transport and accessibility study

concept plan application for redevelopment and expansion of royal far west at 12-22 wentworth street, 16 &19-21 south steyne, manly

prepared on behalf of Royal Far West by **TRAFFIX** traffic & transport planners
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1. introduction

TRAFFIX has been commissioned by Royal Far West to undertake a transport and accessibility report in support of a Proposed Concept Plan Application for the redevelopment and expansion of Royal Far West at 12-22 Wentworth Street, 16 & 19-21 South Steyne, Manly. The application relates to uses for health, clinical and educational purposes, including a mixed use development comprising residential flat buildings, commercial, retail and hotel/serviced apartments. The report follows upon a previous report prepared in support of the Preliminary Environmental Assessment that was prepared by Urbis Pty Ltd, which was an application made under Part 3A of the Environmental Planning and Assessment Act, 1979, following authorisation of the Concept Plan by the Minister. This report should therefore be read in conjunction with the overall Environmental Assessment, of which this report forms a part. The Environmental Assessment has been prepared by Urbis Pty Ltd and deals with all relevant matters as identified under the in the Director General's requirements.

This report documents the findings of our investigations and it is emphasised that the report follows the general principles and assessment methodology adopted in the Preliminary Environmental Assessment; as well as all matters raised by Council, the Roads and Traffic Authority and Transport NSW in the Director General's Requirements.

The traffic impacts of the proposed concept plan have been assessed and based on the RTA's 'Guide to Traffic Generating Developments' where applicable. Furthermore, the objectives of the Integrated Land Use and Transport planning policy have been considered and embodied in this document with specific reference to alternative modes of transport available in the nearby vicinity. The intention of this planning policy package specifically aims to reduce the reliance on cars by promoting alternative modes of transport and improve access to housing, jobs and services by walking and cycling. These objectives have been represented within this transport and accessibility report and are discussed in Section 5 'Traffic Management & Accessibility'.

The relevant Director General's Requirements for the transport and accessibility impacts are as follows:

- *Demonstrate how users of the development will be able to make travel choices that support the achievement of relevant NSW State Plan targets;*
- *Detail the existing public transport provision, pedestrian and cycle movements within the vicinity of the site and determine the adequacy of the proposal to meet the likely future demand for increased public transport and pedestrian and cycle access;*
- *Identify potential traffic impacts during the construction stage of the project, and measures to mitigate these impacts.*
- *Describe the measures to be implemented to promote sustainable means of transportincluding public transport usage and pedestrian and bicycle linkages in addition to addressing the potential for implementing a location specific sustainable travel plan (e.g.Workplace Travel Plan);*
- *Daily and peak traffic movements likely to be generated by the proposed development, including the impact on nearby intersections and the need/associated funding for upgrading or road improvement works (if required). The traffic impact assessment should consider base models with future traffic generated by the proposed expansions and redevelopment of Royal Far West. Key intersections to be examined/modelled include:*
    - *Darley Road and Wentworth Street, East Esplanade and Wentworth Street; East Esplanade and Belgrave Street; and Sydney Road and Belgrave Street/Pittwater Road.*
- *Details of the proposed access, parking provisions and service vehicle movements associated with the proposed development;*
- *Details of proposed car parking provisions. Minimal levels of on-site car parking for the proposed development having regard to the high public transport accessibility of the site, opportunities for car sharing, local planning controls and RTA guidelines.*

2. location and site

The site is situated on the present Royal Far West site, on the western side of South Steyne, between Wentworth Street to the north and Victoria Parade to the south, and is within the Manly commercial centre. Manly Village public school lies approximately 15 metres to the west of the site.

The site currently consists of a number of Royal Far West buildings with a combined area of approximately 6,400m^2. It has a northern frontage of approximately 106 metres to Wentworth Street, an eastern frontage of approximately 80 metres to South Steyne, an irregular southern site boundary of approximately 131 metres to neighbouring residential properties and a western boundary of approximately 47 metres to the Manly Community Centre.

There are currently four driveway crossings that access the site, with two driveway crossings of 3.4 metres and 3.8 metres width on South Steyne; and two driveway crossings of 5.3 metres width on Wentworth Street.

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

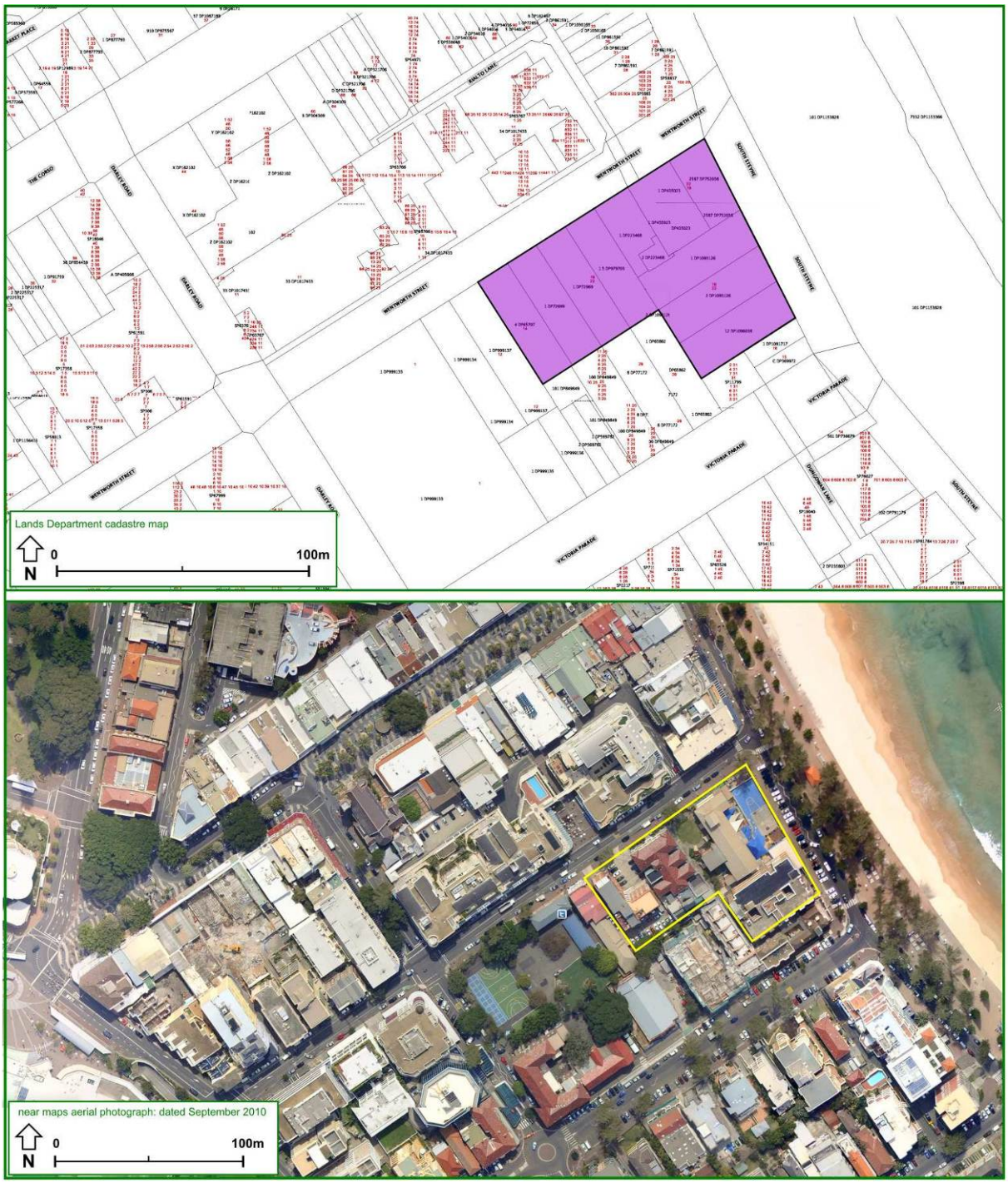


figure 2: site plan

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:

- Pittwater Road: an RTA State Road (MR 159) that generally runs in a north-south direction linking Manly in the south with Mona Vale in the north. Pittwater Road carries 15,371 vpd in the vicinity of the site;
- Sydney Road: an RTA State Road (MR 159) that generally runs in an east-west direction between Balgowlah in the west and Manly in the east. Sydney Road carries 16,523 vpd in the vicinity of the site;
- Belgrave Street: an RTA State Road (MR 159) that runs in a north-south direction linking East and West Esplanade in the south with Pittwater Road and Sydney Road in the north;
- South Steyne: an RTA Regional Road (RR 7343) that runs in a north-south direction between Ashburner Street in the south and North Steyne in the north. Two site accesses are situated on South Steyne.
- West Esplanade an RTA Regional Road (RR 2025) that generally runs in an east west direction between Commonwealth Parade in the west and East Esplanade in the East;
- Raglan Street an RTA Regional Road (RR 2026) that generally runs in an east west direction between Parkview Road in the west and North Steyne in the east;
- Darley Road an RTA Regional Road (RR 2026) that generally runs in a north-west direction between Bluefish Drive in the south and The Corso in the north;

- East Esplanade — a local collector road that generally runs in a north-west direction between Stuart Street in the south and West Esplanade in the north;
- Wentworth Street — a local collector road that runs in an east-west direction between East Esplanade in the west and South Steyne in the west. Two site accesses are situated on Wentworth Street; and
- Victoria Parade — a local road that runs in an east-west direction to the south of the site between East Esplanade in the west and South Steyne in the west;

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

figure 3: road hierarchy

3.2 general description of road environment

Pittwater Road is constructed with an 11.5 metre undivided carriageway in the vicinity of the site and generally carries a single lane of traffic in either direction. Pittwater Road forms a signal controlled intersection with Raglan Street to the north of the site. At its intersection with Raglan Street, this expands to three lanes in the southbound direction with the addition of a kerbside lane and the restriction of parallel kerbside parking.

Sydney Road is constructed with a 12.8 metre undivided carriageway and generally carries a single lane of traffic in either direction. Sydney Road forms a signal controlled intersection with Belgrave Street to the north-west of the site. At its intersection with Belgrave Street this expands to two lanes of traffic in either direction through the restriction of parallel kerbside parking.

Belgrave Street is constructed with a 15 metre undivided carriageway and generally carries two lanes of traffic in either direction. Belgrave Street forms a signal controlled 'T-junction' with East / West Esplanade to the west of the site. At its intersection with East / West Esplanade this expands to three lanes of traffic in the southbound direction through the restriction of parallel kerbside parking.

South Steyne is constructed with a 14 metre undivided carriageway adjacent to the site and carries a single lane of traffic in the southbound direction adjacent to the site and is subject to a 40 km/hr speed limit. South Steyne is subject to timed parking restrictions and 90° front-in angle parking occupies the South Steyne site frontage. South Steyne forms a priority controlled 'T-junction' with Wentworth Street and Victoria Parade to the east of the site, with South Steyne being the major road in both cases. To the north of its intersection with Wentworth Street, South Steyne facilitates two-way traffic flow. A drop-off only bus zone is located opposite the site, to the north of the South Steyne / Victoria Parade intersection.

West Esplanade is constructed with a 13 metre undivided carriageway and generally carries a single lane of traffic in either direction. At its intersection with Belgrave Street this expands to two lanes of traffic in the eastbound direction through the restriction of parallel kerbside parking.

Raglan Street is constructed with a 12.8 metre undivided carriageway and generally carries two lanes of traffic in either direction. Raglan Street forms a signal controlled intersection with Pittwater Road and a priority controlled 'T-junction' with North Steyne to the north of the site.

Darley Road is constructed with a 12.8 metre undivided carriageway and generally carries a single lane of traffic in either direction. Darley Road forms a signal controlled intersection with Wentworth Street and a roundabout controlled intersection with Victoria Parade. At its intersection with Wentworth Street this expands to two lanes of traffic through the restriction of parallel parking.

East Esplanade is constructed with a 12 metre undivided carriageway and generally carries a single lane of traffic in either direction. East Esplanade forms the major road in a signal controlled 'T-junction' with Wentworth Street and a priority controlled 'T-junction' with Victoria Parade to the south-west of the site.

Wentworth Street is constructed with an 11 metre undivided carriageway and generally carries a single lane of traffic in either direction and is subject to a 40 km/hr speed limit. Wentworth Street is subject to timed parking restrictions. Wentworth Street forms the major road in a priority controlled 'T-junction' with Rialto Lane, forms a signal controlled intersection with Darley Road and forms the stem of a signal controlled 'T-junction' with East Esplanade. At its intersection with Darley Road and East Esplanade, this expands to two lanes through the restriction of parallel kerbside parking.

Victoria Parade is constructed with a 24 metre undivided carriageway and generally carries a single lane of traffic in either direction and is subject to a 40 km/hr school zone. Victoria Parade is subject to timed parking restrictions, with 90° angle parking on both sides. A 2.5 metre wide bicycle lane is located on the northern side of Victoria Parade between the footpath and 90° angle parking. Victoria Parade forms a roundabout controlled intersection with Darley Road and forms the stem of a signal controlled 'T-junction' with East Esplanade to the south-west of the site.

3.3 public transport

The existing bus and ferry services that operate in the locality are shown in **figure 4**. It is evident that the site benefits from excellent access to the public transport system with buses travelling throughout the locality, to select sub-regional centres and to the city from the bus / ferry interchange at Manly Wharf. The key bus routes that operate from Manly Wharf are summarised in **table 1**.

table 1: frequency and number of peak services of major bus routes

Route	Median Frequency Weekday AM Peak (From Manly) (hh:mm)	Median Frequency Weekday PM Peak (To Manly) (hh:mm)	Number of Services Weekday AM Peak
136 (Chatswood – Frenchs Forest – Dee Why – Manly)	22:00	21:00	9
140 (Manly – Macquarie University – Epping)	1:20:00	1:00:00	2
143, 144 (Chatswood – St Leonards / Royal North Shore Hospital– Manly)	10:00	9:00	17
E50 (Manly – North Sydney – Milsons Point)	15:00	21:00	8
169, E69 (Manly – Narraweena – (Seaforth) – City)	20:00	55:30	6
171, E71 (Manly – Balgowlah Heights – City)	20:00	30:00	6
E70 (Manly – Balgowlah – City)	10:00	11:00	17

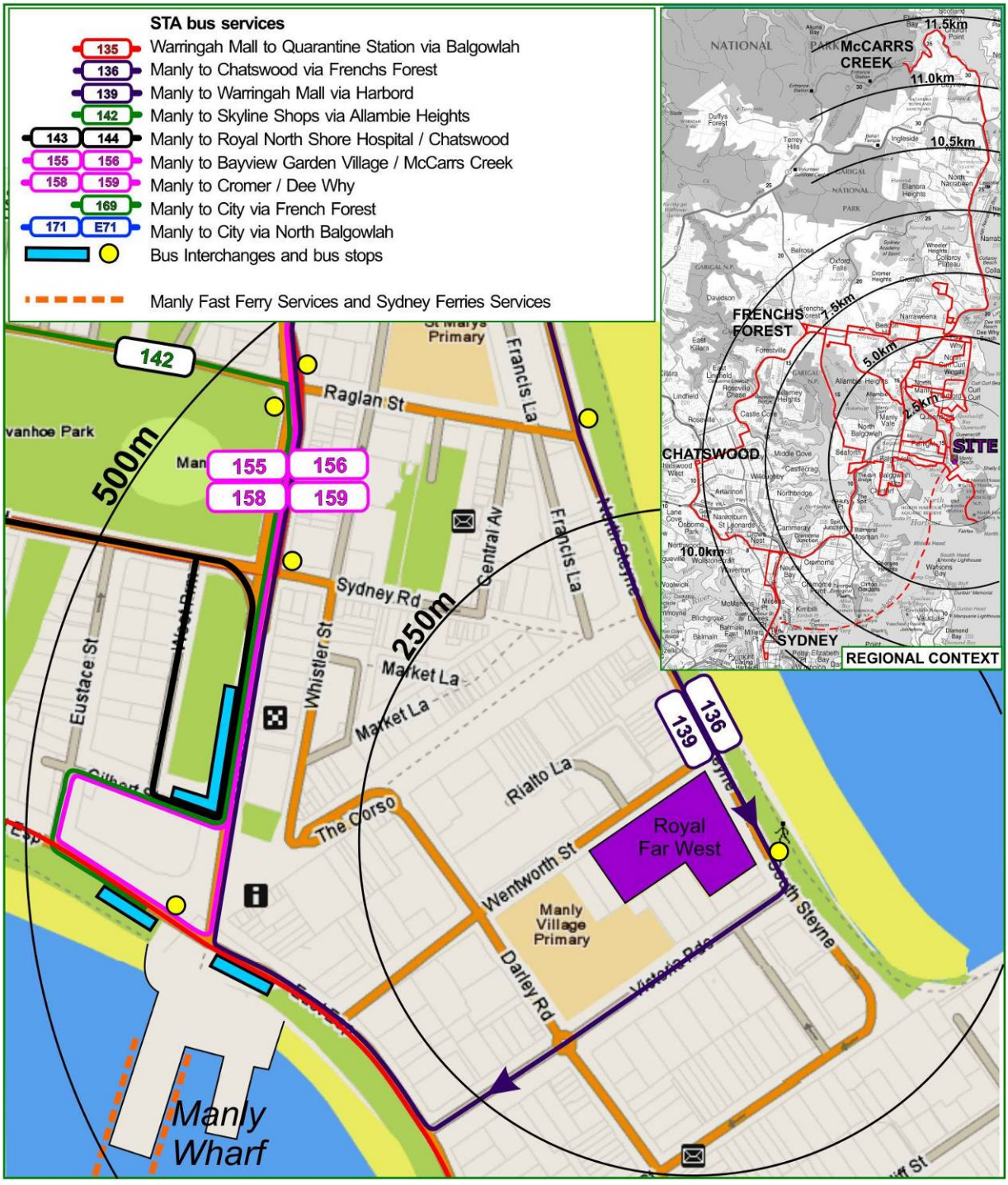


figure 4: public transport services

It can be seen from **table 1** that extensive bus services are available from Manly Wharf with connections to the Sydney CBD, North Sydney CBD and Chatswood CBD. Services to other sub-regional centres such as Epping are less frequent however demand for these routes is lower.

There are currently 35 daily ferry departures from Manly (Monday to Friday) to Circular Quay which are available to the general public. In addition to these bus and ferry services, six new ferries are proposed by the State Government's Metropolitan Transport Plan 2020. The existing 40 km/hr speed limits in the vicinity of the site, timed / metered parking restrictions, wide pedestrian footpaths, dedicated cycleways, vibrant streetscape and existing public transport infrastructure all encourage extensive use of public transport by the users of the proposed development.

The majority of public transport demand is to the above mentioned CBD centres. Journey to work data indicates that 11% of total trips are undertaken by bus and 25% of total trips are undertaken by ferry. An additional 9% of trips are achieved by the combination of two forms of public transport (generally ferry and train or bus and ferry). These figures indicate that a large proportion of trips (approximately 45%) are undertaken using Manly's wide range of public transport facilities.

In addition, Manly has excellent pedestrian footpath systems and cycle network facilities. The extensive footpath system that exists within Manly offers connections to the south towards Manly bus/ferry terminal which can be used for both pedestrians and cyclists. The cycle routes are formed by on-road cycleways with exclusive cycle lanes provided on approach to a number of intersections and in particular to the south of the site along Wentworth Street and Darley Street. There are numerous off-road cycle routes to the north of the site along South Steyne also. In summary, the location of the site within the Manly commercial centre will also ensure that users will be able to walk or cycle for many of their local trips

3.4 existing site generation

The existing Royal Far West development and associated retail outlets on site currently generate traffic which is accommodated in the nearby intersections as is included in the surveys reported upon in Section 3.5. Nevertheless, in order to assess a worst case traffic scenario (which potentially overstates future traffic conditions), no account has been taken of these trips which are quite dispersed throughout the day, although still significant.

3.5 existing intersection performances

The scope of the analysis has identified the Director General's requirements and examines all intersections that are expected to be impacted and these are as follows:

- Wentworth Road and Darley Road;
- East Esplanade and Wentworth Road;
- East Esplanade, West Esplanade and Belgrave Street;
- Belgrave Street and Sydney Road.

The existing conditions at the time of maximum traffic volumes over the period surveyed (7.00-9.00am and 4.00-6.00pm) were extracted from the surveys and the results (which are shown in **figures 5 and 6**) were 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 at 1.1 can be assumed. For intersections controlled by roundabout or give way/stop control, satisfactory intersection operation is generally indicated by a DOS of 0.8 or less.

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

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

Level of Service	Average Delay per Vehicle (secs/veh)	Traffic Signals, Roundabout	Give Way and Stop Signs
A	less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity; at signals incidents will cause excessive delays. Roundabouts require other control mode	At capacity and requires other control mode
F	More than 70	Unsatisfactory and requires additional capacity.	Unsatisfactory and requires other control mode or major treatment.

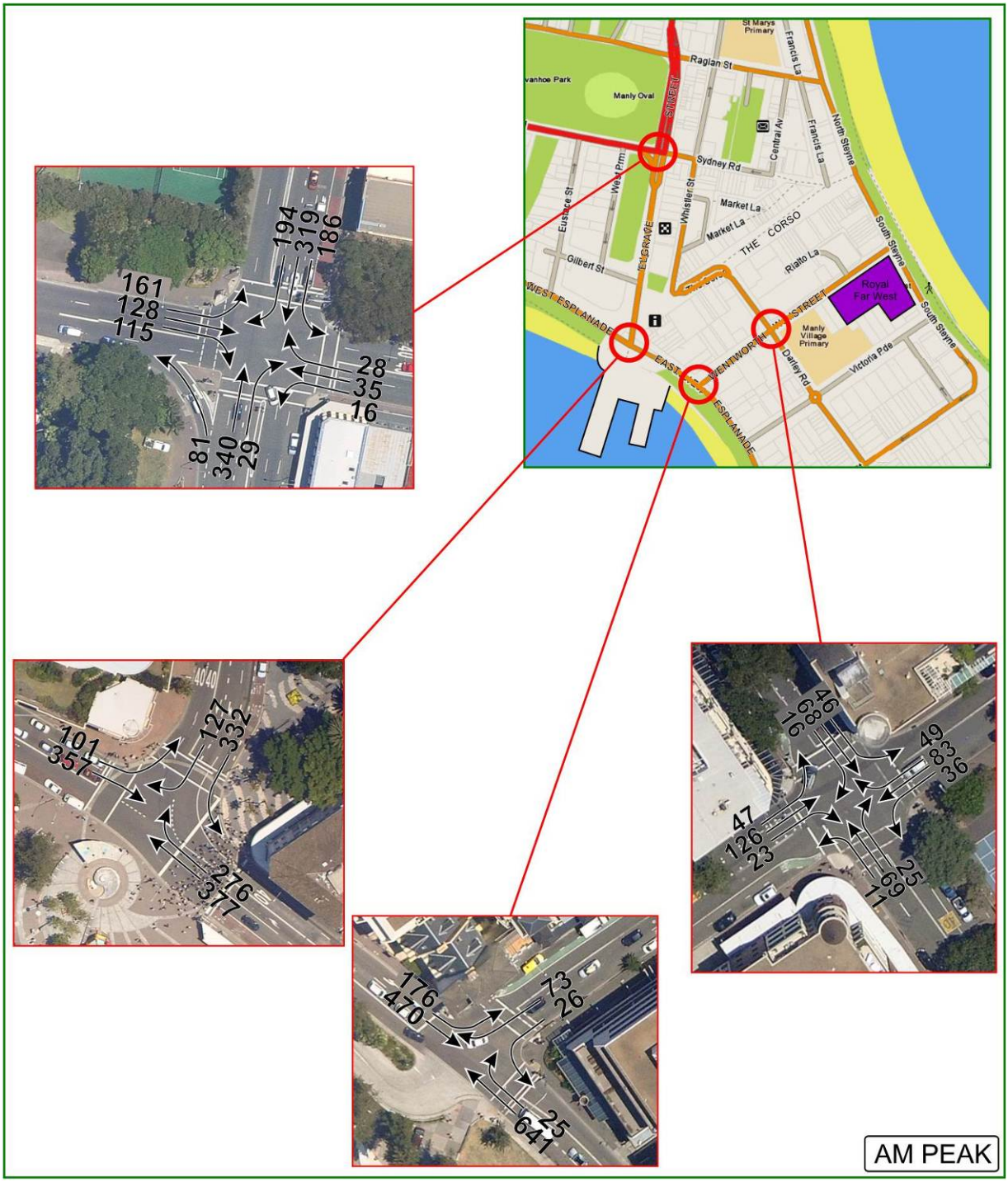


figure 5: existing am peak traffic volumes

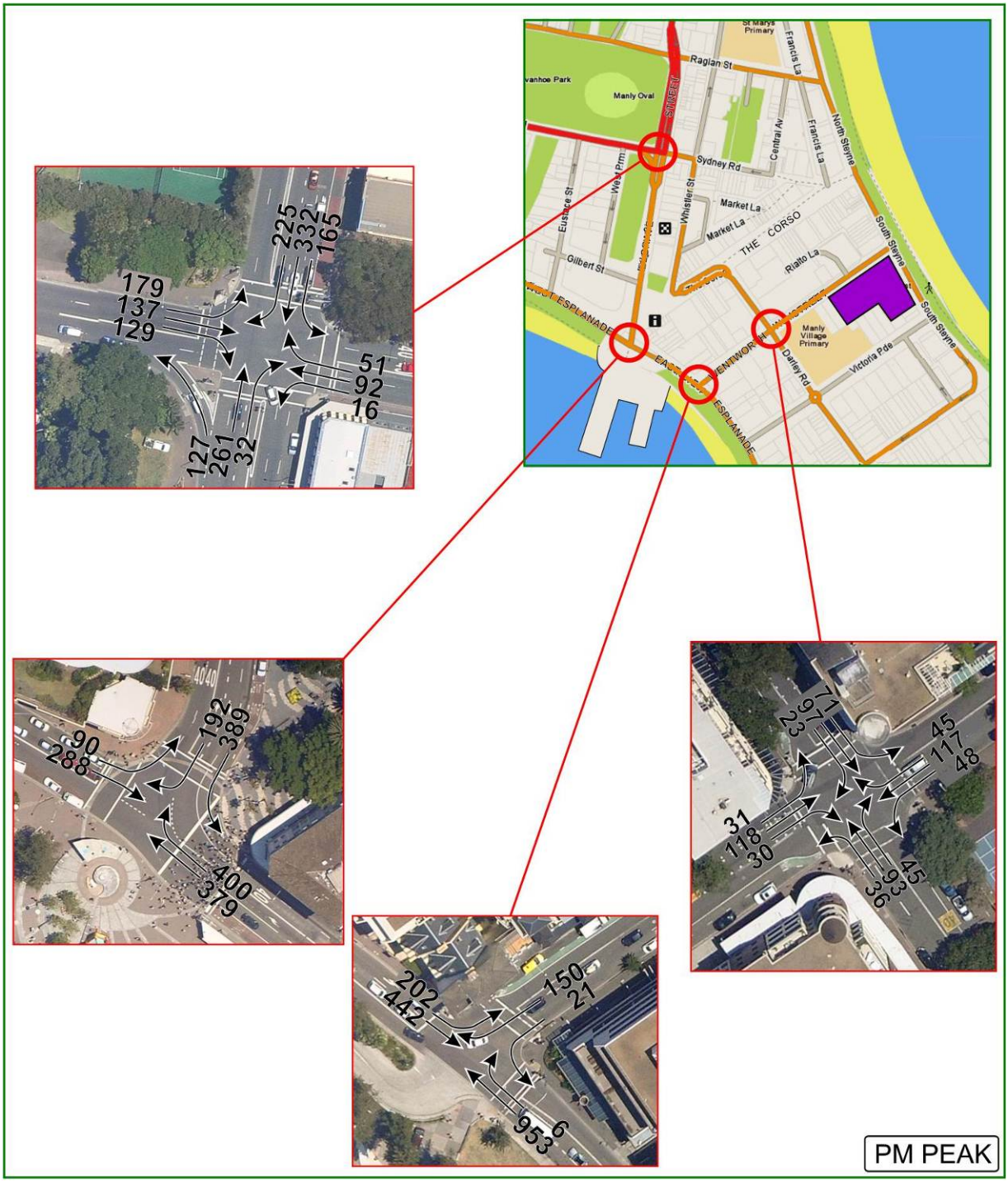


figure 6: existing pm peak traffic volumes

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 3: existing intersection performance: am and pm peak hour

Intersection Description	Period	Control Type	Degree of Saturation	Intersection Delay	Level of Service
Darley Road & Wentworth Street	AM	Signals- Fixed Time	0.271	12.8	A
	PM		0.312	13.5	A
East Esplanade & Wentworth Street	AM	Signals- Fixed Time	0.565	13.5	A
	PM		0.807	16.3	B
East/West Esplanade & Belgrave Street	AM	Signals- Fixed Time	0.595	33.0	C
	PM		0.793	36.1	C
Sydney Road & Belgrave Street	AM	Signals- Fixed Time	1.000	23.2	B
	PM		1.000	23.4	B

It can be seen from **table 3** that the critical intersections operate satisfactorily with Level of Service C or better. It should be noted that the intersection of Sydney Road and Belgrave Street has a stated Degree of Saturation of 1.000 which is due to the short right turn lane in Belgrave Street (northern approach) which is not accurately represented in the model and which in practice operates at a satisfactory level of service. This intersection overall operates at Level of Service B and these results are consistent with on-site observations during both peaks.

The intersection of Wentworth Street and East Esplanade also accommodates access to the car park which forms its southern approach. This approach generated minimal traffic and was not included in the modelling, which in any case operates very satisfactorily with level of service A in the AM peak and B in the PM peak. Nevertheless, it is stressed that the most relevant use of this analysis is to compare the relative change in the performance parameters as a result of the proposed development. This is discussed further in Section 5.

4. description of proposed development

A detailed description of the proposed development is provided in the Concept Application report prepared by Urbis. In summary, the development for which approval is now sought comprises the following components:

- Demolition of all existing structures;
- Construction of a mixed use development with the following attributes:
  - Royal Far West Building
  - Hotel consisting of 164 rooms
  - Retail component of 1,327m^2
  - 32 unit residential development;
- The provision of 2 basement levels of car parking comprising of 92 spaces on each level;

The traffic and parking impacts arising from the development are discussed in Sections 5 and 6. Reference should be made to the plans submitted separately to Council which are presented at reduced scale in **appendix b.**

5. transport management and accessibility

5.1 traffic management objectives

The NSW Government State government policies that are particularly relevant for consideration in relation to this application are as follows:

- Metropolitan Transport Plan 'Connecting the City of Cities';
- NSW State Plan;
- NSW Planning Guidelines for Walking and Cycling;
- NSW Bike Plan;
- NSW Health's Healthy Urban Development Checklist.
- Integrating Land Use and Transport – A Planning Policy Package

Generally the primary objective of Government is reflected in a Transport Access Guide for a major development which is aimed at reducing the reliance on private vehicle usage associated with the proposed development. Part of reducing the mode share of private vehicle use will involve promoting the use of other travel modes including public transport, cycling and walking. These are discussed further in the following sections.

5.2 parking requirements

5.2.1 council requirements

The site is subject to the controls of Manly Council including the relevant DCP and LEP, although regard also needs to be given to the requirements of the RTA's Guideline as well as other survey-based assessments where these are of assistance. The Manly DCP for the Business Zone 1989 and Manly DCP for the Residential Zone 2007 have been reviewed and utilised to calculate the parking provision for the proposed development:. In this regard, commercial, retail and residential uses are to

be introduced to the site as part of the development. The resulting parking requirement is provided in **table 4**.

table 4: manly parking rates and provision

Type	GFA/Yield	Manly DCP	Spaces Required	Spaces Provided
Residential	32 units	1 space per dwelling +0.2 per 2 bed unit +0.5 per 3 bed unit +0.25 visitors per dwelling	49	123
Hotel	164 rooms	1 space per 4 rooms	41	
Retail	1327m^2	1 space per 40m^2	33	
Combined			**123**	**123**
Royal Far West		n/a	n/a	61
		Totals	n/a	184

The proposed 32 residential units comprise 6 one bedroom, 12 two bedroom and 14 three bedroom units. Table 4 demonstrates that 123 parking spaces are 'nominally' required by Manly Council for the residential, hotel and retail components of the development and this does not include the parking provision for Royal Far West. These parking rates are considered appropriate and are specifically attuned to the needs of the local area and expected demands. This is particularly the case for the residential units as these are generally expected to attract buyers with a higher than average car ownership, appropriate to the exclusive nature of the development which benefits from extensive water views in a sought-after location. Accordingly, no reduction to Council's parking rate is considered warranted. These residents will nevertheless predominantly use public transport for the journey to work, with use of cars for other trip purposes, including recreational and shopping trips. Finally, any reduction in parking for residents or visitors would be likely to create increased parking pressure on local streets which are already under intense parking pressure.

The development provides 184 parking spaces which therefore includes 61 parking spaces to be dedicated to Royal Far West. It has been confirmed that a future total of 90 staff are proposed and a

provision of 45 spaces will therefore be provided for staff, with one space per 2 employees. This is appropriate based on experience with the current Royal Far West operations which presently relies on significant on-street parking. The proposed development will remove this necessity providing dedicated parking spaces on site and increasing the availability of on-street parking for others which is a public benefit.

The balance of 16 spaces will therefore be allocated for visitor parking by Royal Far West, which is also based on expected peak demands which occur generally during the day and on evenings. On this basis, a total parking provision of 184 spaces is considered to effectively satisfy the DCP requirement.

It is proposed that the arrangement of parking can be further detailed at project application stage when more accurate areas and specific hotel room numbers and staff will be confirmed. The provision of visitor parking can also be reassessed at project application stage when further details on the operation and provision of specific facilities and services for Royal Far West are available.

5.2.2 disabled parking

This is a matter for assessment during later Project Application/s and compliance with relevant AS 2890.6 (2009) will be required. It is anticipated that an allocation of 1-2% of the total parking will be afforded and this is consistent with AS 2890.1.

5.3 pedestrian and bicycle facilities

An extensive footpath system exists within Manly and particularly along South Steyne, with connections to the south towards Manly bus/ferry terminal which can be used for both pedestrians and cyclists. The development links to the existing footpath network and provides a benefit for all residents within the precinct to the south of the site. 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.

The majority of the cycle routes are generally formed by on-road cycleways with exclusive cycle lanes provided on approach to a number of intersections and in particular to the south of the site along Wentworth Street and Darley Street which continue to the east on several roads. Furthermore, there are numerous off-road cycle routes to the north of the site along South Steyne. The extensive Manly bicycle network is illustrated in figure 7 below.

figure 7: manly bike network

In summary, the development of the public road network provides a system of footpaths that will allow pedestrians to move freely within and through the site. This development links with the existing pedestrian network external to the site and also to the Manly bicycle network.

5.4 pedestrian safety

The main Royal Far West pedestrian access is via Wentworth Street and this incorporates a footpath on the western side of the main access road. Pedestrians are able to continue along into the site without crossing the main driveway serving the basement car parks which is located to the north of the pedestrian entrance. Hotel and residential pedestrian entry points are located separately along South Steyne. It is evident that pedestrians will have safe access to the development.

5.5 ferry services

The site is within a very reasonable walking distance of the Manly bus/ferry interchange to the immediate south of Belgrave Street and The Corso and is approximately 425 metres from the development. It is expected that residents will utilise the frequent ferry services to the CBD, as discussed in Section 3.

5.6 taxi services

Taxi services will be able to access the site directly via the primary vehicle access point from Wentworth Street which proposes a sole vehicular drop off point. Taxi services will be important with the provision of a 168 room tourist hotel on site. It is considered that the necessary facilities are provided in order to accommodate this service with the provision of a well-designed, high capacity set down/pick up area.

5.7 servicing

A service area is to be provided through the main vehicular access. It is anticipated that the site will be serviced by an 8.8 metre MRV truck, which is the standard service vehicle as defined in AS 2890.2. The service area can be assessed further upon project application stage when swept path analysis can be undertaken.

5.8 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, 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.

5.9 public transport usage

The current pedestrian facilities, ferry services to the CBD and the nearby bus stops have the most significant potential to improve traffic conditions and reduce car dependency. In addition, it is expected that a Workplace Travel Plan and/or a Travel Access Guide would be prepared in support of the application at a later time. It is proposed that a Travel Access Guide/Workplace Travel Plan will be prepared in response to a suitable condition of consent. This would include the promotion of alternate travel modes to private vehicle usage and travel demand measures including car sharing, public transport availability (bus, ferry and taxi), cycle and pedestrian routes and linkages, bicycle end-user facilities and motorcycle parking. The provision of a drop-off area within the site is of particular benefit to taxi use, which is a form of public transport.

This Travel Access Guide and/or Workplace Travel Plan would address the primary objective of increasing sustainable means of transport and can be conditioned subject to later Project Application/s.

5.10 traffic impacts

5.10.1 Introduction

As previously mentioned in section 4 the proposed concept design of the development comprises of the following:

- Royal Far West Building
- Hotel consisting of 164 rooms
- Retail component of 1,327m^2
- 32 unit residential development;

The traffic generation as assessed assumes a worst case scenario for the proposed mixed use development, based on an original land use mix and yield that generated slightly higher traffic volumes.

5.10.2 trip generation

- Residential Generation

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. Application of this rate to the proposed 58 unit's results in a generation of 17 trips per hour with a likely 80:20 split in the direction of peak flow. Hence, volumes will be as follows:

- 3 in and 14 out during the morning peak period (7-8am and 8-9am); and
- 14 in and 3 out during the afternoon peak period (4-5pm and 5-6pm).

- Hotel Generation

The generation rate for the hotel component of the development has been based on surveys undertaken by Traffix in 2009 of the Rydges Hotel, North Sydney which is identified as a comparable hotel premises. It comprises of 166 rooms and generated 69 vehicle trips during the critical PM period (4-5pm). This equates to 41.5 veh/hr/100 rooms. The proposed development consists of 168 rooms

and therefore results in a comparable 70 vehicle trips per hour during the PM peak. The same level of activity has been assumed in the AM peak and with a 50:50 directional split the following volumes are predicted:

- 35 in and 35 out during the morning (7-8am and 8-9am); and
- 35 in and 35 out during the evening (4-5pm and 5-6pm);

Surveys undertaken at the Vibe Hotel (North Sydney) in 2009 generated 24 vehicle trips during the critical PM period equating to a trip rate of 14.6 veh/hr/100rooms. It should be noted that the surveyed Vibe Hotel is comparable in size comprising of 165 rooms. This rate was deemed to be insufficient for the proposed development as it is understood that a tourist location such as Manly will attract additional vehicle trips. It is therefore considered that the rate of 41.5 veh/hr/100 rooms is appropriate and assumes a 'worst case' scenario for the proposed development.

Royal Far West Staff Generation

Given that the Royal Far West currently exists on site, it is considered that only the increase staffing numbers and visitors should be taken into account in the modelling. It is clear from Section 3.5 (existing intersection performances) that the existing development generation is accommodated satisfactorily on the existing road network. Staff numbers are proposed to increase by only 13 people, with a 6 veh/hr assumed to occur. It is noted that visitors to the Royal Far West facility are dispersed throughout the day and indeed, throughout the week. The majority of visitors/families who attend the site are also expected to use public transport and thus no generation has been account for visitors during the on-street peak periods.

Retail Generation

The RTA's Guide to Traffic Generating Developments for speciality shops adopts a rate of 4.6 vehicle trips per 100m^2 for Thursday evening peak periods. However, the retail shops will feature along the promenade of Manly onto South Steyne and will draw the vast majority of their patronage from passing (walking) trips. A reduced trip rate of 2.3 vehicle trips per 100m^2 has therefore been adopted as a worst case scenario which generates 28 trips per peak hour, with an assumed 50/50 directional

split. Trips during the AM peak will be associated mainly with staff arrivals and 10 veh/hr have been assumed for this purpose.

- Combined Use Traffic Generation

Taking the above generations into account the development will generate trips as follows:

- AM Peak 103 trips per hour (51 in, 52 out) during the morning peak (8-9am) and;
- PM Peak 121 trips (66 in, 55 out) during the afternoon peak (5-6pm).

5.10.3 peak period Intersection performances

The external traffic impacts arising from the development have been based on the basis of the trip rates discussed above, with 103 veh/hr in the AM peak and 121 veh/hr in the PM peak. These trips have been distributed onto the existing road network on the basis of journey to work data and having regard for the attractiveness of available routes with the following distributions:

- 33% of trips to the Northern Beaches;
- the remaining 67% of trips (to the east, south and west) which requires the majority of vehicles to traverse through the intersection of Belgrave Street and Sydney Road.

Thus, using these splits the traffic has been distributed onto the existing road network. It should be noted that assumed travel paths have been identified for vehicles arriving and departing to/from the site. These trips have been distributed on the route assumptions and modelled accordingly.

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 5: existing + future development intersection performance: am and pm peak hour

Intersection Description	Period	Control Type	Degree of Saturation	Intersection Delay	Level of Service
Darley Road & Wentworth Street	AM	Signals- Fixed Time	0.271	12.7	A
	PM		0.322(0.312)	13.5	A
East Esplanade & Wentworth Street	AM	Signals- Fixed Time	0.565	13.7(13.5)	A
	PM		0.807	16.4(16.3)	B
East Esplanade & Belgrave Street	AM	Signals- Fixed Time	0.595	33.0	C
	PM		0.802(0.793)	36.5(36.1)	C
Sydney Road & Belgrave Street	AM	Signals- Fixed Time	1.000	23.6(23.2)	B
	PM		1.000	23.9(23.4)	B

Note: Figures in brackets relate to existing parameters only where changes occur

It is evident that the traffic impacts from the proposed development have a minimal effect on the road network and the additional trips are readily accommodated. It should be noted at this stage that the primary vehicle access is proposed to be approximately 80 metres from the intersection of Wentworth Street and South Steyne. This intersection has not been modelled using aaSIDRA and was not required to be modelled under the Director General's requirements. In any case, it is clear from on-site observations that this intersection is under peak loadings on weekends when tourist activity is at a maximum. In addition, this intersection is not considered to be a primary route for vehicles associated with the site.

It should be noted that TRAFFIX is aware of the proposed Manly 2015 Masterplan and the traffic modelling summary report published by Bitzios in March 2011. It is evident that the modelling results for the Royal Far West development (see above) illustrate minor changes of the critical intersection performances. The Manly 2015 Masterplan is currently on exhibition and at this stage it is unclear as to which proposed network changes will be implemented. In addition, Bitzios have suggested two options for North and South Steyne and have concluded that the full closure of North and South Steyne will cause "unacceptable delays and queuing within the Manly CBD in peak periods".

Nevertheless, council may wish to address this traffic increase associated with the Royal Far West development when undertaking further strategic modelling in the area.

In summary, the critical intersections as requested by the DGR's have been assessed and it is evident from the results in **table 5** that the existing road network can accommodate the additional traffic generated by the proposed development given that the level of service for each intersection remains generally unchanged.

5.11 construction traffic management

It is anticipated that a detailed construction traffic management plan (CTMP) will be prepared in response to a condition of consent when more detailed information will be available and a builder is appointed. Nevertheless, some construction principles have been developed and will guide this on-going process through the Project Application stage/s. It will need to address requirements during each stage (demolition, site preparation, excavation, construction, fit-out and landscaping) and will need to include consideration of times of operation, truck access routes, site access, average truck frequencies, truck sizes, parking for construction workers, work zone requirements, pedestrian control, traffic management plans and any road occupancy applications. These are matters that cannot be addressed at this time although in principle, there are considered to be no obvious constraints to the preparation of a safe and efficient Construction Traffic Management Plan.

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 as discussed above.

6. access & internal design aspects

6.1 access & internal design

The main site access is via the western frontage to Wentworth Street to the south of the intersection of Wentworth Street and South Steyne. It will require a minimum 6-9 metre combined entry/exit width. It is acknowledged that appropriate sight lines will be provided at the property line to ensure adequate visibility between vehicles leaving the car park and pedestrians on the frontage road footpath on Wentworth Street.

The internal design will be assessed in more detail at the Project Application stage of the assessment however in general the principles of AS 2890.1 have been reflected in the concept plans provided in **appendix b**. In particular the following aspects considered noteworthy:

- All parking modules allocated to the residential and retail outlets are to be designed with a minimum width of 2.4 metre wide bays and 5.8 metre wide aisles which complies with the requirements of AS 2890.1 for Class 1 parking;
- All parking modules allocated to the Hotel are to be designed with a minimum width of 2.5 metre wide bays and 5.8 metre wide aisles which complies with the requirements of AS 2890.1 for Class 1 parking;
- All ramps are designed with a minimum transition of 2.0 metres at 1:8 (12.5%) with a maximum grade of 1:5 (20%) for ramps less than 20 metres in length which complies with AS 2890.1;
- All sloping floors within the parking aisle are designed with a maximum grade of 1:20 (5%) measured parallel to the angle of parking and 1:16 (6.25%) in any other direction;
- All parking spaces located adjacent to obstructions will provide an additional 300mm clearance;

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

- 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);

- All visitor parking is consolidated into one area;
- 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, based on the adopted traffic planning principles outlined in this Concept Plan.

7. 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.

- *Demonstrate how users of the development will be able to make travel choices that support the achievement of relevant NSW State Plan targets;*

  It is evident throughout this report and in particular in sections 3.3 Public Transport, 5.3 Pedestrian & Bicycle Facilities, 5.5 Ferry Services, 5.6 Taxi Services and 5.9 Public Transport Usage that the development is located in an area with excellent alternative travel modes available other than private car use. The development links into the existing pedestrian and bicycle network and therefore follows the target of increasing active transport as a means of connecting into the transport network as proposed by the NSW State Plan targets in reducing car dependency.

- *Detail the existing public transport provision, pedestrian and cycle movements within the vicinity of the site and determine the adequacy of the proposal to meet the likely future demand for increased public transport and pedestrian and cycle access;*

  As previously mentioned in the report there are excellent pedestrian and cycle networks which serve the Manly area. The development site is situated in a location where it has access to on road cycle routes as well as an extensive footpath system which exists within Manly and particularly along South Steyne with connections to the south and in particular Manly bus/ferry terminal. The public transport has been detailed in the report and it is considered that there is sufficient provision to accommodate the increase of public transport usage supplied by the development.

- *Identify potential traffic impacts during the construction stage of the project, and measures to mitigate these impacts.*

  It has been identified in Section 5.11 that a Construction Traffic Management Plan (CTMP) will be prepared in response to a condition of consent when more detailed information will be available

and a builder is appointed. 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. Specific truck movements will be identified and implemented onto the existing road network.

- *Describe the measures to be implemented to promote sustainable means of transportincluding public transport usage and pedestrian and bicycle linkages in addition to addressing the potential for implementing a location specific sustainable travel plan (e.g.Workplace Travel Plan);*

  It is proposed that the Travel Access Guide/Workplace Travel Plan will be prepared in response to a suitable condition of consent. This would include the promotion of alternate travel modes and travel demand measures including car sharing, public transport availability (bus, ferry and taxi), cycle and pedestrian routes and linkages, bicycle end-user facilities and motorcycle parking

- *Daily and peak traffic movements likely to be generated by the proposed development, including the impact on nearby intersections and the need/associated funding for upgrading or road improvement works (if required). The traffic impact assessment should consider base models with future traffic generated by the proposed expansions and redevelopment of Royal Far West. Key intersections to be examined/modelled include:*

  - *Darley Road and Wentworth Street, East Esplanade and Wentworth Street; East Esplanade and Belgrave Street; and Sydney Road and Belgrave Street/Pittwater Road.*

  Section 3.5 (Existing Intersection Performances) discusses the existing base case scenario which was modelled using aaSIDRA for the key intersections mentioned above. Section 5.10 investigates the traffic impacts of the development using the RTA'S Guide to Traffic Generating Developments. In total the traffic generated by the development is 103 veh/hr during the AM Peak and 121 veh/hr during the PM peak and assesses a worst case scenario. These are very moderate for a large development. This traffic has been distributed onto the existing road network and modelled accordingly using SIDRA. It should be noted that assumed travel paths have been identified for vehicles arriving and departing to/from the site and were distributed on the route assumptions. Results (appendix c) indicated that no improvement works are required as a consequence of the traffic generated from the proposed development.

- *Details of the proposed access, parking provisions and service vehicle movements associated with the proposed development;*

  The proposed primary vehicular access is located on Wentworth Street and will give access to the 184 parking spaces on two basement levels. Section 6 (Access & Internal Design) discusses the access driveway and the standard dimensions required by AS 2890.1(2004). On-site parking provision has been discussed in Section 5.2 and effectively meets the requirements of Manly's relevant DCPs. It is also assumed that a standard service vehicle of 8.8metres length will make use of the developments service area which has duel access with the primary vehicle entrance. Swept path analysis for the service vehicle will be undertaken at project application stage when the vehicle specifications are confirmed.

- *Details of proposed car parking provisions. Minimal levels of on-site car parking for the proposed development having regard to the high public transport accessibility of the site, opportunities for car sharing, local planning controls and RTA guidelines.*

  This has also been addressed in Section 5.2 of this report. In summary the parking provision is generally in accordance with the requirements of Manly Council's DCPs which already embody rates that are intended to encourage the use of alternative transport modes and will result in reduced car dependency which is consistent with the objectives of State Government policy more generally. No further reduction of parking is considered necessary or desirable due to the expected demands; but also the current pressure on on-street parking which should not be exacerbated.

  Car sharing has been addressed in the report and in particular would form an integral part of the Travel Plan for residents of the development. Car share operators (such as Go-Get) could be engaged to locate within the proposed future road network, 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. In addition it is noted that there is currently a deficiency in parking requirements within the Royal Far West (RFW) development. The proposal to increase the provision of parking for RFW will reduce dependency upon on-site parking.

8. conclusions

In summary:

- The proposed use of the site as a mixed use development is a moderate 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 assessed in detail and the predicted traffic is moderate for such a development. These impacts can be readily accommodated by the road network and future traffic generation as a result of the proposed development have been analysed using aaSidra modelling. The results convey that the critical intersections will remain relatively unchanged;
- Parking for the proposed development is generally in accordance with Council's Development Control Plan parking parameters and will assist in reducing car dependency, while providing sufficient parking to ensure that existing on-street parking demands are not exacerbated;
- The proposed access driveways and internal design aspects are appropriate from the concept design and will operate satisfactorily. A swept path assessment will be undertaken as permissible under AS2890.1 and AS2890.2 to confirm that all movements can occur safely and efficiently at Project Application stage/s; and
- The DGR's have been considered and addressed within this Transport and Accessibility Report with a summary of these matters provided in Section 7.

It is therefore concluded that the proposed development is supportable on traffic planning grounds.

appendix a

photographic record

View looking at the intersection of Wentworth Street and South Steyne with the existing Royal Far West building to the left of the picture.

View looking east along Darley Road at its intersection with Wentworth Street. This intersection is to the south of the proposed development.

View looking south at the intersection of Wentworth Street and East Esplanade.

View looking south at the intersection of East/West Esplanade and Belgrave Street.

View looking north along Belgrave Street towards its intersection with Sydney Road.

appendix b

reduced plans

architectus™

Architecture
Urban Design
Planning
Interior Architecture

ANALYSIS LEGEND

- PRIMARY VEHICULAR ACCESS POINT
- RESIDENTIAL PEDESTRIAN ENTRY POINTS
- HOTEL PEDESTRIAN ENTRY POINT
- RFW PEDESTRIAN ENTRY POINT
- ACTIVE RETAIL EDGE
- SOFT LANDSCAPING
- PROPOSED NEW CHILDRENS PLAY AREA
- LOCATION OF ADJOINING NEIGHBOURS PRIMARY LIVING SPACES
- LOCATION OF ADJOINING NEIGHBOURS PRIVATE OPEN SPACE

(A) GROUND FLOOR RETAIL OF F&B USE

(B) HOTEL LOBBY WITH PEDESTRIAN ACCESS FRONTING BEACH

(C) EXISTING 2 STOREY HERITAGE HOUSE TO BE CONVERTED FROM CLINICAL TO RESIDENTIAL USE

(D) ADJOINING NEIGHBOURS PRIVATE OPEN SPACE

(E) RFW CHILDRENS GAMES AREA INCORPORATING INDOOR / OUTDOOR LEARNING FACILITY

(F) EXISTING HERITAGE BUILDING (DRUMMOND HOUSE) TO REMAIN AND BE INCORPORATED INTO NEW RFW FACILITY

(G) CURTILAGE TO HERITAGE FACADE MAINTAINED WITH SURROUNDING OPEN LANDSCAPED AREAS

(H) PROPOSED SOLE VEHICULAR DROP OFF AND SERVICE ENTRY

(I) RFW FACILITY INCORPORATING CLINICAL, EDUCATIONAL AND ADMIN USES

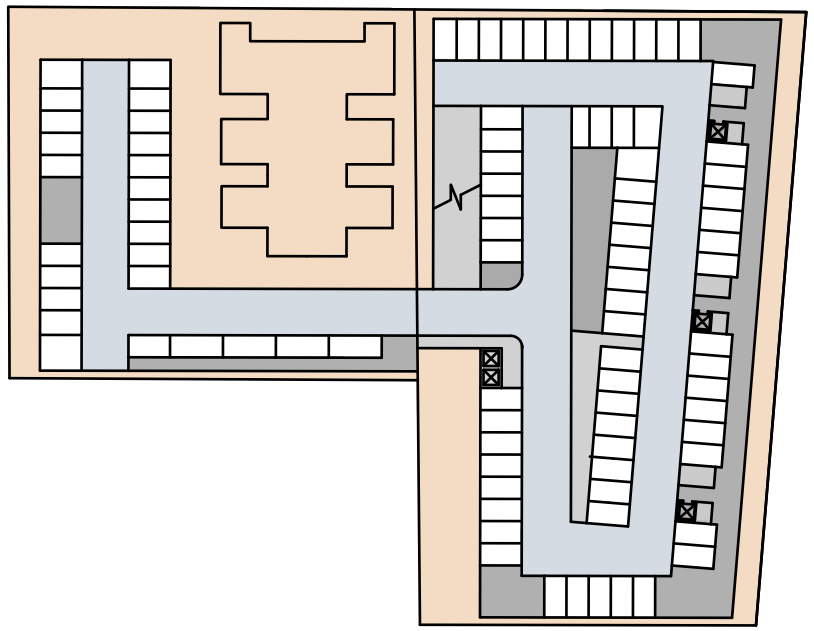
CONCEPT PLAN ONLY: SUBJECT TO DETAIL DESIGN

CONEPT PLAN -PROPOSED MIXED USE DEVELOPMENT. MANLY, NSW

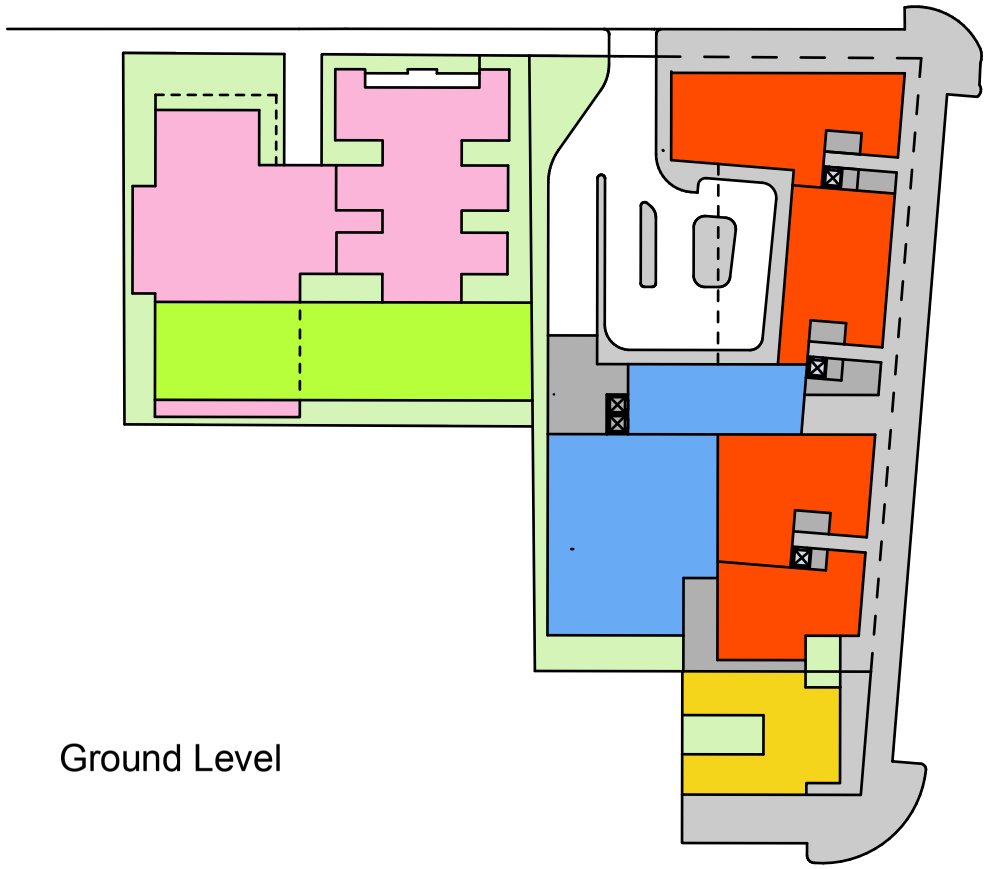
DATE **APR 2011**	Prepared for **ROYAL FAR WEST**	Drawing **PROPOSED GROUND FLOOR ANALYSIS**	Scale **1:1000**	Drawing no **CP-06**	Issue **C**

architectus™

Architecture
Urban Design
Planning
Interior Architecture



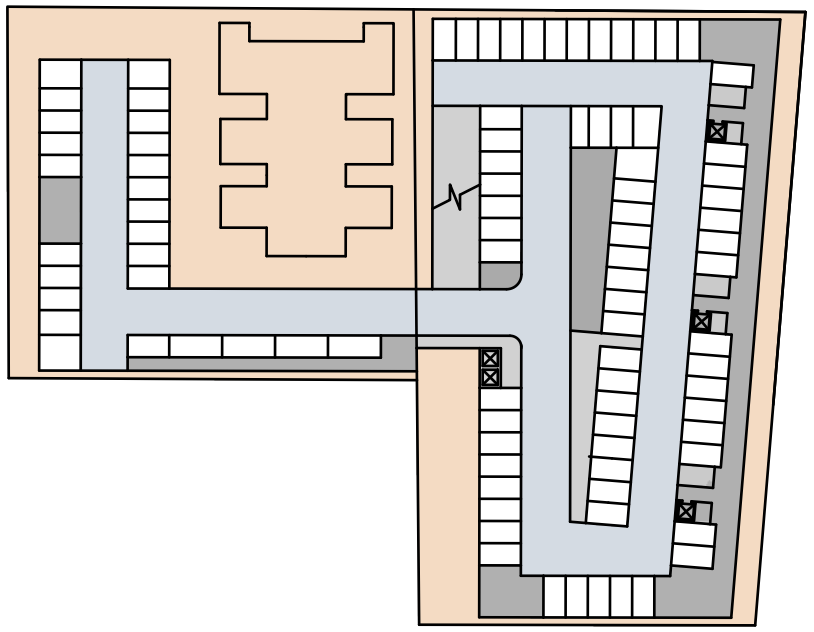
Level B2



Ground Level

legend

- residential
- royal far west use
- hotel use
- roof below
- retail
- Ground Level Landscaping
- Level 1 courtyard
- Childrens Playground



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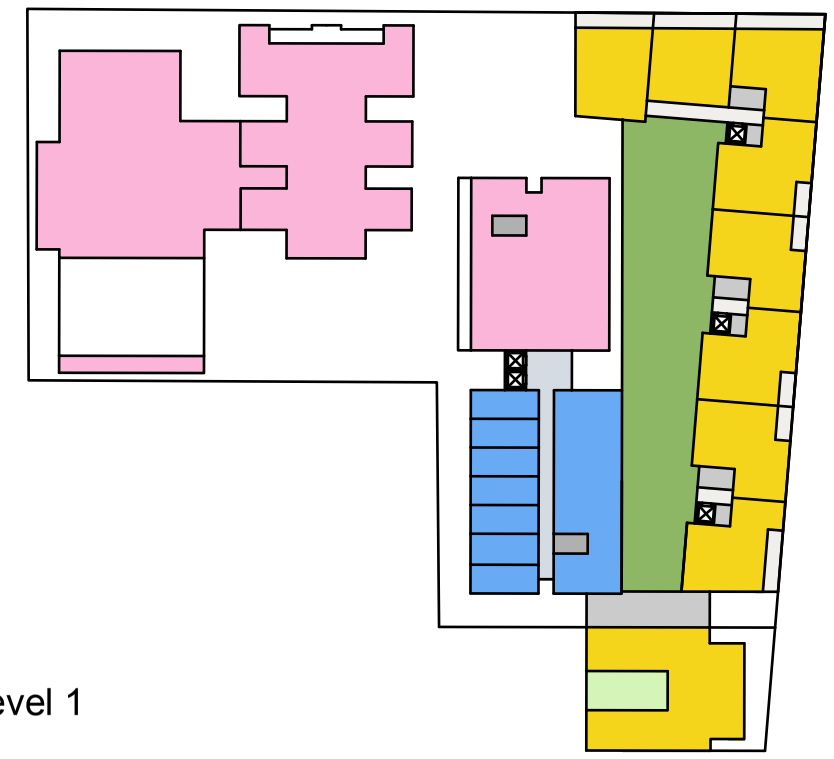


Level 1

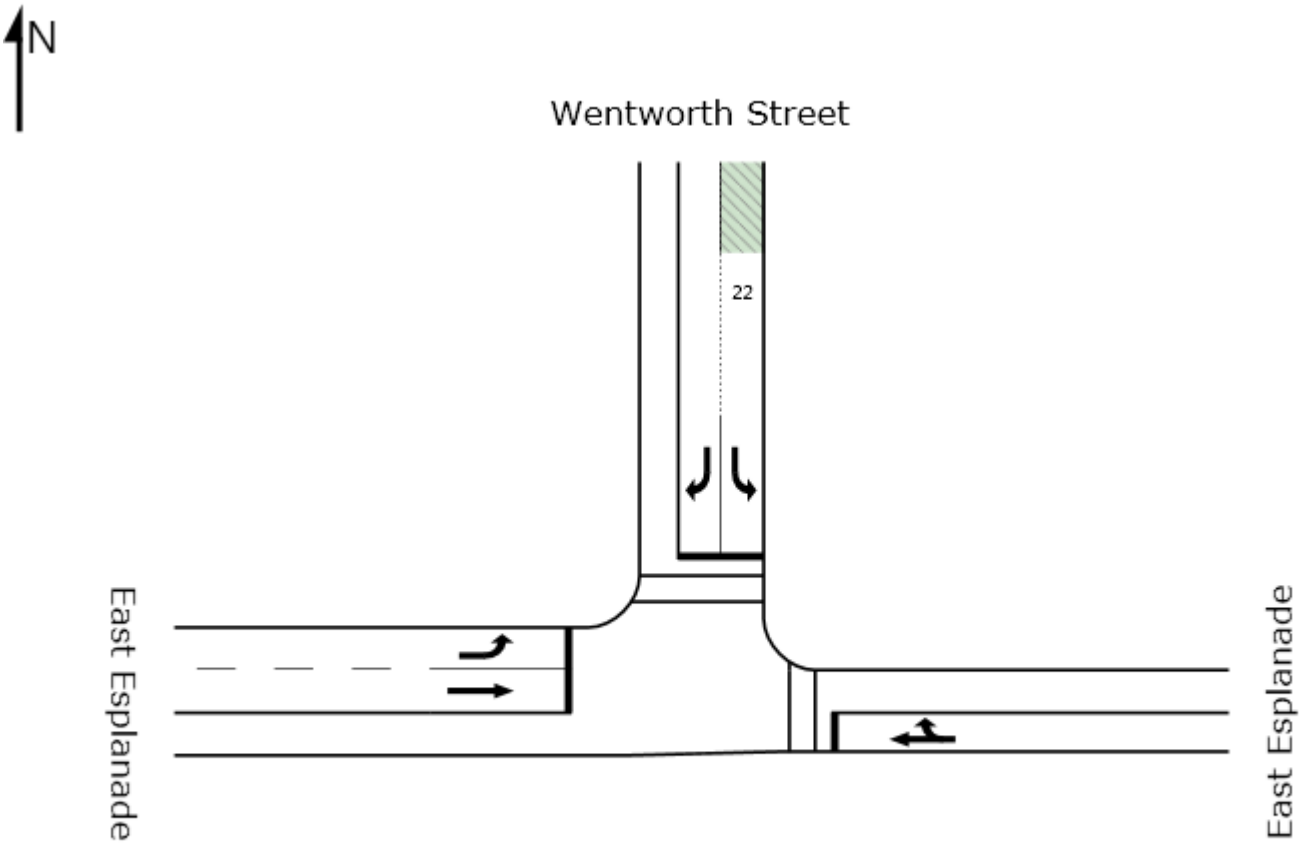
CONEPT PLAN -PROPOSED MIXED USE DEVELOPMENT. MANLY, NSW

CONCEPT PLAN ONLY: SUBJECT TO DETAIL DESIGN

DATE	Prepared for	Drawing	Scale	Drawing no	Issue
APR 2011	**ROYAL FAR WEST**	**INDICATIVE FLOOR PLANS: B2, B1, GF, L1**	**1:1000 @ A3**	**CP-14**	**C**

appendix c

sidra outputs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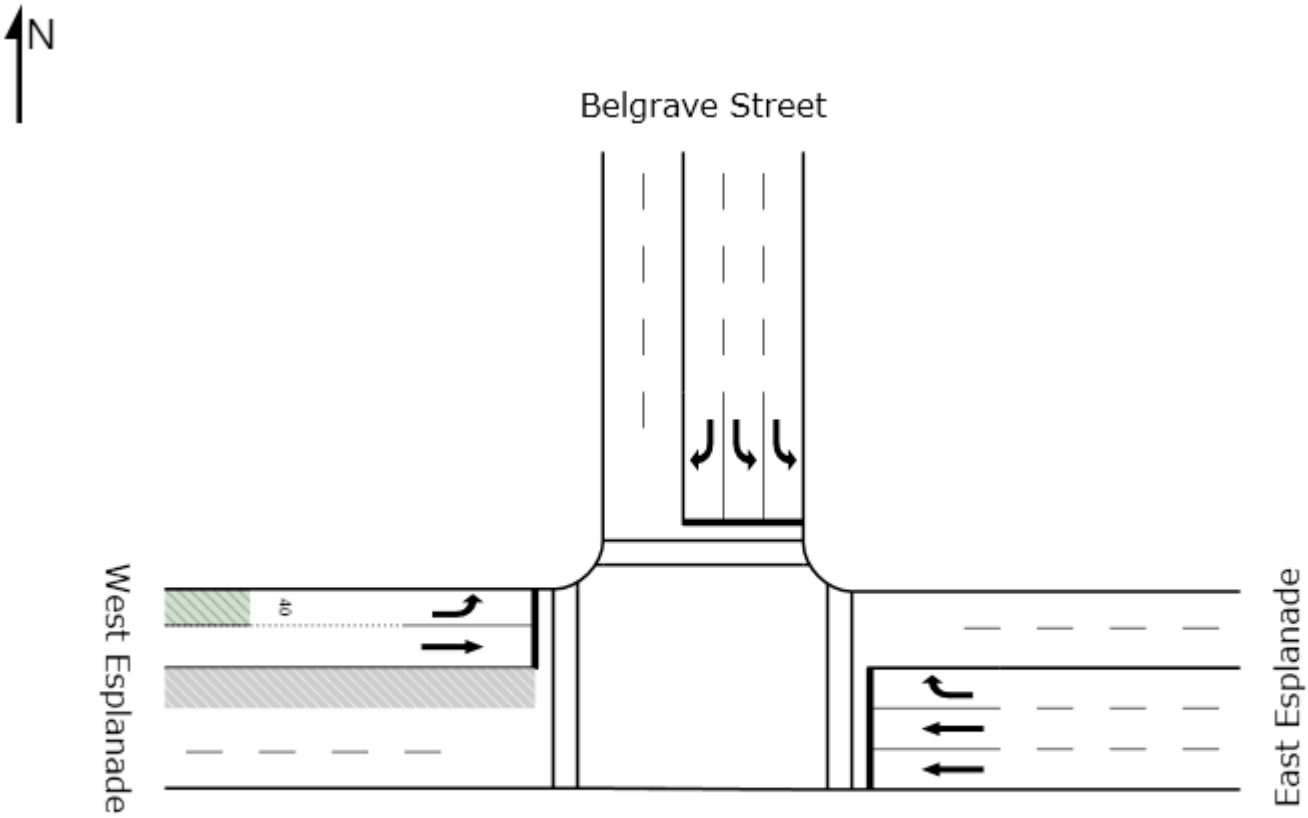
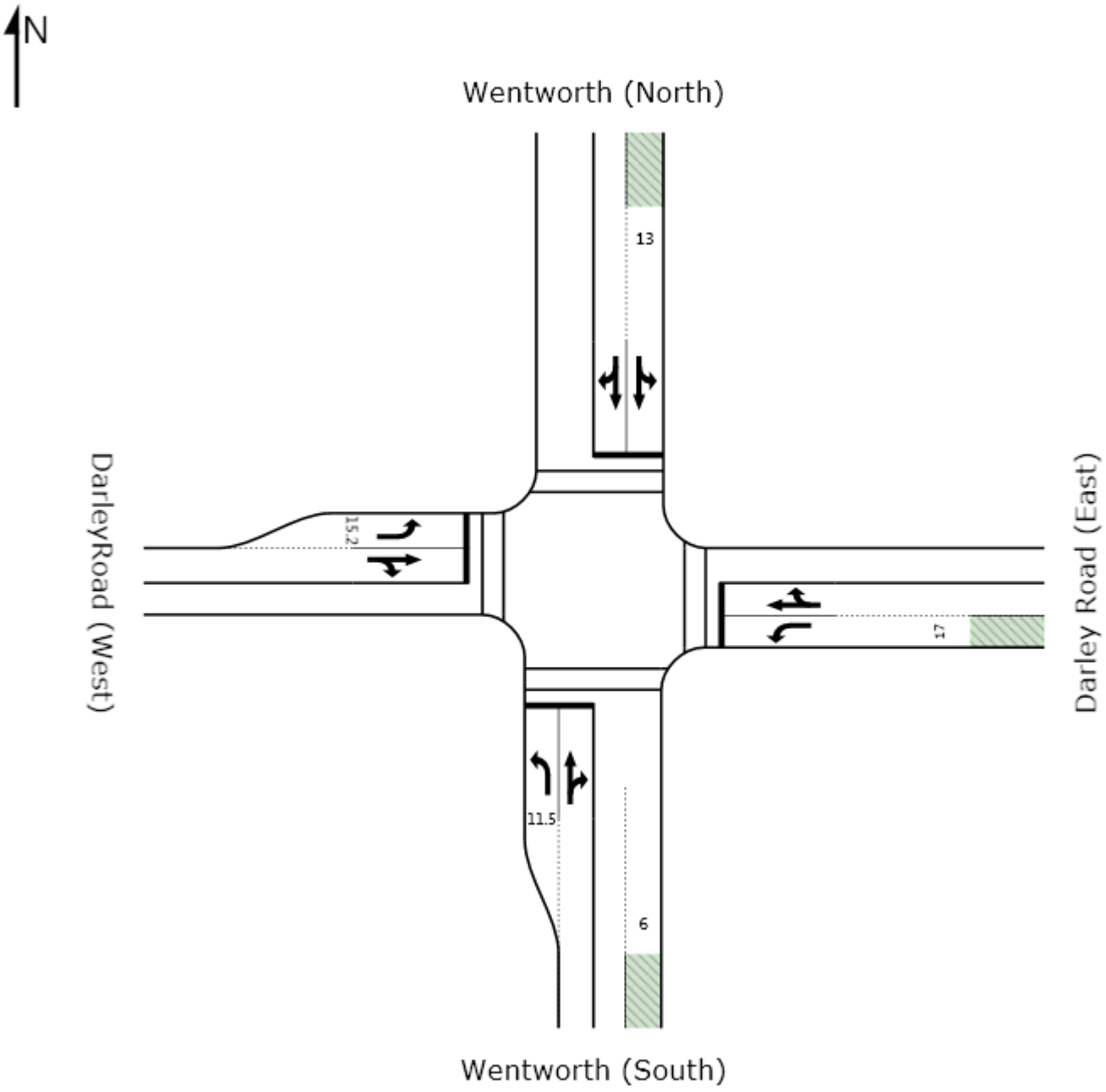
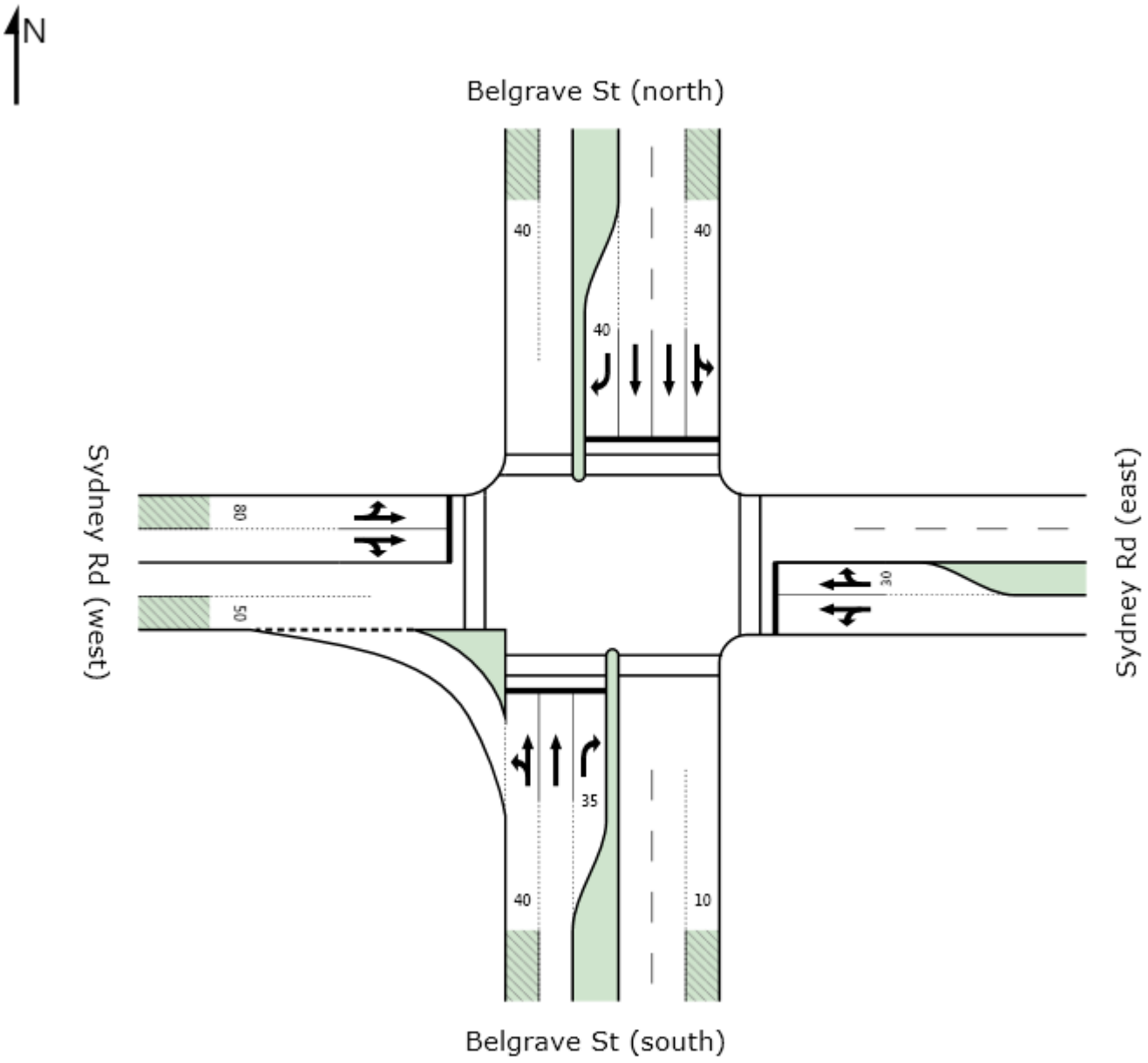
Wentworth Street
22
East Esplanade
East Esplanade


N
Belgrave Street
West Esplanade
East Esplanade


N
Wentworth (North)
DarleyRoad (West)
Darley Road (East)
Wentworth (South)
13
15.2
17
11.5
6


N
Belgrave St (north)
40
40
40
Sydney Rd (west)
80
50
Sydney Rd (east)
30
35
40
10
Belgrave St (south)

appendix c-1

am existing conditions

MOVEMENT SUMMARY

Site: East Esplanade/Wentworth _Existing AM

Intersection: Wentworth/East Esplanade
Period: AM
Intersection: Existing
Signals - Fixed Time Cycle Time = 100 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
East: East Esplanade											
5	T	641	7.5	0.565	11.8	LOS A	19.1	142.4	0.63	0.57	23.6
Approach		641	7.5	0.565	11.8	LOS A	19.1	142.4	0.63	0.57	23.6
North: Wentworth Street											
7	L	26	11.5	0.216	36.5	LOS C	1.5	11.2	0.78	0.69	13.5
9	R	73	0.0	0.151	37.3	LOS C	3.9	27.4	0.81	0.75	13.1
Approach		99	3.0	0.216	37.1	LOS C	3.9	27.4	0.80	0.74	13.2
West: East Esplanade											
10	L	176	2.8	0.157	14.9	LOS B	4.9	35.1	0.45	0.71	22.7
11	T	470	3.0	0.394	10.1	LOS A	12.9	92.8	0.54	0.48	25.5
Approach		646	2.9	0.394	11.4	LOS A	12.9	92.8	0.52	0.54	24.7
All Vehicles		1386	5.1	0.565	13.5	LOS A	19.1	142.4	0.59	0.57	22.7

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	30.4	LOS D	0.1	0.1	0.78	0.78
P5	Across N approach	53	10.1	LOS B	0.1	0.1	0.45	0.45
All Pedestrians		106	20.3				0.62	0.62

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

MOVEMENT SUMMARY

Site: E/W Esplanade/Belgrave Existing AM

Intersection: East/West Esplanade/ Belgrave Street
Period: AM
Scenario: Existing
Signals - Fixed Time Cycle Time = 114 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
East: East Esplanade											
5	T	377	2.7	0.433	14.8	LOS B	9.6	68.7	0.77	0.64	20.8
6	R	276	4.0	0.581	46.0	LOS D	14.9	107.7	0.92	0.83	10.7
Approach		653	3.2	0.581	28.0	LOS B	14.9	107.7	0.84	0.72	14.8
North: Belgrave Street											
7	L	332	4.8	0.479	29.9	LOS C	5.9	43.1	0.93	0.79	12.8
9	R	127	9.4	0.268	41.8	LOS C	7.2	54.4	0.83	0.78	9.9
Approach		459	6.1	0.479	33.2	LOS C	7.2	54.4	0.91	0.79	11.8
West: West Esplanade											
10	L	101	4.0	0.586	52.8	LOS D	6.7	48.3	0.93	0.78	22.0
11	T	357	1.1	0.594	36.1	LOS C	18.0	127.1	0.90	0.78	25.8
Approach		458	1.7	0.595	39.8	LOS C	18.0	127.1	0.91	0.78	24.8
All Vehicles		1570	3.6	0.595	33.0	LOS C	18.0	127.1	0.88	0.76	18.6

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	51.2	LOS E	0.2	0.2	0.95	0.95
P5	Across N approach	53	37.1	LOS D	0.1	0.1	0.81	0.81
P7	Across W approach	53	51.2	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		159	46.5				0.90	0.90

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: Darley/Wentworth _Exisitng AM

Intersection: Wentworth/Darley Rd
Period: AM
Scenario: Existing
Signals - Fixed Time Cycle Time = 50 seconds (Practical 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: Wentworth (South)											
1	L	47	2.0	0.271	13.2	LOS A	1.0	7.3	0.60	0.65	21.0
2	T	126	2.0	0.191	9.4	LOS A	3.3	23.4	0.64	0.52	22.4
3	R	23	2.0	0.191	14.0	LOS A	3.3	23.4	0.64	0.77	21.2
Approach		196	2.0	0.271	10.8	LOS A	3.3	23.4	0.63	0.58	21.9
East: Darley Road (East)											
4	L	11	2.0	0.053	17.1	LOS B	0.3	2.1	0.71	0.63	17.5
5	T	69	2.0	0.175	13.6	LOS A	2.5	18.0	0.75	0.59	17.9
6	R	25	2.0	0.175	18.1	LOS B	2.5	18.0	0.75	0.75	17.5
Approach		105	2.0	0.175	15.0	LOS B	2.5	18.0	0.75	0.64	17.8
North: Wentworth (North)											
7	L	36	2.0	0.185	13.1	LOS A	0.8	5.6	0.59	0.64	25.2
8	T	83	2.0	0.192	9.4	LOS A	3.0	21.0	0.64	0.52	26.3
9	R	49	2.0	0.192	13.9	LOS A	3.0	21.0	0.64	0.74	25.2
Approach		168	2.0	0.192	11.5	LOS A	3.0	21.0	0.63	0.61	25.7
West: DarleyRoad (West)											
10	L	46	2.0	0.248	17.5	LOS B	1.2	8.8	0.73	0.68	17.5
11	T	68	2.0	0.150	13.4	LOS A	2.3	16.0	0.75	0.58	18.4
12	R	16	2.0	0.149	18.2	LOS B	2.3	16.0	0.75	0.77	17.8
Approach		130	2.0	0.248	15.5	LOS B	2.3	16.0	0.74	0.64	18.0
All Vehicles		599	2.0	0.271	12.8	LOS A	3.3	23.4	0.68	0.61	21.6

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	19.4	LOS B	0.1	0.1	0.88	0.88
P3	Across E approach	53	12.3	LOS B	0.1	0.1	0.70	0.70
P5	Across N approach	53	18.5	LOS B	0.1	0.1	0.86	0.86
P7	Across W approach	53	12.3	LOS B	0.1	0.1	0.70	0.70
All Pedestrians		212	15.6				0.79	0.79

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

MOVEMENT SUMMARY

Site: Sydney/ Belgrave_Existing_AM

Intersection: Sydney Road / Belgrave Street
Period: AM
Scenario: Existing
Signals - Fixed Time Cycle Time = 130 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: Belgrave St (south)											
1	L	81	24.7	0.124	7.2	LOS A	0.8	6.6	0.16	0.59	35.8
2	T	340	8.2	0.398	12.6	LOS A	9.1	68.1	0.70	0.60	26.6
3	R	29	0.0	0.097	18.9	LOS B	0.9	6.3	0.63	0.69	23.7
Approach		450	10.7	0.398	12.0	LOS A	9.1	68.1	0.60	0.61	27.7
East: Sydney Rd (east)											
4	L	16	12.5	0.088	32.4	LOS C	1.6	11.7	0.85	0.72	12.5
5	T	35	0.0	0.245	23.0	LOS B	2.3	16.0	0.80	0.59	13.4
6	R	28	0.0	0.244	26.9	LOS B	2.3	16.0	0.76	0.73	14.5
Approach		79	2.5	0.244	26.3	LOS B	2.3	16.0	0.80	0.67	13.6
North: Belgrave St (north)											
7	L	186	2.2	0.454	17.9	LOS B	5.0	35.8	0.63	0.74	22.3
8	T	351	7.2	0.205	11.3	LOS A	4.7	35.3	0.63	0.52	25.8
9	R	162	5.7	1.000[3]	53.0	LOS D	10.6	77.7	0.96	0.82	10.7
Approach		699	5.4	1.000	22.8	LOS B	10.6	77.7	0.71	0.65	18.8
West: Sydney Rd (west)											
10	L	161	7.5	0.491	25.5	LOS B	9.1	67.1	0.79	0.80	20.3
11	T	128	2.3	0.491	31.8	LOS C	10.2	73.0	0.85	0.74	26.7
12	R	115	2.6	0.491	54.2	LOS D	10.2	73.0	0.94	0.88	12.1
Approach		404	4.5	0.491	35.7	LOS C	10.2	73.0	0.85	0.80	20.2
All Vehicles		1632	6.5	1.000	23.2	LOS B	10.6	77.7	0.72	0.68	20.9

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

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	158	59.1	LOS E	0.6	0.6	0.95	0.95
P3	Across E approach	211	36.2	LOS D	0.6	0.6	0.75	0.75
P5	Across N approach	211	59.1	LOS E	0.7	0.7	0.95	0.95
P7	Across W approach	211	59.1	LOS E	0.7	0.7	0.95	0.95
All Pedestrians		791	53.0				0.90	0.90

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).

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am future scenario

MOVEMENT SUMMARY

Site: East Esplanade/Wentworth _Existing+Dev AM

Intersection: Wentworth/East Esplanade
Period: AM
Scenario: Existing+Development
Signals - Fixed Time Cycle Time = 100 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
East: East Esplanade											
5	T	641	7.5	0.565	11.8	LOS A	19.1	142.4	0.63	0.57	23.6
Approach		641	7.5	0.565	11.8	LOS A	19.1	142.4	0.63	0.57	23.6
North: Wentworth Street											
7	L	26	11.5	0.058	36.5	LOS C	1.5	11.2	0.78	0.71	13.5
9	R	84	0.0	0.174	37.6	LOS C	4.5	31.2	0.81	0.76	13.1
Approach		110	2.7	0.174	37.3	LOS C	4.5	31.2	0.81	0.75	13.2
West: East Esplanade											
10	L	195	2.6	0.173	15.0	LOS B	5.4	38.7	0.45	0.72	22.7
11	T	470	3.0	0.394	10.1	LOS A	12.9	92.8	0.54	0.48	25.5
Approach		665	2.9	0.394	11.6	LOS A	12.9	92.8	0.51	0.55	24.6
All Vehicles		1416	4.9	0.565	13.7	LOS A	19.1	142.4	0.59	0.57	22.5

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	30.4	LOS D	0.1	0.1	0.78	0.78
P5	Across N approach	53	10.1	LOS B	0.1	0.1	0.45	0.45
All Pedestrians		106	20.3				0.62	0.62

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

MOVEMENT SUMMARY

Site: E/W Esplanade/Belgrave
Existing+Dev AM

Intersection: East/West Esplanade/ Belgrave Street
Period: AM
Scenario: Existing+Dev
Signals - Fixed Time Cycle Time = 114 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
East: East Esplanade											
5	T	383	2.6	0.439	14.9	LOS B	9.7	69.7	0.77	0.65	20.8
6	R	282	3.9	0.593	46.2	LOS D	15.2	109.9	0.93	0.83	10.7
Approach		665	3.2	0.593	28.1	LOS B	15.2	109.9	0.84	0.72	14.8
North: Belgrave Street											
7	L	351	4.6	0.506	30.1	LOS C	6.2	45.3	0.94	0.80	12.7
9	R	127	9.4	0.268	41.8	LOS C	7.2	54.4	0.83	0.78	9.9
Approach		478	5.9	0.506	33.2	LOS C	7.2	54.4	0.91	0.79	11.8
West: West Esplanade											
10	L	101	4.0	0.586	52.8	LOS D	6.7	48.3	0.93	0.78	22.0
11	T	357	1.1	0.594	36.1	LOS C	18.0	127.1	0.90	0.78	25.8
Approach		458	1.7	0.595	39.8	LOS C	18.0	127.1	0.91	0.78	24.8
All Vehicles		1601	3.6	0.595	33.0	LOS C	18.0	127.1	0.88	0.76	18.5

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	51.2	LOS E	0.2	0.2	0.95	0.95
P5	Across N approach	53	37.1	LOS D	0.1	0.1	0.81	0.81
P7	Across W approach	53	51.2	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		159	46.5				0.90	0.90

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: Darley/Wentworth _Exisitng AM+Dev

Intersection: Wentworth/Darley Rd
Period: AM
Scenario: Existing+Dev
Signals - Fixed Time Cycle Time = 50 seconds (Practical 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: Wentworth (South)											
1	L	47	2.0	0.271	13.2	LOS A	1.0	7.3	0.60	0.65	21.0
2	T	145	2.0	0.214	9.5	LOS A	3.7	26.3	0.65	0.53	22.3
3	R	23	2.0	0.215	14.1	LOS A	3.7	26.3	0.65	0.77	21.2
Approach		215	2.0	0.271	10.8	LOS A	3.7	26.3	0.64	0.59	21.9
East: Darley Road (East)											
4	L	11	2.0	0.053	17.1	LOS B	0.3	2.1	0.71	0.63	17.5
5	T	69	2.0	0.175	13.6	LOS A	2.5	18.0	0.75	0.59	17.9
6	R	25	2.0	0.175	18.1	LOS B	2.5	18.0	0.75	0.75	17.5
Approach		105	2.0	0.175	15.0	LOS B	2.5	18.0	0.75	0.64	17.8
North: Wentworth (North)											
7	L	36	2.0	0.185	13.1	LOS A	0.8	5.6	0.59	0.64	25.2
8	T	94	2.0	0.229	9.6	LOS A	3.5	24.6	0.66	0.54	26.1
9	R	60	2.0	0.229	14.1	LOS A	3.5	24.6	0.66	0.75	25.0
Approach		190	2.0	0.229	11.7	LOS A	3.5	24.6	0.65	0.62	25.6
West: DarleyRoad (West)											
10	L	46	2.0	0.248	17.5	LOS B	1.2	8.8	0.73	0.68	17.5
11	T	68	2.0	0.150	13.4	LOS A	2.3	16.0	0.75	0.58	18.4
12	R	16	2.0	0.149	18.2	LOS B	2.3	16.0	0.75	0.77	17.8
Approach		130	2.0	0.248	15.5	LOS B	2.3	16.0	0.74	0.64	18.0
All Vehicles		640	2.0	0.271	12.7	LOS A	3.7	26.3	0.68	0.62	21.7

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	19.4	LOS B	0.1	0.1	0.88	0.88
P3	Across E approach	53	12.3	LOS B	0.1	0.1	0.70	0.70
P5	Across N approach	53	18.5	LOS B	0.1	0.1	0.86	0.86
P7	Across W approach	53	12.3	LOS B	0.1	0.1	0.70	0.70
All Pedestrians		212	15.6				0.79	0.79

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

MOVEMENT SUMMARY

Site: Sydney/Belgrave_Existing +Dev_AM

Intersection: Sydney Road / Belgrave Street
Period: AM
Scenario: Existing+Development
Signals - Fixed Time Cycle Time = 130 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: Belgrave St (south)											
1	L	87	23.0	0.181	8.4	LOS A	1.4	12.1	0.23	0.61	33.9
2	T	340	8.2	0.398	12.6	LOS A	9.1	68.1	0.70	0.60	26.6
3	R	29	0.0	0.097	18.9	LOS B	0.9	6.3	0.63	0.69	23.7
Approach		456	10.5	0.398	12.2	LOS A	9.1	68.1	0.61	0.61	27.5
East: Sydney Rd (east)											
4	L	16	12.5	0.099	31.7	LOS C	1.8	13.2	0.85	0.74	12.7
5	T	46	0.0	0.276	23.1	LOS B	2.6	18.1	0.81	0.60	13.4
6	R	28	0.0	0.276	27.6	LOS B	2.6	18.1	0.77	0.74	14.3
Approach		90	2.2	0.276	26.0	LOS B	2.6	18.1	0.80	0.67	13.6
North: Belgrave St (north)											
7	L	186	2.2	0.454	17.9	LOS B	5.0	35.8	0.63	0.74	22.3
8	T	372	7.2	0.217	11.4	LOS A	5.0	37.4	0.63	0.52	25.6
9	R	163	5.1	1.000[3]	53.0	LOS D	10.6	77.6	0.96	0.82	10.7
Approach		721	5.3	1.000	22.5	LOS B	10.6	77.6	0.71	0.65	18.9
West: Sydney Rd (west)											
10	L	180	6.7	0.537	25.8	LOS B	10.0	73.0	0.80	0.80	20.2
11	T	128	2.3	0.537	31.8	LOS C	11.2	80.2	0.86	0.74	26.6
12	R	134	2.2	0.537	55.8	LOS D	11.2	80.2	0.95	0.88	11.8
Approach		442	4.1	0.537	36.6	LOS C	11.2	80.2	0.86	0.81	19.6
All Vehicles		1709	6.2	1.000	23.6	LOS B	11.2	80.2	0.73	0.68	20.6

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

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	158	59.1	LOS E	0.6	0.6	0.95	0.95
P3	Across E approach	211	36.2	LOS D	0.6	0.6	0.75	0.75
P5	Across N approach	211	59.1	LOS E	0.7	0.7	0.95	0.95
P7	Across W approach	211	59.1	LOS E	0.7	0.7	0.95	0.95
All Pedestrians		791	53.0				0.90	0.90

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).

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pm existing conditions

MOVEMENT SUMMARY

Site: East Esplanade/Wentworth _Existing PM

Intersection: Wentworth/East Esplanade
Period: PM
Intersection: Existing
Signals - Fixed Time Cycle Time = 100 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
East: East Esplanade											
5	T	953	1.2	0.806	15.5	LOS B	35.3	249.8	0.83	0.77	20.2
Approach		953	1.2	0.807	15.5	LOS B	35.3	249.8	0.83	0.77	20.2
North: Wentworth Street											
7	L	21	0.0	0.158	36.0	LOS C	1.2	8.3	0.78	0.68	13.6
9	R	150	0.7	0.312	38.9	LOS C	7.6	53.5	0.85	0.79	12.7
Approach		171	0.6	0.312	38.6	LOS C	7.6	53.5	0.84	0.77	12.8
West: East Esplanade											
10	L	202	2.0	0.179	15.0	LOS B	5.6	39.9	0.45	0.72	22.6
11	T	442	1.1	0.366	9.9	LOS A	12.1	85.2	0.53	0.47	25.8
Approach		644	1.4	0.366	11.5	LOS A	12.1	85.2	0.51	0.55	24.7
All Vehicles		1768	1.2	0.807	16.3	LOS B	35.3	249.8	0.71	0.69	20.3

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	30.4	LOS D	0.1	0.1	0.78	0.78
P5	Across N approach	53	10.1	LOS B	0.1	0.1	0.45	0.45
All Pedestrians		106	20.3				0.62	0.62

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

MOVEMENT SUMMARY

Site: E/W Esplanade/Belgrave Existing PM

Intersection: East/West Esplanade/ Belgrave Street
Period: PM
Scenario: Existing
Signals - Fixed Time Cycle Time = 110 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
East: East Esplanade											
5	T	473	0.8	0.571	16.1	LOS B	12.1	85.3	0.84	0.71	19.8
6	R	437	1.6	0.793	47.7	LOS D	23.6	167.2	0.98	0.91	10.4
Approach		910	1.2	0.793	31.3	LOS C	23.6	167.2	0.91	0.80	13.8
North: Belgrave Street											
7	L	439	1.4	0.597	31.4	LOS C	8.0	57.0	0.96	0.82	12.3
9	R	299	2.7	0.582	43.3	LOS D	15.3	109.3	0.91	0.83	9.6
Approach		738	1.9	0.597	36.2	LOS C	15.3	109.3	0.94	0.83	11.0
West: West Esplanade											
10	L	101	3.0	0.327	50.3	LOS D	6.4	46.0	0.92	0.78	22.6
11	T	389	0.3	0.777	43.7	LOS D	21.2	149.1	0.99	0.91	23.5
Approach		490	0.8	0.777	45.1	LOS D	21.2	149.1	0.98	0.88	23.3
All Vehicles		2138	1.4	0.793	36.1	LOS C	23.6	167.2	0.93	0.83	16.5

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	49.2	LOS E	0.2	0.2	0.95	0.95
P5	Across N approach	53	41.0	LOS E	0.1	0.1	0.86	0.86
P7	Across W approach	53	49.2	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		159	46.5				0.92	0.92

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: Darley/Wentworth _Exisitng PM

Intersection: Wentworth/Darley Rd
Period: PM
Scenario: Existing
Signals - Fixed Time Cycle Time = 50 seconds (Practical 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: Wentworth (South)											
1	L	32	2.0	0.209	15.9	LOS B	0.8	5.7	0.68	0.65	19.2
2	T	118	2.0	0.242	12.4	LOS A	3.7	26.5	0.74	0.60	19.7
3	R	30	2.0	0.242	17.0	LOS B	3.7	26.5	0.74	0.77	19.2
Approach		180	2.0	0.242	13.8	LOS A	3.7	26.5	0.73	0.64	19.5
East: Darley Road (East)											
4	L	32	2.0	0.139	14.4	LOS A	0.8	5.4	0.63	0.65	19.2
5	T	114	2.0	0.250	11.1	LOS A	3.9	27.8	0.70	0.58	19.8
6	R	50	2.0	0.250	15.6	LOS B	3.9	27.8	0.70	0.77	19.0
Approach		196	2.0	0.250	12.8	LOS A	3.9	27.8	0.69	0.64	19.5
North: Wentworth (North)											
7	L	51	2.0	0.299	16.0	LOS B	1.3	9.1	0.69	0.67	23.3
8	T	119	2.0	0.284	12.7	LOS A	4.2	30.1	0.75	0.62	23.8
9	R	48	2.0	0.285	17.2	LOS B	4.2	30.1	0.75	0.77	23.2
Approach		218	2.0	0.299	14.4	LOS A	4.2	30.1	0.74	0.66	23.5
West: DarleyRoad (West)											
10	L	65	2.0	0.312	14.7	LOS B	1.5	10.9	0.65	0.67	19.3
11	T	74	2.0	0.155	10.6	LOS A	2.4	17.3	0.67	0.53	20.5
12	R	28	2.0	0.155	15.3	LOS B	2.4	17.3	0.67	0.76	19.5
Approach		167	2.0	0.312	13.0	LOS A	2.4	17.3	0.66	0.63	19.8
All Vehicles		761	2.0	0.312	13.5	LOS A	4.2	30.1	0.71	0.64	21.0

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	16.0	LOS B	0.1	0.1	0.80	0.80
P3	Across E approach	53	15.2	LOS B	0.1	0.1	0.78	0.78
P5	Across N approach	53	15.2	LOS B	0.1	0.1	0.78	0.78
P7	Across W approach	53	15.2	LOS B	0.1	0.1	0.78	0.78
All Pedestrians		212	15.4				0.79	0.79

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

MOVEMENT SUMMARY

Site: Sydney/ Belgrave_Existing_PM

Intersection: Sydney Road / Belgrave Street
Period: PM
Scenario: Existing
Signals - Fixed Time Cycle Time = 130 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: Belgrave St (south)											
1	L	127	7.1	0.191	7.3	LOS A	1.5	11.3	0.19	0.61	35.2
2	T	261	8.0	0.305	12.0	LOS A	7.0	52.3	0.67	0.56	27.2
3	R	32	0.0	0.106	18.9	LOS B	1.0	7.0	0.63	0.69	23.7
Approach		420	7.1	0.305	11.1	LOS A	7.0	52.3	0.52	0.59	28.9
East: Sydney Rd (east)											
4	L	16	0.0	0.164	29.3	LOS C	3.3	22.9	0.84	0.78	13.7
5	T	92	1.1	0.457	22.7	LOS B	4.1	29.3	0.82	0.64	13.7
6	R	51	2.0	0.458	28.3	LOS B	4.1	29.3	0.80	0.75	14.0
Approach		159	1.3	0.457	25.2	LOS B	4.1	29.3	0.82	0.69	13.8
North: Belgrave St (north)											
7	L	165	0.6	0.401	17.7	LOS B	4.5	31.4	0.62	0.74	22.5
8	T	386	2.1	0.219	11.4	LOS A	5.2	37.1	0.63	0.52	25.6
9	R	171	3.6	1.000[3]	51.9	LOS D	10.7	77.4	0.97	0.83	10.9
Approach		722	2.2	1.000	22.4	LOS B	10.7	77.4	0.71	0.64	18.9
West: Sydney Rd (west)											
10	L	179	1.7	0.536	25.7	LOS B	10.2	72.3	0.80	0.81	20.2
11	T	137	1.5	0.536	31.0	LOS C	11.0	78.0	0.86	0.74	26.9
12	R	129	1.6	0.536	55.6	LOS D	11.0	78.0	0.95	0.88	11.8
Approach		445	1.6	0.535	36.0	LOS C	11.0	78.0	0.86	0.81	19.9
All Vehicles		1746	3.2	1.000	23.4	LOS B	11.0	78.0	0.71	0.68	20.6

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

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	158	59.1	LOS E	0.6	0.6	0.95	0.95
P3	Across E approach	211	36.2	LOS D	0.6	0.6	0.75	0.75
P5	Across N approach	211	59.1	LOS E	0.7	0.7	0.95	0.95
P7	Across W approach	211	59.1	LOS E	0.7	0.7	0.95	0.95
All Pedestrians		791	53.0				0.90	0.90

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).

appendix c-4

pm future scenario

MOVEMENT SUMMARY

Site: East Esplanade/Wentworth _Existing+Dev PM

Intersection: Wentworth/East Esplanade
Period: PM
Scenario: Existing+Development
Signals - Fixed Time Cycle Time = 100 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
East: East Esplanade											
5	T	953	1.2	0.806	15.5	LOS B	35.3	249.8	0.83	0.77	20.2
Approach		953	1.2	0.807	15.5	LOS B	35.3	249.8	0.83	0.77	20.2
North: Wentworth Street											
7	L	21	0.0	0.043	36.0	LOS C	1.2	8.3	0.78	0.70	13.6
9	R	160	0.6	0.333	39.1	LOS C	8.1	56.7	0.86	0.79	12.7
Approach		181	0.6	0.333	38.8	LOS C	8.1	56.7	0.85	0.78	12.8
West: East Esplanade											
10	L	224	1.8	0.198	15.2	LOS B	6.2	44.0	0.46	0.72	22.5
11	T	442	1.1	0.366	9.9	LOS A	12.1	85.2	0.53	0.47	25.8
Approach		666	1.4	0.366	11.7	LOS A	12.1	85.2	0.51	0.55	24.6
All Vehicles		1800	1.2	0.807	16.4	LOS B	35.3	249.8	0.71	0.69	20.3

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	30.4	LOS D	0.1	0.1	0.78	0.78
P5	Across N approach	53	10.1	LOS B	0.1	0.1	0.45	0.45
All Pedestrians		106	20.3				0.62	0.62

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

MOVEMENT SUMMARY

Site: E/W Esplanade/Belgrave
Existing+Dev PM

Intersection: East/West Esplanade/ Belgrave Street
Period: PM
Scenario: Existing+Dev
Signals - Fixed Time Cycle Time = 110 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
East: East Esplanade											
5	T	478	0.8	0.577	16.1	LOS B	12.2	86.3	0.84	0.71	19.8
6	R	442	1.6	0.802	48.3	LOS D	24.0	170.6	0.99	0.91	10.3
Approach		920	1.2	0.802	31.6	LOS C	24.0	170.6	0.91	0.81	13.7
North: Belgrave Street											
7	L	461	1.3	0.626	32.7	LOS C	8.4	59.3	0.96	0.84	11.9
9	R	299	2.7	0.582	43.3	LOS D	15.3	109.3	0.91	0.83	9.6
Approach		760	1.8	0.626	36.9	LOS C	15.3	109.3	0.94	0.84	10.9
West: West Esplanade											
10	L	101	3.0	0.327	50.3	LOS D	6.4	46.0	0.92	0.78	22.6
11	T	389	0.3	0.777	43.7	LOS D	21.2	149.1	0.99	0.91	23.5
Approach		490	0.8	0.777	45.1	LOS D	21.2	149.1	0.98	0.88	23.3
All Vehicles		2170	1.3	0.802	36.5	LOS C	24.0	170.6	0.94	0.83	16.3

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P3	Across E approach	53	49.2	LOS E	0.2	0.2	0.95	0.95
P5	Across N approach	53	41.0	LOS E	0.1	0.1	0.86	0.86
P7	Across W approach	53	49.2	LOS E	0.2	0.2	0.95	0.95
All Pedestrians		159	46.5				0.92	0.92

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: Darley/Wentworth _Exisitng +Dev PM

Intersection: Wentworth/Darley Rd
Period: PM
Scenario: Existing+Dev
Signals - Fixed Time Cycle Time = 50 seconds (Practical 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: Wentworth (South)											
1	L	32	2.0	0.203	15.1	LOS B	0.8	5.5	0.66	0.65	19.6
2	T	140	2.0	0.260	11.8	LOS A	4.1	29.5	0.73	0.59	20.2
3	R	30	2.0	0.260	16.4	LOS B	4.1	29.5	0.73	0.78	19.6
Approach		202	2.0	0.260	13.0	LOS A	4.1	29.5	0.71	0.63	20.0
East: Darley Road (East)											
4	L	32	2.0	0.143	15.1	LOS B	0.8	5.6	0.66	0.65	18.7
5	T	114	2.0	0.263	11.8	LOS A	4.0	28.6	0.73	0.59	19.1
6	R	50	2.0	0.263	16.4	LOS B	4.0	28.6	0.73	0.77	18.6
Approach		196	2.0	0.263	13.5	LOS A	4.0	28.6	0.72	0.65	18.9
North: Wentworth (North)											
7	L	51	2.0	0.290	15.3	LOS B	1.2	8.8	0.66	0.67	23.8
8	T	129	2.0	0.309	12.1	LOS A	4.6	32.8	0.74	0.61	24.2
9	R	58	2.0	0.309	16.6	LOS B	4.6	32.8	0.74	0.77	23.5
Approach		238	2.0	0.309	13.9	LOS A	4.6	32.8	0.73	0.66	23.9
West: DarleyRoad (West)											
10	L	65	2.0	0.322	15.4	LOS B	1.6	11.3	0.67	0.68	18.8
11	T	74	2.0	0.162	11.3	LOS A	2.5	17.8	0.69	0.55	19.9
12	R	28	2.0	0.162	16.1	LOS B	2.5	17.8	0.69	0.77	19.0
Approach		167	2.0	0.322	13.7	LOS A	2.5	17.8	0.69	0.64	19.3
All Vehicles		803	2.0	0.322	13.5	LOS A	4.6	32.8	0.71	0.65	21.0

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	16.8	LOS B	0.1	0.1	0.82	0.82
P3	Across E approach	53	14.4	LOS B	0.1	0.1	0.76	0.76
P5	Across N approach	53	16.0	LOS B	0.1	0.1	0.80	0.80
P7	Across W approach	53	14.4	LOS B	0.1	0.1	0.76	0.76
All Pedestrians		212	15.4				0.79	0.79

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

MOVEMENT SUMMARY

Site: Sydney/Belgrave_Existing +Dev_PM

Intersection: Sydney Road / Belgrave Street
Period: PM
Scenario: Existing+Development
Signals - Fixed Time Cycle Time = 130 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: Belgrave St (south)											
1	L	132	6.8	0.205	7.4	LOS A	1.7	12.5	0.20	0.61	35.0
2	T	261	8.0	0.305	12.0	LOS A	7.0	52.3	0.67	0.56	27.2
3	R	32	0.0	0.108	19.6	LOS B	1.0	7.2	0.64	0.69	23.3
Approach		425	7.1	0.305	11.1	LOS A	7.0	52.3	0.52	0.59	28.9
East: Sydney Rd (east)											
4	L	16	0.0	0.175	29.3	LOS C	3.5	24.5	0.84	0.78	13.7
5	T	102	1.0	0.486	23.0	LOS B	4.4	31.0	0.83	0.64	13.6
6	R	51	2.0	0.485	29.3	LOS C	4.4	31.0	0.82	0.76	13.6
Approach		169	1.2	0.486	25.5	LOS B	4.4	31.0	0.83	0.69	13.6
North: Belgrave St (north)											
7	L	165	0.6	0.401	17.7	LOS B	4.5	31.4	0.62	0.74	22.5
8	T	405	2.1	0.230	11.5	LOS A	5.5	39.0	0.64	0.53	25.4
9	R	171	3.3	1.000[3]	51.9	LOS D	10.8	77.4	0.97	0.83	10.9
Approach		741	2.2	1.000	22.2	LOS B	10.8	77.4	0.71	0.64	19.0
West: Sydney Rd (west)											
10	L	201	1.5	0.590	26.0	LOS B	11.2	79.3	0.81	0.81	20.0
11	T	137	1.5	0.590	30.8	LOS C	12.1	86.0	0.87	0.75	26.9
12	R	151	1.3	0.590	57.2	LOS E	12.1	86.0	0.96	0.89	11.6
Approach		489	1.4	0.590	37.0	LOS C	12.1	86.0	0.87	0.82	19.3
All Vehicles		1824	3.0	1.000	23.9	LOS B	12.1	86.0	0.72	0.68	20.3

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

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

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	158	59.1	LOS E	0.6	0.6	0.95	0.95
P3	Across E approach	211	36.2	LOS D	0.6	0.6	0.75	0.75
P5	Across N approach	211	59.1	LOS E	0.7	0.7	0.95	0.95
P7	Across W approach	211	59.1	LOS E	0.7	0.7	0.95	0.95
All Pedestrians		791	53.0				0.90	0.90

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).