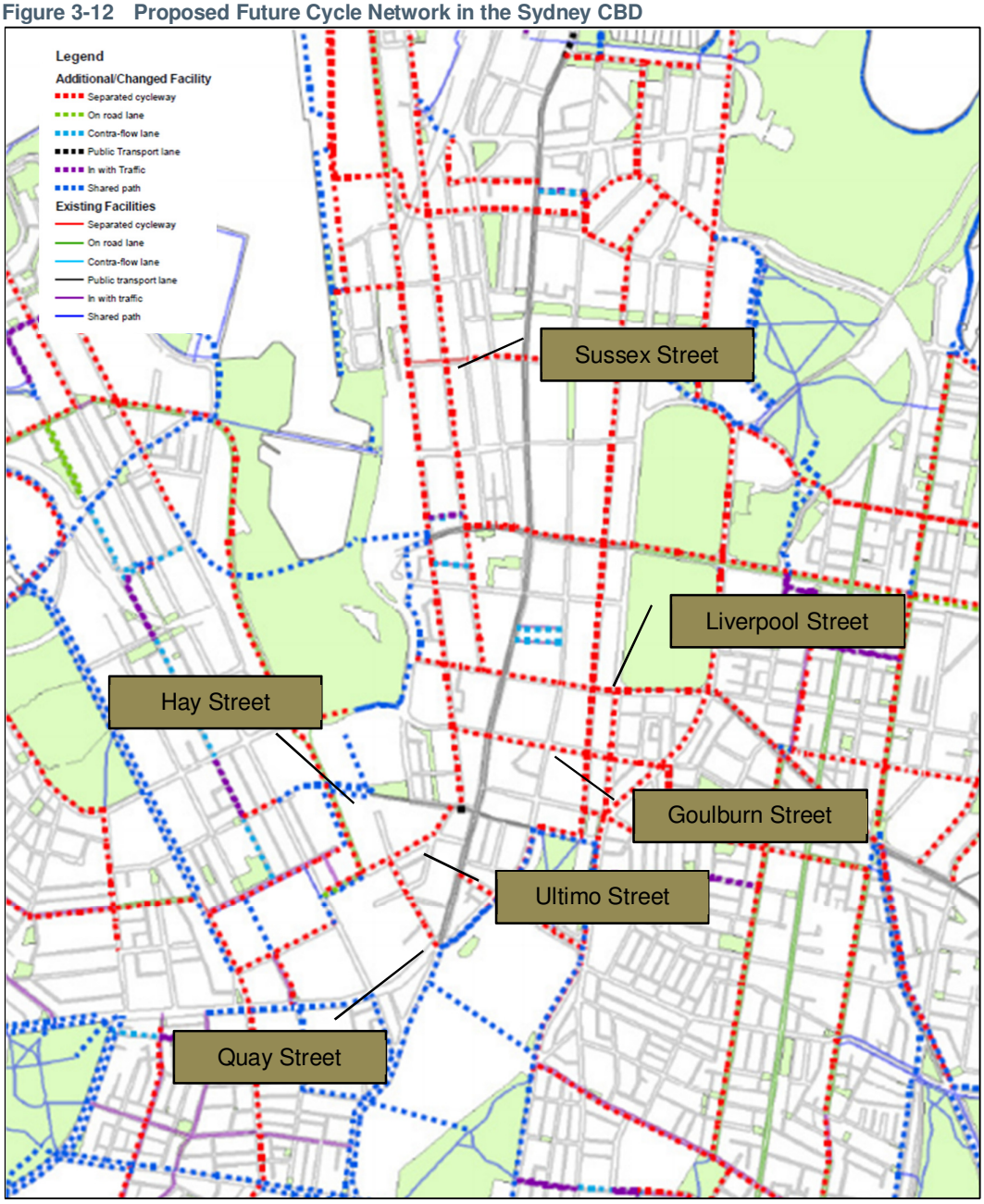
3-12 shows the proposed future cycle network in the Sydney CBD. The key cycle facilities proposed within the vicinity of SICEEP include:

- A separated cycle path along Ultimo Road linking Harris Street to Hay Street;
- A separated cycle path along Hay Street;
- Separated cycle paths along Sussex Street, Goulburn Street and Liverpool Street

Figure 3-12 Proposed Future Cycle Network in the Sydney CBD



Source: www.cityofsydney.gov.au

3.4 PARKING

3.4.1 EXISTING PARKING SUPPLY

There are a number of public carparks located adjacent to and within walking distance to the SICEEP that can accommodate a total of approximately 10,000 bays (including all existing facilities).

Figure 3-13 presents the locations of these car parks with Table 3-12 indicating their respective capacities.

Table 3-12 Car Parking Capacity

Map ID	Car Park	Bays	Availability[1]	
			Day	Evening
1	Exhibition Centre	900	800	600
2	Sydney Entertainment Centre	1900	926	1423
3	Harbourside[2]	1387	152	568
4	1 Dixon Street	100	14	53
5	Darling Quarter	600	66	246
6	Darling Park	680	110	410
7	320 Harris Street	260	28	106
8	Market City[1]	614	68	250
9	World Square[1]	557	62	227
10	Star City[2]	2500	1282	1588
11	Citigate Central (Thomas St) [1]	600	67	245
	Total	10,098	3575	5716

[1] Cited in Halcrow Traffic report with availability within 5 minutes walk

[2] Cited in Halcrow Traffic report with availability within 5 minutes travel

The carparks listed in Table 3-12 are the carparks that were surveyed. There are other public carparks within a 10 minute walk that can also potentially service the excess parking demand during peak periods. These carparks are listed in Table 3-13.

Table 3-13 Additional Carparks within a 10-Minute Walk Distance

Map ID	Car Park
A	Capitol Square
B	HSBS Centre
C	Cinema Centre
D	234 Sussex
E	Citipark

Map ID	Car Park
F	2 Market Street
G	Her Majesty's

Figure 3-13 Locations of Car Parking in the vicinity of the SICEEP

4 TRAFFIC MODELLING APPROACH

4.1 OVERVIEW OF THE TRAFFIC MODELLING APPROACH

A micro-simulation model was developed for the core study area. AIMSUN (Advanced Interactive Microscopic Simulator for Urban and Non-Urban Networks) is a dynamic transport modeling software tool that has the ability to model the movements of individual vehicles and their interactions with other traffic and network constraints. This level of modeling is well suited for modeling traffic circulation in urban centres, and developments such as the SICEEP development. The network modelling was then supplemented by more detailed assessments of selected key intersections using the SIDRA intersection modelling software to test intersection performance at the isolated level during the selected peak hours and to identify potential measures to achieve improved outcomes.

The traffic modelling encompasses the Whole of Precinct (WOP) and investigates cumulative impacts from the development of the PPP, The Haymarket and the Hotel. The future modelling scenario represents 'worst case scenario' analysis and accounts for design proposals put forth at this time of writing.

4.2 AIMSUN MODELLING

The base AIMSUN model was initially developed by Mott MacDonald[1] for INSW. The base model represented existing conditions on a Friday PM Peak (5:30 pm to 6:30 pm) with a network coverage consisting of 14 intersections. The Mott MacDonald base model employed the traffic state demand method and did not include pedestrian movements at the intersection. As agreed with the INSW, the base model developed by Mott MacDonald will be adopted by Hyder but further developed to incorporate Darling Harbour Live's masterplan, specifically:

- Reconfiguration and realignment of Darling Drive;
- Additional zones to represent car park access (ingress and egress); and
- Incorporate pedestrian movements at intersections.

Furthermore,

- A Saturday PM peak model was also developed; and
- Calibration and validation checks were undertaken

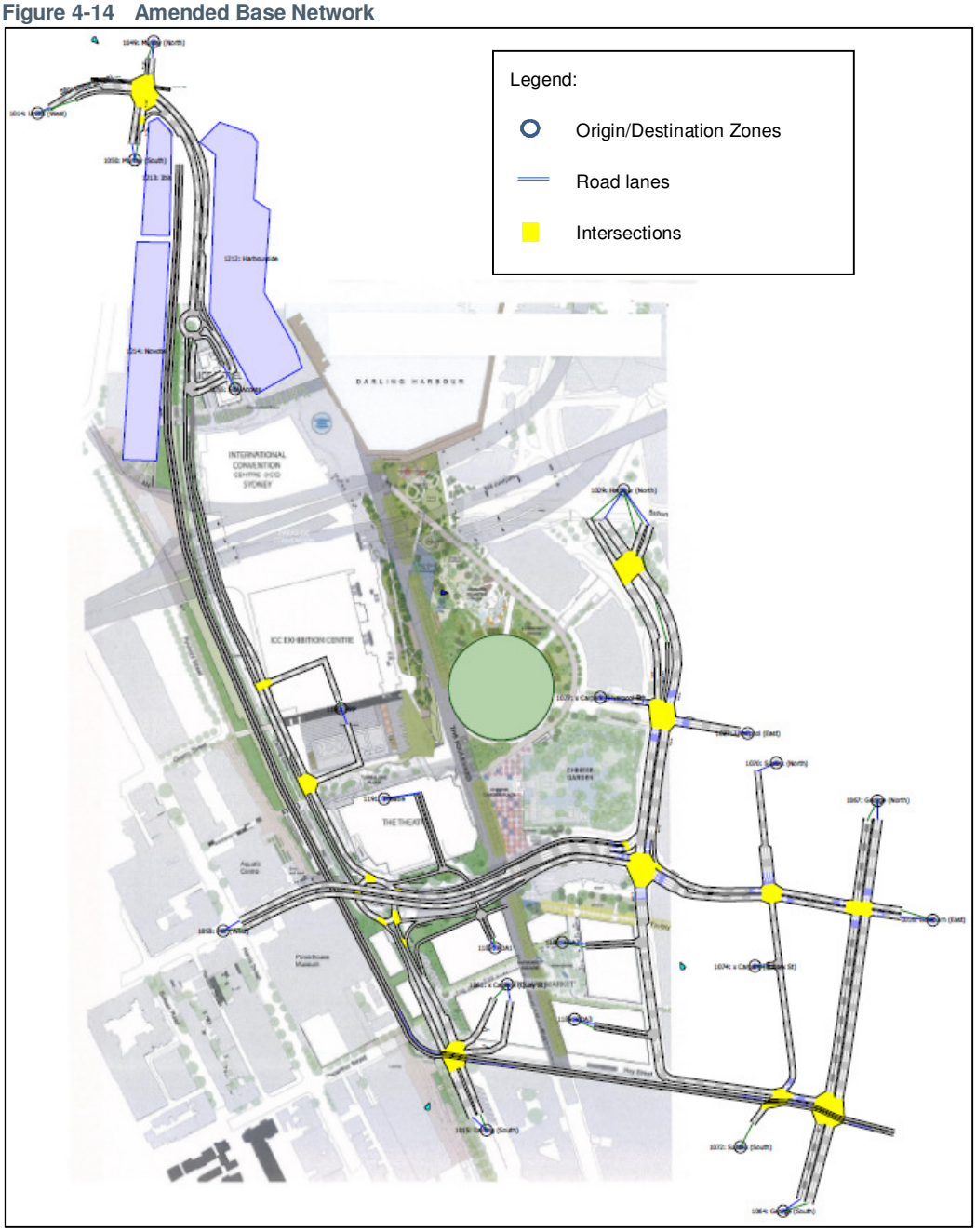
The future AIMSUN (Non-event and Event) models were developed to facilitate a more in-depth analysis of the operational impacts of key intersections within the SICEEP study area. The AIMSUN models were calibrated and validated in accordance with industry standards with reference to the RMS Paramics Modelling Guidelines to ensure that the models adequately represent reality. The models represented weekday and weekend afternoon (PM) peak periods, i.e.:

- Weekday (Friday) PM peak period between 5:30 pm and 6:30 pm, and
- Weekend (Saturday) PM peak period between 6:00 pm and 7:00 pm.

[1] SICEEP - Traffic and Transport Conditions – Mott MacDonald, May 2012

Figure 4-14 shows the amended future base network that includes the access nodes to the car parks within the SICEEP.

Figure 4-14 Amended Base Network



4.2.1 MODEL CALIBRATION AND VALIDATION

Model calibration is the process of matching the modelled flows with the observed traffic flows after adjusting the model parameter and inputs in a logical manner. The calibration of the model confirms the consistency of the future year model and assessment of the impact of increase traffic and network changes in the future.

The criteria for the calibration of a model include the GEH assessment criteria based on the UK Design Manual for Roads and Bridges requirements. This assessment criteria requires not less than 85% of the total modelled flows to be greater than a GEH value of 5. In addition, all GEH values are required to be less than 10.

The AIMSUN models for both the Friday and Saturday PM Peaks complied with these requirements. Table 4-14 presents the model calibration and validation results.

The models also have to comply with the following requirements for validation purposes which further confirm the robustness of the models.

- At least 85% of links with difference in flow within 100 vph for flows <700 vph;
- At least 85% of links with difference in flow within 15% for flows between 700 and 1700 vph; and
- At least 85% of links with difference in flow within 400 vph for flows >1700 vph.

The Base PM Peak (Friday and Saturday) models generally met the above requirements. All future scenario models ('non-event' and 'event') met the difference in flow criteria.

Table 4-14 Model Calibration and Validation Results

Criteria	Friday PM Peak		Saturday PM Peak	
UK Design Manual criteria for acceptable model performance	Target	Achieve	Target	Achieve
Link flows				
Links with difference in flow within 100 vph for flows <700 vph	85%	97%	85%	98%
Links with difference in flow within 15% for flows between 700 and 1700 vph	85%	64%*	85%	100%
Links with difference in flow within 400 vph for flows >1700 vph	85%	n/a	85%	n/a
GEH Statistics				
Links with GEH Statistic < 5	85%	85%	85%	94%

Note:

* Large traffic flow difference is observed at Goulburn Street / Sussex Street (I-7) and Sussex Street / Hay Street (I-9) due to upstream and downstream congestion. However, it does not impact on the study area.

4.2.2 MODEL RUNS

AIMSUN model runs were undertaken to determine future network performance. It should be noted that certain assumptions and limitations apply for the modelling. They include:

- Traffic count data from survey were used for existing model runs;
- Future turning movement volumes were calculated based on traffic generation and distribution parameters outlined in Section 6.1;

- For the existing and future scenario, all signalised intersections are modelled with the fixed SCATs phasing and signal settings. The current phasing plan sourced from the RMS has been assumed. It should be noted that in reality, the SCATS algorithm does not follow a fixed phasing plan but has the ability to adjust signal phasing to suit actual demand to improve operational efficiency thereby maximising throughput whilst reducing delay. This would imply that the outcomes of the model runs have limitations in terms of the approximation of the operational performance of the intersections.
- Cycle time is fixed at 120 minutes.
- Exit from the carparks assume a 30-minute discharge rate.
- Exiting vehicles from The Theatre car park and the public car park at The Haymarket will be directed to the one way southbound exit lane onto Darling Drive.

4.3 FIT FOR PURPOSE

The SICEEP AIMSUN model was further updated by Hyder for the specific purpose of investigating traffic impact within the SICEEP study area. The traffic forecasting model was developed to:

- Create a tool capable of simulating the traffic flows on study area under different access and network scheme scenarios, with outputs sufficiently detailed on network operational issues;
- Provide input for intersection geometry analysis and to assist in the decision process quantifying network impact from proposed development within precinct; and
- Prepare a traffic report which can be used as a basis for development approval.

4.4 SIDRA MODELLING

Detailed SIDRA modelling is employed to further confirm the outcomes of the micro-simulation modelling and to determine future intersection performance at key locations. The assumptions used for the modelling include:

- For the future scenario, all signalised intersections are modelled with optimum signal settings. SIDRA optimises the signal phasing time allocation based on the approach demand to achieve optimum results in terms of LoS;
- Demand volumes tested at the intersections were based on the assumed traffic distribution parameters; and
- Short lane effects were modelled for signalised intersections to account for adjacent lane spillover.

Section 3.1.5 outlines the parameters in the assessment of intersection performance and formats of the modelling outcomes.

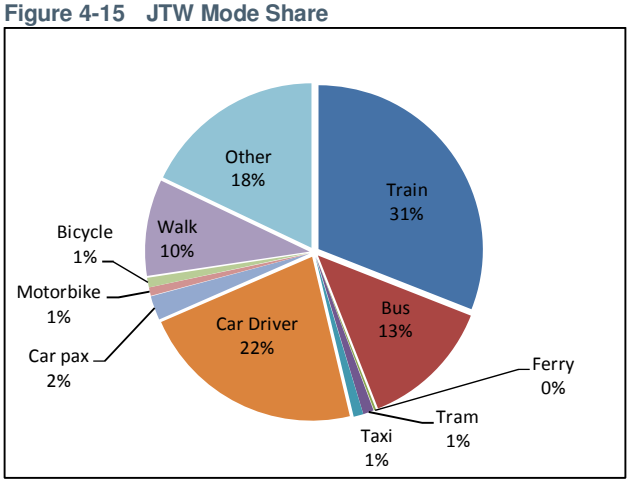
4.5 MODE SHARE TARGETS

4.5.1 JOURNEY TO WORK (JTW) – PRECINCT AS A WORKPLACE

The 2006 Journey To Work (JTW) data for the precinct as a destination for work (travel zones 0163 is the area north of the Western Distributor and travel zone 0164 is the area south of the Western Distributor) revealed an existing mode share of 24% for car mode (22% as driver and

2% as passenger), 45% for public transport, 11% for walk and cycle mode and 20% for other modes. This mode profile provides indication of the likely mode share during typical business hours. Figure 4-15 below shows the breakdown.

Figure 4-15 JTW Mode Share



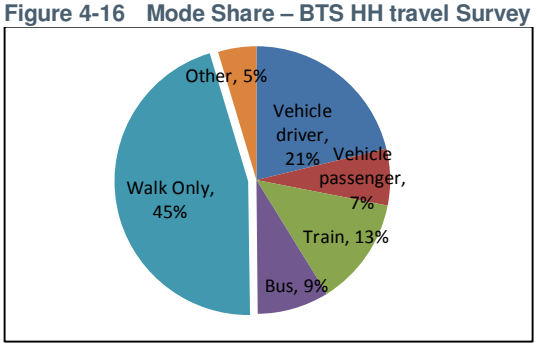
Source: BTS 2006 JTW Dataset

A target of 20% would equate to a reduction of around 9% in the current mode share for car driver and is considered to be achievable considering the improved access to alternative modes. This target has been adopted in determining peak parking demand for typical daytime events. However, for evening events, it is noted that the car mode share is more likely to be higher due to safety reasons and convenience for nightime travel. For events occurring in the evening, it is assumed that the mode share for car drivers would increase to around 26%.

4.5.2 HOUSEHOLD (HH) TRAVEL SURVEY – PRECINCT AS A DESTINATION

In terms of visitors to the precinct to attend major events, it is anticipated that visitors will be encouraged to travel by public transport for major events occurring at the SICEEP. Transport arrangements when coupled with entry tickets to events are likely to attract visitors to travel by public transport. Data from the BTS HH Travel Survey (linked trips) with Sydney LGA as a destination is used to provide indication of how people are likely travel to the precinct. The data revealed that linked trips to precinct as a final destination comprise mostly of walk trips and a similar proportion of public transport share. This implies that people visiting the precinct are likely to take the train, bus or other transport to a nearby destination then would walk to the precinct.

Figure 4-16 Mode Share – BTS HH travel Survey



5 DEVELOPMENT COMPONENTS

5.1 OVERVIEW

SICEEP includes the development of a combination of new multi-functional facilities and flexible spaces to enhance the existing convention, exhibition and entertainment facilities. The SICEEP development works consists of the demolition of the existing Entertainment Centre and Entertainment Centre car park (Haymarket) to give way to redevelopment into mixed-use precinct with residential/retail precinct; an increase in capacity of the exhibition and convention space - ICC, ICC Exhibition Centre, as well as the development of the new Multi-Functional Entertainment Centre (MFEC) – The Theatre.

5.2 RECONFIGURATION AND REALIGNMENT OF DARLING DRIVE

It is proposed that Darling Drive be reconfigured and realigned to accommodate the expansion of the ICC Exhibition Centre and the development of the loading dock facilities. It is noted that the existing configuration of Darling Drive provides two lanes per direction with a one directional off-road cycle lane on either side. This existing design was intended to also cater to truck parking, loading and queuing on Darling Drive prior to loading/unloading at the existing Exhibition Centre loading docks. The proposed design reduces Darling Drive to one lane per direction (with a storage lane/turn bay on the northbound lane at the access entrance to the ICC Exhibition Centre north carpark) but transfers truck parking, loading and queuing within the loading dock facilities.

The assessment of mid-block lane capacity of Darling Drive is essential to provide an indication of the ability of Darling Drive to carry existing and future traffic.

The AUSTROADS *Guide to Traffic Engineering Practice - Part 2: Roadway Capacity* states that the typical one-way mid-block lane capacities on urban roads under interrupted flow conditions are 900-1000 vehicles/hr/lane. Table 5-15 provides the traffic flow limits for different levels of service, in terms of peak hour flows for one and two lanes of unidirectional travel. Level of Service is used as a performance standard to assess effect of a development proposal on the traffic efficiency of the road network.

Table 5-15 LOS Criteria – Urban Road Peak Hour Flows

Level of Service	One Lane (veh per hr)	Two Lanes (veh per hr)
A	200	900
B	380	1400
C	600	1800
D	900	2200
E	1400	2800

It is estimated that the average peak hour volume on Darling Drive is approximately in the order of 550 vehicles per hour per direction. From Table 5-15, it can be stated that Darling Drive will still have the capacity to accommodate existing traffic plus additional traffic to be generated by the north and south car parks. Hence, the proposed reconfiguration of Darling Drive is anticipated to be able to accommodate the average peak hour volume plus the additional volume to/from the carparks.

5.3 ROAD CHANGES TO EXHIBITION PLACE

The network represented in the future base model initially assumes the current configuration of the access lane from Darling Drive/Pier Street roundabout to The Theatre carpark and the proposed Northwest carpark in The Haymarket, including the access link to Pier Street on-ramp adjacent to Exhibition Place. Further design development works have introduced proposals for road changes to the access lane from the roundabout. A one-way system is being proposed whereby vehicles accessing the carparks will enter from the roundabout but will exit via a one way road running parallel to northern boundary of the northwest block of The Haymarket in the east-west direction then turning southbound parallel to Darling Drive merging into the outer lane on Darling Drive. This is shown in Figure 5-17. This new configuration will force vehicles exiting the carparks to travel southbound towards Ultimo Road.

Figure 5-17 Road Changes to Exhibition Place

The above road changes will impact on the existing bus operators and coach access under the Pier Street viaduct. However, two new bus drop-off locations will be provided within the precinct.

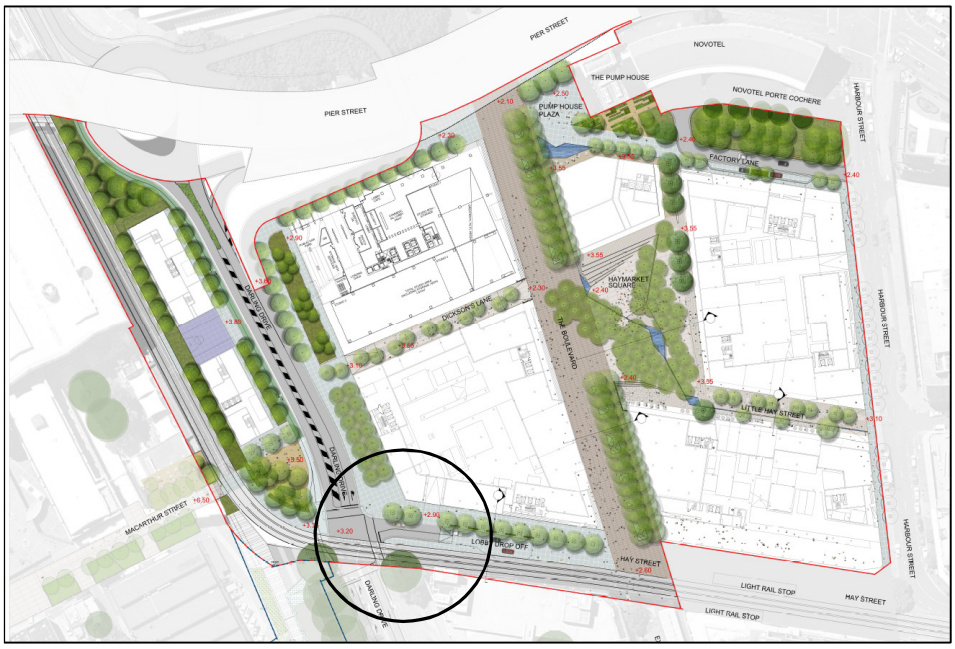
The impact of this proposed road change has been modelled and the results are presented in Section 6.2 of this report.

5.4 NEW LANEWAY AT HAY STREET

A new laneway at Hay Street is being proposed to service the podium at the Southwest sector of The Haymarket Precinct. The laneway will also serve as a drop off for residents and visitors. The laneway is adjacent to the access driveway to the SW carpark and entry and exit will be

controlled in the same manner as the carpark access via the signal system at the intersection with Darling Drive. This is similar to existing SEC carpark entry arrangements.

Figure 5-18 New Laneway at Hay Street



5.5 PARKING PROVISION

Car parking provision for the SICEEP will consist of parking facilities for Darling Central/Bayside and The Haymarket.

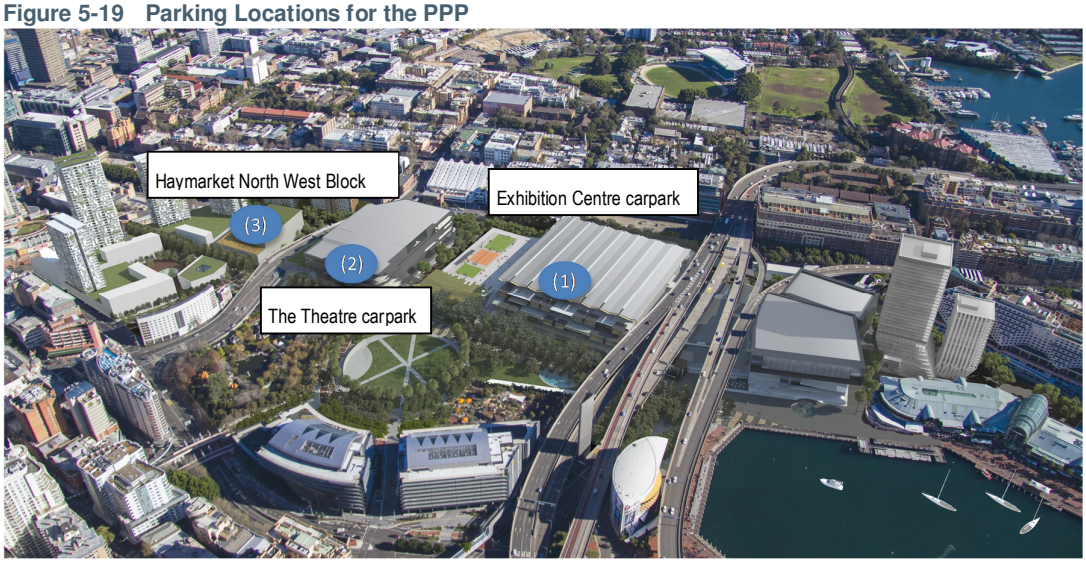
5.5.1 OVERALL PARKING FOR THE PPP AND THE HAYMARKET

Parking provision for the PPP will be located at:

- ICC Exhibition Centre carpark (719 spaces);
- The Theatre carpark (107 spaces); and,
- The Haymarket North West block carpark (400 spaces) located within The Haymarket Precinct.

Figure 5-19 shows the location of parking facilities for the PPP.

Figure 5-19 Parking Locations for the PPP



Source of Photo: Lend Lease Development

For the Darling Central/Bayside, parking provisions will consist of the redevelopment of the Convention and Exhibition Centre carpark (north carpark – Darling Central) and the new facilities for The Theatre (south carpark – Darling Central).

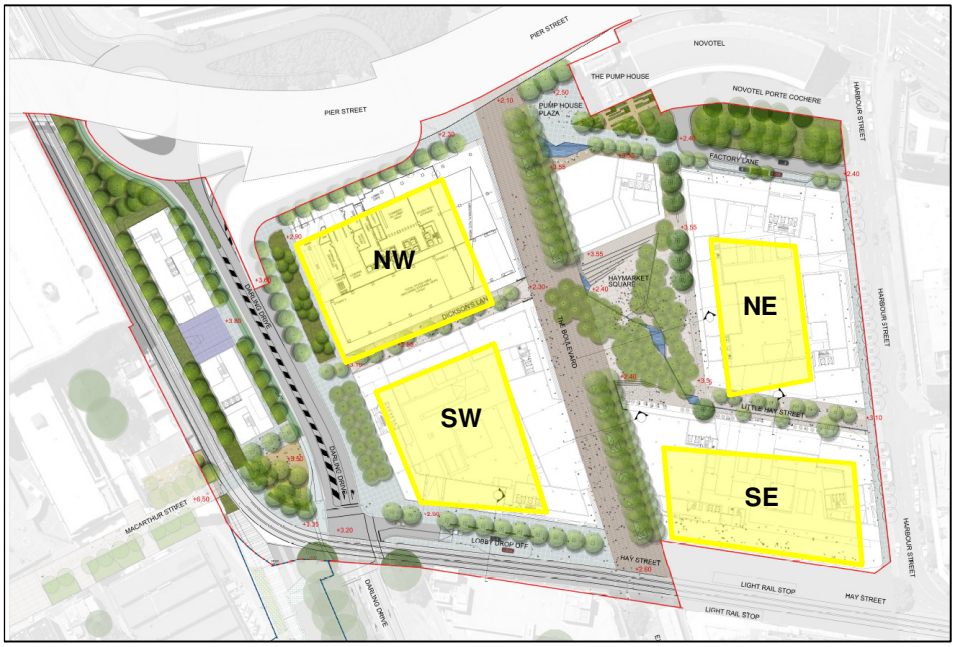
The proposed layout of the north carpark provides a total of 719 (711 standard and 8 disabled) car parking spaces and will have entrance and exit access arrangement along Darling Drive.

The south carpark (The Theatre) will have 107 car parking spaces and will have a new entrance and exit on the south side fronting the existing Entertainment Centre loading access road below Pier Street.

An additional 400 spaces will be provided within The Haymarket Precinct.

Parking provision for The Haymarket will consist of four blocks (NW, SW, NE and SE) with a total provision of approximately 1,440 car park spaces. It is intended that 400 spaces in the northwest block be allocated for public carpark and will be available for visitors to the Precinct for retail as well as for the PPP facilities only as part of event parking onsite. The egress and exit point of the NW block will be at northern side facing Pier Street, the egress and exit point of the SW block will be maintained on the southwest corner off the intersection of Darling Drive/Hay Street, the egress and exit point of the NE block and the SE block will be provided on the east side fronting Harbour Street. This is shown in Figure 5-20.

Figure 5-20 Parking Locations for The Haymarket



A breakdown of the car park spaces is shown in Table 5-16.

Table 5-16 Proposed Parking Provision

Parking Location	Proposed Car Parking Bays	
ICC Exhibition North Centre car park (north – Darling Central)	719	
The Theatre car park (south – Darling Central)	107	
Total provision for PPP[1]		1226[1]
Residential / retail / student accommodation / commercial car park (The Haymarket Precinct) [1]		
North West Office/Commercial	50	
North East residential	350	
North residential	30	
South East residential	285	
South West residential	325	
Total provision within The Haymarket Precinct		1040
North West Public Carpark[2]	400	
Total for Whole of Precinct		2266

[1] Current indicative design for The Haymarket Precinct

[2]This public carpark will consist of 400 car park spaces to be delivered under The Haymarket Precinct and will be available for visitors for the precinct and for use as well for the PPP as part of the event parking onsite

The existing car parking provision consists of 1,900 car park spaces at the Entertainment Centre carpark and 900 car park spaces at the Exhibition Centre, totalling 2,800 spaces.

However, 600 spaces at the Entertainment Centre carpark are blocked off as per Darling Quarter development approval. In comparison to the existing, the overall proposed parking provision for the Precinct will be reduced by approximately 536 spaces. This is in line with the overall commitment to implement sustainable initiatives/transport measures and urban design that encourage the uptake of non car mode transport and reduce dependency on the private car vehicle within the Precinct. Sections 5.5.2 and 5.5.3 further justifies suitability and adequacy of the proposed car parking provisions for the proposed development.

5.5.2 CAR PARKING REQUIREMENTS FOR THE PPP COMPONENT

There are currently no specified guidelines on parking generation rates for dynamic facilities such as convention centres, exhibition halls and entertainment centres. The future parking requirements for the precinct can be guided by past trends or current patronage and by current strategies promoting sustainable transport where target mode share for car mode is set lower than the existing whilst supported by strategies to reduce car reliance and promote Green Travel. The assessment of the requirements can be based on the following:

- Demand Scenario 1: Event driven demand and capture rate – An analysis of SCEC and SEC historical data was undertaken to quantify the event driven car parking demand and capture rate within the precinct.
- Demand Scenario 2: Demand modelling based on average annual demand – Car bay population is based on AEG Ogden's event and patronage forecast with a view to provide maximum value for money to the State.
- Demand Scenario 3: Peak demand modelling – While the car park solution is based upon providing value for money to the State, it must be demonstrated that during occasional occurrence of simultaneous large events within the Core Facilities that adequate car bays are available to service this demand.
- Benchmarking – The number of car bays provided for core facilities are benchmarked against other convention and exhibition centres in Australia.

a) Demand Scenario 1: Event driven demand and capture rate

The carpark demand for the PPP is primarily driven by convention and exhibition events which typically occur during the day. Activities at the ICC and ICC Exhibition are anticipated to manifest a peak parking demand during typical working hours of the day.

Analysis of the SCEC car park between January 2010 and December 2011 demonstrates an average event capture rate of 21%. This capture rate is defined as the number of car park transactions (521,557) divided by the number of SCEC facility attendee days (2,558,929). The capture rate is used to approximate the strong correlation that exists between event patronage and the number of car park transactions.

Analysis of the SEC car park demonstrates that demand is driven by a combination of entertainment event demand, plus low yielding early bird parking which is used as back fill where events are not occurring. The majority of entertainment events occur at night with records showing activities at the existing Entertainment Centre are likely to manifest a peak parking demand on a weekday evening, typically on a Friday evening.

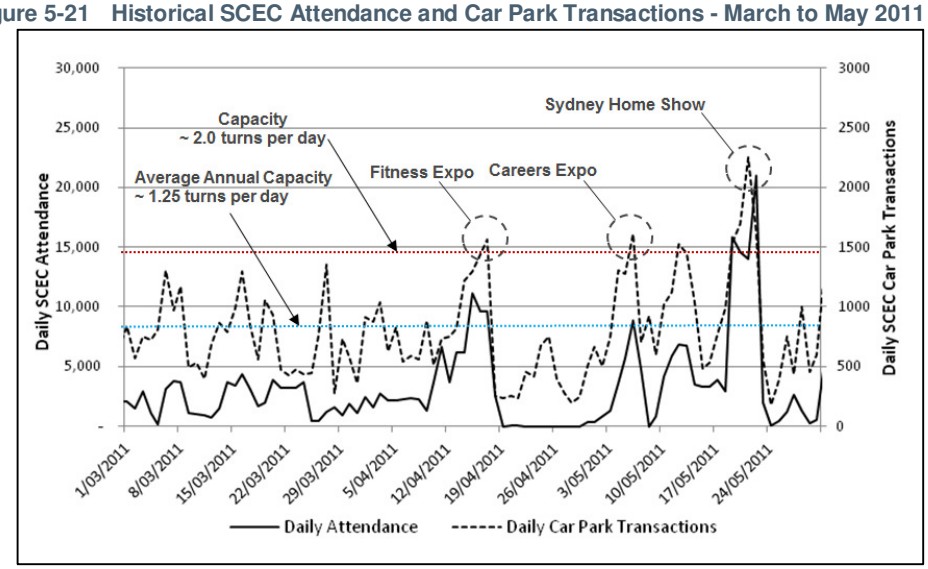
b) Demand Scenario 2: Demand modelling based on average annual demand

In order to establish carpark requirements, modelling has been undertaken by W. Hamill Consulting to determine an optimum car park provision rate for the PPP. This modelling has

been carried out based on average demand in order to maximise efficiency of the car park solution. A review of historical data revealed the following:

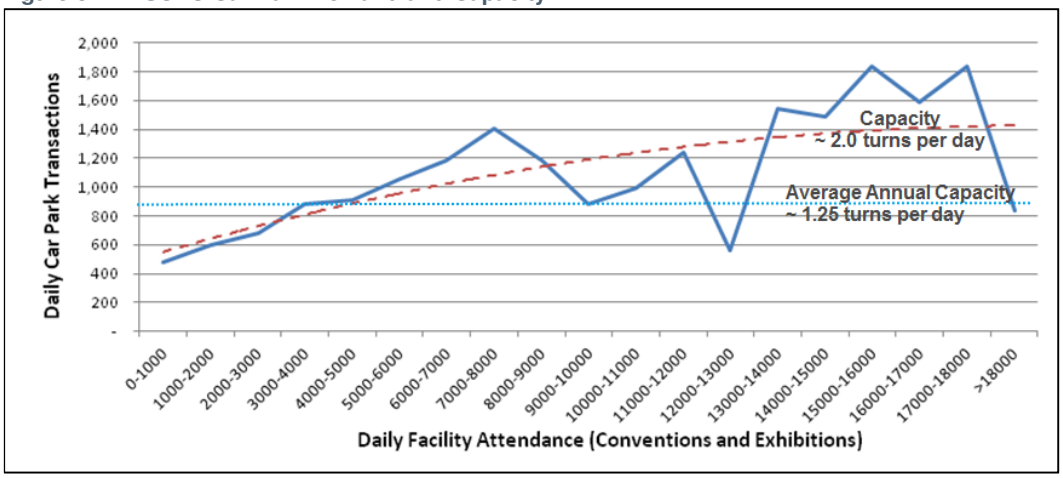
- The existing SCEC car park demonstrates an average capture rate of 21% as described in section a) above. Over a 2 year period the existing SCEC car park demonstrated an average capacity of 1.25 times the number of car bays. This means that each car bay can sustain a maximum of 1.25 transactions per day over the course of a year. While the actual capacity on a given day can exceed this value, the lower annual average takes into account the daily distribution of parkers including variation in demand during the week, as well as seasonal variation.
- The maximum car park demand occurred on Saturday 16 October 2010 during the International Motor Show exhibition. On this day, the SCEC car park recorded 2,806 transactions equalling 3.8 turns per bay per day. For peak day analysis in section c) the maximum capacity is assumed to be 4 turns per bay per day.
- The chart below demonstrates the daily SCEC attendance and number of car park transactions over a 3 month period. This demonstrates that for medium to large exhibition events the car park typically reaches a capacity at 2.0x the number of car bays.

Figure 5-21 Historical SCEC Attendance and Car Park Transactions - March to May 2011



- Furthermore, the trend line in the chart below (SCEC Car Park Demand and Capacity) demonstrates that the existing SCEC car park typically approaches capacity at approximately 2.0 turns per bay per day during large exhibition event days. On days where the existing SCEC facility has a low attendance (less than 1,000 attendees), there remains a baseline demand for approximately 500 car bays. This demand is largely driven by event organisers, event bump in/out day demand and casual parkers accessing the Darling Harbour precinct.

Figure 5-22 SCEC Car Park Demand and Capacity



Car park revenue is primarily driven by demand from conventions, exhibition and entertainment event attendees. Demand Scenario 2 patronage and car park demand for 2019 is summarised in Table 5-17 below:

Table 5-17 Demand Scenario 2 Patronage and Car Park Demand, 2019

Building	Forecast Annual Attendee Days	Annual Car Park Demand (@ 21% capture rate)
Conference/Convention	590,070	123,915
Exhibition	702,343	147,492
Entertainment	441,000	92,610
Other Casual Parkers		221,607
Total	**1,733,413**	**585,624**

Based on Demand Scenario 2 the average car park demand per day is 1,604 transactions. Therefore, 1,283 bays are required to satisfy this average demand (i.e. 1,283 bays x 1.25 = 1,607 transactions). Increasing the number of car bays above 1,283 bays will provide minimal increase to revenue. Therefore additional capital expenditure on car bays will not provide value for money to the State.

It should be noted that the current layout of facilities results in each car park primarily servicing different markets. The SCEC car park caters for day time convention and exhibition event attendees, whereas the SEC car park primarily caters to commuters and early birds along with a large capacity to service occasional peak entertainment events.

The proposal will result in a much higher efficiency as car parks and facilities are better located to The Theatre (where that activity has moved from the south east of the Precinct to the centre west). This will enable a greater number of car bays to be used for both day and night time events, which will provide a better optimised and value for money car park solution.

c) Demand Scenario 3: Peak demand modelling

In order to test the car park solution, an assessment is made of its performance under peak demand scenarios. These scenarios are expected to occur infrequently (approximately 3 times a year) when multiple large events occur simultaneously.

The analysis is based on population estimates calculated for each scenario based on a test event scenario of three (3) conferences in the ICC plus a concert at The Theatre.

The analysis assumes a target mode share of 20% for private car transport. This is in line with the key objectives of *Sustainable Sydney 2030* and the overall *Sydney Metropolitan Strategy* whereby planning policies are aimed at reducing reliance on cars whilst improvements to public transport and active transport facilities are aimed at encouraging public transport patronage and active transport mode use. Crucial to successfully achieving these objectives is adequate consideration of factors that have an impact on people's travel behaviour. These factors include but are not limited to:

- Availability of alternative modes
- Service frequency of public transport
- Accessibility to non-car modes
- Pedestrian amenities and quality of pedestrian environment, and
- Availability of parking

Section 3.2 of this report cites the high level of availability of public transport connections and the general frequency of operation by rail, bus, ferry, and light rail. The existing services facilitate access of patrons and visitors to the precinct via these modes of transport.

Moreover, the design proposal for the SICEEP puts emphasis on improving access to allow optimum use of public transport, walking and cycling in support of the strategy to achieve a target reduction of car mode share to 20%.

Striking a balance between parking supply and demand is critical to ensure that efforts to promote sustainable transport will be supported. From a planning perspective, providing excess parking will defeat the purpose of encouraging use of sustainable transport modes.

Three peak parking demand profiles have been considered:

a) Daytime weekday – Medium exhibition plus three conferences in the ICC;

b) Daytime weekend – Large consumer exhibition plus three conferences in the ICC; and

c) Evening – Large banquet plus a concert in The Theatre.

The above scenarios are expected to occur infrequently. In the 2010 and 2011 calendar years, SCEC had greater than 20,000 attendees on only 8 days, or 1% of total days. Three quarters of these occasions fell on weekends.

Table 5-18 Peak Demand Estimates

Facility	Maximum number of persons		
	Morning	Afternoon	Evening
ICC			
Plenary Space / Meeting Space[1]	4,250	4,250	-
Banqueting Space[1]	-	-	2,500
Sub-Total	4,250	4,250	2,500
ICC Exhibition			
Lower Exhibition Halls	12,690	17,951	-
Upper Exhibition Halls	1,075	1,075	-
Sub-Total	13,765	19,026	-
The Theatre			
Plenary	-	-	8,000[4]
Sub-Total	-	-	8,000
Total for the day	**18,015**	**23,576**	**10,500**
Car Parking Demand (target mode share for car mode) [2]	**3,603**	**4,715**	**2,300**
Car Park Bays required [3]	**948**	**1,240**	**2,300**

[1] This is in accordance with the populations density outlined in the NSW Project Brief.

[2] For Peak Demand 1 and 2 a target mode share of 20% for private car is assumed in line with the key objectives of Sustainable Sydney 2030 and the overall Sydney Metropolitan Strategy whereby planning policies are aimed at reducing reliance on cars whilst improvements to public transport and active transport facilities are aimed at encouraging public transport patronage and active transport mode use. For Peak Demand 3, the assumed mode share is higher at 22.5% (i.e. evening).

[3] Peak Demand 1 and 2 assumes that 26.3% of attendees are present at any one time as the demand is spread throughout the day. This assumption aligns with the maximum car park demand during the International Motor Show where parking turnover was observed to be 3.8 per car park bay per day. Peak Demand 3 assumes that 100% of attendees are present at the one time, reflecting the nature of the concerts and banquets

[4]During design development, the number of persons in the plenary may increase to 9,000 persons.

The above assessment of population based carparking demand confirms the maximum number of carparking spaces required for the Core Facilities during a weekday is 948, and on a weekend day is 1,240. On this basis, the proposed provision for the PPP of 1,226 car parking spaces is deemed to be sufficient. It is important to ensure that the SICEEP precinct contains adequate car parking for peak weekday demand as surrounding car parks will likely approach capacity due to commuter demand.

On weekend days and week nights car parks adjacent to the precinct have greater supply capacity without commuter use for business and tertiary institutions and as such the existing infrastructure can be efficiently used to satisfy rare peak demand. Satisfaction of car park demand for each of the peak parking scenarios is presented in Figure 5-23 and Table 5-19 below.

Figure 5-23 Precinct and Surrounding Car Park Locations

Table 5-19 Peak Demand Car Park Solution

Map ID	Car Park	Bays	Availability[3]		Peak Demand 1	Peak Demand 2	Peak Demand 3
			Day	Evening			
1	ICC Exhibition Centre	719	719	719	719	719	719
2	The Theatre	107	107	107	107	107	107
3	West of The Haymarket Square and South of Pier Street	400	400	400	130	400	400
4	Harbourside[2]	1387	152	568	-	22	568

Map ID	Car Park	Bays	Availability[3]		Peak Demand 1	Peak Demand 2	Peak Demand 3
5	1 Dixon Street	100	14	53	-		53
6	Darling Quarter	600	66	246	-		246
7	Darling Park	680	110	410	-		224
8	320 Harris Street	260	28	106	-		
9	Market City[1]	614	68	250	-		
10	World Square[1]	557	62	227	-		
11	Star City[2]	2500	1282	1588	-		
12	Citigate Central (Thomas St) [1]	600	67	245	-		
	Total	8264	3067	4911	948	1240	2309

[1] Cited in Halcrow Traffic report with availability within 5 minutes walk

[2] Cited in Halcrow Traffic report with availability within 5 minutes travel

[3] Availability is based on parking occupancy data cited in the Halcrow Report and MottMacDonald Report.

Table 5-19 above presents parking availability in the vicinity of the precinct and a proposed car park solution to address the peak demand for Scenario 2 and 3. The offsite carparks listed are within 5 minutes' walk or 5 minutes travel. Occupancy data presented in the Halcrow Report provide an indication of parking availability during the day (1:00 p.m.) and evening (6:00 p.m.). It is also further stated in the Mott MacDonald Report that parking occupancy for off-site parking spaces is 89% at 1pm and 59% at 6pm and consequently decreases later in the evening. As a parking strategy to manage Demand Scenario 3, it is proposed that the available off-site parking supply be considered to address additional parking supply requirements during the peak demand.

On the basis of the above three scenarios, it is concluded that the 1226 carparking bays proposed for the PPP is sufficient to serve the peak carparking demands of visitors, while also offering the best value for money for the State. Peak days are likely to be infrequent and therefore it is more efficient to make use of the existing car park supply surrounding the SICEEP precinct rather than construct additional car bays that will be used infrequently. Additionally, the construction of additional carparking bays to satisfy infrequent peak demand scenarios is not justified by the additional revenue as the marginal increase of the carpark is going to provide a diminishing return on each additional carparking bay, particularly so when catering to peak demand scenarios.

d) Benchmarking

Table 5-20 below sets out the number of car bays provided for similar Australian facilities in relation to venue capacity. This demonstrates that the number of car bays planned for ICC Sydney is similar to Melbourne and in excess of Adelaide and Brisbane.

Table 5-20 Car Park Benchmarking

Facility	Venue Capacity (persons)	Car park Spaces	Attendees per Car Park Space
Melbourne Convention and Exhibition Centre	8000	1610	5
Adelaide Convention Centre	9500	1200	8
Brisbane Convention and Entertainment Centre	17500	1600	11
ICC Sydney	8500	1226	7

In conclusion, based on a carpark sizing based on revenue and demand, the following is noted:

- Car park capture rate is 21% of the number of event attendee days
- Daily car park capacity equals 1.25x the number of bays

The analysis of three peak demand scenarios (daytime weekday, daytime weekend and evening) demonstrates that the car park solution provides adequate parking for daytime weekday demand. Excess peak weekend day and evening demand can be serviced by surrounding supply of carparks as there will be excess available capacity outside of working hours.

Such an approach is expected to provide the greatest value for money option for the State by not requiring the construction of additional peak demand infrastructure that is likely to be used less frequently.

It is concluded that the carparking bays of 826 proposed for the PPP plus the 400 space public car park in the southern precinct are sufficient to serve the carparking demands of the events/conventions/exhibitions and at the same time offer the best value for money for the State.

5.5.3 CAR PARKING REQUIREMENTS FOR THE HAYMARKET PRECINCT

On-site car parking provision for The Haymarket is assessed against guidelines listed in the RMS *Guide to Traffic Generating Development (Section 5 – Parking Requirements for Specific Land Uses)* and parking rates approved for similar developments within the City of Sydney LGA (CoS).

Parking rates generally vary by type of land use development and location of development. Factors to be considered include the availability of public transport, mode split, car occupancy, availability of on-street parking, and others.

RMS Guidelines

The RMS Guidelines stipulates parking rates based on surveyed developments and researched conducted by the RMS. For the RMS, the main criterion in the assessment of parking provided for developments is the adequacy of off-street parking to meet the peak parking accumulations observed and thereby discouraging on-street parking thus maintaining the existing levels of service and safety of the road network. Hence, the RMS guidelines stipulate the required minimum parking provision for a specific development. The Guide also notes that potential variations between local government areas must also be considered. Thus, these parking provision rates will be validated against the City of Sydney Council's rates.

Table 5-21 RMS Parking Rates and Proposed provisions

Land Use Type	Units / Rooms / GLA[3]	RMS Suggested Parking Rates	RMS Guidelines for Parking Requirements	Proposed Parking Provision
Residential			735 spaces	990 spaces
Studio[1]	122	(0.4 spaces/1 bedroom) [1]		
One bedroom	653	0.4 spaces/1 bedroom		
Two Bedroom	558	0.7 spaces/2 bedroom		
Three Bedroom	27	1.2 spaces/3 bedroom		
Visitor parking:		Plus 1 space/7 units	194 spaces[2]	
Office/ Commercial	15,000 – 25,000[3] sqm GFA	Unrestrained – 1 per 40sqm Restrained - 1 per 125sqm GFA (assuming Category E, CoS DCP2012) [4]	120 spaces (15,000 sqm GFA) or 200 spaces (25,000 sqm GFA	50
Retail	7,689 sqm GFA	1/50 sqm GFA	154 spaces	
TOTAL			1009 to 1089 spaces	1,040 spaces

[1] No rates stipulated for Studio type, assumes same rate as one-bedroom.

[2] Visitor parking will be at the public carpark.

[3] Indicative only pending final design.

[4] Indicative only. The site does not fall within an assigned category and the adjacent areas are Category D and F

Based on the above parking rates of the RMS, the estimated minimum car parking requirements for The Haymarket Precinct is 1,009-1089 spaces. A total of 1040 spaces will be provided in the precinct plus the 400 space public carpark to be located in the northwest sector. Hence, The Haymarket Precinct development complies with the minimum provision as required from the RMS guidelines.

City of Sydney Council Parking Rates

On the other hand, the City of Sydney Council's Development Control Plan (DCP) states that car parking spaces must be provided to meet the car parking needs of the development having regard to the accessibility of the development and Council's policy of reduced car dependency. Council has clarified that the DCP is written to indicate the maximum number of car parking spaces allowable and not to impose an absolute minimum of car parking spaces required. Various DCPs have been developed by Council to apply to specific areas of the City.

Sydney DCP 2012 is the most recent DCP that covers the Pyrmont and Darling Harbour and it supports the Sydney Local Environmental Plan (LEP) 2012 with more detailed planning and design guidelines for developments within the CoS. However, the SICEEP development site is excluded from the area covered under the Sydney LEP 2012 and hence, the parking rates contained in the LEP do not apply to the development proposed. Instead, the development seeks approval for parking rates that are considered appropriate for the development on the basis of comparisons with rates applied to the immediate surrounding areas and known CoS approved rates of comparable land use developments.

Residential

The proposal seeks development approval for a total of 1,360 residential units totalling 114,435 sqm GFA. The parking rates being proposed are:

- Studio apartments – 0.25 space`
- One bedroom – 0.5 space
- Two bedroom – 1.2 space
- Three bedroom and more – 2 spaces

The proposed rates being sought for The Haymarket Precinct residential component are consistent with those approved for comparable developments within the City of Sydney. Comparable developments in the area that have been approved with the above parking rates include:

- Carlton and United Brewery (CUB) site in Chippendale 1400 dwellings with 132,950 sqm GFA. Based on the mix of units, a total of 1,072 parking spaces for residential use
- The Quay site in Haymarket – 271 residential apartments and 270 parking spaces.
- Harold Park – 1,250 dwellings with 120,361 sqm GFA. The parking rates applied to Harold Park differ slightly from the above since the maximum car parking spaces is set out in a site specific LEP.

With the future mix of land uses between The Haymarket and the PPP, demand for parking will balance across different peak periods and consequently, reduce potential impacts associated with parking provision.

Office / Commercial

It is proposed to incorporate between 15,000 sqm to 25,000 sqm of GFA allocated for office/commercial development and proposes to provide a total of 50 spaces to support the office/commercial space. This equates to a range of between approximately 1 space per 326 sqm commercial GFA to a maximum of 1 space per 300 sqm.

The above rate is comparable to Darling Walk which has a GFA of 64,000 sqm and basement parking with 200 spaces.

Retail

No car parking is proposed to support the retail and the student accommodation land uses on the basic premise that the development site has the locational advantage of being in close proximity to existing public transport and active transport modes and it is anticipated to also mainly service the local areas surrounding the site whereby patrons will likely access the site via walking trips. It should be noted that significant enhancements for the active transport network for the immediate area is being proposed as part of the development proposal.

Table 5-22 summarises the parking rates for The Haymarket.

Table 5-22 Summary of Proposed Parking Provision for The Haymarket Precinct

Land Use Type	Units / Rooms / GLA	Proposed Parking Rates for The Haymarket	Proposed Parking Provision
Residential			990 spaces
Studio	122	0.25 spaces/studio	
One bedroom	653	0.5 spaces/1 bedroom	
Two Bedroom	558	1.2 spaces/2 bedroom	
Three Bedroom	27	2 spaces/3 bedroom	

Land Use Type	Units / Rooms / GLA	Proposed Parking Rates for The Haymarket	Proposed Parking Provision
Office/ Commercial	15,001 sqm GFA	1 space / max 300 sqm GFA	50
Retail	7,689 sqm GFA	No provision	-
Student accommodation	422	No provision	-

Hotel

The hotel development is expected to require minimal parking. The majority of trips to similar developments located near the CBD generate walking trips than vehicular trips. The majority of guests would arrive at the hotel via taxi, coach, mini bus or light rail. A relative small proportion would arrive by private car or hire car. Other hotel patrons who visit the hotel for functions or conferences arrive by private vehicle but will be expected to find parking in the public carparks in the vicinity of the site. Moreover, most Sydney CBD businesses only provide a small number of staff parking spaces and the majority of the staff are expected to use non-car modes for travel to work.

5.6 LOADING FACILITIES

Loading dock facilities to all of the ICC Sydney will be provided during the operational phase of the development, in accordance with the Project Brief. Loading facilities will be provided at three key nodes:

- ICC Bayside Loading Dock
- ICC Exhibition South Loading Dock
- The Theatre Loading Dock

All loading dock facilities will be designed in accordance with Australian Standard AS 2890.2 – Parking Facilities Part 2: Off-street commercial vehicle facilities. The loading dock design for ICC Sydney will allow parking and containment for up to 43 trucks loading at any one time plus trucks accommodated within halls during unloading with significantly improved efficiency compared to existing loading dock arrangements.

The overall loading design will accommodate concurrent operation of sufficient loading/unloading positions to all ICC Sydney, during major single and concurrent events. Furthermore, the proposed layouts will ensure that separation between loading vehicle access and public access points to the ICC Sydney is maintained. A suitable off-site truck marshalling yard, for waiting vehicles will be developed at a future date, to allow a bump in/bump out system to operate, as part of the operator's future loading dock traffic and operations management.

Table 5-23 Proposed Loading Dock Capacity

Facility	Capacity
ICC Bayside Loading Facility	
Pantecs / 19.0m articulated vehicles	3
Vans / 8.8m medium size vehicles	4

Facility	Capacity
ICC Exhibition Centre Loading Facility	
RL6.0m - 19.0m articulated vehicle	18
RL21.0m - 19.0 articulated vehicle	14
The Theatre Loading Facility	
19.0m articulated vehicle	3
12.5m HRV	1

5.6.1 THE ICC BAYSIDE LOADING FACILITY

The ICC Bayside loading dock facility is provided at RL2.5m and can accommodate three pantecs (or 19.0m articulated vehicles) and four van bays (or 8.8m medium size vehicles), at any one time. It will serve two purposes: (1) as production loading dock for entertainment events in the 2,500 seat Darling Harbour Theatre as well as OB Van parking and (2) as the In-House Loading dock for the kitchen and general loading deliveries. The theatre and kitchens are located on RL 5.8m and is connected to the loading dock by a lift shaft.

A direct at-grade access to the loading dock facilities to the ICC Bayside is proposed off the southbound lane of Darling Drive. A slip lane approximately 40m in length is proposed adjacent to the southbound lane of Darling Drive, prior to the access point for the ICC Bayside loading dock facility. This slip lane will allow the designated containment and queuing of two 19.0m articulated vehicles.

The loading dock facility is sufficiently large, to allow the turning movements of a 19.0m articulated vehicle to manoeuvre into the loading dock bays without encroaching onto the public roadway.

5.6.2 THE ICC EXHIBITION CENTRE LOADING FACILITY

Loading dock facilities to the ICC Exhibition Centre are proposed in two locations, on the first level (RL 6.0m) and upper level (RL21.0m) of the ICC Exhibition. Access to the first level loading dock is proposed via a slip lane on the southbound lane of Darling Drive. The slip lane is approximately 155m in length, up to the start of the loading dock access ramp. This will provide a traffic management system, allowing the queuing and containment of vehicles in the designated lane, outside of the main public travel lane. Further vehicle queue containment of 150m is provided within the loading dock access ramp and circulation lane, prior to vehicle arrival at the loading dock facility.

The loading dock facilities on the lower level are accessed via a one way circulation system in the clockwise direction leading to a large loading dock facility on the eastern side of the ICC Exhibition building. The one way circulation roadway will eliminate conflict of vehicles, allowing for a more efficient operation of the first level loading dock facility.

This loading dock facility will cater for the containment of eighteen (18) 19.0m articulated vehicles, at any one time. Egress from this loading dock facility is proposed via the one-way circulation lane, which exits south of the ICC Exhibition, onto Darling Drive. Access and egress arrangements to the surrounding road network will therefore be maintained via the southbound lane of Darling Drive. Vehicles will only have to travel 100m to the Pier Street/Darling Drive roundabout that will enable them to travel northbound, via the northbound Darling Drive lane, or southbound via Darling Drive or Pier Street.

Further loading dock facilities are provided for the ICC Exhibition on the upper level. A new access ramp structure will be constructed above Darling Drive. Access to the upper level loading dock is proposed from the same slip lane off the southbound Darling Drive laneway, as for the first level loading dock. Rather than navigating the first level circulation lane, a supplementary ramp structure, located on the western side of the ICC Exhibition, will link the first level (RL 6.0m) loading dock ramp, with the upper level (RL 21.0m) loading dock.

Consequently, this provides a similar traffic management system, allowing vehicles to queue in a designated queue lane, approximately 155m in length, outside of the main public travel lane. The upper loading dock facility for the ICC Exhibition, will cater for the containment of fourteen (14) 19.0m articulated vehicles, at any one time

Access to the upper level loading dock is made from the southern end, with vehicles exiting on the northern end of the loading dock. This will alleviate conflict of vehicle movements within the upper level loading dock, providing separate access and egress at opposite ends of the upper level loading dock.

Egress from the upper level ICC Exhibition loading dock facility, is proposed via two ramps connecting the upper level to the first level, and then the first level with the southbound lane of Darling Drive. Vehicles exiting the upper level loading dock will not have to circulate around the ICC Exhibition building on the first level, as a separate exit point is proposed along Darling Drive. This will assist with the operation of concurrent loadings on both the first and upper levels of the ICC Exhibition.

The location of the lower loading dock under the exhibition building will reduce truck noise impacting the surrounding neighbourhood while the upper level loading dock will be acoustically treated to ensure noise levels are within the required boundary noise requirements.

5.6.3 THE THEATRE LOADING FACILITY

Loading dock access to The Theatre will be provided in a similar location, to the current loading dock arrangement to the existing Exhibition Centre building. Access to The Theatre will be via a loading dock access ramp, located off the existing Darling Drive / Pier Street roundabout.

The Theatre loading dock will allow for the containment of three (3) 19.0m articulated vehicles and one (1) 12.5 HRV, within the loading dock facility, at any one time. Access and egress to The Theatre loading dock facility will be maintained with similar connections to the existing road network, via the northbound and southbound lanes of Darling Drive; and from the Pier Street off-ramp and on-ramp lanes.

There is unlikely to be queuing of vehicles, within the public roadway when entering The Theatre loading dock, as the proposed loading dock access ramp will accommodate the containment of two (2) 19.0m articulated vehicles. The Theatre loading dock access ramp will allow the passing of vehicles, entering and egressing the facility concurrently.

5.6.4 LOADING FACILITY IN THE HAYMARKET

The design layout for The Haymarket is still currently being finalised. The preliminary drawings include provisions for loading facilities within carparks. The loading areas are designed to accommodate mainly delivery vans/service vehicles/8.8m medium size vehicles.

A service area is also being proposed south of the student accommodation block to accommodate mainly service vehicles/delivery vans for the student residents moving furniture and white goods to the student accommodation.

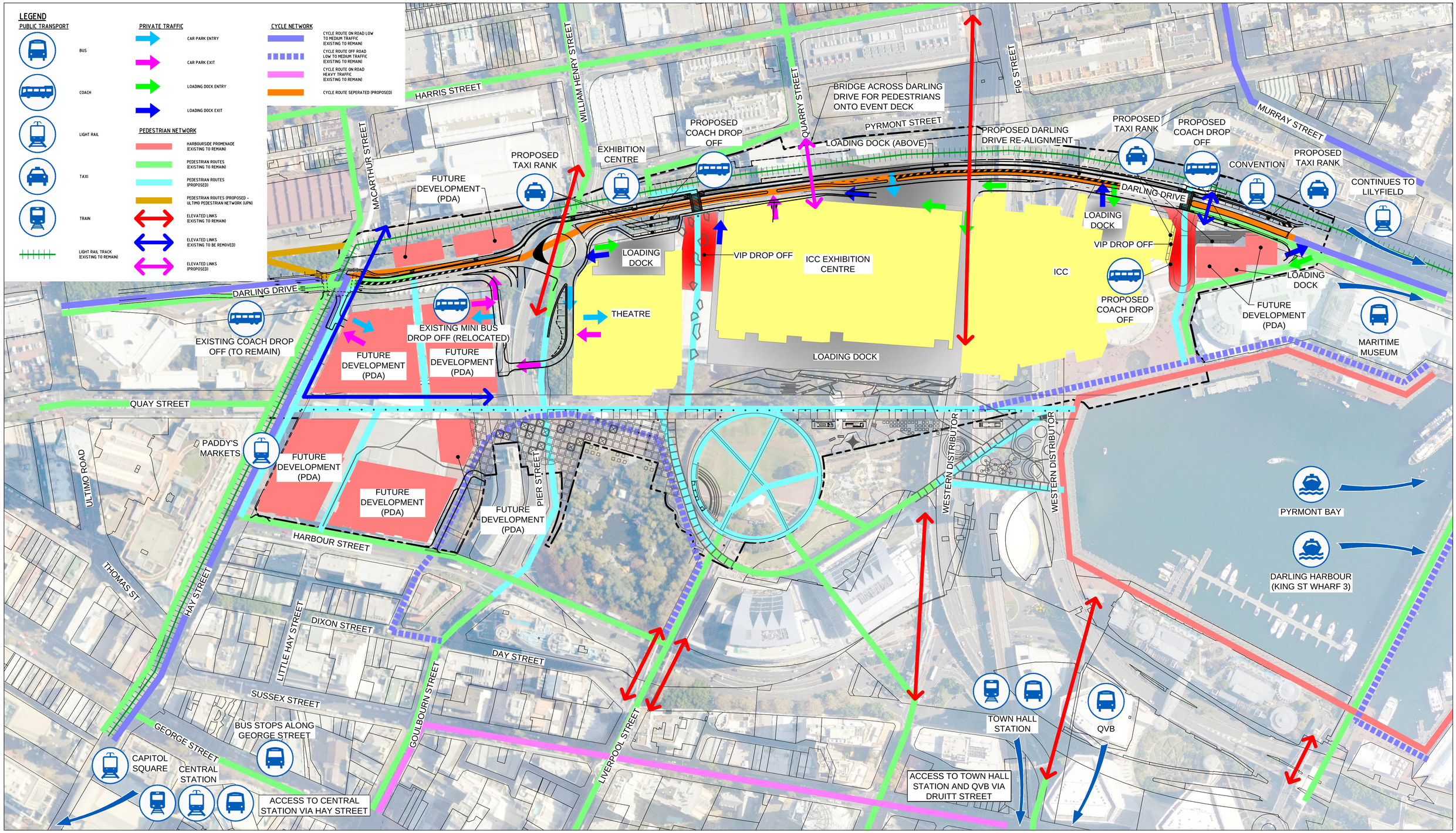
5.7 PEDESTRIAN NETWORK

The proposed pedestrian network builds on the initiatives introduced with the Ultimo Pedestrian Network and the Chinatown Public Domain Plan and provides interfacing with the improved pedestrian network around South Darling Harbour. Aside from maintaining existing routes, the design will extend the UPN to Darling Drive to improve access and strengthen linkages between Central Station, the education precinct (UPS/TAFE), Haymarket, Chinatown from the south towards the Powerhouse Museum and Darling Harbour to the north. The reconfiguration of Darling Drive and the new pedestrian connections will enhance accessibility to Quarry Street to the west and create new east-west connections through Tumbalong Place.

The design proposes to enhance at-grade pathways through the Haymarket towards Tumbalong Park creating a direct north-south promenade extending from Quay Street to the Harbourside and linking major public gathering spaces (Haymarket Square, Tumbalong Park and Harbouside) within the Precinct.

The Traffic Transport and Access Plan (shown in Figure 5-24) illustrates the proposed pedestrian connections and linkages

SYDNEY INTERNATIONAL CONVENTION, EXHIBITION AND ENTERTAINMENT PRECINCT



DARLING HARBOUR LIVE

REFERENCE MAP

NOTES:

1. DO NOT SCALE FROM DRAWINGS. WORK TO WRITTEN DIMENSIONS ONLY.
2. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
3. ALL COORDINATES TO MGA. ALL LEVELS TO AHD.
4. ALL DIMENSIONS, COORDINATES AND LEVELS TO BE VERIFIED ON SITE BEFORE PROCEEDING WITH WORK. HYDER SHALL BE NOTIFIED IN WRITING OF ANY DISCREPANCIES.
5. THIS DRAWING MUST BE READ IN CONJUNCTION WITH ALL RELEVANT CONTRACTS, SPECIFICATIONS AND DRAWINGS.
6. PRECINCT BOUNDARIES ARE INDICATIVE ONLY AND ARE SUBJECT TO CHANGE.

0 30 60 90 120 150m

1 : 1500

REV	DESCRIPTION	DATE
01	ISSUE FOR DEVELOPMENT APPLICATION	05/03/2013

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PROJECT

SICEEP
DARLING HARBOUR
PRIVATE PUBLIC PARTNERSHIP (PPP)

DRAWING TITLE

TRAFFIC, TRANSPORT AND ACCESS PLAN

STATUS

DEVELOPMENT APPLICATION

SCALE @ A1	DRAWN	DESIGNED	REVIEWED	APPROVED
1 : 1500	KMc	-	JH	GI

PROJECT NUMBER	DRAWING NUMBER	REV
AA004399	PP-CI-0011	01

Original Sheet Size A1 - 841 x 594mm

5.8 CYCLE NETWORK

Darling Harbour Live proposes to build upon the initiatives of City of Sydney to improve connectivity in the Precinct with the cycle network and new public transport linkages. The proposal will create new cycling routes through the Public Domain by:

- Extending the cycling route in the east west direction and providing a new shared pedestrian and cycle pathway linking the Precinct to the west along the Darling Drive corridor link and;
- Enhancing the north-south connections at Quay Street to Harbourside via a through route between the ICC Exhibition Centre and Tumbalong Park.

As part of the realignment and reconfiguration of Darling Drive, cycle connections will be enhanced via the dual lane two-way segregated cycle path on the west side of Darling Drive. Further connections to the existing routes will be provided through new linkages on the existing road network.

The proposed cycle way will be segregated to improve the safety of cyclists along Darling Drive and will run along the western side of Darling Drive.

The dual lane cycle way will tie into a shared space zone, in the southern sector, south of the Darling Drive / Pier Street roundabout. Within this shared space zone, the dual cycle way will split and link into the existing single lane, one-way cycle way network, on either side of Darling Drive.

North of the Darling Drive / Pier Street roundabout the dual lane two-way segregated cycle-way will be provided along the western side of Darling Drive, until it meets the proposed scramble crossing in the northern sector by the ICC and ICC Hotel. At this junction the proposed cycle-way will utilise the proposed scramble crossing to allow a safe connection to the existing single lane, one-way cycle way network, on the eastern side of Darling Drive. Consequently, the proposed cycle way will revert back to a single lane, one-way cycle way, and link into the existing cycle network on both sides of Darling Drive.

5.9 TAXIS, COACHES AND BUSES

The preferred masterplan includes provision for the following:

- Parking provision for 12 minibuses. It is noted, however, that due to the new theatre exit arrangements, storage of mini buses will occur within the various PPP loading docks (particularly, the east loading dock of the ICC Exhibition Centre) subject to this being an operator managed function;
- Parking provision for 12 coaches adjacent to the University of Technology Sydney (UTS);
- New drop-off and pick-up facilities for taxis (18 in the northern and 11 in the southern);
- Five new drop-off and pick-up taxi bays for the ICC Hotel in Bayside;
- VIP access and drop-off at the loop road for the ICC and ICC Hotel as well as in a shared space between the ICC Exhibition Centre and The Theatre;
- New drop-off facilities for buses and coaches (one in the south of the Precinct and one in the north). These new facilities will replace the drop-off under the Pier Street viaduct; and
- emergency vehicle access to all areas of the Precinct.

6 TRAFFIC IMPACT ASSESSMENT

6.1 TRAFFIC GENERATION AND DISTRIBUTION

6.1.1 OVERVIEW

Trip generation in the precinct was based on actual traffic activity for the precinct, plus the incremental change between the present and future development profiles.

6.1.2 PPP COMPONENT

Traffic generation attributed to the PPP development is estimated on the basis of the future accommodation potential of the individual facilities. As there are no published guidelines on potential trip generation rates for facilities such as convention centre, exhibition centre or entertainment centre, trip generation is derived from the potential car parking demand of each facility, taking into account car mode share and expected turnover of the facility.

Trip generation is estimated based on the number of visitors at each facility. The worst scenario assumes occupancy of all key facilities at any one time. The visitor count is converted to vehicle trips by applying assumptions on mode split, turnover rates and inbound/outbound flow directional splits. Table 6-24 summarises the trip generation and distribution parameters applied to calculate total vehicle trips.

Table 6-24 PM Peak Traffic Generation for the PPP

PPP	Total Pax	Car Mode Share	Turnover Rate	Trips In	Trips Out	IN	OUT	Total Vehicle Trips
ICC (Convention Centre)	7,250	20%	80%	20%	80%	232	928	1,160
ICC Exhibition Centre[1]	4,161	20%	80%	20%	80%	133	533	666
The Theatre	8,000	22.5%	25%	90%	10%	405	45	450
Total						770	1506	2,276

[1]Assumes 1 person per 10 square metres

For the purpose of this assessment, the following traffic distribution is assumed:

- 60% trips anticipated to arrive/depart from the north via Darling Drive north;
- 10% trips anticipated to arrive/depart from the east via Goulburn Street and George Street;
- 15% trips to arrive from the south via Darling Drive south;
- 25% trips to depart to the south via Darling Drive south;
- 10% trips to arrive from the north via Harbour Street north;
- 15% trips to depart to the north via Harbour Street north; and,
- 5% trips anticipated to arrive from east via George Street/Hay Street.

This traffic distribution follows the observed directional flows taken from Hyder's Sydney Strategic Model.

6.1.3 THE HAYMARKET PRECINCT

An indication of the peak hour traffic generation potential of the future development within The Haymarket Precinct has been based on the Roads and Traffic Authority *Guide to Traffic Generating Developments" (2002)*. The RTA's Guide provides a series of traffic generation rates for a variety of land uses based on generic surveys undertaken by the RTA. These rates are generally applied to the Gross Floor Area (GFA) or Gross Leasable Floor Area (GLFA).

The typical peak hour traffic generation rates applicable for the proposed land uses of The Haymarket Precinct are as follows:

- Residential evening peak vehicle trips: 0.24 vehicle trips per hour for each unit
- Retail evening peak hour vehicle trips: 0.56 vehicle trips per hour per 100sqm GLFA
- Commercial evening peak vehicle trips 2 vehicle trips per hour per 100sqm GFA

Application of the above traffic generation rates to the proposed development yields a weekday peak period total traffic generation potential of 372 vehicle trips per hour comprising 270 In / 102 Out during evening peak periods. These traffic generation projections have been based on an arrival/departure split of 80/20 for residential, 50/50 for retail and 20/80 for commercial during the evening peak period. The estimated peak hour traffic generation for the proposed future developments is shown in Table 6-25.

Table 6-25 Traffic Generation for The Haymarket

The Haymarket Divisions	IN (vtph)	OUT (vtph)	TOTAL (vtph)
North East and North	100	25	125
South East	75	19	94
South West	86	21	107
North West	9	37	46
Total	270	102	372

The above table assumes the following:

- Retail trips will mainly consist of non-car trips; and
- Office/Commercial trips would be capped with the available parking space allocation.

For the purpose of this assessment, the following traffic distribution is assumed:

- 30% trips anticipated to arrive from western suburbs via M4 Western Distributor;
- 10% trips anticipated to arrive from western suburbs via Great Western Highway/Parramatta Road;
- 30% trips anticipated to arrive from northern suburbs via M4 Western Distributor and then through Darling Drive and Ultimo Road;
- 20% trips anticipated to arrive from southern suburbs by using Eastern Distributor and then through north Darling Drive and Ultimo Road; and,

- 10% trips anticipated to arrive from southern suburbs by using Great Western Highway and then through Harris Street and Ultimo Road.

6.1.4 HOTEL

There are no guidelines for trip generation rates for hotel developments in the RMS Guide. However, it is suggested that analysis of trip generation for hotel developments be based on surveys of similar existing hotels. In the absence of survey data, reference is made to trip generation rates for Novotel Hotel Darling Harbour located along Harris Street[2]. It has been reported to be in the range of 0.08 – 0.15 vehicle trips per guest room. The rate provides indication of potential traffic generation for a hotel development in the vicinity of Darling Harbour.

However, it is anticipated that majority of the trips to the hotel will generate walking trips rather than vehicular trips. The majority of guests would arrive at the hotel via taxi, coach, mini bus or light rail. A relative small proportion would arrive by private car or hire car. Other hotel patrons who visit the hotel for functions or conferences may arrive by private vehicle but will be expected to find parking in the exhibition centre or public carparks near the vicinity of the site as no new parking will be provided as part of the hotel development. It is also anticipated that majority of the staff will be expected to use non-car modes for travel to work.

In summary, vehicle trip generation to the hotel will be minimal. For the purpose of this assessment, it is assumed that the trip generation rate for the hotel in the PM peak would be approximately 0.15 vehicle trips per guest room. Hence, a total of 137 vehicle trips during the PM peak are assumed. A 50/50 split in directional flow (inbound/outbound and northbound/southbound) is assumed. Main access to the hotel would be on Darling Drive.

6.1.5 STUDENT ACCOMMODATION

There are also no guidelines for trip generation rates for student accommodation in the RMS Guide. However, it is anticipated that majority of the trips for the student accommodation will comprise of walking trips and public transport trips during the peak hour. Vehicle trips for this land use are expected to be minimal and are anticipated to mostly occur outside the normal commuter peak. No parking will be provided for this land use but loading facilities will be incorporated in the design layout to allow for students moving in and moving out. In the absence of any guidelines, it is assumed that vehicle trip generation for student accommodation is not likely to exceed the vehicle trip generation for high density residential (0.24 vehicle trips per unit) and a high estimate could potentially be in the order of 0.12 vehicle trips per unit. Hence, for a total of 422 units, vehicle trip generation could be in the order of 50 vehicle trips.

6.2 INTERSECTION OPERATION

6.2.1 SIDRA INTERSECTION ANALYSIS

SIDRA Intersection modelling was undertaken to determine operational performance at key intersections.

The future network assumes the proposed road changes explained in Section 5.3 with one-way flow to and from the carparks. Access to the carpark entry is via the Darling Drive/Pier Street roundabout while exit from the carparks follow the one way road lane along Darling Drive

[2] Novotel Darling Harbor Traffic Impact Assessment, Arup

towards Ultimo Road. From Ultimo Road, vehicles with destinations north of the precinct will have to travel northbound either via Harbour Street or Harris Street.

The results of the modelling are presented in the following section. The tables below summarise the modelling results.

Table 6-26 Future Intersection Performance – (Friday Event)

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
(I-1) Darling Dr / Murray St / Pyrmont Bridge Rd	Signalised	Murray St North	44.7	D	40.9	C
		Darling Dr East	38.1	C		
		Murray St South	50.0	D		
		Pyrmont Bridge Rd West	40.3	C		
(I-2) Darling Dr / Pier street	Roundabout	Darling Dr North	4.0	A	9.4	A
		Pier St (off-ramp) East	9.4	A		
		Darling Drive South	8.9	A		
(I-3) Darling Dr / Car Park Access	Signalised	Darling Dr North	8.7	A	10.7	A
		Future Haymarket Car Park Access	71.7	F		
		Darling Dr South	7.9	A		
(I-4) Pier St / Harbour St / Goulburn St	Signalised	Harbour St North	40.7	C	33.8	C
		Goulburn St East	35.1	C		
		Harbour St South	38.7	C		
		Pier St West	23.0	B		
(I-5) Harbour St / Liverpool St	Signalised	Harbour St North	23.8	B	35.5	C
		Liverpool St East	45.0	D		
		Harbour St South	33.9	C		
		Car Park Exit (West)	70.8	F		

Table 6-27 Future Intersection Performance (Saturday Event)

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
(I-1) Darling Dr / Murray St / Pyrmont Bridge Rd	Signalised	Murray St North	54.4	D	61.2	E
		Darling Dr East	32.0	C		
		Murray St South	59.8	E		
		Pyrmont Bridge Rd West	85.9	F		
(I-2) Darling Dr / Pier street	Roundabout	Darling Dr North	4.3	A	9.8	A
		Pier St (off-ramp) East	9.7	A		
		Darling Drive South	20.5	B		

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
(I-3) Darling Dr / Car Park Access	Signalised	Darling Dr North	9.4	A	10.4	A
		Future Haymarket Car Park Access	62.6	E		
		Darling Dr South	6.9	A		
(I-4) Pier St / Harbour St / Goulburn St	Signalised	Harbour St North	49.6	D	38.4	C
		Goulburn St East	33.0	C		
		Harbour St South	44.7	D		
		Pier St West	24.1	B		
(I-5) Harbour St / Liverpool St	Signalised	Harbour St North	15.1	B	20.4	B
		Liverpool St East	29.9	C		
		Harbour St South	17.9	B		
		Car Park Exit (West)	33.5	C		

The results indicate that the impact of the SICEEP development does not impose conditions on the intersections worse than what would have otherwise occurred through existing traffic.

The results further indicate:

- Optimised signal settings at all intersections will improve intersection performance and maintain level of service at acceptable levels;
- Improved signal coordination at the intersection at Harbour Street/Pier Street/Goulburn Street; Goulburn Street/Sussex Street and Goulburn Street/George Street will minimise downstream effects;
- The overall performance of the intersections is maintained in 'status quo' with the one way scheme for the Friday event traffic. Hence, no adverse impact on intersection performance is expected from the development;
- Friday event traffic, the intersection of Pyrmont Bridge Road/Murray Street/Darling Drive intersection operates at "LoS C. With the one way exit lane, vehicles are diverted away from the Darling Drive/Pier Street roundabout and the Pyrmont Bridge Road/Murray Street/Darling Drive intersection;
- With the exception of Pyrmont Bridge Road/Murray Street/Darling Drive intersection, the operational performance of the key intersections are considered satisfactory for Saturday event traffic;
- The critical movements at the Pyrmont Bridge Road/Murray Street/Darling Drive intersection are the right turning movement from Pyrmont Bridge Road to Murray Street and the right turning movement from Darling Drive to Murray Street. It is noted that the RT bay from Pyrmont Bridge Road is only 40 metres. The 95% back of queue for that movement is 65 m. Similarly, the RT bay from Darling Drive East to Murray Street north is 50 m while the 95% back of queue is 86m.

The above critical movements indicate improvement measures are required to achieve satisfactory intersection performance. However, it should be noted that only the right turning movement from Darling Drive to Murray St is directly attributable to traffic movements generated

by the future SICEEP development. The right turn movements from Pyrmont Bridge Road to Murray Street represent vehicle movements outside the study cordon and have also manifested to be a critical movement in the existing intersection operations.

To achieve satisfactory intersection performance, the following improvement measures may be considered:

- Pyrmont Bridge Road eastbound right turning bay extension at intersection with Darling Drive and Murray Street.
- Darling Drive westbound right turning bay extension at intersection with Murray Street and Pyrmont Bridge Road.
- Goulburn St westbound right turning bay extension at intersection with Harbour Street. The RT bays are 30m and 28m while the 95% back of queue is observed to be 49m and 46m, respectively. Although this movement does not impact on the overall intersection operational performance, the modelling shows there are capacity issues in terms of lane queues and spillover to the adjacent through lane.

Detailed SIDRA Results are attached in Appendix C

6.2.2 AIMSUN INTERSECTION ANALYSIS

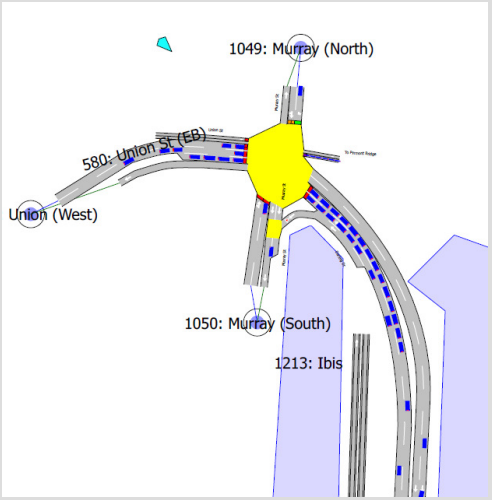
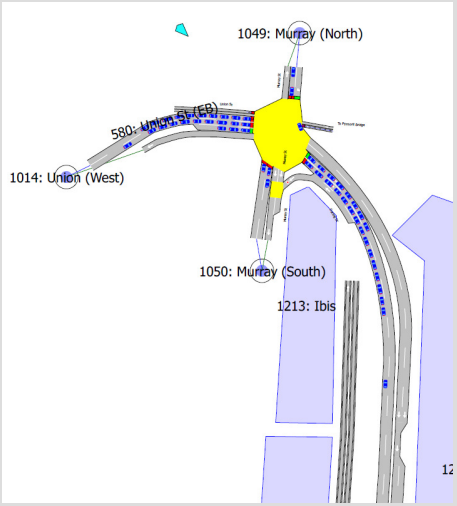
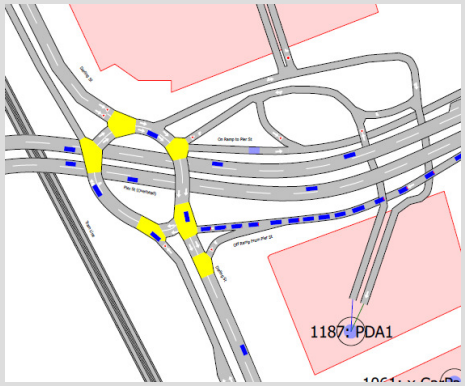
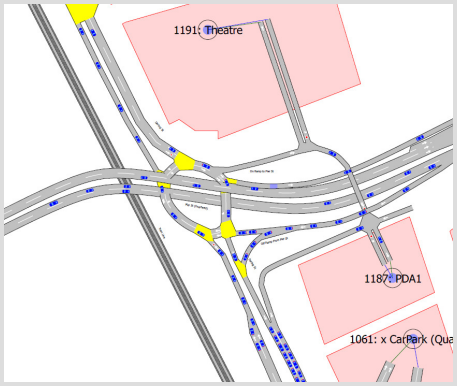
Intersection analysis, based on the AIMSUN assessment indicated some intersection related operational issues at following three intersections including:

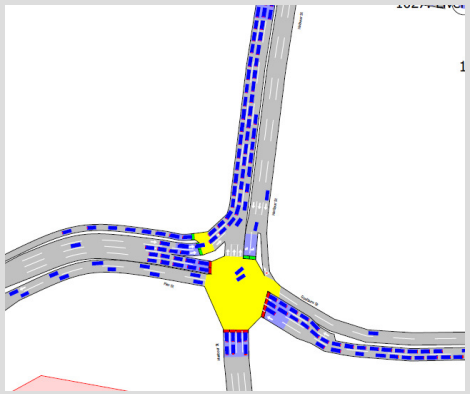
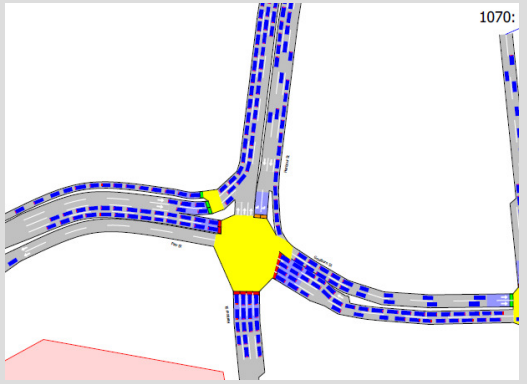
- Darling Drive/Pyrmont Bridge Road/Murray Street intersection
- Harbour Street/Pier Street/Goulburn Street intersection
- Harbour Street/Liverpool Street

While some of these issues do not necessarily reflect an overcapacity situation for the entire intersection, any further increase on the demand from both future background and precinct development traffic at these locations will impact network capacity.

Key existing network issues identified for PM peak period are presented in Table 6-28. Screenshots from AIMSUN models are shown to illustrate the location and nature of each network issue. The level of service (LoS) results by each approach road is shown in Appendix D.

Table 6-28 Key Network Operational Issues in typical (Friday) PM Peak

ID	Location	Key Issues	AIMSUN Snapshot Existing	AIMSUN Snapshot Future
1	Pyrmont Bridge Road / Darling Drive/Murray Street Intersection (I-1)	Existing intersection layout has no exclusive left on Pyrmont Bridge Road west approach. There is one shared through-left at the intersection stopline. Existing and future scenario suggests occasional delays and queues along shared through-left turn lane on Pyrmont Bridge Road. The right turn movements from Pyrmont Bridge Road west approach and Darling Drive East approach may also experience delays and queues that spill-over the adjacent through lane. Future scenario mimics existing conditions.		
2	Darling Drive/Pier Street Roundabout (I-2)	Existing conditions show heavy westbound traffic on the off-ramp. Future scenario eliminates queueing on the Pier street off ramp approach to the roundabout		

ID	Location	Key Issues	AIMSUN Snapshot Existing	AIMSUN Snapshot Future
3	Harbour Street/Pier Street/Goulburn Street	Currently there are two exclusive right turning lanes (short lanes) at the intersection stopline on Goulburn Street. Model indicated for existing and future scenarios high right turn demand occasionally experiencing long queues exceeding the right turn bay lengths and spill backs to adjacent through lane.		
4	Harbour Street/ Pier Street/Goulburn Intersection and Harbour Street/Liverpool Intersection	Northbound traffic from Pier St turning left at Pier Street/Harbour Street intersection experiences long queues that extends back from Harbour Street /Liverpool intersection. Model indicated 907veh/hr turning left from Pier Street. This is observed for the existing scenario. The additional traffic from the development will experience extended queues on Pier Street. Future scenario show similar results.