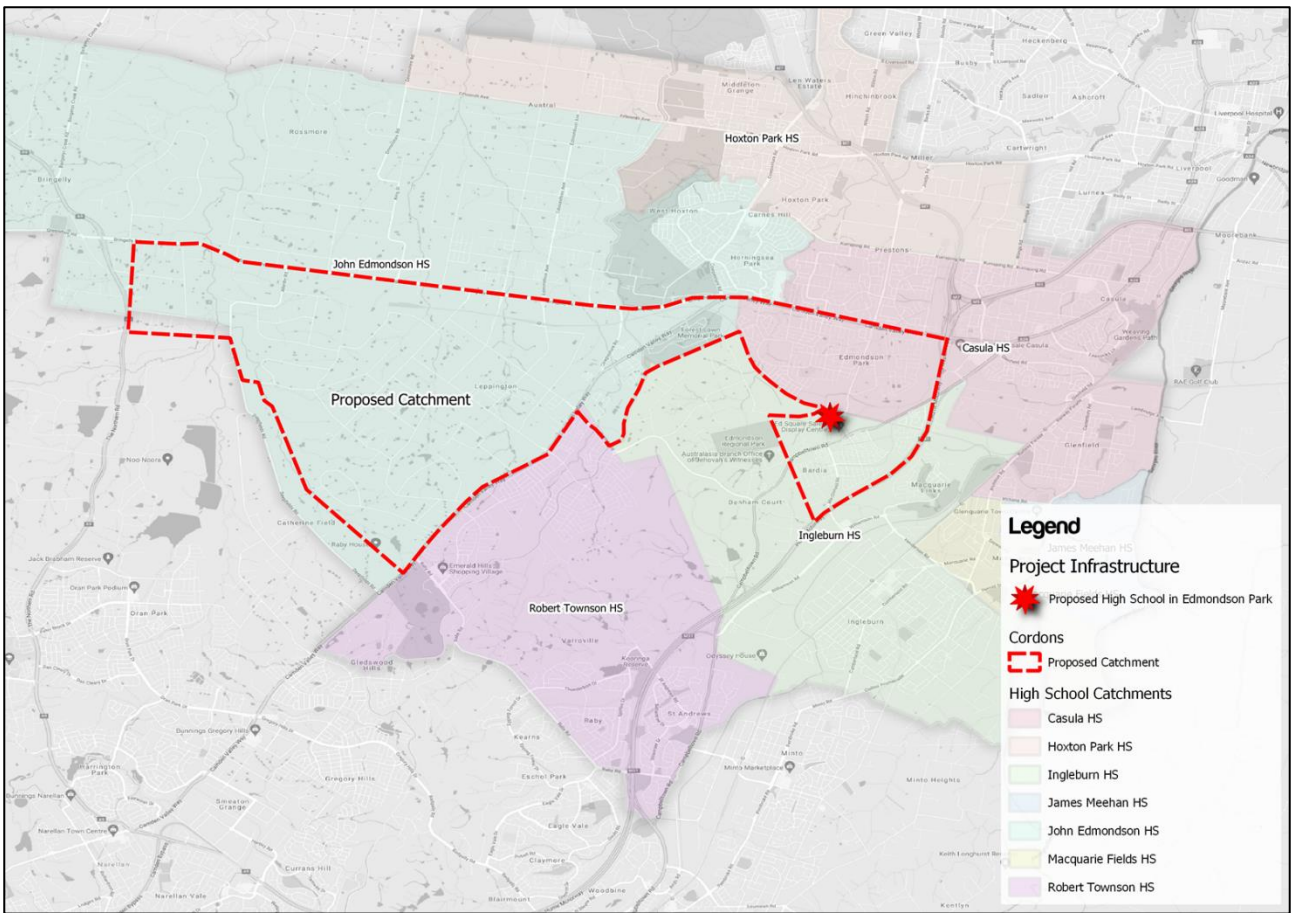


Figure 5: Public School Catchment Areas

The above demonstrates that majority of potential students resides to the south of Campbeltown Rd and to the west of the Hume Highway. It is not expected that the catchment area will accommodate the areas north of Camden Valley Way / Bringelly Road. This broadly indicates natural boundaries defined by main roads and to provide capacity to accommodate students that resides in existing enrolment areas of adjacent schools.

3.4 Existing Active Transport Connections

A shared pedestrian and cyclist path is provided along the western side of Soldiers Parade. Footpaths are provided on both sides of Henderson Road, Sergeant Street and General Boulevard. Existing footpath is also provided on the west side of General Boulevard.

MOD 11 does not include changes to the previously proposed key pedestrian and bicycle connections within the Town Centre Core and RP 1 but seeks to update the road network and road typologies within RP 2 & 3, which is further discussed in Section 4.2.

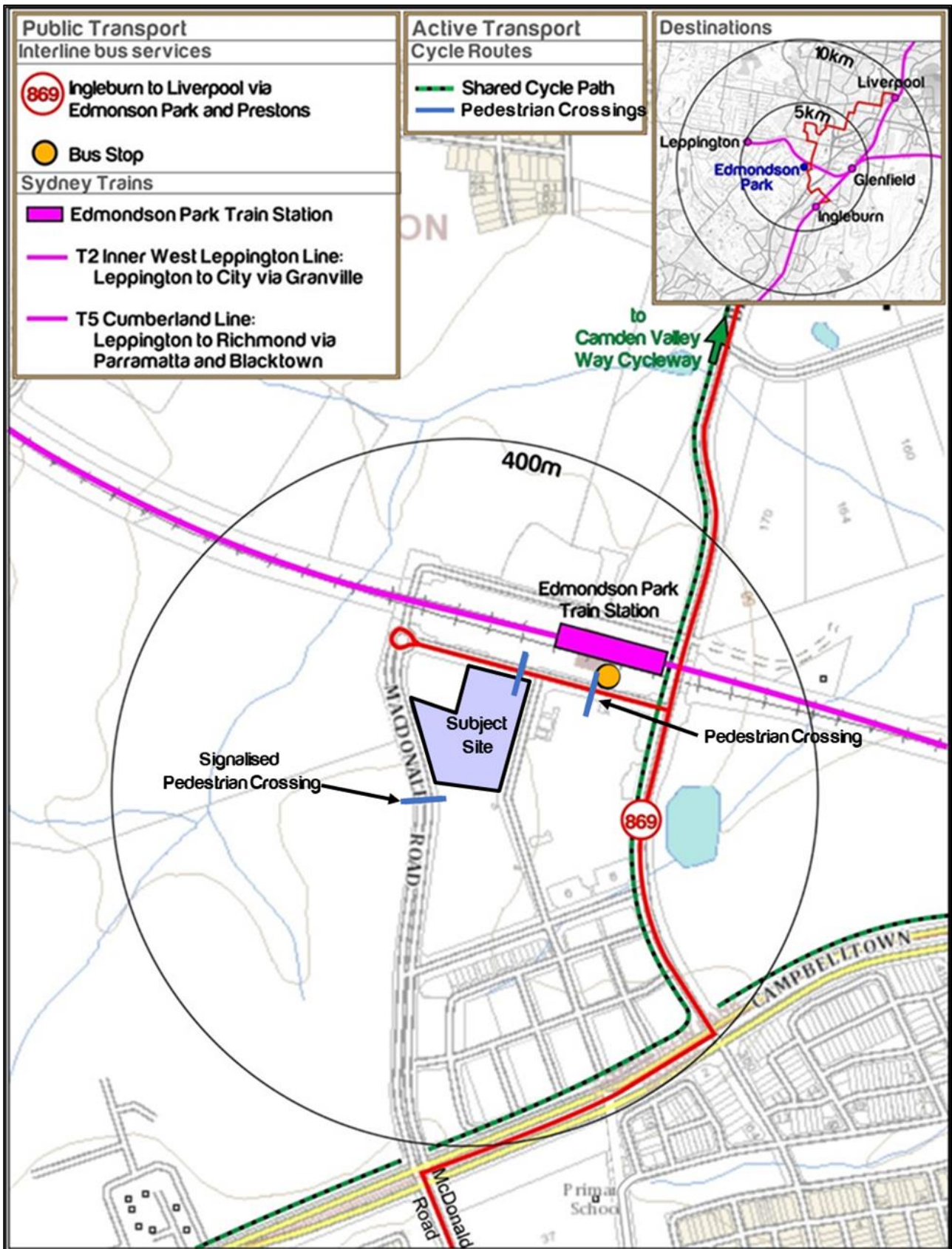


Figure 6: Existing Bus Network near Edmondson Park

3.5 Existing Public Transport Services

3.5.1 Bus Service

A bus interchange is provided at Edmondson Park Station to the north of the School site which is currently serviced by following bus routes:

- Bus Route 869: Ingleburn to Liverpool via Edmondson Park & Prestons
- Bus Route 859: Carnes Hill to Edmondson Park Station
- Bus Route 868 Edmondson Park Station to Ingleburn

Notwithstanding, bus services relating to the site directly are outlined below.

With regards to the proposed school catchment and resulting school bus services, it is not assumed that there will be a need for additional bus stops around the Ed.Square Town Centre, however a detailed assessment of bus services will be undertaken during the SSDA phase.

Initial consultation with Transport for NSW has commenced in relation to the likely future need for school buses. The planning of school bus routes form part of the future SSDA phase for the School development.

3.5.2 Rail Service

The site lies immediately to the south of the Edmondson Park Station which is serviced by the T2 Inner West & Leppington and the T5 Cumberland Line. The current Sydney Rail Network is presented below.



Figure 7: Sydney Rail Network

4 Transport Assessment

The assessment undertaken within this section of the report relates to any impacts created as a result of the change to the Concept Plan to cater for the development of a school, and the relocation of residential developments.

4.1 Travel Mode Share

Journey-to-Work (JTW) data from the Australian Bureau of Statistics (ABS) 2016 Census and specifically aggregated Destination Zones (DZ) have been referenced to understand the baseline travel characteristics of the Site.

The project site is largely vacant at present. For earlier studies underpinning the Concept Plan, AECOM developed the mode split and travel destination data from a range of surrounding suburbs / travel zones (TZs) to establish the potential travel pattern and trip destinations for the proposed development. These travel zones included:

- Horningsea Park and Prestons (Group 1)
- Localities separated by major roads to Glenfield, Macquarie Fields, Ingleburn and Minto. (Group 2)
- Localities adjacent to Glenfield, Macquarie Fields, Ingleburn and Minto. (Group 3)

These travel modes are presented in Table 4.

TABLE 4: JOURNEY TO WORK MODE SHIFT DATA

Land Use Type	Total Trips	Vehicle Driver	Vehicle Passenger	Train	Bus	Others ¹	Did Not Travel
Liverpool LGA	62,988	60%	7%	16%	1%	4%	12%
Campbelltown LGA	67,237	65%	7%	10%	2%	6%	11%
Group 1	7,805	70%	6%	9%	2%	3%	10%
Group 2	9,448	60%	6%	19%	1%	3%	11%
Group 3	4,573	50%	5%	27%	1%	6%	12%
Average	-	61%	6%	16%	1%	4%	11%

Note: 1) includes walking, cycling and other travel modes not stated

It is evident that the private vehicle (car) is the preferred mode of choice for commuters travelling to work in the area. The data indicates that on average 67% travel to work by car with 61% as the driver and 6% as passenger.

This is reflective of the current nature of the area, which accommodates rural residential properties and agricultural businesses only. However, noting the future land use of the Site as suburban in nature, it is expected that the JTW data will not accurately reflect the current trends for travel to places of work being close to a train station.

4.2 Measures to Reduce Private Vehicular Use

4.2.1 General Objectives

The following objectives identified for Travel Demand Management Strategies:

- Provide excellent travel mode choices and encourage walking, cycling and public transport trips;
- Limit unnecessary car trips, particularly for shorter trips;
- Promote alternatives to vehicle ownership for the residents within the locality;
- Reduce the need to travel, especially during peak periods;
- Facilitate the efficient use of land, through road space allocation and proximity of jobs and services to people; and
- Create a liveable community, with excellent local environmental quality and community cohesion.

Measures include implementation of Travel Plans and provision of adequate bicycle parking and End-of-Trip Facilities.

4.2.2 Implementation for Each Site Within Town Centre

A framework GTP is expected to be prepared to inform future site-specific travel plans within Ed.Square. Each of the end users within the Site will have slightly different travel characteristics and therefore individual travel plans will be prepared to address the specific needs of the occupier during each Site's DA/SSDA process.

A travel plan is a package of measures to assist in managing the transport needs of an organisation. It promotes the uptake of realistic choices of sustainable travel modes to and from a site, thereby reducing reliance upon single occupancy car travel. The travel plans will set; targets, a series of measures to meet these targets and the process for monitoring and reviewing the travel plan, including the allocation of a Travel Plan Coordinator.

4.2.3 School's Active Transport

To ensure the increase in active transport mode share, extensive pedestrian and cycling facilities have been provided as part of previous stages of development completed, with further walking and cycling infrastructure to be delivered within the local road network that forms part of EPS.

The key pedestrian access routes within the local road network provide a footpath/cycleway/shared path on at least one side of the road, with majority of the roadways within the immediate walking catchment of the school with access to footpaths on both sides of the road.

A signalised pedestrian crossing on Macdonald Rd has also been proposed to further improve the school's active transport options and connectivity to the surrounding areas, sporting and public recreation facilities and connectivity to residential areas within walking and cycling catchment of the school.

A Preliminary School Travel Plan in conjunction with a Transport Assessment will be prepared by Schools Infrastructure NSW's Project Team and will form part of the State Significant Development Application for the School following approval of the S75W Modification.

The proposed active transport network has been outlined below. It is clear that much of the localised catchment is within walking and cycling distance from the site, with access also available via rail connections to other nearby Stations.

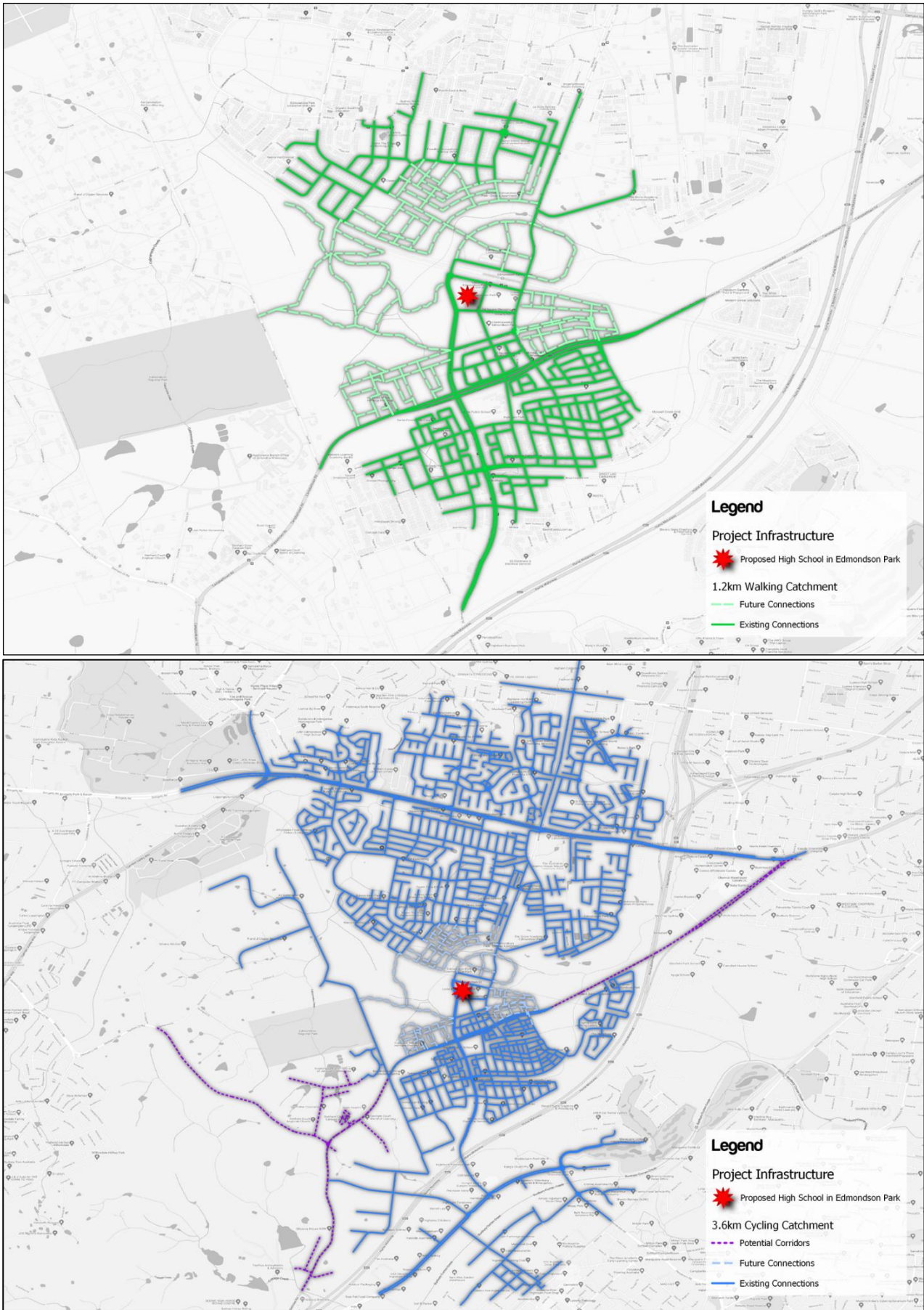


Figure 8: Proposed Active Transport Network

4.3 Proposed Future Public Transport Upgrades

To further aid the shift in mode share away from private vehicles, the introduction of additional public transport services is a key influencing factor.

4.3.1 Public Bus Services

It is anticipated that additional public bus services may be provided in the future as a result of the substantial development envisaged for the area and the South-West Growth Centre more generally.

4.3.2 Private (On-Demand) Bus Services

On Demand public transport is a form of service that allows a person to have a bus pick you up from a designated spot (of your choosing) and be taken to your destination and is designed to improve connections to/from transport hubs and popular destinations. This type of service is currently on trial within Edmondson Park.

4.3.3 Additional Pedestrian Crossings

With consideration for the Indicative Kiss & Ride within Henderson Lane and bus stop locations within Henderson Road at Edmondson Park Train Station, it is noted that pedestrian crossings / children's crossings are proposed at the following locations (and outlined within Figure 6):

- Signalised pedestrian crossing on MacDonald Road (to the south of the proposed location of the school)
- Pedestrian crossing on Sergeants Street, adjacent to Henderson Lane (to the east of the proposed location of the school)

With the proposed School, it is anticipated that pedestrian movements will significantly increase within the immediate vicinity of the school.

The below table demonstrates a warrant assessment against TfNSW Supplement to AS1742.10:2009 (Version 3.1, March 2021) based on forecast traffic and pedestrian conditions of the proposed crossing locations.

TABLE 5: MARKED PEDESTRIAN CROSSING WARRANT ASSESSMENT

Location	Reduced Warrant		Special Warrant			Children's Crossing		
	Ped =>30	Veh =>200	Ped =>30	Veh =>500	PV => 45,000	Ped =>20	Veh =>50	Speed 60km/h
Sergeants Street (South of Henderson Lane)	M	M	M	M	N	M	Y	N

Note: "M", or orange scores indicate that based on existing modelling undertaken within the OAR. The current numbers do not meet volume requirements; however, there is potential for growth within the

surrounding areas, with the School development, future land releases and continued development within Ed.Square Town Centre..

The above table demonstrates that while the crossing locations do have the potential for implementation based on all assessments. It should be considered that the assessment should be undertaken in more detail during the school’s SSDA process.

Notwithstanding, a signalised intersection may be considered if the following warrant for a crossing primarily utilised by children is met (as outlined within Section 2.5 of the RTA’s *Traffic Signal Design Guidelines, Section 2 – Warrants*;

- For each of 2 one-hour periods of an average day;
 - The pedestrian flow crossing the major road exceeds 50 persons/hour, and
 - The major road flow exceeds 600 vehicles/hour in each direction,

TABLE 6: MARKED PEDESTRIAN CROSSING WARRANT ASSESSMENT

Location	Reduced Warrant	
	Ped =>50	Veh =>600
MacDonald Road South of School	M	Y

Note: “M”, or orange scores indicate that based on existing modelling undertaken within the OAR. The current numbers do not meet volume requirements; however, there is potential for growth as the School development occurs and future land releases and continued development within Ed.Square occurs.

Based on the above, it would suggest that the reduced warrant could be met once the school is operational. Nonetheless, implicit design of the crossing would be confirmed during the SSDA process.

5 Operational Impacts

5.1 Traffic Generation

The following key trip generation rates have been utilised and approved within MOD4, therefore are also expected to be utilised within this report.

TABLE 7: DEVELOPMENT TRIP GENERATION RATES

Land Use Type	AM	PM
Residential	Medium Density: 0.62 trips / hour / dwelling High Density: 0.51 trips / hour / dwelling	
Retail	2.00 trips per 100 sq m GLFA	3.68 trips per 100 sq m GLFA2
Medical	-12.41 + 0.57*Beds trips	-11.96 + 0.69*Beds trips
School	1 trip per 2 students	N/A

Note: 1). Within previous S75W reports, reference to nearby private hospitals suggests a bed/GLA ratio of 0.009 beds per GLA. Therefore 8,000m² results in approx. 75 beds.

Based on the above, the proposed MOD 12 forecast peak hour trip generation rate for TCS and RP3 are as follows;

TABLE 8: FORECAST EPFTC PEAK HOUR TRIP GENERATION - MOD 12

Land Use	MOD 11		MOD 12		Difference	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
Residential	1,073	1,003	1,108	1,038	35	35
Retail	700	1,288	693	1,276	-7	-12
Medical	30	40	0	0	-30	-40
School	0	0	1,020	0	1,020	0
Total	1,784	2,382	2,821	2,314	1,018	-17

5.2 Traffic Assignment

This study has adopted the broader external trip distribution assumptions (to / from Ed.Square) consistent with the approved trip distribution assumptions. Revised traffic assignment within Ed.Square has been undertaken as part of this study. The findings of the traffic assignment and resultant traffic distribution have been included within the OAR (located within Appendix A).

5.3 Traffic Impacts

To assess the potential 'net' impact of the proposed MOD 12, Aimsun modelling has been undertaken for the scenarios listed in **Table 9**. Further details of the modelling methodology, inputs and assumptions are available in Appendix A.

TABLE 9: MODELLING SCENARIOS

Scenario No	Scenario Description	2026	2036
1	MOD 4 + Commuter Car Park (Baseline)	•	•
2	MOD 11 + Commuter Car Park	•	•
3	MOD 12 + Commuter Car Park	•	•
3a	MOD 12 with signalised pedestrian crossing + Commuter Car Park	•	•

Note: Dots within the 2026 and 2036 columns indicate that each scenario has been assessed for that particular design year.

5.3.1 Aimsun Intersection Performance

For the key intersections, Aimsun level of service (based on approach delays) for Scenario 1 and Scenarios 3/3a are summarised in **Table 10**.

It is noted that the road previously known as East Town Street is now referred as Borneo Street to reflect updated road names in the locality.

TABLE 10: INTERSECTION LOS – 2026

Intersection	Control	Peak	Criteria	S1	S3	S3a
Campbelltown Rd / Borneo St	Signal	AM	Delay (sec)	37	39	36
			LOS	C	C	C
		PM	Delay (sec)	37	40	31
			LOS	C	C	C
Campbelltown Rd / Soldiers Pde	Signal	AM	Delay (sec)	33	34	33
			LOS	C	C	C
		PM	Delay (sec)	27	28	27
			LOS	B	B	B
Campbelltown Rd / MacDonald Rd	Signal	AM	Delay (sec)	47	48	50
			LOS	D	D	D
		PM	Delay (sec)	56	53	48
			LOS	D	D	D
MacDonald Rd / General Blvd	Signal	AM	Delay (sec)	19	19	20
			LOS	B	B	B
		PM	Delay (sec)	21	16	12
			LOS	B	B	A
Soldiers Pde / General Blvd	Roundabout	AM	Delay (sec)	3	5	4
			LOS	A	A	A

		PM	Delay (sec)	4	6	4
			LOS	A	A	A
Soldiers Pde / Henderson Rd	Signal	AM	Delay (sec)	24	31	34
			LOS	B	C	C
		PM	Delay (sec)	25	26	21
			LOS	B	B	B
MacDonald Rd / Henderson Rd	Roundabout	AM	Delay (sec)	3	3	3
			LOS	A	A	A
		PM	Delay (sec)	5	7	4
			LOS	A	A	A
General Blvd / Borneo St	Roundabout	AM	Delay (sec)	3	2	3
			LOS	A	A	A
		PM	Delay (sec)	2	1	1
			LOS	A	A	A

As shown above, all key intersections in the study area are expected to perform acceptably in 2026 during both peak hours with LOS D or better among the scenarios assessed.

The 2036 Aimsun level of service (based on approach delays) for Scenario 1 and Scenarios 3/3a are summarised in **Table 11**.

TABLE 11: INTERSECTION LOS – 2036

Intersection	Control	Peak	Criteria	S1	S3	S3a
Campbelltown Rd / Borneo St	Signal	AM	Delay (sec)	33	32	32
			LOS	C	C	C
		PM	Delay (sec)	35	29	30
			LOS	C	C	C
Campbelltown Rd / Soldiers Pde	Signal	AM	Delay (sec)	27	28	28
			LOS	B	B	B
		PM	Delay (sec)	25	21	22
			LOS	B	B	B
Campbelltown Rd / MacDonald Rd	Signal	AM	Delay (sec)	44	43	43
			LOS	D	D	D
		PM	Delay (sec)	47	45	44
			LOS	D	D	D
MacDonald Rd / General Blvd	Signal	AM	Delay (sec)	17	18	16
			LOS	B	B	B
		PM	Delay (sec)	18	17	16
			LOS	B	B	B
Soldiers Pde / General Blvd	Roundabout	AM	Delay (sec)	4	6	6
			LOS	A	A	A

		PM	Delay (sec)	3	4	5
			LOS	A	A	A
Soldiers Pde / Henderson Rd	Signal	AM	Delay (sec)	27	33	33
			LOS	B	C	C
		PM	Delay (sec)	23	31	21
			LOS	B	C	B
MacDonald Rd / Henderson Rd	Roundabout	AM	Delay (sec)	3	3	3
			LOS	A	A	A
		PM	Delay (sec)	6	4	4
			LOS	A	A	A
General Blvd / Borneo St	Roundabout	AM	Delay (sec)	3	2	2
			LOS	A	A	A
		PM	Delay (sec)	2	1	1
			LOS	A	A	A

As shown above, all key intersections in the study area are also expected to perform acceptably in 2036 during both peak hours with LOS D or better among the scenarios assessed.

5.4 Summary of Traffic Generation Findings

Summarising the key points of the operational assessment:

- The 2026 Interim modelling captures the development extents of the Ed.Square masterplan. The results demonstrate that the 2026 interim signals perform at a satisfactory level, performing at LOS D or better.
- As part of the precinct-wide modelling, the undertaken traffic modelling for 2036 project year performs at satisfactory levels, performing at LOS D or better. The Ed.Square access intersection performs at LOS B or better.
- As such, it outlines that the introduction of a midblock pedestrian crossing (approximately 150m south of Henderson Road) does not materially impact the performance of MacDonald Rd with regard to network performance measures (travel time, LOS or delay).
- Furthermore, the above outlines that the increase in trips generated by the introduction of the school does not create a material impacts on the network performance (when comparing Scenario 1 (MOD11) and Scenario 3/3a (MOD12)).

Overall, it can be concluded that the proposed network and key intersections performs acceptably in Scenario 3/3a (i.e., MOD 12) in both horizon years of 2026 and 2036. As such, the impacts of the development have readily been considered in the determination of the precinct-wide upgrades and are deemed acceptable.

6 Parking Requirements

6.1 Car Parking Rates

6.1.1 Proposed Car Parking Requirements – General

According to the Ed.Square Design Guidelines – September 2021, car parking for the Town Centre Core and the new RP3 residential flat building will be provided at the following rates:

- Residential Flat Building (High Density):
 - 1 space per 1 – 2 Bedroom dwellings;
 - 2 spaces per 3 Bedroom dwellings; and
 - 1 Visitor spaces per 10 dwellings.
- Retail:
 - Major Retail (Supermarket, DDS, etc.): 4.1 spaces per 100m² NLA;
 - All other retail, commercial, medical, cinema and entertainment uses: 4.1 spaces per 100m² NLA;
- Child Care: 1 space per 10 children and 1 space per 2 staff members;
- Gym: 3 spaces per 100m² NLA;

Consideration for school parking will be assessed in further detail at a later date as part of the SSDA application. All other car parking rates shall form scope for future development applications, to ensure that the precinct has an adequate provision of parking spaces.

6.1.2 Accessible Car Parking

Accessible parking in accordance with DCP and/or in accordance with Section D3.5 of the National Construction Code applicable at the time of application or Construction Certification.

6.1.3 Visitor Parking

Outlined within Section 6.1.1, visitor car parking spaces for the high density residential units will be provided at the following rates:

- 1 space per 10 dwellings for residential flat buildings.

It is noted that detailed design of roads and the location of on-street parking and other signage shall form scope for future development applications.

6.1.4 Bicycle Parking

With reference to the Design Solution DS4.12 of Ed.Square Design Guidelines – September 2021, Bicycle parking is provided as follows:

- Residential flat buildings: 1 space per dwelling which can be provided within a dwelling's individual storage cage or within a shared facility
- Non-residential Uses: 1 space per 200m² of non-residential GFA (15% of this requirement is accessible for visitors).

Visitors spaces should be located in easily accessible locations with weather protection.

Commercial and retail development is provided with adequate change and shower facilities for cyclists. Facilities are located conveniently close to bike storage areas.

Whilst the Design Guidelines are the applicable controls for future development, it is noted that the DCP states the following:

The storage of bicycles for a unit in a residential flat building or multi-dwelling housing may be combined with a unit's allocated basement storage area. The bicycle parking space may also be combined with a storage room within the dwelling. The area for bicycle parking must be larger than a Class 1 locker.

This infers some flexibility with regard to the design and location of resident bicycle parking within the Town Centre. Nevertheless, it is noted that detailed design of bicycle parking spaces and their location shall form scope for future development applications.

6.2 Servicing

Reference is made to DS4.4 — DS4.8 of the Ed.Square Design Guidelines which outline relevant controls in relation to service vehicle loading and design.

Servicing within the Town Centre Core will occur from the dedicated service areas agreed upon during their respective DA's. It is proposed that the school shall have servicing occur on-site and/or from Henderson Lane and will not compromise safety amenity or capacity for the public road network system.

All servicing, including waste collection, for the Residential Precincts will occur on-street from the local roads and/or the local community roads such as Mews, as outlined within the previous MOD 11 submission. In this regard, the servicing strategy for the Residential Precincts will not be impacted by the changes proposed under MOD 12.

Further detail regarding waste collection can be found in the Waste Management Plan prepared by SLR Consulting.

7 Summary & Conclusions

7.1 Key Findings

The key findings of this Traffic Impact Assessment are:

- Ason Group has been engaged by Frasers Property Australia (FPA) to prepare a Traffic Assessment (TA) report to support the proposed Section 75W modification (MOD 12) to the Edmondson Park South (EPS) Concept Plan (MP 10_0118).
- MOD 12 mainly relates to the changes within EPS following the introducing a 2,000-place high school in the NW quadrant of the Town Centre, and corresponding relocation of town centre apartment yield to the RP3 development area (highlighted in green within Figure 3).
- It is important to note that MOD 12 can be accommodated with the completed and/or committed upgrades to the local road network. The Aimsun analysis indicates that MOD 12 will have no material impact on the performance of the surrounding road network. All key intersections are expected to still operate at an acceptable LOS D or better.
- The Indicative Scheme developed to aid MOD 12 is expected to include sufficient parking to accommodate the forecast parking demand. Notwithstanding, the quantum and design of car parking (inclusive of visitor, accessible and bicycle parking) for each development shall be subject to individual DA conditions.
- Visitor car parking spaces will readily satisfy potential residential visitor demands, as required under the Design Guidelines.
- Existing and future public and active transport infrastructure have been reviewed. The existing transport services and additional active transport infrastructure to be constructed surrounding the Site can readily accommodate the future demand of the Ed.Square Town Centre and School.

7.2 Conclusion

In summary, the Proposal is supportable on traffic planning grounds and will not result in any adverse impacts on the surrounding road network or the availability of on-street parking.

Appendix A. Options Assessment Report

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Option Assessment Report

Ed.Square - MOD 12

30/09/2021

P0818r03v2

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APPENDICES

Appendix A.

Appendix B.

Appendix C.

Glossary

Acronym	Description
AM	Weekday morning peak
CCP	Commuter Car Park
CRU	Campbelltown Road Upgrade
Council	Liverpool City Council
DA	Development Application
DCP	Development Control Plan
EPFTC	Edmondson Park Frasers Town Centre, otherwise known as Ed.Square
EPS	Edmondson Park South
GFA	Gross Floor Area
LEP	Local Environmental Plan
LGA	Local Government Area
LOS	Level of Service
MOD	Section 4.55 Modification (also referred as a S4.55)
OAR	Options Assessment Report
PM	Weekday afternoon peak
REF	Review of Environmental Factors
RP	Residential Precinct
RPW	Residential Precinct West
STFM	Sydney Traffic Forecasting Model
SWGK	South West Growth Centre
TCNE	Town Centre North-East
TCNW	Town Centre North-West
TCS	Town Centre South
TDT 2013/04a	TfNSW Technical Direction, Guide to Traffic Generating Developments – Updated traffic surveys, August 2013
TfNSW	Transport for New South Wales
VHT	Vehicle Hours Travelled
VKT	Vehicle Kilometres Travelled

1 Introduction

1.1 Overview

Ason Group has been engaged by Frasers Property Australia (FPA) to provide traffic modelling services to support the proposed Section 75W modifications (MOD 12) to the Edmondson Park South (EPS) Concept Plan (MP 10_0118). Edmondson Park South is also known as Ed.Square.

Ed.Square comprises of approximately 25 hectares and is located to the north of Campbelltown Road and south of the Edmondson Park Station and railway line, excluding the TfNSW commuter car park at the NW of the sub-precinct. Proposed MOD 12 relates to the Eastern Residential Precinct and Town Centre West and changes to RP3 Stage 9 by introducing a 2,000-place high school in the NW quadrant of the Town Centre and corresponding relocation of town centre apartment yield to the RP3 Stage 9. MOD 12 will consider the relevant horizon years including further review of background information including pertaining to the new school use on the site by desktop site analysis, available mode share and trip distribution patterns. For this MOD 12 assessment, traffic Aimsun microsimulation models were developed for horizon years 2026 and 2036.

This Options Assessment Report (OAR) summarises all inputs, assumptions and results of Aimsun modelling assessment for Ed.Square MOD 12 for the horizon years 2026 and 2036.

Ed.Square is located within the City of Liverpool Council's (Council) Local Government Area (LGA). A Site Context figure is presented in **Figure 1**, which provides an appreciation of the EPFTC and its location within the greater EPS which itself forms part of the Southwest Growth Centre (SWGC).

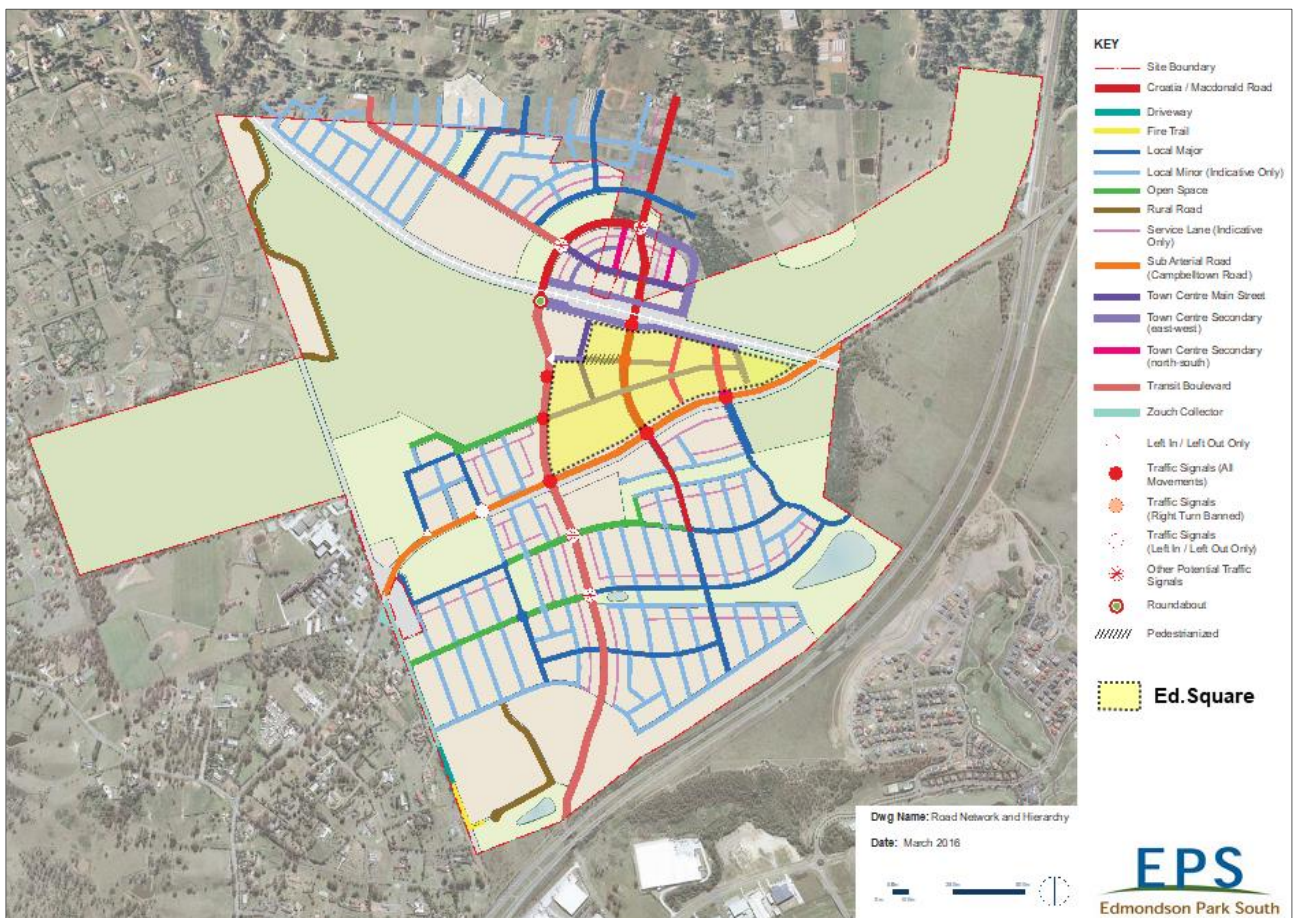


Figure 1: Overview of Ed.Square Site

1.2 Study Objectives

The objectives of this OAR are:

- To assess the traffic impacts of the proposed modifications to the EPFTC – under different land use information – in 2026 and 2036 on the surrounding road network.
- Compare the network performance of potential demand scenarios across EPFTC and identify the most appropriate land use for the planned road network.

1.3 References

This OAR should be read in conjunction with below documents prepared by Ason Group -

- Modelling Methodology Report (MMR): P0818r02v2_Modelling Methodology Report_Ed.Square_MOD 12_Issue II.pdf, dated 23 June 2021.
- Base Model Technical Note (Base TN): P0818tn01v1_Ed.Square_Scenario 1 (Baseline).pdf, dated 19 July 2021'.
- MOD 11 Report: P0818r01v1 MOD 11 TIA_Edmondson Park South Frasers Town Centre (MP 10_0118).PDF, dated 27 April 2021.

A number of documents were also reviewed and referenced for this study, such as:

- Edmondson Park Town Centre _Section 75W Traffic Modelling Report, Revision E, dated 02 February 2017, prepared by Aecom (referred as 'Aecom RtS Traffic Report').
- Campbelltown Road Upgrade Review of Environmental Factors, Traffic and Transport Modelling Assessment, dated 11 March 2013, prepared by Aecom (referred as 'REF Report').
- Edmondson Park South CCP -Traffic, Transport and Access Impact Assessment.PDF, dated 15 May 2020 (referred as 'CCP Report').
- Edmondson Park South - Concept Plan MOD 5 - Transport Management and Accessibility Plan, dated 04 June 2020, prepared by Aecom (referred as 'MOD 5 TMAP').
- Edmondson Park South - Concept Plan MOD 5 - Transport Management and Accessibility Plan Addendum, dated 04 June 2020, prepared by Aecom (referred as 'MOD 5 TMAP Addendum').
- School Transport Plan, New Primary School in Edmondson Park for SINSW, dated 26 May 2021, prepared by PTC. (referred as 'School Transport Plan').

2 Modelling Inputs

2.1 Assessment Year and Time period

Aimsun microsimulation models have been developed for the horizon years of 2026 and 2036, in accordance with preceding studies.

The models have been for 1-hour evaluation period (with an additional 30-minute warm up period) each for weekday AM and PM peaks. The typical commuter peaks were chosen as 8:00am – 9:00am and 5:00pm – 6:00pm. **Table 1** outlines the modelling time periods used for each peak.

TABLE 1: MODELLING PERIOD

Peak	Warm Up (30 minutes)	Evaluation Period (1 hour)
AM	07:30 am – 08:00 am	08:00 am – 09:00 am
PM	04:30 pm – 05:00 pm	05:00 pm – 06:00 pm

2.2 Modelling Scenarios

A total of 8 scenarios have been assessed for the horizon years (including future 'Baseline' scenario), as summarised in **Table 2**.

TABLE 2: MODELLING SCENARIOS

Scenario No	Scenario Description	2026	2036
1	MOD 4 + Commuter Car Park (Baseline)	•	•
2	MOD 11 + Commuter Car Park	•	•
3	MOD 12 + Commuter Car Park	•	•
3a	MOD 12 with signalised pedestrian crossing + Commuter Car Park	•	•

2.3 Network Geometry

The Aimsun network layout and travel zones for 2026 Scenario 1 (Baseline) are shown in **Figure 2**. A total of 28 travel zones were coded in the network. Travel zones 1 – 9 generally represent areas located outside of the Ed.Square and therefore referred as 'External' zones, whereas the rest (10 – 28) belong to the broader EPS and are referred as 'Internal' zones includes both Landcom site and Ed.Square site.

Aimsun network layouts for all the scenarios are attached in **Appendix A**.

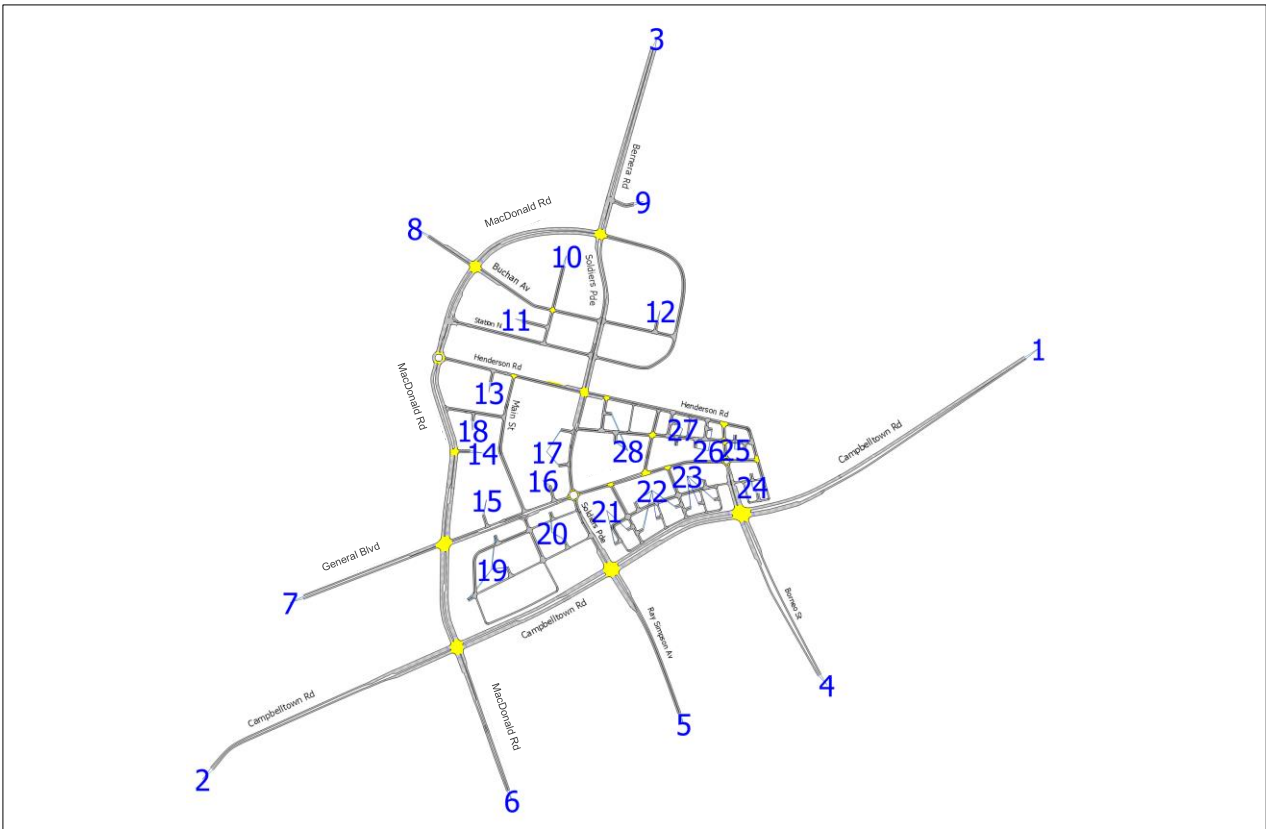


Figure 2: Aimsun Network Layout and Travel Zones – 2026 Scenario 1 (Baseline)

For the 2036 Baseline, one lane was added on each direction of Campbelltown Road – to allow additional capacity for through movements – as shown in **Figure 3**. The additional lane is in accordance with the long-term plans for Campbelltown Road as outlined in the REF for the Campbelltown Road Upgrade

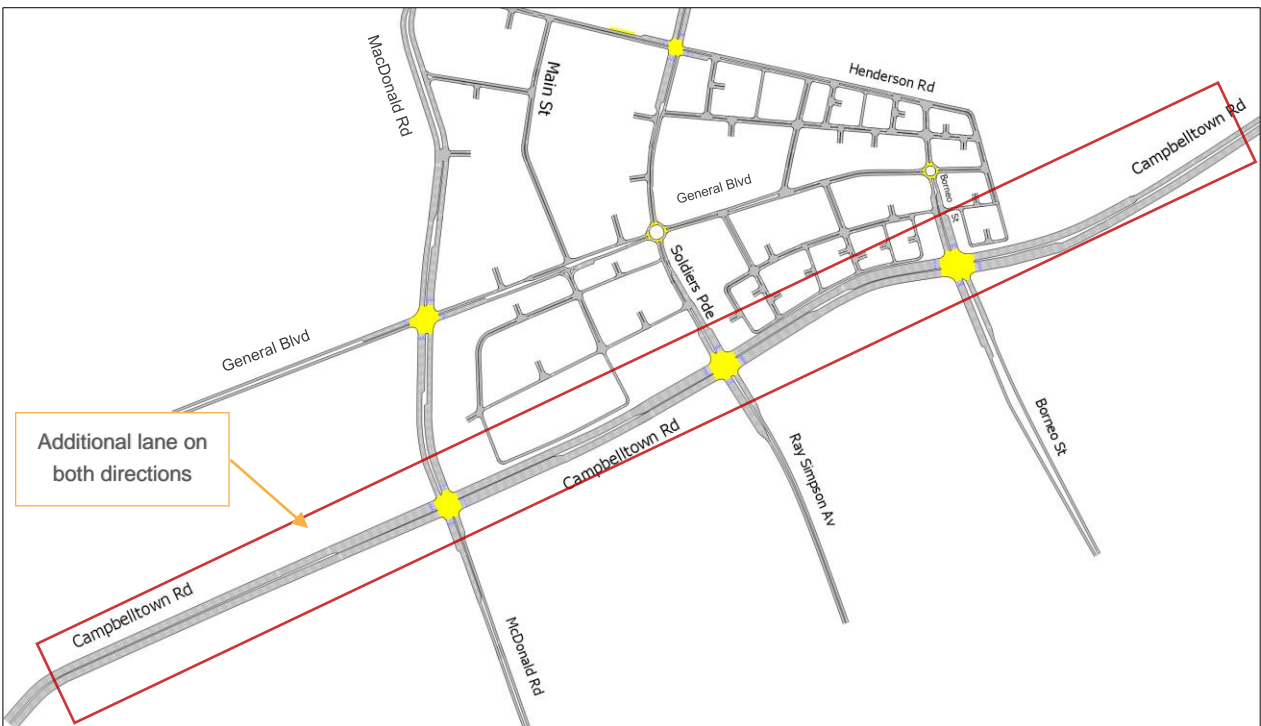


Figure 3: 2036 Base Layout with Added Capacity on Campbelltown Road

A number of additional changes were adopted in the network representing Scenarios 3 and 3a (MOD 12) compared to Scenario 1 (MOD 4), as shown in **Figure 4** and listed below:

- removal of the internal link between Zone 28 and Soldiers Parade indicated by green box in **Figure 4**
- conversion of the MacDonald Road access point located north of Access Street from permitting all movements to Left-In / Left-Out only, as shown by red box in **Figure 4**, and addition of a Loading Dock access south of Access Street, permitting all movements shown by red box in **Figure 4**.
- Limitation of road capacity within the model for the Henderson Road and Borneo Street link to 500 pcu per hour per lane – reflective of Local Area Traffic Management devices such as on-street parking, speed humps etc. – to discourage rat-running vehicles. Failure to do this resulted in excessive external demands seeking to use Borneo Street (as opposed to Soldiers Parade) to travel east, leading to excessive delays.

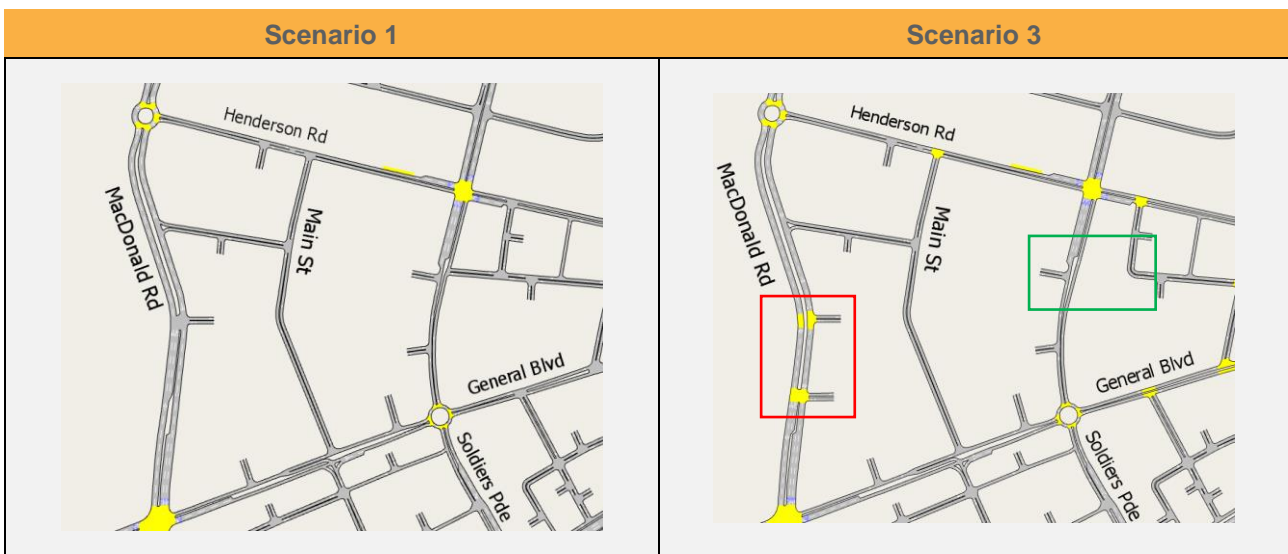


Figure 4: Geometric Changes adopted in Scenario 3 (MOD 12)

A further geometric change adopted in Scenario 3a (MOD 12), compared to Scenario 3, was the inclusion of a mid-block signalised pedestrian crossing on MacDonald Road approximately 150m south of Henderson Road as shown by red box in **Figure 5**. This change is applicable to both 2026 and 2036 and is intended to explore the implications of a signalised pedestrian crossing to provide improved access to the future school.

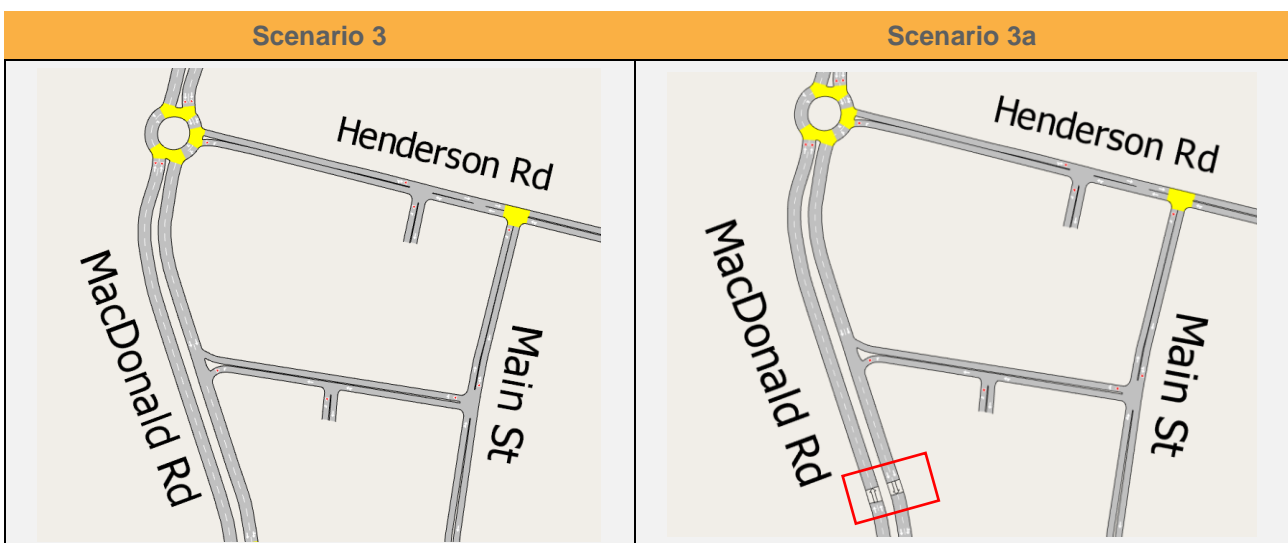


Figure 5: Geometric Changes adopted in Scenario 3a (MOD 12)

2.4 Background Traffic

The background or ‘passing’ traffic in the network refers to traffic travelling between zones that do not belong to Ed.Square. The steps of determining background traffic for 2026 and 2036 is summarised below:

- Collated and analysed TfNSW Sydney Traffic Forecasting Model (or STFMs) data.
- Background traffic was sourced from the STFM Cordon matrices, more precisely for trips between external travel zones.
- A factor of 55% was adopted to convert 2 hours of STFM volumes into one peak-hour volumes.
- Heavy vehicle percentage was adopted as 4%, based on review of survey data in the preceding studies.

2.5 Development Traffic

Key assumptions with regard to development traffic are outlined below:

- Heavy vehicle percentage: Assumed 2% for External-to-Internal and Internal-to-External trips, and 0% for Internal-to-Internal trips.
- Trip Generation Rates: based on MOD 4 RtS TIA report, as shown in **Table 3**.
- In / Out splits were also based on MOD 4 RtS TIA report, as shown in **Table 4**.
- Directional distribution is obtained from STFM ‘select link analysis’ data and presented in **Table 5** and **Table 6** for AM and PM respectively.

TABLE 3: DEVELOPMENT TRIP GENERATION RATES

Land Use Type	AM	PM
Residential⁽¹⁾	Medium Density: 0.62 trips / hour / dwelling High Density: 0.51 trips / hour / dwelling	
Retail	2.00 trips per 100 sq m GLFA	3.68 trips per 100 sq m GLFA ⁽²⁾
Medical⁽³⁾	-12.41 + 0.57*Beds trips	-11.96 + 0.69*Beds trips
School	1 trip per 2 students	N/A

Notes: (1) First principal assessment based on mode split assumptions.

(2) 4.6 trips per 100 m² GLFA for retail land use for PM peak hour based on RMS Guide; however, based on the trip generation assessment included in the MOD 4 RtS Traffic Modelling Report, it is believed that a 20% link trip reduction has been adopted, resulting in an equivalent trip rate of 3.68 trips per 100 m² GLFA.

(3) Referencing nearby private hospitals, a bed/GLFA ratio was calculated to be 0.009. This yields approximately 75 beds for the 8,000 m² GLFA of medical use.

TABLE 4: IN / OUT TRIP DISTRIBUTION PERCENTAGE

Land Use Type	AM		PM	
	In	Out	In	Out
Residential	25%	75%	80%	20%
Retail/Medical	60%	40%	50%	50%

TABLE 5: DIRECTIONAL DISTRIBUTION PERCENTAGE - AM

Land Use	From / To	AM			
		north	east	south	west
Buchan Ave 1500-place school	From	0%	18%	42%	40%
	To	0%	1%	54%	44%
2000-place school Ed.Square	From	39%	38%	10%	13%
	To	40%	21%	13%	26%
RPW	From	20%	74%	6%	0%
	To	43%	51%	6%	0%

TABLE 6: DIRECTIONAL DISTRIBUTION PERCENTAGE - PM

Land Use	From / To	PM			
		north	east	south	west
Buchan Ave 1500-place school	From	0%	8%	78%	14%
	To	0%	20%	50%	30%
2000-place school Ed.Square	From	44%	23%	12%	20%
	To	41%	32%	12%	15%
RPW	From	28%	65%	6%	0%
	To	29%	67%	3%	0%

2.6 Development Yield

With reference to **Figure 6**, overall development yield for all the scenarios is presented in **Table 7**.



Figure 6: Development Sub-precincts

TABLE 7: DEVELOPMENT YIELD

Area	Land Use Type	Unit	Scenario 1	Scenario 2	Scenario 3 & 3a
RP1	Medium-density Dwelling	No of units	348	348	348
RP2	Medium-density Dwelling	No of units	307	307	207
RP3	Medium-density Dwelling	No of units	237	237	93
	High-density Dwelling	No of units			409
TCS	High-density Dwelling	No of units	992	992	827
	Retail GFA	m2	35,000	35,000	34,662
	Medical	m2	8,000	8,000	
	High school	no of students			2,040
CCP	n/a - veh/hr specified		AM = 420 in, PM = 350 out		
RPW	Medium-density units	No of units	270	270	270
TCNW	High-density units	No of units	257	257	257
	Retail GFA	m2			
TCNE	High-density units	No of units	164	164	164
	Retail GFA	m2			
Buchan Ave	Medium-density units	No of units	396	396	396
	High-density units	No of units			
	Primary school (students)	no of students	1,500	1,500	1,500
	High school (students)	no of students			

2.7 Public Transport

No frequency of operation of these bus routes services during network peak periods are listed in **Table 8**.

A bus interchange is provided at Edmondson Park Station immediately to the north of the site which is currently serviced by following bus routes:

- Bus Route 859: Carnes Hill to Edmondson Park Station
- Bus Route 868: Edmondson Park Station to Ingleburn
- Bus Route 869: Ingleburn to Liverpool via Edmondson Park & Prestons

TABLE 8: BUS OPERATION IN THE STUDY AREA

Bus Route No	Route Description	Number of Service in Peak Hour	
		AM	PM
859	Edmondson Park Station to Carnes Hill	1	2
	Carnes Hill to Edmondson Park Station	2	2
868	Edmondson Park Station to Ingleburn	-	1
	Ingleburn to Edmondson Park Station	-	3
869	Ingleburn to Liverpool via Edmondson Park	5	4
	Liverpool to Ingleburn via Edmondson Park	4	4

3 Model Results

3.1 Overall Network Performance

Key network performance measures are:

- Vehicle Kilometres Travelled (VKT) is the total number of vehicles times distance travelled in the network. If the total number of vehicles are the same, an increase in VKT indicates that vehicles are travelling longer distance to avoid congestion.
- Vehicle Hours Travelled (VHT) is the total number of vehicles times the travel time for all trips. An increase in VHT is generally due to increased delays and build-up congestion in the network.
- Vehicle Speed is calculated using VKT divided by VHT, and it implies average vehicle speed in the network.
- Unreleased vehicle indicates the total number of vehicles that could not enter the network due to downstream capacity constraints.
- Number of Stops shows the total number of stops during the model evaluation period for all the trips due to queueing or giving-way. An increase in number of stops indicates more congestion and / or reduced capacity for traffic approaching from minor roads.

3.1.1 Design Year – 2026

Table 9 and Table 10 present the network performance outcomes for all scenarios for 2026 AM and 2026 PM, respectively.

TABLE 9: NETWORK PERFORMANCE STATISTICS – 2026 AM

Measure	S1	S3	S3a
Vehicle Kilometres Travelled (VKT, km)	10,284	10,812	10,815
Vehicle Hours Travelled (VHT, hr)	373	411	414
Vehicular Speed (km/hr)	28	26	26
Unreleased Vehicle	70	228	248
Number of Stops	10,196	11,244	11,502

TABLE 10: NETWORK PERFORMANCE STATISTICS – 2026 PM

Measure	S1	S3	S3a
Vehicle Kilometres Travelled (VKT, km)	11,293	10,636	10,604
Vehicle Hours Travelled (VHT, hr)	416	345	351
Vehicular Speed (km/hr)	27	31	30
Unreleased Vehicle	1	2	2
Number of Stops	12,712	9,552	9,887

Comparison of the above statistics across scenarios indicate below key points for network performance:

- In AM peak, Scenario 3 and Scenario 3a operate with slightly lower speed (2 km) compared to Scenario 1 as there is additional traffic volume due to school trips in the morning peak hour. On the other hand, PM peak shows higher speed (3-4 km) as the traffic is more in Scenario 1 during PM peak.

- Compared to the total number of trips in the network, the number of unreleased vehicles range between 0% - 3% in Scenarios 1 to 3a.
- Overall, the 2026 AM and PM network statistics indicate that – Scenarios 3 and 3a perform similar to Scenario 1.

3.1.2 Design Year – 2036

Table 11 and **Table 12** below present the network performance statistics for all scenarios for 2036 AM and 2036 PM, respectively.

TABLE 11: NETWORK PERFORMANCE STATISTICS – 2036 AM			
Measure	S1	S3	S3a
Vehicle Kilometres Travelled (VKT, km)	11,622	11,886	11,847
Vehicle Hours Travelled (VHT, hr)	401	412	409
Vehicular Speed (km/hr)	33	29	29
Unreleased Vehicle	50	136	155
Number of Stops	10,507	11,163	11,193

TABLE 12: NETWORK PERFORMANCE STATISTICS – 2036 PM			
Measure	S1	S3	S3a
Vehicle Kilometres Travelled (VKT, km)	12,265	11,627	11,654
Vehicle Hours Travelled (VHT, hr)	428	387	392
Vehicular Speed (km/hr)	33	30	30
Unreleased Vehicle	41	26	15
Number of Stops	11,408	9,830	10,251

Comparison of the above statistics across scenarios indicate below key points for network performance for 2036:

- In AM peak, Scenario 3 and Scenario 3a operate with slightly lower speed (4 km) compared to Scenario 1 as there is additional traffic volume due to school trips in the morning peak hour. On the other hand, PM peak shows higher speed (3 km) as the traffic is more in Scenario 1 during PM peak.
- Compared to the total number of trips in the network, the number of unreleased vehicles range between 0% - 2% in Scenarios 1 to 3a.
- Overall, the 2026 AM and PM network statistics indicate that – Scenario 3 and 3a perform similar to Scenario 1.

3.2 Travel Time

Average vehicle travel times have been compared among all scenarios for three key routes in the network, as shown in **Figure 7**.



Figure 7: Travel Time Routes

3.2.1 Design Year – 2026

Figure 8 and **Figure 9** present the travel time for three major routes in the study area for 2026 AM and PM, respectively.

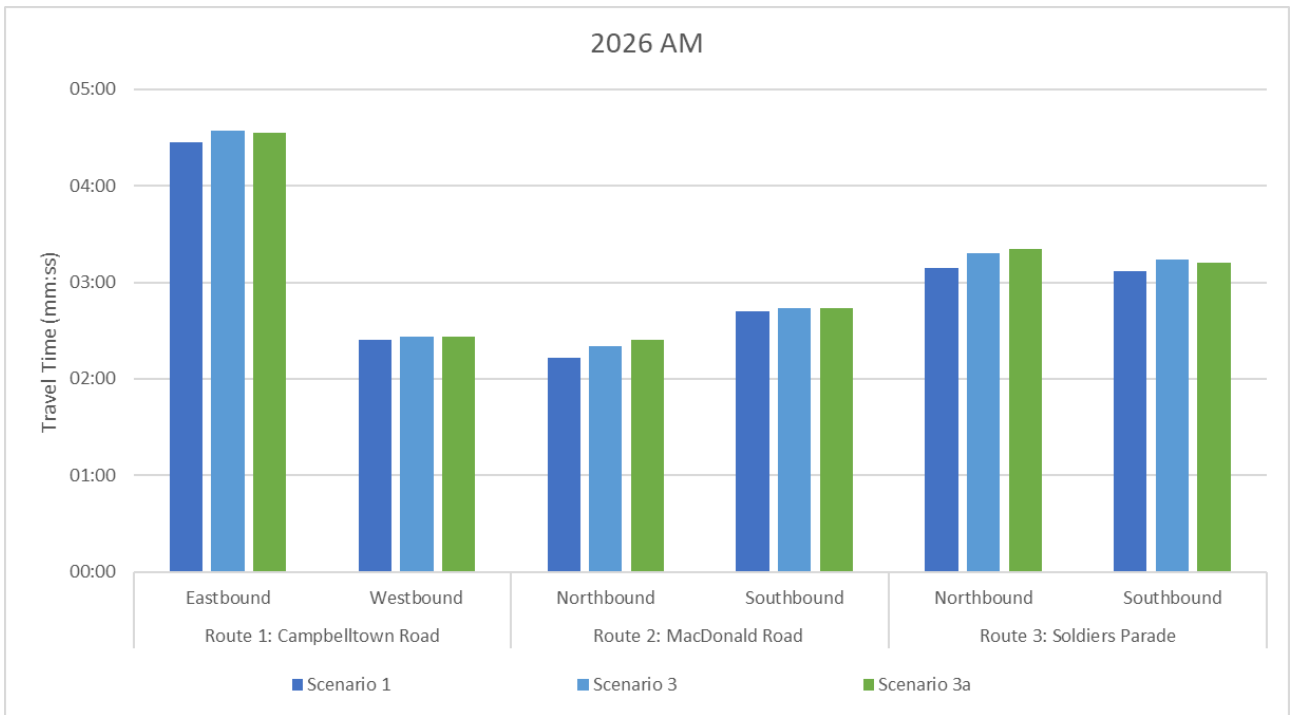


Figure 8: 2026 AM Travel Time Comparison

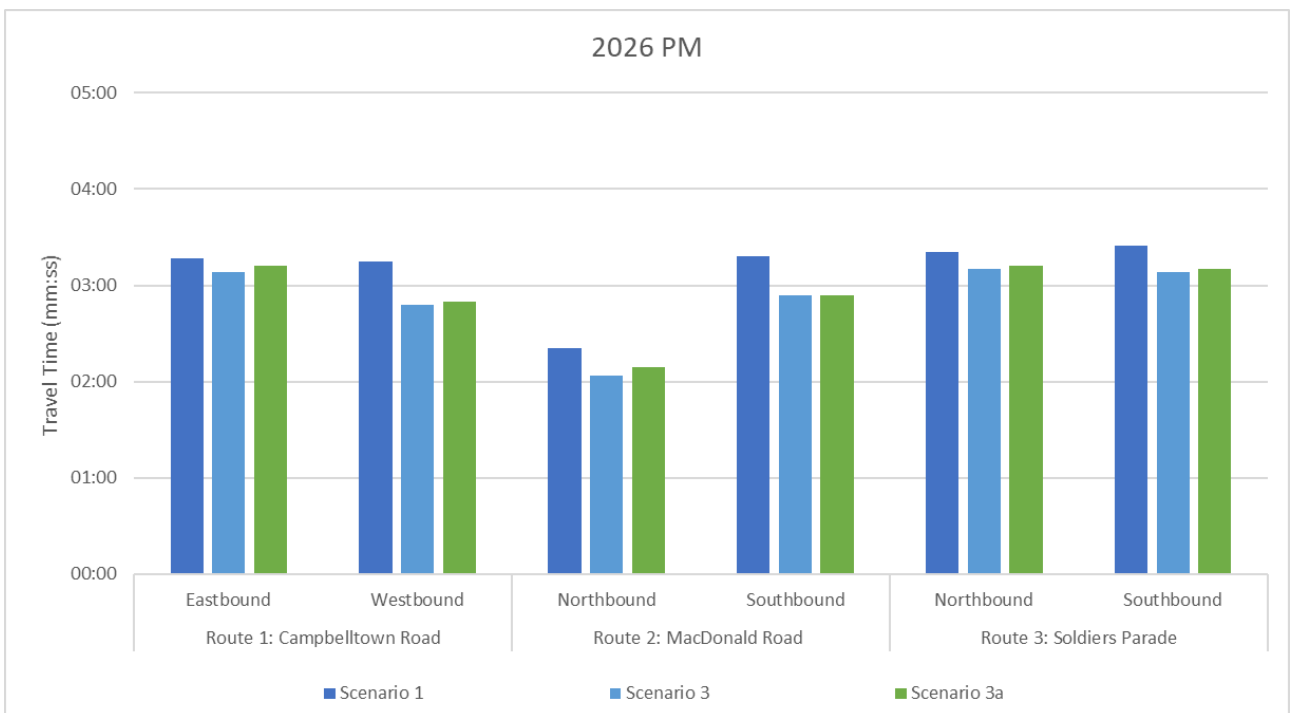


Figure 9: 2026 PM Travel Time Comparison

Comparison of travel time among the scenarios indicate following key points:

- For Campbelltown Road, travel time is similar for Scenario 1, 3 and 3a during both AM and PM peak periods.
- Travel time on MacDonald Road is consistent among all the scenarios during both peak hours in both direction.
- Travel time on Soldiers Parade is also very similar for Scenario 1, 3 and 3a during both AM and PM peak periods.

Overall – the 2026 AM and PM network travel time indicates that – Scenario 3 and Scenario 3a perform similar to Scenario 1.

3.2.2 Design Year – 2036

Figure 10 and Figure 11 represent the travel time for three major routes in the study area for 2036 AM and PM, respectively.

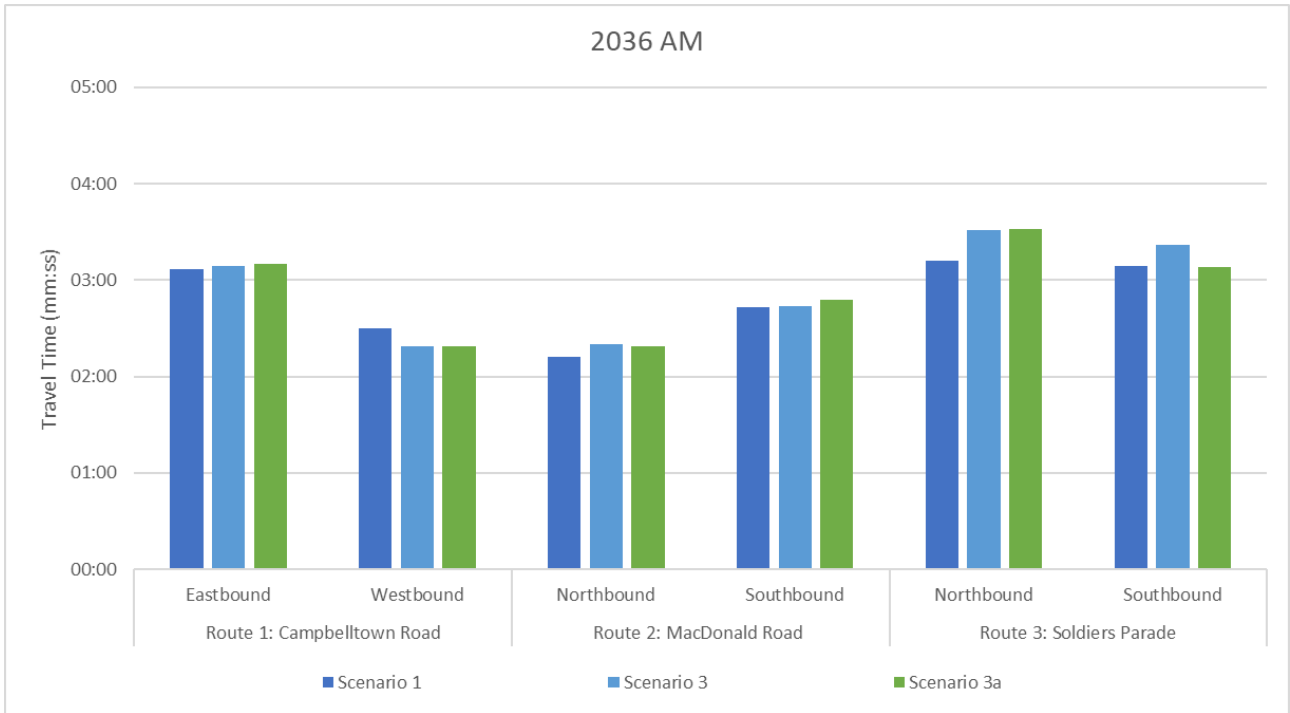


Figure 10: 2036 AM Travel Time Comparison

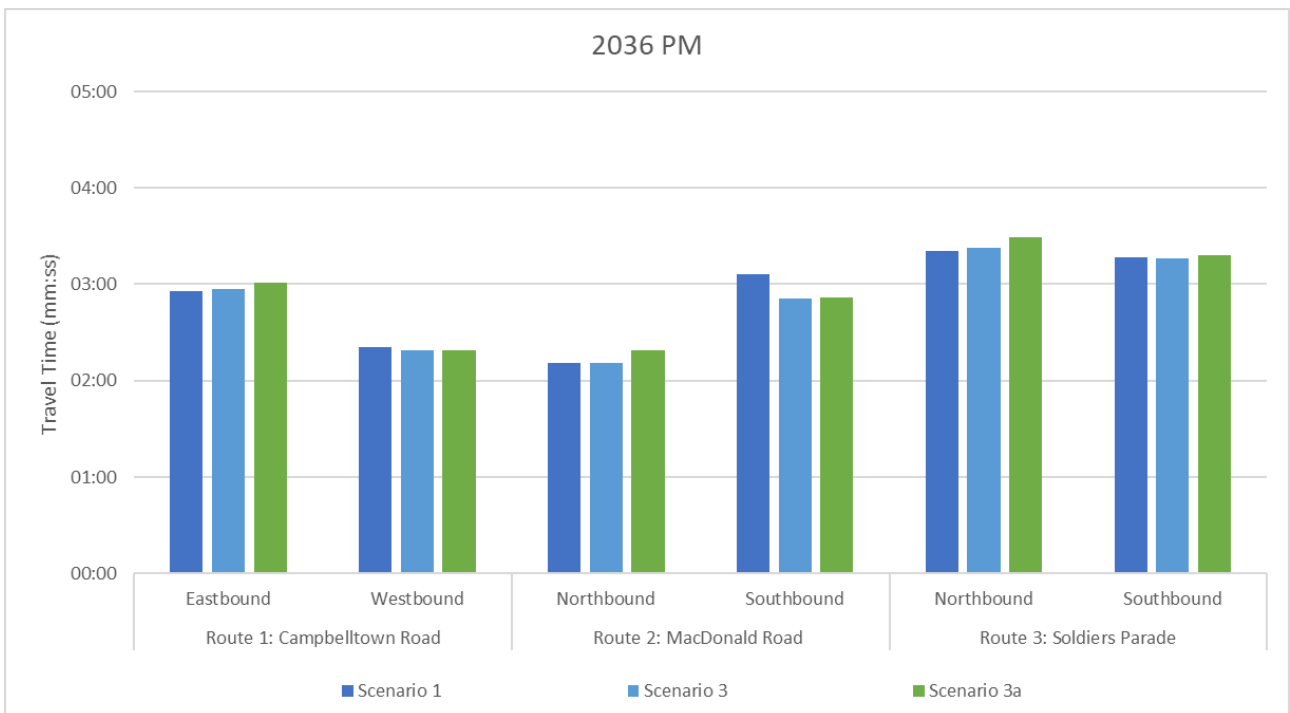


Figure 11: 2036 PM Travel Time Comparison

Comparison of travel time among the scenarios indicate following key points:

- For 2036 design year, Travel time is consistent for all the routes among all the scenarios during both peak hours.

Overall – the 2036 AM and PM network travel time indicates that – Scenario 3 and 3a perform similar to Scenario 1.

Comparing the travel time between 2026 and 2036, it is noted that Campbelltown Road has additional lane each direction, therefore, the 2036 travel time is less compared to 2026 travel time.

3.3 Aimsun Intersection Performance

Level of service of the key intersections, based on approach delays, are extracted from Aimsun and summarised in the following sections. Turn counts of the key intersections for all scenarios are attached in **Appendix B**.

3.3.1 Design Year – 2026

LOS of the key intersections in 2026 AM and PM are outlined in **Table 13**.

TABLE 13: INTERSECTION LOS – 2026						
Intersection	Control	Peak	Criteria	S1	S3	S3a
Campbelltown Rd / Borneo St	Signal	AM	Delay (sec)	37	39	36
			LOS	C	C	C
		PM	Delay (sec)	37	40	31
			LOS	C	C	C
Campbelltown Rd / Soldiers Pde	Signal	AM	Delay (sec)	33	34	33
			LOS	C	C	C
		PM	Delay (sec)	27	28	27
			LOS	B	B	B
Campbelltown Rd / MacDonald Rd	Signal	AM	Delay (sec)	47	48	50
			LOS	D	D	D
		PM	Delay (sec)	56	53	48
			LOS	D	D	D
MacDonald Rd / General Blvd	Signal	AM	Delay (sec)	19	19	20
			LOS	B	B	B
		PM	Delay (sec)	21	16	12
			LOS	B	B	A
Soldiers Pde / General Blvd	Roundabout	AM	Delay (sec)	3	5	4
			LOS	A	A	A
		PM	Delay (sec)	4	6	4
			LOS	A	A	A
Soldiers Pde / Henderson Rd	Signal	AM	Delay (sec)	24	31	34
			LOS	B	C	C

		PM	Delay (sec)	25	26	21
			LOS	B	B	B
MacDonald Rd / Henderson Rd	Roundabout	AM	Delay (sec)	3	3	3
			LOS	A	A	A
		PM	Delay (sec)	5	7	4
			LOS	A	A	A
Soldiers Pde / Station South	Priority	AM	Delay (sec)	1	1	1
			LOS	A	A	A
		PM	Delay (sec)	2	1	1
			LOS	A	A	A
General Blvd / Borneo St	Roundabout	AM	Delay (sec)	3	2	3
			LOS	A	A	A
		PM	Delay (sec)	2	1	1
			LOS	A	A	A
MacDonald Rd / Buchan Ave	Signal	AM	Delay (sec)	25	24	32
			LOS	B	B	C
		PM	Delay (sec)	26	25	20
			LOS	B	B	B
MacDonald Rd / Soldiers Pde	Signal	AM	Delay (sec)	23	21	21
			LOS	B	B	B
		PM	Delay (sec)	20	19	17
			LOS	B	B	B

For design year 2026, all the intersections in the study area except perform acceptably during both peak hour with LOS D or better among the scenarios.

3.3.2 Design Year – 2036

LOS of the key intersections in the study area for 2036 AM and PM are outlined in **Table 14**.

TABLE 14: INTERSECTION LOS – 2036

Intersection	Control	Peak	Criteria	S1	S3	S3a
Campbelltown Rd / Borneo St	Signal	AM	Delay (sec)	33	32	32
			LOS	C	C	C
		PM	Delay (sec)	35	29	30
			LOS	C	C	C
Campbelltown Rd / Soldiers Pde	Signal	AM	Delay (sec)	27	28	28
			LOS	B	B	B
		PM	Delay (sec)	25	21	22
			LOS	B	B	B
Campbelltown Rd / MacDonald Rd	Signal	AM	Delay (sec)	44	43	43
			LOS	D	D	D

		PM	Delay (sec)	47	45	44
			LOS	D	D	D
MacDonald Rd / General Blvd	Signal	AM	Delay (sec)	17	18	16
			LOS	B	B	B
		PM	Delay (sec)	18	17	16
			LOS	B	B	B
Soldiers Pde / General Blvd	Roundabout	AM	Delay (sec)	4	6	6
			LOS	A	A	A
		PM	Delay (sec)	3	4	5
			LOS	A	A	A
Soldiers Pde / Henderson Rd	Signal	AM	Delay (sec)	27	33	33
			LOS	B	C	C
		PM	Delay (sec)	23	31	21
			LOS	B	C	B
MacDonald Rd / Henderson Rd	Roundabout	AM	Delay (sec)	3	3	3
			LOS	A	A	A
		PM	Delay (sec)	6	4	4
			LOS	A	A	A
Soldiers Pde / Station South	Priority	AM	Delay (sec)	1	1	1
			LOS	A	A	A
		PM	Delay (sec)	2	2	2
			LOS	A	A	A
General Blvd / Borneo St	Roundabout	AM	Delay (sec)	3	2	2
			LOS	A	A	A
		PM	Delay (sec)	2	1	1
			LOS	A	A	A
MacDonald Rd / Buchan Ave	Signal	AM	Delay (sec)	28	30	31
			LOS	B	C	C
		PM	Delay (sec)	22	22	21
			LOS	B	B	B
MacDonald Rd / Soldiers Pde	Signal	AM	Delay (sec)	21	18	20
			LOS	B	B	B
		PM	Delay (sec)	17	17	18
			LOS	B	B	B

For design year 2036, all the intersections in the study area perform with acceptable level of service during both peak hour with LOS D or better for Scenarios 1, 3 and 3a.

3.4 Congestion

Queue patterns are summarised below, and Aimsun congestion maps (also called 'Density Plots') for all scenarios are attached in **Appendix C**.

3.4.1 Design Year – 2026

2026 AM and PM queues observed for all scenarios can be summarised as:

- During 2026 AM peak, long queues are observed on eastbound direction of Campbelltown Road, and eastbound direction of Buchan Avenue in all scenarios.
- During 2026 PM peak, long queues are observed on westbound direction of Campbelltown Road and southbound direction of MacDonald Road south of General Boulevard in all scenarios.

3.4.2 Design Year – 2036

2036 AM and PM queues observed for all scenarios can be summarised as:

- During 2036 AM peak, long queues are observed on the eastbound direction of Buchan Avenue in all scenarios (the patterns are similar to those of 2026 AM). Due to added capacity on Campbelltown Road, eastbound queues on the north leg of Campbelltown Road / Borneo Street intersection were far less compared to 2026 AM (i.e. no spill-back to upstream intersections).
- During 2036 PM peak, long queues are observed on northbound direction of MacDonald Road in all scenarios.

4 Conclusion

Ason Group has been commissioned by Frasers Property Australia to carry out traffic modelling assessment to investigate proposed land-use scenarios of Ed.Square MOD 12. Accordingly, traffic microsimulation models were prepared in Aimsun for horizon years 2026 and 2036 in accordance with TfNSW Traffic Modelling Guidelines.

Key inputs and outcomes of this assessment are:

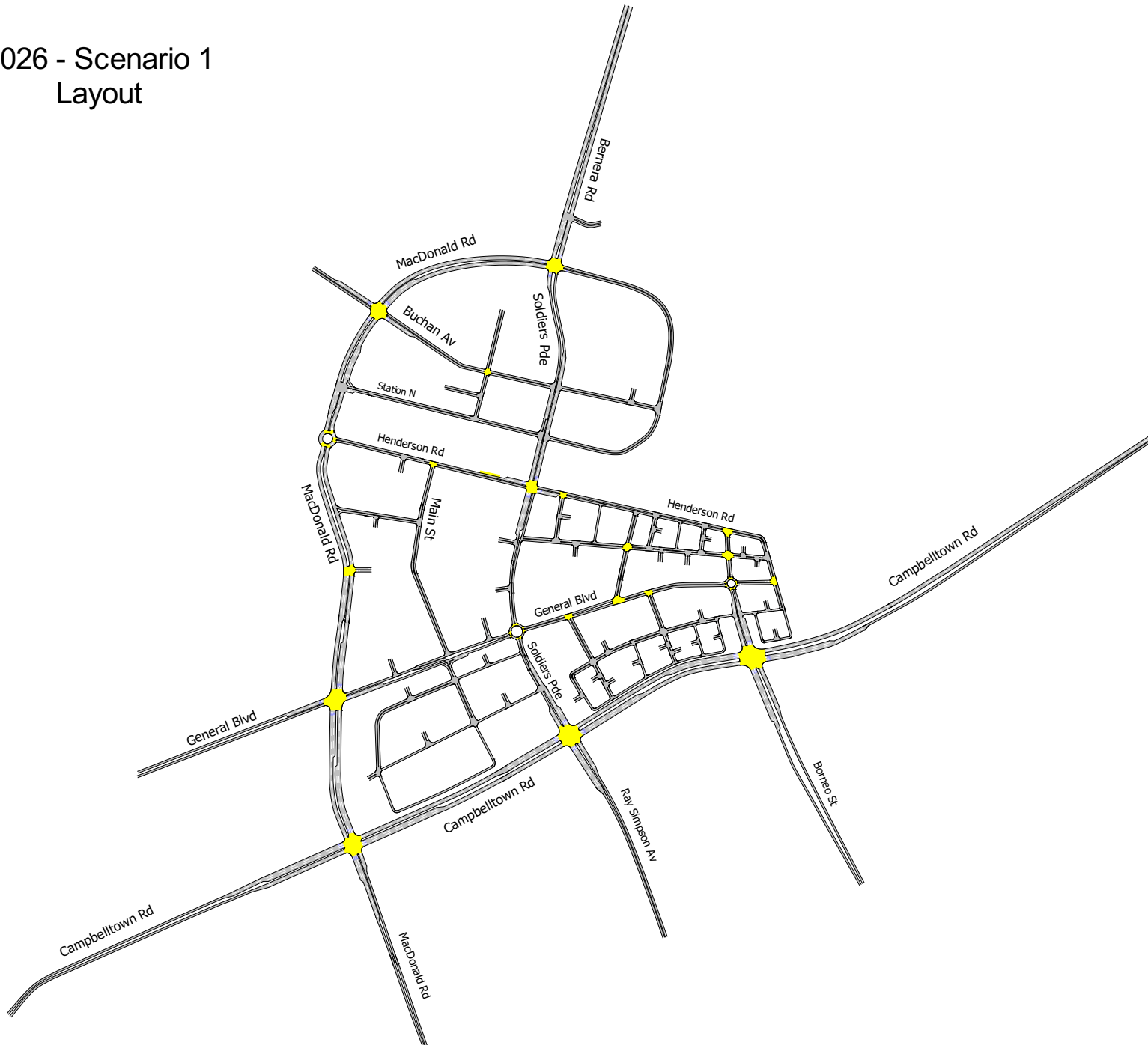
- The development traffic for the approved MOD 4 and Commuter Car Park were considered the baseline (Scenario 1) for this assessment.
- The modelling results indicate that – in Scenario 1 during weekday peak hours of each horizon year, the model network and the key intersections would perform acceptably in terms of the network performance statistics, travel time and intersection LOS. All the key intersections in the network performs at LOS D or better in both 2026 and 2036 AM and PM.
- Scenario 3 represents the proposed MOD 12 and Commuter Car Park. MOD 12 relates to Town Centre West and changes to RP3 Stage 9 by introducing a 2,000-place high school in the north-west quadrant of the Town Centre and corresponding relocation of Town Centre apartment yield to the RP3 Stage 9. Scenario 3 performs similar to Scenarios 1 in both 2026 and 2036 in terms of the network performance measures, travel time and intersection LOS. All key intersections in the network perform at LOS D or better in both 2026 and 2036 AM and PM.
- Scenario 3a also represents the proposed MOD 12 and Commuter Car Park. The only difference between Scenario 3 and 3a is the signalised pedestrian crossing on MacDonald Road approximately 150m south of Henderson Road. Scenario 3a performs similar to Scenario 3 in both 2026 and 2036 in terms of the network performance measures, travel time and intersection LOS though a marked increase in travel time has been observed on Soldiers Parade southbound in 2026 PM peak. All key intersections in the network perform at LOS D or better in both 2026 and 2036 AM and PM.

Overall, it can be concluded that the proposed network and key intersections performs acceptably in Scenario 3 (i.e. MOD 12 with Commuter Car Park) in both horizon years of 2026 and 2036. Also, the performance outcomes of Scenario 3 are consistent with Scenario 1 (MOD 4 with Commuter Car Park).

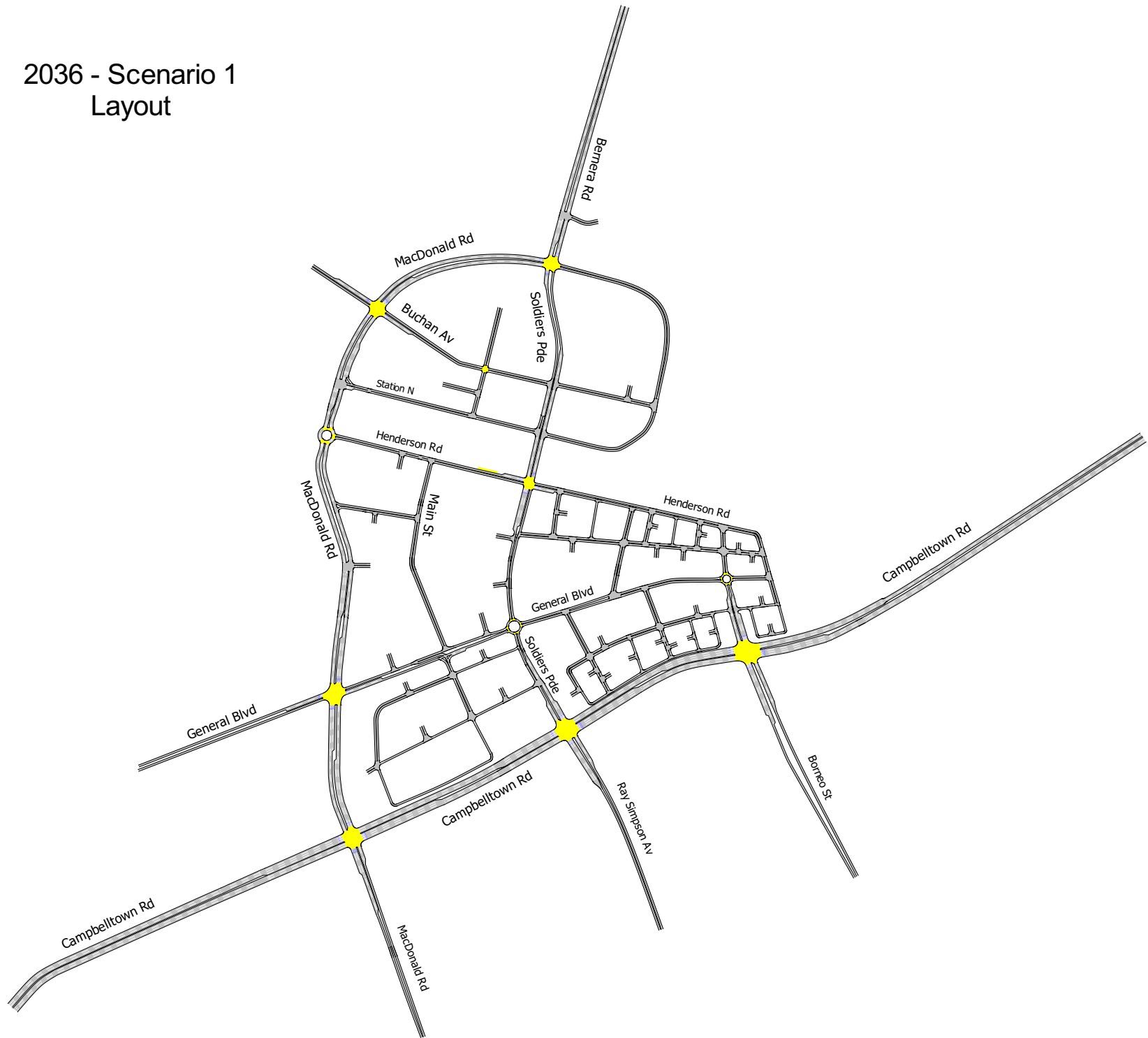
Appendix A.

Network Layout

2026 - Scenario 1 Layout



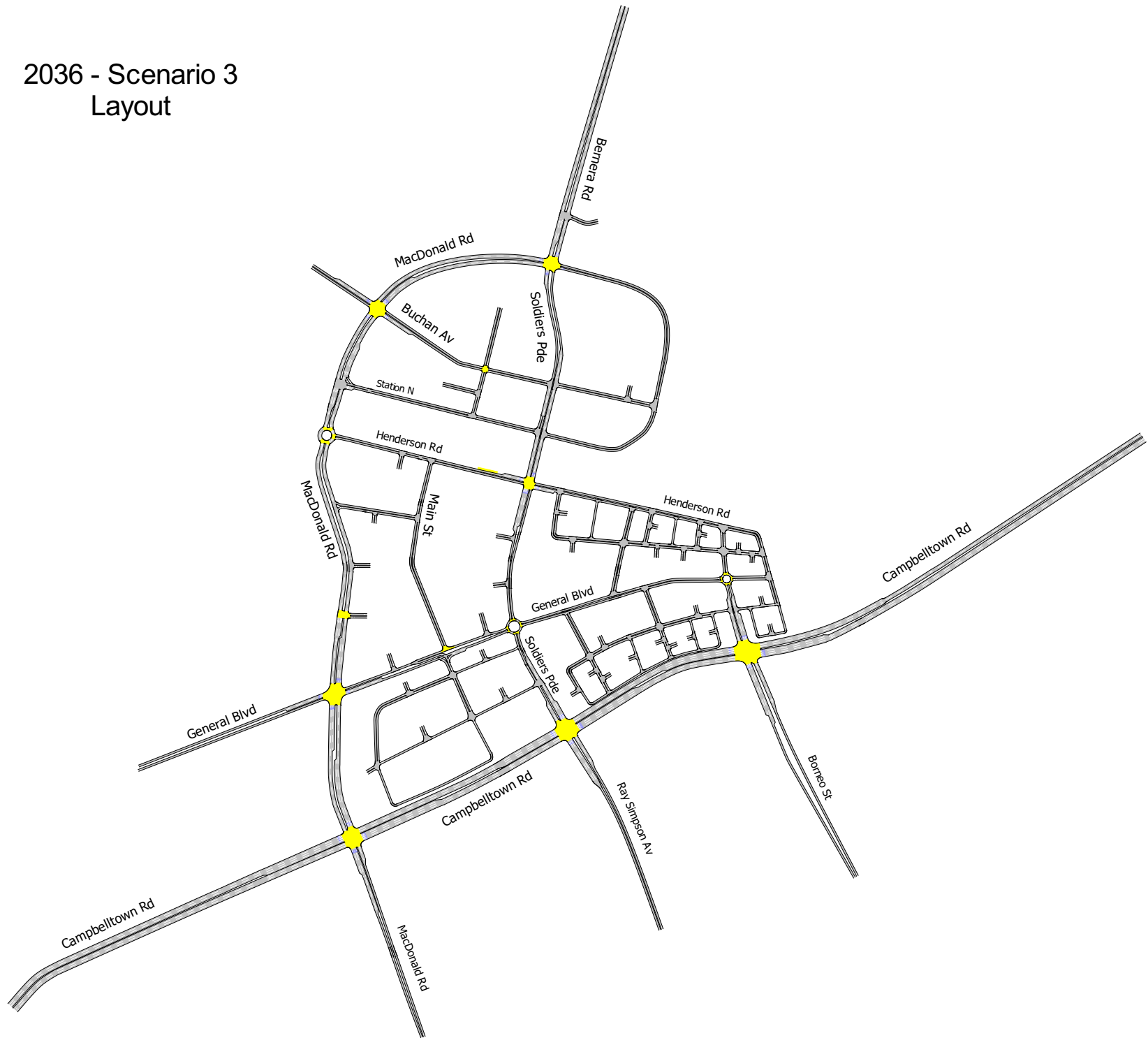
2036 - Scenario 1 Layout



2026 Scenario 3



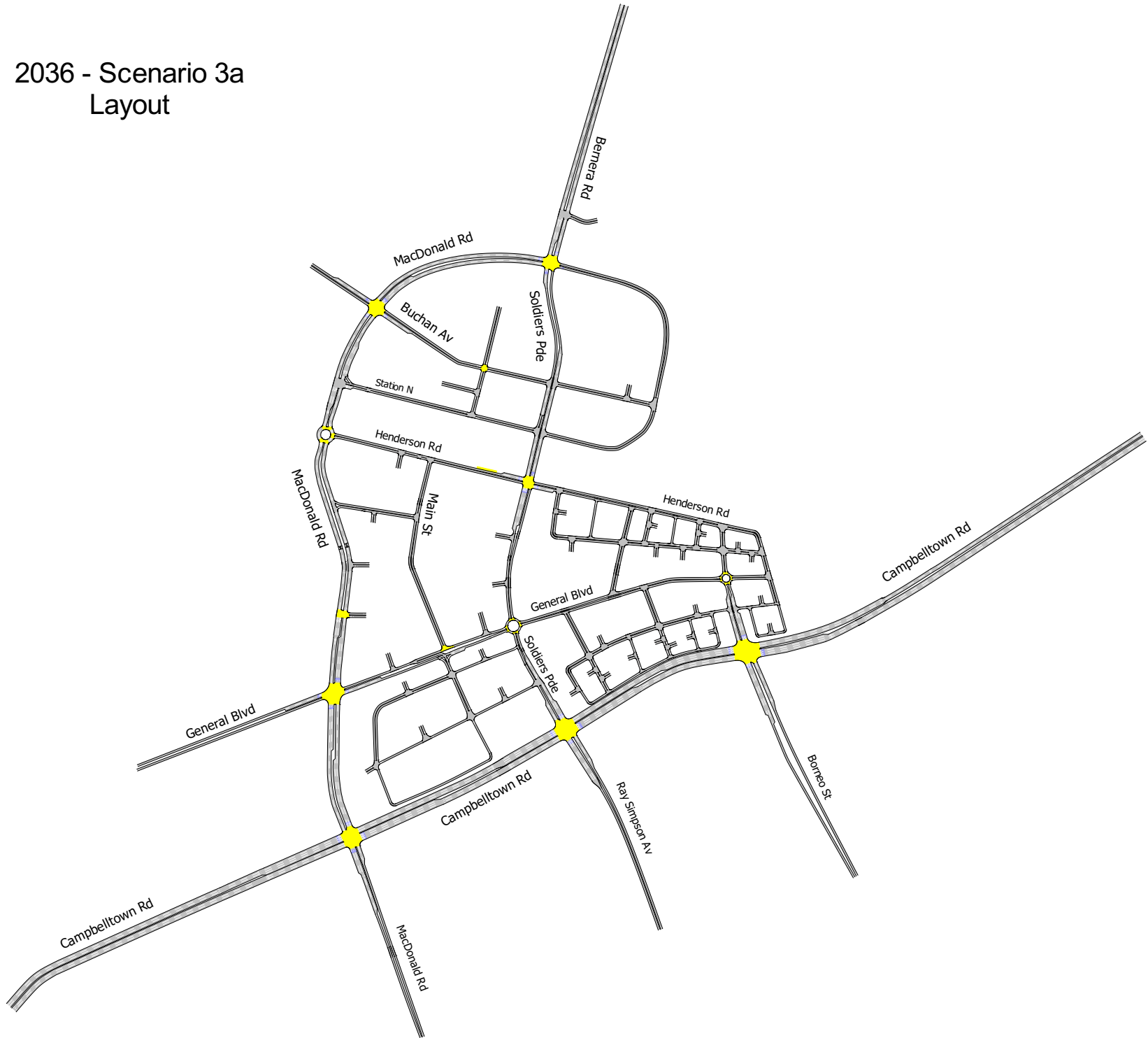
2036 - Scenario 3 Layout



2026 Scenario 3a Layout



2036 - Scenario 3a Layout



Appendix B.

Turn Volume

Turn Volume

Intersection	Approach	Turn	AM				PM			
			2026		2036		2026		2036	
			S1	S3	S1	S3	S1	S3	S1	S3
Campbelltown Rd / Borneo St	Eastern Av (N)	R	22	28	19	26	39	10	31	24
		T	114	129	147	128	184	58	94	79
		L	547	616	556	611	300	252	324	305
	Campbelltown Rd (E)	R	229	236	177	238	435	394	398	371
		T	623	681	828	744	1,370	1,378	1,634	1,627
		L	21	19	123	17	26	21	24	25
	Borneo St (S)	R	43	40	42	46	31	30	56	31
		T	101	107	99	102	104	72	167	88
		L	24	17	26	32	22	26	66	15
	Campbelltown Rd (W)	R	27	22	117	29	15	18	21	18
		T	1,553	1,520	1,752	1,798	1,018	1,031	1,153	1,160
		L	4	6	30	5	17	19	17	26
Campbelltown Rd / Soldiers Pde / Ray Simpson Av	Soldiers Pde (N)	R	202	137	291	357	67	95	67	95
		T	94	124	107	129	172	100	101	99
		L	25	39	80	48	17	16	27	26
	Campbelltown Rd (E)	R	40	50	55	43	87	107	156	78
		T	608	631	687	709	1,318	1,263	1,540	1,534
		L	25	50	140	47	31	51	32	57
	Ray Simpson Av (S)	R	83	73	42	80	62	63	73	68
		T	93	111	70	79	136	105	129	104
		L	56	53	70	70	16	40	110	37
	Campbelltown Rd (W)	R	34	28	15	42	19	29	8	22
		T	1,477	1,429	1,778	1,700	971	986	1,084	1,106
		L	115	114	196	219	218	166	243	371
Campbelltown Rd / MacDonald Rd	MacDonald Rd (N)	R	402	524	562	501	650	579	623	606
		T	166	228	98	145	234	229	256	209
		L	54	23	28	55	15	27	18	17
	Campbelltown Rd (E)	R	71	73	97	109	138	146	144	174
		T	579	557	656	740	1,008	1,034	1,384	1,264
		L	211	187	281	282	237	215	198	234
	MacDonald Rd (S)	R	319	330	320	332	260	260	264	256
		T	247	252	255	261	247	261	259	265
		L	41	31	59	61	40	45	56	55
	Campbelltown Rd (W)	R	75	69	92	92	60	58	95	69
		T	1,264	1,222	1,661	1,580	930	887	1,042	1,217
		L	581	602	489	507	428	448	464	291

Intersection	Approach	Turn	AM				PM			
			2026		2036		2026		2036	
			S1	S3	S1	S3	S1	S3	S1	S3
MacDonald Rd / General Blvd	MacDonald Rd (N)	R	4	7	7	6	18	17	18	12
		T	463	615	630	633	712	782	797	648
		L	106	309	85	276	141	196	147	153
	General Blvd (E)	R	12	9	15	38	30	7	27	31
		T	9	10	9	6	17	11	9	10
		L	136	147	41	25	179	35	98	173
	MacDonald Rd (S)	R	34	118	66	56	82	53	85	35
		T	854	799	764	806	690	751	727	647
		L	12	13	10	13	44	54	56	49
	General Blvd (W)	R	23	12	16	34	1	6	12	11
		T	42	47	48	26	11	4	3	5
		L	17	15	14	9	4	3	4	4
Soldiers Pde / General Blvd	Soldiers Pde (N)	R	125	145	20	16	143	34	75	163
		T	169	133	273	339	152	131	111	144
		L	30	28	25	13	32	27	38	17
	General Blvd (E)	R	295	229	281	263	244	220	315	241
		T	16	9	13	36	36	25	24	32
		L	32	33	40	32	31	25	14	14
	Soldiers Pde (S)	R	91	128	79	101	66	84	61	62
		T	263	281	350	387	324	252	399	425
		L	6	12	13	13	8	4	17	15
	General Blvd (W)	R	97	108	132	114	112	104	105	97
		T	304	329	287	318	298	214	165	190
		L	146	176	151	156	202	176	197	167
Soldiers Pde / Henderson Rd	Soldiers Pde (N)	R	33	153	74	153	17	15	13	11
		T	389	317	379	375	463	283	372	420
		L	74	69	51	90	70	106	93	115
	Henderson Rd (E)	R	50	88	52	129	62	47	67	63
		T	77	148	115	105	116	82	89	48
		L	1	9	1	16	1	3	1	4
	Soldiers Pde (S)	R	107	83	104	80	98	72	107	77
		T	405	411	460	463	506	415	576	584
		L	281	255	303	316	204	195	284	227
	Henderson Rd (W)	R	40	46	32	32	56	11	33	12
		T	24	105	112	122	100	39	94	95
		L	20	9	7	9	2	5	2	1

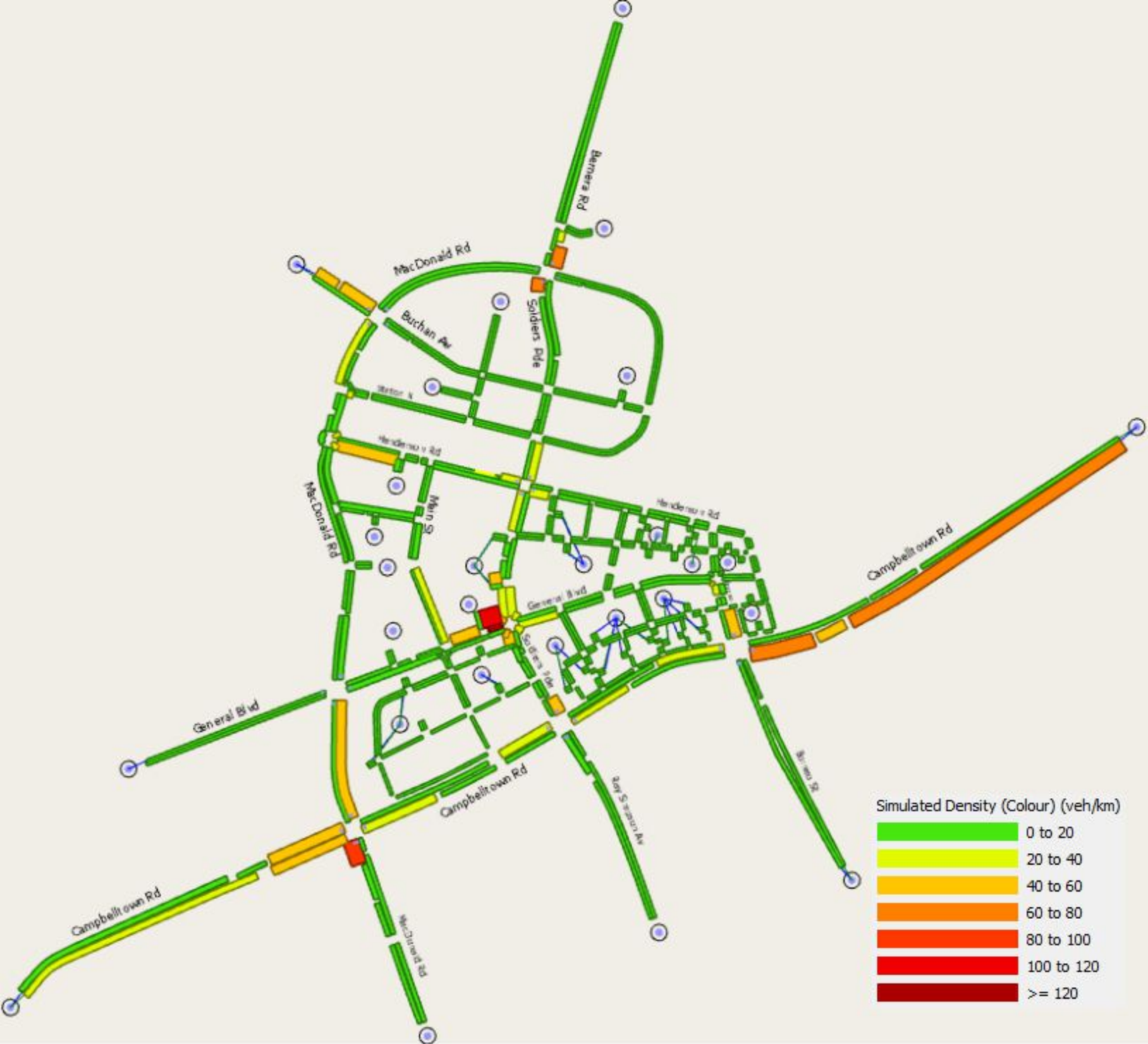
Intersection	Approach	Turn	AM				PM			
			2026		2036		2026		2036	
			S1	S3	S1	S3	S1	S3	S1	S3
Henderson Rd / MacDonald Rd	MacDonald Rd (N)	T	671	726	839	827	1,023	970	1,000	860
		L	209	275	267	238	126	26	65	69
	Henderson Rd (E)	R	104	144	119	81	169	142	233	231
		L	31	30	8	7	239	217	181	198
	MacDonald Rd (S)	R	141	122	95	99	3	4	2	1
		T	700	667	683	707	628	673	673	578
Soldiers Pde / Station South	Soldiers Pde (N)	T	496	537	484	594	550	401	475	542
		L	1	1	1	1	1	1	1	1
	Station South (E)	L	2	2	18	22	2	3	4	4
	Soldiers Pde (S)	T	411	466	475	537	448	346	493	569
		L	64	42	43	62	127	120	150	79
	Station South (W)	L	67	125	99	114	66	32	58	61
MacDonald Rd / Buchan Av	MacDonald Rd (N)	R	4	9	6	17	12	8	13	9
		T	373	335	382	318	531	624	616	480
		L	6	8	10	8	28	27	32	31
	Station North (E)	R	11	4	5	6	6	4	11	7
		T	24	28	30	28	17	5	11	15
		L	5	13	11	15	2	3	2	2
	MacDonald Rd (S)	T	319	264	217	159	383	450	423	298
		L	482	463	527	547	432	413	540	499
		R	456	597	670	688	611	356	435	449
	Buchan Av (W)	T	6	13	3	7	6	10	7	10
		L	50	7	7	12	39	13	7	7
		R	379	342	392	326	559	652	649	510
Soldiers Pde / MacDonald Rd	Soldiers Pde (N)	T	403	497	436	548	530	409	481	556
		L	1	6	21	17	2	2	2	2
		R	20	22	18	20	7	6	4	4
	MacDonald Rd (E)	T	3	2	3	1	1	1	2	1
		L	1	1	1	1	1	1	1	1
	Soldiers Pde (S)	R	1	1	1	1	1	1	1	1
		T	479	577	560	646	472	348	515	591
		L	3	8	2	16	12	8	11	9
	MacDonald Rd (W)	R	66	19	16	22	68	41	25	27
		T	8	4	4	5	9	9	21	27
		L	307	251	209	151	350	417	396	258

Appendix C.

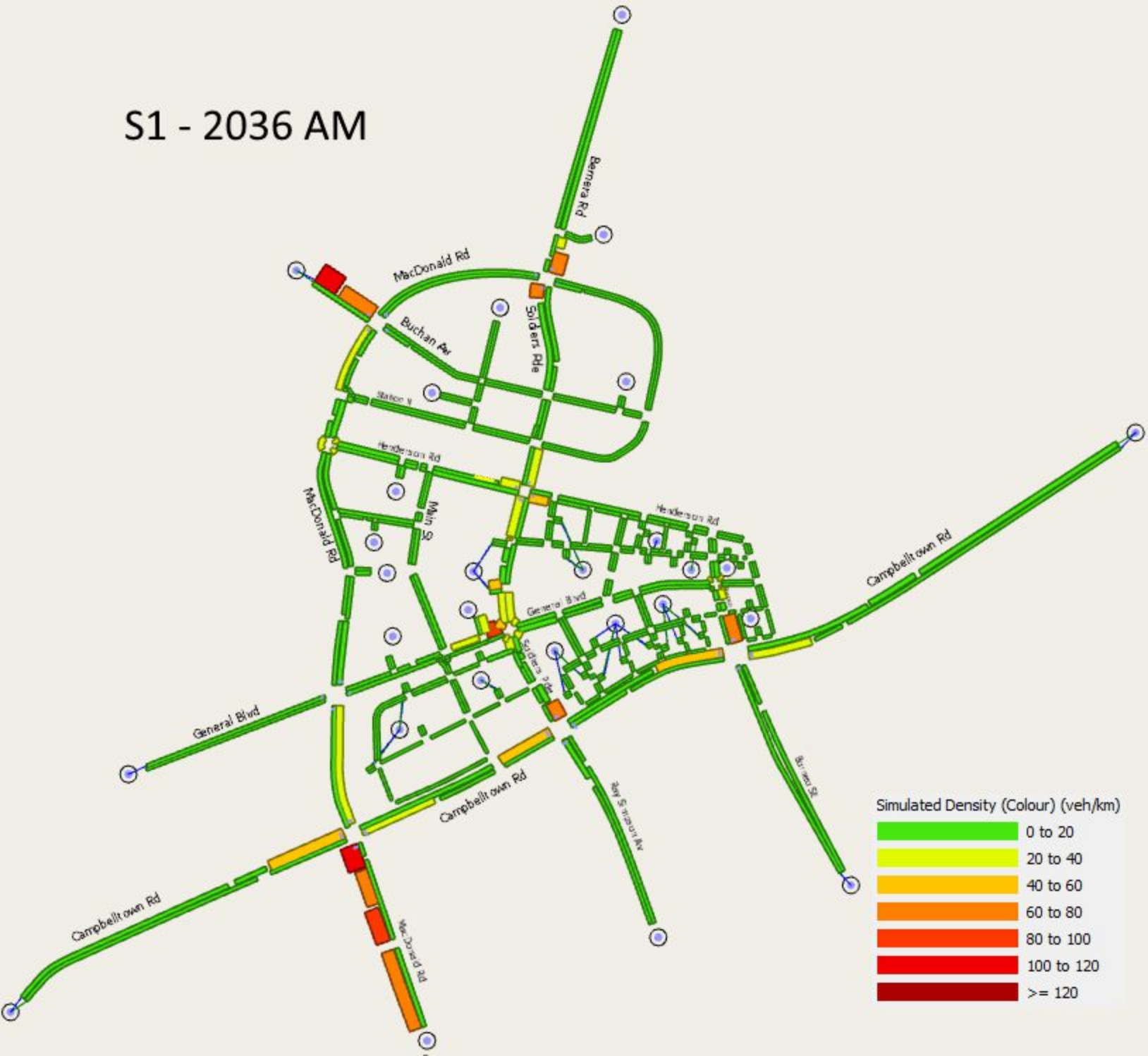
Congestion Plots

S1 - 2026 AM





S1 - 2036 AM



S1 - 2036 PM



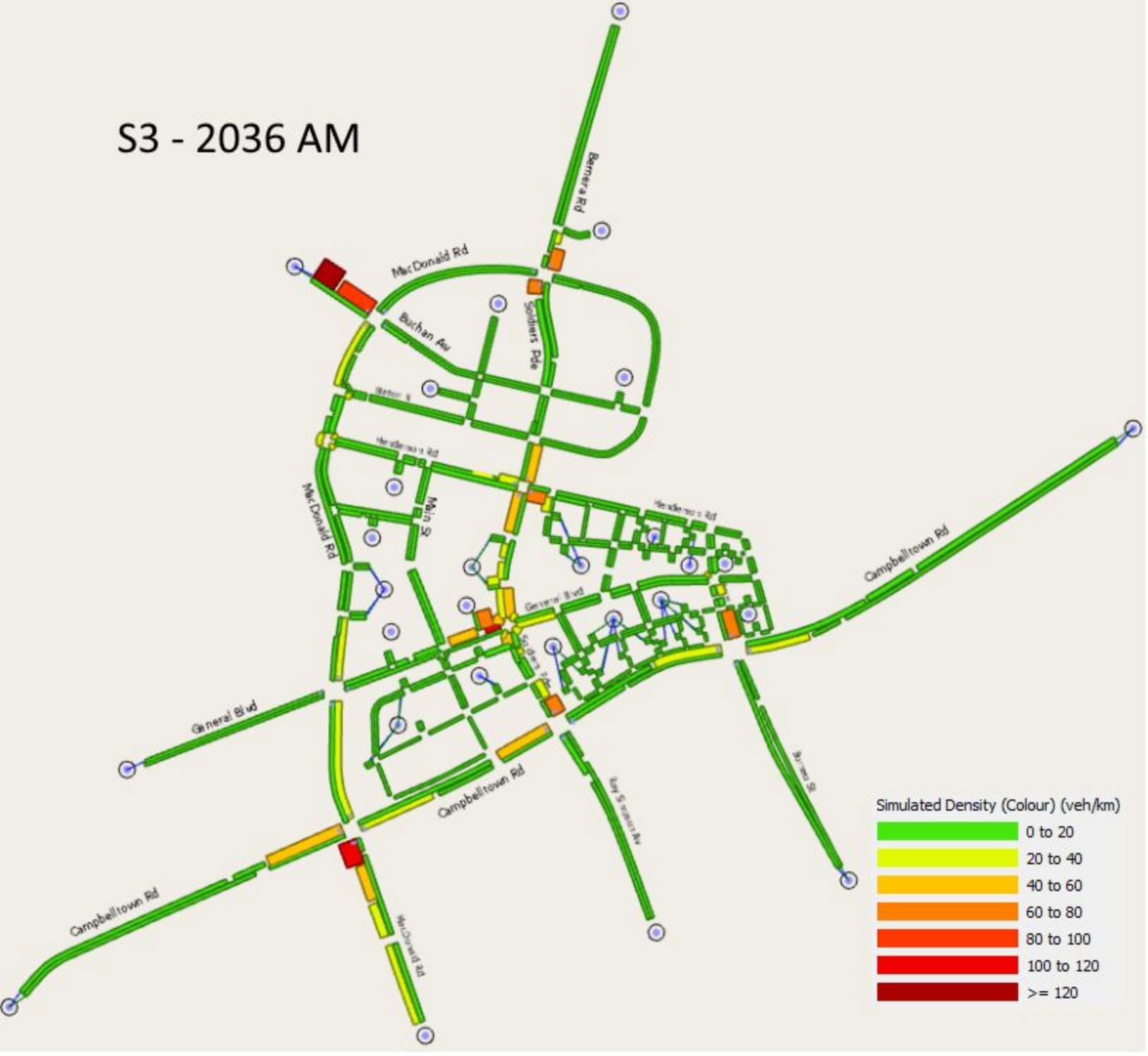
S3 - 2026 AM



S3 - 2026 PM



S3 - 2036 AM



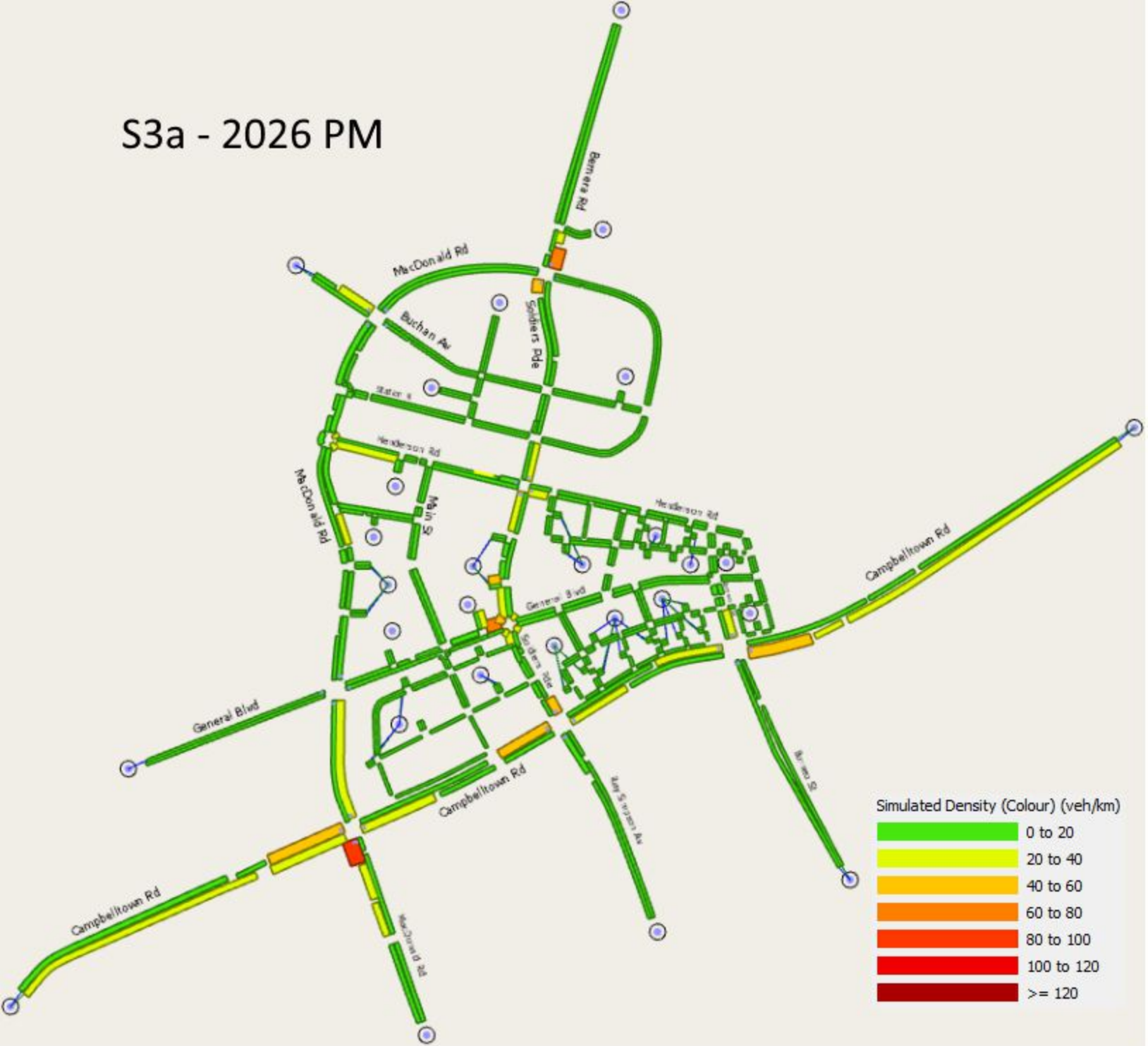
S3 - 2036 PM



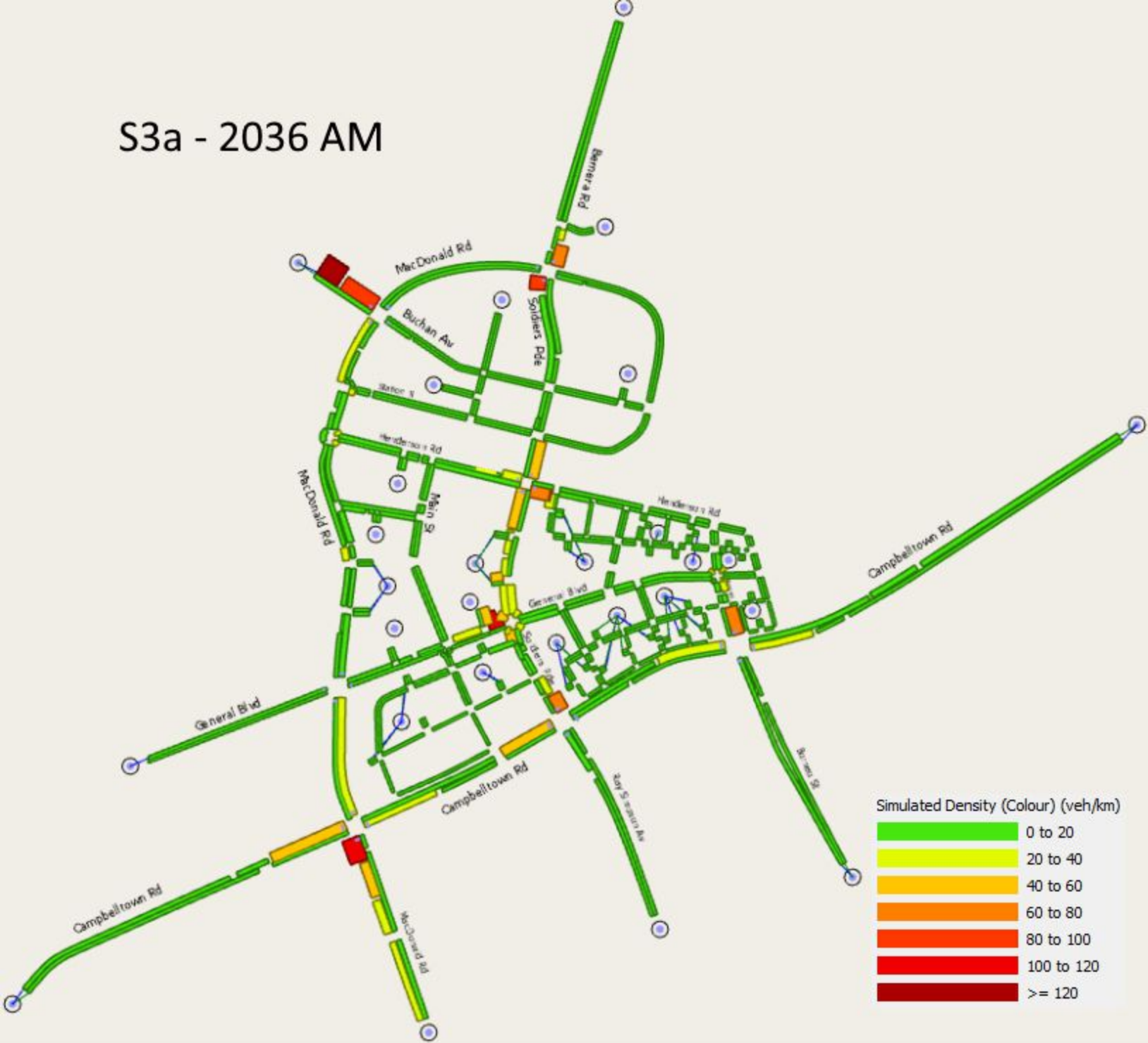
S3a - 2026 AM



S3a - 2026 PM



S3a - 2036 AM



S3a - 2036 PM

