Crown Resorts Limited

Stage 1C Remediation and Earthworks

Construction Traffic Management Plan

002

Rev A | 17 June 2015

Job number 234183

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1 Introduction

This report has been prepared by Arup for Crown Resorts Limited ('Crown') to accompany a State Significant Development Application (SSDA) for remediation and earthworks at Barangaroo South.

1.1 Site location and context

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

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

1.2 Stage 1C remediation and earthworks

The works that are the subject of the SSDA are termed the Stage 1C remediation and earthworks.

The land which is the subject of the Stage 1C remediation and earthworks SSDA is located in the north-western corner of Barangaroo South. With reference to the Barangaroo 'development blocks', as identified within the approved Concept Plan Urban Design Controls (MP06_0162 MOD 6), the Stage 1C remediation and earthworks area is located to the west of Blocks 4A, 4B and 4C and incorporates part of Globe Harbour.

The Stage 1C remediation and earthworks are described as follows:

- carrying out of remediation and validation within the Stage 1C remediation and earthworks area to ensure it is suitable for the intended future uses of the land;
- construction of a perimeter retention wall system and internal stabilising walls (called the 'Stage 1C groundwater retention wall system') to the west of Block 4B and Block 4C. The Stage 1C groundwater retention wall system would be fully integrated with the Stage 1B retention wall system (as specified by Lend Lease in the EIS for SSD 5897-2013), with direct connections to create a unified groundwater retention wall system across Stage 1B and Stage 1C; and
- bulk excavation within the perimeter of the Stage 1C groundwater retention wall, and the installation of lateral restraining structures to support the perimeter retention wall system.

1.3 Scope of the Report

This report assesses the forecast construction traffic generated during all stages of the development of the site and its likely impact to the road network, as well as pedestrian safety and amenity issues during the construction of the subject development. It assesses the cumulative traffic impacts associated with Stage 1C remediation and earthworks and the following surrounding construction works:

Works directly related to Barangaroo South

- Basement Construction
- T2 Commercial Building
- T1 Commercial Building
- T3 Commercial Building
- C2 Commercial Building
- R8/R9 Residential Buildings
- Concrete Batch Plant Operation
- Block 4 Remediation
- Block 5 Remediation
- City Walk Bridge
- R1 Building
- R7 Building

Works external to Barangaroo South

- Wynyard Walk
- Headland Park and Northern Cove
- Barangaroo Central – Waterfront Promenade and Interim Public Domain Works
- Barangaroo Ferry Wharf

With respect to construction work external to Barangaroo South, assumptions have been made regarding expected vehicular activity based on documents submitted as part of the planning applications for each of these works.

These works will be assessed in an updated construction traffic management plan when more certainty surrounding their expected start date and level of construction activity is known.

1.4 Study Objectives

Specific issues addressed in the report include:

- Estimate construction related traffic generation and its anticipated route to and from the site;
- Determine the impact of the construction traffic on the existing road network;
- Assess the pedestrian safety along the site boundary and at the work site vehicular entry and exit points;
- Assess any potential traffic conflicts with car, bus and other vehicles; and
- Address provisions for pedestrians during construction works.

2 Existing Traffic Conditions

2.1 Road Network

Hickson Road is a wide road corridor that runs along the western side of Sydney CBD, and bounds the east of the construction site. The Sussex Street section continues south from Napoleon Street to Hay Street. It is two-way north of King Street and one way southbound, south of King Street. Hickson Road forms the northern extension of Sussex Street and continues north from Napoleon Street to George Street at Dawes Point.

Napoleon Street provides a connection between Hickson Road and Kent Street / Margaret Street. It is a relatively wide road and has moderate downward slope from Kent Street to Hickson Road.

Shelley Street provides a connection between Sussex Street (to the north) and Erskine Street (to the south). Shelley Street also forms a northbound connection from Harbour Street. Construction works are currently taking place on Shelley Street opposite Lime Street, temporarily closing the connection to Sussex Street to vehicular traffic.

Lime Street is located south of the construction site in a north-south direction and currently provides limited local access from priority controlled Erskine Street.

2.2 Pedestrian Conditions

There are a number of existing dedicated pedestrian facilities adjacent to the Barangaroo South site, including:

- Signal controlled pedestrian crossings across all three approaches of the Napoleon Street / Kent Street / Margaret Street intersection
- Signal controlled pedestrian crossings across all three approaches of the Sussex Street / Shelley Street intersection
- A pedestrian refuge across Napoleon Street at Hickson Road which provides a dedicated two-staged crossing
- A zebra crossing on Hickson Road north of Napoleon Street
- Adequate footpaths on both sides of Hickson Road and Napoleon Street

2.3 Traffic Volumes

Traffic counts were undertaken in the Barangaroo precinct in July 2013 and are presented in Table 1. These counts were compared with those undertaken by AECOM in November 2011 over the same time period.

The traffic volumes on Hickson Road and Sussex Street progressively increase towards the south as vehicles join this southbound route on the western side of the city. This is particularly evident in the PM peak, when Sussex Street is utilised as a major departure route from the city to the Western Distributor-Anzac Bridge and routes further south and east.

Table 1: Hickson Road / Sussex Traffic Volumes

Traffic Count Date	Road	Location	AM Peak (8am – 9am)			PM Peak (5pm – 6pm)		
			NB	SB	Total	NB	SB	Total
Nov 2011	Hickson Road	North of Napoleon Street	647	250	897	469	659	1,128
Jul 2013			601	254	855	380	606	986
% Change from 2011 to 2013			*-7%*	*+2%*	*-5%*	*-19%*	*-8%*	*-13%*
Nov 2011	Sussex Street	North of Shelley Street	1,101	705	1,806	747	805	1,552
Jul 2013			926	556	1,482	569	714	1,283
% Change from 2011 to 2013			*-16%*	*-21%*	*-18%*	*-24%*	*-11%*	*-17%*
Nov 2011	Sussex Street	North of Erskine Street	628	619	1,247	479	808	1,287
Jul 2013			650	518	1168	409	845	1,254
% Change from 2011 to 2013			*+4%*	*-16%*	*-6%*	*-15%*	*+5%*	*-3%*
Nov 2011	Sussex Street	North of King Street	597	1,005	1,602	294	1,223	1,517
Jul 2013			578	907	1,485	316	1,364	1,680
% Change from 2011 to 2013			*-3%*	*-10%*	*-7%*	*+7%*	*+12%*	*+11%*

Source: Arup traffic surveys 25 July 2013, AECOM traffic surveys 8th November 2011

It should be noted that both surveys were conducted on a typical Thursday outside of school holiday periods, and are therefore representative of traffic volumes in the precinct. Key points to emerge from the recent traffic surveys include:

- North of Napoleon Street adjacent to the main Barangaroo site access point, traffic volumes have decreased on average by 10% since the November 2011 counts over both the AM and PM peak hours
- On Sussex Street between Napoleon Street and Shelley Street, there has been a significant reduction in traffic during both the AM and PM peak hours since the November 2011 counts. This may possibly be the result drivers avoiding the road works on Shelley Street and Sussex Street being carried out during the July 2013 count.

The existing morning and afternoon peak hour intersection traffic volumes from the July 2013 traffic surveys are illustrated in Figure 1 and Figure 2.

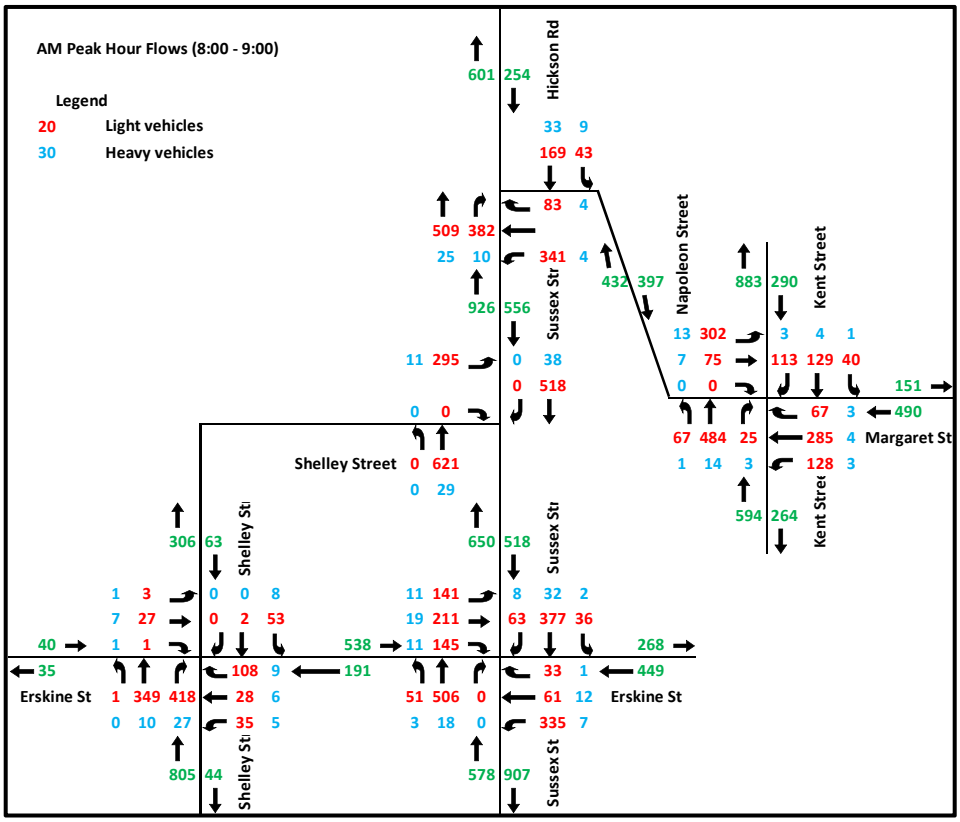


Figure 1: AM Peak Hour Traffic Flows, July 2013

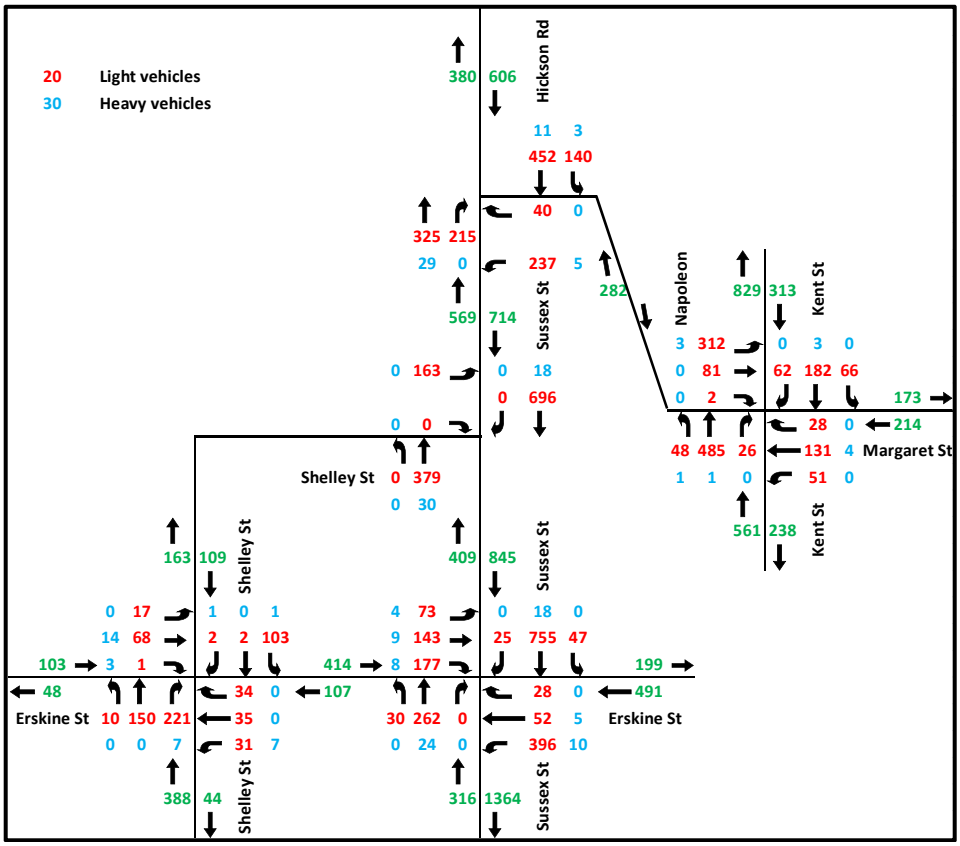


Figure 2: PM Peak Hour Traffic Flows, July 2013

2.4 Existing Road Network Constraints

The key constraint on the road network in the Barangaroo precinct is the queuing that forms in the PM peak period on Sussex Street. This is a result of more congested traffic operating conditions in the vicinity of the cross traffic movements at the King Street and Market Street intersections. As shown below in Figure 3 below, vehicle queues after 5pm can extend back beyond the Hickson Road / Napoleon Street intersection.

Figure 3: Typical Southbound Queue on Sussex Street – PM Peak

A further issue identified on the existing road network is the queue of vehicles that can form on Sussex Street turning right into Napoleon Street during the AM peak hour. Recent traffic surveys demonstrates approximately 400 vehicles undertook this movement between 8am and 9am. However given the relatively low flow of southbound traffic on Hickson Road during this time, as well as the good available sight distance, sufficient and frequent gaps exists for vehicles to turn right into Napoleon Street. This allows the queue to clear quickly.

2.5 Existing Construction Activity

Construction works on the Barangaroo South site commenced in late 2011, with construction of the C4 and C5 buildings well underway as of March 2014. Piling works are being completed to the C3 building area to facilitate commencement of slab on ground commencement.

Stormwater works to Lime Street are progressing with sheet pile installation to follow. Stormwater works are also being completed to Hickson Road (south) to facilitate works progressing further north and returning to Napoleon Street.

The number of construction vehicles generated by the site, over the course of a typical weekday in July 2013, is shown in Figure 4 below.

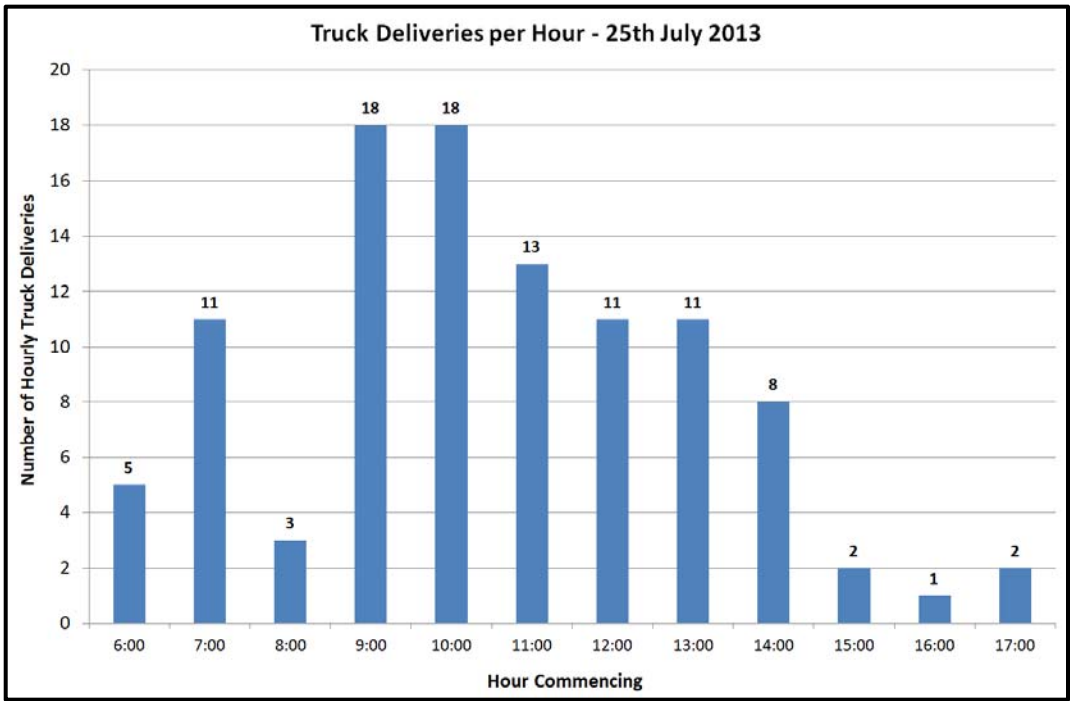


Figure 4: Existing Construction Activity for Barangaroo South

Source: Lend Lease Buildings, July 2013

This existing profile demonstrates the majority of vehicle activity takes place outside the commuter peak hours of 8am-9am and 5pm-6pm. Most notably, construction activity dissipates significantly after 3pm, with only 5% of the day's total trucks arriving after this time. 2 truck deliveries were recorded during the PM peak hour of 5pm – 6pm, equating to 2% of the daily vehicle activity.

This shows that the construction activity generated by Barangaroo South has a relatively minor impact on the operation of nearby intersections during the critical PM peak period (4pm-7pm).

3 Construction Program

3.1 Barangaroo South Works

Table 2 below outlines the concurrent developments within the Barangaroo South site, noting the start and finish dates by annual quarters.

Table 2: Construction Details of Barangaroo South Works

Project	**Project Duration***		**Overlaps with Stage 1C works**
	Start	***Finish***	
Stage 1a Basement Construction	Oct 2011	Sept 2015	✗
C3 Commercial Building	Mar 2014	Sept 2016	✓
C4 Commercial Building	May 2013	Oct 2015	✓
C5 Commercial Building	Oct 2013	Apr 2016	✓
C2 Commercial Building	Jul 2015	Sep 2016	✓
R8/R9 Residential Buildings	Jun 2014	Nov 2015	✓
Batch Plant Operation	Sept 2013	Sept 2015	✓
Block 4 Remediation Works	Aug 2015	Mar 2017	✓
Block 5 Remediation Works	Nov 2015	Oct 2017	✓
Stage 1a Public Domain Works	Jul 2014	Mar 2016	✓
City Walk Link Bridge	Oct 2014	Jun 2015	✗
Building R1	Sep 2015	Jun 2016	✓
Building R7	Jul 2015	Apr 2016	✓
Stage 1C remediation works	Sep 2015	Apr 2017	✓
Crown Sydney	Feb 2017	Nov 2019	✓
Hickson Road Remediation	Jun 2016	Jul 2018	✓
Stage 1B development (basement and towers)	Dec 2016	Feb 2022	✓

** The above dates are indicative only and allow for future tenant fit out works within the individual buildings*

^ Use of the Concrete batch plant may be extended to June 2018 to support the construction of Barangaroo Stage 1B development

3.2 Works External to Barangaroo South

The construction staging for works external to the Barangaroo South site are outlined in Table 3 below. This table includes only projects where truck movements are envisaged for the direct Barangaroo precinct – i.e. Hickson Road and Sussex Street and internal access roads.

Table 3: Construction Details of Works Adjacent to Barangaroo South

Project	**Project Duration**		**Overlaps with Stage 1C works**
	Start	***Finish***	
Wynyard Walk Bridge	Apr 2013	Sep 2015	✗
Headland Park Main Works	Apr 2013	Jul 2015	✗
Barangaroo Ferry Wharf	Aug 2015	Aug 2016	✓
Barangaroo Central – Waterfront Promenade	Mar 2014	Jul 2015	✗

4 Construction Traffic Movements

4.1 Overall Principles

The overall construction traffic management principles will be to ensure:

- Construction access driveways are designed to allow trucks to enter and leave the site in a forward direction;
- Construction access driveways are managed and controlled by site personnel;
- Safety for works and the public in the vicinity of the worksite is maintained;
- Designated truck routes for all access points are developed which minimises the impacts on the local road network;
- A safe, convenient and appropriate environment is established for pedestrians and cyclists at all times; and
- Appropriate capacity for pedestrians along the Hickson Road footpath is maintained

4.2 Traffic Routes

The predominant traffic routes that construction vehicles utilise to Barangaroo and the Stage 1C construction site are presented in Figure 5 and Figure 6 on the following pages, and summarised below.

From the north and north-west:

- Harbour Bridge – Western Distributor – Bathurst Street – Liverpool Street – Harbour Street – Shelley Street – Erskine Street – Sussex Street (inbound); and
- Hickson Road – Napoleon Street – Kent Street – Western Distributor – Harbour Bridge (outbound)

This southbound truck activity would occur during peak hours as there is no access for general traffic from the Harbour Bridge to York Street between 6.30am – 9.30am (Monday – Friday).

From the west and south-west:

- Anzac Bridge – Western Distributor – Sussex Street – Hickson Road (inbound); and
- Hickson Road – Sussex Street – Western Distributor – Anzac Bridge (outbound)

From the south and east:

- Eastern Distributor – Cross City Tunnel – Western Distributor – Wattle Street – Western Distributor – Sussex Street – Hickson Road (inbound); and
- Sussex Street – Harbour Street – Cross City Tunnel (outbound)

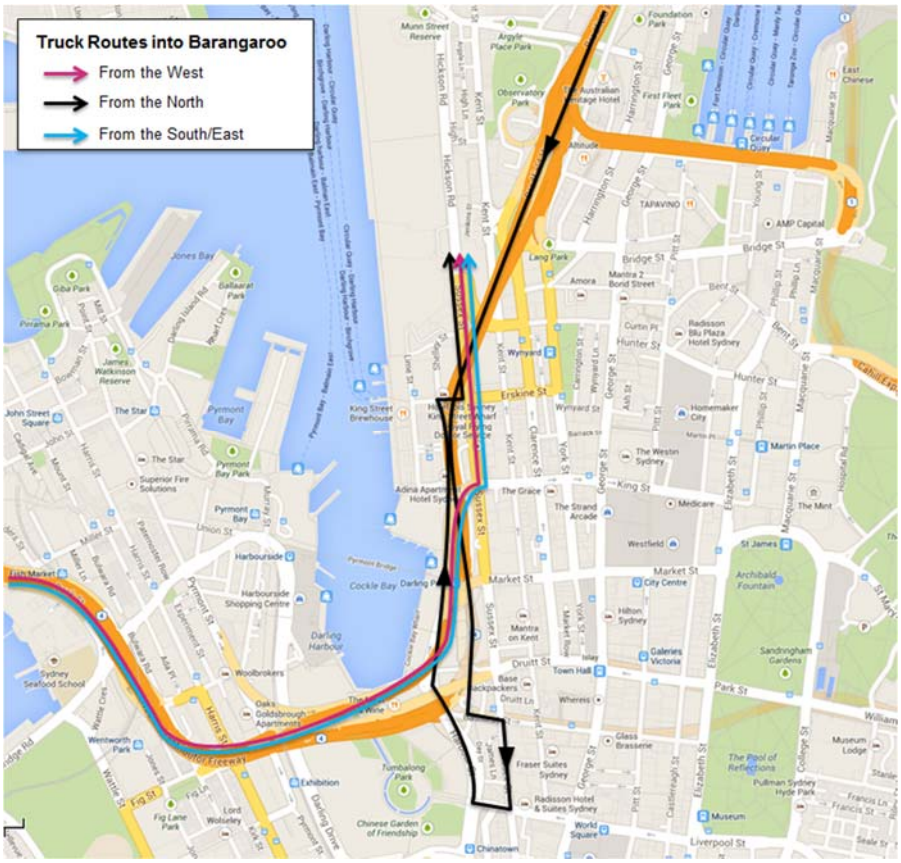


Figure 5: Inbound Traffic Routes to Barangaroo

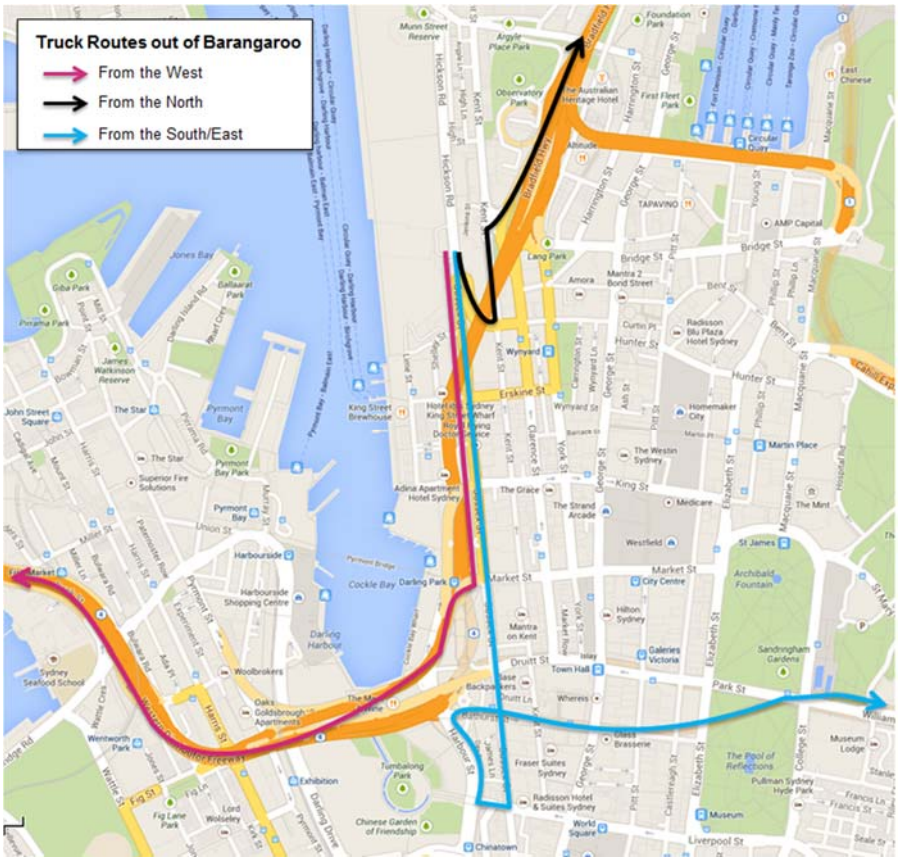


Figure 6: Outbound Traffic Routes from Barangaroo

4.3 Forecast Traffic Activity

An assessment has been made of the cumulative impacts of construction activities in the precinct, based on the works described in Section 3 of this report.

The proposed construction timeframe for the Stage 1C remediation and earthworks will extend into the period of the occupation of the Barangaroo South Stage 1A development. As such, an assessment of the road network impact of these works during this time has also been undertaken.

4.3.1 Construction Vehicle Movements

The number of construction vehicles generated by works within the Barangaroo South site is based on recent advice from Lend Lease Buildings. The number of vehicle movements expected during the peak hours has been determined based on the existing activity profile for the Barangaroo South site (as per Figure 4).

Construction vehicle activity generated by works external to Barangaroo South have been forecast based on the supporting planning documents to each of the project application, as follows:

- **Headland Park**: *Barangaroo Headland Park Early Works – Construction Traffic Management Plan and Impact Assessment, Halcrow (October 2010)*
- **Wynyard Walk**: *Wynyard Walk Review of Environmental Factors (BPL-R-EN-059[A]), April 2012*

  Bridge Works - Traffic Management Plan (BPL-R-GN-053), May 2012
- **Barangaroo Central – Waterfront Promenade:** *Barangaroo Central Waterfront Promenade and Interim Public Domain – Traffic Impact Assessment, Aurecon (Rev 4, 30 Oct 12)*

It is noted that the construction program for the Barangaroo Central Waterfront Promenade has been shortened compared to that outlined in the original planning application. However, it is considered that the original estimate of 40 truck movements in the peak hour (as outlined in the planning report) is overly conservative. Therefore, notwithstanding the shorter construction period, the cumulative analysis has retained the figure of 40 peak hour truck movements.

Stage 1C Remediation and Earthworks

The works associated with the Stage 1C remediation and earthworks is anticipated to occur between December 2015 and February 2018.

Based on early estimates from Crown and Lend Lease, the Stage 1C works is forecast to generate between 40 and 90 construction vehicle movements[1] per day. This equates to between 4 and 9 traffic movements per hour.

[1] For the purposes of this report, a traffic movement is defined as the one-way flow of a single vehicle at a particular location. A vehicle entering the site, and departing some time later, is considered as two traffic movements.

4.3.2 Development Traffic

The proposed construction timeline for the Stage 1C works coincides with the occupation of commercial and residential buildings within the Barangaroo development. These include:

- C3 commercial building
- C4 commercial building
- C5 commercial building
- R8/R9 residential buildings
- C2 commercial building
- R1 & R7 buildings
- Headland Park

210 cars and 50 service vehicles are anticipated to be generated from these developments during peak hours following their occupation (including associated on-street parking).

4.3.3 Cumulative Traffic Movements

Table 4 on the following page provides a detailed summary of anticipated construction and development traffic movements associated with each project in the Barangaroo precinct. This demonstrates the peak traffic activity is anticipated to occur in April 2020, with 438 traffic movements forecast during the AM peak hour.

As illustrated in Figure 4, the majority of construction truck movements occur prior to the afternoon peak commuter period (5pm – 6pm). Therefore the analysis has considered the morning peak hour (8am – 9am) to determine the impacts arising from the Stage 1C works.

Barangaroo Construction Traffic Management Plan

Forecast Vehicle Activity - Vehicle Movements per Hour

Project	2015												2016											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operational Traffic Movements																								
C3 Commercial Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	42	42	42	42
C4 Commercial Building	0	0	0	0	0	0	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
C5 Commercial Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53	53	53	53	53	53	53	53
R8/R9 Residential Buildings	0	0	0	0	0	0	0	0	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
C2 Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	4	4	4	4
R1 & R7 Buildings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7	7	7	7	7	7	7
On-Street Parking	0	0	0	0	0	0	0	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Headland Park	0	0	0	0	0	0	0	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Crown Sydney	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Car Movements	***0***	***0***	***0***	***0***	***0***	***0***	***52***	***80***	***104***	***104***	***104***	***104***	***104***	***104***	***104***	***104***	***168***	***168***	***168***	***210***	***210***	***210***	***210***	***210***
Service Vehicle Movements	0	0	0	0	0	0	0	25	25	25	25	25	25	25	25	25	40	50	50	50	50	50	50	50
Total Operational Traffic Movements	**0**	**0**	**0**	**0**	**0**	**0**	**52**	**105**	**129**	**129**	**129**	**129**	**129**	**129**	**129**	**129**	**208**	**218**	**218**	**260**	**260**	**260**	**260**	**260**
Construction Traffic Movements*																								
Basement Construction	8	8	8	4	4	4	4	4	4	4	4	4	2	2	2	2	2	2	2	2	2	0	0	0
T1 Commercial Building	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T2 Commercial Building	10	10	10	8	8	8	6	6	6	6	6	6	4	4	4	2	2	2	0	0	0	0	0	0
T3 Commercial Building	8	8	8	6	6	6	6	6	6	4	4	4	2	2	2	2	0	0	0	0	0	0	0	0
R8/R9 Residential Buildings	6	6	6	4	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Concrete Batch Plant Operation	6	6	6	7	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Block 4 Remediation	0	0	0	0	0	0	0	40	40	40	40	40	40	40	40	40	40	38	38	38	12	12	12	30
Block 5 Remediation	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	4	4	4	10	10	10	10
Hickson Road Remediation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	10
Stage 1A Public Domain	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0
C2 Building + C6 Kiosk	0	0	0	0	0	0	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	0	0	0
C8 Building	0	0	0	0	0	0	0	0	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
R1 Building	0	0	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0
R7 Building	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0	0	0
City Walk Bridge	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stage 1C remediation	0	0	0	0	0	0	0	0	4	4	4	4	4	4	4	6	6	6	6	6	6	6	6	6
Crown Sydney	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stage 1B Basement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
Building R4a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Building R4b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Building R5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barangaroo South Total	***48***	***48***	***48***	***37***	***38***	***38***	***29***	***69***	***78***	***76***	***78***	***74***	***68***	***68***	***68***	***64***	***60***	***60***	***56***	***60***	***40***	***35***	***35***	***86***
Barangaroo South Total	16	16	16	16	16	16	16	16	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wynyard Walk	6	6	6	6	6	6	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Headland Park Main Works	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Barangaroo Ferry Wharf	40	40	40	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Construction Traffic Movements	***110***	***110***	***110***	***59***	***60***	***60***	***52***	***92***	***101***	***77***	***79***	***75***	***69***	***69***	***69***	***65***	***60***	***60***	***56***	***60***	***40***	***35***	***35***	***86***
Total Additional Traffic Movements	**110**	**110**	**110**	**59**	**60**	**60**	**104**	**197**	**230**	**206**	**208**	**204**	**198**	**198**	**198**	**194**	**268**	**278**	**274**	**320**	**300**	**295**	**295**	**346**

Project	2017												2018											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operational Traffic Movements																								
C3 Commercial Building	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
C4 Commercial Building	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
C5 Commercial Building	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
R8/R9 Residential Buildings	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
C2 Building	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
R1 & R7 Buildings	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
On-Street Parking	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Headland Park	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Crown Sydney	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Car Movements	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***
Service Vehicle Movements	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Total Operational Traffic Movements	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**
Construction Traffic Movements*																								
Basement Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T1 Commercial Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T2 Commercial Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T3 Commercial Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R8/R9 Residential Buildings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Concrete Batch Plant Operation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Block 4 Remediation	30	12	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Block 5 Remediation	10	3	3	3	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hickson Road Remediation	10	10	10	10	10	10	5	5	5	4	4	4	4	10	10	10	5	5	5	0	0	0	0	0
Stage 1A Public Domain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C2 Building + C6 Kiosk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C8 Building	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R1 Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R7 Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
City Walk Bridge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stage 1C remediation	6	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crown Sydney	0	6	6	6	6	7	7	7	7	7	7	9	9	9	9	9	9	9	9	9	9	9	9	9
Stage 1B Basement	27	27	27	27	27	27	27	27	27	27	27	50	50	50	50	50	50	50	50	50	50	50	50	50
Building R4a	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Building R4b	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Building R5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barangaroo South Total	***86***	***67***	***67***	***52***	***46***	***47***	***42***	***42***	***42***	***38***	***38***	***63***	***63***	***69***	***69***	***69***	***64***	***64***	***64***	***59***	***59***	***59***	***59***	***59***
Barangaroo South Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wynyard Walk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Headland Park Main Works	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barangaroo Ferry Wharf	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Construction Traffic Movements	***86***	***67***	***67***	***52***	***46***	***47***	***42***	***42***	***42***	***38***	***38***	***63***	***63***	***69***	***69***	***69***	***64***	***64***	***64***	***59***	***59***	***59***	***59***	***59***
Total Additional Traffic Movements	**346**	**327**	**327**	**312**	**306**	**307**	**302**	**302**	**302**	**298**	**298**	**323**	**323**	**329**	**329**	**329**	**324**	**324**	**324**	**319**	**319**	**319**	**319**	**319**

438

* Anticipated construction vehicle activity generated by Barangaroo South worksites are based on recent information provided to Arup by Lend Lease Buildings

Barangaroo Construction Traffic Management Plan

Forecast Vehicle Activity - Vehicle Movements per Hour

Project	2019												2020											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operational Traffic Movements																								
C3 Commercial Building	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
C4 Commercial Building	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
C5 Commercial Building	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
R8/R9 Residential Buildings	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
C2 Building	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
R1 & R7 Buildings	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
On-Street Parking	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Headland Park	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Crown Sydney	0	0	0	0	0	0	0	0	0	0	0	91	91	91	91	91	91	91	91	91	91	91	91	91
Total Car Movements	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***210***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***
Service Vehicle Movements	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	60	60	60	60	60	60	60	60	60
Total Operational Traffic Movements	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**260**	**351**	**351**	**351**	**351**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**
Construction Traffic Movements*																								
Basement Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T1 Commercial Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T2 Commercial Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T3 Commercial Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R8/R9 Residential Buildings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Concrete Batch Plant Operation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Block 4 Remediation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Block 5 Remediation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hickson Road Remediation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stage 1A Public Domain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C2 Building + C6 Kiosk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C8 Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R1 Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R7 Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
City Walk Bridge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stage 1C remediation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crown Sydney	9	9	10	10	10	10	10	10	10	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0
Stage 1B Basement	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50	23	23	23	0	0	0
Building R4a	0	0	0	0	0	0	0	0	12	12	10	10	10	10	10	12	12	12	12	12	12	12	12	12
Building R4b	0	0	0	0	0	0	0	0	10	10	9	9	9	9	9	10	10	10	10	10	10	10	10	10
Building R5	0	0	0	0	0	0	0	0	5	5	4	4	4	4	4	5	5	5	5	5	5	5	5	5
Barangaroo South Total	***59***	***59***	***60***	***60***	***60***	***60***	***60***	***60***	***87***	***87***	***83***	***73***	***73***	***73***	***73***	***77***	***77***	***77***	***50***	***50***	***50***	***27***	***27***	***27***
Barangaroo South Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wynyard Walk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Headland Park Main Works	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barangaroo Ferry Wharf	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Construction Traffic Movements	***59***	***59***	***60***	***60***	***60***	***60***	***60***	***60***	***87***	***87***	***83***	***73***	***73***	***73***	***73***	***77***	***77***	***77***	***50***	***50***	***50***	***27***	***27***	***27***
Total Additional Traffic Movements	**319**	**319**	**320**	**320**	**320**	**320**	**320**	**320**	**347**	**347**	**343**	**424**	**424**	**424**	**424**	**438**	**438**	**438**	**411**	**411**	**411**	**388**	**388**	**388**

Project	2021												2022											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Operational Traffic Movements																								
C3 Commercial Building	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42	42
C4 Commercial Building	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52	52
C5 Commercial Building	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
R8/R9 Residential Buildings	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
C2 Building	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
R1 & R7 Buildings	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
On-Street Parking	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
Headland Park	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Crown Sydney	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91	91
Total Car Movements	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***	***301***
Service Vehicle Movements	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60
Total Operational Traffic Movements	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**
Construction Traffic Movements*																								
Basement Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T1 Commercial Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T2 Commercial Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T3 Commercial Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R8/R9 Residential Buildings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Concrete Batch Plant Operation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Block 4 Remediation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Block 5 Remediation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hickson Road Remediation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stage 1A Public Domain	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C2 Building + C6 Kiosk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C8 Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R1 Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R7 Building	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
City Walk Bridge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stage 1C remediation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crown Sydney	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stage 1B Basement	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Building R4a	12	12	12	12	12	12	12	12	3	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0
Building R4b	10	10	10	10	10	10	10	10	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0
Building R5	5	5	5	5	5	5	5	5	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Barangaroo South Total	***27***	***27***	***27***	***27***	***27***	***27***	***27***	***27***	***6***	***6***	***6***	***6***	***6***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Barangaroo South Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wynyard Walk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Headland Park Main Works	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barangaroo Ferry Wharf	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Construction Traffic Movements	***27***	***27***	***27***	***27***	***27***	***27***	***27***	***27***	***6***	***6***	***6***	***6***	***6***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Total Additional Traffic Movements	**388**	**388**	**388**	**388**	**388**	**388**	**388**	**388**	**367**	**367**	**367**	**367**	**367**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**	**361**

* Anticipated construction vehicle activity generated by Barangaroo South worksites are based on recent information provided to Arup by Lend Lease Buildings

4.4 Road Network Operations

4.4.1 Traffic Distribution

Consistent with the forecasts adopted in previous construction traffic management plans for Barangaroo South works, 70% of construction vehicles are forecast to approach the worksite from the southern and western parts of Sydney. The remainder would approach from the northern direction (i.e. via the Harbour Bridge, Western Distributor and Harbour Street). For trucks returning to the north, they would utilise Napoleon Street and then turn left onto Kent Street to approach the Harbour Bridge. Margaret Street would not be used as a construction route during peak hours.

4.4.2 Road Network Layout

The traffic modelling has considered the future road network layout in the Barangaroo precinct. This includes:

- The closure of the northern section of Shelley Street to vehicular traffic following the completion of the Wynyard Walk development (subject to the approval of the road authority).
- The installation of traffic signals at the Hickson Road / Napoleon Street intersection, including the provision of a fourth leg at the intersection which provides egress from the Stage 1A basement car park.

Prior to the completion of the Barangaroo Stage 1B development, the Hickson Road / Globe Street intersection will be priority controlled.

4.4.3 Traffic Modelling

This report examines in detail the future stage traffic operations of the five nearest and most relevant intersections to the Stage 1c construction site, namely:

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

Lane saturation flows within the LinSig model have been lowered at certain locations to consider the impact of queue spillback from upstream and downstream intersections. This is particularly relevant on Sussex Street (southbound) and Margaret Street (eastbound) during the PM peak hours.

The results of the LinSig intersection modelling are summarised in Table 5 and detailed in Appendix A.

4.4.4 Intersection Operation

The effect of the estimated additional peak hour traffic during (for the combined construction and operational activities) has been investigated for each of the affected intersections during the AM peak hour. Negligible construction traffic movements are anticipated during the PM peak hour and therefore this has not been considered in the analysis.

The modelling results for the future peak hour traffic movements are summarised in Table 5.

Table 5: Intersection Analysis

Peak	**Intersection**	**Future Traffic Peak, 2016 (Excluding Stage 1C construction)**			**Future Traffic Peak, 2016, (Including Stage 1C construction)**		
		LOS	DOS	AVD (sec)	LOS	DOS	AVD (sec)
AM	Sussex St / Erskine St	C	C	0.65	30	C	0.67
	Hickson Rd / Napoleon St	C	C	0.88	39	D	0.93
	Kent St / Margaret St	B	B	0.61	26	B	0.64
	Hickson Rd / Globe St	A	B	0.62	15	B	0.64

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

The results of the LinSig intersection analysis forecast minimal changes in the operation of key intersections as a result of the additional construction traffic generated during Stage 1C works, when compared with the base case scenario. The additional construction vehicles associated with the Stage 1C works will have a negligible impact on forecast road network performance.

During the AM peak hour, when construction vehicles attributable to Stage 1C works are expected to access the site, the road network generally operates satisfactorily. The addition of between 4-9 hourly construction traffic movements associated with Stage 1C works do not have an impact on the overall operation of the local road network, and requires no further works to accommodate the levels of construction traffic anticipated.

5 Pedestrian and Vehicle Management

5.1 Construction Vehicle Management

5.1.1 Hours of Operation

The proposed site hours of operation, 7am – 6pm on weekdays, are similar to the existing project approvals for Barangaroo South. These hours assist the site traffic movements being generated mainly outside the normal commuter peak traffic periods, such that their impacts on the surrounding road network are minimised.

5.1.2 Construction Routes

Trucks will not able to use York Street or Clarence Street in the AM peak between 6am and 10am due to existing restrictions.

5.1.3 Internal Site Vehicle Access

Access for construction vehicles to the Stage 1C works construction site will be located via Hickson Road at the existing gatehouse, approximately 350m north of the Sussex Street / Napoleon Street intersection. No truck queuing is to occur on Hickson Road. All vehicles will enter the site in a forwards direction. Figure 8 indicates a diagram of the proposed construction site access.

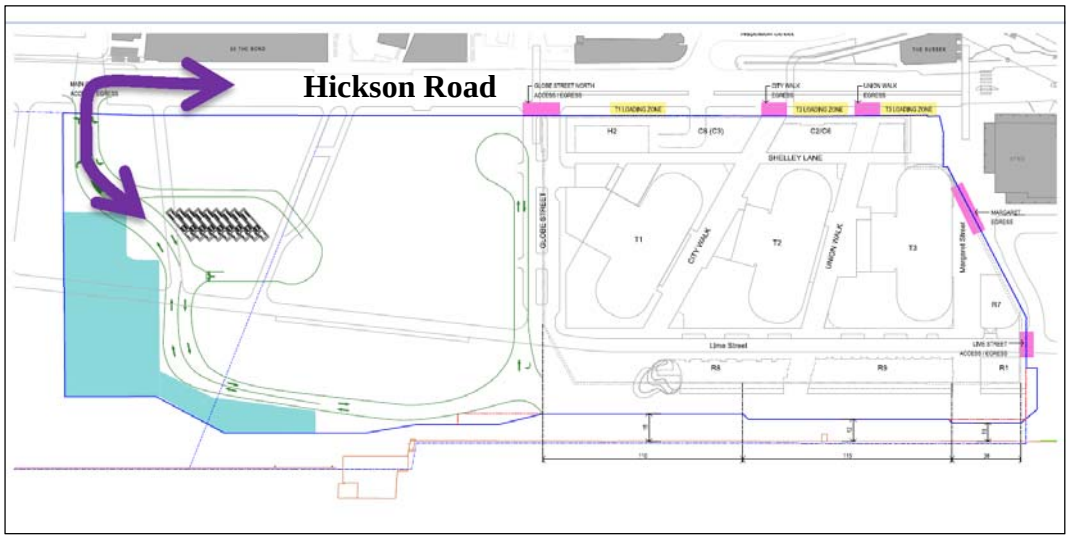


Figure 8: Proposed Construction Site Entry and Exit (indicative only)

5.1.4 Emergency Vehicle Access

Site entries are to be clearly signposted for the benefit of all approaching site traffic, in particular emergency services vehicles.

5.1.5 Access for Construction Workers

To reduce the impact on the local road network associated with construction for Stage 1C works, no on-site parking is to be provided for construction workers. In this manner it is being treated like any other CBD construction project. The constrained parking environment surrounding the site, coupled with the relatively high cost of long term parking, will ensure the majority of construction workers arrive to the site via public transport.

Construction workers through their site inductions will be provided with travel advice about public transport, walking and cycling routes to the site.

5.1.6 Traffic Control Recommendations

The site traffic control recommendations for each worksite gate entry or exit point (including all appropriate signage) will be determined by means of a Traffic Control Plan to be prepared by an RMS accredited contractor closer to construction commencement.

Truck movements are to be staged and coordinated to prevent trucks circulating CBD streets whilst awaiting access to the site.

Construction vehicles will approach the site from areas outside the CBD using major arterial routes such as the M4, M5 etc.

The size of trucks proposed to access the site will be in accordance with Clause 300-3 of the Road Rules in terms of lengthy vehicle restrictions.

The vehicular traffic movements at each of the site entry or exit gates for traffic to and from Hickson Road will potentially need to be controlled by a flagman to ensure no potential traffic safety conflicts occur between the site truck traffic and pedestrians on the adjacent footpath, as per MP10_0023 condition of consent no.D4(c).

Personnel will not be permitted to use stop/slow signage in Hickson Road or Sussex Street on weekdays between 7am and 9am and 4pm to 7pm. However, personnel using stop/slow signage will be permitted on Hickson Road, north of the intersection of Hickson Road and Napoleon Street, when it is required to ensure safe truck access at designated site access points, provided that vehicles queue lengths generated as a result of the traffic control do not exceed more than six vehicles in either direction.

Any activity likely to impact the operational efficiency of the state road network and/or for works within 100m of traffic lights would be the subject of an application to the Transport Management Centre for a road occupancy licence.

5.2 Pedestrian Management

There are a number of existing pedestrian routes which will facilitate movement for construction workers to and from the Barangaroo South site.

Existing pedestrian crossing facilities on Napoleon Street (pedestrian refuge) and Hickson Road (zebra crossing) will facilitate access for construction workers into the site. Dedicated pedestrian crossing legs at the Margaret Street / Kent Street and Sussex Street / Shelley Street intersections will remain in place during the Wynyard Walk bridge and tunnel works, which will allow safe pedestrian movement across Napoleon Street towards the Barangaroo site.

From mid 2015 site access for construction workers will be improved through the completion of the City Walk Bridge and installation of traffic signals at the Hickson Road / Napoleon Street intersection. This will provide safe and efficient access for construction workers walking across Hickson Road and Sussex Street.

A summary of the key pedestrian routes for construction workers accessing the Barangaroo site is presented in Figure 9.

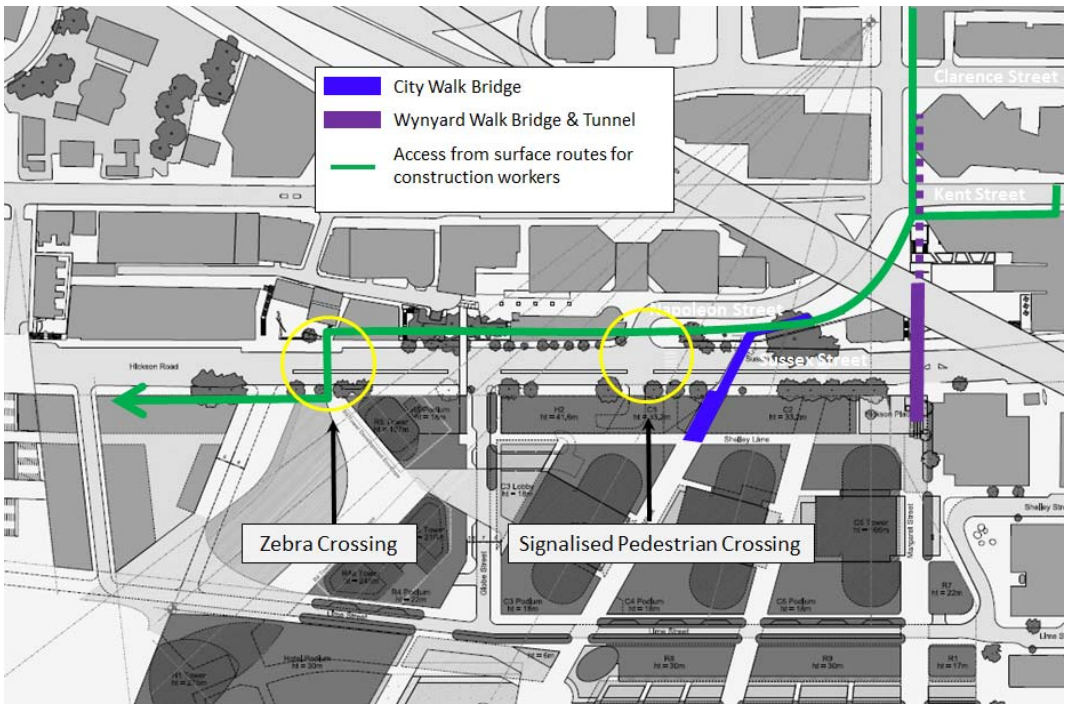


Figure 9: Key Pedestrian Routes to Barangaroo Site

6 Summary and Conclusions

Arup has prepared this construction staging traffic assessment for Stage 1C construction works to support a State Significant Development Application for the Stage 1C remediation and earthworks at Barangaroo. The cumulative impacts of construction traffic activity associated with all works currently planned in the Barangaroo precinct have been assessed, including an analysis of all future truck movements out of the proposed access and egress points. The assessment concludes that the construction related traffic impacts arising from all future works, including that of the Stage 1C works, can be appropriately managed.

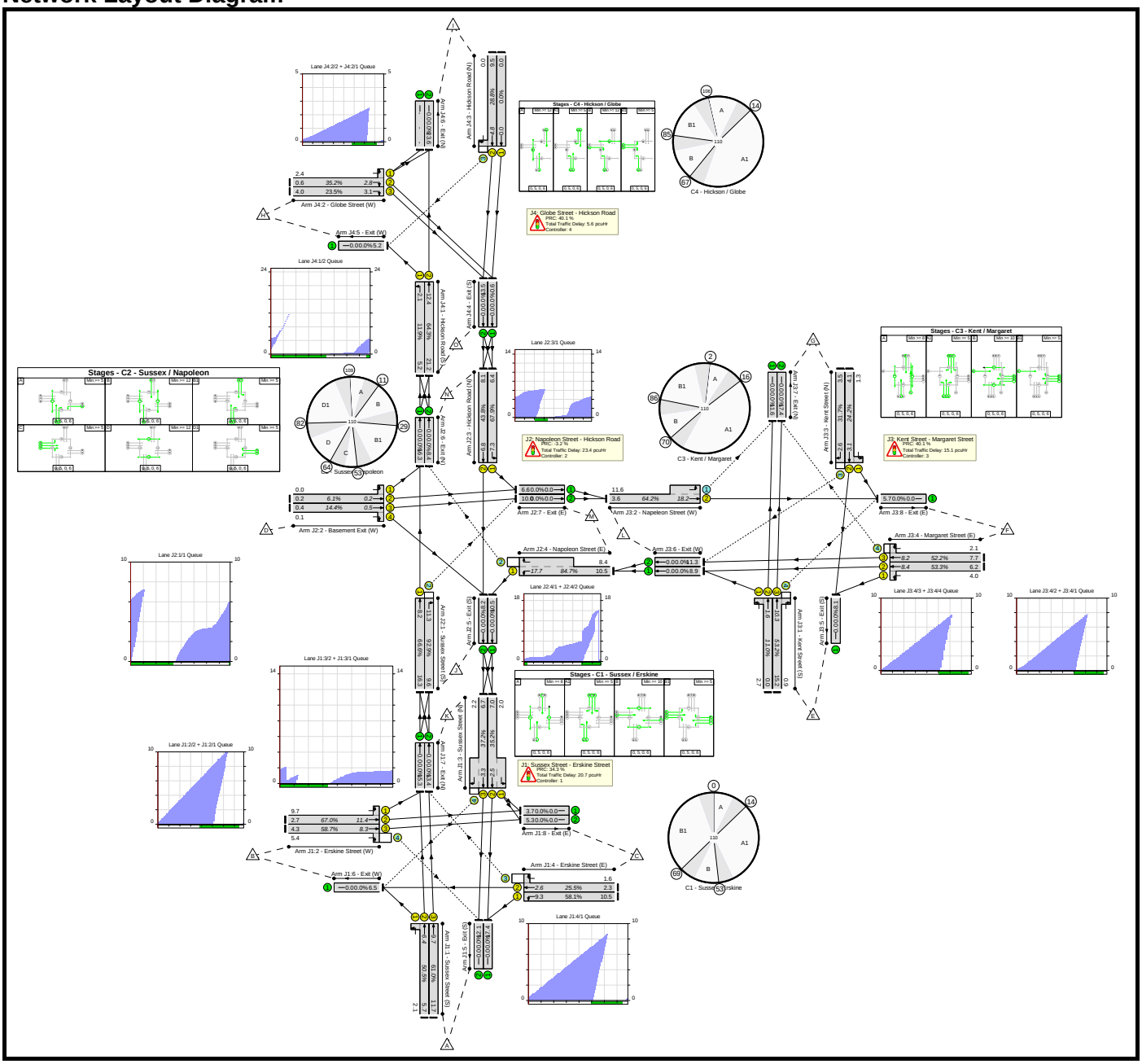
Appendix A

LinSig Modelling Outputs

Basic Results Summary

Scenario 2: 'AM Future' (FG9: 'AM Future with Stage 1B basement', 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	-	-	**92.9%**	-	-	-	-	-
J1: Sussex Street - Erskine Street	-	-	**67.0%**	-	-	-	-	-
1/2+1/1	Sussex Street (S) Left Ahead	U	50.5%	33.9	254	1440:1440	5.9	6.4
1/3	Sussex Street (S) Ahead	U	61.0%	31.1	383	1440	8.9	9.7
2/2+2/1	Erskine Street (W) Left Ahead	U	67.0%	40.2	404	1800:1800	10.4	11.4
2/3+2/4	Erskine Street (W) Right Ahead	U+O	58.7%	37.6	318	1800:1440	7.5	8.3
3/2+3/1	Sussex Street (N) Ahead Left	U	35.2%	15.3	293	1800:1800	2.2	2.5
3/3+3/4	Sussex Street (N) Ahead Right	U+O	37.2%	15.8	291	1800:1440	3.0	3.3
4/1	Erskine Street (E) Left	U	58.1%	38.0	342	1800	8.6	9.3
4/2+4/3	Erskine Street (E) Ahead Right	U+O	25.5%	29.8	129	1440:1440	2.4	2.6
J2: Napoleon Street - Hickson Road	-	-	**92.9%**	-	-	-	-	-
1/1	Sussex Street (S) Ahead	U	66.6%	21.4	534	1800	7.2	8.2
1/2	Sussex Street (S) Right	O	92.9%	79.7	315	1800	6.6	11.3
2/2+2/1	Basement Exit (W) Left Ahead	U	6.1%	69.2	6	1800:1800	0.2	0.2
2/3+2/4	Basement Exit (W) Right Ahead	U	14.4%	68.6	16	1800:1800	0.4	0.5
3/1	Hickson Road (N) Left	U	67.9%	69.7	211	1800	6.3	7.3
3/2	Hickson Road (N) Ahead	U	43.8%	25.2	265	1800	6.4	6.8
4/1+4/2	Napoleon Street (E) Left Right	U+O	84.7%	39.9	619	1800:1800	15.1	17.7
J3: Kent Street - Margaret Street	-	-	**64.2%**	-	-	-	-	-
1/2+1/1	Kent Street (S) Left Ahead	U	11.0%	20.3	88	1800:1800	1.6	1.6
1/3+1/4	Kent Street (S) Ahead Right	U+O	53.2%	18.3	526	1800:920	9.8	10.3

Basic Results Summary

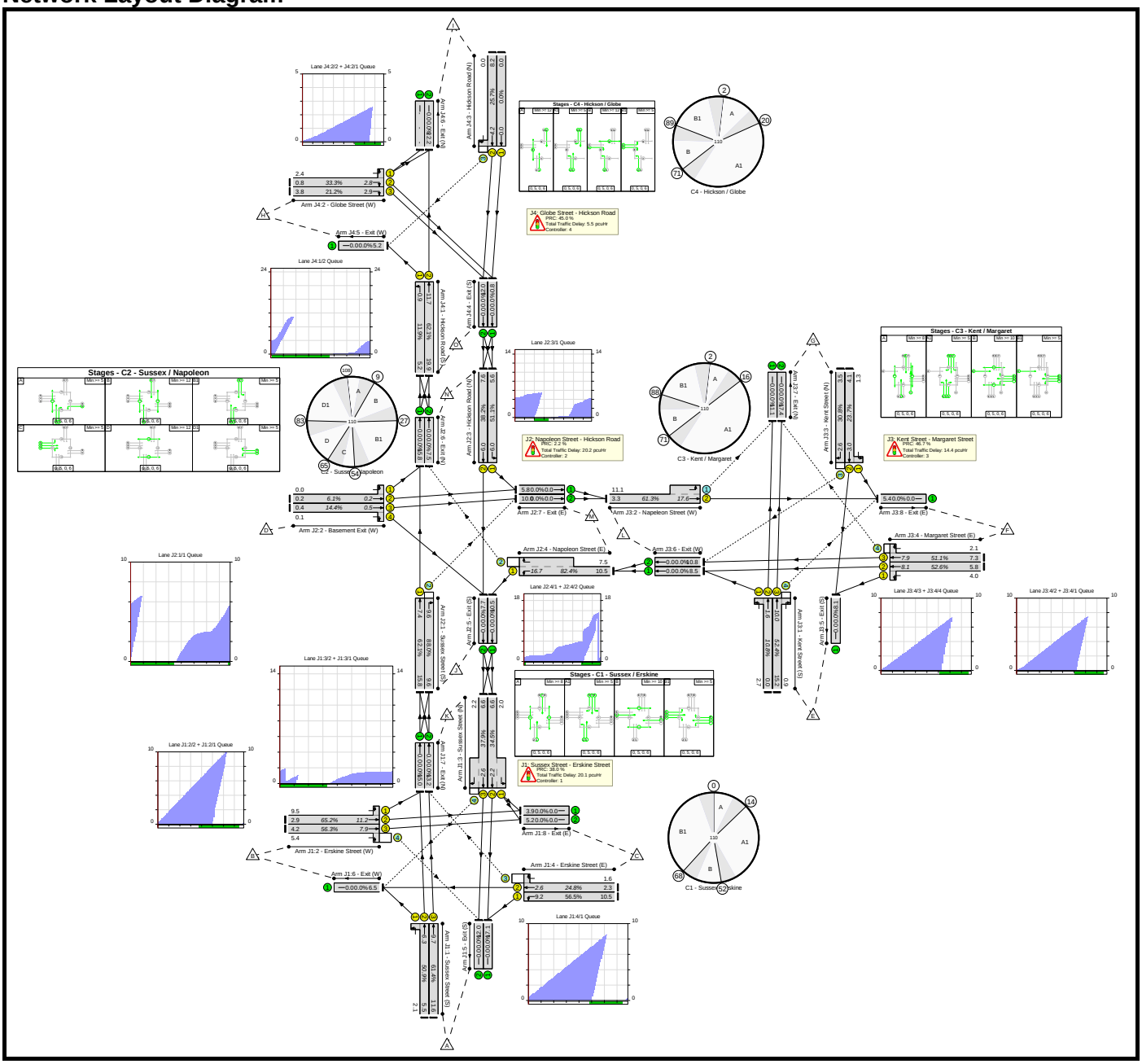
2/2+2/1	Napeleon Street (W) Left Ahead	U+O	64.2%	26.7	498	920:1800	17.3	18.2
3/2+3/1	Kent Street (N) Ahead Left	U	24.2%	16.9	174	1800:920	2.9	3.1
3/3	Kent Street (N) Right	O	31.7%	31.4	116	1800	2.4	2.6
4/2+4/1	Margaret Street (E) Left Ahead	U	53.3%	34.9	334	1800:1800	7.8	8.4
4/3+4/4	Margaret Street (E) Ahead Right	U+O	52.2%	35.1	323	1800:1800	7.7	8.2
J4: Globe Street - Hickson Road	**-**	**-**	**64.3%**	**-**	**-**	**-**	**-**	**-**
1/1	Hickson Road (S) Left	U	11.9%	8.2	170	1800	2.1	2.1
1/2	Hickson Road (S) Ahead	U	64.3%	8.1	694	1800	11.5	12.4
2/2+2/1	Globe Street (W) Right Left	U	35.2%	51.3	97	1800:1800	2.5	2.8
2/3	Globe Street (W) Right	U	23.5%	32.5	131	1800	2.9	3.1
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	28.8%	13.0	311	1800:1800	4.6	4.8

C1 - Sussex / Erskine	PRC for Signalled Lanes (%):	34.3	Total Delay for Signalled Lanes (pcuHr):	20.74	Cycle Time (s):	110
C2 - Sussex / Napoleon	PRC for Signalled Lanes (%):	-3.2	Total Delay for Signalled Lanes (pcuHr):	23.37	Cycle Time (s):	110
C3 - Kent / Margaret	PRC for Signalled Lanes (%):	40.1	Total Delay for Signalled Lanes (pcuHr):	15.08	Cycle Time (s):	110
C4 - Hickson / Globe	PRC for Signalled Lanes (%):	40.1	Total Delay for Signalled Lanes (pcuHr):	5.62	Cycle Time (s):	110
	PRC Over All Lanes (%):	-3.2	Total Delay Over All Lanes(pcuHr):	64.81		

Basic Results Summary

Scenario 3: 'AM Future' (FG5: 'AM Future without Stage 1B basement', 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	-	-	**88.0%**	-	-	-	-	-
J1: Sussex Street - Erskine Street	-	-	**65.2%**	-	-	-	-	-
1/2+1/1	Sussex Street (S) Left Ahead	U	50.9%	34.9	249	1440:1440	5.8	6.3
1/3	Sussex Street (S) Ahead	U	61.4%	32.0	378	1440	8.9	9.7
2/2+2/1	Erskine Street (W) Left Ahead	U	65.2%	38.6	404	1800:1800	10.3	11.2
2/3+2/4	Erskine Street (W) Right Ahead	U+O	56.3%	36.2	312	1800:1440	7.2	7.9
3/2+3/1	Sussex Street (N) Ahead Left	U	34.5%	14.9	282	1800:1800	1.9	2.2
3/3+3/4	Sussex Street (N) Ahead Right	U+O	37.9%	14.8	287	1800:1440	2.3	2.6
4/1	Erskine Street (E) Left	U	56.5%	36.7	342	1800	8.6	9.2
4/2+4/3	Erskine Street (E) Ahead Right	U+O	24.8%	29.0	129	1440:1440	2.4	2.6
J2: Napoleon Street - Hickson Road	-	-	**88.0%**	-	-	-	-	-
1/1	Sussex Street (S) Ahead	U	62.1%	18.8	518	1800	6.6	7.4
1/2	Sussex Street (S) Right	O	88.0%	63.1	315	1800	6.4	9.6
2/2+2/1	Basement Exit (W) Left Ahead	U	6.1%	69.2	6	1800:1800	0.2	0.2
2/3+2/4	Basement Exit (W) Right Ahead	U	14.4%	68.6	16	1800:1800	0.4	0.5
3/1	Hickson Road (N) Left	U	51.1%	58.7	184	1800	5.4	6.0
3/2	Hickson Road (N) Ahead	U	38.2%	20.8	250	1800	5.7	6.0
4/1+4/2	Napoleon Street (E) Left Right	U+O	82.4%	43.0	591	1800:1800	14.5	16.7
J3: Kent Street - Margaret Street	-	-	**61.3%**	-	-	-	-	-
1/2+1/1	Kent Street (S) Left Ahead	U	10.8%	19.7	88	1800:1800	1.5	1.6
1/3+1/4	Kent Street (S) Ahead Right	U+O	52.4%	17.6	526	1800:920	9.5	10.0

Basic Results Summary

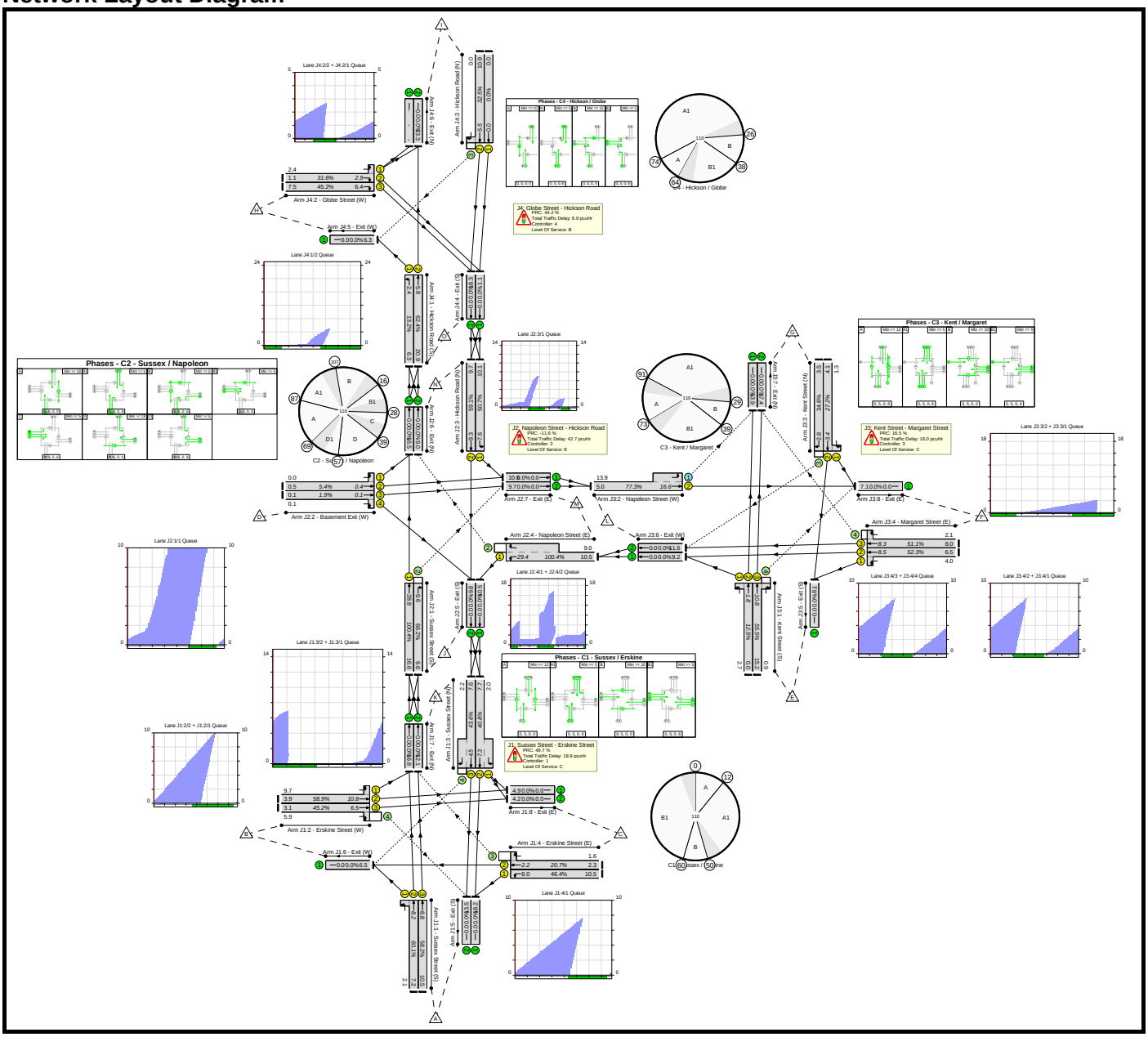
2/2+2/1	Napeleon Street (W) Left Ahead	U+O	61.3%	25.9	471	920:1800	16.9	17.6
3/2+3/1	Kent Street (N) Ahead Left	U	23.7%	16.2	174	1800:920	2.8	3.0
3/3	Kent Street (N) Right	O	30.8%	30.3	116	1800	2.4	2.6
4/2+4/1	Margaret Street (E) Left Ahead	U	52.6%	35.5	321	1800:1800	7.5	8.1
4/3+4/4	Margaret Street (E) Ahead Right	U+O	51.1%	35.6	308	1800:1800	7.4	7.9
J4: Globe Street - Hickson Road	**-**	**-**	**62.1%**	**-**	**-**	**-**	**-**	**-**
1/1	Hickson Road (S) Left	U	11.9%	4.1	170	1800	0.8	0.9
1/2	Hickson Road (S) Ahead	U	62.1%	10.3	650	1800	10.9	11.7
2/2+2/1	Globe Street (W) Right Left	U	33.3%	48.0	103	1800:1800	2.6	2.8
2/3	Globe Street (W) Right	U	21.2%	30.6	125	1800	2.7	2.9
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	25.7%	13.6	269	1800:1800	4.0	4.2

C1 - Sussex / Erskine	PRC for Signalled Lanes (%):	38.0	Total Delay for Signalled Lanes (pcuHr):	20.12	Cycle Time (s):	110
C2 - Sussex / Napoleon	PRC for Signalled Lanes (%):	2.2	Total Delay for Signalled Lanes (pcuHr):	20.15	Cycle Time (s):	110
C3 - Kent / Margaret	PRC for Signalled Lanes (%):	46.7	Total Delay for Signalled Lanes (pcuHr):	14.42	Cycle Time (s):	110
C4 - Hickson / Globe	PRC for Signalled Lanes (%):	45.0	Total Delay for Signalled Lanes (pcuHr):	5.50	Cycle Time (s):	110
	PRC Over All Lanes (%):	2.2	Total Delay Over All Lanes(pcuHr):	60.18		

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

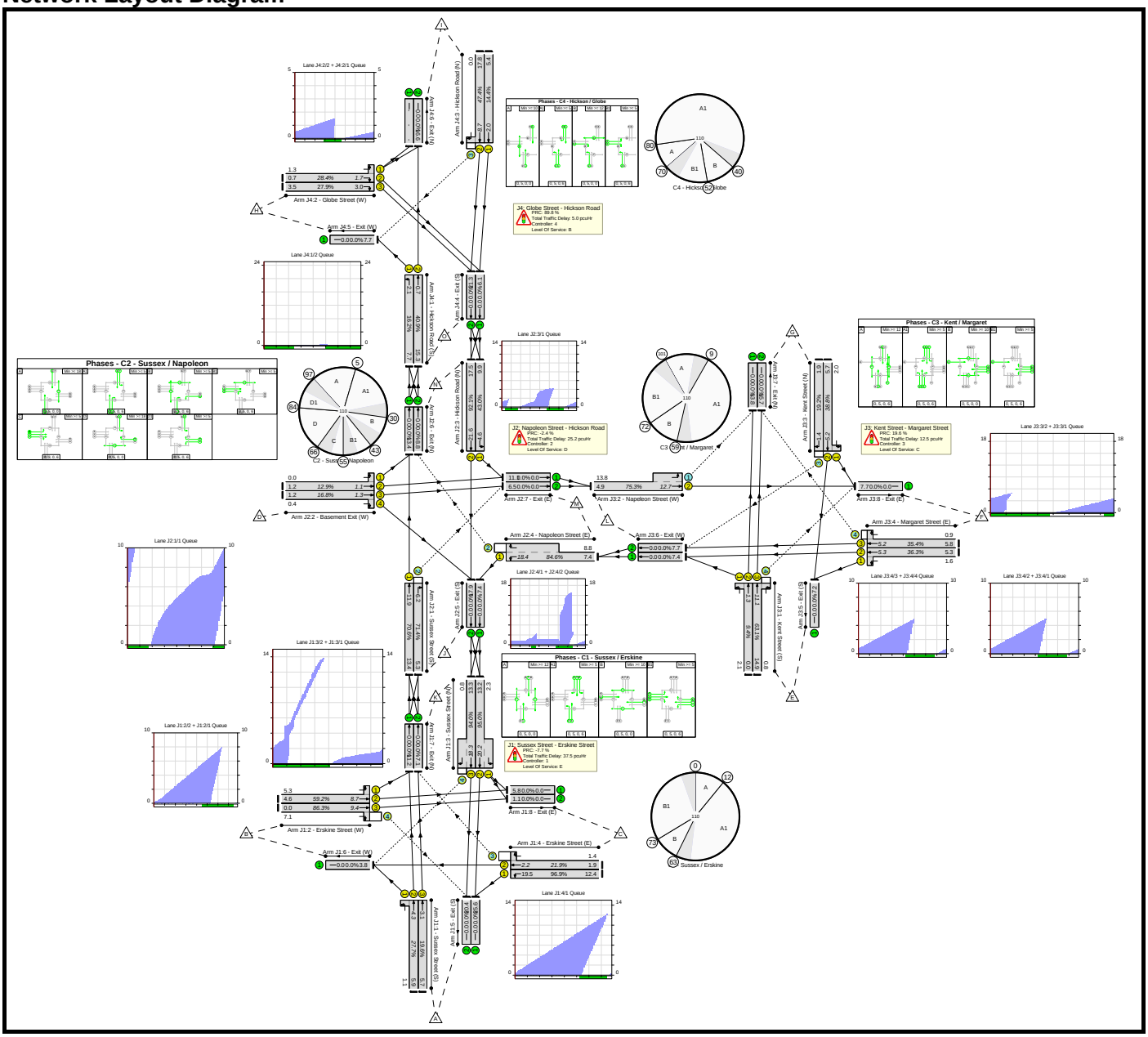
2/2+2/1	Napeleon Street (W) Left Ahead	U+O	77.3%	24.1	619	920:1800	14.9	16.6
3/2+3/1	Kent Street (N) Ahead Left	U	27.2%	19.9	174	1800:920	3.2	3.4
3/3	Kent Street (N) Right	O	34.6%	35.2	116	1800	2.5	2.8
4/2+4/1	Margaret Street (E) Left Ahead	U	52.3%	33.1	344	1800:1800	7.9	8.5
4/3+4/4	Margaret Street (E)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