Lend Lease Pty Ltd

Barangaroo South Concept Plan (MP06_0612 MOD8)

Transport Management and Accessibility Plan

Issue

Job number 222061-15

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

Executive Summary

This report supports a modification to Concept Plan (MP06_0162) submitted to the Minister for Planning and Infrastructure pursuant to Section 75W of Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act), addressing the relevant Director General Requirements (DGRs)

This Transport Management and Accessibility Plan (TMAP) report addresses the changes that have come about as a result of the proposed floor space modifications as well as any changes to the future public transport plans announced by the NSW Government. Although there have been changes in the Gross Floor Area (GFA) and site layout, the transport principles and assumptions for the analysis has remained consistent with the original TMAP for the Barangaroo South site prepared by the NSW Government in September 2008 - including the rates for calculating population, parking and trip generation, as well as the journey to work mode share target of only 4% trips by car.

The Barangaroo site has been divided into three distinct redevelopment areas (from north to south) – the Headland Park, Barangaroo Central and Barangaroo South (also known as Barangaroo Stage 1). Although the Concept Plan Amendment only relates to Barangaroo South, this report considers the whole precinct to maintain consistency of the analysis when compared to previous traffic studies for the overall Barangaroo site.

Planning for Barangaroo included a process of developing a Concept Plan that provided for a public recreation area and a mixed use area. The proposed modification to the Concept Plan seeks to:

- Relocate the landmark building (Block Y) from the harbour onto the land in the Barangaroo South site in front of the existing Blocks 4A, B and C;
- Revise the layout of Blocks 4A-C;
- Amend the size and location of the Southern Cove and public domain;
- Redistribute the GFA, public domain and land uses across development blocks 1-3, 4A-C, X and Y;
- Increase the maximum GFA on the site to provide for additional GFA within the hotel building and redistribution of land uses;
- Increase the height of the buildings within modified 'Block 4' and the relocated Block Y; and
- Amend the conditions of the Concept Approval to reflect the modifications to development.

The latest modification of the Concept Plan (Mod 8) seeks approval for total floor area for the whole site of 605,911m^2 GFA across Barangaroo, comprised of:

(a) a maximum of 183,028m^2 and a minimum of 84,595m^2 residential GFA;

(b) a maximum of 76,000m^2 GFA for tourist uses (of which a maximum of 59,000m^2 may be located in Barangaroo South);

(c) a maximum of 34,000m^2 GFA for retail uses (of which a maximum of 30,000m^2 may be located in Barangaroo South);

(d) a maximum of 5,000m^2 GFA for active in the Public Recreation zone (3,500m^2 of which will be in Barangaroo South); and

(e) a minimum of 12,000m^2 GFA for community uses that may be located within the Public Recreation or Mixed Use zones.

For the purposes of this assessment, particularly with respect to the traffic generation and traffic modelling undertaken, a mix land use types has been assumed for Barangaroo based the per land use category GFA limits nominated above, as proposed to be modified. These are as follows:

- 342,334m^2 commercial;
- 48,200m^2 hotel/tourist;
- 6,848m^2 public;
- 167,479m^2 residential;
- 26,500m^2 retail/other uses; and
- 14,500 m^2 active/community uses.

The TMAP report has considered the transport recommendations and findings of a number of key planning documents relevant to the Barangaroo Precinct, those being:

- Barangaroo Integrated Transport Plan;
- NSW Long Term Transport Masterplan;
- Sydney City Centre Access Strategy

Initial planning approval for Barangaroo South was based on the principle of achieving high usage of public transport, walking and cycling as a method of travel to work, with a target of 4% by car. The mode split targets have been largely retained in this TMAP report, with the exception of ferry trips. With the provision of a new ferry hub at Barangaroo South it is expected that a minimum of 4% of all journey to work trips to Barangaroo will be undertaken via ferry.

Traffic analysis has been undertaken using the same transport principles and assumptions that were used for TMAP September 2008 including the rates for calculating population, parking and trip generation. The analysis has considered the cumulative traffic impacts arising from the changes in GFA relating to both Barangaroo South (i.e. the proposed modification) and the Barangaroo Central precinct. A comparison of the traffic generation forecast under the Modified Concept Plan (Mod 2) and the proposed modification (Mod 8 + 9) is listed in Table 1 below.

Table 1 Traffic generation comparison

Time Period	Direction	TMAP 2008 (Mod 2 GFA)	TMAP Mod 4	TMAP Mod 8	TMAP Mod 8 + Mod 9
AM Peak Hour	In	348	347	336	349
	Out	260	268	317	369
	Two-way	**608**	**614**	**653**	**718**
PM Peak Hour	In	299	290	390	424
	Out	452	447	389	398
	Two-way	**751**	**736**	**779**	**821**

A corridor traffic model (using the LinSig 3.2 software package) was developed to assess the future road network performance arising from the Concept Plan modification. The modelling has considered the cumulative traffic impacts of the Barangaroo development, including traffic generated by Barangaroo Central and Headland Park. The modelling indicates little difference in the road network performance due to the minor traffic increase arising from the Concept Plan modification. Changes in vehicle delays are relatively minor in both the AM and PM commuter peak hours.

Car parking will provided at the same parking ratios as used in TMAP September 2008, excluding for the hotel. Approximately 2,100 car parking bays are envisaged for the residential component of the development - based on an indicative dwelling mix. The quantum of traffic generated by the residential uses is based on the total number of dwellings provided and independent of the number of resident parking bays. The number of on-street parking spaces within Barangaroo has reduced from 275 envisaged in the TMAP September 2008 to 40.

The Barangaroo precinct will be served by a number of pedestrian and public transport enhancements planned to be delivered in the coming years, including:

- Wynyard Walk pedestrian bridge and tunnel;
- City Walk pedestrian bridge;
- Expansion of the Sydney CBD cycleway network;
- Upgrades to Wynyard Station;
- Introduction of new bus routes to Barangaroo and Walsh Bay via the city centre;
- Provision of new taxi ranks within the Barangaroo precinct;
- Construction of a new ferry hub at Barangaroo; and
- Construction of the CBD and South East Light Rail link;

These improvements will accommodate the future population of the Barangaroo precinct by providing a number of viable (non private vehicle) transport options – meeting the mode split target for journey to work trips by private vehicle of 4%. The works will be delivered primarily from government agencies with the exception of the commitments made by Lend Lease under their Project Development Agreement with the Barangaroo Delivery Authority.

Contents

Tables

Figures

Appendices

1 Introduction

1.1 Background

This report supports a modification to Concept Plan (MP06_0162) submitted to the Minister for Planning pursuant to Section 75W of Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The proposed application is the outcome of negotiations between Lend Lease and the NSW Government, including the Barangaroo Delivery Authority, to relocate the approved landmark hotel building site from a pier over Sydney Harbour to a location on land elsewhere on the Barangaroo South site. It also incorporates a number of related changes to the urban design guidelines to maintain an appropriate built form and public domain outcome for the Barangaroo South site.

1.2 Overview of the Proposed Modification

The proposed modification to the Concept Plan seeks to:

- Relocate the landmark building (Block Y) from the harbour onto the land in the Barangaroo South site in front of the existing Blocks 4A, B and C;
- Revise the layout of Blocks 4A-C;
- Amend the size and location of the Southern Cove and public domain;
- Redistribute the GFA, public domain and land uses across development blocks 1-3, 4A-C, X and Y;
- Increase the maximum GFA on the site to provide for additional GFA within the hotel building and redistribution of land uses;
- Increase the height of the buildings within modified 'Block 4' and the relocated Block Y; and
- Amend the conditions of the Concept Approval to reflect the modifications to development.

It is also proposed to amend Part 12 of Schedule 3 of the Major Development SEPP to reconcile the SEPP with the modifications to the Concept Plan, including amending the location of the RE1 and B4 Mixed Use zone boundaries.

1.3 Site Location

Barangaroo is located on the north western edge of the Sydney Central Business District. It is 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 development dominated by large CBD commercial tenants to the south.

The Barangaroo site has been divided into three distinct redevelopment areas (from north to south) - the Headland Park, Barangaroo Central and Barangaroo South. Concept Plan (Mod 8) relates to Barangaroo South only as shown in Figure 1.

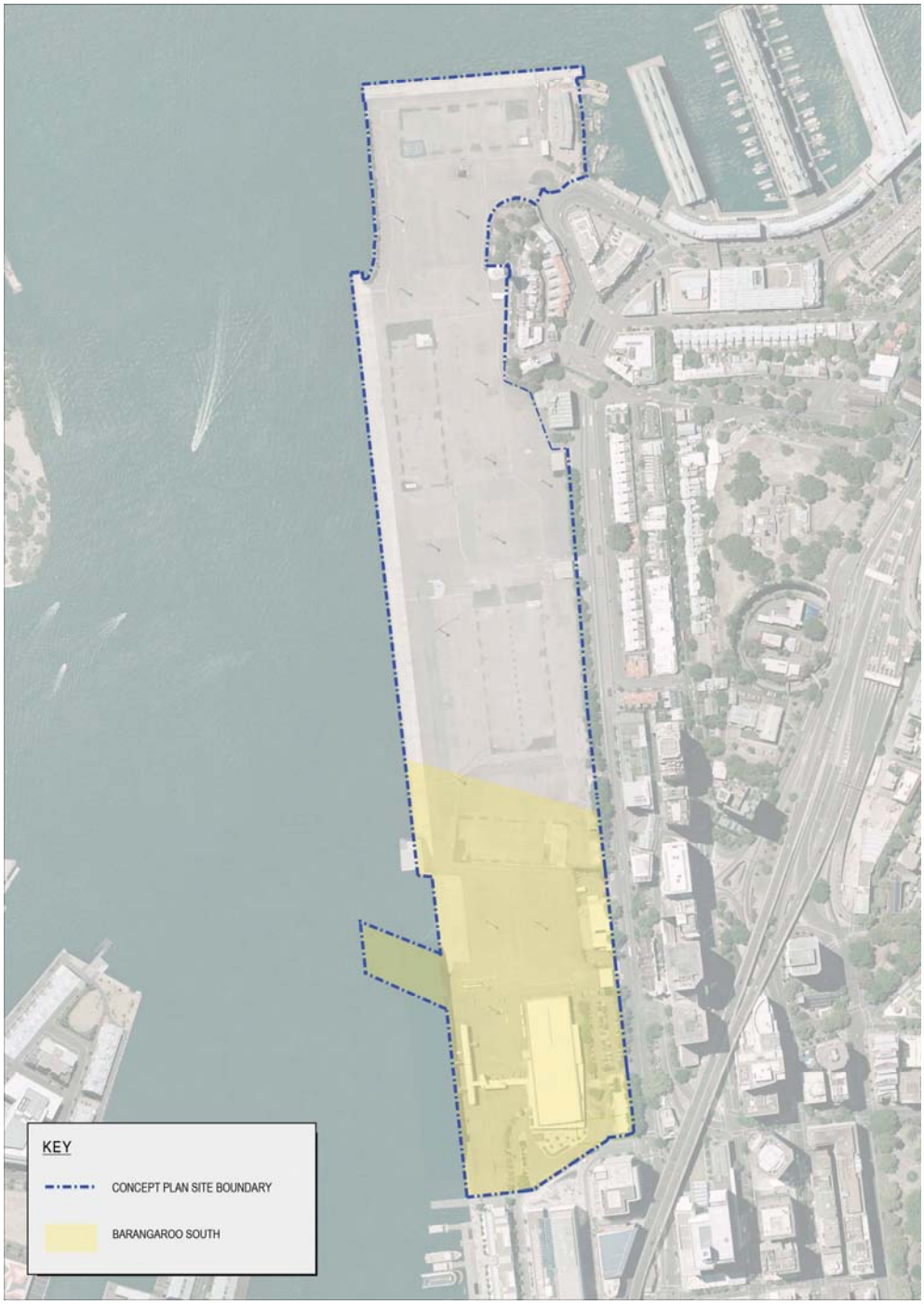


Figure 1 Indicative Site Boundary for Barangaroo South

1.4 Planning History

On 9 February 2007 the Minister approved a Concept Plan for the site and on 12 October 2007 the land was rezoned to facilitate its redevelopment. The Approved Concept Plan allowed for a mixed use development involving a maximum of 388,300m^2 of gross floor area (GFA) contained within 8 blocks on a total site area of 22 hectares.

A condition of consent also required two enlarged water intrusions into the Barangaroo site, one at the northern end and one at the southern end and the creation of a natural northern headland.

Modification No. 1 was approved in September 2007 which corrected a number of minor typographical errors.

On 25 February 2009 the Minister approved Modification No. 2 to the Concept Plan. The Approved Concept Plan as modified allowed for a mixed use development involving a maximum of 508,300m^2 of GFA contained within 8 blocks on a total site area of 22 hectares.

On 11 November 2009 the Minister approved Modification No. 3 to the Concept Plan to allow for a modified design for the Headland Park and Northern Cove. The Approved Concept Plan as modified allowed for a mixed use development involving a maximum of 489,500m^2 of GFA contained within 7 blocks on a total site area of 22 hectares.

On 16 December 2010 the Minister approved Modification No. 4 to the Concept Plan. The Approved Concept Plan as modified allowed for a mixed use development involving a maximum of 563,965m^2 of GFA contained within 7 blocks on a total site area of 22 hectares, an increase in height of a number of the proposed towers within Barangaroo South, the establishment of the new pier and landmark building extending into the Harbour; and reconfiguration and activation of the public waterfront area through the introduction of uses including retail and residential to the west of Globe Street.

Modification No. 5 was withdrawn.

Modification No.6 was approved in March 2015 to re-align a number of the block boundaries without changing the overall GFA.

Modification No.7 was approved in April 2015 which permitted the use of the concrete batching plant over the entire site, without changing the overall GFA.

1.5 Purpose of Report

This report has been prepared in support of the Concept Plan Amendment (MP06_0162 MOD 8), addressing the relevant Director General Requirements. This document was prepared with reference to the amendment to the "Barangaroo Transport Management and Accessibility Plan, Request for Detailed Proposal - Barangaroo South" issued by the NSW Government in 2008 (TMAP September 2008) and the "Transport Management and Accessibility Plan Supplementary Report" prepared by Arup in 2010 (Supplementary TMAP 2010). Since the 2008 TMAP was prepared, there have been some changes which have implications for the precinct, including:

- Modifications to the planned floor space mix;
- Changes to the future public transport network serving the precinct; and
- Adjustments in the road network layout (both internal and external to the site)

The main transport principles have remained unchanged including journey to work mode share target of only 4% trips by car.

1.6 Responses to Director Generals Requirements

Table 2 below summarises the responses to the transport related issues addressed in the DGR MP06_0162 MOD 8 – key issues 8 (transport management, traffic and car parking and vehicular access) and 9 (pedestrian and cycle access).

Table 2: DGR Summary

DGR No.	Issue	Report Reference
8 - Transport Management, Traffic & Car Parking and Vehicular Access		
8.1	Undertake an assessment of future transport needs associated with Barangaroo Central and the Headland Park, 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 differing uses) and week; and confirmation or modification (with justification) to the AM and PM peak commute mode share targets for Barangaroo as outlined in the Barangaroo Integrated Transport Plan 2012.	Section 3.2 & 3.3
8.2	Analyse the operation of existing and future transport networks (all modes) to understand the implications for Barangaroo, The analysis of the future road network operations needs to focus on intersections in the north-west quadrant of the CBD in the vicinity of Barangaroo, in particular, address the road network in the King Street Wharf area to ensure that intersections such as Erskine Street and Lime Street and Lime Street itself are modified to cater for the different traffic demands that Barangaroo South will bring to the network.	Section 4.3 & 4.4
8.3	Analyse car parking provision and how traffic generation (number of vehicles and time of access) will be managed in response to capacity limitations on the road network, The car parking breakdown shall identify all approved car parking numbers, and all potential car parking numbers across the whole of the Barangaroo site.	Section 4.5

DGR No.	Issue	Report Reference
8.4	Undertake a corridor model analysis of the road network, including an analysis of traffic generation and circulation, and service vehicle arrangements as a consequence of the modification; and demonstrate the potential to accommodate additional vehicular movements (including private vehicles, buses, commercial traffic and cyclists) in the surrounding road network.	Section 4.4
8.5	Undertake an assessment of the public transport network and associated pedestrian linkages and demonstrate that additional people movements can be accommodated by the surrounding public transport network.	Section 4.6 through to Section 4.13.
8.6	Outline late night transport provision to support the hotel and casino.	Section 4.14
8.7	Outline the timing and responsibility for delivering the transport network to serve Barangaroo,	Section 5.4
8.8	Prepare a comprehensive Traffic Management and Accessibility Plan, including an assessment of all of the above matters and: - cumulative regional traffic impacts, including but not limited to, local and regional intersections and road improvements, and vehicular access options; - impacts from changes to Barangaroo South (MOD 9); - amendments to accommodate future bus service provision on Hickson Road (in consultation with Transport for NSW); - identify provision for taxi ranks and coach parking on site; - the timing and cost of infrastructure works and identification of funding; - package of travel demand management measures for workers, residents and visitors to the site. - emergency vehicle access arrangements; and - proposed loading dock provisions and access arrangements to loading docks and car parks.	This document
9 - Pedestrian & Cycle Access		
9.1	Outline the future cycleway network and demonstrate direct cycle connections between Barangaroo South and the strategic cycleway network as outlined in the Sydney City Centre Access Strategy.	Section 4.7
9.2	Outline provisions for walking and demonstrate provision for direct walking connections	Section 4.6

In addition to addressing the above DGRs, the traffic modelling contained within this TMAP report addresses Condition C3A of the approved Concept Plan in relation to the proposed Modification 8.

.

2 Transport and Access Planning Framework

2.1 Methodology

The TMAP September 2008 was derived from the iterative process that commenced in 2006. This involved refinement of the Barangaroo concept and development details, establishment of the statutory planning and approvals framework, and preparation of the initial Transport concept based on investigation of various transport and access matters. The Statement of Commitments and development of the Concept Plan Modification facilitated the more detailed assessment of transport and access matters in a series of supporting studies including detailed Paramics modelling. These have provided the basis for the TMAP September 2008. This previous work informed this TMAP report.

Since the TMAP September 2008 (Mod 2) was released a Transport Report was carried out to support the Modified Concept Plan (Mod 4). The study used reiterated the transport principles outlined in the TMAP September 2008 report as a basis for the analysis of the traffic impacts for the modification. Although the Mod 4 study is considered, this current TMAP report uses the TMAP September 2008 and associated reports as the basis for comparison, given the transport modelling and road network analysis underpinning the 4% car mode share was undertaken at this point in time.

2.2 Service Principles

The service principles of Barangaroo with regards to mode split targets, opportunity to create a transport hub and provide good access to public transport remain largely unchanged from that described in the September 2008 TMAP. These principles are outlined below.

- meet the mode split targets and provide access to existing public transport bus and rail services;
- provide access to public transport to/from the site without prejudicing the majority of existing passengers to and from the CBD;
- provide the opportunity for integration with envisaged future public transport projects;
- not preclude the opportunity to create a major multimodal transport interchange with ferry, rail and bus services; and
- provide safe and convenient access to all, including the mobility impaired.

2.3 Scope of Investigations

2.3.1 Barangaroo Integrated Transport Plan

The Barangaroo Integrated Transport Plan (BITP) was released in August 2012, which was prepared by a taskforce chaired by Transport for NSW and included City of Sydney, BDA, Lend Lease and other Government agencies. The plan outlines a series of transport strategies and actions to accommodate the significant employment growth in the northern CBD over both the short and long term. A selection of the recommended actions includes:

- Plan for investigation of a future bus corridor along Hickson Road in lieu of light rail;
- To accommodate the significant increase passenger throughput over the short and long term (up to 26%), prepare a costed implementation plan to upgrade the station and improve capacity;
- Investigate options to relieve congestion at the Wynyard bus interchange and increase the number of bus stops and layovers;
- Construct Wynyard Walk, City Walk Bridge and other bridges over Hickson Road as per existing planning approvals;
- Improving cycling access to Barangaroo by extending the City of Sydney's bicycle network, including upgrading existing bicycle shoulder lanes on Hickson Road; and
- Locate sufficient taxi ranks in consultation with City of Sydney, BDA and the Taxi Council.

2.3.2 NSW Long Term Transport Masterplan

The NSW Long Term Transport Master Plan was released in December 2012 and outlines a 20 year plan for the direction of transport services across NSW. The plan presents an integrated approach to transport planning and identifies the roles different modes of transport play in meeting the future needs of the State population.

The Master Plan aims to integrate public transport services to maximise future use as well as improve the overall customer experience. The master plan discusses the implementation of the 'Opal' card – the future integrated public transport ticketing system for NSW.

2.3.3 Sydney City Centre Access Strategy

The Sydney City Centre Access Strategy was released by the NSW Government in December 2013 following a period of public review. The document outlines the NSW Government's key strategies for transport access to, and within, the Sydney CBD. A summary of the key elements of the strategy relevant to Barangaroo include:

- Commitment to the construction of a new ferry hub at Barangaroo South and new ferry routes to provide more opportunities to access Barangaroo via public transport ;
- New bus routes to run to Barangaroo and Walsh Bay via the city centre, Napoleon Street and Hickson Road, with the major bus stop serving the precinct to in the area surrounding Wynyard Station on York, Clarence and Kent Streets;
- Commitment to the completion of the Wynyard Walk bridge and tunnel which will provide a direct and accessible pedestrian connection between Barangaroo and Wynyard Station;
- Identification of new taxi rank locations within Barangaroo South;
- Commitment to the implementation of light rail along George Street through the CBD;
- Completion of the city cycleway network, including new bi-directional cycle routes on Castlereagh Street and Pitt Street and the identification of new routes into Barangaroo via the Pyrmont Bridge and Sydney Harbour Bridge cycleways;
- Upgrades to Wynyard Station including better interchange facilities for rail, bus and ferry customers at the station and at Barangaroo; and
- Improving visitor information including wayfinding and signage to CBD destinations and transport hubs in major visitor precincts such as Barangaroo.

3 Barangaroo Development

3.1 Proposed Maximum GFAs

The latest modification of the Concept Plan (Mod 8) seeks approval for total floor area for the whole site of 605,911m^2 GFA across Barangaroo, comprised of:

(a) a maximum of 183,000m^2 of residential GFA;

(b) a maximum of 76,000m^2 GFA for tourist uses (of which a maximum of 59,000m^2 may be located in Barangaroo South);

(c) a maximum of 34,000m^2 GFA for retail uses (of which a maximum of 30,000m^2 may be located in Barangaroo South);

(d) a maximum of 5,000m^2 GFA for active in the Public Recreation zone (3,500m^2 of which will be in Barangaroo South); and

(e) a minimum of 12,000m^2 GFA for community uses that may be located within the Public Recreation or Mixed Use zones.

For the purposes of this assessment, particularly with respect to the traffic generation and traffic modelling undertaken, a mix land use types has been assumed for Barangaroo based the per land use category GFA limits nominated above, as proposed to be modified. These are as follows:

- 342,334m^2 commercial;
- 48,200m^2 hotel/tourist;
- 6,848m^2 public;
- 167,479m^2 residential;
- 26,500m^2 retail/other uses; and
- 14,500 m^2 active/community uses.

3.1.1 Barangaroo South

The latest modification of the Concept Plan seeks approval for total floor area for the Barangaroo South site of 535,186m^2 GFA. This comprises of:

(a) a maximum of 154,000m^2 of residential GFA;

(b) a maximum of 59,000m^2 GFA for tourist uses;

(c) a maximum of 30,000m^2 GFA for retail uses;

(d) a maximum of 3,500m^2 GFA for active uses in the Public Recreation zone, which may include Community Uses.

For the purposes of this assessment, a mix land use types has been assumed for the Barangaroo South Site based the per land use category GFA limits nominated above, as proposed to be modified. These are as follows:

- 312,109m^2 commercial;
- 48,200m^2 hotel/tourist;
- 3,598m^2 public;
- 143,479m^2 residential; and
- 24,300m^2 retail/other uses.

In addition, up to 3,500m^2 of active uses are planned for Barangaroo South

3.1.2 Barangaroo Central (Mod 9)

Concurrent with this Concept Plan modification, a separate planning application is to be lodged to increase the maximum allowable floor space to be developed within Stage 2 of the Barangaroo site (Barangaroo Central). The changes to the permissible floor space relate to the commercial, residential and retail components of the development.

Based on current advice provided by the Barangaroo Delivery Authority, the assumed floor space mix for Barangaroo Central is as follows:

- 25,000m^2 commercial;
- 20,000m^2 public;
- 75,000m^2 residential; and
- 5,000m^2 retail/other uses.

3.1.3 Total Floor Space

The GFA allocation per activity is shown in Table 3 for the above mentioned approvals and modifications of the Concept Plan.

Table 3 Total GFA's for the Barangaroo Development

	Commercial	Hotel/Tourist	Public	Residential	Retail/ Other Uses	Total
Consolidated Concept Plan from 2007						
Consolidated Concept Plan	253,000	35,800	5,000	75,000	31,000	**399,800**
TMAP September 2008 – Concept Plan Modification for additional commercial (Mod 2)						
Concept Plan	373,000	35,800	5,000	75,000	31,000	**519,800**
Modified Concept Plan for Headland Park (Mod 3)						
Concept Plan (Mod 3)	371,500	30,000	4,750	64,000	30,750	**501,000**
Mod 4						
Barangaroo South	323,700	33,000	13,000	99,763	33,777	**503,240**
Barangaroo Central	30,225	0	3,250	24,000	1,750	**59,225**
Concept Plan (Mod 4)	353,925	33,000	16,250	123,763	35,527	**562,465**
Mod 8 (Modification to Barangaroo South Only)						
Barangaroo South	312,109	48,200	3,598	143,479	24,300	**531,686**
Barangaroo Central	30,225	0	3,250	24,000	1,750	**59,225**
Active/Community Uses						**14,500**
Concept Plan (Mod 8)	342,334	48,200	6,848	167,479	26,500	**605,911**
Mod 8 + Mod 9 (Modification to Barangaroo South & Barangaroo Central)						
Barangaroo South	312,109	48,200	3,598	143,479	24,300	**531,686**
Barangaroo Central	25,000	0	20,000	75,000	5,000	**125,000***
Active Uses						**4,500**
Concept Plan (Mod 8 + Mod 9)	337,109	48,200	23,598	218,479	29,300	**661,186**

* based on current advice provided by the Barangaroo Delivery Authority

3.2 Site Population

The assumptions used for estimating the population numbers are summarised in Table 4 below. These population assumptions are consistent with those previously utilised in the TMAP September 2008.

Table 4 Site Population Assumptions

Land Use	Floor Space	Density	Site Population
Commercial	337,109m2	1 employee / 20m^2 GFA	16,855
Hotel/Tourist	48,200m2	1 employee / 20m^2 GFA	2,410
Public	23,598m2	1 employee / 20m^2 GFA	1,180
Retail/Other Uses	32,580m2	1 employee / 20m^2 GFA	1,629
Sub-Total: Workers			***22,074***
Workers On-site per Day[1]			***20,198***
Residential	218,479m^2	2 residents / 100m^2 GFA	4,370

3.3 Mode Share Targets

Initial planning approval for Barangaroo South was based on the principle of achieving high usage of public transport, walking and cycling as a method of travel to work. Journey to work mode share by car is targeted at 4% which will be achieved through minimal on-site parking and promotion of travel demand management plans. These mode split targets were adopted in the Barangaroo Integrated Transport Plan.

The overall mode split targets have been largely retained for the Barangaroo site from the TMAP September 2008, with the exception of ferry trips. The current TMAP assigns only a 1% mode to ferry for journey to work. With the provision of a new ferry hub at Barangaroo South (further described in section 4.10), it is expected that a minimum of 4% of all journey to work trips to Barangaroo will be undertaken via ferry. This is at the lower end of the target ferry mode share outlined in the Barangaroo Integrated Transport Plan – similar to the rest of the northern CBD. The BITP notes that potentially up to 8% of works trips via ferry is achievable should existing travel patterns for workers near Circular Quay be replicated at Barangaroo. Large tenants in this area already record ferry mode share as high as 7% indicating that there is good potential for an increased ferry mode share with increased services and improved frequencies.

The increase in ferry mode share will likely result in a reduction of other public transport modes. A reduction of 2% by train and 1% by bus has been assumed in this study.

[1] Consistent with previous TMAPs, it has been assumed 8.5% of workers would not be on-site on a typical day

Table 5 Mode Share Targets

Mode	TMAP Mod2	TMAP Mod8	Number
Car (driver / passenger)	4.0%	4.0%	808
Bus / Light Rail	20.0%	19.0%	3,636
Train	63.0%	61.0%	12,321
Ferry	1.0%	4.0%	808
Other (pedestrian, cyclists, motorcycles, taxi)	12.0%	12.0%	2,424
Total	**100%**	**100%**	20,198

A detailed summary of the number of workers commuting to Barangaroo during the AM commuter peak hour is summarised in Table 6.

Table 6 Number of People Arriving at Barangaroo – Peak Hours

Mode	Number of People Travelling to Work			
	%	Daily	AM peak period (3 hour peak)	AM peak hour
Car (driver / passenger)	4.0%	808	646	394
Bus / Light Rail	19.0%	4,040	3,232	1,971
Train	61.0%	12,725	10,180	6,210
Ferry	4.0%	202	162	99
Other (pedestrian, cyclists, motorcycles, taxi)	12.0%	2,424	1,939	1,183
Total	**100%**	**20,198**	**16,158**	**9,857**

4 Transport and Access Service Strategy

4.1 Site Access

The site access arrangements for Barangaroo South are shown in Figure 2 for:

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

The key pedestrian routes are focused on Wynyard Walk which provides connection to Wynyard Station for train and bus passengers. This new pedestrian infrastructure, as provided for in the Sydney City Centre Access Strategy, will provide a direct and accessible pedestrian connection between Barangaroo and Wynyard Station.

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 bicycle routes for access.

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 City Walk, Union Walk and Transport Place. Emergency vehicles may also traverse Shelley Street and Sussex Street/Hickson Road.

Cars access the Stage 1A basement parking areas via vehicle ramps onto Globe Street and Lime Street with a basement egress available onto Hickson Road opposite Napoleon Street. Two vehicular entry and exit points are currently envisaged for cars utilising the Stage 1B basement, with access provided from the northern end of Globe Street.

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

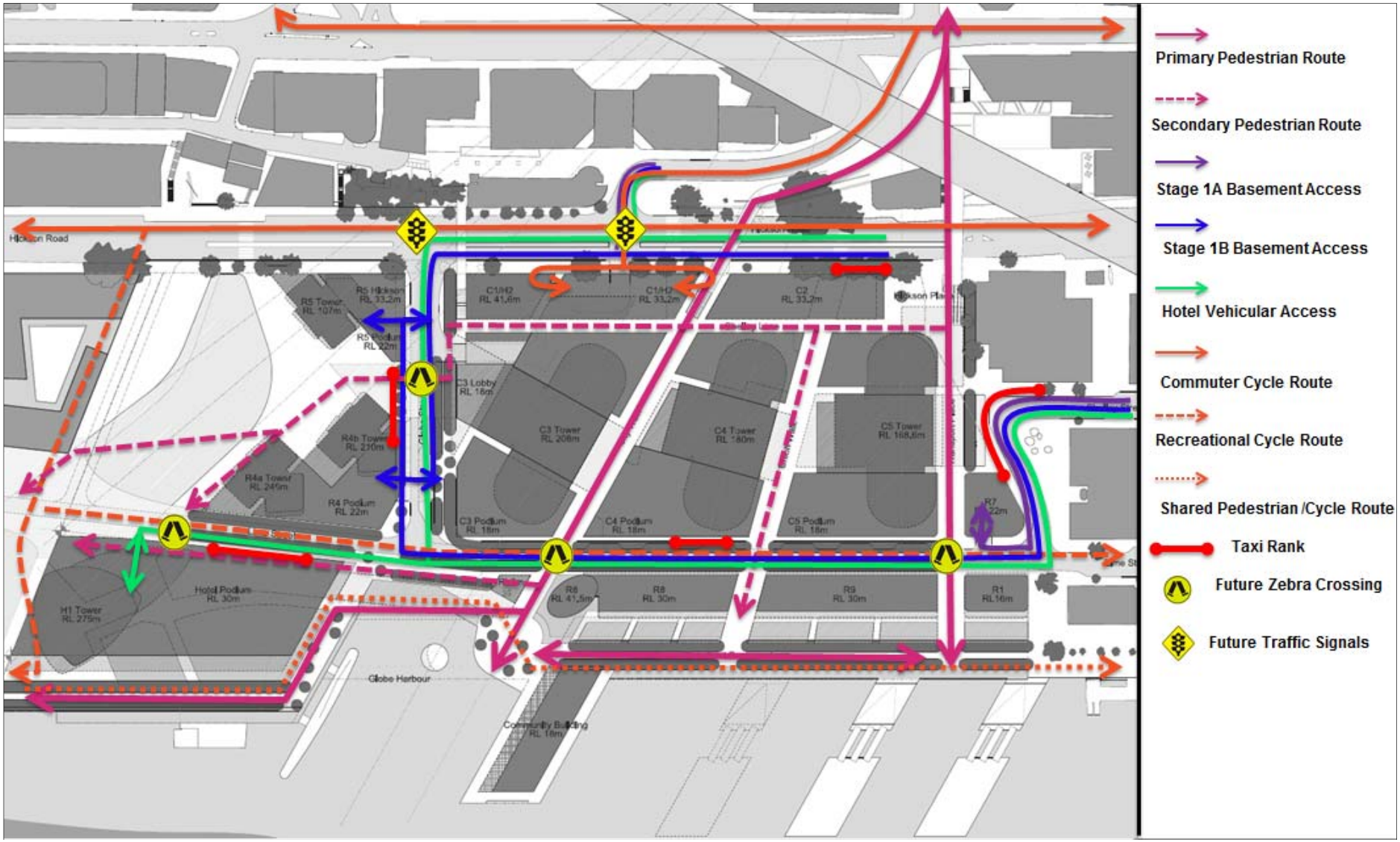


Figure 2 Barangaroo Site Access

4.2 Road Network Layout

There have been a number of amendments to the road network layout assumed in the TMAP September 2008. Some roads in Barangaroo South and the surrounding precinct will now be pedestrian ways rather than vehicular access routes. Modifications to the road network serving Barangaroo since the TMAP September 2008 are as follows:

- Following the completion of the Wynyard Walk development and approval from the RMS, the northern section of Shelley Street (previously known as Margaret Street West) will be closed to vehicular traffic. The existing traffic signals at the Shelley Street / Sussex Street intersection will be removed.
- Napoleon Street West will no longer serve as a vehicular access route through the precinct. The western approach of the Hickson Road / Napoleon Street intersection will instead function as an exit from the Stage 1A basement car park via a new signalised intersection.
- The northern entry to the commercial car park and loading dock is via Globe Street, north of Napoleon Street. This serves as an entry only for commercial vehicles, and both an entry and exit for service vehicles. This intersection will be upgraded to traffic signals in the ultimate configuration.
- An entry to the commercial and residential car park levels is provided via an access adjoining Lime Street in the south-west corner of the basement. This serves as an entry and exit.

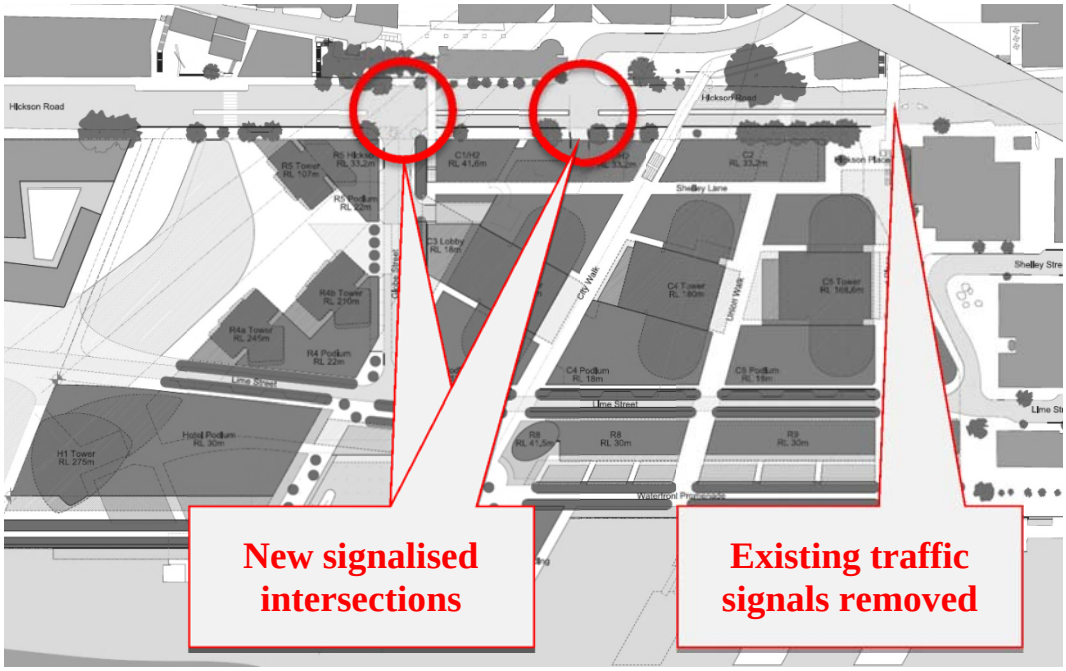


Figure 3 Road Network Layout

4.3 Road Network Operations

4.3.1 TMAP September 2008

Paramics modelling of Sydney CBD was utilised to test traffic options with different traffic generations and traffic management measures and is outlined in the MWT 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.

Peak hour traffic generation based on the proposed land use mix outlined in the September 2008 TMAP is summarised in Table 7.

Table 7 Traffic Generation TMAP September 2008 Modified Concept Plan Mod 2

Traffic generation as per Barangaroo TMAP September 2008			**AM Peak Hour 8am – 9am**				**PM Peak Hour 5pm – 6pm**			
Land Use	**Variable**	**Variable number**	**trip rate[2]**	**no of trips**	**In**	**Out**	**trip rate**	**no of trips**	**In**	**Out**
Light Vehicles										
Residential	dwelling	750	0.14	105	21	84	0.09	68	54	14
Commercial	car space	622	0.26	162	129	32	0.26	162	32	129
Retail	car space	52	0.4	21	17	4	0.4	21	4	17
On street parking	car space	275	0.4	110	88	22	0.8	220	88	132
Public off street parking	car space	300	0.04	12	10	2	0.4	120	24	96
Hotel	rooms	730	0.1	73	15	58	0.1	73	58	15
Sub total				**482**	**279**	**203**		**663**	**261**	**402**
Heavy vehicles										
Service vehicles				60	30	30		0	0	0
Coaches				0	0	0		22	11	11
Sub total				**60**	**30**	**30**		**22**	**11**	**11**
Total traffic generation				**542**	**309**	**233**		**685**	**272**	**413**
Public Transport (Bus)				*66*	*39*	*27*		*66*	*27*	*39*
Total additional traffic				**608**	**348**	**260**		**751**	**299**	**452**

[2] Refer Masson Wilson Twiney Modified Concept Plan Report, July 2008 (Section 4.6)

4.3.2 Concept Plan Modification Mod 4

In December 2010 Modification No. 4 to the Concept Plan was approved, allowing for a mixed use development involving a maximum of 563,965m^2 of GFA. The implications for traffic generation resulting from the approved scheme are summarised in Table 8 below.

Table 8 Traffic Generation TMAP September 2010 Modified Concept Plan Mod 4

Traffic generation as per Barangaroo TMAP September 2008			**AM Peak Hour 8am – 9am**				**PM Peak Hour 5pm – 6pm**			
Land Use	**Variable**	**Variable number**	**trip rate[3]**	**no of trips**	**In**	**Out**	**trip rate**	**no of trips**	**In**	**Out**
Light Vehicles										
Residential	dwelling	1166	0.14	163	33	131	0.09	105	84	21
Commercial	car space	590	0.26	153	123	31	0.26	153	31	123
Retail	car space	62	0.4	25	20	5	0.4	25	5	20
On street parking	car space	275	0.4	110	88	22	0.8	220	88	132
Public off street parking	car space	300	0.04	12	10	2	0.4	120	24	96
Hotel	rooms	249	0.1	25	5	20	0.1	25	20	5
Sub total				**488**	**278**	**211**		**648**	**252**	**397**
Heavy vehicles										
Service vehicles				60	30	30		0	0	0
Coaches				0	0	0		22	11	11
Sub total				**60**	**30**	**30**		**22**	**11**	**11**
Total traffic generation				**548**	**308**	**241**		**670**	**263**	**408**
Public Transport (Bus)				*66*	*39*	*27*		*66*	*27*	*39*
Total additional traffic				**614**	**347**	**268**		**736**	**290**	**447**

[3] Refer Masson Wilson Twiney Modified Concept Plan Report, July 2008 (Section 4.6)

4.3.3 Concept Plan Modification Mod 8 (Barangaroo South)

Peak hour traffic generation has been analysed to reflect the revised GFAs (as proposed in Table 3) for this Concept Plan modification. 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 hotel.

Given the unique nature of the future hotel, the most appropriate method to forecast traffic generation is to refer to an existing development with comparable characteristics. The Crown resort in Melbourne was selected as a suitable site which will provide similar uses to that of the proposed hotel at Barangaroo.

To facilitate this study, 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 described in detail in Appendix A of this report.

Table 9 Traffic Generation TMAP, Mod 8 (Barangaroo South)

2015 Concept Plan (MOD 8)			**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	1675	0.14	234	47	188	0.09	151	121	30
Commercial	car space	568	0.26	148	118	30	0.26	148	30	118
Retail	car space	50	0.4	20	16	4	0.4	20	4	16
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
Hotel*				75	51	24		213	147	66
Cultural / Civic				8	6	2		8	2	6
Sub Total				**513**	**260**	**253**		**691**	**340**	**351**
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				**587**	**297**	**290**		**713**	**351**	**362**
Public Transport (Bus)				*66*	*39*	*27*		*66*	*39*	*27*
Total Additional Traffic				**653**	**336**	**317**		**779**	**390**	**389**

* See Appendix A for further detail

The following common assumptions have been used, consistent with those utilised in the TMAP September 2008:

- 1 residential unit provides an average of 100m^2
- Commercial and public trips split 80% in / 20% out during AM and 80% out / 20% in during PM
- Residential trips split 80% out / 20% in during AM and 80% in / 20% out during PM
- Public use parking at Headland Park assumed to generate at retail rate during PM peak hour and at 10% of that level during AM peak hour
- No net change in traffic generation during peak hours will occur as a result of the conversion of the existing 270 ninety degree parallel spaces to 125 short term on-street car parking spaces on Hickson Road
- Bus numbers were based on the Barangaroo Bus Service Strategy, Transport and Traffic Planning Associates April 2008

A key change since the TMAP September 2008 concerns the number of on-street parking spaces within the precinct. Current planning for Barangaroo South and Central allows for approximately 40 parking spaces on the local streets - a significant reduction from the 275 assumed in the TMAP September 2008. This is a result of both the pedestrianisation of some streets in the precinct and the design progression of Globe Street and Lime Street, which will accommodate only a small number of on-street parking spaces.

It should be noted that the traffic generation rate for the residential component of the site is based on the number of dwellings provided, and is independent of the number of parking bays provided.

4.3.4 Concept Plan Modification Mod 8+Mod9

This TMAP report has modelled the cumulative traffic impacts on the local road network arising from the revised GFAs of the southern and central Barangaroo precincts (i.e. Mod 8 + Mod 9). This is summarised in Table 10.

Table 10 Traffic Generation TMAP, Mod 8 + 9

2015 Concept Plan (MOD 8 + 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	2185	0.14	306	62	244	0.09	197	157	40
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
Hotel*				75	51	24		213	147	66
Cultural / Civic				8	6	2		8	2	6
Sub Total				***584***	***275***	***309***		***733***	***377***	***361***
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				**658**	**312**	**346**		**759**	**388**	**372**
Public Transport (Bus)				*66*	*39*	*27*		*66*	*39*	*27*
Total Additional Traffic				**724**	**351**	**373**		**825**	**427**	**399**

* See Appendix A for further detail

4.3.5 Traffic Generation Comparison

A comparison of the traffic generation forecast under the Modified Concept Plan (Mod 2) and the proposed modification (Mod 8 + 9) has been undertaken and is listed in Table 11 and illustrated in Figure 4.

Comparison has been made with the traffic forecast in the TMAP September 2008 (Mod 2) given the transport modelling and road network analysis underpinning the 4% car mode share was undertaken at this point in time. The previous 2010 TMAP (Mod 4) reiterated the transport principles outlined in the TMAP September 2008. The traffic generation forecasts outlined in the Mod 4 TMAP have been included as reference material.

Table 11 Traffic generation comparison

Time Period	Direction	TMAP 2008 (Mod 2 GFA)	TMAP Mod 4	TMAP Mod 8	TMAP Mod 8 + Mod 9
AM Peak Hour	In	348	347	336	351
	Out	260	268	317	373
	Two-way	**608**	**614**	**653**	**724**
PM Peak Hour	In	299	290	390	427
	Out	452	447	389	399
	Two-way	**751**	**736**	**779**	**825**

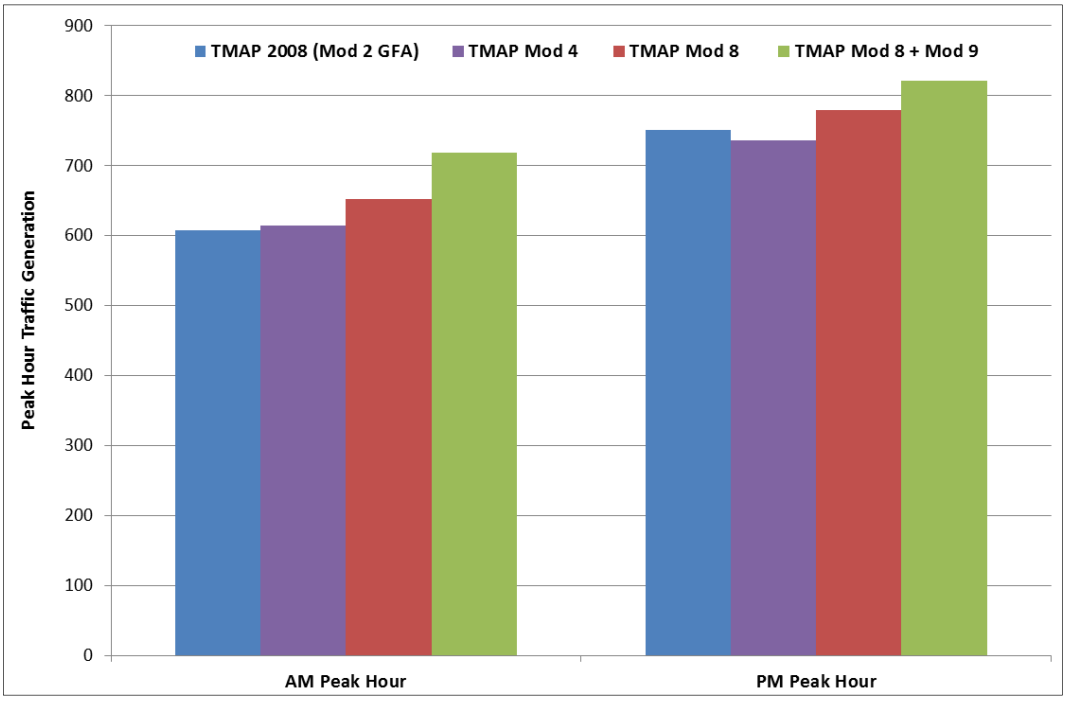


Figure 4 Traffic Generation Comparison

4.3.6 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 the hotel is expected to be highest in the evening after 7pm and on weekends – therefore not coinciding with the road network peak hours.

Figure 5 below provides an illustration of the variation in traffic generated by the entire Barangaroo development (Mod 8 + 9) 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. The hotel is anticipated to be the primary generator of vehicular traffic from the entire Barangaroo site in the evening peak hour.

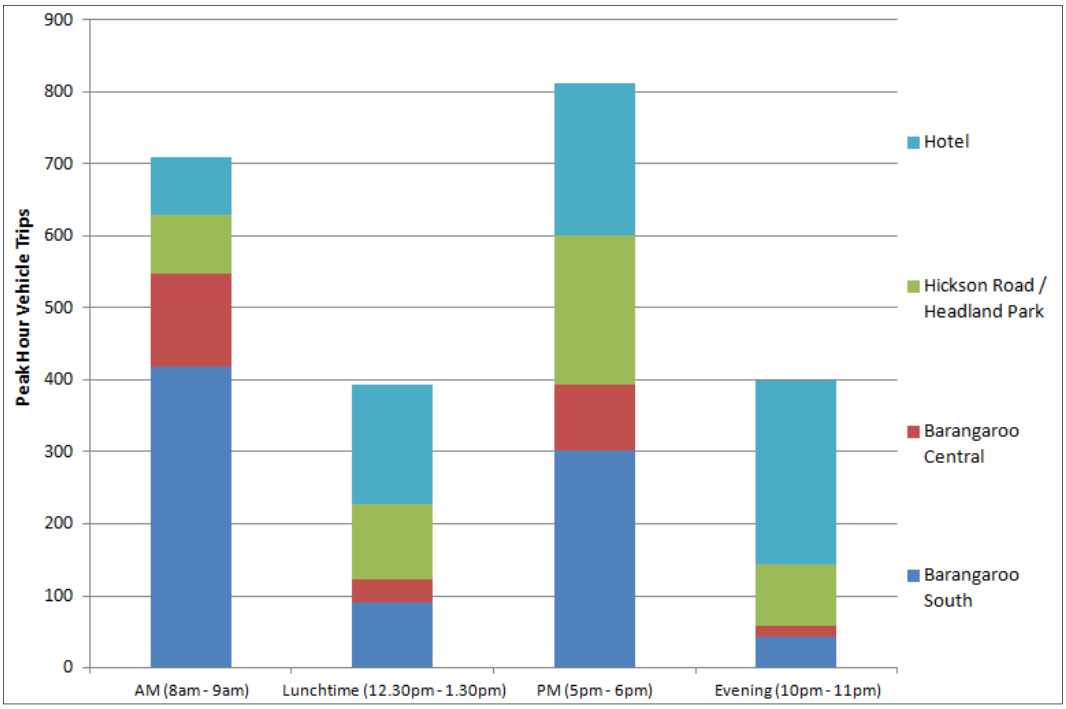


Figure 5 Off Peak Traffic Generation (Mod 8+9)

4.4 Road Network Modelling

4.4.1 Description

The operation of the road network following the full development of Barangaroo has been modelled using the LinSig analysis software. The LinSig model has considered the revised road network layout as described in Section 4.1 of this study, including the future closure of Shelley Street to vehicle movements following the completion of the Wynyard Walk development.

The modelling does not consider the redistribution of traffic arising from the changes in transport conditions in the CBD following the introduction of the light rail on George Street. It is understood that Transport for NSW is currently preparing a mesoscopic traffic model which considers the traffic impacts of this proposal. The results of this analysis were not available at the time of writing.

4.4.2 Traffic Volumes

Traffic counts were undertaken for this study in the Barangaroo precinct in July 2013 and are presented in Figure 6 and Figure 7.

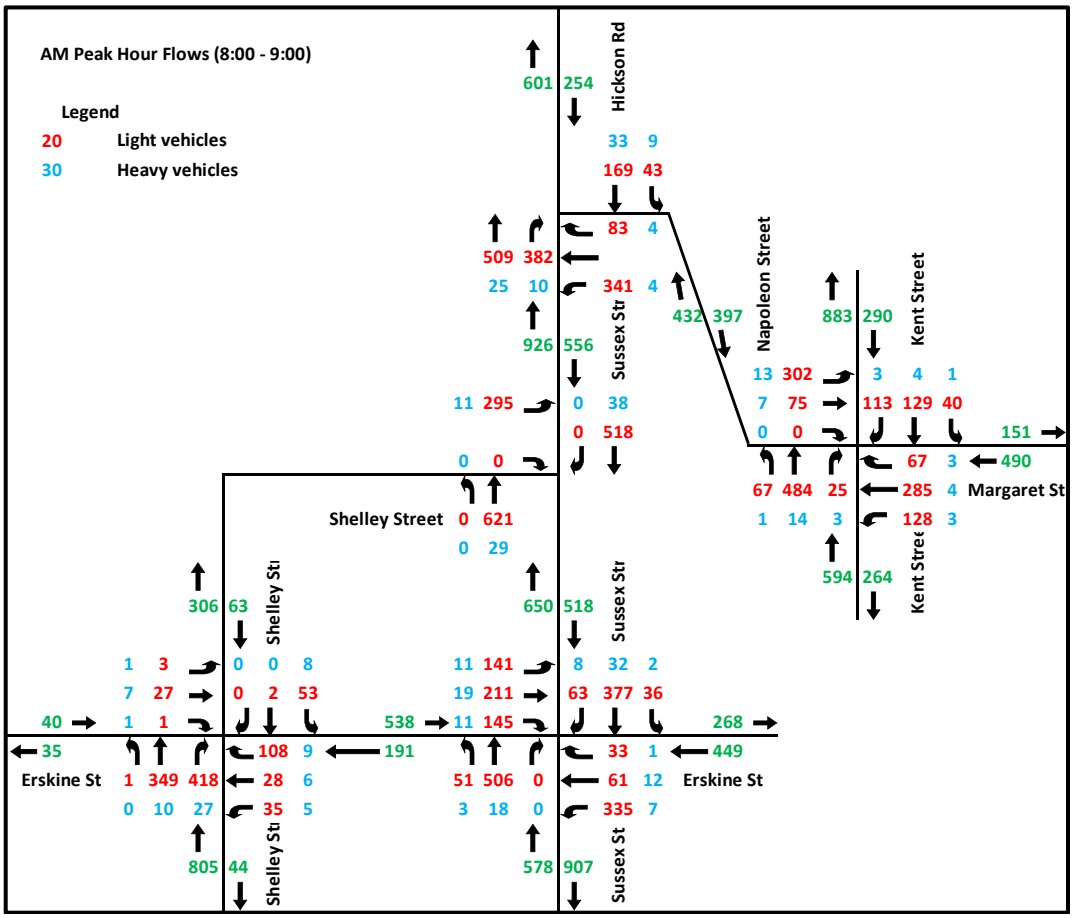


Figure 6 AM Peak Hour Traffic Flows, July 2013

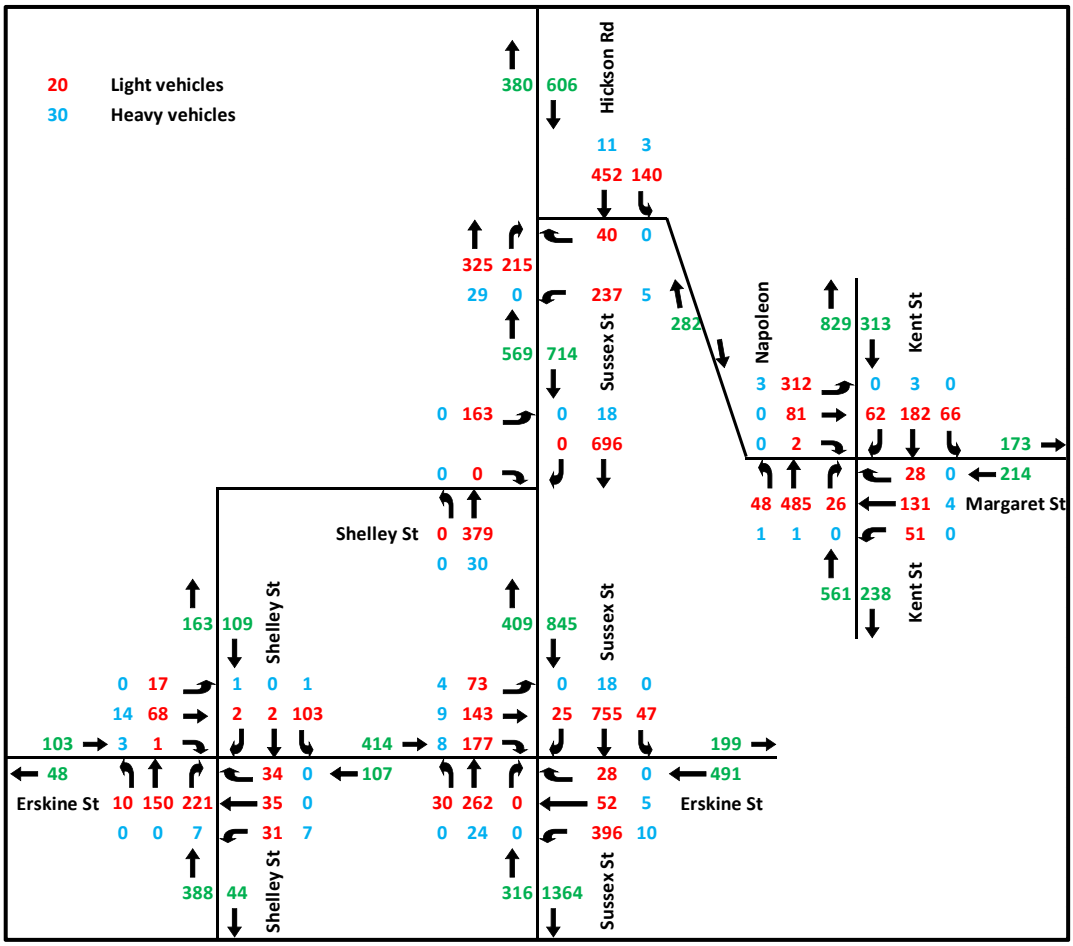


Figure 7 PM Peak Hour Traffic Flows, July 2013

4.4.3 Traffic Distribution

Existing Traffic

The closure of the northern section of Shelley Street following the completion of the Wynyard Walk development will necessitate a redistribution of traffic currently turning left from Shelley Street into Sussex Street. These traffic movements have been redistributed as follows:

- 50% will travel via Lime Street and Globe Street North; and
- 50% will turn right from Shelley Street into Erskine Street and then left into Sussex Street

This redistribution is based on current traffic patterns which indicate that of the vehicles previously turning left from Shelley Street into Sussex Street, approximately half would turn right onto Napoleon Street and the remaining half would continue north along Hickson Road.

Development Traffic

Traffic associated with the new development has been distributed across the road network based on Journey to Work Census data, consistent with the assumptions outlined in the MWT Modified Concept Plan – Transport Report, July 2008.

Table 12 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%**

These key approach and departure routes are consistent with previous Concept Plan modifications, as well as those illustrated in the BITP (Figure 8).

Figure 8 Arrival and Departure Traffic Routes

Source: Barangaroo Integrated Transport Plan, Figure 7

4.4.4 Intersection Operation

A corridor traffic model (using the LinSig 3.2 software package) was developed to assess the future road network performance arising from the Concept Plan modification. 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 13 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)

It is understood that the RMS and Transport for NSW are currently investigating the reinstatement of a second eastbound traffic lane on Margaret Street. This lane was removed following the closure of the Kent Street pedestrian tunnel to provide additional footpath capacity on Margaret Street. This new traffic lane has not been included within the LinSig traffic model. Provision of this measure would significantly reduce the extent of queue spillback experienced in the PM peak hour for eastbound vehicles – therefore improving the operation of the Kent Street / Napoleon Street / Margaret Street intersection.

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 as summarised in Table 14. 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.

Table 14 Intersection level of service

Level of Service	Average Vehicle Delay (seconds)	Traffic Signals and Roundabouts	Priority Intersections ('Stop' and 'Give Way')
A	< 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity. At signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity; requires other control mode
F	>71	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing; requires other control mode

Another common measure of intersection performance is the degree of saturation, which provides an overall measure of the capability of the intersection to accommodate additional traffic. A DOS of 1.0 indicates that an intersection is operating at capacity.

The results of the traffic modelling are summarised in Table 15 below. Full analysis is provided as an Appendix B.

Table 15 Traffic Modelling Results

Peak	Intersection	TMAP 2008 (Mod 2 GFA)			TMAP Mod 8+9		
		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

The cumulative traffic analysis indicates little difference in the road network performance due to the minor traffic increase arising from the Concept Plan modification. Changes in vehicle delays are relatively minor in both the AM and PM commuter peak hours.

In both scenarios analysed, the forecast queue length at the northern approach of the Hickson Road / Sussex Street intersection is forecast to spill back to the Hickson Road / Globe Street intersection. It is recognised however that significant vehicle queuing currently occurs in the southbound direction on Sussex Street in the PM Peak hour 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.

The operation of the future signalised intersections on Hickson Road will be dependent on the operating conditions of intersections further downstream on Sussex Street. Essentially they will act as ‘slave’ in the Sussex Street road network, with intersections at King Street and Market Street acting as the ‘masters’.

In this context, the road network impacts of the proposed modification are considered modest.

4.5 Car Parking

This car parking analysis has been based at the same parking ratios as used in TMAP September 2008, excluding for the hotel. These rates are summarised below.

Table 16 Parking Rates

Land Use and Activity	Parking Rate
Commercial	1 space / 600m^2 GFA
Retail	Based on the City of Sydney LEP2005 rates for 'other' uses.
Residential	Bedsitter: 0.5 spaces / dwelling 1 bed: 0.5 spaces / dwelling 2 bed: 1.2 spaces / dwelling 3 bed: 2.0 spaces / dwelling 3+ bed: 2.0 spaces / dwelling
Hotel	n/a
Hickson Road on-street parking	n/a
On-Street parking within Barangaroo	n/a
Headland Park Off-Street car park	n/a

The parking numbers presented in this section are nominal numbers extrapolated from:

- The assumed GFA mix described in Section 3 and an indicative dwelling mix for residential uses (which may be subject to change), applying the approved car parking rates specified under the Concept Plan; and
- An assessment of parking demand and management in relation to hotel uses.

The parking numbers are presented below for the purposes of presenting the potential parking needs of development under the Concept Plan, as proposed to be modified. Actual parking numbers may vary from those presented in this report and will be confirmed in the relevant applications to carry out development contemplated by the Concept Plan.

While the proposed GFA may potentially provide for more car parking on the site, this has not resulted in a significant increase in traffic generation in the vicinity of the site as demonstrated in Section 4.4.

Table 17 Comparison of Potential Parking Supply Spaces

Land Use	TMAP Mod 2	TMAP Mod 4	TMAP Mod 8
Commercial / Mix Use	673	652	647
Hotel	146	156	500*
Residential	771	1,166	2,205^
Parkland public car park	300	300	300
Total on site	***1,187***	***2,274***	***3,652***
Hickson Road on-street parking	125	125	125
On-Street parking within Barangaroo	275	275	25 (Barangaroo South) 15 (Barangaroo Central)
Public buildings	16	16	16
Ports Parking	140	0	0
Grand Total	**2,446**	**2,690**	**3,833**

^ Based on indicative dwelling mix for residential uses. Final residential car parking provision to be determined at a later stage of the planning process

* Includes parking related to the serviced apartments, retail and gaming component, and based on expected demand based on surveys of comparable facility. Excludes residential component. See Appendix A for further information

Since the September 2008 TMAP there has been further development with respect to planning for on-street parking within the Barangaroo precinct. A number of internal roads previously envisaged are now dedicated pedestrian routes. Further, the design development of both Lime Street and Globe Street has progressed to a stage where it is now known that space available for on-street parking is limited. The number of on-street parking spaces within Barangaroo has reduced from 275 to 40 (25 in Barangaroo South, 15 in Barangaroo Central).

The profile of car parking demand for the hotel (excluding residential uses) across a typical weekend demonstrates demand is likely to peak at approximately 800 spaces on a Friday and Saturday evening. 500 spaces may potentially be allocated for the non-residential uses within the hotel building. At all other times however, the on-site parking provision will accommodate the expected car parking demand for the hotel (excluding residential uses).

During periods when car parking demand may exceed visitors and staff of the hotel will be required to either use alternate transport or find parking in the surrounding road network and off-street publicly accessible commercial car parks. As demonstrated in Figure 9, there are numerous existing off-street publicly accessible commercial car parks located in proximity to the proposed hotel site which are expected to have sufficient capacity to accommodate any additional demand for car parking for the hotel (excluding residential uses) during the evenings.

Shared parking arrangements could also be established with nearby commercial buildings as an appropriate and efficient means of managing parking requirements. For example The Star has a similar arrangement with the Harbourside Car Park.

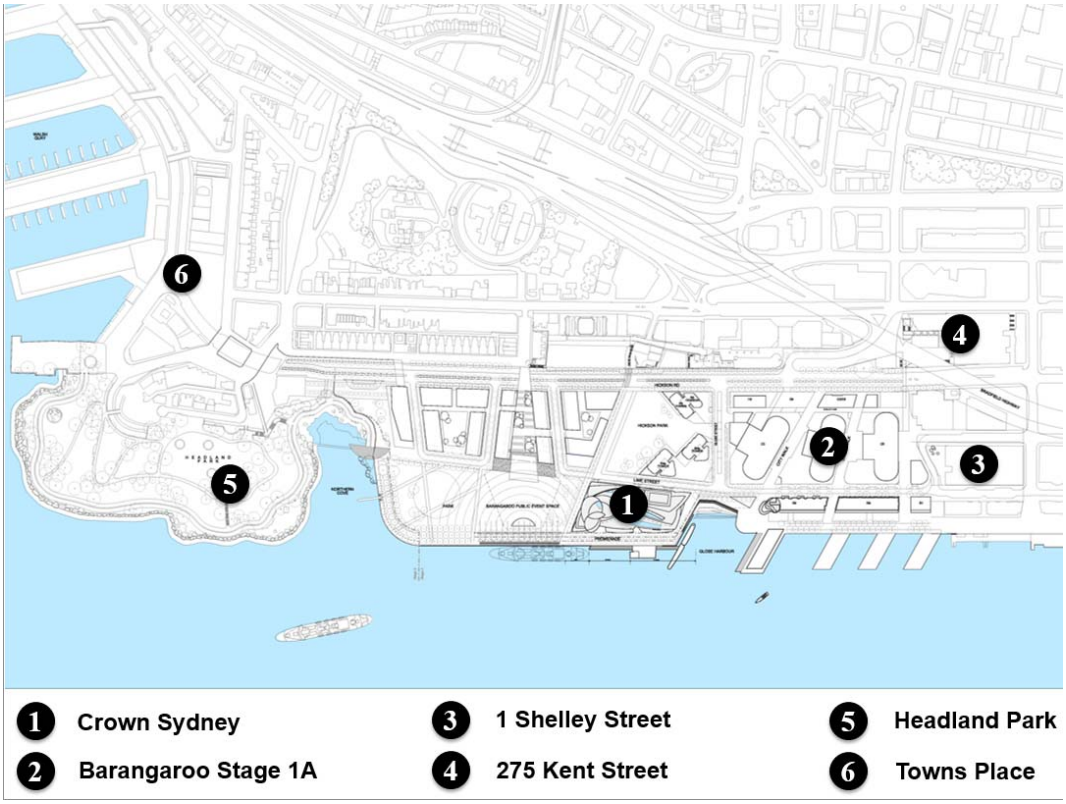


Figure 9 Public Off-Street Car Parks

4.5.1 Car Park Management

The provision of car parking will be staged depending on the timing of the various components of the development. It is likely that various elements of car parking areas are managed in differing forms. The residential cars are likely to be managed through the owners corporation and transferred with individual apartments. The residential car parks will have controlled access. The commercial and retail car parking is likely to be managed as a common pool by a single operator.

4.6 Pedestrian Linkages

4.6.1 Pedestrian Context and Needs

High levels of pedestrian access are essential to achieving the low car mode share target that is critical to making the Barangaroo development successful. The committed mode share target for "Other" (which includes pedestrians and cyclists) is 12% for the journey to work to Barangaroo.

The Barangaroo Pedestrian Precinct Demand strategy, developed by Arup for Lend Lease (in conjunction with the Barangaroo Delivery Authority) in 2013, provides a summary of expected weekday, weekend, and event populations across the Barangaroo development site. This gives an estimation of the anticipated foot traffic along major pedestrian routes over different time periods.

The strategy identified high pedestrian activity at all times of the day travelling along two major corridors, those being:

- From Wynyard Station, across the Wynyard Walk bridge and through to the Barangaroo Ferry Hub and waterfront promenade; and
- From Wynyard Station, across City Walk bridge and through to Lime Street and the waterfront promenade.

A summary of the maximum expected pedestrian flows along key walkways is presented in Table 18.

Table 18: Maximum Hourly Pedestrian Movements

Link	Weekday AM	Weekday Midday	Weekday PM	Weekday Evening	Weekend
City Walk Bridge	3,827	2,366	3,180	2,557	1,829
Wynyard Walk Bridge	6,846	2,336	4,341	2,721	1,551
City Walk	4,637	4,926	4,196	2,759	1,880
Union Walk	3,463	3,105	2,744	1,087	583
Transport Place	5,342	2,144	3,426	2,457	1,436
Foreshore Promenade	748	2,091	1,448	793	2,294

It should be noted that the pedestrian volumes presented above represent a conservative scenario where the population densities and occupancy rates assumed for the various land uses within Barangaroo are higher than those in this TMAP report. This served the purpose of providing an estimate of the maximum number of pedestrian movements along various routes to inform the design of pedestrian walkways within Barangaroo South and ensure the peak pedestrian access demands may be accommodated. This is the case as described in the ensuing sections.

4.6.2 Pedestrian Routes and Facilities

For AM and PM peak period trips by workers at Barangaroo, the main pedestrian desire lines will be between the commercial development in the southern end of the site and Wynyard public transport hub. The main desire lines will change in the midday peak more towards mid-city areas. Outside peak periods, pedestrians will focus more strongly on access to Walsh Bay and King Street wharf areas along the waterfront promenade, as well as Wynyard and mid-city.

Appropriate at-grade pedestrian crossing facilities (either pedestrian signals or zebra crossings) are planned throughout the precinct to ensure pedestrians are provided with safe and efficient road crossing opportunities along key desire lines.

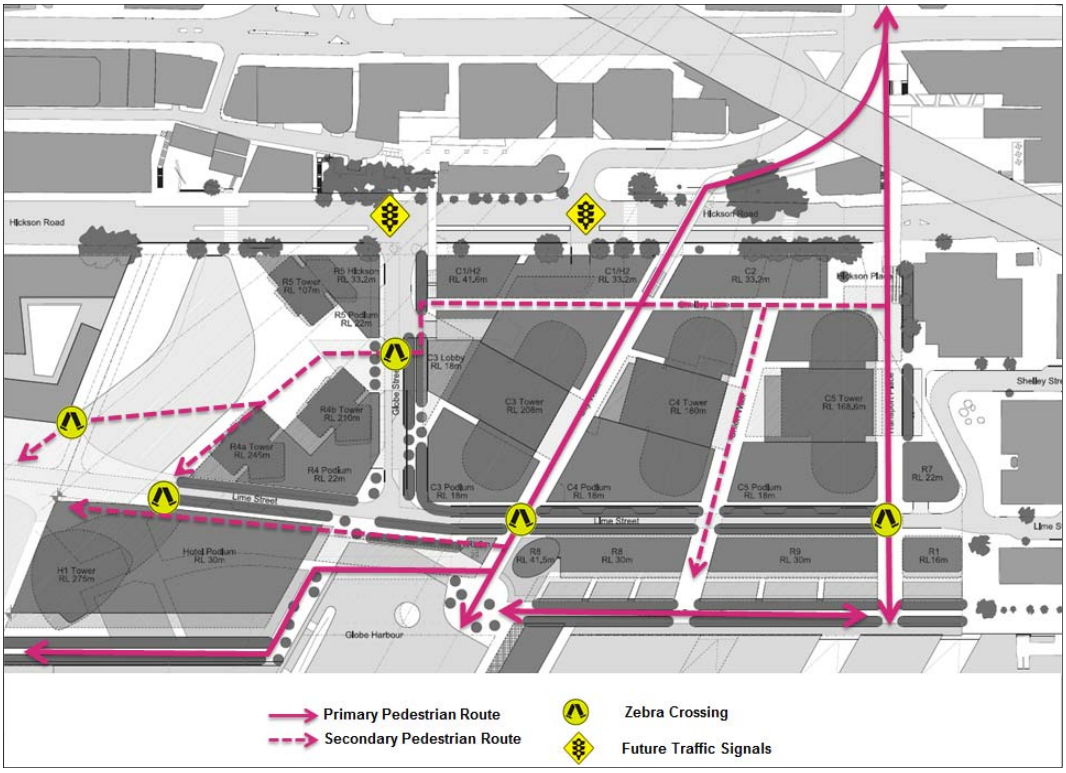


Figure 10 Major Pedestrian Routes

4.6.3 Pedestrian Linkages

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 11.

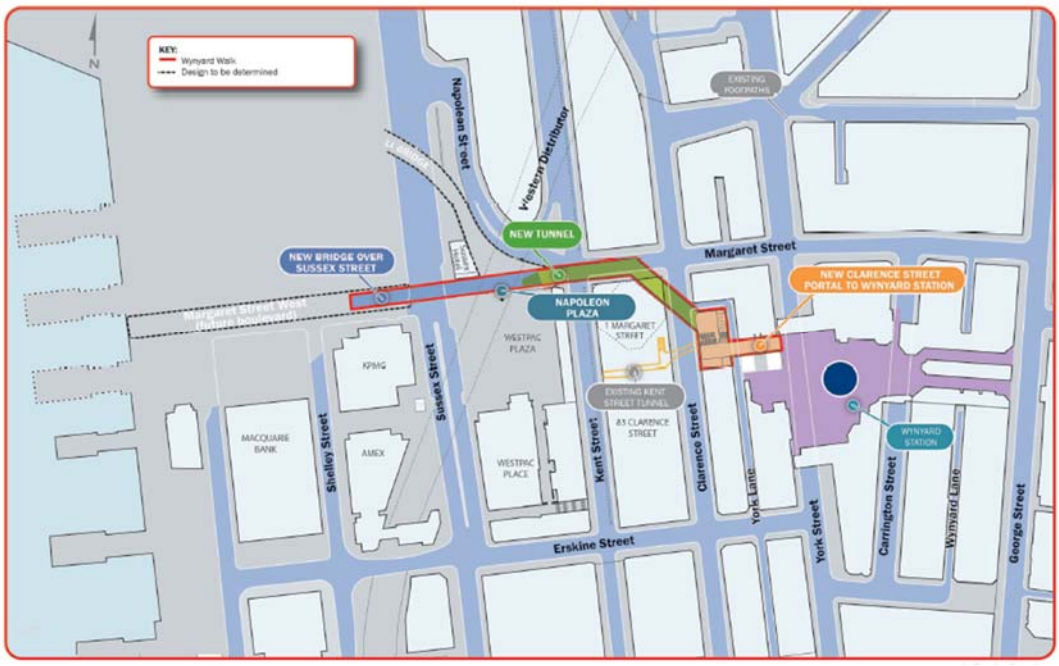


Figure 11 Wynyard Walk (Source: REF April 2012, Transport for NSW)

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 is forecast to be operational by 2015. An overview of the City Walk Bridge alignment is presented in Figure 12.

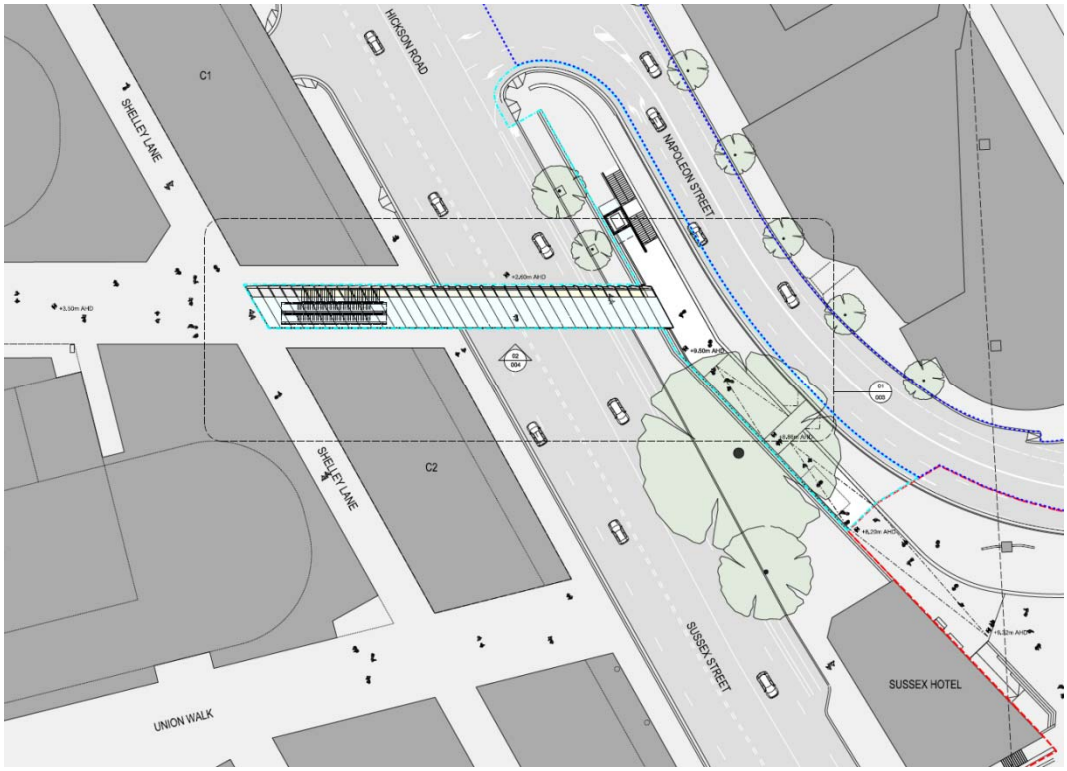


Figure 12 City Walk Bridge

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 13.

Figure 13 Pedestrian Routes

Source: Barangaroo Integrated Transport Plan, Figure 5

4.7 Cycling

4.7.1 External Bicycle Network

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's strategic cycleway network map (see Figure 14) indicates future cycleway connections into Barangaroo to be via the Pyrmont Bridge cycleway and the Harbour Bridge cycleway. These new links are yet to be determined.

Figure 14 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 Barangaroo is outlined in Figure 15 on the following page.

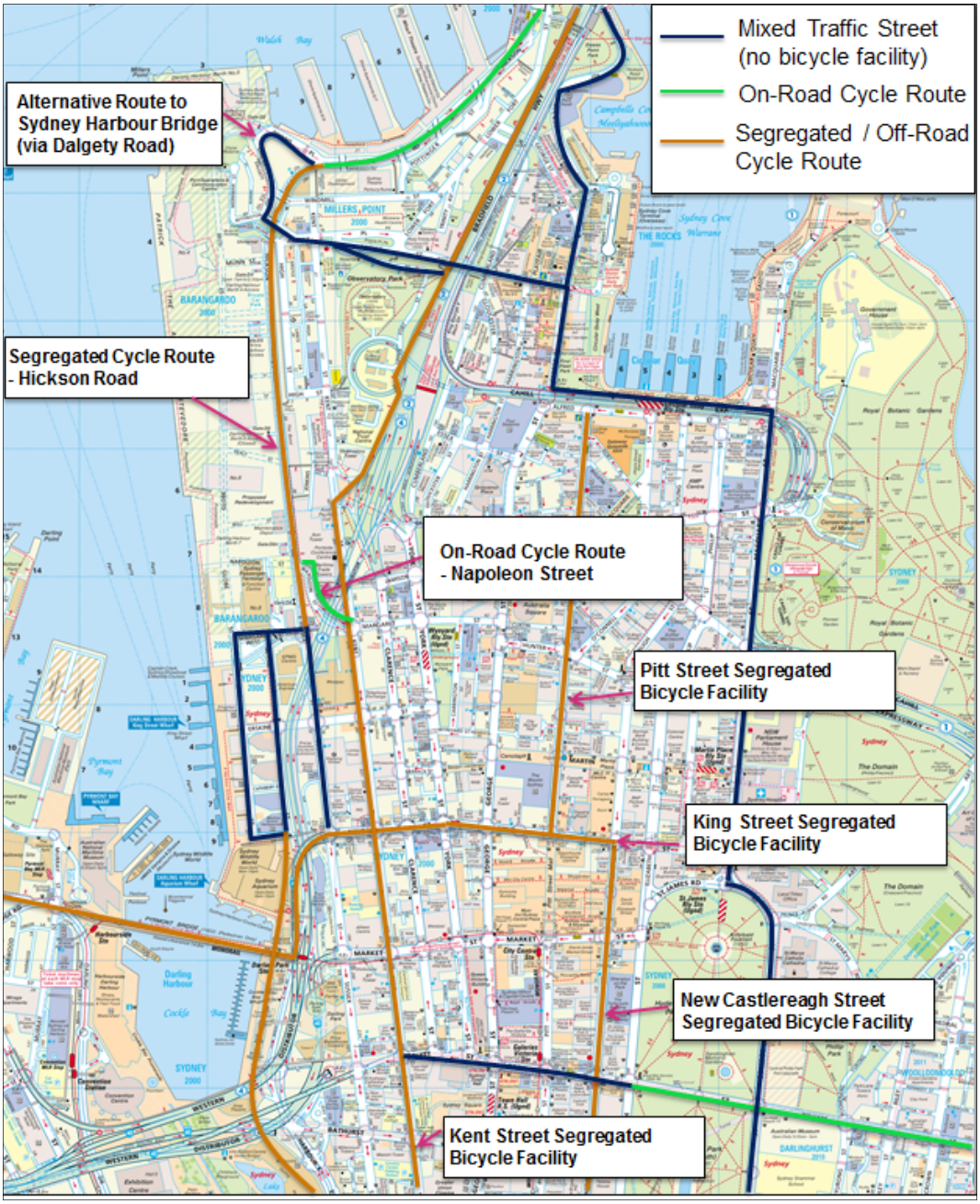


Figure 15 Future Cycleway Network

4.7.2 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.

Given the high level of pedestrian movement, street furniture and retail/café activity on public pedestrian routes through Barangaroo (e.g. Union Walk, City Walk, foreshore promenade), these paths will not be signposted to permit cycling activity. The potential for pedestrian/cycle conflicts is considered too high in these areas to permit cycling movements. To travel through the Barangaroo precinct, cyclists will utilise the public roadways (Globe Street and Lime Street) or dismount from their bikes and walk along the pedestrian routes. These pedestrian routes will be treated like any other footpath in the CBD, for example in Martin Place where cycling is not permitted.

The recommended internal cycle network is outlined in Figure 16.

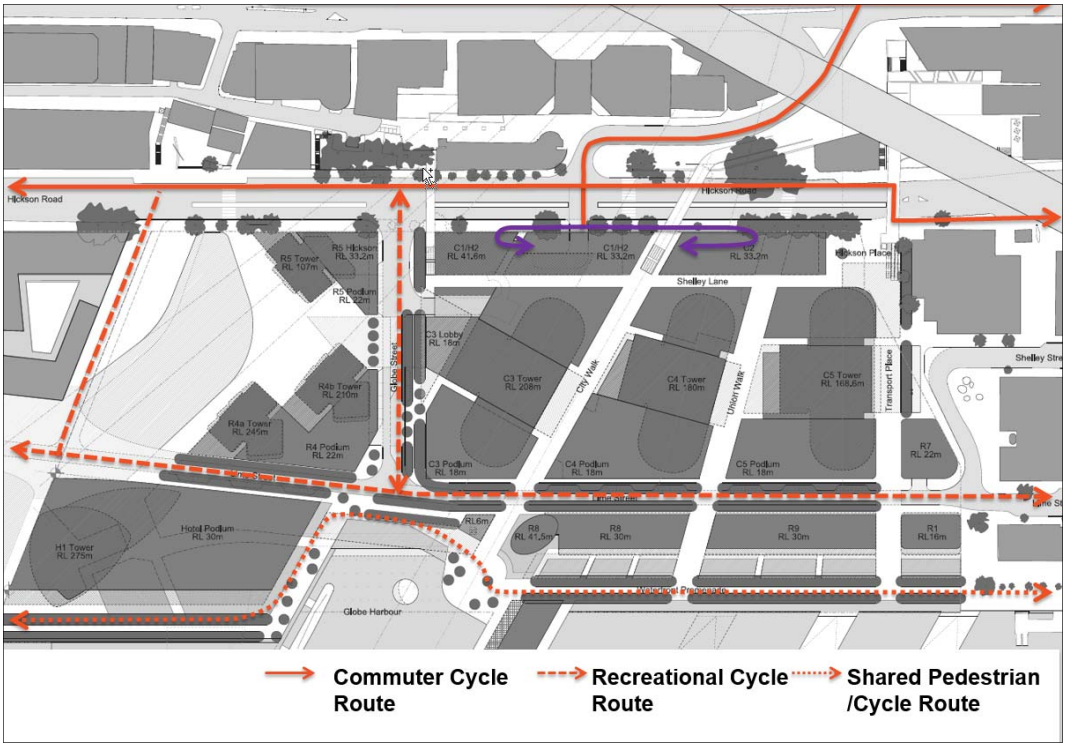


Figure 16 Barangaroo Internal Bicycle Network

4.7.3 Bicycle Parking and End of Trip Facilities

A minimum target of 5% of the commercial building occupants provided with a bicycle parking space has been adopted which aligns with the mode share target of 4% of journey to work by bicycle. Complementary end of trip facilities (e.g. lockers, showers and change rooms) will be provided for staff throughout the development.

Short term visitor bike parking will be available in the permanent public domain adjacent to major buildings. Bicycle parking spaces will be provided in the basement to meet the needs of the buildings tenants.

4.8 Heavy Rail and Metro 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

4.8.1 North West Metro

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

4.8.2 Wynyard Station

A significant number of work trips into Barangaroo 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 2015 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 will start in 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.

4.8.3 North West/South West Rail Link

The NSW Government is committed to building the North West Rail Link and South West Rail Link. Work continues on the projects including:

- Planning for the Rapid Transit System which will connect the 23km distance between Epping and Rouse Hill.
- Construction of the South West Rail Link, which includes 10.5km of twin track between Glenfield and Leppington, two new stations at Edmondson Park and Leppington, car parking and a train stabling facility at Rossmore. The project will be finalised in 2016

These two links are being integrated into the rail system as shown in the plan for operating trains in three tiers as shown in Figure 17

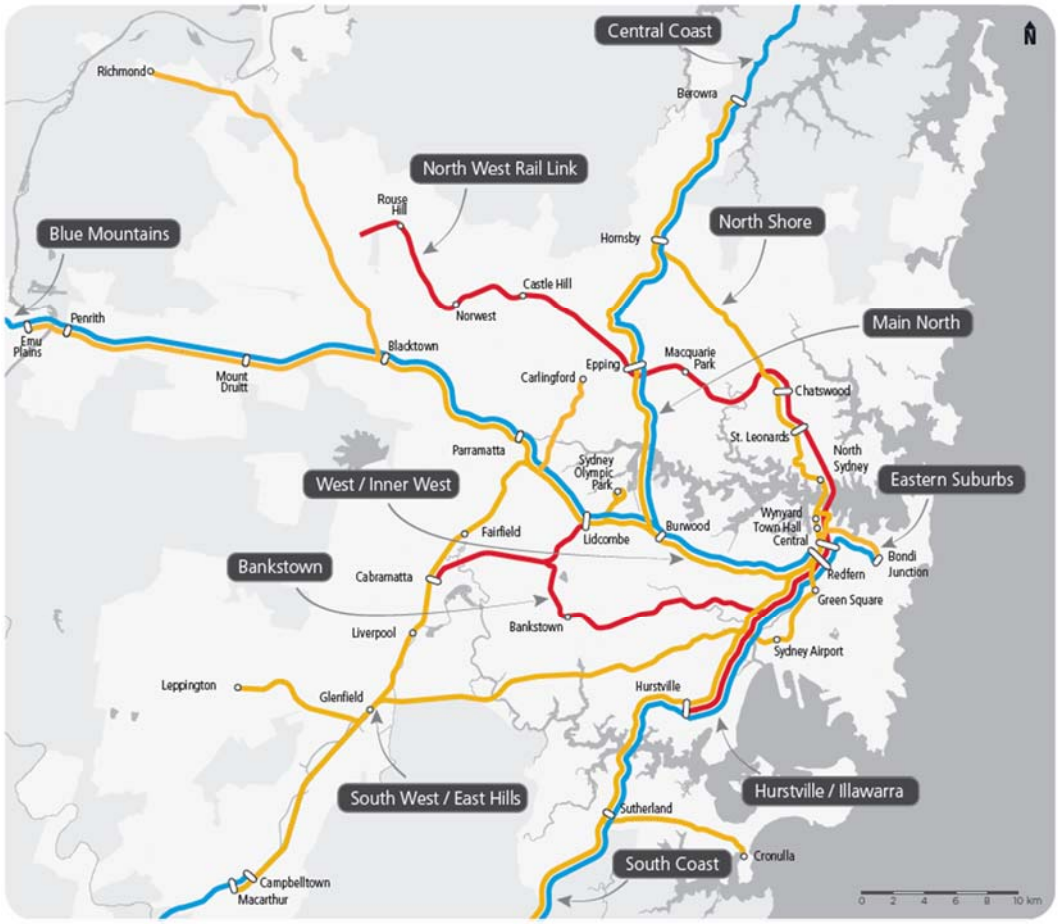


Figure 17 Future Sydney Rail Network

(Source: Sydney's Rail Future, TfNSW June 2012)

The North West Rail Link is planned by the NSW Government to run as a shuttle service between Chatswood and Cudgegong Road in the North West growth sector. The proposed alignment is presented in Figure 18.

Figure 18 North West Rail Link Proposed Alignment

4.8.4 Sydney Rapid Transit

In June 2015 the NSW Government detailed plans to construct a new rapid transit network to deliver more train services across Sydney. The $20 billion dollar investment plan extends the north west rail link (currently under construction) to Chatswood, under Sydney Harbour, through the CBD and on to Bankstown using new trains and fully automated rail system. Train frequencies will increase to every two minutes through CBD stations once completed.

Provision of a rapid transit line through the CBD would relieve pressure at Wynyard Station and provide an alternative public transport option for access to Barangaroo.

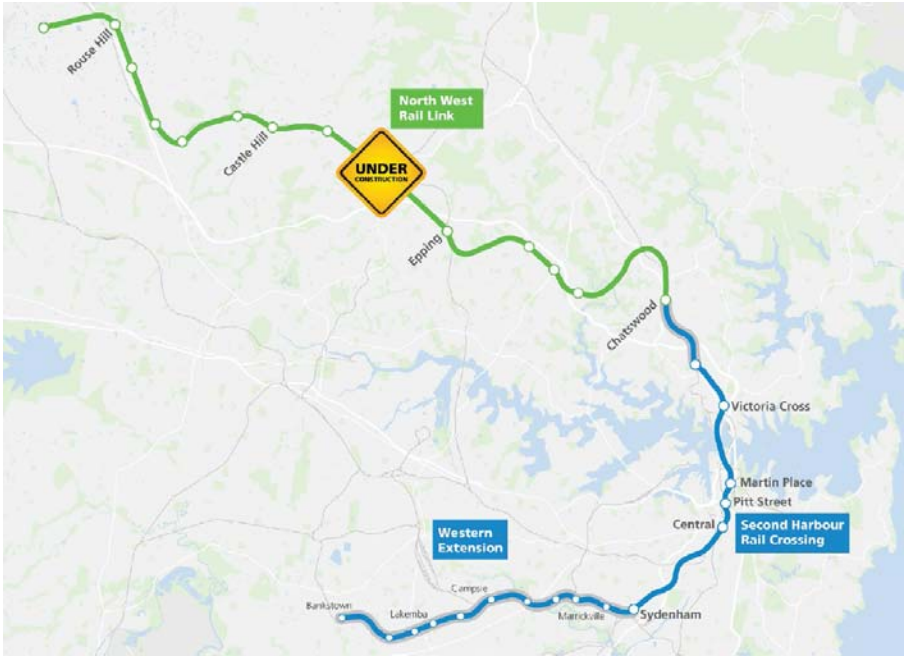


Figure 19 Sydney Rapid Transit Network

4.9 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 20.

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 Barangaroo South and provide good accessibility for commuters and visitors travelling to the precinct. 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.

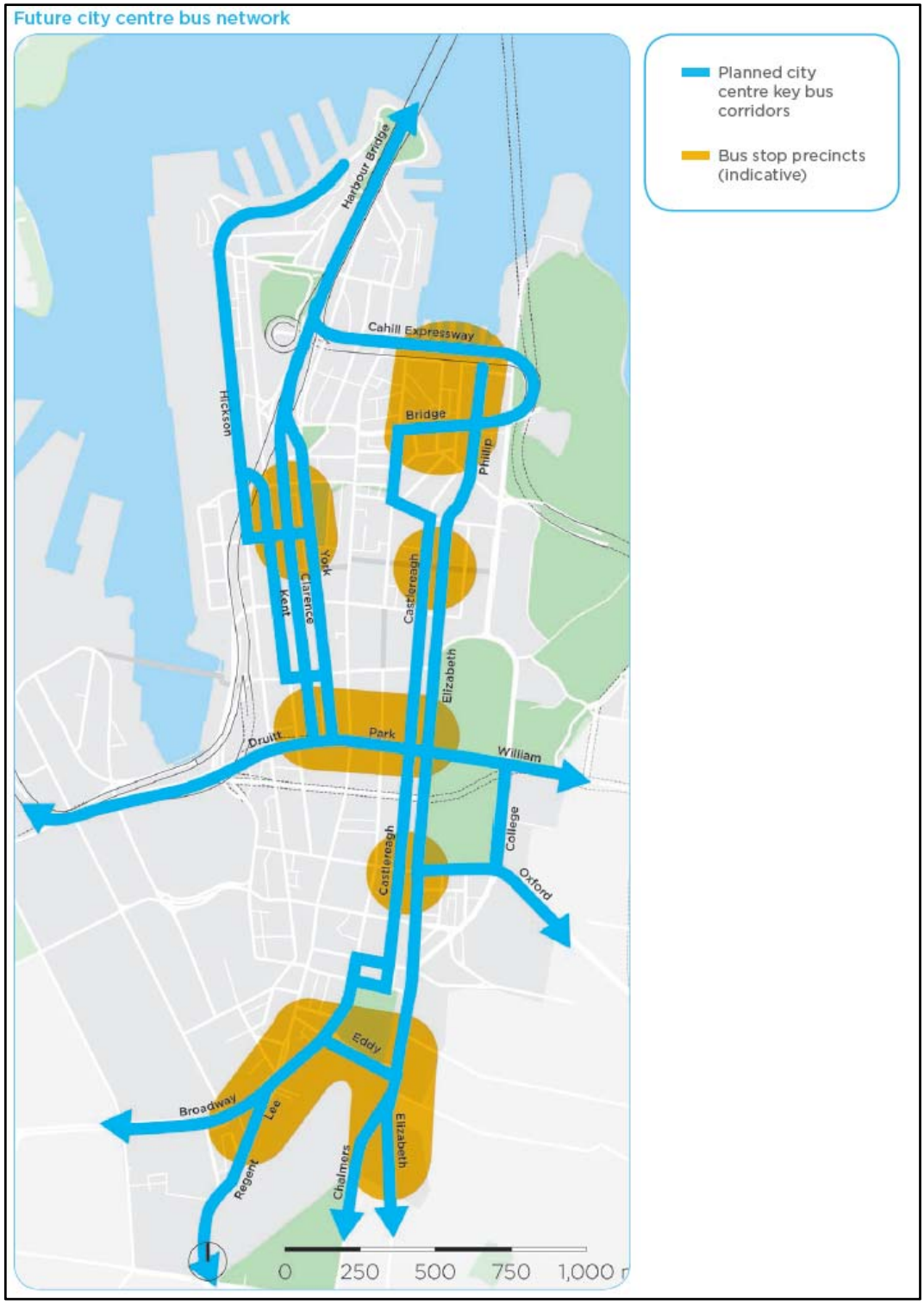


Figure 20 Future City Centre Bus Network

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

The Barangaroo Integrated Transport Plan identifies bus service planning work to accommodate bus patronage access.

Based on existing bus routes, Barangaroo workers and visitors travelling by Bus would mostly walk from Wynyard Bus Interchange, Town Hall, George Street or Elizabeth Street, depending on the origin of their trip. A few existing services terminate closer to Barangaroo, at Millers Point and at King Street Wharf.

There are opportunities to extend some bus services to terminate at Barangaroo, and the potential to introduce a bus service along Hickson Road to link the three parts of Barangaroo with the other foreshore attractions between Darling Harbour and Circular Quay, and to Haymarket to the South.

One aim of such services would be to provide opportunities for those commuters and visitors who are unable to walk from Wynyard or from other bus routes but are able to transfer between buses (for example, about 2,300 Barangaroo workers are forecast to commute by bus by 2024, and a proportion of those will want to transfer to a bus that terminates close to Barangaroo).

4.10 Water Based Transport

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 development of the new Barangaroo ferry wharf will not preclude provision for water taxis within Barangaroo. Planning for this mode of transport is ongoing, however it is envisaged a facility for these vessels would be provided in the vicinity of the southern cove.

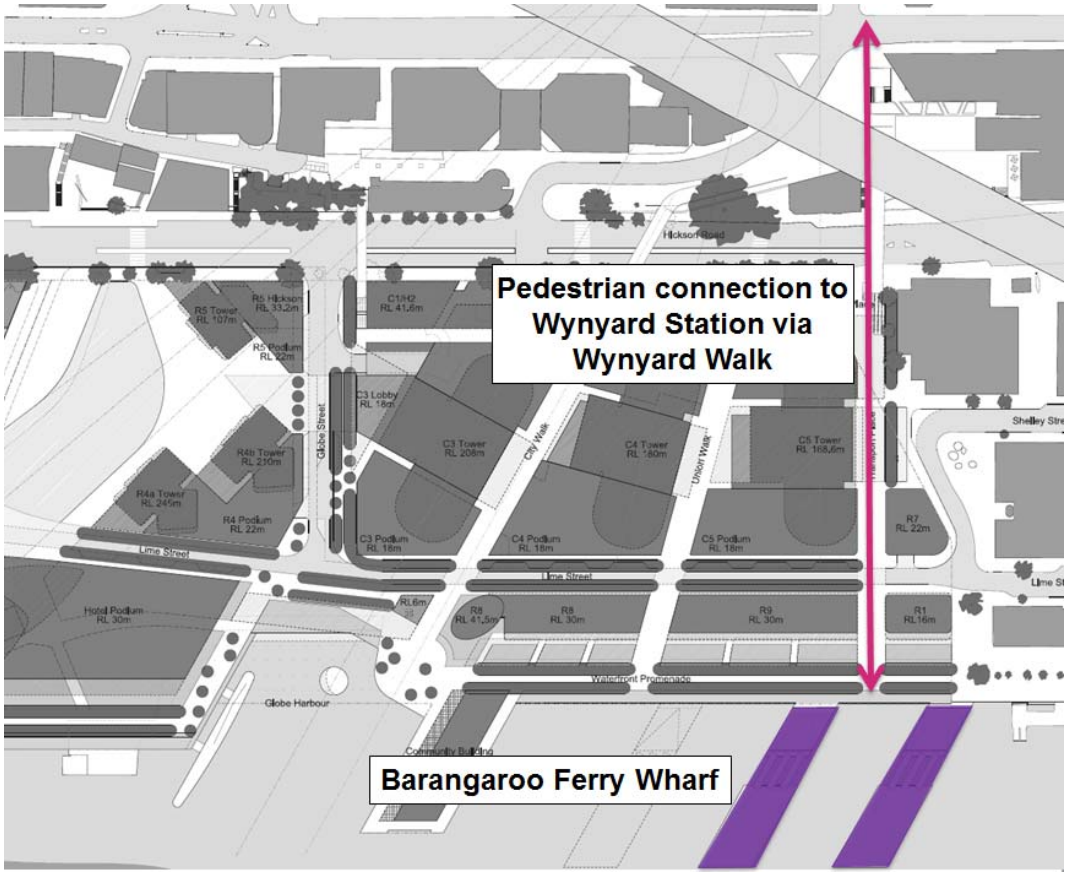


Figure 21 Barangaroo Ferry Wharf

4.11 Coaches

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

4.12 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. It could be expected that public transport patronage to Barangaroo from the inner west would shift mode from bus and rail as a result of these extensions.

4.12.1 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 22. 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 2015.

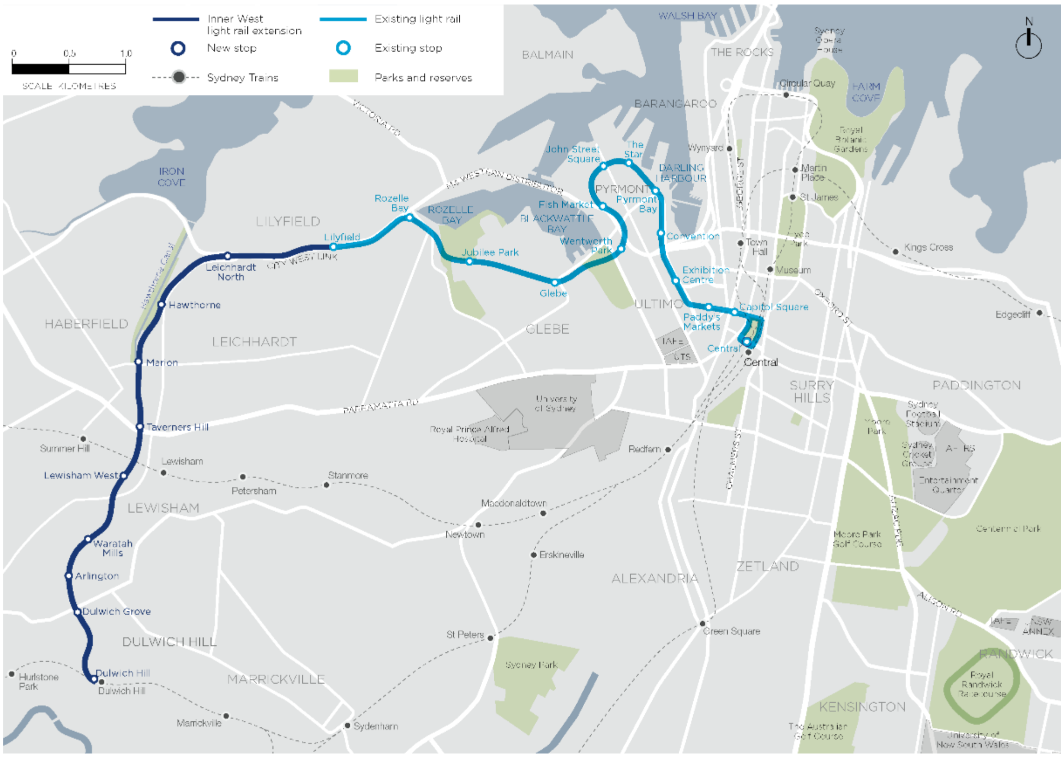


Figure 22 Inner-West Light rail extensions

4.12.2 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 23 CBD and South East Light Rail Route Map

4.13 Taxis

A number of taxi ranks are proposed throughout the Barangaroo South precinct to serve the commercial, resident and visitor population. These will be strategically located to serve major buildings including the hotel, residential buildings and commercial towers, in line with the objectives outlined in the Barangaroo Integrated Transport Plan. Taxis will form an important component of the transport network serving Barangaroo, particularly for tourists and those departing the precinct late at night.

Current planning also allows for taxi ranks at the following locations:

- Western side of Sussex Street, opposite the Sussex Hotel;
- Northern side of Globe Street adjacent to Stage 1B development;
- Northern side of Shelley Street adjacent to Transport Place;
- Eastern side of Lime Street opposite the T2 building; and
- Western side of Lime Street near the hotel.

A summary of the taxi ranks currently planned for Barangaroo South is shown in Figure 24.

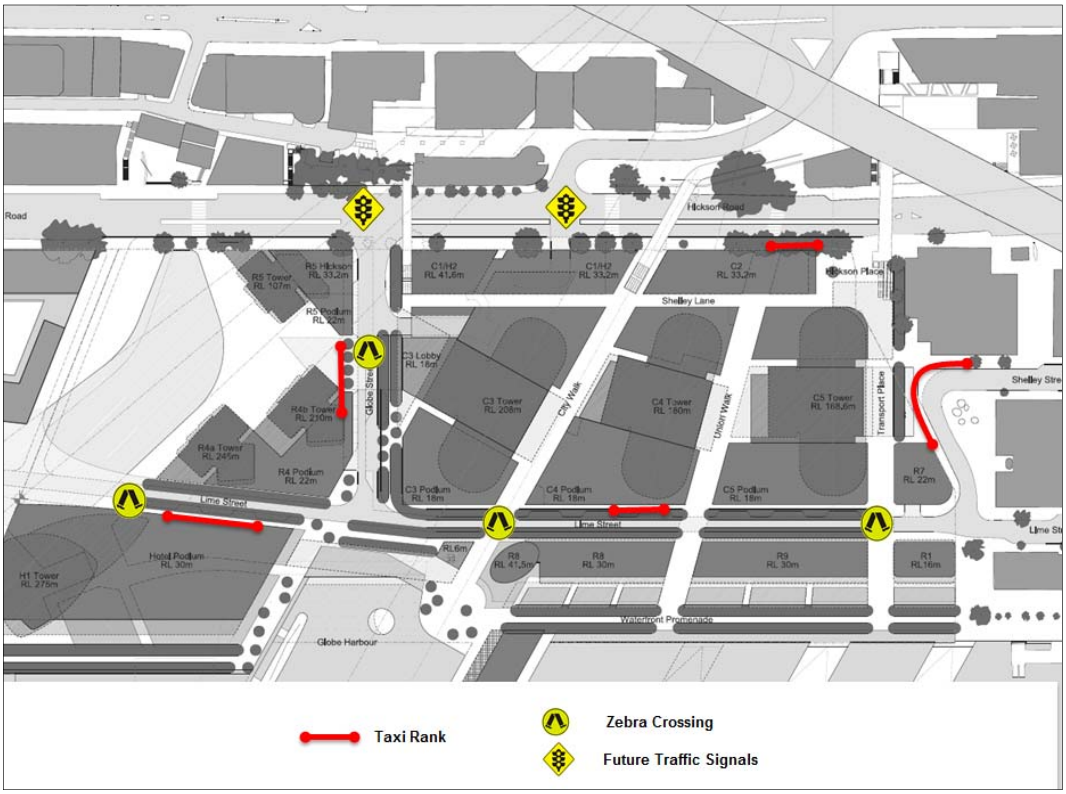


Figure 24 Proposed Taxi Ranks

Note: Indicative only, not to scale

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.

4.14 Late Night Transport Network

Barangaroo is a mixed use precinct 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 Section 4.13. 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.

5 Summary of Requirements

5.1 Transport and Accessibility Framework

The transport and accessibility framework includes: overarching requirements, detailed requirements and timing and funding of relevant infrastructure.

5.2 Overarching Requirements

The main requirement for delivering a good quality transport network at Barangaroo is meeting the mode split target for journey to work trips with a very low private vehicle use of 4% and high use of public transport. The largest challenge will be meeting the 61% base mode share for rail which will require the provision of a safe and efficient pedestrian connection between the site and Wynyard station. This is being delivered through:

- The construction of the Wynyard Walk bridge and tunnel;
- The construction of the City Walk bridge; and
- $100 million upgrade of Wynyard Station to provide additional capacity including upgraded existing and new platform stairs to improve pedestrian circulation and reduce queuing.

5.3 Detailed Requirements

5.3.1 Road Network

- The journey to work mode share targets including the low share for car travel must be implemented;
- The proposed network must provide cohesive connections from Barangaroo to CBD streets and regional roads;
- Signalisation of intersections along Hickson Road at Napoleon Street and Glove Street will provide the primary vehicular access and egress points from Barangaroo South;
- Timely delivery and funding of the required road and intersection upgrades is essential; and
- All proposed road network changes and improvements are subject to approval by the road authority.

5.3.2 Car Parking

- The parking rates adopted in this TMAP based on an assumed land use mix are to be applied;
- On-street parking supply must be short stay only and limited in number; and
- Limited parking is to be provided at Headland Park to cater for leisure and tourist requirements.

5.3.3 Pedestrian Connections

- The main route between Barangaroo and Wynyard Station will be facilitated via the Wynyard Walk – a high quality pedestrian connection which provides direct access to Barangaroo;
- Design and delivery of the Wynyard Walk is to be undertaken by the NSW Government; and
- Other grade separated connections between existing streets and Barangaroo will be implemented, including the City Walk pedestrian bridge.

5.3.4 Rail Services

- Improvements to Wynyard Station are proposed to by the NSW Government to accommodate the significant increase passenger throughput over the short and long term; and
- The construction of the North West Rail Link and South West Rail Link will improve rail access for those travelling to Barangaroo

5.3.5 Bus Services

- The Sydney City Centre Access Strategy outlines a redesigned bus network which improves bus reliability and address congestion and capacity constraints;
- New bus routes will run to Barangaroo and Walsh Bay via the city centre, Napoleon Street and Hickson Road; and
- Bus stops must be provided on Hickson Road to service new bus routes into Barangaroo

5.3.6 Ferry

- The introduction of a new ferry wharf at Barangaroo will improve accessibility via this mode of transport

5.3.7 Cycling

- The delivery of an enhanced cycleway network as outlined in the in the Sydney City Centre Access Strategy will provide improved connectivity to local and regional bicycle routes; and
- The inclusion of facilities for cyclists (e.g. bicycle parking) within the development in Barangaroo will promote travel via this mode.

5.3.8 Light Rail

- Design and delivery of light rail through the CBD and inner west by the NSW Government has the potential to shift mode from bus and rail as a result of these extensions.

5.3.9 Travel Planning

A series of Travel Demand Management Plans for the commercial and residential buildings in Barangaroo South has already been prepared in previous project applications. These plans outline measures that will be encouraged of future tenants to support sustainable modes of travel to Barangaroo and reduce car dependency. A summary of these measures are outlined below.

General Marketing and Promotion

The objectives of the TDMP will only be achieved with the support of building employees. Marketing the benefits and promoting the sustainable alternatives available are therefore crucial in encouraging staff to adopt the TDMP measures. It is important that at an early stage, staff are made aware of the need for the TDMP, and that it is emphasised that the measures are being introduced to support and encourage people to use cars more wisely. In addition to raising general awareness, any successes achieved will be fully publicised to staff in order to motivate them to use sustainable modes of transport.

- A dedicated webpage for employees commercial buildings will be created to include travel information section containing information on cycle parking and useful links to public transport websites specific to the office location.;
- Support and promote events such as National Bike Week, Bike2Work Days, walk to work day to staff through, broadcast messages and intranet.

Reducing The Need To Travel

To ensure that sustainable transport options are promoted to staff when making journeys for work purposes, and to reduce the need to travel, the following measures should be implemented. These measures require implementation by staff members across the building.

- Active promotion of the office teleconferencing facilities as an alternative to face to face meetings. This can be achieved by placing ‘reducing the need to travel’ as an item on internal group meeting agendas;
- Include teleconference meetings as a standard option in client proposals in preference to face to face meetings where practical; and
- Consider a more formal approach to working from home and actively encourage staff to consider this option. Include working from home as an item on the agenda for internal group meetings.

Spreading Travel Demand

Currently the highest travel demand occurs in the peak periods between 7am and 9am and 4pm to 6pm. Public Transport services are in lower demand and road congestion is lower during the inter peak and off peak. Tenants could be encouraged to implement flexible working hours allowing the employees to arrive at work and leave work during the shoulders of the peak e.g. start work at 10am and finish at 6.30 pm or start at 7am and finish at 3.30pm.

Travel During the Working Day

To provide staff with a choice of convenient sustainable transport option for work – related travel during the working day the following initiatives should be promoted:

- Use of the Sydney Trains network to travel to places that are on or near a train line;
- Walk to places that are close by rather than taking the taxi;
- Promotion of the taxi pooling system which would cross check for common destinations and inform the passenger of possible taxi pooling options.

Cycling

In order to activate and promote cycling the following measures should be taken:

- Provide Sydney cycle maps to staff;
- Participate in annual events such as 'Ride to Work Day';
- Provide secure bicycle parking and end of trip facilities for building staff
- Broadcasts in staff areas should have news of events / generic posters promoting cycling;
- Staff who cycle to work should be encouraged to form a Bicycle User Group in order to provide a body of regular cyclists who can discuss issues relating to the provision of on-site cycling facilities and the maintenance of off-site cycle routes; and
- Set up ‘Bike Buddies’ scheme for less confident staff interested in cycling.

Public Transport

To promote the use of public transport work related trips and journeys to/from Barangaroo.

- Create and maintain an intranet ‘Public Transport links page’ containing useful links to journey planning websites in Sydney;
- Consider reimbursing or partially reimbursing staff for journey to work trips made by public transport;
- Consider providing interest-free loans for staff to buy an annual ticket for public transport;
- Provide useful public transport maps and promotional items to potential and current public transport users; and
- Investigate the possibility of purchasing an Opal Card for general use of building staff for business journeys, in lieu of cars and taxis

Walking

Specific Travel Plan measures designed to encourage more walking trips to and from work by those employees living within a reasonable distance.

- Produce walking related articles for inclusion in the office newsletter focussing on ‘walking champions’ to highlight best practise in walking to business meetings;

- Create and maintain an intranet ‘useful walking routes’ containing useful routes to key parts of the Sydney CBD, including public transport terminals at Wynyard, Circular Quay, Martin Place and Town Hall rail stations;
- Participate in Walk to Work day.

Staff Induction

To ensure new members of staff are aware of the Travel Demand Management Plan, all new staff members should be made aware of the Plan as part of their induction process. The TDMP section of the induction should provide new starters with the following:

- A brief introduction to the TDMP and its purpose;
- Tour of the office to include a visit to cycle parking areas and shower and changing facilities; and
- Provision of TDMP information which would include information on incentives to use sustainable means of transport e.g. /taxi share system.

Visitor Travel / Site Access Information

For internal site access information, consider developing an interactive map to show useful walking routes, nearby public transport terminals and popular cycling routes to work, expanded to include additional local information useful to staff such as nearby shops and services or locations for recreational activities

5.4 Delivery and Timing

The various transport initiatives outlined in this strategy will be delivered primarily from government agencies with the exception of the commitments made by Lend Lease under their Project Development Agreement with the Barangaroo Delivery Authority. This is summarised in Table 19 below.

Table 19 Delivery and Timing of Transport Measures

Measure	Description	Responsibility for Delivery	Estimated Timing
Road network modifications	Signalisation of Hickson Road / Napoleon Street	Lend Lease, City of Sydney and BDA	2015
	Signalisation of Hickson Road / Globe Street	Lend Lease, City of Sydney and BDA	Prior to the opening of Stage 1B
Pedestrian connections	Wynyard Walk	TfNSW	2016
	City Walk Bridge	Lend Lease	2015
	Union Walk and City Walk (at-grade routes)	Lend Lease	2015
	Foreshore Walk	BDA	From 2015
Bicycle connections	Hickson Road bi-directional cycleway	BDA and City of Sydney	To be confirmed
	Napoleon Street eastbound cycle lane	BDA and City of Sydney	2015
Bus and coach services	Allocation of space on Hickson Road to accommodate future bus stops	TfNSW, City of Sydney and BDA	2015
	Allocation of kerbside space in vicinity of the hotel for coach set down / pick up	Lend Lease and BDA	To be confirmed
Taxi services	Provision of taxi ranks serving Barangaroo South	Lend Lease and City of Sydney	From 2015
Water based transport	Barangaroo Ferry Hub	TfNSW	2016

6 Conclusions

This Transport Management and Accessibility Plan (TMAP) report supports a modification to Concept Plan (MP06_0162) submitted to the Minister for Planning pursuant to Section 75W of Part 3A of the Environmental Planning and Assessment Act 1979 (EP&A Act). This report addresses the changes that have come about as a result of the proposed floor space modifications as well as any changes to the future public transport plans announced by the NSW Government. The report has considered the transport recommendations and findings of a number of key planning documents relevant to the Barangaroo Precinct, those being:

- Barangaroo Integrated Transport Plan;
- NSW Long Term Transport Masterplan;
- Sydney City Centre Access Strategy

Initial planning approval for Barangaroo South was based on the principle of achieving high usage of public transport, walking and cycling as a method of travel to work, with a target of 4% by car. The mode split targets have been largely retained in this TMAP report, with the exception of ferry trips which has increased to a minimum of 4% of all journey to work trips.
A cumulative traffic analysis has been undertaken which considers the development of the entire Barangaroo precinct - using the same transport principles and assumptions that were used for TMAP September 2008. A corridor traffic model was developed which assessed the future performance of the road nework serving the precinct. The modelling indicated little difference in the road network performance due to the minor traffic increase arising from the Concept Plan modification. Changes in vehicle delays were found to be relatively minor in both the AM and PM commuter peak hours.

Car parking will provided at the same parking ratios as used in TMAP September 2008, excluding for the hotel. Approximately 2,100 car parking bays are envisaged for the residential component of the development - based on an indicative dwelling mix. The quantum of traffic generated by the residential uses is based on the total number of dwellings provided and independent of the number of resident parking bays. The number of on-street parking spaces within Barangaroo has reduced from the 275 envisaged in the TMAP September 2008 to 40 – consistent with the transport planning principles for the precinct.

The Barangaroo precinct will be served by a number of pedestrian and public transport enhancement planned to be delivered in the coming years, including:

- Wynyard Walk pedestrian bridge and tunnel;
- City Walk pedestrian bridge;
- Expansion of the Sydney CBD cycleway network;
- Upgrades to Wynyard Station;
- Introduction of new bus routes to Barangaroo and Walsh Bay via the city centre;
- Provision of new taxi ranks within the Barangaroo precinct;
- Construction of a new ferry hub at Barangaroo; and
- Construction of the CBD and South East Light Rail link;

These improvements will accommodate the future population of the Barangaroo precinct by providing a number of viable (non private vehicle) transport options – meeting the mode split target for journey to work trips by private vehicle of 4%. The works will be delivered primarily from government agencies with the exception of the commitments made by Lend Lease under their Project Development Agreement with the Barangaroo Delivery Authority.

Appendix A

Hotel Traffic and Parking Generation Methodology

A1 Hotel Forecast Traffic Generation

A1.1 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 factors such as public transport availability, availability and cost of parking, mixed use and complementary nature of various land use components and peak traffic generation hours. 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 proposed hotel at Barangaroo South, the most appropriate method to forecast future traffic generation is to refer to development with similar characteristics (e.g. with components of retail, tourist and gaming facilities). The Crown resort in Melbourne was identified as a suitable site.

To facilitate this study, Arup was provided with parking and traffic data by Crown. This included both video surveillance footage and entry/exit data from Crown's car parking areas. This is further described in the sections below.

A1.2 Self-Park Traffic Movements

The methodology undertaking for forecasting the number of self-park traffic movements for the proposed hotel 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 recorded.
- 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 The proposed hotel relative to the total number in Crown Melbourne
- A profile of activity was then generated for the proposed hotel which considered all anticipated self-park arrivals and departures. It should be noted that the data was not moderated to match the anticipated capacity of the hotel basement – which is likely to be lower than that at Crown Melbourne.

Screenshots of the porte-cocheres taken from the surveillance footage are shown in Figure 25 and Figure 26.

Figure 25 Crown Melbourne VIP Gaming Porte-Cochere

Figure 26 Crown Melbourne Hotel Porte-Cochere

The forecast number of self-park arrivals and departures for a typical Friday and Saturday (the busiest days of the week) is shown in Figure 27 and Figure 28. The number of vehicles generated Monday to Thursday are generally significantly lower than those experienced on Fridays on Saturdays.

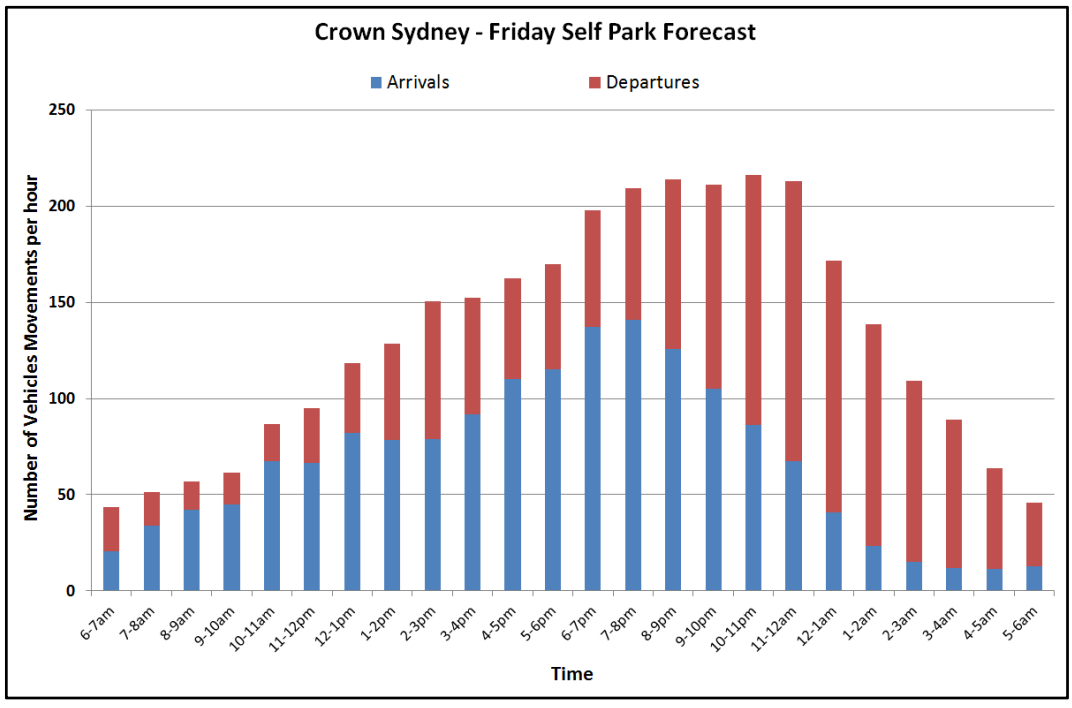


Figure 27 Friday Self-Park Traffic Movements

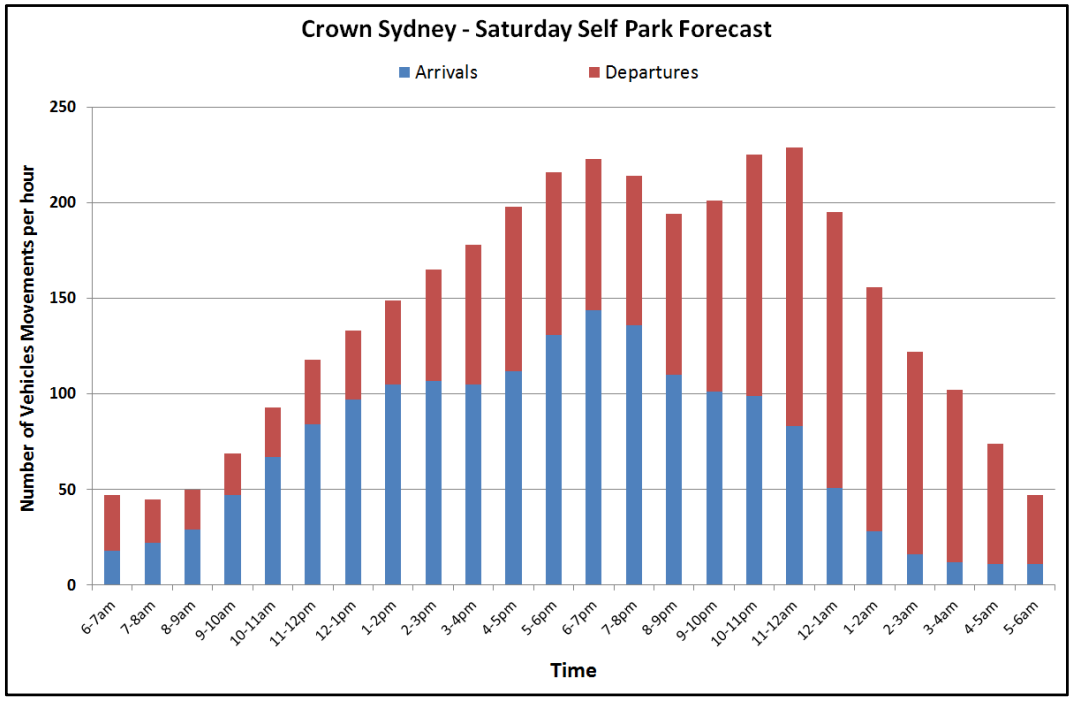


Figure 28 Saturday Self-Park Traffic Movements

A1.3 Valet Movements

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

The forecast number of valet arrivals and departures at the hotel porte-cochere for a typical Friday and Saturday are shown in Figure 29 & Figure 30.

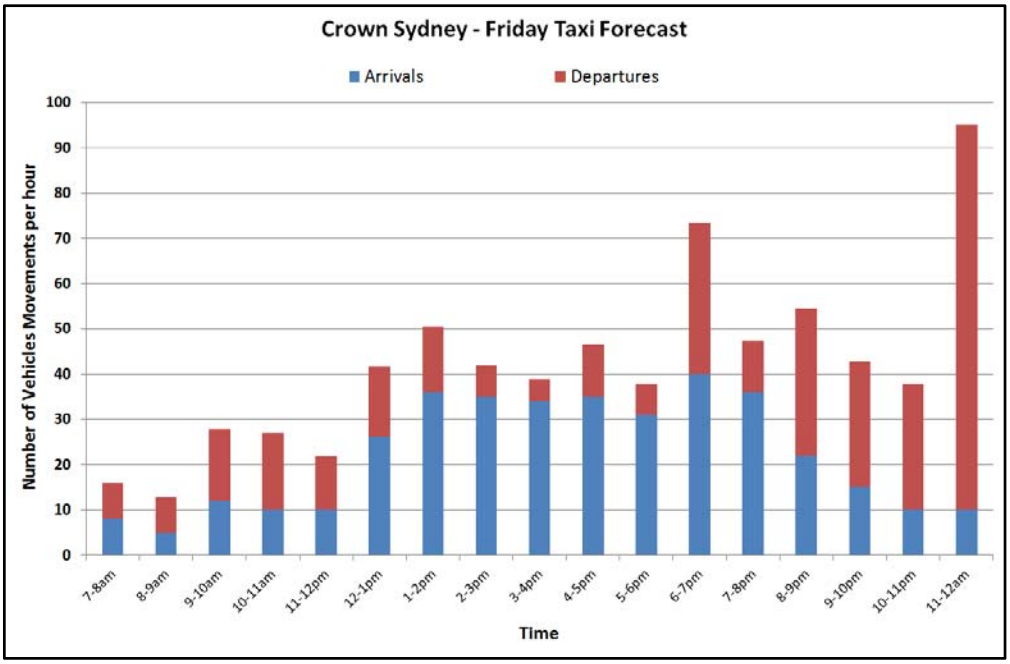


Figure 29 Friday Valet Traffic Movements

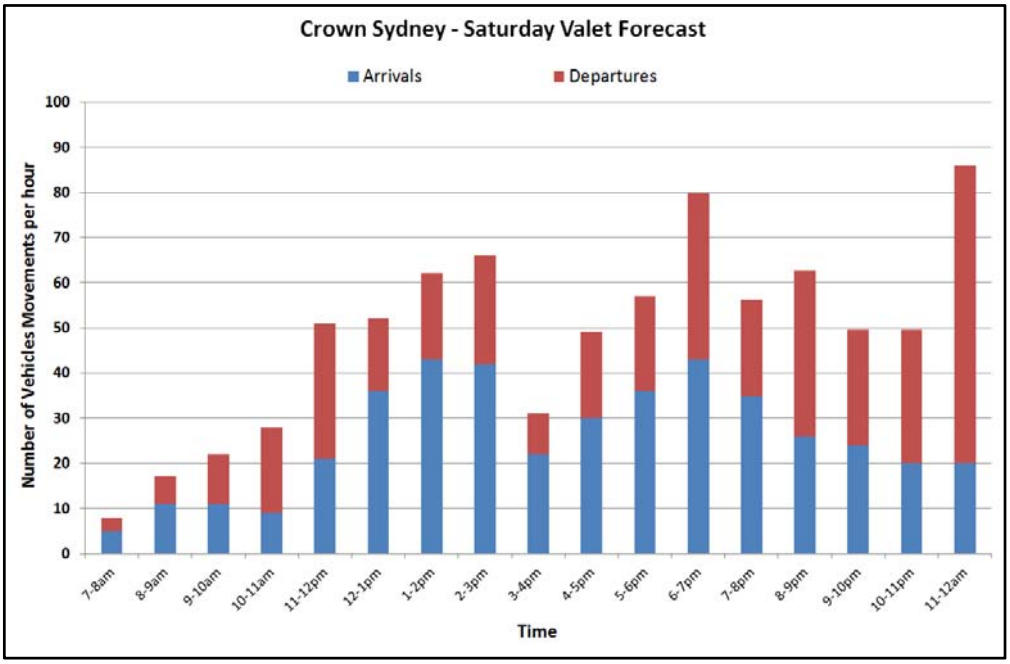


Figure 30 Saturday Valet Traffic Movements

A1.4 Service Vehicle Movements

To estimate the likely level of service vehicles generated by The proposed hotel, 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 31 and Figure 32. 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)

The detailed survey results are provided in Table 20 and Table 21.

Figure 31 Crown Metropol Loading Dock

Figure 32 Crown Promenade Loading Dock

Table 20 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 Vehicle	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 21 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 Vehicle	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%***

Based on these surveys, a revised profile of service vehicle movements for a busy Friday at the proposed hotel has been developed. This has assumed a total of 51 service vehicle movements, in line with that recorded at Crown Promenade. The breakdown of these movements is shown in Table 22 below

Table 22 Hotel Forecast Service Vehicle Movements

Time Period			***Hotel Forecast Service Vehicle Movements***			
			Vans	*Trucks*	*Garbage Vehicles*	**Total**
5:00	to	6:00	0	0	0	0
6:00	to	7:00	3	1	0	4
7:00	to	8:00	2	1	0	3
8:00	to	9:00	3	0	0	3
9:00	to	10:00	2	2	0	4
10:00	to	11:00	0	2	2	4
11:00	to	12:00	3	2	0	5
12:00	to	13:00	0	3	0	3
13:00	to	14:00	6	4	0	10
14:00	to	15:00	5	3	0	8
15:00	to	16:00	3	1	0	4
16:00	to	17:00	2	1	0	3
Total Service Vehicle Movements			**29**	**20**	**2**	**51**
% of Total Movements			**57%**	**39%**	**4%**	**100%**

A1.5 Parking Provision

A1.5.1 Parking for Non-Residential Uses

Based on the anticipated number of arrival and departures into the hotel basement (refer sections A1.2 and A1.3), the total parking demand for the proposed hotel can be estimated. This forecast demand, shown over a peak weekend period, is shown in Figure 33.

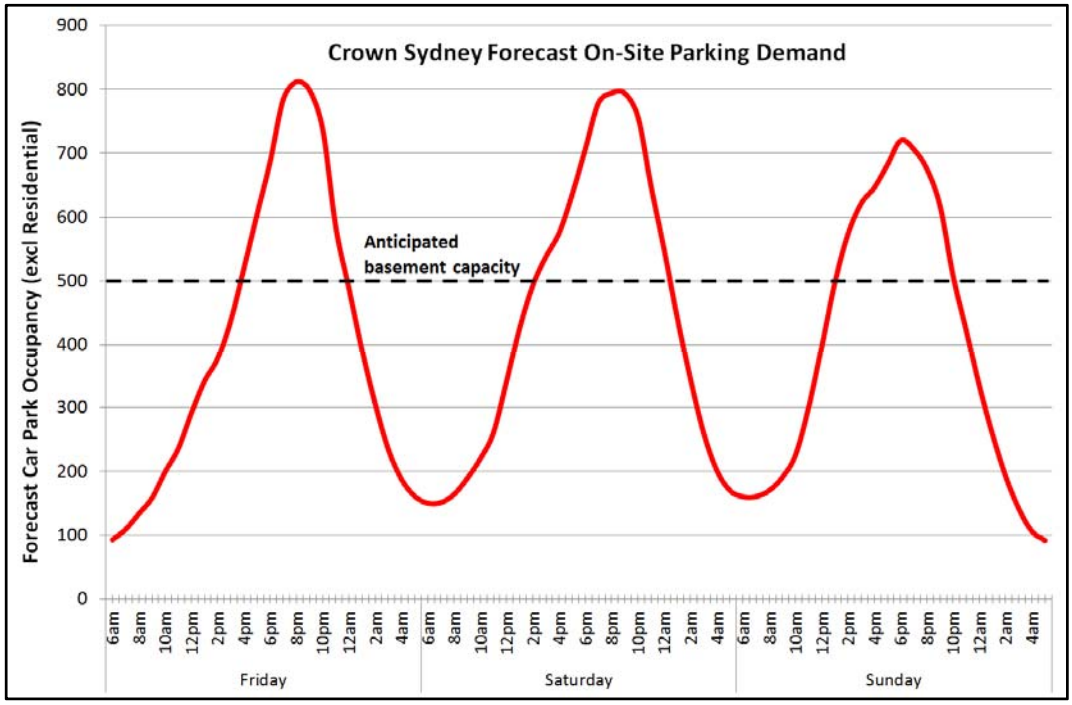


Figure 33 Hotel Forecast Car Parking Demand

This profile demonstrates car parking demand (excluding residential uses) will peak at approximately 800 spaces – above the anticipated 500 spaces to be allocated for non-residential uses. Other off-street car parks in the precinct, such as in the Barangaroo South 1A basement, may be utilised to accommodate the shortfall of approximately 300 spaces during peak periods.

A1.5.2 Parking for Residential Uses

The level of parking for residential uses will be dependent on the final dwelling mix, however will be based on the following maximum car parking rates (consistent with those in Section 4.5 of the main report)

- Studio apartment: 0.25 spaces / unit
- 1 bed apartment: 0.50 spaces / unit
- 2 bed apartment: 1.2 spaces / unit
- 3 bed apartment: 2 spaces / unit

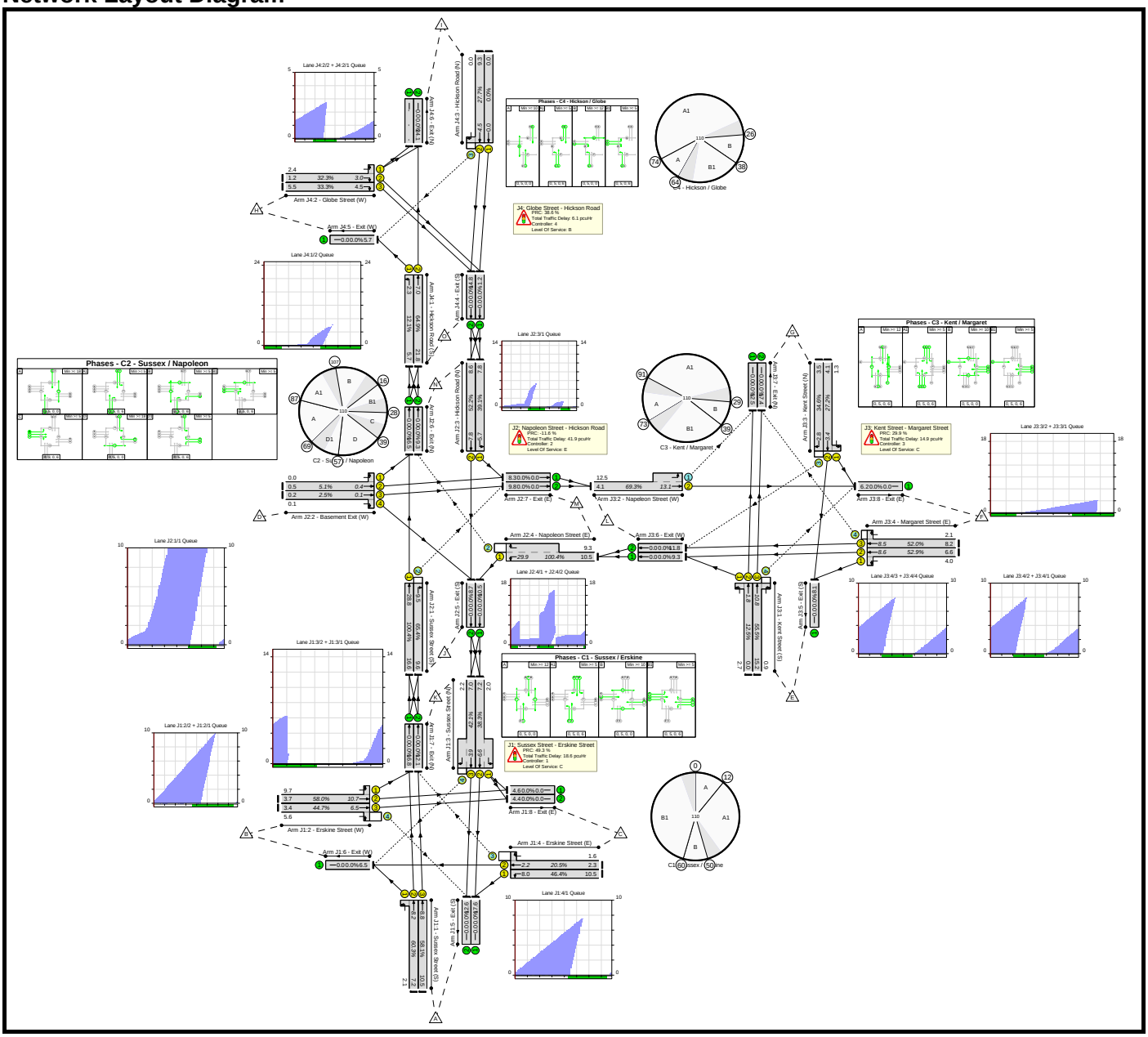
Appendix B

LinSig Traffic Modelling Outputs

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

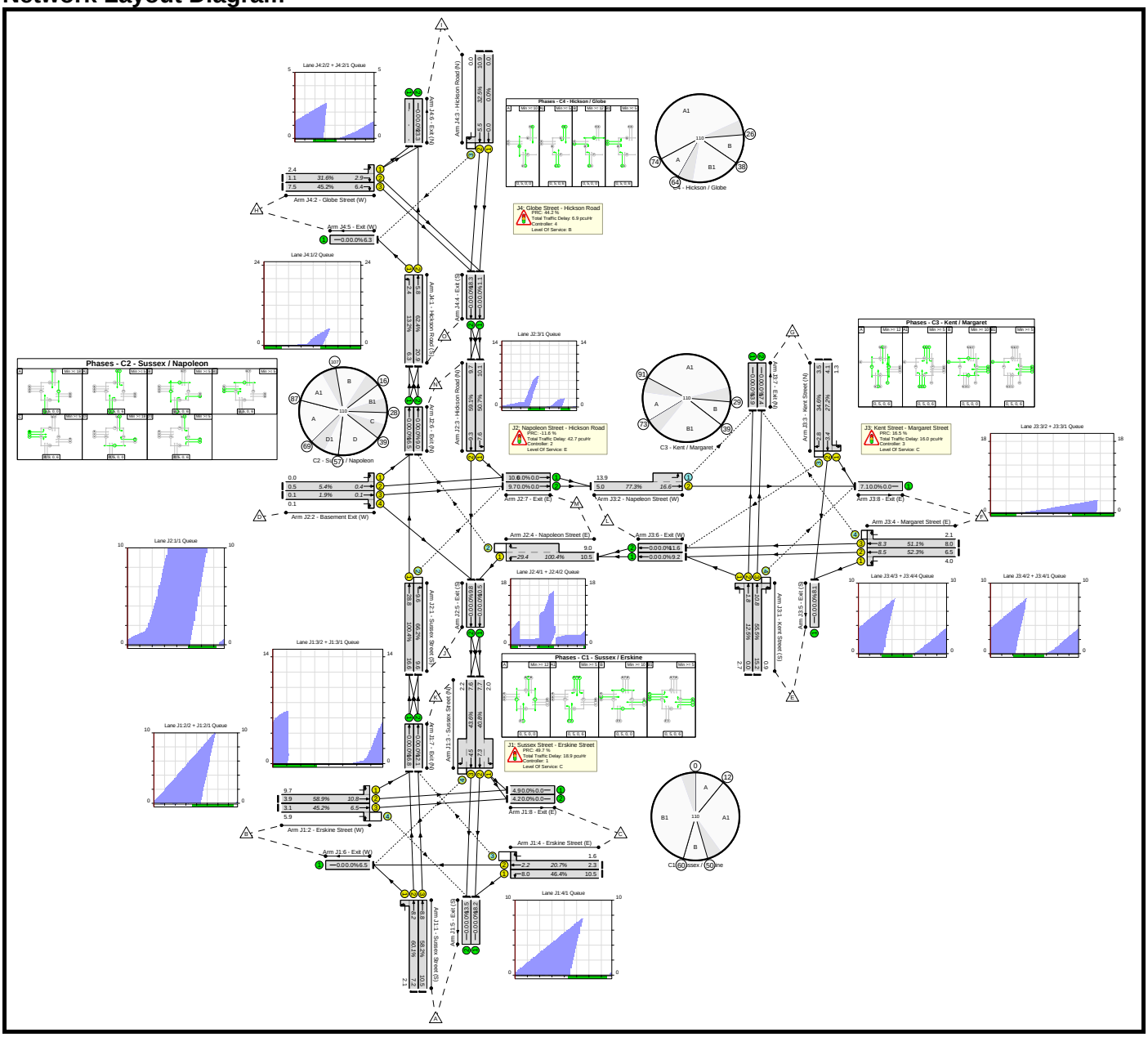
2/2+2/1	Napeleon Street (W) Left Ahead	U+O	69.3%	19.5	544	920:1800	12.0	13.1
3/2+3/1	Kent Street (N) Ahead Left	U	27.2%	19.9	174	1800:920	3.2	3.4
3/3	Kent Street (N) Right	O	34.6%	35.2	116	1800	2.5	2.8
4/2+4/1	Margaret Street (E) Left Ahead	U	52.9%	33.3	348	1800:1800	8.0	8.6
4/3+4/4	Margaret Street (E) 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

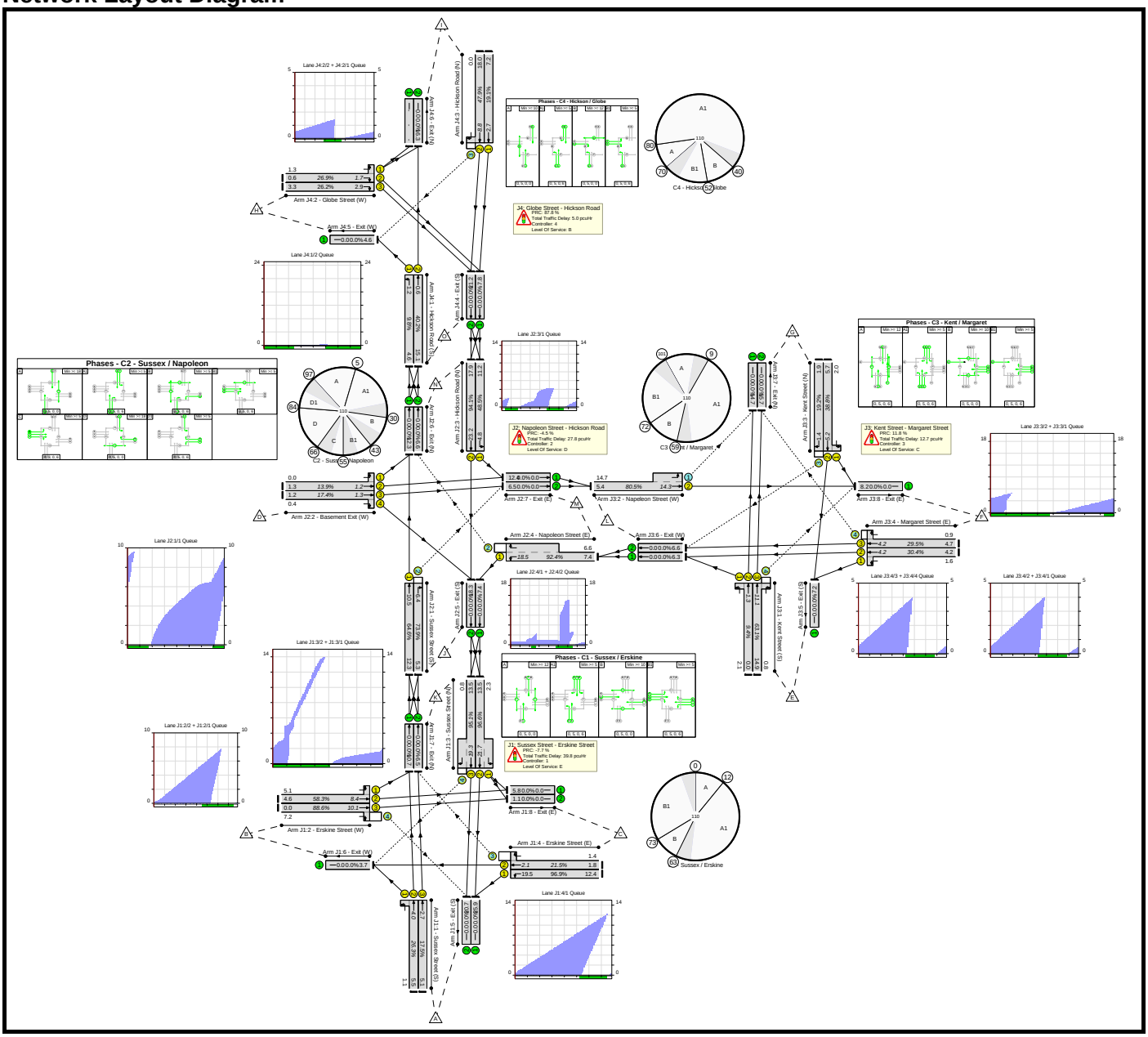
2/2+2/1	Napeleon Street (W) Left Ahead	U+O	77.3%	24.1	619	920:1800	14.9	16.6
3/2+3/1	Kent Street (N) Ahead Left	U	27.2%	19.9	174	1800:920	3.2	3.4
3/3	Kent Street (N) Right	O	34.6%	35.2	116	1800	2.5	2.8
4/2+4/1	Margaret Street (E) Left Ahead	U	52.3%	33.1	344	1800:1800	7.9	8.5
4/3+4/4	Margaret Street (E) 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

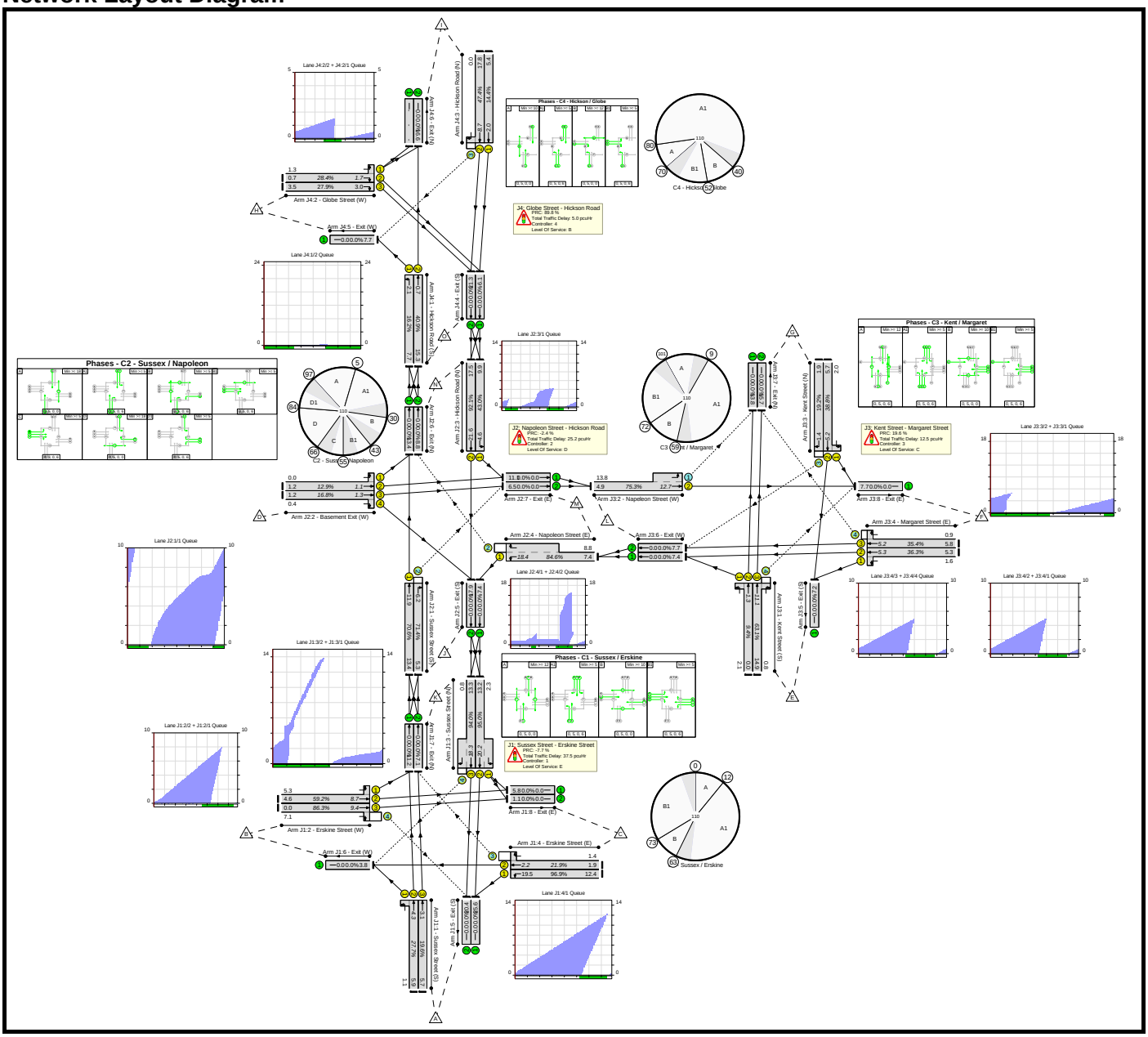
2/2+2/1	Napeleon Street (W) Left Ahead	U+O	80.5%	21.3	658	920:1440	12.3	14.3
3/2+3/1	Kent Street (N) Ahead Left	U	38.8%	22.3	251	1800:920	4.9	5.2
3/3	Kent Street (N) Right	O	19.2%	33.4	62	1800	1.3	1.4
4/2+4/1	Margaret Street (E) Left Ahead	U	30.4%	30.7	189	1800:1800	4.0	4.2
4/3+4/4	Margaret Street (E) 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	