Transport Management and Accessibility (TMAP) Study

for a Concept Plan Application for a Residential Development at 5 Whiteside Street and 14-16 David Avenue, Ryde

Prepared on behalf of EGC Custodian Services by **TRAFFIX** traffic & transport planners
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Contents

List of Appendices:

1. Introduction

TRAFFIX has been commissioned by EGC Custodian Services to prepare a Transport Management and Accessibility (TMAP) Study relating to a proposed Concept Plan Application on lands located at 5 Whiteside Street and 14-16 David Avenue, at North Ryde. The TMAP Study has been incorporated into the Director General Requirements at the request of Ryde Council, but is not a requirement of either the RTA or the Ministry of Transport. In this regard, the full scope of investigations under a TMAP study is not considered to be particularly relevant to an exclusively residential development of the scale proposed, which is a low traffic generating land use (Section 5.11 refers). These matters are nevertheless covered in this report, which is to accompany an Environmental Assessment undertaken by Urbis and which responds to the relevant issues raised by the Director General's Requirements dated 27th January 2011.

The Concept Plan seeks approval for the construction of four separate residential buildings, denoted A, B and C and D. Buildings are comprised of a total of 213 residential units, with 311 parking spaces within a three level basement car park accessed via the proposed internal roadway.

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.

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 southern side of Epping Road, generally between Lane Cove Road in the east and Herring Road in the west. The site is approximately 950 metres from both the Macquarie Park Railway Station and the Macquarie University Railway Station.

In a more local context, the site lies to the immediate east of Whiteside Street and has a northern frontage onto Epping Road of about 180 metres which follows the alignment of an RTA road reservation that creates a significant set-back from the Epping Road carriageway. This land is to be landscaped under the Concept Plan application. The site has a short western boundary to Whiteside Street (via No. 5 Whiteside Street) which is a strategic landholding that permits access to this road. The site also has a short eastern boundary onto David Avenue (via 14-16 David Avenue). The majority of the western and eastern site boundaries are onto the rear of existing residential developments that front either Whiteside Street or David Avenue. The southern site boundary is onto residential dwellings that front Parklands Road.

The site has an irregular configuration with a total area of 13,960m^2 and with the exception of the dwelling lots that provide access to the site is mainly otherwise essentially vacant, though with some structures.

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.

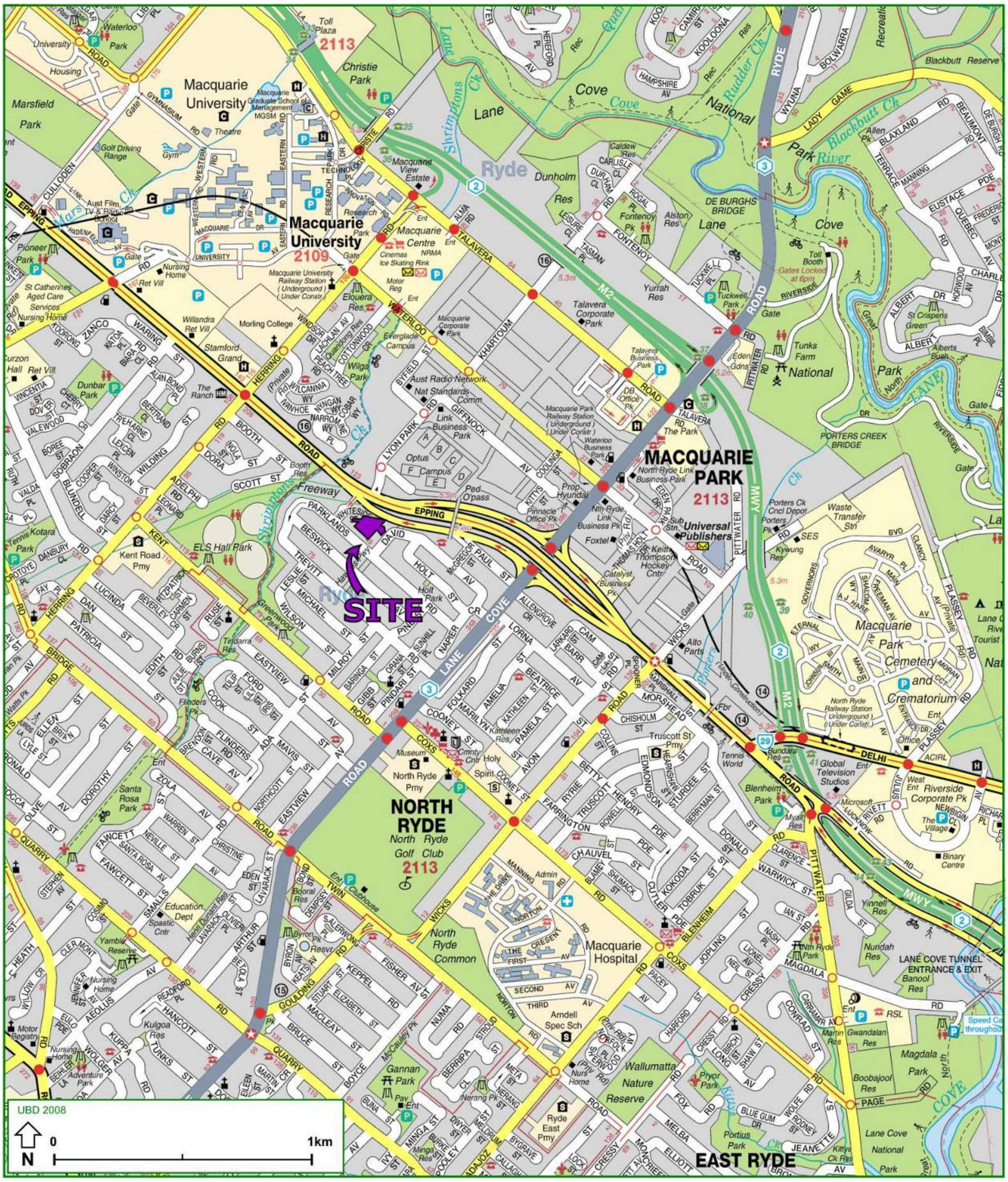

Figure 1: Location Plan

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.
- Whiteside Street a local road that provides a left turn entry movement from Epping Road into the residential precinct that contains the subject site. This road is however two-way for a short distance between the subject site and Parklands Road. It is estimated to carry less than 500 vehicle movements per day.
- Parklands Road a local residential street that provides access to properties along both sides of its length and which connects to the internal road network

within the existing residential precinct. It is estimated to carry less than 500 vehicle movements per day.

- David Avenue — a local residential street that provides access to properties along both sides of its length. It is estimated to carry less than 500 vehicle movements per day.
- Paul Street — a local road that provides for left turn entry and exit movements from the westbound on-ramp to Epping Road from Lane Cove Road, serving the residential precinct that contains the subject site. It is estimated to carry 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. This is subject to the proposed provision of left out movements from the subject site onto Epping Road which has been agreed in principle by the RTA, subject to measures taken to discourage non-development traffic from using this new access route. This is discussed further below.

3.2 General Description of Road Environment

Epping Road is constructed with a varying width divided carriageway and generally carries three lanes of traffic in either direction. To the east 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 the western side of this intersection, there are dual westbound lanes at ground level that run parallel to the Epping Road overpass. These lanes merge into a single lane a distance of 100 metres east of Whiteside Street. This single lane is an auxiliary lane that in effect provides a 100 metre long deceleration lane for the left turn movement into Whiteside Street. The lane also extends 140 metres west of Whiteside Street, providing an opportunity for traffic to merge with through traffic movement, joining the three through lanes on Epping Road.

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 dual 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 dual 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.

Whiteside Street provides two-way local access between Parklands Road and the existing cul-de-sac that is constructed adjacent to the proposed main site access. It has a 7.2 metre wide carriageway over this section, with kerbside parking permitted along both sides. The cul-de-sac also accommodates the single exit lane from Epping Road. This movement is under free-flow conditions and the narrow width of Whiteside Street reinforces the low-speed environment for traffic exiting Epping Road and this situation will remain. Whiteside Street forms the stem of a 'T' junction with Parklands Road to the immediate south of the site. Whiteside Street will provide the only site access, with all traffic access proposed via its intersection with Epping Road.

Parklands Road is constructed with a 7.2 metre wide carriageway, also with on-street parking permitted along both sides which creates a low speed environment. Parklands Road provides a circuitous route through the residential precinct to the south of the site, which is used for local traffic access only. In the east, it connects to Napier Crescent which intersects Lane Cove Road at a 'T' junction, with only left-in and left-out movements permitted to/from Lane Cove Road.

David Avenue is constructed with a 6.5 metre wide carriageway, and permits on-street parking along both approaches. It connects to Napier Crescent and is an alternate route to the Parklands Road.

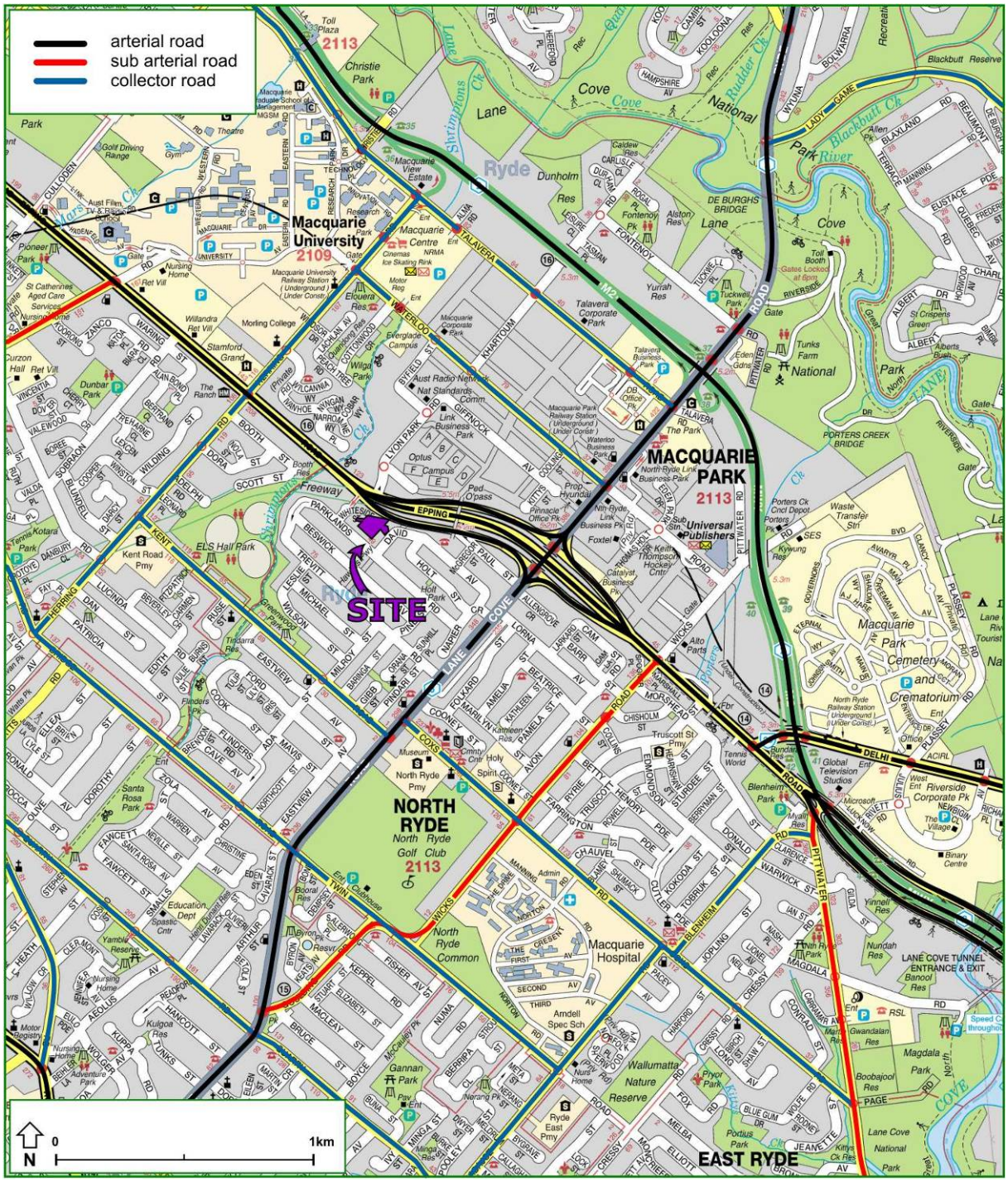

Figure 3: Road Hierarchy

3.3 Public Transport

3.3.1 Rail

The site benefits from excellent exposure to public transport and is serviced by both bus and rail. Macquarie Park Railway Station is located approximately 950 metres to the north-east of the site, at the junction of Lane Cove Road with Waterloo Road. Macquarie University Station is located a similar distance to the north-west of the site, at the junction of Talavera Road with Herring Road. This further improves the site's accessibility to public transport services. These distances are only slightly greater than the 800 metres walking distance typically associated with access to railway stations for commuter trips, but will still be relatively convenient for these and other trip purposes.

The rail corridor operates between Chatswood and Epping Stations and this link was integrated into the CityRail network in October 2009, with eight train services per hour (combined in both directions) operating between 5am and 11pm on all days of the week.

3.3.2 Buses

Existing bus services operating in the locality are shown in **Figure 4** below. It is evident that the site is served by buses travelling along both Epping Road and Lane Cove Road. The services provide connections to the Sydney CBD, Chatswood, Ryde, Gordon, Manly, Blacktown, Epping and Parramatta, with high frequencies during peak periods.

These services are less frequent at off-peak times, including on weekends.

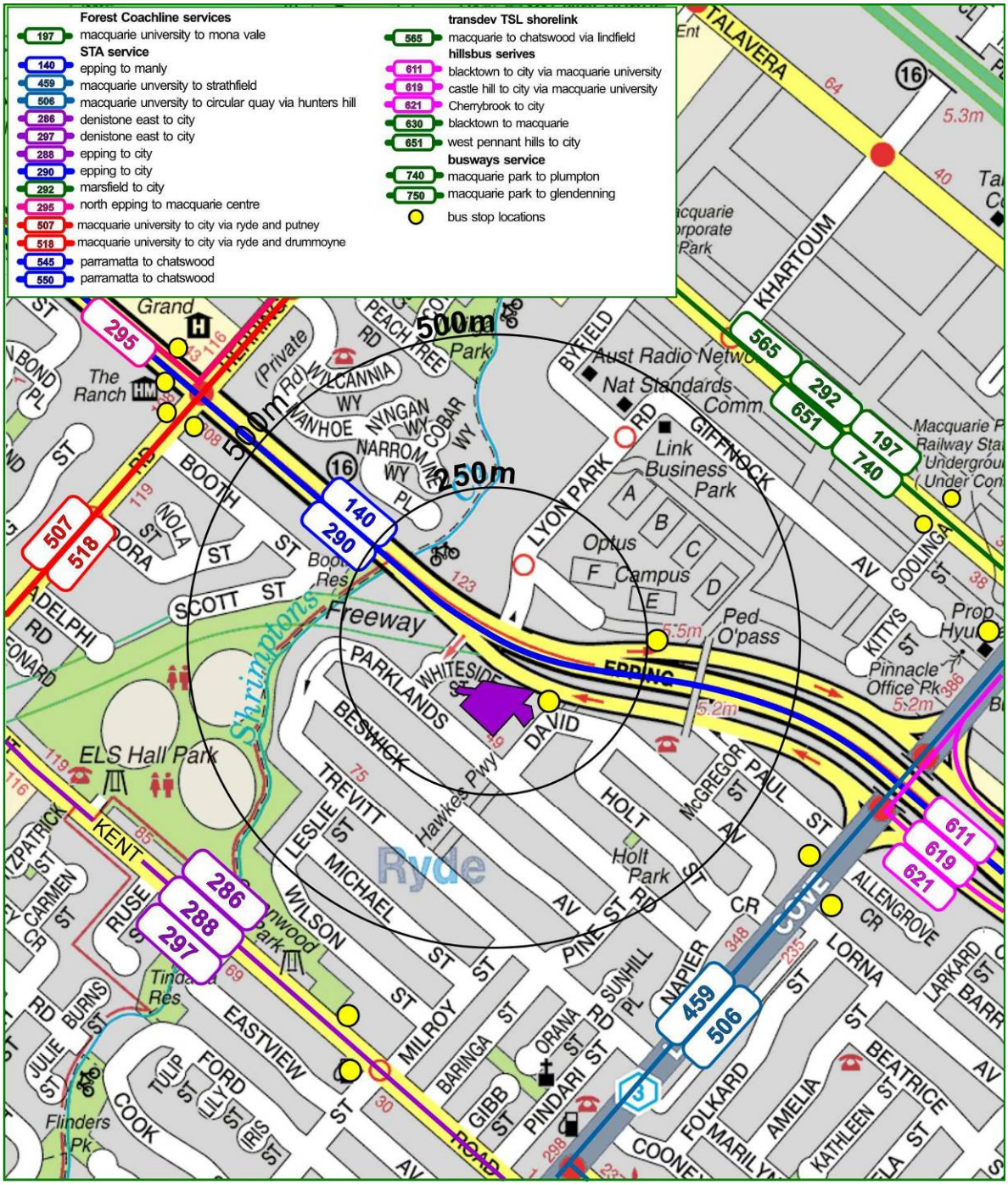

Figure 4: Public Transport Services

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 only 3-4 vehicles per hour during peak periods results. These are minimal and have not been removed from the network for the purpose of this report, ensuring a conservative approach.

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 under existing conditions include:

- Lane Cove Road and Epping Road;
- Epping Road and Herring Road;
- Trevitt Street with Lane Cove Road;
- Whiteside Street and Epping Road; and
- Napier Street with Lane Cove Road.

It is noted that the development proposes a new access to Epping Road to service all entry and exit movements associated with the site. As such the intersections of Trevitt Street, Napier Street and Paul Street with Lane cove Road will continue to operate as currently occurs under the future scenarios.

The turning movements for the intersections of interest were extracted from Paramics, with additional surveys undertaken of turning movements to provide improved calibration. The intersections 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 (sec/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
Lane Cove Road & Epping Rd	AM	Signals	1.10	80.6	F
	PM		0.93	59.2	E
Herring Rd & Epping Rd	AM	Signal	1.00	44.1	D
	PM		1.45	59.7	E
Whiteside Street & Epping Rd	AM	Priority	NA	NA	NA
	PM		NA	NA	NA
Trevitt Road & Lane Cove Rd	AM	Priority	0.78	87.7	F
	PM		0.59	64.1	E
Paul Street & Lane Cove Rd	AM	Priority	0.81	92.5	F
	PM		0.57	57.3	E
Napier Crescent & Lane Cove Rd	AM	Priority	1.03	174.1	F
	PM		0.57	61.1	E

It can be seen from **Table 1** that the key intersections of Epping Road and Herring Road and Epping Road and Lane Cove Road operate unsatisfactorily during both the AM and PM peak periods. This has however been well documented by Council and the RTA and these intersections have been identified in strategic modelling as requiring significant upgrades to accommodate future road network growth. The intersections of Whiteside Street with Epping Road operates with a level of service A during the existing AM and PM peak periods as there are currently no opposing movements. The intersections of both Napier Crescent and Trevitt Road with Lane Cove Road both operate with a LoS F and E during the AM and PM peak periods respectively. This however is typical for local roads connecting to congested arterial roads where priority is given to the major movements along the arterial road. In this case, Lane Cove Road is one of Sydney's major RTA Main Roads and as such this result is expected.

It is again however reiterated that the proposed site access has been designed such that no development traffic will be provided access to the intersections of either Napier Crescent with Lane Cove Road or Trevitt Road with Lane Cove Road.

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.

3.6 Existing On-Street Parking Demand

In order to assess the existing on-street parking demand in the vicinity of the site, a review of Nearmap (www.nearmap.com.au) was undertaken. Nearmap provides dated periodic satellite imagery of the Macquarie Park region and clearly indicates existing on-street parking utilisation. A summary of the relevant weekday images is included in Appendix D.

Review of these images indicates a high level of on-street parking availability during weekdays. We understand that this evidence differs to resident's perception of this situation raised during the recent community consultations sessions. Notwithstanding, to limit the potential for additional on-street parking in the local area, additional measures are discussed in Section 5.7 of the report.

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.
- Construction of four residential buildings accommodating a total of 213 units including:
  - 63 one bedroom dwellings
  - 100 two bedroom dwellings, and
  - 50 three bedroom dwellings.
- The provision of 21 accessible units (included in the above).
- The construction of a three level basement car park, comprising 311 spaces including 22 accessible spaces.
- Provision of a low-speed internal roadway which runs in an east-west direction with access onto Whiteside Street only. This provides access to a loading area within the site; as well as limited on-street spaces for use by service vehicles and occasional visitors. This roadway is proposed with a narrow width and with traffic calming measures and extensive landscaping to actively encourage low-speeds and pedestrian right of ways.

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, some of which are presented at reduced scale in **Appendix B** for ease of reference.

5. TMAP

5.1 Introduction

The traffic impact assessment undertaken in this report is based on a low trip rate that has been widely adopted for comparable development sites within Macquarie Park. The applicable rate is discussed further in Section 5.11 and is commensurate with the trip rate adopted by the RTA in a sub-regional centre. In effect, this represents about a 27% reduction for comparable sites within smaller centres; as well as the traffic generation for units based on the RTA's "unconstrained" trip rates for medium density residential development, which in many cases reflects relatively poor access to public transport. To achieve this target, various initiatives are proposed. These are discussed below and include improved connectivity to bus services, provision of pedestrian and bicycle linkages, a constrained parking supply, car sharing arrangements and the formulation of a Transport Access Guide.

These should be seen in the context where the site is expected to accommodate about 600-800 residents, which is a moderate density that in itself does not warrant additional infrastructure above the levels already planned or implemented for Macquarie Park. This includes the Macquarie Park Railway Station and the Macquarie University Railway Station which are both within a reasonable walking distance of the site, particularly for commuter (journey to work) trips.

5.2 Bus Services

Numerous bus services operate in the vicinity of the site, as shown in Figure 4, which is provided in the context of existing services. Eastbound (City bound) services are able to be accessed via the pedestrian overpass at Paul Street. Westbound services along Epping Road are readily accessed via an existing bus stop west of Paul Street. Nevertheless, the development proposes an indented bus bay within the RTA lands adjacent to the site which will provide an alternative/additional stop (refer to the landscape plan prepared by Aspect Studios which is provided in Appendix B).

Services are also available along Lane Cove Road and Herring Road as indicated in Figure 4 and these are all within a reasonable walking distance for residents, particularly for commuter (journey to work) trips, but also for other trip types.

These services operate regularly and will provide an alternative travel mode choice for residents. The use of these services should be encouraged by residential strata managers and employers where possible. This may include the provision of current service timetable and route information within reception, foyer and/or other communal areas within the site and this would be embodied within a Transport Access Guide as discussed in Section 5.10.

5.3 Rail Services

As mentioned, the site is within a reasonable distance of the Macquarie Park Railway Station and the Macquarie University Railway Station. These services are on the main North Line and connect Chatswood with Epping, with direct links therefore to the North Shore Line to the Sydney CBD and to the Cumberland Line between Hornsby and Strathfield.

Notwithstanding the above, it is expected that a significant proportion of residents will work within Macquarie Park (including the University) and this is expected to be a major component of the marketing strategy.

5.4 Pedestrian and Bicycle Linkages

An extensive footpath system is proposed along the Epping Road frontage and the frontage to Whiteside Street, for use by both pedestrians and cyclists. These link to the existing footpath network and provide a benefit for all residents within the precinct to the south of the site. This includes access to the proposed indented bus bay on Epping Road, should this be supported by the State Transit Authority. Furthermore, significant internal pedestrian connectivity is proposed to allow easy access along the main pedestrian desire line to Whiteside Street; as well as to Epping Road. 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 modes.

It should be noted that both the Ryde Bicycle Strategy Master Plan 2007 and Planning Guidelines for Walking and Cycling were reviewed and elements have been adopted within the design. Although the Ryde Bicycle Strategy Mater 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 as mentioned. The Planning Guidelines for Walking and Cycling 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 that link to the major crossing and desire lines on Epping Road, to ensure ease of access to public transport as well as the range of services that are available within Macquarie Park more generally, including open space, shopping and educational activities.

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 Whiteside Street are considered appropriate to facilitate future pedestrian and cycle needs as identified in the report.

In summary, the development of the public road network and private road network within the site provides a system of footpaths that will allow pedestrians to move freely within and through the site. This system links with the existing pedestrian network external to the site. It is expected that cyclists will use the internal road carriageways that are provided as a shared on road facility. This is considered appropriate as these roads do not form part of a through -cycle route.

The majority of the external cycle routes are via shared road carriageways. The subject site does not specifically form part of the existing or proposed cycle network and it is considered sufficient to provide access to these established routes only. Therefore, dedicated cycle lanes within the site are not considered necessary.

5.5 Pedestrian Safety

The internal design incorporates footpath linkages as discussed above. In addition, the internal design incorporates a pedestrian network of footpaths that are separate from vehicle movement accesses and corridors. The main pedestrian access is via Whiteside Street and this incorporates a footpath on either side of the internal access road. The basement car park entry and exit driveways cross the northern and southern footpaths respectively along the internal access road. This is deemed satisfactory in terms of pedestrian safety as good sight lines are provided.

The internal road system is also designed as a low speed environment, with minimal traffic volumes over the majority of its length (less than two vehicles per hour to the east of the car park access locations). It is recommended that this internal roadway be signposted with a 10km/h speed limit. There is also a potential to construct raised thresholds crossing opportunities along the main internal roadway, however this can be assessed in more detail at Project Application stage.

5.6 Servicing

The site is to be serviced by vehicles up to and including an 8.8 metre medium rigid vehicle (MRV), which is a standard service vehicle as defined in AS2890.2.

The development incorporates a consolidated garbage collection area (which will also be used for servicing) at the south-eastern corner of Building A. Garbage will be brought to this location from the basement garbage areas by a caretaker for centralised collection using either Council's contractors (by agreement) or by a private contractor. The garbage truck will approach along the internal road and reverse into the garbage area before exiting the site in a forward direction.

The design of the loading area has allowed for access in a single movement by A 6.4M SRV with access by an 8.8m MRV also achievable with some overhang over the opposite kerb. This is considered supportable but local widening can be provided should Council prefer.

Removalist vans and trucks will be able to park within designated parking bays along the internal road, where ample parking is available and can be secured when needed by management.

5.7 Parking Requirements

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 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. Finally, it is 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, any 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	63	1.0 spaces per unit	63	63
Two Bedroom	100	1.2 spaces per unit	120	120
Three Bedroom	50	1.6 spaces per unit	80	80
Visitor	213	1 space per 4 units	53	48
		Totals	316	311

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. In addition the subject site 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 weekends, for which car usage is frequently a more viable option. However, it is expected that these residents would primarily rely on non-car travel modes for the journey to work given the close proximity of the site to excellent bus and rail services and would therefore leave their car at home within the parking areas as provided (rather than on-street). This underlines the importance of

preserving the amenity of existing residents in the residential streets adjoining the development where significant on-street parking effects would have a potential adverse impact. 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 the journey to work.

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 the development for use by the residents. This would reduce car ownership and may potentially reduce parking levels (refer Section 5.8).

It is also proposed that the residential parking scheme, enforced within the local road network adjoining the development, not be extended to residents of the proposed development. The on-site parking provision is considered adequate in accommodating all parking demands associated with the development and by not extending this to the future tenants it will actively reduce car ownership levels and ensure adequate on-street parking for residents is maintained.

In summary, the development proposes a total of 311 spaces compared with 316 spaces as required under Council's minimum controls. The slight reduction in the DCP is considered acceptable in the circumstances and also complies with the requirements of the DGR's. The slight reduction is related to the visitor parking requirement only, which has been reduced from 53 spaces to 48 spaces. This equates to a rate of 1 space/4.4 units which exceeds the RTA's requirements for a sub-regional centre.

5.8 Transport Access Guide

5.8.1 General

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.

Notwithstanding, the implementation of transport plans is more difficult to achieve in residential developments. In contrast to a workplace environment or other destination based land uses, where

opportunities to influence travel demand (such as car pooling) are easier, it is relatively difficult within a residential development to encourage non car usage other than for the journey to work.

In the case of residential developments, sustainable travel can however be maximised for all trip types through the promotion of public transport and the use of car share vehicles. This is also essential where parking is restricted, as is proposed, with the adoption of minimum parking rates. This ensures that residents are aware of the availability, relative convenience and frequency of such services. For this reason a Travel Plan is to be prepared at Project Application stage which will be located in common areas and will identify such aspects as:

- Local bus stop locations;
- Bus and rail time tables;
- Location of taxi ranks in the locality;
- Location of local services within walking distance such as convenience stores, supermarkets and other retail related areas;
- Location of car share vehicles within reasonable walking distance (if any); and
- Local cycle routes including the City of Ryde Cycle Map.

Knowledge of these services and the specific locations of the services will ensure that the development provides maximum opportunity for residents to use non car travel modes. The development also includes extensive bicycle facilities to promote non car travel for local trips in particular; and commuter trips in general. It is therefore expected that Project Applications will be conditioned to require a Travel Plan to be prepared and this is invited.

Notwithstanding the above, it will be appreciated that the site is located within close proximity to major bus routes and two railway stations and this will maximise trips using public transport generally, including journey to work trips but also other trip types; even in the absence of a Travel Plan.

5.8.2 Taxis

Taxi services will be able to access the internal road directly via the proposed access to Epping Road.

5.8.3 Car Share

It is considered that car share arrangements will form an integral part of future Project Applications and this can be conditioned at the appropriate time and would form part of a Travel Plan. Consultation with car share operators such as Go Get would be undertaken to provide car share vehicles within the proposed future road network or basement car park, for use by local residents. This will be dependent upon the requirements of car share operators although the development is considered to be a suitable candidate site for the provision of on-street facilities for car share vehicles. This would also form part of a Travel Plan.

5.9 Trip Generation

The generation of the proposed development has been based on the rate of 0.4/unit/hr which is higher than 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. This is therefore a conservative assessment that potentially overstates the traffic impacts of the site. Application of this rate to the proposed 213 units results in a generation of 85 trips per hour with a likely 80:20 split in the direction of peak flow. Hence, volumes will be as follows:

- 17 in and 68 out during the morning peak period (7-8am and 8-9am); and
- 68 in and 17 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.

5.10 Paramics Micro Simulation Assessment

5.10.1 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 Macquarie Park network, known as the Macquarie Park Corridor Paramics Model (MPCPM) consists of a total of 80 zones and covers the peak one hour periods for both the AM and PM peak periods being from 7.45 am - 8.45am and 4.45pm – 5.45pm. The network map shown in **Figure 5** below shows the extent of the model, while **Figure 6** depicts the relationship of the MPCPM and the LEP Boundary as shown in the Ryde Council, Paramics Reference Document.

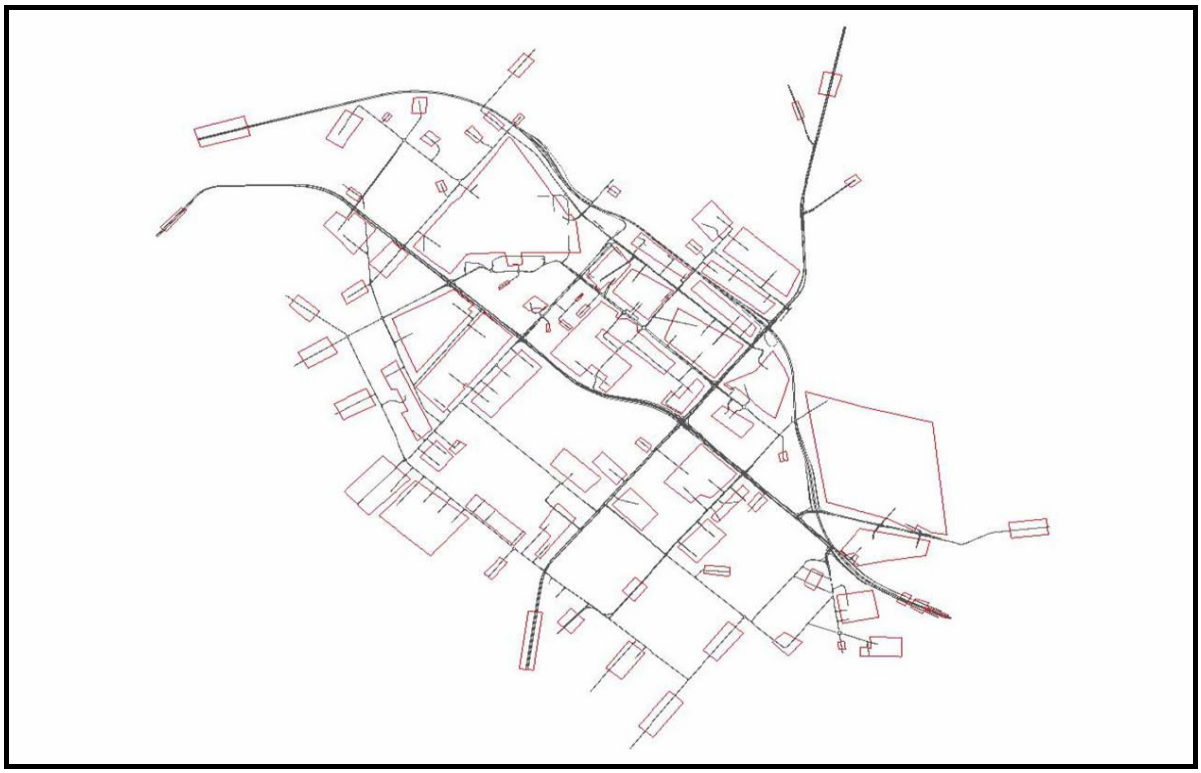

Figure 5: MPCPM Network Map

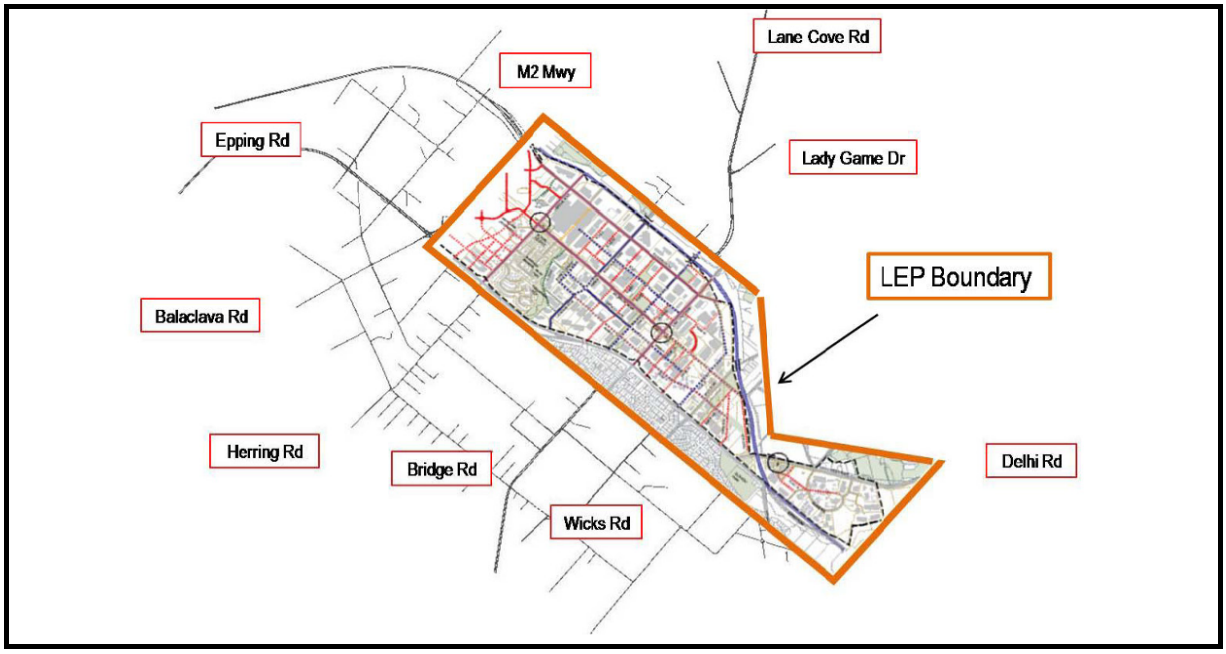

Figure 6: MPCPM and LEP Boundary

The assessment has been undertaken in accordance with Macquarie Park User Manual (Reference Documents 1 and 2) provided by Council and is discussed below.

5.10.2 Additional Network Coding

As required, a new development Travel Zone (Zone 81) has been coded to represent the demands associated with the new development in accordance with the required protocols. Due to the position of the proposed development no additional links were required to be coded to model the likely future travel routes to be utilised by the development traffic apart from the proposed access to Epping Road.

The location of the site within the model is shown in **Figure 7** with the additional links and location of the new zone shown in **Figure 8** below.

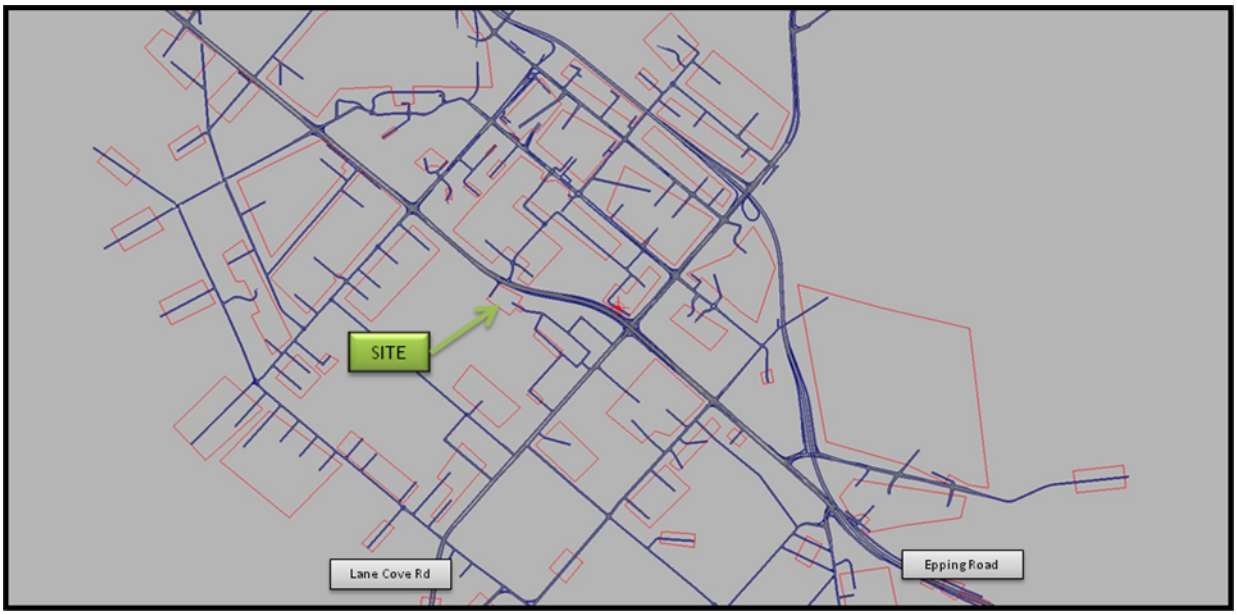

Figure 7: Site Location within Model

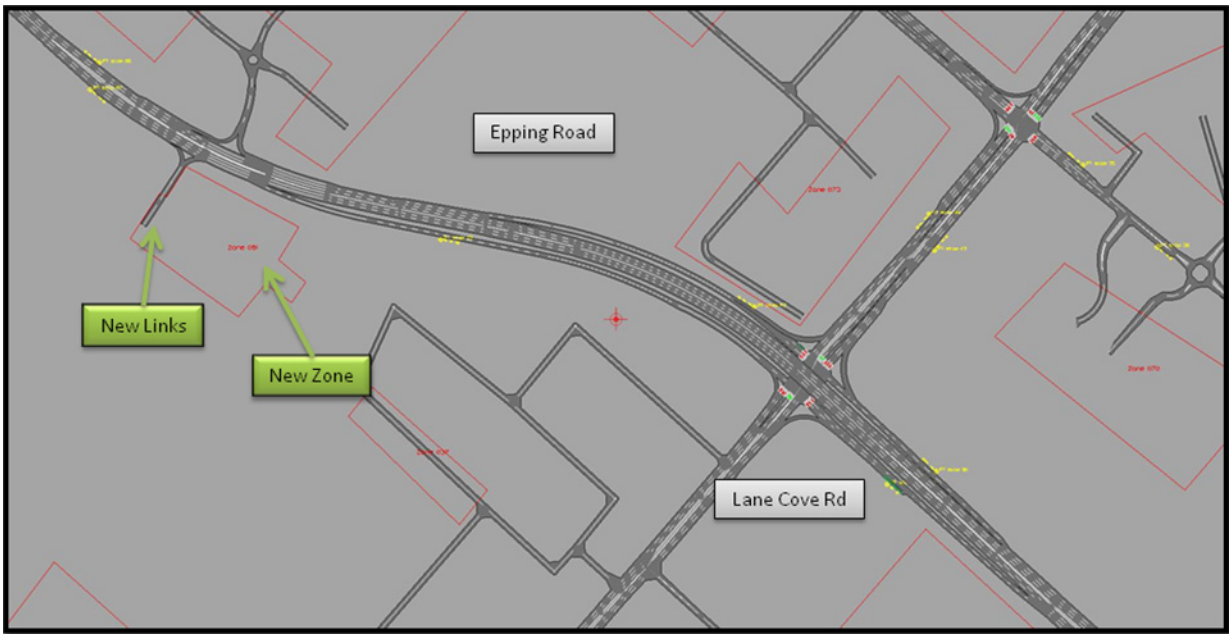

Figure 8: Additional Zone and Links

5.10.3 Trip Distribution

The future distribution of traffic has been assessed using the Ministry of Transport 2006 Journey to Work Data for Travel Zone 2487 in which the development site is located. The directional travel splits which resulted from this analysis is summarised in **Table 3** below.

Table 3: Journey to Work Travel Data by Direction

Direction	From TZ2494	
	Volume	%
North	70	11%
South	106	17%
East	410	67%
West	23	4%

This distribution was then applied to the amended demand matrix for the AM peak and reversed for the PM peaks resulting in the distribution shown in **Table 4**.

Table 4: Future Distribution

Zone	AM Peak		PM Peak	
	To Zone 81	From Zone 81	To Zone 81	From Zone 81
46	2	9	9	2
51	14	55	55	14
57	2	14	14	2
64	1	1	1	1
65	3	3	3	3
Total	**21**	**82**	**82**	**22**

As the development proposes access only to Epping Road, and the generation of the development will not exceed the 5% limit on any existing intersection approached, no additional surveys were considered necessary.

5.10.4 Results

Both the “without development” models and “with development” models were run in accordance with the reference documentation to determine the impacts of the development on the local road network. The results of this assessment are summarised below for the key intersections identified by the RTA including:

- Epping Road with Herring Road
- Lane Cove Road with Epping Road;
- Whiteside Street with Epping Road; and
- Napier Street with Lane Cove Road.

Some discrepancies with the models were observed and are evident in the results summarised below. In particular, variations in traffic flows were recorded which were inconsistent with expected results. That is, traffic flows at locations not influenced by development traffic varied significantly between the existing and future development. Disproportionate variations in traffic flows and delays were also recorded which suggest variations in the Paramics simulation. This was discussed with Council. Subsequently, the Macquarie Park Corridor Reference Documentation was amended for developments considered as “major development sites”. The amended procedures require the use of aaSIDRA at key intersections with the development traffic manually superimposed onto the existing turning volumes extracted from the “without development” models in accordance with the routes identified in the “with development” model.

For the purpose of this application, this amended procedure was used to check the future turn flows at critical intersections. Subsequently the amended turning counts were utilised for all subsequent SIDRA Intersection analysis.

The overall results are summarised in **Tables 5 and 6** below for the AM and PM peaks respectively. These tables include the existing and future turn volumes and associated average delays measured in seconds based on the Paramics model. It is noted that no change to the existing intersections of Napier Street with Lane Cove Road was recorded as the development traffic will not make use of this intersection at any time.

Table 5: AM Model Results - Paramics

Intersection	Approach	Direction	Movement	Base Model turn Count (hr)	Development Model Turn Count (hr)	Difference	Base turn delay (s)	Development turn delay (s)	Difference
Lane Cove Road / Epping Road	Epping Road	Westbound	Left	29	42	13	0	0	0
			Through	0	0	0	0	0	0
			Right	1058	1029	-29	59	60	1
	Epping Road	Eastbound	Left	298	354	56	33	23	-9
			Through	0	0	0	0	0	0
			Right	215	214	-1	83	91	8
	Lane Cove Road	Northbound	Left	68	73	5	0	0	0
			Through	2267	2307	40	10	8	-1
			Right	326	348	22	51	51	0
	Lane Cove Road	Southbound	Left	570	546	-24	3	2	-1
			Through	1504	1415	-89	16	16	0
			Right	344	330	-14	69	74	4
Epping Road / Herring Road	Epping Road	Westbound	Left	52	57	5	0	0	0
			Through	1539	1450	11	17	18	1
			Right	336	364	28	56	57	1
	Epping Road	Eastbound	Left	923	904	-19	0	0	0
			Through	1926	1925	-1	13	13	0
			Right	35	34	-1	74	73	-1
	Herring Road	Northbound	Left	17	20	3	0	0	0
			Through	294	296	2	40	39	-1
			Right	333	337	4	28	30	2
	Herring Road	Southbound	Left	450	545	95	4	5	2
			Through	43	48	5	49	48	-2
			Right	157	165	8	54	47	-7
Epping Road / Whiteside	Epping Road	Westbound	Through	1930	1791	-139	0	0	0
	Epping Road	Southbound	Left	0	17	17	0	1	1
	Whiteside	Northbound	Left	0	68	68	0	0	0

Table 6: PM Model Results - Paramics

Intersection	Approach	Direction	Movement	Base Model turn Count (hr)	Development Model Turn Count (hr)	Difference	Base turn delay (s)	Development turn delay (s)	Difference
Lane Cove Road / Epping Road	Epping Road	Westbound	Left	166	194	28	0	0	0
			Through	0	0	0	0	0	0
			Right	931	920	-11	51	50	-2
	Epping Road	Eastbound	Left	605	539	-66	16	9	-7
			Through	0	0	0	0	0	0
			Right	442	422	-20	52	52	0
	Lane Cove Road	Northbound	Left	248	296	48	0	0	0
			Through	1263	1385	122	21	17	-4
			Right	108	117	9	67	69	2
	Lane Cove Road	Southbound	Left	531	548	17	1	4	3
			Through	1846	1650	-196	19	21	3
			Right	442	435	-7	69	62	-8
Epping Road / Herring Road	Epping Road	Westbound	Left	308	284	-24	0	1	1
			Through	1695	1746	51	21	21	-1
			Right	244	245	1	101	83	-18
	Epping Road	Eastbound	Left	411	428	17	0	0	0
			Through	1707	1718	11	18	17	0
			Right	75	77	2	76	88	12
	Herring Road	Northbound	Left	82	62	-20	2	0	-2
			Through	165	163	-2	64	64	1
			Right	234	241	7	63	60	-3
	Herring Road	Southbound	Left	476	511	35	6	5	-1
			Through	312	332	20	24	27	3
			Right	947	946	-1	25	24	-2
Epping Road / White Side	Epping Road	Westbound	Through	2303	2338	35	0	0	0
	Epping Road	Southbound	Left	0	68	68	0	1	1
	Whiteside	Northbound	Left	0	17	17	0	2	2

In addition, Paramics screen shots from both the “With Development” AM and PM models are provided below and indicate the level of traffic increase as a result of the development. Existing vehicles are represented as blue blocks with development traffic indicated by red blocks.

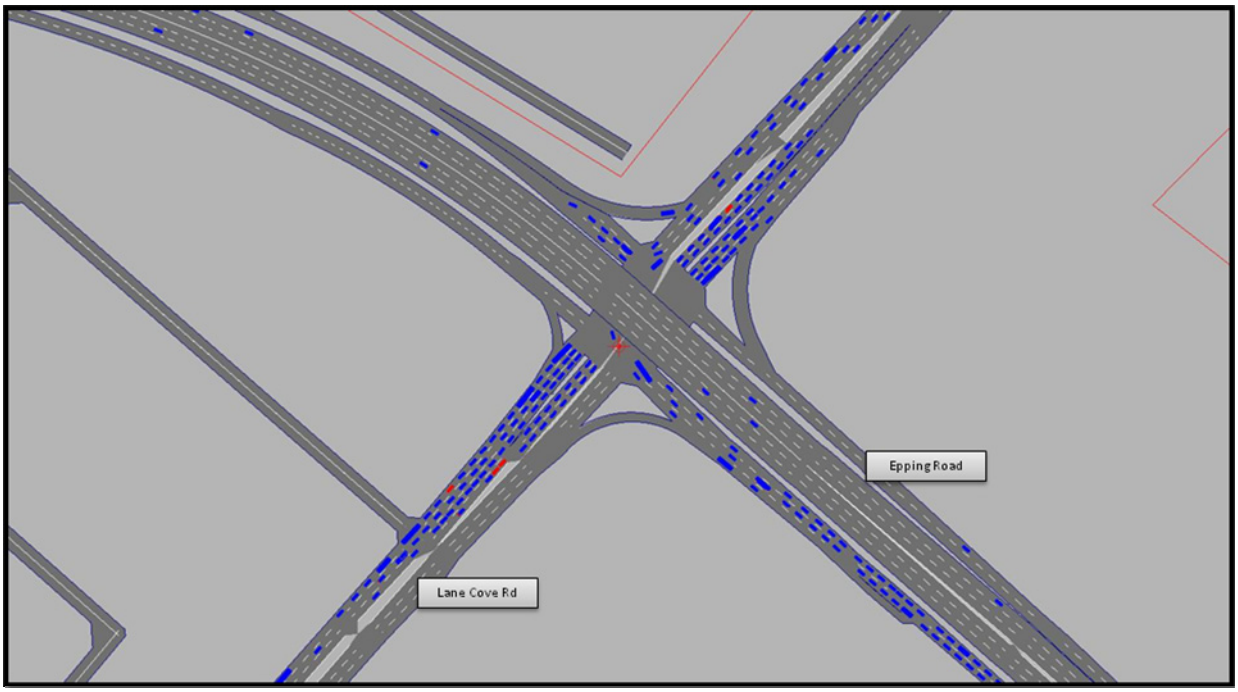

Figure 9: Lane Cove Road and Epping Road – Future AM

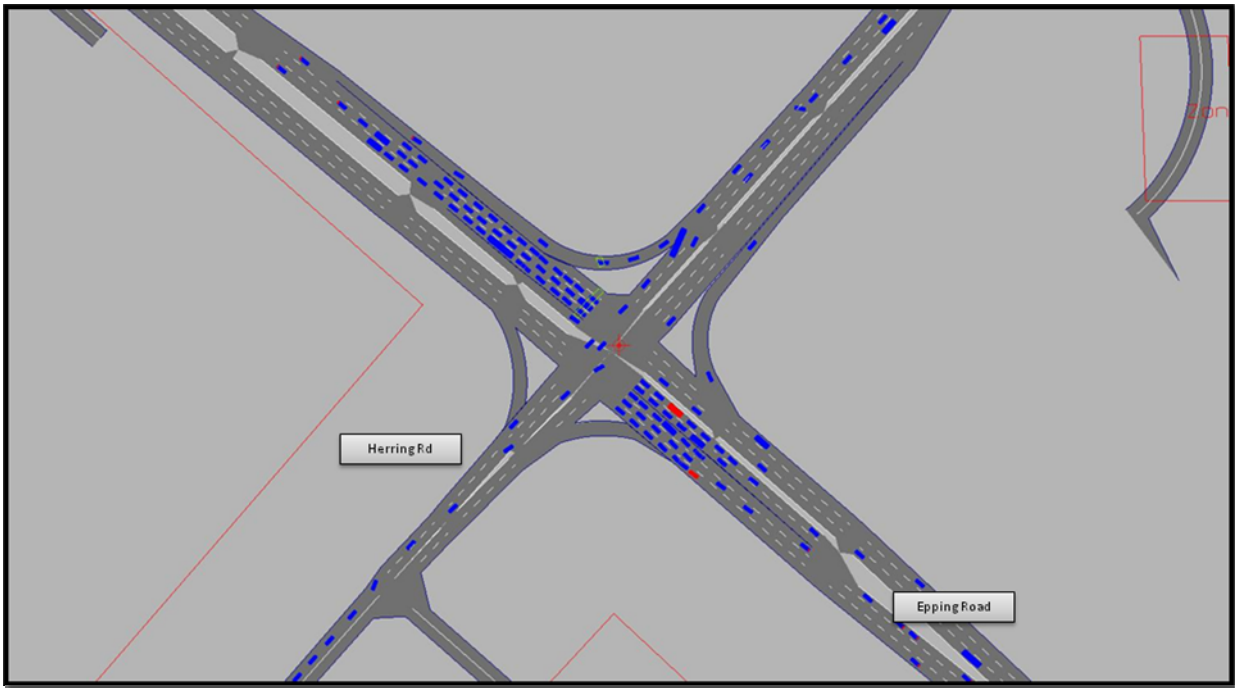

Figure 10: Herring Road and Epping Road – Future AM

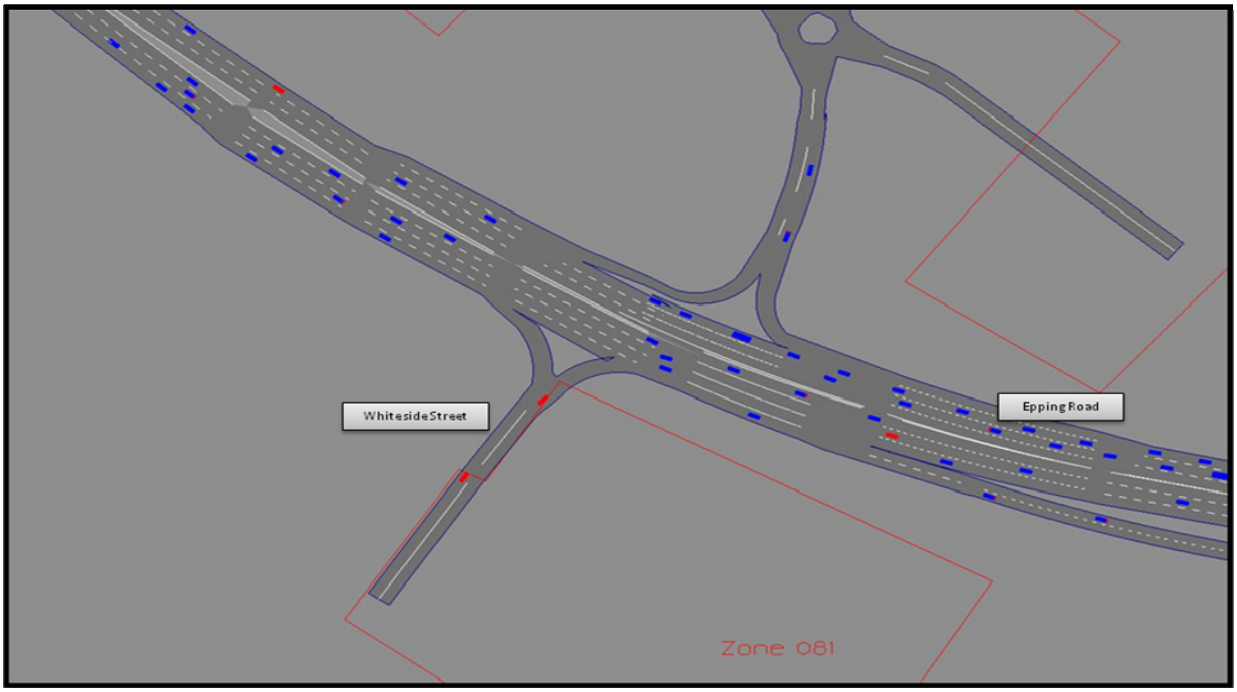

Figure 11: Whiteside Street and Epping Road – Future PM

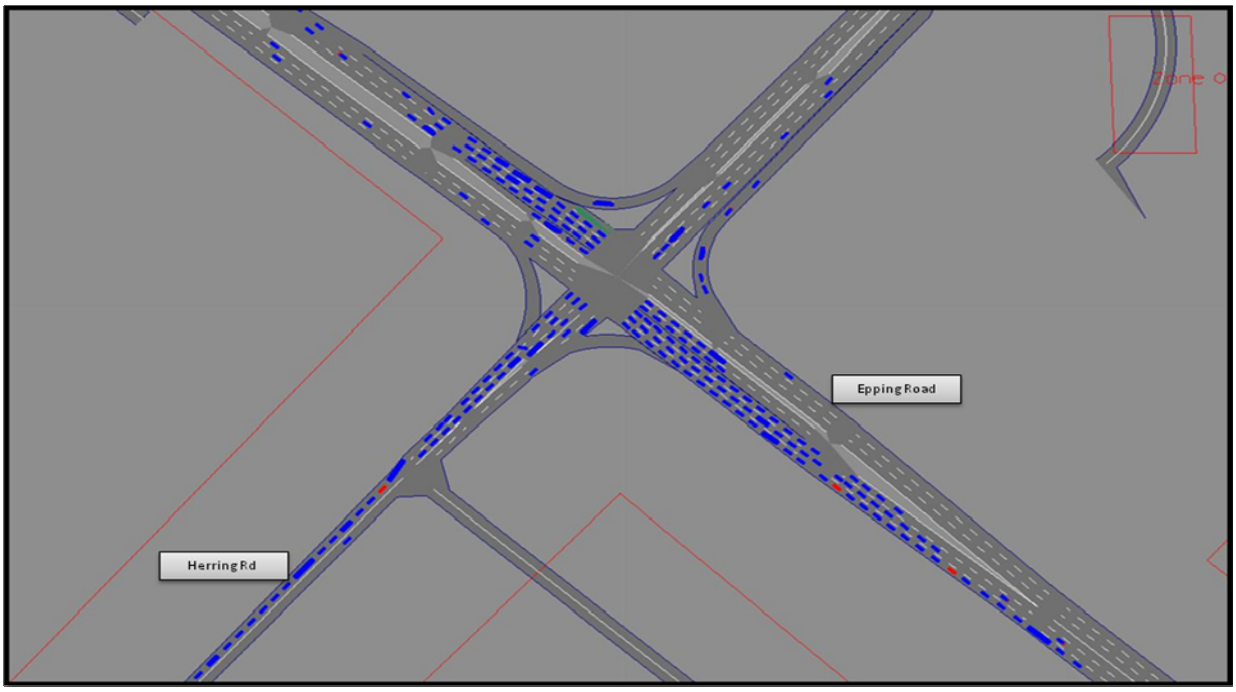

Figure 12: Herring Road and Epping Road – Future PM

The proposed site access to Epping Road results in all vehicles departing the site being required to utilise the intersection of Epping Road and Herring Road before redistributing onto the road network. The Paramics assessment indicated that all vehicles departing the site and travelling in a northbound direction will turn right from Epping Road into Herring Road and continue to either Waterloo Road or Talavera Road depending on traffic conditions. Southbound and eastbound vehicles will distribute relatively evenly between the existing roundabout controlled intersections of Herring Road with Ivanhoe Road to the north or Herring Road with Dora Street to the south and undertake 'U Turn" movements before turning east onto Epping Road to access either Lane Cove Road or the M2 Motorway. Turning movement delays at these critical intersections however remained constant based on the outputs extracted from the AM model, as summarised in Tables 5 and 6, indicating that the additional volumes associated with the development will have a minimal impact on the existing operation. This is expected due to the moderate generation of the site when compared to the existing and future traffic flows at key intersections.

During the critical PM peak period all vehicles will access the site via the proposed Epping Road access with no access provided via any other route. As such the additional traffic resulting from the development will have a negligible impact on the existing road network or critical intersection operations which will continue to operate as currently occurs.

Accordingly based on the outputs extracted the from Paramics modelling, undertaken in accordance with Council's requirements, the development will have a negligible impact on the operation of critical intersections within the local road network during either the AM or PM peak period.

Nevertheless, as required by the City of Ryde Paramics Reference Document, any intersection where development traffic approaching the intersection is greater than 5% of the existing approach requires further SIDRA analysis. Although this scenario did not occur, key intersections were subsequently modelled using SIDRA utilising the turning movements from the Paramics models. A summary of the future performance at key intersections is included in **Table 7** below

Table 7: Future Intersection Operation - Sidra

Intersection Description	Period	Control Type	Degree of Saturation	Intersection Delay	Level of Service
Whiteside Street & Epping Rd	AM	Priority	0.49	15.4	B
	PM		0.49	15.2	B
Epping Road & Herring Road	AM	Signal	1.00	46.6	D
	PM		1.46	60.6	E
Epping Road & LCR	AM	Signal	1.10	91.4	F
	PM		0.92	60.7	E
Trevitt Road & Lane Cove Rd	AM	Priority	Existing Conditions Maintained		
	PM				
Paul Street & Lane Cove Rd	AM	Priority	Existing Conditions Maintained		
	PM				
Napier Crescent & LCR	AM	Priority	Existing Conditions Maintained		
	PM				

It is evident from Table 7 that the proposed development will have a negligible impact on the existing operation of critical intersections which will continue to operate with similar delays and LoS to that currently recorded. It is also noted that as access is only proposed via Epping Road, the development will have no impact on the existing operation of the intersections of:

- Trevitt Street with Lane Cove Road.
- Whiteside Street and Epping Road,
- Napier Street with Lane Cove Road, and
- Paul Street with .either Epping Road or Lane Cove Road.

Accordingly, based on the analysis outlined above which has been undertaken in accordance with the Director General's requirements, Ryde Council and the RTA, the generation of the development is considered supportable on traffic planning grounds.

5.10.5 Residential Amenity

The development access is to Epping Road only and accordingly the existing residential amenity within the local road network will be maintained at all times.

It is noted however that through consultation with residents, “Rat Running” through local roads to the south of the development occurs and results in significant delays at key intersections. It is believed from inspection that the existing AADT volumes on residential streets surrounding the development would most likely exceed thresholds set by the RTA. Although the proposed development will have no impact on the future operation of the local road network, it is recommended that a Local Area Traffic Management (LATM) assessment be undertaken by Council to identify measures to improve existing conditions.

5.11 Access

In accordance with the RTA’s requirements no vehicular access is proposed across the northern boundary of the site. The site access is proposed via an internal road that connects to Whiteside Street to the immediate south of the existing cul-de-sac. It has a minimum width of 6 metres with local widening and channelisation on approach to Whiteside Street, where it forms a ‘T’ junction with Whiteside Street and allows left-in/right-out movements only and southbound through movements along Whiteside Street only. The form of this ‘intersection’ is a matter for Council during the assessment process. It is considered however that the current design with only left-in/right-out movements being permitted to/from the subject site, as well as southbound through movements along Whiteside Street is the optimal arrangement.

Whiteside Street is proposed to operate as a two-way street north of its intersection with the internal road and as a one-way southbound street south of this intersection. All southbound movements to Whiteside Street via Epping Road will be permitted as currently occurs, however it is proposed that only residents within the site will be permitted to travel north along Whiteside Street exiting onto Epping Road;

The restriction of exit movements from the site to Epping Road will be achieved by channelisation of vehicles into a position which makes let turn movements not possible and will be coupled with a No Left Turn restriction. The one-way southbound section will ensure no vehicles are able to gain

access to the proposed exit to Epping Road whilst still facilitating all existing southbound movements to local traffic.

The design of the access has been influenced through consultation with residents concerned with the potential impacts of additional traffic within the local road network. The proposed access design will ensure that access to/from the site will only be available via Epping Road with no access provided to Lane Cove Road through the local road network. Accordingly the generation associated with the proposed development will have no impact on the existing local road network.

The internal road provides a direct connection into the basement car parks via spate entry and exit driveways. To the immediate east of the basement access, the road is designed with a narrow alignment, with extensive landscaping and limited on-street parking. The internal roadway will allow access by service vehicles and residents of buildings C & D (8 spaces) and is treated with traffic calming measures to support low speeds. These measures include use of paving, a curvilinear alignment, extensive landscaping and a 10 km/h speed zoning. It would also be possible to construct raised thresholds at crossing points and this can be considered further at Project Application stage. The narrow width is considered acceptable due to the low traffic generation of vehicles continuing past the proposed car park access locations (approximately 2 vehicles per hour during peak periods with reduced generation at all other times). The internal roadway also proposes passing bays and a turning bay to allow for entry and exit from the site at all times.

5.12 Internal Design Aspects

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 provided in Appendix B. In particular the following aspects considered noteworthy:

- All parking modules are generally designed with a minimum width of 2.4 metre wide bays and 5.8 metre wide aisles which complies with the requirements of AS2890.1 for Class 1 parking.
- All parking spaces located adjacent to obstructions have been provided with an additional 300mm clearance.
- Disabled parking spaces are located within close proximity to lifts and designed in accordance with the requirements of AS2890.6 (Off Street Parking for People with Disabilities).

- Access to the basement car park is proposed via separate entry and exit driveways located on the western boundary of Building A and Building B respectively. The access has been located such that the majority of all vehicular traffic enters the basement without needing to traverse internal roadway. This reduced potential conflicts with pedestrians and is considered best practice.

In addition to this, the following aspects will need to be confirmed at future Project Application stage/s:

- All ramp gradients and transitions comply with AS2890.1.
- All sloping floors within parking aisles have gradients which do not exceed the requirements specified in AS2890.1.
- All visitor parking is consolidated into one area, and
- Service vehicle requirements will need to be confirmed and detailed swept path analysis undertaken.

Having regard for the internal design aspects embodied in the Concept Plan, the proposal is considered acceptable and will operate satisfactorily and is supportable on traffic planning grounds. It is emphasised that a more detail assessment will be required at the Project Application Stage.

5.13 Construction Traffic Management

It is anticipated that a detailed construction traffic management plan (CTMP) will be prepared in response to a condition of consent associated with subsequent Project Application/s, when more detailed information will be available and a builder is appointed. Nevertheless, some construction principles have been developed and will guide this ongoing process through the Project Application stage/s. Specifically, it is anticipated that truck access will be available only via Epping Road and Whiteside Street so that the proposed exit onto Epping Road, as agreed by the RTA, will need to be constructed early. No restrictions on the use of rigid or articulated trucks are considered necessary with the proposed reliance on Epping Road.

It is recommended that all construction employee parking demands be contained within the site as far as practicable. Investigations will be undertaken as to the staging of the construction activities and these will take into account the need to provide adequate parking for employee prior to the

completion of the basement car park. The use of basement car parks will be available following their completion. The CTMP will address all relevant matters in detail and will include the following:

- Confirmation of timing of construction stages, average truck levels for each stage and types of trucks to be used.
- Proposed access arrangements and access routes to be relied upon.
- Number of workers to be deployed during each stage.
- Pedestrian management practices along frontage roads.
- Locations of Work Zones if required.
- Internal management arrangements including staff parking.
- Preparation of Traffic Control Plans as appropriate.
- Outline of site induction procedures and management practices; and
- Nomination of a contact for any resident complaints and procedures for resolution of issues.

6. Response to DGR's

The matters discussed below are in direct response to the specific requests for information outlined in the Director Generals Requirements (DGR's) relating to the transport and accessibility impacts of the proposed development. The numbering below reflects the order in which the specific matters are raised in the DGR's:

(Item 6) Provide a Transport Management and Accessibility Plan (TMAP) prepared with reference to the Metropolitan Transport Plan – Connecting the City of Cities, the NSW State Plan 2010, NSW Planning Guidelines for Walking and Cycling, the Integrating Land Use and Transport Policy package and the RTA's Guide to Traffic Generating Developments, including consideration of (refer to the specific matters outlined below):

This TMAP report has been produced with the above documents taken into full account as discussed. It is noted however that for an exclusively residential development generating moderate traffic impacts, the potential for limiting private car use is not as high as can occur with work travel plans, where more policy options are generally available.

The potential impacts on the local road network and, in particular, the intersections identified in the RTA response dated 9th December 2010. Consideration should also be given to the use of Ryde Council's Macquarie Park 2007 Base Paramics Model where appropriate.

The analysis undertaken in this report is based on the Ryde Council Paramics Model and is therefore far more extensive in its ambit than the level of investigation that was contemplated by the RTA. However it is noted that Paramics model provided by Council is questionable and some of the results obtained suggest operational errors in the modelling. In particular large variations in turning movements at intersections not impacted by the development were recorded in addition significant reduction in delays as a result of minor variations in traffic flows. This has been discussed at length with Council. Notwithstanding this, the turning counts at key intersections were extracted and verified and assessed using SIDRA which confirmed no change in existing operation of key intersections resulting from the future development.

An assessment of the access restrictions detailed in the RTA response dated 15th December 2010 in relation to adjacent road reservations and their impact on the proposed development.

This has been addressed in Section 5.11 of this report. All ingress by vehicular traffic is proposed via the existing intersection of Whiteside Street and Epping Road. All egress is proposed via a new public roadway to Epping Road which will form part of Whiteside Street. This was given in principle approval by the RTA.

An estimate of the trips generated by the proposed development, including an assessment of existing and proposed public transport, pedestrian and cycle movements within the vicinity of the site and any measures to address increased demand on existing public transport, walking or cycle infrastructure.

The impacts of the development have been addressed in detail in Section 5 of this report. The development will generate a maximum net increase of only 85 veh/hr during the AM and PM peak periods which equates to between 1-2 additional movements per minute. All trips will occur via Epping Road which is to have a new exit connection as agreed with the RTA. The development, with an assumed 650 residents, will generate only moderate increases in demand for public transport and these will focus on the journey to work, with reliance made on bus and rail services as outlined. Improved footpath connections are provided to assist access to these services (and walking generally) and in addition, a new bus stop is able to be accommodated immediately adjacent to the site. Bicycle provision is made in accordance with Council's requirements with an internal road system that facilitates cycling, with a low speed environment.

Identification of measures to manage travel demand and increase the use of public and non-car travel modes and the potential for improving accessibility to local services and facilities and local connections.

The development proposes to accept a condition at Project Application stage to require the preparation of a Travel Plan to promote alternate travel modes. This will include the provision of bicycle facilities, opportunities for car sharing, and the promotion of taxis, buses and train services. The provision of parking at a level slightly below Council's minimum requirement is also expected to reduce private car usage.

Appropriate on-site parking provision having regard to Council and RTA guidelines and the availability of public transport (Note: The Department supports reduced car parking in areas well served by public transport.

This has also been addressed in Section 6 of this report. In summary the parking provision proposed is less than that required by Council's DCP 2010 which will encourage the use of alternative transport modes and will result in reduced car dependency which is consistent with the objectives of both the Macquarie Park Corridor and State Government policy more generally. The provision of further reduced parking supply is not supported on the basis of the potential adverse impacts that on street parking could have on the amenity of existing residents in the locality. The RTA's Guideline would require less parking however this would only be applicable within a sub-regional centre and the subject site is not as well served by public transport as occurs within sub-regional centres.

7. Conclusions

In summary:

- The proposed use of the site as a high density residential development is a low traffic-generating use and the assessment undertaken has demonstrated that it is supportable on traffic/transport planning grounds.

- The traffic impacts associated with the development have been undertaken as a worst case assessment with adopted generation rates that are higher than those recommended by the RTA for high density residential uses. Nevertheless the generation of 85 vehicles per hour (combined in both directions) has a minimal impact on the operation of key intersections in the vicinity, with all trips to occur via Epping Road, as agreed in principle with the RTA and with no reliance on the local road network to the south of the site.

- An assessment has been undertaken using the Macquarie Park Paramics Model in accordance with the requirements set out in the appropriate Ryde Council reference documentation. The result of the modelling indicates that the queues and average delays at key intersections as a result of the development would remain generally at existing levels and major intersections would continue to operate as presently occurs.

- The access has been designed such that development traffic will only be permitted access to the site via Epping Road with no access provided to the local road network. The existing access from Epping Road to Whiteside Street will however be maintained for the use of local traffic.

- Parking for the proposed development is generally in accordance with Council's DCP, with a slight reduction sought in recognition of the Director General's Requirements. The parking provision proposed is nevertheless slightly below the minimum permissible under Council's DCP and will assist in reducing car dependency, while providing sufficient parking to ensure that on-street parking demands are discouraged, thereby protecting the amenity of existing residents in the locality. It is also suggested that the existing Residential Parking Scheme enforced in the locality not be extended to residents of the development which will assist in reducing car ownership levels and ensure no parking by residents occurs within the local road network.

- The proposed access driveways and internal design aspects are appropriate and will operate satisfactorily. A swept path assessment has been undertaken as permissible under AS2890.1 and AS2890.2 and this confirms that generally, movements can occur safely and efficiently. Local

widening of the internal roadway will be required to ensure sufficient access for vehicles larger than an MRV if required. Nevertheless, this will be reconfirmed at Project Application stage/s; and

- The DGR's have been considered and addressed within this TMAP report.

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 east along Epping Road at existing entry to Whiteside Street.

View looking north-east along Whiteside Street adjacent to the site.

View looking west along Epping Road adjacent to Whiteside Street.

View looking south-east along Whiteside Street showing the location of the proposed main access roadway.

View looking north-east across Parklands Road towards Whiteside Street.

View looking east along Parklands Road at Whiteside Street.

Appendix B

Reduced Plans

PRELIMINARY

Nominated Architects Adam Haddow 7188 John Pradel 7004

Rev.	Date	Revision	By	Chk.
00	10.05.11	Preliminary Consultant Issue	ML	AH
01	17.05.11	Consultant Issue	ML	AH

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Civil Engineering
WorleyParsons consulting practices
Level 12, 141 Walker Street
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Client
On behalf of
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Level 14, 345 George Street,
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+612 9220 7000

Project
Whiteside Street,
North Ryde
EGC Custodian Services

Drawing Name
Plan
Concept Plan

Date	Scale	Sheet Size
17.05.2011	1:400	@ A1
Reg No.	Drawn	Chk.
	ML	AH
Job No.	Drawing No.	Revision
4694	DA-04	01

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2010 Australia
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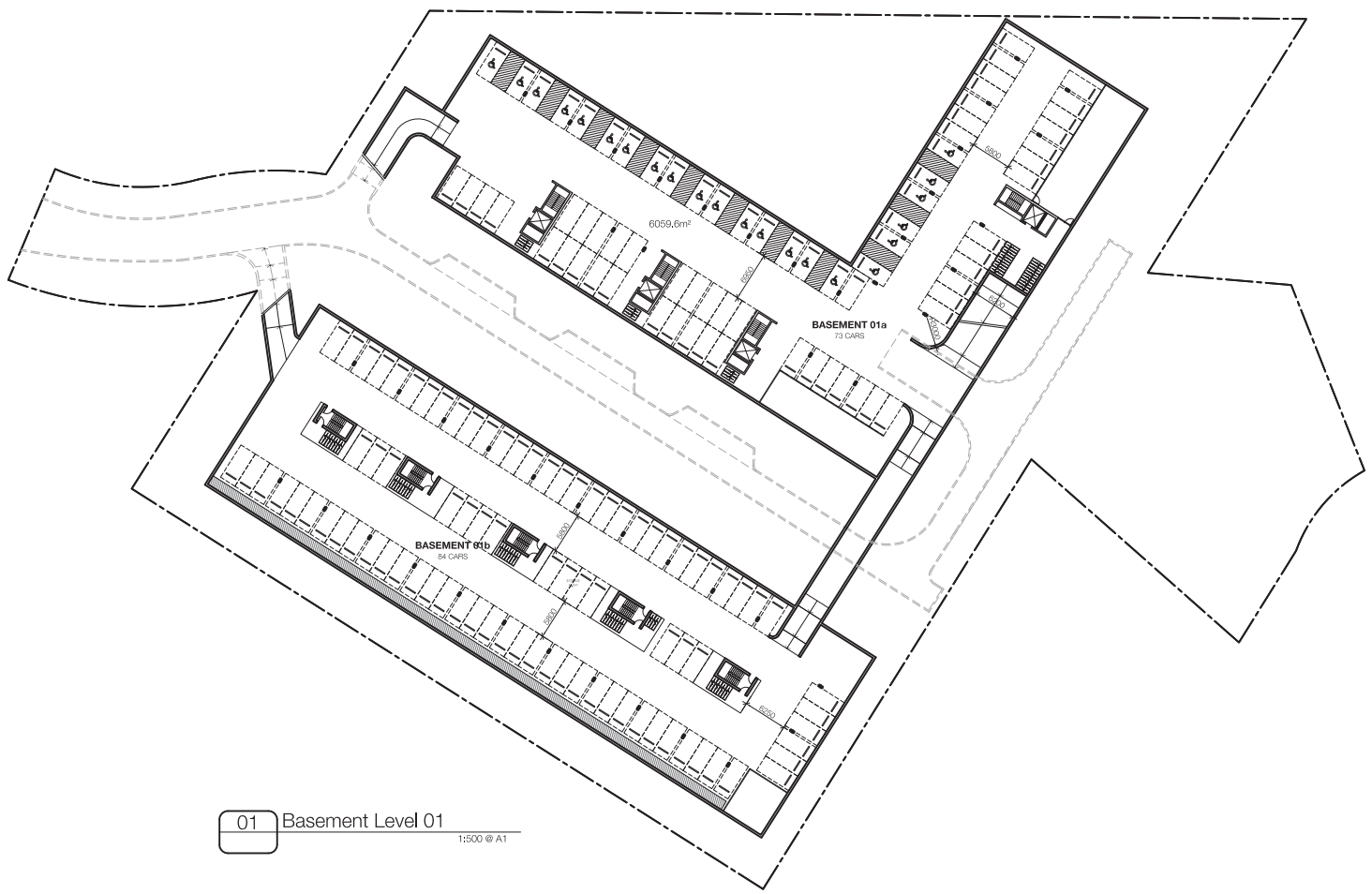

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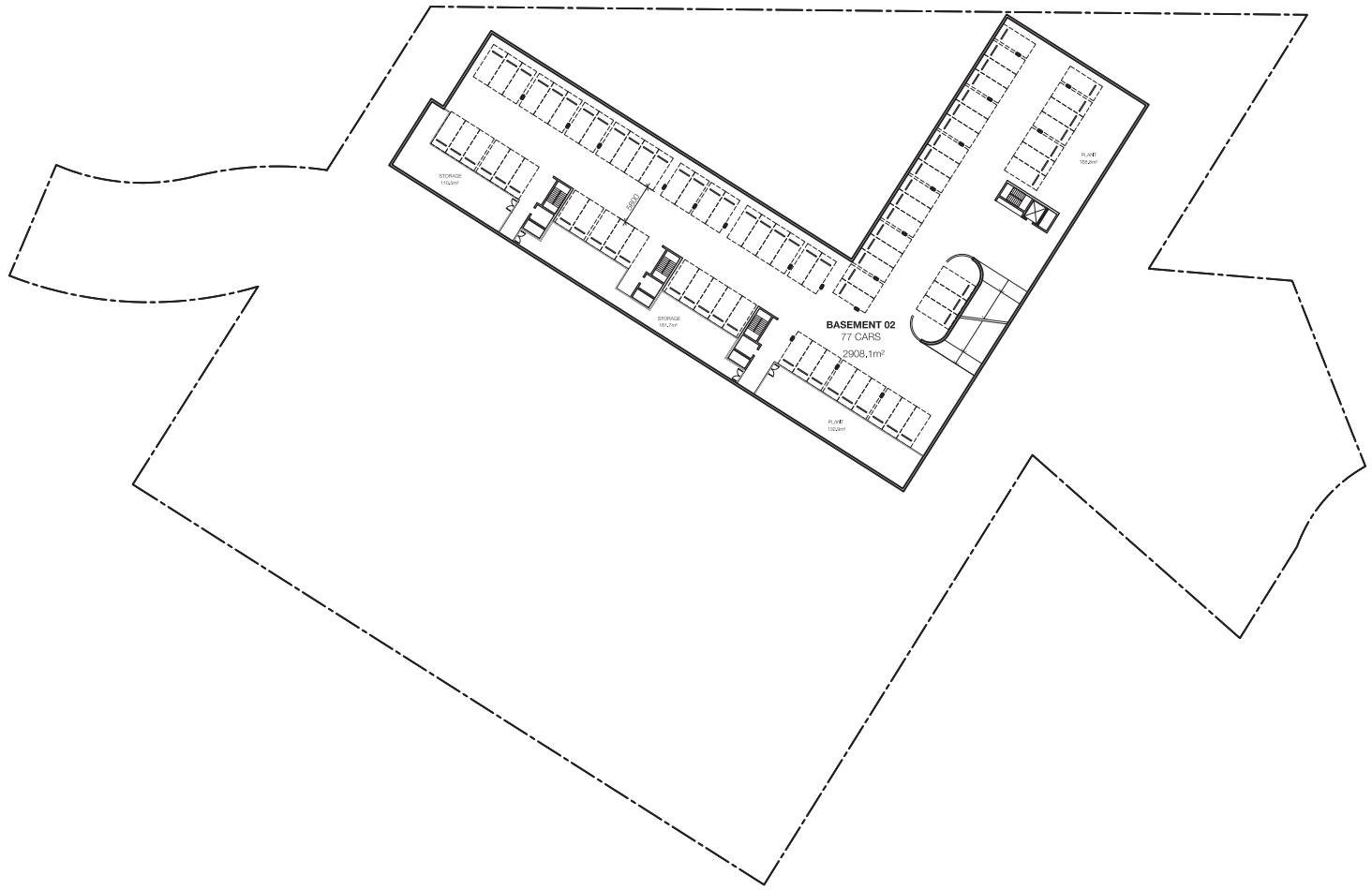

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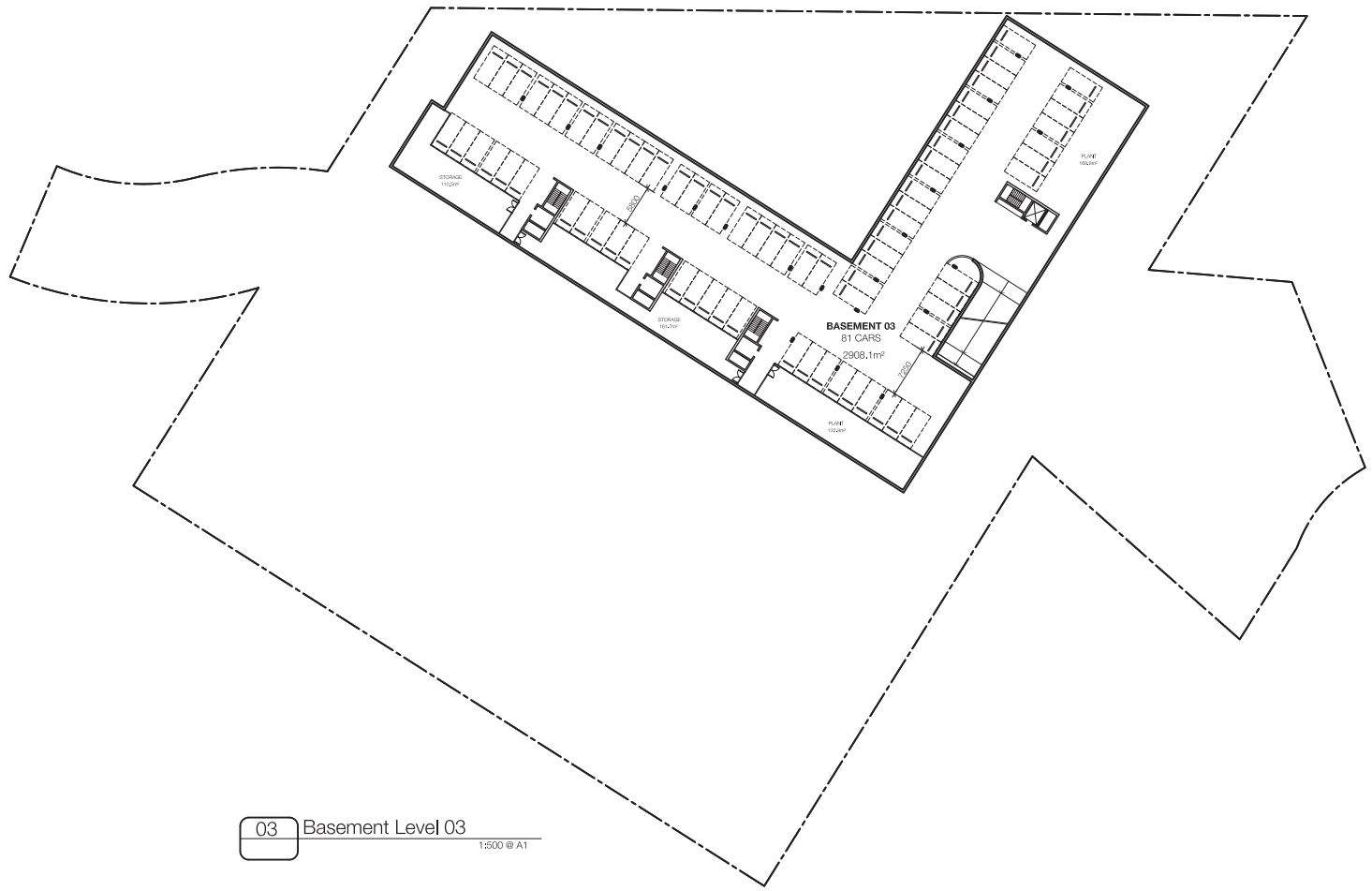

03 Basement Level 03
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PRELIMINARY

Nominated Architects Adam Haddow 7188 John Pradel 7004

Rev.	Date	Revision	By	Chk.
00	03.05.11	Preliminary Consultant Issue	ML	AH
01	17.05.11	Consultant Issue	ML	AH

Consultant
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Level 12, 141 Walker Street
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urbis
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Consultant
Landscape design
ASPECT Studios
Studio 61, Level 6, 61 Marlborough Street
Surry Hills, Sydney
+612 9699 7182

Client
On behalf of
EGC Custodian Services
Level 14, 345 George Street,
Sydney
+612 9220 7000

Project
Whiteside Street,
North Ryde
EGC Custodian Services

Drawing Name
Plan
Basement Levels

Date	Scale	Sheet Size
17.05.2011	1:500	@ A1
Reg No.	Drawn	Chk.
	ML	AH
Job No.	Drawing No.	Revision
4694	DA-10	01

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Surry Hills NSW
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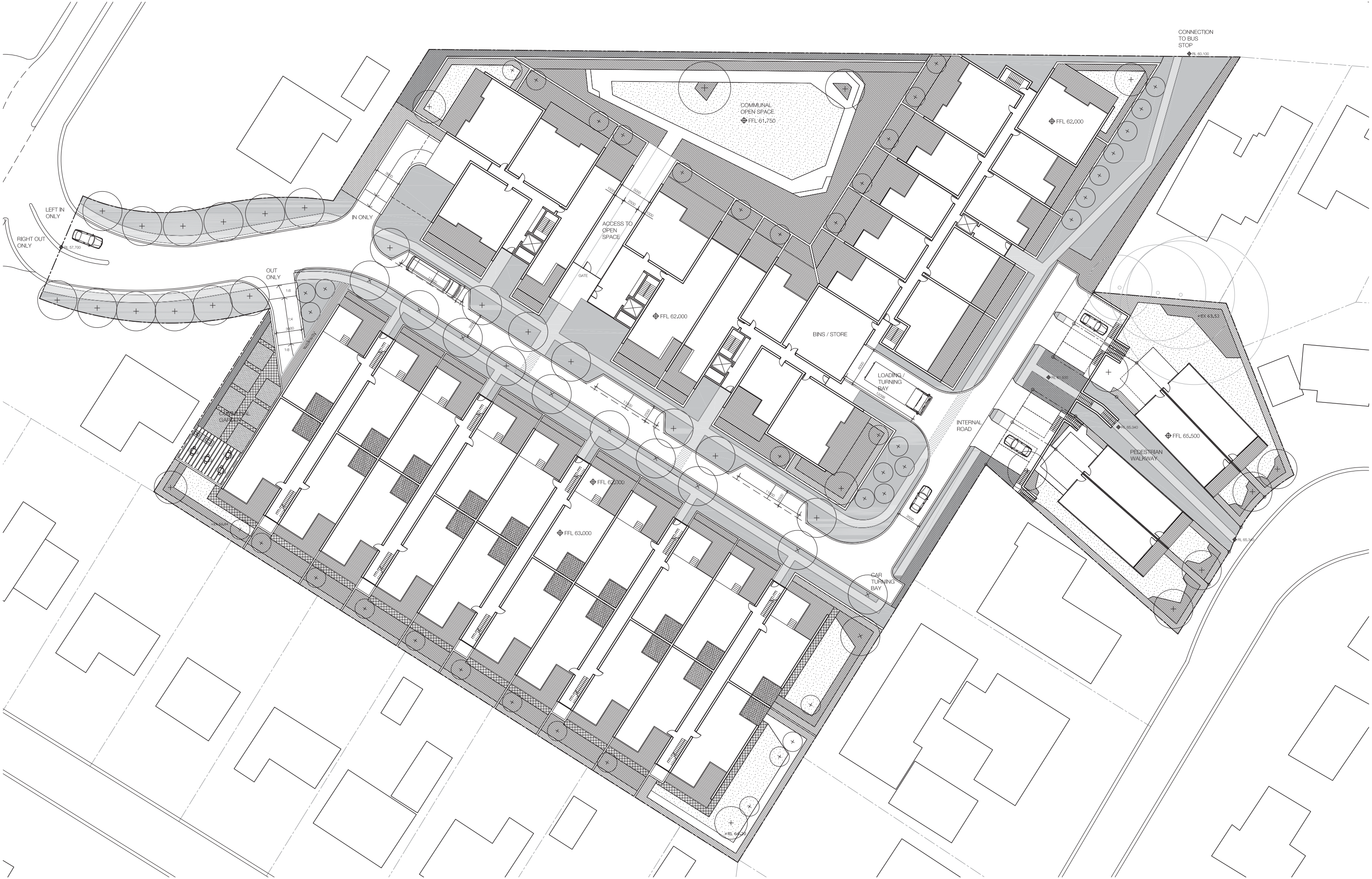

FOR APPROVAL

Nominated Architects Adam Haddow 7188 John Pradel 7004

Rev.	Date	Revision	By	Chk.
00	10.05.11	Preliminary Consultant Issue	ML	AH
01	17.05.11	Consultant Issue	ML	AH
02	27.05.11	Issue for EA	ML	AH

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Client
On behalf of
EGC Custodian Services
Level 14, 345 George Street,
Sydney
+612 9220 7000

Project
Whiteside Street,
North Ryde
EGC Custodian Services

Drawing Name
Plan
Ground Floor

Date	Scale	Sheet Size
27.05.2011	1:250	@ A1
Reg No.	Drawn	Chk.
	ML	AH
Job No.	Drawing No.	Revision
4694	DA-11	02

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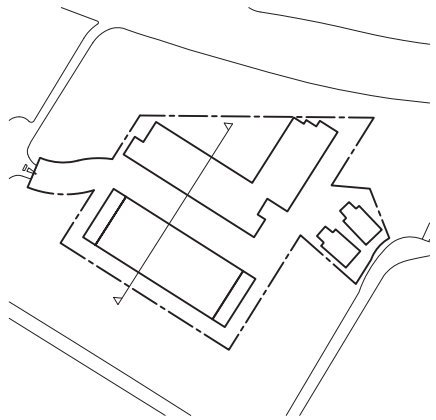

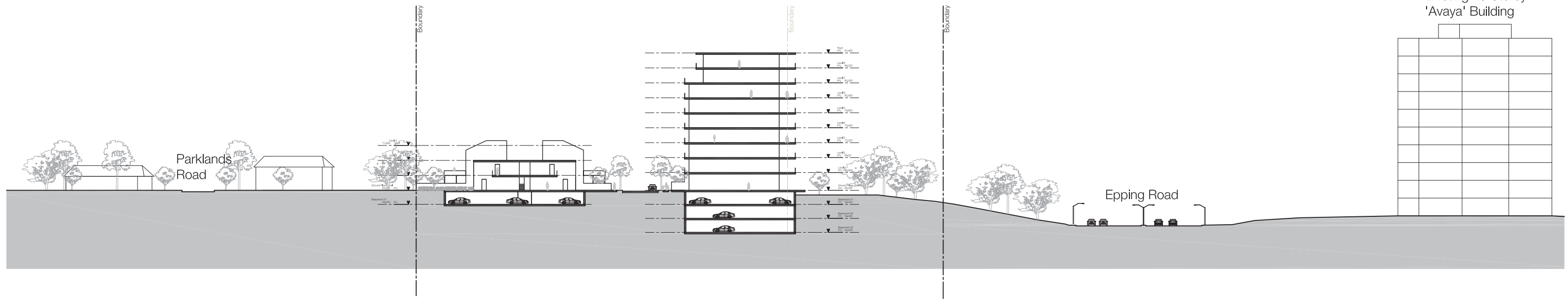

PRELIMINARY

Nominated Architects Adam Haddow 7188 John Pradel 7004

Rev.	Date	Revision	By	Chk.
00	03.05.11	Preliminary Consultant Issue	ML	AH
01	17.05.11	Consultant Issue	ML	AH

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Client
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+612 9220 7000

Project
Whiteside Street,
North Ryde
EGC Custodian Services

Drawing Name
Section
A

Date	Scale	Sheet Size
17.05.2011	1:250	@ A1
Reg No.	Drawn	Chk.
	ML	AH
Job No.	Drawing No.	Revision
4694	**DA-20**	01

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Appendix C

Sidra Outputs

Appendix C-1

Existing Conditions

MOVEMENT SUMMARY

Site: Epping Rd & Herring Rd EX - AM

Eppinhg Rd & Herring Rd
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 East: Epping Road (east)											
21	L	73	4.0	0.667	45.3	LOS D	29.5	185.0	0.87	0.90	27.8
22	T	1720	4.0	0.667	37.5	LOS C	37.7	236.7	0.87	0.78	28.3
23	R	396	4.0	0.843	84.1	LOS F	16.8	105.5	1.00	0.93	18.2
Approach		2188	4.0	0.843	46.2	LOS D	37.7	236.7	0.90	0.81	25.7
North East: Herring Road (north)											
24	L	499	4.0	0.611	31.1	LOS C	24.6	154.4	0.76	0.82	32.6
25	T	36	4.0	0.202	69.1	LOS E	7.8	49.2	0.96	0.71	20.1
26	R	172	4.0	0.509	79.7	LOS F	7.8	49.2	1.00	0.78	19.0
Approach		706	4.0	0.611	44.9	LOS D	24.6	154.4	0.83	0.81	27.0
North West: Epping Road (west)											
27	L	941	4.0	0.529	7.8	NA[9]	NA[9]	NA[9]	0.00	0.60	49.7
28	T	2077	4.0	0.895	46.2	LOS D	48.8	306.7	0.96	0.94	25.4
29	R	32	4.0	0.121	68.2	LOS E	2.8	17.7	0.86	0.73	21.0
Approach		3049	4.0	0.895	34.6	LOS C	48.8	306.7	0.66	0.83	29.9
South West: Herring Road (south)											
30	L	14	4.0	0.698	95.7	LOS F	26.4	165.9	0.98	0.88	17.1
31	T	490	4.0	0.693	83.0	LOS F	26.4	165.9	0.97	0.85	17.7
32	R	171	4.0	1.000[3]	66.9	LOS E	12.5	78.5	0.98	0.81	21.3
Approach		675	4.0	1.000	74.5	LOS F	26.4	165.9	0.98	0.62	18.8
All Vehicles		6619	4.0	1.000	44.1	LOS D	48.8	306.7	0.79	0.80	26.8

Level of Service (Aver. Int. Delay): LOS D. 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
9 Continuous movement

MOVEMENT SUMMARY

Site: Epping Rd & Herring Rd EX - PM

Eppinhg Rd & Herring Rd
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 East: Epping Road (east)											
21	L	372	4.0	0.904	63.9	LOS E	45.7	287.1	1.00	1.03	22.2
22	T	1771	4.0	0.905	57.4	LOS E	57.9	363.6	1.00	0.99	22.3
23	R	217	4.0	1.452	506.8	LOS F	23.4	147.2	1.00	1.55	4.0
Approach		2359	4.0	1.452	99.8	LOS F	57.9	363.6	1.00	1.05	15.7
North East: Herring Road (north)											
24	L	519	4.0	0.514	20.6	LOS B	20.8	130.9	0.61	0.78	38.5
25	T	351	4.0	0.512	40.0	LOS C	33.7	211.5	0.84	0.73	27.5
26	R	976	4.0	0.786	53.7	LOS D	33.7	211.5	0.94	0.88	24.4
Approach		1845	4.0	0.786	41.8	LOS C	33.7	211.5	0.83	0.82	27.9
North West: Epping Road (west)											
27	L	421	4.0	0.237	7.7	NA[9]	NA[9]	NA[9]	0.00	0.60	49.8
28	T	1696	4.0	0.779	28.4	LOS B	31.0	195.0	0.81	0.72	32.3
29	R	69	4.0	0.837	93.5	LOS F	7.2	45.1	1.00	0.86	16.9
Approach		2186	4.0	0.837	26.5	LOS B	31.0	195.0	0.66	0.70	33.6
South West: Herring Road (south)											
30	L	75	4.0	0.885	90.2	LOS F	15.9	100.1	1.00	1.09	17.7
31	T	291	4.0	0.884	82.1	LOS F	15.9	100.1	1.00	1.01	17.6
32	R	123	4.0	1.000[3]	80.3	LOS F	10.8	67.7	1.00	0.79	18.9
Approach		488	4.0	1.000	82.9	LOS F	15.9	100.1	1.00	0.97	17.9
All Vehicles		6879	4.0	1.452	59.7	LOS E	57.9	363.6	0.85	0.87	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.

3 x = 1.00 due to short lane
9 Continuous movement

MOVEMENT SUMMARY

Site: EX-AM

Lane Cove Road & Epping Road
EX AM
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	71	3.0	1.067	124.7	LOS F	77.7	551.1	1.00	1.26	15.1
2	T	2368	3.0	1.062	132.9	LOS F	96.8	694.9	1.00	1.37	13.6
3	R	451	3.0	0.978	115.3	LOS F	22.0	158.2	1.00	1.10	15.9
Approach		2889	3.0	1.062	130.0	LOS F	96.8	694.9	1.00	1.32	14.0
East: Epping Rd (east)											
4	L	135	3.0	0.074	9.5	NA[9]	NA[9]	NA[9]	NA[9]	0.65	54.6
5	T	1	3.0	1.039	173.0	LOS F	30.4	218.5	1.00	1.29	10.9
6	R	662	3.0	1.083	156.4	LOS F	30.4	218.5	1.00	1.17	12.5
Approach		798	3.0	1.083	131.6	LOS F	30.4	218.5	0.83	1.08	14.3
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	1491	3.0	0.649	38.7	LOS C	29.5	211.6	0.87	0.78	30.8
9	R	226	3.0	0.491	76.2	LOS F	9.6	68.7	0.98	0.79	21.5
Approach		2214	3.0	0.649	36.0	LOS C	29.5	211.6	0.69	0.75	32.5
West: Epping Rd (west)											
10	L	333	3.0	0.416	38.2	LOS C	17.2	123.2	0.74	0.80	32.6
11	T	1	3.0	0.274	53.0	LOS D	8.1	58.5	0.88	0.71	24.9
12	R	171	3.0	0.273	61.7	LOS E	8.1	58.5	0.87	0.77	24.8
Approach		504	3.0	0.416	46.2	LOS D	17.2	123.2	0.78	0.79	29.4
All Vehicles		6405	3.0	1.083	91.1	LOS F	96.8	694.9	0.85	1.05	18.4

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	69.1	LOS F	0.2	0.2	0.96	0.96
P3	Across E approach	53	49.6	LOS E	0.2	0.2	0.81	0.81
P7	Across W approach	53	45.6	LOS E	0.2	0.2	0.78	0.78
All Pedestrians		159	54.8				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 F. LOS Method for individual pedestrian movements: Delay (HCM).

MOVEMENT SUMMARY

Site: EX-PM

Lane Cove Road & Epping Road
EX PM

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	399	3.0	0.313	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		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]	NA[9]	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	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: EX-AM

Lane Cove Rd & Napier Cres
EX-AM
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: Lane Cove Rd (south)											
1	L	12	0.0	0.103	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
2	T	2211	0.0	0.518	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2222	0.0	0.518	0.0	LOS A	0.0	0.0	0.00	0.01	59.9
North: Lane Cove Rd (north)											
8	T	2105	0.0	0.337	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2105	0.0	0.337	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
West: Napier Cres											
10	L	116	0.0	0.871	108.2	LOS F	6.7	46.8	0.99	1.33	15.1
Approach		116	0.0	0.872	108.2	LOS F	6.7	46.8	0.99	1.33	15.1
All Vehicles		4443	0.0	0.872	2.8	NA	6.7	46.8	0.03	0.04	55.7

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 F. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: EX-PM

Lane Cove Rd & Napier Cres
EX-PM
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: Lane Cove Rd (south)											
1	L	19	0.0	0.115	8.2	LOS A	0.0	0.0	0.00	1.03	49.0
2	T	2438	0.0	0.573	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2457	0.0	0.573	0.1	LOS A	0.0	0.0	0.00	0.01	59.9
North: Lane Cove Rd (north)											
8	T	2105	0.0	0.337	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2105	0.0	0.337	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
West: Napier Cres											
10	L	25	0.0	0.278	61.1	LOS E	1.2	8.4	0.96	1.01	22.4
Approach		25	0.0	0.278	61.1	LOS E	1.2	8.4	0.96	1.01	22.4
All Vehicles		4587	0.0	0.573	0.4	NA	1.2	8.4	0.01	0.01	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 E. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: EX-AM

Lane Cove Rd & Napier Cres
EX-AM
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: Lane Cove Rd (south)											
1	L	12	0.0	0.103	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
2	T	2211	0.0	0.518	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2222	0.0	0.518	0.0	LOS A	0.0	0.0	0.00	0.01	59.9
North: Lane Cove Rd (north)											
8	T	2105	0.0	0.337	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2105	0.0	0.337	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
West: Napier Cres											
10	L	107	0.0	0.807	92.5	LOS F	5.4	38.1	0.99	1.24	16.9
Approach		107	0.0	0.809	92.5	LOS F	5.4	38.1	0.99	1.24	16.9
All Vehicles		4435	0.0	0.809	2.3	NA	5.4	38.1	0.02	0.03	56.5

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 F. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: EX-PM

Lane Cove Rd & Napier Cres
EX-PM

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: Lane Cove Rd (south)											
1	L	19	0.0	0.115	8.2	LOS A	0.0	0.0	0.00	1.03	49.0
2	T	2438	0.0	0.573	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2457	0.0	0.573	0.1	LOS A	0.0	0.0	0.00	0.01	59.9
North: Lane Cove Rd (north)											
8	T	2105	0.0	0.337	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2105	0.0	0.337	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
West: Napier Cres											
10	L	20	0.0	0.220	57.3	LOS E	0.9	6.5	0.96	1.00	23.3
Approach		20	0.0	0.220	57.3	LOS E	0.9	6.5	0.96	1.00	23.3
All Vehicles		4582	0.0	0.573	0.3	NA	0.9	6.5	0.00	0.01	59.5

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 E. 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 Rd & Napier Cres
EX-AM
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: Lane Cove Rd (south)											
1	L	12	0.0	0.103	8.2	LOS A	0.0	0.0	0.00	1.05	49.0
2	T	2211	0.0	0.518	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2222	0.0	0.518	0.0	LOS A	0.0	0.0	0.00	0.01	59.9
North: Lane Cove Rd (north)											
8	T	2105	0.0	0.337	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2105	0.0	0.337	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
West: Napier Cres											
10	L	104	0.0	0.784	87.7	LOS F	5.1	35.6	0.98	1.22	17.5
Approach		104	0.0	0.785	87.7	LOS F	5.1	35.6	0.98	1.22	17.5
All Vehicles		4432	0.0	0.785	2.1	NA	5.1	35.6	0.02	0.03	56.7

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 F. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

SIDRA INTERSECTION

MOVEMENT SUMMARY

Site: EX-PM

Lane Cove Rd & Napier Cres
EX-PM
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: Lane Cove Rd (south)											
1	L	68	0.0	0.117	8.2	LOS A	0.0	0.0	0.00	0.91	49.0
2	T	2438	0.0	0.585	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2506	0.0	0.585	0.2	LOS A	0.0	0.0	0.00	0.02	59.6
North: Lane Cove Rd (north)											
8	T	2105	0.0	0.337	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2105	0.0	0.337	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
West: Napier Cres											
10	L	25	0.0	0.290	64.1	LOS E	1.2	8.7	0.97	1.01	21.7
Approach		25	0.0	0.290	64.1	LOS E	1.2	8.7	0.97	1.01	21.7
All Vehicles		4637	0.0	0.585	0.5	NA	1.2	8.7	0.01	0.02	59.2

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 E. LOS Method for individual vehicle movements: Delay (RTA NSW).

Approach LOS values are based on the worst delay for any vehicle movement.

SIDRA INTERSECTION

Appendix C-2

Future Scenario

MOVEMENT SUMMARY

Site: Epping Rd & Herring Rd FU - AM

Eppinhg Rd & Herring Rd
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 East: Epping Road (east)											
21	L	79	4.0	0.671	45.2	LOS D	29.6	186.0	0.87	0.90	27.8
22	T	1722	4.0	0.670	37.6	LOS C	37.9	238.2	0.87	0.78	28.3
23	R	459	4.0	0.978	115.2	LOS F	22.7	142.8	1.00	1.09	14.5
Approach		2260	4.0	0.978	53.6	LOS D	37.9	238.2	0.90	0.85	23.7
North East: Herring Road (north)											
24	L	554	4.0	0.769	32.4	LOS C	28.5	178.8	0.80	0.84	31.9
25	T	36	4.0	0.202	69.1	LOS E	3.6	22.3	0.96	0.71	20.1
26	R	172	4.0	0.509	79.7	LOS F	7.8	49.2	1.00	0.78	19.0
Approach		761	4.0	0.769	44.8	LOS D	28.5	178.8	0.85	0.82	27.0
North West: Epping Road (west)											
27	L	943	4.0	0.530	7.8	NA[9]	NA[9]	NA[9]	NA[9]	0.60	49.7
28	T	2077	4.0	0.895	46.2	LOS D	48.8	306.7	0.96	0.94	25.4
29	R	32	4.0	0.121	68.2	LOS E	2.8	17.7	0.86	0.73	21.0
Approach		3052	4.0	0.895	34.6	LOS C	48.8	306.7	0.66	0.83	29.9
South West: Herring Road (south)											
30	L	14	4.0	0.698	95.7	LOS F	26.4	165.9	0.98	0.88	17.1
31	T	490	4.0	0.693	83.0	LOS F	26.4	165.9	0.97	0.85	17.7
32	R	171	4.0	1.000[3]	66.9	LOS E	12.5	78.5	0.98	0.81	21.3
Approach		675	4.0	1.000	74.5	LOS F	26.4	165.9	0.98	0.62	18.8
All Vehicles		6747	4.0	1.000	46.6	LOS D	48.8	306.7	0.79	0.81	26.0

Level of Service (Aver. Int. Delay): LOS D. 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.
9 Continuous movement

MOVEMENT SUMMARY

Site: Epping Rd & Herring Rd FU - PM

Eppinhg Rd & Herring Rd
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 East: Epping Road (east)											
21	L	374	4.0	0.912	65.6	LOS E	46.8	294.1	1.00	1.04	21.8
22	T	1784	4.0	0.911	58.9	LOS E	59.2	371.7	1.00	1.00	22.0
23	R	219	4.0	1.466	519.4	LOS F	23.9	150.1	1.00	1.56	4.0
Approach		2377	4.0	1.466	102.4	LOS F	59.2	371.7	1.00	1.06	15.5
North East: Herring Road (north)											
24	L	534	4.0	0.527	20.8	LOS B	21.7	136.3	0.62	0.78	38.4
25	T	351	4.0	0.512	40.0	LOS C	20.8	130.5	0.84	0.73	27.5
26	R	976	4.0	0.786	53.7	LOS D	33.7	211.5	0.94	0.88	24.4
Approach		1860	4.0	0.786	41.7	LOS C	33.7	211.5	0.83	0.82	27.9
North West: Epping Road (west)											
27	L	428	4.0	0.241	7.7	NA[9]	NA[9]	NA[9]	NA[9]	0.60	49.8
28	T	1696	4.0	0.779	28.4	LOS B	31.0	195.0	0.81	0.72	32.3
29	R	69	4.0	0.837	93.5	LOS F	7.2	45.1	1.00	0.86	16.9
Approach		2194	4.0	0.837	26.4	LOS B	31.0	195.0	0.66	0.70	33.6
South West: Herring Road (south)											
30	L	75	4.0	0.885	90.2	LOS F	15.9	100.1	1.00	1.09	17.7
31	T	291	4.0	0.884	82.1	LOS F	15.9	100.1	1.00	1.01	17.6
32	R	123	4.0	1.000[3]	80.3	LOS F	10.8	67.7	1.00	0.79	18.9
Approach		488	4.0	1.000	82.9	LOS F	15.9	100.1	1.00	0.97	17.9
All Vehicles		6919	4.0	1.466	60.6	LOS E	59.2	371.7	0.85	0.88	22.1

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.
9 Continuous movement

MOVEMENT SUMMARY

Site: FU-AM

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	73	3.0	1.065	124.9	LOS F	77.6	550.1	1.00	1.25	15.1
2	T	2368	3.0	1.063	133.5	LOS F	97.1	697.0	1.00	1.37	13.6
3	R	451	3.0	1.094	154.1	LOS F	29.8	214.2	1.00	1.20	12.6
Approach		2892	3.0	1.094	136.5	LOS F	97.1	697.0	1.00	1.34	13.5
East: Epping Rd (east)											
4	L	135	3.0	0.074	9.5	NA[9]	NA[9]	NA[9]	NA[9]	0.65	54.6
5	T	8	3.0	1.035	141.3	LOS F	28.0	201.1	1.00	1.21	12.7
6	R	662	3.0	1.040	132.1	LOS F	28.0	201.1	1.00	1.11	14.3
Approach		805	3.0	1.040	111.7	LOS F	28.0	201.1	0.83	1.03	16.3
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	1491	3.0	0.649	38.7	LOS C	29.5	211.6	0.87	0.78	30.8
9	R	235	3.0	0.538	77.6	LOS F	10.0	71.6	0.99	0.80	21.2
Approach		2222	3.0	0.649	36.3	LOS C	29.5	211.6	0.69	0.75	32.4
West: Epping Rd (west)											
10	L	333	3.0	0.423	38.9	LOS C	17.4	124.6	0.75	0.80	32.3
11	T	49	3.0	0.356	54.1	LOS D	10.5	75.1	0.90	0.73	24.9
12	R	177	3.0	0.356	62.5	LOS E	10.5	75.1	0.88	0.79	24.7
Approach		559	3.0	0.423	47.7	LOS D	17.4	124.6	0.80	0.79	28.7
All Vehicles		6478	3.0	1.094	91.4	LOS F	97.1	697.0	0.86	1.05	18.4

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	69.1	LOS F	0.2	0.2	0.96	0.96
P3	Across E approach	53	49.6	LOS E	0.2	0.2	0.81	0.81
P7	Across W approach	53	45.6	LOS E	0.2	0.2	0.78	0.78
All Pedestrians		159	54.8				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 F. LOS Method for individual pedestrian movements: Delay (HCM).

MOVEMENT SUMMARY

Site: FU-PM

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	148	3.0	0.916	86.7	LOS F	41.0	294.1	1.00	1.10	19.9
2	T	1349	3.0	0.917	71.2	LOS F	42.6	306.2	1.00	1.07	21.3
3	R	234	3.0	0.927	103.9	LOS F	11.8	84.9	1.00	1.01	17.2
Approach		1732	3.0	0.927	76.9	LOS F	42.6	306.2	1.00	1.07	20.5
East: Epping Rd (east)											
4	L	399	3.0	0.313	9.6	NA[9]	NA[9]	NA[9]	NA[9]	0.65	54.5
5	T	33	3.0	0.901	84.9	LOS F	17.5	125.5	1.00	1.01	18.5
6	R	500	3.0	0.900	92.9	LOS F	17.5	125.5	1.00	1.00	18.7
Approach		932	3.0	0.900	57.0	LOS E	17.5	125.5	0.57	0.85	26.0
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	1401	3.0	0.855	55.8	LOS D	35.1	252.4	0.99	0.97	25.0
9	R	207	3.0	0.823	91.3	LOS F	10.0	71.6	1.00	0.91	18.9
Approach		2069	3.0	0.855	49.1	LOS D	35.1	252.4	0.77	0.89	27.4
West: Epping Rd (west)											
10	L	624	3.0	0.899	61.1	LOS E	40.1	287.6	0.99	1.06	24.7
11	T	15	3.0	0.513	49.8	LOS D	14.2	102.0	0.90	0.76	25.8
12	R	318	3.0	0.514	57.8	LOS E	14.2	102.0	0.88	0.81	25.8
Approach		957	3.0	0.899	59.9	LOS E	40.1	287.6	0.95	0.97	25.1
All Vehicles		5689	3.0	0.927	60.7	LOS E	42.6	306.2	0.84	0.95	24.3

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.

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	60.8	LOS F	0.2	0.2	0.90	0.90
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	55.3				0.86	0.86

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-AM

Epping Road and Whiteside Street
FU-AM
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: Whiteside Street											
1	L	72	0.0	0.178	15.4	LOS B	0.7	4.7	0.71	0.90	42.2
Approach		72	0.0	0.178	15.4	LOS B	0.7	4.7	0.71	0.90	42.2
East: Epping Road (east)											
4	L	18	0.0	0.436	10.9	LOS A	0.0	0.0	0.00	1.33	58.9
5	T	842	0.0	0.442	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		860	0.0	0.441	0.2	LOS A	0.0	0.0	0.00	0.03	79.4
West: Epping Road (west)											
11	T	2105	0.0	0.491	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2105	0.0	0.491	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
All Vehicles		3037	0.0	0.491	0.4	NA	0.7	4.7	0.02	0.03	64.3

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 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-PM

Epping Road and Whiteside Street
FU-PM
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: Whiteside Street											
1	L	18	0.0	0.047	15.2	LOS B	0.2	1.2	0.69	0.90	42.2
Approach		18	0.0	0.047	15.2	LOS B	0.2	1.2	0.69	0.90	42.2
East: Epping Road (east)											
4	L	72	0.0	0.471	10.9	LOS A	0.0	0.0	0.00	1.26	58.9
5	T	842	0.0	0.470	0.0	LOS A	0.0	0.0	0.00	0.00	80.0
Approach		914	0.0	0.470	0.9	LOS A	0.0	0.0	0.00	0.10	77.9
West: Epping Road (west)											
11	T	2105	0.0	0.491	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		2105	0.0	0.491	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
All Vehicles		3037	0.0	0.491	0.3	NA	0.2	1.2	0.00	0.03	64.7

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.

Appendix D

On-Street Parking Demand

Thursday 30 December 2010
Source: Nearmap

Thursday 16 September 2010
Source: Nearmap

Monday 16 August 2010
Source: Nearmap

Thursday 15 July 2010
Source: Nearmap

Wednesday 16 June 2010
Source: Nearmap

Tuesday 15 June 2010
Source: Nearmap

Monday 10 May 2010
Source: Nearmap

Tuesday 27 April 2010
Source: Nearmap