

3 EXISTING TRANSPORT CONDITIONS

3.1 ROAD NETWORK PERFORMANCE

This section establishes the existing transport network performance in the study area around the SICEEP. An assessment of existing network capacity has been undertaken to identify key issues with regard to network deficiencies at key roads and intersections.

3.1.1 TRAFFIC SURVEY DATA

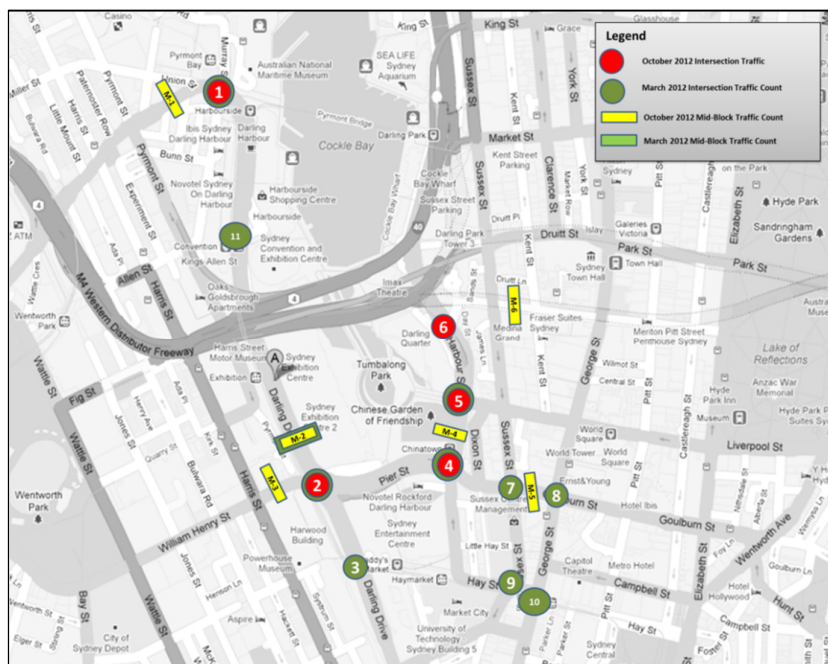
INSW provided intersection turning movement counts for eight intersections and midblock automatic tube counts for 7 locations within the study area. The intersection classified turning movement counts were undertaken for three hours in the AM peak (7-10am) and three hours in the PM peak (4-7pm) on a Thursday (25 October 2012) and on a Saturday (27 October 2012). The midblock automatic tube counts were collected for three days from Thursday to Saturday (25-27 October 2012).

Traffic surveys were also undertaken as part of the Transport Study commissioned by INSW to Mott MacDonald. The traffic survey data was also provided to Hyder for reference in this study. The surveys covered turning movement counts at 14 intersections and were undertaken for two hours (4:30-6:30 p.m.) on a Friday (23 March 2012). The midblock automatic tube counts were collected at two locations for a period of seven (7) days (16-23 March 2012).

Combining both data sets, a total of nineteen (19) intersections had survey data, eight (8) of which had both weekday and weekend data while eleven (11) sites had only weekday data. Both data sets were utilised to inform the analysis for model development, calibration and validation.

Figure 3-4 shows locations of the selected surveyed intersections and midblock locations included in the modelling.

Figure 3-4 Survey Locations



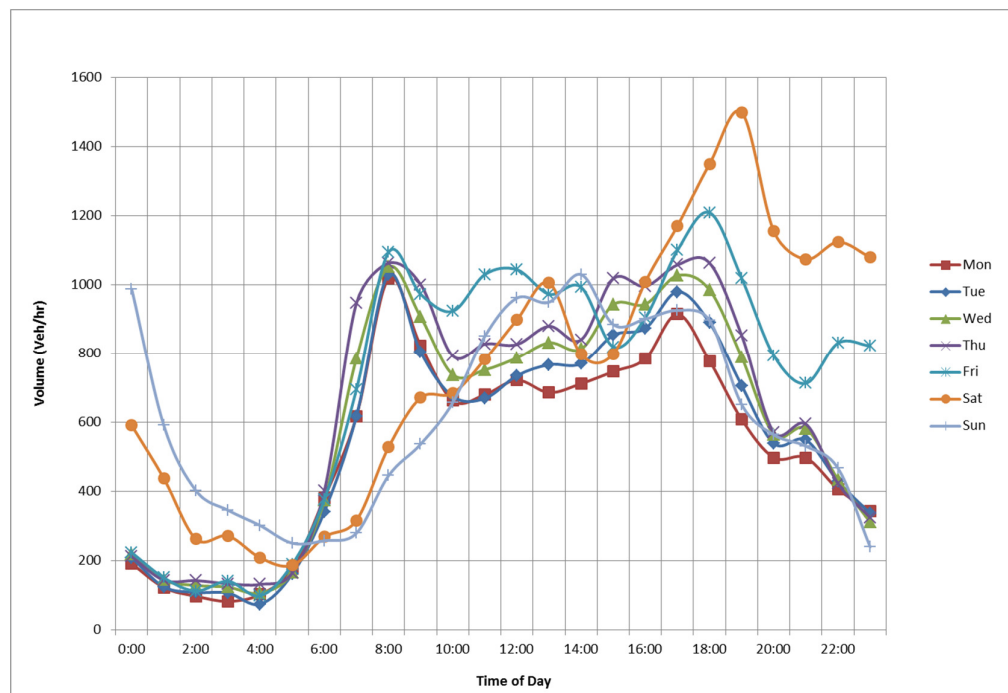
3.1.2 TRAFFIC VOLUME TRENDS

In the study document prepared by Mott MacDonald, it was reported that Friday evening (5.30pm to 6.30pm) manifests the highest peak for traffic volume at the study area compared to other weekday traffic volume (based on midblock 24hours data collection). The profile shown in Figure 3-5 below represents traffic volume trends observed on Darling Drive.

Insights from the data include:

- Monday to Thursday follow similar trends and volume profiles throughout the day;
- Morning peak hour is generally between 8am to 9am and evening peak hour is generally between 5pm to 6pm on a weekday;
- Friday shows a different trend with the traffic increasing till 9am and remaining relatively constant until 6pm after then traffic volume decreases but then starts again to increase at 9 pm and reaches a daily high at midnight; and
- Saturday evening peak is 38% higher than the average weekly peak. Different traffic pattern indicates the use of the network by regular commuter traffic for most of the week and the shift to “entertainment-related” traffic for both Friday and Saturday evenings.

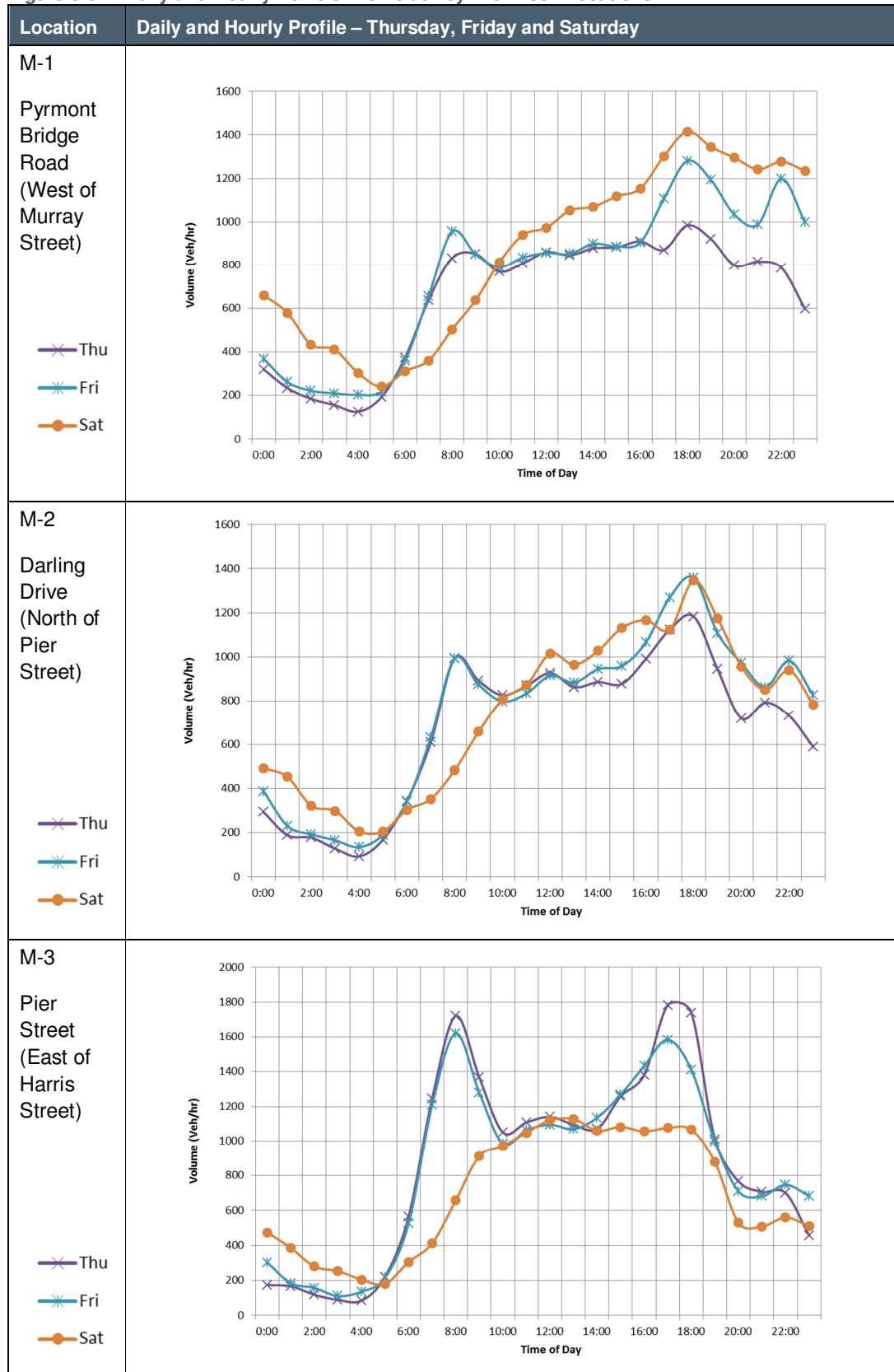
Figure 3-5 Seven days Traffic Volume Counts (March 2012), Darling Drive

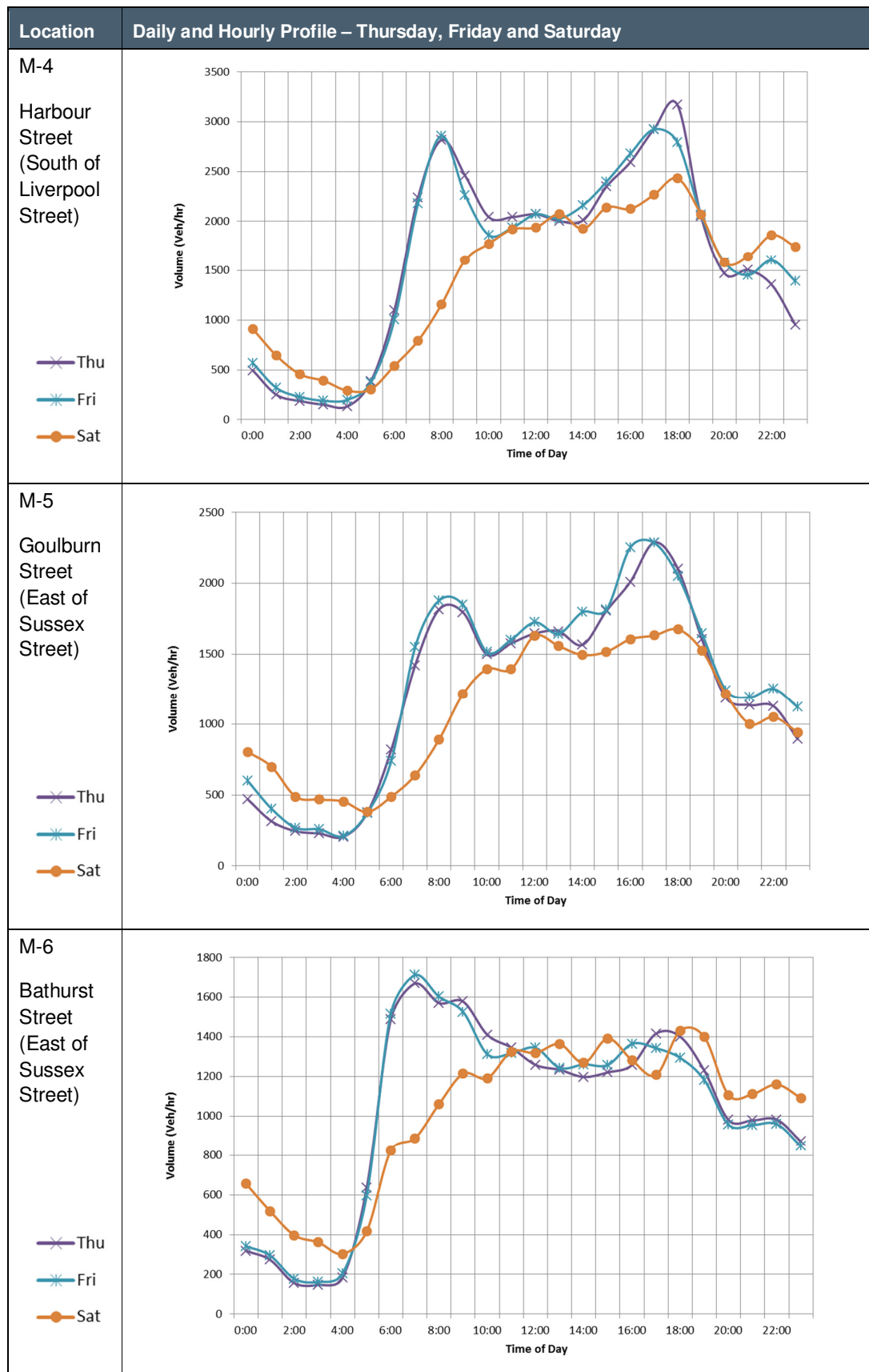


Mid-block counts conducted in November 2012 showed similar trends on Pyrmont Bridge Road and Darling Drive with Saturday count manifesting the highest PM peak period. Traffic volumes observed on Pier Street, Harbour Street, Goulburn Street and Bathurst Street showed weekday (Thursday and Friday) traffic to be generally higher than weekend (Saturday) traffic.

Figure 3-6 (M-1 to M-6) show the daily and hourly traffic profiles observed during the survey period.

Figure 3-6 Daily and Hourly Vehicle Profile at Key Mid-Block Locations





3.1.3 OBSERVED PEAK PERIODS AT INTERSECTIONS

For each of the 19 intersections in the study area, peak periods were identified by looking at hourly flows. Table 3-4 summarises the highest peak hour observed at surveyed intersections. The hour between 17:00 PM and 18:00 PM shows predominant weekday peak for about 7 sites. The weekend PM peak spreads over between 18:00 PM and 19:00 PM. The hour between 18:00 PM and 19:00 PM shows the predominant peak for seven (7) of the eight (8) sites which had weekend data.

Table 3-4 Observed AM and PM Peak Periods at Key Intersections

Intersection	Control Type	Weekday PM Peak	Weekend PM Peak
Harris Street/William Henry Street	Signal	17:00-18:00	
Harris Street/Macarthur Street	Signal	16:30-17:30	
Darling Drive/Pier Street	Roundabout	17:30-18:30	17:45-18:45
Darling Drive/Hay Street	Signal	17:00-18:00	
Harbour Street/Liverpool	Signal	17:00-18:00	18:00-19:00
Harbour Street/Goulburn	Signal	17:30-18:30	18:00-19:00
Pymont Street/Allen Street	Signal	17:30-18:30	
Goulburn Street/Sussex Street	Signal	17:30-18:30	
Sussex Street/Hay Street	Signal	17:30-18:30	
George Street/Goulburn Street	Signal	17:00-18:00	
George Street/Hay Street	Signal	17:15-18:15	
Darling Drive/Convention Access	Carpark	17:30-18:30	
Harris Street/Quarry Street	Signal	17:15-18:15	
Murray Street/Darling Drive	Signal	18:00-19:00	18:00-19:00
Druitt Street/Sussex Street	Signal	17:00-18:00	18:00-19:00
Bathurst Street/Day Street	Signal	17:15-18:15	18:00-19:00
Harbour Street/Day Street	Signal	17:45-18:45	18:00-19:00
Sussex Street/Bathurst Street	Signal	17:30-18:30	18:00-19:00

Hence, for modelling purposes, the following peak hours are adopted within the SICEEP study area AIMSUN traffic models:

- Weekday : Friday PM peak between 17:30 PM and 18:30 PM; and
- Weekend : Saturday PM Peak between 18:00 PM and 19:00 PM

3.1.4 PEAK HOUR TRAFFIC VOLUMES AT KEY ROADS

This section summarises the peak hour traffic flows on key intersections within the study area. The intersection turning movement data was used to identify the current capacity problems at key intersections. The traffic data also provides a basis to consider likely traffic changes that

would result from the future growth and proposed improvement options. The results are based on survey data recorded from key intersections in 2011 and 2012.

Table 3-5 summarises Friday and Saturday afternoon (PM) peak hour traffic volumes on key roads in the study area.

Table 3-5 Peak Hour Traffic Volumes at Key Roads

Road	Locations	Friday PM Peak (5:30-6:30pm)			Saturday PM Peak (6:00-7:00pm)		
		NB/WB	SB/EB	2way	NB/WB	SB/EB	2way
Pymont Bridge Road	West of Murray Street	585	755	1340	590	830	1420
Darling Drive	North of Pier Street	823	536	1359	803	589	1392
Pier Street	East of Harris Street	832	781	1613	574	554	1128
Harbour Street	South of Liverpool Street	1598	1358	2956	1201	1231	2432
Goulburn Street	East of Sussex Street	1250	1098	2348	804	872	1676
Bathurst Street	East of Sussex Street	0	1365	1365	0	1445	1445

Note: Northbound (NB), Eastbound (EB), Southbound (SB), Westbound (WB); Peak 1 hour traffic is estimated from AM peak 3 hour and PM peak 2 hour traffic data. Traffic data in the above table represents one hour traffic in vehicles.

The turning volumes for AM and PM peak hour at key intersections are shown in Appendix B.

3.1.5 EXISTING NETWORK CAPACITY AND LEVEL OF SERVICE (LOS)

The criteria for evaluating the operational performance of intersections are provided by the *RMS Guide to Traffic Generating Developments, Version 2.2, October 2002*. The criterion is based on a qualitative measure (i.e. Level of Service), which is applied to each average delay band.

The 'Level of Service' is the standard used to measure the performance of the intersection operation. This is defined as the qualitative assessment of the quantitative effect of factors such as speed, traffic volume, geometric features, delays and freedom of movement.

The intersections were assessed for existing operational performance using SIDRA Intersection Analysis. SIDRA Intersection calculates the amount of delay experienced by vehicles using an intersection, and gives a Level of Service rating. The 'Level of Service' (LOS) indicates the relative performance of that intersection with regard to the average delay (in seconds per vehicle) experienced by vehicles at the intersection.

The LoS value is determined by the overall average vehicle delay for all movements for signalised intersections, the while with roundabout, "Stop" and "Give Way" sign control intersections, the LoS value is determined by the critical movement with the highest average delay.

Table 3-6 summarises intersection LoS criteria used to assess the intersection performance.

Table 3-6 LOS Criteria

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

In general, SIDRA predicts intersection performance for the following key parameters:

- Degree of saturation (DoS);
- Average delays to intersection;
- Level of service (LoS) determined from LoS criteria from Table 3-6; and
- Queue length.

It should be noted that inappropriate interpretation of these parameters can create misleading conclusions, particularly for sign controlled intersections. For example, for a sign controlled intersection LoS is determined by the highest delay for minor traffic movements and there are instances where the LoS could be lower such as LoS “F” but associated only to a small volume of traffic being delayed. In this situation, the intersection should actually not have a significant capacity issue except for that one minor movement.

3.1.6 EXISTING INTERSECTION PERFORMANCE

SIDRA modelling was undertaken to assess existing operational performance of key intersections. The model runs were based on:

- Traffic survey data from the peak hour intersection turning movement counts;
- SCATS (Sydney Coordinated Adaptive Traffic System) data on phasing plan and cycle time; and,
- Existing intersection configurations.

Table 3-7 and Table 3-8 below present the summary of existing level of service (LoS) for the key intersections of the precinct.

Table 3-7 Intersection Performance of Existing Friday PM Peak Condition (2012)

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	49.7	D	44.9	D
		Darling Dr East	33.4	C		
		Murray St South	58.7	E		
		Pyrmont Bridge Rd West	49.9	D		
(I-2) Darling Dr / Pier street	Roundabout	Darling Dr North	3.6	A	10.2	A
		Pier St (off-ramp) East	8.9	A		
		Existing SEC Car Park Exit	5.8	A		
		Darling Drive South	7.9	A		
(I-3) Darling Dr / Car Park Access	Signalised	Darling Dr North	19.4	B	23.0	B
		Future Haymarket Car Park Access	46.5	D		
		Darling Dr South	16.4	B		
(I-4) Pier St / Harbour St / Goulburn St	Signalised	Harbour St North	61.4	E	44.2	D
		Goulburn St East	28.6	C		
		Harbour St South	51.3	D		
		Pier St West	34.2	C		
(I-5) Harbour St / Liverpool St	Signalised	Harbour St North	24.3	B	34.0	C
		Liverpool St East	42.3	C		
		Harbour St South	31.8	C		
		Car Park Exit (West)	65.8	E		

* it is assumed that 90 vehicles are coming out and 15 vehicles are going into the SEC car park exit / entry leg at Darling Drive and Pier Street roundabout. (for both Friday and Saturday)

**model short lane as full lane to examine the actual capacity of the adjacent lane

Table 3-8 Intersection Performance of Existing Saturday PM Peak (2012)

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	57.6	E	47.3	D
		Darling Dr East	30.5	C		
		Murray St South	64.2	E		
		Pyrmont Bridge Rd West	52.9	D		
(I-2) Darling Dr / Pier street	Roundabout	Darling Dr North	3.6	A	10.4	A
		Pier St (off-ramp) East	9	A		
		Existing SEC Car Park Exit	6.1	A		
		Darling Drive South	9.6	A		
(I-3) Darling Dr /	Signalised	Darling Dr North	19.4	B	23.0	B

Intersection	Intersection Control	Approach	Average Delay Approach (sec/veh)	Approach LoS	Overall Average Delay (sec/veh)	Overall LoS
Car Park Access		Future Haymarket Car Park Access	46.5	D		
		Darling Dr South	16.5	B		
(I-4) Pier St / Harbour St / Goulburn St	Signalised	Harbour St North	53.9	D	42.4	C
		Goulburn St East	31.3	C		
		Harbour St South	51.6	D		
		Pier St West	31.2	C		
(I-5) Harbour St / Liverpool St	Signalised	Harbour St North	19.1	B	27.5	B
		Liverpool St East	44.8	D		
		Harbour St South	20.5	B		
		Car Park Exit (West)	58.2	E		

* it is assumed that 90 vehicles are coming out and 15 vehicles are going into the SEC car park exit / entry leg at Darling Drive and Pier Street roundabout. (for both Friday and Saturday)

**model short lane as full lane to examine the actual capacity of the adjacent lane

The results of the modelling reveal the following key findings:

- The modelling investigation has found that on the overall the five key intersections perform at an acceptable LoS on a typical Friday or Saturday PM peak.
- Some turning movements have longer delays and have capacity issues with the available phase time splitting information;
- At intersection I-1, left and right turning from Pyrmont Bridge Road west are the critical movements in terms of average delay. Queue length will occasionally exceed right turning bay (40m) and overflow to the adjacent lane;
- Similar results for right turning from Darling Drive east which showed queue lengths exceeding lane storage length (50m) and blocking the through traffic movement; and,
- Right turning from Goulburn Street East in the intersection I-4 shows a potential capacity issue and the queue extends back of the short turning bay and blocks the through movement. At present there is provision for two short lanes – 30m and 28m for right turning vehicles.

3.2 PUBLIC TRANSPORT SERVICES

The site is accessible via public transport services generally located on the eastern side of the Darling Harbour precinct and consisting of buses, light rail, ferry services and heavy rail.

3.2.1 CITYRAIL SUBURBAN RAIL SERVICES

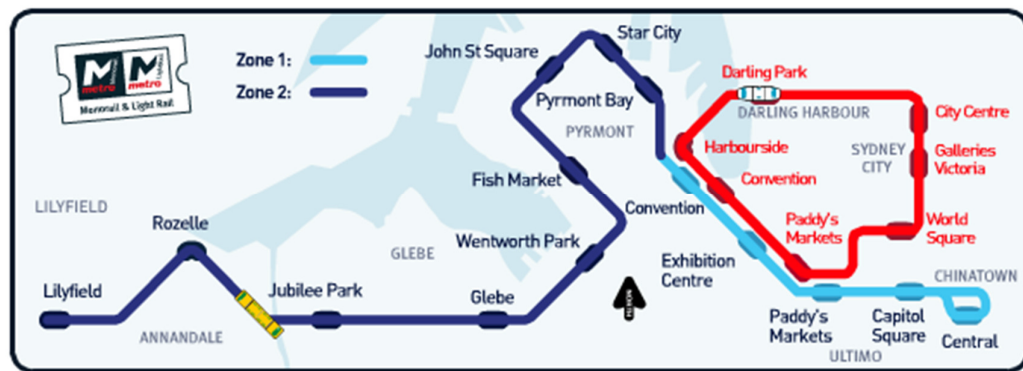
The SICEEP site is accessible via the suburban rail stations in the CBD with walking distances from approximately 400-800 metres from the train station at Town Hall and Central Station, respectively. Town Hall Station is approximately 5-10 minutes walking distance to Tumbalong Park via Bathurst Street and Druitt Street. Central Station is a good 10-12 minutes' walk via Ultimo Road/George Street. Both rail stations provide connections to the suburban rail network with Central Station also servicing interurban and inter regional rail services and coaches.

Most train services do not operate between midnight and 4 AM but an alternative NightRide bus service is available between these hours on most Sydney suburban lines.

3.2.2 LIGHT RAIL

The Metro Light Rail provides a direct connection from Central Station/CBD on the eastern side with the inner West suburbs through Darling Harbour South. The Metro Light Rail transport system traverses east west from Central Station along Hay Street via Capitol Square, Paddy's Market, then travels north parallel to Darling Drive with stops at ICC Exhibition Centre, Convention Centre, up to Pyrmont Bay, then Star Casino then onwards to Lilyfield. The light rail operates from 6am to 11pm daily between Central Station and Lilyfield with a service frequency of 10-15 minutes and 24 hours daily between Central Station and Star Casino with night service at 30 minute intervals. Extended hours are also observed on the Central Station to Lilyfield route during Fridays and Saturdays.

Figure 3-7 Sydney Light Rail Service Coverage



Source: www.metrotransport.com.au

Construction of the Inner West Light rail extension project is now underway and on track for completion around early 2014. The extension will run along the former Rozelle rail freight corridor connecting Central Station to Lilyfield and through the inner west to Dulwich Hill.

3.2.3 EXISTING BUS SERVICES

Bus services in the Sydney CBD are provided by Sydney Buses. There are no bus routes or bus stops in the immediate vicinity adjoining the SCEC or along Darling Drive. The closest bus stop is located at the Maritime Museum some 5 minutes walking distance from the Site and is being serviced by bus route 443 and bus route 448. The bus stop located at Exhibition Place, south of the ICC Exhibition Centre mainly services coaches and shuttle buses used by tour groups.

In proximity to the site, a large number of routes operating in the CBD have stops along George Street, with the majority stopping at Town Hall/QVB approximately some 10 minutes walking distance from the SICEEP.

A total of eight (8) bus routes travelling along George Street can service the transport demand for the SICEEP. These routes including bus routes 443 and 448 will be assessed in terms of its level of service based on its current operating characteristics.

The routes consist of daily full time service, Monday to Friday peak hour service, pre-pay service only and a combination of pre-pay and pay-on-board service.

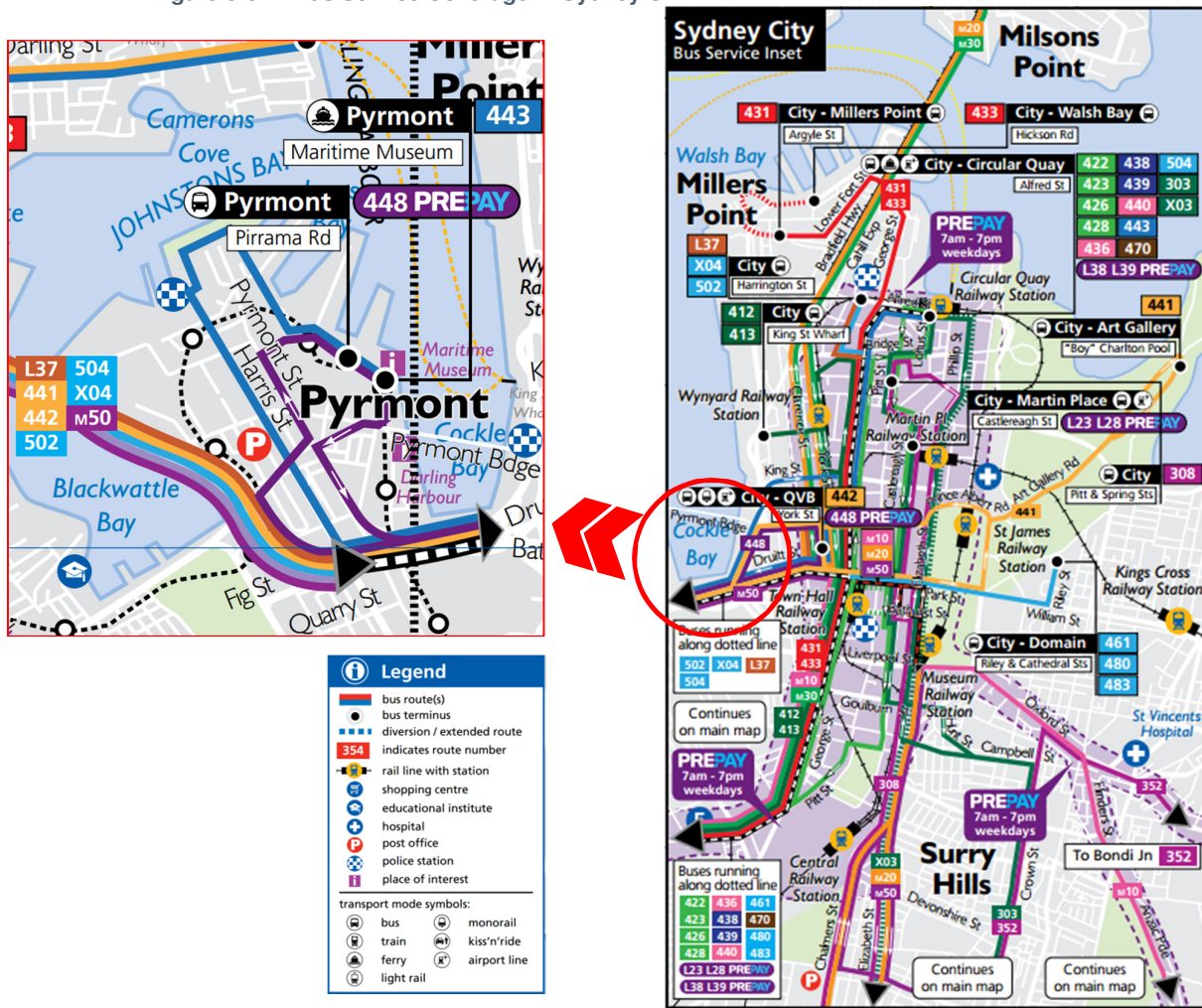
The routes are shown in Figure 3-8. In addition to the above routes, Sydney Buses operates Route 555 which is a free shuttle bus service in the CBD. The Sydney CBD shuttle bus runs every 10 minutes in both directions on a loop from Central Station to Circular Quay via Elizabeth and George Streets. On weekdays, the shuttle bus operates from 9:30am to 3:30pm with a late finish of 9pm on Thursday evenings and on weekends from 9:30am to 6:00pm. Commuters can board these high frequency buses from any bus stop marked with the green shuttle logo. Each bus is an accessible bus that can be used by people in wheelchairs or with other accessibility requirements, and parents or carers with prams.

Level of Service

The Transport Research Board's *Transit Capacity and Quality of Service Manual (2003)* (Washington, DC) outlines a means of determining the Level of Service of bus routes. Based on an assessment of service frequency, service hours, and coverage an indicative Level of Service for a given area can be determined.

The criterion for Level of Service based on service frequency is shown in **Table 3-9**, while Level of Service criteria for service hours is shown in **Table 3-10**. Level of Service C and above is considered acceptable and would be attractive to users.

Figure 3-8 Bus Service Coverage in Sydney CBD



Source: www.151300.com.au