

Area 20 Transport and Access Study

Final Report

Department of Planning

October 2010



Area 20 Transport & Access Study

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Executive Summary

This report details the findings of a transport and access investigation for the Area 20 precinct in the North West growth centre of Sydney. The precinct comprises about 245 hectares of land at the corner of Schofields and Windsor Roads, Rouse Hill.

The DoP is proceeding with the precinct planning of Area 20. As part of that precinct planning process, transport and access investigations are required to feed into the development of an Indicative Layout Plan (ILP). The Precinct is anticipated to yield more than 2,200 dwellings and about 6,000 persons at full development (average occupancy of 2.8 persons per dwelling). The Draft ILP accommodates the proposed North West Rail Link (NWRL), a rail station to the north of Schofields Road between Tallawong and Cudgegong Roads and a stabling facility in the vicinity of Tallawong Road. The Precinct is anticipated to accommodate employment and retail land uses around the station and stabling yard.

This Transport and Access Study defines the road hierarchy, road classifications and other initiatives required to accommodate forecast traffic and other activities across the Precinct at full development. The key findings are as follows:

- The ILP should provide for a Commercial Road West but it should not be a higher order road. The road should have a collector road classification with a maximum of two through traffic lanes plus kerbside on-street parking.
- Commercial Road West should not be an extension of Commercial Road and should provide for signalised left in/left out only traffic access at its intersection with Windsor Road.
- The ILP provides for road over rail connections to Schofields Road at Terry, Cudgegong and Tallawong roads.
- The intersection of Tallawong Road with Schofields Road should be retained but realigned to intersect with the Ridge Road.
- Cudgegong Road is proposed to be extended to intersect with Schofields Road in order to provide access to and from the proposed 1,000 – 1,200 space commuter car park.
- The Commercial Road West should be terminated at Terry Road, such that there is only one vehicular crossing across the Creek within the Area 20 precinct.
- Forecast traffic activity suggests that the only vehicular road crossing of Second Ponds Creek should be on Rouse Road.
- All roads should be designed in accordance with the adapted cross-sections outlined in the BCC Growth Centre Precincts DCP.
- Rouse Road should be upgraded between Windsor Road and Tallawong Road in the short to medium term. Further examination will be required at about the 800 dwelling threshold to determine whether a western extension of Rouse Road beyond Tallawong Road is required as indicated in the North West Structure Plan. In the short to medium term east-west through traffic should be focussed on Schofields Road and to a lesser extent, Guntawong Road.
- Heavy vehicle movement through the precinct will be discouraged through a range of regulatory and design initiatives.

- The emerging pedestrian and Cycle plan must have regard to Council's proposed "Route 2" links via Rouse Road and Cudgegong Road.
- Whilst the emerging design of the rail link provides no cycle/pedestrian link within the 50 metres corridor, this is seen as an important access component within and through the Area 20 precinct and should be pursued.
- The Precinct should be developed so as to facilitate bus access along Schofields, Windsor, Tallawong, Rouse Roads, Commercial Road West and around the station precinct.
- In total, the rail line could trigger the need for a total of three bridges between Windsor Road and Tallawong Road. These include the Terry and Cudgegong Road bridges and a possible pedestrian crossing of the stabling yard to the west. The proposed Tallawong station will include an unpaid pedestrian crossing of the rail line and station structure to the west of Cudgegong Road.
- A draft North West Sector Bus Servicing Plan developed by the NSW Transport and Infrastructure (NSWTI) (now TransportNSW) proposes an all day route network. Area 20 would have direct service to Rouse Hill and Parramatta via Regional Route R2, and to Schofields Station via Regional Route R3. District Route D3 would also link the northern part of Area 20 to Rouse Hill. These remain unchanged in the Metropolitan Transport Plan (February 2010).
- Key transport related infrastructure items have been identified including a new Rouse Road bridge. Indicative cost estimates have been prepared which suggest total funding needs will amount to about \$29m excluding those items required to be provided and funded by the RTA and TransportNSW.

Analyses for this project were undertaken subsequent to the release of the NSW Government's *Metropolitan Transport Plan – Connecting the City of Cities* on 21 February 2010. The report does make reference to the provisions of the Plan as they relate to Area 20.

1.0 Introduction

Urbanhorizon Pty Ltd, in association with Road Delay Solutions, has been commissioned by the Department of Planning (DoP) to undertake transport and access investigations for the Area 20 precinct at Rouse Hill.

1.1 Scope

The purpose of the transport and access investigations is as follows:

- Inform the ILP process in respect of allotment yield and layout.
- Assess and test the transport impacts of the proposed development within the study area (Area 20 and part of Riverstone East).
- Recommend transport infrastructure and services required to accommodate the development.
- Consult with relevant agencies and prepare an infrastructure implementation plan.
- Take a multi-modal approach to the needs assessment of the development.
- Assess and suggest ways of reducing trip making and VKTs.

The investigation is strategic in nature, the outputs informing the ILP and Section 94 Contributions Plan.

1.2 Report Overview

The report comprises seven sections as follows:

Executive Summary

- 1.0 Introduction
- 2.0 Proposed Development
- 3.0 Existing Conditions
- 4.0 Future Travel Mode Assessment
- 5.0 Road Network Futures
- 6.0 Multi-Modal Futures
- 7.0 Implementation and Staging

Bibliography

Glossary

Appendix A – Metropolitan Transport Plan, February 2010

Appendix B – Model Run Outputs

Appendix C – Model Vehicle Generation Parameters

Appendix D – NSWTI Proposed All Day Bus Route Network

2.0 Proposed Development

A summary of the population and employment status of the growth centre and Area 20 is provided below. The outcomes of consultation undertaken in 2009 and 2010 with various NSW government agencies are also provided in Section 2.3.

2.1 North West Growth Centre

In 2006 there were an estimated 9,920 persons and 7,100 workers within the North West Growth Centre study area. The DoP specified forecasts for the same area to 2036 is an additional 70,000 dwellings and 38,000 workers.

2.2 Area 20 Precinct

The context map overleaf (**Figure 2.1**) shows the boundaries of the Area 20 precinct, the study area for the purpose of this investigation. At the commencement of the study, in the absence of the rail link and stabling facility, the precinct was anticipated to yield about 2,500 dwellings and about 7,000 persons at full development (the proposed ILP provides for more than 2,200 dwellings). Key amongst the Structure Plan elements is the provision for higher density housing in the area adjacent to the Rouse Hill Town Centre (RHTC). The North West Structure Plan also shows:

- Mixed use employment corridor along Schofields Road.
- Commercial Road extension between Windsor Road and Schofields Road.
- Rouse Road extension beyond Tallawong Road to the Riverstone Precinct in the vicinity of Oak Street.
- North West Rail Link to Vineyard via Rouse Hill.

2.2.1 Precinct Planning Status

In February 2009, DoP launched investigations of the released Area 20 to identify its suitability for different types of development. A team of consultants including Urbanhorizon Pty Ltd, are assisting in the preparation of an Indicative Layout Plan (ILP), which will show where roads, housing, infrastructure, public areas and services should be located. The specialist studies include transport and access (the focus of this report), masterplanning and urban design, land capability and contamination, noise and vibration, ecology, flooding and drainage and heritage. It is anticipated that an ILP will be placed on exhibition during 2010.

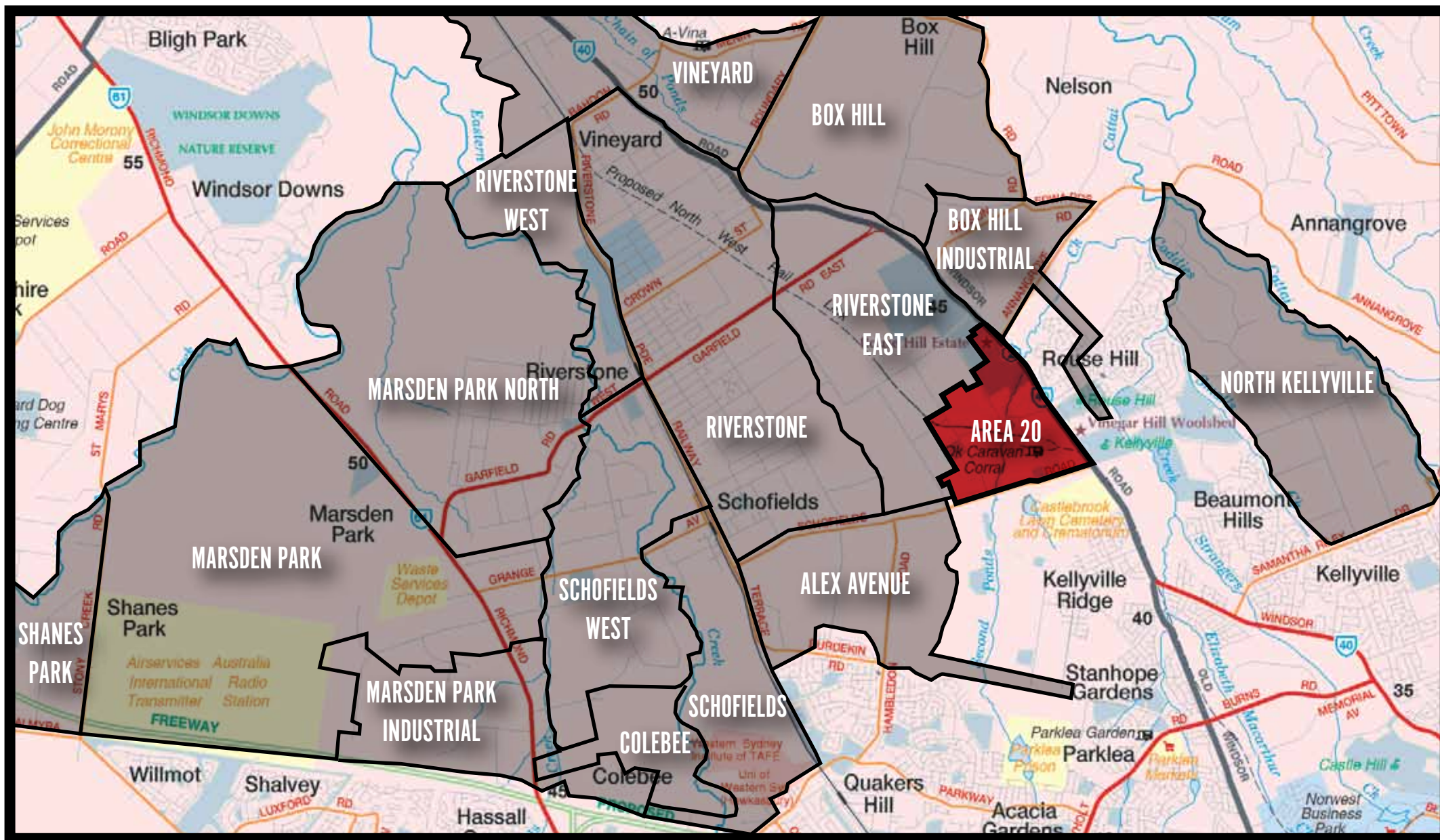


Figure 2.1 — Site Context

2.3 North West Rail Link Assumptions

The corridor will be about 50 metres in width. The alignment is 2.5 kilometres long and parallels Schofields Road from RHTC to a parking station at Tallawong Road. A future extension to the Richmond Rail Line is proposed beyond a stabling facility. The other assumptions with respect to the construction of the rail link are as follows:

- West of Terry Road most of the line will be in tunnel permitting development across and above the rail line.
- The rail portal is located immediately west of Terry such that bridge structures will be required at Terry and Cudgegong Roads and across the stabling facility to the east of the precinct.
- The crossing of the creek will be via rail bridge.

Whilst tunnel construction would be less intrusive to the Precinct, the cost of tunnelling all the line through the precinct would be prohibitive.

2.4 Consultation

A series of study stakeholder consultation meetings were held in 2009 and 2010 with government agencies including:

- DoP
- RTA
- MoT
- RailCorp
- Blacktown Council

The key outcomes of this consultation are summarised below. Ongoing consultation with BCC, RTA, NSWTI and other agencies has been undertaken throughout 2010.

2.4.1 Department of Planning

The key issues raised by DoP officers included:

- The preferred number of intersections along the Windsor and Schofields Road frontage to the site.
- The provisions of the North West Structure Plan and other relevant strategic transport plans.
- The recommended capacity and intersection treatments on the higher order roads within the precinct.
- The role and function of Rouse Road. The Rouse Road Second Ponds Creek crossing will need to be upgraded to allow all weather access and improved safety having regard to existing and proposed uses along Rouse Road.
- The number of vehicular crossings of Second Ponds Creek.
- Pedestrian access between the Area 20 precinct and the adjacent Regional Centre.

2.4.2 Ministry of Transport and TransportNSW

MoT/TransportNSW officers advised as follows:

- The need to make provision for bus access into and through the Area 20 precinct, via Rouse Road, Windsor, Schofields Road, Cudgegong Road and to the rail station. TransportNSW will be responsible for the interchange design of the station precinct and the commuter car parking facility.
- The MoT has prepared a North West Sector Bus Servicing Plan, a draft of which was made available to the Area 20 team in late November 2009. The key recommendations of the Plan are addressed in **Section 4.3**.
- The MoT has updated its Interchange Guidelines, the contents of which may be relevant to aspects of this Area 20 investigation.
- The need to make provision for train stabling for the North West Rail Link and a future extension beyond Rouse Hill.

2.4.3 Roads and Traffic Authority

RTA officers advised as follows:

- The options for the treatment of the Schofields and Windsor Road intersection are being examined. The preferred option is an at-grade intersection, although RTA officers advise that a grade separated intersection would be preferred after 2026. The Area 20 ILP does not preclude this grade separated option and sets aside land that would accommodate both options.
- A westward extension of the Commercial Road through the Area 20 site will not be required and need not be provided for in the ILP.
- The number of signalised intersections along Schofields and Windsor Road should be minimised.
- The RTA does not support reductions in prescribed corridor widths where they impact upon road safety and network operations.
- The future upgrade of Schofields Road will necessitate the need for Tallawong Road to be deviated through the corner lot (north-east corner) to provide an appropriate signalised intersection.
- The Cudgegong and Schofields road intersection can operate as a left in/left out intersection.
- AM/PM clearways or no stopping restrictions should be introduced along Rouse Road (Windsor to Tallawong Roads) consistent with its collector function.
- A full road shoulder should be provided on both sides of all collector roads and above (where only a single travel lane is to be provided) capable of holding a parked vehicle 3 metres wide from the face of the kerb.
- A pedestrian/cycle bridge should be provided across Windsor Road between the Schofields and Commercial Road intersections.

In relation to the RTA correspondence of 18 May 2010 the following information is submitted:

- The Netanal model has selected trips allocated between residential, employment and local retail/commercial zones. To simply increase the PM trip rate will

retain the length and destination of trips within the matrix. By manually applying retail trips to the PM peak the user has far more control on the origin and destination, given the scope of the retail land use within a region. These trips are not presented in the development growth tables as there are too numerous to detail.

- The Netanal model volumes may be low on select links, in comparison with other models of the study area, as a result of:
 - The inclusion of a considerable local road network.
 - Differing vehicle generation rates.
 - The assignment algorithm and route selection process in Netanal determines the impacts of intersection delay at each and every node which certainly differ from most available strategic modelling programs. As intersection delays increase with increases in link volume, route selection is made to improve travel time (trip cost) resulting in variation to alternate modelling packages.
- While Urbanhorizon and Road Delay Solutions have no RTA data with which to make a comparison between trip outputs, it is generally considered the vehicle projections on the major arterial corridors, within the study area, fluctuate between links as a consequence of the abovementioned factors.
- The conceptual intersection treatments (Figure 5.2), show the minimum treatments required to achieve the reported performance levels. They will differ somewhat from those prepared by the various road authorities but are intended as a guide for the purpose of DCP preparation and strategic costing.

2.4.4 Blacktown City Council

BCC officers advised as follows:

- Any at-grade intersection solution at the Schofields and Windsor Road intersection will need to address pedestrian access generally and movement between the Area 20 precinct and Regional Centre specifically.
- Any western extension of Commercial Road through the study area will need to ensure through traffic is discouraged by banning right turns into the Commercial Road West (from Windsor Road southbound), load limits and capacity limitations on the extension itself.
- Clearways may be needed along Commercial Road West during peak hours, especially along the southern side of the road.
- No further extension of Rouse Road west of Tallawong Road may be required, as Guntawong Road could provide an alternative east-west link through to the Riverstone Precinct.
- The location of a school on Rouse Road will require that the Transport and Access Plan minimise pedestrian/vehicular conflict at this location.

2.4.5 RailCorp

RailCorp officers advised as follows:

- The Plan would need to be developed having regard to the proposed relocation of Schofields Rail Station and the associated bus routing and servicing implications.
- Park and ride options at the new Schofields Station have been developed, but a preferred outcome has yet to be defined.

3.0 Existing Conditions

The existing situation with respect to mode shares, traffic volumes, public transport services, heavy vehicles, pedestrians and cyclists is described below.

3.1 Travel Demand

Total daily travel demand across the main travel modes has been documented in the October 2007 Riverstone and Alex Avenue Transport and Access Study (Arup, 2007). The report indicates that the travel zones in the vicinity of Area 20 accommodated a total of about 234,000 daily trips in 2004. The mode shares in the locality are summarised in **Table 3.1**.

Table 3.1 – Existing Travel Mode Shares, 2004

Travel Mode for all trip Purposes	Travel Mode Share
Car Driver	59.3%
Car Passenger	25.6%
Train	3.9%
Bus	2. %
Walk	7.5%
Bicycle	0.23%
Other	0.67 %
Total	100 %

Source: HTS / Arup, 2007

Analysis undertaken as part of the Alex Avenue and Riverstone ILP preparation reaffirms that walking and cycling are locally based travel modes. Conversely, rail travel is primarily regionally based. Most car travel and bus travel is regional, although about 30% is locally based.

3.2 Roads and Traffic Activity

The Area 20 precinct is bounded by two classified arterial roads, Windsor Road and Schofields Road. In 2005 the Annual Average Daily Traffic (AADT) volume along Windsor Road in the vicinity of the site was about 40,000 veh/day (2005). The AADT Schofields Road west of Windsor Road was about 11,000 veh/day (2005).

Windsor Road has been widened to either four or six lanes between Windsor and Kellyville over recent years. At the Area 20 precinct the road comprises two through lanes northbound and three through lanes southbound.

At the recently completed four way intersection between Windsor Road, Rouse Hill Drive and Schofields Road, Windsor Road comprises:

- A left turn slip lane into Schofields Road
- A left turn slip lane into Rouse Hill Drive
- A single right turn bay into Rouse Hill Drive
- A single right turn bay into Schofields Road
- A single northbound bus only through lane

At the Windsor Road intersection, Schofields Road comprises:

- A left turn slip lane into Windsor Road
- An acceleration lane from Windsor Road
- Dual right turn lanes
- Dual through lanes to Rouse Hill Drive



Photograph 1 – Looking east along Schofields Road towards Rouse Hill Drive and the Regional Centre, February 2009

A summary of the existing peak hour two way traffic volumes on key roads within the study area has been prepared on the basis of RTA and BCC supplied count information. Refer to **Table 3.2**.

Table 3.2 – Current Traffic Volumes, 2005

Road	AM Peak	PM Peak	Daily	Percentage Heavy Vehicles (%)
Windsor Rd (nth of Merriville Rd)	4,000	4,000	38,829	10
Windsor Rd (sth of Garfield Rd)	3,300	3,300	31,652	10
Schofields Rd (near Second Ponds Ck)	600	540	10,903	5

Source: RTA & BCC, 2008

3.3 Public Transport

An overview of existing bus and rail services in the locality is provided below.

3.3.1 Bus Services

The existing Rouse Hill, Quakers Hill, Kellyville Ridge and Parklea Area bus routes provide reasonable levels of frequency during the average weekday. This includes the Transitway Services introduced in 2007 (T63, T64 and T65).

Table 3.2 – Existing Bus Service Frequencies, 2009

Route	Inbound (to City & Blacktown)					Outbound (to Schofields & Rouse Hill)				
	0 – 9am	9am-3pm	3-6pm	6-12pm	All Day Total	0 – 9am	9am-3pm	3-6pm	6-12pm	All Day Total
610 / X Rouse_H to City via Castle H	4	12	6	4	26	4	12	6	5	27
741 Castle_H Kellyville_R Blacktown	8	12	7	6	33	7	12	6	7	32
751 / 2 Quakers H Blacktown	15	12	6	7	40	6	12	8	11	37
T63 Kellyville_R & Parklea Transitway	7	6	3	0	16	1	7	5	2	15
T64 Rouse_H Transitway	8	6	1	0	15	0	5	4	6	15
T65 Rouse_H Transitway	10	11	6	10	37	7	12	8	12	39

Source: Westbus, 2009

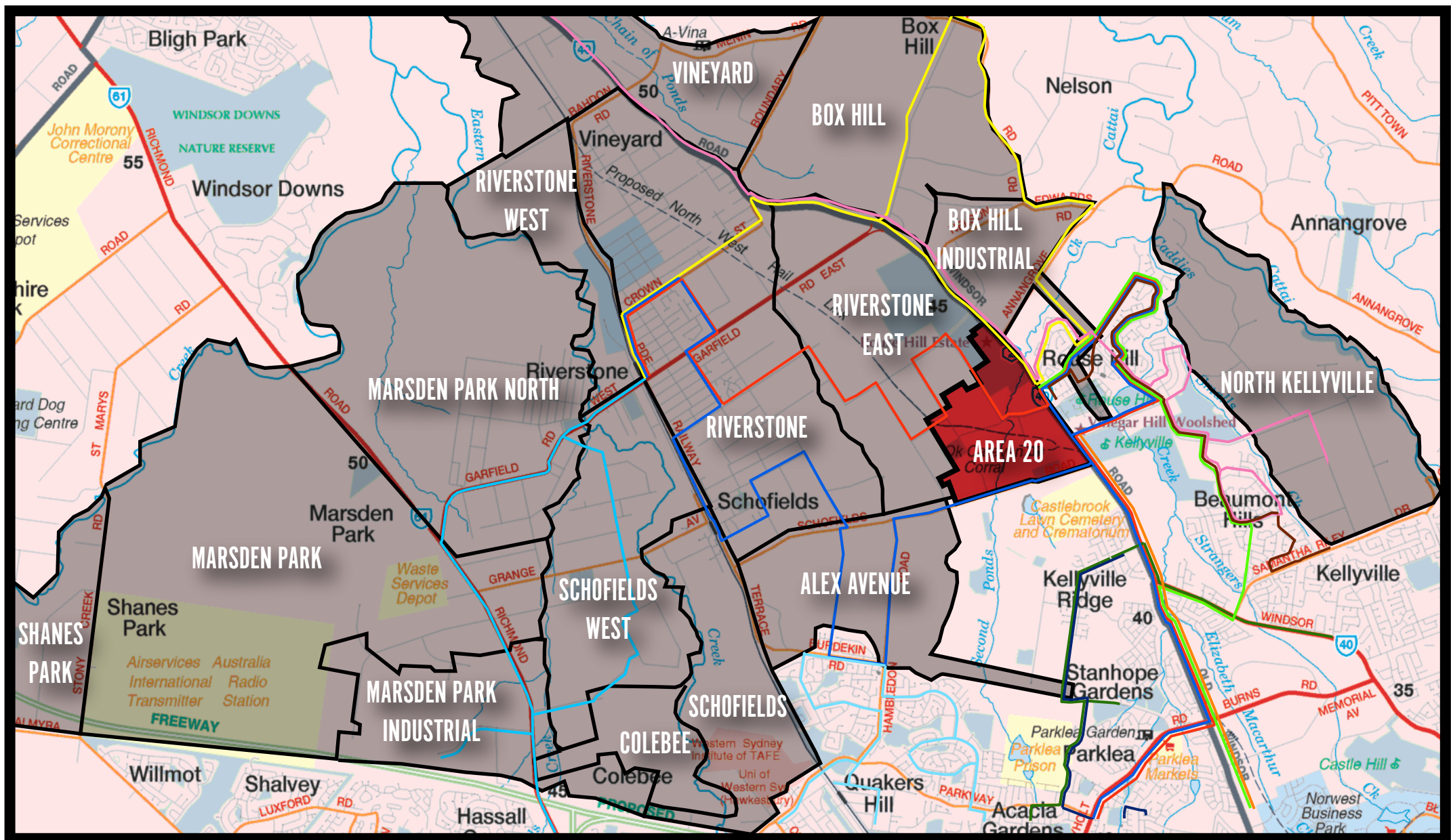


Figure 3.1 — Existing Bus Routes

The current number of local and regional bus services in areas surrounding Rouse Hill, Quakers Hill, Kellyville Ridge and Parklea is about 165-167 scheduled inbound and outbound services. T-Way bus services link the area at RHTC with Parramatta and other centres in the locality.

3.3.2 Rail Services

The nearest train station to the Area 20 precinct is Schofields Station, which is located about 5.4 kilometres from the Windsor/Schofields Road intersection. There are about 37 rail services each weekday from Schofields to the Sydney CBD. Travel time from Schofields to Parramatta is about 35 minutes and about 60 minutes to Central Station. Between 5:00 AM and 9:00 PM weekday trains run about one every 30 minutes. In 2005 there were about 1,800 outbound passengers using trains from the locality destined for Parramatta or the Sydney CBD.

The bus services shown in **Figure 3.1** link the Area 20 site with Schofields Station either directly along Schofields Road or via lower order roads in the area.

3.4 Heavy Vehicles

The impact of heavy vehicles was, and continues to be, a significant issue in the precinct planning being undertaken in Alex Avenue and Riverstone. This stems from a number of factors, including the proximity and role of Windsor, Richmond and Schofields Roads, the existence of truck generating (industrial) land uses and the location of Area 20 and other precincts between Windsor and the M7 Motorway.

Area 20 is unlikely to bear the brunt of through heavy vehicle traffic movements, however, heavy vehicle percentages along both Windsor and Schofields Roads are forecast to remain high. Current heavy vehicle percentages along Windsor and Schofields Road are about 10% and 5% respectively. Investigations undertaken during the preparation of the Alex Avenue and Riverstone ILPs indicate that the main heavy vehicle movements are as follows:

- Via Riverstone Parade.
- Via Bandon Road en-route to and from Windsor Road.
- Via Garfield Road en-route to and from Windsor Road.

Arup (2007) notes that the number of daily truck movements through the Riverstone town centre approaches 3,000 trucks/day.

3.5 Pedestrians and Cyclists

HTS supplied mode share information indicates that residents and workers in the locality do walk to and from rail and bus interchanges for journey to work trips “in numbers consistent with other areas across Sydney”. Conversely, the use of bicycles is negligible and needs to be increased as part of the development of the Area 20 ILP. Current travel mode share is 7.5% for walking and about 0.2% for cycling. The upgrade of Windsor Road and the proposed improvements to Schofields Road provide for shared footpaths and cycleways. The network developed internally within Area 20 will need to interface with these existing peripheral systems.



Photograph 2 – Looking west along Commercial Road towards Area 20, February 2009

3.6 Summary

The key findings are summarised as follows:

- Existing mode shares within the locality are too heavily biased towards the private motor vehicle.
- AADT along Windsor and Schofields Road is about 40,000 and 11,000 veh/day, respectively.
- An RTA/Landcom upgrade plan for Schofields Road provides for a 41 metre wide road reservation along the southern boundary of the Area 20 Precinct. This may be greater than 41 metres if a proposed 'Boulevard' option is adopted.
- The RTA/Landcom upgrade plan for Schofields Road provides for an intersection with Ponds Boulevard.
- RTA officers acknowledge that there may be no need to provide for a western extension of Commercial Road through the Area 20 site. The intersection of Commercial Road West and Windsor Road could be left in / left out only as provided for in the preferred Area 20 ILP.
- The ILP does provide for Commercial Road West in the south-eastern corner of the Area 20 precinct.
- Bus services in the vicinity of the site operate at an average peak period frequency of one service every 15 minutes.
- Rail service frequencies average about 30 minutes at Schofields Station.

4.0 Future Travel Mode Assessment

4.1 Land Use Change

The Area 20 Precinct is planned to accommodate more than 2,200 residential lots in both low and higher density forms. Medium / high density is to be located in the south east corner of the precinct, with the bulk of remaining residential being medium density except for a small amount of lower density residential in the precinct west of Terry Road. The Draft ILP provides for an open space network focussed on a linear open space link along Second Ponds Creek. Neighbourhood uses including a Primary School and community uses are located on Rouse Road while a local centre and mixed uses will be located near the proposed rail station.

4.2 Road Traffic

4.2.1 Schofields Road and Commercial Road West

The RTA, in collaboration with Landcom, has developed a road upgrade plan for Schofields Road between Windsor and Richmond Roads. In the vicinity of the Area 20 Precinct the upgrade plan provides for an ultimate 41 metre wide road reservation comprising four through traffic lanes plus right turn lanes and a generous median. It is understood that the RTA is also considering a more generous 'Boulevard' option that would see the total road reserve widened to 43 metres. The first stage of the upgrade will be between Windsor Road and Tallawong Road, the entire length of the southern boundary of Area 20, and is scheduled to begin construction by 2011. The upgrade plan also makes provision for the following:

- A new four way intersection at the Schofields/Commercial Road West / Ponds Boulevard.
- A left in / left out T-intersection at Schofields/Cudgegong Road.
- A realigned four way intersection at Schofields / Tallawong/Ridge Line Drive.
- A four way intersection at Schofields / Hambledon Roads.

Discussions with RTA officers have reaffirmed that a westward extension of Commercial Road through the Area 20 site will not be required. Provision will be made for traffic ingress and egress along Commercial Road West (at Windsor Road) via a left in / left out intersection. That is, through traffic movement between the existing Commercial Road and the proposed Commercial Road West will not be possible.

Schofields / Windsor Road Intersection

With respect to the intersection of Schofields Road and Windsor Road, RTA officers advise that a grade separated intersection would be preferred after 2026. The Area 20 ILP does not preclude this grade separated option.

4.2.2 Internal Road Network Consideration

The internal Area 20 Precinct road network has been developed subsequent to the examination of a number of internal road network scenarios assessed with the aid of the NETANAL Model. These are addressed in **Section 5.3**.

Capacity thresholds, published by Austroads, are based on the particular road function to ensure an acceptable LoS of 'D', or better. These thresholds are compared to the projected vehicle volumes to ascertain the required mid block capacity requirements of specific road types. These thresholds have been used to determine the mid block lane configurations throughout Area 20.

The capacity of each particular road type has been determined (See **Section 5.3**) by considering a number of key factors, noted in Austroads '*Roadway Capacity*' manual, including, but not limited to:

- Vehicle speed.
- Volume of vehicles demanding to use the carriageway (linked to road classification).
- Potential for lane changing (higher vehicle volumes reduce the incidence of lane changing).
- Available lane widths and lateral clearances.
- Surrounding land use characteristics (industrial, residential, retail, commercial, etc.).
- Vertical and horizontal carriageway alignments.
- Carriageway condition.
- Carriageway access (driveways, side street intersections, etc.)

4.3 Public Transport

NSWTI (now TransportNSW) officers provided the Area 20 team with a copy of a Draft North West Sector Bus Servicing Plan in late November 2009. Nothing in the Draft ILP precludes or is inconsistent with the broad thrust of the NSWTI Draft Plan. The road network and hierarchy has been developed such that bus access into and through the precinct will not be precluded.

The NSWTI Draft Plan proposes an all day route network (**Appendix D**) based on:

- Regional routes that offer a higher frequency service connecting town centres to town centres, town centres to regional centres and serve employment centres. These bus services run into the evening.
- District routes which run less frequently, do not run into the evening and seek to serve 90% of the resident population located within 400m of the service.

The Plan assumes a resident population in Area 20 of about 4,200 persons at full development. Area 20 would have direct service to Rouse Hill and Parramatta via Regional Route R2, and to Schofields Station via Regional Route R3. District Route D3 would also link the northern part of the area to Rouse Hill.

Subsequent to the release of the Bus Servicing Plan, the NSW Government announced the *Metro Metropolitan Transport Plan – Connecting the City of Cities* on 21 February 2010. The key elements of the Plan that potentially impact the Area 20 precinct include:

- New express rail services along the Richmond rail line to the west of the precinct. This will be made possible by the implementation of a new relief rail line between Eveleigh and Wynyard station which eliminates the need for western trains to merge with suburban track before entering the CBD facilitating increased services along the western line.
- Start work on the 23 kilometre North West Rail Link from Epping to Rouse Hill in 2017. The link will include six new underground stations at Franklin Road, Castle Hill, Hills Centre, Norwest Business Park, Burns road and Rouse Hill and a new stabling facility west of Rouse Hill. (Note: The North West Structure Plan makes provision for a rail link along the alignment of Windsor Road via the RHTC terminating at Vineyard which will no longer be required).
- Investment in buses and strategic corridors. **Appendix A** shows the 'future Strategic Corridors' provided for in the Plan through the North West Growth Centre in the vicinity of Area 20. No details regarding timing of the future strategic bus routes have been provided. Discussions with TransportNSW officers in October 2010 reaffirm that these strategic routes are consistent with those identified in the 2009 Bus Servicing Strategy.

Officers within TransportNSW have been examining the possibility of an extension of the proposed NWRL from Rouse Hill to the Richmond rail line, generally along the alignment of Schofields Road as per the abovementioned Structure Plan. This includes

a station and stabling facility in the area between Tallawong and Cudgegong Roads, just to the north of Schofields Road. The Draft ILP makes provision for both the station and stabling facility.

Within Area 20 buses will be routed primarily along Collector Roads (Rouse Road, Commercial Road, Tallawong Road, etc.) which will have a carriageway width of 11 metres (within a 20-25 metre road reserve). This will be adequate to accommodate bus access during peak and off peak periods.

4.4 Heavy Vehicles

Through heavy vehicle traffic will be discouraged from entering the Area 20 Precinct by:

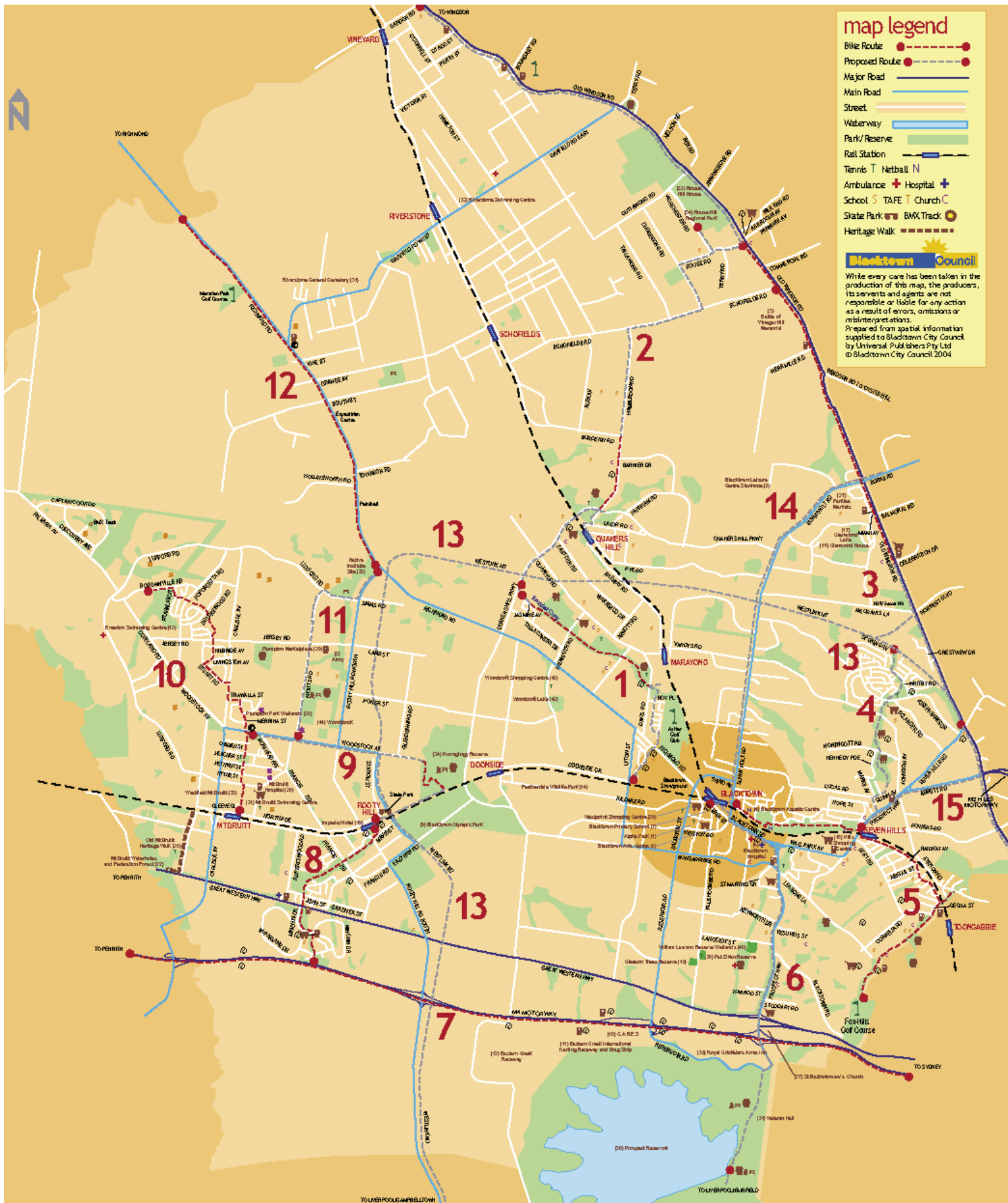
- Not providing for through traffic movement from Commercial Road through to Commercial Road West and limiting access to Commercial Road West to signalised left in / left out (at Windsor Road).
- Restricting available capacity along the Commercial Road West (2 through lanes in the off peak periods).
- By introducing a light vehicles only restriction along selected Area 20 roads including Rouse Road (buses excepted).
- Providing advisory signposting that requires that heavy vehicles use Windsor and Schofields Roads.
- Not providing for right turn movements from Windsor Road into the Commercial Road West.

4.5 Pedestrians & Cyclists

A planned cycle path, through Area 20 via Rouse Road and Mile End Road, will provide access to the Rouse Hill Regional Centre bus interchange. **Figure 4.1** details Blacktown City Council's Bicycle Network and in particular, Route 2 through Area 20. The proposal impacts Rouse Road and Cudgegong Road. These roads will be developed to accommodate a shared 2.0 metre wide footpath and cycleway on at least one side of the road reserves.

Pedestrian access between the Area 20 Precinct and the RHTC needs to be safe and convenient if mode shares to car are to be reduced. At-grade pedestrian access will need to be provided at each of the following locations:

- On all approaches of the signalised intersection of Windsor Road / Commercial Road West.
- On all approaches of the signalised intersection of Windsor Road / Schofields Road.
- East-west along Rouse Road at key intersections.
- North-south along Tallawong, Cudgegong, Windsor and Worcester Roads and along Second Ponds Creek as well.



4.6 Future Mode Shares

The design and layout of the Area 20 Precinct will be such as to bring about a change in travel mode share in favour of public transport, walking and cycling. The mode split of 'cars as driver' for the journey to work could be reduced by between 5 and 10% compared to existing surrounding areas. Similarly, the total VKT (vehicle kilometres travelled) to be generated by the proposed development should be reduced by at least 5% below that which would be generated by a 'conventional' approach to development. The target mode shares that form part of this Area 20 Transport and Access Plan are listed in **Table 4.1**.

4.6.1 The Mode Share Impact of the Rail Station

The provision of scheduled heavy rail services to and from a station located within the Area 20 Precinct will increase the likelihood that mode shares to public transport will approach or exceed the estimated 5-10% . The Mode shares for 'cars as driver' for the journey to work could be reduced by more than 5% compared to existing surrounding areas. Similarly, the total VKT (vehicle kilometres travelled) to be generated by the proposed development should be reduced by more than 5% below that which would be generated by a 'conventional' approach to development. The proportion of shorter car based trips is unlikely to change, however, some residents and workers needing to make longer car based trips to destinations at Parramatta and beyond, will use rail providing it delivers benefits in terms of travel time and convenience.

Table 4.1 – Target Full Development Travel Mode Shares, circa 2030

Travel Mode for all trip Purposes	Current Travel Mode Share	Target Mode Share	% Change
Car Driver	59.3%	55.0%	-4.3%
Car Passenger	25.6%	24.0%	-1.6%
Train	3.9%	5.0%	+1.1%
Bus	2.0%	4.0%	+2.0%
Walk	7.5%	9.5%	+2.0%
Bicycle	0.23%	1.5%	+1.27%
Other	0.67%	1.0%	+0.33%
Total	100 %	100 %	100 %

Source: Urbanhorizon Pty Ltd, 2009

4.7 Summary

The key findings are summarised as follows:

- The design and layout of the Area 20 Precinct aims to reduce car based trip generation and total precinct VKTs.
- The Precinct could accommodate more than 2,200 residential dwellings at full development (circa 2030).

- The proposed layout of residential densities in the context of the road network will be based on higher densities focussed towards Rouse Hill Town Centre, Rouse Hill Village and near the new rail station.
- Heavy vehicle movement through the precinct will be discouraged through a range of regulatory and design initiatives.
- The emerging pedestrian plan must have regard to Council's proposed "Route 2" links via Rouse Road and Cudgegong Road.
- The emerging road network must have regard to NSWTI's proposed "District Bus Route D3" via Rouse Road.
- The intersections of Rouse, Commercial, Schofields, Terry and Cudgegong Roads with Windsor Road must provide for safe and accessible pedestrian access.

5.0 Road Network Futures

This section details the outcomes of the traffic modelling having regard to the principles outlined below.

5.1 Principles

The projected volumes for the key road links within the Area 20 Precinct, are presented in **Table 5.3**. Internal, local roads are considered capable of managing the movement of about 630vph during the morning and evening peak periods. Refer to **Table 5.1** below. Collector roads, such as Rouse Road, Tallawong Road and the proposed Commercial Road West, are considered capable of managing about 900vph/l during the peaks.

Table 5.1: Mid Block Link Capacity Thresholds

Road Type Conditions	Lane Capacity at LoS 'F' (veh / hour)	Assumed Maximum Satisfactory Lane Flow in Vehicles / hour (LoS 'D')
Urban Divided / Undivided Highways with Clearways and signal coordination	1,500	1,350
Urban Divided / Undivided Highway conditions with interruptions	1,200	1,080
Rural Two-Way Two-Lane	1,400	900
2 Lane Residential Street with on street parking	700	630

Source: Road Delay Solutions, 2009

5.2 Model Runs

The Netanal model utilises defined travel demand between zonal pairs, represented as assimilated traffic movements, throughout the Sydney Metropolitan Area. The program incrementally assigns vehicular traffic onto a computer based road network developing link demand forecasts on each modelled section of road.

Route selection between zonal pairs is determined on the basis of the shortest travel time or cost, considering the inherent route delays incurred along possible link(s). Parameters such as link capacity, speed and distance are coded into the model, by the user, from which the program determines the relative vehicular delays on each route, selecting, after undertaking a prescribed number of iterations, the route with the shortest travel time. Costs and travel time are relative within the Netanal model. Time penalties are applied to turn movements, stops and delays and the like which in turn have a corresponding cost.

In the most general form, this 'cost' represents a combination of factors that drivers take into account when choosing routes through the road network; the most important of these factors are time and distance.

The premise on which the future year modelling has been based, specifically the route selection process, is the current value of time. Toll values, toll diversion penalties and socio economic decision making defaults, have not been increased with CPI or standard of living projections.

5.2.1 Incremental Assignment

In order to reflect the impact of congestion on route selection, Netanal assigns the traffic from the trip table as a series of equal increments. This process is outlined below.

The process commences by identifying the routes with the shortest travel times, for each origin-destination pair, with no traffic using the roads (i.e. based on sign-posted speed limits, green lights, etc). Known colloquially as increment 0 (zero), the link and intersection delays, accumulated over the modelled one hour, are tabulated for later reference. The first incremental run of the Model imposes the time delays recorded during Increment 0 and adds the delays to the travel time of each link. During the increment, routes yielding the lowest travel time between zonal pairs are chosen. Again the resultant delays on each link are recorded by the program.

Each subsequent increment performs ongoing route selection based on recorded delay and the resultant link travel times. As delays stabilise, so too does the route selection within the Model, until the optimum number of increments are run. At the completion of the incremental run, the optimum routes and vehicle demands on each link are reported.

Incremental convergence is employed to determine the projective stability and optimum number of increments. The process of incremental convergence involves the running of sensitivity models reflecting a differing number of increments, with the projected volumes on a select number of key links, reported. Once the differential change between the projected volumes, on each reported link, minimises, the Model is considered stable and the resultant number of increments are utilised in the project model runs. For this project, 20 increments were found to provide stability in link demand.

5.2.2 Assignment Calculations

Netanal calculates travel time on the basis of the capacity related, geometric and operational characteristics of roads and intersections defining the road network. The following are specifically incorporated in the calculations for the mid-block section of each link.

Speed-flow relationships As traffic volume increases, speeds on roads decrease and the relationships within Netanal take this into account. The speed is based on the ratio of the traffic flow to the nominated road capacity. Netanal assumes free flow

conditions on links up to a set value of degree of saturation (DS). This value is set to equal 90%. When traffic flows on a particular link exceeds the DS set value, the speed drops according to a speed flow relationship, to the power of four.

Transit lanes The proportion of traffic using the transit and non-transit lanes on a section of road is based on RTA surveys of Epping Road, Military Road and Victoria Road. The surveys reported that the transit lanes operated to a maximum of 50% of the adjacent trafficable lane. Illegal use was reported as 25% while the DS of the adjacent lane was below 0.75.

Bus lanes, and bus stops, can be included as part of the network. Netanal can report on travel time changes on these routes.

Those network characteristics, which may vary across a 24hr time of day operation, such as transit lanes, bus lanes, parking restrictions, toll fees, turn prohibitions, etc, are included in the network definition and further impact on the assignment route selection.

Intersection delay, calculated within the model, employs the *Austroad's* and *AARB* established formulae for the control of intersections operating as Give Way or Stop Sign, roundabout or traffic signals. For the latter the benefits of Sydney's coordinated signal control system, SCATS, on improved traffic flow are incorporated. A turn penalty is added to the travel time to represent the delay that is associated with pedestrian conflict with left turns and opposing traffic for right turns. Netanal specifically calculates both road mid-block and intersection performance. The model is therefore able to calculate queues when traffic demand exceeds capacity and incorporate the queuing delay in the calculation of travel time for each route. If the travel time remains lower on a particular route with queues, Netanal will continue to assign traffic to that route until such time as the queue results in a time delay that makes an alternative route more attractive.

5.2.3 Future Trip Matrix

The geographic region to be modelled is represented by a trip matrix (trip table), that details the individual travel demands between origin and destination pairs. Each distinct area representing a trip origin or end is called a 'Zone'. The Sydney Netanal model contains some 960 zones, following disaggregation. These elements define areas of homogenous land use (e.g. residential, industrial, retail, education, airports, hospitals) enclosed and linked by physical features such as major roads, railways and rivers. The trip table specifies the number of car trips travelling from each zone to every other zone in the modelled area.

The boundaries of these zones for the Sydney Metropolitan Area were defined in 1996, by the NSW Department of Transport's TPDC, and have been generic across all traffic and transport modelling activities undertaken in Sydney. New boundaries and a refined zonal pattern were defined by TPDC at the end of 2008, but have yet to be employed.

The assignment process described above essentially determines the anticipated route selection made by motorist between the 'origin' and 'destination' zone during a designated time period. The total number of trips between all the zonal pairs produces the projected traffic volumes reported by the model. **Netanal models the road network assignment over a 1 hour period.**

The future year trip matrices, produced by TPDC, have been developed from a 4 step travel model based on forecast population, employment and the transport network. These trip tables form the basis for the Netanal future year trip demands. Generally, the Netanal distribution for the future year trip tables of the Sydney Metropolitan Region has been retained from the TPDC trip matrices. However, irregularities have been found between the land use assumptions within the TPDC matrices and available data, making it necessary to disaggregate the coarse zone structure to better reflect the future year demand generations. Following the zonal disaggregation process, the sensitivity of the trip end distribution, for the NWGC, has been reported between select zones within the North West Growth Centre and regional catchments.

For the NWGC, an option has been written for Netanal to extract the zonal distribution of a trip matrix between a specified zone and an external zone, or region of zones, within or outside a cordon. This option has been utilised to discern the distribution from Riverstone, Schofields and Marsden Park for the purpose of trip matrix verification.

The vehicle generation parameters, adopted for this project, are presented in **Appendix C**.

As summarised in Section 4.2, earlier Model scenarios examined within NETANAL included the following:

- No Commercial Road West extension from Windsor Road.
- Rouse Road extended to Tallawong Road and Rouse Road extended west of Tallawong Road as shown in the North West Structure Plan.
- A second vehicular crossing at Second Ponds Creek.
- No Tallawong Road connection to Schofields Road.
- No Cudgegong Road connection to Schofields Road.

Copies of the most recent Netanal Model plots are provided in **Appendix B**. The Model produces forecast 1 hour peak volumes in both directions.

5.3 Model Outputs / Results

Commercial Road West

The Commercial Road West accommodates about 600 and 900 vehicles per hour (**Table 5.3**) in the AM and PM peaks, respectively under the ILP scenario at full development in 2036. This is consistent with its Collector Road classification, however, the left in/left out restriction at Windsor Road ensures that the link does not accommodate excessive through traffic.

Rouse Road

Under the ILP scenario, Rouse Road (east of Cudgegong Road) is forecast to carry about 500 and 600 veh/hr in the AM and PM peaks, respectively. Volumes immediately west of Windsor Road are forecast to be higher, 1,600 and 1,200 veh/hr in the AM and PM peaks, respectively. These volumes assume Rouse Road links with Tallawong Road to the west.

Tallawong Road

Tallawong Road (north of Schofields Road) is forecast to accommodate about 1,500 and 1,600 veh/hr in the AM and PM peaks, respectively. This would be consistent with its Collector Road function. Earlier modelling showed that having no Tallawong/Schofields Road connection would result in traffic diversion along both Cudgegong Road and the Commercial Road West, increasing flows beyond their road classifications.

Cudgegong Road

Cudgegong Road (north of Schofields Road) is forecast to accommodate about 500 and 600 veh/hr in the AM and PM peaks, respectively. This would be consistent with its Major Local Street classification provided the capacity of the proposed commuter car park does not exceed 1,200 spaces. Car parking capacity increases beyond this would require reclassification and the signalisation of the Schofields / Cudgegong intersection accommodating all or most traffic movements. Earlier modelling showed that deletion of the Cudgegong/Schofields Road connection would result in an increase in traffic along Tallawong Road, but at a level consistent with its classification. The RTA's Schofields Road Upgrade Plan provides for a T-Intersection between Cudgegong and Schofields Roads with left in / left out access only.

Terry Road

Terry Road (north of Schofields Road) is forecast to accommodate about 1,800 and 2,250 veh/hr in the AM and PM peaks, respectively. This would be consistent with its Collector Road function.

5.4 Road Network Infrastructure Needs

Table 5.2 summarises the key road needs for the Area 20 precinct. The model analysis and land use considerations reaffirm the following:

- A lower order Commercial Road West can be incorporated into the precinct road network.
- The Commercial Road West should not be a higher order road but should have a collector road classification with a maximum of two through traffic lanes plus kerbside on-street parking.
- Commercial Road West should not be an extension of Commercial Road and should provide for signalised left in / left out vehicular movements only at its intersection with Windsor Road.
- The intersection of Tallawong Road with Schofields Road should be retained but realigned to intersect with The Ridge Road.

Table 5.2 – Area 20 Key Road Design Requirements

Road	Forecast Peak Vol (veh / hr)	Classification	Required Reservation	Required lanes	Bus Access	Other
Tallawong	1,600	Collector	As per BCC Growth Centre Precincts DCP	4 through peak, 2 through off-peak	Yes	Buses
Cudgegong	600	Major Local	"	2 through	Yes	-
Rouse	1,600	Collector	"	4 through peak	Yes	Buses
Commercial Rd West	900	Collector	"	"	Yes	Buses
Terry Road	2,250	Collector	"	"	Yes	Buses

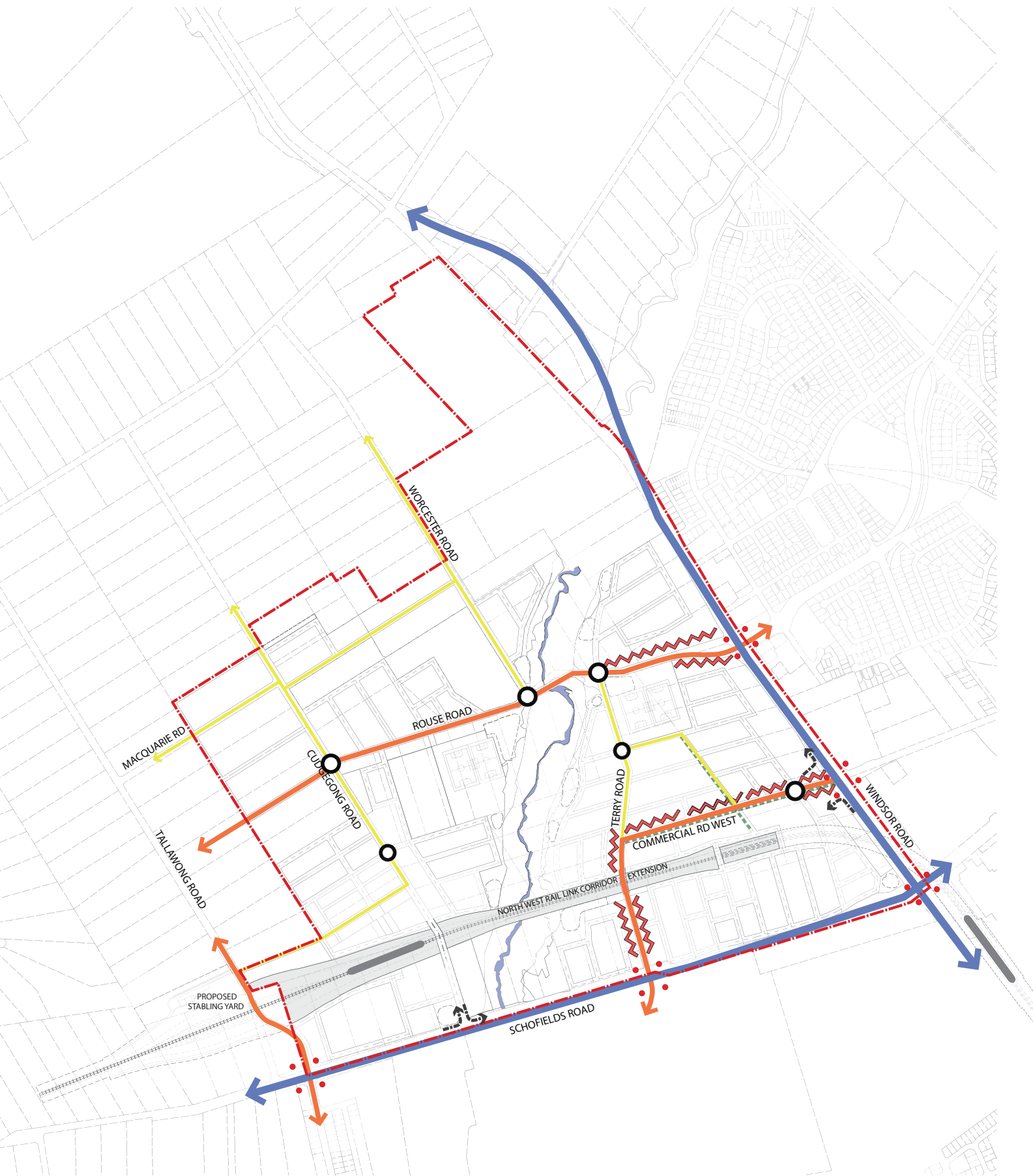
Source: Urbanhorizon Pty Ltd & RDS 2009

- Cudgegong Road can be extended to intersect with Schofields Road but only to provide for left in/left out movements. This is consistent with RTA planning and the RTA's Schofields Road Upgrade Plan which provides for a T-Intersection at Cudgegong and Schofields Roads with left in / left out access only.
- The Commercial Road West should be terminated at Second Ponds Creek, such that there should be only one vehicular crossing across the Creek within the Area 20 precinct (that is, at Rouse Road).
- All roads should be designed in accordance with the adapted cross-sections outlined in the BCC Growth Centre Precincts DCP.
- Rouse Road should be upgraded between Windsor Road and Tallawong Road in the short to medium term. Further examination will be required at about the 800 dwelling threshold to determine whether a western extension of Rouse Road beyond Tallawong Road is required (2036 Model outputs assume the extension is in place). Based on current estimates, this is likely to be by 2018 / 2020. In the short to medium term east-west through traffic should be focussed on Schofields Road and to a lesser extent, Guntawong Road (to the north of Area 20).
- The suggested full development intersection treatments are shown in **Figure 5.2**.

Table 5.3 – NETANAL Model Forecast Link Volumes, 2036

Road	Location		NB	SB	EB	WB	Total
Windsor	N of Rouse	AM	1736	2585			4321
		PM	2614	1394			4008
Windsor	N of Schofields	AM	1115	2102			3217
		PM	2404	1057			3461
Schofields	W of Windsor	AM			1363	806	2169
		PM			909	797	1706
Windsor	S of Schofields	AM	1527	2933			4460
		PM	2803	1478			4281
Worchester	S of Westminster	AM	143	38			181
		PM	111	58			169
Cudgegong	S of Westminster	AM	174	122			296
		PM	53	37			90
Tallawong	S of Westminster	AM	361	764			1125
		PM	649	726			1375
Rouse	E of Tallawong	AM			151	204	355
		PM			237	164	401
Rouse	E of Cudgegong	AM			178	317	495
		PM			219	368	587
Rouse	W of Windsor	AM			938	719	1657
		PM			615	605	1220
Commercial	W of Windsor	AM			296	317	613
		PM			280	504	784
Terry	N of Schofields	AM	616	1262			1878
		PM	1423	830			2253
Cudgegong	N of Schofields	AM	179	318			497
		PM	455	119			574
Tallawong	N of Schofields	AM	318	1203			1521
		PM	705	879			1584

Source: RDS, 2010

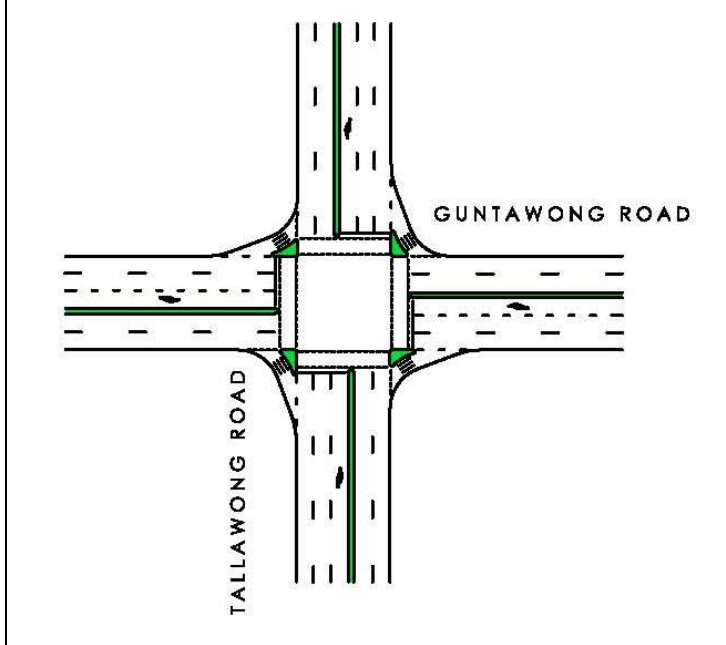
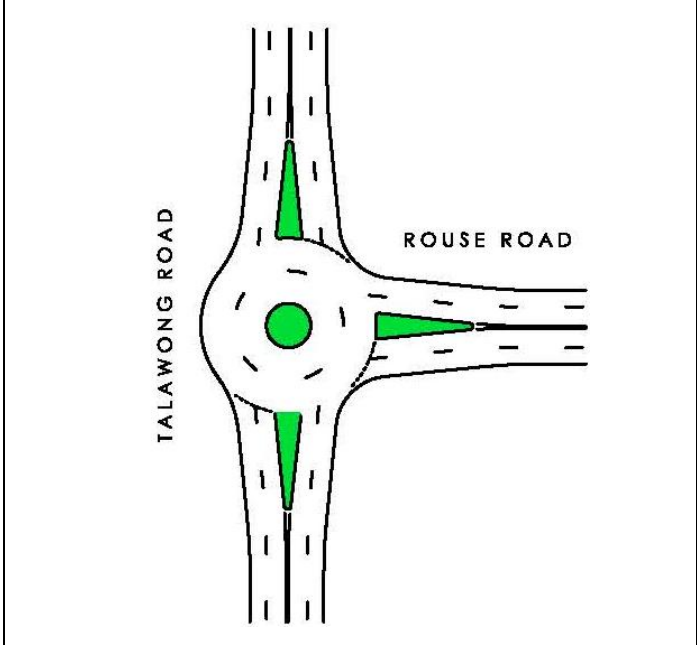
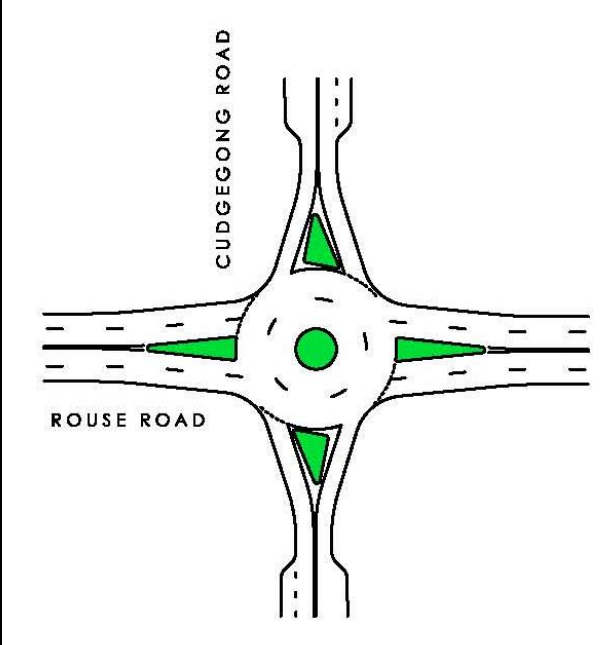
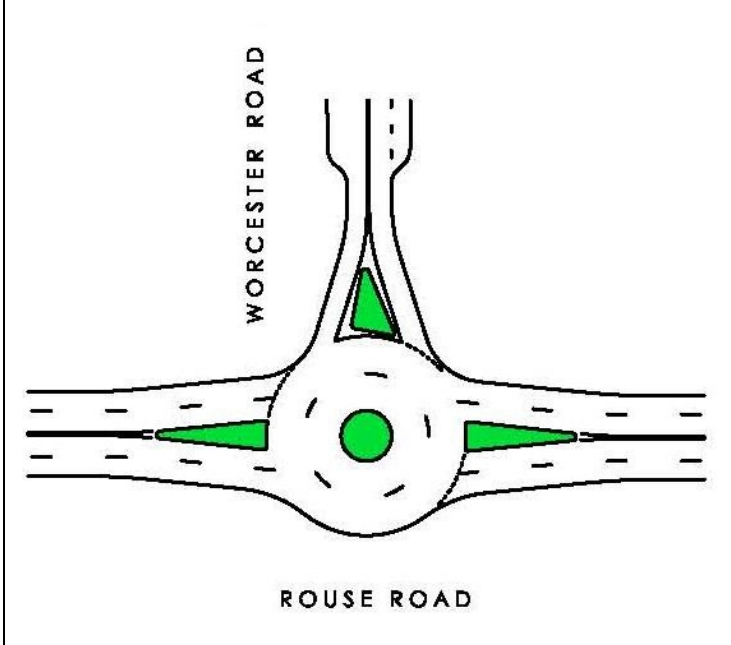
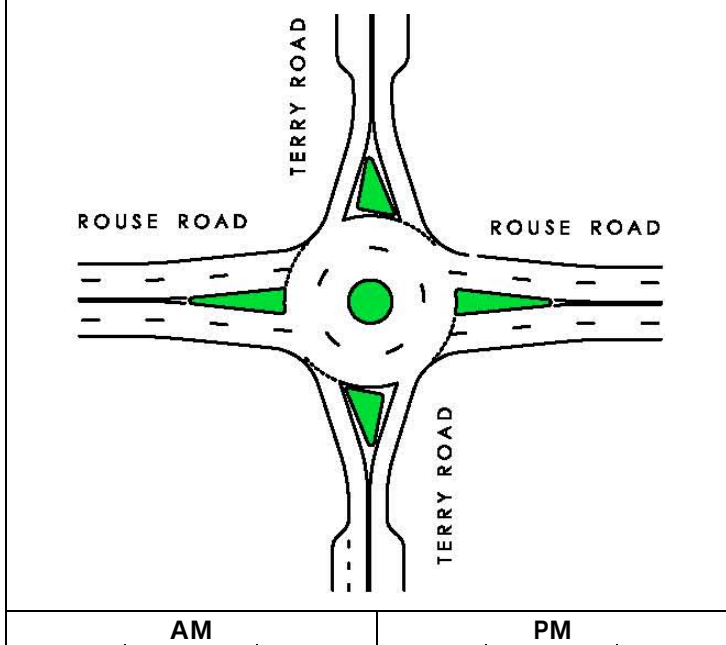
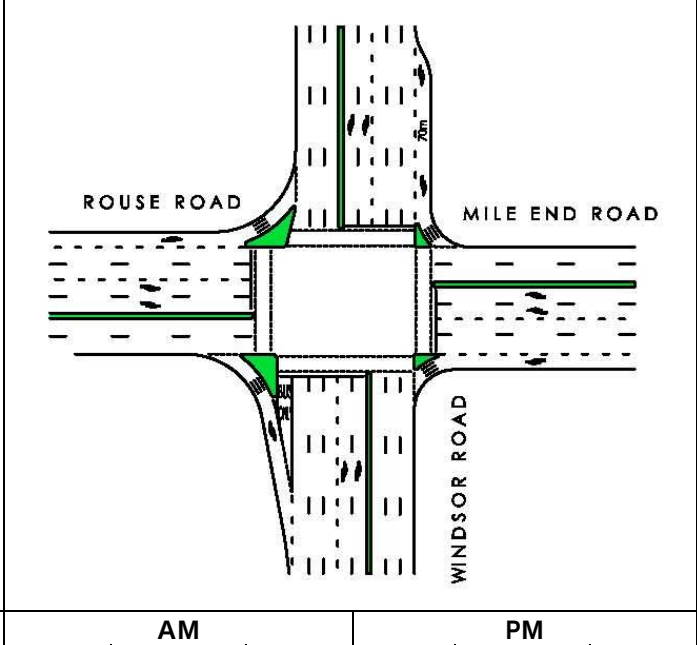
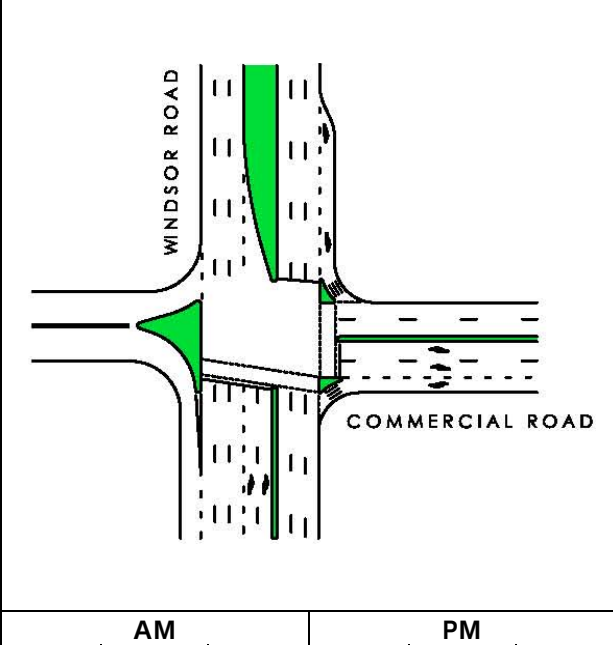
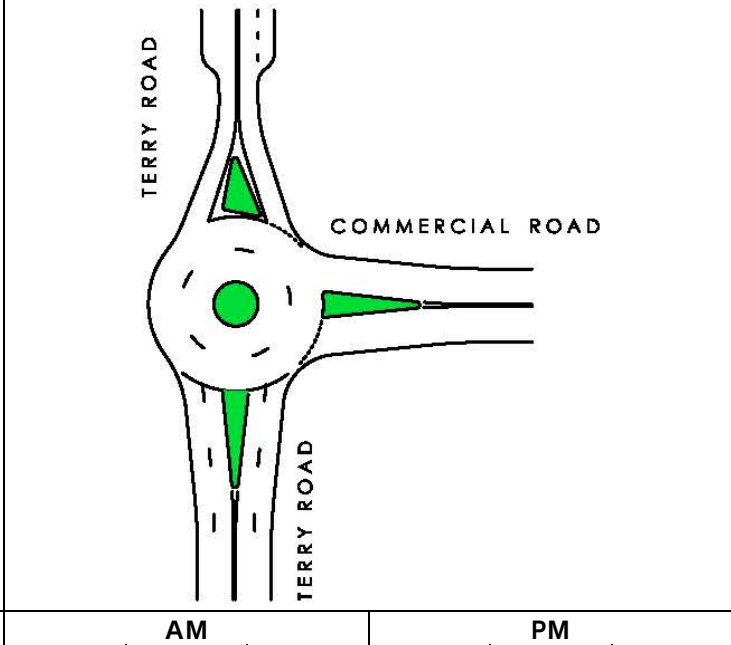


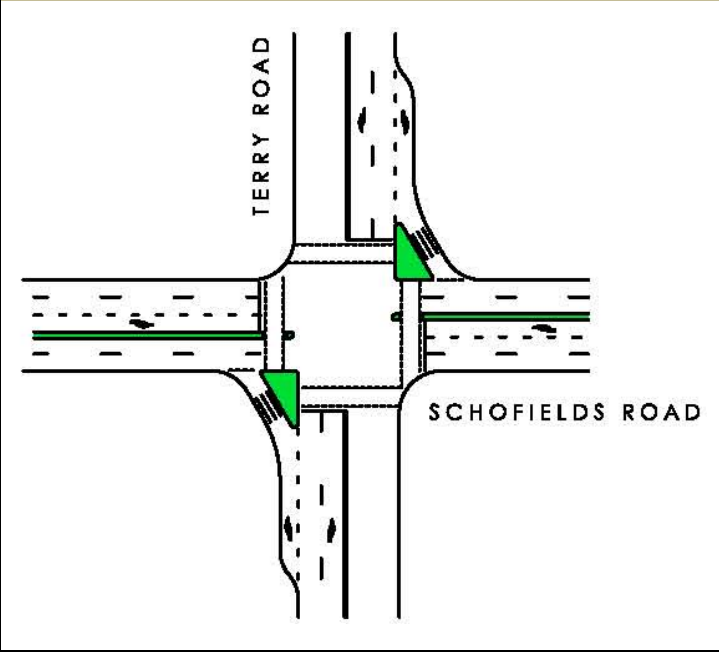
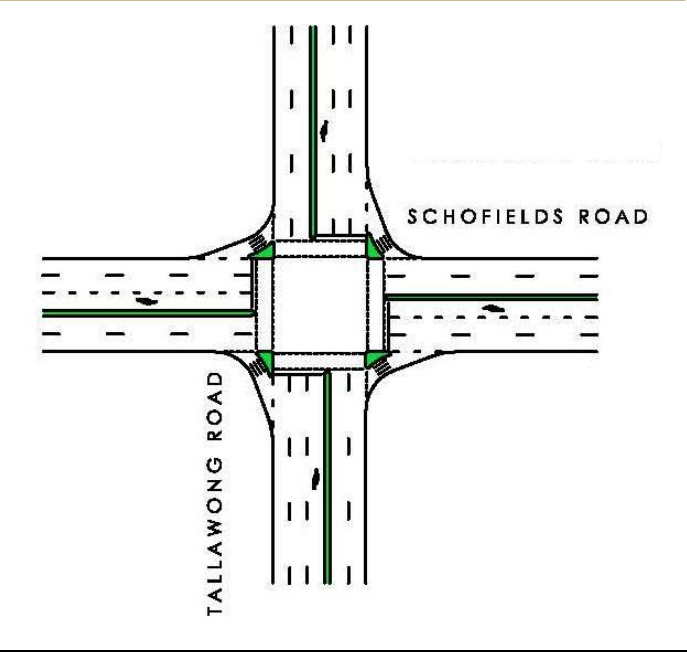
Road Network & Hierarchy

- | | | |
|--|---|---|
|  Precinct Boundary |  Other Local streets |  Left in - Left out
Signalised Intersection |
|  Creek Line |  No Direct Vehicular Access |  Roundabout |
|  Arterial Roads |  Widened Road Reservation
for Landscape | |
|  Collector Roads |  Signalised Intersections | |
|  Major Local Streets | | |



0 100 200 500m

Tallawong Road and Guntawong Road						Tallawong Road and Rouse Road						Rouse Road and Cudgegong Road						Rouse Road and Worcester Road					
																							
AM			PM			AM			PM			AM			PM			AM			PM		
DS	AVD (secs)	LoS	DS	AVD (secs)	LoS	DS	AVD (secs)	LoS	DS	AVD (secs)	LoS	DS	AVD (secs)	LoS	DS	AVD (secs)	LoS	DS	AVD (secs)	LoS	DS	AVD (secs)	LoS
0.43	9	A	0.46	15	B	0.61	9	A	0.62	11	A	0.29	9	A	0.29	11	A	0.21	12	A	0.22	12	A
Rouse Road and Terry Road						Windsor Road and Rouse Road						Windsor Road and Commercial Road						Commercial Road and Terry Road					
																							
AM			PM			AM			PM			AM			PM			AM			PM		
DS	AVD (secs)	LoS	DS	AVD (secs)	LoS	DS	AVD (secs)	LoS	DS	AVD (secs)	LoS	DS	AVD (secs)	LoS	DS	AVD (secs)	LoS	DS	AVD (secs)	LoS	DS	AVD (secs)	LoS
0.62	16	B	0.70	21	B	0.89	31	C	0.88	30	C	0.72	35	C	0.80	41	C	0.38	9	A	0.42	17	B

Schofields Road and Terry Road						Schofields Road and Tallawong Road					
											
AM			PM			AM			PM		
DS	AVD (secs)	LoS	DS	AVD (secs)	LoS	DS	AVD (secs)	LoS	DS	AVD (secs)	LoS
0.87	38	C	0.88	41	C	0.88	40	C	0.88	44	D

5.5 Summary

The key findings are summarised as follows:

- Local roads should carry about 630 veh/hr/l.
- Collector roads should carry about 900 veh/hr/l.
- A Commercial Road West is acceptable provided it does not connect with Cudgegong Road, its capacity is limited and it intersects with Windsor Road via a left in/left out arrangement.
- There is no need to provide for a western extension of Commercial Road through the Area 20 site.
- Rouse Road need not extend west of Tallawong Road in the short to medium term.
- Both Tallawong and Cudgegong Roads should connect with Schofields Road.
- The only vehicular crossing of Second Ponds Creek should be at Rouse Road.
- Road infrastructure should be designed in accordance with the BCC Growth Centre Precincts DCP.

6.0 Multi-Modal Futures

This section details the outcomes of the investigation into the needs of other modes across the Area 20 Precinct. Precinct requirements for rail, buses, pedestrians and cyclists are identified.

6.1 Public Transport

The roads that may be required to accommodate two way bus movement include:

- Schofields Road
- Windsor Road
- Commercial Road West
- Tallawong Road
- Rouse Road

None of the roads will require specific geometric alterations to accommodate the buses with the exception of Rouse Road, where 30m long indented bus bays may be required on both sides of the road carriageway at the primary school. The 2009 Bus Servicing Plan and the Metropolitan Transport Plan identify future strategic bus corridors along Schofields, Rouse, Windsor and Tallawong roads.

The proposed North West Rail Link Extension will not impede proposed bus access as provided for in the North West Sector Bus Servicing Plan and Transport Plan. Buses will still be able to access Schofields Road via Tallawong and Cudgegong Roads (left turn in and out only at Schofields Road) and along Rouse Road to the north. The greatest threat to bus accessibility would stem from decisions to truncate roads in an effort to avoid bridging costs. The Terry and Cudgegong bridges will facilitate effective bus access through both the residential and industrial sectors of the precinct.

6.2 Tallawong Station Considerations

The introduction of the Station will have the following masterplan implications:

- The east-west road running along the northern side of the rail corridor past the proposed rail station will need to accommodate kerbside kiss and ride, taxi and bus bay facilities that may impact upon the road reservation width in the vicinity of the station.
- The east west road will pass under the Cudgegong Road bridge. There will need to be pedestrian access between the bridge and Cudgegong Road.
- Buses will need to loop around local roads in the light industrial and residential areas to the north of the station in order to access the station for passenger drop off and pick up.
- Provision will need to be made for direct pedestrian and cyclist access across the station via an unpaid concourse link.

There is scope to provide bus shuttle connections between a park and ride facility at Tallawong Road and the RHTC in the interim between construction of the car park and the commencement of train operations via the new Tallawong rail station. Buses could

access the station precinct via Tallawong Road and circulate in a clockwise movement around the Local Centre to exit via the Cudgegong/Schofield Road intersection or continue via Rouse Road.

6.2.1 Modal Share Implications

See **Section 4.6.1**.

6.3 Pedestrians and Cyclists

The BCC Growth Centre Precincts DCP specifies the minimum pedestrian and cycleway requirements for roads within precincts. Blacktown Council's Route 2 cycleway impacts Rouse Road and Cudgegong Road. Provision will need to be made within each reserve for a shared footway and cycleway. Other shared footways and cycleways forming part of the Draft ILP include:

- east-west link across the Creek along the alignment of the local road running along the northern side of the rail corridor.
- north-south links along the western and/or eastern sides of the Creek between the north of the Area 20 Precinct through to, and under, Schofields Road.
- At-grade pedestrian access between Area 20 and the RHTC and Rouse Hill Village.
- The indicative cost estimates in **Table 7.1** provide for the possible construction of a pedestrian/cycle bridge across the Schofields / Windsor Road intersection. This is unlikely to be required in the short to medium term and may be better located north of the intersection.

6.4 Commuter Car Parking Futures

A new Tallawong Station is likely to generate moderate to high commuter car parking demand as rail patronage grows over time. The Draft ILP provides for between 1,000 and 1,200 commuter car parking spaces (in the area between the station and Schofields Road) estimated as follows.

Preliminary future car parking demand has been forecast having regard to:

- Estimated peak hourly station entries.
- Current and estimated car driver mode shares.
- Adjustment of the demand estimates, factoring in the impact of existing and proposed commuter car parking supply at other stations within the region.

Possible future rail (Tallawong Station) daily station entries and exits are unknown. Arup (Riverstone and Alex Avenue Transport and Access Study Arup, October 2007) advises that under existing conditions about 21% of passengers accessing the Richmond Line stations in this area do so by car.

The Commuter parking and other mode of access requirements report, 2006, prepared for the Transport Infrastructure Development Corporation (TIDC), notes that the number of park-and-ride passengers, as a percentage of morning peak passenger entries, varies across the metropolitan area (CityRail network). On average, car

drivers contributed about 24% of total in-bound AM passengers, but as many as 40-50% of total passenger entries for stations with generous parking supply. Sample stations include Holsworthy (49%), Seven Hills (47%), Leumeah (46%), Penrith (45%) and Warwick Farm (43%). The new Tallawong station is likely to attract car driver mode shares in excess of 21% closer to possibly 40%. Under such a scenario car space demand at Tallawong Station could approach 1,000 car spaces where total daily station entries exceed 2,500 persons. (2,500 persons x 40% = 1,000).

To put this 2,500 daily entries estimate into context, the following existing CityRail entries were recorded at nearby station in 2007:

- Blacktown Station: 15,000 persons
- Seven Hills Station: 6,600 persons
- Riverstone Station: 1,040 persons
- Schofields Station: 540 persons

The number of required commuter car spaces will not only be linked to actual passenger station entries; it will be a function of the extent of car parking supply provided at other nearby stations. Estimates of likely future car parking demand at each of the NWRL stations were prepared for TIDC and documented in the Commuter Parking and Other Mode of Access Requirements Report, 2006 (TIDC). The report concludes that total commuter car parking demand along the NWRL is likely to be between 3,075 and 3,600 car spaces. Planning for the NWRL was progressing (prior to deferral) on the basis that 3,400 spaces will be provided and that no commuter car parking will be provided at the Rouse Hill Regional Centre, in order to reinforce the transit and service function of the centre.

The assumption that on or around 2020, Tallawong Station could attract as many as 1,000 park and ride commuters, is considered reasonable for the purpose of precinct planning. It will depend on several factors including:

- Tallawong Station passenger entries.
- The extent of parking provided at other nearby stations (including CityRail and North West Rail Link Extension stations).

6.5 Other Modes

Bus, car, walking and cycling will be the principal modes available to move; to, from and within the Area 20 Precinct. Rail access via Schofields Station will also be important as is NWT-Way access via the Regional Centre. The NSW Government announced in February 2010 that it would start work on the 23 kilometre North West Rail Link from Epping to Rouse Hill in 2017. The link will include six new underground stations at Franklin Road, Castle Hill, Hills Centre, Norwest Business Park, Burns Road and Rouse Hill and a new stabling facility west of Rouse Hill. (Note: The North West Structure Plan makes provision for a rail link along the alignment of Windsor Road via the RHTC terminating at Vineyard). Such a rail link would improve accessibility to and from the Area 20 precinct.

6.6 Summary

The key findings are summarised as follows:

- The suggested precinct road network will facilitate good bus access into and through the precinct, consistent with the NSWTI's emerging Bus Servicing Plan for the North West Sector.
- The focus of cycleway access will be via Rouse Road, Windsor Road, Schofields Road, Cudgegong Road, the Second Ponds Creek and possibly within the 50 metre rail corridor.
- The proposed upgrade of the at-grade Schofields/Windsor Road intersection will need to accommodate pedestrian access on all approaches.
- The NSW Government announced in February 2010 that it would start work on the 23 kilometre North West Rail Link from Epping to Rouse Hill in 2017.

7.0 Implementation & Staging

The costs of the transport infrastructure and services required to support the development of Area 20 will be met by the developers of the Precinct, the State Government and by Blacktown City Council. A regional infrastructure levy has been determined under Section 94E of the Environmental Planning and Assessment Act in late 2006. The levy is referred to as the Special Infrastructure Contribution (SIC). A Questions and Answers memorandum released in December 2008 provides more recent information.

The levy as originally envisaged embraced about 75% of the total estimated cost of future regional infrastructure including higher order roads, bus services, rail lines, emergency services, health services, educational facilities and open space. As of December 2008, the type of works included in the State infrastructure levies has been refined such that rail infrastructure and bus services are excluded. In late 2008 the NSW government announced application of a new threshold of \$20,000 above which contributions for individual residential dwellings may not be imposed except with the approval of the Minister for Planning. A further direction imposes a \$30,000 per lot contribution for release areas.

Within the Area 20 Precinct, the funding of items not embraced by the SIC levy (lower order roads, drainage works, bridge crossings, pedestrian and cycle paths) may be funded as works in kind by the developer or via a Section 94 Plan applying to the Precinct.

7.1 Costings and Apportionment

Indicative cost estimates (+/- 40%) of each of the key Precinct elements have yet to be prepared. These will be prepared by the DoP in consultation with BCC as part of its development of a Precinct specific Section 94 Contributions Plan. The DoP / BCC estimates will be indicative only and will be further developed with appropriate concept design work. The actual costs of the various upgrade elements will be impacted by market conditions nearer the time of construction, the job size and the level of project difficulty and complexity.

7.2 DCP & Section 94 Inputs

A preferred road network and road hierarchy has been identified that reaffirms the road corridor and road design standards detailed in the BCC Growth Centre Precincts DCP and Council's Engineering Guide for Development, 2005. The road network and hierarchy identified in **Figure 5.1** will accommodate forecast peak traffic movements within the Precinct as development progresses. The typical road cross sections will be contained in the BCC Growth Centre Precincts DCP and accompanying schedule for Area 20 prepared by the DoP. These have been modified and adapted from the BCC Growth Centre Precincts DCP. These are considered appropriate for the Area 20 Precinct, however, the Collector roads (Tallawong, Rouse, Commercial and Terry Roads) will most likely be funded by the proponents of development via a BCC Precinct Specific Section 94 Contributions Plan. There is scope to revisit the extent of the

proposed road corridor widths and cross sectional requirements of these roads with a view to reducing total property acquisition costs, road reservation maintenance and property impacts more generally. RTA officers have advised that they “do not support reductions in corridor widths and cross sectional requirements as this may have the potential to affect safety and operational performance of the road network”.

7.3 Implementation & Responsibilities

Table 7.1 lists the key infrastructure items that have been identified through this transport analysis and assigns suggested responsibilities.

Table 7.1 – Upgrade Items and Responsibilities – Area 20 Precinct, 2009

Item	Activity	Quantity	Indicative cost	Responsibility
Roads:				
1	Arterial roads	2	N/A	Schofields & Windsor Road upgrades are the responsibility of the RTA
2	Collector Roads ¹	3	\$4m	Section 94 and developer.
3	Local Roads ²	multiple	\$12.8m	Developer.
Intersections:				
4	Along Schofields Road	3	N/A	Intersections will be upgraded as part of the Schofields Road Upgrade Project the cost of which will be met by the RTA.
5	Along Windsor Road	2	\$1m	Section 94.
6	At Guntawong Rd ³	1	\$500,000	<i>The proposed traffic signals at the intersection of Windsor Road and Guntawong Road is external to the Area 20 Precinct</i>
7	Roundabouts ⁴	5	\$1.25m	Section 94 and developer.
8	Regulatory signage	8-10	\$5,000	Section 94 and developer.
Bus related infrastructure:				
9	Bus Stop signage	8-10	\$2,500	MoT / TransportNSW.
10	Shelters	1	\$25,000	The costs of shelter provision on Rouse Road at the School will be met by the MoT.
Bridges:				
11	Rouse Rd	1	\$4m	Section 94.
Pedestrian related infrastructure:				
12	Creek crossings ⁵	3	\$750,000	Section 94.
13	Second Ponds Ck Linear Cycleway ⁶	1	\$1.05m	The cycleway will have a length of about 1.5 kilometres (both sides), the costs of which will be met via Section 94.
14	Ped/cycle Bridge ⁷	1	\$4m	Possible future bridge crossing of the Windsor Road / Schofields Road intersection linking the Area 20 precinct with the RHTC. With lifts.
Total			\$29.38m	

Source: Urbanhorizon, 2009

1. \$1m per km x 4km
2. \$800,000 per km at 16km
3. \$500,000 intersection upgrade cost
4. \$250,000 per roundabout
5. \$250,000 per ped/cycle crossing
6. \$350,000 per km x 3.0km
7. Assumes bridge with DDA compliant lifts x 2

Bibliography

Arup (2007) Riverstone and Alex Avenue Transport and Access Study, October 2007.

Blacktown City Council (2005) Engineering Guide for Development.

Growth Centres Development Code, 2007 and BCC Growth Centre Precincts DCP.

Ministry of Transport (2006) Design Guidelines for Interchanges and Car Parks, September.

NSWTI (2009) Draft North West Sector Bus Servicing Plan, October.

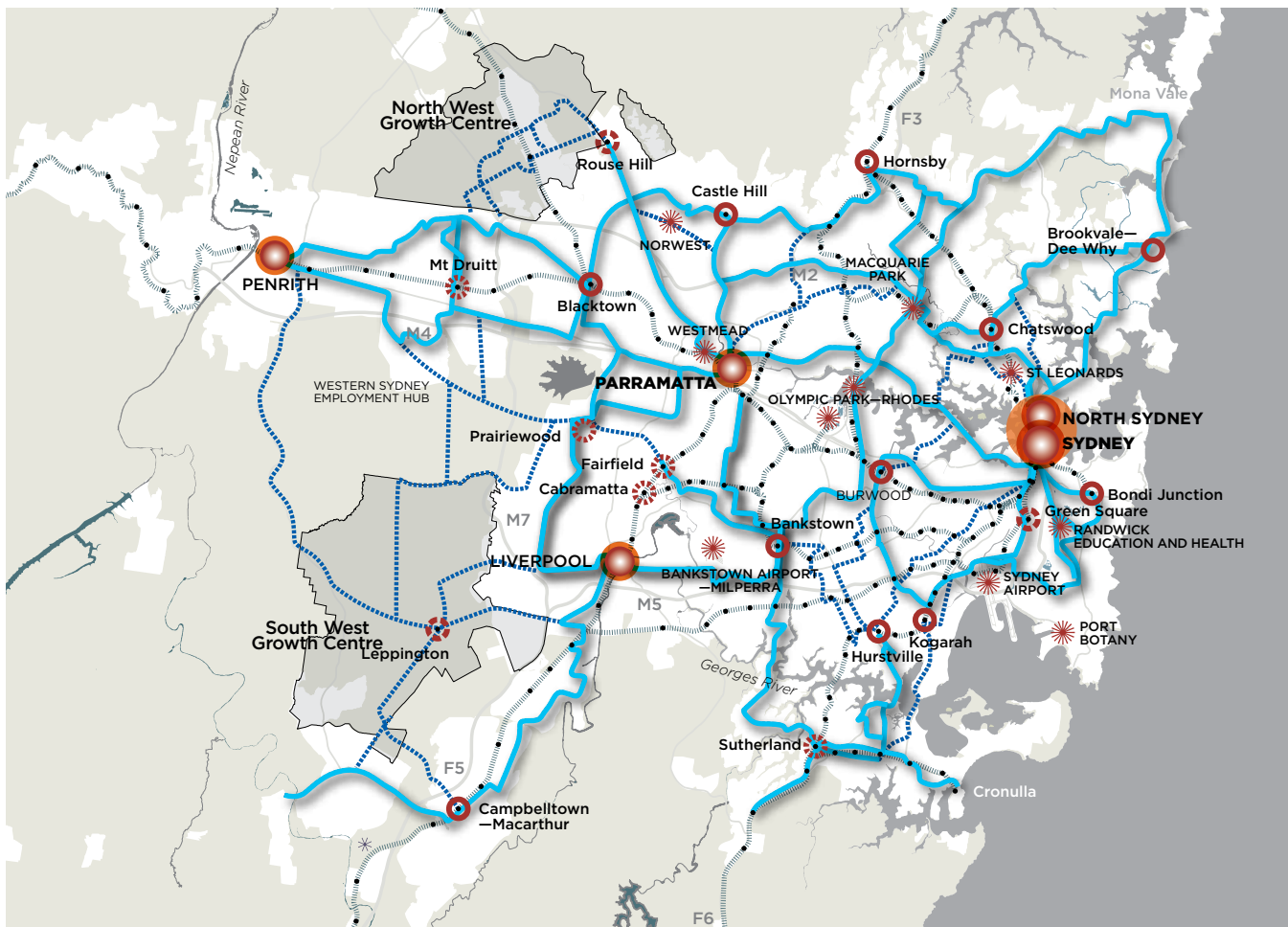
Roads and Traffic Authority (1993), Guide to Traffic Generating Developments, Sydney, Australia.

Road Delay Solutions (2009) North West Growth Centre – Area 20 – Preliminary Draft Transport and Access Study End State Year 2036.

Glossary

AADT	Average Annual Daily Traffic
AARB	Australian Road Research Board
BCC	Blacktown City Council
DCP	Development Control Plan
DDA	Disability Discrimination Act, 1992
DoP	Department of Planning
DS	Degree of Saturation
EPA	Environmental Planning & Assessment Act, 1979
GCC	Growth Centres Commission
HTS	Household Travel Survey, MoT
ILP	Indicative Layout Plan
JTW	Journey to Work
LoS	Level of Service
LGA	Local Government Area
MoT	Ministry of Transport
NSGC	North West Growth Centre
NWT-Way	North West Transitway
REP	Regional Environmental Plan
RHTC	Rouse Hill Regional Centre
RTA	Roads and Traffic Authority
SCATS	Sydney Coordinated Signal Control System
SEPP	State Environmental Planning Policy
SIC	Special Infrastructure Contribution
STM	Strategic Travel Model
TPDC	Transport Population Data Centre
VKT	Vehicle Kilometres Travelled
VPD	Vehicles per day
VPH	Vehicles per hour

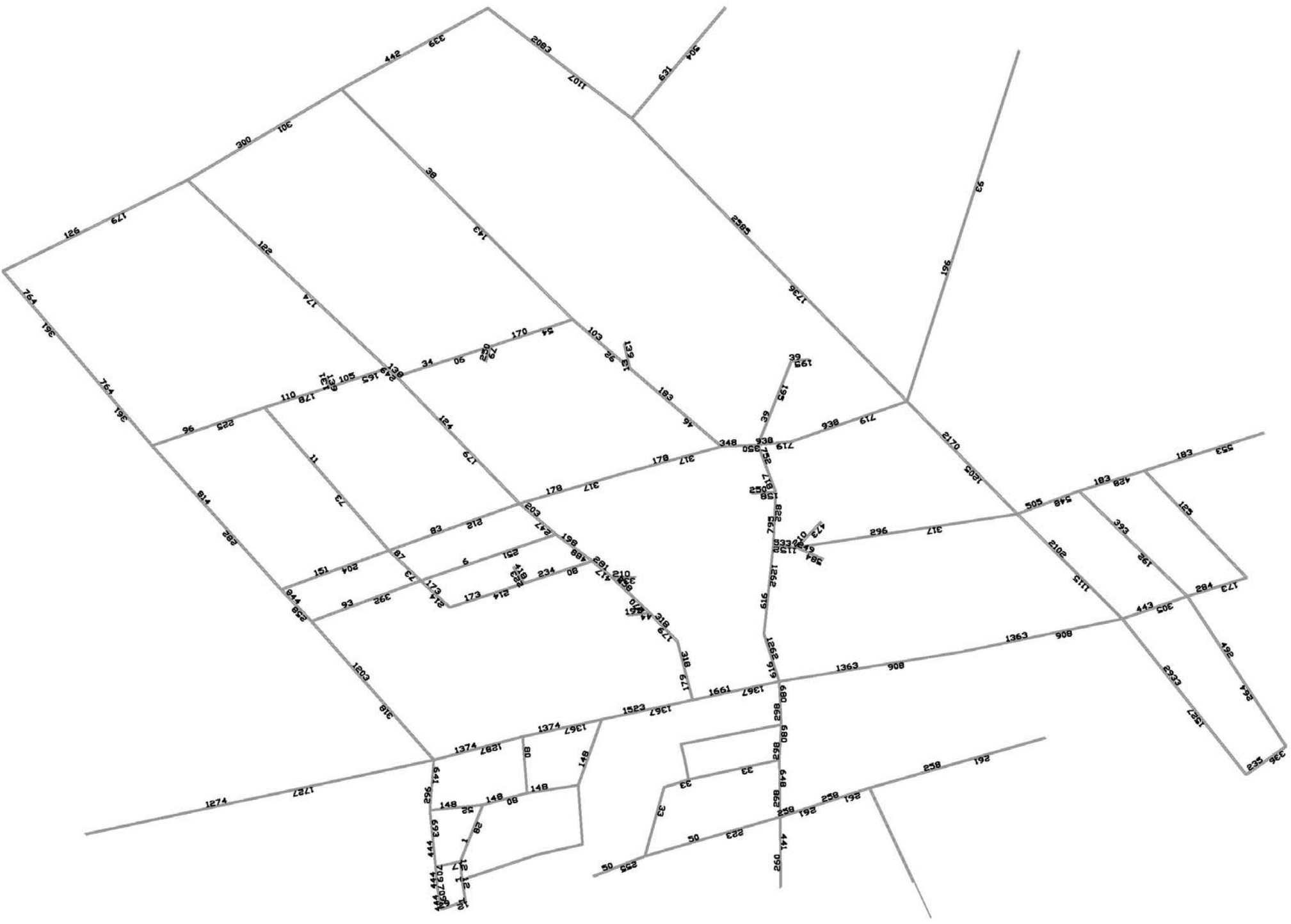
Appendix A – Metropolitan Transport Plan, Feb 2010



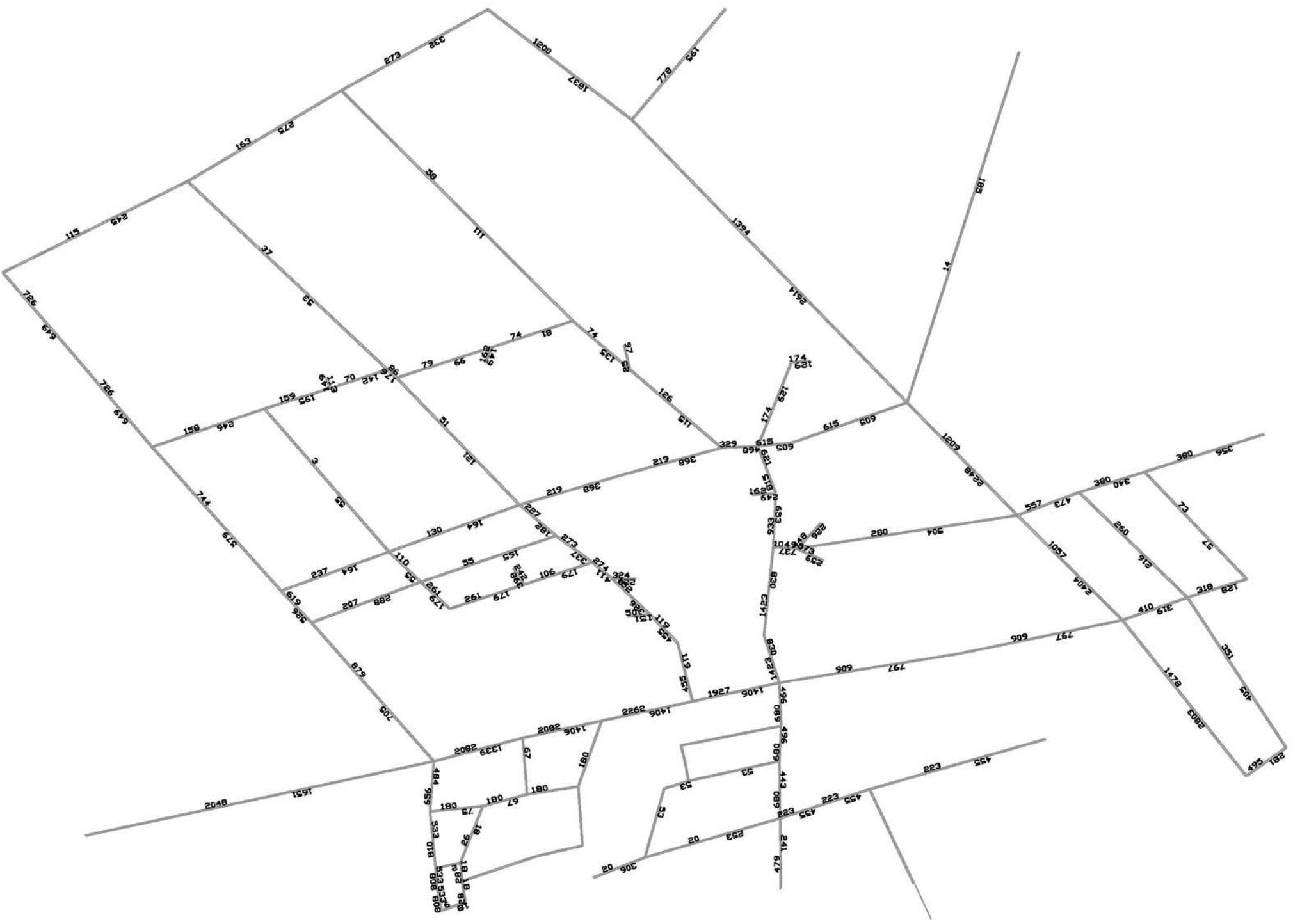
Map of Strategic Bus Corridors

SOURCE: NSW DEPARTMENT OF PLANNING

Appendix B – Model Run Outputs



PLOT SHOWS VEHICLE VOLUMES/HOUR
MODEL = 2036 AM PEAK NORTHWEST GROWTH CENTRE BOX HILL & AREA 20 MODEL
NETWORK = 2036 NWGC - BOX HILL & AREA 20 ROAD NETWORK
CORDON FILE = A20.CDR
Model Run Date = 07/10 13:29. Model = 36AMBH_Ver = Autoptm 2010
X Scale Factor = 1. Y Scale Factor = 1. Plot File = 36AMBH.XBH. Network = 2036DPTC. D/D = 36AM22.



PLT SHDWS VEHICLE VOLUMES/HOUR
 MODEL = 2036 PM PEAK NORTHWEST GROWTH CENTRE BDX HILL & AREA 20 MODEL
 NETWORK = 2036 NWCC - BDX HILL & AREA 20 ROAD NETWORK
 CORDON FILE = A20.COR
 Model Run Date = 9/10 13:24. Model = 36FMBH. Ver = AutoRun. 2010
 X Scale Factor = 1. Y Scale Factor = 1. Plot File = 36FMBH.XBH. Network = 2036OPTC. D/D = 36FMB22.

Appendix C – Model Vehicle Generation Parameters

Table 3: Vehicle Generation Parameters by Land Use

NWGC Development Footprint	Current Year	Growth 2036	Total 2036
Number of dwellings (lots)	0	2,235	2,235
Commercial Land (employees)	0	260	260
Area of retail land (hectare)	0	0	0
Area of industrial land (hectare)	0	0	0
Area of educational land (hectare)	0	0	0
Trip Generation Rates (Peak Hour)			
<u>Residential</u>			
- Vehicle Trips per Dwelling		0.57	
- Reduction in Vehicle Trips due to Transport Initiatives		0.0%	
- Percent Outbound in Morning Peak		80%	
- Percent Outbound in Evening Peak		20%	
<u>Commercial</u>			
- Calculated on...100m2 GLFA=2 or Employees=1		1	
- Trips per, as above, Morning Peak		0.79	
- Trips per, as above, Evening Peak		0.79	
- Reduction in Vehicle Trips due to Transport Initiatives		12.5%	
- Percent Outbound in Morning Peak		15%	
- Percent Outbound in Evening Peak		85%	
<u>Retail</u>			
- Employees per hectare		25	
- Trips per Employee in Morning Peak		0.83	
- Trips per Employee in Evening Peak		0.83	
- Percent Car Driver		50%	
- Reduction in Vehicle Trips due to Transport Initiatives		12.5%	
- Percent Outbound in Morning Peak		15%	
- Percent Outbound in Evening Peak		85%	
<u>Industrial</u>			
- Employees per hectare		20	
- Trips per Employee in Morning Peak		0.83	
- Trips per Employee in Evening Peak		0.83	
- Percent Car Driver		50%	
- Reduction in Vehicle Trips due to Transport Initiatives		12.5%	
- Percent Outbound in Morning Peak		15%	
- Percent Outbound in Evening Peak		85%	
<u>Education</u>			
- Employees per hectare		25	
- Trips per Employee in Morning Peak		0.7	
- Trips per Employee in Evening Peak		0.7	
- Percent Car Driver		50%	
- Reduction in Vehicle Trips due to Transport Initiatives		12.5%	
- Percent Outbound in Morning Peak		15%	
- Percent Outbound in Evening Peak		85%	
<u>Residential Containment</u>		0%	

Appendix D – NSWTI Proposed All Day Bus Route Network

