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Report

Western Sydney Stadium - Stage 2 Development Application (DA) - Traffic Impact Assessment

Prepared for Lend Lease

Prepared by Beca Pty Ltd

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Revision History

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1.0	**Bert Prinsloo/Aaron Washington**	Draft report for Review	17/02/2017
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Document Acceptance

Action	Name	Signed	Date
Prepared by	**Aaron Washington Campbell Clarke**		03/03/2017
Reviewed by	**Bert Prinsloo**		03/03/2017
Approved by	**Stephen Hewett**		03/03/2017
on behalf of	Beca Pty Ltd		

Executive Summary

The Application (referred to as SSDA16_8175) follows the approval of a Stage 1 SSD DA (SSDA16_7534) in December 2016. The Stage 1 SSDA sets out a Concept Proposal for the redevelopment of the Western Sydney Stadium (WSS) and future supporting uses.

This report addresses the Transport Impact Assessment (TIA) for the redevelopment of WSS (Stage 2 DA). There were a number of Secretary's Environmental Assessment Requirements (SEARs) issued in relation to transportation, some of which are directly addressed as part of this TIA.

The renewal of the Stadium forms part of the NSW State Government's revitalisation of Sydney's key sporting stadia. The NSW Government has identified the redevelopment of the Western Sydney Stadium as a major urban renewal project and have committed $300 million to its renewal. The Stadium is to be redeveloped for increased capacity, greater activation and relationship with O'Connell Street as well as future ancillary uses to support the stadium. The increased capacity allows for additional seating for approximately 10,000 more spectators in a seating bowl with 30,000 seats, including 27,000 general admission seats and 3,000 corporate seats.

This TIA assesses the traffic and transportation effects of a new 30,000 seat stadium with the purpose to:

- Describe the existing transport and traffic environment, including how spectators and staff travel to the stadium;
- Describe the potential impacts of the transportation effects of 30,000 seat stadium on the network
- Recommend any measures as appropriate to manage or mitigate the transportation impacts of the stadium.

The report describes the Proposed Development, Assessment Methodology, Existing and Proposed Development Traffic & Transport Conditions, Assessment of Effects of Proposed Development, Potential Mitigations and Conclusions and Recommendations.

The assessment attempts to understand the travel behaviour of spectators to and from the stadium during event days but also understand the current and future traffic movements in and around the stadium during different peak periods on non-event days. The impact these trips will have on the transport infrastructure as people using heavy rail, light rail, buses, cars, bicycles or walk to and from the stadium, or passing the development, needs to be assessed. Every spectator to the stadium becomes a pedestrian at some stage in the trip and to make this a safe and enjoyable experience the City of Parramatta wants the CBD to be the walkable heart of a vibrant and healthy city as stated in their vision for walking in the CBD.

Some impacts will need mitigating measures as the current transport infrastructure needs improvement to provide an acceptable Level of Service for all transport users and specifically pedestrians as this is the largest mode of travel to and from the stadium.

Section 5 discusses the effects the proposed development is expected to have on the transportation network within the stadium area of influence. This will benchmark against the anticipated operation of the current stadium if maintained in its existing state in 2019, allowing the ability to isolate the effect of the new WSS and clearly understand the potential mitigation measures to be implemented (Section 6) to reach the required or acceptable operational performance as guided by the SEAR's.

Section 6 also summarises the recommendations which include potential management solutions and suggested upgrades to infrastructure to ensure acceptable levels of service, especially for those super events that will occur once or twice a year and test the operational performance of the traffic and transport infrastructure and operations. The ultimate test is how safe and comfortable the spectator's and workers' experience is on the journey to and from an event whether they drive, walk, cycle, use a bus or train (including light rail).

With the careful application of the proposed mitigating measures and appropriate managed solution this facility should satisfy the requirements as directed by the SEARs.

Implementing these recommendations and monitoring the effects during these super events will ensure ongoing improvement to create a pleasant experience for spectators and comfort for transport users to an acceptable level as intended by this prestigious facility.

Contents

1 Background

1.1 Introduction

This report supports a State Significant Development (SSD) Development Application (DA) submitted to the Minister for Planning pursuant to Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The Application (referred to as SSDA16_8175) follows the approval of a Stage 1 SSD DA (SSDA16_7534) in December 2016. The Stage 1 SSDA sets out a Concept Proposal for the redevelopment of the Western Sydney Stadium and future supporting uses. In summary, the Stage 1 Consent includes the following components:

- **Concept Proposal** for the Western Sydney Stadium, including building envelopes, a new 30,000 seat stadium, 500 surface car parking spaces, access, ancillary infrastructure and landscaping; and
- **Detailed works** for staged demolition and removal of the existing stadium and associated infrastructure and the Parramatta Swimming Centre.

It is anticipated that the new stadium will be operational in 2019.

1.2 Overview of Proposed Development

The proposal relates to a detailed ('Stage 2') DA for the detailed design and construction of the stadium. This SSD DA seeks approval for the following components of the development:

- Detailed design of the stadium, public domain and car parking spaces;
- Construction and use of the 30,000 seat stadium including:
  - General Admission Facilities including bars, food and drink stalls, amenities and viewing areas;
  - A function centre and kitchen facility;
  - Associated Stadium facilities including player and coaching facilities, media and press conference rooms, security and stadium managers' facilities;
  - Waste storage and loading dock;
- Construction and embellishment of the public domain including;
  - Outdoor sporting and recreation facilities;
  - Public plazas and entertainment areas;
  - General landscaping works;
- Provision of up to 500 car parking spaces with vehicle access to the development from O'Connell Street and internal roads for vehicular circulation;
- Provision of signage zones, lighting and other ancillary stadium elements;
- Pedestrian access and footpath upgrades along O'Connell Street; and
- Extension and augmentation of physical infrastructure / utilities as required.

1.3 Background

1.3.1 Stadia Strategy

The stadium is the first project to be delivered under the NSW Government's $1.6 billion Stadia Strategy, the largest investment in sporting infrastructure since the 2000 Olympics. The new Western Sydney Stadium will:

- Be able to cater for bigger crowds, provide an improved game day experience and bring major benefits to the Western Sydney economy;

- Generate approximately 1,200 jobs during construction and between 600 and 900 jobs once operational for sporting event days and major events; and
- Cater for a range of sporting and community uses within the precinct.

1.3.2 Concept Proposal (SSDA 16_7534)

Infrastructure NSW (iNSW) on behalf of Venues NSW submitted a State Significant Development Application (SSDA) for the Stage 1 concept proposal and demolition of the existing stadium in July 2016. Consent for the Stage 1 SSDA was granted by the Minister for Planning on 7 December 2016 and includes:

- a maximum total GFA of approximately 60,000 m^2 (excluding the playing pitch) for the stadium development, including:
    - additional seating for approximately 10,000 more spectators in a seating bowl with 30,000 seats, including 27,000 general admission seats and 3,000 corporate seats;
    - playing pitch;
    - five levels of premium box/terrace, function/lounge offerings and a number of suite offerings;
    - flood lighting, stadium video screens and other ancillary fittings;
    - additional facilities for team, media, administration and amenity, including:
        - police facility and security office;
        - players changing rooms;
        - ticket gates and ticket boxes;
        - media interview rooms;
        - green room;
        - production suite and joint operation control room;
        - event briefing rooms;
        - hirers office and patron services offices;
        - first aid facilities;
        - loading docks for deliveries; and
        - food, beverage and retail facilities.
- a maximum GFA of approximately 20,000 m^2 for future development of ancillary uses within the northern corner of the Site;
- transport, parking and accessibility;
- public domain elements; and
- landscaping elements throughout the Site.

1.3.3 Design Excellence and Project Tender

Since receiving the development consent for Stage 1, Venues NSW have appointed Lendlease as the contractor for the Stage 2 detailed design and the demolition and construction of the stadium. The tender process also served as a competitive design process in accordance with the Director General's Design Excellence Guidelines and Clause 7.10 of the *Parramatta Local Environmental Plan 2011*.

1.3.4 Site Establishment works Modification

A modification application (MOD 1) was made to the Stage 1 DA pursuant to Section 96(2) of the EP&A Act in February 2017. The modification seeks to expand the approved range of site preparation works to include piling and remediation/earthworks, as outlined below:

- Remediation works comprising the excavation and storage of contaminated materials and bulk excavation. Contaminated materials will be stored on site and capped below ground in accordance with the recommendations outlined in the Remedial Action Plan.

- Piling works which will comprise the driving and drilling of concrete piles to establish foundations for the construction of a stadium located within the Stage 1 building envelope.

The modification application is currently under assessment by the Department of Planning and Environment (DPE) and is awaiting determination.

1.4 Site Description

The Western Sydney Stadium is located at 11-13 O'Connell Street, within the Parramatta Park on the north-eastern edge of the Parramatta CBD. It is bound to the south and west by the Parramatta Park and the Parramatta River, the Parramatta Leagues Club to the north and O'Connell Street to the east. The Site is located within the City of Parramatta local government area (LGA).

A locational context plan is provided at **Figure 1.1** below.

Figure 1.1 – Site Context Plan

The site has an area of approximately 95,000m^2 and owned by Venues NSW and The Parramatta Park Trust.

The site is irregular in shape and is illustrated in **Figure 1.2** below.

Figure1.2 – Site Aerial Plan

1.5 This Report

Beca has been commissioned by Lendlease to provide a Traffic Impact Assessment (TIA) for the proposed Western Sydney Stadium (WSS) in Parramatta. The TIA (this report) is the input to the Stage 2 Development Application (DA) and responds to State Significant Infrastructure Secretary's Environmental Assessment Requirements (SEAR's).

This TIA assesses the traffic and transportation effects of a 30,000 seat stadium. The purpose of this report is to:

- Describe the existing transport and traffic environment, including how spectators and staff travel to the stadium;
- Describe the potential impacts of the transportation effects of 30,000 seat stadium on the network
- Recommend any measures as appropriate to manage or mitigate the transportation impacts of the stadium.

1.6 Relevant Documents

Relevant documents utilises in the production of this TIA include:

- Western Sydney Stadium – Transport and Accessibility Working Paper, AECOM (2016).
- Parramatta Leagues Club – Joint Regional Planning Panel (2015SYW097) (2015).
- Guide to Traffic Generating Developments, Issue 2.2, RTA (2002).
- EIS Guidelines – Road and Related Facilities (DoPI).
- Development Near Rail Corridors and Busy Roads – Interim Guideline.
- NSW Planning Guidelines for Walking and Cycling.
- Austroads Guide to Traffic Management Part 12: Traffic Impacts of Development.
- NSW Bicycle Guidelines (RMS).
- Cycling Aspects of Austroads Guide.
- Australian Standards AS2890.3 (Bicycle parking facilities).
- Information obtained during stakeholder meetings and follow-up material provided by Parramatta City Council.

1.7 Secretary's Environmental Assessment Requirements (SEAR's)

On 17 January 2017, the State Government issued the final SEARs associated with the requirements for the Stage 2 DA for the Design & Construction phase of the project. There were a number of SEARs issued in relation to transportation, some of which are directly addressed as part of this TIA. Others will be addressed by other accompanying reports within the Lendlease's Stage 2 DA submission.

Table 1.1 details the SEAR's related to traffic and transport issues, and identifies the scope and relevance to this TIA.

Table 1.1 – Transportation SEAR's (ID – 7)

SEAR Issue ID	Key Issue	Addressed in TIA
7.1	Details of the current daily and peak hour vehicle, public transport, pedestrian and bicycle movements and existing traffic and transport facilities provided on the road network located adjacent to the proposed development.	Sections 4.1 and 4.2
7.2	An estimate of the total daily and peak hour trips generated by the proposal from each strategic direction during weekday and weekend game day/non-game day operations and event modes, including vehicle, public transport, pedestrian and cycle trips.	Section 4
7.3	An assessment of the operation of the operation of all existing and future transport networks, and their ability to accommodate the forecast number of trips to and from the proposal.	Section 5
7.4	An assessment of the adequacy of existing and proposed pedestrian and bicycle provisions, cycling network and suitable end-of-trip facilities to meet the likely future demand of the proposal in consultation with Transport for NSW and City of Parramatta, with regard to ongoing regional network planning and the need/associated funding requirements for upgrading existing facilities and infrastructure (if required).	Section 5
7.5	The operational impact of the proposed development on existing and future public transport infrastructure within the vicinity of the site, ensuring that adjacent transport infrastructure has a net improvement in form and function as a result of the proposal.	Considered in Section 5, but underlined section not addressed in TIA.
7.6	Details of existing and proposed vehicular access, taxi and car parking arrangements for players/officials, patrons and visitors (i.e. weekday and weekend game day/non-game day operation and event modes), including compliance with parking codes and Australian Standards.	Considered in Landscape Architect's Report and included here in Section 5.

SEAR Issue ID	Key Issue	Addressed in TIA
7.7	Strategies and sustainable travel initiative to support the access to and use of public transport and active transport modes, which support the achievement of State targets, particularly for the provision of end-of-trip facilities, green travel plans and wayfinding strategies.	Section 6, as well as event management plan
7.8	An assessment of the impact of additional traffic generated by the proposal on the existing road network and operation of bus services (including altered routes)	Section 5
7.9	The daily and peak vehicle movement impacts on nearby intersections, with consideration of the cumulative impacts from other proposed and approved developments in the vicinity of the proposal and the need/associated funding for upgrading or road improvement works (if required)	Section 5
7.10	The proposed access arrangements and measures to mitigate any associated traffic impacts and impacts on public transport pedestrian and bicycle networks.	Section 6
7.11	Details of existing and proposed car and bicycle parking provisions, including end of trip facilities and the consideration of the availability of public transport and the requirements of the relevant parking codes and Australian Standards.	Considered in Landscape Architect's Report and included here in Section 5.
7.12	Location of pedestrian and bicycle facilities in secure, convenient, accessible areas close to main entries incorporating lighting and passive surveillance.	Considered in Landscape Architect's Report and included here in Section 5.
7.13	Service vehicle access, delivery and loading arrangements and estimated service vehicle movements (including vehicle type and the likely vehicle type and the likely arrival and departure times)	Considered in Architect's Report and included here in Section 4.
7.14	Details of how traffic, parking, public transport and active transport movements would be managed during major and minor events to minimise impacts to the surrounding network, including the preparation of draft Event Management Plan.	Suggested mitigations in Section 6, Infrastructure NSW developing Event Management Plan.
7.15	In relation to construction traffic: • Undertake an assessment of the cumulative impacts associated with other construction activities; • Undertake an assessment of road safety at key intersections and locations subject to heavy vehicle movements and high pedestrian activity; • Provide details of anticipated peak hour and daily truck movements to and from the site; • Provide details of temporary cycling and pedestrian access arrangements during construction; • Provide details of construction vehicle access management at all stages of construction and • Detail the traffic and transport impacts during construction and how these impacts will be migrated for any associated traffic, bus scheduling and potential delays, pedestrian, cyclists, parking and public transport, including the preparation of a draft Construction Traffic Management Plan to determine the proposed management of impact. This plan should include truck routes, truck movements, hours of construction, access arrangements, parking arrangements and traffic control measures for all demolition/construction activities.	Addressed in Construction Traffic Management Plan (CTMP), separate deliverable before start of demolition activities. Traffic impact from bulk earthworks and general construction activities is addressed in this TIA.

1.8 Report Structure

The remainder of the report structure for the TIA include:

- Section 2 – Proposed Development, this documents the development as proposed from a transportation perspective.
- Section 3 – Assessment Methodology, this describes the methodology adopted for the TIA.
- Section 4 – Existing and Proposed Development Traffic & Transport Conditions, this benchmarks the existing traffic environment, before and after the proposed development.
- Section 5 – Assessment of Effects of Proposed Development, this describes the outcomes of assessment of the effects on the proposed network.
- Section 6 – Potential Mitigations, this identifies what strategies could be implemented to address identified transport effects associated with the proposed development.
- Section 7 – Alignment with Transport Strategies, this describes how the mitigations and outcomes of the TIA align with New South Wales transport strategies.
- Section 8 – Conclusions and Recommendations, this outlines the overall recommendations of the TIA.

2 Proposed Development

2.1 Project Description

Section 1.2 provided a detailed description of the proposed development.

The proposed development, from a transport impact perspective and its locality to the adjacent transport network, is unaltered from that presented in the Stage 1 DA, produced by AECOM and submitted in 2016.

2.2 Proposed Operations and Access

The Stage 1 DA concluded that:

Although the Proposed Development is predicted to maintain acceptable peak period game day vehicle performance levels of Level of Service D (LoS D) or better at the key intersections within the study area, the new stadium would generate significant volumes of pedestrian demand travelling through these locations before and after the 43 or 44 scheduled sporting events per annum. In particular, full capacity games would generate 30,000 spectators, which is almost double the average of the last five games in 2016.

Therefore, as the majority of spectators are predicted to walk on footpaths between the stadium and secondary modes of transport in and around Parramatta CBD, a further review of pedestrian movements and performance should be undertaken as part of the subsequent detailed design stage. It should focus on the primary pedestrian movements between the proposed Western Sydney Stadium and the eastern side of O'Connell Street. The layout, capacity and operations of existing signalised intersections and connecting footpaths may require upgrades to accommodate future pre-game and post-game peaks in pedestrian demand and encourage more spectators to consider walking as a more sustainable mode of travel.

The two-way vehicular access road and key intersections within the study area should be monitored during the first game(s) at the Stadium to determine if the operational performance is in line with acceptable levels of service. A review of the operational performance of road and pedestrian networks/hubs (including Parramatta Train Station and O'Connell Street bus stops) in this way would identify any unexpected issues, challenges or even opportunities at an early stage.

2.2.1 Hours of operation

The hours of operation would be consistent with the existing NRL and A-League game times (generally between 2 pm and 10 pm on a weekday). However, recognising that the new stadium may attract additional games, music and other entertainment events, the hours of operation may alter in order to respond to the types of events held.

2.2.2 Events and schedules

Once operational (projected early 2019), the Western Sydney Stadium would primarily be used for major sporting events, concerts and fairs.

The stadium is expected to operate as a competition site for teams such as the Parramatta Eels (NRL), the Western Sydney Wanderers (A-League soccer) and other NRL franchises under the NSW Stadia Strategy objectives for the consolidation of venues. The number of event days are therefore projected to increase substantially under the Project (refer to **Table 2.1**). An increase in patron attendance to the events is also projected, based on ten year historical growth periods of each sport. **Table 2.1** provides an indication of future events, however, the exact schedule of future events to be held at Western Sydney

Stadium would be developed by Venues NSW in consultation with relevant event organisers and sporting associations.

Table 2.1 - Event calendar and attendees

	Existing events	Projected number of events under the Project
Event Calendar		
Parramatta Eels	9	10
NRL Team 2	0	10
NRL Team 3	0	10
WS Wanderers	13-14	11-12
Other (e.g. Final Series, Concerts)	0	1
Total events	**22-23**	**43-44**
Attendances		
Parramatta Eels	13,300, no growth	10% uplift, no growth
NRL Team 2	15,900, no growth	10% uplift, no growth
NRL Team 3	11,800, no growth	10% uplift, no growth
WS Wanderers	13,500, 0.7% growth	10% uplift, 0.7%growth
Other (e.g. Final Series, Concerts)	N/A – no events	30,000

Table 2.2 lists attendance figures for the last five sporting events at the current stadium during April and May 2016. Attendance ranged from 8,961 at the Parramatta Eels vs. Melbourne Storm NRL game to 20,084 viewing the Western Sydney Wanderers vs. Brisbane Roar A-League football match; which equates to 97% of the stadium capacity. The average attendance for the last five games was around 14,650, which equates to 71% of the existing total capacity.

Table 2.2 - Attendance figures – last five events

Date	Sport	Event	Attendance	
			Total	% of Capacity
23/05/16	NRL	Parramatta Eels vs. Melbourne Storm	8,961	43%
13/05/16	NRL	Parramatta Eels vs. South Sydney Rabbitohs	16,013	77%
07/05/16	NRL	Pacific Test Double Header	15,225	73%
24/04/16	A-League	Western Sydney Wanderers vs. Brisbane Roar	20,084	97%
09/04/16	NRL	Parramatta Eels vs. Canberra Raiders	12,947	62%
		Average	**14,646**	**71%**

Source: www.austadiums.com

Table 2.3 presents the top five attendance figures recorded at the stadium since it was opened over 30 years ago in March 1986. The highest attendance was at the Parramatta Eels vs. West Tigers NRL game in April 2005, which at 21,141 spectators was 2% more than the stadium capacity. In summary, the table shows:

- NRL games dominate the list with all five games being hosted by the Parramatta Eels;
- Four of the five games were played between August 2005 and August 2006; and

- Two of the games were against the Brisbane Broncos, which implies that the majority of the crowd were Parramatta Eels fans due to the distance to travel for away fans. Interestingly, the recent and previously discussed A-League game was very close to being on this list and it was also played against Brisbane opposition. This suggests that both the Western Sydney Wanderers and Parramatta Eels have a latent fan- base that could exceed the existing capacity.

Table 2.3 - Attendance figures – top five highest

Rank	Date	Sport	Event	Attendance	
				Total	% of Capacity
1	21/04/06	NRL	Parramatta Eels vs. West Tigers	21,141	102%
2	27/08/06	NRL	Parramatta Eels vs. Brisbane Broncos	20,353	98%
3	02/09/05	NRL	Parramatta Eels vs. Brisbane Broncos	20,340	98%
4	12/08/05	NRL	Parramatta Eels vs. Canterbury Bulldogs	20,289	98%
5	28/08/09	NRL	Parramatta Eels vs. Penrith Panthers	20,237	97%

Source: www.austadiums.com

Accessibility and circulation

Although the existing stadium is conveniently situated within 1km from the Parramatta CBD, connectivity is somewhat constrained by the Parramatta River to the south and west and the Parramatta Leagues Club to the north. These natural and built barriers restrict the flow of both pedestrian and transport movements to/from the stadium creating a 'bottleneck' to the gateway of O'Connell Street; which is the primary road corridor that distributes movements to destinations in a northern, southern and eastern direction. Additionally, a footbridge that is located near the Parramatta Leagues Club links pedestrian movements between the stadium and Parramatta Park to the west.

The proposed Western Sydney Stadium would be located on the same Site as the existing facility between O'Connell Street and the Parramatta River; around 1km from the Parramatta CBD. Consequently, existing accessibility constraints that are caused by natural (Parramatta River) and built (Parramatta Leagues Club) barriers would continue to impact the flow of pedestrian movements to/from the Proposal.

However, demolition of the Parramatta Swimming Centre would unlock connectivity from O'Connell Street and beyond to the south and east. This would also create an open space of enhanced accessibility for pedestrian movements travelling to/from the new stadium gates either directly to the Eastern Grandstand or around the new stadium to other entry/exit points.

Consequently, existing pedestrian crossings on O'Connell Street would be heavily utilised; particularly before and after games that attract large attendance figures that are greater than the existing capacity.

In summary, as indicated in **Figure 2.1**, transport accessibility and vehicular access to the proposed Western Sydney Stadium complex would be provided via the following:

1) A two-way vehicular access road (via the existing O'Connell Street and Victoria Road signalised intersection) on the northern side of the Site, with a 500 space car park.
2) A new access road from O'Connell Street south of the stadium along the western side of the stadium to exit south back on to O'Connell Street. This access road would allow staff, player and service vehicles to enter and exit the Site via O'Connell Street and minimise congestion. This entry would be via this southern entrance off O'Connell Street and then into a lower ground service concourse beneath the western grandstand. This proposed bus/service vehicle route would mitigate the existing

safety and operational issue of buses having to reverse along the stadium access road to the corporate entrance at the Western Grandstand. See Section 2.2.6 for service vehicle access.

3) The current signalised pedestrian crossing across O'Connell Street, opposite the current swimming pool complex, and the signalised intersection in (1) will provide dedicated controlled crossings for pedestrians crossing O'Connell Street.

There is an opportunity to combine (2) and (3) to allow a more direct pedestrian access to the southern gate of the Eastern Stand if it proves to be beneficial for overall operations. Sections 5 and 6 address the performance, options and proposed remedial measures for these intersections.

Cyclist connectivity to the stadium would be provided through the existing cycle network that runs along the Parramatta River and within Parramatta Park, and the Site would provide cyclist lock-up facilities to encourage sustainable transport.

Overall, the proposed Western Sydney Stadium would provide enhanced accessibility for both pedestrian, cyclists and vehicular (car and bus) modes of travel.

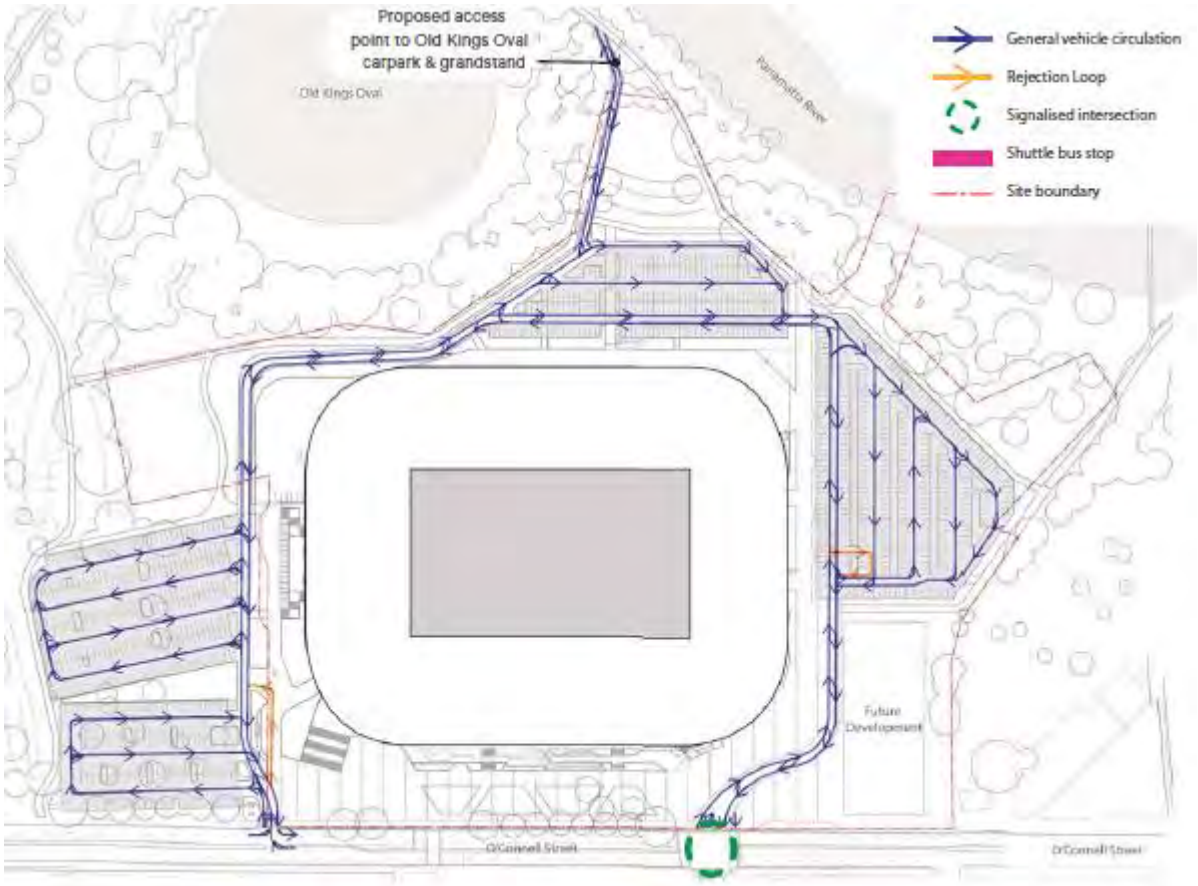


Figure 2.1 – WSS - Proposed access and circulation

2.2.3 Parking

The proposed **parking facilities,** as indicated in **Figure 2.2** below include:

A total of 500 carparking spaces, including 4 coach parking spaces, are proposed within the site over three carparks, accessible via O'Connell Street. An additional 350 carparking spaces sit to the south of the site within the Parramatta Parks Trust carpark.

The **Northern Carpark** sits north of the stadium and west of the future development lot. It accommodates 297 parking spaces including four coach parking spaces, 7 disabled parking spaces and parking for emergency vehicles, PRUA (persons requiring Universal Access), the hirer, match officials and media personnel.

The **Western Carpark** is an intermediate terrace to the west of the stadium concourse. The carpark is paved with asphalt and decorative concrete banding providing 181 parking spaces as well as a VIP drop off. During major events this carpark has the ability to be gated off to enable an overlay of events to occur such as markets, outdoor functions and game day events. A generous tree lined path through this carpark offers pedestrian connections from the stadium concourse to the River Terraces.

The **Southern Carpark** comprises 267 retained parking spaces as part of the original Parramatta Park Trust carpark, accompanied by an additional 83 new parking spaces within a reconfigured arrangement to achieve a total of 350 parking spaces. This carpark retains a number of existing mature trees where possible in turf verges.

VIP Parking - an additional 22 parking spaces are located within the loading dock that are reserved for use by VIPs.

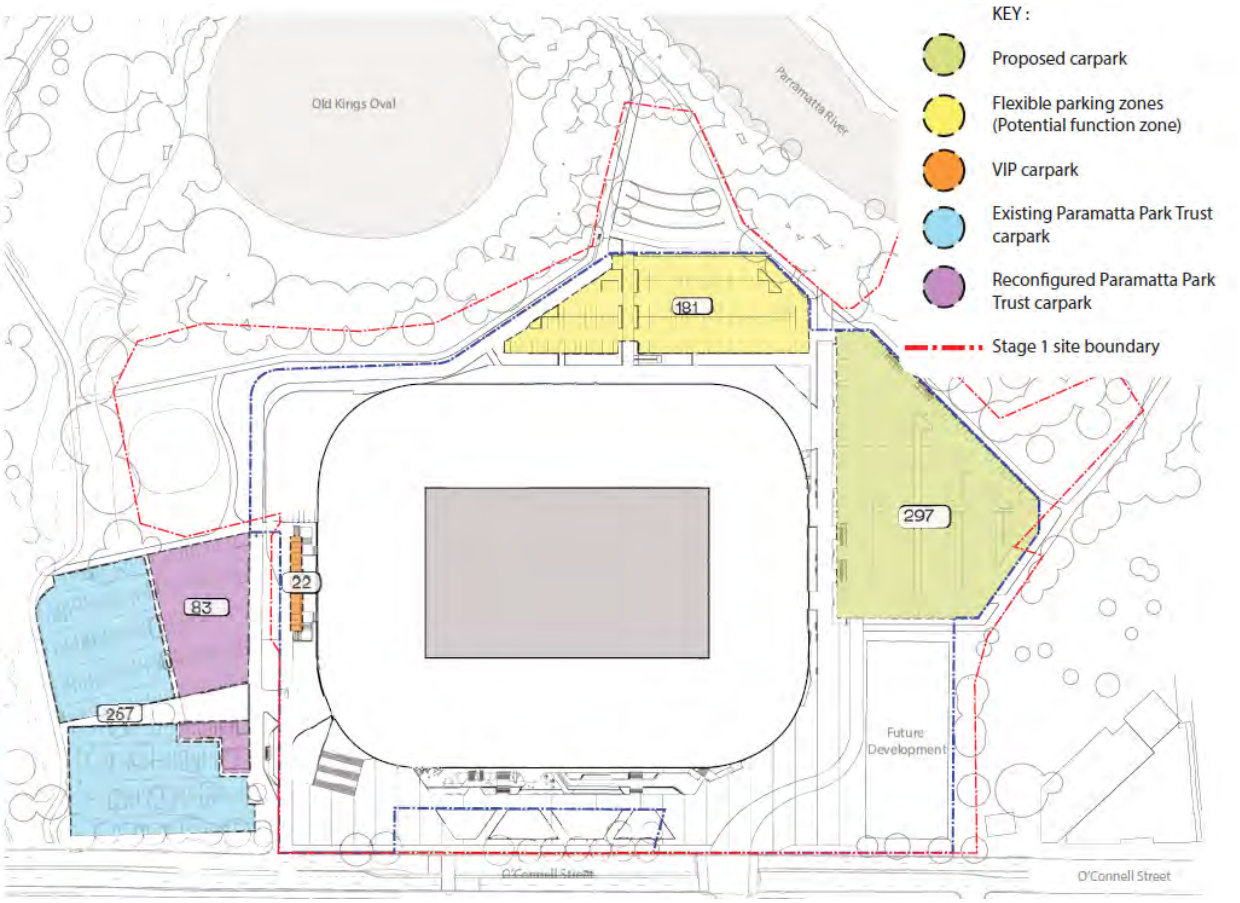


Figure 2.2 – WSS - Proposed Parking Facilities

2.2.4 Emergency Vehicle Access

Access for emergency vehicles is through both the southern and northern entry points from O'Connell Street. As indicated in **Figure 2.3** below emergency vehicles will have 360-degree access around the stadium via the Western Carpark and ramped access road. Access for emergency vehicles into the stadium can be gained through the southern entry and loading dock area.

In every day mode, Old Kings Oval can be accessed by emergency vehicles using either entry, through the Western carpark or ramped access road (1). Emergency vehicles access has also been maintained from the north of the site via Parramatta Park (2).

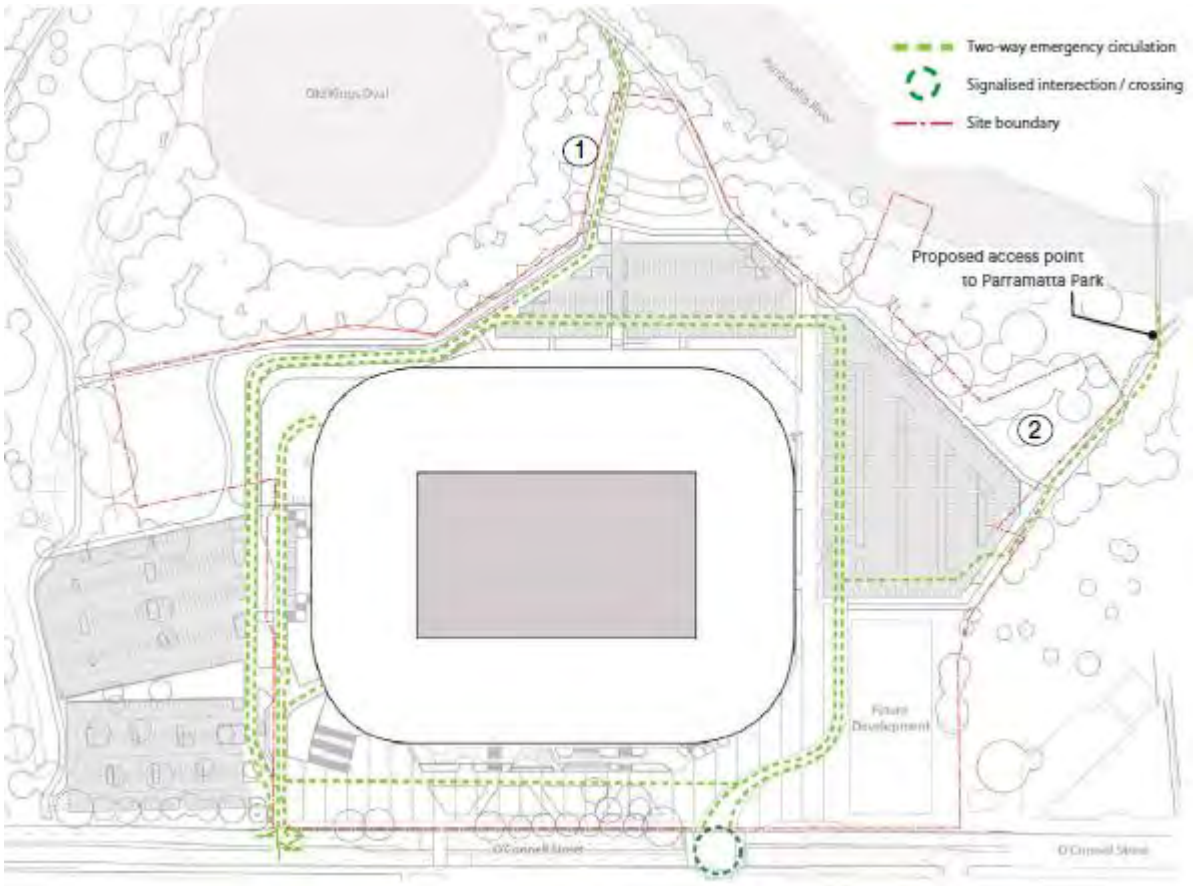


Figure 2.3 – WSS - Emergency Vehicle Access

2.2.5 Workforce

The workforce at the stadium complex would vary between event and non-event days.

On event days, the in-house stadium co-ordinator would be responsible for overseeing all events held at the new stadium. Up to 600 staff (comprising permanent and contract staff) would be required to operate the stadium to provide catering, security, cleaning and customer service functions. However, up to 900 staff may be required during concert events. Security, police and first aid officers would also be located throughout the stadium on event days.

On non-event days, staffing requirements may vary between ~ five and 100 employees depending on the preparation task required for any upcoming events and ongoing maintenance requirements.

2.2.6 Service Vehicles and Team Buses Access

Service vehicles and team buses are expected to enter the Stadium complex through an access road which connects to O'Connell Street south of the Stadium – see **Figure 2.4**. The loading area for service vehicles is proposed to be located beneath the western forecourt which will minimise the conflict between heavy vehicles and pedestrians. Service vehicles will comprise of but are not limited to stadium staff vehicles, telecast vehicles, food/beverage delivery vehicles and emergency service vehicles which will be a mix of light commercial vehicles and heavy vehicles.

It is anticipated that service/team buses vehicles will arrive at the stadium in the hours leading up to an event and the number of vehicles is likely to range depending on the size and type of each event. Upon exiting the stadium, because of the time needed to load goods into vehicles after an event, vehicles would likely depart at a time after most spectators have left the stadium and stadium car park, providing minimal delay to exiting service vehicles.

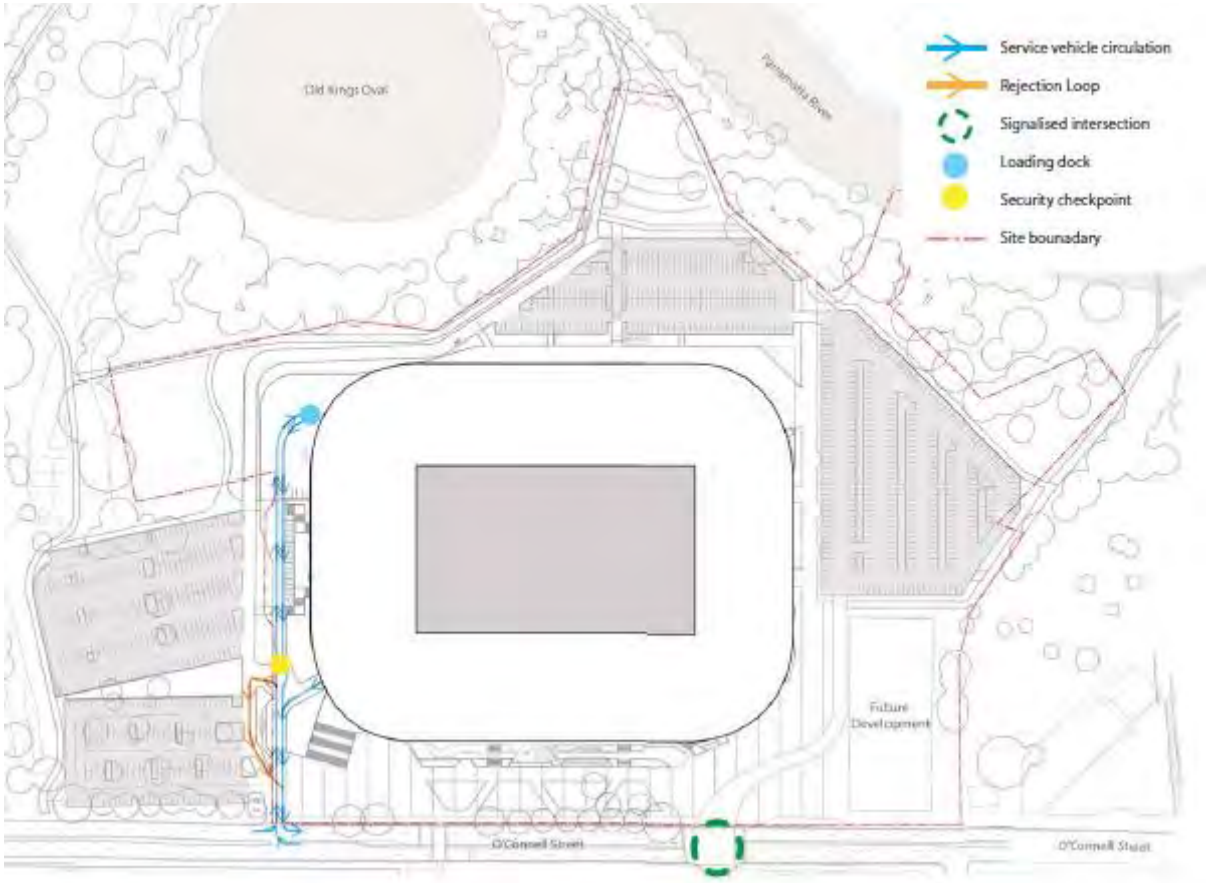


Figure 2.4 – WSS - Service/Team Bus Vehicle Access

2.3 Development Demand

Future year travel demands and patterns that will be generated by the new stadium have been estimated using historic spectator game day attendance figures that are based on major events (full capacity), minor events (half capacity) and no events scenarios at the stadium. It is noted that a comparable stadium was not used to estimate peak hour movements of the various travel modes for the above scenarios because of the required timeframe to collect the relevant volumes/patterns. Further to this, comparable stadiums with a similar function, geography and size could not be determined as each stadium within the Sydney region has its own unique characterises which may produce biased data.

The methodology used to estimate the peak hour movements and trips for each travel mode are explained further in **Section 3** and have generally been in line with observations and patterns in data collected during the site visit. This allows for factors that affect future year travel demands to be more consistent with the existing stadium such as on-street parking capacity, proximity to public transport, geography and socio demographic characteristics.

3 Assessment Methodology

The assessment methodology adopted for this TIA follows closely the work undertaken within the Stage 1 DA Transport and Accessibility Working Paper, produced by AECOM. The key difference being that the work undertaken within this TIA has been developed in a way to respond to the SEARs set on the Stage 2 DA (outlines in Section 1.7).

The unique nature of trip generation for sporting stadia, such as the WSS, need to take account of the in-bound and outbound trips for every spectator, for which the majority are shifting from one transport mode to the other during the trip and eventually become a pedestrian as they enter and exit the stadium. These spectator transport modes can be train, light rail, private vehicle, taxi, bus, bicycle, walking or a combination of these. In addition there are the trips from service vehicles, workers and team members leading up to an event and leaving after the event.

This section describes how we determine, distribute and apply these trips on the existing transport network and then assess the impact on the operational performance of the network elements for different peak period scenarios.

3.1 General Transportation Methodology

The following general transport development assessment methodology was undertaken for the TIA:

- Trip Generation – the number of trips generated by the development under a number of different scenarios.
- Mode Share – the way in which people travel to the development under different scenarios.
- Trip Distribution – the distribution of these trips across various modes across time.
- Trip Assignment – the routes that these trips take under a number of different scenarios.

3.1.1 Multi-Modal Transportation

To capture the extent of transportation activities and to enable the ability to be able to quantify the effects of the proposed development, comprehensive multi-modal transport information is required. This is supplemented by the information gathered in the consultation phase and include:

- Vehicle Movement Information, sources:
    - Stage 1 DA Traffic Data, obtained from AECOM via Infrastructure NSW.
    - SCATS data for all four existing intersections identified, obtained from RMS.
    - On-site observations of peak hour movements, used to determine flow patterns and model calibration parameters.
    - Traffic data associated with Parramatta Leagues Club development, as well as any other notable developments.
- Pedestrian Movement Information, sources:
    - Stage 1 DA Pedestrian Data, obtained from AECOM.
    - Site observations of pedestrian routes and trip attractors/generators.
- Bus, Train and Light Rail Transfers:
    - Stage 1 DA Information, obtained from AECOM via Infrastructure NSW.
    - Information on Light rail from TfNSW.

- Publically available train and bus timetables (TfNSW).

- On-site Parking Occupancy Information:
  - Stage 1 DA Information, obtained from AECOM via Infrastructure NSW.

This TIA evaluated the transportation effects using a combination of data sources listed above and consideration of appropriate assumptions where necessary.

The use of multiple data sets required data manipulation into a format that could be used within the analytical stages of the evaluations.

3.2 Area of Influence

The area of influence of the development adopted for this TIA maintains that introduced in Stage 1 DA as shown in **Figure 3.1** below.

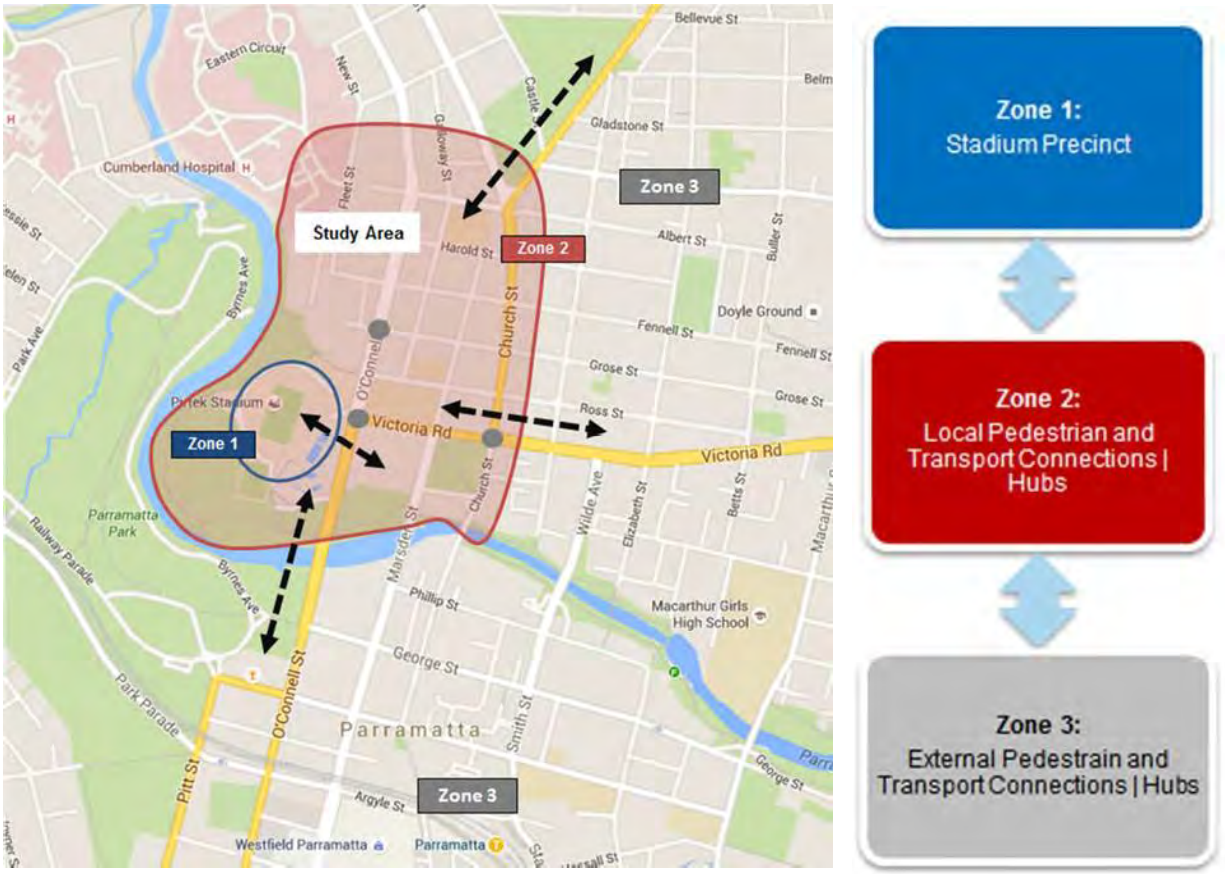


Figure 3.1 - Modelling and assessment zone structure and study area (Source: AECOM)

Each zone was identified as having distinct influences on the transport network:

- Zone 1 – Stadium Precinct.
- Zone 2 – Local Pedestrian and Transport Connections/Hubs.
- Zone 3 – External Pedestrian and Transportation Connections/Hubs.

For each of these zones, impacts on each of the transport modes were assessed. These assessments used a combination of quantitative and qualitative assessment, following on from the methodology adopted within the Stage 1 DA. **Table 3.1** documents how each mode was assessed through the various zones.

Table 3.1 – Assessment approach for area of influence

Zone	Car	Bus	Light Rail	Heavy Rail	Cycling	Walking
Zone 1	Quantitative	Quantitative	N/A	N/A	Qualitative	Qualitative/ Quantitative
Zone 2	Quantitative/ Qualitative	Quantitative/ Qualitative	Qualitative	N/A	Qualitative	Qualitative/ Quantitative
Zone 3	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative

Note: Light Rail and Heavy Rail were identified as N/A in Zone 1, and Heavy Rail N/A in Zone 2. This is because within these zones, these transport modes do not exist and therefore are not a mode that can be assessed.

3.3 Scenarios

There are a number of scenarios that were tested in order to assess the anticipated effect on the transport network within the identified zones. **Table 3.2** lists these scenarios.

Table 3.2 – Transport Scenarios Tested

Stadium Type	Year	Period	Event	Reference Figure
Current	2016	PM Peak – Weekday	Sampled Event	Fig 4.3
Current	2016	PM Peak – Weekday	Sampled No-Event	Fig 4.4
Current	2016	AM Peak – Weekday	No-Event	Fig 4.5
Current	2019	AM Peak – Weekday Arrivals	No Event	Fig 4.14
Current	2019	PM Peak – Weekday Arrivals	No Event	Fig 4.15
Current	2019	PM Peak – Weekday Arrivals	Half Event	Fig 4.16
Current	2019	PM Peak – Weekday Arrivals	Full Event	Fig 4.17
Current	2019	PM Peak – Weekday Departures	No-Event	Fig 4.18
Current	2019	PM Peak – Weekday Departures	Half Event	Fig 4.19
Current	2019	PM Peak – Weekday Departures	Full Event	Fig 4.20
Current	2019	Weekend Peak	No Event	Fig 4.21
Current	2019	Weekend Peak	Full Event	Fig 4.22
Proposed	2019	Weekend Peak	No Event	Fig 4.23
Proposed	2019	Weekend Peak	Full Event	Fig 4.24
Proposed	2019	AM Peak – Weekday Arrivals	No-Event	Fig 4.28
Proposed	2019	PM Peak – Weekday Arrivals	No-Event	Fig 4.29
Proposed	2019	PM Peak – Weekday Arrivals	Half Event	Fig 4.30
Proposed	2019	PM Peak – Weekday Departures	Half Event	Fig 4.31
Proposed	2019	PM Peak – Weekday Arrivals	Full Event	Fig 4.32
Proposed	2019	PM Peak – Weekday Departures	Full Event	Fig 4.33

3.4 Trip Generation

Trip generation for the proposed development has been determined based on the type of event that is occurring within a given scenario. These typically are associated with spectator, staff and general public transport generation to and from the stadium.

Table 3.3 summaries the spectator generation associated with various event types.

Table 3.3 – Spectator Trip Generation Scenarios

Stadium Type	Event Type	Spectators
Current Stadium	No Event	0 Spectators
Current Stadium	Half Event	10,386 Spectators
Current Stadium	Full Event	20,771 Spectators
Proposed Stadium	No Event	0 Spectators
Proposed Stadium	Half Event	15,000 Spectators
Proposed Stadium	Full Event	30,000 Spectators

Table 3.4 summarises the staff generation associated with various event types. These workforce figures have been obtained from the Stage 1 DA (Section 2.2.2). Staffing numbers for the existing and proposed stadium are identified as being the same. Therefore, during a non-event day, there is not expected to be any additional effect on the transport network.

Table 3.4 – Staff Trip Generation Scenarios

Stadium Type	Event Type	Staff
Current Stadium	No Event	50 Staff (five to 100 generally)
Current Stadium	Half Event	600 Staff
Current Stadium	Full Event	900 Staff
Proposed Stadium	No Event	50 Staff (five to 100 generally)
Proposed Stadium	Half Event	600 Staff
Proposed Stadium	Full Event	900 Staff

Table 3.5 summaries the general public and corporate use trip generation associated with various event types. These general public/corporate use figures are related to car parks on site. It is assumed that during an event, these car parks will be used exclusively by spectators.

Table 3.5 – General Public Generation Scenarios

Stadium Type	Event Type	General Public Car spaces
Current Stadium	No Event	640 car spaces (340 + 300)
Current Stadium	Half Event	0 car spaces
Current Stadium	Full Event	0 car spaces
Proposed Stadium	No Event	800 car spaces (500 + 300)
Proposed Stadium	Half Event	0 car spaces
Proposed Stadium	Full Event	0 car spaces

3.5 Mode Share

Mode Share for Zones 1 and 2 have been obtained from the Stage 1 DA (Table 3.1). Zone 3 mode share has been based on information from Table 4.6 of the Stage 1 DA which identifies the mode share at a Local Government Authority (LGA) level. Due to the proximity of the stadium to public transport networks, these values have been amended to be weighted more heavily to public transport modes.

In the Stage 1 DA, the presence of Light Rail was excluded from the assessment. Through consultation with Transport for New South Wales (TfNSW), information regarding Light Rail has been incorporated into the mode share assumptions. It is assumed that these light rail trips will replace some current vehicle trips.

Table 3.6 provides the assumed mode shares for the current stadium as provided in the Stage 1 DA. It should be noted that in this report all the onsite parking was assumed to be occupied by corporate spectators.

Table 3.6 – Mode Share Assumptions Spectators – Current Stadium – 2016 Sampled Event

Zone	Car	Bus	Light Rail	Heavy Rail	Cycling	Walking
1	6.1%	1.0%	0.0%	0.0%	0.0%	92.0%
2	12.0%	1.0%	0.0%	0.0%	0.0%	87.0%

The mode share associated with the current and proposed stadium will be influenced by available parking, as well as the introduction of light rail. The mode shares utilised for the event scenarios discussed below, are based on full events. These mode shares are also utilised for the half event scenario.

Table 3.7 summarises the assumed mode share for Zones 1 to 3 for a full event at the current stadium. Public transport mode shares for the current stadium have been determined based on the availability of public transport and following trends at an LGA level. Further details are provided in **Section 4.1.2**.

Mode share assumptions associated with Light Rail are discussed further in **Section 4.2.4**.

Table 3.7 – Mode Share Assumptions Spectators – Current Stadium – 2019 Full Event

Zone	Car	Bus	Light Rail	Heavy Rail	Cycling	Walking
1	5.9%	1.0%	0.0%	0.0%	1.0%	92.1%
2	5.0%	1.0%	20.0%	0.0%	1.0%	73.0%
3	49.0%	10.0%	0.0%	25.0%	1.0%	20.0%

It should be noted that Light Rail is not anticipated to be operational until 2019, however it has been included in order to evaluate the influence that it will have on travel demands.

Table 3.8 summarises the assumed mode share associated with the proposed development during a full event in 2019.

Table 3.8 – Mode Share Assumptions Spectators – Proposed Stadium – 2019 Full Event

Zone	Car	Bus	Light Rail	Heavy Rail	Cycling	Walking
1	5.5%	1.0%	0.0%	0.0%	1.0%	92.5%
2	3.5%	1.0%	14.0%	0.0%	1.0%	80.5%
3	49.0%	10.0%	0.0%	25.0%	1.0%	20.0%

In addition to spectators, the current and proposed stadium will also have staff required to operate an event. It is assumed that staff will have a similar travel mode split as spectators during both non-events and events. In Zone 3, it should be noted that it has been assumed that 20% of the mode share remain walking trips. This has been assumed to take into account the people who live within the catchments, those users that do not leave the catchment over the hour or where already present in the area (i.e. go to the Parramatta CBD, bars, restaurants etc).

Information regarding the assumptions used to determine mode shares are discussed further in **Sections 4 and 5.**

3.6 Trip Distribution

The trips generated and assigned to various modes associated with the evaluated scenarios were distributed over the intended duration of an event. The critical period and anticipated most likely time for an event is during the evening of a weekday. The Stage 1 DA identified the period between 5:00pm and 10:00pm as the duration of influence associated with event generation. Typically, peak event periods are predicted to occur in the half hour before 6:00pm and half an hour after 8:00pm.

Data provided within the Stage 1 DA, in particular intersection counts of pedestrians and vehicles provides details regarding arrival and departure profiles for spectators during a sample event on Monday 23 May 2016. These distributions indicated that the majority of spectators access the stadium between 5:00pm and 7:00pm, and egress between 8:00pm and 9:00pm. Some late arrival spectators did occur between 7:00pm and 8:00pm.

Table 3.9 summarises the sampled trip distribution for spectators during the peak arrival and departure period. Assumptions were made regarding the trip distributions associated with Light Rail and Heavy Rail. These took into account their proximity to the stadium and their relation to linked pedestrian trips. Cycling trips were assumed to follow the same profile as pedestrians.

Table 3.9 – Spectator Access and Egress Distribution

	Access (Arrivals)			Egress (Departures)	
Time	17:00 – 18:00	18:00 – 19:00	19:00 – 20:00	20:00 – 21:00	21:00 – 22:00
Vehicle	30%	65%	5%	75%	25%
Bus	50%	50%	0%	50%	50%
Light Rail	25%	75%	0%	75%	25%
Heavy Rail	25%	75%	0%	75%	25%
Cycling	20%	70%	10%	88%	12%
Pedestrians	20%	70%	10%	88%	12%

In addition to spectators, there are varying numbers of staff required for specific events at both the current and proposed stadium. It is anticipated that staff will enter and exit the stadium outside the periods associated with spectators. **Table 3.10** summaries the assumed distribution of staff trips.

Table 3.10 – Staff Access and Egress Distribution

	Access (Arrivals)			Egress (Departures)	
Time	17:00 – 18:00	18:00 – 19:00	19:00 – 20:00	20:00 – 21:00	21:00 – 22:00
Vehicle	100%	0%	0%	0%	100%
Bus	100%	0%	0%	0%	100%
Light Rail	100%	0%	0%	0%	100%
Heavy Rail	100%	0%	0%	0%	100%
Cycling	100%	0%	0%	0%	100%
Pedestrians	100%	0%	0%	0%	100%

3.7 Trip Assignment

The trip assignment to routes within the transport network has been developed based on a mixture of information provided in the Stage 1 DA, in conjunction with an assessment of likely trip attractors within Parramatta, calibrating against the assumed mode shares.

The Stage 1 DA (Table 3.1 and Section 6) provides trip assignment information associated with the current and proposed development. These mode shares primarily are associated with Zones 1 and 2. As part of this TIA, for Zone 3, trip assignment has been based on likely trip attractors. These include parking availability, entertainment areas and public transport facilities. **Table 3.11** summarises the trip assignment information provided in the Stage 1 DA that relates to spectators exiting Zone 1.

Table 3.11 – Spectator walk distribution Zone 1 – Stage 1 DA (Table 3.1)

Direction	North	North-East	East	South-East	South
Zone 1	10%	20%	30%	30%	10%

Table 6.1 of the Stage 1 DA indicates the anticipated number of pedestrians present in Zones 2 and 3. These figures have been utilised to establish the expected trip assignment routes for various event types.

It should be noted that the Stage 1 DA assessment did not take into account potential light rail trips whilst this TIA has taken into account the potential influence of Parramatta Light Rail.

It should also be noted that the impact of construction traffic up to the opening of the new stadium does not contribute a significant amount of additional trips as the closing of the carpark and swimming pool-generated trips balance out these trips. Any other development in the vicinity that could have construction traffic impacted have been taken as part of the background growth in and around the Parramatta CBD – see **Section 4.1.1**.

Trip assignments associated with each mode are discussed further in **Section 4**.

3.8 Operational Assessment of Vehicular Effects

As with the Stage 1 DA, this TIA has assessed the intersection performance at the O'Connell/Grose, O'Connell/Victoria and Victoria/Church intersections. An additional intersection, the Southern Trust Carpark Access/Egress was also assessed. This is due to the important function that O'Connell Street plays within the Parramatta area and being part of the proposed Inner Ring Road around the Parramatta CBD, as well as proposed changes to the car parking size as part of the proposal.

The operational assessment was undertaken using the SIDRA Intersection modelling software, as used within the Stage 1 DA. Existing intersection parameters were obtained from Roads and Maritime Services (RMS) Sydney Coordinated Adaptive System (SCATs) data and supplemented by on-site observations during weekday peak periods during February 2017. Additional information regarding the modelling and associated outcomes is included in **Section 5**.

4 Existing and Proposed Transport Conditions

4.1 Existing Transport Conditions

This section discusses the existing transport conditions associated with the existing stadium. Currently the stadium has a capacity of 20,771 spectators, with 640 on-site car parks. The information presented in this section utilises the data obtained and builds on the assessments undertaken in the Stage 1 DA.

The Stage 1 DA assessed the impact of peak egress from the stadium during an evening weekday event. This was assessed as the most critical period from a stadium perspective. Feedback received on the Stage 1 DA indicated that effects associated with other periods and event conditions is also important especially the weekday afternoon peak that could coincide with an event. Additionally, the impact on all modes, not just on the road network. The weekday peak egress associated with the road network has not been reassessed as part of this assessment, as it has been adequately assessed in the Stage 1 DA.

4.1.1 Road Network

As indicated in **Figure 4.1** below, plans for two orbital "ring roads" were proposed by Parramatta Council in 2012 as part of the 20-year plan for the state's infrastructure needs.

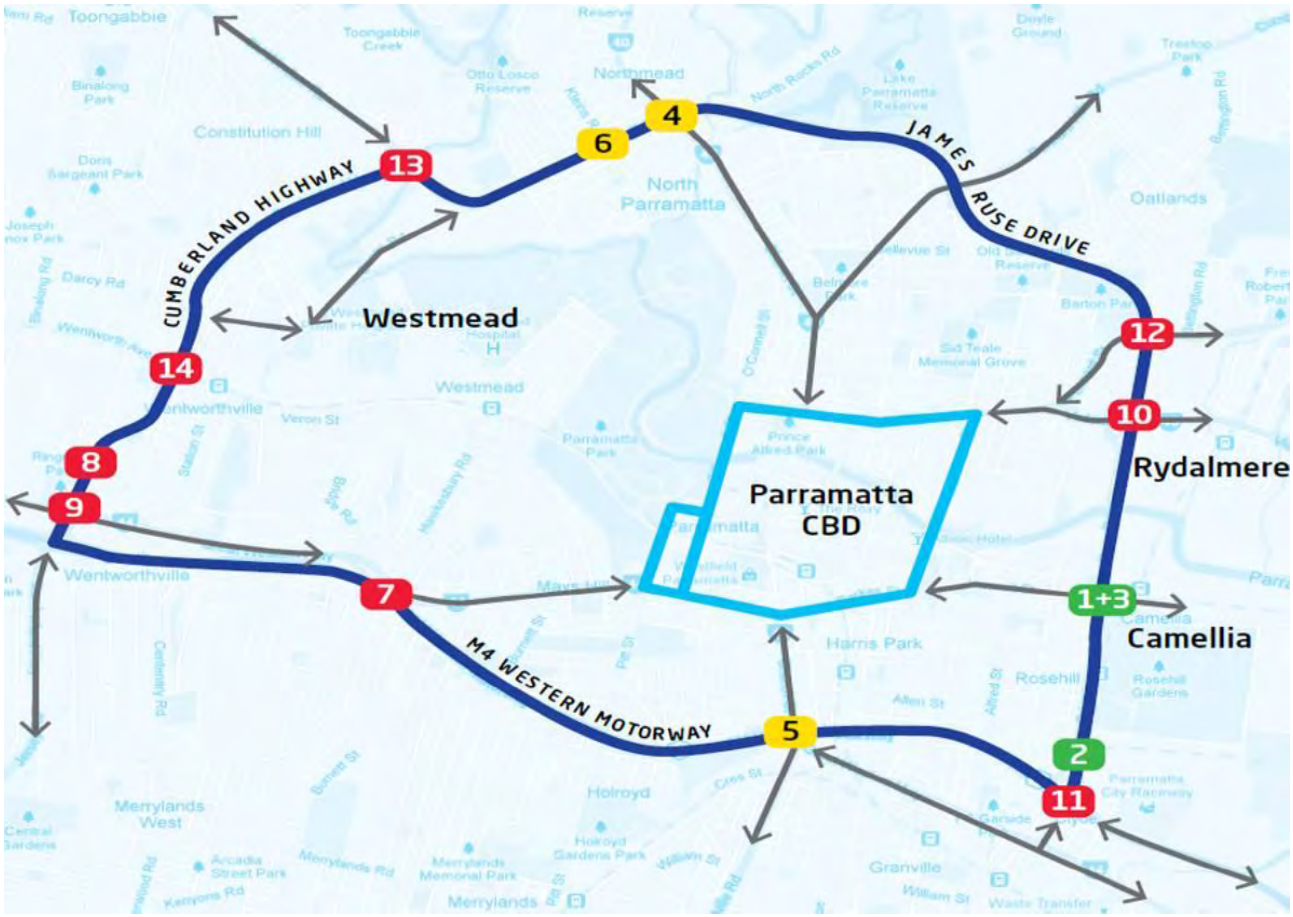


Figure 4.1 – Concept of two orbital ring roads around Parramatta (Parramatta City Council - 2012)

The importance of the Inner Ring Road has been confirmed during stakeholder consultation for this TIA emphasizing the importance of O'Connell Street as forming a key part of the ring road to allow destination traffic to better circumnavigate the city rather than cross it. The intent is to help shift the balance of traffic from through traffic to destination traffic, allowing the city centre to function more effectively.

Figure 4.2 identifies the key intersections that are assumed to be within the area of influence of the WSS development. The O'Connell Street/Victoria Road intersection is the prominent intersection and the main proposed access to the stadium. Victoria Road is also the most important route for pedestrians to the stadium. These intersections form the basis for the assumed scope for transportation analysis for this TIA, discussed further below.

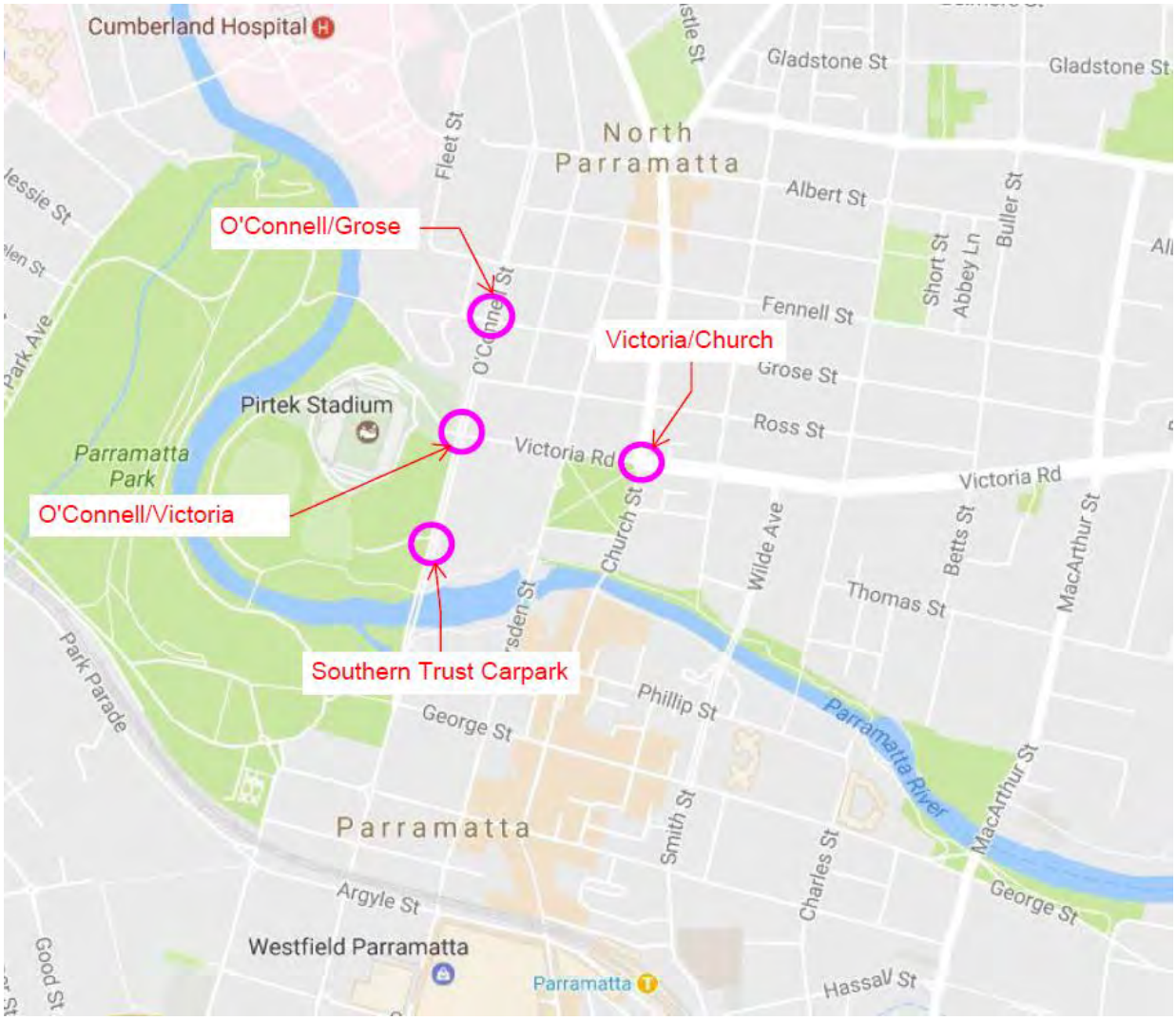


Figure 4.2 – Traffic Network Key Intersections

For the Stage 1 DA, existing road and intersection data for event and non-event day traffic was collected. This data was collected in the form of intersection counts, as well as automated vehicle detectors. Further Information is detailed in Section 4.4 of the Stage 1 DA.

This data was used to evaluate the expected traffic demand associated with the stadium, including pass-by traffic associated with surrounding car parking facilities. Traffic demand forecasts were provided in Section 6 of the Stage 1 DA report, which were based on the difference between event traffic accounting for anticipated background growth (assumed at 1%). The information presented was associated with the peak departure period of 8:45 to 9:45pm.

Feedback provided from Roads and Maritime Services (RMS) in regard to the Stage 1 DA, it was advised that growth is anticipated to be higher and suggested a value of 2% per annum be adopted.

Table 4.1 below illustrates the daily volumes on key road links in the vicinity of the stadium. These volumes were collected on the sampled event day.

Table 4.1 – Daily Traffic Volumes (ADT) – 23 May 2016 (Stage 1 DA)

Location	Volume
O'Connell Street (north of Parramatta River)	29,258
Victoria Road (west of Church Street)	14,466

These volumes indicate that O'Connell Street currently accommodates a significant amount of traffic daily, and is an important link into and out of Parramatta. Victoria Road is a major contributor to traffic entering O'Connell Street and provides access to other key road links within the network.

The intersection count information collected as part of the Stage 1 DA has indicated that the peak vehicle arrival period for vehicles to the stadium is between 17:30 and 18:30. This generally aligns with the network peak that was evaluated as being between 17:15 and 18:15.

Within the Stage 1 DA, the difference in volumes between a non-event and event day traffic was used to forecast the amount of trips generated. The theory being that this will take into account the pass-by trips associated with spectators parking in other zones. This methodology has been retained in regard to the assessment of the existing stadium for no event, half event and full event. Due to the updated background growth (2%), the assessments will need to reassess the peak egress period.

Figure 4.3 below illustrates the existing intersection flows during the peak arrivals period, which coincides with the network peak. Egress is discussed in Section 4.4.2 of the Stage 1 DA.

No information regarding the Southern Trust Car Park was available within the Stage 1 DA. Sample data and observations of the car park were collected as part of the development of this TIA. Over the sample period, it was observed that the Car Park had a high occupancy rate and large amount of turnover, approximately 20% of the 300 parking lots per hour. This would be expected, as the car park is likely to be occupied by people using the Parramatta Community Swimming Pool. Therefore, for the purposes of this assessment, it has been assumed that during the network peaks a large proportion of trips to the car park occur. Taking this into account, it is assumed in the AM peak (8:00 to 9:00), 40% of vehicle arrivals occur, with 40% of egress occurs in the PM peak (17:30 – 18:30). During an event, it is assumed that the proportion of trips and trips access and egress the car park will be similar to the stadium carpark, so will adopt the same relative difference between non-event and event day volumes.

This intersection operates as a priority controlled give-way intersection with full movements into the site, and a left out movement during egress. The right turn movement out of the car-park is banned, but some movements were observed during the sampling. These however have been excluded. The sample showed that 1/3 of vehicles enter from the north, with the remaining 2/3 entering from the south.

Larger versions of the traffic count Figures are provided in **Appendix A** for better readability.

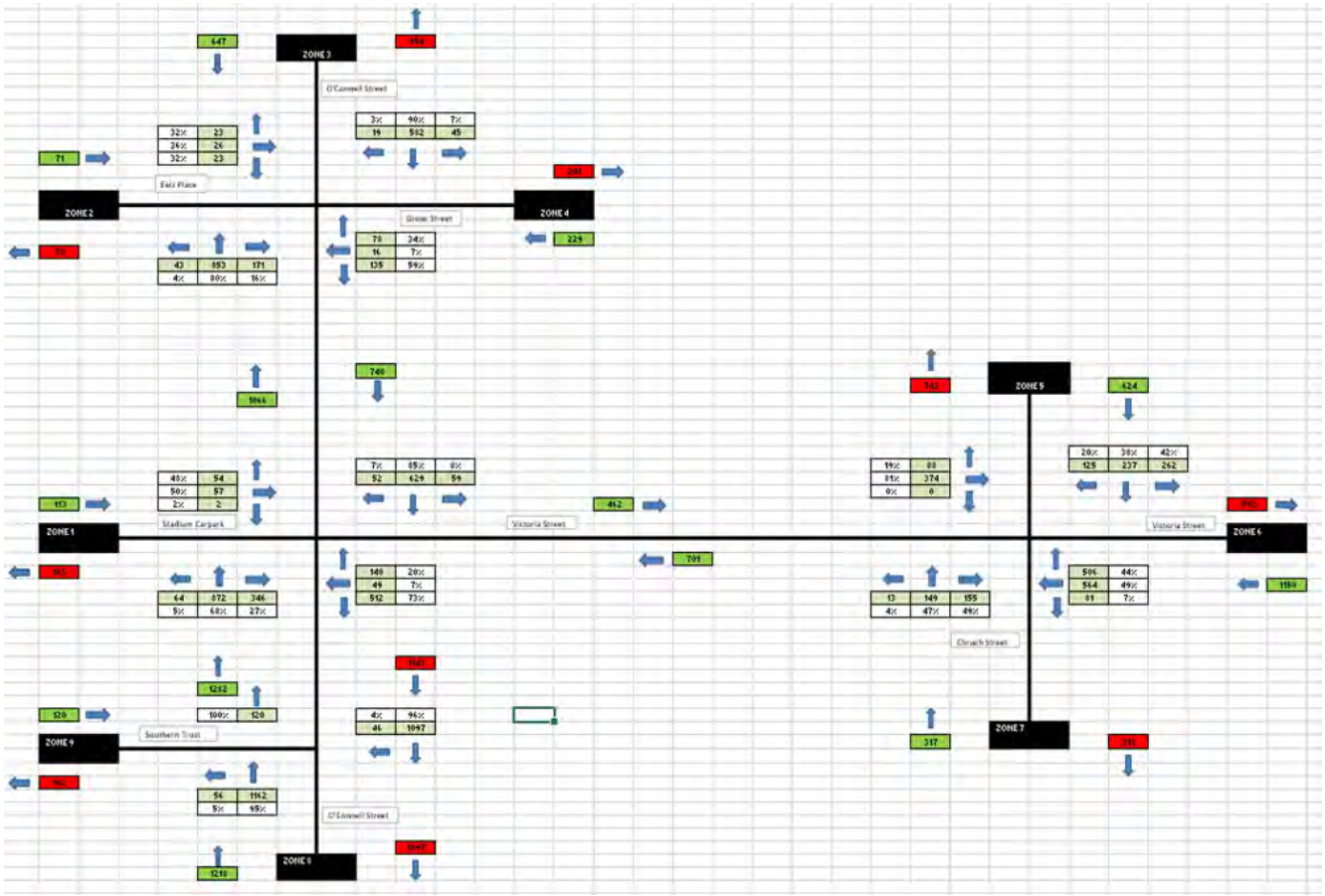


Figure 4.3 – Peak arrival turning traffic volumes – Sampled Event 23 May 2016 (17:30 – 18:30)

In addition, sample data was collected on a non-game day during the sampled week. Turning movements were provided in the Stage 1 DA for Tuesday 24 May 2016.

Figure 4.4 illustrates the turning movements during the corresponding peak arrival and network peak for a non-game day. Non-game day flows during the peak departure period are discussed in Section 4.4.2 of the Stage 1 DA.

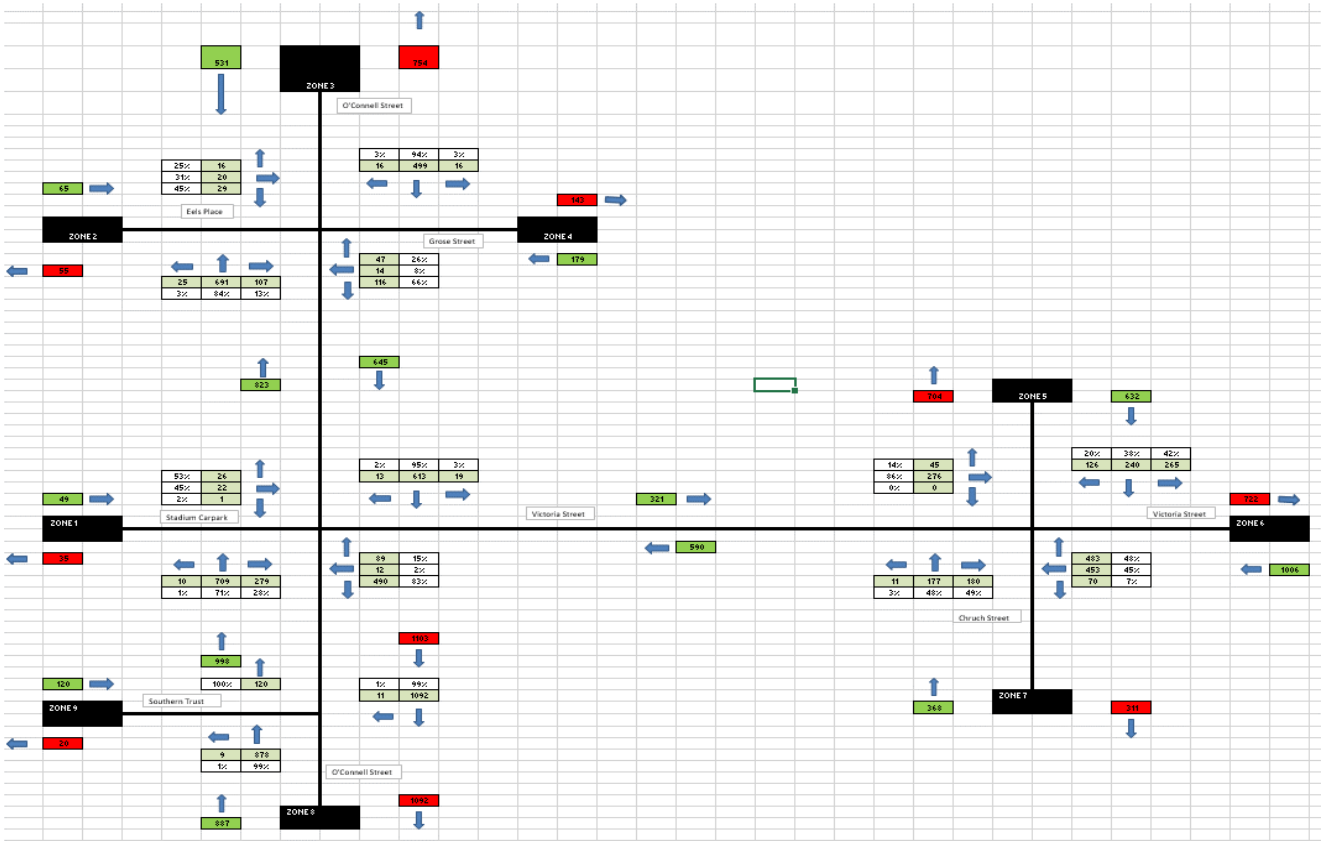


Figure 4.4 – Peak arrival turning traffic volumes – Sampled Non-Event 24 May 2016 (17:30 – 18:30)

It should be noted that there was some disparity between the flow counts for various intersections. This is related to some trips being generated within the cordon and mid-block links. The differences are less than 10%.

Feedback from the Stage 1 DA indicated that the morning (AM) network peak should be assessed. Traffic volumes for this period were not available in the Stage 1 DA. Data obtained from City of Parramatta was used to determine the flows during this period, these are illustrated in **Figure 4.5**. The proposal will only influence the O'Connell Street/Victoria Road intersection during the AM peak, therefore these are the intersection traffic volumes assessed.

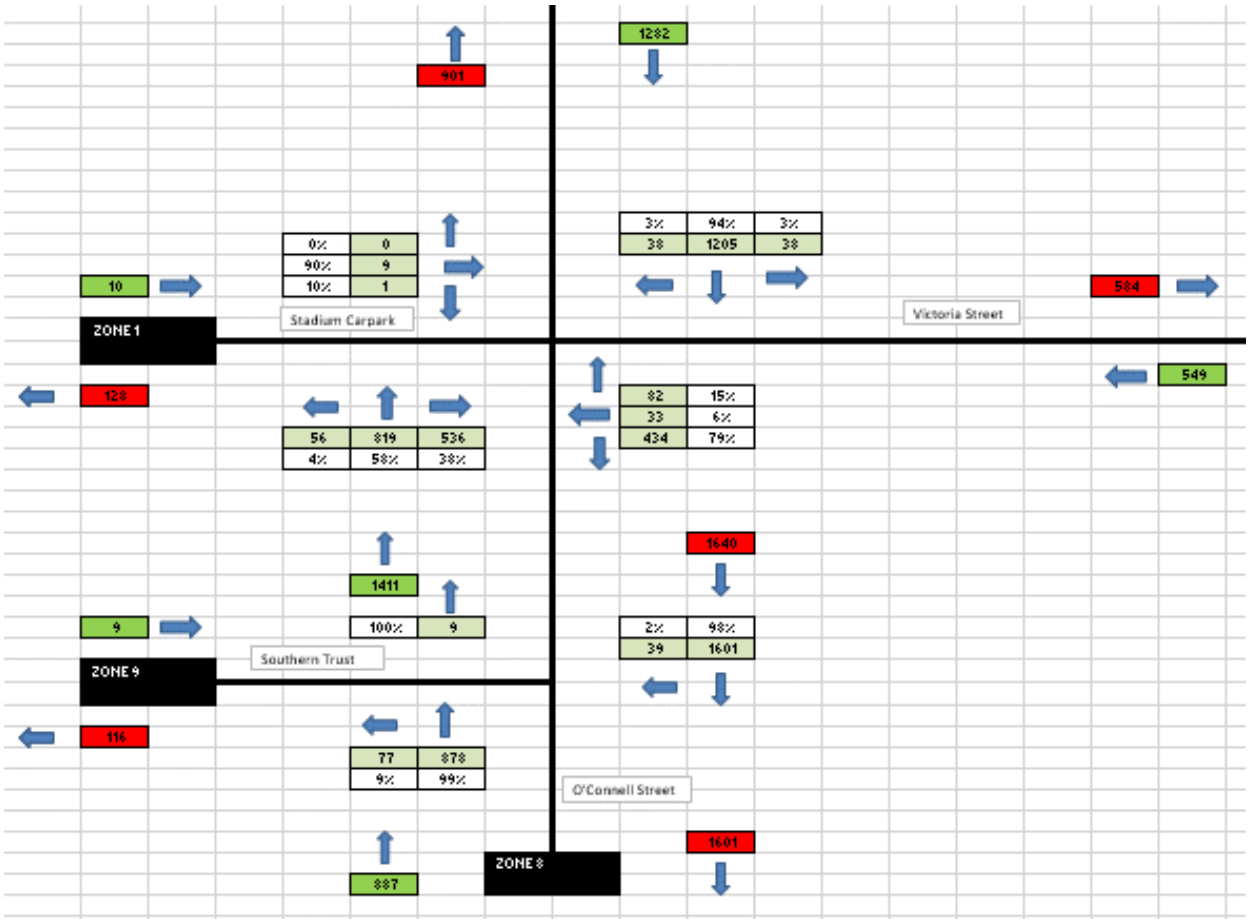


Figure 4.5 – AM Peak Period Turning Volumes – 2016 (8:00 to 9:00) – Count Data (City of Parramatta)

During a non-game day, the car park at the stadium is used by general public traffic and by day to day staff using the facility.

The flows associated with the current stadium during events in the future, including the effect of growth and surrounding developments are discussed in **Section 4.2**.

The Stage 1 DA in Section 3.1.2 indicated that within Zone 2, there is expected to be 12% mode share associated with cars. It has also stated that there is a limitation of 500 car parks within this zone. Using the information within Table 6.1 of the Stage 1 DA report, this would mean that of the 27,720 spectators entering Zone 2, 3,326 will be using vehicles. Given the assumed vehicle occupancy factor of 2.0 passengers per vehicles, this equates to 1663 vehicles exiting Zone 2, far in advance of the 500 available car parks. Therefore, this TIA has limited vehicular mode share in Zone 2 to 500 vehicles.

Within Zone 1, there is currently parking availability for 640 vehicles across the stadium and Southern Trust carparks. It is assumed that the mode share for a full event will be similar to a half event.

In Zone 3, there is a large amount of parking availability within the Parramatta CBD, circa 8,000 within car parking buildings (not including on-street parking). This includes the 510 parking lots at the Justice Precinct car park. This suggests that parking and car travel from Zone 3 will continue to be a viable mode for stadium users. The effect of these trips on the intersections assessed is captured using the methodology discussed previously.

4.1.2 Public Transport Network

Figure 4.6 identifies the key bus stops along the bus routes and public transport links within the vicinity of WSS. The routes that feed these stops and their utilisation are investigated as part of the multi-modal assessment of the TIA.

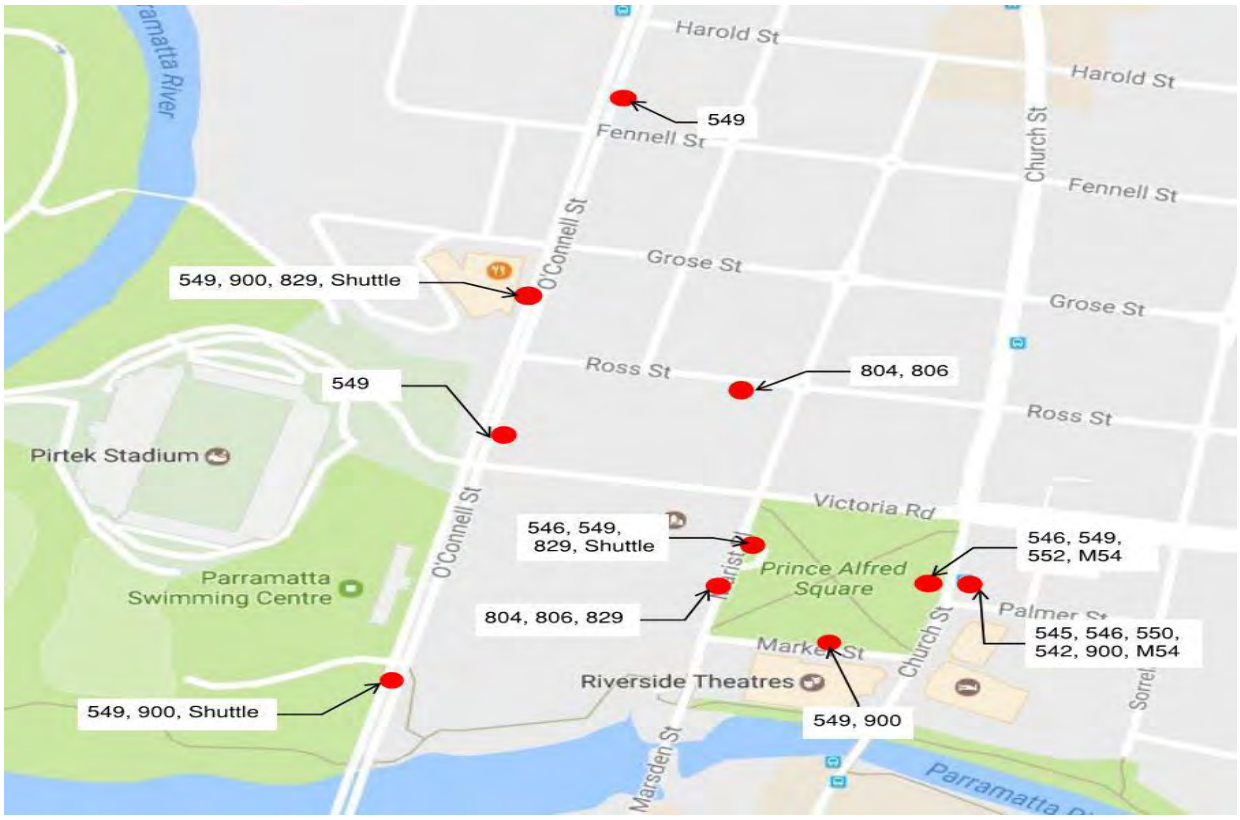


Figure 4.6 – Key Bus Stops and Bus Routes within Vicinity of WSS

Figure 4.7 shows the Parramatta bus network for both State and Council operated services. Sydney Transit operates an extensive bus network within and connecting to Parramatta.

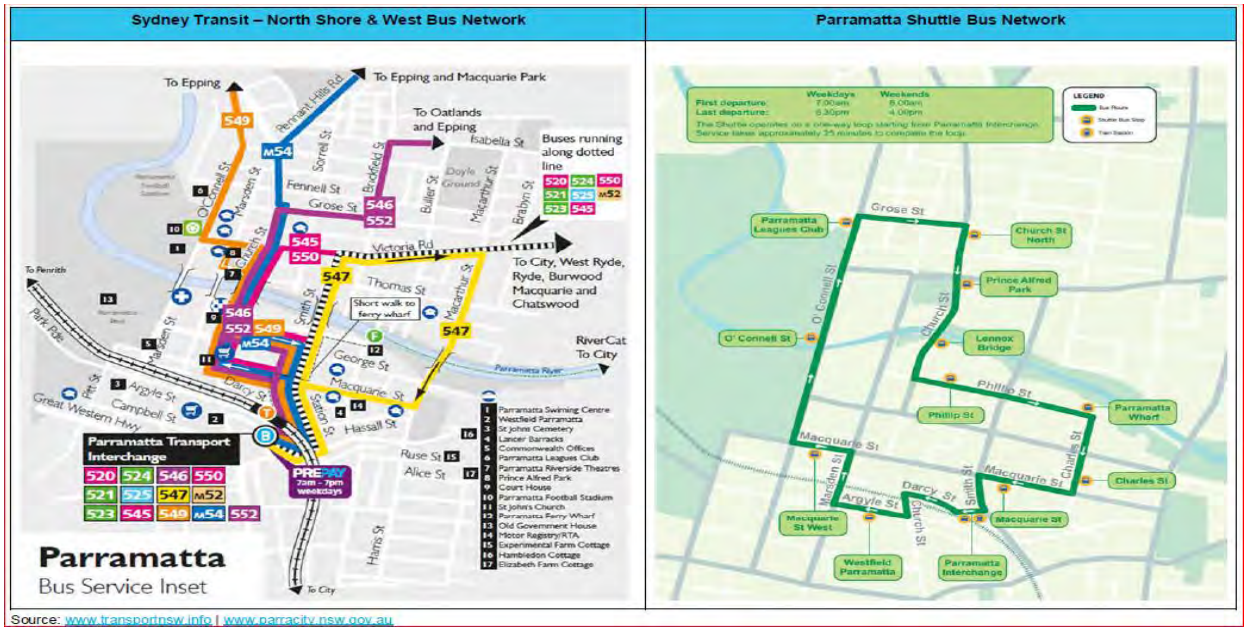


Figure 4.7 – Bus routes with bus stops along O'Connell Street next to the WSS

Existing public transport information related to heavy rail and bus networks was discussed extensively in Section 4.3 of the Stage 1 DA. Key points to note in regard to the stadium development are:

- Heavy Rail
  - 23 trains on the Western Main Line in the up direction (towards Sydney CBD), it should be noted that this number is assumed to be 19 (Sydney Trains Working Timetable) in AM peak period.
  - 19 trains on the Western Main Line in the down direction (towards Penrith) in the AM peak period.

  - 2 trains on the Western Suburban Line in the up and down direction on the Cumberland Line
  - 13 off-peak services in the up and down direction out of Parramatta.
  - Parramatta station contributing to 40-45% of peak hour loads on current services.
- Bus Services
  - Two northbound and three southbound services per hour during the AM peak along O'Connell Street.
  - Two northbound and two southbound services per hour during the PM peak along O'Connell Street.
  - 10-minute free shuttle service operating during specific times.

AM peak period trains frequencies are typically replicated in the PM peak period. The bus services discussed above are associated with Zone 2.

Within Zone 3, the following routes exist that are supplementary to those discussed above:

- M54 Parramatta to Macquarie Park via Epping
  - Five services per hour in the AM peak, six services per hour in PM peak, two services per hour in the off-peak.
- M54 Macquarie Park to Parramatta via Epping
  - Five services per hour in the AM peak, six services per hour in PM peak, two services per hour in the off-peak.
- 546 Parramatta to Epping via Oatlands & North Rocks
  - Two service per hour in the AM peak, two services per hour in the PM peak, one service per hour in the off-peak.
- 546 Epping to Parramatta via North Rocks & Oatlands
  - Two service per hour in the AM peak, two services per hour in the PM peak, one service per hour in the off-peak.
- 552 Parramatta to Oatlands
  - One service per hour during the off-peak between the AM and PM peak.
- 552 Oatlands to Parramatta
  - One service per hour during the off-peak between the AM and PM peak.
- 545 Parramatta to Chatswood via Eastwood & Macquarie Centre.
  - Four service per hour during the AM peak, five service per hour during the PM peak, two service per hour in the off-peak.
- 545 Chatswood to Parramatta via Macquarie Centre & Eastwood.
  - Four service per hour during the AM peak, six service per hour during the PM peak, two services per hour in the off-peak
- 550 Chatswood to Parramatta via Macquarie Park.
  - Two services per hour between 2:00pm and 3:00pm.
- In addition, 8 other services operate from the Parramatta interchange along Smith Street and Victoria Road

The Stage 1 DA does not provide information regarding the number of stadium users that utilise heavy rail during events. It does provide an indication that within Zone 2, there is a 1% mode share associated with Buses. For the sample event this was calculated to equate to 170 spectators, as indicated in Appendix B of the Stage 1 DA. It is anticipated that within Zone 3, some of the pedestrian trips will eventuate as heavy rail and bus trips.

For Zone 3, the mode share values were established based on overall mode shares associated with the Parramatta LGA, adjusted to take into account public transport availability and proximity. **Table 4.2** summarises the Parramatta LGA mode splits for heavy rail and bus travel, and it also summarises the assumptions used for the TIA.

Table 4.2 – Public Transport Mode Shares

	Heavy Rail	Bus Passenger
Parramatta LGA (2012-2013)	7%	5%
Assumed Mode Share – Zone 3	25%	10%

These assumptions are considered reasonable for during an event in an urban area with strong public transport availability. It is appreciated that during a half event, these mode shares may be less as parking availably will be higher. However, these events even though more frequent will be less critical on the transport network. As such these mode share have been maintained for the assessment of non-events and half events.

Based on the assumptions regarding public transport modes, the number of public transport users associated with a half and full event were determined. **Table 4.3** summarises the anticipated bus and heavy rail loads in each zone associated with the current stadium during a full event.

Table 4.3 – Public Transport Trips – Current Stadium Full Event

	Bus Passenger Trips	Heavy Rail Passenger Trips
Zone 1	217	0
Zone 2	200	0
Zone 3	1,487	2,914
Total	1,904	2,914

Table 4.4 summarises the anticipated bus and heavy rail loads anticipated in each zone associated with the current stadium during a half event.

Table 4.4 – Public Transport Trips – Current Stadium Half Event

	Bus Passenger Trips	Heavy Rail Passenger Trips
Zone 1	110	0
Zone 2	101	0
Zone 3	739	1,477
Total	950	1,477

4.1.3 Pedestrian Networks

Figure 4.8 identifies the assumed key pedestrian links between parking and public transport facilities. These routes have been based on information through initial discussion and the work undertaken during the Stage 1 DA. These links forms the bases of the transportation surveys and pedestrian analysis.

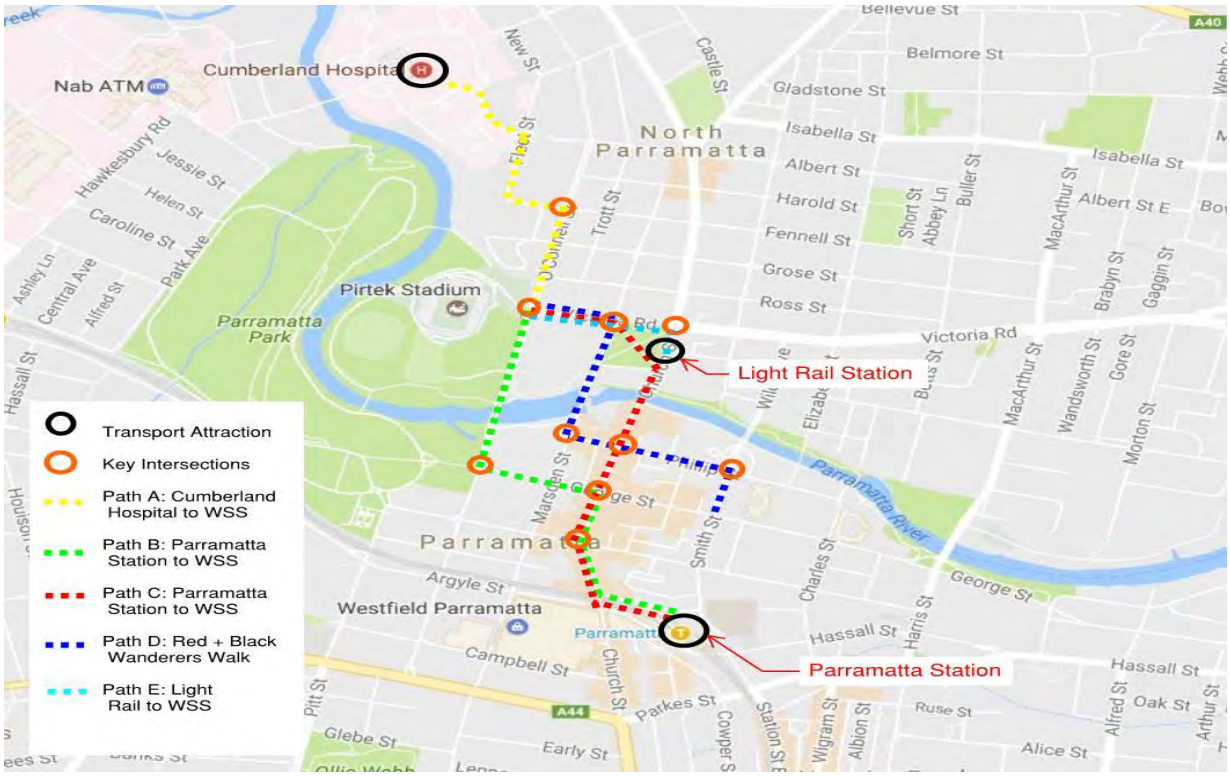


Figure 4.8 – Key Pedestrian Lines within Area of Influence

The primary task associated with pedestrian networks was to evaluate the existing pedestrian networks and how these relate to high level pedestrian desire lines, taking account of the day-to-day connectivity, as well the impact for an event.

Pedestrian demands have been determined based on likely routes taken during an event. Leaving Zone 1, the information in Table 3.1 of Stage 1 DA indicates the direction of travel of pedestrians entering and exiting the stadium both currently and proposed. Within Zone 2, the information provided from the intersection counts undertaken during the Stage 1 DA provide an indication of an anticipated direction of travel. This information and availability of parking was used to determine the direction of travel within Zone 2. The inclusion of Parramatta Light Rail will influence pedestrian behaviours exiting Zone 2. Therefore, the walk distributions existing have been amended and are illustrated in **Table 4.5** against the previously reported distributions.

Table 4.5 – Amended zone 1 walk distribution to account for Light Rail

Direction	North	North-East	East	South-East	South
Zone 1 – Stage 1 DA	10%	20%	30%	30%	10%
Zone 1 – Amended	10%	15%	50%	15%	10%

These amended zone figures are more consistent with the likely predicted walking distributions of the proposed stadium where the main access will be located adjacent to the O'Connell/Victoria intersection. This is expected to place added demand on Victoria Road, as well as the O'Connell/Victoria Road intersection.

For Zone 3, the pedestrian trip assignments were determine based on anticipated desired trip attractor. This has been assumed to be Zone 2, the car parking area near the Cumberland Hospital, the Parramatta Train Station and the Parramatta CBD (Parking availability and entertainment).

Figure 4.9 illustrates the assumed pedestrian routes for a **full event** at the current stadium in 2019 during the **peak arrival** period (18:00 – 19:00).

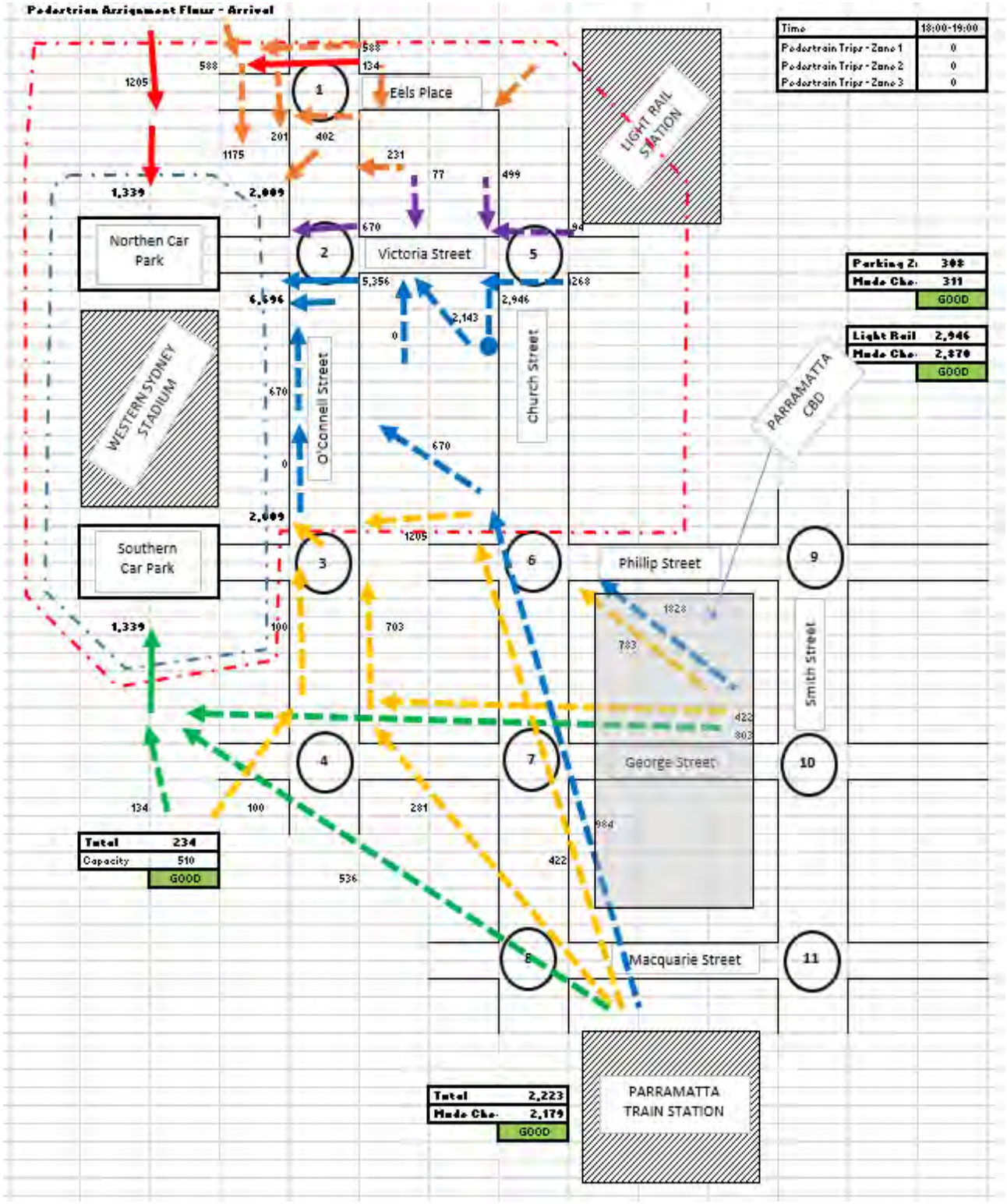


Figure 4.9 – Assumed pedestrian arrival volumes – current stadium (17:00 – 18:00)

Figure 4.10 illustrates the assumed pedestrian volumes during **peak departures** (20:00 – 21:00) from the current stadium during a **full event**.

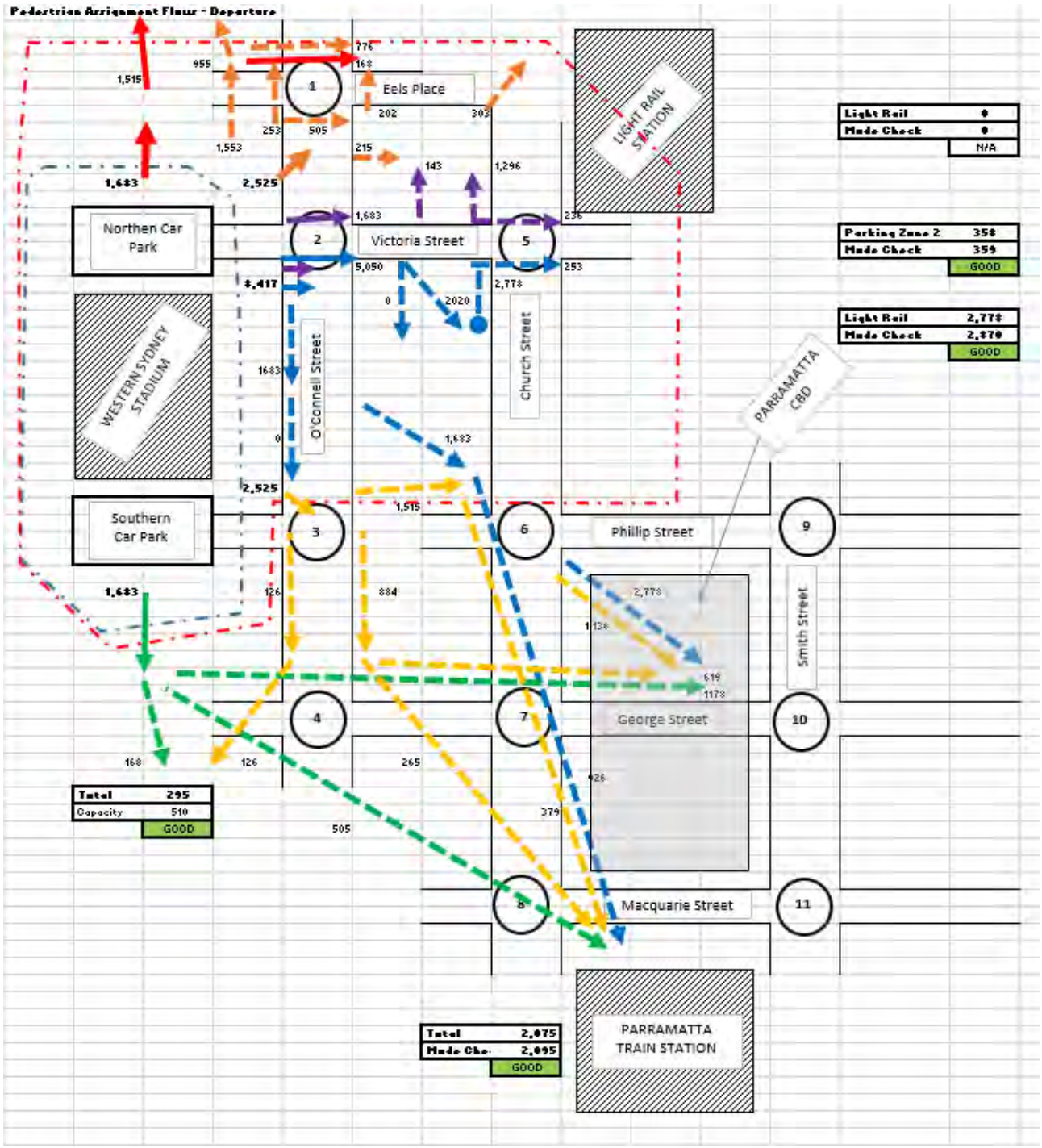


Figure 4.10 – Assumed pedestrian departure volumes (20:00 – 21:00)

The flows during a **half event** would equate to roughly half those shown above. Within the operational traffic modelling, the pedestrian volumes at the identified network have been included.

Based on this information, anticipated pedestrian volumes during peak hour arrivals and departures on key pedestrian links is summarised in **Table 4.6.**

Table 4.6 – Assumed pedestrian volumes on key links – current stadium full event

Link	Arrivals (18:00 – 19:00)	Departures (20:00 – 21:00)
O'Connell Street, north of Victoria Road	2,009	2,525
O'Connell Street, south of Victoria Road	670	1,683
O'Connell Street, south of Parramatta River	2,142	2,694
Victoria Road, east of O'Connell Street	6,026	6,733
Church Street, north of George Street	4,018	5,219
Church Street, south of George Street	2,223	2,075

4.1.4 Parramatta Walking Strategy

Parramatta Council recently completed a study on pedestrian activities in the CBD, Final Draft - Parramatta Walking Strategy (PWS) (*Cardno – February 2017*). The peak pedestrian non-game day movements in the CBD were counted and the results are summarised in **Figures C1 to C3** in **Appendix C** of this TIA.

4.1.5 Wayfinding and green travel plans

The PWS report provided information on green travel plans and suggestions on how it can be applied in the Parramatta CBD and surroundings. In the context of the WSS it is about maximising walking as the preferred transport mode to and from the stadium. As indicated in Figures 3.6 and 3.7 above the mode share for pedestrians to and from the stadium is already the largest at 92%. The opportunity to further enhance the green travel plan objectives should focus on:

- Providing a connected network of cycle paths/ footpaths of sufficient width, grade, and illumination and surface conditions to promote safe access to destinations;
- Improve the permeability of the CBD by providing pedestrian connections through the site via laneways and shortcuts designed appropriately and in accordance with Crime Prevention through Environmental Design (CPTED) principles;
- Ensure the internal road network balances connectivity with amenity, creating equal priority for all road users;
- Include mixed use facilities in the development to reduce the distance people have to travel for some trips; and
- Promote active transport travel choices and their benefits to new residents and workers.

The potential to further improve wayfinding information was undertaken for this TIA. **Figure 4.11** indicates the current locations of wayfinding information to the stadium as well as potential new locations to improve guidance signage along the pedestrian desire lines.

Parramatta City Council also have current Wayfinding Plinths and Finger Blade signs around Parramatta CBD as indicated in Figure C4 in **Appendix C**.

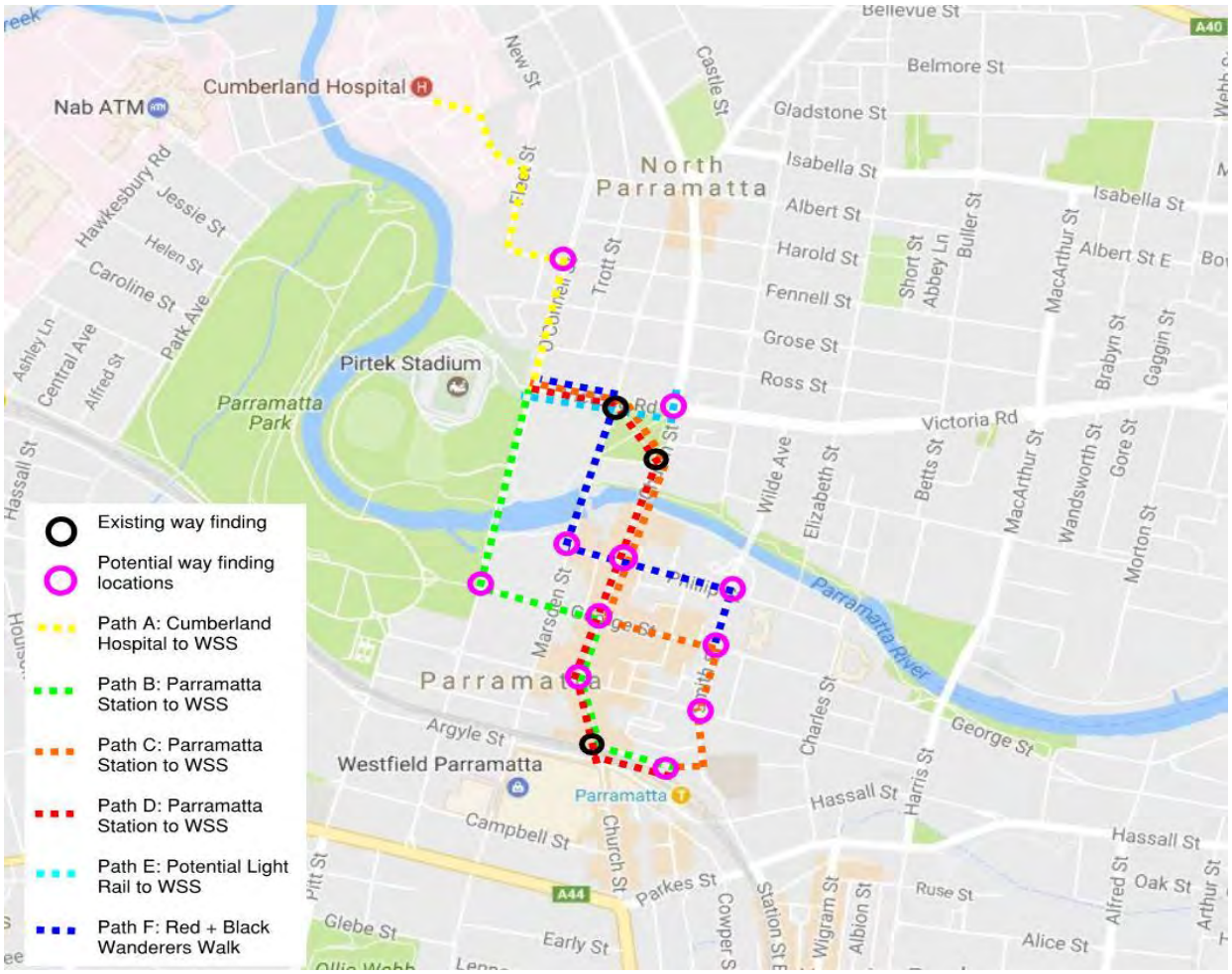


Figure 4.11 – Locations of current wayfinding guidance signage and potential new signage

4.1.6 Cycling Network

There is an extensive cycling network that connects the stadium to surrounding areas and the Parramatta CBD. Council is also planning to complete missing links in the Parramatta Valley Cycleway (PVC) and upgrade sections. A master plan for the PVC is being implemented stage by stage. As part of the upgrades a boardwalk is planned for the section on the northern side of the river to the east of the CBD. The Escarpment Boardwalk will be a critical section of the Cycleway which, when completed, will allow continuous connection between the University of Western Sydney at Rydalmere past the CBD to Parramatta Park. Planned for the northern side of the river, the boardwalk will support regional walking and cycling trips to the CBD.

As per the PWS, Parramatta's existing cycle network provides connections to the CBD from each direction but there is a lack of separated cycling facilities within the CBD. The existing routes incorporate a combination of primarily on-road (mixed traffic) and some off-road facilities. Clear through routes are provided from the east to west, however direct north-south connections are lacking. Existing and proposed (DRAFT) Cycle Route Network in and around the Parramatta CBD are shown on **Figures 4.12** and **4.13** respectively.

Figure 4.13 indicates that bicycle access is sufficient and provide good on-street and off-street routes to and from the proposed stadium.

Two key on-road routes proceed directly through the CBD and run from east to west along Macquarie and George Streets. The link along George Street connects from the west through Parramatta Park and proceeds to the east towards Alfred Street.

From the north, two routes provide connections to the CBD; the first is an off-street facility along O'Connell Street, with an on-road facility along Elizabeth Street connecting to a shared path bridge across the Parramatta River, and connecting to Phillip Street.

From the south, two on-road routes provide links to the east-west route along Macquarie Street via Station Street, and Wigram Street continuing along Charles Street. Another off-road route approaches from the south-west along Pitt Street, before continuing east along Argyle Street and connecting to the Westfield Shopping Centre and Parramatta Transport Interchange.

A recreational shared path facility called the Parramatta River Cycleway is provided on both sides of the Parramatta River foreshore, beginning at the Parramatta ferry wharf and proceeding west towards Church Street. West of Church Street, the path continues on-road along Market Street, before returning to an off-road environment and proceeding through Parramatta Park. The Parramatta River Cycleway connects to Sydney Olympic Park in the east and Westmead in the west.

Along with the cycleway, there are only a few other routes in the CBD where pedestrians and bicycles currently interact. There are some shared paths for use by both bicycles and pedestrians, generally located on the periphery of the CBD; along Pitt Street, the railway line near Harris Park Station and Harris Street. The northern side of Argyle Street between Church Street and Pitt Street is also a shared path.

There are a number of regional routes for cyclists. The M4 cycleway, the T-way from the north-west, and the Parramatta Valley Cycleway from the east provide east-west links. From the south, shared paths on the western side of Church Street, Station Street, and Pitt Street provide a connection to the CBD.

Separation of pedestrians and bicycles should be encouraged as the CBD develops and population grows. Cyclists should be provided with their own dedicated facilities to encourage people travelling longer than two kilometres to consider cycling rather than driving. The existing shared paths should be assessed for their appropriateness into the future. As demand from both pedestrians and cycling grows, separation is recommended to reduce conflict and perception of safety.

No bicycle counts were available but for the purposes of the WSS, the focus should be more on accessibility as path capacity is not seen to restrict level of service at key intersections and crossing points.

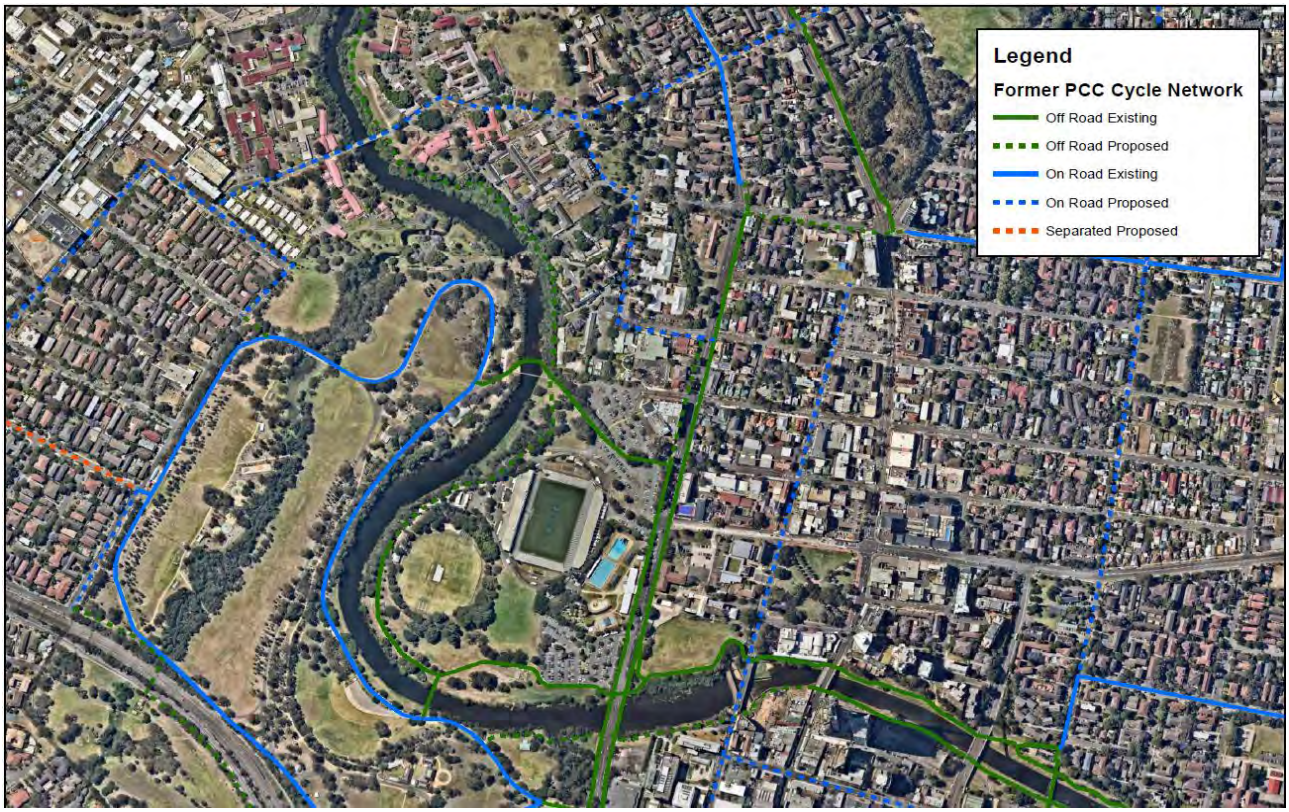


Figure 4.12 – Former Parramatta City Council Cycle Network (Source: Parramatta City Council)

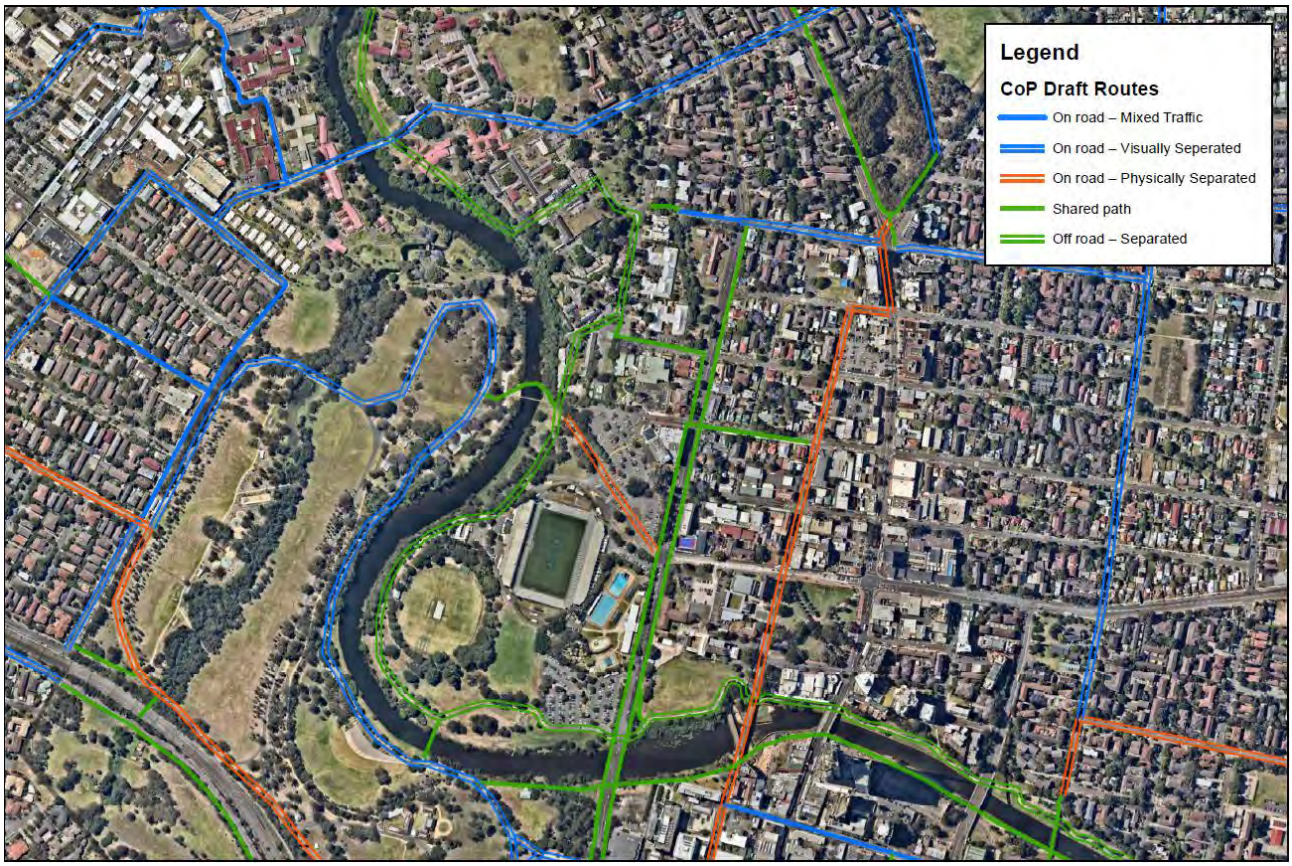


Figure 4.13 – City of Parramatta DRAFT Cycle Route Network (Source: Parramatta City Council)

4.1.7 Road Safety

It is anticipated that the new stadium will generate an increase in both pedestrian and traffic movements within the study area during game-days and therefore increase the potential for pedestrian/vehicle conflicts. Safety measures should focus on minimising the potential and severity of these conflicts whilst still maintaining an acceptable level of service for all road users.

The majority of spectators will access the Stadium by foot from the eastern side of O'Connell Street, requiring pedestrians to cross at the signalised intersections or pedestrian mid-block crossing on O'Connell Street. From information from the Stage 1 DA it was observed, during the game day site visit, that a number of pedestrians wishing to cross O'Connell Street would not utilise the numerous pedestrian crossings and would instead use the raised median island along O'Connell Street as a form of pedestrian refuge before waiting for a suitable gap in traffic to cross. This needs to be addressed in the design to channel pedestrians to the safe crossing point.

4.2 Future Transport Conditions

4.2.1 Forecast Growth

Section 3.1.3 of the Stage 1 DA identified that a 1% per annum background growth rate had been applied to vehicular traffic on the road network. Stakeholder feedback on the Stage 1 DA has indicated that this is too low and that 2% per annum background growth is more appropriate. Therefore, 2% background growth per annum on the road transport network has been adopted for this TIA.

4.2.2 Future Road Network Traffic Volumes

Trip assignment and direction for vehicles entering and exiting the stadium has been based on the movements allowed at each access/egress, as well as the sample information provided in the Stage 1 DA and observation data collected as part of the production of this TIA.

We have developed flows for the PM peak arrival and departure periods, 17:30-18:30 and 20:45-21:45, based on the splits and intersection counts collected as part of Stage 1 DA during a non-game day and game day event. Applying a 'background' 2% per annum growth rate to the 2016 non-game day intersection traffic counts, we were able to derive the anticipated 2019 intersection turning volumes/patterns.

In order to determine the existing 2016 traffic volumes for game day (half capacity) and game day (full capacity) the intersection splits were determined from information provided by Stage 1 DA and the cordon arrival volumes were calculated by multiplying the difference in volume between a 2016 game day and non-game day by a factor of 1.16 (10386/8961), (Half Event) and 2.3 (20771/8961), (Full Event). These factors were based on 8, 961 spectators that attended the 2016 Parramatta Eels and Melbourne Storm NRL game and the existing stadium capacity (20771).

This methodology was retained in regards to assessing the 2019 future year traffic volumes for half and full capacity events associated with the proposed stadium. For example, the 2019 cordon arrival volumes were determined from the differences in volumes between an existing non-event and event day traffic, multiplied by a growth rate of 2% p.a. and a scaling factor of 1.67 (15000/8961) and 3.35 (30000/8961) for a half and full capacity events respectively.

Utilising this information the expected vehicular trips associated with a **non-event, half** and **full event** for the existing stadium in 2019 **weekday** peak periods are illustrated in **Figures 4.14 to 4.20**.

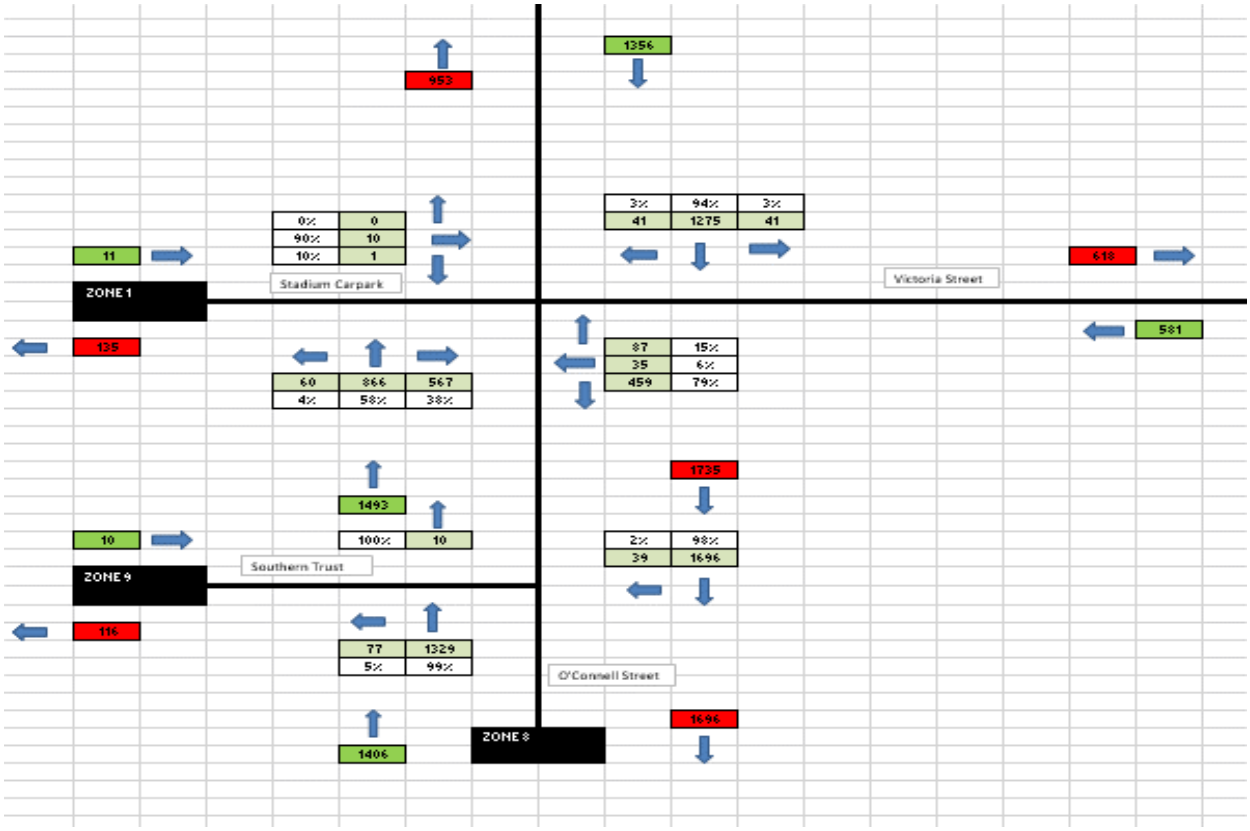


Figure 4.14 – AM Peak Arrivals (8:00 to 9:00pm) Current Stadium (2019) – No Event turning volume

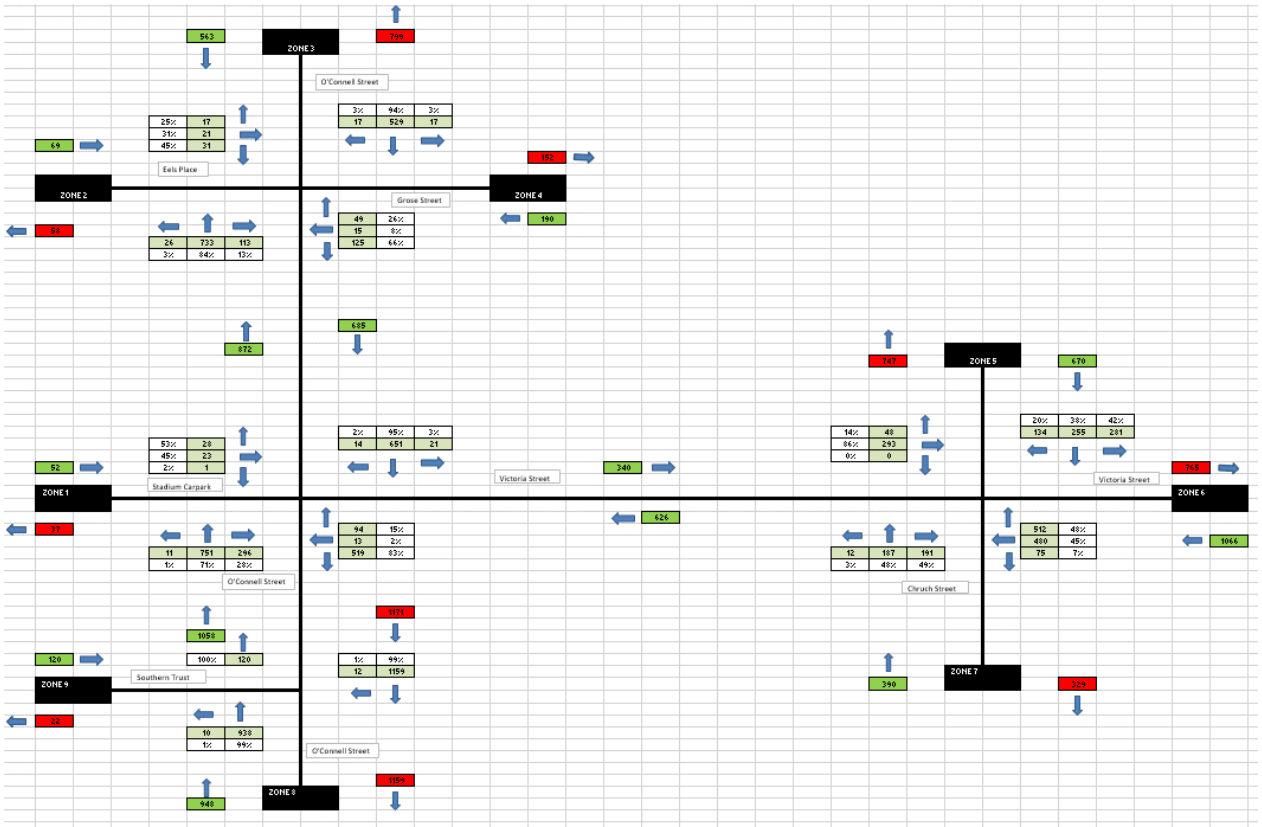


Figure 4.15 – Peak Arrivals (17:30 to 18:30pm) Current Stadium (2019) – No Event turning volume

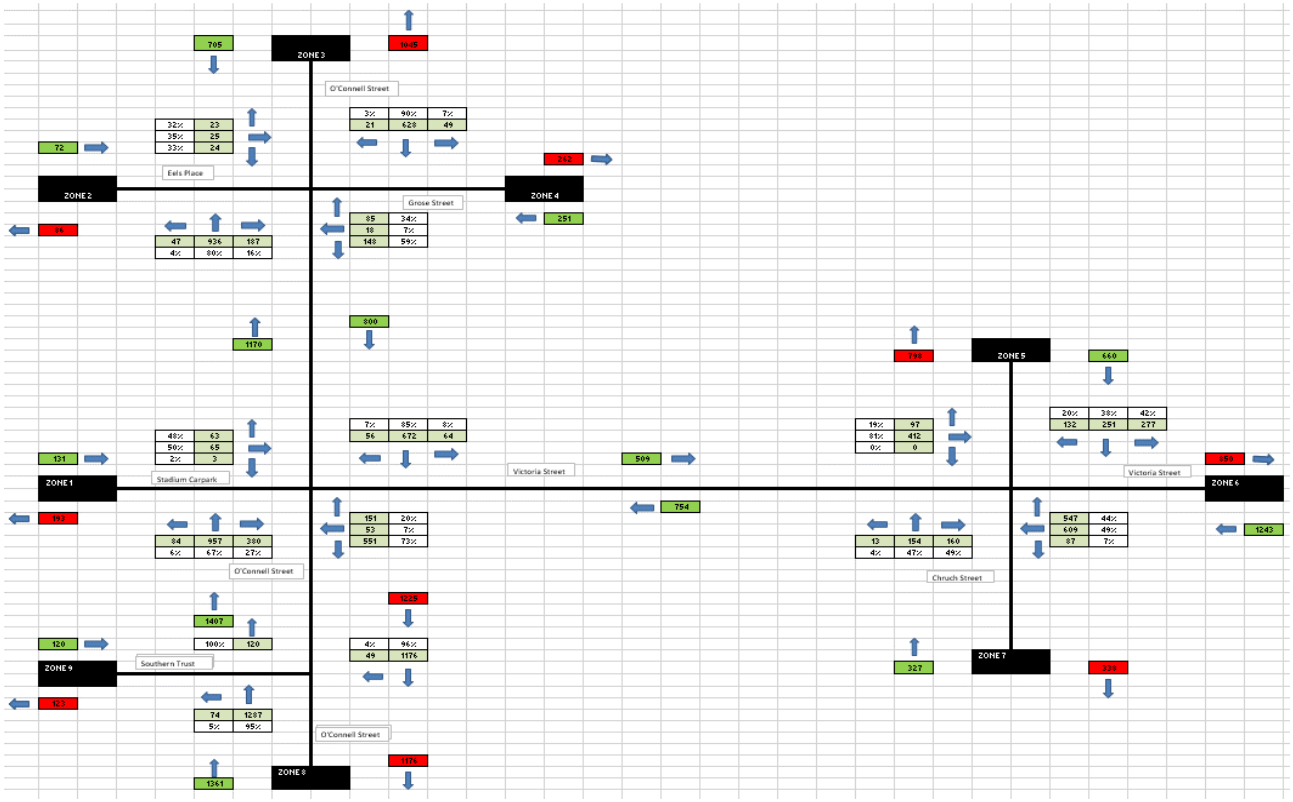


Figure 4.16 – Peak Arrivals (17:30 to 18:30pm) Current Stadium (2019) – Half Event turning volumes

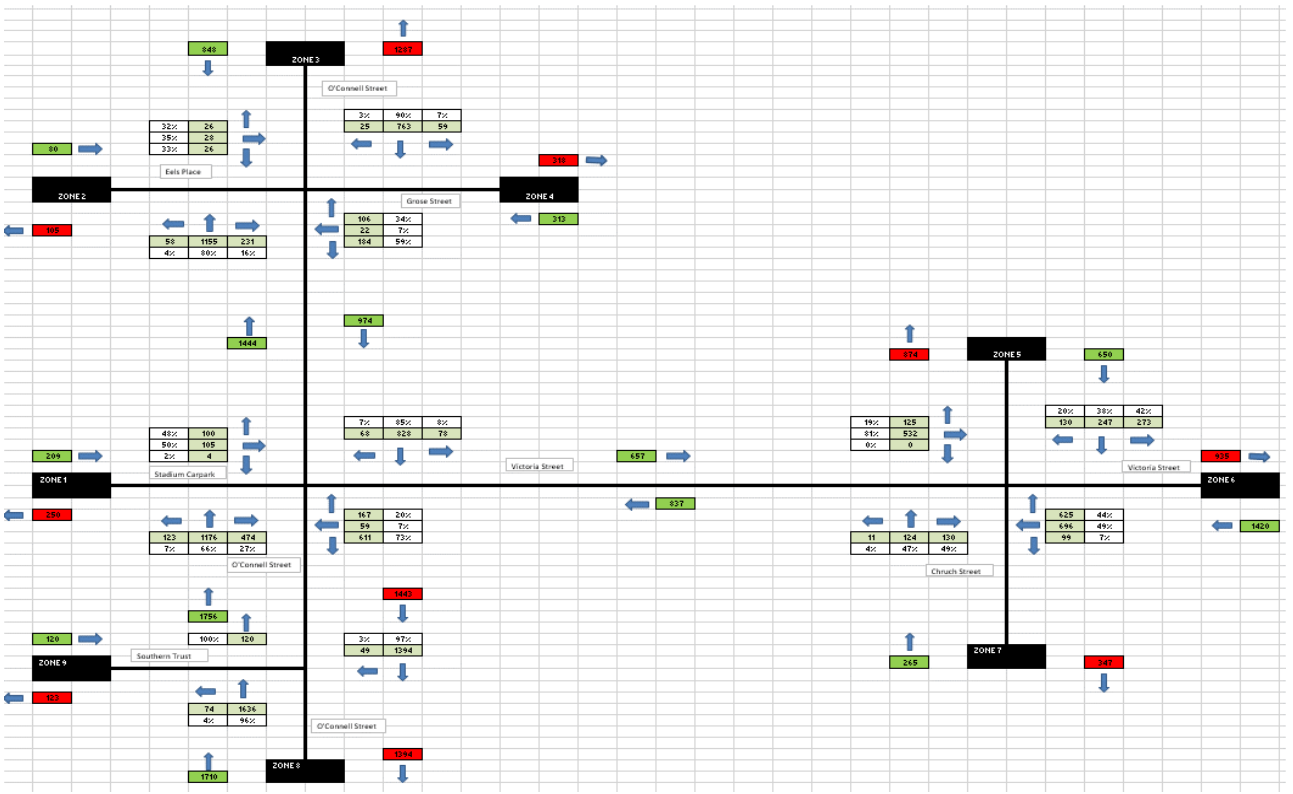


Figure 4.17 – Peak Arrivals (17:30 to 18:30pm) Current Stadium (2019) – Full Event turning volumes

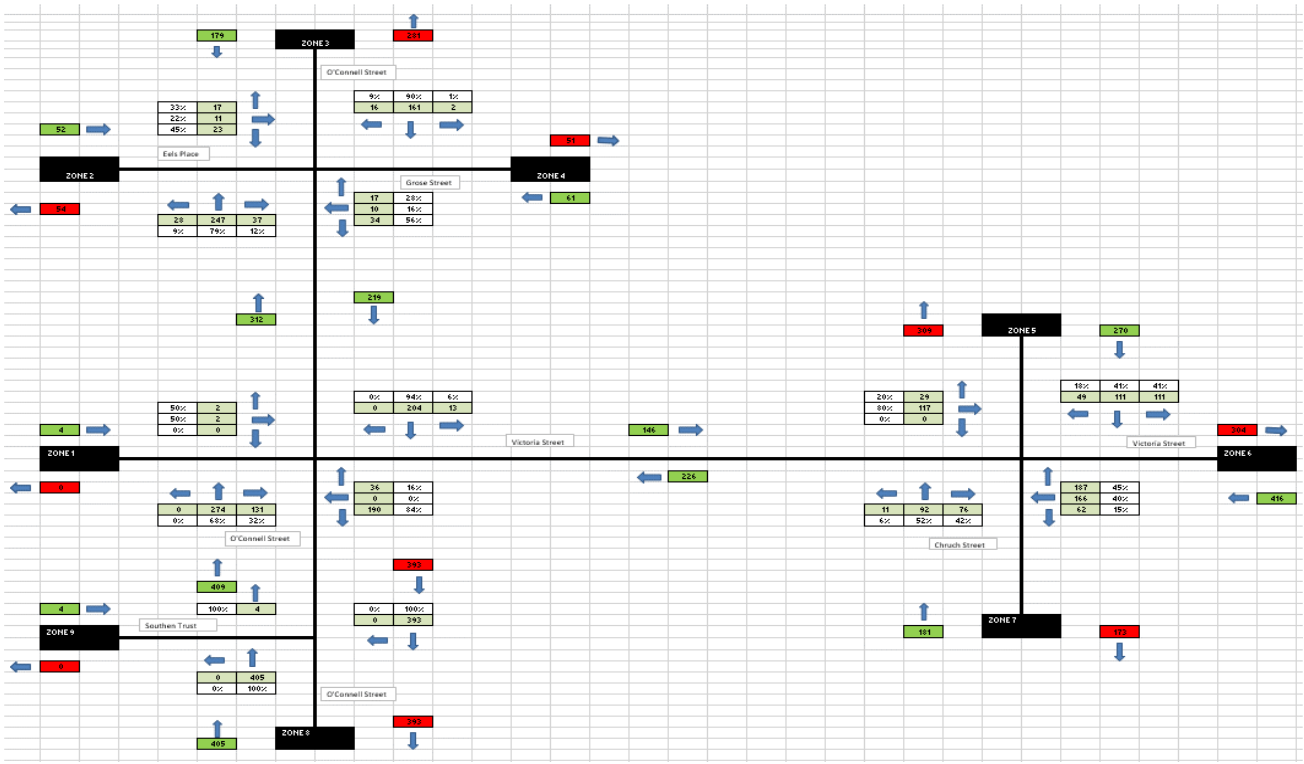


Figure 4.18 – Peak Departures (20:45 to 21:45pm) Current Stadium (2019) – No Event turning volumes

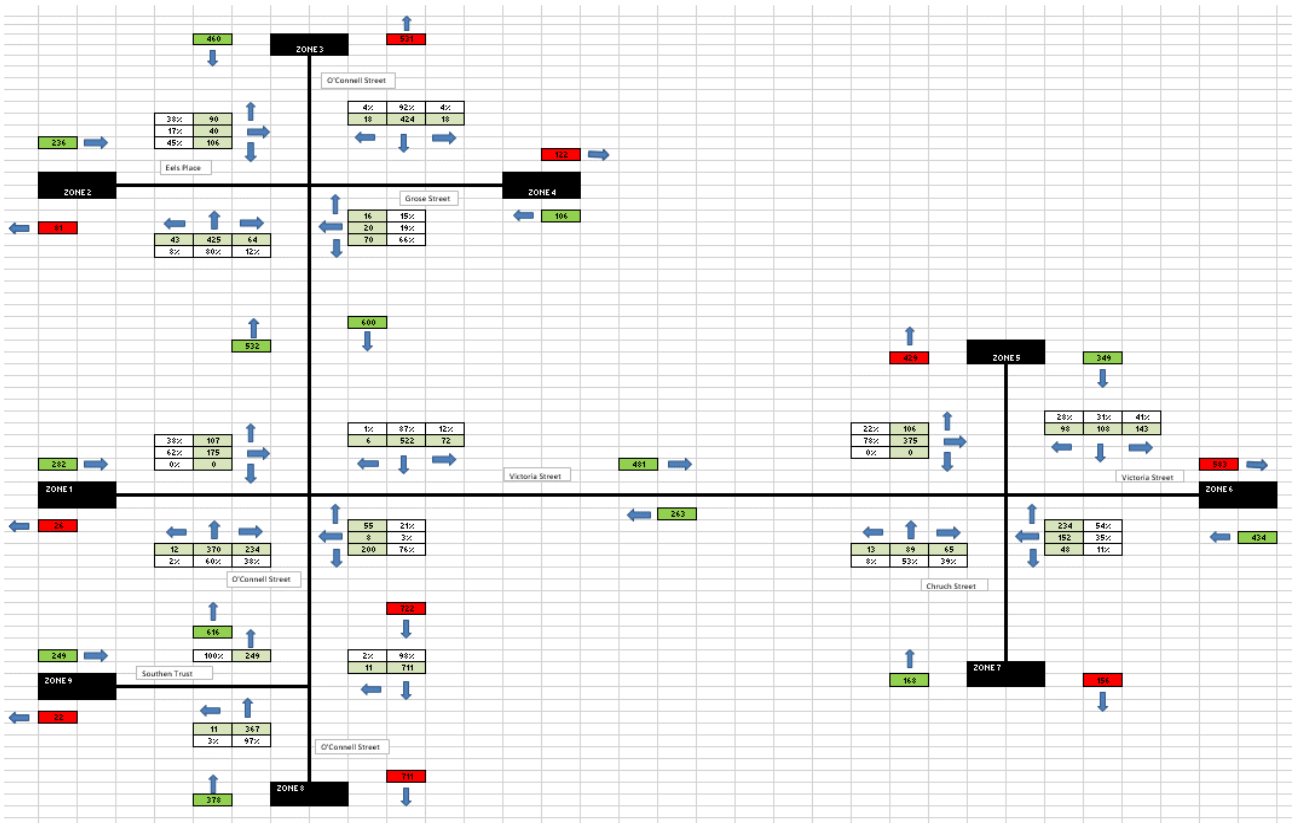


Figure 4.19 – Peak departures (20:45 to 21:45pm) Current Stadium (2019) – Half Event turning volumes

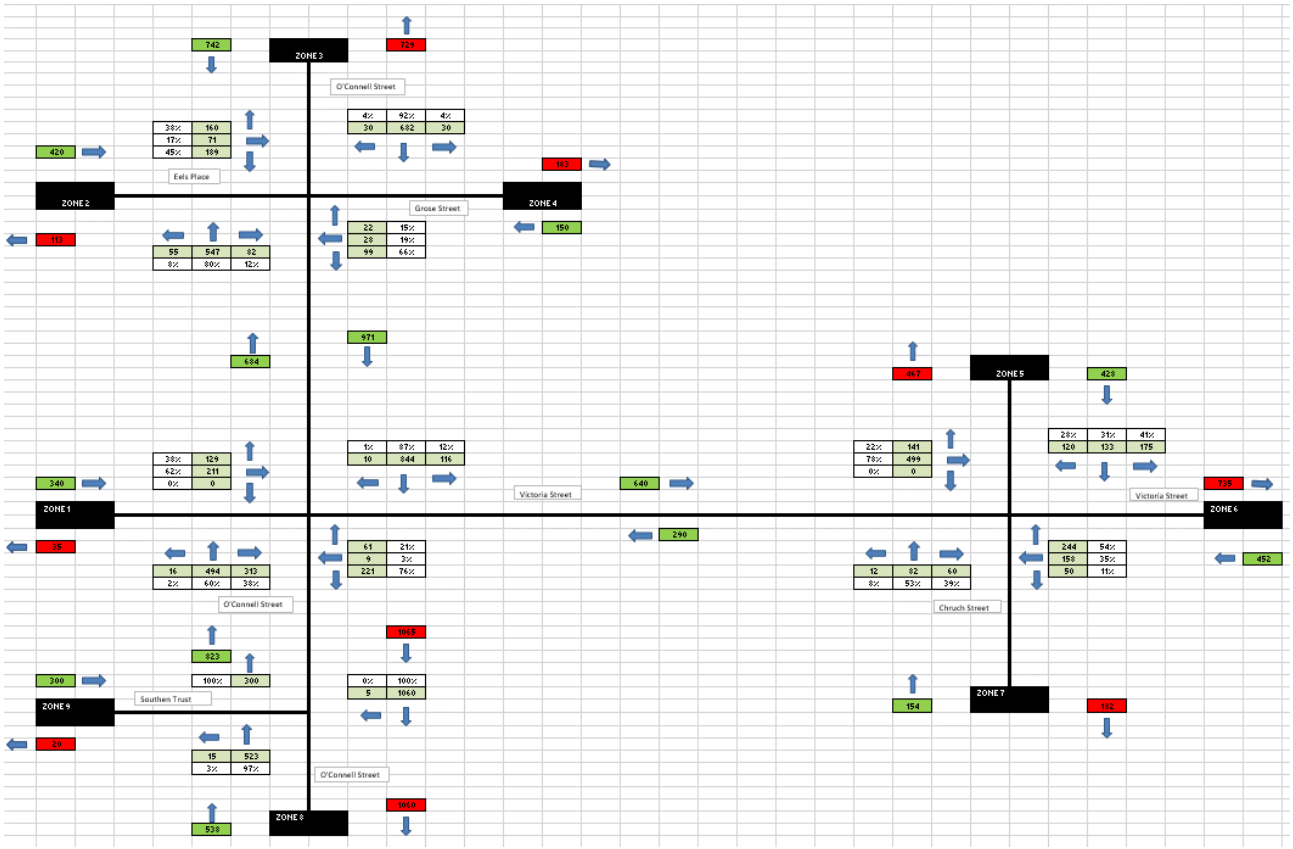


Figure 4.20 – Peak departures (20:45 to 21:45pm) Current Stadium (2019) – Full Event turning volumes

In addition to the weekday peak periods, events are likely to be operated over the weekend. No existing weekend data when an event has occurred was available. Therefore, it was not possible to ascertain the distribution of weekend trips and the associated correlation to event traffic. Therefore, for assessment purposes, it is assumed that weekend traffic could be as high as 80% of weekday peak traffic volumes, and as such this was used as part of the quantitative assessment.

Figure 4.21 to 4.24 illustrate the anticipated traffic volumes associated with a **non-event** and **full event** that occurs over the **weekend** peak periods.

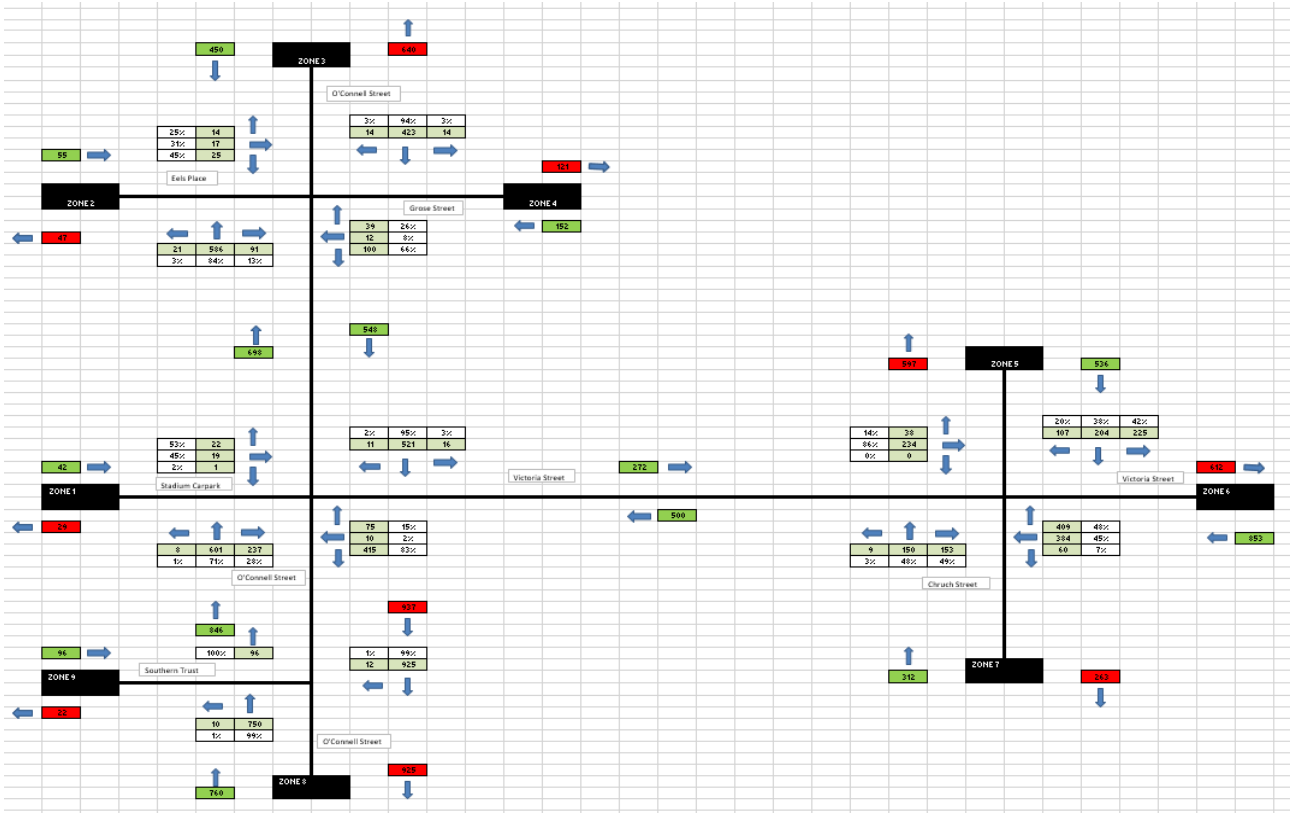


Figure 4.21 – Weekend Peak Current Stadium (2019) – Non-Event turning volumes

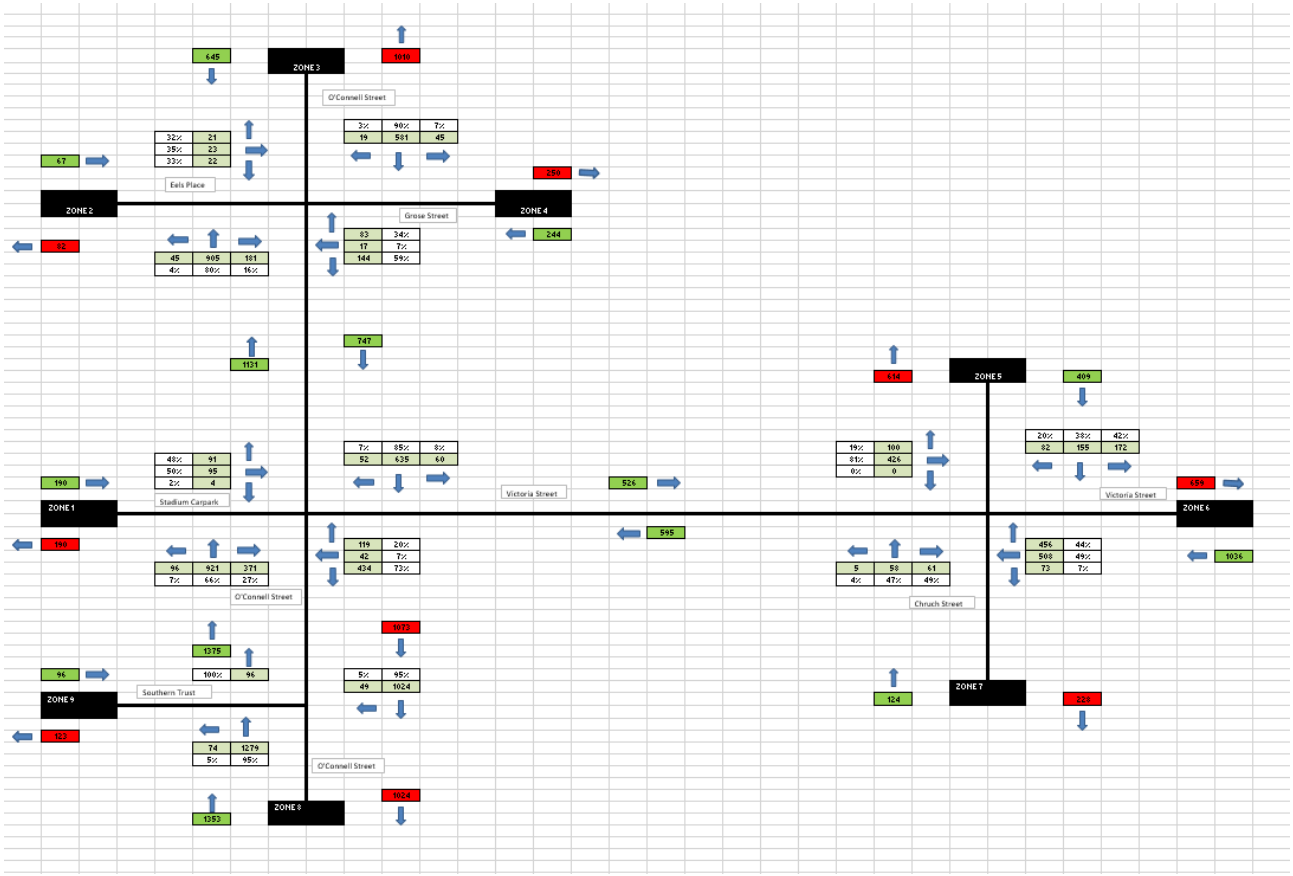


Figure 4.22 – Weekend Peak Current Stadium (2019) – Full Event turning volumes

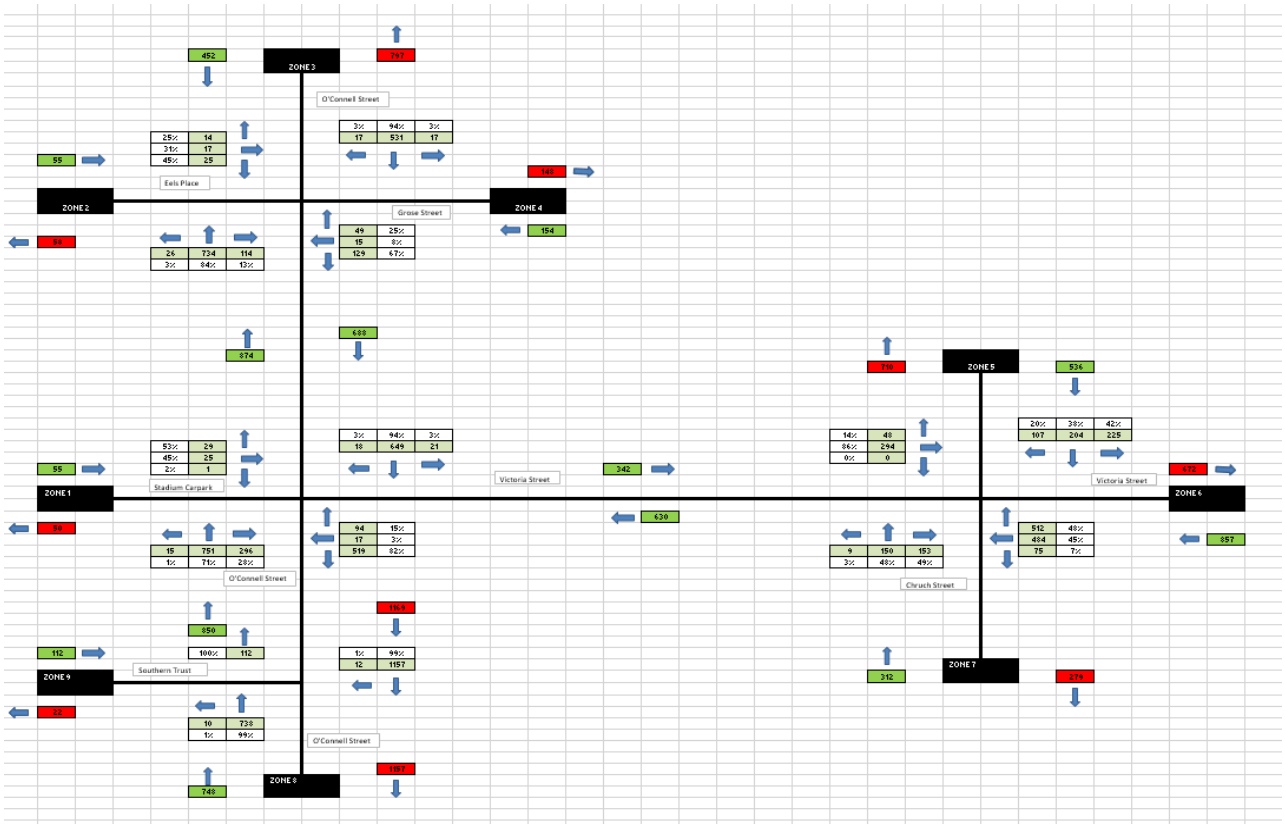


Figure 4.23 – Weekend Peak Proposed Stadium (2019) – Non-Event turning volumes

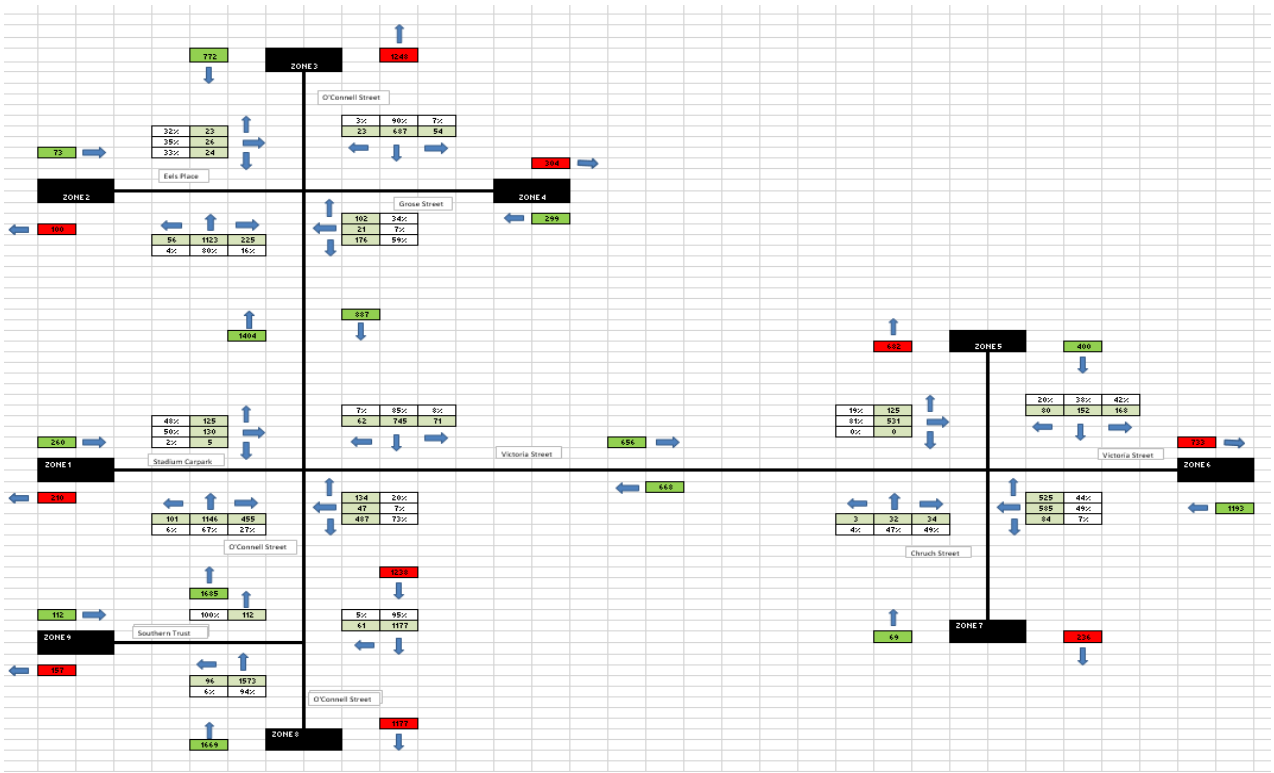


Figure 4.24 – Weekend Peak Proposed Stadium (2019) – Full Event turning volumes

4.2.3 Surrounding Developments

Parramatta is experiencing and is predicted to continue to experience significant development. This growth is associated with the transformation of Parramatta into Sydney's second CBD. Within the area of influence of the Stadium, there are a number of developments that could directly influence transportation operations associated with the operation of the stadium. These include, but are not limited to:

- Parramatta Leagues Club – Multi-level carpark development; and
- New school located directly adjacent to the stadium.

It is predicted that the school development will have negligible impacts on the stadium development as the peak travel periods associated with each will not occur concurrently (i.e. peak school is pre network peaks).

The Parramatta Leagues Club development will influence the WSS development. It is likely that users of the facilities will be associated with events at the stadium. Currently there is an existing at-grade car park on the site. An application has been made to develop a 1001 space multi-story carpark with a retention of 94 at-grade carpark. Currently available information detailed in the Joint Regional Planning Panel decision identifies that a "deferred commencement" consent be issued based on 437 multi-story parks and 94 at-grade (531 total). In addition to the development, the application indicated that Eels Place will be widened to two lanes in each direction.

To accommodate this development, a sensitivity test associated with the proposed stadium during a full event with the parking capacities indicated below was undertaken. Further details are included in **Section 5.1.3.**

4.2.4 Transport Projects

There are a number of transportation projects within Parramatta that could influence transportation patterns in the future, of which some of the important ones include Parramatta Light Rail, Sydney Metro West and the Parramatta North Urban Transformation (PNUT) project:

4.2.4.1 Parramatta Light Rail

A meeting with Transport for New South Wales (TfNSW) was held on Tuesday 14 February 2017. At this meeting the opportunities and challenges associated with Parramatta Light Rail were discussed. It was indicated that the likely alignment would be along Church Street, and that a pedestrianized zone maybe implemented. It was also indicated that when constructed, O'Connell Street will form a key role within the Parramatta road network and likely to induce additional traffic demand due to displaced trips.

On Friday 17 February 2017, TfNSW released details regarding their proposed Parramatta Light Rail.

The route will link Parramatta's CBD and Parramatta Train Station to the Westmead Health precinct, Parramatta North Urban Transformation Program, the new Western Sydney Stadium, the relocated Powerhouse Museum, the private and social housing redevelopment at Telopea, Rosehill Racecourse and three Western Sydney University campuses. **Figures 4.25** and **4.26** illustrate the preferred route, which goes along Church Street, directly parallel to the WSS with the proposed station just south of Victoria Road next to Prince Alfred Square.

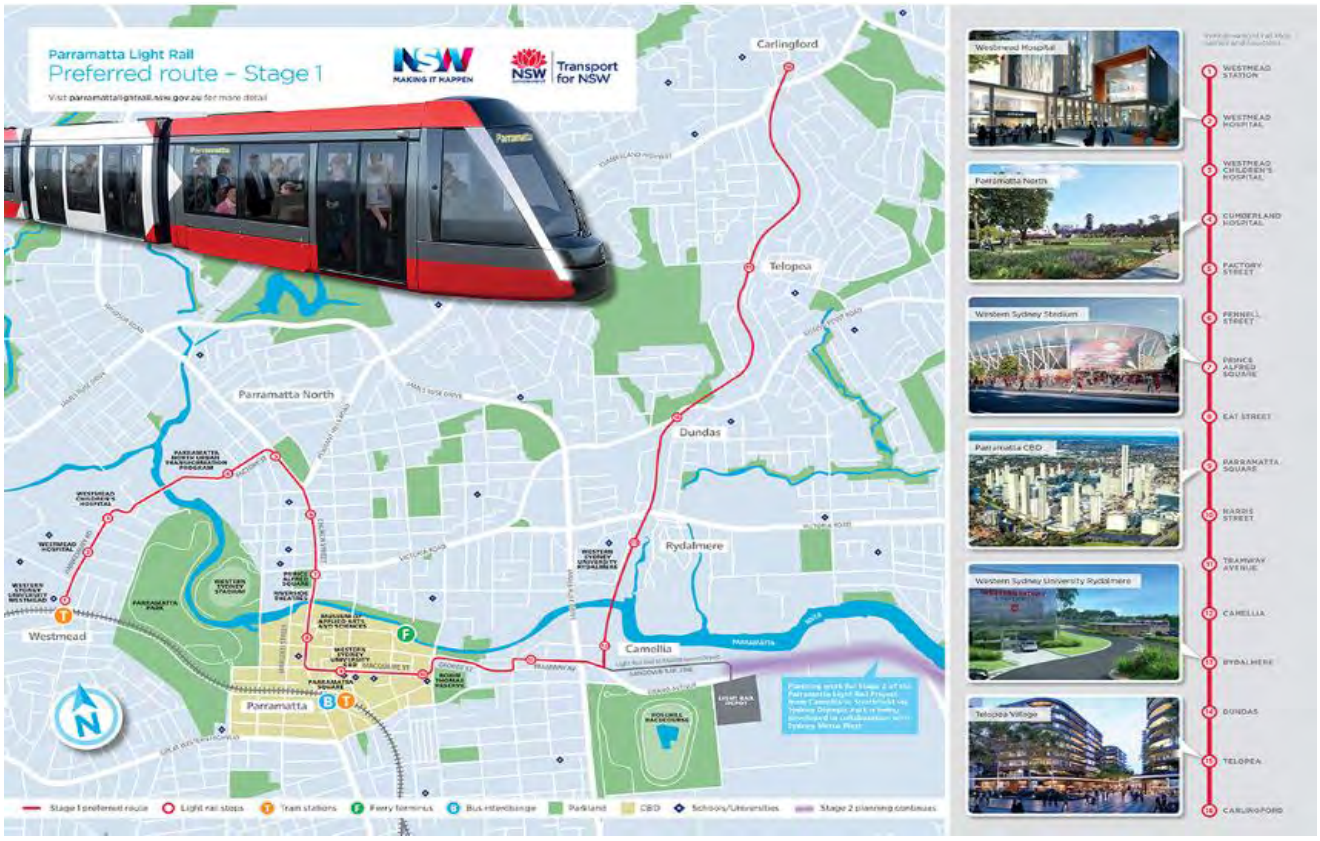


Figure 4.25 – Parramatta Light Rail Stage 1 Preferred Route

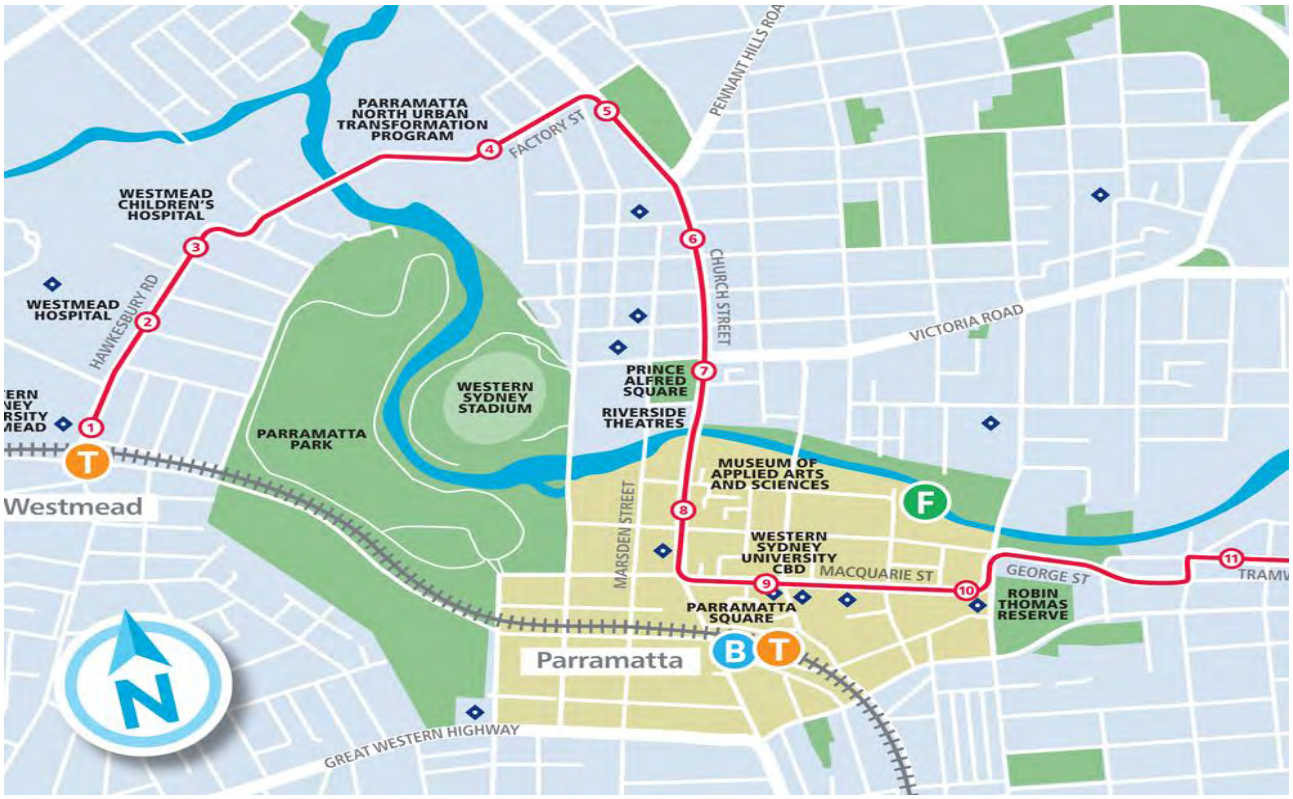


Figure 4.26 – Parramatta Light Rail Stage 1 Preferred Route – Church Street and Station 7 at Victoria Road/Prince Alfred Square

A sensitivity test regarding these displaced trips and the effect on O'Connell Street was undertaken. Within this test, it was assumed that 50% of the straight-through traffic on Church Street would be applied to O'Connell Street. In reality, Light Rail would be anticipated to reduce the number of vehicular trips. Additionally, rationalise parking availability and promotion of alternative modes would reduce demand within Parramatta.

Light Rail as a mode has been included within the assessment of mode share for the stadium during event. This was done to ascertain the likely influence on the transport network. Within the operational modelling of intersection performance Light Rail has not been included, as this is not possible with the modelling software adopted for this project.

Parramatta Light Rail is predicted to operate on 7.5 minute headways in each direction, with a capacity of 250 per service in each direction. This equates to a total capacity of 2,000 customers in each direction (4,000 net). For the purposes of this assessment, it assumed that users of the WSS could utilise 50% of this capacity, i.e. 2,000 trips per hour, 4000 total over the two hour peak arrival and departure period.

Table 4.7 equates this to the number of Light Rail trips associated with a half event and full event at the current stadium. The Light Rail passenger demand associated with the proposed stadium is discussed in **Section 4.3.2**.

Table 4.7 – Assumed Light Rail Trips – Half and Full Event at existing stadium

	Half Event	Full Event
Zone 1	2,024	3,992

During events, there may be a desire for more trips. To manage this effect, crowd management during events and public information regarding travel choices will need to be made available.

4.2.4.2 Sydney Metro West

The NSW Government has announced a new underground metro railway line linking the Parramatta and Sydney CBDs, and communities along the way.

The Sydney Metro West project addresses Sydney's rapid growth, with the city's population to increase above 6 million in the next 20 years. Sydney's west is growing the fastest – an extra 420,000 people are expected to move into the corridor between Greater Parramatta and central Sydney over that time, with more than 300,000 jobs expected to be created in this corridor by 2036.

The project also means faster and more frequent services will be able to be delivered on the Sydney Trains network from outer western Sydney areas like Penrith and Blacktown, with increased capacity for those customers into Parramatta and the CBD.

The existing T1 Western Line – which is more than a century old – is expected to be severely overcrowded by the early 2030s, despite ongoing upgrade works and more services.

Currently, the T1 moves around 40,000 people in the morning peak hour and is operating at 135 per cent seated capacity. New metro rail will be able to move about 40,000 people an hour in each direction.

Sydney Metro West will work together with the T1 to service the growing needs of Western Sydney, effectively doubling the rail capacity of the Parramatta to Sydney corridor.

The NSW Government will work with industry, the community, businesses and local stakeholders like councils along the route to get feedback on potential station locations and the best outcomes to serve Sydney for the next century and beyond.

The final number of potential stations will be identified following community and industry consultation. Four key precincts to be serviced have initially been identified at:

- Parramatta, where the number of jobs is expected to double over the next 20 years to 100,000.
- Sydney Olympic Park, where 34,000 jobs and more than 23,000 residents will be located by 2030.
- The Bays Precinct, Sydney's new innovation hub where 95 hectares of land is being regenerated.
- The Sydney CBD, allowing easy access to the existing public transport network and Stages 1 and 2 of Sydney Metro, which is currently under construction.

The new railway is expected to be built largely underground and operational in the second half of the 2020s.

Sydney Metro West will integrate with long-term transport planning for Western Sydney including rail needs currently being investigated around the future Western Sydney Airport.

4.2.4.3 Parramatta North Urban Transformation (PNUT)

The NSW Government is seeking to conserve, unlock and share the heritage of Parramatta North. For the PNUT, Parramatta North will become a vibrant place with new homes and jobs with heritage conservation at its heart. This area is just north of the WSS and generate trips along the main corridors between this area and Parramatta CBD as indicated in **Figure 4.27**.

Figure 4.27 – PNUT Development Area

The PNUT program will attempt to:

- conserve heritage buildings, respecting the social history of the area;
- retain many heritage buildings in public ownership enabling retail, commercial and cultural use to fund ongoing maintenance;
- provide around 2,700 new homes in multi-storey apartment buildings;
- create around 2,000 new jobs, including 80 permanent jobs in retail, over the life of the program;
- improve transport connections between Parramatta CBD and Westmead;
- protect environmental assets, such as the Parramatta River riverbank and a flying fox colony; and
- deliver social, cultural and recreational infrastructure, and public art.

4.2.4.4 Other Initiatives, Transport Plans, Key developments and Growth

The Parramatta CBD Planning Strategy (2015) sets the visions, principles, actions and implementation plan to guide a new planning framework for the Parramatta CBD.
The Strategy's vision states: Parramatta will be Australia's next great city, defined by landmark buildings and high quality public spaces with strong connections to regional transport. It will respect its heritage, be an exemplar in design excellence and ensure its streets are well activated. The Strategy aims to create a liveable, active and highly desirable city.

The Strategy commits Council to investigating the required regional and local transport infrastructure upgrades required to facilitate the growth of the CBD across public domain improvements, including new CBD spaces and street upgrades and access and transport improvements, including light rail.

A summary of these initiatives and plans are provided in **Appendix B** for information.

4.3 Proposed Development Transport Conditions

This section of the report discusses the anticipated transport conditions associated with the development.

4.3.1 Road Network

For the road network, the key difference associated with the proposed new stadium from the current stadium will be associated with the increased availability of on-site parking and the increased parking demand within the Parramatta CBD and the associated increase in through-trips on key parts of the network.

4.3.1.1 Day – to – day Operations

During day-to-day operations, the number of staff operating at the stadium is predicted to be similar to the current stadium. Therefore, there is anticipated to be no increase in staff movements on the road network.

The key difference on a day to day basis associated with the stadium is the inclusion of additional parking on-site. Currently there are 340 car parks located within the stadium car park and 300 at the Southern Trust car park (640 total). The development proposes 800 car park (450 at the Stadium car park and 350 at Southern Trust car park). This results in an additional 32% capacity at the stadium car park and 17% at the Southern Trust car park). Traffic flow information for the O'Connell Street/Victoria Road car park has been used to develop adjusted flow patterns to account for this anticipated increased demand. This has been calculated by applying an additional 32% trips to in and out movements of the car park during the network AM peak (8:00 to 9:00) and PM Peak (17:30 to 18:30).

Figures 4.28 and **Figure 4.29** illustrate the assumed daily flows associated with the proposed stadium on a non-game day.

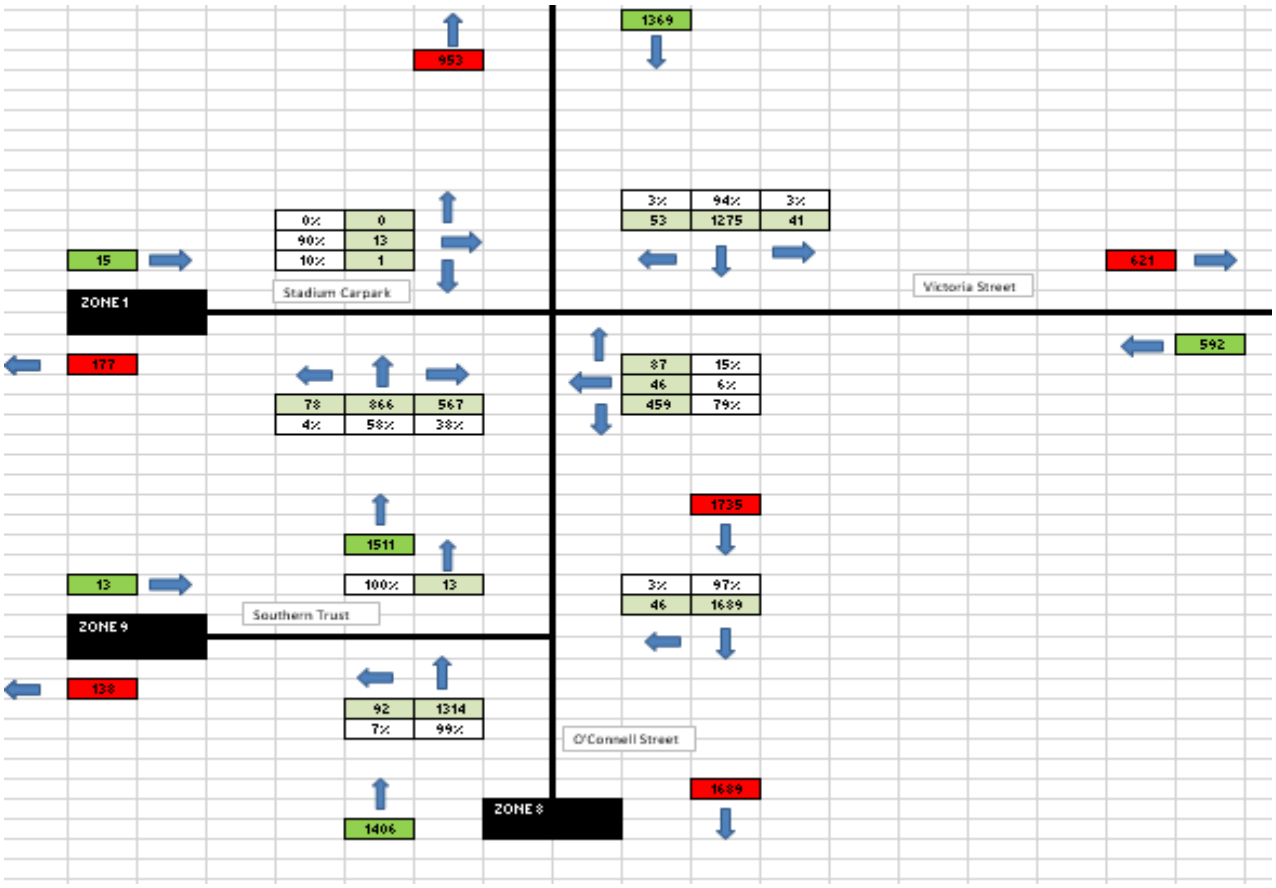


Figure 4.28 – Proposed Stadium (2019) turning volumes non-game day AM peak (8:00 to 9:00)

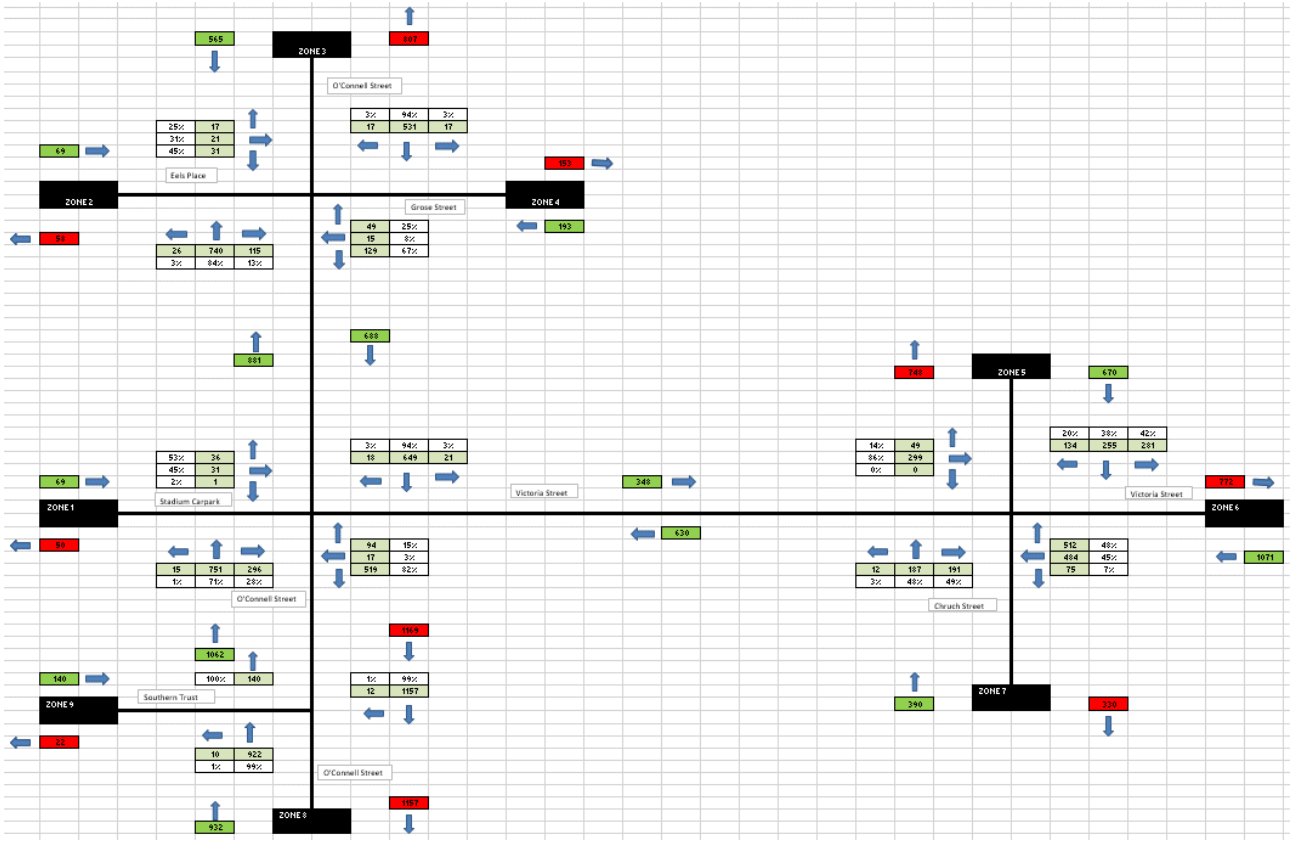


Figure 4.29 – Proposed Stadium (2019) turning volumes –non-game day PM Peak (17:00 – 18:00)

4.3.1.2 Half-Capacity Event

The traffic volumes associated with a half event have been determined based on the difference between a non-game and game day event for the sampled event, taking into account background growth, spectator generation and scaling up based on the sampled event size. This is the same methodology as discussed previously in Section 4.1.1. A half capacity event is assumed to have 15,000 spectators and 600 staff.

Figures 4.30 and **Figure 4.31** illustrate the peak arrival (17:30 to 18:30pm) and departure (20:45 to 21:45pm) periods.

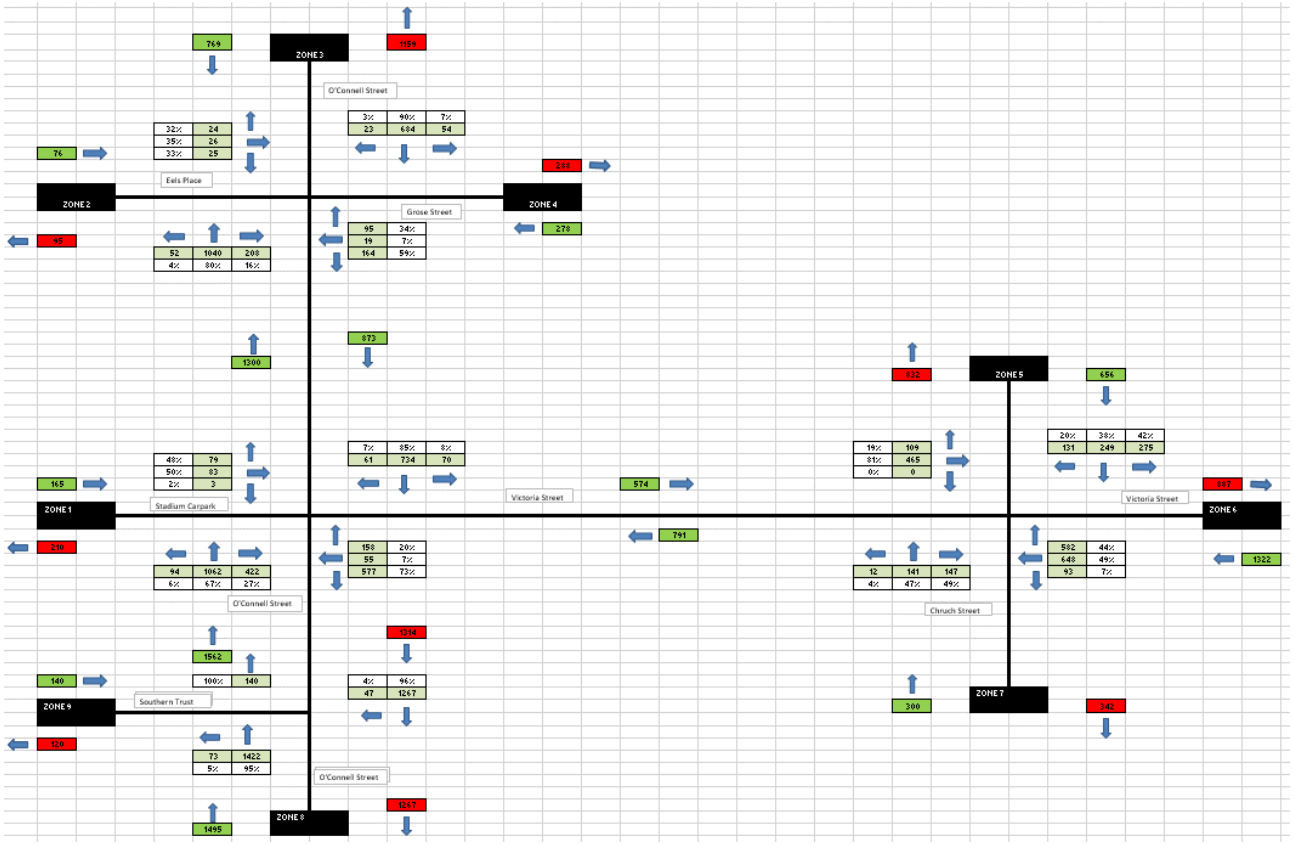


Figure 4.30 – Proposed Stadium (2019) turning volumes - during Half Event – Peak Arrivals (17:30 – 18:30)

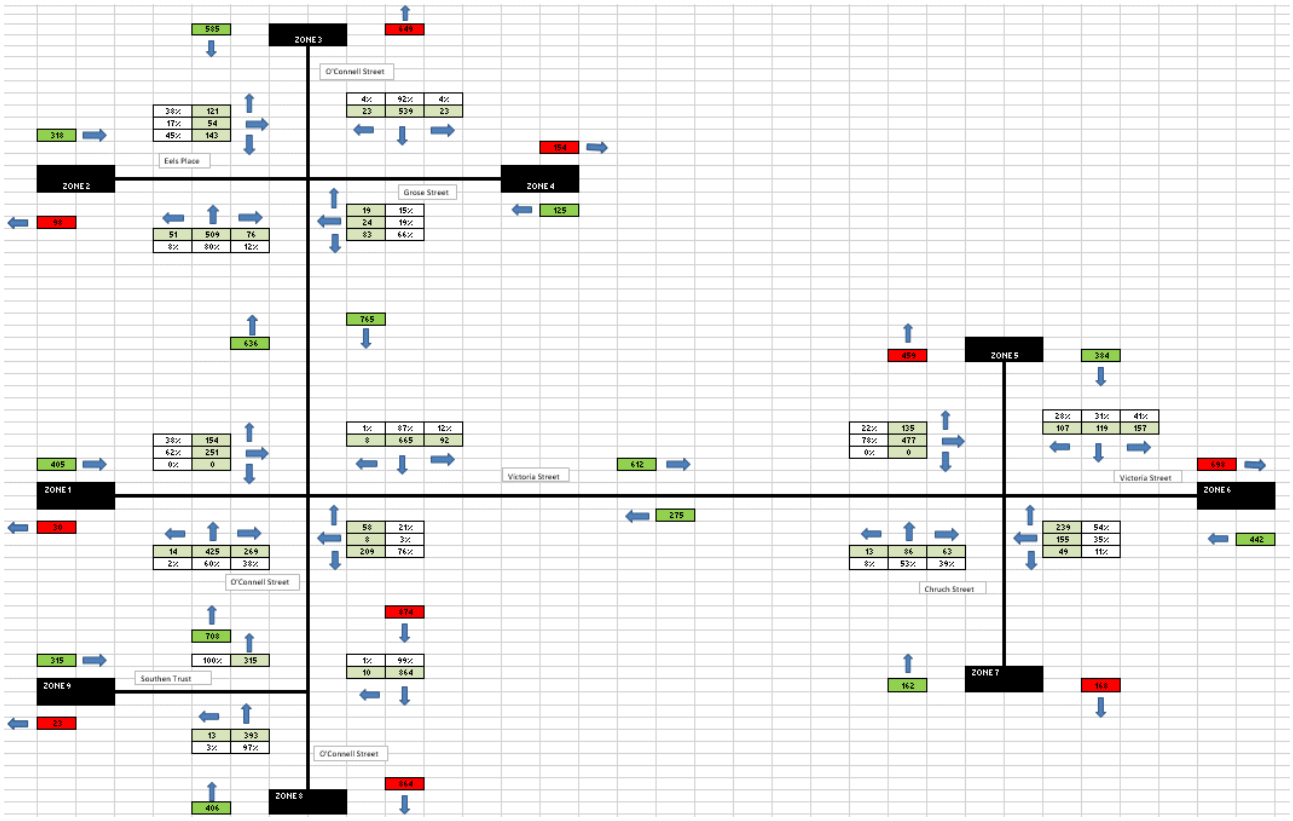


Figure 4.31 - Proposed Stadium (2019) turning volumes - during Half Event – Peak Departures (20:45 to 21:45pm)

4.3.1.3 Full-Capacity Event

The traffic volumes associated with a full event have been determined based on the methodology discussed previously for a full event at the proposed stadium.

Figures 4.32 and **Figure 4.33** illustrate the peak arrival (17:30 to 18:30pm) and departure (20:45 to 21:45pm) periods.

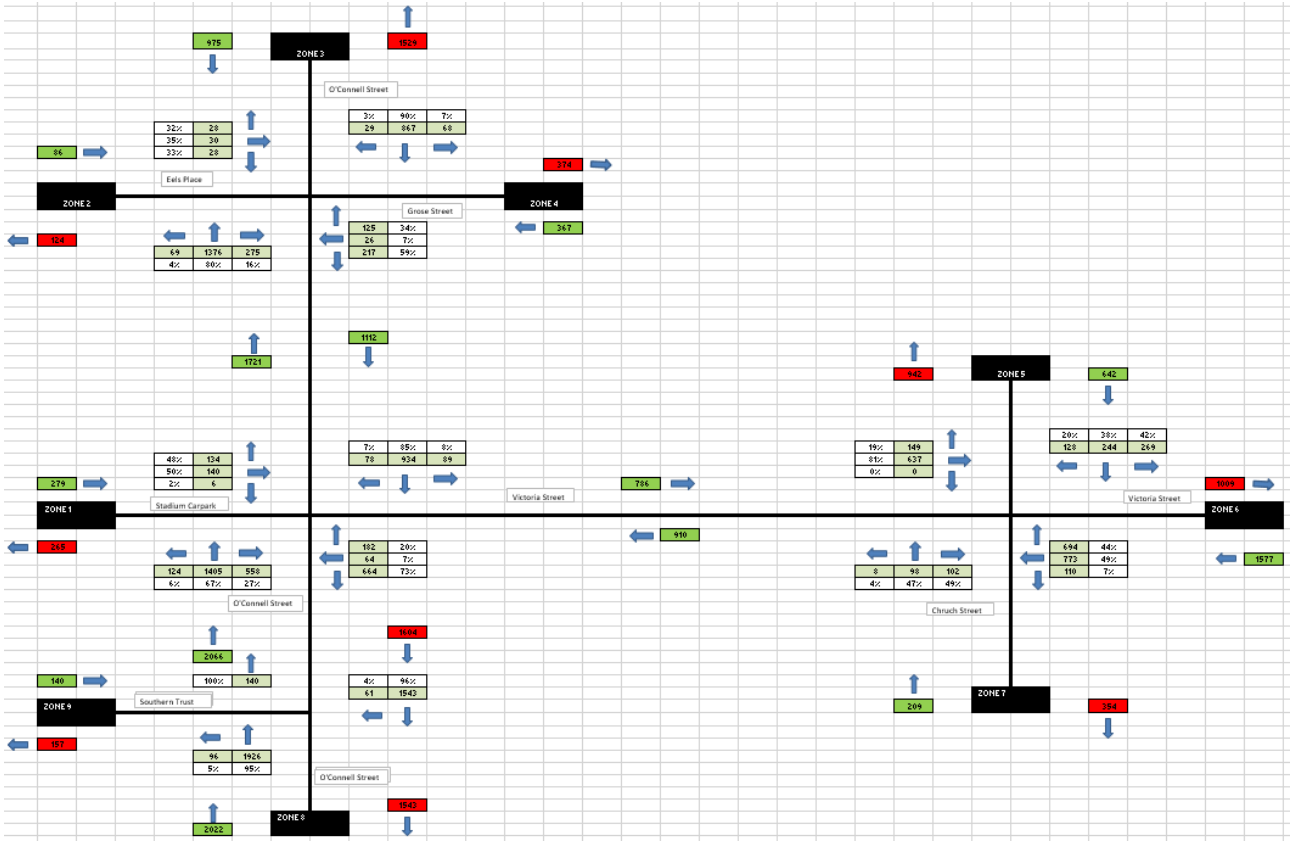


Figure 4.32 – Proposed Stadium (2019) turning volumes - during Full Event – Peak Arrivals (17:30 to 18:30pm)

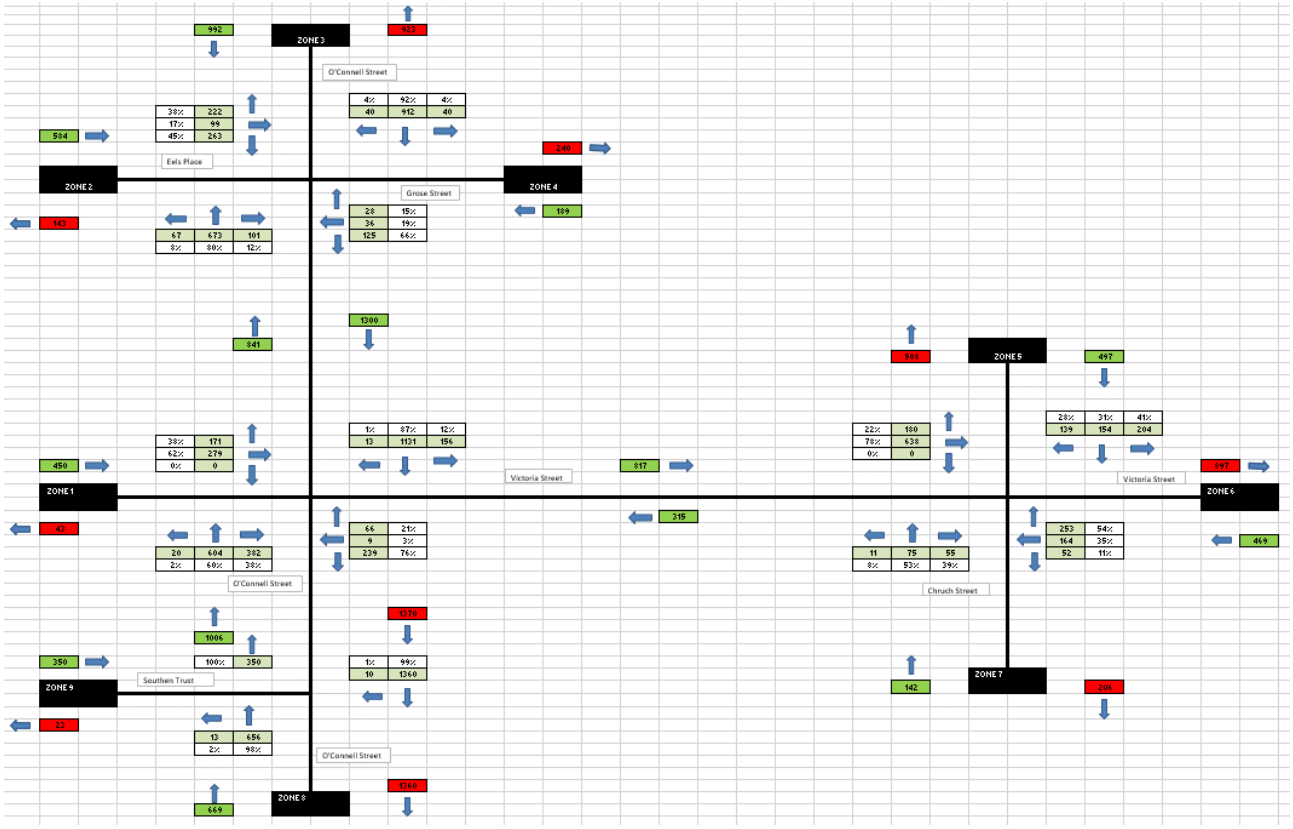


Figure 4.33 – Proposed Stadium (2019) turning volumes - during Full Event – Peak Departures (20:45 to 21:45pm)

4.3.2 Public Transport Network

For public transport networks the key effect associated with the proposed development will be associated with the operation of events at the stadium. Light Rail patronage is assumed to be capped at the levels discussed in Section 4.2.3.1. Therefore, in the context of the proposed development, the key influence of the development will be on bus and heavy rail patronage. The mode shares within each zone are assumed to be the same for the proposed stadium as those identified for the current.

4.3.2.1 Day – to – day Operations

During day to day operations, the proposed stadium is predicted to have the same number of occupants as the current stadium. Therefore, the proposed development is not anticipated to generate any additional public transport trips over those associated with the current stadium.

4.3.2.2 Half-Capacity Event

During a half capacity event at the proposed stadium, there is predicted to be additional public transport trips associated with the proposed development. **Table 4.8** summarises the proposed bus trips associated with the proposed stadium within each zone relative to those of the current stadium.

Table 4.8 – Bus demand comparison between proposed and current stadium for half capacity event

	Current Stadium	Proposed Stadium	Difference
Zone 1	110	156	+46
Zone 2	101	144	+43
Zone 3	739	1,162	+423
Total	950	1,462	+512

The information developed indicates that the proposed stadium could generate an additional 512 bus trips during a half event. This equates to an increase in demand of 54%.

Table 4.9 summarises the assumed heavy rail trips associated with the proposed stadium within each zone relative to the current stadium.

Table 4.9 – Heavy Rail demand comparison between the proposed and current stadium for half capacity event

	Current Stadium	Proposed Stadium	Difference
Zone 1	0	0	0
Zone 2	0	0	0
Zone 3	1,477	2,323	+846
Total	1,477	2,323	+846

The information developed indicates that the proposed stadium could generate an additional 846 heavy rail trips during a half event. This equates to an increase in demand of 57%.

Potential effects associated with this increased demand is discussed in Section 5.2.2.

4.3.2.3 Full-Capacity Event

During a full capacity event, there is anticipated to be an increased demand on public transport facilities associated with the proposed development. **Table 4.10** summarises the proposed bus trips associated with the proposed stadium within each zone relative to those of the current stadium.

Table 4.10 – Bus demand comparison between proposed and current stadium for full capacity event

	Current Stadium	Proposed Stadium	Difference
Zone 1	217	309	+92
Zone 2	200	286	+86
Zone 3	1,487	2,301	+814
Total	1,904	2,896	+992

The information developed indicates that the proposed stadium could generate an additional 992 bus trips during a full event. This equates to an increase in demand of 52%.

Table 4.11 summarises the assumed heavy rail trips associated with the proposed stadium within each zone relative to the current stadium.

Table 4.11 – Heavy Rail demand comparison between the proposed and current stadium during a full event

	Current Stadium	Proposed Stadium	Difference
Zone 1	0	0	0
Zone 2	0	0	0
Zone 3	2,914	4,602	+1,688
Total	2,914	4,602	+1,688

The information developed indicates that during a full event, the proposed stadium could generate an additional 1,688 heavy rail trips, this equates to a 58% increase.

4.3.3 Pedestrian Networks

This section discusses the anticipated demand on pedestrian networks as a result of the proposed development. The demand has been generated based on the number of pedestrian trips generated and distributed across the network, following the same methodology as discussed in Section 4.1.3.

It is important to assess whether the predicted number of pedestrians can be accommodated on the existing pedestrian network or whether this will need to be temporarily managed on match days. This could include road closures and an enhanced Wayfinding Strategy to spread the demand on the pedestrian network.

The assessment evaluates the pedestrian linkages to public transport networks and how they complement each other. This includes establishing the constraints to pedestrian access to the stadium, including delays at intersections. Mitigations are to recommend implementations that can be provided to maximise pedestrian benefits, including temporary mitigation measures during events.

The importance of the amenity for pedestrians and cyclists in the Parramatta CBD has been included in the 2010 Parramatta City Centre Integrated Transport Plan as indicated in **Figure 4.34**.

Figure 4.34 – Pedestrian and Cycle Amenity Zone (2010 Parramatta City Centre Integrated Transport Plan)

The Parramatta Walking Strategy (*final draft report dated 16/02/2017 by Cardno*) states the City of Parramatta (Council) is delivering a CBD which will enhance the walking experience for people who live, work, study and visit there. As the CBD undergoes significant redevelopment, Council will plan streets and city areas that are accessible, safe and prioritised for pedestrians. This Walking Strategy is planned to coincide with the transformation of the CBD; the implementation of the Walking Strategy should be staged to align with the design and construction of city developments.

City of Parramatta's vision for walking in the CBD

Parramatta's CBD will be the walkable heart of a vibrant and healthy city. The CBD's growth will be the stimulus to transform the streets into places that are safe, active, and accessible for everyone at all times of the day and week.

Our streets will encourage residents, workers, students, shoppers and visitors to make safe and simple walking journeys to jobs, school, recreation, cultural, and retail districts. They will enjoy the streets as public spaces to meet, wait and watch. Pedestrians will be prioritised and respected in the CBD, enjoy stronger community connections, opportunities to be healthy and active, benefitting the CBD's economy from the increased numbers of people choosing to walk, shop and linger.

4.3.3.1 Day – to – day Operations

On a day-to-day basis, the stadium is not predicted to generate any additional pedestrian movements. There may be an increase in pedestrian activity associated with the increased car park size. However, this is likely to less than the reduced pedestrian activity associated with the removal of the Parramatta Community Swimming Pool.

4.3.3.2 Half-Capacity Event

During a half event, there is anticipated to be 15,000 spectators, as well as 600 staff at the stadium. A large majority of these spectators and staff will be pedestrian trips as the exit the stadium precedent (Zone 1), the number of trips will dissipate and disperse as user trips transition onto other modes and other routes.

Table 4.12 summarises the number of pedestrian trips anticipated within each zone for the proposed stadium relative to the current stadium in each zone during a half event. These trips, and the associated differences are distributed over the two hour arrival and departure periods, as discussed in Section 3.6.

Table 4.12 – Pedestrian demand comparison between proposed and current stadium during a half event.

	Current Stadium	Proposed Stadium	Difference	% Difference
Zone 1	10,118	14,430	+4,312	+43%
Zone 2	7,386	11,616	+4,248	+58%
Zone 3	1,477	2,323	+846	+57%

The information developed indicates that within Zone 2 and 3, the wider project influence area, during a half event it is anticipated that the proposed stadium will increase pedestrian demand by circa 57%.

The peak arrival and departure periods for pedestrians associated with the stadium is expected to be the same as the current stadium, that being 6:00-7:00pm and 8:00-9:00pm respectively. Using the same methodology as discussed in Section 4.1.3, the route assignment for these peak departure and arrival periods was estimated.

Figure 4.35 illustrates the assumed peak arrival flows associated with the proposed stadium during half event.

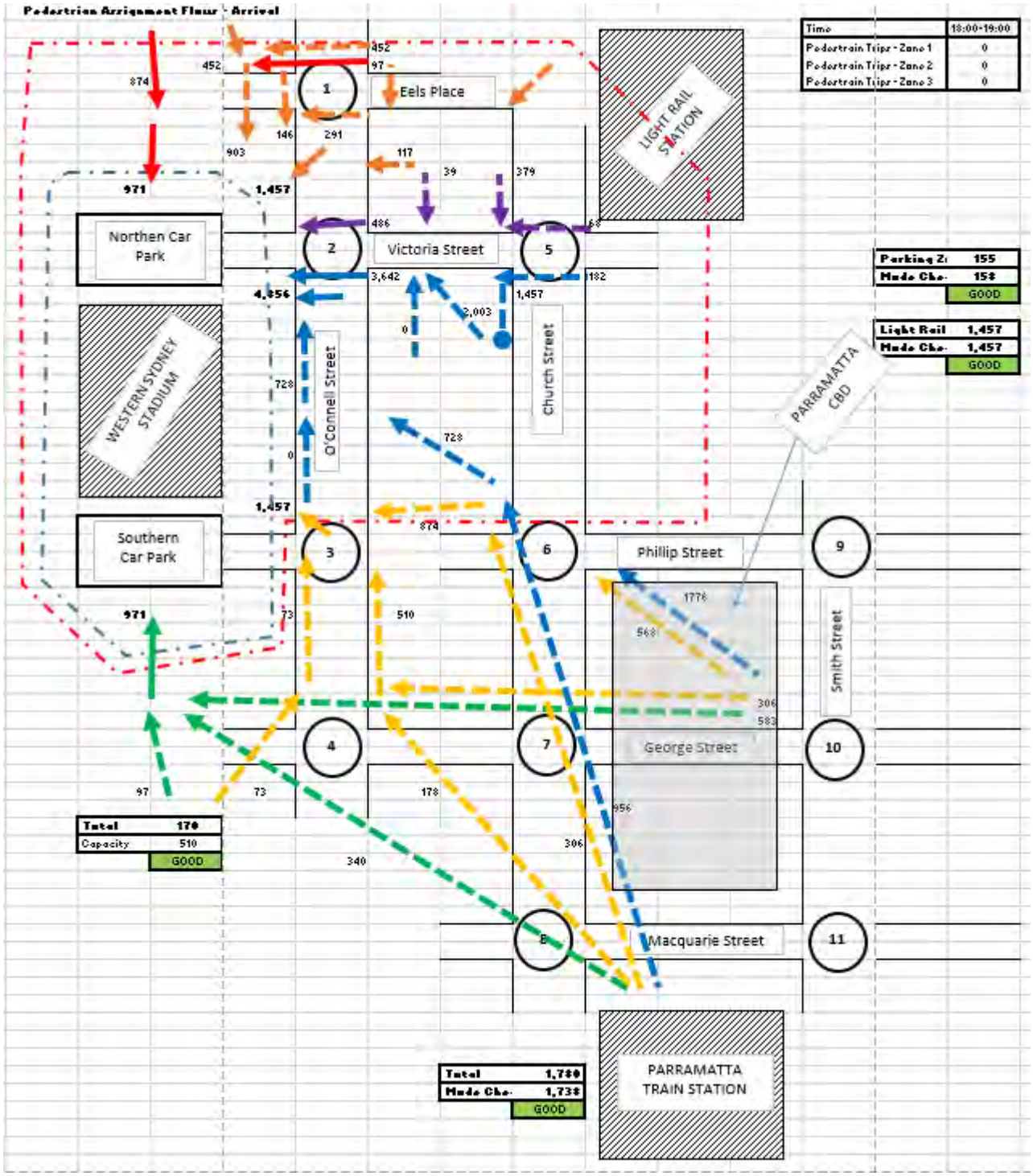


Figure 4.35 – Proposed Stadium (2019) pedestrian volumes - during Half Event – Peak Arrivals

Table 4.13 provides a comparison between the proposed and current stadium during a half event on key routes within the area of influence of the stadium.

Table 4.13 – Assumed pedestrian volumes on key links for peak arrivals – comparison between proposed and current for half event

Link	Current Stadium	Proposed Stadium	Diff	% Diff
O'Connell Street, north of Victoria Road	1,009	1,457	+448	+44%
O'Connell Street, south of Victoria Road	504	728	+224	+44%
O'Connell Street, south of Parramatta River	1,075	1,554	+479	+45%
Victoria Road, east of O'Connell Street	2,858	4,128	+1,270	+44%
Church Street, north of George Street	2,496	3,605	+1,109	+44%
Church Street, south of George Street	1,284	1,780	+496	+39%

Figure 4.36 illustrates the assumed peak departure flows associated with the stadium during a half event.

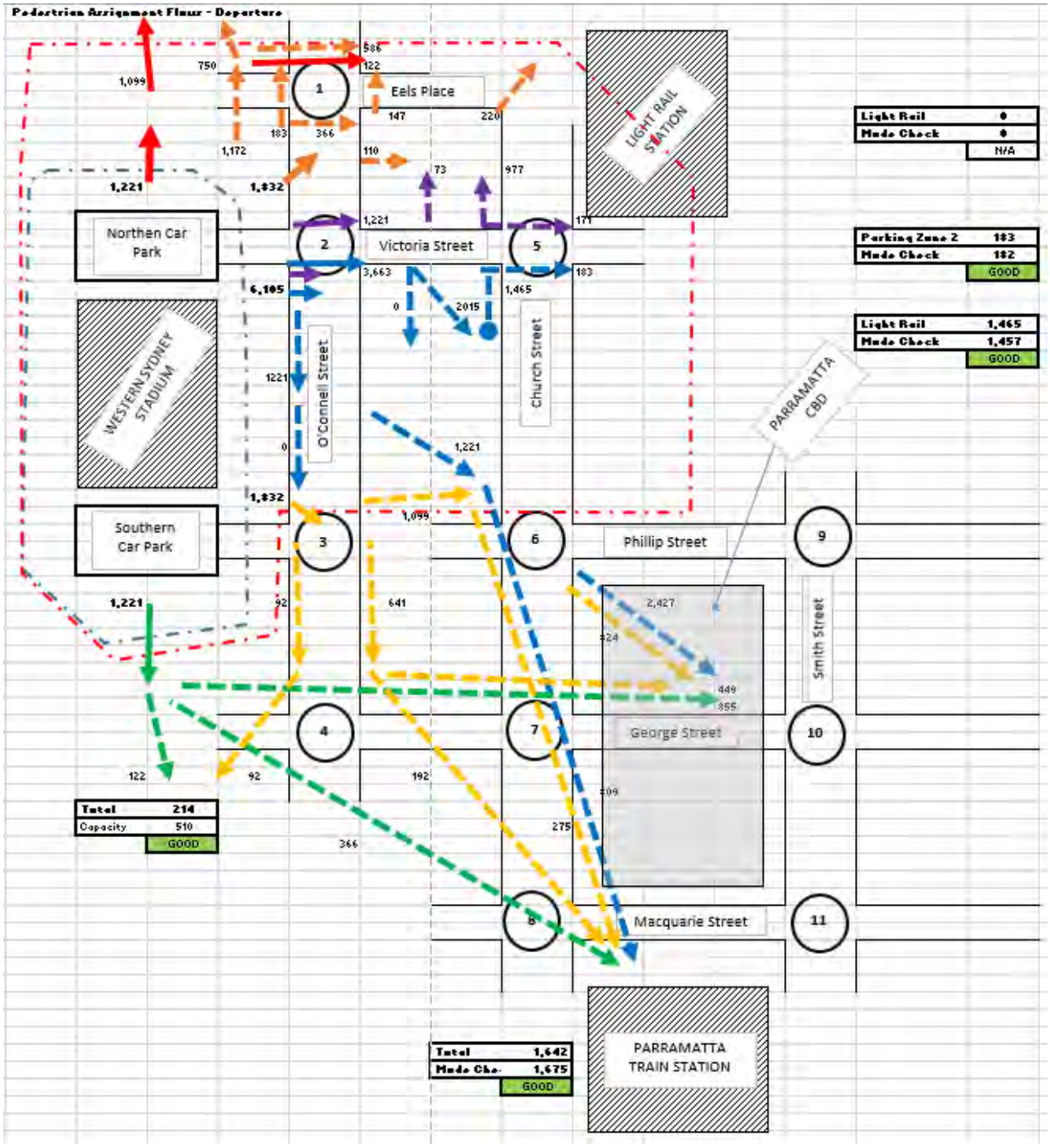


Figure 4.36 – Proposed Stadium (2019) pedestrian volumes - during Half Event – Peak Departures

Table 4.14 provides a comparison between the proposed and current stadium during a half event on key routes within the area of influence of the stadium.

Table 4.14 – Assumed pedestrian volumes on key links for peak departures – comparison between proposed and current for half event

Link	Current Stadium	Proposed Stadium	Diff	% Diff
O'Connell Street, north of Victoria Road	1,268	1,832	+564	+44%
O'Connell Street, south of Victoria Road	845	1,221	+376	+44%
O'Connell Street, south of Parramatta River	1,352	1,954	+602	+45%
Victoria Road, east of O'Connell Street	3,381	4,884	+1,503	+44%
Church Street, north of George Street	3,001	4,335	+1,334	+44%
Church Street, south of George Street	1,137	1,642	+505	+44%

The information generated indicates that each of the key links within the area of influence are expected to have an increase in demand of 44%, this is consistent with the outcomes of the Stage 1 DA. Victoria Road and Church Street are anticipated to be the critical links, with current volumes being between 3,000 and 3,500 pedestrians per hour, raising to 4,500 to 5,000 per hour.

This increased demand and its corresponding influence on the existing infrastructure is discussed in **Section 5.3.2.**

4.3.3.3 Full-Capacity Event

During a full event, there is anticipated to be 30,000 spectators, as well as 900 staff at the stadium. A large majority of these spectators and staff will be pedestrian trips as the exit the stadium precedent (Zone 1), the number of trips will dissipate and disperse as user trips transition onto other modes and other routes.

Table 4.15 summarises the number of pedestrian trips anticipated within each zone for the proposed stadium relative to the current stadium in each zone during a half event. These trips, and the associated differences are distributed over the two-hour arrival and departure periods, as discussed in Section 3.6.

Table 4.15 – Pedestrian demand comparison between proposed and current stadium during a full event

	Current Stadium	Proposed Stadium	Difference	% Difference
Zone 1	19,959	28,583	+8,624	+43%
Zone 2	14,570	23,009	+8,439	+58%
Zone 3	2,914	4,602	+1,688	+58%

The information developed indicates that within Zone 2 and 3, the wider project influence area, during a half event it is anticipated that the proposed stadium will increase pedestrian demand by approximately 58%. This is in line with the trends identified a half event discussed in the previous section.

The peak arrival and departure periods for pedestrians associated with the stadium is expected to be the same as the current stadium, that being 6:00-7:00pm and 8:00-9:00pm respectively. Using the same methodology as discussed in Section 4.1.3, the route assignment for these peak departure and arrival periods was estimated.

Figure 4.37 illustrates the assumed peak arrival flows associated with the proposed stadium during a full event.

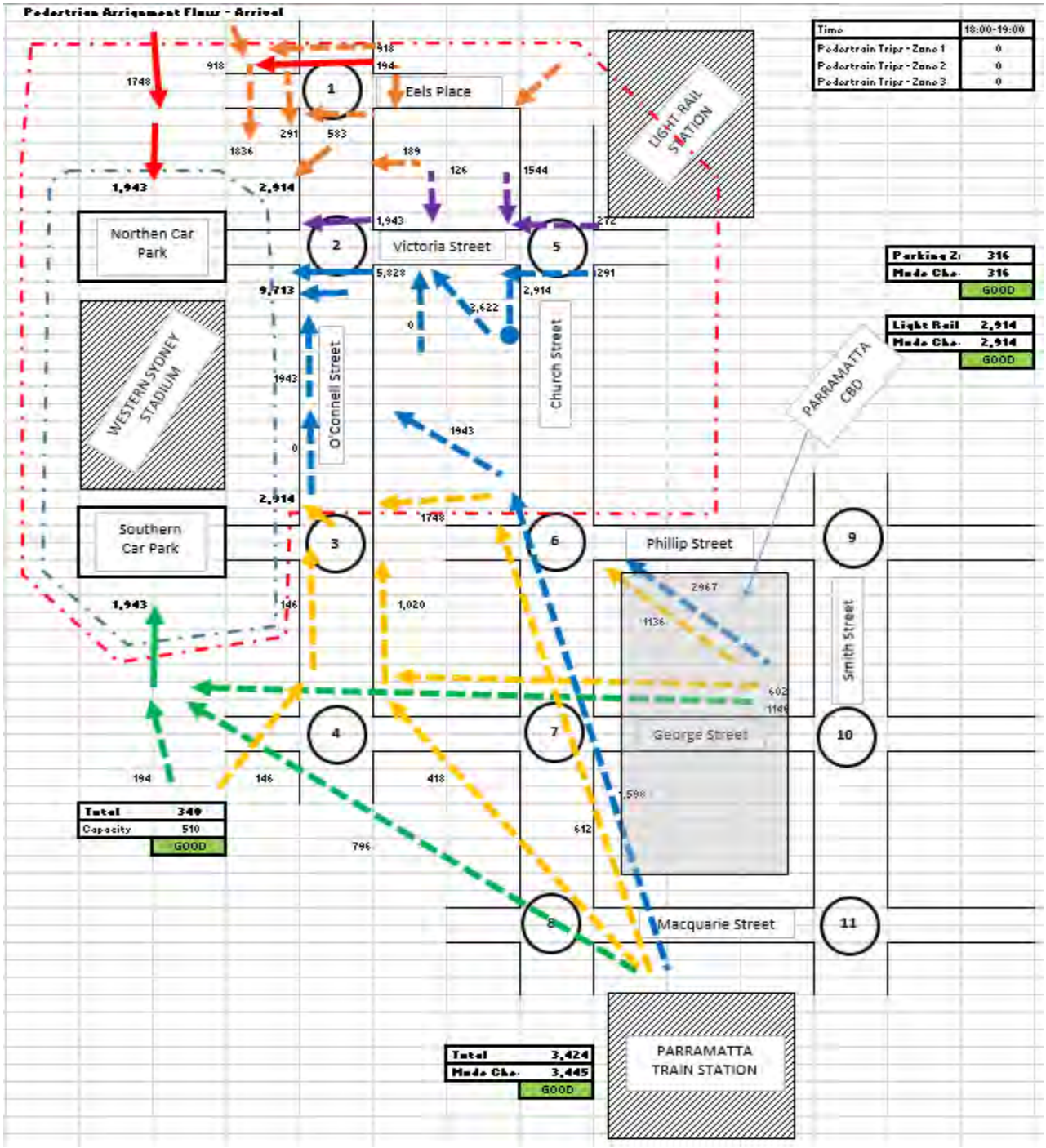


Figure 4.37 – Proposed Stadium (2019) pedestrian volumes - during Full Event – Peak Arrivals

Table 4.16 provides a comparison between the proposed and current stadium during a half event on key routes within the area of influence of the stadium.

Table 4.16 – Assumed pedestrian volumes on key links for peak arrivals – comparison between proposed and current for full event

Link	Current Stadium	Proposed Stadium	Diff	% Diff
O'Connell Street, north of Victoria Road	2,009	2,914	+905	+45%
O'Connell Street, south of Victoria Road	670	1,943	+1,273	+190%
O'Connell Street, south of Parramatta River	2,142	3,109	+967	+45%
Victoria Road, east of O'Connell Street	6,026	7,771	+1,745	+29%
Church Street, north of George Street	4,018	6,313	+2,295	+57%
Church Street, south of George Street	2,223	3,424	+1,201	+54%

Table 4.16 indicates that there are some considerable differences in pedestrian volumes and routes taken as an outcome of the proposed stadium. The main differences are due to the increased size and the presence of light rail, which alters trip behaviours. With the current stadium, it is expected that light rail could take a mode share of 20%; for the proposed, this reduced to 14%. The effect of this that with the current stadium light rail generates more traffic along Victoria Road, and southbound along O'Connell. With the proposed, there are still an increase on Victoria, but a higher demand on O'Connell as those additional pedestrian use alternative modes to light rail.

Figure 4.38 illustrates the assumed peak departure flows associated with the stadium during a full event.

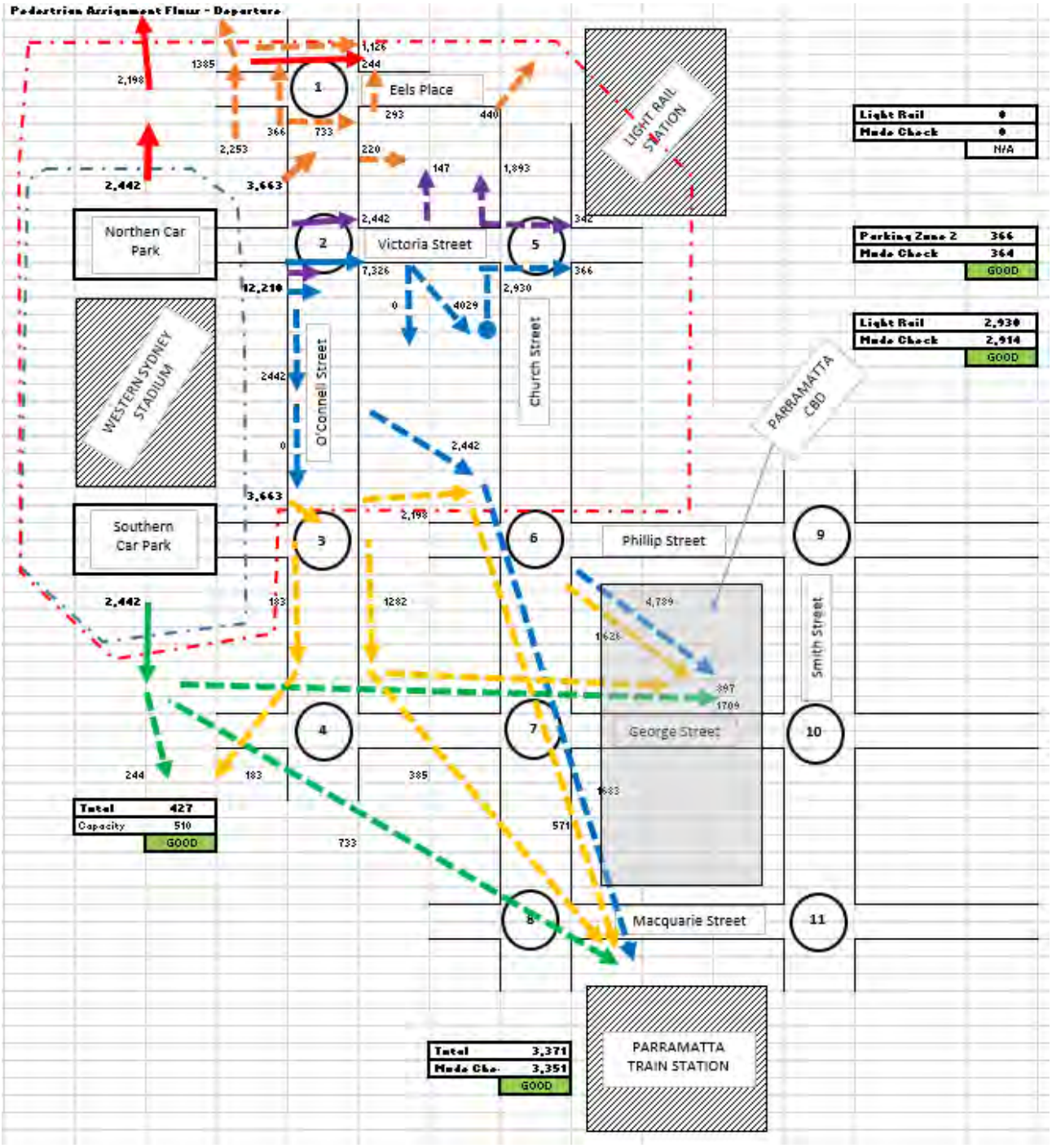


Figure 4.38 – Proposed Stadium (2019) pedestrian volumes - during Full Event – Peak Departures

Table 4.17 provides a comparison between the proposed and current stadium during a half event on key routes within the area of influence of the stadium.

Table 4.17 – Assumed pedestrian volumes on key links for peak departures – comparison between proposed and current for full event

Link	Current Stadium	Proposed Stadium	Diff	% Diff
O'Connell Street, north of Victoria Road	2,525	3,663	1,138	+45%
O'Connell Street, south of Victoria Road	1,683	2,442	+759	+45%
O'Connell Street, south of Parramatta River	2,694	3,907	+1,213	+45%
Victoria Road, east of O'Connell Street	6,733	9,768	+3,035	+45%
Church Street, north of George Street	5,219	8,669	+3,450	+66%
Church Street, south of George Street	2,075	3,372	+1,297	+63%

The assessment has indicated that during a full event at the stadium, the key departure links will be Victoria Road and Church Street, which are expected to have hourly pedestrian volumes of 9,000 to 10,000 and 8,000 to 9,000 respectively.

The effects on the pedestrian network associated with these volumes is discussed in **Section 5.3.3**.

4.3.3.4 Pedestrian Level of Service

In accordance with Parramatta Walking Strategy (*Cardno – February 2017*), recommendations for the appropriate path widths and the suitability based on environmental context and pedestrian volumes were derived. Based on Parramatta's CBD environs, and clear path of travel requirements for two wheelchairs to pass and buffer zone considerations, it is recommended that the minimum clear path of travel designed for Parramatta is 2.2 metres wide along the majority of CBD streets. On streets at the outskirt of the CBD, the minimum clear path of travel can be reduced to 1.8 metres. These minimum clear path width recommendations do not include buffer zones, recommended to be between 0.2 and 0.5 m from building facades, kerbs and bench seating ect.

Previous information and that from site investigations undertaken as part of this TIA have provided the approximate width of footpaths within the Parramatta CBD and surrounding streets. These results are compliant with Transport for London (TfL) total footway width recommendations which allow for relatively unconstrained movement along the paths, outlined in **Table 4.18** below. The TfL's guideline is a well-respected source of pedestrian level of comfort estimation.

Table 4.18 – Transport for London total footway width recommendations

Category	Low	Medium	High
Pedestrians per hour	< 600	600 – 1,200	> 1,200
Total width (metres)	2.9	3.3 – 4.2	5.3
Clear width (metres)	2.0	2.2	3.3

The Level of Service assessment for pedestrian volumes on footpaths was based on the Fruin model, another well-respected source to determine what the expected performance of pedestrian movements on the Parramatta streets will be.

The streets assessed include O'Connell St (north of Victoria Rd, south of Victoria Rd, south of Parramatta River), Victoria Rd (east of O'Connell St) and Church St (north of George St, south of George St).

The Fruin's LoS model uses a pedestrian density versus capacity calculation to determine the pedestrian level of service. The Fruin's LoS can be derived from **Figure 4.39** by first determining the pedestrian flow rate per minute per metre width. For example, for a half capacity event in 2016, there are 1268 pedestrians arriving between 18:00-19:00 from O'Connell St, north of Victoria St. Travelling over 60 minutes along an average footpath of 2.5m there are approximately 8.5 pedestrians/min/metre using this path of travel. This equates to a LoS A.

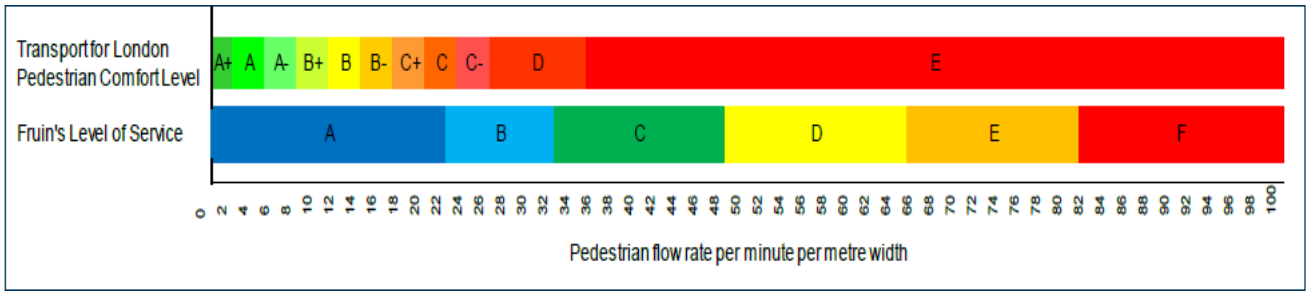


Figure 4.39 – Fruin's method of determining pedestrian LoS on footpaths

Applying Fruin's model the analysis of the footpaths to and from the WSS revealed that for all existing 2016 arrivals (18:00-19:00) and departures (20:00-21:00) the path of travel for all scenarios, both half and full capacity events, had a level of service A-B. Similarly, a LoS A-B was also determined for future year, 2019 half capacity event arrivals and departures.

For a 2019 full capacity event, the arrivals saw a LoS C along Victoria Rd, east of O'Connell St with all other paths of travel maintaining a LoS A-B. Likewise, a full capacity event in 2019 increased to LoS D on Victoria Rd and LoS C along Church St, north of George St.

It is clear that the footpath capacity for continuous flow of pedestrians along the footpaths, servicing pedestrians to and from the WSS, operates at an acceptable LoS now and in 2019 when the stadium will open.

It is however the intersection capacity and LoS that impacts on the free flow of pedestrians and hence a significant reduction in LoS, as discussed in Section 5.3.

The calculated LoS for pedestrian volumes for the different scenarios are shown in **Appendix C**.

4.3.4 Cycling Networks

As indicated in Figure 4.13 (Section 4.1.6), Parramatta Council is planning to complete missing links in the Parramatta Valley Cycleway (PVC) and upgrade sections. As stated before, for this TIA and for cyclists, it is more about accessibility to and around the stadium rather than operational performance of the cycle paths. It is also about the assessment of the adequacy of existing and proposed bicycle provisions, cycling network infrastructure and suitable end-of-trip facilities to meet the likely future demand of the WSS proposal. To this extent the bicycle access and circulation to and from the Stadium is shown in **Figure 4.40** below.

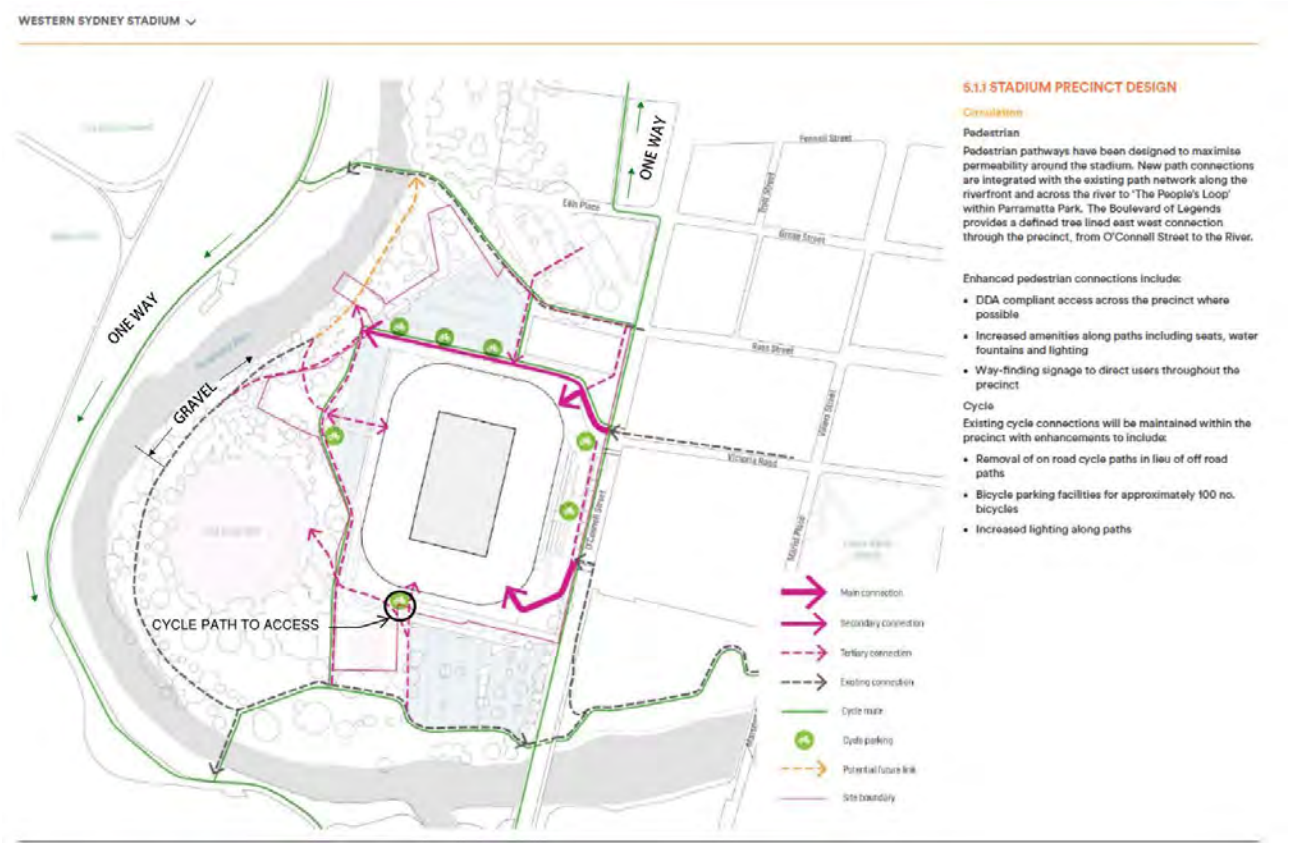


Figure 4.40 – Existing and enhanced cycle access to Stadium (*Source: Aspect Studio WSS report*)

The work undertaken by Parramatta Council to enhance the cycling network that provides access to the stadium should be a great encouragement for spectators by using their bikes and a positive step forward green travel in Parramatta.

5 Assessment of Effects of Proposed Development

This section of the TIA discusses the effect the proposed development is expected to have on the transportation network within the stadium area of influence. This will benchmark against the anticipated operation of the current stadium if maintained in its existing state in 2019, allowing the ability to isolate the effect of the new WSS.

5.1 Assessment of Effects on Road Network

The assessment on the road network was undertaken using the intersection modelling programme SIDRA Intersection Version 6. This package allows for the modelling of intersections within Zone 2 and maintains the methodology of the Stage 1 DA. For the intersections, SCATS data was used to develop phase sequence, cycle times and proportion of pedestrian calls on the crossings. Within the future years, the available phase sequences for the intersections with an optimised cycle time were run.

5.1.1 Day-to-day Operations

Day to day operations associated with the proposed development are related to staff and general public movements egress and accessing the stadium intersections. Each of the intersections were assessed during the AM and PM (coincides with stadium arrival peak) and weekend peak periods for 2019 for both the current and proposed stadium.

On a day to day basis, only the O'Connell Street/Victoria Road and Southern Trust Car Parks will be influenced by the development, and hence where the only intersections modelled. Additionally, during the weekend, it is not anticipated that the proposed development will influence the operation of the O'Connell/Grose and Church/Victoria intersection, and the effects will be less critical than the PM peak. Therefore, these were not modelled in SIDRA.

5.1.1.1 O'Connell Street/Victoria Road Intersection

The O'Connell Street/Victoria Road intersection operates on a simple three-phase sequence with an observed cycle time of 109 seconds in the AM peak and 107 seconds in the PM peak. During the AM peak, pedestrian phases were called 20 – 60% of the phases, and 10 – 20% in the PM peak.

Table 5.1 summaries the outcomes of SIDRA modelling for the intersection during the AM peak for the current and proposed stadium.

Table 5.1 – SIDRA Modelling outcomes – AM Peak (Non-Event)

Year	Scenario	Delay	Worse Movement	Cycle Time
2016	Current Stadium	28.8 (C)	61.3 (E) – RT Victoria Road	109 s
2019	Current Stadium	31.6 (C)	67.5 (E) – RT Victoria Road	90 s
2019	Proposed Stadium	31.7 (C)	64.0 (E) – RT Victoria Road	90 s

The results of the modelling indicate that the proposed stadium will have a very minor impact on the intersection during the AM network peak, increasing the overall intersection delay by 0.1s.

Table 5.2 summaries the outcomes of the SIDRA modelling for the intersection during the PM peak for the current and proposed stadium.

Table 5.2 – SIDRA Modelling outcomes – PM Peak (Non-Event)

Year	Scenario	Delay	Worse Movement	Cycle Time
2016	Current Stadium	20.6 (B)	52.4 (E) – RT Victoria Road	107 s
2019	Current Stadium	18.7 (B)	46.0 (D) – RT Victoria Road	90 s
2019	Proposed Stadium	19.0 (B)	46.3 (D) – RT Victoria Road	90 s

The results of the modelling indicate that the proposed stadium is going to have a minimal impact on the intersection performance, increasing average intersection delay by 0.3s. It is also indicating that a reduced cycle time could have operational benefits. This may be due to a more even flow distribution in 2019, or is has the ability to clear short lanes faster.

Table 5.3 summaries the outcome of the SIDRA modelling for the intersection during the weekend. Note that no weekend data was available and the flows have been assumed based on 80% of the weekday PM peak. Therefore, only the 2019 current and proposed scenarios were modelled.

Table 5.3 – SIDRA Modelling outcomes – PM Peak (Non-Event)

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	17.5 (B)	46.3 (D) – RT Victoria Road	90 s
2019	Proposed Stadium	18.8 (B)	46.1 (D) – RT Victoria Road	90 s

The results of the modelling indicate based on the assumed weekend flows, the proposed stadium will have a minor impact on the intersection performance, raising the average intersection delay by 1.3 seconds. The Level of Service (LoS) is unaffected.

5.1.1.2 Southern Trust Carpark

The southern trust carpark operates as a priority controlled intersection, with right turns out of the intersection banned. It was observed that some vehicles do turn right, there illegal movements were not included within the modelling. SIDRA provides default parameters for follow-up headway and gap acceptance for LT and RT movements on opposed movements. These are calibrated for rural intersections and deemed conservative. Onsite observations and information from Table 4.19 of the Stage 1 DA indicate that there are currently no issues associated with vehicle entering and exiting the car park on a day-to-day basis. **Table 5.4** identifies the assumed headway and follow-up used within the modelling.

Table 5.4 – SIDRA modelling parameters used in modelling

	LT Out	RT In
SIDRA Parameter – Gap Acceptance	5.0 s	4.5 s
SIDRA Parameter – Follow up Headway	3.0 s	2.5 s
Modelled – Gap Acceptance	3.0 s	3.0 s
Modelled – Follow up Headway	2.0 s	2.0 s

Table 5.5 summaries the outcomes of the intersection modelling during the AM peak for the current and proposed stadium.

Table 5.5 – SIDRA Modelling outcomes – AM Peak (Non-Event)

Year	Scenario	Delay	Worse Movement
2016	Current Stadium	0.4	12.5 (A) – RT O'Connell Street (N)
2019	Current Stadium	0.5	14.1 (A) – RT O'Connell Street (N)
2019	Proposed Stadium	0.5	14.0 (A) – RT O'Connell Street (N)

The outcomes of the modelling indicate that the proposed stadium is not expected to have an effect on the performance of the Southern Trust carpark intersection during the AM peak. The critical movements is the right turn movement into the carpark from O'Connell Street, this movement has to give way to all other movements. Queuing is not expected to exceed the available stacking length in 2019.

Table 5.6 summaries the outcomes of the intersection modelling during the PM peak for the current and proposed stadium.

Table 5.6 – SIDRA Modelling outcomes – PM Peak (Non-Event)

Year	Scenario	Delay	Worse Movement
2016	Current Stadium	0.5	8.1 (A) – RT O'Connell Street (N)
2019	Current Stadium	0.5	8.5 (A) – RT O'Connell Street (N)
2019	Proposed Stadium	0.6	8.4 (A) – RT O'Connell Street (N)

The result of the modelling indicate that the proposed development is not expected to have an influence on the intersection performance during the PM Peak period. The queues associated with the right turn movement from O'Connell Street are anticipated to be contained within the available physical stacking length.

Table 5.7 summaries the outcome of the SIDRA modelling for the intersection during the weekend. As discussed previously, there is no weekend data was available and the flows have been assumed based on 80% of the weekday PM peak. Therefore, only the 2019 current and proposed scenarios were modelled.

Table 5.7 – SIDRA Modelling outcomes – Weekend Peak (Non-Event)

Year	Scenario	Delay	Worse Movement
2019	Current Stadium	0.5	7.5 (A) – RT O'Connell Street (N)
2019	Proposed Stadium	0.5	7.4 (A) – RT O'Connell Street (N)

The outcomes of the SIDRA modelling indicate that during the weekend, based on the assumptions adopted, the proposed development is not anticipated to have an impact on the intersection performance. The queuing associated with the tight turn movement from O'Connell Street is anticipated to be contained within the available stacking length.

5.1.1.3 O'Connell Street/Grose Street Intersection

The O'Connell Street/Grose Street Intersection operates with a Single Diamond Phasing. Supplied SCATs data indicate that the optional phases are not operating during the peak periods, therefore, these were not included in the 2016 current modelling. In the 2019 scenarios, the ability to operate these alternative phases

was allowed. SCATS has indicated a 56s on average in the PM peak. The development is not anticipated to influence the AM peak hour and hence has not been modelled. Pedestrian demand for crossings were determined.

For the future years and scenarios, the modelling has assumed optimised cycle times for delay reduction with a range between 90s and 150s.

Table 5.8 summaries the outcomes of the SIDRA modelling for the intersection during the PM peak period for the current and proposed stadium.

Table 5.8 – SIDRA Modelling outcomes – PM Peak (Non-Event)

Year	Scenario	Delay	Worse Movement	Cycle Time
2016	Current Stadium	15.9 (B)	35.5 (C) – RT Eels Place	56s
2019	Current Stadium	20.0 (B)	54.1 (D) – RT Eels Place	90s
2019	Proposed Stadium	20.1 (B)	54.2 (D) – RT Eels Place	90s

The outcomes of the SIDRA modelling indicate that during the PM network peak, the proposed development is not anticipated to have an effect on the O'Connell/Grose Intersection. The intersection may operate better with a reduced cycle time similar to that currently.

5.1.1.4 Church Street/Victoria Road Intersection

The Church Street/Victoria Road Intersection operates with Single Diamond Phasing. SCATs data indicates that during the PM Peak it operating on an A, C, E, E, F sequence, with C being an option peak direction phase that is triggered the majority of the cycles. The average cycle time during the peak hour was observed at 113s. SCATs data was also used to indicate the number of pedestrian calls in each cycle, which occur in most cycles.

Table 5.9 summaries the outcomes of the SIDRA modelling for the intersection during the PM peak period for the current and proposed stadium.

Table 5.9 – SIDRA Modelling outcomes – PM Peak (Non-Event)

Year	Scenario	Delay	Worse Movement	Cycle Time
2016	Current Stadium	38.8 (C)	54.9 (D) – LT Victoria Road (W)	113 s
2019	Current Stadium	33.5 (C)	48.1 (D) - RT Church Street (S)	90 s
2019	Proposed Stadium	33.5 (C)	48.1 (D) - RT Church Street (S)	90 s

The proposed development is not expected to have any influence on the intersection during the PM peak during day-to-day operations.

5.1.2 Half-Capacity Event

Traffic modelling was undertaken on the intersection during a half event situation for both the current and proposed stadiums. These events are more frequent than full events, and the modelling provides guidance into the anticipated effect of the proposed stadium on the road network. All modelling was undertaken based on the peak arrivals (17:30 to 18:30) and departure (20:45 to 21:45) periods. Discuss the effects during a half-capacity event.

5.1.2.1 O'Connell Street/Victoria Road Intersection

The O'Connell Street/Victoria Road Intersection provides the main access to the stadium both with the current stadium and the proposed. It is also the location of the main pedestrian assembly area.

Table 5.10 summarises the outcomes of the SIDRA modelling during a half event for the peak vehicle arrival (17:30 to 18:30) period for the current and proposed stadium.

Table 5.10 – SIDRA Modelling outcomes – Peak Arrivals (17:30 to 18:30) Half Event

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	32.4 (C)	81.2 (F) – RT O'Connell Street (S)	90 s
2019	Proposed Stadium	28.1 (B)	62.4 (E) – RT O'Connell Street (N)	110 s

The results indicate that with a longer cycle time and an increased demand, the intersection during a half event with the proposed stadium is performing better. This may be due to a more evenly distributed load on the intersection approaches. Both intersection are expected to be operating within capacity.

The SIDRA modelling indicates that all pedestrian crossings are operating at LoS D for the current stadium, worsening to LoS E for the proposed stadium the expected queuing is anticipated to increase from 6.4 to 12.4m. This is indicating that with the proposed stadium, more time is being given to vehicular traffic, mainly on O'Connell Street, which is to the detriment of pedestrians at intersection. With this level of queuing and delay, it would be anticipated that a managed solution during half events would be required. Mitigation options are discussed in Section 6. Alternatively, more time at the signals could be provided for pedestrians, this would be the detriment of vehicular traffic.

Table 5.11 summarises the outcomes of the SIDRA modelling during a half event for the peak vehicle departures (20:45 to 21:45).

Table 5.11 – SIDRA Modelling outcomes – Peak Departures (20:45 to 21:45) Half Event

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	29.1 (C)	47.9 (D) – RT O'Connell Street (N)	90 s
2019	Proposed Stadium	27.5 (B)	45.9 (D) – RT Victoria Road	100 s

The outcomes of the modelling have indicated that during a half event, the intersection performance is anticipated to be improved, even with the higher demand. As with the arrival period, this may be due to the extended cycle time or potentially a more evenly or optimised distribution of flow.

SIDRA modelling has indicate that the pedestrian delay at the current stadium during a half event is anticipated to be operating at a LoS E for both the existing and proposed stadium. Queuing at the crossings is expected to increase from 7.1m to 18.2m. With this level of queuing, a managed solution is required to manage crowds during events, which is discussed further in Section 6. A solution maybe to allocate more green time to pedestrians, this would be to the detriment of vehicular traffic.

It should be noted that the modelling of the intersection assumed that vehicles have priority over pedestrians and that pedestrian's will behave in orderly manner at intersections. It would be anticipated that at a critical mass of pedestrians, reverse priority would occur and vehicles would not have priority, leading to a detriment in intersection performance.

5.1.2.2 Southern Trust Carpark

Traffic modelling was undertaken on the Southern Trust car park priority controlled intersection during a half capacity event for both the current and proposed intersection. This was undertaken for both the peak arrival and departure periods.

Table 5.12 summarises the outcomes of the SIDRA modelling during a half event for the peak arrival period (17:45 to 18:45).

Table 5.12 – SIDRA Modelling outcomes – Peak Arrivals (17:30 to 18:30) Half Event

Year	Scenario	Delay	Worse Movement
2019	Current Stadium	0.9 (A)	13.3 (A) – RT O'Connell Street (N)
2019	Proposed Stadium	1.2 (A)	17.1 (A) – RT O'Connell Street (N)

The results of the modelling indicate that during a half capacity event, the proposed stadium is not expected to effect the performance of the Southern Trust Carpark intersection.

Table 5.13 summaries the outcomes of the SIDRA modelling during a half event for the peak vehicle departures (20:45 to 21:45).

Table 5.13 – SIDRA Modelling outcomes – Peak Departures (20:45 – 21:45) Half Event

Year	Scenario	Delay	Worse Movement
2019	Current Stadium	1.2 (A)	6.3 (A) – RT O'Connell Street (N)
2019	Proposed Stadium	1.9 (A)	7.6 (A) – RT O'Connell Street (N)

The modelling indicates that the proposed stadium is not expected to have an influence on the intersection during a half event.

5.1.2.3 O'Connell Street/Grose Street Intersection

Traffic modelling of the O'Connell/Grose Intersection was undertaken during the peak arrival and departure periods for a half event. This included anticipated pedestrian demand, as discussed in the previous section. The modelling utilised the existing phase sequence, and allowed for the use of optional phases.

Table 5.14 summarises the outcomes of the SIDRA modelling associated with a half event at both the current and proposed stadium.

Table 5.14 – SIDRA Modelling outcomes – Peak Arrivals (17:30 to 18:30) Half Event

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	23.2 (B)	53.9 (D) – RT Eels Place	90 s
2019	Proposed Stadium	23.3 (B)	56.0 (D) – RT Eels Place	90 s

The modelling has indicated that the proposed stadium is not expected to have any effect on the intersection during the peak arrival period. It has also indicated that expected current pedestrian performance at the intersection is LoS D, which is expected to be maintained as a result of the proposed stadium.

Table 5.15 summaries the outcomes of the SIDRA modelling associated with a half event at both the current and proposed stadium during peak departures.

Table 5.15 – SIDRA Modelling outcomes – Peak Departures (20:45 to 21:45) Half Event

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	24.3 (B)	46.0 (D) – RT Eels Place	90 s
2019	Proposed Stadium	25.6 (B)	45.8 (D) – RT Eels Place	90 s

As with the peak arrivals period, the proposed stadium is not expected to influence the performance of the intersection during the peak departure periods. Pedestrian delay at the intersection is expected to be LoS D with the current stadium, worsening to LoS E with the proposed stadium. Queuing at the intersection is expected to go from 1.2m to 1.8m. It is therefore not expected that the proposed stadium will require any additional mitigation over what is currently provided at the intersection.

5.1.2.4 Church Street/Victoria Road Intersection

The Church Street/Victoria Road intersection is the furthest intersection from the stadium, and hence is expected to be least affected by the proposed stadium. Traffic modelling was conducted on the intersection as a result of the current and proposed stadium during the peak arrival and departure periods.

Table 5.16 summaries the outcomes of the traffic modelling for the peak arrival period for the current and proposed stadium.

Table 5.16 – SIDRA Modelling outcomes – Peak Arrivals (17:30 to 18:30) Half Event

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	35.5 (C)	49.3 (D) – RT Church Street (S)	90 s
2019	Proposed Stadium	37.4 (C)	50.2 (D) – RT Church Street (S)	90 s

The outcomes of the traffic modelling indicate that the propose stadium is not expected to be detrimental to the performance of the intersection during the peak arrival period.

Table 5.17 summaries the outcomes of the traffic modelling during the peak departure period for both the current and proposed stadium.

Table 5.17 – SIDRA Modelling outcomes – Peak Departures (20:45 to 21:45) Half Event

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	30.0 (C)	51.7 (D) – RT Church Street (S)	90 s
2019	Proposed Stadium	30.8 (C)	48.7 (D) – RT Church Street (S)	90 s

Traffic modelling suggests the operational performance intersection is not anticipated to be effected during the operation of a half event.

5.1.3 Full Capacity Event

Traffic modelling was undertaken on the intersection during a full event situation for both the current and proposed stadiums. These events are the least frequent and anticipated to happen once or twice annually. The modelling provides guidance into the anticipated effect of the proposed stadium on the road network. All modelling was undertaken based on the peak arrivals (17:30 to 18:30) and departure (20:45 to 21:45) periods.

5.1.3.1 O'Connell Street/Victoria Road Intersection

As discussed in the previous section, the O'Connell Street/Victoria Road Intersection is the critical intersection associated with the stadium area of influence.

Table 5.18 summarises the outcomes of traffic modelling of a full event at the current and proposed stadium during the peak arrival period, which coexists with the PM network peak.

Table 5.18 – SIDRA Modelling outcomes – Peak Arrivals (17:30 to 18:30) Full Event

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	29.1 (C)	62.2 (E) – RT O'Connell Street (N)	100 s
2019	Proposed Stadium	42.7 (D)	186.4 (F) – RT Victoria Road	100 s

The results of the traffic modelling indicate that the during the peak arrival period during a full event, the performance of this intersection is expected to be affected by the proposed stadium. Additionally pedestrian delay is expected to be operating at LoS E.

A way to improve both pedestrian and vehicular performance at the intersection would be to remove the stadium access at the intersection, and operate a signalised T intersection. This provides a more efficient phase sequence and removes interactions between pedestrian and vehicles. The stadium access could operate with a new access/egress arrangement mid-block.

An alternative solution will to be manage travel demand or re-divert traffic onto alternative routes, discussed in **Section 6**.

Modelling of the potential signalised T-Intersection was undertaken, the performance of this option is provided in **Table 5.19.**

Table 5.19 – SIDRA Modelling outcomes – Peak Arrivals (17:30 to 18:30) Full Event – Sensitivity Test

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	29.1 (C)	62.2 (E) – RT O'Connell Street (N)	100 s
2019	Proposed Stadium	42.7 (D)	186.4 (F) – RT Victoria Road	100 s
2019	Proposed Stadium – Signalised T	32.1 (C)	56.5 (E) – S O'Connell St (N)	100 s

The results of the modelling indicate that if the intersection was converted to a signalised T-Intersection, the operational performance could be improved from a LoS D to C. The modelling has assumed the crossing on the northern approach would be removed. This would allow for an optimised three-phase sequence where the right turn out of Victoria Road is not in conflict with pedestrians. This option, with the signalisation of the Southern Trust Carpark intersection would allow for a higher level of control of "O'Connell Street and enable the ability to close the mid-block section to become a pedestrian zone.

Table 5.20 summarises the outcomes of the traffic modelling associated with the peak departure period associated with both the current and proposed stadium.

Table 5.20 – SIDRA Modelling outcomes – Peak Departures (20:45 to 21:45) Full Event

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	29.3 (D)	54.8 (D) – RT Victoria Road	110 s
2019	Proposed Stadium	40.2 (C)	61.4 (E) – LT O'Connell Street (N)	90 s

The traffic modelling indicates that during the peak departure periods, the proposed stadium is not expected to influence the performance of the intersection. SIDRA is indicating that pedestrian crossing is operating at a LoS F currently, improving to LoS E with the proposed stadium. The associated queuing is expected to go from 20.2m to 27.1m.

With this level of queuing, a managed solution is required to control pedestrian behaviours and ensure safety for spectators around the stadium. This is discussed further in **Section 6**.

It should be noted that the modelling of the intersection (SIDRA) assumed that vehicles have priority over pedestrians and that pedestrian's will behave in orderly manner at intersections. It would be anticipated that at a critical mass of pedestrians, reverse priority would occur and vehicles would not have priority, leading to a detriment in intersection performance.

5.1.3.2 Southern Trust Carpark

The southern trust car park was modelled during a full event for the current and proposed stadium. **Table 5.21** summarises the outcomes of the traffic modelling for the intersection during the peak arrivals period.

Table 5.21 – SIDRA Modelling outcomes – Peak Arrivals (17:30 to 18:30) Full Event

Year	Scenario	Delay	Worse Movement
2019	Current Stadium	35.0 (C)	35.0 (C) – RT O'Connell Street (N)
2019	Proposed Stadium	270.0 (F)	5,873 (F) – LT Stadium Access

The results of the modelling indicate that intersection cannot cope with the anticipated demand during a full event at the proposed stadium. With the level of demand anticipated, excess queuing associated with safety issues would be likely.

There are various options that could be implemented for this intersection. One option could be to manage demand at the intersection by not allowing it to be operated as a public car park during an event day and only allowing entries and exists outside the arrival and departure peaks. Another option could be changing the intersection configuration to a signalised T-intersection. This would also have benefits for pedestrians crossing O'Connell Street.

Traffic modelling was undertaken to evaluate the performance of the intersection if a signalised T-intersection were to be implemented with the results shown in **Table 5.22**.

Table 5.22 – SIDRA Modelling outcomes – Peak Arrivals (17:30 to 18:30) Full Event – Sensitivity Test

Year	Scenario	Delay	Worse Movement
2019	Current Stadium	35.0 (C)	35.0 (C) – RT O'Connell Street (N)
2019	Proposed Stadium	270.0 (F)	5,873 (F) – LT Stadium Access
2019	Proposed Stadium – Signalised T	13.8 (B)	57.2 (E) – RT Southern Cross Car Park

The results of the modelling indicate that the inclusion of a signalised T-Intersection will have notable improvements on the operational performance of the intersection. It provides an opportunity for vehicular traffic to egress and access the site, and provides improved crossing opportunities for pedestrians. It is recommended that there is merit in exploring this option further.

Table 5.23 summaries the outcomes of the traffic modelling associated with the peak departures periods associated with both the current and proposed stadium.

Table 5.23 – SIDRA Modelling outcomes – Peak Departures (20:45 – 21:45) Full Event

Year	Scenario	Delay	Worse Movement
2019	Current Stadium	1.1 (A)	6.5 (A) – LT Stadium Access
2019	Proposed Stadium	2.7 (A)	17.2 (B) – LT Stadium Access

The results of the modelling indicate that during the peak departure period, it is not expected that the proposed stadium will influence the intersection performance.

5.1.3.3 O'Connell Street/Grose Street Intersection

The main influence on the O'Connell Street/Grose Street Intersection during a full event will be the influence of the potential multi-story car park at the Eels Leagues Club. For the base modelling, the base land use has been maintained. A sensitivity test based on the "deferred commencement" condition of 531 car parks (45% more than current) and full development of 1095 car parks (300% more than current) was undertaken.

Table 5.24 summarises the outcomes of the traffic modelling during the peak arrival period associated with a full event at the current and proposed stadium, including the potential implications of the Leagues Club Development.

Table 5.24 – SIDRA Modelling outcomes – Peak Arrivals (17:30 – 18:30) Full Event, including surrounding development

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	24.7 (B)	55.3 (D) – RT Eels Place	90 s
2019	Proposed Stadium	25.0 (B)	55.4 (D) – RT Eels Place	90 s
2019	Proposed Stadium (45% Additional)	26.0 (B)	55.4 (D) – RT Eels Place	90 s
2019	Proposed Stadium (300%) Additional)	29.6 (C)	59.6 (E) – RT Grose Street	90 s

The traffic modelling indicates that the proposed stadium does not influence the performance of the intersection during the peak arrival period. The Leagues Club Development only have a slight impact on network performance during the peak arrival period.

Table 5.25 summaries the outcomes of traffic modelling during the peak departure period associated with a full event at the current and proposed stadium, including the potential implications of the Leagues Club Development.

Table 5.25 – SIDRA Modelling outcomes – Peak Departures (20:45 – 21:45) Full Event, including surrounding development

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	26.0 (B)	50.7 – RT O'Connell Street (S)	90 s
2019	Proposed Stadium	26.1 (B)	52.3 – RT O'Connell Street (S)	90 s
2019	Proposed Stadium (45% Additional)	31.5 (C)	55.4 – RT O'Connell Street (S)	90 s
2019	Proposed Stadium (300%) Additional)	195.2 (F)	316.1 – RT Eels Place	150 s

The results of the traffic modelling indicates that the proposed stadium does not influence the performance of the intersection during the peak departure period. The Leagues Club Development is expected to have a detrimental effect on the intersection during the peak departure period. The majority of this delay is confined to Eels Place, meaning queues can be contained on site, potentially mitigating any impact on O'Connell Street.

With the deferred commencement of carpark development, the Leagues Club development would not be expected to significantly detriment the operational performance of the intersection.

5.1.3.4 Church Street/Victoria Road Intersection

As discussed in Section 5.1.2.4, the Church Street/Victoria Road Intersection is expected to be the least influenced by the proposed stadium.

Table 5.26 summarises the outcomes of the traffic modelling during the peak arrivals period associated with a full event at the current and proposed stadium.

Table 5.26 – SIDRA Modelling outcomes – Peak Arrivals (17:30 – 18:30) Full Event

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	38.9 (C)	55.6 (D) – LT Victoria Road (W)	90 s
2019	Proposed Stadium	40.4 (C)	65.3 (E) – RT Church Street (S)	100 s

The results of the traffic modelling suggest that the proposed stadium is not expected to influence the performance of the intersection during the peak arrival period.

Table 5.27 summarises the outcomes of the traffic modelling during the peak arrivals period associated with a full event at the current and proposed stadium.

Table 5.27 – SIDRA Modelling outcomes – Peak Departures (20:45 – 21:45) Full Event

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	30.7 (C)	48.6 (D) – RT Church Street (S)	90 s
2019	Proposed Stadium	31.1 (C)	50.5 (D) – RT Victoria Road (E)	90 s

The outcomes of the traffic modelling indicate that the proposed stadium is not expected to influence traffic performance at this intersection.

5.1.4 Light Rail Sensitivity Test

With the introduction of Light Rail, it is anticipated that there will be a reduction in vehicle operability along Church Street and traffic is likely to be pushed onto alternative corridors. Modelling, as well as details regarding to changes to the road network were not available at the time of writing. Therefore, to test the potential effect of light rail on O'Connell Street, a likely overflow route, a sensitivity test was undertaken.

The sensitivity test was conducted during a non-event scenario during the PM network peak for the current and proposed stadium and assumed that 50% of the 2019 traffic on Church Street is transferred to O'Connell Street. The O'Connell/Victoria and O'Connell/Grose Intersections were both tested.

Tables 5.28 and **5.29** summaries the outcomes of the sensitivity test associated the light rail sensitivity test.

Table 5.28 – SIDRA Modelling outcomes – PM Peak (Non-Event) – Light Rail Sensitivity

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	17.5 (B)	46.3 (D) – RT Victoria Road	90 s
2019	Proposed Stadium	18.8 (B)	46.1 (D) – RT Victoria Road	90 s
2019	Current Stadium – 100% Church	19.8 (B)	53.0 (D) – RT Victoria Road	90 s
2019	Proposed – 100% Church	20.8 (B)	54.9 (D) – RT Victoria Road	90s

Table 5.29 – SIDRA Modelling outcomes – PM Peak (Non-Event) – Light Rail Sensitivity

Year	Scenario	Delay	Worse Movement	Cycle Time
2019	Current Stadium	20.0 (B)	54.1 (D) – RT Eels Place	90 s
2019	Proposed Stadium	20.1 (B)	54.2 (D) – RT Eels Place	90 s
2019	Current Stadium – 100% Church	17.2 (B)	55.8 (D) – RT Eels Place	90 s
2019	Proposed – 100% Church	15.9 (B)	55.5 (D) – RT Eels Place	90 s

The results of the sensitivity test indicate that during a non-event, the effect of light rail is not expected to effect the O'Connell Street Intersections. Further work within the development of light rail is required to establish the full effect of their proposal.

5.2 Assessment of Effects on Public Transport Networks

This section of the TIA discussed the anticipated effect on the public transport network associated with the proposed development. This benchmarks off existing knowledge of the public transport networks.

5.2.1 Day-to-day Operations

During day-to-day operations at the stadium, there is not expected to be any additional staff and users associated with the proposed stadium compared to the current stadium. Therefore, there is not expected to be any effects on the public transport network as a result of the proposed stadium.

5.2.2 Half-Capacity Event

Section 4.3.2.2 identified that the proposed stadium is predicted to generate an additional 512 bus passenger trips and 846 heavy rail trips during a half-capacity event. This was determined based on the assumed heavy rail and bus mode share and distribution during an event.

5.2.2.1 Bus Patronage

Based on the assumed mode share and trip distribution, it is expected that in Zone 2, the current stadium would generate 50 (50% distribution across two-hour arrival period) bus trips during the peak arrival and departure period. This increases to 72 with the proposed stadium.

The information discussed in Section 4.1.2 indicates that there are 14 buses available in Zone 2, with an assumed occupancy of 55 passengers, this equates to a total capacity of 770. Based on this information, stadium customers would contribute to 6.5% of total bus capacity. With the proposed stadium would increase to 9.4%, resulting in 2.9% increase.

No bus occupancy data was available, but based on the anticipated increase in demand, there is not expected to be a notable impact on bus operations.

Within Zone 3, the assessment has indicated that the current stadium is predicted to generate 370 bus trips during the peak arrival and departure period, increasing to 581 with the proposed stadium. Section 4.1.2 identifies that there are 22 services using the roads adjoining the stadium area of influence, and another 8 service types at the Parramatta Interchange. With these 22 services, this would equate to a total capacity 1,210. If the eight other service types operated at a frequency of 4 bus per hour, this would equate to an additional capacity of 1,740. Therefore, it is assumed that the bus capacity within Zone 3 is 2,950 passengers.

Based on this information, during a half event at the current stadium, 12.5% of all bus trips would be associated with the stadium arriving and departing. This increases 19.7% with the proposed development, an increase of 7.2%. No current occupancy data was available and it assumed that the bus network would have the latent capacity to handle these additional trips. Additionally, stadium arrivals and departures would likely be contra-peak, and not expected to be influenced by network peak loading.

5.2.2.2 Heavy Rail Patronage

For the heavy rail network, all trips would be within Zone 3. Using the mode share and distribution information assumed, it has been evaluated that the current stadium during an event could produce 1,108 trips during the peak arrivals and departure periods. This is predicted to increase to 1,742 as a result of the proposed stadium.

The information in Section 4.1.2, and obtained from the Stage 1 DA indicates that there are 19 T1 (Western Line) and 2 T5 (Cumberland Line) trains operating in both the up and down direction at Parramatta Station. The 19 T1 trains are assumed to be double deck, eight car trains with an assumed reliable operating capacity of 1,200 passengers. The two T5 services are assumed to be double deck, 4 car trains with an assumed operating capacity of 600 passengers. Based on this information, this would equate to a total reliable operating capacity for heavy rail at Parramatta Station of 48,000 passengers. Therefore, the existing stadium would be anticipated to contribute 2.3% of the capacity during the peak arrival period. The proposed stadium would raise this to 3.6%, an increase of 1.3%. No line load and occupancy data was available, but based on this level of demand and the assumption that passengers using heavy rail will be contra-flow, it is not expected that the proposed stadium will have any effect on the heavy rail network.

In the off-peak for heavy rail, which coincides with the peak departure period, section 4.1.2 indicates that there are 13 trains in the up and down direction. Based on this information, there is assumed to be an off-peak total reliable operating capacity of 31,200 passengers. Using the anticipated demand during peak departures this results in 3.6% for the current stadium, increasing to 5.6% with the proposed stadium. This occurs during lower loading levels on the heavy rail network and as such is not expected to have an effect.

5.2.3 Full Capacity Event

Section 4.3.2.3 identified that the proposed stadium is predicted to generate an additional 992 bus passenger and 1,688 heavy rail trips during a full event. This is determined based on the assumed heavy rail and bus mode share and distribution during an event.

5.2.3.1 Bus Patronage

Based on the assumed information, within Zone 2, it is expected that there would be 100 bus trips during the peak arrival and departure period associated with the current stadium, increasing to 143 with the proposed stadium.

Using the information provided in Section 5.2.2.1, with the assumed bus service availability of 770 total capacity, the current stadium would be contributing 13.0%. This would increase to 20% with the proposed stadium, a 7.0% increase.

Within Zone 3, the expected bus demand is calculated at 744 trips in the peak arrival and departure period. This is anticipated to increase to 1,151 with the proposed stadium. Based on the calculated capacity of 2,950, the existing stadium could be contributing 25% of trips, raising to 39% as a result of the proposed stadium.

It is not expected that there would be a significant effect on bus services as a result of the proposed development. However, there may be some increase at specific bus stops, which could require management during events to ensure safe behaviours.

5.2.3.2 Heavy Rail Patronage

The information and assumptions used have indicated that within Zone 3, during a full event, the current stadium is predicted to generate 2,186 passenger trips during the peak arrival and departure period. This is expected to increase 3,452 with the proposed stadium.

Using the capacity information discussed in Section 5.2.2.2, during the peak arrival period, the current stadium is expected to contribute to 4.5% of the total heavy rail strips, increasing to 7.2%, an increase of 2.7%. During the peak departures period, the existing stadium is expected to contribute 7% of total heavy rail trips, increasing to 11% with the proposed stadium. Based on the trips likely being contra-flow in the network

peak and off-peak during the event departure, it's not expected that the proposed development will affect the operation of the heavy rail network.

There may be some increase in peak loading on the Parramatta station platforms.

5.3 Assessment of Effects on Pedestrian Networks

Pedestrian counts at key intersections and spectator walk distributions departing the stadium (Zone 1) were provided from the Stage 1 DA. From this information the pedestrians demand and likely routes to and from an event were determined as well as the background day-to-day pedestrian flows on non-event days. To assess the pedestrian flow capacity and Level of Service (LoS) along these routes it is necessary to assess the routes for the footpath LoS (Zone 2, free flow capacity), and the key intersection LoS (capacity restricted by available signal time for pedestrians).

a) Based on the information from Figures 4.9 and 4.10 above, these pedestrian volumes allowed an assessment of the pedestrian **footpath** capacity performance using the Level of Service (LoS) methodology described in Section 4.3.3.4.

b) At a signalised intersection LoS is mainly dependant on the available green time for a pedestrian phase, within the available intersection cycle time for all users; often competing with vehicular traffic.

As indicated before, the footpath movements generally operate at acceptable levels of service; but as soon as the flow of pedestrians reaches the signalised intersections to cross to or from the stadium precinct during an event, it competes for signal time with vehicles on the road (mainly O'Connell Street) which can create significant queuing during arrival and departure peaks, impacts on the free flow of pedestrians and hence have a significant reduction in LoS. There is also the risk that with the current infrastructure configuration, reverse priority between pedestrian and vehicles could occur, influencing safety and the performance on the road network.

5.3.1 Footpaths

Based on the methodology described in Section 4.3.3.4, the level of service on pedestrian footpaths on the streets leading to the stadium were analysed.

The Fruin model for Level of Service; calculated from the pedestrian flow rate per minute per metre width, was used to assess the effects of the pedestrian footpath network for half capacity events. Whilst this methodology was maintained throughout, it is more realistic to assume the peak pedestrian flow rate will occur over a shorter period of time within the peak hour and hence the peak 30-minute flow-rate was used to determine LoS performance.

5.3.2 Day-to-day Operations

During the day to day operations at the stadium, there is not expected to be minimal pedestrian activity on top of general public movements. This could even be lesser than the current day-to-day movements as the Parramatta Community Swimming Pool will be removed as part of the new stadium development.

5.3.3 Half-Capacity Event

5.3.3.1 Pedestrian movement on Footpaths

The footpaths assessed were situated along key pedestrian routes to and from the stadium, including O'Connell St (north of Victoria Rd, south of Victoria Rd, south of Parramatta River), Victoria Rd (east of O'Connell St) and Church St (north of George St, south of George St).

For the **current stadium** (2016) under a half capacity scenario, the results revealed most pedestrian footpaths arriving at the stadium operated under a LoS A. For arrivals, Victoria Rd, east of O'Connell St, operates at LoS B (Appendix A, Table C1) whilst Victoria Rd and Church St, north of George St, also perform at LoS B for the peak departures (Appendix A, Table C2).

For the arrivals at the **proposed stadium** (2019), Victoria Rd operates under a LoS C while Church St, north of George St operates under LoS B (Appendix A, Table C5). All other arrival footpaths run at LoS A. Similarly, when departing the stadium, Victoria Rd and Church St operate under a LoS C (Appendix A, Table C6).

5.3.3.2 Key Intersections

O'Connell St/Victoria Rd Intersection:

During arrival time for a half capacity event, the SIDRA modelling indicated that the signalised pedestrian crossings at key intersections operate at LoS D for the **current stadium** (2016) whilst the **proposed stadium** (2019) is expected an increase in pedestrian **arrival** queue length from 6.4m to 12.4m, hence worsening to LoS E. This is expected since more green time is being allocated to vehicular movements with the increased demand, to the detriment of crossing pedestrians. It would be expected that a managed solution during half events would be required based on the current intersection layouts and operations. Alternatively, more time at the signals could be provided for pedestrians, this would be to the detriment of vehicular flows.

Upon **departure** from the stadium (20:45 - 21:45), it is anticipated that for both the **current** and **proposed** stadium, pedestrian delay is operating at LoS E and queuing is expected to increase from 7.1m to 18.2m. As described earlier, a managed solution would be required to manage crowds during events to maintain proper flow of pedestrians across O'Connell Street.

Signalised Pedestrian Crossing (currently across from the swimming pool)

This crossing does not align with the desire lines for pedestrians to and from the stadium. It is also not likely to be coordinated to the signalised O'Connell/Victoria intersection. It is demand-driven and will effect traffic flow on O'Connell Street.

Southern Trust Intersection:

There is no existing pedestrian crossing at this location however in order to maintain efficient pedestrian traffic and intersection performance another option could be to change the intersection configuration to a signalised T-intersection providing both vehicular and pedestrian benefits.

O'Connell St/Grose St Intersection:

For arriving spectators, the existing pedestrian performance at this intersection is LoS D, which is expected to be maintained as a result of the proposed stadium. However, for departures, the level of service is expected to worsen to LoS E with the proposed stadium as queuing is anticipated to go from 1.2m to 1.8m.

As such, no additional mitigation is required to manage the intersection performance than what is already provided.

5.3.4 Full Capacity Event

5.3.4.1 Pedestrian movement on Footpaths

For the **current stadium** (2016) under a full capacity scenario, the results revealed most pedestrian footpaths arriving at the stadium operated under a LoS A to D. For arrivals and departures, Victoria Rd, east of O'Connell St, operates at LoS D (Appendix A, Table C3 & C4).

For the **proposed stadium** (2019), Victoria Rd operates under a LoS E (arrivals) and F (departures) – Appendix A, Table C7 & C8. Church St, north of George St operates under LoS D (arrivals) and E (departures) (Appendix A, Table C7 & C8). All other arrival footpaths operate at LoS A to C.

5.3.4.2 Key Intersections

O'Connell St/Victoria Rd Intersection:

SIDRA modelling revealed that for spectators **arriving** at the proposed stadium (2019) under a full capacity event, the pedestrian delay is expected to be operating at LoS E. In order to improve both the pedestrian and vehicular performance at the intersection, an option is to remove stadium access and operate a signalised T-intersection. As described in Section 5.1.3.1, this provides a more efficient phase sequence and removing pedestrian/vehicle interaction.

During the peak **departures** period (20:45 – 21:45), the pedestrian crossing is currently running at a LoS F. With the development of the proposed stadium this will increase to a LoS E, although queuing is expected to go from 20.2m to 20.7m. As such, a managed solution is required to control pedestrian movements and ensure safe crossing into and out of the stadium.

Signalised Pedestrian Crossing (currently across from the swimming pool)

Similar to Section 5.3.3.2 above this crossing does not align with the desire lines for pedestrians to and from the stadium. It is also not likely to be coordinated to the signalised O'Connell/Victoria intersection. It is demand-driven and will effect traffic flow on O'Connell Street.

Southern Trust Intersection:

Similar to Section 5.3.3.2 above, there is no existing pedestrian crossing at this location however in order to maintain efficient pedestrian traffic and intersection performance another option could be to change the intersection configuration to a signalised T-intersection providing both vehicular and pedestrian benefits.

O'Connell St/Grose St Intersection:

As discussed above in 5.3.2.1, the development of the proposed stadium is not expected to have a significant effect on the pedestrian intersection performance. The current level of service is anticipated to worsen from LoS D to LoS E.

As such, no additional mitigation is required to manage the intersection performance than what is already provided.

5.4 Assessment of Effects on Cycling Networks

As indicated in Section 4.3.4, the current provision of cycling paths servicing the stadium and the proposed upgrading of the cycling network seems to addressing the need and encouraging cyclists sufficiently to increase this mode of travel to events at the WSS.

5.5 Assessment of Effects on Parking

Aspect Studio has provided background detail to address the requirements for parking around the stadium. Beca provided traffic engineering input for improved circulation, parking layout and measures for mitigating squeeze points where turning radii for event vehicles can be accommodated.

This TIA have taken into account the overall on-street and off-street parking supply for the study area and incorporated that into the trip generation assessment, but has not undertaken a comprehensive parking study within the area of influence.

5.6 Assessment of Effects on Internal Transportation

The effects for internal circulation, parking layout, rejection points, turning radii and provision for different type of vehicles has been discussed with architects and landscape of the proposed development and details of these have been incorporated into their reports for the Stage 2 DA.

6 Potential Mitigations and Recommendations

The impacts on the transport network as a result of the new WSS need to be mitigated to reach the required or acceptable operational performance as guided by the Secretary's Environmental Assessment Requirements (SEAR's) in Section 1.7.
There are number of opportunities to provide mitigation measures of the effects on the network based on the assessment of the Existing and Proposed Transport Conditions (Section 4) and the Assessment of Effects of the Proposed Development (Section 5) to improve the operational performance of the network around the new stadium when it opens in 2019. These potential mitigations and recommendations are provided below as general measures and also specific measures as indicated below.

6.1 General Measures

It is clear from the expected operational performance of the transport network and key intersections around the new stadium that a detailed Event Day Management Plan (EDMP) would be required to manage the interaction between pedestrians and vehicles on O'Connell Street when spectators arriving at the stadium before an event and departing after an event. Mitigating strategies may include methods of demand management, duration extension to stop peak loading, or encouragement of alternative routes or modes. An example of what should be considered in the EDMP is attached as **Appendix D**.

Other options would be to:

- Remove the interaction through the provision of infrastructure. This could encourage pedestrians to use the existing pedestrian path along the Parramatta River and under O'Connell Street, or provide another bridge.
- An EDMP could identify strategies to work with TfNSW and Sydney Trains to manage peak loading on buses and trains (now including light rail) to avoid platform and stop crowding.

6.2 Specific Potential Mitigation Measures

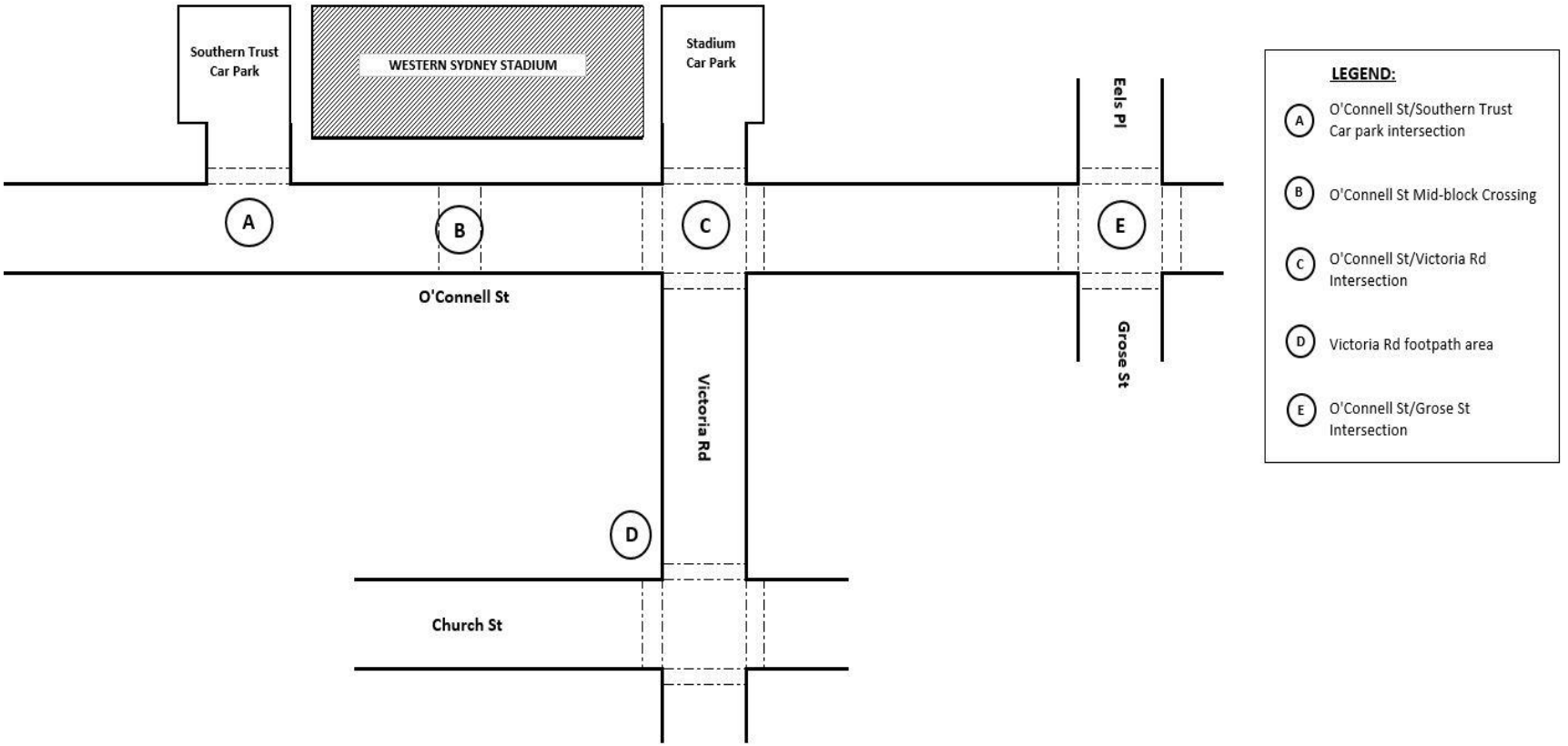
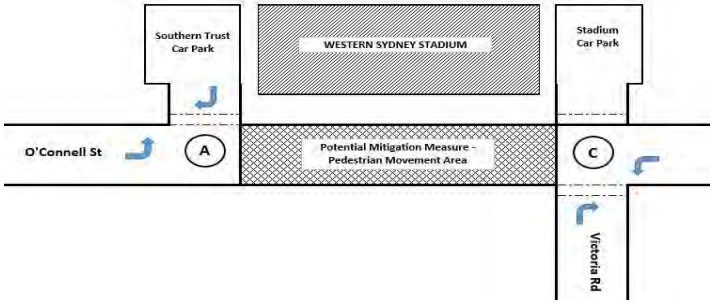


Table 6.1 – Specific Potential Mitigation Measures

Key Intersections	Effects on 2019 stadium – Current Infrastructure	Potential Mitigation to improve infrastructure or operations
A Access to Southern Carpark from O'Connell Street	▪ This intersection is currently operates as a prioritised intersection with a LoS F during a full event at the proposed stadium (Arrivals – 2019). ▪ There are very limited gaps in the vehicle stream on O'Connell Street during peak event periods to allow vehicles to exit. ▪ There is currently no provision for pedestrians to cross at this intersection.	▪ Close carpark for peak arrival period (from 17:30). ▪ Close carpark for event day to general public. ▪ Opportunity to signalise intersection to provide: - Turning opportunities for vehicles exiting and entering the carpark; - Pedestrian crossing close to the important south-eastern gate of the stadium; and - Better operation and safety performance of the intersection at peak periods.
B Mid-block (signalised) pedestrian crossing	▪ This crossing is not aligned and wrongly positioned to service the pedestrian desire lines to and from the stadium. ▪ This crossing is unlikely to be used on a day-to-day basis and is likely to become a redundant asset. ▪ The signal is demand driven (push-button activated) and will influence traffic flow on O'Connell Street. ▪ Not likely to be coordinated with with the O'Connell/Victoria signalised intersection, creating inefficiencies.	▪ As a minimum measure it would be required to manage pedestrian behaviours at the crossing in the lead-up and after events. During peak event periods it will be an unsafe intersection with pedestrians expected to have long wait times to cross. ▪ Remove crossing and re-integrate at **A** to align with pedestrian desire lines. ▪ Close off O'Connell Street between **A** and **C** during an event to remove conflict between vehicles and pedestrians – see **C**.
C O'Connell Street/ Victoria Road intersection	▪ This is the main pedestrian and main vehicle access point to the stadium, which operate in conflict. ▪ During a full event, vehicle traffic on O'Connell Street operates at LoS D which is still acceptable (without any other intervention or measures). ▪ For half and full events: - Long waiting times for pedestrian as they wait for green time to cross O'Connell Street – potentially long queues.	▪ As a minimum measure it would be required to manage pedestrian behaviours at the crossing in the lead-up and after events. During peak event periods it will be an unsafe intersection with pedestrians expected to have long wait times to cross. ▪ Remove vehicle access to stadium ▪ It would be ideal to separate the main vehicle access from the main pedestrian access point to the stadium.

Key Intersections	Effects on 2019 stadium – Current Infrastructure	Potential Mitigation to improve infrastructure or operations
	- High potential for unsafe interactions between pedestrians and vehicles and potential for reverse priority as pedestrian numbers hit a critical mass.	■ A potential managed solution is to close off O'Connell Street between **A** and **C** during peak event periods – see sketch:  - Remove vehicle access to stadium and create T- intersection; - Reduces interactions between pedestrians and vehicles; - Creates more green time for pedestrians to cross and enables more efficient signal phase sequence; - Allows the availability of a significant pedestrian-only area to cross to and from the stadium between **A** and **C** with no vehicular interaction.
D	■ No expected effect on current infrastructure	■ When the light rail is built it would be necessary to manage the crowd at proposed stops, especially during departures from the stadium at peak event times to manage peak loading to avoid platform crowding.
E	■ Refer to Sections 5.3.3.2 and 5.3.4.2 in the report – no effect on current infrastructure, with existing car parking levels at Parramatta Eels Leagues Club.	■ As a minimum measure it would be required to manage pedestrian behaviours at the crossing in the lead-up and after events (half and full). During peak event periods, unsafe behaviour at the intersection could occur with pedestrians expected to have long wait times to cross.

7 Alignment with Transport Strategies

The information below are mostly obtained from the *Parramatta Walking Strategy - February 2017:*
This TIA has taken notice of these strategies and attempted to align where applicable to address the requirements for the Stage 2 DA.

State Infrastructure Strategy

The NSW State Infrastructure Strategy (2012) presents a vision for 2032 and makes recommendations for infrastructure investment over the next 20 years, including infrastructure provision in the Parramatta area to establish its role as Sydney's second CBD. The key recommendations outlined in the Strategy include a $1 billion investment to improve public transport between Parramatta and the Greater Sydney area.

A Plan for Growing Sydney

A Plan for Growing Sydney (2014) identifies opportunities for improving the Parramatta transport network, in particular public transport, and walking and cycling connections that extend from Westmead to Rydalmere through the Parramatta CBD. The Plan references a proposed active transport network referred to as the "Green Grid", which aims to provide convenient links between the Parramatta CBD and surrounding recreational and open spaces. The Parramatta Ways project will bring this to life.

The Long Term Transport Master Plan

The NSW Long Term Transport Master Plan (2012) identifies strategies and actions for integrated transport across the state over the next 20 years. Short-term actions identified for the Parramatta area will support a growth in active transport mode share in the CBD, including improved pedestrian and cycle connections through the CBD and to regional destinations, improved amenity around the Parramatta transport interchange, and alignment of the bus network with light rail network proposals.

Parramatta Strategic Framework

The Parramatta Strategic Framework (2016) identifies six key urban values to develop the character of Parramatta: Resilient, Connected, Vibrant, Inclusive, Respectful and Prosperous. Key principles directly relevant to the Walking Strategy include optimising the 'spine and shoulders' structure of the CBD as a walkable and active city centre, and utilising that spine for high intensity retail with residential and commercial above.

Sydney's Walking Future

The NSW Government is focused on supporting walking for short trips, understanding that increased walking will benefit the community's health, the environment, and relieve pressure on local road networks. Sydney's Walking Future (2013) identifies Parramatta as a major activity centre as part of the Connecting Communities Program which aims to encourage people to walk at these centres, prioritising the development of pedestrian infrastructure within a two kilometre catchment of major centres and interchanges.

City of Parramatta plans and strategies:

Parramatta CBD Planning Strategy

The Parramatta CBD Planning Strategy (2015) sets the visions, principles, actions and implementation plan to guide a new planning framework for the Parramatta CBD.
The Strategy's vision states: Parramatta will be Australia's next great city, defined by landmark buildings and high quality public spaces with strong connections to regional transport. It will respect its heritage, be an exemplar in design excellence and ensure its streets are well activated. The Strategy aims to create a liveable, active and highly desirable city.

The Strategy sets out the following jobs and population targets for 2036:

- Jobs – increase 27,000 from 49,000 (2011) to 76,000 (2036)
- Dwellings – increase 7,500 from 3,500 (2011) to 11,300 (2036)

The Strategy commits Council to investigating the required regional and local transport infrastructure upgrades required to facilitate the growth of the CBD across public domain improvements, including new CBD spaces and street upgrades and access and transport improvements, including light rail.

Parramatta CBD Planning Framework

The Parramatta City Centre Planning Framework Study (2014) presents a number of scenarios for different frameworks to support growth, through the identification of opportunities, constraints and market conditions. The Study's economic analysis noted the need to improve transport links to new potential labour markets, both in the CBD and greater Parramatta area. Council's advocacy of transport improvements was highlighted as a priority so as to encourage the growth of employment opportunities in the centre. Emphasis was given to maximising transport capacity and reducing congestion by advocating for sustainable transport modes in the centre, including mass transit, walking and cycling.

Integrated Transport Plan for the Parramatta CBD

The Integrated Transport Plan for Parramatta City Centre (2010) responds to the Parramatta City Centre Plan (2007) which sets the planning framework for an additional 30,000 jobs and 20,000 residents by 2031. It aims to manage the existing and future sustainable transport needs of the CBD as it works to move away from reliance on car use to public and active transport. The sustainable transport objectives for the CBD are:

- > Promote and support walking, cycling and sustainable travel change;
- > Support and facilitate public transport use; and
- > Manage traffic to minimise its adverse impacts especially car commuters and through traffic.

Four key elements of the Plan support an enhanced walking experience in Parramatta:

1. Ongoing lobbying for improved public transport. Recent commitments have demonstrated the effectiveness of this element;
2. Creation of a Pedestrian and Cycle Amenity Zone, delivering improvements through new facilities and lower speed limits;
3. Support of City and Regional Ring Roads to ensure traffic uses appropriate routes, remove through traffic from the CBD and improve conditions for pedestrians and cyclists in the CBD; and
4. Relocating car parking to the CBD periphery.

The Pedestrian Amenity Zone is proposed to include: 40 kilometre per hour speed limit, additional crossing infrastructure, conversion of one-way streets to two-way, completion of the riverside shared path, reductions to ped-vehicle conflicts at driveways and widening of footpath space.

Parramatta Strategic Transport Study

The Draft Parramatta Strategic Transport Study (2016), aims to inform Council of the transport infrastructure requirements from implementing the Parramatta CBD Planning Strategy. The Study undertook a review of existing public transport services and infrastructure, travel patterns, parking yields and land use scenarios, and prepared a series of travel demand recommendations for consideration by Council. Significant extra demand on all transport modes has been identified and is the subject of further investigation.

Parramatta City Centre Lanes Strategy

Recognising that lanes provide significant benefits to the walkability and experience of city centres, the Parramatta City Centre Lanes Strategy (2010) identifies lanes throughout the CBD to include in a lane improvement pilot program.
The Strategy notes that the CBD's primary street network provides large CBD blocks of up to 250 metres in the east-west direction. Over time lanes have developed to provide servicing, access to car parks and through the development of shopping arcades.
The Strategy's Lanes Framework Plan recommends 23 new lanes and retention of the existing 57 lanes in the short-term. For each new, retained or removed (long term) lane, the Lanes Framework Plan sets out the type, strategic purpose, timing, owner, feasibility and action required for each lane.

Parramatta Safety Plan

The Parramatta Safety Plan (2014) aims to implement initiatives that improve the safety of the local community and visitors, and also promotes both the CBD and wider LGA as a pleasant and safe place to live, work and play.
The Plan has developed five strategic objectives, which oversee a program of proposed actions in response to the issues identified. Of relevance to the CBD and the Walking Strategy is Objective 2:
2. Build a safe and more prosperous Parramatta CBD for people, businesses and organisations
The proposed actions grouped under the five objectives range from the implementation of facility and infrastructure upgrades, to launching community initiatives and cooperation with government and private organisations.

Parramatta Ways

The Parramatta Ways Report (2016) sets out the opportunities to connect green spaces across the Local Government Area (LGA) with community facilities, transport nodes and neighbourhood destinations via safe and enjoyable walking routes with the aim to reshape Parramatta as a liveable, walkable city. Parramatta Ways will deliver the NSW Government's vision for the Green Grid, proposing 51 kilometres of new footpath, and will be Australia's largest interconnected open space, bushland, and urban walking network.
Whilst the focus of the project is on streets outside of the CBD, Parramatta Ways provides direct connectivity to the CBD.

The Parramatta Parking Implementation Plan Economics Report

The Parramatta Parking Implementation Plan Economics Report (2016) presents a review and assessment of the proposed plan to undertake closures and redevelopments of off-street car parking sites over a 15-year period as the CBD grows, and projects such as the proposed Parramatta Light Rail are delivered.
The changes to parking yields over the course of the proposed program of works include an increase in the total number of car park spaces (both on-street and off-street) from under 6,000 to under 7,000.

Appendices

Appendix A: Larger versions of the traffic count Figures for better readability.

Figure 4.3: Peak arrival turning traffic volumes - Sampled Event 23 May 2016 (17:30-18:30)

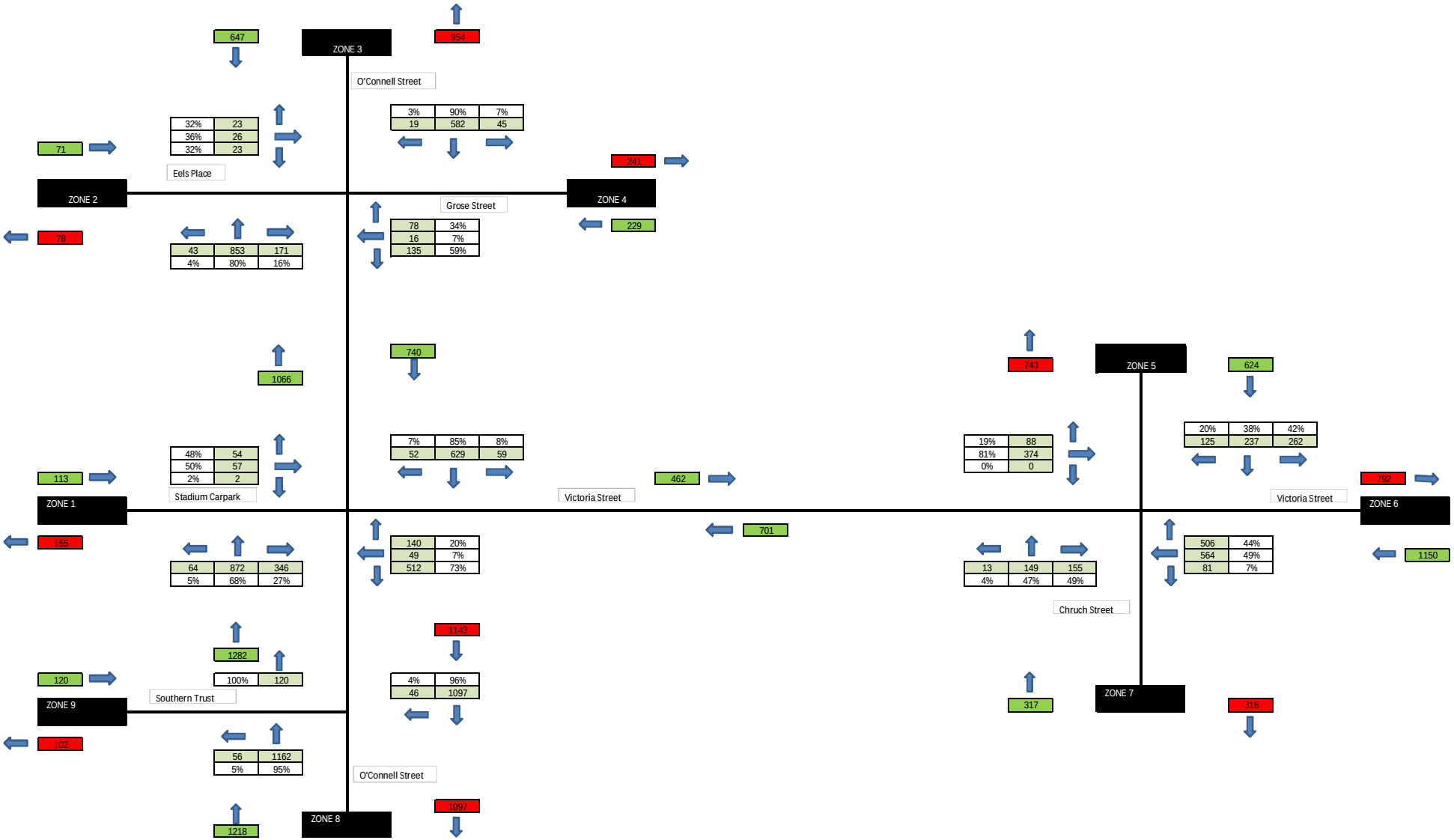


Figure 4.4: Peak arrival turning traffic volumes - Sampled Non-Event 24 May 2016 (17:30-18:30)

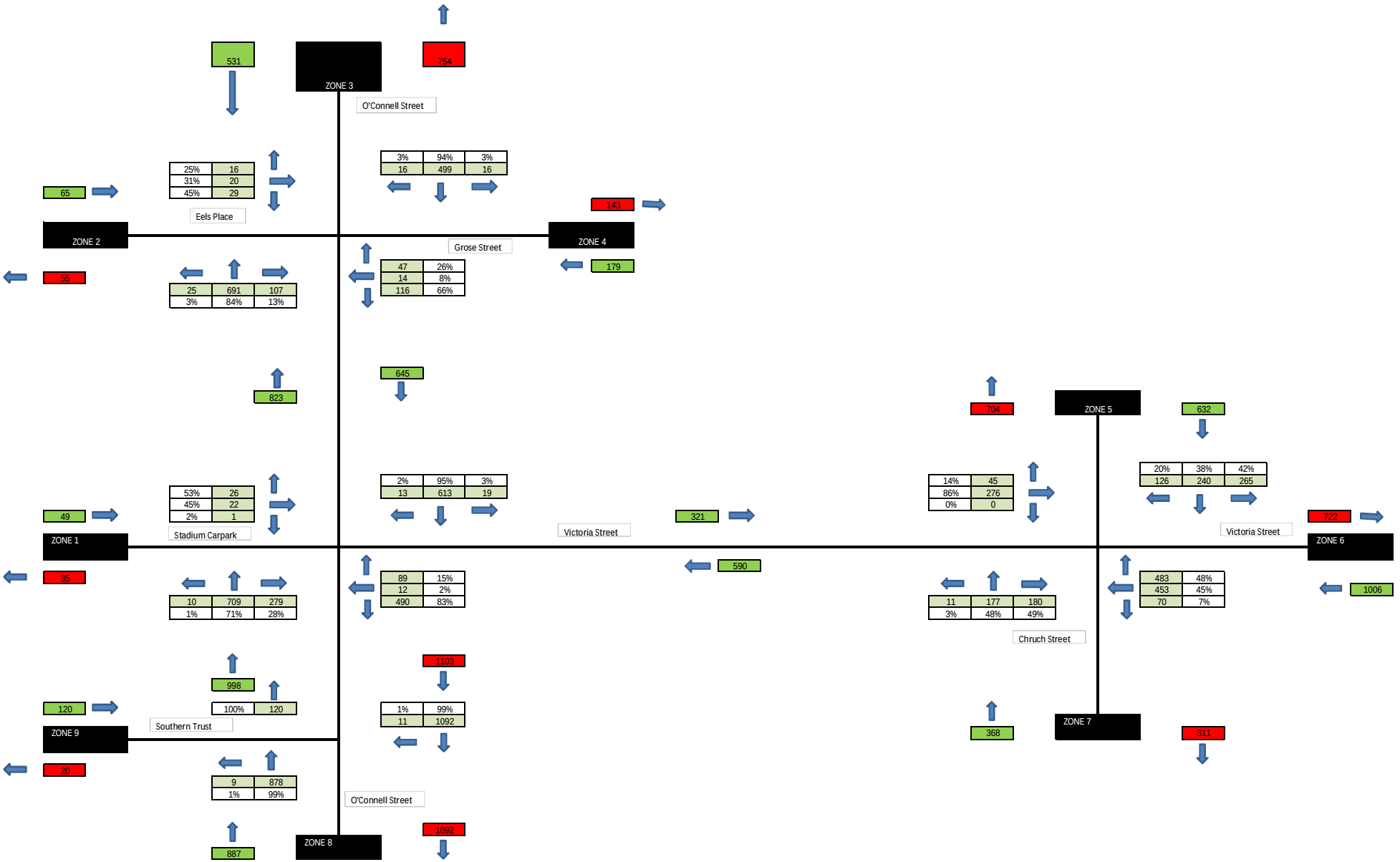


Figure 4.15: Peak Arrivals (17:30-18:30) Current Stadium (2019) - No Event turning volumes

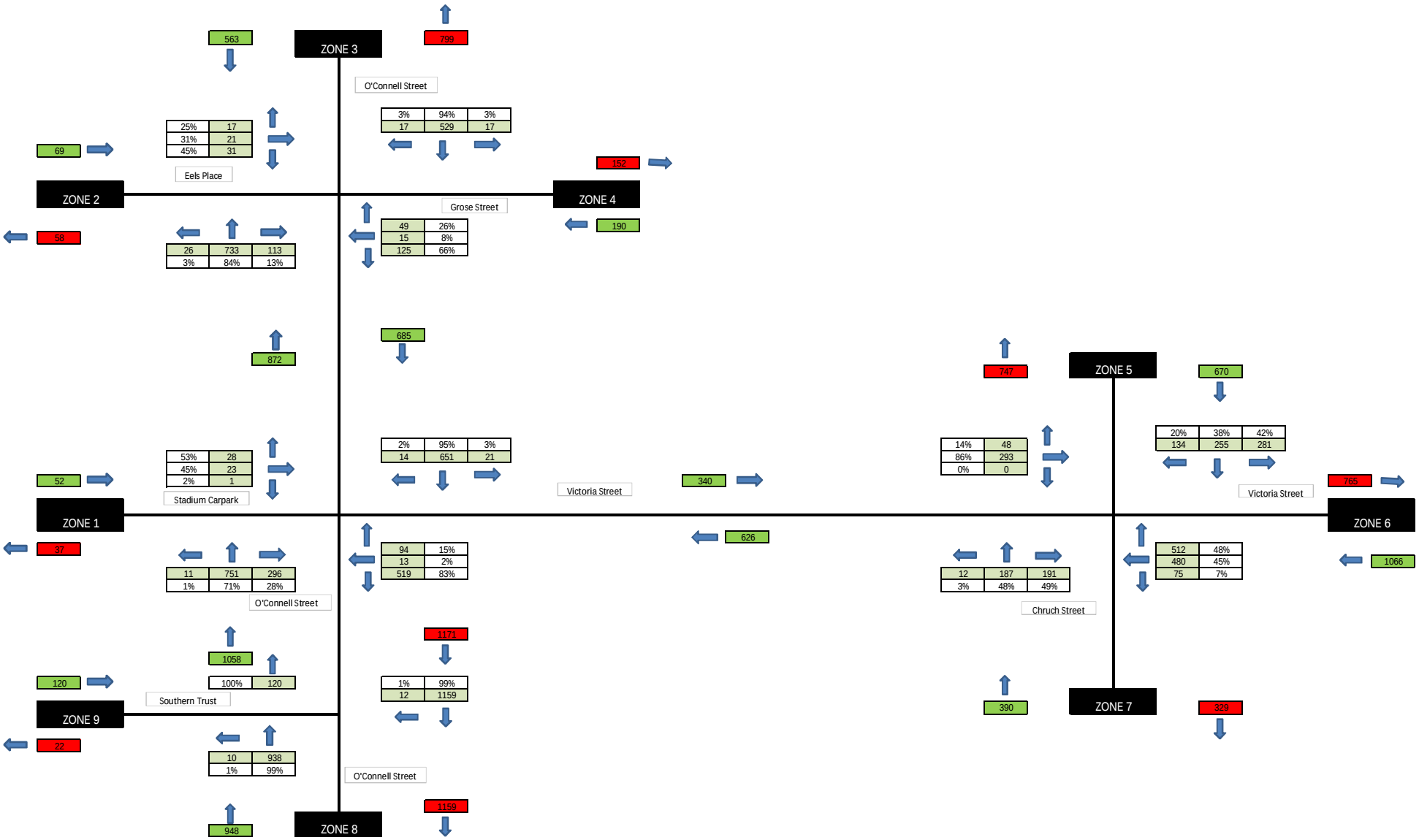


Figure 4.16: Peak Arrivals (17:30-18:30) Current Stadium (2019) - Half Event turning volumes

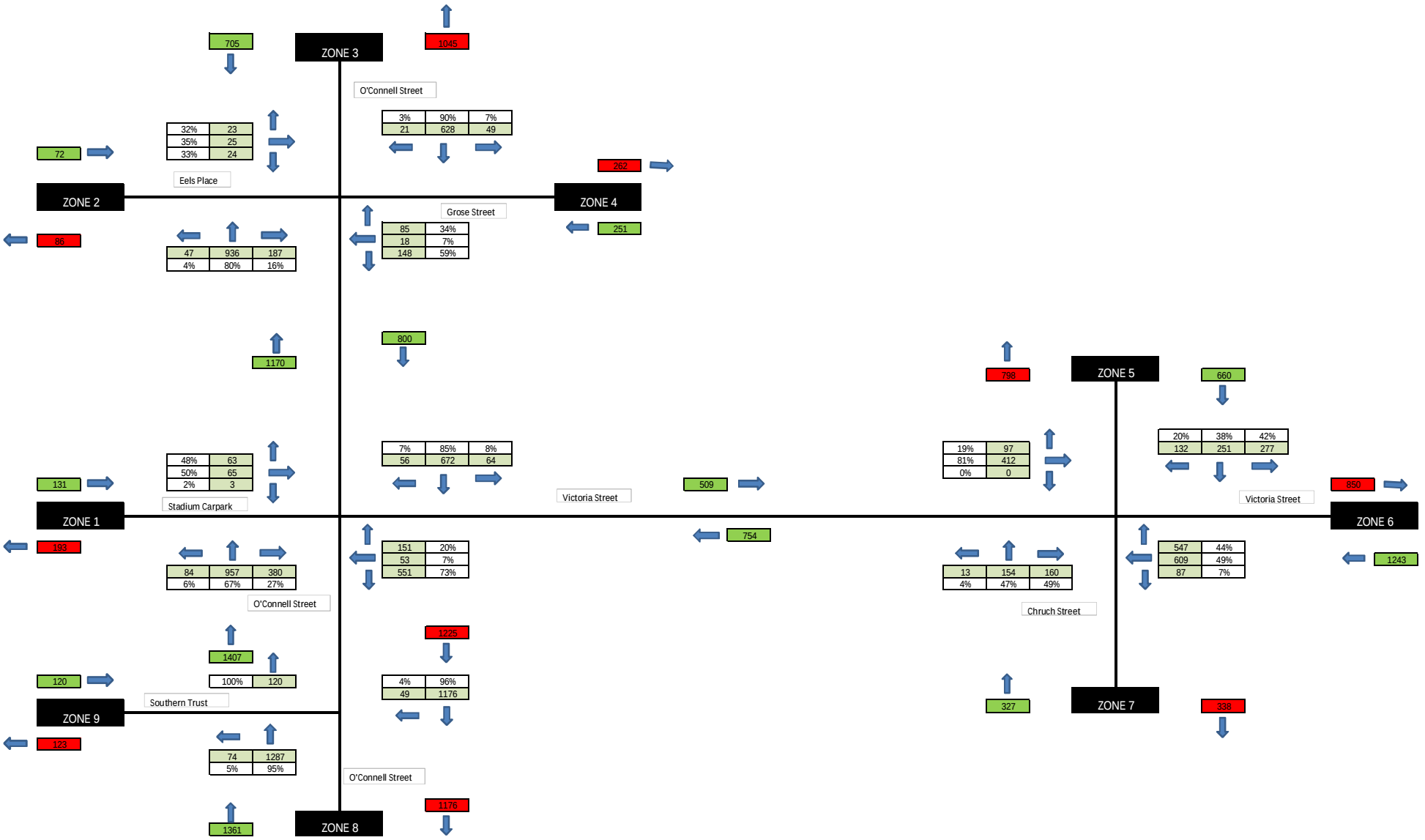


Figure 4.17: Peak Arrivals (17:30-18:30) Current Stadium (2019) - Full Event turning volumes

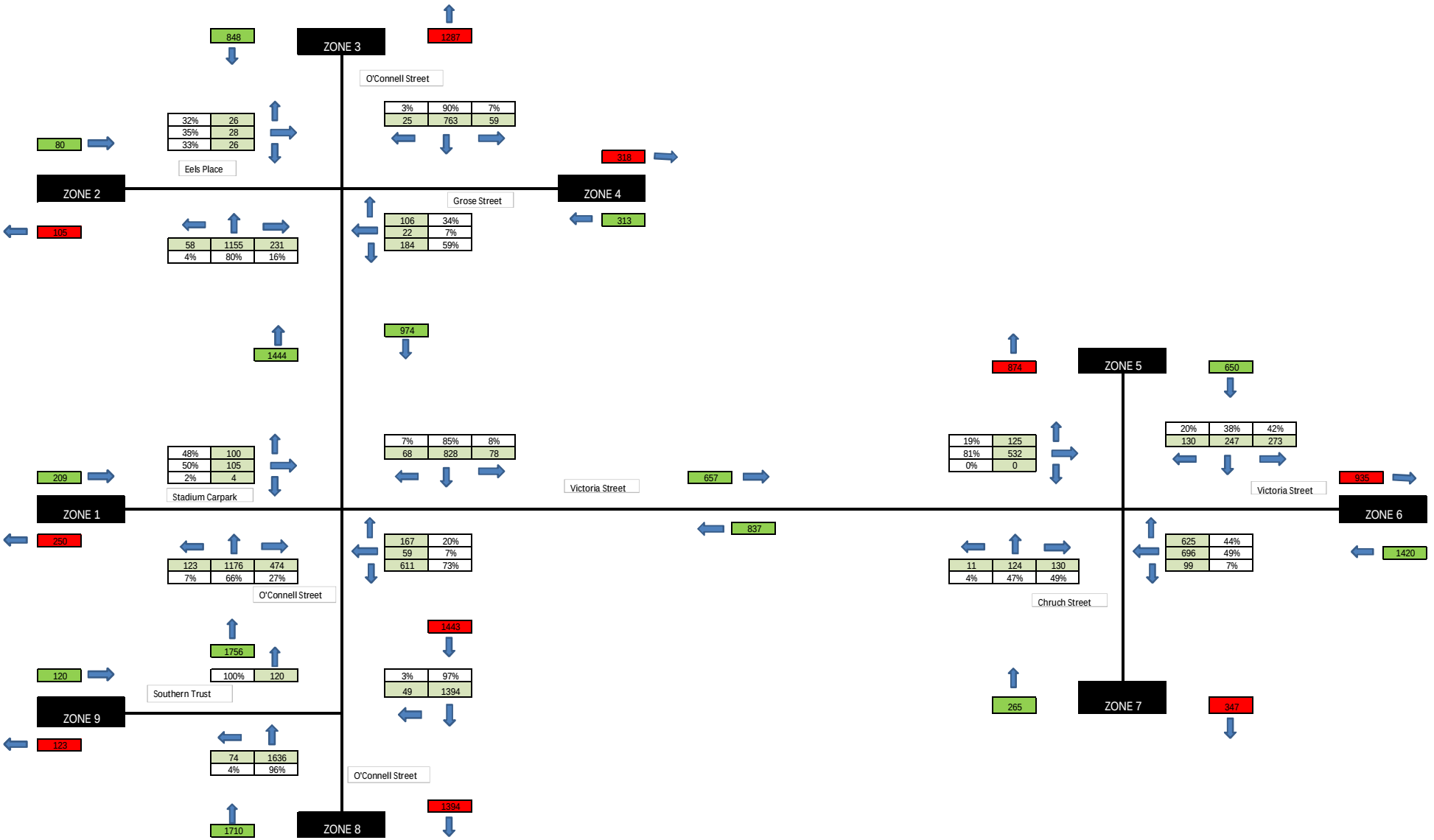


Figure 4.18: Peak Departures (20:45-21:45) Current Stadium (2019) - No Event turning volumes

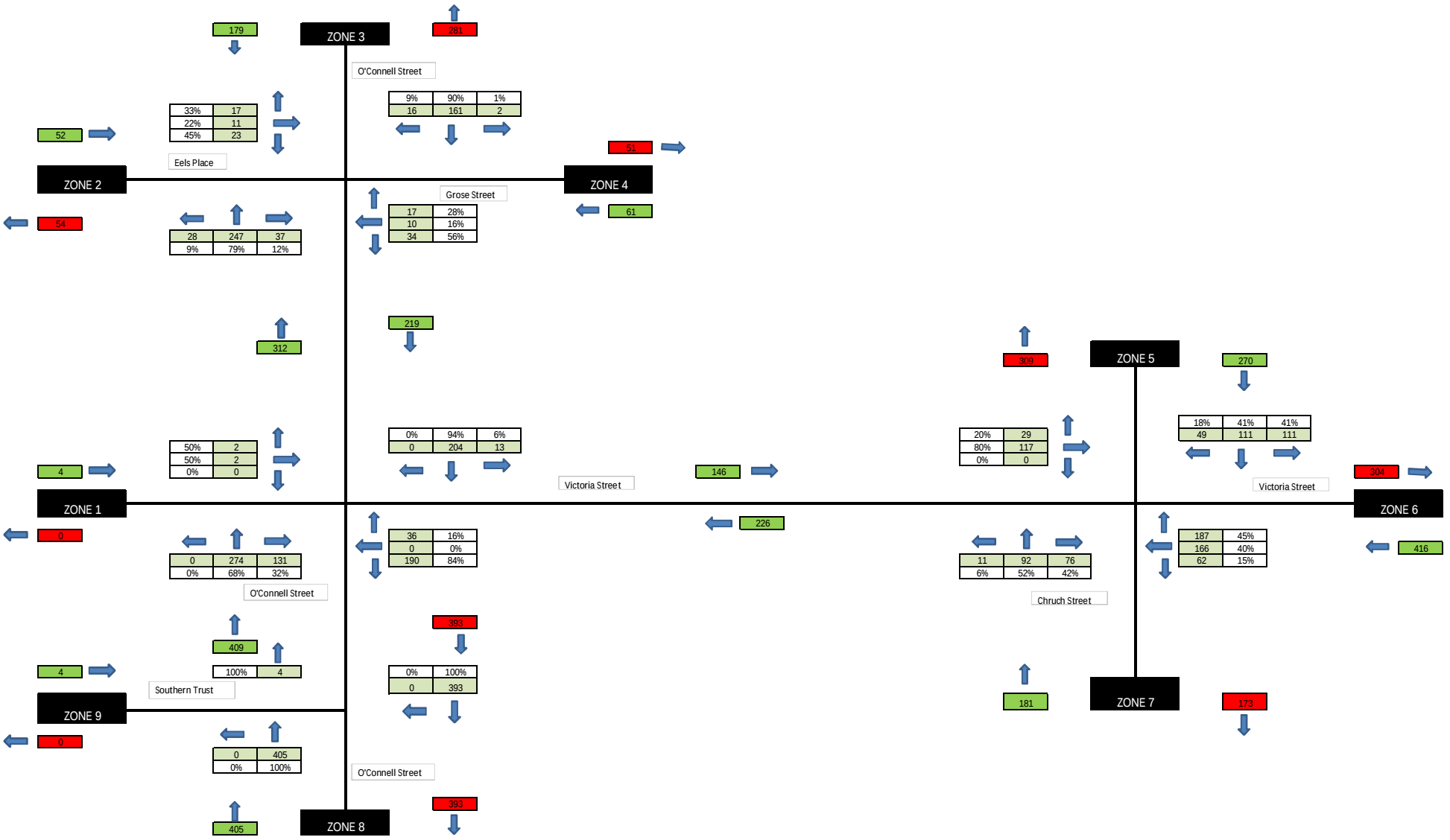


Figure 4.19: Peak Departures (20:45-21:45) Current Stadium (2019) - Half Event turning volumes

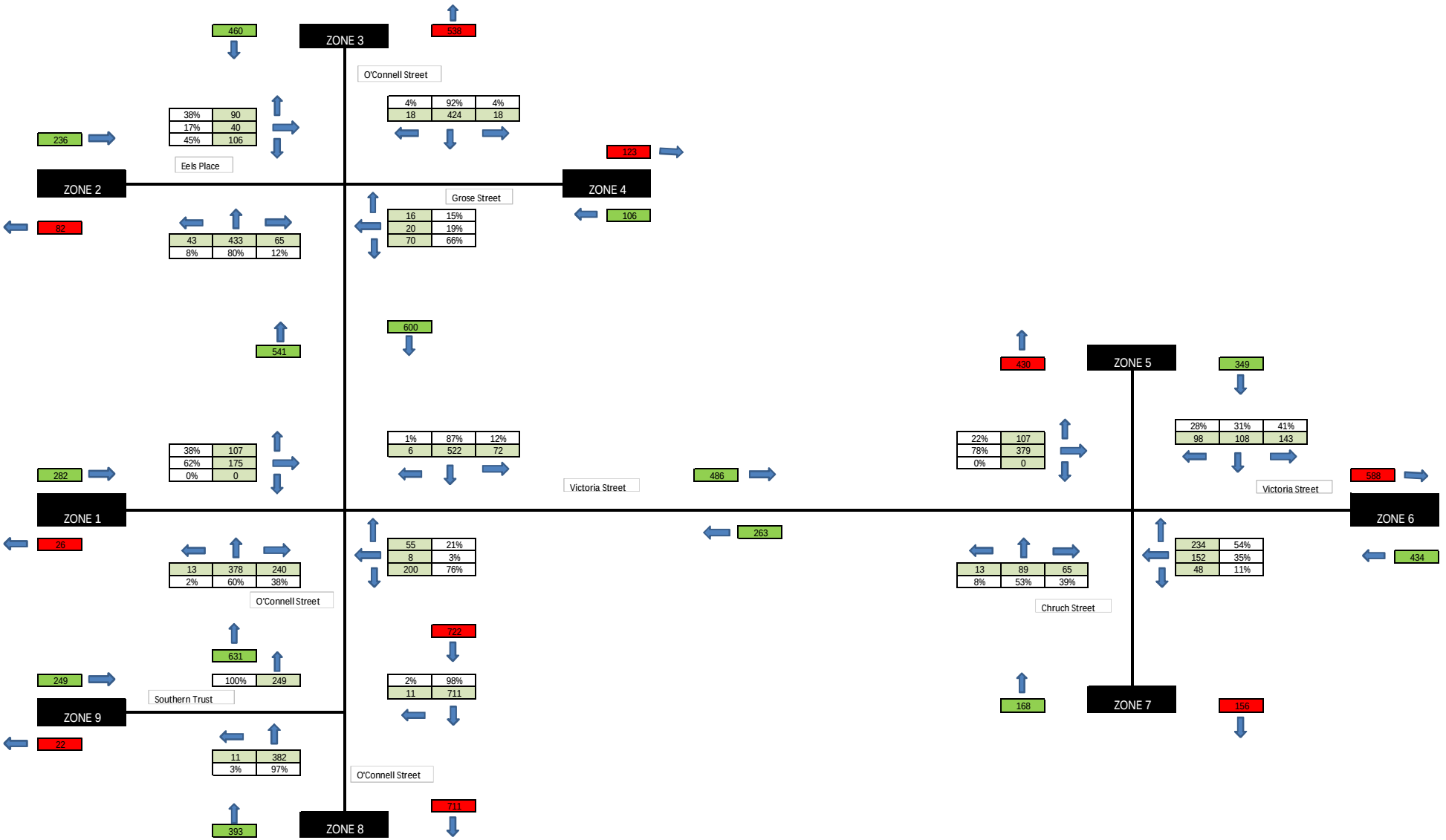


Figure 4.20: Peak Departures (20:45-21:45) Current Stadium (2019) - Full Event turning volumes

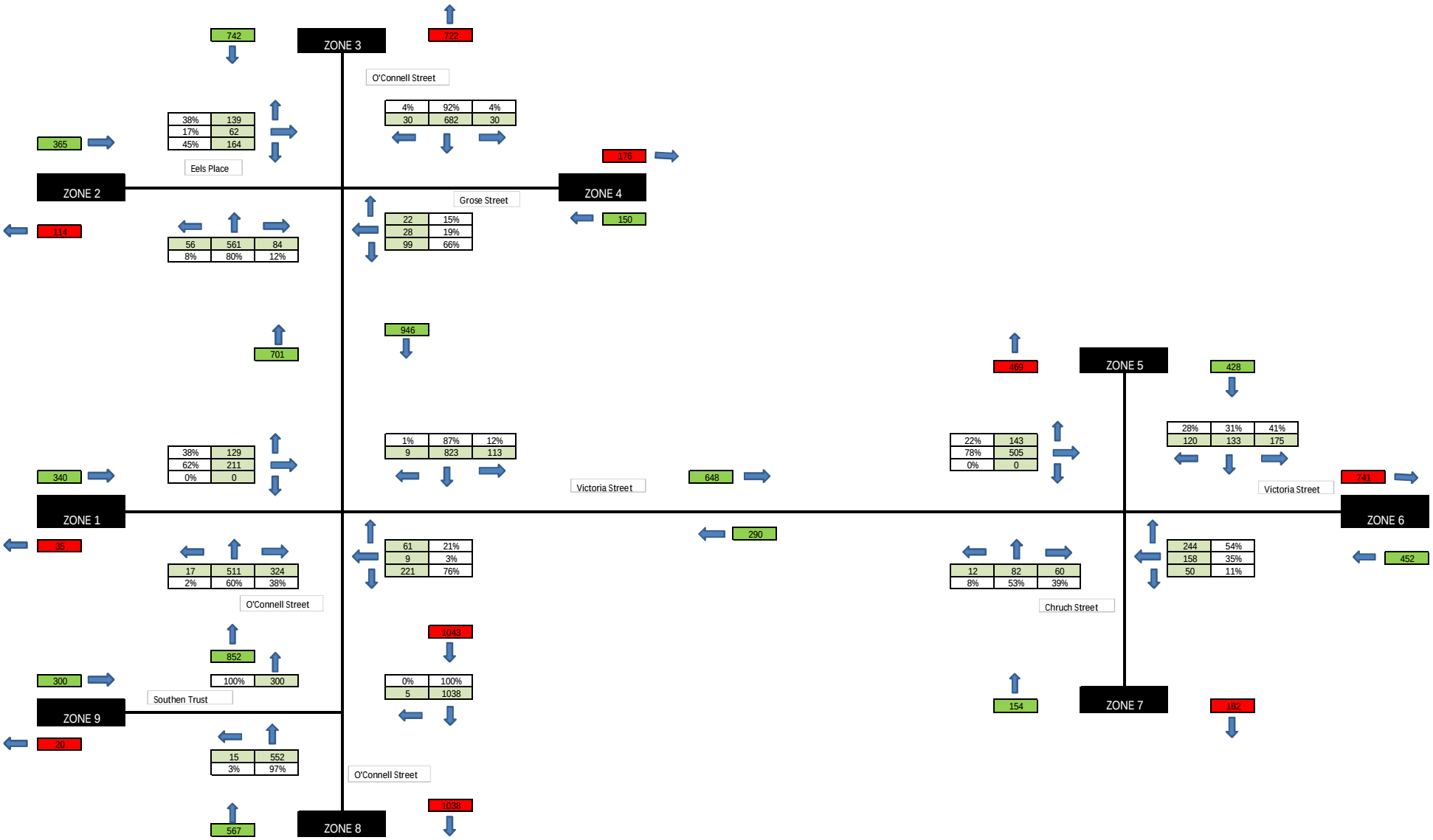


Figure 4.21: Weekend Peak Current Stadium (2019) - Non-Event turning volumes

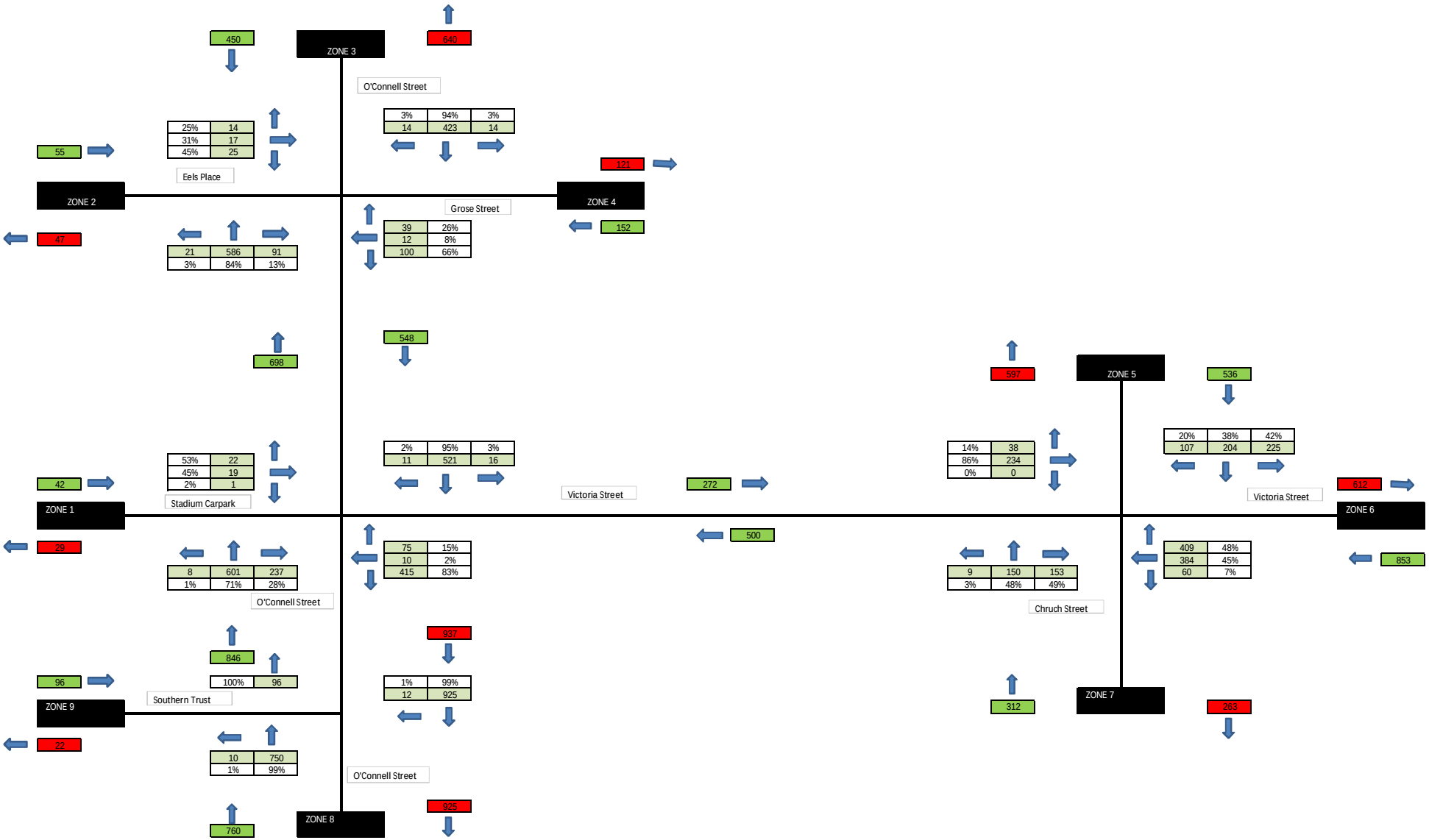


Figure 4.22: Weekend Peak Current Stadium (2019) - Full Event turning volumes

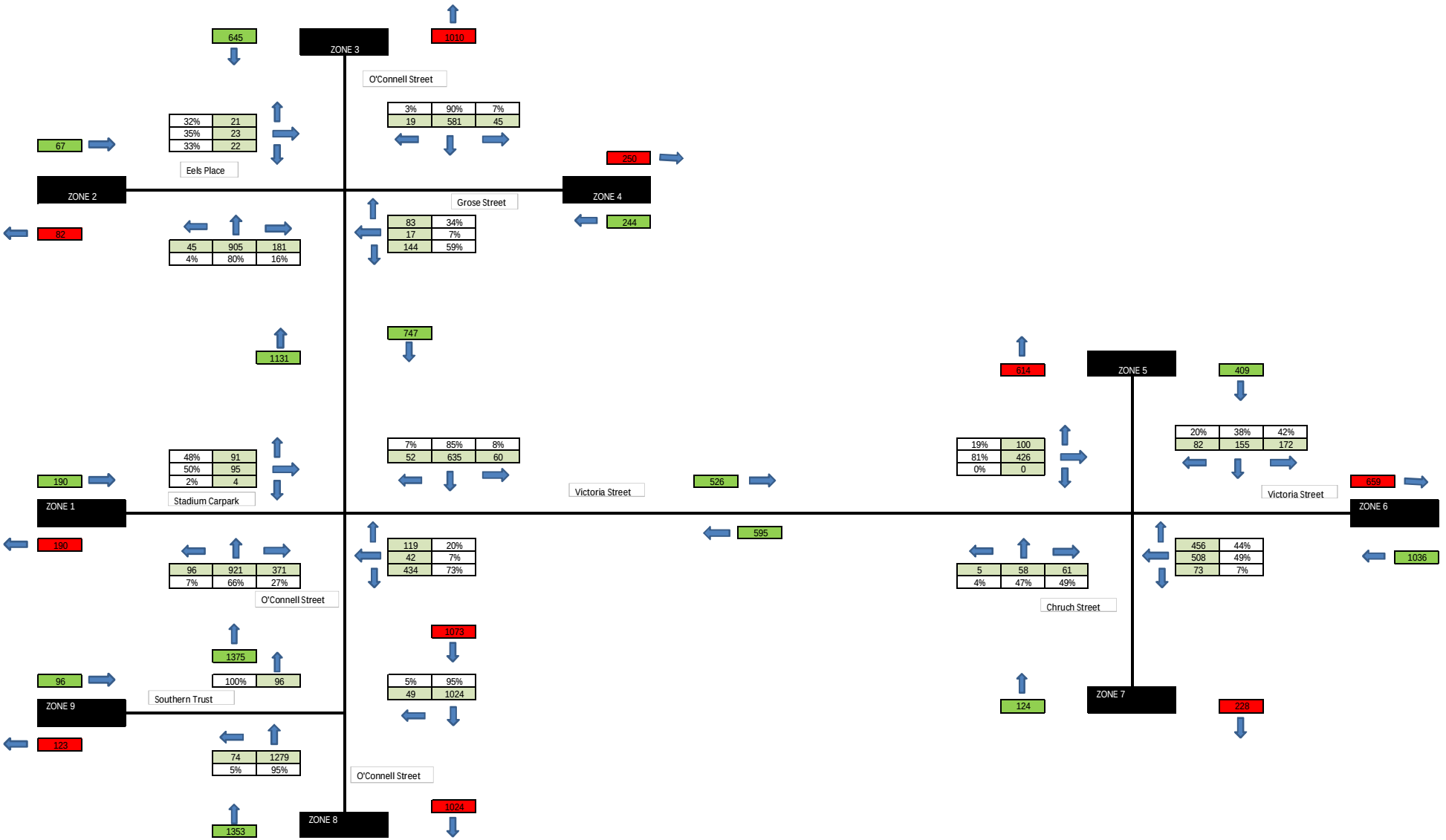


Figure 4.23: Weekend Peak Proposed Stadium (2019) - Non-Event turning volumes

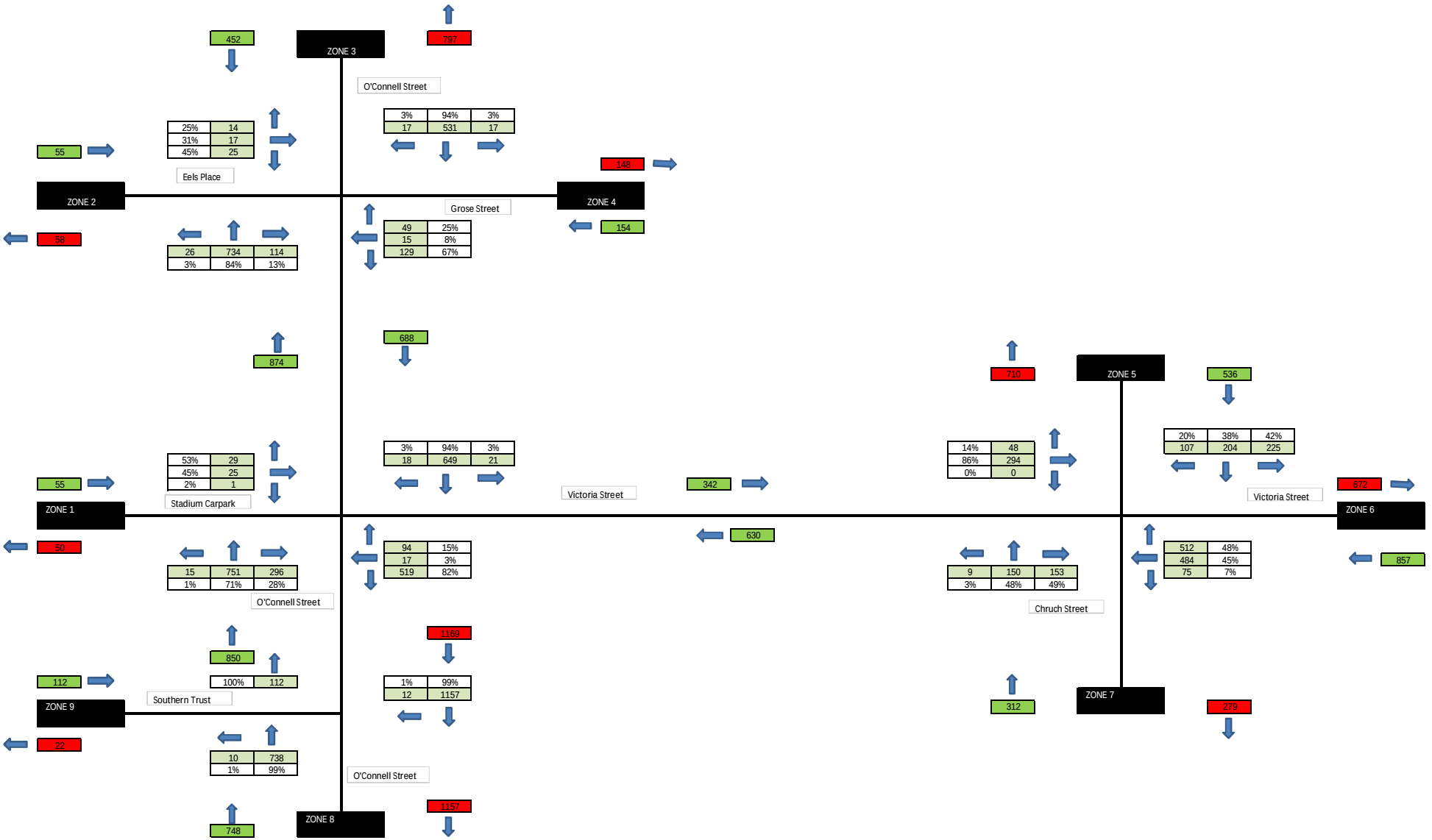


Figure 4.24: Weekend Peak Proposed Stadium (2019) - Full Event turning volumes

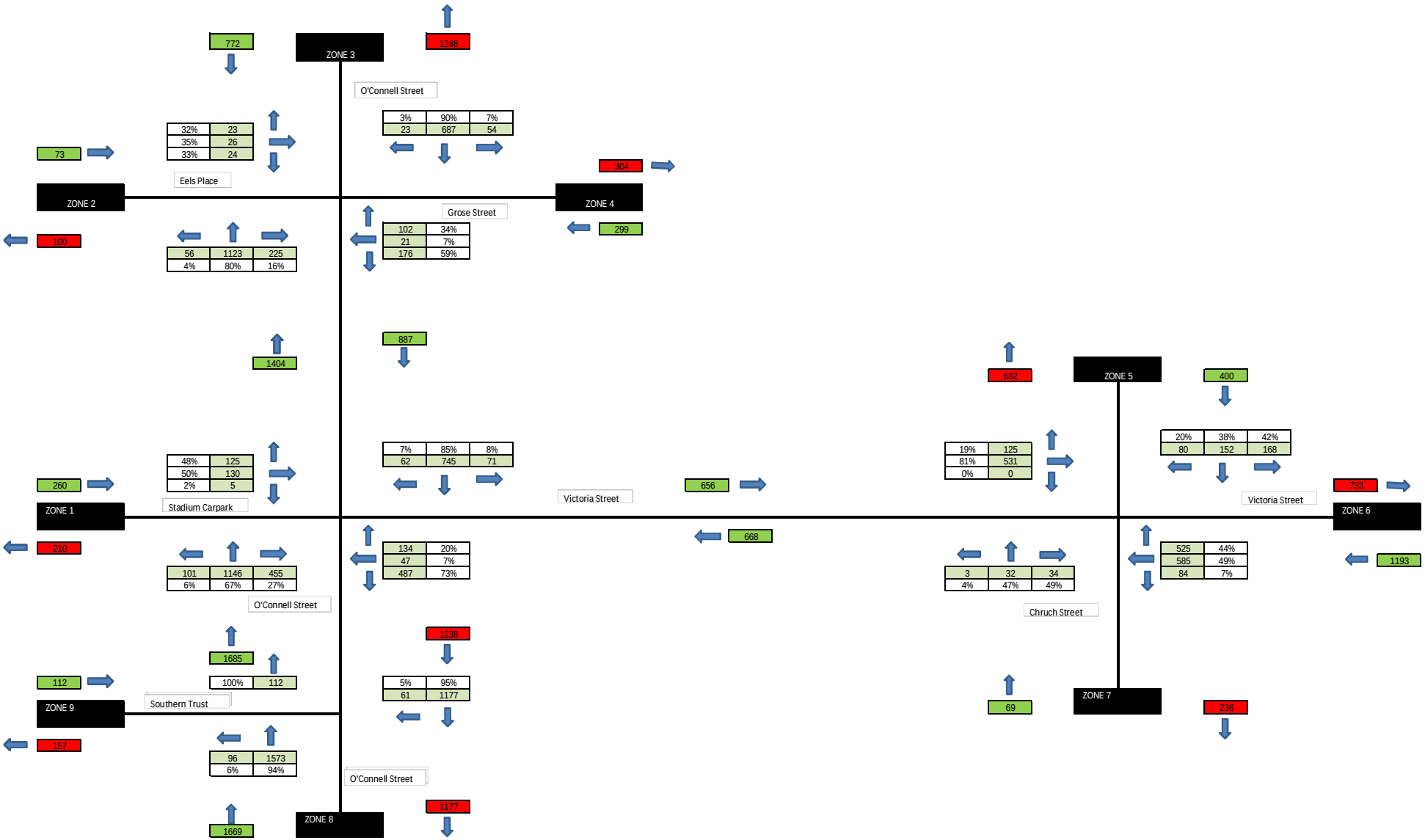


Figure 4.29: Stadium turning volumes - Proposed Stadium (2019) non-game day PM Peak (17:30-18:30)

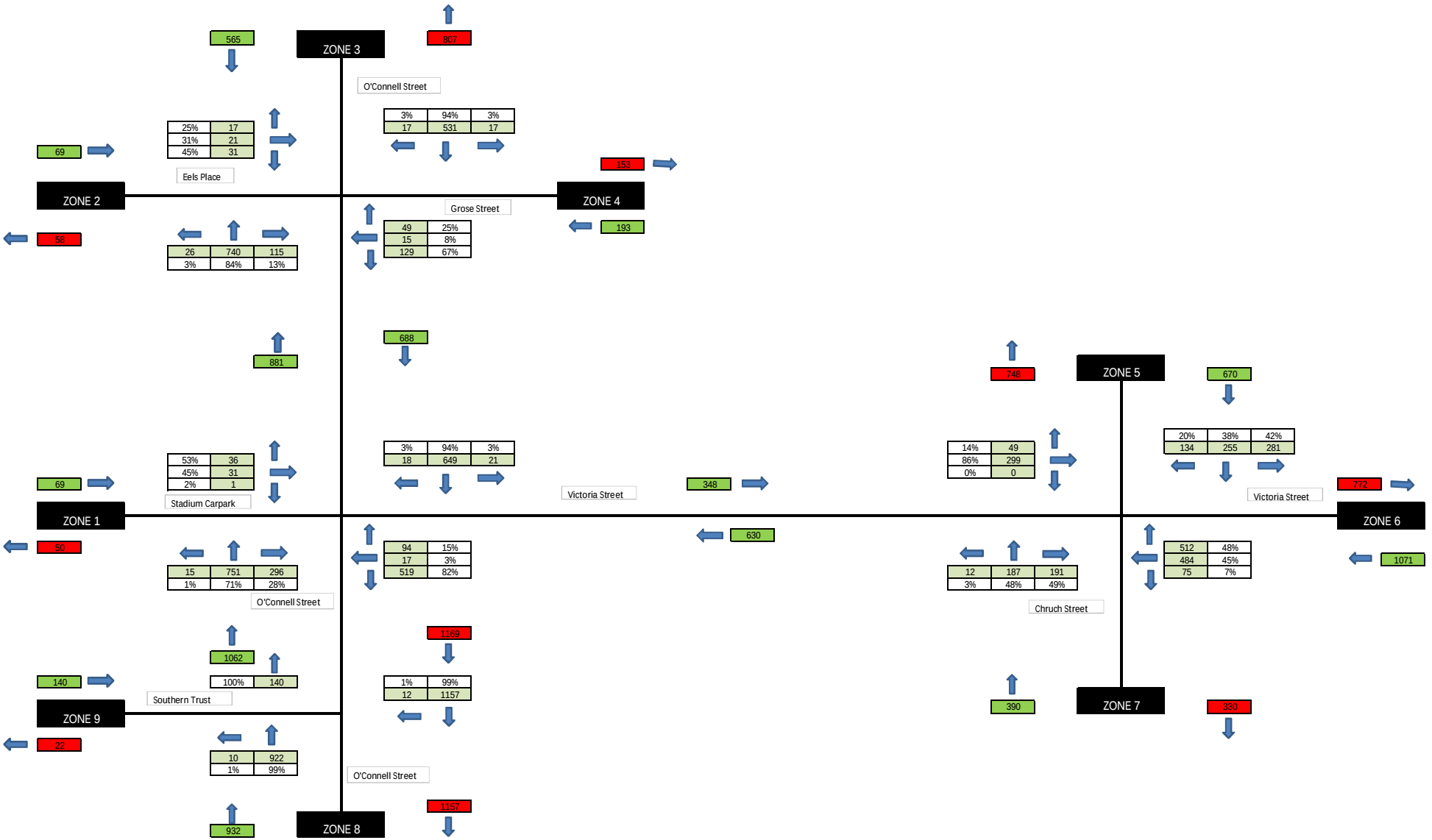


Figure 4.30: Proposed stadium volumes - Proposed Stadium (2019) during Half Event PM peak arrivals (17:30 - 18:30)

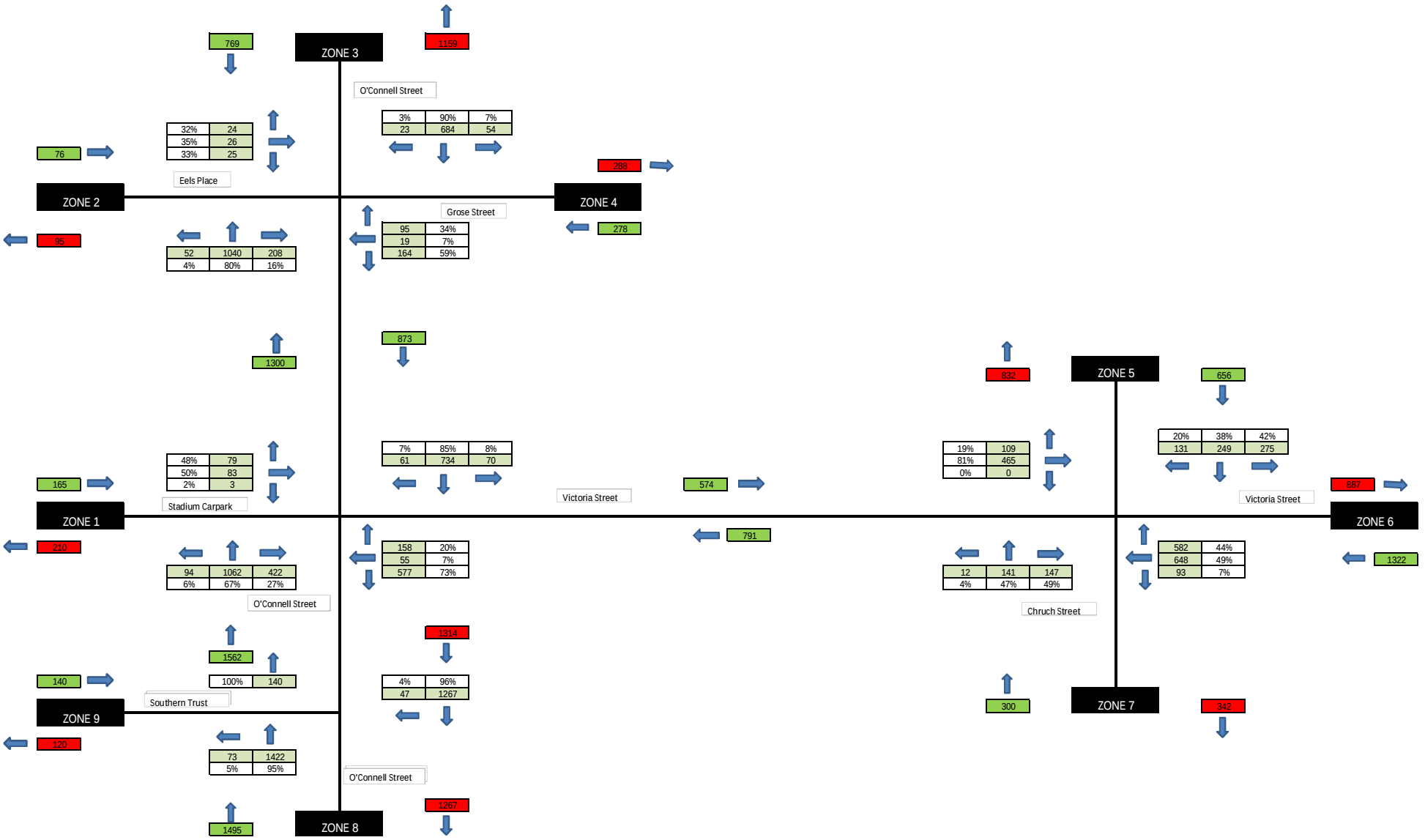


Figure 4.31: Proposed stadium volumes - Proposed Stadium (2019) during Half Event PM peak departures (20:45 - 21:45)

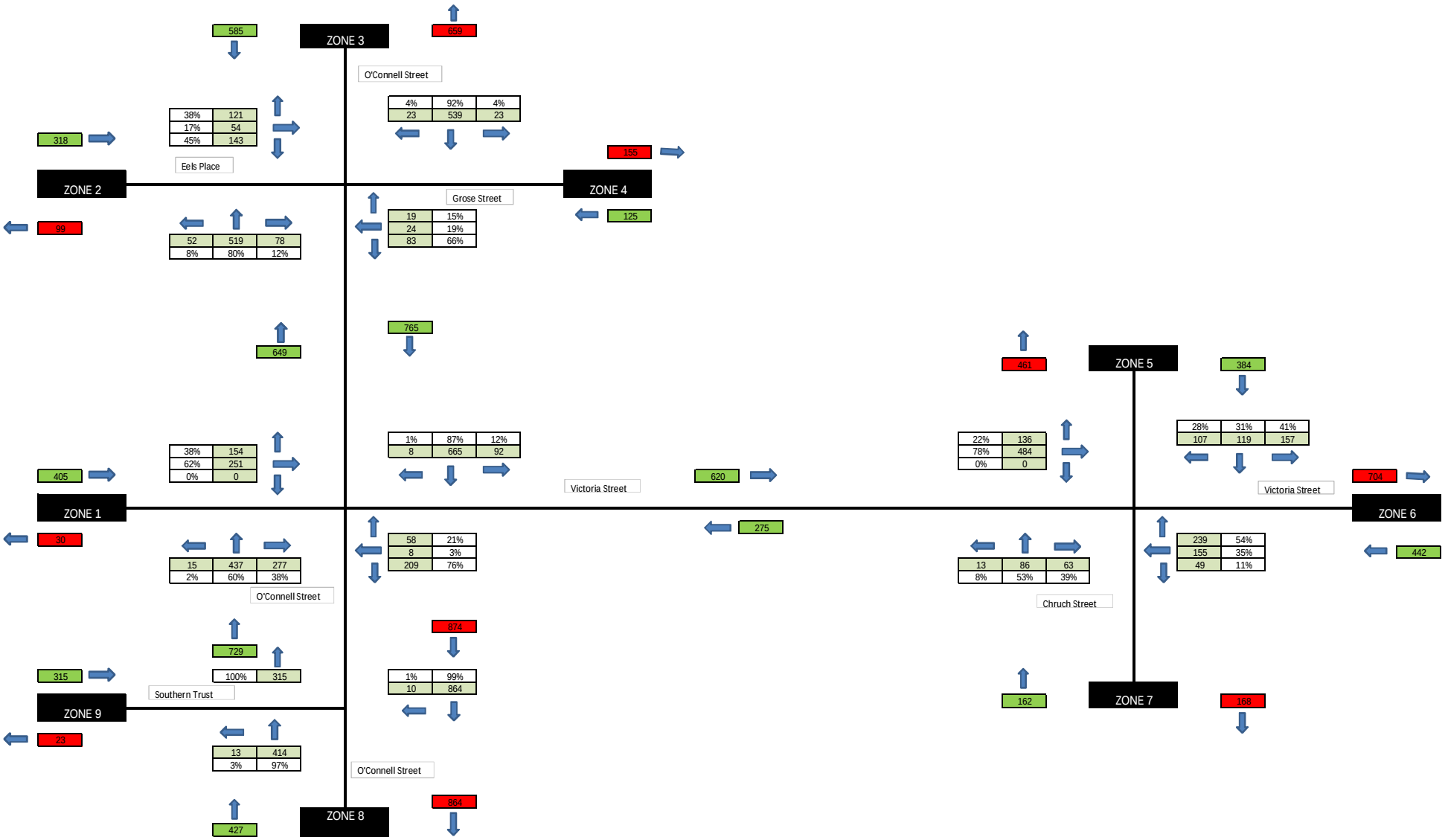


Figure 4.32: Proposed stadium volumes - Proposed Stadium (2019) during Full Event PM peak arrivals (17:30 - 18:30)

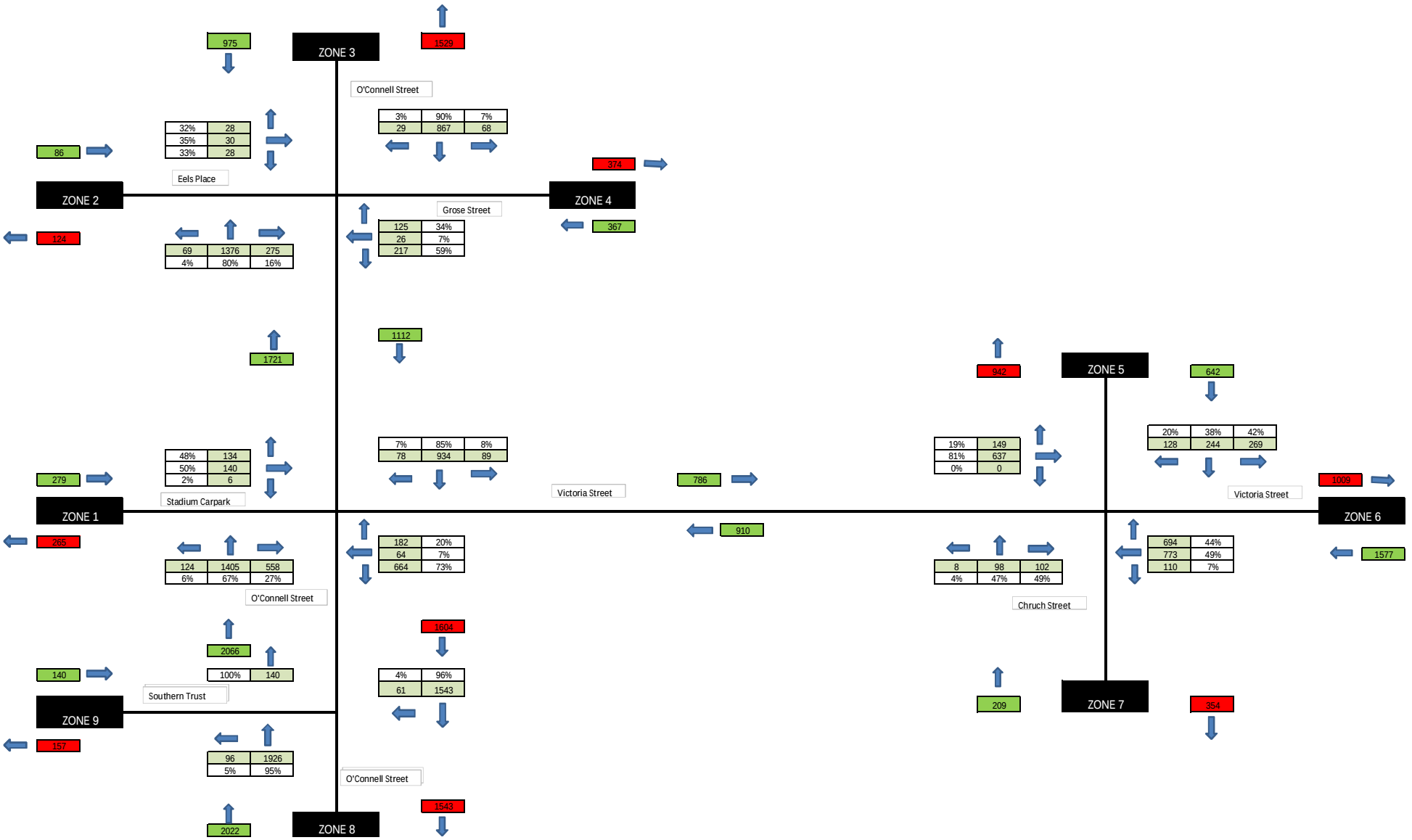
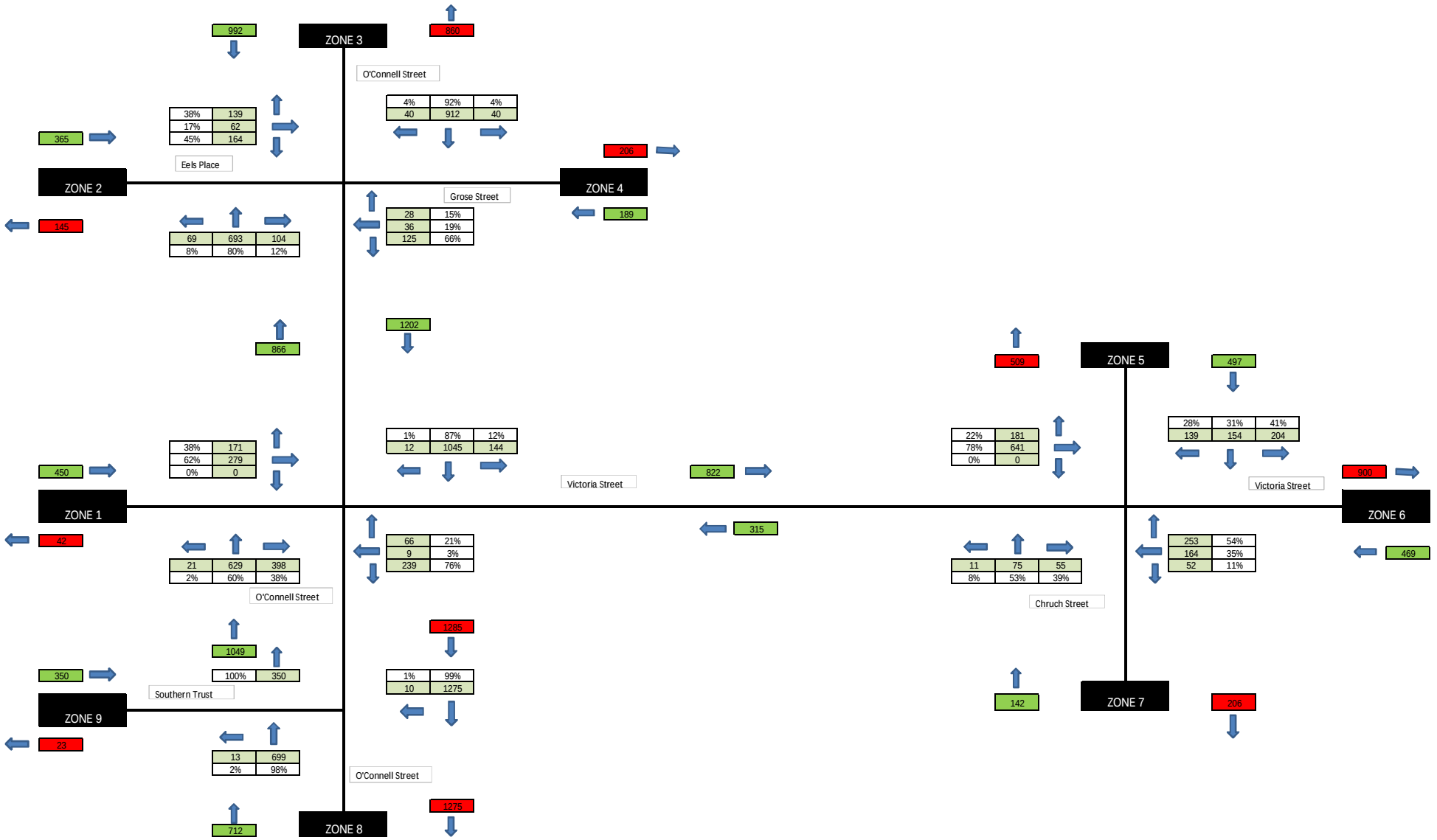


Figure 4.33: Proposed stadium volumes - Proposed Stadium (2019) during Full Event PM peak departures (20:45 - 21:45)



Appendix B:
Current Initiatives, Transport Plans, Key developments and Growth

Key Development sites in the CBD

Parramatta Council recently completed a study on pedestrian activities in the CBD, Final Draft - Parramatta Walking Strategy (*Cardno – February 2017*). This study states that a number of major redevelopments are already planned and underway throughout the CBD. These are driven by Council, State Government and private developers and will contribute more people and activity in the CBD in the short to medium term. Growth in the night-time and weekend economy can be expected to occur as the residential developments are populated and cultural and sporting attractions open. Specific city-changing developments and investment within the CBD are shown on **Figure B1** and described below.

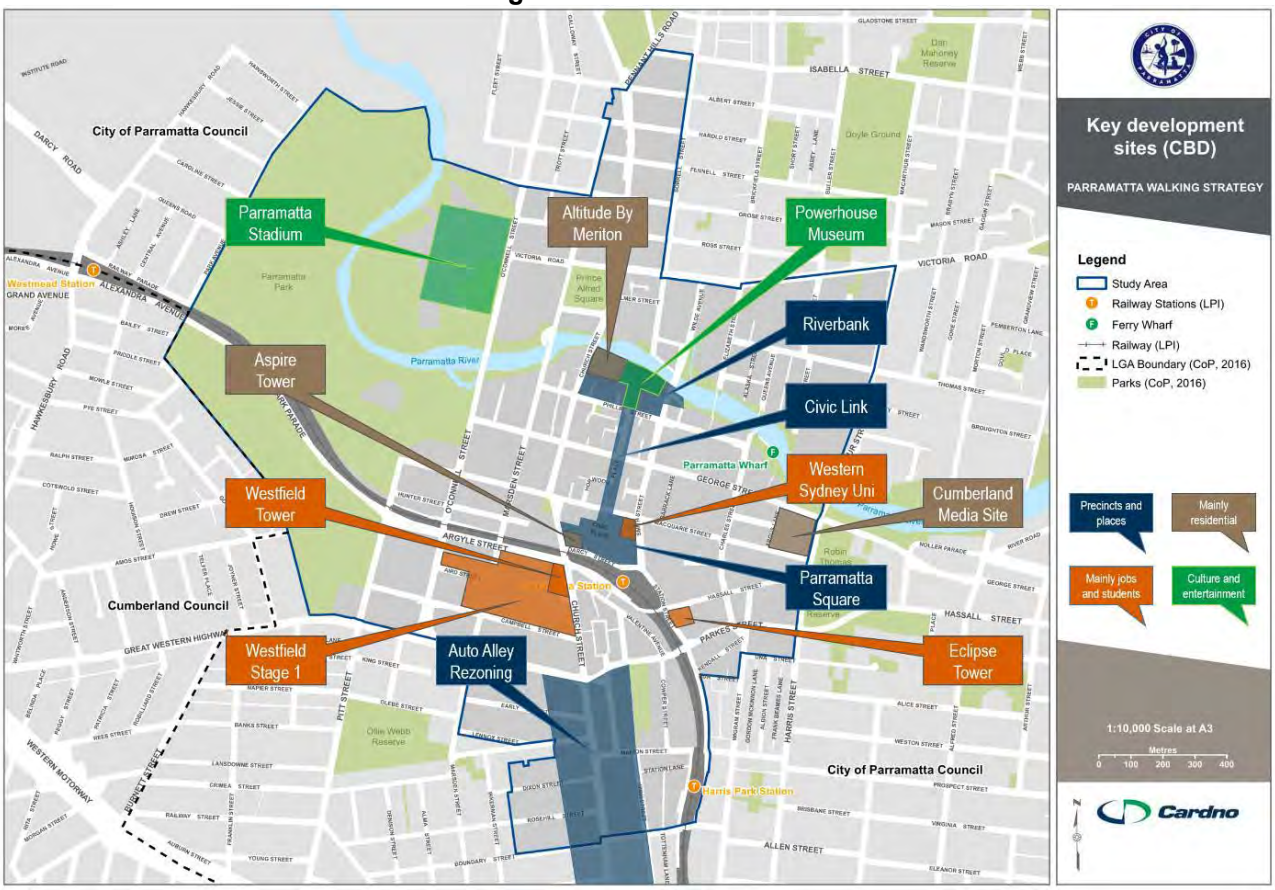


Figure B1 – Key Development Sites within the CBD (*Source: Final Draft Parramatta Walking Strategy, Cardno – February 2017*)

Growth precincts adjacent to the CBD (Source: Final Draft Parramatta Walking Strategy, Cardno – Feb. 2017)

As well as the development occurring within the CBD, there are a number of key residential, commercial and education developments adjacent to, or located close to the CBD, will also affect travel demand. These developments include:

- Westmead Health Precinct – 13,000 more jobs, increasing to 25,000 and 4,000 more students increasing to 6,000 by 2030;
- Parramatta Road – up to 40,000 new homes along Parramatta Road between the Sydney CBD and Parramatta in the next 30 years, with Granville nominated as one of the key sites;
- Camellia – Establish new town centre with increase in residents and higher job density;

- Sydney Olympic Park – 18,000 more homes and around 500,000 square metres for new commercial, retail, community uses and sporting venues. 6,000 new dwellings will be delivered by 2030;
- Parramatta North heritage precinct – approximately 7,000 new residents over the next ten years; and
- Rydalmere Education Precinct – increase in students from 13,000 to 30,000 over the next 20 years.

The major development planned around the CBD are shown on **Figure B2**.

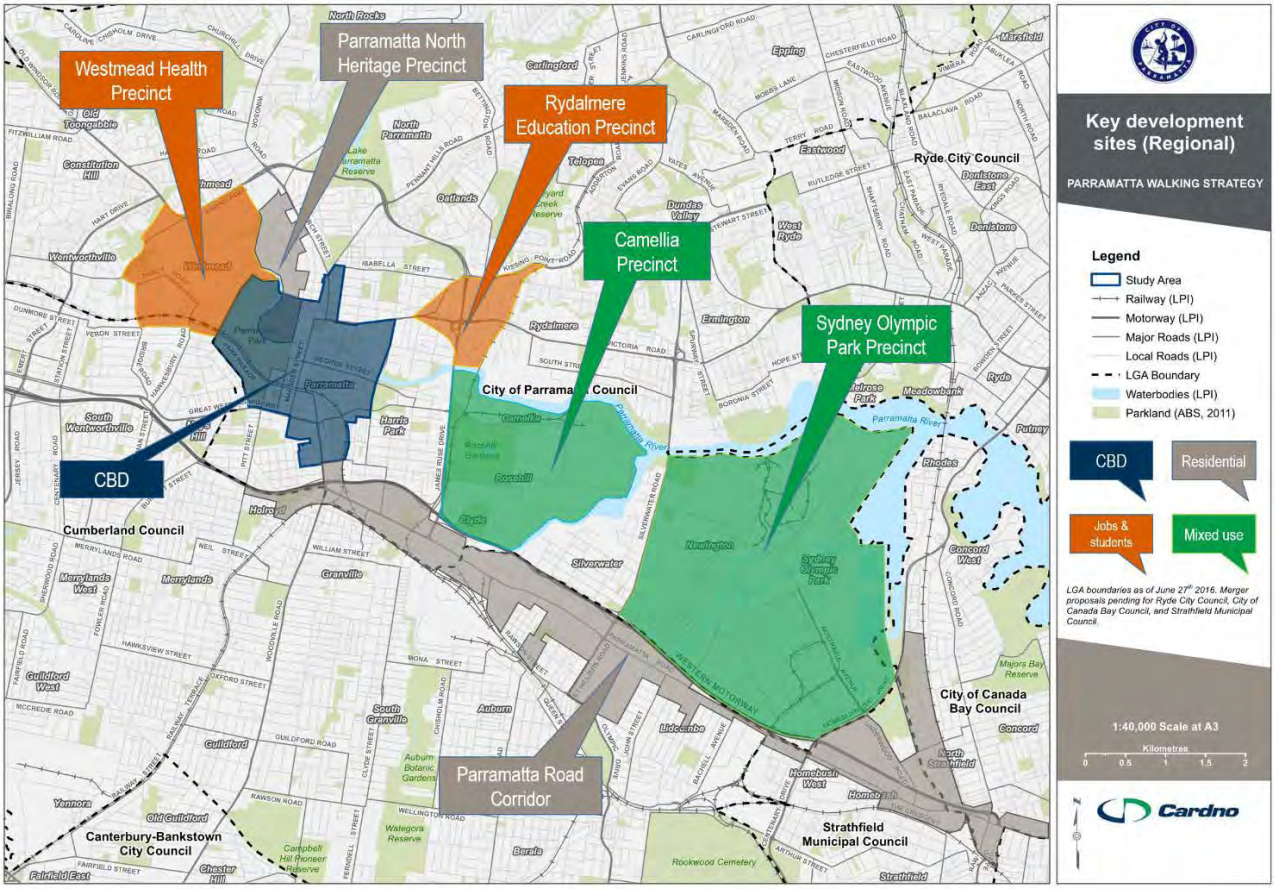


Figure B2 – Major development planned around the CBD (*Source: Final Draft Parramatta Walking Strategy, Cardno – February 2017*)

Appendix C: Pedestrians volumes (*Parramatta Walking Strategy – Cardno February 2017*)

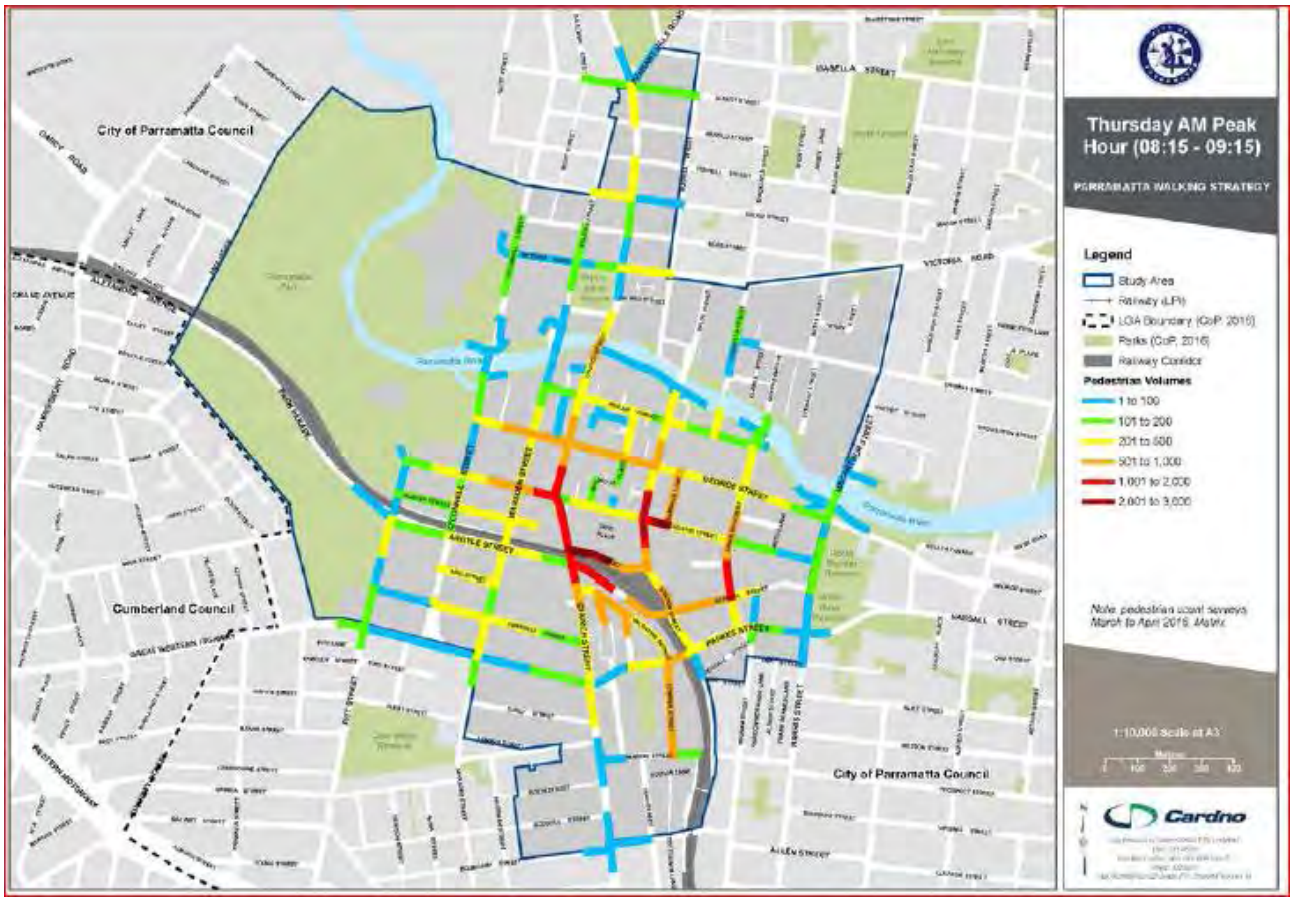


Figure C1 – Current Pedestrian Volumes – Thursday AM Peak (*Parramatta Walking Strategy – Cardno February 2017*)

Figure C2 – Current Pedestrian Volumes – Thursday PM Peak (*Parramatta Walking Strategy – Cardno February 2017*)

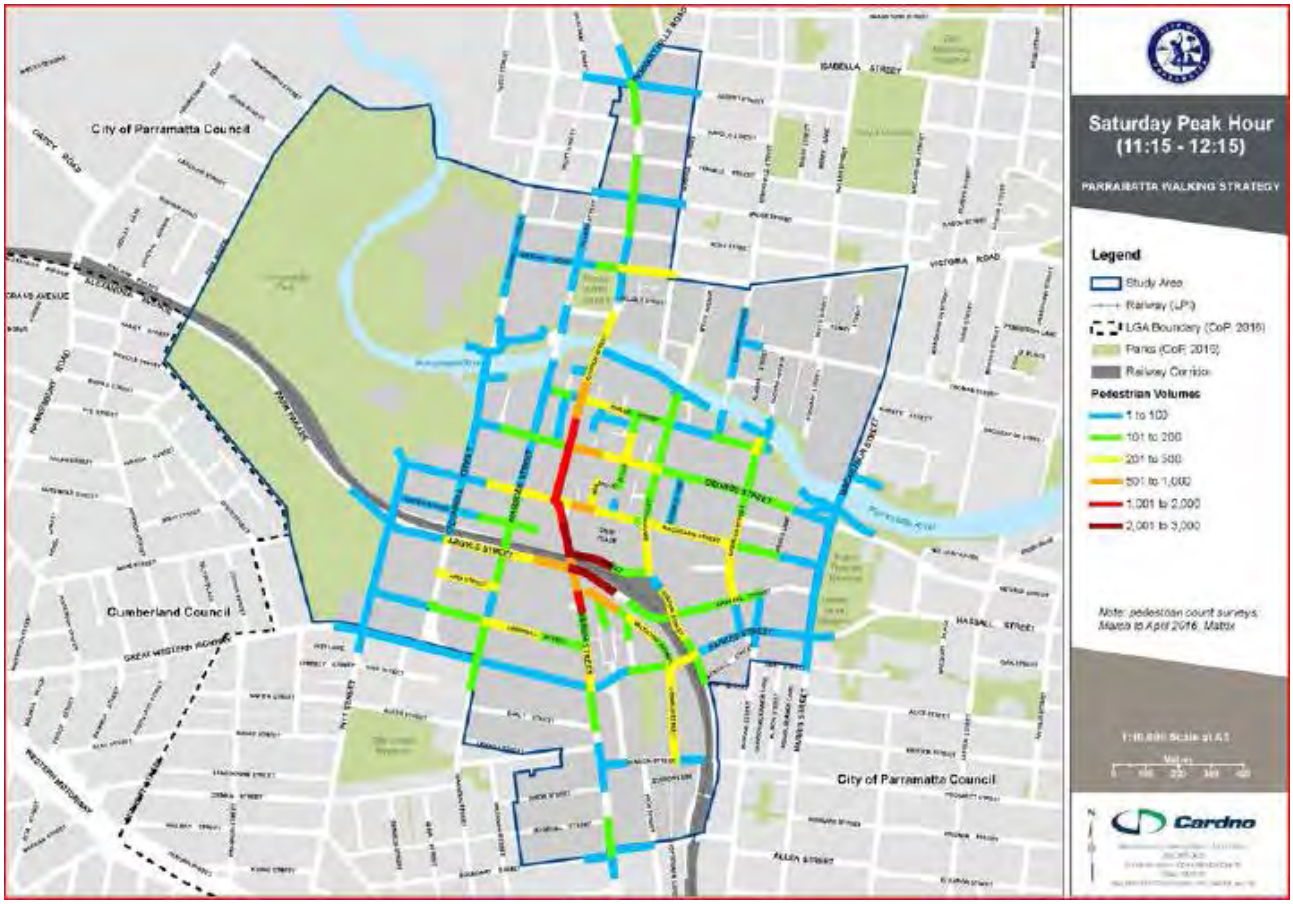


Figure C3 – Current Pedestrian Volumes – Saturday AM Peak (*Parramatta Walking Strategy – Cardno February 2017*)

Tables C1 to C8 below provide pedestrian level of service at key intersections for different event scenarios.

Table C1: 2016 half capacity event arrivals – Pedestrian level of service

Link	Arrivals (18:00 – 19:00)	Average Width of footpath (m)	# Pedestrians (Ped/min/m)	LoS	# Pedestrians (Ped/30 min/m)	LoS
O'Connell Street, north of Victoria Road	1,009	3	5.61	A	11.22	A
O'Connell Street, south of Victoria Road	504	3	2.80	A	5.6	A
O'Connell Street, south of Parramatta River	1,075	3	5.97	A	11.95	A
Victoria Road, east of O'Connell Street	2,858	3.5	13.61	A	27.22	B
Church Street, north of George Street	2,496	4	10.40	A	20.8	A
Church Street, south of George Street	1,284	4	5.35	A	10.7	A

Table C2: 2016 half capacity event departures – Pedestrian level of service

Link	Departures (20:00 – 21:00)	Average Width of footpath (m)	# Pedestrians (Ped/min/m)	LoS	# Pedestrians (Ped/30 min/m)	LoS
O'Connell Street, north of Victoria Road	1,268	3	7.04	A	14.08	A
O'Connell Street, south of Victoria Road	845	3	4.69	A	9.38	A
O'Connell Street, south of Parramatta River	1,352	3	7.51	A	15.02	A
Victoria Road, east of O'Connell Street	3,381	3.5	16.10	A	32.2	B
Church Street, north of George Street	3,001	4	12.50	A	25	B
Church Street, south of George Street	1,137	4	4.74	A	9.48	A

Table C3: 2016 full capacity event arrivals – Pedestrian level of service

Link	Arrivals (18:00 – 19:00)	Average Width of footpath (m)	# Pedestrians (Ped/min/m)	LoS	# Pedestrians (Ped/30 min/m)	LoS
O'Connell Street, north of Victoria Road	2,009	3	11.16	A	22.32	A
O'Connell Street, south of Victoria Road	670	3	3.72	A	7.44	A
O'Connell Street, south of Parramatta River	2,142	3	11.90	A	23.8	B
Victoria Road, east of O'Connell Street	6,026	3.5	28.70	B	57.4	D
Church Street, north of George Street	4,018	4	16.74	A	33.5	B
Church Street, south of George Street	2,223	4	9.26	A	18.5	A

Table C4: 2016 full capacity event departures – Pedestrian Level of service

Link	Departures (20:00 – 21:00)	Average Width of footpath (m)	# Pedestrians (Ped/min/m)	LoS	# Pedestrians (Ped/30 min/m)	LoS
O'Connell Street, north of Victoria Road	2,525	3	14.03	A	28.06	B
O'Connell Street, south of Victoria Road	1,683	3	9.35	A	18.7	A
O'Connell Street, south of Parramatta River	2,694	3	14.97	A	29.9	B
Victoria Road, east of O'Connell Street	6,733	3.5	32.06	B	64.12	D
Church Street, north of George Street	5,219	4	21.75	A	43.5	C
Church Street, south of George Street	2,075	4	8.65	A	17.3	A

Table C5: 2019 half capacity event arrivals – Pedestrian level of service

Link	Arrivals (18:00 – 19:00)	Average Width of footpath (m)	# Pedestrians (Ped/min/m)	LoS	# Pedestrians (Ped/30 min/m)	LoS
O'Connell Street, north of Victoria Road	1,457	3	8.09	A	16.18	A
O'Connell Street, south of Victoria Road	728	3	4.04	A	8.08	A
O'Connell Street, south of Parramatta River	1,554	3	8.63	A	17.26	A
Victoria Road, east of O'Connell Street	4,128	3.5	19.66	A	39.32	C
Church Street, north of George Street	3,605	4	15.02	A	30.04	B
Church Street, south of George Street	1,780	4	7.42	A	14.84	A

Table C6: 2019 half capacity event departures – Pedestrian level of service

Link	Departures (20:00 – 21:00)	Average Width of footpath (m)	# Pedestrians (Ped/min/m)	LoS	# Pedestrians (Ped/30 min/m)	LoS
O'Connell Street, north of Victoria Road	1,832	3	8.72	A	17.44	A
O'Connell Street, south of Victoria Road	1,221	3	6.78	A	13.56	A
O'Connell Street, south of Parramatta River	1,954	3	10.86	A	21.72	A
Victoria Road, east of O'Connell Street	4,884	3.5	23.26	B	46.52	C
Church Street, north of George Street	4,335	4	18.06	A	36.12	C

Church Street, south of George Street	1,642	4	6.84	A	13.68	A

Table C7: 2019 full capacity event arrivals – Pedestrian level of service

Link	Arrivals (18:00 – 19:00)	Average Width of footpath (m)	# Pedestrians (Ped/min/m)	LoS	# Pedestrians (Ped/30 min/m)	LoS
O'Connell Street, north of Victoria Road	2,914	3	13.88	A	27.76	B
O'Connell Street, south of Victoria Road	1,943	3	10.79	A	21.58	A
O'Connell Street, south of Parramatta River	3,109	3	17.27	A	34.54	C
Victoria Road, east of O'Connell Street	7,771	3.5	37.00	C	74	E
Church Street, north of George Street	6,313	4	26.30	B	52.6	D
Church Street, south of George Street	3,424	4	14.27	A	28.54	B

Table C8: 2019 full capacity event departures – Pedestrian level of service

Link	Departures (20:00 – 21:00)	Average Width of footpath (m)	# Pedestrians (Ped/min/m)	LoS	# Pedestrians (Ped/30 min/m)	LoS
O'Connell Street, north of Victoria Road	3,663	3	17.44	B	34.88	C
O'Connell Street, south of Victoria Road	2,442	3	13.57	A	27.14	B
O'Connell Street, south of Parramatta River	3,907	3	21.71	B	43.42	C
Victoria Road, east of O'Connell Street	9,768	3.5	46.51	D	93.04	F
Church Street, north of George Street	8,669	4	36.12	C	72.24	E
Church Street, south of George Street	3,372	4	14.05	A	28.1	B

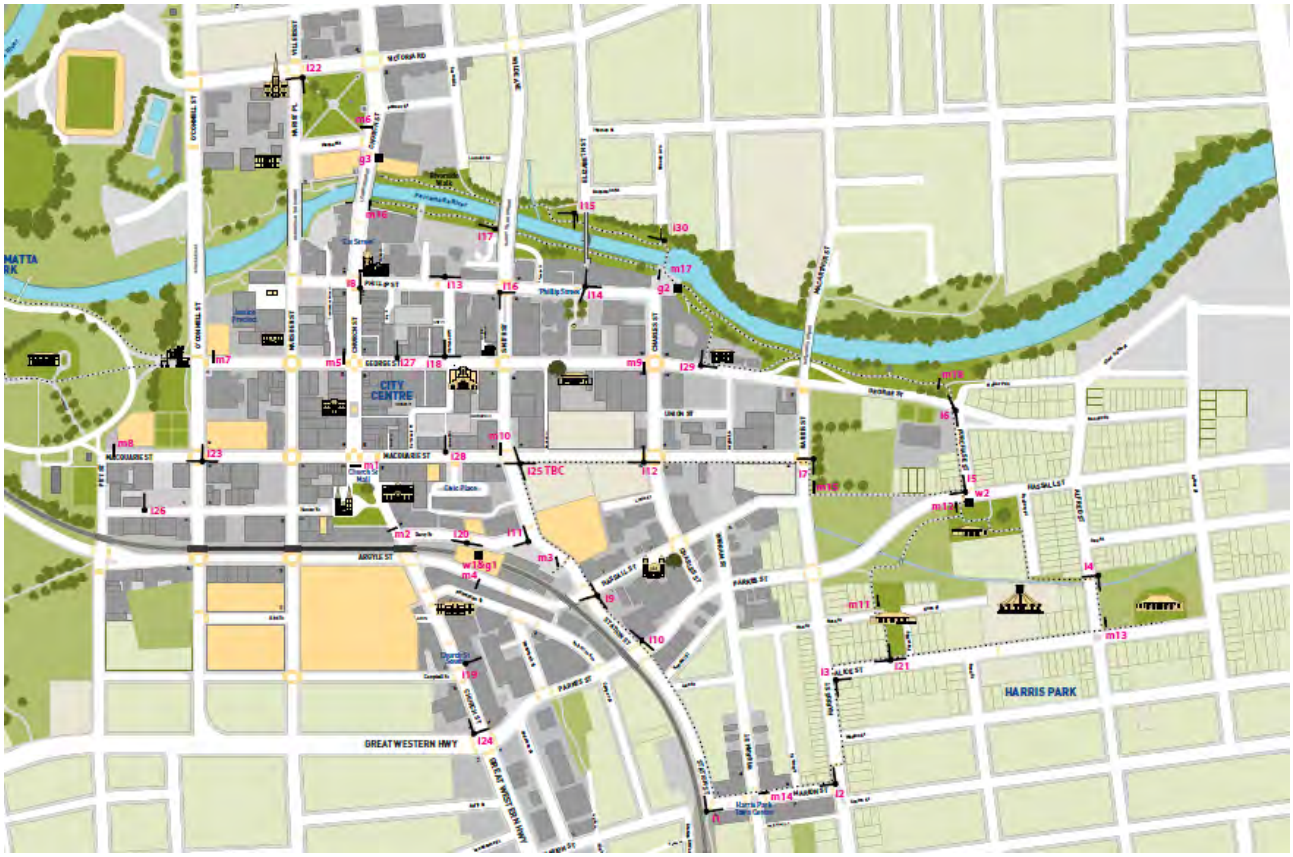


Figure C4 – Current Wayfinding Map of Plinths and Finger Blade signs around Parramatta CBD (*Source: CoP – 2009*)

Appendix D: Example - Event Day Management Plan - Framework

INTRODUCTION

An Event Day Management Plan **(EDMP)** should be provided as a framework for the management of spectator movements by all modes of transport to and from the Western Sydney Stadium **(WSS)** in Parramatta, on event days. It will also identify measures that may be required to manage spectators.

The WSS will accommodate up to 30,000 spectators and a full range of modern spectator facilities, including some 850 car parking spaces of which a percentage would be specifically for use by mobility impaired supporters. An appropriate number of cycle parking spaces should be provided on site to accommodate demand.

This document should be prepared in consultation with key stakeholders including Infrastructure New South Wales, The City of Parramatta, Transport for New South Wales, Roads and Maritime Services, NSW Police, NSW Fire Service and NSW Ambulance and the relevant clubs using the venues.

The EDMP should be an evolving document and include a flow chart showing process and stakeholder engagement.

TYPE, FREQUENCY AND DURATION OF EVENTS

The type of event (e.g. football, league), anticipated number of spectators, days of the week, anticipated kick off and finish times should be described.

The EMDP should define the magnitude of events at the stadium as a different plan may be triggered for different spectator numbers. Definition of events:

- Major event 15,000 - 30,000 spectators
- Minor events – less than 15,000 spectators

SPECTATOR MODE SHARE

The mode share used in developing the EDMP should be consistent with the approved TIA and updated as appropriate to reflect real events (as this will be a live document that should be continuously updated with fresh information).

LOCAL AREA

A map of the local area should present the stadium and the key transport options and stations, spectators will use to travel to the stadium.

TRAVEL TO AND FROM THE STADIUM

This section of the EDMP should describe the opportunities for travel to and from the WSS by public transport, private vehicle, coach, walking and cycling.

Public transport

It is assumed that Transport for New South Wales and the Train Operating Companies would prepare separate event day management plans for the operation of stations focusing on pre-event arrival and post-event departure. This should include any queuing management required outside the station.

The EDMP needs to be specific in how spectators would be routed to and from (pre and post event) the various Public Transport facilities to ensure safety and efficiency and avoiding conflicts, with the overriding objective being to provide safe connections to Public Transport which enable spectators to access and egress the stadium in a timely manner.

Heavy rail & Light Rail

A map showing the location of the heavy rail stations spectators are expected to use should be included. Also a brief summary of the event day services and frequencies and walking distance / time between stadium and stations.

Bus

A map showing the location of the bus stops spectators are expected to use should be included. Also a brief summary of the event day services and frequencies and a walking distance / time between stadium and closest bus stops.

Private Car

The EDMP should include information on travel to WSS by private car such as:

- Car ingress and egress routes;
- Number, location and allocation of parking spaces for different users;
- Parking hierarchy for different users;
- Management of car park (eg. Permit control) including circulation, rejection and sequencing;
- Arrival and departure times for cars and identify any restrictions on departure post-event;
- Management measures for late arrivals; and
- Identify any areas where on-street parking will need to be suspended temporarily to assist with access and egress.

Coach

The EDMP should include information on travel to WSS by team or supporter coaches:

- Team and supporter ingress and egress routes;
- Number, location and allocation of parking spaces for team and supporter coaches;
- Parking hierarchy for team and supporter coaches;
- Management of coach park (eg. Registering with stadium so anticipated number of coaches is understood before the event and can be accommodated);
- Arrival and departure times for team and supporter coaches and identify any restrictions on post-event departures; and
- Management measures for late arrivals.

Cycling

Identification of the anticipated number of cyclists and description of the location of an appropriate number of parking spaces to accommodate these users.

KEY SPECTATOR ROUTES

The EDMP should include a map showing the stadium and Key Pedestrian Routes and any Event Crowd Management that may be required. This will include the key predicated routes from the heavy rail stations, light rail station and other destinations to stadium entry and egress points.

It is considered that an appropriate Fruin Level of Service for major events on the footpaths would be a Level of Service D as seen in the below Figure 1.

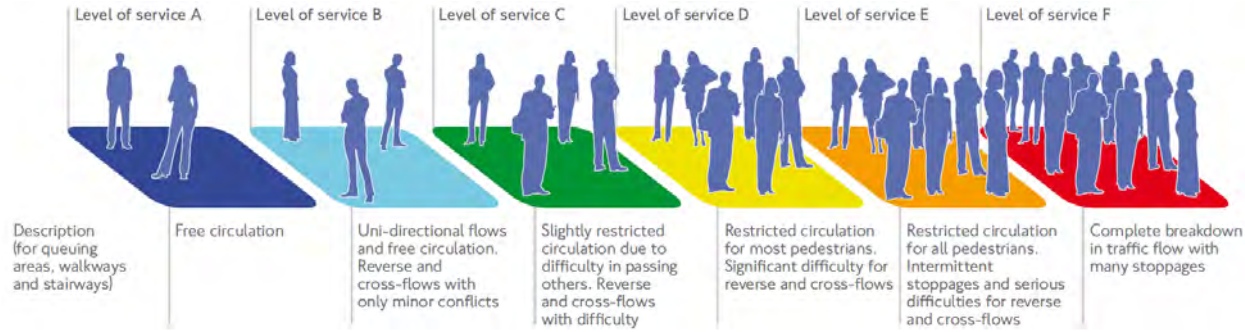


Figure 1: Pedestrian Levels of Service Source: Transport for London

Identification of any roads that may need closing to accommodate the anticipated demand of spectators that cannot be accommodated on existing footpaths should also be shown on the map. The aim will be to distribute the spectators as evenly as is possible on the existing pedestrian network.

Identification of “hot spot” intersections where queueing may need to be managed in peak times before and after the event due to spectator numbers. It is anticipated that management will be more important in the departure after an event. The location of these managed queues should be shown on a map. Any “no-go” areas for pedestrians post event should also be shown on the map.

An event day Signage Strategy may be required between stations and the stadium to encourage spectators to use the identified key spectator routes and to help with distribution.

This section will need to be developed in consultation with key stakeholders particularly the NSW Police and City Of Parramatta.

OTHER CONSIDERATIONS

It may evolve that separate management plans and/or operational plans are needed to facilitate safe and efficient spectator movement e.g. wayfinding/signage strategy, crowd control strategies, and car parking management that would be produced to sit under the EDMP.

A Stadium Event Management Plan is also anticipated to be prepared which should cover stadium operations such as stewarding, catering, emergency access routes, waste management. This is typically developed by the operator in collaboration with the City Council and emergency services.

An Event Day Travel Plan may also be required to discourage spectators from driving to the stadium and to encourage spectators to use public transport and sustainable modes (walking and cycling). A strategy to achieve this (e.g. offering PT tickets with event tickets, perhaps at a discount) could be included in the EDMP.