

Sydney Harbour Casino  
Properties Pty Ltd

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**Project Star - Transport**

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Transport Impact of Star  
City Redevelopment

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City Redevelopment

H.DA – T.1000  
C.DA - T.1000

September 2008

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This report takes into account the particular instructions and requirements of our client.

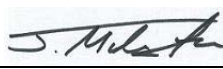





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## Executive Summary

The following report describes the traffic and transport impact of the proposed redevelopment of Star City Casino. Under the proposed plan, there is to be a 309 room hotel placed on the site on the corner of Edward and Union Streets, Pyrmont. Further, the existing casino site is to be upgraded to include additional entertainment and retail areas, as well as providing a new porte cochere on Pirrama Road. Approximately 500 new underground parking spaces are planned to cater for the additional casino patrons. The extended car park floor plates and location at the south end beyond the existing car park will encourage the new car parking bays under the new hotel to be used mainly by dedicated parkers that obtain some advantage from the location: hotel patrons to the hotel above, regular casino members, and valet parking operations. A through site link is proposed to provide pedestrians access from the hotel and casino entrance on Pyrmont Street through to Pirrama Road and Pyrmont Bay Park.

There are presently a number of transport options for people to access Star City. 2,500 underground parking bays exist under the site, with a large number of overflow parking spaces available in nearby Darling Harbour car parks. The casino has both a light rail and bus terminal, providing fast and direct access from the Sydney CBD and Central Station to the site. Ferry services are available, docking at Pyrmont Bay Wharf, and the Pyrmont Bridge provides a direct route for cyclists and walkers to arrive to the casino from the CBD.

Vehicular access to Star City Casino will remain largely as existing. The porte cochere on Pyrmont Street will be extended to include drop offs and valet parking for the new hotel. A porte cochere is also proposed to be located on Pirrama Road, replacing the existing staircase. It is envisaged that this will become the foremost entry point for the redeveloped casino complex.

Micro-simulation traffic modelling of the proposed Pirrama Road porte cochere demonstrated it would have no adverse impact on the surrounding road network. There would always be a surplus of available drop off bays during peak periods, with commissionaire staff to manage the porte cochere during these busy times.

Following the casino project upgrade, there is likely to be a significant rise in casino patronage compared to the current levels. The approximate 500 extra parking bays proposed, which are intended cater for the users of the new hotel and expanded casino complex only, will simply maintain the present balance of on-site and overflow parking during the peak casino periods of Friday and Saturday evenings.

Modelling and analysis performed on key intersections surrounding the site demonstrated that there would be acceptable impacts on the adjacent road intersections.

Measures to mitigate the impact of various aspects of the proposed development include:

- Driveway style crossings over vehicular entry/exit points to allow for continuous footpath segments to encourage vehicles to give way to pedestrians
- Improved lighting around the Jones Bay Road/Pirrama Road intersection to improve pedestrian safety
- Placing double solid lines along Pirrama Road between Edward Street and Jones Bay Road to discourage right turns in and out of the porte cochere
- Appropriate signage and barriers at the loading bay entrance on Edward Street given the 3.8m clearance height
- Support for City of Sydney Council's program for footpath widening of Union Street
- Reviewing and monitoring the performance of the Murray Street/Pyrmont Bridge Road intersection following the completion of the proposed development
- Development of a Green Transport Plan to encourage public transport and other sustainable transport modes to the site by staff and visitors

- Enhanced bicycle facilities to accommodate Star City staff
- Providing clear and unobstructed pedestrian paths to the Pirrama Road entrance to discourage crossings over the porte cochere entry and exit points
- Reviewing the availability, usage and pricing control policies of Star City car park and surrounding Darling Harbour car parks in the years following the casino upgrade

Overall, the issues arising from the proposed upgrade of Star City Casino, both during and following construction, are satisfactory and manageable from a transport perspective.

# 1 Introduction

Arup was appointed by Sydney Harbour Casino Properties Pty Ltd to prepare a transportation and parking assessment for the proposed redevelopment of Star City Casino and the new hotel on the corner of Edward and Union Streets, Pyrmont. The 309 room hotel will have its own address and entrance via Union Street but will be fully integrated into the adjacent permanent casino complex. This integration is envisaged to result in many complementary activities between the venues and multiple use of facilities by patrons in a single visit. The study also investigated the traffic impact of the proposed redevelopment, through the addition of new entertainment and retail areas of the existing casino site.

## 1.1 Scope

The study considered within its terms of reference the Director General's Requirements<sup>1</sup> for the Environmental Assessment of a former proposal for a 309 Room hotel and retail complex, and the Preliminary Environmental Assessment for Tabcorp<sup>2</sup> for the current proposal of September 2008. The latest Director General's Requirements regarding the study areas for the traffic and transport impact of the project involve:

- Addressing measures and impacts to mitigate impacts on surrounding roads and intersections
- Considering the future traffic generation associated with the proposal
- Providing detailed modelling for key intersections around the casino site
- Detailing strategies to encourage public transport usage for casino staff and patrons
- Complying with relevant Council and RTA traffic and parking codes
- Detailing the provision of movement of shuttle buses, coaches, taxis, service and delivery vehicles
- Detailing the existing and future pedestrian and cycle movements in the site vicinity
- Considering the proposed footpath widening on Union Street at Pyrmont Bridge Road and two-way traffic scheme on Pyrmont Street south of Pyrmont Bridge Road.

The study was prepared in accordance with relevant authorities guidelines such as Council and RTA Guidelines for Traffic Generating Developments. Design was generally in accordance with Australian Standards and AUSTROADS guidelines.

The following chapters include:

- Project Description
- Site Assessment
- Site Location and Description
- Site Accessibility
- Existing Transport Conditions
- Proposed Development
- Access Arrangements
- Data Collection and Analysis
- Future Demand Analysis

<sup>1</sup> Director Generals Requirements 08\_0098 Planning NSW, 30 June 2008

<sup>2</sup> PEA by Urbis for Tabcorp June 2008

- Recommended Works and Measures

## 1.2 Project Description

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The presently vacant site on the corner of Union and Edward Streets previously contained the Pyrmont Electricity Switching Station, and has a total area of just over 5,000m<sup>2</sup>, with the remainder of the block containing the permanent casino complex. The hotel development will have frontages to Pyrmont Street, Union Street and Edward Street, and will provide pedestrians access through the casino to Pirrama Road from Pyrmont Street. The hotel will also contain conference, entertainment and retail areas for use in conjunction with other casino facilities.

The proposed redevelopment of the casino site involves replacing the existing Spanish Stairs on Pirrama Road with a porte cochere entrance. This, combined with a proposed light and sound show adjacent to the porte cochere, aims to make Pirrama Road the focal entrance point of the casino. In addition to the porte cochere, some additional entertainment and retail areas are also proposed to complement the existing casino facilities.

## 2 Site Assessment

### 2.1 Site Location and Description

Star City Casino is located in the inner-city suburb of Pyrmont, approximately two kilometres west of the Sydney CBD, and is shown in Figure 1. The site area is approximately 40,000m<sup>2</sup> and is enclosed by Pyrmont Street, Union Street, Edward Street, Pirrama Road and Jones Bay Road.

The land surrounding the casino is of mixed use, with public, commercial and residential buildings present. Significant landmarks close to the site include the National Maritime Museum, The Novotel Darling Harbour Hotel and the Sydney Exhibition and Convention Centre. Major arterial roads serving the area include the Western Distributor, The Cross City Tunnel and Harris Street. The site is also accessible via public transport through STA Bus services, Sydney Ferries and the Sydney light-rail line (LRT). The Pyrmont Bridge provides convenient access for pedestrians and cyclists from the CBD to the casino site.



**Figure 1 Casino Site Location**

### 2.2 Consultation

#### 2.2.1 City of Sydney Council

The purpose of this consultation was to present the latest development proposal to City of Sydney Council, and advise them of the proposed scope of the traffic report that is being undertaken. Feedback was sought on any issues and requirements regarding the project. Key intersections and circulation issues associated the casino upgrade were discussed, with Council largely agreeing with the methodology proposed.

Council raised concern about the current operation of the Pymont Bridge Road/Murray Street intersection. They suggested a possible right turn ban from Pymont Bridge Road into Murray Street. This impact and necessity of this measure is to be discussed in the analysis.

It was noted by Council that ideally all trucks would drive into the site and leave in a forward direction. It was acknowledged that this is difficult for the articulated trailers which occasionally come to the site. Council advised that the State Theatre Company has a management plan in place relating to low frequency articulated vehicle movements into their loading dock. A similar arrangement could be proposed at the Lyric Theatre, allowing these vehicles to enter in a reversing motion over the footpath.

Council queried whether measures could be introduced which would encourage more people to utilise the Edward Street entrance to the underground Casino car park. It was felt that this entrance is presently underutilised, with most patrons electing to access the car park via Pirrama Road. Improved signage around the Pymont area informing people of the availability of this entrance may be appropriate in future years.

Other issues regarding the bus/coach lane, parking availability and other access arrangements were also discussed.

#### 2.2.2 RTA

The Roads and Traffic Authority (RTA) were generally happy with the proposal. The key issues raised in the consultations were:

- The RTA is likely to defer to Council views on the majority of local matters
- RTA don't have a strong view on whether the right turn from Pymont Bridge Road to Murray St should be retained
- RTA is aware of studies for SHFA that expects an overall decline of parking bays (mainly public) in the Darling Harbour area, possibly balanced by some additional bays at Darling Walk and 500 at Star City. With this expected net decrease in parking bays at Darling Harbour in the short term, there would be a reduction in traffic generation on the surrounding road network.
- RTA sees no warrant for a new crossing on Pirrama Road. They advised that no intersections around the area were classed as black spots, with Arup to detail this in the final analysis.
- RTA had only recently sent their comments on the Director Generals' requirements back to Department of Planning. Apparently there were no major changes to previous DGRs, apart from adding a requirement for a TMAP (Transport Mobility and Access Plan) as part of the approval. RTA would accept a relatively simple TMAP, concentrating on maximising mode split to public transport.

### 2.3 Site Accessibility

The new hotel will operate as part of the permanent casino complex in terms of access for patrons. Approximately 500 car parking spaces are to be sought on the site to serve hotel and casino patrons, and will be fully integrated with the existing 2,500 car parking spaces under the permanent casino, sharing internal circulation routes with all public access. This occurs through the two existing car park entrances; one on Edward Street and the other on Pirrama Road. A direct public pedestrian path with an accompanying retail arcade is envisaged to connect Pymont Bay Park to the intersection of Union and Pymont Street.

The new porte cochere on Pirrama Road will serve as an additional drop off point for patrons to the main casino area. This should act as the foremost pedestrian entrance to the permanent casino complex, and will complement the existing porte cochere on Pymont Street.

## 2.4 Existing Transport Conditions

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### 2.4.1 Introduction

The existing transport situation at Star City has been regularly surveyed and analysed by Arup for over a decade as part of the casino's regular reporting requirement to the authorities on the availability and cost of car parking at the site and the surrounding streets. These reports have consistently reported that the cost and supply of parking at Star City has been managed by the owner to deter non-Star car parking by CBD commuters and to relieve pressure on on-street car parking in Pyrmont so as not to disadvantage local residents, business and visitors use of on-street car parking.

Since opening, Star City has settled into the transport system for the wider area of Pyrmont, complementing the bus, light rail, and taxi services for surrounding businesses and residents. The original critical mass of the casino activity to support a vibrant 24 hour transport system has been supplemented in recent years by extensive residential development such as Jackson's Landing and the wharf residences, businesses such as Foxtel, Seven Network, and Fairfax media, and local activity such as the foreshore pathway and activities.

### 2.4.2 Car Parking

#### Off Street

The Star City Car Park is operating with 2163 car spaces available for self park over Levels B2 to B5 and part of B1 with 337 valet parking spaces on the remainder of Level B1. Occupancy levels of self parking continue to be monitored, showing that parking on-site is in the range 2,000 to 2,500 spaces in the evenings on Fridays, Saturdays and Sundays. The other weekdays range up to a peak occupancy of 1,500 spaces. This pattern of occupancy has remained unchanged over recent years.

Currently, Star City staff who enter the on-site car park after 4am, and leave before 7pm, pay a flat parking rate of \$7. In addition, due to staff shifts commencing or finishing during the night when limited public transport is available, there is an arrangement with both Harbourside and the Entertainment Centre Car Park where staff can park for \$7 per shift.

In addition to this, a number of other major off-street car parks are in close proximity to the casino, including Harbourside car park and the Exhibition Centre car park. These off-site car parks are used at peak attendance times with patrons travelling to Star City either on the light rail or by walking.

#### On Street

Approximately 1,200 off-street parking spaces also exist within a 500 metre radius of the site, with the large majority of these spaces time restricted to two hour parking or less. On-street kerb side car parking in the Ultimo/Pyrmont area came under greater control by City of Sydney Council on opening of the casino with the introduction of pay and display parking with time periods in the range ¼hr to 2hr. This significantly reduced the amount of all day on-street car parking and the potential for patrons to park on-street.

### 2.4.3 Public Transport Modes

Star City is well served by public transport services to and from the central area and suburbs. Buses, LRT, Monorail and ferries all serve the site at frequent intervals during the day and into the evening.

#### Bus

Sydney Buses operate two services to and from the Star City site. Services 443 and 448 run from Circular Quay to the Casino and Darling Harbour throughout the day at frequent intervals between 6.00am and 1.00am. Service 449 runs out to the west between 9.30am and 2.50pm on weekdays only.

There are also buses operating on Harris Street with the main service being the 501 to West Ryde. This service is only a short walk from Star City. Each bus has a maximum capacity of approximately 50 passengers. Up to 600 passengers per hour could potentially be transported by bus to and from Star City when services reach their peak.

Additional private bus services are operated between Star City and the suburbs. These suburban buses generally operate every two hours to and from Star City, with the latest buses departing Star City between 11pm and midnight. Passengers are charged \$10 for the return fare, but then receive \$10 free cash to use at the Star City complex.

#### LRT/Monorail

The Sydney Light Rapid Transit links Star City with Darling Harbour, Chinatown and Central Station. Services operate 24 hours a day, 365 days a year at a frequency of 10-15 minutes.

In addition, the Monorail links Sydney's central area with Darling Harbour. The closest station to Star City is located at Harbourside. Monorail services operate 365 days a year with frequencies of 3-5 minutes, running until late in the evening (midnight Thursday to Saturday).

Star City currently pays the full cost for its staff to travel on the light rail between Central and the station at the casino.

#### Ferry

Ferry and water taxi services are available to Star City via Pyrmont Bay Wharf. Scheduled Sydney Ferries services link Pyrmont Wharf with Darling Harbour, Balmain, Milsons Point and Circular Quay. Sydney Ferries services run throughout the day, with the last ferry dropping off/picking up at Pyrmont Bay Wharf at 10.30pm.

In addition there are Darling Harbour shuttle services and water taxis that operate between the Star City Pontoon, Darling Harbour and Circular Quay.

#### 2.4.4 Other Transport Modes

##### Walk

The proximity of Star City to Darling Harbour and the CBD means that patrons can choose to walk from nearby locations. Many patrons visit the Casino after another event such as dinner or a show at another location.

Patrons also walk into Star City having travelled on another form of transport such as the monorail or train. Patrons parking off-site in a Darling Harbour Car Park or on-street also walk into Star City.

##### Cycling

The Pyrmont Bridge – Pyrmont Bridge Road – Union Street bike route is the main western gateway to the CBD. The Pyrmont Bridge is used by up to 400 cyclists in the 2 hour morning and afternoon peak periods (Source: City of Sydney).

## 3 Proposed Development

### 3.1 Nature of Proposed Development

There are two major aspects to the proposed redevelopment of the Star City Casino site. The first involves the construction of a new 309 room hotel at the presently vacant site on the corner of Edward and Union Street. Approximately 500 extra basement car parking bays, which are desired to serve hotel and casino users only, will form a lateral extension of the existing 2,500 underground spaces. The extended car park floor plates and location at the south end beyond the existing car park will encourage the new car parking bays under the new hotel to be used mainly by dedicated parkers that obtain some advantage from the location: hotel patrons to the hotel above, regular casino members, and valet parking operations. Vehicular access to the car park will remain unchanged, with vehicles entering either via Pirrama Road or Edward Street. The hotel will comprise of conference and dining areas, as well as additional entertainment and retail facilities. An extension of the existing retail arcade is also proposed to provide a pedestrian through site link from Pymont Bay Park through to Pymont Street.

The second aspect of the redevelopment involves the demolition of the staircase on Pirrama Road, to be replaced with a new driveway porte cochere entrance. This porte cochere on Pirrama Road is to refocus much of the vehicular drop off movements from the existing Pymont Street frontage. In addition, the existing entertainment and retail areas are to be expanded within the permanent casino site. There are proposed to be a number of new restaurants and entertainment facilities along the eastern side of the building, with the intention of generating tourism and creating a world class casino complex.

#### 3.1.1 Gross Floor Areas of Each Component of Proposed Development

Both the existing and proposed gross floor areas (GFA) of each component of the new development at Star City Casino are displayed in Table 1.

**Table 1 Proposed GFA of Star City development**

	Existing GFA (m <sup>2</sup> )	Proposed GFA (m <sup>2</sup> )	Total GFA (m <sup>2</sup> )
<b>Existing Casino</b>			
	102,551	6,003	108,554
<b>New Hotel</b>			
	0	23,885	23,885
<b>TOTAL PROJECT</b>			
	102,551	29,888	132,439

### 3.2 Access

#### 3.2.1 Vehicular

Presently there are three major locations of vehicular access to the casino for the public. These are:

- Edward Street North/Pirrama Road intersection. Five control gates are available and tidal flow arrangements are envisaged if demanded by peak flows. This intersection, which is signal controlled, also allows for coach ingress to the coach drop-off, pick-up and parking area, and Star Theatre loading.
- Edward Street South from Pymont Bridge Road where two entry and two exit lanes are available to the car park.

- The porte cochere which is located on the Pyrmont Street frontage (entrance via Jones Bay Road) and includes direct dedicated circulation to and from the car park for valet parking.

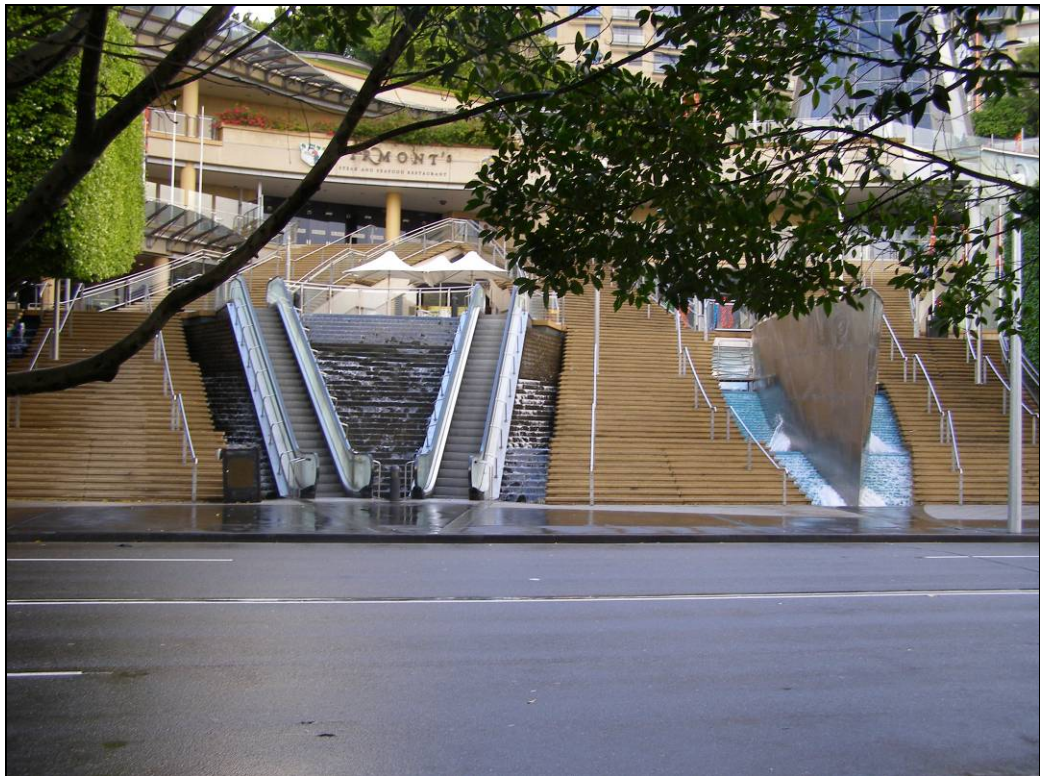
Under the proposed development plan, the existing Pyrmont Street porte cochere is to be extended to the entrance of the new hotel. Vehicular exit points will remain as existing, with an additional exit point for hotel porte cochere users. The entrance to the casino car park is to remain via either Edward Street or Pirrama Road.

In addition to these access points, there is to be a further access location on Pirrama Road through a proposed porte cochere. In terms of vehicle circulation, it is to act solely as a drop off location, with one lane reserved for passing vehicles and the other for vehicles laying over. During busy casino periods this area would be under the control of commissionaire staff. It is envisaged that this two lane porte cochere will become the foremost entry point for the redeveloped casino complex.

### 3.2.2 Pedestrian

Currently, pedestrians can access the casino complex via entry points on Pyrmont Street and Pirrama Road. The Pirrama Road entrance contains a wide set of stairs leading up to the main entrance level, as seen in Figure 2. Initially built to satisfy egress requirements, these stairs are presently under utilised by casino patrons. The proposed redevelopment of the site involves the removal of these stairs, to be replaced with at grade pedestrian access to a set of vertical access stairs inside the casino complex.

Under the proposed development, there is to be a through site link which connects Pyrmont Street and Union Street with Pyrmont Bay Park, and should improve pedestrian access around the casino site. Presently, the pedestrian thoroughfare loops around the casino's interior, making it difficult and sometimes confusing for patrons to find their way around. The proposed through site link provides a more direct access pathway through the casino.



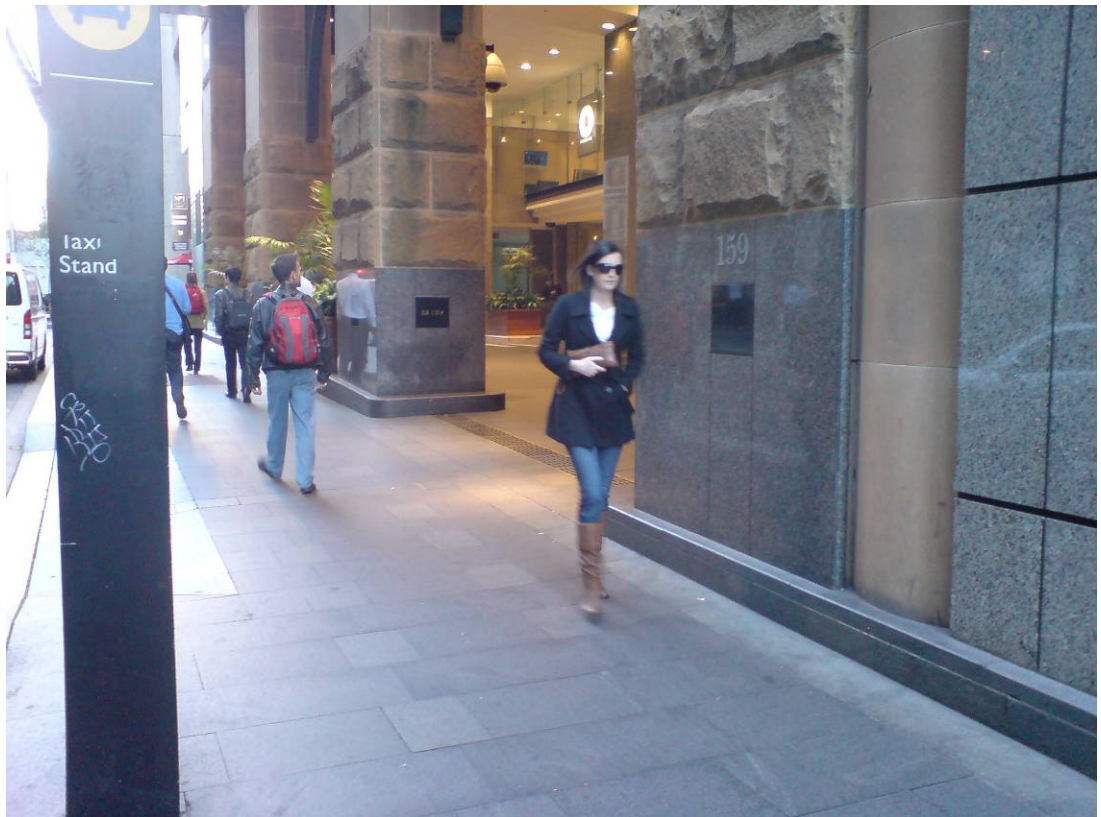
**Figure 2 Present Pedestrian Entrance on Pirrama Road**

Council may be concerned at the two additional vehicular driveway crossing points of the footpath on Pirrama Road at the porte cochere entrance. Arup pedestrian studies (see Section 4.4) show however that this footpath segment between the two crossing points is

not widely utilised by pedestrians. This concern should be further offset by the improved pedestrian environment in the area.

Further concern may also be focused on the additional driveway crossing point at the hotel porte cochere exit. The through site link entrance on the corner of Pyrmont and Union Streets, allowing pedestrians access to the complex without having to cross the driveway, should alleviate this issue somewhat.

Figure 3 and Figure 4 illustrate the porte cochere outside Macquarie Bank/ Westin Hotel porte cochere in Pitt Street south of Martin Place. The taxi rank outside on Pitt Street also feeds the porte cochere. From the Star City perspective, this provides a reasonable example of a geometrically constrained porte cochere with columns and busy footpath that works well under the management of a commissionaire. The driveway style entrance which is fully integrated with the adjoining footpath would be the preferred option for the Star City porte cochere.



**Figure 3** Porte Cochere Entrance Outside Westin Hotel



**Figure 4 Pedestrian Crossing of Porte Cochere Outside Westin Hotel**

### 3.2.3 Public Transport

Both a bus and light rail terminal exists for patrons to access the casino adjacent to Pirrama Road in the undercroft of the casino. Escalators are present which transport people down from the casino entrance level to the undercroft. Two bays exist for STA buses to set down and pick up passengers, and there are two light rail platforms for trains travelling either east towards the city or west towards Glebe. On average during peak periods around five to six bus and light rail services operate during an hour.



**Figure 5 STA Bus and Coach Service Bay in Casino Undercroft**



**Figure 6 Light Rail Platform at Star City Casino**

Access to the casino and hotel complex via public buses and the light rail service will remain in the undercroft of the casino, and will not be affected. Pedestrian walkways across the bus and coach lane are to remain in place following the redevelopment. Security and use of

public transport may be improved by the activation of this area by the new retail and casino access.

The proposed development of Barangaroo (Darling Harbour East wharves) opposite Star City may create an opportunity for a ferry shuttle between the two tourist and entertainment precincts.

### 3.2.4 Bicycles

Conditions for cyclists will be largely unaffected due to the proposed redevelopment. Existing bicycle facilities, such as secure bicycle parking, storage lockers and changing facilities, should be enhanced to encourage Star City staff to consider this alternative mode of transport to the site.

The City of Sydney Cycle Strategy and Action Plan, released in 2007, details a number of improvements to the road cycling network around the CBD and Pyrmont area. A key feature of the strategy is to connect up existing gaps in the bicycle network west of the Pyrmont Bridge. This will provide cyclists more convenient and safer access travelling from the Pyrmont Bridge to Union Street at the Murray Street/Pyrmont Bridge Road intersection. The plan also includes a continuous recreational foreshore cycleway between The Crescent and Pyrmont Bridge Road.

These improvements to the cycling network around the Pyrmont and CBD area will create a friendlier environment for cyclists travelling in the vicinity of the casino site.

### 3.2.5 Taxis

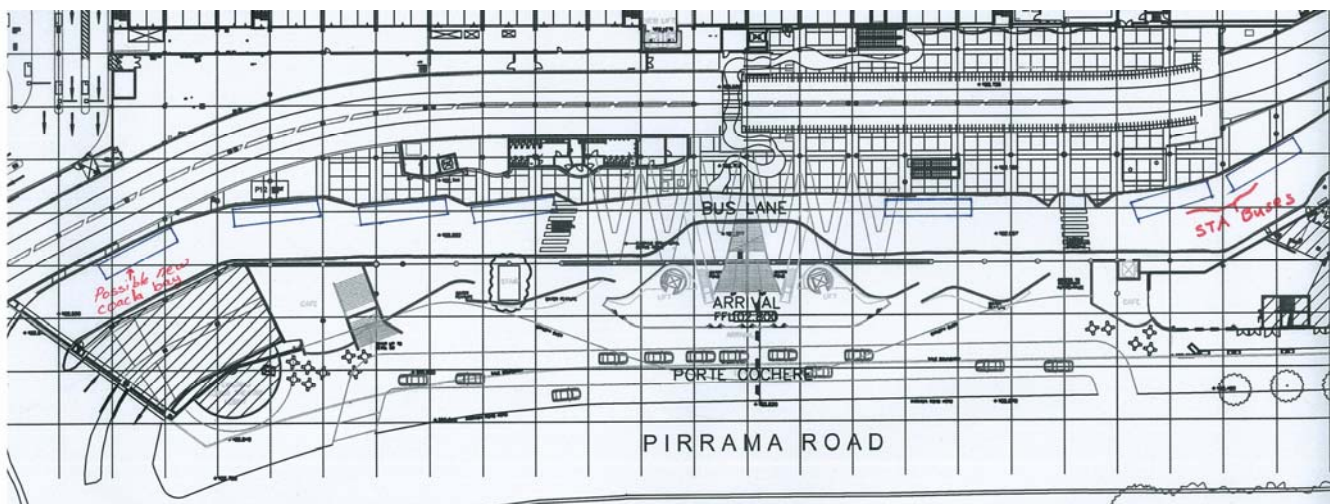
Taxis services can remain largely as existing in terms of the taxi rank on Jones Bay Road and operations through the existing porte cohere. The proposed new porte cohere on Pirrama Road is suited to taxi drop offs of arriving patrons.

The new hotel porte cohere can be served by taxis at its front door in a similar way to the existing hotel. Taxis then exit the porte cohere via the proposed new vehicle egress on Pyrmont Street.

This should provide satisfactory services to taxi patrons.

### 3.2.6 Coaches and Minibuses

There are to be some minor modifications to the present bus and coach layover area under the proposed development plan. The present lane outside the main entrance is to be narrowed to 3m to accommodate the enhanced entrance location on Pirrama Road. The lane then widens back out to 11m either side of the main entrance. This arrangement, including the location of all bus and coach bays, is displayed below.



**Figure 7 Bus/Coach Lane Arrangement**

Due to the narrowing of the bus lane, two of the existing coach bays would have to be removed because of a lack of space for passing vehicles. The proposed arrangement allows just over 4 metres between the kerb and entry, and 7 metres is the required width for a moving bus to pass a stationary bus on a straight road.

One additional bay for a bus or coach could possibly be placed towards the entry of undercroft area (indicated in Figure 7). If this bay were to be introduced, there would be a net overall loss of one coach bay due to the proposed modifications. Present on-site observations indicate that coaches park in these bays for significant periods, neither dropping off nor picking up passengers. With the loss of one and possibly two bays, Star City staff would have to properly manage the new layover area so that bays are available for incoming coaches.

Some Star City shuttle buses presently park for extended periods on the eastern side kerb of the bus and coach lane. These bays will be generally unaffected under the proposed arrangement, however one or two parking spaces may be lost. These could be replaced by utilising the spare space opposite some of the coach bays (seen in Figure 5), or by removing some of the parking that exists opposite the Government bus bays.

The two Government bus bays will be unaffected by this revised layout.

### 3.2.7 Limousines and Stretch Limousines

Limousines access to the Pyrmont Street porte cochere will remain in place, with no significant modifications proposed.

The proposed new porte cochere on Pirrama Road is to act as an additional limousine drop off point. With the redevelopment of the eastern casino frontage, it is planned that the majority of limousine arrivals will take place via this porte cochere. A 'red carpet arrival' is envisaged, with distinguished guests arriving by limousine for presentation and awards nights entering through this entrance.

### 3.2.8 Service Vehicles

Delivery vehicles servicing the hotel and the Lyric Theatre are to make use of the proposed expanded loading bay on Edward Street. This improved loading bay allows for 48 foot articulated vehicles to be raised on the platform lift within the loading dock to serve the Lyric Theatre, reducing the time these trucks presently block Edward Street. The time taken for un-loading and re-loading will be reduced by single handling of load.

These large articulated vehicles are to reverse across the footpath into the loading bay, before making a series of manoeuvres to back into the loading dock. While it was not considered ideal to have these vehicles reversing over the footpath, there are unique circumstances that are applicable in this situation. These include:

- Articulated vehicles only arrive either to set up or pack up the set of a major stage show. These stage shows generally run over a four to five month period, so these vehicles will be performing these manoeuvres only a few times per year.
- As Edward Street features a cul-de-sac, there is little pedestrian activity along the footpath
- During periods when these heavy vehicles are using the loading dock, traffic controllers will be present to ensure traffic flows smoothly and pedestrians are not in any danger

Medium Rigid Vehicles (MRV's) will enter the loading bay in a forward direction, and drive straight in to their unloading position. They can then exit the loading bay in a similar forwards motion, irrespective of whether the other MRV is present or not.

### 3.2.9 Valet Parking

The present valet parking arrangements for casino patrons are to remain in place following the expansion of the casino complex. Vehicles enter the porte cochere on Jones Bay Road, with the valet parking utilised via the existing ramp into level B1 of the underground car park.

Valet parking will be available for hotel patrons via the extended porte cochere outside the hotel entrance on Pyrmont Street.

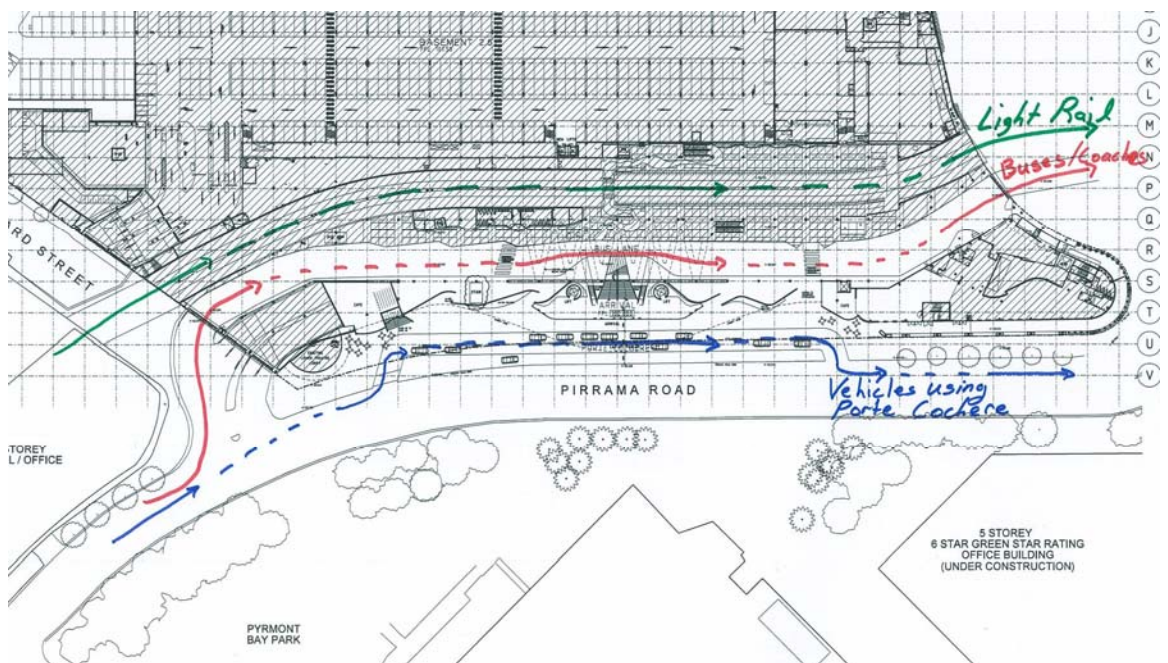
### 3.2.10 Emergency Vehicles

The present high standard of emergency vehicle access to the site will be retained under the proposed development.

## 3.3 Vehicle Circulation

### 3.3.1 Pirrama Road

Vehicles will enter and exit the porte cochere in a left in, left out motion, with right turns to and from Pirrama Road to be prohibited. The porte cochere is to comprise of two lanes, with the right lane reserved for passing traffic and the left lane containing the individual drop off bays. For special event functions, a 'red carpet' arrival setup can be accommodated, with limousines dropping off distinguished guests outside the front of the casino entrance. The present arrangement where buses and coaches enter the casino undercroft via a left turn off Pirrama Road will be retained. This circulation pattern is displayed in Figure 8.



**Figure 8 Vehicle Circulation Adjacent to Pirrama Road**

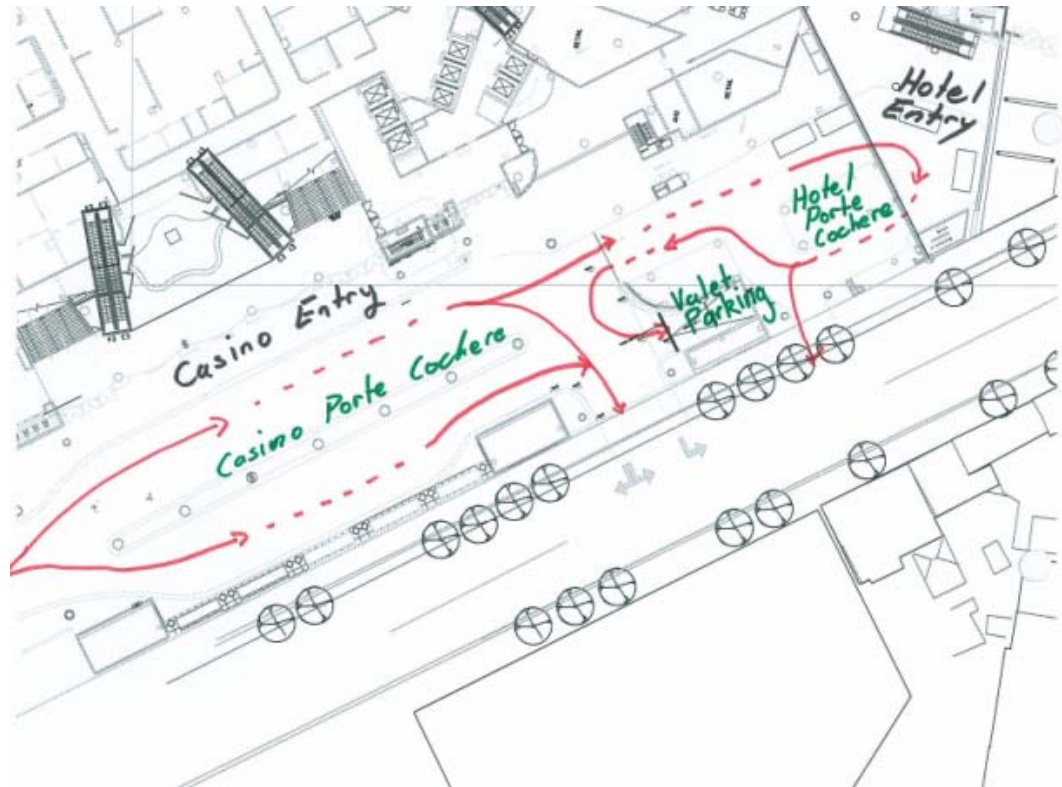
### 3.3.2 Pyrmont Street

Vehicle access to the casino porte cochere adjacent to Pyrmont Street is retained as existing. After entering on Jones Bay Road, vehicles can set down on either side of the median strip and drop off/pick up passengers. They then may exit onto Pyrmont Street.

Access to the new hotel porte cochere is also obtained via Jones Bay Road, with vehicles passing the existing valet parking ramp to a series of drop off bays located outside the hotel entrance. Vehicles utilising the valet parking option then perform a loop around a traffic island within the porte cochere, and proceed back around to the current valet parking ramp.

An additional vehicular egress point is planned to allow taxis and other drop off vehicles associated with the hotel access to Pyrmont Street. This method of circulation has been analysed and can function appropriately without inducing any traffic management issues.

These circulation patterns associated with the Pyrmont Street porte cochere are illustrated in Figure 9.



**Figure 9 Vehicle Circulation in Pyrmont Street Porte Cochere**

### 3.4 Construction Traffic

During construction of the proposed development there is anticipated to be a workforce of up to 400 persons on the site at the peak of construction activity. This workforce includes contractors personnel located in offices on the site. People working on the site will be encouraged to avail themselves of public transport to alleviate as far as possible impact on surrounding base traffic and on-street parking. Bus services are available directly to the site as have been used over previous years for access to the construction site for the existing casino complex. The expected high mode shift to public transport means that the majority of workers could be expected to walk across Darling Harbour to access Town Hall Station or take a bus to access Central Station and other destinations.

No parking can be made available on site for private vehicles and accordingly these cars would be parked in legal on-street parking bays on the Pyrmont peninsula and in off-street car parks. It will therefore be a condition of employment that construction personnel respect the concerns of residents over parking and those personnel using private vehicles for transport will be encouraged to park their vehicles in public car parking facilities in order to maintain good relations with the residents around the project.

Deliveries to the site would occur during the daytime shift, i.e. 7.00am to 5.00pm at up to a peak rate of 10 per hour giving a total number of 100 delivery trucks each way per day.

Construction traffic routes have been previously adopted by Star City Casino to be in accordance with the guidelines developed by City of Sydney Council. The "Construction Traffic Scheme" report prepared by Project Planning Associates Pty Ltd, July 1994, for NSW

Public Works adopts the following approach and departure routes for Pyrmont Bay which would be used by the construction traffic for the casino upgrade:

Approach Routes:

- Arterial Routes: Pyrmont Bridge Road
- Local Routes: Pyrmont Street, Edward Street, Union Street (east), Darling Drive

Departure Routes:

- Arterial Routes: Pyrmont Bridge Road and Pyrmont Street
- Local Routes: Pyrmont Street, Edward Street, Darling Drive

### 3.5 Safety

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At the time of writing, data was unavailable regarding the history of vehicular and pedestrian accidents on the roads surrounding Star City Casino. However, following consultations with the Roads and Traffic Authority (RTA), it was established that no intersections in the area of the casino feature on the RTA list of 'black spots'. With the increased number of pedestrians expected to make use of the casino, a more detailed review of pedestrian safety at key intersections, such as Pirrama Road/Edward Street, may be required in the design phase of the project.

## 4 Data Collection and Analysis

### 4.1 Turning Movement Survey

Traffic counts were undertaken on Friday 23<sup>rd</sup> May 2008 at a cordon of points surrounding the site. A Friday was selected as the survey date as patronage data indicated that Friday and Saturday evenings generated the highest number of casino patrons during a typical week. The particular intersections surveyed, which are illustrated in Figure 10, include:

- Pyrmont Bridge Road/Harris Street
- Pyrmont Bridge Road/Pyrmont Street
- Pyrmont Street/Union Street
- Pyrmont Street/Jones Bay Road
- Union Street/Edward Street
- Pirrama Road/Jones Bay Road
- Pyrmont Bridge Road/Union Street
- Pyrmont Bridge Road/Murray Street



Figure 10 Traffic Survey Locations

Turning movements of vehicles were recorded during both the morning (7am – 9:30am) and evening (4:30pm – 7pm) commuter peak periods. Counts were also performed from 7pm until 1am the next morning, to include the event and late peak periods experienced on Friday nights due to shows and late night entertainment at the casino. Results of the survey indicated the peak hourly traffic volumes occurred between 8am – 9am (AM peak), 6.15pm – 7.15pm (PM peak) and 10.30pm-11.30pm (late peak).

Initial traffic counts of key intersections on Pymont Bridge Road, Union Street and Pymont Street for each time period are displayed in Figure 11.

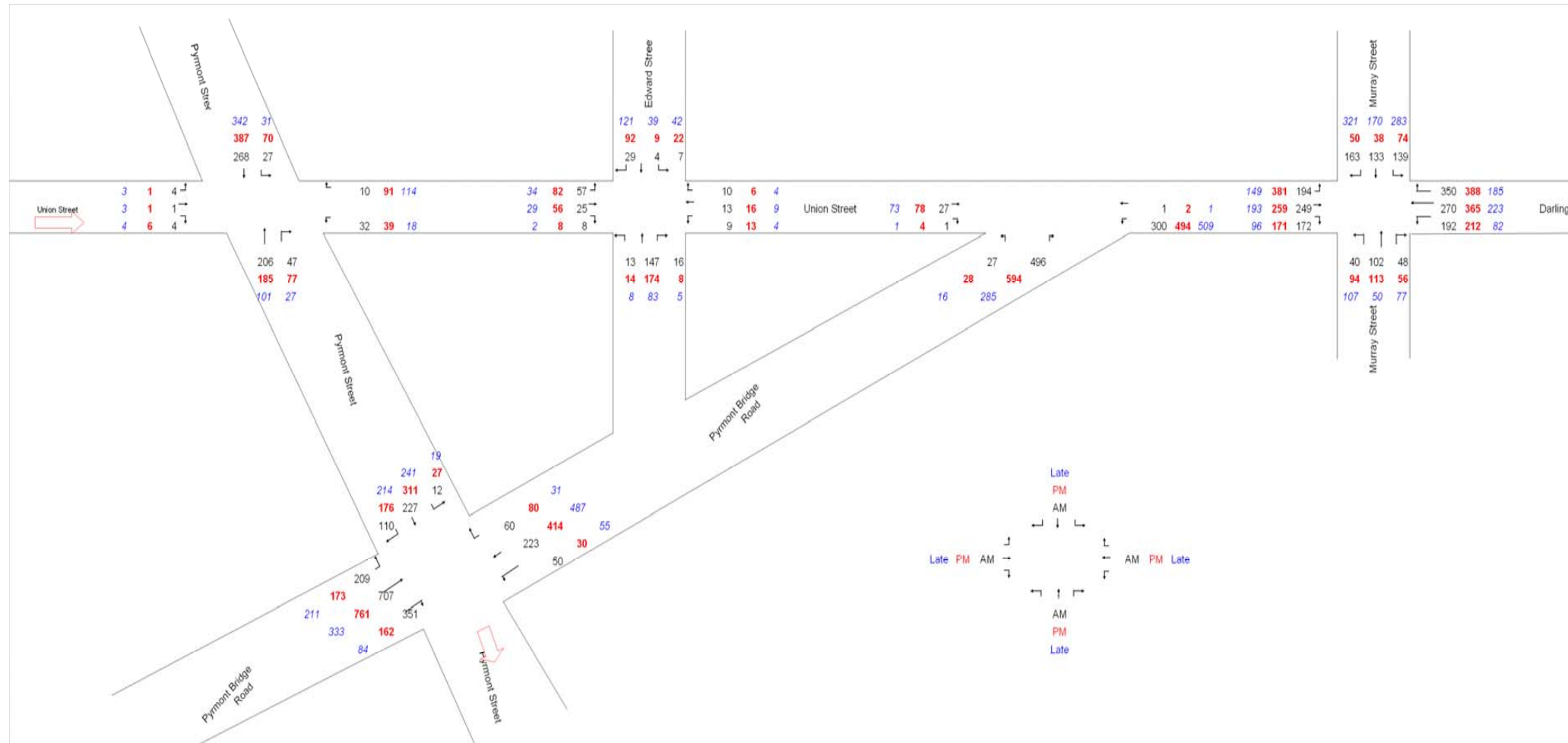


Figure 11 Traffic Count Results for Key Intersections Surrounding Star City Casino

## 4.2 Automated Traffic Counts

Traffic volume data for a week long period was obtained for roads surrounding the permanent casino site. The specific locations surveyed were:

- Pirrama Road between Jones Bay Road and Edward Street
- Pyrmont Street between Jones Bay Road and Union Street
- Pyrmont Street between John Street and Point Street

The automated counts recorded the volume, class and speed of vehicles travelling on these particular roads every hour for the week ending 3<sup>rd</sup> June, 2007. Some key results to emerge from these counts are summarised in Table 2.

**Table 2 Traffic Volumes Along Key Roads Surrounding the Casino**

Location	Maximum Daily Vehicle Flow		Maximum Hourly Vehicle Flow	
	Northbound	Southbound	Northbound	Southbound
Pirrama Rd opposite Casino	5697 (Saturday)	2778 (Friday)	532 (Saturday, 22:00)	203 (Friday, 19:00)
Pyrmont St opposite Casino	3751 (Saturday)	5010 (Saturday)	270 (Friday, 19:00)	399 (Wednesday, 18:00)
Pyrmont St near John St	1283 (Friday)	801 (Friday)	96 (Wednesday, 10:00)	64 (Friday, 18:00)

Some key results to emerge from the automated counts include:

- The highest vehicular flows on all three sections of roads generally occur on Friday and Saturday evenings
- The PM peak period between 6pm and 8pm experiences the greatest traffic volumes on a daily basis
- The late event peak period of between 10pm and 11pm on Saturday evening accounted for the highest hourly traffic flow on Pirrama Road. This can be explained by the late arrival of casino patrons on weekend evenings coupled with the departure of people following the conclusion of a theatre show.
- The percentage of heavy vehicles on both Pirrama Road and Pyrmont Street (near John Street) were both in the low range of below 3%. However opposite the casino entrance on Pyrmont Street, heavy vehicles accounted for 11% of the total traffic.
- The vehicular volumes on Pyrmont Street near John Street towards the more residential areas of the Pyrmont area were significantly lower than those experienced adjacent to the permanent casino site.

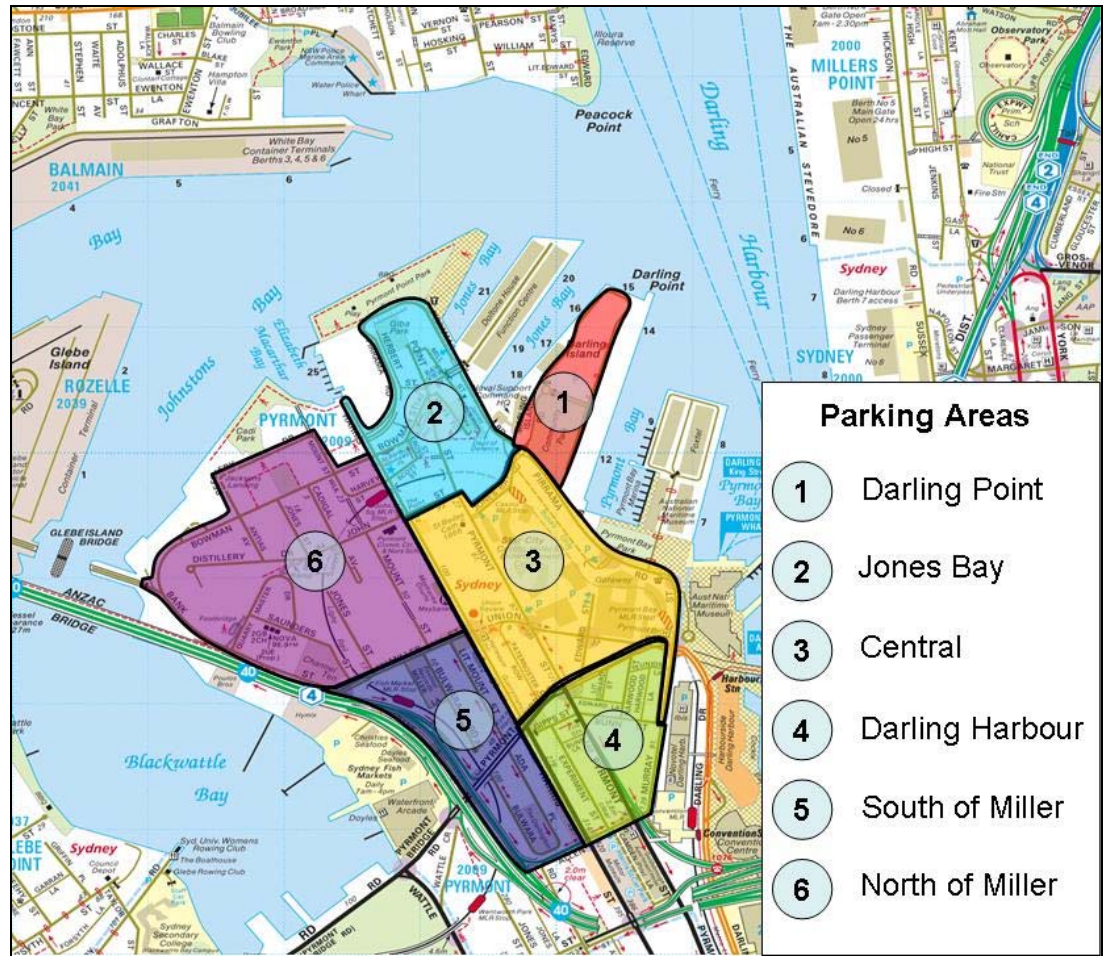
## 4.3 Parking Survey

A parking inventory analysis was undertaken for both on and off street car parks within viable walking distance of the permanent casino site. The aim of this survey was to obtain an overall parking inventory of Star City, streets and other off street car parks serving the Star City Casino complex.

### 4.3.1 On-Street Parking Survey

A survey of all on-street parking within an approximate 500 metre radius of the casino complex was undertaken on Friday 23<sup>rd</sup> and Saturday 24<sup>th</sup> May, 2008. The surveys were conducted between the hours of 9am and 4.30pm on both days. The total number of occupied and available spaces, as well as the parking control that is present, were recorded. A total of 60 street sections, equating to over 1,250 parking spaces, were

surveyed. For simplicity, these street sections were subdivided into six different zones, which are displayed in Figure 12.



**Figure 12 On-Street Parking Areas**

Some results of the on-street parking survey are presented in Table 3.

**Table 3 On-Street Parking Survey Results**

Parking Area	Total Number of Parking Spaces	Percentage of Occupied Spaces	
		Friday 23/05/08	Saturday 24/05/08
Darling Point	79	43%	30%
Jones Bay	183	87%	78%
Central	267	74%	80%
Darling Harbour	166	85%	86%
South of Miller Street	171	85%	77%
North of Miller Street	388	72%	79%

The on-street parking survey demonstrates the wide availability of parking within the vicinity of Star City Casino. The clear majority of these streets are controlled by residential parking schemes of two hours or less. This level of parking occupancy is generally consistent with those recorded during surveys undertaken by Arup in May 2006 on key streets during the Friday and Saturday evening peak periods (5pm - 1am). This suggests that casino parking accounts for only a moderate proportion of overall casino parking demand on these local

streets. The majority of parking is likely related to business during the day and by residential vehicles facilitated by the resident parking schemes.

#### 4.3.2 Off-Street Parking Survey

In conjunction with the previously described on-street survey, an inventory of all the major off-street car parks serving the Star City complex was also undertaken. Conducted on Friday May 23<sup>rd</sup>, a spot count of ten car parks was undertaken to gain an understanding of the parking supply around the Pyrmont/Ultimo/City area. The survey was conducted between 10am and 4pm.

A summary of the available off street parking areas serving the permanent casino site is shown in Table 4.

**Table 4 Off-Street Car Parks in Vicinity of Star City Casino**

Car Park Name	Total Number of Available Bays	Parking Charge
Star City Casino	2500	11am-5pm: Mon-Thurs: \$12, Fri-Sun: \$17 (for 6 hrs) 5pm-11pm: Mon-Thurs: \$17, Fri-Sun: \$22 (for 6 hrs)
Harbourside	1387	0.5-1 hour: \$7, 1-2: \$14, 2-3: \$19, 3-4: \$22, 4-5: \$25
Motor Museum	420	0-.5 hour: \$3, .5-1 hour: \$7, 1-2 hour: \$15, 2-3 hour: \$21, >3 hours: \$26
Sydney Fish Markets	272	0-1 hour: \$2, >1 hour: \$2 + \$5 per every half hour
Exhibition/Convention Centre	750	Daytime: 0-1 hour: \$8, 1-2: \$15, 2-4: \$21, 4-5: \$25, >5: \$27 Night: 0-1 hour: \$7, 1-2: \$13, >2: \$18
Sydney Entertainment Centre	1900	0.5 hour \$3, .5-1: \$7, 1-2: \$14, 2-3: \$21, >3: \$25
Market City	610	Daytime: >4 hours: \$25, Night-time weekday: \$9
383 Kent Street	306	0-1 hour: \$13, 1-2: \$25, 2-3: \$20, >3: \$48
2 Market Street	635	>3 hours: \$49
Cinema Centre	905	0-0.5 hour: \$5, 1-2: \$21, 2-3: \$28, 3-4: \$34, >4 hours: 39

The survey of these major car parks demonstrates the availability of over 9,600 parking spaces within viable walking distance of the casino site. A number of these parking bays are utilised by Star City users during peak casino periods when on-site parking is not available.

#### 4.4 Pedestrian Survey

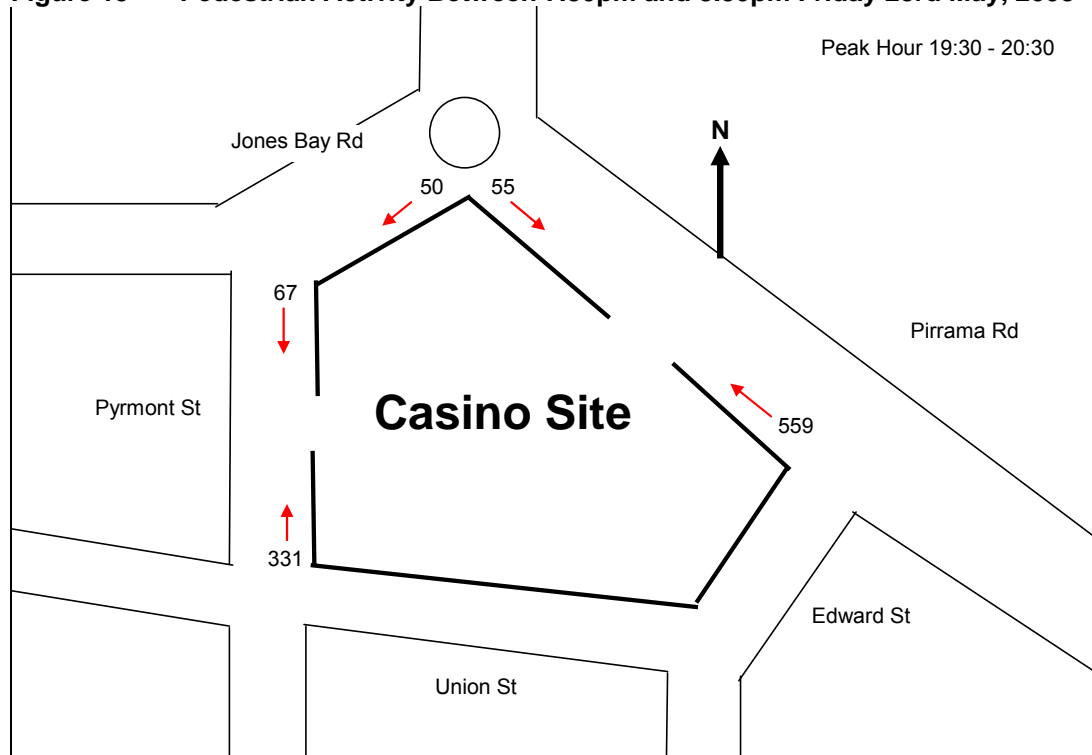
Pedestrian counts were undertaken between 7.30pm and 10pm on Friday 23<sup>rd</sup> May, 2008 around the casino site. The survey was conducted to record the amount of pedestrian traffic

the casino generates on a busy evening. Staff were positioned at locations surrounding the site, and recorded in 15 minute intervals the number of pedestrians walking in the area around the casino. While not every pedestrian recorded was entering the casino site, the survey still provided a useful indication of where the majority of the pedestrian traffic generated by the casino was emerging from.

Some significant results to emerge from the pedestrian study include:

- The large majority of pedestrians enter the casino from the southern side of Pyrmont Street and Pirrama Road. This is displayed graphically for the peak hour between 7.30pm and 8.30pm in Figure 13.
- Over the course of the night, the Pirrama Road entrance steps were used more widely, by a ratio of almost 2:1, compared to the Pyrmont Street entrance
- Few pedestrians visiting the casino complex entered via the residential streets to the north and west of the site
- The peak period of pedestrian activity occurred between 7.30pm and 8.30pm, corresponding to the beginning of the stage show
- Only a very minor number of pedestrians were observed walking along Pirrama Road without entering the casino complex
- Site observations indicated the significant number of patrons entering the casino via Pirrama Road would cross at the traffic signals opposite the car park entrance

**Figure 13 Pedestrian Activity Between 7.30pm and 8.30pm Friday 23rd May, 2008**



## 4.5 Public Transport Patronage

### 4.5.1 Existing Patronage Data

Arup conducted surveys in May 2001 and April 2002 with the objective of estimating the annual volume of staff travelling on the light rail line to the casino. These surveys ran over a 24 hour period, and recorded the number of staff arriving to the site from the casino light rail station. Results of the survey are displayed in Table 5.

**Table 5 Staff Light Rail Usage**

Survey Date	Boarding tram Between Central and Star City	Boarding tram Between Lilyfield and Star City	Arrival by Other Means
Friday 11th May, 2001	633	38	1274
Friday 12th April, 2002	609	65	1139
Tuesday 16th April, 2002	520	76	881

These surveys show that approximately  $\frac{1}{3}$  of all staff take the option of using the light rail to arrive to work at the casino.

Arrival profiles indicate the majority of staff travelling by light rail arrives in the morning between 6.30am and 11.30am. During the evening peak period, the number of staff arriving by light rail relative to those arriving by other modes is much lower compared to the morning peak hours.

#### 4.5.2 May 2008 Survey

An analysis of the level of usage of the public transport options available to casino patrons was undertaken on Thursday 29<sup>th</sup> May, 2008. Surveys were undertaken for both the morning (7.30am – 9am) and afternoon (4.30pm – 6pm) peak periods, as well as prior to the start of a theatre show between 6:30pm and 8pm. The number of people utilising both the STA bus terminal and the light rail station were recorded, with results presented in Table 6 below.

**Table 6 Public Transport Patronage at Star City Casino**

Time Period	STA Buses		Light Rail	
	Embarking	Disembarking	Embarking	Disembarking
AM (07:30 -09:00)	16	0	48	145
PM (16:30 – 18:00)	63	0	146	164
Late (18:30 – 20:00)	36	0	157	256

Observations and results indicate little present usage of the bus services to Star City Casino. Over the entire survey period, not one person was recorded arriving to the casino bus terminal. In future years these bus services should be promoted to Star City staff and visitors as a viable option to encourage more people to utilise this transport option.

In comparison to the STA bus services, the light rail was more popular with casino patrons. The large majority of light rail users were either arriving from, or departing to, the direction of the city. This confirms the results of the staff light rail survey that the majority of people arrive from the eastern direction.

## 5 Future Demand Analysis

### 5.1 Assumptions

#### 5.1.1 Traffic Generation

The forecast future traffic in the vicinity of Star City Casino is to be modelled based on the increase in on-site car parking availability. In the order of 500 spaces are proposed to form a lateral extension of the 2,500 spaces that are presently available in the underground car park, representing an increase of 20% in the total parking availability. The future traffic generation for the key intersections surrounding the site shall be modelled based on this increased figure.

It should be noted that this is a conservative forecast and represents a worst case scenario for traffic generation. It is likely that during the AM and PM peak hours the relative increase in traffic associated with the proposed redevelopment will be less than the above stated figure.

#### 5.1.2 Casino Patronage

The integration of the new entertainment and retail areas at the casino with the new hotel complex at the Switching Station site will induce an increase in casino patronage. This pedestrian activity shall be modelled based on the existing and proposed floor areas of both the new hotel and redeveloped casino. Information relating to the present casino patronage, supplied by Tabcorp, is displayed in Table 7 below.

**Table 7 Average Daily Visitors to Star City Casino**

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Average Daily Visitors	19,419	20,290	20,402	21,334	24,801	31,560	26,996

Source: Tabcorp

In addition to these daily visitors, in the order of 2,000 employees are on site on a given day, with more on the weekends in accordance with the increased visitor demand.

Presently, approximately 103,000m<sup>2</sup> of entertainment, retail and hotel floor space exists within the permanent casino site. Under the plans of the development, as shown in Table 1, there is proposed to be in the order of an additional 30,000m<sup>2</sup> of floor space in both the permanent casino and the new hotel. This represents an increase of 29% in the total floor space of the site.

To directly model the increase in daily patronage based on this increase in floor space would be a conservative estimate, and it is highly probable that the actual rise in patronage will be less than 29%. Much of the additional floor space is intended to provide improved circulation within the existing complex, and would not induce a linear increase in the number of daily visitors. However for modelling purposes, an expected growth of 29% in the daily number of casino patrons was assumed.

### 5.2 Pirrama Road Porte Cochere

Modelling for the proposed porte cochere on Pirrama Road was performed to determine whether this new entrance location would affect external traffic flows. This porte cochere is to develop the image of Pirrama Road as the prominent entrance location for the redeveloped casino site.

### 5.2.1 Assumptions

Some key assumptions in the traffic modelling of the proposed porte cochere on Pirrama Road include:

- The porte cochere is to act solely as a drop off location, with pick ups to occur only at the existing Pymont Street porte cochere
- The right lane will act solely as a passing lane and will not be used for vehicle drop offs
- In the order of 90% of the vehicles and taxis presently using the existing porte cochere as a drop off area would use the Pirrama Road porte cochere in the future
- Vehicles would be arriving at a constant rate over an hour long peak period
- During busy periods, Star City would provide commissionaire staff to effectively manage the arriving vehicles and direct them where to drop off their passengers
- Based on the results pedestrian surveys, the through pedestrian traffic on the Pirrama Road footpath would not result in any delays for vehicles entering or exiting the porte cochere
- For special event occasions, a set of four stretch limousines were modelled to arrive in a four minute window within the peak hour period

### 5.2.2 Methodology

The level of queuing on the proposed Pirrama Road porte cochere is dependent on the volume of traffic, the number of available drop off bays, and the time each vehicle is present in these drop off bays.

Traffic counts conducted by Arup in July 2007 during both Friday and Saturday evening peak traffic periods were used to determine the existing drop off rates on both Pirrama Road and the Pymont Street porte cochere. From these counts, it was established that the 6.30pm to 7.30pm Saturday evening period experienced the greatest number of vehicular drop offs. This time period was selected as the peak period in the simulation model.

The number of future vehicular drop offs at the proposed porte cochere was based on the following factors:

- The number of existing drop offs on Pirrama Road
- The number of existing drop offs at the Pymont Street porte cochere
- The future increase in casino patronage compared to current levels due to the casino redevelopment

A series of factors, which were conservative in nature, translated existing drop offs on Pymont Street to future drop offs on Pirrama Road. From this, the number of expected arrivals in the peak hour could be determined, equating to just over 100 vehicular arrivals.

The time taken (dwell time) for taxis and vehicles to stop, drop off passengers and then depart the parking bay were recorded from present on site observations. A large variation in the dwell times of these vehicles exists depending on the number of people in the vehicle and the payment method in the case of taxis.

### 5.2.3 Micro-Simulation Modelling

A traffic micro-simulation model was developed to assess the traffic operational impact of the porte cochere on the Pirrama Road network. Micro-simulation models simulate individual components of traffic flow and congestion providing outputs in real time 3D visual display. For this study they are able to represent complex interactions of vehicles on a small road network. The software chosen for the purpose of developing a modelling tool was Q-Paramics (version 6.4) which is recognised as a leading micro-simulation modelling software in Australia and internationally.

Drop-off manoeuvres were simulated using fixed route vehicles manually assigned to stops representing bays and given dwell times of 90 seconds with a standard deviation of 30 seconds for taxis and private vehicles, and 120 seconds with a standard deviation of 30 seconds for limousines. Based on on-site observations, these dwell times are probably an over-estimate of what would generally occur.

Vehicles used for the simulation were RTA standard Paramics taxi vehicle types. Four limousines were also simulated with vehicle dimensions: length - 7.5 m; width - 1.86 m; weight - 2.5 tonne.

#### 5.2.4 Results

Results of the Paramics modelling of the Pirrama Road porte cochere shows no significant impact to the road network surrounding the casino. The porte cochere is able to cope easily with the peak level of traffic, with only 3 to 4 bays filled up at any one time. Even with the arrival of four limousines, there is still significant spare capacity. An arrival profile simulation video, showing the arrival of vehicles and limousines in a ten minute period during this peak hour, is attached with this report (marked as Appendix A<sup>3</sup>).

Considering the conservatism of the model, and the fact that vehicular drop offs are considerably reduced outside the 6.30pm - 7.30pm Saturday peak hour, it would be extremely unlikely for there to be any vehicle spill-over onto Pirrama Road due to queuing in the porte cochere.

### 5.3 Traffic Movements

#### 5.3.1 Introduction

In urban areas, the performance of a road network is generally a function of the performance of key intersections. Performance is quantified in terms of Level of Service (LOS), which is an index of the operational performance of traffic at an intersection and is based on the average delay per vehicle. LOS ranges from A – very good to F – highly congested conditions, as shown in Table 8 below.

**Table 8 Level of Service Definitions**

Level of Service (RTA Definition)	Average Delay per Vehicle (seconds)
A	< 14.5
B	14.5 ≤ 28.5
C	28.5 ≤ 42.5
D	42.5 ≤ 56.5
E	56.5 ≤ 70.5
F	≥ 70.5

Another common measure of intersection performance is the degree of saturation (DS), which provides an overall measure of the capability of the intersection to accommodate the traffic levels. A DS of 1 indicates that the intersection is operating at capacity, however the desirable (and practical) degree of saturation is less than 1 as shown in Table 9.

<sup>3</sup> The Paramics simulation has modelled the porte cochere to narrow to a single lane outside the main entry point, as per the drawings issued to Arup in June 2008. Updated designs in September 2008 show the porte cochere to be two lanes the whole way across. This revised geometry will not however affect the results of the Paramics modelling.

**Table 9 Practical Degree of Saturation**

Intersection Type	Practical Degree of Saturation
Signals	0.90
Roundabout	0.85
Priority	0.80

### 5.3.2 Intersection Performance

There are three times of the day that are relevant to considering the impact of the proposed redevelopment. In terms of the busiest times of day on the road system these are the morning and afternoon commuter peak hours. A third busy period is relevant when the casino generates its peak traffic flows at 10.30-11.30pm. This is when patrons departing the various casino facilities will coincide with patrons arriving at the casino after other early evening activities.

From the traffic counts undertaken, as described in Section 4.1, and the forecast predicted increase in traffic to the proposed development, the future traffic impact on key intersections surrounding the site could be analysed. Sidra analysis was undertaken for six key intersections surrounding the casino complex for the AM, PM and late event peaks. Since the AM peak does not in any way correspond with people arriving to the casino, the predicted increase in traffic as a result of the development was not applied during this time period.

These key intersections, as nominated in the Director General's requirements for the project application, are:

- Pyrmont Bridge Road/Pyrmont Street
- Pyrmont Street/Union Street
- Union Street/Edward Street
- Pyrmont Bridge Road/Union Street
- Pyrmont Bridge Road/Murray Street
- Pirrama Road/Edward Street<sup>4</sup>

The results of the traffic modelling on these key intersections are presented in Table 10.

<sup>4</sup> Traffic counts from a previous Arup survey on a Saturday evening in July 2007 were used to model the Pirrama Road/Edward Street intersection.

**Table 10 Sidra Analysis of Future Intersection Performance**

Intersection	AM/PM/Late	Sidra Results		
		DS	Av Del (s)	LOS
Pymont Bridge Road/ Pymont Street	AM	0.758	17	B
	PM	0.808	41	C
	Late	0.507	34	C
Pymont Street/ Union Street	AM	0.159	9	A
	PM	0.277	13	A
	Late	0.269	15	B
Union Street/ Edward Street	AM	0.127	15	B
	PM	0.195	16	B
	Late	0.193	14	B
Pymont Bridge Road/ Union Street	AM	0.144	5	N/A
	PM	0.361	4	N/A
	Late	0.170	2	N/A
Pymont Bridge Road/ Murray Street	AM	1.000	40	C
	PM	1.000	40	C
	Late	0.926	49	D
Pirrama Road/ Edward Street	AM	N/A	N/A	N/A
	PM	0.672	11	A
	Late	0.468	12	A

DS – Degree of Saturation, Av Del – Average vehicle delay in seconds, LOS – overall intersection level of service

### 5.3.3 Analysis

Sidra analysis on the road network demonstrate that five of the six key intersections are below saturation level after accounting for the increase in casino traffic following the proposed development. Three of these intersections have significant spare capacity, with a level of service of B or greater, coupled with a low average vehicle delay.

The Pymont Bridge Road/Murray Street intersection is predicted to be at capacity in all three critical time periods following the casino upgrade. A Sidra analysis was conducted for the present situation, which also showed the intersection is currently operating at capacity.

As stated previously, it is highly unlikely that there will be a 20% increase in vehicular traffic during the peak hourly periods. Most of the additional traffic generated by the casino will be entertainment and hotel patrons. Tabcorp advises that the majority of hotel users would generally arrive between 12pm and 4pm, and approximately half of all casino patrons arrive after 7.45pm. A significant proportion of the traffic associated with the casino during the PM peak period is related to people attending stage shows at the Lyric Theatre and Star Theatre. With no additional theatre style entertainment facilities proposed as part of the upgrade, most of this additional generated traffic would arrive further into the night.

Additionally, following consultations with the RTA, it is foreshadowed that there will be a net loss of parking bays in the Darling Harbour area over the coming years. This would lead to a reduced rate of traffic generation on the road network. Further, the rate of car bays per employee or resident would decline, as new floor space with lower rates of car parking is developed in the future.

Although the Pyrmont Bridge Road/Murray Street intersection is currently operating at a high degree of saturation, observations indicate that all vehicles typically proceed through the intersection in a single signal cycle. With the increased vehicular traffic in future years not expected to be significant during peak hours, this intersection will likely continue to operate at largely existing levels following the casino upgrade.

#### 5.4 Pedestrian Movements

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Future pedestrian flow patterns are expected to be similar to those observed during the pedestrian counts as described in Section 4.4. With the proposed redevelopment of the Pirrama Road entrance, there may be a slight rise in the number of pedestrians utilising this entrance who previously used the Pyrmont Street entrance.

Three additional vehicular driveway crossing points, on the footpath of Pirrama Road and Pyrmont Street, are planned as a result of the proposed development. Studies have shown that there are presently only a minimal number of pedestrian movements across these crossing points. Despite this, measures must be implemented at these points to ensure pedestrian safety. These measures are discussed in Section 6.3 of this report.

#### 5.5 Parking Demand

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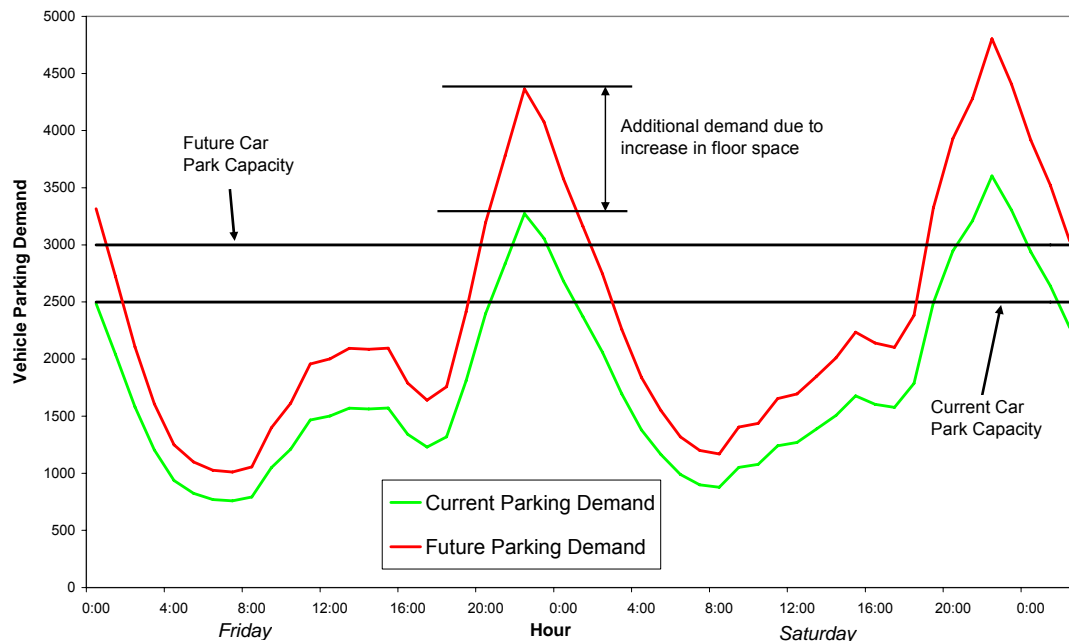
Approximately 500 additional underground parking bays are sought to provide parking solely for the additional casino and hotel patrons associated with the development. This represents a 20% increase in the total number of on-site parking spaces available for casino and hotel users only. This level of parking increase was approved under the DA for the Switching Station site in 1997. The layout and design of these additional parking spaces are in accordance with Australian Standards for off street car parking (AS 2890.1).

The extended car park floor plates and location at the south end beyond the existing car park will encourage the new car parking bays under the new hotel to be used mainly by dedicated parkers that obtain some advantage from the location: hotel patrons to the hotel above, regular casino members, and valet parking operations.

The demand for parking associated with Star City Casino is presently greatest on Friday and Saturday evenings during peak event periods. During these times, in the order of 2,000 to 2,500 spaces are occupied in the underground casino car park. The car park generally fills up between 7.30 and 8pm, with vacant bays only becoming available after midnight. Data and daily patronage modelling from previous Arup studies suggests that the total parking demand for the casino car park is as high as 3,600 spaces on Saturday evenings. This was based both on a 24 hour arrival and departure profile for casino patrons, and existing car park entry/exit data.

The additional demand for parking during these peak periods is managed through the external supply of parking in the Darling Harbour precinct. Outside of these evening peaks, demand is considerably lower, and thus casino parking is largely contained on site.

As described in Section 5.1.2, due to the casino upgrade, a significant growth in the total number of daily visitors to the casino is expected. With this increased patronage, there will be an associated rise in demand for the amount of parking on site. The forecast present and future parking demand generated by the casino on Friday and Saturdays is illustrated in Figure 14.



**Figure 14 Present and Future Projected Vehicle Parking Demand**

The increase in floor space associated with the redevelopment of the casino has induced a linear increase in the present demand for on-site parking. This is indicated in the graph by the difference between the red and green lines.

The proposed additional parking bays will largely retain the balance of overflow parking in the Darling Harbour precinct compared to the level of on-site parking. These bays will satisfy in the order of two thirds of the additional on-site parking demand generated by the new hotel and expanded casino complex. This level of parking maintains a supply-constrained parking provision that encourages public transport use, while also minimising the impact on local residents and businesses.

Additional parking bays also need to be provided to accommodate the new staff associated with the hotel and casino expansion. The Liquor, Hospitality & Miscellaneous Union (LHMU), which represents a large proportion of staff at Star City, have received a number of representations from staff in recent years regarding the safety of walking between Harbourside Car Park and Star City. Star City are keen to ensure that staff are provided with safe parking options, and the additional parking bays proposed will go some way to achieving this.

In future years, there is the possibility that the availability of off street parking in the Darling Harbour area will diminish. It is anticipated there may be a loss of parking bays in both the Entertainment Centre and Exhibition Centre car parks, reducing the overall level of parking supply. These car parks are used by Star City patrons during peak periods, and thus providing additional on-site parking may be necessary to compensate for this possible reduction of parking bays in the Darling Harbour precinct.

On street parking availability in the vicinity of the casino is currently well utilised. Failure to provide additional underground parking to accommodate the additional casino patrons may cause more of these people to park in these residential areas.

In future years following the completion of the casino upgrade it is advised that the parking situation both at Star City and the surrounding car parks is constantly monitored and reviewed. This specifically would apply to availability, usage and pricing controls.

## 6 Recommended Works and Measures

### 6.1 Traffic Management Measures

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#### 6.1.1 Key Intersections

Sidra analysis conducted on six key intersections surrounding the permanent casino site demonstrated that five of these intersections will operate at below saturation level during all critical daily time periods following the casino upgrade.

The Murray Street/Pymont Bridge Road is currently operating at a high degree of saturation during all three daily peak periods. This situation will likely remain unchanged in the future following the casino upgrade.

City of Sydney Council has discussed the possibility of banning the right turn movement from Pymont Bridge Road into Murray Street. This may ease aspects of congestion at this intersection, however may induce traffic issues at other surrounding intersections. Further, with the Harbourside car park and Novotel Darling Harbour located on Murray Street, this an important turning movement, and many people trying to access these sites will be affected if a right turn ban was imposed. Star City encourages its staff and patrons to utilise Harbourside Car Park during peak periods when the casino car park fills up, and is opposed to this possible right turn ban.

Although Murray Street/Pymont Bridge Road intersection is currently operating at a high degree of saturation, all vehicles typically proceed through the intersection in a single signal cycle. The most suitable action here would be to leave the intersection as existing, and review and monitor its performance following the casino expansion.

#### 6.1.2 Roads and Access Paths

A minor number of alterations to the existing road network and other access paths to the casino are proposed. These are:

- Placing double solid lines on Pirrama Road between Edward Street and Jones Bay Road to discourage right turns in and out of the new porte cochere
- Appropriate signage and line-marking at the entrance to the extended hotel porte cochere to direct vehicles in the right direction
- Implementing traffic management measures such as traffic controllers when articulated vehicles are entering the loading dock on Edward Street
- Given the 3.8m headroom of the new loading dock, measures are recommended so that vehicles above this height are prevented from entering the loading area. This would include appropriate signage and an overhanging barrier at the entrance ramp, 3.8m above the ground

#### 6.1.3 Parking

The present on-street residential parking restrictions that exist around the Pymont/Ultimo area should remain in place following the proposed upgrade. City of Sydney Council are enforcing on-street car parking and it is critical to the ongoing management of car parking that this enforcement continue at a reasonable level to ensure patrons are educated to using off-street car parks.

### 6.2 Sustainable Transport Measures

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#### 6.2.1 Improved Services

The planned through site pedestrian link connecting Pymont Bay Park with the Pymont Street entrance will activate the eastern side of the casino site, directing people to the main entrance of the casino on Pirrama Road. The bus and light rail terminal is located directly under this entrance, and hence visitors would be more aware of its presence.

The planned north-west metro link, running from Rouse Hill to St James Station in the CBD, will act as a further public transport option for casino users in future years. The metro station at Pyrmont would likely be within close walking distance of the site, with passengers having the ability to interchange with the light rail line. Travel time from Pyrmont Station to Martin Place is scheduled to take just three minutes, with services running frequently. The metro line is planned for completion in 2017.

The activation of the Pirrama Road entrance should increase the number of patrons arriving to the site via ferry in future years. This will be further enhanced following the possible development of ferry terminals as part of the Barangaroo project. Given the short walk from the wharf to the casino, this ferry route could be popular with tourists, as well as the 16,000 expected daily workers at Barangaroo.

#### 6.2.2 Star City Policies

With the numerous transport options available to casino users to access the complex, Star City could consider establishing a green transportation plan. A green transport plan is a package of measures introduced to promote the use of public transport, walking and cycling by patrons and employees for travel to and from work and also for business related trips.

As part of the green transport plan, Star City could consider developing a more integrated approach to mobility management. Rather than a number of people in different departments managing a variety of transport issues, as is currently the case, the roles of these staff members could be adjusted so that a more centralised approach is taken to mobility arrangements. This would assist in developing and promoting sustainable transport methods to all site users, encouraging them to leave their cars at home and take alternate modes of transport. This adjustment would improve accountability and would demonstrate Star City's commitment to sustainability.

Improved and enhanced facilities for cyclists should be provided for Star City staff to cycle to work. This involves increasing the amount of secure underground parking racks, providing showers and changing facilities, and also lockers for cyclists to store their riding apparel. In consultation with Council, some public bicycle parking rails could also be provided by Star City to encourage visitors to the cycle to the casino.

### 6.3 Pedestrian Facilities

The proposed development has some implications for pedestrian access to and from Star City. Some improvements to pedestrian facilities may include:

- Improved lighting at both pedestrian entry points (Pyrmont Street and Pirrama Road) could be provided to create a more suitable pedestrian environment. This would also include upgrading the lighting arrangement at the roundabout on Jones Bay Road and Pirrama Road to improve pedestrian safety.
- As discussed in Section 3.2.2, the preferred option for the new porte cochere is to have a driveway style entrance which is fully integrated with the adjoining continuous footpath. This approach would encourage porte cochere traffic to give way to pedestrians crossing over the driveway points.
- City of Sydney Council's proposed program of widening the footpath on Union Street at Pyrmont Bridge Road will improve pedestrian access to Star City.
- The pedestrian access points at the Pirrama Road entrance must be clear and accessible to patrons. This is to discourage them from crossing the porte cochere entry and exit points. The entrance walkways must be clear and unobstructed, so there is little to no congestion along these corridors.

- The majority of pedestrians already enter the casino via signalised crossings already present at the intersection of Pirrama Road and Edward Street. Very few people cross Pirrama Road illegally opposite the site entrance. This will be reinforced by recommending that double lines be placed on Pirrama Road to discourage both vehicular right turns in and out of the porte cochere, and also illegal pedestrian movements across Pirrama Road.
- The through site pedestrian link will improve pedestrian access through the casino complex, and discourage the large majority of pedestrians from crossing the porte cochere exit points on Pyrmont Street.
- The planned improvements to the cycling network around Pyrmont as part of the City of Sydney Cycle Strategy will improve ease of access for cyclists travelling in the vicinity of the casino complex.

## 7 Conclusions

The approximate 500 car parking bays proposed will be integrated into the existing car park, with no additional vehicular car park access points. These additional bays will maintain the present balance of on and off site parking in the Darling Harbour area. The access controls will be adequate to manage the traffic with no additional queuing back onto the public road network.

The proposed new driveway and porte cohere to Pirrama Road is designed to give priority to pedestrian flow, and will attract a portion of existing vehicular drop off movements, mainly taxis drop-off, and also special event drop-off. Taxi pick-up and ranking arrangements, car parking, valet parking and coach arrangements will remain effectively as existing via the Pyrmont Street porte cochere, which will also serve as the porte cohere to the new hotel.

The analysis of external traffic impacts has demonstrated acceptable impacts in the adjacent road intersections, including modelling of the six key intersections nominated by the Director General's requirements. The majority of road traffic generated by the casino is contained in the Darling Harbour precinct, and not in the residential areas of Pyrmont.

Measures to mitigate the impacts as a result of the upgrade include:

- Improved lighting of the Pirrama Road/Jones Bay Roundabout to maximise pedestrian safety (a zebra crossing is not suitable here)
- Continuous footpath treatment along Pirrama Road with driveway style crossovers encouraging porte cohere traffic to give way to pedestrians
- Commissionaire staff to manage the operation of the porte cohere at all busy times
- Support for Council footpath upgrading program of Union Street
- Placing double lines on Pirrama Road to discourage right turn movements in and out of the porte cochere
- Reviewing and monitoring the performance of the Murray Street/Pyrmont Bridge Road intersection following the completion of the project

The existing public transport, coach and light rail system will be retained and enhanced by:

- The coach and light rail area has been improved by more direct and safer pedestrian links. Overall lighting, signage, and attractiveness of this area will be improved.
- The new Casino entry treatment to Pirrama Road will attract activity and focus to this eastern side of the site. Trams and buses will be right next to and under the "front door" of Star City.
- A Green Transport Plan to encourage sustainable transport behaviours and choices from Star City staff and visitors
- Pedestrian paths to and through the site are improved
- Bike parking will be increased and improved, integrated with regional bike route improvements around the Pyrmont and CBD area
- The bus, light rail and possibly proposed Metro station at Pyrmont integrated into the design circulation
- Improved and activated access to Pirrama Road will encourage use of ferry services

The car park circulation is in accordance with Australian Standards, Council and RTA codes, and will be a logical extension of the existing car park levels and circulation paths.

Existing services and delivery arrangements are enhanced, with full off-street dock for the new hotel and improved dock for the Lyric Theatre. Ease of emergency vehicle access will be maintained at existing high levels.

Appendix A

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**Paramics Modelling  
Simulation**

Some visual screenshots of the Paramics simulation model for the Pirrama Road porte cochere are displayed below. The simulation demonstrates that the porte cochere is able to easily cope with the expected volumes of traffic during a busy Friday or Saturday evening peak period. The scenario of a major awards night, where a number of high profile celebrities would arrive in limousines, was also modelled. During these periods, where Star City staff would be managing the porte cochere area, there would still be sufficient capacity for other private vehicles. The screenshots below display the porte cochere vehicles parking to drop off passengers on the left hand kerb, with the right lane used solely for passing traffic.

This Paramics simulation is contained on a CD which was submitted along with this traffic and transport report. Additional copies (either soft or hardcopy) can be obtained by contacting Arup directly.

