THE STAR

MODIFICATION 13 TRAFFIC IMPACT STATEMENT

PREPARED BY

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THE STAR

EXECUTIVE SUMMARY

Background

SEGL has commenced a five-year redevelopment journey to create a landmark, exemplar integrated resort. This proposed redevelopment will occur through the lodgment of two s75W modification applications to the original Major Project Approval (MP08_0098) with the *Department of Planning and Environment* (the Department).

Modification 14 (Mod 14) was determined in October 2017 and included approval for a range of upgrades to the existing site. These upgrades included the enclosure of the level 3 terrace to facilitate an expansion in gaming floor area and a new bar and restaurants, expansion of the level 3 pre-function space, changes to the Astral Hotel lobby and retail space, and alterations to internal vertical transportation, services and infrastructure, including the harbour heat rejection system.

Mod 13 is a modification to the development as approved under MP08_0098, up to and including Mod 14. Accordingly, in the impact analysis that follows, the base case, or 'Do Nothing', includes the approved future Mod 14 development.

Standards

The proposed development has been assessed against all relevant standards/guidelines, including the following:

- AS/NZS 2890.1 (2004): Off-street car parking. For design of carpark spaces / dimensions, aisle dimensions, pavement marking and signposting.
- AS 2890.2 (2002): Off-street commercial vehicle facilities. For layout, design, operation of loading dock, service area, access driveways.
- AS 2890.3 (2015): Bicycle parking. For layout, design of bicycle parking devices, pavement marking, signposting and clearances.
- AS/NZS 2890.6 (2009): Off-street car parking for people with disabilities. For design requirement of carpark spaces, headroom, dimensions, and pavement marking for people with disabilities.
- RMS Guide to Traffic Generating Developments 2002. For reviewing the general requirements of traffic generation from the new developments.
- RMS Guide to Traffic Generating Developments, Updated traffic surveys (TDT 2013/04a). For determining specific trip generation for high density apartment buildings in Pyrmont.
- City of Sydney DCP 2012. Schedule 7, Transport, parking, and access. For assessing the requirements for parking access and design, and the active transport strategy.
- City of Sydney LEP 2012, Part 7, Division 1. For assessing parking rates.

Findings

This Traffic Impact assessment has identified the following key findings:

- The site is well serviced by public and active transport links.
- Analysis of the 8 critical intersections in the surrounding network revealed that nearly all intersections are providing good levels of service (LOS C or better), in all peaks, which suggests that the network has significant reserve capacity.
- Most of the community concerns regarding traffic in the area relate to special events and/or taxi operational issues. Modification 13 does not increase the frequency or impacts of special events generated by the Star Entertainment precinct. Taxi queues are causing significant disruption to Pirrama Road. This issue is being addressed by relocating taxis into the service road under the site.
- Sydney buses services are currently underutilised throughout most of the day. There is sufficient capacity to accommodate the additional staff and visitor trips generated by this proposal. Poor bus frequencies were a major concern raised by the community during consultation. However, this view seems inconsistent with the current schedule and may be more about routing and destinations.

- Light Rail services are currently highly utilised in the AM and PM peaks periods with up to 95% of total capacity occupied. Fortunately, due to shift work patterns at The Star, most future staff trips associated with the modification will fall outside the light rail peak demand periods. Access arrangements to the platforms are adequate to cope with the proposed increase in staff and visitor trips, any further increases in service frequencies, in response to higher levels of demand, are a commercial matter for the operator TransDEV. However, discussions with TransDEV have identified opportunities to increase the capacity of services, using larger vehicle sets, which would double the current vehicle capacity.
- Ferry services have sufficient capacity to accommodate the additional staff and visitor trips generated by this proposal.
- The site is within 1.2km (a 15-minute walk) of Town Hall station. With the proposed upgrades to CBD heavy rail services proposed as part of the CBD Metro project, there is sufficient capacity to accommodate the proposed increase in visitor and staff trips by rail.
- The proposed Metro West link represents a major opportunity to further improve public transport choices for visitors and staff travelling to The Star.
- The Star currently has a parking capacity of 2,795 spaces following completion of the vertical access upgrades associated with D2015/1515. It is the biggest off-street parking provider in the Pyrmont area. The approved maximum parking limit for the site is 3,000 spaces (MP08_0098).
- Average maximum car park occupancy rate is 92%, on Saturdays. However, parking capacity is regularly exceeded during special events.
- There are 2,892 off-street parking spaces within walking distance of The Star. During business hours, utilisation was less than 60% leaving 1,150 alternate spaces available for Star patron use.
- There are 1,200 on-street parking spaces within walking distance of The Star. During business hours, utilisation was less than 78% leaving 275 alternate spaces available for Star patron use.
- Management of parking demand, on occasions when The Star car park is full, is uncoordinated. There is a parking guidance scheme in place in the Pyrmont precinct, however, it is not fully functional.
- Staff surveys reveal that 47.6% use public or active transport to travel to work at the star. Since 73% of Star staff are engaged in shift work, safety concerns and a lack of 24-hr public transport services, is an impediment to increased use of public transport for some staff.
- The main staff shift changeover times fall outside traditional AM and PM peak periods. Staff travel peaks are 4am, noon and 8pm.
- Staff travel by car contributes 16%, 15% and 7% to total car movements in/out of the Star during the AM, PM and Off-peak periods, respectively.
- Modification 14 will increase daily staffing levels by 5%. Modification 13 will increase daily staffing levels by a further 13%.
- The Star's main loading dock on Jones Bay Road is operating 80% capacity despite allocating 2 loading bays to construction deliveries. SEGL is proposing several capacity upgrades to this dock as part of Modification 14. These improvements will provide more than enough capacity to accommodate any increased deliveries resulting from Modification 13.
- The proposed modifications to The Star will generate the following impacts on vehicle trips to/from The Star during peak periods:

	MOD13
AM	16%
PM	15%
OP	9%

- SEGL's strategy to mitigate these traffic impacts is to provide a new car park entry on Pyrmont Street, to spread the demand more evenly across the road network, and reduce the pressure on Pirrama Road. Additionally, the proposal to relocate Taxis into the service road will address the late-night operational issues caused by taxi queueing in Pirrama Road.

Analysis indicates that with the Star mitigation strategies in place, the local road network will continue to operate at existing or otherwise acceptable performance levels despite the additional traffic generated by Modification 13.

Mitigation

Modification 13 proposes the following mitigation strategies to limit the environmental impacts of the proposal, beyond what exists, up to and including Modification 14:

- SEGL to provide 221 parking spaces to ameliorate the parking impacts of Modification 13. However, the total parking provision on-site is not to exceed the 3,000-approved maximum parking limit set by MP08_0098.
- SEGL to expand and modify the Pyrmont Parking Guidance System proposed in Modification 14, to include additional signage and information specific to Modification 13.
- SEGL to provide a new Pyrmont Street access to the Level B1 car park. This new access is crucial to mitigating the traffic impacts of the development by spreading impacts more evenly across the road network.
- SEGL to provide a new right turn access from Jones Bay Road into the Port Cochere. This new access is crucial to mitigating the traffic impacts of the development by spreading impacts more evenly across the road network.
- SEGL to provide a left-in and right-in access to the new Ritz Carlton port cochere entry. The right-in access from Pirrama Road is essential to allow Taxis queued on-site in the service road to access the Ritz Hotel.
- SEGL to upgrade the Star Events loading dock in the service road to accommodate the additional deliveries associated with the Ritz Carlton Hotel and Apartments located in the tower above.
- SEGL to produce Tower Loading Dock and Car Stacker Management Plans
- SEGL to provide 35 Class 1 bike spaces and 62 visitor bike spaces to encourage active transport and mitigate impacts of the development.
- SEGL to install bike parking upgrades as early works in Modification 13, to improve cycle parking opportunities during construction.
- SEGL to formalise the taxi parking scheme in the service road.
- During construction, SEGL to restrict on-site parking for workers to 200 spaces. These spaces will be controlled using a booking system. Parking above this threshold will be actively discouraged through on-site parking fees.

Consideration of SEARs

Trip Generation & Network Performance

The review of trip generation impacts and traffic network performance in Sections 4.2, 4.3, 4.13 4.14 and 4.16 demonstrated that the additional traffic generated by the proposal during construction, and operation, would have limited environmental impacts on network performance and parking demand beyond what is currently experienced due to the existing development and operation of the site, up to and including Modification 14.

This is achieved through mitigation strategies such as:

- Limitations on construction parking
- Heavy reliance on public transport services for workers travelling to the construction site
- Limited provision of on-site car parking targeted to the new Tower development
- Implementation of the Pyrmont Parking Guidance System to manage traffic movements in the precinct
- Relocation of taxi services into the service road
- Commitments to major increases in employee and visitor cycle parking facilities
- A traffic reassignment strategy during operation that redirect traffic away from critical parts of the road network towards a new car park access on Pyrmont

Cumulative Impacts

The review of cumulative impacts in Section 4.4 outlined the competing demands on the road network during construction and operation of the proposal. The proposal limits its competing demands on the network, during operation, through a traffic reassignment strategy that reduces both its current, and future, impacts on those parts of the road network most under pressure from other developments.

For example, the Pyrmont Bridge Road and Murray Street intersection is under significant pressure from development in Darling Harbour and Pyrmont. The traffic reassignment strategy proposed as part of Modification 13 will reduce the potential impacts of the modification on this intersection. Indeed, during the PM and Off-peak periods existing demands will remain the same or be reduced, up to 3%, after development. A summary of the proposed traffic increases and reductions across the adjacent road network were presented in Tables 4.5 and 4.6.

Impacts on Public Transport

The review of public transport services in Sections 4.5 and 4.7 demonstrated that the site is well serviced by public transport and that the Modification 13 proposal seeks to maintain or improve site access to those services.

Impacts on Light Rail

Section 4.6 highlights the proposed improvements to the light rail interchange by opening the station entrance, improving pedestrian, taxi, cycle and coach linkages, increased station activation and passive surveillance, as well as providing cosmetic upgrades. The proposals to restrict northbound pedestrian access up service road open future opportunities to extend the station platforms sufficiently to accommodate higher capacity light rail fleets that could double current capacity.

Sustainable Travel Initiatives

Section 4.8 details SEGL's commitment to sustainable travel initiatives, such as its Draft Star Travel Plan, which seeks to reduce the Star's long-term travel impacts on the Pyrmont area.

Parking and Access

Section 4.9 details current and proposed parking access arrangements. It demonstrates that the site will have sufficient on-site car parking to meet current and future needs. Section 4.10 also demonstrates SEGL's commitment to improving employee and visitor cycle parking facilities across the site, locating them adjacent to major interchanges and cycle access networks.

Service Road Access

Section 4.10 and 4.12 outlines the proposed improvements to the service road and Star Events loading docks. These improvements relocate taxis into the service road, thereby relieving pressure on Pirrama Road, and provide an upgrade of the loading facilities to accommodate the requirements of the new Tower development. This service road also provides the access point for the new car stacker parking system proposed to satisfy and mitigate the additional parking demands of the new Tower development.

Safety During Construction

Section 4.17 highlights how the proposal will limit environmental impacts on pedestrian access and safety during construction, and operation. Modification 13 includes proposals that have the potential to impact on pedestrian safety and access around the site, these include:

- The new Ritz Carlton Port Cochere
- The new Pyrmont Street Car Park Entry
- The new right turn facility into the existing Jones Bay Road Port Cochere

The Modification 13 proposals have sought to mitigate environmental impacts and improve upon current pedestrian access arrangements through a series of mitigation strategies, including:

- Locating new vehicle crossings away from pedestrian desire lines
- Relocating existing vehicle crossings away from pedestrian desire lines
- Transferring traffic movements away from heavy pedestrian demand flows at Pirrama Road to quieter pedestrian areas in Pyrmont Street
- Changes of paving material in public domain to clearly delineate roadway and footpath
- Header course or flush concrete kerb to accentuate the edge of vehicle links
- Bollards for pedestrian/crash protection and to define the transition zone between pedestrian and vehicle access areas
- Sight lines clear of obstructions (e.g. Trees or street furniture) at entry and exit points in accordance with AS2890.1.

With the above mitigation strategies in place, the development proposed in Modification 13 will have a limited environmental impact, during construction and operation, beyond what exists, up to and including Modification 14.

Conclusion

After assessment of the development proposed in Modification 13 against the relevant SEAR's transport related requirements (refer Table 1.1), it is concluded that the proposed development will have a limited environmental impact, during construction and operation, beyond what exists, up to and including Modification 14.

1 INTRODUCTION

1.1 CONTEXT

The Star Entertainment Group Limited (SEGL) is a leading operator of integrated resorts catering to both local and international visitors and is the operator of The Star Sydney (The Star). SEGL is proposing to advance a revitalisation of the existing complex.

SEGL has commenced a five-year redevelopment journey to create a landmark, exemplar integrated resort. This proposed redevelopment will occur through the lodgment of two s75W modification applications to the original Major Project Approval (MP08_0098) with the *Department of Planning and Environment* (the Department).

Modification 14 (Mod 14) was determined in October 2017 and included approval for a range of upgrades to the existing site. These upgrades included the enclosure of the level 3 terrace to facilitate an expansion in gaming floor area and a new bar and restaurants, expansion of the level 3 pre-function space, changes to the Astral Hotel lobby and retail space, and alterations to internal vertical transportation, services and infrastructure, including the harbour heat rejection system.

Modification 13 (Mod 13) is a modification to the development as approved under MP08_0098, up to and including Mod 14. Accordingly, in the impact assessments that follows, the base case, or 'Do Nothing', includes the approved future Mod 14 development.

1.2 SITE LOCATION & DESCRIPTION

The subject site (the site) is located at 20-80 Pyrmont Street, Pyrmont, which is legally described as Lot 500 in DP1161507, Lot 301 in DP 873212 (SP56913), and Lot 302 in DP873212. The site also accommodates a light rail line (including 'The Star' light rail station) legally described as Lot 211 in DP 870336. The service road to the north of the site, comprising Lot 1 in DP 867854 and Lot 201 in DP 867855, is also part of the proposal under Modification 13.

The site is bounded by Pirrama Road to the north-east, Jones Bay Road to the north-west, Pyrmont Street to the south-west, Union Street to the south and Edward Street to the east. The location and configuration of the site is shown in Figure 1.1 below.

Figure 1.1: Aerial Image of the Subject Site

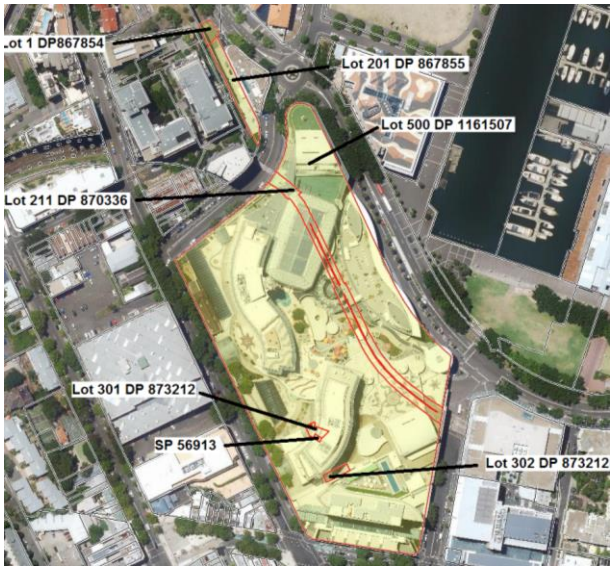
Map Source: maps.six.nsw.gov.au

The site is leased by SEGL from the Independent Liquor and Gaming Authority (ILGA). SEGL is a leading operator of integrated resorts that appeal to both local and international visitors. SEGL is the operator of The Star Sydney (The Star), with a casino license to operate a casino through to the year 2093.

The legal description of the site is presented in Figure 1.2.

The site has a total area of 39,206m^2 (excluding Lot 1 in DP 867854 and Lot 201 in DP 867855 to the north), and is occupied by the existing integrated resort which includes a multi-storey entertainment facility, gaming areas, retail spaces, multiple restaurants and bars, the Sydney Lyric Theatre, 480 hotel rooms/serviced apartments across three towers, and basement parking.

Figure 1.2: Legal Description of the Site



Map Source: maps.six.nsw.gov.au

1.3 SITE ACCESS

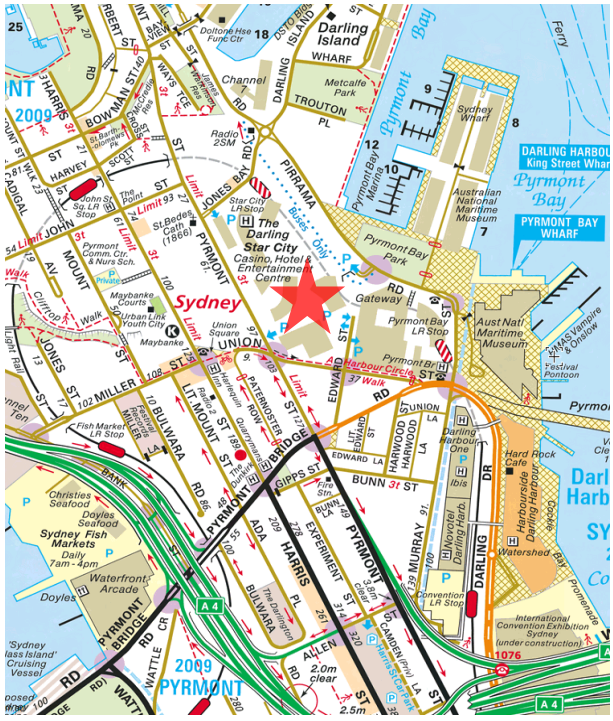
The areas surrounding the site have mixed use, with public, commercial, and residential buildings present. Significant attractors to the local area also include the National Maritime Museum, The Novotel Darling Harbour Hotel and the Sydney International Convention Centre.

Major arterial roads serving the area include the Western Distributor, the Cross-City Tunnel, and Harris Street. The Star site access roads are shown in Figure 1.3.

The site is well serviced by public transport with access to light rail, bus, and ferry services. CBD heavy rail services at Town Hall Station are also available within a 15-minute walk of the site via Pyrmont Bridge.

The Pyrmont Bridge provides a link to the CBD for pedestrian and cyclists. In addition, there are dedicated cycle lanes along Union Street (adjacent to the site) linking with cycling routes across the Anzac Bridge and beyond.

Figure 1.3: The Star Site Access Roads



Source: © 2010 Streetdirectory.com.au

A light rail station is provided directly under The Star, offering access from the station via stairs and lifts. The light rail operates between Central and Dulwich Hill, with services to The Star operating 24 hours a day. Light rail services are currently highly utilised in the AM and PM peak periods, with up to 95% of total capacity occupied.

Figure 1.4: The Star Light Rail Station

The Star is permitted to have a maximum of 3,000 car parking spaces across the whole site (per MP08_0098).

There are three major vehicular access points to the Casino including:

- Edward Street East/Pirrama Road intersection;
- Edward Street West from Pyrmont Bridge Road, and
- Jones Bay Road left-in-only access to the Port Cochere

Currently, pedestrians can access the Casino complex via entry points on Pyrmont Street, Jones Bay Road, Edward Street and Pirrama Road.

1.4 PREVIOUS STUDIES

Current transport access arrangements for The Star site were established based on the following traffic impact statements:

- Transport Impact of Star City Redevelopment prepared by Arup dated September 2008 and supplementary report dated December 2008;
- Traffic impact of Star City Redevelopment prepared by Arup dated September 2008;
- Report Addendum prepared by Arup, dated 11 August 2009;
- Traffic Impact Assessment prepared by Arup, dated October 2010, Arup Transport Report, dated 14 January 2011 and Arup response to PAC comments on MUEF Loading Dock dated 10 June 2011; and
- Modification 14 Traffic Impact Assessment, Mott MacDonald, September 2016.

This report provides an update of transport access conditions and assesses the cumulative traffic impacts of Modification 13 and 14 against the Secretary's Environmental Assessment Requirements (SEARs).

Figure 1.5: Jones Bays Road Entry to the Port Cochere

1.5 SEARS

Urbis, on behalf of SEGL, made a request for Secretary's Environmental Assessment Requirements (SEARs), pursuant to Clause 3, Schedule 2 of the Environmental Planning and Assessment Regulation 2000 in relation to the modification of MP08_0098. The request was made on 17 December 2015 for works proposed under Modification 13.

The relevant SEAR's requirements are addressed in Section 4 of this report. A summary of the SEARs and a reference for the section in this report where each is assessed, is provided in Table 1.1.

Table 1.1 Applicable SEAR Requirement for Modification 13

	SEAR Requirement	Report Reference
Operational Related Requirements		
1	Evaluates daily and peak hour vehicle, public transport and pedestrian movements likely to be generated by the development (construction and operation) including peak traffic movements.	Section 4.2
2	Models and assesses the current and future performance of key intersections providing access to the site under 'project and 'no project' scenarios, and identifies any upgrades (road/intersections) required because of the proposal.	Section 4.3
3	Evaluates the cumulative impacts and potential conflict with traffic movements generated by existing and approved development near the site.	Section 4.4
4	Assesses the ability of existing and future public transport networks (including light rail, ferry, and bus networks) to accommodate the forecast number of trips generated by the proposal.	Section 4.5
5	Assesses and details the impacts on the light rail (including passenger access to platforms) to ensure the development does not adversely impact on its safe and efficient operation.	Section 4.6
6	Outlines existing public transport services and opportunities for greater usage for workers and visitors.	Section 4.7
7	Details sustainable travel initiatives for workers and visitors, particularly for the provision of end-of-trip facilities.	Section 4.8
8	Details existing and proposed vehicular access and car parking arrangements for workers and visitors (cars, coaches/buses & taxi ranks), including compliance with parking codes and Australian Standards.	Section 4.9
9	Details of the potential impacts to access and manoeuvring in the bus interchange.	Section 4.10
10	Identifies pedestrian and cycle connections/circulation, particularly the cycle network identified in the Sydney City Centre Access Strategy.	Section 4.11
11	Details access arrangements for emergency and service vehicles, including loading dock arrangements.	Section 4.12
Construction Related Requirements		
12	Outlines anticipated daily and peak hour light and heavy vehicle movements to and from the site.	Section 4.13
13	Outlines car parking and work zones for construction traffic.	Section 4.14
14	Outlines access arrangements for workers to/from the site, emergency vehicles, and service vehicle movements.	Section 4.15
15	Outlines measures to mitigate construction traffic impacts on vehicles, pedestrians, cyclists, and public transport operations.	Section 4.16
16	Outlines measures to maintain pedestrian and cyclist safety during construction.	Section 4.17

1.6 PLANNING CONTEXT

The following section discusses environmental planning instruments, strategies, plans and guidelines considered relevant to the SEARs assessment of Modification 13.

1.6.1 Integrating Land use & Transport Policy, 2000

The Transport for NSW Integrating Land Use and Transport (ILUT) policy package provides a framework for NSW Government agencies, councils and developers to integrate land use and transport planning at regional and local levels, and is given statutory authority through Section 117 of the Environmental Planning and Assessment Act 1979, which allows the Minister for Planning to give directions to councils regarding the principles, aims, objectives or policies to be achieved in the preparation of local environmental plans.

The ILUT policy package is represented by Ministerial Direction 3.4 - Integrating Land Use and Transport. The five objectives of Direction 3.4 are:

1. Improving access to housing, jobs and services by walking, cycling and public transport;
2. Increasing the choice of available transport and reducing dependence on cars;
3. Reducing travel demand including the number of trips generated by development and the distances travelled, especially by car;
4. Supporting the efficient and viable operation of public transport services; and
5. Providing for the efficient movement of freight.

1.6.2 Sydney City Centre Access Strategy, 2013

The Sydney City Centre Access Strategy[1] (SCCAS) is NSW's first detailed plan setting out preferred routes for people to enter, leave and travel within the central part of Sydney, which includes The Star's site at Pyrmont.

The SCCAS emphasises the need to integrate all modes, to manage demand effectively, and maximise uptake and supply of public transport to keep the city growing and thriving. The SCCAS identifies the following TfNSW actions that would directly benefit visitors and staff travelling to The Star:

- Simplify and extend the late night public transport network, including transporting people from key night time precincts into Town Hall for easy distribution on the late night public transport and NightRide system;
- Increase bus frequencies on routes and corridors serving the late-night economy; and
- Improving the safety at key locations on existing cycleway links.

This will result in:

- New bus services and longer hours of service for bus passengers;
- More integrated late night bus services connecting to key late night hubs including NightRide services, and
- Improved safety for those travelling at night.

The SCCAS also flags that it intends to investigate the provision of off-street and on-street parking, noting that: Off-street parking is the major generator of vehicle traffic entering and exiting the city centre during peak periods. The location of parking facilities, as well as their size and how they are accessed, determines how much congestion they cause.

[1] Transport for NSW, December 2013, http://www.transport.nsw.gov.au/sites/default/files/b2b/publications/sydney-city-centre-access-strategy-final-web.pdf

1.6.3 City of Sydney Cycle Strategy and Action Plan 2007-2017

Released in 2007, the City of Sydney Cycle Strategy and Action Plan covers a ten-year period, which is now nearing its conclusion (in 2017). Targets include:

- Trips by cycling, as a percentage of all trips, to increase from under 2% in 2006 to 10% by 2016;
- Increase the proportion of all trips between 2km and 20km to 20% made by bicycle by 2016;
- Achieve 80% confidence for cyclists within the City of Sydney by 2016;
- Reduce the number of collisions and injuries involving bicycles;
- Secure resident and employee parking and high-quality end of trip facilities at all new relevant developments, and
- Visitor cycle parking to be provided at all new developments.

SEGL is proposing to provide cycle parking for Modification 13 in accordance with Council DCP rates.

1.6.4 City of Sydney Walking Strategy and Action Plan 2015-2030

Released in 2015, the City of Sydney Walking Strategy and Action Plan sets out the City's vision for walking over the next 15 years. The high-level targets, relevant to The Star, are summarised as follows:

- Walking to increase as the primary mode of transport for commute trips amongst City of Sydney residents from 29% to 33% by 2030;
- Walking to account for 60% of local trips (within CoS) by 2030, and
- Walking to account for 50% of all trips to and from late-night precincts (such as Star) by 2030, up from 37% today.

1.6.5 Environment & Sustainability

SEGL has a five year "Environment and Sustainability Strategy and Framework" comprising six key focus areas (shown below), which include a range of projects and initiatives aimed at delivering tangible outcomes and enduring behavioral changes.

Figure 1.6: The Star's Environment and Sustainability Strategy Focus Areas

Recent achievements of the Strategy include:

- Sustainability Committees at each casino property for ongoing accountability – the Travel Plan Champions (TPC) could report to this Committee.
- Environment and Sustainability intranet site reaching over 6000 team members since its program launch – the adopted Travel Plan could be located on this site also, with regular updates on progress.
- Development of a Draft Star Travel Plan

1.7 STANDARDS

The proposed development has been assessed against all relevant standards/guidelines, including the following:

- AS/NZS 2890.1 (2004): Off-street car parking. For design of carpark spaces / dimensions, aisle dimensions, pavement marking and signposting.
- AS 2890.2 (2002): Off-street commercial vehicle facilities. For layout, design, operation of loading dock, service area, access driveways.
- AS 2890.3 (2015): Bicycle parking. For layout, design of bicycle parking devices, pavement marking, signposting and clearances.
- AS/NZS 2890.6 (2009): Off-street car parking for people with disabilities. For design requirement of carpark spaces, headroom, dimensions, and pavement marking for people with disabilities.
- RMS Guide to Traffic Generating Developments 2002. For reviewing the general requirements of traffic generation from the new developments.
- RMS Guide to Traffic Generating Developments, Updated traffic surveys (TDT 2013/04a). For determining specific trip generation for high density apartment buildings in Pyrmont.
- City of Sydney DCP 2012. Schedule 7, Transport, parking, and access. For assessing the requirements for parking access and design, and the active transport strategy.
- City of Sydney LEP 2012, Part 7, Division 1. For establishing maximum limits for parking.
- Austroads Guide to Road Design.
- Austroads Guide to Traffic Management, Part 12, Traffic Impacts of Development.

1.8 STAKEHOLDER CONSULTATION

During the development and assessment of the Modification 14 and 13 applications, SEGL met with the following stakeholders to identify traffic concerns or issues relating to the Star's upgrade proposals;

- City of Sydney, 17/10/2016, meeting with Council planning team to discuss Taxi ranks and Pyrmont Street entry.
- City of Sydney, 22/11/2016, Site inspection with Council traffic engineering and planning team to discuss the Modification 14 and 13 proposals.
- City of Sydney, 13/2/2017, meeting with Council traffic engineering and planning team (meetings minutes attached in Appendix E).
- TfNSW, CBD Coordination Office, 10/1/2017 and 30/1/2017, meetings to identify and discuss major developments occurring in the CBD over the next 5 years (meeting minutes attached in Appendix E).
- TfNSW, CBD Coordination Office, 12/7/2017, meeting to brief Transport on Modification 13, seek updates on major CBD developments, and contacts for RMS and Sydney Buses (meetings minutes attached in Appendix E)
- TransDEV, 2/8/2017, meeting to brief the Light Rail operator on Modification 13, and subsequent site visit on 17/8/2017
- SEGL has contacted the RMS Land Use Management team to provide a stakeholder briefing. A copy of that briefing is presented in Appendix E.

1.9 COMMUNITY CONSULTATION

As part of the development of the Modification 13 application, SEGL engaged KJ Associates to manage and document a community engagement process. Several public information sessions were held and visitors were given the opportunity to provide feedback through an on-line survey. Mott MacDonald representatives also attended several sessions to answer traffic queries and listen to community concerns first-hand.

Below is a summary of the main traffic and parking related concerns raised by the community with respect to Modification 13.

1.9.1 Traffic

There was a notable amount of feedback in relation traffic and transport, which has known issues in the area. Feedback highlighted concerns in relation to increased traffic congestion in the area because of the proposed development – both during the construction and operational phases. Comments noted specific areas of concern including Harris Street, Pyrmont Bridge Road, Pyrmont Street, Pirrama Road, Point Street and access to the Anzac Bridge.

Some people felt that the residential component of the development will generate further traffic and transport issues. Residents were particularly concerned about how changes to traffic flow would impact upon access to their properties.

Increased pressure on public transport services was identified as an issue of interest. It was noted that the light rail is at capacity and that buses in the area (e.g. 389 bus) are not frequent enough. It was suggested that there is a need to increase the frequency of light rail and bus services, and introduce a regular ferry service to and from the venue.

There was also discussion around the need for an integrated traffic and transport strategy for the area, taking into consideration new developments including, but not limited to, Harbourside, Cockle Bay, The Ribbon, and Bays Precinct. It was suggested that The Star has a role to play in developing a more comprehensive approach to traffic and transport in the area.

1.9.2 Parking

Residents were also concerned about parking related issues, noting that there is currently insufficient street parking, particularly when there are events in the area. There was some concern that there will be no provision for additional parking.

1.10 SCOPE OF THIS REPORT

The remainder of this report details:

Section 2 – Existing Transport Conditions. This section provides an update of existing transport conditions around the site in accordance with the SEARs.

Section 3 – The Modification. This section provides a description of the key traffic and transport aspects of the modification

Section 4 – Impact Assessment & Conclusions. Provides an impact assessment of the modification against each transport requirement in the SEARS

Section 5 – Summary & Conclusions. This section identifies the suggested commitments required to mitigate the potential adverse transport impacts of the proposal. It finishes with a conclusion confirming that the proposed development will have a limited environmental impact, during construction and operation, beyond what exists, up to and including Modification 14.

2 EXISTING TRANSPORT CONDITIONS

This section provides an update on existing transport conditions around the site in accordance with the SEARS conditions.

2.1 DATA REFRESH

The following data was collected for the Modification 13 and 14 assessments:

- Peak period pedestrian and classified vehicular movements at 8 critical junctions around the site (Nov 2017);
- 7-day classified link flow counts on Pirrama Road, Pyrmont Street, and Jones Bay Road (Nov 2017);
- Inventory of on-site parking facilities (June 2016);
- A 9-month sample of on-site car park utilisation based on car-park barrier counts (ending September 2015);
- A detailed 7-day on-site parking space utilisation survey derived from Star's new Skidata parking management system (May 2016); and
- A staff travel survey undertaken in August and September 2016.

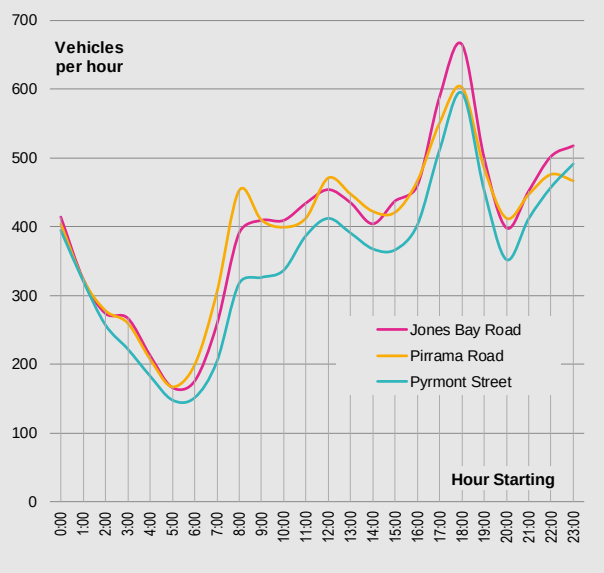
2.2 EXISTING TRAFFIC DEMAND

Mid-block traffic surveys were undertaken over a 7-day period in November 2017 on Jones Bay Road, Pirrama Road and Pyrmont Street. The classified surveys revealed the following patterns:

- 2-way traffic flows around The Star site generally peak at around 6pm;
- Jones Bay Road experiences the highest 2-way traffic flows which peak at 670v/h; and
- Heavy vehicles represent up to 6.7% of daily traffic flows on Pirrama Road. Whilst the proportion of heavy vehicles on Jones Bay Road and Pyrmont Street is less than 4.0% and 6.4%, respectively.

The average hourly demand profile is presented in Figure 2.1.

Figure 2.1: 7-day Average Hourly Demand Profile (vehicles) For Week Ending 19 November 2017



2.3 ROAD NETWORK PERFORMANCE

The existing performance of the surrounding road network was assessed using SIDRA 7.0 Network. This software assesses intersection performance in terms of:

- Levels of Service (RMS Delay method);
- Degree of Saturation, and
- Average Vehicle Delays (secs).

Site inspections were undertaken at eight critical intersections in the adjacent network in peak periods to record prevailing cycle lengths, phasing arrangements, green-splits, queue lengths and pedestrian protection. The signal timing assumptions adopted for the base case analysis is presented in Appendix A.

The road network performance has been assessed at the following peak traffic periods:

- AM peak, 8:00am to 9:00am;
- PM Peak, 5:30pm to 6:30pm; and
- Off-Peak, 10:30pm to 11:30pm.

The Level of Service (LOS) results of the SIDRA analysis are summarised in Table 2.1. The analysis indicates that all sites are providing good levels of services (LOS C or better), in all peaks, which suggests that the network has significant reserve capacity. Detailed SIDRA Network analysis outputs for the existing network are presented in Appendix A.

2.4 OFF-STREET CAR PARKING

A detailed audit of parking spaces, undertaken for the design of The Star's new Skidata parking management system, revealed that The Star car park had capacity for 2,845 vehicles. The inventory of parking spaces on each parking level is presented in Table 2.2.

MP08_0098 established an approved maximum car parking limit of 3,000 spaces for the site. However, due to operational, circulation and storage requirements, the full car park capacity has not been realised. Whilst SEGL is proposing the construction of 221 parking spaces as part of Modification 13, the total parking provision on-site will not exceed the current approved maximum 3,000 parking space limit for the site.

A review of car-park utilisation was undertaken using two data sources:

- A 9-month sample of car-park barrier counts, for the period ending September 2015, sourced from the old parking management system, and
- A detailed 7-day sample of space occupancy, undertaken in May 2016, sourced from the recently installed Skidata parking system.

The analysis of the larger 2015 data sample, as presented in Table 2.3, revealed an average maximum occupancy rate of 92%, on Saturdays, which leaves an average 230 spare spaces. In rare cases where patrons were turned away, the excess was accommodated through on-street or private car-parks within walking distance of The Star. The alternate parking sites are discussed later in Section 2.5.

Table 2.1: Existing Road Network Performance November 2017 (Level of Service)

Site	AM	PM	OffPk
1. Pyrmont St & Jones Bay Rd	A	A	A
2. Pyrmont St & Union Street	B	C	C
3. Pyrmont St & Pyrmont Bridge Rd	B	C	C
4. Pyrmont Bridge Rd & Union St	A	A	A
5. Pirrama Rd & Star Car Park Entry	A	B	B
6. Jones Bay Rd & Pirrama Rd	A	B	B
7. Union St & Edward St	B	C	C
8. Pyrmont Bridge Rd & Murray St	C	C	C

Source: Mott MacDonald SIDRA 6.1 Network Analysis

Table 2.2: Inventory of Star Car Park Capacity (May,2016)

Level	Casual	Sovereign	Mobility Impaired	TOTAL
P1	459		6	465
P2	220	302	4	526
P3	601		18	619
P4	679			679
P5	556			556
Total	2515	302	28	2845

Source: Star Skidata System

Table 2.3: Average Daily Car Park Movements & Occupancy Rates (Jan-Sep 2015)

Day of week	Average Daily Car-park Exit Movements	Average Maximum Occupancy Rate	Max No. of Turn-away
Mon	3466	63%	0
Tue	3434	65%	0
Wed	3613	68%	0
Thu	3876	72%	0
Fri	4101	79%	80
Sat	4669	92%	150
Sun	4640	78%	100
7-Day Ave	3971	74%	

Source: Star Barrier Count Surveys

The more detailed space occupancy data, sourced from The Star's new Skidata parking system, revealed the following demand patterns during the 1-week sample collected in late May 2016:

- The heaviest demand for The Star car-parking occurred Thursday to Sunday.
- Car park capacity peaked at just over 2400 spaces (86% utilisation) by 10pm on the Saturday evening.
- The main influx of parking demand occurred after 6pm on Friday and Saturday. On Thursday and Sunday the influx of parking demand occurs earlier in the middle of the day.
- Level P1 and P5 were generally underutilised and did not exceed 59% and 78% utilisation, respectively.
- Use of mobility impaired parking spaces peaked at 88% utilisation.
- Sovereign parking spaces were close to 100% utilised each night by 8pm.

The results of the analysis are presented below in Figures 2.2 to 2.4.

Figure 2.2: Star Car Park Utilisation, By Level, Thu-Sun for Week Ending 29 May 2016

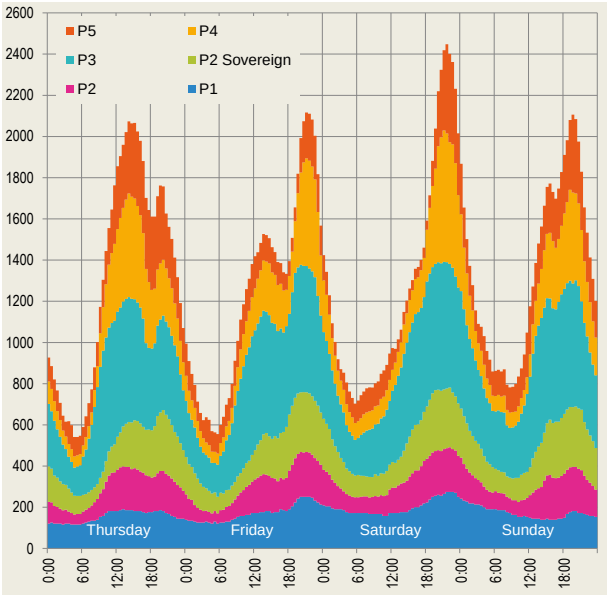


Figure 2.3: Star Car Park Utilisation, By Type, Thu-Sun for Week Ending 29 May 2016

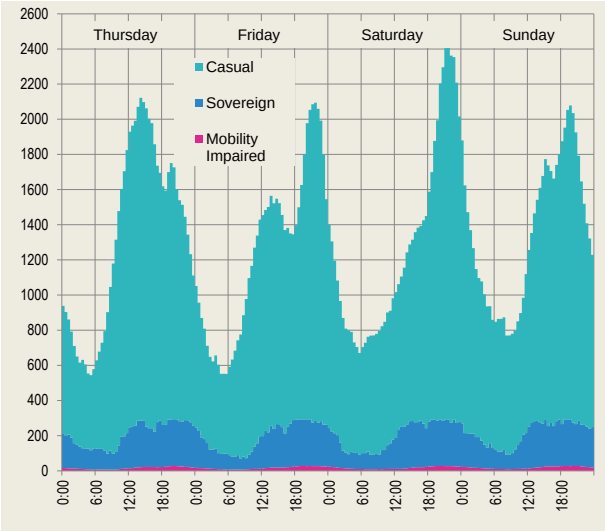
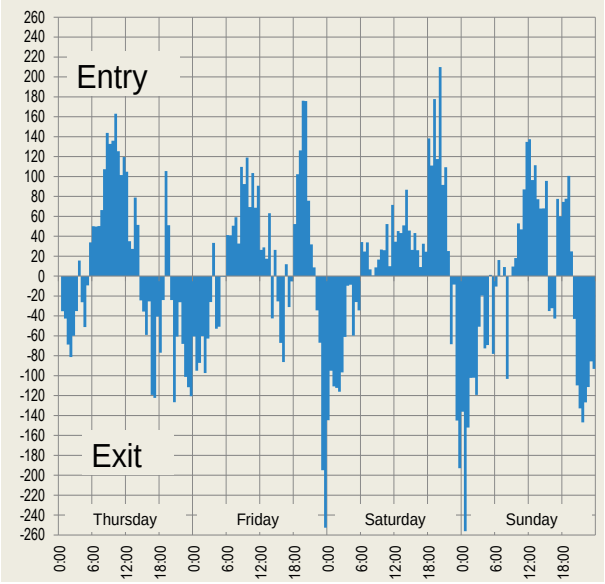


Figure 2.4: Star Car Park Net Entry and Exits, Thu-Sun, for Week Ending 29 May 2016



2.5 ALTERNATE PARKING

An inventory of alternate off-street and on-street car parking within walking distance of The Star site was undertaken in June 2016.

A summary of off-street and on-street car parking capacity and availability (during business hours) is presented in Figures 2.5 and 2.7. The on-street parking inventory was broken down into 6 geographic sectors, as shown in Figure 2.6.

The inventory revealed:

- 2892 off-street parking spaces within walking distance of The Star site.
- Utilisation of these spaces during business hours was around 60% leaving up to 1,150 spaces available for use by The Star patrons as an alternative to on-site parking.
- The Harbourside carpark located to the south of the site had the greatest number of vacancies.
- There were over 1,200 on-street parking spaces within walking distance of the site and up to 275 (22%) were available during the business hour survey.
- The largest concentration of on-street spaces is to the north-west of the site.

Figure 2.5: Off-street Car Parking Availability Within Walking Distance of The Star

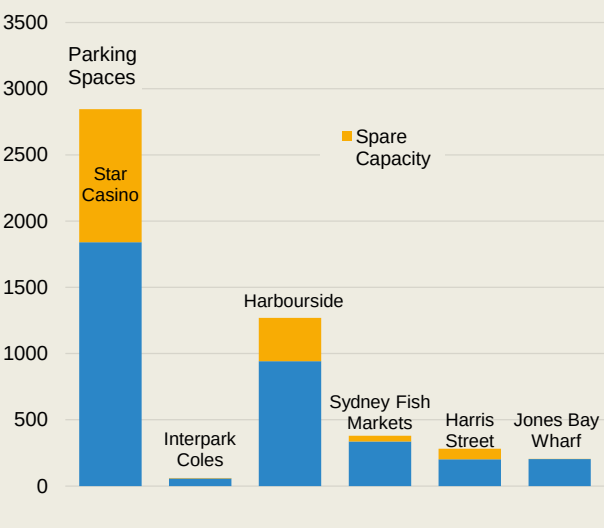
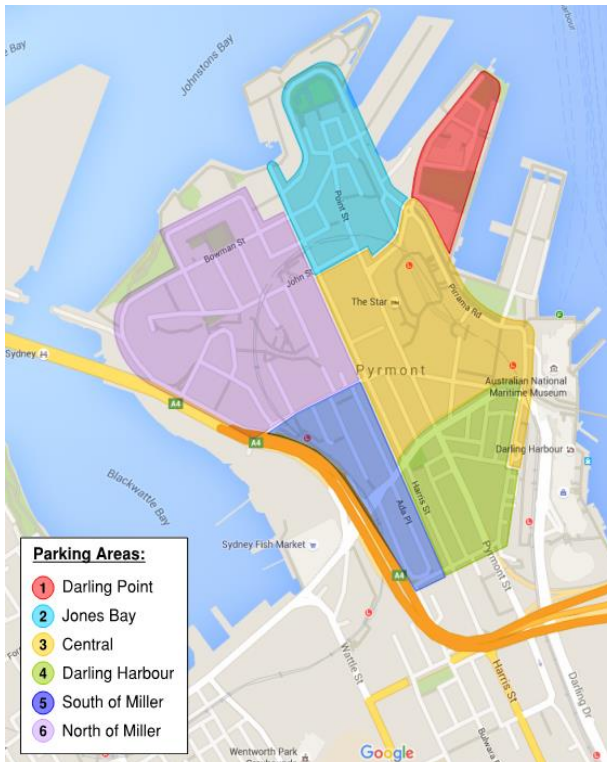


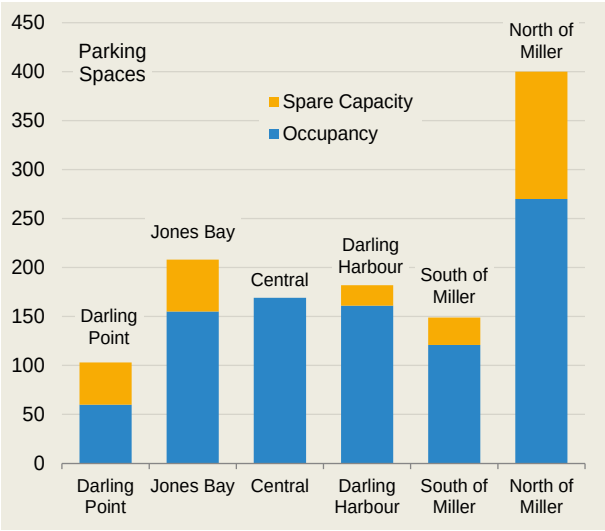
Figure 2.6: On-street Parking Zones



Source: google.com.au/maps

The recent opening of the ICC Sydney with its two 24-hour parking stations has provided an additional 826 off-street parking spaces within walking distance of The Star.

Figure 2.7: On-street Parking Availability within walking Distance of The Star



2.6 PARKING GUIDANCE SYSTEMS

On those occasions when The Star's own customer car park reaches capacity, there is no coordinated, real time response guiding customers to alternate off-street car parking locations. The main parking alternatives for Star visitors are:

- On-street parking
- The Star valet parking
- Off-street commercial parking sites such as at commercial sites such as Jones Bay Wharf, harbourside and Sydney ICC.

The preference for managing over-flow demand from the Star car park is to redirect visitors to off-street parking sites. On-street spaces in off-peak periods are limited in the Pyrmont area and visitors searching the network for spaces add to local traffic congestion.

There was a parking guidance system in place around The Star precinct to direct visitors to local off-street parking facilities. However, this system is:

- Not fully operational;
- Not up-to-date in respect to all available local car parking provisions;
- Not designed or operated to a consistent standard; and
- Ineffectual in providing drivers with accurate and timely real-time information enabling them to make informed decisions on their car parking options.

Recently, Lend Lease engaged Parking Sense (as part of the ICC construction) to upgrade part of the system, obtain data feeds from local car parks and manage the system. As part of this work, the following signs were installed:

- Sign gantry on the westbound exit from the western distributor to the Darling Drive roundabout (refer Figure 2.8); and
- Cantilever sign on Pyrmont Bridge Road immediately north of Pyrmont Street (refer Figure 2.9).

At present the two new signs do not display information on The Star car park capacity. SEGL's parking managers, Park Assist, are working with Parking Sense to agree commercial arrangements for the supply and distribution of parking information

The design of the two new parking guidance signs is inadequate in the following ways:

- There is too much information on the signs. Drivers will have insufficient time to read, consider and react;
- The provision of two ICC focal points is unnecessary at these decision points. A single combined total for ICC would have sufficed;
- Information, such as the parking and arrow symbols, is unnecessarily repeated on the signs adding to the clutter;
- This upgrade covers only part of the existing Pyrmont system, and
- Some key destinations are missing e.g. Harris Street.

Figure 2.8: Sign on Western Distributor Off-ramp

Figure 2.9: Sign on Pyrmont Bridge Road

Figure 2.10: Existing and Alternate Pyrmont Bridge Road Sign Design

In response to stakeholder comments, Modification 14 is upgrading the Pyrmont Parking Guidance System (PPGS) as outlined below:

- SEGL will work with TfNSW and Parking Sense to upgrade the PPGS;
- SEGL to provide data feed to Parking Sense, and mobile parking apps, to continually update signage displays; and
- SEGL to contribute to upgrade costs of the system and lead resolution of the proposed signage.

The main benefits of the upgraded system include:

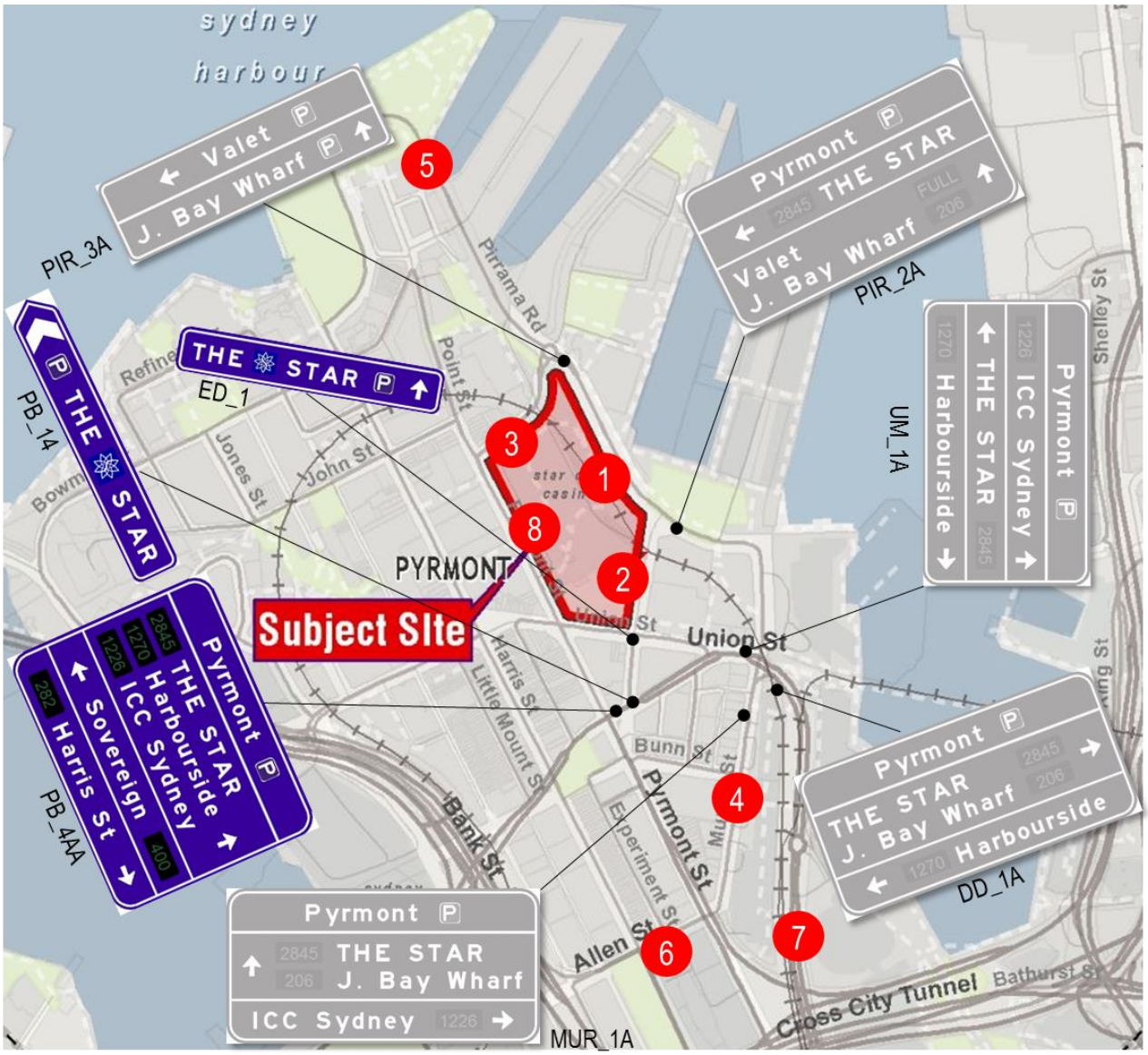
- It reduces unnecessary circulation of traffic in the precinct. Drivers are warned early enough that they can choose an alternate parking facility if their first choice is full;
- It does not impact on mode-share decisions (drivers have already committed to car use);
- Driver focus remains on the road and not on a mobile navigational device; and
- Most of the system is already in place.

Modification 13 will require some additional signage. The proposed modifications to the PPGS scheme under Modification 13 are presented in Figure 2.11.

Modification 13 also included the following minor modifications to the Modification 14 upgrades:

- 2 new static signs on Pyrmont Bridge Road; and
- A re-design of the Pyrmont Bridge Road and Pyrmont Street sign (PB-44A).

Figure 2.11: Proposed Pyrmont Parking Guidance Scheme



Parking Stations

1. The Star Pirrama Road Car Park
2. The Star Edward Street Car Park
3. The Star Valet parking
4. Harbourside Car Park
5. Jones Bay Wharf Car Park
6. Harris Street Car Park
7. ICC Sydney Car Park
8. The Star Sovereign Pyrmont Street Car Park

2.7 STAFF TRAVEL PATTERNS

2.7.1 Staff Travel Survey

The Star employs up to 5,000 staff. Only 2,500 may work on-site on any given day.

In August and September 2016, The Star undertook a travel survey of staff and contractors as part of an update to The Star Travel Plan.

The survey was issued by email and offered random prize draw of a $250 Star card to encourage participation. The Star received 913 complete responses and 71 incomplete responses. This represents a statistically significant response rate for the given population and a margin of error less than 5%.

The results of the staff travel survey are presented in the following sections.

2.7.2 Staff Roles

The breakdown of roles of the 913-staff surveyed is presented in Table 2.4. Most staff (73%) were engaged in roles that require shift work whilst the remaining staff worked typical office hours.

2.7.3 Staff Arrival & Departure Patterns

The Star is a 24/7 operation and never closes. A review of shift data provided by The Star revealed the following:

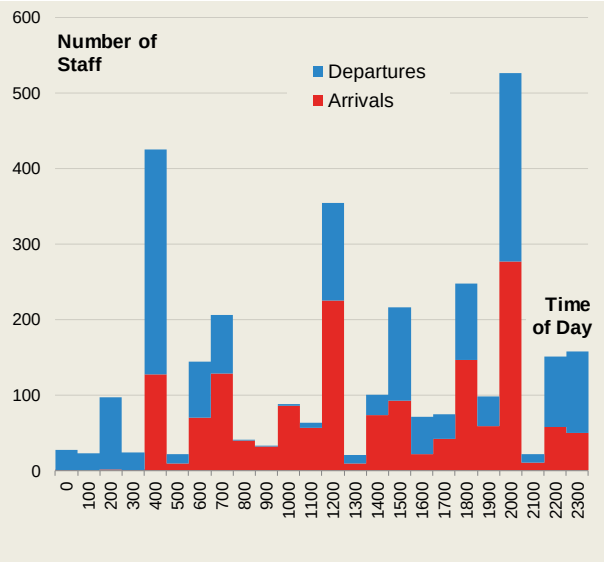
- The main shift changeover times fall outside traditional AM and PM peak periods and instead peak at 4am, noon and 8pm.
- The secondary staff peaks occur at traditional AM and PM peak periods.
- There are additional supplementary shifts across the day which help to minimise the overall impact of staff travel across the transport network.

Staff arrival and departure patterns over a typical weekday are presented in Figure 2.12.

Table 2.4: Staff Roles

Role	%
Corporate/ Office	27%
Hotel & Guest Experience	7%
Gaming, Food and Beverage	60%
Security	6%

Figure 2.12: Staff Arrival and Departure Times over a typical weekday



2.7.4 Staff Travel Modes

The breakdown of daily travel modes, of the 913-staff surveyed, are presented in Table 2.5.

This clearly demonstrates the excellent public transport connectivity of the site which has achieved up to 42.1% of all staff trips to/from the site by public or active transport modes.

To put this in context, staff trips represent less than 16%, 15% and 7% of all car trips to/from the site during the AM, PM and Off-peak periods, respectively (refer Table 2.6).

Table 2.5: Staff Mode of Travel

Mode	%
Car as driver or passenger	52.4%
Train	21.7%
Active transport (walk or cycle)	7.1%
Light Rail	6.2%
Bus	6.2%
Motorcycle	2.7%
Ferry	0.9%
Other	2.7%
Totals	100%

Table 2.6: Staff Contribution to Site Car Trips

	AM	PM	OP
No. Employees trips	200	280	150
% by Car	52%	52%	52%
Estimated No Employee Car Trips	105	147	79
Total Number of Observed Car Trips to/from the site(1)	660	956	1100
Employee contribution to Car trips to the site	16%	15%	7%

Notes

1) Hourly observed traffic movements entering The Star car parks and Port Cochere during the AM, PM and Off-peak hour (Nov 2017).

2.8 ACTIVE TRANSPORT

Pedestrian and cycling facilities in proximity of the site provide a sound level of access to the strategic network, including a shared path link to the CBD via Pyrmont Bridge, a shared path link to the west via the Anzac Bridge, and an on-road (mixed traffic) link to the south via Darling Drive.

The cycleway on Pyrmont Bridge Road is identified as a strategic route in the Sydney City Centre Access Strategy, and provides access to the greater strategic network. Pyrmont Bridge is similarly identified as a strategic route that provides access to and from the CBD for both cyclists and pedestrians. A shared path network along the foreshore also provides a scenic recreation route for leisure purposes as well as access to commercial areas including Jones Bay Wharf.

Active transport access to The Star is provided via a separated cycleway on Union Street, a shared path and mixed traffic conditions on Pirrama Road, and the footpath network on all roads surrounding the site. The active transport network in proximity of the site is presented in Figure 2.13.

End of trip facilities are provided at The Star for staff to change and shower after cycling to work. It is noted that there are opportunities to improve visitor cycle parking at The Star. During site visits bikes were observed chained to the fences on Pirrama Road, demonstrating that cycle parking conveniently located near the key pedestrian access points would improve accessibility and safety for cyclists. There are currently no formal bicycle parking provisions for guests visiting the site.

Data collected by Strava in relation to cycling was analysed to determine the utilisation of the active transport routes in proximity of The Star. Strava is a company that collects data from active transport users recording journeys using their applications. A heatmap generated from Strava data, sourced March 2017, is presented in Figure 2.14

Figure 2.13: Active Transport Networks

Map Source: sydneycycleways.net/map/

Figure 2.14: Strava Heat Map of Existing Cycleway & Walkway Utilisation

Source: Strava, March 2017

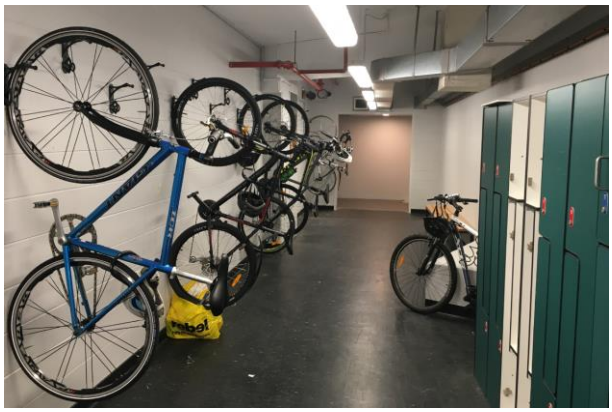
Figure 2.15: Union Street Cycleway, Pyrmont

2.9 CYCLE PARKING

2.9.1 Existing

The Star's staff end of trip facilities for cyclists, consists of 26 wall-mounted racks and storage lockers in a secure room accessible only by staff security cards. It has no showering facilities. The room is located on level P2 of the car park, accessed via the entry ramp off Edward Street. The door to the room opens and closes automatically so that staff do not have to dismount their bikes. A series of bollards provide protection for waiting cyclists.

Figure 2.16: Secure Staff Bike Parking Facility



The Star Traffic Manager advises that storage lockers in the staff bike parking room are not being used by staff due to the lack of shower facilities. Staff prefer to leave their bike and change/shower in the extensive back-of-house staff facility on the level above.

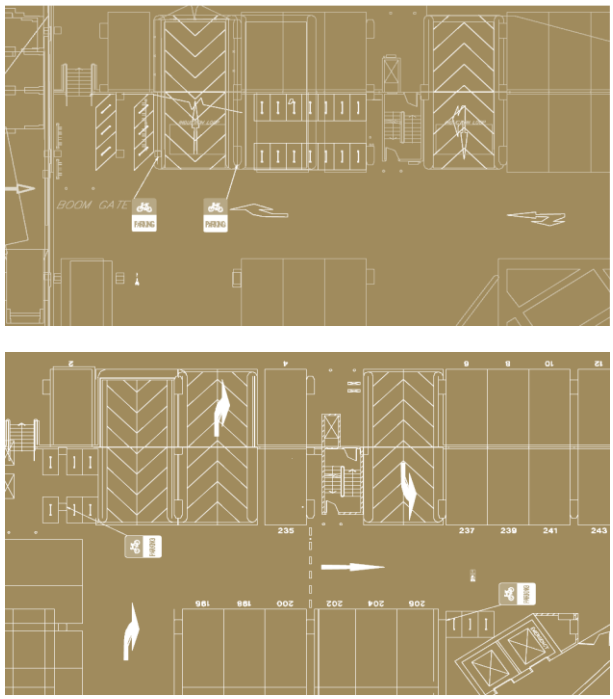
Staff surveys revealed that 7.1% of staff are travelling to work at Star by active transport (cycling or walking). To place this in context, based on a daily workforce of 2,500 staff, this represents up to 180 people per day.

2.9.2 Modification 14

As part of modification 14, SEGL is implementing the following upgrades to cycle parking, which will be in place prior to the completion of Modification 13:

- SEGL is removing the underutilised lockers in the existing staff bike parking facility and installing five additional bike parking racks to accommodate the additional staff parking requirements associated with Modification 14.
- SEGL is installing 29 visitor parking spaces located across the Level B1 and B2 car parks as part of Modification 14 (refer Figures 2.17).

Figure 2.17: Level B1 and B2 Visitor Cycle Parking Proposals



2.10 PEDESTRIAN ACCESS

2.10.1 Existing

The main pedestrian access points to the site include:

- Pirrama Road;
- Pyrmont Street;
- Jones Bay Road; and
- Union Street and Edward Street.

Pedestrian flow data was collected, as part of the November 2017 traffic surveys, at the eight critical intersections surrounding the site. This crossing flow data has been processed to produce the bubble maps in Figures 2.18 to 2.20, which illustrate the pedestrian densities around the site.

The analysis reveals:

- Heavy AM and PM peak pedestrian demand along the northern side of Union Street and Pyrmont Bridge Road.
- Later in the evenings, pedestrian demand switches more to the western side of Pirrama Road.

Figure 2.18: AM Peak Hour Pedestrian Densities (8:00-9:00am)

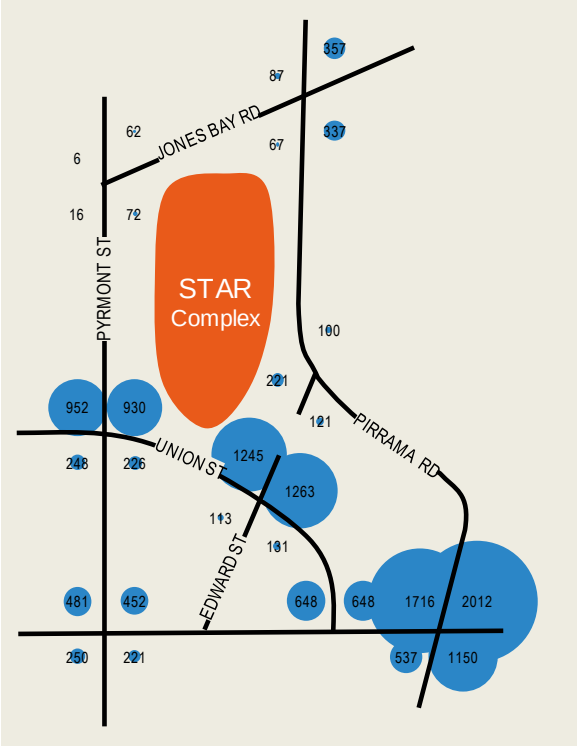


Figure 2.19: PM Peak Hour Pedestrian Densities (5:30-6:30pm)

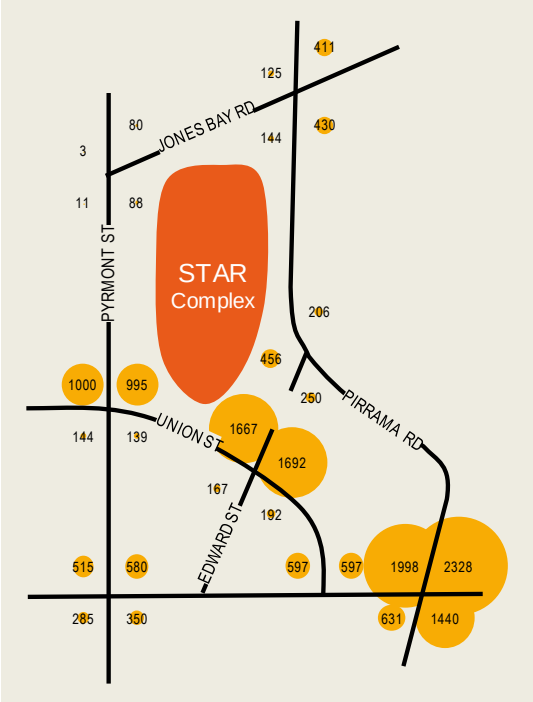
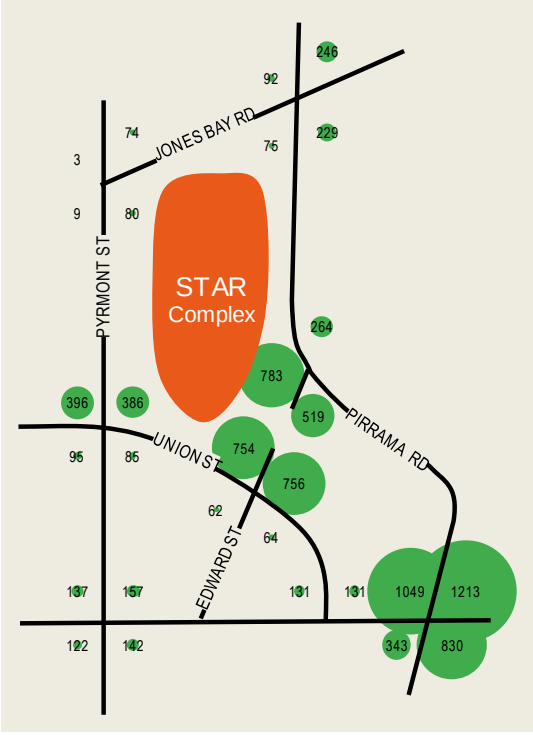


Figure 2.20: Off Peak Hour Pedestrian Densities (10:30-11:30pm)



2.10.2 Modification 14 Upgrades

Due to the expansion of the retail zone in the Astral Hotel Lobby as part of Modification 14, a reconfiguration of pedestrian access is being undertaken in this area.

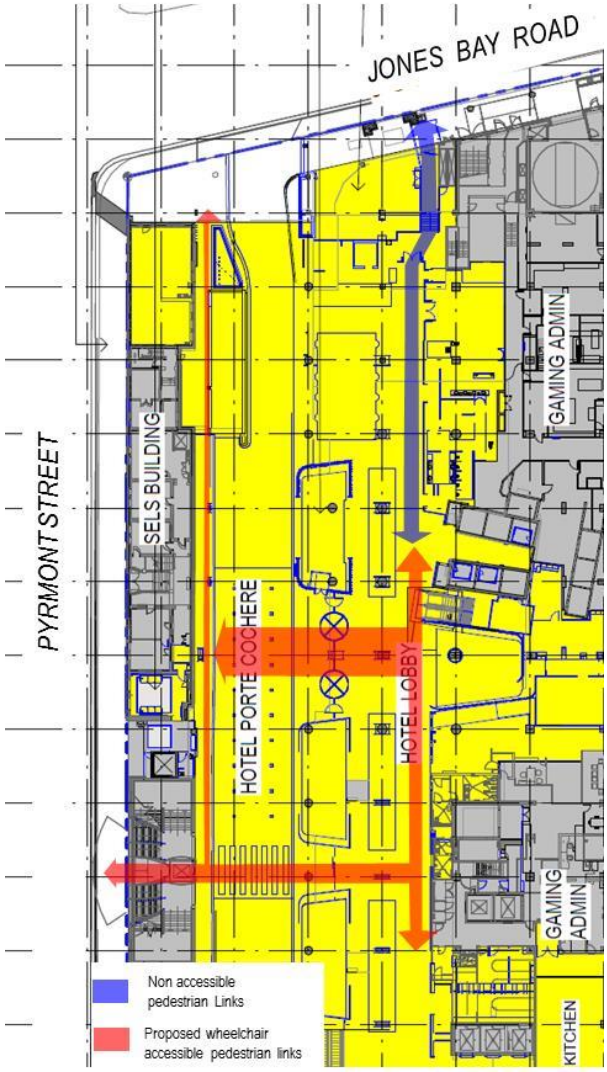
The existing pedestrian pathway from the Astral Hotel lobby entrance up the side of the Port Cochere ramp to Jones Bay Road is being replaced with an internal pedestrian pathway leading through the new Astral Hotel Lobby retail zone to Jones Bay Road. The existing pedestrian pathway does not comply with wheelchair accessibility standards and it will be replaced with another pedestrian pathway that is also not wheelchair accessible.

However, Code compliant accessible pathway to/from the main entrance of the Astral Hotel Lobby is available from the Astral Hotel Lobby across the Port Cochere, into the lift on the western side of the Port Cochere and out onto the Pyrmont Street footpath (refer Figure 2.21 and 2.22).

No other changes are proposed to the existing pedestrian external access points to the site.

Figure 2.21: Western accessible pathway from Astral lobby to Jones Bay Road

Figure 2.22: Modification 14 to Astral Hotel lobby Pedestrian Access



2.11 PUBLIC TRANSPORT ACCESS

Public transport access to The Star site is available by light rail, bus and ferry services. CBD heavy rail services are also available within a 15-minute walk of the site via Pyrmont Bridge.

A graphical presentation of the public transport modal access arrangements for The Star is presented in Figure 2.23.

A summary of public transport service frequency is presented in Table 2.7.

Figure 2.23: Public Transport Modal Access

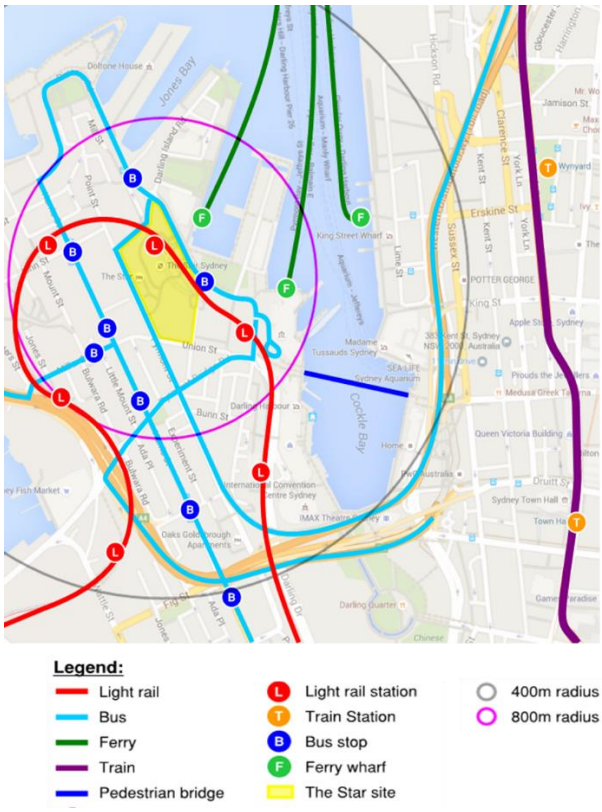


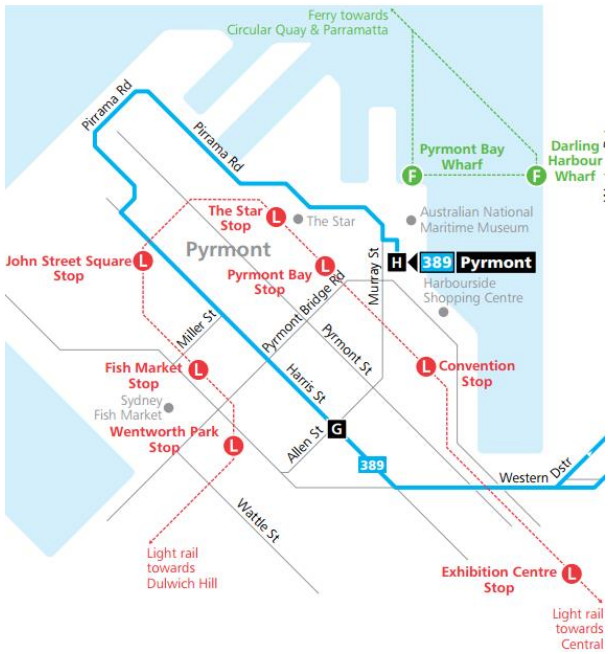
Table 2.7: Public Transport Service Frequency

Mode	Typical Frequency (min)		
	AM Peak	PM Peak	Evening Peak
Light Rail	8	8	15-30
Bus	7-8	5-6	20-30
Train	1-4	1-4	1-7
Ferry	30	30	60

2.11.1 Public Buses

Bus service 389 operates between North Bondi and Pyrmont, with the closest bus stops located on Pirrama Road immediately adjacent to The Star, as shown in Figure 2.24. Buses operate from approximately 6am to 1:30am. Bus services have been modified since the project approval, with route 389 replacing routes 443 and 448.

Figure 2.24: Bus Route 389



Source: sydneybuses.info/routes

Opal card data collected in May 2016 for the Pirrama Road stops are presented in Figures 2.25 and 2.26.

The data indicates that the Sydney Buses are currently underutilised throughout most of the day, with the greatest demand occurring in the PM weekday commuter peak.

Community consultation identified infrequency of bus services as a major issue for the community. However, a review of the timetables does not seem to support this concern. The issue seems more about route and destination choice of services passing through the CBD, rather than frequency.

Figure 2.25: Sydney Buses Boardings & Alightings (Friday)

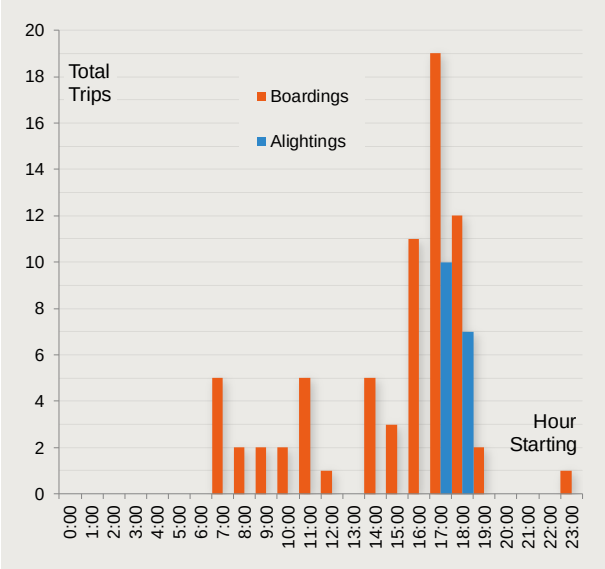
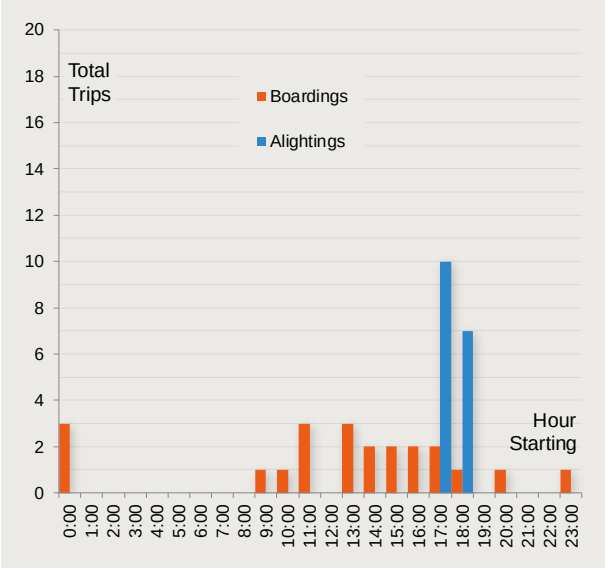


Figure 2.26: Sydney Buses Boardings & Alightings (Saturday)



2.11.2 Coaches

Most of the demand for private coach parking at The Star is associated with chartered tours bringing guests to special events and Lyric Theatre matinée performances. Modification 13 does not propose any increases to existing site uses (e.g. Lyric Theatre) that are likely to increase demand for coach parking

Coaches are currently permitted to set-down and pick-up in the service road under the Star building. Coaches then depart the interchange and park at the following locations:

- Pirrama Road southbound, immediately south of the roundabout – 64m of 'No Parking, Buses Excepted';
- Pirrama Road, northbound, immediately north of the Star car park entry – 30m of 'Bus Zone';
- Pirrama Road, northbound, immediately south of the roundabout – 37m of 'No Parking';
- Pyrmont Street, southbound, mid-block – 10m of loading zone, 25m of 'No Parking', 20m of 'No Stopping', and 30m of 'Loading Zone, 7am-5pm Mon/Fri; and
- CBD formal coach parking areas located on the other side of the Harbour e.g. Lime Street.

Peak demand for coach parking is on a Tuesday or Wednesday between midday and 3:00pm. The average dwell time for coaches is 3-4 hours. Coaches are currently not permitted to park long-term within the interchange due to geometric constraints within the service road.

During agency consultation, the City of Sydney indicated a preference for coaches to park in the dedicated coach facilities in the CBD - the closest being the Lime Street facilities, between King & Erskine Streets. This area can accommodate up to eight 12m-long buses. There are an additional 55 coach spaces in Lime Street, in an underground coach parking facility. Use of these CBD locations requires a 2.8km, 5-10min journey (one way), along existing congested routes through the CBD. Implementation of these parking practices would require:

- CoS enforcement of existing parking restrictions around the site.
- SEGL working with coach operators to disseminate information on alternate parking options.

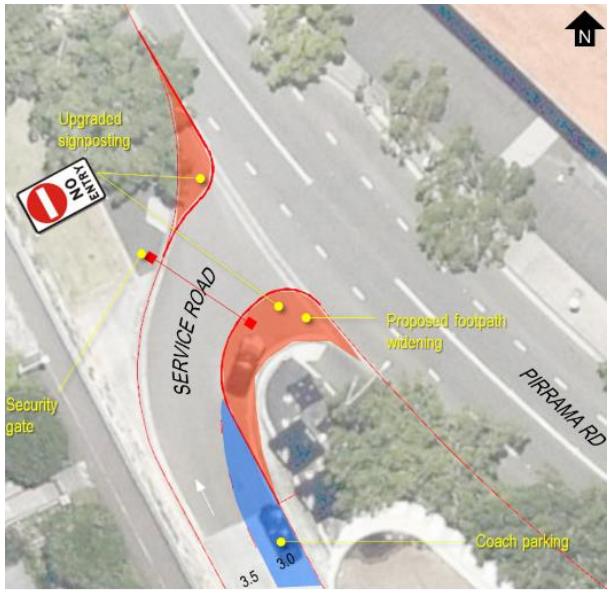
SEGL is providing 50m of coach parking on the service road exit ramp up to Pirrama Road. This ramp is currently signposted 'No Parking, Tow-away Zone'. However, local commuters are ignoring the 'No Entry' signs and parking restrictions and are illegally accessing and parking on the ramp. This creates operational problems for SEGL who may need this kerb space for special event storage or parking.

As part of Modification 14, SEGL is upgrading coach parking as follows:

- The conversion of the No Parking restrictions on the eastern side of the service road exit ramp to 'No Parking, Coaches Excepted, 6am to 6pm'.
- Localised footpath widening at the exit to Pirrama Road and provision of a security boom gate and associated signage to physically restrict illegal car entry from Pirrama Road (refer Figure 2.27).
- Security monitoring to deter/move illegal parking.

The 50m of coach parking on the service road exit ramp will accommodate 4 large on-site coach spaces or 5-6 mini-bus spaces. The footpath widening would still permit coaches to turn right onto Pirrama Road, to return to the interchange for the passenger pick-up. Any excess coach parking demand will be directed to the formal on-street facilities in Pirrama Road or the CBD.

Figure 2.27: Coach Parking on Service Road Ramp



2.11.3 Star Express Buses

The Star Express is a network of chauffeured coaches which operate on dedicated routes between The Star and key suburbs across greater Sydney.

Routes operate on scheduled timetables, beginning as early 7:30am and departing from the The Star entertainment precinct as late as 1:00am. Table 2.8 provides a summary of Star Express Services. Figure 2.29 shows the Star Express routes.

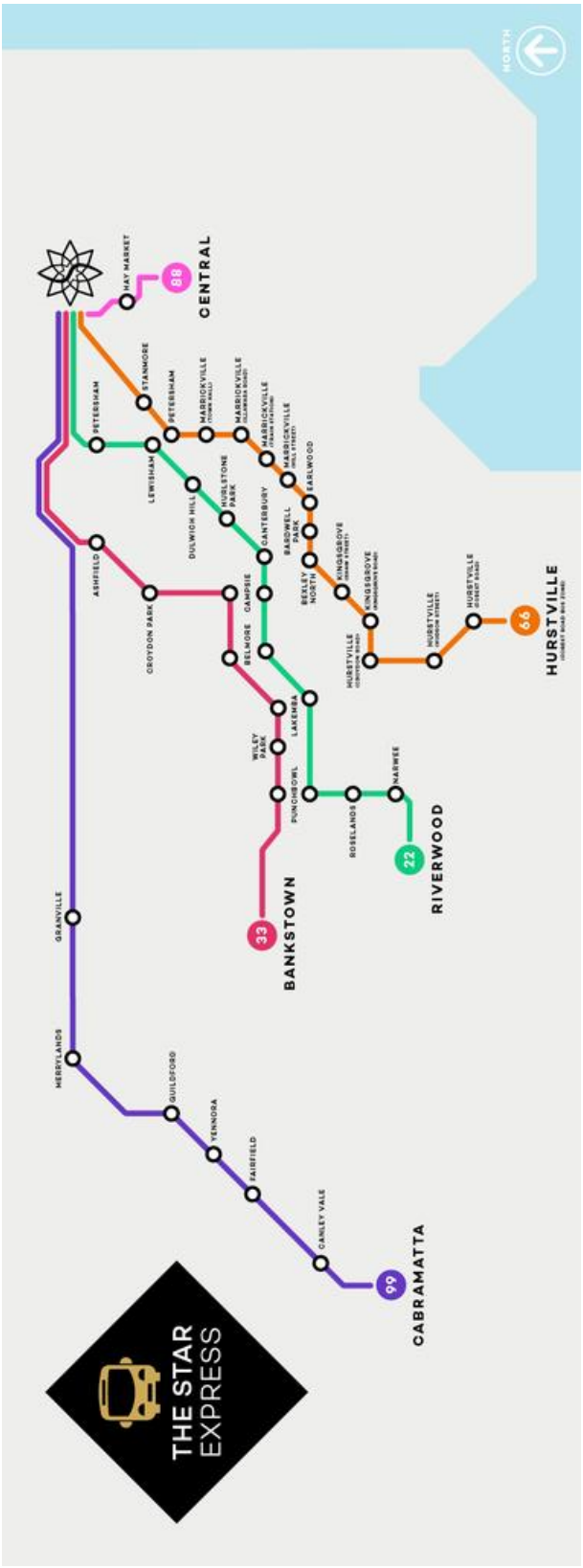
The Star Express costs up to $10 for a return ticket.

Figure 2.28: Star Express Bus Stops

Table 2.8: Star Express Services

ID	Route	No. Daily Services	No. Stops
88	Central	34	3
33	Bankstown	9	9
22	Riverwood	7	13
66	Hurstville	7	16
99	Cabramatta	34	8

Figure 2.29: Star Express Routes



Source: star.com.au/about-us/the-star-express-coach

2.11.4 Light Rail

A Light Rail station is provided directly under The Star, offering access from the station via stairs and lifts. The light rail operates between Central and Dulwich Hill, with services to The Star operating 24 hours a day. Light rail services are currently highly utilised in the AM and PM peak periods, with up to 95% of total capacity occupied. Figures 2.32 to 2.35 summarise boardings and alightings at The Star Station during the AM and PM peaks.

Fortunately, due to shift work patterns at The Star, most future staff trips associated with modification 13 will fall outside the light rail peak demand periods.

A major driver for commuter peak demand is associated with commercial land uses in the surrounding areas unrelated to The Star. Light Rail services have increased in frequency since previously indicated in the Part 3A Project Approval (MP08_0098).

Whilst access arrangements to the platforms are adequate to cope with increased services, any further increases in service frequencies, in response to high levels of demand, are a commercial matter for the operator TransDev.

During stakeholder engagement meetings and site visits with TransDEV, the following opportunities were identified:

- With the opening of the Sydney Light Rail in March 2019, the Inner west line will be used by the new high-capacity sets (450 passengers) to access the main maintenance depot. A low-capacity link between the two lines is being built to allow this. There may be an opportunity to run some limited high-capacity sets from the SLR fleet on the Inner West line for special events
- Inner West Line services are stopping at the southern end of the Star platforms. This makes the northern crossing point superfluous except for pedestrians using the informal pedestrian link up the service road. Both SEGL and TransDEV agreed that this informal path up the service road should be discouraged. The SEGL upgrade of the service road will include physical pedestrian barriers to restrict this movement. TransDEV saw this as an opportunity to close the northern crossing and extend the platform by 2m to accommodate the operator's future high-capacity fleet. The new fleet would double the current service capacity from 217 to 450 passengers.
- TransDEV would consider scheduling additional services during Modification 13 construction to accommodate the workforce peaks
- Coordination between TransDEV and SEGL during scheduled light rail shutdowns will be essential during Modification 13 construction.

Figure 2.30: The STAR Light Rail Station

Figure 2.31: The STAR Light Rail northern at-grade platform crossing

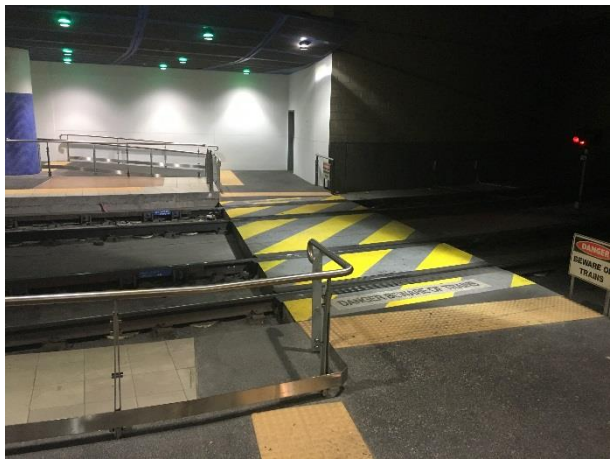


Figure 2.32: Star Light Rail Station Patronage (June 2016, AM Peak, Outbound Direction)

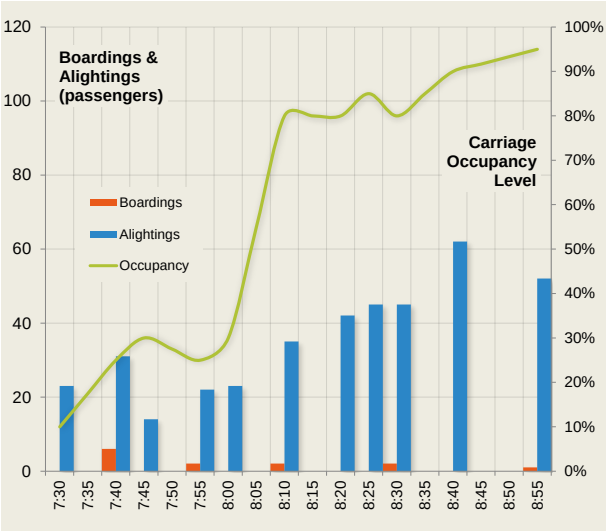


Figure 2.33: Star Light Rail Station Patronage (June 2016, AM Peak, Inbound Direction)

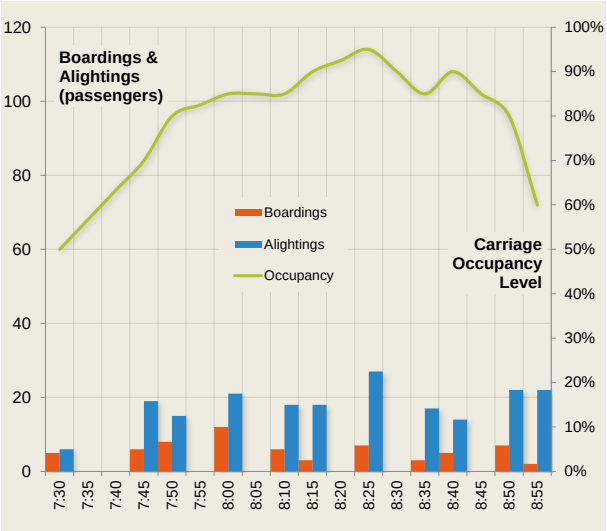


Figure 2.34: Star Light Rail Station Patronage (June 2016, PM Peak, Outbound Direction)

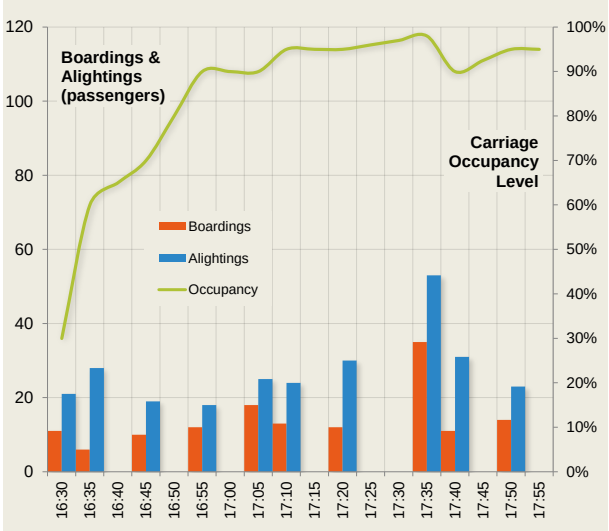
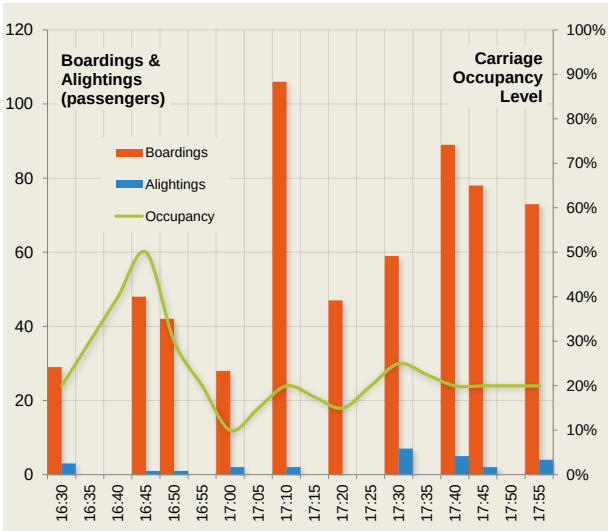


Figure 2.35: Star Light Rail Station Patronage (June 2016, PM Peak, Inbound Direction)



2.11.5 Rail

The T1 North Shore & Northern Line train services stop at Town Hall station, providing access to The Star by a 15-minute walk over Pyrmont Bridge. Trains operate from approximately 5am to 1am. Opal card boarding and alighting data collected in May 2016 for Town Hall station, is presented in Figures 2.36 and 2.37 below.

Additionally, Central Station is just a 6-minute light rail trip from the site.

All the Sydney suburban rail lines service these two major CBD stations.

Figure 2.36: Town Hall Station Boardings & Alightings (Friday)

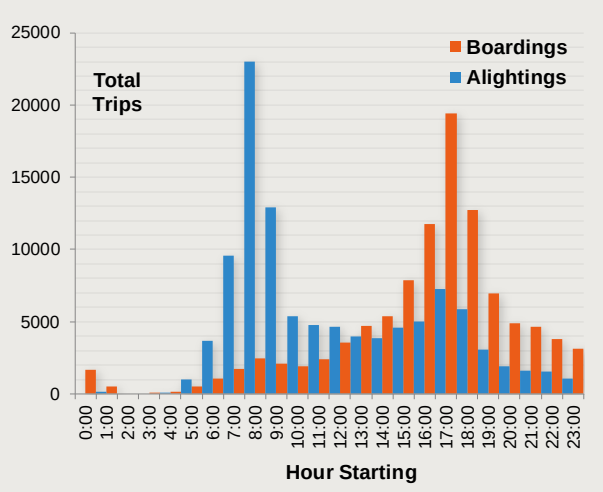
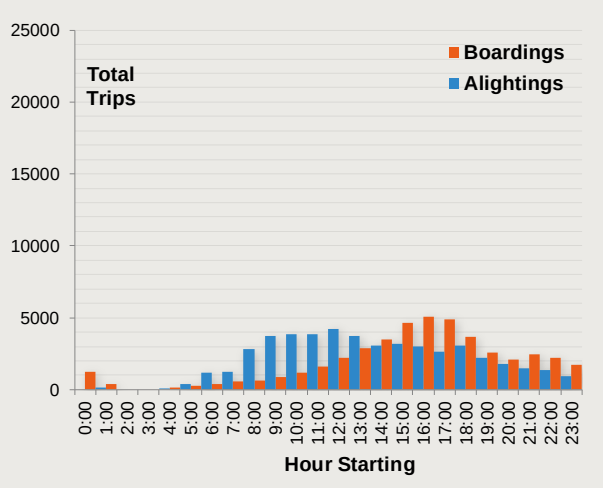


Figure 2.37: Town Hall Station Boardings & Alightings (Saturday)



2.11.6 Sydney Metro West

The NSW Government recently announced plans for the Sydney Metro West linking the CBDs of Parramatta and Sydney. 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. The project is expected to be built largely underground and be operational in the second half of the 2020s.

The recently released Interim Rail Link and Metro Corridor Land Application Map included in the Draft SEPP for Metro West shows the route passing under the southern end of The Star site and a new metro station located immediately west of the Star site under the Union Street and Harris Street intersection.

A Metro West station located so close to The Star represents a major opportunity to further improve public transport choices for visitors and staff travelling to the site.

Figure 2.38: Extract from the Interim Rail Link and Metro Corridor Land Application Map

Source: planning.nsw.gov.au/~/media/Files/DPE/Maps/map-state-environmental-planning-policy-infrastructure-2007-interim-rail-link-and-metro-corridor-land-application-map-2016-11-22.ash

2.11.7 Ferry

Ferries utilise the Pyrmont Bay wharf which is a short walk from Pirrama Road access to The Star. Ferry services operate from approximately 6am to 8pm.

Ferry services connecting with the Pyrmont Bay wharf include the F4 Darling Harbour route (Sydney Ferries) and the Sydney Harbour Eco Hopper Ferry route (a privately operated fast ferry) which operates services between Manly, Q-Station, Watson's Bay, Taronga Zoo, Milson's Point/Luna Park, Circular Quay and Darling Harbour seven days per week..

Opal card patronage data collected in May 2016 for Pyrmont Bay Wharf is presented in Figures 2.39 and 2.40 below.

Figure 2.39: Sydney Ferry Network

Source:
http://www.transportnsw.info/resources/documents/maps/sydney-ferries-network-map.pdf

Figure 2.40: Pyrmont Bay Ferry Wharf Boardings and Alightings (Friday)

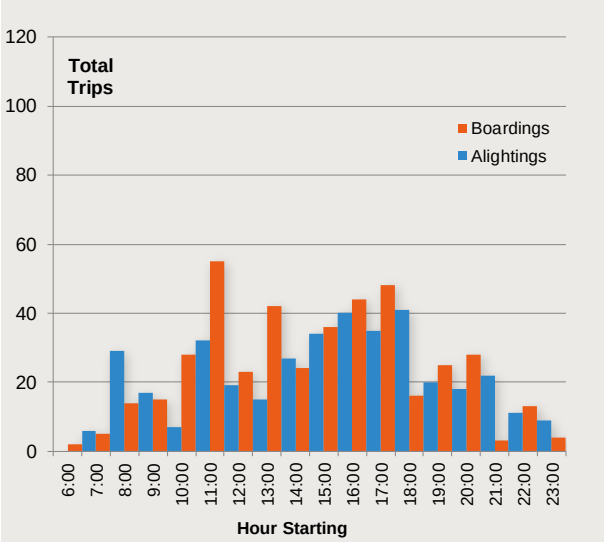
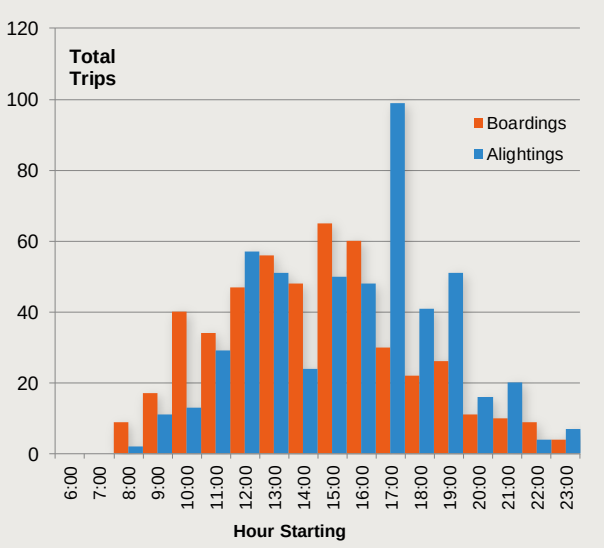


Figure 2.41: Pyrmont Bay Ferry Wharf Boardings and Alightings (Saturday)



2.12 LOADING DOCK FACILITIES

The following loading docks currently service the Star complex:

1. The Star Loading Dock (Jones Bay Road);
2. The Darling Loading Dock (Edward Street); and
3. The Star Events Centre Loading Dock (Service Road).

2.12.1 The Star Loading Dock (Jones Bay Road)

The Star Loading Dock is the main loading dock for The Star complex. It is staffed by a warehouse manager, supervisor, 12 store persons and 2 administrative staff. A food safety inspector is also permanently stationed at the dock.

Current loading dock operating hours are:

- 0700 to 1800 Monday to Friday;
- 0700 to 1330 Saturday; and
- 0700 to 1100 Sunday.

The clearance height of The Star Loading Dock door is 3.2m.

It receives deliveries of fresh produce and non-perishables and beverages for outlets, general items such as stationary, mail, promotional items, computers, gaming equipment, as well as being the entry point for deliveries such as cards, maintenance supplies for in-house facilities and contractors, laundry, and housekeeping items (including uniforms) gas and cooking oils.

Figure 2.43 shows a sample of daily deliveries to the Jones Bay Road loading dock.

The Star Loading Dock staging area constrains the throughput of stock across the dock. Whilst there are multiple docks (6) and unloading areas there is only one staging and sorting area that can manage only one full truckload of eight pallets at one time.

Figure 2.42: The Star Loading dock (Jones Bay Road)

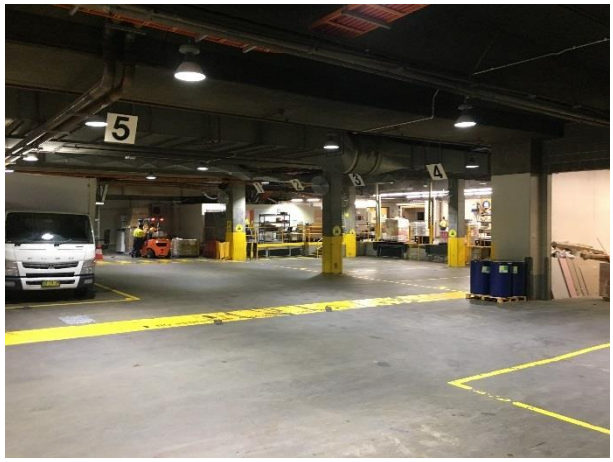
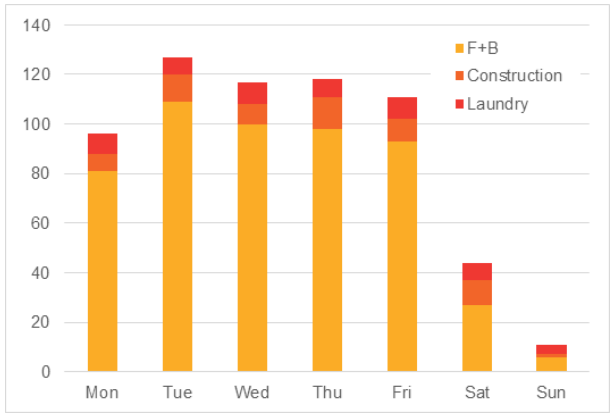


Figure 2.43: Sample of Daily Deliveries to The Star's Main Loading Dock on Jones Bay Road (March, 2016)



2.12.2 Darling Loading Dock (Edwards Street)

The Darling Loading dock is principally a service dock used to receive retail and restaurant tenant's stock deliveries. Whilst SEGL monitors all deliveries, the individual tenants are responsible for their own logistics services. Contractors (couriers) delivering to outlets in the Retail Arcade do so into those outlets own storage adjacent to the dock. Two store persons staff the dock. A security guard has recently been added to monitor/enforce tenant compliance with agreed loading dock management practices.

The Darling loading dock is also used for managing waste removal from The Star. Recycling bins, compactors, glass bins are stored in, and collected from, the dock. Stewarding remove full waste bins to the compactor area at the dock, replacing them with clean empty bins at the point of use.

Normal loading dock operating hours are:

- 0700 to 1500 Monday to Friday;
- 0700 to 1200 Saturday; and
- Closed Sunday and Public Holidays.

Outside these times, access to the loading dock is provided by appointment with Star security.

The height of the Darling Loading dock door is 4.2m.

2.12.3 The Star Events Loading Dock (Service Road)

The Star Events Centre loading dock is located within the northern part of the Light Rail terminal and is accessible via a one-way service road from Pirrama Road. This loading dock is primarily used to unload and reload goods and production equipment used for stage plays, concerts, private functions and special events (e.g. Aria awards).

This loading dock operates 24 hours per day during special events and is operational 365 days per year. It has a freight elevator and raised loading dock platform that accommodates rear loading of a 19m semi-trailer. The raised dock platform can cater to loading or unloading two vehicles at a time, as two opposite bays. Vehicle heights cannot exceed 4.3m.

The demand for this loading dock will not be impacted by the works proposed in Modification 14. The freight elevator only provides access to The Star Events back-of-house zone. Stairs physically prevent transfer of loads to other parts of the building such as Sovereign or Astral and Darling hotels.

Two (2) security officers man the dock on a rotating roster.

Outside of special events, normal loading dock operating hours are:

- 0600 to 1800 Monday to Friday;
- 0600 to 1800 Saturday; and
- Closed on Sundays and Public Holidays.

Figure 2.44: Darling Loading dock (Edward Street)

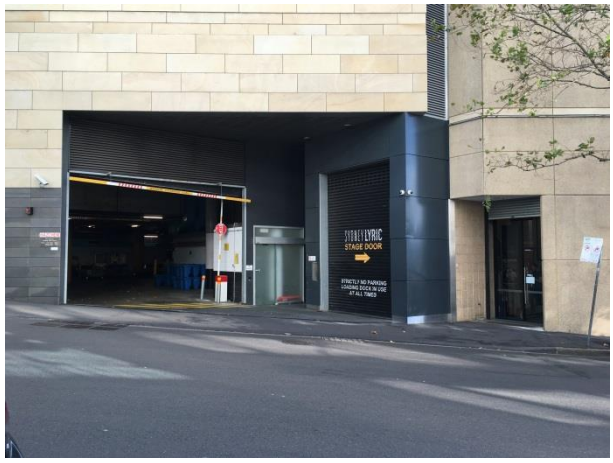
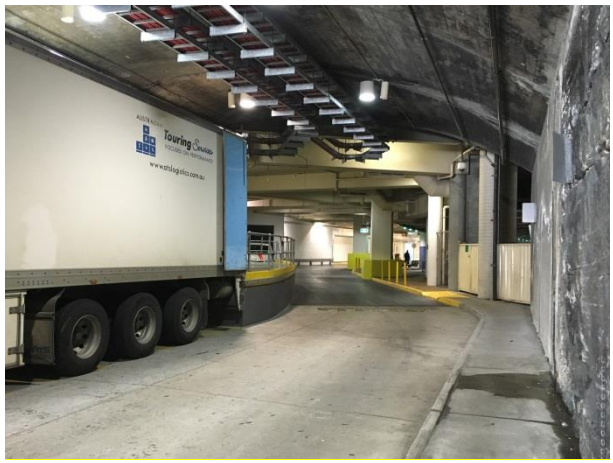


Figure 2.45: The Star Events Loading dock (Service Road)



2.12.4 Main Users of The Star Loading Docks

The three loading docks discussed above, support the following Star business units:

- Food and beverage is the largest user of logistics services at The Star, based on daily deliveries of fresh produce and perishable foodstuffs, as well as bulk packaged beer, wines, spirits and packaged water. Food and beverage deliveries account for up to 85% of deliveries on weekdays and 60% of deliveries on weekends.
- Hotels are a low/moderate user of logistics services at The Star, based on deliveries and pick-up via the docks for linen services by contracted providers, delivery of Hotel consumables and limited storage of wines and beverages to support room services.
- Gaming is a low/moderate user of logistics services at The Star, based on deliveries and pick-up via the docks for uniform laundering services provided by contracted providers. Gaming also use the docks for delivery and pick-up of gaming equipment.
- Facilities and Properties are a low volume user of logistics services at The Star, based on deliveries and pick-up via the docks.
- Cage/Finance. Activities around cash transfers and delivery of gaming equipment (e.g. cards and dice) are limited to 1-hour delivery per week under full security and are of a confidential nature.
- Events are a low volume user of logistics services at The Star, based on deliveries and pickup of Event materials via the docks.
- Retail tenants are low volume users of logistics services at The Star, based on deliveries and pickup via the docks. SEGL only monitors Tennant deliveries to the loading docks and is not responsible for their logistic services.

2.12.5 Supply Strategy

The current supply strategy for The Star's main loading dock, located on Jones Bay Road, splits the supply of fresh produce from beverages and dry goods. Fresh food is delivered daily (except Sundays when only fresh bread is received) and sorted to outlet and staged in corridors awaiting pick up by outlet. Beverages and dry goods are purchased approximately weekly to replenish central stock holding areas. The unloaded goods travel from the loading dock on palettes, down a lift, to the warehouse facility.

Table 2.9: The Star Loading Dock Delivery Schedules

Delivery Time	Suppliers	Indicative Hourly Volume (palettes)	Indicative Hourly Truck Deliveries
0700-0800	Fuel bakery, Pamalat (milk), The Grumpy baker, Tip Top, Pace Farm, Rich Products, Continental Patisserie, Brasserie bread, Hong Australia, M&G, Australia Convenience, Bidvest	25	12
0800-0900	Australia on a plate, Matt Browns, Hong Australia, PFD, Simon Johnson, Game Farm, Primo (P&M), Havericks	10	6
0900-1000	Top Cut, Deshel, Nicholson & Saville, Andrews Meat Industries, M&J	10	6
1000-1100	B&E Poultry, Andrews Meat Industries, Vic's, T&F	5	4
1100-1200	Simon George and Sons	8	1
1200-1800	ALM, Bidvest Hospitality, Foster's, BUNZL, Coca-Cola, De Costi, Joto	5	7

Source: Carinya Group, July 2016

2.12.6 Star Loading Dock Capacity

In June 2016, Star engaged Carinya Group to undertake a logistics audit of the main Star Loading Dock located on Jones Bay Road. The audit identified the following:

- On a typical weekday the loading dock processes up to 20-25 pallets per hour (80% of estimated capacity) during the AM peak hour (0700-0800). This is despite allocating two of the six available loading bays to construction deliveries associated with D2015/1515.
- Seasonal peaks associated with Easter and Christmas can increase deliveries by as much as 30%. During peaks, the number/frequency of trucks does not usually increase, instead, the volume of each load increases to compensate for the increased site demands.
- Whilst there are multiple docks and unloading areas, capacity of the dock is being constrained by inadequate staging and sorting areas that can only manage a single truckload (8 pallets) at a time.
- Deliveries are heaviest on Tuesday, Wednesday and Friday and peak at 90-100 pallets per day.

A review of delivery data from March 2016 also revealed that construction accounted for up to 8% of the average weekday delivery movements through the dock and 20% of the average weekend delivery movements.

2.12.7 Modification 14

To mitigate the potential impacts on loading dock operations generated by Modification 14 and other future Star expansion projects, Modification 14 includes an upgrade to the Jones Bay Road loading dock to increase storage and sorting areas, thereby resolving the current bottleneck restraining cross-docking processes.

These upgrades will include:

- Fill in Dock 1 to extend sorting and staging area;
- Construct new dock offices and remove existing offices;
- Extend the dock platform from where the offices are to the Jones Bay Road wall of the dock, relocating the CO2 gas cylinders and plumbing;
- Install the beverage reserve cool room and blast chillers; and
- Extend docks 5 and 6 and install fresh produce cool room, freezer, and waste collection area.

These upgrades will increase loading dock capacity by up to 45 palettes per hour.

2.12.8 Conclusions

The main conclusions from the review of loading operations are:

- The Star's main loading dock on Jones Bay Road is operating at 80% capacity despite allocating 2 loading bays to construction deliveries. This loading dock can comfortably process current delivery demands of the site.
- SEGL is now undertaking several capacity upgrades to the loading dock, as part of modification 14 to provide for the future growth of The Star Casino Complex beyond Modification 14.
- SEGL will also reclaim loading bays 5 and 6 at the completion of Modification 14 construction works, which will increase available loading bays by 33%.

2.13 PORT COCHERE

2.13.1 Existing Operations

The main users of the Porte Cochere include, Royal Limousines, Avis Rental, Diamond Members, Taxis and the Valet service.

Royal operate 24/7 and generally use the spaces adjacent to the pedestrian crossing near the Astral Hotel entry. They have an office near the crossing. There have been operational problems with drivers leaving their limousines parked and unattended for long periods. This should only be used for short term parking (up to 15-min) with drivers staying with their cars always. Royal have dedicated spaces on P1 for longer-term parking.

Diamond members are permitted to park their cars in the Port Cochere (generally opposite the Hotel entry). There are between 10 and 20 diamond members at present. They are frequent visitors. There may be 6-7 visiting on any day.

The valet service pick-up peak demand is after 11am in the morning (Hotel check-out). The set-downs peak occurs after 3pm (Hotel check-in). Hotel guests are the main users of valet parking during peak periods. The Casino arrivals are more random in nature.

Table 2.10 summarises current resourcing of the valet service.

Under resourcing of the valet service has been identified as an operational issue. During peak periods, anywhere up to 10 cars can be stacked waiting to be taken to the car-park. This results in double parking behaviour. It can take up to 5-minutes for a valet to take a vehicle to the car-park and return.

The current bay outside the hotel is used for stacking valet vehicles. However, this double parking practice is considered undesirable and will be addresses with the Modification 14 upgrade proposals for the Port Cochere.

When the general car park is full, patrons are encouraged by staff, located at the Pirrama Road entry, to use the valet service in the Port Cochere or other commercial parking sites located within walking distance of The Star.

Figure 2.46: Port Cochere Taxi Stand outside the Casino Entry

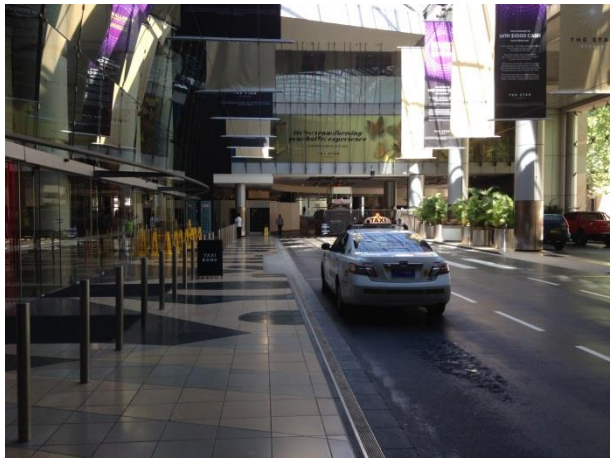


Figure 2.47: Port Cochere Valet Parking outside the Astral Hotel entry

Table 2.10: Resourcing of Valet Service

Day of Week	Shifts		
	0700-1500	1500-2300	2300-0700
Mon-Thu	1	1	1
Fri-Sat	2	2	1
Sun	2	1	1

2.13.2 Modification 14 Upgrades

The Modification 14 changes to the Port Cochere will include:

- Modification to the Astral Hotel façade within the Port Cochere adjoining Pyrmont Street and Jones Bay Road. This will relocate all north-south pedestrian movements along the Port Cochere roadway within the safety of the widened building foyer.
- modifications to the layout and width of the porte cochere adjacent to the existing set-down and pick-up areas.

A minimum roadway width of 8.6m will be maintained in the Port Cochere to accommodate two set-down/pick-up lanes 2.8m wide each and a 3.0m wide circulating lane.

Operations in the Port Cochere will not be significantly changed by Modification 14. Taxis, limousines, valet service and hire cars will continue to operate out of the Port Cochere, as they currently do, however, waiting areas for each will become more formalized.

The existing pick-up zone immediately outside the Casino entry has been reduced from 3 to 2 spaces, due to the installation of escalators as part of D2015/1515, and will be converted to a taxi drop-off-only zone in Modification 14.

The existing bay outside the Astral Hotel entry will be paved and the lobby façade extended out to improve pedestrian access to the Astral Lobby. This will prevent the opportunity for double parking of valet vehicles, which currently blocks the Hotel entry. SEGL will be increasing its resourcing of valet resources and will monitor resourcing levels to eliminate any potential for back-ups.

A sketch of the proposed operational changes to taxi and valet parking arrangements is presented in Figure 2.48.

SEGL is increasing resourcing of the valet service to ensure quicker dispatching of vehicles.

Additionally, SEGL is increasing in the number of taxi bays in the Port Cochere during peak times, to include:

- 3 taxi set-down/pick-up bays in front of the Astral Hotel entry;
- 2 taxi set-down bays at the Casino entry; and
- 6 taxi pick-up bays and patron queuing system at the Casino entry.
- 1 taxi set-down/pickup bay at the Residences.

Finally, SEGL is installing an electronic taxi call system and removing the Jones Bay Road feeder rank, as part of Modification 14.

2.14 SPECIAL EVENTS

SEGL holds more than 100 special events throughout the year. Most of these events may have local traffic, noise or light impacts but reflect day to day operation of a large entertainment precinct. The frequency and consent conditions for noise and lighting events are controlled by planning approvals.

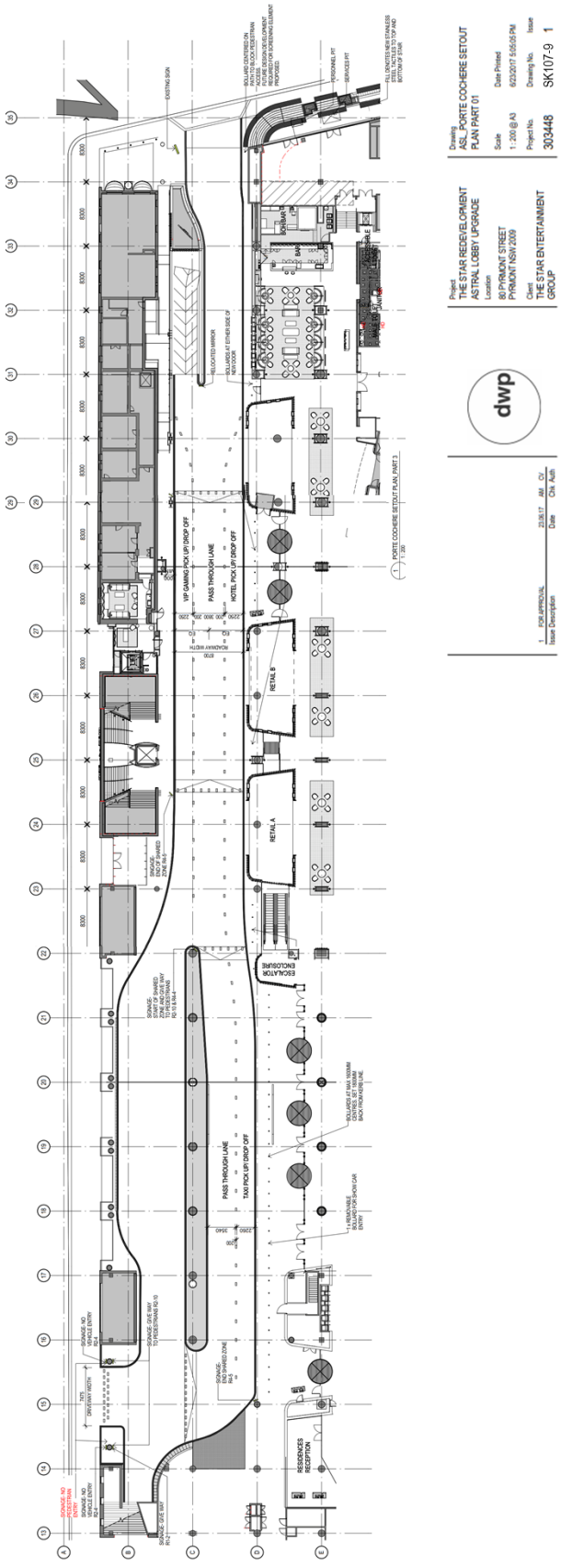
Up to 5 special events each year are classified as Class 1-4 special events under the RMS special event guidelines[2], thereby requiring traffic management intervention and/or planning approval by road authorities. These larger events include:

- ARIA Awards
- AACTA's
- Dally M Awards
- NRL events

Modification 13 is not expected to increase the current frequency or impacts of Star-related Class 1-4 special events each year.

2 http://www.rms.nsw.gov.au/trafficinformation/downloads/special_events_guide_part1.pdf

Figure 2.48: Modification 14 Changes to the Port Cochere



3 THE MODIFICATION

3.1 THE PROPOSED MODIFICATION

This section summarises all works proposed under Modification 13. Sections 3.2 to 3.11 provide more detail on transport related aspects of these proposals.

3.1.1 New Ritz-Carlton Hotel and Residential Tower

- Demolition of part of the existing building in the northern portion of the site, including part of the Pirrama Road façade and part of the Jones Bay Road façade.
- Construction of a new Tower, 237.0 metres AHD (approximate, 234 metres from Pirrama Road);
- Residential uses across 35 levels, comprising:
    - A residential vehicular drop off lobby on Level B2
    - A residential lobby on Level 00 to be accessed from Jones Bay Road;
    - Residential communal space on Level 07 to be accessed via Level 08; and
    - 204 residential apartments located from Levels 05 to 06 and from Levels 08 to 38, featuring one-bedroom, two-bedroom and three-bedroom unit types (Note – no Level 13)
- Hotel uses across 31 levels, comprising:
    - A hotel arrival lobby on Level B2 to be accessed from the new Ritz-Carlton porte-cochere along Pirrama Road;
    - A hotel Sky Lobby for guest check-in on Level 39 and 40, featuring a restaurant, bar and lounge;
    - 220 hotel rooms located from Level 42 to 58 and from Level 60 to 61
    - A hotel spa and gym on Level 07
    - A VIP link to the Sovereign Room on Level 04 and 04 Mezzanine
    - A Ritz-Carlton Club lounge and terrace on Level 59
    - Hotel staff end-of-trip facilities on Level B3
    - Hotel staff arrival point on Level 00
    - Hotel back-of-house and plant on Level B2, 02, 03, 05, 41 and 42
- A Neighbourhood Centre consisting of the following proposed uses including street level cafe, library, learning / innovation hub, multipurpose function centre, practice rooms (functional use to be finalised in conjunction with a neighbourhood panel);
- A new car-parking stacker system below the new porte-cochere of the Ritz-Carlton Hotel, with a total capacity of 221 spaces, to serve the new hotel and apartments;
- Vertical transport associated with the tower and podium; and
- A new drop-off / pick up area (short-term parking) on Jones Bay Road for the proposed apartments.

3.1.2 Level 07

- A 'Ribbon' at Level 07 connecting the new Hotel and Residential Tower to the existing building along Pirrama Road, comprising:
    - Two pools and associated pool decks (one for the new Hotel, one for The Star); and
    - Two food and beverage premises with associated store rooms and facilities;
- Lift access from the Level 05 Terrace to Level 07;
- Residential communal open space associated with the new residential apartments, comprising pool and landscaped terrace at the base of the Tower adjacent to Jones Bay Road;
- Gym and associated change rooms and facilities for the residents;
- Gym and associated change rooms and facilities for hotel guests; and
- Landscaping treatments.

3.1.3 Level 05 Sky Terrace

- Three food and beverage outlets with external areas;
- Completion of the Vertical Transportation drum to connect with Level 05 Terrace;
- Designated event spaces on the Terrace; and
- Landscaping treatment.

3.1.4 Level 05 Astral Hotel Pool and Spa Recreational Facility Upgrade

- New pool deck, pool, spa, gym and amenities upgrade for Astral Hotel and Residences.

3.1.5 Tower to Sovereign Link by Escalator and Lift

- Link from the Tower (across Level 04 and Level 04 Mezzanine) to the Sovereign Resort and MUEF at Level 03, connected via Lift G4, Lift VIP 1 and escalators.
- Extension of the lift service to stop at Level 00, 01 and 05 in addition to Level 3, 4 and 4M.

3.1.6 Level 03 Sovereign Column Façade Treatment along Pirrama Road

- New glazed detail to enclose exposed Level 03 Sovereign columns along the Pirrama Road façade.

3.1.7 Various reconfiguration works around Vertical drum Level 00 to L5

- Revolving door at L00 main entrance landing Pirrama Road end
- Sliding door at L00 landing at stairs from Light Rail
- Reconfiguring of existing L1 and 2 void edge
- New escalators from L2 to L3 due to revised landing at Level 3
- Infill of L2 atrium void to main entrance at Pirrama Road

3.1.8 Level 03 Sovereign Façade Integration Works

- Upgrades to the Pirrama Road and Jones Bay Road façades to integrate the new Ritz Carlton Hotel and Residential Tower with the existing building.

3.1.9 Infrastructure Upgrades

- A new plant room located within the podium over Levels 03, 04, 05 and 06 of the proposed Hotel and Residential Tower;
- Relocation of the current Level 03 cooling towers (adjacent to the MUEF) to the Level 09 plant room above the Level 06 plantroom adjacent to the Astral Hotel;
- New capstone microturbine units and associated flues in the proposed plant room at Level 03 between the Darling Hotel and the Astral Residence Tower;
- New capstone microturbine units and associated flues in the new Level 03 plant room at the base of the Tower;
- Relocation of the existing main switch-room to the new plant room on Level 02, south of the demolition area;
- Relocation of the existing data recovery centre to the new plant room on Level B1 of the Darling Hotel;
- Relocation of diesel generator flues to the side of the new Level 09 plantroom, adjacent to Astral Hotel

3.1.10 Level B2 Transport Interchange

- Upgrades to the Event Centre Loading Dock;
- Entry into Basement car stacker for the Tower apartments and Ritz-Carlton Hotel;
- New commuter bike parking and hire bike system;
- Upgrade of finishes to light rail station surrounds and removal of existing wall barrier to the Pirrama Road frontage;
- Upgraded taxi-rank arrangements;
- New Star coach parking; and
- Realignment of kerbs and line-marking.
- Note – no works to the Light Rail corridor

3.1.11 Transport Improvements – Other Locations

- Reconfiguration of existing median strips on Jones Bay Road and addition of new median strip on Pyrmont Street, with associated line-marking to enable a new right-hand turning lane into the Astral Hotel Porte-Cochere;
- New Pyrmont Street carpark entry and exit, associated line marking, changes to internal circulation, and reconstruction of the pedestrian footpath along Pyrmont Street; and
- Relocation of existing feeder taxi-rank from Jones Bay Road to the Level B2 transport interchange.

3.1.12 Site Wide Landscape and Public Domain Upgrades

- Upgrades to street frontages along Pirrama Road (for the Hotel Porte Cochere) and Jones Bay Road (for the residential entry);
- Upgrades to street frontage to Pyrmont Street, due to new car parking entry; and
- Upgrade to the entry forecourt of SELS building at the corner of Jones Bay Road and Pyrmont Street. (Note: no works within SELS building is proposed)

3.1.13 Level 00 - Restaurant Street

- Creation of a new destination Restaurant Street by:
- Incorporating existing Balla & Black Food and Beverage premises on Level 00; and
- Converting existing retail shops into new Food and Beverage tenancies

3.1.14 Pirrama Road and Jones Bay Road - Food and Beverage tenancies

- A revised food and beverage tenancy at the existing Pizzaperta outlet along Pirrama Road;
- A new food & beverage tenancy at the Marquee street entry; and
- A small café outlet adjacent to the residential lift lobby at Jones Bay Road.
- A new food & beverage tenancy accessed off existing walkway from Jones Bay Road

3.1.15 Food and Beverage – Other Locations

- Reconfiguration of Harvest Buffet, including new escalators from Level 00 Food Court to Level 01; and
- Refurbishment of Bistro 80 into the interim Century tenancy. (Note: The Century tenancy post construction is proposed to be at the Jones Bay end of L00 – Restaurant Street

3.1.16 Darling Hotel Corners

- Upgrade of the corner plaza at the Union/Edward Street property entry to accommodate:
  - A new food and Beverage premises on Level 01 and 02;
  - A new entry foyer leading to the Food Court;
  - A relocated awning enclosure at street level;
- Upgrade of the corner plaza at the Union/Pyrmont Street property entry to accommodate:
  - A new awning enclosure at for the existing café;
  - New revolving door at entry to Darling Hotel
  - Eight (8) luxury display cases at Darling Hotel car park entry; and
  - Two car display areas at Darling Hotel car park entry.

3.1.17 Site-Wide Acoustic Strategy

- A site-wide acoustic monitoring strategy applied to assess impact of potential noise generating sources in Mod13.

3.1.18 Site-Wide Lighting Strategy

- A site-wide lighting strategy integrating and improving the existing lighting across the precinct, with new lighting the proposed Tower, Podium and Ribbon, including:
  - Internal lighting of Hotel and Residential spaces;
  - Illuminated highlights at the Sky Lobby and Club Lounge levels;

- Integrated lighting on the eastern and western vertical façade slots and angled roof profile;
- Podium external illumination from awnings, and under retail and lobby colonnades;
- Landscape lighting on Level 07 open terraces and pool decks;
- Feature lighting accentuating the wing-like profile of the Ribbon and vertical element;
- Internal and external lighting to Food and Beverage outlet at Union/Edward Street corner;
- Façade LED lighting to the heritage SELS Building

3.1.19 Special Acoustic Events and Special Lighting Events

- Approval for twelve (12) Special Acoustic Events per year at the Level 05 Outdoor or Under cover Event Space or the Level 07 Ribbon Pool Deck for up to 1,900 people;
- Approval for ninety for (90) Special Lighting Event nights per year.for the use of permanent installation of moving projector lights on the rooftop of the Astral Hotel

3.1.20 Signage Upgrades

- Consolidation of existing signage approvals and new signage, including:
  - Approved signs
  - Wayfinding signs;
  - Business identification (including for Food and Beverage outlets); and
  - Signage on the Tower and Podium.

3.1.21 Stormwater upgrades

- Stormwater upgrade works, including increased pit inlets and pipe capacities at the low points along Pyrmont Street and Edward Street.

3.2 STAFFING LEVELS

The Star currently employs over 5,000 staff. On average, only 2,500 may work on the site on any day. These are spread over multiple shifts.

This represents a current employee density of 1 employee per 53m^2 of GFA spread over multiple shifts.

Staffing levels are expected to increase by 125 staff per day following completion of the Modification 14 upgrades.

The estimated increase in staffing levels resulting from Modification 13 is presented in Table 3.1.

Table 3.1: Staffing Increases due to Modification 13

Upgrades	GFA	Estimated Daily Staff
MOD13 General[3]	9,435	178
Ritz Carlton Hotel	14,935	128
Apartments	22,507	10
TOTALS	46,877	316
% Increase	33%	12%

3.3 SERVICE ROAD ARRANGEMENTS

In Modification 14, SEGL has relocated the Pirrama Road taxi rank to the Service Road running under the site. This temporary arrangement provides significantly more off-road storage for taxis servicing the Pirrama Road entry (up to 12 additional spaces). Taxis exit the service road at Pirrama Road, north of the Jones Bay Road roundabout. This will help to address some current operational issues, related to taxi queuing on Pirrama Road. This was introduced as a part of Modification 14 early works, and will remain in place during Modification 13 construction.

In Modification 13, these taxi arrangements will be formalised with the taxi ranks being moved to the eastern side of the service road, abutting the new open Pirrama Road entry plaza. It will include:

- The installation of a new taxi queuing system for managing waiting patrons in the Pirrama Road plaza;
- 2 pick-up bays;
- 2 set-down bays;
- A feeder rank with space for more than 12 taxis;
- A taxi call-up system to feed the following pick-up ranks around the site: i) Ritz Carlton Hotel, ii) Astral Hotel, iii) Casino and iv) Astral Residence; and
- Removal of the on-street feeder rank in Jones Bay Road.

[3] Based on current employee densities for the site

3.4 PORT COCHERE ACCESS

Access to the main Port Cochere from Jones Bay Road is currently restricted to a left-turn entry only. This restricts taxi and valet parking arrivals to approach via a circuitous route via Murray Street, Pirrama Road and Jones Bay Road. Alternatively, a more direct approach via Pyrmont Street requires users to travel east down Jones Bay Road and perform a u-turn at the Pirrama Road roundabout. Unfortunately, illegal mid-block u-turns are occurring frequently.

To facilitate Port Cochere arrivals, Modification 13 proposes the introduction of a right turn facility from Jones Bay Road into the Port Cochere.

The peak hour forecast flows at the Port Cochere entry, with Modification 13, are presented in Table 3.2. These are derived from a traffic re-assignment model discussed further in Section 4.1.4. The forecast entry flows through the Astral Port Cochere, with Modification 13, will increase between 3% and 8%, whilst the background movements along Jones Bay Road remain static.

Given the proximity of the Port Cochere entry to Pyrmont Street and the complexity of the site, the arrangement was assessed using VISSIM micro-simulation software. The simulation confirms that the proposed arrangement operates satisfactorily and would not result in any queuing issues during peak periods. A movie capture of the simulation is included in the Traffic Impact Assessment submission for Modification 13.

The Jones Bay Road entry modifications will include:

- Line marking changes;
- Modifications to the existing median; and
- Loss of up to 5 on-street parking spaces along the northern kerb of Jones Bay Road.

The loss of 5 on-street parking spaces would be offset by the removal of the taxi feeder rank on the southern side which could release up to 6 new parking spaces.

Table 3.2: Forecast Peak Hour Flows at Port Cochere Entry (vehicles/hour)

Movement		AM	PM	Off Peak
EB	Thru	280	210	190
	Right	20	10	130
WB	Thru	190	420	290
	Left	30	60	200

Figure 3.1: Proposed Jones Bay Road Right Turn Access Into Port Cochere

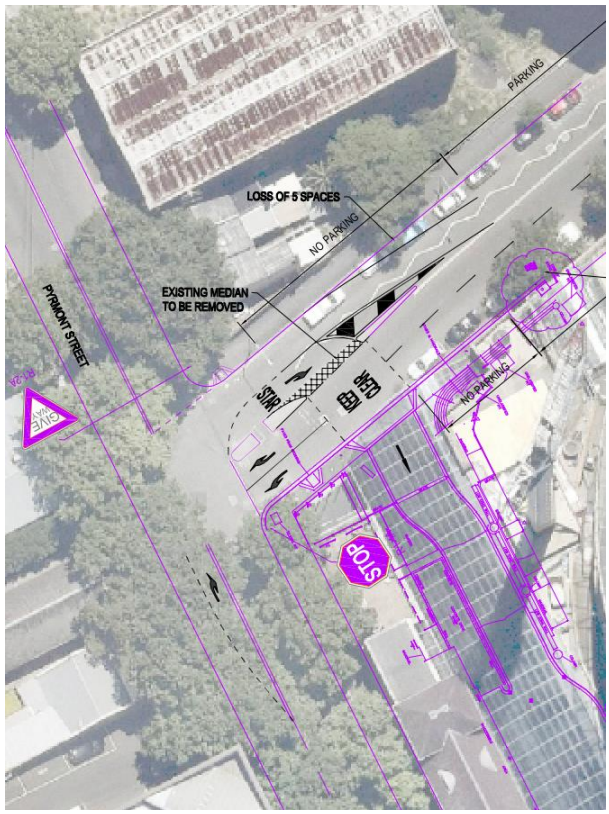
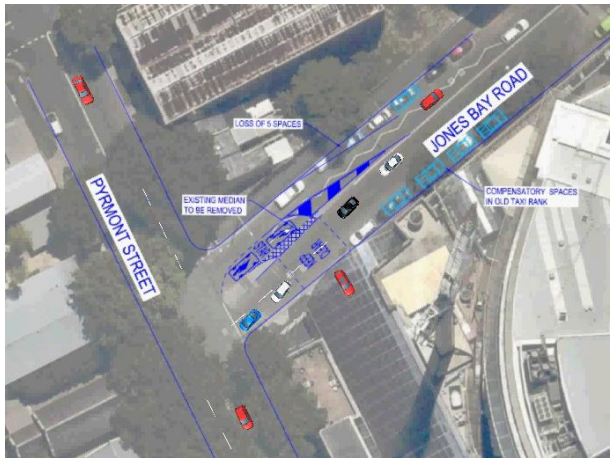


Figure 3.2: VISSIM simulation of arrangement



The proposed changes to the Jones Bay Road Port Cochere entry will not have any significant impact on pedestrian access or safety for the following reasons:

- This is an existing driveway crossing facility
- It does not generate any additional pedestrian/vehicle conflicts, this is a reassignment of existing taxi/valet movements
- This end of the site has the lowest pedestrian demands
- No changes to footpath facilities are required
- The existing pedestrian refuge in Jones Bay Road is maintained

3.5 PYRMONT STREET CAR PARK ENTRY

Modification 13 includes the creation of a new car park entry on Pyrmont Street. The car park entry will be in located in Pyrmont Street, 70m north of Union Street. This will place it opposite the proposed car park entry to 100 Harris Street (D/2015/1179).

The new Pyrmont Street entry will service Sovereign member access to the Level B1 car park. The entry ramp design features:

- A 'Category 4' driveway with 2-lane entry and exit ramps;
- Ramp grades less than 1 in 5 with transitions to prevent underside scraping in accordance with AS2890.1;
- Provision of boom-gates at the bottom of the ramp on a flat grade;
- The vehicle queuing distance from Pyrmont Street down to the entry boom gate is 48m (8 vehicles);
- Removal of parking spaces to allow turning movements at the end of the blind aisles created by the entry/exit ramp bisecting the upper mezzanine level as required by AS2890.1;
- Minor reconfiguration of Level B1 circulation patterns; and
- Removal of 4-5 parking on-street parking spaces across the new driveway entrance.

The forecast peak hour traffic movements in/out of the driveway are presented below in Table 3.3. These are derived from a traffic re-assignment model discussed further in Section 4.1.2.

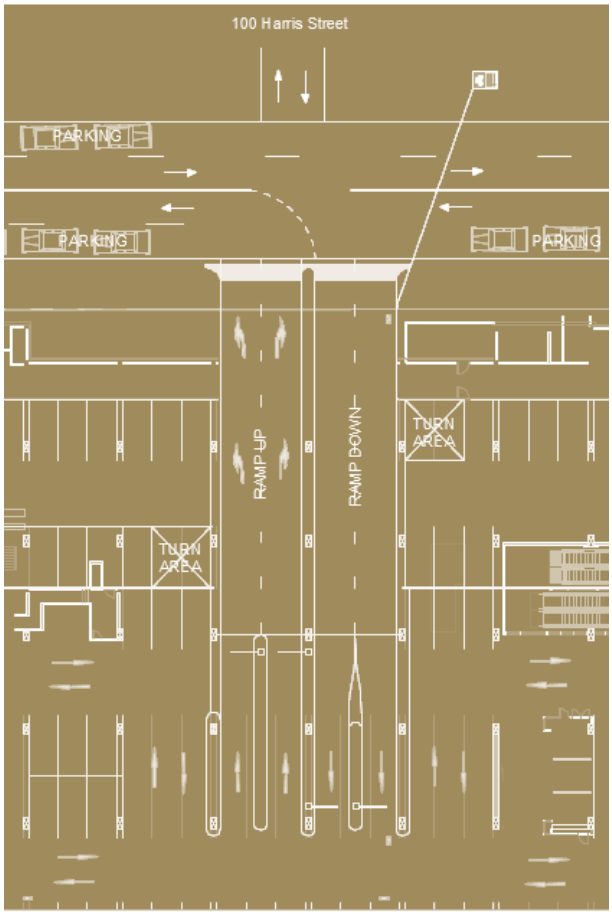
Table 3.3: Forecast Peak Hour Traffic Movements at Pyrmont Street Car Park Entry

Movement		AM	PM	Off Peak
NB	Thru	310	260	290
	Right	150	190	20
SB	Thru	250	420	290
	Left	30	40	20
WB	Left	60	160	200
	Right	0	0	0

Figure 3.3: 3D Render of Pyrmont Street Car Park Entry Proposal

Source: MOD13-AS2073, Issue D

Figure 3.4: Pyrmont Street Entry Ramp layout



Whilst this new Pyrmont Street Car Park entry is adding a new vehicle/pedestrian conflict point in Pyrmont Street, the environmental impact on pedestrian access and safety around the site is limited, for the following reasons:

- This location has some of the lowest pedestrian traffic demand around the site, peaking at less than 80 pedestrians per hour in the AM peak. During the evening car park entry peak, pedestrian volumes are less than 60 per hour.
- This new entry transfers vehicles away from the heavy pedestrian demand areas in Pirrama Road (up to 400 pedestrians an hour) across to the quieter areas in Pyrmont Street. Thereby assisting in reducing overall vehicle/pedestrian conflicts at the site
- Vehicle traffic enters and exits the car park at 90 degrees to the flow of pedestrians and traffic along Pyrmont Street, thereby maximising sight lines
- The awning and planters have been designed to maximise exit traffic sight lines to pedestrians
- Signage will be provided at the car park exit warning drivers to give-way to pedestrians
- Paving treatments and textures will be used to provide visual cues to pedestrians that vehicles cross the footpath in this area

SIDRA analysis for the intersection, under Modification 13 forecast flows, suggest the driveway will operate at LOS A in all peaks. The detailed SIDRA analysis is provided in Appendix B.

Additionally, the cumulative impacts of both 100 Harris and the Star modifications were also assessed (Refer Section 4.3.2).

The forecast AM and PM peak hour flows in/out of 100 Harris Street were interpolated from a Traffic Impact Assessment report prepared by Traffix in August 2015 (D/2015/1179).

The SIDRA analysis confirms that with the combined flows of both developments, the driveway arrangements operate at LOS C or better in the AM and PM peaks.

Table 3.4: Combined Driveway Performance (Worst Movement)

	AM	PM
Level of Service (worst movement)	B	C
Degree of Saturation	0.159	0.365
Delay per vehicle (Sec)	14.4	23.5

Figure 3.6: SIDRA Combined Car Park Entry Configuration

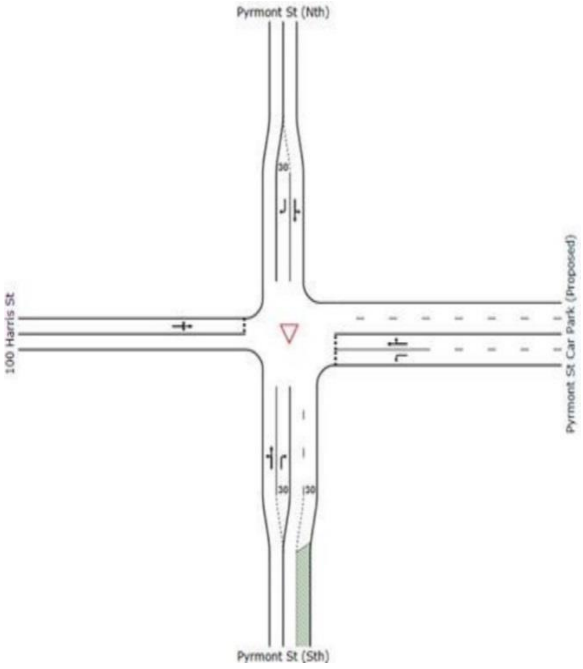
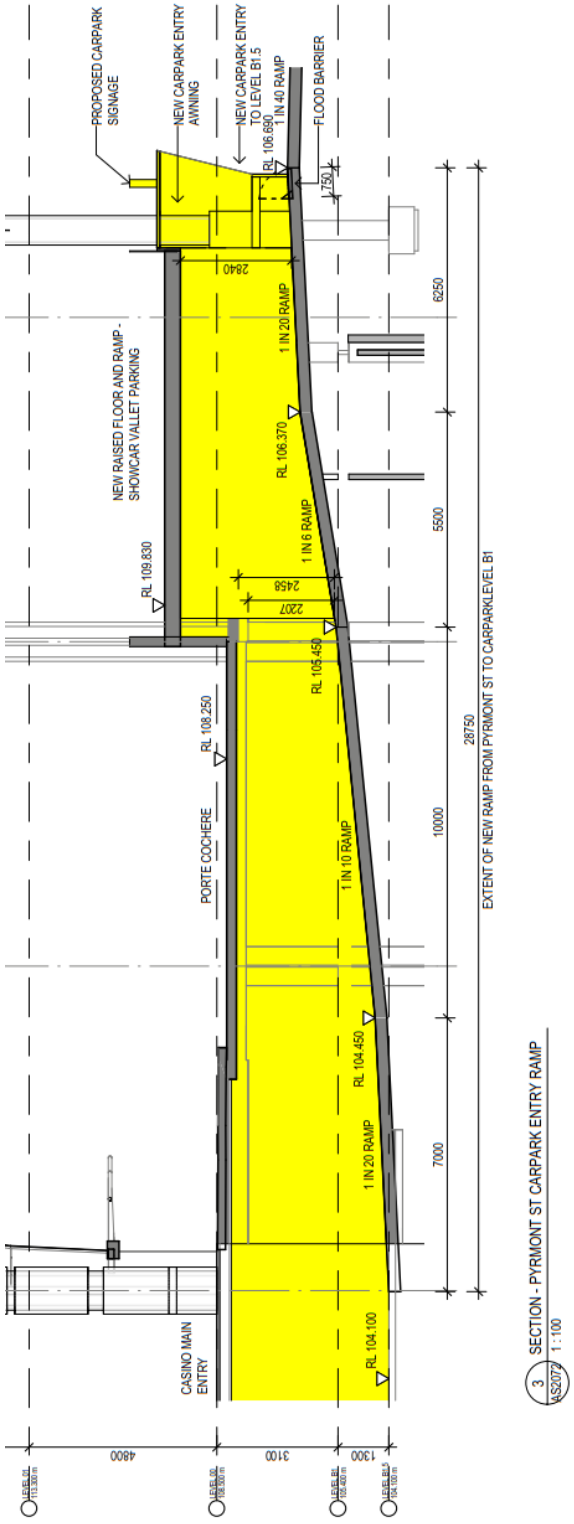


Figure 3.5: Pyrmont Street Car Park Entry Ramp Grades



Source: MOD13-AS2073, Issue D

3.6 RITZ CARLTON HOTEL ACCESS

Modification 13 includes a new Port Cochere arrangement on Pirrama Road to service the Ritz Carlton Hotel located in the new Tower.

The new Port Cochere has:

- Set-down and pick-up areas for up to 6 taxis or 2-3 coaches;
- Left-in and right-in entry from Pirrama Road. The right-in entry is required to facilitate taxi access from the feeder rank located in the service road under the Star building; and
- Left-out exit to Pirrama Road.

The existing northbound Sydney Buses Bus Stop (shown yellow) will be located between the new entry and exit points. This will require relocation of the bus stop 5m further south and a shortening of the overall bus zone from 41m to 31m (shown red).

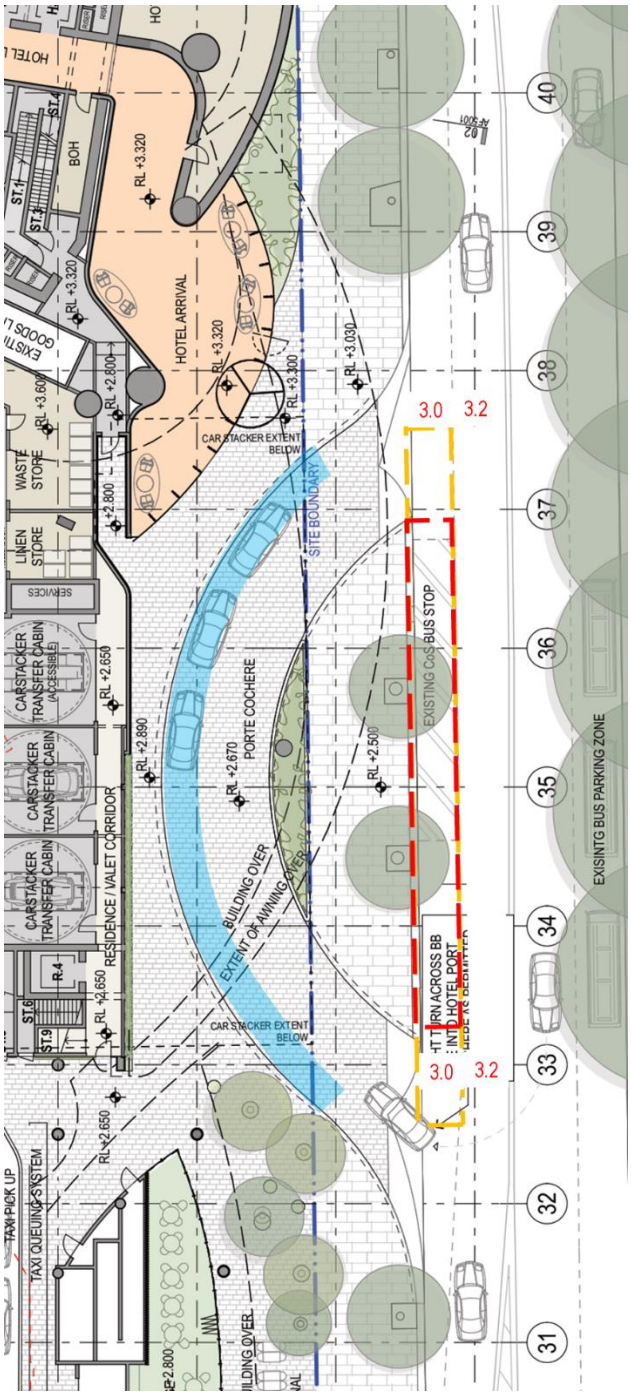
The layout of the new Port Cochere and bus stop is presented in Figure 3.7.

During consultation, CoS requested that the entry/exit angles of the Port Cochere be increased to 90 degrees to the direction of Pirrama Road. Unfortunately, this request could not be adopted, as a multi-arc alignment would have significantly reduced the usable parking opportunities within the Port Cochere, due to issues with vehicle swept path geometry.

Another design response considered, was to reduce the radius of the arc. However, this would have reduced the length of bus stop between the entry and exit and the usable parking opportunities.

The proposed single-arc design provides parking and passing opportunities along the entire length of the outer arc (Shown blue in Figure 3.7).

Figure 3.7: Ritz Carlton Port Cochere Arrangement



Source: SM13-AF102-DA01

The 45 to 50-degree entry and exit angles provide acceptable sight lines to the footpath crossings and Pirrama Road traffic on exit. Swept path analysis indicates smooth entry and exit to/from the Port Cochere for all vehicles. The proposed geometry reinforces the preferred left-in and left-out traffic circulation for Pirrama Road northbound carriageway users. The ramps at the entry and exit ensure that traffic is slowed, at the crucial conflict conflicts, by a physical change in grade.

Other key design measures for maintaining pedestrian safety under this Port Cochere arrangement include:

- Change of material from unit pavers to granite setts in public domain to clearly delineate roadway and footpath
- Header course or flush concrete kerb to accentuate the arc of the roadway.
- Bollards following the header course for pedestrian/crash protection at similar spacings to the current taxi port cochere to the south. This is also important for defining the transition zone between pedestrian and vehicle access areas.
- Paving finishes can also be modified between roadway and pedestrian zone (e.g. honed for pedestrian and hammered finish for roadway).
- Sight lines are clear of obstructions (e.g. Trees or street furniture) at the Port Cochere entry and exit in accordance with AS2890.1.

The requirement to maintain a bus stop between the Port Cochere access points may impact on the operation of the Port Cochere exit sight lines. Most of the time the bus stop will be clear, providing good sight lines towards northbound traffic flows in Pirrama Road (more than the minimum stopping sight distance of 45m for a 50km/h environment). However, when a Sydney Buses service stops to pick up and set down passengers, traffic sight lines may be reduced for short periods. This should not be a significant safety issue as the Pirrama Road carriageway is 2-lanes at the exit, which permits drivers to exit safely into the kerb-side lane, in front of the bus, without the need to merge with the main through traffic lane.

Overall, the new Ritz Carlton Hotel Port Cochere arrangement will not impact negatively on pedestrian access and safety in the Pirrama Road forecourt, for the following reasons:

- This new facility replaces an existing taxi facility located further to the south
- This new facility will generate less taxi traffic than the existing facility it replaces, as it only serves the Ritz Carlton Hotel. The taxi facilities servicing the eastern side of the Star complex have been relocated into the service road.
- This new facility is located further away from the major pedestrian desire lines towards the Casino, theatre and light rail, located at the southern end of the Pirrama Road forecourt. This will have the positive impact of reducing pedestrian/vehicle conflicts
- The design measures, previously outlined, will provide clear visual cues that clearly define and protect pedestrian/vehicle transition zones and sight lines

Turn bay protection for the taxi right turn was not provided as part of the proposal for the following reasons:

- It would impact coach parking facilities along the eastern kerb
- The low turning volumes combined with the limited traffic benefits of providing such a facility

SIDRA analysis for the proposed southbound right turn movement into the Port Cochere, estimates no queuing, minimal delay (7.1 seconds per vehicle for the worst movement), and LOS A performance during the peak period (refer to modelling results in Appendix E). The good performance of the Port Cochere entry proposal is due to:

- Southbound taxi turning movements being less than 20 vehicles per hour during peak periods
- The maximum oncoming (competing) traffic flows during peak periods being less than 300 vehicles per hour
- The existing signals, located to the south of the turn, providing large breaks in the oncoming traffic to allow taxis to turn

3.7 CAR PARKING

The on-site car parking capacity has recently been reduced from 2,845 spaces to 2,795 spaces following completion of the vertical access upgrades associated with D2015/1515.

The Sovereign car park entry ramp, proposed under Modification 13, will remove a further 46 spaces, reducing overall site car park capacity to 2,777 spaces.

Following MP08_0098 approvals, The Star had approval for up to 3,000 spaces on site.

As part of Modification 13, SEGL is proposing to install an additional 221 spaces in accordance with relevant City of Sydney DCP2012 and LEP 2012 rates (refer Table 3.5).

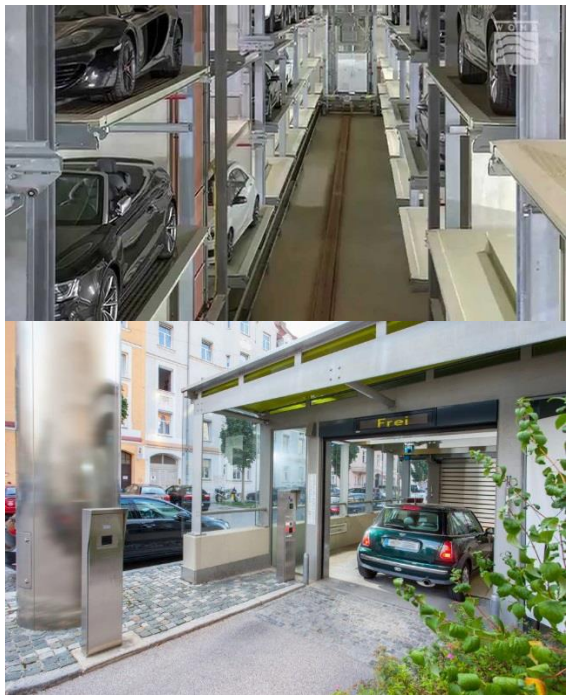
These spaces would be accommodated in a car stacker facility located under the new Tower. The additional parking would not exceed the current maximum parking approvals for the site.

Table 3.5: Proposed Car Parking Provision

Use	Unit	No.	Rate	Spaces
Hotel	Rooms	100	1 per 4 bedroom	25
	Rooms	120	1 per 5 bedroom	24
Apartment (Residents)	1 bed	31	0.4	12
	2 bed	131	0.8	105
	3 bed	36	1.1	40
Apartment (Visitors)	Units	30	0.167 per dwelling	5
	Units	40	0.1 per dwelling	4
	Units	134	0.05 per dwelling	7
			TOTAL	221

The non-tower components of the proposal will result in an increase in GFA of approximately 9,435m^2. For a 'Category E' site with FSR greater than 2.5:1, the increase in GFA would require 63 additional spaces. Even with the proposed decrease in car parking from 2,845 spaces to 2,749 spaces at the completion of Modification 13, and the 44 car spaces required to accommodate Modification 14 works, it is anticipated that there will be sufficient spare capacity within the basement car-park at The Star to accommodate the normal day-to-day parking demand associated with the non-tower components of the proposal.

Figure 3.8: Multi-parker Stacker Car Park System



Source: wohr.com.au/en/product/multiplier-740.html

As noted earlier in Section 2.5, in those cases where the Star car park reaches capacity, there are over 2,892 alternate off-street parking spaces within walking distance of the Star Entertainment Precinct.

Section 2.6 also outlined the proposed Pyrmont Parking Guidance System which is to be progressively installed as part of Modifications 14 and 13. This system will further mitigate any impacts of the proposal during special events or periods when the Star car park reaches capacity.

3.8 TOWER CAR PARK STACKER

Modification 13 includes a 221-space car stacker system under the footprint of the new Tower. The system will be accessed via the service road under The Star building. The stacker access is located on the eastern side of the service road just south of the Star Events loading dock (refer Figure 3.9).

The capacity of the system has been designed to cater for peak hour trips generated by the Ritz Carlton Hotel valet service and Residential Apartments (refer Table 3.6). The forecast demands are based on the following assumptions:

- Valet parking trip generation based on observed valet parking rates for the Astral and Darling Hotels, listed in Table 3.7
- RMS trip generation rates[4] for high density residential apartment development in Pyrmont (0.18 and 0.10 trips per apartment in the AM and PM peaks, respectively).

Each lift unit can accommodate up to 24 parking movements per hour providing a combined capacity of 72 parking movements per hour.

Table 3.6: Peak Hour trips in/out of the Proposed Tower Car Stacker

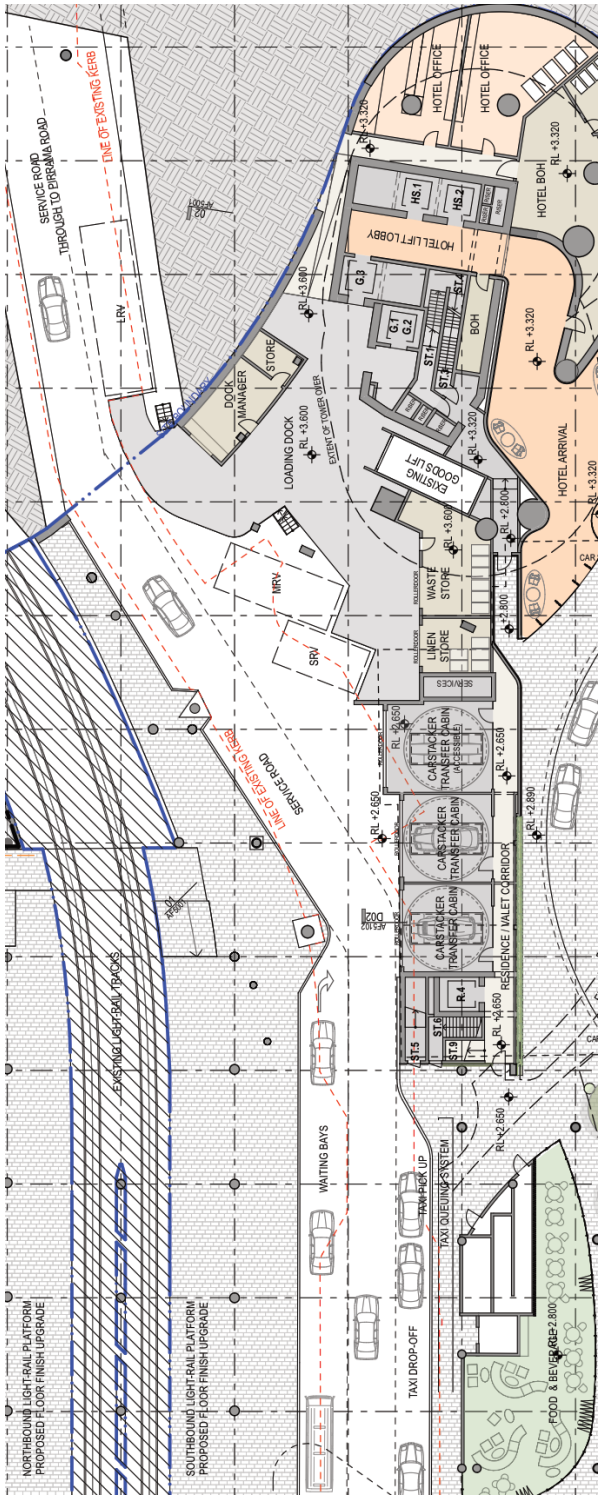
Peak		In	Out	Total
AM	Residential	7	29	36
	Hotel	4	13	17
PM	Residential	16	4	20
	Hotel	17	16	33

Table 3.7: Observed Astral & Darling Hotel Valet Parking Peak Hour Trip Generation Rates per room

Peak	Entry	Exit	Total
AM	0.02	0.06	0.08
PM	0.08	0.07	0.15

At least one of the storage retrieval units is fully accessible for wheel chair users providing access to the entire stacker capacity. Swept path entry/exit access to the stacker retrieval units has been checked and confirmed for a B99 design vehicle (refer Figure 3.10).

Figure 3.9: Proposed access point for car stacker servicing the Ritz and residential apartments



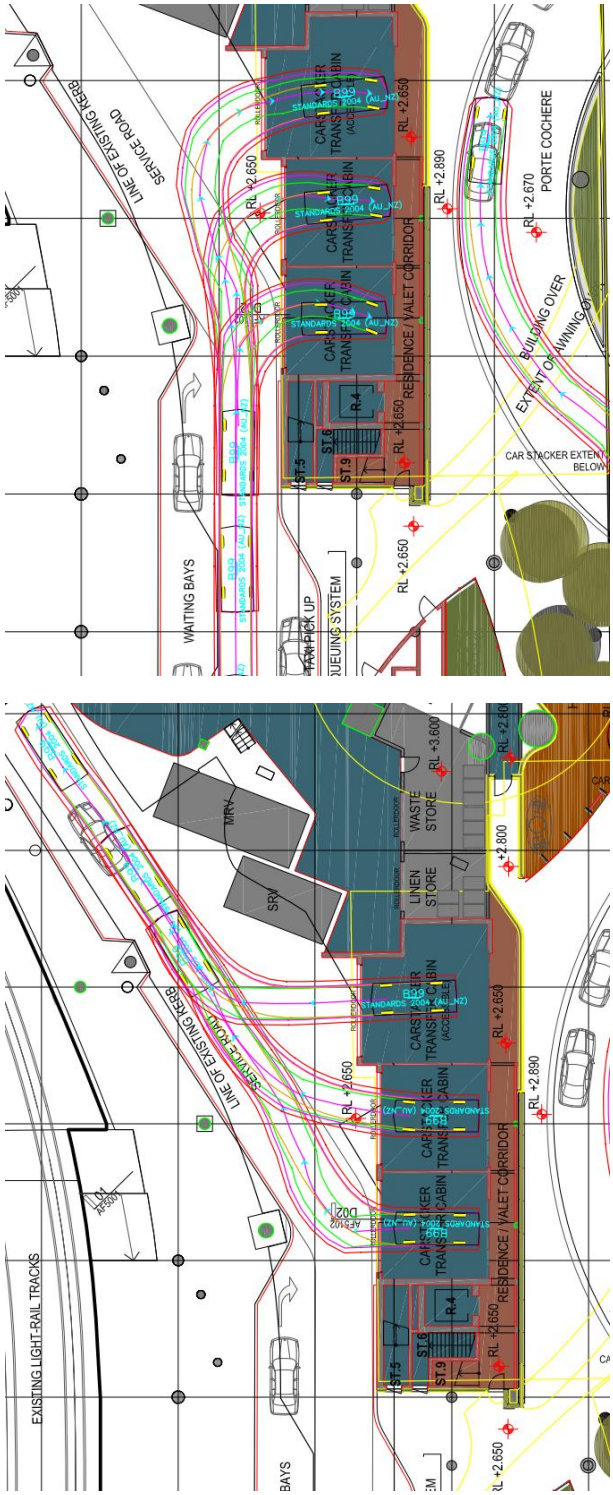
Source: SM13-AF102-P6

[4] RMS Technical Direction TD2013/04a

SEGL will produce a Loading Bay Management Plan and Car Stacker Management Plan which will include:

- Management of queueing along the service road because of malfunction of one or more of the car-stacker retrieval units
- The details of alternate parking locations to redirect vehicles due to extensive queueing in the service road
- Management of incidents in the service road and at the retrieval units or loading bays
- Security access arrangements for Hotel valet services, Tower visitors and residents
- Management of conflicts between car accessing the stacker and service vehicle movements to/from the adjacent loading bays

Figure 3.10: Car (B99) forward entry and exit swept path from stacker lift



3.9 STAR EVENTS LOADING DOCK UPGRADES

The existing Star Events loading dock is to be upgraded to accommodate additional delivery traffic associated with the Ritz Carlton Hotel and Apartments proposed in Modification 13.

The upgraded loading dock will provide:

- 1x LRV raised dock;
- 1 x MRV raised dock;
- 1x SRV raised dock; and

The dock is designed to accommodate the expected cumulative demands of 30-45 deliveries per day.

Proposed hours of operation are:

- Mon-Fri – 24 hours; and
- Sat, Sun & Public Holidays – 24 hours, as required.

ChangeLogic have prepared a loading dock plan and capacity assessment for the Star Events loading dock.

Swept path analysis has been undertaken to ensure the arrangement satisfies the relevant design vehicles (refer Figure 3.11).

Additionally, the existing 15m long Taxi Zone on the southern side of Jones Bay Road, approaching the mid-block crossing, will be converted to a short-term parking zone (15-minutes) for visitors/deliveries to the Tower. This will accommodate up to three SRV. This Jones Bay Road taxi zone will become redundant with the proposed relocation of taxis to the service road under the site.

Figure 3.11: Proposed Star Events Loading Dock Upgrades

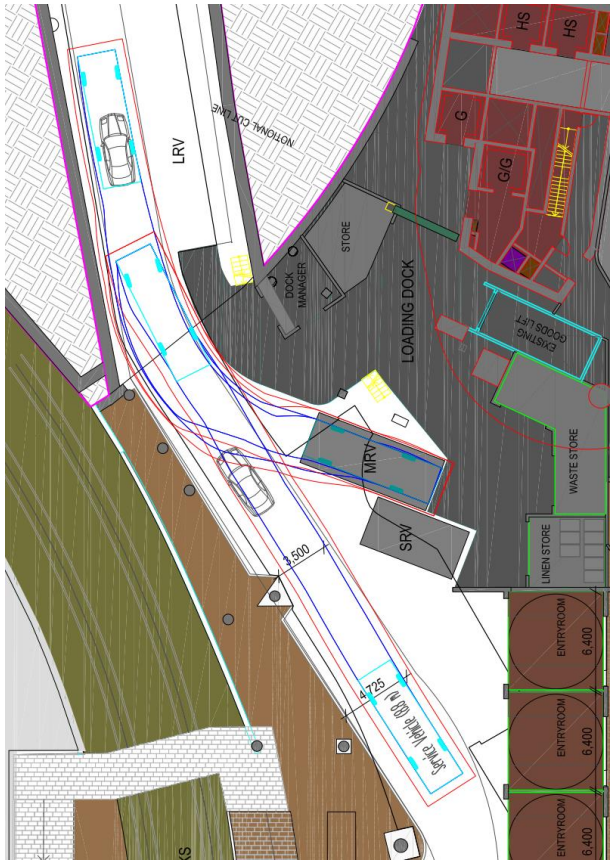
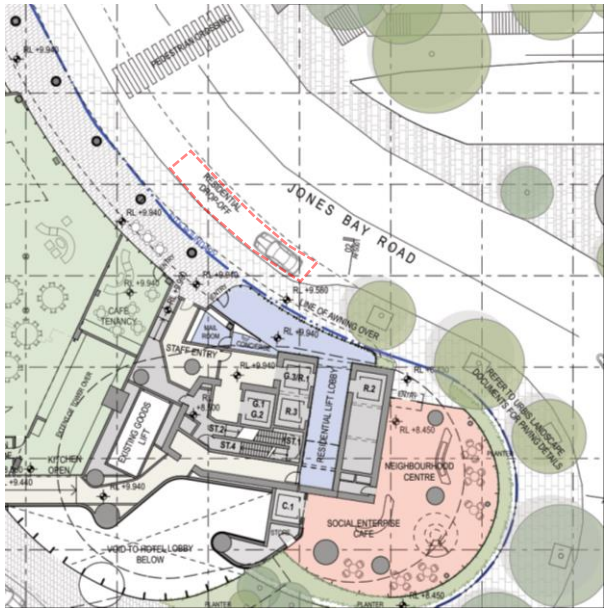


Figure 3.12: Jones Bay Road Residential Drop-off Zone



Source: SM13-AF1000-P5

3.10 BICYCLE PARKING

The following cycle parking provisions are proposed to mitigate the potential impacts of additional employee and visitor trips generated by Modification 13:

- 35 x Class 1 spaces for employees; and
- 62 x visitor spaces.

The proposed location for the employee parking is a 66 sqm secure room at the Union Street and Edwards Street entry to the food court and Casino escalators (refer Figure 3.13 & 3.14). The entry is located 40m from the Union Street cycleway, with a direct line of sight and ramp access to the cycle way.

The SEGL strategy for visitor cycle parking provision is:

- 20 rental bikes in the Pirrama Road forecourt or in public domain location to be agreed with CoS (e.g. in Pyrmont Bay Park, adjacent to the Pirrama Road shared path, refer Figure 3.15).
- 13 bike lockers adjacent to the Light Rail platform in an unused 32sqm SEGL retail space (refer Figure 3.16 and 3.17).
- 29 bike racks located in groups at the major entry points to the site (refer Figures 3.18 and 3.19) or at public domain locations to be agreed with CoS.

Table 3.5 Employee Cycle Parking Spaces

Use	Staff per shift[5]	Rate	Provision
Hotel	92	1 per 4	23
Apartments	-	-	-
Star	118[6]	1 per 10	12
Total			35

Table 3.6: Visitor Cycle Parking Spaces

Use	Measure	Rate	Provision
Hotel	220 rooms	1 per 20	11
Apartments	204 units	1 per 10	20
Star	9,435sqm	1 per 300	31
Total			62

Figure 3.13: Entry to Proposed Staff Cycle Parking Facility on Edward Street

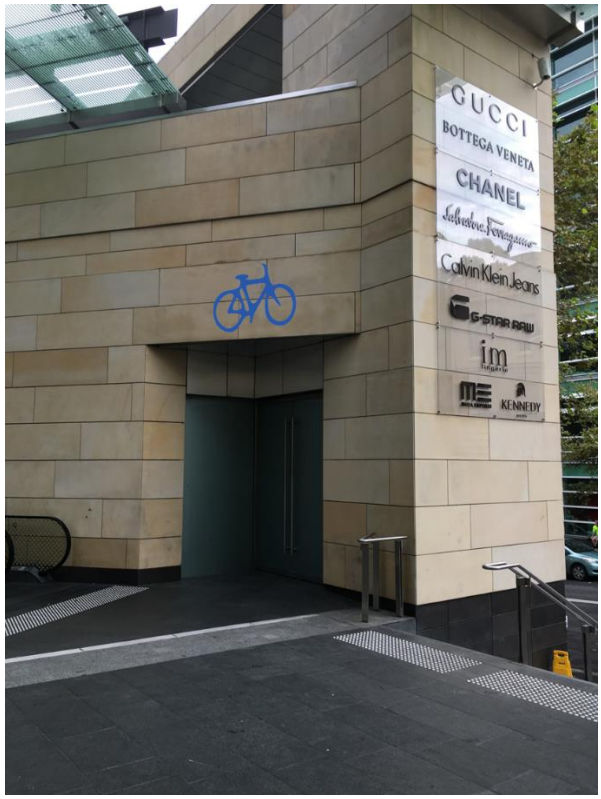
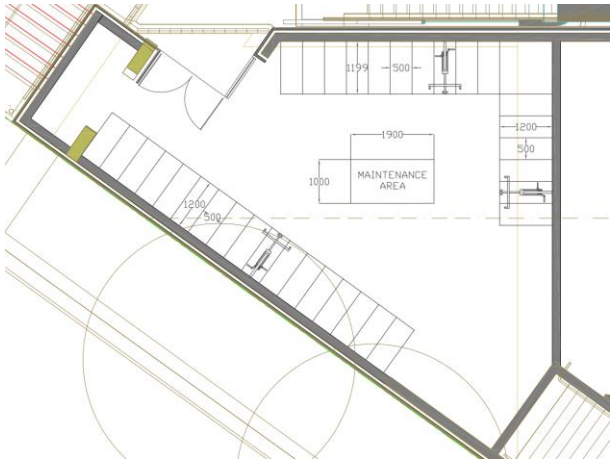


Figure 3.14: Proposed Staff Cycle Parking Facility on Edward Street



All cycle parking spaces proposed under Modification 13 will be designed in accordance with AS 2890.3.

[5] Assumes 3 main shifts per day and a 2-shift overlap at start/end of each shift
[6] Based on existing employee densities of 1 staff per 53 sqm of GFA per day.

Figure 3.15: Public Domain location for a bike rental facility

Figure 3.16: Proposed Public Bike Locker Space at the Light Rail Station

Figure 3.17: Proposed location for Public Bike Lockers at the Light Rail Station

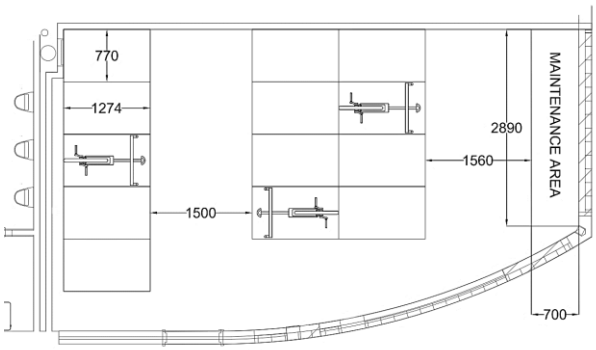


Figure 3.18: Proposed Location for visitor bike parking at the Union Street and Edward Street entry

Figure 3.19: Proposed Location for visitor Bike Parking on Jones Bay Road

3.11 CONSTRUCTION

3.11.1 Construction Program

The Modification 13 works are scheduled to commence in February 2019 and be completed by February 2023 (4-year program).

3.11.2 Hours of Work

The assumed hours of construction, based on existing consent conditions (MP08_0098), will be:

- 0700 to 1730 Monday to Friday (inclusive);
- 0800 to 1500 Saturday; and
- No work on Sundays or Public Holidays.

Additionally, approval is being sought to undertake internal, non-noise generating works, on a 24/7 basis.

3.11.3 Methodology

Construction works associated with Modification 14 will overlap by up to 9 months with Modification 13.

Many of the construction practices that have worked successfully during previous upgrade works, such as D2015/1515, will also be utilised for Modification 13. These practices include:

- Use of loading bays 5 and 6, in the Jones Bay Road loading dock, for construction deliveries. A review of delivery data from March 2016 revealed that construction accounted for up to the 8% of the average weekday delivery movements through the dock and 20% of the average weekend delivery movements. The use of bays 5 and 6 has not impacted normal loading operations. On a typical weekday, the loading dock processes up to 20-25 pallets per hour (80% of estimated capacity) during the AM peak hour (0700-0800). Over the rest of the day deliveries drop significantly to less than 10 pallets per hour.
- Use of the existing crane mounted on the roof at the north-western end of the site.
- Use of the existing Loading Zone along the eastern kerb of Pyrmont Street (Between Jones Bay Road and Edward Street).

In addition, the contractors will be seeking to use the Modification 14 proposed tower crane position and off-road delivery site on the Pirrama Road promenade (where the taxi drop-off and pick-up area is currently located).

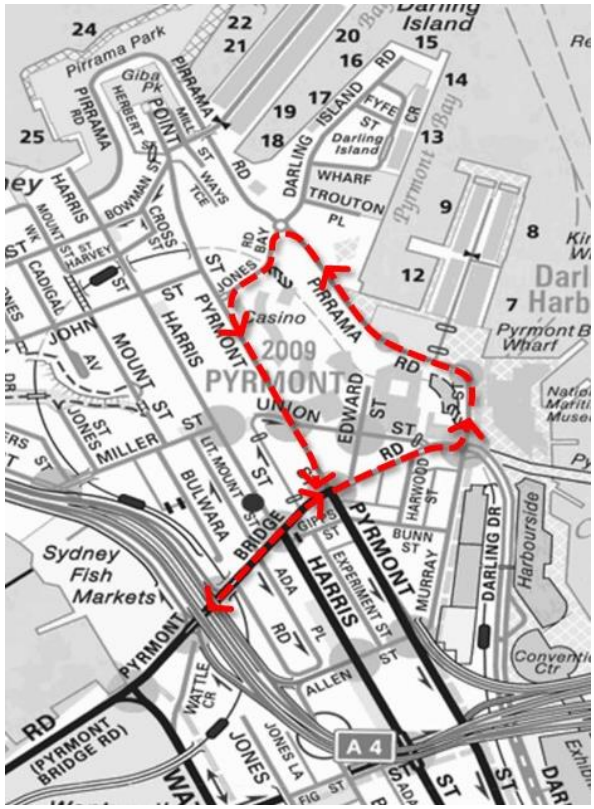
3.11.4 Haulage Routes

Construction deliveries to the site will be via the following routes outlined in Figure 3.20. This route will provide access to the main delivery locations around the site:

- Pirrama Road (Forecourt);
- Jones Bay Road Construction Zone;
- Jones Bay Road Loading Dock; and
- Pyrmont Street Construction Zone.

This route will accommodate up to a 19m semi-trailer.

Figure 3.20: Proposed Haulage Routes



Map Source: © 2010 Streetdirectory.com.au

4 IMPACT ASSESSMENT

The SEARS identified sixteen key transport related impacts that must be assessed in the Modification 13 application. These requirements are listed in the following sections along with an assessment for each. The first section provides an overview of the assessment methodology.

4.1 ASSESSMENT METHODOLOGY

Modification 13 is a modification to the Major Project MP08_0098 as previously modified, up to and including Modification 14. Accordingly, the traffic and transport related impacts of Modification 13 have been assessed against a base case that includes The Star development as currently exists as well as the approved (but yet to be constructed) Modification 14 development.

This methodology has been used in the assessments that follow in Section 4 of this report.

Sections 4.1.1, 4.1.2, 4.1.3, and 4.1.4 describe the assessment methodology for developing the trip matrices for cars, trucks, buses, cycles and taxis.

4.1.1 Base Case Modelling

The assessment of traffic impacts was undertaken using SIDRA 7.0 Network. This software assesses intersection performance in terms of:

- Levels of Service (RMS Delay method);
- Degree of Saturation, and
- Average Vehicle Delays (secs).

The base case models were developed and calibrated using count and queue length data collected in November 2017. Site inspections were also undertaken at the eight critical intersections during peak periods to record prevailing cycle lengths, phasing arrangements, green-splits, queue lengths and pedestrian protection. The signal timing assumptions adopted for the base case analysis is presented in Appendix A.

The road network performance has been assessed at the following peak traffic periods:

- AM peak, 8:00am to 9:00am;
- PM Peak, 5:30pm to 6:30pm; and
- Off-Peak, 10:30pm to 11:30pm.

4.1.2 Base Case Trip Assignment

The intersection and link flow data collected in November 2017 was used to develop individual ‘base case’ trip matrices for cars, trucks, buses, taxis and cycles. These matrices define the patterns of movement throughout the road network within the Star precinct and were critical to accurately assigning and reassigning Modification 13 traffic growth for the SEARS impact assessments that follow.

The car, truck, bus, taxi and cycle matrices were developed and calibrated using LINSIG matrix estimation tools. The matrices were calibrated till more than 95% of turning movements, at the eight critical junctions, achieved a GEH value less than 5.0 and 100% achieved a GEH value less than 10.0. Calibration was done separately for each vehicle matrix and for each peak period resulting in a total of 15 separate matrices (3 peaks x 5 vehicle matrices).

The car matrices were then further separated into ‘Star’ and ‘Non-Star’ car matrices. The Star matrices were developed using the observed entry/exit data for the Star access points during each peak. These internal trips were then assigned to the external cordon based on the origin suburbs of 89,423 active Star members and their most likely direction of approach. The remaining Non-Star car movements become background traffic in the network which are not impacted by Modification 13 growth.

4.1.3 Future Base Case Trip Assignment

Modification 13 is a modification to the Major Project MP08_0098 as previously modified, up to and including Modification 14. Accordingly, in the impact analysis that follows, the base case, or 'Do Nothing' includes the approved future Modification 14 development.

To represent this future approved scenario, the 'Star' car matrices in the base case have been increased by 5% to reflect the Modification 14 growth estimates (refer Table 4.1).

All other base case matrices for trucks, buses, taxis and cycles, remain the same.

Table 4.1: Impact of Modification 14 on Peak hour trips to/from Star

Component	Peak	In	Out	Total
Total	AM	19	6	24
	PM	23	21	44
	Off Peak	19	32	52
% Increase	AM	5%	5%	5%
	PM	5%	5%	5%
	Off Peak	5%	5%	5%

4.1.4 Future Impact (with Mod 13) Trip Assignment

The future impact assessment (i.e. with full development of Mod 13) has been modelled to reflect the traffic reassignment strategy proposed as part of Mod 13.

The proposed traffic reassignment strategy will assign more importance to the Pyrmont Street approach/departure, which will spread the potential traffic impacts of the proposal more evenly across the adjacent networks.

This traffic reassignment strategy helps reduce the potential impacts at critical intersections such as Pyrmont Bridge Road and Murray Street. It will be achieved through:

- Improved static wayfinding
- Use of the upgraded parking management system
- Relocation of the Sovereign member car-park entry/exit to Pyrmont Street. There are over 89,000 active sovereign members accessing more than 300 dedicated spaces. Any member over-flow will be directed to the public car-parking levels via the existing Edward Street car-park entry/exit.

The traffic network re-assignment assumptions are presented in Tables 4.2 to 4.4.

Table 4.2: Modification 13 Traffic Reassignment in the AM Peak

Entry/Exit	Entry		Exit	
	Exist	MOD 13	Exist	MOD 13
Pirrama Road Car Park	47%	34%	15%	5%
Service Road Entry	0%	0%	0%	0%
Edward St Car Park	52%	30%	41%	10%
Astral Port Cochere Exit	0%	0%	44%	44%
Astral Port Cochere Entry	1%	1%	0%	0%
New Sovereign Car Park	0%	35%	0%	41%
	100%	100%	100%	100%

Table 4.3: Modification 13 Traffic Reassignment in the PM Peak

Entry/Exit	Entry		Exit	
	Exist	MOD 13	Exist	MOD 13
Pirrama Road Car Park	25%	18%	47%	22%
Service Road Entry	0%	0%	0%	0%
Edward St Car Park	72%	30%	35%	25%
Astral Port Cochere Exit	0%	0%	18%	18%
Astral Port Cochere Entry	2%	2%	0%	0%
New Sovereign Car Park	0%	50%	0%	35%
	100%	100%	100%	100%

Table 4.4: Modification 13 Traffic Reassignment in the Off Peak

Entry/Exit	Entry		Exit	
	Exist	MOD 13	Exist	MOD 13
Pirrama Road Car Park	45%	25%	52%	27%
Service Road Entry	0%	0%	0%	0%
Edward St Car Park	40%	30%	35%	25%
Astral Port Cochere Exit	0%	0%	13%	13%
Astral Port Cochere Entry	15%	15%	0%	0%
New Sovereign Car Park	0%	30%	0%	35%
	100%	100%	100%	100%

4.1.5 Trip Generation

The Tower will have distinctly different impacts on traffic than the proposed upgrades to the remainder of The Star site.

For the purposes of the traffic assessment:

- the Ritz Carlton Hotel trip generation rate is based on observed valet and taxi trip rates for the Darling Hotel (171 rooms) and Astral Hotel & Residences (480 rooms) located on the site.
- The Residential apartment trip generation is based on RMS standard trip generation rates.

For the remainder of The Star upgrades, being a more complex mixture of retail, gaming, access, back-of-house and entertainment uses, a generic trip rate per 100 sqm of GFA was used. This rate, based on current site GFA and trip generation, assumes a worst-case scenario - that the existing site mode share will be maintained.

4.2 TRIP GENERATION

The Modification application shall evaluate daily and peak hour vehicle, public transport, and pedestrian movements likely to be generated by the development (construction and operation) including peak traffic movements.

4.2.1 Construction Trips

An estimate of average daily construction trips (workers and Deliveries) are provided in Section 4.13.

4.2.2 Ritz Carlton Hotel

The Ritz Carlton Hotel trips are based on the observed trip rates per room for the existing Darling and Astral Hotels, as outlined in Tables 4.5 to 4.8.

Table 4.5: Observed Port Cochere Valet Trips per room

	Entry	Exit	1-way Trips
AM	0.02	0.06	0.08
PM	0.08	0.07	0.15

Table 4.6: Observed Port Cochere Taxi Trips per room

	Entry	Exit	1-way Trips
AM	0.02	0.03	0.05
PM	0.07	0.08	0.14

Table 4.7: Observed Port Cochere Combined Trips per room

	Entry	Exit	1-way Trips
AM	0.04	0.09	0.13
PM	0.14	0.15	0.29

Table 4.8: Forecast Ritz Carlton Hotel Combined Trips based on 220 rooms

	Entry	Exit	1-way Trips
AM	9	20	28
PM	31	33	64

4.2.3 Tower Residential Apartments

The forecast Residential Apartment vehicle trips listed in Table 4.9 are based on:

- An RMS standard rate of 0.18 vehicle trips per apartment in AM peak (0.18 x 204 apartments = 37 trips);
- An assumed AM peak 20/80 directional split for in/out movements;
- An RMS standard rate of 0.10 vehicle trips per apartment in PM peak (0.1 x 204 apartments = 20 trips); and
- An assumed PM peak 80/20 directional split for in/out movements
- An assumed rate of 0.10 vehicle trips per apartment in the Off Peak (0.1 x 204 apartments = 20 trips)
- An assumed Off Peak 50/50 directional split for in/out movements;

Table 4.9: Forecast Tower Residential Apartment Trips based on 204 apartments

	Entry	Exit	1-way Trips
AM	7	29	37
PM	16	4	20
Off Peak	10	10	20

Other trips generated by the residential apartments during peaks periods, by other modes such as walking, cycling and public transport, are presented in Table 4.11.

These estimates are based on the household assumptions in Table 4.10, a worse-case 100% occupancy rate, and 2016 census data on prevailing journey to work mode share patterns for the Pyrmont area (population of 6,758 employed residents).

Table 4.10: Residential Apartment Household Assumptions

	1 Bed	2 Bed	3 Bed	Totals
No. Dwellings	81	104	19	204
Occupancy Rates[7]	1.3	1.9	2.7	
Est. Population	105	198	51	354
% Employed[8]	61%	61%	61%	
No. Daily Commuters	64	121	31	216
No. Peak Hour Commuters[9]	36	68	18	121

Table 4.11: Forecast Peak Hour Residential Apartment Trips by Mode

Mode	Mode Share %[10]	Total Trips
Train	10%	13
Bus	12%	14
Ferry	0%	0
Light Rail	2%	3
Taxi	1%	2
Car Driver	25%	30
Car, As Passenger	3%	4
Bicycle	2%	3
Walked	43%	53
Total	100%	121

[7] City of Sydney DCP 2015

[8] Estimates based on the 2016 Census of employment, income and education data for Pyrmont

[9] Peak period to peak hour conversion factor of 0.56

[10] Estimates based on the 2016 Census of employment, income and education data for Pyrmont

4.2.4 Remaining Star Upgrades

The remainder of the Star upgrades are based on:

- The observed site trip generation rates listed in Table 4.12;
- An increase of 6,633 sqm of GFA resulting from the approved Modification 14 upgrades
- An increase of 9,433 sqm of GFA for Modification 13.

The estimated increase in trips due to the 9,433sqm of general upgrades to the Star, is presented in Table 4.13

Table 4.12: Existing Star Trip rates per 100sqm of GFA

Peak	Type	Entry	Exit	Total
AM	Car	0.35	0.09	0.44
	Taxi	0.02	0.02	0.04
	Truck	0.00	0.00	0.01
	Total	0.37	0.12	0.49
PM	Car	0.31	0.31	0.63
	Taxi	0.04	0.05	0.09
	Truck	0.00	0.00	0.00
	Total	0.36	0.36	0.72
Off Peak	Car	0.19	0.37	0.57
	Taxi	0.17	0.08	0.25
	Truck	0.00	0.00	0.00
	Total	0.37	0.46	0.82

Table 4.13: Estimated Trip Generation due to Modification 13 increase in GFA

Peak	Type	Entry	Exit	Total
AM	Car	33	9	42
	Taxi	2	2	4
	Truck	0	0	1
	Total	35	12	47
PM	Car	30	29	59
	Taxi	4	5	8
	Truck	0	0	0
	Total	34	34	68
Off Peak	Car	18	35	54
	Taxi	16	8	24
	Truck	0	0	0
	Total	34	43	78

4.2.5 With Project Total Impact

The estimated cumulative traffic impacts of the Modification 14 and 13 proposals is presented in Tables 4.14 and 4.15.

The traffic impacts of Modifications 13 and 14 have been assigned to the adjacent road network based on:

- The origin suburbs of 89,423 active Star members and their most likely direction of approach.
- A redistribution of some existing and proposed Star trips associated with the opening of the Pyrmont Street car park entry for Sovereign members. There are over 89,000 active Sovereign members. The Star car-park has over 300 spaces dedicated to their use alone.
- A redistribution of some taxi and valet parking trips associated with the provision of a right turn into Jones Bay Road entry

The traffic network re-assignment assumptions were presented earlier in Tables 4.2 to 4.4.

Table 4.14: Impact of Modification 14 on Peak hour trips to/from Star

Component	Peak	In	Out	Total
Total	AM	19	6	24
	PM	23	21	44
	Off Peak	19	32	52
% Increase	AM	5%	5%	5%
	PM	5%	5%	5%
	Off Peak	5%	5%	5%

Table 4.15: Impact of Modification 13 on Peak hour trips to/from Star

Component	Peak	In	Out	Total
Hotel	AM	9	20	28
	PM	31	33	64
	Off Peak	0	0	0
Apartments	AM	7	29	37
	PM	16	4	20
	Off Peak	10	10	20
Star	AM	35	12	47
	PM	34	34	68
	Off Peak	34	43	78
Totals	AM	51	61	112
	PM	81	71	152
	Off Peak	45	54	98
% Increase	AM	10%	35%	16%
	PM	16%	14%	15%
	Off Peak	9%	8%	9%

The resultant traffic impacts on the critical intersections around the site are presented in Table 4.1. Traffic impacts on link flows in the adjacent network are presented in Tables 4.17 and 4.18

In terms of the State Road network interface, the proposed modifications will increase traffic on Pyrmont Bridge Road, west of Pyrmont Street, by 13%, 18% and 5% in the AM, PM and Off-peak hour periods, respectively. Further west, at the interchange with the Western Distributor, this impact would be diluted to an impact of between 2% and 5%.

Most of the forecast traffic growth on the local road network will be on Pyrmont Street. Conversely there is estimated to be little or negative growth on Pirrama Road, Murray Street and Jones Bay Road due to the proposed re-assignment of traffic to Pyrmont Street.

Importantly, the traffic reassignment proposed in the modification, will reduce pressure on the critical intersection of Pyrmont Bridge Road, Murray Street and Union Street. This intersection is expected to be impacted by traffic growth associated with the new Sydney ICC development

Table 4.16: Estimated Traffic Impacts on network intersections due to Modification 13

Intersection	AM	PM	Off Pk
Pyrmont Street / Jones Bay Road	10%	3%	-3%
Pyrmont Street / Union Street	31%	41%	25%
Pyrmont Street / Pyrmont Bridge Road	15%	18%	11%
Pyrmont Bridge Road / Union Street	30%	-5%	1%
Pirrama Road / Star Car Park Entrance	12%	-7%	-19%
Jones Bay Road / Pirrama Road	8%	-1%	-11%
Union Street / Edward Street	-9%	3%	5%
Pyrmont Bridge Road / Murray Street	14%	1%	-3%

Table 4.17: Estimated Traffic Impacts (%) on adjacent network links due to Modification 13

Link	AM	PM	Off Pk
Jones Bay Rd	12%	-2%	-10%
Pyrmont St (Immediately South of Jones Bay Rd)	11%	4%	-3%
Pyrmont St (Immediately north of Union Street)	35%	47%	25%
Pyrmont St (South of Union St)	36%	48%	30%
Pyrmont Bridge Rd (West of Pyrmont St)	11%	17%	3%
Pirrama Rd (South of Jones Bay Rd)	1%	7%	-10%
Edward St (North of Union St)	-11%	3%	13%
Pirrama Road (South of Star Car Park Entry)	11%	-9%	-22%
Pyrmont Bridge Rd (East of Edward Street)	18%	-8%	-1%

Table 4.18: Estimated Traffic Impacts (vehicles/hour) on adjacent network links due to Modification 13

Link	AM	PM	Off Pk
Jones Bay Rd	53	-13	-72
Pyrmont St (Immediately South of Jones Bay Rd)	60	25	-20
Pyrmont St (Immediately north of Union Street)	216	377	208
Pyrmont St (South of Union St)	226	411	262
Pyrmont Bridge Rd (West of Pyrmont St)	178	252	56
Pirrama Rd (South of Jones Bay Rd)	5	42	-75
Edward St (North of Union St)	-31	13	39
Pirrama Road (South of Star Car Park Entry)	60	-81	-270
Pyrmont Bridge Rd (East of Edward Street)	123	-63	-11

4.2.6 Public & Active Transport Impacts

The cumulative impacts of Modification 14 and 13 on daily employee trips, by mode, is presented in Table 4.18.

Due to shift work patterns at The Star, most future employee trips generated by the modifications will fall outside the commuter peak demand periods. The main shift changeover times are 4am, midday and 8pm. The AM and PM commuter peak hours' account for only 13% and 15% of the total daily Star employee trips, respectively.

Additionally, the Star visitor peaks fall outside the public transport commuter peak demand periods, when public transport services are under utilised.

Table 4.18: Forecast Increase in Daily Employee Trips by Mode

Mode	Current Staff mode	MOD14 Daily Trips	MOD13 Daily Trips
Car	52.4%	66	166
Train	21.7%	27	69
Active	7.1%	9	22
Light Rail	6.2%	8	20
Bus	6.2%	8	20
Motorcycle	2.7%	3	9
Ferry	0.9%	1	3
Other	2.8%	3	9
Total	100%	125	316

4.3 NETWORK PERFORMANCE

The Modification application shall model and assesses the current and future performance of key intersections providing access to the site under 'project and 'no project' scenarios, and identifies any upgrades (road/intersections) required because of the proposal.

The performance of the surrounding road network, without project, during construction, and with project, was assessed using SIDRA 6.1 Network.

This software assesses network and intersection performance in terms of:

- Levels of Service (RMS Delay method);
- Degree of saturation; and
- Average Vehicle Delays (secs).

4.3.1 No Project

The performance of the current road network, as previously assessed, was documented earlier in Section 2.3.

The analysis indicated that nearly all critical intersections around the site are providing good levels of services (LOS C or better), in all peaks, which suggests that the network has significant reserve capacity.

4.3.2 With Project

The performance of the surrounding road network under the cumulative impacts of Modification 14 and 13, are presented in Table 4.19. Detailed SIDRA outputs are presented in Appendix B.

With two exceptions, the analysis indicates that nearly all sites are still providing good levels of services (LOS C or better), in all peaks, which suggests that the network has sufficient reserve capacity.

The exceptions are the intersection of Pyrmont Street and Union Street and the intersection of Pyrmont Street and Pyrmont Bridge Road. Under Modification 13, the PM peak performance at these site drops from LOS C to D. In the context of the prevailing Sydney road network, this still represents acceptable levels of service.

Detailed SIDRA analysis outputs for the adjacent network, with the additional traffic associated with Modification 13, are presented in Appendix C.

The SEGL mitigation strategy to assign more importance on the Pyrmont Street approach/ departure has spread the potential traffic impacts of the proposal more evenly across the adjacent network. This traffic reassignment strategy has helped reduce the potential impacts at critical intersections such as Pyrmont Bridge Road and Murray Street. Given the success of the SEGL mitigation strategies in achieving acceptable network performance levels under Modification 13,

SEGL does not propose any intersection or network capacity upgrades.

Table 4.19: Road Network Performance (Level of Service) Without/With Modification 13

Site	AM		PM		Off Peak	
	Without	With	Without	With	Without	With
1. Pyrmont St & Jones Bay Rd	A	A	A	A	A	A
2. Pyrmont St & Union Street	B	C	C	D	C	C
3. Pyrmont St & Pyrmont Bridge Rd	B	B	C	D	C	C
4. Pyrmont Bridge Rd & Union St	A	A	A	A	A	A
5. Pirrama Rd & Star Car Park Entry	A	A	B	A	B	B
6. Jones Bay Rd & Pirrama Rd	A	A	B	B	B	B
7. Union St & Edward St	B	B	C	B	C	B
8. Pyrmont Bridge Rd & Murray St	C	C	C	C	C	C
9. Pyrmont Street & Sovereign Car Park Entry/Exit	-	A	-	A	-	B

Source: Mott MacDonald SIDRA 7.0 Network analysis

4.4 CUMULATIVE IMPACTS

The modification shall evaluate the cumulative impacts and potential conflict with traffic movements generated by existing and approved development near the site.

4.4.1 Construction

The CBD Coordination Office (CCO) has identified the following developments that are planned or under construction near the SEGL site:

- Harbourside Redevelopment (2018 to TBC);
- IMAX (now to 2019);
- The Ribbon (2017 to 2020);
- Cockle Bay Wharf (2018/19 to 2023);
- ICC Hotel (now complete);
- Darling Square (now to 2019);
- Hay Street Redevelopment (2017 to 2019/20); and
- Sydney Light Rail Zones 9-13 (Q3 2017 to 2019).

The Harbourside and Darling Square developments are the only planned developments likely to share the Pyrmont Bridge Road haulage route with The Star during construction. This will only impact on inbound movements passing through the intersection of Murray Street, Union Street and Pyrmont Bridge Road. On the return journey, The Star construction traffic bypasses this critical intersection.

All other projects planned or under construction are well removed from the proposed Modification 13 works, or will be completed when Modification 13 construction commences.

Figure 4.1: Other Development in the Precinct

Source: Transport for NSW

Harbourside

As of January 2018, this proposal had completed public exhibition. Further detailed development applications are required before building can commence. The development application(s) will be guided by a design excellence framework and urban design guidelines.

The Site is located within Darling Harbour. It is bound by Pyrmont Bridge to the north, the Sydney International Convention, Exhibition and Entertainment Precinct (SICEEP) to the south, Darling Drive and the alignment of the Light Rail to the west and Cockle Bay to the east. The proposed redevelopment will include the following quantum of gross floor area (GFA):

- Residential 35,000 sqm; and
- Retail 52,000 sqm

During the period of construction, the access routes for this development will be via: Pyrmont Street, Pyrmont Bridge Road, Harris Street, Darling Drive and Harbour Street.

The main conflict area between haulage routes proposed under this development and the works proposed under Modification 14 for SEGL, will be at the intersection of Pyrmont Bridge Road and Murray Street (to the north) and Darling Drive (to the south). The Harbourside truck movements have been anticipated to be spread evenly throughout the construction programme, where it is estimated 3-4 trucks will enter and exit the site every hour over the duration of the development.

The Harbourside traffic impact assessment also identified that construction works would result in increased demand for adjacent parking facilities, such as the ICC and to a lesser extent SEGL, due to the displacement of some Harbourside customer parking during construction.

IMAX & The Ribbon

As of June 2014, this proposal has been approved by the DPE for construction. Demolition and construction of the IMAX cinema site is underway now.

The subject site is in a prominent position within Darling Harbour along the western fringe of Sydney CBD. Occupying land between the two Western Distributor elevated roadways, the site of approximately 2,330sqm has a frontage primarily north facing to the pedestrian environment of Darling Harbour. The site is under the care and control of SHFA and is occupied by the IMAX Cinema, function centre and associated restaurants/ cafes.

The proposed redevelopment will include:

- 403 luxury seat IMAX cinema;
- Residential 17,280sqm;
- Retail 5,470sqm; and
- 588 room six-star W Hotel 32,130sqm.

During the period of construction, the access routes for this development will be via: Wheat Street, and Harbour Street. Construction traffic associated with this development is not expected to conflict with Modification 14 construction traffic.

Cockle Bay Wharf

As of January 2018, the amended proposed concept plans for Cockle Bay had been lodged with the Department and include a new retail shops, bars and restaurants, along with a commercial office tower up to 195m in height.

The amended proposal was on public exhibition from 16 November to 15 December 2017.

Engagement is now closed and feedback is being considered.

The development application is staged, and stage 1 proposes changes to land uses, gross floor area, building size, public walkways, pedestrian and vehicle access.

Further detailed development applications are required before any building can commence. Future development application(s) will be guided by any requirements approved as part of the stage 1 application, a design excellence framework and urban design guidelines.

The proposed redevelopment will include the following quantum of gross floor area (GFA):

- Commercial 85,000sqm;
- Retail 25,000sqm; and
- Public Domain 12,000sqm.

Cockle Bay Wharf is located on the eastern side of Darling Harbour. The proposed redevelopment will not affect the works proposed under Modification 14 for SEGL. During the period of construction, the access routes for this development will be via: Harbour Street, Wheat Road; and Western Distributor (where northbound traffic will be diverted via King Street).

Access to the site is available from Harbour Street via Wheat Road. Wheat Road passes through the site in a northerly direction and Harbour Street is located adjacent to the eastern boundary of the site.

The redevelopment will include an extension of the development over the northbound and southbound carriageways of the Western Distributor and the diversion of Wheat Road through the site.

Darling Square

In May 2017, The NSW Government has approved a plan to beautify and provide greatly improved facilities at the site of the former Entertainment Centre site, known as Darling Square, which is the final piece in the wider Sydney International Convention Exhibition and Entertainment precinct.

The Darling Square Site is, located in the south of the SICEEP Site, within the northern portion of the suburb of Haymarket. Bounded by the Powerhouse Museum to the west, the Pier Street overpass and Little Pier Street to the north, Harbour Street to the east, and Hay Street to the south; and has is irregular in shape and occupies an area of approximately 37,700sqm. At completion, this development will add an additional 400 public car spaces.

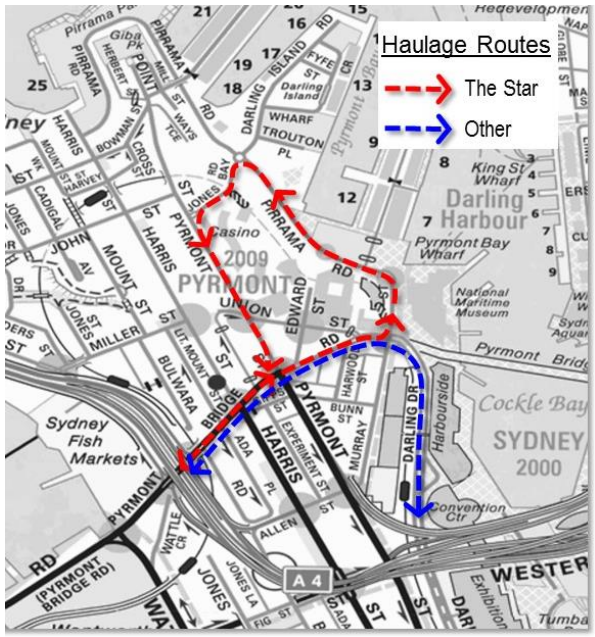
Darling Square includes offices, shops, around 1500 homes, and more than 1500 student accommodation beds. The centrepiece, Darling Exchange, will be a spectacular and uniquely designed six-storey building that includes market halls, a childcare centre, a roof top restaurant and bar and a library with a designated 'Innovation Exchange' providing IQ hub space for freelancers and start up workers.

Construction traffic associated with this development is 3-4 trucks per hour spread evenly throughout the construction programme. The main conflict points with the Modification 14 haulage routes will be trucks entering/exiting the darling square site via Darling Drive and Pyrmont Bridge Road. SEGL has mitigated its potential impacts on this intersection through the choice of haulage route which avoids the intersection on the outbound journey.

Conclusion

The proposed Modification 13 pedestrian and traffic planning during construction has been reviewed in the context of the wider CCO advised approved or proposed construction activities in the Pyrmont precinct. No adverse pedestrian or traffic impacts are anticipated during construction of Modification 13.

Figure 4.2: Summary of Pyrmont Haulage Routes



Map Source: © 2010 Streetdirectory.com.au

4.4.2 100 Harris

Modification 13 includes the creation of a new car park access on Pyrmont Street. The car park access will be in located in Pyrmont Street, 70m north of Union Street. This will place it opposite the proposed car park access to the 100 Harris Street development (D/2015/1179).

A cumulative impact assessment of performance of the two driveways has been undertaken.

The arrangement was modelled using SIDRA 6.1, under the combined AM and PM turning movements for the two sites. The traffic demands for the 100 Harris Street driveway are derived from the traffic impact assessment report prepared by Traffix (Aug 2015). The assumed layout for the analysis is presented in Figure 4.3

The performance of the combined car park arrangement is presented in Table 4.20. The analysis indicates that the combined driveway arrangement will operate at LOS C or better in the AM and PM peaks.

Figure 4.3: Proposed Pyrmont Street Car Park Entry/Exit Layout.

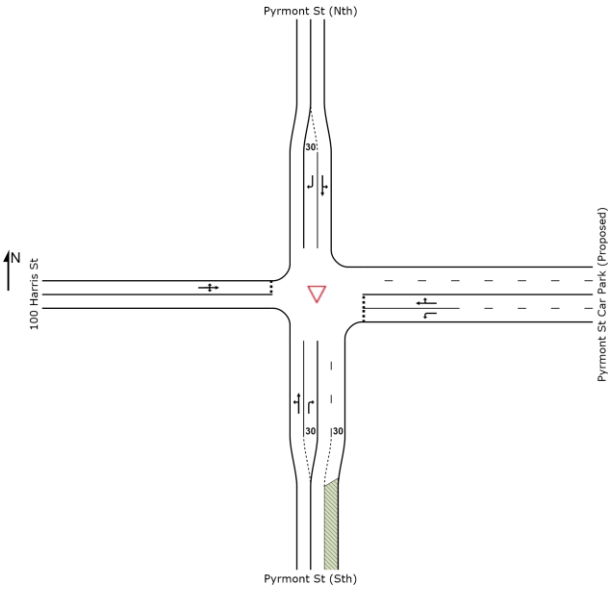


Table 4.20: Combined Driveway Performance (Worst Movement)

	AM	PM
Level of Service (worst movement)	B	C
Degree of Saturation	0.159	0.365
Delay per vehicle (Sec)	14.4	23.5

4.4.3 Other Developments

The CCO has identified the following developments that are planned or under construction near SEGL site:

- Harbourside Redevelopment (2018 to TBC);
- IMAX (now to 2019);
- The Ribbon (2017 to 2020);
- Cockle Bay Wharf (2018/19 to 2023);
- ICC Hotel (now complete);
- Darling Square (now to 2019);
- Hay Street Redevelopment (2017 to 2019/20); and
- Sydney Light Rail Zones 9-13 (Q3 2017 to 2019).

The Harbourside and Darling Square developments are the only planned developments likely to share the Pyrmont Bridge Road access route with The Star.

The intersection most impacted by these other developments is Murray Street, Union Street and Pyrmont Bridge Road. SEGL will minimise its impact on this critical intersection, as part of Modification 13, through a strategy to assign more importance on the Pyrmont Street approach/departure with a new car park entry. This strategy will minimise traffic growth at the intersection to 14% in the AM peak, whilst maintaining or reducing current flows in the PM and Off-peak periods.

4.5 PUBLIC TRANSPORT

The modification shall assess the ability of existing and future public transport networks (including light rail, ferry and bus networks) to accommodate the forecast number of trips generated by the proposal.

The earlier analysis of existing public and active transport facilities in Section 2.11 revealed the following:

- The site is well serviced by public and active transport links.
- Sydney buses services are currently underutilised. There is sufficient capacity to accommodate the additional staff and visitor trips generated by this proposal.
- Light Rail services are currently highly utilised in the AM and PM peaks periods with up to 95% of total capacity occupied. Fortunately, due to shift work patterns at The Star, most future staff trips associated with the modification will fall outside the light rail peak demand periods. Access arrangements to the platforms are adequate to cope with the proposed increase in staff and visitor trips, any further increases in service frequencies, in response to higher levels of demand, are a commercial matter for the operator TransDev.
- Ferry services have sufficient capacity to accommodate the additional staff and visitor trips generated by this proposal.
- The site is within 15-minute walk of Town Hall station. With the proposed upgrades to CBD heavy rail services proposed as part of the CBD Metro project (late 2020's), there is sufficient capacity to accommodate the proposed increase in visitor and staff trips by rail.

It is the conclusion of this assessment that there is sufficient capacity for the existing public transport networks to accommodate the additional trips generated by Modification 13.

In addition, the Metro West proposal, which currently includes a station located within 160m of the Star, represents a major long-term opportunity to further improve public transport choices for visitors and staff travelling to The Star.

4.6 LIGHT RAIL

The modification shall assess and detail the impacts on the light rail (including passenger access to platforms) to ensure the development does not adversely impact on its safe and efficient operation.

Modification 13 will positively impact on the light rail in the following ways:

- It opens the views and pedestrian linkages between Pirrama Road and the light rail station. This will improve passive surveillance opportunities.
- It provides a strong centralised pedestrian link between the light rail station and coach services, taxis, and Pirrama Road.
- It provides a large raised pedestrian crossing of the service road.
- It provides public bike locker facilities, adjacent to the light rail station platform.
- It includes cosmetic upgrades to the station precinct to improve the customer experience.
- The SEGL proposal to relocate taxis to the service road will help activate the station precinct and improve passive surveillance.

It is the conclusion of this assessment that Modification 13 will not adversely impact on the safe and efficient operation of the Light Rail.

With the opening of the CBD and South East Light Rail (CSELR) in March 2019, the Inner West Line will be used by the CSELR new high-capacity sets (450 passengers) to access the main maintenance depot. A low-capacity link between the two lines is being built to allow this. There may be an opportunity to run some limited high-capacity sets from the CSELR fleet on the Inner West line for special events.

Inner West Line services are currently stopping at the southern end of the Star station platforms. This makes the northern crossing point superfluous except for pedestrians using the informal pedestrian link up the service road. Both SEGL and TransDEV agreed that this informal path up the service road should be discouraged. The SEGL upgrade of the service road as part of Modification 13 will include physical pedestrian barriers to restrict this movement up the service road. TransDEV saw this as an opportunity to close the northern crossing and extend the platform by 2m to accommodate the operator's future high-capacity fleet. The new fleet would double the current service capacity from 220 to 450 passengers.

Figure 4.4: Existing Northern at-grade Pedestrian at The Star Light Rail stop.

4.7 PUBLIC TRANSPORT

The modification shall outline existing public transport services and opportunities for greater usage for workers and visitors.

4.7.1 Existing Services

Existing public transport services are outlined in Section 2.11.

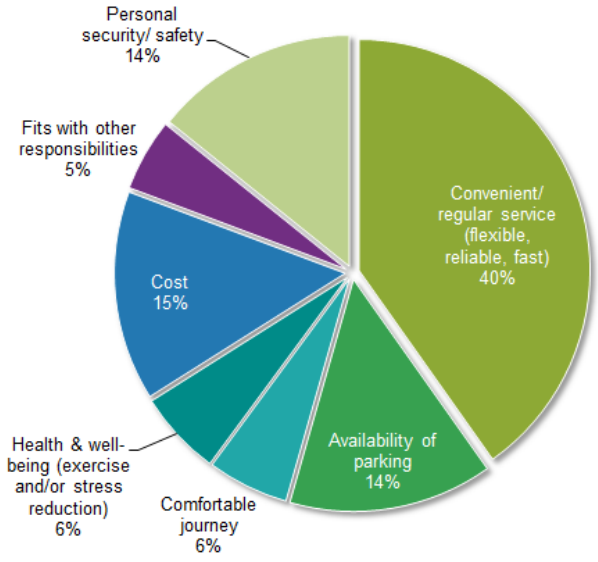
4.7.2 Mode Choice Drivers

The staff survey undertaken during the development of the Star Travel Plan identified that the top 3 factors affecting staff mode choice were the following:

1. Convenient/regular services (flexible, reliable, fast) – 40% indicated this as the highest priority.
2. Cost – 15% indicated this as the highest priority.
3. Availability of parking, and personal security/safety – 14% indicated this as the highest priority.

Additional observations included that almost 80% of staff use the same mode(s) for their commute between home and work, 13% use a different mode on another workday, and 8% use a different mode to and from work.

Figure 4.5: Primary Reason for Mode Choice



4.7.3 Motivators

Staff were also asked how likely certain factors would be to motivate them to change their mode of travel to avoid traffic congestion or overcrowding.

The responses indicate that the three factors most likely to change the mode of travel for staff are:

1. Improved service frequencies for public transport.
2. A shuttle bus to/from public transport interchanges near The Star.
3. Incentives to try out and use other modes (such as public transport discounts).

The findings are consistent with the primary reason for mode choice found earlier in the survey (i.e. convenient/regular services).

4.7.4 Opportunities

The Metro West proposal, one of which currently includes a station located within 160m of the Star, represents a major long-term opportunity to further improve public transport choices for visitors and staff travelling to The Star.

Section 2 outlined the Star Express Services that SEGL provides for visitors to encourage more sustainable transport choices. SEGL operates 91 private bus services, across five dedicated routes and stops at 49 locations. They operate services to Central, Burwood, Riverwood, Hurstville and Cabramatta. SEGL is monitoring visitor demand for these services and will expand them further as required. The Star Express Services are promoted on the Star web-site.

4.8 SUSTAINABLE TRANSPORT

The modification shall detail sustainable travel initiatives for workers and visitors, particularly for the provision of end-of-trip facilities.

SEGL has produced a draft Star Travel Plan which outlines a series of initiatives to improve the sustainable travel choices for staff and visitors travelling to The Star.

The draft travel plan was presented to the Executive Team in November 2017 along with some examples of best practice. These included website examples, travel starter packs for new and existing staff and high-level examples of where the Star is doing well, how to maximize the strength points and what to do for improvement. It was agreed that the Executive Team members would act as Travel Plan Champions for delivery.

A Working Group comprising of staff members across the organization was established in December 2017. Three meetings have been held since then with a schedule of monthly meetings.

Actions that have been undertaken so far, include:

- Introduction to the process undertaken to date and review of staff surveys.
- A detailed review of the actions in the draft travel plan. This includes determining which department is responsible for delivery, revised timescale and how they link to the overarching objectives. Some of the initial actions (quick wins) which the group is currently progressing include:
    - A draft travel planning intranet site has been developed and currently out for internal review. This provides links to travel planning tools and information on alternative modes of travel as well as an introduction to the working group and the Action Plan. A calendar of events is being developed to support this with marketing material and tied to a future sustainability day at the end of March 2018. Changes to the 'Getting Here' section of The Star's website will follow this.
    - A night time audit to understand the travelling environment for shift workers is programmed to take place in March 2018.

- Discussions have started with potential bike sharing companies in relation to working closely to improve parking opportunities and providing incentives for staff to use them.
- The latest meeting was held on the 14th of February where a site audit was undertaken and lead by the Transport Manager. A number of improvements was identified to end of trip facilities and wayfinding. These are to be workshopped next month (March) with a view to providing a business case to the Travel Planning Champions.

4.8.1 Travel Plan Mode Shift targets

The preliminary mode share targets proposed in the Draft Star Travel Plan are presented in Table 4.21.

This is a live document that will develop strategies over time to incentivise and then monitor progress towards the nominated mode shift targets.

Table 4.21: Draft Mode share targets

Mode	2016 Existing Mode Share %	2019 Target Mode Share %	% Change By Year-3
Walk	6.6	7.3	+10
Cycle	0.5	1.5	+300
Public Transport	35	38.5	+10
Car Pool	7.5	8.2	+10
Motorcycle	2.7	3	+10
Taxi/ Ride Share	0.4	0.4	-
Car	44.5	38.4	- 16
Other	2.7	2.7	-
TOTALS	100	100	

4.8.2 Travel Plan Measures

The Draft Star Travel Plan sets out the actions and timeframes that The Star will commit to, to provide more convenient, safer, and more sustainable travel options for its staff and visitors both now and in the future.

Ongoing monitoring of the progress of individual actions as well as the overall achievement of targets is required to maintain the momentum of the Travel plan. It is proposed that the progress of the Travel Plan towards achieving mode-share targets should be monitored on an annual basis. To this end, it is proposed that full surveys be undertaken in year 3 and 5 and smaller snapshot travel surveys be undertaken at the end of each year 1, 2 and 4. This will allow targets to be continually altered to reflect levels of success and ensure that final targets are realistic and achievable.

Being a significant tourist attractor and employer, The Star already uses many avenues for internal and external promotion and marketing. It is proposed that The Star Travel Plan (including weblinks and a phone number for further information) would be included in relevant marketing materials.

4.9 ACCESS

The modification shall detail existing and proposed vehicular access and car parking arrangements for workers and visitors (cars, coaches/buses & taxi ranks), including compliance with parking codes and Australian Standards.

4.9.1 Existing

Existing parking and access arrangements are outlined in the following sections:

- Section 2.4, Off-street Parking;
- Section 2.5, Alternate Parking, including Modification 14 commitments to upgrade the Pyrmont Parking Guidance System;
- Section 2.8, Cycle Parking, including Modification 14 commitments to upgrade cycle facilities;
- Section 2.11.2, Coach Parking, including Modification 14 commitments to provide 4 large coach parking spaces on the service road exit ramp;
- Section 2.12, Loading Dock facilities, including Modification 14 commitments to upgrade the capacity of the Star Loading in Jones bay Road; and
- Section 2.13, Port Cochere arrangements, including Modification 14 commitments to upgrade Port Cochere operations.

4.9.2 With Project

The Modification 13 proposed changes to parking and access arrangements and compliance with parking codes are outlined in the following sections:

- Section 3.3, Proposed upgrades to Service Road;
- Section 3.4, Proposed upgrades to the Port Cochere Access in Jones Bay Road;
- Section 3.5, Proposed Pyrmont Street Car park access;
- Section 3.6, Proposed Ritz-Carlton Hotel Access;
- Section 3.8, Proposed Car Stacker System under the new Tower;
- Section 3.9, Proposed upgrades to the Star Events Loading; and
- Section 3.10, proposed bicycle parking facilities.

4.10 SERVICE ROAD

The modification shall detail the potential impacts to access and manoeuvring in the bus interchange.

The service road upgrades proposed under Modification 13 are presented in Section 3.3.

The Modification 13 upgrades to the service road will include:

- Increased pedestrian storage on the eastern kerb;
- Centralised and raised pedestrian crossing area;
- Relocation of taxis into the service road to provide increased on-site feeder storage and formal pick-up and set-down bays as well as taxi call systems and patron queuing facilities;
- Widening of the service road and provision of formal coach set-down and pick-up areas. The widening of the road and formalisation of coach parking will provide additional manoeuvring area and improve coach accessibility to existing coach parking arrangements;
- Relocation of the Star Express services to the northern end of the light rail platform;
- Closure of the informal pedestrian links between the northern ends of the Light Rail platforms and the northern section of the service road
- Modifications to Star Events loading dock access; and
- Car lift access to the Tower car stacker system.

4.11 ACTIVE TRANSPORT

The modification shall identify pedestrian and cycle connections/circulation, particularly the cycle network identified in the Sydney City Centre Access Strategy.

4.11.1 Existing

A review of active transport links around the site is provided in Section 2.8.

A review of existing cycle parking facilities, including those proposed under Modification 14, are outlined in Section 2.9.

A review of pedestrian access facilities, including upgrades proposed under Modification 14, are outlined in Section 2.10.

4.11.2 Proposed

The cycle parking upgrades proposed under Modification 13 are outlined in Section 3.10.

4.11.3 Impacts on Pedestrians Access and Safety

Modification 13 includes the following proposals that have the potential to impact on pedestrian safety and access around the site:

- The new Ritz Carlton Port Cochere
- The new Pyrmont Street Car Park Entry
- The new right turn facility into the existing Jones Bay Road Port Cochere

The Modification 13 proposals have sought to minimise impacts and improve upon current access arrangements through a series of mitigations strategies discussed below.

4.11.4 Ritz Carlton Port Cochere

Key design measures for maintaining pedestrian safety under this Port Cochere arrangement include:

- Change of material from unit pavers to granite setts in public domain to clearly delineate roadway and footpath
- Header course or flush concrete kerb to accentuate the arc of the roadway.
- Bollards following the header course for pedestrian/crash protection at similar spacings to the current taxi port cochere to the south. This is also important for defining the transition zone between pedestrian and vehicle access areas.
- Paving finishes can also be modified between roadway and pedestrian zone (e.g. honed for pedestrian and hammered finish for roadway).
- Sight lines are clear of obstructions (e.g. Trees or street furniture) at the Port Cochere entry and exit in accordance with AS2890.1.

Overall, the new Ritz Carlton Hotel Port Cochere arrangement will not impact negatively on pedestrian access and safety in the Pirrama Road forecourt, for the following reasons:

- This new facility replaces an existing taxi facility located further to the south
- This new facility will generate less taxi traffic than the existing facility it replaces, as it only serves the Ritz Carlton Hotel. The taxi facilities servicing the eastern side of the Star complex have been relocated into the service road.
- This new facility is located further away from the major pedestrian desire lines towards the Casino, theatre and light rail, located at the southern end of the Pirrama Road forecourt. This will have the positive impact of reducing pedestrian/vehicle conflicts
- The design measures, previously outlined, will provide clear visual cues that clearly define and protect pedestrian/vehicle transition zones and sight lines

4.11.5 New Pyrmont Street Car Park Entry

Whilst this new car park entry is adding a new vehicle/pedestrian conflict point in Pyrmont Street, it is not expected to have any significant negative impact on pedestrian access and safety around the site, for the following reasons:

- This location has some of the lowest pedestrian traffic around the site (peaking at less than 80 pedestrians per hour in the AM peak). During the evening peak when car park entries peak, the volume of pedestrians is less than 60 pedestrians per hour)
- This new entry transfers vehicles away from the heavy pedestrian demand areas in Pirrama

Road (up to 400 pedestrians an hour) across to the quieter areas in Pyrmont Street. Thereby assisting in reducing overall vehicle/pedestrian conflicts at the site

- Vehicle traffic enters and exits the car park at 90 degrees to the flow of pedestrians and traffic along Pyrmont Street, thereby maximising sight lines
- The awning and planters have been designed to maximise exit traffic sight lines to pedestrians
- Signage will be provided at the car park exit warning drivers to give-way to pedestrians
- Paving treatments and textures will be used to provide visual cues to pedestrians that vehicles cross the footpath in this area

4.11.6 Jones Bay Road right turn

The proposed changes to the Jones Bay Road Port Cochere entry will not have any significant impact on pedestrian access or safety for the following reasons:

- This is an existing driveway crossing facility
- It does not generate any additional pedestrian/vehicle conflicts, this is a reassignment of existing taxi movements
- This end of the site has the lowest pedestrian demands
- No changes to footpath facilities are required
- The existing pedestrian refuge in Jones Bay Road is maintained

4.12 LOADING DOCKS

The modification shall detail access arrangements for emergency and service vehicles, including loading dock arrangements.

The Modification 14 upgrades to the Star Loading dock in Jones Bay Road are outlined in Section 2.12.

The proposed Modification 13 upgrades to the Star Events loading dock under the new Ritz Carlton tower are outlined in Section 3.9. This loading dock will service all deliveries to the new Ritz Carlton and Residential Tower.

Emergency vehicles will access the new Ritz Carlton and Residential Tower via the new port cochere on Pirrama Road, or alternatively, the Star Events loading dock within the Service Road under the tower.

The combination of upgrades proposed in these two modifications will accommodate the additional service vehicle demands generated by Modification 13.

No changes to emergency vehicle access to the site are proposed under Modification 13.

4.13 CONSTRUCTION TRIPS

The modification shall outline anticipated daily and peak hour light and heavy vehicle movements to and from the site.

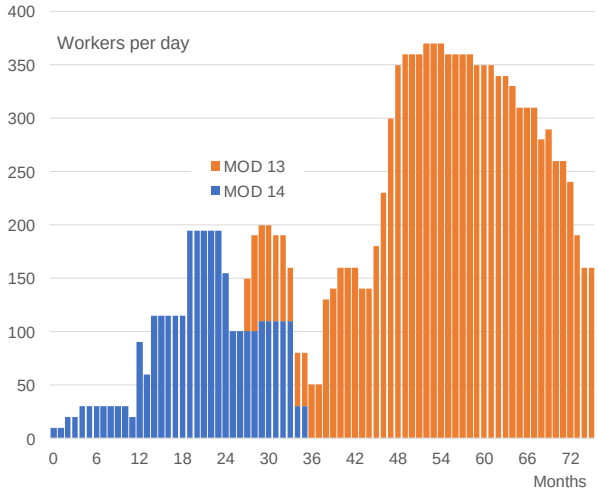
4.13.1 Construction Workers

A profile of the average daily work-force on-site during the 4-year construction period is presented in Figure 4.6.

A review of 2011 Journey to Work Travel data[11] specific to labourers, technicians and trade workers travelling to the Pyrmont area[12], revealed that 36% travelled by car as driver. Up to 40% travelled by car as a driver or passenger (refer Figure 4.7). If the trends in this sample of 1,487 workers prevails, the construction workforce may generate up to 144 private vehicle trips. This represents a 22% increase in existing AM peak vehicle trips to/from the site and a 15% increase in existing PM peak vehicle trips to/from the site during construction of Modification 13.

Additionally, up to 11% of the workforce (40 workers) would access the site using active transport modes.

Figure 4.6: Average Daily Workforce



[11] 2011JTW_Table05_V1.3
[12] Data for BTS Travel Zones 78, 88, 89, 108, 152-157 (refer Figure 4.8)

Figure 4.7: Travel Mode of Labourers, Technicians and Trade Workers Travelling to the Pyrmont Area

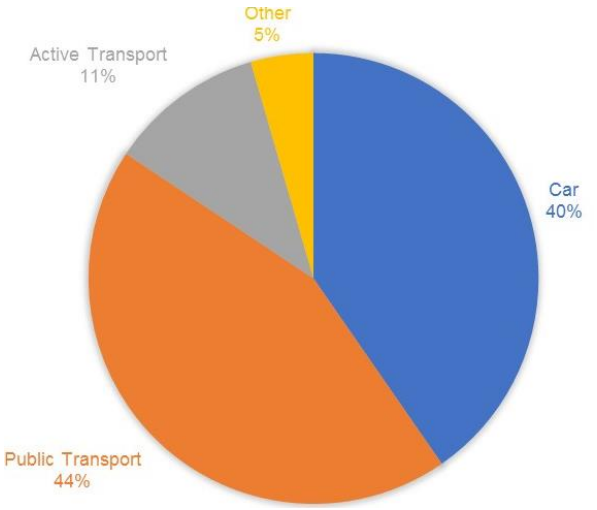
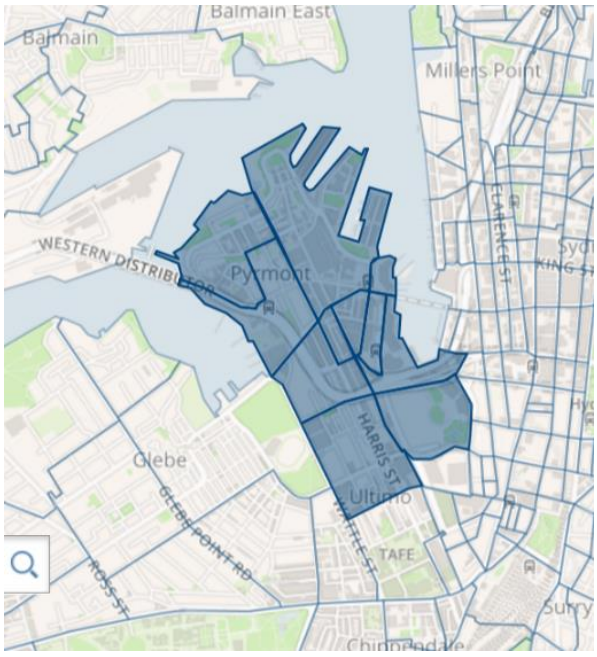


Figure 4.8: Journey To Work Sample Area



Source: http://visual.bts.nsw.gov.au/jtwbasic/

4.13.2 Construction Deliveries

The average of number of construction deliveries per day is expected to peak at 45 deliveries per day.

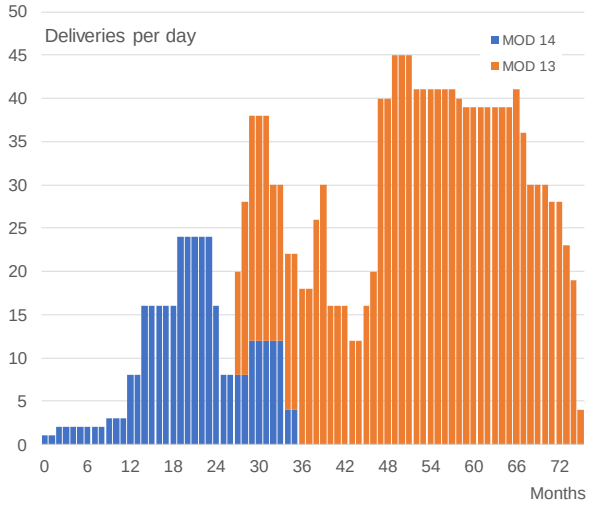
The first peak is associated with the overlap of Modification 14 and 13 construction activities.

The second peak, which extends for approximately 20 months of the Modification 13 project, is associated with the structural and façade construction, and fit-out stages occurring simultaneously.

After the 66th month of the project and the completion of the structural construction phase, the numbers of deliveries progressively diminish as the project reaches closure.

A profile of the average daily deliveries over the 4-year construction period is presented in Figure 4.9.

Figure 4.9: Average Number of Construction Deliveries per day



4.13.3 Cumulative Traffic Impacts

The cumulative traffic impacts (workers, deliveries, and Modification 14 operations) on the critical intersections around the site is summarized in Table 4.22.

The performance of the surrounding road network, under the additional construction traffic (workers and deliveries), was assessed using SIDRA 6.1. The Level of Service (LOS) results of the SIDRA analysis are summarised in Table 4.23.

The SIDRA analysis indicates that the surrounding network will operate at existing or acceptable performance levels, despite the additional traffic associated with Modification 13, construction activity.

Detailed outputs for the SIDRA analysis of construction traffic are presented in Appendix D.

SEGL is proposing the following strategies to mitigate construction traffic impacts:

- The proposed split of the haulage route reduces pressure on the intersection of Murray Street, Darling Street and Pyrmont Bridge Road during the outbound journey
- SEGL will encourage construction workers to take advantage of the excellent public transport access in accordance with the strategies outlined in The Star Travel Plan
- SEGL will restrict on-site parking for workers to 200 spaces. These spaces will be controlled using a booking system and parking above this threshold will be actively discouraged through on-site parking fees
- SEGL will provide an on-site tool drop-off and storage facility to allow tradespeople to drop off and store their specific machinery for the project
- SEGL will inform staff during induction and regular management meetings about restrictions on on-site car parking and the limited on-street parking surrounding the site
- SEGL will display public transport timetable information at key locations within the work site and ensure that it is easily accessible by staff

Table 4.22: Estimated traffic increase at adjacent intersections due to SEGL construction

Intersection	AM	PM
Pyrmont Street / Jones Bay Road	0%	0%
Pyrmont Street / Union Street	2%	2%
Pyrmont Street / Pyrmont Bridge Road	5%	4%
Pyrmont Bridge Road / Union Street	5%	6%
Pirrama Road / Star Car Park Entrance	7%	5%
Jones Bay Road / Pirrama Road	0%	1%
Union Street / Edward Street	12%	7%
Pyrmont Bridge Road / Murray Street	4%	3%

Table 4.23: Estimated Road Network Performance During Construction (level of service)

Intersection	AM	PM
Pyrmont Street / Jones Bay Road	A	A
Pyrmont Street / Union Street	B	C
Pyrmont Street / Pyrmont Bridge Road	C	C
Pyrmont Bridge Road / Union Street	A	A
Pirrama Road / Star Car Park Entrance	A	B
Jones Bay Road / Pirrama Road	A	B
Union Street / Edward Street	B	C
Pyrmont Bridge Road / Murray Street	C	C

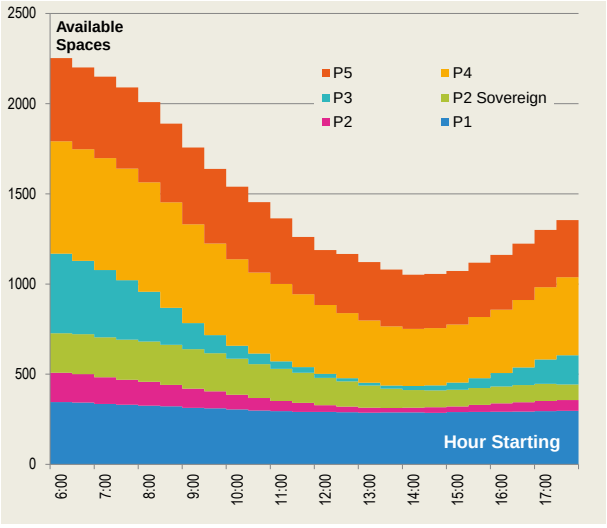
4.14 CONSTRUCTION PARKING

The modification shall outline car parking and work zones for construction traffic.

4.14.1 Construction Worker Parking

SEGL will allocate up to 200 on-site spaces for construction staff in its on-site car park. During business hours, The Star car-park is significantly underutilised and has sufficient capacity to accommodate this parking provision. However, to discourage car travel to the site, these spaces will be controlled using a booking system and parking above this threshold will be actively discouraged through on-site parking fees. Additionally, SEGL will continue to encourage construction workers to take advantage of the excellent public transport access in accordance with the strategies outlined in The Star Travel Plan.

Figure 4.10: Reserve Star Car Parking Capacity on Average Weekday (6am to 6pm)



4.14.2 Work Zone (Edward Street)

A 20m long Type B hoarding and work zone will be proposed in Edward Street.

The hoarding will be designed to avoid removal of crucial trees, such as T38 to T40, as outlined in the Arboricultural Impact Assessment Report.

The work zone will require restriction on use for the last three on-street parking spaces on Edward Street east of Union Street.

4.14.3 Work Zone (Pyrmont Street)

A 30m long Type B hoarding and work zone will be proposed in Pyrmont Street at the location of the new Sovereign Car Park Entry (opposite 100 Harris Street).

The hoarding will be designed to avoid removal of crucial trees, such as T20 and T24, as outlined in the Arboricultural Impact Assessment Report.

The adjacent work zone will require restriction on use for up 5 on-street car spaces.

The raising of the Port Cochere to achieve suitable overhead clearances on the access ramps, will require closure of the western side of the Port Cochere during construction. This will not impact taxi or valet operations as the area is used for display of glamour vehicles.

4.14.4 Work Zone (Tower & Ribbon)

An indicative arrangement for the proposed Tower and Ribbon construction sites is presented in Figure 4.11.

The main impacts on pedestrian and vehicle access arrangements will include:

- Restriction of pedestrian access along the front of Pirrama Road work zone. All pedestrians would be diverted west against the building to maintain access to existing escalators, lifts, light rail and relocated taxi zone. Type B hoardings would be provided over the walkway. A minimum walkway width of 3-4m will be maintained always.
- Wayfinding will support the proposed pedestrian and taxi diversions.
- A Type A hoarding will be provided along the Pirrama Road frontage. This hoarding will be

designed to avoid removal of crucial trees, such T50-55 and T56-T60, as outlined in the Arboricultural Impact Assessment Report.

- A Type B hoarding will be provided on the Jones Bay Road footpath. This hoarding will be designed to avoid removal of crucial trees, such T5 and T6 as outlined in the Arboricultural Impact Assessment Report.
- A Type B hoarding will be provided on the Pirrama Road footpath approaching the roundabout. This hoarding will be designed to avoid removal of crucial trees, such as T72, as outlined in the Arboricultural Impact Assessment Report. It will also maintain pedestrian access to the adjacent Sydney Buses bus stop always.
- The Taxi arrangements in the Service Road, that were implemented as part of Modification 14, will remain.
- The Star Express bus arrangements implemented during Modification 14, will remain.
- Wayfinding will support the proposed pedestrian and taxi diversions.
- Some SEGL tenants in the Pirrama Road forecourt may have to suspend al-fresco dining operations due to the proposed closures and pedestrian diversions. Hoardings will be provided to minimise impacts on these venues.
- Construction vehicle access in/out of the Pirrama Road construction site will use the existing kerb crossings. Sliding gates would be provided on the entry and exit. All trucks will enter and exit the site in a forward direction.
- No stopping restrictions along the front of the Pirrama Road construction site. All loading/unloading is within the site.
- The construction sites will be protected with Type A hoardings, where adjacent to traffic, and Type B hoarding over the pedestrian access corridors.
- Major special events such as the ‘Aria’ Awards may have to be suspended/ re-organised during the two-year construction period due to the constraints imposed by the proposed construction arrangements.

4.14.5 Temporary Service Road closure

During column strengthening works and upgrades to the Star Events loading docks, temporary closure of the northern end of the service road may be required for up to 4-months. An alternate link from the Service road to Pirrama Road is proposed during the construction closures. This temporary link will allow SEGL to maintain Taxi and Coach operations in the service road.

The alignment for the temporary link across the Pirrama Road forecourt, is presented in Figures 4.11 and 4.12.

The geometry of the link will be constrained by the need to weave through the building support columns within the forecourt. The columns restrict the access link to a minimum width of 4.8m.

A swept path analysis was undertaken using an Austroads standard 12.5m bus (refer Figure 4.12). The analysis indicates that the left turn onto Pirrama Road will require the southern end of the bus zone to be shortened from 41m to 21m to ensure that large vehicles can enter Pirrama Road without swinging out into the southbound carriageway.

The shortening of the existing bus zone is not expected to impact Sydney Buses services for the following reasons:

- A 21m stop is adequate for the current service frequencies and stopping patterns. It is unlikely that there would more than one bus stop at the stop, at any one time
- The temporary exit creates a 20m clear zone on the approach to the stop to allow buses to manoeuvre comfortably into the stop

Figure 4.11: Pirrama Road and Jones Bay Road Pedestrian and Vehicle Access Arrangements

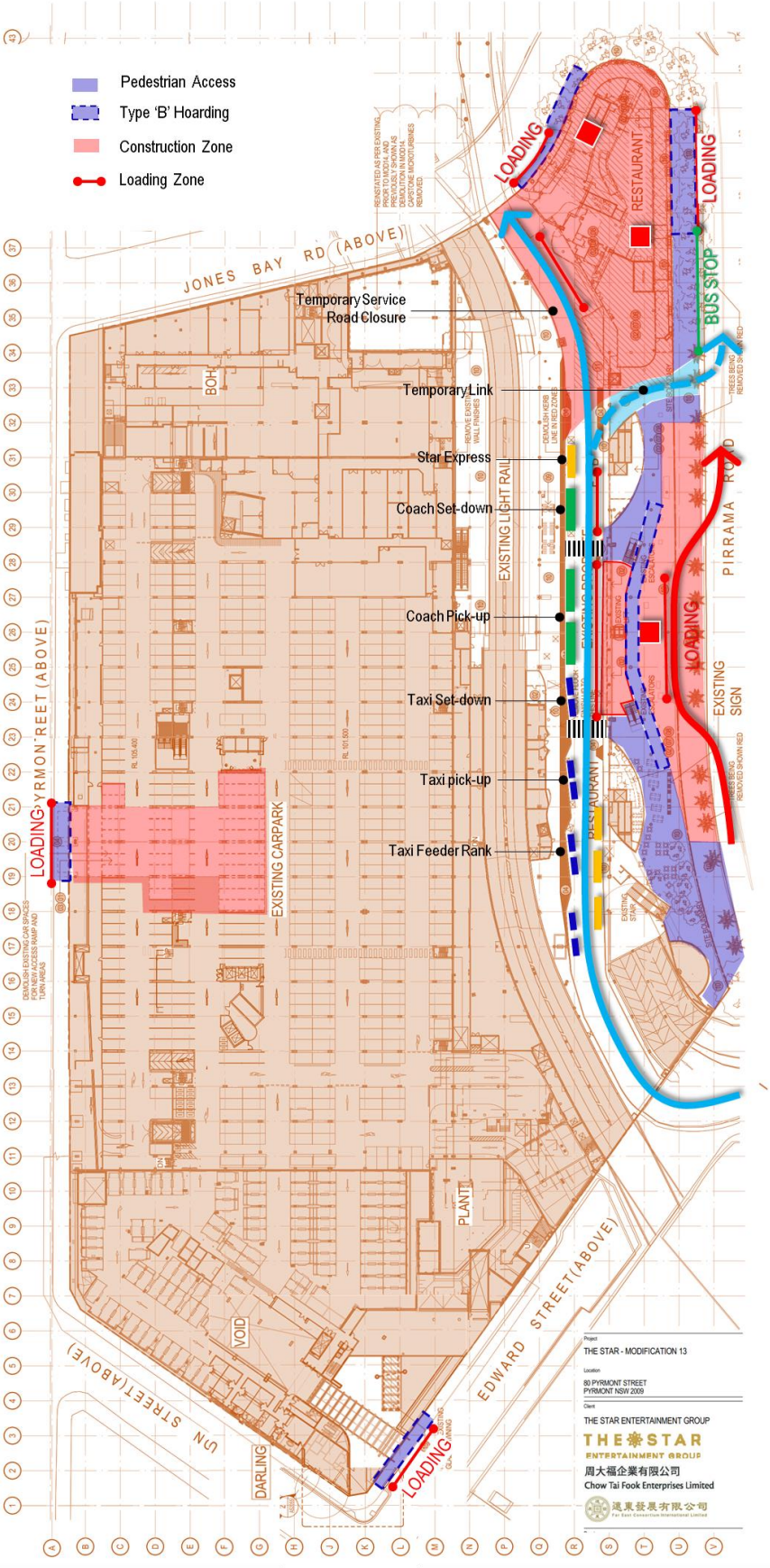
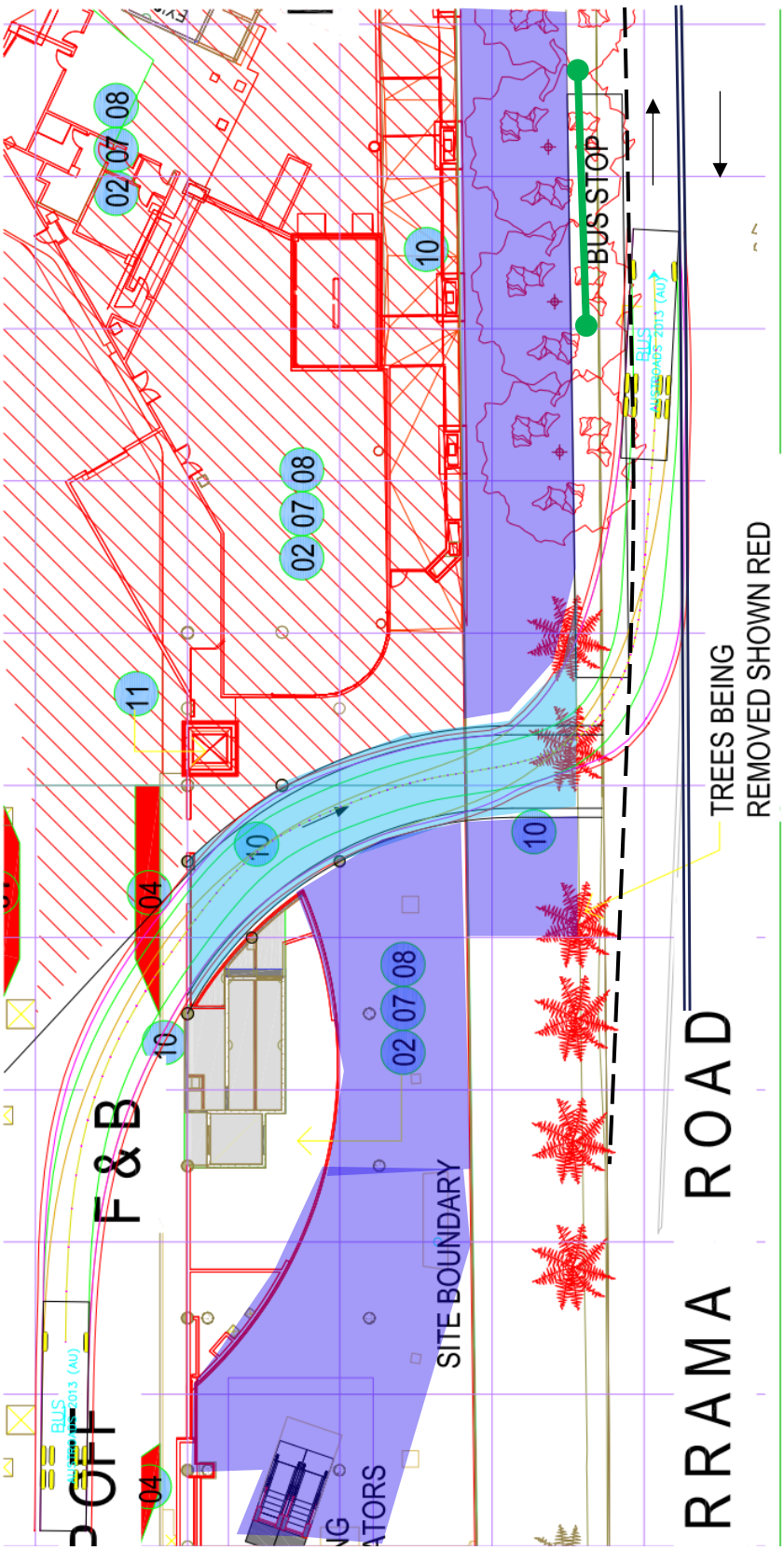


Figure 4.12: Temporary Service Road Link to Pirrama Road



4.15 CONSTRUCTION ACCESS

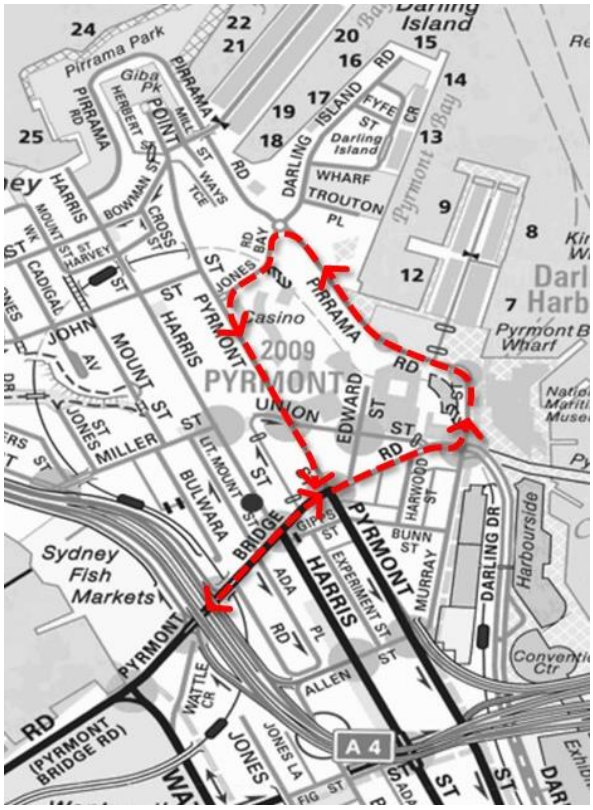
The modification shall outline access arrangements for workers to/from the site, emergency vehicles, and service vehicle movements.

Construction deliveries to the site will be via the following routes outlined in Figure 4.13. This route will provide access to the main delivery locations around the site:

- Pirrama Road (Forecourt);
- Jones Bay Road Construction Zone;
- Jones Bay Road Loading Dock; and
- Pyrmont Street Construction Zone.

This route will accommodate up to a 19m semi-trailer.

Figure 4.13: Proposed Haulage Routes



Map Source: © 2010 Streetdirectory.com.au

4.16 CONSTRUCTION MITIGATION

The modification shall outline measures to mitigate construction traffic impacts on vehicles, pedestrians, cyclists, and public transport operations

4.16.1 Impacts on Vehicles

Section 4.13.3 demonstrated that the cumulative construction impacts of worker and delivery traffic would not have a significant impact the adjacent road network.

The SIDRA analysis indicated that the surrounding network will operate at existing or acceptable performance levels, despite the additional traffic associated with Modification 13, construction activity.

This impact was mitigated in the following ways:

- The proposed split of the haulage route (refer Figure 4.13) reduces pressure on the intersection of Murray Street, Darling Street and Pyrmont Bridge Road during the outbound journey.
- SEGL will restrict on-site parking for workers to 200 spaces. These spaces will be controlled using a booking system and parking above this threshold will be actively discouraged through on-site parking fees.
- Additionally, SEGL will continue to encourage construction workers to take advantage of the excellent public transport access in accordance with the strategies outlined in The Star Travel Plan.

4.16.2 Impacts on Pedestrians

Sections 4.14.2 to 4.14.5 identified how SEGL would maintain, and keep safe, key pedestrian links by providing Type B hoarding protection adjacent to work zones.

4.16.3 Impacts on Bus Services

The proposed Modification 13 construction activities are not expected to impact on bus services for the following reasons:

- The traffic analysis has demonstrated that the increased traffic due to construction (workers and deliveries) will not have any significant impact on the performance of the network used by existing bus services.
- The temporarily shortened northbound Pirrama Road bus stop will still have sufficient capacity and accessibility to satisfy current bus requirements (refer section 4.14.5).
- The proposed relocation of taxis into the service road during construction, is expected to increase on-site taxi storage significantly and help reduce taxi queuing issues on Pirrama Road that have impacted on bus services in the past.

4.16.4 Impacts on Cyclists

The proposed construction activities are not expected to impact on cyclist for the following reasons:

- The proposed construction traffic arrangements do not impact on any cycle parking or cycle paths. Existing staff cycle parking facilities will be maintained on Level B2 throughout construction.
- The proposed construction traffic arrangements maintain existing active transport access along the Pirrama Road entry to The Star and light rail station.

The visitor and employee cycle parking upgrades proposed in Modification 13, will be undertaken as early works, to improve cycle parking opportunities during construction.

4.17 CONSTRUCTION PEDESTRIAN & CYCLE SAFETY

The modification shall outline measures to maintain pedestrian and cyclist safety during construction.

Sections 4.14.2 to 4.14.5 identified how SEGL would maintain, and keep safe, key pedestrian and cycle links by providing Type B hoarding protection adjacent to construction areas.

During column strengthening works and upgrades to the Star Events loading docks, temporary closure of the northern end of the service road may be required for up to 4-months. An alternate link from the Service road to Pirrama Road is proposed during the construction closures. This will introduce a temporary pedestrian /vehicle conflict zone through the forecourt, during construction.

Fortunately, this temporary access has been located away from the major pedestrian desire lines to the Theatre, Casino and Light Rail and will only be in place for 4-months. To mitigate the impacts of this arrangement on pedestrian access, SEGL will:

- Upgrade the pavements and surface treatments at the footpath crossing to ensure the travel surface remains intact and even, to avoid trip hazards, and to provide visual cues to pedestrians warning them of potential vehicle crossing movements
- The link will cross the footpath at 90 degrees to the flow of pedestrians to maximise sight lines to pedestrians and cyclists
- Provide manual traffic control at crossing points
- Hoardings would be set-back to ensure clear sight lines between vehicles and pedestrians/cyclists

5 SUMMARY & CONCLUSIONS

5.1 MODIFICATION 14

Modification 14 was determined in October 2017 and included approval for a range of upgrades to the existing site. These upgrades included the enclosure of the level 3 terrace to facilitate an expansion in gaming floor area and a new bar and restaurants, expansion of the level 3 pre-function space, changes to the Astral Hotel lobby and retail space, and alterations to internal vertical transportation, services and infrastructure, including the harbour heat rejection system.

The following mitigation strategies in that upgrade will contribute to limiting the environmental impacts of both modifications:

- SEGL to expand staff and visitor cycle parking and trip end facilities to encourage more travel to the site by active transport modes.
- SEGL to work with TfNSW and Parking Sense to upgrade the Pyrmont Parking Guidance System.
- SEGL to provide data feed to Parking Sense, and mobile parking apps, to continually update signage displays.
- SEGL to contribute to upgrade costs of the Pyrmont Parking Guidance System and lead resolution of the proposed signage.
- SEGL to provide 4 large coach parking spaces on the service road exit ramp leading up to Pirrama Road, including localised footpath widening at the service road exit to restrict illegal access and security monitoring to deter illegal parking practices.
- SEGL to upgrade the Star Loading dock on Jones Bay Road to increase storage and sorting areas.
- SEGL to increase resourcing of the Astral valet service to ensure quicker dispatching of vehicles and eliminate any potential for blocking of the Astral Hotel entry.
- SEGL to relocate the Pirrama Road taxi rank into the service road.
- SEGL to provide an electronic taxi call system in the Port Cochere and removal of the Jones Bay Road feeder rank.
- SEGL to submit the draft Star Travel Plan to the Department.

5.2 MODIFICATION 13

Modification 13 proposes the following mitigation strategies to limit the environmental impacts of the proposal, beyond what exists, up to and including Modification 14:

- SEGL to provide 221 parking spaces to ameliorate the parking impacts of Modification 13. However, the total parking provision on-site is not to exceed the 3,000-approved maximum parking limit set by MP08_0098.
- SEGL to expand and modify the Pyrmont Parking Guidance System proposed in Modification 14, to include additional signage and information specific to Modification 13.
- SEGL to provide a new Pyrmont Street access to the Level B1 car park. This new access is crucial to mitigating the traffic impacts of the development by spreading impacts more evenly across the road network.
- SEGL to provide a new right turn access from Jones Bay Road into the Port Cochere. This new access is crucial to mitigating the traffic impacts of the development by spreading impacts more evenly across the road network.
- SEGL to provide a left-in and right-in access to the new Ritz Carlton port cochere entry. The right-in access from Pirrama Road is essential to allow Taxis queued on-site in the service road to access the Ritz Hotel.
- SEGL to upgrade the Star Events loading dock in the service road to accommodate the additional deliveries associated with the Ritz Carlton Hotel and Apartments located in the tower above.
- SEGL to produce Tower Loading Dock and Car Stacker Management Plans
- SEGL to provide 35 Class 1 bike spaces and 62 visitor bike spaces to encourage active transport and mitigate impacts of the development.

- SEGL to install bike parking upgrades as early works in Modification 13, to improve cycle parking opportunities during construction.
- SEGL to formalise the taxi parking scheme in the service road.
- During construction, SEGL to restrict on-site parking for workers to 200 spaces. These spaces will be controlled using a booking system. Parking above this threshold will be actively discouraged through on-site parking fees.

5.3 CONSIDERATION OF SEARS

5.3.1 Trip Generation and Network Performance

The review of trip generation impacts and traffic network performance in Sections 4.2, 4.3, 4.13, 4.14 and 4.16 demonstrated that the additional traffic generated by the proposal during construction, and operation, would have limited environmental impacts on network performance and parking demand beyond what is currently experienced due to the existing development and operation of the site up to and including Modification 14.

This is achieved through mitigation strategies such as:

- Limitations on construction parking
- Heavy reliance on public transport services for workers travelling to the construction site
- Limited provision of on-site car parking targeted to the new Tower development
- Implementation of the Pyrmont Parking Guidance System to manage traffic movements in the precinct
- Relocation of taxi services into the service road
- Commitments to major increases in employee and visitor cycle parking facilities
- A traffic reassignment strategy during operation that redirect traffic away from critical parts of the road network towards a new car park access on Pyrmont

5.3.2 Cumulative Impacts

The review of cumulative impacts in Section 4.4 outlined the competing demands on the road network during construction and operation of the proposal. The proposal seeks to limit its competing demands on the network, during operation, through a traffic reassignment strategy that reduces both its current, and future, impacts on those parts of the road network most under pressure from other developments.

For example, the Pyrmont Bridge Road and Murray Street intersection is under significant pressure from development in Darling Harbour and Pyrmont. The traffic reassignment strategy will minimise traffic growth at the intersection to 14% in the AM peak, whilst maintaining or reducing current flows in the PM and Off-peak periods. A summary of the proposed traffic increases and reductions across the adjacent road network were presented in Tables 4.13 and 4.14.

5.3.3 Impacts on Public Transport

The review of public transport services in Sections 4.5 and 4.7 demonstrated that the site is well serviced by public transport and that the Modification 13 proposal seeks to maintain or improve site access to those services.

5.3.4 Impacts on Light Rail

Section 4.6 highlights the proposed improvements to the light rail interchange by opening the station entrance, improving pedestrian, taxi, cycle and coach linkages, increased station activation and passive surveillance, as well as providing cosmetic upgrades. The proposals to restrict northbound pedestrian access up service road open future opportunities to extend the station platforms sufficiently to accommodate higher capacity light rail fleets that could double current capacity.

5.3.5 Sustainable Travel Initiatives

Section 4.8 details SEGL's commitment to sustainable travel initiatives, such as its Draft Star Travel Plan, which seeks to reduce the Star's long-term travel impacts on the Pyrmont area.

5.3.6 Parking and Access

Section 4.9 details current and proposed parking access arrangements. It demonstrates that the site will have sufficient on-site car parking to meet current and future needs. Section 4.11 also demonstrates SEGL's commitment to improving employee and visitor cycle parking facilities across the site, locating them adjacent to major interchanges and cycle access networks.

5.3.7 Service Road Access

Section 4.10 and 4.12 outlines the proposed improvements to the service road and Star Events loading docks. These improvements relocate taxis into the service road, thereby relieving pressure on Pirrama Road, and provide an upgrade of the loading facilities to accommodate the requirements of the new Tower development. This service road also provides the access point for the new car stacker parking system proposed to satisfy and mitigate the additional parking demands of the new Tower development.

5.3.8 Safety During Construction

Section 4.17 highlights how the proposal will limit environmental impacts on pedestrian access and safety during construction, and operation. Modification 13 includes proposals that have the potential to impact on pedestrian safety and access around the site, these include:

- The new Ritz Carlton Port Cochere
- The new Pyrmont Street Car Park Entry
- The new right turn facility into the existing Jones Bay Road Port Cochere

The Modification 13 proposals have sought to mitigate environmental impacts and improve upon current pedestrian access arrangements through a series of mitigation strategies, including:

- Locating new vehicle crossings away from pedestrian desire lines
- Relocating existing vehicle crossings away from pedestrian desire lines
- Transferring traffic movements away from heavy pedestrian demand flows at Pirrama Road to quieter pedestrian areas in Pyrmont Street
- Changes of paving material in public domain to clearly delineate roadway and footpath
- Header course or flush concrete kerb to accentuate the edge of vehicle links
- Bollards for pedestrian/crash protection and to define the transition zone between pedestrian and vehicle access areas
- Sight lines clear of obstructions (e.g. Trees or street furniture) at entry and exit points in accordance with AS2890.1.

With the above mitigation strategies in place, the development proposed in Modification 13 will have a limited environmental impact, during construction and operation, beyond what exists, up to and including Modification 14.

5.4 CONCLUSION

After assessment of the development proposed in Modification 13 against the relevant SEAR's transport related requirements (refer Table 1.1), it is concluded that the proposed development will have a limited environmental impact, during construction and operation, beyond what exists, up to and including Modification 14.

APPENDIX A SIDRA ANALYSIS OF EXISTING NETWORK CONDITIONS

Summary of Results

		AM Peak				PM Peak				Off-Peak			
Ref.	**Intersection**	DoS	LOS	Avg. Delay (s)	95% Back of Queue (m)	DoS	LOS	Avg. Delay (s)	95% Back of Queue (m)	DoS	LOS	Avg. Delay (s)	95% Back of Queue (m)
1	Pyrmont Street / Jones Bay Road	0.11	A	7.1	3.2	0.23	A	6.8	2.5	0.233	A	6.4	1.1
2	Pyrmont Street / Union Street	0.356	B	22.3	66.6	0.828	C	31.6	81.6	0.81	C	28.8	81.6
3	Pyrmont Street / Pyrmont Bridge Road	0.983	B	28.1	125.2	0.8	C	28.7	149.4	0.757	C	28	148.1
4	Union Street / Edward Street	0.167	B	20.5	23.8	0.285	C	24	35.4	0.207	C	21	28
5	Pyrmont Bridge Road / Union Street	0.131	A	8.7	1.1	0.168	A	8.5	45.7	0.261	A	5.9	76.3
6	Union Street / Murray Street / Darling Drive	1.017	C	41	98.9	0.846	C	33.2	84.5	0.926	C	34.6	133
7	Pirrama Road / Star Car Park Entrance	0.2	A	4.8	6.1	0.445	B	17	61.4	0.486	B	16.9	64.9
8	Jones Bay Road / Pirrama Road	0.242	A	11.3	9.7	0.4	B	12.2	16.2	0.482	B	13.8	21.1
9	Jones bay Road / Port Cochere Entry	0.144	A	4.7	0	0.268	A	4.6	0	0.318	A	4.6	0
10	Pyrmont Street / Port Cochere Exit	0.15	A	8.9	1.6	0.202	B	11.3	40.3	0.424	B	11.7	27.7
11	Pyrmont Bridge Road / Edward Street	0.164	A	5	0.5	0.135	A	4.9	20.1	0.139	A	5.2	47.1
12	Pirrama Road Pedestrian Crossing	0.324	A	4	41.3	0.387	A	3.5	71.2	0.446	A	3.3	75.9
-	**Network**	**1.017**	E	**15**		**0.846**	E	**15.1**		**0.926**	E	**14.6**	

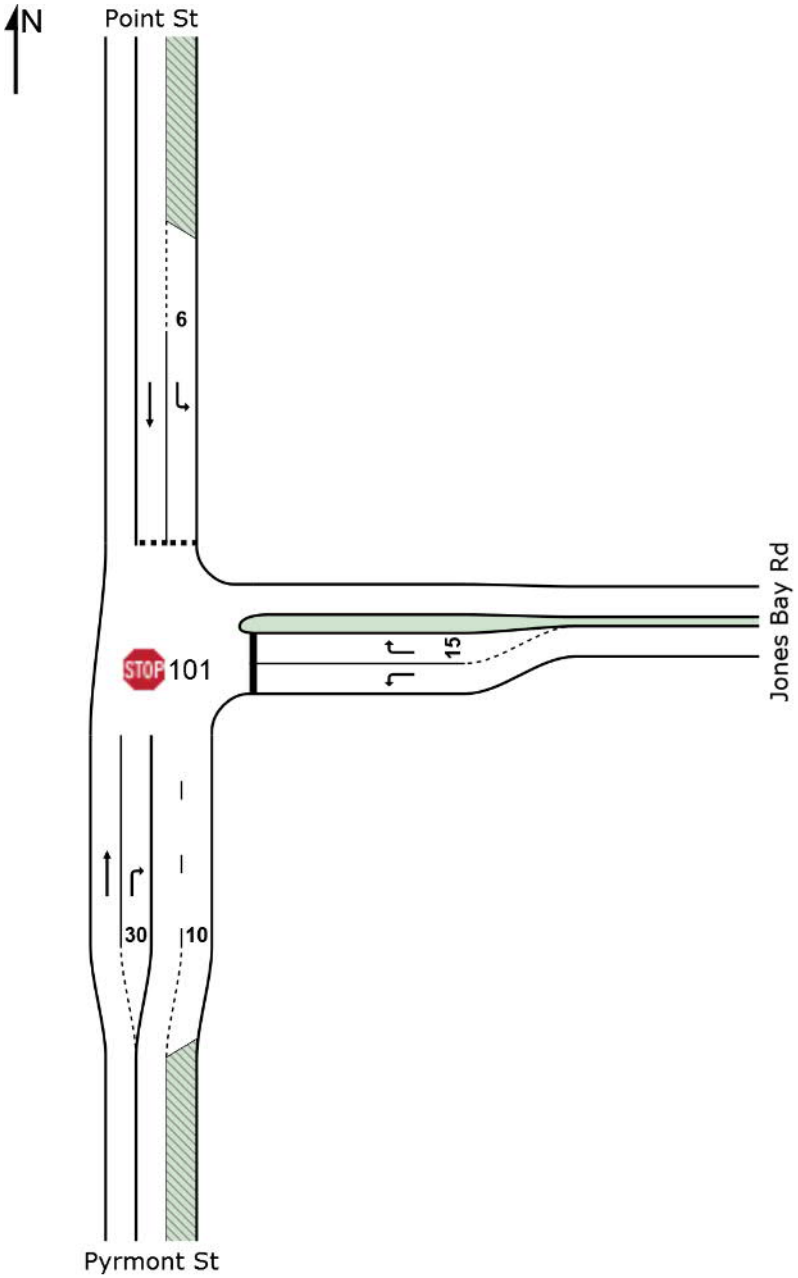
Observed Signal Timings Data

TCS	Description	Signal Timings (sec)	Phase Splits (observed)					Cycle Length (sec)
			A	B	C	D	E	
3063	Pyrmont St / Union St	AM (sec)	23	24	22			69
		PM (sec)	52	20	21			93
		OP (sec)	52	20	21			93
		Min. Green	5	5	5			
		Yellow	4	4	4			
		All-red	2	2	2			
1835	Pyrmont St / Pyrmont Bridge Rd	AM (sec)	34	50	23	24		131
		PM (sec)	21	67	21	25		134
		OP (sec)	21	67	21	25		134
		Min. Green	5	5	5	5		
		Yellow	4	4	4	4		
		All-red	2	2	2	2		
3203	Pirrama Rd / Star Car Park Entrance	AM (sec)	114	17				131
		PM (sec)	22	15				37
		OP (sec)	22	15				37
		Min. Green	5	5				
		Yellow	4	4				
		All-red	2	2				
3202	Union St / Edward St	AM (sec)	23	59				82
		PM (sec)	21	43				64
		OP (sec)	21	43				64
		Min. Green	5	5				
		Yellow	4	4				
		All-red	2	2				
2834	Union St / Murray St / Darling Drive	AM (sec)	29	24	20	0	13	86
		PM (sec)	35	23	29	17	18	122
		OP (sec)	35	23	29	17	18	122
		Min. Green	5	5	5	5	5	
		Yellow	4	4	4	4	4	
		All-red	2	2	2	2	2	

SITE LAYOUT

Site: 101 [AM Pyrmont St/Jones Bay Rd]

No Project
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 101 [AM Pyrmont St/Jones Bay Rd]

Network: 1 [AM Star Casino Network]

No Project
Stop (Two-Way)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pyrmont St													
2	T1	62	3.2	62	3.2	0.032	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
3	R2	199	2.5	199	2.5	0.109	4.6	LOS A	0.0	0.0	0.00	0.53	36.7
Approach		261	2.7	261	2.7	0.109	3.5	NA	0.0	0.0	0.00	0.40	39.7
East: Jones Bay Rd													
4	L2	141	7.8	141	7.8	0.101	5.1	LOS A	0.0	0.0	0.00	1.02	17.1
6	R2	36	2.8	36	2.8	0.050	7.1	LOS A	0.2	1.2	0.43	0.91	20.5
Approach		177	6.8	176[N1]	6.8	0.101	5.5	LOS A	0.2	1.2	0.09	1.00	18.2
North: Point St													
7	L2	64	0.0	64	0.0	0.046	4.3	LOS A	0.2	1.4	0.29	0.51	24.3
8	T1	137	1.5	137	1.5	0.110	3.3	LOS A	0.4	3.2	0.30	0.48	27.0
Approach		201	1.0	201	1.0	0.110	3.6	LOS A	0.4	3.2	0.30	0.49	26.0
All Vehicles		639	3.3	638[N1]	3.3	0.110	4.1	NA	0.4	3.2	0.12	0.60	32.3

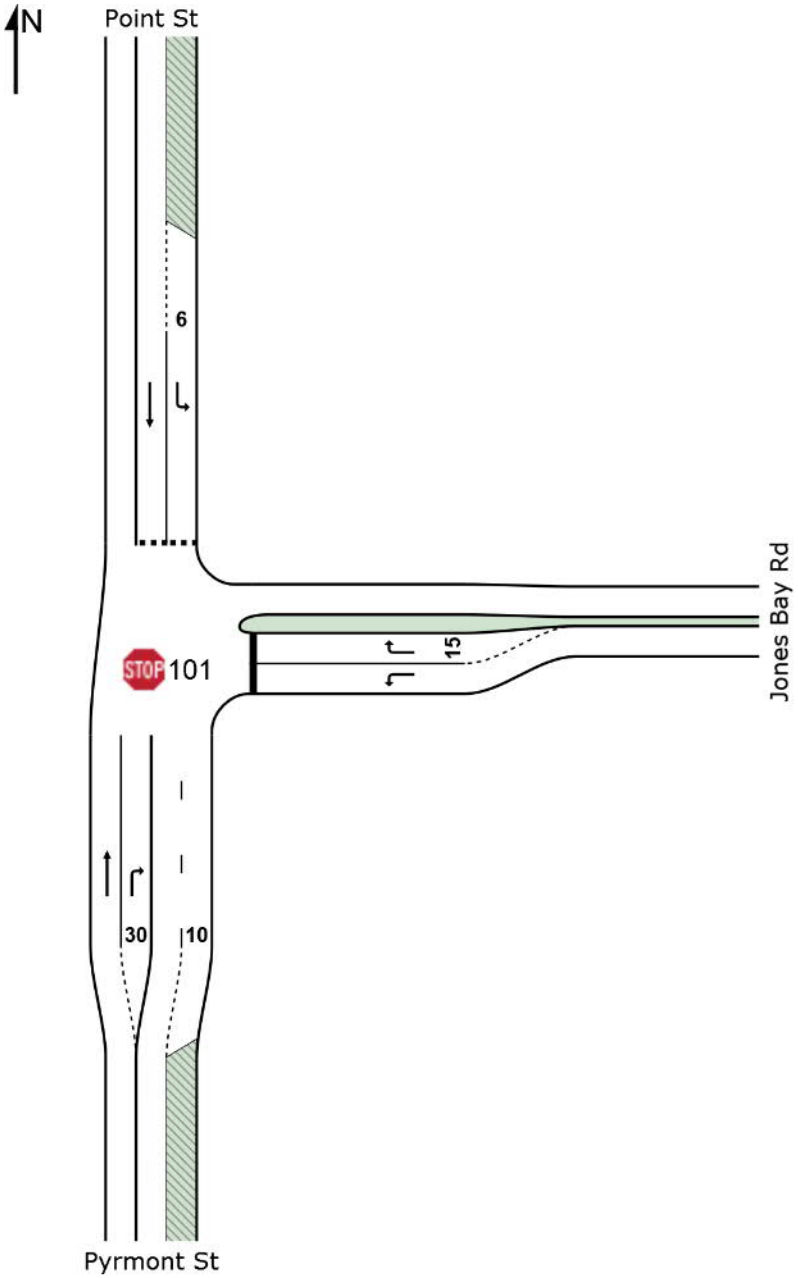
Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 2.4 %
Number of Iterations: 10 (maximum specified: 10)

N1 Arrival Flow value is reduced due to capacity constraint at oversaturated upstream lanes.

SITE LAYOUT

Site: 101 [PM Pyrmont St/Jones Bay Rd]

No Project
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 101 [PM Pyrmont St/Jones Bay Rd]

Network: N101 [PM Star Casino Network]

No Project
Stop (Two-Way)

Movement Performance - Vehicles

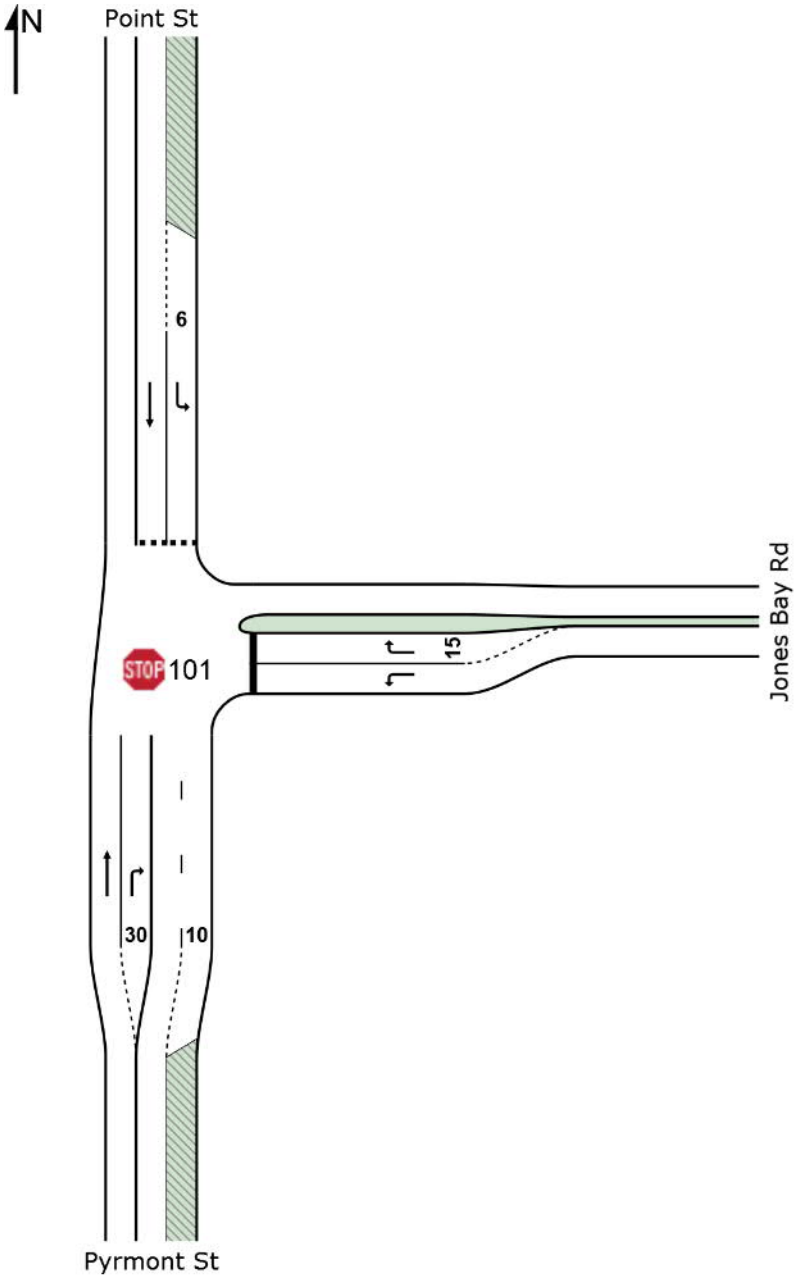
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Pyrmont St													
2	T1	152	0.0	152	0.0	0.078	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
3	R2	108	0.0	108	0.0	0.058	4.6	LOS A	0.0	0.0	0.00	0.53	36.7
Approach		260	0.0	260	0.0	0.078	1.9	NA	0.0	0.0	0.00	0.22	44.2
East: Jones Bay Rd													
4	L2	330	0.9	330	0.9	0.230	5.0	LOS A	0.0	0.0	0.00	1.00	17.1
6	R2	65	0.0	65	0.0	0.085	6.8	LOS A	0.3	2.0	0.41	0.91	20.8
Approach		395	0.8	395	0.8	0.230	5.3	LOS A	0.3	2.0	0.07	0.99	18.1
North: Point St													
7	L2	66	0.0	66	0.0	0.044	4.0	LOS A	0.2	1.4	0.20	0.49	25.1
8	T1	115	2.6	115	2.6	0.089	3.1	LOS A	0.4	2.5	0.25	0.46	27.6
Approach		181	1.7	181	1.7	0.089	3.4	LOS A	0.4	2.5	0.23	0.47	26.6
All Vehicles		836	0.7	836	0.7	0.230	3.8	NA	0.4	2.5	0.08	0.64	31.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 11.2 %
Number of Iterations: 10 (maximum specified: 10)

SITE LAYOUT

Site: 101 [OP Pyrmont St/Jones Bay Rd]

No Project
Stop (Two-Way)



MOVEMENT SUMMARY

Site: 101 [OP Pyrmont St/Jones Bay Rd]

Network: N101 [OP Star Casino Network]

No Project
Stop (Two-Way)

Movement Performance - Vehicles

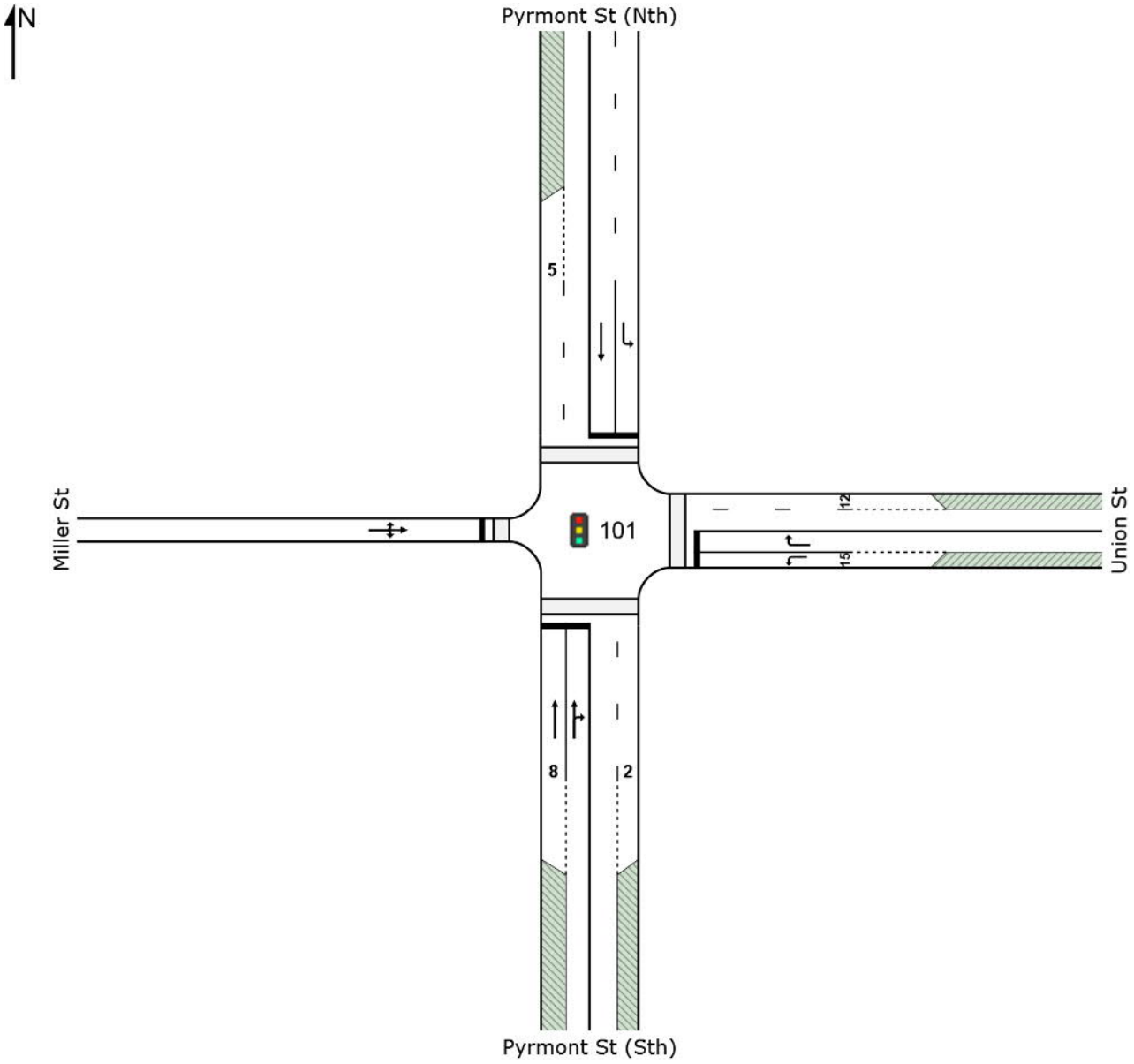
Mov ID	OD Mov	Demand Flows Total	HV	Arrival Flows Total	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Pyrmont St													
2	T1	53	0.0	53	0.0	0.027	0.0	LOS A	0.0	0.0	0.00	0.00	50.0
3	R2	218	0.0	218	0.0	0.117	4.6	LOS A	0.0	0.0	0.00	0.53	36.7
Approach		271	0.0	271	0.0	0.117	3.7	NA	0.0	0.0	0.00	0.43	39.1
East: Jones Bay Rd													
4	L2	335	0.3	335	0.3	0.233	4.9	LOS A	0.0	0.0	0.00	1.00	17.1
6	R2	34	0.0	34	0.0	0.042	6.4	LOS A	0.1	1.0	0.37	0.88	21.4
Approach		369	0.3	369	0.3	0.233	5.1	LOS A	0.1	1.0	0.03	0.99	17.8
North: Point St													
7	L2	49	0.0	49	0.0	0.036	4.3	LOS A	0.2	1.1	0.30	0.51	24.2
8	T1	45	0.0	45	0.0	0.036	3.3	LOS A	0.1	1.0	0.29	0.47	27.1
Approach		94	0.0	94	0.0	0.036	3.8	LOS A	0.2	1.1	0.30	0.49	25.5
All Vehicles		734	0.1	734	0.1	0.233	4.4	NA	0.2	1.1	0.06	0.72	30.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 21.8 %
Number of Iterations: 10 (maximum specified: 10)

SITE LAYOUT

Site: 101 [AM Pyrmont St/Union St]

No Project
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [AM Pyrmont St/Union St]

Network: 1 [AM Star Casino Network]

No Project
Signals - Fixed Time Coordinated Cycle Time = 100 seconds (Network Cycle Time - User-Given)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pyrmont St (Sth)													
2	T1	247	2.8	247	2.8	0.356	19.5	LOS B	6.5	46.6	0.64	0.55	14.5
3	R2	29	3.4	29	3.4	0.356	25.3	LOS B	6.5	46.6	0.66	0.58	13.9
Approach		276	2.9	276	2.9	0.356	20.1	LOS B	6.5	46.6	0.64	0.55	14.4
East: Union St													
4	L2	38	7.9	38	7.9	0.189	48.7	LOS D	1.8	13.6	0.98	0.74	5.3
6	R2	16	6.3	16	6.3	0.055	42.4	LOS C	0.7	5.2	0.93	0.70	5.9
Approach		54	7.4	54	7.4	0.189	46.8	LOS D	1.8	13.6	0.97	0.73	5.5
North: Pyrmont St (Nth)													
7	L2	42	7.1	42	7.1	0.037	10.1	LOS A	0.7	5.2	0.36	0.61	16.0
8	T1	294	3.4	294	3.4	0.342	19.1	LOS B	9.2	66.6	0.69	0.59	9.7
Approach		336	3.9	336	3.9	0.342	18.0	LOS B	9.2	66.6	0.65	0.60	10.2
West: Miller St													
10	L2	9	0.0	9	0.0	0.130	40.8	LOS C	1.7	12.5	0.87	0.70	4.0
11	T1	14	0.0	14	0.0	0.130	37.6	LOS C	1.7	12.5	0.87	0.70	4.0
12	R2	19	5.3	19	5.3	0.130	40.7	LOS C	1.7	12.5	0.87	0.70	4.0
Approach		42	2.4	42	2.4	0.130	39.7	LOS C	1.7	12.5	0.87	0.70	4.0
All Vehicles		708	3.7	708	3.7	0.356	22.3	LOS B	9.2	66.6	0.69	0.59	10.6

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 2.4 %
Number of Iterations: 10 (maximum specified: 10)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	196	43.6	LOS E	0.5	0.5	0.94	0.94
P2	East Full Crossing	42	43.3	LOS E	0.1	0.1	0.93	0.93
P3	North Full Crossing	937	45.0	LOS E	2.6	2.6	0.97	0.97
P4	West Full Crossing	65	43.4	LOS E	0.2	0.2	0.93	0.93
All Pedestrians		1240	44.6	LOS E			0.96	0.96

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [AM Pyrmont St/Union St]

Network: 1 [AM Star Casino Network]

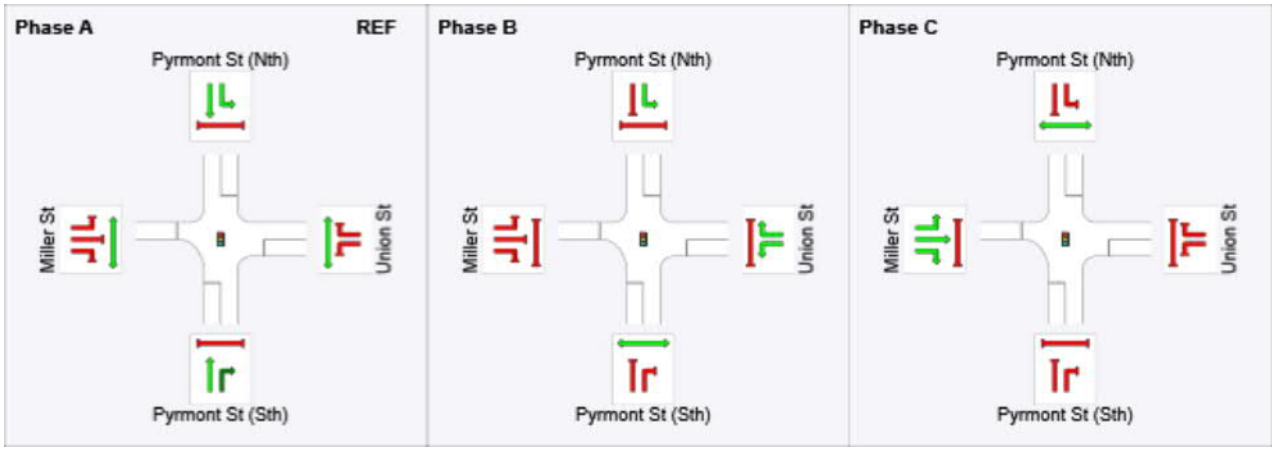
No Project
Signals - Fixed Time Coordinated Cycle Time = 100 seconds (Network Cycle Time - User-Given)

Phase Times determined by the program
Green Split Priority applies
Phase Sequence: Existing Phasing - AM
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Phase Change Time (sec)	0	51	74
Green Time (sec)	45	17	20
Phase Time (sec)	51	23	26
Phase Split	51 %	23 %	26 %

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



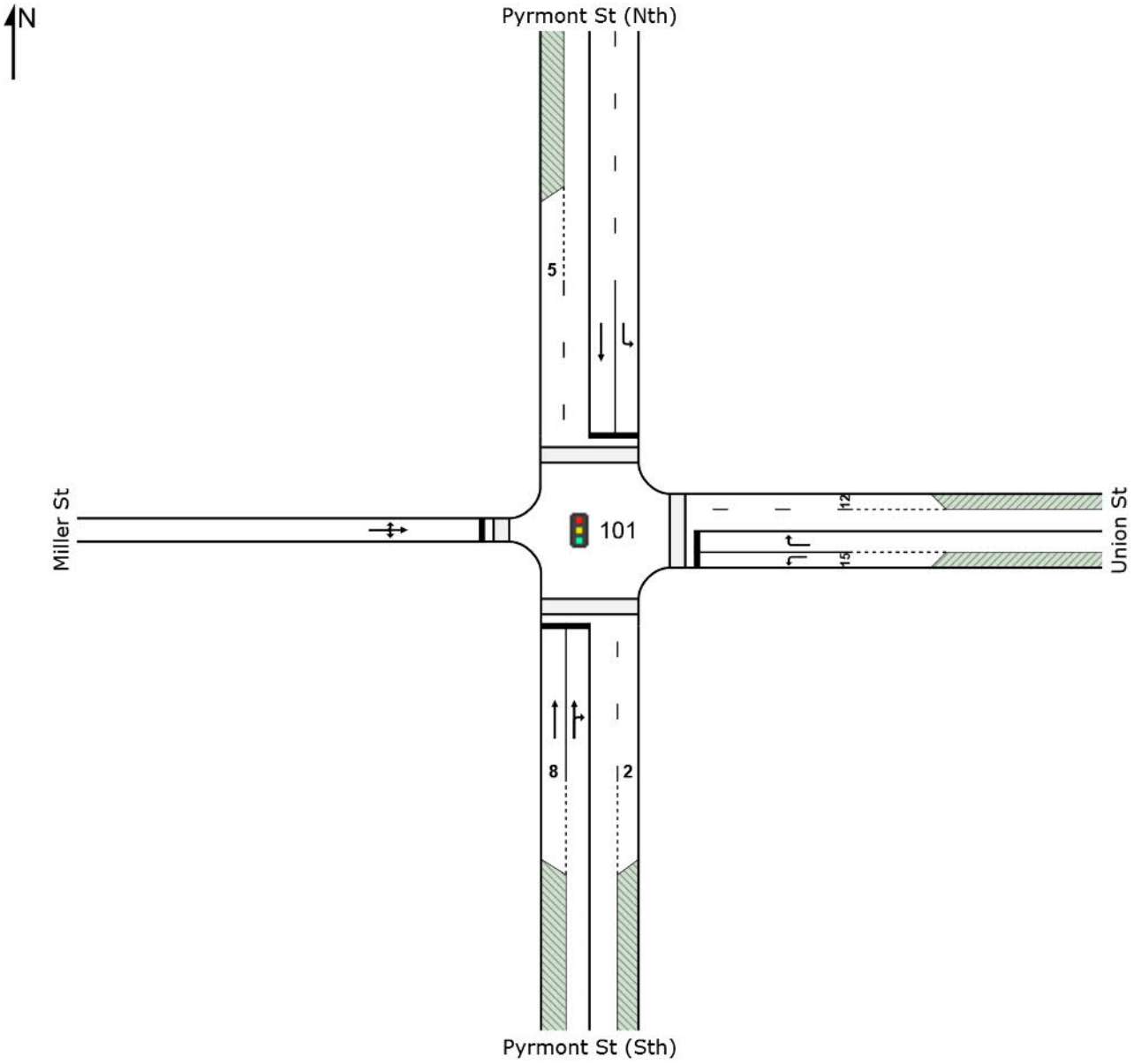
REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

SITE LAYOUT

Site: 101 [PM Pyrmont St/Union St]

No Project
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [PM Pyrmont St/Union St]

Network: N101 [PM Star Casino Network]

No Project
Signals - Fixed Time Coordinated Cycle Time = 100 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pyrmont St (Sth)													
2	T1	214	0.0	214	0.0	0.649	21.7	LOS C	5.5	38.2	0.56	0.47	13.4
3	R2	41	0.0	41	0.0	0.649	44.0	LOS D	5.5	38.2	0.88	0.74	8.3
Approach		255	0.0	255	0.0	0.649	25.3	LOS C	5.5	38.2	0.61	0.51	12.2
East: Union St													
4	L2	99	0.0	99	0.0	0.770	56.4	LOS E	5.3	37.4	1.00	0.90	4.7
6	R2	35	0.0	35	0.0	0.114	47.4	LOS D	1.6	11.3	0.97	0.74	5.3
Approach		134	0.0	134	0.0	0.770	54.1	LOS D	5.3	37.4	0.99	0.86	4.8
North: Pyrmont St (Nth)													
7	L2	74	0.0	74	0.0	0.058	8.8	LOS A	1.1	7.7	0.33	0.61	17.5
8	T1	467	1.1	467	1.1	0.828	31.4	LOS C	11.6	81.6	0.92	0.94	6.4
Approach		541	0.9	541	0.9	0.828	28.3	LOS C	11.6	81.6	0.84	0.89	7.0
West: Miller St													
10	L2	6	0.0	6	0.0	0.165	45.7	LOS D	1.3	9.1	0.91	0.71	3.5
11	T1	5	0.0	5	0.0	0.165	42.5	LOS D	1.3	9.1	0.91	0.71	3.5
12	R2	18	0.0	18	0.0	0.165	45.7	LOS D	1.3	9.1	0.91	0.71	3.5
Approach		29	0.0	29	0.0	0.165	45.1	LOS D	1.3	9.1	0.91	0.71	3.5
All Vehicles		959	0.5	959	0.5	0.828	31.6	LOS C	11.6	81.6	0.80	0.78	7.6

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 11.2 %
Number of Iterations: 10 (maximum specified: 10)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	85	43.4	LOS E	0.2	0.2	0.93	0.93
P2	East Full Crossing	61	43.4	LOS E	0.2	0.2	0.93	0.93
P3	North Full Crossing	986	45.1	LOS E	2.7	2.7	0.97	0.97
P4	West Full Crossing	65	43.4	LOS E	0.2	0.2	0.93	0.93
All Pedestrians		1198	44.8	LOS E			0.96	0.96

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [PM Pyrmont St/Union St]

Network: N101 [PM Star Casino Network]

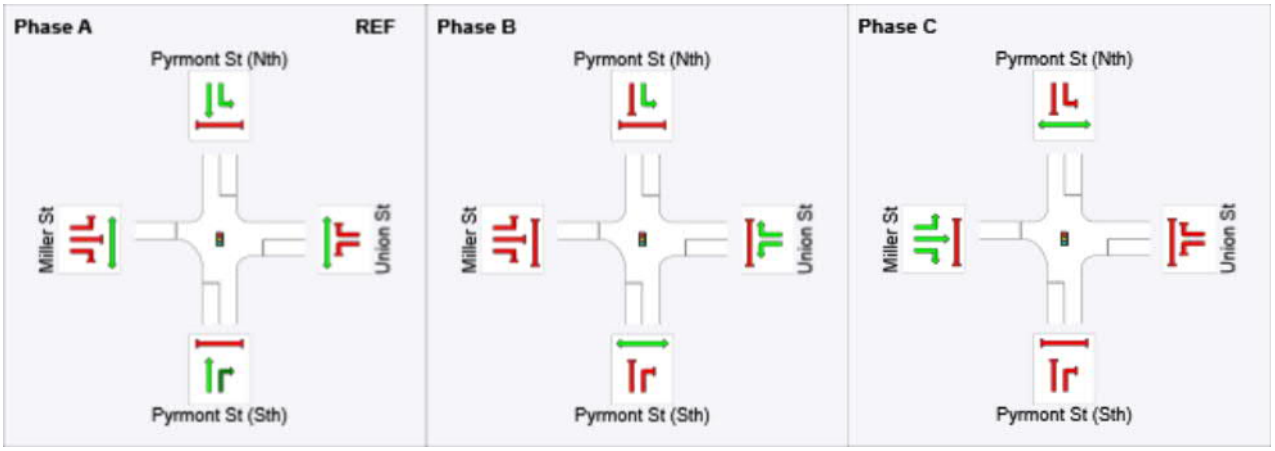
No Project
Signals - Fixed Time Coordinated Cycle Time = 100 seconds (User-Given Phase Times)

Phase Times specified by the user
Phase Sequence: Existing Phasing - AM
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Phase Change Time (sec)	0	55	78
Green Time (sec)	50	17	16
Phase Time (sec)	56	23	21
Phase Split	56 %	23 %	21 %

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



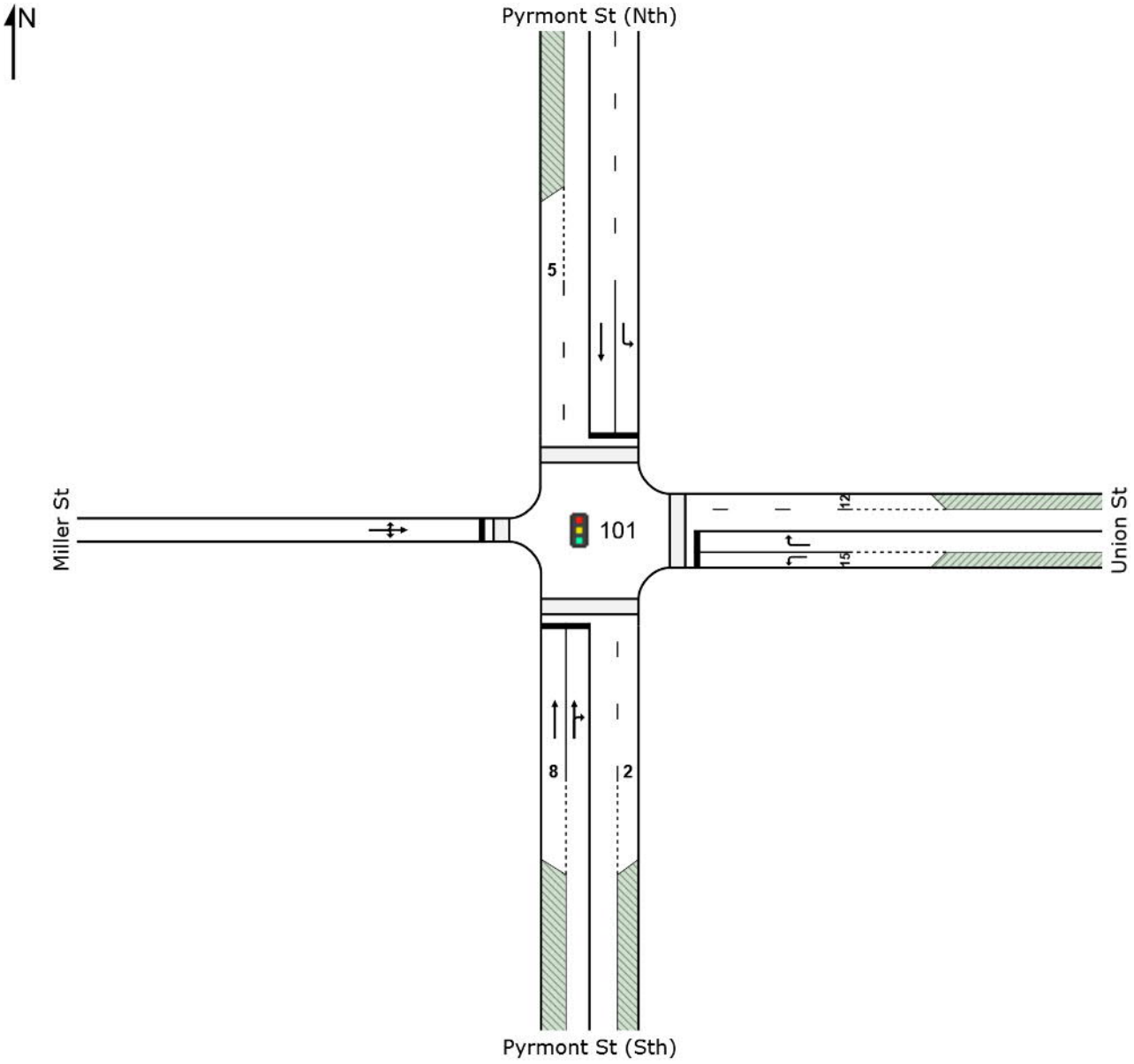
REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

SITE LAYOUT

Site: 101 [OP Pyrmont St/Union St]

No Project
Signals - Fixed Time Isolated



MOVEMENT SUMMARY

Site: 101 [OP Pyrmont St/Union St]

Network: N101 [OP Star Casino Network]

No Project
Signals - Fixed Time Coordinated Cycle Time = 100 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Pyrmont St (Sth)													
2	T1	238	0.0	238	0.0	0.490	21.4	LOS C	6.0	42.0	0.55	0.47	13.6
3	R2	28	0.0	28	0.0	0.490	36.7	LOS D	6.0	42.0	0.78	0.66	9.9
Approach		266	0.0	266	0.0	0.490	23.0	LOS C	6.0	42.0	0.58	0.49	13.1
East: Union St													
4	L2	105	0.0	105	0.0	0.739	60.4	LOS E	5.6	39.2	1.00	0.86	4.4
6	R2	21	0.0	21	0.0	0.078	50.6	LOS D	1.0	7.2	1.00	0.72	5.0
Approach		126	0.0	126	0.0	0.739	58.7	LOS E	5.6	39.2	1.00	0.84	4.5
North: Pyrmont St (Nth)													
7	L2	80	0.0	80	0.0	0.062	8.5	LOS A	1.2	8.1	0.32	0.61	17.9
8	T1	493	0.4	493	0.4	0.810	27.1	LOS C	11.6	81.6	0.89	0.89	7.2
Approach		573	0.3	573	0.3	0.810	24.5	LOS C	11.6	81.6	0.81	0.85	7.9
West: Miller St													
10	L2	1	0.0	1	0.0	0.076	42.7	LOS D	0.7	5.0	0.88	0.66	3.9
11	T1	8	12.5	8	12.5	0.076	39.5	LOS D	0.7	5.0	0.88	0.66	3.9
12	R2	7	0.0	7	0.0	0.076	42.6	LOS D	0.7	5.0	0.88	0.66	3.9
Approach		16	6.3	16	6.3	0.076	41.1	LOS D	0.7	5.0	0.88	0.66	3.9
All Vehicles		981	0.3	981	0.3	0.810	28.8	LOS C	11.6	81.6	0.77	0.74	8.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 21.8 %
Number of Iterations: 10 (maximum specified: 10)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	28	43.3	LOS E	0.1	0.1	0.93	0.93
P2	East Full Crossing	61	43.4	LOS E	0.2	0.2	0.93	0.93
P3	North Full Crossing	343	43.9	LOS E	0.9	0.9	0.94	0.94
P4	West Full Crossing	71	43.4	LOS E	0.2	0.2	0.93	0.93
All Pedestrians		503	43.7	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [OP Pyrmont St/Union St]

Network: N101 [OP Star Casino Network]

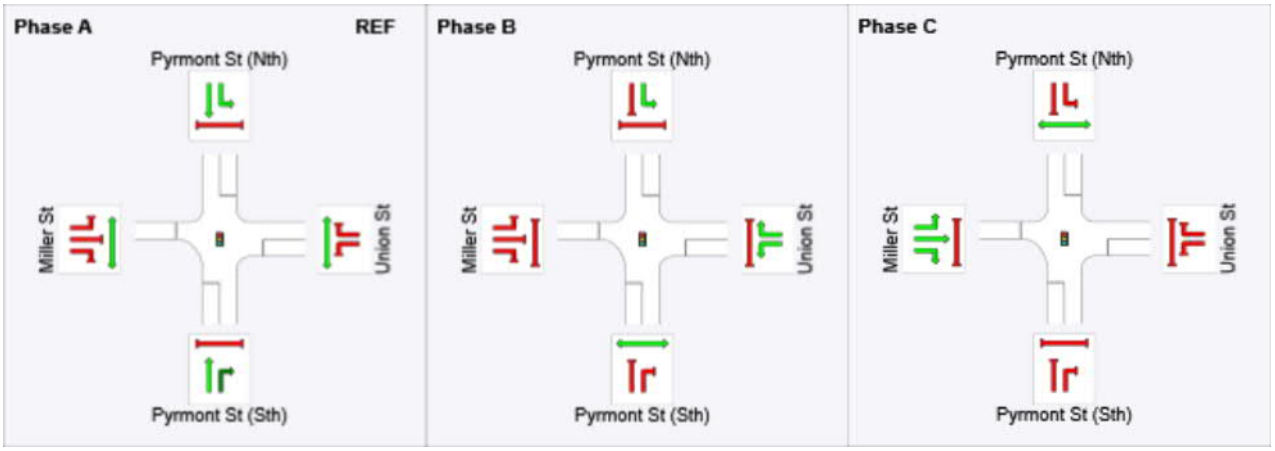
No Project
Signals - Fixed Time Coordinated Cycle Time = 100 seconds (User-Given Phase Times)

Phase Times specified by the user
Phase Sequence: Existing Phasing - AM
Reference Phase: Phase A
Input Phase Sequence: A, B, C
Output Phase Sequence: A, B, C

Phase Timing Results

Phase	A	B	C
Phase Change Time (sec)	0	58	79
Green Time (sec)	53	15	16
Phase Time (sec)	59	20	21
Phase Split	59 %	20 %	21 %

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



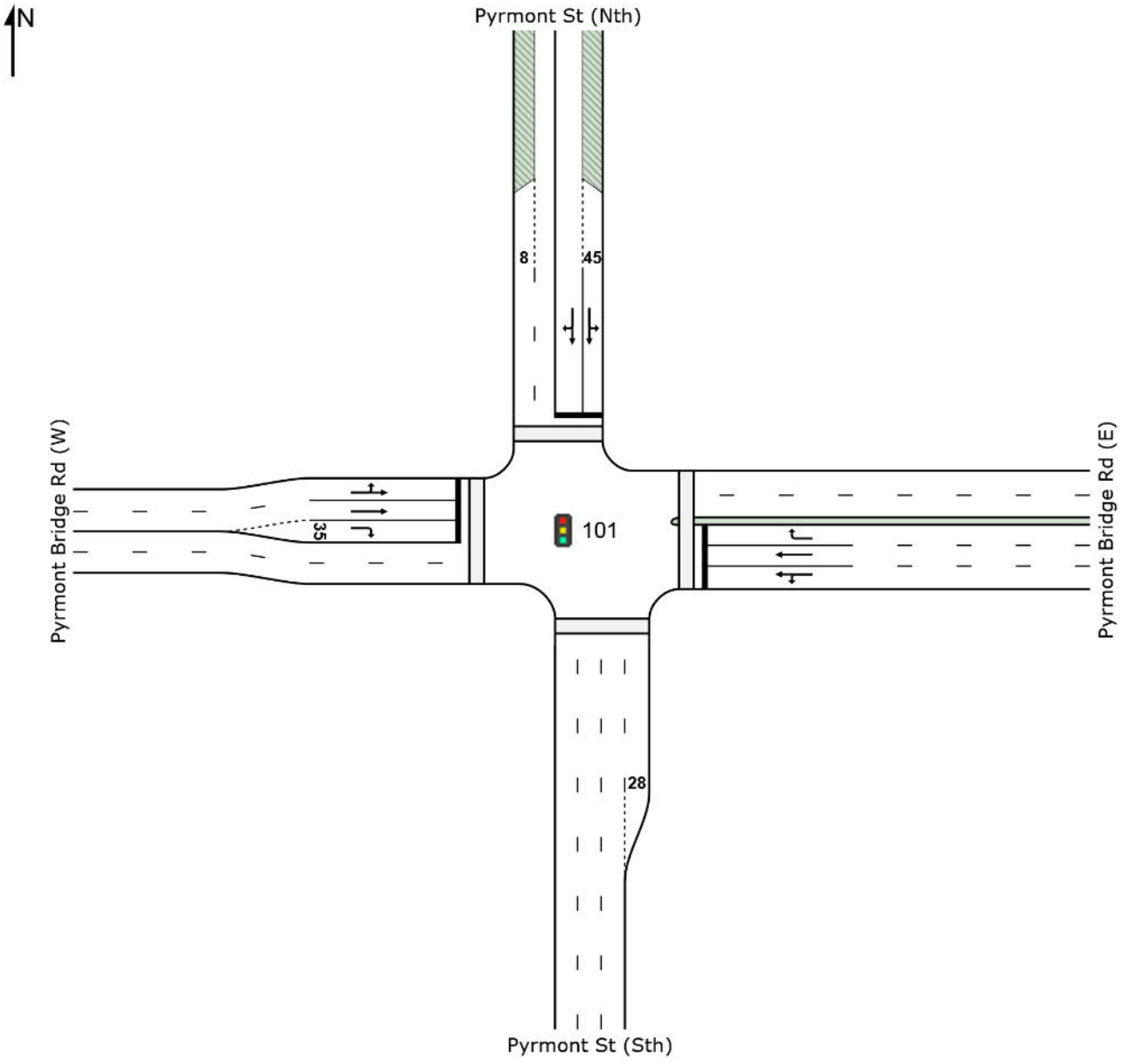
REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied

SITE LAYOUT

Site: 101 [AM Pyrmont St/Pyrmont Bridge Rd]

No Project
Signals - Fixed Time Coordinated



MOVEMENT SUMMARY

Site: 101 [AM Pyrmont St/Pyrmont Bridge Rd]

Network: 1 [AM Star Casino Network]

No Project
Signals - Fixed Time Coordinated Cycle Time = 100 seconds (User-Given Phase Times)

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Arrival Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Pyrmont Bridge Rd (E)													
4	L2	27	7.4	27	7.4	0.240	36.9	LOS C	3.7	27.4	0.79	0.65	6.5
5	T1	190	7.4	190	7.4	0.240	32.1	LOS C	4.0	30.0	0.76	0.62	10.2
6	R2	43	2.3	43	2.3	0.106	32.5	LOS C	1.4	10.0	0.69	0.68	4.1
Approach		260	6.5	260	6.5	0.240	32.7	LOS C	4.0	30.0	0.75	0.63	8.9
North: Pyrmont St (Nth)													
7	L2	5	20.0	5	20.0	0.190	46.2	LOS D	3.7	26.4	1.00	0.78	8.5
8	T1	227	0.9	227	0.9	0.766	47.8	LOS D	13.0	94.4	1.00	0.85	9.1
9	R2	104	9.6	104	9.6	0.766	55.5	LOS D	13.0	94.4	1.00	0.88	9.8
Approach		336	3.9	336	3.9	0.766	50.2	LOS D	13.0	94.4	1.00	0.86	9.4
West: Pyrmont Bridge Rd (W)													
10	L2	240	3.8	240	3.8	0.371	8.4	LOS A	4.0	29.1	0.29	0.48	25.1
11	T1	607	4.6	607	4.6	0.371	3.8	LOS A	4.2	30.4	0.23	0.27	29.6
12	R2	409	2.7	409	2.7	0.983	54.7	LOS D	17.5	125.2	1.00	1.05	6.6
Approach		1256	3.8	1256	3.8	0.983	21.2	LOS B	17.5	125.2	0.49	0.56	12.4
All Vehicles		1852	4.2	1852	4.2	0.983	28.1	LOS B	17.5	125.2	0.62	0.62	10.9

Site Level of Service (LOS) Method: Delay (RTA NSW). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.
Largest change in Average Back of Queue or Degree of Saturation for any lane during the last three iterations: 2.4 %
Number of Iterations: 10 (maximum specified: 10)

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Distance m	Prop. Queued	Effective Stop Rate per ped
P1	South Full Crossing	174	43.6	LOS E	0.5	0.5	0.94	0.94
P2	East Full Crossing	51	43.3	LOS E	0.1	0.1	0.93	0.93
P3	North Full Crossing	413	44.0	LOS E	1.1	1.1	0.95	0.95
P4	West Full Crossing	83	43.4	LOS E	0.2	0.2	0.93	0.93
All Pedestrians		720	43.8	LOS E			0.94	0.94

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

PHASING SUMMARY

Site: 101 [AM Pyrmont St/Pyrmont Bridge Rd]

Network: 1 [AM Star Casino Network]

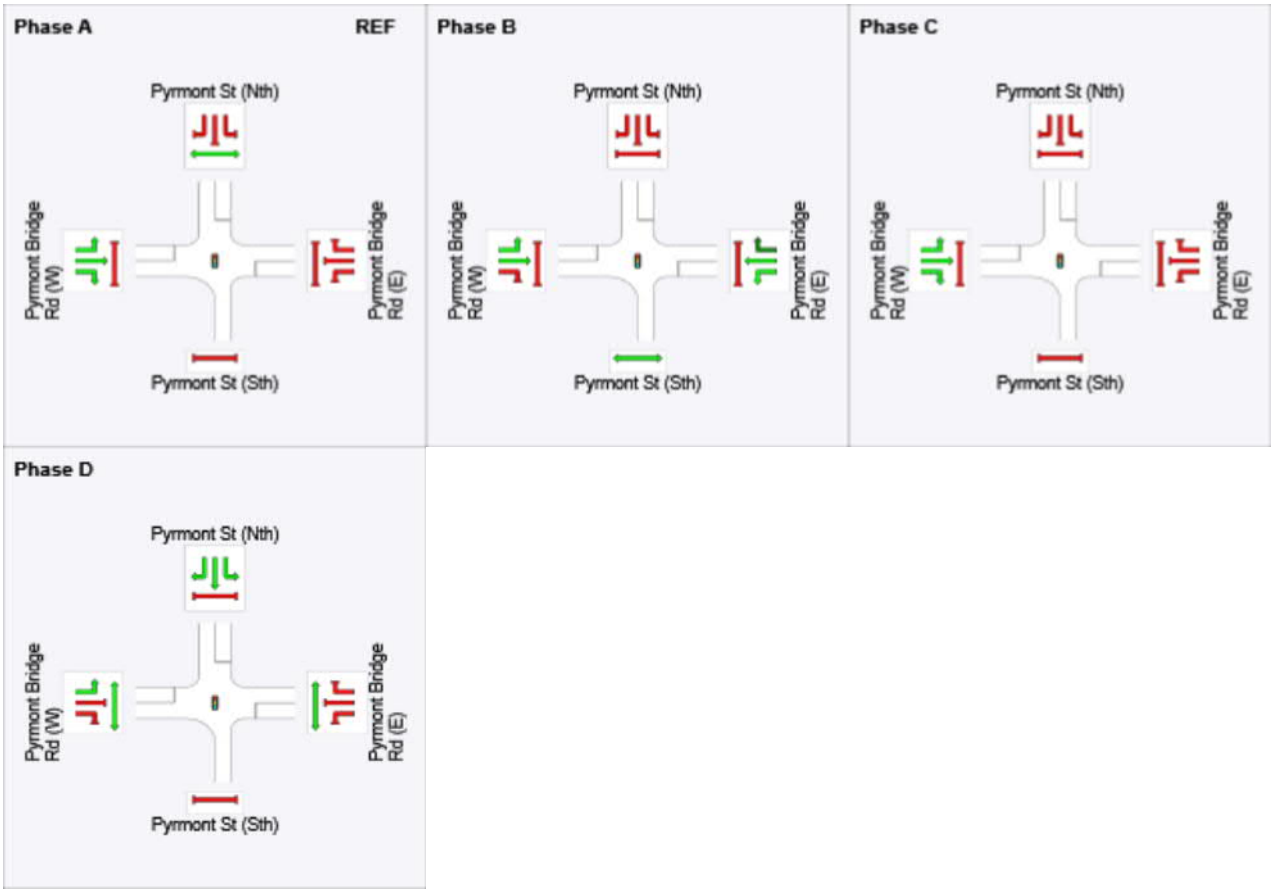
No Project
Signals - Fixed Time Coordinated Cycle Time = 100 seconds (User-Given Phase Times)

Phase Times specified by the user
Phase Sequence: Existing Phasing - AM
Reference Phase: Phase A
Input Phase Sequence: A, B, C, D
Output Phase Sequence: A, B, C, D

Phase Timing Results

Phase	A	B	C	D
Phase Change Time (sec)	0	21	53	71
Green Time (sec)	15	27	12	23
Phase Time (sec)	20	33	18	29
Phase Split	20 %	33 %	18 %	29 %

See the Phase Information section in the Detailed Output report for more detailed information including input values of Yellow Time and All-Red Time, and information on any adjustments to Intergreen Time, Phase Time and Green Time values in cases of Pedestrian Actuation, Phase Actuation and Phase Frequency values (user-specified or implied) less than 100%.



REF: Reference Phase
VAR: Variable Phase

Normal Movement	Permitted/Opposed
Slip/Bypass-Lane Movement	Opposed Slip/Bypass-Lane
Stopped Movement	Turn On Red
Other Movement Class (MC) Running	Undetected Movement
Mixed Running & Stopped MCs	Continuous Movement
Other Movement Class (MC) Stopped	Phase Transition Applied