Transport Construction Authority

North Ryde Station Precinct Part 3A and SSS Application

Transport Assessment for Preliminary Environmental Assessment

ARUP

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November 2010

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1 INTRODUCTION

Arup was commissioned by Transport Construction Authority (TCA) to undertake a Transport Assessment to supplement a Preliminary Environmental Assessment (PEA) for the North Ryde Station Precinct Concept Plan.

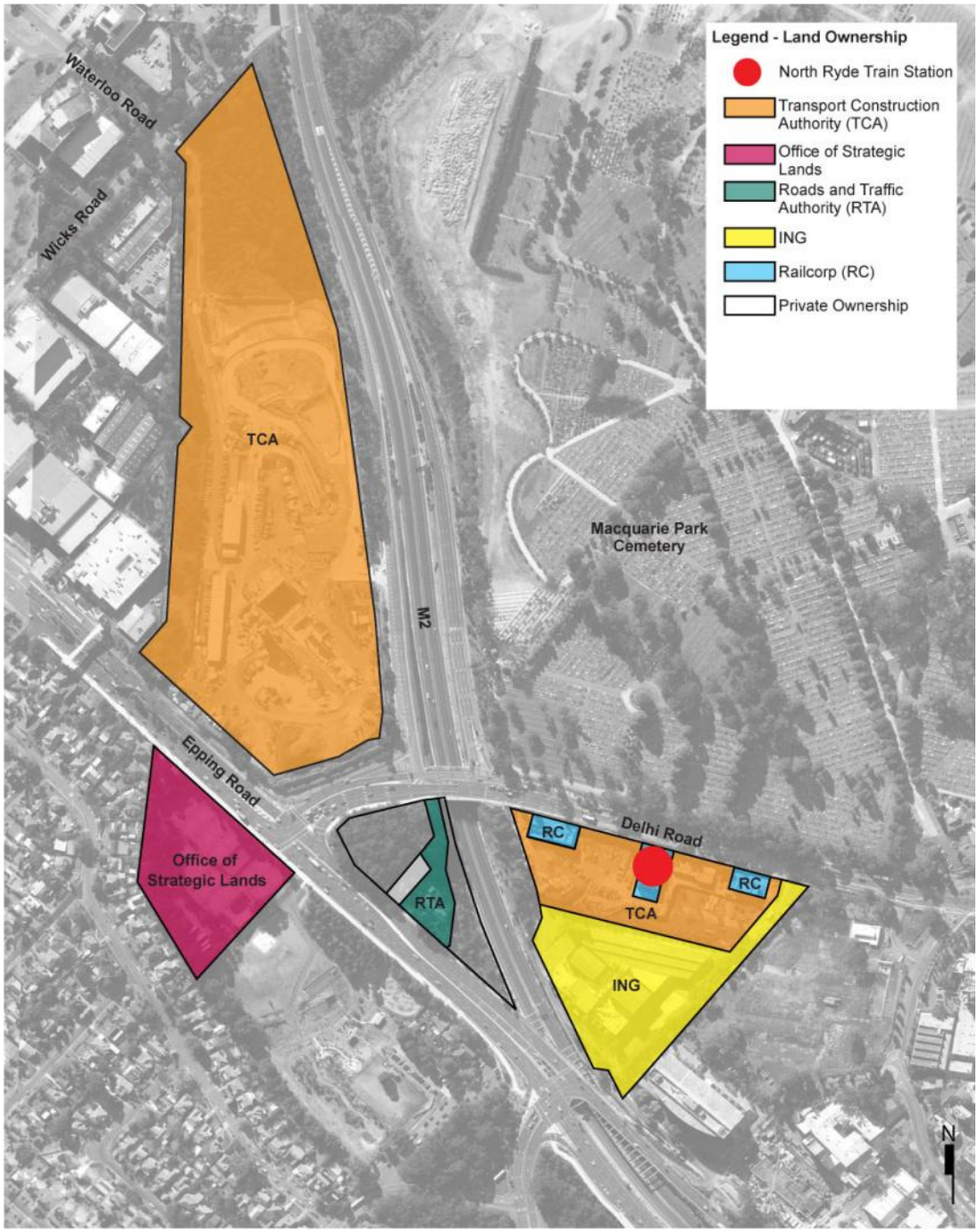
North Ryde Station is on the Epping to Chatswood Rail Link (ECRL) which opened in 2009. Patronage levels on the new line are generally high with the exception of the North Ryde Station. This is primarily due to the surrounding area being largely undeveloped with poor connectivity between the station and nearby residential catchments to the south.

In order to rectify this situation, a transit oriented development that encourages station usage and improves connectivity is proposed for vacant lands around the North Ryde Station known as the North Ryde Station Precinct. Landowners include the TCA, RTA, Office of Strategic Lands and private land holdings as shown in Figure 1. The Concept Plan area is within the City of Ryde (CoR) Local Government Area.

This Transport Assessment includes the following sections:

Section 2	Existing Transport and Accessibility Situation
Section 3	Description of Concept Plan
Section 4	Future Transport and Accessibility Situation
Section 5	Transport Assessment of Concept plan
Section 6	Proposed Transport Access Scheme

Figure 1 The North Ryde Station Precinct

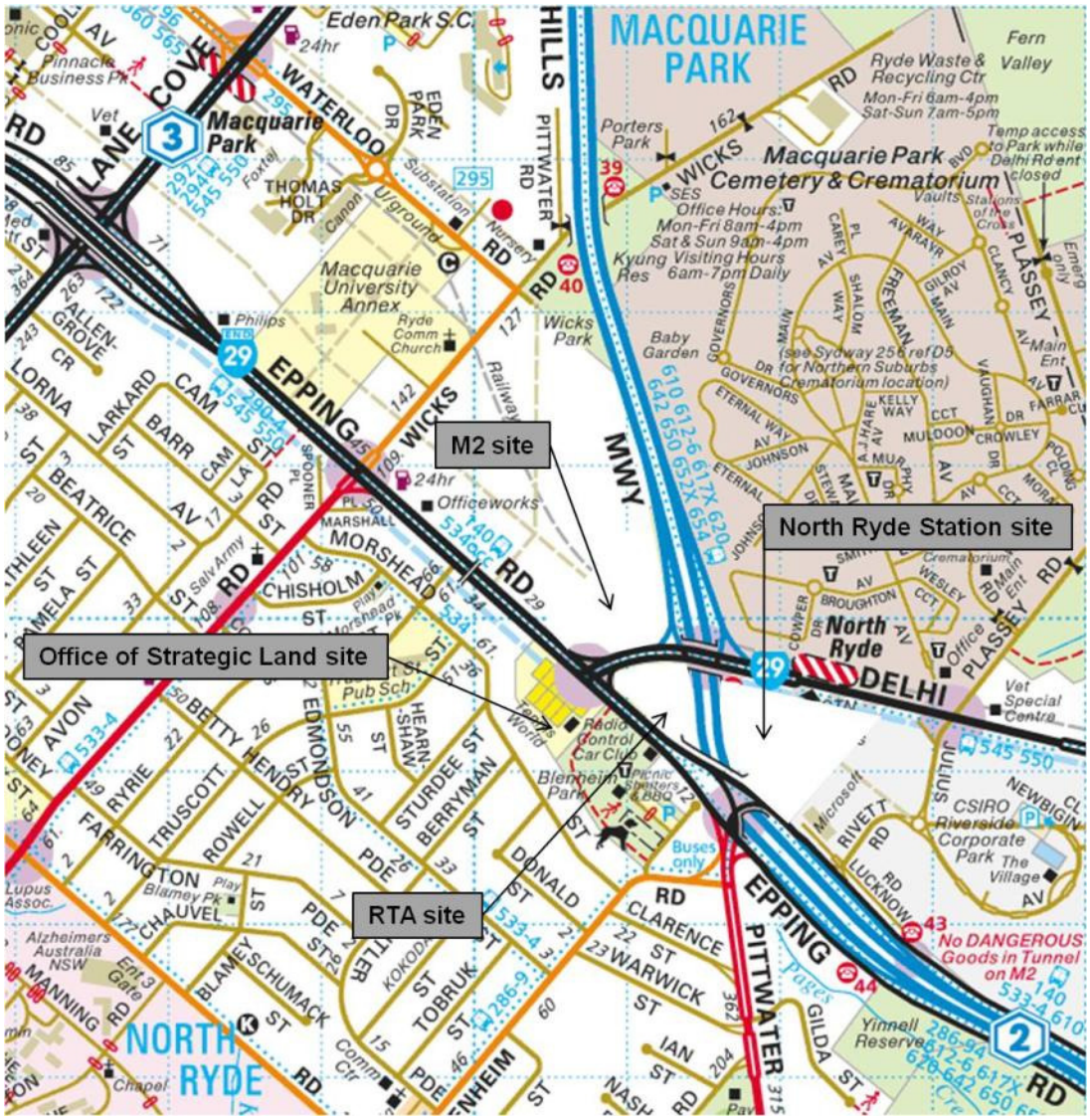


2 EXISTING TRANSPORT AND ACCESSIBILITY SITUATION

2.1 Walking and Cycling

Pedestrian and cycle access in the vicinity of the Concept Plan sites is generally limited. Priority has historically been given, in general, to vehicular travel over pedestrian/cycle travel. The area is dominated by two major road reserves – Epping Road and the M2 Motorway as shown on Figure 2 (refer to Figure 1 for location of sites within precinct).

Figure 2 North Ryde Local Area



Pedestrian connections generally follow the road network and as a result access to North Ryde Station is indirect with access confined to the east and west approaches of Delhi Road. Pedestrian crossing opportunities of major roads are generally limited to at-grade facilities at major intersections supplemented by a footbridge across Epping Road between Delhi Road and Wicks Road.

The main cycling facility in the area is a shared path on the southern side of Epping Road from Wicks Road to the Gore Hill Freeway. This is a high quality 3-4m wide facility that provides for regional cycling trips. On-road cycle lanes also exist on Delhi Road in the vicinity of the station.

End of trip facilities, such as parking, showers and lockers, are provided in some commercial developments near the station. Public bike parking rails exist on the southern side of Delhi Road immediately east of the station.

2.2 Public Transport

The Concept Plan area is served by both train and bus services.

Since the integration of the ECRL with the CityRail network in October 2009, eight train services every hour (four in either direction at 15 minute intervals) service North Ryde Station between 5am and 11pm as shown in Table 1. Rail services now operate from Hornsby to Epping via Beecroft, and then follow the ECRL to Chatswood and the North Shore Line to the Sydney CBD.

North Ryde Station can currently only be accessed from Delhi Road with a central single station entry. There is no commuter parking at the station although there is a kiss-and-ride drop-off zone on both sides of Delhi Road.

Table 1 Existing Train Services to North Ryde Station

Direction	Weekday Services			Saturday Services		Sunday Services	
	AM Peak	PM Peak	Off-Peak	AM Peak	PM Peak	AM Peak	PM Peak
Chatswood to Epping	4	4	4	4	4	4	4
Epping to Chatswood	4	4	4	4	4	4	4
TOTAL	**8**	**8**	**8**	**8**	**8**	**8**	**8**

Rail patronage data for North Ryde and other selected stations is presented in Table 2. The data shows that North Ryde Station has very low usage compared to other stations on the ECRL and the wider CityRail network. There are approximately 140 stations on the CityRail network with higher usage than North Ryde Station.

Table 2 Weekday Station Entries

Station	Total Weekday Entries
North Ryde	1,050*
Macquarie Park	2,990*
Macquarie University	7,390*
Epping	8,770^
Eastwood	6,700^
Chatswood	20,470^
Gordon	7,360^
St Leonards	14,260^

*May 2010, ^2009; Source: RailCorp

Based on arrival/departure patterns at similar stations, it is estimated that current weekday usage of North Ryde Station is as follows:

15% journey to work – residents from North Ryde to elsewhere

55% journey to work – employees to North Ryde from elsewhere

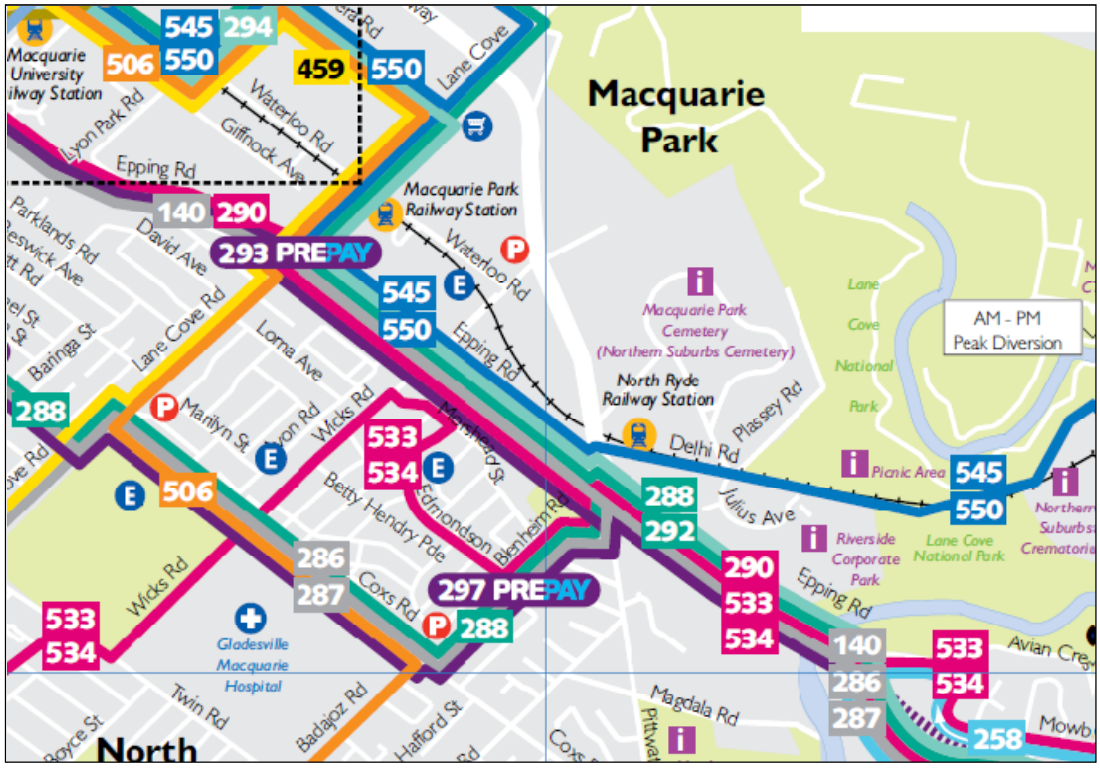
30% other trips – business, leisure etc

The Concept Plan area is served by a number of different State Transit Authority (STA) bus routes (refer to Figure 3), primarily along the busy Epping Road corridor between Parramatta, Epping, Macquarie Park etc to the west and Lane Cove, North Sydney and the City to the east. These services benefit from a number of bus priority lanes on Epping Road and other bus priority measures at key intersections.

Two bus services operate along Delhi Road between Parramatta and Chatswood, utilising newly constructed bus stops adjacent to the station. A number of bus services operate along the M2 although there are no stops in the vicinity of the Concept Plan area.

Bus patronage data is generally not available for individual routes.

Figure 3 Existing Bus Services in North Ryde



Source: STA, November 2010

2.3 Road Network

2.3.1 Major Roads

The Concept Plan area is surrounded by a number of major roads which carry significant traffic volumes (refer to Figure 2) including:

- M2 Motorway
- Epping Road
- Delhi Road
- Lane Cove Road
- Waterloo Road
- Wicks Road
- Pittwater Road

Full vehicular access to the North Ryde commercial precinct between Epping Road and Delhi Road is provided by two Julius Ave intersections on Delhi Road. Left in/left out access is also provided at the southern end of Rivett Road to Epping Road.

2.3.2 Key Intersections

The operation of the local road network is primarily a function of the performance of key intersections including:

- Epping Road / Delhi Road
- Epping Road / Pittwater Road
- Epping Road / Wicks Road
- Delhi Road / M2
- Delhi Road / Road 38 (un-named road to east of North Ryde Station)
- Delhi Road / Julius Ave / Plassey Road

2.3.3 Traffic Volumes

Annual Average Daily Traffic (AADT) data for key roads, obtained from the RTA, is provided in Table 3.

Table 3 Average Daily Traffic Volumes

Road	Location	2005 AADT	2008 AADT
M2	Lane Cove Road to Epping Road	52,200	na
Epping Road	East of Wicks Road	76,798	78,885
Delhi Road	East of M2	32,287	na
Pittwater Road	at Buffalo Creek	19,555	na
Wicks Road	South of Epping Road	21,101	na
Julius Ave (west)	South of Delhi Road	3,000*	

Source: RTA, na – not available

*Estimated from traffic study for 27 – 37 Delhi Road development application

Note: The most recently available RTA data is generally for the year 2005. The *Macquarie Park Traffic Study* does not provide any additional AADT data.

Recently collected traffic data (*Epping to Chatswood Rail Line Operational Road Traffic Surveys*, Hyder for TCA, July 2010) indicated that there was no significant change in traffic volumes on Delhi Road as a result of the ECRL. The surveys also found that bus stop, kiss and ride, and taxi allocations at North Ryde Station are generally sufficient for current demand but additional bicycle parking provision may be warranted if rail patronage increases.

Surveys conducted in 2006 suggest that the left-in from Epping Road to Rivett Road has a volume of approximately 650 vehicles per hour (vph) in the AM peak and the corresponding left-out to Epping Road has 270 vph in the PM peak.

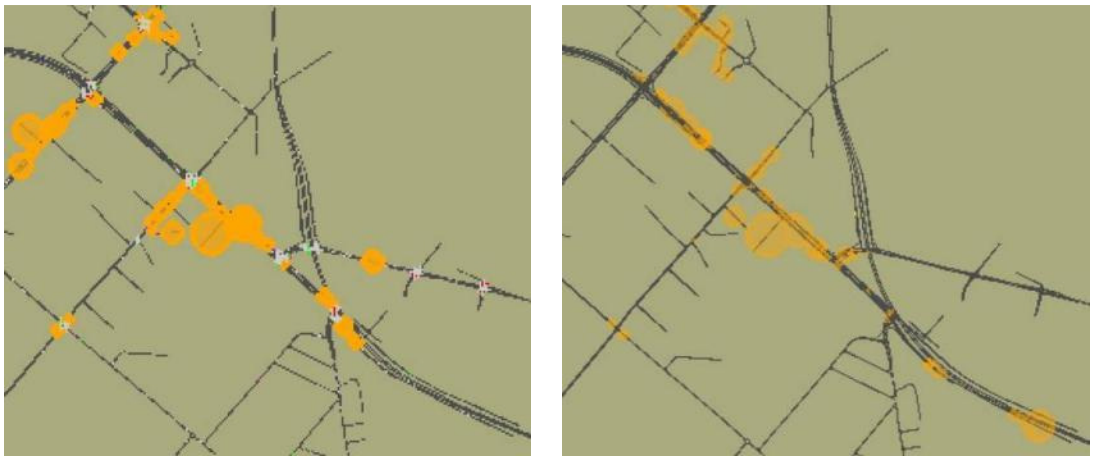
Further traffic data, including peak hour data at key intersections, will be collected as part of the Environmental Assessment phase of the Part 3A assessment.

2.3.4 Road Network Performance

The arterial roads in the study area carry relatively high traffic volumes, particularly during peak periods. The *Macquarie Park Traffic Study* (refer to section 4.7.3) identified congestion 'hotspots' as shown in Figure 4.

Figure 4 Existing Congestion Hotspots

AM Peak Hour **PM Peak Hour**



Source: *Macquarie Park Traffic Study*

The Lane Cove Tunnel, which opened in March 2007, did not result in a major change to traffic conditions within the study area.

As reported in section 2.3.3, the ECRL, which opened in 2009, did not result in a significant change in traffic levels on the North Ryde road network.

Significant congestion currently occurs at the following locations:

- Epping Road eastbound on its approach to Delhi Road and Pittwater Road in the morning peak.
- Epping Road / Delhi Road and Delhi Road / M2 intersections in afternoon peak.
- Lane Cove Road between Epping Road and M2 in both morning and afternoon peaks.

2.4 Car Parking

The Macquarie Park area contains significant on-site parking within commercial developments but there are no major off-street public car parks. There is no parking on main roads such as Epping Road and Delhi Road, and no commuter car park associated with North Ryde Station. Public on-street parking is provided on most local streets such as Julius Ave, Lucknow Road and the residential area around Blenheim Park. The spaces in streets between Delhi Road and Epping Road typically have high occupancy levels during business hours.

3 DESCRIPTION OF CONCEPT PLAN

A Concept Plan has been developed for the various sites that constitute the North Ryde Station Precinct:

1. M2 Site
2. North Ryde Station Site (TCA/ING)
3. Office of Strategic Land (OSL) Site
4. RTA Site

Table 4 presents the following data for each site:

- site name
- current ownership
- site area
- proposed land use by GFA and FSR

The Concept Plan and proposed GFA represent an ultimate development scenario. It is likely that development would occur in a number of stages. The findings of this preliminary assessment as presented in the following sections of the report generally relate to the ultimate development scenario.

Section 5 of this report assesses the transport requirements of each of the sites in terms of likely trip generation, the mode of these trips and the origin/destination of these trips.

Section 6 of this report develops a transport access scheme for the Concept Plan area in terms of walking, cycling, public transport and vehicular access. The transport access scheme is mainly presented in terms of the ultimate development scenario. The Transport Assessment prepared for the Environmental Assessment phase would develop a staging/priorities plan for key measures such as shared paths, footbridges, road links, intersection upgrades, increased public transport services etc.

Table 4 Concept Plan Site Details

Site Name	Ownership	Site Area (Ha)	Proposed Land Use	Proposed Max GFA (sqm)
M2 Site	TCA	9.16	Commercial	42,300
			Retail	3,000
			Residential	202,140
Subtotal				**247,440**
North Ryde Station Site - Northern Site	TCA	1.3	Commercial	6,310
			Retail	3,000
			Residential	31,608
North Ryde Station Site - Southern Site	ING	1.76	Commercial	0
			Retail	0
			Residential	49,060
Subtotal				**89,978**
Office of Strategic Land	OSL	1.48	Commercial	0
			Retail	0
			Residential	18,310
Subtotal				**18,310**
RTA Site	RTA	0.67	Commercial	0
			Retail	0
			Residential	10,710
Subtotal				**10,710**
Total				**366,438**

4 FUTURE TRANSPORT AND ACCESSIBILITY SITUATION

The future transport and accessibility situation for the Concept Plan area will be affected by a range of objectives and policies including:

- NSW Government State Plan mode split targets
- implementation of City of Ryde Bicycle Strategy
- implementation of City of Ryde Walking Strategy
- recommendations of City of Ryde's Macquarie Park Traffic Study
- implementation of more bus priority measures and increased bus services
- better integration of ECRL as part of rail network expansion
- implementation of measures contained in the Macquarie Park Transport Management and Accessibility Plan (TMAP)
- road network improvements including M2 upgrade
- Ryde Local Environment Plan 2010

The likely impacts of these are summarised in the following sections.

4.1 NSW Government State Plan

The NSW State Plan 2010 includes the following transport targets:

- Increase the proportion of total journeys to work by public transport in the Sydney Metropolitan Region to 28% by 2016 (2009 value 24%).
- Increase the mode share of bicycle trips made in the Greater Sydney region, at a local and district level, to 5% by 2016 (2009 value 1%).

The State Plan states that these targets will be met by a range of inter-related policy measures.

4.2 City of Ryde Walking Strategy

CoR's plans for improved walking facilities in the North Ryde area are included in the *Macquarie Park Corridor Development Control Plan 2010* which is further described in section 4.8. The plan includes a vision for increased pedestrian links and a greatly improved pedestrian environment. Key items in the plan include:

- a possible pedestrian/cycle bridge over the M2 between the M2 Site and Macquarie Park Cemetery;
- pedestrian through-site links within major development sites;
- green pedestrian link between the North Ryde Station Site and the commercial developments to the east; and
- pedestrian bridge and access way connecting residential areas to the south of Epping Road to the North Ryde Station plaza and park.

4.3 City of Ryde Bicycle Strategy

The *Ryde Bicycle Strategy and Masterplan* (City of Ryde, 2007) outlines a series of both infrastructure and non-infrastructure measures to promote cycling within the City of Ryde. A key focus is to maximise interchange opportunities with bus and rail public transport. The

Macquarie Park Corridor Development Control Plan 2010, further described in section 4.8, includes a proposed bicycle network as shown in Figure 5 based on the 2007 masterplan. The proposed network of bicycle routes in the Macquarie Park Corridor is presented in Figure 5. Key connections are to North Ryde Station and to the Epping Road shared path.

The *2010 NSW Bikeplan* (NSW Government) identifies North Ryde to Macquarie University as a major missing link in the Metro Sydney Bike Network. The Bikeplan states that "the NSW Government will fully fund construction of an average of 10 kilometres of new connections in the Metro Sydney Bike Network each year, focusing first on the identified priority metro links".

4.4 Bus Services

Additional bus priority measures will continue to be introduced across Sydney in the future. Epping Road lies on Strategic Bus Corridor 9, Parramatta – City, and further measures may be possible in the North Ryde area.

Buses are a flexible form of public transport and new services can be introduced with a relatively short lead-in time. Increased demand for bus services as a result of the proposed development may lead to higher frequencies on existing routes and the provision of additional routes such as through the North Ryde business park area.

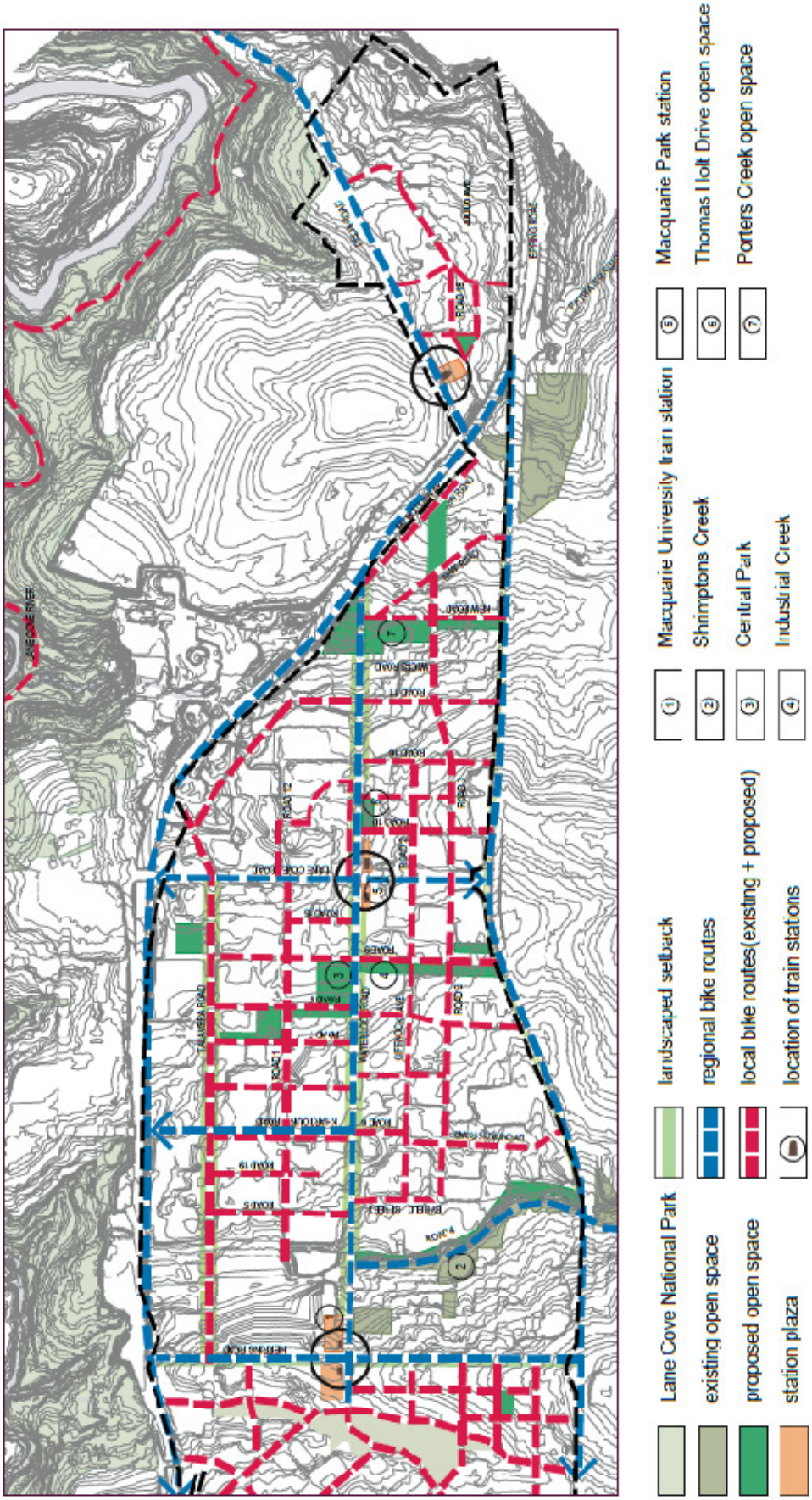
4.5 Rail Services

The NSW Government plans to build the following rail links in the next decade:

- Northwest Rail Link
- Epping to Parramatta Rail Link

Both of these links would contribute to better integration of ECRL into the wider Sydney metropolitan rail network. This would lead to rail becoming a more attractive option for trips to the North Ryde area.

Figure 5 Macquarie Park Corridor Proposed Bicycle Network



4.6 Macquarie Park Transport Management and Accessibility Plan

The *Macquarie Park Transport Management and Accessibility Plan* (TMAP) was prepared in 2002 for City of Ryde and the NSW Government. Although the document is now somewhat dated, many of the measures have been implemented or incorporated into subsequent policy documents as described elsewhere in this report.

4.7 Road Network Improvements

Various road network improvements for the North Ryde area have been investigated by the NSW Government and City of Ryde:

4.7.1 M2 Upgrade

An upgrade of the M2 has recently been approved and will include:

- Physical widening eastbound from Beecroft Road to Lane Cove Road by one additional lane. One of the eastbound lanes east of Terrys Creek would be marked as a transit lane.
- Physical widening westbound from Lane Cove Road to Beecroft Road to reinstate the breakdown lane and provide wider through lanes.
- Physical widening of Norfolk Tunnel just east of Beecroft Road eastbound and westbound to provide an additional lane eastbound and wider lanes westbound.
- Provision of a new east facing on-ramp at Christie Road and a new east facing off-ramp at Herring Road/Talavera Road, Macquarie Park.

There will be major infrastructure works east of Lane Cove Road, however, the speed limit on the entire motorway will be standardised at 100 km/h.

The upgrade is forecast to increase traffic volumes on the Epping Road – Lane Cove Road section of the M2 by between 10% - 20% compared to the no upgrade option. Traffic increases are forecast to be higher in the AM peak than the PM peak.

The upgrade is also forecast to result in a slight decrease in traffic volumes on Lane Cove Road between the M2 and Epping Road, and a significant decrease on Epping Road between Pittwater Road and Lane Cove Road, compared to the no upgrade option.

4.7.2 M2 / Lane Cove Road East Facing Ramps

The M2 Upgrade project does not include the provision of east facing ramps to/from the M2 at Lane Cove Road. The RTA is, however, investigating this infrastructure upgrade as a separate medium to long term project. If constructed, the ramps would have the potential to significantly change traffic patterns on Lane Cove Road, Epping Road, Waterloo Road and Wicks Road. The nature of these changes would be dependent on a range of factors, including the level of tolling, if any, on the ramps. Detailed traffic modelling would be required to predict the impacts with any degree of certainty.

4.7.3 Macquarie Park Traffic Study

City of Ryde undertook the *Macquarie Park Traffic Study* (MPTS) in 2008 (Bitzios for City of Ryde, July 2008).

A key component of the MPTS was the development of a Q-Paramics micro-simulation traffic model for the 2007 road network, i.e. preceding the opening of the ECRL. It covers two one-hour weekday peak periods: 7:45 – 8:45 AM and 4:45 – 5:45 PM.

Various infrastructure upgrade options were tested for the year 2031 using a 40% public transport mode split for the Macquarie Park area, including:

- New Road 38 – a new four lane road between Epping Road at Pittwater Road and Delhi Road near North Ryde Station, with signalised intersection at each end. Signals have

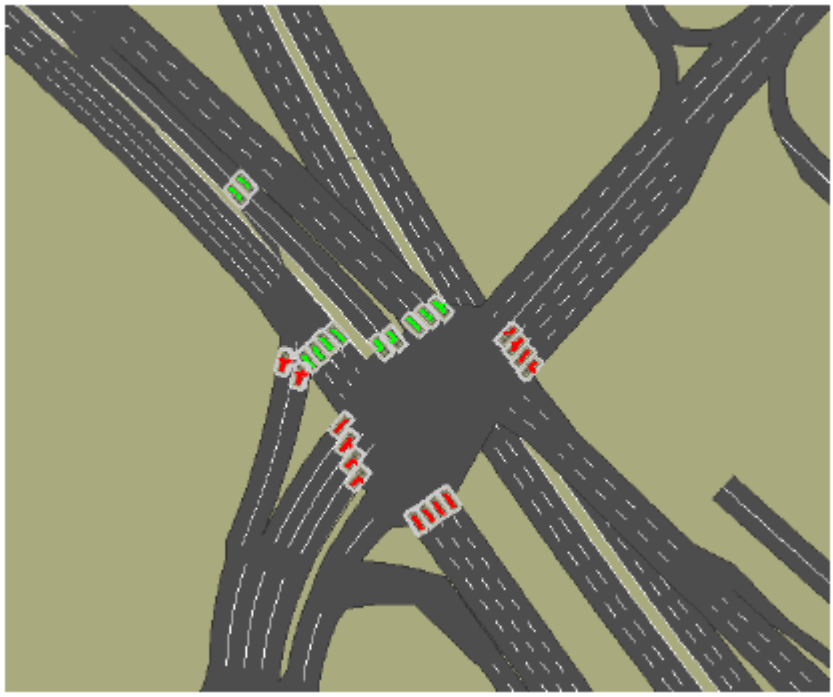
been recently constructed at the Delhi Road end (refer to Figure 6) as part of the ECRL surface works. Movements at the Epping Road end would be restricted as follows:

  - left-in from Epping Road west, through from Pittwater Road, no right turn in from Epping Road east; and
  - left, through and right out from Road 38 to Epping Road and Pittwater Road.

- M2 westbound off-ramp – new westbound off-ramp connecting to the eastern end of Waterloo Road.
- Epping Road/Delhi Road – new grade-separated right turn from Epping Road to join the Delhi Road-M2 westbound on-ramp.
- Lane Cove Road/M2 – new east facing ramps (refer to section 4.7.2).

These upgrades are not included in any RTA or City of Ryde committed works programs although some are included in the *Macquarie Park Corridor Development Control Plan 2010* described in the following section.

Figure 6 Macquarie Park Traffic Study – Indicative Layout of Proposed New Road 38 at Epping Road/Pittwater Road



4.8 Ryde Local Environment Plan 2010

The *Ryde Local Environment Plan 2010* and *Macquarie Park Corridor Development Control Plan 2010* form the basis for planning in the Macquarie Park Corridor. Key items of relevance to this Concept Plan include (**figures are reproduced in Appendix B of this report**):

- A long term vision for the Macquarie Park area, with smaller street blocks, increased pedestrian and cycleway links, and greatly improved pedestrian environment.
- The Street Network Structure Plan (refer to Figure 21) contains a number of proposed new roads to and within a number of the sites, including:
  - extension of the eastern end Waterloo Road;
  - two new roads within the M2 Site; and

- north-south road along eastern boundary of the North Ryde Station Site (refer to Road 38 in section 4.7.3) with connections to two east-west roads.

The Street Network Structure Plan includes four indicative street types with indicative street cross-sections shown in (Figure 22, Figure 23 and Figure 24):

- Primary Streets (Type 1) – two traffic lanes in each direction, no parking, two-way cycle path, footpaths.
- Secondary Streets (Type 2) – single traffic lane in each direction, on-street parking, on-road cycle lanes, footpaths.
- Tertiary Streets (Type 3) - two traffic lanes in each direction, on-street parking on one side, footpaths.
- Small Streets (Type 4) – traffic lanes in each direction or one-way street, no parking, footpaths.

- North Ryde Station Precinct - Figure 4.5.41 Special Precinct 3 Illustrative Plan, Objective 10 *states that vehicular circulation includes but is not limited to:*

  a. *public roads along all sides of the new park.*

  b. *an additional vehicular connection from Pittwater Road to Delhi Road subject to RTA approval,*

  c. *New streets through to Epping Road. New streets may be a split street providing vehicular and service access to development along Epping Road.*

- The North Ryde Station Precinct Controls refer to this current masterplanning process:

  A significant portion of the land in this precinct is owned by the State Government Corporation responsible for the delivery of the Epping to Chatswood Rail Line Transport Infrastructure Development Corporation (TIDC). It is noted that these lands have been identified as "Deferred" under LEP and Adopted LEP planning provisions (relating to land use zoning, floor space ratio, buildings heights, access and open space network and carparking provisions), pending further masterplanning to be undertaken by TIDC.

  TIDC is masterplanning its lands in conjunction with adjoining landowners (which are predominantly government bodies) to ensure future land use and access successfully integrates with North Ryde Station. Therefore provisions in this DCP are indicative only and final provisions will be incorporated upon completion of the masterplanning process.

  Preliminary studies identify a possible land bridge across the M2 tollway. The operators of the M2 tollway made a submission during the Final of the Adopted DCP raising concerns about the feasibility and potential impact of a land bridge. Therefore in the preparation of a Master Plan for this precinct the RTA and M2 tollway operators must approve a land bridge.

- Off-street parking controls

  The objectives for off-street parking controls in the Macquarie Park Corridor are as follows:

  (a) to encourage accessibility by foot, bicycle and public transport,

  (b) to support the management and supply of parking as the primary means to influence travel behaviour of employees,

  (c) to encourage greater reliance on public transport,

  (d) to assist in the management of increased car usage and traffic congestion in the corridor,

  (e) to effect a greater shift to public transport.

Parking for new commercial developments within the Concept Plan area would generally be provided at a **maximum** of one space per 70 or 80m^2 GFA as shown in Figure 25 reproduced from the Ryde LEP (refer to Appendix B of this report). Parking for residential units within 400m of a railway station would be provided at a rate of 1 space per dwelling for a one bedroom unit, increasing to 1.6 spaces for a three bedroom unit (Ryde DCP 2010, Part 9.3: Car Parking). These parking rates are subject to negotiation with CoR in the context of the overall objective to minimise car dependency.

Development in the Macquarie Park Corridor must occur within the framework of the Street Network Structure Plan. However, CoR are unlikely to construct new roads independently of the redevelopment of sites and therefore, new roads will generally be constructed in conjunction with the redevelopment of sites.

5 TRANSPORT ASSESSMENT

5.1 Forecast Trip Generation

The ultimate development of the Concept Plan area, for the year 2031 based on typical rates for m^2 per employee and number of people per household, may result in:

- 2,000 – 4,000 new full-time equivalent employees
- 5,000 – 8,000 new residents

In the **peak hour** this may generate in the order of:

- 3,000 new journey to work trips (all transport modes) to the commercial land uses; and
- 3,500 new trips (all transport modes) from the residential land uses (includes journey to work, school, shopping, leisure etc trips).

5.2 Forecast Origin/Destination Profile

The main source of data relating to all modes of transport for journey to work trips is the 2006 ABS Census. This data was analysed to give an indication of likely trip patterns to/from the development sites. Table 5 shows the origin of journey to work trips **to commercial land uses** based on similar existing nearby developments. Table 6 shows the destination of journey to work trips **from residential land uses** based on similar existing nearby developments.

Table 5 Origin of Journey to Work Trips to Commercial Land Uses

Statistical Division	Origin of Journey to Work Trips to North Ryde*
Lower Northern Sydney (Ryde, Hunter's Hill, Lane Cove, Mosman, North Sydney, Willoughby)	23%
Central Northern Sydney (Baulkham Hills, Hornsby Ku-ring-gai)	21%
Central Western Sydney (Auburn, Holroyd, Parramatta)	8%
Inner Sydney (Botany Bay, Leichhardt, Marrickville, Sydney)	8%
Northern Beaches (Manly, Pittwater, Warringah)	8%
Blacktown	5%
Other	27%

*selected North Ryde travel zones

Table 6 Destination of Journey to Work Trips for Residential Land Uses

Statistical Division	Destination of Journey to Work Trips to North Ryde*
Lower Northern Sydney (Ryde, Hunter's Hill, Lane Cove, Mosman, North Sydney, Willoughby)	44%
Inner Sydney (Botany Bay, Leichhardt, Marrickville, Sydney)	22%
Central Northern Sydney (Baulkham Hills, Hornsby, Ku-ring-gai)	5%
Inner Western Sydney (Ashfield, Burwood, Canada Bay, Drummoyne, Strathfield)	5%
Central Western Sydney (Auburn, Holroyd, Parramatta)	4%
Other	20%

*selected North Ryde travel zones

It is likely that new commercial developments within the Concept Plan area would draw heavily from employees that live in an arc of northern suburbs from Baulkham Hills to North Sydney. There would be a significant number of employees residing within 5km of the North Ryde area.

A considerable proportion of current residents of the North Ryde area work in the employment-rich arc from Macquarie Park to the City including the lower North Shore.

5.3 Forecast Mode Split

Journey to work data from the 2006 Census, for selected nearby developments, was analysed to give an indication of the likely usage of different travel modes to/from the development sites. The data presented in Table 7 is for the year 2006 and precedes the opening of the ECRL. However, due to the relatively low patronage levels using North Ryde Station, it is unlikely that current patterns have changed significantly from the 2006 data.

Table 7 Existing Mode Split – Journey to Work Trips

Mode	Journey to Work Trips*	
	To North Ryde Travel Zones	From North Ryde Travel Zones
Train	4%	4%
Bus	4%	17%
Car (driver or passenger)	89%	72%
Other modes	3%	7%

*selected North Ryde travel zones

The mode split in any location is dependent on a range of factors, including:

- availability of public transport services
- parking (availability and cost)
- walking and cycling facilities
- road network conditions
- the costs, both real and perceived, of available travel modes

The Concept Plan provides for some mixed land uses where people can live and work in close proximity to each other. The existing mode split proportions presented above are unlikely to be representative of the ultimate development of the Concept Plan area because of various specific factors including:

- The expected increase in rail travel due to the proximity of North Ryde Station within 800m of all of the sites.
- The future Northwest Rail Link and Epping to Parramatta Rail Link which would contribute to better integration of ECRL into the wider Sydney metropolitan rail network.
- Continued improvements to bus services including better integration with other forms of public transport.
- Future improvements to the walking and cycling environment, including a number of specific measures, such as footbridges, that are discussed in section 6.

- Lower future parking rates in commercial developments (1 per 80m^2) compared to rates for existing developments (1 per 40m^2 - 50m^2) and lower availability of all-day parking on local streets.
- Increased congestion on the arterial road network.
- Other measures to promote non-car transport modes such as the implementation of workplace travel plans.

The forecast mode split proportions for the ultimate Concept Plan development are presented in Table 8. The forecast proportion of trips by non-car modes is higher than the targets specified in the NSW State Plan 2010 and CoR's targets for the Macquarie Park Corridor. It will therefore be a transit oriented development that encourages station usage and improves connectivity to North Ryde Station.

Table 8 Forecast Mode Split – Journey to Work Trips (Ultimate Concept Plan Development)

Mode	Journey to Work Trips		All Weekday Trips (includes Journey to Work trips)	
	To Concept Plan Sites	From Concept Plan Sites	To Concept Plan Sites	From Concept Plan Sites
Train	30%	30%	28%	30%
Bus	30%	20%	28%	22%
Car (driver or passenger)	33%	40%	37%	38%
Other modes	7%	10%	7%	10%

This mode split may result in an additional:

- 6,000 entries to North Ryde Station over an entire weekday
- 4,500 people boarding bus services in the North Ryde area over an entire weekday
- 500 weekday bike trips for a range of different purposes

The increase in rail patronage translates into a forecast increase in daily weekday entries from the current level of 1,050 to 7,000 for the ultimate development. This forecast future number of entries is similar to patronage currently occurring at Macquarie University Station. Improved urban design and travel management measures may also lead to increased rail patronage from non-Concept Plan sites.

The forecast additional traffic generation for the Concept Plan area is discussed in the following section.

5.4 Forecast Traffic Generation

The forecast traffic generation (vehicle trips) of the development sites has been assessed on the basis of the RTA's *Guide to Traffic Generating Developments* and parking rates specified in *Ryde Local Environment Plan 2010*.

The following traffic generation rates have been adopted:

commercial 1.0 vehicle trips per hour / 100m^2 GFA (RTA Guide section 3.5)

residential 0.30 to 0.35 vehicle trips per hour / 100m^2 GFA depending on proximity to the station (RTA Guide section 3.3.3)

The RTA Guide rate for commercial development, 2 trips per 100m^2 GFA, is based on parking equating to 1 space per 40m^2. LEP 2010 provides for a maximum parking rate of 1

space per 80m^2 and therefore a traffic generation rate of 1 trip per 100m^2 GFA is appropriate.

The forecast ultimate traffic generation, based on the GFA values described in section 3, is presented in Table 9. It can be seen that the M2 and North Ryde Station sites are forecast to generate significant traffic volumes, whilst the OSL and RTA sites only minor volumes.

Table 9 Forecast Traffic Generation – Ultimate Concept Plan Development

Site	Total GFA					Traffic Generation (veh trips/100m² GFA)				Traffic Generation (veh/hr)			
						AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
	Total (m2)	Commercial (m2)	Retail (m2)	Residential (m2)	Residential dwellings	Commercial	Residential	Commercial	Residential	Arrivals	Departures	Arrivals	Departures
1. M2 Site	247,440	42,300	3,000	202,140	2,438	1.00	0.35	1.00	0.35	494	651	622	523
2a. North Ryde Station Site (TCA)	40,918	6,310	3,000	31,608	381	1.00	0.30	1.00	0.30	71	88	85	74
2b. North Ryde Station Site (ING)	49,060	0	0	49,060	592	1.00	0.30	1.00	0.30	37	118	103	52
3. Office of Strategic Land site (OSL)	18,310	0	0	18,310	221	1.00	0.35	1.00	0.35	16	51	45	22
4. RTA site	10,710	0	0	10,710	129	1.00	0.30	1.00	0.30	8	26	22	11
Total	366,438	48,610	6,000	311,828	3,761					626	934	878	682

6 PROPOSED TRANSPORT ACCESS SCHEME

6.1 Walking and Cycling

A walking and cycling strategy has been developed to support the Concept Plan scheme based on the following key principles:

- the provision of smaller street blocks
- direct walking and cycling connections to North Ryde Station
- direct cycling connections to the Epping Road shared path regional cycling route
- controlled crossing points at roads
- footbridges over main roads where appropriate

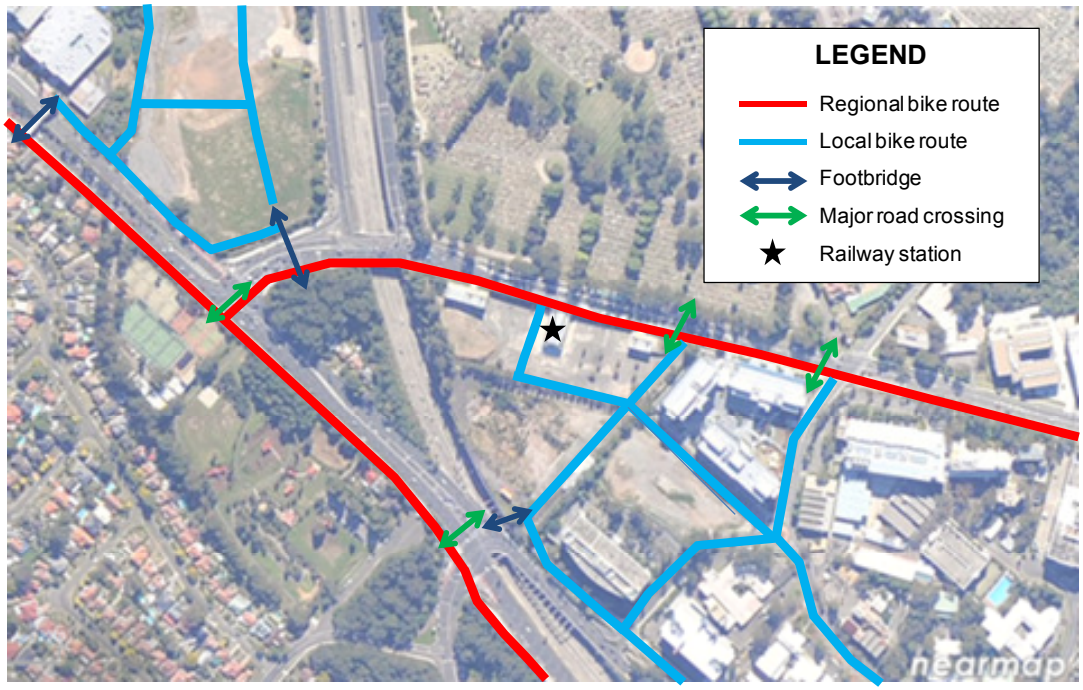
The cycling strategy is illustrated in Figure 7. The walking strategy includes all cycling routes as shared paths, footpaths on both sides of streets and through-site links. Most of the land contained within the North Ryde Station Precinct is within easy walking distance of the station assuming some of the direct linkages can be provided.

Two key elements of the strategy are:

- A footbridge over Delhi Road between Epping Road and M2 interchange to provide for direct access between the M2 Site and the North Ryde Rail Station portal on the southern side of Delhi Road.
- A footbridge over M2 to connect the southern end of Road 38 to Epping Road. This would make for a more direct connection to the station for areas south of Epping Road and also a direct connection to the regional cycleway.

Both of these elements would provide benefit to the wider community in addition to the North Ryde Station Precinct.

Figure 7 Cycling Strategy



6.2 Public Transport

The analysis described in the preceding section demonstrates that development of the Concept Plan sites will result in a significant increase in both bus and train patronage.

The forecast increase in train patronage is within the capacity of North Ryde Station and the capacity of train services on the ECRL.

The walking and cycling measures proposed will increase accessibility to the station and key bus stops, particularly in terms of more direct walking routes to North Ryde Station. This will have the effect of increasing the catchment area for the station.

An increased demand for bus services may lead to higher frequencies on existing services and the introduction of new routes.

Development of the Concept Plan sites does not require major investment in supporting public transport infrastructure because such measures were included in the ECRL.

6.3 Road Network

Vehicular access arrangements for the various sites are discussed in the following sections and the preferred access arrangements are illustrated in a number of figures.

6.3.1 M2 Site

It is highly unlikely that any new road links could be constructed over or under the M2 corridor. A pedestrian footbridge, however, could be considered as discussed in section 6.1. In addition, Epping Road is particularly congested between Wicks Road and the Lane Cove Tunnel. The performance of this section of roadway is a function of the capacity of three main intersections – Wicks Road, Delhi Road and Pittwater Road, and it is unlikely that a new full-movement intersection could be constructed to serve the M2 Site.

The M2 Site is the largest of the Concept Plan sites and a number of access points are desirable to disperse the traffic onto the surrounding road network. The preferred access arrangement for the site consists of three access points:

- Waterloo Road at Wicks Road
- Epping Road left-in/left-out
- M2 Delhi Road on-ramp

These are described in more detail below.

Waterloo Road at Wicks Road

The *Street Network Structure Plan* of the *Macquarie Park DCP 2010* includes a number of new roads to or through the M2 Site. The most critical of these is an extension of Waterloo Road from Wicks Road and this is supported as a key access point to the site. It would be in the form of a CoR Type 1 road.

The Waterloo Road / Wicks Road intersection would be signalised to accommodate background and development traffic. Preliminary capacity analysis suggests that two approach lanes would be required on each approach (left/through and right) except for Wicks Road north where one lane would be sufficient.

Figure 8 M2 Site – Waterloo Road Access

Epping Road Left-in/left-out

The *Street Network Structure Plan* of the *Macquarie Park DCP 2010* also includes a connection from the Waterloo Road extension through to Epping Road. This is supported as a key access point to the site. The intersection on Epping Road would be in the form of a left-in/left-out access. It would be located as far to the west as possible to reduce conflict with the left turn slip lane to Delhi Road.

The access point on Epping Road eastbound has the potential to attract significant traffic volumes in a north-south direction. The internal road would be designed as a local, low-speed road to dissuade through traffic (CoR Type 3 road).

The most critical movement at Epping Road is the left turn out of the site and the capacity on this movement would be limited by the absorption capacity of the Epping Road eastbound traffic stream.

Figure 9 M2 Site – Epping Road Access

M2 Delhi Road On-ramp

The M2 Site has previously been used as a construction compound for the ECRL and will again be used for this purpose during construction of the M2 upgrade. A left turn slip lane and site access intersection currently exists on the Delhi Road on-ramp as shown in Figure 10.

As part of the development of the site it is proposed to construct a similar access to the existing construction compound access. It would accommodate traffic arriving at the site from Epping Road, Delhi Road or the M2 from the north-west (via a U-turn at the Delhi Road signals), and traffic departing the site via the M2 to the north-west.

TCA has previously undertaken preliminary investigations of such an access as summarised in Appendix A. A possible location for the access is shown on Figure 12. It would be located approximately 70m north of Delhi Road, in a relatively low speed environment compared to the northern end of the on-ramp, and would include deceleration and acceleration lanes.

Figure 10 Existing Delhi Road to M2 On-ramp

A number of design issues would need to be resolved during the Environmental Assessment phase, including:

- The introduced weaving manoeuvres for traffic entering the site from Delhi Road east or M2 U-turn conflicting with traffic turning onto the on-ramp from Delhi Road west.
- The operational performance of the Delhi Road / M2 interchange intersection due to the increased traffic that the access point would induce, and also the proximity of the M2/Delhi Road intersection to the Epping Road/Delhi Road intersection.
- The potential for improvements to the Delhi Road / M2 interchange intersection as described in the *Macquarie Park Traffic Study.*

The precedent that such an arrangement would establish for motorway interchanges although the Herring Road on-ramp to the M2 at Macquarie Park is similar as shown in Figure 11. At this location left-in access is provided to Macquarie View Estate.

Figure 11 Site Access on Herring Road On-ramp, Macquarie Park

Figure 12 M2 Site – M2 On-ramp Access

6.3.2 North Ryde Station Site

The northern and southern components of the North Ryde Station Site would share common vehicular access points and are therefore considered together.

The options for vehicular access to the North Ryde Station Site are:

- existing Road 38 connecting to the north with Delhi Road
- connections to Julius Ave and Rivett Road to the east
- extension of Road 38 to Epping Road to the south

The primary access to the North Ryde Station Site would be the northern section of Road 38 which has an existing signalised intersection at Delhi Road. This intersection has been constructed with a right turn lane into Road 38 from Delhi Road west and two lanes for exiting Road 38. This approach is consistent with CoR's *Street Network Structure Plan*.

The North Ryde commercial precinct between Epping Road and Delhi Road currently has vehicular access to the north via two Julius Ave intersections on Delhi Road, and to the south via a left in/left out arrangement on Epping Road. It would therefore be beneficial to connect the site to this road network. This can be achieved by constructing two roads that are included in CoR's *Street Network Structure Plan.*

Road 18 currently exists as a private road as part of the Stockland development, immediately north of the road, with a connection to Julius Ave. There are no major obstacles to extending this road to the west to connect to Road 38.

CoR's *Street Network Structure Plan* also includes an un-named parallel road to the south of Road 18. Provision of this road in the shown location may not be possible due to ownership constraints. It is therefore recommended that Lucknow Road be extended to connect with Road 38, to provide another connection between Road 38 and Julius Ave – Rivett Road.

Both the Road 18 and Lucknow Road extensions should be built as CoR Type 2 roads with a single traffic lane in each direction. Small roundabouts at the intersections with Road 38 would be appropriate. These links would allow traffic generated by the precinct to be more evenly distributed across three signalised intersections on Delhi Road and the Epping Road access point.

The extension of Road 38 to Pittwater Road is not critical to the operation of the local road network serving the site. It would attract significant through traffic impacting on the amenity of the local area, severing the sites from the commercial developments to the east. Construction of the road would also require a bridge over the M2 and extensive signal modifications at the Epping Road / Pittwater Road intersection. It is therefore proposed to extend Road 38 to the southern end of the site but not to connect it to Epping Road. It would be a CoR Type 2 road with a single traffic lane in each direction. A walking/cycling connection to Epping Road is, however, recommended as described in section 6.1.

Figure 13 North Ryde Station Site Access

Note: Internal roads within North Ryde Station Site are indicative only

6.3.3 Office of Strategic Land Site

The two main options for vehicular access to the Office of Strategic Land Site are:

- utilising the existing left-in/left-out access on Epping Road at the northern end of the site
- adding a fourth approach to the Epping Road / Delhi Road signals

The RTA may permit an entry at the Epping Road / Delhi Road signals – left-in from Epping Road and straight-in from Delhi Road. However, an exit is unlikely to be acceptable because it would require a new signal phase at an intersection with existing capacity constraints. The impact on the performance of other approaches would be unacceptable.

The existing left-in/left-out access on Epping Road, approximately 110m northwest of Delhi Road, would form a suitable access to the proposed residential development. The access is expected to generate relatively low traffic volumes during peak periods, i.e. up to 70 vph.

The most critical movement is the left turn out of the site. Motorists using this access point would be assisted by gaps in the Epping Road westbound traffic stream caused by the Delhi Road signals.

Figure 14 Office of Strategic Land Site Access

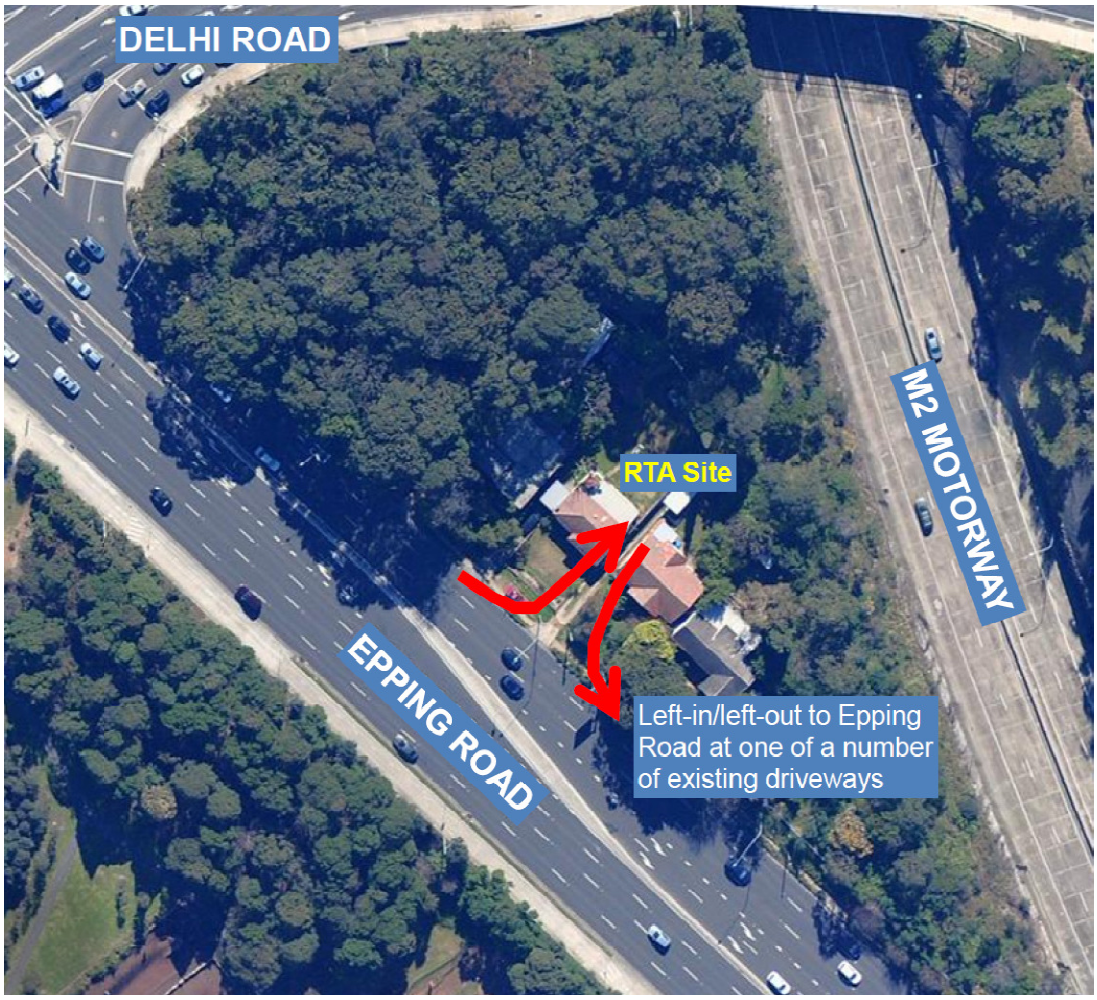
6.3.4 RTA Site

The only feasible option for providing vehicular access to the RTA Site is in the form of a left-in/left-out on Epping Road at the location of one of the existing residential driveways.

The left-in/left-out access on Epping Road is expected to generate relatively low traffic volumes during peak periods, i.e. up to 35 vehicles per hour (vph). Proximity to North Ryde Station and a major bus corridor, in conjunction with low parking rates, would encourage high public transport usage.

The most critical movement is the left turn out of the site. Motorists using this access point would be assisted by gaps in the Epping Road eastbound traffic stream caused by the Delhi Road signals.

Figure 15 RTA Site Access



6.3.5 Forecast Traffic Volumes at Access Points

Forecast peak hour traffic volumes at each access point, based on the ultimate traffic generation values of Table 9, are shown on Figure 16 and Figure 17.

The Environmental Assessment stage will include more detailed traffic modelling of the impacts of these traffic volumes on the wider road network.

Figure 16 Forecast Traffic Volumes at Access Points – AM Peak Hour

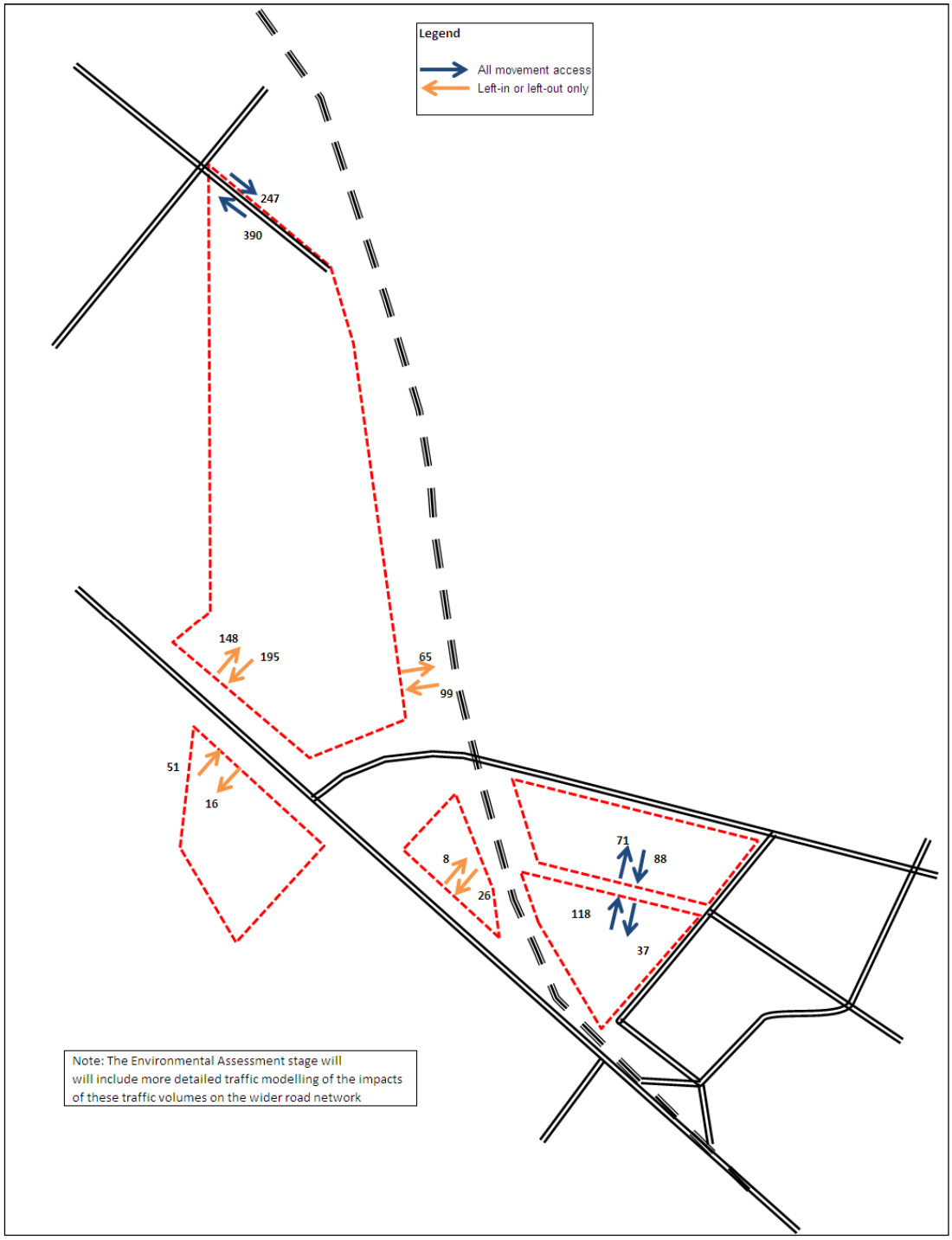
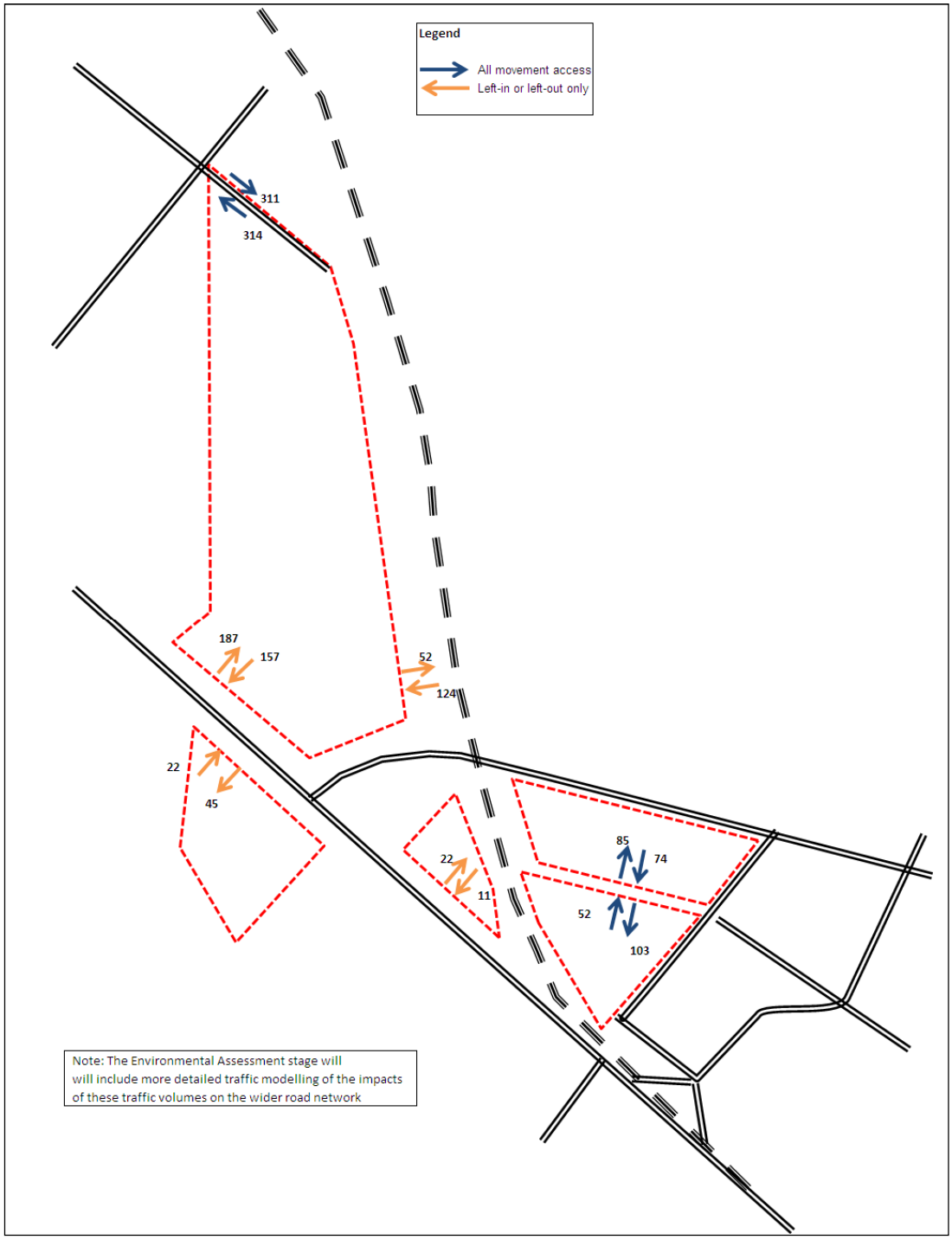


Figure 17 Forecast Traffic Volumes at Access Points – PM Peak Hour



7 SUMMARY AND CONCLUSIONS

This report describes the existing situation, development Concept Plan proposal, forecast trip generation and proposed transport access scheme for the North Ryde Station Precinct Concept Plan.

Key findings of this assessment are:

- Future developments within the Concept Plan area will be well-served by public transport, both bus and train, allowing for high levels of non-car travel to the site. The ultimate development will therefore maximise public transport patronage through the appropriate placement of compatible land uses around North Ryde Station.
- The ultimate development may result in an additional:
    - 6,000 entries to North Ryde Station over an entire weekday
    - 4,500 people boarding bus services in the North Ryde area over an entire weekday
    - 500 weekday bike trips for a range of different purposes
    - 1,550 car trips in a weekday peak hour.
- The increase in rail patronage translates into a forecast increase in daily weekday entries at North Ryde Station from the current level of 1,050 to 7,000 for the ultimate development.
- The Concept Plan allows for the provision of critical walking and cycling links, including:
    - connection from southern end of Road 38 to Epping Road at Pittwater Road
    - footbridge over Delhi Road between Epping Road and M2 interchange.
- Vehicular access to the development sites is proposed to be as shown on Figures 10 to 15.

The forecast proportion of trips by non-car modes is higher than the targets specified in the *NSW State Plan 2010* and CoR's targets for the Macquarie Park Corridor. It will therefore be a transit oriented development that encourages station usage and improves connectivity to North Ryde Station.

The Transport Assessment prepared as part of the Part 3A Environmental Assessment phase would include a more detailed investigation of the issues described in this report including more detailed traffic modelling.

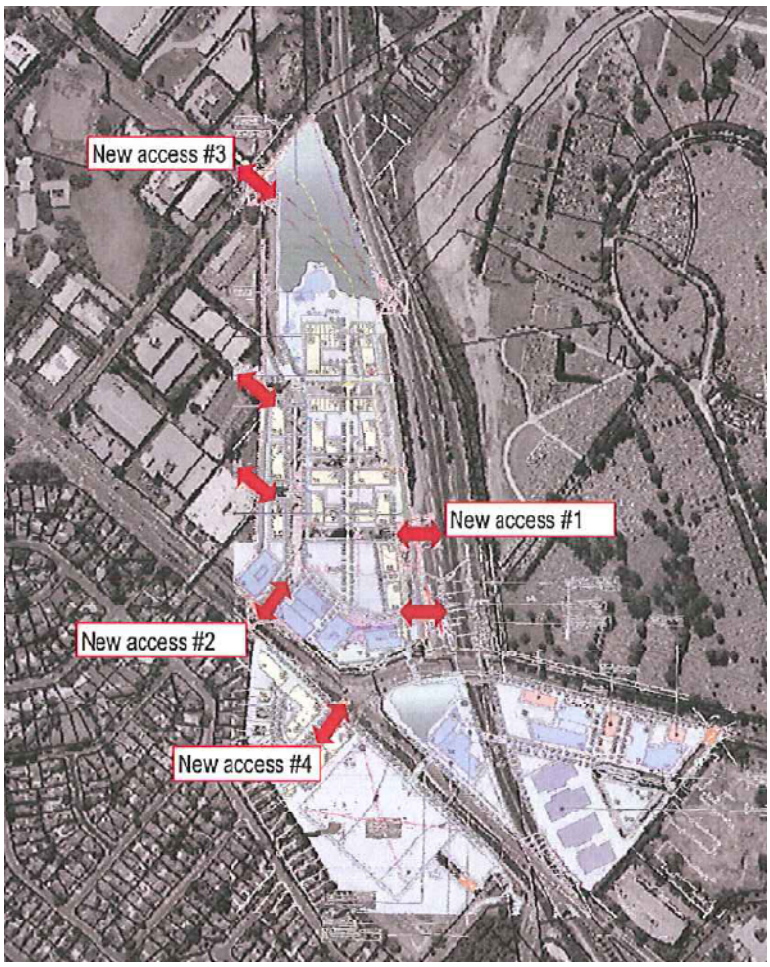
8 APPENDIX A - TRANSPORT AND ACCESS BACKGROUND REVIEW

The various Concept Plan sites, particularly the M2 Site, have been the subject of a number of traffic investigations over the few years as part of the preliminary masterplanning process. These investigations are summarised in the following sections and, where relevant, referenced in the main body of the report.

8.1 Macquarie Park Land Owners Group, Site Access Assessments (Bitzios for TCA, August 2008)

Subsequent to the MPTS, TCA appointed Bitzios to undertake a site access assessment of the sites that are the subject of this current study. The access locations investigated are shown on Figure 18.

Figure 18 Site Access Locations Investigated in 2008



The study's findings were as follows:

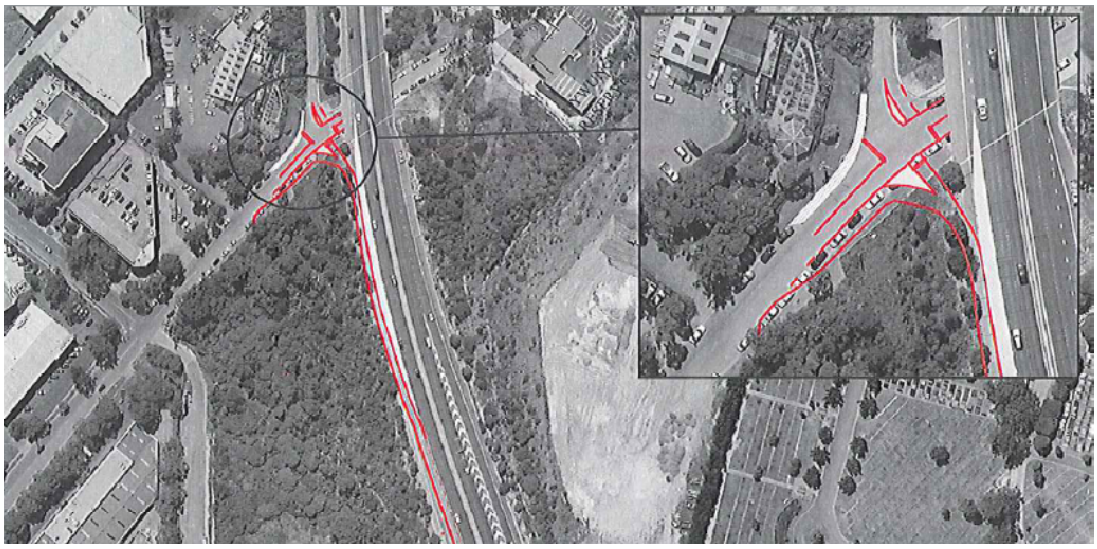
- Access location 1 – left in/left out on the M2 westbound on-ramp: This was found to be an important connection providing access to the site and reducing traffic flow through other key intersections. Approval from the RTA should be possible because no apparent safety or capacity issues are evident.
- Access location 2 – left in/left out on Epping Road: This was found to be achievable with no adverse impacts on the safety or operational efficiency of Epping Road.

- Access location 3 – intersection of Wicks Road / Waterloo Road: This was found to be a suitable access location. In the longer term it could be a part of a connection to the M2.
- Access location 4 – intersection of Epping Road / Delhi Road: This was found to be a suitable location for an entry into the site from Epping Road westbound and Delhi Road. However, an exit from the site at this location is not possible due to the adverse impacts on operational performance of the signals.

8.2 M2 – Wicks Road Off-Ramp Assessment (Bitzios for TCA, September 2008)

Subsequent to the *Macquarie Park Land Owners Group, Site Access Assessments* (August 2008), Bitzios was appointed by TCA to conduct a more detailed assessment of an off-ramp to the M2 westbound at the northern end of Wicks Road (refer to Figure 19). The arrangement would provide an entry to the M2 Site for traffic heading northwest on the M2.

Figure 19 M2 – Wicks Road Off-Ramp – Indicative Layout



The most critical operational issue is the introduced weaving manoeuvres due to the close proximity of the Delhi Road on-ramp to the proposed Wicks Road off-ramp. Weaving analysis was undertaken using the US Highway Capacity Manual.

It was found that the distance between the ramps would be approximately 700m which is substantially less than the generally accepted minimum distance. Unsafe weaving manoeuvres would be likely to occur.

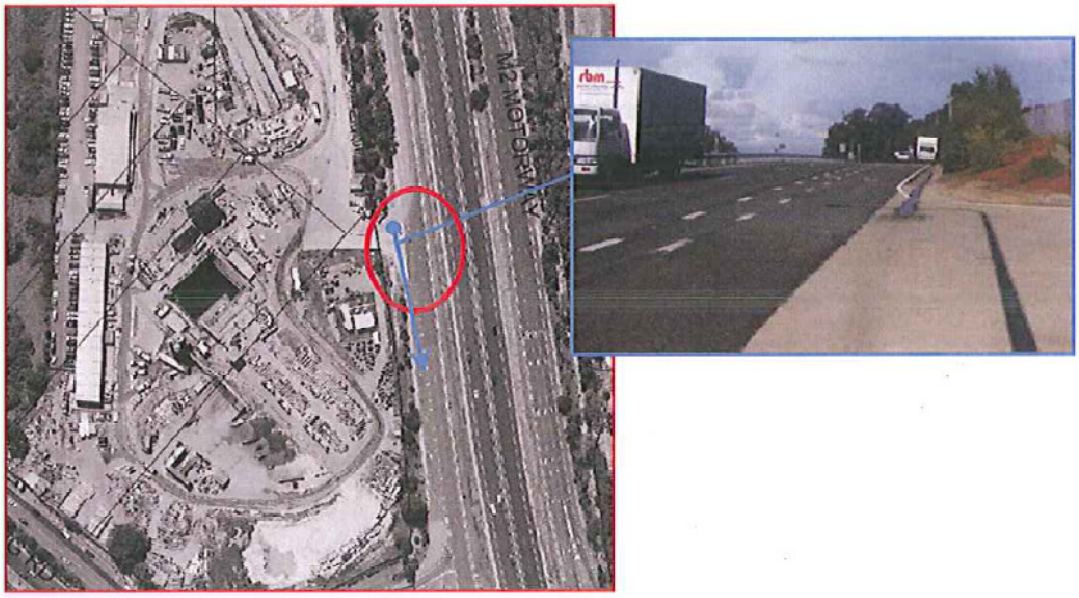
Bitzios's final recommendation was:

> *"Overall, given the inherent operational issues with the 'at-grade' off-ramp, the cost/impact of regrading the Delhi Road ramp and the relatively short life of this facility, a braded Wicks Road off-ramp (i.e. over the Delhi Road on-ramp) would appear a more cost effective solution than at at-grade off-ramp/weave panel on the M2".*

8.3 M2 Site Access Relocation Advice (Bitzios for TCA, October 2008)

Subsequent to the *M2 – Wicks Road Off-Ramp Assessment*, Bitzios was appointed by TCA to investigate shifting the proposed access location 1 (refer to section 8.1) approximately 100m to the south of the location shown in Figure 20. The access, which would still be on the Delhi Road on-ramp, would be a left in/left out layout including deceleration and acceleration lanes.

Figure 20 M2 – Delhi Road On-Ramp – Indicative Layout



The main advantage of this location is that it involves a slower speed environment compared to the main through lanes of the motorway or the northern section of the Delhi Road on-ramp.

The proposal was found to be feasible with a requirement that the intersection be located at least 66m from Delhi Road.

In late 2008, subsequent to the Bitzios advice, TCA had informal discussions with RTA/Transurban on this issue. The RTA/Transurban response was that a number of constraints exist that make provision of such an access unlikely to be approved:

- An existing short right turn lane for Delhi Road westbound onto M2. The access would increase traffic on this movement that is already at capacity.
- The access would lead to a significant increase in U-turns coming off the M2 eastbound then turning onto the M2 westbound on-ramp then into the site.
- The proximity of the M2/Delhi Road intersection to the Epping Road/Delhi Road intersection is a significant constraint and capacity enhancement will be required in the future.
- A more detailed traffic study, using forecast traffic volumes 20 to 30 years into the future, would need to be undertaken before RTA/Transurban would consider such an access.

9 APPENDIX B – SELECTED FIGURES FROM MACQUARIE PARK CORRIDOR DEVELOPMENT CONTROL PLAN 2010

Figure 21 MCPC DCP 2010 - Figure 4.5.05 Street Network Structure Plan

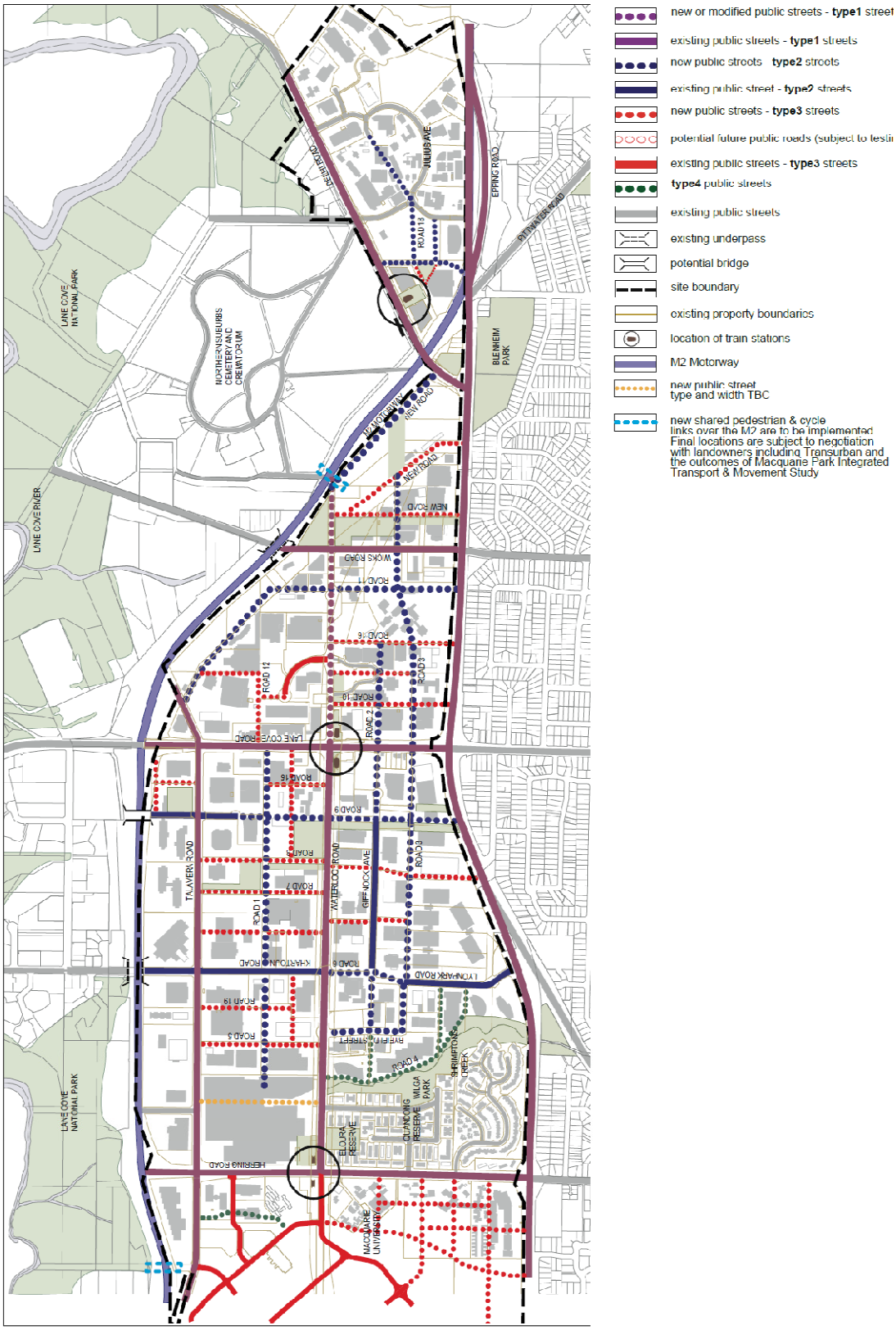
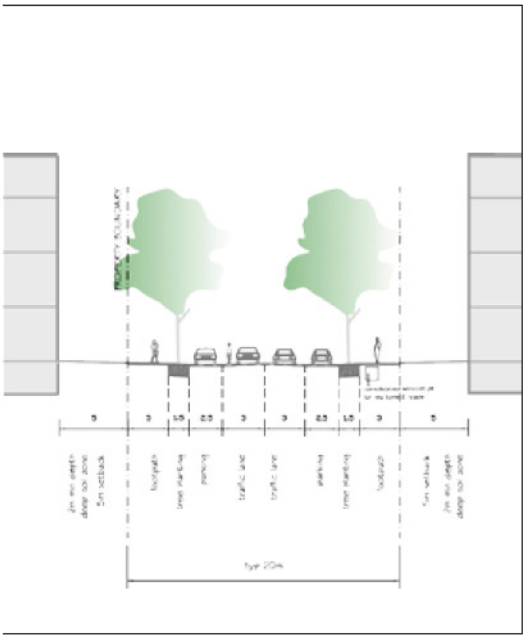


Figure 22 MCPC DCP 2010 - Figure 4.5.53 Type 1 streets section (30m road reserve)

Figure 23 MCPC DCP 2010 - Figure 4.5.55 and 4.5.56 Type 2 street section (20.4m or 22.2m road reserve)



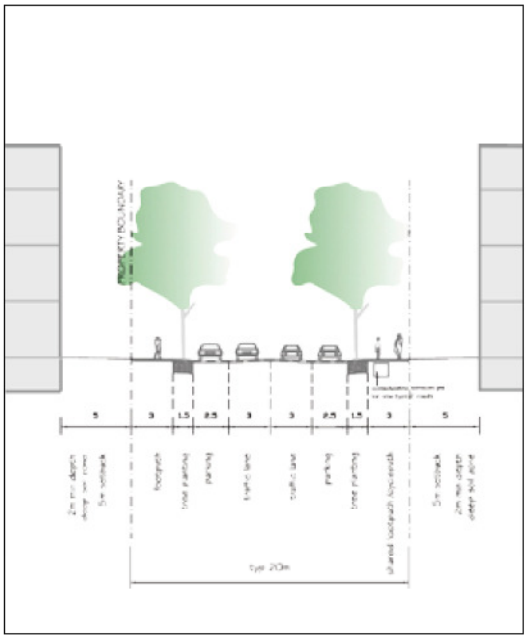


Figure 24 MCPC DCP 2010 - Figure 4.5.58 Type 3 streets section (15.5m road reserve)

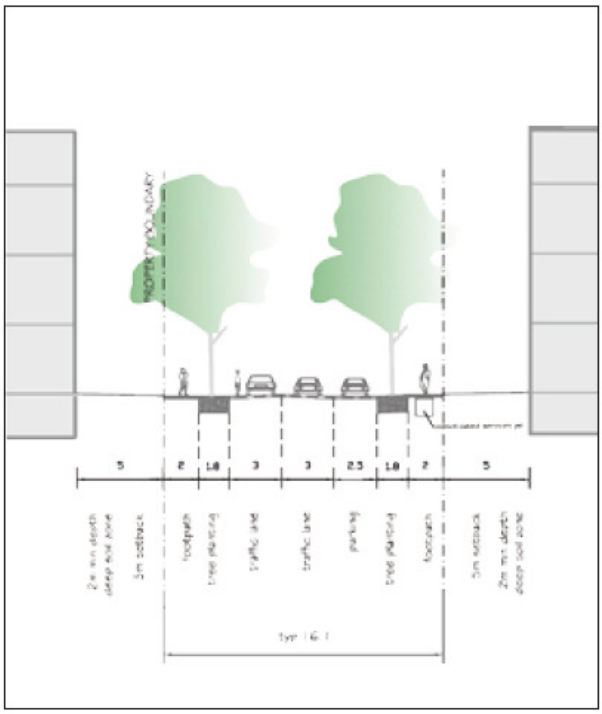


Figure 25 Macquarie Park Corridor Parking Restrictions Map (sheet 9)