

7. Parking Strategy

7.1 On & Off-Site Parking Supply

The TMAP Assessment report prepared by Halcrow (dated 26 July 2011) included a summary of the parking supply and availability within a 5 minute walk of the site. The findings are summarised below in Table 7.1.

Table 7.1: Existing Parking Demand & Supply (July 2011)

Car Park	Supply	1:00 PM		6:00 PM	
		Occupied	Available	Occupied	Available
SEC	1900	926	974	1423	477
SCEC	900	800	100	600	300
World Square	557	495	62	330	227
Market City	614	546	68	364	250
Thomas Street	600	533	67	355	245
Total	4571	3300	1271	3072	1499

Source: Halcrow SICEC TMAP Report 2011

600 spaces in the Sydney Entertainment Centre have been reserved for the use of Darling Quarter leaving a parking supply of only 1300 spaces. The SCEC car park will be demolished as part of the redevelopment of the SICEEP precinct thereby changing the total number of spaces available.

The estimated future parking supply and demand off site is shown below in Table 7.2. The table takes into account additional car parks within 300m of the site that were not included in the Halcrow report. It is assumed that the parking occupancy for off-site parking spaces is 89% at 1pm and 59% at 6pm and that occupancy decreases later in the evening. This assumption is based on the occupancy of site as observed in the Halcrow report.

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Table 7.2: Future Parking Demand & Supply

Car Park	Supply	1:00 PM		6:00 PM	
		Occupied	Available	Occupied	Available
World Square (Secure)	557	495	62	330	227
Market City (Wilson)	614	546	68	364	250
Thomas Street (Wilson)	600	533	67	355	245
Harbourside	1387	1235	152	819	568
Darling Quarter (Wilson)	600	534	66	354	246
Harris Street (Secure)	260	232	28	154	106
No 1 Dixon (Secure)	130	116	14	77	53
Capitol Square	TBC	TBC	TBC	TBC	TBC
Cinema Centre (Secure)	700	623	77	413	287
Darling Park (Wilson)	1000	890	110	590	410
234 Sussex St (Secure)	TBC	TBC	TBC	TBC	TBC
St Andrews House (Wilson)	TBC	TBC	TBC	TBC	TBC
Citigate Central (Mirvac)	630	561	69	372	258
Star City (Casino)	2500	1218	1282	912	1588
Darling Wharf	TBC	TBC	TBC	TBC	TBC
Citipark Sydney (Wilson)	TBC	TBC	TBC	TBC	TBC
Atrium (Interpark)	61	55	6	36	25
2 Market Street (Secure)	TBC	TBC	TBC	TBC	TBC
Total	9039	7038	2001	4776	4263

7.2 Parking Demand

The proposed development includes several activities that are anticipated to be managed to occur at different times. Nevertheless, it is anticipated that on occasion, these activities will occur simultaneously. For the purpose of assessing the peak parking demand two scenarios have been assessed including:

- Weekend Peak (a large event occurring at the Exhibition Centre on a Saturday); and
- Friday Evening (a number of events occurring at different venues).

7.2.1 Peak Parking Demand during Exhibition Centre Events

Historical records indicate that the largest event held at the exhibition centre is the International Motor Show which peaks during weekends. It is noted that this event is planned to be relocated to another venue by 2014, however, for the purpose of this assessment it still represents the worst case scenario which is likely to occur once or twice per year.

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With the exception of 2009, this is an annual event attracting approximately 180,000 to 250,000 visitors over 10 days with the highest recorded attendance over one day (i.e. from 10am to 10pm) being in the order of 25,000 pax during a Saturday. Little or no competing events are held during the peak Saturday in the Entertainment and Convention Centres in order to manage traffic conditions and parking availability.

Conservatively assuming that 30,000 visitors is the upper limit expected to be attending the site during such a Saturday, it is estimated that a maximum of 6,500 visitors will be attending the site at any one time. This assumption is based on spreading the total visitors over the entire day.

By adopting the 22.5% target for visitors driving to the site during events, it is anticipated that the peak parking demand on a Saturday will be in the order of 1,463 spaces (say 1,500 spaces).

Given that the very few events, if any, are anticipated to be held at the entertainment arena or convention centre during the Convention Centre's Saturday peak, it is envisaged that the parking demand of 1,500 spaces will be completely catered for on site by the 1,600 spaces provided on site.

7.2.2 Peak Parking Demand for Several Concurrent Events

The peak parking demand during the week is predominantly associated with the Entertainment Centre. Currently, the larger events associated with the Entertainment Centre are held on weekday evenings. This trend is anticipated to continue.

In order to assume a realistic worst case scenario in this assessment, it is assumed that the Convention Centre and Entertainment Centre will operate at peak on the same day, with only a small proportion of the Exhibition Centre being used. The site is anticipated to be managed such that the peak parking demand for each site will not occur simultaneously. In this scenario, it is envisaged that the peak parking demand for the Convention Centre and the Exhibition Centre are likely to occur during typical working hours (i.e. between 9am and 5pm) and that the peak parking demand for the Entertainment Centre is likely to occur after 8pm, most likely on a Friday.

The peak parking demand for each land use has been estimated below.

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Table 7.3: Peak Parking Demand per Land Use

Land Use	Visitors	Visitors Driving	Peak Parking Demand
Exhibition Centre	4000	20%	800
Entertainment Centre	8000	22.5%	1800
Convention Centre	4500	20%	900

The higher proportion of drivers for the Entertainment Centre is anticipated due to the event occurring during the evening (i.e. 8pm onwards). The other two land uses are anticipated to peak during typical business hours.

In light of the above, the change in parking demand throughout the day has been estimated for each land use in order to determine the peak parking demand for the entire site during a Friday evening. The estimated numbers are shown below in Figure 7.1.

Figure 7.1: Anticipated Parking Demand

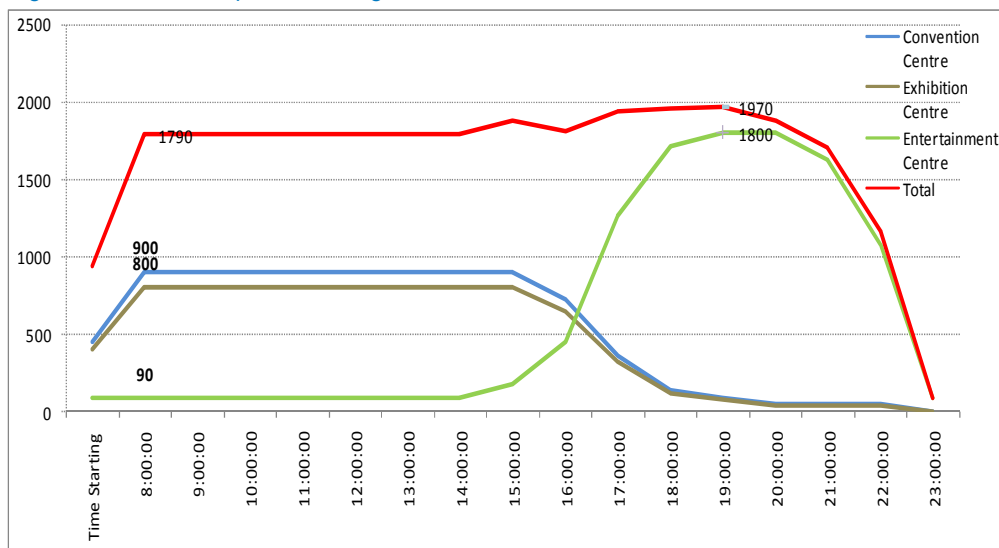


Figure 7.1 indicates that the peak parking demand (approximately 1970 parking spaces) will occur in the evening, after the typical weekday traffic peak period and is predominantly associated with the Entertainment Centre.

Based on the proposed number of parking spaces on site (1,600 spaces), it is envisaged that the proposed development will rely on approximately 200 and 400 off-site spaces during business hours and in the evening respectively.

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The surveys undertaken for parking availability within close proximity to the site indicate that there are approximately 2,000 and 4,850 spaces available at 1pm and at 6pm respectively.

In light of the above, it is anticipated that the proposed development will not have any significant adverse impact on parking availability during weekdays and Weekends. It should be noted that the assessment is an observation of an estimated worst case scenario which is not anticipated to occur regularly, thereby strengthening the robustness of the parking assessment.

8. Traffic Impacts

8.1 Background

The review of existing traffic volumes on the adjacent road network suggests that the peak traffic movements on surrounding road network occur on Friday evening between 5.30pm and 6.30pm. The peak traffic volumes on Friday evening include vehicular traffic from commuters leaving their workplace as well as visitors arriving to the City to attend Friday night events. The Friday evening peak period is considered as a worst case scenario for the traffic movements in the vicinity of the site and as such, the traffic impact assessment of the proposed development has therefore been undertaken for the Friday evening peak period. During other times of weekdays and weekends traffic volumes on surrounding road network are significantly lower and as such traffic impact is expected to be less significant.

8.2 Trip Generation

There are no published Australian guidelines on the trip generation rates for these types of facilities e.g. Convention Centre, Exhibition Centre, Entertainment Centre. As such, trip generation for the proposed development has been derived from the anticipated car parking demand for each land use of the proposed development and similar developments in other major cities. The anticipated car parking demand for the development has been discussed in Section 7.2 of the report.

The trip generation rates adopted for each land use of the proposed development is detailed below including their anticipated in/out split from/to the site. The trip generation rates adopted below represent the worst case scenario.

8.2.1 The Convention Centre

The convention centre is anticipated to be utilised for a wide range of events and the nature of these events will influence the volume and brief patterns of trip making associated with them. In terms of determining the impacts of this trip generation on the adjacent road network, the worst case scenario would involve an all-day function in which delegates arrive in the morning and depart in the afternoon. The anticipated peak parking demand for the Convention Centre is 900 spaces. It is conservatively assumed that the total trip generation for the Convention Centre is 80% of the anticipated peak car parking demand. This equates to a trip generation of 720 vehicles per hour (vph) during the Friday evening peak period. The in/out split for the Convention Centre has been determined by assuming that the majority of traffic will

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depart during the evening peak period. The trip generation for the evening peak period has been determined by assuming 80% outbound trips and 20% inbound trips.

The trip generation for the Convention Centre including their in / out split determined by adopting the abovementioned assumptions and summarised in Table 8.1.

Table 8.1: Anticipated Trip Generation for the Convention Centre

Land Use	Anticipated peak Parking Demand # (vph)	% Turnover	Total Trips (vph)	In/Out Split		In/Out Trips (vph)
				In	Out	
Convention Centre	900	80%	720	20%	80%	144 576

8.2.2 The Exhibition Centre

The Exhibition Centre is anticipated to be utilised similar to the Convention Centre which will cater for meetings, conferences, exhibitions and special events. The worst case scenario would involve an all-day function in which delegates arrive in the morning and depart in the afternoon. The anticipated peak parking demand for the Exhibition Centre is 800vph (Refer Section 6). It is conservatively assumed that the total trip generation for the Exhibition Centre is 80% of the anticipated peak car parking demand. This equates to a trip generation of 630vph during the Friday evening peak period. The in/out split for the Convention centre has been determined by assuming that the majority of traffic will depart during the evening peak period. The trip generation for the evening peak period has been determined by assuming 80% outbound trips and 20% inbound trips. The trip generation for the Exhibition Centre including their in / out split determined by adopting the abovementioned assumptions and is summarised in Table 8.2.

Table 8.2: Anticipated Trip Generation for the Exhibition Centre

Land Use	Anticipated peak Parking Demand # (vph)	% Turnover	Total Trips (vph)	In/Out Split		In/Out Trips (vph)
				In	Out	
Exhibition Centre	800	80%	640	20%	80%	128 512

8.2.3 The Entertainment Centre

The Entertainment Centre is likely to generate a much different pattern of travel to the Convention Centre and Exhibition Centre and because of the nature of the events held. The entertainment Centre may be utilised for concerts which mainly occurs during later evening hours/night time outside of the business peak periods. Nevertheless, a conservative 25% trip generation of the peak parking demand has been assumed for the evening peak period where small proportion of visitors are anticipated to travel during evening peak period. The anticipated peak parking demand for the Entertainment Centre is 1,800vph for a 25% conservative turnover, a trip generation of the Entertainment Centre is 450vph during the evening peak period. The in/out split for the Entertainment Centre has been determined by assuming that the vast majority of traffic will arrive during the late evening period and leave at night after the events. The trip generation for the evening peak period has been determined by assuming 90% inbound trips and 10% outbound trips.

The trip generation for the Entertainment Centre including their in/out split has been determined by adopting the abovementioned assumptions and is summarised in Table 8.3.

Table 8.3: Anticipated Trip Generation for the Entertainment Centre

Land Use	Anticipated peak Parking Demand #		Total Trips (vph)	In/Out Split		In/Out Trips (vph)
	(vph)	% Turnover				
Entertainment Centre	1800	25%	450	In	90%	405
				Out	10%	45

The total trip generation and In/out split for the entire SICEEP precinct is summarised in Table 8.4.

Table 8.4: Total Trip Generation - SICEEP Precinct

Land Use	Anticipated peak Parking Demand #		Total Trips (vph)	In/Out Split		In/Out Trips (vph)
	(vph)					
SICEEP Precinct	3500		1810	In		677
				Out		1133

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The trip generation for the proposed development also depends on the on-site car parking supply within the SICEEP precinct as well as off-site car parking supply in the close proximity to the site. The proposed on-site car parking supply includes 300 car parking spaces in the North Precinct and 1,300 car parking spaces in the South Precinct. Any additional car parking demand is anticipated to be accommodated within the Off-Site Car parks in close proximity of the site. The trip generation of the proposed development has been proportionately allocated to the proposed car parking supply and summarised in Table 8.5.

Table 8.5: Allocation of Trip Generation to each car park (for Friday Evening Peak period)

Carparks	Caparking Supply	Proportion of Parking	In/Out Split		In/Out Trips (vph)
			In	Out	
North Precinct	300	16.6%	In		112
			Out		188
South Precinct	1300	71.8%	In		486
			Out		814
Off-site carparks	210	11.6%	In		79
			Out		131
Total	1810	100.0%	In		677
			Out		1133

8.2.4 Trip Distribution

The trip distribution has been estimated based on the existing traffic flows in the vicinity of the site as well as the anticipated travel pattern to/from the site. For each car park access, trip distribution has been estimated based on the anticipated travel pattern to/from major roads and discussed below:

North Precinct car park (SICEEP)

The northern precinct of the SICEEP caters for 300 car parking spaces and will have direct access from Darling Drive. The trip distribution to/from the North Precinct of the site is shown in Appendix B. The following assumptions included for trip distribution from North Precinct of the site.

- 30% trips anticipated to arrive from western suburbs by using M4 Western Distributor Freeway and then through Darling Drive (north) with left turn entry to the site. The same proportion of trips will leave the site using the same route;

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- 10% trips anticipated to arrive from western suburbs by using Great Western Highway and then through Darling Drive (south) with right turn entry to the site. The same proportion of trips will leave the site using the same route;
- 30% trips anticipated to arrive from northern suburbs by using M4 Western Distributor Freeway and then through Darling Drive (north) with left turn entry to the site. The same proportion of trips will depart through Darling Drive (south) - Pier Street - Harbour Street route to access M4 Western Distributor Freeway;
- 20% trips anticipated to arrive from southern suburbs by using Eastern Distributor Motorway and then through Cross City Tunnel and then through Darling Drive (north) with left turn entry to the site. The same proportion of trips will depart through Darling Drive (south) - Pier Street - Harbour Street route to access M4 Western Distributor Freeway; and
- 10% trips anticipated to arrive from southern suburbs through other routes and will travel through Great Western Highway-Harris Street-Ultimo Road - Darling Drive (south) with right turn entry to the site. The same proportion of trips will leave the site using the same route.

9. Traffic Impact Assessment

9.1 AIMSUN Modelling

The traffic modelling used in the analysis has been undertaken utilising the dynamic software AIMSUN (Advanced Interactive Microscopic Simulator for Urban and Non-Urban Networks)

The modelling results are based on traffic data provided and collected at the time. Traffic patterns and volumes as well as signal operation are subject to variation at different times for a variety of reasons. It is not possible to model all these variations and for this reason this modelling is an approximation only of the actual traffic operation. For example SCATS, the traffic signal software used by RTA to manage traffic operations, has the ability to adjust signal phasing at intersections dependent on variations in demand to improve traffic operational efficiency, this has the potential to reduce delays to some traffic movements and at the same time adversely affect other traffic movements.

The program provides output inclusive of vehicle delays and queues at intersections. The vehicle delays can be correlated to a level of service utilising the HCM method which ranks both intersection & traffic movement level of service based on average vehicle delay as outlined below:

Level of
Service
(LOS)

A	Excellent -- vehicles unaffected by other vehicles
B	Very Good – intersection has spare capacity
C	Good – generally intersection operating satisfactorily
D	Acceptable – intersection operating near capacity
E	Poor - at capacity and may require intersection improvements
F	Very Poor- unsatisfactory & requires intersection improvements

9.2 Methodology

The surrounding road network for the SICEEP was identified as consisting of Darling Drive from Murray Street to Quay Street, Pier Street from Darling Drive to Harbour Street and Harbour Street from Liverpool Street to Hay Street.

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From this the following intersections were highlighted as key points affecting traffic movements surrounding the SICEEP:

The Intersections analysed include:

- Darling Drive with Murray Street and Union Street
- Darling Drive and Pier Street
- Darling Drive and Quay Street
- Harbour Street and Liverpool Street
- Harbour Street with Pier Street and Goulburn Street

Traffic Data Obtained:

- 24 hour daily mid block counts were taken in Harris Street and Darling Drive to reflect the traffic volume trends.
- Peak Hour counts at the intersections listed above.
- Site observations
- SCATS data

From the combination of this data an AIMSUN micro-simulation model was constructed to represent the existing traffic movements around the SICEEP site.

Friday evening peak hour from 5:30pm to 6:30pm was used as representing the network under usual high level traffic flow and would also be beneficial to illustrate impacts on traffic for future development of the SICEEP site.

It should be noted that the model needs to be validated to ensure that it is in accordance with the Paramics micro-simulation modelling – RTA manual.

9.3 Traffic Movements for SICEEP

Review of the daily traffic movements over a weekly period indicated that traffic from Monday to Thursday followed similar trends and volumes through the day. For these days the morning peak hour was between 8am and 9am and the evening peak hour was between 5pm and 6pm. The evening being the greater in volume of the two daily peak.

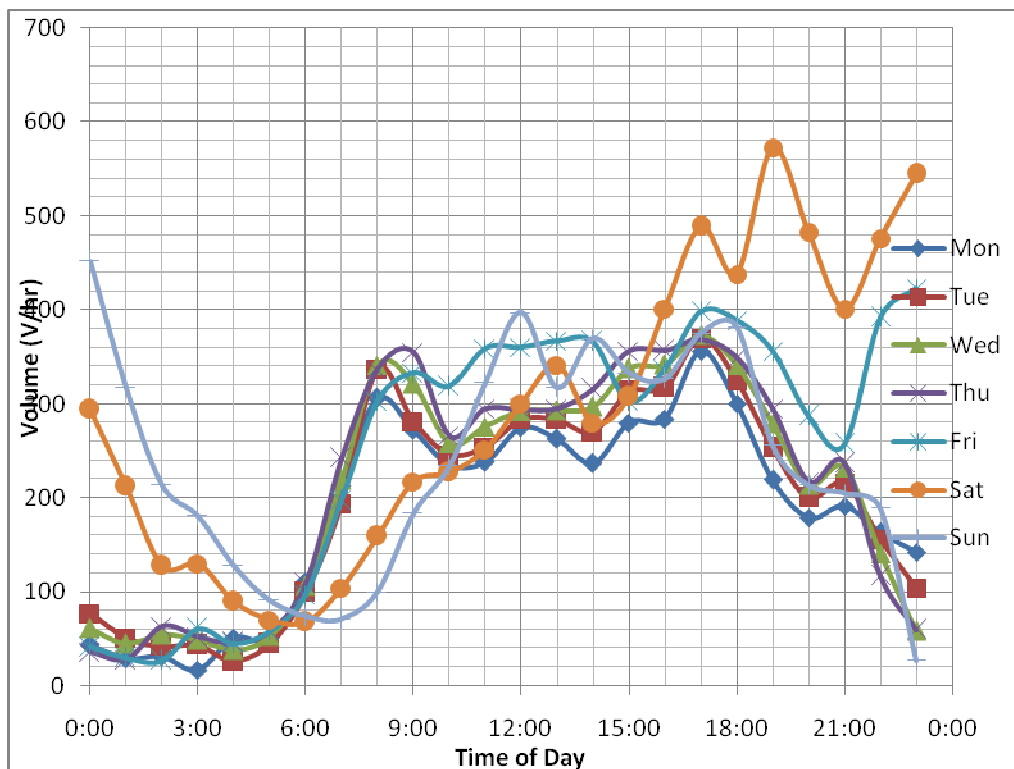
This trend changed on Friday with the traffic still increasing till 9am but then staying relatively constant through the day until 6pm where the traffic lulled until started to begin to peak again at 9pm until a daily high at midnight.

Weekend traffic also showed a different traffic pattern with high volume of traffic in the early morning to a low at 6am then steadily increasing during the day. Saturday traffic has the highest daily volume and the highest peaks 7pm and 11pm.

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These differing patterns would be explained by the change in network uses from regular commuter traffic to entertainment traffic for both Friday and Saturday evenings. Saturday evening peak displaying approximately 38% more traffic than the average weekly peak. A summary of the variation in traffic volumes by day of the week is provided in Figure 9.1.

Figure 9.1: Traffic Volume Variation



9.4 Darling Drive with Murray Street and Union Street

This intersection is signalised and is the main north western entrance for traffic entering the SICEEP. It is fed and feeds traffic from major traffic routes of Wattle Street and Harris Street as well as Pymont Bridge Road and connecting road to Star City casino.

The intersection is also a major connection point of pedestrian and cycle traffic from Darling Harbour to Pymont. Because of this it has recently had a dedicated controlled cycle crossing added from Pymont Bridge side to Union Street.

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The table and figures below show surveyed traffic volumes at the intersection, intersection arrangement and traffic signalling phasing (including proportion of time allocated to each signal phase).

Table 9.1: 2012 Evening Peak Hour Traffic Volumes

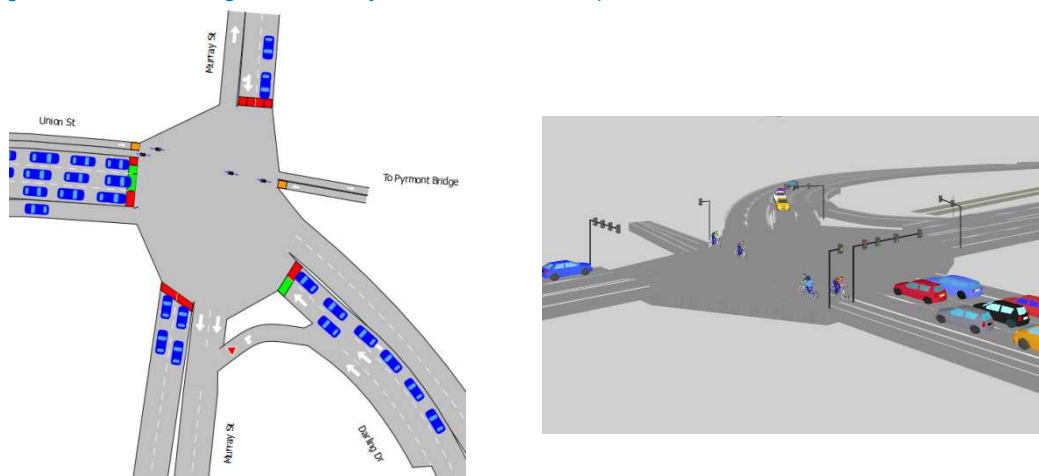
Approach	Turn Volumes			Turn Percentages		
	L	T	R	L	T	R
North	110	89	89	38%	31%	31%
East	173	234	223	27%	37%	35%
South	65	68	80	31%	32%	38%
West	91	343	152	16%	59%	26%

Table 9.2: Future Evening Peak (2012 Peak plus Full Development Trip Generation)

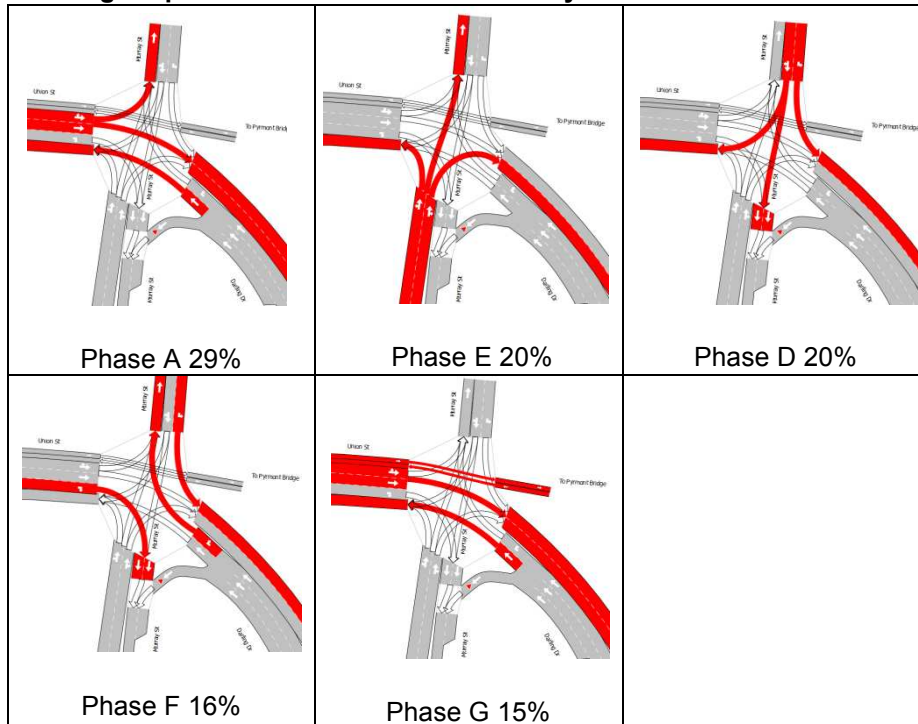
Approach	Turn Volumes			Turn Percentages		
	L	T	R	L	T	R
North	110	89	89	38%	31%	31%
East	173	428	223	21%	52%	27%
South	79	68	80	35%	30%	35%
West	91	640	156	10%	72%	18%

This intersection has an existing average LOS D at model peak hour and a forecast average LOS E with the development. The results of the AIMSUN model are discussed in Section 9.9 of this report.

Figure 9.2: Darling Drive/Murray Street AIMSUN snapshot



Phasing Sequence Modelled with 110 sec Cycle Time



9.5 Darling Drive and Pier Street

This is a grade separated intersection with Pier St as an overpass and Darling Street forming a roundabout with the on and off ramps for the connection to Pier Street.

This intersection receives traffic entering the SICEEP from the east via Goulburn Street, Harbour Street and Sydney CBD and allows the traffic to be distributed to the north and south.

The table and figures below show surveyed traffic volumes at the intersection, intersection arrangement and traffic signalling phasing (including proportion of time allocated to each signal phase).

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Table 9.3: 2012 Evening Peak Hour Traffic Volumes

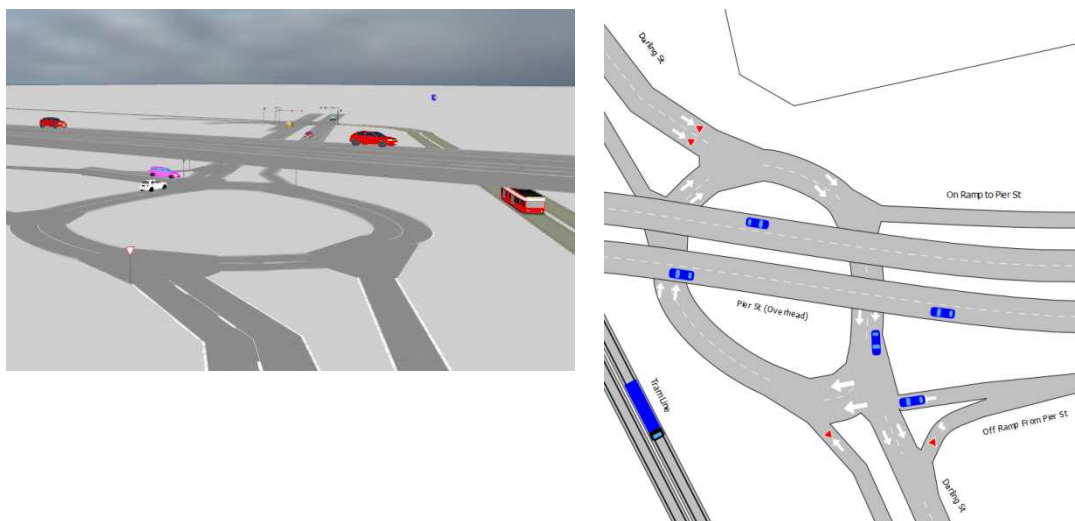
	Turn Volumes			Turn Percentages		
	L	T	R	L	T	R
	305	213		59%	41%	0%
East	129		445	22%	0%	78%
South		224	108	0%	67%	33%
West						

Table 9.4: Future Evening Peak (2012 Peak plus Full Development Trip Generation)

Approach	Turn Volumes			Turn Percentages		
	L	T	R	L	T	R
North	333	490		40%	60%	0%
East	202		473	30%	0%	70%
South		322	404	0%	44%	56%
West						

This intersection has an existing average LOS A at model peak hour and a forecast average LOS E with the development. The results of the AIMSUN model are discussed in Section 9.9 of this report.

Figure 9.3: Darling Drive/Pier Street AIMSUN snapshot



9.6 Darling Drive and Quay Street

This is a signalised intersection that includes crossing for tram line.

The intersection mainly caters for traffic entering and existing the Entertainment Centre multi-storey car park. The arrangement of the signal timings is such that trams are given their own phase. Tram traffic is very light and only affects the operation of the intersection in very minor way. The table and figures below show surveyed traffic volumes at the intersection, intersection arrangement and traffic signalling phasing (including proportion of time allocated to each signal phase).

Table 9.5: 2012 Evening Peak Hour Traffic Volumes

Approach	Turn Volumes			Turn Percentages		
	L	T	R	L	T	R
North	32	314		9%	91%	0%
East	66		36	65%	0%	35%
South		292	21	0%	93%	7%
West						

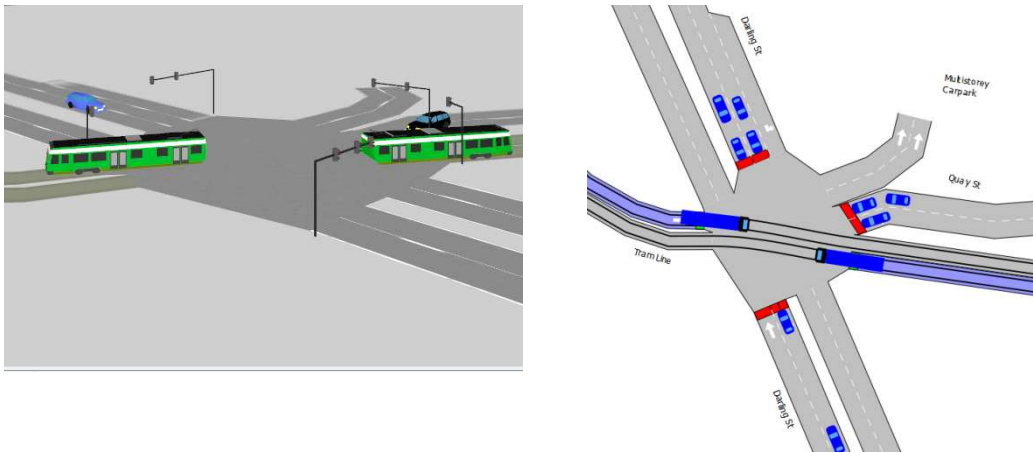
Table 9.6: Future Evening Peak (2012 Peak plus Full Development Trip Generation)

Approach	Turn Volumes			Turn Percentages		
	L	T	R	L	T	R
North	324	372		47%	53%	0%
East	514		402	56%	0%	44%
South		320	215	0%	60%	40%
West						

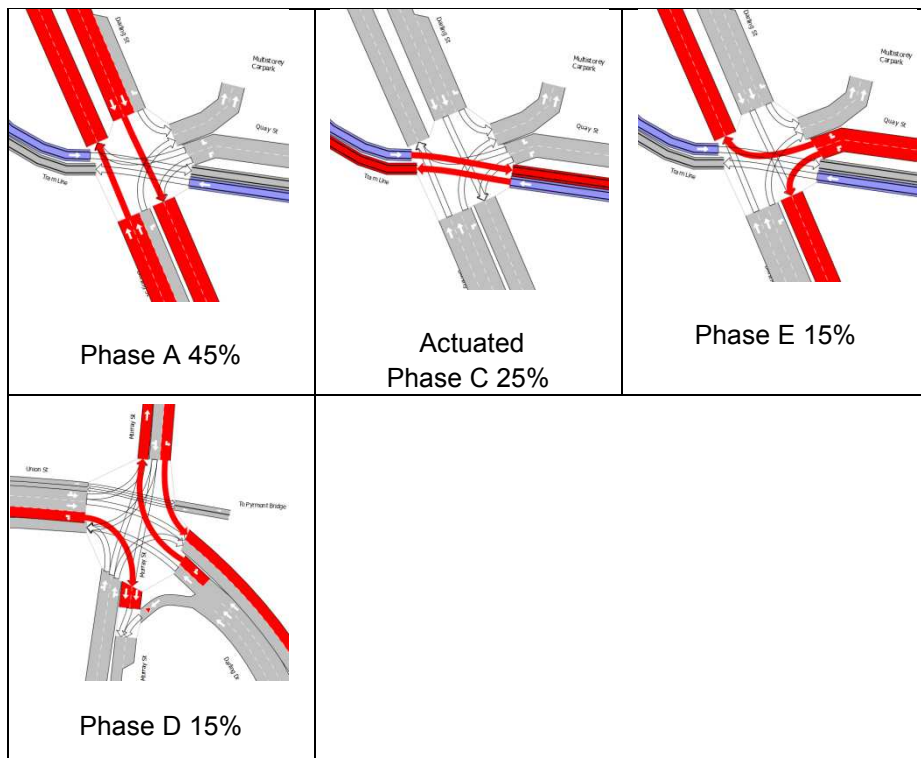
This intersection has an existing average LOS B at model peak hour and a forecast average LOS F with the development. The results of the AIMSUN model are discussed in Section 9.9 of this report.

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Figure 9.4: Darling Drive/QuayStreet AIMSUN snapshot



Phasing Sequence Modelled with 120 sec Cycle Time



9.7 Harbour Street and Liverpool Street

This is a signalised intersection. The intersection includes an actuated signalised exit from the car park within the phasing cycle.

Modelling and site observation indicate that this intersection is very sensitive to increases in traffic volume.

The table and figures below show surveyed traffic volumes at the intersection, intersection arrangement and traffic signalling phasing (including proportion of time allocated to each signal phase).

Table 9.7: 2012 Evening Peak Hour Traffic Volumes

Approach	Turn Volumes			Turn Percentages		
	L	T	R	L	T	R
North		904		0%	100%	0%
East	536		169	76%	0%	24%
South		1530		0%	100%	0%
West						

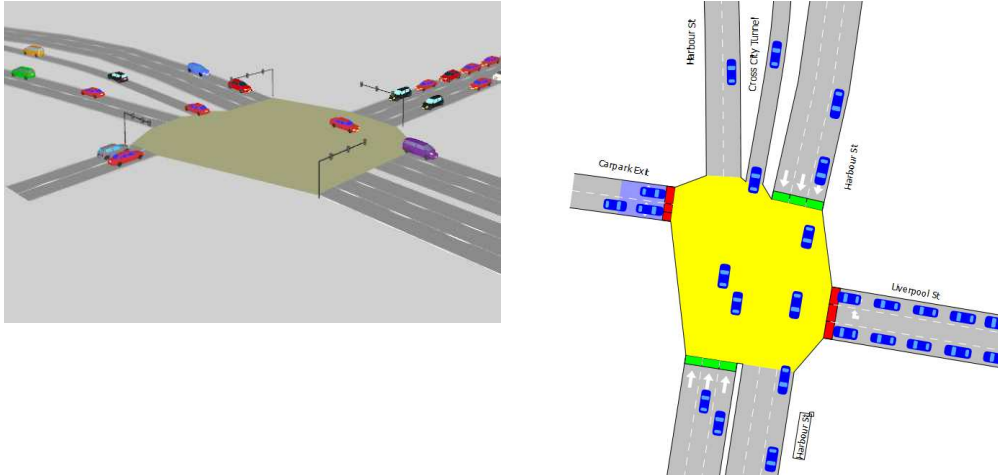
Table 9.8: Future Evening Peak (2012 Peak plus Full Development Trip Generation)

Approach	Turn Volumes			Turn Percentages		
	L	T	R	L	T	R
North		913			100%	
East	566		178	76%		24%
South		1858			100%	
West						

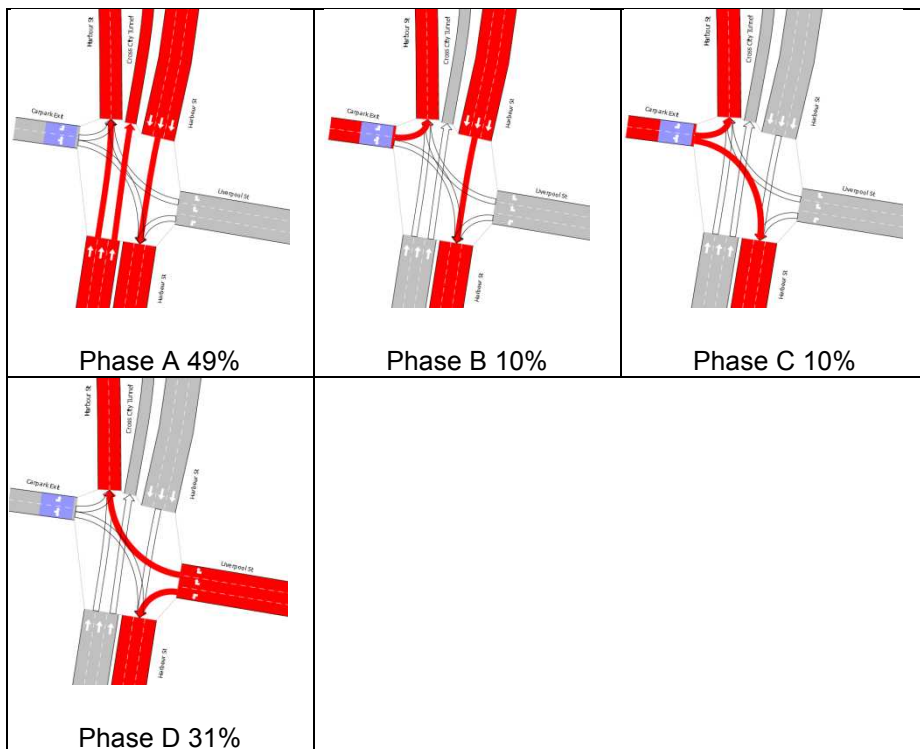
This intersection has an existing average LOS D at model peak hour and a forecast average LOS E with the development. The results of the AIMSUN model are discussed in Section 9.9 of this report.

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Figure 9.5: Harbour Street/Liverpool Street AIMSUN snapshot



Phasing Sequence Modelled with 110 sec Cycle Time



9.8 Harbour St with Pier St and Goulburn St

This is a signalised intersection and has the greatest volume of traffic of all the intersections studied. As this intersection is on the edge of Sydney CBD it is sensitive to increases in traffic volumes and subject to flow on effects from congestion upstream of the SICEEP network.

Access to the SICEEP from the east is via this intersection onto Pier St. Exiting traffic from SICEEP passes through the control on this intersection but is directed northbound onto Harbour Street and restricted from entry onto Goulburn Street.

Table 9.9: 2012 Evening Peak Hour Traffic Volumes

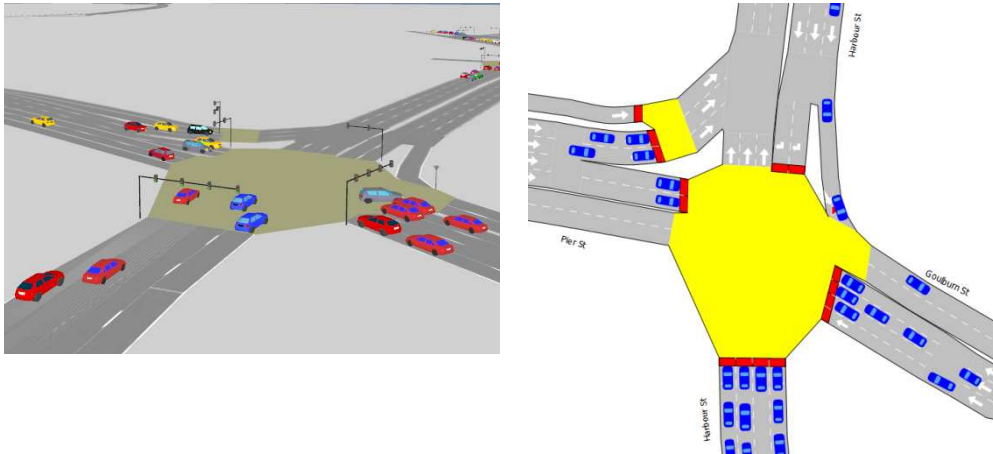
Approach	Turn Volumes			Turn Percentages		
	L	T	R	L	T	R
North	552		786	41%	0%	59%
East		436	506	0%	46%	54%
South	111	261	96	24%	56%	21%
West	751	419		64%	36%	0%

Table 9.10: Future Evening Peak (2012 Peak plus Full Development Trip Generation)

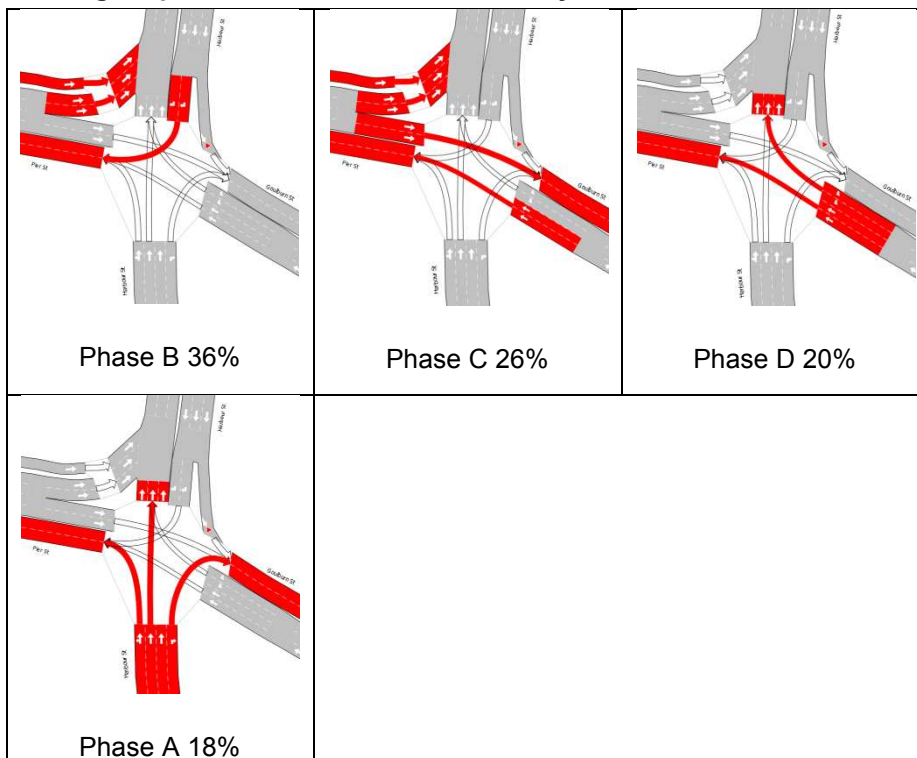
Approach	Turn Volumes			Turn Percentages		
	L	T	R	L	T	R
North	525		822	39%	0%	61%
East		496	506	0%	49%	51%
South	117	261	96	25%	55%	20%
West	1079	419		72%	28%	0%

This intersection has an existing average LOS D at model peak hour and a forecast average LOS D with the development. The results of the AIMSUN model are discussed in Section 9.9 of this report.

Figure 9.6: Harbour Street/Pier Street AIMSUN snapshot



Phasing Sequence Modelled with 110 sec Cycle Time



9.9 Aimsun Results

The results of the modelling for both the existing and future traffic conditions are summarised below in Table 9.11 and Table 9.12 respectively. The detailed results are shown in the Appendix C.

Table 9.11: Existing Traffic Conditions

Intersection	Average Delay	Average LOS	Worst LOS	Worst Movement
Darling / Murray	43.3	D	F	Right from Western Leg
Darling / Pier	7.9	A	C	Entrance from Northern Leg
Darling / Quay	19.7	B	D	Left & Right from Eastern Leg
Harbour / Pier	43.5	D	F	Left from Darling St (Western Leg) Through from Southern Leg
Harbour / Liverpool	50.9	D	E	Left from Eastern Leg Through from Southern Leg

Table 9.12: Future Traffic Conditions during a Major Event

Intersection	Average Delay	Average LOS	Worst LOS	Worst Movement
Darling / Murray	78.8	E	F	Right & through from Western Leg
Darling / Pier	69.4	E	F	Entrance from Northern Leg
Darling / Quay	454.9	F	F	Left & Right from Eastern Leg Right from Southern Leg
Harbour / Pier	58.4	E	F	Left from Darling St (Western Leg) Left & Through from Southern Leg
Harbour / Liverpool	53.5	D	E	Left from Eastern Leg Through from Southern Leg

Table 9.11 and 9.12 indicate the results of the AIMSUN modelling. The results indicate that extensive delays are expected at the Darling Drive /Quay Street intersection during a major event. The detailed results show that majority of the increase in total delay for the intersection is for traffic exiting the car park. This corresponds to commuters queuing out of the car park when leaving an event such as a concert. These delays would be contained within the multi storey car park and are not anticipated to impact on the surrounding traffic network. Furthermore, the future parking provision for the multi storey car park is to be reduced from 1900 to 1300 parking spaces. This will reduce the level of traffic activity anticipated to be generated by the development.

It should be noted that the existing peak traffic volumes and AIMSUN model results shown in Table 9.1 do not capture the peak trip generation for the SCEC and SEC car

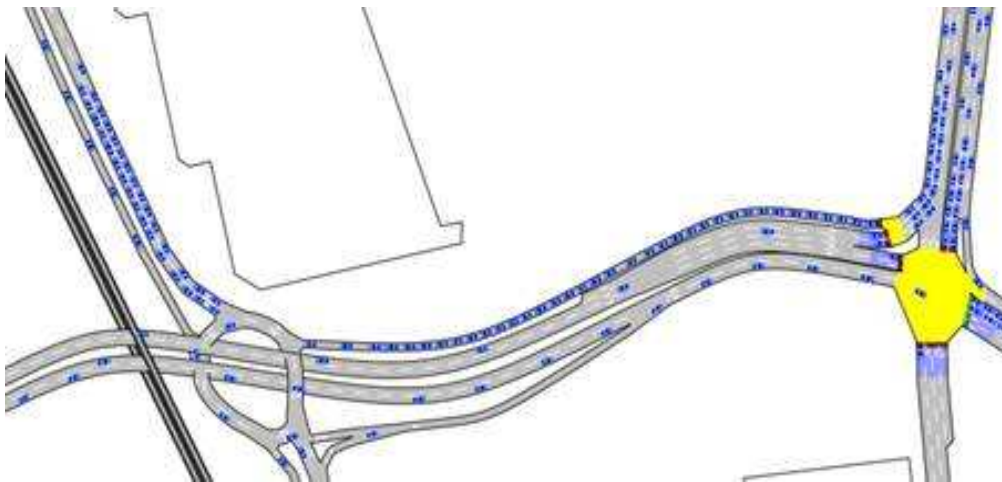
Sydney International Convention, Exhibition and Entertainment Precinct

parks, which have peak periods occurring at different times of the day. Table 9.12 indicates a future worst case traffic scenario. The peak traffic generation associated with the development was combined with the existing peak traffic volumes.

Based on the conservative future AIMSUN model results, the average LOS for the intersections within the model are considered to be acceptable. Mitigation measures are not anticipated to be required for the majority of the intersections within the adjacent road network, with the exception of the Pier Street and Harbour Street intersection.

The worst performing movement is anticipated to be the traffic movement travelling from Darling Drive into Pier Street followed by a left turn onto Harbour Street. The poor performance of both intersections is a result of the poor capacity of the Harbour Street intersection to cater for this movement leading to an adverse upstream delay at the Pier Street and Darling Drive intersection (refer to Figure 9.7 below). Mitigation measures for the intersection of Harbour Street and Pier Street are detailed within Section 11 of this report.

Figure 9.7: Pier Street Corridor(Darling Drive and Harbour Street Intersections)



10. Pedestrian and Public Transport Impact Assessment

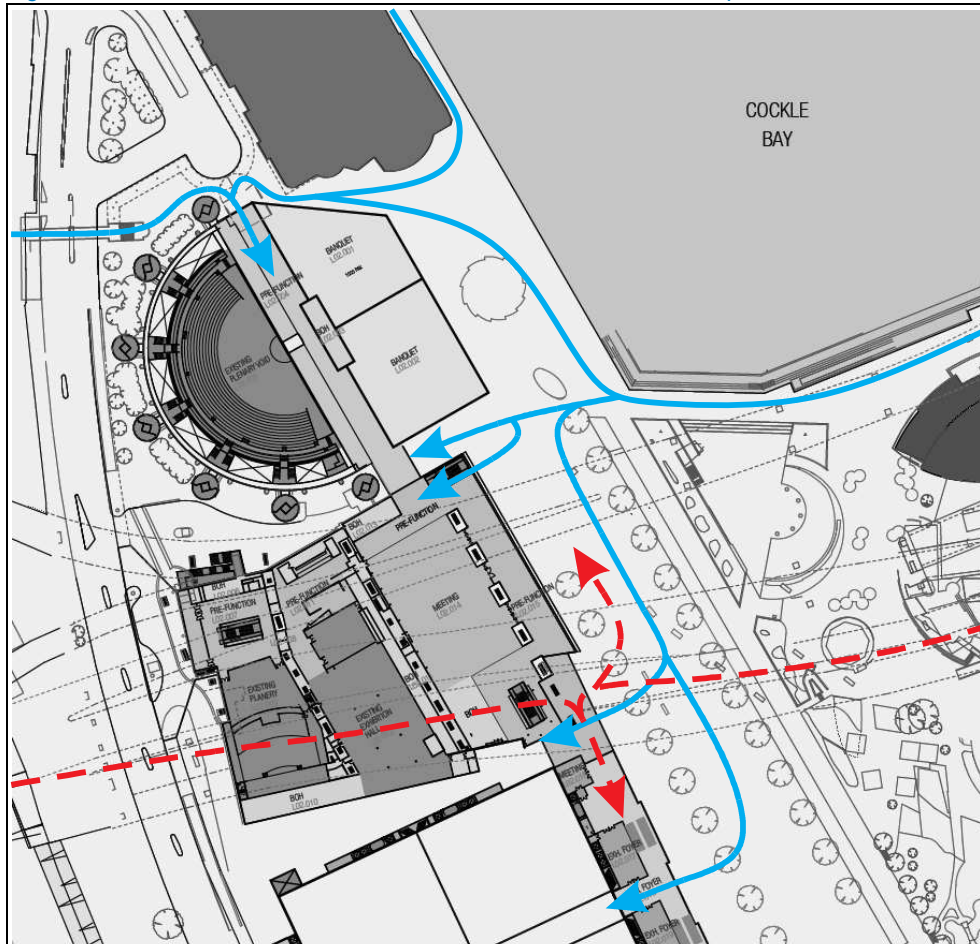
10.1.1 Pedestrian Network Impacts

The development of SICEEP will provide improved pedestrian linkages and thoroughfares. Pedestrian access to the existing SICEEP area from the western suburbs of Pyrmont and Ultimo are heavily constrained by Darling Drive, the Monorail corridor and the western distributor and Pier Street overpasses. The proposed development will incorporate two separate raised connections to the precinct from the west, providing an improved east-west pedestrian connection to the site. This will be achieved through the removal of the existing monorail corridor and infrastructure. The eastern end of Quarry Street will be developed to provide a raised walkway to the new foyer of the proposed Exhibition Centre. The Foyer will provide access to the exhibition halls and the adjacent Entertainment Centre Concourse, as well as a through connection to Tumbalong Park and the rest of the Darling Harbour Precinct.

Pedestrian access to the Convention Centre will remain essentially unchanged under the proposed development, with the main access located at the northern end of the precinct, adjacent to the bus bay and taxi rank at the rear of the Harbourside Shopping Centre. The existing accesses from the Darling Harbour Waterfront via sets of stairs will continue to provide access to both the Convention Centre and the northern extents of the Exhibition Centre. There is an existing pedestrian walkway along the western distributor viaduct from Harris Street that provides an east-west pedestrian connection between Darling Harbour and Pyrmont. This route is also wheelchair accessible, with a lift that provides access to the existing Convention Centre concourse. This is marked in red within Figure 10.1. This pedestrian walkway is anticipated to be retained and it is recommended this pedestrian link be integrated into the successful proponents design.

Sydney International Convention, Exhibition and Entertainment Precinct

Figure 10.1: Convention Centre and Exhibition Centre North Proposed Pedestrian Access



Source: Mott Macdonald – Blue and dashed red lines represent pedestrian access paths

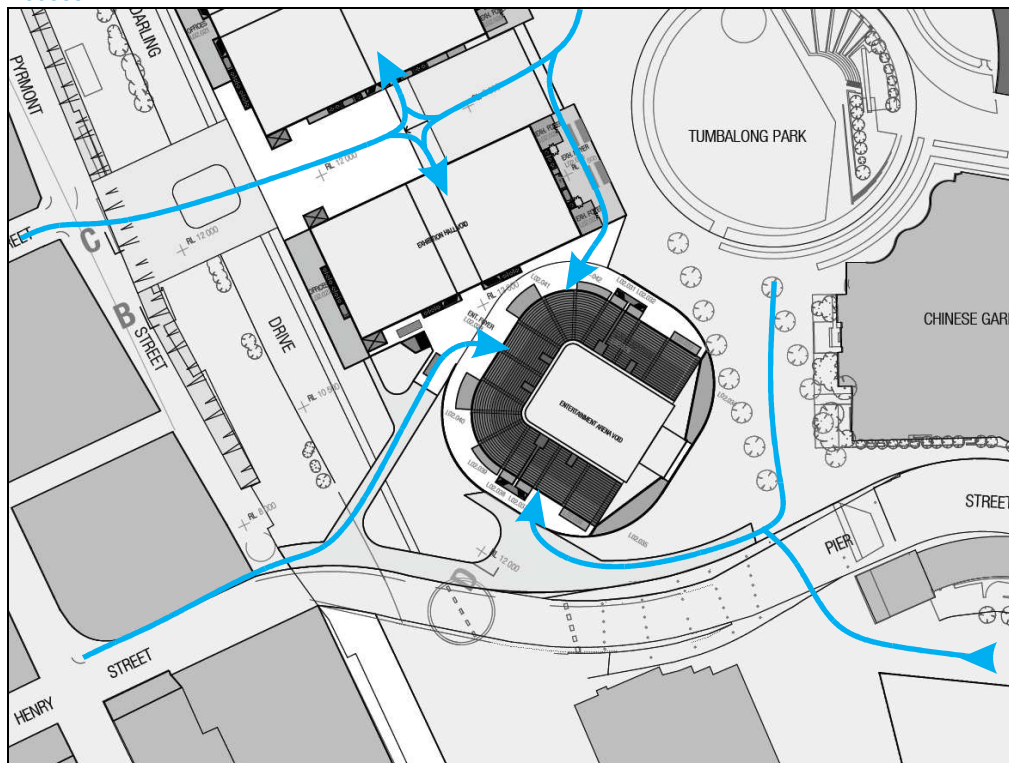
The relocation of the Entertainment Centre north of the Pier Street overpass provides both constraints and opportunities in terms of access to the venue. The proposed centre will be bound by Darling Drive to the west and an access road to the south. The existing Entertainment Centre is located in an open quarter allowing for access to the site from three sides of the venue. In the proposed configuration, external pedestrian access to the site will be comprised of two raised access points at the south western boundary of the complex and access from the east of the site from the central walkway that divides the complex and Tumbalong Park.

The raised access points will be provided by a raised walkway over Darling Drive, connecting the eastern concourse of SICEEP with the intersection of William Henry Street and Harris Street in the west. The first access enters the Entertainment Centre foyer on the north western face of the building. The second access to the Entertainment Centre foyer is on the south western face. Internal pedestrian access

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will also be via the Exhibition Centre foyer. Figure 10.2 indicates the proposed new pedestrian accesses for the Entertainment and Exhibition Centres.

Figure 10.2: Exhibition Centre South and Entertainment Centre Proposed Pedestrian Access



Source: Mott Macdonald – Blue lines represent pedestrian access paths

The impact of the proposed development should not have a significant impact on the pedestrian accessibility to the precinct. The relocation of the Entertainment Centre is considered suitable in terms of pedestrian access and safety, with the Tumbalong Park domain and Darling Harbour Waterfront areas to the east that can easily accommodate large crowds that the integrated venue could generate. The removal of the existing Entertainment Centre and construction of the Quay Gateway Quarter will generate pedestrian demand, however this demand will be in the order of the pedestrian demand currently generated by the Entertainment Centre. Given the size of the area and the numerous pedestrian access points, from the north via Harbour Street and Tumbalong Park, via Quay Street to the south, the pedestrian access way to the west and Hay Street to the East, concerns associated with congestion, safety or wayfinding are unlikely to be experienced.

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One of the major pedestrian routes includes access from the retained Entertainment Centre car park across the access road under the Pier Street overpass. It is envisaged that a large number of pedestrians will cross this intersection when arriving or leaving a major event. It is envisaged that the crossing facilities may require an upgrading under increase demand from

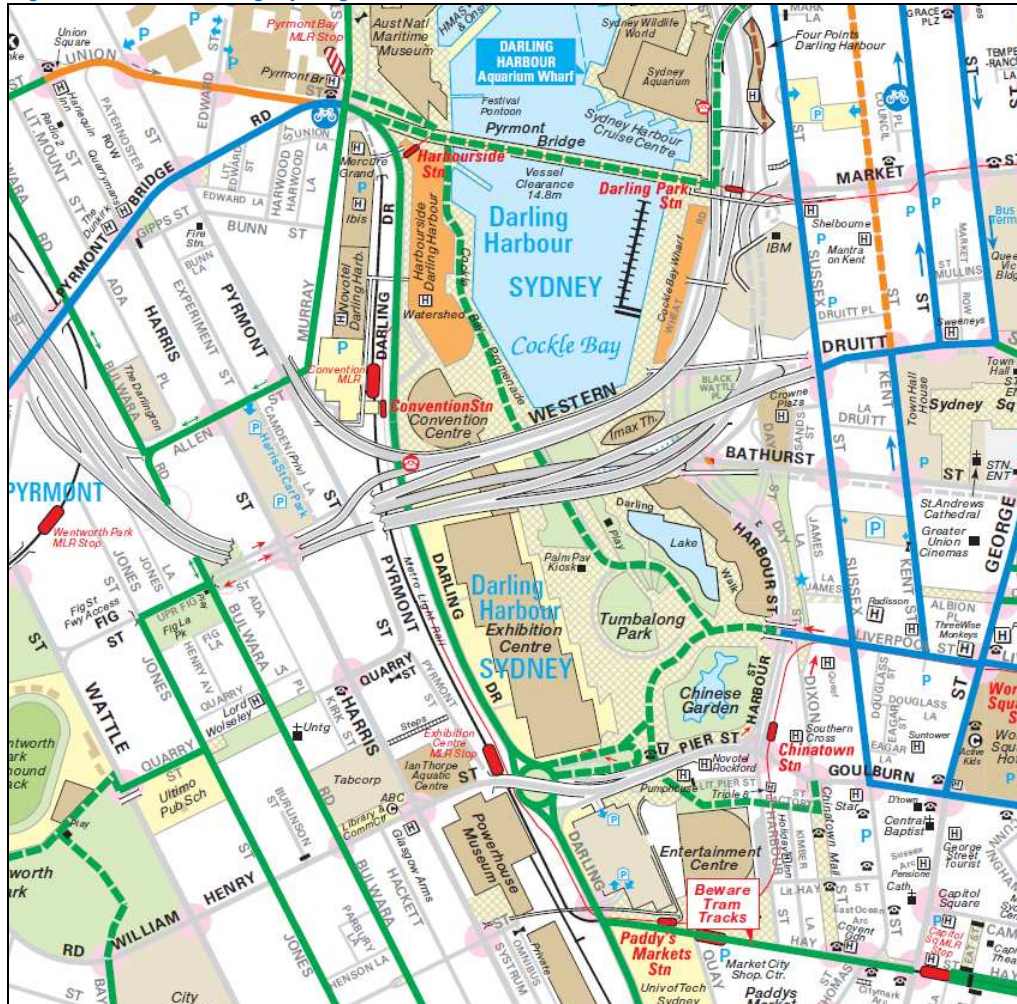
The Pier Street / Harbour Street intersection is anticipated to carry significant pedestrian traffic during major events, particularly for concerts where pedestrian traffic is anticipated to be tidal in nature. This intersection lies on a major pedestrian route between the site and public transport and provides a poor level of service for large volumes of pedestrians. Furthermore, the intersection consists of 2 islands that have poor storage capacity for a large number of pedestrians crossing the road, such that it is anticipated to result in safety concerns.

10.1.2 Cycling Network Impacts

Figure 10.3 shows the existing cycling network around and through the SICEEP site. There is expected to be limited impact on the cycling network under the development of the SICEEP Site. Darling Drive will provide an on road access to the site from the south along the western boundary of the site. Access to the site from the north west and east will be available via a number of on road facilities within the Sydney CBD that connect with the existing off road facilities within Tumbalong Park and the Darling Harbour Waterfront . Regional access to the site will be available from the west via the Pyrmont Bridge Road on road cycleway and the Union Street separated cycleway. It is proposed that bicycle parking be made available on the eastern frontage of the Exhibition and Entertainment Centre complex. Specific details of bicycle parking and end-of-trip facilities for the proposed development will need to be confirmed by the successful proponent at the detailed design stage.

Sydney International Convention, Exhibition and Entertainment Precinct

Figure 10.3: Existing Cycling Network



Source: Mott Macdonald

10.1.3 Light Rail Network Impacts

The existing light rail network travels along the southern and western boundary of the site, with stops at Paddys Markets, Exhibition Centre and Convention Centre. The light rail provides a connection between the inner west areas of Pyrmont, Rozelle and Lilyfield to the Central Station Transport Interchange. Under the proposed development, these stops are to remain in service, providing access to the respective areas of SICEEP.

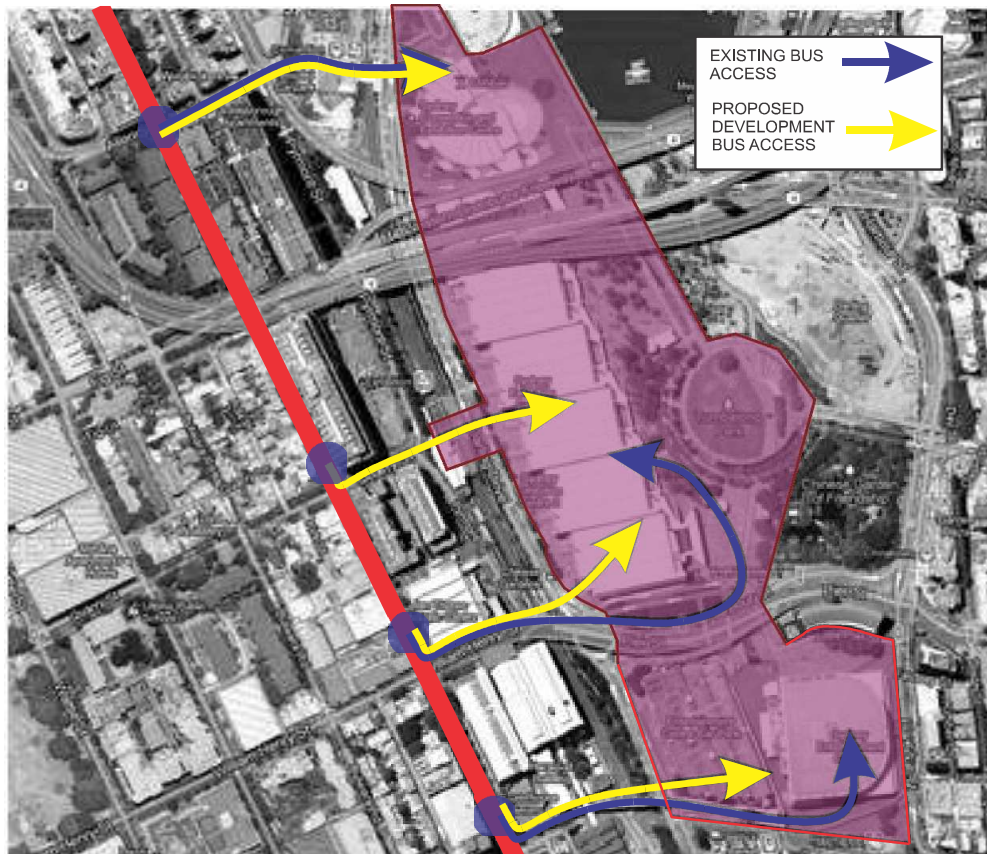
10.1.4 Bus Network Impacts

The proposed development of the SICEEP site will not have a significant impact on existing bus services. The only bus service that operates in close proximity to the site is route 443 between Pyrmont and Circular Quay, via the Star Casino and the QVB. The closest stops are at Allen Street north west of the site, and the bus stops outside the Ian Thorpe Aquatic Centre and Powerhouse Museum on Harris Street to the west of the site.

The Powerhouse Museum bus stop currently provides access to the Entertainment Centre via a raised pedestrian walkway that also services the monorail and the Entertainment Centre Car Park. Under the proposed development, this bus stop will provide access to the Quay Gateway Quarter. The Ian Thorpe Aquatic Centre bus stop currently provides the closest access to the southern halls of the Exhibition Centre. Under the proposed development, a new raised walkway at the end of Quarry Street will provide improved access to the Exhibition and Entertainment Centres. The nearest bus stop for access to the Convention Centre is from the bus stop next to the intersection of Allen and Harris Street. This bus stop will remain the closest access point to the bus network from the site. Bus stop locations and access routes are shown in Figure 10.4

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Figure 10.4: Bus Network Access



Source: Mott Macdonald

10.1.5 Coach and Private Bus Operators

The proposed SICEEP development will involve new coach and private bus arrangements. The existing Entertainment Centre has a large indented Coach Zone at the front of the building, to provide access for tours and large groups of people. Under the proposed development, this indented bay will be retained for use by private buses and coaches servicing the hotels along Harbour Street and the Quay Gateway Quarter, but a new coach zone will be located on Pyrmont Street, adjacent to the new pedestrian link to the complex from Quarry Street over Darling Drive. This coach zone will provide access to the proposed Exhibition and Entertainment Centres. The existing coach and bus zone for the Convention Centre is located north of the complex at the rear of the Harbourside Shopping Centre. This area is to be retained under the proposed development and will remain the main access point for coaches and private buses servicing the Convention Centre.

10.1.6 Monorail Removal

Under the proposed development, the existing Monorail network will be decommissioned and dismantled. This decision was based on low patronage levels and increased maintenance costs, as well as constraining elements of the design for the proposed development, including the building adjacent to the Quay Gateway Quarter car park, and the pedestrian walkway deck over Darling Drive from Quarry Street to the Exhibition Centre. The majority of patrons using the Monorail are tourists, and it is envisaged that other modes of public transport like the light rail will accommodate for the loss of the Monorail service.

10.1.7 Heavy Rail Network Impacts

The closest railway stations to the site are Town Hall and Central. These provide access to virtually all of the service lines on the Cityrail network, and are two of Sydney's busiest train stations. Central train station is approximately 10 minutes walk to the site of the existing Entertainment Centre, the proposed Quay Gateway Quarter area of the SICEEP site. Town Hall station is approximately 15 minutes walk from the main complex. The redevelopment of SICEEP is anticipated to generate a marginally increased demand compared to the existing development, which will partly be accommodated by the heavy rail system.

For major events, the promotion of utilising public transport to access the site may also increase the modal share of visitors using heavy rail to access the site, however the impact of this increased demand on the rail network is anticipated to be minimal. This is due to the varying peak demand periods for the various development within the site, the majority of which do not coincide with the commuter peak periods.

11. Responses and Measures based on AIMSUN Modelling

The outcomes of the AIMSUN modelling comparison provide an indication of the traffic impacts on the numerous intersections surrounding the SICEEP site, based on the calculated traffic generated by the new development. These traffic impacts are generally anticipated to be manageable without ameliorative measures being required, however it was identified from the analysis that measures would be required to address the traffic impacts at the Pier Street/Harbour Street intersection.

11.1.1 Pier St / Harbour St Intersection

This intersection is currently underperforming during major events and is in need of an ameliorative treatment. There are currently three left turning lanes from Pier Street into Harbour Street, one of which is separated with a median to separate traffic approaching from Darling Street. The three lanes are insufficient to provide an acceptable level of service or saturation level for this movement. However, the provision of the Entertainment Centre is considered to be a relocation of the Sydney Entertainment Centre which would redirect a significant pedestrian travel path across this intersection. In turn, this will further deteriorate the intersection's performance.

The intersection is not designed to cater for the high pedestrian traffic anticipated to use this intersection (i.e. the distance pedestrians need to travel across the western leg of the intersection is 32m and the islands are too small to allow sufficient storage space for pedestrians between phases). Refer to Figure 11.1 below.

Figure 11.1: Pier Street/Harbour Street Intersection



In light of the above, it is recommended that an ameliorative treatment be implemented in order to improve traffic flow and improve pedestrian safety. The following are a set of possible ameliorative treatments. These treatments require further investigation particularly in relation to financial feasibility and physical constraints.

1. Removal of the islands in the intersection in order to prevent pedestrians from queuing in the intersection. This would need to be combined with a reconfiguration of the phasing arrangement in order to provide sufficient time for pedestrians to cross. The net result of this option is that the efficiency of the intersection would be adversely affected and may still result in poor pedestrian safety given the length of travel required to cross Pier Street;
2. The intersection will need to be redesigned with a view to increase the capacity of the left turn from Pier Street into Harbour Street as well as increasing the storage capacity of the islands;

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3. The provision of a pedestrian bridge over the intersection in order to separate pedestrian and vehicular traffic. This should be combined with the reconfiguration of the intersection to remove pedestrian crossings as well as altering the phasing arrangement. The net result would be a greatly increased capacity of the intersection combined with a greater level of safety for pedestrians; and
4. Increased buses to and from nearby stations.

12. Conclusions

The current and future transport conditions surrounding the Sydney International Convention, Exhibition and Entertainment Precinct has been assessed. The main points to note from this assessment are as follows:

- The existing Convention, Exhibition and Entertainment Centres have been proposed to be redeveloped into the Sydney International Convention, Exhibition and Entertainment Precinct (SICEEP);
- This report, along with consultation with all relevant authorities, serves the purpose of informing the assessment of traffic and transport requirements associated with the precinct;
- The site is currently adequately serviced by public transport including heavy & light rail, the monorail, buses, ferries and taxis;
- The site is adequately serviced by a distinct pedestrian connectivity allowing pedestrians easy access throughout the precinct as well as linking to pedestrian networks in surrounding areas;
- The site consists of sufficient bicycle facilities to cater for the current demand and allows for connectivity to the existing bicycle network;
- The current vehicular access arrangement is adequate to cater for the existing car parks as well as the loading / service vehicle facilities;
- There are approximately 10,000 spaces within a 10 minute walk to the precinct;
- There are 1,980 spaces and 731 spaces available in the Entertainment Centre and Exhibition Centre respectively;
- The parking demand for the precinct varies significantly throughout the year, however, the parking capacity is reached two times per year;
- On average, 67.9% of visitors to the precinct arrive in a vehicle during a typical midday period. It is estimated that this proportion increases to 80% during evenings;
- The road network study area consists of three distinct sections working relatively independent of each other. The three sections include three intersections along Harris Street, three intersections along Darling Street and six intersections in a grid formation defined by Harbour Street, Goulburn Street and George Street;
- In terms of connectivity associated with the precinct, the Harbour Street / Goulburn Street / Pier Street intersection is considered to be the key intersection linking each section together;
- A series of intersection modelling was undertaken for each intersection within the study area. The analyses revealed that the Harbour Street / Goulburn Street / Pier Street intersection is performing poorly. This intersection is considered to be the key intersection to consider in accommodating traffic associated with the precinct;

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- The left turn movement from Pier Street into Harbour Street performs at a Level of Service F particularly during larger events. The queuing of this movement extends back to Harbour Street and adversely affects the performance of the roundabout;
- The allocation of 600 spaces in the Sydney Entertainment Centre (SEC) will prevent motorists associated with SICEEP from using it and therefore reduce traffic travelling from Darling Street to Pier Street and to Harbour Street (particularly during major events) and result in an improved performance of the intersection;
- The relocation of the SEC to the northern side of Pier St will result in an increase in pedestrian movements across the Pier St / Harbour St intersection particularly during major events in which the movements to and from the train station are anticipated to be tidal in nature;
- The Pier St / Harbour St intersection design is not anticipated to cater for the increased pedestrian movements associated with major events particularly given the distance required to cross the road as well as the small storage space provided by the islands in the intersection;
- An ameliorative treatment will be required in order to provide safety for pedestrians and improve the intersection's traffic efficiency;
- The determination of the most appropriate treatment is subject to further investigation in terms of financial feasibility and physical constraints. However, it is recommended that the possible reconfiguration of the intersection be considered as well as the possibility of providing a pedestrian overpass.
- The analysis contained within this report is indicative and based on possible outcomes from the range of assumptions adopted. The PPP Proponent should undertake a separate detailed assessment upon successful tender for the project, including detailed consultation with relevant authorities and key stakeholders.



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FEDERICO RAMOS

TRAFFIC ENGINEER



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STEPHEN LUKE

TRANSPORT PLANNING MANAGER - AUSTRALIA

Appendices

Appendix A. Construction Traffic Management Plan_____

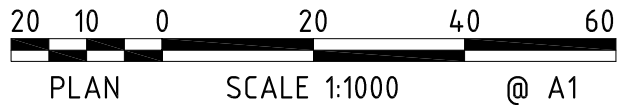
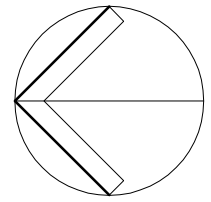
Appendix B. Traffic Volume Summary_____

Appendix C. AIMSUN Modelling Results_____

Appendix A. Construction Traffic Management Plan

- GENERAL NOTES:
1. ALL WORKS TO COMPLY AS1742.3
 2. ALL WORKS TO COMPLY WITH NSW WORK COVER
 3. ALL WORKS TO COMPLY WITH ALL OH&S POLICIES
 4. ALL TRAFFIC CONTROL DEVICES TO CONFIRM TO AS1742
 5. CONFLICTING STREET SIGNS TO BE COVERED FOR THE DURATION OF WORKS
 6. CONSTRUCTION VEHICLES FOR DELIVERY AND SPOIL REMOVAL SHALL BE AVOIDED DURING PEAK TRAFFIC PERIOD ON BUSINESS DAYS. IE 7am TO 9am DURING MORNING PEAK PERIOD AND AFTER 4pm IN EVENING PEAK PERIOD.
 7. THIS IS A CONCEPTUAL TRAFFIC MANAGEMENT PLAN ONLY AND SUBJECT TO CHANGE DEPENDING ON PROPOSED STAGING OF WORKS AND ADDITIONAL SITE SPECIFIC REQUIREMENTS.
 8. FURTHER SITE TRAFFIC MANAGEMENT PLANS TO BE DEVELOPED AND IMPLEMENTED BY 'PUBLIC PRIVATE PARTNERSHIP' (PPP) TO THE SATISFACTION OF CITY OF SYDNEY COUNCIL AND 'ROADS AND MARITIME SERVICES' (RMS).
 9. ADDITIONAL SIGNS, VARIABLE MESSAGE SIGNS OR TRAFFIC CONTROLLERS TO BE PROVIDED AS REQUIRED.
 10. THE CONDITION OF THE TEMPORARY PAVEMENT, SIGNAGE, BARRIERS AND DELINEATION DEVICES SHALL BE INSPECTED DAILY AND RECTIFICATIONS TO BE ADDRESSED AS REQUIRED.
 11. VEHICLE MANAGEMENT PLAN TO BE PREPARED BY PPP FOR VEHICLE USAGE WITHIN THE WORK ZONE COVERING THE CONSTRUCTION VEHICLE MOVEMENT.
 12. ALL LOADING AND UNLOADING ASSOCIATED WITH CONSTRUCTION MUST BE ACCOMMODATED ONSITE
 13. NO PEDESTRIAN ACCESS SHALL BE PROVIDED THROUGH THE SITE DURING CONSTRUCTION PERIOD

Notes



Key to symbols

LEGENDS

- SYDNEY CONVENTION CENTER REFURBISHMENT WORK (INDICATIVE SITE EXTENT)
- SYDNEY EXHIBITION AND ENTERTAINMENT CENTRE - DEMOLITION AND NEW CONSTRUCTION (INDICATIVE SITE EXTENT)
- DEMOLITION OF EXISTING ENTERTAINMENT CENTER (INDICATIVE SITE EXTENT)
- TEMPORARY TRAFFIC MANAGEMENT SIGN
- BOLLARDS/CONES
- WATER FILLED BARRIERS
- SITE FENCE

Reference drawings

P1	10.08.12	AMP	ISSUED FOR INFORMATION	DP	GS
Rev	Date	Drawn	Description	Ch'k'd	App'd



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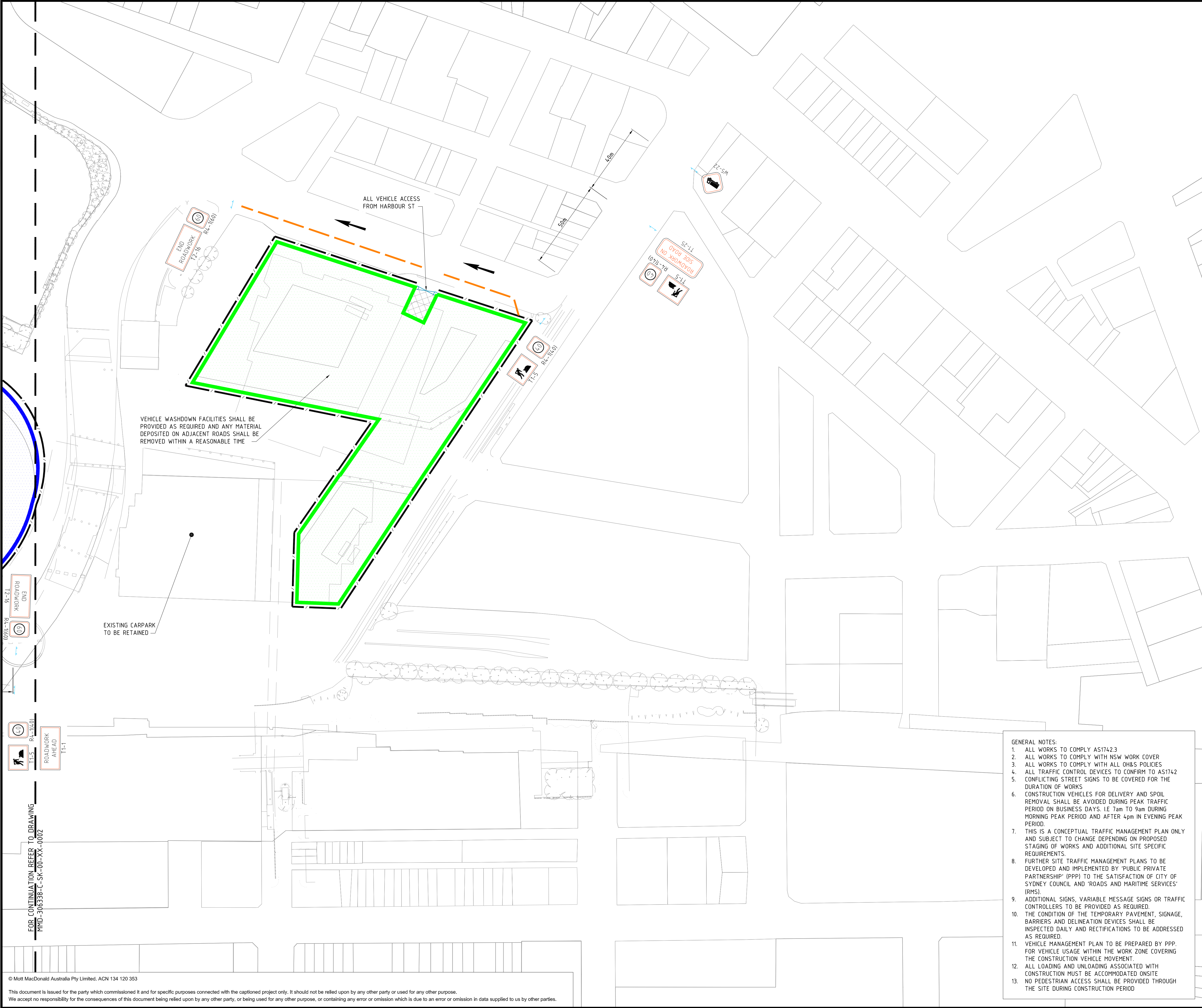


Title
**SICEEP
CONCEPTUAL TRAFFIC
MANAGEMENT PLAN**

Designed	DP	Eng check	GWS
Drawn	AMP	Coordination	X
Dwg check	DP	Approved	X

Scale at A1 1:1000	Status PRE	Rev P1
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Drawing Number
MMD-306338-C-SK-00-XX-0001



Notes

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PLAN SCALE 1:1000 @ A1

Key to symbols

LEGENDS

- NORTH PRECINCT
- SOUTH PRECINCT
- TEMPORARY TRAFFIC MANAGEMENT SIGN
- BOLLARDS/CONES
- WATER FILLED BARRIERS
- SITE FENCE

Reference drawings

P1	10.08.12	AMP	ISSUED FOR INFORMATION	DP	GS
Rev	Date	Drawn	Description	Ch'k'd	App'd

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Title

**SICEEP
CONCEPTUAL TRAFFIC
MANAGEMENT PLAN**

Designed	DP		Eng check	GWS	
Drawn	AMP		Coordination	X	
Dwg check	DP		Approved	X	
Scale at A1	1:1000		Status	PRE	P1

Drawing Number

MMD-306338-C-SK-00-XX-0002

FOR CONTINUATION REFER TO DRAWING
MMD-306338-C-SK-00-XX-0002

GENERAL NOTES:

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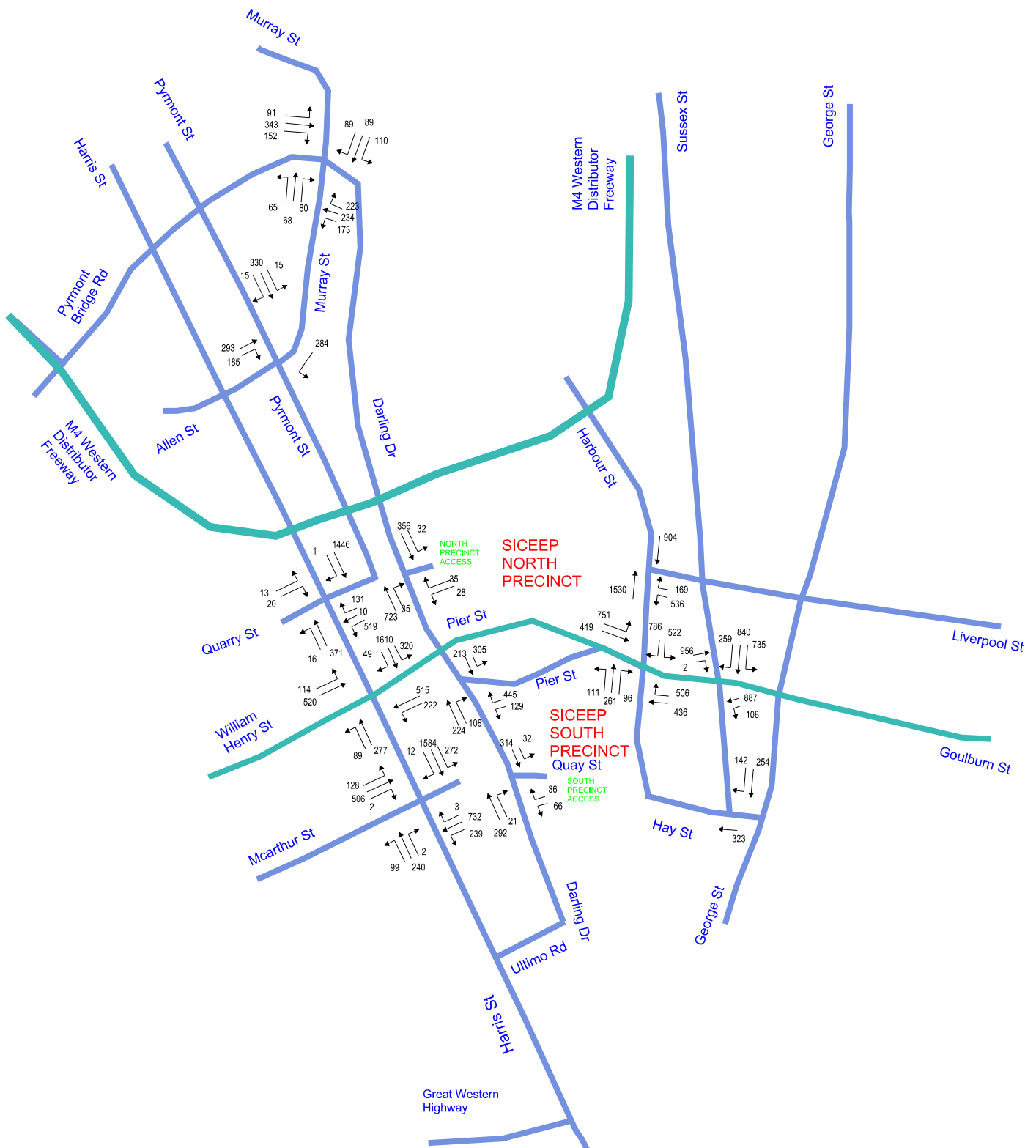
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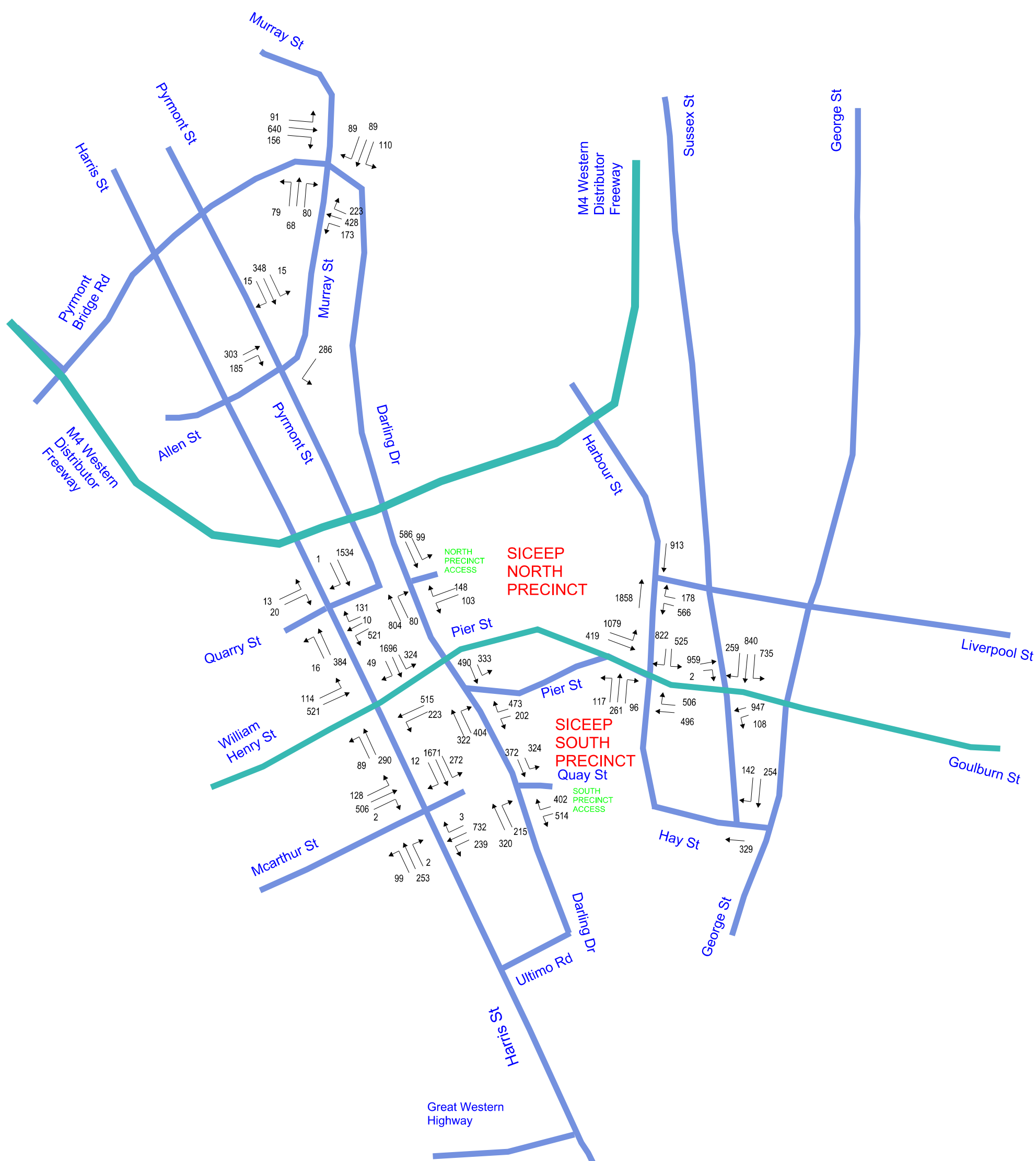
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Appendix B. Traffic Volume Summary

Existing Traffic volumes-VPH
(Friday 23/03/2012)
2012 Evening Peak Period



Evening Peak Period Traffic volumes With Development (vph)



Evening Peak Period
Total trip distribution for the site
in vph
(North Precinct + South Precinct
+ Off-site carparks)

