

Canada Bay Council

**Rhodes Station Precinct,
Transport Assessment
and Public Domain
Outcomes**

August 2014

Henson Consulting

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1 Introduction

1.1 Background

1.2 Scope of Report, and Study Process

Henson Consulting was commissioned by Canada Bay Council in June 2014 to undertake an assessment of transport and public domain outcomes for the area around Rhodes railway station, next to Homebush Bay west of Sydney CBD. The study team included StudioGL for urban design advice.

This assessment and report was prepared with reference to traffic impact assessment as required by the RMS Guide to Traffic Generating Developments, and other relevant Australian Standards and controls.

1.3 Background

Rhodes was originally strongly influenced by its geographical location on the river, and subsequently by the opportunity and severance created by the rail line and Metroad Route 3 upgradings. The resultant area is served by few external transport links. Those external transport links are relatively “heavy duty” rail and road links, and do not support good walking cycling and public transport connectivity. Council policy in Rhodes has been to minimise unnecessary car use by using a restrictive car parking code of a maximum of one car space per residential unit, regardless of its size and number of bedrooms. The effectiveness of this policy is much lower car ownership in Rhodes than might otherwise have been the case. Despite this admirable transport oriented development approach by Council, most of the development in recent decades has come with some on-site car parking, which has contributed to local vehicular traffic flows. This increase of vehicles and pedestrians has progressively heightened the modal conflicts around the railway station.

The imminent redevelopment of the Station Precinct (also known as Precinct D, to comprise dwellings, retail, supermarket, and ancillary uses to total approximately 140 000-160 000 square metres of floor area), construction of the bus/pedestrian/cycle bridge across Homebush Bay and new bus routes, and construction of the Northern Freight Line create an opportunity to consider a “total design” and management approach to the area.

“Future proofing” considerations include potential up-scaling of the development east of the railway including the industrial area at the north and the office parks at the south, a local ferry wharf, and crossing opportunities of the railway for all modes including long term future widening of the Leeds Street-Walker Street underpass of the railway.

There will be very strong benefit/cost ratio paybacks for “missing link” improvements to the pedestrian, cycling, and vehicle network. Council requires a study to identify opportunities to influence the development of the Station Precinct to optimize its role as the community and transport hub of the Rhodes area, and as input to a master plan approach to Planning NSW.

1.4 Key Issues and Objectives

The objective of the study was to assess precinct functions and the pre-eminence of non-car modes to address the following key issues, and to provide practical transport and public domain solutions to accommodate the proposed development:

- The accessibility of the precinct by a range of transport modes including car, public transport, walking and cycling;
- The ability of the public transport network to service the precinct in the peak and off peak and weekend periods;
- Mode share targets reflecting high quality public domain and urban design standards;
- Means of minimising travel demand by car and maximising the share of travel by other modes including public transport, cycling and walking, or car share;
- Compliance with the requirements of planning controls including the Local Environment Plan (LEP) and Development Control Plan (DCP);
- Justification of car parking provision and precinct servicing arrangements
- Access for the mobility impaired;
- Means of accommodating and integrating trips generated by the development including necessary improvements to public transport services, pedestrian systems, bicycle routes, and the road network;
- Means of mitigating any adverse impacts of the development on movement systems;
- Means of improving access to the precinct having regard to vehicular, pedestrian, cycle and public transport access;
- Impacts on and means of improving pedestrian accessibility to public transport, shops, schools, open spaces, community centres and the like.
- Impacts on and means of improving pedestrian and road user safety;

1.5 Existing Studies and Reports and Guidelines

Existing studies and reports include area studies by Council and the RMS NSW on some nearby roads, and a range of NSW Government departments. The Metropolitan Strategy for Sydney also has some information regarding this area. The key transport guidelines taken into account in this study include the following and local studies reported in following chapters:

- Austroads Guidelines
- Guidelines to Traffic Generating Developments, RMS NSW
- Australian Standard AS/NZS 2890.1 – 2004 Parking facilities Part 1: Off-street car parking
- Australian Standard AS 2890.2 – 2002 Off-Street Parking Part 2: Commercial vehicle facilities.
- Australian Standard AS 2890.3 – 1993 Parking Facilities Part 3: Bicycle Parking Facilities

- Australian Standard AS2890.6 - 2009 Off street Parking for People with Disabilities; and other guidelines for the mobility impaired and other access requirements including vision impairment
- 'Planning Guidelines for Walking and Cycling', Department of Infrastructure, Planning and Natural Resources December 2004.
- NSW Bike Plan (May 2010).

1.6 Scope of This Report

The Primary Study Area is the area bounded by the railway, Gauthorpe St, Marquet Street, and Mary Street.

The Secondary Study area is the whole of the Rhodes Peninsula, including East Rhodes.

Figure 1: Rhodes area and context



2 Studies and Reports

2.1 Draft Inner West Sub regional Strategy; State Plan , Metropolitan Plan 2036; Draft Metropolitan Strategy for Sydney 2031

These reports identify Rhodes Business Centre as a Specialised Precinct that will accommodate some of the growth of metropolitan Sydney. Local centres will be designed so there are more opportunities to walk and cycle, and greater use of public transport will be encouraged.¹

2.2 Canada Bay Futures Plan/ Local Planning Strategy 2010²

The plan refers to the NSW State Plan targets of increasing the share of peak hour journeys on public transport in Sydney by 25% by year 2016, safer roads, jobs closer to home, and improving the efficiency of the road network. The plan also refers back to the Metropolitan Strategy and Inner West Subregion Draft Subregional Strategy. The target recommended by this Strategy for transport modal split is a 10% shift away from the private car in both journey to work travel (provided by the Census) and for all trips (provided by the Household Travel Survey) over a 10 year period.

2.3 Rhodes West Development Control Plan, Nov 2010;

The DCP vision for Rhodes West included integrating communities, a range of high quality public open spaces, and leadership in ESD initiatives. DCP objectives include a street layout that maximises connections to all surrounding areas and creates a high quality public domain that is permeable and safe. DCP objectives numbers #10-#19 describe this in more detail, including #017: Establish a hierarchy of streets that distinguish between major streets for through traffic and public transport, and local streets. The DCP (Section 3.2.1) states that the main distributor for traffic in the Rhodes Peninsula is the Walker Street/Rider Boulevard spine.

¹ Your future Sydney, page 16

² Canada Bay Local Planning Strategy 2010.

Figure 2: DCP Street Network Plan



2.4 Canada Bay Local Environmental Plan 2013;

The Planning Proposal³ for a proposed amendment to the LEP included on 10 December 2013, the City of Canada Bay Council endorsed the Master Plan developed by Conybeare Morrison as the basis for Council's submission to the NSW Planning Gateway, for a rezoning in relation to the Station Precinct, Rhodes (Precinct D). The Master Plan proposed uplift in the amount of floor space and an increase in building height permitted for a series of sites within the Station Precinct of Rhodes Peninsula that form part of a Voluntary Planning Agreement and subject to Canada Bay Local Environmental Plan 2013.

The amended planning proposal⁴ includes the Hossa site at 3-9 Marquet Street and 4 Mary Street, and includes approximately 1400 dwelling units and 140 000-160 000m² Gross Floor Area (GFA) including retail, commercial, hotel, and recreational facilities. Parking is based on one car space per unit so there are potentially 1400 residential car spaces with an additional 200 spaces to be provided as part of the 34 Walker Street redevelopment and leisure centre. The proposal was for more floor space and car parking in a proposal for a market town-style village centre involving an interconnected series of laneways and public spaces in

³ PROPOSED AMENDMENT TO THE CANADA BAY LOCAL ENVIRONMENTAL PLAN 2013, AMENDMENT NO.3 – STATION PRECINCT (PRECINCT D), RHODES PENINSULA, DECEMBER 2013

⁴ Subject to receipt by Council of final proposal

the southern half of the Precinct, flanked by retail and commercial uses, on land opposite the railway station. With some of the 20 000 population planned⁵ at Wentworth Point using Rhodes station and retail, planning for a bus-rail interchange and a higher quality of public domain was stated as an important priority.

2.5 Developer proposals for the subject precinct

The current Planning Proposal includes some major changes from early schemes including a pedestrian overpass of Walker Street to the railway station concourse bridge, removal of the 16 Walker Street property from the Billbergia development site, and the need to shift delivery access one block further south. The former "Hossa" site (now known as B1 Central) including 4 Mary Street and 3-9 Marquet Street is now part of the Planning Proposal, and involves the construction of a 29 storey residential/commercial and retail development.

The August 2014 Planning Proposal includes the following approximate amounts of gross floor area in six high rise buildings:

- 100 000m² for residential (1300 units)
- 20 000m² for retail and commercial
- 5 000m² for hotel (96 rooms)
- 8 500m² for recreation centre

In addition to on-site parking for the above uses, a 250 space public car park is to be provided under the recreation centre at 34 Walker Street.

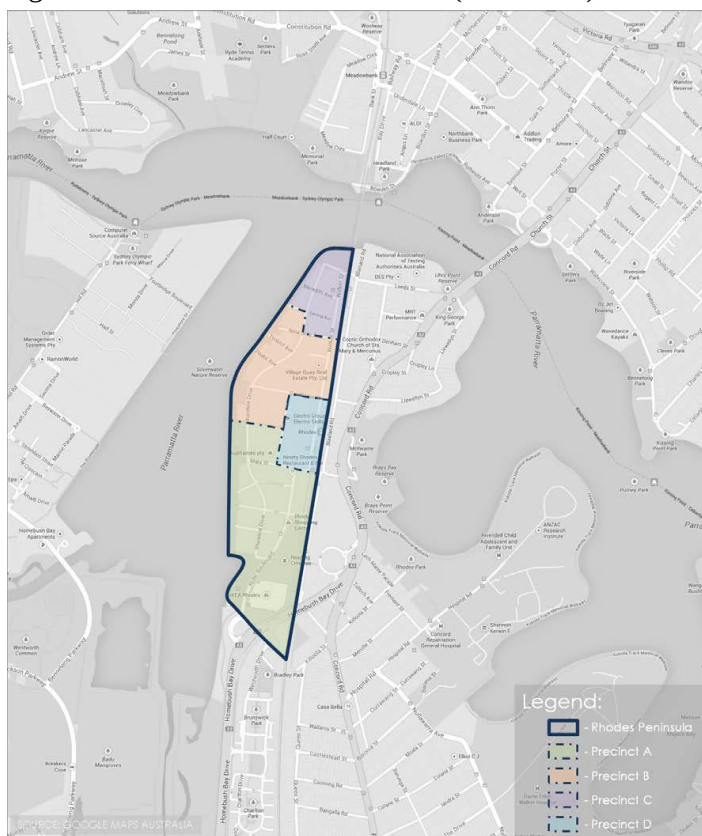
2.6 Rhodes Station Precinct Proposed Uplift Traffic Study

The report⁶ assesses additional development potential given current conditions and future planned infrastructure provisions (including the proposed Homebush Bay Bridge) and changes in travel behaviour.

⁵ 8349 dwellings from Wentworth Point TMAP Sept 2012 by 2011 Census average household size of 2.03 persons in Wentworth Point and 3.08 persons in Auburn LGA plus other related uses and Sydney Olympic Park uses.

⁶ Rhodes Station Precinct Proposed Uplift Traffic Study, Draft, GTA for Billbergia Group, 2/2/2014; Updated GTA report of 28 May 2014.

Figure 3: Rhodes West Location Plan (from GTA)



In addition to the uncompleted development at Rhodes, Council also advises the last stage of the Rhodes Corporate Park was recently completed, but not yet occupied. The un-occupied area at Rhodes Corporate Park is some 18,400m² gross floor area. GTA indicates that approved development yet to be completed in Precinct D (includes the Hossa development site in Precinct D) is:

- 494 residential apartments, and
- 10,020m² of retail floor area.

The GTA analysis indicates that the traffic arising from the proposed uplift would not result in noticeable adverse traffic impacts when compared with traffic conditions under the approved development.

From the GTA assessment, Rider Boulevard and Walker Street would meet the requirements for the implementation of a 40km/hr high pedestrian activity area. Shoreline Drive does not meet the criteria for the implementation of a 40km/hr high pedestrian activity area, but may be appropriate to provide a 40km/hr local traffic area speed zone. In all cases, traffic calming devices may be required to reduce existing speed down to an appropriate level.

Council requested the GTA study to identify the destination and origin of vehicles travelling along Walker Street and Rider Boulevard to determine if it is being used as a rat run to by-pass congestion of Concord Road/Homebush Bay Drive. The study was also to identify if the travel volumes can be reduced. The proportion of through trip or “rat running” traffic on Rider Boulevard and Walker Street is approximately 15 per cent depending on direction of travel and time of day. From the analysis, it appears that there is some evidence of “rat running” on Rider Boulevard/Walker Street traffic through Rhodes to by-pass the congestion

on Homebush Bay Drive/Concord Road. However, the proportion of “rat running” is considered by GTA to be relatively minor. At this stage as the internal intersections appear to be operating satisfactorily, it is recommended by GTA that no immediate actions be undertaken, but to continue to monitor the situation. In addition, it would be difficult to deter traffic from “rat running” through the area given the current traffic conditions on Homebush Bay Drive and Concord Road. It would require some drastic and draconian measures (e.g. full or partial road closures) to be introduced that may not necessarily provide any material benefits to local residents, but instead create un-necessary inconvenience.

Council requested the GTA study to consider the implications of installing traffic signals at the intersections of Shoreline Drive with Rider Boulevard, Rider Boulevard with Mary Street and adjacent to the train station stairs on Walker Street. The study was also to identify and assess alternative options to address pedestrian and traffic safety at these locations. GTA concluded that with all things considered, it is not recommended for signals to be installed at either intersection, as it is most likely to fail any cost benefit ratio analysis given the limited benefits they would provide. In relation to provision of a traffic signal control on Walker Street adjacent to the train station stairs, based on current traffic and pedestrian usage, GTA considered it is unlikely to meet RMS warrants for a traffic signal controlled pedestrian crossing. However, following the completion of the redevelopment of Rhodes Peninsula and Wentworth Point, it may have sufficient usage to comply with the warrant. With some of the 20 000 population planned at Wentworth Point using Rhodes station and retail, planning for a bus-rail interchange and a higher quality of public domain was stated as an important priority.

Figure 4: Pedestrian Volume counts (source GTA)

Table A.1: Pedestrian Volume Summary	Morning Peak Hour	Evening Peak Hour	Daily
Location			
Mid-block crossings north of the pedestrian crossing	89	14	314
Pedestrian crossing	176	45	703
Mid-block crossings south of the pedestrian crossing	479	413	2,867

The existing counts above suggest that many pedestrians cross Walker Street other than at the zebra crossing, despite the zebra crossing nearby. Henson Consulting does not believe a signalised crossing will improve this, as many people are impatient to wait for a “green man” crossing signal in a town centre situation.

The GTA signal analysis appeared to forecast and use S3 full development vehicular traffic volumes, but used existing pedestrian volumes crossing Walker Street adjacent to the station. The GTA analysis did not mention bikes. This seems an oversight in evaluating a situation where the subject site and many units in Rhodes and Wentworth Point are yet to be occupied or generate pedestrians.

The GTA analysis is effectively based on land use vehicle traffic generation rates, and does not detail mode split targets, or the Homebush Bay Bridge and its effect on increasing bus, pedestrian, and bike flows.

Council requested the GTA traffic study to make recommendations on which facilities (if any) would be suitable to make Walker Street pedestrian friendly, whilst keeping in mind that Walker Street/Mary Street/ Rider Boulevard is to be

retained as the distributor route. As the precinct develops pedestrian, cycling and bus trips and vehicular trips are all likely to increase. Walker Street is relatively narrow for the type of traffic (i.e. buses, cycle routes high pedestrian numbers) and this may not be able to accommodate all interchange distributor functions. With consideration to retaining Rider Boulevard/Walker Street as the distributor route within Rhodes, GTA recommended for a 40km/hr High Pedestrian Activity Area on Walker Street between Mary Street and Gauthorpe Street with a mid block signalised crossing adjacent to the railway station to be provided.

Council requested that the GTA study identify any measures to discourage non-residential traffic on Shoreline Drive. There are two issues along the Rider Boulevard/Walker Street that would deter non-residential traffic from using it. At present, Rider Boulevard forms a priority controlled T-intersection with Mary Street where traffic on Rider Boulevard gives way to traffic on Mary Street including the right turn movement from Rider Boulevard to Mary Street. In addition, the pedestrian crossing on Walker Street outside the railway station adds further delays to traffic using Walker Street especially after an arrival of a train where a significant volume of pedestrians have been off-loaded.

GTA recommended for the Rider Boulevard-Mary Street intersection to have its priority reversed such that traffic on Mary Street gives way to traffic on Rider Boulevard. If required, a modified T-junction with the reversed priority could also be provided at this intersection. The modified T-junction option provides splitter islands on Mary Street to channelise and reduce travel speed of vehicles on Mary Street. The scheme shows Give Way on both Mary Street approaches and does not appear to consider the option of making the Rider/Mary/Walker route continuous, with Give Way only on the Mary Street eastbound approach.

This solution prioritises vehicular trips above pedestrian trips. Other potential impacts would be increased speeds as cars would no longer be required to look out for pedestrians. The pedestrian queuing space on the station side is also constrained given the likely pattern of pedestrian movement (e.g. the evening peak after a train departure)

It is noted that the current traffic and pedestrians flows at this location may not meet the warrant for a signalised crossing, but with additional development in the area, it may be possible to provide a signalised crossing at this location in the future.

Council requested the GTA study to consider the installation of a roundabout at the intersection of Gauthorpe and Walker Streets, taking into consideration bus movements (including proposed bus movements resulting from the construction of the Homebush Bay Bridge) and impacts on cyclists and pedestrians. The Homebush Bay Bridge Traffic Management and Access Report (prepared by consultant Arup dated 16 January 2012) indicates that future bus movements across the Homebush Bay Bridge would be approximately 20 buses per hour (10 buses in each direction across the bridge).

The GTA analysis allows for an additional 15 bus movements per hour turning left from Walker Street to Gauthorpe Street plus an additional 15 bus movements per hour turning right from Gauthorpe Street to Walker Street i.e. a total of 30 bus movements per hour. From Table 5.4, it can be seen that the Gauthorpe Street-Walker Street operating as a roundabout would operate satisfactorily with Level of Service A performance (excellent) for both peak periods. It is noted the results are consistent with those predicted for the same intersection operating under

priority control. As such, from a capacity perspective there are no issues if the intersection was to be converted to operate as a roundabout. Therefore, GTA state it is not expected the roundabout would provide any material adverse impacts to pedestrians and cyclists, instead it would provide better outcomes for all road users.

This seems contrary to accepted wisdom of the adverse effect of roundabouts on pedestrians and cyclists: for example the City of Sydney has a policy of not constructing roundabouts in walkable areas. A roundabout would help redirect traffic along Marquet Street if the decision is made to encourage through traffic away from Walker Street between Gauthorpe Street and Mary Street.

Council requested that the GTA study identify means of encouraging vehicles to access the Rhodes shopping centre via the ramp off Homebush Bay Drive rather than local streets. GTA suggested removal of Shopping Centre advisory signage from Averill Street. The 40km/h zone may also help in this regard.

The GTA report does not provide detailed Transport Impact Assessment advice on the proposed Billbergia development in terms of car parking, loading dock, or through site links.

2.7 Traffic speed and volume data provided by Council

This data was provided by Council and summarised in the following diagrams. In general terms daily traffic is four thousand along the foreshore Shoreline Drive, less than two thousand on the mid road Marquet Street, and eight thousand along the railway Walker Street route. Key future interventions proposed are the use of speed platforms at multiple locations.

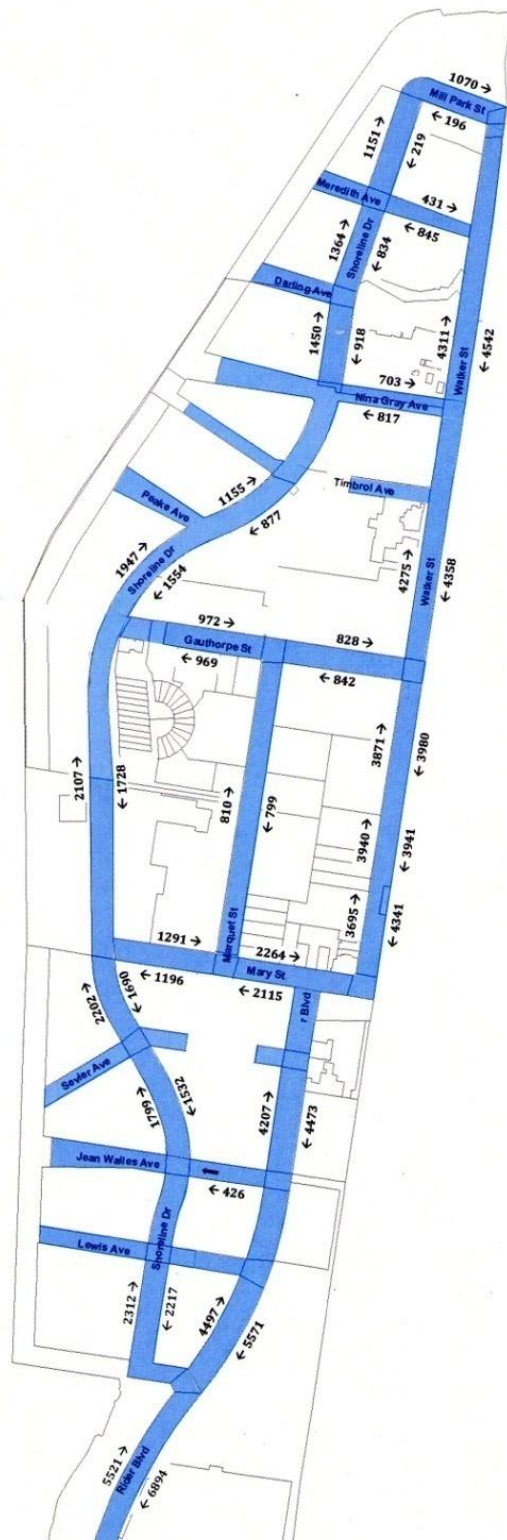
Figure 5: Rhodes Peninsula 7 Day AADT⁷ (Annual Average Daily Traffic)⁷ Council data, 2014

Figure 6: 85th Percentile Speeds of Vehicles⁸

⁸ Council data, 2014, 85th percentile is the speed not exceeded by 85percent of vehicles.

2.8 Public Domain Concept Plans

Draft diagrams received were Public Domain Concept Plan Option 2⁹ which showed the Rhodes Town Square extended as a shared zone paving and road surface from the existing crossing to Rider Boulevard, and a Threshold Paving across the existing pedestrian crossing, proposed pedestrian bridge, angle parking on Walker Street east side with a proposed cycle path, and three main intersecting pedestrian links within the Station Precinct site/Billbergia Site: diagonal link, straight link, and Shopping/Cafe Promenade to Mary Street. The sketch showed zebra crossings within the shared zone.

A Shared Zone in this area does not meet RMS requirements¹⁰ for a shared zone because appropriate locations include “ Low traffic volume (less than 100 vehicles per hour or 1000vehicles per day)streets with high pedestrian activity; Areas with a low demand for vehicular movement such as cul de sacs , Areas where there is either limited or no formal pedestrian areas such as footpaths” and inappropriate locations are :” Roads with high traffic volumes; must not be located along bus routes or heavy vehicle routes except delivery or garbage trucks”. Drivers must give way to pedestrians in a Shared Zone, and therefore in a busy pedestrian area next to the railway station, bus drivers attempting to maintain timetables are likely to find this delay unworkable.

Therefore a Shared Zone was not appropriate in this location, unless most traffic and all buses are diverted away from the station to Gauthorpe Street or Shoreline Drive. The current plan is shown in the following figure.

Figure 7: Public Domain Concept Plans, August 2014 (extract)



⁹ Context , LSK 003 March 2014

¹⁰ Shared Zones , Policy and Guidelines, Published July 2012, Version 1.0 SS/12/01, Transport for NSW

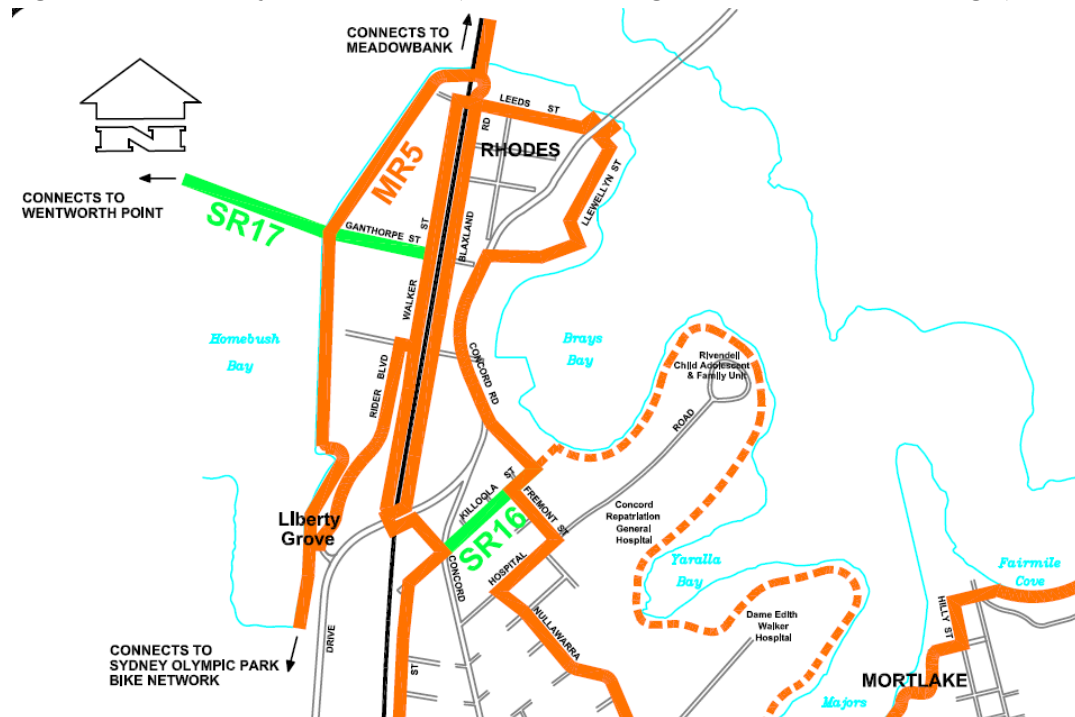
2.9 Homebush Bay Bridge approvals reports, including TMAP

The Homebush Bay Bridge Traffic Management and Access Report (prepared by consultant Arup dated 16 January 2012) indicates that future bus movements across the Homebush Bay Bridge would be approximately 20 buses per hour (10 buses in each direction across the bridge).

2.10 Council Cycleway Strategy,(Draft)

The City of Canada Bay Interim Bike Map will be replaced by the Strategic Review of the Canada Bay Bike Plan¹¹, Main Routes (orange) are generally long and traverse a significant portion of the LGA, and connect several destinations. These routes are where the majority of funds and resources should be allocated. Secondary Routes (green) are the remainder, generally shorter and provide links between Major Routes and/or to a single destination. The full combined future bike network is shown on Figure 3. Note: this figure shows all routes including those that are not likely to be implemented within the 10 year program period. A missing link is east –west linking Brays Bay/Route 3/Station/ buses/bike routes/Homebush Bay Bridge.

Figure 8: Canada Bay Bike Network (extract of Strategic Review of Bike Plan Fig 3)



2.11 Homebush Bay Bridge Cycling Strategy¹²

The bridge planned to be completed by 2016 has been designed to carry public buses, maintenance and emergency vehicles, pedestrians, and cyclists, and disability vehicles. Private vehicles including taxis, hire cars, and motorbikes would be prohibited. The bridge lands on the Gauthorpe Street alignment.

¹¹ Transport and Urban Planning , April 2014

¹² GTA, 17 June 2014

Figure 9: Bridge landing in Rhodes and Gauthorpe Street



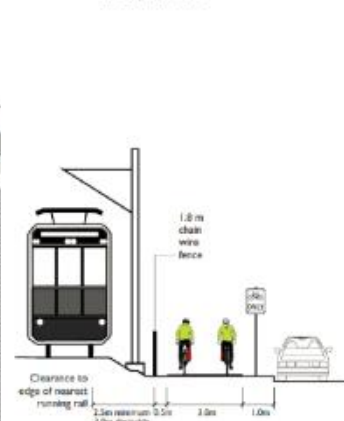
Source: Scott Carver Architects, drawing no. SK-015, rev G

Figure 5.4: Potential facility and cross-section - Gauthorpe Street, Rhodes



Source: NSW Bicycle Guidelines - Figure 4.4 and Figure 6.8 (RMS, 2003)

Figure 5.5: Potential cross-section - Walker Street, Rhodes



The report states that a high quality bike link between the bridge and the station is imperative to encourage multimodal trips, and there is expected to be a high demand for secure bike parking at Rhodes station. The GTA report does not forecast bike or pedestrian flows or bike parking demand.

2.12 Concord West Masterplan

The Concord West Masterplan has recommended that a number of properties in the Concord West Industrial Precinct be rezoned from General Industrial to Medium Density Residential. Urban design and traffic studies have been completed to inform future redevelopment. The Masterplan has been adopted but the sites have not yet been rezoned.

2.13 Proposed Metropolitan Parking Policy Strategy

Consultation with TfNSW indicates that the development of the proposed MPP is in abeyance, and that local council parking strategies will continue to influence parking.

2.14 Implications of Rail and associated parking policy

There is no major Park-and Ride facility proposed for Rhodes. The only major car park in the station precinct is the off-street retail and recreational car parking in the new development accessed primarily off Gauthorpe Street. This is appropriate given Rhodes status as a major Destination Station for employment, and the objectives of public transport oriented development. On-street parking will include car share spaces.

2.15 North Sydney Freight Corridor

The Northern Sydney Freight Corridor (NSFC) program is a joint Australian and NSW Government initiative to improve capacity and reliability for passenger and freight trains between Sydney and Newcastle. The NSFC program currently comprises includes North Strathfield Rail Underpass and Epping to Thornleigh Third Track. There are no freight changes at Rhodes, but passenger train customers will benefit directly from the NSFC program investment. New station facilities, including lifts, are being built at Concord West and at Cheltenham. The program provides overtaking tracks that improve reliability for freight and passenger trains.

2.16 Bus and Unsworth Report

Bus interaction with rail at Rhodes is currently relatively minor, but will change with the opening of Homebush Bay Bridge bus services. Regional services are forecast to grow, including the Strategic Bus Corridor from Burwood to Macquarie.

Bus #458 serves the west side of the station via Walker Street and Rider Boulevard, to Burwood and Ryde shops. These routes operate 2-3 services in the peak hours, and 2 services per hour off-peak.

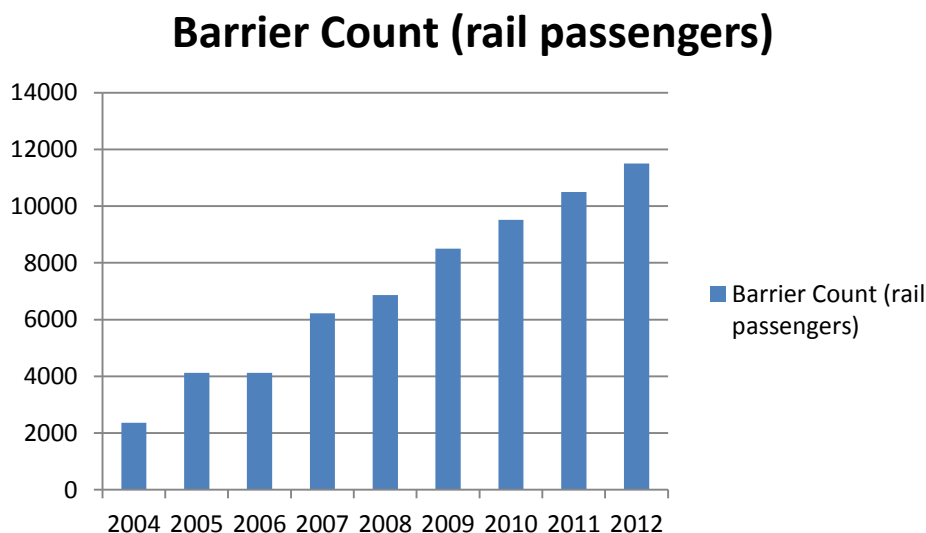
Bus # 459 and #459 serves Concord Road stops east of the station. Bus # 533 links SOP to Macquarie Park. Bus #M41 provides a cross-regional service.

4 Existing Conditions

4.1 Pedestrian and Bike Volumes - the current experience in Rhodes

Rhodes railway station is now a modern pleasant public transport interchange. The CityRail Compendium for year 2012 showed that Rhodes in 2011-12 has joined at #40 on the list of forty busiest railway stations on the network with an approximately 3700 barrier count in the 3.5 hour am weekday peak (06.00 to 09.30am, 1630 entries, 2080 exits), one of the select few stations outside the Sydney CBD that have more barrier exits than entrances i.e. it is a destination station for workers. A total barrier count of 10 500 passengers per 24-hour weekday in year 2012 was a fourfold increase from the 2360 passengers in year 2004, effectively over twenty percent growth in patronage every year.

Figure 10: Rhodes railway station, train passengers in plus out on average weekday.



Data on existing 2013-2014 pedestrian flows is given in the GTA report. Henson Consulting observations on Tuesday 10 June 2014 (7.30 am to 8.30 am morning peak hour) indicate:

- Few pedestrians have origins or destinations east of Blaxland Road, despite zebra crossing at the station (10 persons/hour) There is only one coffee shop and low-generation office uses in this area.
- Many pedestrians ignore the zebra crossing of Walker Street at the station
- Pedestrians comprise mostly local workers and residents in the peak hours, mostly young professionals, with less than 10 % school children (this may increase in future years as the population ages)
- Station staff reported that the activity starts from very early, with the station busy from 6.30am. This suggests that many Rhodes residents travel long distances by public transport to work.
- The rail overbridge concourse past the ticket office has the design potential to be extended at both ends, with bridges over Walker Street and Blaxland Road.

- Significant unticketed through pedestrians use the station (120 p/h out of 2560 total observed or 5%), facilitated by the removal of ticket barriers with the Opal Card.
- Strong flows to the station between Walker Street and the station (1320 p/h). This flow is evenly distributed from north and south on Walker Street, with many pedestrians observed to come from long distances further north on the Rhodes peninsula via the continuously paved western footpath of Walker Street. Many find a long walk preferable to a short bike ride.
- Strong flows between the station and the Rhodes Business Park/HP offices via the pathway on the west side of Blaxland Road (720 p/h) This footpath is cluttered and not wide enough despite recent improvements by Council and some pedestrians walk along the carriageway.
- Significant flow between station and Rhodes Shopping Centre (400 p/h)
- Few bikes were observed, and there were only approximately 10 bikes parked in the facility to the west of the station. No bikes were observed to cross the station concourse using the lift or stairs (there are no ramps).
- The bike path along Walker Street has evolved over the years and exhibits: some confusing signage, alternation between cycle lane/shared paths/pedestrian path/and on-road path, and on-road bike logos are worn away e.g. Walker Street at Mary Street.

From the railway station, an 800 metre convenient commuter walk takes in most of the suburb of Rhodes. A 1.5 kilometre walk or cycle ride will cover the whole peninsula, much of Wentworth Point and Concord Hospital.

4.2 Station Precinct

Road reservation widths are approximately scaled as:

- Mary Street 20m
- Marquet Street 20m
- Rider Boulevard 25m
- Shoreline Drive 22m
- Gauthorpe Street 22m
- Walker Street 20m to rail fence north of station

4.3 Current Parking Supply, Controls, Pricing and Usage

Current on-street parking is time limited for the block west to and including Marquet Street, and east in the immediate vicinity of the railway station, excluding the unlimited parking along the rail line boundary: this parking is occupied from very early in the morning, with a proportion of what appears to be permanent parking. Parking demand and usage is high, and estimated over 95% occupied on weekdays after about 8am. Observed occupancy of these bays was slightly higher in the morning, but ranged between 80% and 98% occupied throughout the day, indicative of a suppressed demand for car parking. There is also some car share parking in Rhodes Shopping Centre.

4.4 Current and proposed road works and traffic management works and bike paths etc

Discussions with Council and RMS officers did not indicate any major proposed immediate transport network works. Traffic signals have recently been installed at the Blaxland/Leeds intersection. Cycle paths have recently been completed on Blaxland Road and works completed along the railway line at Rhodes Corporate Park.

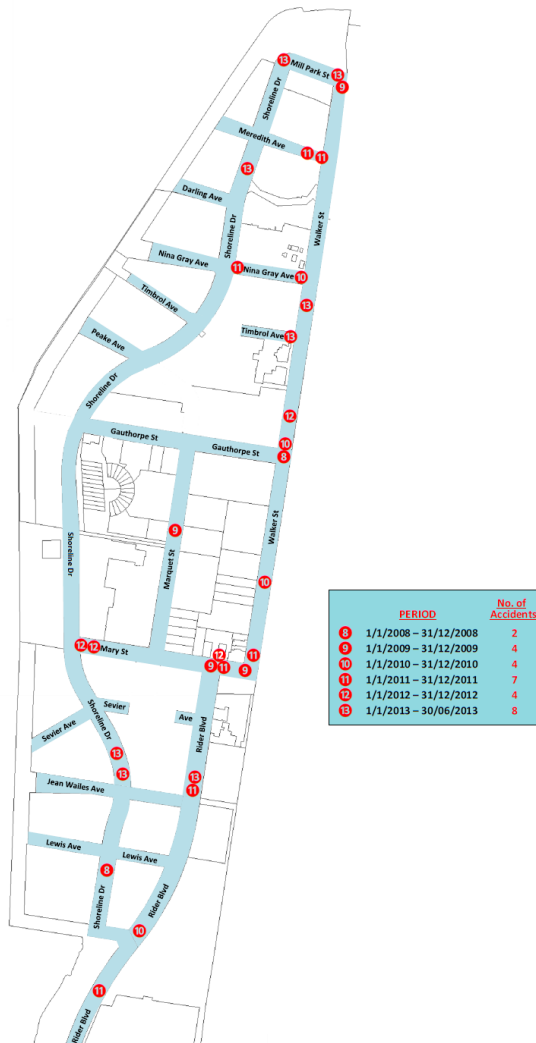
4.5 Heavy Vehicles flows and percentages

Heavy vehicle percentages are not unusually high.

4.6 Road Safety

RMS records¹³ indicate that there is no unusual concentration of crashes around the subject site.

Figure 11: Rhodes Peninsula Traffic Crashes, 2008-2013¹⁴



¹³ Crashstats 2010

¹⁴ Data provided by Council

4.7 Short term pick up and set down

Short term pick up and set down space is available both sides of the railway station, but is not substantial or formalised.

4.8 Off- Street car parking

All the recent major residential, commercial, and retail development in Rhodes include off-street car parking in accordance with authorities requirements.

4.9 Demographics and Mode Split

The 2011 Census showed the suburb of Rhodes had 15% of households with no registered motor vehicles, 50% higher than the NSW average, and a much lower proportion than NSW average for 2,3 or more cars per household. In Rhodes (State Suburb), 76.3% of people were not born in Australia, and arguably may have a migrant and cultural background open to less travel by private car.

Figure 12: Mode Split: Travel to Work (ABS Census 2011, Rhodes –State Suburb)

Travel to Work employed persons aged 15 years and over	Rhodes	Rhodes %	NSW %	Australia %	Canada Bay LGA% 2006 ¹⁵
Car as driver	1155	40.7	57.6	60.2	58.7
Train	955	33.7	6.2	3.9	9.7
Walked only	149	5.3	4.1	3.7	2.7
Car as passenger	99	3.5	5.0	5.3	*included as driver
Train, Bus, Ferry	60	2.1	1.4	0.8	11.7
Bicycle					0.7
People who travelled to work by public transport	1103	38.9	13.8	10.4	
People who travelled to work by car as driver or passenger	1255	44.3	62.8	65.5	

¹⁵ Local Planning Strategy 2010

5 Future Development

5.1 Future development

The Billbergia proposals are described, as they are known above. A key issue is the proposed car park and service vehicle access off the Walker Street frontage. There is other major development, mainly residential, yet to be completed and occupied north of Gauthorpe Street.

The area to the west of the railway also has development potential: rezoning of the area to the north of Mary Street from existing low density residential to higher densities, plus potential redevelopment of the business park area to the south of Mary Street at higher Floor Space Ratios and density.

Increased numbers of residents and workers are forecast in the surrounding areas, including Wentworth Point, Sydney Olympic Park, and the Canada Bay Local Government Area.

5.2 Network capacity and effects

Key future transport network effects are likely to include:

- Homebush Bay Bridge
- Wentworth Point development, including the proposed Wentworth Point Primary School
- Further development and road upgrades east of the railway.
- Additional bus and ferry services
- Improvement of the Walker Street -Leeds Street underpass of the railway, with better vehicle, bike and pedestrian links.

5.3 Target mode split

The target mode split might be considered as the above 2011 Census of 44.3% by car plus Councils LGA-wide aim to reduce private car by 10 percent, to reduce this to 40%. Rail might increase by a similar amount from 38.9% to 43.2%. This target might be even higher for Rhodes.

Existing pedestrian counts, being commuter and employee and some student flows, might be expanded to estimates of future pedestrian flows in the ratio of

- total Rhodes development approved plus uplift versus existing
- 20 additional buses per hour (10 in each direction) via Homebush Bay Bridge (HBB) plus up to 10 other community buses, at 50 passengers per bus is 1500 persons
- Additional cyclists via Homebush Bay Bridge
- Additional pedestrians including the growth of Wentworth Point via Homebush Bay Bridge, say 1000 per hour

This suggests an overall doubling from existing in overall pedestrian volumes at full development. If the ten year future peak hour rail patronage is 3200

passengers per peak hour, the secondary mode split connecting to the station might be estimated as:

- 70% walk , 2240 pedestrians per hour
- 15% bus, 480 bus passengers per hour, 50% boarding, 25 per bus bound to the station precinct, 10 buses per hour
- 10 % bike , 320 cyclists, 50% boarding, 180 bikes in that hour to be parked or carried on train
- 5% kiss and ride/park and ride etc, mostly boarding, 160 car passengers per hour, 1 minute each, suggests 3 kiss and ride spaces.

5.4 Future Parking Policy

It is likely that any future parking policy will retain or strengthen off-street and on-street parking rates, charges, and restrictions.

5.5 Bus Routes and stops

Key changes to the bus network will be to introduce Wentworth Point/Sydney Olympic Park services via the new bridge to circulate via the west side of Rhodes station. TfNSW have not finalised these services¹⁶, but a future 20 buses per hour loading or unloading (10 across Homebush Bay Bridge in each direction, 5 from growth of existing services, 5 others, even with no layover proposed at the station) would require 3 bus bays in each direction. There is also a possibility of community buses and event coaches for Sydney Olympic Park.

TfNSW has concept plans to connect a wide range of places with buses via Rhodes, including some or all of Lidcombe, Sydney Olympic Park Ferry Wharf and SOP precinct and railway station, Macquarie Park, Bankstown, and Five Dock. Bus vehicles would include standard 12.5m buses, 14.5m long rigid buses, and articulated buses, with wide swept turning path implications for stops and intersection layouts.

Regional Services would route via Homebush Bay Bridge-Gauthorpe Street - Marquet Street- Mary Street- and Walker Street north, stopping at the Rhodes railway station but not the Rhodes Shopping Centre.

Local Services would route via Homebush Bay Bridge -Gauthorpe Street-Marquet Street- Mary Street-Walker Street, and via Rider Boulevard and Shoreline Drive.

Bus stops and layovers are mooted near the east end of the bridge, near the railway station and near Rhodes Shopping Centre. No bus stops are mooted in Marquet Street.

Bus services along Concord Road are expected to continue to increase, but would mostly stay on Concord Road rather than Blaxland Road.

A long term possibility for pedestrians and bikes is to extend the railway concourse level across Blaxland Road and through a site redevelopment to then cross over Concord Road to land at Macilwaine Park on the east side of Concord Road.

¹⁶ Meeting of Council officers, TfNSW officers, and Henson Consulting 7 August 2014.

Extending this concourse to the west on a bridge across Walker Street would also reduce the need for pedestrians and cyclists and passengers from buses on the western kerb to cross Walker Street at grade. Until such time as a bridge crossing and high quality stairs, lifts, and escalators are provided, the substantial pedestrian volumes would have to be handled at-grade on Walker Street.

5.6 Best Practice to Address Trends in Increased Urban Growth and Density

The DCP emphasises managing the transport demand that is generated by a development to encourage more sustainable transport options. ‘Managing Transport Demand’ refers to the measures taken which minimise the need to travel and the length of trips, particularly by cars, and encourages travel by more sustainable modes of transport (DIPNR, Integrating Land Use and Transport, 2001).

The proposed precinct development is appropriately located close to convenient pedestrian paths, signalised crossings, bus stops, railway station, bike routes that link conveniently to local and regional shopping and dining, employment, schools and universities, and open space and recreation. This convenience will encourage maximum use of transport other than private cars. Many residents are likely to often use these modes in preference their private cars, and therefore reduce the peak hour traffic generation.

5.7 Design vehicles

The design vehicle for car parking is the Australian Standards AS2890.1 Off Street Car Parking B99 vehicle (99th percentile vehicle represented by a very large car or Ford Transit Van medium wheelbase van) to public parking. The design vehicle to service waste using a private contractor is also likely to be the AS2890.2 HRV (bus 12.5m long) with headroom of over 4m. The issue of articulated vehicles semi trailers to the Billbergia supermarket requires clarification. (current deliveries to Rhodes Shopping Centre and IKEA are in and out at the south via Oulton Street to Route 3, and some articulate vehicles go in from the Jean Wailes Avenue traffic signal access point.

5.8 Sight distance of driveways

Desirable minimum sight distances should be provided at all driveways. An example of problems exists at the Pinnacle building at 7 Rider Boulevard.

5.9 Service Vehicle access and analysis of projected queuing at entrances

Waste collection should be located on-site including truck access to the commercial and residential waste and recycling spaces. Sufficient parking and traffic management elements should be provided on site to avoid queuing at the entrance.

6 Discussion

6.1 Possible public domain options around the station with the preferred option be included in the recommendations.

The Rhodes West DCP road hierarchy shows some anomaly in that there are generally two north-south primary streets, but there are three running between Mary Street and Gauthorpe Street. This might be expected if this was a classic Central Business District within Rhodes, but that is not the case, as the area west of Gauthorpe Street is typical residential. Four functional road hierarchy options were identified in the initial four diagrams, and then shown in some more detail as follows.

Figure 13: Functional Road Hierarchy options



// OPTION 1a - Walker Street as the major distributor

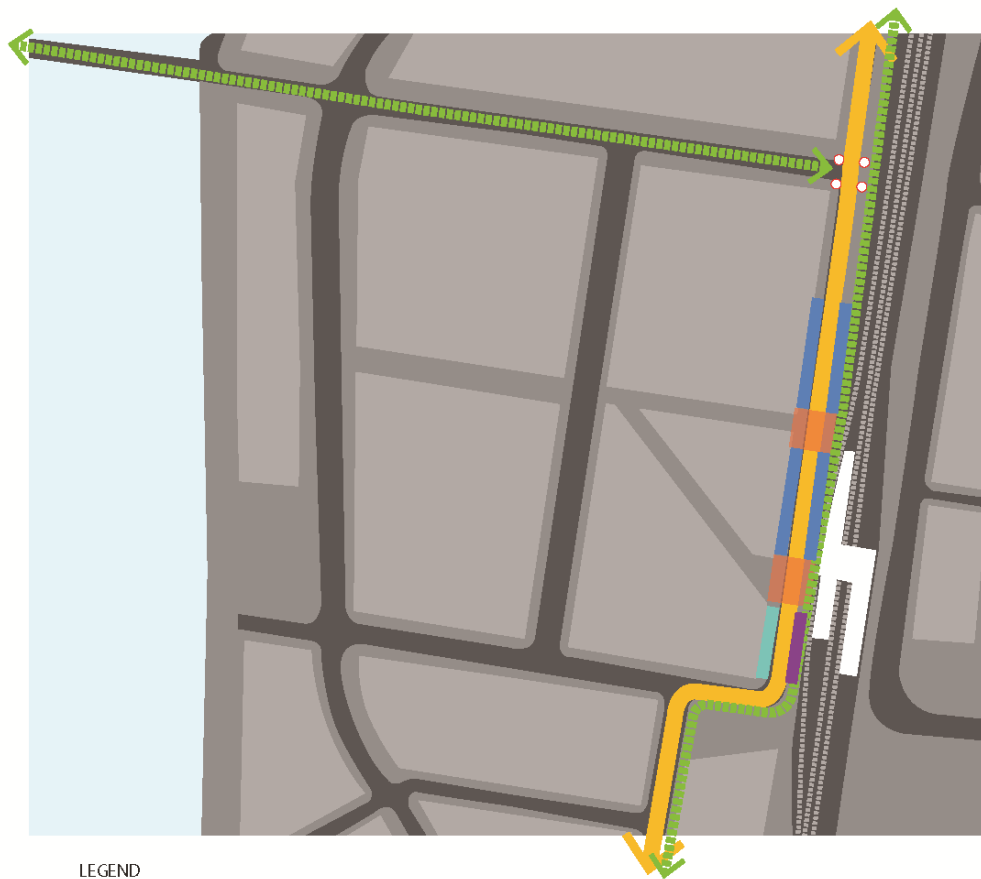


Figure A-2. Option 1a

LEGEND

- Major traffic distributor
- Bus parking and access
- Bike access route
- On-street marked shared bike access
- Pedestrian priority zone
- Taxi rank
- Kiss and Ride
- Proposed signalised intersection
- Proposed roundabout
- Rhodes station

// OPTION 1b - Walker Street as the major distributor

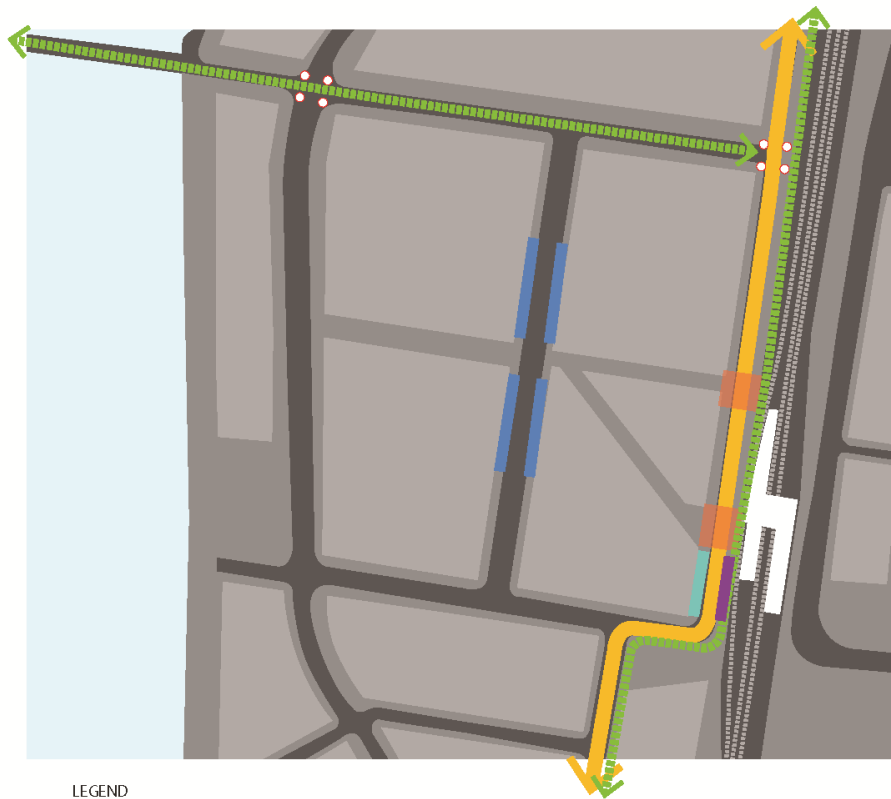


Figure A-3. Option 1b

- LEGEND**
- Major traffic distributor
 - Bus parking and access
 - Bike access route
 - On-street marked shared bike access
 - Pedestrian priority zone
 - Taxi rank
 - Kiss and Ride
 - Proposed signalised intersection
 - Proposed roundabout
 - Rhodes station

// OPTION 2a - Marquet Street as the major distributor

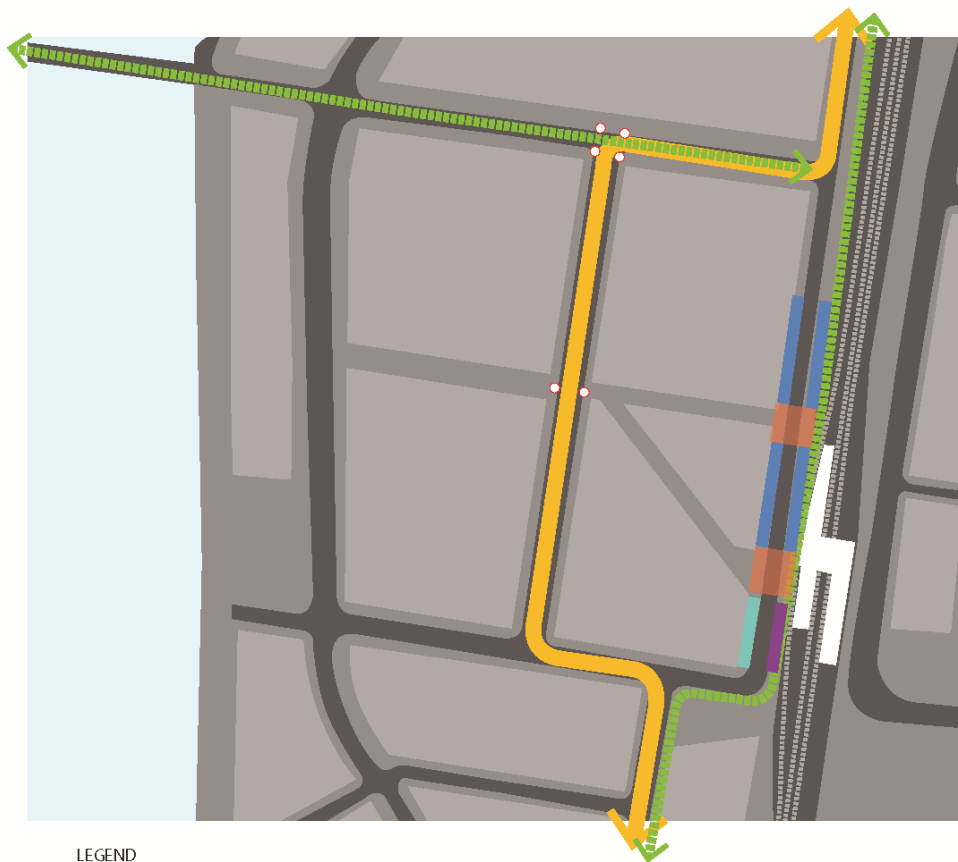


Figure A-4. Option 2a

LEGEND

- Major traffic distributor
- Bus parking and access
- Bike access route
- On-street marked shared bike access
- Pedestrian priority zone
- Taxi rank
- Kiss and Ride
- Proposed signalised intersection
- Proposed roundabout
- Rhodes station

// OPTION 2b - Marquet Street as the major distributor

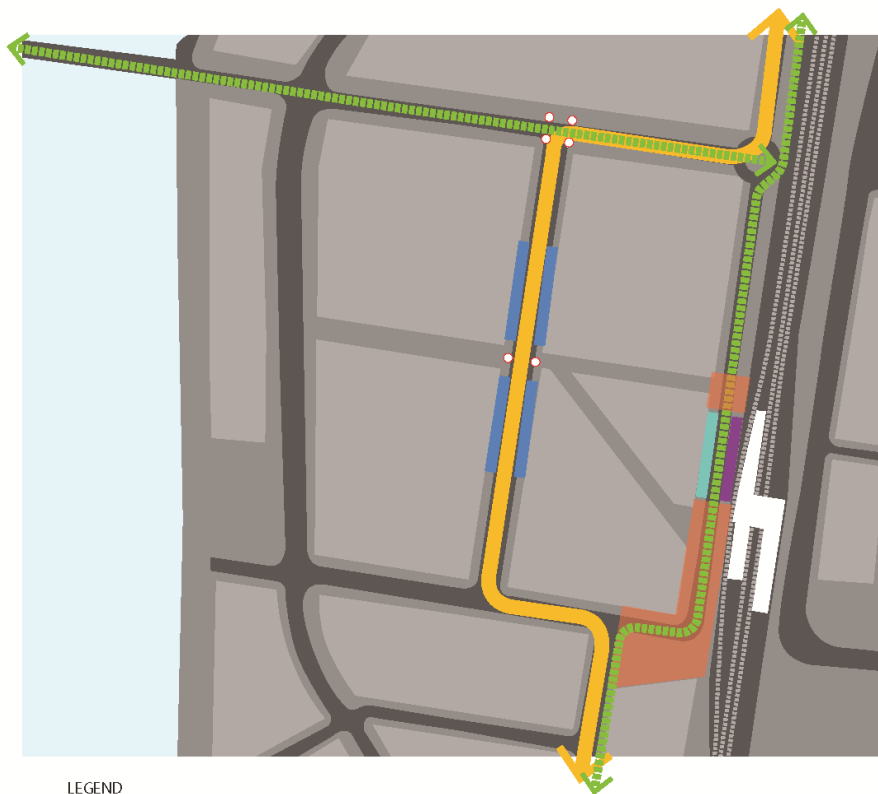


Figure A-5. Option 2b

LEGEND

- Major traffic distributor
- Bus parking and access
- Bike access route
- On-street marked shared bike access
- Pedestrian priority zone
- Taxi rank
- Kiss and Ride
- Proposed signalised intersection
- Proposed roundabout
- Rhodes station

// OPTION 2c - Marquet Street as the major distributor

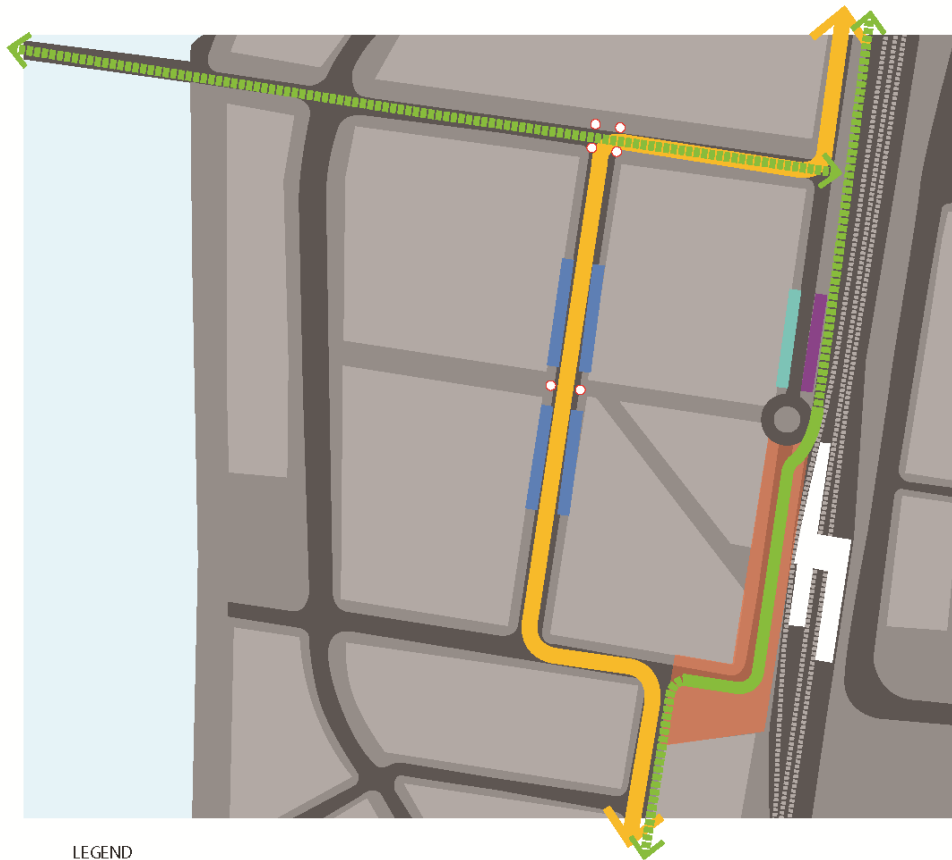


Figure A-6. Option 2c

LEGEND

- Major traffic distributor
- Bus parking and access
- - - Bike access route
- On-street marked shared bike access
- Pedestrian priority zone
- Taxi rank
- Kiss and Ride
- ○ Proposed signalised intersection
- Proposed roundabout
- Rhodes station

// OPTION 3a - Shoreline Drive as the major distributor

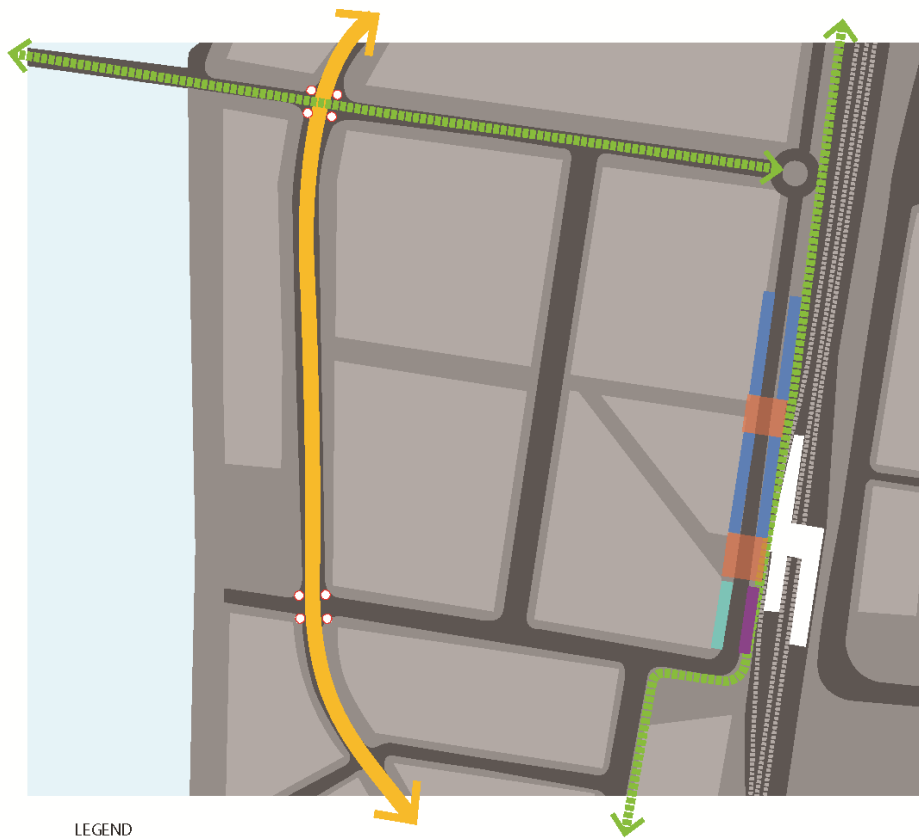


Figure A-7. Option 3a

LEGEND

- Major traffic distributor
- Bus parking and access
- Bike access route
- On-street marked shared bike access
- Pedestrian priority zone
- Taxi rank
- Kiss and Ride
- Proposed signalised intersection
- Proposed roundabout
- Rhodes station

// OPTION 3b - Shoreline Drive as the major distributor

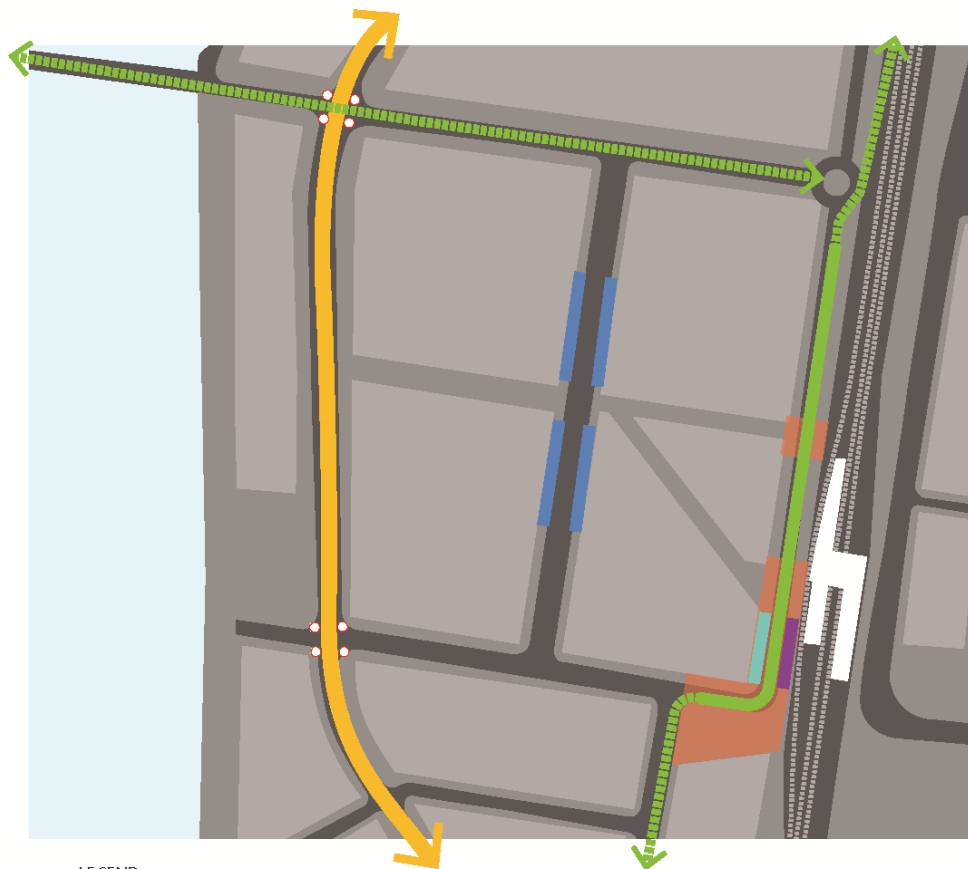


Figure A-8. Option 3b

LEGEND

- Major traffic distributor
- Bus parking and access
- Bike access route
- On-street marked shared bike access
- Pedestrian priority zone
- Taxi rank
- Kiss and Ride
- Proposed signalised intersection
- Proposed roundabout
- Rhodes station

// OPTION 3c - Shoreline Drive as the major distributor

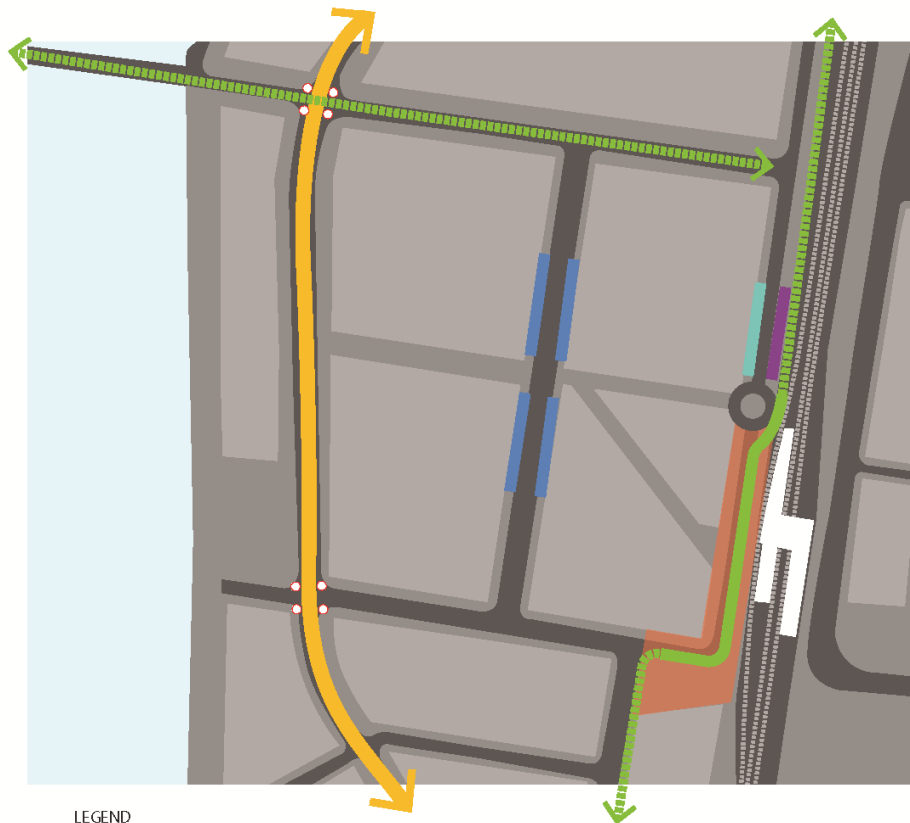


Figure A-9. Option 3c

LEGEND

- Major traffic distributor
- Bus parking and access
- Bike access route
- On-street marked shared bike access
- Pedestrian priority zone
- Taxi rank
- Kiss and Ride
- Proposed signalised intersection
- Proposed roundabout
- Rhodes station

Two key options were selected that determine many of the downstream decisions and detail, and a summary of the key issues are presented in the following table.

Figure 14: Selected Key Options

Issue/ Option:	Do Nothing Option	Walker Street Primary Option 1a	Marquet Street Primary Option 2b
Policy		As per DCP	Contrary to DCP
Public Domain	Existing problems	Too much through traffic/buses for Shared Zone. Pedestrians have priority over vehicles, and primary vehicular traffic flow would be delayed/congested.	Supports a Town Square and Shared Zone
Buses	Bus stop capacity inadequate		too far/obstructed sightlines for bus stops in Marquet from station
Pedestrians	Pedestrian crossing delay	Marquet Street has potential to be pedestrian promenade linking ped through site paths south of Mary St and steps north of Gauthorpe St	Walker Street has potential to be a slow speed pedestrian, cycle and bus environment but Marquet becomes another busy street to cross
Vehicles	Increasing traffic flows	Designated main street in DCP	Indirect route for vehicles, with a risk that through traffic will divert to Shoreline Drive
			Additional traffic in Mary Street and Gauthorpe Street
<u>Sub-option: One way traffic pair</u> Clockwise, Walker southbound , Marquet northbound	NA	NA	Possible but likely increased speeds; assists bus turning paths; reduces right turn conflicts, could narrow the carriageway to keep two traffic lanes whilst widening the footpaths/bike paths/public space
			All bus stops on the station side kerb
			Creates difficult junctions for other local streets
			Must cross westbound bikes
<u>Sub-option: Shared Zone town square</u>	Too much through traffic for Shared Zone ¹⁷	Too much through traffic/buses for Shared Zone. Pedestrians have priority over vehicles, and primary vehicular traffic flow would be delayed/congested.	Would allow shared zone, except for Rider Boulevard – Mary Street – Marquet Street carriageways.

¹⁷ RTA/RMS Technical Direction 2000/6 . Authorisation of Shared Zones is by RMS and 10km/h signage. TfNSW Policy and guidelines of July 2012 requires “Low traffic volume streets with high pedestrian activity”. Current traffic flows ≤ 100 vehicles per hour and ≤ 1000 vehicles per day; Current speed limit ≤ 50 km/h; Length of proposed Shared Zone ≤ 400 metres; Current speed limit of adjoining roads ≤ 50 km/h; Current carriageway width minimum trafficable width of 2.8 metres; Route access must not be located along bus routes or heavy vehicle routes except delivery or garbage trucks; Streets with narrow or no footpaths where pedestrians are forced to use the road; ; kerbs must be removed unless excepted by the RMS.

7 Recommendations

7.1 General

The objective of the study was to assess precinct functions and the pre-eminence of non-car modes.

Pedestrian flows around the station may increase to 3200 pedestrians per hour around the station. This is considerably more than the existing hourly flow of vehicles along Walker Street (current approximately 800 vehicles per hour and 8 000 vehicles per day) and future traffic flows. Bike volumes may increase to over 200 bikes per hour.

This is consistent with NSW Government and Council policy to prioritise users of Rhodes Station Precinct as:

1. Mobility impaired persons
2. Emergency services
3. Pedestrians including children
4. Cyclists
5. Bus/train/taxi
6. Service vehicles
7. Cars

7.2 Road Classification and Road Hierarchy

This study recommends the Walker Street Primary road hierarchy Option 1a.

Walker Street and Rider Boulevard remain the primary route through West Rhodes.

Marquet Street and Gauthorpe Street carry less through traffic, and provide access driveways to servicing and car parking.

7.3 Proposal by Council for a 40km/h High Pedestrian Activity Area and a 40K Speed Zone for the Rhodes Peninsula (West of the train tracks).

All of the above options are consistent with a 40km/h zone, which should be supported.

7.4 Vehicular, Service, Cycle and Pedestrian Circulation Routes

The railway station should continue to act as the main pedestrian focus and crossing of the railway. The elevated railway concourse should be extended in the current Station Precinct proposal for a pedestrian bridge to the west across Walker Street and should be considered in the longer term to the east as a pedestrian bridge across Blaxland Road and ultimately across Concord Road.

There is no obvious east-west pedestrian and bicycle route. The through site link across the Billbergia site is a primary pedestrian route between the Homebush Bay

Bridge and foreshore and the railway station and on to eastern Rhodes. The following figure shows bicycle routes.

Figure 15: Bicycle Routes



Gauthorpe Street should be the primary bike route east west, connecting to the Homebush Bay Bridge, foreshore bike path, and Walker Street bike route and railway station. The through site link is not suitable for bikes and will be primarily a pedestrian link.

7.5 Public Domain Works in the Primary Study Area

The recommended public domain here needs to interface with the railway station, existing shops and development and the Developer proposals, and street traffic¹⁸. A key issue here is the relatively narrow 20m road reserve¹⁹ in Walker Street compared to the 25m road reserve that allows the generous promenade treatment in Rider Boulevard, as shown in the Appendix photographs and the following diagrams.

¹⁸ Austroads Part 14 and RMS NSW Bicycle Guidelines section 5.3 state that mixed traffic streets using wide cross section roads provide for comfortable sharing by motor vehicles and bicycles with lanes wide enough to permit comfortable passing. Lane widths between 3.7m and 4.2m are suitable for cyclists to share with vehicles.

¹⁹ Based on surveys undertaken for the Northern Freight Line project, provided to Council, but still needs detail surveys to confirm the location of the rail reserve boundary and established trees.

Figure 16: Walker Street Station Precinct Public Domain Works Plan

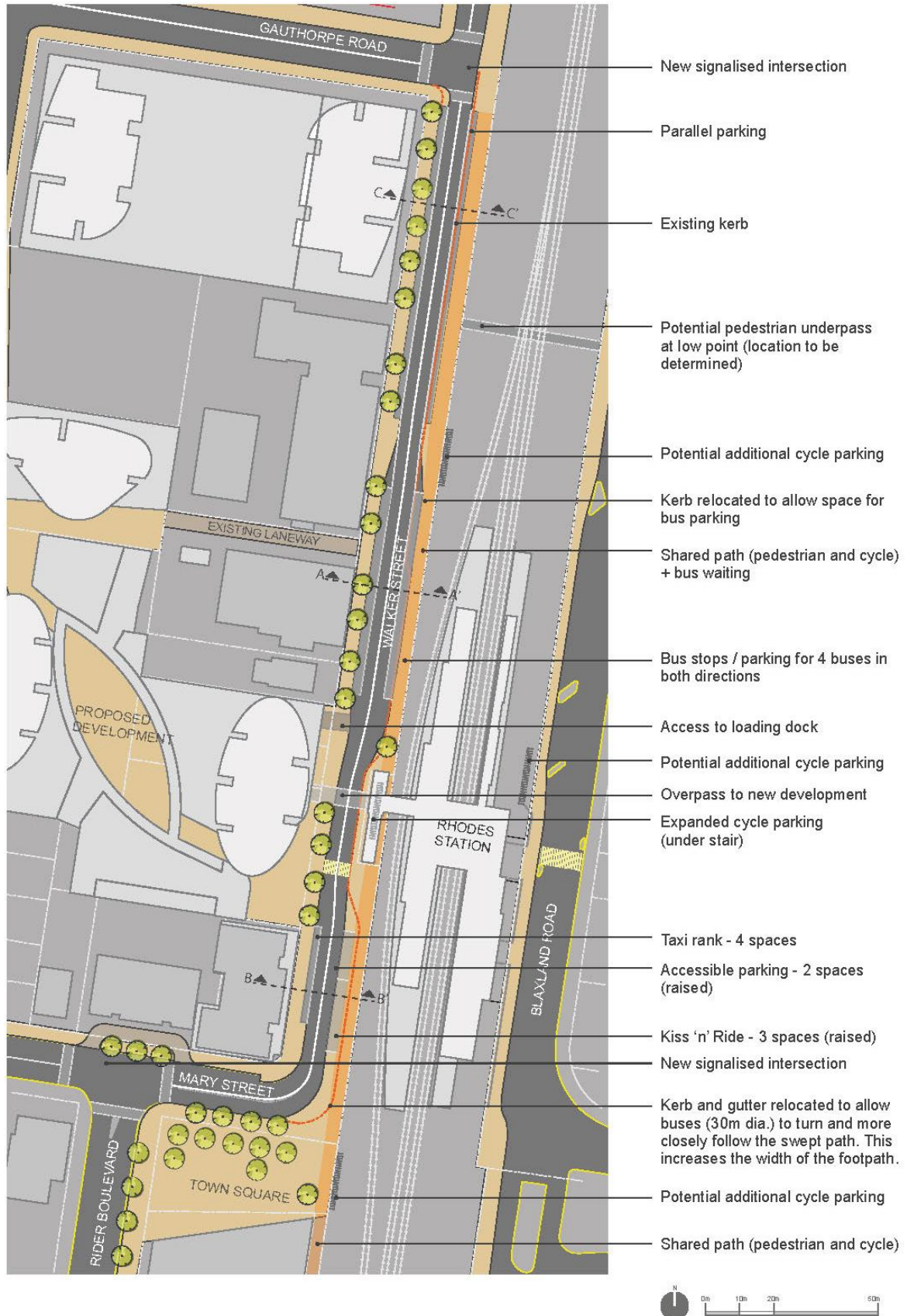
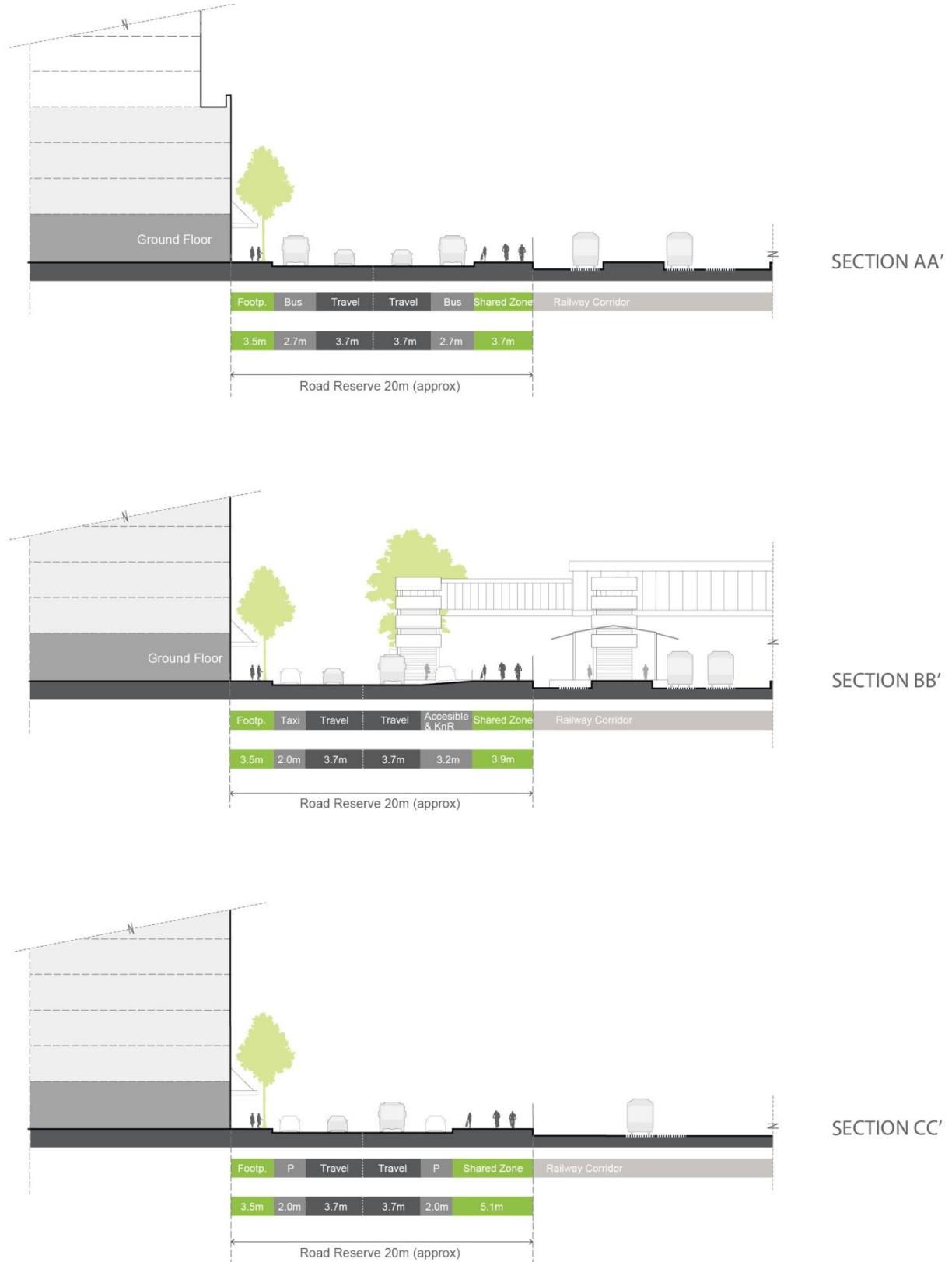


Figure 17: Walker Street Station Precinct Public Domain Works -Sections



Further investigations will be required in detailed survey and design of Walker Street, including existing trees, poles, and underground services.

The existing Town Square on the southern side of Mary Street is part of a ubiquitous public domain theme and style and operations such as pavement dining across the whole Rhodes Station Precinct. The Rhodes Station Precinct design and operations should be co-ordinated with an experienced Place Manager, with regard to Councils long term liabilities for maintenance and replacement of the public domain assets funded initially by developers.

A pedestrian bridge over Walker Street should be provided to link the station concourse with the shopping centre and other facilities. This link should have excellent vertical transportation in the form of stairs, lifts and escalators to serve as a convenient and attractive walk for all pedestrians and disabled persons, including from buses on both sides of the roads and station, Marquet Street and further west. The route should also be open and secure at all times.

Taxi Rank for 4 taxis (28m) should be provided on the west kerb of Walker Street to activate the precinct and Town Square.

The Rider Boulevard walking and urban design attractiveness should extend across to Walker Street.

The implementation of traffic signals at this intersection of Mary Street and Rider Boulevard to coincide with the opening of the Homebush Bay Bridge should be investigated, subject to²⁰ RMS warrants. Signals will create gaps in traffic streams for buses and others. Installing signals in the first instance will avoid the need to install changes to stop sign controls that would then need to be updated within a few years.

If traffic signals cannot be warranted on the basis of growing traffic flows, the traffic priority should be changed to a Stop sign control on Mary Street eastbound approach to Rider Boulevard, with a wide pedestrian refuge island (2.5m). Stop sign controls should be removed from the Rider Boulevard approach to Mary Street and replaced with a crossing, with a median pedestrian refuge.

The implementation of traffic signals at the intersection of Walker Street and Gauthorpe Street to coincide with the opening of the Homebush Bay Bridge should be investigated, subject to²¹ RMS warrants. Signals will create gaps in traffic streams for buses and others. A roundabout at Walker St/Gauthorpe St is not recommended because of problems associated with pedestrian and cyclist safety and large bus turning paths.

A bus zone for 4 buses should be provided on the eastern kerb of Walker Street (60m), and for 2-4 buses on the western kerb of Walker Street (30m-60m).

Kiss and ride bays should be provided for three cars on the eastern kerb of Walker Street (21m)

Two accessible parking bays (14m) should be provided on the east side of Walker Street near the railway station.

The existing zebra pedestrian crossing should be retained. If vehicular traffic delay or traffic diversion to other local streets or pedestrian crash records become

²⁰ Existing RMS warrants

²¹ Existing RMS warrants

unacceptable, further investigations of traffic signals on the pedestrian crossing, or pedestrian barrier fencing may be required in the short to medium term.

When commuter parking is removed around transport interchanges, TfNSW has a policy of trying to replace that same number of car spaces elsewhere nearby. 10 informal spaces on the east side of Walker Street would be lost anyway with the redevelopment of the Gauthorpe Street/Walker Street intersection. There are already significant lengths of No Stopping on the eastern side of Walker Street, but the total loss of existing unlimited commuter angle parking would be 19 car bays. This should be relocated as parallel parking in Walker Street south of Gauthorpe Street and within the 250 public off-street spaces proposed in the Billbergia development.

Bike parking for at least 200 bikes should be provided near the railway station. Given the iconic nature of the new Homebush Bay Bridge, this bike parking could also be iconic. Bike parking structures might help screen residents from road noise. Bike parking might also be combined with a Bike Depot shopfront, providing security and bike services, sales, bike rental, electric bike battery charging, etc for locals and tourists bound for Rhodes and Homebush Bay and the waterfront. The examples shown below engender civic pride and are highly valued by progressive global employers of the type attracted to Rhodes business parks.

Figure 18: Examples of Iconic Bike Parking



22



1. Set the bicycle.



2. Push the entry button.



3. The gate opens and the bicycle is stored automatically.

²² Hirai Station Bicycle Parking Lot (Tokyo), Start of Operation: 2009, Capacity: 756 bicycles
Type & Structure: Mechanical underground parking system 18 bicycles/rack x 14 racks x 3



23



24



The off-road bike path imperative should be resolved along the eastern side of Walker Street where it passes the railway station. Bikes should pass to the east of

²³ Park Street Cycle Park, Cambridge, UK. Britain's biggest free indoor city centre cycle park. It provides space for 282 cycles in a variety of cycle racks and lockers.

²⁴ Whistler Street Bicycle Parking Station by Manly Council, NSW, is a demonstrated success over more than five years of operation. Council charges a one-off application fee of \$20 (no ongoing fees) and a fully refundable access card fee of \$30. The station is accessible 24 hours every day, and provides parking for at least fifty bikes.

the railway overbridge stairway support, without conflicting with pedestrians from the stairway out to the kerb and crossing.

The on road and off road route of bikes on Walker Street should be resolved in further design investigations. The shared path recommended on the eastern verge needs to take account of bus stop furniture and existing mature trees, with a minimum of clutter and interference as shown in the following example.

Figure 19: Example of keeping thoroughfare clear (Railway Square, Sydney)



The designated on-road bike route in Walker Street is desirable to be retained as part of Councils primary bike route plans, but may be combined with wider general traffic lanes because bike lanes cannot easily be extended into Mary Street or Rider Boulevard anyway. The 2.7m bus zone and 4.0m wide cross section vehicle lane arrangement totalling 6.7m wide can easily be redistributed to the TfNSW preference for a 3.3m bus zone and 3.7m mixed vehicle traffic lane totalling 7.0m wide.

Off street parking and servicing should be accessed off driveways in Marquet Street or Gauthorpe Street, as per existing land uses. If Walker Street must be used, driveways should be located as far away from the railway station as possible.

7.6 Traffic Management Recommendations for the wider area

Implement Councils proposed 40km/h zone.

Implement an area-wide way-finding and signage strategy.

The widening or duplication of the underpass of Leeds Street- Walker Street under the railway is not a priority at this stage, and should be considered if and when the area of Rhodes east of the railway is investigated for redevelopment.

Walker Street and Blaxland Road should operate as one traffic lane in each direction, widening to two lanes on approach to intersections where required.

Pedestrian and Bike underpass of the railway should be investigated at the low point of Walker Street near Gauthorpe Street (existing stormwater culvert) or near Mary Street to provide better crossing opportunities of the railway.

7.7 Rhodes area east of the railway

The footpath on the west side of Blaxland Street has recently been cleared of unnecessary clutter and widened, and any future reconstruction should further that process in order to improve the level of service for the growing pedestrian flows.

No further significant changes are proposed in the short term for the area east of the railway. In the longer term, it is likely that parts of the central area between the Railway and Concord Road will redevelop significantly: probably residential in the north and commercial employment in the south. Despite the likely high mode split to non-car modes, this will probably introduce more traffic onto the local roads.

This suggests that all the roads will have some Primary Street function in a street network hierarchy similar to the Rhodes West DCP: Blaxland Road, Lee Street, Cavell Avenue, Averill Street, and Alfred Street.

Extensive analysis of additional road crossings under and over the railway and Concord road have been undertaken for developers in recent decades, but no new road flyover or new road tunnel scheme has been able to overcome the fundamental problems of topography, environment, and the limited additional traffic capacity of Route 3. It is likely therefore that the road network will remain relatively unchanged.

It will therefore be important to maximise the capacity and use of non-car modes. High capacity pedestrian, accessible wheelchair, and bike routes should be reserved in accordance with the Councils current bike strategy north-south along the length of the railway perimeter (from John Whitton Bridge across the Parramatta River, along Blaxland Road, across the business park to Alfred Street and connecting further south), and reserved east-west across the peninsula linking Homebush Bay Bridge with the railway station and Rhodes east and foreshore, perhaps grade separated from traffic using the existing station concourse extended over Walker Street and extended to the east side over Concord Road.

Redevelopment of the Rhodes business park site would create a long term opportunity to construct another pedestrian and bicycle, and perhaps vehicle, link across the railway.

Future redevelopment could be used to fund these improved transport linkages.

8 Conclusions

The key conclusions of this Study are:

- The project design will support NSW Government and Council targets to increase the transport mode share to the sustainable modes of public transport, walking, and cycling.
- Parking layout, circulation and accesses can be designed in accordance with the relevant Australian Standards.
- Access points for pedestrians, cyclists, and vehicles are suitable and in accordance with road hierarchy considerations. The proposed operation can be appropriately managed and have no significant adverse impact on amenity or safety.

9 Appendix : Selected Site Photos June 2014













10 Appendix : Explanatory notes

Description and Classification Methods

Glossary and descriptions are generally in accordance with the recommendations of Australian Standards AS 1348-1986.

Term	Definition
access control control of access	1. Preventing vehicles and people crossing property lines by means of barriers or regulations. 2. Arranging matters so that vehicles and people have access at predetermined locations.
amenity	That element in the layout and operation of town and country which makes for a comfortable and pleasant life rather than a mere existence. It relates also to the preservation of such characteristics of a neighbourhood as make it pleasing in appearance to both the passer-by as well as to the resident and those across the road.
assignment traffic assignment	Process of allocating trips onto existing or planned routes available on the road or public transport network. Assignment may be based on one or more factors known to influence route selection, e.g. Travel time, distance, cost.
at-grade crossing level crossing	Crossing at the same level, such as a railway crossing which is at the same level as a road, or a normal road intersection.
base case	System that would exist without the introduction of the changes proposed in the project being analysed.
calibration	Process of determining the parameters of the mathematical travel models so that these models simulate observed travel patterns as accurately as possible.
capacity	Maximum flow of trains, vehicles, passengers or goods that can be accommodated in a transport system in a specified period.
road capacity	Maximum number of vehicles or pedestrians that can pass over a given section of a lane, road or footpath in one direction (or in both directions for a two-lane or three-lane road) during a given time period under prevailing road and traffic conditions. It is the maximum rate of flow that has a reasonable expectation of occurring. In the absence of a time modifier, capacity is an hourly volume. The capacity would not normally be exceeded without changing one or more of the conditions that prevail. In expressing capacity, it is essential to state the prevailing road and traffic conditions under which the capacity is applicable.
census collector's district (abbreviation CCD)	Unit of area for which each census collector is responsible for collecting information. CCDs are the smallest individual areas for which basic land use and population data are available in Australia.
central business district (abbreviation CBD)	Dominant area of business and commercial activity within a given area. CBDs are characterised by high density office and retail development, large numbers of pedestrians and vehicles, and a heavy demand for parking. Also known as central activities district (CAD).
centroid	Assumed point in a traffic zone that represents the origin or destination of all trips to or from the zone. Generally, the weighted centre of trip ends rather than a geometric centre of the zonal area.
commercial vehicle	Road vehicle constructed specifically to convey goods, passengers or burden in the course of trade or business.
cordon	Imaginary line drawn around a given study area at which traffic counts and interviews may be taken.
desire line	Straight line joining two centroids and showing the desired direction of travel.
distribution	Process by which the number of trips between zones is estimated. The distribution may be measured or be estimated by a growth factor process or by a synthetic model such as a gravity model.
85th Percentile	Value of variable characteristic of individuals in a population, possessed by at or below 85 per cent of that population.
elasticity	Ratio of the change in demand for a commodity to the change in price of that commodity. In transport, a high ratio is termed elastic while a low ratio is termed inelastic.
grade separation	The separation of road, rail or other traffic so that crossing movements which would otherwise conflict are effected at different elevations.
journey	Movement involving one or more trips, e.g.: (a) a 'journey-to-work', which could involve a direct trip to work or an intermediate stop for some other but secondary purpose; (b) an 'origin-to-origin' journey, which could involve several trips, each for a particular purpose. Home-to-home journeys have also been termed 'tours'.
model	Mathematical description of a situation which uses data on past and present conditions to make predictions about the effects of changes.
passenger car unit equivalent car unit	Measure involving the conversion of different types of vehicles into their equivalent passenger cars in terms of operating characteristics.
public transport	Service by bus, rail, taxi or other means which provides transport to the public on a regular basis for payment of a prescribed fare.
road hierarchy	Grading of roads according to increasing or decreasing importance of their traffic carrying or other function.

Term	Definition
screenline	Imaginary line which splits a study area into two parts. Usually located along railway lines or rivers to minimise the number of crossing points.
sight distance	The distance measured along the carriageway over which objects of defined height are visible to a driver.
traffic	movement between locations of persons, goods and information by means of mechanical, electrical or personal methods.
base traffic	That traffic already present on a facility, or that traffic unlikely to be affected by design changes.
by-passable traffic	That traffic which can be diverted from a particular road or area because drivers do not wish to stop on that road or in that area.
local by-passable traffic	Term normally used to refer to short distance traffic that can be diverted, usually at the expense of increased distance, not increased time.
through by-passable traffic	Term normally used to refer to longer distance traffic that can be diverted without significant time or distance penalties.
converted traffic	Component of traffic which has changed its mode of travel, e.g. from train to car.
diverted traffic	Component of traffic which has changed its route but not its origin, destination, or mode of travel.
generated traffic	1. Traffic created by a new or improved facility as distinct from traffic which is diverted to a facility and normal traffic increase. 2. Traffic created by changes in land use.
induced traffic	Additional traffic resulting from some improvement in a road or in traffic arrangements.
potential traffic	Total volume which would move between two terminals assuming ideal travelling conditions.
shifted traffic	Component of traffic whose desire lines have been shifted because of change of origin or destination.
suppressed traffic	Reduction in traffic volume resulting from a change in traffic arrangements.
trip	1. One-way movement from one place to another for a particular purpose (<i>see also journey</i>). Note: Care is required in applying this general definition. In particular, the definition of 'purpose' will affect the way in which person, vehicle or commodity movements are classified into trips. In travel surveys, the 'purpose' set often includes 'change mode' and 'serve passenger', thus making a trip correspond to a movement by only one mode. Movements for these purposes have been variously called 'legs', 'segments', or 'unlinked trips', in transport planning practice. For analyses, trips are often 'linked', thus making a trip embrace more than one mode and/or lower order purpose. 2. In public vehicle operations: the movement by one vehicle or unit in one direction from the start of a route to the end of it.
external trip	Trip which starts or ends outside the study area.
through trip	Trip which starts and ends outside the study area, but which passes through the study area.
internal trip	Trip which starts and ends in the study area.
linked trip	One-way movement from one place to another for a specific purpose, involving more than one mode of travel.
trip distribution	1. The geographical distribution of trips. 2. Process by which the total number of trips is converted to individual zone-to-zone movements.
vehicle hours of travel (abbreviation VHT)	Total vehicle hours of travel over a road segment or number of road segments for a certain period, usually a specified year.
vehicle kilometres of travel (abbreviation VKT)	Total vehicle kilometres of travel over a road segment or number of road segments for a certain period, usually a specified year.
volume	Number of persons, vehicles or pedestrians passing a given point in a specified period of time.

Field surveys have been used to assess conditions. Unless specifically stated otherwise, these assessments have been transferred directly to the record sheets and not modified. Field descriptions may therefore be used as an independent estimate of conditions which can be correlated with other data.

AUSTROADS Design Vehicle Classification (AUSTROADS/SAA, 1995)

Bicycles	see Austroads Part 13	
Motorcycles	see Austroads Part 13	
Car/van - 85th percentile car, 99th percentile car	5.0 metres long	2 axles
Service vehicle	8.8 metres long	2 axles
Single unit truck/bus	12.5 metres long	3 axles
Long rigid bus	14.5 metres long	3 axles
Articulated bus	19.0 metres long	4 axles
Prime mover and semi-trailer	19.0 metres long	6 axles
Prime mover and long semi-trailer	25.0 metres long	6 axles
B-Double	25.0 metres long	9 axles
Road train	36.0 – 53.0 metres long	11-16 axles

Levels of Service

- **Level of Service A** is a condition of free flow in which individual drivers are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to manoeuvre within the traffic stream is extremely high, and the general level of comfort and convenience provided is excellent.
- **Level of Service B** is in the zone of stable flow and drivers still have reasonable freedom to select their desired speed and to manoeuvre within the traffic stream, although the general level of comfort and convenience is a little less than with level of service A.
- **Level of Service C** is also in the zone of stable flow, but most drivers are restricted to some extent in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience declines noticeably at this level.
- **Level of Service D** is close to the limit of stable flow and is approaching unstable flow. All drivers are severely restricted in their freedom to select their desired speed and to manoeuvre within the traffic stream. The general level of comfort and convenience is poor, and small increases in traffic flow will generally cause operational problems.
- **Level of Service E** occurs when traffic volumes are at or close to capacity, and there is virtually no freedom to select desired speeds or to manoeuvre within the traffic stream. Flow is unstable and minor disturbances within the traffic stream will cause break-down.
- **Level of Service F** is the zone of forced flow. With it, the amount of traffic approaching the point under consideration exceeds that which can pass it. Flow break-down occurs, and queuing and delays result.

Degree of Saturation: The DS is another measure of the operational performance of individual intersections. As both queue length and delay increase rapidly as DS approaches 1.0, it is usual to attempt to keep DS to less than 0.9. Values of DS in the order of 0.7 generally represent satisfactory intersection operation. When DS exceeds 0.9 residual queues can be anticipated.

Road Classification

Broad Classification		
Arterial Roads	Freeways	Those roads with full access control and grade separated intersections, whose primary function is to service large traffic movements.
	Primary Arterial Roads	Those arterial roads whose main function is to form the principal avenue of communication for metropolitan traffic movement not catered for by freeways.
	Secondary Arterial Roads	Those roads which supplement the Primary Arterial Roads in providing for through traffic movement, to an individually determined limit that is sensitive to both roadway characteristics and abutting land users.
Local Roads	Collector Roads	Those non arterial or 'intermediate' roads which distribute traffic between the arterial roads and the local street system, which provide local connection between arterial roads and which provide access to abutting property. It is the collector road, which mixes the basic functions of carrying traffic – often at excessive speed – and serving as a local residential street, that is the generator of many of the problems encountered in traffic management in Local Traffic Areas.
	Local Access Streets	Those streets, not being arterials or collectors, whose main (traffic) function is to provide access to abutting property.

Source: Austroads Part 10, 1988

Classification of Residential Streets

Access Street	Access Place	The lowest order of street providing access to sites without any traffic generated by sites in other streets. Target maximum speed 15 km/h. Indicative traffic volume 300 vpd.
	Local Street	Access streets are generally streets where the residential environment is dominant,

		traffic is subservient, speed and volume are low and pedestrians and cycle movements are facilitated. Target maximum speed 40 km/h. Indicative traffic volume <200 vpd.
Collector Streets	Minor Collector	The collector street collects traffic from access streets and carries higher volumes of traffic. A reasonable level of residential amenity and safety is maintained by restricting traffic volumes and vehicle speeds. Vehicle speeds are controlled by street alignment, intersection design and, in some cases, by speed control measures. Target maximum speed 50 km/h. Indicative traffic volume <3000 vpd.
	Major Collector	The major collector is generally short and connects the collector street with the road corridor network. Fronting development should still be encouraged, but with siting conditions which ensure acceptable amenity and safety. Target maximum speed 60 km/h. Indicative traffic volume <6000 vpd.

Source: *AMCORD 1995, Element 1.3 Street Networks*

Road management between Roads and Maritime Services (replacing Roads and Traffic Authority) and councils in NSW provides for three categories of road: State, Regional and Local. Refer to NSW Road Management Arrangements for more details. **Legal Class** The Roads Act 1993 provides for roads to be classified as Freeways, Controlled Access Roads, Tollways, State Highways, Main Roads, Secondary Roads, Tourist Roads, Transitways and State Works. The classification of a road empowers Roads and Maritime Services (replacing Roads and Traffic Authority) to exercise broad authority over some, or all, aspects of legally classified roads and to provide financial assistance to councils. **Administrative Class** To simplify administration of the various legal road classes, the roads in which Roads and Maritime Services (replacing Roads and Traffic Authority) has an interest and council roads are grouped into a three tier administrative classification system of State, Regional and Local Roads. The schedule of roads classified under the Roads Act 1993 and of State and Regional Roads is on the RMS website.