PACIFIC PLANNING PTY LTD

TRAFFIC IMPACT ASSESSMENT REPORT FOR 60-80 SOUTHERN CROSS AVENUE AND 45-65 (HALL CIRCUIT) FLYNN AVENUE MIDDLETON GRANGE

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Aimsum Report Prepared by Bitzios Consulting October 2019.

1.0 EXECUTIVE SUMMARY

The proposal adopts the transport planning objectives first identified in the Report Integrating Land Use -Improving Transport Choice prepared by NSW Department of Urban Affairs and Planning and now incorporated into the Transport for NSW-Future Transport Strategy 2056. These objectives include reducing (VKT) vehicle kilometres travelled by car, promoting active and sustainable transport and promoting active lifestyle choices. These objectives are delivered in this proposal by reducing car dependent travel for local trips by having good bicycle and pedestrian accessible travel paths and by providing parklands and green spaces within the development. The inclusion of social and employment services within this local centre will reduce car dependent trips and promotive active lifestyle choice for all user types. A new Smart Transit Corridor along Fifteenth Avenue as shown in Liverpool Council's *The Draft Strategic Planning Document -A Land Use Vision 2050* will provide better public transport access for this centre.

The proposal provides more employment opportunities with proposed office space, restaurants, a medical centre and ancillary medical office suites as well as Soho housing component for smaller business operations. A smaller supermarket and mini- minor market and associated food and eateries will provide employment opportunities surrounding the new parklands. The new parklands will provide social and recreational infrastructure as well as supporting an active travel lifestyle. These parklands will provide flora and fauna connections to the green parklands north of the subject site.

The revised scheme has reduced the amount of residential density on the site from 912 units to 670 residential dwellings and provides a greater mix of employment and social uses. The proposed FSR on the site ranges from 1:1 (R1 zone) to 2.3:1 (B2 zone) and enables a total maximum 1.98:1 density for the scheme. This density is not considered high in its context and can sustainably enable the desired urban objectives the scheme promotes.

Middleton Grange will be a key local centre between the new Western Sydney International (Nancy-Bird Walton) Airport and Liverpool CBD and this proposal will provide a catchment population of workers and residents along the new Smart Transit corridor.

This report is provided in support of a Planning Proposal. Initial discussions have been held with Liverpool Council to ascertain the road and public transport infrastructure considerations after a draft traffic study was provided for comment. A detailed investigative Modelling report prepared using AIMSUN has been prepared by Bitzios Consulting and is located in Appendix E of this report. The modelling report reflects all proposed road infrastructure changes and the influence of future public transport infrastructure and the projected land use changes to the year 2030.

2.0 INTRODUCTION

2.1 Background

We have been engaged to review the traffic and parking requirements in support of a proposed Town Centre at 60-80 Southern Cross Avenue and 45-65 (Hall Circuit) Flynn Avenue Middleton Grange. The development is located within the Liverpool Council Local Government Area and has been planned with consideration to Councils Planning Policy Framework.

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The site is shown in **Figure 1 Location Plan.**

2.2 Scope of Report

This application relates to the planning proposal for the site for a Town Centre comprising 670 residential units in addition to the following components and associated gross floor areas (GFA) stated in **Table 3.1a.**

Table 3.1a Summary of Uses and Areas

	Uses	Area M^2	No of Units
Summary	Neighbourhood Shops	4060	
	Retail Shops	5822	
	Café Restaurant	6447	
	Office	7023	
	Commercial-Entertainment	2862	
	Childcare	505	
	Gymnasium	3500	
	Medical Centre	1175	
	Imaging Diagnostic	1189	
	Ancillary Health Offices	1964	
	Medical Suites	7012	
	Outpatients	1189	
	Major Supermarket	2600	
	Mini Major	1200	
	Soho Ground Floor	1200	
	Residential Units		670
	Community Centre	500	
	Total	**48248**	

Each area per precinct is identified in **Table 3.1b.**

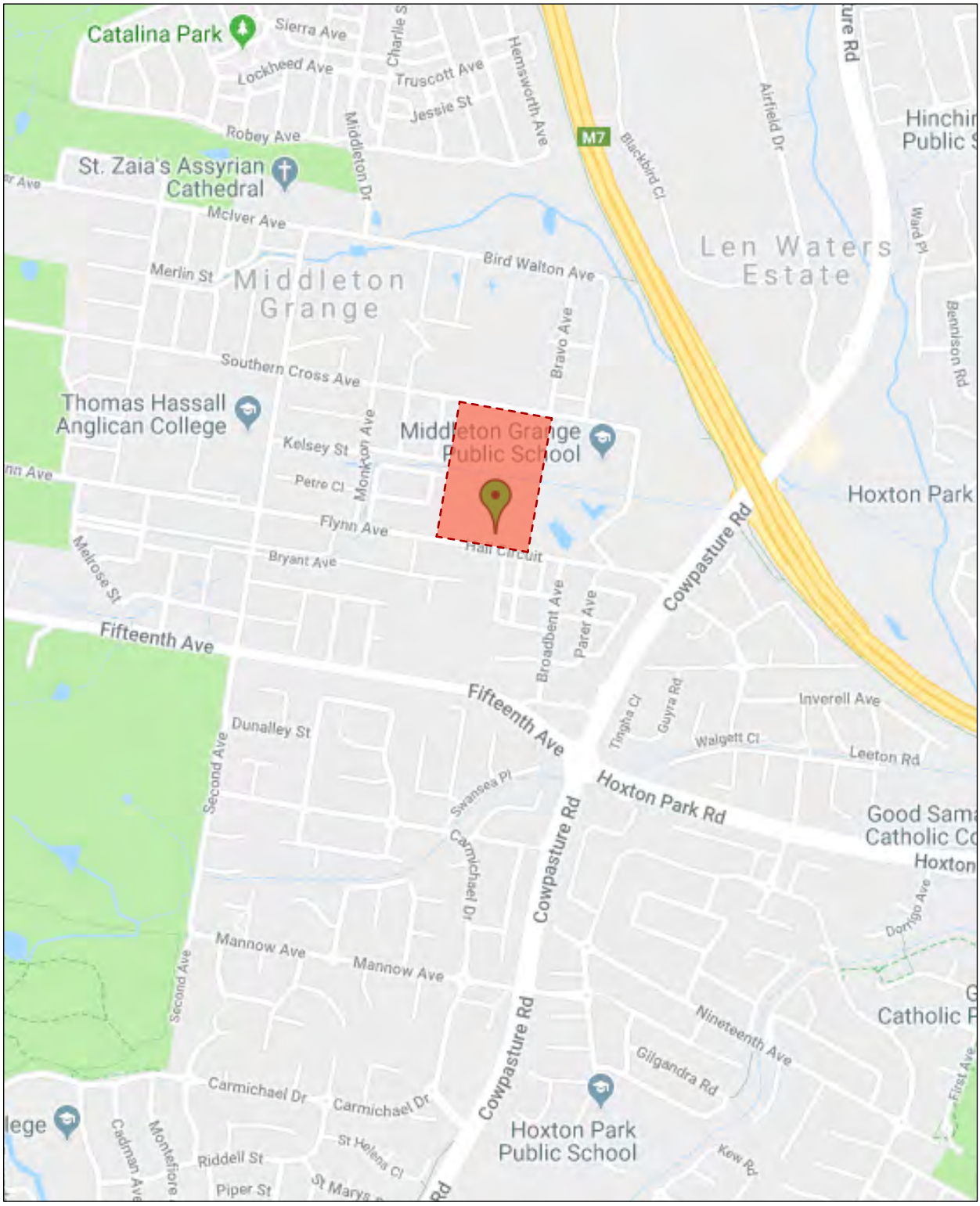

FIGURE 1: LOCATION PLAN

Table 3.1b PROPOSED Summary Of Uses and Areas

SUMMARY

Location	Uses	Area M^2	No of Units
Precinct Lot 2	Neighbourhood shops	2030	
	Café Restaurant	718	
	Ground Floor Soho	600	
	Residential Terrace		17
	Residential Shop Top		12
	Total	**3348**	
Precinct Lot 3	Neighbourhood shops	2030	
	Café Restaurant	724	
	Ground Floor Soho	600	
	Residential Soho		
	Residential Terrace		17
	Residential Shop Top		12
	Total	**3354**	
Precinct Lot 4	Retail Shops	1790	
	Café Restaurant	2000	
	Commercial/Entertainment	2862	
	Childcare Centre	505	
	Residential		292
	Total	**7157**	
Precinct Lot 5	Major Supermarket	2600	
	Liquor Store	300	
	Retail Shops	2600	
	Café Restaurant	1000	
	Gymnasium	3500	
	Office	4135	
	Residential		241
Total GFA	**Total**	**14135**	
Precinct Lot 6	Mini Major	1200	
	Café-Retail	1500	
	Retail Shops	580	
	Office	2888	
	Residential		79
Total GFA	**Total**	**6168**	
Precinct Lot 7	Medical Centre **	1175	
	Retail	552	
	Café Restaurant	505	
	Imaging Diagnostic	1189	
	Ancillary Health Offices	1964	
	Medical Suites-offices	7012	
	Outpatients	1189	
	Total	**13586**	
Parkland*	Community Centre	500	
		48248	**670**

(2.2 Continued)

In preparation of this traffic report, we also refer the following Statutory Controls and Reports.

- Liverpool Council DCP-2008 Part 2.5- Middleton Grange.
- Liverpool Council DCP-2008 Part 1-General Controls For All Development.
- Liverpool Council Local Environmental Plan 2008.
- Connected Liverpool 2050 – Draft Local Strategic Planning Statement a Land Use vision to 2050 – Liverpool City Council.
- Future Transport Strategy 2056 – NSW Government.
- Middleton Grange Town Centre Public Transport Options Paper prepared by Transit Systems Next Generation Transport
- Base Model Development Report 60-80 Southern Cross Avenue & 45-65 Hall Circuit Middleton Grange Reference 16.068r01v02 September 2017 prepared by Traffix.
- Traffic Impact Assessment 60-80 Southern Cross Avenue & 45-65 Hall Circuit Middleton Grange Reference 16.068r04v01September 2017 prepared by Traffix.
- Letter Report prepared by Traffix Traffic and Transport Planners dated September 18, 2019.

We have been provided with a revised summary of the retail and commercial areas of the development from Pacific Planning. We have also referred to the SEARS Application drawings for Lot 7 Precinct and to the Proposed Concept Plans Option 12 for the Development.

We have investigated the traffic generation for each Precinct/ Lot Area. We refer to the summary traffic generation shown in Table 3.4 which states the areas for each Precinct Lot and summary of residential units.

3.0 EXISTING TRAFFIC CONDITIONS

3.1 Existing Site

As each precinct has its own unique characteristics and this is reflected in the way that the traffic generation yield is calculated in our analysis.

The subject site is located approximately 7.0 kilometres west of Liverpool CBD and 600 metres travel distance (450 metres Radial distance) west of the Westlink M7 Motorway Interchange with Cowpasture Road. The site is located approximately 12.5km to the proposed Western Sydney Airport.

The site is irregular in configuration and has a total site area of 6.27 hectares. It has a northern frontage to Southern Cross Avenue and a southern frontage to Flynn Avenue of approximately 200 and 220 metres, respectively. The eastern boundary of approximately 310 metres is shared with the existing public school and vacant land, with the remaining western boundary of approximately 300 metres shared with neighbouring residential dwellings.

The site currently accommodates four (4) residential dwellings, comprising two (2) dwellings in the northern section and two (2) in the southern section. Vehicular access is currently provided to each existing residential dwelling from Southern Cross Avenue and Flynn Avenue, respectively. A Location Plan is presented in **Figure 1.** The connection of the site to M7, future M9 Orbital and Western Sydney Airport is shown in **Figure 2A Overall Site Connection Plan**. The Site is shown in **Figure 2B Site Plan.**

3.2 Road Inventory

The road hierarchy in the vicinity of the site is shown in **Figure 3** with the following roads of particular interest:-

M7 Motorway (Westlink): A privately operated toll-way also known as the 'Western Sydney Orbital' that generally traverses north-south between Baulkham Hills in the north and Prestons in the south. It is subject to 100km/h speed zoning and accommodates two (2) lanes of traffic in each direction along a divided carriageway.

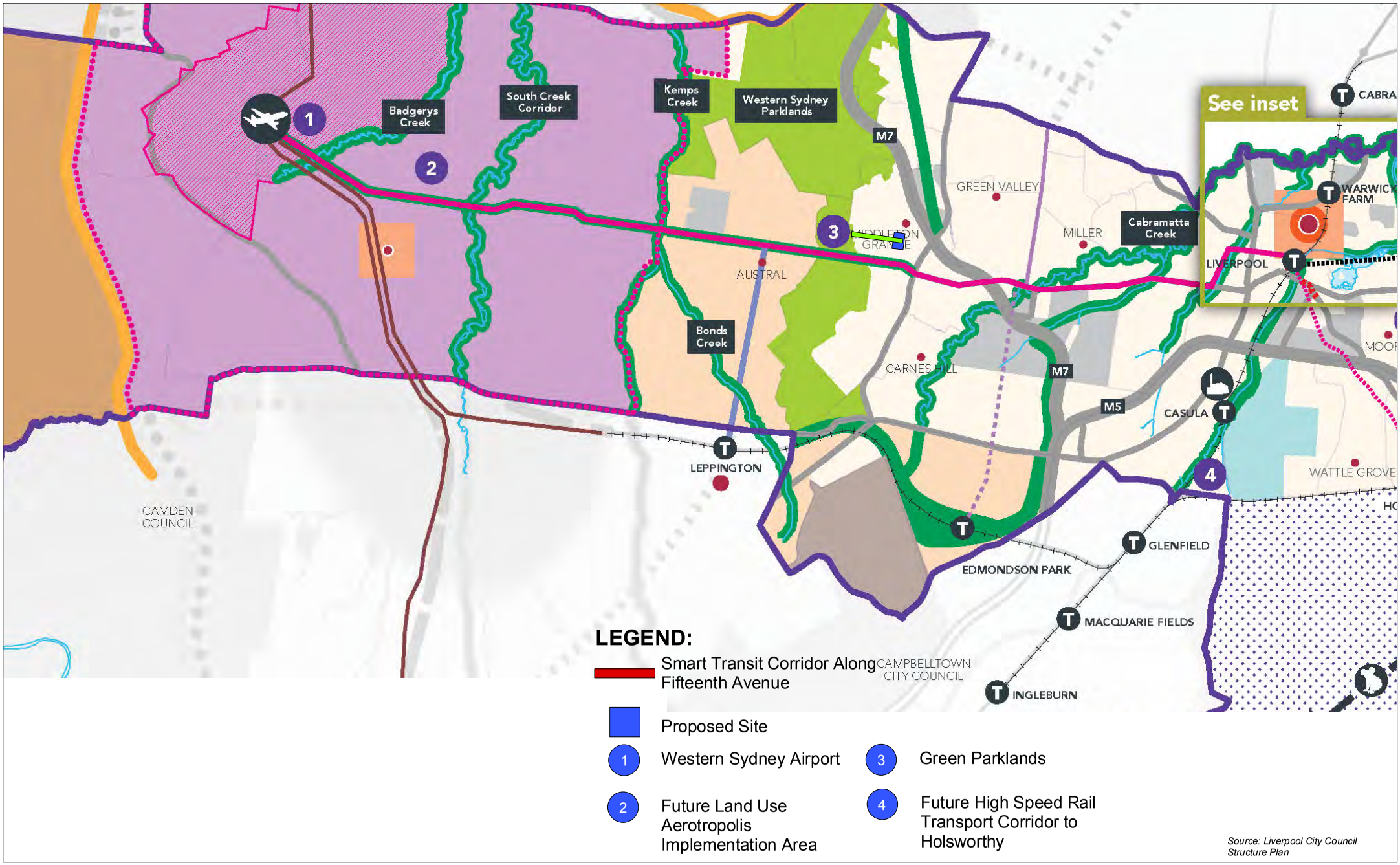

FIGURE 2A: OVERALL SITE CONNECTION PLAN

FIGURE 2B: SITE PLAN

(3.2 continued)

Cowpasture Road: An RMS Main Road (MR 648) that traverses north-south between the Horsley Drive in the north and Camden Valley Way in the south. Within the vicinity of the site. It is subject to 70km/h speed zoning and accommodates two (2) lanes of traffic in each direction. Cowpasture Road does not permit on-street parking.

Hall Circuit: A local road that generally traverses east-west between Qantas Boulevard in the east and Southern Cross Avenue in the west, noting that there is an alternate Hall Circuit in the south between Flynn Avenue and Sixteenth Avenue East. It is subject to 50km/h speed zoning and accommodates a single lane of traffic in each direction, with unrestricted on-street parking permitted along both sides of the road.

Flynn Avenue: A local road that traverses east-west between Hall Circuit in the east and Twenty Seventh Avenue in the west. Within the vicinity of the site, it is subject to 50km/h speed zoning and accommodates a single lane of traffic in each direction, with unrestricted on-street parking permitted along both sides of the road.

Bravo Avenue: A local road that traverses north-south between Bird Walton Avenue in the north and Southern Cross Avenue in the south. It is subject to 50km/h speed zoning and accommodates a single lane of traffic in each direction, with unrestricted on-street parking permitted along both sides of the road. In relation to the site, Bravo Avenue is proposed to extend southbound and connect onto Qantas Boulevard.

It can be seen from **Figure 3** that the site is conveniently located with respect to the arterial (Westlink M7 Motorway) and sub-arterial (Cowpasture Road) roads serving the region. As such, the local road network is able to distribute traffic and provide connections onto the wider road network.

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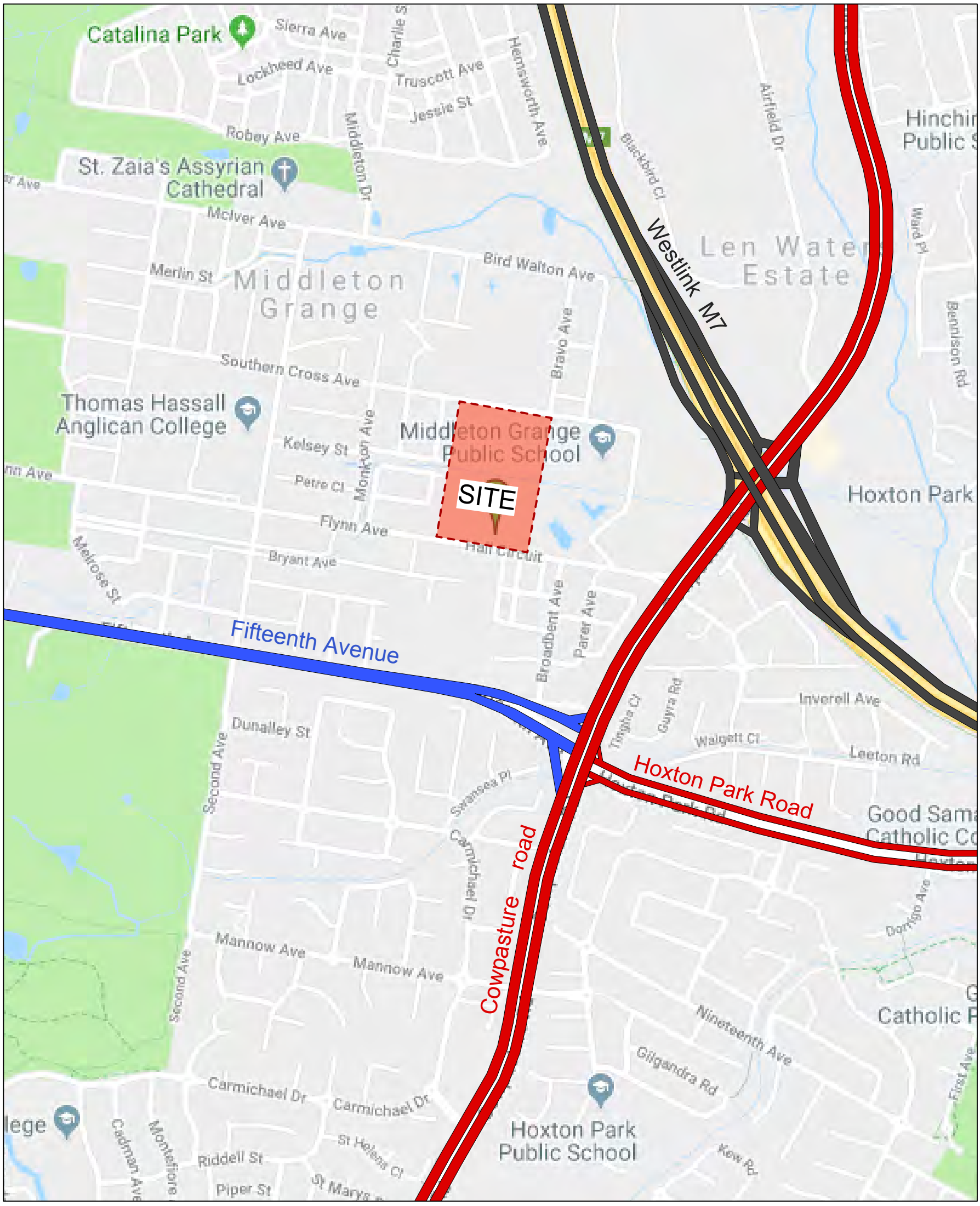


LEGEND:

- Arterial Road
- Sub-arterial Roads
- Collector Roads

FIGURE 3: ROAD HIERARCHY

0m 100m 200m

3.3 Public Transport

The existing bus services that operate in the locality are shown in **Figure 4**. It is evident that the development has limited access to public transport services with bus stops along Cowpasture Road and Kingsford Smith Avenue. These bus stops provide services to the following routes:

- 827 – Carnes Hill Marketplace to Liverpool via Bonnyrigg Heights.
- 852 – Carnes Hill Marketplace to Liverpool via Greenway Drive and Cowpasture Road.
- 853 - Carnes Hill to Liverpool via Hoxton Park Road.
- 854 - Carnes Hill to Liverpool via Greenway Drive and Hoxton Park Road.
- 855 – Rutleigh Park to Liverpool via Austral and Leppington Station.

Furthermore, the above bus routes provide regular services to Liverpool Railway Station, thereby providing commuters' access along the following lines:

- T2 – Inner West and South Line.
- T3 – Bankstown Line.
- T5 – Cumberland Line.

N

400m

800m

LEGEND:

- Bus Stop
- 827 Carnes Hill Marketplace to Liverpool
- 852 Carnes Hill Marketplace to Liverpool
- 853 Carnes Hill to Liverpool
- 854 Carnes Hill to Liverpool
- 855 Rutleigh Park to Liverpool

FIGURE 4: PUBLIC TRANSPORT

0m 100m 200m

4.0 TRAFFIC EFFECTS OF PROPOSED DEVELOPMENT

4.1 Proposed Development

A detailed description of the proposed development is provided in the SEE Report prepared separately. The overall development seeks to provide a wide range of uses and this is detailed in the design of the 6 precinct areas.

The design is centred on active transport links and parklands and creates a community and central social hub.

Reference is made to the Urban Design Report prepared by Christensen Obrien Architects. A site Plan is located in **Appendix A** showing the street layout and precinct locations.

4.2 Internal Roads

The proposed internal road network comprises of two (2) primary roads and associated access lanes and service vehicle access lanes. The indicative roads and access lanes are shown in **Figure 5.**

Main Street	A local road that traverses north-south and provides the primary link between Southern Cross Avenue in the north and Flynn Avenue to the south. This road also provides connections to the rear access lanes of Lots 2 and 3 with an additional:" shared zone" between Main Street and Middleton Drive.
Middleton Drive	A local road that traverses north-east and provides connection between Southern Cross Drive in the north and Qantas Boulevard in the east. This road also provides a connection to Main Street in the west. The majority of this road is to be designated as a "shared zone" which will promote active transport links within the site.
Access Lanes	There are various laneways proposed for the subdivision with access lanes located to the west of Lots 2 and 3 and service lanes located for Lots 5 and 6 to the west.

The streets have followed the sectional design properties of *Liverpool DCP Part 2.5 – Middleton Grange*. Street Sections showing the cross-sectional properties of the streets is located in **Appendix A** of this report.

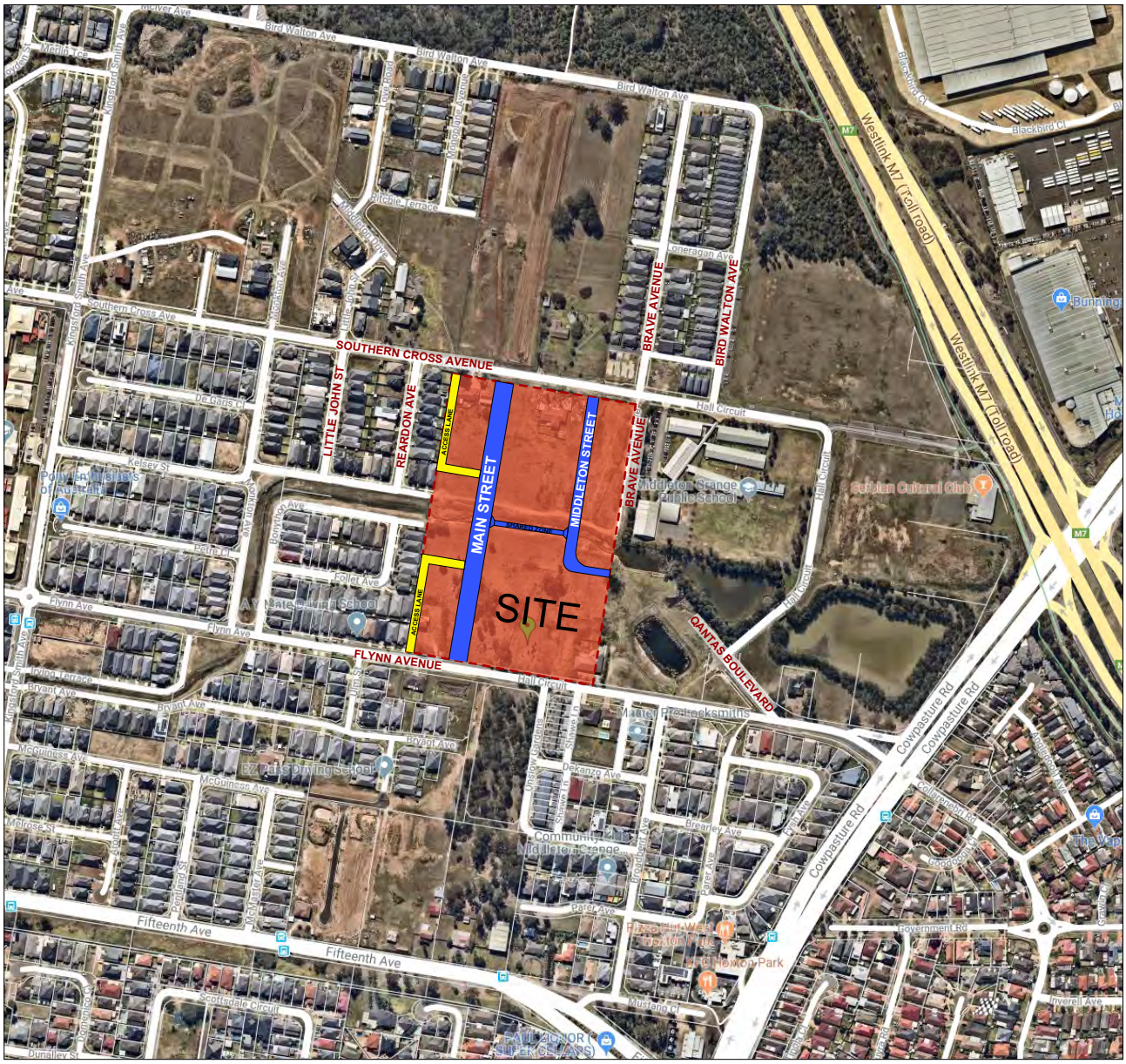


FIGURE 5: INTERNAL ROAD NETWORK

4.3 Traffic Generation

As each precinct has its own unique characteristics and this is reflected in the way that the traffic generation yield is calculated in our analysis.

A thorough preliminary investigation into the appropriate planning uses for each precinct was undertaken by the planners and the traffic generation was calculated according to each precinct (Lot).

For the purposes of comparison, the previous traffic generation prepared by Traffix (Reference No 16.068r04v01) dated September 2017 is summarised below:-

Table 4.3a

Uses	Total Units	Area M^2	Traffic Generation		Total	
			IN	OUT		
Residential Units	912		73	292	365	AM
			292	73	365	PM
Commercial		2533	41	10	51	AM
			8	32	41	PM
Retail		20240	81	20	101	AM
			607	607	1214	PM
		TOTAL	195	322	**517**	AM
			907	712	**1620**	PM

4.3.1 Traffic Generation Rates

The traffic generation rates outlined in the RMS Guide to Traffic Generating Developments 2002, RMS Technical Direction TDT 2013/04a and Council's recommendations have been adopted for the purpose of this development.

These applicable rates are summarised in **Table 4.3b**.

Table 4.3b

	Traffic Rate	Rate	AM Peak Period Rate		Traffic Rate	Rate	PM Peak Period	
Land Use			**IN**	**OUT**			**IN**	**OUT**
Residential	Council Advice	0.4 trips per dwelling	0.25	0.75	Council Advice	0.4 trips per dwelling	0.66	0.33
Retail	Council Advice	0.5 trips per 100m2 LFA			Council Advice	0.5 trips per 100m2 LFA		
Retail Supermarket/Mimi Major	RMS Guide To Traffic Generating Developments	155 A(SM)per 1000m2 Thurs Peak PM 0.1	0.1	0.1	RMS	155 A(SM)per 1000m2 Thurs Peak PM 0.9	0.5	0.5
Commercial	RMS	RMS 2.02/100M^2	0.80	0.20	RMS 1.63/100M^2	RMS 1.63/100M^2	0.2	0.8
Restaurant	RMS	5 per 100m2 PM Only				5 per 100m2 PM Only	0.5	0.5
Medical Centre	RMS/data	Based upon number of consulting rooms 2.22 trips per room	0.50	0.50	RMS/data	Based upon number of consulting rooms 2.22 trips per room	0.5	0.5
Childcare Centre	RMS/data	60 children at 0.8 trips per child over 2 hours	0.50	0.50	RMS/data	60 children at 0.7 trips per child over 2 hours	0.5	0.5
Gymnasium**	RMS/data	3 per 100m2 PM Only			RMS/data	3 per 100m2 PM Only	peak after 6pm	

The following assumptions have been made in the calculation of the traffic generation for this site namely:-

- A reduction of 20% for linked and multipurpose trips from retail to other retail given the amount of retail on the site and a supermarket and mini major such as Aldi and other uses in accordance with the *RMS Guide to Traffic Generating Developments Section 3.6 Retail*.

- We refer to the *Connected Liverpool Strategy 2050* and which states a proposed smart transit corridor along Fifteenth Avenue. The smart transit corridor will not be operational until 2024-2025.This will provide future travel mode choice and assist in the future reduction of traffic generation as well as increase active transport trips.

(4.3.1 Continued)

- Active transport by way of bicycle path and shared paths will help to reduce car dependency within the development.
- Precinct 7 uses are stated in the SEARs application and traffic generation has been calculated accordingly. It is noted that further selection of uses will be subject to the major project application process.
- Precinct 5 has the retail areas broken into retail, a major supermarket, café/restaurant and on the first-floor entertainment/Commercial spaces and gymnasium and childcare centre.
- The office traffic generation rate used across the development is the Liverpool rate in the *RMS TDT 2013/04a* of 2.02 trips/ 100m^2 for AM and 1.63 trips/ 100 m^2 for PM.
- The car driver rate from the JTW data should also be used in the calculations for office and medical centre use.
- The calculation of traffic generation for the medical centre refers to the *RMS Traffic Generating Developments and Analysis Data No 20* and also our own reports on medical centres. Traffic Generation is typically derived from the number of consulting rooms. We estimate that there could be up to 60 consultancy rooms with an average waiting time of 27 minutes for each room. We have assumed an occupancy rate of 85%. We have assumed that the ancillary health could be specialist's rooms. The car driver rate from the JTW data should also be used in the calculations.
- We have assumed the rate for residential units of 0.4 which we understand has been provided by Council and documented in Council's meeting minutes dated 27th February 2017.
- A further reduction in traffic generation for residential has been made for Soho Style apartments in Precinct Areas lots 2 and 3. About 25% could be assigned. The commercial component on the ground floor would not generate traffic generation for the commercial component as it is owner occupied. This has not been adopted as part of the current scenario summary.

(4.3.1 Continued)

The summary calculations show an AM Peak Hour Traffic Generation of **774** vehicles in the AM and **1427** vehicles in the PM Peak Hour. Each Precinct has been calculated and is included in **Appendix A.**

Table 4.3c PROPOSED TRAFFIC GENERATION FOR 60-80 Southern Cross Ave and 45-65 (Hall Circuit) Flynn Ave Middleton Grange

Use	Area M^2	No of Units	Generation Rate	TOTAL	Reduction for multi-purpose trips 20% for retail/café/medical
Precinct Lot 2	3348	29	TOTAL AM	20.2	19
		29	TOTAL PM	87	72
Precinct Lot 3	3354		TOTAL AM	20.2	19
			TOTAL PM	87	72
Precinct Lot 4	7157	292	TOTAL AM	206.2	188
			TOTAL PM	376	324
Precinct Lot 5	14135	241	TOTAL AM	223.5	214
			TOTAL PM	484	405
Precinct Lot 6	6168	79	TOTAL AM	106.0	103
			TOTAL PM	326	276
Precinct Lot 7	13586	0	TOTAL AM	283	231
			TOTAL PM	342	278
		670	AM	859	**774**
			PM	1702	**1427**

The traffic Generation from each precinct has been shown for the AM and PM Peak Hours in **Figure 6A** and **Figure 6B** Respectively.

4.4 Vehicular Access To and From The site

All heavy rigid and articulated vehicles up to 19 metres long vehicle will access the site via Qantas Boulevarde as confirmed by Liverpool Council.

Each precinct ingress and egress point is identified in **Figure 7**.

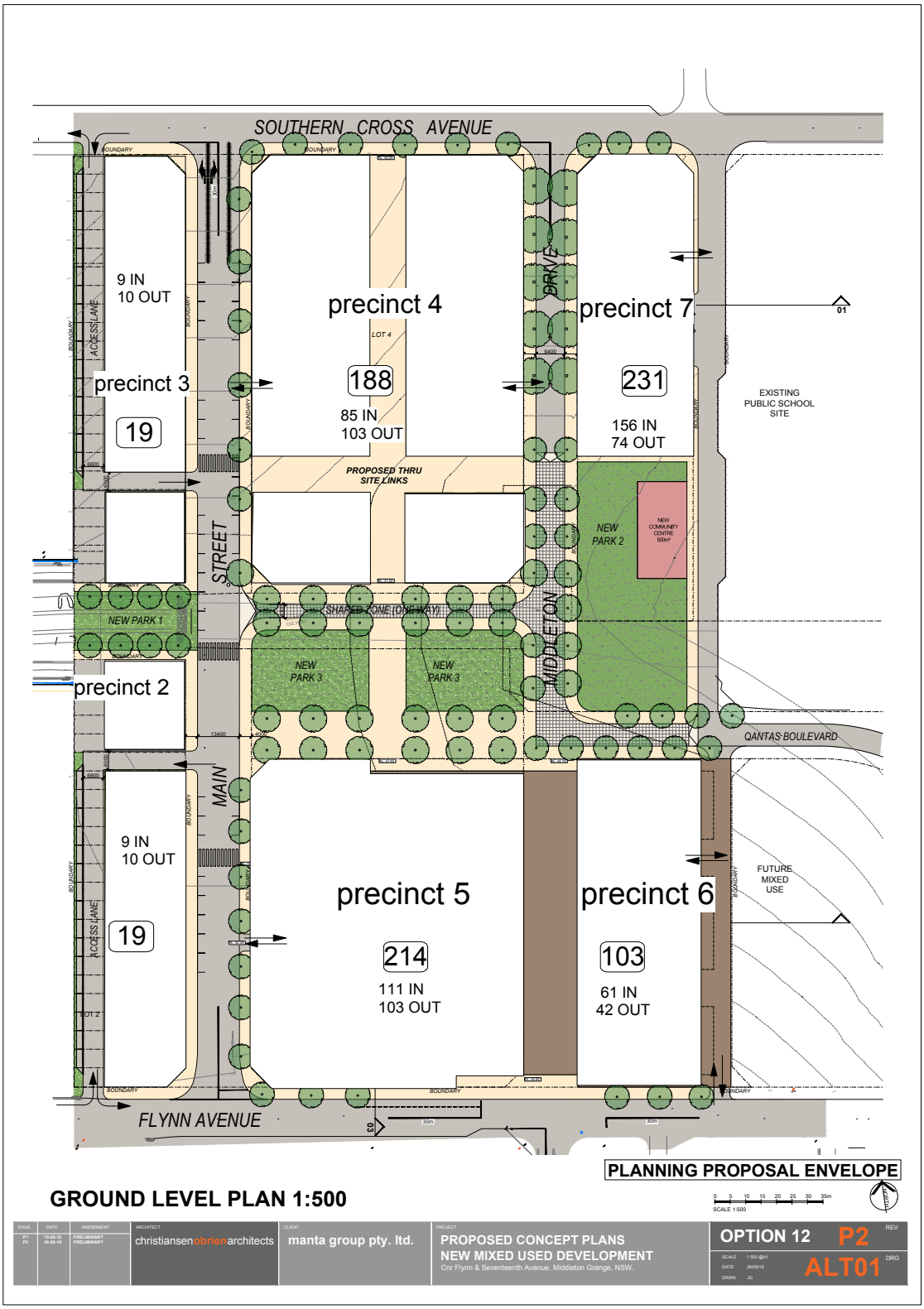


Figure 6A Traffic Generation

Future Development Traffic
AM Peak Hour

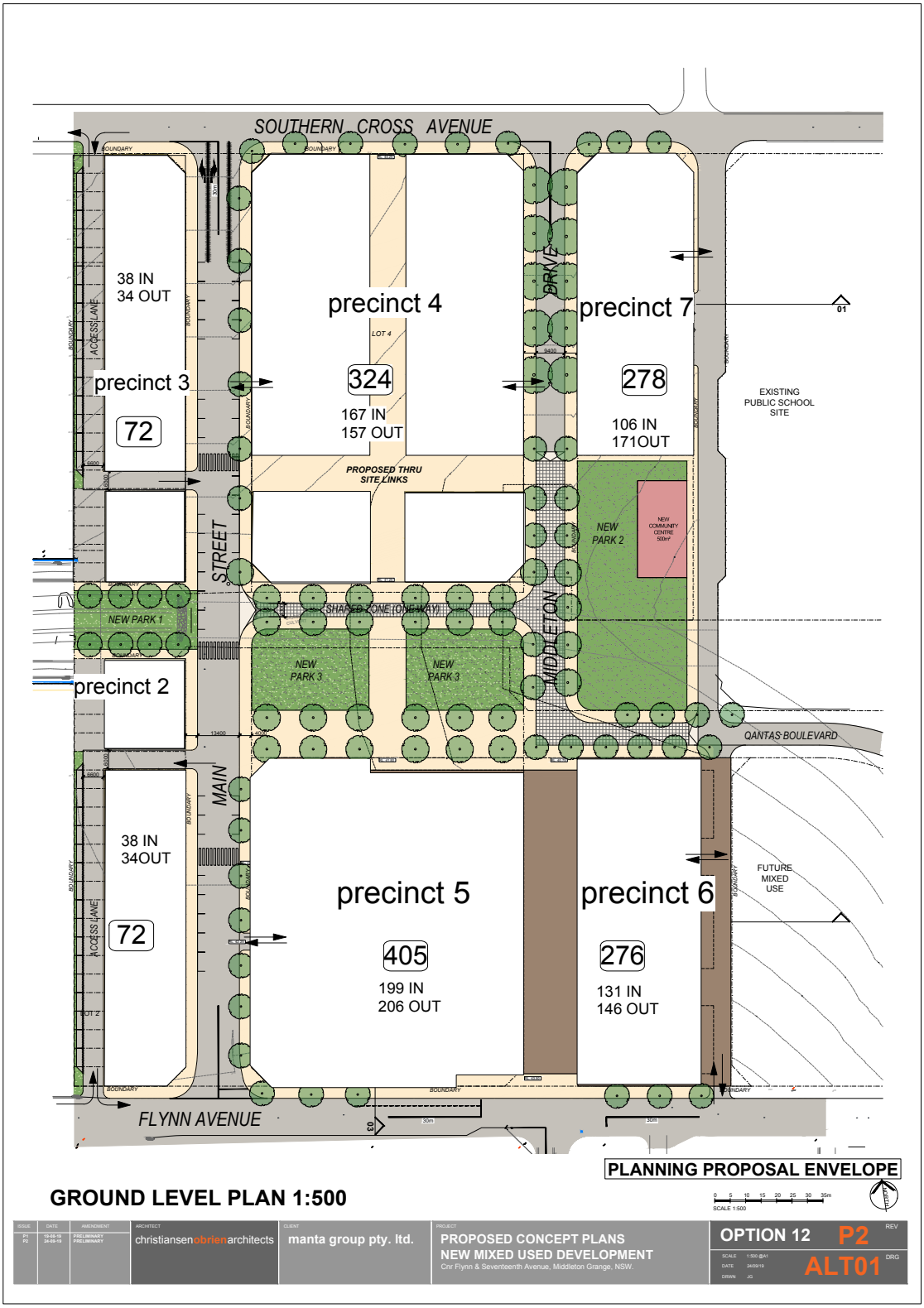


Figure 6B Traffic Generation

Future Development Traffic
PM Peak Hour

5.0 PARKING REQUIREMENTS

5.1 Car Parking

The Liverpool Development Control Plan 2008(DCP) provides the car parking rates and provisions for various components of the proposal. Typically, developments located outside the Liverpool City Centre would attract the following recommended rates based on the associated leasable floor areas (LFA) and Gross Floor Areas (GFA's).

Table 5.1 PROPOSED PARKING RATES

	Parking Rate	Rate (See Table 13 LDCP)
Land Use		
Residential	1 Bedroom	1 space per on bedroom dwelling
	2 Bedroom	1.5 spaces per 2 bedroom dwelling
	3 Bedroom	2 spaces per three bedroom dwelling
	Visitor	1 visitor space per 4 bedroom dwelling
Commercial	Offices	1 space per 35m2 LFA (Business Zones)
	Childcare	1 space per 35m2 LFA (Business Zones)
	Medical Suites	1 space per 35m2 LFA
	Medical Centre	1 space per 25m2 LFA
	Restaurant	1 space per 20m2 LFA (Business Zones)
	Gymnasium	1 space per 22m2 LFA
Retail	Shops	1 space per 25m2 LFA
	Entertainment-Commercial	1 space per 25m2 LFA

5.2 Accessible Parking

The Liverpool Development Control Plan 2008(DCP) specifies the accessible parking rates for developments with over 20 car parking spaces. These rates are associated with land uses and are listed below:-

1 per 100 car parking spaces (Retail, Commercial, Industry, and Transport)
2 per 100 car parking spaces (Community, Recreation, Accommodation or Education)
3 per 100 car parking spaces (Entertainment or Health)

5.3 Motorbike Parking

The Liverpool Development Control Plan 2008(DCP) recommends a motorcycle parking rate of 1 space per 20 car parking spaces for developments within the Liverpool City Centre. We note that there is not a rate suggested for areas outside of the City Centre.

All Residential-Mixed Use developments should provide motorbike parking as suggested by the Architectural Design Guide (ADG) for residential use.

5.4 Bicycle Parking

The Liverpool Development Control Plan 2008(DCP) outlines bicycle parking provision at the following recommended rates presented in **Table 5.2**.

Table 5.2 PROPOSED BICYCLE PARKING RATES

	DCP Bicycle Parking Rates	
Land Use	**Residential/Staff**	**Visitor/Customer**
Residential	Greater of the following:- 1 space per 2 dwellings or 1 space per 4 bedrooms	1 space per 10 dwellings
Commercial Offices	1 space per 200m2 GFA	1 space per 750m2 GFA
Shopping Centres	1 space per 300m2 GFA	1 space per 750m2 LFA
Medical Centres and Health Consulting Rooms	1 space per 10 staff	2 spaces per centres. Plus 1 space per 5 consulting room.
Indoor Facilities (Gym)	1 space per 10 staff	2 spaces Plus 1 space per 100m2 GFA

5.4 Servicing

The Liverpool Development Control Plan 2008(DCP) outlines the service vehicle provision and the following rates are stated in **Table 5.3**.

Table 5.3 SERVICING REQUIREMENTS

	DCP Parking Rates	
Land Use	**Zoning**	**Service and Loading**
Multi Dwelling Housing and Residential Flat Buildings	Residential and Business Zones	Service areas for removalists and garbage servicing
Office Premises	Business Zones	LFA> 2000m2 require waste collection vehicle
Retail Premises	Business Zones	LFA> 4000m2 require waste collection vehicle
Restaurants	Residential Zones	Waste Collection Vehicle Service Requirements
Medical Centres and Health Consulting Rooms	N/A	LFA> 2000m2 require waste collection vehicle Servicing for small van
Indoor Facilities (Gym)	Business Zones	Service Access for a small rigid vehicle

A detailed summary of the parking provision in **Table 4.4** is provided in **Appendix C** of this report.

A summary of each precinct area parking supply is shown in **Figure 7.**

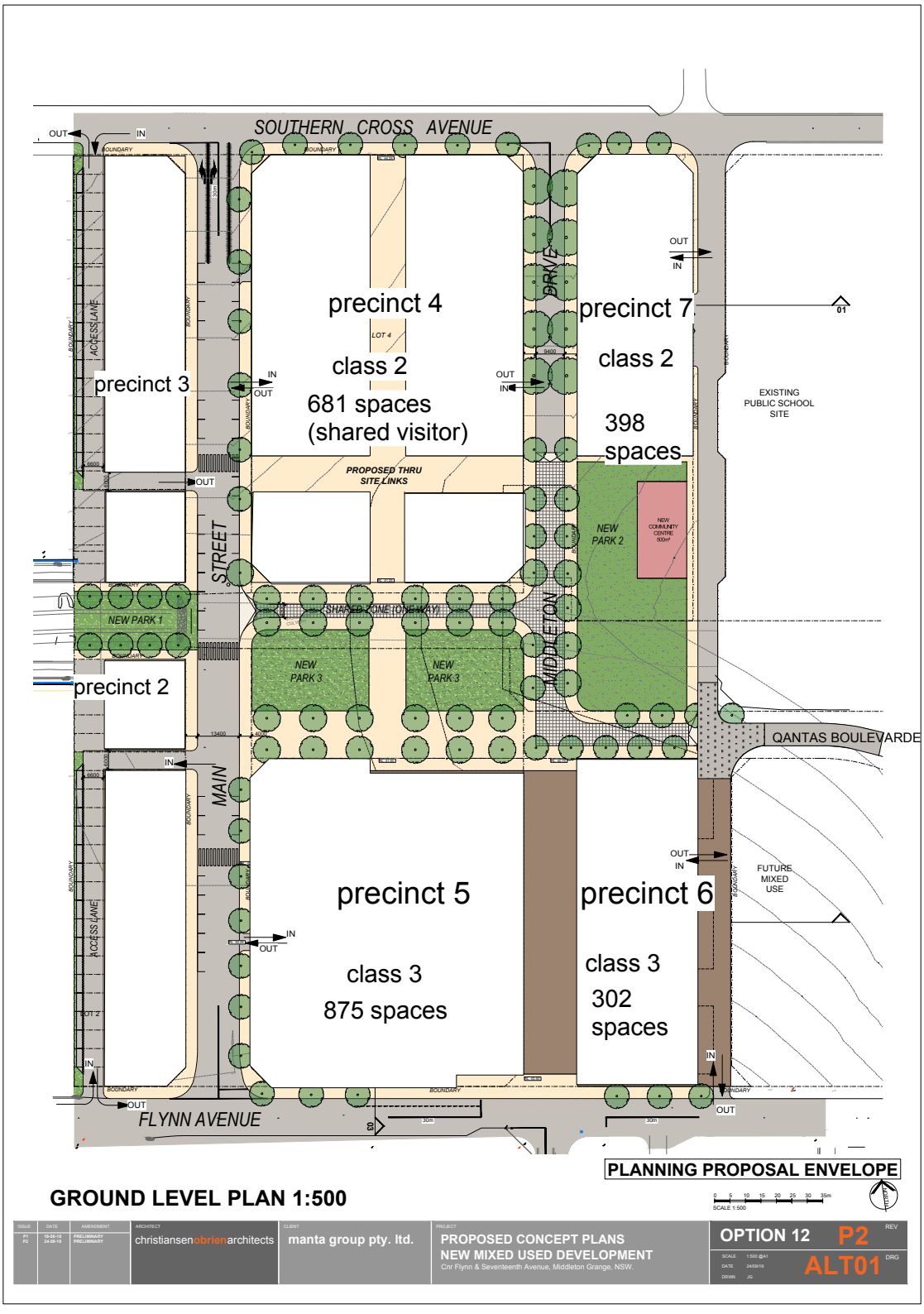


Figure 7 Precinct Parking

6.0 PUBLIC BENEFIT RECOMMENDATIONS

The following transport infrastructure benefits have been identified as shown in the Planning Proposal Envelope Plan located in **Appendix A**.

These key actions include:-

Land Uses- *Employment and mixed use focus along Southern Cross Avenue, Flynn Avenue and Eastern Side of Main Street.*
Transport and Movement- *Capitalise on development around transport modes. Reduce car dependency by improving access to public and active transport infrastructure.*
Place-making-*. Break up large blocks with laneways and through site linkages. Facilitate site amalgamation to provide opportunities for master-planned redevelopment which delivers good public open space outcomes.*
Open space, linkages and connections-*Reinforce the cycle link as a connection to the cycle links for Middleton Grange Network. Leverage new development to provide new open space, high quality and active public domains and new through-site links.*

6.1 Bicycle Travel Path and Facilities

The shared access laneways will provide cycle links and active transport links through the north-south connections and east to west connections through the development. On street cycle way paths can be provided in Main Street.

6.2 On Street Parking Bays

Main Street will provide on street parking for local neighbourhood shops on both east and western sides of the street. It is anticipated that ½ hour parking between 8am and 6pm will allow for customer parking to the retail use for Precinct Lots 2 and 3 and for Lot 4.

6.3 Pedestrian Pathways

Pedestrian pathways have been provided to all streets in accordance with the Street Sections Layouts in the DCP.
Internal Shared paths will have landscape planting to further enhance internal active spaces.

6.4 Bus Shelter Upgrade in Flynn Avenue

A new bus shelter could be incorporated into the site frontage along Flynn Avenue which is connected to the new north-south pedestrian link through the site.

6.5 New Parks 1, 2 and 3

A new public open space parks will promote social and active lifestyle opportunities. New Park 1 has access off Main Street between Precincts 2 and 3. New Park 3 runs east to west between Main Street and Middleton Drive. New Park 2 provides a large parkland facility between Middleton Drive and Bravo Avenue.

7.0 PROPOSED INFRASTRUCTURE

7.1 Proposed Infrastructure Council and NSW Government Initiatives

A number of future planned infrastructure upgrades are proposed by Liverpool Council and approved developments and Transport for NSW. These are shown diagrammatically in **Figure 8** in this report and listed below.

1. Smart Transit Corridor. Additional lanes east and westbound. Separated Bus Lane eastbound and westbound.
2. Signalised Intersection at Second Avenue/Kingsford Smith Avenue/Fifteenth Avenue
3. Interium re-alignment works to Qantas Dr/Fifteenth Ave. A copy of the Interium works is located in **Appendix D** of this report.
4. Signalised Intersection at Flynn Ave/Kingsford Smith Avenue.
5. Cowpasture Road 3 lanes northbound from Fifteenth Ave to Airfield Drive
6. Cowpasture Road 3 lanes southbound from Fifteenth Ave to Airfield Drive
7. Road Re-alignment Works Middleton Drive-seventeenth Ave Ref No Sk01-5236
8. Middleton Drive-Aviation Road Connection under M7. Relocation of bicycle lanes

9.a. Roundabout at Bird Walton Avenue and Middleton Drive.

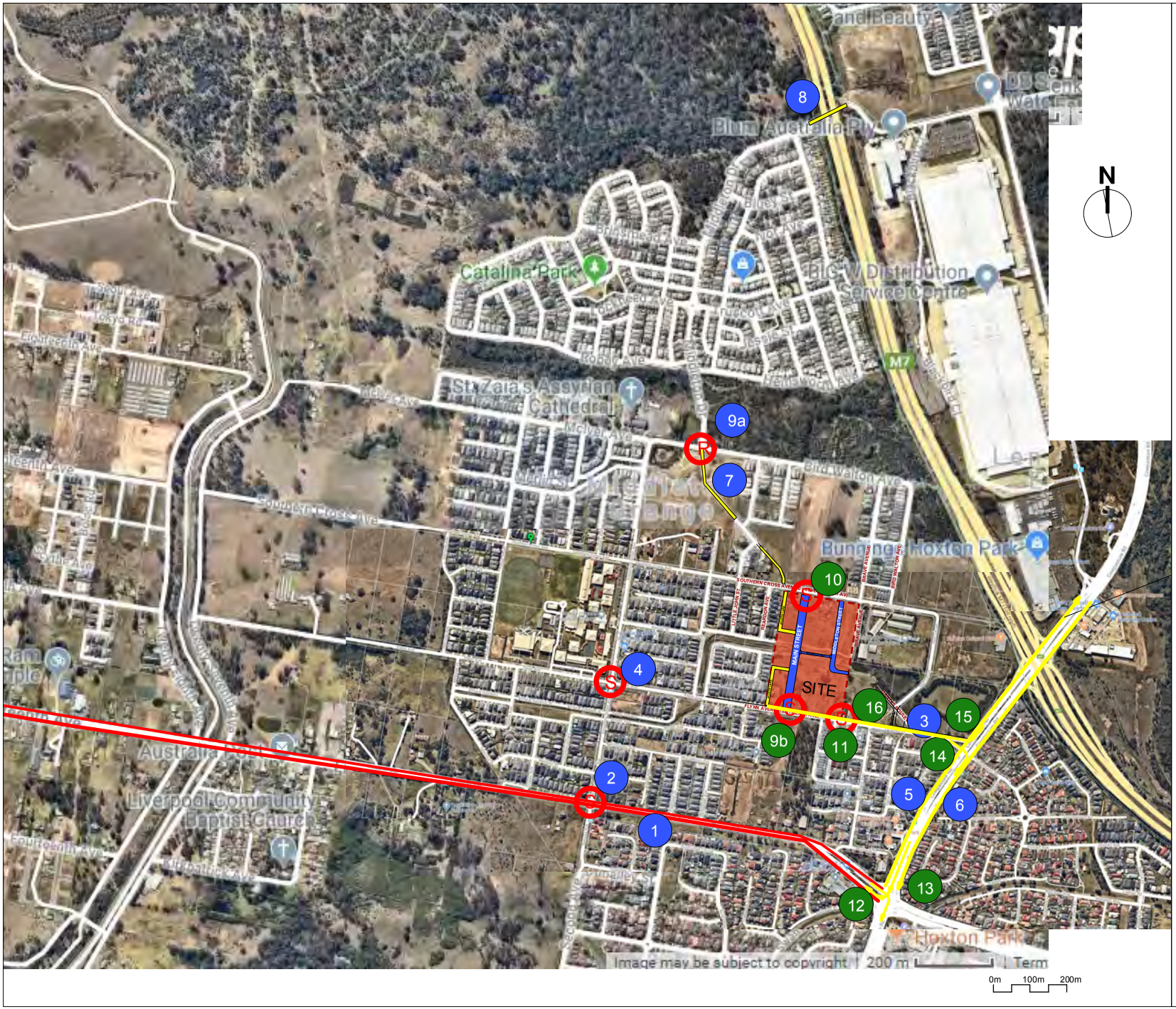
7.2 Proposed Infrastructure For Development

Proposed infrastructure upgrades for the development are included in scenario testing in the AIMSUN modelling report prepared by Bitzios Consulting. Items 12-15 were first identified in the TIA report number 16.068r04v01 prepared by Traffix in September 2017.

9.b. Signalised Intersection Main Street-Flynn Avenue (Hall Circuit).

10. Signalised Intersection at Main Street and Southern Cross Avenue (Hall Circuit).
11. Signalised Intersection into development car park (Private Access) off Flynn Avenue (Hall Circuit).
12. Additional Right Turn lane from Fifteenth Ave to Cowpasture Rd Southbound.
13. Additional Right Turn lane from Cowpasture Road (N) to Fifteenth Avenue Westbound.
14. Additional short right turn lane from Flynn Ave to Cowpasture Road Southbound.
15. Additional left turn lane from Flynn Ave to Cowpasture Road Northbound.
16. Additional Eastbound lane across Development Site in Flynn Avenue to Cowpasture Road.

These infrastructure developments have been checked as a result of the modelling carried out by Bitzios Consulting. The modelling report is located in Appendix E of this report.



NSW Government-Council

1. Smart Transit Corridor
2. Signalised Intersection at Second Avenue/Kingsford Smith Ave/Fifteenth Ave
3. Interium realignment works to Qantas Dr/ Fifteenth Ave
4. Signalised Intersection at Flynn Ave/ Kingsford Smith Avenue
5. Cowpasture Road 3 lanes northbound from Fifteenth Ave to Airfield Drive
6. Cowpasture Road 3 lanes southbound from Fifteenth Ave to Airfield Drive
7. Road Re-alignment Works Middleton Drive-seventeenth Ave Ref No Sk01-5236
8. Middleton Drive-Aviation Road Connection under M7 Relocation of bicycle lanes
9a. Rounabout at Bird Walton Avenue and Middleton Drive

Development

9b. Signalised Intersection Main Street-Flynn Avenue
10. Signalised Intersection off Main Street-Southern Cross Avenue
11. Signalised Intersection into development car park off Flynn Ave
12. Additional Right Turn lane from Fifteenth Ave to Cowpasture Rd Southbound
13. Additional RHT bay from Cowpasture Road (N) to Fifteenth Avenue Westbound
14. Additional short right turn lane from Flynn Ave to Cowpasture Road Southbound
15. Additional left turn lane from Flynn Ave to Cowpasture Road Northbound
16. Additional lane eastbound outside development site along Flynn Ave to Cowpasture Road

FIGURE 8: INFRASTRUCTURE MAP
SHOWING STATE GOVERNMENT, COUNCIL PLANNED INFRASTRUCTURE AND PROPOSED DEVELOPMENT INFRASTRUCTURE

8.0 AIMSUN MODELLING

8.1 AIMSUN Modelling Background

Previous Modelling was carried in Report Base Model Development Report 60-80 Southern Cross Avenue & 45-65 Hall Circuit Middleton Grange reference number 16.068r01v02 September 2017 prepared by Traffix. We refer to page 2 of the TIA report by Traffix Reference No 16.068404v01 which states:-

"The scope and requirements of this modelling report were outlined by RMS during an inception meeting held on 29 March 2017. In this regards the "base case model" has been developed by Traffix and has been reviewed and approved by RMS for use".

The base case model was obtained from Traffix for the purposes of preparing the development scenarios.

8.2 AIMSUN Development Scenarios

The AIMSUN modelling is proposed to develop the following scenario tests as follows:-

Develop a year 2030"do minimum model" which includes all future committed road network improvements and background traffic growth within the study area. The "do minimum model" does not include traffic from the proposed development.

Development of a "2030 with development model 1" which is the same as the "2030 do minimum model" but with development traffic added and based on the development size as per the current 2008 LEP.

Development of a "2030 with development model 2" which is the same as the "2030 do minimum model" but with development traffic based on the new development proposal.

The scenario tests will include all assumptions listed in Section 7 and the background development traffic and growth determined in consultation with the Transport For NSW-RMS. The impacts of upon key road links and intersections will be summarized in the Modelling Report prepared by Bitzios Consulting.

9.0 CONCLUSIONS AND SUMMARY

- The revised scheme has reduced the amount of residential density on the site from 912 units to 670 residential dwellings and provides a greater mix of employment and social uses. The proposed FSR on the site ranges from 1:1 (R1 zone) to 2.3:1 (B2 zone) and enables a total maximum 1.98:1 density for the scheme.

- This density is not considered high in its context and can sustainably enable the desired urban objectives the scheme promotes and is supported by the AIMSUN modelling.

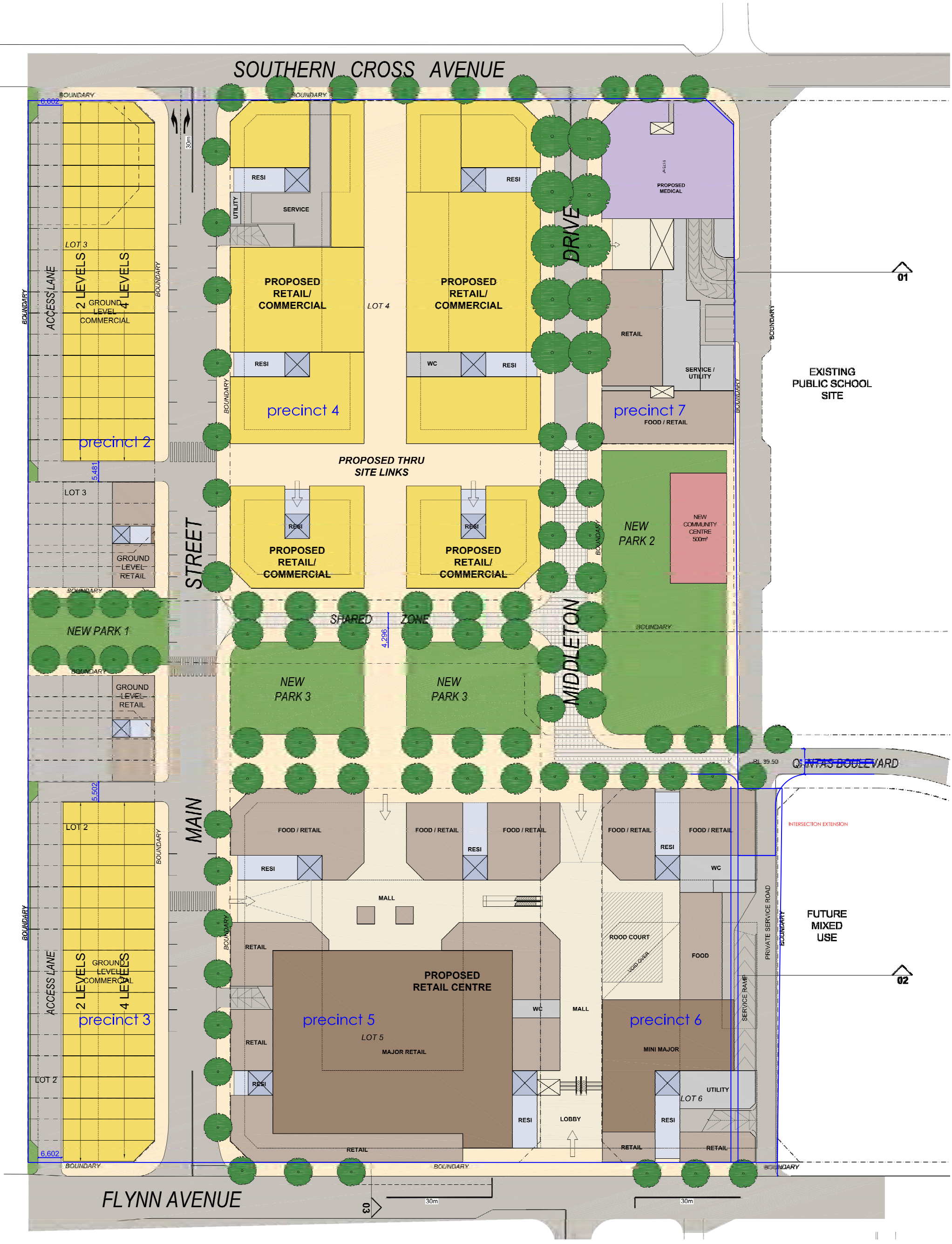
- The “2030 with development model 2 Future development model with the proposed development and upgrades will operate with spare capacity across the network.

- The 2030 with development model 1” current LEP was tested with the identified Council and Government Infrastructure upgrades and showed that under these conditions the network was slightly constrained and operating at near capacity.

- The improvements shown in the Future 2030 development model 2 demonstrate an improvement in travel time and an improvement in level of service for the key intersections across the network.

APPENDICES

APPENDIX A



PLANNING PROPOSAL ENVELOPE

GROUND LEVEL PLAN 1:500

0 5 10 15 20 25 30 35m
SCALE 1:500

NORTH

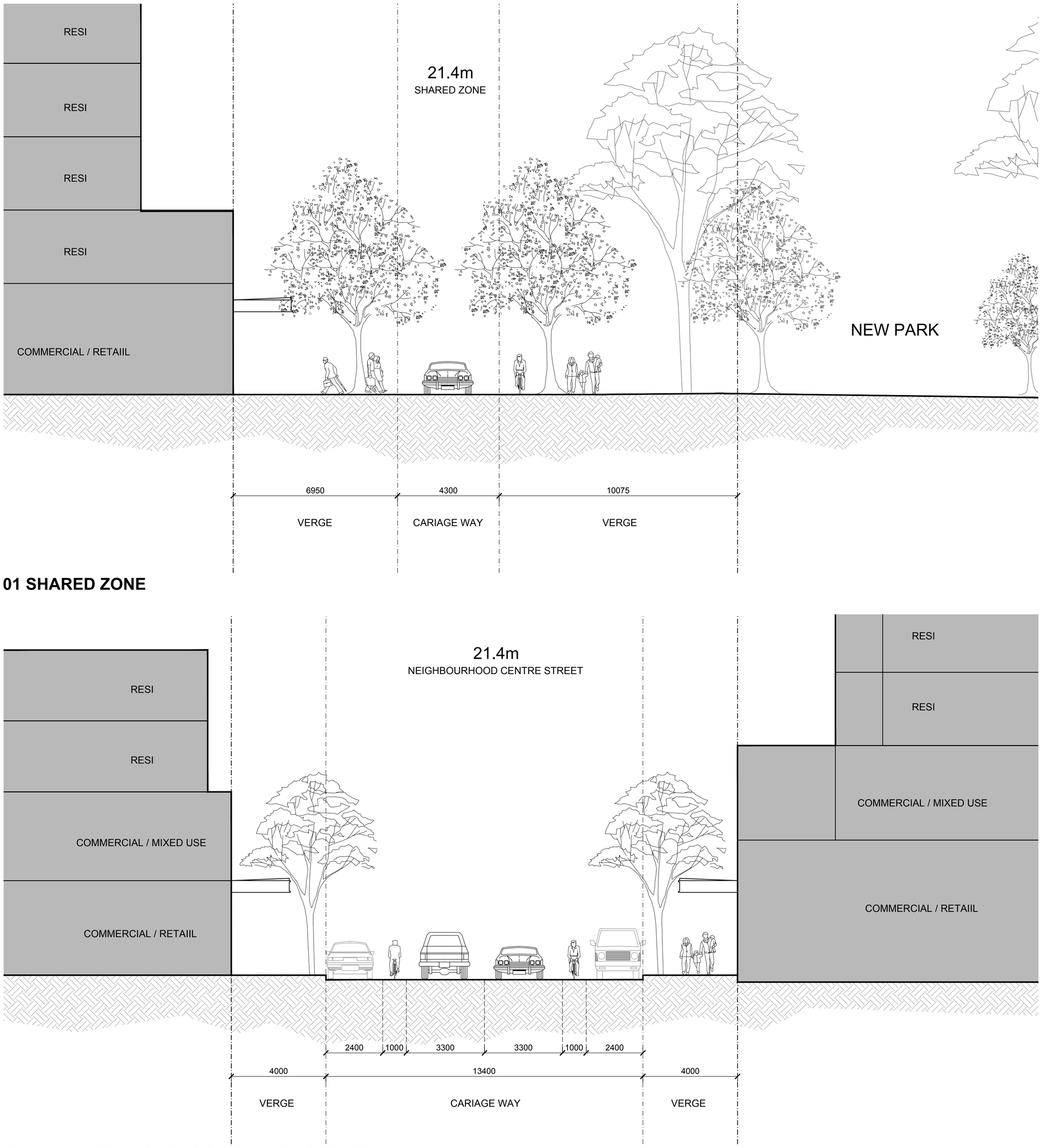
DATE	AMENDMENT
19-08-19	PRELIMINARY

ARCHITECT
christiansenobrienarchitects

manta group pty. ltd.

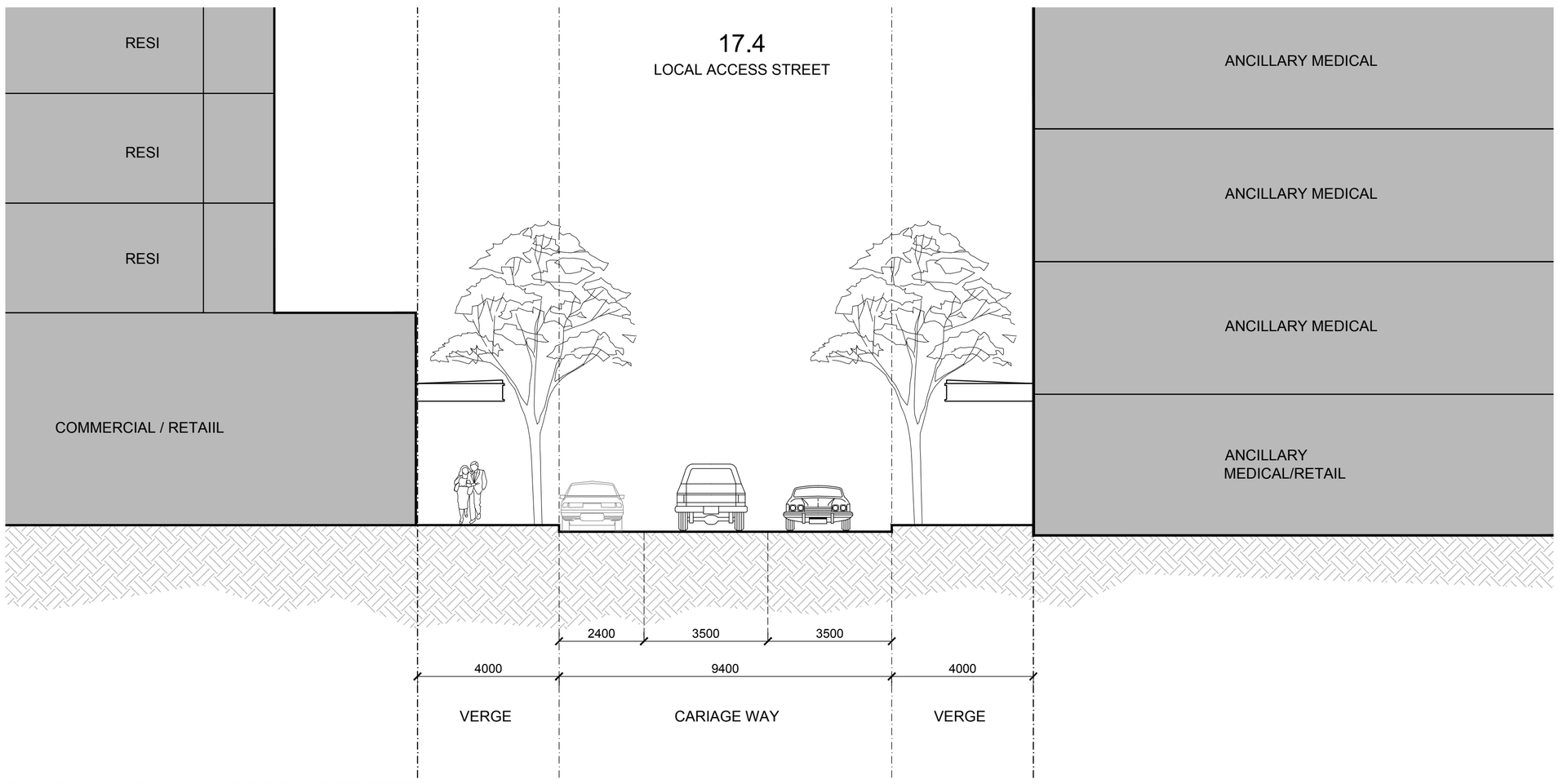
PROJECT
PROPOSED CONCEPT PLANS
NEW MIXED USED DEVELOPMENT
Cnr Flynn & Seventeenth Avenue, Middleton Grange, NSW.

OPTION 12 P1 REV
SCALE 1:500 @A1
DATE 19/08/19
DRWN JG
ALT01 DRG



01 SHARED ZONE

02 21.4m NEIGHBOURHOOD CENTRE STREET



03 17.4m LOCAL ACCESS STREET

STREET SECTIONS

0 5 10 15 20 25 30 35m

SCALE 1:500

NORTH

ISSUE	DATE	AMENDMENT
P1	19-08-19	PRELIMINARY
P2	24-09-19	PRELIMINARY

architect
christiansenobrienarchitects

manta group pty. ltd.

BUILDING HEIGHTS
NEW MIXED USED DEVELOPMENT
Cnr Flynn & Seventeenth Avenue, Middleton Grange, NSW.

OPTION 12 REV **P2**

SCALE N.T.S
DATE 24/09/19
DRWN JG

DRG **DCP07**

APPENDIX B

Table 3.3a PROPOSED TRAFFIC GENERATION FOR 60-80 Southern Cross Ave and 45-65 Hall Circuit(Flynn Ave) Middleton Grange

Precinct Lot 7

Location	Use	Area M^2 GFA	Area M^2 LFA	Generation Rate	IN	OUT	TOTAL	IN	OUT	Reduction for multi purpose trips 20% for retail and medical centre	
Ground	Medical Centre **	1175		RMS Data and Analysis-2.22 x 30 x 0.85 x0.733	20.75	20.75	41.50			37.3	AM-PM
	Retail	552	469	0.5 trips per 100m2 LFA AM 6 trips per 100m2 PM							
				AM 0.8 IN & 0.2 OUT	1.88	0.47	2.35			1.9	AM
				PM 0.5 IN & OUT	14.08	14.08	28.15			22.5	PM
	Café Restaurant	505		5 per 100m2 PM Only	12.63	12.63	25.25			20.2	PM
First Floor	Imaging Diagnostic	1189		RMS Data and Analysis-2.22 x 30 x 0.85 x0.733	20.75	20.75	41.50			33.2	AM-PM
	Ancillary Health	1964		RMS 2.02/100M^2; 50% IN & OUT (Liverpool)	19.84	19.84	39.67			31.7	PM
	Ancillary Health			RMS 1.63/100M^2; 50% IN & OUT (Liverpool)	16.01	16.01	32.01			25.6	AM-PM
Upper Levels	Office	7012		RMS 2.02/100M^2; 80% IN and 20% OUT AM and 20% IN 80% Out in PM	113.31	28.33	141.64			113.3	AM
				RMS 1.63/100M^2; 80% IN and 20% OUT AM and 20% IN 80% Out in PM	22.86	91.44	114.30			91.4	PM
	Outpatients	1189		RMS 2.02/100M^2; 80% IN and 20% OUT AM and 20% IN 80% Out in PM	19.21	4.80	24.02			19.2	AM
				RMS 1.63/100M^2; 80% IN and 20% OUT AM and 20% IN 80% Out in PM	3.88	15.50	19.38			15.5	PM
	Total	**13586**		TOTAL AM	192	91	283	156.3	74.2	231	
				TOTAL PM	131	211	342	106.2	171.3	278	

NOTES ** Medical Centre assumed 30 rooms- Imaging Diagnostic assume 30 rooms
Average Length of stay 27 minutes or Rate of 2.22 per hour
85% occupancy rate of rooms
car driver mode 73.33%
Rates for Office uses TDT 2013/04a for Liverpool

Table 3.3b PROPOSED TRAFFIC GENERATION FOR 60-80 Southern Cross Ave and 45-65 (Hall Circuit) Flynn Ave Middleton Grange

Precinct Lot 6

Location	Use	Area M^2 GFA	Area M^2 LFA	Generation Rate	IN	OUT	TOTAL	IN	OUT	Reduction for multi purpose trips 20% for retail/café	
Ground	Mini Major	1200	1020	RMS 155A(SM) THURS; 155 x*1020/1000							
				AM (10% Trips AM)AM 0.1 IN and OUT	8	8	15.81			12.6	AM
				PM (90% Trips) 0.5 IN & OUT	71	71	142.3			113.8	PM
	Café/Retail	1500		5 per 100m2 PM Only	38	38	75			60.0	PM
	Retail Shops	580	493	0.5 trips per 100m2 LFA AM 6 trips per 100m2 PM							
				AM 0.8 IN & 0.2 OUT	0.20	0.05	0.25			0.2	AM
				PM 0.5 IN & OUT	14.79	14.79	29.58			23.7	PM
First Floor	Office **	2888		RMS 2.02/100M^2; 80% IN and 20% OUT AM and 20% IN 80% Out in PM	46.67	11.67	58.34			58.3	AM
				RMS 1.63/100M^2; 80% IN and 20% OUT AM and 20% IN 80% Out in PM	9.41	37.66	47.07			47.1	PM
	Total	**6168**									
				Hour	IN	OUT	TOTAL	IN	OUT		
Residential	No Of Units/A	Traffic Gen Rate			0.25	0.75					
	79	0.4		AM	7.90	23.70	31.60			31.6	AM
					0.67	0.33					
	79	0.4		PM	21.07	10.53	31.60			31.6	PM
				TOTAL AM	63	43	106.0	60.8	42.0	103	
				TOTAL PM	154	172	326	130.6	145.6	276	

NOTES ** Rates for Office uses TDT 2013/04a for Liverpool

Table 3.3c PROPOSED TRAFFIC GENERATION FOR 60-80 Southern Cross Ave and 45-65 (Hall Circuit) Flynn Ave Middleton Grange

Precinct Lot 5

Location	Use	Area M^2 GFA	Area M^2 LFA	Generation Rate	IN	OUT	TOTAL	IN	OUT	Reduction for multi purpose trips 20% for retail/café		
Ground	Major Retail Supermarket	2600	2210	RMS 155A(SM) THURS; 155 x*1020/1000								
				AM)AM 0.1 IN and OUT	15.5	15.5	31.0			24.80	AM	
				PM (90% Trips) 0.5 IN & OUT	60	60	119.3			95.47	PM	
				0.5 trips per 100m2 LFA AM 6 trips per 100m2 PM								
	Liquor Store	300		AM 0.8 IN & 0.2 OUT	1.20	0.30	1.50			1.20	AM	
				PM 0.5 IN & OUT	9	9	18			14.40	PM	
	Retail Shops	2600	2210	0.5 trips per 100m2 LFA AM 6 trips per 100m2 PM								
				AM 0.8 IN & 0.2 OUT	8.84	2.21	11.05			8.84	AM	
				PM 0.5 IN & OUT	66.30	66.30	132.60			106.08	PM	
	Café/restaurant	1000		5 per 100m2 PM Only	25.00	25.00	50.00			40.00	PM	
First Floor	Gymnasium and Health Precinct **	3500		3 per 100m2 PM Only	52.50	52.50	105.00			0.00	PM	Peak after 6pm**
	Office	4135		RMS 2.02/100M^2; 80% IN and 20% OUT AM and 20% IN 80% Out in PM	66.82	16.71	83.53			83.53	AM	
				RMS 1.63/100M^2; 80% IN and 20% OUT AM and 20% IN 80% Out in PM	13.48	53.92	67.40			67.40	PM	
	Total	**14135**										
				Hour	IN	OUT	TOTAL					
Residential	No Of Units/A	Traffic Gen Rate			0.25	0.75						
	241	0.4		AM	24.10	72.30	96.40			96.40	AM	
					0.67	0.33						
	241	0.4		PM	64.27	32.13	96.40			96.40	PM	
				TOTAL AM	116.5	107.0	223.5	111.3	103.0	214		
				TOTAL PM	238	246	484	199	206	405		

Table 3.3d PROPOSED TRAFFIC GENERATION FOR 60-80 Southern Cross Ave and 45-65 (Hall Circuit) Flynn Ave Middleton Grange

Precinct Lot 4

Use	Area M^2 GFA	Area M^2 LFA	Generation Rate	IN	OUT	TOTAL	IN	OUT	Reduction for multi purpose trips 20% retail/ entertainment/café	
Retail Shops	1790	1522	0.5 trips per 100m2 LFA AM 6 trips per 100m2 LFA PM							
			AM 0.8 IN & 0.2 OUT	6.09	1.52	7.61			6.09	AM
			PM 0.5 IN & OUT	45.66	45.66	91.32			73.06	PM
Café/restaurant	2000		5 per 100m2 PM Only	50.00	50.00	100.00			80.00	PM
Entertainment/ Commercial	2862		RMS 2.02/100M^2; 80% IN and 20% OUT AM and 20% IN 80% Out in PM	46.25	11.56	57.81			46.25	AM
			RMS 1.63/100M^2; 80% IN and 20% OUT AM and 20% IN	9.33	37.32	46.65			37.32	PM
Childcare	505		60 children at 0.8/2 trips AM and 60 x 0.7\2PM	12.00	12.00	24.00			19.20	AM
			60 children at 0.7/2 trips PM	10.50	10.50	21.00			16.80	PM
Total	**7157**									
			Hour	IN	OUT	TOTAL				
No Of Units/Area	Traffic Gen Rate			0.25	0.75					
292	0.4		AM	29.20	87.60	116.80			116.80	AM
				0.67	0.33					
292	0.4		PM	77.87	38.93	116.80			116.80	PM
			TOTAL AM	93.54	112.68	206.2	85.4	103.0	188	
			TOTAL PM	193.36	182.41	376	167	157	324	

Table 3.3e PROPOSED TRAFFIC GENERATION FOR 60-80 Southern Cross Ave and 45-65 Flynn Ave Middleton Grange

Precinct Lot 3

Location	Use	Area M^2 GFA	Area M^2 LFA	Generation Rate	IN	OUT	TOTAL	IN	OUT	Reduction for multi purpose trips 20% for retail/café	
Ground	Neighbourhood Shops	2030	1726	0.5 trips per 100m2 LFA AM 6 trips per 100m2 PM							
				AM 0.8 IN & 0.2 OUT	6.90	1.73	8.63			6.90	AM
				PM 0.5 IN & OUT	19.84	19.84	39.69			31.75	PM
	Café/restaurant	724		5 per 100m2 PM Only	18.10	18.10	36.20			28.96	PM
	Soho	600		Note: Ground Floor does not generate as owner occupied							
	Total	**3354**									
Residential				Hour	IN	OUT	TOTAL	IN	OUT		
	No Of Units/Area	Traffic Gen Rate			0.25	0.75					
	29	0.4		AM	2.90	8.70	11.60			11.60	AM
					0.67	0.33					
	29	0.4		PM	7.73	3.87	11.60			11.60	PM
				TOTAL AM	9.80	10.43	20.2	9.0	9.5	18.50	
				TOTAL PM	45.68	41.81	87	38	35	72.31	

Table 3.3f PROPOSED TRAFFIC GENERATION FOR 60-80 Southern Cross Ave and 45-65 (Hall Circuit) Flynn Ave Middleton Grange

Precinct Lot 2

Location	Use	Area M^2 GFA	Area M^2 LFA	Generation Rate	IN	OUT	TOTAL	IN	OUT	Reduction for multi purpose trips 20% for retail/café	
Ground	Neighbourhood shops	2030	1726	0.5 trips per 100m2 LFA AM 6 trips per 100m2 PM							
				AM 0.8 IN & 0.2 OUT	6.90	1.73	8.63			6.90	AM
				PM 0.5 IN & OUT	19.84	19.84	39.69			31.75	PM
	Café/restaurant	718		5 per 100m2 PM Only	17.95	17.95	35.90			28.72	PM
	Soho	600									
	Total	**3348**									
Residential				Hour	IN	OUT	TOTAL	IN	OUT		
	No Of Units/Area	Traffic Gen Rate			0.25	0.75					
	29	0.4		AM	2.90	8.70	11.60			11.60	AM
					0.67	0.33					
	29	0.4		PM	7.73	3.87	11.60			11.60	PM
				TOTAL AM	9.80	10.43	20.2	9.0	9.5	18.50	
				TOTAL PM	45.53	41.66	87	38	34	72.07	

APPENDIX C

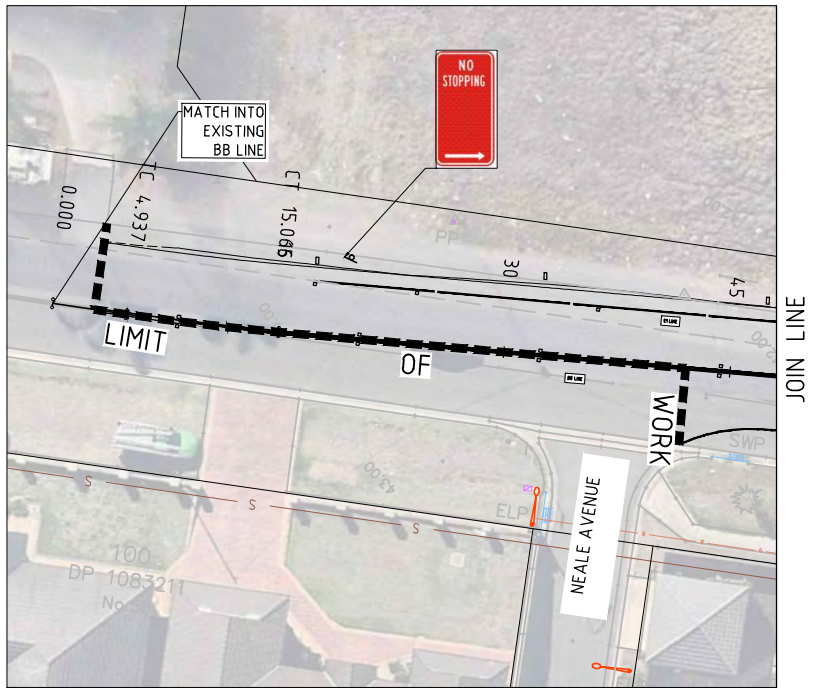
Table 4.4 Proposed Summary Of Uses and Parking

SUMMARY

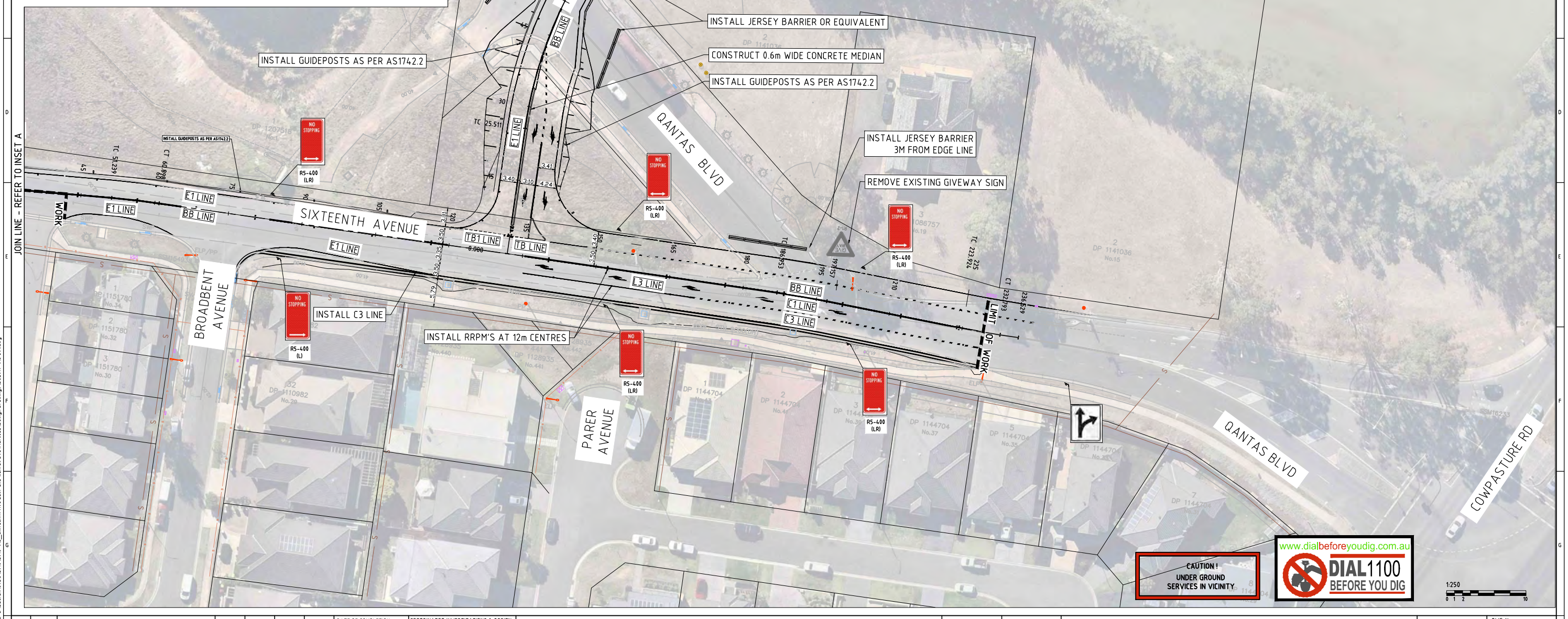
Location	Uses	Area M^2	LFA**	No of Units	Parking Rate	Parking Required	
Precinct Lot 2	Neighbourhood Shops	2030	1725.5		1 space per 25m2 LFA	69.0	
	Café Restaurant	718	610.3		1 space per 25m2 LFA	24	
	Ground Floor Soho	600					
	Residential			**29**			
	Residential Soho			5	2 spaces per 3 bedrooms	10	
	Residential Terrace			12	2 spaces per 3 bedrooms	24	
	Residential Shop Top			12	2 spaces per 3 bedrooms	24	
	Visitor					7	
		3348				**158**	
Precinct Lot 3	Neighbourhood Shops	2030	1725.5		1 space per 25m2 LFA	69	
	Café Restaurant	724	615.4		1 space per 25m2 LFA	25	
	Ground Floor Soho	600					
	Residential			**29**			
	Residential Soho			5	2 spaces per 3 bedrooms	10	
	Residential Terrace			12	2 spaces per 3 bedrooms	24	
	Residential Shop Top			12	2 spaces per 3 bedrooms	24	
	Visitor					7	
		3354				**159**	
Precinct Lot 4	Retail Shops	1790	1521.5		1 space per 25m2 LFA	61	
	Café Restaurant	2000	1700		1 space per 20m2 LFA	85	
	Commerical/Enterainment	2862	2432.7		1 space per 25m2 LFA	97	
Shared/Visitor	Childcare Centre	505			1 space per 35 LFA	14	
	Residential			**292**			
	1 bed			58	1 space/dwelling	58	
	2 bed			204	1.5 spaces/dwelling	307	
	3 bed			29	2 spaces/dwelling	58	
	Visitor					73	*** shared**
		7157				**681**	
Precinct Lot 5	Major Supermarket	2600	2210		1 space per 25m2 LFA	88	
	Retail Shops	2600	2210		1 space per 25m2 LFA	88	
	Retail Liquor	300	255		1 space per 25m2 LFA	10	
	Café Restaurant	1000	850		1 space per 20m2 LFA	43	
	Gymnasium	3500	2975		1 space per 22m2	135	
	Office	4135	3514.75		1 space per 35 LFA	100	
	Residential			**241**			
	1 bed			48	1 space/dwelling	48	
	2 bed			169	1.5 spaces/dwelling	253	
	3 bed			24	2 spaces/dwelling	48	
	Visitor					60	
Total GFA		14135				**875**	
Precinct Lot 6	Mini Major	1200	1020		1 space per 25m2 LFA	41	
	Café-Retail	1500	1275		1 space per 20m2 LFA	51	
	Retail Shops	580	493		1 space per 25m2 LFA	20	
	Office	2888	2454.8		1 space per 35 LFA	70	
	Residential			**79**			
	1 bed			16	1 space/dwelling	16	
	2 bed			55	1.5 spaces/dwelling	83	
	3 bed			8	2 spaces/dwelling	2	
	Visitor					20	
Total GFA		6168				**302**	
Precinct Lot 7	Medical Centre **	1175	999		1 space per 25m2 LFA	40	
	Retail	552	469		1 space per 25m2 LFA	19	
	Café Restaurant	505	429		1 space per 20m2 LFA	21	
	Imaging Diagnostic	1189	1011		1 space per 25 LFA	40	
	Ancillary Health Offices	1964	1669		1 space per 35 LFA	48	
	Outpatient	1189	1011		1 space per 35 LFA	29	
	Medical Suites	7012	5960.2		1 space per 35 LFA	200	
	Total	**13586**				**398**	
Parkland	**Community Centre**	**500**					
	TOTAL	**48248**		**670**		**2572**	

Note * Shared Visitor Res with retail parking

APPENDIX D



INSET A



NOTES:

1. ALL LINEMARKING & SIGNAGE IS TO BE INSTALLED IN ACCORDANCE WITH AUSTRALIAN STANDARDS AND RMS REQUIREMENTS AND SPECIFICATIONS.
2. RRPM'S (RAISED REFLECTIVE PAVEMENT MARKERS) ARE TO BE INSTALLED IN ACCORDANCE WITH RMS SPECIFICATIONS FOR EACH LINEMARKING TYPE AS SHOWN ON THE DRAWINGS.
3. WHERE EXISTING LINEMARKING CONFLICTS WITH NEW LINE MARKING, THE EXISTING LINEMARKING SHALL BE REMOVED.
4. ALL LINEMARKING REMOVAL WHETHER AS REQUIRED BY NOTE 3, OR AS SHOWN ON THE DRAWINGS, IS TO BE BY WATER BLASTING.
5. ALL SIGNPOSTS SHALL BE INSTALLED USING THE V-LOCK SYSTEM.
6. ANY SIGNAGE TO BE REMOVED (AS INDICATED ON THESE DRAWINGS) IS TO BE DELIVERED BY THE CONTRACTOR TO COUNCIL'S DEPOT.
7. LIGHTING ALONG HALL CIRCUIT TO BE DESIGNED AND INSTALLED BY OTHERS.

ISSUE	DATE	REASON FOR ISSUE	DRAWN	SIGNED	APPROV	OWNER
A	17/04/19	ISSUED FOR TENDER	V.C			

DATE OF COMPLETION	COORDINATOR INVESTIGATIONS & DESIGN
DATE OF RELEASE	MANAGER-TECHNICAL SUPPORT
DATE OF ACCEPTANCE	PROJECT ENGINEER
DATE OF RELEASE	MANAGER - INFRASTRUCTURE & DELIVERY

LIVERPOOL CITY COUNCIL INVESTIGATIONS & DESIGN

GROUND FLOOR, 33 MOORE STREET, LIVERPOOL, NSW 2170
Ph 1300 36 2170 Fax (02) 9821 9333

FOR TRAFFIC COMMITTEE

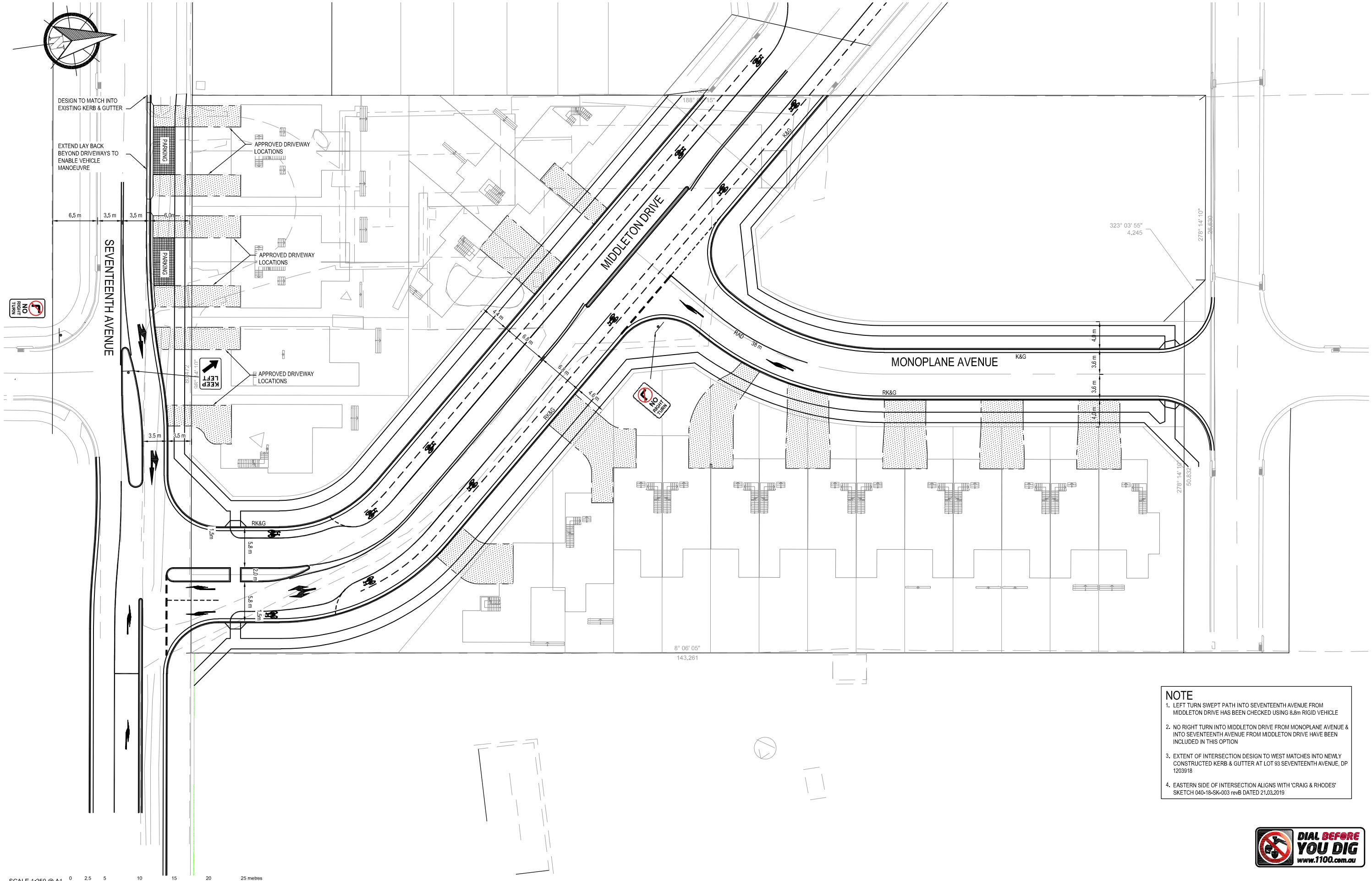
SURVEYED	D.M./G.B. DATE 08.15	DATUM	A.H.D./M.G.A.
DESIGNED	V.C DATE DATE	CHECKED	B.P DATE DATE
DRAWN	V.C DATE DATE	CAD FILE	XREF:

DRAWING TITLE

SIXTEENTH AVENUE, MIDDLETON GRANGE
PROPOSED ROAD RECONSTRUCTION AND ASSOCIATED WORKS
INTERSECTION OF SIXTEENTH AVE & HALL CCT
LINEMARKING & SIGNPOSTING PLAN

JOB No	DS2018/013
SCALES	PLAN 1:250
DWG. No	301
ISSUE No	A
CONTRACT No	

File: G:\DESIGN\JOBS\2018\2018-013_Sixteenth Ave East and Qantas Blvd\Autocad\Design Drawings\DS2018-013 301.dwg
Plotted: 08/30/19 11:35:35



SCALE 1:250 @ A1
SCALE 1:500 @ A3

0 2.5 5 10 15 20 25 metres

NOTE

1. LEFT TURN SWEPT PATH INTO SEVENTEENTH AVENUE FROM MIDDLETON DRIVE HAS BEEN CHECKED USING 8.8m RIGID VEHICLE
2. NO RIGHT TURN INTO MIDDLETON DRIVE FROM MONOPLANE AVENUE & INTO SEVENTEENTH AVENUE FROM MIDDLETON DRIVE HAVE BEEN INCLUDED IN THIS OPTION
3. EXTENT OF INTERSECTION DESIGN TO WEST MATCHES INTO NEWLY CONSTRUCTED KERB & GUTTER AT LOT 93 SEVENTEENTH AVENUE, DP 1203918
4. EASTERN SIDE OF INTERSECTION ALIGNS WITH 'CRAIG & RHODES' SKETCH 040-18-SK-003 revB DATED 21.03.2019

DIAL BEFORE YOU DIG www.1100.com.au

Issue	Description	Date	Drawn	Approved
2	ISSUED FOR INFORMATION	08/08/19	AS	SW
1	ISSUED FOR INFORMATION	01/08/19	AS	SW

mepstead & ASSOCIATES
REGISTERED SURVEYORS AND DEVELOPMENT CONSULTANTS

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M & C PROPERTY PTY LTD
ATF WONG FAMILY TRUST
1 LITTLE QUEEN STREET
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Project:
PROPOSED RESIDENTIAL SUBDIVISION
LOT 194, D.P.2475
85 SEVENTEENTH AVENUE
MIDDLETON GRANGE 2171

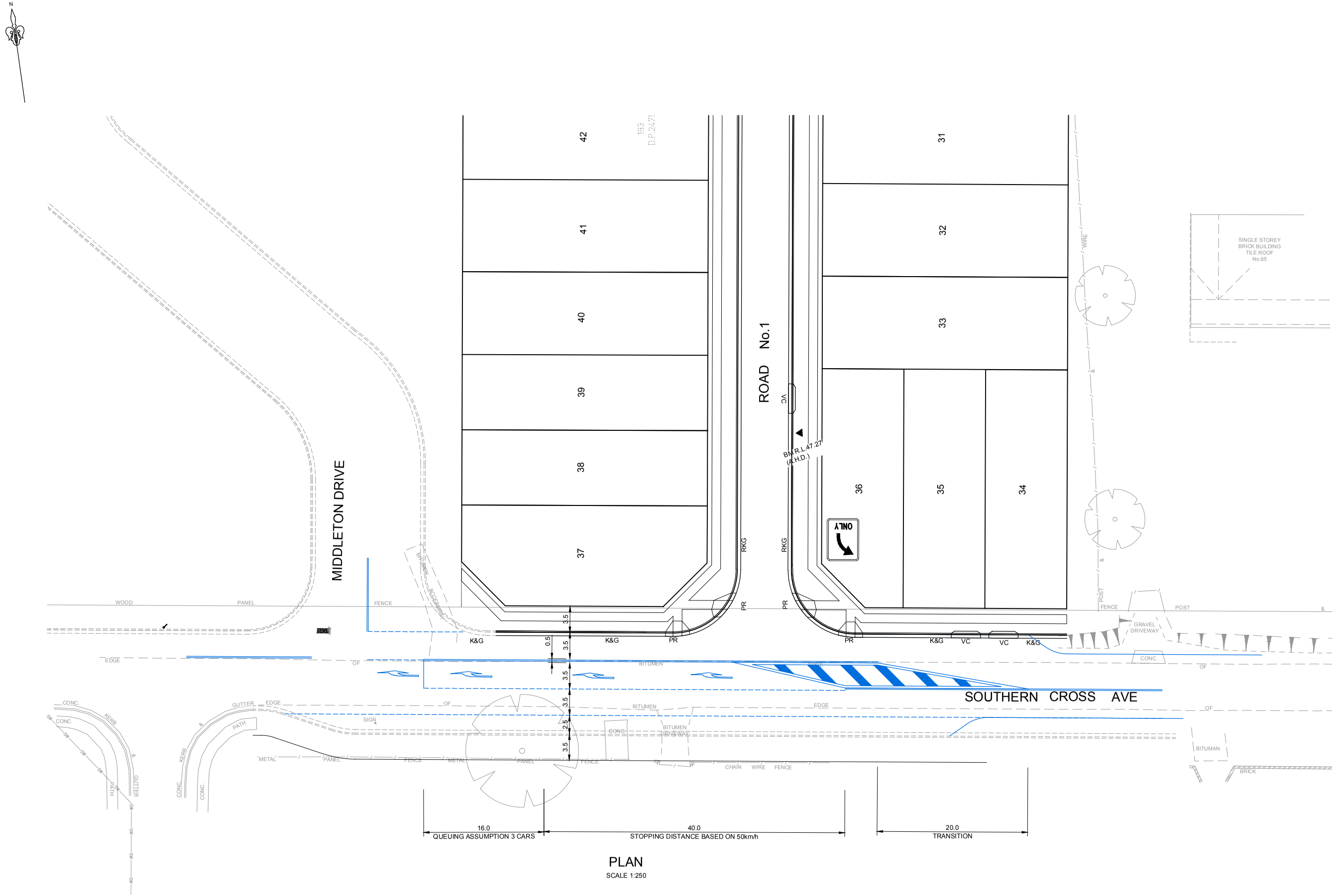
Designed:	AS	Scale:	1:250
Drawn:	AS	Datum:	A.H.D
Checked:	SW	Date:	AUGUST 2019
L.G.A:	LIVERPOOL CITY COUNCIL		

A1

Drawing Title:
SEVENTEENTH AVENUE / MIDDLETON DRIVE
OPTION 1 LAYOUT

Issue:	2
Drg. No.	SK01
Our Ref:	5236
Sheet No.	

A1



PLAN
SCALE 1:250

SKETCH

0 2.5 5 7.5 10 15 20 25m
1:250

REV	DATE	AMENDMENT DESCRIPTION
B	21.03.19	CLIENT COMMENTS
A	19.03.19	PRELIMINARY

APPROVED COMPANY AS/NZS 4801 OH&S Management System QMS
APPROVED COMPANY ISO 14001 Environmental Management System QMS
APPROVED COMPANY ISO 9001 Quality Management Systems QMS
DIAL 1100 BEFORE YOU DIG

Project
PROPOSED DEVELOPMENT OF
LOT 178 & 193 D.P. 2475
SOUTHERN CROSS DRIVE, MIDDLETON GRANGE

Principal:	DEFENCE HOUSING AUSTRALIA		
Scale 1:250	Date 19.03.19	Council Ref. -	
	Datum -	L.G.A. LIVERPOOL CITY COUNCIL	
Calc's R.X.	Drawn. E.F.	Proj.Man. M.L.	Client Ref. -

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Drawing Title
SOUTHERN CROSS AVE
INTERSECTION SKETCH

C&R Ref.	Drawing Ref.	Revision
040-18	040-18-SK-003	B

APPENDIX E

60-80 Southern Cross Avenue and 45-65 Hall Circuit, Middleton Grange

Traffic Modelling Assessment

Pacific Planning Pty Ltd

25 October 2019

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Document Issue History

Report File Name	Prepared	Reviewed	Issued	Date	Issued to
P4356.001R 60-80 Southern Cross Avenue Middleton Grange Traffic Modelling Assessment	S. Daizli / J. Yang	D. Bitzios	A. Ahmed	25/10/2019	Matthew Daniel, Pacific Planning mdaniel@pacificplanning.com.au

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Appendices

1. INTRODUCTION

1.1 Background

A Town Centre development is proposed at 60-80 Southern Cross Avenue and 45-65 (Hall Circuit) Flynn Avenue in Middleton Grange. The development is located within the Liverpool Council Local Government Area. The Town Centre development proposal includes 670 residential dwellings and 48,248 square meters of mixed use facilities including office space, restaurants, a medical centre and ancillary medical office suites, as well as smaller business operations.

A 2017 'existing conditions' (Base) Aimsun model was developed by Traffix. The model includes all key roads within the Middleton Grange. Sections of Hoxton Park Road and Cowpasture Road were also included in the model.

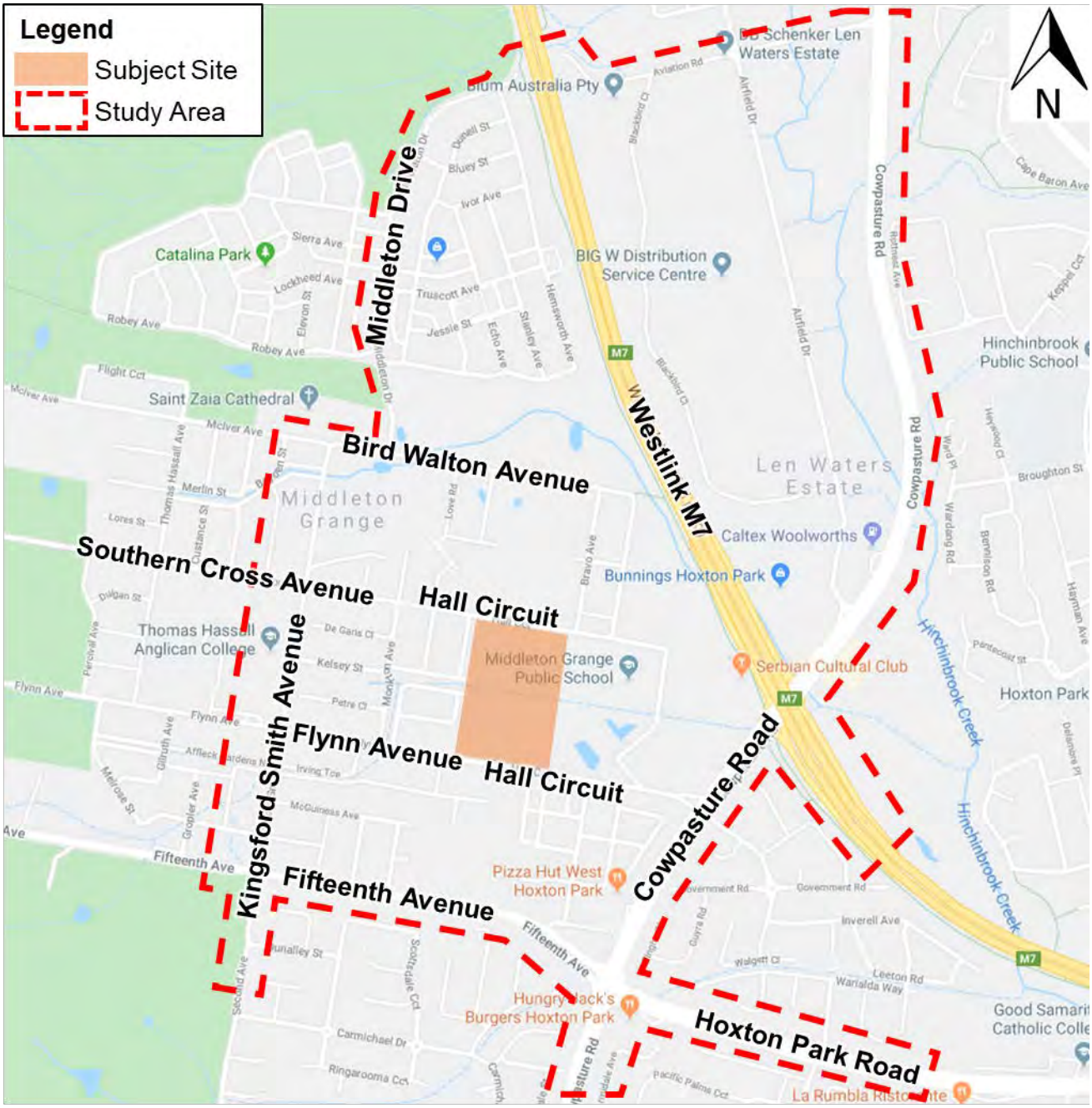
Pacific Planning Pty Ltd has engaged Bitzios Consulting to undertake a traffic assessment of the proposed development using the 2017 Base Aimsun Model for the assessment. This report summarises the outcomes of the traffic assessment.

1.2 Site Location and Study Area

The subject site is located at 60-80 Southern Cross Avenue and 45-65 Hall Circuit, Middleton Grange Town Centre, in the Liverpool Local Government Area, NSW. The study area and extent of the modelled network is bounded by Aviation Road in the north, Cowpasture Road in the east, Fifteenth Avenue in the south and Kingsford Smith Avenue in the west. Other roads within the study area include:

- Hoxton Park Road
- Westlink M7 Motorway (M7) on and off-ramps at Cowpasture Road
- Southern Cross Avenue
- Hall Circuit
- Flynn Avenue
- Bird Walton Avenue
- Middleton Drive.

The site location and study area are shown in Figure 1.1.



Adapted from Google Maps

Figure 1.1: Site Location and Study Area

2. EXISTING CONDITIONS

2.1 Subject Site

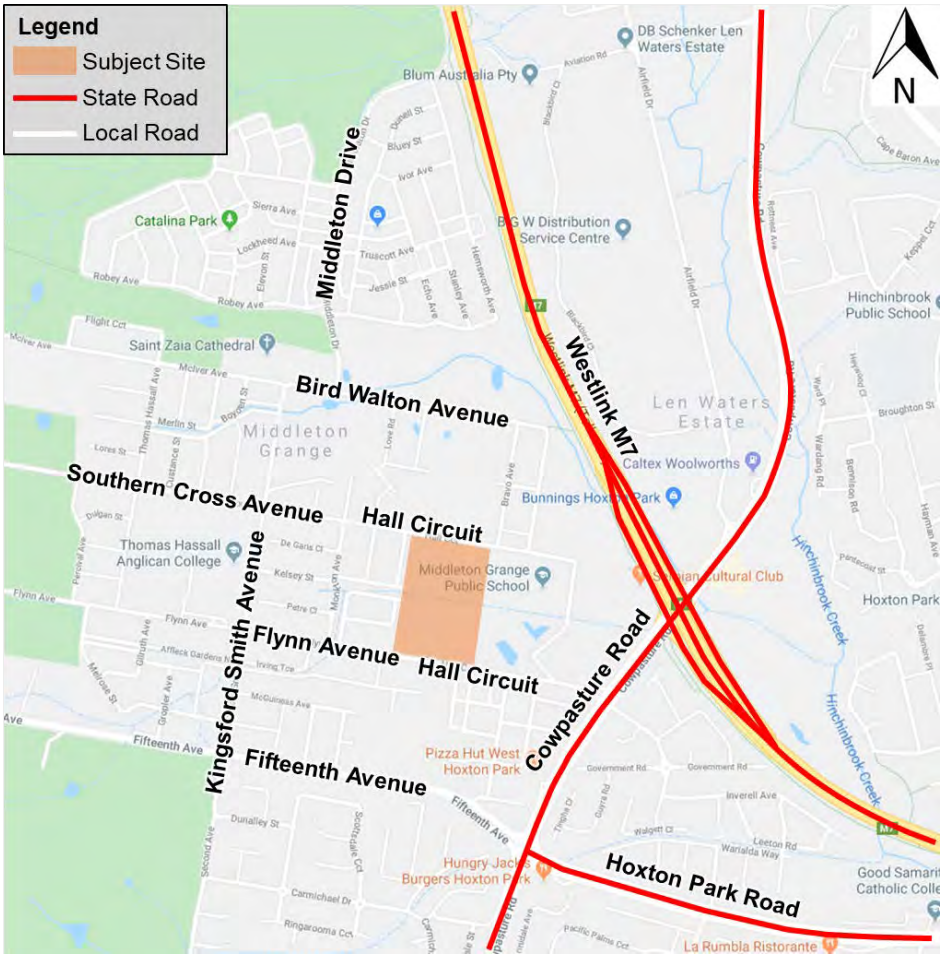
The subject site (1 to 6/-/DP1207518, 1/-/DP1078564 and 12/-/DP1108343) currently includes five single dwellings on predominantly greenfield land and is approximately 7.9 hectares in total. The land is currently zoned B2 Local Centre, R1 General Residential, RE1 Public Recreation and SP2 Drainage under the Liverpool Local Environmental Plan (LEP) 2008.

2.2 Road Network and Hierarchy

The road network contained within the study area includes a mix of state and local roads. Cowpasture Road, Hoxton Park Road and the M7 provide the primary connections between the study area and the wider road network. The classification of roads within the study area are as follows:

- State roads:
  - Cowpasture Road
  - Hoxton Park Road
  - M7.
- Local roads:
  - All other roads.

The study area's road hierarchy is illustrated in Figure 2.1.



Adapted from Google Maps

Figure 2.1: Road Hierarchy Within the Study Area

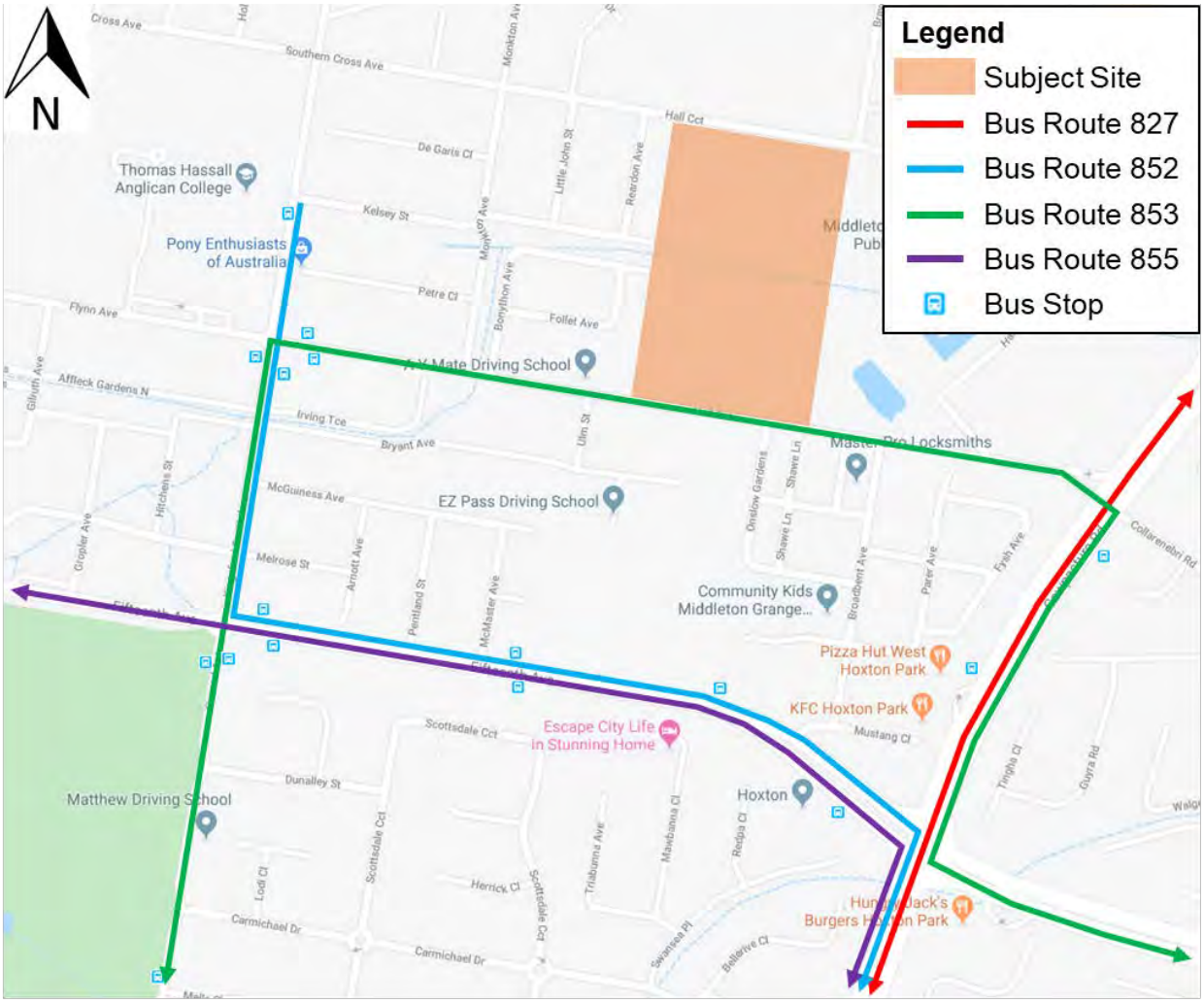
2.3 Public Transport Network and Services

2.3.1 Buses

The study area is serviced by three bus routes, all operated by Interline Bus Services. Routes and service frequencies are summarised in Table 2.1. A map of the bus routes is shown in Figure 2.2.

Table 2.1: Bus Routes and Frequency

Route No.	Route Description	Direction of Travel	Service Frequency
827	Carnes Hill Marketplace to Liverpool via Bonnyrigg Heights	Both directions	30 mins (daily)
852	Carnes Hill Marketplace to Liverpool via Greenway Dr & Cowpasture Rd	Carnes Hill Marketplace to Liverpool	1 service (late off-peak)
853	Carnes Hill to Liverpool via Hoxton Park Rd	Both directions	15-30 (peak periods) 60 mins (off peak periods, weekends and public holidays)
855	Rutleigh Park to Liverpool via Austral & Leppington Station	Both directions	7-9 services (Monday-Friday) 3-4 services (weekends and public holidays)



Adapted from Google Maps

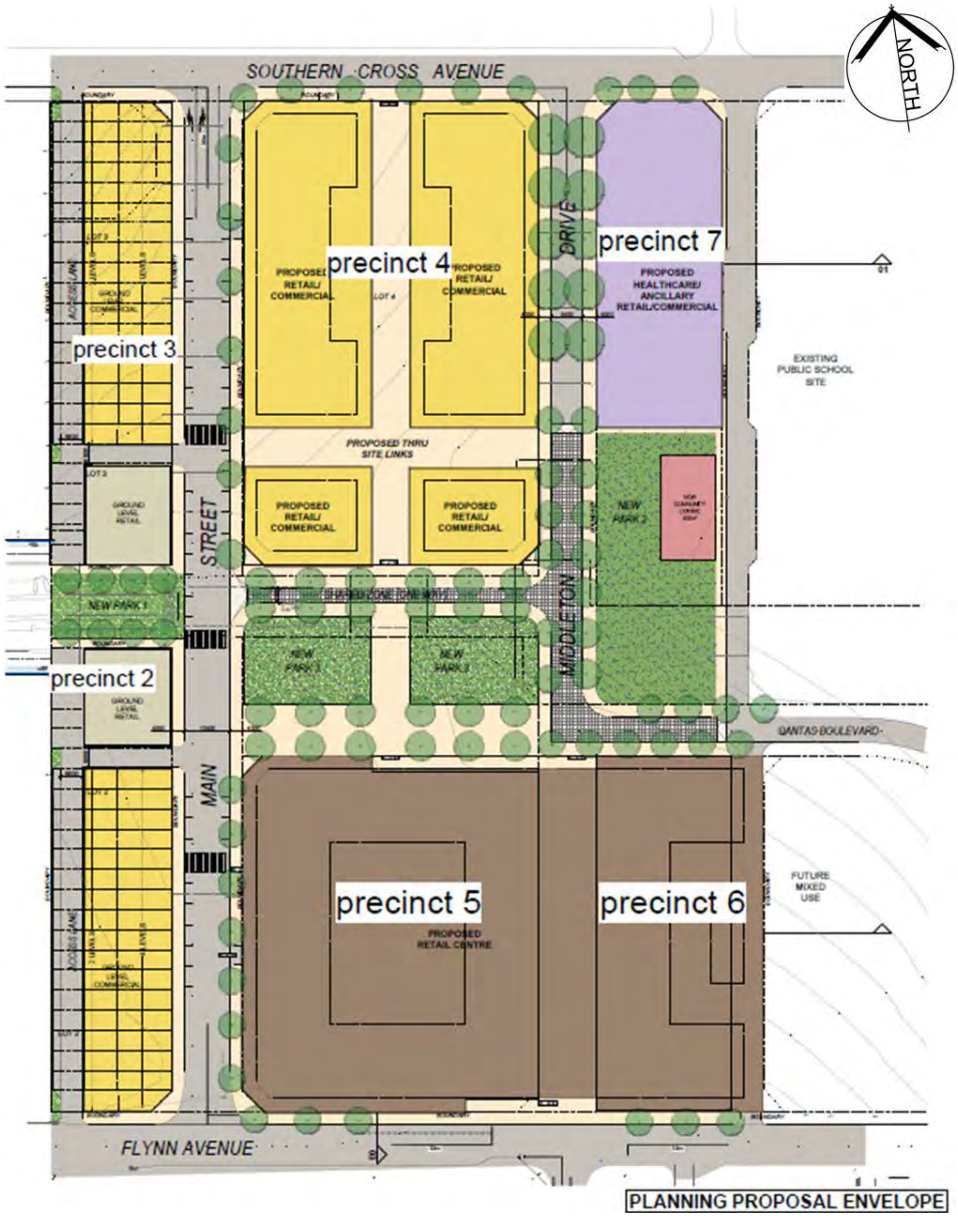
Figure 2.2: Bus Routes Near the Subject Site

3. DEVELOPMENT PROPOSAL

3.1 Development Description and Layout

The proposed development will be split into six precincts (or lots) with additional uses as follows and as shown in Figure 3.1:

- Precinct 2 – Ground level retail
- Precinct 3 – Ground level commercial
- Precinct 4 – Retail/commercial
- Precincts 5 and 6 – Retail centre
- Precinct 7 – Health care and ancillary retail/commercial
- Community centre
- Three parks.



Source: Proposed Concept Plans New Mixed Used Development (Christensen Obrien Architects, 24 September 2019)

Figure 3.1: Proposed Development Layout

3.2 Development Yields

A breakdown of the yield of each component of the proposed development is shown in Table 3.1.

Table 3.1: Proposed Development Components and Yields

Component	GFA (m^2)	Units
Ancillary health offices	1,964	-
Café restaurant	6,447	-
Childcare	505	-
Commercial-Entertainment	2,862	-
Community centre	500	-
Gymnasium	3,500	-
Imaging diagnostic	1,189	-
Major supermarket	2,600	-
Medical centre	1,175	-
Medical suites	7,012	-
Mini major	1,200	-
Neighbourhood shops	4,060	-
Office	7,023	-
Outpatients	1,189	-
Residential units	-	670
Retail shops	5,822	-
Soho ground floor	1,200	-
Total	**48,248**	**670**

Source: Traffic Impact Report For 60-80 Southern Cross Avenue and 45-65 (Hall Circuit) Flynn Avenue Middleton Grange (Lyle Marshall & Partners Pty Ltd, September 2019) Table 3.1a

The specific precinct yields are attached in **Appendix A.**

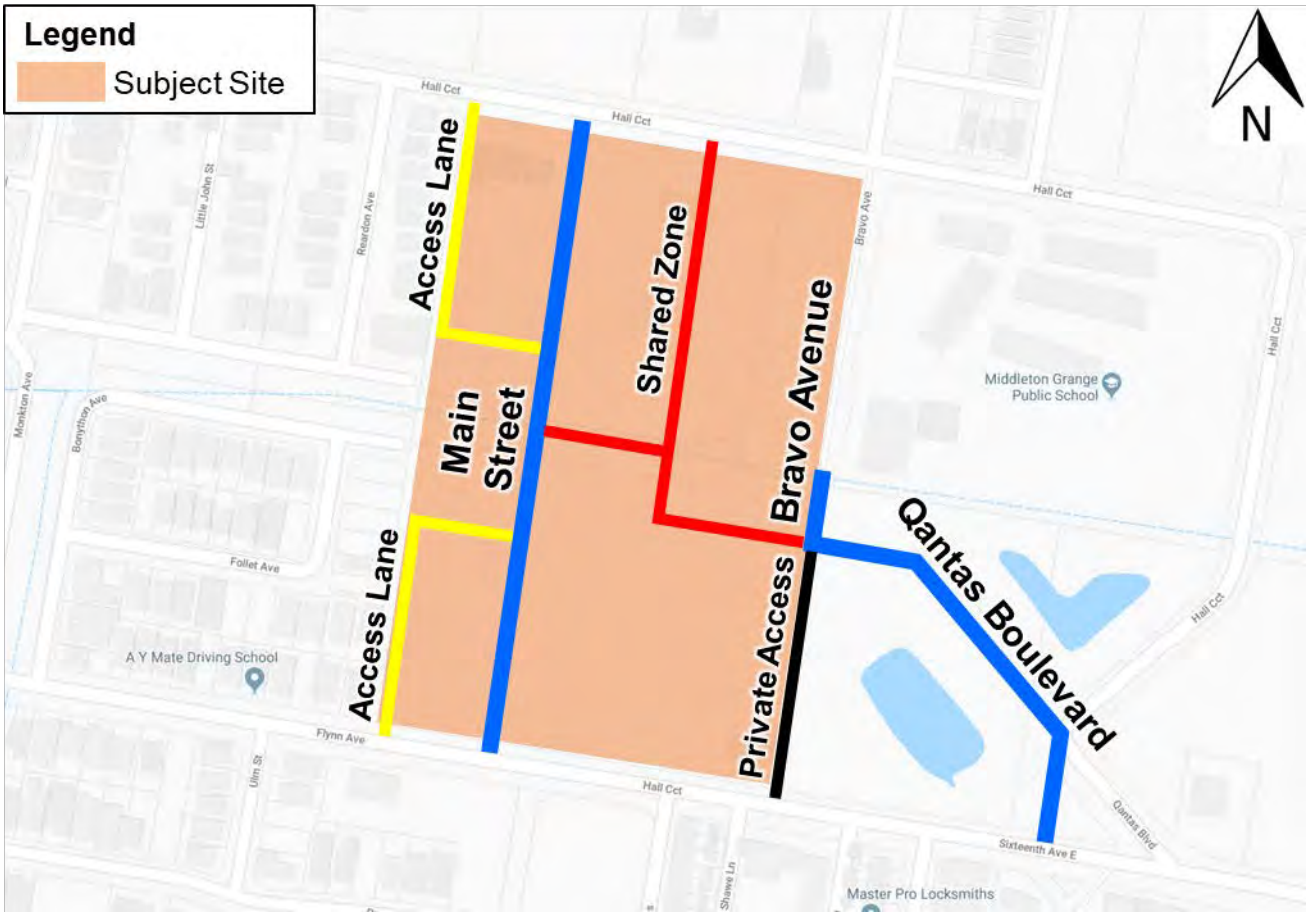
3.3 Internal Road Arrangement

The proposed road network within the development includes two primary north-south roads:

- Main Street linking both sides of Hall Circuit
- An extension of Bravo Avenue south to a new Qantas Boulevard alignment west and south to Sixteenth Avenue East.

There will also be shared zones from Main Street and Hall Circuit north to Qantas Boulevard and Bravo Avenue, two access lanes on the western side and a private access road for the Precinct 6 development on the south-eastern side.

The internal road layout is shown in Figure 3.2.



Source: Proposed Concept Plans New Mixed Used Development (Christensen Obrien Architects, 24 September 2019)

Figure 3.2: Proposed Internal Road Network

4. TRAFFIC GENERATION AND DISTRIBUTION

4.1 Background Traffic Growth

Background traffic growth was extracted from (Sydney Travel Forecasting Model) STFM sub-area matrices, provided by Roads and Maritime Services for the years 2018 and 2031. The STFM model outputs were based on 'LU16' forecasts for population and employment.

A number of assumptions were made in the processing of the STFM outputs:

- As the provided matrices were for two-hour peak periods in the AM and PM peak, a factor of **0.55** was applied to estimate the one-hour peak period demands
- The internal zone representing internal Middleton Grange traffic was removed from the calculation of the growth matrices because future development traffic within the study was calculated separately and added to the background growth
- A factor of **0.8** was applied to certain origin-destination pairs in the PM peak hour, to account for a spreading of traffic to outside of the peak hour period as drivers will naturally seek to avoid growing congestion during peak periods
- The O-D pairs which were factored down include:
  - North-south through traffic between Cowpasture Road (south) and Cowpasture Road (north)
  - East-west through traffic between Hoxton Park Road (east) and Fifteenth Avenue (west)
  - Turning traffic between Hoxton Park Road (east) and Cowpasture Road (south).

The future year (2031) base demand matrices were calculated considering the above and then adding the zone-to-zone growth between 2016 and 2031 from the STFM to the 2018 Base Aimsun model traffic demands.

4.2 LEP Traffic

For one of the modelled scenarios, named the **LEP Scenario**, the subject site is assumed to be developed according to what is currently achievable under the 2008 LEP under Clause 5.3 and the 'B2" designation. The development yields for this scenario were provided by Pacific Planning Pty Ltd and are shown below in Table 4.1.

Table 4.1: LEP Site Yields

Table 2008 LEP with Cl 5.3 Applied B2

Zone	Area(m2)	FSR	Height	Approx Potential GFA (m2)	Approx No Dwellings	Retail Space/Non Residential	RES GFA	Non Res GFA
R1-General Residential	15310	0.75:1	8.5	11482.5	122	0		
B2- Local Centre	42157	1:5:1 (Area 4)	18	63235	504	15808	58909	
RE1- Public Recreation	751	N/A	N/A	N/A				
Open Space not RE1	1249							
			Total	74717.5	626	15808		15808
			Total Res GFA + Non RES					74717

Source: Preliminary Traffic Assessment Report for 60-80 Southern Cross Avenue and 45-65 (Hall Circuit) Flynn Avenue Middleton Grange (Pacific Planning Pty Ltd, September 2019) Table 3.1c

4.3 Traffic Generation Rates

The traffic generation rates adopted were based on Pacific Planning Pty Ltd's preliminary traffic assessment report for the development (dated September 2019) as summarised in Table 4.2.

Table 4.2: Traffic Generation Rates

	Traffic Rate	Rate	AM Peak Period Rate		Traffic Rate	Rate	PM Peak Period	
Land Use			IN	OUT			IN	OUT
Residential	Council Advice	0.4 trips per dwelling	0.25	0.75	Council Advice	0.4 trips per dwelling	0.66	0.33
Retail	Council Advice	0.5 trips per 100m2 LFA			Council Advice	0.5 trips per 100m2 LFA		
Retail Supermarket/Mimi Major	RMS Guide To Traffic Generating Developments	155 A(SM)per 1000m2 Thurs Peak PM 0.1	0.1	0.1	RMS	155 A(SM)per 1000m2 Thurs Peak PM 0.9	0.5	0.5
Commercial	RMS	RMS 2.02/100M^2	0.80	0.20	RMS 1.63/100M^2	RMS 1.63/100M^2	0.2	0.8
Restaurant	RMS	5 per 100m2 PM Only				5 per 100m2 PM Only	0.5	0.5
Medical Centre	RMS/data	Based upon number of consulting rooms 2.22 trips per room	0.50	0.50	RMS/data	Based upon number of consulting rooms 2.22 trips per room	0.5	0.5
Childcare Centre	RMS/data	60 children at 0.8 trips per child over 2 hours	0.50	0.50	RMS/data	60 children at 0.7 trips per child over 2 hours	0.5	0.5
Gymnasium**	RMS/data	3 per 100m2 PM Only			RMS/data	3 per 100m2 PM Only	peak after 6pm	

Source: Preliminary Traffic Assessment Report for 60-80 Southern Cross Avenue and 45-65 (Hall Circuit) Flynn Avenue Middleton Grange (Pacific Planning Pty Ltd, September 2019) Table 3.1c

4.4 Traffic Generation

4.4.1 LEP Scenario Traffic

Based on the allowable yields under the LEP identified in Section 4.2, and the trip generation rates / splits in Section 4.3, the traffic generation presented in Table 4.4 was used for the LEP scenario.

Table 4.3: LEP Scenario Traffic Generation

Peak	Total Traffic Generated	Directional Traffic Splits	
		IN	OUT
AM	329 trips	102 trips	227 trips
PM	329 trips	207 trips	122 trips

4.4.2 Development Scenario Traffic

The traffic generation for this scenario was based on the above rates in Section 4.3 and the development components provided by Lyle Marshall & Partners Pty Ltd (dated 27 September 2019). The AM and PM peak hour traffic volumes in and out of each precinct are provided in Table 4.4 and Table 4.5 respectively.

Table 4.4: AM Peak Development Traffic Generation

Precinct	AM Peak Traffic Volume		Total Traffic Volume Generated
	In	Out	
2	9	10	19
3	9	10	19
4	85	103	188
5	111	103	214
6	61	42	103
7	156	74	230
Total In/Out Traffic Volume	**431**	**342**	**773**
Total In/Out Split	**56%**	**44%**	**100%**

Source: Scope of Work Attachment (Lyle Marshall & Partners Pty Ltd, September 2019) Figure 7A

Table 4.5: PM Peak Development Traffic Generation

Precinct	PM Peak Traffic Volume		Total Traffic Volume Generated
	In	Out	
2	38	34	72
3	38	34	72
4	167	157	324
5	199	206	405
6	131	146	277
7	106	171	277
Total In/Out Traffic Volume	**679**	**748**	**1,427**
Total In/Out Split	**48%**	**52%**	**100%**

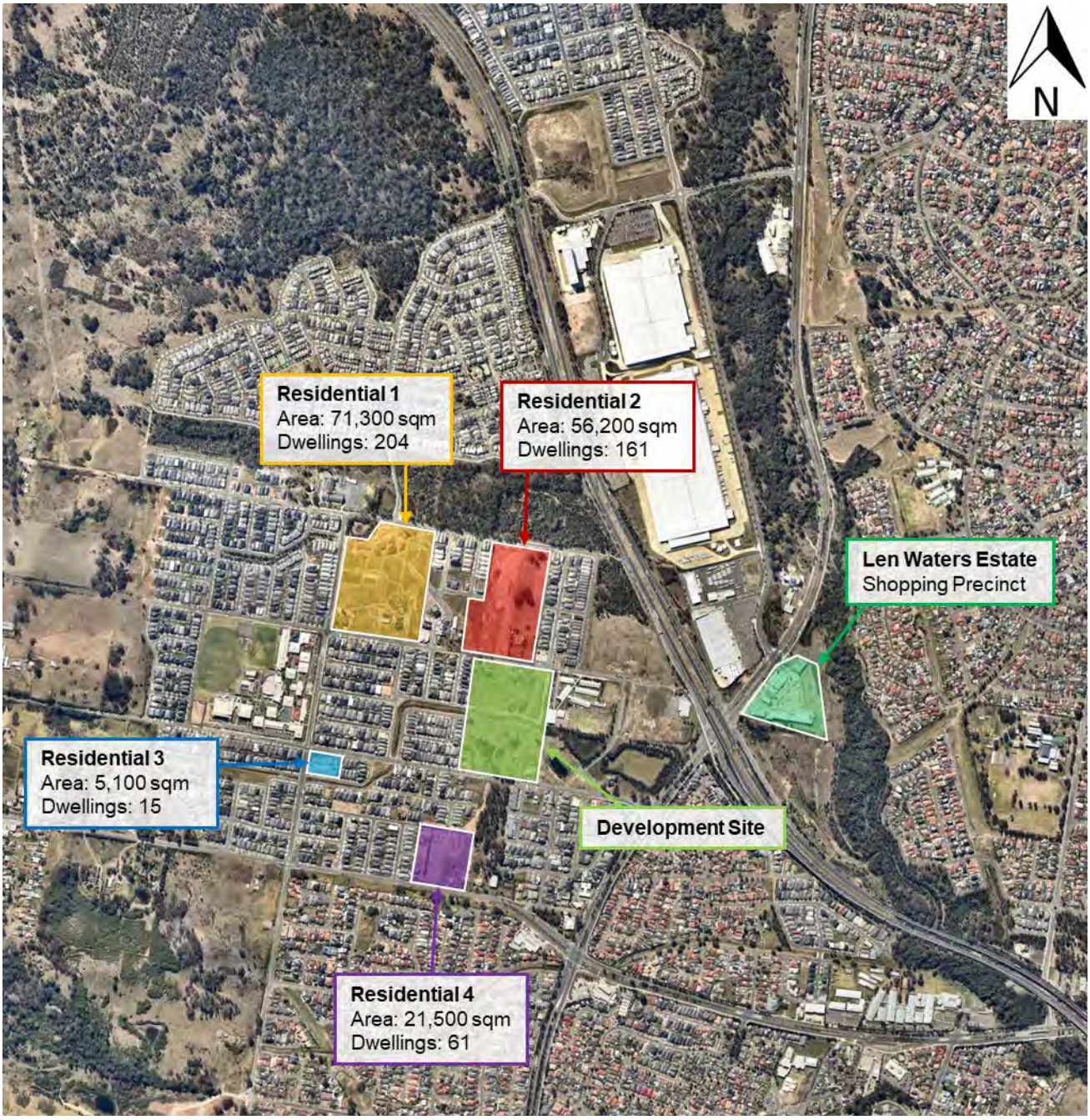
Source: Scope of Work Attachment (Lyle Marshall & Partners Pty Ltd, September 2019) Figure 7B

4.5 Other Surrounding Developments

4.5.1 Other Development Components

There are four other land areas in Middleton Grange that were both vacant and zoned for residential development under the Liverpool LEP 2008. These areas were assumed to be fully developed by 2030 and their traffic was included in the AIMSUN traffic modelling. Residential dwelling sites in Residential Areas 1, 2 and 4 were assumed to be 350m^2 in area and each dwelling site in Residential Area 3 was assumed to be 340m^2 in site area.

The study area also includes the Len Waters Estate located east of the Cowpasture Road/Airfield Drive intersection and which includes an ALDI, McDonalds, Oporto, Move Yourself and Guzman y Gomez. The locations of each development area are shown in Figure 4.1.



Adapted from Nearmap

Figure 4.1: Areas of Expected Development Within the Study Area

4.5.2 Traffic Generation – Other sites

The traffic generation for the residential development areas (numbered 1 to 4) was calculated based on the estimated number of residential dwellings in each area.

The following rates for low density dwelling were adopted from Roads and Maritime Services' Technical Direction TDT2013/4a:

- AM Peak: 0.99 trips per dwelling
- PM Peak: 0.95 trips per dwelling.

The total residential development traffic generation (not associated with the proposed development) is summarised in Table 4.6.

Table 4.6: Residential Development Peak Development Traffic Generation

Peak	Development	Total Trips Generated	Traffic Split		Directional Trips Generated	
			IN	OUT	IN	OUT
AM	Residential 1	194	25%	75%	49	146
	Residential 2	153			38	115
	Residential 3	14			4	11
	Residential 4	58			15	44
	TOTAL	**419**			**105**	**314**
PM	Residential 1	202	67%	33%	135	67
	Residential 2	159			107	52
	Residential 3	15			10	5
	Residential 4	60			40	20
	TOTAL	**436**			**292**	**144**

The Len Waters Estate Shopping Precinct is accessed via a new connection to the south-east at the Cowpasture Road / Airfield Drive traffic signals. From satellite imagery, the total area of the precinct was measured to be approximately 23,600 m^2. For the purpose of this assessment, it was assumed that 20% of the total area is allocated as Gross Leasable Floor Area (GLFA), amounting to 4,720 m^2.

The following rates for small suburban shopping centres were selected for estimation of the site's trip generation, based off surveys undertaken by Bitzios Consulting for Roads and Maritime for shopping centres under 10,000m^2:

- AM Peak: (0.066 * GLFA) + 126 trips
- PM Peak: (0.089 * GLFA) + 170 trips.

The total precinct traffic generation is summarised in Table 4.7.

Table 4.7: Shopping Precinct Peak Development Traffic Generation

Peak	Total Traffic Generated	Traffic Split		Directional Traffic Split	
		IN	OUT	IN	OUT
AM	438 trips	50%	50%	219 trips	219 trips
PM	590 trips	50%	50%	295 trips	295 trips

4.6 Trip Distribution

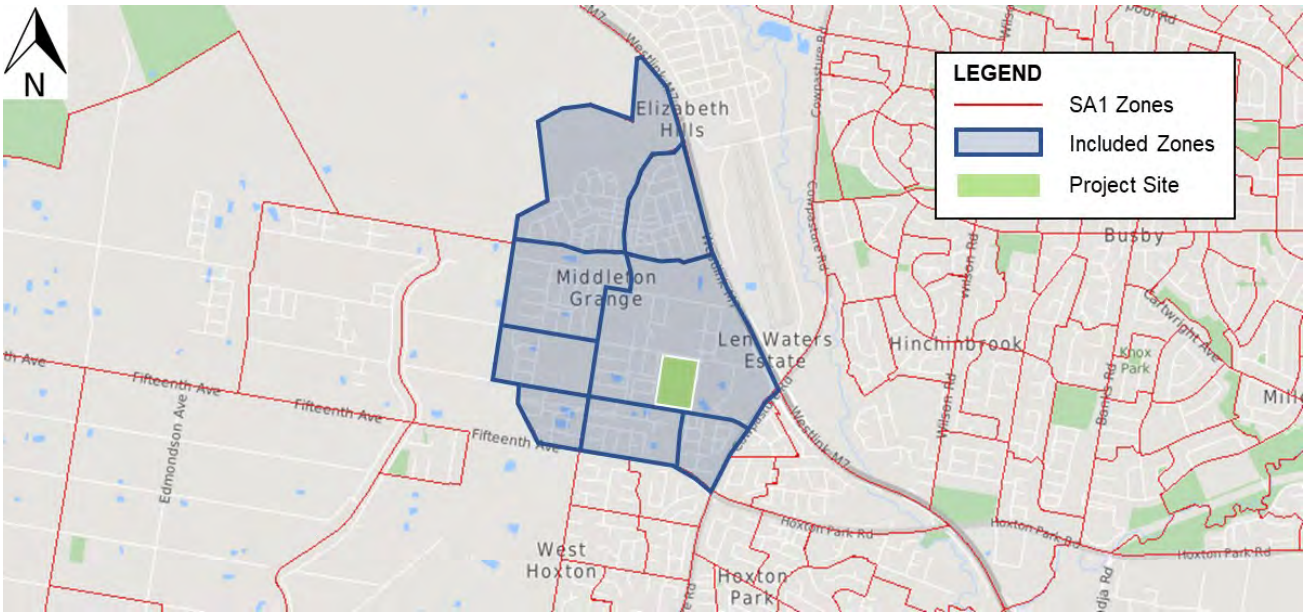
4.6.1 Methodology

The development trip distribution was estimated by comparing the following sources:

- 2016 Australian Bureau of Statistics (ABS) Census Journey to Work data
- Transport Performance and Analytics (TPA) 2018 and 2031 Sydney Strategic Traffic Forecasting Model (STFM) data.

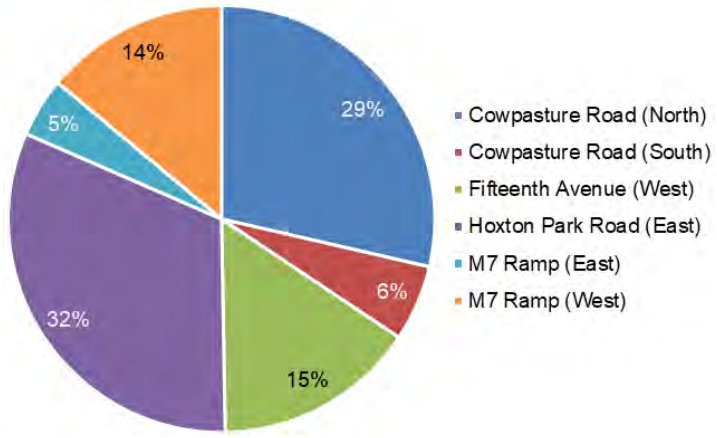
4.6.2 2016 Journey to Work Data

The Statistical Area Level 1 (SA1) regions included in the Journey to Work analysis are shown in Figure 4.2. The trip distribution of residents from and employees to these regions are shown in Figure 4.3 and Figure 4.4 respectively.



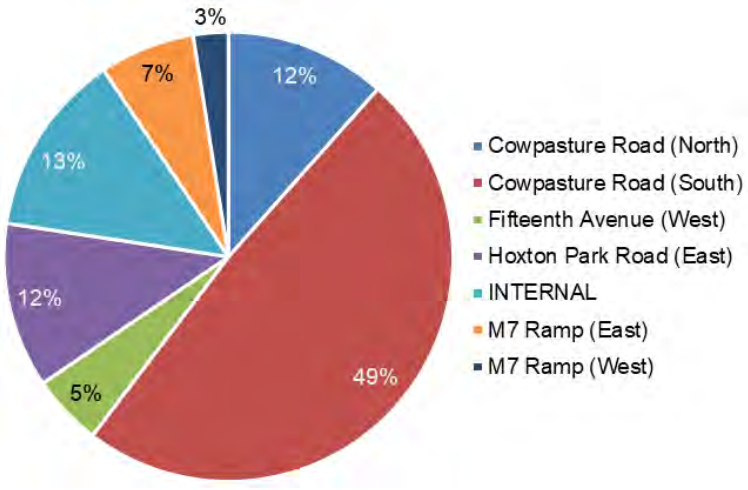
Source: https://itt.abs.gov.au/itt/r.jsp?ABSMaps

Figure 4.2: SA1 Regions Included in Journey to Work Analysis



Source: ABS TableBuilder 2016

Figure 4.3: Journey to Work Trip Distribution of Residents from Middleton Grange



Source: ABS TableBuilder 2016

Figure 4.4: Journey to Work Trip Distribution of Employees to Middleton Grange

The estimated traffic distribution as based on the JTW data is summarised in Table 4.8.

Table 4.8: JTW Estimated Trip Distributions

External Zone	AM Peak		PM Peak	
	In	Out	In	Out
Cowpasture Road (North)	12%	29%	29%	12%
Cowpasture Road (South)	49%	6%	6%	49%
Fifteenth Avenue (West)	5%	15%	15%	5%
Flynn Avenue (West)	0%	0%	0%	0%
Hoxton Park Road (East)	12%	32%	32%	12%
M7 Ramp (East)	7%	5%	5%	7%
M7 Ramp (West)	3%	14%	14%	3%
Second Avenue	0%	0%	0%	0%
Southern Cross Avenue (West)	0%	0%	0%	0%
Internal Zones	13%	0%	0%	13%

4.6.3 2018 and 2031 STFM Model Outputs

The STFM 'cordon' matrices for the study area was assessed to determine development traffic distribution assumptions for the AM (7:30-8:30am) and PM (4:45-5:45pm) peak periods. These were based on the proportions of the trip growth between the Middleton Grange (internal zone) and the wider road network (external zones) between 2018 and 2031.

The resulting combined traffic distribution of residents from the study area and employees to the study area are summarised in Table 4.9 for both peak periods.

Table 4.9: STFM 2018-2031 AM and PM Peak In/Out Trip Distribution

External Zone	AM Peak		PM Peak	
	In	Out	In	Out
Cowpasture Road (North)	10%	8%	11%	11%
Cowpasture Road (South)	2%	5%	8%	3%
Fifteenth Avenue (West)	16%	9%	11%	21%
Flynn Avenue (West)	3 %	1%	2%	2%
Hoxton Park Road (East)	29%	44%	39%	29%
M7 Ramp (East)	8 %	9%	7%	7%
M7 Ramp (West)	5%	7%	5%	6%
Second Avenue	18%	10%	9%	14%
Southern Cross Avenue (West)	9%	7%	8%	7%

4.6.4 Comparison between JTW and STFM distribution

The distributions based on JTW and STFM data were compared to ascertain the degree of difference between the two methodologies. It was found that the STFM distribution favoured origins and destinations along Hoxton Park Road to the east and Fifteenth Avenue to the west, with a lesser emphasis of Cowpasture Road to the south.

It was considered that the JTW data will not appropriately reflect the planned future expansion of Hoxton Park Road and Fifteenth Avenue to be a major east-west corridor with bus transit services. Furthermore, the planned Western Sydney Airport located in Badgerys Creek to the west is expected to significantly affect the existing traffic distribution of the area. The 2016 JTW data does not reflect these future changes.

The STFM distribution was determined to be the more appropriate source for the purpose of distributing trips to/from the future developments in the model.

4.7 Peak Hour Profiles

For a more sensitive release of traffic within the peak hour, 15-minute peak hour profiles were extracted from the base model traffic demand matrices for the study area. The profiles are presented in Table 4.10.

Table 4.10: Peak Hour Profiles – AM and PM Peak

Time Period	AM Peak	PM Peak
7:30 AM - 7:45 AM	24%	25%
7:45 AM - 8:00 AM	26%	23%
8:00 AM - 8:15 AM	26%	25%
8:15 AM - 8:30 AM	24%	26%

5. FUTURE NETWORK UPGRADES

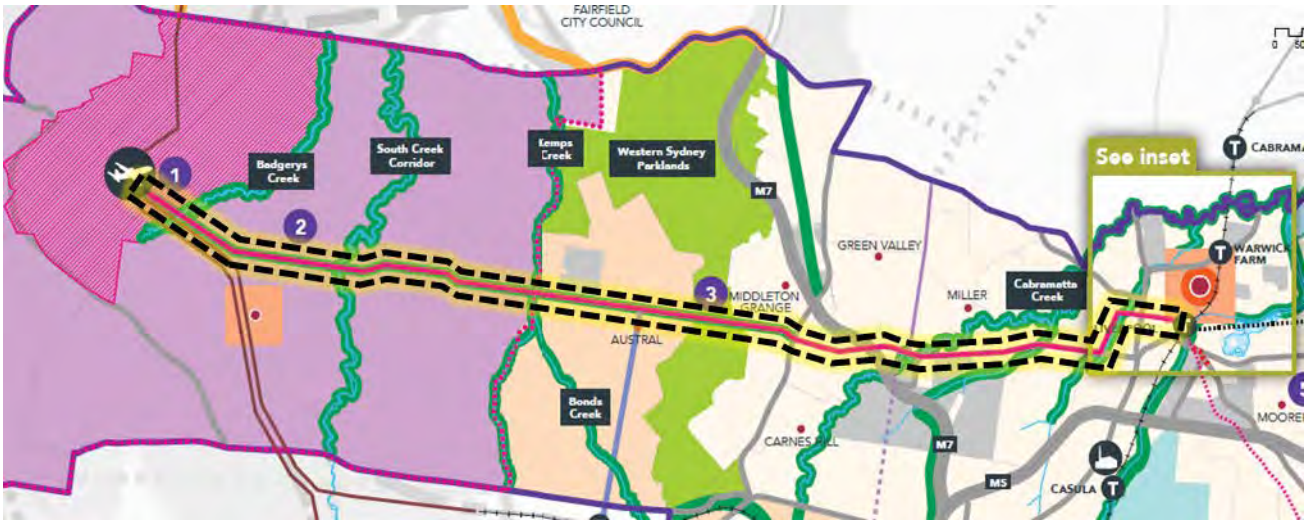
5.1 Overview

In conjunction with future development in the area and the new airport, the NSW Government and Council are committing to a number of upgrades to the surrounding road network. These upgrades are included in all future modelling scenarios.

The proposed network upgrades are detailed in the following sections. Preliminary schematic designs for the intersection upgrades are attached in **Appendix B.**

5.2 Fifteenth Avenue Smart Transit Corridor

The Fifteenth Avenue Smart Transit (FAST) Corridor is a key bus service corridor between the future Western Sydney International Airport and Liverpool Railway Station via Fifteenth Avenue, Hoxton Park Road and the existing T-way as shown in Figure 5.1 below. The corridor is to include a dedicated bus lane in each direction on Fifteen Avenue within the study area.



Source: Connected Liverpool 2050

Figure 5.1: Proposed Fifteenth Avenue Smart Transit Corridor

5.3 Fifteenth Avenue/Kingsford Smith Avenue/Second Avenue Signalised Intersection

The Fifteenth Avenue/Kingsford Smith Avenue/Second Avenue roundabout is proposed to be upgraded to a signalised intersection. Both Fifteenth Avenue approaches will have two general traffic lanes, a bus lane and a short right turn lane. Both the Kingsford Smith Avenue and Second Avenue approaches will have a left turn/through lane and a short right turn lane. Pedestrian crossings will be provided on all sides. Figure 5.2 shows the concept layout of this intersection.

Adapted from Nearmap

Figure 5.2: Proposed Fifteenth Avenue/Kingsford Smith Avenue/Second Avenue Signalised Intersection

5.4 Kingsford Smith Avenue/Flynn Avenue Signalised Intersection

The Kingsford Smith Avenue/Flynn Avenue roundabout is proposed to be upgraded to a signalised intersection. The north, east and west approaches will each have a left turn/through lane and a short right turn lane, and the south approach will have two lanes. Pedestrian crossings will be provided on all sides. Figure 5.3 shows the concept layout of this intersection.

Adapted from Nearmap

Figure 5.3: Proposed Kingsford Smith Avenue/Flynn Avenue Signalised Intersection

5.5 Cowpasture Road Widening between Hoxton Park Road/Fifteenth Avenue and Airfield Drive

To increase capacity of the primary north-corridor in the area, Cowpasture Road between Hoxton Park Road/Fifteenth Avenue and Airfield Drive will be widened from two through lanes to three through lanes in both directions. This will allow additional through traffic flow through the traffic signals along Cowpasture Road in this section.

5.6 Middleton Drive Road Realignment

Middleton Drive between Love Road and Little John Street will be extended north to the Bird Walton Avenue/McIver Road/Middleton Drive intersection and south to Hall Circuit at the north-western end of the subject site. Figure 5.4 shows the proposed alignment.

Adapted from Nearmap

Figure 5.4: Proposed Middleton Drive Road Realignment

5.7 Middleton Drive and Bird Walton Avenue roundabout

As a part of the re-alignment of Middleton Drive, the new intersection with Bird Walton Avenue is upgraded to be a single-lane roundabout, based on Liverpool City Council's advice that the subject intersection will be upgraded as a part of the subdivision of the adjacent allotment.

5.8 Middleton Drive-Aviation Road Connection

Middleton Drive and Aviation Road will be connected via a new road under the M7, providing an additional link between Cowpasture Road and Middleton Grange. The existing bicycle lanes west of the M7 will be relocated as a result.

6. PERFORMANCE ASSESSMENT CRITERIA

6.1 Performance Measures

Traffic performance measures were identified at the following three levels:

- **Intersection Level:** measures including delays and Level of Service (LoS) for each turning movement
- **Route Level:** including travel time and delays along key road sections
- **Network Level:** including travel time and distance travelled by all vehicles within the study area.

6.2 Intersection Measures

The following measures were proposed to evaluate the individual turning movements:

- Individual turning volumes
- Individual turning movement delay and overall intersection delay
- LoS for individual turning movements and intersections overall
- Average Queue Length on each approach of an intersection
- Maximum Queue Length on each approach of an intersection.

LoS is a measure of an intersection's operational performance and is related to the number of seconds vehicles are delayed at each approach. Table 6.1 shows the standard LoS criteria for intersection assessment.

Table 6.1: Intersection Level of Service Criteria

Level of Service	Average Delay (sec/veh)	Traffic Signals and Roundabouts	Give Way and Stop Signs
A	< 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals, incidents will cause excessive delays Roundabouts require other control mode	At capacity, requires other control mode
F	> 70	Flow breakdown; forced flow	Intersection failure

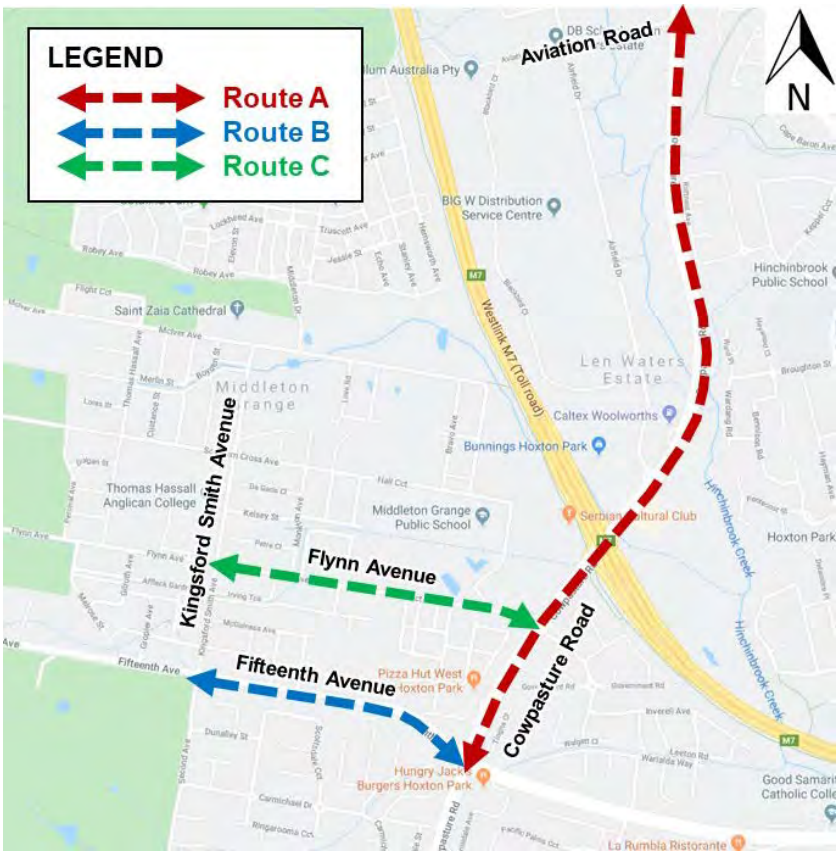
Source: Roads and Maritime Guide to Traffic Generating Developments (2002) Table 4.2

These criteria recommend that for signalised intersections, the LoS is given by the average vehicle delay for all movements, whereas for roundabouts and priority-controlled intersections with give way and stop signs, the LoS is determined by the movement with the highest delay.

6.3 Route Level

The following three travel routes, as also shown in Figure 6.1, provide measures of congestion within the study area:

- **Route A:** Cowpasture Road between Fifteenth Avenue and Aviation Road (northbound and southbound)
- **Route B:** Fifteenth Avenue between Kingsford Smith Avenue and Cowpasture Road (eastbound and westbound)
- **Route C:** Flynn Avenue between Kingsford Smith Avenue and Cowpasture Road (eastbound and westbound).



Adapted from Google Maps

Figure 6.1: Travel Time Survey Routes

6.4 Network Level

The following network performance measures have been used:

- Vehicle Kilometres Travelled (VKT)
- Vehicle Hours Travelled (VHT)
- Average network speed (km/h)
- Completed Trips at the end of the peak period
- Incomplete Trips at the end of the peak period
- Unreleased Trips at the end of the peak period.

At the end of each simulation, AIMSUN provides a summary of the above measures. In a congested network with a substantial number of unreleased trips, the VKT and VHT outputs were adjusted to account for unreleased trips.

7. 2030 NETWORK PERFORMANCE

7.1 Scenarios Assessed

Table 7.1 summarises the three scenarios assessed as part of the AIMSUN traffic modelling.

Table 7.1: Scenarios Assessed

Scenario	Description	AM	PM
2030 Do Minimum	▪ Background traffic growth only ▪ Other committed development traffic (Residential 1-4 and Len Waters Shopping Precinct) as per Figure 4.1 ▪ All network improvements committed by the NSW Government and Council as per Section 4.6.4	√	√
2030 With LEP Development	▪ 'Do Minimum' plus with development traffic as per the Liverpool LEP 2008 for the subject site	√	√
2030 With Proposed Development	▪ 'Do Minimum' plus with development traffic as per the revised development proposal for the subject site	√	√

7.2 Proposed Development Upgrades

In addition to the committed road upgrades detailed in Section 5, a number of further upgrades are proposed as a part of the subject site's development proposal. These upgrades are detailed in the following sub-sections, with schematic designs provided in **Appendix C.**

Furthermore, a future bus service was coded into the model demands, operating along the FAST corridor on Fifteenth Avenue with a 10-minute frequency in both directions.

7.2.1 Additional Eastbound Travel Lane

An additional eastbound travel lane will be provided on Flynn Avenue/Hall Circuit from the development site frontage to Cowpasture Road, which will increase the capacity of the main street servicing the development and allow it to accommodate the development traffic.

7.2.2 Hall Circuit south/Main Street Signalised Intersection

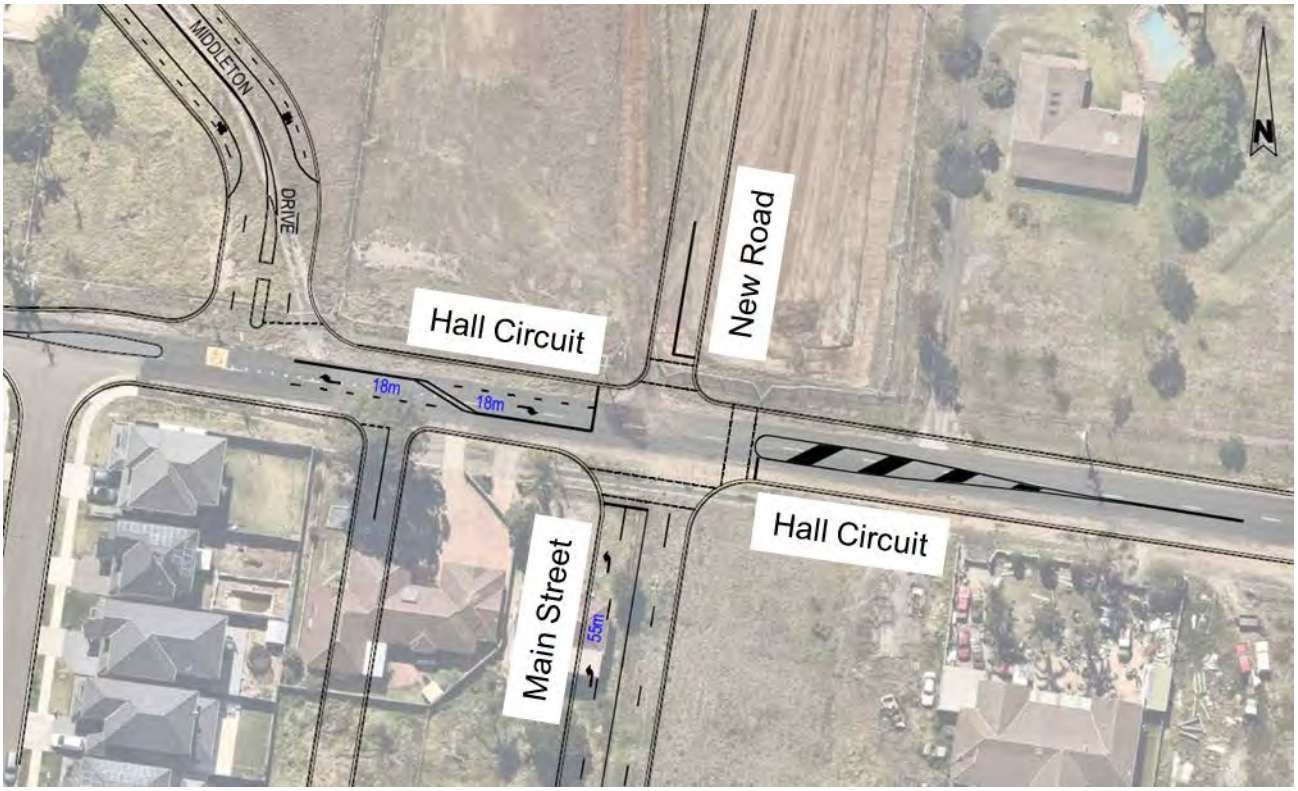
A new signalised T-intersection will be provided at Hall Circuit and the new Main Street at the southern end of the subject site. The north and west approaches will each have two lanes, and the east approach will have a through lane and a short right turn lane. Pedestrian crossings will be provided on all sides. Figure 7.1 shows the concept layout of this intersection.

Adapted from Nearmap

Figure 7.1: Proposed Hall Circuit south/Main Street Signalised Intersection

7.2.3 Hall Circuit north/Main Street Signalised Intersection

A new signalised intersection will be provided at Hall Circuit and the new Main Street at the northern end of the subject site. The north and east approaches will each have one lane, the south approach will have a short left turn lane and a through/right turn lane, and the west approach will have a through lane and a short right turn lane. Pedestrian crossings will be provided on the northern, eastern and southern sides. Figure 7.2 shows the concept layout of this intersection.

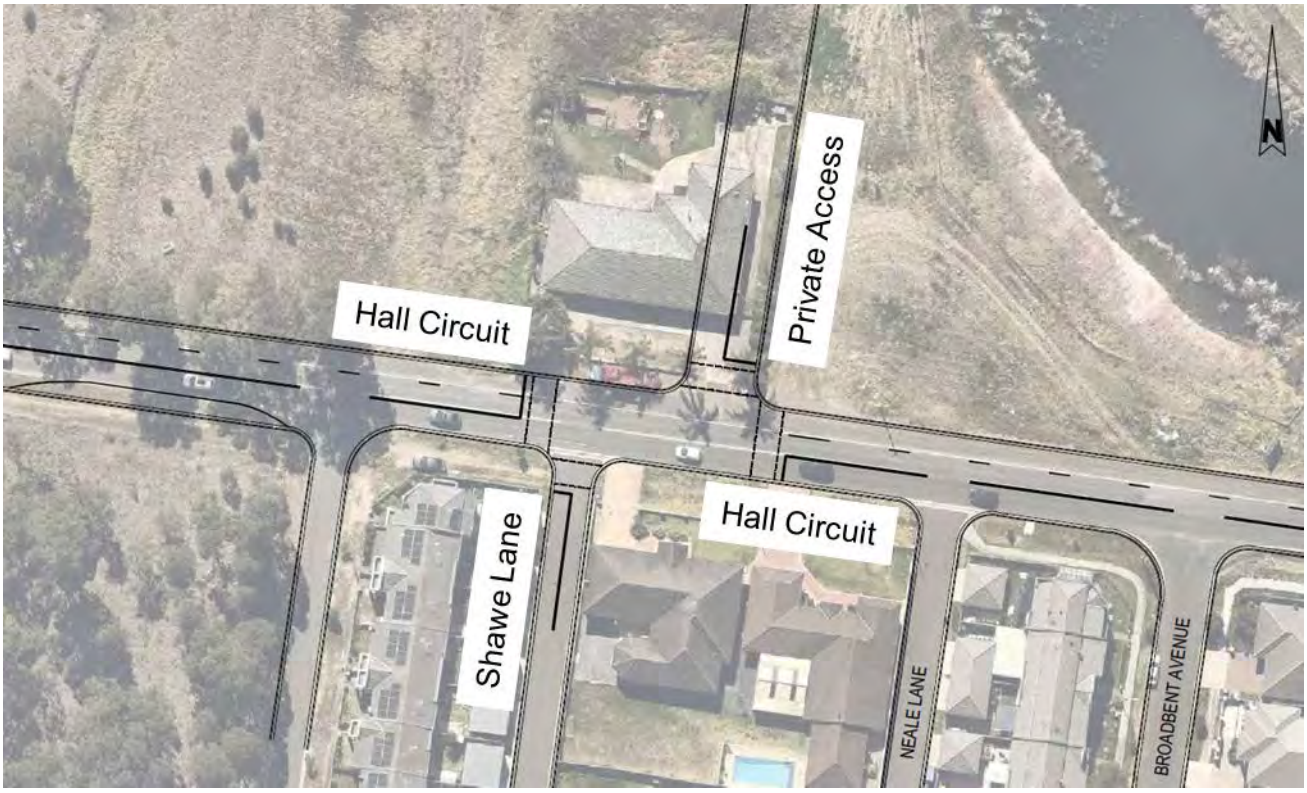


Adapted from Nearmap

Figure 7.2: Proposed Hall Circuit north/Main Street Signalised Intersection

7.2.4 Hall Circuit south/Shawe Lane/Private Access Signalised Intersection

A new signalised staggered T-intersection will be provided at Hall Circuit south/Shawe Lane and the Precinct 6 development private access road at the south-eastern of the development. The north, east and south approaches will have one lane, and the west approach will have two lanes. Pedestrian crossings will be provided on all sides. Figure 7.3 shows the concept layout of this intersection.



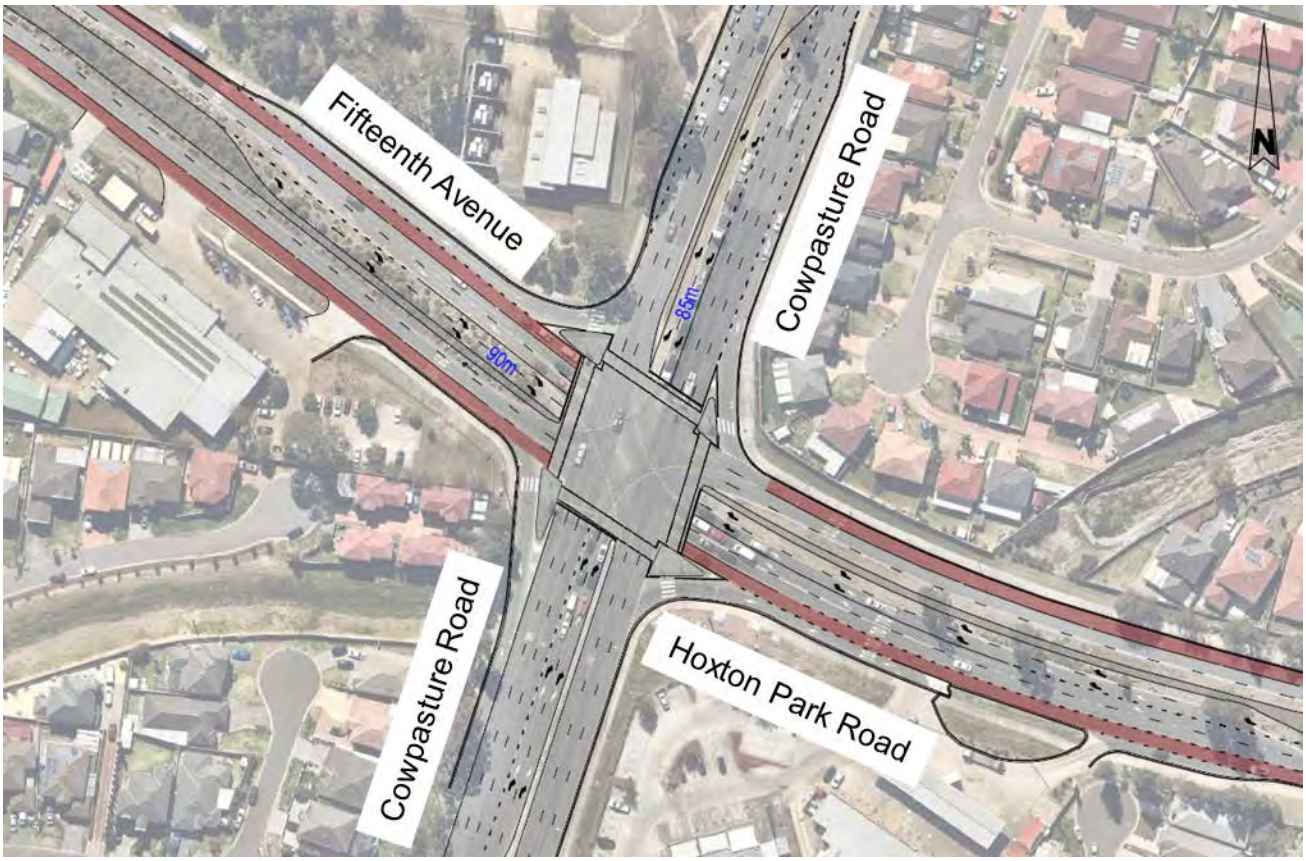
Adapted from Nearmap

Figure 7.3: Proposed Hall Circuit south/Shawe Lane/Private Access Signalised Intersection

7.2.5 Cowpasture Road/Hoxton Park Road/Fifteenth Avenue Intersection Upgrades

The Cowpasture Road/Hoxton Park Road/Fifteenth Avenue signalised intersection will have the following upgrades as shown in Figure 7.4:

- Bus lane along Hoxton Park Road and Fifteenth Avenue in both directions
- Additional short right turn lane from Cowpasture Road (north) into Fifteenth Avenue (west)
- Additional short right turn lane from Fifteenth Avenue (west) into Cowpasture Road (south).



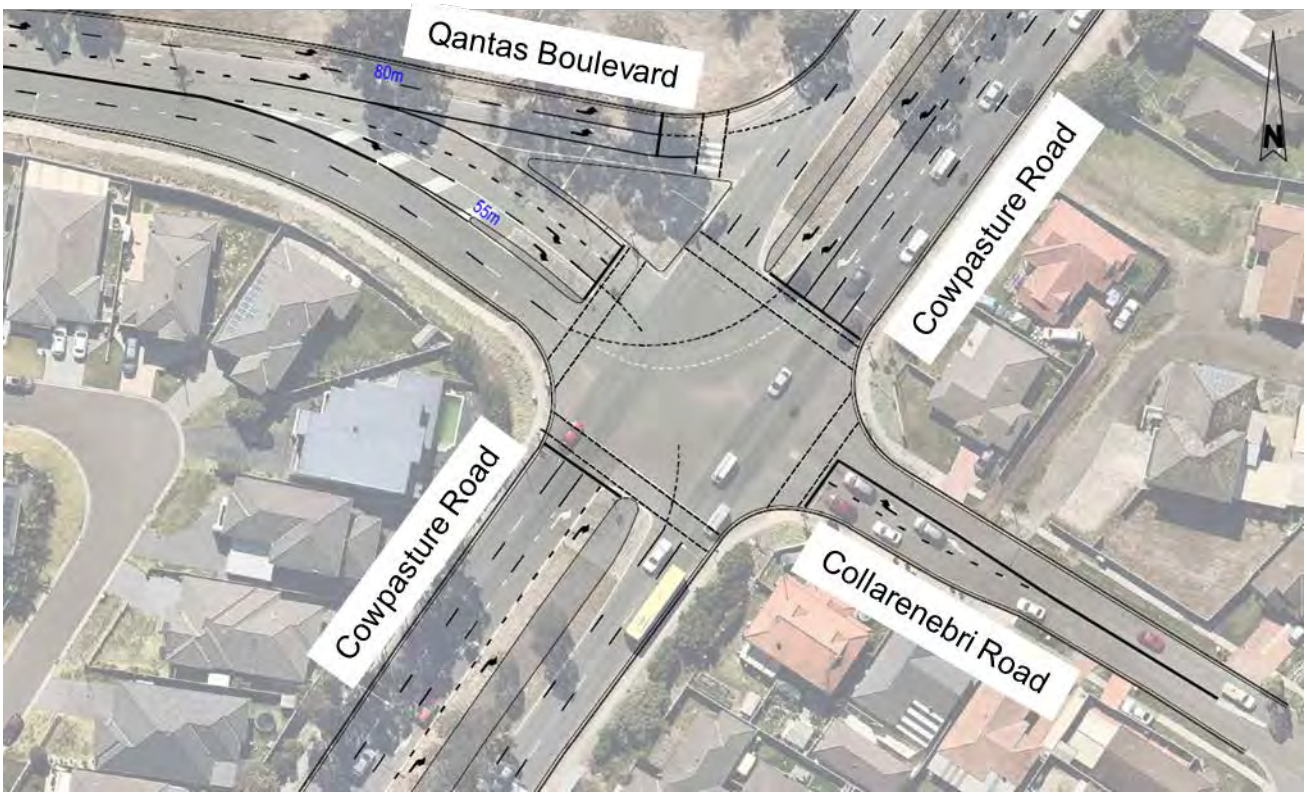
Adapted from Nearmap

Figure 7.4: Proposed Upgraded Cowpasture Road/Hoxton Park Road/Fifteenth Avenue Intersection

7.2.6 Cowpasture Road/ Collarenebri Road/Qantas Boulevard Intersection Upgrades

The Cowpasture Road/Hoxton Park Road/Fifteenth Avenue signalised intersection will have the following upgrades as shown in Figure 7.5:

- Additional through lane along Cowpasture Road in both directions
- Additional short right turn lane from Cowpasture Road (north) into Qantas Boulevard (west)
- Additional short right turn lane from Qantas Boulevard (west) into Cowpasture Road (south)
- Conversion of the left turn with care slip lane from Qantas Boulevard (west) into Cowpasture Road (north) to dual signalised left turn slip lanes with a pedestrian crossing.



Adapted from Nearmap

Figure 7.5: Proposed Upgraded Cowpasture Road/Collarenebri Road/Qantas Boulevard Intersection

7.3 Intersection Performance Outputs

7.3.1 Intersection Analysis

The performance comparison of the key network intersections is summarised in Table 7.2. The results from the three (3) scenarios are compared to show development impacts on network level of service. The detailed results are provided in Appendix D.

Table 7.2: Intersection Level of Service Comparison – AM and PM Peaks

Intersection	Level of Service					
	Do Minimum		LEP Development		Proposed Development	
	AM	PM	AM	PM	AM	PM
Cowpasture Road Flynn Avenue Collarenebri Road	B	C	B	C	B	B
Cowpasture Road Hoxton Park Road Fifteenth Avenue	B	B	B	B	B	B
Kingsford Smith Avenue Fifteenth Avenue Second Avenue	D	D	D	D	E	E
Kingsford Smith Avenue Flynn Avenue	C	B	C	B	D	C
Cowpasture Road Westlink M7	B	B	B	B	B	B
Cowpasture Road Airfield Drive	B	F	B	F	A	C
Main Street Flynn Street	A	A	B	A	A	A

The key findings are summarised below:

- Overall results indicate that the Do Minimum future base network operates at mostly optimal levels of service, with the exception of the Cowpasture Road / Airfield Drive intersection (which experiences some delays due to the addition of the eastern approach connecting to the new shopping precinct)
- Likewise, the LEP development scenario exhibits largely similar results, with some minor decreases in LOS observed
- The proposed development scenario, including the accompanying upgrades, is not observed to result in any significant decrease in intersection level of service at any of the key intersections
- The LOS of the Cowpasture Road / Airfield Drive intersection during the PM peak improves to LOS C in the proposed development scenario, from LOS F in both the Do Minimum and LEP development scenarios. The improvements are attributed to reduction in the PM peak southbound queues on Cowpasture Road as shown in Figure 7.6.
- The LOS of the new traffic signals at the Kingsford Smith Avenue / Fifteenth Avenue / Second Avenue intersection decreases from LOS D in the Do Minimum and LEP development scenarios to LOS E in the proposed development scenario due to an increase in overall intersection delays by approximately 15 seconds.

Figure 7.6: Queues Southbound on Cowpasture Road

7.3.2 Middleton Drive and Aviation Road Connection

The connection of Middleton Drive and Aviation Road under the M7 will attract up to 400 vehicles from the Cowpasture Road north-south corridor by providing an alternative access / exit from the Middleton Grange catchment. This will alleviate the traffic pressure at the Cowpasture Road / Flynn Avenue intersection, particularly the left-turn traveling northbound during the AM peak period.

The connection also improves network connectivity by servicing traffic predominantly from the northern side of the study area.

7.3.3 Development Site Access Intersections

The three (3) traffic signals proposed as part of the development site access points were found to exhibit a satisfactory intersection performance capable of accommodating the development traffic. The performance at these intersections show minimal delays, with overall intersection performance operating at an optimal LOS A to B.

7.4 Route Performance Outputs

Average vehicle travel times through each section of route identified in Section 6.1.2 were extracted from the models. The travel time graphs are provided in **Appendix E** and described below.

The AM northbound travel time along Route A (the Cowpasture Road north-south corridor) is shown in Figure 7.7. The graph indicates that there is minimal difference between the three (3) scenarios in terms of northbound travel time. Overall, the Proposed Development scenario shows the quickest travel times, with overall durations of between 5 and 6 minutes for the length of the route.

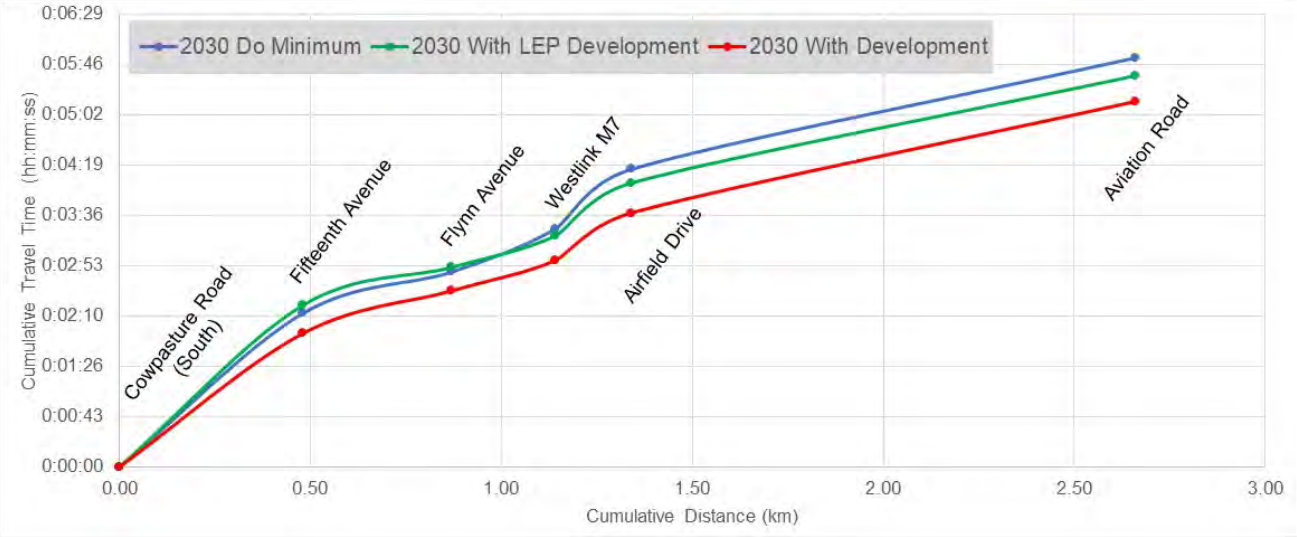


Figure 7.7: AM Travel Time – Route A Northbound

The AM eastbound travel time along Route B (the Fifteenth Avenue east-west corridor) is shown in Figure 7.8. The graph indicates that while there is minimal difference in travel times between the Do Minimum and LEP development scenarios, there is an increase in travel time of approximately one minute for the Proposed Development scenario. This is primarily due to delays at the Fifteenth Avenue / Kingsford Smith Avenue intersection, due to the additional eastbound demand during the morning peak. It is noted that past the Kingsford Smith Avenue intersection, the travel time remains largely consistent with the other scenarios.

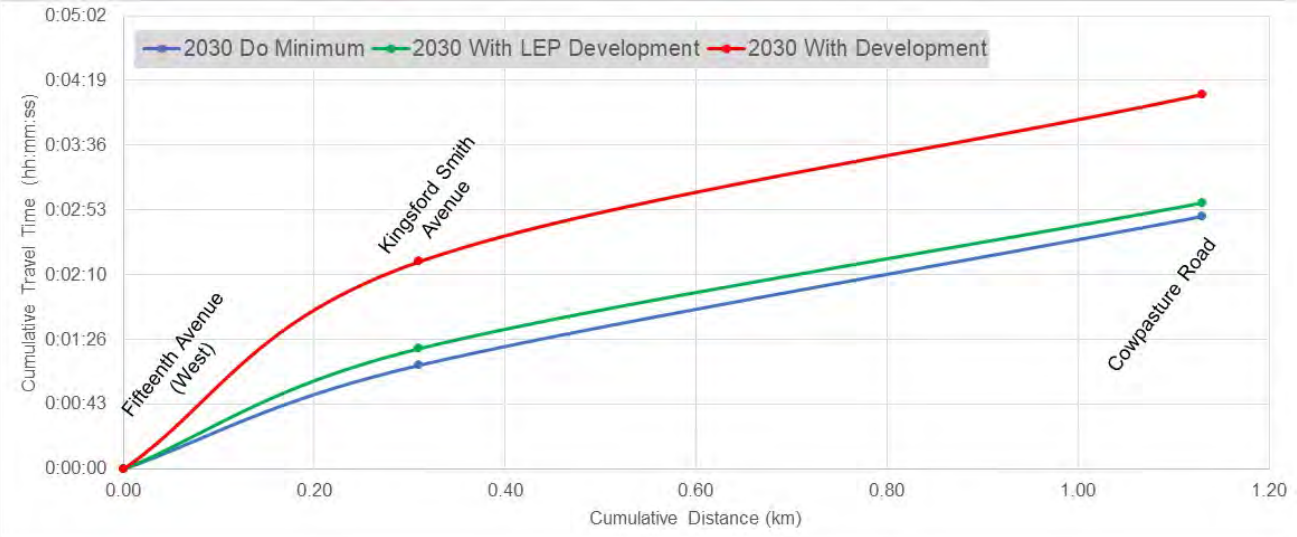


Figure 7.8: AM Travel Time – Route B Eastbound

The AM eastbound travel time along Route C (the Flynn Avenue east-west street which will service development traffic) is shown in Figure 7.9. There is a sizeable increase in travel time for the LEP Development scenario relative to the Do Minimum scenario. This is reflective of the increased eastbound traffic which is constrained by the existing layout at the Cowpasture Road intersection (i.e. with its single short right turn bay).

Conversely, the Proposed Development scenario exhibits similar travel times as the Do Minimum scenario, which is indicative that the proposed road upgrades to accompany the development are capable of mitigating travel time impacts and accommodating the development traffic demands.

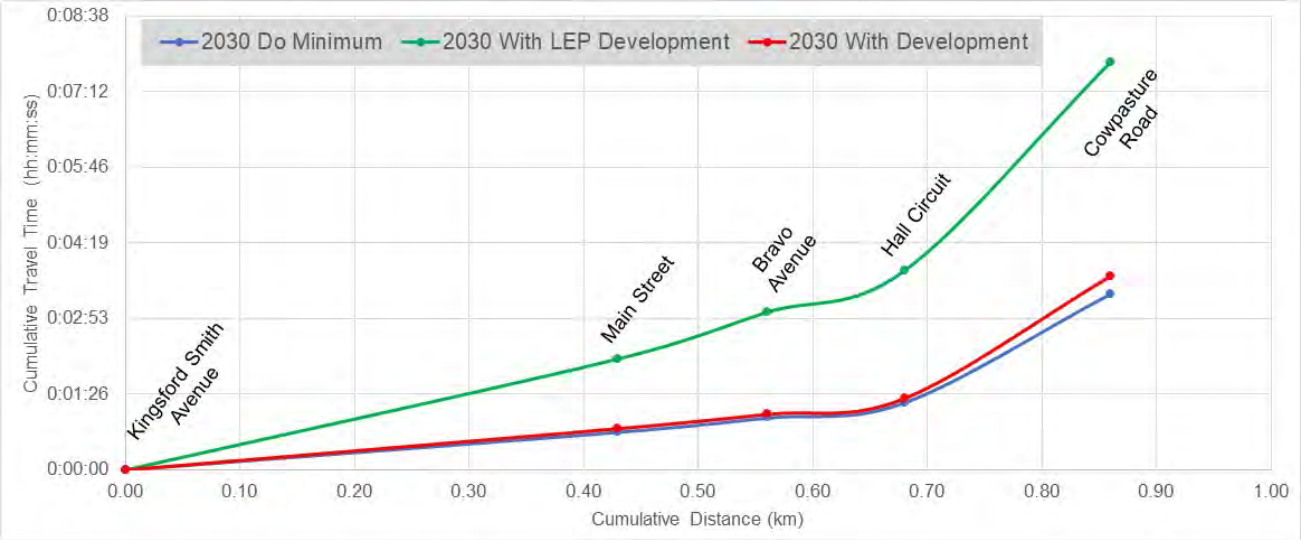


Figure 7.9: AM Travel Time – Route C Eastbound

The PM southbound travel time along Route A is shown in Figure 7.10 below. A significant decrease in travel time for the southbound movement is observed in for the Proposed Development scenario relative to the other cases, with the Do Minimum and LEP development scenarios having similar travel times. This is expected to arise primarily due to the provision of the right-turn bay on the north approach of the Cowpasture Road / Fifteenth Avenue / Hoxton Park Road traffic signals. The increased right turners due to increased future demand for westbound traffic resulted in overspilling of the existing single right turn bay, causing friction in the southbound traffic stream. This is alleviated significantly by the proposed upgrades under the Proposed Development scenario.

Figure 7.10: PM Travel Time – Route A Southbound

7.5 Network Performance Outputs

The network statistics for all three (3) scenarios in the modelled AM and PM peak hours are summarised in Table 7.3. The statistics extracted from model results include Vehicle Hours Travelled (VHT) and Vehicle Kilometres Travelled (VKT), as well as the average speed through the network.

Table 7.3: 2030 With Development 1 Intersection Performance – AM and PM Peaks

Measure	2030 Do Minimum		2030 With LEP Development		2030 With Proposed Developments	
	AM	PM	AM	PM	AM	PM
Total Input Flow (veh)	11,525	10,447	11,658	10,788	12,183	11,984
Total Travel Time (hr)	790	872	875	949	894	992
Total Distance (km)	22,931	20,473	23,139	21,016	23,851	23,043
Total Delay (hr)	75	84	93	93	96	97
Average Speed (km/hr)	29.0	23.5	26.5	22.1	26.7	23.2
Average Travel Time (min)	4.2	5.0	4.6	5.3	4.5	5.0
Average Distance (km)	2.0	2.0	2.0	1.9	2.0	1.9
Average Delay (s)	24	29	30	31	29	29
Unreleased Trips (veh)	114	0	265	0	192	0
Stops (occurrences)	15,710	15,540	18,409	18,063	19,747	21,970
Completed Trips (veh)	11,416	10,113	11,477	10,431	12,055	11,707

The overall findings are summarised below:

- VHT and VKT both increase with the Proposed Development scenario due to the increase in traffic demands
- Total delay time experienced by vehicles in the network increases with the Proposed Development, which is expected due to the higher volume of vehicles serviced by the network
- While the average vehicle delay in the Proposed Development scenario is higher than the Do Minimum scenario, it is shown to be slightly lower than in the LEP development scenario
- A significant number of additional trips are completed during the Proposed Development scenario model runs, with minimal unreleased trips in the AM peak and no unreleased trips in the PM peak for all scenarios.

8. CONCLUSIONS

Key conclusions from the assessment of the traffic impacts of the proposed development at 60-80 Southern Cross Avenue and 45-65 Hall Circuit Middleton Grange are:

- The scheme includes a total of 670 residential dwellings and variety of commercial, retail and recreational uses.
- The "2030 with LEP development" was tested based on the current LEP and including identified Council and State Government Infrastructure upgrades. This scenario showed that under these conditions the network was constrained and operating at near capacity.
- The "2030 with proposed development" modelling demonstrates that with the development's proposed road network upgrades that the network will operate with spare capacity.
- The "2030 with proposed development" modelling generally demonstrates a reduction in travel time and an improvement in level of service for the key intersections across the network compared to the "2030 Do Minimum" and "2030 with LEP development" scenarios.

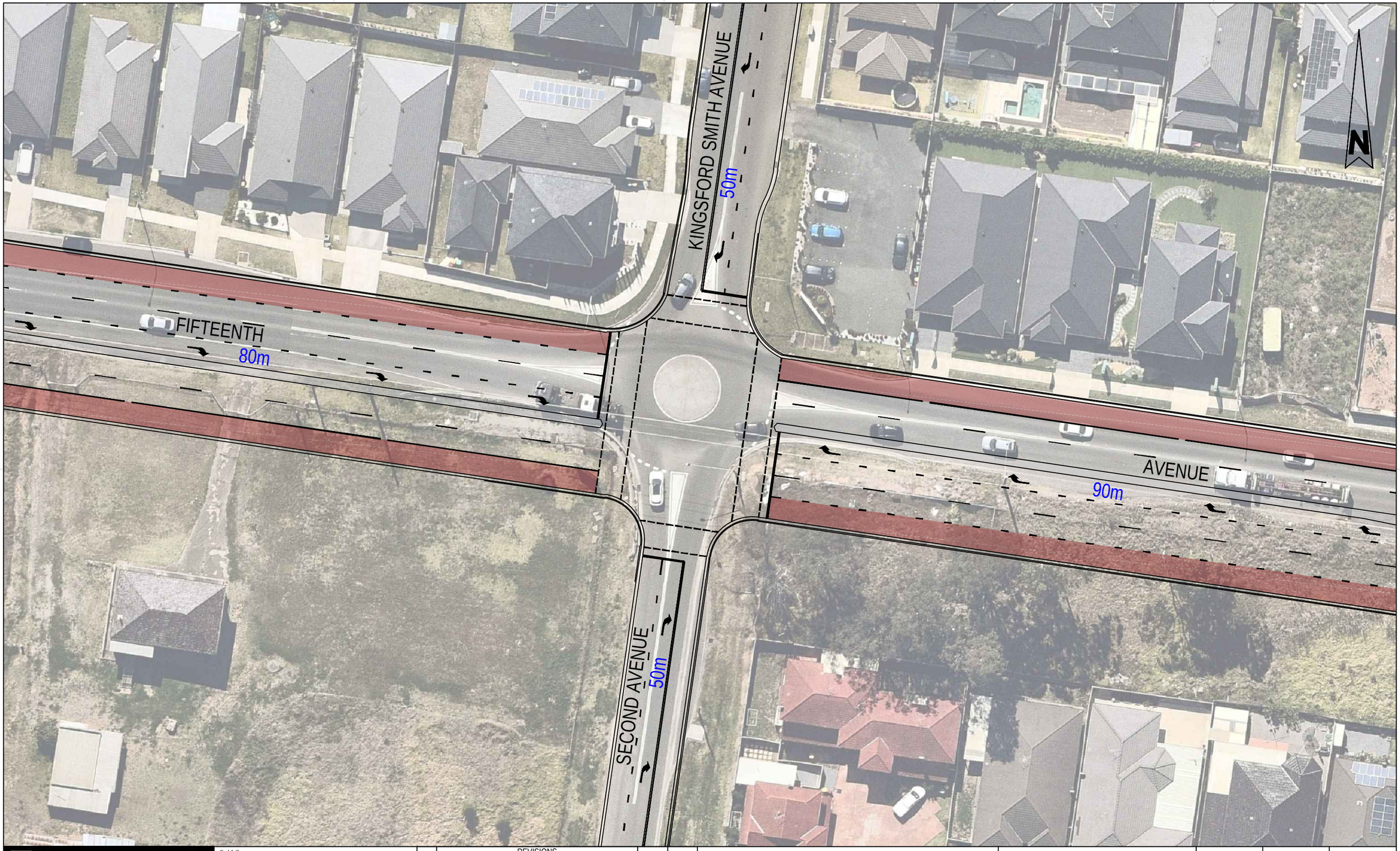
Appendix A: Precinct Yields

Table 3.1b PROPOSED Summary Of Uses and Areas

SUMMARY

Location	Uses	Area M^2	No of Units
Precinct Lot 2	Neighbourhood shops	2030	
	Café Restaurant	718	
	Ground Floor Soho	600	
	Residential Terrace		17
	Residential Shop Top		12
	Total	**3348**	
Precinct Lot 3	Neighbourhood shops	2030	
	Café Restaurant	724	
	Ground Floor Soho	600	
	Residential Soho		
	Residential Terrace		17
	Residential Shop Top		12
	Total	**3354**	
Precinct Lot 4	Retail Shops	1790	
	Café Restaurant	2000	
	Commercial/Entertainment	2862	
	Childcare Centre	505	
	Residential		292
	Total	**7157**	
Precinct Lot 5	Major Supermarket	2600	
	Liquor Store	300	
	Retail Shops	2600	
	Café Restaurant	1000	
	Gymnasium	3500	
	Office	4135	
	Residential		241
Total GFA	**Total**	**14135**	
Precinct Lot 6	Mini Major	1200	
	Café-Retail	1500	
	Retail Shops	580	
	Office	2888	
	Residential		79
Total GFA	**Total**	**6168**	
Precinct Lot 7	Medical Centre **	1175	
	Retail	552	
	Café Restaurant	505	
	Imaging Diagnostic	1189	
	Ancillary Health Offices	1964	
	Medical Suites-offices	7012	
	Outpatients	1189	
	Total	**13586**	
Parkland*	Community Centre	500	
		48248	**670**

Appendix B: Committed Road Network Upgrades



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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	INTERSECTION LAYOUT	G.Y	24.10.2019

Scale @ A3 0 5 10 15 20 25 1:500

Project: P4356
60 - 80 Southern Cross Avenue
Middleton Grange

Title: Intersection Layout Concept
Fifteenth Avenue, Second Avenue &
Kingsford Smith Avenue

Design	Drawn	Checked
J.Y	G.Y	A.A

PRELIMINARY

Date: 24.10.2019

Project Number	Sheet Number	Issue
P4356	1	001

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	INTERSECTION LAYOUT	G.Y	24.10.2019

Scale @ A3 0 5 10 15 20 25 1:500

Project
P4356
60 - 80 Southern Cross Avenue
Middleton Grange

Title
Intersection Layout Concept
Flynn Avenue & Kingsford Smith Avenue

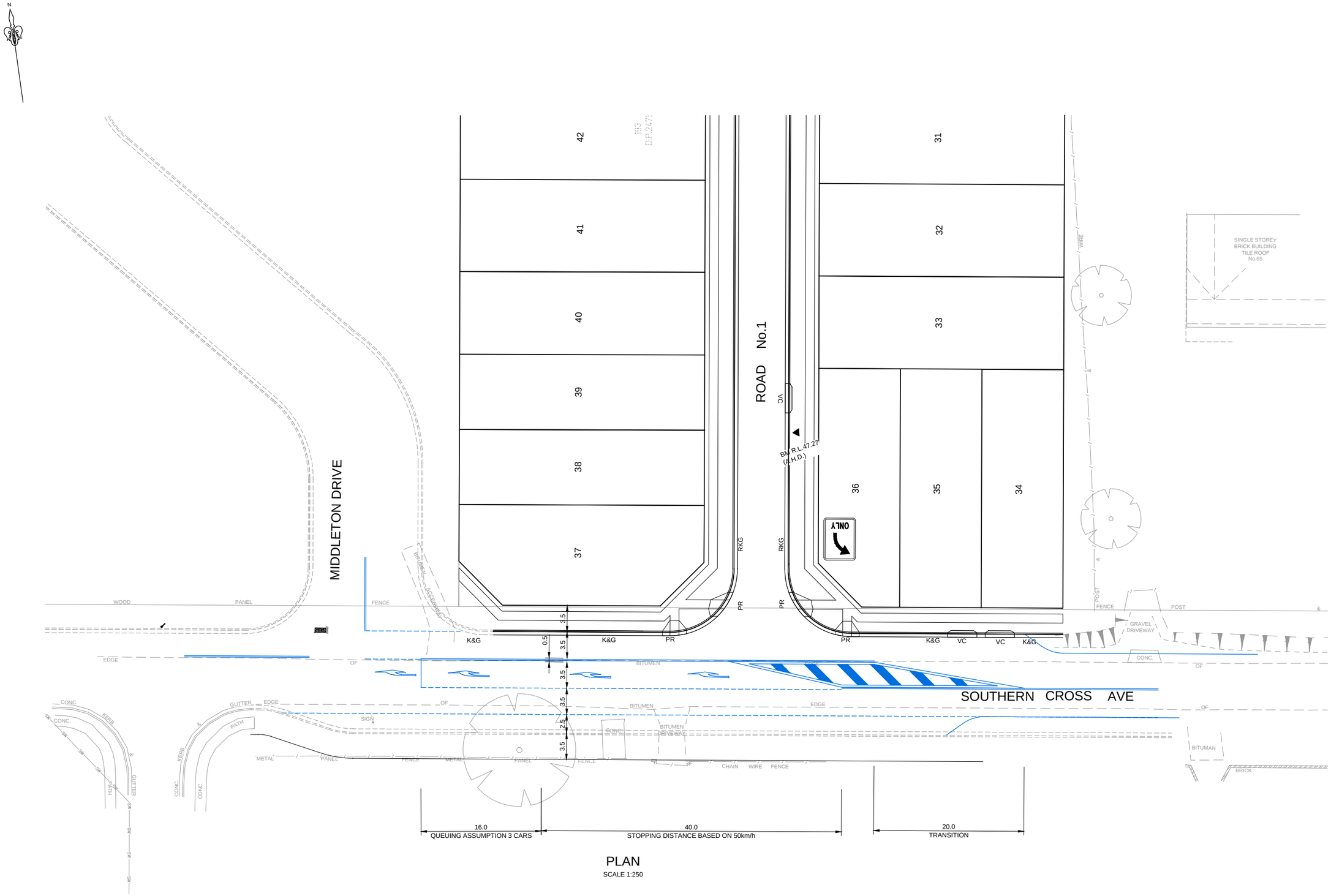
Design	Drawn	Checked
J.Y	G.Y	A.A

PRELIMINARY

Date 24.10.2019

Project Number	Sheet Number	Issue
P4356	2	001

A1



PLAN

SCALE 1:250

SKETCH

0 2.5 5 7.5 10 15 20 25m
1:250

REV	DATE	AMENDMENT DESCRIPTION
B	21.03.19	CLIENT COMMENTS
A	19.03.19	PRELIMINARY

APPROVED COMPANY AS/NZS 4801 OH&S Management System QMS
APPROVED COMPANY ISO 14001 Environmental Management System QMS
APPROVED COMPANY ISO 9001 Quality Management Systems QMS
DIAL 1100 BEFORE YOU DIG

Project:
PROPOSED DEVELOPMENT OF
LOT 178 & 193 D.P. 2475
SOUTHERN CROSS DRIVE, MIDDLETON GRANGE

Principal:	DEFENCE HOUSING AUSTRALIA		
Scale	1:250	Date	19.03.19
Datum	-	Council Ref.	-
L.G.A.	LIVERPOOL CITY COUNCIL		
Calc's	R.X.	Drawn.	E.F.
Proj.Man.	M.L.	Client Ref:	-

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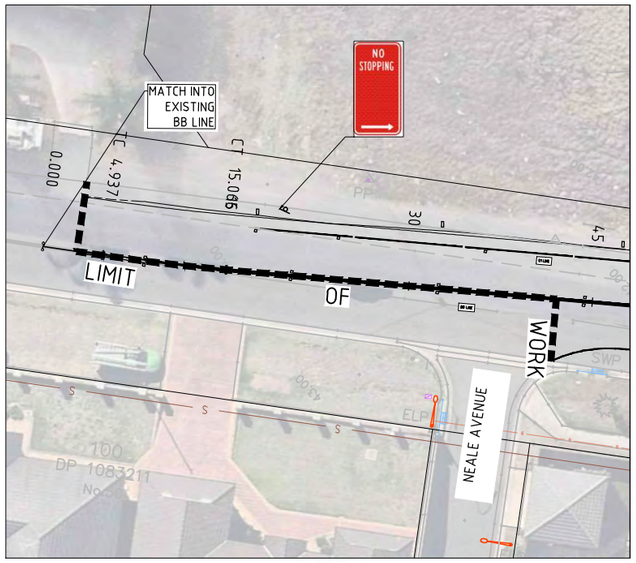
Drawing Title: SOUTHERN CROSS AVE INTERSECTION SKETCH

C&R Ref.	Drawing Ref.	Revision
040-18	040-18-SK-003	B



INSET A

JOIN LINE

JOIN LINE - REFER TO INSET A

NOTES:

1. ALL LINEMARKING & SIGNAGE IS TO BE INSTALLED IN ACCORDANCE WITH AUSTRALIAN STANDARDS AND RMS REQUIREMENTS AND SPECIFICATIONS.
2. RRPM'S (RAISED REFLECTIVE PAVEMENT MARKERS) ARE TO BE INSTALLED IN ACCORDANCE WITH RMS SPECIFICATIONS FOR EACH LINEMARKING TYPE AS SHOWN ON THE DRAWINGS.
3. WHERE EXISTING LINEMARKING CONFLICTS WITH NEW LINE MARKING, THE EXISTING LINEMARKING SHALL BE REMOVED.
4. ALL LINEMARKING REMOVAL WHETHER AS REQUIRED BY NOTE 3, OR AS SHOWN ON THE DRAWINGS, IS TO BE BY WATER BLASTING.
5. ALL SIGNPOSTS SHALL BE INSTALLED USING THE V-LOCK SYSTEM.
6. ANY SIGNAGE TO BE REMOVED (AS INDICATED ON THESE DRAWINGS) IS TO BE DELIVERED BY THE CONTRACTOR TO COUNCIL'S DEPOT.
7. LIGHTING ALONG HALL CIRCUIT TO BE DESIGNED AND INSTALLED BY OTHERS.

INSTALL GUIDEPOSTS AS PER AS1742.2

INSTALL JERSEY BARRIER OR EQUIVALENT

CONSTRUCT 0.6m WIDE CONCRETE MEDIAN

INSTALL GUIDEPOSTS AS PER AS1742.2

INSTALL JERSEY BARRIER 3M FROM EDGE LINE

REMOVE EXISTING GIVEWAY SIGN

INSTALL C3 LINE

INSTALL RRPM'S AT 12m CENTRES

HALL CCT

QANTAS BLVD

SIXTEENTH AVENUE

BROADBENT AVENUE

PARER AVENUE

COWPASTURE RD

E1 LINE

BB LINE

TB1 LINE

TB LINE

C3 LINE

C1 LINE

WORK

LIMIT OF WORK

NO STOPPING

R5-400 (LR)

R5-400 (L)

CAUTION ! UNDER GROUND SERVICES IN VICINITY

www.dialbeforeyoudig.com.au DIAL1100 BEFORE YOU DIG

1:250

ISSUE	DATE	REASON FOR ISSUE	DRAWN	SIGNED	APPROV	OWNER
A	17/04/19	ISSUED FOR TENDER	V.C			

DATE OF COMPLETION	COORDINATOR INVESTIGATIONS & DESIGN
DATE OF RELEASE	MANAGER-TECHNICAL SUPPORT
DATE OF ACCEPTANCE	PROJECT ENGINEER
DATE OF RELEASE	MANAGER - INFRASTRUCTURE & DELIVERY

LIVERPOOL CITY COUNCIL INVESTIGATIONS & DESIGN

GROUND FLOOR, 33 MOORE STREET, LIVERPOOL, NSW 2170
Ph 1300 36 2170 Fax (02) 9821 9333

FOR TRAFFIC COMMITTEE

SURVEYED	D.M./G.B. DATE 08.15
DESIGNED	V.C DATE DATE
DRAWN	V.C DATE DATE
DATUM	A.H.D./M.G.A.
CHECKED	B.P DATE DATE
CAD FILE	XREF:

DRAWING TITLE

SIXTEENTH AVENUE, MIDDLETON GRANGE
PROPOSED ROAD RECONSTRUCTION AND ASSOCIATED WORKS
INTERSECTION OF SIXTEENTH AVE & HALL CCT
LINEMARKING & SIGNPOSTING PLAN

JOB No	DS2018/013
SCALES	PLAN 1:250
DWG. No	301
ISSUE No	A
CONTRACT No	

File: G:\DESIGN\JOBS\2018\2018-413_Sixteenth Ave East and Qantas Blvd\Autocad\Design Drawings\DS2018-413 301.dwg
Plotted: 08/30/19 17:35:35

Appendix C: Upgrades Proposed by the Development

BITZIOS consulting
traffic engineering ■ transport planning

Gold Coast
Suite 26, 58 Riverwalk Avenue, Robina QLD 4226.
P: (07) 5562-5377
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Sydney
Studio 203, 3 Gladstone Street, Newtown NSW 2042.
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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	INTERSECTION LAYOUT	G.Y	24.10.2019

Scale @ A3 0 10 20 30 40 50 1:1000

Project: P4356
60 - 80 Southern Cross Avenue
Middleton Grange

Title: Intersection Layout Concept
Fifteenth Avenue, Hoxton Park Road & Cowpasture Road

Design	Drawn	Checked
J.Y	G.Y	A.A

PRELIMINARY

Date: 24.10.2019

Project Number	Sheet Number	Issue
P4356	3	001

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REVISIONS			
Issue	Revisions/Descriptions	Drawn	Date
001	INTERSECTION LAYOUT	G.Y	24.10.2019

Scale @ A3 0 5 10 15 20 25 1:500

Project: P4356
60 - 80 Southern Cross Avenue
Middleton Grange

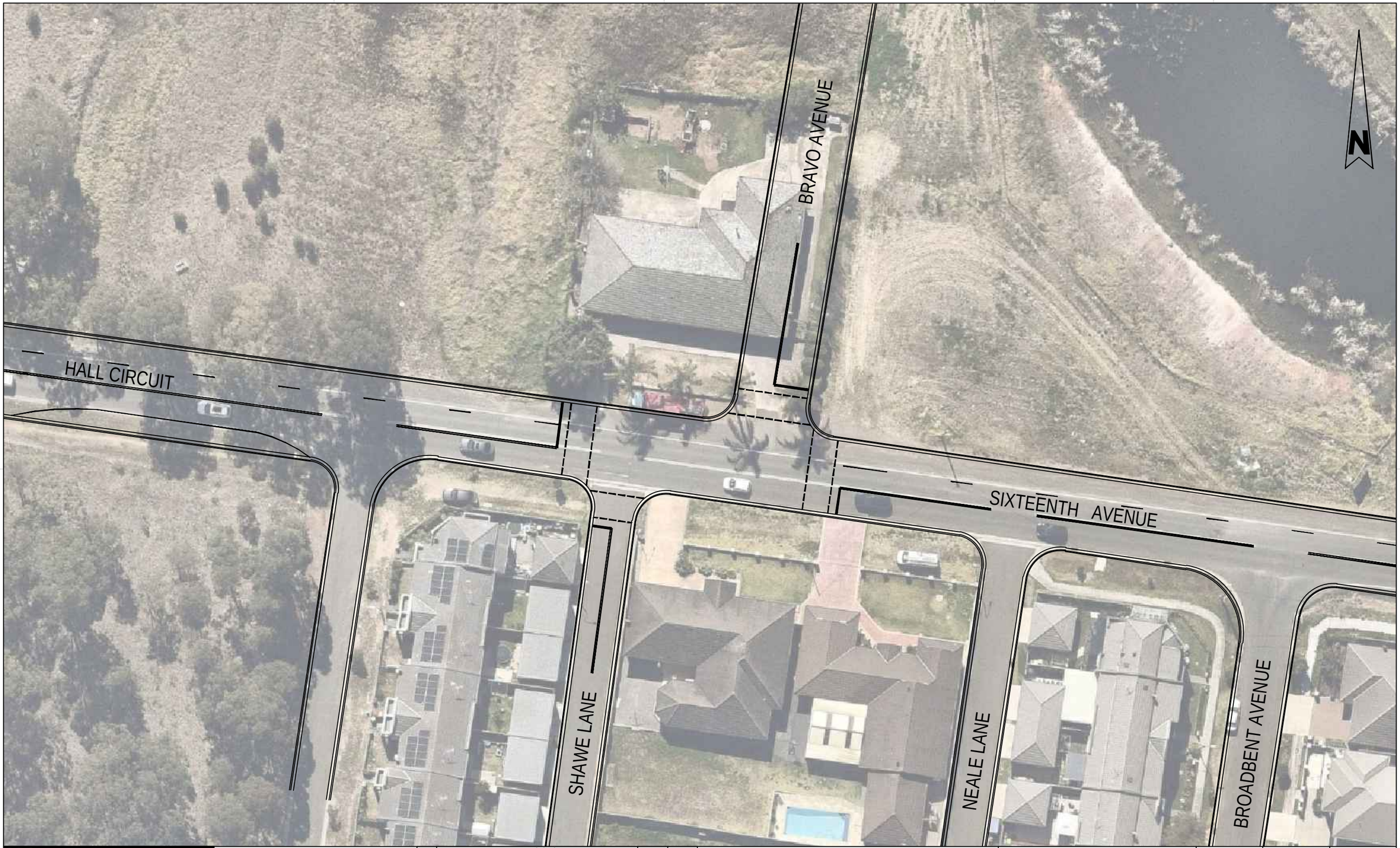
Title: Intersection Layout Concept
Sixteenth Avenue, Cowpasture Road & Collarenibri Road

Design	Drawn	Checked
J.Y	G.Y	A.A

PRELIMINARY

Date: 24.10.2019

Project Number	Sheet Number	Issue
P4356	4	001



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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	INTERSECTION LAYOUT	G.Y	24.10.2019

Scale @ A3 0 5 10 15 20 25 1:500

Project: P4356
60 - 80 Southern Cross Avenue
Middleton Grange

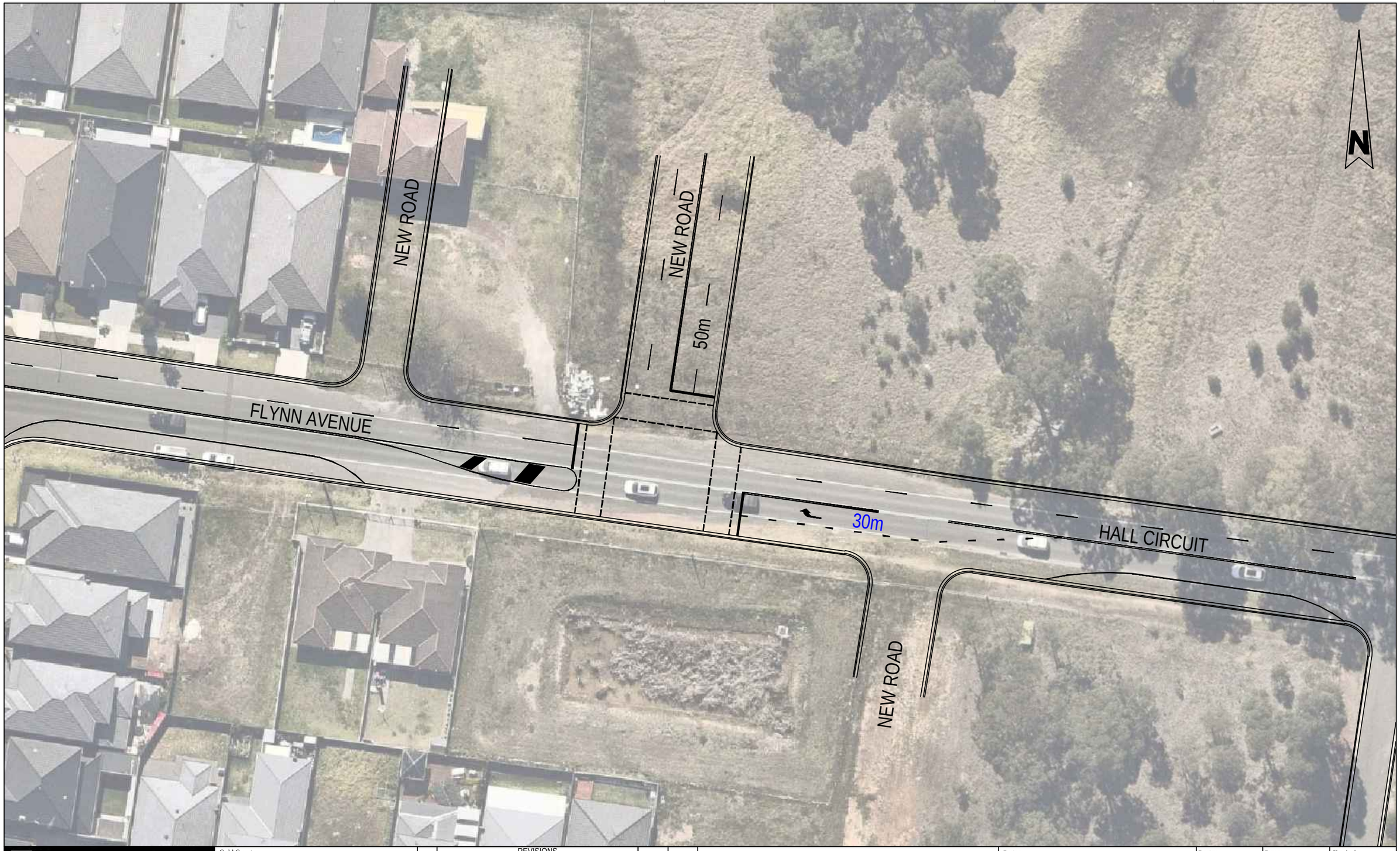
Title: Intersection Layout Concept
Sixteenth Avenue, Bravo Avenue,
Hall Circuit & Shawe Lane

Design	Drawn	Checked
J.Y	G.Y	A.A

PRELIMINARY

Date: 24.10.2019

Project Number	Sheet Number	Issue
P4356	5	001



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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	INTERSECTION LAYOUT	G.Y	24.10.2019

Scale @ A3 0 5 10 15 20 25 1:500

Project: P4356
60 - 80 Southern Cross Avenue
Middleton Grange

Title: Intersection Layout Concept
Flynn Avenue, Hall Circuit & New Road

Design	Drawn	Checked
J.Y	G.Y	A.A

PRELIMINARY

Date: 24.10.2019

Project Number	Sheet Number	Issue
P4356	6	001

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	INTERSECTION LAYOUT	G.Y	24.10.2019

Scale @ A3 0 5 10 15 20 25 1:500

Project: P4356
60 - 80 Southern Cross Avenue
Middleton Grange

Title: Intersection Layout Concept
Southern Cross Avenue, New Road &
Main Development Road

Design	Drawn	Checked
J.Y	G.Y	A.A

PRELIMINARY

Date: 24.10.2019

Project Number	Sheet Number	Issue
P4356	7	001

Appendix D: 2030 Intersection Results Comparison

P4356 60_80 Southern Cross Ave Middleton Grange

AIMSUN Intersection Results Comparison 2030

AM Peak 0730-0830

								Volume (veh)			Delay (seconds)			Level of Service			Average Queue (veh)			Maximum Queue (veh)		
ID	Intersection	Aimsun Code	Turn Number	Movement Code	From	To	Turn	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development
101	Cowpasture Road	8592	1	101-1	Cowpasture Road (N)	Qantas Boulevard (W)	R	223	250	276	64	62	67	E	E	E	2	2	3	8	9	7
	Collarenebri Road	8590	2	101-2		Cowpasture Road (S)	T	1,320	1,298	1,301	26	28	18	B	B	B	3	3	2	13	13	13
	Cowpasture Road	8591	3	101-3		Collarenebri Road (E)	L	26	30	29	29	30	22	B	C	B	0	0	0	3	3	3
	Qantas Boulevard	8588	4	101-4	Collarenebri Road (E)	Cowpasture Road (N)	R	78	75	73	70	69	65	E	E	E	1	1	1	8	7	7
		8589	5	101-5		Qantas Boulevard (W)	T	28	25	27	78	84	75	F	F	F	1	1	1	5	5	5
		8587	6	101-6		Cowpasture Road (S)	L	34	34	34	59	57	60	E	D	E	1	1	1	4	4	4
		8584	7	101-7	Cowpasture Road (S)	Collarenebri Road (E)	R	18	20	21	82	80	83	F	F	F	0	0	0	3	3	3
		8585	8	101-8		Cowpasture Road (N)	T	2,186	2,223	2,246	9	8	10	A	A	A	1	1	1	9	9	10
		8586	9	101-9		Qantas Boulevard (W)	L	171	212	270	7	6	8	A	A	A	0	0	0	4	3	6
		8593	10	101-10	Qantas Boulevard (W)	Cowpasture Road (S)	R	219	301	526	41	41	33	C	C	C	3	3	2	7	5	4
		8594	11	101-11		Collarenebri Road (E)	T	39	37	4	69	87	60	E	F	E	0	0	0	1	1	1
		9953	12	101-12		Cowpasture Road (N)	L	725	640	713	14	13	28	A	A	B	2	2	2	7	7	6
					All			5,067	5,145	5,521	20	21	21	B	B	B	1	1	1	13	13	13
102	Cowpasture Road	8496	1	102-1	Cowpasture Road (N)	Fifteenth Avenue (W)	R	250	252	263	19	20	27	B	B	B	1	1	1	3	2	2
	Hoxton Park Road	8495	2	102-2		Cowpasture Road (S)	T	752	722	739	21	21	21	B	B	B	1	1	1	2	2	2
	Cowpasture Road	9932	3	102-3		Hoxton Park Road (E)	L	566	646	825	9	8	7	A	A	A	1	1	1	4	4	4
	Fifteenth Avenue	8497	4	102-4	Hoxton Park Road (E)	Cowpasture Road (N)	R	541	563	633	33	33	30	C	C	C	2	2	2	5	5	5
		8499	5	102-5		Fifteenth Avenue (W)	T	683	665	702	25	26	25	B	B	B	1	1	1	3	2	3
		9926	6	102-6		Cowpasture Road (S)	L	298	321	313	5	5	4	A	A	A	0	0	0	4	4	4
		8501	7	102-7	Cowpasture Road (S)	Hoxton Park Road (E)	R	583	578	578	39	39	40	C	C	C	3	3	3	4	4	4
		8500	8	102-8		Cowpasture Road (N)	T	1,480	1,492	1,483	22	22	21	B	B	B	3	3	2	4	4	4
		9929	9	102-9		Fifteenth Avenue (W)	L	172	172	157	0	0	0	A	A	A	0	0	0	0	1	1
		8493	10	102-10	Fifteenth Avenue (W)	Cowpasture Road (S)	R	222	232	231	39	39	48	C	C	D	2	2	2	5	6	5
		8492	11	102-11		Hoxton Park Road (E)	T	964	945	859	20	20	25	B	B	B	2	1	2	3	3	3
		9923	12	102-12		Cowpasture Road (N)	L	313	361	375	6	5	12	A	A	A	0	0	1	4	4	4
					All			6,825	6,949	7,159	22	21	22	B	B	B	1	1	1	5	6	5
103	Kingsford Smith Avenue	10012338	1	103-1	Kingsford Smith Avenue (N)	Fifteenth Avenue (W)	R	249	249	256	73	79	81	F	F	F	5	5	5	11	11	12
	Fifteenth Avenue	10012337	2	103-2		Second Avenue (S)	T	196	212	220	74	81	79	F	F	F	4	4	4	9	10	9
	Second Avenue	10012427	3	103-3		Fifteenth Avenue (E)	L	13	11	9	63	72	79	E	F	F	0	0	0	2	1	1
	Fifteenth Avenue	10012330	4	103-4	Fifteenth Avenue (E)	Kingsford Smith Avenue (N)	R	97	92	121	93	93	104	F	F	F	2	2	3	7	6	11
		10012329	5	103-5		Fifteenth Avenue (W)	T	797	792	787	13	13	21	A	A	B	1	1	1	6	6	8
		10012430	6	103-6		Second Avenue (S)	L	181	179	176	10	9	15	A	A	B	0	0	1	5	4	6
		10012333	7	103-7	Second Avenue (S)	Fifteenth Avenue (E)	R	236	240	243	85	87	75	F	F	F	5	5	5	12	11	12
		10012332	8	103-8		Kingsford Smith Avenue (N)	T	132	130	160	88	88	79	F	F	F	3	3	3	8	8	8
		10012429	9	103-9		Fifteenth Avenue (W)	L	184	177	171	73	76	72	F	F	F	3	3	3	10	9	8
		10012334	10	103-10	Fifteenth Avenue (W)	Second Avenue (S)	R	194	200	190	162	171	191	F	F	F	6	6	7	16	18	19
		10012336	11	103-11		Fifteenth Avenue (E)	T	878	892	911	42	46	56	C	D	D	3	3	4	10	10	9
		10012428	12	103-12		Kingsford Smith Avenue (N)	L	128	137	212	24	27	43	B	B	C	1	1	2	6	6	11
					All			3,286	3,311	3,455	52	55	61	D	D	E	3	3	3	16	18	19
104	Kingsford Smith Avenue	10012454	1	104-1	Kingsford Smith Avenue (N)	Flynn Avenue (W)	R	158	136	167	34	54	84	C	D	F	2	2	4	9	10	13
	Flynn Avenue	10012455	2	104-2		Kingsford Smith Avenue (S)	T	424	433	444	22	42	64	B	C	E	2	5	7	14	20	22
	Kingsford Smith Avenue	10012456	3	104-3		Flynn Avenue (E)	L	2	6	5	21	70	72	B	E	F	0	0	0	1	2	2
	Flynn Avenue	10012461	4	104-4	Flynn Avenue (E)	Kingsford Smith Avenue (N)	R	53	53	54	50	64	58	D	E	E	1	1	1	4	7	6
		10012460	5	104-5		Flynn Avenue (W)	T	224	237	216	40	52	50	C	D	D	2	3	3	14	18	15
		10012462	6	104-6		Kingsford Smith Avenue (S)	L	32	53	60	34	56	60	C	D	E	0	1	1	3	5	7
		10012459	7	104-7	Kingsford Smith Avenue (S)	Flynn Avenue (E)	R	77	74	144	33	39	57	C	C	D	1	1	2	5	5	8
		10012458	8	104-8		Kingsford Smith Avenue (N)	T	260	292	299	19	22	31	B	B	C	1	1	1	5	5	5
		10012457	9	104-9		Flynn Avenue (W)	L	147	127	144	18	20	33	B	B	C	1	1	1	6	6	6
		10012452	10	104-10	Flynn Avenue (W)	Kingsford Smith Avenue (S)	R	160	160	166	45	74	64	D	F	E	2	4	3	9	14	13
		10012453	11	104-11		Flynn Avenue (E)	T	214	198	184	31	36	34	C	C	C	2	2	2	10	11	10
		10012451	12	104-12		Kingsford Smith Avenue (N)	L	88	112	118	33	40	35	C	C	C	1	1	1	7	8	7
					All			1,841	1,881	2,001	30	42	52	C	C	D	1	2	2	14	20	22
106	Bravo Avenue	9543	1	106-1	Bravo Avenue (N)	Hall Circuit(W)	R	8	7	7	0	0	1	A	A	A	0	0	0	0	0	0
	Hall Circuit	9544	2	106-2		Bravo Avenue (S)	T	46	44	77	1	1	1	A	A	A	0	0	0	1	1	2
	Bravo Avenue	9542	3	106-3		Hall Circuit(E)	L	0	0	1	1	0	0	A	A	A	0	0	0	0	0	0
	Hall Circuit	9537	4	106-4	Hall Circuit(E)	Bravo Avenue (N)	R	2	4	4	1	1	0	A	A	A	0	0	0	0	0	0
		9536	5	106-5		Hall Circuit(W)	T	7	5	22	0	0	0	A	A	A	0	0	0	0	0	0
		9538	6	106-6		Bravo Avenue (S)	L	0	6	53	0	0	0	A	A	A	0	0	0	0	0	0
		9545	7	106-7	Bravo Avenue (S)	Hall Circuit(E)	R	0	0	0	0	0	0	A	A	A	0	0	0	0	0	0
		9547	8	106-8		Bravo Avenue (N)	T	0	0	0	0	0	0	A	A	A	0	0	0	0	0	0
		9546	9	106-9		Hall Circuit(W)	L	17	9	29	0	1	1	A	A	A	0	0	0	0	0	1
		9541	10	106-10	Hall Circuit(W)	Bravo Avenue (S)	R	199	286	246	1	1	2	A	A	A	0	0	0	3	2	4
		9539	11	106-11		Hall Circuit(E)	T	10	11	8	1	1	1	A	A	A	0	0	0	0	1	1
		9540	12	106-12		Bravo Avenue (N)	L	5	4	3	0	0	0	A	A	A	0	0	0	0	0	0
					All			293	377	450	1	1	2	A	A	A	0	0	0	3	2	4
107	Kingsford Smith Avenue	9644	1	107-1	Kingsford Smith Avenue (N)	Southern Cross Avenue (W)	R	53	57	57	7	7	10	A	A	A	0	0	0	2	2	2
	Southern Cross Avenue	9642	2	107-2		Kingsford Smith Avenue (S)	T	318	304	366	4	5	7	A	A	A	0	0	0	4	5	8
	Kingsford Smith Avenue	9643	3	107-3		Southern Cross Avenue (E)	L	21	26	24	2	3	4	A	A	A	0	0	0	0	1	1
	Southern Cross Avenue	9646	4	107-4	Southern Cross Avenue (E)	Kingsford Smith Avenue (N)	R	8	16	37	11	11	20	A	A	B	0	0	0	1	2	3
		9647	5	107-5		Southern Cross Avenue (W)	T	82	88	76	8	9	16	A	A	B	0	0	0	3	3	4
		9645	6	107-6		Kingsford Smith Avenue (S)	L	3	10	7	4	6	7	A	A	A	0	0	0	1	1	1
		9640	7	107-7	Kingsford Smith Avenue (S)	Southern Cross Avenue (E)	R	13	18	15	7	6	10	A	A	A	0	0	0	1	1	1
		9639	8	107-8		Kingsford Smith Avenue (N)	T	113	108	129	3	3	5	A	A	A	0	0	0	1	2	2
		9641	9	107-9		Southern Cross Avenue (W)	L	179	183	201	3	3	3	A	A	A	0	0	0	1	1	3
		9648	10	107-10	Southern Cross Avenue (W)	Kingsford Smith Avenue (S)	R	64	60	72	10	12	21	A	A	B	0	0	0	3	3	3
		9650	11	107-11		Southern Cross Avenue (E)	T	200	202	212	9	8	18	A	A	B	0	0	1	6	5	9
		9649	12	107-12		Kingsford Smith Avenue (N)	L	29	23	32	5	6	12	A	A	A	0	0	0	1	2	2
					All			1,083	1,095	1,229	5	6	10	A	A	B	0	0	0	6	5	9

P4356 60_80 Southern Cross Ave Middleton Grange

AIMSUN Intersection Results Comparison 2030

AM Peak 0730-0830

								Volume (veh)			Delay (seconds)			Level of Service			Average Queue (veh)			Maximum Queue (veh)		
ID	Intersection	Aimsun Code	Turn Number	Movement Code	From	To	Turn	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development
108	Cowpasture Road	10013498	1	108-1	Cowpasture Road (N)	McIver Avenue (W)	R	330	322	360	1	1	1	A	A	A	0	0	0	0	0	0
	Bird Walton Avenue	10013497	2	108-2		Middleton Drive (S)	T	52	70	25	1	1	1	A	A	A	0	0	0	0	0	0
	McIver Avenue	10013496	3	108-3		Bird Walton Avenue (E)	L	84	77	113	0	0	0	A	A	A	0	0	0	0	0	0
		10013499	4	108-4	Bird Walton Avenue (E)	Cowpasture Road (N)	R	12	7	16	1	1	1	A	A	A	0	0	0	0	0	0
		10013502	5	108-5		McIver Avenue (W)	T	4	4	5	1	1	1	A	A	A	0	0	0	0	0	0
		10013501	6	108-6		Middleton Drive (S)	L	0	0	0	0	0	0	A	A	A	0	0	0	0	0	0
		10013504	7	108-7	Middleton Drive (S)	Bird Walton Avenue (E)	R	0	0	0	0	0	0	A	A	A	0	0	0	0	0	0
		10013503	8	108-8		Cowpasture Road (N)	T	62	28	44	1	1	1	A	A	A	0	0	0	0	0	0
		10013506	9	108-9		McIver Avenue (W)	L	11	10	30	0	0	0	A	A	A	0	0	0	0	0	0
		10013509	10	108-10	McIver Avenue (W)	Middleton Drive (S)	R	0	1	1	3	1	1	A	A	A	0	0	0	0	0	0
		10013508	11	108-11		Bird Walton Avenue (E)	T	1	4	3	1	1	1	A	A	A	0	0	0	0	0	0
		10013507	12	108-12		Cowpasture Road (N)	L	149	145	194	0	0	0	A	A	A	0	0	0	0	0	0
					All			483	479	519	1	1	1	A	A	A	0	0	0	0	0	0
109	Cowpasture Road	10338	1	109-1	Cowpasture Road (N)	Westlink M7 (W)	R	235	237	245	45	43	51	D	D	D	1	1	2	6	6	6
	Westlink M7	10336	2	109-2		Cowpasture Road (S)	T	1,227	1,236	1,206	11	11	7	A	A	A	1	1	1	5	5	5
	Cowpasture Road	10312	3	109-3		Westlink M7 (E)	L	293	278	289	1	1	1	A	A	A	0	0	0	1	2	1
	Westlink M7	10334	4	109-4	Westlink M7 (E)	Cowpasture Road (N)	R	297	299	299	57	57	87	D	D	F	2	2	3	8	8	8
		10314	6	109-6		Cowpasture Road (S)	L	99	101	129	5	5	6	A	A	A	0	0	0	3	4	4
		10345	7	109-7	Cowpasture Road (S)	Westlink M7 (E)	R	321	305	342	60	62	61	E	E	E	3	3	3	10	9	9
		10343	8	109-8		Cowpasture Road (N)	T	2,151	2,135	2,150	13	8	8	A	A	A	2	1	1	9	7	7
		10349	9	109-9		Westlink M7 (W)	L	514	507	541	1	2	2	A	A	A	0	0	0	3	5	6
		10339	10	109-10	Westlink M7 (W)	Cowpasture Road (S)	R	277	267	293	57	59	75	E	E	F	2	2	3	8	7	8
		10303	12	109-12		Cowpasture Road (N)	L	33	29	34	11	8	9	A	A	A	0	0	0	2	2	2
					All			5,447	5,395	5,527	19	18	20	B	B	B	1	1	1	10	9	9
110	Cowpasture Road	10381	1	110-1	Cowpasture Road (N)	Airfield Drive (W)	R	11	12	17	90	88	79	F	F	F	0	0	0	3	3	3
	Landmark Shopping Centre Access	10382	2	110-2		Cowpasture Road (S)	T	1,388	1,395	1,358	30	30	19	C	C	B	5	4	3	20	20	16
	Cowpasture Road	10012420	3	110-3		Landmark Shopping Centre Acce	L	23	23	19	35	34	25	C	C	B	0	0	0	2	2	2
	Airfield Drive	10012423	4	110-4	Landmark Shopping Centre Acc	Cowpasture Road (N)	R	19	18	18	66	68	74	E	E	F	0	0	0	3	3	3
		10012421	5	110-5		Airfield Drive (W)	T	90	89	0	65	59	73	E	E	F	2	1	0	4	4	0
		10012485	6	110-6		Cowpasture Road (S)	L	105	100	191	5	5	5	A	A	A	0	0	0	4	3	5
		10012419	7	110-7	Cowpasture Road (S)	Landmark Shopping Centre Acc	R	172	158	161	56	55	54	D	D	D	3	2	2	5	5	5
		10384	8	110-8		Cowpasture Road (N)	T	2,117	2,122	2,123	5	5	3	A	A	A	1	1	1	3	3	3
		10369	9	110-9		Airfield Drive (W)	L	176	195	187	1	1	0	A	A	A	0	0	0	2	2	1
		10380	10	110-10	Airfield Drive (W)	Cowpasture Road (S)	R	264	260	185	53	54	57	D	D	E	2	2	1	3	3	3
		10012504	11	110-11		Landmark Shopping Centre Acc	T	19	21	20	67	73	84	E	F	F	0	0	0	2	2	2
		10376	12	110-12		Cowpasture Road (N)	L	20	22	21	10	11	16	A	A	B	0	0	0	2	2	2
					All			4,403	4,415	4,301	20	19	14	B	B	A	1	1	1	20	20	16
111	Cowpasture Road	10443	1	111-1	Cowpasture Road (N)	Aviation Road (W)	R	196	185	232	84	79	104	F	F	F	4	4	7	16	16	20
	Cowpasture Road	10442	2	111-2		Cowpasture Road (S)	T	1,390	1,402	1,371	2	2	2	A	A	A	0	0	0	7	7	6
	Aviation Road	10440	8	111-8	Cowpasture Road (S)	Cowpasture Road (N)	T	2,155	2,170	2,181	9	7	10	A	A	A	1	1	2	18	18	19
		10441	9	111-9		Aviation Road (W)	L	24	24	26	8	7	8	A	A	A	0	0	0	1	1	1
		10446	10	111-10	Aviation Road (W)	Cowpasture Road (S)	R	19	9	13	57	47	36	E	D	C	0	0	0	1	1	1
		10445	12	111-12		Cowpasture Road (N)	L	227	196	248	22	25	21	B	B	B	1	1	1	2	2	2
					All			4,010	3,986	4,071	11	9	13	A	A	A	1	1	2	18	18	20
112	Qantas Boulevard	9472	1	111-1	Qantas Boulevard (N)	Qantas Boulevard (E)	L	255	359	346	1	9	18	A	A	B	0	1	2	2	8	8
	Qantas Boulevard	10001487	4	111-4	Qantas Boulevard (E)	Qantas Boulevard (N)	R	58	50	155	14	10	17	A	A	B	0	0	1	4	3	7
	Sixteenth Avenue East	9475	5	111-5		Sixteenth Avenue East (W)	T	365	438	419	2	2	2	A	A	A	0	0	0	1	2	2
		9477	11	111-11	Sixteenth Avenue East (W)	Qantas Boulevard (E)	T	739	637	898	1	14	3	A	A	A	0	2	0	5	7	4
		9476	12	111-12		Qantas Boulevard (N)	L	36	27	37	2	11	4	A	A	A	0	0	0	0	2	1
					All			1,453	1,511	1,855	2	9	7	A	A	B	0	1	0	5	8	8
113	Main Street	10011939	1	111-1	Main Street (N)	Flynn Avenue (W)	R	8	60	30	7	48	35	A	D	C	0	0	0	1	2	3
	Flynn Avenue	10011940	3	111-3		Flynn Avenue (E)	L	102	113	88	6	96	34	A	F	C	0	8	1	4	26	6
	Flynn Avenue	10011943	4	111-4	Flynn Avenue (E)	Main Street (N)	R	62	125	101	8	9	15	A	A	A	0	0	0	3	5	5
		10011944	5	111-5		Flynn Avenue (W)	T	321	333	331	3	4	6	A	A	A	0	0	0	7	9	11
		10011942	11	111-11	Flynn Avenue (W)	Flynn Avenue (E)	T	604	577	709	0	10	5	A	A	A	0	1	0	1	5	5
		10011941	12	111-12		Main Street (N)	L	37	40	74	0	9	4	A	A	A	0	0	0	1	2	2
					All			1,135	1,248	1,334	2	18	9	A	B	A	0	2	0	7	26	11
114	Southern Cross Avenue	10001301	5	111-5	Southern Cross Avenue (E)	Southern Cross Avenue (W)	T	26	18	69	0	0	4	A	A	A	0	0	0	0	0	3
	Main Street	10012045	6	111-6		Main Street (S)	L	5	4	1	1	1	1	A	A	A	0	0	0	0	0	0
	Southern Cross Avenue	10012044	7	111-7	Main Street (S)	Southern Cross Avenue (E)	R	5	7	1	4	4	58	A	A	E	0	0	0	1	1	1
		10012043	9	111-9		Southern Cross Avenue (W)	L	70	108	31	0	0	47	A	A	D	0	0	0	1	1	4
		10012046	10	111-10	Southern Cross Avenue (W)	Main Street (S)	R	67	72	25	2	2	6	A	A	A	0	0	0	2	2	1
		10001303	11	111-11		Southern Cross Avenue (E)	T	174	232	207	0	1	4	A	A	A	0	0	0	0	0	5
					All			347	441	335	1	1	8	A	A	A	0	0	0	2	2	5

P4356 60_80 Southern Cross Ave Middleton Grange

AIMSUN Intersection Results Comparison 2030

PM Peak 1645 - 1745

								Volume (veh)			Delay (seconds)			Level of Service			Average Queue (veh)			Maximum Queue (veh)		
ID	Intersection	Aimsun Code	Turn Number	Movement Code	From	To	Turn	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development
101	Cowpasture Road	8592	1	101-1	Cowpasture Road (N)	Qantas Boulevard (W)	R	405	435	529	59	71	55	E	F	D	3	4	4	13	15	14
	Collarenebri Road	8590	2	101-2		Cowpasture Road (S)	T	1,911	1,926	2,084	40	47	19	C	D	B	6	7	3	16	16	11
	Cowpasture Road	8591	3	101-3		Collarenebri Road (E)	L	68	67	68	41	42	24	C	C	B	1	1	0	4	4	3
	Qantas Boulevard	8588	4	101-4	Collarenebri Road (E)	Cowpasture Road (N)	R	39	40	45	58	59	58	E	E	E	1	1	1	5	5	4
		8589	5	101-5		Qantas Boulevard (W)	T	6	5	2	55	48	38	D	D	C	0	0	0	2	2	1
		8587	6	101-6		Cowpasture Road (S)	L	24	34	28	50	44	43	D	D	C	0	0	0	3	5	3
		8584	7	101-7	Cowpasture Road (S)	Collarenebri Road (E)	R	39	46	45	54	52	61	D	D	E	1	1	1	4	5	7
		8585	8	101-8		Cowpasture Road (N)	T	1,280	1,276	1,302	35	36	38	C	C	C	4	4	4	10	10	10
		8586	9	101-9		Qantas Boulevard (W)	L	440	543	640	23	22	19	B	B	B	2	2	2	9	9	10
		8593	10	101-10	Qantas Boulevard (W)	Cowpasture Road (S)	R	141	147	450	64	70	36	E	E	C	2	2	2	6	7	4
		8594	11	101-11		Collarenebri Road (E)	T	54	61	13	60	61	57	E	E	E	0	0	0	1	1	2
		9953	12	101-12		Cowpasture Road (N)	L	562	570	632	8	8	21	A	A	B	1	1	2	6	6	5
					All			4,970	5,152	5,838	36	40	29	C	C	B	2	2	2	16	16	14
102	Cowpasture Road	8496	1	102-1	Cowpasture Road (N)	Fifteenth Avenue (W)	R	317	321	421	19	19	25	B	B	B	1	2	1	3	3	2
	Hoxton Park Road	8495	2	102-2		Cowpasture Road (S)	T	1,325	1,327	1,444	12	12	11	A	A	A	1	1	1	2	2	2
	Cowpasture Road	9932	3	102-3		Hoxton Park Road (E)	L	394	427	699	5	5	5	A	A	A	0	0	1	4	4	4
	Fifteenth Avenue	8497	4	102-4	Hoxton Park Road (E)	Cowpasture Road (N)	R	851	932	1,028	20	20	17	B	B	B	2	2	2	4	4	4
		8499	5	102-5		Fifteenth Avenue (W)	T	684	662	771	23	24	20	B	B	B	1	1	1	2	2	2
		9926	6	102-6		Cowpasture Road (S)	L	543	533	513	8	8	8	A	A	A	1	1	1	4	4	4
		8501	7	102-7	Cowpasture Road (S)	Hoxton Park Road (E)	R	482	465	472	35	37	44	C	C	D	2	2	3	4	4	5
		8500	8	102-8		Cowpasture Road (N)	T	929	957	971	26	26	24	B	B	B	2	2	2	4	4	4
		9929	9	102-9		Fifteenth Avenue (W)	L	167	162	232	0	0	1	A	A	A	0	0	0	1	1	2
		8493	10	102-10	Fifteenth Avenue (W)	Cowpasture Road (S)	R	160	152	150	60	60	81	E	E	F	2	2	2	5	5	5
		8492	11	102-11		Hoxton Park Road (E)	T	527	548	511	30	30	35	C	C	C	1	1	1	3	3	2
		9923	12	102-12		Cowpasture Road (N)	L	22	16	30	7	7	6	A	A	A	0	0	0	1	1	2
					All			6,403	6,502	7,242	20	20	20	B	B	B	1	1	1	5	5	5
103	Kingsford Smith Avenue	10012338	1	103-1	Kingsford Smith Avenue (N)	Fifteenth Avenue (W)	R	141	172	268	67	77	69	E	F	E	3	4	5	13	13	12
	Fifteenth Avenue	10012337	2	103-2		Second Avenue (S)	T	61	81	180	63	68	64	E	E	E	1	1	3	5	6	8
	Second Avenue	10012427	3	103-3		Fifteenth Avenue (E)	L	8	10	12	65	76	68	E	F	E	0	0	0	1	1	1
	Fifteenth Avenue	10012330	4	103-4	Fifteenth Avenue (E)	Kingsford Smith Avenue (N)	R	172	164	278	170	163	100	F	F	F	8	7	7	12	11	11
		10012329	5	103-5		Fifteenth Avenue (W)	T	804	823	853	27	26	57	B	B	D	2	2	4	7	6	8
		10012430	6	103-6		Second Avenue (S)	L	163	153	192	13	12	27	A	A	B	0	0	1	4	5	8
		10012333	7	103-7	Second Avenue (S)	Fifteenth Avenue (E)	R	171	166	192	55	54	76	D	D	F	2	2	4	10	11	11
		10012332	8	103-8		Kingsford Smith Avenue (N)	T	148	163	173	59	57	76	E	D	F	2	2	3	8	8	8
		10012429	9	103-9		Fifteenth Avenue (W)	L	137	138	138	47	46	68	D	D	E	2	2	2	7	7	6
		10012334	10	103-10	Fifteenth Avenue (W)	Second Avenue (S)	R	176	175	174	167	171	71	F	F	F	7	7	3	17	16	12
		10012336	11	103-11		Fifteenth Avenue (E)	T	744	716	720	40	43	78	C	C	F	2	2	5	9	8	9
		10012428	12	103-12		Kingsford Smith Avenue (N)	L	203	250	283	23	26	58	B	B	E	1	1	4	7	10	17
					All			2,928	3,010	3,463	53	53	68	D	D	E	3	3	3	17	16	17
104	Kingsford Smith Avenue	10012454	1	104-1	Kingsford Smith Avenue (N)	Flynn Avenue (W)	R	114	111	103	22	23	46	B	B	D	1	1	1	7	5	7
	Flynn Avenue	10012455	2	104-2		Kingsford Smith Avenue (S)	T	187	230	258	15	16	23	A	B	B	1	1	1	8	9	12
	Kingsford Smith Avenue	10012456	3	104-3		Flynn Avenue (E)	L	2	4	3	12	16	32	A	B	C	0	0	0	1	1	1
	Flynn Avenue	10012461	4	104-4	Flynn Avenue (E)	Kingsford Smith Avenue (N)	R	25	22	18	49	45	51	D	D	D	0	0	0	4	3	2
		10012460	5	104-5		Flynn Avenue (W)	T	118	118	100	30	32	34	C	C	C	1	1	1	7	8	9
		10012462	6	104-6		Kingsford Smith Avenue (S)	L	70	104	186	33	33	41	C	C	C	1	1	2	7	7	8
		10012459	7	104-7	Kingsford Smith Avenue (S)	Flynn Avenue (E)	R	125	203	151	24	30	50	B	C	D	1	2	3	7	9	9
		10012458	8	104-8		Kingsford Smith Avenue (N)	T	182	175	297	16	21	27	B	B	B	0	1	1	4	4	5
		10012457	9	104-9		Flynn Avenue (W)	L	61	56	83	17	18	22	B	B	B	0	0	0	5	4	4
		10012452	10	104-10	Flynn Avenue (W)	Kingsford Smith Avenue (S)	R	153	160	179	32	33	39	C	C	C	1	1	2	8	9	9
		10012453	11	104-11		Flynn Avenue (E)	T	100	82	105	26	24	23	B	B	B	1	0	1	6	5	4
		10012451	12	104-12		Kingsford Smith Avenue (N)	L	150	179	167	26	25	20	B	B	B	1	1	1	8	9	6
					All			1,286	1,446	1,650	24	26	32	B	B	C	1	1	1	8	9	12
106	Bravo Avenue	9543	1	106-1	Bravo Avenue (N)	Hall Circuit (W)	R	4	8	13	0	0	0	A	A	A	0	0	0	0	0	1
	Hall Circuit	9544	2	106-2		Bravo Avenue (S)	T	7	4	21	1	1	2	A	A	A	0	0	0	0	0	1
	Bravo Avenue	9542	3	106-3		Hall Circuit (E)	L	0	0	0	1	0	0	A	A	A	0	0	0	0	0	0
	Hall Circuit	9537	4	106-4	Hall Circuit (E)	Bravo Avenue (N)	R	1	0	2	0	0	0	A	A	A	0	0	0	0	0	0
		9536	5	106-5		Hall Circuit (W)	T	10	21	65	0	0	1	A	A	A	0	0	0	0	0	0
		9538	6	106-6		Bravo Avenue (S)	L	0	17	78	0	0	0	A	A	A	0	0	0	0	0	0
		9545	7	106-7	Bravo Avenue (S)	Hall Circuit (E)	R	0	0	0	0	0	0	A	A	A	0	0	0	0	0	0
		9547	8	106-8		Bravo Avenue (N)	T	1	0	0	0	0	0	A	A	A	0	0	0	0	0	1
		9546	9	106-9		Hall Circuit (W)	L	0	10	67	0	1	2	A	A	A	0	0	0	0	1	3
		9541	10	106-10	Hall Circuit (W)	Bravo Avenue (S)	R	132	109	196	1	1	3	A	A	A	0	0	0	1	2	4
		9539	11	106-11		Hall Circuit (E)	T	7	8	4	1	1	1	A	A	A	0	0	0	0	0	1
		9540	12	106-12		Bravo Avenue (N)	L	4	7	5	1	1	1	A	A	A	0	0	0	0	0	0
					All			165	183	451	1	1	2	A	A	A	0	0	0	1	2	4
107	Kingsford Smith Avenue	9644	1	107-1	Kingsford Smith Avenue (N)	Southern Cross Avenue (W)	R	49	49	50	4	4	7	A	A	A	0	0	0	2	2	3
	Southern Cross Avenue	9642	2	107-2		Kingsford Smith Avenue (S)	T	81	93	81	3	3	4	A	A	A	0	0	0	1	2	2
	Kingsford Smith Avenue	9643	3	107-3		Southern Cross Avenue (E)	L	9	22	26	1	1	3	A	A	A	0	0	0	0	0	1
	Southern Cross Avenue	9646	4	107-4	Southern Cross Avenue (E)	Kingsford Smith Avenue (N)	R	10	4	17	5	6	10	A	A	A	0	0	0	1	1	2
		9647	5	107-5		Southern Cross Avenue (W)	T	127	139	175	5	4	7	A	A	A	0	0	0	4	4	7
		9645	6	107-6		Kingsford Smith Avenue (S)	L	4	19	16	2	2	4	A	A	A	0	0	0	1	1	1
		9640	7	107-7	Kingsford Smith Avenue (S)	Southern Cross Avenue (E)	R	5	5	14	4	5	5	A	A	A	0	0	0	1	1	2
		9639	8	107-8		Kingsford Smith Avenue (N)	T	159	161	252	4	4	4	A	A	A	0	0	0	0	0	2
		9641	9	107-9		Southern Cross Avenue (W)	L	75	66	81	3	3	3	A	A	A	0	0	0	0	0	1
		9648	10	107-10	Southern Cross Avenue (W)	Kingsford Smith Avenue (S)	R	41	52	78	8	8	13	A	A	A	0	0	0	2	2	3
		9650	11	107-11		Southern Cross Avenue (E)	T	126	134	167	4	5	8	A	A	A	0	0	0	3	3	4
		9649	12	107-12		Kingsford Smith Avenue (N)	L	31	31	31	3	3	6	A	A	A	0	0	0	1	2	2
					All			717	772	988	4	4	6	A	A	A	0	0	0	4	4	7

P4356 60_80 Southern Cross Ave Middleton Grange

AIMSUN Intersection Results Comparison 2030

PM Peak 1645 - 1745

								Volume (veh)			Delay (seconds)			Level of Service			Average Queue (veh)			Maximum Queue (veh)		
ID	Intersection	Aimsun Code	Turn Number	Movement Code	From	To	Turn	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development	Do Minimum	LEP Development	Proposed Development
108	Middleton Drive	10013498	1	108-1	Middleton Drive (N)	McIver Avenue (W)	R	126	144	130	1	1	1	A	A	A	0	0	0	0	0	0
	Bird Walton Avenue	10013497	2	108-2		Middleton Drive (S)	T	51	50	61	1	1	1	A	A	A	0	0	0	0	0	0
	McIver Avenue	10013496	3	108-3		Bird Walton Avenue (E)	L	9	7	24	0	0	0	A	A	A	0	0	0	0	0	0
		10013499	4	108-4	Bird Walton Avenue (E)	Middleton Drive (N)	R	39	40	80	1	1	1	A	A	A	0	0	0	0	0	0
		10013502	5	108-5		McIver Avenue (W)	T	3	2	2	1	1	1	A	A	A	0	0	0	0	0	0
		10013501	6	108-6		Middleton Drive (S)	L	0	0	0	0	0	0	A	A	A	0	0	0	0	0	0
		10013504	7	108-7	Middleton Drive (S)	Bird Walton Avenue (E)	R	0	0	0	0	0	0	A	A	A	0	0	0	0	0	0
		10013503	8	108-8		Middleton Drive (N)	T	80	97	26	1	1	1	A	A	A	0	0	0	0	0	0
		10013506	9	108-9		McIver Avenue (W)	L	5	7	17	0	0	0	A	A	A	0	0	0	0	0	0
		10013509	10	108-10	McIver Avenue (W)	Middleton Drive (S)	R	0	0	0	0	0	0	A	A	A	0	0	0	0	0	0
		10013508	11	108-11		Bird Walton Avenue (E)	T	0	1	7	1	1	1	A	A	A	0	0	0	0	0	0
		10013507	12	108-12		Middleton Drive (N)	L	181	174	272	1	1	1	A	A	A	0	0	0	0	0	0
					All			228	243	297	1	1	1	A	A	A	0	0	0	0	0	0
109	Cowpasture Road	10338	1	109-1	Cowpasture Road (N)	Westlink M7 (W)	R	90	97	105	53	52	62	D	D	E	1	1	1	4	4	5
	Westlink M7	10336	2	109-2		Cowpasture Road (S)	T	1,785	1,788	1,948	15	17	7	A	B	A	2	2	1	5	5	5
	Cowpasture Road	10312	3	109-3		Westlink M7 (E)	L	299	278	304	1	1	1	A	A	A	0	0	0	1	1	1
	Westlink M7	10334	4	109-4	Westlink M7 (E)	Cowpasture Road (N)	R	298	293	289	51	52	53	D	D	D	2	2	2	7	7	7
		10314	6	109-6		Cowpasture Road (S)	L	191	211	226	20	24	14	B	B	A	1	1	1	6	6	6
		10345	7	109-7	Cowpasture Road (S)	Westlink M7 (E)	R	100	105	162	47	49	51	D	D	D	1	1	1	4	4	5
		10343	8	109-8		Cowpasture Road (N)	T	1,450	1,440	1,485	16	17	15	B	B	B	2	2	2	9	9	9
		10349	9	109-9		Westlink M7 (W)	L	318	330	319	1	1	1	A	A	A	0	0	0	2	2	3
		10339	10	109-10	Westlink M7 (W)	Cowpasture Road (S)	R	472	492	548	57	58	69	E	E	E	3	3	5	7	8	8
		10303	12	109-12		Cowpasture Road (N)	L	51	49	54	2	2	2	A	A	A	0	0	0	2	2	2
					All			5,054	5,083	5,440	21	23	20	B	B	B	1	1	1	9	9	9
110	Cowpasture Road	10381	1	110-1	Cowpasture Road (N)	Airfield Drive (W)	R	3	10	5	129	178	111	F	F	F	0	0	0	3	3	3
	Landmark Shopping Centre Access	10382	2	110-2		Cowpasture Road (S)	T	1,833	1,845	1,978	150	157	55	F	F	D	28	31	12	66	64	54
	Cowpasture Road	10012420	3	110-3		Landmark Shopping Centre Acc	L	25	25	38	165	168	55	F	F	D	1	1	0	4	5	4
	Airfield Drive	10012423	4	110-4	Landmark Shopping Centre Acc	Cowpasture Road (N)	R	33	30	34	63	63	75	E	E	F	1	1	1	3	3	3
		10012421	5	110-5		Airfield Drive (W)	T	105	105	0	85	85	0	F	F	A	2	2	0	4	4	0
		10012485	6	110-6		Cowpasture Road (S)	L	181	169	281	14	13	15	A	A	A	1	1	1	5	5	5
		10012419	7	110-7	Cowpasture Road (S)	Landmark Shopping Centre Acc	R	245	240	249	36	37	40	C	C	C	2	2	2	4	5	6
		10384	8	110-8		Cowpasture Road (N)	T	1,430	1,416	1,464	6	6	4	A	A	A	1	1	1	3	3	3
		10369	9	110-9		Airfield Drive (W)	L	137	127	142	1	1	0	A	A	A	0	0	0	1	1	1
		10380	10	110-10	Airfield Drive (W)	Cowpasture Road (S)	R	187	195	114	39	41	57	C	C	D	1	1	1	3	3	3
		10012504	11	110-11		Landmark Shopping Centre Acc	T	14	14	31	70	64	60	F	E	E	0	0	0	2	2	2
		10376	12	110-12		Cowpasture Road (N)	L	7	8	7	4	6	3	A	A	A	0	0	0	1	1	1
					All			4,200	4,184	4,343	76	80	33	F	F	C	3	3	2	66	64	54
111	Cowpasture Road	10443	1	111-1	Cowpasture Road (N)	Aviation Road (W)	R	127	131	180	47	50	77	D	D	F	2	2	3	8	9	19
	Cowpasture Road	10442	2	111-2		Cowpasture Road (S)	T	2,022	2,043	2,078	3	1	2	A	A	A	1	0	0	12	7	11
	Aviation Road	10440	8	111-8	Cowpasture Road (S)	Cowpasture Road (N)	T	1,488	1,482	1,472	8	8	9	A	A	A	1	1	1	16	16	17
		10441	9	111-9		Aviation Road (W)	L	23	25	36	10	9	11	A	A	A	0	0	0	2	2	3
		10446	10	111-10	Aviation Road (W)	Cowpasture Road (S)	R	0	3	7	76	63	47	F	E	D	0	0	0	0	1	1
		10445	12	111-12		Cowpasture Road (N)	L	129	132	199	30	29	23	C	C	B	1	1	1	2	2	2
					All			3,789	3,816	3,972	7	7	9	A	A	A	1	1	1	16	16	19
112	Qantas Boulevard	9472	1	111-1	Qantas Boulevard (N)	Qantas Boulevard (E)	L	170	135	396	0	0	10	A	A	A	0	0	1	2	2	8
	Qantas Boulevard	10001487	4	111-4	Qantas Boulevard (E)	Qantas Boulevard (N)	R	60	97	263	14	15	20	A	B	B	0	0	1	4	4	9
	Sixteenth Avenue East	9475	5	111-5		Sixteenth Avenue East (W)	T	795	890	907	4	5	14	A	A	A	0	0	2	5	16	20
		9477	11	111-11	Sixteenth Avenue East (W)	Qantas Boulevard (E)	T	587	659	678	0	1	2	A	A	A	0	0	0	1	1	3
		9476	12	111-12		Qantas Boulevard (N)	L	3	2	15	2	4	2	A	A	A	0	0	0	0	0	0
					All			1,614	1,782	2,259	2	4	10	A	B	B	0	0	1	5	16	20
113	Main Street	10011939	1	111-1	Main Street (N)	Flynn Avenue (W)	R	6	18	112	11	24	35	A	B	C	0	0	1	2	3	6
	Flynn Avenue	10011940	3	111-3		Flynn Avenue (E)	L	21	47	128	2	4	30	A	A	C	0	0	1	2	2	10
	Flynn Avenue	10011943	4	111-4	Flynn Avenue (E)	Main Street (N)	R	317	349	298	7	13	14	A	A	A	0	1	1	7	8	7
		10011944	5	111-5		Flynn Avenue (W)	T	451	510	582	4	9	9	A	A	A	0	1	1	7	9	12
		10011942	11	111-11	Flynn Avenue (W)	Flynn Avenue (E)	T	274	373	280	0	1	6	A	A	A	0	0	0	1	2	4
		10011941	12	111-12		Main Street (N)	L	8	56	83	1	2	7	A	A	A	0	0	0	1	1	4
					All			1,076	1,354	1,483	4	7	13	A	A	A	0	0	1	7	9	12
114	Southern Cross Avenue	10001301	5	111-5	Southern Cross Avenue (E)	Southern Cross Avenue (W)	T	11	33	159	0	0	5	A	A	A	0	0	0	0	0	5
	Main Street	10012045	6	111-6		Main Street (S)	L	4	5	0	1	1	0	A	A	A	0	0	0	0	0	1
	Southern Cross Avenue	10012044	7	111-7	Main Street (S)	Southern Cross Avenue (E)	R	1	5	1	1	1	20	A	A	B	0	0	0	0	1	1
		10012043	9	111-9		Southern Cross Avenue (W)	L	245	254	51	1	1	41	A	A	C	0	0	1	3	4	6
		10012046	10	111-10	Southern Cross Avenue (W)	Main Street (S)	R	16	29	47	1	2	5	A	A	A	0	0	0	1	1	2
		10001303	11	111-11		Southern Cross Avenue (E)	T	121	96	163	0	0	5	A	A	A	0	0	0	0	0	5
					All			397	422	421	1	1	9	A	A	A	0	0	0	3	4	6

Appendix E: Travel Time Comparison

P4356 60_80 Southern Cross Ave Middleton Grange

AIMSUN Travel Time Comparison 2030
AM Peak 0730-0830
Route A

Northbound

Sections	Section Distance (km)	Cumulative Distance (km)	2030 Do Minimum	2030 Do Minimum (Cumulative)	2030 With LEP Development	2030 With LEP Development (Cumulative)	2030 With Development	2030 With Development (Cumulative)
Cowpasture Road (South)	0.00	0.00	-	0:00:00	-	0:00:00	-	0:00:00
Fifteenth Avenue	0.48	0.48	0:02:12	0:02:12	0:02:19	0:02:19	0:01:54	0:01:54
Flynn Avenue	0.39	0.87	0:00:36	0:02:48	0:00:33	0:02:51	0:00:37	0:02:31
Westlink M7	0.27	1.14	0:00:37	0:03:24	0:00:27	0:03:18	0:00:26	0:02:57
Airfield Drive	0.20	1.34	0:00:51	0:04:16	0:00:46	0:04:04	0:00:41	0:03:38
Aviation Road	1.32	2.66	0:01:36	0:05:51	0:01:32	0:05:36	0:01:36	0:05:13

Southbound

Sections	Section Distance (km)	Cumulative Distance (km)	2030 Do Minimum	2030 Do Minimum (Cumulative)	2030 With LEP Development	2030 With LEP Development (Cumulative)	2030 With Development	2030 With Development (Cumulative)
Cowpasture Road (North)	0.00	0.00	-	0:00:00	-	0:00:00	-	0:00:00
Aviation Road	0.33	0.33	0:00:33	0:00:33	0:00:31	0:00:31	0:00:37	0:00:37
Airfield Drive	1.33	1.66	0:01:48	0:02:21	0:01:47	0:02:18	0:01:37	0:02:14
Westlink M7	0.20	1.86	0:00:30	0:02:51	0:00:30	0:02:48	0:00:28	0:02:42
Flynn Avenue	0.26	2.12	0:00:48	0:03:39	0:00:49	0:03:38	0:00:42	0:03:24
Fifteenth Avenue	0.39	2.51	0:01:37	0:05:16	0:01:36	0:05:14	0:01:22	0:04:46

P4356 60_80 Southern Cross Ave Middleton Grange

AIMSUN Travel Time Comparison 2030
AM Peak 0730-0830
Route B

Eastbound

Sections	Section Distance (km)	Cumulative Distance (km)	2030 Do Minimum	2030 Do Minimum (Cumulative)	2030 With LEP Development	2030 With LEP Development (Cumulative)	2030 With Development	2030 With Development (Cumulative)
Fifteenth Avenue (West)	0.00	0.00	-	0:00:00	-	0:00:00	-	0:00:00
Kingsford Smith Avenue	0.31	0.31	0:01:09	0:01:09	0:01:20	0:01:20	0:02:18	0:02:18
Cowpasture Road	0.82	1.13	0:01:39	0:02:48	0:01:37	0:02:58	0:01:51	0:04:10

Westbound

Sections	Section Distance (km)	Cumulative Distance (km)	2030 Do Minimum	2030 Do Minimum (Cumulative)	2030 With LEP Development	2030 With LEP Development (Cumulative)	2030 With Development	2030 With Development (Cumulative)
Hoxton Park Road (East)	0.00	0.00	-	0:00:00	-	0:00:00	-	0:00:00
Cowpasture Road	0.59	0.59	0:01:24	0:01:24	0:01:24	0:01:24	0:01:24	0:01:24
Kingsford Smith Avenue	0.81	1.40	0:01:10	0:02:34	0:01:10	0:02:34	0:01:20	0:02:44

P4356 60_80 Southern Cross Ave Middleton Grange

AIMSUN Travel Time Comparison 2030
AM Peak 0730-0830
Route C

Eastbound

Sections	Section Distance (km)	Cumulative Distance (km)	2030 Do Minimum	2030 Do Minimum (Cumulative)	2030 With LEP Development	2030 With LEP Development (Cumulative)	2030 With Development	2030 With Development (Cumulative)
Kingsford Smith Avenue	0.00	0.00	-	0:00:00	-	0:00:00	-	0:00:00
Main Street	0.43	0.43	0:00:43	0:00:43	0:02:07	0:02:07	0:00:47	0:00:47
Bravo Avenue	0.13	0.56	0:00:16	0:00:59	0:00:53	0:03:00	0:00:16	0:01:03
Hall Circuit	0.12	0.68	0:00:17	0:01:17	0:00:47	0:03:47	0:00:18	0:01:21
Cowpasture Road	0.18	0.86	0:02:04	0:03:21	0:03:58	0:07:45	0:02:19	0:03:40

Westbound

Sections	Section Distance (km)	Cumulative Distance (km)	2030 Do Minimum	2030 Do Minimum (Cumulative)	2030 With LEP Development	2030 With LEP Development (Cumulative)	2030 With Development	2030 With Development (Cumulative)
Cowpasture Road	0.00	0.00	-	0:00:00	-	0:00:00	-	0:00:00
Hall Circuit	0.18	0.18	0:00:20	0:00:20	0:00:20	0:00:20	0:00:22	0:00:22
Bravo Avenue	0.12	0.30	0:00:16	0:00:36	0:00:16	0:00:36	0:00:20	0:00:43
Main Street	0.13	0.43	0:00:18	0:00:53	0:00:20	0:00:56	0:00:22	0:01:05
Kingsford Smith Avenue	0.43	0.86	0:01:22	0:02:16	0:01:40	0:02:36	0:01:35	0:02:40

P4356 60_80 Southern Cross Ave Middleton Grange

AIMSUN Travel Time Comparison 2030
PM Peak 1645-1745
Route A

Northbound

Sections	Section Distance (km)	Cumulative Distance (km)	2030 Do Minimum	2030 Do Minimum (Cumulative)	2030 With LEP Development	2030 With LEP Development (Cumulative)	2030 With Development	2030 With Development (Cumulative)
Cowpasture Road (South)	0.00	0.00	-	0:00:00	-	0:00:00	-	0:00:00
Fifteenth Avenue	0.48	0.48	0:01:20	0:01:20	0:01:20	0:01:20	0:01:27	0:01:27
Flynn Avenue	0.39	0.87	0:01:16	0:02:36	0:01:20	0:02:40	0:01:26	0:02:53
Westlink M7	0.27	1.14	0:00:36	0:03:11	0:00:36	0:03:16	0:00:34	0:03:27
Airfield Drive	0.20	1.34	0:00:49	0:04:00	0:00:51	0:04:07	0:00:59	0:04:26
Aviation Road	1.32	2.66	0:01:39	0:05:39	0:01:39	0:05:46	0:01:39	0:06:05

Southbound

Sections	Section Distance (km)	Cumulative Distance (km)	2030 Do Minimum	2030 Do Minimum (Cumulative)	2030 With LEP Development	2030 With LEP Development (Cumulative)	2030 With Development	2030 With Development (Cumulative)
Cowpasture Road (North)	0.00	0.00	-	0:00:00	-	0:00:00	-	0:00:00
Aviation Road	0.33	0.33	0:00:29	0:00:29	0:00:28	0:00:28	0:00:31	0:00:31
Airfield Drive	1.33	1.66	0:04:08	0:04:37	0:04:10	0:04:38	0:02:23	0:02:54
Westlink M7	0.20	1.86	0:00:49	0:05:26	0:00:59	0:05:37	0:00:24	0:03:18
Flynn Avenue	0.26	2.12	0:01:19	0:06:45	0:01:35	0:07:12	0:00:44	0:04:02
Fifteenth Avenue	0.39	2.51	0:04:00	0:10:46	0:04:02	0:11:14	0:02:03	0:06:04

P4356 60_80 Southern Cross Ave Middleton Grange

AIMSUN Travel Time Comparison 2030
PM Peak 1645-1745
Route B

Eastbound

Sections	Section Distance (km)	Cumulative Distance (km)	2030 Do Minimum	2030 Do Minimum (Cumulative)	2030 With LEP Development	2030 With LEP Development (Cumulative)	2030 With Development	2030 With Development (Cumulative)
Fifteenth Avenue (West)	0.00	0.00	-	0:00:00	-	0:00:00	-	0:00:00
Kingsford Smith Avenue	0.31	0.31	0:01:08	0:01:08	0:01:13	0:01:13	0:02:21	0:02:21
Cowpasture Road	0.82	1.13	0:01:56	0:03:04	0:02:06	0:03:19	0:02:51	0:05:11

Westbound

Sections	Section Distance (km)	Cumulative Distance (km)	2030 Do Minimum	2030 Do Minimum (Cumulative)	2030 With LEP Development	2030 With LEP Development (Cumulative)	2030 With Development	2030 With Development (Cumulative)
Hoxton Park Road (East)	0.00	0.00	-	0:00:00	-	0:00:00	-	0:00:00
Cowpasture Road	0.59	0.59	0:01:38	0:01:38	0:01:54	0:01:54	0:01:55	0:01:55
Kingsford Smith Avenue	0.81	1.40	0:01:51	0:03:29	0:01:34	0:03:29	0:03:06	0:05:01

P4356 60_80 Southern Cross Ave Middleton Grange

AIMSUN Travel Time Comparison 2030
PM Peak 1645-1745
Route C

Eastbound

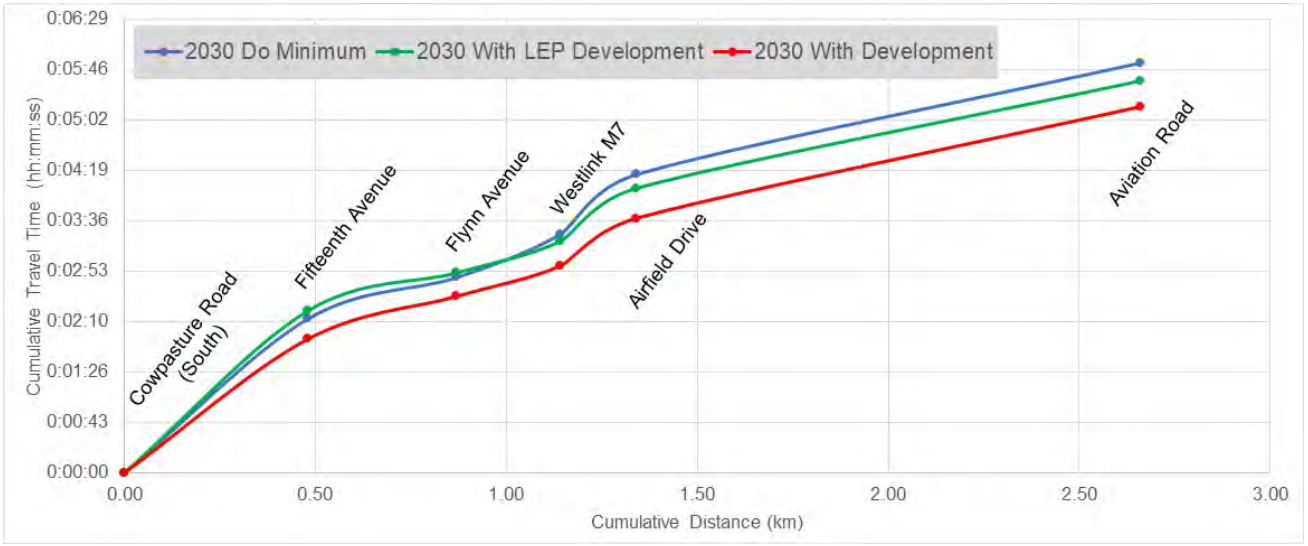
Sections	Section Distance (km)	Cumulative Distance (km)	2030 Do Minimum	2030 Do Minimum (Cumulative)	2030 With LEP Development	2030 With LEP Development (Cumulative)	2030 With Development	2030 With Development (Cumulative)
Kingsford Smith Avenue	0.00	0.00	-	0:00:00	-	0:00:00	-	0:00:00
Main Street	0.43	0.43	0:00:42	0:00:42	0:00:42	0:00:42	0:00:48	0:00:48
Bravo Avenue	0.13	0.56	0:00:16	0:00:58	0:00:20	0:01:02	0:00:20	0:01:08
Hall Circuit	0.12	0.68	0:00:16	0:01:14	0:00:18	0:01:20	0:00:18	0:01:25
Cowpasture Road	0.18	0.86	0:02:09	0:03:24	0:02:49	0:04:09	0:01:56	0:03:21

Westbound

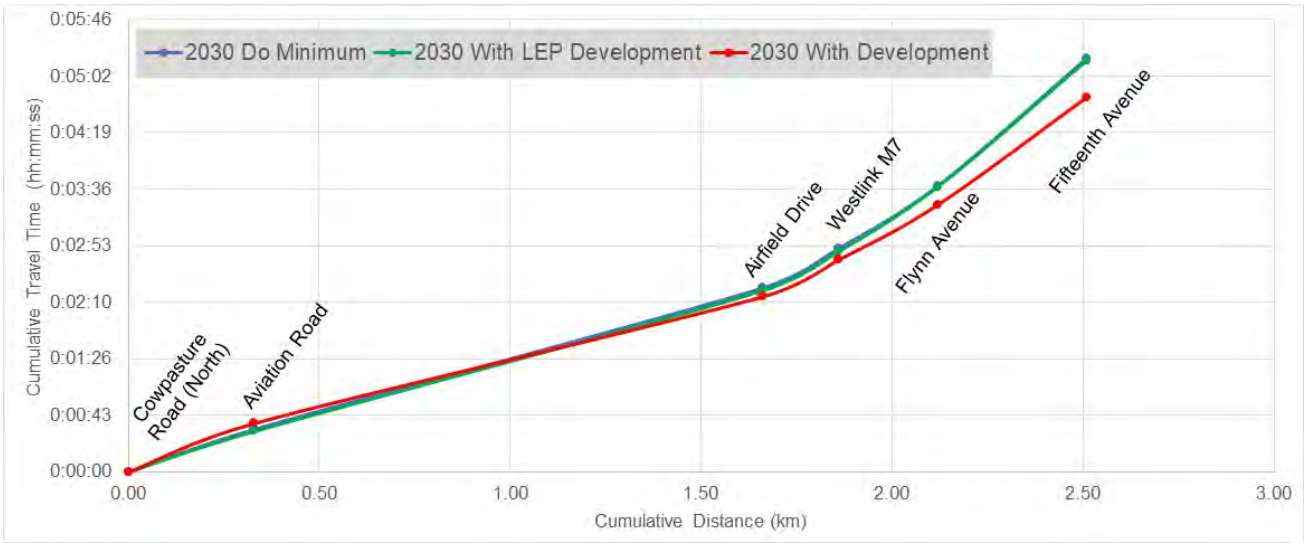
Sections	Section Distance (km)	Cumulative Distance (km)	2030 Do Minimum	2030 Do Minimum (Cumulative)	2030 With LEP Development	2030 With LEP Development (Cumulative)	2030 With Development	2030 With Development (Cumulative)
Cowpasture Road	0.00	0.00	-	0:00:00	-	0:00:00	-	0:00:00
Hall Circuit	0.18	0.18	0:00:23	0:00:23	0:00:25	0:00:25	0:00:36	0:00:36
Bravo Avenue	0.12	0.30	0:00:18	0:00:40	0:00:21	0:00:46	0:00:29	0:01:04
Main Street	0.13	0.43	0:00:21	0:01:01	0:00:27	0:01:13	0:00:26	0:01:31
Kingsford Smith Avenue	0.43	0.86	0:01:12	0:02:13	0:01:12	0:02:25	0:01:17	0:02:48

Route A – Cowpasture Road

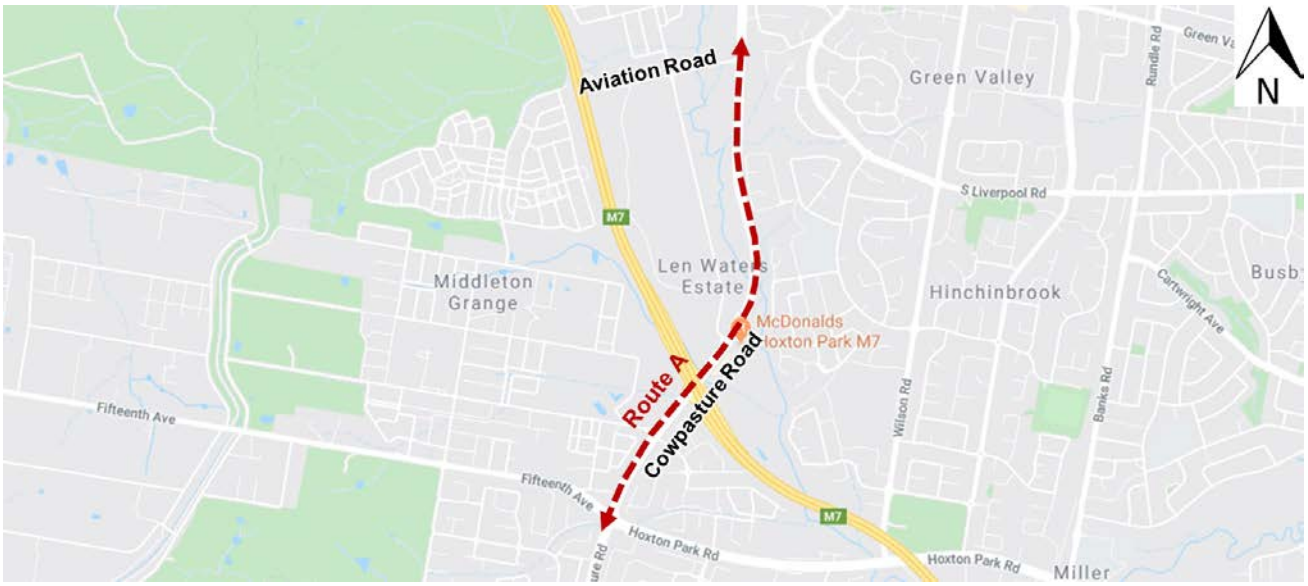
Route A – Northbound – AM Peak



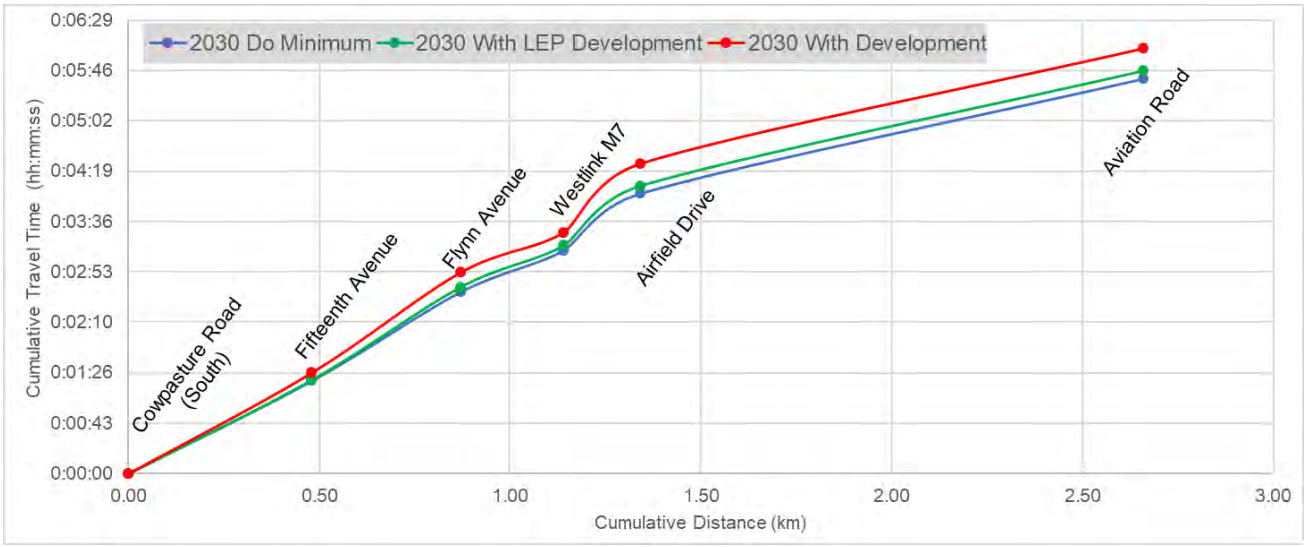
Route A – Southbound – AM Peak



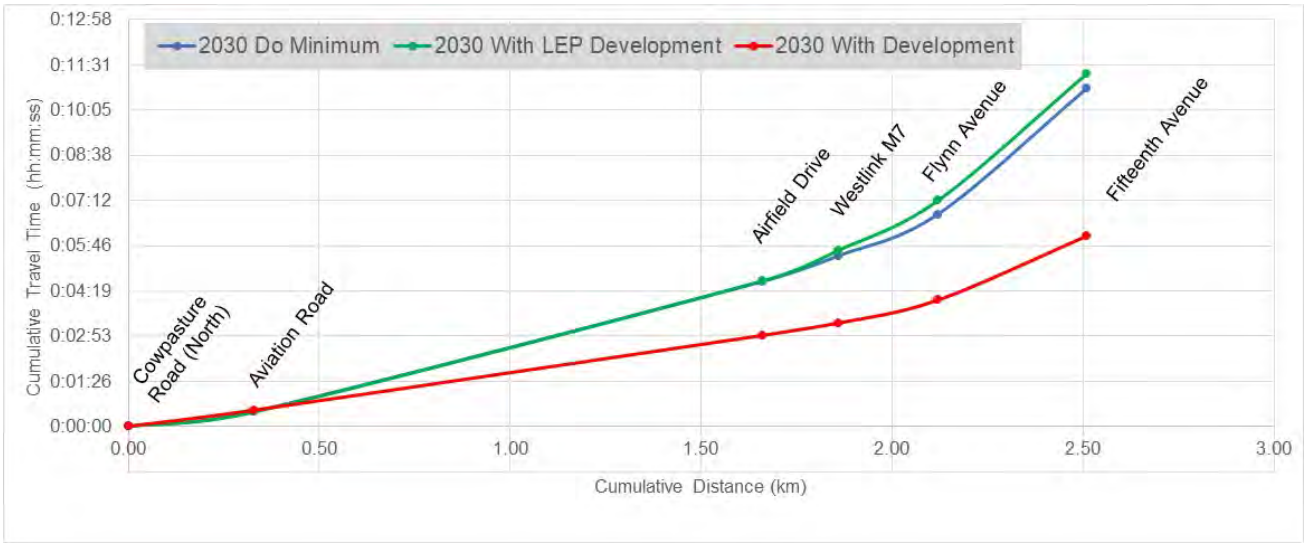
Route A – Cowpasture Road



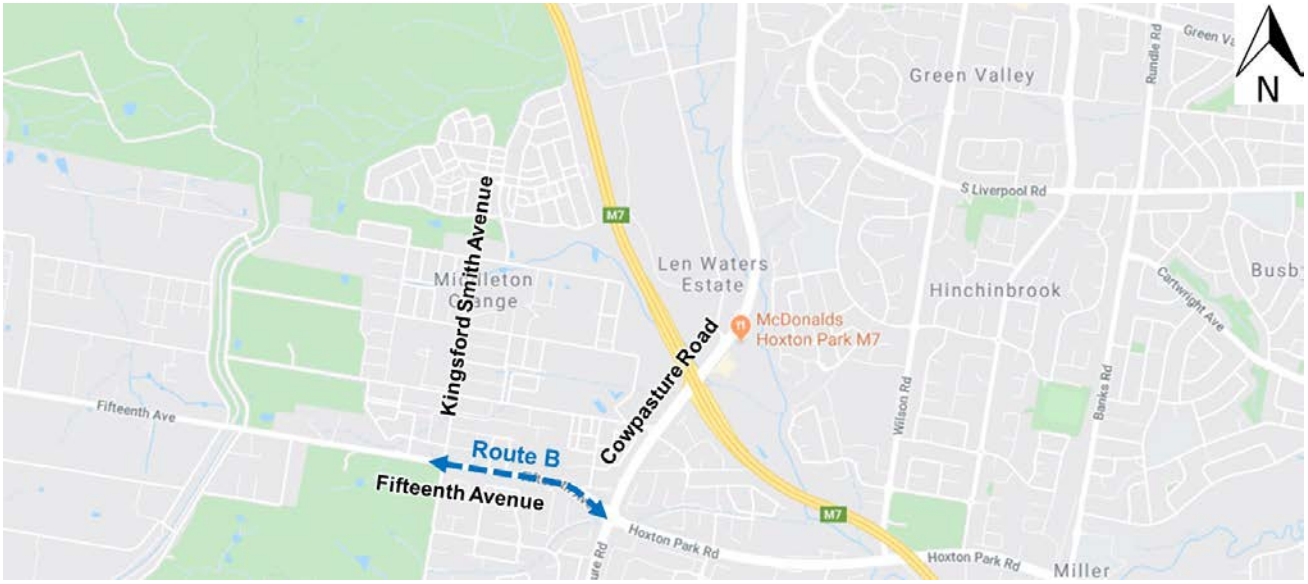
Route A – Northbound – PM Peak



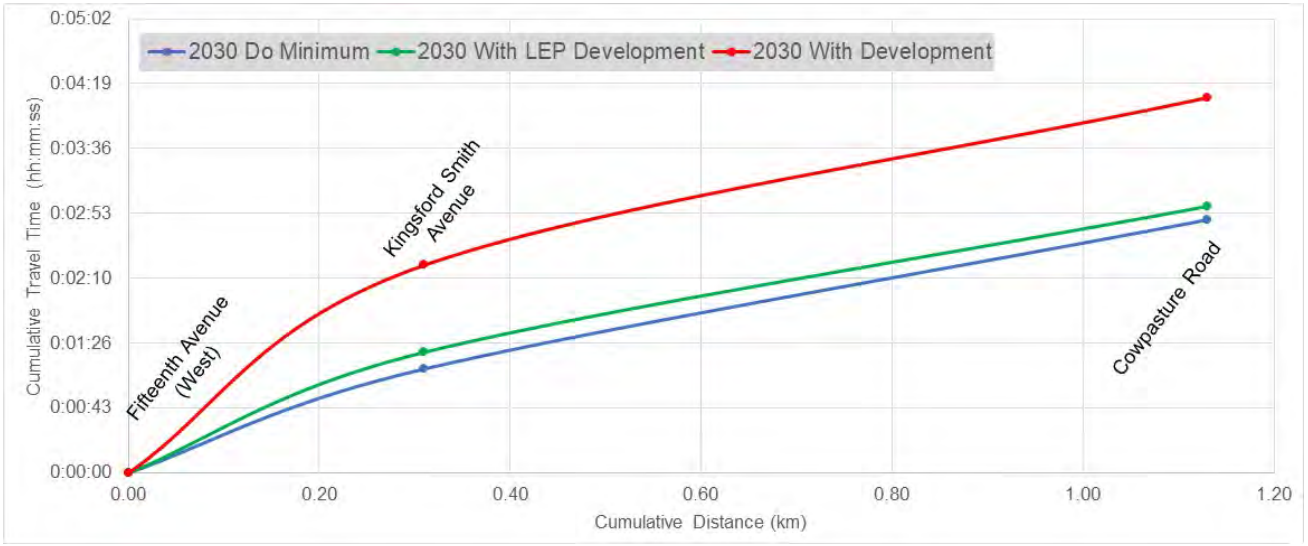
Route A – Southbound – PM Peak



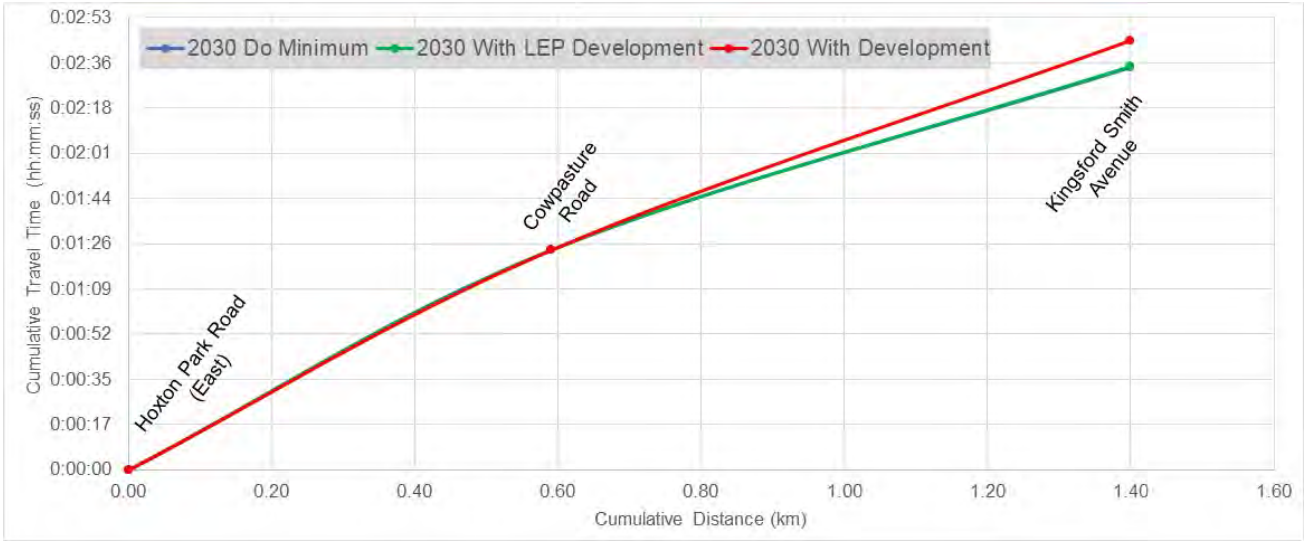
Route B – Fifteenth Avenue



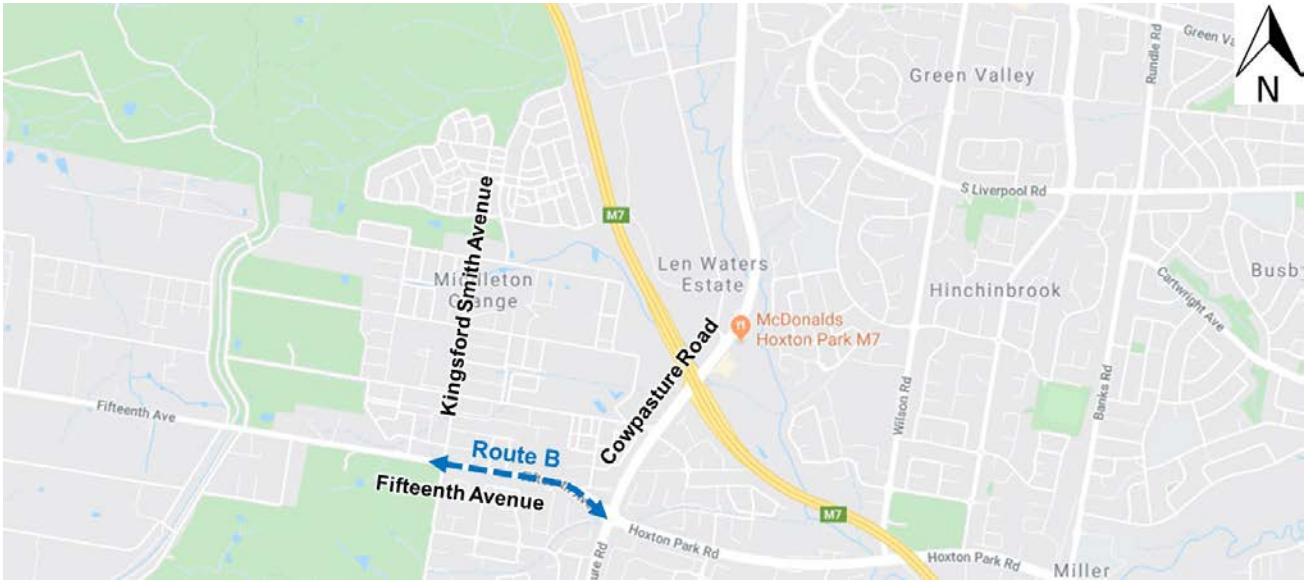
Route B – Eastbound – AM Peak



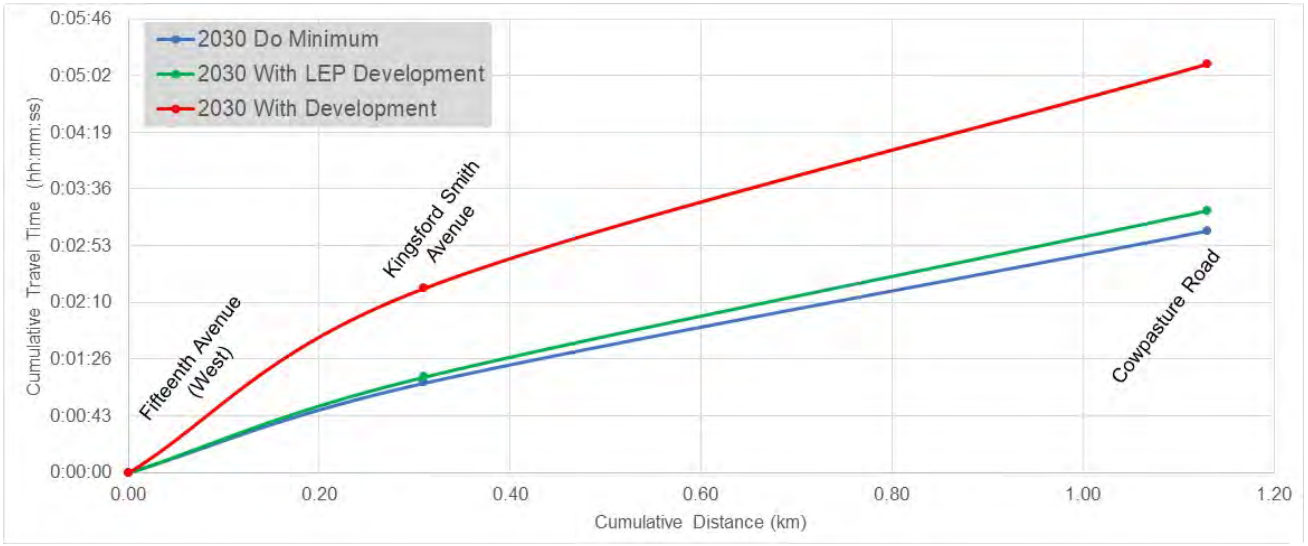
Route B – Westbound – AM Peak



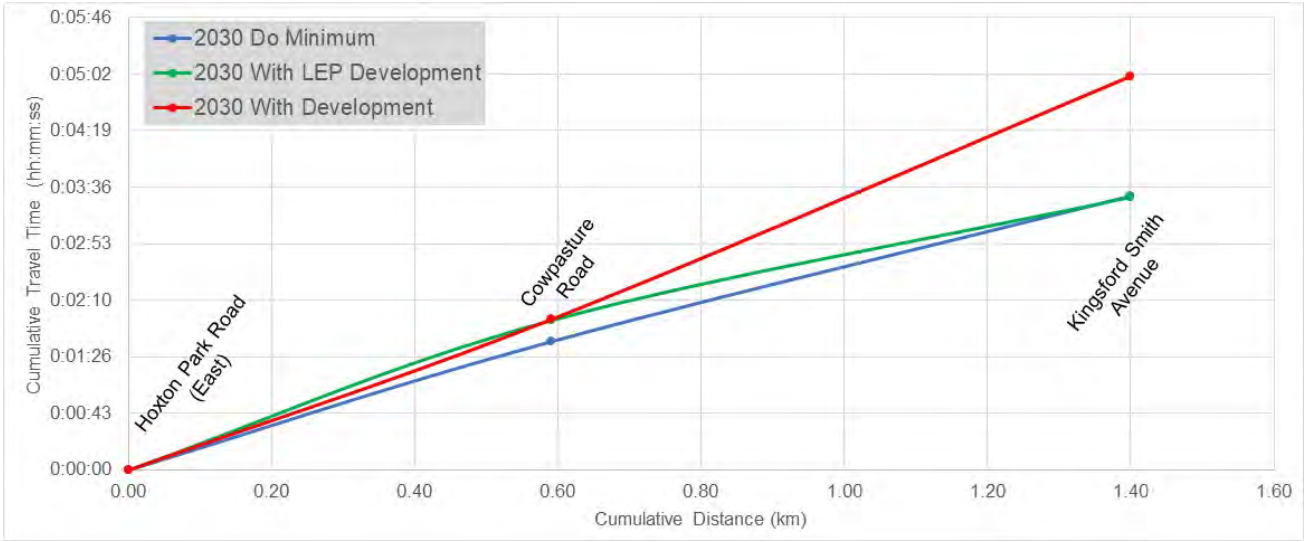
Route B – Fifteenth Avenue



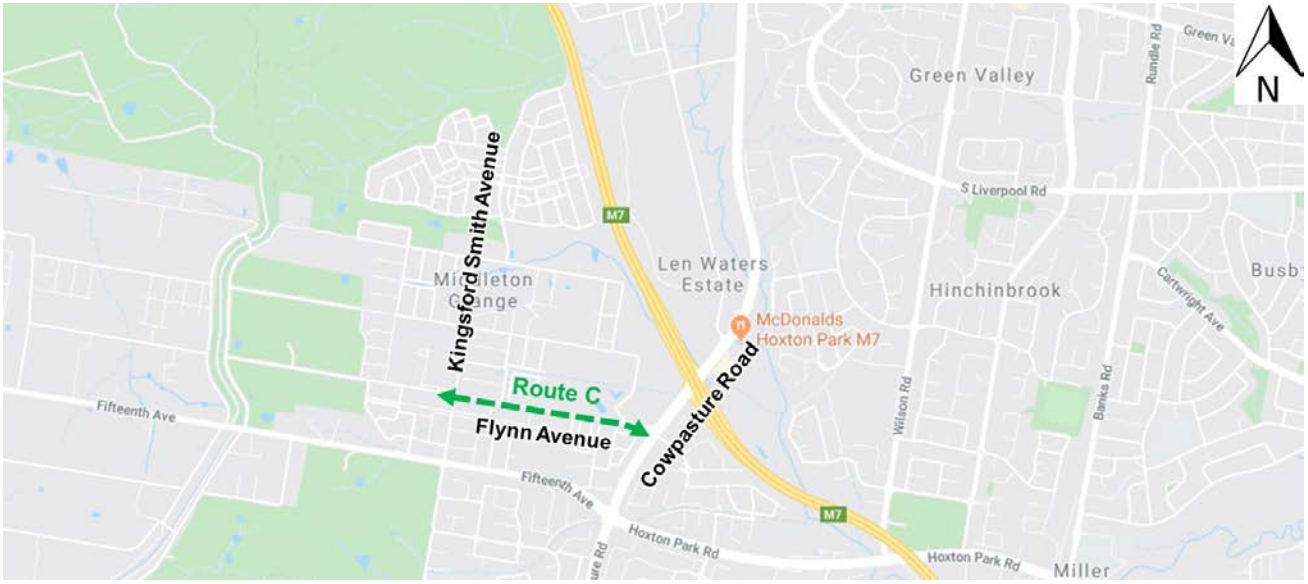
Route B – Eastbound – PM Peak



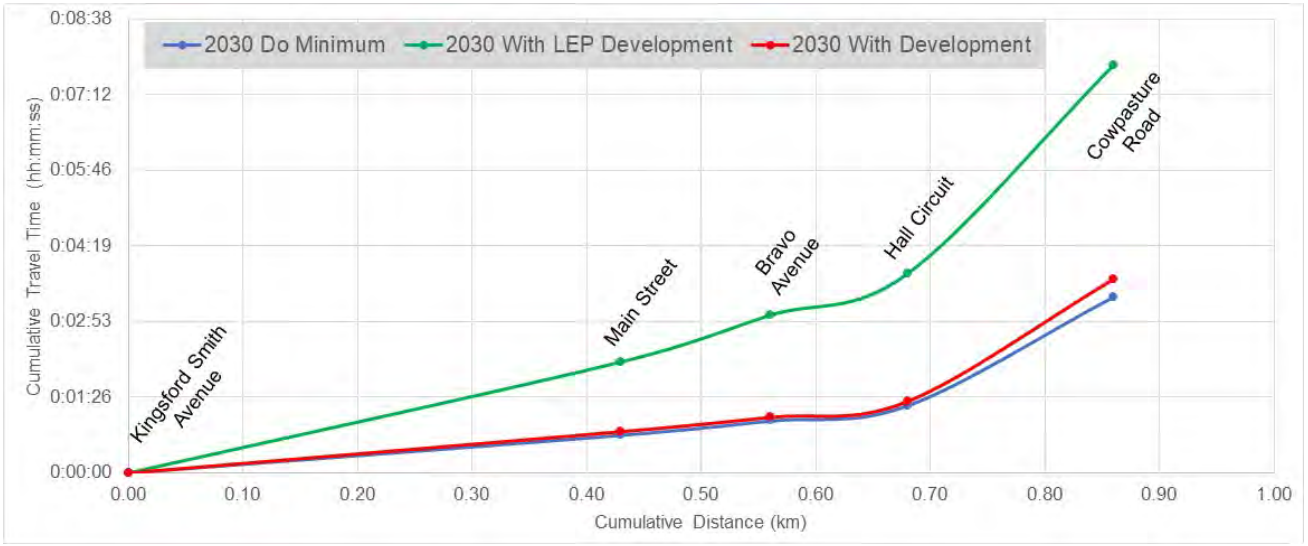
Route B – Westbound – PM Peak



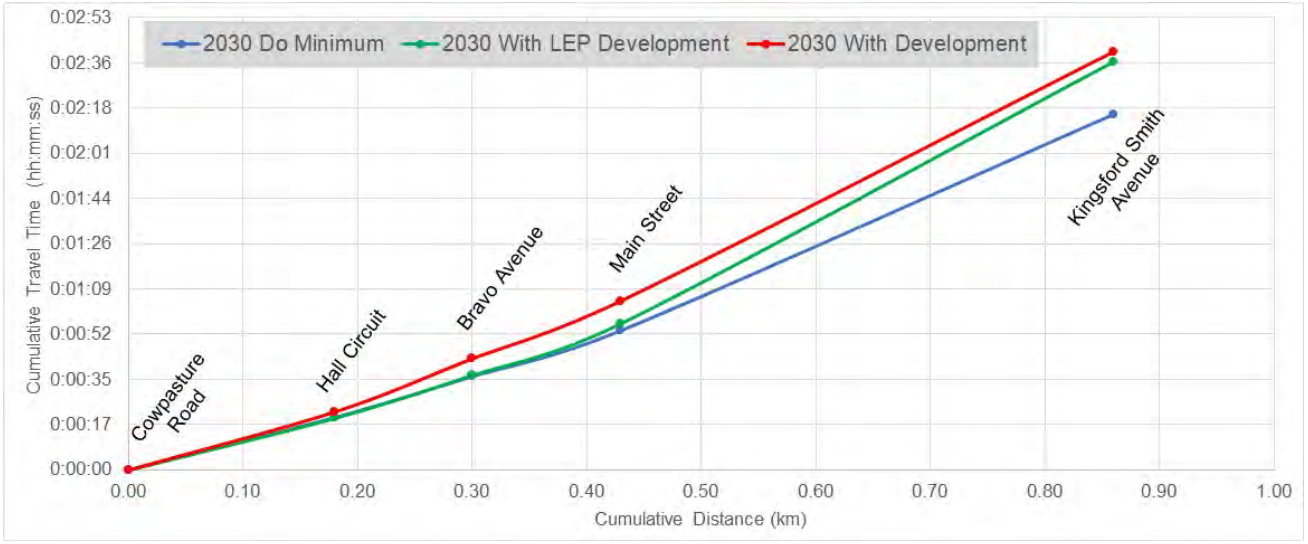
Route C – Flynn Avenue



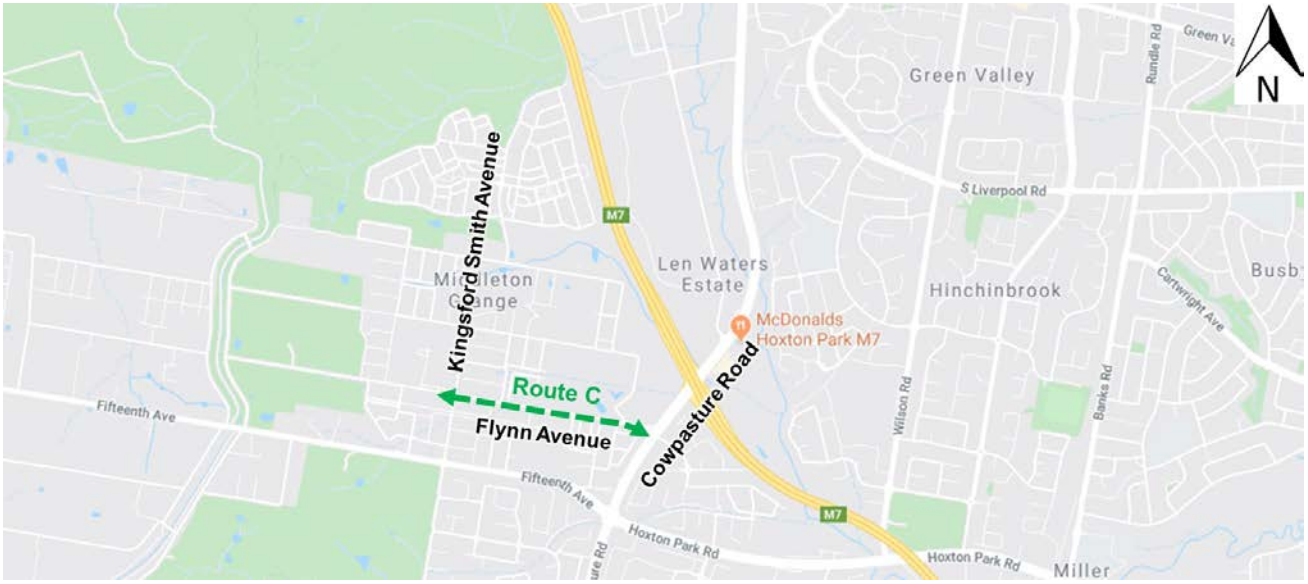
Route C – Eastbound – AM Peak



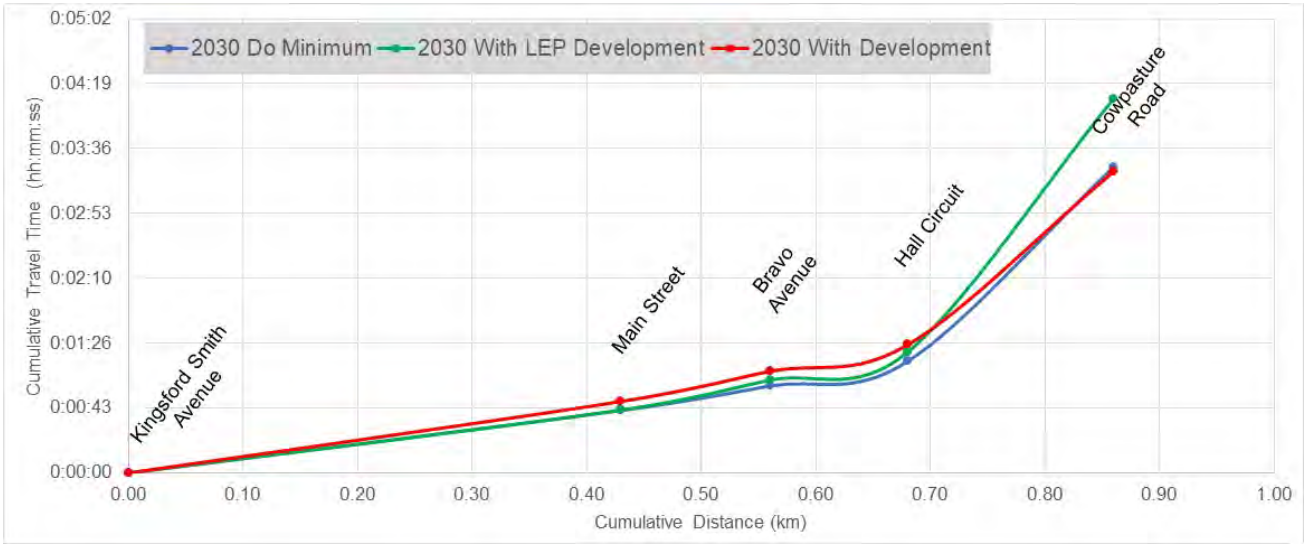
Route C – Westbound – AM Peak



Route C – Flynn Avenue



Route C – Eastbound – PM Peak



Route C – Westbound – PM Peak