Crown Resorts Limited

Crown Sydney Hotel Resort

Transport Assessment

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Job number 234183

Arup
Arup Pty Ltd ABN 18 000 966 165

Arup
Level 10 201 Kent Street
PO Box 76 Millers Point
Sydney 2000
Australia
www.arup.com

ARUP

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1 Introduction

1.1 Study Background

This report has been prepared on by Arup on behalf of Crown Resorts Limited ('Crown') to accompany a State Significant Development Application (SSDA) for the Crown Sydney Hotel at Barangaroo. The Hotel is proposed in accordance with the approved Barangaroo Concept Plan (as modified) and is located within Barangaroo South. The Hotel will be undertaken in two phases. Phase 1 will comprise excavation and site preparation while Phase 2 will comprise the main building (basement and above). Development approval for Phase 1 (also known as Stage 1C) is the subject of a separate SSDA.

1.2 Background

The 22 hectare Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – the Headland Park, Barangaroo Stage 2 and Barangaroo Stage 1 (herein after referred to as Barangaroo South).

Lend Lease was successfully appointed as the preferred proponent to develop Barangaroo Stage 1 (otherwise known as Barangaroo South) on 20 December 2009.

1.3 Site Description

Barangaroo is located on the north western edge of the Sydney Central Business District (CBD), bounded by Sydney Harbour to the west and north; the historic precinct of Millers Point (for the northern half), The Rocks and the Sydney Harbour Bridge approach to the east; and a range of new development dominated by large CBD commercial tenants and the King Street Wharf/Cockle Bay precinct to the south.

The 22ha Barangaroo site is generally rectangular in shape and has a 1.4 kilometre harbour foreshore frontage, with an eastern street frontage to Hickson Road. The site has been divided into three distinct redevelopment areas (from north to south) – the Headland Park, Barangaroo Central and Barangaroo South, and has been subject to multiple investigations that detail the physical and natural characteristics of the site.

The Barangaroo Delivery Authority (BDA) is the state government authority that manages and delivers the development of Barangaroo.

1.4 Crown Sydney Hotel Resort Development

The Crown Sydney Hotel Resort development will comprise a single high rise building that will include a hotel, VIP gaming facilities and residential apartments. More specifically approval is sought for:

- Construction and use of a hotel, VIP gaming facilities and residential apartment building with associated retail and restaurant uses and a basement car park to accommodate parking and servicing allocated to the proposed uses within the development, comprising a total Gross Floor Area of approximately 77,500m2 and a maximum building height of approximately 271 metres (RL 275);
- Associated building signage; and
- Provision of services and utilities and some public domain works required to service the building.

1.5 Scope of the Report

This report has been prepared to accompany the SSDA for the Crown Sydney development. It responds to the transport related issues identified in the Secretary's Environmental Assessment Requirements (SEARs) for the SSDA. This includes the following considerations:

- *Demonstrate consistency with the Barangaroo Integrated Transport Plan and the Sydney City Centre Access Strategy.*
- *The EIS shall include a Traffic and Transport Impact Assessment that provides, but is not limited to, the following:*
    - *daily and peak hour vehicle, public transport, pedestrian and bicycle movements and existing traffic and transport facilities provided on the road network;*
    - *daily and peak traffic movements likely to be generated by the development, including peak traffic movements;*
    - *assessment of the existing and future performance of key intersections*
    - *providing access to the site, and any upgrades (road/intersections) required as a result of the development. The assessment of the existing*
    - *and future road network operations needs to consider the cumulative traffic volumes and focus on intersections in the north-west quadrant of the CBD in the vicinity of Barangaroo . The assessment needs to be supported by appropriate modelling and analysis to the satisfaction of Roads and Maritime Services;*
    - *details of the proposed number of car parking spaces and compliance*
    - *with appropriate parking codes. It should demonstrate a minimalist approach to the provision of on-site parking, and how traffic generation (number of vehicles and time of access) will be managed in response to*
    - *capacity limitations on the road network;*
    - *pedestrian and cycle connections/circulation and required upgrades to meet the likely future demand within the precinct and connections to the*

external networks, particularly the cycle network identified in the Sydney City Centre Access Strategy;

- *existing public transport services and opportunities for greater usage for residents, workers and visitors;*
- *outline late night transport provision and demonstrate late night transport provision to support Crown Resort;*
- *assessment of future transport needs associated with the Crown Resort, including a clear understanding of the travel task for all modes at different times of the day (peak, off-peak, and other peak periods*
- *relevant to the hotel/casino) and week;*
- *demonstrate that additional people movements can be accommodated by the surrounding public transport network (Wynyard bus/rail interchange via Wynyard Walk, bus stops, future light rail on George Street and proposed ferry hub at Barangaroo South);*
- *details of sustainable travel initiatives for residents, workers and visitors, particularly for the provision of end-of-trip facilities;*
- *assessment of proposed loading dock provisions and access arrangements to loading docks;*
- *details of existing and proposed vehicular access and car parking arrangements for workers and visitors (cars, coaches/buses & taxi ranks), including compliance with parking codes and Australian Standards, and measures to mitigate any associated traffic impacts and*
- *impacts on public transport, pedestrian and cycle networks; and*
- *details of access arrangements for emergency and service vehicles (including vehicle type and likely arrival and departure times of service vehicles).*

2 Transport and Access

2.1 Site Access

The site access arrangements for Crown Sydney and the wider Barangaroo South precinct are shown in Figure 1 for:

- Pedestrians
- Cyclists
- Service vehicles
- Cars to basement and hotel

The key pedestrian routes are focused on Wynyard Walk and City Walk pedestrian bridges which provide connections to Wynyard Station for train and bus passengers.

Cyclists will access the basement bicycle parking facility via a dedicated bicycle entry on Hickson Road. Cyclists will use Hickson Road, Sussex Street and Napoleon Street for access into the precinct.

Service vehicles access the basement loading area from Globe Street and arrive and depart from Hickson Road.

Emergency vehicles gain access within the precinct along Globe Street and Lime Street where they can stop to gain foot access to area. Emergency vehicles may also traverse Shelley Street and Sussex Street/Hickson Road.

Cars accessing the Crown Sydney basement parking area via a vehicle ramp fronting Lime Street. A porte-cochere is proposed which will provide taxi drop off / pick up and valet parking for visitors.

The primary vehicle access route into the hotel will be via Hickson Road and Globe Street. Key aspects of the access strategy for the hotel include:

- A new porte-cochere to be located within the site boundary;
- Entry and exit for vehicles utilising valet parking to be located at the northern end of Lime Street within the porte-cochere; and
- A consolidated basement entry/exit for service vehicles, as well as self-park patrons and residents further south on Lime Street

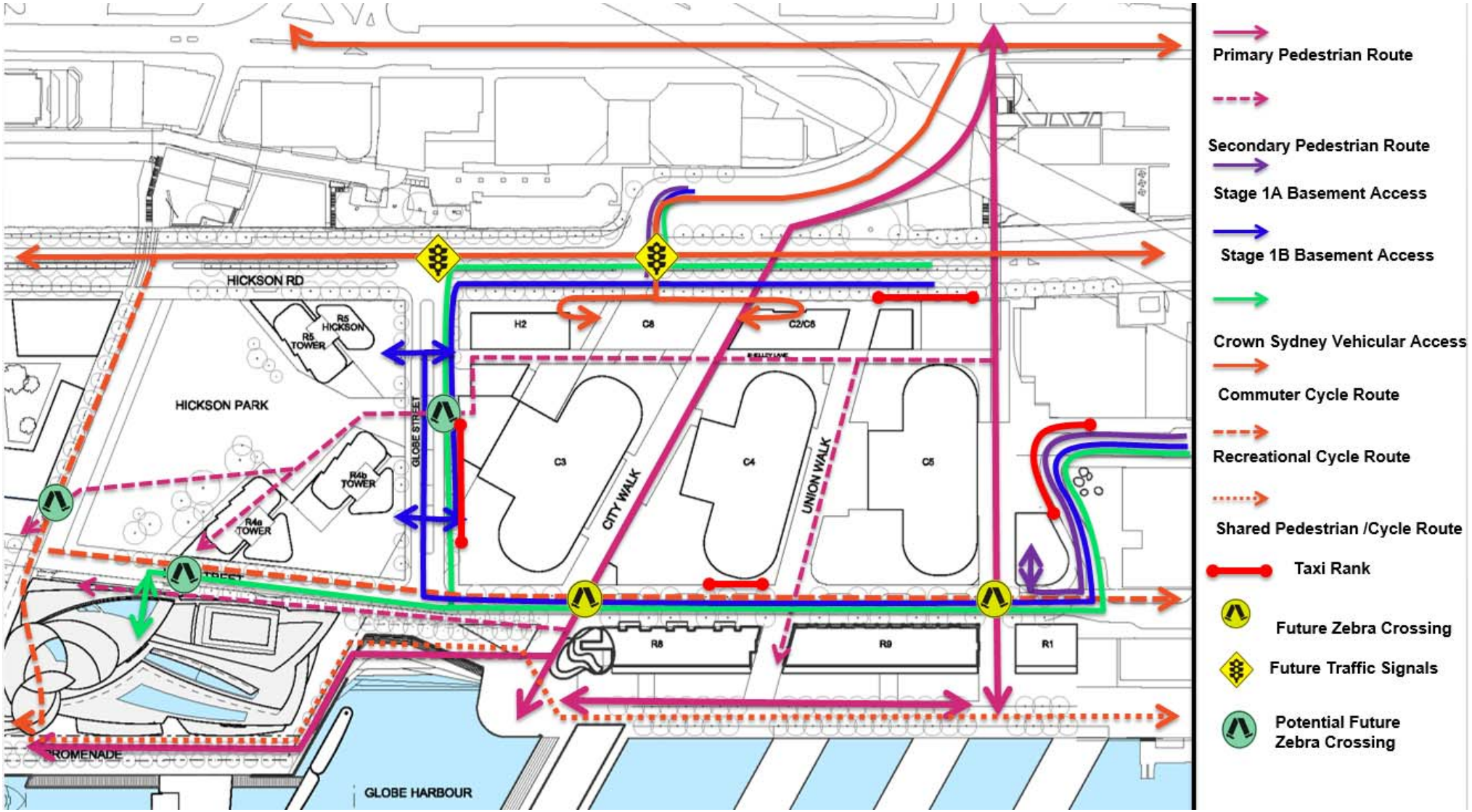


Figure 1 Crown Sydney Site Access

2.2 Pedestrian and Bicycle Connections

2.2.1 Strategic Transport Context

The NSW Government is committed to enhanced pedestrian and cycle linkages to reduce car dependency and support sustainable modes of travel. The **NSW Long Term Transport Master Plan**, finalised in December 2012, outlines the following key actions to support walking and cycling:

- Improved bicycle parking at transport interchanges;
- Provision of a connected cycling network that targets investment in clearly defined cycleways within a 5km radius of major urban centres;
- Prioritised pedestrian access and amenity around public transport interchanges;
- Pedestrian infrastructure to support Barangaroo, including the Wynyard Walk;
- Identification of opportunities to improve pedestrian priority at signalled intersections on major urban centre desire lines.

The **Sydney City Centre Access Strategy** was released by Transport for NSW in December 2013. This strategy aims to deliver a fully integrated transport network that prepares Sydney's city centre for the future. The focus is on improving access and circulation by public transport and active transport modes. A key focus is improved legibility and conditions for pedestrians and completing the cycleway network. The strategic cycleway and pedestrian improvements as outlined in the strategy are shown in Figure 2.

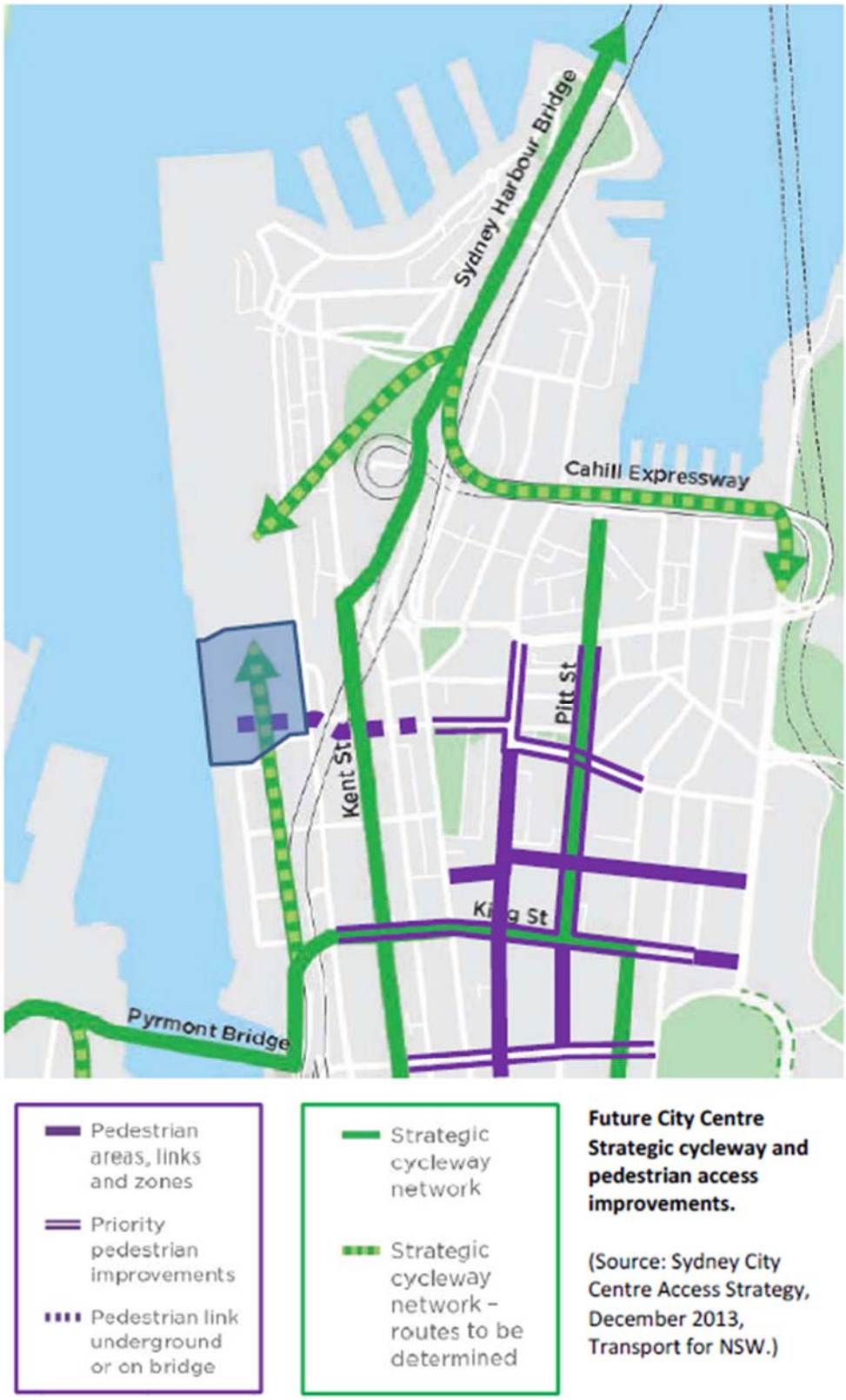


Figure 2 Future City Centre Strategic cycleway and pedestrian access improvements

In December 2013 Transport for NSW released two policy documents focussing specially on walking and cycling, those being **Sydney's Walking Future** and **Sydney's Cycling Future.** These documents provide a framework for the way walking and cycling infrastructure is planned and prioritised in Sydney, with the network of routes consistent with that outlined in the Sydney City Centre Access Strategy (Figure 2).

Key points to emerge from these strategies with relevance to the Crown Sydney project include:

- A safe and connected bicycle network benefits the wider transport network by improving access to towns and centres, reducing congestion and increasing capacity on the public transport system
- Investment in bicycle infrastructure should be prioritised within 5km of public transport interchanges
- As a component of a safe and connected network, bicycle parking facilities at public transport interchanges should be provided. The strategy references the Bike and Ride imitative which aims to make it more convenient for customers to ride to transport hubs and leave their bikes securely locked.
- Commitment to invest in new walking links that connect people to public transport
- Investment in walking infrastructure to be prioritised within 2km of public transport interchanges

The journey to work mode share targets outlined for the Barangaroo precinct, as well as the pedestrian and bicycle infrastructure to be provided, aligns with the overall aims and objectives of these key policy documents.

2.2.2 Pedestrian Connections

The site will be well serviced by a number of pedestrian routes which link with the wider Barangaroo precinct. A number of zebra crossings are proposed which are located on major pedestrian desire lines to facilitate the safe movement of pedestrians to and from the site. For the ultimate Barangaroo development the following pedestrian linkages are proposed:

Wynyard Walk

The NSW Government has commenced work on Wynyard Walk (previously Barangaroo Pedestrian Link), a direct pedestrian link between the new Barangaroo development and Wynyard Station and transport interchange. The Wynyard Walk will provide a high level of access to public transport for the growing western corridor of the CBD, including Barangaroo and the King Street Wharf. Wynyard Walk will allow people to access Barangaroo from Wynyard Station in approximately six minutes. The Wynyard Walk bridge (over Sussex Street) will open in 2015, with the new tunnel connection to open in 2016. The proposed route for Wynyard Walk is shown in Figure 3.

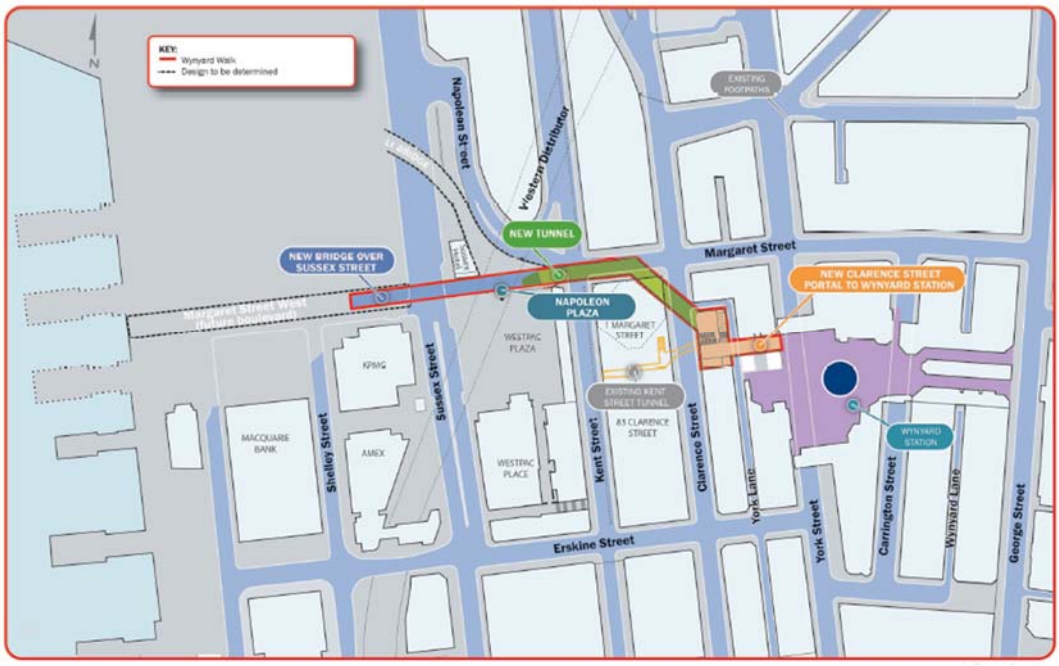


Figure 3 Wynyard Walk (Source: REF April 2012, Transport for NSW)

City Walk Bridge

A new pedestrian link bridge over Sussex Street/Hickson Road located close to the intersection of Hickson Road and Napoleon Street which links into the Wynyard Walk. The facility will enhance connectivity between Barangaroo South and the Wynyard Station precinct. The bridge opened in July 2015. An overview of the City Walk Bridge alignment is presented in Figure 4.

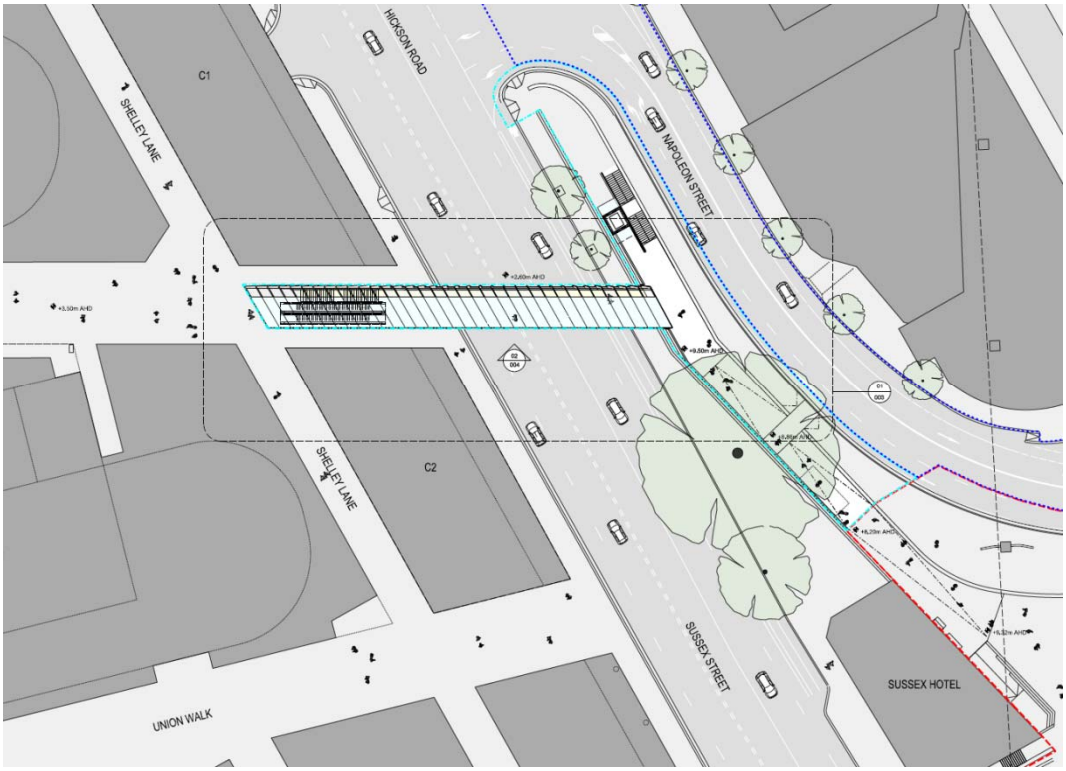


Figure 4 City Walk Bridge

2.2.3 Pedestrian Routes

The primary pedestrian site access point is located at the southern end of the development, adjacent to Globe Harbour. This location provides links to major pedestrian routes within Barangaroo South and Central, including the foreshore promenade and City Walk Bridge. These routes then provide linkages to key transport interchanges in the precinct, including Wynyard bus and rail interchange and the new Barangaroo ferry wharf.

A secondary pedestrian access route is located on Lime Street adjacent to the hotel porte-cochere. A zebra crossing is proposed along the pedestrian desire line opposite this location. Many pedestrians travelling to Barangaroo Central will likely use the Lime Street eastern footpath and cross at the zebra crossing on Lime Street.

Lime Street, between Globe Street and Barangaroo Central, is not expected to act as a major through pedestrian route. The vast majority of people accessing the precinct from Barangaroo South will either enter Crown Sydney adjacent to Globe Harbour, or continue down to the waterfront. Those travelling to Barangaroo Central will walk through the open space area adjacent to the R4 residential tower.

These pedestrian routes are summarised in Figure 5.

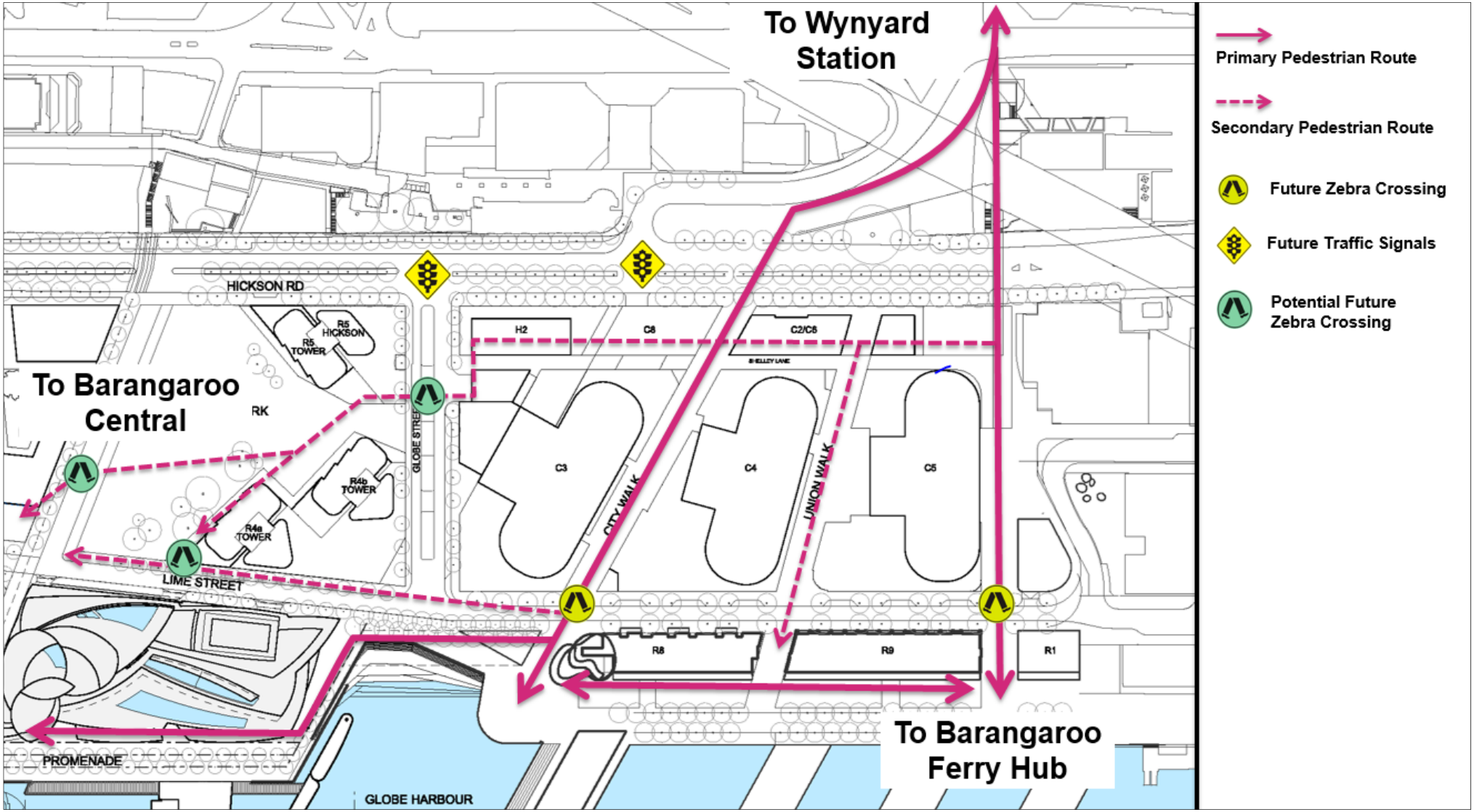


Figure 5 Pedestrian Network

A number of additional pedestrian connections are proposed to service the Barangaroo Central and Headland Park precincts. This includes new pedestrian bridges over Hickson Road at High Street and Jenkins Street, as well as a permeable internal pedestrian network which provides connections to Barangaroo South. These are consistent with the connections identified in the Barangaroo Integrated Transport Plan as illustrated in Figure 6.

Figure 6 Future Pedestrian Routes in Barangaroo Precinct

Source: Barangaroo Integrated Transport Plan, Figure 5

2.2.4 Bicycle Connections

A high quality bicycle network will service Crown Sydney and provide connectivity to the wider Barangaroo precinct.

The Sydney City Centre Access Strategy outlines the future city centre cycleway network to encourage growth in cycling and reduce pressure on the public transport system. Measures proposed include:

- Extending the Kent Street cycleway south to Liverpool Street
- Construction of a bi-directional cycleway on Liverpool Street
- Construction of a bi-directional cycleway on Castlereagh Street and Pitt Street, providing a new north-south connection through the CBD
- Extending the existing King Street cycleway to Castlereagh Street
- Extending the east- west cycleway along Park Street to Castlereagh Street

The strategy also notes that investigations for additional cycleway connections in the city centre are ongoing, including “cycle connections to Barangaroo”. The strategic cycleway network map (see Figure 7) indicates these connections to be via the Pyrmont Bridge cycleway and the Harbour Bridge cycleway.

Figure 7 Strategic Cycleway Network Map

Source: Sydney City Centre Access Strategy (NSW Government, 2013)

The primary route for riders travelling to Barangaroo South from the north (via the Sydney Harbour Bridge cycleway) will be via the new cycleway along Napoleon Street. This is consistent with the City of Sydney cycling strategy. An

alternative route exists via Argyle Street, Dalgety Road and Hickson Road. Many cyclists will find this route attractive given the low traffic volumes and the available road space.

Napoleon Street will form a key link for cyclists travelling between the Barangaroo South development and the existing separated cycleway on Kent Street. Discussions are currently ongoing with the road authority regarding the most appropriate facility to be provided at this location, however it is currently envisaged a bicycle lane will be provided for eastbound riders (uphill), with a mixed traffic environment in the westbound direction. This is consistent with that identified in the Barangaroo Integrated Transport Plan.

A bi-directional separated cycleway is envisaged on the eastern side of Hickson Road, up to the intersection with Towns Place. This is currently under investigation by Lend Lease in conjunction with the road authority and other stakeholders. Beyond this point, the existing single direction on-road cycle lane will facilitate the movement of cyclists onwards towards The Rocks and Circular Quay. It is assumed the cycleway will commence at Shelley Street, which will provide a link to the new Transport Place.

The future external bicycle network serving Crown Sydney is outlined in Figure 8 on the following page.

Figure 8 Future Cycleway Network Serving Crown Sydney

2.2.5 Internal Bicycle Network

Cycling within Barangaroo will be confined to the internal road network, i.e. along Globe Street and Lime Street. These will function as mixed traffic streets given the relatively low levels of vehicular traffic and anticipated 40km/hr speed limit. On-road bicycle symbols can be provided at minimum 200m intervals towards the centre of the travel lane to signify to drivers the presence of cyclists along these routes. The route along Lime Street will connect with a recreational cycle route which continues through Barangaroo Central and into Headland Park.

The cycle network currently envisaged is outlined in Figure 9.

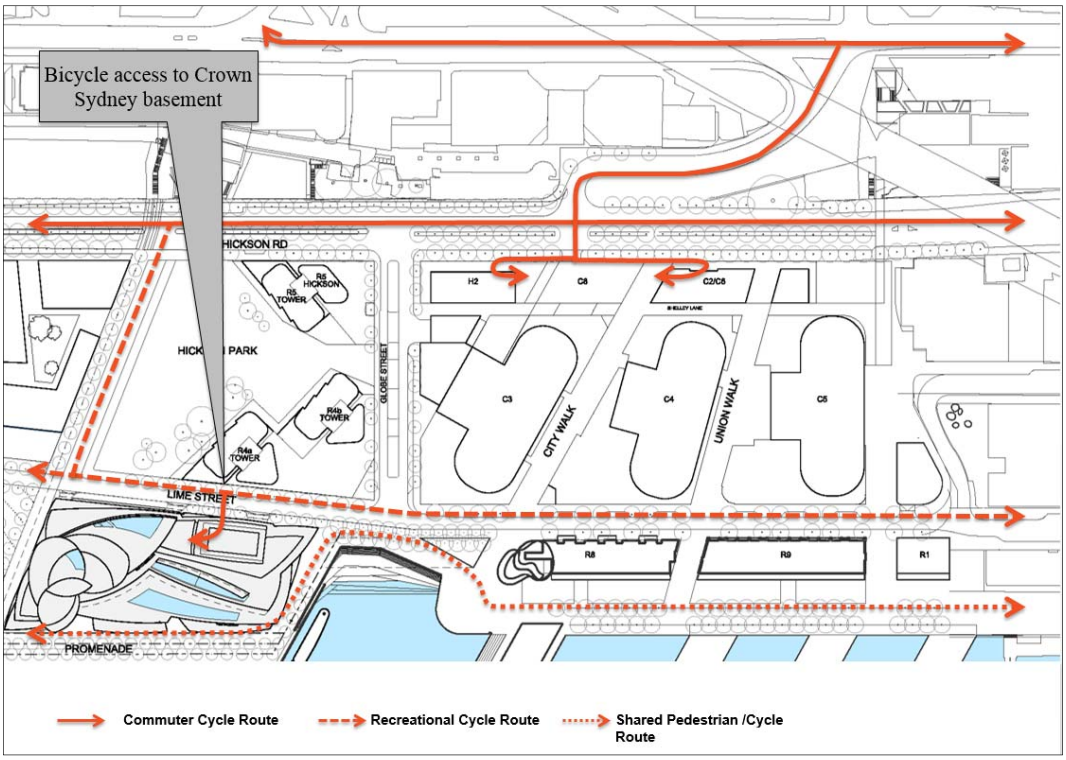


Figure 9 Bicycle Network

2.3 Vehicular Access

The preferred access strategy for Crown Sydney is shown in Figure 10 and includes the following key aspects:

- A new porte-cochere to be located within the site boundary;
- Entry and exit for vehicles utilising valet parking to be located at the northern end of Lime Street within the porte-cochere; and
- A consolidated basement entry/exit for service vehicles, as well as self-park patrons and residents further south on Lime Street

The primary vehicle access route into Crown Sydney will be via Hickson Road and Globe Street.

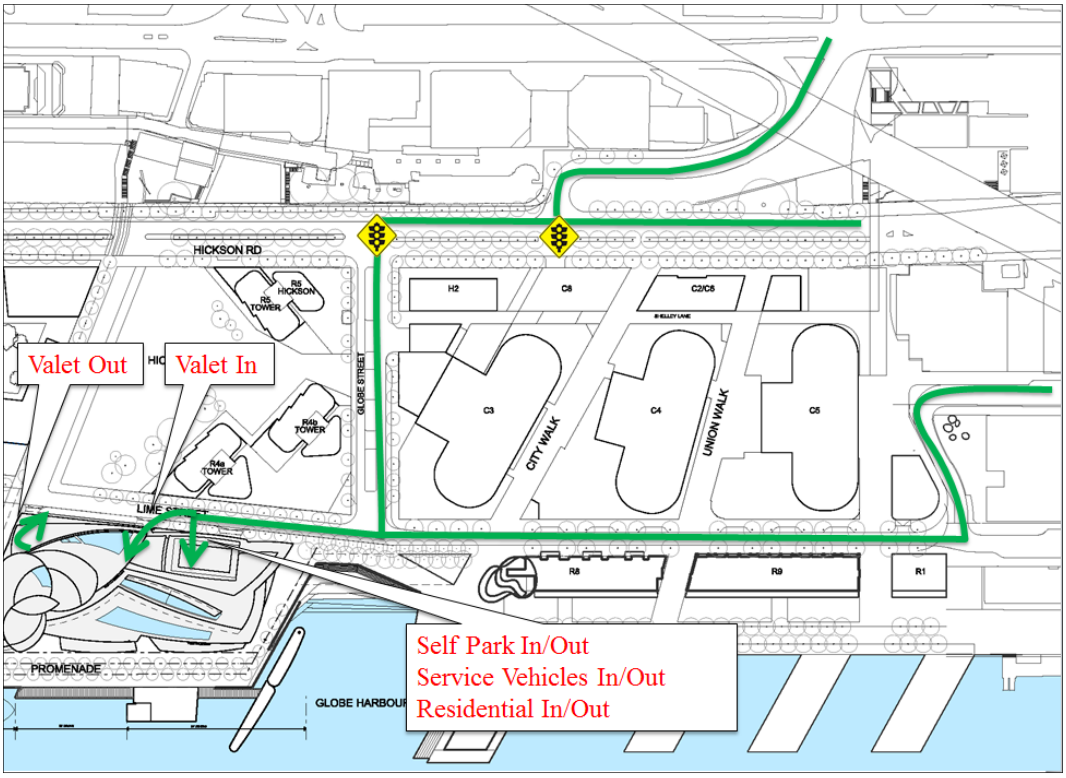


Figure 10 Vehicular site access

2.4 Valet Parking

Valeted cars are taken down from the porte-cochere in a dedicated ramp to the B1 level. Valeted cars returned to the guest using the up basement ramp, and driven a short stretch along Lime Street into the porte-cochere for returning to the guest. This is illustrated in Figure 11.

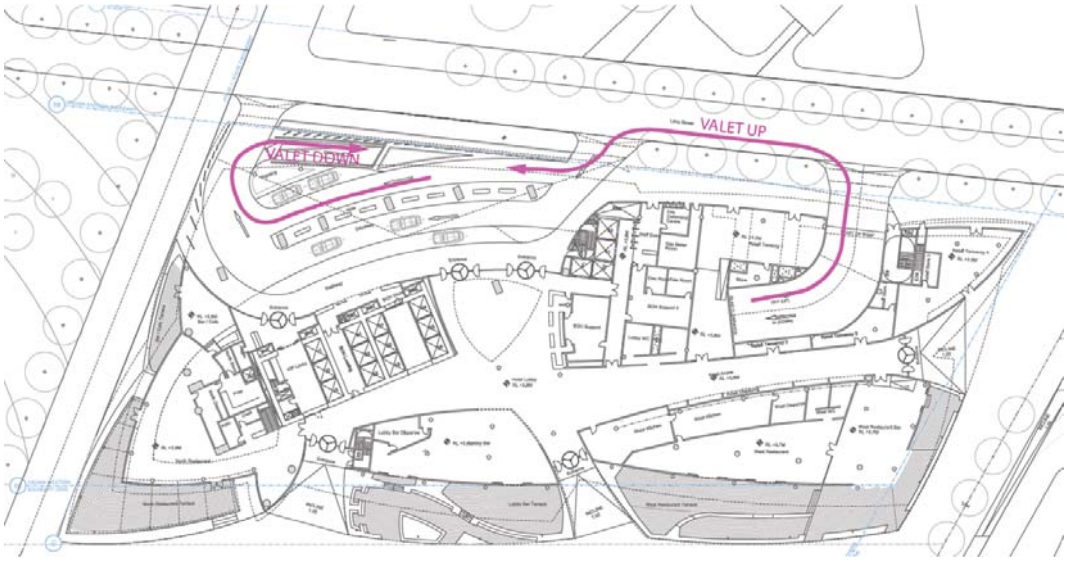


Figure 11 Valet Parking Operations

2.5 Access by Ferry

Existing commuter ferry services providing access to Barangaroo and the CBD arrive and depart from King Street Wharf (number 3) and Circular Quay.

The Sydney City Centre Access Strategy commits to constructing a new ferry hub at Barangaroo, delivered in time for major tenants moving in to the development. This new wharf will support the commercial development of the precinct, with new ferry services anticipated from the east and north, as well as the existing western ferry catchments.

The new ferry hub will service the new development and connect ferry users to the western and midtown parts of the city centre via the Wynyard Walk link. It will reduce capacity constraints on the Circular Quay terminal and will bring additional ferry services and routes directly to Barangaroo. The Barangaroo Ferry Hub proposal initially commits to the construction of two wharves. However provision is made within the design for the construction of a third wharf based on future demand and uptake

A planning application for the construction and operation of a ferry hub was lodged to the Department of Planning and Environment in December 2014. The proposal is currently under review.

An illustration of the proposal is shown in Figure 12 below.

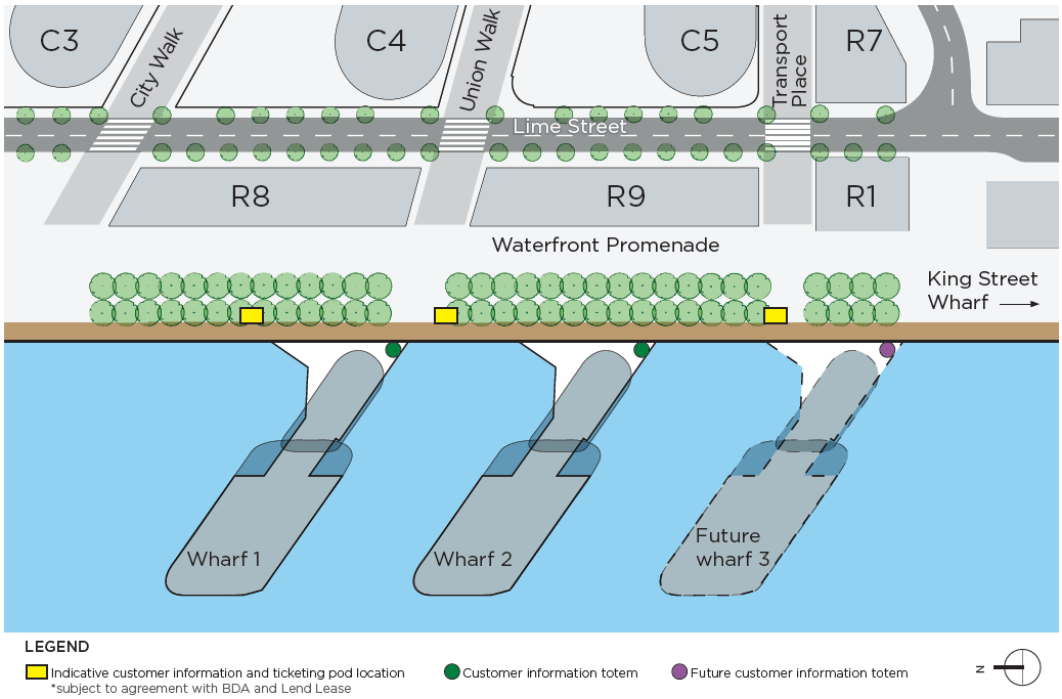


Figure 12 Barangaroo Ferry Wharf

Source: Barangaroo Ferry Hub Submission Report (Transport for NSW, 2015)

2.6 Access by Taxi

Taxis will use the hotel porte-cochere as a means of dropping off and picking up passengers. Planning for taxi ranks in the Barangaroo precinct is currently ongoing, in consultation with key stakeholders including City of Sydney, Transport for NSW, the Barangaroo Delivery Authority and the RMS.

A summary of the taxi ranks currently planned for Barangaroo South is shown in Figure 13. The identified zones currently provide for approximately 18 taxi bays.

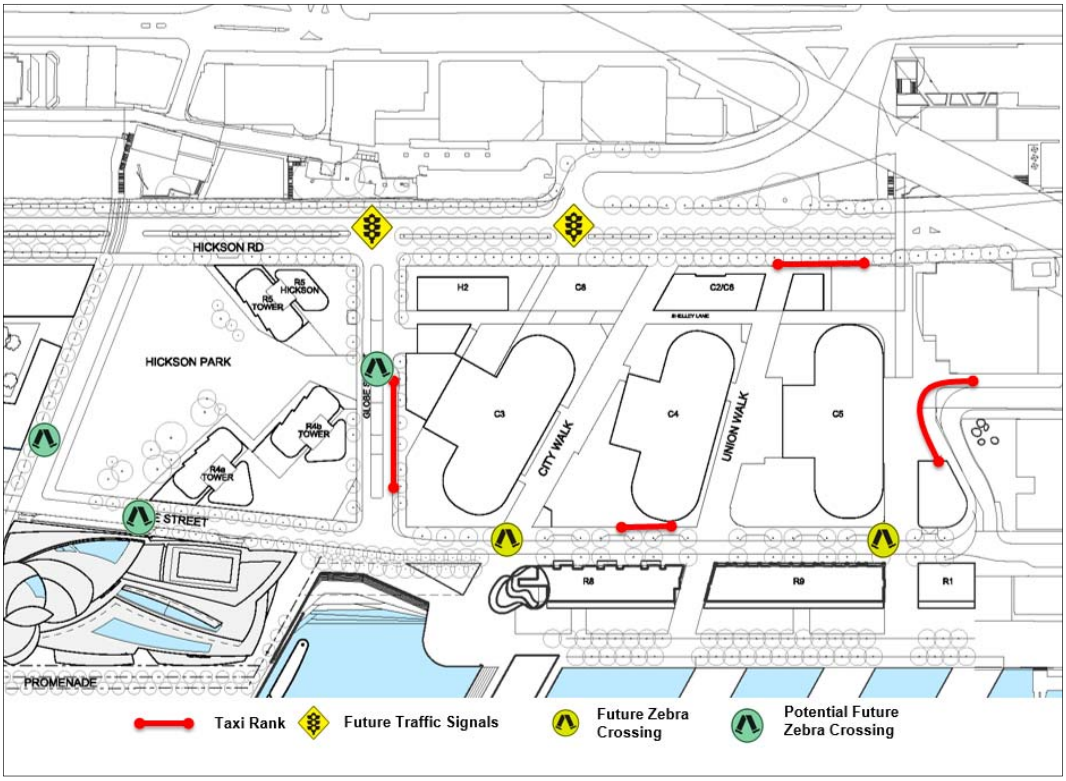


Figure 13 Proposed Taxi Ranks

2.7 Coaches

Allocation of kerbside space in vicinity of Crown Sydney for coach set down / pick up is planned within the Barangaroo Concept Plan. This will service tour groups travelling to and from Crown Sydney to other areas of Sydney. Additional on-street set-down and pick up space is understood to be provided within the Barangaroo Central precinct.

Current planning has identified kerbside parking on the western side of Lime Street just south of the basement access to Crown Sydney for coach pick up and set down. The final location for coaches will be confirmed at a later date in consultation with key stakeholders.

2.8 Late Night Transport Network

Crown Sydney will be an integrated resort which will generate activity at all hours of the day, including in the evening and late at night. A number of transport alternatives will be available at these times, including:

- Train services from Wynyard which run until 1am on weeknights on several routes, resuming again at 4.30am. On weekends the last train service departs Wynyard at 1.41am.
- Ferry services at the future Barangaroo Ferry Hub are expected to run until midnight seven days a week;
- Taxi services will provide an important form of late night transport for users, as they currently do at King Street Wharf. Taxis will be available at all hours of the night at the strategic taxi ranks identified in Figure 13. These ranks will likely be managed during busy periods to accommodate the increased demands expected in the evening.

As bus planning for the precinct is currently still in progress, the availability of buses as a late night transport option is still to be confirmed.

2.9 Emergency Vehicle Access

Emergency vehicles gain access within the precinct along Globe Street and Lime Street where they can stop to gain foot access to the Crown Sydney site. Emergency vehicles may also traverse Shelley Street and Sussex Street/Hickson Road, as well as the foreshore promenade and walks.

3 Operational Impacts

3.1 Crown Sydney Traffic Generation

3.1.1 Methodology

The primary document relating to traffic impact assessments in NSW is the RMS's *Guide to Traffic Generating Developments*. Traffic generation forecasts are typically based on rates per m^2 of GFA development for each type of land use, or other factors including parking provision or dwelling numbers. Rates are usually derived from one of the following two sources:

- Standard rates contained in the RMS's Guide to Traffic Generating Developments; or
- Rates estimated on the basis of surveys of existing developments similar to the proposed development.

Traffic generation rates are heavily influenced by a number of factors such as public transport availability and parking availability. The RMS guide notes that:

Surveys of existing developments similar to the proposal, can also be undertaken and comparisons may be drawn. By simplifying generation rates, site-by-site variations from the average are not taken into account……..Departures from the average generation rates for individual development proposals may be adopted, in which case such a departure should be justified with relevant supporting facts.

Given the unique nature of the integrated resort, the most appropriate method to forecast future traffic generation is to refer to similar elements of the existing Crown resort in Melbourne. Arup was provided with parking and traffic data by Crown for a number of their properties in Melbourne. This included both video surveillance footage and entry/exit data from Crown's car parking areas. This is further described in the sections below.

3.1.2 Self-Park Traffic Movements

The methodology undertaken for forecasting the anticipated number of self-park traffic movements for Crown Sydney was as follows:

- The number of black, platinum and gold members entering and exiting the Crown Melbourne basement car park over the course of an entire year (broken down each hour for every day of the week) was provided by Crown.
- Major event days (e.g. AFL grand final, Melbourne Cup) were excluded from the analysis to provide a typical representation.
- The data was then moderated based on the number of members anticipated for Crown Sydney relative to the total number in Crown Melbourne.
- A profile of activity was then generated for Crown Sydney which considered all forecast self-park arrivals and departures. It should be noted that the data was not moderated further to match the capacity of the Crown Sydney basement – which is significantly lower than that at Crown Melbourne.

The forecast number of self-park arrivals and departures for a typical Friday and Saturday (the busiest weekday and weekend day) is shown in Figure 14 and Figure 15. The number of vehicles generated Monday to Thursday are generally significantly lower than those experienced on Fridays on Saturdays.

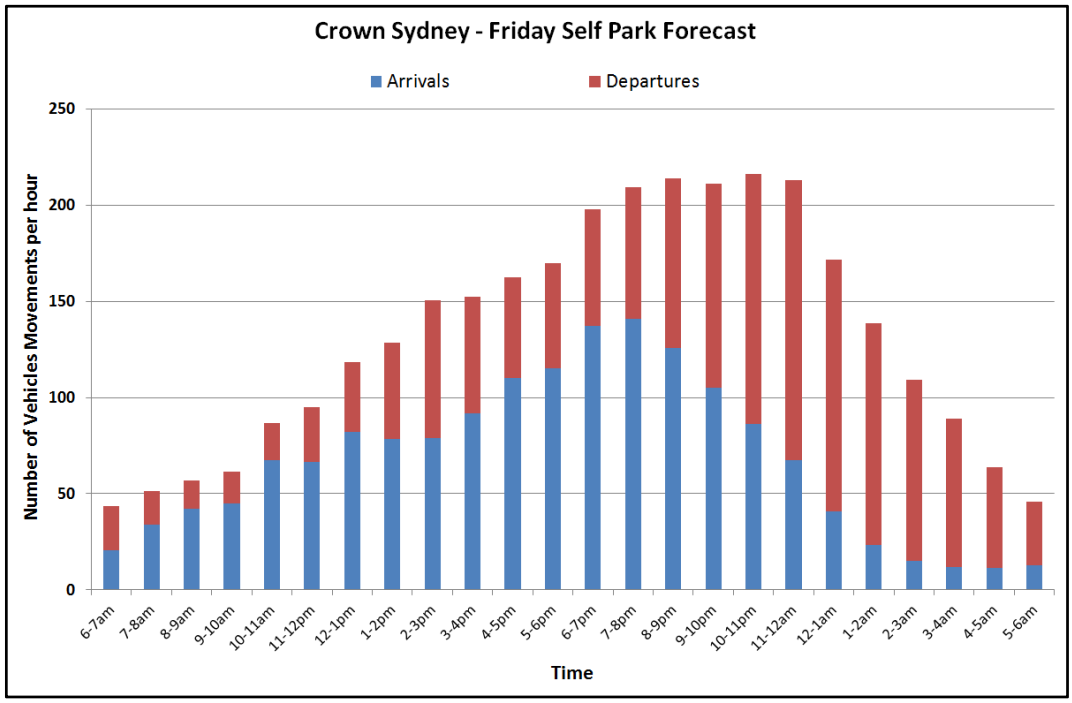


Figure 14 Friday Self-Park Traffic Movements

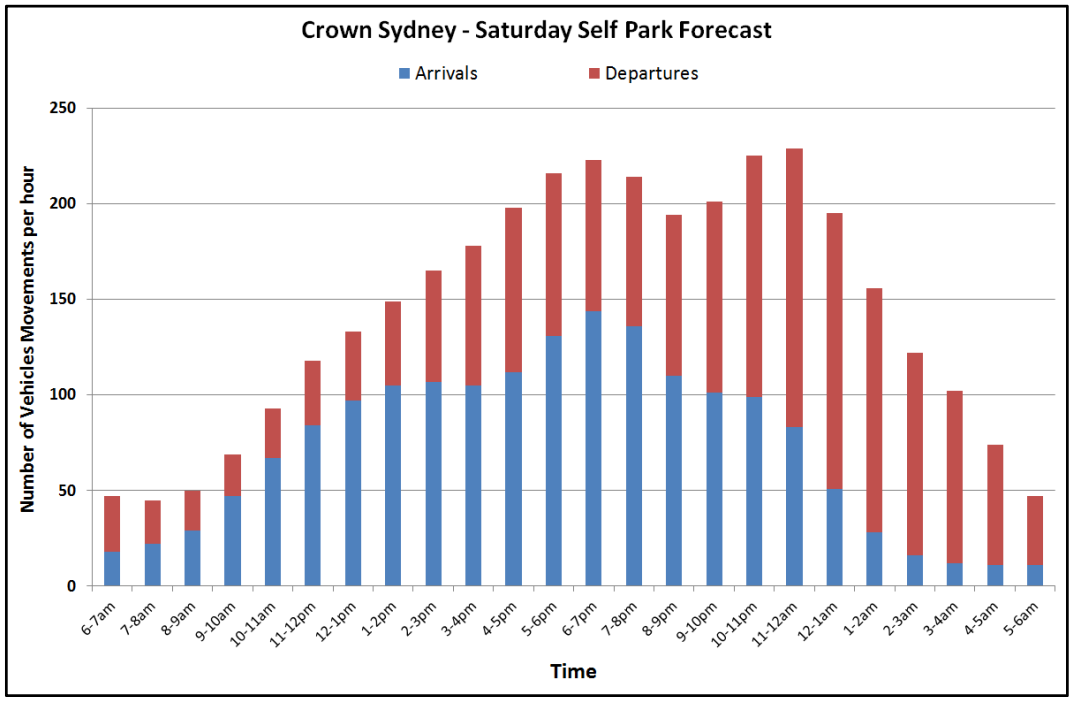


Figure 15 Saturday Self-Park Traffic Movements

The forecast profile of traffic movements during the PM commuter peak hour (5pm-6pm), by day of the week, is shown in Figure 16. This illustrates that Friday is expected to be the busiest weekday with respect to traffic movements. Between Monday and Thursday, the number of vehicles generated by Crown Sydney is forecast to be between 10% and 20% less than what is anticipated on a typical Friday. The traffic analysis undertaken as part of this study has considered vehicle movements generated on a Friday, therefore a worst case scenario has been tested.

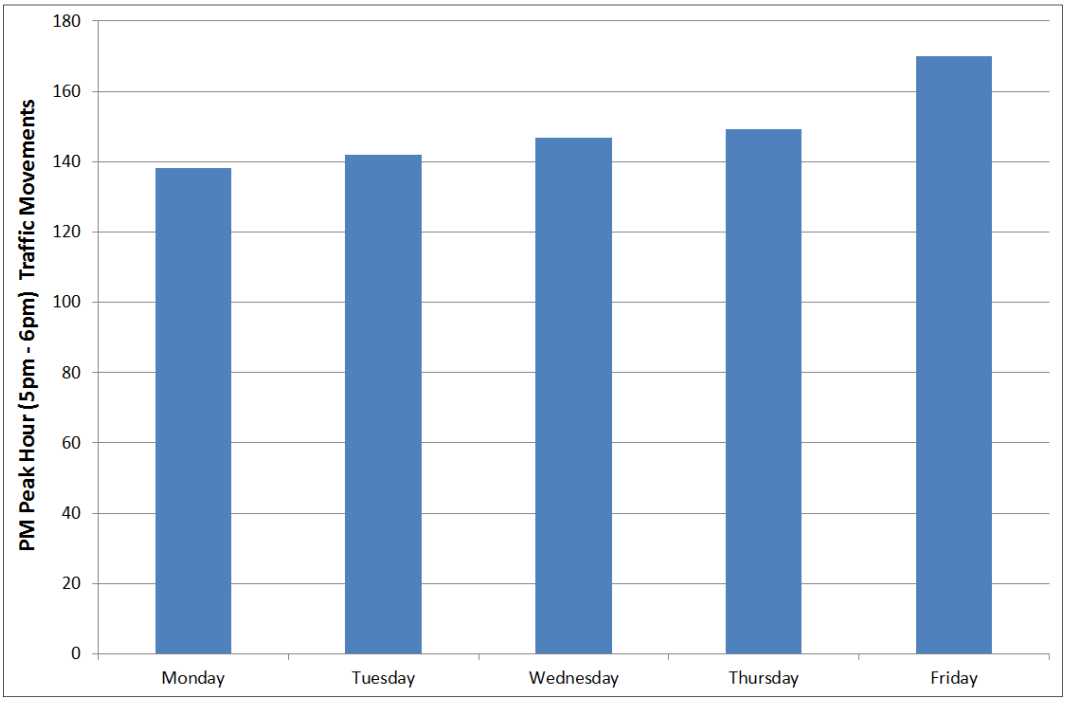


Figure 16 Crown Sydney Weekly Traffic Profile

3.1.3 Valet & Taxi Movements

Arup studied surveillance footage of the Crown Melbourne southern and eastern porte-cochere to determine potential taxi and valet use over a typical Friday and Saturday. Traffic counts of taxis, chauffeured cars and valet vehicles were conducted between 7am and midnight to determine the likely level of traffic generated by Crown Sydney. These counts included traffic movements related to the hotel, VIP gaming, restaurant and function room uses.

The forecast number of valet and taxi movements at Crown Sydney porte-cochere for a typical Friday and Saturday are shown in Figure 17 & Figure 18.

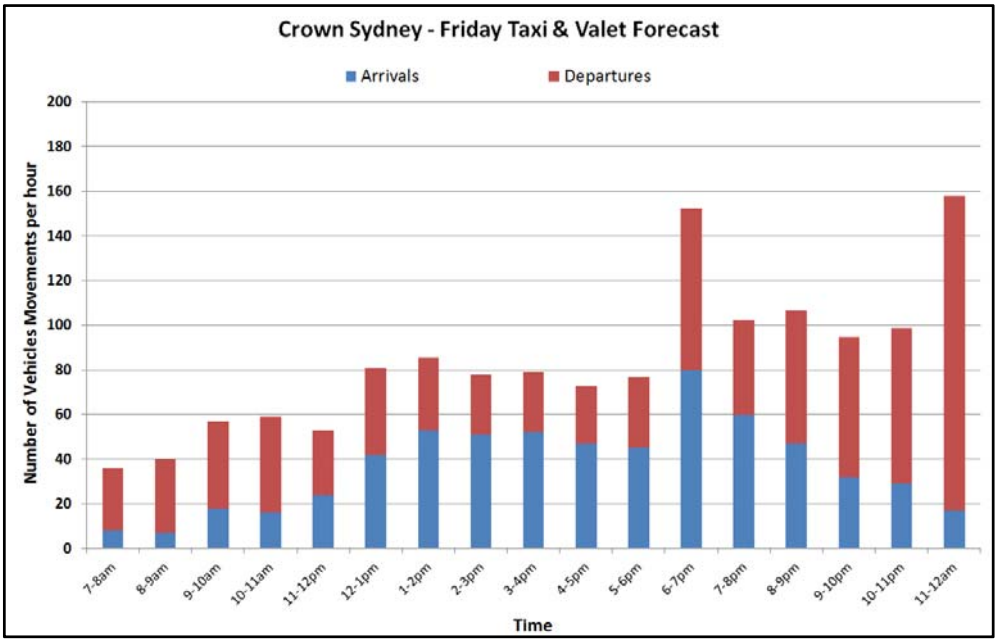


Figure 17 Friday Taxi & Valet Traffic Movements

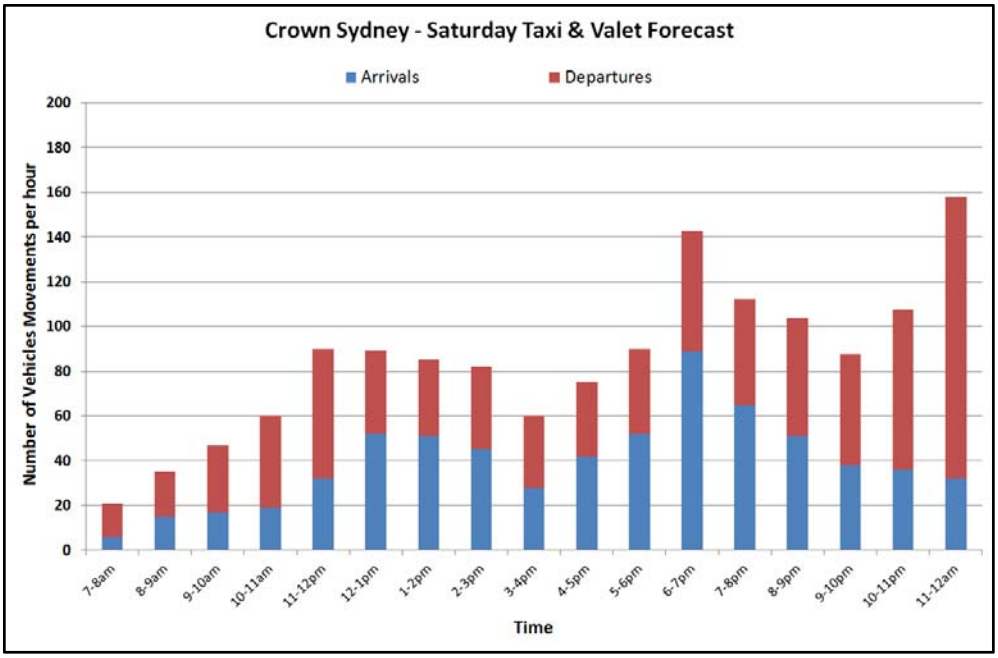


Figure 18 Saturday Taxi & Valet Traffic Movements

Screenshots of the valet movements within the porte-cocheres taken from the surveillance footage are shown in Figure 19 and Figure 20.

Figure 19 Crown Melbourne VIP Gaming Porte-Cochere

Figure 20 Crown Melbourne Hotel Porte-Cochere

3.1.4 Residential Vehicle Movements

Traffic generation rates adopted for the residential component of the development are consistent with those utilised for the Barangaroo South, which are as follows:

- AM Peak (8am – 9am): 0.14 vehicle trips / dwelling
- PM Peak (5pm – 6pm): 0.09 vehicle trips / dwelling

These rates were developed based on site specific traffic generation surveys at similar residential developments in the CBD on Sussex Street and Kent Street. Recent 2011 Census data indicates that only 5% of residents in the northern CBD area use private vehicles as their primary mode of travel to work. The majority (84%) walked to their office, supporting the low traffic generation rates utilised.

Based on the 66 residential dwellings proposed, there are forecast to be 10 / 7 vehicle trips generated in the AM/PM peak hours.

3.1.5 Service Vehicle Movements

To estimate the likely level of service vehicles generated by Crown Sydney, Arup studied video footage of similar loading dock facilities in two Crown properties in Melbourne. Surveillance footage was studied between 5am and 5pm for Friday 30 August which is typically the busiest day of the week in terms of loading activity. The properties studied were:

- Crown Metropol (658 rooms plus restaurant, bar & retail)
- Crown Promenade (465 rooms plus restaurant, bar & conferencing)

Screenshots of the two loading docks taken from the surveillance footage are shown in Figure 21 and Figure 22. Key findings are as follows:

- During the AM peak period (7am – 10am), where pedestrian and vehicle volumes are generally highest, there were no more than 10 service vehicle movements generated by either Crown Metropol or Crown Promenade. This indicates that the majority of vehicle movements are more likely to occur during the middle of the day
- The majority of service vehicle movements were observed to be smaller delivery vans, with the remainder consisting of waste pick-ups, food deliveries and small to medium trucks (medium rigid vehicles)

Based on these surveys, a profile of service vehicle movements for a busy Friday at Crown Sydney has been developed – shown in Table 1 below

Table 1 Crown Sydney Forecast Service Vehicle Movements

Time Period	***Crown Sydney Forecast Service Vehicle Movements***			
	Vans	*Trucks*	*Garbage Vehicles*	**Total**
AM Peak Hour (8am – 9am)	3	0	0	3
PM Peak Hour (5pm – 6pm)	0	0	0	0
Daily	29	20	2	51

The detailed survey results are provided in Table 2 and Table 3.

Figure 21 Crown Metropol Loading Dock

Figure 22 Crown Promenade Loading Dock

Table 2 Crown Promenade Loading Dock Counts

Vehicle Type	Total Service Vehicle Movements per Hour (In + Out)												Total In	Total Out	Total Movements	% of Total
	5-6AM	6-7AM	7-8AM	8-9AM	9-10AM	10-11AM	11-12PM	12-1PM	1-2PM	2-3PM	3-4PM	4-5PM				
Van	0	3	2	3	2	0	3	0	6	5	3	2	**15**	**14**	***29***	***57%***
Truck	0	1	1	0	2	2	2	3	4	3	1	1	**10**	**10**	***20***	***39%***
Garbage Vehicles	0	0	0	0	0	2	0	0	0	0	0	0	**1**	**1**	***2***	***4%***
Total	*0*	*4*	*3*	*3*	*4*	*4*	*5*	*3*	*10*	*8*	*4*	*3*	**26**	**25**	***51***	***100%***

Table 3 Crown Metropol Loading Dock Counts

Vehicle Type	Total Service Vehicle Movements (In + Out)												Total In	Total Out	Total Movements	% of Total
	5-6AM	6-7AM	7-8AM	8-9AM	9-10AM	10-11AM	11-12PM	12-1PM	1-2PM	2-3PM	3-4PM	4-5PM				
Van	0	0	0	0	5	6	1	2	3	4	1	2	**12**	**12**	***24***	***62%***
Truck	0	0	0	0	0	0	0	2	0	2	2	1	**4**	**3**	***7***	***18%***
Garbage Vehicles	0	0	1	3	0	0	2	0	1	1	0	0	**4**	**4**	***8***	***20%***
Total	*0*	*0*	*1*	*3*	*5*	*6*	*3*	*4*	*4*	*7*	*3*	*3*	**20**	**19**	***39***	***100%***

3.2 Road Network Modelling

3.2.1 Methodology

In September 2008 the NSW Government prepared a TMAP for the Barangaroo South site. As a component of this study, traffic modelling of the Sydney CBD was undertaken to determine the impact on the road network following the development of the precinct. This is documented in the Masson Wilson Twiney Modified Concept Plan – Transport Report, July 2008. The modelling concluded the road network would operate satisfactorily based on the modified concept plan development, with a 4% journey to work car mode share. This modelling included the provision for a 730 room luxury hotel on the Barangaroo South site.

This report has considered cumulative traffic implications arising from Crown Sydney and other land uses as outlined the most recent modification to the Barangaroo Concept Plan (MP_0062 Mod 9) *in comparison* to that outlined in the September 2008 TMAP.

The operation of the road network following the completion of the Barangaroo has been modelled using the LinSig analysis software. The LinSig model has considered the road network layout as described in Section 2.1 of this study, including the future closure of Shelley Street to vehicle movements following the completion of the Wynyard Walk development (subject to the approval of the road authority).

3.2.2 Existing Traffic Volumes

Traffic counts were undertaken in the Barangaroo precinct in July 2013, which have been utilised as the basis for the traffic modelling undertaken in this study. These existing flows are and are presented in Appendix A.

3.2.3 Development Traffic Volumes

This report has modelled the cumulative traffic impacts on the local road network arising from the revised GFAs of the southern and central Barangaroo precincts as outlined in the most recent modification to the Barangaroo Concept Plan (MP_0062 Mod 9).

All assumptions from TMAP September 2008 and MWT Modified Concept Plan – Transport Report, July 2008 including traffic generation rates and parking ratios have remained the same for this analysis, excluding the proposed Crown Sydney development.

The forecast traffic generation during the AM and PM peak hours are outlined in Table 4.

Table 4 Forecast Peak Hour Traffic Generation

2014 Concept Plan (MOD 9)			AM Peak Hour				PM Peak Hour			
Land Use	**Variable**	**Variable Number**	**trip rate**	**no of trips**	**In**	**Out**	**trip rate**	**no of trips**	**In**	**Out**
Light Vehicles										
Residential	Dwelling	2143	0.14	300	60	240	0.09	193	154	39
Commercial	car space	558	0.26	145	116	29	0.26	145	29	116
Retail	car space	55	0.4	22	18	4	0.4	22	4	18
On-Street Parking	car space	40	0.4	16	13	3	0.8	32	13	19
Public Off Street Parking	car space	300	0.04	12	10	2	0.4	120	24	96
Crown Sydney*				75	51	24		213	147	66
Cultural / Civic				8	6	2		8	2	6
Sub Total				***578***	***273***	***305***		***733***	***374***	***360***
Heavy Vehicles										
Service vehicles				70	35	35		0	0	0
Coaches				4	2	2		22	11	11
Sub Total				74	37	37		22	11	11
Total traffic generation				**652**	**310**	**342**		**755**	**385**	**371**
Public Transport (Bus)				*66*	*39*	*27*		*66*	*39*	*27*
Total Additional Traffic				**718**	**349**	**369**		**821**	**424**	**398**

* See Section 3 for further detail

A comparison of the traffic generation assessed for the September 2008 TMAP (Mod 2) and the latest concept plan modification (Mod 9) is listed in Table 5 below.

Table 5 Traffic generation for AM and PM peak hour

Time Period	Direction	TMAP Mod 2 (Sep 2008)	TMAP Mod 9
AM Peak Hour	In	348	349
	Out	260	369
	Two-way	**608**	**718**
PM Peak Hour	In	299	424
	Out	452	398
	Two-way	**751**	**821**

3.2.4 Peak and Off Peak Traffic Generation

The mix of land uses proposed within the Barangaroo precinct will generate trips during both the traditional commuter peak hours (i.e. 7am-10am and 4pm-7pm) and other times of the day – e.g. lunchtime peak and evening peak. Traffic generation for Crown Sydney is expected to be highest in the evening after 7pm and on weekends – therefore not coinciding with the road network peak hours.

Figure 23 below provides an illustration of the variation in traffic generated by the entire Barangaroo development throughout a typical weekday. This demonstrates that traffic generated during the lunchtime and evening peak hours is expected to be less than that in the commuter peak hours. Evening peak hour traffic is forecast to be less than half of that the PM commuter peak hour. Crown Sydney is anticipated to be the primary generator of vehicular traffic from the entire Barangaroo site in the evening peak hour.

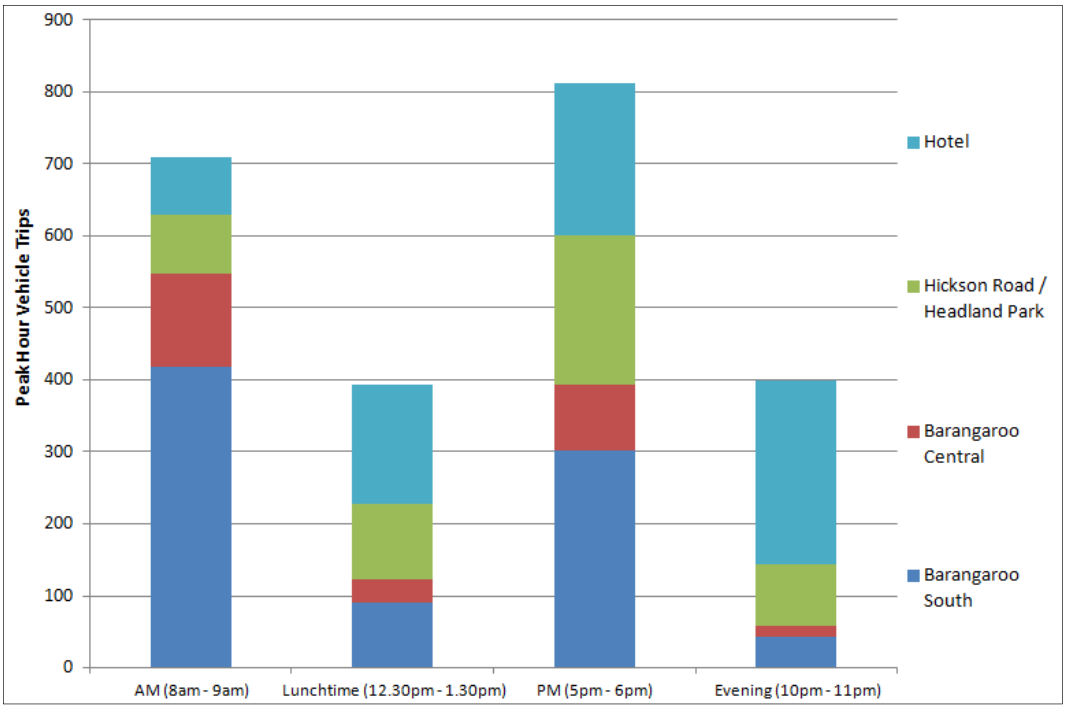


Figure 23 Peak and Off Peak Traffic Generation

3.2.5 Traffic Distribution

Table 6 outlines the assumed traffic distribution associated with the Crown Sydney development. This distribution is consistent with the assumptions outlined in the MWT Modified Concept Plan – Transport Report, July 2008 and subsequent Barangaroo planning reports.

Table 6 Development Traffic Distribution

Direction	Route	Distribution
North	Harbour Bridge	40.7%
East	Eastern Distributor	22.9%
	William Street	1.5%
	Oxford Street	4.1%
South	Harbour Street	8.6%
West	Western Distributor	21.8%
Sydney Inner	-	0.4%
Total		**100%**

3.2.6 Intersection Operation

This report examines in detail the future stage traffic operations of the nearest and most relevant intersections to Crown Sydney, namely:

- Hickson Road & Globe Street, **Traffic Signals (Future)**
- Napoleon Street & Hickson Road, **Priority Controlled (Existing), Traffic Signals (Future)**
- Sussex Street & Erskine Street, **Traffic Signals**
- Napoleon Street, Margaret Street & Kent Street, **Traffic Signals**

A corridor traffic model (using the LinSig 3.2 software package) was developed to assess the future road network performance arising from the Crown Sydney development. This modelling software allows intersections to be modelled in a single network and provides signal optimisation to reflect future traffic conditions within the Barangaroo precinct.

Within the LinSig model, the lane capacity at a number of locations was manually reduced to reflect queue spillback from downstream and upstream intersections that currently occurs during peak hours. The following capacity adjustments were applied in the model.

Table 7 Capacity adjustments at key intersections

Intersection	Approach	Movement	Capacity Adjustment
Kent Street / Napoleon Street / Margaret Street	South	Through	20% reduction (PM only)
	West	Through	50% reduction (PM only)
Sussex Street / Erskine Street	South	Through	20% reduction (AM only)
	North	Through	50% reduction (PM only)

The road network performance has been measured against three parameters, those being:

- Level of Service (LOS)
- Degree of Saturation (DOS)
- Average Vehicle Delay (AVD)

The performance of intersections in an urban environment is measured in terms of its Level of Service (LoS). Levels of service ranges from A (very good) to F (over capacity with significant delays). This is described in the RTA Guide to Traffic Generating Developments. Across the Sydney CBD road network, it is not uncommon for intersections to operate at Level of Service E or F (at capacity) during commuter peak hours.

The results of the LinSig intersection modelling are outlined in Table 8 and detailed in Appendix B.

Table 8 Intersection Analysis

Peak	Intersection	TMAP 2008 (Mod 2 GFA)			TMAP 2014 (Mod 9 GFA) Including Crown Sydney		
		LOS	DOS	AVD (sec)	LOS	DOS	AVD (sec)
AM	Sussex Street / Erskine Street	B	0.60	27	B	0.60	27
	Hickson Road / Napoleon Street	E	1.00	68	E	1.00	69
	Kent Street / Margaret Street	B	0.69	25	B	0.77	26
	Hickson Road / Globe Street	B	0.65	15	B	0.62	16
PM	Sussex Street / Erskine Street	E	0.97	59	D	0.97	55
	Hickson Road / Napoleon Street	D	0.94	48	D	0.92	43
	Kent Street / Margaret Street	B	0.81	24	B	0.75	23
	Hickson Road / Globe Street	A	0.48	11	A	0.47	11

LOS - Intersection Traffic Level of Service, DOS - Degree of Saturation, AVD - Average Delay per vehicle

The results of the LinSig intersection analysis forecast minimal changes in the operation of key intersections surrounding the site as a result of the modified Barangaroo Concept Plan Mod 9 (including Crown Sydney), compared with that forecast under the approved Mod 2.

As illustrated in Figure 14, the peak vehicular activity generated by Crown Sydney is anticipated to occur between 7pm and midnight, after employees have departed their offices for the day and therefore not coinciding with the evening commuter peak hour. This reduces the impact on the local road network.

Traffic generated by the Crown Sydney development in the AM and PM peaks will be counter-cyclical to that of commuter traffic. That is, movements to Crown Sydney are generally outbound in the morning peak, and inbound in the PM peak – the opposite direction to commercial workers travelling to and from the city. This further reduces the traffic impacts arising from the proposed development.

It should be noted that the above analysis has considered the traffic generated by Crown Sydney on a busy Friday evening. As shown in Figure 16, traffic movements between Monday and Thursday are expected to be 10%-20% lower than that modelled for a busy Friday. This will further reduce the impact on the road network during these times.

The analysis forecasts the intersection at Sussex Street and Erskine Street to be operating at or above capacity in the PM peak hour. It is recognised that significant vehicle queuing currently occurs in the southbound direction on Sussex Street during this time as a result of more congested traffic operating conditions in the vicinity of the cross traffic movements at the King Street and Market Street intersections. These intersections effectively act as the ‘masters’ along Sussex Street and impact on vehicle queues and delays of intersections to the north, particularly Sussex / Erskine Street. This intersection is forecast to operate at capacity in the PM peak hour under both scenarios assessed.

In this context, the road network impacts of the Crown Sydney development are considered modest.

3.3 Pedestrian-Vehicle Interaction

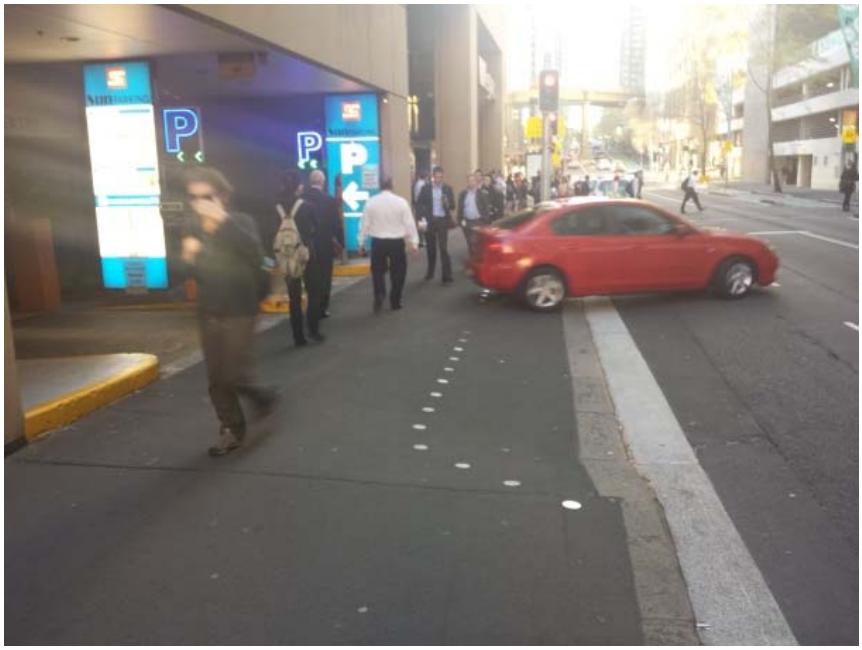
The development proposes vehicular cross-over points on Lime Street to service the porte-cochere and basement car park entrance.

3.3.1 Surveys

Arup conducted surveys during the PM peak hour (5pm-6pm) to understand the existing level of pedestrian and vehicles activity at the following locations:

- Pitt Street opposite Hilton Hotel (refer Photograph 1)
- Kent Street opposite Westpac Building (refer Photograph 2)

Photograph 1 Pitt Street, Sydney



Photograph 2 Kent Street, Sydney

In addition to these Sydney examples, Arup studied surveillance footage of pedestrian movements across the porte-cochere entry and exit points to Crown Metropol on Whiteman Street and western porte-cochere on Clarendon Street in Melbourne. All of these locations involve uncontrolled driveway style entrances. The number of pedestrians and vehicles recorded these locations is outlined in Table 9.

Table 9 Pedestrian/Vehicle Traffic Counts

Location	**PM Peak Hour Counts (5pm – 6pm)**	
	Vehicles	Pedestrians
Pitt Street opposite Hilton Hotel	204	3,800
Kent Street opposite Westpac Building	145	890
Whiteman Street Melbourne (Crown Metropol)	136	250
Clarendon Street Melbourne (Crown western porte-cochere)	103	270
Lime Street (Crown Sydney forecast)	**182**	**200**

3.3.2 Analysis

The surveyed locations provide good examples of driveway crossovers which are integrated with the pedestrian footpath, across which vehicles can pass slowly. These are typical driveway environments where motorists and pedestrians are aware of how to interact appropriately.

The anticipated level of vehicular activity on Lime Street is comparable to the observed sites. With respect to pedestrian movements, the western side of Lime Street is anticipated to accommodate in the order 200 pedestrians per hour – similar to that recorded at Crown properties in Melbourne.

The number of pedestrians expected on Lime Street is significantly less than that observed at Pitt Street and Kent Street in Sydney. These locations are both busy CBD environments which accommodate significant foot traffic throughout the day. The footpaths in these areas provide links to public transport nodes, as well as retail and commercial buildings. The northern section of Lime Street does not provide a comparable level of connectivity, and is not expected to attract similar levels of pedestrian throughput compared to a CBD street.

3.3.3 Mitigation Measures

To emphasise pedestrian priority along Lime Street, driveway style entrances which are fully integrated with the adjoining footpath are recommended. The footpath is to be at one continuous level, with no layback. The treatment will therefore be an area which is designed for pedestrians, across which vehicles can pass slowly. Drivers of vehicles will be guided and encouraged to give way to pedestrians on the footpath as required by law.

The crossings should also be designed with consistent pavement material, including a delineation of vehicle paths. Improved lighting and signage indicating the rights of pedestrians will further emphasise pedestrian priority in these areas.

Photograph 3 illustrates the Westin Hotel porte-cochere in Pitt Street south of Martin Place. This provides a good example of a geometrically constrained (albeit historic columns originally) porte-cochere with columns and busy footpath that works well under the management of a commissionaire.

Photograph 3 Westin Hotel Porte-Cochere, Sydney

3.3.4 Summary

It is considered that the proposed vehicular access points into Crown Sydney can be managed appropriately, given that:

- Lime Street is not expected to act as a major through pedestrian route;
- the primary pedestrian access point into Crown Sydney is located at the southern end of the development, adjacent to Globe Harbour;
- the porte-cochere and driveway access/egress will be under the control of Crown, with staff to be present on site to manage vehicle movements during busy periods;
- the vehicular driveways will be designed to be fully integrated with the adjoining footpath to emphasise pedestrian priority; and
- the anticipated level of pedestrian and vehicular activity on Lime Street is comparable or lower than for similar sites surveyed in Sydney and Melbourne. These are typical urban street environments where drivers and pedestrians are aware of how to interact appropriately

4 Car Parking and Loading

4.1 Car Parking Provision

4.1.1 Non-Residential Uses

500 car parking bays are proposed within the Crown Sydney basement to service the hotel, retail, entertainment and gaming components of the development. These 500 bays are to be allocated evenly between:

- valet parking – 250 bays
- self-park – 250 bays

Based on the anticipated number of arrival and departures into the Crown Sydney basement (refer section 3.1), the total parking demand for Crown Sydney can be estimated. This forecast demand is shown in Figure 24.

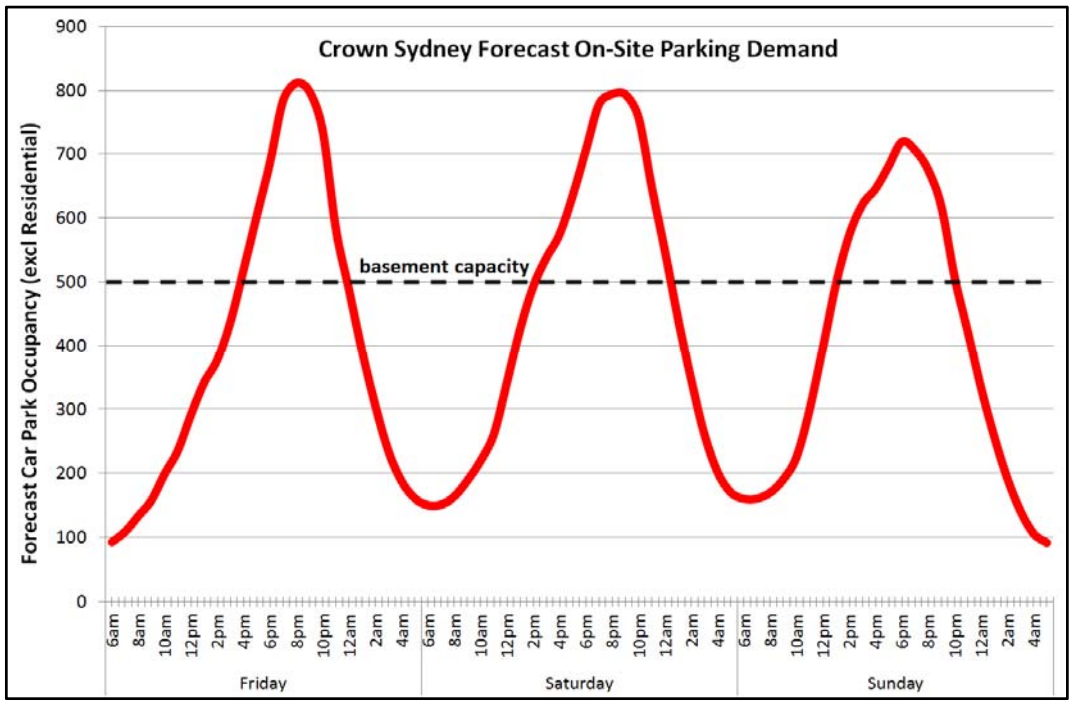


Figure 24 Crown Sydney Forecast Car Parking Demand

The above profile demonstrates car parking demand (excluding residential uses) will peak at approximately 800 spaces on a Friday and Saturday evening – above the 500 spaces to be allocated for non-residential uses. For the majority of the time however, the on-site parking provision will accommodate the expected demand.

During busy periods, other off-street car parks in close proximity to Crown Sydney will be utilised to accommodate this residual demand. There are a number of publically available parking facilities in the area which have spare capacity during the evenings when Crown Sydney parking demand is highest. There will be opportunities for shared parking arrangements in nearby commercial buildings which is an efficient means of meeting parking requirements. For example, the Barangaroo Stage 1A basement is likely to be available for public use on weekday evening and weekends when demand generated by commercial uses is low. These off-peak periods coincide with the peak parking demand for Crown Sydney, and therefore create the opportunity for the shared use of spaces. A 300 space off-street car park is also planned for Headland Park which may service Crown Sydney users.

A summary of the publically available off-street parking areas in the vicinity of Crown Sydney are illustrated in Figure 25.

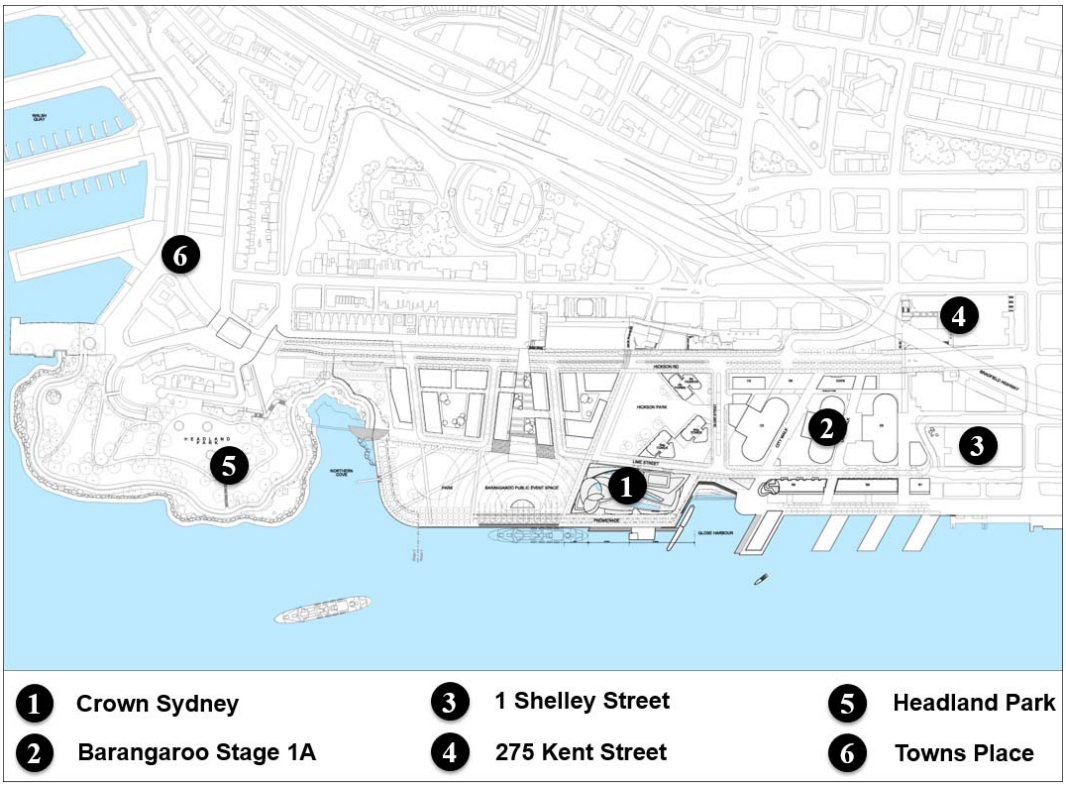


Figure 25 Public Off-Street Car Parks

4.1.2 Parking for Residential Uses

The level of parking for residential uses is based on (maximum) car parking rates as outlined in the approved Barangaroo Concept Plan. These parking rates, along with the proposed dwelling mix for the site, are outlined in Table 10.

Table 10 Residential Parking Allocation

Dwelling Type	Number	Maximum Car Parking Rate	Number of Spaces*
2 Bedroom	28	1.2 spaces / unit	34
3 Bedroom	32	2.0 spaces / unit	64
4 Bedroom	5	2.0 spaces / unit	10
5 Bedroom	1	2.0 spaces / unit	2
Total	**66**		**110**

* rounded up to the nearest whole number

4.2 Car Park Design

All car parking areas and access ramp systems into the Crown Sydney basement have been designed in accordance with AS2890.1 – 2004, Off-street car parking. Car stackers are proposed to service the valet parking areas within the car park. The layout of the car park serving the car stacker areas has been assessed using the AutoTrack software, with the B99 design vehicle able to adequately manoeuvre both in and out the car stacker space.

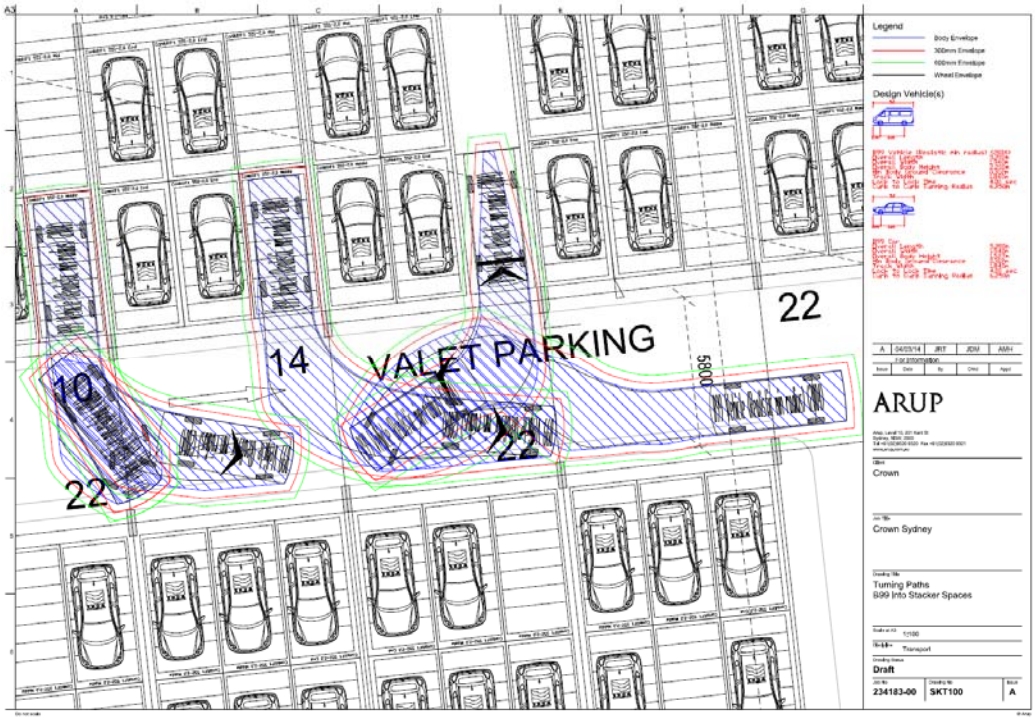


Figure 26 Vehicle Manoeuvring into Car Stacker Spaces

4.3 Bicycle Parking and End of Trip Facilities

4.3.1 Non-Residential Uses

Secure bicycle parking will be provided for Crown Sydney staff members within the basement. 83 secure bicycle spaces will be provided for Crown Sydney staff. These are to be located in a secure lockable compound (e.g. bike cage) within the Crown Sydney basement.

Complementing this secure bike parking, end of trip facilities will also be provided for Crown Sydney staff. This will include 83 lockers (1 per bike space), 6 showers and male and female changing rooms.

Some public bicycle parking (e.g. u-rails) will be provided in the public domain. Currently 37 spaces have been allocated for public use. These will mainly be utilised by short-term visitors to the precinct, and be located within close proximity to the building entries.

4.3.2 Residential Uses

Bicycle parking for Crown Sydney residents will be provided in accordance with Green Star and City of Sydney Council's requirements. One secure bicycle space will be provided for each residential dwelling (68 spaces total).

4.4 Motorcycle Parking

Space will be allocated within the Crown Sydney basement for motorcycle parking. This will be provided in line with Green Star requirements, with space currently allocated for up to 35 motorbikes and/or mopeds.

4.5 Loading Dock

4.5.1 Design

The Crown Sydney loading dock has been designed to accommodate vehicles no larger than standard garbage trucks (medium rigid vehicles). A vertical clearance of 3.6m has been provided so that it is not possible for larger vehicles (e.g. heavy rigid vehicles) to access the loading dock.

It should be recognised that the constrained size of the loading dock in the Crown Sydney basement will limit the number of service vehicles that may physically enter and exit the dock in any one particular hour. Crown Sydney provides 2 service vehicle bays. As a point of comparison, the Barangaroo Stage 1A basement includes over 30 service vehicle bays including provision for 12.5m heavy rigid vehicles. The loading dock layout is shown in Figure 27 and Figure 28.

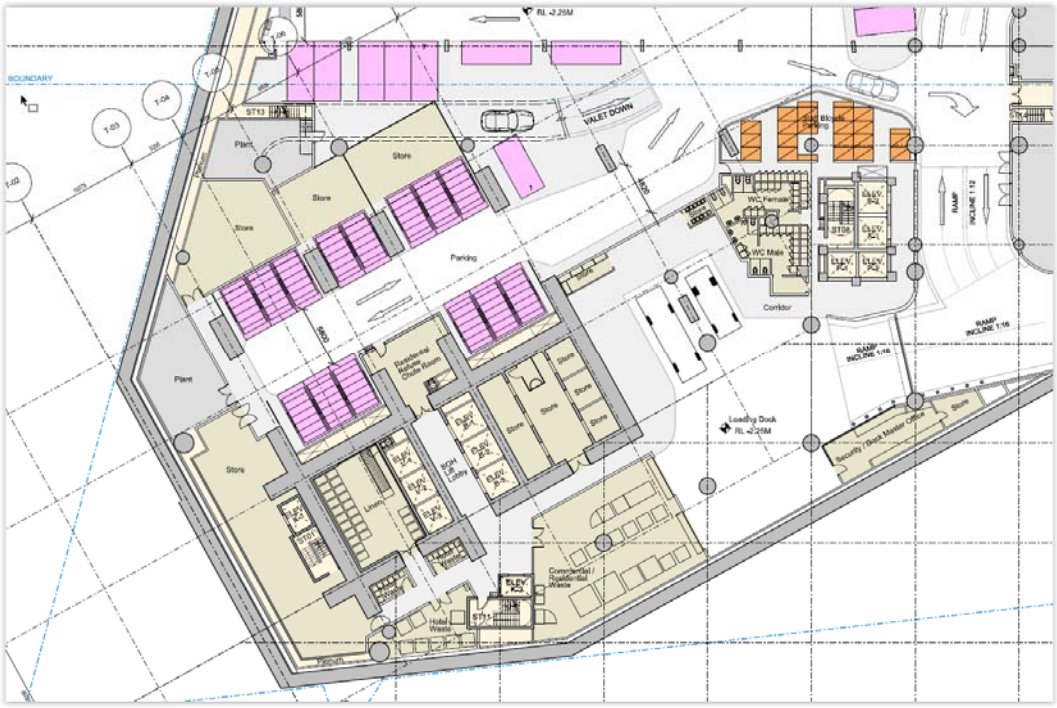


Figure 27 Crown Sydney Loading Dock (Plan View)

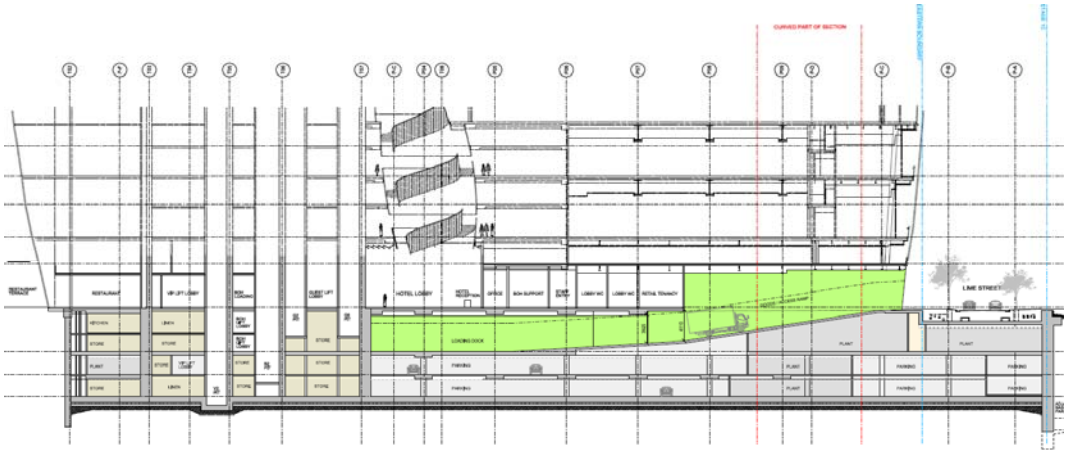


Figure 28 Crown Sydney Loading Dock (Section View)

4.5.2 Loading Dock Plan of Management

A loading dock management plan will be implemented which will ensure the dock operates efficiently and deliveries are distributed over the course of the day, consistent with the limited capacity of the loading dock. Similar operational plans are in place in Crown properties in Melbourne and other major developments in the Sydney CBD. Some key elements of the plan are as follows:

Tender, Procurement and Contract:

- Scope for the tender of regular supply goods will require suppliers to base their service proposal on delivering to an agreed schedule and time slot (30 minutes maximum)
- The Crown Sydney supply agreements will include delivery time Key Performance Indictors (KPI's) and associated penalties
- Vendors supplying to Crown Sydney will conform to a Standards for Delivery and Supply Handbook; listed below are the key requirements relating to delivery timelines

Scheduling:

- Deliveries are to be strictly managed, with drivers to be allocated strict delivery windows for when they may access the loading dock
- Time slots will be based on the functional use activities (ie. Morning food deliveries to support restaurants)
- Time slots will also be allocated for infrequent deliveries and couriers
- Each vehicle will be allocated a maximum 30 minute window to arrive, unload and depart. Each van delivery is typically able to arrive, unload and depart within 15 minutes.
- Time allocations will be provided for resident's removalist access and future fit-out deliveries, typically after 3.00pm on week days, after midday on Saturday and all day Sunday. Other mid-week time slots often become available once the principal vendors are contracted.
- Rejection of deliveries will occur at the discretion of the warehouse management team. Deliveries may be rejected if any parts of the Crown Standards for Supply are not met. This includes but is not exclusive to;
    - Delivery is late for agreed time slot
    - Delivery time inconvenient (applicable only to vehicles without time-slots)
    - Not delivering on the delivery due date
    - Items not delivered to agreed specification
    - Stock or delivery vehicle not HACCP compliant
    - Documentation in breach of requirements
    - All costs to re-deliver product is to be borne by the supplier or carrier.

Driver Behaviour:

- All drivers are to report to a dock master, who has ultimate control of vehicles entering and leaving the loading dock
- All vehicles must stop at the stop line prior to entering and leaving the dock back onto the public roadway. They must wait for acceptable gap in pedestrian traffic before entering or exiting the site.

5 Public Transport

A number of public transport options will be available Crown Sydney patrons. These are described in the sections below.

5.1 Light Rail

In December 2012, the NSW Government released 'Sydney's Light Rail Future'. This document details plans for expanding the existing light rail network to the Sydney CBD and South Eastern Sydney as well as the completion of the Inner West Light Rail extension

5.1.1 Inner West Light Rail Extension

The first stage of the inner-west light rail extension is a 5.6km extension running between Lilyfield and Dulwich Hill as shown in Figure 29. It will run from the current light rail terminus at Lilyfield, along the disused freight rail corridor, to Dulwich Hill. The extension opened in March 2014.

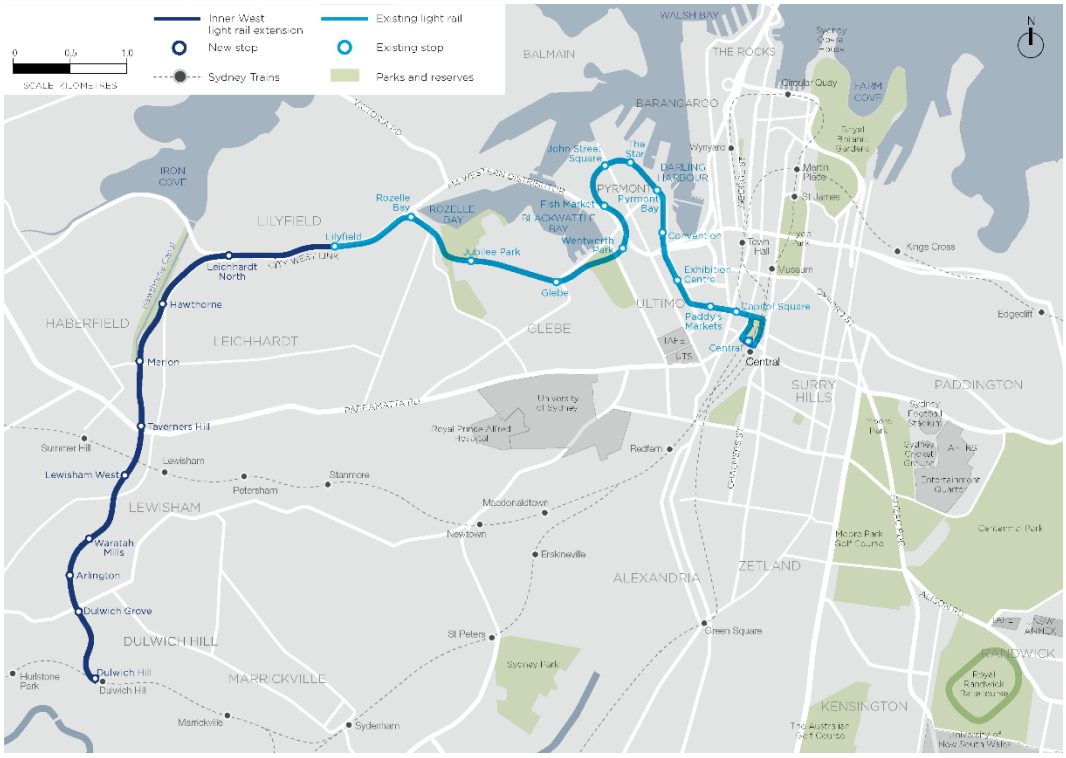


Figure 29 Inner-West Light rail extensions

5.1.2 CBD and South East Light Rail

The CBD and South East Light Rail link will connect Circular Quay to the University of New South Wales via Anzac Parade and Alison Road. The integration of existing and planned light rail networks would further enhance patronage by this mode to Barangaroo. This link will include the pedestrianisation of a 1 kilometre section of George Street, between Bathurst and Hunter Streets. Construction is scheduled to commence in 2015 and will take five to six years to complete.

Figure 30 CBD and South East Light Rail Route Map

5.2 Heavy Rail

The NSW Long Term Transport Masterplan released in December 2012 outlines a 20 year plan and includes the following rail projects for Sydney:

- North West and South West Rail Lines
- Second Harbour Crossing including new city rail line
- Wynyard Station improvement works

5.2.1 CBD Metro

Although the Metro scheme has been cancelled by the NSW Government, the metro corridor under Barangaroo South is being maintained.

5.2.2 Wynyard Station

A significant number of visitor trips to Crown Sydney are anticipated to occur by rail, with Wynyard Station to act as the major transport hub. Actions relating to Wynyard Station in the Sydney City Centre Access Strategy include:

- Better interchange facilities for rail and bus passengers at the station and at Barangaroo.
- Station refurbishment.
- Station upgrade in the longer term.

In May 2014 the NSW Government announced a $100 million upgrade of Wynyard Station. The works include an upgrade to the CBD station's concourse and platforms, new lighting, tiling and signage to improve wayfinding.

Transport for NSW has engaged the Novo Rail Alliance to design and deliver $10 million worth of early works for the station. Subject to planning approvals, major construction for the Wynyard Station upgrade commenced in mid 2015 and is expected to finish in 2016. Key features of the works include:

- New, premium fixtures and finishes, such as lighting, tiling and painting;
- Widened paid concourse and ticket gates;
- Reduced clutter on the concourse and platforms;
- Upgraded existing and new platform stairs to improve pedestrian circulation and reduce queuing;
- New wayfinding and signage to make it easier for customers to move in and around the Station;
- Improving operational reliability through upgraded services and removal of redundant services; and
- Renovated back of house areas, including new and relocated Station Manager's office.

5.2.3 South West Rail Link

The South West Rail Link opened to the public in early 2015 and includes:

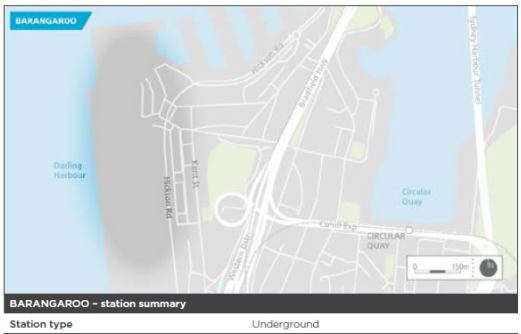
- A new 11.4-kilometre rail line from Glenfield to Leppington
- Two new stations located at Edmondson Park and Leppington, including commuter car parking
- A train stabling facility at Rossmore
- An upgrade of the existing Glenfield Station and bus/rail interchange, including new commuter car parking
  construction of Glenfield North and Glenfield South rail flyovers

5.2.4 Sydney Metro

The Sydney Metro concept involves 66km of metro rail between Rouse Hill and Bankstown. On 23 June 2015 the NSW Government confirmed a new underground metro station would be constructed at Barangaroo, to be incorporated within the overall Sydney Metro project. Whereas the station had previously been optional, it is now included as a planned station and is part of the project's base case.

Based on patronage modelling undertaken by Sydney Metro, delivery of a new station at Barangaroo will, in the morning peak reduce entries and exits at both Wynyard Station and Martin Place station by approximately 5,000 passengers. Many of these passengers will be travelling to and from Barangaroo - including the Crown Sydney Hotel Resort site.

A summary of the features of the Barangaroo station is illustrated in Figure 31 below.



BARANGAROO – station summary

Station type	Underground
Location	Barangaroo
LGA	City of Sydney
Centre type	Global Sydney
Primary station function	Destination
Catchment	Employment and Visitor
Access modes	
Walk	Yes
Cycle	Yes
Bus	Yes
Light rail	No
Taxi	Yes
Kiss and ride	No
Park and ride	No

Figure 31 Barangaroo metro station

Source: Sydney Metro City & Southwest Project Overview (June 2015)

In a broader context, Sydney Metro is the next major rail project identified in Sydney's Rail Future. Sydney Metro scope has been developed to meet the Project objectives and deliver key elements of Stages 4 and 5 of Sydney's Rail Future. The project would extend rapid transit under Sydney Harbour, through the central business district (CBD) of Sydney and west to Bankstown, with capacity to run up to 30 trains per hour in each direction through the city on the new line.

The project represents a major increase in the capacity of Sydney's rail network, providing a 60 per cent increase in the number of trains in the peak periods and catering for an extra 100,000 customers per hour. Sydney Metro would significantly improve reliability across the rail network by addressing current and emerging constraints such as train crowding, platform and station crowding, and network complexity.

Sydney Metro Northwest (previously known as the North West Rail Link) is currently under construction and includes eight new fully accessible railway stations and 4,000 commuter car parking spaces. Metro services will start in the first half of 2019 with a train every four minutes in the peak, or 15 trains an hour.

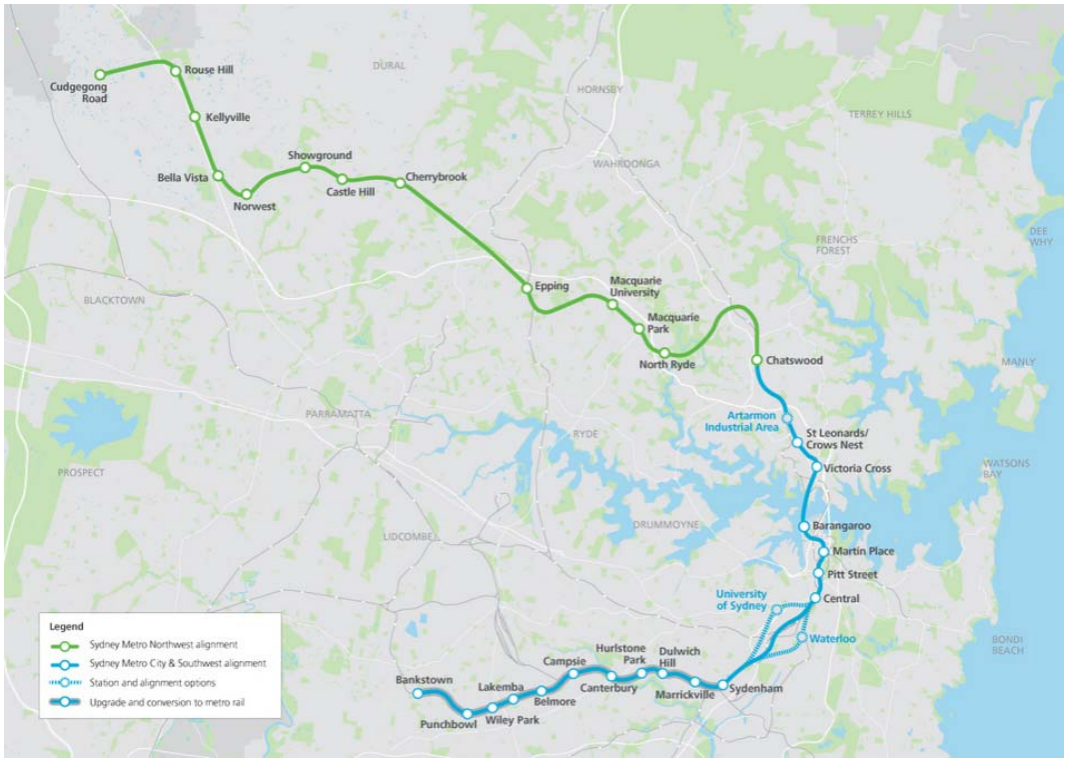


Figure 32 Sydney Metro Project

Source: Transport for NSW

5.3 Bus Services

The Sydney City Centre Access Strategy outlines a redesigned bus network which improves bus reliability and address congestion and capacity constraints. Some of the key proposals relevant to the Barangaroo development include:

- New bus routes will run to Barangaroo and Walsh Bay via the city centre, Napoleon Street and Hickson Road
- Erskine Street to act as a key east-west bus corridor in the northern CBD
- The major bus stop precinct serving Barangaroo will be in the area surrounding Wynyard Station on York, Clarence and Kent Streets.
- Approximately every second bus service on key Inner West bus routes entering the city centre via Broadway will only operate to Central. This will reduce the number of buses unnecessarily entering the city centre. The remaining services will continue to the northern end of the city centre via Elizabeth Street northbound and Castlereagh Street southbound.
- Bus routes servicing the Eastern Suburbs will utilise Elizabeth Street. Passengers travelling to Barangaroo will alight at Martin Place and walk through the city and across Wynyard Walk

The future city centre bus network is summarised in Figure 33.

Locations for new bus stops to serve the future routes along Hickson Road and Sussex Street are currently being investigated by Transport for NSW. These stops would be in close proximity to Crown Sydney and provide good accessibility for visitors to the site. The Barangaroo Integrated Transport Plan envisages two pairs of bus stops would be provided on Hickson Road to serve Barangaroo South and Central Barangaroo/Headland Park.

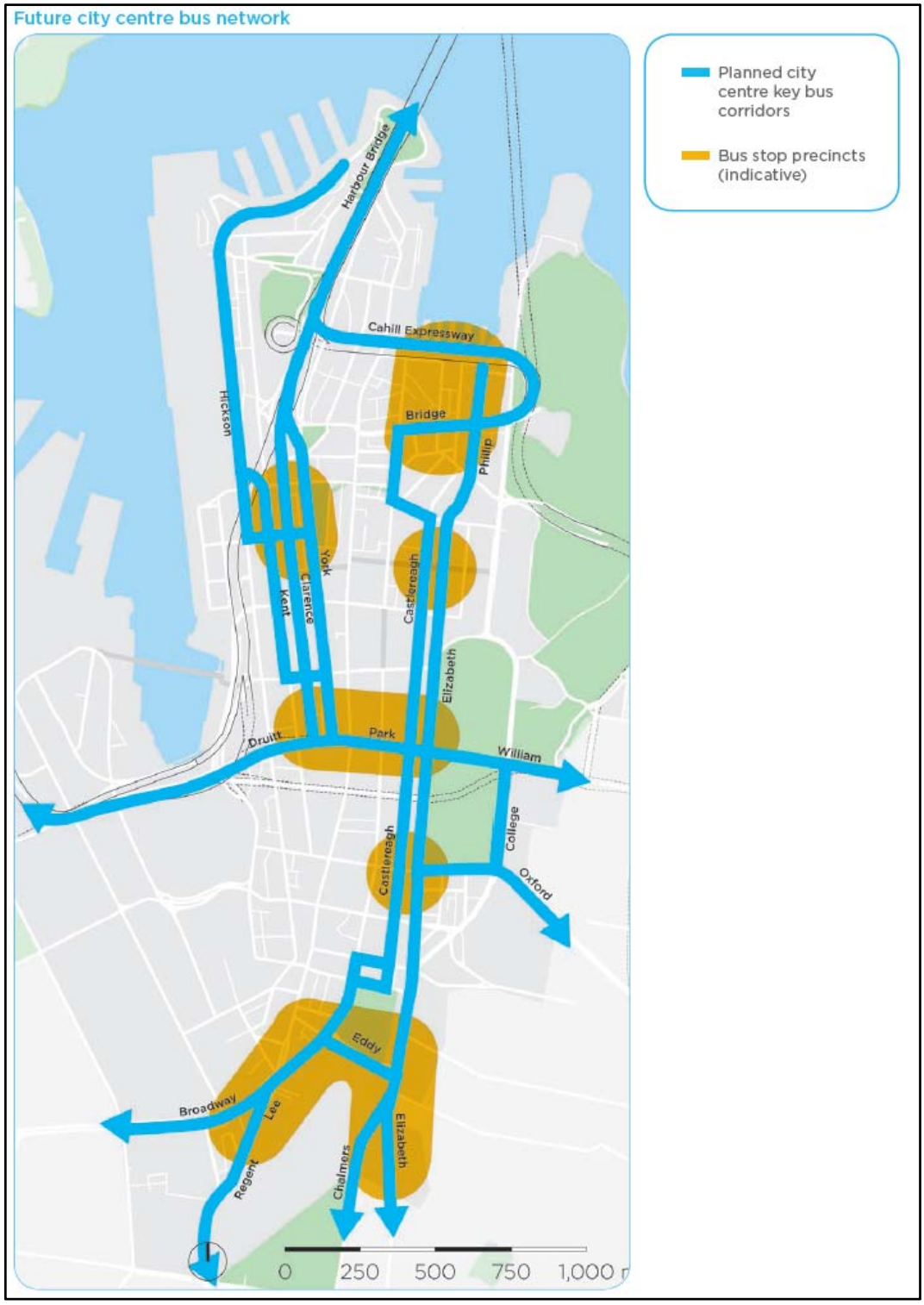


Figure 33 Future City Centre Bus Network

Source: Sydney City Centre Access Strategy (NSW Government, 2013)

6 Summary and Conclusions

This report has been prepared to support the State Significant Development Application for Crown Sydney, and has analysed all relevant traffic and transport matters arising from the proposal. The project comprises of a new 6 star hotel, residential apartments and restaurant, retail and VIP Gaming.

A total parking provision of approximately 500 spaces is proposed for all uses excluding residential, which is a shortfall of approximately 300 spaces based on forecast arrival and departure profiles during busy periods. Other off-street car parks in close proximity to Crown Sydney will be utilised to accommodate this parking shortfall during busy periods, including the Barangaroo Stage 1A basement and planned 300 space off-street car park at Headland Park.

The site will be well serviced by a number of pedestrian routes which link with the wider Barangaroo precinct. A number of zebra crossings are proposed which are located on major pedestrian desire lines to facilitate the safe movement of pedestrians to and from the site.

The NSW Government's commitment to investment in infrastructure projects such as future light rail development across Sydney, the North West and South West Rail Links, the Wynyard Walk and improvements to bus and ferry services will enhance public transport options for Crown Sydney patrons.

The primary vehicle access route into Crown Sydney will be via Hickson Road and Globe Street. Driveway crossover points are proposed on Lime Street to service the porte-cochere and basement car park entrance. These access points will be designed to be fully integrated with the adjoining footpath, encouraging drivers to give way to pedestrians on the footpath as required by law. Given that Lime Street is not expected to act as a major through pedestrian route, and the anticipated level of pedestrian and vehicular activity on Lime Street is comparable or lower than for similar sites surveyed in Sydney and Melbourne, it is considered that the proposed vehicular access points into Crown Sydney can be managed appropriately.

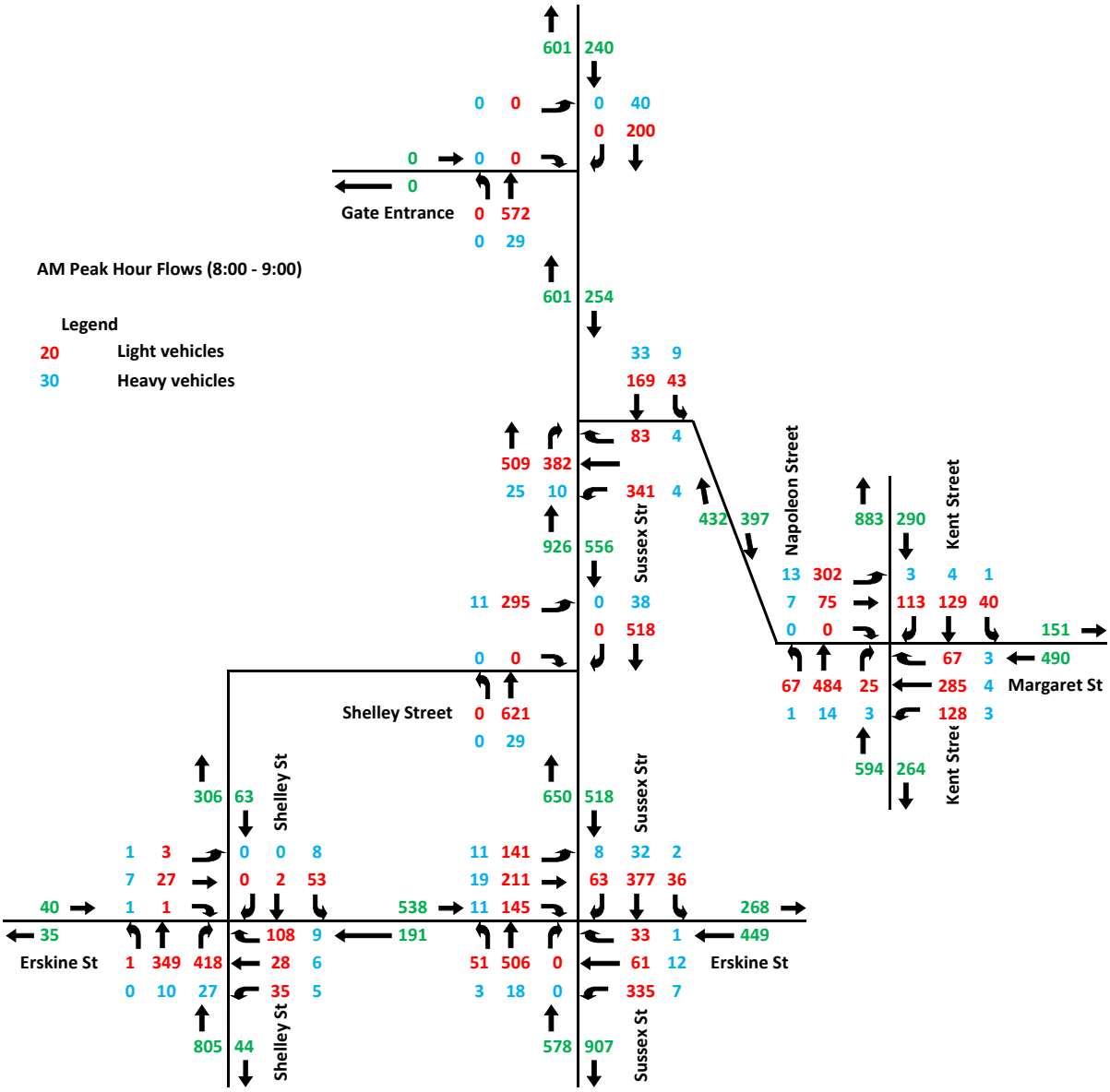
Traffic modelling using the LinSig analysis software forecast minimal changes in the operation of key intersections compared with that previously forecast (and subsequently approved) in the Barangaroo TMAP Stage 1 published by the NSW Government in September 2008. The peak vehicular activity generated by Crown Sydney is anticipated to occur between 7pm and midnight, therefore not coinciding with the evening commuter peak hour. This will reduce the impact on the local road network.

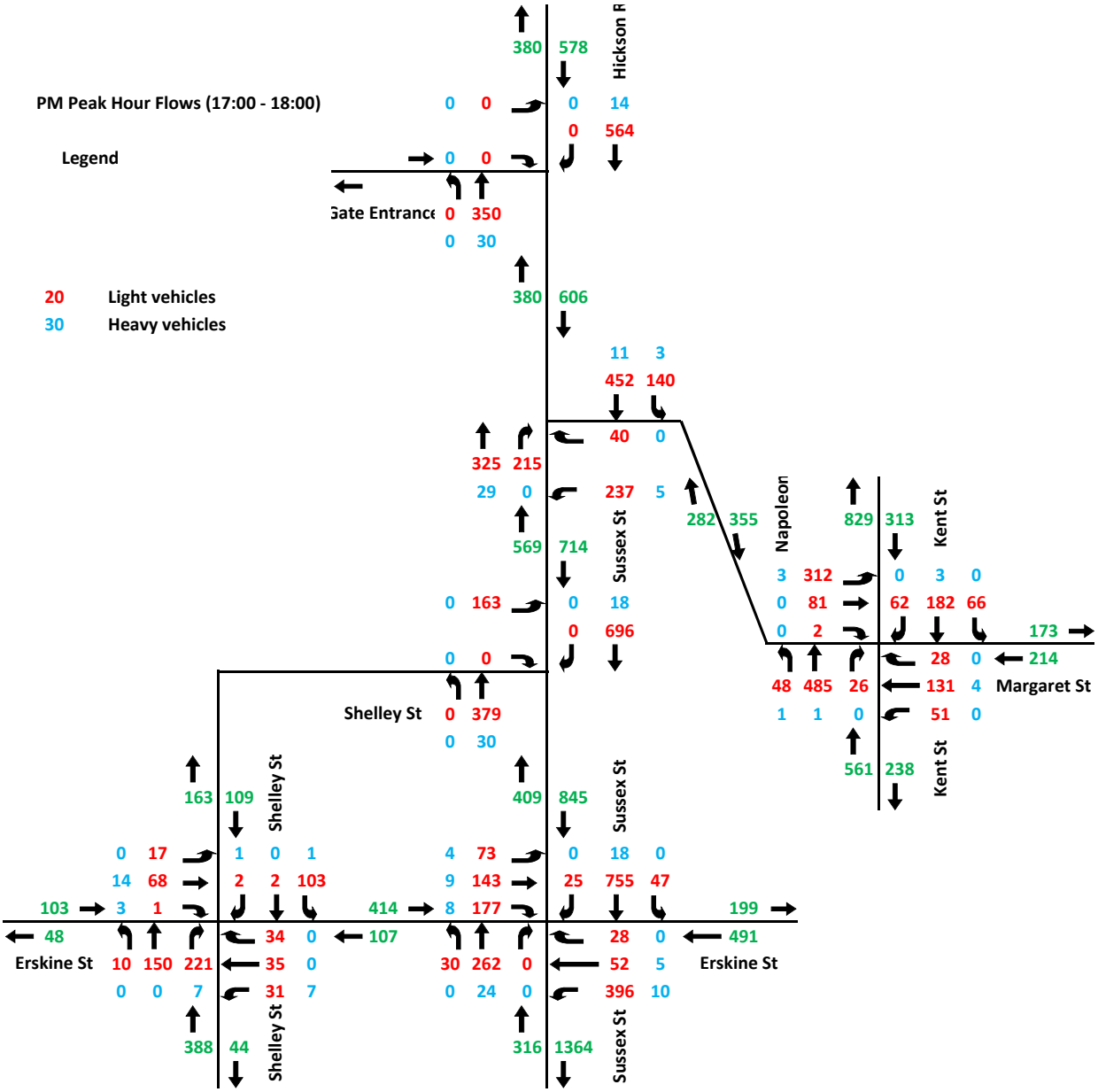
Traffic generated by the Crown Sydney development in the AM and PM peaks will be counter-cyclical to that of commuter traffic. That is, movements to Crown Sydney are generally outbound in the morning peak, and inbound in the PM peak – the opposite direction to commercial workers travelling to and from the city. This further reduces the traffic impacts arising from the proposed development.

The constrained size of the loading dock in the basement will limit the number of service vehicles that may physically enter and exit the dock in any one particular hour. A loading dock management plan will be implemented which will ensure the dock operates efficiently and deliveries are distributed over the course of the day, consistent with the limited capacity of the loading dock.

Appendix A

Existing Traffic Volumes


AM Peak Hour Flows (8:00 - 9:00)
Legend
20 Light vehicles
30 Heavy vehicles
Gate Entrance
Shelley Street
Napoleon Street
Kent Street
Margaret St
Erskine St
Sussex Str
Shelley St
Sussex St
601 240
0 0 0 40
0 200
0 0 0
0
0 572
0 29
601 254
33 9
169 43
83 4
509 382
25 10 341 4
926 556
11 295 0 38
0 518
0 0
0 621
0 29
432 397
883 290
13 302 3 4 1
7 75 113 129 40
0 0 151
67 3 490
67 484 25 285 4
1 14 3 128 3
594 264
306 63
650 518
1 3 0 0 8
7 27 0 2 53
40 1 1 538 11 145 268
35 108 9 191 33 1 449
1 349 418 28 6 51 506 0 61 12
0 10 27 35 5 3 18 0 335 7
805 44
578 907


PM Peak Hour Flows (17:00 - 18:00)
Legend
20 Light vehicles
30 Heavy vehicles
Hickson R
Gate Entrance
Sussex St
Napoleon
Kent St
Margaret St
Shelley St
Erskine St

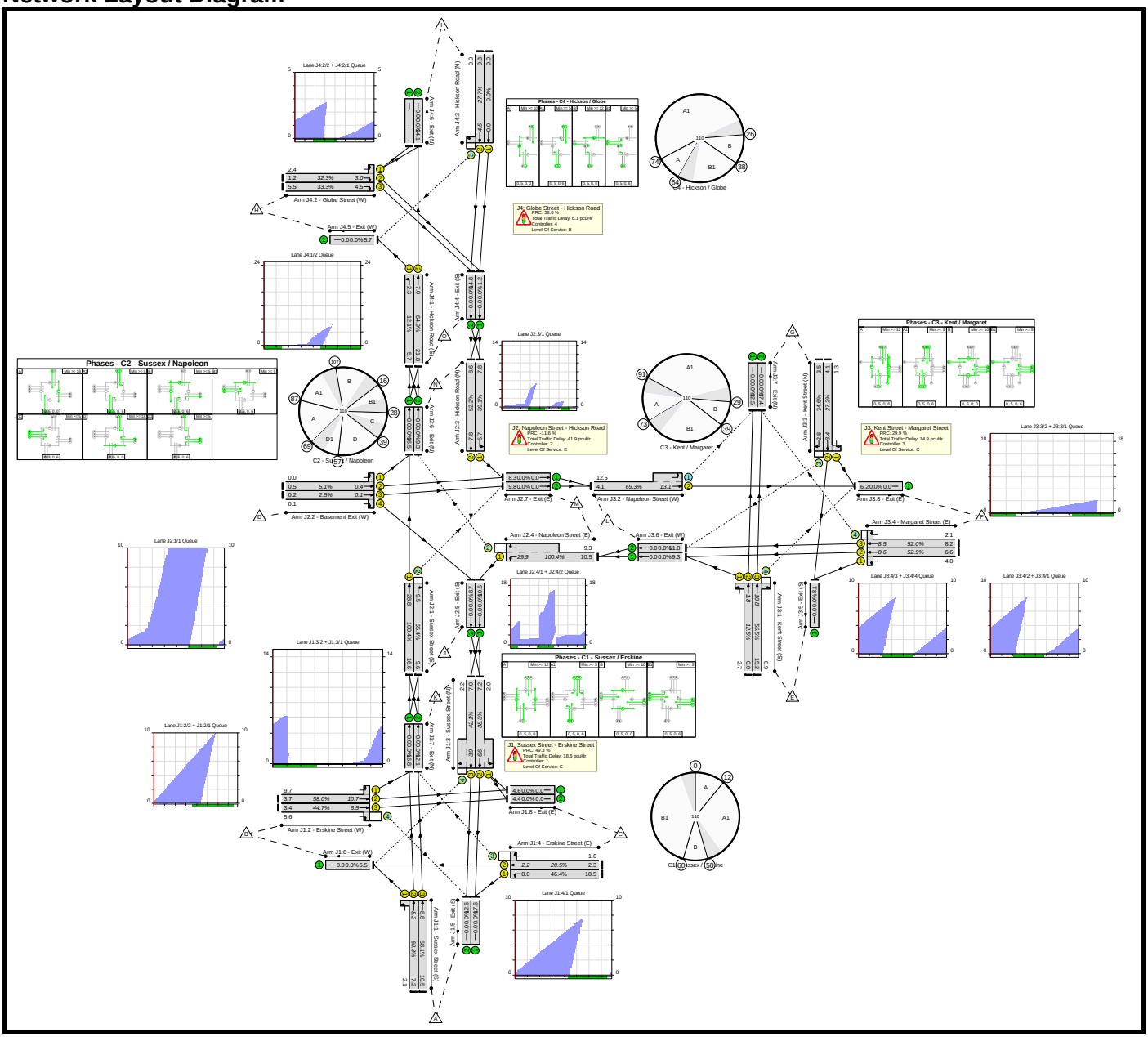
Appendix B

LinSig Intersection Analysis

Basic Results Summary

Scenario 2: 'AM Mod2' (FG9: 'AM Future MOD2 Traffic', Plan 1: 'Future (with Basement)')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Deg Sat (%)	Av. Delay Per PCU (s/pcu)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)
Network: Linsig Modelling	-	-	**100.4%**	-	-	-	-	-
J1: Sussex Street - Erskine Street	-	-	**60.3%**	-	-	-	-	-
1/2+1/1	Sussex Street (S) Left Ahead	U	60.3%	37.4	303	1440:1440	7.4	8.2
1/3	Sussex Street (S) Ahead	U	58.1%	32.4	342	1440	8.1	8.8
2/2+2/1	Erskine Street (W) Left Ahead	U	58.0%	30.2	436	1800:1800	10.0	10.7
2/3+2/4	Erskine Street (W) Right Ahead	U+O	44.7%	27.8	294	1800:1440	6.1	6.5
3/2+3/1	Sussex Street (N) Ahead Left	U	38.3%	18.4	300	1800:1800	6.3	6.6
3/3+3/4	Sussex Street (N) Ahead Right	U+O	42.1%	17.3	301	1800:1440	3.5	3.9
4/1	Erskine Street (E) Left	U	46.4%	28.3	342	1800	7.6	8.0
4/2+4/3	Erskine Street (E) Ahead Right	U+O	20.5%	23.1	128	1440:1440	2.1	2.2
J2: Napoleon Street - Hickson Road	-	-	**100.4%**	-	-	-	-	-
1/1	Sussex Street (S) Ahead	U	100.4%	120.7	542	1800	16.6	28.8
1/2	Sussex Street (S) Right	O	65.4%	34.4	315	1800	8.6	9.5
2/2+2/1	Basement Exit (W) Left Ahead	U	5.1%	45.3	15	1800:1800	0.4	0.4
2/3+2/4	Basement Exit (W) Right Ahead	U	2.5%	44.8	8	1800:1800	0.1	0.1
3/1	Hickson Road (N) Left	U	39.1%	13.4	256	1800	5.4	5.7
3/2	Hickson Road (N) Ahead	U	52.2%	30.8	282	1800	7.3	7.8
4/1+4/2	Napoleon Street (E) Left Right	U+O	100.4%	94.5	649	1800:1800	16.5	29.9
J3: Kent Street - Margaret Street	-	-	**69.3%**	-	-	-	-	-
1/2+1/1	Kent Street (S) Left Ahead	U	12.5%	24.4	88	1800:1800	1.7	1.8
1/3+1/4	Kent Street (S) Ahead Right	U+O	55.5%	20.1	526	1800:920	10.2	10.8

Basic Results Summary

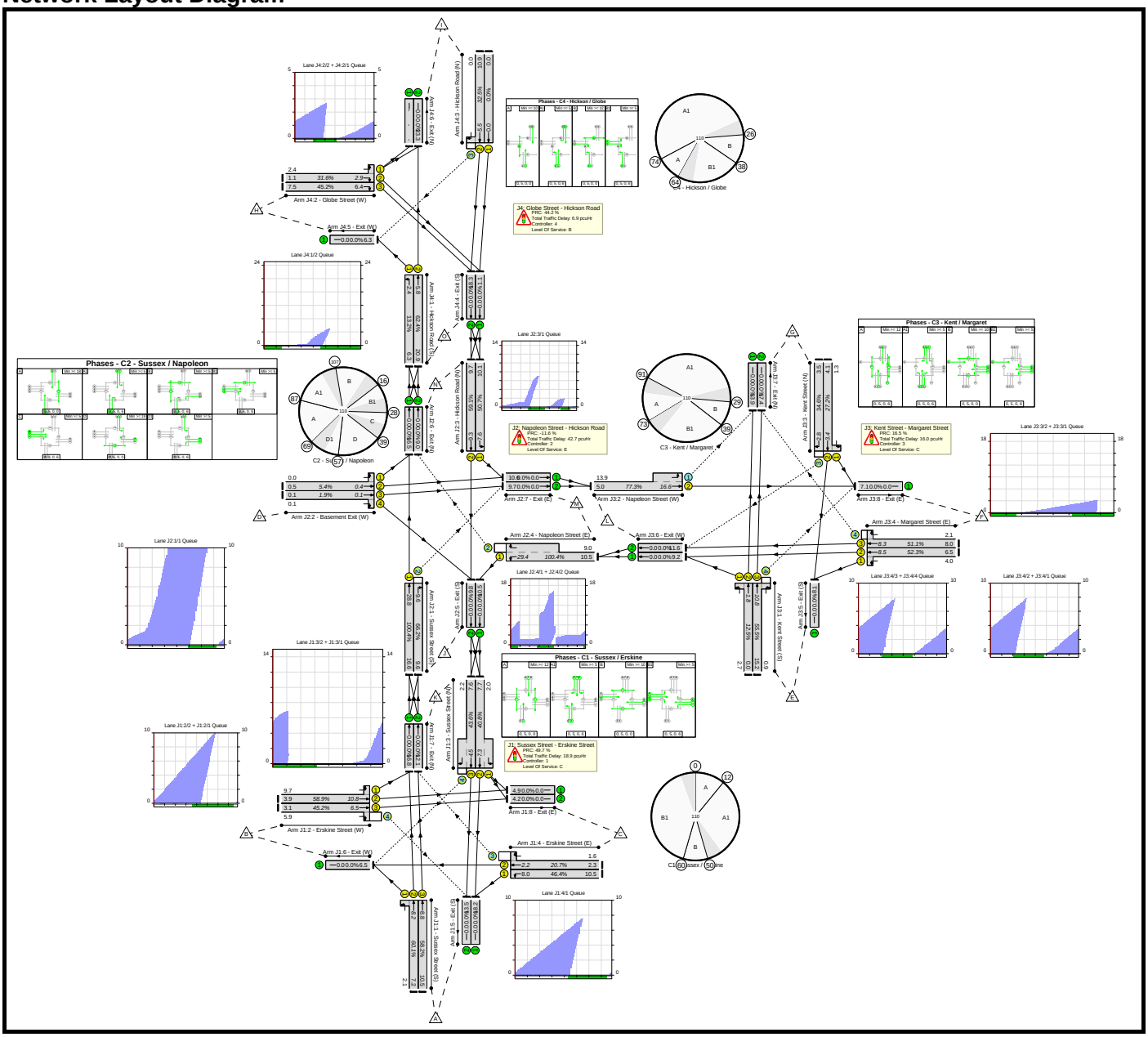
2/2+2/1	Napeleon Street (W) Left Ahead	U+O	69.3%	19.5	544	920:1800	12.0	13.1
3/2+3/1	Kent Street (N) Ahead Left	U	27.2%	19.9	174	1800:920	3.2	3.4
3/3	Kent Street (N) Right	O	34.6%	35.2	116	1800	2.5	2.8
4/2+4/1	Margaret Street (E) Left Ahead	U	52.9%	33.3	348	1800:1800	8.0	8.6
4/3+4/4	Margaret Street (E) Ahead Right	U+O	52.0%	33.5	339	1800:1800	8.0	8.5
J4: Globe Street - Hickson Road	**-**	**-**	**64.9%**	**-**	**-**	**-**	**-**	**-**
1/1	Hickson Road (S) Left	U	12.1%	5.3	188	1800	2.2	2.3
1/2	Hickson Road (S) Ahead	U	64.9%	8.1	714	1800	6.1	7.0
2/2+2/1	Globe Street (W) Right Left	U	32.3%	44.2	117	1800:1800	2.8	3.0
2/3	Globe Street (W) Right	U	33.3%	34.9	180	1800	4.3	4.5
3/1	Hickson Road (N) Ahead	U	0.0%	0.0	0	1800	0.0	0.0
3/2+3/3	Hickson Road (N) Ahead Right	U+O	27.7%	12.4	304	1800:1800	4.3	4.5

C1 - Sussex / Erskine	PRC for Signalled Lanes (%):	49.3	Total Delay for Signalled Lanes (pcuHr):	18.63	Cycle Time (s): 110
C2 - Sussex / Napoleon	PRC for Signalled Lanes (%):	-11.6	Total Delay for Signalled Lanes (pcuHr):	41.88	Cycle Time (s): 110
C3 - Kent / Margaret	PRC for Signalled Lanes (%):	29.9	Total Delay for Signalled Lanes (pcuHr):	14.95	Cycle Time (s): 110
C4 - Hickson / Globe	PRC for Signalled Lanes (%):	38.6	Total Delay for Signalled Lanes (pcuHr):	6.10	Cycle Time (s): 110
	PRC Over All Lanes (%):	-11.6	Total Delay Over All Lanes(pcuHr):	81.56	

Basic Results Summary

Scenario 3: 'AM Mod8' (FG5: 'AM Future MOD8 Traffic', Plan 1: 'Future (with Basement)')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Deg Sat (%)	Av. Delay Per PCU (s/pcu)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)
Network: Linsig Modelling	-	-	**100.4%**	-	-	-	-	-
J1: Sussex Street - Erskine Street	-	-	**60.1%**	-	-	-	-	-
1/2+1/1	Sussex Street (S) Left Ahead	U	60.1%	37.3	302	1440:1440	7.4	8.2
1/3	Sussex Street (S) Ahead	U	58.2%	32.5	343	1440	8.1	8.8
2/2+2/1	Erskine Street (W) Left Ahead	U	58.9%	30.4	443	1800:1800	10.1	10.8
2/3+2/4	Erskine Street (W) Right Ahead	U+O	45.2%	28.1	295	1800:1440	6.1	6.5
3/2+3/1	Sussex Street (N) Ahead Left	U	40.8%	18.3	318	1800:1800	6.9	7.3
3/3+3/4	Sussex Street (N) Ahead Right	U+O	43.6%	17.2	320	1800:1440	4.1	4.5
4/1	Erskine Street (E) Left	U	46.4%	28.3	342	1800	7.6	8.0
4/2+4/3	Erskine Street (E) Ahead Right	U+O	20.7%	23.0	129	1440:1440	2.1	2.2
J2: Napoleon Street - Hickson Road	-	-	**100.4%**	-	-	-	-	-
1/1	Sussex Street (S) Ahead	U	100.4%	120.7	542	1800	16.6	28.8
1/2	Sussex Street (S) Right	O	66.2%	35.0	315	1800	8.7	9.6
2/2+2/1	Basement Exit (W) Left Ahead	U	5.4%	45.4	16	1800:1800	0.4	0.4
2/3+2/4	Basement Exit (W) Right Ahead	U	1.9%	44.6	6	1800:1800	0.1	0.1
3/1	Hickson Road (N) Left	U	50.7%	15.4	332	1800	7.1	7.6
3/2	Hickson Road (N) Ahead	U	59.1%	33.0	319	1800	8.6	9.3
4/1+4/2	Napoleon Street (E) Left Right	U+O	100.4%	95.1	639	1800:1800	16.2	29.4
J3: Kent Street - Margaret Street	-	-	**77.3%**	-	-	-	-	-
1/2+1/1	Kent Street (S) Left Ahead	U	12.5%	24.4	88	1800:1800	1.7	1.8
1/3+1/4	Kent Street (S) Ahead Right	U+O	55.5%	20.1	526	1800:920	10.2	10.8

Basic Results Summary

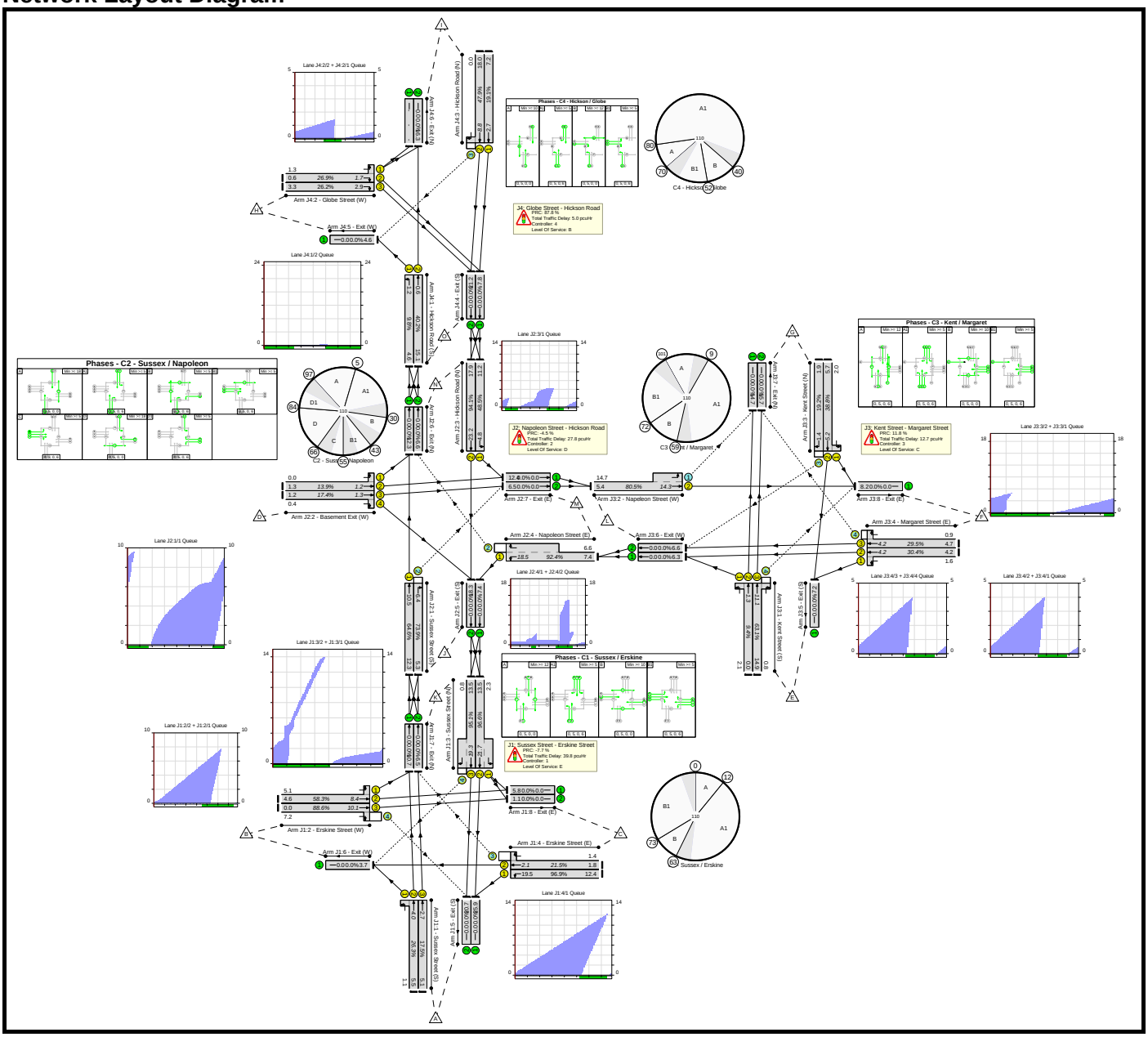
2/2+2/1	Napeleon Street (W) Left Ahead	U+O	77.3%	24.1	619	920:1800	14.9	16.6
3/2+3/1	Kent Street (N) Ahead Left	U	27.2%	19.9	174	1800:920	3.2	3.4
3/3	Kent Street (N) Right	O	34.6%	35.2	116	1800	2.5	2.8
4/2+4/1	Margaret Street (E) Left Ahead	U	52.3%	33.1	344	1800:1800	7.9	8.5
4/3+4/4	Margaret Street (E) Ahead Right	U+O	51.1%	33.3	333	1800:1800	7.8	8.3
J4: Globe Street - Hickson Road	**-**	**-**	**62.4%**	**-**	**-**	**-**	**-**	**-**
1/1	Hickson Road (S) Left	U	13.2%	5.3	206	1800	2.4	2.4
1/2	Hickson Road (S) Ahead	U	62.4%	7.5	686	1800	4.9	5.8
2/2+2/1	Globe Street (W) Right Left	U	31.6%	44.2	114	1800:1800	2.7	2.9
2/3	Globe Street (W) Right	U	45.2%	37.2	244	1800	6.0	6.4
3/1	Hickson Road (N) Ahead	U	0.0%	0.0	0	1800	0.0	0.0
3/2+3/3	Hickson Road (N) Ahead Right	U+O	32.5%	12.9	356	1800:1800	5.2	5.5

C1 - Sussex / Erskine	PRC for Signalled Lanes (%):	49.7	Total Delay for Signalled Lanes (pcuHr):	18.91	Cycle Time (s):	110	
C2 - Sussex / Napoleon	PRC for Signalled Lanes (%):	-11.6	Total Delay for Signalled Lanes (pcuHr):	42.75	Cycle Time (s):	110	
C3 - Kent / Margaret	PRC for Signalled Lanes (%):	16.5	Total Delay for Signalled Lanes (pcuHr):	16.02	Cycle Time (s):	110	
C4 - Hickson / Globe	PRC for Signalled Lanes (%):	44.2	Total Delay for Signalled Lanes (pcuHr):	6.92	Cycle Time (s):	110	
	PRC Over All Lanes (%):	-11.6	Total Delay Over All Lanes(pcuHr):	84.60			

Basic Results Summary

Scenario 5: 'PM Mod2' (FG10: 'PM Future MOD2 Traffic', Plan 1: 'Future (with Basement)')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Deg Sat (%)	Av. Delay Per PCU (s/pcu)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)
Network: Linsig Modelling	-	-	**96.9%**	-	-	-	-	-
J1: Sussex Street - Erskine Street	-	-	**96.9%**	-	-	-	-	-
1/2+1/1	Sussex Street (S) Left Ahead	U	26.3%	18.2	216	1800:1440	3.8	4.0
1/3	Sussex Street (S) Ahead	U	17.5%	15.8	166	1800	2.6	2.7
2/2+2/1	Erskine Street (W) Left Ahead	U	58.3%	39.8	320	1800:1800	7.7	8.4
2/3+2/4	Erskine Street (W) Right Ahead	U+O	88.6%	86.0	237	1800:920	6.9	10.1
3/2+3/1	Sussex Street (N) Ahead Left	U	96.6%	61.8	515	920:1800	14.0	21.7
3/3+3/4	Sussex Street (N) Ahead Right	U+O	95.1%	56.6	466	900:1440	12.9	19.3
4/1	Erskine Street (E) Left	U	96.9%	103.7	406	1440	12.2	19.5
4/2+4/3	Erskine Street (E) Ahead Right	U+O	21.5%	31.8	106	1440:1800	2.0	2.1
J2: Napoleon Street - Hickson Road	-	-	**94.1%**	-	-	-	-	-
1/1	Sussex Street (S) Ahead	U	64.6%	40.1	402	1800	9.6	10.5
1/2	Sussex Street (S) Right	O	73.9%	63.9	174	1800	5.0	6.4
2/2+2/1	Basement Exit (W) Left Ahead	U	13.9%	46.5	41	1800:1800	1.1	1.2
2/3+2/4	Basement Exit (W) Right Ahead	U	17.4%	46.3	54	1800:1800	1.2	1.3
3/1	Hickson Road (N) Left	U	48.5%	16.0	365	1800	4.3	4.8
3/2	Hickson Road (N) Ahead	U	94.1%	65.3	585	1800	17.3	23.2
4/1+4/2	Napoleon Street (E) Left Right	U+O	92.4%	53.6	459	1800:1800	13.6	18.5
J3: Kent Street - Margaret Street	-	-	**80.5%**	-	-	-	-	-
1/2+1/1	Kent Street (S) Left Ahead	U	9.4%	22.7	69	1440:1800	1.3	1.3
1/3+1/4	Kent Street (S) Ahead Right	U+O	63.1%	21.8	512	1440:920	10.2	11.1

Basic Results Summary

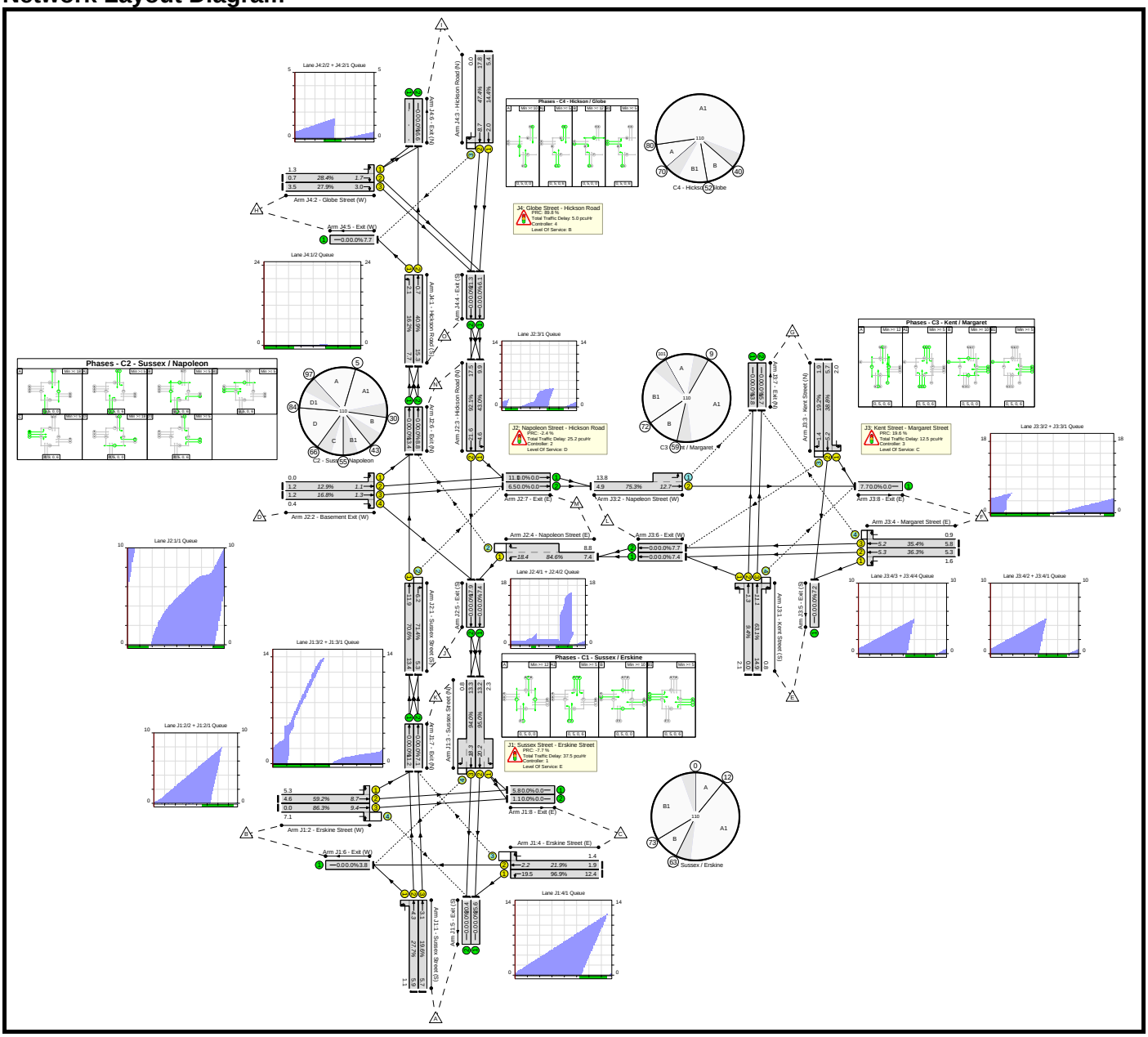
2/2+2/1	Napeleon Street (W) Left Ahead	U+O	80.5%	21.3	658	920:1440	12.3	14.3
3/2+3/1	Kent Street (N) Ahead Left	U	38.8%	22.3	251	1800:920	4.9	5.2
3/3	Kent Street (N) Right	O	19.2%	33.4	62	1800	1.3	1.4
4/2+4/1	Margaret Street (E) Left Ahead	U	30.4%	30.7	189	1800:1800	4.0	4.2
4/3+4/4	Margaret Street (E) Ahead Right	U+O	29.5%	30.7	182	1800:1800	4.0	4.2
J4: Globe Street - Hickson Road	**-**	**-**	**47.9%**	**-**	**-**	**-**	**-**	**-**
1/1	Hickson Road (S) Left	U	9.8%	2.0	152	1800	1.1	1.2
1/2	Hickson Road (S) Ahead	U	40.2%	2.9	493	1800	0.3	0.6
2/2+2/1	Globe Street (W) Right Left	U	26.9%	52.9	62	1800:1800	1.5	1.7
2/3	Globe Street (W) Right	U	26.2%	40.9	107	1800	2.7	2.9
3/1	Hickson Road (N) Ahead	U	19.1%	8.2	235	1800	2.6	2.7
3/2+3/3	Hickson Road (N) Ahead Right	U+O	47.9%	11.1	588	1800:1800	8.3	8.8

C1 - Sussex / Erskine	PRC for Signalled Lanes (%):	-7.7	Total Delay for Signalled Lanes (pcuHr):	39.81	Cycle Time (s): 110
C2 - Sussex / Napoleon	PRC for Signalled Lanes (%):	-4.5	Total Delay for Signalled Lanes (pcuHr):	27.85	Cycle Time (s): 110
C3 - Kent / Margaret	PRC for Signalled Lanes (%):	11.8	Total Delay for Signalled Lanes (pcuHr):	12.72	Cycle Time (s): 110
C4 - Hickson / Globe	PRC for Signalled Lanes (%):	87.8	Total Delay for Signalled Lanes (pcuHr):	4.95	Cycle Time (s): 110
	PRC Over All Lanes (%):	-7.7	Total Delay Over All Lanes(pcuHr):	85.33	

Basic Results Summary

Scenario 6: 'PM Mod8' (FG6: 'PM Future MOD8 Traffic', Plan 1: 'Future (with Basement)')

Network Layout Diagram



Basic Results Summary

Network Results

Item	Lane Description	Lane Type	Deg Sat (%)	Av. Delay Per PCU (s/pcu)	Demand Flow (pcu)	Sat Flow (pcu/Hr)	Max. Back of Uniform Queue (pcu)	Mean Max Queue (pcu)
Network: Linsig Modelling	-	-	**96.9%**	-	-	-	-	-
J1: Sussex Street - Erskine Street	-	-	**96.9%**	-	-	-	-	-
1/2+1/1	Sussex Street (S) Left Ahead	U	27.7%	18.4	229	1800:1440	4.1	4.3
1/3	Sussex Street (S) Ahead	U	19.6%	16.1	186	1800	2.9	3.1
2/2+2/1	Erskine Street (W) Left Ahead	U	59.2%	40.1	325	1800:1800	8.0	8.7
2/3+2/4	Erskine Street (W) Right Ahead	U+O	86.3%	79.8	231	1800:920	6.7	9.4
3/2+3/1	Sussex Street (N) Ahead Left	U	95.0%	53.1	507	920:1800	13.8	20.2
3/3+3/4	Sussex Street (N) Ahead Right	U+O	94.0%	52.0	461	900:1440	12.7	18.3
4/1	Erskine Street (E) Left	U	96.9%	103.7	406	1440	12.2	19.5
4/2+4/3	Erskine Street (E) Ahead Right	U+O	21.9%	31.8	108	1440:1800	2.1	2.2
J2: Napoleon Street - Hickson Road	-	-	**92.1%**	-	-	-	-	-
1/1	Sussex Street (S) Ahead	U	70.6%	43.7	439	1800	10.7	11.9
1/2	Sussex Street (S) Right	O	71.4%	60.2	174	1800	5.0	6.2
2/2+2/1	Basement Exit (W) Left Ahead	U	12.9%	46.3	38	1800:1800	1.0	1.1
2/3+2/4	Basement Exit (W) Right Ahead	U	16.8%	46.3	52	1800:1800	1.2	1.3
3/1	Hickson Road (N) Left	U	43.0%	15.9	324	1800	4.2	4.6
3/2	Hickson Road (N) Ahead	U	92.1%	59.3	573	1800	16.8	21.6
4/1+4/2	Napoleon Street (E) Left Right	U+O	84.6%	33.2	531	1800:1800	15.8	18.4
J3: Kent Street - Margaret Street	-	-	**75.3%**	-	-	-	-	-
1/2+1/1	Kent Street (S) Left Ahead	U	9.4%	22.7	69	1440:1800	1.3	1.3
1/3+1/4	Kent Street (S) Ahead Right	U+O	63.1%	21.8	512	1440:920	10.2	11.1

Basic Results Summary

2/2+2/1	Napeleon Street (W) Left Ahead	U+O	75.3%	17.4	613	920:1440	11.2	12.7
3/2+3/1	Kent Street (N) Ahead Left	U	38.8%	22.3	251	1800:920	4.9	5.2
3/3	Kent Street (N) Right	O	19.2%	33.4	62	1800	1.3	1.4
4/2+4/1	Margaret Street (E) Left Ahead	U	36.3%	31.7	225	1800:1800	5.0	5.3
4/3+4/4	Margaret Street (E) Ahead Right	U+O	35.4%	31.7	218	1800:1800	4.9	5.2
J4: Globe Street - Hickson Road	**-**	**-**	**47.4%**	**-**	**-**	**-**	**-**	**-**
1/1	Hickson Road (S) Left	U	16.2%	2.2	252	1800	2.0	2.1
1/2	Hickson Road (S) Ahead	U	40.9%	2.9	502	1800	0.3	0.7
2/2+2/1	Globe Street (W) Right Left	U	28.4%	52.9	66	1800:1800	1.5	1.7
2/3	Globe Street (W) Right	U	27.9%	41.2	114	1800	2.9	3.0
3/1	Hickson Road (N) Ahead	U	14.4%	7.9	177	1800	1.9	2.0
3/2+3/3	Hickson Road (N) Ahead Right	U+O	47.4%	11.0	582	1800:1800	8.2	8.7

C1 - Sussex / Erskine	PRC for Signalled Lanes (%):	-7.7	Total Delay for Signalled Lanes (pcuHr):	37.52	Cycle Time (s): 110
C2 - Sussex / Napoleon	PRC for Signalled Lanes (%):	-2.4	Total Delay for Signalled Lanes (pcuHr):	25.16	Cycle Time (s): 110
C3 - Kent / Margaret	PRC for Signalled Lanes (%):	19.6	Total Delay for Signalled Lanes (pcuHr):	12.53	Cycle Time (s): 110
C4 - Hickson / Globe	PRC for Signalled Lanes (%):	89.8	Total Delay for Signalled Lanes (pcuHr):	5.00	Cycle Time (s): 110
	PRC Over All Lanes (%):	-7.7	Total Delay Over All Lanes(pcuHr):	80.21	