Preliminary Traffic and Transport Strategy for Draft Built Environment Plan (Stage 1)

September, 2006

Redfern-Waterloo Authority

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Contents

Contents (continued)

Page Number

Contents (continued)

Page Number

List of tables

List of figures

List of appendices

Executive summary

Parsons Brinckerhoff Australia (PB) was engaged by the Redfern-Waterloo Authority to prepare a preliminary transport and traffic strategy to support its Draft Built Environment Plan which was then on exhibition (April-May, 2006). The Redfern Waterloo Authority's Draft Built Environment Plan required a transport context for the entire area of its interest, as well as detailed traffic advice on the potential implications of development of two of the eight key sites included in the Plan; North Eveleigh and the site defined by Redfern Station and Gibbons, Lawson, Regent and Margaret Streets. The purpose of the Transport and Traffic Strategy was to investigate and confirm that these sites could meet their proposed development yields without generating unsustainable levels of car traffic.

Traffic surveys were done of the area that showed traffic levels for the most part have fallen in the area since the opening of the Eastern Distributor and Cross City Tunnel. Heavy vehicle traffic was low, except on Gibbons and Cleveland Streets. Pedestrian numbers were high along all roads, but especially PM access to the Redfern Railway Station from Surry Hills and Redfern on Gibbons Street, and AM access from the Station to the University of Sydney.

To inform the development of the preliminary strategy, analysis was carried out of submissions on the draft BEP that related to traffic, and agencies such as RTA, DOP, RailCorp, State Transit and the City of Sydney, were interviewed

The elements of the proposed preliminary strategy were:

A set of aims for the transport and traffic strategy – Those listed on page 26 of the draft Built Environment Plan (BEP) were the basis, and these were confirmed as feasible by testing future traffic levels and management schemes.

An adopted road hierarchy – the existing road hierarchy as defined by present traffic levels was confirmed (Figure 4-1) as the traffic impacts of the key strategic sites would not alter it. A few investigations were suggested for traffic model testing in terms of potential change to the road hierarchy: the impact of the new access to ATP from Henderson Road, which is under construction; a more direct link between the CBD and the ATP via Boundary Street, and investigation of reducing some on-street parking in Shepherd Street.

A public transport orientation – this is expressed through improved bus route performance in Gibbons and Regent Street, as delivered by RTA's Strategic Bus Corridors program, and better connections in the public domain between local bus stops, Redfern Railway Station Access and the Redfern Street pedestrian upgrade project. Parking controls would be applied to support this objective, too.

An identified network of pedestrian and cycle routes – The City of Sydney's upgrade of Redfern Street is leading a reorientation of the access to Redfern Railway Station and other potential upgrades in the public domain of the station. RWA is constructing a new pedestrian access to Wilson Street opposite Codrington Street. South Sydney Council (Figure 4-5) developed quite a good cycle network that is being extended by RWA through the new pedestrian and bicycle bridge across the rail lines between the ATP and North Eveleigh. This project will connect the off-road cycle path in ATP with the shared zone in North Eveleigh and the Wilson Street cycleway. Lawson Street is maintained as a significant bicycle route

A traffic model that can estimate future traffic impacts – a full traffic impact assessment was carried out of the key strategic sites of North Eveleigh and Redfern Railway Station, Gibbons and Regent Streets which indicated that the traffic control measures proposed resulted in little impact on present traffic conditions other than some adjustment to traffic signals timings in 2016 and some potential loss of on-street parking to lengthen turning bays in Lawson and Shepherd Streets. This assessment was based on the present road network. However, before changing the road networks, a more complex assessment is required, such as through an area-wide Paramics traffic simulation model, that would describe interaction of future impacts and allow contributions to be assessed from developers of the key strategic sites.

A parking policy to manage vehicle use – the provisions of South Sydney's former parking policy, DCP 11, were found to be a good fit for the development objectives of the site, but additional restrictions should be placed on sites immediately adjacent to Redfern Railway Station to achieve a no more than a 40% travel share to private vehicles across the RWA area. As well as on-site parking provision, commercial vehicles need to be managed throughout the day. Again DCP 11 has suitable provisions. These could be supported by the foundation of a Transport Management Group (TMG) for the key sites, which would be handed over to occupants when developments are occupied. The TMG would liaise with transit service providers, the City of Sydney Traffic Committee on kerb-side controls, and coordinate on-site vehicle regulations.

In specific terms relating to the key strategic sites, the proposed redevelopments at North Eveleigh and Redfern Railway Station, Gibbons & Regent Streets sites are expected to generate approximately 1,560 vehicle trips during the AM peak hour. The report explains why this is more realistic forecast than the 3,800 trips that would result from applying the generic RTA formula. When the trips generated from the proposed developments were then added to the background traffic for the future year of 2016, the key roads were determined to have sufficient capacity for the future demand. Using intersection modelling software to analyse the performance of key intersections under pre-development and post-development conditions in 2016 showed that

- key intersections would operate at an acceptable level of service of B or better during both the morning and afternoon peak periods in 2016 with considerable capacity remaining

- with post-development traffic conditions, Abercrombie Street-Shepherd Street, Abercrombie Street-Lawson Street and Cleveland Street-Shepherd Street would require minor modifications to operate acceptably. These included adjustment to the signal phase timing and some lengthening of turn bays through a local reduction in on-street parking.

Major site access to North Eveleigh was recommended to Wilson Street at the existing T-junction between Queen and Forbes Streets and opposite the roundabout at Shepherd Street. A potential minor access could be developed opposite Ivy Street. Frontage properties should have combined access to minimise the impact on parking and the cycleway. Access to the commercial sites on Gibbons and Regent streets should be via the laneways, although not at the expense of key pedestrian links to Redfern Street.

A supplementary task to improved traffic management would be a comprehensive directional sign program for all site users; cars, trucks, transit passengers, pedestrians, cyclists and delivery services.

The next stages in developing the transport and traffic strategy would involve:

Improvements to pedestrian access to Redfern Railway Station – which could range from putting Gibbons Street's two through-traffic lanes in an underpass, to altering the one-way/two-way flows of traffic on Regent and/or Gibbons Streets, to tidying up the Gibbons Street frontage of Redfern Railway Station.

Development of an area-wide traffic simulation model – to measure the impact of network changes and measure the contribution of individual development sites to that change. This model would be an effective tool to assess the traffic impacts of the pedestrian improvement projects.

1. Introduction

Parsons Brinckerhoff Australia (PB) was engaged by the Redfern-Waterloo Authority to prepare a preliminary transport and traffic strategy to support its Draft Built Environment Plan which was then on exhibition (April-May, 2006). The Redfern Waterloo Authority's Draft Built Environment Plan required a transport context for the entire area of its interest, as well as detailed traffic advice on the potential implications of development of two of the eight key sites included in the Plan; North Eveleigh and the site defined by Redfern Station and Gibbons, Lawson, Regent and Margaret Streets. The purpose of the Transport and Traffic Strategy was to investigate and confirm that these sites could meet their proposed development yields without generating unsustainable levels of car traffic.

Other large scale redevelopments in the vicinity, such as the Kent Brewery and Green Square will claim capacity on the same road and transit networks, while existing businesses and residents want to maintain acceptable levels of amenity and safety in their neighbourhoods. To respond to this, the preliminary Transport and Traffic Strategy was developed within a framework with clear principles on safety, amenity, road hierarchy and transport choice to guide future local Transport Management Plans. It also considered the strategies of overarching authorities and previous local traffic studies, some prepared in consultation with the local community, that have proposed transport and traffic improvements for the area, to ensure that those plans inform the new Strategy.

1.1 Context for the transport and traffic strategy

Under the NSW government's Metropolitan Strategy *City of Cities: A Plan for Sydney's Future* (2005), the Redfern-Waterloo area is part of the Sydney CBD to Sydney Airport economic corridor. This, in turn, is a critical part of Australia's broader global economic activity corridor, extending from North Ryde to the Airport. The Redfern-Waterloo area is within the expanded boundaries of the City of Sydney and contains the same dense, urban accessibility to the region that is present in the central business district (CBD). To achieve the outcomes in the Metropolitan Strategy, the State has nominated several strategic sites adjoining Redfern Railway Station that are government owned and provide the opportunity for increased residential and employment development adjacent to high quality public transport services, the Sydney CBD and significant health and education facilities.

The Redfern-Waterloo Authority (RWA) was established in early 2005 to provide an overall framework for revitalising its operational area through urban renewal, job creation, improvements to the physical environment and improvements in the provision of human services. Transport infrastructure and services are important contributors to successful redevelopment of the Redfern-Waterloo area. The NSW Government is a significant landowner in the area, and manages key transport assets such as Redfern Railway Station, the bus services, the arterial pair of Gibbons and Regent Streets, and boundary arterial routes, Cleveland Street, City Road and Henderson Road.

The principal functions of the RWA are to promote and undertake the economic development and use of surplus government land, including the provision of infrastructure and improvement of public spaces. The RWA must also provide and promote employment opportunities and housing choice for local residents and manage and encourage cultural activities.

Under the Redfern-Waterloo Act, the responsible Minister is required to prepare a Redfern-Waterloo Plan to provide an overall framework for the revitalisation of the operational area. The Redfern-Waterloo Plan is to contain three major components; a Built Environment Plan, a Human Services Plan, and an Employment and Enterprise Plan. The Built Environment Plan (Stage 1) was prepared to provide a planning framework for the redevelopment of the RWA's strategic sites within its operational area as shown in Figure 1-1. This preliminary transport and traffic strategy focuses on two of these sites.

1.2 The study area

Source: RWA Draft Built Environment Plan, 2006

Figure 1-1 The Redfern Waterloo Authority's operational area, with RWA's strategic sites

While this report sets a traffic context for the whole of RWA's Operational Area, the two sites that are looked at in detail in this Strategy are Site B, the North Eveleigh zone and Site E, defined by Redfern Railway Station, Lawson and Gibbons Streets. The purpose of this preliminary Transport and Traffic Strategy is to propose traffic management measures so these sites can reach their proposed development yields without generating unsustainable levels of car traffic. The main means of achieving this will be through a high future use of public transport, walking and cycling by the residents, workers and visitors travelling to and from the area.

The transport and traffic demands from the sites have to be managed within the urban context of the Sydney region and under a metropolitan context. Other redevelopments such as the Carlton United Brewery (CUB) and Green Square will claim capacity on the same road and transit networks, while existing businesses and residents will want to maintain acceptable levels of amenity and safety in their neighbourhoods. To allow for this, the preliminary Transport and Traffic Strategy proposes a framework of clear principles on safety, amenity, road hierarchy and transport choice to guide future development of a Transport Management Plan for the Redfern-Waterloo Area.

The Redfern-Waterloo area has been subject to many earlier investigations, yet critical regional inputs on transport planning have not been finalised by government, so the direction rather than forecasts have been addressed. This proposed preliminary strategy has reviewed recent studies in the area and attempts to align the preliminary Transport and Traffic Strategy with the Metro Strategy's Transport Strategy, RTA's vision for roads in the sub-region, and relevant planning by transit services. Proposed transport and traffic improvements for the area have been incorporated into the preliminary Strategy.

1.2.1 North Eveleigh

The sites themselves are not without context. North Eveleigh (Site B) in Darlington is adjacent to an historic residential area with neighbourhood businesses, close to Sydney University. The site was a major employment centre when the government railway shops and support services were located here around the beginning of the 20th century. Now these surplus rail buildings are either being adapted or replaced in three general land-use zones.

The middle zone is predominantly cultural and heritage in use, and contains buildings like the Carriage workshop which is being refurbished as an exciting performance space, or the Carpenters' Shop/Canteen, which is becoming a training centre for the service industry. Construction is currently underway, and new access has to be constructed for pedestrians and vehicles to use the site directly.

To its north, that part of North Eveleigh immediately adjacent to Redfern Railway Station, is the potential site for a landmark development. The Built Environment Plan (Stage 1) called for its character to be predominantly mixed business and residential. It contains a number of properties with access to Wilson Street that will continue as they are now, but extensive redesign and augmentation of the internal transport infrastructure for the bulk of the site between the rail lines and Wilson Street will be required. Whatever use is finally developed on site has to be an effective partner of a renovated Redfern Railway Station.

The southern portion of the site contains no structures of note, and is proposed to be essentially renewed and residential in character, to compliment and buffer the integration with the rest of Darlington.

1.2.2 Redfern Railway Station, Gibbons and Regent Streets

Site F surrounds Lawson Square and contains the twin towers of the former TNT headquarters that are so prominent on the city's southern skyline. Now containing various businesses, including local and state government offices, the structures are advantageously located adjacent to Redfern Railway Station, but are no longer prime office stock as business requirements have changed. With the refurbishment of Redfern Station currently underway, these properties will be key beneficiaries of the improvements, not only from better train access to their site, but from a regional strategic bus corridor, too, and an improved interchange between the two. The one-way arterial road pair of Regent and Gibbons Streets also give the site high sub-regional road accessibility, but at a price. The heavy traffic flows restrict pedestrian flows, create amenity problems with noise and fumes from the through traffic, and provide an alternative route to the harbour crossings for over-height trucks and those with hazardous freight than cannot use the motorway tunnels.

1.3 Report structure

Planning for transport is integrated with the land use development of the area and the regional role of the area. Therefore, the structure of this report is:.

Chapter Two	Describes key aspects of the draft Built Environment Plan (Stage 1) that relate to a policy basis for a transport and traffic strategy.
Chapter Three	Details a review of earlier transport studies and summarises discussions with officers from stakeholder agencies in transport and the City of Sydney.
Chapter Four	Examines the existing transport and traffic conditions generally in the operational area, and specifically those found around the two key redevelopment sites of North Eveleigh, and Redfern Railway Station, Gibbons and Regent Streets.
Chapter Five	Describes the overarching principles of the preliminary transport and traffic strategy.
Chapter Six	Applies the transport and traffic strategy to the proposed levels of use for the two key redevelopment sites of North Eveleigh and Redfern Railway Station, Gibbons and Regent Streets, and assesses the likely traffic and transport impacts.
Chapter Seven	Looks at the next steps in implementing the Transport and Traffic Strategy

2. Overview of the draft Redfern Waterloo Built Environment Plan (Stage 1)

Stage 1 of the draft Built Environment Plan (BEP) was put on public exhibition for two months from February until April, 2006. An amendment to the State Environmental Planning Policy (Major Projects) that enabled the BEP to be carried forward was also on exhibition at the same time. The following sections summarise aspects of the draft BEP that relate to establishing the policy basis for transport and traffic planning in the area.

2.1 Sustainable outcomes

The principles of sustainable development underpin the draft BEP and the amended SEPP (Major Projects) for the RWA strategic sites.

To achieve a more viable economic environment – the draft BEP provides for greater employment for local residents and the wider metropolitan area. It encourages high quality developments where retail, cultural and commercial businesses can provide jobs for the local and broader Sydney community. Not only will a stronger local economy mean greater investment to improve the places and spaces in the area, but there should be a reduction in trips lengths for workers, and more locals in the workforce. This is a multiplying benefit.

To achieve an improved social and cultural environment – the draft BEP promotes increased housing provision, choice and affordability, safety and access, activation of sites adjoining residential areas currently degraded and underutilised. By fostering retail and employment activity, and offering quality community, cultural and civic spaces for residents, workers and visitors more activities are undertaken locally and by modes other than driving. A greater sense of security will also promote walking and cycling over longer periods of the day.

To achieve an improved physical environment - the draft BEP envisages a place with a built form and civic spaces that responds to its context, provides for increased emphasis on public transport, improves access and connections and attracts investments that value environmentally sustainable outcomes. For example, redevelopments should feature reduced energy and water consumption and responsible waste management. The preliminary transport and traffic strategy will need to plan for the correct infrastructure to make transit use more attractive, and work with service providers to ensure service levels are maintained at attractive levels. A direct, safe and accessible pedestrian network is critical.

To achieve a strong governance structure - the draft BEP is supported by a SEPP which will provide the guidelines for future development, and the initiatives of the Human Services Plan and the Employment and Enterprise Plan. On-going governance will be needed to maintain excellence in transit management. One outcome may be delegation to a local transport agency to promote use of non-vehicular modes through direct action and perhaps through service levels. Local needs will be built into road and cycle service plans.

2.2 Transport and traffic strategy principles

On page 26 of the draft BEP, there is a discussion of how the area can capitalise on the high level of accessibility it already has in the metropolitan area to become a destination and origin of trips, as well as maintaining its importance as a place of transfer.

Redevelopment of Redfern Railway Station – the investment in a more attractive, functional and accessible railway station will be the primary catalyst for Redfern to become a destination. It is almost a necessary precursor to redevelopment if the target travel behaviour is to be achieved.

Management of traffic generated from new development - For non-residential land, a target mode-share of 60% non-car use has been chosen for journey to work trips. A parking policy will support this objective, which will be enforced through a Development Control Plan, guided by land use category and location.

Improved connections to bus services – in order to maximise the travel benefits from its rail and bus services, better public domain solutions will be pursued to connect the bus services to each other and the railway station.

Improved traffic operations on Regent and Gibbons Streets – the draft BEP seeks a better balance between the regional traffic roles for this arterial pair of one-way roads and local amenity and revitalised retail operations. On-street parking is being encouraged to aid both objectives, and there will be further investigations of options for pedestrian and traffic improvements on the roads, to discover potential benefits, and whether they can be sustained regionally.

Improved connections between the Australian Technology Park (ATP) and North Eveleigh – to overcome the barrier of the rail lines, the draft plan identifies the need for improved vehicle, pedestrian and cycle connections between the two areas. To this effect, the RWA has committed to construct a pedestrian/cycle bridge.

Safe and easy cycling in the area – the draft plan proposes to enhance the existing cycle network through good connections to the key strategic sites and through the inclusion of cycle terminal facilities in new development, such as secure parking, showers and change rooms.

These principles represent the base policy carried over into the preliminary transport and traffic strategy.

2.3 The elements of a transport and traffic strategy

The essential elements of the proposed preliminary strategy are:

1. a set of aims for the transport and traffic strategy so that the intentions of any guidelines are clear and can be reasonably applied to relevant sites as they are seeking approval for redevelopment
2. an adopted road hierarchy is essential so appropriate efficiency and amenity levels can be established for each road, and then applied in how they relate to adjacent land uses. This will include identifying which roads are suitable for bus services, pedestrian facilities, cycle ways, on-street parking and which would require risk assessment for safety review when roles outside the guidelines are proposed
3. a public transport improvement program so that service providers can respond to increased demand, infrastructure can be programmed that enhances the likelihood of transit being used, and the community can engage in understanding and increasing its use of public transport modes
4. an identified network of pedestrian and cycle routes that encourage the use of these modes for travel to destinations and to public transport modes
5. a traffic model that can estimate future traffic impacts of proposed developments or proposed network changes
6. a parking policy that seeks to manage the demand for car use so that other modes are more competitive, while not leading to excessive demand for on-street parking in the adjacent neighbourhoods as there is not a great supply of public parking in the area.

A policy for the management of commercial traffic that enables business to be carried out efficiently in the area with minimal additional demand for vehicle travel to and from the employment sites.

3. Consultation on transport and traffic

The RWA, while it is charged with achieving better outcomes for its area, is not a road authority or transport service provider. Understanding and working with the road authorities and transport service providers will be essential for realising future improvements. Inputs from stakeholders into the transport and traffic future for the area were taken from past reports and submissions, interviews with relevant officers in government authorities and review of the comments received on the draft BEP.

3.1 Reviewing the policy environment

The Sydney Metropolitan Strategy, *City of Cities: A Plan for Sydney's Future*, outlines a direction to support the use of more sustainable modes to locations with good public transport access and support the Government's investment in public transport. It endorsed the Department of Planning and RTA issued *Guidelines for Walking and Cycling* (January, 2005). The Strategy recognises the importance of controlling parking provision in order to encourage the use of non-car modes and to have a uniform approach to parking provision across centres. To that end, the Transport Section of the Department of Planning is leading a Working Group to prepare a metropolitan parking policy to address parking supply and parking management in centres to deliver the visions of the Metropolitan Strategy. A first draft is expected to be available for consultation in late 2006.

A representative of the Working group advised that the Parking Policy will have a strong focus on major centres, areas adjacent to centres, and within corridors. The Policy will address how parking should be addressed in these areas, such as whether or not the provision of commuter parking is warranted and whether or not to provide parking at railway stations. Another focus will be on how to treat kerbside parking which may be influenced by factors such as the need to provide clear bus priority lanes and the RTA's time of day approach to managing capacity on roads through parking controls.

Under SEPP 11, the RTA produced a *Guide to Traffic Generating Developments* that was intended to ensure that proposed developments contained sufficient provisions that they did not create problems on the road network and that adequate provision of parking was provided on-site, thus minimising the potential for parking overflow onto surrounding streets. Generally, developments were required to provide the minimum levels of parking set out in these guidelines by consent authorities trying to treat all applicants equitably. Providing parking below the rates had to be argued by the applicant, meaning this policy generally favoured developments which provide the minimum levels set out in the guide. RTA is currently looking at revising these guidelines to take into account the policy directions of the Metropolitan Strategy. A representative from RTA advised that the approach would be similar to that advocated in the draft Integrated Land Use and Transport SEPP 66. The proposed approach is centre-focussed and will scale a site's propensity to generate private car trips and to manage parking demand based on proximity to transit services, the mix of uses in the area, and transit loading factors that relate to the relationship of the centre in the network to other centres.

3.2 Earlier studies of the area

The Eveleigh CarriageWorks Transport management plan (TMP) had objectives to restrict parking supply on-site, to provide strong pedestrian linkages to Redfern Railway Station and surrounding areas and to maintain an acceptable level of service for vehicles using the local road network. The original calculation of parking provisions for the development was derived using South Sydney Council's DCP 11, however, the outcomes of this analysis found that those parking provisions on site might lead to an unrealistic mode share target for employee travel by modes other than car to the site, and therefore, overspill parking in the local area. As the car mode share then in nearby sites was around 40.5%, a less stringent parking provision accounting for 90% of expected car demand was applied (less than 100% in order to exert some negative pressure on car usage). The provisions were closer to the City of Sydney (CoS) Council's code then extent codes than the South Sydney standards. Conditions have changed as traffic growth has been constrained in the area and fuel prices have soared, and are expected to remain high. The more rigorous constraint of DCP 11 or the CoS's commercial parking code now appears warranted.

The Australian Technology Park (ATP) *Master Plan Transport Study* (Colston Budd, 1994) presented long term parking objectives for the site that achieved a modal split of approximately 25% car use, 10% walk/taxi/cycle/motorcycle/other and 65% bus/rail. The Study proposes approaches to encourage the use of public transport. The later *Parking Policy and Management* (1998) document outlined the longer term parking policy for the ATP as encouragement of travel behaviour towards use of public transport/walking/cycling by ATP tenants and visitors, achieved mainly through rationing the supply of car parking spaces on-site.

Other issues highlighted in the Masson Wilson and Twiney report *Australian Technology Park Transport Management Plan* (2002) were options for an improved connection between the ATP and the CBD, which selected a reconfiguration of Boundary Street to form a more direct connection between the site and the arterial road network to the CBD and Sydney Airport. Their later study, *ATP Draft Amendment #1 for a Proposed Access Intersection* (2002) recommended a new intersection with Henderson Road, at its junction with Mitchell Road, to be the main entrance to the ATP from the south and west. Construction of this intersection has recently commenced. The Department of Public Works and Services (1998) looked at local traffic benefits of options for connecting North Eveleigh to the ATP via a road tunnel under the rail lines. This was exhibited in the draft BEP. Also shown in the draft BEP was another connection across the train lines further north, towards Redfern Railway Station, for pedestrians and cyclists, where the crossing could be narrower.

In terms of bus service reform, in 2004, former Premier Barry Unsworth, chaired a taskforce that issued a *Review of Bus Services in New South Wales*. Many of the regulatory reforms suggested are being progressed by the Ministry of Transport, but the Strategic Bus Corridors identified are to be implemented by the RTA. Strategic bus corridors are a network of roads that link regional centres. All those identified are to be reviewed by the RTA to ensure that in the future bus services along them will have sufficient priority to provide fast, frequent convenient and direct services. The RTA is implementing the upgraded bus priority in stages.

3.3 Responses from stakeholder agencies

As well as the comments described above in the policy section, the following responses have been made in interviews with other government agencies:

3.3.1 Roads and Traffic Authority

During the course of this study, PB contacted RTA officers in the Network Planning and Traffic Management directorates who look after parking policy, strategic bus corridors, traffic flow issues and major development reviews. PB's key conclusions from those discussions are summarised below.

- RTA does not have an official position on traffic issues associated with in-fill development targeted in the Metropolitan Strategy. Draft SEPP 66 still applies, but it is revising its SEPP 11 guidelines as discussed in Section 3.1 and refers to its Guidelines for Walking and Cycling
- RTA has not yet adopted a formal position on the future of the Southern Arterial or its components, such as Gibbons and Regent Streets. The arterial roads will remain a major access to the City given the growth in airport traffic and Green Square, so RTA wishes to preserve, but not necessarily increase the traffic capacity of the route
- in terms of the local environment, the Minister for Roads has recently allowed the clearways requirement along Regent Street to be lifted so on-street parking may be allowed
- the RTA has no objection to RWA investigating cut and cover proposals for Gibbons Street, although it is generally not disposed towards contributing financially to such investigations. The main RTA concerns would be preservation of the traffic capacity in the corridor and no actions to undermine the strategic bus corridor. Gibbons Street is a hazardous goods route, an alternate route to Airport Motorway for goods that cannot use tunnels
- while Gibbons and Regent Streets are part of the Unsworth Strategic Bus Corridor program (Rte 21, Miranda to CBD), they are unlikely to be studied for a bus priority improvement program of works until 2007 (3rd tranche of studies)
- RTA has no issues with the current road hierarchy
- RTA is concerned about a road tunnel proposal between north and south Eveleigh, and would wish to see more analysis before adopting a position.

3.3.2 NSW Department of Planning

As well as the urban structure aspects of the Sydney Metropolitan Strategy referred to in the previous chapter, another key action for the Department in relation to this site is its role in developing a Metropolitan Parking Strategy. The Department's mandate is outlined in action D.3.2.1 - to develop and implement a metropolitan-wide parking policy for Sydney.

The development of the Metropolitan Parking Policy is in its early phase, and is being lead by the Transport Division of the NSW Department of Planning. An officer of this Section was interviewed in May, 2006. A group composed of representatives from Government agencies has been set up to guide the development of the Policy. This group is currently scoping the issues and aspects to be addressed in the new Policy. No draft document has yet been prepared, and it is anticipated that the first draft will be available in later 2006. In a parallel process, the RTA is reviewing its (SEPP 11) *Guide to Traffic Generating Development*, notably in relation to on-site parking rates where circumstances such as good access to public transport should allow the required parking to be reduced.

The draft (SEPP 66) Integrated Land Use and Transport planning package was considered a useful policy under which to find principles and objectives common to those that would direct development of the Metropolitan Parking Policy. One objective for the Policy would be to provide a consistent, metropolitan-wide framework for parking provision, and to remove competing approaches in the different regions throughout Sydney. The Policy intends to provide a framework for local Councils to guide the preparation of their parking policies.

The Parking Policy will work to encourage the use of public transport, particularly in areas where there is a good provision of public transport services. The objective is to encourage sustainable transport by controlling the provision of car parking and aiming to generate a mode shift towards public transport use. It will have a strong focus on major centres, areas adjacent to centres, and within corridors. The Policy should address how parking should be managed in these areas, such as whether or not the provision of commuter parking is warranted at certain railway stations. Another focus would be how to treat kerbside parking. Policy on kerbside parking will be influenced by factors such as the need for bus lanes and the RTA's approach to enforcing kerbside parking.

3.3.3 City of Sydney

In an interview with the Senior Manager Transport, the following observations were noted:

- the City is interested in preserving a future transit corridor along the Botany Road Corridor as it has already been nominated as a Strategic Bus Route, and it would like to see the RTA abandon any planning that maintains or extends operations of the one-way pair within this corridor
- the City is preparing an integrated transport strategy which will be released later this year. It will tend to focus on linking the City's villages and investigating the potential for the light rail options suggested in the Christie report, or Long-term Rail Plan for Sydney (2001), released under FOI by the NSW government
- the City would like to see the operation for bus rail interchange in the vicinity of Redfern Station improved and a general upgrade in public transport in the Gibbons/Regent Streets corridor
- the City's upgrade of Redfern Street is an important pedestrian initiative and should be integrated with RWA's pedestrian network and reinforced by additional transit service upgrades
- in terms of cycle routes, the City would promote better integration with Henderson Road
- the Traffic Section is looking at the future of LATM in Redfern and a brief has been released to consultants
- issues of parking provision will be addressed in the LEP review underway in the Planning Section of Council.

3.3.4 State Transit

How bus services are planned and operated in NSW was changed in 2004 with the State's adoption of the Unsworth bus service reform proposals. While the Ministry of Transport (MOT) now has the regional route planning role for bus routes in Sydney, especially in the strategic corridors, operations remain the responsibility of the contractor for the region. All of RWA's area of management falls within the Inner Sydney East region (contract 9) operated by State Transit. While the MoT made a submission on the draft BEP outlining its new role, the planning group within Sydney Buses had the following observations to make:

- intensive redevelopment of this area is generally supported given its close proximity to frequent bus services
- interchange does occur around Redfern Railway Station, but placement of the bus stops makes it awkward for passengers and operators, it would be keen to see the pedestrian network improved with the redevelopment of Redfern Railway Station
- if two way traffic operations are restored to Gibbons and Regent Streets, it would prefer to operate in Gibbons Street to remain close to Redfern Station for interchange
- Sydney Buses is interested in participating in any Transport Steering Group that is established by RWA or the Redfern Railway Station upgrade project, although a single organisation is preferred.

3.3.5 RailCorp

RailCorp is committed to the upgrade of Redfern Railway Station, which is a major and historic passenger facility in the Sydney's rail network. It has recently made funds available for a Concept Design Study of the station in conjunction with the RWA. Consultants have been appointed, and have started work in mid-2006.

3.4 Summary of traffic and transport issues raised in submissions on the draft BEP

The draft BEP (Stage 1) was on exhibition for two months until 14 April 2006. As input into the preparation of a preliminary transport and traffic strategy for the area, PB reviewed the comments received that related to traffic and transport. A summary of the responses is found in Table 3-1.

The objective of PB's review was to extract the key issues relating to traffic and transport from the submissions. This information would feed into PB's development of a transport strategy for the area, ensuring PB had covered all applicable issues in the area. Submissions included letters from residents, landowners, local businesses, interest groups and government agencies.

The Redfern-Waterloo Authority received around 325 submissions during the public exhibition of the draft BEP, about a third of which raised at least one traffic or transport issue.

Table 3-1 Frequency of issues being raised in submissions

Broad Topics	No. of comments relating to this topic
Potential increased traffic with the development of Marian Street Park	32
Concerns with future traffic and access to North Eveleigh	
▪ Increased traffic and parking problems for residents in Darlington	28
▪ Concerns over access to redevelopment, not wanting local, narrow streets such as Iverys Lane or Shepherd Street, to be impacted	9
Desire to be consulted and know the transport/traffic plan before BEP is adopted	24
Support for more pedestrian and cycle links	19
Insufficient traffic assessment of proposals for the Redfern Station, Gibbons and Regent Street site	17
General concern that more traffic information was needed	17
General need to upgrade the transit services in the area	16
Support for the urgent upgrading of Redfern Railway Station	11

Of the letters received, 108 identified issues or concerns about traffic and transport in the area. This included the potential impact of increased density on the strategic sites on roads and transit services. Some comments were general, while others raised concerns in regard to specific areas, such as the residential streets of Darlington or Marion Street. A number of requests were received asking for details on traffic and transport measures before the BEP was adopted.

33 letters highlighted issues with the proposed vehicular tunnel between North Eveleigh and the ATP, including how its traffic might impact the residents of Darlington.

4. Existing traffic conditions

An initial examination of the current traffic and how the systems perform is essential to understand the local environment and to set a benchmark against which to measure future system performance. PB got into detailed conditions at the two key sites it was asked to look at closely, North Eveleigh and Redfern Railway Station, Gibbons and Regent Streets. Some of the sites in North Eveleigh have not been occupied for some time, so redevelopment will mark a major change from current conditions. For the Redfern Railway Station site, there is current traffic generating activity, where the impact would arise from the increment of additional activity.

The street grid in the area is relatively fine, given the long established residential and commercial activity in the area and the relatively small land parcels through much of the area. The main passenger (and formerly freight) rail lines to the city also converge in this area, and they create a significant division between the land parcels on either side. There is only a single crossing of the rail lines within Redfern-Waterloo are, which is Lawson Street, with Cleveland Street on its northern boundary. Along the rail line there are a number of large land parcels that were formerly its main workshops. While rail activities still remain at the southern end of the site, many former workshops are being reused, such as at the Australian Technology Park and the CarriageWorks Contemporary Performing Arts Centre. However, much of the land to the west of the rail line is vacant or underutilised and is generating minimal traffic at present.

4.1 Existing road hierarchy

Roads within a network are classified according to a road hierarchy relating closely to their functional role within the road network and the volume of traffic they carry. The Roads and Traffic Authority (RTA) has defined four classes within the hierarchy of roads:

- Arterial Roads – predominately carry through traffic from one region to another forming the principal avenues for urban traffic movements. Typically traffic volumes would be in excess of 15,000 vehicles per day (vpd)
- Sub-arterial Roads – connect the arterial roads to areas of development or carry traffic directly from one part of a region to another, they may also relieve traffic on arterial roads in some circumstances. Typically traffic volumes would range from 5,000 vpd to 20,000 vpd
- Collector Roads – connect the sub-arterial roads to the local road system in developed areas. Typically traffic volumes would be in the range from 2,000 vpd to 10,000 vpd, but residential amenity would begin to decline with volumes in excess of 5,000 vpd
- Local Roads – are the sub-divisional roads within a particular developed area. These are used solely to provide local access, and typically carry low volumes, usually less than 2,000 vpd

- The existing road network in the study includes Regent Street, Gibbons Street, Cleveland Street, Lawson Street, Abercrombie Street, Shepherd Street, Wilson Street, Forbes Street, Golden Grove Street and Ivy Street. How these roads currently fit into a de facto road hierarchy is shown in Figure 4-1. This hierarchy is derived from the measured traffic volumes as they relate to the RTA classification. There is a separate classification of roads which relates not to use, but to responsibility. State roads are usually the high order routes, but they are built and maintained by the RTA. Regional roads are important traffic routes that are maintained by local government, but in recognition of their traffic role, RTA makes a payment to local government for their maintenance based on the total kilometres of regional roads in the municipality. Local roads are the sole responsibility of local government.

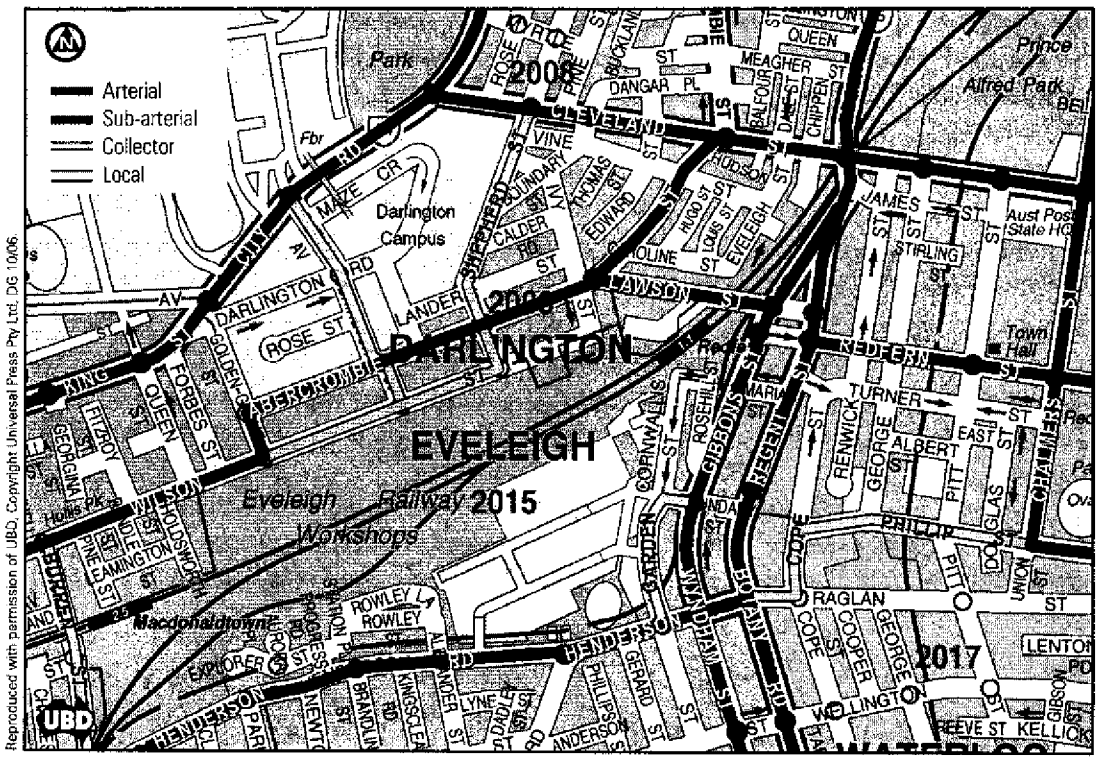


Figure 4-1 Road Hierarchy in 2006

Regent Street is a State road under RTA jurisdiction. RTA provides 100% of the funding towards its maintenance. It is part of a corridor the RTA has referred to as the Southern Arterial, that carries traffic between the CBD and the Airport, although this role has been reduced by the construction of the Airport Motorway. To its south, Regent Street becomes Botany Road and to its north, it connects to Lee Street and George Street. Regent Street is a one way southbound road between just north of Lawson Street to Henderson Road. It is a higher order arterial road and can be expected to carry in excess of 48,000 vpd immediately south of Cleveland Street, where it is a two-way road. It carries 25,000 vpd south of Henderson Road.

Regent Street, between Lawson Street and Henderson Road, is generally a four-lane road with a posted speed limit of 60km/h with a typical urban road cross-section (i.e. kerb and gutter on either side of the road). There are footpaths on both sides of the road which are heavily used. On-street parking is presently not permitted between Cleveland Street and Lawson Street, but is available between Redfern Street and Henderson Road. The RTA has recently permitted the extension of on street parking along Regent Street because of its commercial land use frontages.

Regent Street is also part of the proposed Miranda to CBD Strategic Bus Corridor (21). Due to the Airport Motorway being partially in tunnel, it also is an alternative route for trucks with over-sized or hazardous goods.

Gibbons Street is also a State Road under the jurisdiction of RTA. This route is in parallel with Regent Street, providing the northbound lanes in the arterial pair. To its south, Gibbons Street becomes Wyndham Street and just north of Lawson Street, the northbound and southbound lanes rejoin to become Regent Street. It is a higher order arterial road and carries approximately half of the Regent Street traffic, which is 24,000 vpd south of Cleveland Street.

Gibbons Street is generally a four-lane road with a posted speed limit of 60km/h, with a typical urban road cross section (i.e. kerb and gutter on either side of the road). There are footpaths on either side of the road which are well utilised, especially in the vicinity of Redfern Railway Station's entrance. On-street parking is generally permitted on Gibbons Street between Wyndham Road and Lawson Square. Gibbons Street is also part of the Strategic Bus Corridor and hazardous goods route. .

Cleveland Street is a State road, where RTA provides 100% of the funding towards its maintenance. Cleveland Street is a major arterial to the inner city and the eastern suburbs. Cleveland Street is a higher order arterial road and can be expected to carry in excess of 56,000 vpd. It is generally a four-lane, two-way undivided road with the posted speed limit of 60km/h with typical urban road cross section (i.e. kerb and gutter on either side of the road). On-street parking is generally not permitted on Cleveland Street during peak periods. It carries a high percentage of heavy vehicles. Its footpaths are not well used in this vicinity due to high traffic levels on the kerbside and limited land uses along the route that generate pedestrians.

Lawson Street is classified as a local road. Council provides 100% of the funding towards maintenance. It is a higher order local road, given it is one of the few connections across the main rail lines into the city, and provides access to the University of Sydney from the east and south. Lawson Street can be expected to carry traffic in the range of 7,000 vpd to 10,000 vpd which classifies it as a sub-arterial route. It is generally a two-lane, two-way undivided road with typical urban road cross section. The posted speed limit on Lawson Street is 50km/h. On-street parking is generally not allowed between Regent Street and Eveleigh Street, but is available between Eveleigh Street and Abercrombie Street. It plays a significant role in the pedestrian network, connecting Redfern Station, the University of Sydney and Redfern Town Centre. It is part of the cycleway that connects Wilson Street to Redfern Street.

Abercrombie Street is classified as a local road south of Cleveland Street, but an arterial road north of it. It is a connector between Cleveland Street and Golden Grove Street. Abercrombie Street can be expected to carry traffic in the range of 5,000 vpd to 8,000 vpd which classifies it as a sub-arterial route. It is generally a two-lane, two-way undivided road with typical urban road cross section. The posted speed limit on Abercrombie Street is 50km/h. On-street parking is generally available on Abercrombie Street. South of Lawson Street, it carries large numbers of pedestrians.

Shepherd Street is a local road under Council jurisdiction. It provides a connection to Cleveland Street and Wilson Street. Shepherd Street is a two-lane, two-way road with the posted speed limit of 50km/h, but some sections, particularly near Cleveland Street, are of sub-standard width. It carries in the range of 3,000 vpd to 5,000 vpd, classifying it as a collector road. On-street parking is generally available, and in heavy demand, on Shepherd Street.

Wilson Street is a local road under Council jurisdiction. It provides access to residential and commercial properties. Wilson Street is generally a two-lane, two-way road with the posted speed limit of 50km/h. Given it parallels the rail lines, there is little cross traffic. It can be expected to carry traffic in the range of 3,000 vpd to 5,000 vpd between Ivy Street and Golden Grove Street, classifying it as a collector road, but south of Golden Grove it carries traffic to Erskineville and Newtown from Abercrombie Road, so its function changes to sub-arterial. On-street parking is generally available, and is heavily used. Wilson Street contains an on-street cycleway which is popular and connects the Inner Western suburbs to the University of Sydney and the CBD.

Forbes Street is a local road under Council jurisdiction. It provides access to adjacent properties. It appears to carry less than 2000 cars a day, so it is a local road in the hierarchy, too. Forbes Street is a two-lane, two-way road with the posted speed limit of 50km/h, and is relatively wide in comparison with other streets in the area. It connects King Street with Wilson Street.

Golden Grove Street is a local distributor road under Council jurisdiction. It provides access to frontage properties. Golden Grove Street provides for two-way traffic with a relatively wide cross-section and connects King Street with Wilson Street, and carries traffic flows at the sub-arterial level along that section between Abercrombie and Wilson.

Ivy Street is a local road under Council jurisdiction. It provides access to adjacent properties and carries much less than 200o cars a day. It is a local road. Ivy Street between Abercrombie Street and Wilson Street is a three-lane, one-way road with on-street parking available on both sides of the road.

There are also a number of laneways in the area that are significant links in the pedestrian, property access and bicycle circulation network.

4.2 Existing access arrangements for North Eveleigh and Redfern Railway Station, Gibbons and Regent Streets site

4.2.1 North Eveleigh

There are only two entrances for pedestrians and vehicles to this site. Both are gated as the site is largely vacant and partly a construction site. At the northern end there is an access off Little Eveleigh Street, and at the southern end there is an access to Wilson Street, between Forbes and Queen Streets. This driveway also serves some RailCorp facilities along the rail line. RailCorp is proposed to receive an easement along the Iverys Lane boundary of the site to maintain operational access to its facilities.

There is a pedestrian-only access being constructed to Wilson Street opposite Codrington Street which will provide access to North Eveleigh site and be available from the opening Performing Arts facility.

4.2.2 Redfern Railway Station, Gibbons and Regent Streets

There are serval vehicle access points which use the laneways and cross streets; the closed extension of Redfern Street, Marian Street and Margaret Street and William Lane, to obtain access to the arterial pair. Few driveways have access directly to Gibbons or Regent Streets. The railway lines prevent local connections other than via Lawson Street, which does not directly connect to Redfern Street. The main pedestrian and cycle access to the area is along the Redfern Street axis, including the closed segment between Regent and Gibbons Streets. The double set of traffic signals to the Station, and the timing of traffic along the arterial route were observed to generate sufficient gaps for traffic from these side streets/lanes to enter the arterial traffic stream.

4.3 Traffic flows

Traffic counts were taken at the following intersections to update earlier counts and to measure the main routes likely to be impacted by development of the North Eveleigh and Redfern Railway Station, Gibbons and Regent Street sites. Pedestrians crossing the intersections were also counted at:

- Wilson Street/ Forbes Street
- Wilson Street/ Golden Grove Street
- Wilson Street/ Ivy Street
- Abercrombie Street/ Shepherd Street
- Abercrombie Street/ Lawson Street
- Lawson Street/ Gibbons Street
- Lawson Street/ Regent Street
- Cleveland Street/ Shepherd Street.

The traffic surveys were conducted on Tuesday, 11th of April 2006 for a morning and afternoon peak period at each intersection. The morning peak period surveys were conducted from 6:30AM to 9:00AM, and the afternoon peak period from 4:00PM to 6:00PM. Table 4-1 summarise the hours identified as experienced the highest traffic flow at each intersection.

Table 4-1 Survey peak hours at eight key intersections

Intersections	Survey peak hours	
	Morning peak hour	Afternoon peak hour
Wilson Street/ Forbes Street	7:45AM – 8:45AM	5:00PM – 6:00PM
Wilson Street/ Golden Grove Street	7:30AM – 8:30AM	5:00PM – 6:00PM
Wilson Street/ Ivy Street	7:45AM – 8:45AM	5:00PM – 6:00PM
Abercrombie Street/ Shepherd Street	8:00AM – 9:00AM	5:00PM – 6:00PM
Abercrombie Street/ Lawson Street	8:00AM – 9:00AM	5:00PM – 6:00PM
Lawson Street/ Gibbons Street	8:00AM – 9:00AM	5:00PM – 6:00PM
Lawson Street/ Regent Street	7:45AM – 8:45AM	5:00PM – 6:00PM
Cleveland Street/ Shepherd Street	8:00AM – 9:00AM	4:30PM – 5:30PM

Table 4-1 shows that for most of the intersections, the morning peak hour was generally between 8:00AM and 9:00AM in the study area, with the Wilson Street intersections having a slightly earlier peak hour. The afternoon peak hour, for all but the Cleveland Street/ Shepherd Street intersection, occurred between 5:00PM and 6:00PM.

Figure 4-2 and Figure 4-3 show the morning and afternoon peak hour intersection turning movement volumes at the eight key intersections surveyed. A passenger car unit (pcu) factor of three has been used for heavy vehicles. The traffic volumes in these figures are in vehicles per hour (vph). Pedestrian numbers from the counts are shown in red.

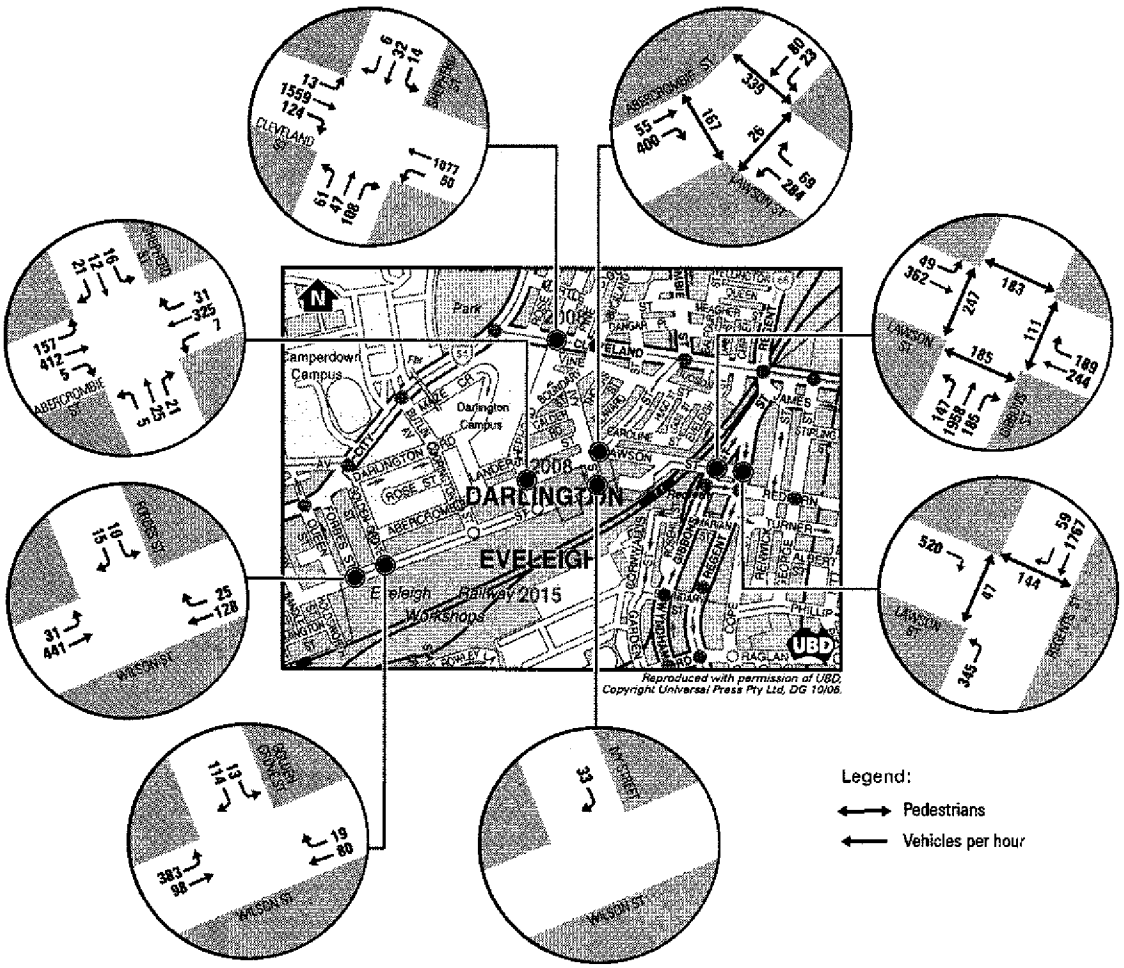


Figure 4-2 Existing morning peak hour intersection volumes (vph)

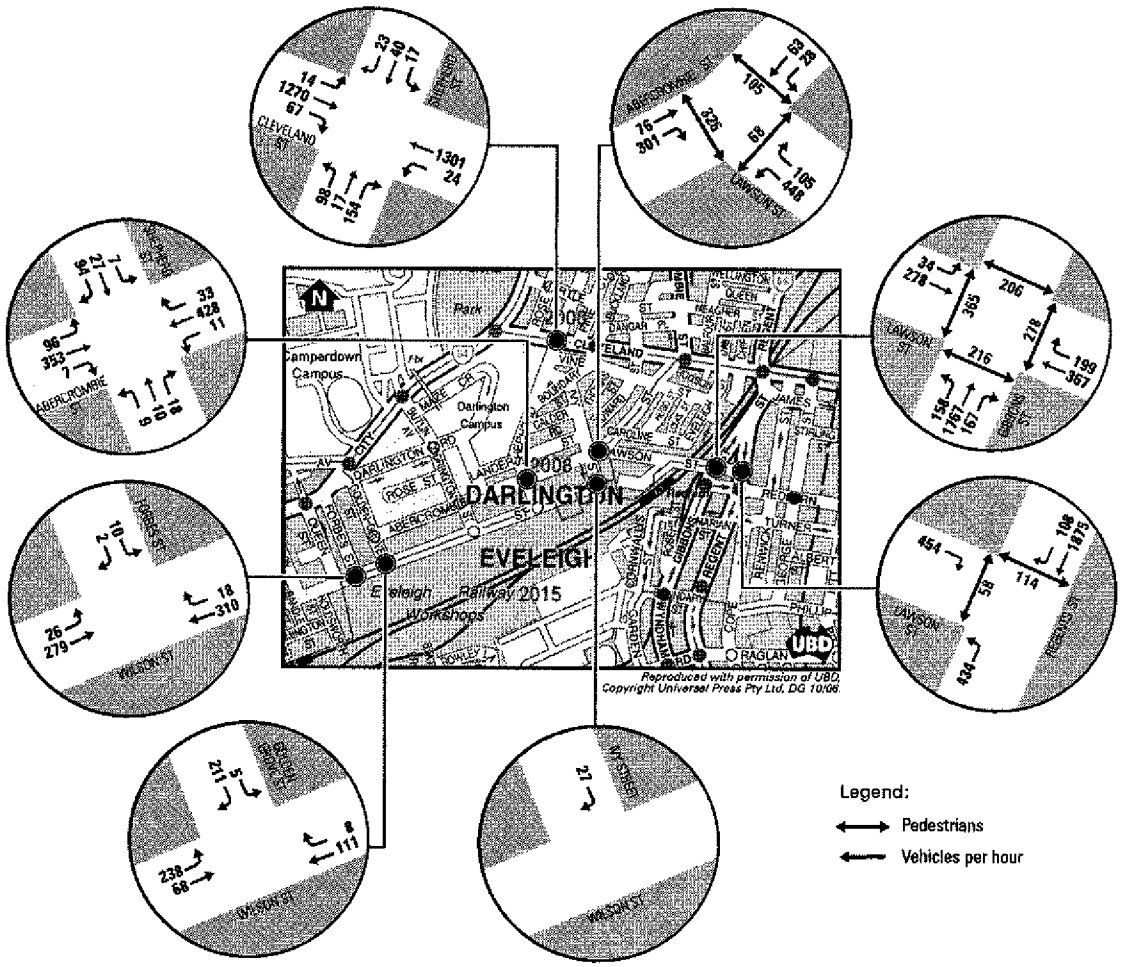


Figure 4-3 Existing afternoon peak hour intersection volumes (vph)

4.3.1 Heavy vehicle movements

The percentages of heavy vehicles captured during the surveys are shown in Table 4-2.

Table 4-2 Percentage of heavy vehicles

Road approach	AM peak hour	PM peak hour
Gibbons St, south of Lawson St	9%	4%
Lawson St, west of Regent St	7%	5%
Lawson St, east of Abercrombie St	1%	2%
Regent St, north of Lawson St	6%	2%
Cleveland St, east of Shepherd St	5%	2%
Shepherd St, south of Cleveland St	6%	<1%
Shepherd St, north of Abercrombie St	<1%	<1%
Abercrombie St, north of Lawson St	4%	1%
Abercrombie St, east of Shepherd St	2%	<1%
Wilson St, east of Golden Grove St	3%	<1%
Golden Grove St, north of Wilson St	3%	<1%
Ivy St, north of Wilson St	3%	4%
Forbes St, north of Wilson St	<1%	<1%

Table 4-2 shows that Gibbons Street, south of Lawson Street, has the highest percentage of heavy vehicles during the morning peak hour. All arterial roads, i.e. Gibbons Street, Regent Street and Cleveland Street have five or higher percentages of heavy vehicle flow during at least one of the peak hours. For all sub-arterial, collector and local roads, except for Lawson Street, west of Regent Street, and Shepherd Street, south of Cleveland Street, the proportion of heavy vehicles are less than 5% for both the morning and evening peak hours.

4.4 Traffic growth rate

Historical intersection traffic volumes were obtained from the previous study, *Eveleigh Carriageworks Transport Management Plan* (PB, 2003). Those traffic surveys were conducted in November 2001. The earlier figures were compared to the new set of intersection surveys to calculate an indicative traffic growth rate per annum. Table 4-3 summarises the traffic volume by directions (i.e. northbound-southbound direction and eastbound-westbound direction).

Table 4-3 Historical traffic volume data

Intersection	Peak hour	November 2001		April 2006		Growth rate per annum (%)	
		N-S	E-W	N-S	E-W	N-S	E-W
Wilson St-Forbes St	Morning	10	600	25	601	30.0%	0.1%
	Afternoon	24	581	12	629	-10.0%	1.7%
Wilson St-Golden Grove St	Morning	141	535	119	560	-3.1%	0.9%
	Afternoon	222	431	216	423	-0.5%	-0.4%
Abercrombie St-Shepherd St	Morning	225	824	100	905	-11.1%	2.0%
	Afternoon	130	1,002	165	898	5.4%	-2.1%
Cleveland St-Shepherd St	Morning	215	2,254	242	2,601	2.5%	3.1%
	Afternoon	400	2,778	349	2,582	-2.6%	-1.4%

NOTE: N-S – North-South direction; E-W – East-West direction

The comparisons in Table 4-3 show that there is no distinct pattern in the traffic flows between 2001 and 2006. In fact, there is virtually no increase in traffic which is more than 50 vehicles per hour in the local streets and which is less than one car a minute. The Abercrombie Street-Shepherd Street intersection shows a 2% increase per annum during the morning peak hour for the east-west direction and 5.4% increase per annum during the afternoon peak hour for the north-south direction. Cleveland Street-Shepherd Street intersection shows approximately 3% increase per annum in the morning peak hour and 2% decrease per annum in the afternoon peak hour. In the last five years, there has not been a measurable change in traffic conditions on local streets.

Annual average daily traffic (AADT) in the vicinity of the subject sites were also obtained from the RTA's Traffic Volume Data 2002 (Sydney Region). Five RTA station locations were shown in Table 4-4 for the survey year of 1999 and 2002.

Table 4-4 RTA traffic volume data

RTA station no.	Road name	Location	AADT		Growth rate per annum (%)
			1999	2002	
02.015	City Road	South of Cleveland Street	44,998	41,411	-2.66%
02.385	Regent Street	South of Cleveland Street	53,834	48,856	-3.08%
00.340	Cleveland Street	At Boundary St intersection	38,377	34,161	-3.66%
00.222	Lawson Street	At Abercrombie Street intersection	6,810	5,515	-6.34%
00.222	Abercrombie Street	At Lawson Street intersection	4,587	3,833	-5.48%

Source: RTA Counting program

The results in Table 4-4 show that there was a general decrease in traffic volumes for both arterial roads. For the arterial roads, such as City Road, Abercrombie Street, Regent Street and Cleveland Street, the decrease in traffic volume could be partially explained by the opening of the Eastern Distributor (from late 1999). Subsequently, the Cross City Tunnel and the high petrol prices would have been expected to support this trend until the present.

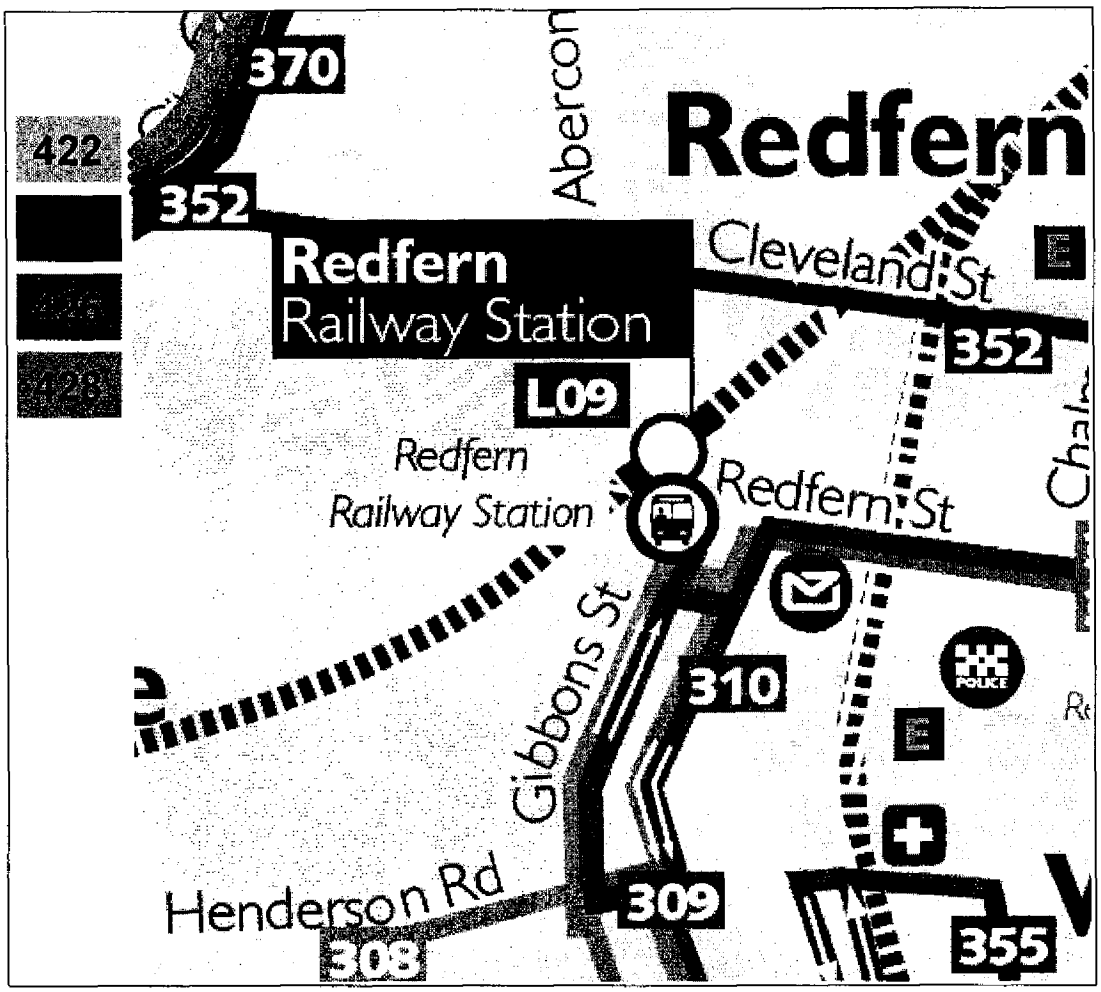


Figure 4-4 Sydney Bus services adjacent to key sites

Table 4-5 State Transit bus routes in Study Area

Route No.	Origin and Destination	AM Peak Frequency (services / hour, 8-9 am)
352	Marrickville Metro – Bondi Junction	3
308	Marrickville Metro – Millers Point	3
309	Port Botany – Circular Quay	4
310	East Gardens – Circular Quay	4
422	Tempe – Circular Quay	4
423	Kingsgrove – Circular Quay	6
426	Dulwich Hill – Circular Quay	5
428	Canterbury – Circular Quay	6
370	Leichhardt – Coogee	6

The bus passengers are predominantly through passengers to the CBD, but heavy interchange with rail does occur here, particularly for employees travelling to the South Central Industrial areas between Redfern and the airport, such as Beaconsfield, Mascot and Botany. The peak movement is quite early, between 7 and 8 AM. The road network, however, is not well suited for interchange or the convenient placement of bus stops for passengers. Over the years, several proposals have been put forward to improve transfer conditions for passengers, but cost, lack of suitable land and a falling demand for interchange as areas redevelop have lead to few improvements. As well as the CBD, major destinations served by the buses in the strategic bus corridor include the Rocks, Newtown, Marrickville, Eastgardens, Mascot, and Port Botany. Along Cleveland Street, there is service to East Sydney and Bondi Junction, Newtown and Marrickville. City Road/King Street contains services to Coogee, UNSW, Glebe, Leichhardt, Kingsgrove, and Canterbury.

This area is well served by transit services, although the passenger facilities are generally poor for waiting and identifying service points. Considerable passenger benefits could be achieved by looking at the passenger infrastructure, as the service levels are already in place. Traffic demands have caused some stops to be poorly placed for safe pedestrian access, especially in regard to crossing streets. Splitting the buses between Gibbons and Regent Streets does reduce the legibility of the system. There are connecting laneways, and distances are not burdensome, but identifying how to reach stops can be difficult.

4.5.3 Taxis

Taxis are easily obtained in the area during business hours, although it can be difficult to hail one at night. Due to the number of demands on kerbspace close to the Station, taxis are difficult to flag close to the station exits.

4.6 The pedestrian network

The structure and coverage of the pedestrian network is good and highly accessible, and the main routes are likely to remain as they are. Lawson and Redfern Streets are the main east/west links, as the rail lines curtail any others. Gibbons Street's western footpath carries a heavy volume of pedestrians to the Station and bus services. Because of the low activity level along the rail side of Wilson Street, pedestrians are more likely to use Abercrombie Street to get to the University, Newtown or Macdonaldtown. Pedestrians heading to Redfern are more likely to use the signals at the closed portion of Redfern Street than Lawson Street, apparently due to the dogleg at Regent Street which is heavily dominated by vehicular traffic. This causes most pedestrians to cross Regent Street to the south side of Redfern Street.

Approaching the Redfern Railway Station, there is little shelter for pedestrians from wind, rain or sun. Pedestrian connections to North Eveleigh from the Station are indirect. Footpaths along Regent Street have more active frontages than those on Gibbons Street.

4.7 Bicycle networks

The sites are well located to major centres of population and employment to be within a feasible length for good levels of bicycle travel. There is a good bicycle network, in terms of coverage and directness, despite the divisiveness of the rail lines. In fact, the rail line does provide some benefits by cutting cross-traffic along routes like Wilson Street and Henderson Road. This is shown in Figure 4-5 (overleaf). Most cycle routes are on-road, so there can be conflicts with on-street parking movements and large vehicles as lanes can be less than best-practice widths. There is a long stretch of off-road route through the ATP. Given the bus and parking activity in Redfern Street, alternate cycle routes have been proposed along parallel lane ways, but the issues of how cyclists would cross the arterial roads has not been addressed.

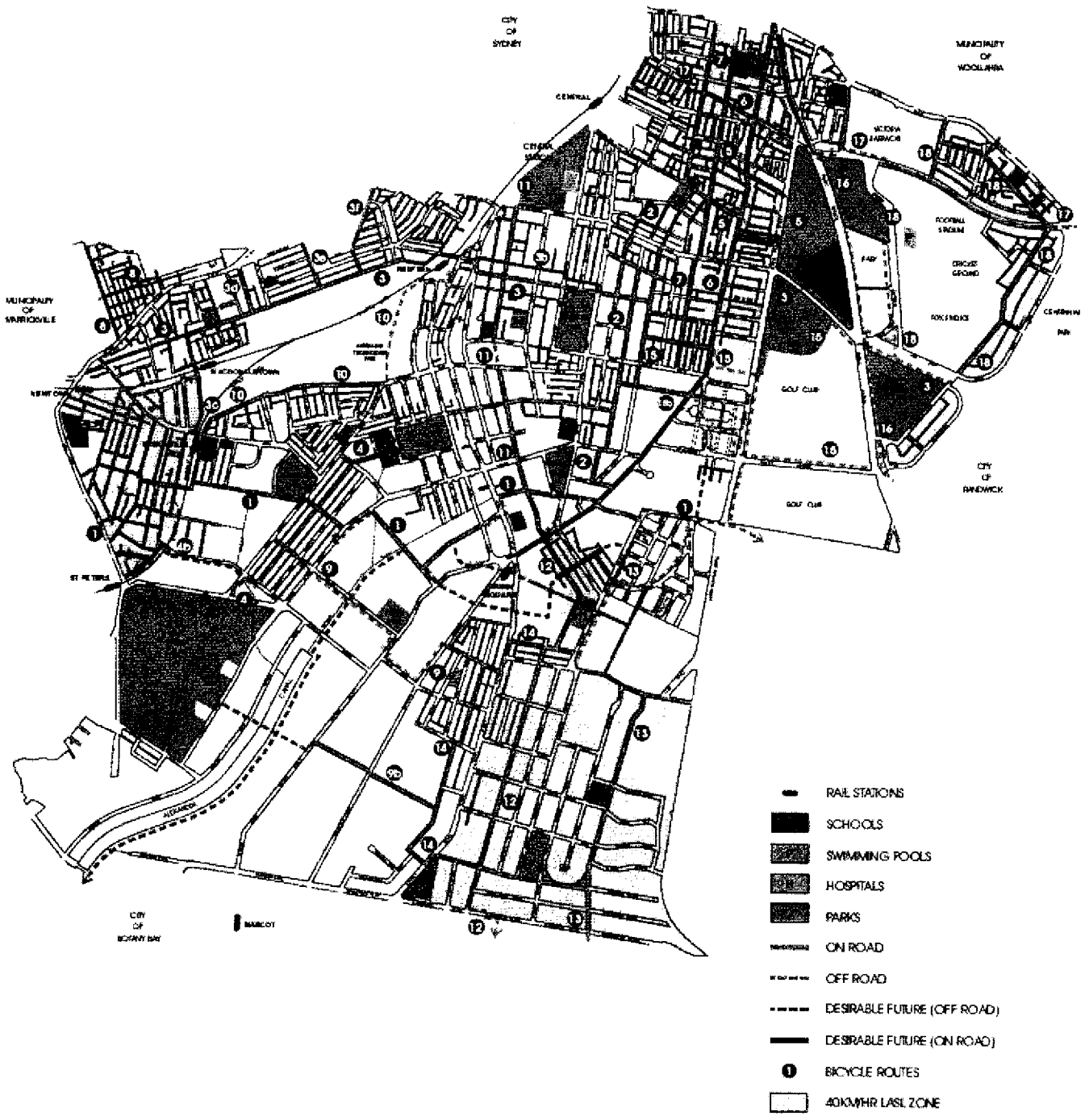


Figure 4-5 Local Bicycle Network as developed by South Sydney Council

5. Proposed transport and traffic strategy

The key elements of the proposed strategy follow, but the formula of calculated provision of on-site facilities and contributions to off-site facilities will be subject to negotiation on each site based on its merits. The points of consideration are likely to be the significance of these large blocks of urban redevelopment and the relatively large differences in propensity to use public transport that even small differences in access distance can generate.

5.1 Aims of the transport and traffic strategy

Key aims of the strategy, as indicated in the draft BEP are:

- redevelopment of Redfern Railway Station
- management of traffic generated from new development
- improved connections to bus services
- improved traffic operations along Regent and Gibbons Streets
- improved connections between ATP and North Eveleigh
- safe and easy cycling in the area.

5.2 Future road hierarchy

The road environment surrounding the RWA strategic sites is stable and established. There appears to be no reason to alter the road hierarchy in the area from what is shown in Figure 4-1, but there are some supplementary links proposed for the future that need to be considered in the future:

- an additional, major access to ATP from Henderson Road, which is under construction.
- a more direct link between the ATP and the CBD via Boundary Street.
- a potential vehicle tunnel linking ATP and North Eveleigh that would cater to local, circulating traffic as it would not be well connected to the arterial system
- restrictions on parking to increase the traffic capacity of Shepherd Street.

Some of the benefits of the existing hierarchy are that it would:

- restrict bus services to the arterial road network, and concentrate them whenever possible in the Strategic Bus Corridor so services become more frequent
- Gibbons and Regent Streets to remain as arterial roads regardless of any traffic measures
- encourage marked cycling routes on direct, connector streets for the convenience and safety of cyclists, although all public thoroughfares may be used by cyclists
- all the streets in the area are urban and must accommodate pedestrians in safety and without capacity restrictions. Walking conditions should be enhanced by lighting, set backs from fast moving traffic and improved weather protection, especially at areas where pedestrians congregate to cross a street.

The City of Sydney works along Redfern Street to improve amenity and the streetscape present an opportunity for the area. Integrating transport planning initiatives from RWA to reinforce this upgraded pedestrian corridor will be pursued, but so will maintaining the performance of the route for bus services.

5.3 Public transport improvement program

The key public transport initiative is the proposed future upgrade of Redfern Railway Station and its improved accessibility to surrounding sites so they can be transit oriented and low in their generation of car traffic. The investment will not only improve the attractiveness of rail travel, but interchange trips will benefit and pedestrian conditions will improve. This process has started with the appointment of the design team, but the decisions of this effort will guide the supporting public transport services.

The RTA has indicated its future role to upgrade Gibbons and Regent Streets as bus routes, as it rolls out the strategic bus corridor program. It is recommended that this program should not only look at the more efficient movement of buses, but the more efficient movement of passengers to and from buses. This would make buses and rail trips more attractive and pedestrian trips more direct and safer for all walkers, not just passengers. Given the closeness of the station to the CBD, a major interchange is not warranted so close to Central Interchange, but a more direct interchange with fewer road crossings should be considered.

Taxis need to feel operations are safer in the area at night. Actions to address this issue should be worked out through the Taxi Council, MoT and RWA. Careful placement of taxi stands and extending security from sites to their adjacent footpaths may be explored.

Coach use should be encouraged for visiting groups to the area, with door-to-door drop off, but long term parking could be considered at ATP.

5.4 Pedestrian and cycle networks

All roads in the areas should be available to cyclists and pedestrians as this is a highly dense urban environment. Trip distances to major employment and residential areas are conducive to walking and cycling, and the infrastructure networks should support this. High capacity/profile routes are still going to be identified for each mode, to capitalise on directness, activity levels, security and grade.

To capture the full community development benefits of the Redfern Street upgrade by the City of Sydney, the Redfern Street axis has to be strengthened. Ideally, it would extend directly over the rail lines and become the core pedestrian thoroughfare serving all major destinations in the northern part of the RWA area. Until then, Lawson Street will remain the hub of pedestrian movement. In the longer term its role may be diminished, but it will remain an important connector, especially for pedestrian destinations north of the Station.

While the improvement of the Station is likely to enhance pedestrian accessibility to all the key sites, full advantage cannot be achieved until there is a comprehensive directory information system. This would have a static sign core program, but may be supplemented with variable message signs that could also carry transit information and means of enhancing perceptions of personal safety.

Off-road cycling opportunities would be enhanced through North Eveleigh as they have been through the ATP. A shared zone concept connecting through the North Eveleigh site would be a successful link for pedestrians and cyclists. Upgrading these areas' connections to the local road network would also benefit cyclists, as well as motorists. The major east/west route of Wilson-Lawson-Redfern Streets may be enhanced through minor infrastructure treatments improvements in the short term. In the longer term, this route might be improved by any local direct traffic connections between North and South Eveleigh which could reduce traffic flow across the Lawson Street Bridge, or offer pedestrians and cyclists an alternative link that was more direct to Redfern Street.

Supplementary connection for cyclists should be sought in the upgraded vehicle-free rail crossings to be associated with the redevelopment of Redfern Railway Station. Secure bicycle parking can encourage cycle/transit interchanges in the Lawson Street area.

5.5 A traffic model

In the intermediate period, the RTA's South Sydney Paramics traffic model will be available to the RWA to calibrate to its forecast development levels so it may test a variety of options for changing and improving the road network. This would provide a consistent assessment basis to look at suggested projects such as a Gibbons Street underpass at Lawson Square, altering directions of traffic flow, adding or removing connections and intersections into the road hierarchy and altering on-street parking controls.

5.6 Draft parking policy

State Regional Environmental Plan 26 - City West applies to the Eveleigh precinct and encourages the use of non-car modes such as public transport, walking and cycling. New developments in the Eveleigh precinct were directed to take advantage of Redfern Railway Station as the major regional access point to public transport. The provision of on-site car parking within the precinct was strictly controlled to shift travel to public transport. Land use zonings in the area were set to provide employment and facilities to encourage people to work and live in the same community, and to ensure re-development was compatible with the traffic capacity of the precinct.

The area's most recent controls on parking are embodied in the former South Sydney Council's DCP 11 which aimed to reduce the level of vehicular travel in the area by reducing parking requirements within developments and improving facilities for pedestrians, cyclists and public transport users. On-site parking was only permitted at levels to control parking demand overflowing into surrounding streets. Provision of on-site parking above the rates was not permitted, while under-provision was considered where sustainable.

The City of Sydney is preparing a revised Parking Code, due for release in 2006. Limited information was available on this process, but the approach was expected to be similar to the former South Sydney code. Council's intentions on parking may be inferred from the Sydney Local Environmental Plan, 2005. Chapter 2, Part 5 – Car Parking, stated that encouragement of private vehicles for commuting to Central Sydney was inconsistent with its ecologically sustainable development objectives, and the environmental amenity of the city and its region. The parking provisions in the LEP were intended to discourage commuter parking by restricting the supply of tenant and public parking facilities, while parking levels to facilitate business and residential activities were maintained at a reasonable level.

It is recommended that the principles within DCP 11 be adopted for setting parking levels within the key strategic sites, but that each site be considered on its own merits for alternative transport access and how it would fit within the overall parking supply for the area. This approach would be consistent with the approach we understand being considered in the Metropolitan Parking Policy.

5.6.1 On-site Parking requirements

The following policies/documents present information regarding car parking provisions and calculations applicable to the RWA's strategic sites:

- South Sydney Council DCP 11 - Transport Guidelines for Development
- RTA's Guide to Traffic Generating Developments
- Eveleigh Carriageworks TMP
- Australian Technology Park: ATP Parking Policy and Management (quoting the revised ATP Master plan 1998)
- City of Sydney Council – Sydney LEP 2005. Chapter 2, Part 5 – Car Parking.

The specific calculations regarding car parking were extracted to the following tables. The rates in these tables only relate to the land uses proposed for the RWA strategic sites.

5.6.2 Comparison of Parking Rates

A number of potential parking codes could be applied to this site in the future as they have been applied in the past. These rates are discussed below with the intent of discovering which would best address the objectives of the transport strategy. The first is discussed is the DCP that applied under the former South Sydney Council. This code set a maximum level that could be accommodated on site, and allowed proponents for individual sites to argue for a lower provision if there were circumstances where fewer parking spaces could be supported with out leading to local parking problems.

Table 5-1 South Sydney Council DCP 11 - Transport Guidelines for Development

DCP 11-Table 1. Residential and Casual Accommodation	
Domestic Dwellings	**Car Parking**
Single dwelling houses and terraces	1 / dwelling
Buildings with more than 2 individual dwellings	1 / dwelling
Residential Units and Town Houses	**Car Parking**
1 Bedroom Units and Bedsitters	0.5 / unit
2 Bedroom Units	0.8 / unit
3 or More bedroom Units	1.2 / unit
Separate visitor parking	1 / 6 units near entrance

DCP 11-Table 1. Residential and Casual Accommodation	
Tourist Accommodation	**Car Parking**
Tourist and private hotels, serviced apartments. Refer food, entertainment and health (table 3) for ancillary bar and dining facilities, and pub hotels	¼ rooms (1st 100), then 1/5 rooms + ¼ staff
Backpacker hotels	Greater of 1/15 beds or 1/5 rooms
Motels	1/room
DCP 11 Table 2. Office, Commercial & Industry	
Office & Commercial	**Car Parking**
Office & Commercial	1 / 125 sqm GFA, 20% allocated to visitors
Retail Developments	**Car Parking**
Auction Rooms	Greater of 1/3 seats or 1/10 sqm GFA + pre-auction storage treated as warehouse
Shopping centres	Survey based assessment needed
Markets	1/stall (stall-holders) + 1.2/stall (patrons)
Small shops	1/50 sqm GFA
DCP 11 Table 3. Food, Entertainment & Recreation	
Food & Beverage	**Car Parking**
Cafes	1/50 sqm (1st 100 sqm), then 1/18 sqm
Hotel (pub)	1/25 sqm GFA
Reception Premises	1/18 sqm GFA
Restaurants	1/50 sqm (1st 100 sqm), then 1/18 sqm
Take-away food shops (with seating of up to 20)	1/50 sqm (1st 100 sqm), then 1/18 sqm
Sport and Recreation	
Cinemas, Theatres	Greater of 1/12 seats or 1/30 sqm GFA
DCP11 Table 4. Community, Education & Health Facilities	
Adult Education and Enlightenment	**Car Parking**
Art Galleries	1/200 sqm GFA
Cinemas, Theatres	Greater of 1/12 seats or 1/30 sqm GFA
Tertiary education establishments, TAFES etc	½ staff + 1/20 effective full-time students

The CarriageWorks Contemporary Performing Arts Centre introduced an entirely different land use into the area, and one where there was no empirical basis for estimating parking demand. In the transport management plan that accompanied the proposal, the following parking provision was suggested for any future residential components. However, it should be noted that no residential development was proposed in the CarriageWorks.

Table 5-2 Eveleigh CarriageWorks TMP

Residential
0.5 space per 1-bedroom unit
1 space per 2-bedroom unit and
1.5 spaces per 3-bedroom unit.

Australian Technology Park (ATP) Parking Policy and Management

The ATP is a business employment site. The 1998, revised ATP Master Plan called for on-site parking to a maximum of 1 car parking space per 125 sq m of gross floor area (GFA) of proposed building. That total included a fixed rate of 20% that would be reserved for visitors. Given the projected maximum floor area of around 200,000 sq m of GFA across the ATP, the revised rate would generate a maximum provision of 1,600 car spaces at the ATP, of which 320 spaces would be reserved for visitors. Applying standard conversion factors, this revised parking rate for the ATP equated to 1 car parking space per 104 sq m Net Leasable Area, as some parking codes present their requirements.

City of Sydney Council – Sydney LEP 2005, Chapter 2, Part 5 – Car Parking

While the actual parking codes for the new boundaries of the City of Sydney are under development, the LEP of 2005 does contain several references to parking. In Clause 65 on Tenant car parking provisions it says '(1) Car parking provided in connection with a building must not result in any maximum set out in the following Table being exceeded, except in a case to which subclause (2) applies and results in a greater number:

Table 5-3 Maximum car parking under Sydney LEP

Type of proposed use	Maximum parking on site spaces permitted
Dwelling-houses	2 spaces per dwelling-house
Residential buildings (including housing for aged persons):	
Studio apartments /bedsitters	1 space per 4 studio apartments/bedsitters
1 bedroom apartments	1 space per 2 apartments
2 bedroom apartments	1 space per apartment plus 1 additional space per 5 apartments
Apartments with 3 or more bedrooms	2 spaces per apartment
Hotels and clubs	1 space per 5 bedrooms 4 spaces per 100 square metres of function room area
Cinemas, theatres and recital halls	1 space per 7 seats
Serviced apartments	1 space per 4 studio apartments/bedsitters 1 space per 2 one-bedroom apartments 1.2 spaces per two or more bedroom apartments
Other uses	$\text{Maximum number} = \frac{\text{Total other FSA}}{\text{Total FSA within development}} \times \frac{\text{Site area}}{50}$

Note. Parking for service and delivery vehicles, motorcycle parking, bicycle parking and car parking for people with mobility impairment should comply with the provisions of the relevant development control plan.

(2) The number of tenant car parking spaces that will be available for use in connection with an existing building to which a development application relates is not to exceed the total of the maximum amounts allowed for each particular use that will be allowed in the building, in accordance with the following:

$$\text{maximum number of car parking spaces for a particular use} = \frac{\text{FSA to be allowed for that use}}{\text{Total FSA to be allowed for all uses}} \times \text{Total number of lawful existing car parking spaces for all uses}$$

5.6.3 Preferred Parking Strategy

The analysis of parking policies in the Redfern area showed a consistent intent to restrain parking supply to encourage the utilisation of public transport services such as those available at Redfern Railway Station. The policies also aimed to discourage car use and acknowledge the strong influence that limiting and managing car parking in the area could contribute towards these objectives. This draft RWA parking policy might also adopt these objectives. We recommend the urban policies incorporated into DCP 11 and the CoS parking codes should form the basis of the RWA approach to parking control.

As the Carriage workshops and ATP parking schemes have set provision at levels slightly higher than DCP11, it will be necessary to restrict sites closer to the transport hubs to a lower provision to achieve the target mode share of 60% for non-car travel across the RWA area. The city's LEP contains some provisions that are more restrictive than DCP 11, and for the sites closest to the station, these should be applied when they are more restrictive, and relaxed to levels closer to the ATP approach the further the subject sites are from the station.

Confirmed Parking Strategy Objectives

- encourage the use of non-car modes, such as public transport, walking and cycling by giving access priority for those modes rather than for parking to activities, with the exception of parking for people with mobility impairments
- target of 60% non-car use for journey to work trips over the combined RWA strategic sites
- utilise Redfern Railway Station as a major transport/interchange node for rail, bus, taxi and pedestrian trips
- limit on-site car parking to levels below anticipated demand if no restraint were applied
- apply effective parking management techniques to discourage uneconomic car use
- ensure overflow car parking from the site is appropriately controlled on surrounding local streets in order to minimise impacts on residents in Darlington and Redfern
- manage the use of public parking in a zone over time of day to maximise the productivity of each parking space. For instance, performance demand should not coincide with peak commercial visitors and operators should try to share the occupancy of spaces between the demands

- until the Metropolitan Parking Policy is released, and the City's parking codes finalised, RWA should generally apply the provisions of DCP 11 as its parking code as a maximum to on-site provision for commercial development and the CoS LEP for residential development.
- If any bonus floor space is allowed, it would not be considered in the parking requirement or lead to an increase the maximum on-site provision. It should be up to a developer to demonstrate that it is entitled to the maximum allowable on its site because it has done all the required tasks to encourage achievement of the parking code's objectives. Appropriate actions that could be part of a subsequent transport management plan in the project application might include:
  - new facilities for pedestrians, cyclists and transit users on site. These might include footpaths, secure parking, leaning bars, resident/worker showers and lockers, public seats, directional signs to bus stops and station with destinations noted, i.e. –city-bound, or airport, Bondi Junction
  - residential bodies corporate not allowing ownership of car parking spaces, but managing their allocation for a fee and not allowing them to be enclosed. Sub-leasing would be prohibited
  - corporate building owners being responsible for managing all parking spaces and allocating them separately in each lease to a maximum share determined by the floor space leased
  - commercial vehicles being managed as described in the next section
  - provide for commercial management of parking within the Carriage workshops, so when the car parking spaces are not required for performances, they may support other activities in the area.

Such measures as these should be incorporated into subsequent Transport Management plans associated with future redevelopments.

5.7 Commercial Vehicle Policy

The section above talked about managing the on-site parking for residents and businesses that will be developed in the RWA strategic sites, but there is another important aspect of parking management and that covers visitors to the sites. There will be residential visitors, but the largest class of visitors to the area will be commercial vehicles supporting the business activities that must succeed to reach community development targets. There has to be a balance between the ease of carrying out business in the area and discouraging the inefficient use of commercial vehicles and limiting space to accommodate them.

Some ideas about the management of commercial traffic are reviewed in the following section.

South Sydney Council DCP 11 – Transport Guidelines for Development, 1996

Extract from Section 3.4.2 on Coaches and Car/Taxi Set-down

Taxi, private vehicle and coach drop-off/set-down areas should be provided for larger developments in a convenient off-street location close to pedestrian entrances, with consideration given to the design of the front of the building, safety and interruption to traffic.

Desirably, the drop-off/set-down point should be in a porte cochere, designated short stay area or indented parking arrangement to suit the site

Extract from Section 3.5 on Garbage and Service Vehicles

Garbage storage and collection areas should be conveniently located and designed so as not to cause unacceptable on-street conflicts. The servicing area should be designed to suit the projected needs of the development...All vehicles are required to leave a site in a forward direction.

Extract from section 5.4: on Delivery and Service Vehicles: Strategy

Adequate on-site provision for delivery and service vehicle access should be made to facilitate the efficiency of the commercial, retail and other functions of Central Sydney.

Objectives

- *to ensure the appropriate on-site provision for parking of service vehicles*
- *to reduce the use of on-street parking for service and delivery vehicles.*

Provisions

5.4.1 The following requirements apply to new development for the provision of parking spaces for delivery and service vehicles:

(i) Commercial premises	*1 space/3,300 sq m FSA or part*
(ii) Retail	*1 space/350 sq m FSA or part*
(iii) Residential buildings and Serviced Apartments	*1 space for first 50 dwellings/ serviced apartments 0.5 spaces for every 50 dwellings/apartments thereafter.*
(v) Hotels	*1 space/50 hotel bedrooms*
(vi) Wholesale, industrial	*1 space/700 sq m FSA or part*
(vi) Other uses	*1 space for 1,750 sq m FSA or part*

5.4.2 The requirements for commercial premises apply to the first 50,000 square metres FSA of any development. Between 50,000 and 100,000 square metres FSA, the requirements for the balance above 50,000 square metres FSA may be reduced by 50%. For areas exceeding 100,000 square metres FSA, the requirements may be reduced by 75%.

5.4.4 Provision is to be made for courier parking spaces (including bicycle parking facilities) near vehicle entry points and near lifts.

5.4.5 Well positioned signs to parking facilities are to be provided for all couriers, including bicycle couriers.

These control measures are consistent with the intents of the RWA traffic strategy and should be adopted, again as a maximum, in the RWA parking controls.

Innovative proposals for commercial vehicle control in RWA's strategic sites

DCP 11 contained some strong principles which are recommended for application to the key sites. Some additional provisions that could be incorporated into later development applications might be:

- unified dock/receiving areas, especially in mixed use developments, so out of hours deliveries are facilitated, aggregated to cover the largest area possible, including residential uses in a mixed environment
- identified taxi collection points to make use of taxis easier, more secure and space efficient. These are not ranks, but development specific locations for transient use near main doors, near shelter and easily found by taxis
- RWA establishing a Transport Management Board, which it would turn over to be run by the new residents and businesses in the area. The Board would prepare TravelSmart material, tailored for user groups such as new residents, workers, delivery services and visitors. Service providers, such as the station manager from Redfern, the Taxi Council and the Port Botany Depot of Sydney Buses, should also be involved in providing information and in service improvement.

5.8 Recommendations on parking control

The parking controls within DCP11, which was prepared by the former City of South Sydney, contain relevant objectives and codes which are recommended for application to the RWA strategic sites. As the Metropolitan Parking Strategy is under development by the Department of Planning and the City of Sydney prepares its new parking codes, RWA should use DCP11 and the precepts of CoS' LEP. By applying controls to each site to match its particular access characteristics, RWA should be able to achieve its target of 60% non-car journeys-to-work. RWA should also promote these constraint and access to public transport considerations in parking provision to these other agencies as they develop their parking policies.

The control of visitor parking, particularly commercial vehicles, also needs to be managed if traffic impacts are to be minimised in the surrounding communities. Again, the provisions of DCP 11 seem to align with RWA objectives. There may be some opportunities, as well, to look at innovative management methods to further control commercial traffic such as:

- consolidated delivery/dispatch facilities which become more efficient as developments are larger, or act more cooperatively across mixed uses
- clear delineation of public vehicles zones for deliveries, taxis, buses, coaches, etc in common areas to serve multiple demands
- RWA to establish a Transport Management Group to be run by residents and business on the strategic sites once they are occupied.

A related aspect of traffic and parking management is a comprehensive directional system which would minimise circulating kilometres of travel and reduce motorist and pedestrian uncertainty.

6. Application of strategy to North Eveleigh, Redfern Railway Station, Gibbons and Regent Streets sites

6.1 The sites

The first application of the transport and traffic strategy will be to two of RWA's strategic sites. The principles that have been developed through this report will be taken through the traffic impact assessment process on these two sites.

North Eveleigh Site

The North Eveleigh site is bounded by Wilson Street to the north, railway lines to the south, residential and commercial developments to the east and Iverys Lane and a residential area to the west. In the north, it is located within 50m from the Redfern Railway station. The site area is approximately 11 hectares, and has been split into three sections for general land use planning consideration. The eastern section, which has some buildings, zoned for mixed uses, commercial and residential use. The central section contains the heritage rail buildings being reused for cultural and artistic, and training uses. It will contain some off-street parking. The southern zone is proposed for housing. Figure 6-1 shows the site and proposed land uses indicated in the draft BEP.

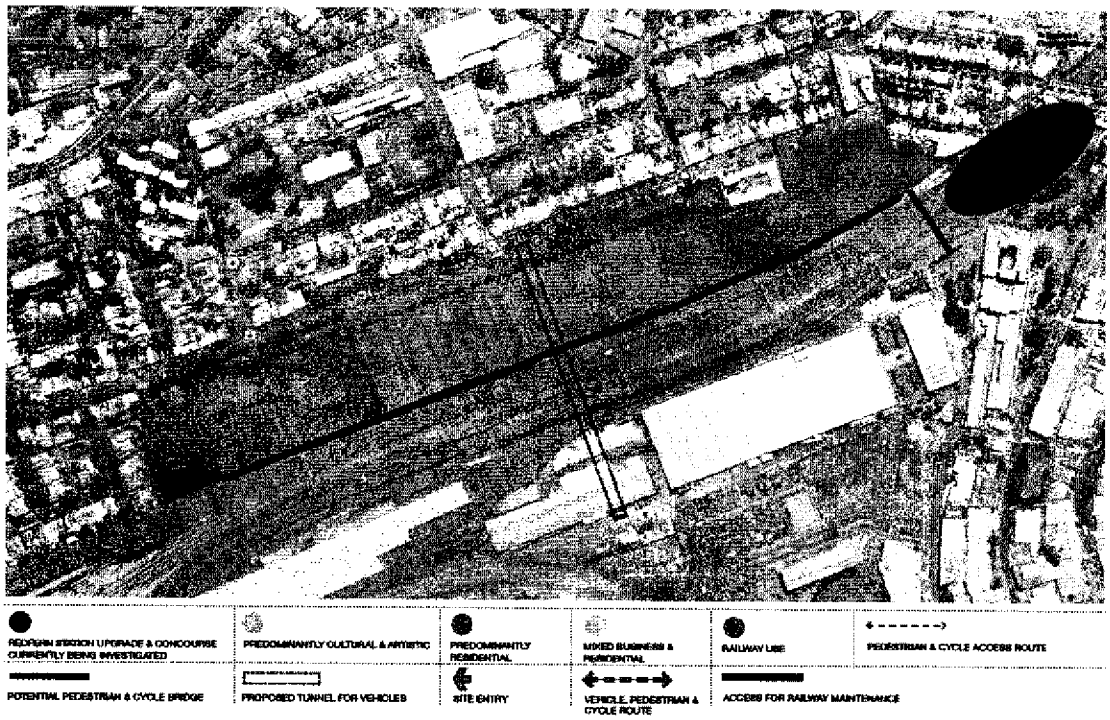


Figure 6-1 North Eveleigh Site with proposed land use zones

Redfern Railway Station, Gibbons and Regent Streets site

This site which contains Redfern Railway Station and its environs, Gibbons and Regent Streets, is bounded by Lawson Street to the north, Margaret Street to the south, Regent Street to the east and railway lines to the west. The City of Sydney's upgrade of Redfern Street project terminates in this site. The proposed redevelopment by RWA would comprise commercial and residential, which is consistent with the current land uses. The site area is approximately 2.2 hectares.

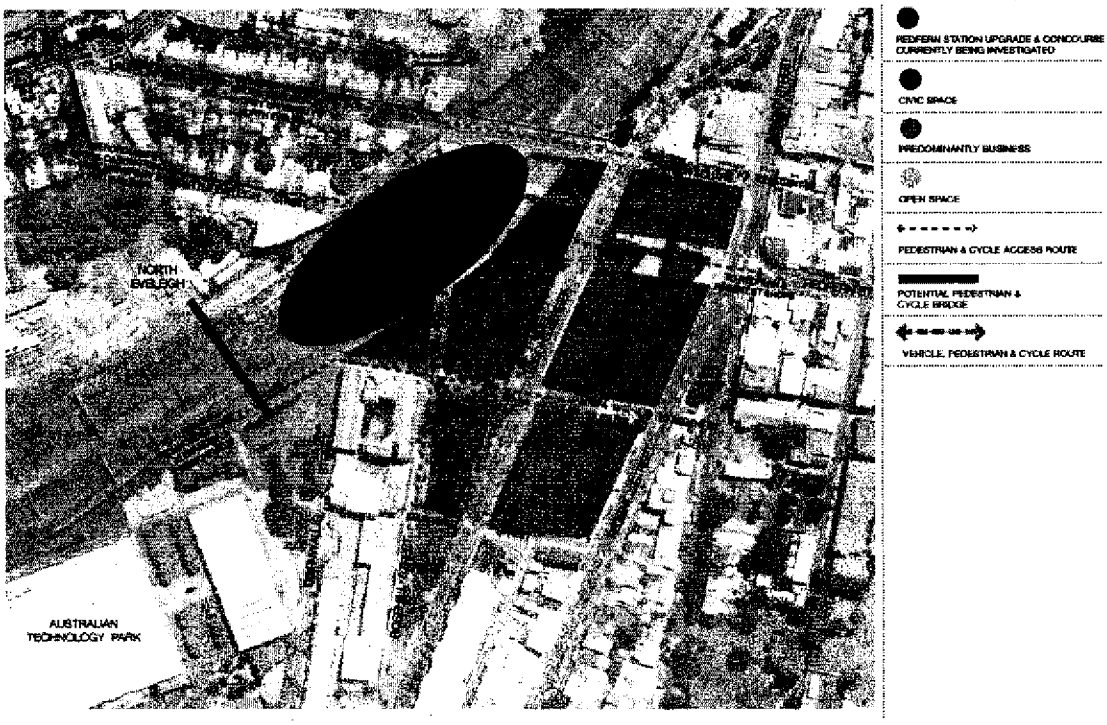


Figure 6-2 Proposed land use zones for Redfern Railway Station, Gibbons and Regent Streets

6.2 Access to North Eveleigh and Redfern Railway Station

6.2.1 North Eveleigh

There is no developed internal roadway through this site, and a formal structure is needed to accommodate existing and proposed development. One of the most important links within the site will be parallel to Wilson Street and the rail lines. In the central section of North Eveleigh, a shared zone is being established between Carriageworks Contemporary Performing Arts Centre and the Blacksmiths' shop In this context, such a design treatment makes traffic and safety sense, but it does leave some hierarchy and circulation issues still to resolve. In the remainder this report, this new connection through North Eveleigh will be referred to under a working title of Blacksmiths' Lane.

In terms of a road design standard, V60kph is suggested at points where the network intersects with Wilson Street. On the site, a low speed of V40kph is recommended. These design speeds will provide a safe and self-enforcing design, although posted speed limits could be less, as Wilson Street is posted presently as 50 kph.

Wilson Street is the frontage street for the site. It provides considerable on-street parking for community, and the University of Sydney students. The traffic strategy would be to minimise loss of on-street parking as it is a community resource, it acts as a traffic buffer to the footpath and it helps to slow traffic speeds. For the entire site, only two vehicle access points are definitely proposed, with a third under further consideration. The existing entrance/exit near Forbes Street would be reinforced and upgraded as the main access for the residential and performing arts space. It would remain a t-junction style intersection with Wilson Street. The mixed business precinct would primarily be served by a new access onto Wilson Street, joining the roundabout at Shepherd Street. Depending on the design of the proposed development in this area, a further left in/left out only access could be provided to Wilson Street.

A barrier-free pedestrian and cycle entrance to the site at Wilson Street, opposite the roundabout at Codrington Street is under construction. This will provide direct access to the Carriage workshop area, join to the shared zone within the site, and perhaps link to future upgraded access to Redfern Station.

Western section

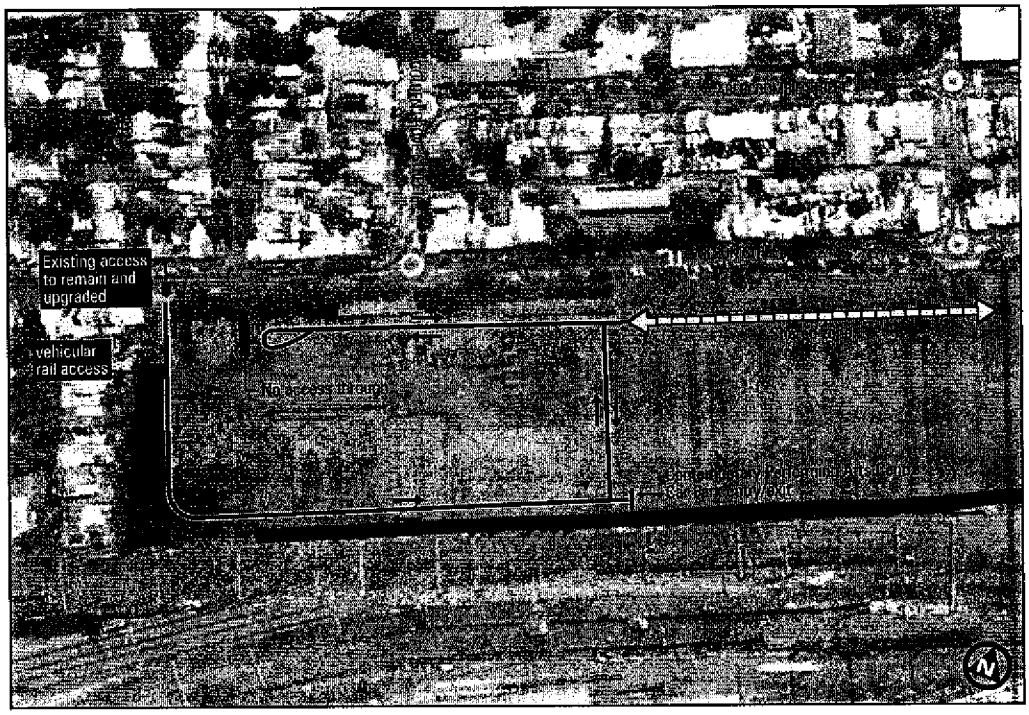
There is currently a gated entrance to the site that serves North Eveleigh. This entrance currently serves the Carriage workshop construction site and provides access to RailCorp's easement to maintain their facilities near the tracks. While it may be possible to separate North Eveleigh's access from RailCorp's future operational needs at this point, it appears more beneficial to maintain the combined access and improve this intersection for both purposes. This would assist the redevelopment on the site, as RailCorp's easement could then be crossed at Wilson Street to accommodate the necessary turn splay at the entrance for North Eveleigh. RailCorp's security gate could be located closer to the rail lines (away from Wilson Street), which would reduce RailCorp's maintenance task. This would ensure that the new access road would meet the site's requirements and be the correct standard of road for the heavy service vehicles that may need to access the rail facilities.

If Blacksmiths Lane is to be a shared zone near the Carriage workshop, the western access to Wilson Street would need to cater for vehicles generated by the residential development proposed in the western section and vehicle access the entertainment precinct in the middle section. With that level of future traffic there were only two feasible access locations; opposite Forbes Street or at the existing entrance to the site. The existing location was preferred as it would be safer for pedestrians, maintained current arrangements as much as possible, and would not present as steep a grade within the site for vehicles to climb. The costs associated with utility relocation should also be minimised by remaining in a similar alignment for the upgraded access.

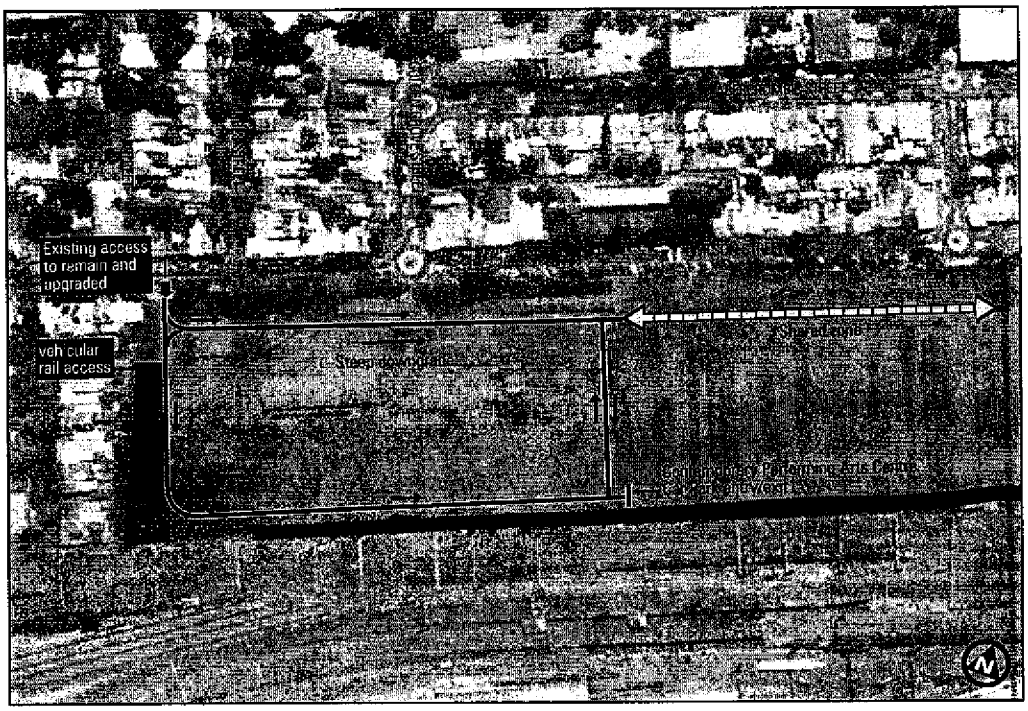
From this access point, there were three options for traffic circulation through the western section of the site generated. They are shown in Figure 6-3.

We did not recommend a full t-junction at Blacksmiths Lane and the access road because:

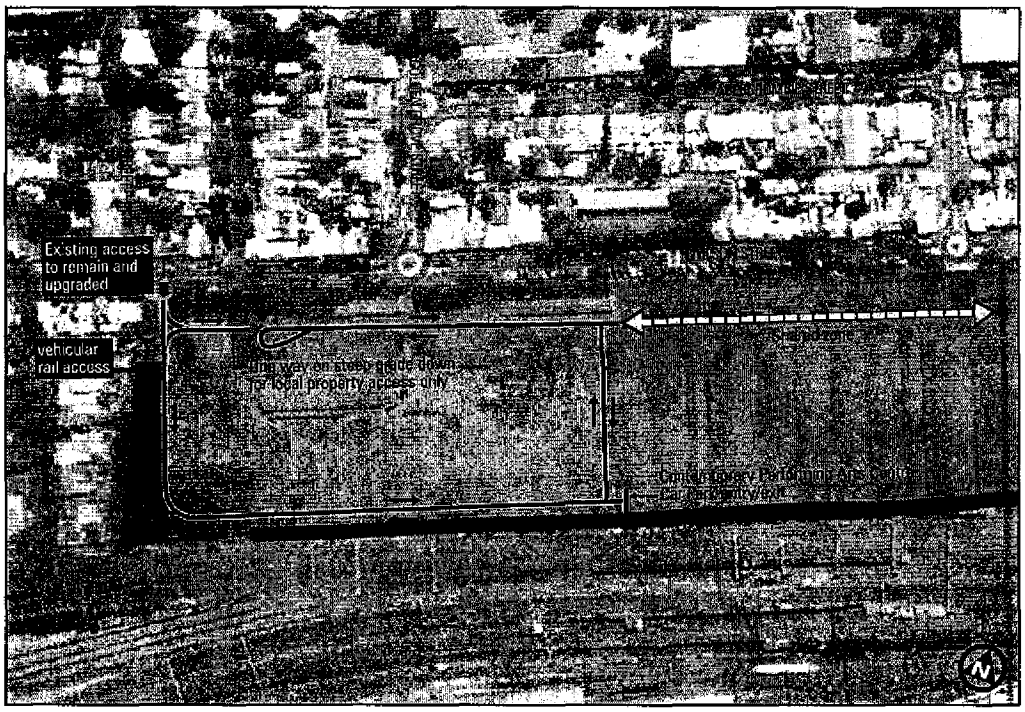
- Blacksmiths Lane traffic could conflict with through traffic too close to a graded access
- the speed differential of entering vehicles and those leaving the shared zone
- vehicles climbing the grade would generate noise in the residential area, particularly after evening performances.



Option 1 - Two way circuit



Option 2 - One way circuit



Option 3 - Hybrid

Figure 6-3 Options for vehicle circulation in western section of North Eveleigh

In summary, we would recommend that the future access to this zone and the Middle Zone coincide with the existing entrance driveway and that the circulation road sweep down to the rear of the site much as it does now. Also Blacksmiths Lane may join the circulating road for pedestrian and cycle connectivity, but vehicles be restricted to one way eastbound flow for at least the length of the lane to the first driveway into parking in the redevelopment. The road circulation road to the Carriage workshop would abut the railway, acting as a buffer for noise and directing most traffic to the central section without having to use the steeper grade on Blacksmith's Lane.

Central Section

Vehicular access to this zone will primarily via the system described in the previous section, especially in the short to medium term. Cars travelling from the Western Section will enter directly into the off street parking area in the Carriage workshop or to surface-level, visitor parking in the Traverser No 2 area. The latter will be accessed through a shared zone for vehicles and pedestrians between the Carriage workshop and Blacksmiths' Shop heritage buildings.

A pedestrian access that can be used by persons with mobility impairments is being constructed in the central section opposite Codrington Street. This access will assist the many local patrons expected to use the entertainment and training facilities on this site. Passengers being dropped off would be expected to use the areas adjacent to this access.

Eastern Section

Access to the eastern section of North Eveleigh (second vehicular access point to the site) could be at two locations:

1. Opposite Shepherd Street - the level difference from Wilson Street is about 4 metres and there should be no difficulty grading from Wilson Street to the lower levels or to a podium level. Shepherd Street has parking on both sides leaving a narrow width for two way traffic. Consideration would need to be given to either banning parking on one side, both sides of the streets, or perhaps just clearway style arrangements during the peaks between Wilson Street and Abercrombie Street. The first option would be the safest, although it would reduce local parking supply. There is good connectivity to Abercrombie Street via a signalised intersection and thence to the wider regional network. The roundabout could be retained and an extra leg installed with relative ease. Large vehicles would have no trouble turning right, although left turn paths would need to be checked in the final design. As this project is not expected to generate many large vehicles wanting to turn left, and there is no current prohibition on doing so, this should not present too many difficulties for this option.
2. At the eastern end near Ivy Street – an access here could be designed here for left turn out only, or to allow all movements, ie. straight in from Ivy Street, right in from Wilson Street, and left out to Wilson Street. The existing grading indicates that a suitable vertical geometry could be achieved. Near this location there is also a (currently disused) pedestrian access to Redfern Railway Station that could be reactivated if it suits the future layout of the station. As future access to Redfern Station would be elevated over the rail lines, there is also an opportunity to work with structure levels to achieve an integrated pedestrian and traffic solution at a podium level and then transition down to the Carriage workshop level at the southern end of the this site.

In summary, Shepherd Street would be the main vehicle access to the eastern section of North Eveleigh. It has the best options for connections to the road network. Accessibility preferences would recommend consideration of a podium level connection between the southern Station pedestrian access and Wilson Street at Shepherd Street, as that would attract many pedestrian to activate the frontage of the area. It appears that a minor access could be developed from Ivy Street, but as it is one way, you would probably use it as an access only. This option, too, works best at a podium level as there is more scope for circulation and activity. The main constraint to a full podium over the site may be the natural ventilation wall for the residential parking on the existing residential building on Wilson Street. The ramp taking traffic down to the Carriage workshop level may need to be at the lower level before abutting that existing residential building.

Redfern Railway Station, Gibbons and Regent Streets

The arterial roads should not be used for direct access to the future development whether the roads remain one-way or become two-way. The laneways should continue to offer access between the arterial roads and the developments

6.3 Pedestrian and cycle requirements

Designing for ease of pedestrian movement around the site is essential to realise the transit orientation of the site. The hub for pedestrian demand will be Redfern Railway Station. RailCorp and RWA have are undertaking a concept design study with a focus on increasing pedestrian accessibility. It is possible to create new pedestrian links to Station that also act as links between the communities on both sides of the rail lines. The pedestrian axis between Redfern Station and Redfern Street is a feature of the City of Sydney's Redfern Precinct upgrade works and should be reinforced in this study by linking that access through to the western section

6.4 Implications of proposed development on traffic

Traffic modelling methodology

The first step in looking at future impacts was to expand the present traffic volumes shown in Figures 4-2 and 4-3 to 2016 levels. Although the historical traffic data between 2001 and 2006 and RTA traffic volumes between 1999 and 2002 show either decreased or no significant change in traffic volumes in the vicinity of the proposed development (refer Table 4-3), a conservative approach was adopted to assume a higher trend for planning purposes. A growth rate of 0.5% per year was applied to the arterial roads forecast flows in a future design year of 2016.

PB developed a spreadsheet model to assess the traffic impact of the proposed developments. The spreadsheet model was used to estimate the trip generation rates for the developments and the trip assignment of the generated trips to the surrounding road network. The analysis was performed for the morning and afternoon peak hours, and added to the projections from 2006 traffic counts.

Due to the proximity of proposed development at Australian Technology Park (ATP), this traffic assessment includes traffic that would be generated by ATP.

6.5 Trip generation

Traffic generation for the proposed development has been estimated based on employment trips generated by residents from residential development and for commuter/ work-related trips attracted to the commercial development. Table 6-1 shows the indicative development levels used as the basis for generating future residential and commercial activity.

Table 6-1 Indicative development estimates the proposed developments

Proposed developments	Residential floor area (m^2)	Commercial floor area (m^2)	Total new floor areas (m^2)
North Eveleigh	72,000*	81,000	153,000
Redfern Railway Station, Gibbons & Regent Streets	85,300	95,600	180,900

Source: RWA correspondence *Excludes existing floor area of CarriageWorks and Blacksmiths Shop

The RTA trip generation rate of 0.24 trips per unit per peak hour for high density residential flat buildings in CBD was adopted for estimating residential trips.

A number of different traffic generation rates for commercial development have been tested:

- RTA – using RTA traffic generation rates for office and commercial developments according to the Guide to Traffic Generating Developments (Version 2.2) October 2002
- Assumption 1 – using 'Eveleigh Carriageworks Transport Management Plan' assumption i.e. 41% car driver/passenger for the mode split
- Assumption 2 – using the assumption from various Traffic Management Plans for Australian Technology Park i.e. 45% car driver/passenger for the mode split
- Assumption 3 – using the mode split assumptions provided by Redfern-Waterloo Authority i.e. 30% car driver/passenger mode split. In addition, there is also evidence that car occupancy rate in the inner city areas is higher than 1.19 (RTA assumptions) according to Sydney Transit & Bus Lane Survey 2005. The vehicle occupancy rate for Broadway, between Regent Street and Shepherd Street is as high as 1.60. The average value of 1.41 has been assumed for the vehicle occupancy rate in the inner city area. Table 6-2 shows the vehicle occupancy rate for the inner city area on non-bus/transit lanes.

Table 6-2 Assumed vehicle occupancy rate for the inner city area

Road	Peak period	Vehicle occupancy rate*
Broadway between Quay Street and Shepherd Street	Morning	1.41
	Afternoon	1.45
Oxford Street, between Jersey Street and College Street	Morning	1.35
	Afternoon	1.44
Average		**1.41**

Source: Sydney Transit & Bus Lane Study March 2005 (Annual Performance Survey–Travel time, Vehicle occupancy & illegal usage) * - vehicle occupancy rate for non-bus and non-transit lanes

Table 6-3 summarises different assumptions used to estimate trip generation rate for the commercial development.

Table 6-3 Different assumptions for trip generation rates

	RTA	Assumption 1	Assumption 2	Assumption 3
Mode split for car driver/passenger (for peak hour)	0.62	0.41	0.45	0.30
Car occupancy rate (persons/ vehicle for peak hour)	1.19	1.19	1.19	1.41
Number of employees per 100m^2	4.75	4.00	4.00	4.00

Using the assumptions shown in Table 6-3, the discounted traffic generation rates can be calculated for the proposed developments. Table 6-4 shows the discounted traffic generation rates and the corresponding estimated traffic under different assumptions.

Table 6-4 Comparison of traffic generation approaches

	Traffic generation rates (trips per 100m^2 gross floor area)	Estimated traffic per peak hour	
		Redfern Railway Station, Gibbons & Regent Streets	North Eveleigh
Residential			
RTA	0.24*	143	205
Commercial			
RTA	2.00	1,619	1,912
Assumption 1	1.11	902	1,065
Assumption 2	1.22	990	1,169
Assumption 3	0.75	557	658
Total			
RTA	-	1,762	2,117
Assumption 1	-	1,045	1,269
Assumption 2	-	1,133	1,373
Assumption 3	-	700	862

NOTE: * - trips per dwelling for residential development

The traffic generation rate of 0.75 trips per 100m^2 (Assumption 3) was adopted for the commercial development for the following reasons:

- low mode split of 0.30 for car driver and passenger due to its close proximity to Redfern Railway Station and Sydney CBD. Also the existing population in Redfern-Waterloo has almost half the car ownership and uses public transport at double the rate of the Sydney metropolitan region
- higher vehicle occupancy rate is observed in the inner city area as shown in Table 6-2. The average value of 1.41 has been adopted compared to the RTA assumption of 1.19
- Redfern-Waterloo Authority assumes 4 employees per 100m2 gross floor area compare to the RTA assumptions of 4.75 employees per 100m2 gross floor area. Hence, the further discounted traffic generation rate was necessary.

For residential development, it was assumed for the subject sites that during the morning peak hour 80% of trips would be outbound and 20% of trips would be inbound. For the evening peak hour, it was assumed that 20% of trips would be outbound and 80% of trips would be inbound for the residential development.

For commercial development, it was assumed for the subject sites that during the morning peak hour 20% of trips would be outbound and 80% of trips would be inbound. For the evening peak hour, it was assumed that 80% of trips would be outbound and 20% of trips would be inbound for the residential development.

Table 6-5 shows the number of trips generated by the proposed developments during the morning and afternoon peak hours for inbound and outbound trips.

Table 6-5 Estimated inbound and outbound peak hour trips for proposed developments

Developments	Morning peak hour trips			Afternoon peak hour trips		
	Inbound	Outbound	Total	Inbound	Outbound	Total
Residential						
North Eveleigh	41	164	205	164	41	205
Redfern Railway Station, Gibbons & Regent Streets	29	114	143	114	29	143
Commercial						
North Eveleigh	526	132	658	132	526	658
Redfern Railway Station, Gibbons & Regent Streets	445	112	557	112	445	557
Total	1041	522	1563	522	1041	1563

6.6 Trip distribution

A spreadsheet model was developed to assess the traffic impact of the proposed developments. The indicative lot yield for each residential and commercial developments were input in the spreadsheet model which in turns converts into trips generated from the proposed developments and assigned to the surrounding road network.

The directional distribution was adopted from the Journey to Work (JTW) dataset from Transport Population Data Centre (TPDC) and summarised in Table 6-6. The directional distribution has been modified to account for the increasing demand from the east direction by increasing 5%, and decreasing the north direction by 5%.

Table 6-6 Directional distribution

Direction	Inbound	Outbound
East	23%	15%
West	34%	26%
North	27%	52%
South	16%	8%
Total	100%	100%

Source: Journey to work (JTW) data from Transport Data Centre (TDC) 1996

While Table 6-6 shows the regional distribution of traffic in the surrounding area, Table 6-7 and Table 6-8 show the assumed route choice and distribution from the proposed development sites, North Eveleigh and Redfern Railway Station, Gibbons & Regent Streets, respectively.

Table 6-7 Trip assignment for North Eveleigh site

Direction	Distribution	Route choice
East	40%	Cleveland St
	60%	Redfern Street via Lawson St
West	30%	King St via Wilson St
	70%	Parramatta Rd via Cleveland St
North	20%	City Rd via Cleveland St
	80%	Gibbons/Regent St via Lawson St
South	60%	Botany Rd via Lawson St
	40%	Botany Rd via Wilson St

Table 6-8 Trip assignment for Redfern Railway Station, Gibbons & Regent Streets sites

Direction	Distribution	Route choice
East	50%	Cleveland St
	50%	Redfern Street
West	100%	Cleveland St
North	100%	Regent St
South	100%	Botany Rd via Gibbons/Regent St

In addition to the proposed developments, the estimated trips generated from the ATP were added to the background traffic.

The traffic that would be generated by the proposed developments during the peak hours in 2016, using the trips generation rates and distribution assumptions at the eight key intersections is shown in Figure 6-4.

The predicted traffic shown in Figure 6-5 was superimposed on the traffic for the design future year of 2016. As discussed in Section 4.3, a growth rate of 0.5% per year has been applied to the arterial roads. The post development traffic volume forecasts are shown in Figure 6-5.

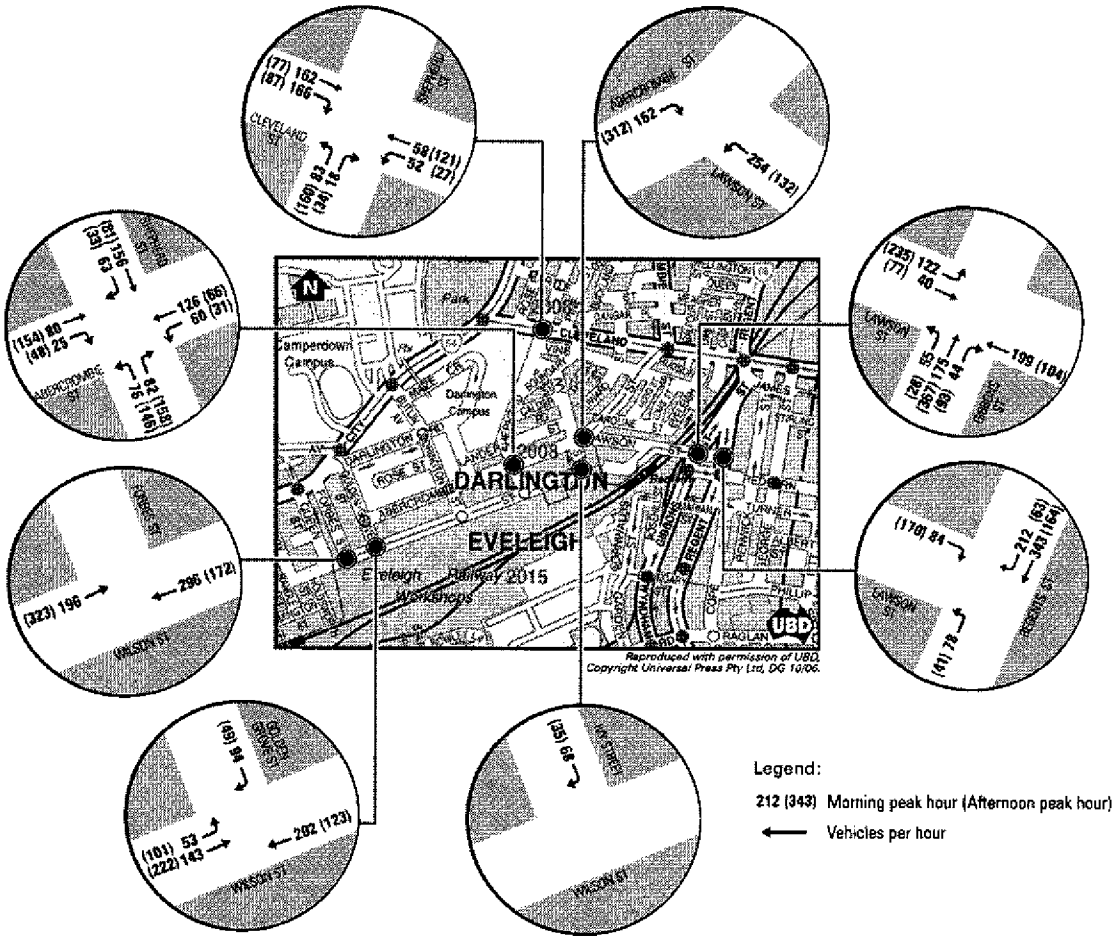


Figure 6-4 Predicted peak hour generated traffic (vph)

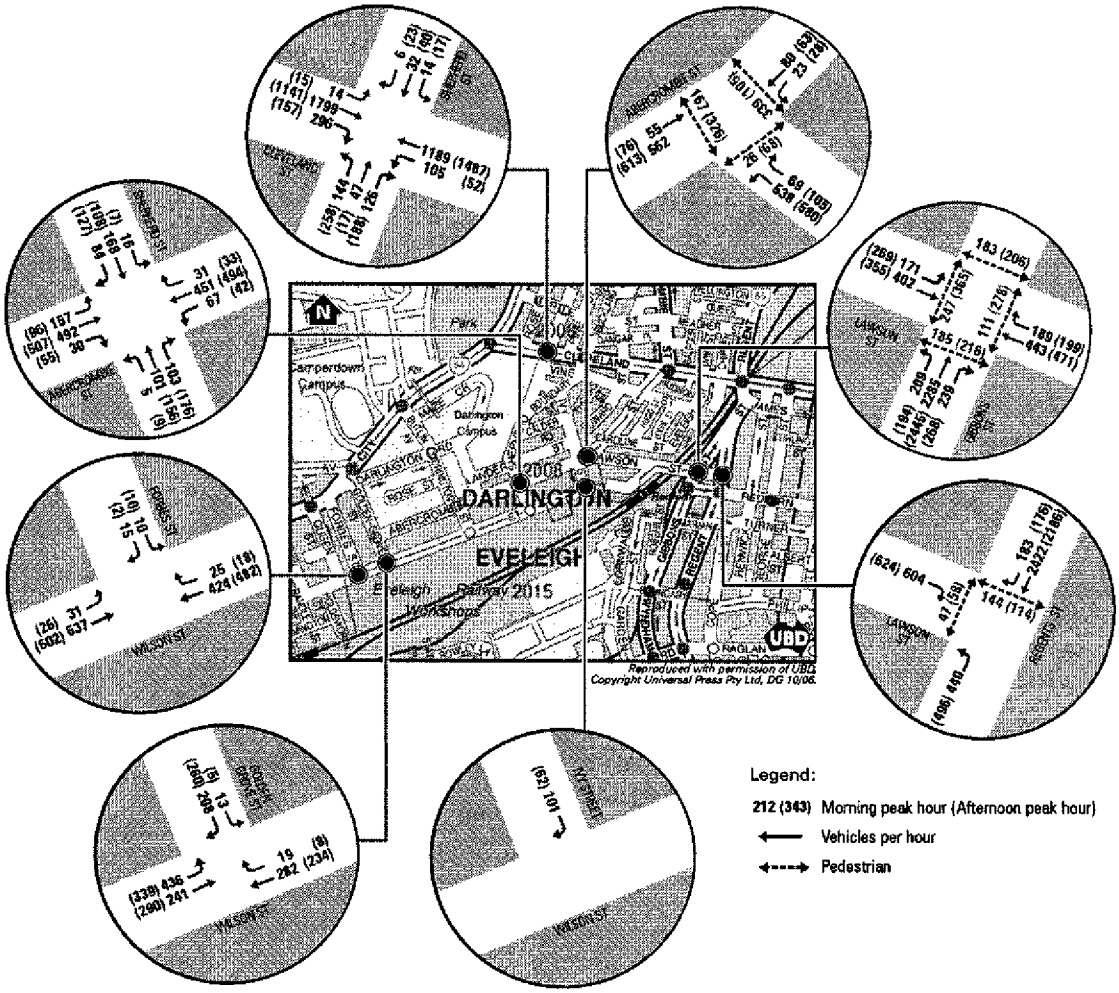


Figure 6-5 Post development peak hour intersection volumes (vph)

6.7 Intersection assessment criteria for simulations

The operation of key intersections within the vicinity of the sites was assessed using the aaSIDRA (SIDRA) intersection modelling software. SIDRA calculates intersection performance measures including:

- level of service, from A to F
- degree of saturation, as a ratio of demand to capacity
- average vehicle delay, in seconds
- maximum queue length, in metres.

6.7.1 Level of service

Level of service (LoS) is one of the basic performance parameters used to describe the operation of an intersection. The levels of service range from A (indicating good intersection operation) to F (indicating over saturated conditions with long delays and queues). At signalised and roundabout intersections, the LoS criteria are related to average intersection delay (seconds per vehicle). At priority controlled intersections, the LoS is based on the average delay (seconds per vehicle) for the worst movement. See Table 6-9.

Table 6-9 Level of service criteria for intersections

Level of service	Average delay (seconds per vehicle)	Traffic signals, roundabout	Give way and stop signs
A	Less than 14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity. At signals, incidents will cause excessive delays. Roundabouts require other control mode	At capacity; requires other control mode
F	Greater than 71	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing; requires other control mode

Source: RTA Guide to Traffic Generating Developments, October 2002

6.7.2 Degree of saturation

Degree of saturation (DoS) is defined as the ratio of demand flow to capacity, and therefore has no unit. As it approaches 1.0, extensive queues and delays could be expected. For DoS greater than 1.0, a small increment in traffic volumes would result in an exponential increase in delays and queue length. For a satisfactory situation, the DoS should be less than the nominated practical degree of saturation, usually 0.9. The intersection DoS is based on the movement with the highest ratio for all types of intersection.

6.7.3 Average delay

Delay is the difference between interrupted and uninterrupted travel times through the intersection and is measured in seconds per vehicle. The delays include queued vehicles decelerating and accelerating to and/or from stop, as well as delays experienced by all vehicles negotiating the intersection. At signalised and roundabout intersections, the average intersection delay is usually reported and is taken as the weighted average delay by summing the product of the individual movement traffic volume and its corresponding calculated delays and dividing by the total traffic volume at the intersection. At priority controlled intersections, the average delay for the worse movement is usually reported.

6.7.4 Maximum queue length

Queue length is the number of vehicles waiting at the stop line and is usually quoted as the 95th percentile back of queue, which is the value below which 95% of all observed queue lengths fall. It is measured as the number of vehicles per traffic lane at the start of the green period at a signalised intersection, when traffic starts moving again after a red signal. For an unsignalised intersection, it is measured during the unblocked period i.e. when queued vehicles on the minor road can enter the major road when a gap is available in the major traffic stream. The intersection queue length is usually taken from the movement with the longest queue length.

6.8 Intersection analysis results

6.8.1 Pre development conditions

The 2016 volumes shown in Figure 6-4 and Figure 6-5 were used to assess the performance of the seven key intersections under existing conditions, or the pre development scenario, using SIDRA. The intersection analysis results from SIDRA are summarised in Table 6-10.

From Table 6-10, it can be seen that all intersections analysed are expected to operate at LoS B or better during both the morning and afternoon peak periods without the traffic contributions from the key strategic sites. Traffic travelling through these intersections can be expected to experience delays in the order of 25 seconds or less at each intersection for both the morning and afternoon peak periods. The majority (all but one) intersections currently operate with an acceptable degree of saturation, less than 0.7 (i.e. there is some spare capacity).

Table 6-10 Pre-development intersection performance

Intersection Name	Ints Control Type	Peak period	Ints DoS	Ave delay	Ints LoS	Queue (m)
Wilson St-Forbes St	Priority	Morning	0.24	17	B	7
		Afternoon	0.19	17	B	13
Wilson St-Golden Grove St	Roundabout	Morning	0.32	8	A	18
		Afternoon	0.20	9	A	10
Wilson St-Ivy St/	Priority	Morning	0.02	9	A	0
		Afternoon	0.02	9	A	0
Abercrombie St-Shepherd St	Signals	Morning	0.70	18	B	111
		Afternoon	0.66	20	B	94
Abercrombie St-Lawson St	Signals	Morning	0.60	23	B	74
		Afternoon	0.66	22	B	92
Lawson St-Gibbons St	Signals	Morning	0.70	25	B	188
		Afternoon	0.63	24	B	159
Lawson St-Botany Rd	Signals	Morning	0.53	18	B	129
		Afternoon	0.54	16	B	130
Cleveland St-Shepherd St	Signals	Morning	0.61	20	B	175
		Afternoon	0.68	22	B	208

6.8.2 Post-development conditions

Intersection analyses for the seven key intersections were repeated for the post development traffic volumes shown in Table 6-11. The results from the 2016 forecasts with the additional traffic from the key strategic sites are discussed below.

Table 6-11 shows that only one intersection; Abercrombie Street-Shepherd Street, is forecast to perform unacceptably, and then, only in the PM peak, as it is currently structured. Abercrombie Street-Lawson Street and Cleveland Street-Shepherd Street intersections would be operating at the LoS D for at least one of the peak periods. These three intersections would be experience more demand than they have capacity for with the degree of saturation greater than one.

All other intersections would be operating acceptably at LoS C or better for both morning and afternoon peak periods. Traffic travelling through these intersections can be expected to experience delays in the order of 40 seconds or less.

Table 6-11 Post-development intersection performance

Intersection Name	Ints Control Type	Peak period	Ints DoS	Ave delay	Ints LoS	Queue (m)
Wilson St-Forbes St	Priority	Morning	0.34	23	B	30
		Afternoon	0.33	22	B	33
Wilson St-Golden Grove St	Roundabout	Morning	0.46	9	A	34
		Afternoon	0.41	9	A	29
Wilson St-Ivy St/	Priority	Morning	0.06	9	A	0
		Afternoon	0.04	9	A	0
Abercrombie St-Shepherd St	Signals	Morning	1.02	51	D	288
		Afternoon	1.13	>70	F	369
Abercrombie St-Lawson St	Signals	Morning	1.01	39	C	209
		Afternoon	1.03	44	D	243
Lawson St-Gibbons St	Signals	Morning	0.84	31	C	272
		Afternoon	0.91	38	C	353
Lawson St-Botany Rd	Signals	Morning	0.69	18	B	188
		Afternoon	0.65	18	B	168
Cleveland St-Shepherd St	Signals	Morning	1.00	40	C	354
		Afternoon	1.00	45	D	421

As indicated previously, the intersection of Abercrombie Street-Shepherd Street, Abercrombie Street-Lawson Street and Cleveland Street-Shepherd Street would require some adjustments to increase capacity in order to accommodate the anticipated traffic that would be generated by the proposed developments. The results are summarised in Table 6-12.

Table 6-12 Post-development intersection performance with improvements

Intersection Name	Ints Control Type	Peak period	Ints DoS	Ave delay	Ints LoS	Queue (m)
Abercrombie St-Shepherd St	Signals	Morning	0.87	30	C	199
		Afternoon	0.89	36	C	238
Abercrombie St-Lawson St	Signals	Morning	0.87	35	C	176
		Afternoon	0.90	41	C	218
Cleveland St-Shepherd St	Signals	Morning	0.83	26	B	255
		Afternoon	0.85	30	C	298

Table 6-12 shows that the Abercrombie Street and Shepherd Street intersection has improved with the cycle time being modified from 60 seconds for both the morning and afternoon peak periods to 70 and 80 seconds for morning and afternoon peak periods, respectively.

As can be seen from Table 6-12, the performance of Abercrombie Street and Lawson Street intersection has improved with the traffic signal cycle time being modified from 60 seconds for both the morning and afternoon peak periods to 80 seconds and 90 seconds for morning and afternoon peak periods, respectively. In addition, the 30m left turn bay at the Lawson Street approach has been modified to a full left turn lane with the 30m right turn bay. Under this modified configuration which involves some adjustment to parking and re-linemarking, Abercrombie Street and Lawson Street intersection would operate with LoS C at either peak periods analysed.

Cleveland Street and Shepherd Street intersection could be improved with extending the left turn bay at Shepherd Street (south approach) from 30m to 70m. Under this modified configuration, Cleveland Street and Shepherd Street intersection would operate with LoS C or better at both peak periods.

6.9 Mid-block capacity

Table 6-13 below shows the uni-directional peak hour flows and the corresponding level of service for six key road sections in the vicinity of the subject site for the post development condition. These road sections would be classified within AUSROADS as urban roads with interrupted flows for benchmarking purposes.

Table 6-13 Mid-block volumes at key road sections

	Morning peak hour		Afternoon peak hour	
	NB/EB	**SB/WB**	**NB/EB**	**SB/WB**
Wilson Street, east of Golden Grove Street	250 (B)	300 (B)	300 (B)	240 (B)
Abercrombie Street, west of Lawson Street	620 (D)	620 (D)	690 (D)	640 (D)
Lawson Street, east of Abercrombie Street	590 (C)	610 (D)	640 (D)	690 (D)
Gibbons Street, south of Lawson Street	2730 (D)	-	2910 (D)	-
Regent Street, south of Lawson Street	-	3030 (D)	-	2810 (D)
Shepherd Street, south of Cleveland St	320 (B)	430 (C)	460 (C)	250 (B)

Note: NB/EB – Northbound/Eastbound, SB/WB – Southbound/Westbound, and (B) – Level of Service

All but Gibbons Street and Regent Street have one through lane for each direction. Gibbons Street and Regent Street, south of Lawson Street have three through lanes.

The AUSTROADS Guide to Traffic Engineering Practice – Part 2 indicates that typically one-way mid block lane capacity on interrupted urban roads would be in the range of 900 to 1,000 vehicles per hour (vph) per lane, which could increase to 1,200 to 1,400 vph under ideal conditions (no on-street parking, few driveways, etc).

From Table 6-13, it can be seen that the roads have sufficient capacity to operate acceptably during both morning and afternoon peak hours. The existing road sections would have sufficient capacity to accommodate the future traffic demand from the proposed developments in 2016.

6.10 Summary of impacts of proposed development on traffic

The proposed development at North Eveleigh and Redfern Railway Station, Gibbons & Regent Streets sites are expected to generate approximately 1,560 vehicle trips during the peak hour. Applying the general RTA rates would yield 3,800, which we have demonstrated is not applicable for this area. The traffic generation rate of 0.75 trips per 100m^2 was adopted for the commercial development on the RWA key strategic sites for the following reasons:

- a higher mode share was assumed for public transport due to the sites' proximity to Redfern Station and also the short distance to the Sydney CBD. Also the existing population in Redfern-Waterloo has almost half the car ownership and uses public transport at double the rate of the Sydney metropolitan region. This reduced the share of generated traffic that would be car driver or passenger to 30%
- a higher vehicle occupancy rate is observed in the inner city area as shown in Table 6-3. An average value of 1.41 was adopted for the proposed developments from surveys, which is 18% greater than the default RTA guideline of 1.19
- Redfern-Waterloo Authority assumes 4 employees per 100m2 gross floor area compared to the RTA assumptions of 4.75 employees per 100m2 of gross floor area. Hence, a further reduction in the traffic generation rate was warranted.

In addition to the proposed developments, the estimated trips generated from the Australian Technology Park were added to background traffic.

The trips generated from the proposed developments were then added to the background traffic for the future year of 2016. A growth rate of 0.5% per annum has been applied on the arterial roads to the base volumes now experienced. This is conservative as actual trends in the area, due to fuel costs and parking control, have been less.

The intersection modelling software, SIDRA has been used to analyse the performance of key intersections under pre-development and post-development conditions in 2016. The intersection analysis results for the pre-development condition show that the intersections are to operate at level of service of B or better during both the morning and afternoon peak periods in 2016. The intersection analysis results for the post-development condition however, showed that intersections such as Abercrombie Street-Shepherd Street, Abercrombie Street-Lawson Street and Cleveland Street-Shepherd Street would be operating at the level of service D, the lowest acceptable level, for at least one of the peak periods without modification. These three intersections would experience demand in excess of supply, indicated by a forecast degree of saturation greater than one.

These intersections were slightly modified and modelled again in order to accommodate the anticipated traffic from the proposed developments. The slight modification of the cycle time in the traffic signals and with some minor changes to the intersection's configurations, the forecast performance of all the intersections improved to level of service C, or better, during both morning and afternoon peak periods. The modifications were to signal phase timings, or through lengthened turn bays and lanes created with some restrictions in on-street parking and adjusted line marking.

Furthermore, the peak hour flows and the corresponding level of service for six key road sections in the vicinity of the subject sites were assessed for the post development capacity. The results show that all six road sections would operate at level of service D or better for both morning and afternoon peak hours. The existing road sections would have sufficient capacity to accommodate the future traffic demand from the proposed developments at an acceptable future performance level.

7. Further Investigations

7.1 Proposed traffic control measures to accommodate growth

The traffic engineering investigations forecast that the proposed levels of development in the RWA key strategic sites of North Eveleigh and Redfern Station could be accommodated on the existing roadways, and with only some limited modification to intersections in the area. The modifications proposed to achieve acceptable intersection performance under full development in 2016 were:

- Abercrombie Street/Shepherd Street: modify 60 sec cycle time to 70 sec in AM peak and 80 in evening peak. This requires cooperation with the RTA to achieve
- Abercrombie Street/Lawson Street: modify the 60 sec cycle time to 80 sec in the AM peak and 90 sec in PM peak. This required cooperation with the RTA to achieve. Also the 30m left turn bay would be converted to a full left turn lane with a 30m right turn bay to adopt to the rebalancing of traffic travelling south through this intersection. This would require the cooperation of the City of Sydney and RTA through the City of Sydney traffic committee when development applications are submitted on the sites
- Cleveland Street/Shepherd Street: in 2016, this intersection would perform acceptably if the left turn bay approaching from the south was extended from 30m to 70m. This would entail the loss of approximately 6 on-street car parking spaces. This, too, would need to be forwarded with the assistance of the City of Sydney as developments are preparing to open.

7.2 Improvement in pedestrian connections between Redfern Street and Redfern Station and North Eveleigh

The City of Sydney is investing in a major upgrade in the streetscape and pedestrian environment along Redfern Street as the main street of the local community. As well as pedestrian links, this is an important route for buses into the city and a continuation of the Lawson Street bicycle route. Redfern Station is the anchor of pedestrian desire line as both a generator and attractor of trips and as it also bridges the rail lines. While RailCorp and RWA are looking at the upgrade of the station as a catalyst for future development, there are other traffic investigations that could also rebalance the road corridors for pedestrian improvements.

7.2.1 Investigation of a Gibbons Street underpass

One means of creating a better environment for pedestrians while maintaining the traffic and bus transit role of Gibbons Street, would be to take advantage of the levels in the area, and construct a new underpass for through traffic underneath a podium for pedestrians at the current level of the street. Constraints on such a proposal would be that it could not acquire much, if any, additional land as the rail lines and substantial private property front the road corridor.

The provision of a cut and cover underpass with a podium would involve a cutting approximately two traffic lanes wide, with vertical retaining walls and a roof slab to carry pedestrians and local traffic over the top. The cutting would be graded to pass under Lawson Street and regain the surface of Gibbons Street to the north. A design objective would keep the cutting cover to 60 metres or less so that the facility would be defined as a short underpass. A longer facility would be considered a tunnel, which would require ventilation and other safety-based infrastructure

Since much of the construction work would be below ground there may be significant utilities affected by the proposal, both in Gibbons Street and in Lawson Street that will need to be relocated. Rail utilities are particularly difficult to locate without pothole testing.

Due to the significance of Gibbons Street in the road network, all construction work would have to be performed while keeping traffic moving as much as possible. Even with great care in traffic management, construction could result in the loss of up to two traffic lanes in Gibbons Street for some periods of time. This is likely to lead to traffic impacts for some distance from the site, particularly in the morning peak.

Given the land tenure constraints, the basic set up of the underpass would be expected to be two through traffic lanes in the underpass and one traffic lane coming up to the surface, and possibly one leading back down. While one through traffic lane would be lost, the capacity of the road is not expected to be diminished because the grade separation of the intersection would remove impedance to the through traffic. This assumption would need to be tested, however, through traffic modelling to the satisfaction of the RTA.

Within these constraints, there are 4 potential options for an underpass that the RWA may wish to investigate. All would provide two through northbound lanes in the underpass:

- Option 1 – would have a north bound exit ramp to Lawson Street on the west side of the underpass structure, and entry ramp from Lawson Street for city-bound traffic. All turns that can currently be made at Lawson and Gibbons would remain. Pedestrians crossing Gibbons Street would have to cross the ramp traffic, but the crossing distance would be shorter (either one or two lanes). Some on-street parking would be lost in Gibbons Street so vehicles could move to the left for the exit ramp to Lawson Street. Peak hour queuing could make weaving difficult to get to the lanes for turns. With the fast, through traffic pushed to the east, property access could be difficult for frontage properties on the eastern kerb
- Option 2 – would have a north bound exit ramp to Lawson Street on the east side of the underpass structure, and an entry ramp to Gibbons Street for city-bound traffic. The network is just a mirror image of Option 1, but it does have more difficulty with getting entry ramp traffic to be able to turn left at Cleveland Street. More conflicts between entry ramp traffic and traffic trying to use the U-turn facility to get to Regent Street would be expected, but it would be easier to provide access to eastern frontage properties
- Option 3 – is the same as Option 1 but without the City oriented entry ramp. This option would ensure there is no additional pressure put on the left turn queue for Cleveland Street which is congested currently during the AM peak

- Option 4 – this option would not provide any ramps between Gibbons Street and Lawson Street, so pedestrians would not have to cross any traffic lanes. Gibbons Street traffic wanting to get to Lawson Street would go through the underpass on the right lane, then use the U turn roadway to Regent Street and then either turns left to Redfern Street or right into Lawson Street. This would add around 440 vph, in both peaks, (based on current traffic volumes) to the U turn move. It is likely that some of this traffic would divert to other routes given this indirect path. City bound traffic from Lawson Street might turn left at Regent Street, left at Marian Street and then left onto Gibbons Street (Traffic signals may need to be considered at this intersection). Access to the properties on the east side could probably be retained through the laneways.

Table 7-1 compares the features of the Options.

Table 7-1 Differences between the Options

Design point	Option 1	Option 2	Option 3	Option 4
Same turns at Lawson Street?	Yes	Yes	No	No
Keeps buses next to station?	Yes	No	Yes	No
Keeps arterial, through capacity?	Yes	Yes	Yes	Yes
Do pedestrians cross traffic?	Yes, ramp	Yes, ramp	Yes, ramp	No
More traffic in Regent Street?	No	No	Yes	Yes
Impact on access to property?	Yes	Less	Yes	Yes
Impact left turn into Cleveland St?	Yes	For Lawson Street traffic	No	No

The extent of these impacts would require analysis through a simulation model testing each of the options to see how they perform in traffic terms and if the benefits can be demonstrated to outweigh the project costs.

7.2.2 The future of the one-way arterial pair

Another future investigation could examine the traffic impacts of changing the current arterial pair of northbound traffic in Gibbons Street and southbound traffic in Regent Street. RTA has had a scheme for a southern arterial that maintained this separation for much of the distance between the CBD and the Airport, and it has not committed to a single future upgrade plan for this corridor (refer Section 3.3.1). In the short term, it wants to see the arterial capacity of the routes remain. Other stakeholders in the area have raised questions about the commercial and amenity benefits of reverting to two-way traffic in both streets, or in just Regent Street.

There are some benefits to one way traffic operation:

- fewer conflicts for pedestrians when crossing streets and fewer, less severe crashes
- greater traffic capacity from the same number of lanes due to reduced turning conflicts at intersections
- more on-street parking capacity as there is less pressure for turning bays.

And there are some consistent disadvantages due to one-way streets:

- greater distances for local circulating traffic to travel to reach the same destination. This is especially true in urban networks where there can be turn bans, too
- more confusion on how bus services operate and bus stop locations.

If there is a desire to assess this option further, there will be a number of issues that require investigation.

Regional issues:

- less road capacity
- additional cost of new traffic signal arrangements, directional signs and line marking
- more congestion between the CBD and the Airport.

Local issues:

- if the roads are to be reconfigured to attract additional car traffic from the surrounding retail catchment, where are those cars going to park
- if Regent Street is converted to two-way, and Gibbons Street remains one-way and arterial in nature, there will be no improvement in access to Redfern Railway Station for pedestrians crossing Gibbons Street
- if bus routes are consolidated in a two-way Regent Street, they will be quite removed from convenience interchange at Redfern Railway Station
- if bus routes are consolidated in a one-way or two-way Gibbons Street, bus stops will be closer to the station, but more stops will impede the flow of through traffic
- if southbound bus stops are put into Gibbons Street, pedestrian safety will need to be carefully managed at the crossing into the Station
- if buses operate two-way in one of the streets, that street will lose on-street parking to accommodate the new bus stops.

With the traffic, and bus operational impacts on the Strategic Bus Corridor, any further consideration of options to alter the traffic directions on Gibbons and Regent Street will require area-wide traffic simulation modelling to address some of the impacts listed above.

7.2.3 Other measures

As the planning for an upgraded Redfern Railway Station progress, it may be possible to combine new access arrangements proposed through that proposal with streetscape improvements in Gibbons Street to obtain an improved pedestrian connection. This may involve improvements to the public domain that leave the capacity of the road system with little to no change.

If the station upgrade contained a more direct pedestrian connection between Redfern Street and the University of Sydney precinct, there would be a substantial strengthening of links between Darlington and Redfern, and a major redistribution of traffic on Lawson, Wilson and Abercrombie Streets.

The restructuring of new development on the key strategic sites to be more transit oriented is expected to enhance the activity and vitality of the area, and reinforce the Redfern Street upgrade program.

7.3 Traffic impact assessment modelling

While the traffic assessment of the key strategic sites in this report demonstrated sufficient capacity existed for development with only minor adjustments to the road network, that conclusion was based on the road network remaining the same as at present. The study area is a dense, urban traffic environment Any significant changes to the network, or even traffic signal timing, may require a more comprehensive analysis, which is usually done through the application of an area-wide traffic simulation model to identify the complex interaction of traffic flows through the local network.

Advancing the design of some of the network changes described above will require a traffic modelling capacity that conforms with road authority (RTA and City of Sydney) requirements. Such a model would measure the impact of proposed road network changes on road network performance or the sensitivity of forecast traffic outcomes under different growth scenarios, or the impacts of particular proposals on the traffic system and how their contribution might be assessed for traffic improvement fees. A model would be only one of the inputs into planning decisions, but it would be critical in examining and justifying any changes to road operations.

Appendix A

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