BETTER TRANSPORT FUTURES
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3 Murray Rose Avenue, Sydney Olympic Park

Lend Lease Project Management and Construction (Australia)

Traffic Impact Assessment

September 2012

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1 Introduction

Background

Better Transport Futures has been commissioned by Lend Lease to prepare a Traffic and Transport Access Report for the proposed commercial development at No., 3 Murray Rose Avenue, Sydney Olympic Park, NSW. The site is within the Parkview Precinct, within Sydney Olympic Park at Homebush, NSW. The work is required to support a Part 3A project application to the Department of Planning for the proposed development of 3 Murray Rose Avenue.

Better Transport Futures has previously undertaken a Traffic and Transport Accessibility Report to support the Development Application of No5 Murray Rose Avenue which is located immediately to the west of 3 Murray Rose Avenue.

Scope of Report

The scope of this report is to review the traffic, transport access and parking implications for the proposed development. The site is part of the overall Sydney Olympic Park area which is being developed in accordance with the overall SOP 2030 Master Plan.

The SOP 2030 Master Plan separates Sydney Olympic Park into 9 precincts. The developments on Murray Rose Avenue form part of the Parkview Precinct. The Parkview Precinct is characterised as mixed use containing commercial, residential and community components.

The Murray Rose developments which consist of 3 commercial and 2 residential buildings were identified in the Master Plan and have been taken into consideration in all the planning and design for Sydney Olympic Park and the floor area and traffic generation have been included in the overall calculations of the Master Plan.

This assessment has taken into account the findings and recommendations made in the SOP Master Plan 2030 Transport Strategy, undertaken in August 2008 by Parsons Brinckerhoff Australia Pty Ltd. That strategy has set the parameters for the future transport development in the Olympic Park, the proposals for 3 Murray Rose Avenue have fully adopted the transport demand management initiatives recommended by the strategy and these have formed the basis of this review.

The Parkview precinct is located on an existing cul-de-sac which ultimately will be reconstructed as a through link in the overall road network of the area. This report has included a review of the staging of the redevelopment to ensure the road construction and building construction is compatible in terms of transport access.

The report also provides advice on access issues, internal site layout and issues relating to service vehicles. Site plans are shown in Appendix A.

Issues and Objectives of the study

The issues relevant to the proposal are:

- The impact on the arterial and local road network due to the additional traffic flows;
- The access arrangements for the development;
- Review the internal site layout and the car park access arrangements,
- Review the service arrangement for the development;
- Review the public transport, walking and cycling facilities;
- Assess any other transport impacts associated with the development; and
- Review the special event impacts and construction impacts of the development.

The objective of the report is to document the impacts of the proposed development and provide advice on any infrastructure work required as part of the development.

Planning Context

In preparing this document, the following guides and publications were used:

- Austroads Guide to Traffic Management (2009);
- RTA Guide to Traffic Generating Developments, Version 2.2 Dated October 2002;
- SOP Master Plan 2030 Transport Strategy, August 2008, prepared by Parsons Brinckerhoff Australia Pty Ltd
- SOPA's Major Event Impact Assessment Guide
- Australian / New Zealand Standard – Parking Facilities Part 1 : off-street car parking (AS2890.1:2004);
- Metropolitan Transport Plan – Connecting the City of Cities (2010);
- Planning Guidelines for Walking and Cycling (2004) NSW Department of Infrastructure, Planning and Natural Resources; and
- Integrated Land Use and Transport (2001), NSW Department of Urban Affairs and Planning.

Report Structure

This report has been structured to address the Director General's Requirement's and provide a comprehensive Traffic and Transport Access Report for the development of 3 Murray Rose Avenue as follows:

- **Section 3** outlines the Sydney Olympic Park Master Plan 2030 Transport Strategy, August 2008 and how this development is an integral part of the development scenarios adopted and brief comments on other related documents;
- **Section 4** describes the existing road network and its operating characteristics;
- **Section 5** describes the details of the proposed development;
- **Section 6** describes the public transport, walking and cycling aspects of the proposals;
- **Section 7** analyses the impact of the development on the surrounding road network;
- **Section 8** details the arrangements during construction and major events; and
- **Section 9** summarises the key findings and recommendations of the study,

Authority Requirements

■ *Table 1-1 DGR Response*

Comment	Report Inclusion
Provide a Transport and Accessibility Study prepared with reference to the Metropolitan Transport Plan – Connecting City of Cities, NSW Planning Guidelines for Walking and Cycling, the Integrated Land Use and Transport Policy Package and the RTA Guide to Traffic Generating Developments.	Section 2.2
Demonstrate how users of the development will be able to make choices that support the relevant State Plan Targets.	Section 5
Detail existing pedestrian and cycling movements in the vicinity of the site and determine the adequacy of the proposal to meet the likely future demand for increase public transport and pedestrian and cycle access.	Section 5
Identify potential traffic impacts during the construction phase of the project and measures to mitigate these impacts.	Section 7.1
Determine the measures to be implemented to promote sustainable means of transport including public transport usage and pedestrian and cycling linkages in addition to addressing the potential for implementing a local specific sustainable travel plan	Section 4.3 and Section 5
Daily and peak travel movements likely to be generated by the proposed development, including impact on the nearby intersections and the need/associated funding for upgrading road improvement works (if required). The Traffic assessment should consider base models with future traffic generated by the proposal.	Section 6
Details of proposed access, parking provisions and service vehicle movements associated with the proposed development.	Section 4.3
Minimal levels of on-site car parking for the proposed development having regards to the high public transport accessibility of the site, opportunities for car sharing, local planning controls	Section 4.3

Comment	Report Inclusion
and RTA guidelines (note: The Department supports reduced parking provisions if adequate public transport is available to access the site).	
Management of traffic, access and parking during special events, with particular regard given to the operation of the site during road closures for these events.	Section 7
Accessible parking to be provided at 3% of the total off street parking spaces in accordance with SOPA Access Guidelines.	Section 4.3

Source: Department of Planning and Infrastructure

2 Sydney Olympic Park Master Plan 2030 Context

2.1 Sydney Olympic Park Master Plan 2030

This development is one of the remaining development sites in the Olympic Park area. It is being developed in accordance with the principles of the Master Plan 2030 and its associated Transport Strategy, undertaken by Parsons Brinckerhoff in August 2008, as a landmark sustainable development.

Figure 2-1 below shows the broader Olympic Park area.

Source: Sydney Olympic Park Authority 2008

Figure 2-1 Current Road Layout

A number of Regional and State Policies and Strategies were accounted for as part of the development of the Master Plan 2030 and its Transport Strategy. Specifically:

- Sydney Metropolitan Strategy; which plans the development of the Metropolitan area for the next 25 years;
- Draft West Central Subregional Strategy (2007); and
- Urban Transport Plan.

Reference to the Transport Strategy document shows the ways in which these State policies have been taken into consideration for the whole of Sydney Olympic Park. Consequently, the Parkview Precinct has been developed and progressed within a Master Plan and Transport Strategy that clearly acknowledges and supports those State policies. In particular, the Transport Strategy sets the framework for travel demand initiatives being adopted and planned for the overall park. All development within the Park is expected to support these initiatives and actively pursue achieving the goals and travel targets set out in the Strategy.

The objectives adopted for the Transport Strategy as part of the overall SOP 2030 Master Plan clearly show the transport framework within which the Park has been developed and which the Parkview Precinct has adopted. Fundamentally the objective is to increase the mode split of non-car journey to work trips from the current 15% to 25% initially then to 40% ultimately. The Precinct has been planned to support all the travel demand management initiatives of the Transport Strategy to achieve this, ranging from restricting parking to the provision of bicycle lockers and pedestrian walkways. These initiatives have been fundamental in the planning of the precinct.

Section 2.3 of the Transport Strategy states the Transport Objectives.

"The transport objectives for this strategy that have influenced Master Plan 2030 include:

- *Targeting an initial journey to work non-car mode share split of 25% in line with other specialised activity centres in the metropolitan area*
- *Adopting a stretch target journey to work non-car mode share of 40% with the introduction of a major public transport initiative such as metro rail in conjunction with increasing the level of commercial development*
- *Monitoring and if necessary, adjusting the quantity of high traffic generating land uses to match road and public transport capacities*
- *Strategically locating commercial and retail land uses around Olympic Park Station and close to local bus service corridors*
- *Maintaining sufficient road capacity to support all levels of events, particularly during weekday commuter peak periods*
- *Improving road connections to surrounding areas such as Newington and Wentworth Point (Homebush Bay West)*
- *Limiting the provision of parking spaces for new developments to encourage public transport use*
- *Continuing the operation of high quality public transport services to sustain existing high public transport mode shares*
- *Maintaining regular public transport services, road access and parking supply sufficiently during major events*
- *Designing a street network that supports bicycles, vehicles and pedestrian use*
- *Building more efficient metropolitan and inter-city rail and bus connections*
- *Integrating transport service planning with adjacent suburbs, specially to reduce the reliance on private vehicle use for trips under 5km*
- *Spreading the commuter peak hours and promoting public and shared private commuter transport as alternatives to private motor cars*
- *Meeting accessibility needs across the entire local transport and street network*
- *Provide for new streets within development sites to facilitate vehicle access."*

The Transport Strategy undertook surveys and research into the existing journey to work characteristics of Sydney Olympic Park (SOP). This indicated approximately 15% of the SOP workforce and students use public transport every day. This compares to 80% in Sydney CBD and 35-50% at other sub-regional centres such as Parramatta and Chatswood and 20% for Rhodes. The Transport Strategy has been developed with the long term goals of 25% non-car based trips rising to 40% as public transport facilities and services are improved. The Strategy states "*Attainment of higher mode share will require major public transport investment and successful travel demand management measures.*"

The surveys undertaken included comments on the existing public transport network at Sydney Olympic Park as shown below. These comments identified a number of deficiencies in the public transport

timetables, routes, and reliability. These have formed a basis for the ongoing improvement of services to the Olympic Park area.

The 3 Murray Rose Avenue development has been developed within the framework of the Sydney Olympic Park 2030 Master Plan Transport Strategy and will provide support for the incentives and initiatives planned to encourage the use of alternative modes of transport and reduce the reliance on the private car for the journey to work.

The development has adopted the following initiatives:

- Parking at 1 bay per 55m$^{2.}$ GFA for staff;
- No on-site parking provided for visitors; in accordance with the rest of the Precinct , no dedicated visitors off street parking has been provided other than on street;
- 88 bicycle racks, showers, lockers and other facilities have been provided in a very prominent position on the ground floor for staff, plus a further 16 bicycle parking bays for visitors;
- The building is located alongside the Bicentennial Park cycle and walking track;
- The building is located within easy walking distance of the Olympic Park Station, and bus stops; and
- A travel plan will be prepared by each leasee of the building, and these will be reviewed each year during the Royal Easter Show when the closest parking to the building (Car Park 6f) will not be available for 6 weeks.

The intersections of Homebush Bay Drive/Australia Ave, and Sarah Durack Avenue /Australia Drive have been modelled in the SOP Transport Strategy based on the longer term development in the area including the 3 Murray Rose Avenue site. Both intersections were identified as requiring upgrades in the future as development continues.

2.2 Other Planning Documents

A number of other documents have undertaken an assessment of the traffic and transport requirements of Sydney. These documents include an assessment of the transport infrastructure requirements of Sydney Olympic Park.

Metropolitan Transport Plan for Sydney 2036 (2010) – Issued by the NSW Government

The Metropolitan Plan for Sydney 2036 supersedes the Metropolitan Plan for Sydney 2031, which was issued in 2005. The Metropolitan Plan integrates land use funded transport planning and seeks to provide a framework for sustainable growth in Sydney. It provides increased targets for public transport usage in the Sydney CBD and regional centres such as Sydney Olympic Park.

The plan indicates that Sydney will require an additional 760,000 jobs by 2036 and aims for half of these jobs to be based in Western Sydney. Further that Sydney Olympic Park has the potential to take on a role of a major urban centre with a mixture of residential, retail and commercial components. The Plan indicates that the number of employees in Sydney Olympic Park will increase from 4,000 (based on 2006 data) to 23,000 in2036.

The development of the commercial and residential buildings on Murray Rose Avenue is consistent with this vision.

Key features of the proposed additional public transport facilities with regards to Sydney Olympic Park are as follows:

- A bus corridor between Hurstville and Macquarie Park via Sydney Olympic Park;
- A Liverpool to Sydney Olympic Park bus corridor; and
- A Parramatta to Burwood via Sydney Olympic Park.

Planning Guidelines for Walking and Cycling (2004) – Issued by the NSW Government

The Planning Guidelines for Walking and Cycling identifies that the number of people cycling to work in Sydney has increased 18% between 1981 and 2001. This is expected to increase as new buildings such as 3 Murray Rose Avenue provide significant cycle parking and other end of trip facilities such as lockers and showers.

The Planning Guidelines for Walking and Cycling have been developed to provide criteria for improving opportunities for walking and cycling in urban centres. Key recommendations of the guidelines include:

- Providing a mix of residential, retail and commercial land uses within accessible centres to increase opportunities for people to live close to working and shopping localities making them more accessible to walking and cycling;
- Providing local and regional walking and cycling networks;
- Provide a grid street network to make walking and cycling trips short and direct;
- Providing a safe, secure and attractive street environment; and
- Providing end of trip facilities such as bicycle parking, showers and lockers.

Each of these points is considered applicable to 3 Murray Rose Avenue and its environs.

The Integrated Land Use and Transport Policy Package (2001) – Issued by the Department of Urban Affairs and Planning

The Integrated Land Use Transport Policy Package is designed to provide a framework for state and local government agencies to integrate land use and transport planning at regional and local levels. Some of the principles identified in the policy package include:

- Develop concentrated centres of housing, employment and public facilities within 400m – 800m of public transport nodes.
- Encourage a mix of housing, employment, services and other compatible uses in accessible centres.
- Provide walkable environments for pedestrians and people with disabilities.
- Maximise cyclists' accessibility to centres, services, facilities and employment locations.
- Concentrate high density, mixed use, accessible centres along public transport corridors within urban areas.

Again each of these points is considered applicable to the 3 Murray Rose Avenue location and its environs.

3 Existing Situation

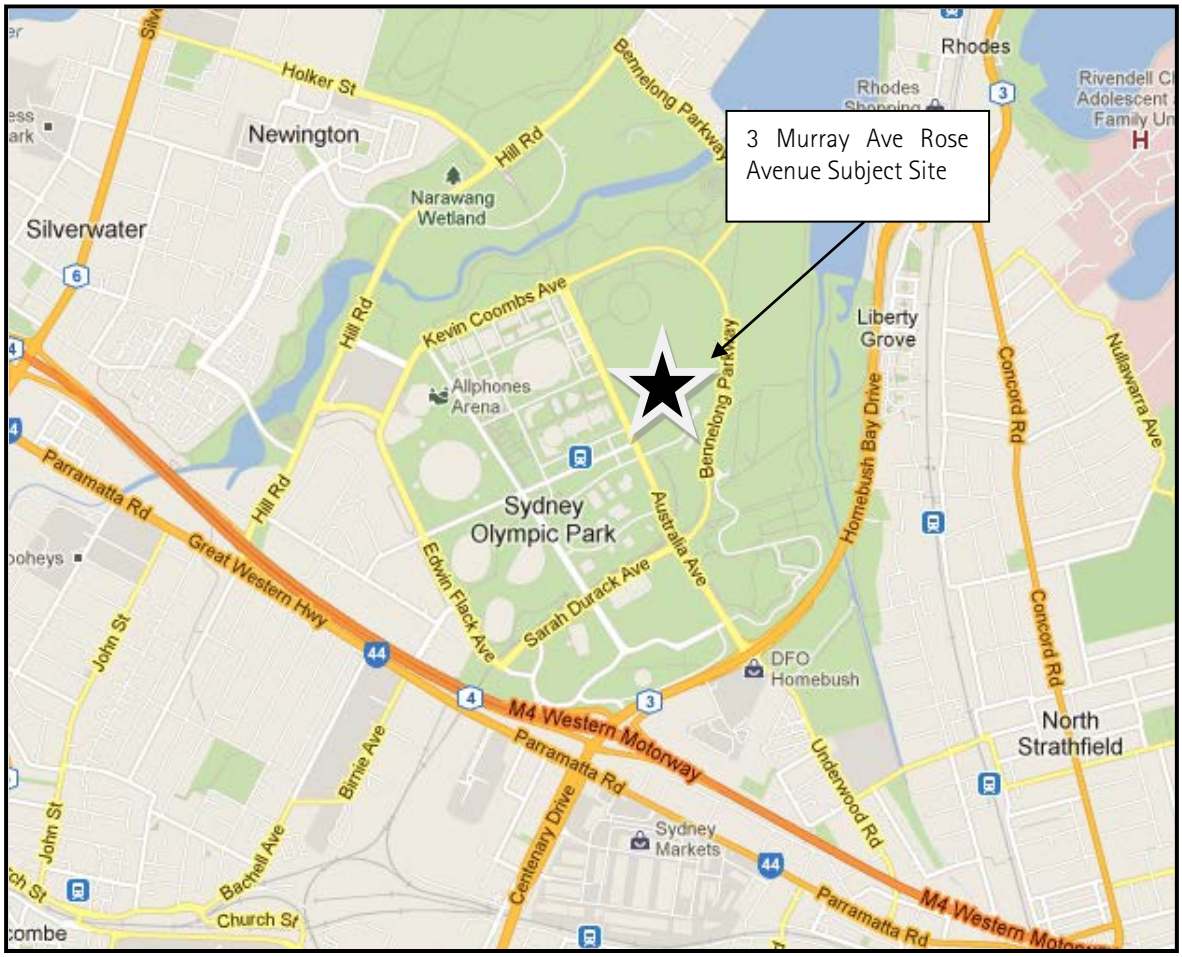
3.1 Site Description and Proposed Activity

The SOPA Master Plan for Murray Rose Avenue, Sydney Olympic Park project includes approximately 37,800m^2 GFA of commercial floor space located in three buildings and 18,500m^2 of residential development. SOP consists of nine precincts with the subject site located within the Parkview Precinct

The construction of 3 Murray Rose Avenue, together with the extension of Murray Rose Avenue through to Bennelong Road are the key components of the current stage of the Parkview Precinct Master Plan.

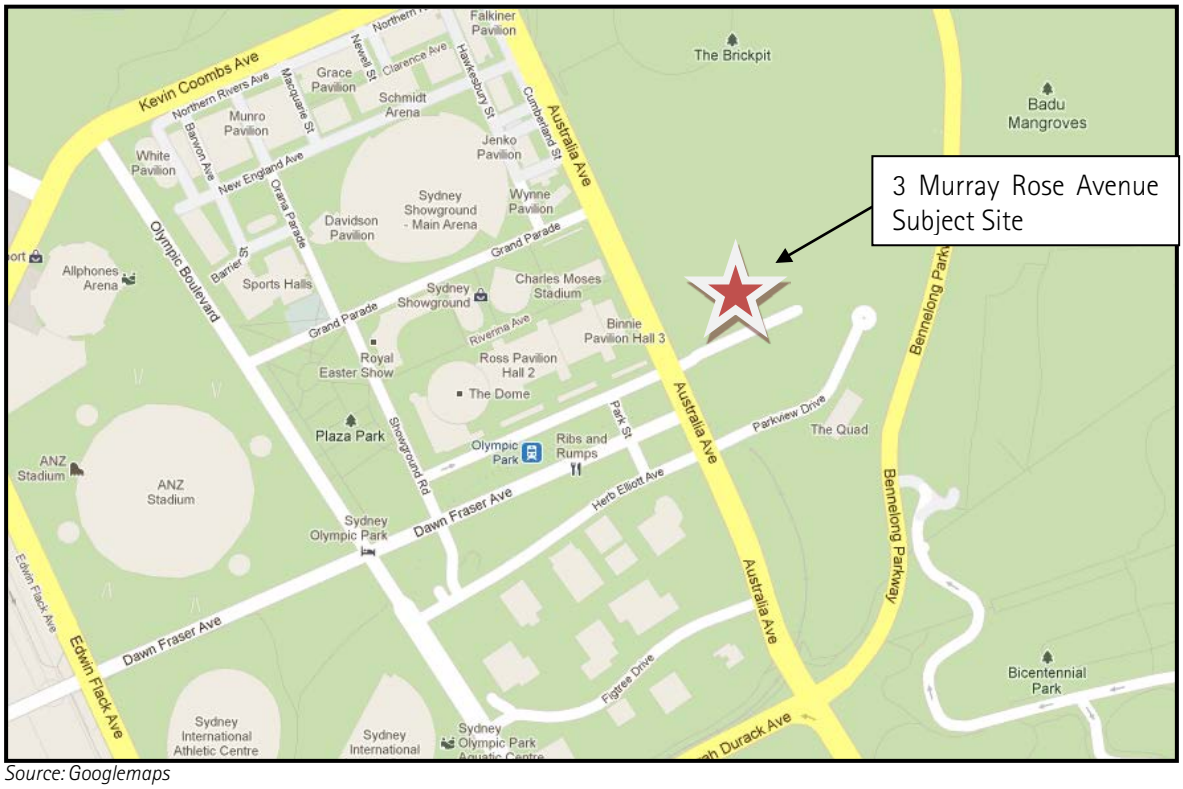
The site is a key development node of the Sydney Olympic Park Master Plan 2030. Access is currently available via Murray Rose Avenue and a link from the cul-de-sac head of Parkview Drive.

The broader location of the site is shown below in Figure 3-1 and a closer perspective displayed in Figure 3-2.



Source: Googlemaps

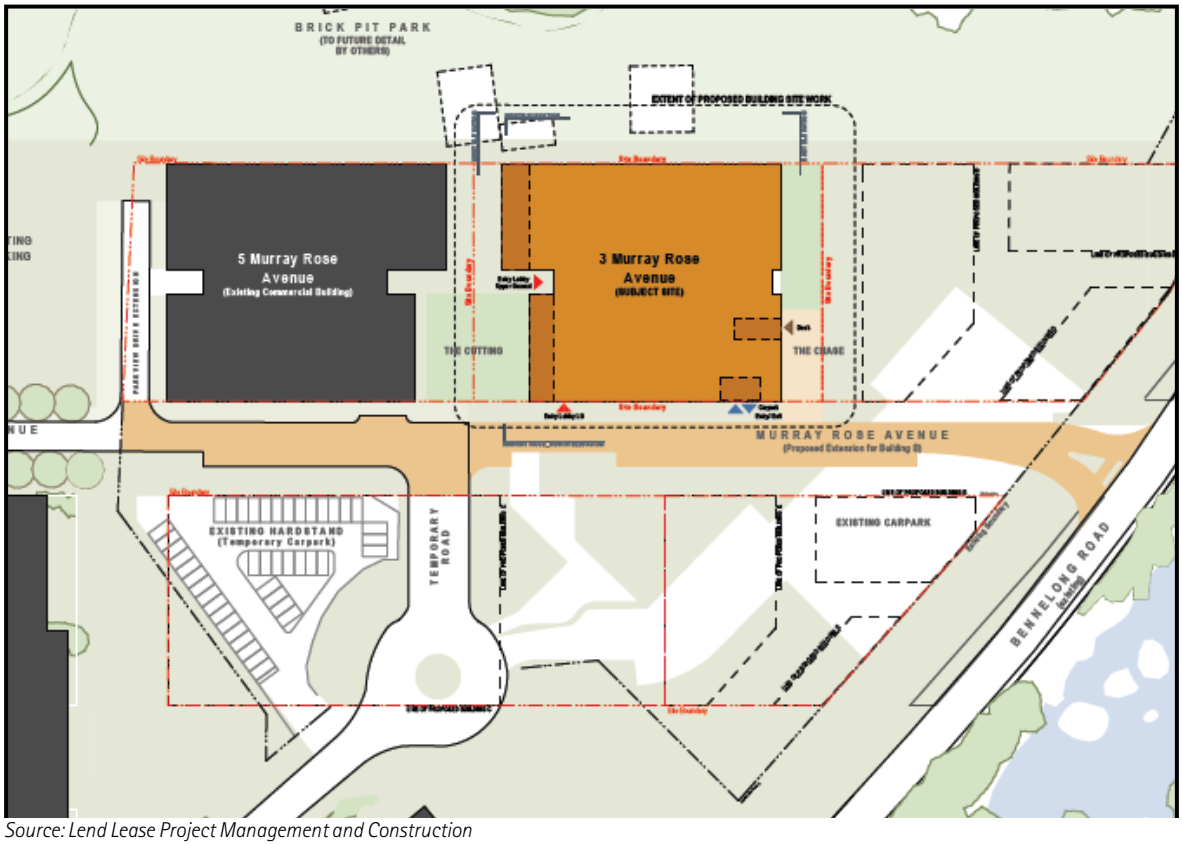
Figure 3-1 Broader Homebush Area.



Source: Googlemaps

Figure 3-2 Site Location

The layout of the proposed 3 Murray Rose Avenue development is displayed below in Figure 3-3.



Source: Lend Lease Project Management and Construction

Figure 3-3 Site Layout

3.2 Existing Traffic Conditions

Homebush Bay Drive

Homebush Bay Drive is a major arterial road in the Sydney metropolitan road network. It is part of Metroad 3 which connects the northern beaches area of Sydney through Homebush Bay and on to the southern suburbs of Sydney. It is a dual carriageway road with high standard access controls along the section in the vicinity of Sydney Olympic Park. It's junction with Australia Avenue is a grade separated interchange which forms the major road access for the Sydney Olympic Park. The posted speed limit is 80 km/h and there are no footpaths on either side of the road; however, a separate pedestrian and bicycle path runs parallel to Homebush Bay Drive through Bicentennial Park to Rhodes. To the south of Australia Avenue it connects to the M4 Western Motorway via another grade separated interchange controlled by traffic signals.

Junctions along the route are generally controlled by traffic signals which are operated by the RMS using the SCATS coordination system. Road classification data is included in Appendix B.

Australia Avenue

In the vicinity of the subject site Australia Avenue is a 4 lane divided carriageway serving as a sub-arterial road and the major road access to the Sydney Olympic Park. It provides an important traffic function at sub-arterial level linking to the major arterial road system at Homebush Bay Drive (Metroad 3). Its posted speed limit varies from 60 km/h at its eastern end to 50 km/h at its western end within the Sydney Olympic Park Precinct. It varies in width from a single lane of travel in each direction north of Kevin Coombs Avenue to a divided four lane carriageway between Kevin Coombs Avenues and Bennelong Road; with a third northbound lane was provided in 2011 between Bennelong Road and Homebush Bay Drive.

Photo 1 - Existing Intersection at Australia Avenue/Parkview Drive.

Photo 2 - Australia Avenue looking north from Murray Rose Avenue

Bennelong Road

Bennelong Road is a 2 lane 2 way collector road within the Sydney Olympic Park road network. To the north it connects with Marjorie Jackson Parkway and Hill Road to provide an alternate access to the northern precincts of Sydney Olympic Park. To the south Bennelong Road connects with Sarah Durack Avenue which provides access to the southern precincts of Sydney Olympic Park. At present it does not provide any direct frontage access to development activity in the vicinity of the subject site.

One of the road's key features is an off road dual use path which forms part of an extensive network of footway/cycleways around the Sydney Olympic Park Precinct.

Bennelong Road provides access to the Brickpit and Bicentennial Park open space areas, and has a number of parking areas available for patrons of these facilities along its length.

The junction of Bennelong Road with Australia Avenue is controlled by traffic signals, with Sarah Durack Avenue forming the fourth leg of this junction.

Murray Rose Avenue

Murray Rose Avenue is a local road with a single lane in each direction. To the west of Australia Avenue it provides access to Sydney Olympic Park Railway Station, which is within walking distance (approximately 400m) of the 3 Murray Rose Avenue site.

The eastern extension of Murray Rose Avenue from Australia Avenue provides access to the 5 Murray Avenue Building. This extension was completed in April 2012 concurrently with the completion of the 5 Murray Rose Avenue building. Murray Rose Avenue intersects Australia Avenue at a priority controlled intersection.

To the west concrete footpaths and time restricted on street parking is provided on both sides of Murray Rose Avenue. To the east a concrete footpath is provided on the southern side of Murray Rose Avenue and no on street parking is permitted.

Herb Elliot Avenue and Dawn Fraser Avenue

Herb Elliot Avenue and Dawn Fraser Avenue are local roads with a single lane in each direction. Concrete footpaths and time restricted on street parking is provided on both sides of Herb Elliot Avenue and Dawn Fraser Avenue.

Dawn Fraser Avenue also provides access to the Sydney Olympic Park Railway Station.

Dawn Fraser Avenue intersects Australia Avenue at a priority controlled intersection while Herb Elliot Avenue intersects Australia Avenue at signals.

Photo 3 – Recently Completed Murray Rose Avenue looking west towards Australia Avenue

Photo 4 - Road Link Between Murray Rose Avenue and Parkview Drive

Parkview Drive

Parkview Drive has a single travel lane in each direction with parking permitted on its southern side. It intersects at Australia Avenue via a four way signalised junction with Herb Elliot Avenue.

Parkview Drive previously operated as a cul-de-sac; however, a link connecting it to Murray Rose Avenue was completed in 2012. This link currently provides access to 5 Murray Rose Avenue during special events. (Refer Section 7).

Parkview Drive provides access to a number of existing commercial sites.

Photo 5 - Parkview Drive Looking West Towards Australia Avenue

3.3 Traffic Volumes

3.3.1 Current Traffic Surveys

To identify the existing traffic conditions a manual traffic survey count was undertaken at the intersection of Australia Avenue and Murray Rose Avenue on the 21st June 2012 between 7:00am – 9:00am and 4:00pm - 6:00pm to account for AM and PM peak activity. A copy of the traffic survey report is included in Appendix C.

Determining the peak hours was undertaken based on the analysis of the 15 minute turning counts as a network average at the intersection of interest. From the traffic survey data the network morning peak hour was calculated to occur between 8:00am – 9:00am and the evening peak between 5:00pm - 6:00pm. The peak hour traffic volumes are presented below in Figure 3-4 and Table 3-1.

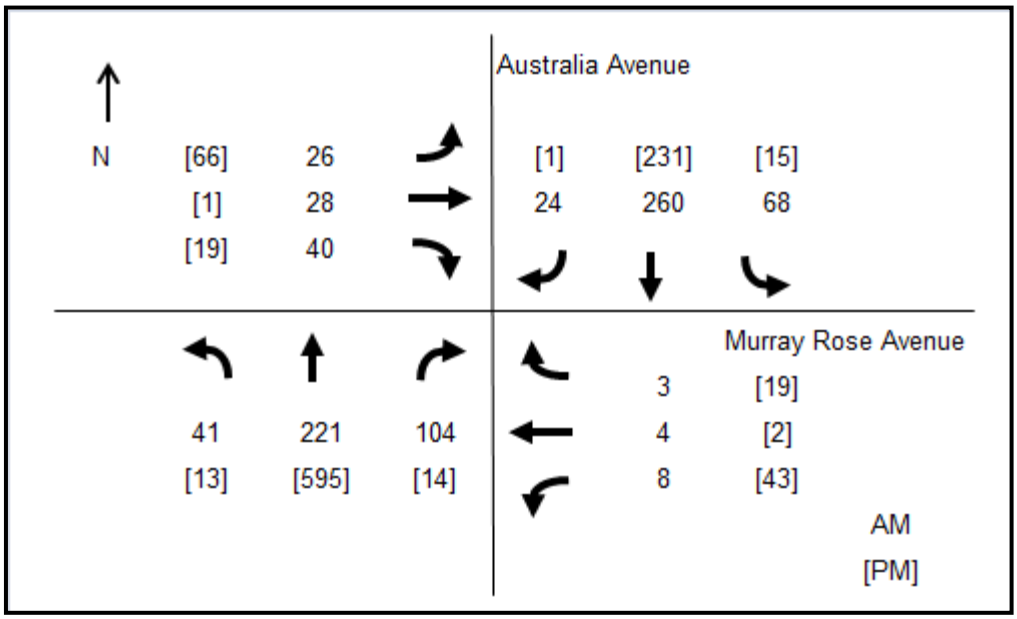


Figure 3-4 Current Peak Hour Traffic Volumes

Table 3-1 June 2012 Traffic Volumes

Road	Direction	Peak flow (1)	Mid-Block Road Capacity (2)	Volume / Capacity ratio
Murray Rose Ave East	Eastbound	200 (AM) 30 (PM)	900 (two-way)	0.22 (AM) 0.03 (PM)
	Westbound	15 (AM) 64 (PM)	900 (two-way)	0.05 (AM) 0.07 (PM)
Murray Rose Ave West	Eastbound	94 (AM) 86 (PM)	900 (two-way)	0.10 (AM) 0.10 (PM)
	Westbound	69 (AM) 16 (PM)	900 (two-way)	0.08 (AM) 0.02 (PM)
Australia Ave North	Northbound	250 (AM) 680 (PM)	2,200 (two-way)	0.11 (AM) 0.31 (PM)
	Southbound	352 (AM) 247 (PM)	2,200 (two-way)	0.16 (AM) 0.11 (PM)
Australia Ave South	Northbound	336 (AM) 622 (PM)	2,200 (two-way)	0.15 (AM) 0.28 (PM)
	Southbound	308 (AM) 293 (PM)	2,200 (two-way)	0.14 (AM) 0.13 (PM)

Notes: 1. Peak flow from 21st June survey results by Better Transport Futures
2. RTA 2002, Urban Road Conditions Level of Service D

The RTA Guide to Traffic Generating Developments (Table 4.4; Urban road peak hour flows per direction) identifies the acceptable midblock capacities for roads with a single lane in each direction as 900 vehicles/hour and roads with two lanes in each direction as 2,200 vehicles/per hour. Thus Australia Avenue and Murray Rose Avenue currently operate acceptably, with significant spare capacity.

It is noted that 5 Murray Rose was not occupied by its intended tenant (Lion Nathan) on the 21st June 2012 when the surveys were undertaken. The Client has indicates that the 5 Murray Rose Avenue building will be fully occupied by October 2012.

3.3.2 Previous Traffic Surveys

As part of the traffic study previously undertaken to support the Development Application of No 5 Murray Rose Avenue, traffic surveys were carried out in October 2009 at the intersection of Parkview Drive/Herb Elliot Avenue with Australia Avenue.

The results of the previous traffic surveys are summarised in Table 3-2 below.

Table 3-2 October 2009 Traffic Volumes

Road	Direction	Peak flow (1)	Mid-Block Road Capacity (2)	Volume / Capacity ratio
Parkview Drive	Eastbound	131 (AM) 152 (PM)	900 (two-way)	0.145 (AM peak) 0.169 (PM peak)
	Westbound	66 (AM) 219 (PM)	900 (two-way)	0.073 (AM peak) 0.243 (PM peak)
Herb Elliot Ave (At Australia)	Eastbound	477 (AM) 585 (PM)	900 (two-way)	0.53(AM peak) 0.65(PM peak)
	Westbound	452 (AM) 531 (PM)	900 (two-way)	0.502(AM peak) 0.59 (PM peak)

Notes: 1. Peak flow from July and August 2009 traffic survey results by Better Transport Futures
2. RTA 2002, Urban Road Conditions Level of Service D

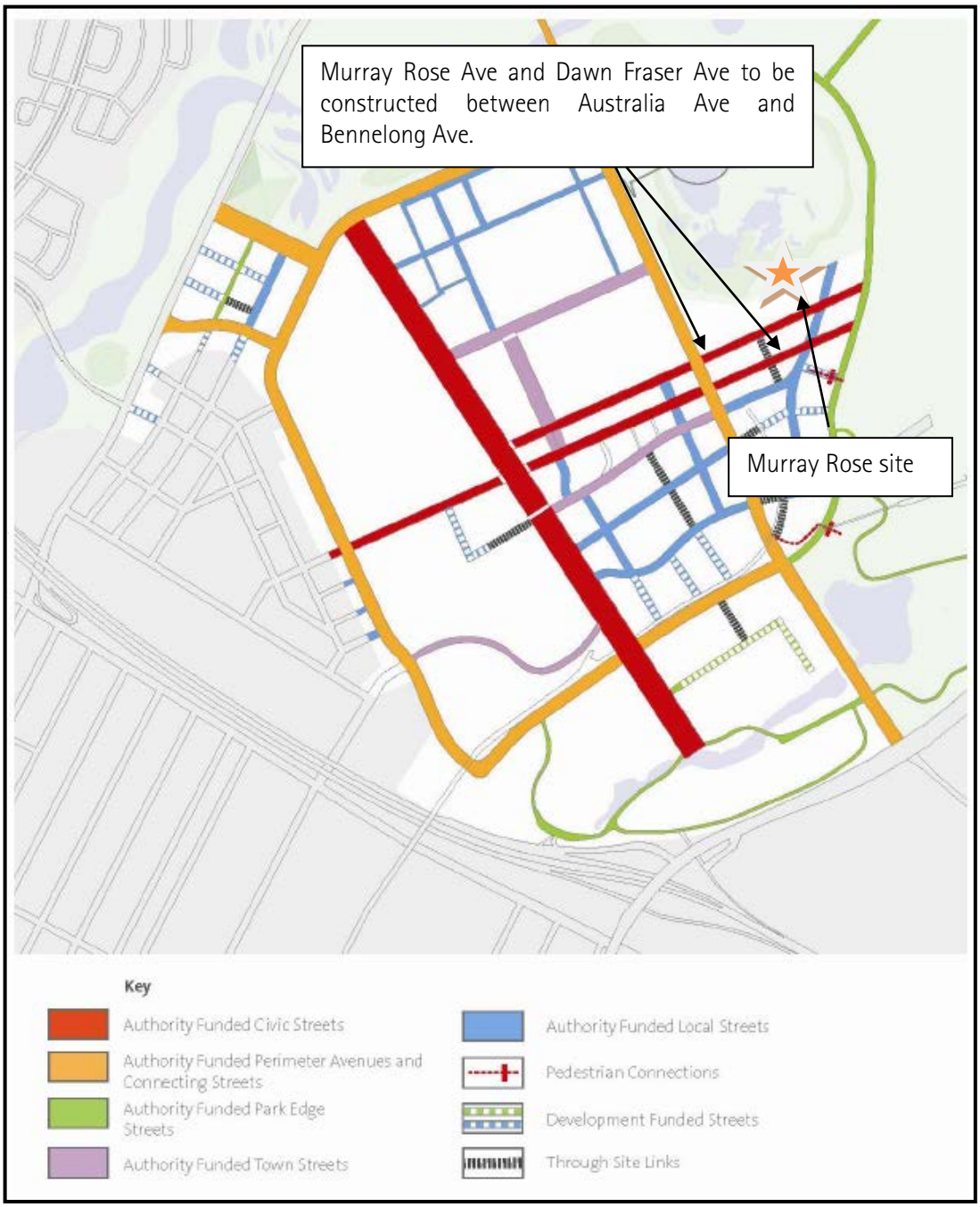
The results of the previous surveys indicate that Parkview Drive and Herb Elliot Avenue operate acceptably, with significant spare capacity.

3.4 Road Network Improvements

The Parkview Precinct Master Plan proposes that Dawn Fraser Avenue and Murray Rose Avenue be extended from their current intersections with Australia Avenue to intersect with Bennelong Road. Additionally, that Parkview Drive will be extended and realigned to form a grid pattern, intersecting with Dawn Fraser Avenue and Murray Rose Avenue.

Access to 3 Murray Rose Avenue is proposed from an extension to Murray Rose Avenue that will intersect Bennelong Road at a T-junction and in the interim from Parkview Drive via the link road.

The proposed road upgrades in the vicinity of the subject site are displayed in Figure 3-5.



Source: Sydney Olympic Park Authority (2008)

Figure 3-5 New roads to be constructed by SOPA

3.5 Traffic Safety and Accident History

SOPA information indicates there are no significant safety issues to be addressed in the study area.

3.6 Parking Supply and Demand

3.6.1 On-street Parking Provision

On street parking is permitted on Murray Rose Avenue west of Australia Avenue, Parkview Drive, Dawn Fraser Avenue and Herb Elliot Avenue. The on-street parking is time restricted with typical quarter hour or one hour limits.

3.6.2 Off-Street Parking Provision

There are 4 SOPA public car parks in this area.

- Car Park 6f- 638 spaces
- Car Park 6a – 61 spaces
- Car Park 6d – 93 spaces
- Car Park 6e – 100 spaces

Car Park 6f is the site which closes down for 6 weeks over the Royal Easter Show. At the same time Australia Avenue is closed from Dawn Fraser Avenue northwards.

All four are popular parking locations for both workers and visitors to the Park area.

The existing off street parking policy is set in the SOP Transport Strategy, August 2008 which states

"Striking the right balance of car parking is an important feature of the Master Plan 2030 Transport Strategy, which aims to attract developers to the site whilst also balancing the amount of traffic generated by developments. With the planning approval and management of public parking in the control of SOPA, a suitable level of car parking can be provided that would not impact the achievement of mode share targets or impact the viability of businesses and venues at Sydney Olympic Park."

The SOP Master Plan indicates there are 10,000 public parking spaces in the area to service the events requirements. This is considered the level of parking provision that will maintain the viability of the commercial developments, service the major events and encourage the use of public transport.

3.6.3 Parking Demand and Utilisation

There is a strong demand for parking both long and short stay in this existing area with site observations indicating Car Park 6d often has no spare capacity.

Site observations, however, indicate that there is provision for parking at the large (638 parking bays) Car Park 6f over the course of a typical working day.

3.6.4 Set down or pick up areas

There are currently no set down/pick areas in the vicinity.

3.7 Other Developments

There is still a number of development sites within the SOP area to be progressed however this precinct is the main commercial project to be constructed within this part of the Park in the near future.

The following stages of the Parkview Precinct Master Plan include the construction of 4 Murray Rose Avenue, a proposed commercial building, and 1 and 2 Murray Rose Avenue, proposed residential buildings.

4 Proposed Development

4.1 The Development

The Master Plan for the Parkview Precinct, Sydney Olympic Park project includes approximately 37,800 m^2 GLA of commercial floor space located with approximately 5,000 m^2 of retail/community space in 3 buildings (3, 4 and 5 Murray Rose Avenue) and 18,500 m^2 of residential development located in 2 buildings (1 and 2 Murray Rose Avenue).

The Parkview Precinct development is proposed to be developed in 3 stages, with the construction of 3 Murray Rose Avenue consistent with the current of development. The first (previous) stage of the development being 5 Murray Rose Avenue is complete.

3 Murray Rose Avenue is a commercial building with a gross floor area (GFA) of 13, 675sqm and net leasable area (NLA) of 12,965sqmThe staging of the site development has taken into account the possibility that parts of the road network may be closed during major events and alternative access has to be maintained. The phasing for the project is as follows:

Previous Stage (all of which have constructed):

- 5 Murray Rose Avenue constructed;
- the section of Murray Rose Avenue from Australia Avenue to just east of 5 Murray Rose Avenue constructed;
- a temporary link road from the existing Parkview Drive cul de sac head through to Murray Rose Avenue constructed; and
- During Major Events it is anticipated the section of Murray Rose Avenue from the intersection with Australia Avenue to west of 5 Murray Rose Avenue will be closed. All access to 5 Murray Rose Avenue will be via the temporary link road to the existing Parkview Drive through to Australia Avenue.

Current Stage:

- 3 Murray Rose Avenue constructed;
- the section of Murray Rose Avenue from 5 Murray Rose Avenue eastwards to Bennelong Road is constructed;
- Access will then be available via Bennelong Road to Murray Rose Avenue and Parkview Drive; and
- During major events access to Australia Avenue via Murray Rose Avenue will not be available but will be via the temporary link road to the existing Parkview Drive, and to Bennelong Road.

Future Stage:

- 4 Murray Rose Avenue, 1 Murray Rose Avenue and 2 Murray Rose Avenue are constructed;
- the section of Dawn Fraser Avenue may be potentially constructed from Australia Avenue to Bennelong Road;
- the temporary link to Parkview Drive is removed and will either be replaced with a link to the west of 4 Murray Rose Avenue or via a link from Murray Rose Avenue to the east of the 4 Murray Rose Avenue building; and
- During major events access to Bennelong Road will be available from both Murray Rose Avenue and the proposed Dawn Fraser Avenue extension, together with access to Australia Avenue via Parkview Drive. The road construction in this stage completes the road network in the area.

This construction staging ensures that access to the Precinct is initially always available via Parkview Drive from Australia Avenue, and ultimately in later stages, from Bennelong Road.

Key design features of the 5 Murray Rose Avenue building and the overall Parkview Precinct include environmental sustainability and a sense of place making to provide work-lifestyle facilities, linking into the current and future traffic systems as defined in the SOP Master Plan. The buildings will be

integrated with the adjacent Bicentennial Park where pedestrian and cyclist networks have been developed.

4.2 Access

As described above the current stage of the 3 Murray Rose Avenue development includes the extension of Murray Rose Avenue to Bennelong Road. It is understood that this will be completed by the Sydney Olympic Park Authority. Accordingly 3 Murray Rose Avenue will be able to be accessed from both the existing Australia Avenue and Murray Rose Avenue intersection and the proposed Bennelong Road and Murray Rose Avenue intersection.

4.2.1 Driveway Location

The driveway to the parking area in 3 Murray Rose Avenue is located on the Murray Rose Avenue frontage approximately 30m to the east of the main building entrance and lobby. The current proposed layout provides a single lane of access into and out of the building.

The loading dock is proposed adjacent to the east of the car park entry.

Full turning movements will be available at both the driveway and loading dock. No protection is provided for right turning vehicles; consequently any vehicles waiting to turn right into or out of the building will delay following vehicles. This is an accepted feature of the precinct which will contribute to slowing vehicle speeds and discouraging short cutting and unnecessary through traffic movements.

4.2.2 Sight Distances

Murray Rose Avenue is a straight alignment with a 5m verge, verge tree planting and a kerbside parking lane. Consequently, adequate visibility from both the service lane driveway and the car park access can be achieved.

4.2.3 Service Vehicle Access

All service vehicle access will use the combined service vehicle and pedestrian link to the loading area provided on the eastern edge of the building with access to the loading dock. Different coloured paving will be used to signify the pedestrian areas.

The loading area has been designed to accommodate a medium rigid truck. The service lane is approximately 9m wide, and has been designed to operate as a low speed pedestrian environment where the service vehicles give way to pedestrians. The number of service vehicles using the lane will vary from day to day but is not expected to exceed the 5 - 12 vehicles a day range.

An interim and final layout is proposed for the 3 Murray Rose Avenue building loading area. In the interim the loading area will be contained within the building footprint. A swept path analysis indicates that there is sufficient space for an 8.8m rigid vehicle to access the loading bay, manoeuvre internally and exit the site in a forward direction.

For the final solution 3 Murray Rose Avenue and the adjoining residential building at 1 Murray Rose Avenue will share a loading area and additional width will be provided to facilitate the internal manoeuvres of an 8.8m rigid vehicle. It is noted, however, that the interim loading area layout will work satisfactorily for an indefinite period until the construction of 1 Murray Rose Avenue.

Garbage trucks will be the most regular service vehicles with all rubbish being stored in 240litre bins. These can be emptied by a range of sized garbage trucks dependant on which contractor is employed by the building management. The new driveway will be designed in accordance with normal Council/SOPA requirements. All service vehicles (medium sized) will able to enter and exit the site in a forward direction.

It is expected that the commercial offices will generate low numbers of delivery van trips, such as stationary, water, and furniture supplies.

The commercial building can expect to have a number of couriers each day, these will be required to use on street parking facilities. There are a number of on-street parking bays on Parkview Drive with 15

minute limits that have been provided to facilitate the provision of parking for couriers and other short term visitors to the subject site.

4.2.4 Road width

The proposed extensions to Murray Rose Avenue and Dawn Fraser Avenue and the realignment of Parkview Drive will be constructed in accordance with the road reserve criteria specified in the SOP Master Plan.

4.3 Parking

4.3.1 Proposed Supply

3 Murray Rose Avenue has been designed to allow parking for 1 vehicle per 55m^2 GFA, providing 249 parking bays. The SOPA guidelines were previously based on a ratio of 1 bay per 55m^2 of GFA; however, in the SOPA 2030 Master Plan they have been changed to the longer term ratio of 1 bay per 80m^2.

The reduction to 1 bay per 80m^2 is in accordance with the SOP 2030 Transport Strategy for the Park aimed at restraining parking demand in the longer term as a travel demand management tool. The Transport Strategy is based on the introduction of a range of major public transport improvements to support the level of commercial, education and residential development planned in the SOP 2030 Master Plan whilst limiting the number of parking bays and maintaining adequate levels of service on the surrounding road system.

Some of the public transport initiatives identified in the master plan include:

- Improving regional and metropolitan bus services through cross-regional bus services;
- Establishing a shuttle bus service to improve access between the town centre and car parks;
- Establishing a metro rail link between Western Sydney and the Sydney CBD, including a stop at Sydney Olympic Park; and
- Establishing Strategic Bus Corridor 13 between Parramatta and Burwood that travels via Sydney Olympic Park.

These public transport initiatives have not yet been developed. It is noted that the bus corridor program is detailed in the RMS website; however, Route 13 is not identified as being part of their current works. Additionally, the development of metro rail link between Western Sydney and the Sydney CBD was cancelled by the former NSW Government in February 2010 and is not currently part of the NSW Governments transport strategy.

It is, therefore, fundamental to the growth of SOP that the ratio of 1:55 be retained until such time as the public transport system is improved. This view is supported by the SOP Master Plan 2030 Transport Strategy undertaken as recently as August 2008, which listed amongst its key findings:

- *"Decrease the provision of commercial private parking from 1 space /55m^2 to 1 space /80m^2 over time linked to major public transport improvements"*

The Strategy identifies a range of projects that, combined, will support this reduction in the parking ratio. Surveys have shown currently only 15% of workers use public transport. The Strategy targets the achievement of an initial mode share of 25%, increasing to 41% with the introduction of the West Metro. The implementation of these projects is still being planned. As yet, there has been no "major" public transport improvement within the SOP over recent years to justify or support the reduction in the parking ratio at this time.

The parking requirements adopted for the precinct development had been based on those set out in Section 6.2 of the SOP Transport Strategy, August 2008 as follows:

- *Commercial, -* *1 space/55m^2 GFA, reducing to 1 space/80m^2 in longer term,*
- *Retail -* *1 space/50m^2*
- *Residential-* *1 space /dwelling – 1 bed*
  1.2 space/dwelling- 2 bed
  1.5 space/dwelling- 3 bed

As stated previously, the longer term parking ratio is intended to be introduced when the public transport services have substantially improved to the stage they offer a viable alternative to the private car for many of the workers in the overall park.

It is not considered at this stage that such improvements have been reached. The provision of 1 bay per 80m^2 would require only 170 parking bays on the site. Given there could be up to (approximately) 1,300 staff accommodated in the building this level of parking combined with limited capacity on the public transport system could result in an under provision of transport capacity.

Whilst constrained parking conditions are an accepted part of operating in the Sydney Olympic Park area the provision of 1 bay per 80m^2 is too restrictive at this time. It is not expected there will be a significant change in the overall level of public transport provision in the foreseeable future. The Parkview development is expect to be constructed within 2 years of approval and would be disadvantaged to have to operate with such restricted parking until such time as investment in public transport is committed and constructed.

Accordingly, the onsite parking at 3 Murray Rose Avenue is proposed to be provided at the previous SOPA guidelines of 1 bay per 55m^2 of GFA.

4.3.2 Parking Layout and circulation

The proposed layout of the 3 Murray Rose Avenue accommodates 249 parking spaces on a series of split level basement floors. The basement floors show the following parking provisions, 249 car parking spaces of which:

- 140 standard spaces measuring 2.4m x 5.4m;
- 70 are small parking bays, measuring 5m x 2.1m;
- 8 are accessible spaces , measuring 5.4m x 3.5m , these are located close to the lift; and
- 31 motorcycle spaces.

The provision of 8 accessible spaces constitutes 3% of the overall parking supply which is consistent with SOPA Access Guidelines.

All spaces, aisles and ramps are designed in accordance with AS 2890.1.2004 as follows:

- Car park spaces are 2.4m x 5.4m, except the 70 small bays and 8 accessible bays;
- Aisles will have a minimum width of 6m;
- All bays adjacent to walls are widened by 300mm;
- All blind aisles have an additional 1m area at the end;
- The entrance/exit area is level;
- All vehicles will be able to enter and exit the site in a forward direction;
- The driveway access lanes are 3m wide; and
- Pedestrian visibility is provided in accordance with AS 2890.1.2004.

4.3.3 Car Park Access

AS 2890.1.2004 specifies that a queuing length of 5 vehicles should be provided on the approach to the entry to the car park. This is partially achieved with 3 vehicles accommodated inside 3 Murray Rose Avenue and on the verge plus a further car in the kerbside lane, providing a queue of 4 vehicles in total. The car park control is proposed to be boom gate controlled. The Australian Standard AS2890.1 2004 indicates entry lanes controlled by a card reader have capacities of 400 vehicles per hour per lane.

This indicates the entry has a theoretical capacity to allow entry to the entire car park in any one hour. Whilst there will be some peak arrivals which will result in temporary queuing across the footpath, the footpath and verge are 5m wide allowing pedestrians to walk around any queuing vehicle. Importantly, the pedestrian entrance to the building is approximately 30m from the vehicular entrance, accordingly any queuing vehicles are unlikely to affect pedestrian movement to and from the site.

It is noted that in accordance with the low traffic volumes on Murray Rose Drive in the circumstance when a vehicle is temporarily delayed on Murray Rose Avenue at the entry to the development it will have a negligible impact on the operation of the adjoining road network.

The car park circulation is a simple legible series of car park ramps that provide direct access to each floor of parking.

4.3.4 Parking Demand

This building has been designed to provide a restricted supply of parking, similar to that supplied throughout the Park over the last 10 years. SOPA have actively restricted the supply of parking over the development of the park to positively encourage the use of alternative modes of transport. Positive measures such as the implementation of a work place travel plan can be undertaken to constrain demand for parking and provide viable travel alternatives for the occupants of the building. It is expected demand will exceed supply and that the parking will have to be strictly managed to ensure efficient and effective use.

4.3.5 Pedestrian and Bicycle Facilities

The Precinct has been designed as a pedestrian/cycling environment, with 106 bicycle parking bays. Bicycle parking has been provided in accordance with the Transport Strategy which requires:

- *Workers* *1 space /200m2 GFA = 68 spaces (88 provided)*
- *Visitors* *1 space/750m2 GFA = 18 spaces (18 provided)*
- *Total required* *86 spaces, 106 spaces have been provided*

The staff bicycle storage area has been placed in a prominent position overlooking Murray Rose Avenue where it is easily seen. Additionally locker and shower facilities are located adjacent to the bicycle storage area.

The development will be targeting Green Start Office Design V3 points for the provision of cycling facilities and accordingly is providing more bicycle parking than is required in the SOP Master Plan.

5 Public Transport and Cyclists (Alternative Modes of Travel)

The Sydney Olympic Park area was planned to operate with excellent public transport facilities and consequently parking provision has been restricted to prevent private parking offering commuters a more convenient journey to work. The public transport facilities are being provided gradually as demand justifies their construction or provision. To date, not all the transport facilities and services originally planned have been provided. Consequently it is widely considered and accepted that the public transport provisions, particularly rail, do not adequately meet the needs of the current daily population of the Park. The proposals for the Parkview precinct will result in a significant increase in the workforce and residents in the area, putting further demands on the current public transport network.

Sydney Olympic Park Railway station is within 330m walking distance of the Parkview area. The Olympic Sprint service to Lidcombe runs on a 10 minute schedule during peak periods and a 20 minute schedule during non-peak periods. The use of the Olympic Park train services generally requires commuters to change trains or to buses at least once each journey.

The four bus routes servicing Olympic Park are:

- 401- to Lidcombe running on a 20minute service in the peak hour, dropping to a 30minute service off peak;
- 533 – to Chatswood, running on a 15 minute service during the peak hours;
- 525 – Burwood to Parramatta via Olympic Park, running on a 10 minute service during peak hours; and
- 526 – to Strathfield. Running on a 10 minute service during peak hours.

These provide commuters with a reasonable service during peak hours but any travel outside these peak hours can result in long waits.

The existing facilities provided for pedestrians and cyclists are extensive in the general vicinity of the site. These have been provided as part of the legacy of the Sydney Olympics, and serve primarily as recreational facilities accessing the nearby Bicentennial Park, the Brickpit and onto the Parramatta River foreshore. There are 16km of on road cycle lanes and in the order of 24km of pedestrian paths and cycleways within the Park linking various attractions, residential areas and parks. The path network also links to the regional cycleway network, and as such provides a high quality alternate transport access for the area, as an alternative to car based travel. Pedestrians are also able to make use of this network.

A map of the bicycle routes serving Sydney Olympic Park is included in Appendix D.

In summary the current opportunities for alternative transport mode use are:

- Metropolitan Train services within 330m walk to Olympic Park Station, 15 minute walk to Concord West Station or 25 minute walk to Lidcombe Station;
- Four metropolitan bus services within 350m walk; and
- Local cycle/walking track within 230m which connects to regional cycling facilities at Homebush Drive.

The SOP Master Plan 2030 Transport Strategy, August 2008 has recognised that the current level of public transport service is not adequate to provide a significant incentive to change from driving to public transport for a large number of workers. Significant investment and commitment are required to provide the level of improvement to the services that would deliver a viable transport system servicing the Olympic Park area and it is expected these improvements will take some time to deliver. The Transport Strategy summarises the required transport incentives being 27 items that could result in the mode share targets being achieved. The options include more frequent and direct bus, rail and ferry services, improving bus services and routes, including regional connections and cross town services, a Park shuttle bus service, more restrictive parking, improved cycle and pedestrian access, and improved transport information.

The building proposed at 3 Murray Rose Avenue has the potential to accommodate up to approximately 1,300 staff. In order to provide adequate transport options for this number of people a range of modes of transport have to be available. Whilst SOP offers a range of public transport options and services, it is questionable if there is adequate capacity on the existing weekday public transport services to transport this number of staff over a peak hour. The four bus routes which service Olympic Park have limited spare capacity in the peak hours, the trains run every 10 minutes from Lidcombe, there is limited spare capacity in the car parks adjacent to the 3 Murray Rose Avenue some times of the year and there are 106 bicycle racks to provide an alternative option for the journey to work.

As part of the ongoing planning for, and operation of, the office development, it will be the responsibility of each leasee in the overall Parkview Precinct to prepare and manage a Travel Plan which may include a Travel Access Guide and measures appropriate for their circumstances and business. This should be prepared in accordance with the SOPA Travel Planning Opportunities Travel Plan Guidelines. It should include transport incentives and measures such as:

- All staff to receive full information regarding the public transport options, maps, guidance for its use, fares, timetables etc, this needs to include alternatives when Major Events occur;
- Review of bus/train timetables to ensure they are appropriate for any shift requirements, have adequate capacity and identify any routes/destinations not adequately catered for, discussions with operators regarding any identified inadequacies;
- Review the opportunity for a workplace based car-pooling scheme to maximise the car occupancy of vehicles arriving at the precinct;
- Review opportunities to introduce flexible work hours and work practises as appropriate;
- Full information on the walking and cycling facilities on the approaches to, and around the building; and
- The Travel Plan should be the responsibility of one person, such as a transport or travel co-ordinator. Their ongoing responsibility will be to ensure that information reaches all employees, is kept up to date, transport issues are actioned, and that all opportunities to reduce car use are investigated. As well their role includes the ongoing monitoring and review of the plan to ensure its currency.

The site cannot be looked at in isolation in terms of public transport; any improvement in the services will benefit the entire Park area and the numerous users. Consequently, incentives to encourage public transport use and reduce the reliance on the private car for travel to the overall precinct should continue to be explored by SOPA, in accordance with those outlined in the SOP Master Plan 2030 Transport Strategy undertaken in August 2008.

It is noted that Nathan Lion, the tenant of 5 Murray Rose Avenue has completed a travel management plan, which will be implemented upon their occupation of the building in October 2012 to enable them to provide valuable information to their staff and visitors on alternate and active transport options. Ultimately the application of Travel Plan measures has the ability to significantly reduce the level of single occupancy motor vehicle usage to the site.

6 Impact of Proposed Development

6.1 Traffic Generation

6.1.1 Daily and Seasonal Factors

The nature of the development will lead to typical morning and afternoon peak traffic generation.

It is considered that there will be minimal seasonal variation factors.

The level of traffic generated by the proposed development has been determined using the same generation rates adopted in the Master Plan Transport Strategy. Section 5.4.1 of that document specifies:

- *"Commercial trip generation rate of 1.66 peak hour vehicle trips per 100m2 GFA based on RTA rates for Office Commercial"*

Based, on 13, 675m2 GFA, this equates to 227 vehicle trips generated by the building per peak hour, although not all these trips will park on site.

For the purposes of this capacity assessment it has been assumed all this traffic will use the Australia Avenue/ Murray Rose intersection. It is noted, however, that upon completion of the current stage Murray Rose Avenue will be extended to Bennelong Avenue, which will provide an alternative access and egress route for the vehicle trips generated by the existing and proposed buildings in the Parkview Precinct. Accordingly, the analysis undertaken in this report consists of a worst case scenario for the future operation of the Australia Avenue and Murray Rose Intersection.

As stated previously the 5 Murray Rose Avenue building was not occupied on the 21st June 2012 when the traffic survey at the intersection of Australia Avenue and Murray Rose Avenue was undertaken. The Client has indicated that the 5 Murray Rose Avenue will be fully tenanted by October 2012.

In order to account for this the trips generated by 5 Murray Rose Avenue have been included in the analysis of the intersection of Australia Avenue and Murray Rose Avenue.

Applying the above trip generation rate, 5 Murray Rose Avenue (based on a 13,268m2 GFA) will generate 220 peak hour trips, in addition to the trips generated by 3 Murray Rose Avenue.

6.2 Traffic Distribution and Assignments

At this stage, for the purposes of this assessment the same turning proportions observed at the intersection of Australia Avenue and Murray Rose Avenue have been applied to the traffic generated by the construction of 3 Murray Rose Avenue.

It has been assumed that 80% of trips are inbound and 20% outbound in the AM peak hour and 20% of trips inbound and 80% outbound in the PM peak hour.

6.3 Peak Hour Impacts on Intersections

To assess the impact of the development upon the intersection of Australia Avenue and Murray Rose Avenue, the computer program Sidra has been used. Sidra is a traffic analysis tool developed originally by the Australian Road Research Board. It calculates the amount of delay to vehicles using an intersection, and gives a level of service rating which indicates the relative performance of the nominated intersection treatment. Levels of Service of A to C are considered to be satisfactory, a level of service of D is acceptable, and levels of E and F are considered unsatisfactory. Sidra also calculates the degree of saturation, which indicates the amount of spare capacity available.

The traffic count for the intersection of Australia Avenue and Murray Rose Avenue was conducted on 21st June 2012 and has been used as the basis of this analysis. It is noted that Stage 2 of the 3 Murray Rose developments includes the extension of Murray Rose eastwards to Bennelong Road. Upon completion this will facilitate improved distribution options for trips generated by the developments on Murray Rose Avenue and reduce the vehicle volumes at the intersection of interest.

For the purposes of this analysis it has been assumed all traffic generated by 3 Murray Rose Avenue will use the intersection of interest for access to represent the worst case scenario. A summary of the results from the Sidra analysis is presented below in Table 6-1:

Table 6-1 Sidra Analysis for Existing Situation –Australia Ave/Parkview Drive, AM / PM peak 2012

	AM Peak			PM Peak		
	Delay (secs)	LOS	95th percentile queue (m)	Delay (secs)	LOS	95th percentile queue (m)
Australia Ave - South	3.8	A	5.4	0.9	A	10.5
Murray Rose Drive - East	13.2	B	0.7	15.4	B	3.5
Australia Ave - North	2.7	A	5.9	2.0	A	5.7
Murray Rose Drive - West	17.8	B	10.2	17.8	B	8.4
TOTAL	**5.1**	**A**		**3.5**	**A**	

The above results confirm the site observations that there are little delays for through movements and minimal delays and queues for traffic on the side road.

The same analysis was completed for the morning and afternoon peak periods, with the additional development flows added. The results for this analysis are presented in Table 6-2 below.

Table 6-2 Sidra Analysis for Future Situation with Construction of 3 Murray Rose Avenue – Australia Ave/Parkview Drive - 2012 base plus development

	AM Peak			PM Peak		
	Delay (secs)	LOS	95th percentile queue (m)	Delay (secs)	LOS	95th percentile queue (m)
Australia Ave - South	6.0	A	9.8	1.5	A	9.9
Murray Rose Drive - East	17.4	B	7.7	22.6	D	39.3
Australia Ave - North	4.3	A	9.1	3.0	A	6.7
Murray Rose Drive - West	34.0	BC	31.0	21.6	B	11.4
TOTAL	**9.5**	**A**		**9.1**	**A**	

The above results confirm that the additional traffic flows associated with the construction of 3 Murray Rose Avenue and the occupation of 5 Murray Rose Avenue can be accommodated at the intersections of Australia Avenue and Murray Rose Avenue All traffic movements will operate well with minimal delays and congestion for traffic during both the morning and afternoon peak periods.

The Sidra results are included in Appendix E.

7 Operation of the Site during Special Events

Sydney Olympic Park is regularly used for premier events that require the closure of key roads in the area, including the Royal Sydney Easter Show in April and the V8 Super Car Racing in December each year. These events, along with others close Australia Avenue north of Murray Rose Avenue for a number of weeks each year. Other events involve other closures for days or weeks at a time. There are regular events at weekends which close specific links throughout the park.

The development site is located on the periphery of the "Event Operations Zone" and will be impacted by some of the events and associated road closures. It is adjacent to the car park site (Car Park 6f) shown in Figure 7-1 below, used for part of the Royal Sydney Easter Show, and it is anticipated the section of Murray Rose Avenue in proximity to Australia Avenue will closed for a month during this event each year. The intersection of Murray Rose Avenue and Bennelong Road will remain open at all times.

Discussions with SOPA have indicated Australia Avenue is always maintained open south of Dawn Frazer Avenue to retain access to the commercial areas. Parkview Drive will also always remain open; consequently access to the Parkview precinct will always be maintained.

Accordingly it is noted that in circumstances when Murray Rose Avenue and Australia Avenue are closed, the population of 3 Murray Rose Avenue will be able to access the site from the Murray Rose and Bennelong Road intersection as well as the road connection from Parkview Drive.

The staging of construction of the Parkview Precinct will ensure adequate vehicle access is available for the successful operation of both the event and the building during road closures. In the short term, alternative access via Parkview Drive to Australia Avenue will always be available. Closures of Australia Avenue south of Dawn Fraser Avenue are not generally permitted, the intersection of Parkview Drive and Herb Elliot Avenue provide access for the major commercial developments during major events and extended road closures.

A review of the road closure information provided by SOPA indicates the closures are unlikely to significantly impact on the operation of the building. Access will still be available via Parkview Drive, and ultimately via Bennelong Drive. The building proposals are unlikely to impact on any of the key event facilities such as bus or coach routes, parking capacity or location, rail station access, pedestrian links and crowd access routes. The building is not located directly on a route where the daily arrivals and departures of the building will impact on a major event operation.

The biggest impact on the operation of the building is likely to be the reduction in public parking available when Car Park 6f is used for other purposes. This will require users to find alternative methods of transport or parking facilities. In these situations the opportunity to transfer some commuters to public transport should be taken and the Travel Plans circulated to inform workers of the transport options available. As stated previously it is important a safe pedestrian route to the Station and bus stops is maintained.

7.1 Construction Traffic

Whilst the full Construction Management Plan for 3 Murray Rose Avenue has not yet been prepared the following is appropriate:

- All vehicles will enter/exit via Murray Rose Avenue;
- A Class B hoarding or loading zone is not required on Parkview Drive, a construction zone and Class A hoarding will be required;
- Once the truck route is known it will be forwarded to the RMS. All construction traffic will be coordinate through LL;
- Overall construction is 15-16 months inclusive of excavation, but exclusive of demolition; and
- The extension of Murray Rose Avenue to Bennelong Road will be completed concurrently with construction of 3 Murray Rose Avenue.

A Construction Traffic Management Plan will be prepared in accordance with the conditions of consent. The construction traffic for this project will be use Murray Rose Avenue to access the subject site.

There will be a number of construction workers on site; however, typically the work will commence on site at 7:00am and finish at around 6:00pm which provides traffic movements on either side of the peak periods.

The vast majority of the work will be contained on site and will, therefore, have little if any impact upon the operation of the adjacent road network.

During intense works e.g. concrete pour, there could be a larger impact, but these generally occur over a number of separate days and are not a continual process.

A construction management plan will be produced with staging details to ensure adequate access is maintained at all times.

All works on site will be governed by the EP&A rules and as stipulated within any development consent granted by Department of Planning including hours of work, or as agreed with SOPA.

Source: Nearmap

Figure 7-1 Showing road closures during major events.

8 Summary and Conclusion

The following conclusions are drawn from the investigations into the development of 3 Murray Rose Avenue, Homebush:

1. The Parkview Precinct development has been designed acknowledging the Travel Demand Management principles adopted by the SOP Master Plan 2030 Transport Strategy undertaken by Parsons Brinckerhoff in August 2008.
2. The building location will offer up to 1,300 staff a range of travel options including buses and trains within 350m, extensive cycling facilities, and walking tracks adjacent to the building, easy access to the metropolitan road network and restricted parking facilities.
3. 3 Murray Rose Avenue has been designed to accommodate 249 parking bays. This is in excess of the 170 bays required by SOPA under the new ratio of 1 bay per 80m2 commercial floor space. Until recently 1 bay per 55m2 was required, which this proposal adheres to. It is considered the public transport services have not been improved to a level where such restricted parking can be justified or supported. A parking ratio of 1 bay per 55m^2 is supported by the SOP Transport Strategy, and that any reduction in this should be linked to the introduction of major improvements in public transport. These major improvements have not been introduced at this stage.
4. It is proposed the car parking ratio for future stages of the Parkview Precinct can be reviewed in line with substantial improvements in public transport services to SOP.
5. Construction of the overall precinct will be staged to ensure adequate access is available year round and during major events in the Olympic Park. Australia Avenue, south of Dawn Frazer Avenue and Parkview Drive are expected to remain open during all major events. Consequently both construction workers' traffic and general commercial traffic will be able to access 3 Murray Rose Avenue during major events.
6. The intersection of Australia Avenue and Murray Rose Avenue has the capacity to accommodate the traffic generated by both 3 Murray Rose Avenue and 5 Murray Rose Avenue.
7. The performances of the key intersections more remote from the site have not been assessed as part of this review. They have been analysed as part of the SOPA Master Plan 2030 Transport Strategy.
8. A Construction Traffic Management Plan can be prepared as a condition of consent,
9. A Workplace Travel Plan will be prepared by each tenant that leases space within the building, as a condition of consent.

The overall conclusion from the investigations is that traffic and access arrangements for the development proposal are satisfactory, subject to detailed design and approval.

Appendix A. Proposed Access Plan

Appendix B. Road Classification

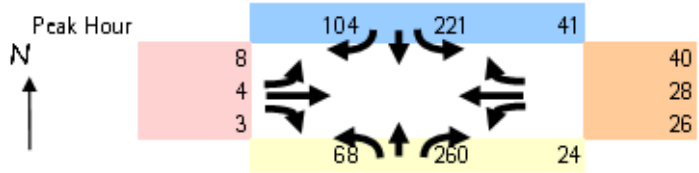
Road Class	Role	Existing/New	Traffic Management Guidelines
Freeways/ Motorways	▪ Freeways/Motorways are a particular form of arterial road in a hierarchical sense, but are considered separately in Part 4 of the Guide because of their distinctive operating characteristics. ▪ Provide for major regional and inter-regional traffic movement in a safe and operationally efficient manner. ▪ The prime traffic movement function dominates entirely and full access control ensures there are no competing access issues.	Existing And New	▪ Freeways and motorways do not have direct access to abutting land. There is thus effectively no access function and traffic management is directed entirely at the traffic movement function and associated aspects of capacity, congestion and speed.
Arterial Roads	▪ Provide for major regional and inter-regional traffic movement in a safe and operationally efficient manner. ▪ Commercial or industrial access requirements or local public transport priorities may need to be given significant weight in developing suitable traffic management strategies.	Existing	▪ Aim to obtain a balance between providing for traffic and providing for activities which occur, or are desired to occur, beside and across the road. The balance will generally favour traffic movement rather than the abutting access function with a focus on capacity and congestion management. ▪ Obtaining this balance will involve negotiations with affected parties including councils.
		New	▪ Planning and design of new arterial roads (other than freeways and motorways) need not necessarily seek to entirely eliminate access to abutting land. However, it is desirable to have substantial control of access for these roads. ▪ Opportunity to plan for the desired balance between traffic and other activities beside and across the road. The planning of that 'balance' should consider: – Type of land use allowed to locate beside the road – Interactions between land uses on either side of the road – Degree of access control for the arterial road, recognising that design and traffic management objectives on arterial roads should be biased towards the needs of through traffic. ▪ Coordinate the planning and design of new arterial roads with the land use development and amending of town planning schemes. ▪ Encourage roadside developments and access arrangements that are compatible with arterial road traffic conditions

Distributor/ Collector Roads	▪ Streets which do not easily fall into either the arterial or the local road category. ▪ Distribute traffic and bus services within the main residential, commercial and industrial built-up areas and link traffic on local roads to the arterial road network. ▪ may be streets which have been designed as local streets, but which have additional traffic functions, usually serving major traffic generators or providing for some non-local traffic movements. ▪ problems often arise with intermediate streets, as their design usually promotes the traffic movement function, while the residents and sometimes the local council, consider the street to be a local street with emphasis on the need for low traffic speed and restricted width ▪ Alternatively, in newer growth areas they may sometimes be under-designed in response to a desired emphasis on local road functions, resulting in operational and safety problems for the higher traffic volume that must use them.	Existing	▪ Traffic management principles are less well-defined than for arterial roads and local streets. ▪ As a consequence actions which result in the traffic function or roadside factors dominating the road environment will not normally be able to be implemented. ▪ Traffic management will normally be aimed at managing relatively high levels of conflict between: – Traffic movement activities generated by abutting land use – The desire of residents for local street functions to dominate, with severe restrictions on traffic speed and the width allocated to traffic movement. ▪ The extent of these conflicting demands may vary considerably throughout the day and a balance needs to be made to achieve traffic operations acceptable to the needs of both motorists and abutting residents.
		New	▪ In new street and road networks, the length of intermediate street classed as distributor/ collector should be minimised as far as possible. ▪ Where these streets are included, they should have complementary abutting land uses which generate a low degree of non-motorised traffic demands or incorporate a degree of access control, or include appropriate treatments to reduce traffic speed and other adverse impacts.
Local Roads and Streets	▪ May serve several functions to a greater or lesser degree. Some of the functions are at least partially incompatible. Typical functions include: – providing vehicular access to abutting property – providing vehicular access to other properties within a local area – providing access for emergency and service vehicles – providing a network for the movement of pedestrians and cyclists – providing a means to enable social interaction within a neighbourhood, e.g. serving as a play area or community open space – contributing visually to the "living" environment. ▪ The extent of each of these functions will vary within a local street network. For example, a street which provides access to several other streets, will have a more prominent vehicle movement role than a small cul-de-sac.	Existing And New	▪ Convey to motorists the impression that they are operating in a space or area which has not been designed soley for motor traffic. ▪ In many instances with residential streets, this desirably requires the road reservation to be constructed in such as way as to eliminate cleer, visual impressions of separate vehicle and pedestrian space. ▪ Detailed guidance can be found in *Part 8:Local Area Traffic Management*

Appendix C. Surveys Data

Turning movement count

Job: p0428D
Day, date: Thu 21 Jun 12
Location: Australia Ave and Murray Rose Ave
Weather: Fine
Client: Better Transport Futures
All motor vehicles



	Australia Ave - North			Murray Rose Ave - East			Australia Ave - South			Murray Rose Ave - West			Total
	1	2	3	4	5	6	7	8	9	10	11	12	vehicle
Time Period	Right	through	Left	Right	through	Left	Right	through	Left	Right	through	Left	movements
07:00 to 07:15	6	18	12	7	0	6	1	32	2	0	0	0	49
07:15 to 07:30	9	30	3	9	1	4	5	70	10	1	0	0	56
07:30 to 07:45	14	42	13	9	1	4	5	75	17	1	0	3	83
07:45 to 08:00	14	63	9	7	9	7	5	59	5	1	0	3	109
08:00 to 08:15	32	50	9	11	11	9	6	69	16	0	0	0	122
08:15 to 08:30	44	66	10	13	7	6	8	57	30	1	4	2	146 Peak
08:30 to 08:45	29	78	14	7	5	4	4	62	25	1	0	2	137
08:45 to 09:00	40	62	12	11	8	9	7	59	9	2	0	1	142
Totals	188	409	82	74	42	49	41	483	114	7	4	11	
07:00 to 08:00	43	153	37	32	11	21	16	236	34	3	0	6	297
07:15 to 08:15	69	185	34	36	22	24	21	273	48	3	0	6	370
07:30 to 08:30	104	221	41	40	28	26	24	260	68	3	4	8	460
07:45 to 08:45	119	257	42	38	32	26	23	247	76	3	4	7	514
08:00 to 09:00	145	256	45	42	31	28	25	247	80	4	4	5	547 Peak Hour

Turning movement count

Job: P0428D

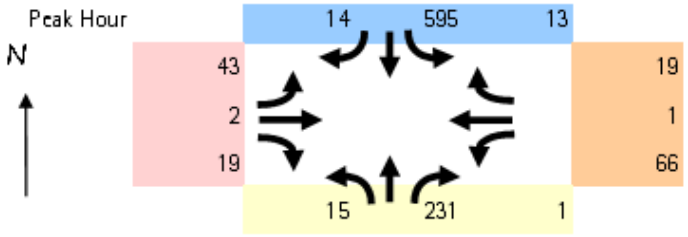
Day, date: Thu 21 Jun 12

Location: Australia Ave and Murray Rose Ave

Weather: Fine

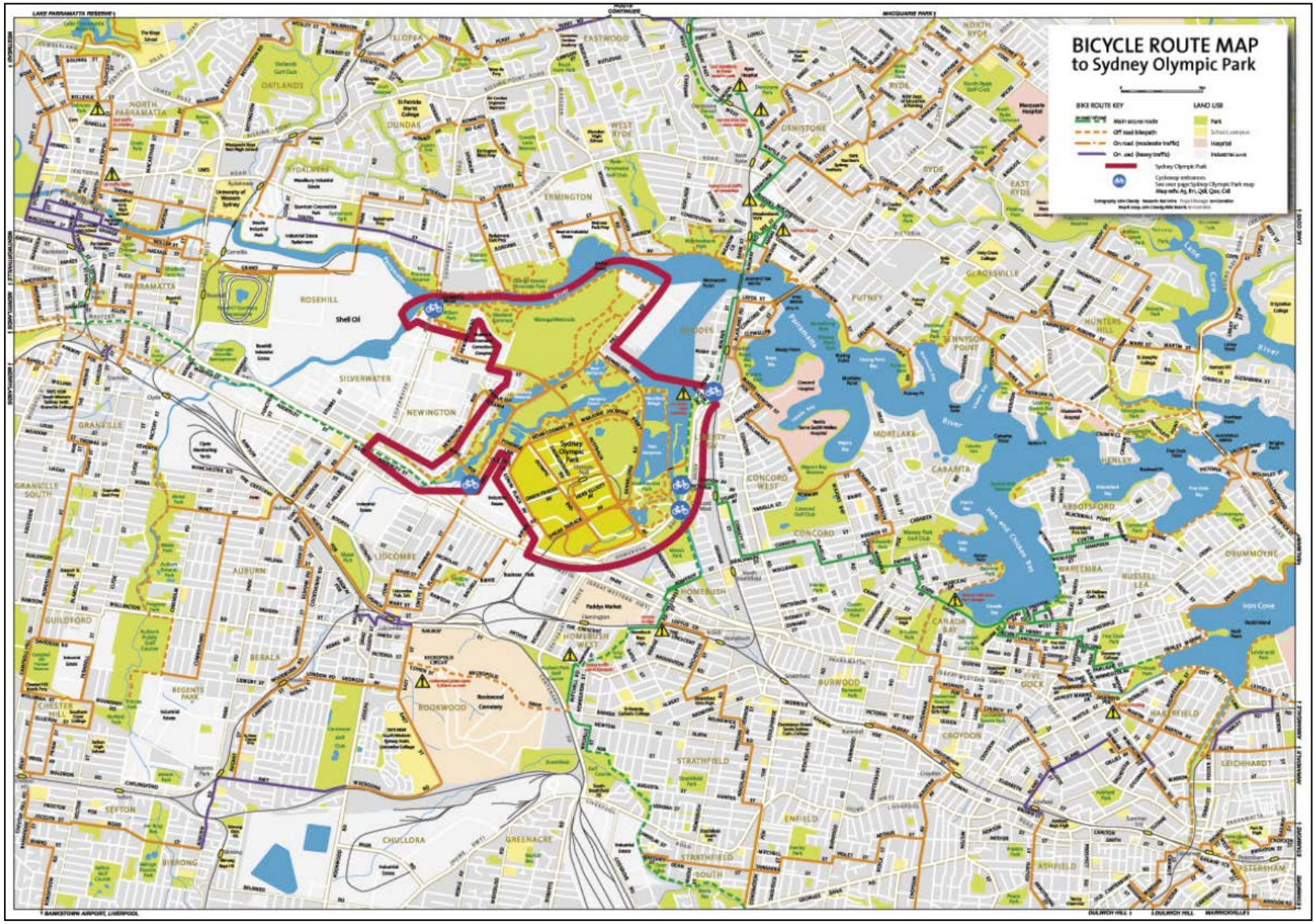
Client: Better Transport Futures

All motor vehicles



Time Period	Australia Ave - North right	Australia Ave - North through	Australia Ave - North Left	Murray Rose Ave - East left	Murray Rose Ave - East through	Murray Rose Ave - East right	Australia Ave - South left	Australia Ave - South through	Australia Ave - South right	Murray Rose Ave - West left	Murray Rose Ave - West through	Murray Rose Ave - West right	Total vehicle movements
16:00 to 16:15	6	106	7	8	1	5	2	39	2	9	1	8	194
16:15 to 16:30	3	96	7	19	0	6	5	43	1	2	1	2	185
16:30 to 16:45	5	129	10	15	0	5	7	42	0	5	1	12	231
16:45 to 17:00	6	115	4	13	2	3	5	42	0	9	1	2	202
17:00 to 17:15	4	138	2	22	0	8	5	43	0	19	1	7	249
17:15 to 17:30	4	151	1	12	0	5	4	70	1	7	0	3	258
17:30 to 17:45	2	148	2	23	0	3	2	60	0	10	0	3	253
17:45 to 18:00	3	158	9	9	1	3	4	58	0	7	1	6	259 Peak
Totals	33	1041	42	121	4	38	34	397	4	68	6	43	
16:00 to 17:00	20	446	28	55	3	19	19	166	3	25	4	24	812
16:15 to 17:15	18	478	23	69	2	22	22	170	1	35	4	23	867
16:30 to 17:30	19	533	17	62	2	21	21	197	1	40	3	24	940
16:45 to 17:45	16	552	9	70	2	19	16	215	1	45	2	15	962
17:00 to 18:00	13	595	14	66	1	19	15	231	1	43	2	19	1019 Peak Hour

Appendix D. Bicycle Routes



Appendix E. Sidra Results

Criteria for interpreting results of SIDRA

1-Level of Service (LoS)

LoS	Traffic Signals and Roundabouts	Give Way and Stop Signs
A	Good	Good
B	Good, with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	Satisfactory	Satisfactory, but requires accident study
D	Operating near capacity	Near capacity and requires accident study
E	At capacity, excessive delay: roundabout requires other control method	At capacity, requires other control mode
F	Unsatisfactory, requires other control mode or additional capacity	Unsatisfactory, requires other control mode

2-Average Vehicle Delay (AVD)

The AVD is a measure of operational performance of an intersection relating to its LoS. The average delay should be taken as a guide only for an average intersection. Longer delays may be tolerated at some intersections where delays are expected by motorists (e.g. those in inner city areas or major arterial roads).

LoS	Average Delay / Vehicle (secs)	Traffic Signals and Roundabouts	Give Way and Stop Signs
A	Less than 15	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	28 to 42	Satisfactory	Satisfactory but accident study required
D	42 to 56	Operating near capacity	Near capacity, accident study required
E	56 to 70	At capacity, excessive delays: roundabout requires other control mode	At capacity; requires other control mode
F	Exceeding 70	Unsatisfactory, requires additional capacity	Unsatisfactory, requires other control mode

3-Degree of Saturation (D/S)

The D/S of an intersection is usually taken as the highest ratio of traffic volumes on an approach to an intersection compared with the theoretical capacity, and is a measure of the utilisation of available green time. For intersections controlled by traffic signals, both queues and delays increase rapidly as DS approaches 1.0. An intersection operates satisfactorily when its D/S is kept below 0.75. When D/S exceeds 0.9, queues are expected.

INTERSECTION SUMMARY

Site: AM Peak Existing

Australia Avenue and Murray Rose AvenueAM Peak Hour - Existing Volumes
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	Vehicles		Persons	
Demand Flows (Total)	871	veh/h	1045	pers/h
Percent Heavy Vehicles	4.2	%		
Degree of Saturation	0.272			
Practical Spare Capacity	194.5	%		
Effective Intersection Capacity	3205	veh/h		
Control Delay (Total)	1.24	veh-h/h	1.48	pers-h/h
Control Delay (Average)	5.1	sec	5.1	sec
Control Delay (Worst Lane)	17.8	sec		
Control Delay (Worst Movement)	18.5	sec	18.5	sec
Level of Service (Aver. Int. Delay)	NA			
Level of Service (Worst Movement)	LOS B			
Level of Service (Worst Lane)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	1.4	veh		
95% Back of Queue - Distance (Worst Lane)	10.2	m		
Total Effective Stops	304	veh/h	365	pers/h
Effective Stop Rate	0.35	per veh	0.35	per pers
Proportion Queued	0.24		0.24	
Performance Index	12.7		12.7	
Travel Distance (Total)	527.0	veh-km/h	632.4	pers-km/h
Travel Distance (Average)	605	m	605	m
Travel Time (Total)	10.2	veh-h/h	12.3	pers-h/h
Travel Time (Average)	42.4	sec	42.4	sec
Travel Speed	51.4	km/h	51.4	km/h
Cost (Total)	335.81	$/h	335.81	$/h
Fuel Consumption (Total)	54.6	L/h		
Carbon Dioxide (Total)	136.7	kg/h		
Hydrocarbons (Total)	0.203	kg/h		
Carbon Monoxide (Total)	8.27	kg/h		
NOx (Total)	0.291	kg/h		

LOS (Aver. Int. Delay) for Vehicles is not applicable since the average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
LOS Method for individual vehicle movements and lanes: Delay (RTA NSW).

MOVEMENT SUMMARY

Site: AM Peak Existing

Australia Avenue and Murray Rose AvenueAM Peak Hour - Existing Volumes
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Australia Ave- South											
1	L	43	10.0	0.116	8.6	LOS A	0.0	0.0	0.00	0.99	49.0
2	T	233	5.0	0.116	0.3	LOS A	0.8	5.4	0.11	0.00	57.4
3	R	109	0.0	0.116	9.4	LOS A	0.8	5.4	0.42	0.73	47.9
Approach		385	4.1	0.116	3.8	LOS A	0.8	5.4	0.18	0.32	53.3
East: Murray Rose Ave - East											
4	L	8	0.0	0.010	9.7	LOS A	0.0	0.3	0.37	0.64	47.3
5	T	4	0.0	0.024	16.7	LOS B	0.1	0.7	0.68	0.79	40.9
6	R	3	0.0	0.024	18.0	LOS B	0.1	0.7	0.68	0.87	40.3
Approach		16	0.0	0.024	13.2	LOS B	0.1	0.7	0.52	0.73	43.9
North: Australia Ave - North											
7	L	72	0.0	0.101	8.2	LOS A	0.0	0.0	0.00	0.87	49.0
8	T	274	5.0	0.101	0.6	LOS A	0.8	5.9	0.23	0.00	55.6
9	R	25	10.0	0.101	9.8	LOS A	0.8	5.9	0.40	0.90	48.9
Approach		371	4.4	0.101	2.7	LOS A	0.8	5.9	0.19	0.23	53.7
West: Murray Rose Ave - West											
10	L	27	0.0	0.271	17.9	LOS B	1.4	10.2	0.62	0.76	40.3
11	T	29	0.0	0.270	16.6	LOS B	1.4	10.2	0.62	0.86	40.8
12	R	42	10.0	0.272	18.5	LOS B	1.4	10.2	0.62	0.91	40.2
Approach		99	4.3	0.271	17.8	LOS B	1.4	10.2	0.62	0.86	40.4
All Vehicles		871	4.2	0.272	5.1	NA	1.4	10.2	0.24	0.35	51.4

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

INTERSECTION SUMMARY

Site: PM Peak Existing

Australia Avenue and Murray Rose AvenuePM Peak Hour - Existing Volumes
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	Vehicles		Persons	
Demand Flows (Total)	1073	veh/h	1287	pers/h
Percent Heavy Vehicles	4.4	%		
Degree of Saturation	0.263			
Practical Spare Capacity	204.0	%		
Effective Intersection Capacity	4076	veh/h		
Control Delay (Total)	1.04	veh-h/h	1.25	pers-h/h
Control Delay (Average)	3.5	sec	3.5	sec
Control Delay (Worst Lane)	27.5	sec		
Control Delay (Worst Movement)	27.6	sec	27.6	sec
Level of Service (Aver. Int. Delay)	NA			
Level of Service (Worst Movement)	LOS B			
Level of Service (Worst Lane)	LOS B			
95% Back of Queue - Vehicles (Worst Lane)	1.4	veh		
95% Back of Queue - Distance (Worst Lane)	10.5	m		
Total Effective Stops	179	veh/h	215	pers/h
Effective Stop Rate	0.17	per veh	0.17	per pers
Proportion Queued	0.28		0.28	
Performance Index	14.2		14.2	
Travel Distance (Total)	650.0	veh-km/h	780.0	pers-km/h
Travel Distance (Average)	606	m	606	m
Travel Time (Total)	12.4	veh-h/h	14.8	pers-h/h
Travel Time (Average)	41.5	sec	41.5	sec
Travel Speed	52.6	km/h	52.6	km/h
Cost (Total)	399.32	$/h	399.32	$/h
Fuel Consumption (Total)	63.6	L/h		
Carbon Dioxide (Total)	159.2	kg/h		
Hydrocarbons (Total)	0.228	kg/h		
Carbon Monoxide (Total)	8.39	kg/h		
NOx (Total)	0.321	kg/h		

LOS (Aver. Int. Delay) for Vehicles is not applicable since the average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
LOS Method for individual vehicle movements and lanes: Delay (RTA NSW).

MOVEMENT SUMMARY

Site: PM Peak Existing

Australia Avenue and Murray Rose Avenue PM Peak Hour - Existing Volumes
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Australia Ave- South											
1	L	14	10.0	0.175	8.6	LOS A	0.0	0.0	0.00	1.11	49.0
2	T	626	5.0	0.175	0.5	LOS A	1.4	10.5	0.20	0.00	56.2
3	R	15	0.0	0.175	9.2	LOS A	1.4	10.5	0.40	0.89	49.2
Approach		655	5.0	0.175	0.9	LOS A	1.4	10.5	0.20	0.04	55.9
East: Murray Rose Ave - East											
4	L	45	0.0	0.049	9.4	LOS A	0.2	1.5	0.34	0.66	47.5
5	T	2	0.0	0.124	26.3	LOS B	0.5	3.5	0.82	0.92	34.4
6	R	20	0.0	0.123	27.6	LOS B	0.5	3.5	0.82	0.94	34.0
Approach		67	0.0	0.123	15.4	LOS B	0.5	3.5	0.50	0.75	42.0
North: Australia Ave - North											
7	L	16	0.0	0.069	8.2	LOS A	0.0	0.0	0.00	1.01	49.0
8	T	243	5.0	0.069	1.6	LOS A	0.8	5.7	0.32	0.00	54.3
9	R	1	10.0	0.070	11.8	LOS A	0.8	5.7	0.60	0.98	48.5
Approach		260	4.7	0.069	2.0	LOS A	0.8	5.7	0.30	0.07	53.9
West: Murray Rose Ave - West											
10	L	69	0.0	0.250	17.7	LOS B	1.2	8.4	0.69	0.92	40.3
11	T	1	0.0	0.263	16.5	LOS B	1.2	8.4	0.69	0.88	40.8
12	R	20	10.0	0.250	18.3	LOS B	1.2	8.4	0.69	0.92	40.3
Approach		91	2.2	0.250	17.8	LOS B	1.2	8.4	0.69	0.92	40.3
All Vehicles		1073	4.4	0.263	3.5	NA	1.4	10.5	0.28	0.17	52.6

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS B. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

INTERSECTION SUMMARY

Site: Copy of AM Peak Existing + Trips

Australia Avenue and Murray Rose AvenueAM Peak Hour - Existing Volumes + Development Traffic
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	Vehicles		Persons	
Demand Flows (Total)	1344	veh/h	1613	pers/h
Percent Heavy Vehicles	2.7	%		
Degree of Saturation	0.622			
Practical Spare Capacity	28.6	%		
Effective Intersection Capacity	2161	veh/h		
Control Delay (Total)	3.54	veh-h/h	4.25	pers-h/h
Control Delay (Average)	9.5	sec	9.5	sec
Control Delay (Worst Lane)	34.0	sec		
Control Delay (Worst Movement)	35.1	sec	35.1	sec
Level of Service (Aver. Int. Delay)	NA			
Level of Service (Worst Movement)	LOS C			
Level of Service (Worst Lane)	LOS C			
95% Back of Queue - Vehicles (Worst Lane)	4.3	veh		
95% Back of Queue - Distance (Worst Lane)	31.0	m		
Total Effective Stops	696	veh/h	835	pers/h
Effective Stop Rate	0.52	per veh	0.52	per pers
Proportion Queued	0.32		0.32	
Performance Index	23.7		23.7	
Travel Distance (Total)	813.1	veh-km/h	975.7	pers-km/h
Travel Distance (Average)	605	m	605	m
Travel Time (Total)	17.3	veh-h/h	20.8	pers-h/h
Travel Time (Average)	46.4	sec	46.4	sec
Travel Speed	46.9	km/h	46.9	km/h
Cost (Total)	560.10	$/h	560.10	$/h
Fuel Consumption (Total)	88.5	L/h		
Carbon Dioxide (Total)	221.5	kg/h		
Hydrocarbons (Total)	0.353	kg/h		
Carbon Monoxide (Total)	15.15	kg/h		
NOx (Total)	0.492	kg/h		

LOS (Aver. Int. Delay) for Vehicles is not applicable since the average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
LOS Method for individual vehicle movements and lanes: Delay (RTA NSW).

MOVEMENT SUMMARY

Site: Copy of AM Peak Existing + Trips

Australia Avenue and Murray Rose AvenueAM Peak Hour - Existing Volumes + Development Traffic
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Australia Ave- South											
1	L	43	10.0	0.148	8.6	LOS A	0.0	0.0	0.00	1.02	49.0
2	T	233	5.0	0.148	0.0	LOS A	1.4	9.8	0.00	0.00	60.0
3	R	307	0.0	0.265	10.2	LOS A	1.4	9.8	0.43	0.74	46.8
Approach		583	2.7	0.265	6.0	LOS A	1.4	9.8	0.23	0.47	51.5
East: Murray Rose Ave - East											
4	L	59	0.0	0.074	10.3	LOS A	0.3	2.3	0.43	0.71	46.8
5	T	29	0.0	0.238	25.0	LOS B	1.1	7.7	0.82	0.94	35.3
6	R	22	0.0	0.238	26.3	LOS B	1.1	7.7	0.82	0.97	35.0
Approach		111	0.0	0.238	17.4	LOS B	1.1	7.7	0.61	0.83	40.5
North: Australia Ave - North											
7	L	200	0.0	0.136	8.2	LOS A	0.0	0.0	0.00	0.72	49.0
8	T	274	5.0	0.136	0.9	LOS A	1.2	9.1	0.34	0.00	53.7
9	R	25	10.0	0.136	9.9	LOS A	1.2	9.1	0.42	0.90	49.0
Approach		499	3.2	0.136	4.3	LOS A	1.2	9.1	0.21	0.34	51.5
West: Murray Rose Ave - West											
10	L	27	0.0	0.622	34.5	LOS C	4.3	31.0	0.81	1.05	30.9
11	T	82	0.0	0.617	33.3	LOS C	4.3	31.0	0.81	1.09	31.1
12	R	42	10.0	0.619	35.1	LOS C	4.3	31.0	0.81	1.12	30.8
Approach		152	2.8	0.618	34.0	LOS C	4.3	31.0	0.81	1.09	31.0
All Vehicles		1344	2.7	0.622	9.5	NA	4.3	31.0	0.32	0.52	46.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS C. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.

INTERSECTION SUMMARY

Site: Copy of PM Peak Existing + Trips

Australia Avenue and Murray Rose Avenue PM Peak Hour - Existing Volumes + Development Traffic
Giveway / Yield (Two-Way)

Intersection Performance - Hourly Values				
Performance Measure	Vehicles		Persons	
Demand Flows (Total)	1551	veh/h	1861	pers/h
Percent Heavy Vehicles	3.0	%		
Degree of Saturation	0.751			
Practical Spare Capacity	6.5	%		
Effective Intersection Capacity	2065	veh/h		
Control Delay (Total)	3.93	veh-h/h	4.72	pers-h/h
Control Delay (Average)	9.1	sec	9.1	sec
Control Delay (Worst Lane)	47.9	sec		
Control Delay (Worst Movement)	48.1	sec	48.1	sec
Level of Service (Aver. Int. Delay)	NA			
Level of Service (Worst Movement)	LOS D			
Level of Service (Worst Lane)	LOS D			
95% Back of Queue - Vehicles (Worst Lane)	5.6	veh		
95% Back of Queue - Distance (Worst Lane)	39.3	m		
Total Effective Stops	619	veh/h	743	pers/h
Effective Stop Rate	0.40	per veh	0.40	per pers
Proportion Queued	0.35		0.35	
Performance Index	26.7		26.7	
Travel Distance (Total)	938.6	veh-km/h	1126.3	pers-km/h
Travel Distance (Average)	605	m	605	m
Travel Time (Total)	20.0	veh-h/h	24.0	pers-h/h
Travel Time (Average)	46.4	sec	46.4	sec
Travel Speed	46.9	km/h	46.9	km/h
Cost (Total)	637.82	$/h	637.82	$/h
Fuel Consumption (Total)	98.0	L/h		
Carbon Dioxide (Total)	245.4	kg/h		
Hydrocarbons (Total)	0.381	kg/h		
Carbon Monoxide (Total)	15.17	kg/h		
NOx (Total)	0.520	kg/h		

LOS (Aver. Int. Delay) for Vehicles is not applicable since the average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
LOS Method for individual vehicle movements and lanes: Delay (RTA NSW).

MOVEMENT SUMMARY

Site: Copy of PM Peak Existing + Trips

Australia Avenue and Murray Rose AvenuePM Peak Hour - Existing Volumes + Development Traffic
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV	Deg. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	v/c	sec		veh	m		per veh	km/h
South: Australia Ave- South											
1	L	14	10.0	0.190	8.6	LOS A	0.0	0.0	0.00	1.11	49.0
2	T	626	5.0	0.191	0.5	LOS A	1.4	9.9	0.15	0.00	56.9
3	R	59	0.0	0.191	9.4	LOS A	1.4	9.9	0.35	0.88	48.9
Approach		699	4.7	0.191	1.5	LOS A	1.4	9.9	0.17	0.10	55.9
East: Murray Rose Ave - East											
4	L	300	0.0	0.334	10.1	LOS A	1.9	13.3	0.45	0.73	46.9
5	T	15	0.0	0.737	46.7	LOS D	5.6	39.3	0.94	1.27	25.9
6	R	134	0.0	0.751	48.1	LOS D	5.6	39.3	0.94	1.26	25.8
Approach		448	0.0	0.752	22.6	LOS D	5.6	39.3	0.61	0.91	36.9
North: Australia Ave - North											
7	L	64	0.0	0.082	8.2	LOS A	0.0	0.0	0.00	0.86	49.0
8	T	243	5.0	0.082	1.6	LOS A	0.9	6.7	0.37	0.00	53.5
9	R	1	10.0	0.081	11.4	LOS A	0.9	6.7	0.58	0.96	48.9
Approach		308	4.0	0.082	3.0	LOS A	0.9	6.7	0.29	0.18	52.4
West: Murray Rose Ave - West											
10	L	69	0.0	0.317	21.6	LOS B	1.6	11.4	0.71	0.96	37.6
11	T	5	0.0	0.310	20.3	LOS B	1.6	11.4	0.71	0.92	38.0
12	R	20	10.0	0.317	22.2	LOS B	1.6	11.4	0.71	0.95	37.6
Approach		95	2.1	0.317	21.6	LOS B	1.6	11.4	0.71	0.96	37.6
All Vehicles		1551	3.0	0.751	9.1	NA	5.6	39.3	0.35	0.40	46.9

LOS (Aver. Int. Delay): NA. The average intersection delay is not a good LOS measure for two-way sign control due to zero delays associated with major road movements.
Level of Service (Worst Movement): LOS D. LOS Method for individual vehicle movements: Delay (RTA NSW).
Approach LOS values are based on the worst delay for any vehicle movement.