



Rhodes East

Department of Planning and Environment

Traffic and Transport Report

Draft Report

18 May 2017



Rhodes East

Project No: IA102900
Document Title: Traffic and Transport Report
Revision: 3
Date: 18 May 2017
Client Name: Department of Planning and Environment
Project Manager: NB
Author: Various
File Name: J:\IE\Projects\04_Eastern\IA102900\02 Documents\01 Transport\Rhodes East Traffic and Transport Draft Report - Revised 20170518.docx

Jacobs Group (Australia) Pty Limited
ABN 37 001 024 095
Level 7, 177 Pacific Highway
North Sydney NSW 2060 Australia
PO Box 632 North Sydney
NSW 2059 Australia
T +61 2 9928 2100
F +61 2 9928 2500
www.jacobs.com

© Copyright 2017 Jacobs Group (Australia) Pty Limited. The concepts and information contained in this document are the property of Jacobs. Use or copying of this document in whole or in part without the written permission of Jacobs constitutes an infringement of copyright.

Limitation: This document has been prepared on behalf of, and for the exclusive use of Jacobs' client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this document by any third party.

Document history and status

Revision	Date	Description	By	Review	Approved
1	04/04/17	Rhodes East Draft Traffic and Transport Report	PT	CS / NB	SK
2	26/04/2017	Rhodes East Draft Traffic and Transport Report - Revised	PT	NB	SK
3	18/05/2017	Rhodes East Draft Traffic and Transport Report – Revised	IM	NB	SK

Contents

Executive summary	1
1. Introduction.....	4
1.1 Background	4
1.2 Purpose of this report	4
1.3 Scope and limitations	4
1.4 Report structure	4
2. Policy, planning and travel context	6
2.1 Strategic planning context	6
2.2 District and local context.....	8
2.3 Existing travel characteristics	9
2.4 Existing transport network constraints.....	15
3. Structure Plan objectives and planning framework	16
3.1 Vision, objectives and principles	16
3.2 Strategic road planning framework.....	18
3.3 Overview of strategic transport modelling approach	19
4. Transport network evaluation	20
4.1 Planning proposal.....	20
4.2 Future travel demand	21
4.3 Road network evaluation	24
5. Proposed transport network	37
5.1 Process of development.....	37
5.2 Walking and cycling.....	37
5.3 Travel demand management	42
5.4 Action plan	46

Executive summary

The Department of Planning & Environment (DPE) is working with the City of Canada Bay to prepare a rezoning proposal for the Rhodes East Investigation Area. The Rhodes East area was nominated as a potential Priority Precinct by the City of Canada Bay.

This report identifies the transport initiatives recommended to support the rezoning proposal for Rhodes East.

Existing transport network constraints

The following constraints have been identified following an assessment of the existing transport network:

- A congested arterial road network (Concord Road) that will continue to be a key bus and freight corridor.
- A congested rail network with train loads approaching capacity at Rhodes Station during peak hours and more passengers expected from Wentworth Point as new development becomes occupied.
- A constrained local road network with a lack of bus priority opportunities.
- Restricted access to the Parramatta River foreshore which inhibits walking and cycling opportunities.
- Major transport infrastructure (railway line and Concord Road) that act as barriers to east-west movements for walking and cycling within Rhodes East, and to Rhodes West and surrounding suburbs.

Proposed future land uses

The Structure Plan, which has land uses allocated across different Character Areas, aims to increase the density and mix of uses that will attract and generate travel demand to, from and within Rhodes East. The proposed number of dwellings and population in 2036 by Character Area are shown in **Table ES.1**.

Of the additional population proposed within the precinct, all residents are located within 800 metres of the Rhodes Station and the proposed ferry wharf (approximately 10 minutes walking distance) and within 400 metres of a bus route. If stringent maximum car parking controls are able to be enforced across the precinct, there is also the opportunity for accommodating additional density, particularly within 400 metres of Rhodes Station, where a reduced household size and zero car parking provisions may be applied. Future rail timetabling improvements will provide added support for this approach.

Table ES.1 : Proposed number of dwellings and population in 2036

Character Area	Number of dwellings	Population (based on 2.3 people per dwelling)
Rhodes East Gateway	159	366
The High Point	962	2,212
Leeds Street Foreshore Precinct	1,355	3,117
Concord Road Corridor	478	1,100
Total	2,954	6,795

Evaluation of transport network

Improvements were tested at key intersections in Rhodes East and on the Concord Road / Church Street / Devlin Street corridor between Victoria Road and Rider Boulevard. Evaluation of the performance of the road network was undertaken using traffic modelling. The results show:

- Overall the existing Concord Road corridor is expected to operate near capacity with most intersections performing at Level of Service (LoS) D or worse. Additional traffic associated with background growth and development will result in a further deterioration in performance along the A3 corridor.

- Based on these findings, proposed intersection improvements outlined in this report result in northbound and southbound travel times on the Concord Road / Church Street / Devlin Street corridor improving by 77 per cent and 55 per cent in the morning peak, and 56 per cent and 49 per cent in the evening peak, respectively in comparison to the “without mitigation” scenarios.
- In Rhodes East, the proposed suggested improvements result in improved LoS and minor decreased delays and queue lengths at most intersections.

Continued growth in travel in and around Rhodes is anticipated regardless of the Rhodes East development. Therefore, in the wider area, the following intersections have been identified as requiring upgrading and improving;

- Delvin Street / Victoria Road.
- Church Street / Morrison Road.
- Church Street / Junction Road.
- Concord Road / Homebush Bay Drive.
- Homebush Bay Drive / Rider Boulevard.

Further investigations by Roads and Maritime Services (Roads and Maritime) into the detailed design and funding will be required regarding the above potential intersection upgrades, regardless of the outcome of the Rhodes East draft Precinct Plan.

With a congested road and rail network, it is likely that more rail services would also be required to stop at Rhodes Station. A high-level analysis of rail demand shows that an additional 1.1 southbound rail services would be required in the 2036 one-hour morning peak to meet demand resulting from the Rhodes East development.

Proposed supporting future transport network

The proposed future land use and transport network aims to support the forecast increase in travel demand as a result of the rezoning proposal for Rhodes East. Overall, there is expected to be an additional 1,535 person trips in the 2036 two-hour morning peak. The proposed transport network to support this additional demand includes the following:

- A street hierarchy that uses the movement and place framework. Concord Road will continue to be the key north-south movement corridor through the precinct for general traffic, freight and buses. Activated frontages in some parts of Mary Street, Blaxland Road and Leeds Street will become ‘Places for People’ (refer to **Section 4.3.1**).
- New and upgraded walking links have been identified where high pedestrian activity will be located and to provide new connections and improved permeability (refer to **Section 5.2.1**).
- Proposed strategic cycling links have been identified based on providing connectivity with regional cycling links and closing missing gaps in the network. These new cycling links improve connectivity through Rhodes to existing links to the north-east, north-west, west and south (refer to **Section 5.2.2**).
- Improved bus services capitalising on the new Bennelong Bridge, improving frequencies and span of hours of key routes, local bus network redesign and improving the quality of interchange at Rhodes Station (refer to **Section 5.2.3**).
- Improvements to ferry access as a result of new ferry wharf at Rhodes (refer to **Section 5.2.3**).
- Increased rail capacity through timetable adjustments, potential quadruplication of the Northern Line through Rhodes and north over the Parramatta River rail bridge, and the future influence of mass transit (either providing a new station and service at Rhodes or by alleviating congestion on the Northern Line) (refer to **Section 5.2.3**).

Overall key findings

- A change in travel behaviour is critical for the success of the rezoning proposal for Rhodes East. A supportive policy and transport network is critical.
- The primary focus for Rhodes East will be to reduce car driver demand, increasing mode share and implementing policies that reinforce a higher mode to modes other than car.
- Development is capped due to transport constraints. In order to achieve the proposed development levels, transport investment, particularly in additional rail capacity, will be required.
- All proposed transport solutions will need further investigation, engineering design, business case development, funding and approvals. Development will need to be staged in line with investment.
- The transport plan has been developed with a certain level of take-up assumed of the development controls. If development exceeds this take-up, the plan may need to be refreshed.
- If government investment in transport unlocks more capacity than anticipated in this plan, the transport and land use plan could be revised to take advantage of the additional network opportunities.
- An integrated package of works consisting of infrastructure, service and policy measures will need to be implemented to service a population growth of 6,795 for Rhodes East which will require key stakeholder agencies to agree on the scale and timing of development and the infrastructure required to support it.
- Based on sensitivity testing undertaken as a part of the study, it is estimated that growth in population of 6,795 across Rhodes East can be supported on the transport network at a manageable but serviceable level of service with a combination of rail service improvements, travel demand management measures and parking rate revisions.

1. Introduction

1.1 Background

The Department of Planning & Environment (DPE) is working with the City of Canada Bay to prepare a rezoning proposal for the Rhodes East Investigation Area. The investigation area comprises 36 hectares of land on the Rhodes Peninsula and is bounded by the Parramatta River, Mary Street and the Main North Railway Line as shown in **Figure 1.1**.

The Rhodes East area was nominated as a potential Priority Precinct by the City of Canada Bay. DPE has commissioned Jacobs Group (Australia) Pty Ltd to undertake the transport investigation for this study. The study has been used to assess and investigate the impacts an additional population of 6,795 across Rhodes East, as identified in the structure plan for 2036. This study attempts to identify the impacts of this population growth on the surrounding transportation network, and propose mitigation measures that will facilitate this growth and the necessary transportation infrastructure measures required to support them.

1.2 Purpose of this report

This report comprises a high-level traffic and transport strategy for the development of Rhodes East to accommodate additional population growth. It is intended that this report be used to guide decision-making on future transport investment for Rhodes East, to ensure unique and variable transport requirements are satisfied.

This report identifies the transport initiatives recommended to support the rezoning proposal for Rhodes East. The approach of this report is to explain the policy and planning context, describe the existing and future travel tasks, evaluate the performance of the transport network, and document the recommended transport network enhancements.

This report attempts to ensure a coordinated and efficient approach to land use planning, sustainable management and transport infrastructure investment that responds to growth targets within the Central District.

1.3 Scope and limitations

As is normal in such studies, the scope of this work entails a number of limitations. The main limitations include:

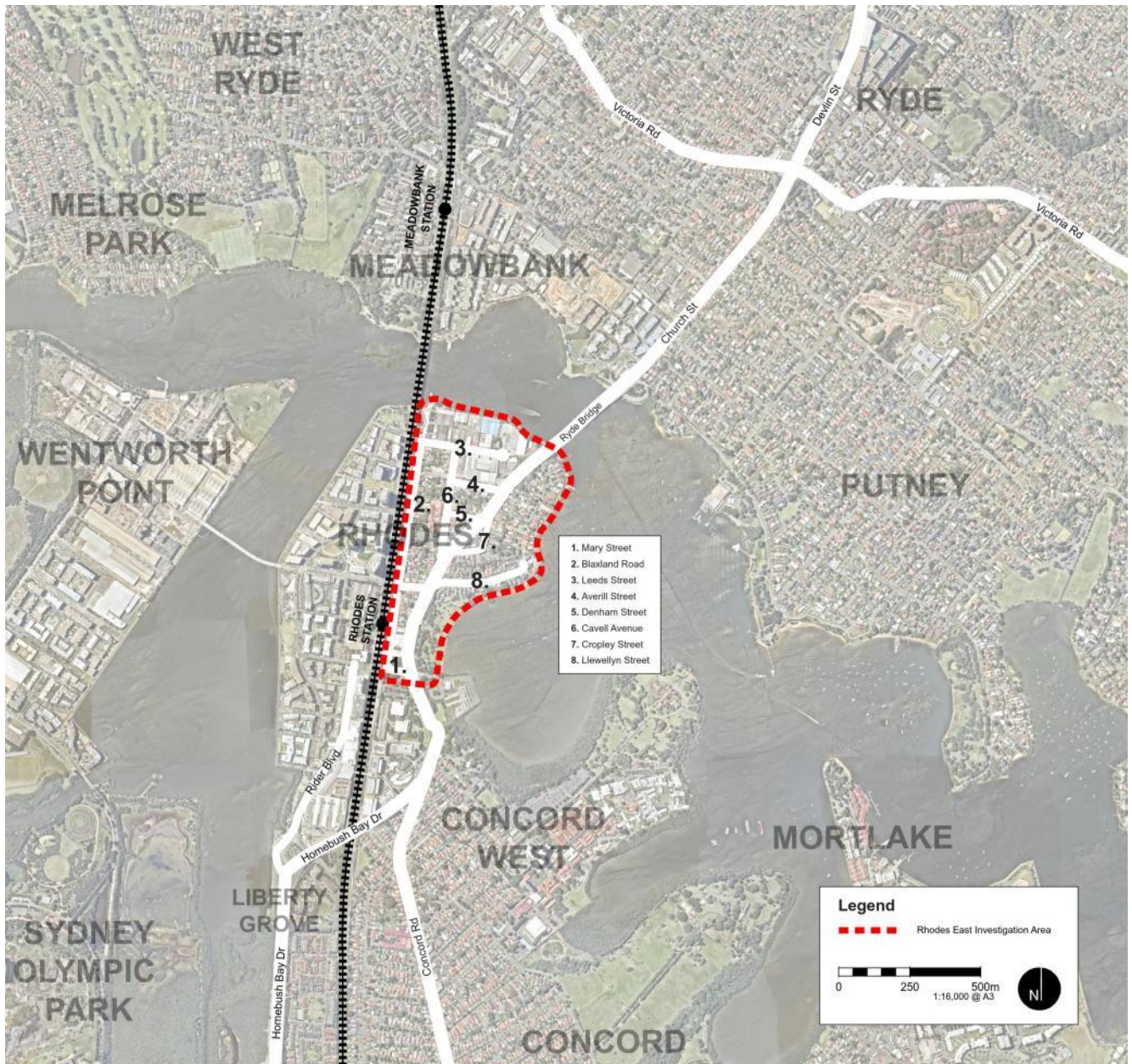
- The absence of area-wide network modelling using a mesoscopic model to identify wider area traffic impacts and mitigation measures across a connected road network.
- The lack of sufficient zone and network detail of the Sydney Strategic Travel Model (STM) to generate robust traffic flows and turn movement growth for key intersections within the study area.
- Lack of understanding of other proposed rail projects (i.e. Sydney Metro West, Sydney Metro North West, Sydney Metro City and South West and Parramatta Light Rail) and their impacts on the T1 Northern Line, in particular Rhodes Station.
- Proposed road network upgrades will require detailed concept designs to be developed using accurate topographical surveys, further engineering investigation, consultation and detailed environmental assessment.

1.4 Report structure

The remainder of this report is structured as follows:

- **Section 2** summarises the policy, planning and travel context including relevant goals and actions from NSW and local policy documents, and the existing travel task.
- **Section 3** describes the Structure Plan objectives for Rhodes East and outlines the transport planning framework used to determine the various transport functions.
- **Section 4** evaluates the performance of the proposed transport network.

- **Section 5** details the future transport task and describes the proposed transport network including new and upgraded walking and cycling links; improvements to bus, light rail, ferry and heavy rail; and improvements to road infrastructure. Travel demand measures including travel plans and parking are also discussed.



Source: Jacobs, 2017

Figure 1.1 : Rhodes East Investigation Area

2. Policy, planning and travel context

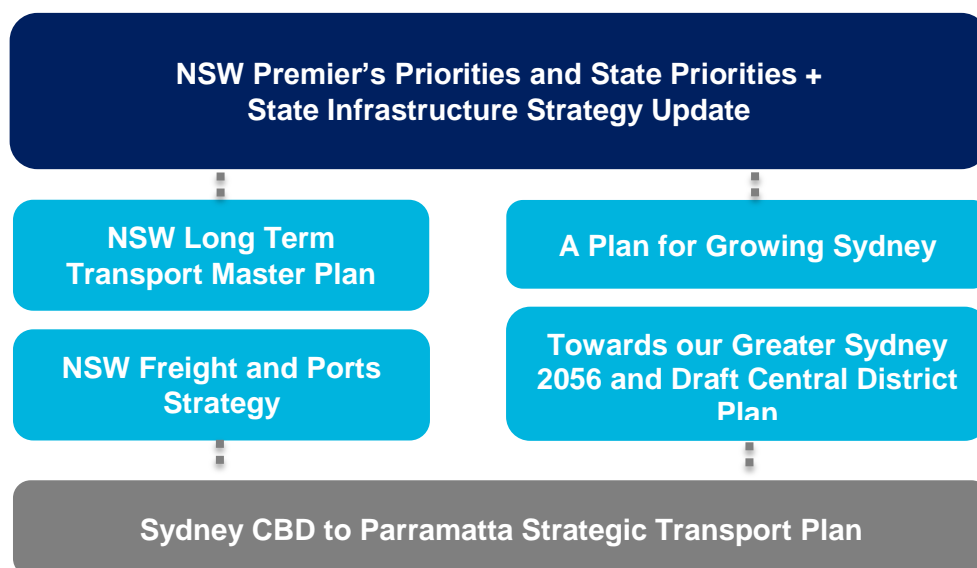
This section documents the policy and planning context that has informed the transport planning outcomes detailed in this report and highlights the key visions, objectives and strategies relevant to Rhodes East. Existing travel characteristics are summarised and existing transport issues described to highlight the constraints that will need to be considered.

2.1 Strategic planning context

NSW Government objectives related to transport and land use planning are detailed in several policies and planning documents including:

- *NSW Premier's Priorities and State Priorities* (NSW Department of Premier and Cabinet 2015)
- *Towards our Greater Sydney 2056 and Draft Central District Plan* (Greater Sydney Commission 2016)
- *A Plan for Growing Sydney* (DPE 2015)
- *NSW Long Term Transport Master Plan (LTTMP)* (Transport for NSW (TfNSW) 2012)
- *State Infrastructure Strategy Update* (SIS 2014) (Infrastructure NSW 2014)
- *Sydney CBD to Parramatta Strategic Transport Plan* (TfNSW 2015)

The relationship between these policies and planning documents is shown in **Figure 2.1** and their relevance to Rhodes East is described below.



Source: Jacobs, 2017

Figure 2.1 : The relationship between NSW Government policies and planning documents

2.1.1 NSW Premier's Priorities and State Priorities

The NSW Government is working to achieve 12 *Premier's Priorities* and 18 *State Priorities* to grow the economy, deliver infrastructure, protect the vulnerable, and improve health, education and public services across NSW.

Specific targets and actions relevant to Rhodes East include:

- Reducing the time people wait for public transport by increasing the frequency of services and improving coordination and integration between transport modes.

- Increasing the proportion of total journeys to work by public transport in the Sydney metropolitan area
- Providing better public transport connections between and within population and economic centres through the development of strategic bus corridors
- Upgrading supporting infrastructure in key centres.

2.1.2 A Plan for Growing Sydney

A Plan for Growing Sydney identifies Rhodes as a key Strategic Centre in the Global Economic Corridor. Strategic centres are areas of intense, mixed economic and social activity that are built around the transport network and feature major public investment in services such as hospitals and education and sports facilities.

Priorities for Rhodes East include:

- Working with council to protect capacity for long-term employment growth in Rhodes.
- Working with council to provide capacity for additional mixed-use development in Rhodes including offices, retail, services and housing.
- Supporting health-related land uses and infrastructure around Concord Hospital.
- Working with council to improve walking and cycling connections between Rhodes train station and Concord Hospital.
- Facilitating construction of a public transport, walking and cycling bridge over Homebush Bay to connect Rhodes to Wentworth Point.

The Plan also establishes a new Priority Growth Area from Greater Parramatta to the Olympic Peninsula, which includes Wentworth Point and Rhodes West (Rhodes East is not included).

2.1.3 NSW Long Term Transport Master Plan

The LTTMP brings together land use planning with transport planning, and it integrates planning for freight and passenger movements, as well as all modes of transport. It includes actions for road, rail, bus, ferries, light rail, cycling and walking. Of relevance to Rhodes, the Parramatta to Sydney CBD via Ryde and Parramatta to Sydney CBD via Strathfield corridors are both identified as strategic corridors with high constraints and Hornsby to Rhodes is identified as a strategic corridor with medium constraints. Rail network performance analysis also indicates that some passengers on the Northern Line will not be able to board a train in the 2031 morning peak under the 'do nothing' scenario.

The LTTMP also identifies that the growing demand for cross-town travel indicates that a CBD-focused transport network is no longer adequate to service the travel needs of Sydneysiders. There is a growing need for trips across the greater metropolitan area and almost half of travel into Sydney is not destined for the CBD. The LTTMP indicates that as cross-town travel increases, congestion is likely to spread further from the CBD, with areas between 20 kilometres and 50 kilometres from the CBD forecast to experience higher reductions in average travel. There is also likely to be a substantial increase in travel times for cross-town routes on some corridors.

2.1.4 State Infrastructure Strategy Update

The SIS 2014 provides the NSW Government with independent advice on infrastructure needs. It recommends that the Western Sydney Rail Upgrade Program should proceed as it effectively addresses the immediate challenges created by rapidly growing demand on the T1 corridor, while providing for key upgrades including Sydney Metro Northwest. The SIS 2014 also states that despite the additional capacity that this could provide, without Sydney Metro all heavy rail lines are forecast to reach capacity between 2017 and 2024.

2.1.5 NSW Freight and Ports Strategy

The *NSW Freight and Ports Strategy* is a core component of the overall strategic planning framework and supports the *Premier's Priorities* and *State Priorities*. The objectives are to deliver a freight network that efficiently supports the projected growth of the NSW economy and to balance freight needs with those of the broader community and environment.

Concord Road is identified as a primary freight route, which links major regions throughout the Sydney metropolitan area to strategically important ports, airports, industrial areas, freight terminals, intermodal terminals and hubs.

The Main North Railway Line is also part of a significant freight route which travels alongside the study area. The Main North Railway Line through Rhodes is part of Australia's busiest rail line, the east coast rail network, servicing Melbourne, Brisbane and Sydney.

2.1.6 Sydney CBD to Parramatta Strategic Transport Plan

The *Sydney CBD to Parramatta Strategic Transport Plan* is a transport plan that aims to improve the way people move along and around one of Sydney's most important and busiest areas, the corridor between Sydney CBD and Parramatta. The plan identifies future transport requirements and interventions at the regional, intermediate and local level by detailing a range of short, medium and long-term initiatives.

The plan sets the strategic framework for how transport can be improved in the corridor, and incorporates the following initiatives that are relevant to Rhodes East:

- The Greater Parramatta to the Olympic Peninsula Priority Growth Area, which includes Wentworth Point and Rhodes.
- Parramatta River ferry initiatives, including a new wharf at Rhodes.
- The Bennelong Bridge to provide access between Rhodes and Wentworth Point.

The plan also identifies that trips less than five kilometres make up 85 per cent of all trips that start and finish in the corridor, which have the potential to be undertaken by walking or cycling.

2.2 District and local context

The Greater Sydney Commission's (GSC) District Plan for the Central District and City of Canada Bay's planning documents provide additional context at the district and local level and are described below.

2.2.1 Greater Sydney Commission District Plans

The GSC was established to bring best practice to Greater Sydney by integrating land use, transport and infrastructure planning and collaborating with state agencies, and local and Commonwealth Governments. The District Plans provide the link between *A Plan for Growing Sydney* and councils' Local Environment Plans. The goal of the District Plans is to have well-coordinated, integrated and effective planning for land use, transport and infrastructure. The District Plans set out the opportunities, priorities and actions and provide the means by which *A Plan for Growing Sydney* can be actioned at a local level.

Situated in the Central District, Rhodes is recognised as a strategic location of metropolitan and district significance. The Rhodes East precinct is one of ten precincts identified as part of the Greater Parramatta to Olympic Peninsula Priority Growth Area that has been prioritised to provide additional mixed-use capacity and long-term employment growth.

2.2.2 City of Canada Bay plans and policies

The *Rhodes West Draft Master Plan* (City of Canada Bay 2009) established Rhodes as a major area for development and growth in the Canada Bay local government area (LGA), projecting at the time that 47 per

cent of future growth would occur within the Rhodes area. Early community concerns focused on the lack of adequate community facilities, proposing reductions less than the areas full development potential.

The *Canada Bay Local Planning Strategy* (City of Canada Bay 2010) identified that there would be intra-centre competition between the Rhodes, Macquarie Park, Parramatta and Burwood strategic centres in attracting future investment and higher order employment. To support future growth and meet ideal employment scenarios the strategy focused on the following key actions:

- Retaining key industry sites and solidifying the Rhodes precinct as a key service industry location.
- Intensifying employment within Rhodes in combination with the provision of transport infrastructure.
- Ensuring and retaining shop frontages in all new developments, and establishing active vibrant public domains, along with improving the urban design and design quality of building development.

The *Rhodes Peninsula Place Plan* (City of Canada Bay 2012) was put forth as a place-making document to give the community input into establishing the desired social and community place-focused outcomes for the Rhodes Peninsula. The plan acknowledges the following:

- That infrastructure provision will need to keep up with population growth and demand.
- The need for a well maintained and accessible public domain.
- Community desire for the Rhodes Peninsula to be more active and vibrant.

The *Canada Bay Local Environmental Plan* (City of Canada Bay 2013) contains zoning amendments, increased building heights and floor space ratio controls to allow for greater capacity of residential dwellings around the Rhodes train station precinct and Rhodes Peninsula.

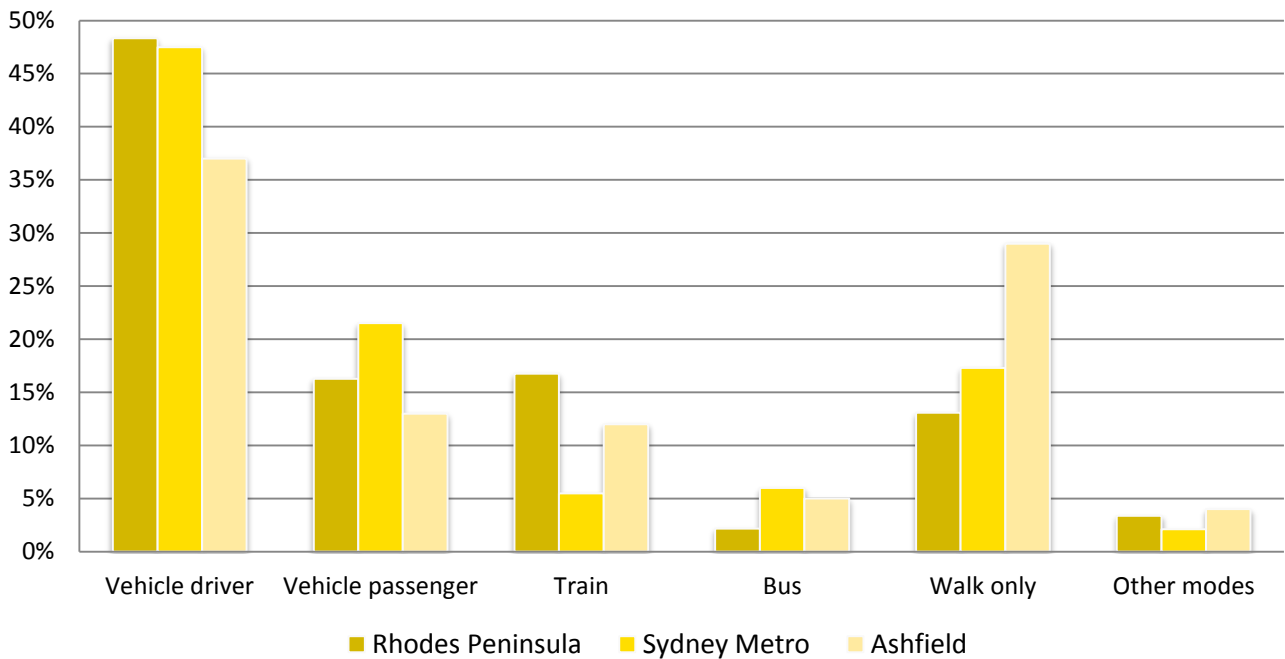
2.3 Existing travel characteristics

2.3.1 Modes of travel

Existing modes of travel used for all trips to and from Rhodes are shown in **Figure 2.2**. Private vehicles account for 65 per cent of trips, 17 per cent of trips are made by train, 13 per cent of trips are made by walking, two per cent are made by bus, and three per cent are made by other modes.

Comparatively, across the Sydney metropolitan area, approximately 69 per cent of trips are made by private vehicle. Trips made by train account for six per cent of trips across Sydney, which is significantly lower than Rhodes, and six per cent are made by bus, which is higher than Rhodes. Walk only trips account for 18 per cent of trips across Sydney, compared to only 13 per cent in Rhodes.

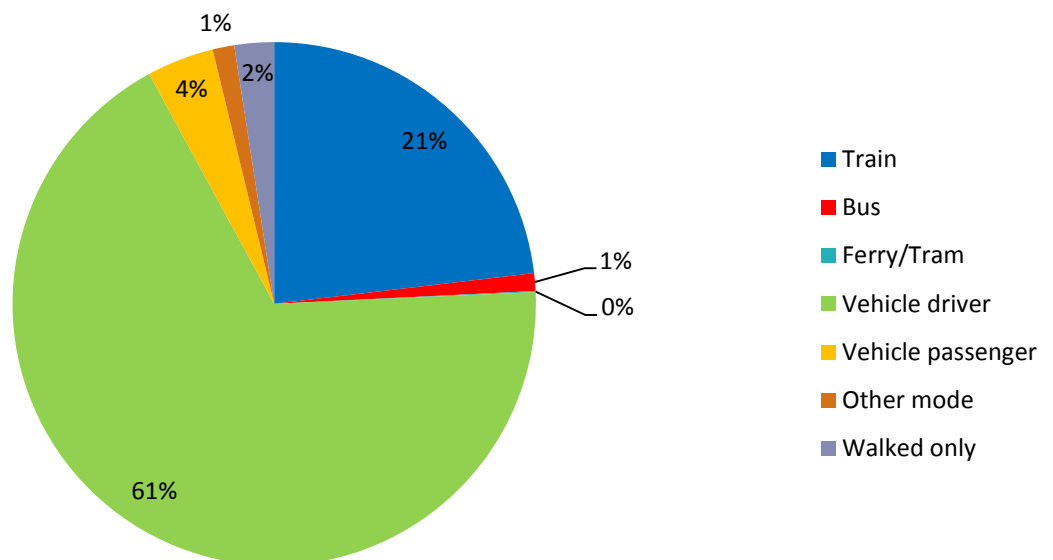
The former Ashfield Local Government Area (LGA), now in the Inner West Council, has been used as a travel comparison or benchmark for Rhodes given its high quality rail access and similar demographic characteristics, with a high professional workforce. The rail mode share for Ashfield is similar to Rhodes at 12 per cent of all trips. However, walk only trips in Ashfield are significantly higher at 29 per cent. The high share of walk trips also translates to a lower overall private vehicle mode share in Ashfield of 50 per cent.



Source: Bureau of Transport Statistics, Household Travel Survey, 2015

Figure 2.2 : Existing modes of travel to and from Rhodes and a comparison with the Sydney metropolitan area and Ashfield LGA

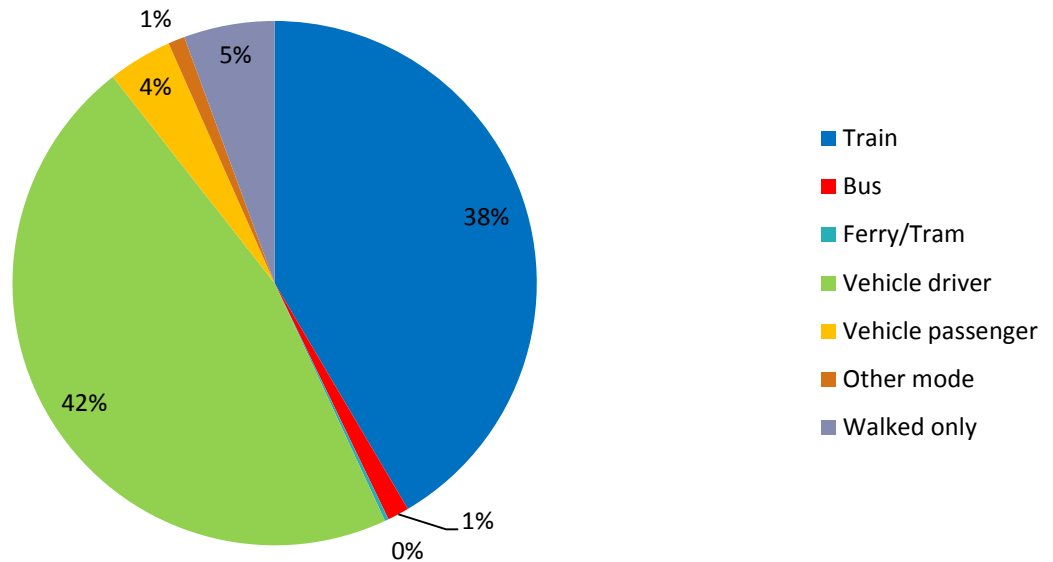
Existing modes of travel for trips to work in Rhodes are shown in **Figure 2.3**. Private vehicles account for 72 per cent of trips, 23 per cent of trips are made by train, two per cent of trips are walk only, and one per cent of trips are made by bus.



Source: Australian Bureau of Statistics, 2011

Figure 2.3 : Existing mode of travel for trips to Rhodes for work

Existing modes of travel for trips to work from Rhodes are shown in **Figure 2.4**. Private vehicles account for 50 per cent of trips, 42 per cent of trips are made by train, six per cent of trips are walk only, and one per cent of trips are made by bus.

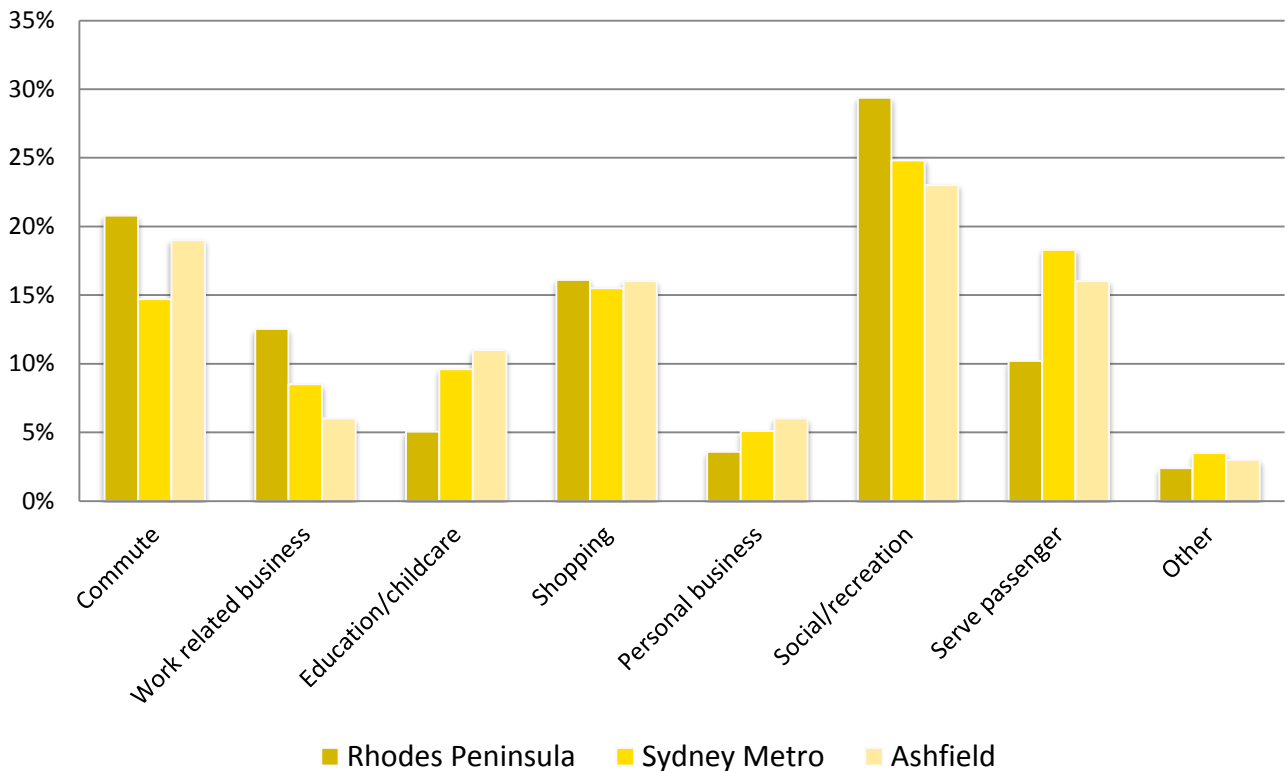


Source: Australian Bureau of Statistics, 2011

Figure 2.4 : Existing mode of travel for trips from Rhodes for work

2.3.2 Trip purpose

Trip purposes for residents in Rhodes are shown in **Figure 2.5**. Rhodes has a higher than average portion of commuter trips at 21 per cent, compared to 15 per cent for Sydney and 19 per cent for Ashfield. Social / recreation trips are also high (29 per cent) and trips serving passengers are low (10 per cent). This may reflect the younger population of Rhodes (median age 28 – Sydney and Ashfield 36 and 35 respectively) with less children being dropped off at school by residents (average children per family 1.4 – Sydney and Ashfield 1.9 and 1.6 respectively) (ABS 2011). The high proportion of social / recreation trips combined with the low walking mode share previously identified suggests that many people are undertaking these types of trips by private vehicle.

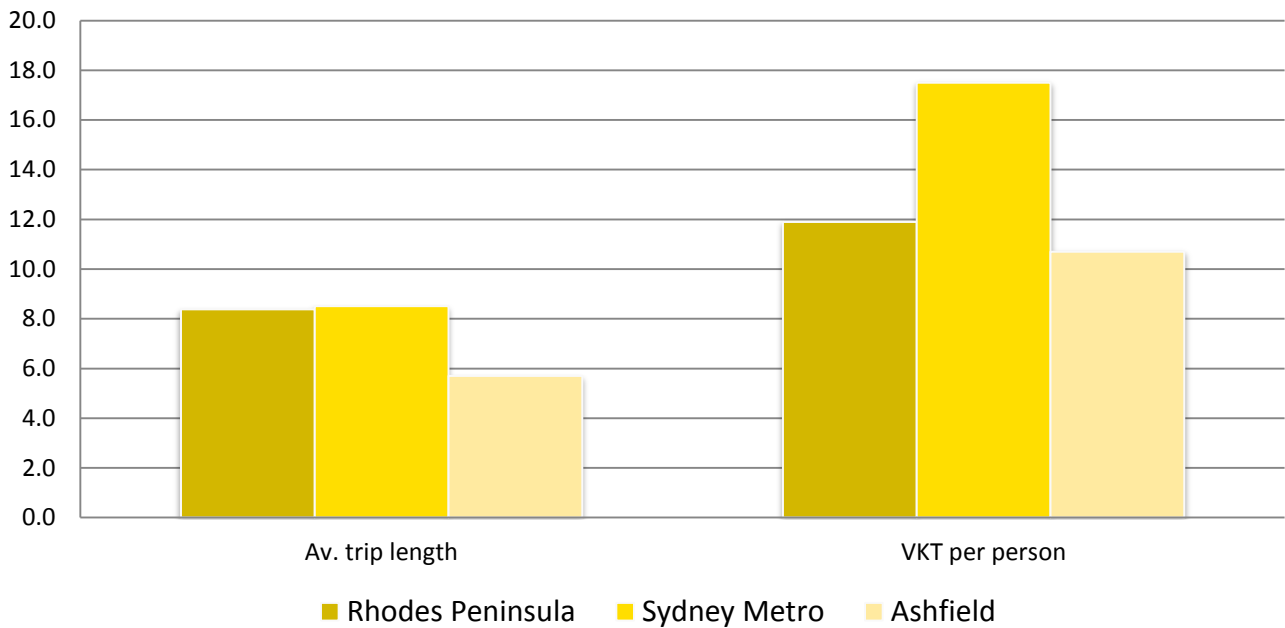


Source: Bureau of Transport Statistics, Household Travel Survey, 2015

Figure 2.5 : Trip purpose for Rhodes and a comparison with the Sydney metropolitan area and Ashfield LGA

2.3.3 Trip distance and number of trips per person

The average trip distance per person in Rhodes is shown in **Figure 2.6**. The average trip length is 8.4 kilometres which is roughly equivalent to the Sydney average, with Ashfield averaging 5.7 kilometres. This difference is likely to be related to the very low walking mode share in Rhodes compared to Ashfield. Rhodes residents travel further on average to access services and employment, either by car or train. The vehicle kilometres travelled (VKT) per person of 11.9 kilometres is more aligned with Ashfield (10.7 kilometres), than the Sydney average (17.5 kilometres).

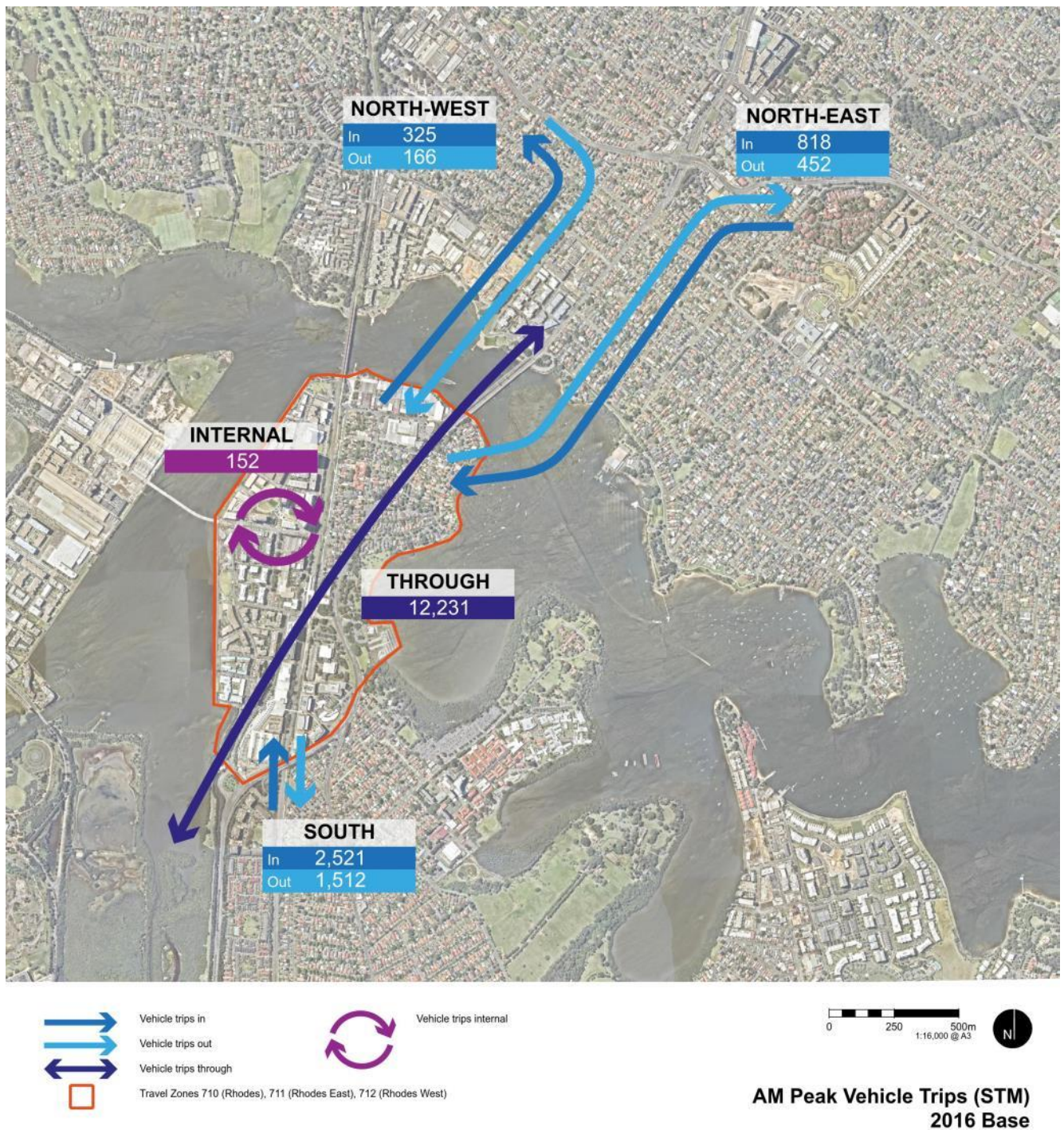


Source: Bureau of Transport Statistics, Household Travel Survey, 2015

Figure 2.6 : Average trip distance and VKT per person in Rhodes and a comparison with the Sydney metropolitan area and Ashfield LGA

2.3.4 Spatial distribution of trips

The spatial distribution of motorised vehicle trips to, through and within Rhodes during the two-hour weekday morning peak period (7.00 am to 9.00 am) is shown in **Figure 2.7**. There are more vehicle trips entering Rhodes than departing in all three directions, indicating Rhodes is more of a destination than a trip origin in the morning peak period. The majority of vehicle trips into and out of Rhodes are from the south via Homebush Bay Drive or Concord Road. Given Homebush Bay Drive and Concord Road are major arterial roads providing inter-regional links, the majority of trips (12,000) pass through Rhodes without stopping. There are very few internal vehicle trips (less than 200).



Source: Sydney Strategic Travel Model, 2016

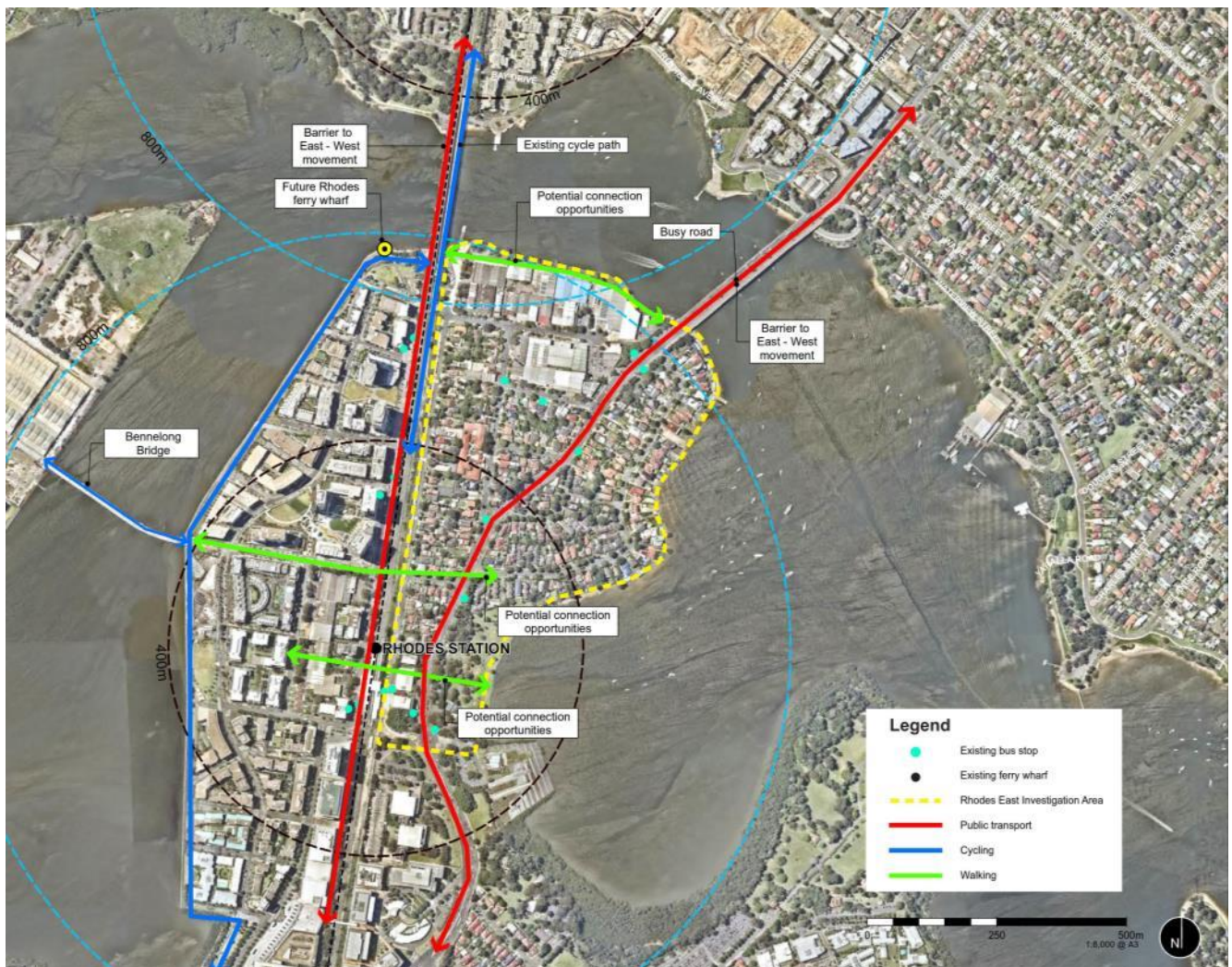
Figure 2.7 : Spatial distribution of trips to, through and within Rhodes

2.4 Existing transport network constraints

Based on an assessment of the existing transport network, the following constraints have been identified:

- A congested arterial road network (Concord Road) that will continue to be a key bus and freight corridor.
- A congested rail network with train loads approaching capacity at Rhodes Station during peak hours and more passengers expected from Wentworth Point as new development becomes occupied.
- A constrained local road network with a lack of bus priority opportunities.
- Restricted access to the Parramatta River foreshore which inhibits walking and cycling opportunities.
- Major transport infrastructure (railway line and Concord Road) that act as barriers to east-west movements for walking and cycling within Rhodes East, and to Rhodes West and surrounding suburbs.

A summary of existing transport network constraints and opportunities is shown in **Figure 2.8**.



Source: Jacobs, 2017

Figure 2.8 : Existing transport network constraints and opportunities

3. Structure Plan objectives and planning framework

Defining the transport planning vision and objectives for Rhodes East will ensure that planning and investment in the transport network will result in positive outcomes, address the areas of highest priority, and cater for increased future transport demands resulting from the rezoning proposal. These are described in this section.

3.1 Vision, objectives and principles

3.1.1 Vision

The Rhodes East Structure Plan includes the following overarching vision for the precinct:

Rhodes East will be a model for sustainable, low-rise high density development, which builds upon the existing character and heritage of the area. It will provide more high quality housing choice, close to public transport and catering to a variety of household types. It will be supported by connections to the water, and local streets will be redesigned to support walking, cycling and use of public transport. Improved amenity will encourage residents and visitors to spend time and continue to take pride in the area.

In order to support this vision and respond to the constraints outlined in **Section 2.4**, four key transport objectives for the precinct have been developed.

- 1) Create a local street network that is designed for people first and vehicles second.
- 2) Prioritise active and public transport, and demand management measures to support sustainable travel behaviour and encourage reduced car use.
- 3) Provide a diversity of land uses with walkable access to a variety of services and facilities to discourage unnecessary car trips.
- 4) Establish the Rhodes peninsula as part of Sydney's connected network of jobs and recreation taking advantage of its central location within the Olympic Peninsula.

3.1.2 Planning principles

Based on the vision and objectives identified, planning principles were used to inform option development and ultimately the transport outcomes for Rhodes East. These principles and how they relate to the objectives are detailed in **Table 3.1**.

Table 3.1 : Transport planning objectives and principles

Objectives	Principles
1. Create a local street network that is designed for people first and vehicles second.	<ul style="list-style-type: none"> • Plan transport networks and land uses to influence the location, timing, scale and density of development. • Implement a road planning framework for the Rhodes East study area that recognises the movement and access requirements across the road network. • Provide improved permeability of connections by removing barriers to local movement by sustainable modes. • Facilitate appropriate provision for freight and local delivery access within the area.

Objectives	Principles
2. Prioritise active and public transport, and demand management measures to support sustainable travel behaviour and encourage reduced car use.	<ul style="list-style-type: none"> • Support public transport and walking and cycling to grow the proportion of travel by these modes. • Provide safe and direct access to support key desire lines and to major trip generators within and outside the precinct. • Leverage off new infrastructure such as the Bennelong Bridge to provide new services and infrastructure to maximise benefits. • Provide a policy framework that supports sustainable travel behaviour (such as parking rates, behavioural programs, travel plans). • Improve efficiency by sharing the road space more effectively among all modes of road based transport.
3. Provide a diversity of land uses to provide residents with walkable access to a variety of services and facilities and discourage unnecessary car trips.	<ul style="list-style-type: none"> • Plan transport networks and land uses to influence the location, timing, scale and density of development.
4. Establish the Rhodes peninsula as part of Sydney's connected network of jobs and recreation taking advantage of its central location within the Olympic Peninsula.	<ul style="list-style-type: none"> • Improve the efficiency of the transport network through increasing passenger and freight efficiency, project prioritisation and making existing infrastructure more efficient. • Consider the broader regional needs of the Greater Parramatta to Olympic Peninsula and the Global Economic Corridor when proposing public transport improvements. • Consider the role of regional freight moving through the precinct.

3.1.3 Potential measures

Ultimately, the Rhodes East project will be measured on how it achieves the vision and objectives. From a transport perspective there are a number of approaches for measuring outcomes. Some potential options and their relationship to the objectives are outlined in **Table 3.2**.

Table 3.2 : Objectives and potential measures

Objectives	Potential measures
1. Create a local street network that is designed for people first and vehicles second.	<ul style="list-style-type: none"> • Number of barriers that influence movement. • Mode share for public transport, walking and cycling. • Level of Service for pedestrians and bicycles. • Average walking distance to public transport.
2. Prioritise active and public transport, and demand management measures to support sustainable travel behaviour and encourage reduced car use.	<ul style="list-style-type: none"> • Mode share for public transport, walking and cycling. • Level of Service for pedestrians and bicycles. • Average walking distance to public transport. • Transfer times/distances for customers interchanging modes. • Number and type of parking spaces provided. • Change in duration of peak periods and off-peak load factors. • Mode shift. • Number of developments with Travel Plans.

Objectives	Potential measures
3. Provide a diversity of land uses to provide residents with walkable access to a variety of services and facilities and discourage unnecessary car trips.	<ul style="list-style-type: none"> • Accessibility to a range of travel options and local services. • Proportion of contained trips.
4. Establish the Rhodes peninsula as part of Sydney's connected network of jobs and recreation taking advantage of its central location within the Olympic Peninsula.	<ul style="list-style-type: none"> • Mode share for public transport, walking and cycling. • Travel time reliability for people and goods. • Proportion of through-traffic and freight vehicles. • Travel times to key centres.

3.2 Strategic road planning framework

The framework defines the future function of the street network on the basis of land use and transport objectives and desired outcomes for Rhodes East. The roads within and around Rhodes provide two primary functions for transport customers:

- Movement – the ability to travel between places.
- Place – the ability to access origins and destinations of travel.

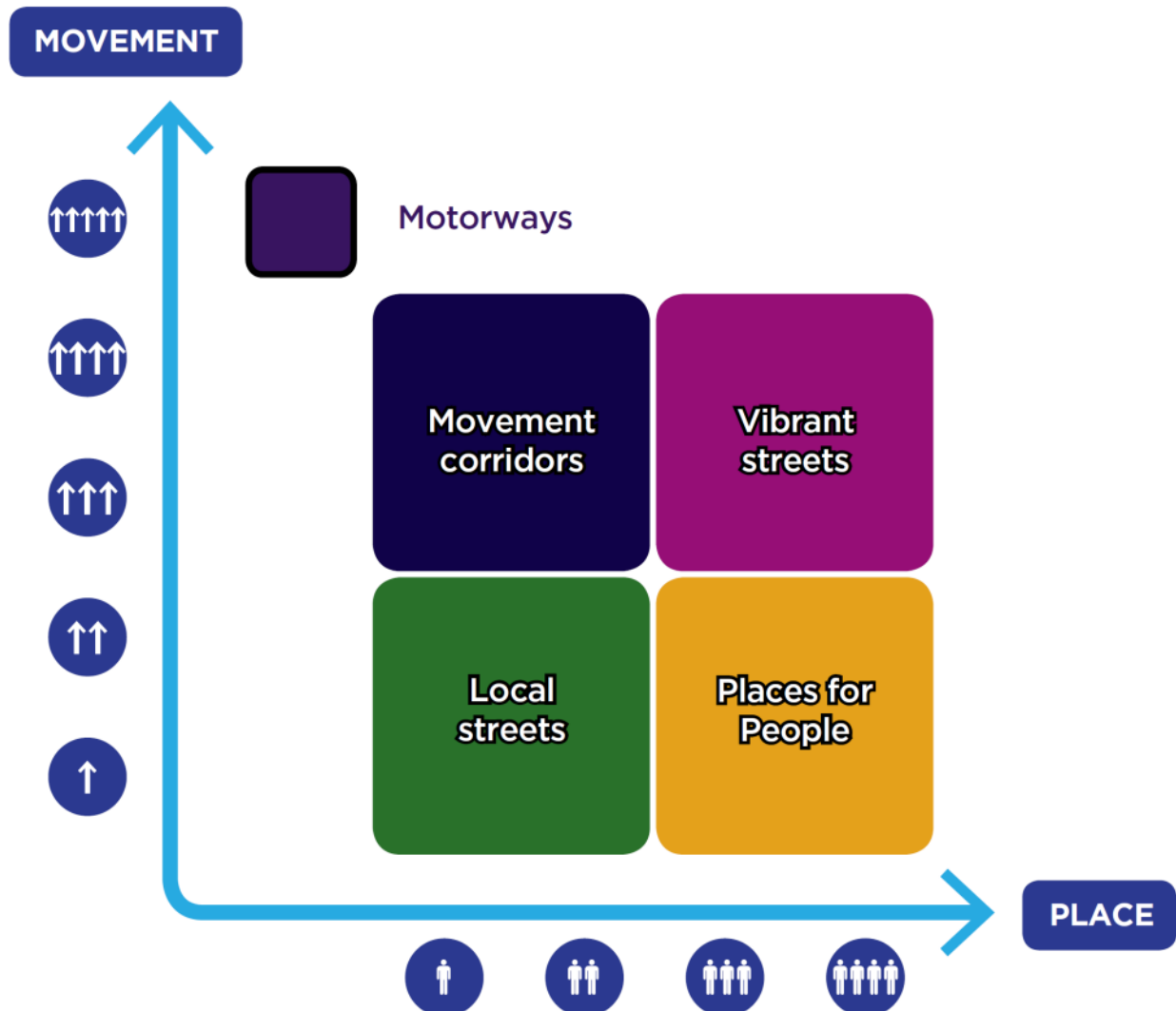
An understanding of the two functions of a street are vital when the two functions are competing, such as through increased movement requirements or improved place amenity. The movement and place function of a street informs planning for the level of access across each of the transport modes. The street network consists of a mixture of different road types serving different functions within the transport network. These are shown in **Figure 3.1**.



Source: TfNSW, 2016

Figure 3.1 : Movement and place hierarchy

The matrix in **Figure 3.2** shows how different street types are categorised in terms of their movement and place function.



Source: TfNSW, 2016

Figure 3.2 : Movement and place framework

3.3 Overview of strategic transport modelling approach

Transport modelling has been undertaken as part of the overall transport evaluation to support the planning for Rhodes East. Transport modelling has been used to inform the understanding of future travel demand, travel patterns and performance of the road network with consideration of:

- Existing land uses, population and employment in the Sydney Greater Metropolitan Area.
- Future land use changes.
- Future proposed, planned and committed transport infrastructure and services.

The Sydney Strategic Travel Model (STM) has been used to identify the amount of trips (travel demand) and what origins and destinations people will travel to, from and within (trip distribution) for all purposes of travel. The STM is used for projecting travel patterns under different land use, transport and pricing scenarios. It can be used to test alternative settlement, employment and transport policies, to identify likely future capacity constraints, or to determine potential usage levels of proposed new transport infrastructure or services.

4. Transport network evaluation

This section examines the transport network impacts on Rhodes East and its surrounding road network from predicted growth derived from the land use scenario identified in Structure Plan. In doing so, it identifies from a high level strategic perspective the network impacts of the proposed population growth of 6,795. This assessment of the transport impacts focusses on 2036 future travel demand and uses the desired assessment criteria for strategic network planning and intersection performance to accommodate future demands.

4.1 Planning proposal

The Structure Plan, which forms the basis of the proposed transport network presented in this report, is shown in **Figure 4.1**. The Structure Plan aims to increase the density and mix of uses that will attract and generate travel demand to, from and within Rhodes East.



Source: RobertsDay, 2016

Figure 4.1 : Rhodes East Structure Plan

Four Character Areas have been identified in the Structure Plan and are described below.

- Rhodes East Gateway – this area will proudly announce arrival at Rhodes East from the south and guide people to Rhodes Station and McIlwaine Park. The built form will reflect its location adjacent to the station with increased density and will encourage the use of public transport. There will be street level activation and a safe, pedestrian friendly environment will be prioritised to promote connectivity between the station, across Concord Road, into McIlwaine Park and to Parramatta River.
- The High Point – this area will largely consist of residential and community uses in the form of apartments and strata titled terraces that will create a balance between increased housing, public and private amenity, and an active and safe pedestrian environment.
- Leeds Street Foreshore Precinct – this area will provide a multi-modal, water-based destination. The precinct will introduce meaningful visual and physical connections to the water in addition to a vibrant mix of uses. The lifestyle and activities promoted within this precinct will prioritise pedestrians.
- Concord Road Corridor – this area will build on its primary role as a transit-focused corridor. Increased walking, cycling and bus patronage will be promoted through combined public domain and built form frontage strategies. Landscaping along Concord Road will provide shade and pedestrian amenity. A combination of retail, residential and adaptable building frontages will activate the precinct.

The land uses and scale of development is based on analysis undertaken by RobertsDay. The proposed number of dwellings and population in 2036 by Character Area are shown in **Table 4.1**.

Table 4.1 : Proposed number of dwellings and population in 2036

Character Area	Number of dwellings	Population (based on 2.3 people per dwelling)
Rhodes East Gateway	159	366
The High Point	962	2,212
Leeds Street Foreshore Precinct	1,355	3,117
Concord Road Corridor	478	1,100
Total	2,954	6,795

4.2 Future travel demand

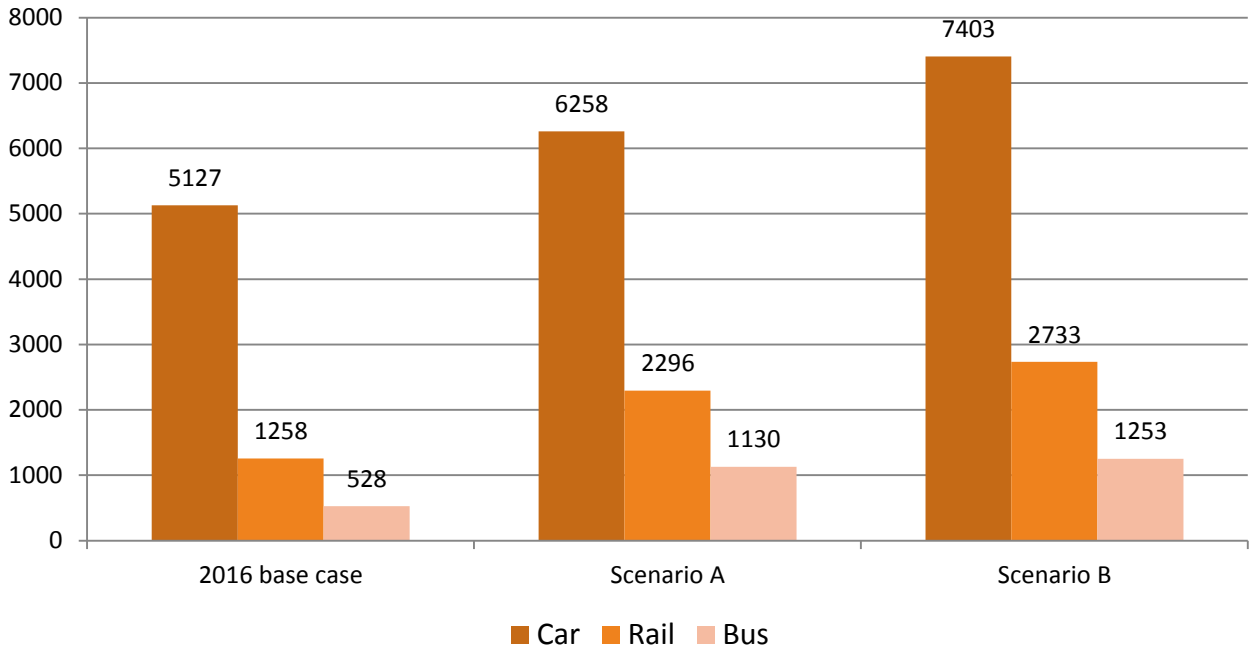
4.2.1 Number of trips

The number of motorised trips resulting from the proposed land use and population in 2036 is shown **Figure 4.2** and has been determined using outputs from the STM. Overall, there is expected to be an additional 1,535 person trips in the 2036 two-hour morning peak with development in Rhodes East compared to no development. The difference in trips compared to the 2016 base case is shown in **Figure 4.3**.

Key findings are as follows:

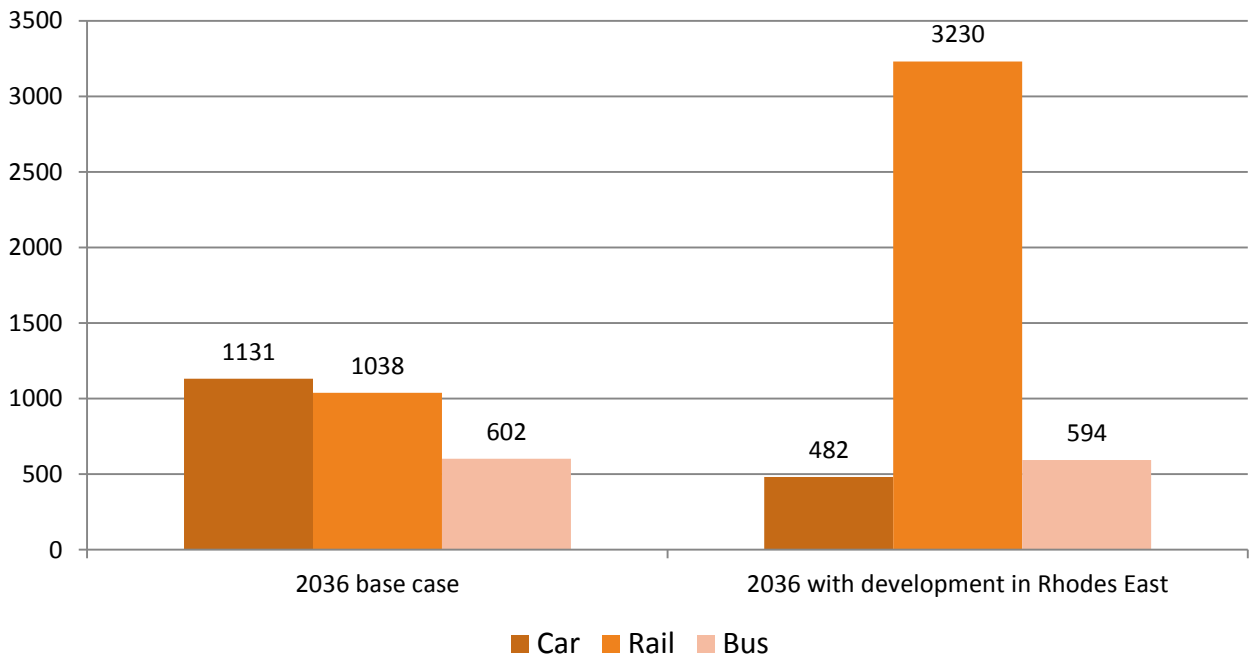
- 2016 base case compared to 2036 base case (with no development in Rhodes East) – there is an increase of approximately 2,800 trips in the two-hour morning peak, including an additional 1,100 car trips and 1,100 rail trips.
- 2036 base case compared to 2036 with development in Rhodes East – there is a decrease of 649 car trips in the two-hour morning peak as a result of an already congested and constrained road network. Consequently there is an increase in the rail mode share with an additional 2,200 rail trips. The number of bus trips remains constant.
- 2036 with development in Rhodes East compared to the 2016 base case – in order to have only a modest increase in car trips compared to the 2016 base case (nearly 500 in the two-hour morning peak), car trips

would need to account for 50 per cent of all motorised trips. This mode shift would require an additional 3,200 passengers to be moved by rail at Rhodes Station in the two-hour morning peak.



Source: Sydney Strategic Travel Model, 2016

Figure 4.2 : Number of trips in Rhodes East, 2036 two-hour morning peak



Source: Sydney Strategic Travel Model, 2016

Figure 4.3 : Difference in trips in Rhodes East compared to the 2016 base case

4.2.2 Rail implications of future travel demand

Continued growth in travel is expected in and around Rhodes regardless of the Rhodes East development. With a congested road and rail network, it is likely that more rail services would be required to stop at Rhodes. However, there is a Northern Line capacity versus Western Line capacity trade-off as the rail lines are shared between Strathfield and Sydney CBD.

As indicated in **Figure 4.3**, there would be an additional 3,200 passengers to be moved by rail at Rhodes Station in the two-hour morning peak in order to limit additional car trips to 500 in the two-hour morning peak. A high-level analysis has been undertaken to determine the number of additional rail services required to meet the projected demand with the following assumptions:

- The two-hour peak demand has been converted to one hour by assuming the peak one hour accounts for 60 per cent of trips.
- 70 per cent of passengers travel southbound to reflect peak demand towards Sydney CBD.
- Average train capacity is 1,200 passengers (at 135 per cent loading).

The analysis shows that an additional 1.1 southbound rail services are required in the 2036 one-hour morning peak to meet demand.

This is indicative only and does not take into account a number of factors including the available capacity of services approaching Rhodes, the potential effect of road network congestion on the desirability of rail, and the effect of increased land use density and mix on walking mode share and how this could impact rail usage.

4.2.3 Key findings of future travel demand analysis

Key finding #1 – Walking needs to be a focus

The existing walking mode share in Rhodes is very low (only 13 per cent). Making Rhodes East a walkable neighbourhood with multiple destinations and services within walking distance is critical.

Key finding #2 – Public transport will need to play a major role

Rail is already carrying a moderate share (17 per cent of all trips) and this will need to increase. Buses have the potential to carry more than the current two per cent of trips, particularly with improvements connecting to Wentworth Point and Sydney Olympic Park via the Bennelong Bridge.

Key finding #3 – Car trips need to be managed

The road network is already congested and more cars in the area is not a desirable outcome to achieve the project vision. The ability to achieve the mode share for car trips will be a factor of demand management (e.g. parking policies) and the success of shifting or shaping behaviour. Providing people with realistic options to walk for short trips, particularly social / recreation and weekend trips, will be a significant influence on the success of the mode share targets. This is not just about the transport network, but also the walkability of the urban form and the mix of land uses within walking distance.

The mode share targets for Rhodes East are shown in **Table 4.2**. In order to ensure consistency and that conflicting policies are not pursued, it is recommended these targets are also adopted for Rhodes West.

Table 4.2 : Mode share targets for Rhodes East

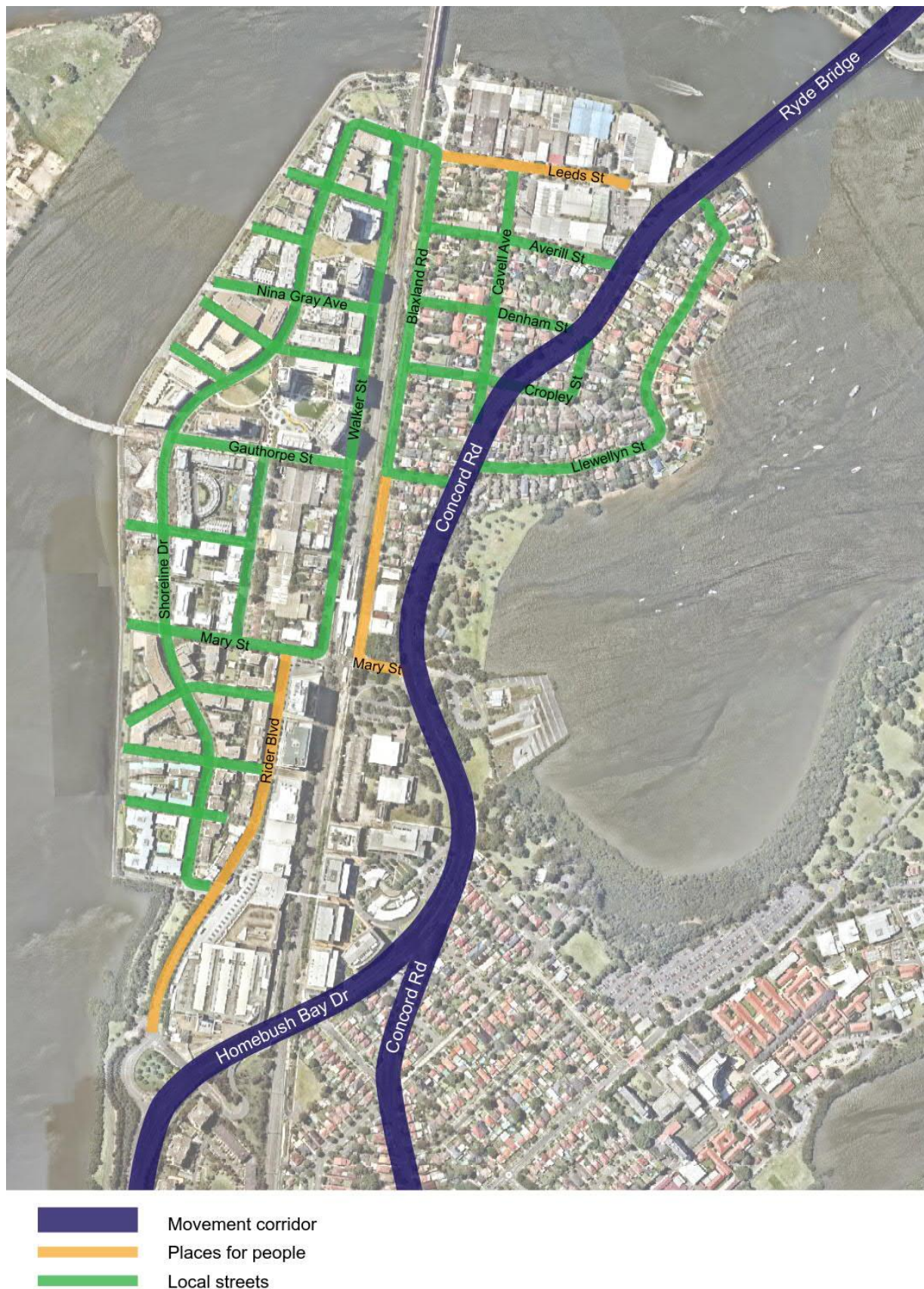
Mode	Existing mode share	Rhodes East target mode share
Private vehicle	65%	40%
Rail	17%	20%
Bus	2%	5%
Walk only	13%	30%
Others (includes cycling)	3%	5%

4.3 Road network evaluation

Evaluation of proposed road improvement measures to accommodate the proposed land use and population in 2036 was undertaken using traffic modelling. These measures have been identified and developed in consultation with DPE, Roads and Maritime Services (Roads and Maritime), TfNSW and the City of Canada Bay.

4.3.1 Proposed street hierarchy

The proposed street hierarchy for the broader Rhodes Precinct using the movement and place framework discussed in **Section 3.2** is shown in **Figure 4.4**. The identified local streets support local access in the Rhodes Precinct. Other streets and their function are also shown.



Source: Jacobs, 2017

Figure 4.4 : Proposed street hierarchy for the broader Rhodes Precinct

Movement corridors

Concord Road will continue to be the key north-south movement corridor through the precinct for general traffic, freight and public transport. The significant volume of traffic, key freight and public transport function, and lack of alternative crossings of Parramatta River between Silverwater Road and Victoria Road, mean that opportunities to downgrade the movement function will be scarce. That said, opportunities to improve crossings for pedestrians and cyclists and the frontage need to be pursued.

Places for People

Rider Boulevard is an existing 'Place for People' that provides an activated north-south frontage connecting south from Rhodes Station to the Rhodes Shopping Centre. The boulevard is characterised by:

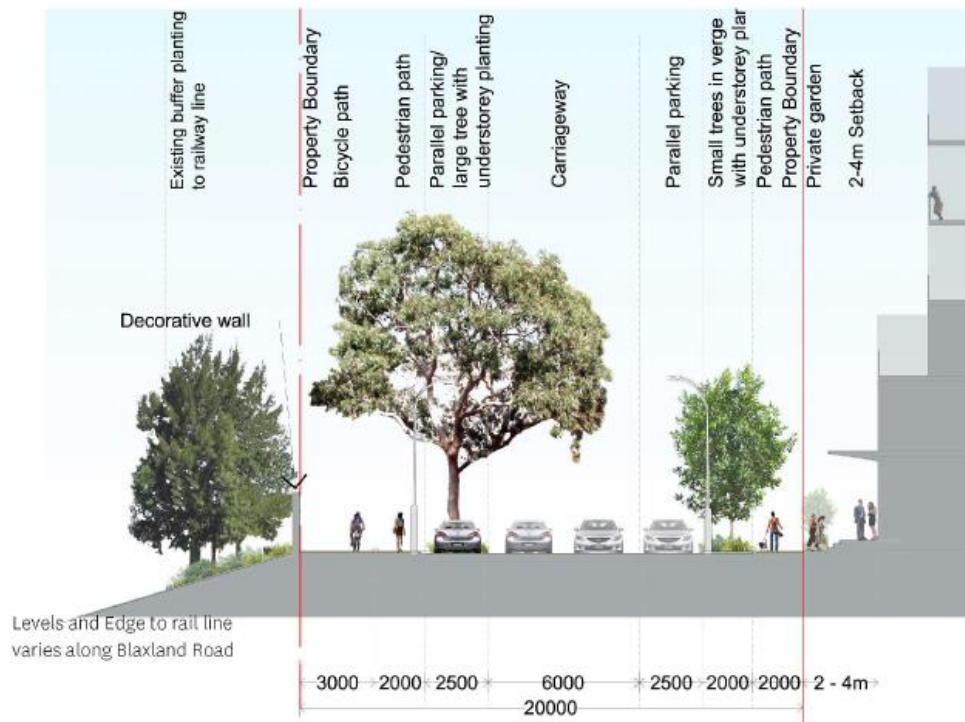
- A diversity of active ground floor uses.
- Restricted on-street parking.
- Generous footpath provision with outdoor seating in some locations.
- An urban plaza on the corner of Mary Street / Rider Boulevard.
- A mixture of marked and signalised pedestrian crossings.
- Cycling lanes.
- 50 kilometres per hour speed limit. This speed limit is not ideal for a 'Place for People' and a 40 kilometres per hour speed limit should be considered.

Mary Street will become a 'Place for People' between Marquet Street and Concord Road, providing the activated east-west spine connecting a diversity of uses through the station precinct.

Blaxland Road between Mary Street and Llewellyn Street will be formalised as a 'Place for People' providing an activated frontage connecting into east-west links across the rail line. An indicative cross-section of Blaxland Road is presented in **Figure 4.5**.

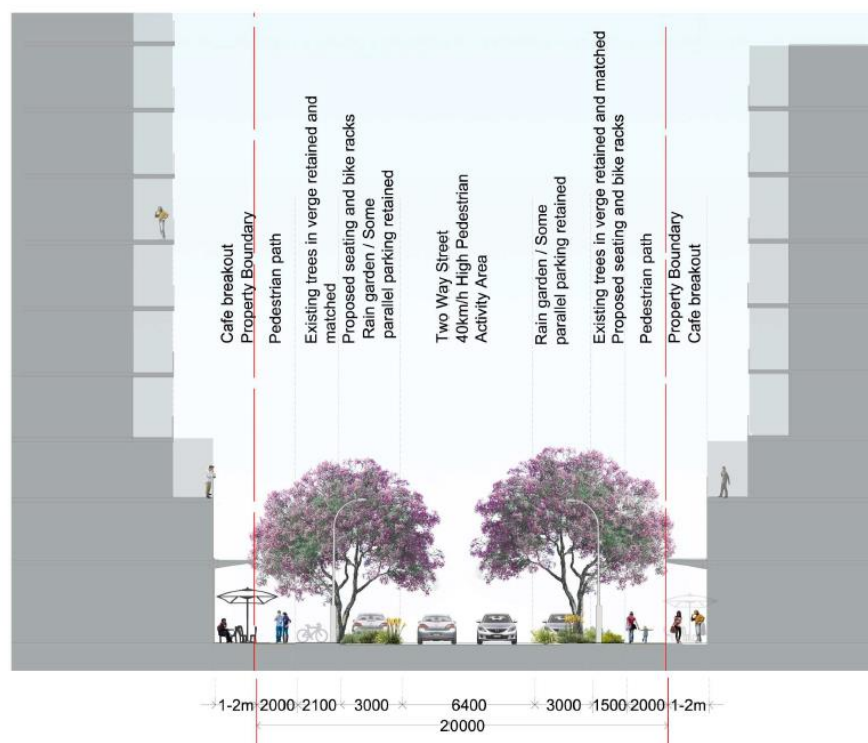
Leeds Street east of Blaxland Road will become a 'Place for People' with an activated 'destination' retail frontage along the northern side. An indicative cross-section of Leeds Street is presented in **Figure 4.6**.

An indicative cross-section of other minor roads in Rhodes East is presented in **Figure 4.7**.



Source: Turf Design Studio, 2016

Figure 4.5 : Indicative cross-section of Blaxland Road.



Source: Turf Design Studio, 2016

Figure 4.6 : Indicative cross-section of Leeds Street.

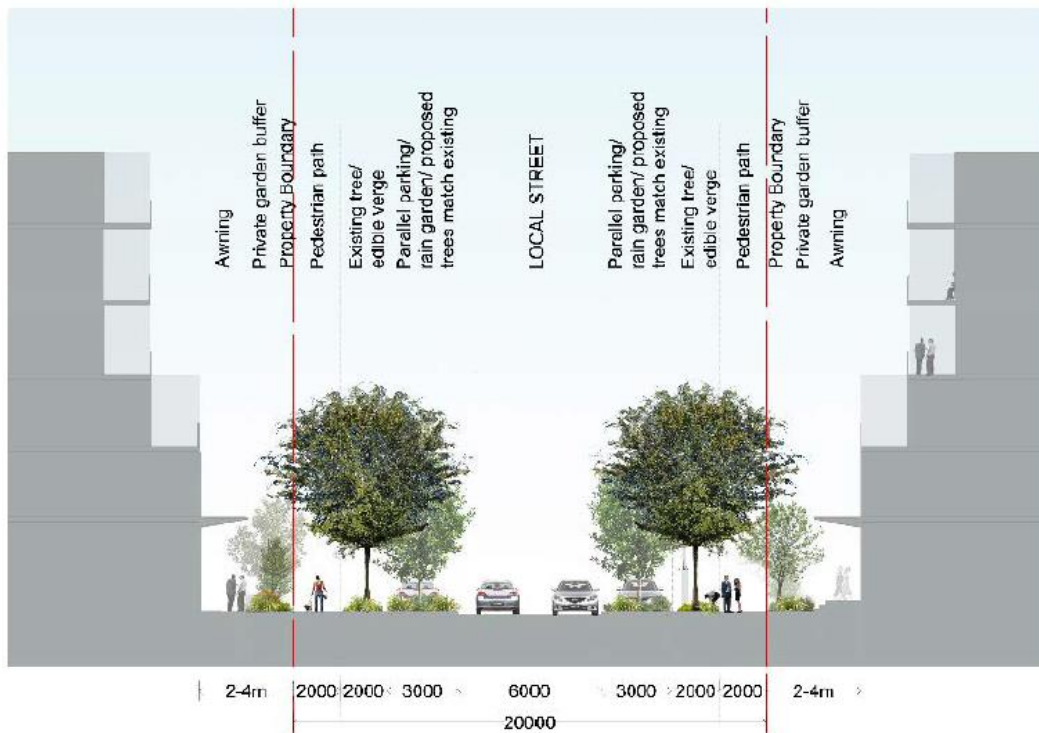


Figure 4.7 : Indicative cross-section of minor roads in Rhodes East.

4.3.2 Assessed intersections

Traffic modelling was undertaken at two geographical levels:

- Concord Road / Church Street / Devlin Street corridor between Victoria Road, Ryde and Rider Boulevard, Rhodes.
- Rhodes East Investigation Area.

These intersections are shown in **Figure 4.8** and listed in **Table 4.3**.



Source: Jacobs, 2017

Figure 4.8 : Intersections assessed as part of road network evaluation

Table 4.3 : Intersections assessed as part of road network evaluation

Concord Road / Church Street / Devlin Street corridor			Rhodes East Investigation Area		
No.	Intersection	Intersection control	No.	Intersection	Intersection control
1	Devlin Street / Victoria Road	Signalised	1	Leeds Street / Blaxland Road	Signalised
2	Church Street / Morrison Road	Signalised	2	Leeds Street / Cavell Avenue	Priority controlled
3	Church Street / Junction Street	Signalised	3	Cavell Avenue / Averill Street	Priority controlled
4	Church Street / Well Street / The Loop Road	Signalised	4	Blaxland Road / New Averill Street extension	Priority controlled
5	Concord Road / Averill Street	Signalised	5	Blaxland Road / New Road, south of Denham Street	Priority controlled
6	Concord Road / Llewellyn Street	Signalised	6	Blaxland Road / New Road, North of Llewellyn Street	Priority controlled
7	Concord Road / Mary Street	Signalised	7	Blaxland Road / Llewellyn Street	Priority controlled
8	Concord Road / Homebush Bay Drive	Signalised			
9	Homebush Bay Drive / Rider Boulevard	Signalised			

4.3.3 Modelling scenarios

A summary of scenarios that are presented in this report is shown in **Table 4.4**.

Table 4.4 : Modelling scenarios

Scenario	Existing intersection layouts ("without mitigation")	Improved intersection layouts ("with mitigation")
2036 with development in Rhodes East, morning peak	✓	✓
2036 with development in Rhodes East, evening peak	✓	✓

4.3.4 Intersection performance analysis criteria

The performance of a road network is largely dependent on the operating performance of intersections, which form critical capacity control points.

Level of Service (LoS) is a qualitative measure describing operational conditions within a traffic stream and their perception by drivers and / or passengers. This measure is used in planning design and operation of roads. It also provides a basis for determining the number of lanes to be provided on the road network. The road operational conditions in terms of LoS criteria are classified into six categories as shown in Table 4.5.

Table 4.5 : LoS criteria for intersections

LoS	Average delay per vehicle (seconds / vehicle)	Traffic signals and roundabouts	Give way and stop signs
A	Less than 15	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity.	Acceptable delays and spare capacity
C	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 delays. Roundabouts require other control mode	At capacity, requires other control mode
F	Over 70	Extra capacity required	Extreme delay, traffic signal or other major treatment required

Source: Roads and Maritime, 2002

4.3.5 Proposed intersection improvements

Proposed improvements at key intersections are proposed and have been modelled as follows:

- Concord Road / Averill Street
 - Extend the Concord Road southbound right turn bay by 50 metres towards Ryde Bridge.
 - Widen Averill Street to provide two exit lanes.
 - Provide additional left-turn capacity on Averill Street – one full length lane and two short lanes.
 - Convert the current signalised pedestrian into a staged crossing on the Concord Road southern approach.
 - Provide a pedestrian bridge across Concord Road.
- Concord Road / Mary Street
 - Remove the signalised pedestrian crossing of Concord Road (a land bridge spanning Concord Road is proposed to the north of the intersection).

Continued growth in travel in and around Rhodes is anticipated regardless of the Rhodes East development. Therefore, in the wider area, the following intersections have been identified as requiring upgrading and improving;

- Delvin Street / Victoria Road.
- Church Street / Morrison Road.
- Church Street / Junction Road.
- Concord Road / Homebush Bay Drive.
- Homebush Bay Drive / Rider Boulevard.

Further investigations by Roads and Maritime into the detailed design and funding will be required regarding the above potential intersection upgrades, regardless of the outcome of the Rhodes East draft Precinct Plan.

4.3.6 Assessment of intersection performance

Intersection modelling results are presented as follows:

- 2036 with development in Rhodes East, morning peak, without mitigation – **Figure 4.9**
- 2036 with development in Rhodes East, morning peak, with mitigation – **Figure 4.10**
- 2036 with development in Rhodes East, evening peak, without mitigation – **Figure 4.11**
- 2036 with development in Rhodes East, evening peak, with mitigation – **Figure 4.12**

Key findings – Concord Road / Church Street / Devlin Street corridor

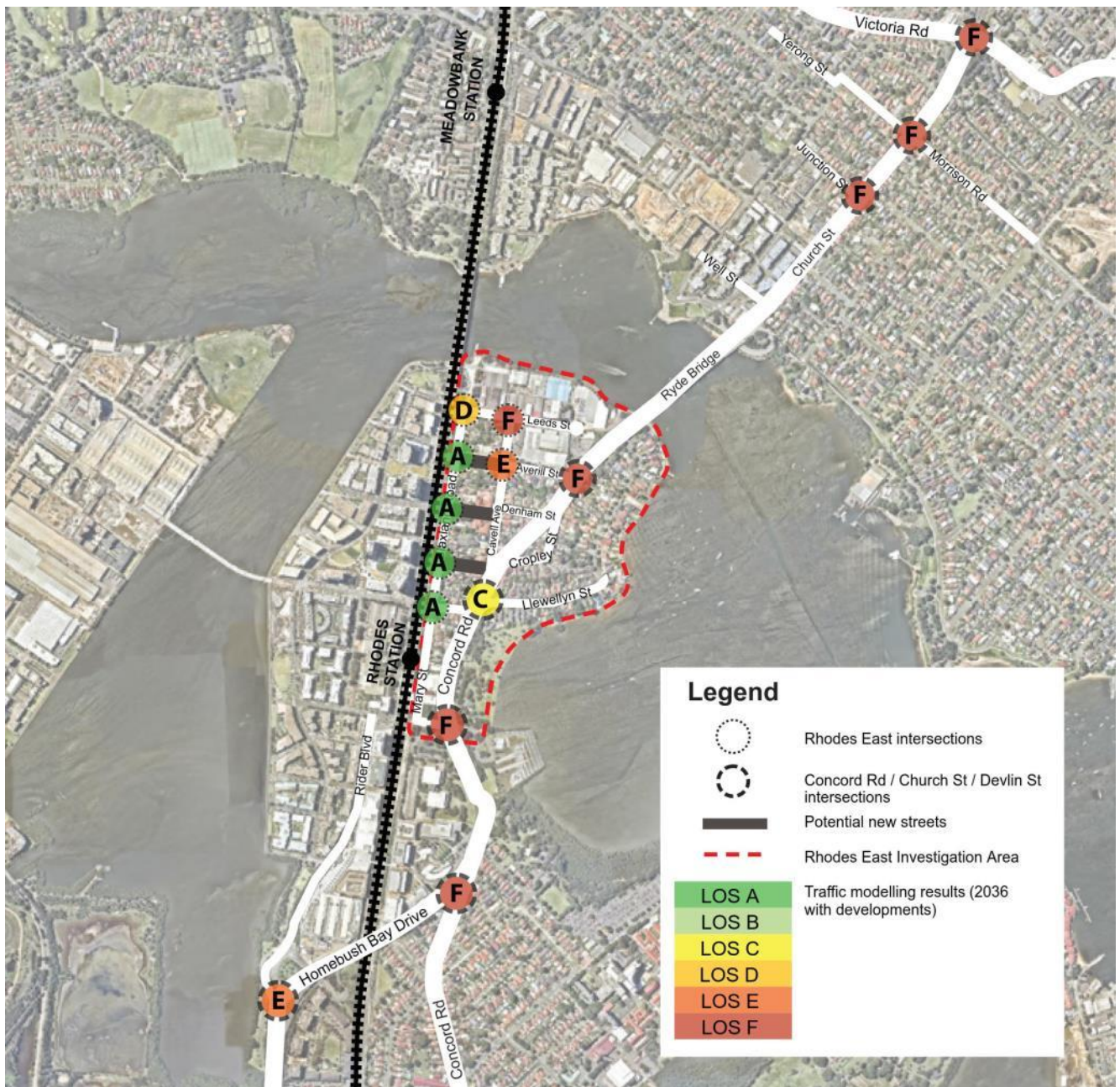
Key findings include:

- Overall the existing Concord Road corridor is expected to operate near capacity with most intersections performing at LoS D or worse. Additional traffic associated with background growth and development will result in a further deterioration in performance with most intersections performing at LoS F.
- In the ‘without mitigation’ scenario, the worst performing intersections are Concord Road / Averill Street which will operate at LoS F with an average delay of 120 seconds in the morning peak and Church Street / Morrison Road which will operate at LoS F with an average delay of 135 seconds in the evening peak.
- A major constraint to northbound traffic flow is caused by the merge under Victoria Road.
- In the “with mitigation” scenario most intersections improve to LoS E or better, however a few intersections are close to LoS F, including Concord Road / Llewellyn Street and Church Street / Morrison Road.
- In the evening peak the improvements at the Concord Road / Averill Street intersection allow more traffic to be released in the southbound direction. As a consequence the performance at the Concord Road / Llewellyn Street intersection deteriorates.
- Compared to the “without mitigation” scenarios, proposed intersection improvements result in northbound and southbound travel times improving by 77 per cent and 55 per cent in the morning peak, and 56 per cent and 49 per cent in the evening peak, respectively.

Key findings – Rhodes East

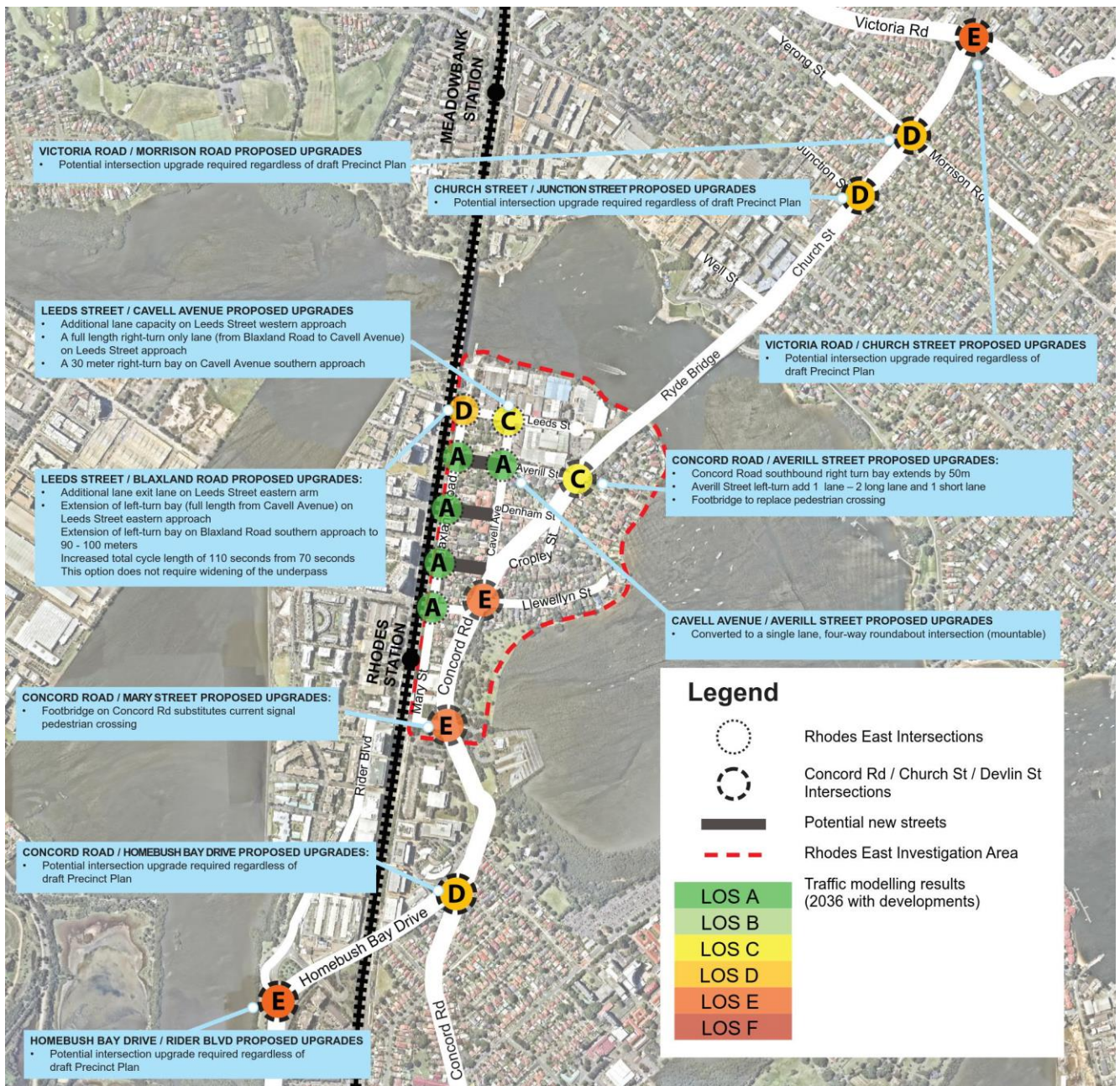
Key findings include:

- In the morning peak, the worst performing intersections are Leeds Street / Cavell Avenue and Cavell Avenue / Averill Street, which will operate at LoS F and E respectively with existing intersection layouts. This is due to the traffic from the Leeds Street precinct, Rhodes West and background traffic that is using Leeds Street, Cavell Avenue and Averill Street to access Concord Road.
- In the evening peak, the worst performing intersection is the Leeds Street / Cavell Avenue intersection with LoS D. All other intersections perform at LoS C or better.
- The proposed improvements result in improved LoS and decreased delays and queue lengths at most intersections. However, in the morning peak the Walker Street / Blaxland Road / Leeds Street intersection shows minimal improvement due to right turning traffic on the Walker Street western approach exceeding the available turn bay storage and blocking through movements on the Walker Street approach.



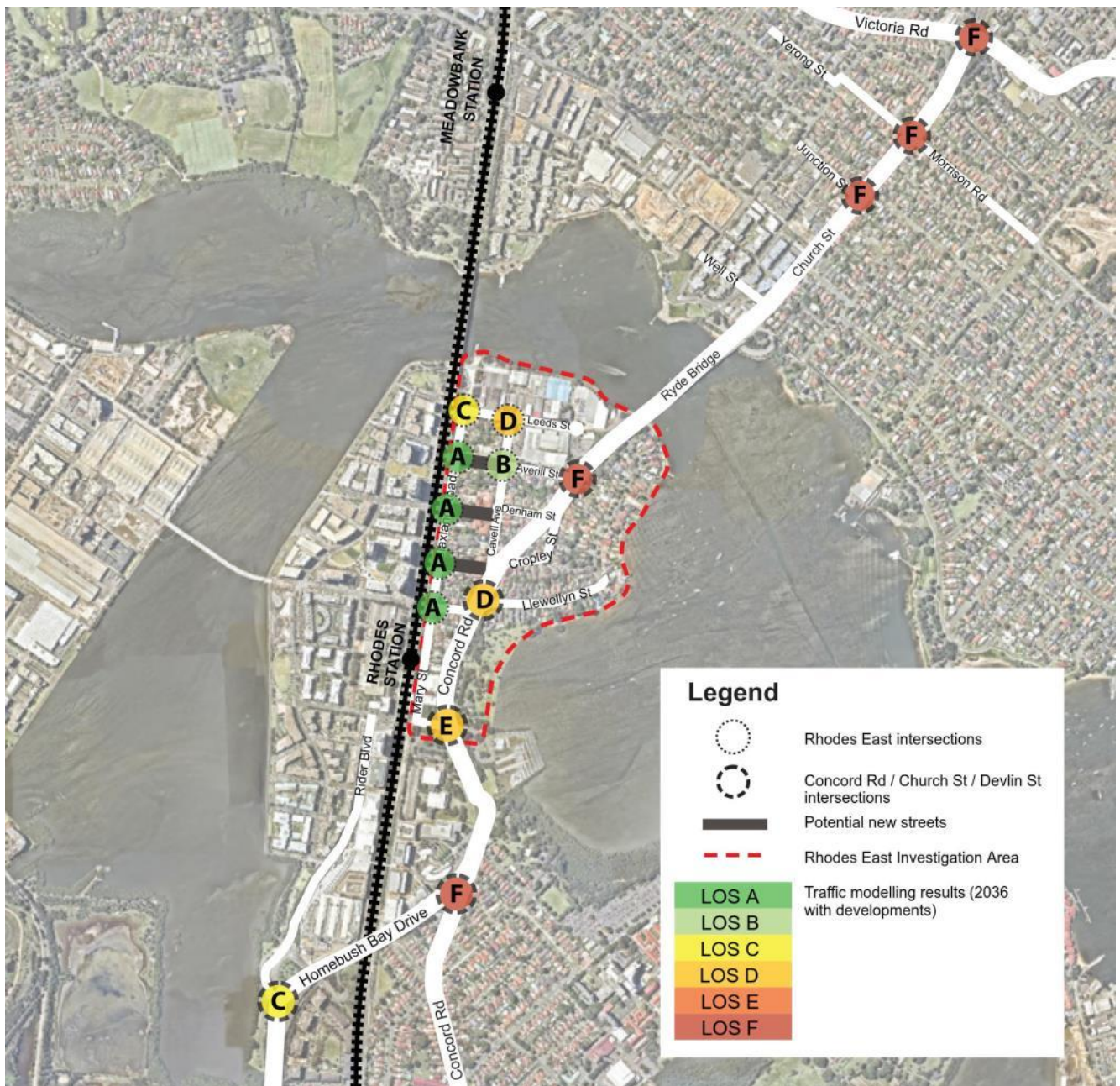
Source: Jacobs, 2017

Figure 4.9 : Intersection performance, 2036 with development in Rhodes East, morning peak, without mitigation



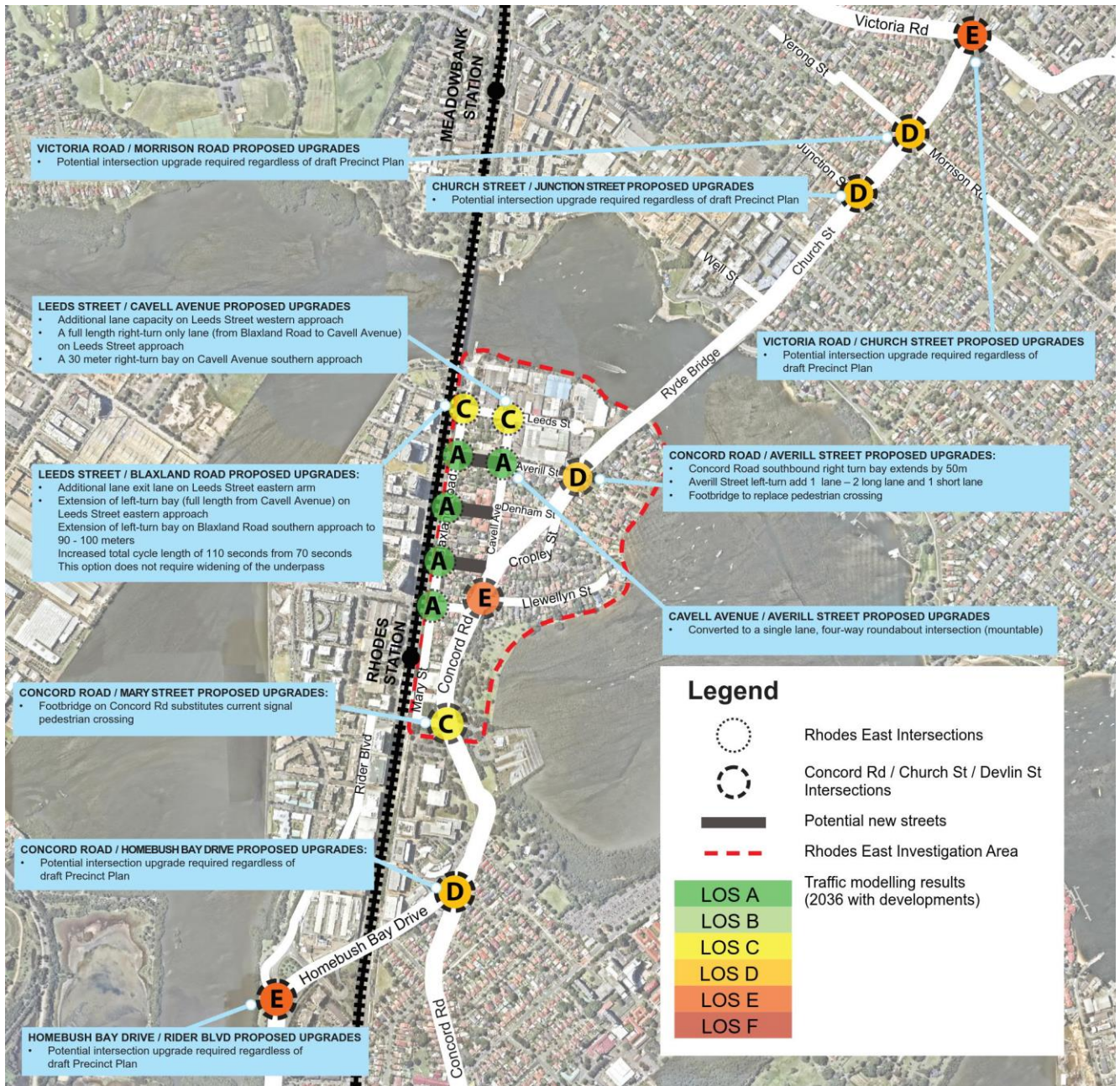
Source: Jacobs, 2017

Figure 4.10 : Intersection performance, 2036 with development in Rhodes East, morning peak, with mitigation



Source: Jacobs, 2017

Figure 4.11 : Intersection performance, 2036 with development in Rhodes East, evening peak, without mitigation



Source: Jacobs, 2017

Figure 4.12 : Intersection performance, 2036 with development in Rhodes East, evening peak, with mitigation

5. Proposed transport network

The proposed transport network responds to the transport planning objectives, identified constraints and future land uses and travel demand. TfNSW, Roads and Maritime and the City of Canada Bay will need to work collaboratively to monitor and review the performance of this transport system to ensure it is able to accommodate future travel demand.

5.1 Process of development

The development of individual strategies and measures for Rhodes East has evolved through an ongoing process based on close consultation with DPE and key stakeholders (TfNSW, Roads and Maritime, and City of Canada Bay). The first step of this process involved identifying and analysing transport-associated issues in the Rhodes East Investigation Area. This was based upon a review of the existing transport and land use conditions that will influence the future development of Rhodes East within the study context.

The second step of the process was the preparation of a preferred Structure Plan and accompanying population growth scenario to create a favourable environment towards future growth in Rhodes to meet District Plan targets.

Finally, the preferred Structure Plan was tested to ascertain the cumulative and regional traffic and transport impacts associated with future land-based demands likely to be imposed on Rhodes East. This process provided an opportunity to identify strategies and measures required to support future traffic and transport growth in Rhodes East. The specific strategies and measures for are detailed in the sub-sections below relating to the five key themes:

- Walking and cycling.
- Bus, light rail and heavy rail.
- Road network.
- Travel demand management.
- Parking.

5.2 Walking and cycling

Planning for walking and cycling has been developed using a strategic network approach, based on the identification of key local and regional desire lines, links, connections and activity areas, as well as street functions determined using the movement and place framework. This approach is focussed on improving connectivity and permeability in the existing walking and cycling network by upgrading existing links and creating links and connections. The proposed future walking and cycling network is shown in **Figure 5.1**.

The walking and cycling links described below take advantage of new streets and pedestrian connections proposed in the Structure Plan, which will support greater levels of walking and cycling by improving access, permeability and intersection densities.

5.2.1 Walking

New and upgraded walking links have been identified where high pedestrian activity will be located and to provide new connections and improved permeability.

Upgraded walking links are proposed on Blaxland Road and Leeds Street, which have been identified as 'Places for People'. A new crossing of the railway line has been proposed at either Llewellyn Street East or Nina Gray Avenue. The crossing of the railway line at Rhodes Station has also been identified to be upgraded, with a new extension east from Blaxland Road to Concord Road to improve access.

New walking links are proposed on new road connections between Blaxland Road and Denham Street, Blaxland Road and Croyley Street and Blaxland Road and Llewellyn Street. A foreshore walking link between the John Whitton rail bridge Ryde Bridge (Concord Road) is also proposed, providing access to the foreshore at the northern end of the peninsula, as well as to the proposed ferry wharf.

Appropriate pedestrian facilities and road treatments will be necessary to provide safe and high quality walking links as outlined above. This will be determined at a later stage following more detailed assessment and design.

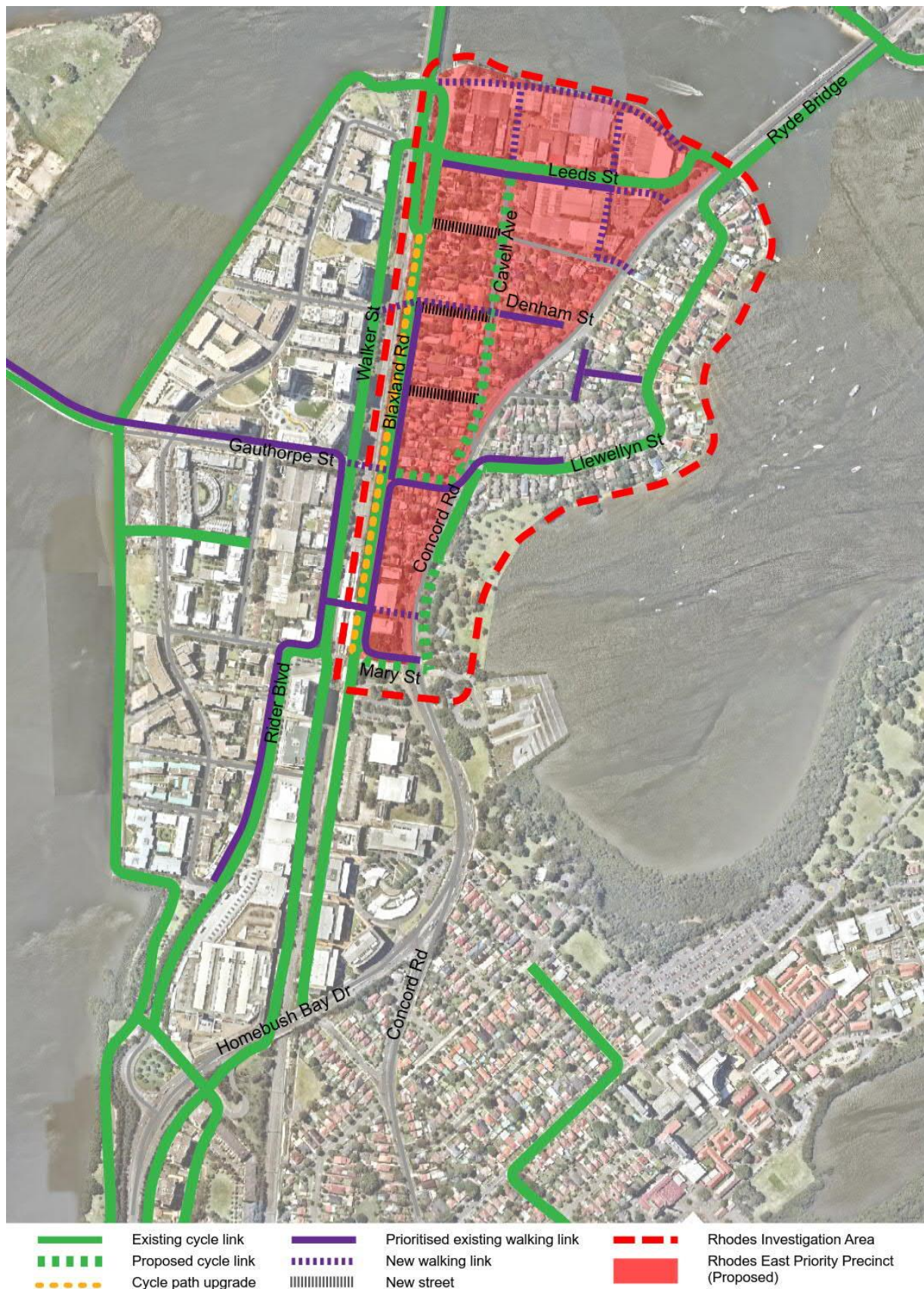
5.2.2 Cycling

Proposed strategic cycling links have been identified are based on providing connectivity with regional cycling links and closing missing gaps in the network. These new cycling links improve connectivity through Rhodes to existing links to the north-east, north-west, west and south.

New links are proposed along Cavell Avenue and Llewellyn Street east, which connects Leeds Street and Blaxland Road; Concord Road south of Llewellyn Street, connecting Fremont Street and a new potential link on Killoolla Street; and new links on Harrison Avenue and Queen Street, connecting existing links on the eastern side of the rail corridor with the Killoolla Street link.

The Blaxland Road cycleway is proposed to be upgraded to a separate cycleway to provide a commuter street for local and regional connections. New links are proposed on Cavell Avenue and Llewellyn Street, connecting Leeds Street, Blaxland Road and Concord Road; and on Concord Road south of Llewellyn Street, connecting to a new link on Mary Street. The existing shared path on Blaxland Road is proposed to be upgraded to a separated cycleway and pedestrian path with widths of three metres and two metres, respectively.

Appropriate cycling facilities such as separated cycleways, shared paths or on-road lanes and stencils will be necessary to provide safe and high quality links as outlined above. This will be determined at a later stage following more detailed assessment design. In addition, on-street bicycle parking should be provided at key locations such as Rhodes Station, and off-street bicycle parking rates should be increased, closer to requirements under the City of Sydney Local Environment Plan. Specific requirements for end of trip facilities should also be developed. More detail on the approach to off-street bicycle parking and end of trip facilities rates is provided in **Section 5.3.3**.



Source: Jacobs, 2017

Figure 5.1 : Proposed future walking and cycling network

5.2.3 Bus, ferry and heavy rail improvements

Bus

The bus network supporting Rhodes East is likely to serve a local function, with rail being the dominant mode of public transport given the extent of the travel task. The bus network will continue to focus on providing connections to destinations not well connected to Rhodes by rail, and providing feeder services to rail.

Opportunities for better bus connections have been enhanced by the completion of the Bennelong Bridge in May 2016. This bridge provides a bus and active transport only connection between Rhodes and Wentworth Point.

Bennelong Bridge services

Routes 526 and 533 provide connections from Rhodes to Wentworth Point and Sydney Olympic Park via the Bennelong Bridge. The 533 continues north to Ryde and Chatswood, whilst the 526 connects to Sydney Olympic Park ferry wharf and south to Strathfield and Burwood. Both services will play a key role as feeder services for Wentworth Point residents requiring access to Rhodes Station, as well as providing connections to other employment centres such as Sydney Olympic Park and Ryde, and to local destinations such as Rhodes Shopping Centre.

As development increases in Rhodes, Wentworth Point and Sydney Olympic Park these connections will increase in importance. This will not only be for residents to the west of the bridge wanting to access Rhodes Station, but also for people travelling between both sides for a variety of purposes such as Rhodes residents working in Sydney Olympic Park.

Other services

The M41 will continue to be the core service on Concord Road providing connections from Rhodes to Ryde, Macquarie Park and Concord.

The local routes 458 and 459 also operate north-south via Rider Boulevard / Walker Street and Concord Road respectively. The 458 is a more frequent service connecting to Ryde and Burwood / Strathfield and providing local connections to Concord Hospital and Rhodes Shopping Centre. The 459 is a less frequent weekday only service and provides an extension to serve Macquarie Park and Macquarie University, and only connects to Strathfield in the south. Routes 458 and 459 will be reviewed in line with annual service reviews.

Proposals

Some of the other key opportunities for buses in Rhodes include:

- Increase frequencies and span of hours of services using the Bennelong Bridge to connect to Wentworth Point and Sydney Olympic Park. This could include consideration of converting the 533 to an all-day, seven day a week service.
- Improving frequency and span of hours on the M41 consistent with *Sydney's Bus Future* (TfNSW 2013) to provide stronger connections to Ryde and Macquarie Park. Also consider removing the diversion into Concord Hospital to improve travel times and reliability for the 'Rapid' service. This should be considered alongside opportunities to strengthen the 458 / 459 as one route.
- Consider local bus network redesign opportunities to improve legibility and quality of service for customers.
- Improved bus stop facilities and walking access to stops on Concord Road, including better connectivity to Rhodes Station for customers, which would need to be coordinated with TfNSW, Roads and Maritime and the City of Canada Bay.
- Improving interchange facilities at Rhodes Station on the western side including high quality shelters and seating for waiting customers.

Ferry

The NSW Government is delivering a new ferry wharf at Rhodes as part of the Transport Access Program. Community consultation on the proposed wharf and interchange at Rhodes was carried out in 2015. The location of the proposed new ferry wharf and interchange at Rhodes is currently being reviewed in response to concerns raised during community consultation about navigation and safety on the water if the wharf was built on the western side of the John Whitton Rail Bridge.

Roads and Maritime and TfNSW are now investigating options including between the John Whitton Rail Bridge and Ryde Bridge. This may create an opportunity to integrate the wharf into the Rhodes East plans, and remove the navigation issues raised. The future wharf location will ultimately be decided from an operational and navigational perspective for Sydney Ferries to run between Rhodes East and Meadowbank.

The current proposed location is in the Leeds Street precinct. The Leeds Street precinct has been designed to reflect this ferry wharf location with a new pedestrian link providing a visual and physical connection from Leeds Street. The proposed foreshore promenade will provide ferry users with access to the broader Rhodes Peninsula and Rhodes Station.

In terms of timing, Roads and Maritime has advised that the new Rhodes wharf will be delivered within the next three to five years. Further community consultation in relation to the proposed wharf will be undertaken by Roads and Maritime.

Rail

The following options are suggested to address the need for increased rail capacity:

- Sydney Metro City & Southwest timetable adjustments to cater for increased capacity via additional services and less crowded services at Rhodes (with Northern Line customers diverting on to the Metro at Epping, prior to reaching Rhodes).
- Quadruplication of the Northern Line through Rhodes and north over the Parramatta River rail bridge, allowing more services to stop at Rhodes Station.
- Mass transit – either providing a new station and service at Rhodes or by alleviating congestion on the Northern Line (e.g. by allowing existing passengers to interchange and connect through to the Sydney CBD or Greater Parramatta).

5.2.4 Road network

The road network will continue to be an integral part of the transport network in the study area, with Concord Road the major north-south arterial road. The road network also facilitates access for walking, cycling and buses to, from and within Rhodes. The road network will mainly serve subregional and regional travel demand for a range of trip purposes.

The Structure Plan proposes five new streets to provide improved permeability for all users to promote walking, cycling, bus, train and ferry use, as well as potentially redirecting traffic away from the Leeds Street precinct which has been identified for a lower traffic volume and speed environment.

This includes the following one-block connections:

- Extension of Averill Street from Cavell Avenue to Blaxland Road.
- Extension of Denham Street from Cavell Avenue to Blaxland Road.
- Extension of Crole Street from Cavell Avenue to Blaxland Road.

Smaller, more compact blocks encourage a diversity of small, medium and large developments across the study area, and a finer grain street network in the study area will have an important role in improving accessibility for pedestrians and cyclists to move within the study area, as well as for motorists to access the arterial road network.

Potential intersection improvements would facilitate access to the study area and provide safe crossing points for pedestrians and cyclists, as well as bus priority measures where required. The exact configuration of new or modified intersections will be determined through more detailed traffic modelling and is described in **Section 4**.

5.3 Travel demand management

Travel demand management involves managing the transport task through:

- Reducing dependence on private vehicles for some trips.
- Rescheduling trips outside of peak periods.
- Encouraging people to better organise their travel so they make more efficient trips resulting in fewer and shorter trips.

Policy and design initiatives that aim to manage travel demand and optimise existing and planned transport infrastructure and services will assist in meeting the future travel task. Three key strategies to manage travel demand in Rhodes are described below.

5.3.1 Transport Management Associations

Transport Management Associations (TMAs) are non-profit, member-controlled organisations that provide transportation services in a particular area, such as a commercial centre, large shopping mall, medical centre or industrial park. They are generally public-private partnerships, consisting primarily of area businesses with local government support.

TMAs can provide a variety of services that encourage more efficient use of transportation and parking resources:

- Access management
- Commuter trip reduction and telework support
- Commuter financial incentives
- Flexitime support
- Freight transport management
- Guaranteed ride home services
- Marketing and promotion
- Shared parking coordination and parking management
- Shuttle services
- Public transport improvements
- Transport access guides
- Wayfinding and multi-modal navigation tools.

TMA stakeholders typically include regional and local government agencies, public transport providers, chambers of commerce or other business organisations, businesses, facility managers (such as a mall or medical centre), employees, nearby residents and customers.

TMAs should support a variety of transportation services, travel options and incentives, including planning efforts to create more pedestrian- and public transport-friendly land use, and parking brokerage services to help businesses share and trade their parking resources. Programs tend to be most effective when they improve consumers' travel choices and provide incentives to use alternatives to driving when possible.

TMAs should work to develop and maintain cooperation between transportation agencies, public transport service providers, businesses, employees and residents who are affected by their programs.

A TMA has been successful in Macquarie Park, for example, where funding is jointly provided for private businesses and government. Should a TMA be deemed a possible option, it is suggested this is applied to the whole of Rhodes, not just Rhodes East. Success will be dictated by influencing the behaviour of future residents and businesses, but also changing existing behaviours.

5.3.2 Travel plans

The success of the mode share targets outlined in **Table 4.2** will be dictated by how they are implemented and how their achievements are measured. One approach for doing this can be through travel plans. A travel plan is a package of site-specific measures implemented to promote and maximise the use of more sustainable modes of travel (City of Sydney 2015). Generally travel plans are undertaken by developers as part of the development application process. For example, the City of Sydney includes requirements in their Development Control Plan DCP around when a travel plan is required. Councils can also actively encourage existing developments to prepare and promote a travel plan. Travel plans include the following essential elements:

- Site audit and data collection – much of the data in this report provides a useful starting point to understand existing behaviour in Rhodes East.
- Objectives and targets – this could include the mode share targets included in **Section 4.2.3**. The target may need to be tailored to be more specific to the particular land use being proposed on the site.
- Actions – linked to objectives and targets such as those included in **Section 3.1**.
- Promotion and marketing strategy – this involves determining customer needs and preferences, creating appropriate products, providing useful information to customer, and promoting their use as public knowledge and attitudes have a major effect on travel behaviour.
- Commitment of resources – in the case of Rhodes East, one approach could be for council and / or developers to provide funding to support the employment of personnel to implement and manage the travel plan. In other cases, TMAs have played this role at a whole-of-precinct level.
- A monitoring and review process – regular reviews need to be implemented (a TMA could play this role) and tangible incentives need to be included. One approach for this could be to link targets to infrastructure funded by developers e.g. if developments do not meet the targets of the travel plan within a certain timeframe using 'soft' measures, developers may need to provide the cost for infrastructure items.
- Governance support – this can be linked to a TMA or similar. The point is that there needs to be high level support and active involvement from the government and private interests involved.

5.3.3 Parking

Off-street parking rates

Car parking controls can be used as a policy tool to manage travel demand and dependence on private vehicles. The approach to recommending parking rates for Rhodes has been based on accessibility to public transport services, with two categories proposed:

- Category 1: high accessibility locations – these areas are classified as locations within 400 metres walking access of Rhodes Station. This also means the location is within close proximity to local services currently existing or planned within the station precinct. The proposed parking rates are the most restrictive.
- Category 2: medium accessibility locations – these areas are outside 400 metres walking access to Rhodes Station. The proposed parking rates are not as restrictive as Category 1, but still at a level appropriately tailored to encourage public and active transport use and discourage unnecessary car trips.

Parking rates for each category and development type are outlined in **Table 5.1**.

Table 5.1 : Proposed maximum parking rates by category and development

Category	Residential (spaces per dwelling)		Other			
	Resident	Visitor	Commercial	Retail	Cafes and restaurants	Industrial
1	0	0	One space per 150m ² GFA	One space per 100m ² GFA	One space for every 150m ² GFA or one space for every six seats (whichever is lesser)	One space per 150m ² GFA
2	0.5	0.1	One space per 100m ² GFA	One space per 70m ² GFA	One space for every 100m ² GFA or one space for every four seats (whichever is lesser)	One space per 120m ² GFA

Car sharing rates have been developed using the parking categories outlined above. Car share schemes are generally more successful in higher density areas with limited off-street parking availability and high quality public transport, and this aligns well with the parking categories. Rates for car sharing spaces in new developments are based on the City of Sydney Development Control Plan (DCP) 2012. A higher rate of provision for car share spaces is proposed for precincts in Category 1 and a moderate rate in Category 2.

Additionally, controls permitting reduced car parking provision where car share spaces are provided are proposed, based on the Leichhardt DCP 2013. Tiered rates would allow car share spaces to be provided in lieu of car parking spaces, determined by the number of car share spaces to be provided. This rate would be highest in Category 1.

City of Sydney and Leichhardt DCPs have been used in the development of car share rates as these are considered best practice and applicable to the future vision of the precinct. A more detailed local assessment will be required to validate or refine the proposed rates, as well as detailed investigation of car share rates for non-residential developments.

Rates for each category and development type are outlined in **Table 5.2**.

Table 5.2 : Proposed car share rates by category and development

Category	Residential car share rate	Car share rate to reduce car parking provision
Category 1	Maximum one per 20 dwellings	N/A
Category 2	Maximum one per 40 dwellings	One in lieu of three parking spaces

The bicycle parking approach has been developed to complement the approach to vehicle parking. A uniform rate has been developed based on rates within the City of Sydney DCP 2012 which are considered best practice in the Sydney context. End-of-trip facilities for non-residential developments and on-street bicycle parking are also included in the bicycle parking approach. As cycling infrastructure is proposed across the precinct and bicycle usage is encouraged across the precinct, one single set of minimum rates is considered appropriate.

The proposed rates are outlined below in **Table 5.3**. End-of-trip facility rates are outlined in **Table 5.4**. Parking spaces should be designed to comply with relevant Australian Standards.

Table 5.3 : Proposed minimum bicycle parking rates

Category	Residential		Commercial		Retail		Industrial	
	Resident	Visitor	Employee	Visitor	Employee	Visitor	Employee	Visitor
All precincts	Two per dwelling	Two per ten dwellings	Two per 150m ² GFA	Two per 400m ² GFA	Two per 250m ² GFA	Four + two per 100m ² GFA	Two per ten employees	Four + two per 100m ² GFA

Table 5.4 : Proposed end-of-trip facilities for non-residential developments

Category	Personal lockers	Showers	Change cubicles	Each 20 additional bicycle spaces
All precincts	One per bicycle space	One per bicycle space	Two per bicycle space	Two

Unbundling and decoupling

Unbundled parking is parking that is separated from the cost or rent of a dwelling or building. This is not only more equitable, but can also reduce the total amount of parking required for the building. For buildings with unbundled parking, a parking rate reduction of 20 per cent is proposed.

Decoupled parking is parking that is spatially separated from the building to which the parking services. It is also generally unbundled from the sale or rental of an apartment or building. The benefits of decoupled parking are significant, enabling transition to a low car dependant future. Decoupled parking has the potential to deliver the significant and mutually reinforcing benefits of parking. The shift towards lower car ownership rates and emergence of the autonomous vehicle will reduce the need for parking and investment in underground parking. In particular, parking stations/basement parking may lose value as vehicles may no longer need to be parked or housed at origin or destination locations.

To achieve this:

- Parking should be spatially decoupled from buildings where possible.
- Sites should be identified for decoupled parking to reduce the need for on-site, underground parking.
- Decoupled parking should be built above ground and managed flexibly as the corridor transitions towards low car ownership and use.

For buildings with decoupled, unbundled parking, a parking rate reduction of 40 per cent on maximum parking rates is proposed. Decoupled parking could be transitioned to other uses when the demand for parking is no longer required, including where new public transport infrastructure is delivered and parking rates for the precinct are reduced to a more accessible parking classification.

On-street parking

Parking in Rhodes West features a mixture of time restrictions and limited unrestricted parking. This provides parking for visitors to the area and discourages resident car ownership. A similar policy should be adopted for Rhodes East to complement the off-street parking approach. The amount of unrestricted on-street parking should be limited as far as possible to ensure space is allocated efficiently and long term free parking is avoided. An 85 per cent occupancy rate has been put forward as a good target to aim for when designing pricing of restricted on-street parking. This aims to ensure adequate turnover of spaces, particularly around retail uses (Shoup 2005). On-street parking will be a critical component of the urban fabric of Rhodes East and should be designed to support the vision for the street, and in particular the walking mode share target.

5.4 Action plan

A summary of actions to implement the transport initiatives recommended to support the rezoning proposal for Rhodes East is presented in **Table 5.5**. The following actions and strategies have been developed in consultation with DPE, TfNSW, Roads and Maritime and City of Canada Bay.

The action plan has been developed for the traffic and transport study in order to provide key stakeholders with a framework whereby transport/policy related issues and corresponding actions may be carried out in an integrated and coordinated approach to achieve the objectives set out in this report.

Table 5.5 : Summary of actions to implement proposed transport initiatives

ID	Item description	Purpose
Road network improvement measures		
1	Upgrade of Concord Road / Averill Street: <ul style="list-style-type: none"> • Extend the Concord Road southbound right turn bay by 50 metres towards Ryde Bridge. • Widen Averill Street to provide two exit lanes. • Provide additional left-turn capacity on Averill Street – one full length lane and two short lanes. • Convert the current signalised pedestrian into a staged crossing on the Concord Road southern approach. • Provide a pedestrian bridge across Concord Road 	<ul style="list-style-type: none"> • Increases capacity of intersection and reduces delays for traffic
2	Upgrade of Concord Road / Mary Street: <ul style="list-style-type: none"> • Remove the signalised pedestrian crossing of Concord Road (a land bridge spanning Concord Road is proposed to the north of the intersection). 	<ul style="list-style-type: none"> • Improves pedestrian safety and connectivity • Increases capacity of intersection and reduces delays for traffic
3	Extension of Averill Street from Cavell Avenue to Blaxland Road	<ul style="list-style-type: none"> • Improves connectivity for all road users • Supports the redirection of traffic away from the Leeds Street precinct which has been identified for a lower traffic volume and speed environment
4	Extension of Denham Street from Cavell Avenue to Blaxland Road	<ul style="list-style-type: none"> • Improves connectivity for all road users • Supports the redirection of traffic away from the Leeds Street precinct which has been identified for a lower traffic volume and speed environment
5	Extension of Croyley Street from Cavell Avenue to Blaxland Road	<ul style="list-style-type: none"> • Improves connectivity for all road users • Supports the redirection of traffic away from the Leeds Street precinct which has been identified for a lower traffic volume and speed environment
Walking improvement measures		
6	Upgrade walking link on Blaxland Road / Mary Street	<ul style="list-style-type: none"> • Improves pedestrian safety and connectivity • Supports mode shift towards increased walking trips
7	Upgrade walking link on Leeds Street	<ul style="list-style-type: none"> • Improves pedestrian safety and connectivity • Supports mode shift towards increased walking trips

ID	Item description	Purpose
8	Upgrade walking link across railway line at Rhodes Station	<ul style="list-style-type: none"> Improves pedestrian safety and connectivity Supports mode shift towards increased walking trips
9	Provide new walking link across railway line at either of the following locations: <ul style="list-style-type: none"> Between Blaxland Road and Gauthorpe Street Between Denham Street / Blaxland Road and Nina Gray Avenue 	<ul style="list-style-type: none"> Improves pedestrian safety and connectivity Supports mode shift towards increased walking trips
10	Provide new walking link on new road connection between Blaxland Road and Denham Street	<ul style="list-style-type: none"> Improves pedestrian safety and connectivity Supports mode shift towards increased walking trips
11	Provide new foreshore walking link between the John Whitton rail bridge and Ryde Bridge (Concord Road)	<ul style="list-style-type: none"> Improves pedestrian safety and connectivity Supports mode shift towards increased walking trips
Cycling improvement measures		
12	Provide new cycling link on Cavell Avenue	<ul style="list-style-type: none"> Improves cyclist safety and connectivity Supports mode shift towards increased cycling trips
13	Provide new cycling link on Llewellyn Street	<ul style="list-style-type: none"> Improves cyclist safety and connectivity Supports mode shift towards increased cycling trips
14	Provide new cycling link on Concord Road south of Llewellyn Street	<ul style="list-style-type: none"> Improves cyclist safety and connectivity Supports mode shift towards increased cycling trips
15	Provide new cycling link on Llewellyn Street	<ul style="list-style-type: none"> Improves cyclist safety and connectivity Supports mode shift towards increased cycling trips
16	Upgrade existing shared path on Blaxland Road to a separated cycleway and pedestrian path	<ul style="list-style-type: none"> Improves pedestrian and cyclist safety and connectivity Supports mode shift towards increased cycling trips
Bus and light rail improvement measures		
17	Increase frequencies and span of hours of services using the Bennelong Bridge	<ul style="list-style-type: none"> Improves bus service quality Supports mode shift towards increased public transport trips
18	Improve frequency and span of hours on the M41	<ul style="list-style-type: none"> Improves bus service quality Supports mode shift towards increased public transport trips
19	Local bus network redesign	<ul style="list-style-type: none"> Improves bus service quality Supports mode shift towards increased public transport trips
20	Improve bus stop facilities and walking access to stops on Concord Road	<ul style="list-style-type: none"> Supports mode shift towards increased public transport trips
21	Improve interchange facilities at Rhodes Station including high quality shelters and seating for waiting customers	<ul style="list-style-type: none"> Supports mode shift towards increased public transport trips

ID	Item description	Purpose
22	Investigate an extension of the Parramatta Light Rail from Sydney Olympic Park to Rhodes via Bennelong Bridge	<ul style="list-style-type: none"> Improves accessibility to and from Rhodes Supports mode shift towards increased public transport trips
Ferry improvement measures		
23	Deliver a new ferry wharf at Rhodes as part of the Transport Access Program	<ul style="list-style-type: none"> Supports mode shift towards increased public transport trips
Rail improvement measures		
24	Sydney Metro City & Southwest timetable adjustments	<ul style="list-style-type: none"> Provides increased capacity for Northern Line services at Rhodes Supports mode shift towards increased public transport trips
25	Quadruplication of the Northern Line through Rhodes and north over the Parramatta River rail bridge	<ul style="list-style-type: none"> Provides increased capacity for Northern Line services at Rhodes Supports mode shift towards increased public transport trips
26	Mass transit – either providing a new station and service at Rhodes or by alleviating congestion on the Northern Line	<ul style="list-style-type: none"> Improves accessibility to and from Rhodes Provides increased capacity for Northern Line services at Rhodes Supports mode shift towards increased public transport trips
Travel demand management measures		
27	Create a Transport Management Association for Rhodes	<ul style="list-style-type: none"> Supports mode shift away from private vehicles to public and active transport
28	Implement travel plans as part of developments	<ul style="list-style-type: none"> Supports mode shift away from private vehicles to public and active transport
29	Implement maximum parking rates	<ul style="list-style-type: none"> Supports mode shift away from private vehicles to public and active transport
30	Implement car share rates	<ul style="list-style-type: none"> Supports mode shift away from private vehicles to public and active transport
31	Implement minimum bicycle parking rates	<ul style="list-style-type: none"> Supports mode shift away from private vehicles to public and active transport
32	Parking unbundling and decoupling	<ul style="list-style-type: none"> Supports mode shift away from private vehicles to public and active transport
33	Review on-street parking	<ul style="list-style-type: none"> Supports mode shift away from private vehicles to public and active transport