transport & accessibility impact study

for a Concept Plan Application relating to the construction of a residential development at 1-9 Allengrove Crescent, Ryde

prepared on behalf of EGC Custodian Services by **TRAFFIX** traffic & transport planners
ref: 10 145 report v4 May 2011

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1. introduction

TRAFFIX has been commissioned by EGC Custodian Services to undertake a Transport & Accessibility Impact Study relating to a proposed Concept Plan Application on lands located at 116a-122b Epping Road, 259-263 Lane Cove Road and 1-9 Allengrove Crescent, at North Ryde. The report is to accompany an Environmental Assessment undertaken by Urbis and responds to the relevant issues raised by the Director Generals Requirements dated 11 June 2010.

The Concept Plan seeks approval for the construction of three, eight storey residential buildings comprising a total of 196 residential units, with 273 parking spaces within three basement levels of car parking.

This report documents the findings of our investigation and concentrates on the requirements outlined by the Director General including the use of the Macquarie Park Corridor Paramics Model to assess the external traffic impacts of the development.

The report is structured as follows:

- Section 2: Describes the site and its location
- Section 3: Documents existing traffic conditions
- Section 4: Describes the proposed development
- Section 5: Assesses the parking requirements
- Section 6: Traffic modelling
- Section 7: Discusses access and internal design aspects
- Section 8: Presents the overall study conclusions.

2. location and site

The site is situated within the Ryde City Council local government area, located approximately 12 kilometres north-west of the Sydney CBD. More specifically, the site is positioned directly opposite the southern boundary of the area identified as the Macquarie Park employments lands on the south-eastern corner of the intersection of Epping Road and Lane Cove Road, approximately 400 metres south of the Macquarie Park Railway Station.

The site has an irregular configuration with a total area of 12,297m^2 and currently consists of numerous low density residential dwellings. It has a northern frontage to Epping Road of approximately 95 metres, an eastern frontage to neighbouring residential developments of 135 metres, a southern frontage to Allengrove Crescent of approximately 76 metres and a western frontage to Lane Cove Road of approximately 95 metres. A small park is located on the north-western corner of the site.

A Location Plan is presented in **figure 1**, with a Site Plan presented in **figure 2**. Reference should also be made to the Photographic Record presented in **appendix a**, which provides an appreciation of the general character of roads and other key attributes in proximity to the site.

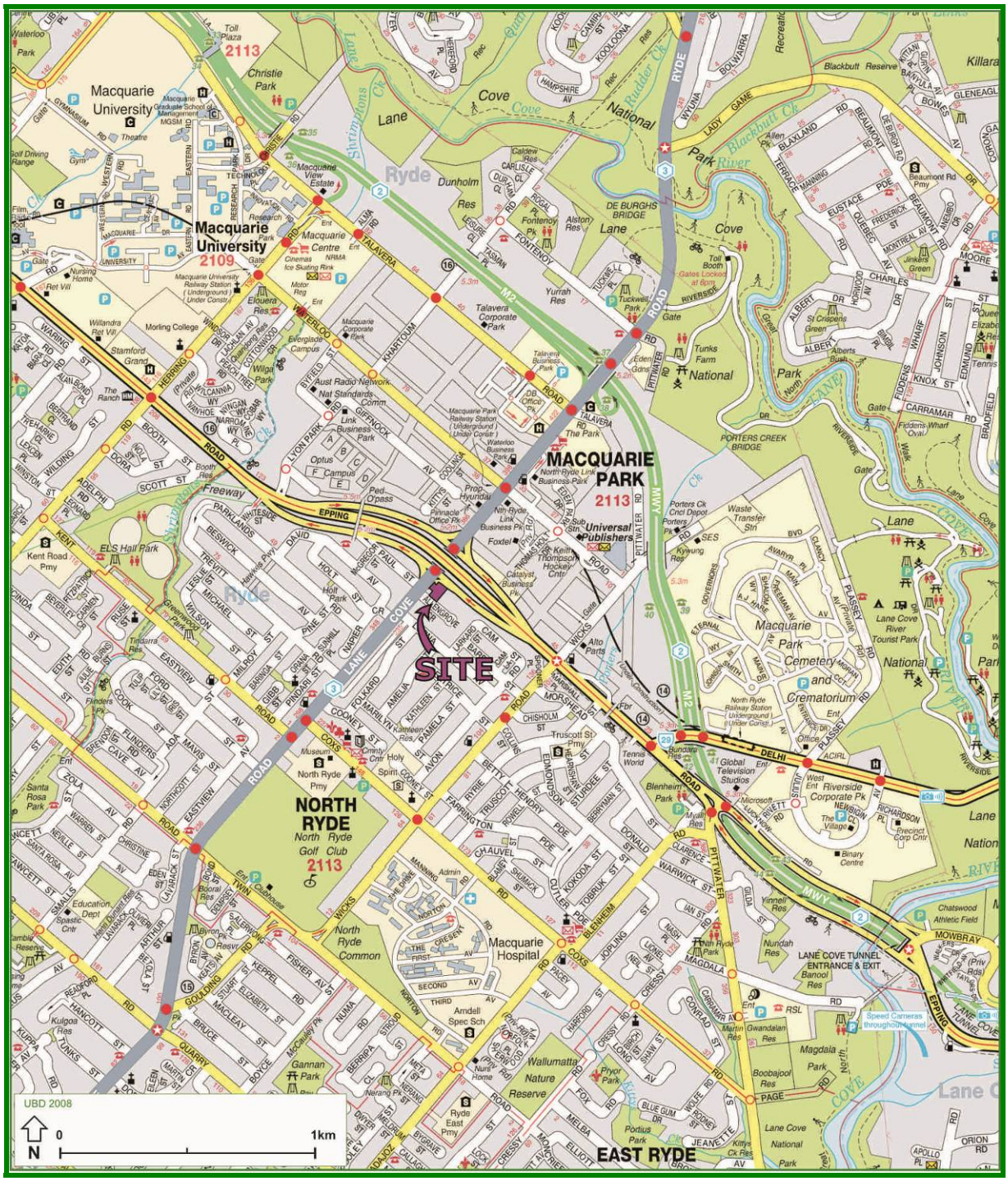


figure 1: location plan

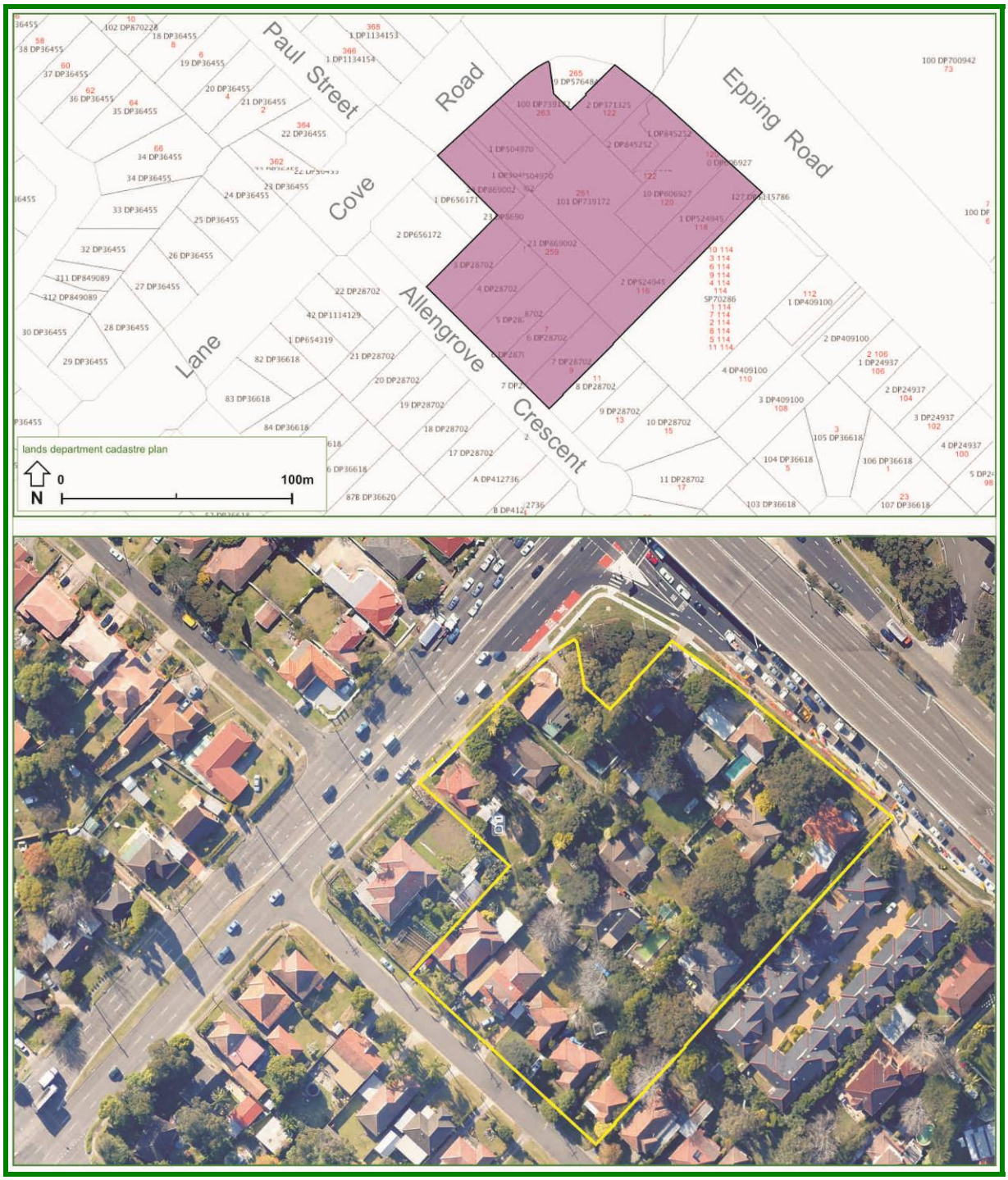


figure 2: site plan

3. existing traffic conditions

3.1 road hierarchy

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

- M2 Motorway: an RTA State Road (MR 6002) that generally runs in an east-west direction between Lane Cove in the east and Baulkham Hills in the west. The M2 Motorway is one of Sydney's major transport corridors to the north-western suburbs. It carries in the order of 95,000vpd.

- Epping Road: an RTA State Road (MR 373) that generally runs in an east-west direction between the M2 Motorway (at Lane Cove) in the east and Blaxland Road (Epping) in the west. Epping Road forms the northern site boundary and carries approximately 50,000vpd.

- Lane Cove Road: an RTA State Road (MR 162) that runs in north-south direction to the west of the site. It forms a continuation of Homebush Bay Drive in the south and continues into Mona Vale Road in the north. It carries approximately 75,000 vpd in the vicinity of the site.

- Wicks Road an RTA Regional Road (RR 2058) that generally runs in a north-south direction parallel to Lane Cove Road, to the east of the site. It runs between Twin Road in the South and crosses Epping Road in the north, forming a junction with Waterloo Road. It carries in the order of 17,000 vpd in the vicinity of the site.

- Allengrove Crescent a local road that forms the southern site boundary and is to accommodate all vehicular access associated with the proposed development. It forms the stem of a T-Junction with Lane Cove Road and is estimated at carrying less than 500 vehicle movements per day.

It can be seen from **figure 3** that the site is conveniently located with respect to the arterial and local road systems serving the region. It is therefore able to effectively distribute traffic onto the wider road network, minimising traffic impacts.

3.2 general description of road environment

Epping Road is constructed with a divided carriageway of varying width and generally carries three lanes of traffic in either direction. In the vicinity of the site, it forms a grade separated overpass at its intersection with Lane Cove Road and is restricted to an 80 km/h speed limit. At its intersection with Lane Cove Road, Epping Road has been constructed with on and off ramps on both approaches to facilitate full turning movements at the intersection. On its westbound approach it includes a unsignalised left turn slip lane, two dedicated right turn lanes and a shared through and right turn lane. On the eastbound approach it includes a unsignalised left turn slip lane, a dedicated bus lane allowing through movements only, a shared through and right turn lane and a dedicated right turn bay which also facilitates U-Turn movements for vehicles rerouting to the west.

Lane Cove Road is constructed with a 22 metre wide divided carriageway, generally carrying three through lanes in either direction. On its northbound approach to its intersection with Epping Road it includes a 155 metre duel lane right turn bay and three through lanes. Left turn movements are permitted via an unsignalised left turn slip lane. The southbound approach is also constructed with a duel lane right turn bay with a length of 165 metres and includes three through lanes. An 80 metre left turn lane is also constructed and allows free flow movements at all times via an unsignalised slip lane. Lane Cove Road is subject to a 70km/h speed restriction in the vicinity of the site.

Allengrove Crescent is constructed with a 7.0 metre wide carriageway and forms the stem of a priority controlled T Junction with Lane Cove Road. A two hour residential parking scheme applies to both the northern and southern sides of Allengrove Crescent.

figure 3: road hierarchy

3.3 public transport

The site benefits from excellent exposure to public transport and is serviced by both bus and rail. Existing bus services operating in the locality are shown in **figure 4** below. It is evident that the site benefits from good access to the bus network with buses travelling along both Epping Road and Lane Cove Road. The Macquarie Railway Station is located approximately 400 metres to the north of the site further improving the sites accessibility to public transport.

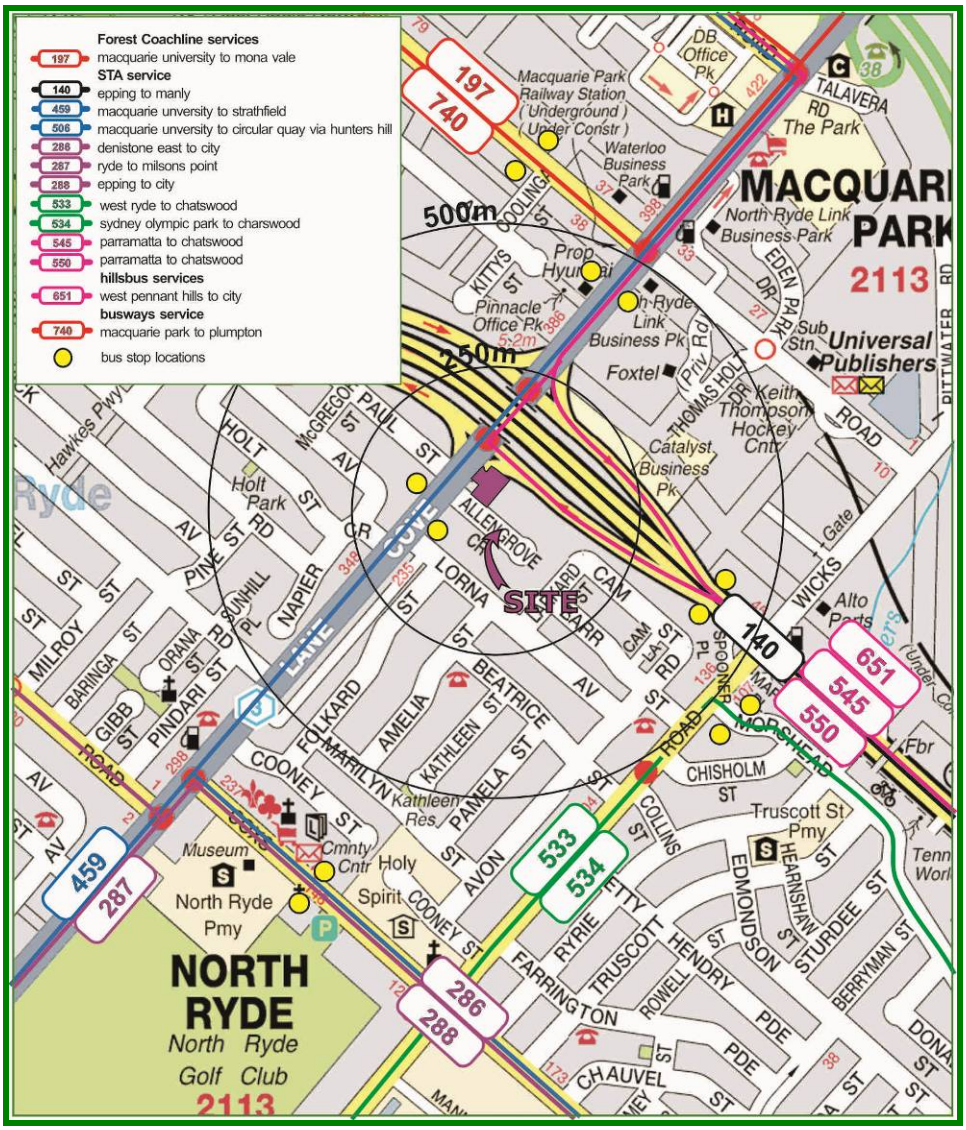


figure 4: public transport

3.4 existing site generation

The existing generation of the site has been assessed with regard to the generation rates published in the RTA's Guide to Traffic Generating Developments. Section 3 of the RTA's guide provides generation rates to be adopted when assessing the generation of a proposed or existing development and is based on extensive surveys undertaken by the RTA. In the case of dwelling houses, the RTA's Guide recommends adoption of a rate of 0.85 trips per dwelling. When applied to the existing dwellings on the site, a generation of 12 vehicles per hour during peak periods results.

3.5 existing intersection performances

To assess the operation of key intersections in the vicinity of the site, turning movements were extracted from the 2010 AM and PM Macquarie Park Corridor Paramics Models provided by Council for the established AM and PM peak periods (being 7.45AM-8.45AM and 4:45PM-5.45PM respectively). The key intersections analysed include:

- Lane Cove Road and Epping Road
- Epping Road and Wicks Road
- Allengrove Crescent and Lane Cove Road, and
- Wicks Road and Barr Street.

The turning movements were then analysed using the SIDRA computer program to determine their performance characteristics under existing traffic conditions. The SIDRA model produces a range of outputs, the most useful of which are the Degree of Saturation (DOS) and Average Vehicle Delay per vehicle (AVD). The AVD is in turn related to a level of service (LOS) criteria. These performance measures can be interpreted using the following explanations:

DOS - the DOS is a measure of the operational performance of individual intersections. As both queue length and delay increase rapidly as DOS approaches 1, it is usual to attempt to keep DOS to less than 0.9. When DOS exceeds 0.9 residual queues can be anticipated, as occurs at many major intersections throughout the metropolitan area during peak periods. In this regard, a practical limit of

1.1 can be assumed. For intersections controlled by roundabout or give way/stop control, satisfactory intersection operation is generally indicated by a DOS of 0.8 or less.

AVD - the AVD for individual intersections provides a measure of the operational performance of an intersection. In general, levels of acceptability of AVD for individual intersections depend on the time of day (motorists generally accept higher delays during peak commuter periods) and the road system being modelled (motorists are more likely to accept longer delays on side streets than on the main road system).

LOS - this is a comparative measure which provides an indication of the operating performance of an intersection as shown below:

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	less than 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 and requires other control mode
F	More than 70	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires other control mode or major treatment.

A summary of the modelled results are provided below. Reference should also be made to the SIDRA outputs provided in **appendix c** which provide detailed results for individual lanes and approaches.

table 1: existing intersection performance: am and pm peak periods

Intersection Description	Period	Control Type	Degree of Saturation	Intersection Delay	Level of Service
LCR & Epping Rd	AM	Signal	1.10	80.6	F
	PM		0.93	59.2	E
Wicks Rd & Epping Rd	AM	Signal	0.96	59.4	E
	PM		1.03	70.3	E
Allengrove Cr & LCR	AM	Priority	0.09	22.9	B
	PM		0.15	33.2	C
Wicks Road & Barr St	AM	Priority	0.21	29.2	C
	PM		0.20	22.7	B

It can be seen from Table 1 that the key intersections of Allengrove Crescent with Lane Cove Road and Wicks Road with Barr Street operate satisfactorily during peak periods with additional capacity. However, both the intersections of Epping Road with Lane Cove Road and Epping Road with Wicks Road generally operate with unsatisfactorily delays during both the AM and PM peak periods. Nevertheless, it is stressed that the most relevant use of this analysis is to compare the relative change in the performance parameters as a result of the proposed development.

The delays and levels of service reported above generally replicate the level of service indicated in the Paramics model and are considered representative of actual conditions. However, some non-standard inputs were used for the Sidra assessment. These include the use of bunching factors (inputted in accordance with the aaSIDRA manual) and the reduction in some capacity factors to account for reduced capacity on some approaches.

4. description of proposed development

A detailed description of the Concept Plan Application is provided in the Environmental Assessment report prepared by Urbis. In summary, the Concept Plan development for which approval is now sought relates to the establishment of uses and building envelopes, road layout and landscaping across the subject site. The proposal comprises the following components:

- Demolition of all existing structures and consolidation of all existing driveway crossings.
- Construction of 196 apartments in several buildings ranging from four to eight storeys, including:
  - 47 one bedroom dwellings
  - 122 two bedroom dwellings, and
  - 27 three bedroom dwellings.
- The construction of a three level basement car park comprising 273 spaces accessed via a new driveway crossing to Allengrove Crescent.
- Provision of a service lane on the eastern side of the development accessed via Allengrove Crescent for use by service vehicles including garbage trucks.

The parking and traffic impacts arising from the Concept Plan are discussed in the following sections. Reference should be made to the plans submitted separately to the Department of Planning and Infrastructure, some of which are presented at reduced scale in **appendix b** for ease of reference.

5. parking requirements

5.1 council controls

Parking for the proposed development has been assessed in accordance with the requirements of the City of Ryde Development Control Plan 2010 and in particular Part 3.4 - "Residential Flat Buildings and Multi Dwelling Housing" and Part 9.3 - "Car Parking". Table 2 below outlines the required and proposed parking allocation based on the land use and apartment mix outlined above. It should be noted that the location of the site within 400 metres of Epping Road, allows the application of reduced parking rates as outlined in section 2.1 of the Car Parking DCP. These rates have been generally adopted and by definition, this supports the objectives of the Director General's Requirements as these are the minimum rates under Council's controls and reflect local car ownership levels and travel behaviour patterns. It is also noted that these minimum rates are mandatory under Council's DCP. It is also highly relevant that Council's DCP is a 2010 document and the published parking rates underpin all strategic planning recently undertaken, including Council's current LEP. Accordingly, significant deviation from these minimum rates is not considered appropriate and is likely to lead to adverse amenity impacts caused by on-street parking effects in particular.

table 2: council parking rates and provision

Type	Number Attending	Council Parking Rates	Spaces Required	Spaces Provided
One Bedroom	47	1.0 spaces per unit	47	41
Two Bedroom	122	1.2 spaces per unit	146	146
Three Bedroom	27	1.6 spaces per unit	43	43
Visitor	196	1 space per 4 units	49	43
		Totals	285	273

The RTA's Guideline does not provide a parking rate for a high density residential flat building that is not within a regional or sub regional centre. Furthermore the subject site, which lies within an employment zone, does not provide the same level of access to the broad range of services and facilities as would typically occur within a regional or sub-regional centre. Having regard for this, the

most comparable parking requirements under the RTA's Guideline relates to medium density residential flat buildings and these rates are comparable to the minimum rates under Council's DCP.

It is emphasised that provision of a relatively high level of parking (compared with a sub-regional centre) is justified in the circumstances as residents would still require access to shopping, recreational, educational and other trip purposes, many of which will occur during the evenings and on-street parking effects would have a potential adverse impact on surrounding residents. This situation may be contrasted with a commercial use where minimum parking rates could be more readily pursued, with reduced parking that can more effectively dictate alternate travel modes, focusing on journey-to–work travel.

Further steps are also encouraged to reduce car dependency. This includes discussions with car share operators to assess the viability of the provision of a car share vehicle being provided within Allengrove Crescent for use by residents. This would reduce the need for car ownership and may potentially reduce parking levels.

In summary, the development proposes a total of 273 spaces which represents a reduction from Council's DCP of 12 spaces. Accordingly the proposed parking provision achieves the objectives of the DGR's whilst providing sufficient parking to meet the future demands of the development on-site with minimal, if any, reliance on on-street parking.

5.2 disabled parking

Disabled car parking will be provided in accordance with all relevant standards and will be designed in accordance with AS2890.6. This is a matter that will be addressed in detail at Project Application stage.

5.3 response to strategic planning policies

Both the Metropolitan Transport Plan and Integrating Land Use and Transport – A Planning Policy Package, seek to reduce car usage and promote public transport and alternate transportation modes

through integrated transport plans; and promoting development within close proximity to public transport. This is particularly important within established commercial centres.

Notwithstanding, the implementation of transport plans is more difficult to achieve in residential developments that are remote from a commercial centre (and the range of facilities it provides within walking distance), and this is the case with the subject site (notwithstanding that it is close to public transport). This has essentially been accepted by Council in structuring the minimum parking permissible under Councils 2010 DCP for application to this site and as such is considered the lowest provision of parking that should be provided without adversely impacting the existing and future amenity of existing (and new) residents.

The development is nevertheless to include bicycle facilities to promote non-car travel for local trips in particular; and commuter trips in general. Again, the development is located within close proximity to major bus routes and the Macquarie Park Railway Station (located 400 metres to the north of the site) and this will continue to encourage journey-to-work trips using public transport as well as a number of trips for other purposes.

In summary, the minimum parking levels under the DCP are supported for this site, on the grounds of the lack of the full range of centre-based services within walking distance; and the need to protect residential amenity within the local street network.

6. traffic modelling

6.1 trip generation

The generation of the proposed development has been based on the RTA's Guide to Traffic Generating Developments which for a high density residential flat building in a metropolitan sub-regional centre attracts a rate of 0.29 trips per unit. However, recent research undertaken by TRAFFIX and confirmed by the RTA indicate that this data is outdated and in fact the generation of high density residential developments is more in the order of 0.4 trips per dwelling, even for many sites close to railway stations. As such, the higher rate has been adopted for development purposes and this approach ensures a worst case assessment. Application of this rate (0.4 trips per dwelling) to the proposed 196 units results in a generation of 78 trips per hour with a likely 80:20 split in the direction of peak flow, that is:

- 16 in and 62 out during the morning peak period (7-8am and 8-9am), and
- 62 in and 16 out during the afternoon peak period (4-5pm and 5-6pm).

The impacts associated with the proposed increase in generation have been assessed using the Macquarie Park Corridor Paramics Model and the results of this are discussed in the following sections.

6.2 paramics micro simulation assessment

6.2.1 Introduction

As stipulated in the Director General's requirements, a Paramics micro simulation model has been used to assess the impacts of the development on the surrounding road network. The assessment has been undertaken as part of the Macquarie Park Traffic Study and the Macquarie Park LEP to assess the overall impact of developments in the study area on the existing and future road networks. The assessment has been undertaken in accordance with Macquarie Park User Manual (Reference Documents 1 and 2) provided by Council and is discussed below.

6.2.2 Additional Network Coding

As required, a new development Travel Zone (Zone 81) has been coded to represent the demands associated with the new development. Subsequently Zone 32 has been reduced in size and the demands file has been edited to reflect the reduced land use catchment which equated to a reduction of 12 vehicles per hour.

Due to the position of the proposed development additional links were required to be coded to model the likely future travel routes expected to be utilised as a result of the development. These include; the proposed access via Allengrove Crescent and the local roads connecting Wicks Avenue and Lane Cove Road being Beatrice Street, Barr Street, Avon Road and Lorna Avenue which are likely egress routes from the site. The additional links are shown in **figure 5** below.

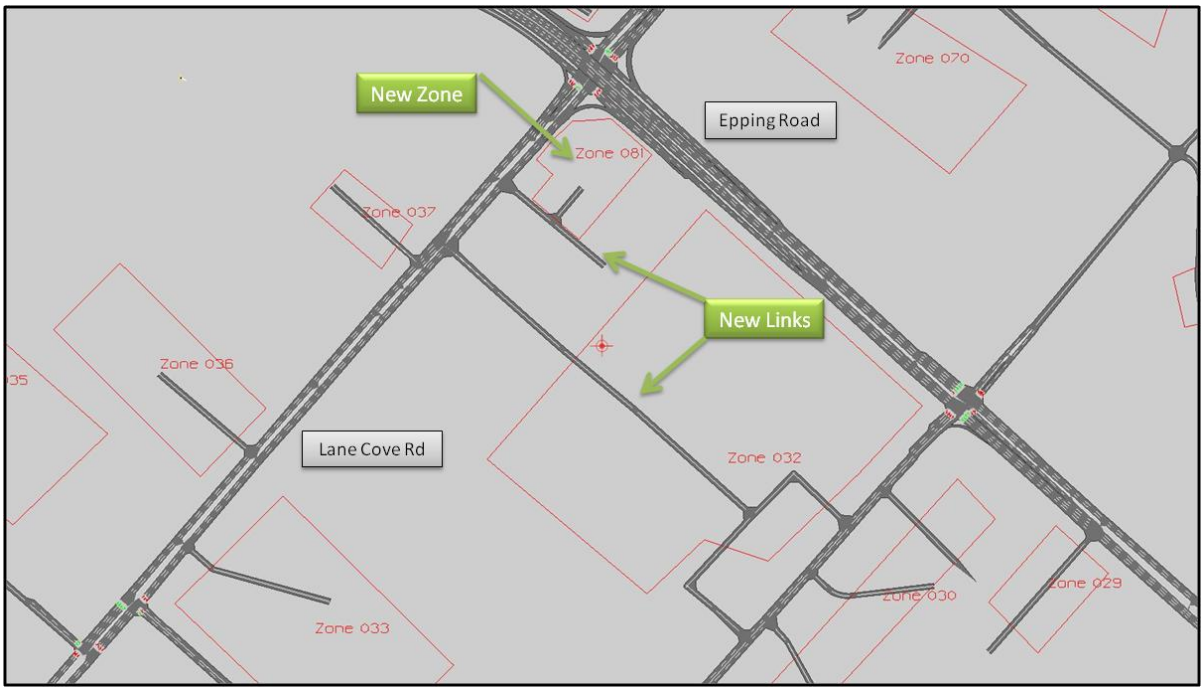


figure 5: additional zone and links

As a consequence of the new link between Wicks Avenue and Lane Cove Road, vehicles in the model are able to reroute or “rat-run” through this precinct, which was not possible in the base model; nor does it occur in reality. As such a restriction was put on all vehicles accessing Lorna Avenue, Barr Street and Beatrice Street to allow access by vehicles with an origin or destination in travel zones 32 and 81 only.

6.2.3 Trip Distribution

Analysis of Zone 32 and other neighbouring zones indicated an unrealistic split in vehicle distributions. Accordingly the future distribution of traffic has been assessed using the Ministry of Transport 2006 Journey to Work Data for Travel Zone 2494. The directional travel splits which resulted from this analysis (for both journey to work trips from TZ2494 and to TZ2494) are summarised in **table 3** below.

table 3: journey to work travel data by direction

Direction	From TZ2494		To TZ2494	
	Volume	%	Volume	%
North	21	7%	151	25%
South	44	15%	106	17%
East	208	72%	286	47%
West	17	6%	65	11%

This distribution was then applied to the amended demand matrix for both the AM and PM peaks and was allocated as shown in **table 4**. All demands associated with Zone 81 are included in the demands file "demands.2".

table 4: journey to work travel data by direction

Zone	AM Peak		PM Peak	
	To Zone 81	From Zone 81	To Zone 81	From Zone 81
46	3	6	6	3
49	10	59	59	10
57	4	12	12	4
65	5	5	5	5
Total	**22**	**82**	**82**	**22**

6.2.4 Link Delay

Variations in link delay as a result of the development on key sections of the model have been analysed below. These include all approaches to the intersection of Epping Road and Wicks Road and the intersection of Epping Road and Lane Cove Road. It should be noted that in some cases the delay has actually reduced. This is a result of varied flow and calculation periods within the model.

table 5: AM link delays

Intersection	Approach	Base Model (sec)	Base Model + Development
Epping Road & Wicks Road	Northbound	45	45
	Southbound	89	89
	Eastbound	19	19
	Westbound	22	21
Epping Road & Lane Cove Road	Northbound (RT)	71	67
	Southbound	15	14
	Eastbound	64	62
	Westbound	50	50

table 6: PM link delays

Intersection	Approach	Base Model (sec)	Base Model + Development
Epping Road & Wicks Road	Northbound	75	73
	Southbound	44	44
	Eastbound	24	27
	Westbound	15	14
Epping Road & Lane Cove Road	Northbound (RT)	64	63
	Southbound	18	18
	Eastbound	62	57
	Westbound	42	39

It is evident from the table above that the generation associated with the development has a minimal impact on the delay at key intersections. In fact, the variation in average delays shown above fluctuates between +3 and -5 seconds. These variations are a result of varying flow and route choices in the model and not a result of increased traffic resulting from the development.

6.2.5 Queue Length

Queue length statistics were extracted from the model and relate to the 95th percentile queues. These are displayed below for the peak 15 minute interval being 8.15AM-8.30AM and 4.15PM-4.30PM at the critical intersection of Wicks Road and Epping Road and Epping Road and Lane Cove Road.

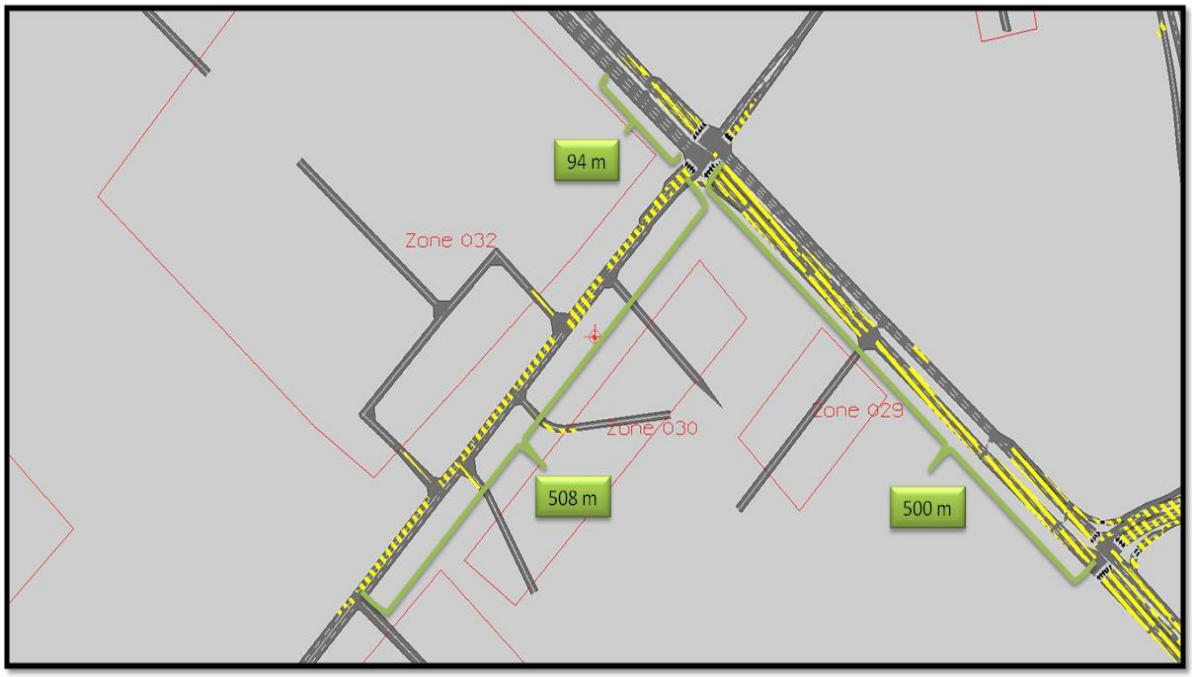


figure 6: wicks road and epping road – existing road network am

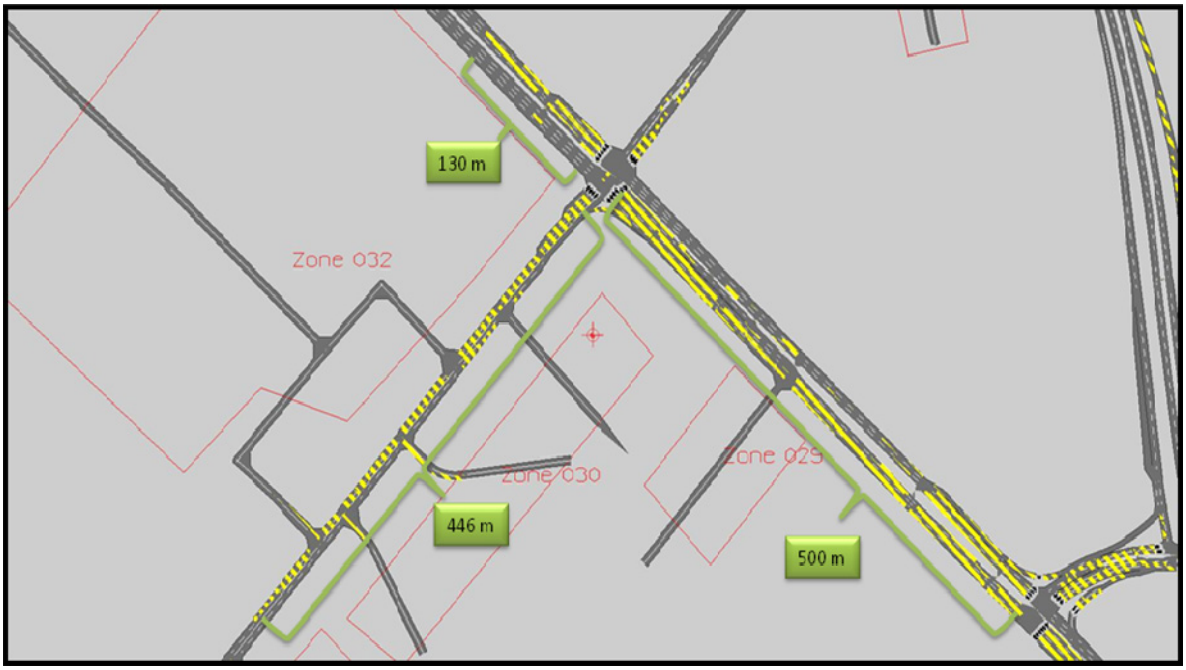


figure 7:wicks rd and epping road – future network am

figure 8: wicks rd and epping road – base case pm

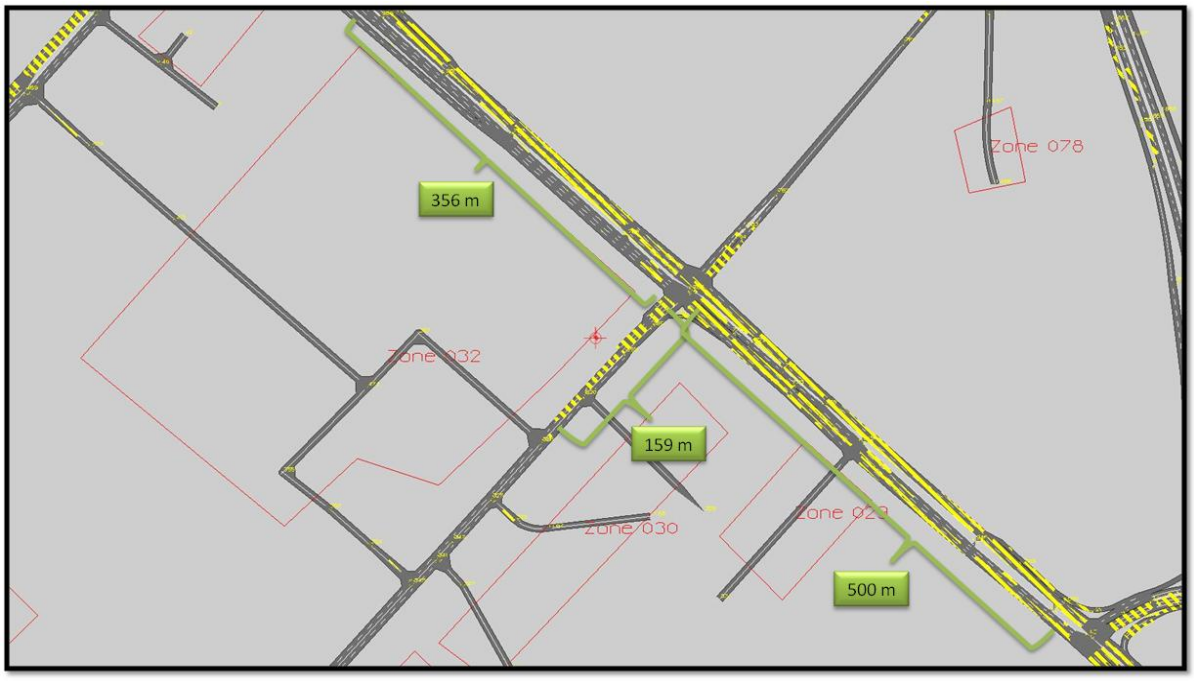


figure 9: wicks rd and epping road – future network pm

figure 10: epping road and lane cove road – base case am

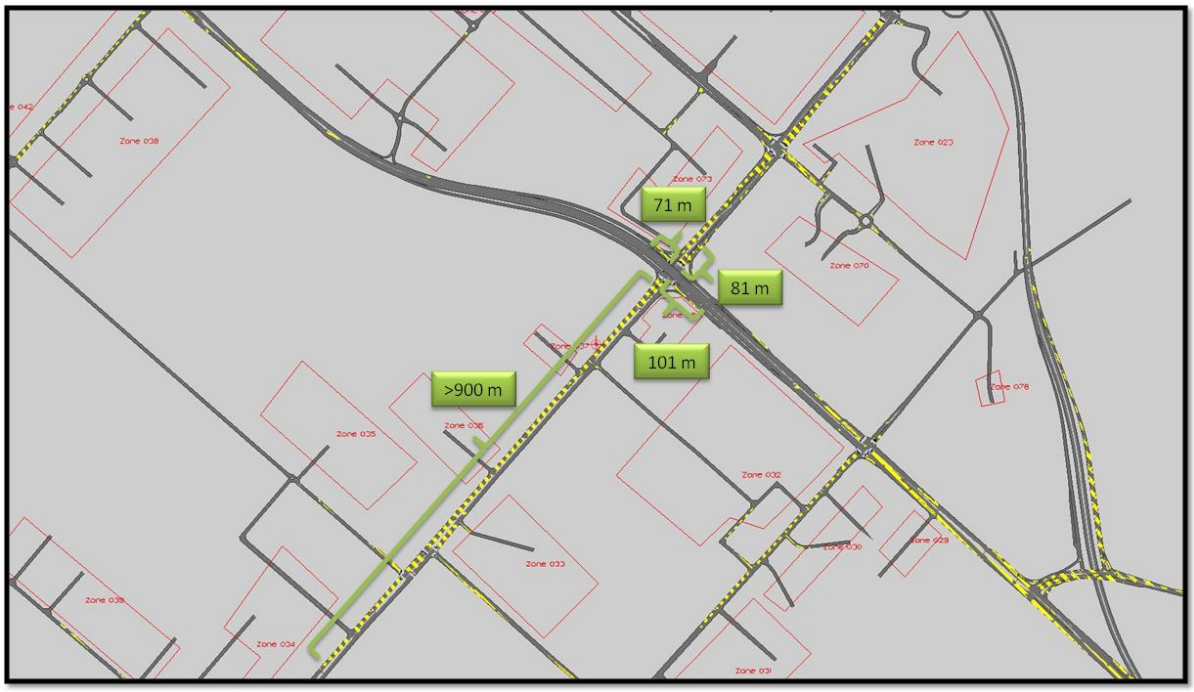


figure 11: epping road and lane cove road – future network am

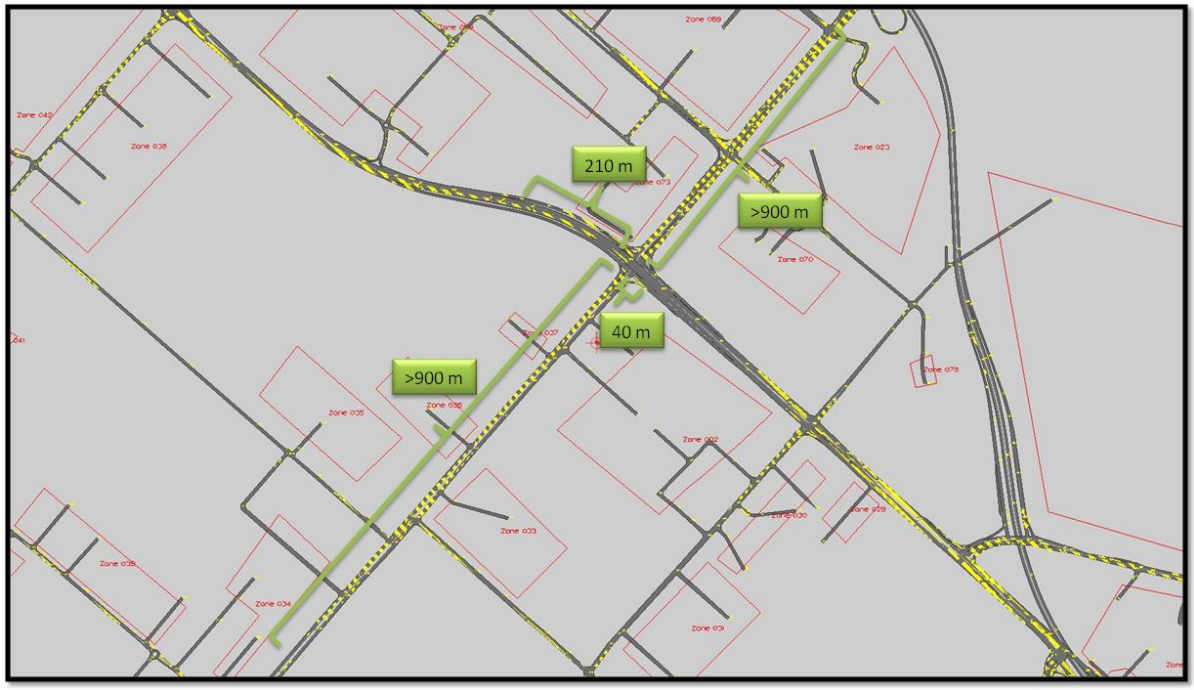


figure 12: epping road and lane cove road – base case pm

figure 13: epping road and lane cove road – future network pm

The figures above show minimal variation in queue lengths as a result of the development during either the AM or PM peak periods at the intersections of Wicks Road with Epping Road and at the intersection of Epping Road with Lane Cove Road. Although some disparity is evident, this is not considered as a result of the development but due to varying flow and route choices within the model over the calculation periods. For example, the increase in volumes on the eastbound approach along Epping Road at its intersection with Lane Cove Road during the AM peak period was only 3 additional vehicles, yet the queue length increase by 39 metres. The disparity between the existing and future queue lengths is therefore considered a result of varying calculation and flow patterns within the model and not as a result of the proposed development.

6.2.6 Future Intersection Operation

The operation of the key intersections analysed in Section 3 have been re analysed using the turning movement data extracted from the Base Case + Development models for the peak one hour periods during both the AM and PM peaks. The results of which are shown below:

table 7: future intersection performance: am and pm peak hour

Intersection Description	Period	Control Type	Degree of Saturation	Intersection Delay	Level of Service
LCR & Epping Rd	AM	signal	1.10	81.9	F
	PM		0.93	59.3	E
Wicks Rd & Epping Rd	AM	signal	1.00	64.5	E
	PM		1.06	70.8	F
Allengrove Cr & LCR	AM	priority	0.37	27.3	B
	PM		0.37	36.6	C
Barr Street & Wicks Rd	AM	priority	0.34	29.2	C
	PM		0.21	16.3	B

It is evident from the Table 7 above, that the level of service at key intersections will remain generally unchanged. The only changes in the level of service as a result of the development are at the intersection of Wicks Road and Epping Road which have increased from a level of service E to F. These increases are however considered acceptable. Specifically, the change in level of service at Epping Road and Wicks Road occurs in the PM peak only and is a result of an increase in delays from 70.3 seconds to 70.8 (a 0.5 second per vehicle change over the peak period) which is considered a minor increase. Furthermore, the existing delay of 70.3 seconds is in fact only 0.2 seconds lower than the delay corresponding to a level of service F (70.5 seconds) as such both the existing and future operation of the intersection will essentially remain unchanged;

Accordingly all key intersections will continue to operate with similar delays and levels of service as a result of the development. Accordingly the development is considered supportable on traffic planning grounds and no external road upgrades are required as a result of the development.

The Paramics model has been provided to Council for separate assessment, including a peer review, and the model will be updated as required.

6.3 residential amenity

The potential impacts of the development on the amenity of existing residents is most appropriately assessed having regard to traffic volumes on affected road sections, based upon the concept of 'environmental capacity'. In doing so, it must be acknowledged that the concept of the 'environmental capacity' of a road is not an exact science. It is dependent upon many factors, including the function (classification) of the road, historic traffic levels, traffic composition (notably the percentage of heavy vehicles), vehicle speeds, road widths, road gradients, road surface conditions, distances to building façades and type of building construction. In addition, individual people have different responses to the prevailing conditions so that circumstances that one person finds unacceptable may be acceptable to another. These variables are set out in Section 4.10 of the Roads and Traffic Authority's Guide to Traffic Generating Developments.

Nevertheless, the Roads and Traffic Authority has formulated design criteria for local and collector residential streets that take due account of amenity and safety considerations. These include an environmental goal and a maximum goal for a collector road as follows:

Road Class	Environmental Goal (veh/hr)	Maximum Volume (Veh/hr)
Local Street	200	300
Collector Street	300	500

In this regard, it will be noted that Allengrove Crescent acts as a local road and as such has an environmental capacity of 300 vehicles per hour as defined in the RTA's Guide to Traffic Generating Developments. The existing volumes along Allengrove Crescent, directly adjacent to the site are in the order of 35 veh/hr based on the RTA's Guidelines. Accordingly the proposed increase of 78 veh/hr will result in only a minor absolute increase in volumes and will remain under the RTA's environmental goal of 200 vehicles per hour. It is however a significant increase in relative terms and this is an unavoidable consequence of Council's zonings.

As such, the residential amenity of Allengrove Crescent will not be adversely affected and the road will continue to operate with a local road function, with volumes that are commensurate with this function. Volumes to the east of the proposed site access will not be impacted.

Additional measures can also be implemented to further reduce trips to and from the site during peak periods. The implementation of site specific travel access plans in foyers and major pedestrian corridors within the site can be used. These contain information for residents about alternative transport measures available to them including local bus and rail timetables, bus stop locations, railway locations, car share details and locations of vehicles, taxi phone numbers and cycle routes and infrastructure locations such as bike racks and lockers. This will encourage the use of non-car modes which in turn will further reduce the traffic generation associated with the development during the weekday peak periods. These can be conditioned as part of the Project Application.

7. access & internal design aspects

7.1 access

The proposed development would require a Category 3 Driveway under AS 2890.1 (2004), being an entry width of 6.0 metres and an exit width of between 4.0 to 6.0 metres. In response, the development proposes a category 2 access driveway comprising a combined entry and exit width of 6.2 metres. This is considered supportable in the circumstances due to the low volumes along Allengrove Crescent and the left-in and right-out configuration of the access, neither of which are contemplated under AS2890.1. That is, AS2890.1 does not provide allowances for individual circumstances or on-street conditions. In this case the provision of a wider access is not considered necessary as vehicles can utilise the whole lane to access the site without impeding through movements or creating delays to other vehicles. As such the access will operate satisfactorily at all times. The reduced width is also considered best practice with respect to urban design and the narrower driveway will have a lesser visual impact on the streetscape within Allengrove Crescent. Accordingly the access will operate satisfactorily and is in our view supportable. Notwithstanding this, a median within the site boundary is considered desirable and this can be assessed at project Application stage.

The service vehicle access located on the eastern boundary is proposed with a 4.0 metre wide driveway and will accommodate one-way flow (with passing opportunities), which due to the low volumes is acceptable. This driveway has been tested using AutoTurn simulation as permissible under AS2890.2 and will operate satisfactorily.

The proposal also takes into account Council's desire to increase the width of Allengrove Road by 2.0 metres adjacent to the site should this be required. It is emphasised that the existing carriageway width within Allengrove Road is considered adequate and will accommodated all future traffic volumes as a result of the development and that a "No Stopping" restriction adjacent to the site on the northern side of Allengrove Road would also achieve Council's objectives. However the proponent does not object to a Condition of Consent requiring the dedication of this land to Ryde City Council.

7.2 internal design

The internal design will be assessed in more detail at the Project Application stage of the assessment however in general the principles of AS2890.1 have been reflected in the concept plans attached. In particular the following aspects considered noteworthy:

- All parking modules are designed with a minimum width of 2.6 metre wide bays and 6.2 metre wide aisles which are superior to the requirements set under AS2890.1.
- All ramps are designed with a minimum transition length of 2.0 metres at 1:8 (12.5%) with a maximum grade of 1:4 (25%) for ramps less than 20 metres in length which complies with AS2890.1.
- All sloping floors within the parking aisle are designed with a maximum grade of 1:20 (5%) measured parallel to the angle of parking and 1:16 (6.25%) in any other direction.
- All parking spaces located adjacent to obstructions have been provided with an additional 300mm clearance.

In addition to this, the following aspects should also be considered at the Project Application stage:

- Disabled parking spaces should be located within close proximity to lifts and should be designed in accordance with the requirements of AS2890.6 (Off Street Parking for People with Disabilities).
- All visitor parking should be consolidated into one area, in close proximity to the site access for ease of signposting.
- A central median should be constructed at the site access to facilitate safe access and to also enable provision of an intercom, and
- A visual splays should be included at the site boundary (adjacent to exiting traffic) and should be designed in accordance with Figure 3.3 of AS2890.1.

Having regard for the internal design aspects discussed above, the current proposal is considered acceptable and will operate satisfactorily. It is emphasised that a more detailed assessment will be required at the Project Application Stage.

7.3 pedestrian and bicycle linkages

An extensive footpath system is proposed with access opportunities for both pedestrians and cyclists on all frontages. The site boundary walls have been set back to provide increased footpath widths along both Lane Cove Road and Epping Road to improve existing pedestrian conditions. Furthermore, significant internal pedestrian connectivity is proposed to allow easy access along pedestrian desire lines to areas such as major bus stops along Lane Cove Road and Epping Road and to pedestrian crossing locations allowing access to the Macquarie Park Railway Station.

Bicycle facilities will be provided in accordance with Council's requirements at Project Application stage. Bicycle facilities including lockers or racks will be provided in convenient locations near to main pedestrian access locations and within the basement car park. The provision of these facilities will encourage alternative transport methods.

It should be noted that both the Ryde Bicycle Strategy Master Plan 2007 and Planning Guidelines for Walking and Cycling (2004) were reviewed and elements have been adopted within the design. Although the Ryde Bicycle Strategy Master Plan 2007 does not directly outline measures for private developments and concentrates more on public domain improvements, the key objectives of encouraging the use of bicycles in the area has been adopted and will be reflected in subsequent Project Application/s, with the provision of bicycle storage facilities and access to bicycle routes. The Planning Guidelines for Walking and Cycling (2004) also mainly apply to major urban centres, regional cities and towns, although some elements have been adopted. These include the provision of pedestrian and cycle access locations within close proximity to the major crossing and desire lines to ensure ease of access.

The Macquarie Park Pedestrian Movement Study has also been reviewed and considered during the planning stages. This report does not identify any major pedestrian or cycle infrastructure upgrades in the vicinity and as such the proposed pedestrian access locations to major crossings on Epping and Lane Cove Roads are considered acceptable to facilitate future pedestrian and cycle needs as identified in the report.

8. conclusions

In summary:

- The proposed use of the site as a high density residential development is considered appropriate on traffic/transport planning grounds.
- The traffic impacts associated with the development have been undertaken as a worst case assessment and adopted generation rates higher than those provided by the RTA. Nevertheless the generation of 78 vehicles per hour has a minimal impact on the operation of key intersections in the vicinity.
- An assessment has been undertaken using the Macquarie Park Paramics Model in accordance with the requirements set out in the appropriate reference documentation. The result of the modelling indicated that the queues and average delays at key intersections as a result of the development would remain at existing levels and would continue to operate as currently occurs.
- Parking for the proposed development has been provided in accordance with the requirements of the Director General's Requirements and represents a minor deviation from Council's DCP.. The parking provision proposed is, however, considered sufficient to meet the future demands of the development on-site with minimal, if any, reliance on on-street parking and will encourage the use of alternative transport modes.
- The proposed access driveways are considered acceptable and will operate satisfactorily. A swept path assessment has been undertaken as permissible under AS2890.1 and AS2890.2 and confirms that all movements can occur safely and efficiently.
- The car park will be assessed in more detail at the project application stage; however the current design adopts the principles set out in both AS2890.1 and Councils DCP. The car park has also been assessed using the computer program AutoTurn, as permitted by AS 2890.1: 2004 and operates safely and efficiently.
- The development will have a minimal impact on the residential amenity within Allengrove Crescent which will continue to operate at levels below those set out by the RTA.

It is therefore concluded that the proposed development is supportable on traffic planning grounds and the proposed development will operate satisfactorily.

appendix a

photographic record

View looking north along Lane Cove Road towards its intersection with Epping Road.

View looking south along Lane Cove Road towards the intersection with Allengrove Road.

View looking north along Lane Cove Road across its intersection with Allengrove Road.

View looking east along Allangrove Road, across Lane Cove Road towards the site.

appendix b

reduced plans

SITE AREA

12 297.1 SQM

GROSS FLOOR AREA

GROUND FLOOR	2 989 SQM
LEVEL 1	3 175 SQM
LEVEL 2	3 175 SQM
LEVEL 3	3 175 SQM
LEVEL 4	2 518 SQM
LEVEL 5	1 983 SQM
LEVEL 6	1 775 SQM
LEVEL 7	1 112 SQM
TOTAL G.F.A.	19 902 SQM

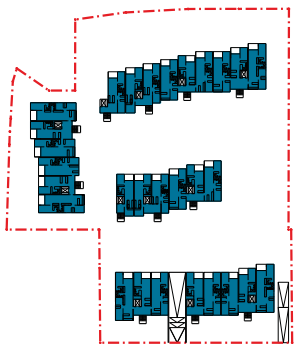
FLOOR SPACE RATIO

SITE AREA	12 297.1 SQM
GFA	19 902 SQM
F.S.R.	1.62 :1

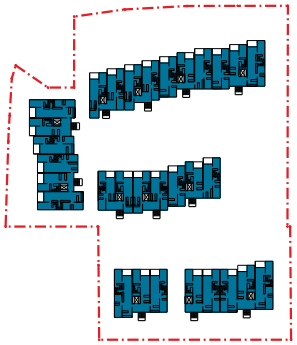
PROPOSED DEVELOPMENT SPLIT

	1 BED UNIT (65 m²)	2 BED UNIT (85 m²)	3 BED UNIT (95 m²)	TOTAL UNITS
GROUND RESIDENTIAL	8	16	5	29
LEVEL 1 RESIDENTIAL	8	18	5	31
LEVEL 2 RESIDENTIAL	8	18	5	31
LEVEL 3 RESIDENTIAL	8	18	5	31
LEVEL 4 RESIDENTIAL	6	16	3	25
LEVEL 5 RESIDENTIAL	4	14	2	20
LEVEL 6 RESIDENTIAL	3	14	1	18
LEVEL 7 RESIDENTIAL	2	8	1	11
TOTAL	47	122	27	196

TOTAL RESIDENTIAL UNITS: 196 UNITS



01 – GROUND FLOOR PLAN
NTS



02 – LEVELS 1 – 3 PLAN
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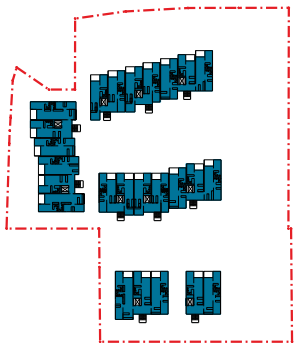

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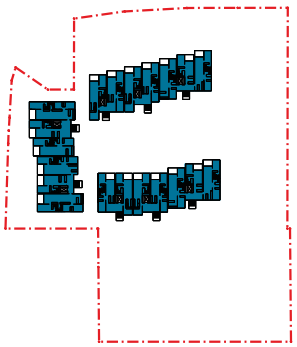

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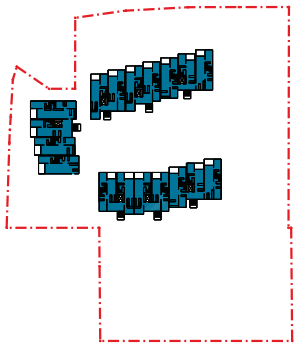

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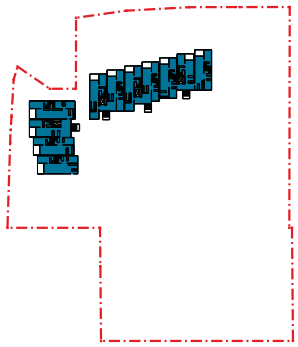

06 – LEVEL 7 PLAN
NTS

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Drawing Original Size A2

Issue	Date	Description
P3	13.04.11	CONSULTANT ISSUE
P2	29.04.11	CONSULTANT ISSUE
P1	29.03.11	CLIENT ISSUE
B	30.10.10	PRELIMINARY ISSUE
A	10.09.10	FINAL CONSULTATION

NORTH

ARBORIST:
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NSW ARCHITECTS REG No. – 5773

PROJECT:
ALLENGROVE CRESCENT, NORTH RYDE

CLIENT:
EGC CUSTODIAN SERVICES

SCALE: NTS @ A2
DATE: OCTOBER 2010
CAD FILE NO:
DRAWN BY: CA, AB
CHECKED 1:
CHECKED 2:
APPROVED:

DRAWING:
AREA CALCULATIONS

JOB No. 5497

DRAWING No. DA – 1501

ISSUE P3

01 – GROUND FLOOR PLAN 1:500

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CLIENT: EGC CUSTODIAN SERVICES
SCALE: 1:500 @ A2
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CAD FILE NO:
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CHECKED 1:
CHECKED 2:
APPROVED:

DRAWING: CONCEPT PLAN ENVELOPES
JOB No. 5497
DRAWING No. DA – 1100
ISSUE P3

0 5 10 20m
1:500 SCALE

01 – GROUND FLOOR PLAN
1:500

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DRAWN BY: CA, AB
CHECKED 1:
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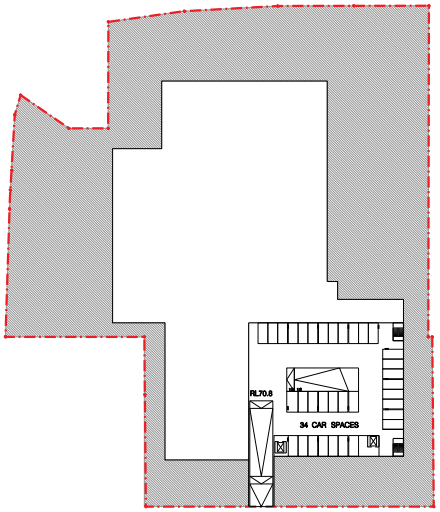
APPROVED:

DRAWING: GROUND FLOOR PLAN
JOB No. 5497
DRAWING No. DA – 1102
ISSUE P3



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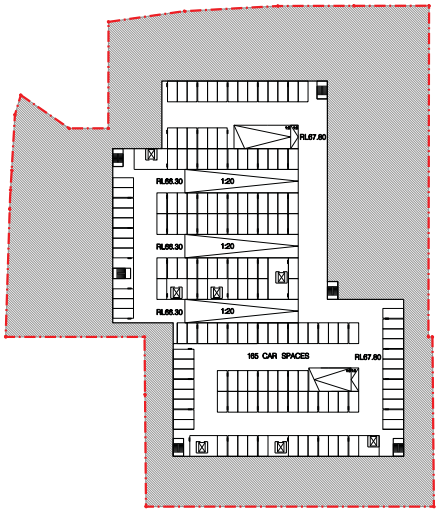

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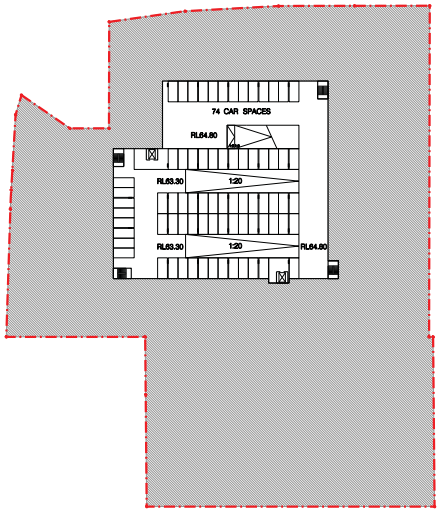

03 – BASEMENT LEVEL 3
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PARKING CALCULATIONS

RESIDENTIAL	COUNCIL REQ'S	PROPOSED PARKING
47 NO. 1-BED DWELLINGS	47	41
122 NO. 2-BED DWELLINGS	147	146
27 NO. 3-BED DWELLINGS	44	43
1 SPACE /4 DWELLINGS (VISITOR)	49	43
TOTAL		
PARKING SPACES	287 SPACES	273 SPACES

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Issue	Date	Description
P4	20.04.11	CONSULTANT ISSUE
P3	13.04.11	CONSULTANT ISSUE
P2	29.03.11	CONSULTANT ISSUE
P1	29.03.11	CLIENT ISSUE
A	10.09.10	FINAL CONSULTATION

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CAD FILE NO:
DRAWN BY: CA, AB
CHECKED 1:
CHECKED 2:
APPROVED:

DRAWING:
BASEMENT FLOOR PLANS
JOB No. 5497
DRAWING No. DA – 1101
ISSUE P4

appendix c

sidra outputs

appendix c-1

existing conditions

MOVEMENT SUMMARY

Site: EX-AM

Lane Cove Road & Allangrove Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Allangrove Rd											
4	L	21	0.0	0.090	22.9	LOS B	0.4	2.6	0.82	0.94	36.8
Approach		21	0.0	0.090	22.9	LOS B	0.4	2.6	0.82	0.94	36.8
North: Epping Road (north)											
7	L	21	0.0	0.305	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
8	T	1723	3.0	0.304	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1744	3.0	0.304	0.1	LOS A	0.0	0.0	0.00	0.01	59.8
All Vehicles		1765	2.9	0.305	0.4	NA	0.4	2.6	0.01	0.02	59.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: EX-PM

Lane Cove Road & Allangrove Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Allangrove Rd											
4	L	21	0.0	0.146	33.2	LOS C	0.6	3.9	0.90	0.97	31.3
Approach		21	0.0	0.146	33.2	LOS C	0.6	3.9	0.90	0.97	31.3
North: Epping Road (north)											
7	L	21	0.0	0.376	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
8	T	2119	3.0	0.373	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2140	3.0	0.373	0.1	LOS A	0.0	0.0	0.00	0.01	59.9
All Vehicles		2161	2.9	0.376	0.4	NA	0.6	3.9	0.01	0.02	59.3

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: EX-AM

Barr Street & Wicks Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wicks Road (south)											
1	L	1	3.0	0.211	8.2	LOS A	0.0	0.0	0.00	1.09	49.0
2	T	791	3.0	0.207	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		792	3.0	0.207	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
North: Wicks Road (north)											
8	T	686	3.0	0.341	0.3	LOS A	1.9	14.0	0.04	0.00	59.0
9	R	193	3.0	0.340	14.7	LOS B	1.9	14.0	0.72	0.96	43.2
Approach		879	3.0	0.341	3.5	LOS B	1.9	14.0	0.19	0.21	54.6
West: Barr Street											
10	L	39	3.0	0.085	14.5	LOS A	0.4	2.6	0.64	0.88	43.0
12	R	8	3.0	0.052	29.2	LOS C	0.2	1.4	0.87	0.96	33.3
Approach		47	3.0	0.085	17.1	LOS C	0.4	2.6	0.68	0.89	40.9
All Vehicles		1718	3.0	0.341	2.3	NA	1.9	14.0	0.11	0.13	56.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: EX-PM

Barr Street & Wicks Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wicks Road (south)											
1	L	11	3.0	0.155	8.3	LOS A	0.0	0.0	0.00	1.08	49.0
2	T	577	3.0	0.154	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		587	3.0	0.154	0.1	LOS A	0.0	0.0	0.00	0.02	59.8
North: Wicks Road (north)											
8	T	737	3.0	0.232	1.6	LOS A	2.2	16.2	0.24	0.00	55.3
9	R	61	3.0	0.232	12.3	LOS A	2.2	16.2	0.60	0.97	47.0
Approach		798	3.0	0.232	2.4	LOS A	2.2	16.2	0.27	0.07	54.6
West: Barr Street											
10	L	69	3.0	0.113	12.2	LOS A	0.5	3.6	0.54	0.82	45.0
12	R	53	3.0	0.206	22.7	LOS B	0.9	6.3	0.82	0.96	36.9
Approach		122	3.0	0.207	16.7	LOS B	0.9	6.3	0.66	0.88	41.1
All Vehicles		1507	3.0	0.232	2.7	NA	2.2	16.2	0.19	0.12	55.0

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: EX-AM

Lane Cove Road & Epping Road
Signals - Fixed Time Cycle Time = 150 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: LCR (south)											
1	L	71	3.0	1.026	99.6	LOS F	70.6	500.8	1.00	1.18	18.1
2	T	2368	3.0	1.028	107.1	LOS F	88.9	638.5	1.00	1.27	16.1
3	R	451	3.0	1.094	154.1	LOS F	29.8	214.2	1.00	1.20	12.6
Approach		2889	3.0	1.094	114.3	LOS F	88.9	638.5	1.00	1.25	15.4
East: Epping Rd (east)											
4	L	135	3.0	0.074	9.5	NA[9]	NA[9]	NA[9]	0.00	0.65	54.6
5	T	1	3.0	0.987	131.8	LOS F	26.7	191.9	1.00	1.18	13.4
6	R	662	3.0	1.026	125.0	LOS F	26.7	191.9	1.00	1.09	14.9
Approach		798	3.0	1.026	105.5	LOS F	26.7	191.9	0.83	1.01	17.0
North: LCR (north)											
7	L	497	3.0	0.273	9.5	NA[9]	NA[9]	NA[9]	0.00	0.65	54.6
8	T	1491	3.0	0.628	37.0	LOS C	28.8	207.0	0.85	0.76	31.5
9	R	226	3.0	0.519	77.4	LOS F	9.7	69.3	0.99	0.79	21.2
Approach		2214	3.0	0.628	35.0	LOS C	28.8	207.0	0.67	0.74	33.0
West: Epping Rd (west)											
10	L	333	3.0	0.436	40.4	LOS C	17.7	127.2	0.76	0.81	31.7
11	T	1	3.0	0.292	54.8	LOS D	8.1	58.5	0.89	0.71	24.4
12	R	171	3.0	0.286	63.6	LOS E	8.1	58.5	0.88	0.77	24.3
Approach		504	3.0	0.436	48.3	LOS D	17.7	127.2	0.80	0.79	28.7
All Vehicles		6405	3.0	1.094	80.6	LOS F	88.9	638.5	0.85	1.01	20.1

Level of Service (Aver. Int. Delay): LOS F. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

9 Continuous movement

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	47.2	LOS E	0.2	0.2	0.79	0.79
P3	Across E approach	53	25.2	LOS C	0.1	0.1	0.58	0.58
P7	Across W approach	53	25.2	LOS C	0.1	0.1	0.58	0.58
All Pedestrians		159	32.6				0.65	0.65

Level of Service (Aver. Int. Delay): LOS D. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS E. LOS Method for individual pedestrian movements: Delay (HCM).

MOVEMENT SUMMARY

Site: EX-PM

Lane Cove Road & Epping Road
Signals - Fixed Time Cycle Time = 150 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: LCR (south)											
1	L	142	3.0	0.914	84.6	LOS F	40.4	290.0	1.00	1.09	20.3
2	T	1349	3.0	0.914	69.9	LOS E	42.2	302.7	1.00	1.07	21.6
3	R	234	3.0	0.927	103.9	LOS F	11.8	84.9	1.00	1.01	17.2
Approach		1725	3.0	0.927	75.7	LOS F	42.2	302.7	1.00	1.06	20.8
East: Epping Rd (east)											
4	L	399	3.0	0.313	9.6	NA[9]	NA[9]	NA[9]	0.00	0.65	54.5
5	T	1	3.0	0.877	88.7	LOS F	16.5	118.4	1.00	1.02	17.9
6	R	500	3.0	0.914	95.9	LOS F	16.5	118.4	1.00	1.00	18.3
Approach		900	3.0	0.914	57.6	LOS E	16.5	118.4	0.56	0.84	25.8
North: LCR (north)											
7	L	461	3.0	0.362	9.6	NA[9]	NA[9]	NA[9]	0.00	0.65	54.5
8	T	1401	3.0	0.855	55.8	LOS D	35.1	252.4	0.99	0.97	25.0
9	R	174	3.0	0.689	85.9	LOS F	8.3	59.5	1.00	0.83	19.7
Approach		2036	3.0	0.855	47.9	LOS D	35.1	252.4	0.77	0.89	27.7
West: Epping Rd (west)											
10	L	624	3.0	0.877	54.6	LOS D	37.3	268.1	0.96	1.03	26.6
11	T	1	3.0	0.459	47.7	LOS D	13.5	97.0	0.88	0.74	26.4
12	R	317	3.0	0.475	55.8	LOS D	13.5	97.0	0.86	0.80	26.4
Approach		942	3.0	0.877	55.0	LOS D	37.3	268.1	0.93	0.96	26.5
All Vehicles		5603	3.0	0.927	59.2	LOS E	42.2	302.7	0.83	0.94	24.7

Level of Service (Aver. Int. Delay): LOS E. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

9 Continuous movement

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	37.5	LOS D	0.2	0.2	0.71	0.71
P3	Across E approach	53	30.1	LOS D	0.1	0.1	0.63	0.63
P7	Across W approach	53	30.1	LOS D	0.1	0.1	0.63	0.63
All Pedestrians		159	32.5				0.66	0.66

Level of Service (Aver. Int. Delay): LOS D. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS D. LOS Method for individual pedestrian movements: Delay (HCM).

MOVEMENT SUMMARY

Site: EX-AM

Wicks Road and Epping Road
Signals - Fixed Time Cycle Time = 150 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wicks Road (south)											
1	L	103	3.0	0.954	51.7	LOS D	6.1	43.6	0.96	0.79	24.8
2	T	61	3.0	0.636	61.9	LOS E	15.8	113.3	0.98	0.82	20.9
3	R	508	3.0	0.636	69.0	LOS E	15.8	113.3	0.97	0.82	20.9
Approach		673	3.0	0.955	65.7	LOS E	15.8	113.3	0.97	0.82	21.4
East: Epping Road (east)											
4	L	668	3.0	0.436	8.9	LOS A	8.7	62.3	0.22	0.67	48.3
5	T	2084	3.0	0.956	76.2	LOS F	62.1	446.0	1.00	1.11	18.8
6	R	656	3.0	0.691	52.4	LOS D	18.2	130.9	0.96	0.93	24.7
Approach		3408	3.0	0.956	58.4	LOS E	62.1	446.0	0.84	0.99	22.6
North: Wicks Road (north)											
7	L	240	3.0	0.533	41.2	LOS C	11.4	81.8	0.88	0.86	28.1
8	T	88	3.0	0.887	71.9	LOS F	9.0	64.9	1.00	0.95	19.4
9	R	101	3.0	0.887	94.3	LOS F	9.0	64.9	1.00	0.95	16.9
Approach		429	3.0	0.887	60.0	LOS E	11.4	81.8	0.93	0.90	22.5
West: Epping Road (west)											
10	L	122	3.0	0.142	31.8	LOS C	6.5	46.6	0.60	0.76	32.0
11	T	1993	3.0	0.914	61.7	LOS E	53.1	381.6	1.00	1.03	21.5
12	R	75	3.0	0.306	32.7	LOS C	3.6	25.6	0.81	0.74	31.7
Approach		2189	3.0	0.914	59.0	LOS E	53.1	381.6	0.97	1.00	22.1
All Vehicles		6700	3.0	0.956	59.4	LOS E	62.1	446.0	0.90	0.97	22.3

Level of Service (Aver. Int. Delay): LOS E. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	28.2	LOS C	0.1	0.1	0.61	0.61
P5	Across N approach	53	28.2	LOS C	0.1	0.1	0.61	0.61
P7	Across W approach	53	49.6	LOS E	0.2	0.2	0.81	0.81
All Pedestrians		159	35.3				0.68	0.68

Level of Service (Aver. Int. Delay): LOS D. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS E. LOS Method for individual pedestrian movements: Delay (HCM).

MOVEMENT SUMMARY

Site: EX-PM

Wicks Road and Epping Road
Signals - Fixed Time Cycle Time = 150 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wicks Road (south)											
1	L	85	3.0	1.001	61.3	LOS E	6.1	43.6	0.99	0.77	22.3
2	T	45	3.0	0.478	59.8	LOS E	12.1	86.7	0.95	0.78	21.3
3	R	383	3.0	0.479	67.1	LOS E	12.1	86.7	0.94	0.80	21.3
Approach		513	3.0	1.000	65.5	LOS E	12.1	86.7	0.95	0.79	21.5
East: Epping Road (east)											
4	L	686	3.0	0.473	11.8	LOS A	15.4	110.3	0.37	0.71	45.4
5	T	2802	3.0	1.032	112.7	LOS F	103.3	741.6	1.00	1.31	14.3
6	R	203	3.0	0.499	36.4	LOS C	5.1	36.7	0.93	0.80	30.1
Approach		3692	3.0	1.032	89.8	LOS F	103.3	741.6	0.88	1.17	17.0
North: Wicks Road (north)											
7	L	379	3.0	0.978	83.1	LOS F	23.4	168.3	1.00	1.04	18.3
8	T	181	3.0	0.978	98.0	LOS F	20.9	149.7	1.00	1.15	15.7
9	R	21	3.0	0.146	72.7	LOS F	20.9	149.7	0.93	0.71	20.1
Approach		581	3.0	0.978	87.3	LOS F	23.4	168.3	1.00	1.06	17.5
West: Epping Road (west)											
10	L	141	3.0	0.124	20.2	LOS B	5.5	39.5	0.43	0.74	38.7
11	T	2047	3.0	0.754	34.3	LOS C	40.4	290.0	0.89	0.81	29.6
12	R	186	3.0	1.000[3]	76.9	LOS F	12.9	92.8	1.00	0.95	19.4
Approach		2374	3.0	1.000	36.8	LOS C	40.4	290.0	0.87	0.81	28.8
All Vehicles		7159	3.0	1.032	70.3	LOS E	103.3	741.6	0.89	1.01	20.0

Level of Service (Aver. Int. Delay): LOS E. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

3 x = 1.00 due to short lane

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	20.3	LOS C	0.1	0.1	0.52	0.52
P5	Across N approach	53	20.3	LOS C	0.1	0.1	0.52	0.52
P7	Across W approach	53	49.6	LOS E	0.2	0.2	0.81	0.81
All Pedestrians		159	30.1				0.62	0.62

Level of Service (Aver. Int. Delay): LOS D. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS E. LOS Method for individual pedestrian movements: Delay (HCM).

appendix c-2

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MOVEMENT SUMMARY

Site: FU-AM Pref Project Appl

Lane Cove Road & Allangrove Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Allangrove Rd											
4	L	86	0.0	0.369	27.3	LOS B	1.8	12.4	0.87	1.01	34.2
Approach		86	0.0	0.368	27.3	LOS B	1.8	12.4	0.87	1.01	34.2
North: Epping Road (north)											
7	L	21	0.0	0.305	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
8	T	1723	3.0	0.304	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		1744	3.0	0.304	0.1	LOS A	0.0	0.0	0.00	0.01	59.8
All Vehicles		1831	2.8	0.368	1.4	NA	1.8	12.4	0.04	0.06	57.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: EX-PM Pref Project App

Lane Cove Road & Allangrove Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Allangrove Rd											
4	L	38	0.0	0.263	36.6	LOS C	1.1	7.6	0.91	0.99	29.8
Approach		38	0.0	0.264	36.6	LOS C	1.1	7.6	0.91	0.99	29.8
North: Epping Road (north)											
7	L	21	0.0	0.376	8.2	LOS A	0.0	0.0	0.00	1.07	49.0
8	T	2119	3.0	0.373	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2140	3.0	0.373	0.1	LOS A	0.0	0.0	0.00	0.01	59.9
All Vehicles		2178	2.9	0.373	0.7	NA	1.1	7.6	0.02	0.03	58.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: FU-AM Pref Project App

Barr Street & Wicks Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wicks Road (south)											
1	L	1	3.0	0.211	8.2	LOS A	0.0	0.0	0.00	1.09	49.0
2	T	791	3.0	0.207	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		792	3.0	0.207	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
North: Wicks Road (north)											
8	T	686	3.0	0.341	0.3	LOS A	1.9	14.0	0.04	0.00	59.0
9	R	193	3.0	0.340	14.7	LOS B	1.9	14.0	0.72	0.96	43.2
Approach		879	3.0	0.341	3.5	LOS B	1.9	14.0	0.19	0.21	54.6
West: Barr Street											
10	L	95	3.0	0.206	15.0	LOS B	0.9	6.7	0.67	0.90	42.5
12	R	8	3.0	0.052	29.2	LOS C	0.2	1.4	0.87	0.96	33.3
Approach		103	3.0	0.206	16.2	LOS C	0.9	6.7	0.69	0.90	41.6
All Vehicles		1774	3.0	0.341	2.7	NA	1.9	14.0	0.13	0.16	55.8

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: FU-PM Pref Project App

Barr Street & Wicks Road
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wicks Road (south)											
1	L	11	3.0	0.155	8.3	LOS A	0.0	0.0	0.00	1.08	49.0
2	T	577	3.0	0.154	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		587	3.0	0.154	0.1	LOS A	0.0	0.0	0.00	0.02	59.8
North: Wicks Road (north)											
8	T	737	3.0	0.232	1.6	LOS A	2.2	16.2	0.24	0.00	55.3
9	R	61	3.0	0.232	12.3	LOS A	2.2	16.2	0.60	0.97	47.0
Approach		798	3.0	0.232	2.4	LOS A	2.2	16.2	0.27	0.07	54.6
West: Barr Street											
10	L	84	3.0	0.136	12.3	LOS A	0.6	4.4	0.54	0.83	45.0
12	R	53	3.0	0.206	22.7	LOS B	0.9	6.3	0.82	0.96	36.9
Approach		137	3.0	0.207	16.3	LOS B	0.9	6.3	0.65	0.88	41.5
All Vehicles		1522	3.0	0.232	2.8	NA	2.2	16.2	0.20	0.13	54.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

MOVEMENT SUMMARY

Site: FU-AM Pref Project App

Lane Cove Road & Epping Road
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: LCR (south)											
1	L	71	3.0	1.026	99.6	LOS F	70.6	500.8	1.00	1.18	18.1
2	T	2368	3.0	1.028	107.1	LOS F	88.9	638.5	1.00	1.27	16.1
3	R	451	3.0	1.094	154.1	LOS F	29.8	214.2	1.00	1.20	12.6
Approach		2889	3.0	1.094	114.3	LOS F	88.9	638.5	1.00	1.25	15.4
East: Epping Rd (east)											
4	L	145	3.0	0.080	9.5	NA[9]	NA[9]	NA[9]	NA[9]	0.65	54.6
5	T	1	3.0	0.987	131.8	LOS F	26.7	191.9	1.00	1.18	13.4
6	R	662	3.0	1.026	125.0	LOS F	26.7	191.9	1.00	1.09	14.9
Approach		808	3.0	1.026	104.2	LOS F	26.7	191.9	0.82	1.01	17.1
North: LCR (north)											
7	L	497	3.0	0.273	9.5	NA[9]	NA[9]	NA[9]	NA[9]	0.65	54.6
8	T	1495	3.0	0.630	37.0	LOS C	28.9	207.7	0.85	0.76	31.5
9	R	226	3.0	0.519	77.4	LOS F	9.7	69.3	0.99	0.79	21.2
Approach		2218	3.0	0.630	35.0	LOS C	28.9	207.7	0.68	0.74	33.0
West: Epping Rd (west)											
10	L	333	3.0	0.436	40.4	LOS C	17.7	127.2	0.76	0.81	31.7
11	T	1	3.0	0.292	54.9	LOS D	8.2	59.1	0.89	0.72	24.4
12	R	173	3.0	0.289	63.6	LOS E	8.2	59.1	0.88	0.77	24.3
Approach		506	3.0	0.436	48.3	LOS D	17.7	127.2	0.81	0.79	28.6
All Vehicles		6422	3.0	1.094	80.4	LOS F	88.9	638.5	0.85	1.01	20.1

Level of Service (Aver. Int. Delay): LOS F. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

9 Continuous movement

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	48.0	LOS E	0.2	0.2	0.80	0.80
P7	Across W approach	53	44.1	LOS E	0.2	0.2	0.77	0.77
All Pedestrians		106	46.0				0.78	0.78

Level of Service (Aver. Int. Delay): LOS E. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS E. LOS Method for individual pedestrian movements: Delay (HCM).

MOVEMENT SUMMARY

Lane Cove Road & Epping Road
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: LCR (south)											
1	L	142	3.0	0.914	84.6	LOS F	40.4	290.0	1.00	1.09	20.3
2	T	1349	3.0	0.914	69.9	LOS E	42.2	302.7	1.00	1.07	21.6
3	R	234	3.0	0.927	103.9	LOS F	11.8	84.9	1.00	1.01	17.2
Approach		1725	3.0	0.927	75.7	LOS F	42.2	302.7	1.00	1.06	20.8
East: Epping Rd (east)											
4	L	440	3.0	0.346	9.6	NA[9]	NA[9]	NA[9]	NA[9]	0.65	54.5
5	T	1	3.0	0.877	88.7	LOS F	16.5	118.4	1.00	1.02	17.9
6	R	500	3.0	0.914	95.9	LOS F	16.5	118.4	1.00	1.00	18.3
Approach		941	3.0	0.914	55.5	LOS D	16.5	118.4	0.53	0.84	26.4
North: LCR (north)											
7	L	461	3.0	0.362	9.6	NA[9]	NA[9]	NA[9]	NA[9]	0.65	54.5
8	T	1417	3.0	0.865	57.4	LOS E	36.1	259.5	1.00	0.99	24.5
9	R	174	3.0	0.689	85.9	LOS F	8.3	59.5	1.00	0.83	19.7
Approach		2052	3.0	0.865	49.1	LOS D	36.1	259.5	0.78	0.90	27.3
West: Epping Rd (west)											
10	L	624	3.0	0.877	54.6	LOS D	37.3	268.1	0.96	1.03	26.6
11	T	1	3.0	0.459	47.8	LOS D	13.8	99.2	0.88	0.75	26.3
12	R	324	3.0	0.486	55.9	LOS D	13.8	99.2	0.86	0.81	26.3
Approach		949	3.0	0.877	55.0	LOS D	37.3	268.1	0.93	0.95	26.5
All Vehicles		5667	3.0	0.927	59.3	LOS E	42.2	302.7	0.83	0.95	24.7

Level of Service (Aver. Int. Delay): LOS E. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

9 Continuous movement

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	59.0	LOS E	0.2	0.2	0.89	0.89
P3	Across E approach	53	54.6	LOS E	0.2	0.2	0.85	0.85
P7	Across W approach	53	50.4	LOS E	0.2	0.2	0.82	0.82
All Pedestrians		159	54.7				0.85	0.85

Level of Service (Aver. Int. Delay): LOS E. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS E. LOS Method for individual pedestrian movements: Delay (HCM).

MOVEMENT SUMMARY

Site: FU-AM Pref Project App

Wicks Road and Epping Road
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wicks Road (south)											
1	L	109	3.0	1.000[3]	49.3	LOS D	6.1	43.6	1.00	0.78	25.5
2	T	65	3.0	0.655	60.6	LOS E	17.1	122.9	0.98	0.82	21.2
3	R	556	3.0	0.655	67.7	LOS E	17.1	122.9	0.97	0.83	21.2
Approach		730	3.0	1.000	64.3	LOS E	17.1	122.9	0.97	0.82	21.7
East: Epping Road (east)											
4	L	668	3.0	0.434	8.9	LOS A	8.7	62.2	0.22	0.67	48.3
5	T	2093	3.0	0.977	86.9	LOS F	66.3	476.2	1.00	1.16	17.2
6	R	656	3.0	0.714	54.0	LOS D	18.7	134.4	0.97	0.93	24.3
Approach		3417	3.0	0.977	65.3	LOS E	66.3	476.2	0.84	1.02	21.1
North: Wicks Road (north)											
7	L	240	3.0	0.536	41.2	LOS C	11.3	80.9	0.89	0.85	28.2
8	T	88	3.0	0.887	72.3	LOS F	9.0	64.9	1.00	0.95	19.3
9	R	101	3.0	0.887	94.3	LOS F	9.0	64.9	1.00	0.95	16.9
Approach		429	3.0	0.887	60.1	LOS E	11.3	80.9	0.94	0.90	22.5
West: Epping Road (west)											
10	L	122	3.0	0.144	32.4	LOS C	6.6	47.1	0.61	0.76	31.8
11	T	1993	3.0	0.930	67.2	LOS E	55.5	398.3	1.00	1.06	20.4
12	R	75	3.0	0.310	33.4	LOS C	3.5	25.3	0.82	0.73	31.4
Approach		2189	3.0	0.930	64.1	LOS E	55.5	398.3	0.97	1.03	21.1
All Vehicles		6766	3.0	1.000	64.5	LOS E	66.3	476.2	0.90	0.99	21.2

Level of Service (Aver. Int. Delay): LOS E. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

3 x = 1.00 due to short lane. Refer to the Lane Summary report for information about excess flow and related conditions.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	38.2	LOS D	0.2	0.2	0.71	0.71
P5	Across N approach	53	38.2	LOS D	0.2	0.2	0.71	0.71
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		159	48.5				0.80	0.80

Level of Service (Aver. Int. Delay): LOS E. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS F. LOS Method for individual pedestrian movements: Delay (HCM).

MOVEMENT SUMMARY

Site: FU-PM Pref Project App

Wicks Road and Epping Road
Signals - Fixed Time Cycle Time = 150 seconds (User-Given Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Wicks Road (south)											
1	L	83	3.0	1.001	62.3	LOS E	6.1	43.6	0.99	0.77	22.1
2	T	85	3.0	0.509	58.6	LOS E	13.4	96.2	0.95	0.78	21.5
3	R	396	3.0	0.508	65.7	LOS E	13.4	96.2	0.94	0.81	21.6
Approach		564	3.0	1.000	64.1	LOS E	13.4	96.2	0.94	0.80	21.6
East: Epping Road (east)											
4	L	686	3.0	0.457	10.7	LOS A	13.3	95.8	0.32	0.70	46.5
5	T	2833	3.0	1.028	109.8	LOS F	103.5	743.2	1.00	1.30	14.6
6	R	203	3.0	0.654	40.6	LOS C	5.4	38.6	0.96	0.83	28.5
Approach		3722	3.0	1.028	87.8	LOS F	103.5	743.2	0.87	1.16	17.2
North: Wicks Road (north)											
7	L	379	3.0	1.034	95.7	LOS F	23.4	168.3	1.00	1.06	16.6
8	T	181	3.0	1.034	111.6	LOS F	22.8	163.9	1.00	1.16	14.3
9	R	21	3.0	0.145	71.6	LOS F	2.1	14.9	0.92	0.71	20.4
Approach		581	3.0	1.034	99.8	LOS F	23.4	168.3	1.00	1.08	15.9
West: Epping Road (west)											
10	L	141	3.0	0.121	19.3	LOS B	5.3	38.3	0.41	0.74	39.2
11	T	2086	3.0	0.759	33.8	LOS C	41.1	295.4	0.89	0.81	29.7
12	R	146	3.0	1.063	126.0	LOS F	12.8	92.2	1.00	1.10	13.5
Approach		2374	3.0	1.063	38.6	LOS C	41.1	295.4	0.86	0.82	28.0
All Vehicles		7241	3.0	1.063	70.8	LOS F	103.5	743.2	0.89	1.01	19.9

Level of Service (Aver. Int. Delay): LOS F. Based on average delay for all vehicle movements. LOS Method: Delay (RTA NSW).
Level of Service (Worst Movement): LOS F. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on average delay for all vehicle movements.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	27.6	LOS C	0.1	0.1	0.61	0.61
P5	Across N approach	53	27.6	LOS C	0.1	0.1	0.61	0.61
P7	Across W approach	53	69.1	LOS F	0.2	0.2	0.96	0.96
All Pedestrians		159	41.4				0.72	0.72

Level of Service (Aver. Int. Delay): LOS E. Based on average delay for all pedestrian movements. LOS Method: Delay (HCM).
Level of Service (Worst Movement): LOS F. LOS Method for individual pedestrian movements: Delay (HCM).