Wilton Rezoning Landowners Group

# Wilton Junction Development

# Transport Management and Accessibility Plan

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PARSONS BRINCKERHOFF

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|---|---|---|---|
| Prepared by: | DB \| BB | Date: 30/06/2014 | Signature:  |
| Reviewed by: | TvD | Date: 30/06/2014 | Signature: |
| Approved by: | GI | Date: 30/06/2014 | Signature:  |

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Parsons Brinckerhoff Australia Pty Limited

*ABN 80 078 004 798*

Level 27 Ernst & Young Centre
680 George Street, Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001
Australia
Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
Email: sydney@pb.com.au
www.pbworld.com

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# Contents

# Contents (Continued)

# List of tables

# List of figures

# List of appendices

# Executive summary

**This study**

A new town is planned at Wilton Junction, strategically located around the Hume Highway/Picton Road Interchange. The new town will comprise residential dwellings, a town centre, schools, enterprise employment areas, retail and light industrial areas. This report constitutes a Transport Management and Access Plan (TMAP) in support of an application for the rezoning of lands known as the Wilton Junction Precinct. The purpose of this report is to assess the transport requirements of the proposed rezoning and to suggest a range of measures to support the levels of growth proposed to the NSW Government for further assessment.

The three proponents, who are landowners at Wilton Junction, are Bradcorp Pty Ltd, Walker Corporation and Governors Hill. Lend Lease, currently delivering the adjacent Bingara Gorge community, is working with the Proponents of this rezoning application to plan and deliver the new town at Wilton Junction and its associated infrastructure.

**The development**

The Wilton Junction Development would comprise:

- Employment and commercial drivers. The delivery of approximately 11,000 jobs focused around a new town centre and in close proximity to the Hume Highway and Picton Road surrounded by employment generating uses for business, bulky goods and light industry, comprising of approximately 120 - 130ha of land.
- Housing. Providing between 11,000 and 13,000 new dwellings (approximately 35,000 residents) across the precinct, inclusive of the 1,165 dwellings already approved at Bingara Gorge.
- Retail. A Town Centre of 17ha with primary retail and, 30,000 $m^2$ GFA bulky goods and highway oriented retail, three village centres (approximately 10,000 to 12,000 $m^2$ GFA) and local shops to support a self-sustaining community. The total retail space proposed is 70,000 $m^2$ GFA.
- Community facilities. Provide a diverse range of high quality community facilities including a schools, library, community centre in a town centre and three neighbourhood centres across the precinct.

The Wilton Junction Development is planned to take several decades to develop to its planned ultimate potential by approximately 2041. Simultaneous to Bingara Gorge, the next stage is being sought by the beginning of 2015 to support the NSW Government's targets for new housing construction per year.

The Wilton Junction Development will be a staged development. The Bingara Gorge component is already under construction. The development of other land within Wilton Junction would follow, with ultimate development anticipated by 2041. An indicative residential dwelling rate is approximately 20% by 2021 and 65% by 2031. Employment land development is expected to lag the release of dwellings by approximately 10% by 2031 due to market conditions.

### Transport assessment

The method of assessing the traffic and transport impacts for the Wilton Junction Development was developed in consultation and agreed with representatives of Transport for NSW, Roads and Maritime Services and Wollondilly Shire Council.

To assess the transport infrastructure requirements and traffic impacts of Wilton Junction, an Aimsun Mesoscopic traffic model was developed for the AM and PM peaks. The Aimsun modelling has also been utilised to determine the infrastructure staging requirements as Wilton Junction develops over time. The Aimsun Mesoscopic traffic model was developed, calibrated and validated in accordance with RMS traffic modelling guidelines. When considering the infrastructure staging, SIDRA modelling was also used to test intersection configurations and supplement the Aimsun modelling.

In developing this suite of models, Parsons Brinckerhoff worked closely with TfNSW (including BTS and RMS) to agree modelling assumptions and inputs throughout the process. The BTS STM model was used to assist with the development of the future year modelling. During the modelling process some issues were identified with the BTS future forecasts. Where these issues could not be reconciled, Parsons Brinckerhoff worked with TfNSW to agree on alternative first principal inputs. Future year base models were developed for the intermediate years of 2024 and 2031, and the year assumed (for modelling purposes only) for ultimate development of 2036.

An upgrade of the Hume Highway/Picton Road Interchange is currently being considered by RMS, and is required regardless of the Wilton Junction Development. However, an alternative interchange upgrade is proposed to provide free-flow movement for the heaviest traffic and freight movements between Sydney to Port Kembla, minimise land take and reduce the need for wide bridges over the Hume Highway. The proposed interchange would include:

- retention of the slip lane for movements from Hume Highway southbound to Picton Road eastbound
- a new fly-over ramp for the Picton Road westbound to Hume Highway northbound movement (also heavily used by existing car traffic)
- new traffic signals for the remaining right-turn movements, but not affecting left-turn movements or the right-turn movement referred to above.

The traffic modelling analysis for the future base scenario identified that the elements in the road network would reach operating levels that require upgrading, regardless of the Wilton Junction Development. The following upgrades are recommended to maintain suitable network performance:

- upgrade the Hume Highway/Picton Road interchange – due by 2015
- upgrade the intersection of Picton Road and Pembroke Parade – due by 2015
- widen one lane section of Picton Road to two lanes, east of Pembroke Parade – due by 2021
- upgrade the intersection of Picton Road and Almond Street – due by 2016.

### Traffic generation

Traffic generation was evaluated, where appropriate to be consistent with the rates for residential, employment and retail rates from the Roads and Maritime Service (RMS) Technical Direction TDT13-04a – Guide to Traffic Generating Developments Updated traffic surveys (RMS, August 2013) for regional areas.

Overall, the development was estimated to generate approximately 160,000 trips across the day and 24,000 during the morning and afternoon peaks (including all modes of transport, e.g. walking, bus, car, etc.). While these are large numbers, as Wilton Junction is being planned as a new town with a high degree of self-sufficiency, approximately half of these trips are contained within the Wilton Junction development itself.

**Road network**

The road network for Wilton Junction is proposed to minimise the impact on the Hume Highway and Picton Road. This includes new north-facing ramps between the Hume Highway and Wilton Junction to preserve capacity at the Hume Highway/Picton Road Interchange for regional trips. Two grade separated overpasses each of Picton Road and the Hume Highway are proposed to allow traffic moving around Wilton Junction to do so without affecting the arterial roads.

The major components of the proposed road network include:

- upgrading of the intersection of Picton Road and Wilton Park Road to traffic signals
- upgrading of the intersection of Picton Road and Pembroke Parade to traffic signals
- provision of a new internal north-south road grade separated from Picton Road at a point 400 m west of Pembroke Parade
- upgrading of the intersection of Picton Road and Almond Street to a give-way seagull intersection in the interim and conversion to grade separation with left-in/left-out access once the area south of Picton Road is developed
- a new intersection on Picton Road, at Wilton Park Road (which will be realigned) with signalised access into the development
- retention of the current east-west road grade separated from the Hume Highway, south of the Nepean River
- new east-west road, grade separated over the Hume Highway, north of Picton Road
- new north-facing ramps from the Hume Highway to Wilton Junction internal roads.

An internal road network has been proposed with:

- a series of internal distributor and collector roads to compliment the State Road Network and manage connections to it at a discrete number of locations
- additional lanes to match the demand requirements, whilst retaining local amenity and promoting active transport modes such as walking and cycling
- intersection controls for internal intersections, including traffic signals and (give-way and stop) sign controlled intersections
- grade-separated connections between development areas across the Hume Highway and Picton Road.

Traffic modelling for a 2036 full development scenario indicates that the internal and external road provisions can mitigate the impacts of the Wilton Junction Development and operate with acceptable levels of performance. A capacity assessment of the proposed future Hume Highway and Picton Road Interchange using the Highway Capacity Manual (HCM) method has indicated that the proposed ramp arrangements could work from an operational perspective with a Level of Service of D or better. This analysis indicates that the Hume Highway, north of Wilton Junction would operate at a satisfactory Level of Service D during the peak periods.

The traffic modelling also indicates that Picton Road, east of Pembroke Parade, would require upgrading to two lanes each way as identified in the Picton Road Corridor Strategy (RMS, 2011). However, the upgrade is recommended sooner than indicated in the Strategy to maintain adequate performance, with or without the Wilton Junction Development.

The staging of road infrastructure for Wilton Junction has been assessed using the Aimsun models for design years (2013, 2024, 2031 and 2036), as well as SIDRA intersection modelling. Table ES.1 shows how the infrastructure would be staged over time, as well as the approximate proportion of dwellings assumed. The infrastructure staging may change depending on the rate and location of development within Wilton Junction. The recommendations made are suggestions to Government to support the Wilton Junction Development. Recommendations for new traffic signals require further assessment at development application stage to determine whether they meet RMS traffic signal warrants and are subject to approval by RMS.

**Table ES.1 Proposed road infrastructure staging for Wilton Junction**

| Percentage of dwellings built | Approximate year | Road upgrades |
|---|---|---|
| 5% | 2015 | ■ Hume Highway/Picton Road Interchange – preliminary upgrade<br>■ Pembroke Parade/Picton Road intersection signals<br>■ Wilton Park Road/Picton Road intersection signals<br>■ Wilton Park Road to Governor's Hill land release<br>■ Almond Street/Picton Road intersection preliminary<br>■ Connection of Bradcorp land to Pembroke Parade<br>■ Connection of Walker Corp land to Pembroke Parade<br>■ Pembroke Parade pedestrian bridge |
| 20% | 2021 | ■ Picton Road widening east of Pembroke Parade<br>■ Connection of Bradcorp land to Wilton Park Road |
| 40% | 2024 | ■ Hume Highway/Picton Road Interchange – full upgrade<br>■ Internal link road<br>■ North-facing ramps<br>■ Grade separation over Picton Road between Hume Highway Interchange and Pembroke Parade |
| 50% | 2028 | ■ Picton Road widening west to western edge of site<br>■ New access intersection on Picton Road, west of Wilton Park Road, and intersection signals<br>■ Extension of internal collector roads |
| 65% | 2031 | ■ Extension of internal collector roads |

It is noted that the proposed infrastructure upgrades indicated on the Master Plan are not approved by RMS, TfNSW, or Council. The Hume Highway/Picton Road interchange upgrade indicated on the Master Plan is not an approved design. The proposed layouts and configurations illustrated have been adopted for the purposes of traffic modelling / traffic assessment only. This TMAP and the rezoning process that it supports, does not confirm a final design for any of the proposed infrastructure upgrades on the local or State Road Network.

### Public transport

Improvements to public transport services and infrastructure are recommended to reduce the amount of car use and meet State Government targets for sustainable transport. The major component of the public transport network would be a greatly expanded bus network, with a mixture of regional, local, school and rural services and service levels commensurate with a town of the size planned for Wilton Junction. Connections to the Sydney Trains and NSW Trains network would be achieved by bus services to Picton in the short-term, and then Campbelltown/Macarthur by 2018, as passenger demand increases. Regional services would also be provided to Wollongong for employment, education and recreational trips.

Park and ride for train journeys is likely to occur at the major stations of Campbelltown and Macarthur. However, park-and-ride facilities would be provided at the Wilton Junction Town Centre in conjunction with the new Campbelltown/Macarthur regional service. An adjustment to the Metropolitan Region Bus Network boundary could be considered in the future to incorporate Wilton Junction within the fare scheme of the rest of Sydney, and support the measures proposed to attract people away from car-based travel.

The bus network would develop over time as development proceeds and new areas and sources of passengers become available. A trunk regional/local service to Picton, combined with local services serving the northern, eastern and southern areas of the development is proposed to provide self-sufficiency and reduce car-based travel for local trips. This would also reduce the impact of local traffic on the arterial road network. A bus network plan is proposed with:

- bus routes, service frequencies and journey time estimates
- estimates of the bus fleet required to service the bus plan
- interchange and layover focussed within the Town Centre
- facilities for passengers at the Town Centre, neighbourhood centres and along the bus routes.

**Walking and cycling**

New cycleways and pedestrian paths are planned within the development connecting to, and compatible with, Wollondilly Shire Council's planned network of shared cycle and pedestrian paths. The pedestrian and cycle networks are designed to have a greater level of permeability than provided to vehicles to promote their greater use. The cycle routes proposed are a mixture of shared paths, mixed traffic, and on-street cycle lanes.

The pedestrian network would concentrate on connecting high trip generating land uses, such as retail centres, community and recreation facilities and schools. Paths would be safe and well lit, with pedestrian crossing treatments on strong pedestrian desire lines at road crossings. All streets (except laneways) would have 1.2 m minimum footpaths, on one or both sides of the street.

Streets within the proposed Town Centre would be designed to reinforce the high pedestrian activity area and improve pedestrian safety. Treatments proposed include entry thresholds (using textured pavement/pavers), road width changes, raised thresholds, street lighting and lower speed limits. Bicycle racks would be provided in the Town Centre, at neighbourhood centres, community centres and recreation facilities. Commercial buildings would be required to provide cyclist end of trip facilities, including bike locking and showers.

**Funding**

The delivery of the package of measures outlined in this TMAP may require funding from a range of sources including State government, Section 94 funds and contributions from developers. An infrastructure works strategy, to be provided with the rezoning application, has been developed for the funding and delivery of road and transport infrastructure by the Wilton Junction Landowner. The aim of the infrastructure plan is to achieve 'no additional cost to government', apportioning cost based on the amount the Wilton Junction development contributes to the need for infrastructure upgrades.

A rapid economic analysis of the proposed road upgrades of the Hume Highway and Picton Road interchange and Picton Road has been undertaken to investigate the benefits of additional grade separation. The dominant freight movement between Sydney and Port Kembla via the Hume Highway and Picton Road was selected and analysed due to its impact on freight efficiency. The analysis indicated that the grade separation of the existing Picton Road and Pembroke Parade intersection, instead of the proposed signalised upgrade, would have a positive benefit cost ratio (BCR) of 1.9. However, it is noted that the proposed signalised upgrade is adequate to mitigate the impacts of the Wilton Junction Development.

**Package of mitigation measures**

To address the transport impacts of the Project, and to achieve the mode share targets, a package of mitigation measures are proposed. Timeframes and delivery mechanisms for the recommended strategic and local transport planning measures are proposed and would need to be confirmed by the relevant agencies.

It is proposed that travel plans would be developed to provide personalised travel information that highlights the diversity of transport options on offer. The Development Control Plan (DCP) for the Precinct will require that Work Travel Plans (WTP) and Travel Access Guides (TAG) be produced by the developers and businesses.

# 1. Introduction

This report constitutes a Transport Management and Access Plan (TMAP) in support of an application for the rezoning of lands known as the Wilton Junction Precinct. The Wilton Junction Development comprises the rezoning of several land holdings around the junction of the Hume Highway and Picton Road in south-west Sydney for a new community including residential dwellings, a town centre, schools, enterprise employment areas, retail and light industrial areas.

Parsons Brinckerhoff were commissioned by Elton Consulting on behalf of the Wilton Rezoning Landowners Group to assess the transport impacts of the proposed new development and provide advice on a range of transport measures that could be implemented to support the growth proposed under the rezoning proposal. The report has been prepared to address the road, traffic and transport-related issues raised in the NSW Department of Planning and Environment (DP&E – formerly Department of Planning and Infrastructure (DP&I)) State Environment Planning Policy (SEPP) study requirements, issued on the basis of the project Master Plan.

## 1.1 Project background

In November 2011, the State Government invited landowners with large properties in suitable locations to nominate sites which might be able to deliver additional housing to address Sydney's housing supply shortfall.

A number of major landholders in the Wilton area responded to the NSW Government's invitation and nominated land adjoining the Hume Highway and Picton Road intersection for consideration as part of the Potential Housing Opportunities Program. This area has subsequently become known as Wilton Junction, and sits within the Wollondilly Shire. Following a Council resolution in May 2012, four major landowners (known as the Wilton Junction Landowners' Group) signed an agreement to work cooperatively with Council in the preparation of a high level master plan for Wilton Junction to deliver high quality new housing, jobs close to homes, supporting social and utilities infrastructure and services, and a range of complementary land uses.

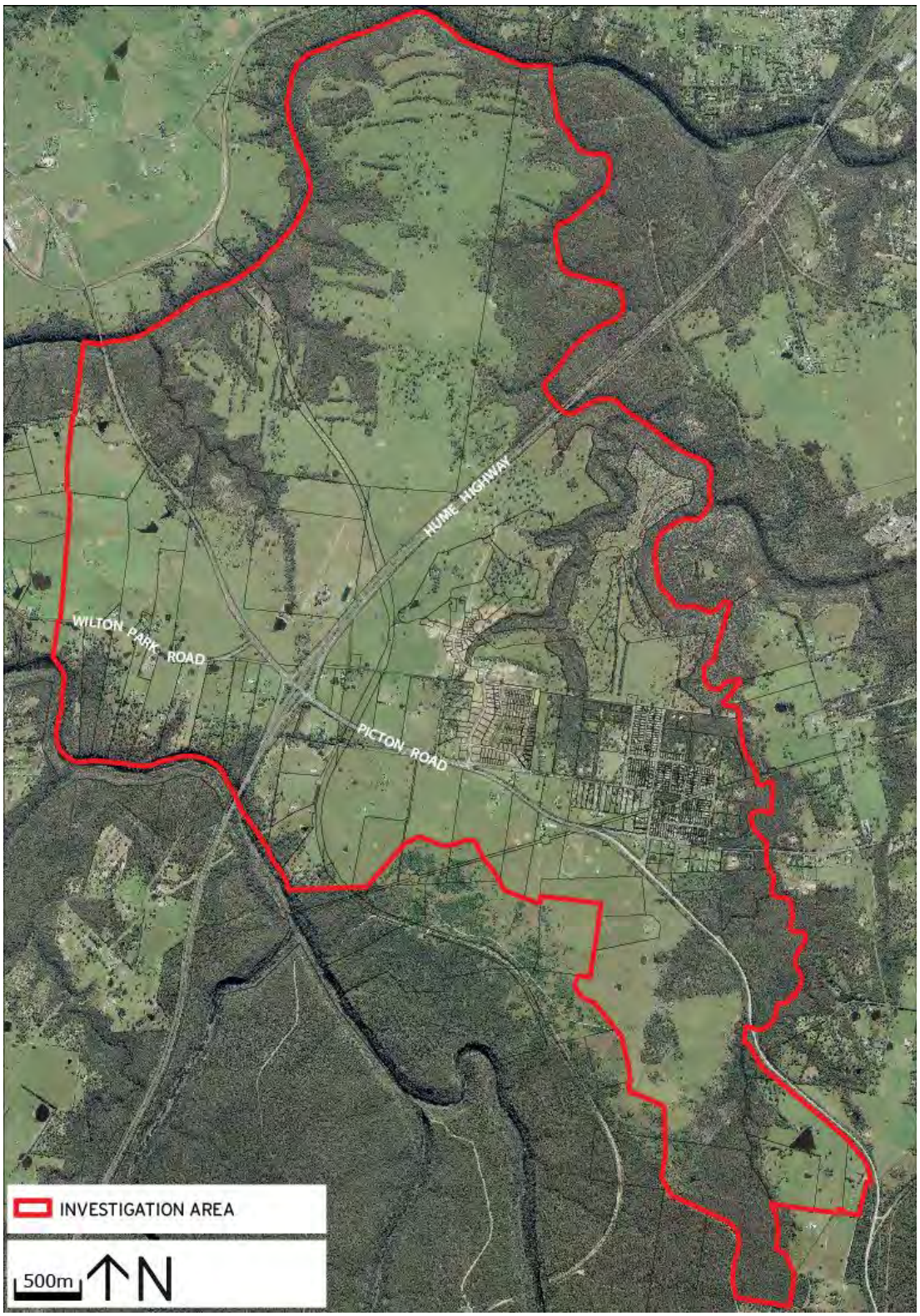
A High Level Master Plan and a Preliminary Infrastructure Requirements Report were considered by Wollondilly Shire Council on 17 December 2012, with Council resolving to give in-principle support to the proposal. The Council also resolved to request that the rezoning be a state driven process.

Subsequently, the NSW Government decided to coordinate the statutory planning process, led by the NSW Department of Planning & Infrastructure (now the Department of Planning and Environment, DP&E). The Minister for Planning and Infrastructure (now the Minister for Planning and Environment) proposed to prepare a State Environmental Planning Policy (SEPP), as per Section 24 and Section 37 of the *Environmental Planning and Assessment Act 1979,* with a view to rezone the land through an amendment to the Wollondilly Local Environmental Plan (LEP) 2011. The amendment to the LEP would facilitate the early delivery of housing and infrastructure, linked to an agreed Infrastructure, Servicing and Staging Plan for the Wilton Junction Precinct.

The DP&I (now DP&E) issued Director-General's Requirements (DGRs) to guide planning investigations for a new town at Wilton Junction. The DGRs set the criteria for carrying out environmental investigations across the site. The investigations examine the potential for the site at Wilton Junction to be rezoned under a state environmental planning policy (SEPP).

## 1.2 Study area

Wilton Junction is located within Wollondilly Shire Council and is approximately 80 km from Sydney Central Business District, and 30 km north-west of Wollongong. The development area, shown in Figure 1.1, includes the existing village of Wilton and the recently approved suburb of Bingara Gorge.




Source: Connor Holmes, 2014

**Figure 1.1 Wilton Junction Development area**

In the wider regional context, shown in Figure 1.2, Wilton Junction is located south of the South West Growth Centre around Leppington. The Precinct is crossed by two potential rail lines, including the Maldon to Dombarton Freight Rail Line and a potential alignment for a high-speed rail between Melbourne, Canberra and Sydney.

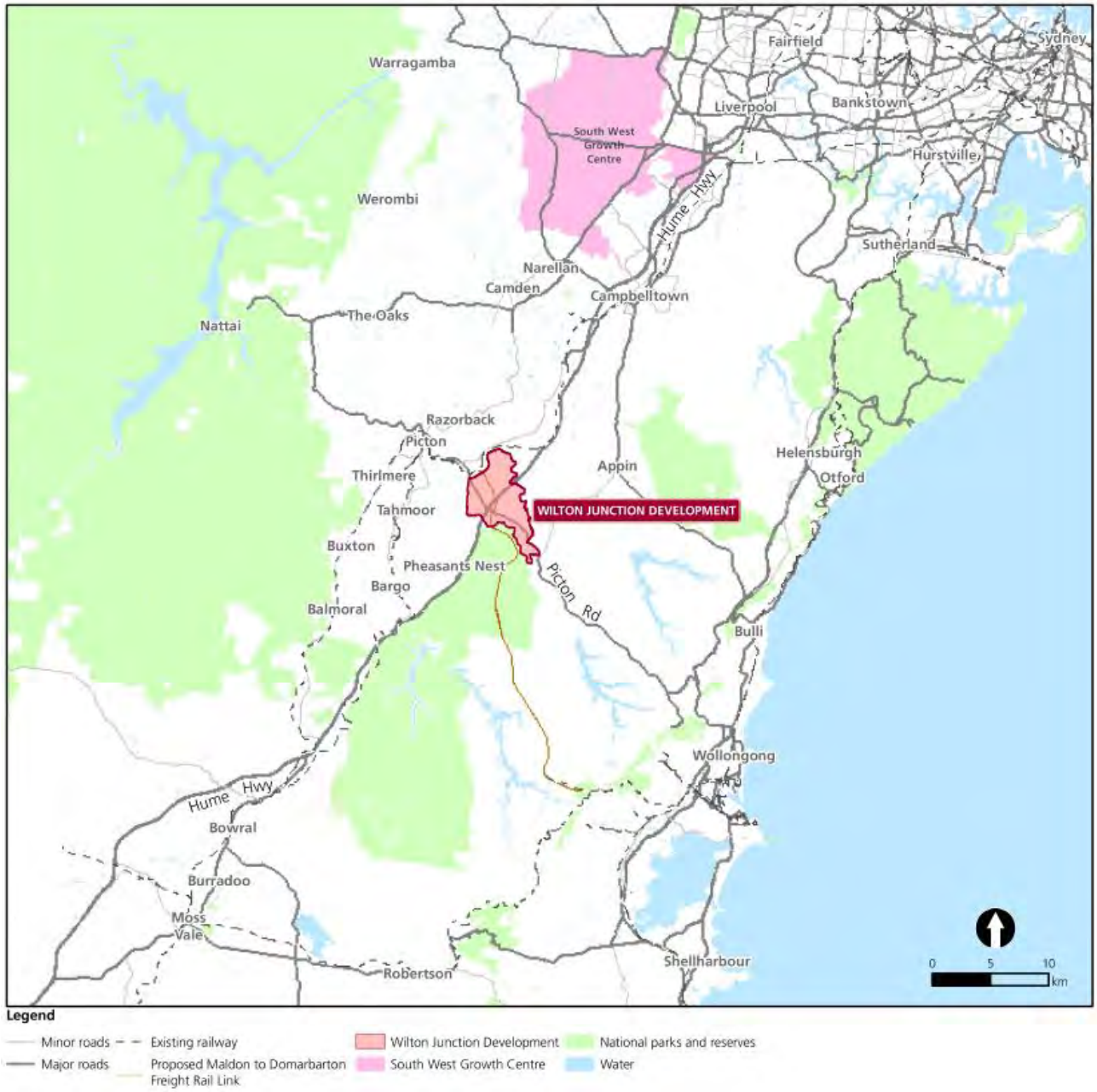



**Figure 1.2 Regional context**

Wilton is currently a small village with a population of 1,890 in 595 homes[1]. In addition to the historic village, development has started at the Bingara Gorge development, which has already been rezoned for residential uses, with approval for 1,165 dwellings, a primary school, and local shops.

[1] 2011 Census, Australian Bureau of Statistics

## 1.3 Study objectives

This report outlines the travel requirements of the Wilton Junction Precinct by road, public transport, walking and cycling. The objective of this TMAP is to:

- adopt and recommend the implementation of transport planning principles to maximise the use of public transport, walking and cycling
- identify and manage the transport impacts of the Wilton Junction Precinct Project on surrounding sites and transport networks
- help reduce reliance on the private car
- address the SEPP study requirements for the Precinct.

## 1.4 Report structure

This report forms part of the studies required to be undertaken to meet the DGR'S outlined by the DP&E (formerly DP&I) as part of the investigations for the release and rezoning through a SEPP. The study outcomes and report has also informed the development and preparation of a Master Plan for Wilton Junction.

This report is structured as follows:

- Section 2 presents information on existing transport conditions, including:
  - existing travel behaviour
  - road network characteristics, including a description of the surrounding road network, existing traffic volumes, local intersection performance and a description of how the road network operates
  - current levels and details of public transport services
  - pedestrian and cycle networks and a description of the issues experienced
  - existing safety issues.
- Section 3 details the proposed development.
- Section 4 contains a:
  - review of the relevant State and Local government plans and strategies, and recent studies for other developments
  - review of population and employment forecasts
  - strategic assessment of the transport issues forecast for the Wilton area.
- Section 5 describes the modelling process, assesses the impact of the Project on the surrounding road network, analyses the proposed development and provides information on accesses and street design.
- Section 6 assesses the project in terms of its provision for and impact on public transport, pedestrians, cyclists and parking.
- Section 7 provides a rapid economic assessment of the benefits of upgrading Picton Road with grade separated intersections to the Development east of the Hume Highway.
- Section 8 provides an outline of measures proposed to mitigate the impacts of the development, and provides information on their delivery.

## 1.5 Study requirements

On 2 May 2013, the Director General, DP&E (formerly DP&I) issued a list of State Environment Planning Policy (SEPP) study requirements for the Wilton Junction Precinct. The TMAP has been developed in consideration of the study requirements for roads, traffic and transport. The location in the TMAP in which each of the study requirements is addressed is outlined in Table 1.1.

**Table 1.1 State Environment Planning Policy Study Requirements – Roads, Traffic and Transport**

| Requirement | Reference |
|---|---|
| ■ Base assumptions relating to population, employment, transport generation, degree of employment self-containment and travel mode splits are to be generally agreed by TfNSW prior to the commencement of the Study | 5.3, 5.4 |
| ■ Strategic modelling shall then be undertaken in the Sydney Strategic Transport Model (STM). TfNSW shall undertake this modelling in consultation with the proponent and then provide the outputs to the proponent. The STM shall be used to determine the likely growth in travel demand associated with the proposal and assist to refine the mode split between vehicular trips and public transport trips. | 5.3 |
| ■ The proponent shall undertake mesoscopic modelling for the purpose of determining route assignment and identifying infrastructure upgrades required using the outputs of the STM modelling (it is noted that TfNSW, RMS and the proponent have agreed that AIMSUN will be used for the mesoscopic modelling). The mesoscopic model must be able to demonstrate that due consideration has been given to a range of factors including weave movements and lengths. | Section 5 |
| ■ The proponent's modelling must consider the implications of the development on the functionality of Picton Road and specifically the impact to freight, recognising that the Long Term Transport Master Plan acknowledges the need to provide efficient freight connections to Port Kembla. In this regard, the modelling must consider two infrastructure scenarios for Picton Road: | 5.8 |
| ▸ Picton Road with no new at grade intersections and a free flow arrangement of Hume Highway and Picton Road. The layout of the interchange of the Hume Highway and Picton Road to be modelled shall be determined in consultation with TfNSW and RMS. | 5.8 |
| ▸ Picton Road with at grade intersections east of the Hume Highway. | 5.8 |
| ■ Based on the results of the modelling, the proponent shall undertake an economic assessment on the impact of the two separate options on freight activity and access to and from the Illawarra Region. | Section 7 |
| ■ An assessment of mitigating measures to accommodate the proposal with an agreed scope and costs (at a strategic level) with TfNSW and RMS. | Section 8 |
| ■ A Transport Management and Accessibility Plan (TMAP) must be prepared in consultation with TfNSW to identify and assess: | This report, Section 8 |
| ▸ the provision and staging of the required traffic and transport infrastructure, including regional and local intersection and road improvements required. | 5.11 |
| ▸ how the works required are to be funded and any proposed contributions to local and State or regional infrastructure. | 8.1 |
| ▸ public transport needs and the capacity of existing services. | 6.2 |
| ▸ scenarios including road works. | 5.10 |
| ■ The TMAP shall identify a road hierarchy and access strategy that minimises local trips on Picton Road between the four quadrants of the development and safely manages pedestrian and cyclists desire lines in a high speed environment. Consideration must be given to the management of east west crossings of the Hume Highway and north south crossings of Picton Road (particularly east of the Hume Highway). | 5.8, 5.9, 6.3, 6.4 |
| ■ The TMAP shall identify vehicular, pedestrian and cyclist infrastructure on (and above) both the Hume Highway and Picton Road required to accommodate the proposal as well as suitable public transport infrastructure, cognisant of the public transport infrastructure and services modelled in the Sydney Travel Model. | 5.8, 5.9, 5.10, 6.2, 6.3, 6.4 |
| ■ The TMAP shall identify (and preserve) land required for future road infrastructure upgrades. The extent of land required shall be determined in consultation with RMS. | Section 8 |

# 2. Existing situation

This section outlines the existing travel behaviour of residents and employees in the area around the proposed Development. It also looks at locations with characteristics similar to how Wilton Junction could develop, to provide guidance in the potential travel behaviour of the residents and employees in the Development. It describes the current transport capacity and performance of the surrounding roads, the public transport network and services and the walking and cycling network.

## 2.1 Travel behaviour

The travel behaviour of existing nearby residents and employees can provide a guide to how the future residents and employees of the Development may travel. Travel behaviour varies widely, but certain characteristics can be grouped depending on the:

- purpose for the journey
- the time period of the journey
- the mode or combination of modes of transport used from the origin to the destination.

Three sets of data exist for assessing these travel characteristics:

- Australian Bureau of Statistics publishes broad travel data gathered from the questions asked in the five-yearly Census. Useful data includes the population, number of dwellings, amount of workers and students, mode of travel to work and time of work trips made.
- The Census results for NSW are further analysed by the Bureau of Transport Statistics (BTS), within Transport for NSW. The Journey to Work (JTW) data set analyses work commuting trips and links their origin and destination zones, creating a matrix of movements around the Sydney Greater Metropolitan Area (GMA). This is useful to determine the current directions of travel to and from an area and mode share.
- BTS also undertakes a continuous Household Travel Survey (HTS) which samples households in the Greater Metropolitan Area (GMA). The survey involves respondents completing a diary of their travel patterns for all trip purposes. The results are compiled on an annual basis, but can be combined to form a large pool of data.

Due to the sample size, only certain types of data are available from each data set. Weekend data was not available.

**Number of daily trips per person**

The 2010/2011 release of HTS data (BTS, 2012) indicates that people in Sydney GMA made 3.77 trips per person per weekday, whilst people in Wollondilly LGA made an average of 3.9 trips.

**Reason for travelling**

Trips generated from dwellings can be made for several purposes. Trip purposes can include: commute to work, work related business, education/childcare, shopping, personal business, social/recreation, serve passenger or other. For the purposes of this study, these categories have been amalgamated to those shown in Table 2.1. Data from the 2010/2011 release of HTS data for Sydney GMA were used to estimate these rates. Travel behaviour during the peaks can be different from patterns for the whole day, so percentages are presented for daily, AM peak and PM peak trips.

**Table 2.1 Trip purpose percentages by time of day for Sydney GMA**

| Trip purpose | Daily | AM peak | PM peak |
|---|---|---|---|
| Commute, work related business | 28% | 41% | 29% |
| Education/childcare | 10% | 28% | 14% |
| Shopping, personal business | 29% | 16% | 26% |
| Other, social/recreational | 32% | 14% | 31% |
| **Total** | **100%** | **100%** | **100%** |

Source: Household Travel Survey (HTS) 2010/11 Release, Bureau of Transport Statistics, Transport for NSW (2012)

Note: Trips to serve passenger were apportioned across the other four categories and included in their percentages

### Car ownership

The number of cars owned per dwelling is a measure of residents in an area's ability to choose to travel other than by transit. Many new land release areas have a high number of vehicles per dwelling, indicating that more people in the household have the ability to drive. Car ownership is influenced by the number of people per dwelling as well as the level of alternative transport options, affluence, job type and the availability of free parking. The average number of cars per household for the Wollondilly LGA measured in the 2010/2011 HTS survey was 2.2, compared to a Sydney GMA average of 1.55 vehicles per household. Based on the 2011 Census data, Wilton had a slightly higher average of 2.3 vehicles per dwelling.

Based on a per capita basis, Wollondilly LGA with 0.73 vehicles per person has one of the highest number of vehicles per person of all local government areas across Sydney GMA, but is on par with Camden and lower than Wingecarribee (0.76 – the highest in the Sydney GMA). The Sydney GMA average was 0.59 vehicles per person.

### Transport mode share

The choice of travel mode varies depending on the range of transport services available, car availability, need for predictable arrival time, the length of the journey and the reason for travelling. The mode split for trips to work during the AM peak to employment precincts in the outer south-west Sydney area are shown in Table 2.2. The mode split percentages are calculated using data from the BTS 2011 JTW dataset.

**Table 2.2 AM peak period mode split examples for trips to surrounding employment**

| Travel mode/ Destination | Wilton, Maldon, Razorback | Picton, Thirlmere, Tahmoor | Appin | Wollondilly LGA | Camden LGA | Campbell-town LGA |
|---|---|---|---|---|---|---|
| 2011 Travel zones | 3008, 3010 | 3013, 3015, 3016, 3017 | 3009 | 3000 to 3025 | 3100 to 3131 | 3200 to 3307 |
| Train | 0% | 1% | 1% | 1% | 1% | 3% |
| Bus | 0% | 0% | 0% | 0% | 1% | 1% |
| Taxi | 1% | 0% | 0% | 0% | 0% | 0% |
| Car as driver | 81% | 85% | 90% | 84% | 85% | 82% |
| Car as passenger | 6% | 7% | 5% | 7% | 8% | 8% |
| Truck | 8% | 2% | 1% | 3% | 2% | 1% |
| Motorbike | 0% | 1% | 1% | 1% | 0% | 0% |
| Bicycle | 0% | 0% | 0% | 0% | 0% | 0% |
| Other mode | 0% | 1% | 0% | 1% | 0% | 0% |
| Walked only | 3% | 3% | 1% | 4% | 2% | 2% |
| **Total** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |

Source: 2011 Journey to Work (BTS, 2013), selected travel zones

The corresponding mode share for work trips from the selected residential precincts near Wilton are shown in Table 2.3. They show the potential range of mode shares that the future residents of the Wilton Junction Development could achieve. Factors influencing this range include the level of access to public transport, the supply of parking and road congestion in the surrounding area.

**Table 2.3 AM peak period mode split examples for trips from surrounding population**

| Travel mode/ Origin | Wilton, Maldon, Razorback | Picton, Thirlmere, Tahmoor | Appin | Wollondilly LGA | Camden LGA | Campbell-town LGA |
|---|---|---|---|---|---|---|
| 2011 Travel zones | 3008, 3010 | 3013, 3015, 3016, 3017 | 3009 | 3000 to 3025 | 3100 to 3131 | 3200 to 3307 |
| Train | 6% | 5% | 5% | 5% | 7% | 18% |
| Bus | 1% | 0% | 1% | 1% | 1% | 1% |
| Taxi | 0% | 0% | 0% | 0% | 0% | 0% |
| Car as driver | 82% | 82% | 83% | 83% | 82% | 69% |
| Car as passenger | 5% | 6% | 4% | 5% | 5% | 7% |
| Truck | 4% | 3% | 4% | 3% | 2% | 2% |
| Motorbike | 0% | 1% | 0% | 1% | 1% | 0% |
| Bicycle | 0% | 0% | 0% | 0% | 0% | 0% |
| Other mode | 0% | 0% | 0% | 1% | 0% | 0% |
| Walked only | 2% | 2% | 2% | 2% | 1% | 2% |
| **Total** | **100%** | **100%** | **100%** | **100%** | **100%** | **100%** |

Source: 2011 Journey to Work (BTS, 2013), selected travel zones

In addition to the modes of travel outlined above, an additional 7% of Wilton residents worked from home, which is higher than the SMA average of 5%.

Of the residents who use the train to get to work (from Camden, Campbelltown, Wollondilly LGAs and the Southern Highlands), on average 49% walked to the station, 32% drove to the station, 8% were car passengers and 9% caught the bus and 2% used other modes. While the percentage for bus to rail was low for the existing Wilton township, this is due to the limited bus service available.

### Direction of travel

The trip distribution for JTW trips (all modes) in the AM peak from and to Wollondilly LGA is listed in Table 2.4. Trips within Wollondilly LGA represent the largest share of all destinations/origins. However, based on these percentages, there is a net surplus of workers in Wollondilly LGA, causing many to travel elsewhere for employment. For those travelling outside the LGA, the majority travel north to Camden, Campbelltown and Liverpool. The pattern of worker trips coming to Wollondilly LGA reveals a significant movement of workers from the Illawarra region to Wollondilly employment.

**Table 2.4 Destination and origin council area for commute trips to/from Wollondilly LGA**

| To LGA | % of trips from Wollondilly LGA |
|---|---|
| Wollondilly | 30% |
| Camden | 13% |
| Campbelltown | 13% |
| Liverpool | 6% |
| Wingecarribee | 4% |
| Penrith | 4% |
| Sydney | 3% |
| Blacktown | 3% |
| Fairfield | 2% |
| Wollongong | 2% |
| Bankstown | 2% |
| Other LGAs | 18% |
| **Total** | **100%** |

| From LGA | % of trips to Wollondilly LGA |
|---|---|
| Wollondilly | 61% |
| Wollongong | 10% |
| Camden | 7% |
| Campbelltown | 6% |
| Wingecarribee | 4% |
| Shellharbour | 2% |
| Penrith | 2% |
| Other LGAs | 9% |
| **Total** | **100%** |

Source: 2011 Journey to Work (BTS, 2013), Wollondilly LGA, all modes

Table 2.5 shows the corresponding information for Camden and Campbelltown LGAs. The majority of the trips made by their workers either stay in the area or travel north. Similar to Wollondilly, there is a net surplus of employees. While Wollondilly LGA is a destination for only 1% of employees, Wollondilly workers make up 9% of the workforce in Camden/Campbelltown.

**Table 2.5 Destination and origin council area for commute trips to/from Camden/Campbelltown LGA**

| To LGA | % of trips from Camden/Campbelltown LGA |
|---|---|
| Campbelltown | 30% |
| Camden | 13% |
| Liverpool | 10% |
| Sydney | 9% |
| Fairfield | 4% |
| Bankstown | 4% |
| Auburn | 2% |
| Botany Bay | 2% |
| Holroyd | 2% |
| Blacktown | 2% |
| Other LGAs | 17% |
| **Total** | **100%** |

| From LGA | % of trips to Camden/Campbelltown LGA |
|---|---|
| Campbelltown | 43% |
| Camden | 22% |
| Wollondilly | 9% |
| Liverpool | 6% |
| Fairfield | 3% |
| Wollongong | 2% |
| Penrith | 2% |
| Other LGAs | 13% |
| **Total** | **100%** |

Source: 2011 Journey to Work (BTS, 2013), Campbelltown & Camden LGAs, all modes

Wingecarribee LGA shows a more self-contained worker trip pattern, with the majority of workers living and working in the area. Of the remaining workers, there is a similar north migration pattern, with workers from Wingecarribee working in Sydney, Campbelltown and Wollondilly and workers from Goulburn and Wollongong taking local positions.

**Table 2.6 Destination and origin council area for commute trips to/from Wingecarribee LGA**

| To LGA | % of trips from Wingecarribee LGA |
|---|---|
| Wingecarribee | 73% |
| Sydney | 3% |
| Campbelltown | 3% |
| Wollondilly | 2% |
| Other LGAs | 19% |
| **Total** | **100%** |

| From LGA | % of trips to Wingecarribee LGA |
|---|---|
| Wingecarribee | 83% |
| Wollondilly | 6% |
| Wollongong | 2% |
| Goulburn Mulwaree | 2% |
| Other LGAs | 7% |
| **Total** | **100%** |

Source: 2011 Journey to Work (BTS, 2013), Wingecarribee LGA, all modes

## 2.2 Road network

The road network providing access to the Wilton Junction Development is dominated by two roads – the Hume Highway and Picton Road, which divide the development into four quadrants. Other roads provide access to neighbouring villages, but their alignment is constrained by the need to cross deep river gorges.

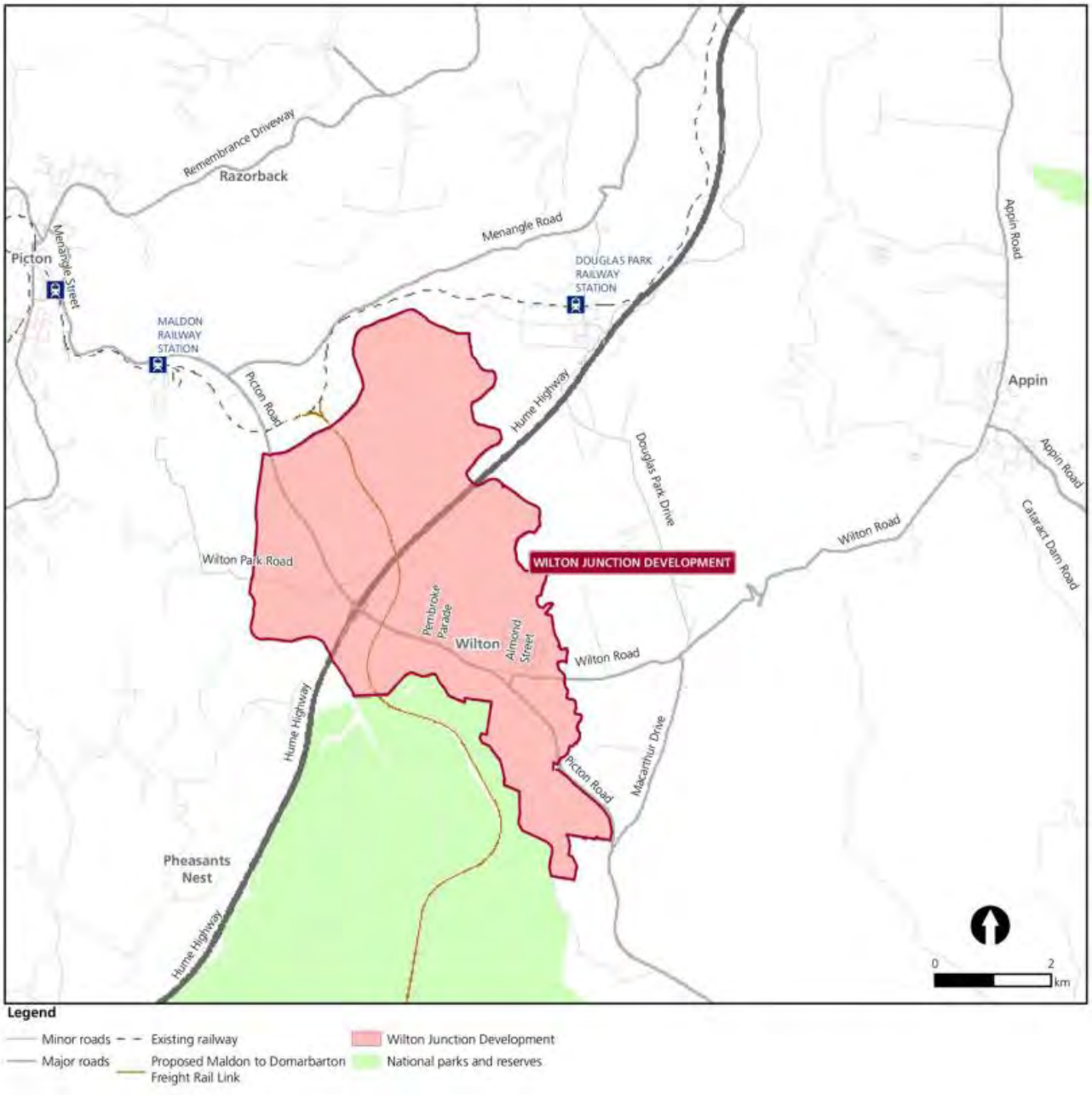



**Figure 2.1 Road network**

### Hume Highway

Hume Highway (M31) is part of the major interstate highway linking Sydney and Melbourne. The upgrading of its 800 km length to dual carriageway was completed in mid-2013. In the vicinity of Wilton, it has two lanes in each direction with a wide median and shoulder lanes. The Hume Highway widens to three lanes in each direction, north of Narellan Road, and four lanes in each direction north of Raby Road.

Roads crossing the Hume Highway are grade separated and access to the Highway is limited to interchange points. The Wilton Junction Development surrounds the interchange between the Hume Highway and Picton Road. The next interchange north is at Narellan Road (22km north) near Camden and Campbelltown, while the next interchange south is at Remembrance Drive near Bargo, 11 km south. Hume Highway is designated as a B-double route and allows vehicles with a maximum vertical height clearance of 4.6 m. This route is signposted as a 110 km/h speed zone.

### Picton Road

Picton Road (B88) is a State road travelling between Picton and Mount Ousley Road (M1) that serves as a freight route to Port Kembla and a commuter traffic route on weekdays. Picton Road generally has one travel lane in each direction, with overtaking lanes at selected locations. Its twisting alignment, relatively high traffic volume and undivided carriageway has resulted in a poor crash history. Picton Road (apart from the section between Picton and Maldon Road) is designated as a B-double route and allows vehicles with a maximum vertical height clearance of 4.6 m (entire length). Picton Road is signposted with a mixture of 60 km/h, 80 km/h and 100 km/h sections, with speed advisory signs on tight bends. The section around the Hume Highway is signposted as 80km/h. Along with Appin Road, Picton Road provides a bypass for vehicles from the Illawarra region bypassing Sydney roads or wishing to access the Westlink M7.

### Remembrance Drive

Regional route 89 Remembrance Drive is a route running parallel to the Hume Highway between Camden and Yanderra that previously formed part of the Hume Highway route until bypassed in 1984. Remembrance Drive passes through the townships of Bargo, Tahmoor and Picton before connecting to the Camden Bypass. Remembrance Drive generally has one travel lane in each direction with overtaking opportunities and some overtaking lanes. It is a designated B-Double route in the event of a temporary closure of the Hume Highway due to an incident, and allows vehicles with a maximum vertical height clearance of 4.6 m.

### Appin Road/Bulli Appin Road

State route B69 connects Campbelltown and Appin with the Southern (Princes) Freeway (M1). It provides access to a colliery and sand mine. Appin Road generally has one travel lane in each direction, however long sections have overtaking lanes. Its carriageway is undivided, with a mixture of 60 km/h, 80 km/h and 100 km/h speed limit sections. Appin Road is designated as a B-double route and allows vehicles with a maximum vertical height clearance of 4.6 m.

### Wilton Road

Regional route 610 is a Regional road connecting Picton Road (via Almond Street) at Wilton to Appin. It is a single carriageway road with one lane in each direction. At its crossing of the Cataract River (Broughton Pass), tight (15 km/h speed advisory) hairpin bends and a bridge with a restriction of one vehicle at any one time limit its capacity. East of Broughton Pass its speed limit is 100 km/h until it reaches Appin township. West of Broughton Pass it has a speed limit of 80 km/h due to a tighter alignment and narrow shoulders. Wilton Road, between Picton Road and Douglas Park Drive, is a designated B-Double route for vehicles up to 19 m in length. Wilton Road (Wilton to Appin) has a 12 tonne load limit and 15m length limit for trucks/buses.

**Douglas Park Drive**

Douglas Park Drive is a rural road connecting Douglas Park to Wilton via a crossing of the Nepean River. It has one lane each way, with a speed limit of up to 100 km/h. However, similar to Wilton Road, its capacity is limited by a narrow causeway at the Nepean River, with tight bends and steep gradients either side. Douglas Park Drive connects to Menangle Road via Camden Road through Douglas Park, including a level-crossing of the Southern Highlands Line. Douglas Park Drive has a 3 tonne load limit and 10 m length limit for trucks and buses. A small section of Douglas Park Drive is approved for 19 metre long B-Doubles near Wilton Road.

**Menangle Road**

Regional route 56, Menangle Road, has one lane each way and connects Picton Road to Campbelltown. It runs parallel to the Hume Highway and Remembrance Drive. It has a mixture of speed limits from 60 km/h to 100 km/h. It crosses the Hume Highway (without connection) via an overbridge south of Narellan Road. Further north it passes areas of new residential development at Macarthur as well as Macarthur Station. Menangle Road, between Picton Road and Finns Road, is a designated B-Double route in the event of a temporary closure of the Hume Highway due to an incident.

**Wilton Park Road**

Wilton Park Road is a local road consisting of two 'No Through Road' sections that connect to Picton Road in (one to the north and one to the south of Picton Road). East of the Nepean River it provides access to rural residential properties and has a speed limit of 80 km/h. West of the Nepean River it provides access to the Maldon industrial area via a level-crossing of the Southern Highlands Line. The connection between the two sections of road has been closed, but consisted of a causeway with steep gradients and tight turns either side.

## 2.3 Traffic volumes

Traffic data from several sources were used to obtain an understanding of current traffic conditions, including RMS data, traffic counts commissioned for this assessment, and traffic data from previous studies and reports. In March 2013 classified intersection turn counts were undertaken at a number of locations around the network. The purpose of these surveys was to assist in calibrating the mesoscopic traffic model (see section 5 for more details), however they provide an indication of local traffic conditions as well. Counts were separated into light and heavy vehicles in 15-minute intervals on a weekday during the AM peak period (6.30–9.30) and PM peak period (15.30–18.30).

The sites surveyed for traffic volumes include:

1. The Northern Road/Camden Valley Way (signalised intersection)
2. The Northern Road/Camden Bypass (interchange)
3. Hume Highway/Narellan Road (interchange)
4. Narellan Road/Blaxland Road/Gilchrist Drive (signalised intersection)
5. Narellan Road/Appin Road/Oxley Street (signalised intersection)
6. Remembrance Drive and Macarthur Road (interchange)
7. Remembrance Drive and Old Hume Highway (signalised intersection)
8. Appin Road/Church Street (give-way)
9. Appin Road/M1 Princes Motorway (interchange)
10. Mount Ousley Road/Picton Road (interchange)

11. Picton Road/Hume Highway (interchange)
12. Menangle Street/Remembrance Drive/Argyle Street (give-way)
13. Barkers Lodge Road/Remembrance Drive (give-way)
14. Hume Highway/Remembrance Drive (interchange).

In addition, intersection approach queue length surveys were undertaken at the following intersections:

1. The Northern Road/Camden Valley Way
2. Hume Highway/Narellan Road
3. Narellan Road/Appin Road/Oxley Street.

The volumes surveyed at the sites along Picton Road, within the Development area are shown in Figures 2.2 and 2.3 for the AM and PM peak hours respectively. Mid-block volumes are shown in Figure 2.4, represented in passenger car units (PCU), where one truck equals two PCU.

Refer to Appendix A for detailed traffic survey results.

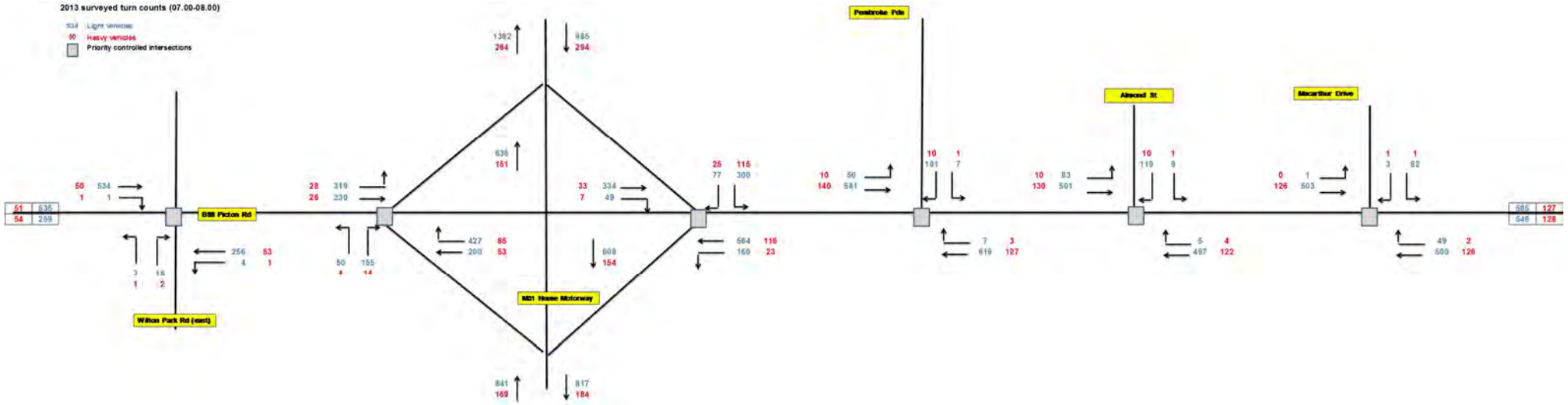



**Figure 2.2 2013 AM peak Surveys Traffic Volumes**

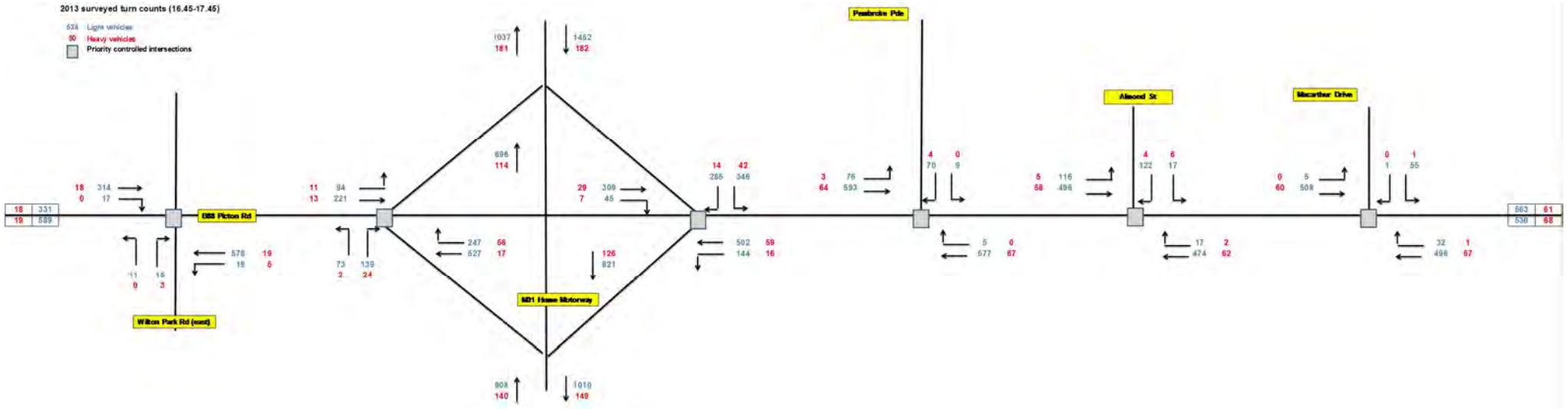



**Figure 2.3 2013 PM peak surveys traffic volumes**

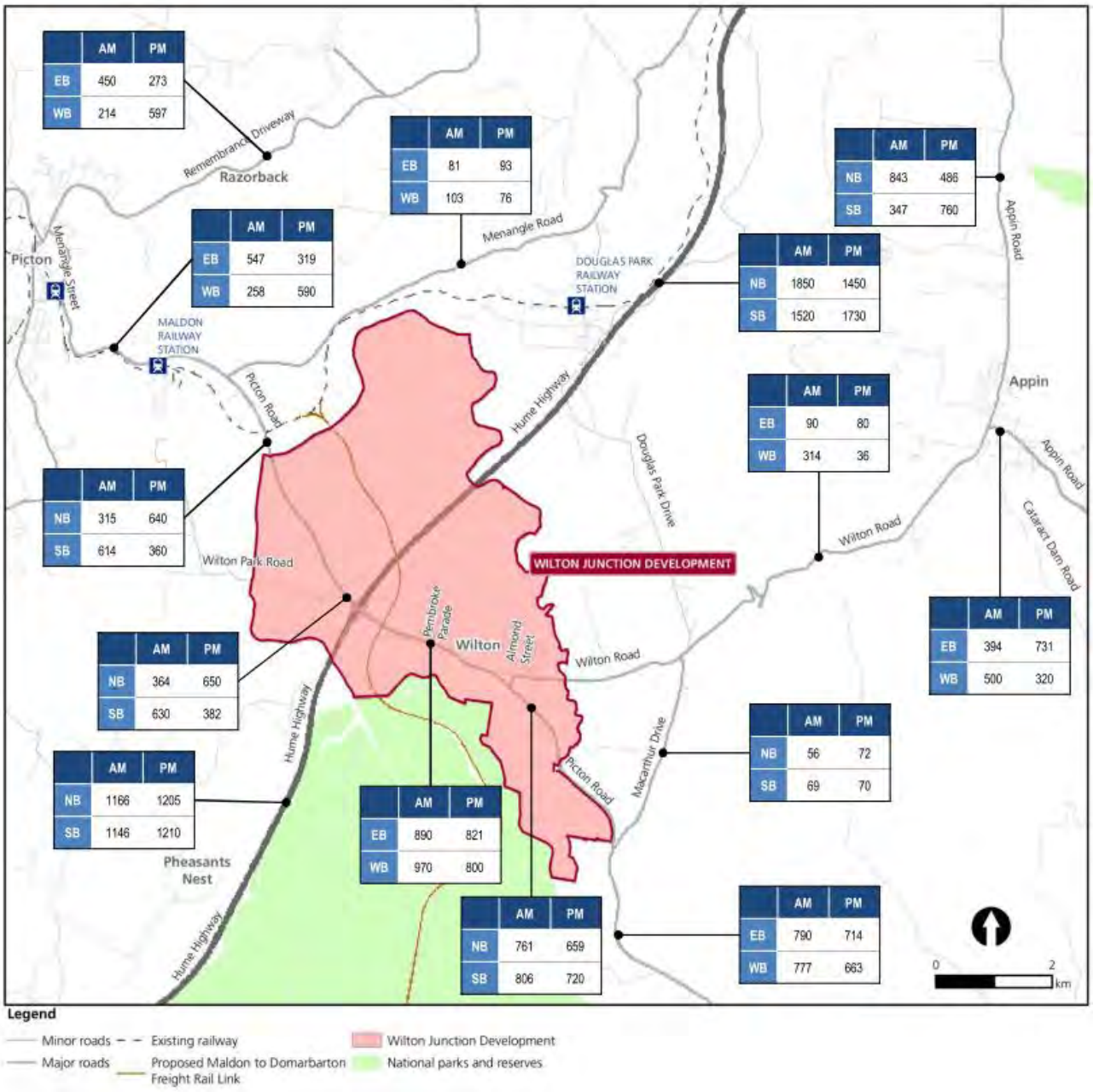
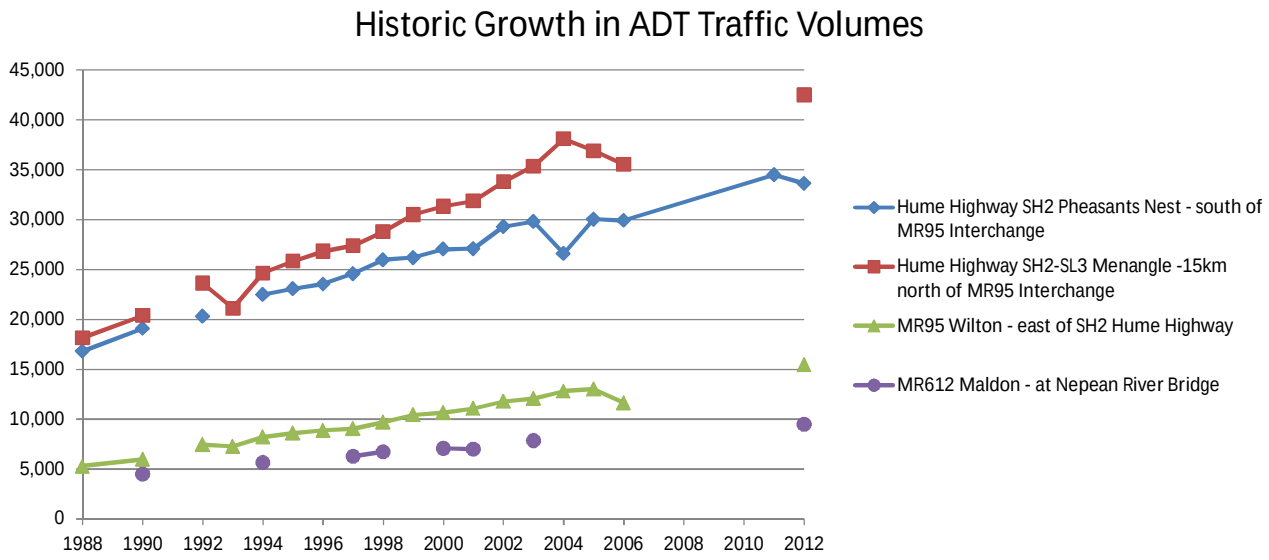



**Figure 2.4 Road network flows (modelled) for 2013 base scenario (PCUs)**

### Historic growth in traffic on the Hume Highway and Picton Road

The Hume Highway has been undergoing an extensive upgrade to improve safety and travel efficiency since the 1970s. This has included the 22 major bypasses and completion of a dual carriageway with a minimum of two lanes per direction in mid-2013. This continual improvement has resulted in a decrease in travel times (totalling over three hours between Sydney and Melbourne), making travel along the Hume Highway easier, especially between the cities of Sydney and Canberra. Associated with this upgrade program and the introduction in 2007 of higher mass limits for heavy goods vehicles, has been growth in traffic volumes.

The historic trend in traffic growth for the Hume Highway and Picton Road is shown in Figure 2.5. The figure shows relatively constant growth between 1988 and 2004 on both roads. However, since 2005, traffic has changed with less predictability.




Source: RMS count data

**Figure 2.5 Historic change in traffic volumes on Hume Highway and Picton Road**

## 2.4 Traffic conditions

The existing performance of the following intersections was extracted from the 2013 AM and PM base Aimsun models:

1. Hume Highway/Picton Road (eastern intersection)
2. Hume Highway/Picton Road (western intersection)
3. Picton Road/Wilton Park Road, east of Menangle Road
4. Picton Road/Pembroke Parade
5. Picton Road/Almond Street
6. Picton Road/Macarthur Road.

Table 2.7 shows the existing intersection performance in average vehicle delay (seconds/vehicle) and Level of Service (LoS) for the AM peak hour (07.00–08.00) and PM peak hour (16.45–17.45). Definitions of the intersection performance criteria are included in Appendix B.

**Table 2.7 2013 intersection performance for the AM and PM peak hours**

| Intersection | AM peak (07.00–08.00) | | PM peak (16.45–17.45) | |
|---|---|---|---|---|
| | Ave. delay (sec/veh) | LoS | Ave. delay (sec/veh) | LoS |
| Hume Highway/Picton Road (Eastern intersection)[1] | 26 | B | 33 | C |
| Hume Highway/Picton Road (Western intersection)[1] | 10 | A | 13 | A |
| Picton Road/Wilton Park Road[1] | 13 | A | 14 | A |
| Picton Road/Pembroke Parade[1] | 28 | B | 16 | B |
| Picton Road/Almond Street[1] | 18 | B | 12 | A |
| Picton Road/Macarthur Road[1] | 15 | B | 9 | A |

(1) priority controlled intersections, LoS and average delay reported is for the worst performing approach

The 2013 model results show that all the key intersections perform at LoS C or better for both peak hours. This is considered a satisfactory level of performance. However, anecdotal evidence indicates that right-turning traffic at the interchange of Hume Highway and Picton Road experiences delays during peak times, resulting in vehicles bypassing queues and making illegal manoeuvres across grassed medians.

## 2.5 Public transport

Existing public transport services in the area are limited, reflecting the small population currently living and working in the area, and the dispersed nature of settlement.

**Rail**

The Southern Highlands Line has limited numbers of inter-city services, with Picton and Douglas Park being the closest Stations. More frequent services are available at Macarthur and Campbelltown Stations, on the Macarthur and Southern Highlands line. Both stations also have commuter car park facilities.

The station with the most frequent services is Campbelltown Station with 15 trains departing towards Sydney in the AM peak hour, followed by Macarthur Station with 9 trains and Picton and Douglas Park with a maximum of 2 trains. Passengers on the Southern Highlands Line are required to change trains at Campbelltown from a diesel train to an electric-powered train.

**Table 2.8 Train service frequency and hours of operation**

| Description | Hours of operation (weekdays) | Frequency per hour/no. services |
|---|---|---|
| Airport & East Hills Line | From Campbelltown/Macarthur<br>(departing 3.57 am to 11.54 pm) | AM peak: 8 services per hour<br>PM peak: 4 services per hour<br>Off peak: 2 services per hour |
| | From Lidcombe<br>(arriving 5.19 am to 12.42 pm) | AM peak: 4–5 services per hour<br>PM peak: 7 services per hour<br>Off peak: 2 services per hour |
| South Line | From Campbelltown/Macarthur<br>(departing 4.01 am to 11.54 pm) | AM peak: 3–6 services per hour<br>PM peak: 2–4 services per hour<br>Off peak: 2–5 services per hour |
| | From Museum<br>(arriving at Campbelltown 6.09 am to 1.37 am) | AM peak: 2 services per hour<br>PM peak: 2–4 services per hour<br>Off peak: : 2–4 services per hour |
| Cumberland Line | From Campbelltown<br>(departing 6.41 am to 7.11 am) | AM peak: 2 trains (total)<br>PM peak: no service<br>Off peak: no service |
| | From Blacktown/Schofields<br>(departing Blacktown 4.32 am to 5.32 pm) | AM peak: no service<br>PM peak: 3 trains (total)<br>Off peak: no service |
| Southern Highlands | From Moss Vale/Goulburn<br>(departing Picton 4.17 am to 9.17 pm) | AM peak: 1–2 services per hour<br>PM peak: 1 service per hour<br>Off peak: 1 service per hour |
| | From Town Hall<br>(arriving Picton 5.47 am to 11.07 pm) | AM peak: 1 service per hour<br>PM peak: 1–2 services per hour<br>Off peak: 1 service per hour |

Source: CityRail timetables, viewed July 2013

Table 2.9 presents the 2012 number of passenger movements through local stations across a typical weekday. Comparing these numbers from 2011 figures there has been a shift in passengers from Macarthur Station to Campbelltown Station.

**Table 2.9 2012 daily passenger movements at local stations**

| Time period | Picton | | Douglas Park | | Macarthur[1] | | Campbelltown | |
|---|---|---|---|---|---|---|---|---|
| | Entries | Exits | Entries | Exits | Entries | Exits | Entries | Exits |
| 02.00 to 06.00 | 10 | 0 | 10 | 0 | 50 | 30 | 100 | 50 |
| 06.00 to 09.30 | 160 | 20 | 40 | 0 | 1,010 | 410 | 3,660 | 770 |
| 09.30 to 15.00 | 70 | 30 | 0 | 10 | 600 | 570 | 1,120 | 1,160 |
| 15.00 to 18.30 | 30 | 140 | 0 | 20 | 420 | 950 | 1,210 | 3,270 |
| 18.30 to 02.00 | 0 | 80 | 0 | 20 | 190 | 310 | 280 | 1,120 |
| 24 Hours | 270 | 270 | 50 | 50 | 2,270 | 2,270 | 6,370 | 6,370 |

Source: Bureau of Transport Statistics website, 2013, Station Ins & Outs

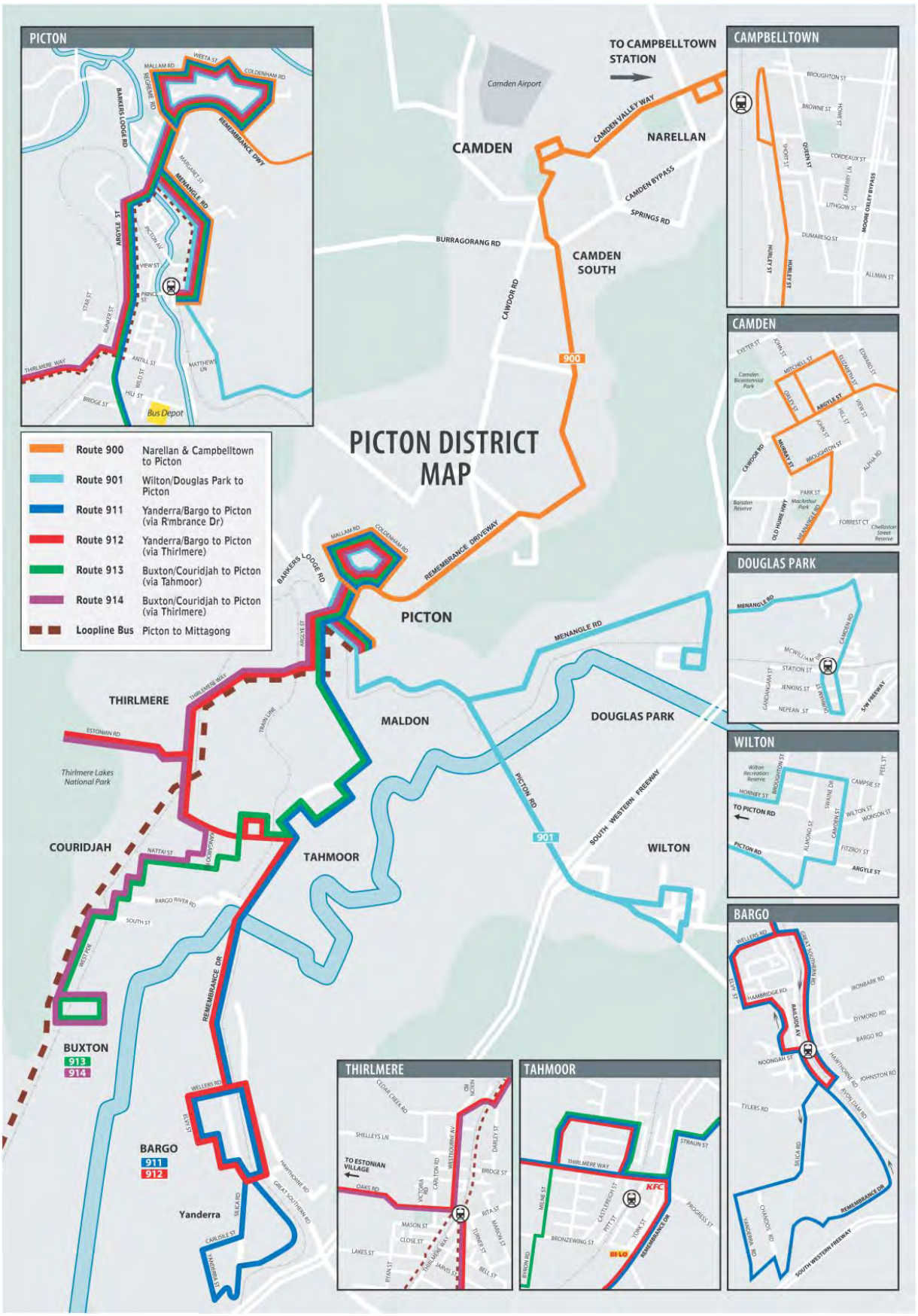
### Bus

Bus services to Wilton township are currently limited to route 901, operated by Picton Buslines, between Douglas Park, Wilton, Maldon and Picton as a loop service. Two services per day operate per weekday. There is no service on weekends. Trips between Wilton and Picton take 20 minutes and 15 minutes between Picton and Wilton.

In the wider network, bus services are focussed around Picton (Picton Buslines), Camden, Macarthur and Campbelltown (Busways). Travelling south from Campbelltown, Route 889 extends as far as Menangle, while from Camden, Routes 894 and 895 travel as far south as Camden South. From here, Routes 38, 39, 40, 47 and 49 operate limited services. Route 900, operated by Picton Buslines is the only regular passenger service route that bridges the gap between Picton and the Macarthur area, operating via Camden to Campbelltown. This service has five services per weekday in each direction, with two services per day on Saturday. There is no service on Sunday.

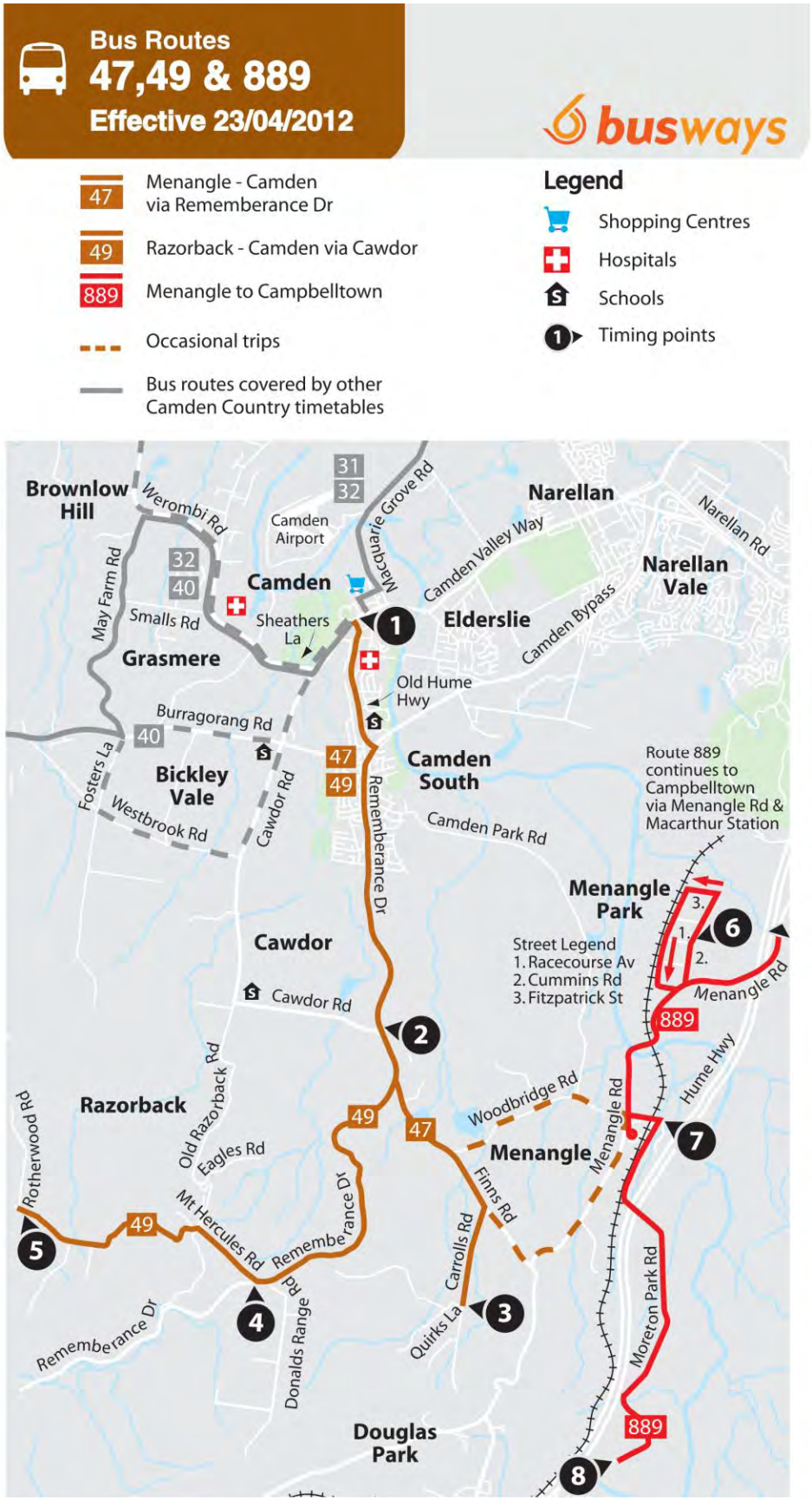
These bus routes and the surrounding network are shown in Figures 2.6 and 2.7.

School buses operate to 15 schools outside Wilton.




Source: Picton Buslines, (Viewed 13 May 2013)

**Figure 2.6 Picton bus services**



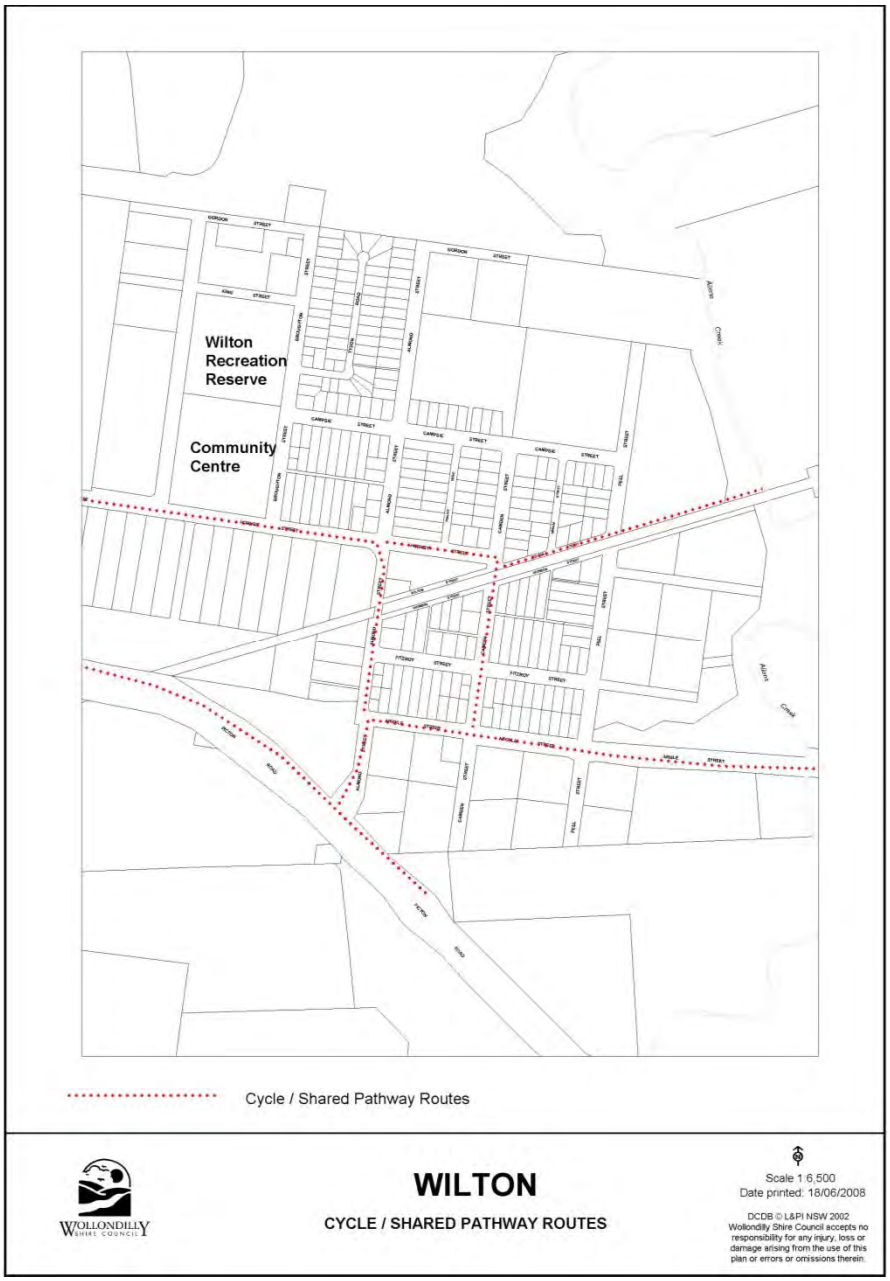

Source: Busways website, (Viewed 13 May 2013)

**Figure 2.7 Busways Camden bus services**

## 2.6 Pedestrian and cycle infrastructure

Pedestrian and cycle facilities in the existing township of Wilton are limited. However, as part of the Bingara Gorge Development, new facilities are being installed, including footpaths on both sides of the street, pedestrian refuges on Oxenbridge Avenue and Chisholm Street, and a school crossing on Greenbridge Drive.

Because of the long distances between townships, walking and cycling trips are typically restricted to short distances. Wollondilly Shire Council has nominated routes within the Shire for shared cycle/pedestrian paths. On a wider scale, routes are planned between Wilton and Picton, Appin and Douglas Park via Wilton Park Road (including through the section currently closed to traffic), Picton Road, Menangle Road, Wilton Road, and Douglas Park Drive. Crossing the Hume Highway, routes are planned along Picton Road and over a new crossing between the Picton Road Interchange and the alignment of the Maldon to Dombarton Rail Link.




Source: Wollondilly Shire Council

**Figure 2.8 Proposed shared cycle pathways for Wilton**

From information on Council's website, the principles for developing shared cycleway routes include:

- connecting logical start and end points (e.g. schools to residential areas, towns to each other etc.)
- maximising/using off-road routes wherever feasible
- on-road routes along major connecting roads may be considered in rural areas to reduce construction costs and increase useability
- target known future land release areas for off-road routes
- link tourist and other places of interest to encourage visitors and residents into recreational cycling.

## 2.7 Picton Road safety

RMS has recently completed a $53 million program of improvements along Picton Road to improve safety, including the installation of median barriers to separate the opposing directions of traffic (see Figure 2.9).

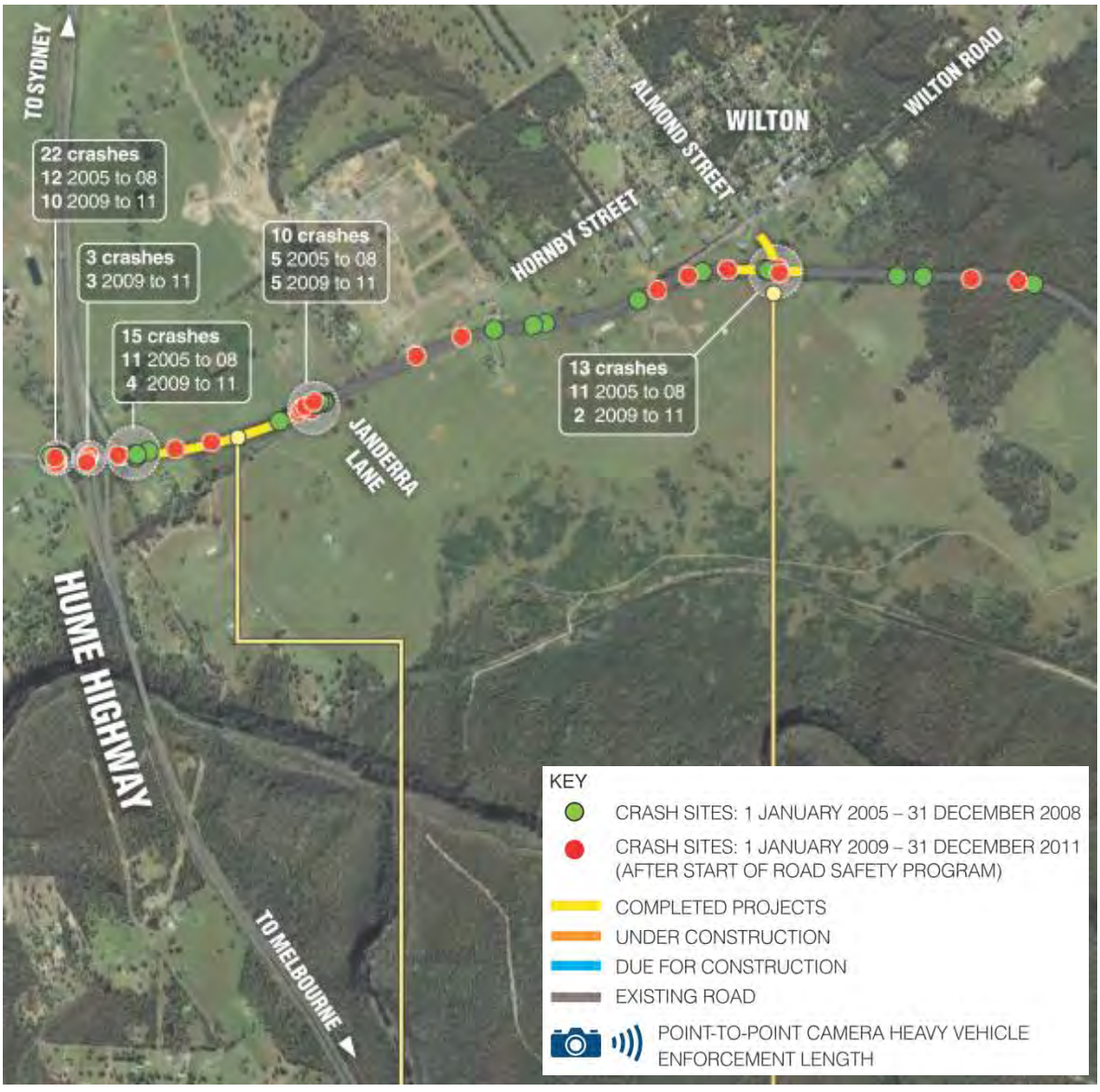
Source: RMS website, Picton Road Safety Improvement Program

**Figure 2.9 Road safety upgrade of Picton Road**

Within the study area completed projects include:

- Janderra Lane to Hume Highway – separation of traffic by rebuilding the concrete median west of Janderra Lane and improvements to line marking and delineation in the right hand lanes.
- Almond Street, Wilton Intersection improvements – widening the road, realigning the eastbound left turn lane into Wilton, improving road drainage, delineation improvements and the installation of street lighting to improve safety at this intersection.

The existing road geometry at the Hume Highway and Picton Road Interchange is contributing to driver confusion resulting in crashes. Between 2005 and 2011, 40 crashes were recorded at the Interchange[2]. Figure 2.10 shows the location of recent crashes on Picton Road. It also illustrates the impact of the two improvement projects listed previously, with crashes per annum reducing by half between Janderra Lane and the Hume Highway and by three quarters at the Almond Street intersection since the completion of these projects.




Source: Picton Road safety improvements Community update, (RMS, May 2012)

**Figure 2.10 Crash history on Picton Road at Wilton**

[2] Picton Road safety improvements Community update, (RMS, May 2012)

Road safety issues at the Hume Highway/Picton Road Interchange include:

- uncertain priority for vehicles turning right onto the on-ramps and vehicles turning right onto Picton Road from the off-ramps
- evidence that drivers are selecting the wrong exit and crossing over grassed traffic islands to re-join the Hume Highway (see Figure 2.11).


Source: Google Streetview, 2013

**Figure 2.11 Tyre tracks in the grass across traffic island at Hume Highway/Picton Road Interchange**

The Picton Road Corridor Strategy (RMS, 2011) includes short and long term strategies to improve road safety and capacity at the Hume Highway and Picton Road Interchange.

## 2.8 Summary of transport network issues

Current travel patterns at Wilton and within Wollondilly Shire are dominated by car-based travel, due to a combination of long distances, limited public transport services and limited current population/employment/shopping/education opportunities. This currently manifests in high levels of car ownership and low transport mode share for non-car modes.

The local road network is based around the Hume Highway with lower–order roads running parallel and connections east to the Illawarra Region crossing the escarpment. Picton Road is operating close to its traffic capacity due to a combination of freight and commuter traffic and traffic bypassing other congested roads within the Sydney network. As a consequence, the interchange between the Hume Highway and Picton Road is also operating close to its capacity. Safety concerns also exist at this interchange with high numbers of crashes recorded. As part of the Picton Road Corridor Strategy, upgrades are planned to address the current capacity and safety issues. See section 4 for further details.

Both train and bus services are limited in the local vicinity, with most residents required to drive to Campbelltown or Macarthur Stations to access frequent train services. Local pedestrian and cycling facilities are also limited due to the small population and lack of pedestrian generators. However, this situation is improving with the construction of Bingara Gorge township.

# 3. Wilton Junction development

Wilton Junction presents a good opportunity to facilitate the creation of new housing and local employment opportunities which addresses significant housing supply shortages and affordability pressures in Sydney. The new town will comprise housing choice through a variety of dwelling sizes and locations, will encourage new business and will provide both physical and social infrastructure.

The area is strategically located around the Hume Highway/Picton Road Interchange, and represents the next potential major town along this transport corridor south of Campbelltown – Macarthur. Moreover, Wilton Junction has the distinct advantage of a consolidated land ownership of more than 2,700 ha in the control of recognised developers, with the resources and capability to expedite housing delivery, roll out enabling infrastructure, deliver social services and provide local employment.

## 3.1 Land owners

The three proponents, who are landowners at Wilton Junction, are:

- Bradcorp Pty Ltd (land at Wilton West)
- Walker Corporation (lands south of Picton Road and east of the Hume Highway)
- Governors Hill (land including the Wilton Aerodrome and lands on both sides of Picton Road west of the Hume Highway).

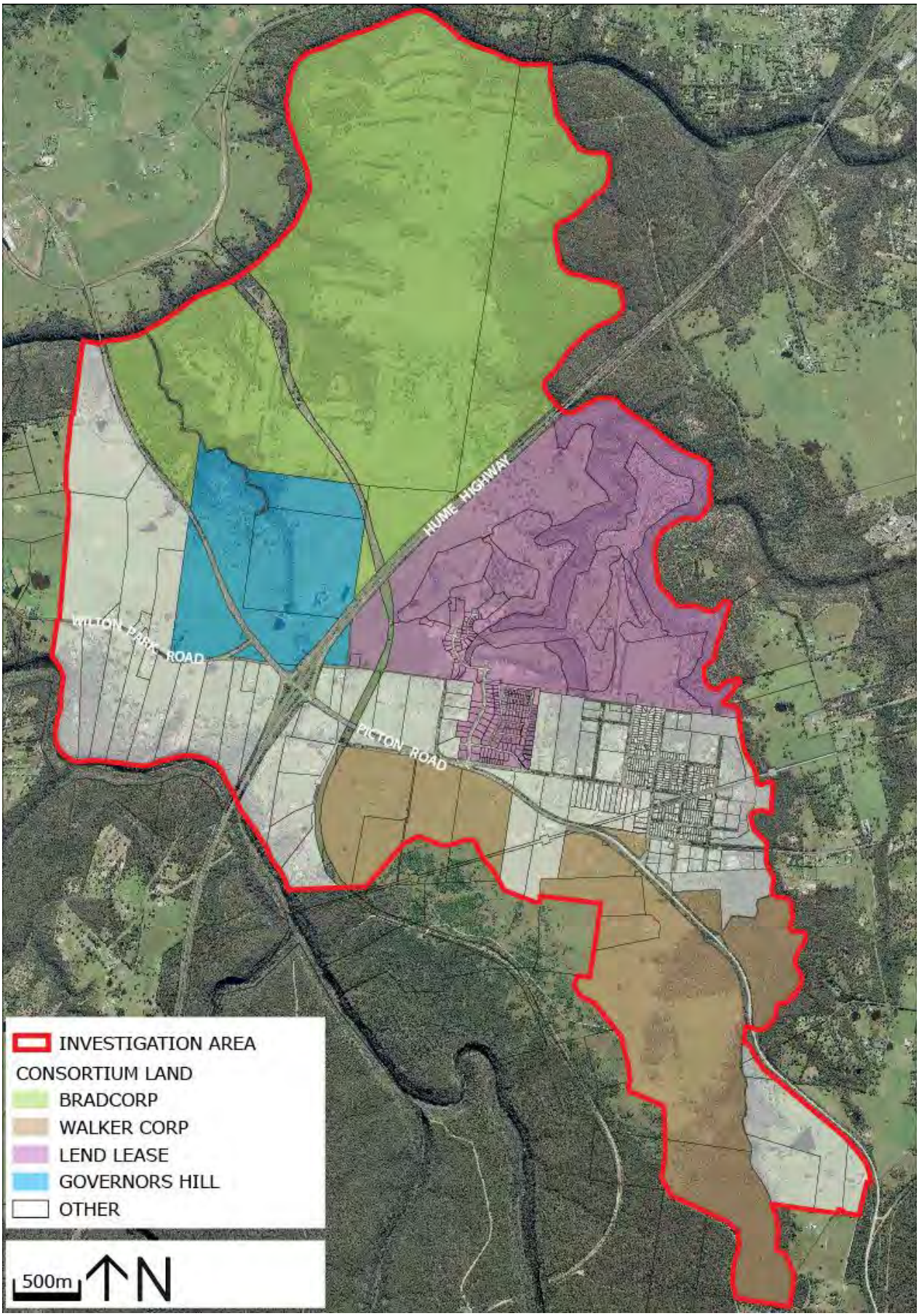
The Investigation Study area includes the Proponents and other private landowners land as outlined in the Table 3.1 below, and shown on Figure 3.1.

**Table 3.1 Wilton Junction Development summary**

| Landowner | Gross area (ha) | Net developable area (ha) |
|---|---|---|
| Lend Lease | 455 | 240 |
| Bradcorp | 872 | 459 |
| Governors Hill | 175 | 124 |
| Walker Corporation | 405 | 230 |
| Other Land | 572 | 489 |
| **Total** | **2,480** | **1,542** |

Source: Wilton Junction New Town High Level Infrastructure Business Case (Elton Consulting on behalf of the Wilton Junction Landowners' Group, February 2013 – Updated May 2014)

Lend Lease will continue with the planning and delivery of its Bingara Gorge community in Wilton, which is already zoned for residential development. This development has approval for approximately 1,165 dwellings, a new village centre, primary school and golf course. Lend Lease is working with the Proponents of this rezoning application to plan and deliver the new town at Wilton Junction and its associated infrastructure.




Source: Connor Holmes, 2014

**Figure 3.1 Wilton Junction land ownership**

## 3.2 Project description

The project seeks to create a new town with between 11,000 and 13,000 new homes and 11,000 jobs. Residential neighbourhoods will be created around green spaces providing a range of housing choice and facilitating healthy lifestyles options for all new residents. A new town, comprising of approximately 17 ha, will be established within the north-west quadrant of the study area and will be surrounded by employment generating uses for business, bulky goods and light industry, comprising of approximately 120–130 ha of land. Smaller neighbourhood centres will be created within the residential neighbourhoods to cater for convenient daily shopping choices. Community facilities and physical infrastructure will be provided facilitating the creation of a self-sustaining community. Existing significant environmental features and heritage items will be preserved commemorating the natural and historical setting of the study area.

The proposed Master Plan will be informed by the following key principles:

- **Employment and commercial drivers.** The delivery of approximately 11,000 jobs focused around a new town centre and in close proximity to the Hume Highway and Picton Road
- **Housing.** Providing between 11,000 and 13,000 new dwellings across the precinct, inclusive of the 1,165 already approved at Bingara Gorge
- **Community facilities**. Provide a diverse range of high quality community facilities including a schools, library, community centre in a town centre and three neighbourhood centres across the precinct
- **Environment**. Conserving ecological features and biodiversity and establishing a Trust to rehabilitate and manage approximately 615 ha of bushland
- **Place making.** Delivering high quality and connected network of streets, spaces and squares throughout the development
- **Activity centres**. Focus on the delivery of a new town centre and three smaller neighbourhood centres with a diverse mix of retail, commerce, business and light industry
- **Traffic and transport.** Providing strategic motorway and bus access to surrounding areas, legible movement throughout the development
- **Infrastructure.** Integrated water, waste water and stormwater management systems and access to all other utilities including gas and NBN.

Specifically for traffic and transport, the key principles are:

- self-containment in services and employment to reduce trip numbers and length
- accommodate and promote work from home opportunities
- integrate land uses to limit trip generation and vehicle movements
- provide for non-car travel modes
- facilitate a bus network comprising local internal bus services to connect local residents with their town centre and community facilities, district routes to other centres (i.e. Picton, Tahmoor & Bargo etc.) and regional services to connect higher order centres such as Campbelltown
- early delivery of public transport infrastructure to establish and reinforce sustainable transport habits
- provision of higher density development and trip generators on bus routes
- establishment of a centralised and accessible public transport interchange
- establish opportunities for Kiss-and-Drop, Park-and-Ride/Park-and-Share
- establish bus priority measures

- ensure multi-modal integration with accessible bus routes and stops connected to the cycling and pedestrian network
- implementation of parking management practices
- ensure connectivity between the four quadrants, especially for non-vehicular movement.

The Master Plan, shown in Figure 3.2, outlines the location of the town centre, retail, schools, employment and residential components, as well as the proposed access arrangements.

From an access viewpoint, the Master Plan includes:

- A town centre located north-west of the Hume Highway/Picton Road Interchange, but connected to the majority of the remaining development via internal roads that do not interact with the State Road Network.
- Local village centres and primary schools within the three major quadrants of the development to contain local trips, as much as possible, to short distances.
- Two grade-separated crossings of the Hume Highway, north of Picton Road, and two grade-separated crossings of Picton Road, east of the Hume Highway, to enable internal vehicle trips to move about the development without delaying regional traffic.
- Grade separated pedestrian and cyclist crossings of the Hume Highway and Picton Road, including a pedestrian bridge over the Hume Highway linking Bingara Gorge with Wilton Junction land.
- New north-facing ramps from the Wilton Junction Development to the Hume Highway, enabling safe and efficient access for regional trips travelling to and from the area.
- Four at-grade intersections with Picton Road, two each side of the Hume Highway Interchange, located:
  - Northwest of the interchange at Wilton Park Road and a new access road approximately 750 m north of Wilton Park Road.
  - Southeast of the interchange at Pembroke Parade and Almond Street.
- An upgrade of the Hume Highway/Picton Road Interchange (not part of the Development) to increase capacity and reduce delays for regional traffic.

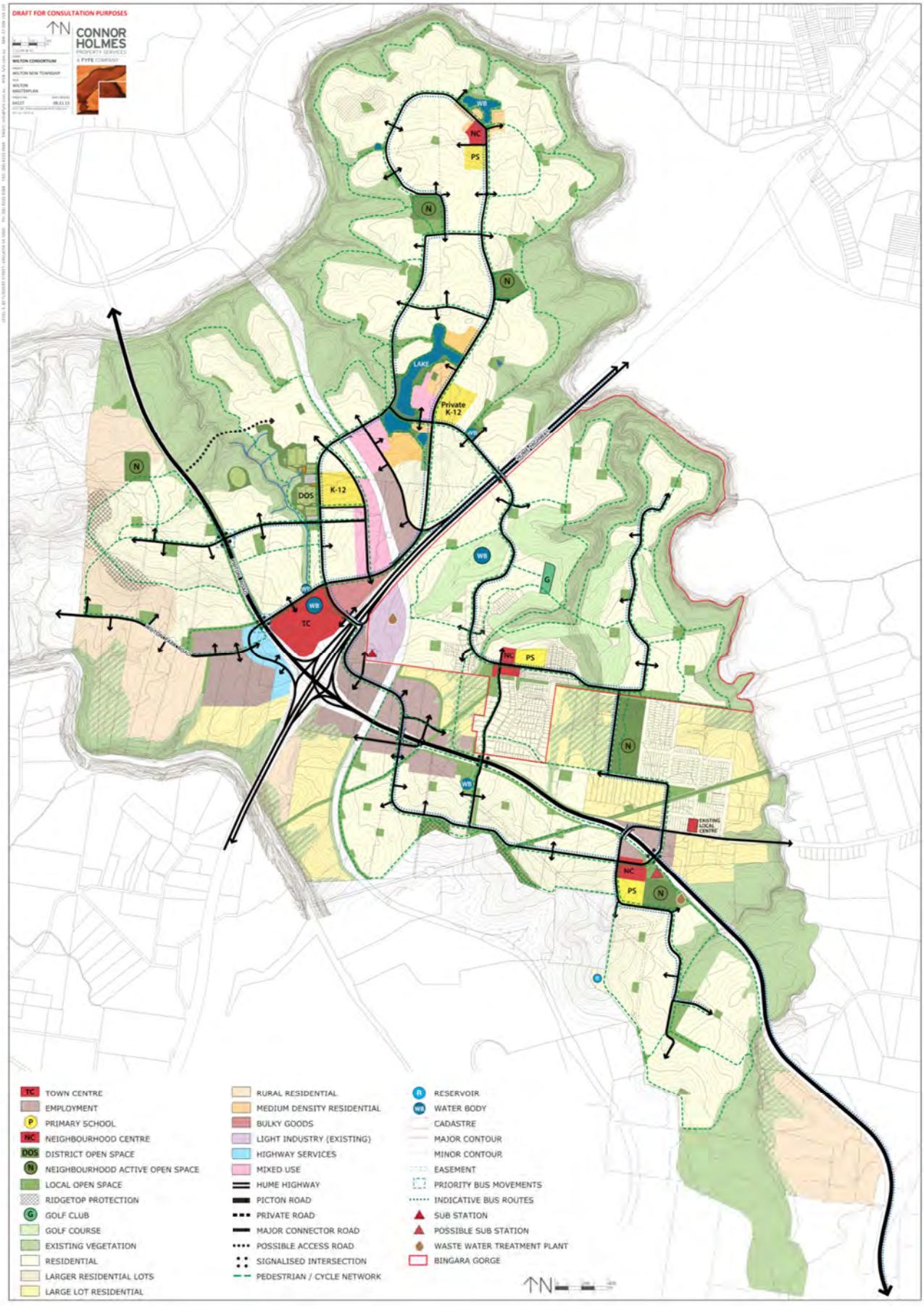
Overlaid on top of this will be a network of streets suitable for bus services and pedestrian / cycle links between the major trip generating areas.

All proposed modifications or additions to existing road networks are subject to review and approval by relevant authorities including RMS, TfNSW, and Council. The Wilton Junction team will continue to participate in workshops with these stakeholders to achieve suitable designs.

The proposed infrastructure upgrades along the Hume Highway and Picton Road, including the Hume Highway/Picton Road interchange, indicated on the Master Plan are not approved by RMS. The proposed layouts and configurations illustrated have been adopted for the purposes of traffic modelling / traffic assessment only. This TMAP and the rezoning process that it supports, does not confirm a final design for any of the proposed infrastructure upgrades on the State Road Network.

The proposed internal road network has been developed to separate and minimise the conflicts – and consequent impacts of these conflicts – between local and regional traffic on the State Road Network. The Wilton Junction team will continue to participate in discussions with relevant authorities to investigate further opportunities to minimise conflicts between local and regional traffic, while also providing an appropriate level of access between the local and State Road Networks.

Opportunities to further refine and optimise the proposed road network will also be possible at the detailed design/development application stage, as more detailed land use plans are defined.



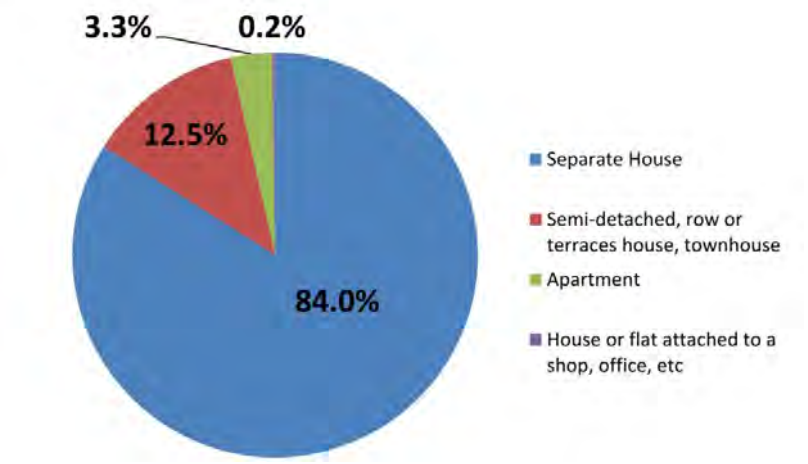

Source: Connor Holmes, 30 May 2014

**Figure 3.2 Wilton Junction master plan**

### Residential development type

The Wilton Junction Development will essentially involve the creation of a major new town in the northwest quadrant of the proposed development. The Development therefore needs to plan for all of the facilities required by the future community that need to be conveniently located without the need to travel to the Sydney Metropolitan area.

To reflect the diverse needs of the future community, a mixture of dwelling types is proposed to provide a range of accommodation options. The anticipated break-down of the dwelling types is shown in Figure 3.3.




Source: MacroPlan Dimasi, 2013

**Figure 3.3 Wilton Junction dwelling types**

A mixture of retail areas are planned in the town centre, the village centres and along Picton Road. It is envisaged that each village centre will contain a small supermarket, as well as speciality stores and services. A description of the types of retail centres planned within the Development is provided in Table 3.2.

**Table 3.2 Wilton Junction retail centres**

| Retail centre | Role & function | Total size ($m^2$ GFA) | Land area (net) (ha) | Timing | Land uses |
|---|---|---|---|---|---|
| Town Centre | Primary retail and commercial centre | 25,000 $m^2$ GFA | 7.5 to 10 ha | 2017 onwards (various stages) | 1 x DDS, 2 x supermarkets, specialty retail and secondary retail |
| Bulky Goods | Local services and employment as well as serving passing traffic | 30,000 $m^2$ GFA | 7.5 to 10 ha | 2020 onwards | Bulky goods and highway oriented retail |
| Village Centre(s) | Supporting convenience retail and business services | 10,000 to 12,000 $m^2$ GFA | 5 ha | 2017 onwards (various stages) | Small supermarket/s plus retail and non-retail specialties |
| Local shops | Small shop/s and offices | 4,000 $m^2$ GFA | 1 to 2 ha | 2017 onwards (various stages) | Convenience shops and local services |
| **Total** | | **65,000 to 70,000 $m^2$ GFA** | **20 to 25 ha** | | |

Source: MacroPlan Dimasi, 2014

(1) Net of local roads and parks etc.

(2) Town centre FSR = 0.35; village centre FSR = 0.4; bulky = 0.4

The total quantities of retail space and retail employment are summarised in Table 3.3.

**Table 3.3 Retail space and employment**

| Retail type | Town centre | Other[1] | Total |
|---|---|---|---|
| **Floor space ($m^2$ GFA)** | | | |
| Bulky goods | 0 | 30,000 | 30,000 |
| Discount department store | 7,000 | 0 | 7,000 |
| Supermarkets | 8,200 | 8,000 | 16,200 |
| Mini-majors | 2,500 | 1,000 | 3,500 |
| Retail specialities | 5,800 | 4,600 | 10,400 |
| Non-retail specialities | 1,200 | 1,100 | 2,300 |
| **Total** | **24,700** | **44,700** | **69,400** |
| **Employment (jobs)** | **798** | **1,183** | **1,961** |

Source: MacroPlan Dimasi, 2014

(1) Includes village centres and road-side retail

## 3.3 Employment scenarios

As mentioned in section 2.1, Wollondilly Shire currently has a net surplus of workers. The Wilton Junction Development has the potential to rebalance this surplus by creating a significant amount of employment within a short travel distance for residents, as opposed to the long travel distances currently undertaken by many residents.

The amount of employment and how many of the residents take up the local jobs are key influences on how much impact on traffic conditions outside the site the development will have. To cover the range of possibilities, upper and lower employment scenarios, summarised in Table 3.4, have been considered.

**Table 3.4 Wilton Junction employment forecasts (2041)**

| Description | Lower | Upper |
|---|---|---|
| Total Residents | 34,955 | |
| Employed Residents | 12,000 | 13,200 |
| Jobs in Wilton Junction | 10,440 | 11,770 |
| Employed residents working in Wilton Junction | 8,400 | 9,240 |
| - Work from home & not fixed | 1,566 | 1,766 |
| - Work in designated Employment Lands | 6,834 | 7,474 |
| Non-Wilton Junction residents working in Wilton Junction | 2,040 | 2,530 |

Source: MacroPlan Dimasi, 2014

The estimate of residents and non-residents taking the jobs within Wilton Junction is an estimate only. Additional analysis has been undertaken using the BTS' STM to assess the journey to work travel patterns of residents and workers in the development using the scenarios outlined in Table 3.4. More details are provided in section 5.

The floor space of the employment land use types are shown in Table 3.5.

**Table 3.5 Employment floor space (2041)**

| Land use | Lower | Upper |
|---|---|---|
| Retail | 65,000 | 75,000 |
| Commercial[1] | 86,343 | 101,592 |
| Industrial | 334,305 | 384,285 |
| **Total** | **485,648** | **560,877** |

Source: MacroPlan Dimasi, 2014

(1) Excludes school/education and community

## 3.4 Staging

Due to its size, the Wilton Junction Development will take several decades to develop to its planned ultimate potential. The Bingara Gorge component is already under construction, with occupation starting in 2010. Due to the NSW Government's targets for new housing construction per year, approval for the next stages of the Wilton Junction Development is being sought by the beginning of 2015, in tandem with the continuing development of the Bingara Gorge development.

The staging of the Wilton Junction Development is designed to match the influx of residents and the creation of jobs, to begin containing trips as early as possible. The percentages of total development shown in Table 3.6 indicate an employment lag of approximately 10% by 2031 due to market conditions.

**Table 3.6 Preliminary staging plan**

| Stage | Time period | Dwellings | Retail floor space | Employment[1] |
|---|---|---|---|---|
| 0 | ≤ 2014 | 420 (3%) | 2,400 (3%) | 250 (2%) |
| 1 | 2015–2021 | 2,540 (21%) | 13,300 (19%) | 2,060 (18%) |
| 2 | 2022–2031 | 7,700 (65%) | 44,500 (64%) | 7,131 (61%) |
| 3 | > 2031 | 11,900 (100%) | 69,400 (100%) | 11,770 (100%) |

Source: Connor Holmes / MacroPlan Dimasi, 2014

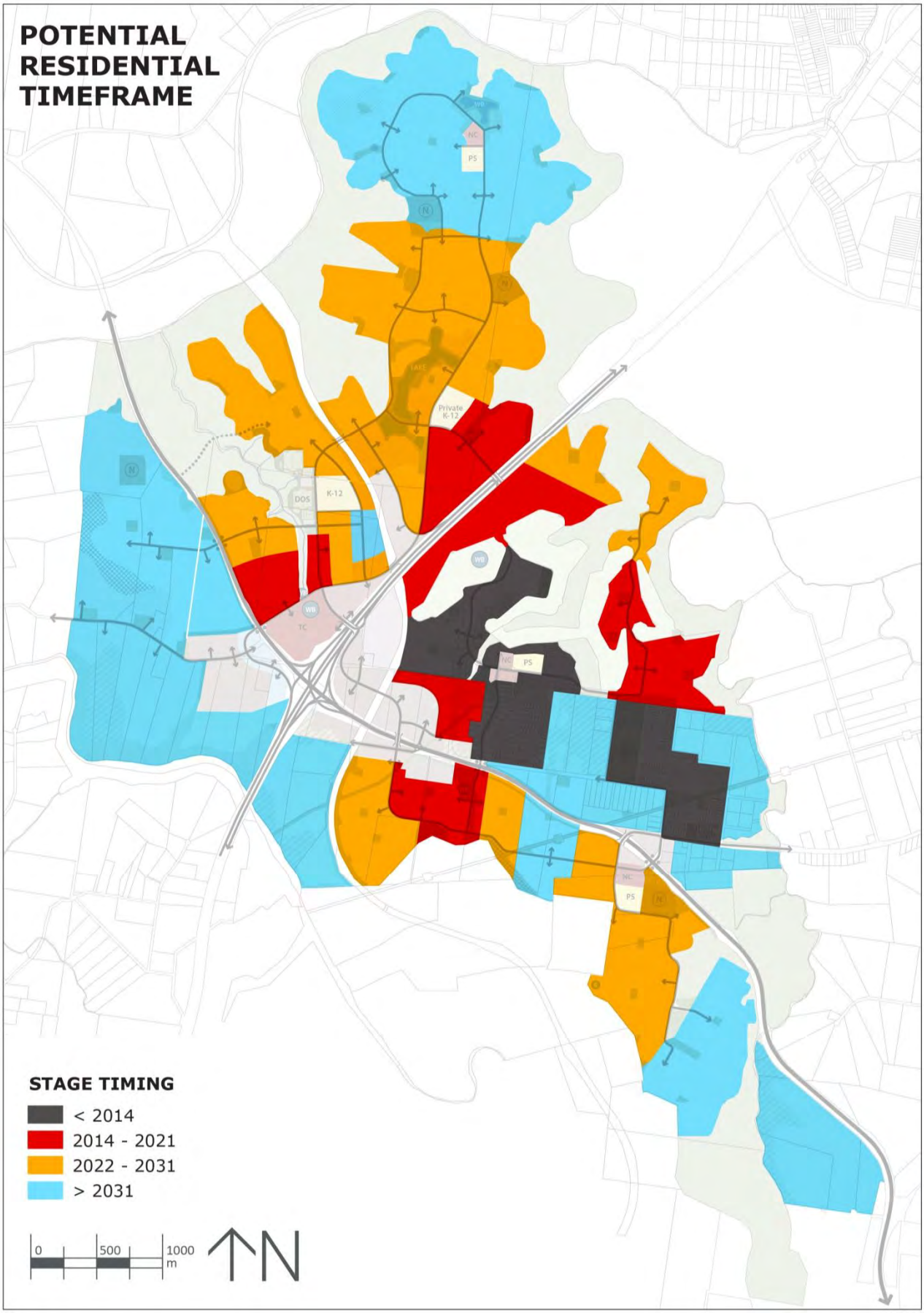
(1) Based on upper employment scenario

Spatially, following the completion of Bingara Gorge, development is expected to continue:

- along the local internal road that utilises the existing bridge over the Hume Highway
- on the southern side of Picton Road near the intersection of Pembroke Parade
- on the northern side of Picton Road near the intersection of Wilton Park Drive.

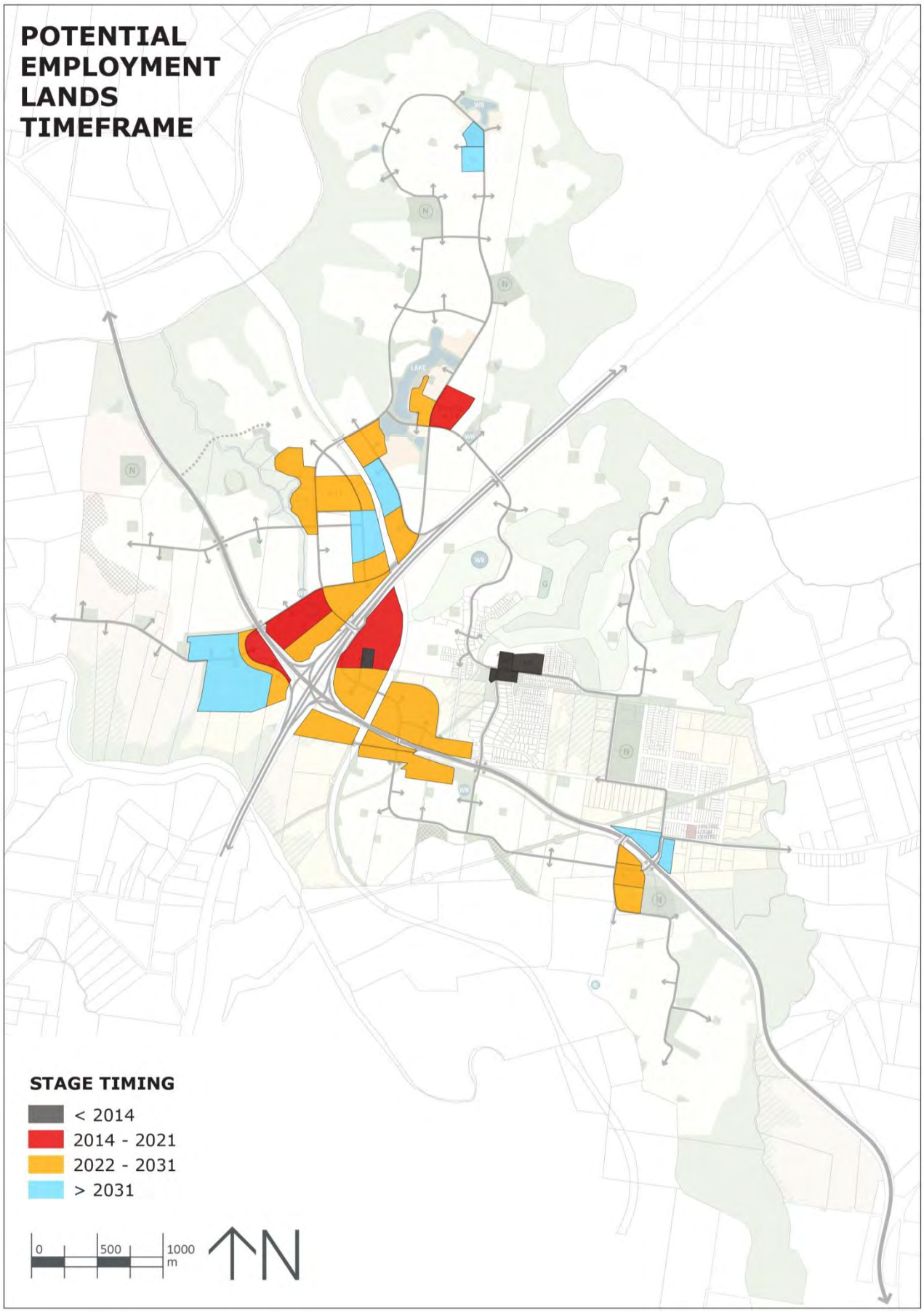
Over time, development would 'fill in' the gaps between these areas and then expand to the extremities of the area. Figures 3.4 and 3.5 indicate the anticipated development staging for residential and employment land. A staging plan for access and internal connections is described in more detail in section 5.

It is noted that the Maldon-Dombarton Rail Link (MDRL – refer section 4.1) traverses the Wilton Junction Development, and as a result may impact development in the area during its construction and operation. However, as the Wilton Junction Development does not encroach upon land reserved for the MDRL, and could in the future consider a grade separated transport network, the construction of the MDRL would not impact the proposed transport network or TMAP for the development. The program of planning and pre-construction design work for the MDRL, including the environmental assessment, is due to be finished by mid-2014.




Source: Connor Holmes, 2014

**Figure 3.4 Indicative residential staging plan**




Source: Connor Holmes, 2014

**Figure 3.5 Indicative employment staging plan**

# 4. Strategic context

## 4.1 State planning context

The most relevant State Government planning documents are reviewed in this section.

**Draft Metropolitan Strategy for Sydney to 2031 (NSW Government, March 2013)**

Sydney is growing rapidly, with current forecasts suggesting that more than 1.3 million additional people will live in Sydney by 2031, requiring 545,000 more homes and 625,000 more jobs[3]. The challenge for government is to make sure communities are provided with the infrastructure to support the growth.

The Metropolitan Strategy is a long-term land use, urban and transport plan. It identifies the location of future urban development and strives for a balance between urban infill and new greenfield development. For employment, it generally seeks to strengthen existing regional and major centres (of which Campbelltown-Macarthur is an existing example and Leppington is a planned future example). The exception is the Western Sydney Employment Area, which builds upon an employment precinct currently being developed, but is not tied to a centre.

The Metropolitan Strategy outlines total growth targets by subregion, with the distribution of that growth to be determined by Subregional Delivery Plans. Wilton Junction is located in the South West Subregion, shown in Figure 4.1. However, as it is a newly proposed site (in its current magnitude) it is not specifically identified in the South West Subregion plan. The 2021 and 2031 targets for this subregion are shown in Table 4.1.

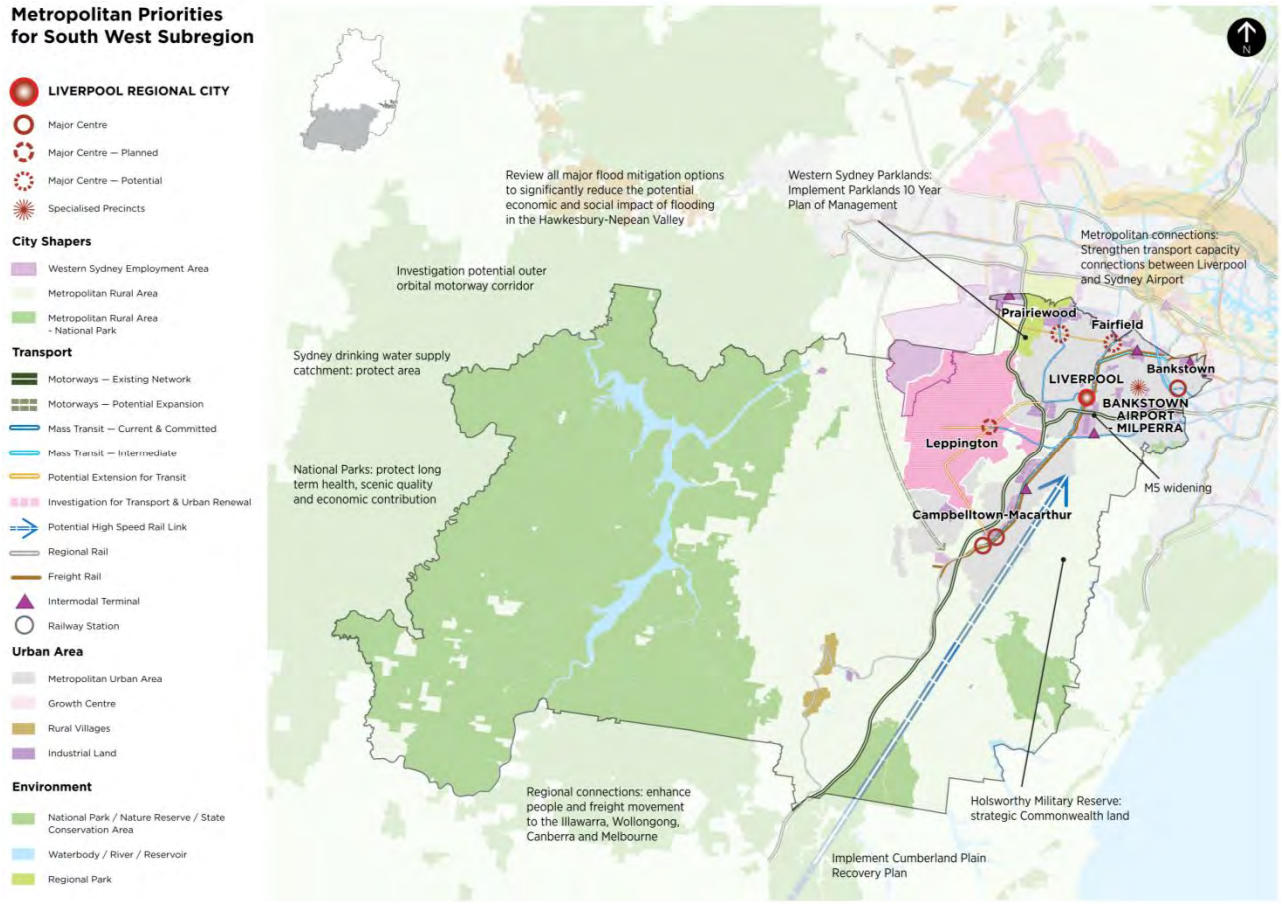
**Table 4.1 Draft Metropolitan Strategy for Sydney targets for South West Subregion**

| Measure | Current | Target to 2021 (2011–2021) | Target to 2031 (2011–2031) |
|---|---|---|---|
| Population | 829,000 | 1,048,000 (218,000) | 1,298,000 (469,000) |
| Housing | 286,000 | 346,000 (60,000) | 427,000 (141,000) |
| Employment | 298,000 | 362,000 (64,000) | 432,000 (134,000) |

Source: Draft Metropolitan Strategy for Sydney to 2031 (NSW Government, March 2013)

The major housing growth area in the South West Subregion is the South West Growth Centre, where 64,000 of the 110,000 new dwellings planned for the surrounding area over the next 20 years are located. The employment targets would be met with increases in several existing and planned centres, including Campbelltown–Macarthur (10,000 new jobs by 2031) and Leppington planned Major Centre (13,000 new jobs by 2031).

[3] Department of Planning & Infrastructure Urban Activation website




Source: Draft Metropolitan Strategy for Sydney to 2031 (NSW Government, March 2013)

**Figure 4.1 South West Subregion**

Based on the criteria for major centres in Appendix A of the Draft Metropolitan Strategy for Sydney, the Wilton Junction Development is on the threshold of being considered as a future major centre. One of the key areas for improvement to be considered as a potential future major centre is in relation to the transport criteria, i.e.:

- transport catchment: subregional
- linked to the metropolitan rail network directly or very high volume trunk bus services
- focal point as a destination and origin for subregional public transport services (typically bus)
- focal point of subregional arterial and collector road network
- freight access links with Sydney freight network.

The road network (and freight) connections will be served by upgrades to Picton Road and the Hume Highway connection planned as part of the Development. However, public transport service improvements beyond the needs of the Development would need to be considered to meet the above criteria.

The Draft Metropolitan Strategy for Sydney makes reference to the priorities and planned transport improvements in the NSW Long Term Transport Master Plan (LTTMP). For the South West Subregion, the most important improvements identified include:

- M9 Outer Sydney Orbital
- South West Rail Line extension (potentially with a transit line to Campbelltown)
- high speed rail in collaboration with Federal Government.

The Draft Metropolitan Strategy for Sydney builds upon the LTTMP strategies for Sydney's Metropolitan Rural Areas, including improved capacity and service quality on major commuting corridors into Sydney. The major connections between Sydney and regional areas are identified, as shown on Figure 4.2. The Strategy includes the M9 Outer Sydney Orbital as part of this network, as well as a corridor between the Hume Highway and Illawarra area in the vicinity of Picton Road/Appin Road.


Source: Draft Metropolitan Strategy for Sydney to 2031 (NSW Government, March 2013)

**Figure 4.2 Regional connections to Sydney**

### *NSW Long Term Transport Master Plan* (Transport for NSW, December 2012)

The *NSW Long Term Transport Master Plan* (LTTMP) provides a framework for addressing transport challenges over the next 20 years. It identifies the Hume Highway to Campbelltown and Narellan Road as corridors under pressure. It also forecasts high levels of congestion on the Airport and East Hills Line by 2031, with 'passenger displacement' (passengers unable to board the full train at peak times) from Revesby to Green Square.

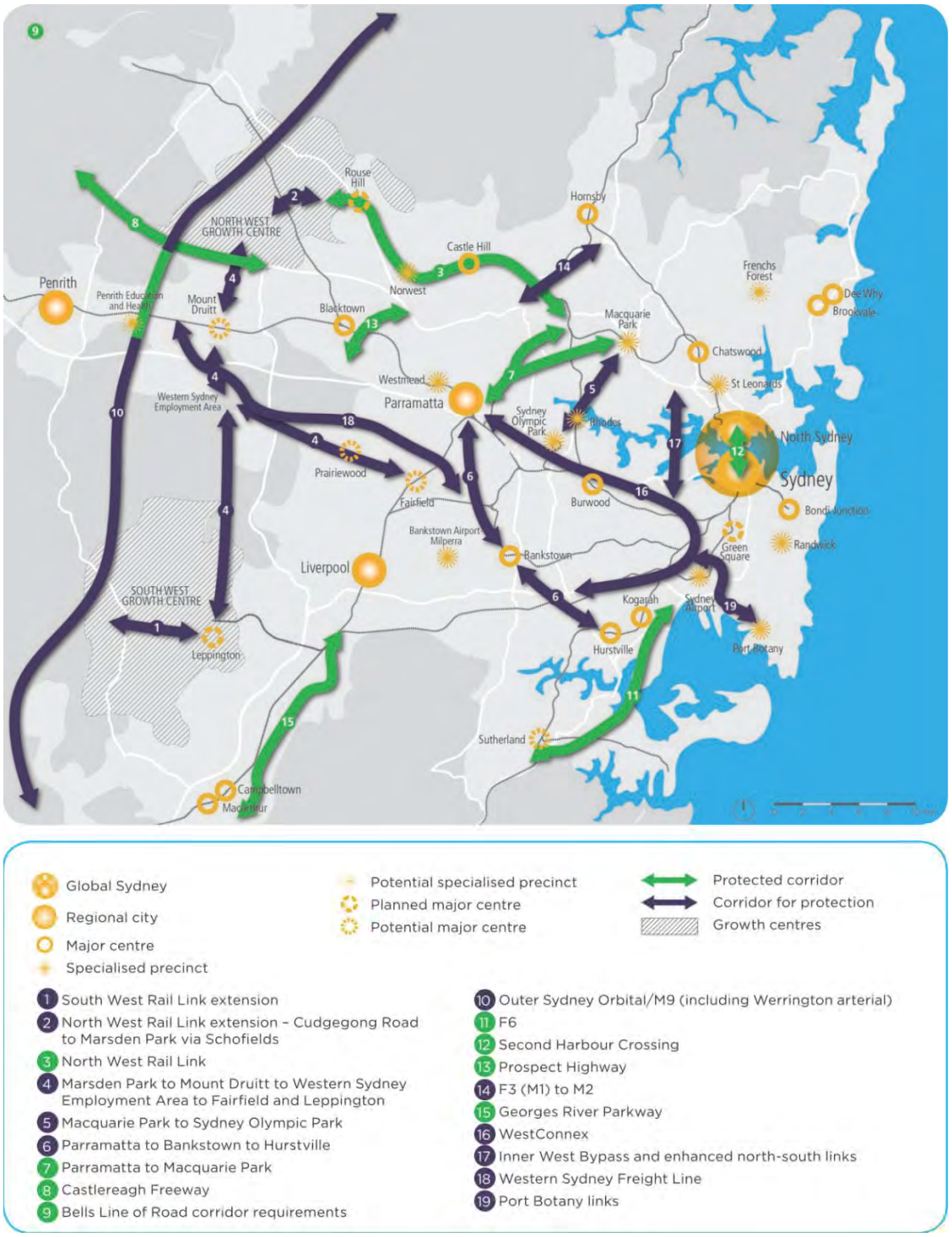
Figure 2.9 of the LTTMP (Regional NSW road hierarchy) identifies the Hume Highway as part of the National Road Network, Picton Road and Appin Road as State Roads, and Remembrance Drive, Menangle Road, Wilton Road as Regional roads.

Funding for road projects included in the LTTMP includes:

- M5 West widening $400 million project cost (private sector funded); $30 million allocated in 2012–13 budget; major works commenced October 2012 and completion by end 2014
- Camden Valley Way upgrade $300 million committed; upgrade of section between Oran Park Drive and Bringelly Road to be completed by end 2015
- Narellan Road upgrade $15.4 million commitment; first stage August 2012, completion in 2015.

The expansion of Port Kembla commenced in August 2011 and will provide a multi-purpose berth, comprising two separate container facilities, each serviced by two berths. Further upgrades will provide for further reclamation, enhanced rail and road infrastructure, two additional multi-purpose berths and four container berths. To support this expansion more efficient freight connections and safety upgrades to Picton Road are already underway, with further capacity upgrades planned in the medium to long term.

Figure 4.3 shows the corridors planned to be protected in the LTTMP. In addition to this, the protection of a corridor for high speed rail (that travels close to the Wilton Junction Development) will be facilitated by collaboration with the Federal Government.




Source: *Long Term Transport Master Plan* (TfNSW, December 2012)

**Figure 4.3 Protected corridors to support urban growth**

The Plan contains an action item to seek to establish connections between the Illawarra Region and the South West Growth Centre with upgrade works to Picton Road, the Princes Highway (A1) and the Illawarra Highway (A48) as required.

The LTTMP includes improvements to bus services across the Sydney Metropolitan area and changes to allow buses to meet passenger requirements in regional areas. It defined tiers for all types of public transport as part of the Strategic Transit Network:

- Mass Transit – high frequency, high capacity services that provide access to major destinations, such as heavy rail
- Intermediate Transit – high frequency but moderate capacity
- Local Transit – getting around locally or providing access to the Mass or Intermediate Transit levels.

Future changes to local bus services to support the Wilton Junction Development should seek to fill the Intermediate and Local Transit tiers.

**NSW 2021, a 10-year plan (NSW Government, 6 September 2011)**

The State Government's *NSW 2021 10-year plan* contains targets for improving transport services and shifting trips away from the use of private vehicles towards public transport, walking and cycling. The plan provides target mode shares for public transport of 28% across the Sydney Metropolitan Region. Increasing the use of walking and cycling for trips is advocated, with the specific targets of more than doubling the mode share of bicycle trips and increasing the mode share of walking trips to 25% by 2016.

It includes the planning policy to encourage job growth in centres close to where people live and to provide access by public transport. It focuses on increasing the percentage of the population living within 30 minutes by public transport of a city or major centre in metropolitan Sydney. For the Wilton Junction Development, this means a target of connecting it to the Campbelltown-Macarthur Major Centre by a 30 minute travel time bus service. For rail, the Plan identifies more express train services for commuters from South Western Sydney.

**Picton Road Corridor Strategy (Roads & Traffic Authority, April 2011)**

The Picton Road corridor connects the coast and the Southern Highlands via the Hume Highway, and provides the major link between the communities of the Southern Highlands and the major employment centres of the Illawarra Region, particularly Wollongong.

Picton Road is generally a two-lane undivided rural road. Traffic volumes along the route vary from approximately 15,300 vehicles per day just east of the Hume Highway to approximately 8,000 vehicles per day west of the Hume Highway.

A large number of heavy vehicles use the road to access commercial and industrial areas in the region, particularly Port Kembla and related areas. Heavy vehicles represent, on average, 18% of all traffic using Picton Road east of the Hume Highway and 11% of all traffic on Picton Road west of the Hume Highway.

Traffic volumes along the full extent of corridor are growing at approximately 3% per annum, and are expected to continue to grow from increasing housing within the area and increasing freight volumes being transported to Port Kembla.

The road has a poor crash history, with contributing factors including:

- frustration for drivers caught behind slower vehicles leading to unsafe overtaking attempts
- inappropriate speed, especially in the wet
- narrow sealed shoulder widths, in conjunction with grades and curves

- substandard curves in sections.

Actions identified for the Corridor that are directly relevant to the Wilton Junction Development (aside from the general improvement in road safety along the corridor), include:

### Short-term priorities (2011–2016)

- continue to provide additional overtaking opportunities, particularly within sections 2 and 3 of the corridor (between the Hume Highway and the Wollondilly/Wollongong local government boundary)
- continue to investigate the need and timing for the construction of additional lanes along the route via the use of strategic network modelling such as TRACKS
- continue development of a treatment to address road safety and traffic efficiency concerns at the Hume Highway/Picton Road Interchange.
- continue to work with the DP&E (formerly DP&I) and local Councils to manage the impact of land releases, particularly within Appin and Wilton, may have on the performance of the corridor.

### Long-term priorities (beyond 2016)

- Through prioritisation based on traffic growth, adopt a staged approach to the provision of additional lanes along the corridor
- Address road safety and traffic efficiency concerns at the Hume Highway/Picton Road Interchange.

**Sydney- Canberra Corridor Regional Strategy 2006-2031 (NSW Government - Department of Planning)**

The Sydney–Canberra Corridor Regional Strategy applies to the local government areas of Wingecarribee, Goulburn Mulwaree, Upper Lachlan, Yass Valley, Palerang and Queanbeyan, and is one of a number of regional strategies prepared by the Department of Planning. The Sydney–Canberra Corridor Regional Strategy builds on previous planning work, including the 1995 Sydney–Canberra Corridor Strategy as well as the Australian Capital Territory (ACT) and Subregion Planning Strategy.

The Regional Strategy represents an agreed NSW Government position on the future of the Sydney–Canberra Corridor. It is the pre-eminent planning document for the Sydney–Canberra Corridor Region and has been prepared to complement other relevant State and local strategies and planning instruments.

Many parts of the Sydney–Canberra Corridor Region continue to experience significant growth given the strategic location of the Region between two capital cities, although in other parts of the Region there is less immediate demand for growth. The primary purpose of the Regional Strategy is to accommodate and manage growth while ensuring that the rural landscapes and environmental settings that define the Region's character are not compromised.

It will do this by ensuring that land is available and appropriately located to sustainably accommodate the projected population growth and associated housing, employment and environmental needs over the period until 2031.

The Strategy acknowledges the importance of a coordinated approach to settlement, whilst taking into account demand for different types of housing and the adequacy of supply. The broad elements of the Strategy are represented on the Regional Strategy Map, which identifies the overall structure of the Region.

### NSW Freight and Port Strategy (Transport for NSW, November 2013)

The Freight and Ports Strategy is the 20 year road map that will ensure freight is at the forefront of the NSW economy. Current commitments to date on network infrastructure tasks across NSW are illustrated in Figure 4.4.

Figure 16 Current commitments to date on network infrastructure tasks across NSW


Source: *NSW Freight and Port Strategy* (Transport for NSW, November 2013)

**Figure 4.4 Committed network infrastructure tasks across NSW**

Strategies which are relevant to the Wilton Junction Development are summarised below.

### Port Kembla

The land controlled by Port Kembla Port Corporation was successfully leased to NSW Ports Consortium as part of the Port Botany transaction. Port Kembla is:

- Currently the primary port in NSW for motor vehicle imports, projected to grow from an import capacity of around 280,000 vehicles to 460,000 vehicles by 2021.
- Likely to continue to support export trades such as coal, minerals and grains.
- Currently Australia's leading port for steel and is one of its largest grain export ports.
- Identified as the location for the development of a future container terminal to augment the capacity of Port Botany when required.

Planning for the accommodation of these trades, and providing long term security of access to port facilities, are a core part of current expansion plans for Port Kembla, which include:

- Outer Harbour expansion project:
  - Stage 1, will provide the first multi-purpose, common-user berth. Stages 2 and 3 will provide enhanced rail and road infrastructure, and additional berths.
  - Port Kembla Port Corporation's Outer Harbour Concept Plan also proposes the development of two separate container facilities, providing a total capacity of 1.2 million TEU per annum.
- Coal export infrastructure expansion:
  - Current coal throughput capacity at Port Kembla is around 17–18 Mtpa. The Port Kembla Coal Terminal proposes to upgrade its capacity in two stages to around 25.5 Mtpa.
- Biodiesel facility:
  - As part of the diversification of Port Kembla, National Biofuels Pty Ltd, is in the process of establishing a biodiesel production facility.
  - It is estimated that the facility will process 1.1 million tonnes of soy bean per annum.

Ultimately, port growth plans will clarify the way in which NSW Ports will expand to meet future growth in freight volumes. The plans will be consistent with the National Port Strategy, together with other key State and regional plans.

Planning for growth in Port Kembla will address the limitations of existing planning approvals by providing increased certainty through integrated planning of port and landside infrastructure needs. This includes the Maldon to Dombarton Rail Link (MDRL) which is currently in the planning and pre-construction design phase, as discussed below.

## Maldon to Dombarton Rail Link

Rail access to Port Kembla from the western coalfields is currently available through the Illawarra Line and the Main South Line. There are capacity issues on both of these lines, with limited available freight paths on both corridors.

The Maldon to Dombarton Rail Link (MDRL) project was proposed to provide improved linkages between the southern and western coalfields and the newly constructed Port Kembla coal terminal. The construction of the MDRL would create a third option to move trains from the western coalfields to Port Kembla. Construction on the line started in 1983, with the line forecast to transport 17 Mtpa of coal.

An expansion of Port Kembla for high intensity container operations when Port Botany reaches throughput capacity may require containers to be moved by both road and rail. The MDRL would provide a rail route between Port Kembla and intermodal facilities in south and western Sydney.

Duplication of the Moss Vale to Unanderra line between Dombarton to Unanderra was completed and commissioned prior to work on the project being suspended in 1988. Current estimates by ARTC are that construction on the project is approximately 15 per cent complete (by value) and in 2010 a review by ACIL Tasman estimated between $624 million and $667 million to complete the line.

The Australian Government recently provided TfNSW with $25.5M to undertake planning and preconstruction development. This planning work, due to be completed mid-2014, encompasses assessment of design, engineering, safety, operations, environmental, economic, cost and stakeholder issues. The construction will involve laying 35 kilometres of standard gauge track to enable the connection of Port Kembla directly to the Main South Line via Dombarton at Maldon. It is likely that future operations on the MDRL will be freight only, and involve diesel locomotives.

Of greatest significance to the Wilton Junction Development, the currently proposed alignment of the MDRL traverses the investigation area in a north-south alignment, as shown in Figure 4.5. Consequently its construction and operation may impact development in the area.

The *Wilton Junction New Town: SEPP Rezoning – Infrastructure Proposal to NSW Government* (Elton Consulting, May 2014) discusses the integration of the proposed development with the MDRL, and the funding and delivery of infrastructure. The Wilton Junction master plan includes provision to protect the identified corridor for the future MDRL. At the request of TfNSW the corridor is proposed to be rezoned SP2, with a buffer identified between the identified corridor and residential and other noise sensitive land uses.

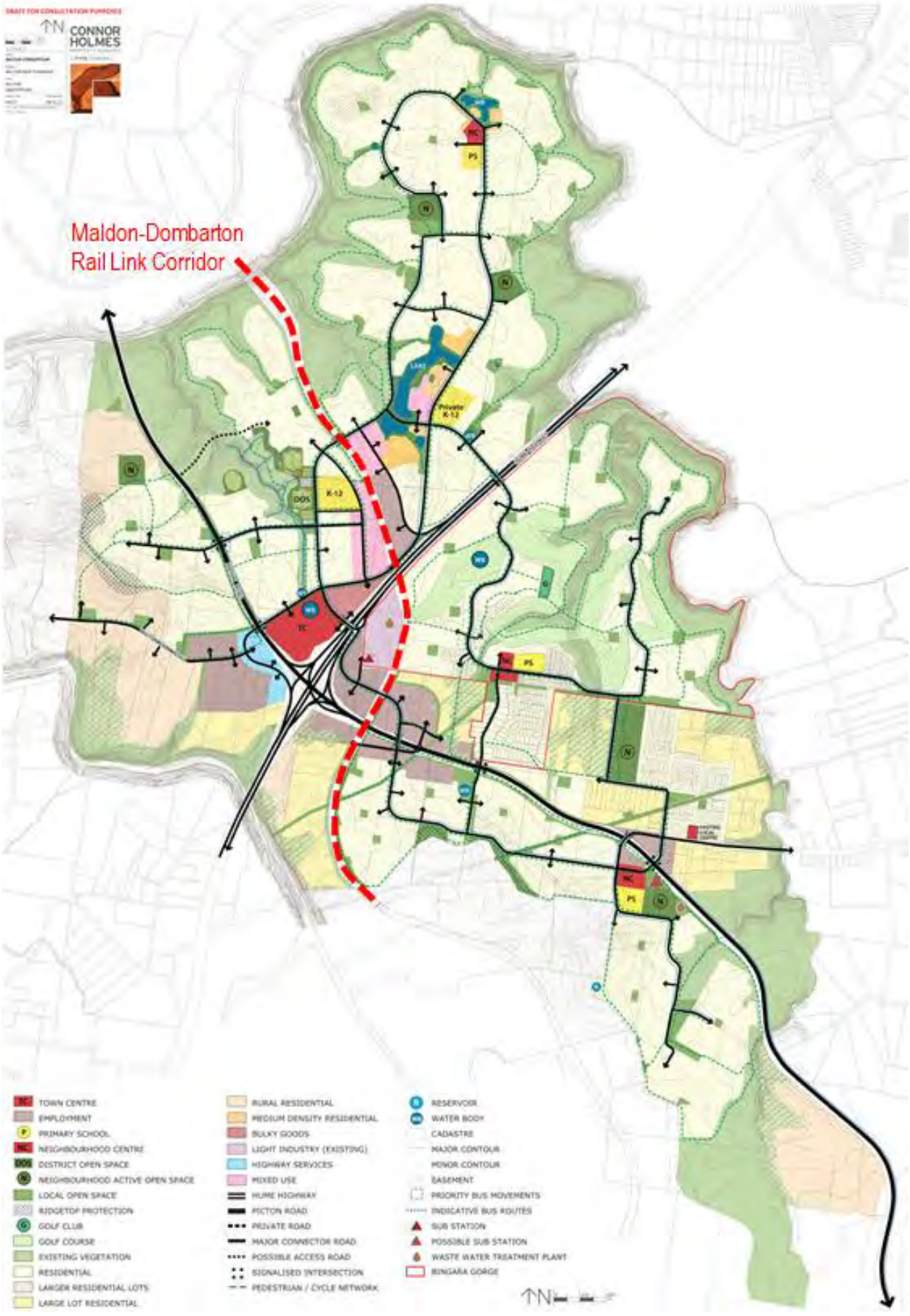



**Figure 4.5 Maldon-Dombarton Rail Link corridor in Wilton Junction Development area**

### Hume Highway and Picton Road

The following projects on the Hume Highway and Picton Road are also of relevance to the Wilton Junction Development:

- Hume Picton:
  - RMS has undertaken modelling to assess alternative interchange layouts that could resolve the long term capacity and road safety concerns associated with the existing Hume Highway/Picton Road interchange layout.
  - The preferred option for upgrading the interchange involves constructing an additional bridge to provide a six lane configuration of Picton Road over the Hume Highway and two continuous off-ramp trumpets from the Hume Highway, reducing conflicting traffic movements and maintaining traffic flow.
- Picton Road – Road Safety Treatments:
  - This $43.6M project provides essential improvements to upgrade Picton Road between the Hume Highway intersection at Wilton and the Mt Ousley Road intersection at Mt Keira Road.
- Hume Highway Bridges - access for B-Triple, Higher Mass Limit and Higher Productivity Vehicles:
  - The Sheahan and Badgally Road bridges on the Hume Highway have been identified by NSW Government as unsuitable for B-Triple and other high productivity vehicles.
  - The initiative is to strengthen these bridges to improve interstate and local freight route continuity on the Hume Highway.
  - Detail structural analysis is completed on Badgally and remedial works required have been identified and costed. Detailed analysis for Sheahan Bridge is currently being undertaken.

## 4.2 Local plans

Wollondilly Shire Local Environment Plan 2011 includes the aim ‘to encourage development that provides for an integrated transport and infrastructure system and adequate facilities and service provision for future growth’.

The Wollondilly Development Control Plan 2011 (DCP) includes the objective ‘to encourage the integration of land use and transport, and provide for environments that are highly accessible and conducive to walking, cycling and the use of public transport’. Volume 7 contains transport planning objectives for the development at Wilton that are generally consistent with the transport planning objectives for the Shire, including:

a) promote a hierarchy and network of publicly accessible roads, shared pathways and trails within the site and linking the site with existing Wilton village

b) provide an access network for public transport

c) provide safe and efficient movement of vehicles, pedestrians and other transport modes within, to and from the area including access for waste servicing vehicles and vehicles servicing non-residential land uses

d) promote permeability and connectivity and create opportunities for movement other than by private motor vehicles.

It recommends that a network of public roads and shared pathways should be planned for new developments such as the Wilton Junction Development. The existing plan for shared pathways in Wilton is shown in Figure 2.8. For new development it requires a plan to be submitted that nominates major circulation routes and major intersections for public roads (see section 5.1), bus routes and bus stops (see section 7.2) and shared pathways (see sections 7.3).

The DCP specifies parking provision for residential and non-residential land uses. The rates specified are generally minimum parking numbers. Parking for the Wilton Junction Development is discussed in more detail in section 5.4.

## 4.3 Population and employment forecasts

Population and employment forecasts for the area have been obtained from both State Government and Wollondilly Council to determine how the Wilton Junction Development will fit with the growth planned.

### BTS population and employment forecasts

The BTS Population and Employment forecasts for the travel zones within the surrounding area were investigated to determine whether the Wilton Junction Development is within current growth forecasts. The forecasts by LGA are shown in Table 4.2, 4.3 and 4.4 for dwellings, population and employment respectively.

**Table 4.2 BTS dwelling forecasts by LGA**

| LGA | 2006 | 2011 | 2016 | 2021 | 2026 | 2031 | 2036 | 2041 |
|---|---|---|---|---|---|---|---|---|
| Camden | 16,551 | 20,722 | 33,082 | 43,743 | 61,908 | 80,643 | 93,372 | 103,635 |
| Campbelltown | 49,026 | 53,021 | 58,840 | 65,846 | 72,958 | 80,083 | 86,963 | 93,721 |
| Wingecarribee | 16,844 | 18,535 | 20,249 | 21,740 | 23,084 | 24,282 | 25,312 | 26,126 |
| Wollondilly | 13,651 | 15,378 | 16,880 | 18,788 | 20,661 | 22,642 | 24,732 | 26,921 |
| **Total** | **96,072** | **107,656** | **129,051** | **150,117** | **178,611** | **207,650** | **230,379** | **250,402** |

Source: BTS Population and Employment Forecasts (August 2012 Release)

The total number of new dwellings for the areas selected between 2011 and 2041 (the anticipated year of full development of Wilton Junction) is approximately 143,000. For Wollondilly Shire it is approximately 11,500. The forecast for Wilton Junction (11,900) is higher than the total number of new dwellings for Wollondilly Shire. The travel zone representing Wilton Junction was forecast to have growth of 1,400 dwellings – approximately the total in the Bingara Gorge development plus some additional in-fill in the current Wilton village.

**Table 4.3 BTS population[1] forecasts by LGA**

| LGA | 2006 | 2011 | 2016 | 2021 | 2026 | 2031 | 2036 | 2041 |
|---|---|---|---|---|---|---|---|---|
| Camden | 50,940 | 63,158 | 99,299 | 129,111 | 178,910 | 229,323 | 261,886 | 288,791 |
| Campbelltown | 147,440 | 157,887 | 172,647 | 191,286 | 209,770 | 228,161 | 245,699 | 262,816 |
| Wingecarribee | 44,374 | 47,515 | 50,663 | 53,629 | 56,397 | 58,893 | 61,079 | 63,046 |
| Wollondilly | 41,221 | 45,992 | 49,766 | 54,839 | 59,665 | 64,766 | 70,125 | 75,729 |
| **Total** | **283,975** | **314,552** | **372,375** | **428,865** | **504,742** | **581,142** | **638,789** | **690,383** |

Source: BTS Population and Employment Forecasts (August 2012 Release)

(1) Population in occupied dwellings

The total population growth for the areas selected between 2011 and 2041 is approximately 376,000. For Wollondilly Shire it is approximately 29,800, i.e. less than the forecast population (34,955) for Wilton Junction.

**Table 4.4 BTS employment forecasts by LGA**

| LGA | 2006 | 2011 | 2016 | 2021 | 2026 | 2031 | 2036 | 2041 |
|---|---|---|---|---|---|---|---|---|
| Camden | 17,318 | 19,811 | 24,273 | 30,598 | 39,236 | 48,962 | 56,115 | 62,185 |
| Campbelltown | 45,926 | 53,422 | 59,529 | 65,438 | 71,019 | 76,784 | 82,945 | 89,587 |
| Wingecarribee | 17,832 | 20,342 | 22,176 | 23,900 | 25,711 | 27,569 | 29,559 | 31,719 |
| Wollondilly | 10,920 | 13,495 | 14,980 | 15,910 | 16,884 | 17,845 | 18,864 | 19,958 |
| **Total** | **91,997** | **107,071** | **120,959** | **135,846** | **152,850** | **171,161** | **187,483** | **203,449** |

Source: BTS Population and Employment Forecasts (August 2012 Release)

The total employment growth for the areas selected between 2011 and 2041 is approximately 96,000. For Wollondilly Shire it is approximately 6,500. The medium and high employment scenarios for Wilton Junction from MacroPlan are both higher than the total growth for Wollondilly Shire. The travel zone representing Wilton Junction (TZ1450) was forecast to have employment growth of 108 jobs.

The BTS population and employment forecasts do not include provision for the Wilton Junction Development beyond what has already been approved for the Bingara Gorge development. These forecasts also form the basis of the assumptions in the STM, which is used for future transport planning by TfNSW.

### Wollondilly Shire Council forecast

Wollondilly Shire Council has supplied forecasts of population growth in the Shire for three scenarios (low, high and maximum scenarios). All three scenarios have growth which is higher than the BTS projections analysed above. However, excluding the Wilton Junction Development that was included in all three scenarios:

- the low scenario has 10% lower growth than the BTS projections in the Shire – 7,275 dwellings versus 8,076 dwellings
- the high scenario has 18% higher growth than the BTS projections in the rest of the Shire – 9,570 dwellings versus 8,076 dwellings
- the maximum scenario has an additional 137% growth in the Shire compared to the BTS projections – 19,170 dwellings versus 8,076 dwellings.

At a detailed level, the differences are not evenly distributed:

- in the low scenario: Warragamba, Silverdale/Orangeville and Appin are higher than BTS, but Cawdor/Razorback and Bargo are lower
- in the high scenario: Picton, Thirlmere, Tahmoor, Warragamba, Silverdale/Orangeville and Appin are higher than BTS, but Cawdor/Razorback and Bargo are lower
- in the max scenario: Picton, Thirlmere, Tahmoor, Warragamba, Silverdale/Orangeville, The Oaks/Oakdale, Cawdor/Razorback, Menangle, Douglas Park and Appin are higher than BTS, only Bargo is noticeably lower.

The location of other developments, either currently in production or planned are shown in Figure 4.6.

In terms of employment, Council has advised of the developments listed in Table 4.5.

**Table 4.5 Wollondilly identified future employment growth**

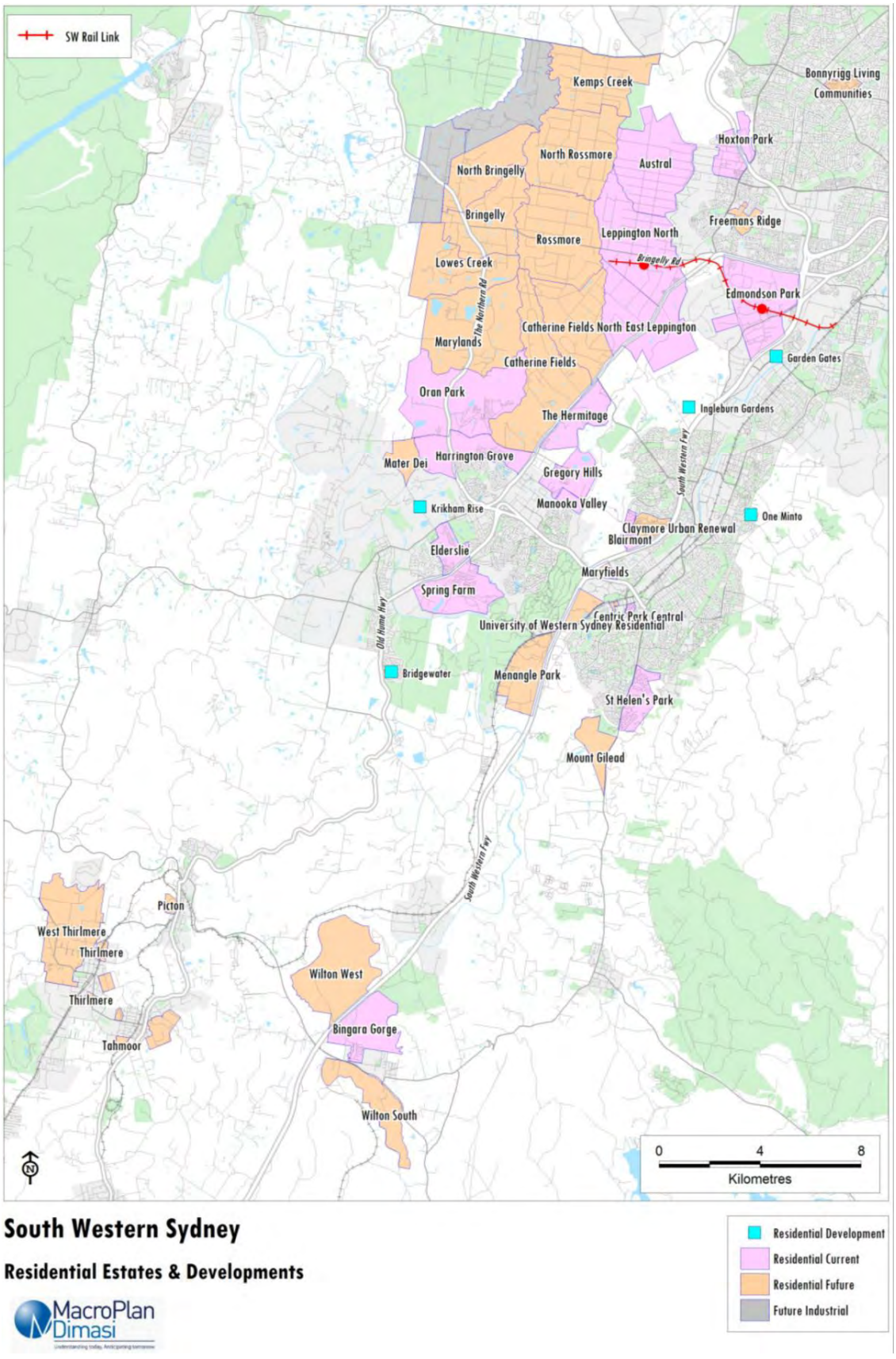
| Planning proposal | Estimated potential jobs |
|---|---|
| Maldon Employment Generating Lands | 825–900 |
| Tahmoor South Business Development Lands | 90 |
| Argyle Street Business Development Lands | 125 |
| North Silverdale Commercial, Industrial and Residential Lands | 45 |
| Warradale Road | 20 |
| Cliffe & Elizabeth Streets Commercial Lands | ~190 |
| Cawdor | 1,000 |
| **Total** | **2,295–2,370** |

Source: Wollondilly Shire Council, email 26 April 2013

(1) Employment Generation Rate is based on figures from EDLP (Economic Land Development Programme) 2010 Overview Report by the Department of Planning

(2) In this report the rate of employment generation is listed as follows:
Sydney Metropolitan - Average – 43 jobs/ha
Inner North - 146 jobs/ha
Sydney City - 131 jobs/ha
North West - 31 jobs/ha
South West - 25 jobs/ha

These employment increases are within the planned growth for Wollondilly Council area as a whole (18,864 jobs), the two large developments – Maldon and Cawdor are not included in their specific zones. STM assumes most of the growth will be in the existing centres of Picton, Tahmoor and Appin. The overall employment numbers in the STM in these areas generally seem appropriate for modelling purposes.




Source: ABS, MacroPlan Dimasi, 2013

**Figure 4.6 Location of other developments**

## 4.4 Redistribution of regional growth forecasts

A development the size of Wilton Junction has the potential to alter the growth in population and employment for a wide surrounding area. Past trends indicate that there is a stable demand for new dwellings and employment space, and production of new development in excess of this demand is likely to have wider consequences in the market.

It was agreed with TfNSW that the planned growth in the LGAs of Camden, Campbelltown, Wollondilly and Wingecarribee would be reduced to accommodate the growth planned for the Wilton Junction Development, so that there would be no net change from current growth forecasts in the South West Subregion. Notionally this could be due to slower than anticipated take up within the South West Growth Centre and the delaying of other projects in other Council areas.

As an overall picture, the BTS housing projections used to develop STM seem reasonable (and comparable with the Council low forecast), apart from the Wilton Junction Development zone which is significantly underestimated. It is therefore proposed to reduce the growth in other Wollondilly zones in the model by 10% to match Council's low scenario, drop growth in Camden and Campbelltown by approximately 10% (and add Wilton, 34,955 people) resulting in no net change to what is currently in the STM model.

**Table 4.6 Population numbers for proposed land use scenarios**

| Area | 2036 Base (No Wilton) | 2036 with Wilton | Reduction of all other areas |
|---|---|---|---|
| Camden | 261,886 | 242,453 | 90.2% growth |
| Campbelltown | 245,699 | 237,112 | 90.2% growth |
| Wingecarribee | 61,079 | 59,752 | 90.2% growth |
| Wollondilly | 70,125 | 99,472 | Additional 31,355 people in TZ1450<br>90.2% growth in other zones |
| **Total** | **638,789** | **638,789** | **100%** |

Source: Parsons Brinckerhoff

A range of employment scenarios were tested to determine their impact on trip patterns in the surrounding area. The amounts of employment tested covered a greater range than indicated in section 3 (Table 3.4), however the maximum employment tested is consistent with the upper employment scenario described.

The employment levels were adjusted based on the ratio of jobs to employed residents, expressed as a percentage, i.e. the percentage of local employment satisfied within the Wilton Junction Development. An additional amount of employment for people living outside the Development was added. The scenarios considered are outlined in Table 4.7.

**Table 4.7 Employment scenarios**

| Percentage of local employment satisfied | 35% | 50% | 70%<br>(High employment) |
|---|---|---|---|
| Employed residents | 13,200 | 13,200 | 13,200 |
| Employed residents working in Wilton Junction | 4,620 | 6,600 | 9,240 |
| Residents working from Home | 3,355 | 4,793 | 1,766 |
| Non-residents working in Wilton Junction | 1,265 | 1,807 | 2,530 |
| **Total jobs** | **5,885** | **8,407** | **11,770** |

Source: MacroPlan Dimasi, 2013

The number of residents and non-residents taking the jobs within Wilton Junction is an estimate only. Additional analysis has been undertaken using the BTS' STM to assess the JTW travel pattern of residents. All scenarios assume the same resident population numbers within Wilton Junction.

Maintaining the overall number of jobs in the area so that there is no net increase in the South West Subregion can be achieved by factoring the employment growth in Camden, Campbelltown, Wollondilly and Wingecarribee Council areas by the following factors:

- 70% employment scenario – factor growth between 2011 and 2036 by 85.5%
- 50% employment scenario – factor growth between 2011 and 2036 by 89.6%
- 35% employment scenario – factor growth between 2011 and 2036 by 92.8%.

Based on agreements with TfNSW, the traffic modelling undertaken for this assessment is based on the 50% employment scenario – i.e. a total of 8,407 jobs. This scenario dropped the population and employment growth in Camden, Campbelltown, Wollondilly and Wingecarribee by 10% to result in no net change to the projections for the South West Subregion.

# 5. Traffic impact assessment

## 5.1 Introduction

In order to determine the infrastructure requirements for Wilton Junction a significant amount of traffic modelling has been undertaken. The modelling has informed the configuration of the internal road network, the layout of intersections within the development plus access points to/from Picton Road and the Hume Highway. Additionally, the modelling was used to determine appropriate upgrades for the Picton Road/ Hume Highway Interchange.

In this section, proposed upgrades to the State Road Network are discussed. It is noted that the proposed infrastructure upgrades along the Hume Highway and Picton Road indicated on the Master Plan are not preferred or approved by RMS. The Hume Highway/Picton Road interchange upgrade indicated on the Master Plan is not an approved design.

The proposed layouts and configurations illustrated have been adopted for the purposes of traffic modelling/ traffic assessment only. This TMAP and the rezoning process that it supports, does not confirm a final design for any of the proposed infrastructure upgrades on the State Road Network.

All proposed modifications or additions to existing road networks are subject to review and approval by responsible authorities including RMS, TfNSW, and Council. The Wilton Junction team will continue to participate in workshops with relevant authorities to achieve suitable designs.

The proposed internal road network has been developed to separate and minimise the conflicts – and consequent impacts of these conflicts – between local and regional traffic on the State Road Network. The Wilton Junction team will continue to participate in discussions with relevant authorities to investigate further opportunities to minimise conflicts between local and regional traffic, while also providing an appropriate level of access between the local and State Road Networks. Opportunities to further refine and optimise the proposed road network will also be possible at the detailed design / development application stage, as more detailed land use plans are defined.

Assessing the transport infrastructure requirements and traffic impacts of Wilton Junction has been undertaken using an Aimsun Mesoscopic traffic model specifically developed for the task. The Aimsun modelling has also been utilised in identifying the infrastructure staging requirements to support the Wilton Junction development into the future. The infrastructure staging assessment has been supplemented with SIDRA intersection modelling.

In developing this suite of models, Parsons Brinckerhoff worked closely with TfNSW (including BTS and RMS) to agree assumptions and inputs throughout the process. The BTS STM model was used to assist with the development of the future year modelling. However, during the modelling process some issues were identified with the BTS future forecasts. Where these issues could not be reconciled, Parsons Brinkerhoff worked with TfNSW to agree on alternative first principal inputs.

Aimsun models were developed to consider both AM and PM peak periods. The scenarios in Table 5.1 were considered.

**Table 5.1 Modelled scenarios**

| Year | Without Wilton Junction | With Wilton Junction |
|---|---|---|
| 2013 | Existing situation[1] | - |
| 2024[2] | Base case | Modelled with staged development[4] |
| 2031[3] | Base case | Modelled with staged development[4] |
| 2036 | Base case | Modelled with full development[5] |

(1) includes Bingara Gorge development to date

(2) modelled as the estimated year when the north-facing ramps for the Wilton Junction Development to the Hume Highway are required as part of the staging of road network upgrades

(3) modelled as an intermediate year

(4) as per Table 3.6

(5) while Wilton Junction is not expected to be complete until 2041, it was required by TfNSW to use 2036 as the completion year for the purposes of modelling due to limitations in the STM forecasting beyond 2036

## 5.2 2013 Base model development

Aimsun Mesoscopic traffic models have been developed, calibrated and validated in accordance with RMS traffic modelling guidelines (March 2013). The study area (as agreed with TfNSW, seen in Figure 5.1) includes a section of Narellan Road along the northern boundary of the model and the M1 route along the eastern edge of the model. The model extends south of Yanderra and West of Picton.

The Aimsun modelling processes including development, calibration and validation are described in the Calibration and Validation report provided in Appendix C. Traffic volumes, measured in light and heavy vehicles were converted to Passenger Car Unit (PCU) for the purpose of modelling, based on the surveyed turn counts data.

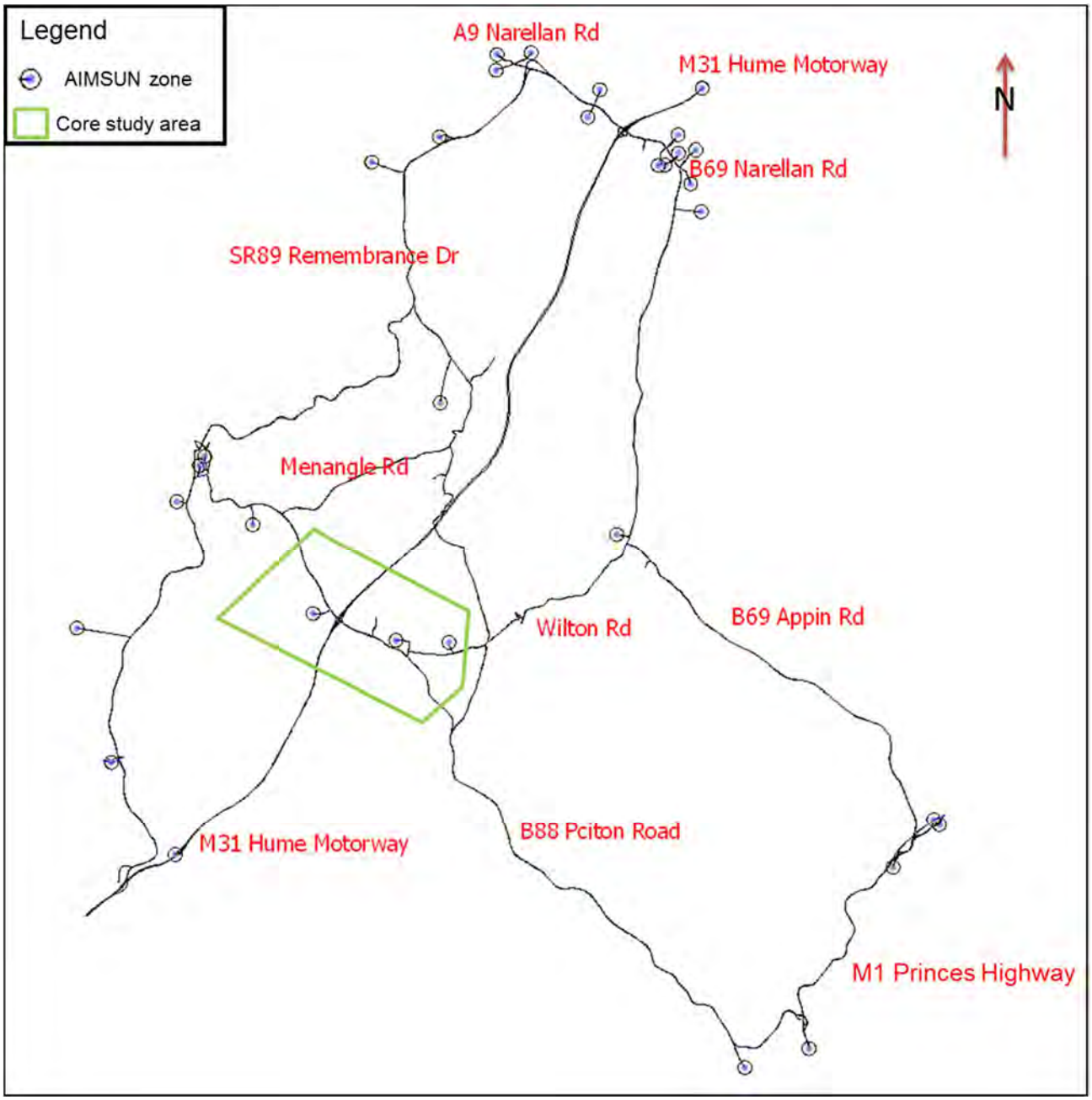



**Figure 5.1 Aimsun model network – 2013 existing conditions**

From anecdotal evidence, it is understood that the existing road network currently experiences:

- congestion on Narellan Road and around the Camden Valley Way/Camden Bypass Interchange
- congestion around the Hume Highway/Picton Road Interchange
- heavy but moving flows along Hume Highway and Picton Road.

As outlined in Section 2.4 and Table 2.7, the intersections modelled within the study area are currently operating at Level of Service C or better. During the site inspection, it was observed that M31 Hume Motorway/B88 Picton Road Interchange operated well during both AM and PM peak conditions, although right turning vehicles on both northbound and southbound off-ramps experience some delays when waiting for suitable gaps to merge onto B88 Picton Road.

## 5.3 Development of future year base matrices

Initially, it was agreed (with TfNSW) to utilise the BTS STM model to determine the 2036 Base trip matrices. However an analysis of the sub-area matrices extracted from STM identified several changes between the 2011 and 2036 matrices that appear to be counter intuitive and not reflective of the BTS population and employment forecasts in this area. As a result of these anomalies, Parsons Brinckerhoff proposed an alternative methodology for developing base 2036 matrices, using BTS population and employment forecasts as the basis for traffic growth. This alternative approach was agreed with TfNSW.

Table 5.2 shows BTS Population and Employment forecasts for sub areas within the study area. Figure 5.2 shows the corresponding areas (approximate).

**Table 5.2 BTS Population & Employment Forecasts by sub-area within the model area**

| Sub-area | 2011 | | 2036 Base | | Growth (2011–2036) | | Growth % (2011–2036) | |
|---|---|---|---|---|---|---|---|---|
| | Residents | Jobs | Residents | Jobs | Residents | Jobs | Residents | Jobs |
| Campbelltown | 57,037 | 25,141 | 92,835 | 37,893 | 35,799 | 12,752 | 63% | 51% |
| Camden | 56,723 | 17,820 | 103,962 | 26,883 | 47,239 | 9,063 | 83% | 51% |
| Wollondilly North | 7,067 | 1,714 | 9,910 | 2,245 | 2,844 | 531 | 40% | 31% |
| Appin/Wilton | 3,267 | 2,170 | 9,100 | 3,035 | 5,833 | 865 | 179% | 40% |
| Picton, Thirlmere, Tahmoor (PTT) | 15,357 | 6,015 | 21,564 | 8,049 | 6,206 | 2,034 | 40% | 34% |
| Wingecarribee (South) | 5,674 | 1,001 | 7,223 | 1,300 | 1,549 | 299 | 27% | 30% |

Source: BTS Population & Employment Forecasts (August 2012 Release) aggregated for travel zones within the study area

(1) Residents = Estimated Resident Population (ERP)

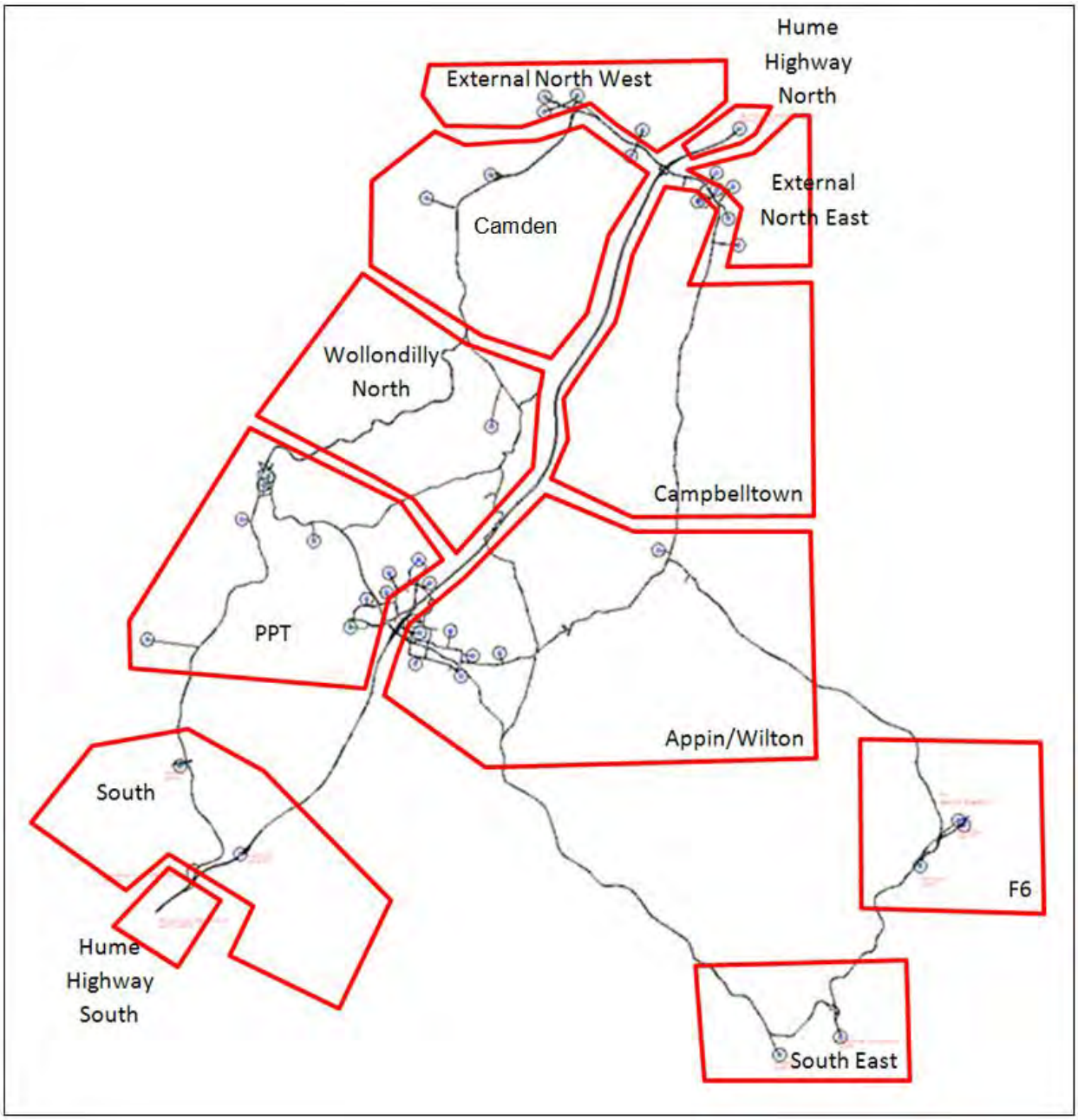



**Figure 5.2 Sub areas within the model area**

On an LGA-wide basis, the changes are summarised for population and employment in Tables 5.3 and 5.4 respectively.

**Table 5.3 BTS population forecasts by Council area**

| Local Government Area | 2011 | 2036 | Total growth (%) | Growth per annum (%) |
|---|---|---|---|---|
| Camden/Campbelltown | 221,045 | 507,585 | 130% | 5.2% |
| Wollondilly/Wingecarribee | 93,507 | 131,204 | 40% | 1.6% |
| Illawarra | 441,956 | 540,573 | 22% | 0.9% |

Source: BTS Population & Employment Forecasts (August 2012 Release)

**Table 5.4 BTS employment forecasts by Council area**

| Local Government Area | 2011 | 2036 | Total growth (%) | Growth per annum (%) |
|---|---|---|---|---|
| Camden/Campbelltown | 73,233 | 139,060 | 90% | 3.6% |
| Wollondilly/Wingecarribee | 33,837 | 48,423 | 43% | 1.7% |
| Illawarra | 164,631 | 206,028 | 25% | 1.0% |

Source: BTS Population & Employment Forecasts (August 2012 Release)

### Alternative methodology – for developing Future Year Base Matrices

The alternative methodology, as agreed with TfNSW, is outlined below.

1. Growth of the sub-areas (see Figure 5.2) within the model boundary are calculated according to the BTS population forecasts between 2011 and 2036 shown in Table 5.1 (BTS Population and Employment forecasts):
   - A matrix balancing exercise was undertaken to balance the Population growth (rows (trips from)) with the Employment growth (columns (trips to)) to achieve BTS growth figures in the AM peak. In the PM peak the rows were factored to Employment growth and the columns to Population growth. Each row and column total has been refined to within 10% of the BTS growth forecast for both Population and Employment (however most are within 1–2%).
2. External zones (roads at the model boundary) would grow as follows:
   - Northern end of the model (External North West and External North East) to the Camden and Campbelltown sub-areas would grow by 5% per annum based on Table 5.3.
   - External zones in the south-eastern corner of the model (near Wollongong) would grow by 1% per annum based on Tables 5.3 and 5.4.
   - External zones to areas within the Wollondilly area and other areas would grow by 1.7% per annum based on Tables 5.3 and 5.4.
3. The total trip numbers to remain similar to that extracted from the STM 2036 Base model.
4. Additional trips were also added into the model to account for the Malden Aggregate Facility on Picton Road (see section 5.3.1 for more detail)

Based on the methodology outlined above, 2036 AM and PM peak future base models were developed.

Tables 5.5 and 5.6 below show the resulting percentage increase between 2011 and 2036 that was applied to the validated Aimsun Base trip matrices to determine 2036 Base Case (do nothing) traffic volumes. Both tables show how the Population and Employment growth figures compare against the STM forecasts.

**Table 5.5 Adjusted 2036 AM peak growth (2011 to 2036) by sub-area**

| From\To | External North-West | External North-East | Campbelltown | Camden | Hume Highway North | Wollondilly North | Appin/Wilton | PTT | Hume Highway South | South | F6 | South-East | Total | BTS Population Forecast |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| External North-West | 250% | 250% | 60% | 60% | 0% | 31% | 43% | 34% | 50% | 27% | 50% | 50% | **74%** | |
| External North-East | 250% | 250% | 60% | 60% | 0% | 31% | 43% | 34% | 50% | 27% | 50% | 50% | **70%** | |
| Campbelltown | 75% | 75% | 63% | 50% | 75% | 31% | 63% | 34% | 63% | 63% | 63% | 63% | **66%** | 63% |
| Camden | 120% | 120% | 60% | 65% | 120% | 31% | 83% | 34% | 100% | 63% | 100% | 100% | **85%** | 83% |
| Hume Highway North | 125% | 0% | 43% | 43% | 0% | 31% | 43% | 34% | 50% | 27% | 0% | 50% | **45%** | |
| Wollondilly North | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 34% | 40% | 40% | 40% | 40% | **40%** | 40% |
| Appin/Wilton | 250% | 250% | 40% | 40% | 250% | 40% | 200% | 34% | 250% | 40% | 250% | 250% | **175%** | 179% |
| PTT | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 40% | 27% | 40% | 40% | **40%** | 40% |
| Hume Highway South | 50% | 50% | 43% | 43% | 50% | 31% | 43% | 34% | 0% | 27% | 43% | 50% | **47%** | |
| South | 27% | 27% | 27% | 27% | 27% | 27% | 27% | 27% | 27% | 27% | 27% | 27% | **27%** | 27% |
| F6 | 50% | 50% | 25% | 25% | 0% | 25% | 25% | 25% | 25% | 25% | -100% | -11% | **-37%** | |
| South-East | 50% | 50% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | 25% | -50% | 1786% | **-18%** | |
| **Total** | **118%** | **91%** | **58%** | **59%** | **73%** | **32%** | **41%** | **35%** | **51%** | **30%** | **-46%** | **36%** | **57%** | |
| BTS Employment Forecast | | | 51% | 51% | | 31% | 40% | 34% | | 30% | | | Compared to STM Total – 97% | |

**Table 5.6 Adjusted 2036 PM peak growth (2011 to 2036) by sub-area**

| From\To | External North-West | External North-East | Campbelltown | Camden | Hume Highway North | Wollondilly North | Appin/Wilton | PTT | Hume Highway South | South | F6 | South-East | Total | BTS Employment Forecast |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| External North-West | 250% | 250% | 63% | 120% | 0% | 40% | 250% | 40% | 43% | 27% | 50% | 50% | **119%** | |
| External North-East | 250% | 250% | 63% | 120% | 0% | 40% | 250% | 40% | 43% | 27% | 50% | 50% | **82%** | |
| Campbelltown | 60% | 60% | 60% | 83% | 30% | 40% | 40% | 40% | 43% | 27% | 25% | 25% | **60%** | 51% |
| Camden | 75% | 75% | 60% | 65% | 50% | 40% | 40% | 40% | 50% | 27% | 50% | 50% | **64%** | 51% |
| Hume Highway North | 0% | 0% | 150% | 120% | 0% | 40% | 250% | 40% | 60% | 27% | 25% | 25% | **87%** | |
| Wollondilly North | 25% | 25% | 40% | 40% | 25% | 40% | 40% | 40% | 25% | 27% | 25% | 25% | **35%** | 31% |
| Appin/Wilton | 40% | 43% | 63% | 83% | 40% | 40% | 200% | 40% | 40% | 27% | 40% | 40% | **50%** | 40% |
| PTT | 25% | 25% | 63% | 83% | 25% | 40% | 40% | 40% | 25% | 27% | 25% | 25% | **39%** | 34% |
| Hume Highway South | 75% | 75% | 63% | 100% | 50% | 40% | 250% | 40% | 0% | 27% | 50% | 50% | **54%** | |
| South | 25% | 25% | 63% | 83% | 25% | 40% | 40% | 40% | 25% | 27% | 25% | 25% | **36%** | 30% |
| F6 | 75% | 75% | 63% | 100% | 0% | 40% | 250% | 40% | 50% | 27% | -100% | -72% | **-51%** | |
| South-East | 75% | 75% | 63% | 100% | 50% | 40% | 250% | 40% | 50% | 27% | -11% | 0% | **31%** | |
| **Total** | **88%** | **72%** | **65%** | **85%** | **43%** | **40%** | **174%** | **40%** | **51%** | **27%** | **-38%** | **-29%** | **59%** | |
| BTS Population Forecast | | | 63% | 83% | | 40% | 179% | 40% | | 27% | | | Compared to STM Total – 94% | |

### 5.3.1 Maldon Aggregate facility

In addition to the population and employment forecasts, the Aimsun modelling has also taken into account the Maldon Aggregate facility located south of Picton Road between Picton and the Hume Highway. The proposed facility which is expected to be operational in late 2013 (post agreement of the forecasting approach) will generate a significant amount of heavy vehicle trips throughout the day. The facility has been included in all future year models (with and without Wilton Junction). It is understood that the vehicles associated with this facility are 32 tonne heavy vehicles. The table below shows the expected trip generation to/from the facility during the AM and PM peaks. This information has been extracted from the Traffic Impact Assessment undertaken for the facility. Due to the size of the vehicles expected (32 tonnes) a conversion factor of 1 Heavy Vehicles to 4 PCU has been applied to the Aimsun modelling (based on the Roads and Maritime Services *Modelling Guidelines Version 1 February 2013, Section 10: Highway Assignment Modelling*).

**Table 5.7 Additional trips generated by the Maldon Aggregate facility**

| | AM peak | | PM peak | |
|---|---|---|---|---|
| **Direction** | **HGV (32t)** | **PCU** | **HGV (32t)** | **PCU** |
| Inbound | 23 | 92 | 19 | 76 |
| Outbound | 23 | 92 | 19 | 76 |
| Total | **46** | **184** | **38** | **152** |

Source: Traffic Impacts Assessment - Maldon Rail Terminal (AECOM)

## 5.4 Future base network performance

To ensure that all the future traffic demand is released onto the road network the modelling of the future year scenarios have assumed significant upgrades to Narellan Road. The population and employment growth around Narellan Road is forecast at approximately 5% per annum. Given that Narellan Road is currently congested, the existing configuration is unable to cater for the high levels of growth expected. This acts a significant constraint within the model network resulting in substantial unreleased demand within the model. Releasing this demand is required to allow the full impacts of Wilton Junction to be assessed. It should be noted that the assumed Narellan Road upgrades are required to cater for the background growth and not as a direct result of the Wilton Junction.

The resulting traffic flows for the 2024 and 2036 scenarios are shown in Figures 5.3 and 5.4 respectively. The models indicate increasing flows on most road sections, including the Hume Highway, Picton Road and Broughton Pass.

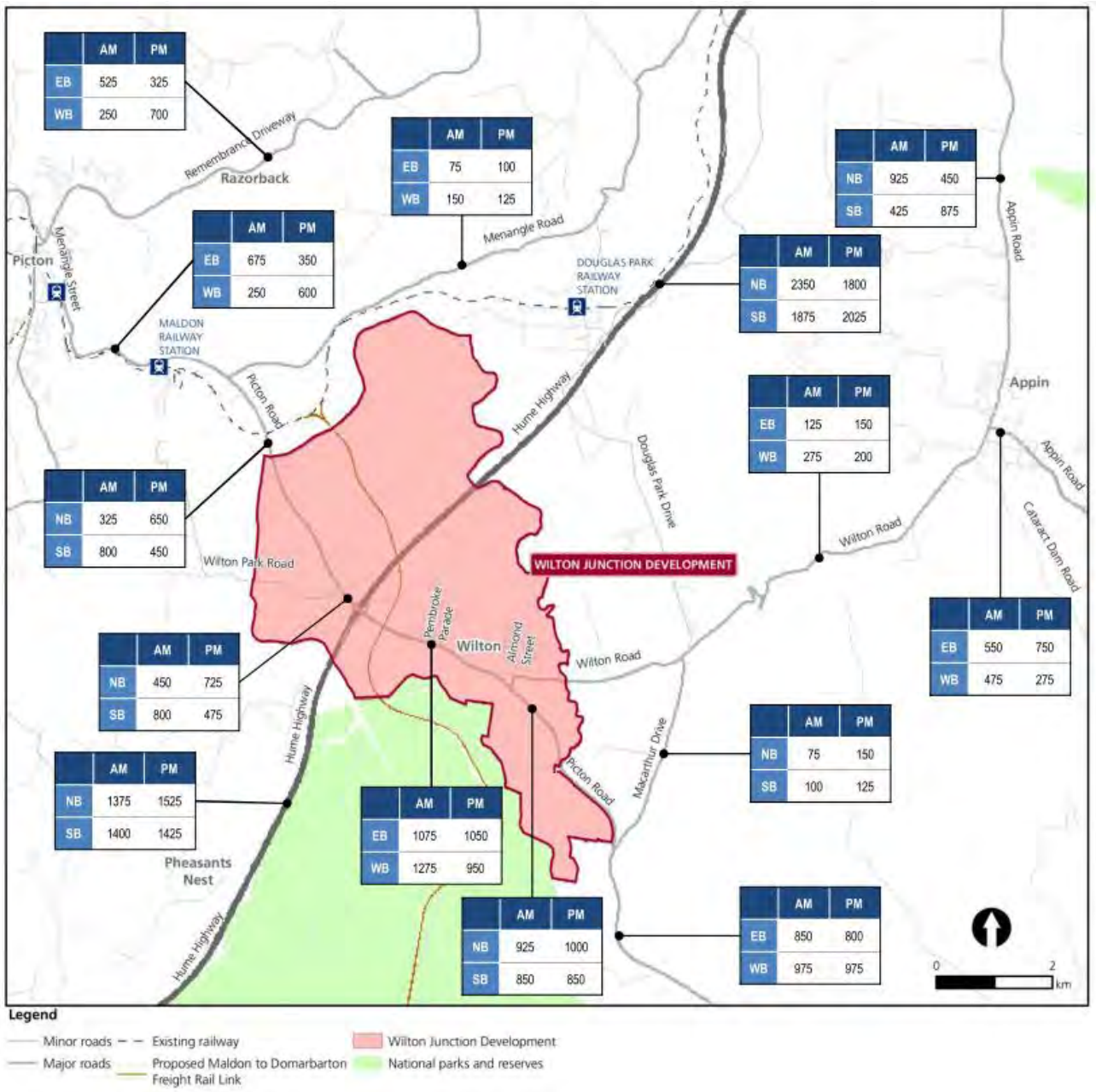



**Figure 5.3 Road network flows for 2024 without Wilton scenario (PCUs)**

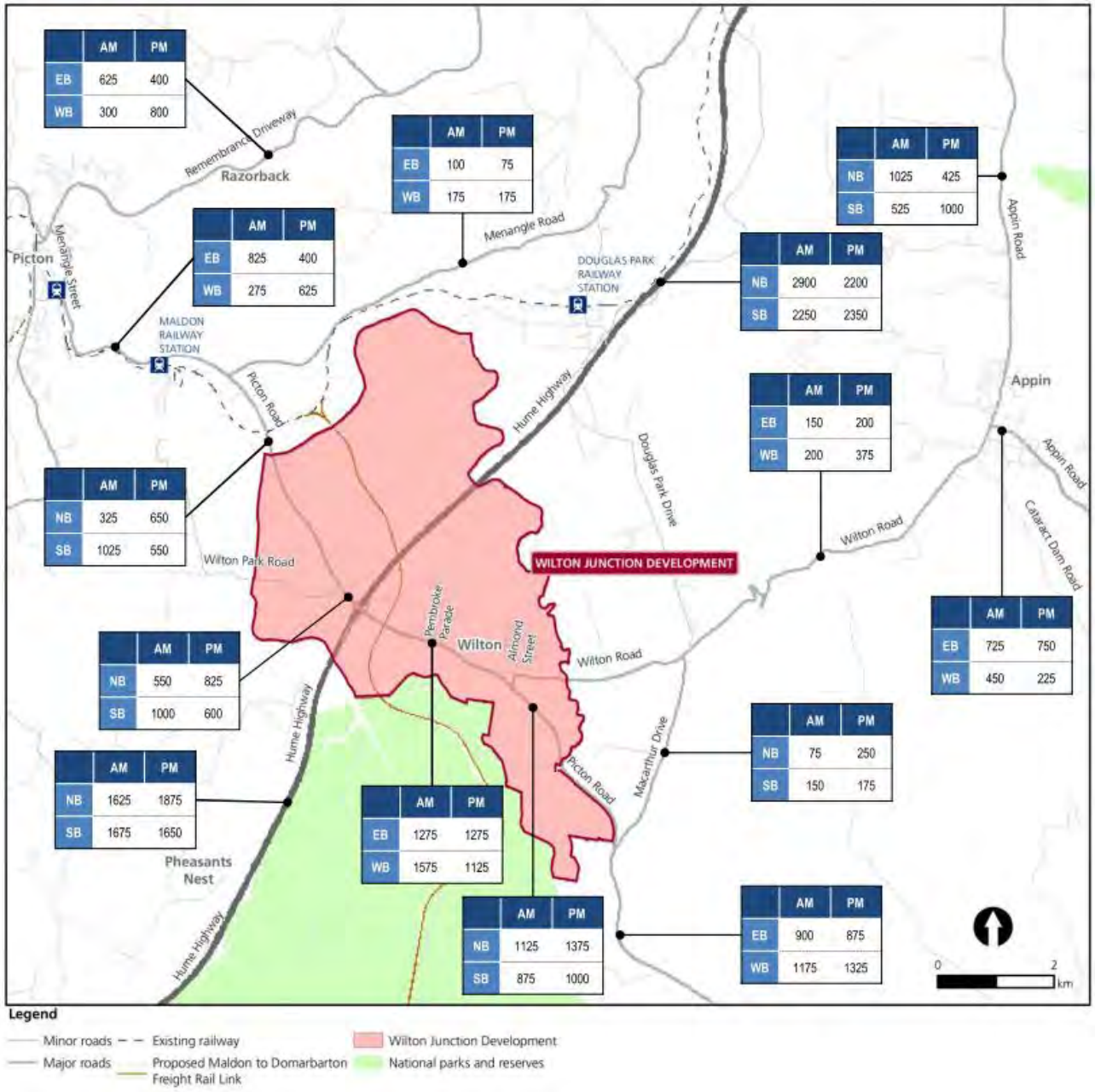



**Figure 5.4 Road network flows for 2036 without Wilton scenario (PCUs)**

### Mid-block performance

Traffic forecasts from the Aimsun model for the 'without Wilton' scenarios, assuming the required infrastructure (described in this section) is in place, are summarised in Table 5.8.

The capacity of Broughton Pass (with its "One vehicle at any one time" restriction) has been estimated by simulating it as a set of traffic signals with an all-red period equal to the clearance time for the 90 m long bridge. It was assumed that it would remain in its current configuration until the level of delay reached LoS F (i.e. by 2031). However, congestion levels may mean upgrading is required before this time.

**Table 5.8 Traffic volume forecasts (pcu/h) for 2013 existing and future 'no Wilton' scenarios**

| Highway section | Direction | 2013 Modelled | | 2024 No Wilton | | 2031 No Wilton | | 2036 No Wilton | |
|---|---|---|---|---|---|---|---|---|---|
| | | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak |
| Hume Highway, north of Picton Road | Northbound | 1,850 | 1,450 | 2,250 | 1,900 | 2,600 | 2,125 | 2,900 | 2,200 |
| | Southbound | 1,525 | 1,725 | 1,875 | 2,150 | 2,125 | 2,275 | 2,250 | 2,350 |
| Hume Highway, south of Picton Road | Northbound | 1,175 | 1,200 | 1,375 | 1,575 | 1,525 | 1,775 | 1,625 | 1,875 |
| | Southbound | 1,150 | 1,200 | 1,400 | 1,425 | 1,550 | 1,600 | 1,700 | 1,650 |
| Picton Road, at Nepean River bridge | Eastbound | 325 | 650 | 825 | 550 | 900 | 550 | 950 | 550 |
| | Westbound | 600 | 350 | 475 | 750 | 500 | 675 | 550 | 700 |
| Picton Road west of Hume Highway | Eastbound | 625 | 375 | 850 | 550 | 950 | 575 | 1,000 | 600 |
| | Westbound | 350 | 650 | 500 | 825 | 550 | 775 | 550 | 825 |
| Picton Road east of Hume Highway | Eastbound | 900 | 825 | 1,075 | 1,100 | 1,200 | 1,200 | 1,275 | 1,275 |
| | Westbound | 975 | 800 | 1,275 | 975 | 1,500 | 1,075 | 1,650 | 1,150 |
| Picton Road east of Pembroke Parade | Eastbound | 750 | 750 | 1,050 | 1,000 | 1,150 | 1,050 | 1,250 | 1,100 |
| | Westbound | 800 | 575 | 1,025 | 925 | 1,175 | 1,025 | 1,275 | 1,100 |
| Picton Road east of Almond Street | Eastbound | 800 | 725 | 1,025 | 925 | 1,125 | 1,000 | 1,225 | 1,050 |
| | Westbound | 750 | 650 | 875 | 825 | 900 | 925 | 925 | 975 |
| Picton Road east of Macarthur Drive | Eastbound | 800 | 700 | 975 | 825 | 1,075 | 925 | 1,150 | 950 |
| | Westbound | 775 | 650 | 875 | 900 | 950 | 925 | 975 | 1,000 |
| Wilton Road, at Broughton Pass | Northbound | 50 | 100 | 125 | 175 | 150 | 200 | 150 | 200 |
| | Southbound | 50 | 100 | 150 | 175 | 175 | 175 | 200 | 200 |

To assess the impact of these increasing volumes on the road network, mid-block Levels of Service have been estimated based on standard Austroads lane capacities for different types of roads (the level of service thresholds used are outlined in Table A.2). The results are provided in Table 5.9.

**Table 5.9 Summary of link performance for 2013 existing and future 'without Wilton' scenarios**

| Highway Section | Road type | Direction | 2013 Modelled | | 2024 No Wilton[1] | | 2031 No Wilton[1] | | 2036 No Wilton[1] | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak |
| Hume Highway, north of Picton Road | Freeway | Northbound | B | A | B | B | C | B | C | B |
| | | Southbound | A | B | B | B | B | B | B | B |
| Hume Highway, south of Picton Road | Freeway | Northbound | A | A | A | B | A | B | B | B |
| | | Southbound | A | A | A | A | B | B | B | B |
| Picton Road, at Nepean River bridge | 2-lane 2-way | Combined | C | C | D | D | D | D | D | D |
| Picton Road west of Hume Highway | Multi-lane arterial | Eastbound | A | A | A | A | A | A | A | A |
| | | Westbound | A | A | A | A | A | A | A | A |
| Picton Road east of Hume Highway | Multi-lane arterial | Eastbound | A | A | A | A | B | B | B | B |
| | | Westbound | A | A | B | A | B | A | B | B |
| Picton Road east of Pembroke Parade | 2-lane 2-way | Combined | D | D | E | E | E | E | E | E |
| Picton Road east of Almond Street | 2-lane 2-way | Combined | D | D | E | D | E | E | E | E |
| Picton Road east of Macarthur Drive | 2-lane 2-way | Combined | D | D | E | D | E | E | E | E |
| Wilton Road, at Broughton Pass | One lane bridge | Combined | E | E | E | E | A[2] | A[2] | A | A |

(1) Includes current approval for Bingara Gorge

(2) Cataract River Bridge at Broughton Pass widened to one lane in each direction

The analysis of the 'without Wilton' scenario indicates that Picton Road between Pembroke Parade and Almond Street will reach LoS E by 2021 and east of Almond Street will reach LoS E by 2024. This is sightly sooner than the Picton Road Corridor Strategy (RMS, 2011) findings, which recommended that Picton Road be upgraded by 2026.

### Intersection performance – Future base

In the first instance 2024 and 2036 future base scenarios were assessed to isolate the impacts resulting from the growth in background traffic from the impacts of the proposed development. The road network in the 2024 and 2036 future base models remained the same as per the existing layout. Tables 5.10 and 5.11 show the forecast intersection performance for the 2024 and 2036 future base scenarios respectively in the AM and PM peak hours.

**Table 5.10 Intersection performance for 2024 future base scenario in the AM and PM peak hours**

| Intersection | AM peak (07.00–08.00) | | PM peak (16.45–17.45) | |
|---|---|---|---|---|
| | Ave. delay (sec/veh) | LoS | Ave. delay (sec/veh) | LoS |
| Hume Highway/Picton Road (Eastern intersection)[1] | 152 | F | 430 | F |
| Hume Highway/Picton Road (Western intersection)[1] | 18 | B | 23 | B |
| Picton Road/Wilton Park Road[1] | 23 | B | 16 | B |
| Picton Road/Pembroke Parade[1] | 235 | F | 24 | B |
| Picton Road/Almond Street[1] | 141 | F | 30 | C |
| Picton Road/Macarthur Road[1] | 20 | B | 19 | B |

(1) priority controlled intersections, LoS and average delay reported is for the worst performing approach

The 2024 future base model highlights that the Hume Highway/Picton Road Interchange would operate significantly over capacity in both peaks, as a result of background traffic growth.

Pembroke Parade and Almond Street would both operate at LoS F in the AM peak with traffic experiencing extensive delays. This is mainly due to the increased traffic volumes on Picton Road in both directions, which would significantly reduce the number of gaps available for traffic exiting at both intersections.

**Table 5.11 Intersection performance for 2036 future base scenario in the AM and PM peak hours**

| Intersection | AM peak (07.00–08.00) | | PM peak (16.45–17.45) | |
|---|---|---|---|---|
| | Ave. delay (sec/veh) | LoS | Ave. delay (sec/veh) | LoS |
| Hume Highway/Picton Road (Eastern intersection)[1] | 180 | F | 775 | F |
| Hume Highway/Picton Road (Western intersection)[1] | 40 | C | 33 | C |
| Picton Road/Wilton Park Road[1] | 22 | B | 17 | B |
| Picton Road/Pembroke Parade[1] | 609 | F | 35 | C |
| Picton Road/Almond Street[1] | 365 | F | 191 | F |
| Picton Road/Macarthur Road[1] | 29 | C | 37 | C |

(1) priority controlled intersections, LoS and average delay reported is for the worst performing approach

The Aimsun intersection modelling for the 2024 and 2036 'without Wilton' scenarios indicated the following:

- By 2015 the Hume Highway Picton Road Interchange is forecast to require upgrading due to deteriorating intersection performance and existing safety concerns.[4]

[4] This is the assessment of Parsons Brinckerhoff as part of its traffic modelling and analysis. This has not been confirmed by RMS and upgrading of the interchange has not been committed to.

- By 2024 or sooner:
  - The Pembroke Parade and Almond Street intersections with Picton Road would both operate at LoS F in the AM peak with traffic experiencing extensive delays.
  - Picton Road should be upgraded as per the Picton Road corridor strategy.
- By 2036 the northern part of the model network around Narellan Road would be over capacity and significant upgrades would be required to cater for the expected growth in that area.

It is noted that the bottleneck created on Narellan Road would restrict the traffic flows travelling to the Hume Highway/Picton Road Interchange. Without this constraint in the network, the performance of the interchange is likely to deteriorate further.

The Aimsun model results in conjunction with SIDRA intersection models have been used to estimate when road upgrades are required. The timeframe for road upgrades are indicated on Figure 5.5. Interpolation has been used to estimate the timing of upgrades between 2013, 2024 and 2036.

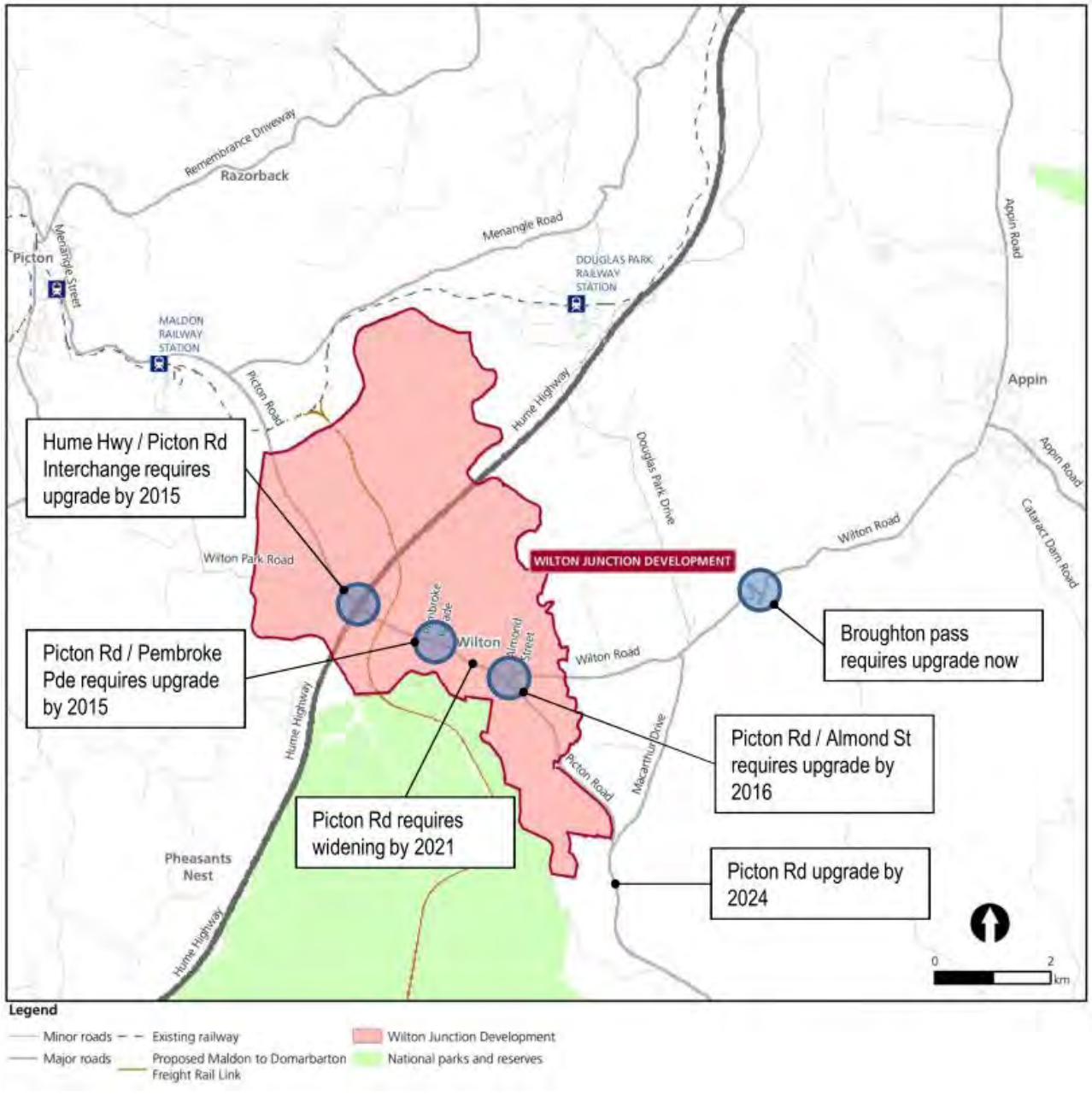



**Figure 5.5 Estimated timing of road upgrades without Wilton Junction Development**

## 5.5 Upgraded road network performance

A 2036 do-minimum model was subsequently developed to address the capacity constraints identified in the 2036 future base scenario. The following upgrades within the core study area were included in the model network:

- Hume Highway/Picton Road – signalising both western and eastern intersections, adding an extra ahead lane in both directions on the bridge, adding an extra right turn lane on the bridge in the westbound direction, adding an extra right turn short lane on both the northbound and southbound off-ramps
- Picton Road/Pembroke Parade – signalising this intersection, adding an extra right turn short lane on Pembroke Parade
- Picton Road/Almond Street – signalising this intersection, adding an extra left turn short lane on Almond Street.

Table 5.12 shows the intersections performance for 2036 with-upgrade scenario in the AM and PM peak hours. Note that the Picton Road/Wilton Road and Picton Road/Macarthur Road intersections are priority controlled intersections, and therefore the LoS shown is based on the worst performing approach.

**Table 5.12 Intersection performance for 2036 with-upgrade scenario in the AM and PM peak hours**

| Intersection | AM peak (07.00–08.00) | | PM peak (16.45–17.45) | |
|---|---|---|---|---|
| | Ave. delay (sec/veh) | LoS | Ave. delay (sec/veh) | LoS |
| Hume Highway/Picton Road (Eastern intersection)[2] | 19 | B | 17 | B |
| Hume Highway/Picton Road (Western intersection) [2] | 19 | B | 22 | B |
| Picton Road/Wilton Park Road[1] | 23 | B | 13 | A |
| Picton Road/Pembroke Parade[2] | 15 | B | 16 | B |
| Picton Road/Almond Street[2] | 25 | B | 16 | B |
| Picton Road/Macarthur Road[1] | 19 | B | 15 | B |

(1) priority controlled intersections, LoS and average delay reported is for the worst performing approach
(2) signalised intersection, LoS and average delay reported is for the average of all movements based on traffic volume

The 2036 with-upgrade model results show that the proposed road upgrades would be able to accommodate the background traffic growth by 2036 for both peak hours. The *Picton Road Corridor Strategy* indicates that the widening of Picton Road is required by 2026. Traffic modelling undertaken for this study, indicates that this upgrade is required as soon as 2021.

## 5.6 Development of with-Wilton Junction matrices

As part of the modelling process, Wilton Junction was initially modelled in the STM. The purpose of this was to inform a number of high level outputs (including modal split, trip distribution, trip containment) to be used in the Aimsun modelling. Three employment scenarios were considered and analysed in STM:

- Low employment scenario: 6,456 jobs
- Medium employment scenario: 11,769 jobs
- High employment scenario: 13,450 jobs.

For all three scenarios, a forecast population of 34,955 people (11,900 dwellings) was included for Wilton Junction.

In the STM modelling, the population and employment growth in the surrounding areas was reduced marginally. This change was made on the assumption that the overall BTS growth forecasts are accurate and therefore to achieve no net change to the BTS figures in the STM model, some population and employment growth would be redistributed to Wilton. This approach was agreed with TfNSW.

**Table 5.13 Adjustments to growth in other areas due to Wilton Junction**

| Area | Reduced growth in other areas due to Wilton |
|---|---|
| Camden | 90.2% growth |
| Campbelltown - North | 90.2% growth |
| Campbelltown - South | 90.2% growth |
| Wingecarribee | 90.2% growth |
| Wollondilly | Additional 31,355 people in TZ1450, 90.2% growth in other zones |
| **Total** | **100%** |

### Trip containment

The STM modelling was utilised to determine the level of trip containment which can be expected within Wilton Junction, depending on the mix of population and employment. Table 5.14 shows the percentage of trip containment estimated from the STM model for each of the three employment scenario.

**Table 5.14 STM estimate of trip containment within Wilton Junction for employment containment scenarios**

| Time period | Movement | Low employment (35%) | Medium employment (50%) | High employment (70%) |
|---|---|---|---|---|
| AM peak | Trips starting in Wilton | 48% | 52% | 56% |
| | Trips finishing in Wilton | 76% | 74% | 70% |
| PM peak | Trips starting in Wilton | 75% | 73% | 71% |
| | Trips finishing in Wilton | 56% | 58% | 61% |

(1) Output calculated from 2036 STM model runs

Following discussion with TfNSW it was agreed to use a conservative 50%employment containment figure in the Aimsun Modelling. This does not imply that the high employment containment option cannot be achieved.

## 5.7 Trip generation

The STM model was to be used to determine the trip generation rates to be used in the Aimsun Model. Upon investigation, the trip generation rates produced by the STM model appeared to be low (at 0.5 vehicles trips per dwelling), compared with existing RMS guidelines and from surveys of similar development in the area. Therefore it was agreed to revert to exiting survey data collected in the area to determine what trip rates to use (this was agreed with TfNSW).

### Residential

Traffic surveys undertaken on Pembroke Parade for the existing Wilton township as part of approved Bingara Gorge[5] indicated an average trip rate of 0.7 vehicle trips per dwelling during the peak hour. Due to the position of the surveys, local trips, i.e. those residential trips to the local shops, primary schools or visiting friends were not included. It is estimated that these local trips could add between 0.08 and 0.14 vehicle trips per dwelling during the peak hour. This vehicle trip rate is broadly consistent with RMS Technical Direction TDT13-04a – Guide to Traffic Generating Developments Updated traffic surveys (RMS, August 2013) for regional areas.

For the Wilton Junction Development, this rate of 0.7 vehicle trips per dwelling during the peak hour has been assumed, with the additional allowance of 0.08 vehicle trips per dwelling during the AM peak hour and 0.14 vehicle trips per dwelling during the PM peak hour for local trips (to the nearest local shops, primary school, etc.). Therefore the total vehicle trip generation rate applied was 0.78 vehicle trips per dwelling during the AM peak hour and 0.84 vehicle trips per dwelling during the PM peak hour. The daily traffic generation rate estimated from TDT13-04a was 5.65 vehicle trips per dwelling.

### Employment

An analysis of RMS Technical Direction TDT13-04a – Guide to Traffic Generating Developments Updated traffic surveys (RMS, August 2013) vehicle and person trip generating rates for offices has been used to estimate the number of vehicle trips per employee during the peak periods of:

- 0.6 trips per employee during the AM peak hour
- 0.45 trips per employee during the PM peak hour.

A similar process was undertaken for the business park component, which indicated a slightly higher afternoon trip rate of:

- 0.6 trips per employee during the AM peak hour
- 0.5 trips per employee during the PM peak hour.

### Retail

Similarly, the RMS TDT2013-04a rate for a small shopping centre (i.e. less than 10,000 $m^2$ GFA) and large shopping centre (20,000–30,000 $m^2$ GFA) has been used. This equated to:

- 12.3 trips per 100 $m^2$ GFA during the Thursday evening peak hour for local retail centres
- 6.0 trips per 100 $m^2$ GFA during the Thursday evening peak hour for town centre retail.

During the peak, it is assumed that some of trips will be linked, i.e. stopping at the shop on their way to somewhere else, as opposed to trips exclusively for shopping.

### Total trips

The total numbers of trips (all modes) for the AM and PM peaks as well as the typical weekday are shown in Table 5.15. These have been broken down into four quadrants dissected by the Hume Highway and Picton Road.

[5] Traffic Review of Proposed Wilton Junction Development (Colston Budd Hunt & Kafes Pty Ltd, November 2012)

**Table 5.15 Trip numbers (all modes, production and attraction) by quadrant and time period (full development)**

| Quadrant | Daily | | AM peak hour | | PM peak hour | |
|---|---|---|---|---|---|---|
| | In | Out | In | Out | In | Out |
| North quadrant | 45,463 | 45,463 | 5,411 | 8,156 | 7,452 | 5,800 |
| East quadrant | 11,717 | 11,717 | 1,411 | 2,287 | 1,979 | 1,494 |
| South Quadrant | 18,051 | 18,051 | 1,431 | 3,686 | 3,345 | 1,689 |
| West Quadrant | 5,217 | 5,217 | 949 | 1,057 | 832 | 929 |
| **Total** | **80,449** | **80,449** | **9,201** | **15,187** | **13,608** | **9,913** |

### Internal trip containment and directional split

The percentage of trips into and out of the developments was estimated by land use type based on the results of the STM modelling. The percentages assumed for the AM and PM peak hours are shown in Table 5.16. The directional split assumed across the day is 50% trips in/50% trips out. Internal trip containment was as per the STM numbers reported in Table 5.14.

**Table 5.16 Assumed directional split for peak hour trips**

| Time period | Direction | Residential | Local retail | Bulky goods, Large retail | Employment, Business park |
|---|---|---|---|---|---|
| AM peak | In | 30% | 50% | 60% | 75% |
| | Out | 70% | 50% | 40% | 25% |
| | **Total** | **100%** | **100%** | **100%** | **100%** |
| PM peak | In | 70% | 50% | 50% | 15% |
| | Out | 30% | 50% | 50% | 85% |
| | **Total** | **100%** | **100%** | **100%** | **100%** |

### Mode split

The potential mode shares for the development in the area was based on the percentages for surrounding areas, calculated from 2011 JTW and HTS data. The proposed mode shares for the area by land use, trip purpose and time of day are shown in Table 5.17. The corresponding all-purpose mode share for Wollondilly LGA from the 2010-2011 HTS data is provided for comparison.

**Table 5.17 Mode share of trips (all purposes)**

| Transport mode | Daily | AM peak | PM peak | Daily HTS data for Wollondilly[1] |
|---|---|---|---|---|
| Vehicle Driver | 68% | 60% | 65% | 60% |
| Vehicle Passenger | 15% | 19% | 17% | 21% |
| Train | 2% | 3% | 3% | 2% |
| Bus | 4% | 6% | 4% | 5% |
| Walk | 10% | 10% | 11% | 9% |
| Cycle | 1% | 1% | 1% | 2% |
| **Total** | **100%** | **100%** | **100%** | **100%** |

(1) From: Bureau of Transport Statistics: 2010/11 Household Travel Survey (HTS), five years pooled

The resulting number of trips for the Wilton Junction Development for the AM peak, PM peak and typical weekday are shown in Table 5.18.

**Table 5.18 Vehicle trip numbers (production and attraction) by land use and time period**

| Land use | | Daily | | AM peak hour | | PM peak hour | |
|---|---|---|---|---|---|---|---|
| | | In | Out | In | Out | In | Out |
| Residential | Work | 10,481 | 10,481 | 1,021 | 4,085 | 2,317 | 772 |
| | Education | 382 | 382 | 68 | 270 | 116 | 39 |
| | Shopping | 9,201 | 9,201 | 333 | 1,333 | 1,901 | 634 |
| | Other | 8,635 | 8,635 | 252 | 1,007 | 1,943 | 648 |
| | Local Primary School + Other | 1,854 | 1,854 | 182 | 182 | 259 | 259 |
| Retail | Bulky | 2,935 | 2,935 | 0 | 0 | 289 | 289 |
| | Small | 8,302 | 8,302 | 291 | 291 | 582 | 582 |
| | Large | 4,649 | 4,649 | 231 | 154 | 385 | 385 |
| Employment | | 8,849 | 8,849 | 3,783 | 1,261 | 544 | 3,084 |
| Business park | | 956 | 956 | 0 | 0 | 28 | 156 |
| **Total** | | **56,245** | **56,245** | **6,161** | **8,584** | **8,365** | **6,847** |

### Trip distribution

The trip distribution for trips external to from the Wilton Junction development was determined from the STM model. Table 5.19 shows the directional splits to and from Wilton in the AM and PM peaks.

**Table 5.19 Trip direction based on STM model results**

| Direction | Out of Wilton | | Into Wilton | |
|---|---|---|---|---|
| | AM peak | PM peak | AM peak | PM peak |
| Hume Highway (north) | 47% | 49% | 48% | 48% |
| Hume Highway (south) | 11% | 7% | 7% | 10% |
| Illawarra (east) | 23% | 16% | 16% | 21% |
| Wollondilly LGA (Picton, west) | 10% | 15% | 16% | 11% |
| Wollondilly LGA | 3% | 5% | 6% | 3% |
| Wollondilly LGA (north east) | 6% | 7% | 7% | 6% |
| **Total** | **100%** | **100%** | **100%** | **100%** |

### Traffic flows assigned to the road network

The traffic volumes generated by the Wilton Junction Development have been assigned to the road network within the Aimsun models. The resulting traffic flows for the 2024 and 2036 scenarios on the external road network are shown in Figures 5.6 and 5.7 respectively. Traffic flows within the Wilton Junction internal road network are outlined in section 5.9.1.

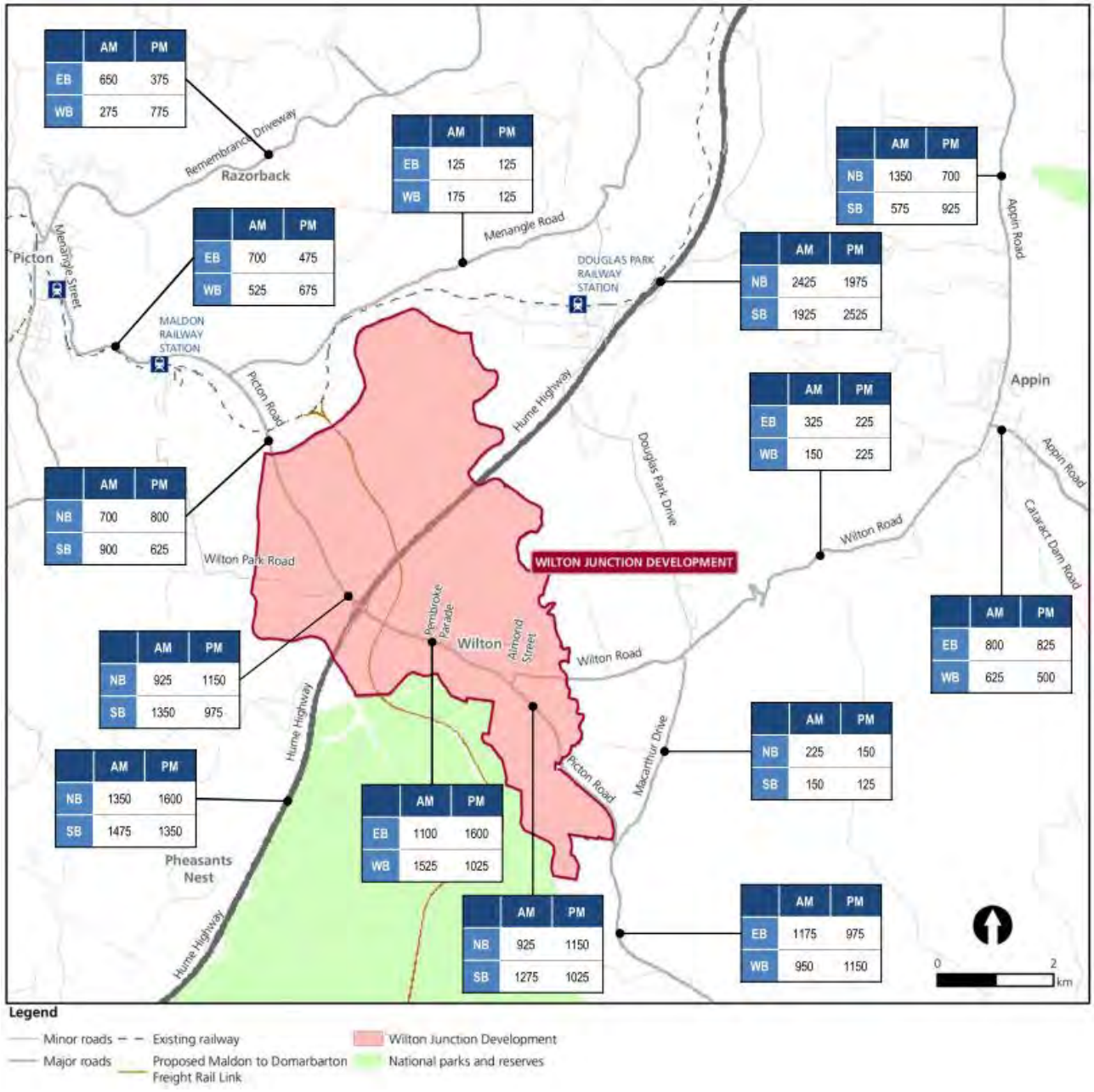



**Figure 5.6 External road network flows for 2024 with Wilton scenario (PCUs)**

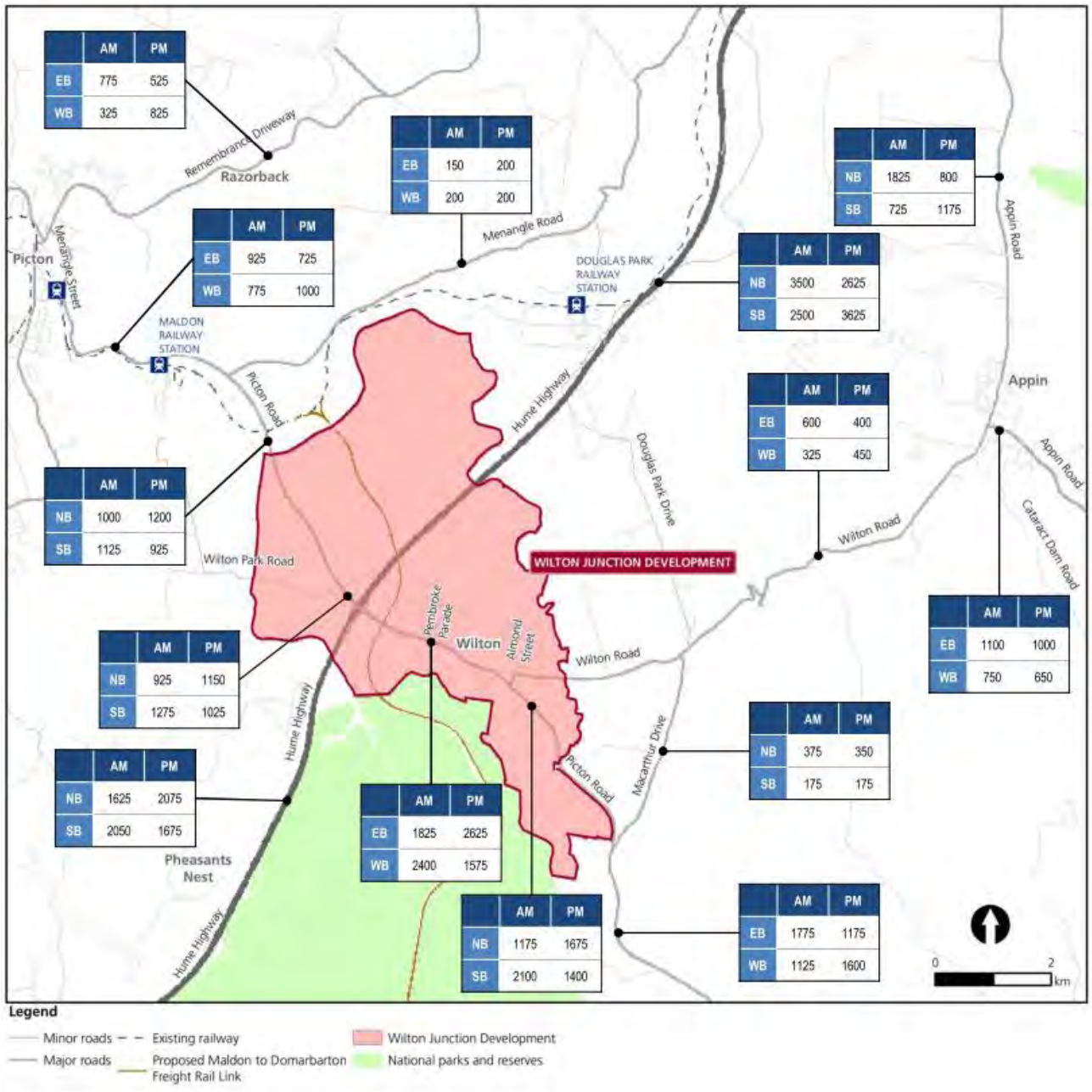



**Figure 5.7 External road network flows for 2036 with Wilton scenario (PCUs)**

## 5.8 Wilton Junction Road network

The AIMSUM modelling has been used to develop the road network within Wilton Junction and the interfaces with Picton Road and the Hume Highway. A number of key features are proposed, which seek to maximise local access whilst minimising the impacts on Picton Road and at the Picton Road/Hume Highway Interchange.

The road network for the Project has been developed based on the need to:

- separate state road traffic (Picton Road and Hume Highway) from local (internal) traffic
- provide a permeable network that reduces travel distances
- slow traffic as it moves through the village centre to improve amenity and pedestrian safety
- match road capacity and standard to the anticipated traffic volume
- facilitate access for trucks to employment lands without having to travel past residential properties
- enable the movement of bus services through the network
- enable and promote walking and cycling as a transport mode for short trips
- use minor local streets for short streets only.

Based on the above principals the key components of the proposed road network include:

1. Hume Highway/Picton Road upgrade
2. internal connector road
3. north facing ramps
4. upgrades to Picton Road east
5. grade separation at Almond Street.

Figure 5.8 shows the location of these key components.

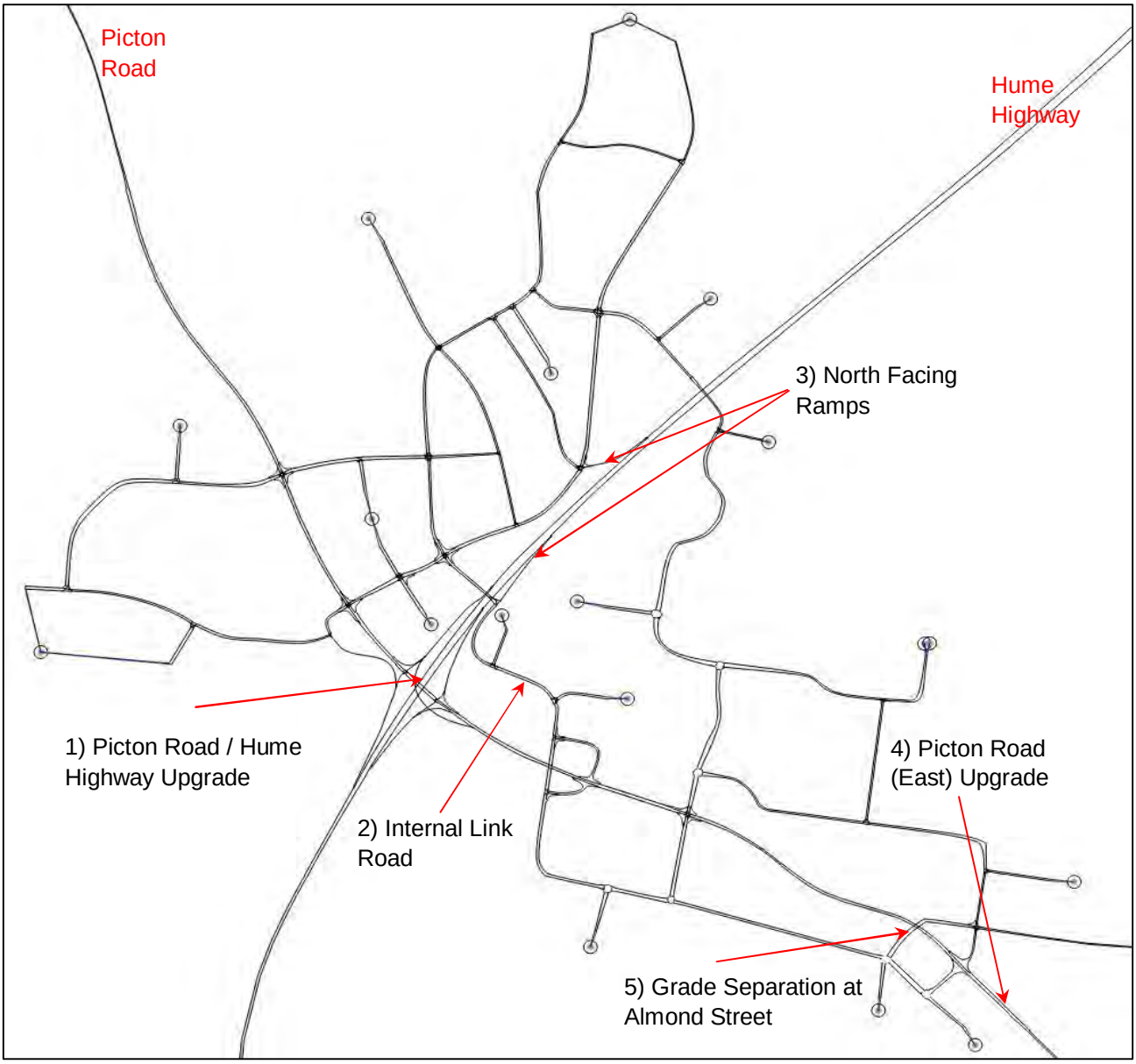



**Figure 5.8 Key components of the proposed Wilton Junction road network**

### Hume Highway/Picton Road upgrade

An upgrade of the Hume Highway/Picton Road Interchange is currently being considered by RMS. The existing interchange has safety issues (see section 2.7) and capacity issues during peak times. Recognising that this interchange needs upgrading, RMS recently applied for Infrastructure Australia funding to upgrade this interchange. RMS has undertaken some preliminary modelling work at this location and has considered a number of different upgrade options. However a preferred option is yet to be identified.

Under the 'with Wilton Junction' scenario, it is proposed that the interchange will need to be upgraded, regardless of whether Wilton Junction proceeds or not. However, a configuration different to that included in the Infrastructure Australia funding application is proposed. The proposed upgrade seeks to provide free flow movements to/from the north/east which is currently (and expected to remain in 2036) the largest car and truck movement using the interchange.

The Infrastructure Australia funding application configuration would require an additional bridge to be constructed over the Hume Highway. The proposed design shown in Figure 5.9 maintains the current bridge

whilst allowing for future widening if required. It includes a new elevated ramp for the westbound to northbound movement that caters for freight traffic from Sydney to Port Kembla. It also includes two new sets of traffic signals. However the westbound to northbound ramp diverges before the new signals, avoiding delay to freight and general traffic.

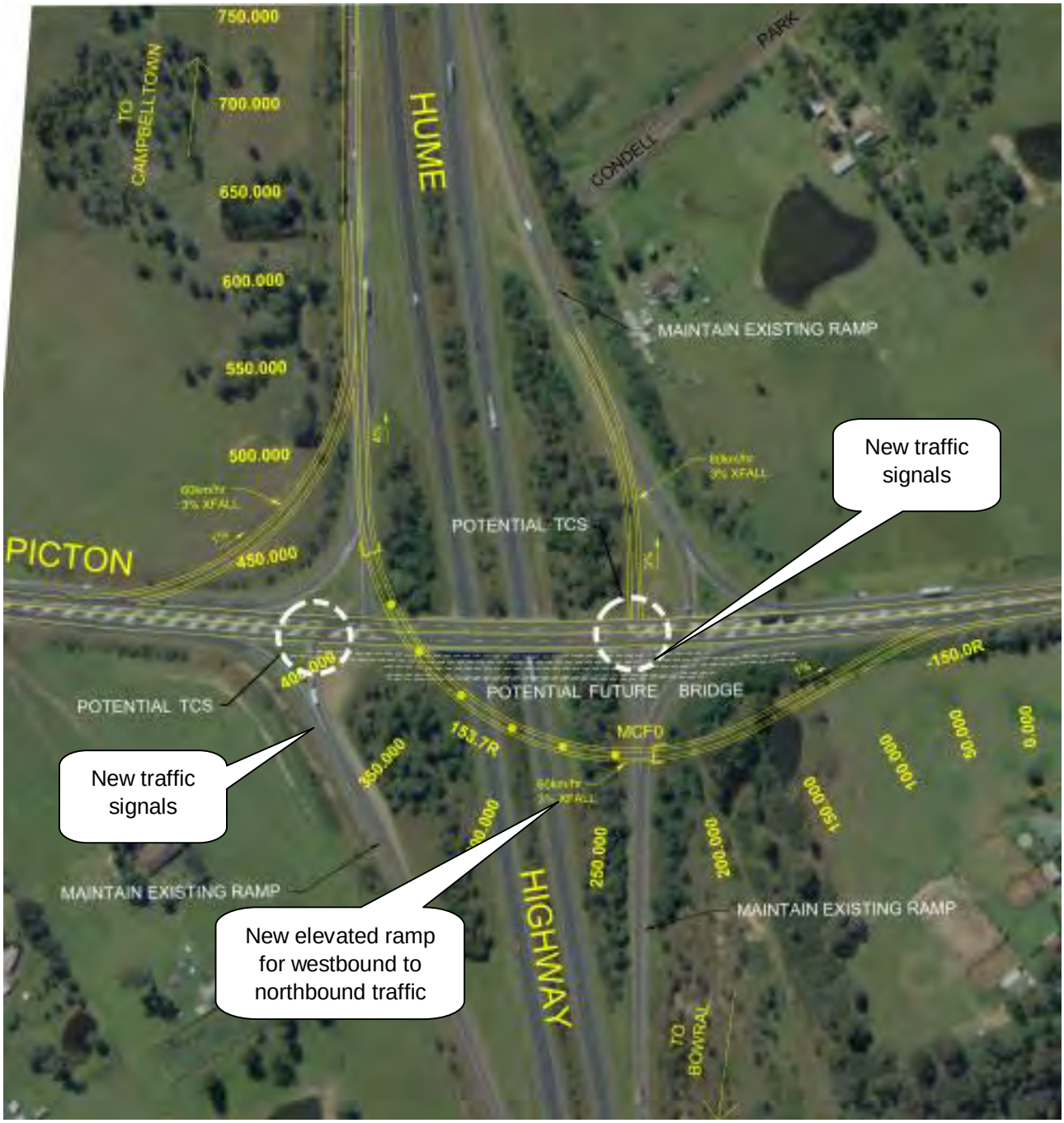



**Figure 5.9 Proposed Hume Highway/Picton Road interchange upgrade**

The Hume Highway/Picton Road Interchange shown in Figure 5.9 has been included in the Aimsun model. The configuration included in the model, shown in Figures 5.8 and 5.10, allowed for free-flow movement from Picton Road westbound to the Hume Highway northbound, but required this traffic to pass through the new traffic signals. The switch to the new layout is not expected to have a significant influence on the traffic volumes using the interchange.

### Internal Link Road

With a high level of job/trip containment expected within Wilton Junction, the need for a strong internal connector road is imperative. The proposed internal link road connects three of the land quadrant (dissected by the Hume Highway and Picton Road), allowing residents to travel within Wilton without the need to use Picton Road.

Grade separation across the Hume Highway and Picton Road maintains the integrity for longer and more strategic trips, such as the freight movement to Port Kembla. This provides a significant benefit to internal trips which can move around Wilton without delaying vehicles on the Hume Highway and Picton Road.

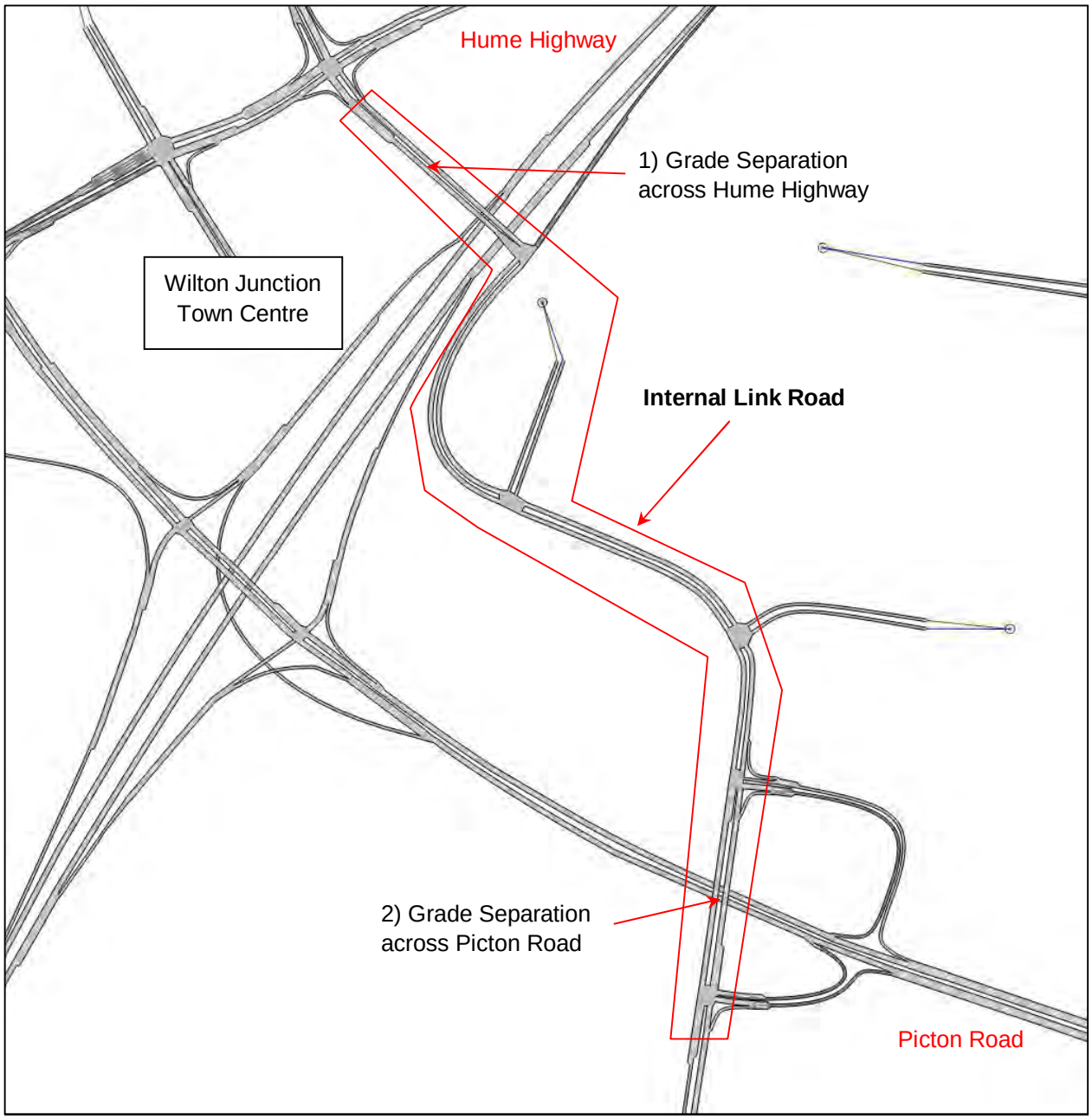



**Figure 5.10 Proposed internal link road**

### North-facing ramps from Wilton Junction to Hume Highway, north of Picton Road

The north facing ramps provide access for Wilton Junction to and from the Hume Highway (north) without the need to use the Picton Road/Hume Highway Interchange, thereby preserving more capacity at this interchange for regional and strategic traffic. The north facing slips roads also link with internal link road helping to minimise travel distance (reduce vehicle kilometres of travel) throughout Wilton, whilst providing direct access to Wilton Town Centre.

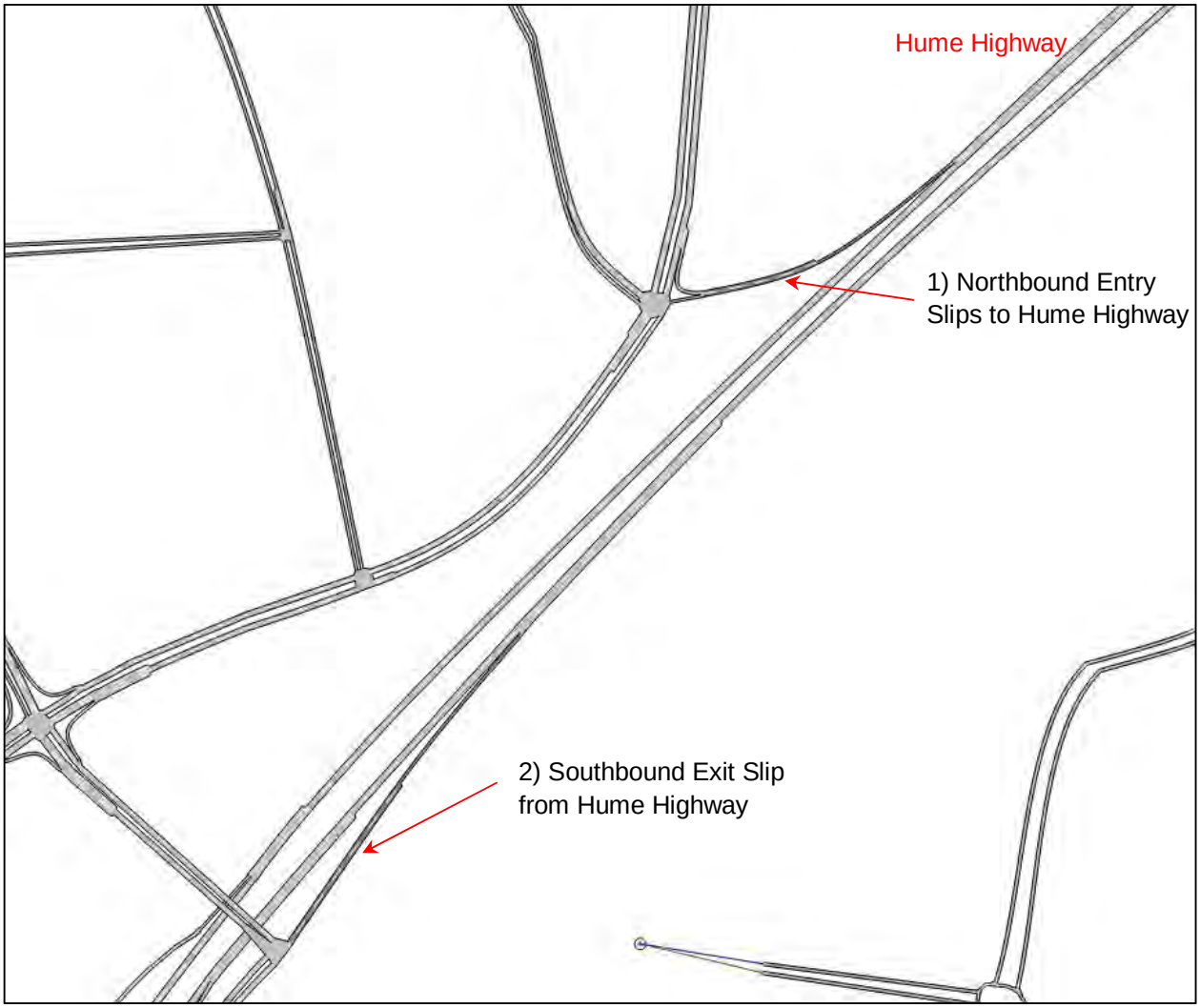



**Figure 5.11 Proposed north-facing ramps to the Hume Highway**

### Grade separation at Almond Street

In order to preserve the integrity of Picton Road it is proposed to make Almond Street left-in-left-out, whilst providing a new grade separated link across Picton Road. The grade separation also links with the Wilton Junction internal link road.

### Picton Road upgrade

The upgrading of Picton Road to two lanes in each direction (between Wilton Park Road and Macarthur Drive) is assumed to occur by 2026 based on RMS' Picton Road Safety Improvement Program. Modelling for the future base and with Wilton Junction scenarios indicates that this should occur before this year.

### 5.8.1 Wilton Junction road hierarchy

Based on the forecast traffic volumes for the AM and PM peaks, the access requirements and the principals outlined in section 5.8 and incorporating the key infrastructure components, the road hierarchy for Wilton Junction was developed. Figure 5.12 shows the proposed road hierarchy.

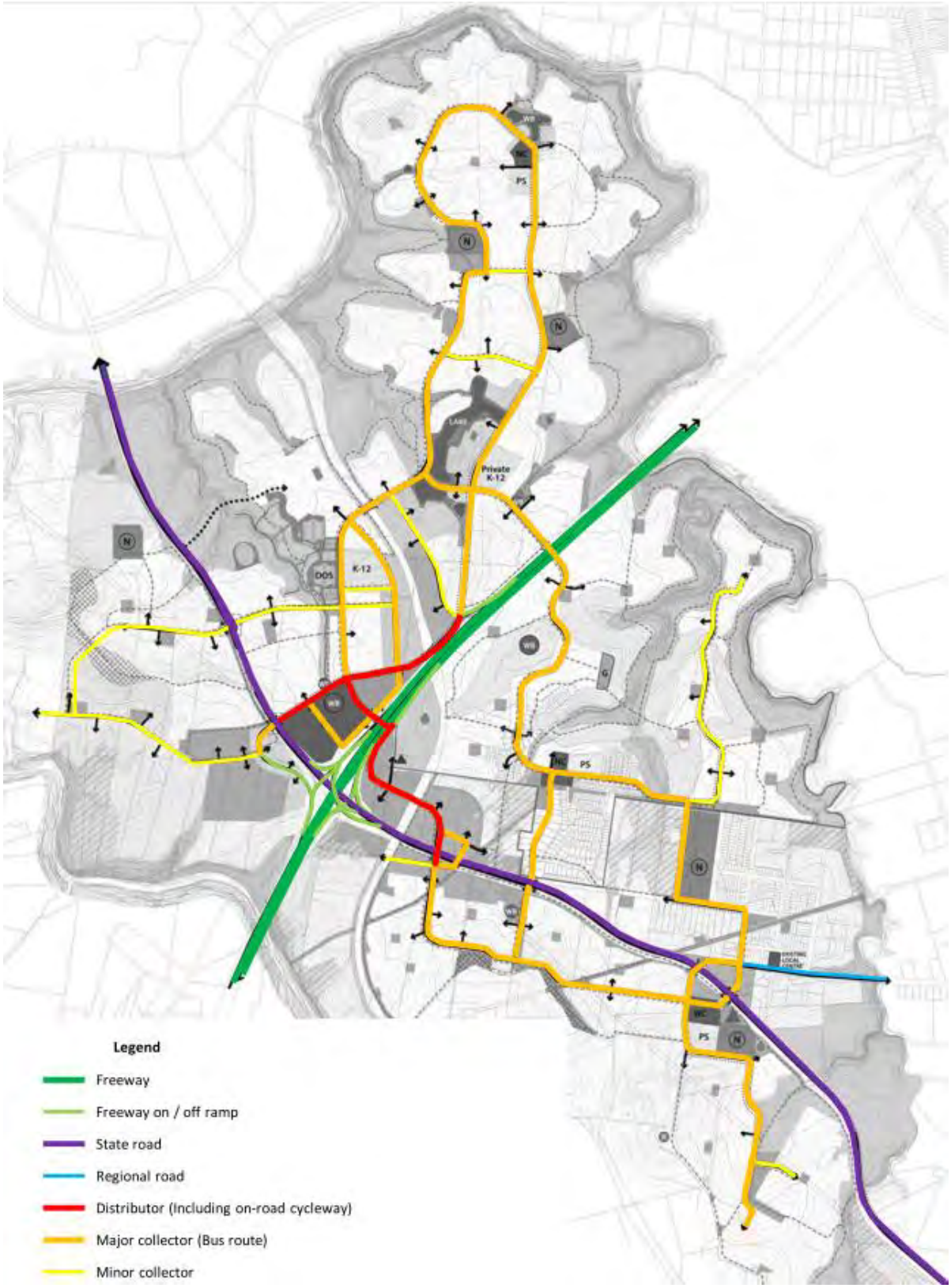


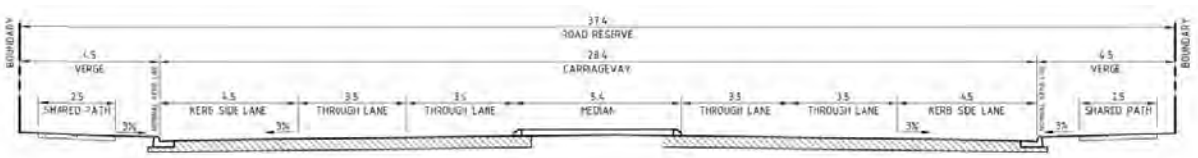
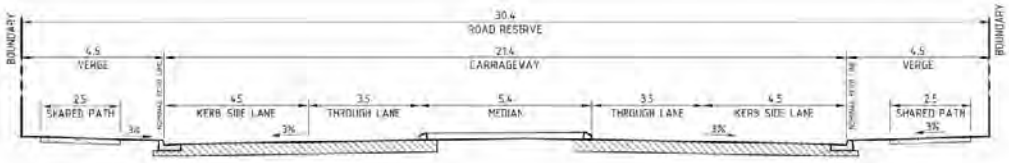
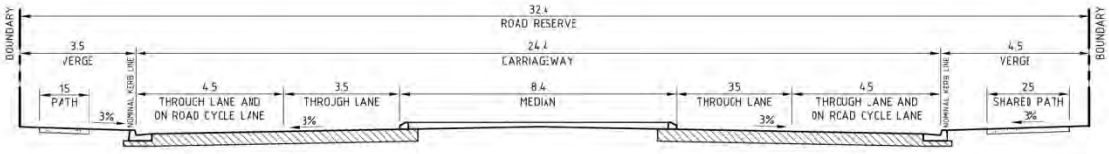
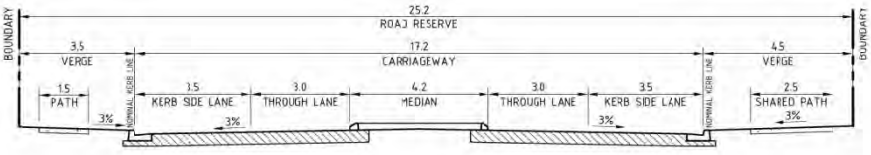
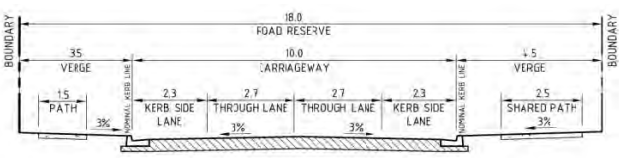

**Figure 5.12 Internal road hierarchy**

To provide enough capacity between intersections, some of the busiest road links within the development would require three traffic lanes in each direction. The number of lanes required for safe and efficient road network operation would be proactively provided to accommodate demand, determined by further detailed modelling at the Development Application stage of the project. As a minimum roads within the development would have one traffic lane in each direction plus parking, but would be constructed with sufficient width to be converted to two traffic lanes in each direction in the future.

## 5.9 Street design

The typical street cross-sections within Wilton Junction have been designed based on the RMS and Wollondilly Shire Council standards. Indicative street sections are provided in Table 5.20. These street types relate to the road hierarchy indicated in Figure 5.12.

**Table 5.20 Indicative street cross-sections**

| Road type and dimensions |
|---|
|  <br>SUB ARTERIAL - 6 LANE |
|  <br>SUB ARTERIAL - 4 LANE |
|  <br>DISTRIBUTOR ON ROAD CYCLEWAY - TYPE 1 |
|  <br>COLLECTOR BUS ROUTE - TYPE 4 |
|  <br>COLLECTOR - TYPE 7 |

Source: BG&E Civil Engineering, June 2014

Basic design elements for internal roads include:

- Lane width = 3.0 m to 3.5 m
- Kerbside parking lane width = 3.0 m
- On-street cycle lane width = 1.5 m
- Verge width = 4.0 to 4.5 m
- Footpath width = 1.2 m.

Streets within the town centre could have a carriageway width based on the 'Distributor on road cycleway' street type, enabling use by buses and cyclists and on-street parking. Footpaths in the town centre would generally be wider to cater for the higher numbers of pedestrians and footpath activity. A road safety audit would be undertaken during the detailed design process to eliminate safety issues before construction.

### 5.9.1 Forecast traffic volumes within Wilton Junction

Forecast 2024 and 2036 traffic volumes with Wilton Junction in place are shown in Figures 5.13 to 5.16.

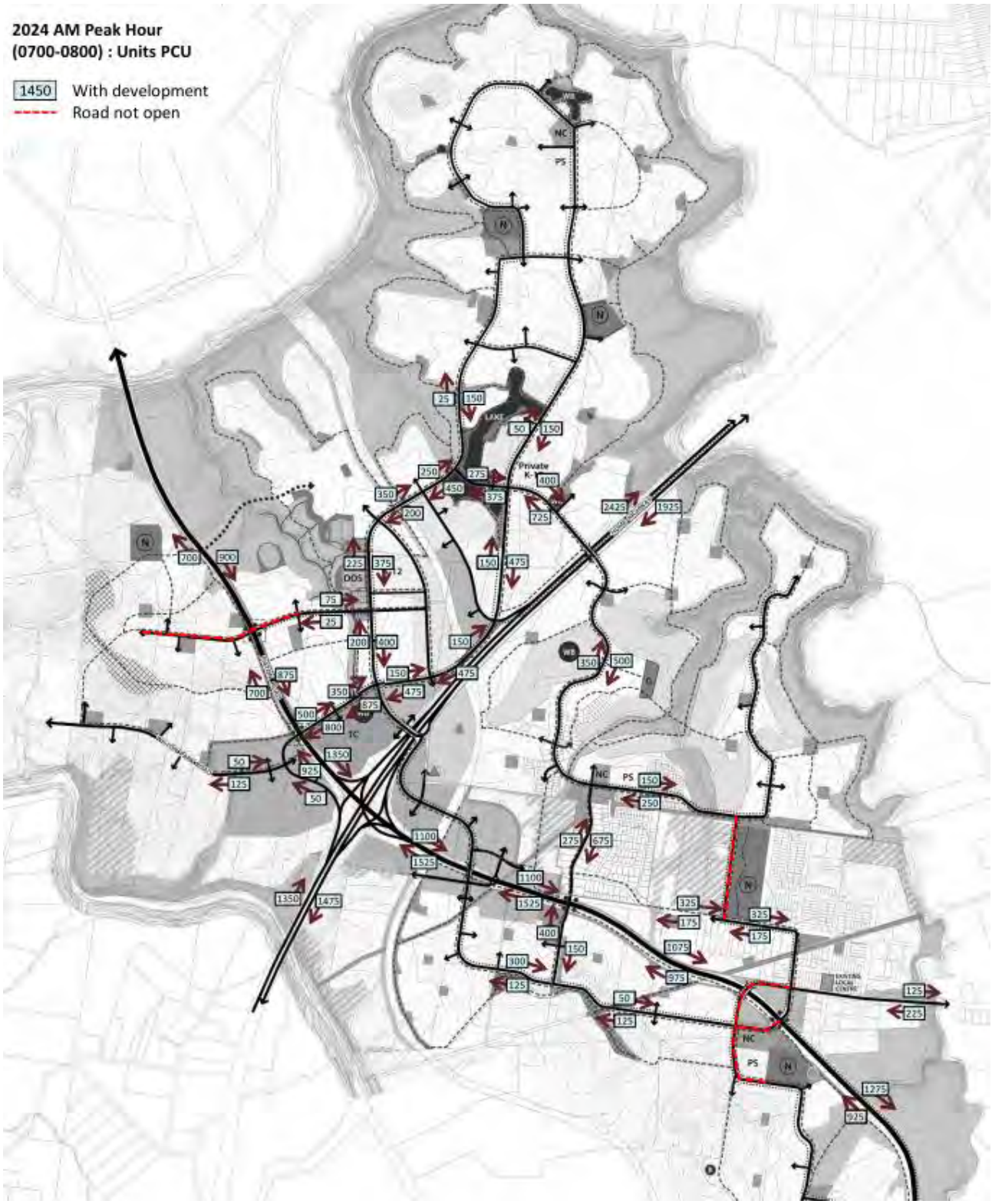



**Figure 5.13 Internal road network flows for 2024 AM peak hour with Wilton scenario (PCUs/hr)**

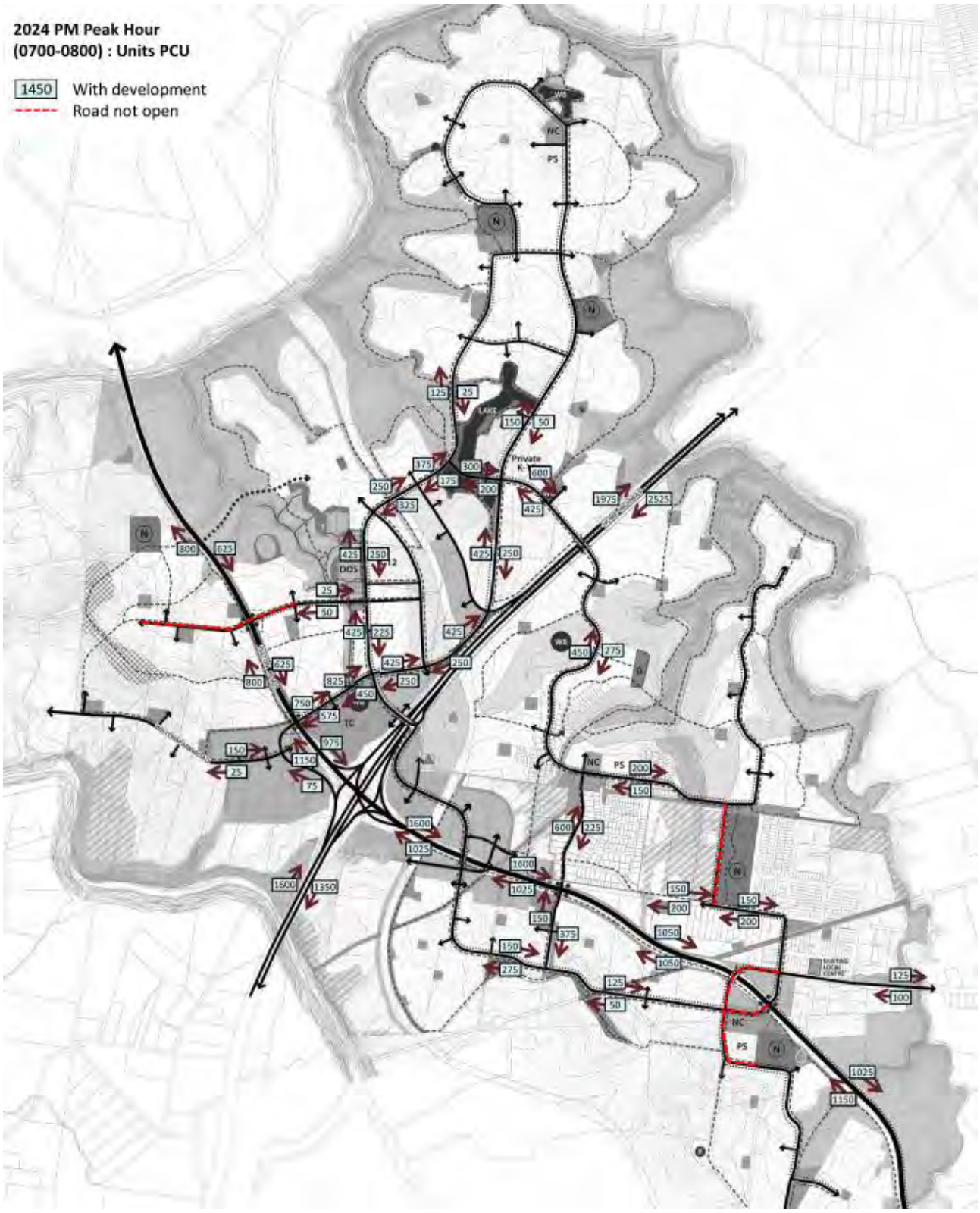



**Figure 5.14 Internal road network flows for 2024 PM peak hour with Wilton scenario (PCUs/hr)**

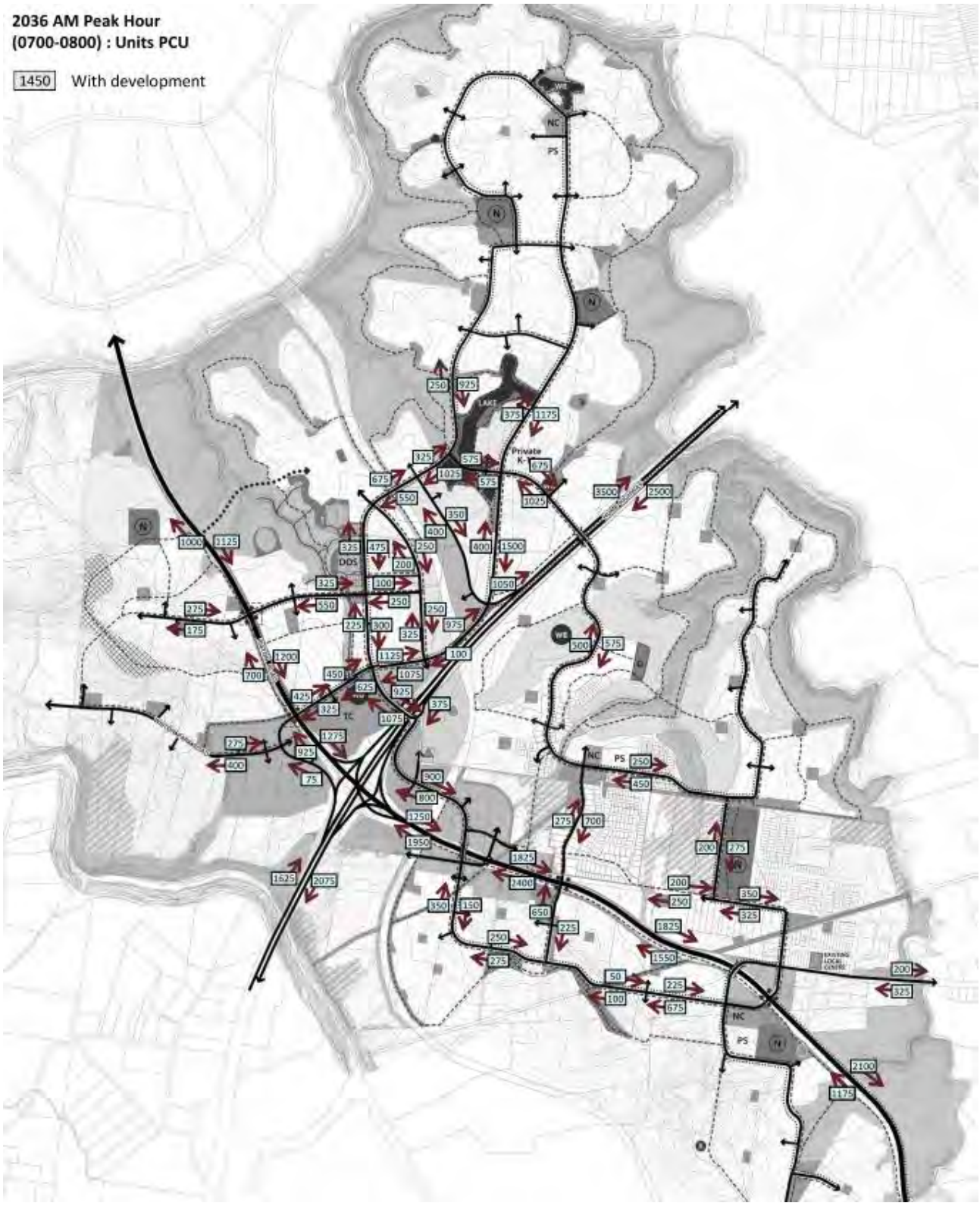



**Figure 5.15 Internal road network flows for 2036 AM peak hour with Wilton scenario (PCUs/hr)**

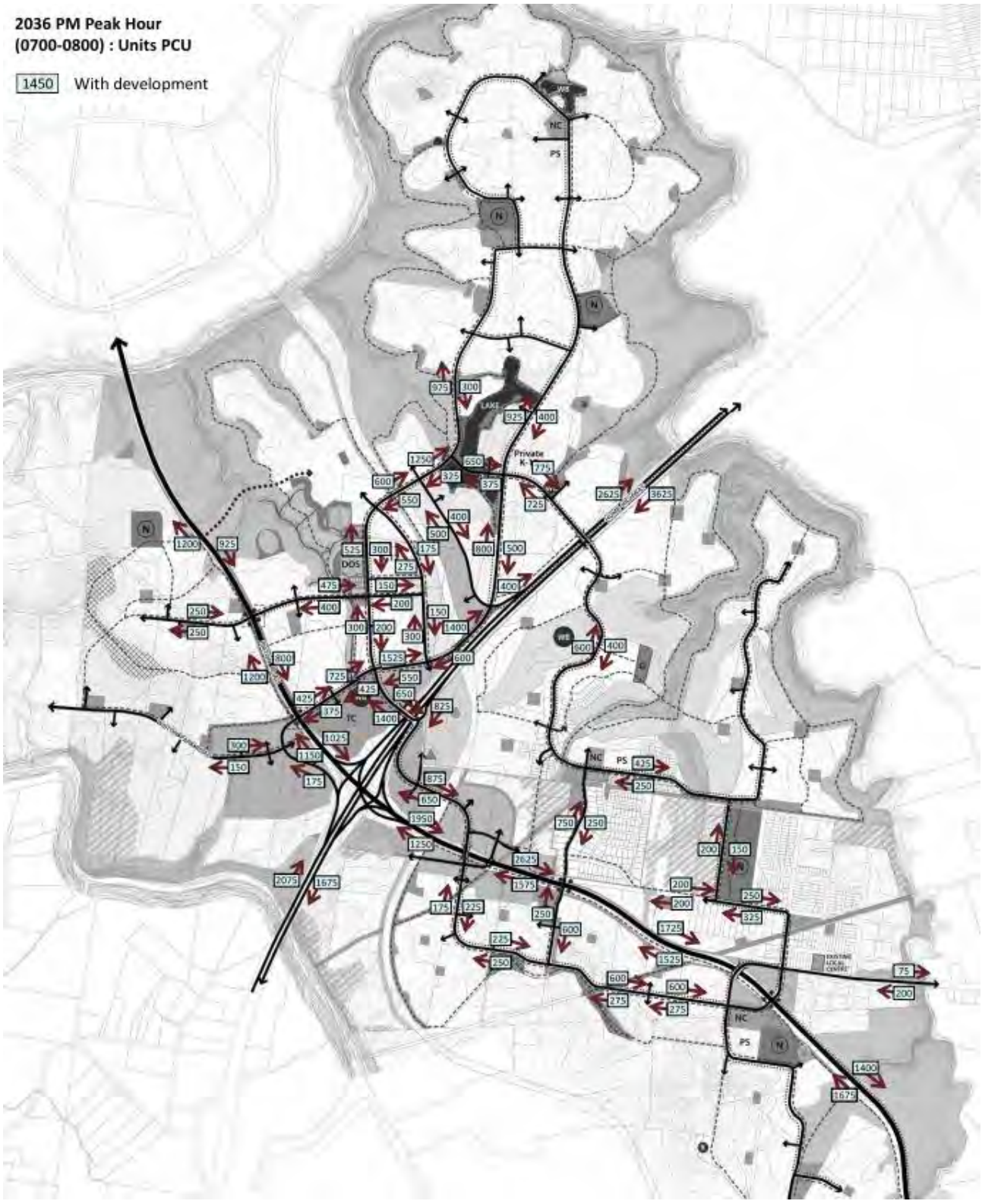



**Figure 5.16 Internal road network flows for 2036 PM peak hour with Wilton scenario (PCUs/hr)**

## 5.10 With-Wilton Junction network performance

The mid-block levels of service have been estimated using the same Austroads lane capacities for different types of roads, to assess the impact of the Wilton Junction Development. Table 5.21 shows the traffic volumes forecast by Aimsun for the 'with-Wilton' scenarios, assuming the required infrastructure (described in this section) is in place.

**Table 5.21 Traffic volume forecasts (pcu/h) for 2013 existing and future 'with Wilton' scenarios**

| Intersection | Direction | 2013 Modelled | | 2024 with Wilton | | 2031 with Wilton | | 2036 with Wilton | |
|---|---|---|---|---|---|---|---|---|---|
| | | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak |
| Hume Highway, north of Picton Road | Northbound | 1,850 | 1,450 | 2,425 | 1,975 | 3,150 | 2,475 | 3,500 | 2,625 |
| | Southbound | 1,525 | 1,725 | 1,925 | 2,525 | 2,350 | 3,250 | 2,500 | 3,625 |
| Hume Highway, south of Picton Road | Northbound | 1,175 | 1,200 | 1,350 | 1,600 | 1,525 | 1,900 | 1,625 | 2,075 |
| | Southbound | 1,150 | 1,200 | 1,475 | 1,350 | 1,900 | 1,550 | 2,075 | 1,675 |
| Picton Road, at Nepean River bridge | Eastbound | 325 | 650 | 900 | 625 | 1,000 | 850 | 1,125 | 925 |
| | Westbound | 600 | 350 | 700 | 800 | 900 | 1,025 | 1,000 | 1,200 |
| Picton Road west of Hume Highway | Eastbound | 625 | 375 | 1,350 | 975 | 975 | 725 | 1,275 | 1,025 |
| | Westbound | 350 | 650 | 925 | 1,150 | 700 | 900 | 925 | 1,150 |
| Picton Road east of Hume Highway | Eastbound | 900 | 825 | 1,100 | 1,600 | 1,150 | 1,600 | 1,250 | 1,950 |
| | Westbound | 975 | 800 | 1,525 | 1,025 | 1,175 | 1,125 | 1,950 | 1,250 |
| Picton Road east of Pembroke Parade | Eastbound | 750 | 750 | 1,075 | 1,050 | 1,600 | 1,575 | 1,825 | 1,725 |
| | Westbound | 800 | 575 | 975 | 1,050 | 1,400 | 1,400 | 1,550 | 1,525 |
| Picton Road east of Almond Street | Eastbound | 800 | 725 | 1,275 | 1,025 | 1,900 | 1,275 | 2,100 | 1,400 |
| | Westbound | 750 | 650 | 925 | 1,150 | 1,075 | 1,575 | 1,175 | 1,675 |
| Picton Road east of Macarthur Drive | Eastbound | 800 | 700 | 1,175 | 975 | 1,700 | 1,100 | 1775 | 1,175 |
| | Westbound | 775 | 650 | 950 | 1,150 | 1,100 | 1,500 | 1,125 | 1,600 |
| Wilton Road, at Broughton Pass | Northbound | 50 | 100 | 325 | 225 | 500 | 325 | 600 | 400 |
| | Southbound | 50 | 100 | 150 | 225 | 250 | 375 | 325 | 450 |

The mid-block Level of Service for the road links analysed has been assessed based on the on standard Austroads lane capacities for different types of roads shown in Table A.2 and the traffic volumes shown in Table 5.21. The results are provided in Table 5.22.

**Table 5.22 Summary of link performance for 2013 existing and future 'with Wilton' scenarios**

| Intersection | Road type | Direction | 2013 Modelled | | 2024 with Wilton | | 2031 with Wilton | | 2036 with Wilton | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak |
| Hume Highway, north of Picton Road | Freeway | Northbound | B | A | C | B | C | C | D | C |
| | | Southbound | A | B | B | C | B | C | C | D |
| Hume Highway, south of Picton Road | Freeway | Northbound | A | A | A | B | A | B | B | B |
| | | Southbound | A | A | A | A | B | B | B | B |
| Picton Road, at Nepean River bridge | 2-lane 2-way | Combined | C | C | D | D | E | E | E | E |
| Picton Road west of Hume Highway | Multi-lane arterial | Eastbound | A | A | B | A | C | B | C | C |
| | | Westbound | A | A | A | B | B | C | C | C |
| Picton Road east of Hume Highway | Multi-lane arterial | Eastbound | A | A | A | B | B | B | B | C |
| | | Westbound | A | A | B | A | B | B | C | B |
| Picton Road east of Pembroke Parade | Multi-lane arterial | Eastbound | D | D | A | A | B | B | C | B |
| | | Westbound | | | A | A | B | B | B | B |
| Picton Road east of Almond Street | Multi-lane arterial | Eastbound | D | D | B | A | C | B | C | B |
| | | Westbound | | | A | B | A | B | B | B |
| Picton Road east of Macarthur Drive | 2-lane 2-way | Combined | D | D | E | E | E | E | E | E |
| Wilton Road, at Broughton Pass | One lane bridge | Combined | E | E | A[1] | A[1] | B[1] | B[1] | C[1] | C[1] |

(1) Cataract River Bridge at Broughton Pass widened to one lane in each direction

With the additional Wilton Junction traffic, the capacity of Broughton Pass (with its 'One vehicle at any one time' restriction) is likely to be exceeded before 2024. Other upgrades, such as the widening of Picton Road are likely to be required sooner than they would for the future without Wilton Junction Development scenarios.

Traffic modelling indicates that the Hume Highway, north of the new north-facing ramps for Wilton Junction would be operating close to, but still within acceptable performance criteria (Level of Service D).

### 5.10.1 Impact of PCU factor

The Aimsun model was developed based on the assumption that the range of heavy vehicle sizes would result in the approximation that:

- one light vehicle equals one PCU
- one heavy vehicle equals two PCUs.

The Roads and Maritime Services *Traffic Modelling Guidelines (Version 1 February 2013, Section 10: Highway Assignment Modelling)*:

- one passenger car equals one PCU
- one light commercial vehicle equals one PCU
- one rigid heavy equals two PCUs
- one bus equals two PCUs
- one articulated truck equals four PCUs.

Classified traffic counts supplied by RMS following the development of the Aimsun model indicate an average number of PCUs per heavy vehicle of approximately three on both the Hume Highway and Picton Road.

As a sensitivity test, the mid-block Levels of Service have been recalculated based on the assumption that one heavy vehicle equals three PCUs. The results are shown in Appendix D. The impact of the change in PCU factor is summarised below:

- all roads are generally within the same Level of Service as the original PCU factor
- the Hume Highway remains at Level of Service D – i.e. it remains within acceptable performance parameters regardless of the PCU factor used
- some upgrades are required sooner, such as Picton Road east of Pembroke Parade.

The traffic analysis undertaken for the mid-block analysis for the future base, shown in section 5.4 indicates that, with the assumption of the 2 PCU conversion factor for heavy vehicles, Picton Road east of Pembroke Parade would require upgrading in 2021 with no Wilton Junction Development. With the Wilton Junction Development, the upgrade would be required in 2018.

The sensitivity tests using the 3 PCU factor indicates that Picton Road, east of Pembroke Parade would reach the limit of Level of Service D performance based on current traffic volumes, and reach Level of Service E east of Almond Street in the eastbound direction during the morning peak. It would require upgrading in the next few years regardless of the Wilton Junction development.

The traffic modelling undertaken is still considered a robust assessment of the impacts of the Wilton Junction development. It is noted that as a predominantly residential, retail and town centre development, the trip generation of trucks from Wilton Junction is expected to be small, and therefore the PCU factor used does not have a large effect on the amount of impact the development has on the road network.

## 5.10.2 Access and internal intersections

An access strategy has been sought that balances between permeability, impacts on arterial traffic flow and protecting the development streets from high levels of through traffic. The access arrangements and the proposed intersection controls within the internal road network are shown in Figure 5.17.


**Figure 5.17 Access locations and intersection control**

### Intersection performance

Table 5.23 shows the performance of key intersections within the study area for the 2024 with-Wilton scenario for both peak hours. The results show that the proposed road infrastructures would be able to cater for the Wilton development in 2024. The signalisation of the intersections of Picton Road with Wilton Park Road, Pembroke Parade and Almond Street would be required.

**Table 5.23 Intersection performance for 2024 with Wilton scenario in the AM and PM peak hours**

| Intersection | Control | AM peak (07.00–08.00) | | PM peak (16.45–17.45) | |
|---|---|---|---|---|---|
| | | Ave. delay (sec/veh) | LoS | Ave. delay (sec/veh) | LoS |
| Hume Highway/Picton Road (Eastern intersection)[2] | signals | 18 | B | 17 | B |
| Hume Highway/Picton Road (Western intersection)[2] | signals | 8 | A | 10 | A |
| Picton Road/Wilton Park Road[2] | signals | 27 | B | 29 | B |
| Picton Road/Pembroke Parade[2] | signals | 25 | B | 28 | B |
| Picton Road/Almond Street[2] | signals | 10 | A | 11 | A |
| Internal link Road/Wilton Park Road extension | signals | 20 | B | 18 | B |
| Picton Road/Macarthur Road[1] | give-way | 14 | B | 10 | A |

(1) priority controlled intersections, LoS and average delay reported is for the worst performing approach
(2) signalised intersection, LoS and average delay reported is for the average of all movements based on traffic volume

Table 5.24 shows the forecast intersection performance for the 2036 'with Wilton' scenario.

**Table 5.24 Intersection performance for 2036 with Wilton scenario in the AM and PM peak hours**

| Intersection | Control | AM peak (07.00–08.00) | | PM peak (16.45–17.45) | |
|---|---|---|---|---|---|
| | | Ave. delay (sec/veh) | LoS | Ave. delay (sec/veh) | LoS |
| Hume Highway/Picton Road (Eastern intersection)[2] | signals | 19 | B | 17 | B |
| Hume Highway/Picton Road (Western intersection)[2] | signals | 8 | A | 9 | A |
| Picton Road/Wilton Park Road[2] | signals | 29 | C | 36 | C |
| Picton Road/Bradcorp Access Road[2] | signals | 25 | B | 26 | B |
| Picton Road ramp/Walker Corp new Bridge (Northern intersection)[2] | signals | 3 | A | 5 | A |
| Picton Road ramp/Walker Corp new Bridge (Southern intersection)[2] | signals | 16 | B | 14 | A |
| Picton Road/Pembroke Parade[2] | signals | 24 | B | 24 | B |
| Picton Road/Almond Street[1] | give-way | 14 | A | 12 | A |
| Internal link Road/Wilton Park Road extension | signals | 24 | B | 25 | B |
| Internal link Road/New south facing off-ramp | signals | 14 | A | 19 | B |
| Internal link Road/New north facing on-ramp | signals | 14 | A | 11 | A |
| Picton Road/Macarthur Road[1] | give-way | 25 | B | 13 | B |

(1) priority controlled intersections, LoS and average delay reported is for the worst performing approach
(2) signalised intersection, LoS and average delay reported is for the average of all movements based on traffic volume

The Aimsun and SIDRA modelling for 2036 shows that the proposed road network would adequately accommodate the traffic generated and attracted to the proposed development at Wilton Junction without any performance issues.

**Highway Capacity Manual (HCM) analysis**

HCM analysis has been undertaken to determine if the proposed arrangements for on and off ramp connections to the Hume Highway perform from an operational perspective. The HCM analysis considers a number of variables including traffic volumes, gradients, ramp lengths, ramp spacing and design speed. The HCM analysis shows the following operational LoS results:

- northbound:
  - the main carriageway is expected to operate at LoS D downstream of the two entry ramps
  - the proposed entry ramp (with Wilton Junction) is expected to operate at LoS D at the merge
  - the Picton Road entry ramp is expected to operate at LoS C
- southbound:
  - the main carriageway is expected to operate at LoS D upstream of the two exit ramps
  - the new exit ramp expected to operate at LoS D at the diverge
  - the Picton road entry ramp is expected to operate at LoS C at the diverge.

The HCM analysis can be found in Appendix E.

## 5.11 Infrastructure staging

Parsons Brinckerhoff has assessed the appropriate road infrastructure staging for Wilton Junction. To assist with this analysis, Aimsun models for design years (2013, 2024, 2031 and 2036), as well as SIDRA modelling was undertaken to determine when certain parts of the infrastructure would be required (with interpolating between different design years).

Table 5.25 and Figure 5.18 show how the infrastructure would be staged over time, including the approximate year which the infrastructure will be required, as well as the approximate number of dwellings assumed. The infrastructure staging may change depending on the rate and location of development within Wilton Junction.

The upgrade of the Hume Highway/Picton Road interchange could be undertaken in a staged process, with the installation of the traffic signals by 2015 and the addition of the flyover ramp between 2017 and 2019.

During the early stages of development, opportunities would be considered to improve interim pedestrian and cycling connections between the Town Centre and areas to the east of the Hume Highway, to both the north and south of Picton Road.

**Table 5.25 Proposed road infrastructure staging for Wilton Junction**

| Percentage of dwellings built | Approximate year | Road upgrades |
|---|---|---|
| 5% | 2015 | ■ Hume Highway/Picton Road Interchange – preliminary upgrade<br>■ Pembroke Parade/Picton Road intersection signals<br>■ Wilton Park Road/Picton Road intersection signals<br>■ Wilton Park Road to Governor's Hill land release<br>■ Almond Street/Picton Road intersection preliminary<br>■ Connection of Bradcorp land to Pembroke Parade<br>■ Connection of Walker Corp land to Pembroke Parade<br>■ Pembroke Parade pedestrian bridge |
| 20% | 2021 | ■ Picton Road widening east of Pembroke Parade<br>■ Connection of Bradcorp land to Wilton Park Road |
| 40% | 2024 | ■ Hume Highway/Picton Road Interchange – full upgrade<br>■ Internal link road<br>■ North-facing ramps<br>■ Grade separation over Picton Road between Hume Highway Interchange and Pembroke Parade) |
| 50% | 2028 | ■ Picton Road widening west to western edge of site<br>■ New access intersection on Picton Road, west of Wilton Park Road, and intersection signals<br>■ Extension of internal collector roads |
| 65% | 2031 | ■ Extension of internal collector roads |

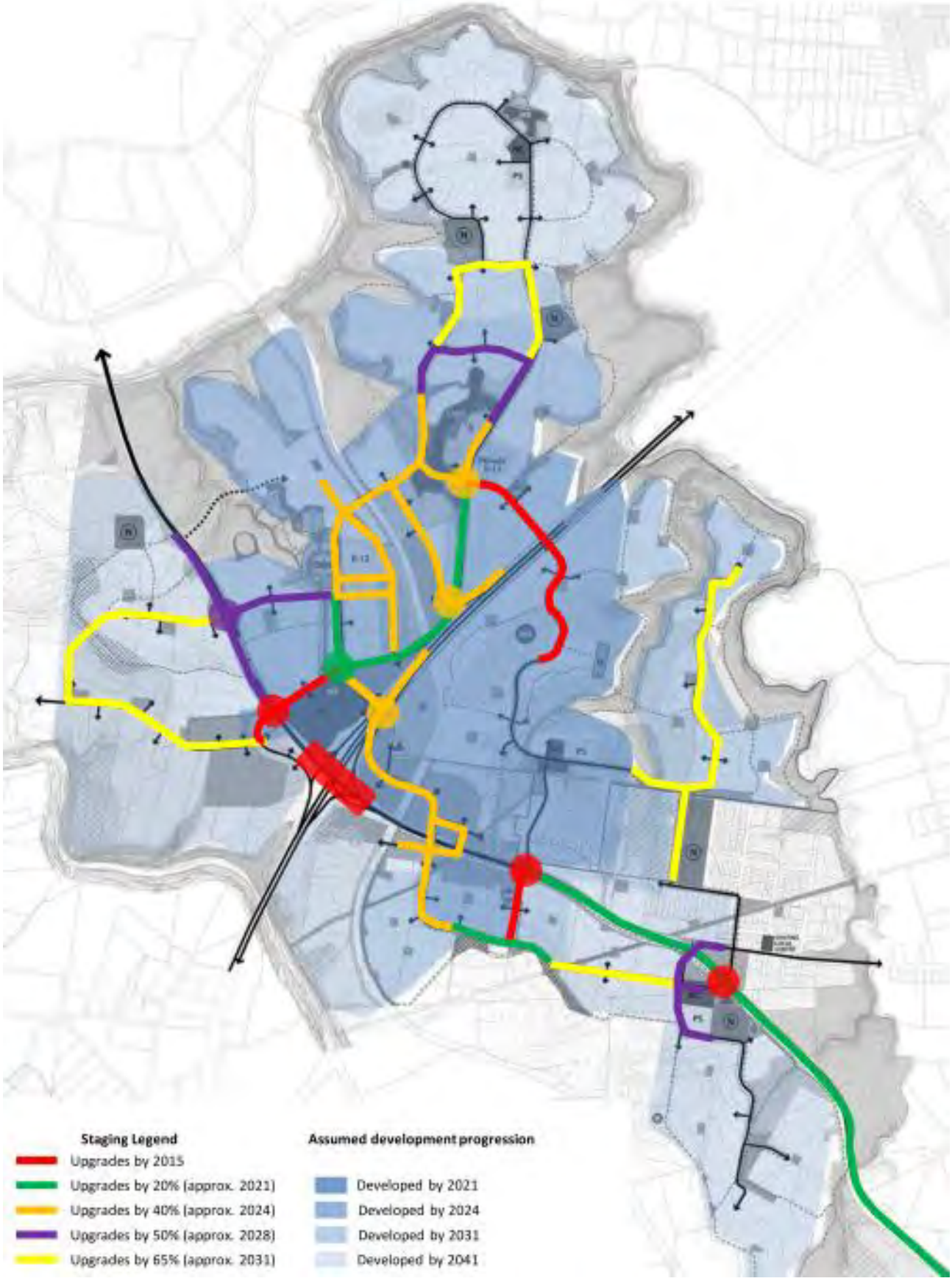



**Figure 5.18 Proposed road infrastructure staging for Wilton Junction**

# 6. Public transport, pedestrians, cyclists and parking

The Wilton area currently has a lack of public transport services that reinforces the reliance on car-based travel for the majority of trips. The magnitude of the Wilton Junction Development offers the opportunity to provide high-quality alternative transport services and infrastructure to substantially change the travel behaviour of residents and workers.

The public transport strategy seeks to strengthen connections to rail at stations with frequent services, to connect Wilton to the surrounding regional centres and to promote the self-sufficiency of Wilton Junction. Within the Development sites, footpaths and shared cycle paths and lanes, and on-street cycle lanes would be provided along with public bicycle parking facilities. The provision of parking in the Development will also support sustainable travel behaviour. The provision of Park-and-Ride facilities will encourage the use of public transport. The sensible positioning of off-street parking will discourage multi-trips and encourage walking within the town centre (described below).

## 6.1 Connections to rail services

Southern Highlands Line train services are available at Picton and Douglas Park, but with no plans to increase the frequency of services in Sydney's Rail Future, Campbelltown and Macarthur are likely to remain the most important stations for residents of Wilton Junction by rail. Opportunity exists to influence how people get to these stations through the provision of a Park-and-Ride area near the bus interchange and express bus services.

Due to the way the transport mode is recorded in the JTW and HTS data sets, people using the train are recorded as train regardless of how they get to the station. An analysis of the detailed mode tables within the 2011 JTW data indicates that, for train passengers from Camden, Campbelltown, Wollondilly LGAs, excluding people who walked to the station (unlikely from Wilton Junction), the access modes used were:

- Bus to Rail 20%
- Car driver to Rail 62%
- Car passenger to Rail 16%
- Other mode to Rail 2%.

While the percentage for bus to rail was lower for the existing Wilton township, this is due to the limited bus service available. As discussed in section 6.2, an express bus route is planned to offer an efficient connection to Campbelltown and Macarthur Stations, along with a network of connecting local routes.

A Park-and-Ride facility at Wilton Town Centre may encourage residents who do not live within easy walking distance of a bus route to drive to the town centre and use the express bus service to Campbelltown Station rather than driving all the way to Campbelltown. The success of a three-stage journey (car to bus to rail) needs to overcome the penalty of multiple interchanges. This can be achieved through the quality of the interchange facilities at Wilton Junction interchange, efficient timetabling for connecting services and integrated ticketing between bus and rail.

Based on the forecasts of trip numbers outlined in section 5, it is anticipated that up to approximately 410 people could seek to drive to a train station (Park-and-Ride) in 2036 (165 in 2024). The ability to attract people to Park-and-Ride at Wilton Junction could be influenced by the amount of bus priority and the availability of commuter parking at Campbelltown and Macarthur Stations.

## 6.2 Bus network

The Wilton Junction Landowners Group commissioned Cardno to produce a Public Transport Strategy for the Wilton Junction Development in October 2012. The study considered the current public transport service levels, the current travel behaviour of the area and the future requirements of the Wilton Junction Development. It determined that a target of achieving 10% public transport mode share for all trip types by 2036 should be set for the Development. Its vision for public transport for the Development was that:

> *The residents and visitors of Wilton Junction will enjoy an accessible, connected public transport network that will be seen as a viable alternative to private car use. Equitable and efficient access to services and facilities will be supported by attractive, practical and convenient public transport and integrated with the active transport network.*

It developed a list of guiding principles to be used in planning the future public transport service:

- development of a self-sufficient township
- provision of an integrated and responsive public transport network
- development of urban form and land uses that supports accessible and effective public transport provision
- transport/road network design that provides for accessible, safe and efficient public transport services
- ensuring high quality supporting infrastructure
- appropriate multi-modal integration of transport networks.

The results of the Wilton Junction Public Transport Strategy have been adapted and applied to the currently proposed Development. This has involved revising the service frequencies and external destinations based on the latest traffic modelling. Residential densities of approximately 15 dwellings per hectare and higher around the town centre are considered suitable to support bus services.

Ultimately the planning and implementation of bus services will be undertaken by TfNSW, based on the rate of development in the area to ensure that services are aligned with demand and available road infrastructure.

### 6.2.1 Types of services

For Wilton Junction, a combination of services is planned to cater for the different types of travel purposes:

- local services
- regional services
- rural services/community transport
- school specials.

### Local services

The most important principle for the bus network was seen to be supporting self-sufficiency. This should start with a local service that links residential areas to the nearest district centre and a strategic transport corridor. This local service would focus on the key attractors e.g. the town centre, village centres, community facilities, schools and employment lands.

The first service introduced (from Wilton to Picton) would have both local and regional functions, catering for travel to the regional services and train connections at Picton and facilitating travel between residential areas and the new Wilton Town Centre. Following this, three local bus services would be added as development proceeds. Each route would be introduced once the roads become available and the shops & businesses start to open. As development increases, the frequency and coverage of the service can increase to match demand. The local bus routes would operate to the southern (Walker), eastern (Bingara Gorge), and northern (Bradcorp) developments along the ridge lines.

### Regional services

Whilst Wilton Junction will be largely self-supporting, travel to other areas will be required for employment, education and services. The major destinations and their attractions include:

- Campbelltown
  - Employment
  - Regional services and shopping
  - Frequent Sydney Trains services
  - Health services
- Picton
  - Employment
  - Employees for Wilton Junction businesses
  - Regional services and shopping
- Macarthur
  - Employment
  - University/TAFE
  - Services and shopping
  - Frequent Sydney Trains services
- Wollongong
  - Employment
  - University/TAFE
  - Beaches/recreation.

Camden is also an important destination for employment and regional services. However with connecting bus services available from Picton and Campbelltown, a direct service from Wilton is not considered necessary at this stage.

Towns within Wingecarribee Shire may also be sources of employees for Wilton Junction businesses. However, their dispersed nature makes it difficult to sustain a viable bus services on their own. Once travel patterns are established, the bus network for Wilton Junction can be reviewed to tailor the services to the needs of residents, employees and students.

Initially, the public transport strategy proposes to connect Wilton to existing rail services at Picton until the number of passengers justifies additional/longer bus services to Macarthur and Campbelltown Train Stations, where regular train services are available. Three options are available for the bus routes to Campbelltown/ Macarthur via the Hume Highway, via Appin Road or via Menangle Road. The route via the Hume Highway is quickest but does not offer the possibility of picking up additional passengers along the way (this helps make the service more viable, and offers the benefits of the improved bus frequency to other areas outside Wilton Junction).

The travel times of these options are[6]:

- Hume Highway: 26 to 28 minutes
- Wilton Road and Appin Road: 30 minutes
- Menangle Road: 36 minutes.

The Wilton Road/Appin Road route requires buses to traverse Broughton Pass with its steep gradients and tight hairpin bends. This route is not considered suitable for bus services in its current form. The Menangle Road route is slower, but would allow the bus services to pick up passengers in Douglas Park, Menangle and Menangle Park.

Based on the strategy outlined in *NSW 2021, a 10 year plan* to increase the percentage of the population living within 30 minutes by public transport of a city or major centre in metropolitan Sydney, the Menangle Road route would not be quick enough, hence the Hume Highway route has been selected as the preferred route.

**Rural services/community transport**

The existing bus service (with two/three scheduled trips per day) falls within the definition of a rural service. In the future, rural services could be used to connect low patronage areas to the Wilton Junction Town Centre. Options for rural bus services include:

- local fixed route services
- timetabled services operating on a set route with base frequency of 120 minutes
- flexible transport services such as dial-and-ride and divert-on-demand.

In addition to regularly scheduled services, community transport can be used to meet the transport needs of transport disadvantaged people (such as isolated families, the frail aged, younger people with disabilities, and their carers) by connecting them to recreation, shopping, medical care, social services and social contact.

Services every two hours have been used as a starting basis, but the conversion of this service to a flexible service should be considered to meets the needs of rural communities and those requiring community transport.

**School specials**

Wilton and Bingara Gorge are currently linked to 15 schools by school specials. As the Development proceeds, with additional schools and school children traveling shorter distances, it is anticipated that the focus of school services will change to connecting the local residential areas to the local schools.

Depending on how wide an area the new schools draw students from, some school specials may need to travel to Douglas Park or further afield. Future development may influence school bus requirements to other centres including Bowral, Camden, and Campbelltown. These routes, and the modes of travel, would be at the discretion of TfNSW's School Student Transport Scheme.

Based on the anticipated number of education trips for a population of approximately 35,000, it is anticipated that 15–18 school bus trips could be required both before and after school. This does not include trips to university, which have been included in the regional service calculations to Campbelltown and Wollongong.

6 Google Maps approximate travel times for car, for comparison purposes

### 6.2.2 Bus passenger demand

Based on the trip calculations for Wilton Junction outlined in section 5, the number of bus passengers on local services and heading to/from regional centres has been estimated. The process followed is outlined below:

- total trip generation calculated by land use using the using rates provided section 5.7
- residential trips were divided by trip purpose using HTS data
- the mode share split was applied by trip purpose using a combination of HTS and JTW data, based on the mode shares of surrounding region. The output was numbers of train and bus trips by purpose
- trip direction was estimated based on:
  - train trips were assumed to travel via Macarthur or Campbelltown Stations to access the rest of the Sydney Trains network with frequent services
  - local worker trips by bus were assumed to arrive 50/50 from internal sources and Picton
  - resident work commute bus trips were assigned 50% to internal destinations, 25% to Campbelltown and 25% to Wollongong
  - education trips were assigned to internal routes for primary and secondary students (assumed 80% education bus journeys), and split 50/50 between Campbelltown and Wollongong for tertiary students (assumed 20% education bus journeys)
  - retail trips were assigned to local trips (during the weekday peaks)
- access modes for rail were determined based on an analysis from JTW excluding mode combinations that were unlikely from Wilton
- trips to each destination were summarised and used to estimate a trip frequency in each direction
- bus trip numbers were benchmarked against other cities in NSW with similar populations.

The resulting bus trip numbers are shown in Table 6.1. These numbers are approximate based on the above assumptions. Service patterns and frequencies should be reviewed periodically as the development proceeds and travel patterns become established.

**Table 6.1 Potential peak hour demand for bus services at different stages of development**

| Destination | 2021 | 2024 | 2031 | Full development |
|---|---|---|---|---|
| Local (total) | 50 | 90 | 140 | 220 |
| Picton (to Wilton, from Wilton) | 10, 5 | 20, 10 | 30, 10 | 50, 20 |
| Campbelltown and Macarthur (to Wilton, from Wilton) | 5, 30 | 10, 60 | 10, 100 | 20, 150 |
| Wollongong(to Wilton, from Wilton) | - | 5, 50 | 5, 70 | 10, 110 |
| School (total) | 150 | 280 | 450 | 700 |

Assuming a target occupancy of 40 passengers per bus, the passenger numbers in Table 6.1 have been converted to numbers of buses (refer Table 6.2). These calculations assume no turnover of seats along the route – i.e. each seat is only used once.

**Table 6.2 Potential peak hour bus loads at different stages of development**

| Destination | 2021 | 2024 | 2031 | Full development |
|---|---|---|---|---|
| Local (total) | 2 | 3 | 4 | 6 |
| Picton (to Wilton, from Wilton) | 1, 1 | 1, 1 | 1, 1 | 2, 1 |
| Campbelltown and Macarthur (to Wilton, from Wilton) | 0, 1 | 0, 2 | 0, 3 | 1, 4 |
| Wollongong(to Wilton, from Wilton) | - | 0, 1 | 0, 2 | 1, 3 |
| School (total) | 4 | 7 | 12 | 18 |

These bus load numbers have been used as the basis of the bus service frequency and staging plans. For the service assumptions later in this section, a small amount of turnover in seats is assumed.

### 6.2.3 Staged introduction of services

To match the development of Wilton Junction, it is proposed that the bus network would evolve with routes added over time as new areas get developed and new roads get opened, and frequencies increase to match demand. The 2021, 2024, 2031 and full development bus networks (assumed to correspond to the development demand at 2,500 dwellings, 4,000 dwellings, 7,800 dwellings and 11,900 dwellings respectively) are shown on Figures 6.1 to 6.4 respectively. The 2024 network indicated is after the opening of the grade separated interchange on Picton Road, east of the Hume Highway. Express buses to Campbelltown/Macarthur would use the new north-facing ramps, avoiding the interchange of Picton Road and the Hume Highway and saving travel time.

**2021 (2,500 dwellings) bus network**

- establish a core (full time) service linking Wilton (Town Centre, East and North) with Picton:
  - Picton provides the core connection point for Wilton with the rail network, building on the existing service, buses scheduled to connect with train
  - also provides local connections to the Wilton Town Centre from Wilton East
  - short working local trips (Wilton East to Wilton Town Centre) can be introduced as demand grows
  - establishes a core route through Wilton, which will remain as Wilton develops, but which can be extended to Wilton South as roads are constructed
  - preliminary alignment until roads north of town centre are constructed
  - layover adjacent to existing Wilton shops
- provide an additional peak service from Wilton East direct to Campbelltown via Wilton Town Centre and the Freeway:
  - provides a more direct connection to Campbelltown at times when demand is greatest
  - provides a single transfer option during peak hours for travel between Wilton and points on the rail network north of Campbelltown
  - follows the core route through Wilton, which will remain as Wilton develops, but which can be extended to Wilton South as roads are constructed
  - preliminary alignment until roads north of town centre are constructed
  - layover adjacent to existing Wilton shops
- school special services operated as required, in combination with Wilton to Picton service.

**2024 (4,000 dwellings) bus network**

- reinforce core service from Wilton (Town Centre, East and North) to Picton with additional frequency
- increase number of peak trips on service from Wilton East direct to Campbelltown via Wilton Town Centre and the Freeway
- adjust routes to incorporate new road north of the town centre
- introduce new local service, adjust service levels on school services as required:
  - Town Centre to Wilton East and Wilton South
  - layover at Town Centre
- introduce Wilton to Wollongong service via Picton Road:
  - layover at Town Centre.

**2031 (7,800 dwellings) bus network**

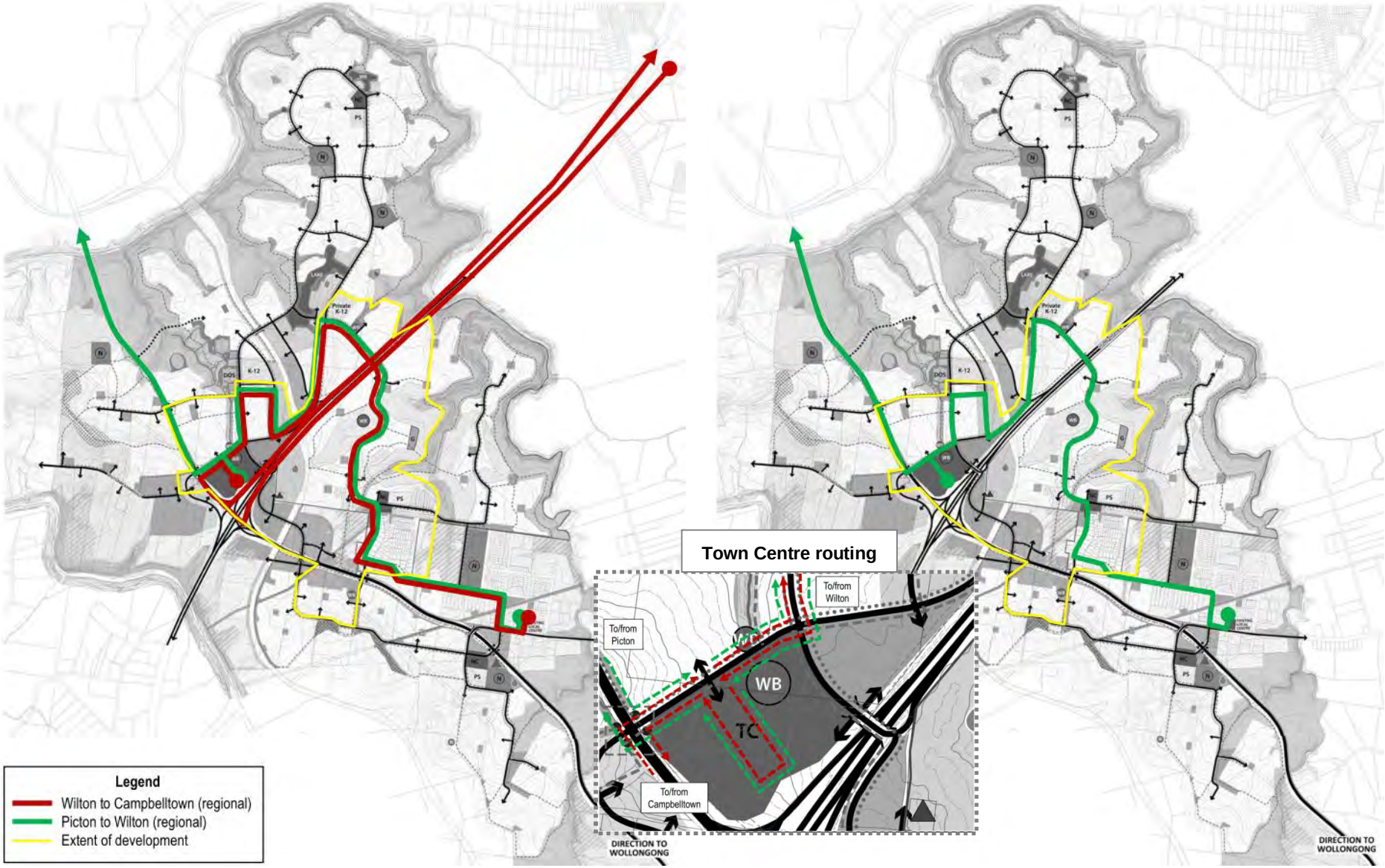
- increase frequency on all routes
- increase hours of operation
- introduce new local services, adjust service levels on school services as required:
  - Town Centre to Wilton East (final route)
  - Town Centre to Wilton South
  - Town Centre to Wilton North
  - out & in services with layover at Town Centre
  - services inter-work at the Town Centre.

**Full development (11,900 dwellings) bus network**

- increase frequency on all routes
- increase hours of operation
- extend the Picton to Wilton service to the Wilton South neighbourhood centre and the Campbelltown express to a southern turn around in Wilton South
- extend routes to serve the new growth areas:
  - Town Centre to Wilton South – extend as far south as possible within Wilton South (final route)
  - Town Centre to Wilton North – extend to northern loop (final route)
  - both services connect two residential areas to the town centre and employment lands.

The potential to combine the Wilton to Campbelltown and Wilton to Wollongong services exists to provide another Campbelltown to Wollongong service. However, due to the directional nature of trips from Wilton Junction, this is not required for the purposes of servicing the proposed development. Connecting the two services would require contra-peak direction services for part of its journey. Whilst numbers of trips to Wollongong are less than Campbelltown, some subsidy of the reverse journey would be required.

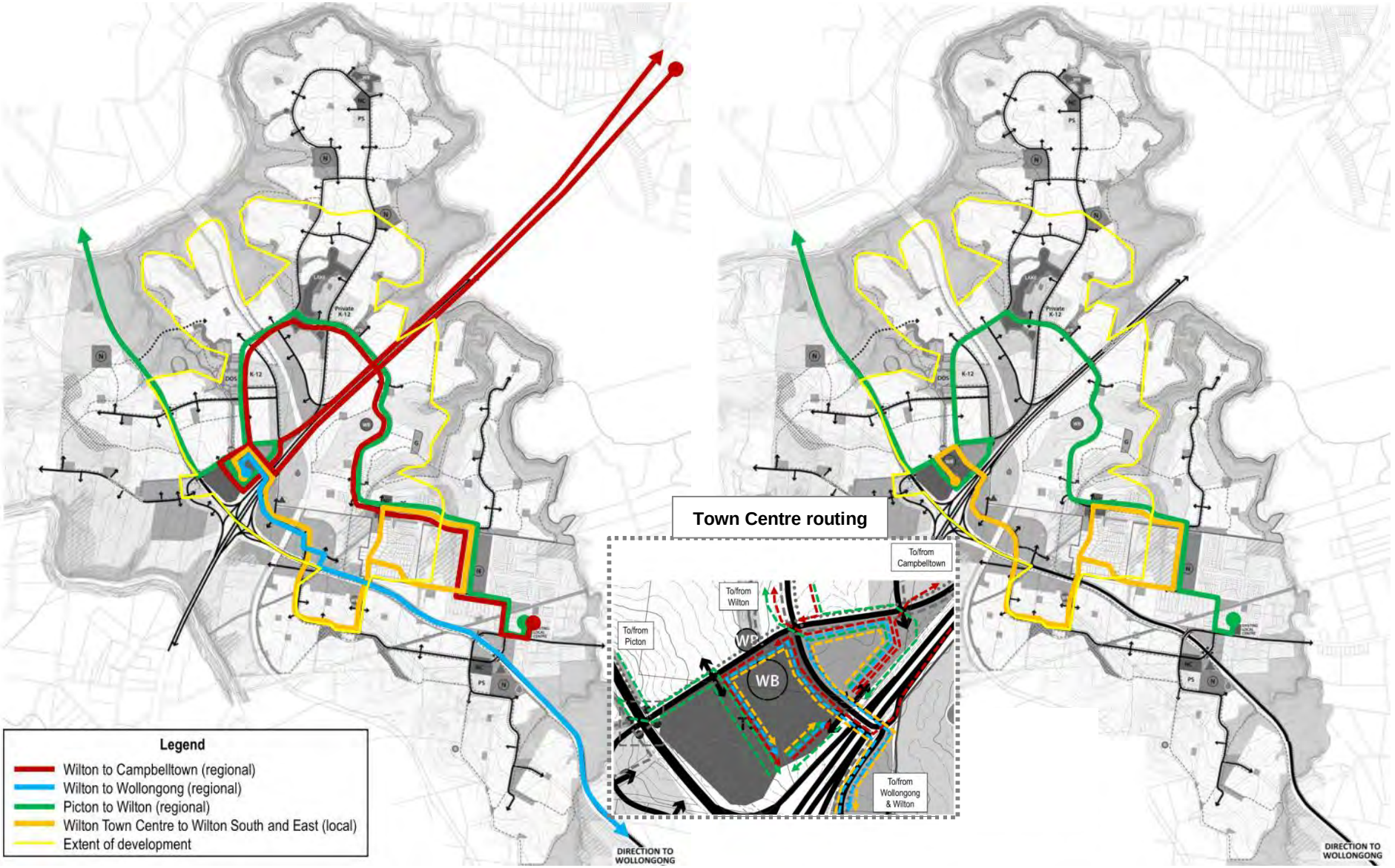
NSW metropolitan bus service contracts contain guidelines that a minimum of 90% of residences should be located within 400 metres of a bus service (usually identified at the bus stop). At this stage of planning for Wilton Junction, the location of bus stops is not known. To estimate the coverage of the proposed bus network, a 400 m buffer was applied around each bus route and the percentage of lane zoned for residential use was estimated.




Peak bus network

Day-time bus network

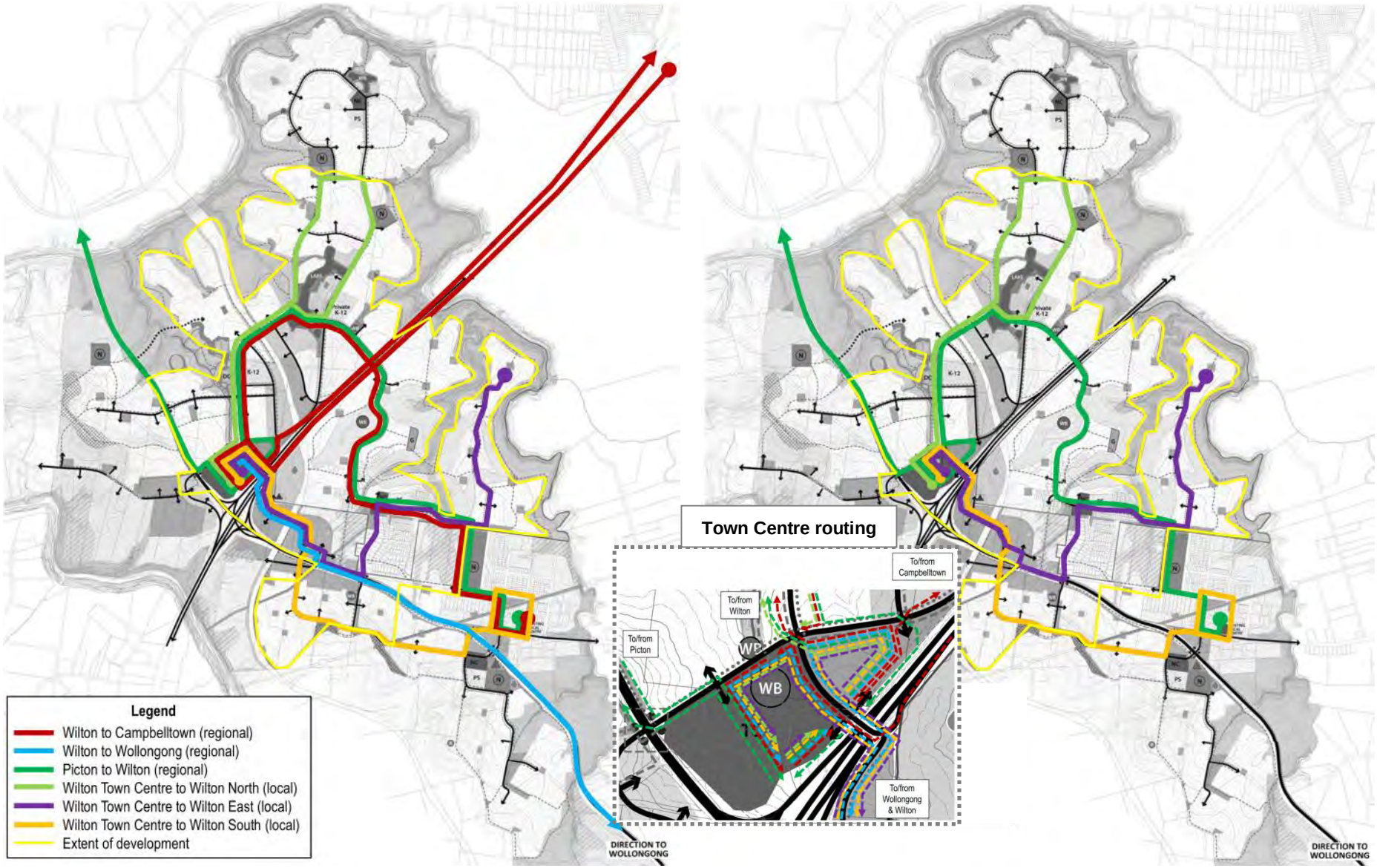
**Figure 6.1 Initial bus network – 2021/2,500 dwellings**




Peak bus network

Day-time bus network

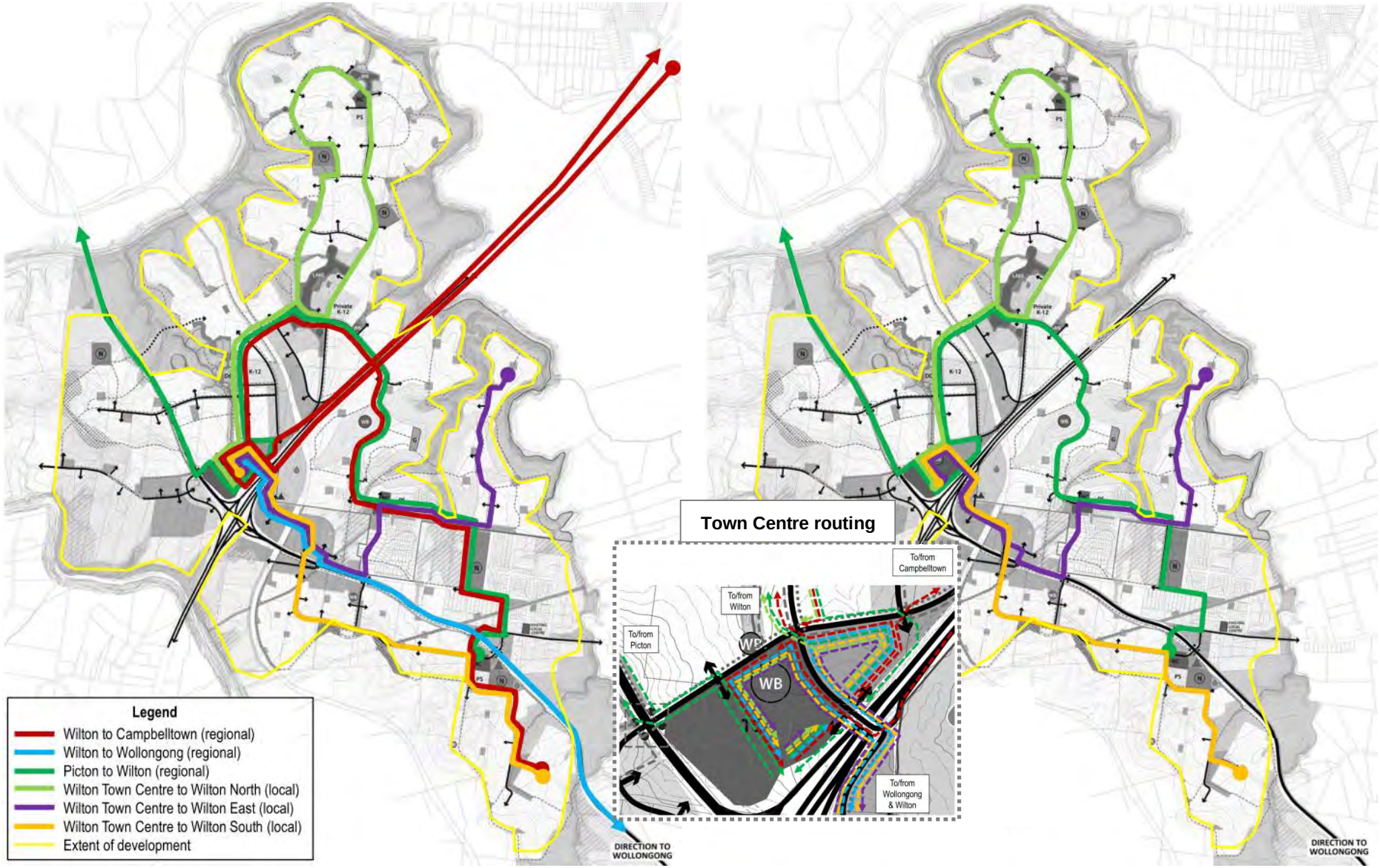
**Figure 6.2 Proposed bus network – 2024/4,000 dwellings**




Peak bus network

Day-time bus network

**Figure 6.3 Proposed bus network – 2031/7,800 dwellings**




Peak bus network

Day-time bus network

**Figure 6.4 Proposed bus network – Full development/11,900 dwellings**

The analysis has shown that 81% of the dwellings within the development will be within 400 m of a bus route. Increasing this percentage would be difficult:

1. The largest number of dwellings outside the 400 m buffer is along two ridge lines. Serving these ridges would require diverting the Wilton North bus and backtracking to get back to the original route, delaying the other passengers and adding to operating costs.
2. Another large number of dwellings in Wilton North lie just outside the 400 m walk distance.
3. The low density rural residential area on the south-western side of Picton Road around Wilton Park Road represents a large area that is served via Picton Road only. Adding a route through this area is possible, but due to the low density and road network the patronage potential is low.
4. The southern end of the Walker Corporation land (south of Picton Road near Almond Street) is presently outside the 400 m buffer where the turnaround for the Wilton South service.
5. Routes ending on dead-end streets are difficult to service in both an economically and operationally attractive manner, and have been avoided where possible.

Changes to the local road structure may be able to assist in increasing the percentage of dwellings within a 400 m walk of a bus service.

### 6.2.4 Bus journey times

Bus journey times have been estimated for the proposed routes (in their final arrangement). The times are indicated in Table 6.3. The times for local bus journeys would enable buses to make two journeys during the peak hour, assisting with the proposed service frequencies and simplifying scheduling. The assumptions made in these calculations are listed below.

- 25 km/h in Wilton Junction and Picton when picking up and setting down passengers (assumes low levels of traffic congestion)
- 20 km/h in Campbelltown/Macarthur and Wollongong
- 80 km/h on the Hume Highway and ramps
- 70 km/h on Picton Road
- 40 km/h on the Illawarra Escarpment.

**Table 6.3 Estimated bus journey times**

| Route | Length (km) | Journey time (mins) |
|---|---|---|
| **Local services** | | |
| Town Centre to Wilton East and back | 12.5 | 30 |
| Town Centre to Wilton South and back | 12.0 | 29 |
| Town Centre to Wilton North and back | 9.2 | 22 |
| **Regional services** | | |
| Wilton to Picton (one-way) | 16.9 | 29 |
| Wilton to Campbelltown and Macarthur (one way) | 35.5 | 48 |
| Wilton to Wollongong (one way) | 41.3 | 54 |

### 6.2.5 Bus service frequency

The trip number calculations presented in section 5 have been used to develop estimates of required bus frequencies on the range of bus routes proposed for Wilton Junction. An average of 40 passengers per bus has been assumed to convert passenger loads into numbers of bus trips. The proposed bus service frequencies, shown in Table 6.4, have been rounded up to the nearest standard bus frequency.

**Table 6.4 Proposed peak hour bus frequencies at different stages of development**

| Route | Starting year[1] | Peak frequency | | | | |
|---|---|---|---|---|---|---|
| | | 2021 | 2024 | 2031 | Full dev. | Details |
| **Local services** | | | | | | |
| Town Centre to Wilton South | 2024[2] | none | 2 | 2 | 2 | per hour each way |
| Town Centre to Wilton East | 2032[3] | none | none | 2 | 2 | per hour each way |
| Town Centre to Wilton North | 2032[3] | none | none | 2 | 2 | per hour each way |
| **Regional services** | | | | | | |
| Picton | 2015 | 2 | 2 | 2 | 3 | per hour each way |
| Campbelltown and Macarthur | 2018 | 1 | 2 | 3 | 4 | per hour in peak direction |
| Wollongong | 2024 | none | 1 | 2 | 3 | per hour in peak direction |
| **Rural** | | | | | | |
| As required based on demand | 2027[4] | none | none | 1 | 2 | per hour |
| **School specials** | | | | | | |
| As required | with opening of schools | Frequencies as required, in balance with local route frequencies | | | | before school and after school |

(1) Starting year is based on the currently assumed released of lots. There are no currently approved plans for the proposed bus network starting years. Modifications to currently assumed timing will result in changes to starting year assumptions.

(2) Commenced when road connecting Wilton South across Picton Road and the Hume Highway to the Town Centre is opened. Progressively expended as new sections become available, then split into two

(3) Based on release timetable of and construction of northern neighbourhood centre.

(4) Anticipated when town centre reaches 50% development

For comparison, other towns in New South Wales with similar populations now to the 2041 forecast for Wilton Junction (full development) are Bowral/Mittagong, Dubbo, Nowra/Bomaderry and Bathurst[7]. A count of the peak hour bus services servicing these towns range from 9 to 12 (based on website timetabled services, viewed 27 August 2013). The 25 services proposed for full development is higher than this range. However, given the low public transport usage in these other regional areas (1% or less[8]), for Wilton Junction to achieve the target of 10% public transport usage contained in the Wilton Junction Development Public Transport Strategy (Cardno, October 2012), higher bus frequencies are required. Wilton Junction bus services have the additional potential to attract demand for bus to rail trips to access the rail services between Campbelltown and Sydney. These frequencies should be reviewed periodically as travel patterns become established. The number of school special buses could be reduced in favour of higher frequencies on the local bus services.

7 ABS publication: 3218.0 Regional Population Growth, Australia Table 1. Estimated Resident Population, Significant Urban Areas (30 April 2013)

8 BTS Journey to Work data, online JTW Explorer (viewed 4 September 2013)

Based on these service numbers, frequencies and lengths, it is estimated that a bus fleet of 14 buses would be required by 2021, 18 buses by 2024, 25 buses by 2031 and 33 buses by full development. These calculations assume approximately 10% spare buses and two school trips per hour per school bus.

### 6.2.6 Regional interchange

The location of the regional interchange is proposed in the town centre to enable it to serve the highest trip-generating land uses. Various locations have been considered for the interchange based on the following characteristics:

- proximity to town centre, employment lands, and other trip generators
- proposed development staging (including consideration of staged development of town centre)
- proximity to potential land (or other car parking facilities) available for Park-and-Ride
- traffic volumes, considering passive surveillance and passenger amenity (including conflicts between bus and passenger movements).

A location within the town centre is proposed as the preferred location as:

- it would integrate public transport with the town centre in a highly visible way
- it would be integrated with the first stage of development, as a potential Park-and-Ride site
- it is centrally located between – and has good access to and from – employment lands located to the northeast, south, and southwest.

The proposed bus interchange would be designed to adequately support the arrival of multiple buses simultaneously to allow the potential for interchange between services. It is possible that Kiss-and-Ride could occur on the road immediately north of the Town Centre, avoiding the need for additional vehicles to enter the high pedestrian area.

### 6.2.7 Facilities

The Wilton Junction Development Public Transport Strategy (Cardno, October 2012) contained recommendations for guiding principles for infrastructure to support bus services. To promote the use of public transport, the facilities are to be of high quality, convenient to use and of a consistent standard. The following principles apply within the development along each of the bus routes:

- bus stops will be optimally located along bus routes to meet demand, ideally spaced every 400 metres[9]
- locate bus stops within 400 m to 500 m of 80–90% of the population
- stops should be located adjacent to side streets where possible and should be connected in to the local footpath network
- bus stops shall be provided with seating, shelter, lighting and public transport service information
- safe and accessible crossing points should be located adjacent to bus stop facilities
- bus stops in town, neighbourhoods and rural centres will be placed within walking distance of key destinations
- co-locate inbound and outbound stops where appropriate
- locate town centre bus stops near areas following Crime Prevention Through Environmental Design (CPTED) principles

[9] It should be noted that for local residential routes, bus stops may be placed at closer intervals to appropriately service local facilities and residents, while for regional routes, bus stops may be spaced further apart in order to achieve service efficiencies.

Additional considerations for the provision of supporting infrastructure for schools are also recommended:

- bus stops placed directly outside schools (in some cases, within school grounds may be appropriate)
- shelters to cater for larger number of passengers
- pedestrian and cycle networks within local area of all schools will be priorities for implementation.

A higher level of infrastructure is required at interchanges, where higher numbers of passengers will use the stop, and where buses will be using the infrastructure for a longer duration. Two categories of interchanges are planned – regional (in the town centre) and local. The infrastructure to be provided is shown in Table 6.5.

**Table 6.5 Interchange facilities**

| Infrastructure | Regional interchange | Local interchange |
|---|---|---|
| Bus stops | Two in each direction (one local/rural/school, one regional) | One in each direction |
| Bus shelters | High quality, high capacity | High quality |
| Bus layover | Yes, in adjacent street | Yes, behind stop |
| Bike racks | Yes | Yes |
| Kiss-and-Ride | Yes | Yes |
| Park-and-Ride | Formal Park-and-Ride | Informal |
| Bus driver facilities | Toilets, meal room | Toilets (existing Wilton township only) |

At both types of interchanges, facilities are required to enable people to transfer between modes, as well as to facilitate bus operations. For example, increased numbers of bike racks at neighbourhood shops could be provided if demand for bike to bus is demonstrated in the area. Bus layover and driver facilities would be provided as close as possible to interchanges, dependant on adjacent land uses.

Based on the service frequency and opportunities to link journeys at Wilton Junction, the number of layover spaces required at Wilton Town Centre is estimated at three at full development. This number will need to be re-assessed once the number of services is confirmed and timetable scheduling of bus services is undertaken.

For the initial stages, it is assumed that the proposed bus services for Wilton Junction could be provided from the Picton Buslines Depot in Picton, and additional depot space would not be required. In the long term, additional depot space may be required to accommodate the buses required to service the proposed bus plan.

The location of any future depot would not necessarily be located within the Wilton Junction Development, as it would be influenced by several factors, including the space required, accessibility to the road network, amount of out-of service running and efficiency gained from amalgamating maintenance and administration functions of one large depot versus several smaller depots. It may be possible to operate a depot from Wilton as a satellite depot, with major servicing and administration provided at the main depot at Picton.

Based on the estimated figure of 33 buses to operate the proposed bus network at full development and a rule-of-thumb value of 120 $m^2$ land required per bus[10], it is estimated that a depot size of approximately 4,000 $m^2$ would be required. A suitable location, if required, would be identified at a later date, in consultation with the local bus operator and TfNSW, and funded in accordance to current development contribution policies.

Figure 6.5 shows the proposed location and nature of public transport infrastructure within Wilton Junction.

[10] Information from Transport for NSW

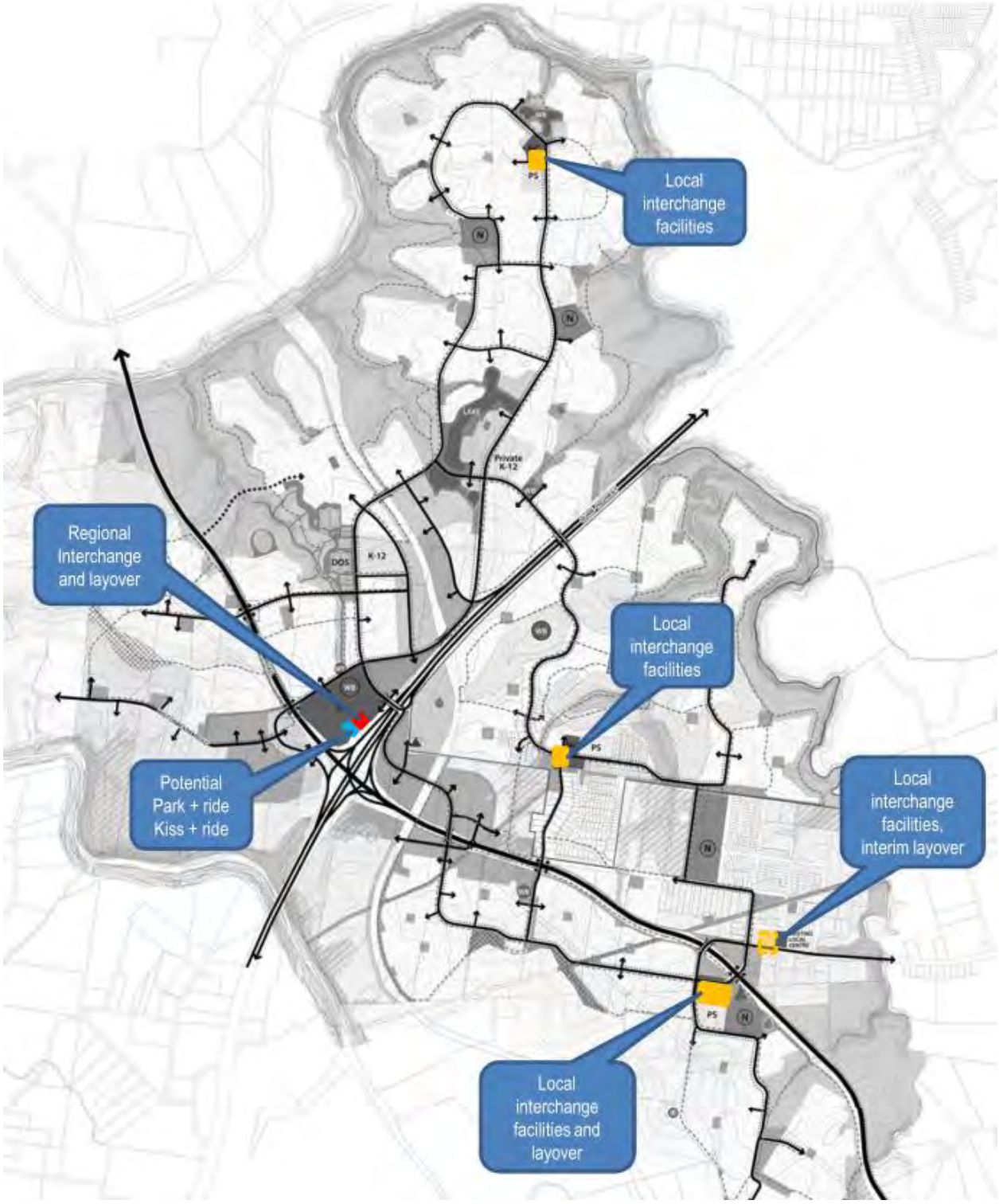



**Figure 6.5 Proposed bus interchange infrastructure**

### 6.2.8 Park-and-Ride and Kiss-and-Ride

As the point where all five bus routes intersect, and where the frequency of services to Campbelltown combine, the regional interchange is likely to be the location that has the most potential for Park-and-Ride (and Kiss-and-Ride). The exact number of spaces required is difficult to quantify, as the relative attractiveness of using the express regional buses to Campbelltown versus driving to Campbelltown is untested and is influenced by many factors.

Based on 2011 JTW statistics for bus trips, the majority of passengers walk to the bus stop (approximately 75%–80%). The percentage of passengers getting a lift to the bus stop (approximately 15%–20%) is larger than the percentage of people driving to the bus stop and parking before boarding the bus (approximately 5%), indicating that Kiss-and-Ride facilities will also be important, especially near the regional interchange.

Combining the anticipated drive to bus numbers with an estimate of the Park-and-Ride at Campbelltown and Macarthur Stations that could be diverted to Wilton Junction, an indicative size of the Park-and-Ride facility is 50 spaces by 2024 and 100 spaces by 2036. The number of spaces required should be monitored once the bus service to Campbelltown is established and travel patterns become settled.

### 6.2.9 Bus region contracts

Currently, the Picton and Wilton region is covered by a rural bus contract, whereas the Campbelltown area is covered by a metropolitan region contract. This has implications for both bus passengers and bus operators in terms of fares, minimum service frequencies and funding of services. The contractual and funding arrangements will need to be confirmed should development proceed in the area.

A short summary of the difference between rural and metropolitan region contract areas is provided below:

- rural and regional contract areas:
  - two Contract Models: A (Individual, non- commercial school routes), and B (commercial contracts including route buses)
  - service guidelines for Regional towns are based on population bands of Country Town Size (7,500 to 30,000) and indicate a target number of return journeys per day, varying with distance of the terminus from the town Centre
  - there are also guidelines for village to town services (up to four weekday return trips)
  - there are no town to town service guidelines. This is left to the discretion of the operator
  - rural and regional fare scale
- Metropolitan and Outer Metropolitan:
  - service guidelines are closer to those in Metro area, which include:
    - a contract services plan and passenger relation plan
    - TfNSW works with operators to determine levels of frequency and coverage
    - service guidelines set specific principles for network coverage and legibility
    - use Metropolitan fare scale (e.g. Travel 20 and My Multi tickets).

### 6.2.10 Bus priority

At this stage, bus priority is not anticipated to be required, as bus numbers are unlikely to reach the levels that would justify special provisions (one bus every two minutes). While traffic conditions around the town centre are likely to be busy during peak times, blockages within Wilton Junction streets that would necessitate bus priority are not anticipated. Specific measures to restrict general traffic that benefit bus operations (e.g. 'No right turn, buses excepted') could be considered to protect amenity within the town centre. The north-facing ramps to the Hume Highway will provide access to the Hume Highway for express buses between Wilton and Campbelltown without the need to pass through the Hume Highway/Picton Road interchange, avoiding conflicts with freight vehicles.

## 6.3 Cycling

Wollondilly Council has planned a network of shared cycle and pedestrian paths. Currently, Picton Road, Almond Street, Camden Road, Argyle Street and Hornby Street in Wilton have been identified to form part of the cycle network. The plan of the shared pedestrian and cycle routes is shown in green dashed lines in Figure 3.2. Bike routes would be designed in accordance with the RTA's NSW Bicycle Guidelines (July 2005) and Austroads' Cycling on Higher Speed Roads (2012).

The cycle routes are proposed with a mixture of shared paths, mixed traffic and on-street cycle lanes. This has been done to avoid mixing cyclists with traffic on the streets with the highest traffic volumes, where possible.

Bicycle racks would be provided in the Town Centre, at neighbourhood centres, community centres and recreation facilities. Commercial buildings would be required to provide cyclist end of trip facilities, including bike locking and showers, as per the requirements of the *Planning guidelines for walking and cycling* (NSW Planning, December 2004).

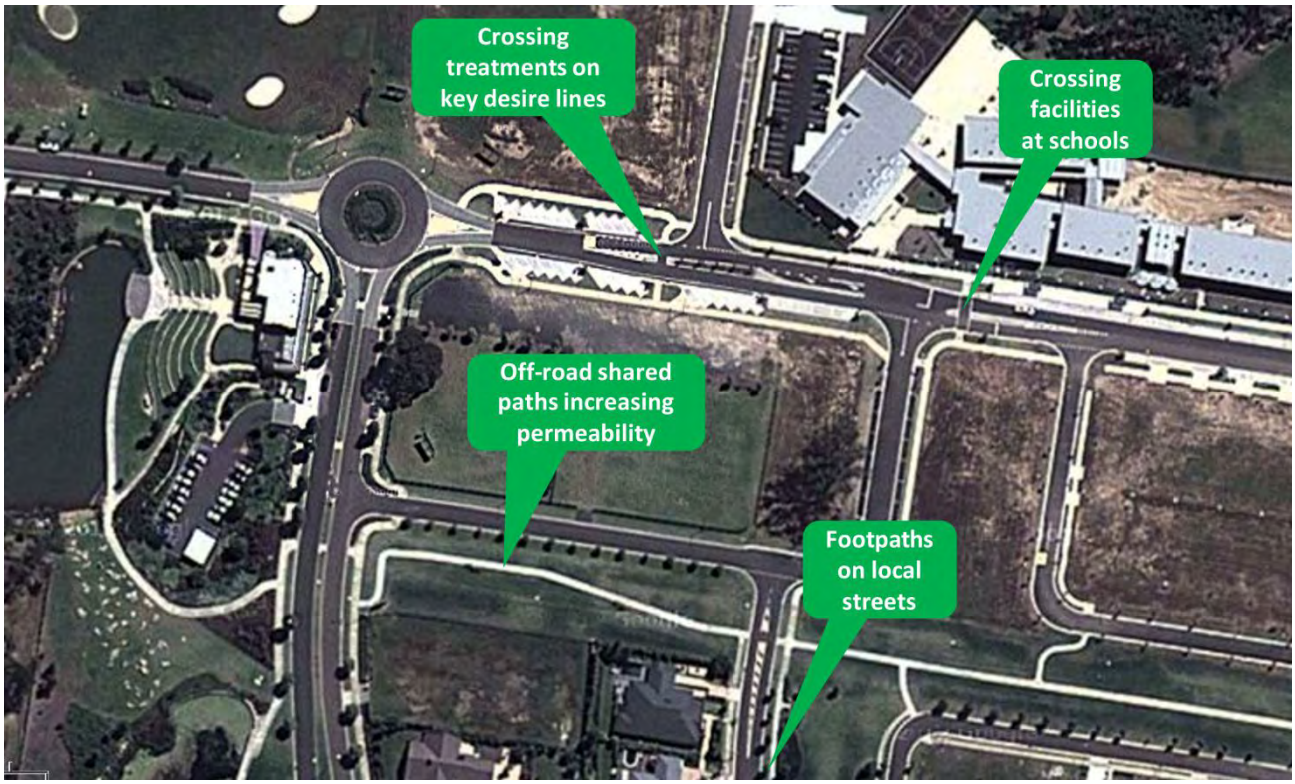
## 6.4 Pedestrians

**Town centre**

Appropriate urban design and traffic management measures are planned along the streets within the Town Centre to reinforce the high pedestrian activity area and improve pedestrian safety. Treatments proposed include entry thresholds (using textured pavement/pavers), road width changes, raised thresholds, street lighting and lower speed limits.

**Local facilities**

The pedestrian and cycle networks are designed to have a greater level of permeability than provided to vehicles to further promote their greater use. Off-street shared paths are planned to complement Wollondilly Council's cycle/pedestrian paths scheme and increase permeability for pedestrians and cyclists. All streets (except laneways) would have 1.2 m minimum footpaths, on one or both sides of the street. Footpaths and shared paths would be designed with regard to the *Planning guidelines for walking and cycling* (NSW Planning, December 2004). Figure 6.6 shows local pedestrian facilities that have already been installed in Bingara Gorge. A similar level of infrastructure is planned for the remaining areas of development with Wilton Junction.




Base image source: DigitalGlobe, 2013

**Figure 6.6 Local pedestrian facilities**

### Crossing opportunities

The pedestrian network would concentrate on connecting high trip generating land uses, such as retail centres, community and recreation facilities and schools. Paths would be safe and well lit, with pedestrian crossing treatments on strong pedestrian desire lines at road crossings.

A key consideration is the crossing opportunities across the major barriers within the development, including the Hume Highway, Picton Road and the Maldon to Dombarton Rail Link. Figure 6.7 shows the location of crossing opportunities of major elements of the pedestrian and cycle network. Additional local crossing opportunities would be identified during detailed design of the development areas.


**Figure 6.7 Pedestrian and cycle crossing opportunities**

The active transport network has been developed to corral pedestrians and cyclists to safe crossing locations, with grade separated crossings of both Picton Road and the Hume Highway. A signal controlled pedestrian crossing of Picton Road at Pembroke Parade is proposed due to the distance to the bridge crossings in this area.

The provision of safe crossing locations, and the active transport network which would guide pedestrians and cyclists to and from these locations, is proposed to prevent uncontrolled, unsafe crossings of the State Road Network. Additional measures to further reduce this risk would be developed at the detailed design/development application stage.

A shared pathway will be provided along Picton Road in accordance with the Wollondilly DCP 2011 Volume 5 – Industrial & Infrastructure Uses and Wollondilly Bike Plan both east and west of the Hume Highway. The speed environment and unsignalised entry ramps make pedestrian crossing movements at the Hume Highway and Picton Road Interchange unsafe. Pedestrians and cyclists will be directed towards the new grade separated crossing of the Hume Highway north of Picton Road, which would include a shared pathway.

All bridge crossings of the Hume Highway and Picton Road would include pedestrian and cycle facilities to minimise the separation impact.

During the early stages of development, opportunities would be considered to improve interim pedestrian and cycling connections between the Town Centre and areas to the east of the Hume Highway, to both the north and south of Picton Road.

## 6.5 Parking

In addition to Park-and-Ride provision, (described above), car parking will be provided to meet Council's requirements, to facilitate local movement and provide for a competitive business environment, whilst not detracting from the transport initiatives to reduce the amount of trips made by car. Car parking solutions that do not dominate the street frontage are proposed such as:

- centralised parking enabling the sharing of parking facilities
- early provision followed by increasing density with reduced additional parking
- allocation of on-street parking in the town centre to priority uses and timed parking to stimulate parking turnover.

These are discussed in further detail below.

**Centralised parking**

Centralising the parking and provision on a precinct basis rather than a property by property basis has several advantages:

- it keeps parking supply in critical locations under tighter policy control
- it reduces the demand by allowing for multi-use trips from a single parking space (given an appropriate mix of uses)
- it encourages park once and walk behaviour which stimulates economic and social activity/vitality within the centre
- it allows for transition from the current high to more sustainable long term rates, which will also encourage alternative transport (public transport, walk and cycle)
- it banks land that can be used for more economical productive purposes at a later date.

Different land uses make their highest demand for car parking at different times of the day: commercial during the morning, retail in the afternoon, and residential at night. These different peak periods allow some of the parking to be used for different purposes at different times of the day. This reduces the amount of land required to fulfil parking needs and restricts supply to make other modes of transport more competitive.

Centralised parking can be above ground but visual amenity of street frontages should be protected. Location of any centralised parking should not occupy vital core space but fringe the town centre encouraging 'park once and walk' behaviour.

As a means of staging longer-term development, centralised car parking can also be used as 'temporary' central car parking. In this case such 'temporary' car parking should be located at or near the site of proposed future public transport; over time as development intensity may occur around the town centre these car parking areas can be redeveloped with a greater mix of uses (as well as providing the necessary 'existing' car parking function). Temporary car parking facilities in these locations can be interim uses on sites to be developed later for residential development.

**Early provision followed by increasing density without additional parking**

The town centre will not have the critical mix of land uses in its initial stages to provide shared trips. To promote the overall success of the Project, and establish its vitality, in the initial phases of the development parking should be provided at slightly higher rates through the early provision of centralised parking.

However, these early concessions to allow parking should not be allowed to impact on the long term sustainability of the town centre. This allows short term concessions on the amount of parking allowed without discriminating against applicants who develop either earlier or later. They all have the same maximum on-site provision, but the rate of centralised parking to be provided would slightly diminish over time so that the overall parking provision finishes with the long-term sustainable rate. This will achieve the 'park once and walk' behaviour desirable in a village centre and successful Transit Oriented Development (TOD) and it will encourage public transport trips for commuters.

**On-site parking**

Some level of on-site parking will be required for residential dwellings, some staff parking, and short term visitors such as tradesman. Residential parking should be located within the building. Staff parking for retail and commercial development can be provided within the building, or as dedicated spaces within a centralised facility.

To improve the urban amenity, on-site parking should be located away from street frontages. At grade car parks should preferably be provided at the rear of sites where they are not visible from active streets, and car park entries across active footpaths should be rationalised.

**On-street parking**

Kerb-side parking manages speed by providing traffic friction. It generally stimulates street activity, can contribute to casual surveillance, and provides a buffer between the verge/footpath and moving traffic. However, on-street parking provision has to be sensitive to bus routes, not encouraging 'cruising and waiting' and targeted to support local businesses.

Provision for Park-and-Ride should be made within walking distance of the bus interchange to manage commuter parking. Time limits of 2 hours on-street and 4 hours off-street would be appropriate for the public town centre parking areas, as it would restrict commuter use and allow enough time for shopping/other business. Time limited parking is not proposed for residential streets.

### Parking rates

The primary guidelines for parking rates within the Wilton Junction Development are:

- Wollondilly Development Control Plan (DCP) 2011
- Roads and Maritime Services *Guide to Traffic Generating Developments Version 2.2* (October 2002).

Wollondilly DCP provides special rates for the Bingara Gorge Development, in addition to its standard rates for residential dwellings. A mixture of dwellings types are planned within the Wilton Junction Development, including separate houses, semi-detached/townhouses, apartments and shop-top housing. For the separate houses the Bingara Gorge parking rates are considered to be appropriate. For other housing types, the standard rates in the DCP are recommended. The proposed residential rates are listed in Table 6.6.

**Table 6.6 Wollondilly DCP 2011 car parking rates for residences**

| Housing type | Parking rate |
|---|---|
| Bingara Gorge dwellings (single dwelling houses) | ▪ greater than 450 $m^2$ lot size: At least two vehicle spaces<br>▪ less than or equal to 450 $m^2$ lot size: At least one vehicle space |
| Dual occupancy and semi-detached dwellings | ▪ one parking space must be provided per dwelling up to 125$m^2$ in gross floor area<br>▪ two parking spaces must be provided per dwelling 125$m^2$ or greater in gross floor area |
| Multi dwelling housing, Attached dwellings and Residential flat buildings | ▪ one covered space per one bedroom dwelling or unit<br>▪ 1.5 covered spaces per two bedroom dwellings<br>▪ two covered spaces per dwellings three bedrooms and above<br>▪ one visitor space must be provided in addition to the above requirements per five dwellings<br>▪ one bicycle park must be provided per five units plus one visitor bicycle park per ten units<br>▪ every dwelling must be provided with a secure covered storage space suitable for bicycles, in addition to any required car parking spaces<br>▪ all developments must provide one disabled car space, as well as one additional disabled space per total 50 spaces on site |
| Shop top housing | ▪ one space per unit<br>▪ one visitor space per five dwellings<br>▪ one disabled space for up to 10 parking spaces required, 2 spaces for 10–20 parking spaces required and 5% of the total provision, where 21 parking spaces or more are required as part of the development |

Source: Wollondilly Development Control Plan 2011

For other land uses, the DCP requires that the parking rates from the RMS' Guide to Traffic Generating Developments are used for some land uses. The applicable rates are listed in Table 6.7. For the retail centres, centralised parking for the precinct is proposed.

**Table 6.7 Wollondilly DCP 2011 car parking rates for other land uses**

| Land use | Parking rate |
|---|---|
| Commercial/office | ▪ one space per 40 $m^2$ GFA |
| Retail | ▪ Town Centre: 4.3 spaces per 100 $m^2$ GFA<br>▪ Neighbourhood Centre: 6.1 spaces per 100 $m^2$ GFA |
| Bulky goods retail | ▪ As per RMS' Guide to Traffic Generating Developments |
| Light Industrial | ▪ one space per 70 $m^2$ GFA of net floor area with a minimum of three spaces per industrial unit<br>▪ one space per 40 $m^2$ of net floor area for ancillary office space<br>▪ minimum 1 space per 100 spaces for disabled persons |

Source: Wollondilly Development Control Plan 2011, RMS Guide to Traffic Generating Developments Version 2.2 (October 2002)

Based on the projected floor areas, the rates in Table 6.6, and applying a 10% discount to the town centre and 5% discount to the neighbourhood centres for complimentary use, the anticipated numbers of off-street public and designated staff parking spaces are:

- Town centre: 2,360 spaces
- Wilton North neighbourhood centre: 340 spaces
- Wilton South neighbourhood centre: 460 spaces.

For the town centre, it is recommended that parking be provided at the neighbourhood centre rate until the amount of retail floor space reaches 10,000 $m^2$ GFA (approximately 610 spaces) and then at the town centre rate thereafter (assessed at a precinct level).

## 6.6 Travel plan

The Project is a mixed land use TOD style development. Achieving success as a liveable community will be greatly enhanced by promoting diversity in transport that caters for the needs of the residents, employees, businesses and visitors whilst promoting positive behaviour.

Personalised marketing strategies have the potential to assist in modifying travel behaviour through communicating relevant travel choice information to the community. Marketing would begin through the provision of travel information kits (including a Travel Access Guide (TAG)) which would be provided to all new residents in the Project. The DCP will require that each development would be required to produce a Workplace Travel Plan (WTP) and provide the relevant information to employees. The successful travel plans implemented for the relocation of Optus to Macquarie Park would be used as a template for business WTPs. Producing these plans would be the responsibility of the developer and businesses.

These TAG and WTP strategies are similar to the TravelSmart schemes. Experience from the introduction of TravelSmart schemes in other locations was reported in 'Evaluation of Australian TravelSmart Projects in the ACT, South Australia, Queensland, Victoria and Western Australia: 2001–2005' (Australian Greenhouse Office located in the Department of the Environment and Heritage, 2005). The average mode split change recorded for households is shown in Table 6.8.

**Table 6.8 Average Household TravelSmart mode split change**

| Mode | Before | After | Change |
|---|---|---|---|
| Car (driver) | 58% | 53% | -5% |
| Car (passenger) | 24% | 24% | 0% |
| Motorcycle | 0% | 0% | 0% |
| Cycling | 2% | 3% | 1% |
| Bus and Train | 5% | 6% | 1% |
| Walking | 11% | 13% | 2% |

The following is taken from the TravelSmart Australia web site:

> *The TravelSmart program includes the development of a Travel Plan. A travel plan is a short, simple document that outlines a range of site-specific actions to encourage the use of more sustainable transport options. It focuses on the way people travel and develops a strategic approach to changing travel behaviour. It is not a one-off event to be undertaken and completed, nor is it a document to be produced and put on the shelf.*
>
> *A travel plan includes going through a process of gathering information about how people travel, identifying the issues, barriers and opportunities, and coming up with actions to improve travel options. Travel plans produce many benefits. They help reduce the impact of travel on the environment but also make good business sense. They can cut traffic congestion around a local area and help people save money on travel by identifying more efficient use of the car whether for commuting or in-work travel.*

The plan incorporates analysis from a range of sources such as surveys, focus groups and workshops in order to clarify issues and identify the best approach forward. Travel plans are flexible and regularly evaluated to ensure they continue to reflect site-specific issues.

It is expected that an outline travel plan can be prepared at an early stage in the development design process, and that the development incorporates the necessary infrastructure and facilities to support the use of non-car modes of transport, particularly access by pedestrians and cyclists. The level of detail within the outline travel plan will be informed by the development design process and the knowledge of the end occupier.

Generally an outline travel plan would be expected to cover:

- type and size of development
- number of employees (estimated or actual)
- the type of work that will be undertaken and hours of operation
- the expected date of building completion and then subsequent occupation
- on-site facilities including:
  - cycle parking
  - change rooms
  - showers
  - pedestrian and cycle paths within the development and connections to the networks in the surrounding area
  - parking spaces and parking management measures

- off-site facilities including:
  - public transport stops and service information
  - local bike paths and lanes
  - footpaths and crossing points
- the expected 'business as usual' mode split (how people will travel in the absence of a travel plan) and the target mode split showing a shift to public transport, walking, cycling and ride share
- an outline travel plan should clearly identify objectives and targets for the travel plan
- incentives offered to change from car driver travel.

Targets must be measureable, however, it should also be recognised that it is a challenge for a developer to commit to targets on behalf of the eventual occupier or tenant of the building. If the end occupier is known and the developer has entered into a contractual arrangement with a prospective tenant then a greater level of detail can be expected with the tenant/occupier committing to specific travel plan actions, activities and outcomes.

Actions identified to be undertaken by the developer, for example, installation of secure cycle parking, must be implemented before the building is occupied to support desirable travel behaviour from the outset.

The WTP and TAG would include brochures to be given to new residents and employees. It could include a website with links to transport agencies, operators, information, and download files.

# 7. Economic analysis

This technical note outlines the approach and results of a rapid cost benefit analysis comparing the benefit and costs of the free flow option at Wilton Junction to the at-grade option.

In this section upgrades to the State Road Network are discussed. It is noted that the proposed infrastructure upgrades along the Hume Highway and Picton Road indicated on the Master Plan are not preferred or approved by RMS. The Hume Highway/Picton Road interchange upgrade indicated on the Master Plan is not a preferred or approved design.

The proposed layouts and configurations illustrated have been adopted for the purposes of traffic modelling which informs this economic assessment. This TMAP and or the rezoning process that it supports, does not confirm a final design for any of the proposed infrastructure upgrades on the State Road Network.

All proposed modifications or additions to existing road networks are subject to review and approval by responsible authorities including RMS, TfNSW, and Council. The Wilton Junction team will continue to participate in workshops with relevant authorities to achieve suitable designs.

The list of State Environment Planning Policy (SEPP) study requirements for the Wilton Junction Precinct included:

> *The proponent's modelling must consider the implications of the development on the functionality of Picton Road and specifically the impact to freight, recognising that the Long Term Transport Master Plan acknowledges the need to provide efficient freight connections to Port Kembla. In this regard, the modelling must consider two infrastructure scenarios for Picton Road:*
>
> - *Picton Road with no new at grade intersections and a free flow arrangement of Hume Highway and Picton Road. The layout of the interchange of the Hume Highway and Picton Road to be modelled shall be determined in consultation with TfNSW and RMS.*
> - *Picton Road with at grade intersections east of the Hume Highway.*
>
> *Based on the results of the modelling, the proponent shall undertake an economic assessment on the impact of the two separate options on freight activity and access to and from the Illawarra Region.*

The timing and nature of the upgrades proposed for Picton Road and the Hume Highway/Picton Road interchange are discussed in section 5.8. The proposed scheme largely addresses the concerns behind these items in the list of study requirements, by minimising the impact of local Wilton Junction traffic on the arterial road network. This section outlines the implications for freight and the results of an agreed simplified economic analysis method.

## 7.1 Proposed Picton Road upgrade

The recommended scheme for Picton Road includes the following by completion of the Wilton Junction Development:

- upgrading of the interchange of the Hume Highway and Picton Road with a free-flow configuration for the major freight movement from Sydney to Port Kembla:
  - retention of the slip lane for movements from Hume Highway southbound to Picton Road eastbound
  - a new fly-over ramp for the Picton Road westbound to Hume Highway northbound movement (also heavily used by existing car traffic)
  - new traffic signals for the remaining right-turn movements, but not affecting left-turn movements or the right-turn movement referred to above.
- grade-separation of the new north-south internal road across Picton Road between Hume Highway and Pembroke Parade
- widening of Picton Road between the new grade separation and Pembroke Parade to three lanes in each direction
- signalisation of the existing intersection of Picton Road and Pembroke Parade
- widening of Picton Road between Pembroke Parade and Almond Street to two lanes in each direction
- grade-separation of the new internal road to the west of Almond Street
- conversion of the intersection of Almond Street to left-in/left-out with no impediment to through traffic (note: interim upgrading to traffic signals until construction of grade-separation)
- widening of Picton Road between Almond Street to Macarthur Drive to two lanes in each direction
- widening of Picton Road east of Macarthur Drive to two lanes in each direction.

These projects are illustrated in Figure 7.1. Based on current truck volumes and the strategic links between the Broader Western Sydney Employment Area and Port Kembla, the movements between points A and B (shown on this figure) have been identified as the critical movements for freight. The assessment of the economic impact on the movement of freight has been undertaken for these two critical movements.

During the consultation process for this study, RMS has provided concept plans for full and partial free-flow upgrades of the Hume Highway and Picton Road Interchange. A different layout, shown in the inset in Figure 7.1, is suggested to:

- provide free-flow movement for the heaviest traffic and freight movements
- minimise land take
- reduce the need for wide bridges over the Hume Highway.

The minimisation of the impacts have been provided for to such an extent that there is only one impediment to the two movements shown in red on Figure 7.1 from A to B and B to A is the proposed traffic signals at the existing intersection of Picton Road and Pembroke Parade. Thus the economic analysis has been confined to the relative benefits of providing an additional grade-separation at this intersection. i.e. the two scenarios assessed are:

- partially grade-separated option: The currently proposed scheme listed previously
- free-flow option: Picton Road with grade separated intersections along Picton Road (include proposed grade separated Pembroke Parade).

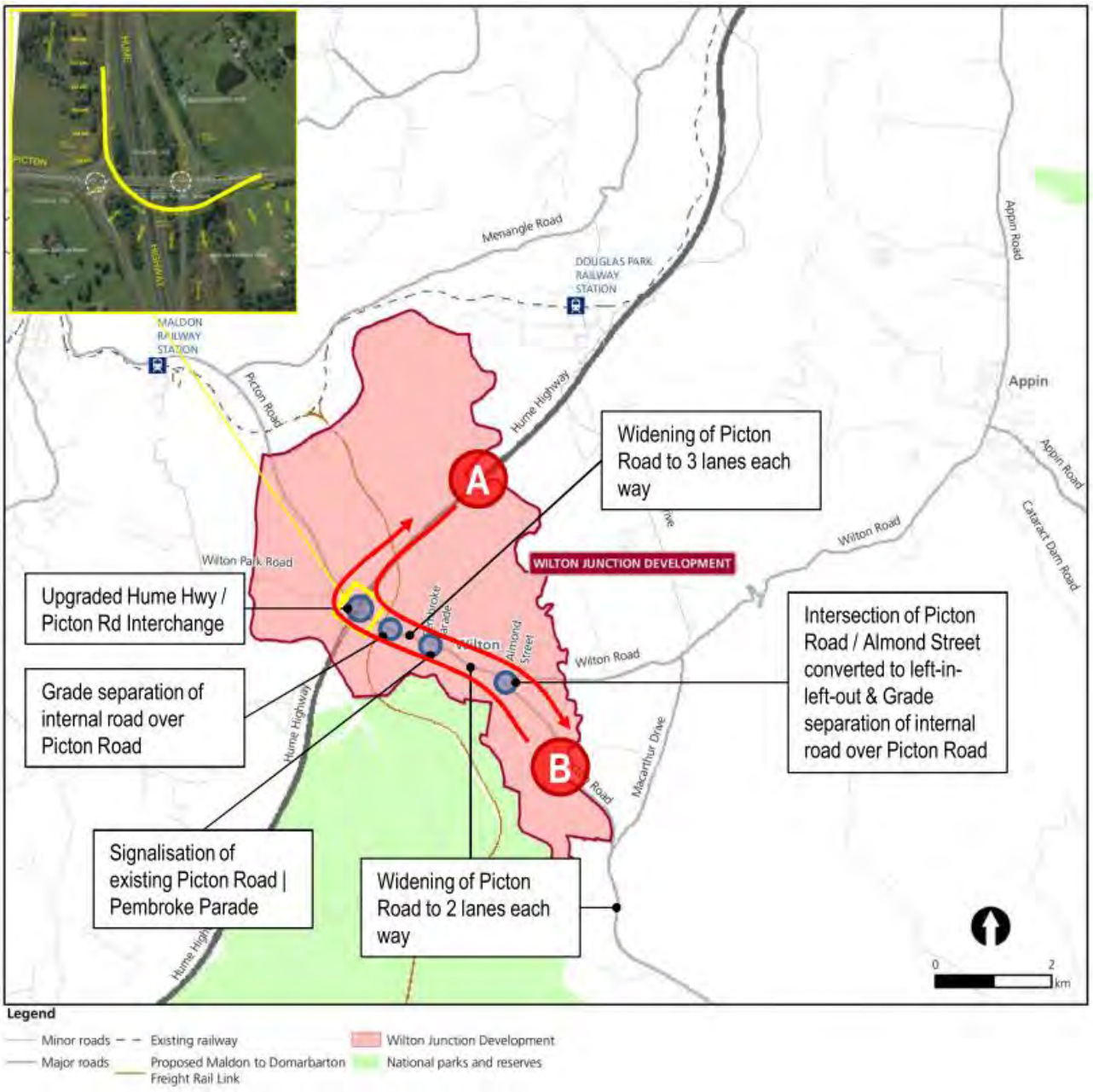



**Figure 7.1 Recommended upgrades of Picton Road affecting major freight movements**

## 7.2 Methodology

The method used to evaluate the relative economic benefits of grade separating the intersection of Picton Road and Pembroke Parade is:

1. Extract vehicle travel times from the Aimsun model between the Hume Highway, at the northern boundary of the development (at point A on Figure 7.1) and Picton Road at the eastern boundary of the development (at point B on Figure 7.1), being the predominant freight movement for the proposed road network with signals at Pembroke Parade for the AM and PM peaks in both directions.
2. Estimate what the travel time for the free flow option would be with no traffic signals using average link speeds.
3. Estimate freight vehicle time and operating costs for the two scenarios.
4. Undertake an economic analysis comparison using the difference in construction costs and upgrade timing.

It is acknowledged that there are other benefits not quantified in this process which may influence the analysis. However, as the study requirements specifically mention freight access to Port Kembla, this analysis process has been adopted with agreement from TfNSW.

## 7.3 Traffic forecast results

The intersection delay reductions by the free flow option when compared to the partially grade-separated option were estimated from the 2031 and 2036 modelling results. The possible grade-separation of the Pembroke Parade intersection was assumed to open in 2022. In line with TfNSW guidelines, benefits were counted over 30 years from project opening. It was assumed that the delay reductions would grow linearly between the two modelling years, and extrapolation was used to forecast benefits in years before 2031 and after 2036. The traffic model outputs used in this analysis were for one AM peak hour and one PM peak hour on a typical weekday. These were converted to an annual total using the expansion factors listed in Table 7.2.

## 7.4 Economic parameters and expansion factors

Table 7.2 shows the economic parameters and expansion factors used in the analysis. They are consistent with the Principles and Guidelines for the Appraisal of Transport Initiatives economic appraisal guidelines by Transport NSW (version 1.5, November 2013).

**Table 7.1 Economic parameters and expansion factors**

| Parameters/factors | Value | Source |
|---|---|---|
| Discount rate | 7% | TfNSW guidelines, page 54 |
| Opening year | 2022 | PB assumption |
| Appraisal period | 30 years from opening year | TfNSW guidelines, page 20 |
| Base year for discounting | 2013 | PB assumption |
| Price base | 2013 | PB assumption |
| Expand 1 hour AM peak and 1 hour PM peak to weekday | 6.13 | TfNSW guidelines, page 269 |
| Expand weekday to annual | 347 | TfNSW guidelines, page 269 |

## 7.5 Project costs

The estimated cost of the grade separation is $9,500,000[11]. This was offset against a second-stage upgrade of the intersection of Picton Road and Pembroke Parade of $1,847,500. Therefore, the free flow option was estimated to be $7,652,500 more expensive than the partially grade-separated option. The difference in maintenance costs would be minimal and therefore is not included in the cost benefit analysis.

## 7.6 Economic benefits

Travel time benefits were based on the projected delay savings estimated from the modelling results. They were calculated separately for light vehicles and heavy vehicles. The adopted values of travel times under rural environment are listed in Table 7.3. They are consistent with the economic appraisal guidelines by Transport NSW.

**Table 7.2 Values of travel time**

| Vehicle type | Value of time ($/hour) |
|---|---|
| Light vehicles | $33.17 |
| Heavy vehicles | $47.94 |

Source: Page 227, TfNSW guidelines

Potential savings in vehicle operating costs, environmental externalities, and crash costs have not been included in this rapid economic assessment.

## 7.7 Results

Based on the estimated travel time savings and the net cost between the free flow option and the partially grade-separated option, the upgrade would achieve a BCR of 1.9 exceeding the cut-off value of 1. This demonstrates that the incremental benefit of the free flow option over the partially grade-separated option outweigh the incremental cost.

A number of sensitivity tests were undertaken to test the impact of critical inputs into economic appraisal:

- increasing discount rate from 7% to 10% would reduce the BCR to 1.4
- increasing capital cost by 20% would reduce the BCR to 1.6
- reducing travel time savings by 20% would reduce the BCR to 1.6.

The above sensitivity tests based on conservative assumptions would still achieve a BCR of more than 1.

Although the rapid analysis focuses on the capital cost and the travel time benefits, in our view it is unlikely that including other insignificant items (e.g. maintenance cost, vehicle operating cost) would materially affect the BCR.

[11] Estimate by BG&E Civil, November 2013

The economic analysis presented is based on the results of traffic forecasting and modelling undertaken in December 2013. Traffic modelling for the project was updated in June 2014, with forecast traffic volumes on the Hume Highway-Picton Road route, which is a key input of this analysis, altered by no more than 5% as a result of the update process. The traffic modelling which has been completed generally indicates that travel times are not sensitive to changes in traffic volumes of this magnitude. Subsequently the sensitivity testing described above indicates that the relatively small change in travel times as a result of the revised traffic modelling would not affect the overall findings of the economic analysis. As a result, the economic analysis previously completed is representative of the latest traffic forecasting results.

While the rapid economic analysis has identified a potential economic benefit for the additional grade-separation, this additional upgrade is not required to mitigate the impacts of the Wilton Junction development. The intersection of Picton Road and Pembroke Parade can operate within acceptable performance parameters in a signalised configuration.

# 8. Transport management and accessibility plan

## 8.1 Package of transport measures

This section summarises the strategies proposed for the Wilton Junction Development to manage the demands it places on local transport infrastructure and encourage positive travel behaviour. It is noted that the proposed infrastructure upgrades along the Hume Highway and Picton Road indicated on the Master Plan are not approved by RMS. The Hume Highway/Picton Road interchange upgrade indicated on the Master Plan is not an approved design.

The proposed layouts and configurations illustrated have been adopted for the purposes of traffic modelling / traffic assessment only. This TMAP and the rezoning process that it supports, does not confirm a final design for any of the proposed infrastructure upgrades on the State Road Network.

All proposed modifications or additions to existing transport networks are subject to review and approval by responsible authorities including RMS, TfNSW, and Council. The Wilton Junction team will continue to participate in workshops with relevant authorities to achieve suitable designs.

The *Wilton Junction New Town SEPP Rezoning – Infrastructure Proposal to NSW Government* (Elton Consulting, May 2014) provides details of estimated costs, responsibilities, and funding mechanisms for identified transport network upgrades.

The package of proposed mitigation measures, implementation timeframes, and responsibilities is summarised in Table 8.1. Once agreement has been reached on the package of measures, lead agencies, timeframes and delivery mechanisms can be confirmed.

The contractual and funding arrangements of bus services and infrastructure will need to be confirmed should development proceed in the area. The Infrastructure Proposal includes the contribution of $8.5M from Wilton Junction Developments to fund public transport facilities, with capital items to be confirmed by TfNSW.

**Table 8.1 Transport network mitigation measures summary**

| Upgrade | Indicative timeframe | | | Triggered by Wilton Junction Development?[1] | Funding responsibility[2] |
|---|---|---|---|---|---|
| | Short term (2014–2018) | Medium term (2019–2024) | Long term (2025–2041) | | |
| **Arterial road upgrades** | | | | | |
| Hume Highway/Picton Road Interchange (Preliminary) | ■ | | | No | NSW Gov |
| Picton Road/Wilton Park Road intersection | ■ | | | Yes | WJLO |
| Picton Road/Pembroke Parade intersection (Preliminary) | ■ | | | Partially | NSW Gov/WJLO |
| Picton Road/Almond Street intersection (Preliminary) | ■ | | | Partially | NSW Gov/WJLO |
| Broughton Pass bridge upgrade | ■ | | | No | NSW Gov |
| Picton Road widening, east to Almond Street | | ■ | | Partially | NSW Gov/WJLO |
| Hume Highway/Picton Road Interchange (Ultimate) | | ■ | | No | NSW Gov |
| Picton Road/Pembroke Parade intersection (Ultimate) | | ■ | | Partially | NSW Gov/WJLO |
| Picton Road/Almond Street intersection grade separation | | | ■ | Yes | WJLO |
| New access intersection on Picton Road west of Wilton Park Road | | | ■ | Yes | WJLO |
| Picton Road widening, east of Almond Street | | | ■ | No | NSW Gov |
| **Local road upgrades** | | | | | |
| New entry road at Wilton Park Road | ■ | | | Yes | WJLO |
| Connection of Bingara Gorge to Town Centre | ■ | | | Yes | WJLO |
| Extension of Pembroke Parade south of Picton Road | ■ | | | Yes | WJLO |
| Expansion of local collector roads in Wilton North | | ■ | | Yes | WJLO |
| New east-west road across Hume Highway north of Picton Road | | ■ | | Yes | WJLO |
| Access ramps between Wilton Junction and the Hume Highway | | ■ | | Yes | WJLO |
| New north-south road and grade separation over Picton Road | | ■ | | Yes | WJLO |
| Expansion of internal collector roads | | | ■ | Yes | WJLO |

| Upgrade | Indicative timeframe | | | Triggered by Wilton Junction Development?[1] | Funding responsibility[2] |
|---|---|---|---|---|---|
| | Short term (2014–2018) | Medium term (2019–2024) | Long term (2025–2041) | | |
| **Bus** | | | | | |
| Develop bus plan | ■ | | | Yes | NSW Gov/ WJLO[3] |
| Establish core Wilton–Picton service | ■ | | | Yes | |
| Existing Wilton township interim terminus | ■ | | | Yes | |
| Bus stops and shelters | ■ | ■ | ■ | Yes | |
| Establish service to Campbelltown/Macarthur | ■ | | | Yes | |
| Town Centre interchange | | ■ | | Yes | |
| Park-and-Ride at Wilton | | ■ | | Yes | |
| Neighbourhood centre interchanges | | ■ | | Yes | |
| Establish service to Wollongong & Wilton South | | ■ | | Yes | |
| Establish service to Wilton East & Wilton North | | | ■ | Yes | |
| **Active transport** | | | | | |
| Cycle parking at town centre | ■ | | | Yes | WJLO |
| Install wayfinding and directional signage | ■ | ■ | ■ | Yes | WJLO |
| Shared paths and footpaths | ■ | ■ | ■ | Yes | WJLO |
| Cycle parking at neighbourhood centres | | ■ | | Yes | WJLO |
| **Travel plans/Access guides** | | | | | |
| Travel Access Guides to new residents | ■ | ■ | ■ | Yes | WJLO |
| Workplace Travel Plans to new business owners | ■ | ■ | ■ | Yes | WJLO |

(1) 'Yes' indicates upgrades required to address existing/impending network traffic issues regardless of Wilton Junction development.

(2) Funding responsibilities consistent with *Wilton Junction New Town SEPP Rezoning – Infrastructure Proposal to NSW Government* (Elton Consulting, May 2014). WJLO = Wilton Junction Land Owners. NSW Gov = NSW Government.

(3) Contractual and funding arrangements of bus services and infrastructure will need to be confirmed should development proceed. Infrastructure Proposal includes the contribution of $8.5M from Wilton Junction Developments to fund public transport facilities, with capital items to be confirmed by TfNSW.

## 8.2 Funding and delivery

The delivery of the package of measures outlined in this TMAP may require funding from a range of sources including State government, Section 94 funds and contributions from developers. An infrastructure works strategy, included in the *Wilton Junction New Town SEPP Rezoning – Infrastructure Proposal to NSW Government* (Elton Consulting, May 2014), has been developed for the funding and delivery of road and transport infrastructure.

A funding plan is proposed that apportions the cost of the infrastructure based on the amount the development contributes to the need for that piece of infrastructure. For example, direct contributions involving the full cost recovery (i.e. no apportionment) can only be used where the public facility is provided to meet the level of demand anticipated by new development only and there is no facility or spare capacity available in the area. If the proposed public facility satisfies not only the demand of new development, but also some regional demand, demand by people from outside the area, or makes up for some existing deficiency, only the portion of demand created by new development can be charged.

The principles underlying the methodology for apportionment are:

- Government cost. Infrastructure required to addressing current infrastructure deficiencies and future requirements to service background growth. (i.e. all current anticipated costs for government without any consideration of Wilton Junction).
- Developer cost. Necessary augmentation of government infrastructure to service Wilton Junction, cost of bringing forward government expenditure, and costs over and above current anticipated costs for government.

The aim of the infrastructure plan is to achieve 'no additional cost to government'. It is understood that the Wilton Junction development will bring forward the requirement for government to expend funds on transport works on Picton Road. Where this occurs, a contribution based on the net present value will be determined.

The Infrastructure Proposal includes an offer of $97,273,726 by the Wilton Junction Landowners to fund transport network upgrades in the area, as shown in Table 8.2. Further details of individual items and responsibilities are provided in Table 8.1.

**Table 8.2 Summary of infrastructure offer**

| Item | Funded amount |
|---|---|
| New Northern On-Ramps, off ramps and bridge over Hume Highway | $44,936,703 |
| Pedestrian bridge over the Hume Highway linking Bingara Gorge with Wilton Junction land | $7,327,273 |
| Picton Road west | $12,779,750 |
| Picton Road East - 20% of the traffic movement | $8,280,000 |
| North South link bridge over Picton Road | $15,400,000 |
| Public transport | $8,550,000 |
| **Total** | $97,273,726 |

Source: *Wilton Junction New Town SEPP Rezoning – Infrastructure Proposal to NSW Government* (Elton Consulting, May 2014)

# Appendix A

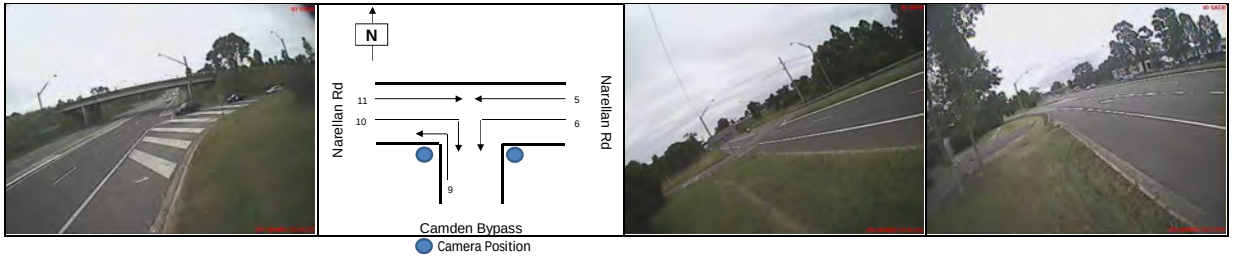
Traffic survey results

# Intersection of The Northern Road and Camden Bypass

**Wednesday, 3 April 2013**

**Austraffic**

| | |
|---|---|
| Survey Start | **6:30 AM 15:30 PM** |
| Intersection Type | T Junction |
| Intersection No. | **2** |
| North Approach | |
| East Approach | **Narellan Rd** |
| South Approach | **Camden Bypass** |
| West Approach | **Narellan Rd** |
| Date | **3/04/13** |
| Classification | **Light Heavy** |




| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | | | | | | | | | | | | | 128 | 17 | 145 | 87 | 7 | 94 | | | | | | | 72 | 3 | 75 | 31 | 6 | 37 | 156 | 24 | 180 | | | | 474 | 57 | 531 |
| 6:45 - 7:00 | | | | | | | | | | | | | 187 | 7 | 194 | 78 | 6 | 84 | | | | | | | 81 | 3 | 84 | 22 | 8 | 30 | 142 | 14 | 156 | | | | 510 | 38 | 548 |
| 7:00 - 7:15 | | | | | | | | | | | | | 166 | 15 | 181 | 61 | 2 | 63 | | | | | | | 66 | 2 | 68 | 27 | 6 | 33 | 169 | 22 | 191 | | | | 489 | 47 | 536 |
| 7:15 - 7:30 | | | | | | | | | | | | | 196 | 12 | 208 | 72 | 12 | 84 | | | | | | | 74 | 2 | 76 | 29 | 6 | 35 | 182 | 22 | 204 | | | | 553 | 54 | 607 |
| 7:30 - 7:45 | | | | | | | | | | | | | 177 | 9 | 186 | 77 | 11 | 88 | | | | | | | 83 | 6 | 89 | 33 | 7 | 40 | 232 | 20 | 252 | | | | 602 | 53 | 655 |
| 7:45 - 8:00 | | | | | | | | | | | | | 239 | 18 | 257 | 101 | 7 | 108 | | | | | | | 94 | 3 | 97 | 42 | 5 | 47 | 219 | 18 | 237 | | | | 695 | 51 | 746 |
| 8:00 - 8:15 | | | | | | | | | | | | | 234 | 11 | 245 | 99 | 7 | 106 | | | | | | | 113 | 3 | 116 | 42 | 10 | 52 | 210 | 7 | 217 | | | | 688 | 38 | 726 |
| 8:15 - 8:30 | | | | | | | | | | | | | 287 | 23 | 310 | 115 | 8 | 123 | | | | | | | 88 | 2 | 90 | 33 | 4 | 37 | 208 | 19 | 227 | | | | 731 | 56 | 787 |
| 8:30 - 8:45 | | | | | | | | | | | | | 255 | 11 | 266 | 120 | 11 | 131 | | | | | | | 112 | 8 | 120 | 42 | 4 | 46 | 179 | 18 | 197 | | | | 708 | 52 | 760 |
| 8:45 - 9:00 | | | | | | | | | | | | | 279 | 19 | 298 | 141 | 10 | 151 | | | | | | | 98 | 4 | 102 | 47 | 2 | 49 | 193 | 9 | 202 | | | | 758 | 44 | 802 |
| 9:00 - 9:15 | | | | | | | | | | | | | 280 | 17 | 297 | 104 | 15 | 119 | | | | | | | 69 | 4 | 73 | 36 | 8 | 44 | 234 | 17 | 251 | | | | 723 | 61 | 784 |
| 9:15 - 9:30 | | | | | | | | | | | | | 197 | 18 | 215 | 84 | 14 | 98 | | | | | | | 66 | 4 | 70 | 28 | 7 | 35 | 197 | 15 | 212 | | | | 572 | 58 | 630 |
| Σ | | | | | | | | | | | | | 2625 | 177 | 2802 | 1139 | 110 | 1249 | | | | | | | 1016 | 44 | 1060 | 412 | 73 | 485 | 2321 | 205 | 2526 | | | | 7513 | 609 | 8122 |
| 7:00 - 9:00 | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 1833 | 118 | | 786 | 68 | | 0 | 0 | | 0 | 0 | | 728 | 30 | | 295 | 44 | | 1592 | 135 | | 0 | 0 | | | | 5629 |

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | | | | | | | | | | | | | 266 | 16 | 282 | 153 | 16 | 169 | | | | | | | 48 | 9 | 57 | 72 | 10 | 82 | 258 | 16 | 274 | | | | 797 | 67 | 864 |
| 15:45 - 16:00 | | | | | | | | | | | | | 291 | 20 | 311 | 195 | 10 | 205 | | | | | | | 53 | 7 | 60 | 80 | 9 | 89 | 285 | 15 | 300 | | | | 904 | 61 | 965 |
| 16:00 - 16:15 | | | | | | | | | | | | | 299 | 10 | 309 | 196 | 6 | 202 | | | | | | | 47 | 3 | 50 | 94 | 9 | 103 | 255 | 17 | 272 | | | | 891 | 45 | 936 |
| 16:15 - 16:30 | | | | | | | | | | | | | 300 | 16 | 316 | 178 | 13 | 191 | | | | | | | 53 | 1 | 54 | 95 | 5 | 100 | 269 | 12 | 281 | | | | 895 | 47 | 942 |
| 16:30 - 16:45 | | | | | | | | | | | | | 270 | 12 | 282 | 210 | 8 | 218 | | | | | | | 47 | 8 | 55 | 131 | 8 | 139 | 292 | 17 | 309 | | | | 950 | 53 | 1003 |
| 16:45 - 17:00 | | | | | | | | | | | | | 302 | 10 | 312 | 179 | 11 | 190 | | | | | | | 48 | 4 | 52 | 107 | 6 | 113 | 236 | 15 | 251 | | | | 872 | 46 | 918 |
| 17:00 - 17:15 | | | | | | | | | | | | | 280 | 10 | 290 | 260 | 10 | 270 | | | | | | | 47 | 3 | 50 | 119 | 5 | 124 | 296 | 6 | 302 | | | | 1002 | 34 | 1036 |
| 17:15 - 17:30 | | | | | | | | | | | | | 266 | 9 | 275 | 218 | 10 | 228 | | | | | | | 65 | 1 | 66 | 106 | 3 | 109 | 254 | 5 | 259 | | | | 909 | 28 | 937 |
| 17:30 - 17:45 | | | | | | | | | | | | | 351 | 10 | 361 | 201 | 1 | 202 | | | | | | | 32 | 1 | 33 | 109 | 2 | 111 | 242 | 3 | 245 | | | | 935 | 17 | 952 |
| 17:45 - 18:00 | | | | | | | | | | | | | 252 | 9 | 261 | 213 | 1 | 214 | | | | | | | 33 | 4 | 37 | 113 | 5 | 118 | 213 | 5 | 218 | | | | 924 | 24 | 948 |
| 18:00 - 18:15 | | | | | | | | | | | | | 278 | 12 | 290 | 186 | 7 | 193 | | | | | | | 35 | 2 | 37 | 104 | 3 | 107 | 232 | 5 | 237 | | | | 835 | 29 | 864 |
| 18:15 - 18:30 | | | | | | | | | | | | | 230 | 11 | 241 | 195 | 4 | 199 | | | | | | | 31 | 1 | 32 | 74 | 0 | 74 | 209 | 5 | 214 | | | | 739 | 21 | 760 |
| Σ | | | | | | | | | | | | | 3385 | 145 | 3530 | 2384 | 97 | 2481 | | | | | | | 539 | 44 | 583 | 1204 | 65 | 1269 | 3041 | 121 | 3162 | | | | #### | 472 | #### |
| 15:45 - 17:45 | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 2359 | 97 | | 1637 | 69 | | 0 | 0 | | 0 | 0 | | 392 | 28 | | 841 | 47 | | 2129 | 90 | | 0 | 0 | | | | 7689 |

# Intersection of Hume Highway and Narellan Road

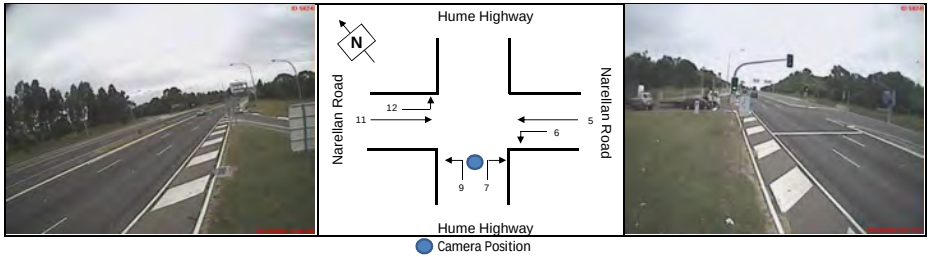
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type Cross Junction
Intersection No. **3A**
North Approach **Hume Highway**
East Approach **Narellan Road**
South Approach **Hume Highway**
West Approach **Narellan Road**

Date **3/04/13**

Classification **Light Heavy**




| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
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| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | | | | | | | | | | | | | 313 | 36 | 349 | 142 | 4 | 146 | 58 | 7 | 65 | | | | 30 | 5 | 35 | | | | 352 | 21 | 373 | 364 | 18 | 382 | 1259 | 91 | 1350 |
| 6:45 - 7:00 | | | | | | | | | | | | | 320 | 33 | 353 | 145 | 10 | 155 | 59 | 4 | 63 | | | | 34 | 5 | 39 | | | | 343 | 25 | 368 | 346 | 16 | 362 | 1247 | 93 | 1340 |
| 7:00 - 7:15 | | | | | | | | | | | | | 301 | 28 | 329 | 169 | 6 | 175 | 46 | 1 | 47 | | | | 37 | 7 | 44 | | | | 409 | 21 | 430 | 384 | 24 | 408 | 1346 | 87 | 1433 |
| 7:15 - 7:30 | | | | | | | | | | | | | 334 | 28 | 362 | 186 | 11 | 197 | 40 | 1 | 41 | | | | 33 | 4 | 37 | | | | 446 | 26 | 472 | 386 | 17 | 403 | 1425 | 87 | 1512 |
| 7:30 - 7:45 | | | | | | | | | | | | | 355 | 33 | 388 | 169 | 4 | 173 | 58 | 4 | 62 | | | | 40 | 5 | 45 | | | | 414 | 26 | 440 | 340 | 21 | 361 | 1376 | 93 | 1469 |
| 7:45 - 8:00 | | | | | | | | | | | | | 410 | 38 | 448 | 156 | 3 | 159 | 60 | 4 | 64 | | | | 47 | 9 | 56 | | | | 469 | 24 | 493 | 347 | 15 | 362 | 1489 | 93 | 1582 |
| 8:00 - 8:15 | | | | | | | | | | | | | 415 | 38 | 453 | 131 | 5 | 136 | 77 | 5 | 82 | | | | 32 | 6 | 38 | | | | 486 | 26 | 512 | 275 | 11 | 286 | 1416 | 91 | 1507 |
| 8:15 - 8:30 | | | | | | | | | | | | | 501 | 33 | 534 | 136 | 5 | 141 | 73 | 3 | 76 | | | | 54 | 6 | 60 | | | | 479 | 19 | 498 | 243 | 10 | 253 | 1486 | 76 | 1562 |
| 8:30 - 8:45 | | | | | | | | | | | | | 375 | 36 | 411 | 122 | 5 | 127 | 51 | 1 | 52 | | | | 37 | 10 | 47 | | | | 513 | 24 | 537 | 289 | 24 | 313 | 1387 | 100 | 1487 |
| 8:45 - 9:00 | | | | | | | | | | | | | 436 | 39 | 475 | 69 | 4 | 73 | 53 | 3 | 56 | | | | 30 | 6 | 36 | | | | 383 | 21 | 404 | 220 | 29 | 249 | 1191 | 102 | 1293 |
| 9:00 - 9:15 | | | | | | | | | | | | | 375 | 33 | 408 | 92 | 10 | 102 | 66 | 5 | 71 | | | | 36 | 11 | 47 | | | | 399 | 33 | 432 | 177 | 34 | 211 | 1145 | 126 | 1271 |
| 9:15 - 9:30 | | | | | | | | | | | | | 349 | 44 | 393 | 80 | 7 | 87 | 34 | 3 | 37 | | | | 29 | 6 | 35 | | | | 357 | 19 | 376 | 147 | 19 | 166 | 996 | 98 | 1094 |
| Σ | | | | | | | | | | | | | 4484 | 419 | 4903 | 1597 | 74 | 1671 | 675 | 41 | 716 | | | | 439 | 80 | 519 | | | | 5050 | 285 | 5335 | 3518 | 238 | 3756 | #### | 1137 | #### |
| 7:00 - 9:00 | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 3127 | 273 | | 1138 | 43 | | 458 | 22 | | 0 | 0 | | 310 | 53 | | 0 | 0 | | 3599 | 187 | | 2484 | 151 | | | | #### |

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
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| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | | | | | | | | | | | | | 756 | 46 | 802 | 127 | 9 | 136 | 23 | 1 | 24 | | | | 33 | 7 | 40 | | | | 389 | 13 | 402 | 125 | 23 | 148 | 1453 | 99 | 1552 |
| 15:45 - 16:00 | | | | | | | | | | | | | 677 | 39 | 716 | 123 | 6 | 129 | 38 | 1 | 39 | | | | 37 | 7 | 44 | | | | 358 | 29 | 387 | 122 | 34 | 156 | 1355 | 116 | 1471 |
| 16:00 - 16:15 | | | | | | | | | | | | | 773 | 24 | 797 | 155 | 6 | 161 | 32 | 3 | 35 | | | | 42 | 2 | 44 | | | | 401 | 19 | 420 | 118 | 21 | 139 | 1521 | 75 | 1596 |
| 16:15 - 16:30 | | | | | | | | | | | | | 780 | 24 | 804 | 162 | 4 | 166 | 35 | 1 | 36 | | | | 37 | 9 | 46 | | | | 373 | 23 | 396 | 122 | 21 | 143 | 1509 | 82 | 1591 |
| 16:30 - 16:45 | | | | | | | | | | | | | 806 | 35 | 841 | 119 | 4 | 123 | 34 | 2 | 36 | | | | 42 | 8 | 50 | | | | 356 | 13 | 369 | 115 | 9 | 124 | 1472 | 71 | 1543 |
| 16:45 - 17:00 | | | | | | | | | | | | | 813 | 26 | 839 | 147 | 1 | 148 | 36 | 0 | 36 | | | | 48 | 6 | 54 | | | | 361 | 11 | 372 | 154 | 11 | 165 | 1559 | 55 | 1614 |
| 17:00 - 17:15 | | | | | | | | | | | | | 882 | 18 | 900 | 157 | 4 | 161 | 22 | 4 | 26 | | | | 30 | 5 | 35 | | | | 390 | 13 | 403 | 184 | 15 | 199 | 1665 | 59 | 1724 |
| 17:15 - 17:30 | | | | | | | | | | | | | 869 | 23 | 892 | 156 | 2 | 158 | 34 | 0 | 34 | | | | 45 | 4 | 49 | | | | 387 | 7 | 394 | 147 | 6 | 153 | 1638 | 42 | 1680 |
| 17:30 - 17:45 | | | | | | | | | | | | | 861 | 20 | 881 | 132 | 2 | 134 | 29 | 0 | 29 | | | | 40 | 4 | 44 | | | | 368 | 13 | 381 | 130 | 7 | 137 | 1560 | 46 | 1606 |
| 17:45 - 18:00 | | | | | | | | | | | | | 876 | 14 | 890 | 128 | 2 | 130 | 24 | 1 | 25 | | | | 42 | 7 | 49 | | | | 362 | 9 | 371 | 121 | 5 | 126 | 1553 | 38 | 1591 |
| 18:00 - 18:15 | | | | | | | | | | | | | 777 | 11 | 788 | 124 | 4 | 128 | 28 | 2 | 30 | | | | 37 | 7 | 44 | | | | 352 | 10 | 362 | 112 | 7 | 119 | 1430 | 41 | 1471 |
| 18:15 - 18:30 | | | | | | | | | | | | | 735 | 19 | 754 | 125 | 1 | 126 | 21 | 1 | 22 | | | | 35 | 4 | 39 | | | | 286 | 8 | 294 | 114 | 4 | 118 | 1316 | 37 | 1353 |
| Σ | | | | | | | | | | | | | 9605 | 299 | 9904 | 1655 | 45 | 1700 | 356 | 16 | 372 | | | | 468 | 70 | 538 | | | | 4383 | 168 | 4551 | 1564 | 163 | 1727 | #### | 761 | #### |
| 15:45 - 17:45 | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 6461 | 209 | | 1151 | 29 | | 260 | 11 | | 0 | 0 | | 321 | 45 | | 0 | 0 | | 2994 | 128 | | 1092 | 124 | | | | #### |

# Intersection of Hume Highway and Narellan Road

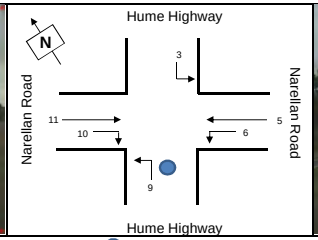
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type Cross Junction
Intersection No. **3B**
North Approach **Hume Highway**
East Approach **Narellan Road**
South Approach **Hume Highway**
West Approach **Narellan Road**

Date **3/04/13**

Classification **Light Heavy**




| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | | | | | | | 81 | 12 | 93 | | | | 347 | 16 | 363 | 13 | 2 | 15 | | | | | | | 109 | 25 | 134 | 31 | 7 | 38 | 378 | 23 | 401 | | | | 959 | 85 | 1044 |
| 6:45 - 7:00 | | | | | | | 92 | 9 | 101 | | | | 365 | 26 | 391 | 18 | 8 | 26 | | | | | | | 101 | 17 | 118 | 30 | 5 | 35 | 368 | 24 | 392 | | | | 974 | 89 | 1063 |
| 7:00 - 7:15 | | | | | | | 78 | 6 | 84 | | | | 368 | 21 | 389 | 26 | 5 | 31 | | | | | | | 99 | 13 | 112 | 32 | 3 | 35 | 422 | 16 | 438 | | | | 1025 | 64 | 1089 |
| 7:15 - 7:30 | | | | | | | 80 | 10 | 90 | | | | 414 | 25 | 439 | 25 | 2 | 27 | | | | | | | 103 | 16 | 119 | 51 | 12 | 63 | 430 | 18 | 448 | | | | 1103 | 83 | 1186 |
| 7:30 - 7:45 | | | | | | | 98 | 7 | 105 | | | | 425 | 14 | 439 | 33 | 1 | 34 | | | | | | | 100 | 21 | 121 | 50 | 8 | 58 | 427 | 22 | 449 | | | | 1133 | 73 | 1206 |
| 7:45 - 8:00 | | | | | | | 132 | 5 | 137 | | | | 420 | 18 | 438 | 28 | 2 | 30 | | | | | | | 140 | 24 | 164 | 39 | 5 | 44 | 491 | 23 | 514 | | | | 1250 | 77 | 1327 |
| 8:00 - 8:15 | | | | | | | 147 | 7 | 154 | | | | 416 | 20 | 436 | 27 | 2 | 29 | | | | | | | 135 | 22 | 157 | 26 | 7 | 33 | 534 | 23 | 557 | | | | 1286 | 81 | 1366 |
| 8:15 - 8:30 | | | | | | | 185 | 7 | 192 | | | | 483 | 17 | 500 | 18 | 4 | 22 | | | | | | | 149 | 21 | 170 | 26 | 1 | 27 | 529 | 22 | 551 | | | | 1390 | 72 | 1462 |
| 8:30 - 8:45 | | | | | | | 194 | 7 | 201 | | | | 374 | 21 | 395 | 17 | 5 | 22 | | | | | | | 121 | 22 | 143 | 27 | 5 | 32 | 535 | 20 | 555 | | | | 1268 | 80 | 1348 |
| 8:45 - 9:00 | | | | | | | 153 | 4 | 157 | | | | 388 | 26 | 414 | 18 | 5 | 23 | | | | | | | 111 | 18 | 129 | 22 | 7 | 29 | 413 | 16 | 429 | | | | 1105 | 76 | 1181 |
| 9:00 - 9:15 | | | | | | | 123 | 4 | 127 | | | | 363 | 27 | 390 | 29 | 4 | 33 | | | | | | | 105 | 15 | 120 | 26 | 11 | 37 | 442 | 28 | 470 | | | | 1088 | 89 | 1177 |
| 9:15 - 9:30 | | | | | | | 123 | 4 | 127 | | | | 312 | 24 | 336 | 27 | 1 | 28 | | | | | | | 119 | 25 | 144 | 26 | 4 | 30 | 372 | 18 | 390 | | | | 979 | 76 | 1055 |
| Σ | | | | | | | 1486 | 82 | 1568 | | | | 4675 | 255 | 4930 | 279 | 41 | 320 | | | | | | | 1392 | 239 | 1631 | 386 | 75 | 461 | 5341 | 253 | 5594 | | | | #### | 945 | #### |
| 7:00 - 9:00 | 0 | 0 | | 0 | 0 | | 1067 | 53 | | 0 | 0 | | 3288 | 162 | | 192 | 26 | | 0 | 0 | | 0 | 0 | | 958 | 157 | | 273 | 48 | | 3781 | 160 | | 0 | 0 | | | | #### |

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | | | | | | | 166 | 8 | 174 | | | | 591 | 28 | 619 | 56 | 0 | 56 | | | | | | | 291 | 26 | 317 | 37 | 2 | 39 | 371 | 11 | 382 | | | | 1512 | 75 | 1587 |
| 15:45 - 16:00 | | | | | | | 163 | 8 | 171 | | | | 543 | 29 | 572 | 54 | 6 | 60 | | | | | | | 260 | 17 | 277 | 30 | 2 | 32 | 369 | 26 | 395 | | | | 1419 | 88 | 1507 |
| 16:00 - 16:15 | | | | | | | 130 | 6 | 136 | | | | 642 | 10 | 652 | 63 | 2 | 65 | | | | | | | 289 | 18 | 307 | 36 | 4 | 40 | 402 | 17 | 419 | | | | 1562 | 57 | 1619 |
| 16:15 - 16:30 | | | | | | | 130 | 5 | 135 | | | | 609 | 16 | 625 | 57 | 8 | 65 | | | | | | | 338 | 14 | 352 | 36 | 5 | 41 | 373 | 20 | 393 | | | | 1543 | 68 | 1611 |
| 16:30 - 16:45 | | | | | | | 131 | 8 | 139 | | | | 601 | 16 | 617 | 72 | 1 | 73 | | | | | | | 324 | 24 | 348 | 39 | 9 | 48 | 352 | 9 | 361 | | | | 1519 | 67 | 1586 |
| 16:45 - 17:00 | | | | | | | 142 | 3 | 145 | | | | 628 | 13 | 641 | 71 | 5 | 76 | | | | | | | 336 | 13 | 349 | 42 | 2 | 44 | 359 | 9 | 368 | | | | 1578 | 45 | 1623 |
| 17:00 - 17:15 | | | | | | | 126 | 4 | 130 | | | | 675 | 10 | 685 | 63 | 2 | 65 | | | | | | | 363 | 10 | 373 | 34 | 1 | 35 | 374 | 16 | 390 | | | | 1635 | 43 | 1678 |
| 17:15 - 17:30 | | | | | | | 151 | 2 | 153 | | | | 634 | 18 | 652 | 70 | 1 | 71 | | | | | | | 394 | 9 | 403 | 46 | 2 | 48 | 376 | 5 | 381 | | | | 1671 | 37 | 1708 |
| 17:30 - 17:45 | | | | | | | 144 | 5 | 149 | | | | 616 | 9 | 625 | 74 | 1 | 75 | | | | | | | 372 | 12 | 384 | 21 | 3 | 24 | 372 | 8 | 380 | | | | 1599 | 38 | 1637 |
| 17:45 - 18:00 | | | | | | | 126 | 5 | 131 | | | | 619 | 8 | 627 | 62 | 2 | 64 | | | | | | | 390 | 7 | 397 | 43 | 1 | 44 | 344 | 11 | 355 | | | | 1584 | 34 | 1618 |
| 18:00 - 18:15 | | | | | | | 143 | 4 | 147 | | | | 556 | 12 | 568 | 60 | 1 | 61 | | | | | | | 343 | 4 | 347 | 23 | 2 | 25 | 352 | 10 | 362 | | | | 1477 | 33 | 1510 |
| 18:15 - 18:30 | | | | | | | 124 | 4 | 128 | | | | 559 | 11 | 570 | 47 | 2 | 49 | | | | | | | 299 | 10 | 309 | 23 | 2 | 25 | 285 | 7 | 292 | | | | 1337 | 36 | 1373 |
| Σ | | | | | | | 1676 | 62 | 1738 | | | | 7273 | 180 | 7453 | 749 | 31 | 780 | | | | | | | 3999 | 164 | 4163 | 410 | 35 | 445 | 4329 | 149 | 4478 | | | | #### | 621 | #### |
| 15:45 - 17:45 | 0 | 0 | | 0 | 0 | | 1117 | 41 | | 0 | 0 | | 4948 | 121 | | 524 | 26 | | 0 | 0 | | 0 | 0 | | 2676 | 117 | | 284 | 28 | | 2977 | 110 | | 0 | 0 | | | | #### |

# Intersection of Remembrance Drive and Macarthur Road

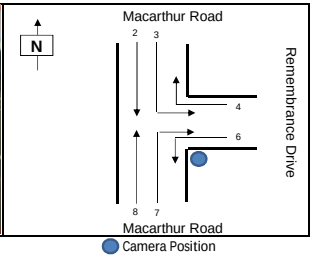
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type T Junction
Intersection No. **6A**
North Approach **Macarthur Road**
East Approach **Remembrance Drive**
South Approach **Macarthur Road**
West Approach

Date **3/04/13**

Classification **Light Heavy**




| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | | | | 6 | 0 | 6 | 55 | 1 | 56 | 20 | 1 | 21 | | | | 9 | 1 | 10 | 7 | 4 | 11 | 4 | 2 | 6 | | | | | | | | | | | | 101 | 9 | 110 |
| 6:45 - 7:00 | | | | 9 | 0 | 9 | 53 | 0 | 53 | 17 | 1 | 18 | | | | 19 | 2 | 21 | 4 | 4 | 8 | 18 | 2 | 20 | | | | | | | | | | | | 120 | 9 | 129 |
| 7:00 - 7:15 | | | | 8 | 0 | 8 | 75 | 2 | 77 | 27 | 0 | 27 | | | | 10 | 4 | 14 | 8 | 4 | 12 | 23 | 0 | 23 | | | | | | | | | | | | 151 | 10 | 161 |
| 7:15 - 7:30 | | | | 12 | 0 | 12 | 71 | 2 | 73 | 15 | 1 | 16 | | | | 9 | 1 | 10 | 7 | 5 | 12 | 26 | 1 | 27 | | | | | | | | | | | | 140 | 10 | 150 |
| 7:30 - 7:45 | | | | 9 | 1 | 10 | 80 | 1 | 81 | 20 | 0 | 20 | | | | 17 | 0 | 17 | 13 | 6 | 19 | 27 | 3 | 30 | | | | | | | | | | | | 166 | 11 | 177 |
| 7:45 - 8:00 | | | | 11 | 0 | 11 | 59 | 3 | 62 | 26 | 1 | 27 | | | | 20 | 1 | 21 | 30 | 4 | 34 | 36 | 0 | 36 | | | | | | | | | | | | 182 | 9 | 191 |
| 8:00 - 8:15 | | | | 10 | 3 | 13 | 76 | 1 | 77 | 22 | 0 | 22 | | | | 17 | 1 | 18 | 31 | 7 | 38 | 37 | 0 | 37 | | | | | | | | | | | | 193 | 12 | 205 |
| 8:15 - 8:30 | | | | 18 | 0 | 18 | 71 | 1 | 72 | 42 | 2 | 44 | | | | 12 | 1 | 13 | 25 | 1 | 26 | 70 | 1 | 71 | | | | | | | | | | | | 238 | 6 | 244 |
| 8:30 - 8:45 | | | | 9 | 0 | 9 | 75 | 2 | 77 | 46 | 1 | 47 | | | | 26 | 0 | 26 | 26 | 6 | 32 | 87 | 0 | 87 | | | | | | | | | | | | 269 | 9 | 278 |
| 8:45 - 9:00 | | | | 12 | 0 | 12 | 74 | 0 | 74 | 39 | 1 | 40 | | | | 20 | 0 | 20 | 25 | 4 | 29 | 80 | 0 | 80 | | | | | | | | | | | | 250 | 5 | 255 |
| 9:00 - 9:15 | | | | 11 | 1 | 12 | 71 | 0 | 71 | 31 | 1 | 32 | | | | 16 | 1 | 17 | 16 | 11 | 27 | 45 | 0 | 45 | | | | | | | | | | | | 190 | 14 | 204 |
| 9:15 - 9:30 | | | | 6 | 0 | 6 | 75 | 1 | 76 | 29 | 0 | 29 | | | | 17 | 2 | 19 | 17 | 11 | 28 | 31 | 1 | 32 | | | | | | | | | | | | 175 | 15 | 190 |
| Σ | | | | 121 | 5 | 126 | 835 | 14 | 849 | 334 | 9 | 343 | | | | 192 | 14 | 206 | 209 | 67 | 276 | 484 | 10 | 494 | | | | | | | | | | | | 2175 | 119 | 2294 |
| 7:00 - 9:00 | 0 | 0 | | 89 | 4 | | 581 | 12 | | 237 | 6 | | 0 | 0 | | 131 | 8 | | 165 | 37 | | 386 | 5 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | | | 1661 |

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | | | | 19 | 2 | 21 | 60 | 0 | 60 | 29 | 0 | 29 | | | | 23 | 3 | 26 | 17 | 19 | 36 | 53 | 2 | 55 | | | | | | | | | | | | 201 | 26 | 227 |
| 15:45 - 16:00 | | | | 14 | 1 | 15 | 58 | 3 | 61 | 29 | 0 | 29 | | | | 13 | 0 | 13 | 23 | 5 | 28 | 86 | 3 | 89 | | | | | | | | | | | | 223 | 12 | 235 |
| 16:00 - 16:15 | | | | 17 | 1 | 18 | 64 | 1 | 65 | 21 | 0 | 21 | | | | 20 | 0 | 20 | 38 | 9 | 47 | 55 | 3 | 58 | | | | | | | | | | | | 215 | 14 | 229 |
| 16:15 - 16:30 | | | | 13 | 0 | 13 | 54 | 0 | 54 | 37 | 0 | 37 | | | | 21 | 1 | 22 | 30 | 9 | 39 | 74 | 0 | 74 | | | | | | | | | | | | 229 | 10 | 239 |
| 16:30 - 16:45 | | | | 12 | 0 | 12 | 62 | 1 | 63 | 19 | 1 | 20 | | | | 20 | 0 | 20 | 24 | 9 | 33 | 69 | 1 | 70 | | | | | | | | | | | | 206 | 12 | 218 |
| 16:45 - 17:00 | | | | 12 | 0 | 12 | 73 | 1 | 74 | 25 | 0 | 25 | | | | 19 | 1 | 20 | 23 | 1 | 24 | 57 | 4 | 61 | | | | | | | | | | | | 209 | 7 | 216 |
| 17:00 - 17:15 | | | | 16 | 0 | 16 | 78 | 2 | 80 | 33 | 0 | 33 | | | | 15 | 1 | 16 | 31 | 0 | 31 | 62 | 2 | 64 | | | | | | | | | | | | 235 | 5 | 240 |
| 17:15 - 17:30 | | | | 13 | 0 | 13 | 57 | 0 | 57 | 25 | 0 | 25 | | | | 24 | 1 | 25 | 22 | 0 | 22 | 60 | 0 | 60 | | | | | | | | | | | | 201 | 1 | 202 |
| 17:30 - 17:45 | | | | 22 | 1 | 23 | 56 | 1 | 57 | 35 | 0 | 35 | | | | 13 | 1 | 14 | 28 | 0 | 28 | 69 | 0 | 69 | | | | | | | | | | | | 223 | 3 | 226 |
| 17:45 - 18:00 | | | | 11 | 0 | 11 | 64 | 0 | 64 | 31 | 0 | 31 | | | | 31 | 0 | 31 | 15 | 2 | 17 | 53 | 1 | 54 | | | | | | | | | | | | 205 | 3 | 208 |
| 18:00 - 18:15 | | | | 10 | 0 | 10 | 58 | 0 | 58 | 25 | 0 | 25 | | | | 14 | 1 | 15 | 12 | 2 | 14 | 66 | 0 | 66 | | | | | | | | | | | | 185 | 3 | 188 |
| 18:15 - 18:30 | | | | 12 | 0 | 12 | 43 | 0 | 43 | 27 | 0 | 27 | | | | 11 | 0 | 11 | 15 | 0 | 15 | 48 | 1 | 49 | | | | | | | | | | | | 156 | 1 | 157 |
| Σ | | | | 171 | 5 | 176 | 727 | 9 | 736 | 336 | 1 | 337 | | | | 224 | 9 | 233 | 278 | 56 | 334 | 752 | 17 | 769 | | | | | | | | | | | | 2488 | 97 | 2585 |
| 15:45 - 17:45 | 0 | 0 | | 119 | 3 | | 502 | 9 | | 224 | 1 | | 0 | 0 | | 145 | 5 | | 219 | 33 | | 532 | 13 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | | | 1805 |

# Intersection of Remembrance Drive and Macarthur Road

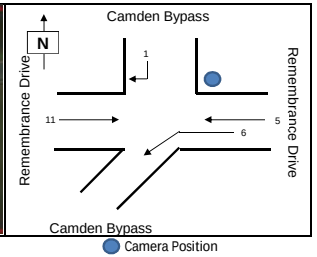
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type Cross Junction
Intersection No. **6B**
North Approach **Remembrance Drive**
East Approach **Camden Bypass**
South Approach **Camden Bypass**
West Approach **Camden Bypass**

Date **3/04/13**

Classification **Light Heavy**




| TIME PERIOD | VEHICLE MOVEMENT 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | VEHICLE MOVEMENT 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | 12 | 4 | 16 | | | | | | | | | | 85 | 8 | 93 | 15 | 4 | 19 | | | | | | | | | | | | | 241 | 4 | 245 | | | | 353 | 20 | 373 |
| 6:45 - 7:00 | 13 | 1 | 14 | | | | | | | | | | 81 | 4 | 85 | 26 | 8 | 34 | | | | | | | | | | | | | 256 | 10 | 266 | | | | 376 | 23 | 399 |
| 7:00 - 7:15 | 13 | 1 | 14 | | | | | | | | | | 67 | 9 | 76 | 19 | 2 | 21 | | | | | | | | | | | | | 243 | 12 | 255 | | | | 342 | 24 | 366 |
| 7:15 - 7:30 | 25 | 1 | 26 | | | | | | | | | | 80 | 9 | 89 | 23 | 5 | 28 | | | | | | | | | | | | | 241 | 5 | 246 | | | | 369 | 20 | 389 |
| 7:30 - 7:45 | 34 | 4 | 38 | | | | | | | | | | 86 | 13 | 99 | 17 | 8 | 25 | | | | | | | | | | | | | 296 | 7 | 303 | | | | 433 | 32 | 465 |
| 7:45 - 8:00 | 32 | 2 | 34 | | | | | | | | | | 118 | 10 | 128 | 24 | 3 | 27 | | | | | | | | | | | | | 281 | 12 | 293 | | | | 455 | 27 | 482 |
| 8:00 - 8:15 | 50 | 0 | 50 | | | | | | | | | | 113 | 11 | 124 | 29 | 5 | 34 | | | | | | | | | | | | | 236 | 4 | 240 | | | | 428 | 20 | 448 |
| 8:15 - 8:30 | 61 | 1 | 62 | | | | | | | | | | 107 | 8 | 115 | 43 | 5 | 48 | | | | | | | | | | | | | 210 | 7 | 217 | | | | 421 | 21 | 442 |
| 8:30 - 8:45 | 51 | 1 | 52 | | | | | | | | | | 115 | 3 | 118 | 54 | 11 | 65 | | | | | | | | | | | | | 192 | 11 | 203 | | | | 412 | 26 | 438 |
| 8:45 - 9:00 | 66 | 2 | 68 | | | | | | | | | | 128 | 3 | 131 | 50 | 6 | 56 | | | | | | | | | | | | | 182 | 13 | 195 | | | | 426 | 24 | 450 |
| 9:00 - 9:15 | 39 | 2 | 41 | | | | | | | | | | 119 | 5 | 124 | 31 | 18 | 49 | | | | | | | | | | | | | 181 | 3 | 184 | | | | 370 | 28 | 398 |
| 9:15 - 9:30 | 41 | 3 | 44 | | | | | | | | | | 87 | 6 | 93 | 25 | 13 | 38 | | | | | | | | | | | | | 162 | 10 | 172 | | | | 315 | 32 | 347 |
| Σ | 437 | 22 | 459 | | | | | | | | | | 1186 | 89 | 1275 | 356 | 88 | 444 | | | | | | | | | | | | | 2721 | 98 | 2819 | | | | 4700 | 297 | 4997 |
| 7:00 - 9:00 | 332 | 12 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 814 | 66 | | 259 | 45 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 1881 | 71 | | 0 | 0 | | | | 3480 |

| TIME PERIOD | VEHICLE MOVEMENT 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | VEHICLE MOVEMENT 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | 43 | 2 | 45 | | | | | | | | | | 192 | 13 | 205 | 39 | 6 | 45 | | | | | | | | | | | | | 141 | 8 | 149 | | | | 415 | 29 | 444 |
| 15:45 - 16:00 | 59 | 3 | 62 | | | | | | | | | | 222 | 8 | 230 | 68 | 14 | 82 | | | | | | | | | | | | | 138 | 11 | 149 | | | | 487 | 36 | 523 |
| 16:00 - 16:15 | 72 | 2 | 74 | | | | | | | | | | 231 | 9 | 240 | 43 | 8 | 51 | | | | | | | | | | | | | 131 | 5 | 136 | | | | 477 | 24 | 501 |
| 16:15 - 16:30 | 50 | 4 | 54 | | | | | | | | | | 266 | 4 | 270 | 60 | 3 | 63 | | | | | | | | | | | | | 153 | 4 | 157 | | | | 529 | 15 | 544 |
| 16:30 - 16:45 | 54 | 3 | 57 | | | | | | | | | | 263 | 9 | 272 | 61 | 9 | 70 | | | | | | | | | | | | | 106 | 4 | 110 | | | | 484 | 25 | 509 |
| 16:45 - 17:00 | 67 | 1 | 68 | | | | | | | | | | 292 | 6 | 298 | 45 | 9 | 54 | | | | | | | | | | | | | 130 | 6 | 136 | | | | 534 | 22 | 556 |
| 17:00 - 17:15 | 68 | 1 | 69 | | | | | | | | | | 329 | 12 | 341 | 50 | 7 | 57 | | | | | | | | | | | | | 147 | 6 | 153 | | | | 594 | 26 | 620 |
| 17:15 - 17:30 | 49 | 0 | 49 | | | | | | | | | | 268 | 6 | 274 | 54 | 4 | 58 | | | | | | | | | | | | | 158 | 1 | 159 | | | | 529 | 11 | 540 |
| 17:30 - 17:45 | 42 | 0 | 42 | | | | | | | | | | 296 | 2 | 298 | 57 | 0 | 57 | | | | | | | | | | | | | 121 | 2 | 123 | | | | 516 | 4 | 520 |
| 17:45 - 18:00 | 54 | 0 | 54 | | | | | | | | | | 295 | 6 | 301 | 47 | 2 | 49 | | | | | | | | | | | | | 108 | 5 | 113 | | | | 504 | 13 | 517 |
| 18:00 - 18:15 | 40 | 0 | 40 | | | | | | | | | | 279 | 5 | 284 | 59 | 3 | 62 | | | | | | | | | | | | | 108 | 3 | 111 | | | | 486 | 11 | 497 |
| 18:15 - 18:30 | 45 | 0 | 45 | | | | | | | | | | 227 | 4 | 231 | 44 | 1 | 45 | | | | | | | | | | | | | 114 | 1 | 115 | | | | 430 | 6 | 436 |
| Σ | 643 | 16 | 659 | | | | | | | | | | 3160 | 84 | 3244 | 627 | 66 | 693 | | | | | | | | | | | | | 1555 | 56 | 1611 | | | | 5985 | 222 | 6207 |
| 15:45 - 17:45 | 461 | 14 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 2167 | 56 | | 438 | 54 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 1084 | 39 | | 0 | 0 | | | | 4313 |

# Intersection of Appin Road and Church Street

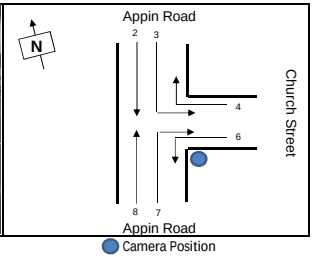
**Thursday, 4 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type T Junction
Intersection No. **7**
North Approach **Appin Road**
East Approach **Church Street**
South Approach **Appin Road**
West Approach

Date **4/04/13**

Classification **Light Heavy**




| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | | | | 9 | 1 | 10 | 41 | 14 | 55 | 56 | 7 | 63 | | | | 11 | 0 | 11 | 10 | 0 | 10 | 9 | 2 | 11 | | | | | | | | | | | | 136 | 24 | 160 |
| 6:45 - 7:00 | | | | 8 | 1 | 9 | 33 | 11 | 44 | 70 | 6 | 76 | | | | 8 | 1 | 9 | 8 | 0 | 8 | 14 | 2 | 16 | | | | | | | | | | | | 141 | 21 | 162 |
| 7:00 - 7:15 | | | | 9 | 3 | 12 | 52 | 7 | 59 | 90 | 5 | 95 | | | | 12 | 1 | 13 | 6 | 0 | 6 | 12 | 0 | 12 | | | | | | | | | | | | 181 | 16 | 197 |
| 7:15 - 7:30 | | | | 10 | 1 | 11 | 72 | 7 | 79 | 96 | 5 | 101 | | | | 15 | 1 | 16 | 6 | 1 | 7 | 16 | 3 | 19 | | | | | | | | | | | | 215 | 18 | 233 |
| 7:30 - 7:45 | | | | 16 | 3 | 19 | 71 | 9 | 80 | 145 | 10 | 155 | | | | 12 | 1 | 13 | 11 | 1 | 12 | 19 | 1 | 20 | | | | | | | | | | | | 274 | 25 | 299 |
| 7:45 - 8:00 | | | | 12 | 3 | 15 | 83 | 10 | 93 | 159 | 9 | 168 | | | | 9 | 0 | 9 | 3 | 1 | 4 | 17 | 0 | 17 | | | | | | | | | | | | 283 | 23 | 306 |
| 8:00 - 8:15 | | | | 18 | 1 | 19 | 68 | 6 | 74 | 145 | 10 | 155 | | | | 11 | 2 | 13 | 4 | 1 | 5 | 16 | 0 | 16 | | | | | | | | | | | | 262 | 20 | 282 |
| 8:15 - 8:30 | | | | 9 | 2 | 11 | 64 | 5 | 69 | 140 | 10 | 150 | | | | 18 | 0 | 18 | 10 | 0 | 10 | 21 | 2 | 23 | | | | | | | | | | | | 262 | 19 | 281 |
| 8:30 - 8:45 | | | | 10 | 2 | 12 | 48 | 5 | 53 | 80 | 12 | 92 | | | | 7 | 1 | 8 | 7 | 0 | 7 | 14 | 2 | 16 | | | | | | | | | | | | 166 | 22 | 188 |
| 8:45 - 9:00 | | | | 13 | 1 | 14 | 51 | 9 | 60 | 90 | 5 | 95 | | | | 9 | 0 | 9 | 8 | 1 | 9 | 19 | 2 | 21 | | | | | | | | | | | | 190 | 18 | 208 |
| 9:00 - 9:15 | | | | 14 | 1 | 15 | 36 | 11 | 47 | 63 | 1 | 64 | | | | 9 | 0 | 9 | 12 | 0 | 12 | 21 | 1 | 22 | | | | | | | | | | | | 155 | 14 | 169 |
| 9:15 - 9:30 | | | | 14 | 2 | 16 | 43 | 10 | 53 | 52 | 8 | 60 | | | | 4 | 0 | 4 | 6 | 0 | 6 | 15 | 1 | 16 | | | | | | | | | | | | 134 | 21 | 155 |
| Σ | | | | 142 | 21 | 163 | 662 | 104 | 766 | 1186 | 88 | 1274 | | | | 125 | 7 | 132 | 91 | 5 | 96 | 193 | 16 | 209 | | | | | | | | | | | | 2399 | 241 | 2640 |
| 7:00 - 9:00 | 0 | 0 | | 97 | 16 | | 509 | 58 | | 945 | 66 | | 0 | 0 | | 93 | 6 | | 55 | 5 | | 134 | 10 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | | | 1994 |

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | | | | 31 | 0 | 31 | 110 | 2 | 112 | 70 | 5 | 75 | | | | 5 | 4 | 9 | 11 | 2 | 13 | 11 | 1 | 12 | | | | | | | | | | | | 238 | 14 | 252 |
| 15:45 - 16:00 | | | | 17 | 2 | 19 | 123 | 3 | 126 | 69 | 5 | 74 | | | | 11 | 2 | 13 | 12 | 1 | 13 | 23 | 1 | 24 | | | | | | | | | | | | 255 | 14 | 269 |
| 16:00 - 16:15 | | | | 15 | 1 | 16 | 101 | 6 | 107 | 77 | 7 | 84 | | | | 21 | 0 | 21 | 12 | 0 | 12 | 25 | 0 | 25 | | | | | | | | | | | | 251 | 14 | 265 |
| 16:15 - 16:30 | | | | 26 | 0 | 26 | 121 | 2 | 123 | 60 | 3 | 63 | | | | 11 | 1 | 12 | 9 | 0 | 9 | 16 | 2 | 18 | | | | | | | | | | | | 243 | 8 | 251 |
| 16:30 - 16:45 | | | | 18 | 1 | 19 | 103 | 4 | 107 | 60 | 4 | 64 | | | | 5 | 1 | 6 | 20 | 0 | 20 | 25 | 0 | 25 | | | | | | | | | | | | 231 | 10 | 241 |
| 16:45 - 17:00 | | | | 16 | 0 | 16 | 114 | 5 | 119 | 59 | 3 | 62 | | | | 14 | 0 | 14 | 15 | 0 | 15 | 22 | 0 | 22 | | | | | | | | | | | | 240 | 8 | 248 |
| 17:00 - 17:15 | | | | 24 | 0 | 24 | 105 | 5 | 110 | 54 | 5 | 59 | | | | 13 | 0 | 13 | 10 | 0 | 10 | 26 | 0 | 26 | | | | | | | | | | | | 232 | 10 | 242 |
| 17:15 - 17:30 | | | | 21 | 1 | 22 | 120 | 6 | 126 | 68 | 4 | 72 | | | | 9 | 1 | 10 | 10 | 0 | 10 | 16 | 0 | 16 | | | | | | | | | | | | 244 | 12 | 256 |
| 17:30 - 17:45 | | | | 23 | 0 | 23 | 104 | 1 | 105 | 71 | 2 | 73 | | | | 12 | 0 | 12 | 6 | 1 | 7 | 16 | 0 | 16 | | | | | | | | | | | | 232 | 4 | 236 |
| 17:45 - 18:00 | | | | 20 | 0 | 20 | 118 | 5 | 123 | 64 | 4 | 68 | | | | 10 | 0 | 10 | 7 | 0 | 7 | 18 | 0 | 18 | | | | | | | | | | | | 237 | 9 | 246 |
| 18:00 - 18:15 | | | | 12 | 0 | 12 | 67 | 2 | 69 | 64 | 3 | 67 | | | | 8 | 0 | 8 | 11 | 0 | 11 | 10 | 0 | 10 | | | | | | | | | | | | 172 | 5 | 177 |
| 18:15 - 18:30 | | | | 9 | 0 | 9 | 47 | 2 | 49 | 49 | 4 | 53 | | | | 13 | 1 | 14 | 8 | 0 | 8 | 11 | 0 | 11 | | | | | | | | | | | | 137 | 7 | 144 |
| Σ | | | | 232 | 5 | 237 | 1233 | 43 | 1276 | 765 | 49 | 814 | | | | 132 | 10 | 142 | 131 | 4 | 135 | 219 | 4 | 223 | | | | | | | | | | | | 2712 | 115 | 2827 |
| 15:45 - 17:45 | 0 | 0 | | 160 | 5 | | 891 | 32 | | 518 | 33 | | 0 | 0 | | 96 | 5 | | 94 | 2 | | 169 | 3 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | | | 2008 |

# Intersection of Appin Roadd and M1 Princes Motorway

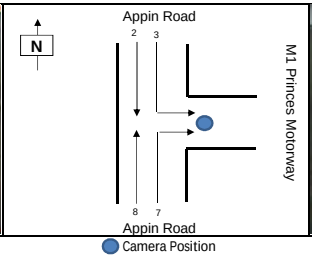
**Thursday, 4 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type T Junction
Intersection No. **8A&B**
North Approach **Appin Road**
East Approach **M1 Princes Motorway**
South Approach **Appin Road**
West Approach

Date **4/04/13**

Classification **Light Heavy**




Camera Position

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | | | | 59 | 11 | 70 | 19 | 4 | 23 | | | | | | | | | | 1 | 0 | 1 | 83 | 11 | 94 | | | | | | | | | | | 162 | 26 | 188 |
| 6:45 - 7:00 | | | | 33 | 15 | 48 | 16 | 0 | 16 | | | | | | | | | | 0 | 0 | 0 | 97 | 10 | 107 | | | | | | | | | | | 146 | 25 | 171 |
| 7:00 - 7:15 | | | | 41 | 13 | 54 | 12 | 2 | 14 | | | | | | | | | | 1 | 0 | 1 | 111 | 13 | 124 | | | | | | | | | | | 165 | 28 | 193 |
| 7:15 - 7:30 | | | | 48 | 24 | 72 | 23 | 0 | 23 | | | | | | | | | | 0 | 0 | 0 | 151 | 15 | 166 | | | | | | | | | | | 222 | 39 | 261 |
| 7:30 - 7:45 | | | | 67 | 15 | 82 | 11 | 0 | 11 | | | | | | | | | | 0 | 0 | 0 | 160 | 16 | 176 | | | | | | | | | | | 238 | 31 | 269 |
| 7:45 - 8:00 | | | | 101 | 11 | 112 | 12 | 0 | 12 | | | | | | | | | | 0 | 0 | 0 | 173 | 16 | 189 | | | | | | | | | | | 286 | 27 | 313 |
| 8:00 - 8:15 | | | | 130 | 15 | 145 | 11 | 3 | 14 | | | | | | | | | | 0 | 0 | 0 | 135 | 14 | 149 | | | | | | | | | | | 276 | 32 | 308 |
| 8:15 - 8:30 | | | | 69 | 13 | 82 | 14 | 2 | 16 | | | | | | | | | | 0 | 0 | 0 | 103 | 24 | 127 | | | | | | | | | | | 186 | 39 | 225 |
| 8:30 - 8:45 | | | | 59 | 9 | 68 | 12 | 0 | 12 | | | | | | | | | | 0 | 0 | 0 | 87 | 10 | 97 | | | | | | | | | | | 158 | 19 | 177 |
| 8:45 - 9:00 | | | | 39 | 13 | 52 | 11 | 1 | 12 | | | | | | | | | | 1 | 0 | 1 | 82 | 5 | 87 | | | | | | | | | | | 133 | 19 | 152 |
| 9:00 - 9:15 | | | | 43 | 16 | 59 | 6 | 3 | 9 | | | | | | | | | | 0 | 0 | 0 | 61 | 13 | 74 | | | | | | | | | | | 110 | 32 | 142 |
| 9:15 - 9:30 | | | | 29 | 8 | 37 | 13 | 4 | 17 | | | | | | | | | | 0 | 0 | 0 | 69 | 10 | 79 | | | | | | | | | | | 111 | 22 | 133 |
| Σ | | | | 718 | 163 | 881 | 160 | 19 | 179 | | | | | | | | | | 3 | 0 | 3 | 1312 | 157 | 1469 | | | | | | | | | | | 2193 | 339 | 2532 |
| 7:00 - 9:00 | 0 | 0 | | 554 | 113 | | 106 | 8 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 2 | 0 | | 1002 | 113 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | | | 1898 |

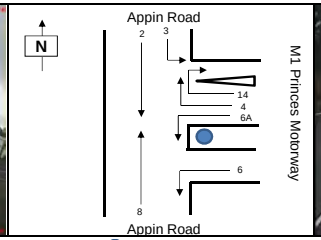
| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | | | | 97 | 6 | 103 | 7 | 0 | 7 | | | | | | | | | | 0 | 0 | 0 | 66 | 11 | 77 | | | | | | | | | | | 170 | 17 | 187 |
| 15:45 - 16:00 | | | | 150 | 9 | 159 | 12 | 1 | 13 | | | | | | | | | | 2 | 0 | 2 | 96 | 6 | 102 | | | | | | | | | | | 260 | 16 | 276 |
| 16:00 - 16:15 | | | | 141 | 7 | 148 | 14 | 0 | 14 | | | | | | | | | | 0 | 0 | 0 | 63 | 12 | 75 | | | | | | | | | | | 218 | 19 | 237 |
| 16:15 - 16:30 | | | | 136 | 7 | 143 | 16 | 0 | 16 | | | | | | | | | | 0 | 0 | 0 | 62 | 8 | 70 | | | | | | | | | | | 214 | 15 | 229 |
| 16:30 - 16:45 | | | | 133 | 8 | 141 | 11 | 0 | 11 | | | | | | | | | | 1 | 0 | 1 | 63 | 7 | 70 | | | | | | | | | | | 208 | 15 | 223 |
| 16:45 - 17:00 | | | | 134 | 7 | 141 | 15 | 0 | 15 | | | | | | | | | | 3 | 0 | 3 | 58 | 5 | 63 | | | | | | | | | | | 210 | 12 | 222 |
| 17:00 - 17:15 | | | | 115 | 10 | 125 | 7 | 0 | 7 | | | | | | | | | | 1 | 0 | 1 | 75 | 10 | 85 | | | | | | | | | | | 198 | 20 | 218 |
| 17:15 - 17:30 | | | | 121 | 9 | 130 | 18 | 0 | 18 | | | | | | | | | | 0 | 0 | 0 | 76 | 6 | 82 | | | | | | | | | | | 215 | 15 | 230 |
| 17:30 - 17:45 | | | | 128 | 4 | 132 | 8 | 0 | 8 | | | | | | | | | | 2 | 0 | 2 | 68 | 7 | 75 | | | | | | | | | | | 206 | 11 | 217 |
| 17:45 - 18:00 | | | | 93 | 3 | 96 | 12 | 0 | 12 | | | | | | | | | | 2 | 0 | 2 | 74 | 9 | 83 | | | | | | | | | | | 181 | 12 | 193 |
| 18:00 - 18:15 | | | | 99 | 8 | 107 | 10 | 0 | 10 | | | | | | | | | | 0 | 0 | 0 | 69 | 7 | 76 | | | | | | | | | | | 178 | 15 | 193 |
| 18:15 - 18:30 | | | | 65 | 6 | 71 | 9 | 0 | 9 | | | | | | | | | | 0 | 0 | 0 | 44 | 8 | 52 | | | | | | | | | | | 118 | 14 | 132 |
| Σ | | | | 1412 | 84 | 1496 | 139 | 1 | 140 | | | | | | | | | | 11 | 0 | 11 | 814 | 96 | 910 | | | | | | | | | | | 2376 | 181 | 2557 |
| 15:45 - 17:45 | 0 | 0 | | 1058 | 61 | | 101 | 1 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 9 | 0 | | 561 | 61 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | | | 1852 |

# Intersection of Appin Roadd and M1 Princes Motorway

**Wednesday, 3 April 2013**

**Austraffic**

| | |
|---|---|
| Survey Start | **6:30 AM 15:30 PM** |
| Intersection Type | T Junction |
| Intersection No. | **8C&D** |
| North Approach | **Appin Road** |
| East Approach | **M1 Princes Motorway** |
| South Approach | **Appin Road** |
| West Approach | |
| Date | **3/04/13** |
| Classification | **Light Heavy** |




Camera Position

| TIME PERIOD | | | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2 | | | 3 | | | 4 | | | 6 | | | 6A | | | 8 | | | 14 | | | | | |
| | | | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 | - | 6:45 | 59 | 11 | 70 | 1 | 2 | 3 | 14 | 0 | 14 | 145 | 6 | 151 | 0 | 0 | 0 | 70 | 11 | 81 | 0 | 0 | 0 | 289 | 30 | 319 |
| 6:45 | - | 7:00 | 33 | 15 | 48 | 0 | 2 | 2 | 7 | 0 | 7 | 130 | 12 | 142 | 0 | 0 | 0 | 90 | 10 | 100 | 0 | 0 | 0 | 260 | 39 | 299 |
| 7:00 | - | 7:15 | 41 | 13 | 54 | 0 | 0 | 0 | 15 | 1 | 16 | 161 | 17 | 178 | 0 | 0 | 0 | 97 | 12 | 109 | 0 | 0 | 0 | 314 | 43 | 357 |
| 7:15 | - | 7:30 | 48 | 24 | 72 | 0 | 0 | 0 | 8 | 1 | 9 | 173 | 16 | 189 | 0 | 0 | 0 | 143 | 14 | 157 | 0 | 0 | 0 | 372 | 55 | 427 |
| 7:30 | - | 7:45 | 67 | 15 | 82 | 0 | 0 | 0 | 10 | 4 | 14 | 288 | 20 | 308 | 0 | 0 | 0 | 150 | 12 | 162 | 0 | 0 | 0 | 515 | 51 | 566 |
| 7:45 | - | 8:00 | 101 | 11 | 112 | 0 | 2 | 2 | 12 | 7 | 19 | 315 | 10 | 325 | 0 | 0 | 0 | 161 | 9 | 170 | 0 | 0 | 0 | 589 | 39 | 628 |
| 8:00 | - | 8:15 | 130 | 15 | 145 | 1 | 0 | 1 | 20 | 2 | 22 | 300 | 19 | 319 | 0 | 0 | 0 | 115 | 12 | 127 | 0 | 0 | 0 | 566 | 48 | 614 |
| 8:15 | - | 8:30 | 69 | 13 | 82 | 7 | 0 | 7 | 12 | 2 | 14 | 301 | 8 | 309 | 0 | 0 | 0 | 91 | 22 | 113 | 0 | 0 | 0 | 480 | 45 | 525 |
| 8:30 | - | 8:45 | 59 | 9 | 68 | 2 | 0 | 2 | 15 | 1 | 16 | 285 | 8 | 293 | 0 | 0 | 0 | 72 | 9 | 81 | 0 | 0 | 0 | 433 | 27 | 460 |
| 8:45 | - | 9:00 | 39 | 13 | 52 | 1 | 0 | 1 | 15 | 0 | 15 | 231 | 14 | 245 | 0 | 0 | 0 | 68 | 5 | 73 | 0 | 0 | 0 | 354 | 32 | 386 |
| 9:00 | - | 9:15 | 43 | 16 | 59 | 0 | 0 | 0 | 9 | 2 | 11 | 208 | 15 | 223 | 0 | 0 | 0 | 52 | 11 | 63 | 0 | 0 | 0 | 312 | 44 | 356 |
| 9:15 | - | 9:30 | 29 | 8 | 37 | 1 | 0 | 1 | 8 | 2 | 10 | 233 | 14 | 247 | 0 | 0 | 0 | 61 | 8 | 69 | 0 | 0 | 0 | 332 | 32 | 364 |
| Σ | | | 718 | 163 | 881 | 13 | 6 | 19 | 145 | 22 | 167 | 2770 | 159 | 2929 | 0 | 0 | 0 | 1170 | 135 | 1305 | 0 | 0 | 0 | 4816 | 485 | 5301 |
| 7:00 | - | 9:00 | **554** | **113** | | **11** | **2** | | **107** | **18** | | **2054** | **112** | | **0** | **0** | | **897** | **95** | | **0** | **0** | | | | |

| Zone 1 | LV | HV |
|---|---|---|
| 7.00-7.30 | 357 | 35 |
| 7.30-8.00 | 625 | 41 |
| 8.00-8.30 | 633 | 31 |
| 8.30-9.00 | 546 | 23 |

| TIME PERIOD | | | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 2 | | | 3 | | | 4 | | | 6 | | | 6A | | | 8 | | | 14 | | | | | |
| | | | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 | - | 15:45 | 97 | 6 | 103 | 2 | 0 | 2 | 11 | 1 | 12 | 294 | 19 | 313 | 0 | 0 | 0 | 55 | 10 | 65 | 0 | 0 | 0 | 459 | 36 | 495 |
| 15:45 | - | 16:00 | 150 | 9 | 159 | 0 | 0 | 0 | 25 | 1 | 26 | 340 | 8 | 348 | 0 | 0 | 0 | 73 | 5 | 78 | 2 | 0 | 2 | 590 | 23 | 613 |
| 16:00 | - | 16:15 | 141 | 7 | 148 | 1 | 0 | 1 | 13 | 0 | 13 | 412 | 13 | 425 | 0 | 0 | 0 | 50 | 12 | 62 | 0 | 0 | 0 | 617 | 32 | 649 |
| 16:15 | - | 16:30 | 136 | 7 | 143 | 3 | 0 | 3 | 11 | 0 | 11 | 403 | 13 | 416 | 0 | 0 | 0 | 51 | 8 | 59 | 0 | 0 | 0 | 604 | 28 | 632 |
| 16:30 | - | 16:45 | 133 | 8 | 141 | 4 | 0 | 4 | 15 | 0 | 15 | 405 | 14 | 419 | 0 | 0 | 0 | 49 | 7 | 56 | 0 | 0 | 0 | 606 | 29 | 635 |
| 16:45 | - | 17:00 | 134 | 7 | 141 | 5 | 0 | 5 | 18 | 0 | 18 | 489 | 14 | 503 | 0 | 0 | 0 | 43 | 5 | 48 | 1 | 0 | 1 | 690 | 26 | 716 |
| 17:00 | - | 17:15 | 115 | 10 | 125 | 0 | 0 | 0 | 15 | 1 | 16 | 414 | 10 | 424 | 0 | 0 | 0 | 61 | 9 | 70 | 0 | 0 | 0 | 605 | 30 | 635 |
| 17:15 | - | 17:30 | 121 | 9 | 130 | 2 | 1 | 3 | 18 | 1 | 19 | 493 | 10 | 503 | 0 | 0 | 0 | 58 | 5 | 63 | 0 | 0 | 0 | 692 | 26 | 718 |
| 17:30 | - | 17:45 | 128 | 4 | 132 | 2 | 0 | 2 | 13 | 0 | 13 | 407 | 7 | 414 | 0 | 0 | 0 | 57 | 7 | 64 | 0 | 0 | 0 | 607 | 18 | 625 |
| 17:45 | - | 18:00 | 93 | 3 | 96 | 1 | 0 | 1 | 14 | 0 | 14 | 419 | 10 | 429 | 0 | 0 | 0 | 62 | 9 | 71 | 0 | 0 | 0 | 589 | 22 | 611 |
| 18:00 | - | 18:15 | 99 | 8 | 107 | 0 | 0 | 0 | 18 | 1 | 19 | 469 | 8 | 477 | 0 | 0 | 0 | 51 | 6 | 57 | 0 | 0 | 0 | 637 | 23 | 660 |
| 18:15 | - | 18:30 | 65 | 6 | 71 | 0 | 0 | 0 | 9 | 0 | 9 | 429 | 5 | 434 | 0 | 0 | 0 | 35 | 8 | 43 | 0 | 0 | 0 | 538 | 19 | 557 |
| Σ | | | 1412 | 84 | 1496 | 20 | 1 | 21 | 180 | 5 | 185 | 4974 | 131 | 5105 | 0 | 0 | 0 | 645 | 91 | 736 | 3 | 0 | 3 | 7234 | 312 | 7546 |
| 15:45 | - | 17:45 | **1058** | **61** | | **17** | **1** | | **128** | **3** | | **3363** | **89** | | **0** | **0** | | **442** | **58** | | **3** | **0** | | | | |

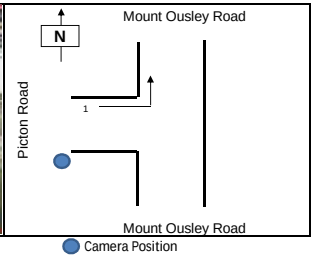
| | LV | HV |
|---|---|---|
| 15.45-16.15 | 790 | 22 |
| 16.15-16.45 | 834 | 27 |
| 16.45-17.15 | 936 | 25 |
| 17.15-17.45 | 931 | 18 |

# Intersection of Mount Ousley Road and Picton Road

**Wednesday, 3 April 2013**

**Austraffic**

| | | |
|---|---|---|
| Survey Start | **6:30** AM | **15:30** PM |
| Intersection Type | T Junction | |
| Intersection No. | **9A** | |
| North Approach | **Mount Ousley Road** | |
| East Approach | | |
| South Approach | **Mount Ousley Road** | |
| West Approach | **Picton Road** | |
| Date | **3/04/13** | |
| Classification | **Light** | **Heavy** |




| TIME PERIOD | | | VEHICLE MOVEMENT 1 | | |
|---|---|---|---|---|---|
| | | | Light | Heavy | Σ |
| 6:30 | - | 6:45 | 1 | 0 | 1 |
| 6:45 | - | 7:00 | 2 | 1 | 3 |
| 7:00 | - | 7:15 | 2 | 1 | 3 |
| 7:15 | - | 7:30 | 2 | 2 | 4 |
| 7:30 | - | 7:45 | 3 | 0 | 3 |
| 7:45 | - | 8:00 | 1 | 0 | 1 |
| 8:00 | - | 8:15 | 2 | 0 | 2 |
| 8:15 | - | 8:30 | 4 | 0 | 4 |
| 8:30 | - | 8:45 | 3 | 0 | 3 |
| 8:45 | - | 9:00 | 2 | 2 | 4 |
| 9:00 | - | 9:15 | 0 | 0 | 0 |
| 9:15 | - | 9:30 | 1 | 0 | 1 |
| Σ | | | 23 | 6 | 29 |
| **7:00** | **-** | **9:00** | **19** | **5** | **24** |

0

| TIME PERIOD | | | VEHICLE MOVEMENT 1 | | |
|---|---|---|---|---|---|
| | | | Light | Heavy | Σ |
| 15:30 | - | 15:45 | 2 | 0 | 2 |
| 15:45 | - | 16:00 | 2 | 1 | 3 |
| 16:00 | - | 16:15 | 5 | 0 | 5 |
| 16:15 | - | 16:30 | 7 | 0 | 7 |
| 16:30 | - | 16:45 | 1 | 0 | 1 |
| 16:45 | - | 17:00 | 3 | 0 | 3 |
| 17:00 | - | 17:15 | 2 | 0 | 2 |
| 17:15 | - | 17:30 | 4 | 0 | 4 |
| 17:30 | - | 17:45 | 1 | 0 | 1 |
| 17:45 | - | 18:00 | 3 | 0 | 3 |
| 18:00 | - | 18:15 | 2 | 0 | 2 |
| 18:15 | - | 18:30 | 3 | 0 | 3 |
| Σ | | | 35 | 1 | 36 |
| **15:45** | **-** | **17:45** | **25** | **1** | **26** |

0

# Intersection of Mount Ousley Road and Picton Road

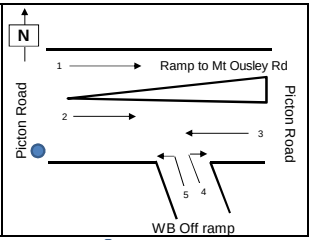
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type T Junction
Intersection No. **9A&B**
North Approach
East Approach **Picton Road**
South Approach **WB Off ramp**
West Approach **Picton Road**

Date **3/04/13**

Classification **Light Heavy**




Camera Position

| TIME PERIOD | | | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | GRAND TOTAL | | |
| | | | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 | - | 6:45 | 0 | 0 | 0 | 106 | 36 | 142 | 6 | 1 | 7 | 4 | 2 | 6 | 0 | 0 | 0 | 116 | 39 | 155 |
| 6:45 | - | 7:00 | 2 | 2 | 4 | 92 | 42 | 134 | 0 | 0 | 0 | 4 | 1 | 5 | 0 | 0 | 0 | 98 | 45 | 143 |
| 7:00 | - | 7:15 | 2 | 1 | 3 | 70 | 33 | 103 | 6 | 0 | 6 | 1 | 0 | 1 | 0 | 0 | 0 | 79 | 34 | 113 |
| 7:15 | - | 7:30 | 2 | 2 | 4 | 96 | 26 | 122 | 8 | 0 | 8 | 2 | 0 | 2 | 0 | 0 | 0 | 108 | 28 | 136 |
| 7:30 | - | 7:45 | 3 | 0 | 3 | 127 | 31 | 158 | 8 | 3 | 11 | 3 | 1 | 4 | 0 | 0 | 0 | 141 | 35 | 176 |
| 7:45 | - | 8:00 | 1 | 0 | 1 | 201 | 39 | 240 | 3 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 205 | 40 | 245 |
| 8:00 | - | 8:15 | 2 | 0 | 2 | 174 | 32 | 206 | 6 | 2 | 8 | 2 | 0 | 2 | 0 | 0 | 0 | 184 | 34 | 218 |
| 8:15 | - | 8:30 | 4 | 0 | 4 | 132 | 23 | 155 | 2 | 0 | 2 | 2 | 2 | 4 | 0 | 0 | 0 | 140 | 25 | 165 |
| 8:30 | - | 8:45 | 3 | 0 | 3 | 116 | 34 | 150 | 2 | 1 | 3 | 7 | 0 | 7 | 0 | 0 | 0 | 128 | 35 | 163 |
| 8:45 | - | 9:00 | 2 | 2 | 4 | 101 | 24 | 125 | 4 | 1 | 5 | 0 | 1 | 1 | 0 | 0 | 0 | 107 | 28 | 135 |
| 9:00 | - | 9:15 | 0 | 0 | 0 | 94 | 18 | 112 | 4 | 0 | 4 | 3 | 0 | 3 | 0 | 0 | 0 | 101 | 18 | 119 |
| 9:15 | - | 9:30 | 1 | 0 | 1 | 73 | 26 | 99 | 7 | 1 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 81 | 27 | 108 |
| Σ | | | 22 | 7 | 29 | 1382 | 364 | 1746 | 56 | 10 | 66 | 28 | 7 | 35 | 0 | 0 | 0 | 1488 | 388 | 1876 |
| 7:00 | - | 9:00 | **19** | **5** | | **1017** | **242** | | **39** | **8** | | **17** | **4** | | **0** | **0** | | | | |

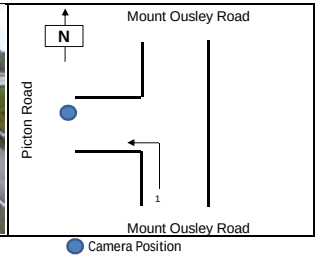
| TIME PERIOD | | | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | GRAND TOTAL | | |
| | | | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 | - | 15:45 | 2 | 0 | 2 | 103 | 27 | 130 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 107 | 27 | 134 |
| 15:45 | - | 16:00 | 3 | 1 | 4 | 122 | 24 | 146 | 2 | 0 | 2 | 3 | 0 | 3 | 0 | 0 | 0 | 130 | 25 | 155 |
| 16:00 | - | 16:15 | 5 | 0 | 5 | 150 | 21 | 171 | 7 | 2 | 9 | 3 | 0 | 3 | 0 | 0 | 0 | 165 | 23 | 188 |
| 16:15 | - | 16:30 | 7 | 0 | 7 | 152 | 25 | 177 | 5 | 2 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 164 | 27 | 191 |
| 16:30 | - | 16:45 | 1 | 0 | 1 | 120 | 23 | 143 | 6 | 0 | 6 | 1 | 0 | 1 | 0 | 0 | 0 | 128 | 23 | 151 |
| 16:45 | - | 17:00 | 3 | 0 | 3 | 121 | 24 | 145 | 1 | 0 | 1 | 3 | 0 | 3 | 0 | 0 | 0 | 128 | 24 | 152 |
| 17:00 | - | 17:15 | 2 | 0 | 2 | 144 | 23 | 167 | 1 | 0 | 1 | 2 | 0 | 2 | 0 | 0 | 0 | 149 | 23 | 172 |
| 17:15 | - | 17:30 | 4 | 0 | 4 | 144 | 15 | 159 | 2 | 0 | 2 | 1 | 1 | 2 | 0 | 0 | 0 | 151 | 16 | 167 |
| 17:30 | - | 17:45 | 1 | 0 | 1 | 150 | 9 | 159 | 5 | 1 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 156 | 10 | 166 |
| 17:45 | - | 18:00 | 3 | 0 | 3 | 139 | 16 | 155 | 5 | 0 | 5 | 2 | 0 | 2 | 0 | 0 | 0 | 149 | 16 | 165 |
| 18:00 | - | 18:15 | 2 | 0 | 2 | 102 | 6 | 108 | 3 | 1 | 4 | 1 | 1 | 2 | 0 | 0 | 0 | 108 | 8 | 116 |
| 18:15 | - | 18:30 | 3 | 0 | 3 | 111 | 13 | 124 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 116 | 13 | 129 |
| Σ | | | 36 | 1 | 37 | 1558 | 226 | 1784 | 38 | 6 | 44 | 19 | 2 | 21 | 0 | 0 | 0 | 1651 | 235 | 1886 |
| 15:45 | - | 17:45 | **26** | **1** | | **1103** | **164** | | **29** | **5** | | **13** | **1** | | **0** | **0** | | | | |

# Intersection of Mount Ousley Road and Picton Road

**Wednesday, 3 April 2013**

**Austraffic**

| | |
|---|---|
| Survey Start | **6:30 AM 15:30 PM** |
| Intersection Type | T Junction |
| Intersection No. | **9C** |
| North Approach | **Mount Ousley Road** |
| East Approach | |
| South Approach | **Mount Ousley Road** |
| West Approach | **Picton Road** |
| Date | **3/04/13** |
| Classification | **Light Heavy** |


| TIME PERIOD | | | VEHICLE MOVEMENT 1 Light | Heavy | Σ |
|---|---|---|---|---|---|
| 6:30 | - | 6:45 | 198 | 40 | 238 |
| 6:45 | - | 7:00 | 120 | 26 | 146 |
| 7:00 | - | 7:15 | 133 | 27 | 160 |
| 7:15 | - | 7:30 | 126 | 35 | 161 |
| 7:30 | - | 7:45 | 109 | 33 | 142 |
| 7:45 | - | 8:00 | 103 | 29 | 132 |
| 8:00 | - | 8:15 | 91 | 27 | 118 |
| 8:15 | - | 8:30 | 81 | 31 | 112 |
| 8:30 | - | 8:45 | 81 | 28 | 109 |
| 8:45 | - | 9:00 | 66 | 28 | 94 |
| 9:00 | - | 9:15 | 64 | 41 | 105 |
| 9:15 | - | 9:30 | 76 | 46 | 122 |
| | Σ | | 1248 | 391 | 1639 |
| 7:00 | - | 9:00 | **790** | **238** | **1028** |

| Zone 1 | LV | HV | Total PCU |
|---|---|---|---|
| 7.00-7.30 | 1012 | 103 | 1218 |
| 7.30-8.00 | 811 | 112 | 1035 |
| 8.00-8.30 | 642 | 107 | 856 |
| 8.30-9.00 | 574 | 110 | 794 |

| TIME PERIOD | | | VEHICLE MOVEMENT 1 Light | Heavy | Σ |
|---|---|---|---|---|---|
| 15:30 | - | 15:45 | 112 | 20 | 132 |
| 15:45 | - | 16:00 | 98 | 21 | 119 |
| 16:00 | - | 16:15 | 99 | 22 | 121 |
| 16:15 | - | 16:30 | 110 | 13 | 123 |
| 16:30 | - | 16:45 | 118 | 20 | 138 |
| 16:45 | - | 17:00 | 128 | 16 | 144 |
| 17:00 | - | 17:15 | 125 | 22 | 147 |
| 17:15 | - | 17:30 | 129 | 10 | 139 |
| 17:30 | - | 17:45 | 120 | 11 | 131 |
| 17:45 | - | 18:00 | 101 | 11 | 112 |
| 18:00 | - | 18:15 | 92 | 7 | 99 |
| 18:15 | - | 18:30 | 52 | 12 | 64 |
| | Σ | | 1284 | 185 | 1469 |
| 15:45 | - | 17:45 | **927** | **135** | **1062** |

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| | LV | HV | Total PCU |
|---|---|---|---|
| 15.45-16.15 | 672 | 76 | 824 |
| 16.15-16.45 | 756 | 59 | 874 |
| 16.45-17.15 | 766 | 56 | 878 |
| 17.15-17.45 | 811 | 46 | 903 |

# Intersection of Mount Ousley Road and Picton Road

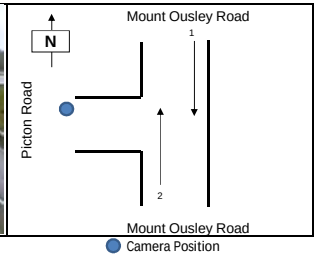
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type T Junction
Intersection No. **9D**
North Approach **Mount Ousley Road**
East Approach
South Approach **Mount Ousley Road**
West Approach **Picton Road**

Date **3/04/13**

Classification **Light Heavy**


| TIME PERIOD | | | VEHICLE MOVEMENT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | | | 2 | | | GRAND TOTAL | | |
| | | | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 | - | 6:45 | 167 | 32 | 199 | 430 | 35 | 465 | 597 | 67 | 664 |
| 6:45 | - | 7:00 | 152 | 18 | 170 | 279 | 11 | 290 | 431 | 29 | 460 |
| 7:00 | - | 7:15 | 161 | 21 | 182 | 418 | 18 | 436 | 579 | 39 | 618 |
| 7:15 | - | 7:30 | 165 | 14 | 179 | 335 | 23 | 358 | 500 | 37 | 537 |
| 7:30 | - | 7:45 | 254 | 13 | 267 | 315 | 27 | 342 | 569 | 40 | 609 |
| 7:45 | - | 8:00 | 362 | 24 | 386 | 284 | 23 | 307 | 646 | 47 | 693 |
| 8:00 | - | 8:15 | 357 | 15 | 372 | 231 | 24 | 255 | 588 | 39 | 627 |
| 8:15 | - | 8:30 | 275 | 23 | 298 | 239 | 25 | 264 | 514 | 48 | 562 |
| 8:30 | - | 8:45 | 217 | 32 | 249 | 213 | 22 | 235 | 430 | 54 | 484 |
| 8:45 | - | 9:00 | 225 | 18 | 243 | 214 | 32 | 246 | 439 | 50 | 489 |
| 9:00 | - | 9:15 | 228 | 16 | 244 | 212 | 18 | 230 | 440 | 34 | 474 |
| 9:15 | - | 9:30 | 243 | 30 | 273 | 232 | 40 | 272 | 475 | 70 | 545 |
| | Σ | | 2806 | 256 | 3062 | 3402 | 298 | 3700 | 6208 | 554 | 6762 |
| 7:00 | - | 9:00 | **2016** | **160** | | **2249** | **194** | | **4265** | **354** | **4619** |

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| TIME PERIOD | | | VEHICLE MOVEMENT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | | | 2 | | | GRAND TOTAL | | |
| | | | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 | - | 15:45 | 307 | 25 | 332 | 245 | 20 | 265 | 552 | 45 | 597 |
| 15:45 | - | 16:00 | 314 | 12 | 326 | 241 | 15 | 256 | 555 | 27 | 582 |
| 16:00 | - | 16:15 | 310 | 19 | 329 | 234 | 18 | 252 | 544 | 37 | 581 |
| 16:15 | - | 16:30 | 326 | 26 | 352 | 242 | 10 | 252 | 568 | 36 | 604 |
| 16:30 | - | 16:45 | 346 | 10 | 356 | 286 | 16 | 302 | 632 | 26 | 658 |
| 16:45 | - | 17:00 | 423 | 23 | 446 | 260 | 11 | 271 | 683 | 34 | 717 |
| 17:00 | - | 17:15 | 367 | 18 | 385 | 253 | 7 | 260 | 620 | 25 | 645 |
| 17:15 | - | 17:30 | 364 | 16 | 380 | 296 | 9 | 305 | 660 | 25 | 685 |
| 17:30 | - | 17:45 | 332 | 16 | 348 | 266 | 16 | 282 | 598 | 32 | 630 |
| 17:45 | - | 18:00 | 348 | 19 | 367 | 259 | 14 | 273 | 607 | 33 | 640 |
| 18:00 | - | 18:15 | 350 | 13 | 363 | 199 | 11 | 210 | 549 | 24 | 573 |
| 18:15 | - | 18:30 | 302 | 8 | 310 | 167 | 10 | 177 | 469 | 18 | 487 |
| | Σ | | 4089 | 205 | 4294 | 2948 | 157 | 3105 | 7037 | 362 | 7399 |
| 15:45 | - | 17:45 | **2782** | **140** | | **2078** | **102** | | **4860** | **242** | **5102** |

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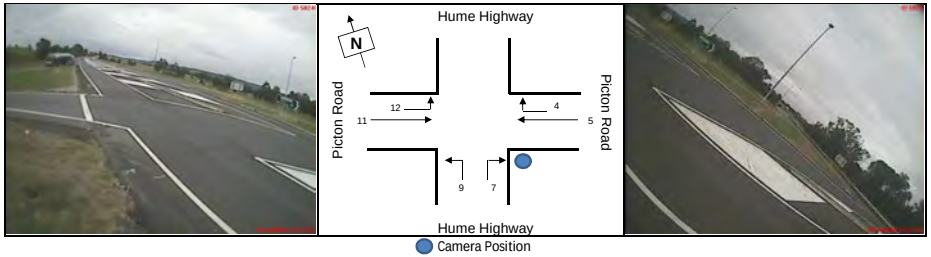
# Intersection of Picton Road and Hume Highway

**Wednesday, 3 April 2013**

**Austraffic**

| | |
|---|---|
| Survey Start | **6:30 AM 15:30 PM** |
| Intersection Type | Cross Junction |
| Intersection No. | **10A** |
| North Approach | **Hume Highway** |
| East Approach | **Picton Road** |
| South Approach | **Hume Highway** |
| West Approach | **Picton Road** |
| Date | **3/04/13** |
| | **4/04/13** |
| Classification | **Light Heavy** |




| TIME PERIOD | VEHICLE MOVEMENT 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | | | | | | | | | | 89 | 25 | 114 | 37 | 12 | 49 | | | |
| 6:45 - 7:00 | | | | | | | | | | 92 | 22 | 114 | 45 | 14 | 59 | | | |
| 7:00 - 7:15 | | | | | | | | | | 99 | 18 | 117 | 34 | 14 | 48 | | | |
| 7:15 - 7:30 | | | | | | | | | | 112 | 15 | 127 | 45 | 10 | 55 | | | |
| 7:30 - 7:45 | | | | | | | | | | 115 | 28 | 143 | 62 | 17 | 79 | | | |
| 7:45 - 8:00 | | | | | | | | | | 101 | 24 | 125 | 59 | 12 | 71 | | | |
| 8:00 - 8:15 | | | | | | | | | | 68 | 22 | 90 | 53 | 9 | 62 | | | |
| 8:15 - 8:30 | | | | | | | | | | 71 | 27 | 98 | 55 | 3 | 58 | | | |
| 8:30 - 8:45 | | | | | | | | | | 63 | 19 | 82 | 54 | 12 | 66 | | | |
| 8:45 - 9:00 | | | | | | | | | | 52 | 22 | 74 | 50 | 8 | 58 | | | |
| 9:00 - 9:15 | | | | | | | | | | 42 | 17 | 59 | 42 | 4 | 46 | | | |
| 9:15 - 9:30 | | | | | | | | | | 49 | 21 | 70 | 51 | 8 | 59 | | | |
| Σ | | | | | | | | | | 953 | 260 | 1213 | 587 | 123 | 710 | | | |
| **7:00 - 9:00** | **0** | **0** | | **0** | **0** | | **0** | **0** | | **681** | **175** | | **412** | **85** | | **0** | **0** | |
| **7:30 - 8:30** | | | | | | | | | | **355** | **101** | | **229** | **41** | | | | |

| TIME PERIOD | VEHICLE MOVEMENT 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | 13 | 5 | 18 | | | | 14 | 0 | 14 | | | | 30 | 3 | 33 | 66 | 6 | 72 | 249 | 51 | 300 |
| 6:45 - 7:00 | 30 | 7 | 37 | | | | 7 | 0 | 7 | | | | 33 | 4 | 37 | 80 | 8 | 88 | 287 | 55 | 342 |
| 7:00 - 7:15 | 30 | 4 | 34 | | | | 9 | 2 | 11 | | | | 49 | 5 | 54 | 85 | 4 | 89 | 306 | 47 | 353 |
| 7:15 - 7:30 | 53 | 7 | 60 | | | | 10 | 1 | 11 | | | | 75 | 10 | 85 | 84 | 9 | 93 | 379 | 52 | 431 |
| 7:30 - 7:45 | 44 | 1 | 45 | | | | 9 | 1 | 10 | | | | 55 | 8 | 63 | 76 | 6 | 82 | 361 | 61 | 422 |
| 7:45 - 8:00 | 28 | 2 | 30 | | | | 22 | 0 | 22 | | | | 51 | 3 | 54 | 74 | 9 | 83 | 335 | 50 | 385 |
| 8:00 - 8:15 | 31 | 2 | 33 | | | | 11 | 2 | 13 | | | | 59 | 7 | 66 | 51 | 3 | 54 | 272 | 45 | 318 |
| 8:15 - 8:30 | 38 | 3 | 41 | | | | 14 | 1 | 15 | | | | 50 | 3 | 53 | 56 | 1 | 57 | 284 | 38 | 322 |
| 8:30 - 8:45 | 26 | 4 | 30 | | | | 15 | 0 | 15 | | | | 49 | 3 | 52 | 45 | 5 | 50 | 252 | 43 | 295 |
| 8:45 - 9:00 | 18 | 3 | 21 | | | | 15 | 0 | 15 | | | | 44 | 9 | 53 | 35 | 3 | 38 | 214 | 45 | 259 |
| 9:00 - 9:15 | 24 | 7 | 31 | | | | 9 | 2 | 11 | | | | 37 | 3 | 40 | 33 | 6 | 39 | 187 | 39 | 226 |
| 9:15 - 9:30 | 29 | 6 | 35 | | | | 12 | 0 | 12 | | | | 38 | 3 | 41 | 25 | 5 | 30 | 204 | 43 | 247 |
| Σ | 364 | 51 | 415 | | | | 147 | 9 | 156 | | | | 570 | 61 | 631 | 710 | 65 | 775 | 3331 | 569 | 3900 |
| **7:00 - 9:00** | **268** | **26** | | **0** | **0** | | **105** | **7** | | **0** | **0** | | **432** | **48** | | **506** | **40** | | | | **2785** |
| **7:30 - 8:30** | **141** | **8** | | | | | **56** | **4** | | | | | **215** | **21** | | **257** | **19** | | | | |

| TIME PERIOD | VEHICLE MOVEMENT 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | | | | | | | | | | 91 | 17 | 108 | 71 | 5 | 76 | | | |
| 15:45 - 16:00 | | | | | | | | | | 78 | 19 | 97 | 83 | 11 | 94 | | | |
| 16:00 - 16:15 | | | | | | | | | | 55 | 13 | 68 | 108 | 13 | 121 | | | |
| 16:15 - 16:30 | | | | | | | | | | 62 | 17 | 79 | 104 | 12 | 116 | | | |
| 16:30 - 16:45 | | | | | | | | | | 64 | 15 | 79 | 127 | 4 | 131 | | | |
| 16:45 - 17:00 | | | | | | | | | | 65 | 18 | 83 | 128 | 5 | 133 | | | |
| 17:00 - 17:15 | | | | | | | | | | 71 | 16 | 87 | 138 | 5 | 143 | | | |
| 17:15 - 17:30 | | | | | | | | | | 56 | 13 | 69 | 132 | 4 | 136 | | | |
| 17:30 - 17:45 | | | | | | | | | | 55 | 9 | 64 | 129 | 3 | 132 | | | |
| 17:45 - 18:00 | | | | | | | | | | 46 | 11 | 57 | 113 | 2 | 115 | | | |
| 18:00 - 18:15 | | | | | | | | | | 40 | 8 | 48 | 105 | 7 | 112 | | | |
| 18:15 - 18:30 | | | | | | | | | | 30 | 10 | 40 | 102 | 1 | 103 | | | |
| Σ | | | | | | | | | | 713 | 166 | 879 | 1340 | 72 | 1412 | | | |
| **15:45 - 17:45** | **0** | **0** | | **0** | **0** | | **0** | **0** | | **506** | **120** | | **949** | **57** | | **0** | **0** | |

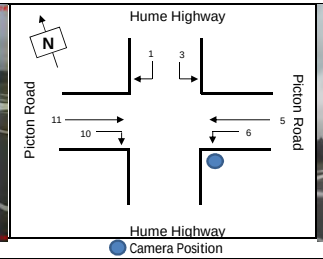
| TIME PERIOD | VEHICLE MOVEMENT 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | 42 | 5 | 47 | | | | 11 | 1 | 12 | | | | 41 | 6 | 47 | 19 | 1 | 20 | 275 | 35 | 310 |
| 15:45 - 16:00 | 44 | 4 | 48 | | | | 15 | 3 | 18 | | | | 44 | 5 | 49 | 23 | 2 | 25 | 287 | 44 | 331 |
| 16:00 - 16:15 | 46 | 6 | 52 | | | | 14 | 1 | 15 | | | | 46 | 2 | 48 | 29 | 4 | 33 | 298 | 39 | 337 |
| 16:15 - 16:30 | 39 | 5 | 44 | | | | 21 | 2 | 23 | | | | 55 | 4 | 59 | 24 | 2 | 26 | 305 | 42 | 347 |
| 16:30 - 16:45 | 44 | 5 | 49 | | | | 11 | 0 | 11 | | | | 46 | 5 | 51 | 23 | 2 | 25 | 315 | 31 | 346 |
| 16:45 - 17:00 | 40 | 5 | 45 | | | | 13 | 1 | 14 | | | | 63 | 5 | 68 | 28 | 1 | 29 | 337 | 35 | 372 |
| 17:00 - 17:15 | 37 | 7 | 44 | | | | 21 | 1 | 22 | | | | 61 | 2 | 63 | 25 | 3 | 28 | 353 | 34 | 387 |
| 17:15 - 17:30 | 28 | 6 | 34 | | | | 19 | 0 | 19 | | | | 57 | 4 | 61 | 26 | 4 | 30 | 318 | 31 | 349 |
| 17:30 - 17:45 | 34 | 6 | 40 | | | | 20 | 0 | 20 | | | | 40 | 2 | 42 | 15 | 3 | 18 | 293 | 23 | 316 |
| 17:45 - 18:00 | 32 | 3 | 35 | | | | 10 | 0 | 10 | | | | 39 | 4 | 43 | 18 | 1 | 19 | 258 | 21 | 279 |
| 18:00 - 18:15 | 34 | 3 | 37 | | | | 10 | 1 | 11 | | | | 34 | 2 | 36 | 15 | 1 | 16 | 238 | 22 | 260 |
| 18:15 - 18:30 | 28 | 2 | 30 | | | | 5 | 1 | 6 | | | | 33 | 1 | 34 | 13 | 1 | 14 | 211 | 16 | 227 |
| Σ | 448 | 57 | 505 | | | | 170 | 11 | 181 | | | | 559 | 42 | 601 | 258 | 25 | 283 | 3488 | 373 | 3861 |
| **15:45 - 17:45** | **312** | **44** | | **0** | **0** | | **134** | **8** | | **0** | **0** | | **412** | **29** | | **193** | **21** | | | | **2785** |

# Intersection of Picton Road and Hume Highway

**Wednesday, 3 April 2013**

**Austraffic**

| | |
|---|---|
| Survey Start | **6:30 AM 15:30 PM** |
| Intersection Type | Cross Junction |
| Intersection No. | **10B** |
| North Approach | **Hume Highway** |
| East Approach | **Picton Road** |
| South Approach | **Hume Highway** |
| West Approach | **Picton Road** |
| Date | **3/04/13** |
| | **4/04/13** |
| Classification | **Light Heavy** |




| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | 19 | 9 | 28 | | | | 51 | 33 | 84 | | | | 112 | 31 | 143 | 32 | 4 | 36 | | | | | | | | | | 7 | 2 | 9 | 36 | 8 | 44 | | | | 257 | 87 | 344 |
| 6:45 - 7:00 | 20 | 7 | 27 | | | | 44 | 28 | 72 | | | | 114 | 29 | 143 | 41 | 6 | 47 | | | | | | | | | | 6 | 2 | 8 | 56 | 9 | 65 | | | | 281 | 81 | 362 |
| 7:00 - 7:15 | 14 | 9 | 23 | | | | 53 | 35 | 88 | | | | 121 | 24 | 145 | 45 | 4 | 49 | | | | | | | | | | 11 | 1 | 12 | 69 | 8 | 77 | | | | 313 | 81 | 394 |
| 7:15 - 7:30 | 22 | 3 | 25 | | | | 71 | 24 | 95 | | | | 140 | 25 | 165 | 30 | 6 | 36 | | | | | | | | | | 12 | 4 | 16 | 114 | 13 | 127 | | | | 389 | 75 | 464 |
| 7:30 - 7:45 | 20 | 8 | 28 | | | | 85 | 26 | 111 | | | | 160 | 37 | 197 | 32 | 8 | 40 | | | | | | | | | | 11 | 1 | 12 | 86 | 8 | 94 | | | | 394 | 88 | 482 |
| 7:45 - 8:00 | 21 | 5 | 26 | | | | 91 | 30 | 121 | | | | 143 | 30 | 173 | 53 | 5 | 58 | | | | | | | | | | 15 | 1 | 16 | 65 | 4 | 69 | | | | 388 | 75 | 463 |
| 8:00 - 8:15 | 26 | 4 | 30 | | | | 64 | 20 | 84 | | | | 99 | 28 | 127 | 40 | 6 | 46 | | | | | | | | | | 22 | 2 | 24 | 66 | 6 | 72 | | | | 317 | 66 | 383 |
| 8:15 - 8:30 | 22 | 1 | 23 | | | | 56 | 32 | 88 | | | | 101 | 28 | 129 | 26 | 3 | 29 | | | | | | | | | | 12 | 2 | 14 | 78 | 5 | 83 | | | | 295 | 71 | 366 |
| 8:30 - 8:45 | 20 | 1 | 21 | | | | 54 | 17 | 71 | | | | 96 | 30 | 126 | 31 | 4 | 35 | | | | | | | | | | 11 | 2 | 13 | 64 | 6 | 70 | | | | 276 | 60 | 336 |
| 8:45 - 9:00 | 21 | 2 | 23 | | | | 53 | 19 | 72 | | | | 81 | 29 | 110 | 33 | 13 | 46 | | | | | | | | | | 9 | 3 | 12 | 53 | 8 | 61 | | | | 250 | 74 | 324 |
| 9:00 - 9:15 | 19 | 3 | 22 | | | | 41 | 17 | 58 | | | | 67 | 19 | 86 | 25 | 8 | 33 | | | | | | | | | | 11 | 1 | 12 | 52 | 9 | 61 | | | | 215 | 57 | 272 |
| 9:15 - 9:30 | 19 | 4 | 23 | | | | 39 | 25 | 64 | | | | 78 | 24 | 102 | 25 | 12 | 37 | | | | | | | | | | 9 | 1 | 10 | 56 | 8 | 64 | | | | 226 | 74 | 300 |
| Σ | 243 | 56 | 299 | | | | 702 | 306 | 1008 | | | | 1312 | 334 | 1646 | 413 | 79 | 492 | | | | | | | | | | 136 | 22 | 158 | 795 | 92 | 887 | | | | 3601 | 889 | 4490 |
| 7:00 - 9:00 | **166** | **33** | | **0** | **0** | | **527** | **203** | | **0** | **0** | | **941** | **231** | | **290** | **49** | | **0** | **0** | | **0** | **0** | | **0** | **0** | | **103** | **16** | | **595** | **58** | | **0** | **0** | | | | **3212** |
| 7:30 - 8:30 | **89** | **18** | | | | | **296** | **108** | | | | | **503** | **123** | | **151** | **22** | | | | | | | | | | | **60** | **6** | | **295** | **23** | | | | | | | |

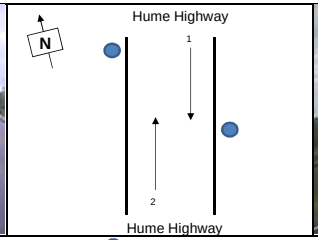
| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | 56 | 3 | 59 | | | | 62 | 18 | 80 | | | | 108 | 22 | 130 | 37 | 5 | 42 | | | | | | | | | | 9 | 3 | 12 | 74 | 9 | 83 | | | | 346 | 60 | 406 |
| 15:45 - 16:00 | 55 | 5 | 60 | | | | 80 | 19 | 99 | | | | 105 | 24 | 129 | 35 | 1 | 36 | | | | | | | | | | 7 | 4 | 11 | 86 | 6 | 92 | | | | 368 | 59 | 427 |
| 16:00 - 16:15 | 63 | 5 | 68 | | | | 89 | 12 | 101 | | | | 102 | 20 | 122 | 36 | 2 | 38 | | | | | | | | | | 7 | 1 | 8 | 83 | 8 | 91 | | | | 380 | 48 | 428 |
| 16:15 - 16:30 | 59 | 6 | 65 | | | | 88 | 13 | 101 | | | | 105 | 25 | 130 | 43 | 8 | 51 | | | | | | | | | | 11 | 2 | 13 | 80 | 6 | 86 | | | | 386 | 60 | 446 |
| 16:30 - 16:45 | 68 | 5 | 73 | | | | 70 | 13 | 83 | | | | 128 | 17 | 145 | 32 | 3 | 35 | | | | | | | | | | 8 | 5 | 13 | 85 | 5 | 90 | | | | 391 | 48 | 439 |
| 16:45 - 17:00 | 56 | 3 | 59 | | | | 81 | 7 | 88 | | | | 135 | 18 | 153 | 30 | 2 | 32 | | | | | | | | | | 13 | 4 | 17 | 85 | 8 | 93 | | | | 400 | 42 | 442 |
| 17:00 - 17:15 | 78 | 6 | 84 | | | | 79 | 14 | 93 | | | | 136 | 17 | 153 | 38 | 2 | 40 | | | | | | | | | | 14 | 1 | 15 | 83 | 6 | 89 | | | | 428 | 46 | 474 |
| 17:15 - 17:30 | 75 | 2 | 77 | | | | 88 | 10 | 98 | | | | 119 | 16 | 135 | 37 | 6 | 43 | | | | | | | | | | 7 | 0 | 7 | 75 | 9 | 84 | | | | 401 | 43 | 444 |
| 17:30 - 17:45 | 76 | 3 | 79 | | | | 98 | 11 | 109 | | | | 112 | 8 | 120 | 39 | 6 | 45 | | | | | | | | | | 11 | 2 | 13 | 66 | 6 | 72 | | | | 402 | 36 | 438 |
| 17:45 - 18:00 | 53 | 0 | 53 | | | | 95 | 6 | 101 | | | | 105 | 13 | 118 | 35 | 1 | 36 | | | | | | | | | | 11 | 1 | 12 | 65 | 6 | 71 | | | | 364 | 27 | 391 |
| 18:00 - 18:15 | 45 | 6 | 51 | | | | 72 | 8 | 80 | | | | 99 | 9 | 108 | 36 | 1 | 37 | | | | | | | | | | 9 | 1 | 10 | 63 | 3 | 66 | | | | 324 | 28 | 352 |
| 18:15 - 18:30 | 42 | 1 | 43 | | | | 74 | 9 | 83 | | | | 93 | 10 | 103 | 23 | 4 | 27 | | | | | | | | | | 8 | 0 | 8 | 51 | 4 | 55 | | | | 291 | 28 | 319 |
| Σ | 726 | 45 | 771 | | | | 976 | 140 | 1116 | | | | 1347 | 199 | 1546 | 421 | 41 | 462 | | | | | | | | | | 115 | 24 | 139 | 896 | 76 | 972 | | | | 4481 | 525 | 5006 |
| 15:45 - 17:45 | **530** | **35** | | **0** | **0** | | **673** | **99** | | **0** | **0** | | **942** | **145** | | **290** | **30** | | **0** | **0** | | **0** | **0** | | **0** | **0** | | **78** | **19** | | **643** | **54** | | **0** | **0** | | | | **3538** |

# Intersection of Picton Road and Hume Highway

**Wednesday, 3 April 2013**

**Austraffic**

| | |
|---|---|
| Survey Start | **6:30 AM 15:30 PM** |
| Intersection Type | Midblock |
| Intersection No. | **10C** |
| North Approach | **Hume Highway** |
| East Approach | |
| South Approach | **Hume Highway** |
| West Approach | |
| Date | **3/04/13** |
| | **4/04/13** |
| Classification | **Light Heavy** |


| TIME PERIOD | VEHICLE MOVEMENT 1 | | | VEHICLE MOVEMENT 2 | | | GRAND TOTAL | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | |
| 6:30 - 6:45 | 123 | 26 | 149 | 162 | 35 | 197 | 285 | 61 | 346 | |
| 6:45 - 7:00 | 139 | 29 | 168 | 156 | 17 | 173 | 295 | 46 | 341 | |
| 7:00 - 7:15 | 156 | 45 | 201 | 144 | 32 | 176 | 300 | 77 | 377 | |
| 7:15 - 7:30 | 148 | 37 | 185 | 157 | 37 | 194 | 305 | 74 | 379 | |
| 7:30 - 7:45 | 161 | 41 | 202 | 168 | 45 | 213 | 329 | 86 | 415 | |
| 7:45 - 8:00 | 143 | 31 | 174 | 167 | 37 | 204 | 310 | 68 | 378 | |
| 8:00 - 8:15 | 156 | 33 | 189 | 185 | 26 | 211 | 341 | 59 | 400 | |
| 8:15 - 8:30 | 147 | 33 | 180 | 155 | 40 | 195 | 302 | 73 | 375 | |
| 8:30 - 8:45 | 154 | 31 | 185 | 140 | 41 | 181 | 294 | 72 | 366 | |
| 8:45 - 9:00 | 124 | 33 | 157 | 161 | 44 | 205 | 285 | 77 | 362 | |
| 9:00 - 9:15 | 98 | 24 | 122 | 135 | 32 | 167 | 233 | 56 | 289 | |
| 9:15 - 9:30 | 106 | 28 | 134 | 156 | 34 | 190 | 262 | 62 | 324 | |
| Σ | 1655 | 391 | 2046 | 1886 | 420 | 2306 | 3541 | 811 | 4352 | |
| **7:00 - 9:00** | **1189** | **284** | | **1277** | **302** | | | | **3052** | 0 |
| **7:30 - 8:30** | **607** | **138** | | **675** | **148** | | | | | |

| TIME PERIOD | VEHICLE MOVEMENT 1 | | | VEHICLE MOVEMENT 2 | | | GRAND TOTAL | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | |
| 15:30 - 15:45 | 169 | 46 | 215 | 174 | 33 | 207 | 343 | 79 | 422 | |
| 15:45 - 16:00 | 168 | 37 | 205 | 209 | 35 | 244 | 377 | 72 | 449 | |
| 16:00 - 16:15 | 160 | 38 | 198 | 203 | 28 | 231 | 363 | 66 | 429 | |
| 16:15 - 16:30 | 174 | 37 | 211 | 158 | 37 | 195 | 332 | 74 | 406 | |
| 16:30 - 16:45 | 181 | 33 | 214 | 205 | 31 | 236 | 386 | 64 | 450 | |
| 16:45 - 17:00 | 179 | 34 | 213 | 189 | 43 | 232 | 368 | 77 | 445 | |
| 17:00 - 17:15 | 199 | 23 | 222 | 174 | 22 | 196 | 373 | 45 | 418 | |
| 17:15 - 17:30 | 204 | 41 | 245 | 172 | 24 | 196 | 376 | 65 | 441 | |
| 17:30 - 17:45 | 239 | 28 | 267 | 161 | 25 | 186 | 400 | 53 | 453 | |
| 17:45 - 18:00 | 217 | 39 | 256 | 153 | 28 | 181 | 370 | 67 | 437 | |
| 18:00 - 18:15 | 206 | 42 | 248 | 139 | 27 | 166 | 345 | 69 | 414 | |
| 18:15 - 18:30 | 187 | 33 | 220 | 136 | 15 | 151 | 323 | 48 | 371 | |
| Σ | 2283 | 431 | 2714 | 2073 | 348 | 2421 | 4356 | 779 | 5135 | |
| **15:45 - 17:45** | **1504** | **271** | | **1471** | **245** | | **2975** | **516** | **3491** | 0 |

# Intersection of Menangle Street, Remembrance Drive and Argyle St

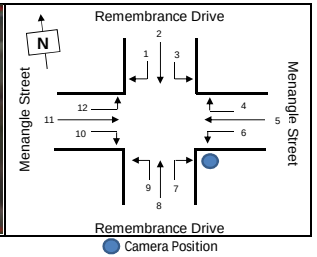
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type Cross Junction
Intersection No. **11**
North Approach **Remembrance Drive**
East Approach **Menangle Street**
South Approach **Remembrance Drive**
West Approach **Menangle Street**

Date **3/04/13**

Classification **Light Heavy**




| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | 0 | 0 | 0 | 29 | 4 | 33 | 13 | 0 | 13 | 5 | 1 | 6 | 0 | 2 | 2 | 9 | 9 | 18 | 24 | 7 | 31 | 97 | 5 | 102 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 177 | 28 | 205 |
| 6:45 - 7:00 | 0 | 0 | 0 | 33 | 3 | 36 | 18 | 2 | 20 | 5 | 2 | 7 | 1 | 0 | 1 | 5 | 5 | 10 | 24 | 5 | 29 | 68 | 9 | 77 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 154 | 28 | 182 |
| 7:00 - 7:15 | 2 | 0 | 2 | 35 | 6 | 41 | 22 | 1 | 23 | 5 | 0 | 5 | 0 | 0 | 0 | 4 | 9 | 13 | 17 | 2 | 19 | 73 | 4 | 77 | 0 | 0 | 0 | 2 | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 161 | 22 | 183 |
| 7:15 - 7:30 | 1 | 0 | 1 | 42 | 3 | 45 | 32 | 2 | 34 | 8 | 2 | 10 | 2 | 0 | 2 | 8 | 1 | 9 | 35 | 11 | 46 | 95 | 5 | 100 | 1 | 0 | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 225 | 25 | 250 |
| 7:30 - 7:45 | 4 | 0 | 4 | 38 | 2 | 40 | 12 | 0 | 12 | 6 | 4 | 10 | 2 | 0 | 2 | 11 | 7 | 18 | 29 | 8 | 37 | 103 | 4 | 107 | 3 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 210 | 25 | 235 |
| 7:45 - 8:00 | 3 | 0 | 3 | 56 | 7 | 63 | 17 | 0 | 17 | 6 | 0 | 6 | 2 | 0 | 2 | 10 | 4 | 14 | 34 | 2 | 36 | 93 | 1 | 94 | 2 | 0 | 2 | 3 | 0 | 3 | 1 | 0 | 1 | 1 | 0 | 1 | 228 | 14 | 242 |
| 8:00 - 8:15 | 7 | 0 | 7 | 58 | 1 | 59 | 14 | 2 | 16 | 9 | 2 | 11 | 0 | 0 | 0 | 12 | 1 | 13 | 32 | 3 | 35 | 115 | 4 | 119 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 251 | 13 | 264 |
| 8:15 - 8:30 | 5 | 0 | 5 | 51 | 5 | 56 | 20 | 0 | 20 | 4 | 0 | 4 | 1 | 0 | 1 | 19 | 6 | 25 | 32 | 2 | 34 | 123 | 3 | 126 | 7 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 264 | 16 | 280 |
| 8:30 - 8:45 | 4 | 0 | 4 | 72 | 4 | 76 | 26 | 1 | 27 | 10 | 0 | 10 | 1 | 0 | 1 | 14 | 4 | 18 | 37 | 2 | 39 | 91 | 6 | 97 | 10 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 267 | 17 | 284 |
| 8:45 - 9:00 | 6 | 1 | 7 | 62 | 4 | 66 | 21 | 1 | 22 | 10 | 1 | 11 | 2 | 0 | 2 | 13 | 9 | 22 | 57 | 7 | 64 | 101 | 11 | 112 | 18 | 1 | 19 | 0 | 0 | 0 | 1 | 0 | 1 | 6 | 2 | 8 | 297 | 37 | 334 |
| 9:00 - 9:15 | 4 | 0 | 4 | 58 | 4 | 62 | 20 | 0 | 20 | 15 | 1 | 16 | 1 | 0 | 1 | 20 | 7 | 27 | 33 | 1 | 34 | 137 | 3 | 140 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 294 | 16 | 310 |
| 9:15 - 9:30 | 2 | 0 | 2 | 76 | 5 | 81 | 19 | 1 | 20 | 8 | 0 | 8 | 2 | 0 | 2 | 17 | 5 | 22 | 37 | 2 | 39 | 97 | 3 | 100 | 6 | 0 | 6 | 2 | 0 | 2 | 1 | 0 | 1 | 4 | 0 | 4 | 271 | 16 | 287 |
| Σ | 38 | 1 | 39 | 610 | 48 | 658 | 234 | 10 | 244 | 91 | 13 | 104 | 14 | 2 | 16 | 142 | 67 | 209 | 391 | 52 | 443 | 1193 | 58 | 1251 | 52 | 1 | 53 | 8 | 2 | 10 | 5 | 0 | 5 | 21 | 3 | 24 | 2799 | 257 | 3056 |
| 7:00 - 9:00 | 32 | 1 | | 414 | 32 | | 164 | 7 | | 58 | 9 | | 10 | 0 | | 91 | 41 | | 273 | 37 | | 794 | 38 | | 42 | 1 | | 6 | 1 | | 4 | 0 | | 15 | 2 | | | | 2072 |
| 7:00 - 8:00 | 10 | 0 | 10 | 171 | 18 | 207 | 83 | 3 | 89 | 25 | 6 | 37 | 6 | 0 | 6 | 33 | 21 | 75 | 115 | 23 | 161 | 364 | 14 | 392 | 6 | 0 | 6 | 6 | 1 | 8 | 3 | 0 | 3 | 2 | 0 | 2 | | | |

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | 2 | 0 | 2 | 130 | 5 | 135 | 14 | 2 | 16 | 14 | 0 | 14 | 1 | 0 | 1 | 21 | 3 | 24 | 30 | 6 | 36 | 119 | 5 | 124 | 8 | 0 | 8 | 4 | 0 | 4 | 0 | 0 | 0 | 1 | 0 | 1 | 344 | 21 | 365 |
| 15:45 - 16:00 | 4 | 0 | 4 | 132 | 2 | 134 | 21 | 1 | 22 | 16 | 0 | 16 | 0 | 0 | 0 | 32 | 9 | 41 | 29 | 5 | 34 | 91 | 1 | 92 | 2 | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 8 | 0 | 8 | 336 | 18 | 354 |
| 16:00 - 16:15 | 5 | 0 | 5 | 137 | 6 | 143 | 14 | 0 | 14 | 11 | 3 | 14 | 3 | 0 | 3 | 22 | 4 | 26 | 20 | 3 | 23 | 95 | 1 | 96 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 2 | 311 | 17 | 328 |
| 16:15 - 16:30 | 6 | 0 | 6 | 156 | 5 | 161 | 12 | 1 | 13 | 10 | 2 | 12 | 2 | 0 | 2 | 35 | 7 | 42 | 21 | 5 | 26 | 67 | 5 | 72 | 2 | 0 | 2 | 2 | 0 | 2 | 1 | 0 | 1 | 4 | 0 | 4 | 318 | 25 | 343 |
| 16:30 - 16:45 | 4 | 0 | 4 | 139 | 5 | 144 | 17 | 0 | 17 | 8 | 0 | 8 | 1 | 0 | 1 | 49 | 6 | 55 | 23 | 4 | 27 | 66 | 0 | 66 | 3 | 0 | 3 | 1 | 0 | 1 | 1 | 0 | 1 | 6 | 0 | 6 | 318 | 15 | 333 |
| 16:45 - 17:00 | 1 | 0 | 1 | 141 | 2 | 143 | 9 | 1 | 10 | 10 | 0 | 10 | 0 | 0 | 0 | 35 | 5 | 40 | 20 | 2 | 22 | 85 | 2 | 87 | 1 | 0 | 1 | 4 | 0 | 4 | 2 | 0 | 2 | 4 | 0 | 4 | 312 | 12 | 324 |
| 17:00 - 17:15 | 3 | 1 | 4 | 142 | 4 | 146 | 19 | 0 | 19 | 11 | 0 | 11 | 1 | 0 | 1 | 38 | 7 | 45 | 18 | 3 | 21 | 81 | 1 | 82 | 3 | 0 | 3 | 2 | 0 | 2 | 1 | 0 | 1 | 6 | 0 | 6 | 325 | 16 | 341 |
| 17:15 - 17:30 | 2 | 0 | 2 | 150 | 1 | 151 | 20 | 0 | 20 | 17 | 1 | 18 | 1 | 0 | 1 | 39 | 6 | 45 | 21 | 3 | 24 | 77 | 3 | 80 | 7 | 0 | 7 | 6 | 1 | 7 | 1 | 0 | 1 | 12 | 0 | 12 | 353 | 15 | 368 |
| 17:30 - 17:45 | 1 | 0 | 1 | 141 | 2 | 143 | 20 | 0 | 20 | 10 | 0 | 10 | 0 | 0 | 0 | 30 | 2 | 32 | 20 | 1 | 21 | 72 | 2 | 74 | 0 | 0 | 0 | 5 | 0 | 5 | 1 | 0 | 1 | 5 | 0 | 5 | 305 | 7 | 312 |
| 17:45 - 18:00 | 2 | 0 | 2 | 132 | 4 | 136 | 26 | 0 | 26 | 16 | 1 | 17 | 2 | 0 | 2 | 29 | 2 | 31 | 17 | 4 | 21 | 89 | 2 | 91 | 1 | 0 | 1 | 2 | 0 | 2 | 1 | 0 | 1 | 1 | 0 | 1 | 318 | 13 | 331 |
| 18:00 - 18:15 | 4 | 0 | 4 | 126 | 2 | 128 | 13 | 1 | 14 | 19 | 0 | 19 | 4 | 0 | 4 | 35 | 3 | 38 | 15 | 0 | 15 | 68 | 2 | 70 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 3 | 0 | 3 | 288 | 8 | 296 |
| 18:15 - 18:30 | 1 | 0 | 1 | 92 | 1 | 93 | 13 | 0 | 13 | 8 | 0 | 8 | 1 | 0 | 1 | 21 | 3 | 24 | 11 | 0 | 11 | 78 | 0 | 78 | 2 | 0 | 2 | 4 | 0 | 4 | 3 | 0 | 3 | 6 | 0 | 6 | 240 | 4 | 244 |
| Σ | 35 | 1 | 36 | 1618 | 39 | 1657 | 198 | 6 | 204 | 150 | 7 | 157 | 16 | 0 | 16 | 386 | 57 | 443 | 245 | 36 | 281 | 988 | 24 | 1012 | 29 | 0 | 29 | 34 | 1 | 35 | 11 | 0 | 11 | 58 | 0 | 58 | 3768 | 171 | 3939 |
| 15:45 - 17:45 | 26 | 1 | | 1138 | 27 | | 132 | 3 | | 93 | 6 | | 8 | 0 | | 280 | 46 | | 172 | 26 | | 634 | 15 | | 18 | 0 | | 23 | 1 | | 7 | 0 | | 47 | 0 | | | | 2703 |
| 16:45 - 17:45 | 7 | 1 | 9 | 574 | 9 | 592 | 68 | 1 | 70 | 48 | 1 | 50 | 2 | 0 | 2 | 142 | 20 | 182 | 79 | 9 | 97 | 315 | 8 | 331 | 11 | 0 | 11 | 17 | 1 | 19 | 5 | 0 | 5 | 27 | 0 | 27 | | | |

# Intersection of Menangle Road and Camden Road

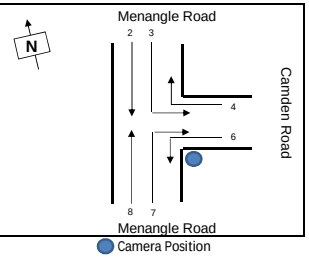
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type T Junction
Intersection No. **12**
North Approach **Menangle Road**
East Approach **Camden Road**
South Approach **Menangle Road**
West Approach

Date **3/04/13**

Classification **Light Heavy**




| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | | | | 10 | 1 | 11 | 2 | 0 | 2 | 14 | 1 | 15 | | | | 2 | 0 | 2 | 1 | 0 | 1 | 26 | 2 | 28 | | | | | | | | | | | | 55 | 4 | 59 |
| 6:45 - 7:00 | | | | 11 | 1 | 12 | 10 | 0 | 10 | 23 | 1 | 24 | | | | 2 | 0 | 2 | 2 | 1 | 3 | 21 | 3 | 24 | | | | | | | | | | | | 69 | 6 | 75 |
| 7:00 - 7:15 | | | | 17 | 2 | 19 | 9 | 1 | 10 | 28 | 0 | 28 | | | | 3 | 0 | 3 | 2 | 0 | 2 | 19 | 0 | 19 | | | | | | | | | | | | 78 | 3 | 81 |
| 7:15 - 7:30 | | | | 29 | 2 | 31 | 19 | 0 | 19 | 23 | 2 | 25 | | | | 2 | 0 | 2 | 0 | 1 | 1 | 18 | 1 | 19 | | | | | | | | | | | | 91 | 6 | 97 |
| 7:30 - 7:45 | | | | 21 | 2 | 23 | 25 | 0 | 25 | 30 | 4 | 34 | | | | 2 | 0 | 2 | 4 | 4 | 8 | 34 | 1 | 35 | | | | | | | | | | | | 116 | 11 | 127 |
| 7:45 - 8:00 | | | | 28 | 1 | 29 | 19 | 1 | 20 | 40 | 2 | 42 | | | | 1 | 0 | 1 | 2 | 0 | 2 | 37 | 4 | 41 | | | | | | | | | | | | 127 | 8 | 135 |
| 8:00 - 8:15 | | | | 24 | 1 | 25 | 8 | 1 | 9 | 42 | 0 | 42 | | | | 4 | 1 | 5 | 1 | 1 | 2 | 42 | 1 | 43 | | | | | | | | | | | | 121 | 5 | 126 |
| 8:15 - 8:30 | | | | 24 | 2 | 26 | 5 | 0 | 5 | 30 | 0 | 30 | | | | 4 | 1 | 5 | 4 | 0 | 4 | 39 | 2 | 41 | | | | | | | | | | | | 106 | 5 | 111 |
| 8:30 - 8:45 | | | | 27 | 3 | 30 | 17 | 0 | 17 | 34 | 0 | 34 | | | | 4 | 0 | 4 | 7 | 0 | 7 | 31 | 0 | 31 | | | | | | | | | | | | 120 | 3 | 123 |
| 8:45 - 9:00 | | | | 15 | 0 | 15 | 11 | 1 | 12 | 26 | 1 | 27 | | | | 5 | 1 | 6 | 6 | 1 | 7 | 32 | 3 | 35 | | | | | | | | | | | | 95 | 7 | 102 |
| 9:00 - 9:15 | | | | 16 | 0 | 16 | 16 | 0 | 16 | 25 | 0 | 25 | | | | 3 | 0 | 3 | 7 | 0 | 7 | 28 | 0 | 28 | | | | | | | | | | | | 95 | 0 | 95 |
| 9:15 - 9:30 | | | | 15 | 0 | 15 | 13 | 0 | 13 | 26 | 0 | 26 | | | | 6 | 0 | 6 | 3 | 1 | 4 | 26 | 0 | 26 | | | | | | | | | | | | 89 | 1 | 90 |
| Σ | | | | 237 | 15 | 252 | 154 | 4 | 158 | 341 | 11 | 352 | | | | 38 | 3 | 41 | 39 | 9 | 48 | 353 | 17 | 370 | | | | | | | | | | | | 1162 | 59 | 1221 |
| 7:00 - 9:00 | 0 | 0 | | 185 | 13 | | 113 | 4 | | 253 | 9 | | 0 | 0 | | 25 | 3 | | 26 | 7 | | 252 | 12 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | | | 902 |

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | | | | 17 | 1 | 18 | 34 | 2 | 36 | 14 | 0 | 14 | | | | 4 | 3 | 7 | 4 | 0 | 4 | 16 | 1 | 17 | | | | | | | | | | | | 89 | 7 | 96 |
| 15:45 - 16:00 | | | | 26 | 1 | 27 | 26 | 1 | 27 | 20 | 0 | 20 | | | | 3 | 0 | 3 | 9 | 1 | 10 | 30 | 0 | 30 | | | | | | | | | | | | 114 | 3 | 117 |
| 16:00 - 16:15 | | | | 22 | 1 | 23 | 23 | 1 | 24 | 18 | 0 | 18 | | | | 6 | 3 | 9 | 3 | 0 | 3 | 26 | 1 | 27 | | | | | | | | | | | | 98 | 6 | 104 |
| 16:15 - 16:30 | | | | 29 | 0 | 29 | 32 | 3 | 35 | 5 | 0 | 5 | | | | 6 | 0 | 6 | 3 | 0 | 3 | 24 | 0 | 24 | | | | | | | | | | | | 99 | 3 | 102 |
| 16:30 - 16:45 | | | | 39 | 1 | 40 | 34 | 0 | 34 | 15 | 0 | 15 | | | | 4 | 0 | 4 | 9 | 0 | 9 | 33 | 1 | 34 | | | | | | | | | | | | 134 | 2 | 136 |
| 16:45 - 17:00 | | | | 41 | 2 | 43 | 39 | 0 | 39 | 18 | 0 | 18 | | | | 5 | 0 | 5 | 9 | 0 | 9 | 17 | 0 | 17 | | | | | | | | | | | | 129 | 2 | 131 |
| 17:00 - 17:15 | | | | 48 | 0 | 48 | 31 | 0 | 31 | 19 | 0 | 19 | | | | 6 | 0 | 6 | 6 | 0 | 6 | 28 | 0 | 28 | | | | | | | | | | | | 138 | 0 | 138 |
| 17:15 - 17:30 | | | | 40 | 0 | 40 | 32 | 0 | 32 | 23 | 0 | 23 | | | | 3 | 0 | 3 | 6 | 0 | 6 | 30 | 0 | 30 | | | | | | | | | | | | 134 | 0 | 134 |
| 17:30 - 17:45 | | | | 44 | 0 | 44 | 30 | 1 | 31 | 17 | 0 | 17 | | | | 3 | 0 | 3 | 1 | 0 | 1 | 27 | 0 | 27 | | | | | | | | | | | | 122 | 1 | 123 |
| 17:45 - 18:00 | | | | 35 | 0 | 35 | 27 | 0 | 27 | 15 | 0 | 15 | | | | 5 | 0 | 5 | 3 | 0 | 3 | 26 | 1 | 27 | | | | | | | | | | | | 111 | 1 | 112 |
| 18:00 - 18:15 | | | | 27 | 1 | 28 | 27 | 0 | 27 | 16 | 1 | 17 | | | | 3 | 0 | 3 | 6 | 0 | 6 | 22 | 1 | 23 | | | | | | | | | | | | 101 | 3 | 104 |
| 18:15 - 18:30 | | | | 19 | 1 | 20 | 22 | 1 | 23 | 15 | 0 | 15 | | | | 6 | 0 | 6 | 2 | 0 | 2 | 28 | 1 | 29 | | | | | | | | | | | | 92 | 3 | 95 |
| Σ | | | | 387 | 8 | 395 | 357 | 9 | 366 | 195 | 1 | 196 | | | | 54 | 6 | 60 | 61 | 1 | 62 | 307 | 6 | 313 | | | | | | | | | | | | 1361 | 31 | 1392 |
| 15:45 - 17:45 | 0 | 0 | | 289 | 5 | | 247 | 6 | | 135 | 0 | | 0 | 0 | | 36 | 3 | | 46 | 1 | | 215 | 2 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | | | 985 |

# Intersection of Hume Highway and Remembrance Drive

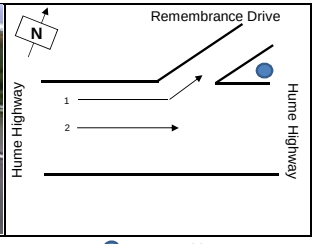
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type T Junction
Intersection No. **13A**
North Approach **Remembrance Drive**
East Approach **Hume Highway**
South Approach
West Approach **Hume Highway**

Date **3/04/13**

Classification **Light Heavy**




Camera Position

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | GRAND TOTAL | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | 8 | 3 | 11 | 121 | 33 | 154 | 129 | 36 | 165 |
| 6:45 - 7:00 | 12 | 2 | 14 | 111 | 26 | 137 | 123 | 28 | 151 |
| 7:00 - 7:15 | 8 | 0 | 8 | 122 | 32 | 154 | 130 | 32 | 162 |
| 7:15 - 7:30 | 10 | 4 | 14 | 148 | 52 | 200 | 158 | 56 | 214 |
| 7:30 - 7:45 | 16 | 2 | 18 | 143 | 27 | 170 | 159 | 29 | 188 |
| 7:45 - 8:00 | 25 | 3 | 28 | 165 | 27 | 192 | 190 | 30 | 220 |
| 8:00 - 8:15 | 16 | 0 | 16 | 136 | 38 | 174 | 152 | 38 | 190 |
| 8:15 - 8:30 | 15 | 1 | 16 | 143 | 39 | 182 | 158 | 40 | 198 |
| 8:30 - 8:45 | 12 | 1 | 13 | 171 | 40 | 211 | 183 | 41 | 224 |
| 8:45 - 9:00 | 15 | 1 | 16 | 139 | 45 | 184 | 154 | 46 | 200 |
| 9:00 - 9:15 | 12 | 3 | 15 | 138 | 33 | 171 | 150 | 36 | 186 |
| 9:15 - 9:30 | 23 | 1 | 24 | 172 | 44 | 216 | 195 | 45 | 240 |
| Σ | 172 | 21 | 193 | 1709 | 436 | 2145 | 1881 | 457 | 2338 |
| **7:00 - 9:00** | **117** | **12** | | **1167** | **300** | | **1284** | **312** | **1596** |

0

| Zone 1 | LV | HV | Total PCU |
|---|---|---|---|
| 7.00-7.30 | 288 | 88 | 464 |
| 7.30-8.00 | 349 | 59 | 467 |
| 8.00-8.30 | 310 | 78 | 466 |
| 8.30-9.00 | 337 | 87 | 511 |

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | GRAND TOTAL | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | 46 | 4 | 50 | 199 | 42 | 241 | 245 | 46 | 291 |
| 15:45 - 16:00 | 51 | 1 | 52 | 246 | 42 | 288 | 297 | 43 | 340 |
| 16:00 - 16:15 | 46 | 2 | 48 | 207 | 36 | 243 | 253 | 38 | 291 |
| 16:15 - 16:30 | 37 | 5 | 42 | 231 | 36 | 267 | 268 | 41 | 309 |
| 16:30 - 16:45 | 41 | 2 | 43 | 211 | 43 | 254 | 252 | 45 | 297 |
| 16:45 - 17:00 | 46 | 2 | 48 | 211 | 31 | 242 | 257 | 33 | 290 |
| 17:00 - 17:15 | 50 | 1 | 51 | 201 | 26 | 227 | 251 | 27 | 278 |
| 17:15 - 17:30 | 48 | 3 | 51 | 198 | 27 | 225 | 246 | 30 | 276 |
| 17:30 - 17:45 | 45 | 0 | 45 | 195 | 26 | 221 | 240 | 26 | 266 |
| 17:45 - 18:00 | 40 | 2 | 42 | 159 | 31 | 190 | 199 | 33 | 232 |
| 18:00 - 18:15 | 26 | 0 | 26 | 180 | 20 | 200 | 206 | 20 | 226 |
| 18:15 - 18:30 | 23 | 1 | 24 | 143 | 26 | 169 | 166 | 27 | 193 |
| Σ | 499 | 23 | 522 | 2381 | 386 | 2767 | 2880 | 409 | 3289 |
| **15:45 - 17:45** | **364** | **16** | | **1700** | **267** | | **2064** | **283** | **2347** |

0 **0**

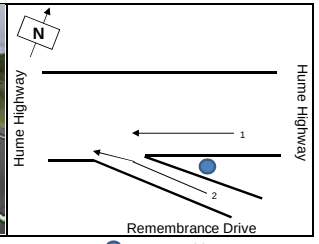
| | LV | HV | Total PCU |
|---|---|---|---|
| 15.45-16.15 | 550 | 81 | 712 |
| 16.15-16.45 | 520 | 86 | 692 |
| 16.45-17.15 | 508 | 60 | 628 |
| 17.15-17.45 | 486 | 56 | 598 |

# Intersection of Hume Highway and Remembrance Drive

**Wednesday, 3 April 2013**

**Austraffic**

| | |
|---|---|
| Survey Start | **6:30 AM 15:30 PM** |
| Intersection Type | T Junction |
| Intersection No. | **13B** |
| North Approach | |
| East Approach | **Hume Highway** |
| South Approach | **Remembrance Drive** |
| West Approach | **Hume Highway** |
| Date | **3/04/13** |
| Classification | **Light Heavy** |


| TIME PERIOD | | | VEHICLE MOVEMENT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | | | 2 | | | GRAND TOTAL | | |
| | | | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 | - | 6:45 | 125 | 43 | 168 | 27 | 4 | 31 | 152 | 47 | 199 |
| 6:45 | - | 7:00 | 140 | 21 | 161 | 26 | 4 | 30 | 166 | 25 | 191 |
| 7:00 | - | 7:15 | 171 | 45 | 216 | 34 | 4 | 38 | 205 | 49 | 254 |
| 7:15 | - | 7:30 | 175 | 41 | 216 | 29 | 4 | 33 | 204 | 45 | 249 |
| 7:30 | - | 7:45 | 178 | 44 | 222 | 46 | 3 | 49 | 224 | 47 | 271 |
| 7:45 | - | 8:00 | 183 | 52 | 235 | 34 | 1 | 35 | 217 | 53 | 270 |
| 8:00 | - | 8:15 | 203 | 33 | 236 | 68 | 4 | 72 | 271 | 37 | 308 |
| 8:15 | - | 8:30 | 175 | 41 | 216 | 53 | 5 | 58 | 228 | 46 | 274 |
| 8:30 | - | 8:45 | 180 | 27 | 207 | 53 | 1 | 54 | 233 | 28 | 261 |
| 8:45 | - | 9:00 | 152 | 39 | 191 | 26 | 2 | 28 | 178 | 41 | 219 |
| 9:00 | - | 9:15 | 132 | 44 | 176 | 30 | 4 | 34 | 162 | 48 | 210 |
| 9:15 | - | 9:30 | 125 | 33 | 158 | 30 | 2 | 32 | 155 | 35 | 190 |
| | Σ | | 1939 | 463 | 2402 | 456 | 38 | 494 | 2395 | 501 | 2896 |
| 7:00 | - | 9:00 | **1417** | **322** | | **343** | **24** | | **1760** | **346** | **2106** |

0

| TIME PERIOD | | | VEHICLE MOVEMENT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1 | | | 2 | | | GRAND TOTAL | | |
| | | | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 | - | 15:45 | 168 | 47 | 215 | 23 | 2 | 25 | 191 | 49 | 240 |
| 15:45 | - | 16:00 | 179 | 45 | 224 | 21 | 0 | 21 | 200 | 45 | 245 |
| 16:00 | - | 16:15 | 145 | 38 | 183 | 24 | 2 | 26 | 169 | 40 | 209 |
| 16:15 | - | 16:30 | 148 | 43 | 191 | 30 | 1 | 31 | 178 | 44 | 222 |
| 16:30 | - | 16:45 | 156 | 34 | 190 | 27 | 1 | 28 | 183 | 35 | 218 |
| 16:45 | - | 17:00 | 159 | 50 | 209 | 26 | 0 | 26 | 185 | 50 | 235 |
| 17:00 | - | 17:15 | 185 | 32 | 217 | 26 | 1 | 27 | 211 | 33 | 244 |
| 17:15 | - | 17:30 | 172 | 38 | 210 | 16 | 1 | 17 | 188 | 39 | 227 |
| 17:30 | - | 17:45 | 215 | 34 | 249 | 29 | 1 | 30 | 244 | 35 | 279 |
| 17:45 | - | 18:00 | 208 | 45 | 253 | 21 | 0 | 21 | 229 | 45 | 274 |
| 18:00 | - | 18:15 | 178 | 39 | 217 | 15 | 2 | 17 | 193 | 41 | 234 |
| 18:15 | - | 18:30 | 177 | 44 | 221 | 20 | 0 | 20 | 197 | 44 | 241 |
| | Σ | | 2090 | 489 | 2579 | 278 | 11 | 289 | 2368 | 500 | 2868 |
| 15:45 | - | 17:45 | **1359** | **314** | | **199** | **7** | | **1558** | **321** | **1879** |

0

# Intersection of Picton Road and Menangle Road

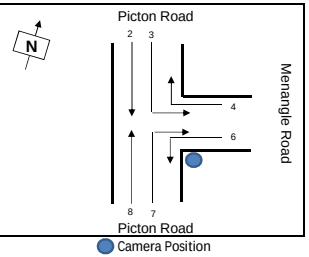
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type T Junction
Intersection No. **14**
North Approach **Picton Road**
East Approach **Menangle Road**
South Approach **Picton Road**
West Approach

Date **3/04/13**

Classification **Light Heavy**




| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | | | | 94 | 8 | 102 | 21 | 0 | 21 | 5 | 0 | 5 | | | | 7 | 2 | 9 | 5 | 1 | 6 | 42 | 11 | 53 | | | | | | | | | | | | 174 | 22 | 196 |
| 6:45 - 7:00 | | | | 106 | 11 | 117 | 8 | 2 | 10 | 7 | 1 | 8 | | | | 8 | 1 | 9 | 10 | 2 | 12 | 46 | 11 | 57 | | | | | | | | | | | | 185 | 28 | 213 |
| 7:00 - 7:15 | | | | 122 | 6 | 128 | 8 | 0 | 8 | 3 | 0 | 3 | | | | 11 | 1 | 12 | 13 | 3 | 16 | 33 | 13 | 46 | | | | | | | | | | | | 190 | 23 | 213 |
| 7:15 - 7:30 | | | | 140 | 14 | 154 | 15 | 3 | 18 | 9 | 1 | 10 | | | | 20 | 2 | 22 | 16 | 2 | 18 | 36 | 9 | 45 | | | | | | | | | | | | 236 | 31 | 267 |
| 7:30 - 7:45 | | | | 114 | 13 | 127 | 23 | 1 | 24 | 10 | 1 | 11 | | | | 15 | 2 | 17 | 15 | 5 | 20 | 52 | 12 | 64 | | | | | | | | | | | | 229 | 34 | 263 |
| 7:45 - 8:00 | | | | 113 | 15 | 128 | 14 | 0 | 14 | 11 | 0 | 11 | | | | 14 | 0 | 14 | 17 | 3 | 20 | 64 | 9 | 73 | | | | | | | | | | | | 233 | 27 | 260 |
| 8:00 - 8:15 | | | | 95 | 11 | 106 | 25 | 1 | 26 | 14 | 0 | 14 | | | | 19 | 1 | 20 | 14 | 2 | 16 | 52 | 7 | 59 | | | | | | | | | | | | 219 | 22 | 241 |
| 8:15 - 8:30 | | | | 88 | 2 | 90 | 23 | 0 | 23 | 12 | 1 | 13 | | | | 15 | 2 | 17 | 13 | 1 | 14 | 58 | 5 | 63 | | | | | | | | | | | | 209 | 11 | 220 |
| 8:30 - 8:45 | | | | 73 | 6 | 79 | 22 | 1 | 23 | 11 | 2 | 13 | | | | 16 | 0 | 16 | 10 | 1 | 11 | 57 | 9 | 66 | | | | | | | | | | | | 189 | 19 | 208 |
| 8:45 - 9:00 | | | | 66 | 7 | 73 | 23 | 0 | 23 | 15 | 1 | 16 | | | | 16 | 2 | 18 | 13 | 1 | 14 | 53 | 6 | 59 | | | | | | | | | | | | 186 | 17 | 203 |
| 9:00 - 9:15 | | | | 64 | 8 | 72 | 26 | 0 | 26 | 12 | 1 | 13 | | | | 4 | 0 | 4 | 13 | 1 | 14 | 41 | 3 | 44 | | | | | | | | | | | | 160 | 13 | 173 |
| 9:15 - 9:30 | | | | 50 | 5 | 55 | 16 | 1 | 17 | 7 | 0 | 7 | | | | 13 | 0 | 13 | 11 | 0 | 11 | 49 | 8 | 57 | | | | | | | | | | | | 146 | 14 | 160 |
| Σ | | | | 1125 | 106 | 1231 | 224 | 9 | 233 | 116 | 8 | 124 | | | | 158 | 13 | 171 | 150 | 22 | 172 | 583 | 103 | 686 | | | | | | | | | | | | 2356 | 261 | 2617 |
| 7:00 - 9:00 | 0 | 0 | | 811 | 74 | | 153 | 6 | | 85 | 6 | | 0 | 0 | | 126 | 10 | | 111 | 18 | | 405 | 70 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | | | 1875 |

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | | | | 57 | 7 | 64 | 18 | 0 | 18 | 11 | 1 | 12 | | | | 6 | 0 | 6 | 10 | 2 | 12 | 73 | 7 | 80 | | | | | | | | | | | | 175 | 17 | 192 |
| 15:45 - 16:00 | | | | 59 | 8 | 67 | 28 | 1 | 29 | 16 | 1 | 17 | | | | 7 | 1 | 8 | 9 | 0 | 9 | 93 | 12 | 105 | | | | | | | | | | | | 212 | 23 | 235 |
| 16:00 - 16:15 | | | | 62 | 5 | 67 | 14 | 1 | 15 | 21 | 1 | 22 | | | | 11 | 1 | 12 | 11 | 0 | 11 | 112 | 11 | 123 | | | | | | | | | | | | 231 | 19 | 250 |
| 16:15 - 16:30 | | | | 57 | 5 | 62 | 12 | 0 | 12 | 16 | 2 | 18 | | | | 19 | 0 | 19 | 12 | 0 | 12 | 118 | 10 | 128 | | | | | | | | | | | | 234 | 17 | 251 |
| 16:30 - 16:45 | | | | 54 | 9 | 63 | 15 | 0 | 15 | 14 | 0 | 14 | | | | 15 | 0 | 15 | 22 | 2 | 24 | 117 | 6 | 123 | | | | | | | | | | | | 237 | 17 | 254 |
| 16:45 - 17:00 | | | | 63 | 4 | 67 | 15 | 0 | 15 | 17 | 1 | 18 | | | | 23 | 1 | 24 | 17 | 0 | 17 | 122 | 6 | 128 | | | | | | | | | | | | 257 | 12 | 269 |
| 17:00 - 17:15 | | | | 75 | 6 | 81 | 11 | 0 | 11 | 38 | 1 | 39 | | | | 16 | 0 | 16 | 23 | 0 | 23 | 130 | 5 | 135 | | | | | | | | | | | | 293 | 12 | 305 |
| 17:15 - 17:30 | | | | 65 | 7 | 72 | 13 | 1 | 14 | 23 | 0 | 23 | | | | 20 | 0 | 20 | 22 | 0 | 22 | 127 | 3 | 130 | | | | | | | | | | | | 270 | 11 | 281 |
| 17:30 - 17:45 | | | | 38 | 4 | 42 | 10 | 0 | 10 | 24 | 1 | 25 | | | | 21 | 0 | 21 | 24 | 0 | 24 | 129 | 2 | 131 | | | | | | | | | | | | 246 | 7 | 253 |
| 17:45 - 18:00 | | | | 45 | 3 | 48 | 19 | 1 | 20 | 31 | 0 | 31 | | | | 12 | 0 | 12 | 15 | 1 | 16 | 110 | 6 | 116 | | | | | | | | | | | | 232 | 11 | 243 |
| 18:00 - 18:15 | | | | 32 | 3 | 35 | 9 | 0 | 9 | 18 | 0 | 18 | | | | 13 | 1 | 14 | 18 | 1 | 19 | 99 | 2 | 101 | | | | | | | | | | | | 189 | 7 | 196 |
| 18:15 - 18:30 | | | | 43 | 3 | 46 | 9 | 0 | 9 | 15 | 1 | 16 | | | | 7 | 0 | 7 | 20 | 0 | 20 | 84 | 5 | 89 | | | | | | | | | | | | 178 | 9 | 187 |
| Σ | | | | 650 | 64 | 714 | 173 | 4 | 177 | 244 | 9 | 253 | | | | 170 | 4 | 174 | 203 | 6 | 209 | 1314 | 75 | 1389 | | | | | | | | | | | | 2754 | 162 | 2916 |
| 15:45 - 17:45 | 0 | 0 | | 473 | 48 | | 118 | 3 | | 169 | 7 | | 0 | 0 | | 132 | 3 | | 140 | 2 | | 948 | 55 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | | | 2098 |

# Intersection of Picton Road and Wilton Park Road

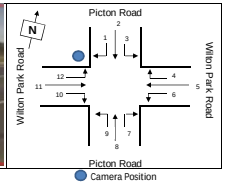
**Wednesday, 1 May 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type Cross Junction
Intersection No. **15**
North Approach **Picton Road**
East Approach **Wilton Park Road**
South Approach **Picton Road**
West Approach **Wilton Park Road**

Date **1/05/13**

Classification **Light Heavy**




| TIME PERIOD | VEHICLE MOVEMENT 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | 0 | 0 | 0 | 110 | 14 | 124 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6:45 - 7:00 | 1 | 0 | 1 | 116 | 12 | 128 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:00 - 7:15 | 0 | 0 | 0 | 122 | 7 | 129 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:15 - 7:30 | 0 | 1 | 1 | 165 | 8 | 173 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:30 - 7:45 | 0 | 0 | 0 | 135 | 8 | 143 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:45 - 8:00 | 1 | 0 | 1 | 112 | 7 | 119 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:00 - 8:15 | 1 | 0 | 1 | 114 | 4 | 118 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 8:15 - 8:30 | 1 | 1 | 2 | 80 | 10 | 90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:30 - 8:45 | 0 | 0 | 0 | 116 | 6 | 122 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:45 - 9:00 | 0 | 0 | 0 | 89 | 16 | 105 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9:00 - 9:15 | 0 | 0 | 0 | 87 | 16 | 103 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9:15 - 9:30 | 4 | 0 | 4 | 76 | 9 | 85 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Σ | 8 | 2 | 10 | 1322 | 117 | 1439 | 4 | 0 | 4 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| 7:00 - 9:00 | 3 | 2 | | 933 | 66 | | 3 | 0 | | 0 | 0 | | 0 | 0 | | 1 | 0 | |

| TIME PERIOD | VEHICLE MOVEMENT 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | 0 | 0 | 0 | 69 | 12 | 81 | 0 | 0 | 0 | 4 | 1 | 5 | 0 | 0 | 0 | 1 | 0 | 1 | 184 | 27 | 211 |
| 6:45 - 7:00 | 0 | 0 | 0 | 61 | 10 | 71 | 2 | 0 | 2 | 4 | 1 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 184 | 23 | 207 |
| 7:00 - 7:15 | 1 | 0 | 1 | 57 | 6 | 63 | 0 | 1 | 1 | 2 | 1 | 3 | 0 | 0 | 0 | 1 | 0 | 1 | 169 | 15 | 184 |
| 7:15 - 7:30 | 0 | 0 | 0 | 43 | 11 | 54 | 0 | 0 | 0 | 3 | 1 | 4 | 0 | 1 | 1 | 0 | 1 | 1 | 211 | 22 | 233 |
| 7:30 - 7:45 | 4 | 0 | 4 | 67 | 10 | 77 | 3 | 0 | 3 | 5 | 0 | 5 | 0 | 0 | 0 | 1 | 0 | 1 | 215 | 18 | 233 |
| 7:45 - 8:00 | 1 | 0 | 1 | 89 | 11 | 100 | 1 | 0 | 1 | 5 | 0 | 5 | 0 | 0 | 0 | 1 | 0 | 1 | 211 | 18 | 229 |
| 8:00 - 8:15 | 2 | 0 | 2 | 62 | 8 | 70 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 185 | 12 | 197 |
| 8:15 - 8:30 | 3 | 0 | 3 | 70 | 6 | 76 | 2 | 0 | 2 | 3 | 1 | 4 | 0 | 0 | 0 | 1 | 0 | 1 | 160 | 18 | 178 |
| 8:30 - 8:45 | 2 | 0 | 2 | 64 | 10 | 74 | 1 | 0 | 1 | 5 | 0 | 5 | 0 | 0 | 0 | 3 | 0 | 3 | 192 | 16 | 208 |
| 8:45 - 9:00 | 5 | 0 | 5 | 66 | 10 | 76 | 2 | 0 | 2 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 165 | 26 | 191 |
| 9:00 - 9:15 | 0 | 0 | 0 | 46 | 10 | 56 | 3 | 2 | 5 | 4 | 0 | 4 | 0 | 0 | 0 | 5 | 0 | 5 | 145 | 28 | 173 |
| 9:15 - 9:30 | 0 | 0 | 0 | 51 | 10 | 61 | 4 | 0 | 4 | 2 | 1 | 3 | 0 | 0 | 0 | 2 | 0 | 2 | 141 | 20 | 161 |
| Σ | 18 | 0 | 18 | 745 | 114 | 859 | 20 | 3 | 23 | 39 | 6 | 45 | 0 | 0 | 0 | 18 | 1 | 19 | 2176 | 243 | 2419 |
| 7:00 - 9:00 | 18 | 0 | | 518 | 72 | | 11 | 1 | | 25 | 3 | | 0 | 0 | | 10 | 1 | | | | |

| TIME PERIOD | VEHICLE MOVEMENT 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | 2 | 0 | 2 | 85 | 10 | 95 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 9 |
| 15:45 - 16:00 | 2 | 0 | 2 | 70 | 17 | 87 | 0 | 0 | 0 | 2 | 0 | 2 | 1 | 0 | 1 | 5 | 0 | 5 |
| 16:00 - 16:15 | 2 | 1 | 3 | 73 | 5 | 78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16:15 - 16:30 | 2 | 0 | 2 | 75 | 7 | 82 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 2 |
| 16:30 - 16:45 | 0 | 0 | 0 | 74 | 5 | 79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16:45 - 17:00 | 3 | 0 | 3 | 66 | 6 | 72 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 17:00 - 17:15 | 4 | 0 | 4 | 81 | 4 | 85 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17:15 - 17:30 | 6 | 0 | 6 | 93 | 6 | 99 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17:30 - 17:45 | 4 | 0 | 4 | 74 | 2 | 76 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17:45 - 18:00 | 2 | 0 | 2 | 56 | 4 | 60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 18:00 - 18:15 | 2 | 0 | 2 | 50 | 3 | 53 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18:15 - 18:30 | 2 | 0 | 2 | 51 | 1 | 52 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Σ | 31 | 1 | 32 | 848 | 70 | 918 | 0 | 0 | 0 | 3 | 0 | 3 | 1 | 0 | 1 | 18 | 0 | 18 |
| 15:45 - 17:45 | 23 | 1 | | 606 | 52 | | 0 | 0 | | 3 | 0 | | 1 | 0 | | 8 | 0 | |

| TIME PERIOD | VEHICLE MOVEMENT 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | 0 | 0 | 0 | 108 | 12 | 120 | 5 | 0 | 5 | 3 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 1 | 213 | 22 | 235 |
| 15:45 - 16:00 | 0 | 0 | 0 | 119 | 9 | 128 | 0 | 0 | 0 | 2 | 0 | 2 | 2 | 0 | 2 | 2 | 0 | 2 | 205 | 26 | 231 |
| 16:00 - 16:15 | 0 | 0 | 0 | 113 | 6 | 119 | 5 | 2 | 7 | 5 | 0 | 5 | 0 | 0 | 0 | 1 | 0 | 1 | 199 | 14 | 213 |
| 16:15 - 16:30 | 0 | 0 | 0 | 134 | 11 | 145 | 2 | 1 | 3 | 1 | 1 | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 217 | 21 | 238 |
| 16:30 - 16:45 | 0 | 0 | 0 | 126 | 11 | 137 | 6 | 3 | 9 | 1 | 0 | 1 | 0 | 0 | 0 | 3 | 0 | 3 | 210 | 19 | 229 |
| 16:45 - 17:00 | 1 | 0 | 1 | 136 | 8 | 144 | 2 | 3 | 5 | 6 | 0 | 6 | 0 | 0 | 0 | 6 | 0 | 6 | 220 | 17 | 237 |
| 17:00 - 17:15 | 0 | 0 | 0 | 126 | 8 | 134 | 5 | 1 | 6 | 6 | 2 | 8 | 0 | 0 | 0 | 2 | 0 | 2 | 225 | 15 | 240 |
| 17:15 - 17:30 | 0 | 0 | 0 | 134 | 5 | 139 | 6 | 0 | 6 | 1 | 1 | 2 | 0 | 0 | 0 | 1 | 0 | 1 | 241 | 12 | 253 |
| 17:30 - 17:45 | 0 | 0 | 0 | 152 | 8 | 160 | 5 | 1 | 6 | 2 | 0 | 2 | 0 | 0 | 0 | 2 | 0 | 2 | 239 | 11 | 250 |
| 17:45 - 18:00 | 0 | 0 | 0 | 124 | 4 | 128 | 6 | 0 | 6 | 2 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 191 | 9 | 200 |
| 18:00 - 18:15 | 0 | 0 | 0 | 140 | 9 | 149 | 1 | 0 | 1 | 2 | 0 | 2 | 0 | 0 | 0 | 3 | 0 | 3 | 198 | 12 | 210 |
| 18:15 - 18:30 | 0 | 0 | 0 | 98 | 5 | 103 | 3 | 0 | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 4 | 0 | 4 | 159 | 6 | 165 |
| Σ | 1 | 0 | 1 | 1510 | 96 | 1606 | 46 | 11 | 57 | 32 | 5 | 37 | 2 | 0 | 2 | 25 | 1 | 26 | 2517 | 184 | 2701 |
| 15:45 - 17:45 | 1 | 0 | | 1040 | 66 | | 31 | 11 | | 24 | 4 | | 2 | 0 | | 17 | 1 | | | | |

| TIME PERIOD | VEHICLE MOVEMENT 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 7:30 | 1 | 1 | 2 | 513 | 41 | 554 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6:45 - 7:45 | 1 | 1 | 2 | 538 | 35 | 573 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:00 - 8:00 | 1 | 1 | 2 | 534 | 30 | 564 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 7:15 - 8:15 | 2 | 1 | 3 | 526 | 27 | 553 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 7:30 - 8:30 | 3 | 1 | 4 | 441 | 29 | 470 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 7:45 - 8:45 | 3 | 1 | 4 | 422 | 27 | 449 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 8:00 - 9:00 | 2 | 1 | 3 | 399 | 36 | 435 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 8:15 - 9:15 | 1 | 1 | 2 | 372 | 48 | 420 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8:30 - 9:30 | 4 | 0 | 4 | 368 | 47 | 415 | 3 | 0 | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |

| TIME PERIOD | VEHICLE MOVEMENT 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 7:30 | 1 | 0 | 1 | 230 | 39 | 269 | 2 | 1 | 3 | 13 | 4 | 17 | 0 | 0 | 0 | 2 | 1 | 3 | 762 | 87 | 849 |
| 6:45 - 7:45 | 5 | 0 | 5 | 228 | 37 | 265 | 5 | 1 | 6 | 14 | 3 | 17 | 0 | 0 | 0 | 2 | 1 | 3 | 793 | 78 | 871 |
| 7:00 - 8:00 | 6 | 0 | 6 | 256 | 38 | 294 | 4 | 1 | 5 | 15 | 2 | 17 | 0 | 0 | 0 | 3 | 1 | 4 | 820 | 73 | 893 |
| 7:15 - 8:15 | 7 | 0 | 7 | 261 | 40 | 301 | 6 | 0 | 6 | 13 | 1 | 14 | 0 | 0 | 0 | 5 | 1 | 6 | 822 | 70 | 892 |
| 7:30 - 8:30 | 10 | 0 | 10 | 288 | 35 | 323 | 8 | 0 | 8 | 13 | 1 | 14 | 0 | 0 | 0 | 6 | 0 | 6 | 771 | 66 | 837 |
| 7:45 - 8:45 | 8 | 0 | 8 | 285 | 35 | 320 | 6 | 0 | 6 | 13 | 1 | 14 | 0 | 0 | 0 | 8 | 0 | 8 | 748 | 64 | 812 |
| 8:00 - 9:00 | 12 | 0 | 12 | 262 | 34 | 296 | 7 | 0 | 7 | 10 | 1 | 11 | 0 | 0 | 0 | 7 | 0 | 7 | 706 | 72 | 778 |
| 8:15 - 9:15 | 10 | 0 | 10 | 246 | 36 | 282 | 8 | 2 | 10 | 14 | 1 | 15 | 0 | 0 | 0 | 9 | 0 | 9 | 662 | 88 | 750 |
| 8:30 - 9:30 | 7 | 0 | 7 | 227 | 40 | 267 | 10 | 2 | 12 | 13 | 1 | 14 | 0 | 0 | 0 | 10 | 0 | 10 | 643 | 90 | 733 |

| TIME PERIOD | VEHICLE MOVEMENT 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 16:30 | 8 | 1 | 9 | 303 | 39 | 342 | 0 | 0 | 0 | 3 | 0 | 3 | 1 | 0 | 1 | 16 | 0 | 16 |
| 15:45 - 16:45 | 6 | 1 | 7 | 292 | 34 | 326 | 0 | 0 | 0 | 3 | 0 | 3 | 1 | 0 | 1 | 7 | 0 | 7 |
| 16:00 - 17:00 | 7 | 1 | 8 | 288 | 23 | 311 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 2 |
| 16:15 - 17:15 | 9 | 0 | 9 | 296 | 22 | 318 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 3 | 0 | 3 |
| 16:30 - 17:30 | 13 | 0 | 13 | 314 | 21 | 335 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 16:45 - 17:45 | 17 | 0 | 17 | 314 | 18 | 332 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| 17:00 - 18:00 | 16 | 0 | 16 | 304 | 16 | 320 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 |
| 17:15 - 18:15 | 14 | 0 | 14 | 273 | 15 | 288 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 |
| 17:30 - 18:30 | 10 | 0 | 10 | 231 | 10 | 241 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |

| TIME PERIOD | VEHICLE MOVEMENT 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 16:30 | 0 | 0 | 0 | 474 | 38 | 512 | 12 | 3 | 15 | 11 | 1 | 12 | 2 | 0 | 2 | 4 | 1 | 5 | 834 | 83 | 917 |
| 15:45 - 16:45 | 0 | 0 | 0 | 492 | 37 | 529 | 13 | 6 | 19 | 9 | 1 | 10 | 2 | 0 | 2 | 6 | 1 | 7 | 831 | 80 | 911 |
| 16:00 - 17:00 | 1 | 0 | 1 | 509 | 36 | 545 | 15 | 9 | 24 | 13 | 1 | 14 | 0 | 0 | 0 | 10 | 1 | 11 | 846 | 71 | 917 |
| 16:15 - 17:15 | 1 | 0 | 1 | 522 | 38 | 560 | 15 | 8 | 23 | 14 | 3 | 17 | 0 | 0 | 0 | 11 | 1 | 12 | 872 | 72 | 944 |
| 16:30 - 17:30 | 1 | 0 | 1 | 522 | 32 | 554 | 19 | 7 | 26 | 14 | 3 | 17 | 0 | 0 | 0 | 12 | 0 | 12 | 896 | 63 | 959 |
| 16:45 - 17:45 | 1 | 0 | 1 | 549 | 29 | 577 | 18 | 5 | 23 | 15 | 3 | 18 | 0 | 0 | 0 | 11 | 0 | 11 | 925 | 55 | 980 |
| 17:00 - 18:00 | 0 | 0 | 0 | 536 | 25 | 561 | 22 | 2 | 24 | 11 | 4 | 15 | 0 | 0 | 0 | 5 | 0 | 5 | 896 | 47 | 943 |
| 17:15 - 18:15 | 0 | 0 | 0 | 550 | 26 | 576 | 18 | 1 | 19 | 7 | 2 | 9 | 0 | 0 | 0 | 6 | 0 | 6 | 869 | 44 | 913 |
| 17:30 - 18:30 | 0 | 0 | 0 | 514 | 26 | 540 | 15 | 1 | 16 | 7 | 1 | 8 | 0 | 0 | 0 | 9 | 0 | 9 | 787 | 38 | 825 |

Peak

Peak

# Intersection of Picton Road and Wilton Park Road

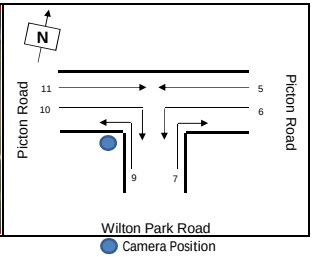
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type T Junction
Intersection No. **15**
North Approach
East Approach **Picton Road**
South Approach **Wilton Park Road**
West Approach **Picton Road**

Date **3/04/13**

Classification **Light Heavy**




| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | | | | | | | | | | | | | 32 | 10 | 42 | 12 | 1 | 13 | 0 | 4 | 4 | | | | 2 | 0 | 2 | 3 | 0 | 3 | 118 | 5 | 123 | | | | 167 | 20 | 187 |
| 6:45 - 7:00 | | | | | | | | | | | | | 37 | 8 | 45 | 14 | 4 | 18 | 0 | 4 | 4 | | | | 0 | 1 | 1 | 2 | 1 | 3 | 113 | 9 | 122 | | | | 166 | 27 | 193 |
| 7:00 - 7:15 | | | | | | | | | | | | | 30 | 5 | 35 | 5 | 7 | 12 | 1 | 3 | 4 | | | | 1 | 1 | 2 | 3 | 0 | 3 | 127 | 6 | 133 | | | | 167 | 22 | 189 |
| 7:15 - 7:30 | | | | | | | | | | | | | 40 | 5 | 45 | 3 | 0 | 3 | 1 | 7 | 8 | | | | 0 | 0 | 0 | 1 | 0 | 1 | 157 | 10 | 167 | | | | 202 | 22 | 224 |
| 7:30 - 7:45 | | | | | | | | | | | | | 64 | 7 | 71 | 1 | 6 | 7 | 2 | 1 | 3 | | | | 1 | 1 | 2 | 1 | 0 | 1 | 138 | 10 | 148 | | | | 207 | 25 | 232 |
| 7:45 - 8:00 | | | | | | | | | | | | | 73 | 4 | 77 | 5 | 6 | 11 | 3 | 2 | 5 | | | | 0 | 0 | 0 | 0 | 0 | 0 | 129 | 14 | 143 | | | | 210 | 26 | 236 |
| 8:00 - 8:15 | | | | | | | | | | | | | 65 | 4 | 69 | 4 | 3 | 7 | 1 | 6 | 7 | | | | 1 | 1 | 2 | 2 | 1 | 3 | 124 | 5 | 129 | | | | 197 | 20 | 217 |
| 8:15 - 8:30 | | | | | | | | | | | | | 62 | 3 | 65 | 4 | 2 | 6 | 0 | 1 | 1 | | | | 2 | 0 | 2 | 3 | 0 | 3 | 109 | 1 | 110 | | | | 180 | 7 | 187 |
| 8:30 - 8:45 | | | | | | | | | | | | | 61 | 4 | 65 | 4 | 7 | 11 | 0 | 5 | 5 | | | | 0 | 1 | 1 | 0 | 2 | 2 | 96 | 3 | 99 | | | | 161 | 22 | 183 |
| 8:45 - 9:00 | | | | | | | | | | | | | 66 | 3 | 69 | 4 | 4 | 8 | 2 | 4 | 6 | | | | 2 | 0 | 2 | 0 | 1 | 1 | 85 | 5 | 90 | | | | 159 | 17 | 176 |
| 9:00 - 9:15 | | | | | | | | | | | | | 50 | 1 | 51 | 1 | 2 | 3 | 2 | 3 | 5 | | | | 1 | 2 | 3 | 2 | 0 | 2 | 86 | 2 | 88 | | | | 142 | 10 | 152 |
| 9:15 - 9:30 | | | | | | | | | | | | | 51 | 6 | 57 | 1 | 3 | 4 | 0 | 2 | 2 | | | | 3 | 0 | 3 | 1 | 1 | 2 | 71 | 3 | 74 | | | | 127 | 15 | 142 |
| Σ | | | | | | | | | | | | | 631 | 60 | 691 | 58 | 45 | 103 | 12 | 42 | 54 | | | | 13 | 7 | 20 | 18 | 6 | 24 | 1353 | 73 | 1426 | | | | 2085 | 233 | 2318 |
| 7:00 - 9:00 | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 461 | 35 | | 30 | 35 | | 10 | 29 | | 0 | 0 | | 7 | 4 | | 10 | 4 | | 965 | 54 | | 0 | 0 | | | | 1644 |

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | | | | | | | | | | | | | 80 | 4 | 84 | 2 | 2 | 4 | 3 | 1 | 4 | | | | 4 | 0 | 4 | 1 | 0 | 1 | 74 | 6 | 80 | | | | 164 | 13 | 177 |
| 15:45 - 16:00 | | | | | | | | | | | | | 105 | 9 | 114 | 1 | 2 | 3 | 0 | 1 | 1 | | | | 2 | 0 | 2 | 0 | 0 | 0 | 82 | 9 | 91 | | | | 190 | 21 | 211 |
| 16:00 - 16:15 | | | | | | | | | | | | | 129 | 11 | 140 | 1 | 2 | 3 | 4 | 2 | 6 | | | | 5 | 0 | 5 | 3 | 0 | 3 | 69 | 3 | 72 | | | | 211 | 18 | 229 |
| 16:15 - 16:30 | | | | | | | | | | | | | 127 | 7 | 134 | 3 | 4 | 7 | 5 | 1 | 6 | | | | 3 | 0 | 3 | 2 | 0 | 2 | 66 | 4 | 70 | | | | 206 | 16 | 222 |
| 16:30 - 16:45 | | | | | | | | | | | | | 131 | 3 | 134 | 3 | 1 | 4 | 3 | 5 | 8 | | | | 5 | 0 | 5 | 1 | 0 | 1 | 65 | 3 | 68 | | | | 208 | 12 | 220 |
| 16:45 - 17:00 | | | | | | | | | | | | | 135 | 7 | 142 | 3 | 2 | 5 | 7 | 3 | 10 | | | | 5 | 1 | 6 | 1 | 0 | 1 | 67 | 1 | 68 | | | | 218 | 14 | 232 |
| 17:00 - 17:15 | | | | | | | | | | | | | 164 | 5 | 169 | 0 | 0 | 0 | 9 | 5 | 14 | | | | 2 | 0 | 2 | 0 | 0 | 0 | 79 | 2 | 81 | | | | 254 | 12 | 266 |
| 17:15 - 17:30 | | | | | | | | | | | | | 150 | 4 | 154 | 1 | 0 | 1 | 9 | 1 | 10 | | | | 3 | 0 | 3 | 5 | 0 | 5 | 65 | 5 | 70 | | | | 233 | 10 | 243 |
| 17:30 - 17:45 | | | | | | | | | | | | | 149 | 3 | 152 | 2 | 0 | 2 | 2 | 2 | 4 | | | | 1 | 0 | 1 | 2 | 0 | 2 | 50 | 2 | 52 | | | | 206 | 7 | 213 |
| 17:45 - 18:00 | | | | | | | | | | | | | 138 | 3 | 141 | 1 | 3 | 4 | 2 | 2 | 4 | | | | 3 | 0 | 3 | 2 | 0 | 2 | 61 | 1 | 62 | | | | 207 | 9 | 216 |
| 18:00 - 18:15 | | | | | | | | | | | | | 121 | 2 | 123 | 0 | 1 | 1 | 1 | 2 | 3 | | | | 4 | 0 | 4 | 0 | 0 | 0 | 39 | 1 | 40 | | | | 165 | 6 | 171 |
| 18:15 - 18:30 | | | | | | | | | | | | | 95 | 5 | 100 | 0 | 0 | 0 | 1 | 2 | 3 | | | | 1 | 0 | 1 | 2 | 0 | 2 | 55 | 1 | 56 | | | | 154 | 8 | 162 |
| Σ | | | | | | | | | | | | | 1524 | 63 | 1587 | 17 | 17 | 34 | 46 | 27 | 73 | | | | 38 | 1 | 39 | 19 | 0 | 19 | 772 | 38 | 810 | | | | 2416 | 146 | 2562 |
| 15:45 - 17:45 | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 1090 | 49 | | 14 | 11 | | 39 | 20 | | 0 | 0 | | 26 | 1 | | 14 | 0 | | 543 | 29 | | 0 | 0 | | | | 1836 |

# Intersection of Picton Road and Pembroke Parade

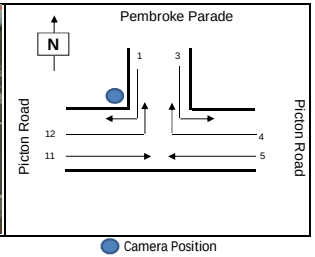
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type T Junction
Intersection No. **16**
North Approach **Pembroke Parade**
East Approach **Picton Road**
South Approach
West Approach **Picton Road**

Date **3/04/13**

Classification **Light Heavy**




Camera Position

| TIME PERIOD | VEHICLE MOVEMENT 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | 17 | 0 | 17 | | | | 0 | 0 | 0 | 2 | 0 | 2 | 121 | 36 | 157 | | | |
| 6:45 - 7:00 | 12 | 2 | 14 | | | | 0 | 0 | 0 | 1 | 0 | 1 | 140 | 34 | 174 | | | |
| 7:00 - 7:15 | 20 | 2 | 22 | | | | 1 | 1 | 2 | 1 | 0 | 1 | 144 | 27 | 171 | | | |
| 7:15 - 7:30 | 14 | 0 | 14 | | | | 1 | 0 | 1 | 1 | 1 | 2 | 155 | 30 | 185 | | | |
| 7:30 - 7:45 | 38 | 7 | 45 | | | | 3 | 0 | 3 | 3 | 2 | 5 | 157 | 33 | 190 | | | |
| 7:45 - 8:00 | 29 | 1 | 30 | | | | 2 | 0 | 2 | 2 | 0 | 2 | 163 | 37 | 200 | | | |
| 8:00 - 8:15 | 28 | 0 | 28 | | | | 3 | 0 | 3 | 1 | 1 | 2 | 113 | 33 | 146 | | | |
| 8:15 - 8:30 | 16 | 2 | 18 | | | | 1 | 0 | 1 | 0 | 0 | 0 | 109 | 27 | 136 | | | |
| 8:30 - 8:45 | 21 | 3 | 24 | | | | 1 | 0 | 1 | 4 | 0 | 4 | 111 | 33 | 144 | | | |
| 8:45 - 9:00 | 25 | 3 | 28 | | | | 3 | 0 | 3 | 2 | 1 | 3 | 85 | 40 | 125 | | | |
| 9:00 - 9:15 | 17 | 0 | 17 | | | | 0 | 0 | 0 | 1 | 0 | 1 | 76 | 26 | 102 | | | |
| 9:15 - 9:30 | 18 | 1 | 19 | | | | 3 | 1 | 4 | 0 | 0 | 0 | 84 | 37 | 121 | | | |
| Σ | 255 | 21 | 276 | | | | 18 | 2 | 20 | 18 | 5 | 23 | 1458 | 393 | 1851 | | | |
| 7:00 - 9:00 | **191** | **18** | | **0** | **0** | | **15** | **1** | | **14** | **5** | | **1037** | **260** | | **0** | **0** | |

| TIME PERIOD | VEHICLE MOVEMENT 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | | | | | | | | | | | | | 81 | 39 | 120 | 7 | 6 | 13 | 228 | 81 | 309 |
| 6:45 - 7:00 | | | | | | | | | | | | | 86 | 32 | 118 | 12 | 4 | 16 | 251 | 72 | 323 |
| 7:00 - 7:15 | | | | | | | | | | | | | 100 | 38 | 138 | 17 | 6 | 23 | 283 | 74 | 357 |
| 7:15 - 7:30 | | | | | | | | | | | | | 172 | 34 | 206 | 12 | 2 | 14 | 355 | 67 | 422 |
| 7:30 - 7:45 | | | | | | | | | | | | | 167 | 32 | 199 | 9 | 2 | 11 | 377 | 76 | 453 |
| 7:45 - 8:00 | | | | | | | | | | | | | 142 | 36 | 178 | 12 | 0 | 12 | 350 | 74 | 424 |
| 8:00 - 8:15 | | | | | | | | | | | | | 127 | 22 | 149 | 6 | 2 | 8 | 278 | 58 | 336 |
| 8:15 - 8:30 | | | | | | | | | | | | | 127 | 37 | 164 | 4 | 1 | 5 | 257 | 67 | 324 |
| 8:30 - 8:45 | | | | | | | | | | | | | 112 | 22 | 134 | 5 | 0 | 5 | 254 | 58 | 312 |
| 8:45 - 9:00 | | | | | | | | | | | | | 96 | 26 | 122 | 13 | 1 | 14 | 224 | 71 | 295 |
| 9:00 - 9:15 | | | | | | | | | | | | | 80 | 26 | 106 | 11 | 1 | 12 | 185 | 53 | 238 |
| 9:15 - 9:30 | | | | | | | | | | | | | 84 | 30 | 114 | 12 | 2 | 14 | 201 | 71 | 272 |
| Σ | | | | | | | | | | | | | 1374 | 374 | 1748 | 120 | 27 | 147 | 3243 | 822 | 4065 |
| 7:00 - 9:00 | **0** | **0** | | **0** | **0** | | **0** | **0** | | **0** | **0** | | **1043** | **247** | | **78** | **14** | | | | **2923** |

| TIME PERIOD | VEHICLE MOVEMENT 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | 25 | 0 | 25 | | | | 2 | 0 | 2 | 0 | 0 | 0 | 115 | 29 | 144 | | | |
| 15:45 - 16:00 | 15 | 0 | 15 | | | | 0 | 1 | 1 | 2 | 0 | 2 | 121 | 22 | 143 | | | |
| 16:00 - 16:15 | 11 | 1 | 12 | | | | 2 | 1 | 3 | 2 | 0 | 2 | 129 | 22 | 151 | | | |
| 16:15 - 16:30 | 13 | 1 | 14 | | | | 1 | 2 | 3 | 0 | 0 | 0 | 138 | 31 | 169 | | | |
| 16:30 - 16:45 | 20 | 2 | 22 | | | | 1 | 0 | 1 | 3 | 0 | 3 | 140 | 17 | 157 | | | |
| 16:45 - 17:00 | 17 | 0 | 17 | | | | 2 | 0 | 2 | 2 | 0 | 2 | 145 | 18 | 163 | | | |
| 17:00 - 17:15 | 28 | 1 | 29 | | | | 3 | 0 | 3 | 1 | 0 | 1 | 148 | 17 | 165 | | | |
| 17:15 - 17:30 | 11 | 2 | 13 | | | | 1 | 0 | 1 | 0 | 0 | 0 | 144 | 22 | 166 | | | |
| 17:30 - 17:45 | 14 | 1 | 15 | | | | 3 | 0 | 3 | 2 | 0 | 2 | 140 | 10 | 150 | | | |
| 17:45 - 18:00 | 9 | 0 | 9 | | | | 0 | 0 | 0 | 1 | 0 | 1 | 136 | 17 | 153 | | | |
| 18:00 - 18:15 | 10 | 0 | 10 | | | | 1 | 0 | 1 | 1 | 0 | 1 | 121 | 8 | 129 | | | |
| 18:15 - 18:30 | 8 | 0 | 8 | | | | 2 | 0 | 2 | 0 | 0 | 0 | 112 | 11 | 123 | | | |
| Σ | 181 | 8 | 189 | | | | 18 | 4 | 22 | 14 | 0 | 14 | 1589 | 224 | 1813 | | | |
| 15:45 - 17:45 | **129** | **8** | | **0** | **0** | | **13** | **4** | | **12** | **0** | | **1105** | **159** | | **0** | **0** | |

| TIME PERIOD | VEHICLE MOVEMENT 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | | | | | | | | | | | | | 123 | 28 | 151 | 15 | 1 | 16 | 280 | 58 | 338 |
| 15:45 - 16:00 | | | | | | | | | | | | | 148 | 25 | 173 | 18 | 2 | 20 | 304 | 50 | 354 |
| 16:00 - 16:15 | | | | | | | | | | | | | 158 | 18 | 176 | 17 | 1 | 18 | 319 | 43 | 362 |
| 16:15 - 16:30 | | | | | | | | | | | | | 153 | 17 | 170 | 13 | 2 | 15 | 318 | 53 | 371 |
| 16:30 - 16:45 | | | | | | | | | | | | | 140 | 19 | 159 | 15 | 0 | 15 | 319 | 38 | 357 |
| 16:45 - 17:00 | | | | | | | | | | | | | 152 | 15 | 167 | 18 | 1 | 19 | 336 | 34 | 370 |
| 17:00 - 17:15 | | | | | | | | | | | | | 154 | 19 | 173 | 12 | 1 | 13 | 346 | 38 | 384 |
| 17:15 - 17:30 | | | | | | | | | | | | | 149 | 16 | 165 | 16 | 1 | 17 | 321 | 41 | 362 |
| 17:30 - 17:45 | | | | | | | | | | | | | 138 | 14 | 152 | 30 | 0 | 30 | 327 | 25 | 352 |
| 17:45 - 18:00 | | | | | | | | | | | | | 131 | 8 | 139 | 25 | 1 | 26 | 302 | 26 | 328 |
| 18:00 - 18:15 | | | | | | | | | | | | | 119 | 12 | 131 | 20 | 1 | 21 | 272 | 21 | 293 |
| 18:15 - 18:30 | | | | | | | | | | | | | 111 | 10 | 121 | 17 | 2 | 19 | 250 | 23 | 273 |
| Σ | | | | | | | | | | | | | 1676 | 201 | 1877 | 216 | 13 | 229 | 3694 | 450 | 4144 |
| 15:45 - 17:45 | **0** | **0** | | **0** | **0** | | **0** | **0** | | **0** | **0** | | **1192** | **143** | | **139** | **8** | | | | **2912** |

# Intersection of Picton Road and Almond Street

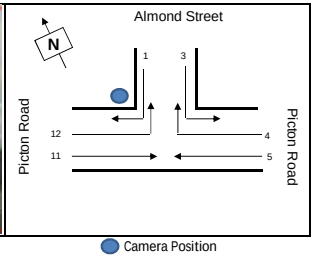
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type T Junction
Intersection No. **17**
North Approach **Almond Street**
East Approach **Picton Road**
South Approach
West Approach **Picton Road**

Date **3/04/13**

Classification **Light Heavy**




Camera Position

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | 23 | 2 | 25 | | | | 3 | 1 | 4 | 3 | 1 | 4 | 110 | 35 | 145 | | | | | | | | | | | | | | | | 66 | 39 | 105 | 12 | 2 | 14 | 217 | 80 | 297 |
| 6:45 - 7:00 | 20 | 2 | 22 | | | | 5 | 2 | 7 | 1 | 1 | 2 | 120 | 34 | 154 | | | | | | | | | | | | | | | | 67 | 31 | 98 | 19 | 1 | 20 | 232 | 71 | 303 |
| 7:00 - 7:15 | 27 | 2 | 29 | | | | 3 | 0 | 3 | 0 | 2 | 2 | 119 | 26 | 145 | | | | | | | | | | | | | | | | 80 | 37 | 117 | 20 | 2 | 22 | 249 | 69 | 318 |
| 7:15 - 7:30 | 21 | 2 | 23 | | | | 2 | 0 | 2 | 2 | 0 | 2 | 132 | 30 | 162 | | | | | | | | | | | | | | | | 141 | 30 | 171 | 26 | 1 | 27 | 324 | 63 | 387 |
| 7:30 - 7:45 | 26 | 1 | 27 | | | | 2 | 1 | 3 | 1 | 2 | 3 | 129 | 31 | 160 | | | | | | | | | | | | | | | | 152 | 32 | 184 | 21 | 5 | 26 | 331 | 72 | 403 |
| 7:45 - 8:00 | 45 | 5 | 50 | | | | 2 | 0 | 2 | 2 | 0 | 2 | 117 | 35 | 152 | | | | | | | | | | | | | | | | 128 | 31 | 159 | 16 | 2 | 18 | 310 | 73 | 383 |
| 8:00 - 8:15 | 24 | 2 | 26 | | | | 6 | 1 | 7 | 3 | 1 | 4 | 92 | 29 | 121 | | | | | | | | | | | | | | | | 113 | 24 | 137 | 18 | 2 | 20 | 256 | 59 | 315 |
| 8:15 - 8:30 | 27 | 2 | 29 | | | | 4 | 0 | 4 | 2 | 0 | 2 | 83 | 24 | 107 | | | | | | | | | | | | | | | | 107 | 28 | 135 | 23 | 4 | 27 | 246 | 58 | 304 |
| 8:30 - 8:45 | 26 | 4 | 30 | | | | 2 | 0 | 2 | 1 | 2 | 3 | 85 | 30 | 115 | | | | | | | | | | | | | | | | 98 | 24 | 122 | 16 | 2 | 18 | 228 | 62 | 290 |
| 8:45 - 9:00 | 25 | 4 | 29 | | | | 3 | 0 | 3 | 1 | 0 | 1 | 62 | 33 | 95 | | | | | | | | | | | | | | | | 85 | 23 | 108 | 13 | 2 | 15 | 189 | 62 | 251 |
| 9:00 - 9:15 | 20 | 5 | 25 | | | | 3 | 2 | 5 | 2 | 1 | 3 | 60 | 23 | 83 | | | | | | | | | | | | | | | | 68 | 21 | 89 | 12 | 7 | 19 | 165 | 59 | 224 |
| 9:15 - 9:30 | 19 | 3 | 22 | | | | 2 | 1 | 3 | 2 | 0 | 2 | 60 | 36 | 96 | | | | | | | | | | | | | | | | 72 | 29 | 101 | 15 | 1 | 16 | 170 | 70 | 240 |
| Σ | 303 | 34 | 337 | | | | 37 | 8 | 45 | 20 | 10 | 30 | 1169 | 366 | 1535 | | | | | | | | | | | | | | | | 1177 | 349 | 1526 | 211 | 31 | 242 | 2917 | 798 | 3715 |
| 7:00 - 9:00 | 221 | 22 | | 0 | 0 | | 24 | 2 | | 12 | 7 | | 819 | 238 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 904 | 229 | | 153 | 20 | | | | 2651 |

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | 32 | 2 | 34 | | | | 1 | 2 | 3 | 1 | 0 | 1 | 87 | 28 | 115 | | | | | | | | | | | | | | | | 104 | 22 | 126 | 25 | 5 | 30 | 250 | 59 | 309 |
| 15:45 - 16:00 | 28 | 1 | 29 | | | | 4 | 0 | 4 | 6 | 0 | 6 | 94 | 19 | 113 | | | | | | | | | | | | | | | | 118 | 26 | 144 | 25 | 2 | 27 | 275 | 48 | 323 |
| 16:00 - 16:15 | 21 | 1 | 22 | | | | 1 | 1 | 2 | 7 | 0 | 7 | 108 | 23 | 131 | | | | | | | | | | | | | | | | 129 | 18 | 147 | 35 | 1 | 36 | 301 | 44 | 345 |
| 16:15 - 16:30 | 25 | 5 | 30 | | | | 2 | 0 | 2 | 5 | 0 | 5 | 110 | 24 | 134 | | | | | | | | | | | | | | | | 122 | 19 | 141 | 34 | 2 | 36 | 298 | 50 | 348 |
| 16:30 - 16:45 | 22 | 2 | 24 | | | | 4 | 2 | 6 | 6 | 0 | 6 | 122 | 16 | 138 | | | | | | | | | | | | | | | | 108 | 18 | 126 | 31 | 3 | 34 | 293 | 41 | 334 |
| 16:45 - 17:00 | 25 | 1 | 26 | | | | 2 | 3 | 5 | 3 | 0 | 3 | 126 | 17 | 143 | | | | | | | | | | | | | | | | 126 | 15 | 141 | 32 | 2 | 34 | 314 | 38 | 352 |
| 17:00 - 17:15 | 33 | 0 | 33 | | | | 7 | 1 | 8 | 6 | 1 | 7 | 116 | 17 | 133 | | | | | | | | | | | | | | | | 130 | 16 | 146 | 29 | 2 | 31 | 321 | 37 | 358 |
| 17:15 - 17:30 | 22 | 2 | 24 | | | | 5 | 1 | 6 | 4 | 1 | 5 | 120 | 19 | 139 | | | | | | | | | | | | | | | | 128 | 13 | 141 | 25 | 1 | 26 | 304 | 37 | 341 |
| 17:30 - 17:45 | 32 | 1 | 33 | | | | 3 | 1 | 4 | 4 | 0 | 4 | 112 | 9 | 121 | | | | | | | | | | | | | | | | 112 | 14 | 126 | 30 | 0 | 30 | 293 | 25 | 318 |
| 17:45 - 18:00 | 23 | 3 | 26 | | | | 6 | 0 | 6 | 5 | 0 | 5 | 111 | 14 | 125 | | | | | | | | | | | | | | | | 101 | 7 | 108 | 28 | 1 | 29 | 274 | 25 | 299 |
| 18:00 - 18:15 | 18 | 0 | 18 | | | | 3 | 0 | 3 | 3 | 0 | 3 | 107 | 9 | 116 | | | | | | | | | | | | | | | | 98 | 10 | 108 | 23 | 2 | 25 | 252 | 21 | 273 |
| 18:15 - 18:30 | 22 | 2 | 24 | | | | 2 | 0 | 2 | 2 | 2 | 4 | 84 | 7 | 91 | | | | | | | | | | | | | | | | 83 | 5 | 88 | 30 | 3 | 33 | 223 | 19 | 242 |
| Σ | 303 | 20 | 323 | | | | 40 | 11 | 51 | 52 | 4 | 56 | 1297 | 202 | 1499 | | | | | | | | | | | | | | | | 1359 | 183 | 1542 | 347 | 24 | 371 | 3398 | 444 | 3842 |
| 15:45 - 17:45 | 208 | 13 | | 0 | 0 | | 28 | 9 | | 41 | 2 | | 908 | 144 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 973 | 139 | | 241 | 13 | | | | 2719 |

# Intersection of Picton Road and Macarthur Drive

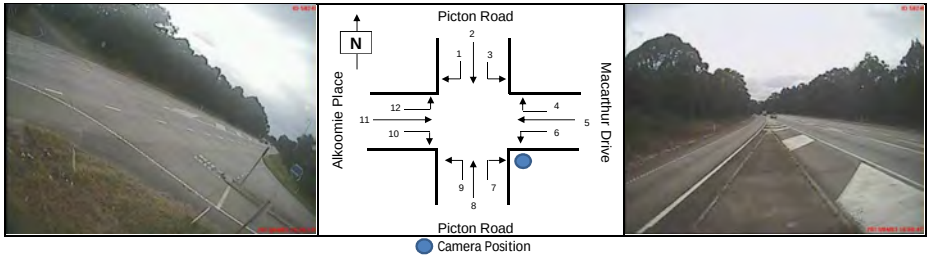
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type Cross Junction
Intersection No. **18**
North Approach **Picton Road**
East Approach **Macarthur Drive**
South Approach **Picton Road**
West Approach **Alkoomie Place**

Date **3/04/13**

Classification **Light Heavy**




| TIME PERIOD | VEHICLE MOVEMENT 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | 0 | 0 | 0 | 70 | 38 | 108 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 1 | 3 |
| 6:45 - 7:00 | 0 | 0 | 0 | 72 | 36 | 108 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 |
| 7:00 - 7:15 | 0 | 0 | 0 | 79 | 32 | 111 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 10 |
| 7:15 - 7:30 | 0 | 0 | 0 | 139 | 26 | 165 | 1 | 0 | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 9 | 0 | 9 |
| 7:30 - 7:45 | 0 | 0 | 0 | 151 | 38 | 189 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 0 | 26 |
| 7:45 - 8:00 | 0 | 0 | 0 | 134 | 30 | 164 | 0 | 0 | 0 | 2 | 0 | 2 | 1 | 0 | 1 | 37 | 1 | 38 |
| 8:00 - 8:15 | 0 | 0 | 0 | 120 | 22 | 142 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 21 | 1 | 22 |
| 8:15 - 8:30 | 0 | 0 | 0 | 108 | 26 | 134 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 14 | 0 | 14 |
| 8:30 - 8:45 | 0 | 0 | 0 | 96 | 22 | 118 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 10 | 1 | 11 |
| 8:45 - 9:00 | 0 | 0 | 0 | 88 | 18 | 106 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 7 | 0 | 7 |
| 9:00 - 9:15 | 0 | 0 | 0 | 71 | 24 | 95 | 1 | 2 | 3 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 2 |
| 9:15 - 9:30 | 0 | 0 | 0 | 71 | 27 | 98 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 9 | 0 | 9 |
| Σ | 0 | 0 | 0 | 1199 | 339 | 1538 | 3 | 4 | 7 | 12 | 1 | 13 | 3 | 0 | 3 | 148 | 4 | 152 |
| 7:00 - 9:00 | 0 | 0 | | 915 | 214 | | 2 | 1 | | 9 | 1 | | 1 | 0 | | 134 | 3 | |
| 7:00 - 8:00 | 0 | 0 | | 503 | 126 | 755 | 1 | 0 | 1 | 3 | 1 | 5 | 1 | 0 | 1 | 82 | 1 | 84 |

| TIME PERIOD | VEHICLE MOVEMENT 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | 15 | 1 | 16 | 111 | 37 | 148 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 199 | 78 | 277 |
| 6:45 - 7:00 | 15 | 0 | 15 | 119 | 36 | 155 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 209 | 72 | 281 |
| 7:00 - 7:15 | 8 | 0 | 8 | 120 | 31 | 151 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 218 | 63 | 281 |
| 7:15 - 7:30 | 11 | 2 | 13 | 130 | 28 | 158 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 291 | 57 | 348 |
| 7:30 - 7:45 | 15 | 0 | 15 | 135 | 35 | 170 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 327 | 73 | 400 |
| 7:45 - 8:00 | 15 | 0 | 15 | 115 | 32 | 147 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 304 | 63 | 367 |
| 8:00 - 8:15 | 10 | 0 | 10 | 96 | 31 | 127 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 248 | 56 | 304 |
| 8:15 - 8:30 | 12 | 0 | 12 | 79 | 26 | 105 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 215 | 52 | 267 |
| 8:30 - 8:45 | 6 | 1 | 7 | 82 | 34 | 116 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 196 | 59 | 255 |
| 8:45 - 9:00 | 9 | 0 | 9 | 64 | 26 | 90 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 170 | 44 | 214 |
| 9:00 - 9:15 | 7 | 0 | 7 | 61 | 25 | 86 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 143 | 51 | 194 |
| 9:15 - 9:30 | 2 | 2 | 4 | 65 | 35 | 100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 148 | 64 | 212 |
| Σ | 125 | 6 | 131 | 1177 | 376 | 1553 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 2668 | 732 | 3400 |
| 7:00 - 9:00 | 86 | 3 | | 821 | 243 | | 0 | 1 | | 1 | 0 | | 0 | 0 | | 0 | 1 | | | | 2436 |
| 7:00 - 8:00 | 49 | 2 | 53 | 500 | 126 | 752 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | | | |

| TIME PERIOD | VEHICLE MOVEMENT 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | 0 | 0 | 0 | 102 | 24 | 126 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 1 | 18 |
| 15:45 - 16:00 | 0 | 0 | 0 | 124 | 22 | 146 | 2 | 1 | 3 | 0 | 1 | 1 | 0 | 0 | 0 | 36 | 1 | 37 |
| 16:00 - 16:15 | 0 | 0 | 0 | 129 | 22 | 151 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 24 | 0 | 24 |
| 16:15 - 16:30 | 0 | 0 | 0 | 120 | 21 | 141 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 1 | 10 |
| 16:30 - 16:45 | 0 | 0 | 0 | 116 | 22 | 138 | 0 | 0 | 0 | 1 | 1 | 2 | 0 | 0 | 0 | 7 | 0 | 7 |
| 16:45 - 17:00 | 0 | 0 | 0 | 129 | 21 | 150 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 11 | 0 | 11 |
| 17:00 - 17:15 | 0 | 0 | 0 | 132 | 13 | 145 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 1 | 20 |
| 17:15 - 17:30 | 0 | 0 | 0 | 129 | 12 | 141 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 0 | 16 |
| 17:30 - 17:45 | 0 | 0 | 0 | 118 | 14 | 132 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 9 | 0 | 9 |
| 17:45 - 18:00 | 0 | 0 | 0 | 105 | 8 | 113 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 6 |
| 18:00 - 18:15 | 0 | 0 | 0 | 104 | 9 | 113 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 9 | 1 | 10 |
| 18:15 - 18:30 | 0 | 0 | 0 | 83 | 6 | 89 | 2 | 0 | 2 | 1 | 1 | 2 | 0 | 0 | 0 | 5 | 0 | 5 |
| Σ | 0 | 0 | 0 | 1391 | 194 | 1585 | 10 | 1 | 11 | 4 | 4 | 8 | 0 | 0 | 0 | 168 | 5 | 173 |
| 15:45 - 17:45 | 0 | 0 | | 997 | 147 | | 8 | 1 | | 2 | 3 | | 0 | 0 | | 131 | 3 | |
| 16:45 - 17:45 | 0 | 0 | | 508 | 60 | 628 | 5 | 0 | 5 | 1 | 0 | 1 | 0 | 0 | | 55 | 1 | 57 |

| TIME PERIOD | VEHICLE MOVEMENT 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | 5 | 1 | 6 | 91 | 25 | 116 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 216 | 51 | 267 |
| 15:45 - 16:00 | 8 | 0 | 8 | 102 | 20 | 122 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 272 | 45 | 317 |
| 16:00 - 16:15 | 9 | 0 | 9 | 113 | 20 | 133 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 276 | 43 | 319 |
| 16:15 - 16:30 | 7 | 1 | 8 | 116 | 23 | 139 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 254 | 46 | 300 |
| 16:30 - 16:45 | 12 | 1 | 13 | 123 | 14 | 137 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 260 | 38 | 298 |
| 16:45 - 17:00 | 7 | 0 | 7 | 130 | 20 | 150 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 280 | 41 | 321 |
| 17:00 - 17:15 | 8 | 0 | 8 | 123 | 18 | 141 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 284 | 32 | 316 |
| 17:15 - 17:30 | 7 | 1 | 8 | 126 | 21 | 147 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 280 | 34 | 314 |
| 17:30 - 17:45 | 10 | 0 | 10 | 119 | 8 | 127 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 258 | 22 | 280 |
| 17:45 - 18:00 | 11 | 0 | 11 | 112 | 12 | 124 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 234 | 20 | 254 |
| 18:00 - 18:15 | 9 | 1 | 10 | 110 | 12 | 122 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 233 | 23 | 256 |
| 18:15 - 18:30 | 7 | 0 | 7 | 89 | 5 | 94 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 187 | 12 | 199 |
| Σ | 100 | 5 | 105 | 1354 | 198 | 1552 | 2 | 0 | 2 | 0 | 0 | 0 | 3 | 0 | 3 | 2 | 0 | 2 | 3034 | 407 | 3441 |
| 15:45 - 17:45 | 68 | 3 | | 952 | 144 | | 2 | 0 | | 0 | 0 | | 2 | 0 | | 2 | 0 | | | | 2465 |
| 16:45 - 17:45 | 32 | 1 | 34 | 498 | 67 | 632 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 0 | 0 | | | |

# Intersection of Picton Road and Mount Keira Road

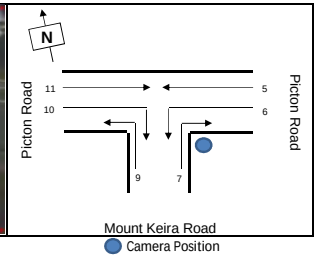
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type T Junction
Intersection No. **19**
North Approach
East Approach **Picton Road**
South Approach **Mount Keira Road**
West Approach **Picton Road**

Date **3/04/13**

Classification **Light Heavy**




| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | | | | | | | | | | | | | 192 | 43 | 235 | 2 | 0 | 2 | 0 | 0 | 0 | | | | 2 | 0 | 2 | 1 | 0 | 1 | 113 | 45 | 158 | | | | 310 | 88 | 398 |
| 6:45 - 7:00 | | | | | | | | | | | | | 121 | 30 | 151 | 0 | 0 | 0 | 1 | 0 | 1 | | | | 4 | 0 | 4 | 1 | 0 | 1 | 83 | 35 | 118 | | | | 210 | 65 | 275 |
| 7:00 - 7:15 | | | | | | | | | | | | | 115 | 29 | 144 | 1 | 0 | 1 | 0 | 0 | 0 | | | | 1 | 0 | 1 | 1 | 0 | 1 | 82 | 35 | 117 | | | | 200 | 64 | 264 |
| 7:15 - 7:30 | | | | | | | | | | | | | 140 | 33 | 173 | 1 | 0 | 1 | 0 | 0 | 0 | | | | 5 | 2 | 7 | 0 | 0 | 0 | 100 | 28 | 128 | | | | 246 | 63 | 309 |
| 7:30 - 7:45 | | | | | | | | | | | | | 119 | 33 | 152 | 0 | 0 | 0 | 2 | 0 | 2 | | | | 3 | 2 | 5 | 1 | 1 | 2 | 130 | 29 | 159 | | | | 255 | 65 | 320 |
| 7:45 - 8:00 | | | | | | | | | | | | | 99 | 34 | 133 | 0 | 0 | 0 | 0 | 0 | 0 | | | | 6 | 1 | 7 | 4 | 1 | 5 | 202 | 39 | 241 | | | | 311 | 75 | 386 |
| 8:00 - 8:15 | | | | | | | | | | | | | 89 | 20 | 109 | 1 | 1 | 2 | 2 | 0 | 2 | | | | 5 | 1 | 6 | 5 | 1 | 6 | 168 | 36 | 204 | | | | 270 | 59 | 329 |
| 8:15 - 8:30 | | | | | | | | | | | | | 90 | 25 | 115 | 0 | 1 | 1 | 0 | 0 | 0 | | | | 8 | 1 | 9 | 3 | 2 | 5 | 138 | 24 | 162 | | | | 239 | 53 | 292 |
| 8:30 - 8:45 | | | | | | | | | | | | | 63 | 32 | 95 | 2 | 0 | 2 | 2 | 1 | 3 | | | | 5 | 1 | 6 | 3 | 0 | 3 | 121 | 30 | 151 | | | | 196 | 64 | 260 |
| 8:45 - 9:00 | | | | | | | | | | | | | 73 | 28 | 101 | 1 | 0 | 1 | 0 | 1 | 1 | | | | 2 | 1 | 3 | 1 | 1 | 2 | 100 | 21 | 121 | | | | 177 | 52 | 229 |
| 9:00 - 9:15 | | | | | | | | | | | | | 59 | 37 | 96 | 0 | 0 | 0 | 1 | 0 | 1 | | | | 2 | 0 | 2 | 3 | 0 | 3 | 84 | 19 | 103 | | | | 149 | 56 | 205 |
| 9:15 - 9:30 | | | | | | | | | | | | | 73 | 45 | 118 | 0 | 0 | 0 | 0 | 0 | 0 | | | | 2 | 0 | 2 | 1 | 0 | 1 | 78 | 25 | 103 | | | | 154 | 70 | 224 |
| Σ | | | | | | | | | | | | | 1233 | 389 | 1622 | 8 | 2 | 10 | 8 | 2 | 10 | | | | 45 | 9 | 54 | 24 | 6 | 30 | 1399 | 366 | 1765 | | | | 2717 | 774 | 3491 |
| 7:00 - 9:00 | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 788 | 234 | | 6 | 2 | | 6 | 2 | | 0 | 0 | | 35 | 9 | | 18 | 6 | | 1041 | 242 | | 0 | 0 | | | | 2389 |

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | | | | | | | | | | | | | 95 | 21 | 116 | 1 | 0 | 1 | 1 | 1 | 2 | | | | 3 | 0 | 3 | 4 | 0 | 4 | 106 | 26 | 132 | | | | 210 | 48 | 258 |
| 15:45 - 16:00 | | | | | | | | | | | | | 103 | 22 | 125 | 1 | 0 | 1 | 2 | 2 | 4 | | | | 2 | 0 | 2 | 3 | 3 | 6 | 127 | 23 | 150 | | | | 238 | 50 | 288 |
| 16:00 - 16:15 | | | | | | | | | | | | | 96 | 26 | 122 | 2 | 0 | 2 | 1 | 0 | 1 | | | | 4 | 0 | 4 | 10 | 0 | 10 | 158 | 23 | 181 | | | | 271 | 49 | 320 |
| 16:15 - 16:30 | | | | | | | | | | | | | 109 | 14 | 123 | 0 | 0 | 0 | 1 | 0 | 1 | | | | 2 | 0 | 2 | 3 | 0 | 3 | 143 | 24 | 167 | | | | 259 | 38 | 296 |
| 16:30 - 16:45 | | | | | | | | | | | | | 112 | 18 | 130 | 1 | 0 | 1 | 0 | 0 | 0 | | | | 2 | 0 | 2 | 6 | 0 | 6 | 142 | 25 | 167 | | | | 263 | 43 | 306 |
| 16:45 - 17:00 | | | | | | | | | | | | | 122 | 17 | 139 | 1 | 0 | 1 | 3 | 0 | 3 | | | | 2 | 0 | 2 | 5 | 0 | 5 | 107 | 23 | 130 | | | | 240 | 40 | 280 |
| 17:00 - 17:15 | | | | | | | | | | | | | 123 | 23 | 146 | 0 | 0 | 0 | 0 | 0 | 0 | | | | 3 | 0 | 3 | 3 | 0 | 3 | 146 | 20 | 166 | | | | 275 | 43 | 318 |
| 17:15 - 17:30 | | | | | | | | | | | | | 126 | 10 | 136 | 0 | 0 | 0 | 1 | 0 | 1 | | | | 2 | 0 | 2 | 4 | 0 | 4 | 150 | 13 | 163 | | | | 283 | 23 | 306 |
| 17:30 - 17:45 | | | | | | | | | | | | | 125 | 13 | 138 | 2 | 0 | 2 | 0 | 0 | 0 | | | | 1 | 0 | 1 | 2 | 0 | 2 | 164 | 12 | 176 | | | | 294 | 25 | 319 |
| 17:45 - 18:00 | | | | | | | | | | | | | 106 | 9 | 115 | 0 | 0 | 0 | 0 | 0 | 0 | | | | 2 | 0 | 2 | 2 | 0 | 2 | 112 | 15 | 127 | | | | 222 | 24 | 246 |
| 18:00 - 18:15 | | | | | | | | | | | | | 98 | 12 | 110 | 0 | 0 | 0 | 1 | 0 | 1 | | | | 2 | 0 | 2 | 2 | 0 | 2 | 113 | 7 | 120 | | | | 216 | 19 | 235 |
| 18:15 - 18:30 | | | | | | | | | | | | | 61 | 11 | 72 | 0 | 0 | 0 | 1 | 0 | 1 | | | | 0 | 0 | 0 | 3 | 0 | 3 | 99 | 13 | 112 | | | | 164 | 24 | 188 |
| Σ | | | | | | | | | | | | | 1276 | 196 | 1472 | 8 | 0 | 8 | 11 | 3 | 14 | | | | 25 | 0 | 25 | 47 | 3 | 50 | 1567 | 224 | 1791 | | | | 2934 | 426 | 3360 |
| 15:45 - 17:45 | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 916 | 143 | | 7 | 0 | | 8 | 2 | | 0 | 0 | | 18 | 0 | | 36 | 3 | | 1137 | 163 | | 0 | 0 | | | | 2433 |

# Intersection of Wilton Road and Macarthur Drive

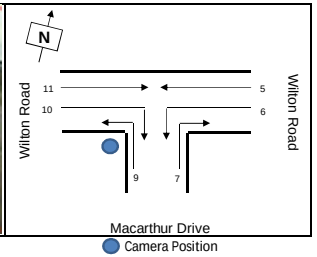
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type T Junction
Intersection No. **20**
North Approach
East Approach **Wilton Road**
South Approach **Macarthur Drive**
West Approach **Wilton Road**

Date **3/04/13**

Classification **Light Heavy**




| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | | | | | | | | | | | | | 15 | 1 | 16 | 3 | 0 | 3 | 12 | 2 | 14 | | | | 1 | 0 | 1 | 0 | 1 | 1 | 14 | 1 | 15 | | | | 45 | 5 | 50 |
| 6:45 - 7:00 | | | | | | | | | | | | | 10 | 2 | 12 | 1 | 0 | 1 | 17 | 0 | 17 | | | | 3 | 0 | 3 | 1 | 0 | 1 | 18 | 2 | 20 | | | | 50 | 4 | 54 |
| 7:00 - 7:15 | | | | | | | | | | | | | 25 | 0 | 25 | 11 | 0 | 11 | 11 | 0 | 11 | | | | 1 | 0 | 1 | 3 | 0 | 3 | 18 | 0 | 18 | | | | 69 | 0 | 69 |
| 7:15 - 7:30 | | | | | | | | | | | | | 20 | 0 | 20 | 10 | 0 | 10 | 10 | 2 | 12 | | | | 1 | 0 | 1 | 1 | 0 | 1 | 29 | 1 | 30 | | | | 71 | 3 | 74 |
| 7:30 - 7:45 | | | | | | | | | | | | | 27 | 2 | 29 | 35 | 0 | 35 | 16 | 0 | 16 | | | | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 24 | | | | 102 | 2 | 104 |
| 7:45 - 8:00 | | | | | | | | | | | | | 37 | 1 | 38 | 32 | 2 | 34 | 16 | 0 | 16 | | | | 1 | 0 | 1 | 1 | 0 | 1 | 26 | 4 | 30 | | | | 113 | 7 | 120 |
| 8:00 - 8:15 | | | | | | | | | | | | | 20 | 1 | 21 | 17 | 0 | 17 | 13 | 1 | 14 | | | | 1 | 0 | 1 | 0 | 1 | 1 | 22 | 0 | 22 | | | | 73 | 3 | 76 |
| 8:15 - 8:30 | | | | | | | | | | | | | 23 | 1 | 24 | 12 | 0 | 12 | 13 | 0 | 13 | | | | 1 | 0 | 1 | 0 | 1 | 1 | 37 | 2 | 39 | | | | 86 | 4 | 90 |
| 8:30 - 8:45 | | | | | | | | | | | | | 19 | 1 | 20 | 11 | 1 | 12 | 5 | 0 | 5 | | | | 1 | 0 | 1 | 1 | 0 | 1 | 22 | 3 | 25 | | | | 59 | 5 | 64 |
| 8:45 - 9:00 | | | | | | | | | | | | | 20 | 1 | 21 | 9 | 0 | 9 | 11 | 1 | 12 | | | | 1 | 0 | 1 | 1 | 0 | 1 | 22 | 0 | 22 | | | | 64 | 2 | 66 |
| 9:00 - 9:15 | | | | | | | | | | | | | 23 | 4 | 27 | 6 | 0 | 6 | 8 | 1 | 9 | | | | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 13 | | | | 50 | 5 | 55 |
| 9:15 - 9:30 | | | | | | | | | | | | | 27 | 1 | 28 | 4 | 0 | 4 | 5 | 1 | 6 | | | | 0 | 1 | 1 | 1 | 0 | 1 | 18 | 1 | 19 | | | | 55 | 4 | 59 |
| Σ | | | | | | | | | | | | | 266 | 15 | 281 | 151 | 3 | 154 | 137 | 8 | 145 | | | | 11 | 1 | 12 | 9 | 3 | 12 | 263 | 14 | 277 | | | | 837 | 44 | 881 |
| 7:00 - 9:00 | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 191 | 7 | | 137 | 3 | | 95 | 4 | | 0 | 0 | | 7 | 0 | | 7 | 2 | | 200 | 10 | | 0 | 0 | | | | 663 |
| 7:00 - 8:00 | 0 | 0 | | 0 | 0 | 0 | | | | | | | 109 | 3 | 115 | 88 | 2 | 92 | 53 | 2 | 57 | | | | 3 | 0 | 3 | 5 | 0 | 5 | 97 | 5 | 107 | | | | | | |

| TIME PERIOD | VEHICLE MOVEMENT | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | | 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | | | |
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | | | | | | | | | | | | | 40 | 1 | 41 | 26 | 1 | 27 | 3 | 1 | 4 | | | | 1 | 0 | 1 | 1 | 0 | 1 | 29 | 3 | 32 | | | | 100 | 6 | 106 |
| 15:45 - 16:00 | | | | | | | | | | | | | 35 | 1 | 36 | 33 | 0 | 33 | 7 | 0 | 7 | | | | 1 | 0 | 1 | 1 | 1 | 2 | 27 | 3 | 30 | | | | 104 | 5 | 109 |
| 16:00 - 16:15 | | | | | | | | | | | | | 30 | 0 | 30 | 18 | 1 | 19 | 7 | 0 | 7 | | | | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 2 | 34 | | | | 87 | 3 | 90 |
| 16:15 - 16:30 | | | | | | | | | | | | | 32 | 5 | 37 | 10 | 2 | 12 | 8 | 0 | 8 | | | | 1 | 0 | 1 | 0 | 0 | 0 | 41 | 1 | 42 | | | | 92 | 8 | 100 |
| 16:30 - 16:45 | | | | | | | | | | | | | 29 | 2 | 31 | 3 | 0 | 3 | 10 | 0 | 10 | | | | 1 | 1 | 2 | 1 | 0 | 1 | 27 | 1 | 28 | | | | 71 | 4 | 75 |
| 16:45 - 17:00 | | | | | | | | | | | | | 34 | 0 | 34 | 15 | 0 | 15 | 10 | 0 | 10 | | | | 1 | 0 | 1 | 0 | 0 | 0 | 34 | 0 | 34 | | | | 94 | 0 | 94 |
| 17:00 - 17:15 | | | | | | | | | | | | | 35 | 0 | 35 | 18 | 0 | 18 | 7 | 0 | 7 | | | | 0 | 0 | 0 | 1 | 0 | 1 | 28 | 0 | 28 | | | | 89 | 0 | 89 |
| 17:15 - 17:30 | | | | | | | | | | | | | 30 | 0 | 30 | 12 | 0 | 12 | 6 | 1 | 7 | | | | 1 | 0 | 1 | 3 | 0 | 3 | 27 | 1 | 28 | | | | 79 | 2 | 81 |
| 17:30 - 17:45 | | | | | | | | | | | | | 24 | 2 | 26 | 7 | 0 | 7 | 7 | 0 | 7 | | | | 1 | 0 | 1 | 2 | 0 | 2 | 25 | 1 | 26 | | | | 66 | 3 | 69 |
| 17:45 - 18:00 | | | | | | | | | | | | | 36 | 1 | 37 | 7 | 0 | 7 | 15 | 0 | 15 | | | | 1 | 0 | 1 | 2 | 0 | 2 | 24 | 0 | 24 | | | | 85 | 1 | 86 |
| 18:00 - 18:15 | | | | | | | | | | | | | 24 | 0 | 24 | 9 | 1 | 10 | 9 | 1 | 10 | | | | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 1 | 19 | | | | 60 | 3 | 63 |
| 18:15 - 18:30 | | | | | | | | | | | | | 24 | 0 | 24 | 4 | 0 | 4 | 7 | 0 | 7 | | | | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 2 | 20 | | | | 53 | 2 | 55 |
| Σ | | | | | | | | | | | | | 373 | 12 | 385 | 162 | 5 | 167 | 96 | 3 | 99 | | | | 8 | 1 | 9 | 11 | 1 | 12 | 330 | 15 | 345 | | | | 980 | 37 | 1017 |
| 15:45 - 17:45 | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 249 | 10 | | 116 | 3 | | 62 | 1 | | 0 | 0 | | 6 | 1 | | 8 | 1 | | 241 | 9 | | 0 | 0 | | | | 707 |
| 16:45 - 17:45 | 0 | 0 | | 0 | 0 | 0 | | | | | | | 123 | 2 | 127 | 52 | 0 | 52 | 30 | 1 | 32 | | | | 3 | 0 | 3 | 6 | 0 | 6 | 114 | 2 | 118 | | | | | | |

# Intersection of Wilton Road and Douglas Park Drive

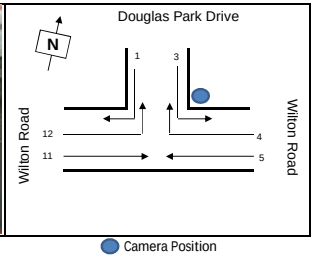
**Wednesday, 3 April 2013**

**Austraffic**

Survey Start **6:30 AM 15:30 PM**
Intersection Type T Junction
Intersection No. **21**
North Approach **Douglas Park Drive**
East Approach **Wilton Road**
South Approach
West Approach **Wilton Road**

Date **3/04/13**

Classification **Light Heavy**




Camera Position

| TIME PERIOD | VEHICLE MOVEMENT 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | 6 | 1 | 7 | | | | 4 | 0 | 4 | 3 | 0 | 3 | 12 | 0 | 12 | | | |
| 6:45 - 7:00 | 3 | 2 | 5 | | | | 2 | 0 | 2 | 7 | 0 | 7 | 9 | 0 | 9 | | | |
| 7:00 - 7:15 | 20 | 0 | 20 | | | | 6 | 0 | 6 | 6 | 0 | 6 | 16 | 0 | 16 | | | |
| 7:15 - 7:30 | 16 | 1 | 17 | | | | 5 | 0 | 5 | 1 | 0 | 1 | 13 | 0 | 13 | | | |
| 7:30 - 7:45 | 40 | 1 | 41 | | | | 11 | 0 | 11 | 3 | 0 | 3 | 23 | 0 | 23 | | | |
| 7:45 - 8:00 | 46 | 3 | 49 | | | | 13 | 0 | 13 | 3 | 0 | 3 | 22 | 0 | 22 | | | |
| 8:00 - 8:15 | 29 | 0 | 29 | | | | 5 | 0 | 5 | 5 | 0 | 5 | 10 | 1 | 11 | | | |
| 8:15 - 8:30 | 18 | 1 | 19 | | | | 2 | 0 | 2 | 8 | 0 | 8 | 15 | 0 | 15 | | | |
| 8:30 - 8:45 | 14 | 2 | 16 | | | | 1 | 0 | 1 | 6 | 1 | 7 | 15 | 0 | 15 | | | |
| 8:45 - 9:00 | 14 | 1 | 15 | | | | 3 | 1 | 4 | 6 | 0 | 6 | 15 | 1 | 16 | | | |
| 9:00 - 9:15 | 12 | 1 | 13 | | | | 7 | 0 | 7 | 7 | 1 | 8 | 17 | 2 | 19 | | | |
| 9:15 - 9:30 | 17 | 1 | 18 | | | | 7 | 0 | 7 | 8 | 0 | 8 | 15 | 0 | 15 | | | |
| Σ | 235 | 14 | 249 | | | | 66 | 1 | 67 | 63 | 2 | 65 | 182 | 4 | 186 | | | |
| 7:00 - 9:00 | 197 | 9 | | 0 | 0 | | 46 | 1 | | 38 | 1 | | 129 | 2 | | 0 | 0 | |
| 7:00 - 8:00 | 122 | 5 | 132 | | | | 35 | 0 | 35 | 13 | 0 | 13 | 74 | 0 | 74 | | | |

| TIME PERIOD | VEHICLE MOVEMENT 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 6:30 - 6:45 | | | | | | | | | | | | | 10 | 1 | 11 | 17 | 2 | 19 | 52 | 4 | 56 |
| 6:45 - 7:00 | | | | | | | | | | | | | 16 | 2 | 18 | 18 | 0 | 18 | 55 | 4 | 59 |
| 7:00 - 7:15 | | | | | | | | | | | | | 15 | 0 | 15 | 14 | 0 | 14 | 77 | 0 | 77 |
| 7:15 - 7:30 | | | | | | | | | | | | | 21 | 0 | 21 | 18 | 3 | 21 | 74 | 4 | 78 |
| 7:30 - 7:45 | | | | | | | | | | | | | 22 | 0 | 22 | 18 | 0 | 18 | 117 | 1 | 118 |
| 7:45 - 8:00 | | | | | | | | | | | | | 16 | 2 | 18 | 24 | 2 | 26 | 124 | 7 | 131 |
| 8:00 - 8:15 | | | | | | | | | | | | | 22 | 0 | 22 | 14 | 1 | 15 | 85 | 2 | 87 |
| 8:15 - 8:30 | | | | | | | | | | | | | 26 | 1 | 27 | 24 | 1 | 25 | 93 | 3 | 96 |
| 8:30 - 8:45 | | | | | | | | | | | | | 16 | 2 | 18 | 10 | 1 | 11 | 62 | 6 | 68 |
| 8:45 - 9:00 | | | | | | | | | | | | | 12 | 0 | 12 | 20 | 1 | 21 | 70 | 4 | 74 |
| 9:00 - 9:15 | | | | | | | | | | | | | 12 | 0 | 12 | 11 | 1 | 12 | 66 | 5 | 71 |
| 9:15 - 9:30 | | | | | | | | | | | | | 16 | 0 | 16 | 7 | 2 | 9 | 70 | 3 | 73 |
| Σ | | | | | | | | | | | | | 204 | 8 | 212 | 195 | 14 | 209 | 945 | 43 | 988 |
| 7:00 - 9:00 | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 150 | 5 | | 142 | 9 | | | | 729 |
| 7:00 - 8:00 | | | | | | | | | | | | | 74 | 2 | 78 | 74 | 5 | 84 | | | |

| TIME PERIOD | VEHICLE MOVEMENT 1 | | | 2 | | | 3 | | | 4 | | | 5 | | | 6 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | 39 | 1 | 40 | | | | 14 | 0 | 14 | 9 | 0 | 9 | 26 | 1 | 27 | | | |
| 15:45 - 16:00 | 51 | 1 | 52 | | | | 19 | 0 | 19 | 5 | 0 | 5 | 18 | 0 | 18 | | | |
| 16:00 - 16:15 | 29 | 1 | 30 | | | | 8 | 0 | 8 | 9 | 0 | 9 | 19 | 0 | 19 | | | |
| 16:15 - 16:30 | 22 | 5 | 27 | | | | 7 | 0 | 7 | 2 | 0 | 2 | 17 | 2 | 19 | | | |
| 16:30 - 16:45 | 15 | 0 | 15 | | | | 5 | 0 | 5 | 7 | 0 | 7 | 18 | 2 | 20 | | | |
| 16:45 - 17:00 | 24 | 0 | 24 | | | | 5 | 0 | 5 | 5 | 0 | 5 | 26 | 0 | 26 | | | |
| 17:00 - 17:15 | 29 | 0 | 29 | | | | 2 | 0 | 2 | 5 | 0 | 5 | 25 | 0 | 25 | | | |
| 17:15 - 17:30 | 23 | 0 | 23 | | | | 4 | 0 | 4 | 3 | 0 | 3 | 20 | 0 | 20 | | | |
| 17:30 - 17:45 | 14 | 1 | 15 | | | | 4 | 0 | 4 | 5 | 0 | 5 | 17 | 1 | 18 | | | |
| 17:45 - 18:00 | 24 | 1 | 25 | | | | 0 | 0 | 0 | 9 | 1 | 10 | 19 | 0 | 19 | | | |
| 18:00 - 18:15 | 15 | 1 | 16 | | | | 1 | 0 | 1 | 3 | 0 | 3 | 19 | 0 | 19 | | | |
| 18:15 - 18:30 | 17 | 0 | 17 | | | | 1 | 0 | 1 | 4 | 0 | 4 | 11 | 0 | 11 | | | |
| Σ | 302 | 11 | 313 | | | | 70 | 0 | 70 | 66 | 1 | 67 | 235 | 6 | 241 | | | |
| 15:45 - 17:45 | 207 | 8 | | 0 | 0 | | 54 | 0 | | 41 | 0 | | 160 | 5 | | 0 | 0 | |
| 16:45 - 17:45 | 90 | 1 | 92 | | | | 15 | 0 | 15 | 18 | 0 | 18 | 88 | 1 | 90 | | | |

| TIME PERIOD | VEHICLE MOVEMENT 7 | | | 8 | | | 9 | | | 10 | | | 11 | | | 12 | | | GRAND TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ | Light | Heavy | Σ |
| 15:30 - 15:45 | | | | | | | | | | | | | 21 | 0 | 21 | 10 | 4 | 14 | 119 | 6 | 125 |
| 15:45 - 16:00 | | | | | | | | | | | | | 16 | 1 | 17 | 17 | 2 | 19 | 126 | 4 | 130 |
| 16:00 - 16:15 | | | | | | | | | | | | | 23 | 0 | 23 | 18 | 2 | 20 | 106 | 3 | 109 |
| 16:15 - 16:30 | | | | | | | | | | | | | 20 | 1 | 21 | 30 | 0 | 30 | 98 | 8 | 106 |
| 16:30 - 16:45 | | | | | | | | | | | | | 16 | 1 | 17 | 19 | 0 | 19 | 80 | 3 | 83 |
| 16:45 - 17:00 | | | | | | | | | | | | | 28 | 0 | 28 | 18 | 0 | 18 | 106 | 0 | 106 |
| 17:00 - 17:15 | | | | | | | | | | | | | 19 | 0 | 19 | 14 | 0 | 14 | 94 | 0 | 94 |
| 17:15 - 17:30 | | | | | | | | | | | | | 17 | 0 | 17 | 15 | 2 | 17 | 82 | 2 | 84 |
| 17:30 - 17:45 | | | | | | | | | | | | | 19 | 0 | 19 | 15 | 1 | 16 | 74 | 3 | 77 |
| 17:45 - 18:00 | | | | | | | | | | | | | 17 | 0 | 17 | 20 | 0 | 20 | 89 | 2 | 91 |
| 18:00 - 18:15 | | | | | | | | | | | | | 11 | 0 | 11 | 18 | 2 | 20 | 67 | 3 | 70 |
| 18:15 - 18:30 | | | | | | | | | | | | | 7 | 0 | 7 | 19 | 2 | 21 | 59 | 2 | 61 |
| Σ | | | | | | | | | | | | | 214 | 3 | 217 | 213 | 15 | 228 | 1100 | 36 | 1136 |
| 15:45 - 17:45 | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | | 158 | 3 | | 146 | 7 | | | | 789 |
| 16:45 - 17:45 | | | | | | | | | | | | | 83 | 0 | 83 | 62 | 3 | 68 | | | |

# Appendix B

Intersection performance criteria

# B1. Intersection performance criteria

### Level of Service (LoS)

Level of Service (Los) is a basic performance parameter used to describe the operation of an intersection. Levels of service range from A (indicating good intersection operation) to F (indicating over-saturated conditions with long delays and queues). At signalised intersections, the LoS criteria are related to average intersection delay (seconds per vehicle). At priority controlled (give-way and stop controlled) and roundabout intersections, the LoS is based on the modelled delay (seconds per vehicle) for the most delayed movement (refer to Table A.1).

**Table A.1 Level of Service criteria for intersections**

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

Source: RMS Guide to Traffic Generating Developments, 2002

### Degree of saturation (DoS)

The Degree of Saturation (DoS) is the ratio of demand flow to capacity, and therefore has no unit. As it approaches 1.0, extensive queues and delays could be expected. For a satisfactory situation, DoS should be less than the nominated practical degree of saturation, usually 0.9. The intersection DoS is based on the movement with the highest value.

### Average vehicle delay

This is the difference between interrupted and uninterrupted travel times through the intersection and is measured in seconds per vehicle. At signalised intersections and roundabouts, the average intersection delay is usually reported. At priority controlled intersections, the average delay for the most delayed movement is usually reported.

### Queue length

Queue length is measured in metres reflecting the number of vehicles waiting at the stop line and is usually quoted as the 95$^{th}$ percentile back of queue, which is the value below which 95% of all observed queue lengths fall. It reflects the number of vehicles per traffic lane at the start of the green period, when traffic starts moving again after a red signal. The intersection queue length is usually taken from the movement with the longest queue length.

**Table A.2 Austroads lane capacities (in PCU)**

| LoS | 2-lane 2-way | Multi-lane arterial | Freeway |
|---|---|---|---|
| A | 490 | 560 | 770 |
| B | 780 | 880 | 1,210 |
| C | 1,190 | 1,280 | 1,740 |
| D | 1,830 | 1,705 | 2,135 |
| E | 3,200 | 2,000 | 2,350 |
| F | Greater than 3,200 | Greater than 2,000 | Greater than 2,350 |

Source: Austroads Guide to Traffic Management Part 3: Traffic Studies and Analysis

# Appendix C

Aimsun model calibration and validation report

Elton Consulting

# Wilton Junction Transport Management and Accessibility Plan
# AIMSUN Mesoscopic Model Calibration and Validation Report

18 October 2013

PARSONS BRINCKERHOFF

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## Author, Reviewer and Approver details

| | | | |
|---|---|---|---|
| Prepared by: | Bill Chen | Date: 18/10/2013 | Signature: Bill Chen |
| Reviewed by: | Graeme Inglis | Date: 18/10/2013 | Signature: Graeme Inglis |
| Approved by: | Graeme Inglis | Date: 18/10/2013 | Signature: Graeme Inglis |

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Parsons Brinckerhoff Australia Pty Limited

*ABN 80 078 004 798*

Level 27 Ernst & Young Centre
680 George Street, Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001
Australia
Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
Email: sydney@pb.com.au
www.pbworld.com


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# Contents

# List of tables

**Page number**



# List of figures

**Page number**





# List of appendices

# 1. Introduction

## 1.1 Background

Parsons Brinckerhoff were commissioned by Elton Consulting on behalf of the Wilton Junction Landowners Group to undertake traffic simulation modelling for the Wilton Junction precinct to assess the traffic impacts resulting from the proposed new development.

A key component of the assessment is the development of existing condition Mesoscopic simulation models to develop a strong understanding of current traffic operations on the surrounding road network and to provide a robust platform on which to assess future year development scenarios.

The purpose of this report is to detail the development of the 2013 base year AIMSUN Mesoscopic models and report on the model calibration and validation process. The purpose of the modelling is twofold:

1. to assist in determining the infrastructure requirements for the Wilton Junction development, and
2. to assess the traffic impacts of the proposed development on existing infrastructure.

The modelling will help to inform the rezoning process.



## 1.2 Report structure

The report is structured as follows:

**Section 2:** Data sources

**Section 3:** Model development

**Section 4:** Model calibration and validation

**Section 5:** Summary and conclusions.

# 2. Data sources

## 2.1 Traffic data

Parsons Brinckerhoff collected a significant amount of traffic data to assist in the development of the base year model. The information provided is detailed below:

- classified intersection turning movement counts
- motorway flow counts
- intersection approach queue lengths
- travel time.

In addition to the above information, Parsons Brinckerhoff was provided the following data from Bureau of Transport Statistics (BTS) and Roads and Maritime Services (RMS):

- the 2011 Sydney Travel Model (STM) outputs (from BTS)
- traffic signal and SCATS count data (from RMS).

### 2.1.1 Classified intersection turning movement counts



The intersection turning movement counts was undertaken by Austraffic (traffic survey specialist) on 4 April 2013 at the following locations (these are noted in Figure 2.1):

3. A9 Narellan Road/Camden Bypass (interchange)
4. M31 Hume Motorway/A9 Narellan Road (interchange)
5. SR89 Remembrance Driveway and Macarthur Road (interchange)
6. B69 Appin Road/Church Street (priority controlled)
7. B69 Appin Road/M1 Princes Highway (interchange)
8. M1 Princes Highway/B88 Picton Road (interchange)
9. M31 Hume Motorway/B88 Picton Road (interchange)
10. Menangle Street/SR89 Remembrance Driveway (priority controlled)
11. Menangle Road/Camden Road (priority controlled)
12. M31 Hume Motorway/SR89 Remembrance Driveway (interchange)
13. B88 Picton Road/Menangle Road (priority controlled)
14. B88 Picton Road/Wilton Park Road, west of Menangle Road (priority controlled)
15. B88 Picton Road/Pembroke Parade (priority controlled)
16. B88 Picton Road/Almond Street (priority controlled)
17. B88 Picton Road/Macarthur Drive (priority controlled)
18. B88 Picton Road/Mount Keira Road (priority controlled)
19. Wilton Road/Macarthur Drive (priority controlled)
20. Wilton Road/Douglas Park Drive (priority controlled)

21. B88 Picton Road/Wilton Park Road, east of Menangle Road (priority controlled, data collected on May 1 2013)

Turn counts were undertaken between 06.30–09.30 for the AM peak and 15.30–18.30 for the PM peak. Counts were classified into light and heavy vehicles with data binned into 15-minute intervals.

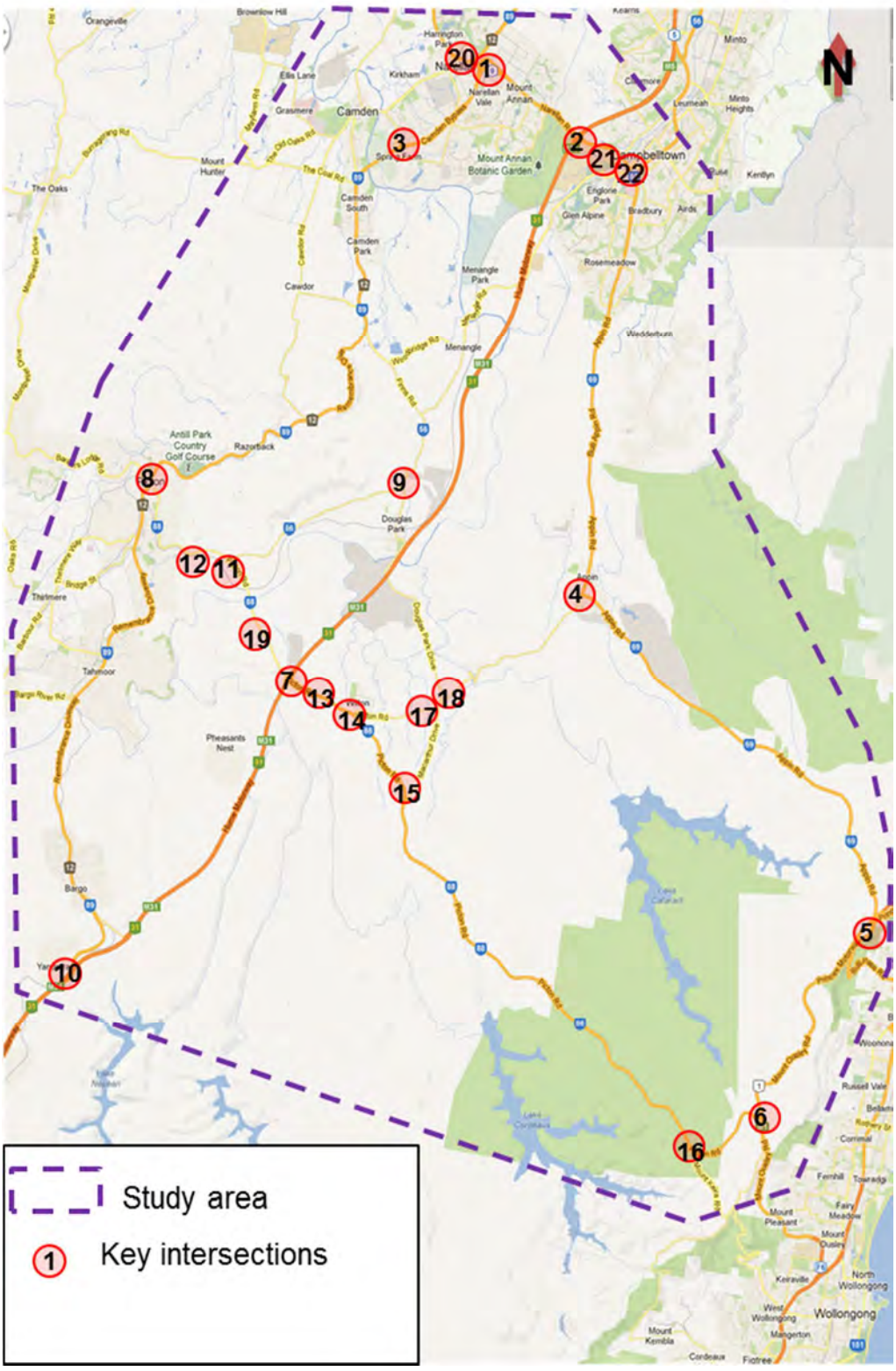



**Figure 2.1 Study area and key intersections**

### 2.1.2 Motorway flow counts

Motorway flow counts were undertaken by Austraffic on April 4 2013 at the following locations:

- M31 Hume Motorway under B88 Picton Road
- M1 Princes Highway at its intersection with B88 Picton Road.

Flow counts were undertaken between 06.30–09.30 for the AM peak and between 15.30–18.30 for the PM peak. Counts were classified into light and heavy vehicles with data binned into 15-minute intervals.

### 2.1.3 Queue lengths

Queue lengths surveys were undertaken by Austraffic on April 4 2013 at each approach at the following intersections:

- M31 Hume Motorway/B88 Picton Road
- M31 Hume Motorway/A9 Narellan Road
- B69 Narellan Road/B69 Appin Road/Oxley Street.

The maximum queue lengths (in vehicle) on each approach were recorded every signal cycle for the signalised intersections and every minute for the priority controlled intersections.

### 2.1.4 Travel times



Parsons Brinckerhoff undertook travel time surveys on 4 April 2013 to obtain travel time validation information. Surveys were taken by 'floating car' method of driving throughout the study area. Video footage of the surveys was recorded and this provided further information on network operation that proved extremely valuable for the model development process.

### 2.1.5 Traffic signal and SCATS count data

A total of four key signalised intersections were modelled in the 2013 base year AIMSUN model. These intersections are noted in Figure 2.1, including:

2. M31 Hume Motorway/A9 Narellan Road (western intersection)
22. A9 Narellan Road/SR89 Remembrance Driveway/A9 the Northern Road
23. B69 Narellan Road/Blaxland Road/Gilchrist Drive
24. B69 Narellan Road/B69 Appin Road/Oxley Street.

Parsons Brinckerhoff was supplied with the following signal data by RMS for these intersections:

- traffic control site (TCS) graphics plots depicting the phasing plans and signal groups and detector locations
- intersection diagnostic monitor (IDM) containing the information on phase times, phase frequencies and cycle lengths
- SCATS traffic counts in 30-minute interval.

### 2.1.6 STM model data

BTS provided the following data from their STM model to assist in the model development and option testing.

- STM zoning structure for the study area
- 2011 STM cordon matrices of the study area.

## 2.2 Site inspection

Site inspection was undertaken by Parsons Brinckerhoff to observe the current traffic conditions in the study area during both the AM and PM periods. Specific note was made of the following:

- restrictions
- intersection and lane configuration
- lane usage
- driver behaviour.

During the site inspection, it was observed that M31 Hume Motorway/B88 Picton Road interchange operated well in both AM and PM peak, with the right turning vehicles on both northbound and southbound off-ramps experiencing some delays when waiting for suitable gaps to merge onto B88 Picton Road.

# 3. 2013 Base year model development

## 3.1 Modelling software

Through extensive consultations with the Transport for New South Wales (TfNSW), AIMSUN software (version 8.0) was selected as the modelling tool of choice to undertake the traffic Mesoscopic modelling for this project.

## 3.2 AIMSUN template

As currently there is no AIMSUN template available in NSW, the template developed by the Department of Planning, Transport and Infrastructure South Australia (DPTI) in conjunction with TSS-Transport Simulation Systems (AIMSUN software vendor) has been used for the development of the base year model. The following notes any changes that have been made to the DPTI's AIMSUN template to assist with model development and calibration:

- vehicle characteristic
- road type.



### 3.2.1 Vehicle characteristics

Different from microsimulation, the Mesoscopic simulator in AIMSUN does not model the overtaking manoeuvre within a model section/link. This leads to unrealistically high delay time for some long highway sections in the model when there are slow vehicles travelling through these locations. Therefore, the default values of speed variability parameters including the **Desired Speed** and **Speed Acceptance** for the DPTI car were adjusted to reflect realistic delays on these locations in the model.

The parameter of the **Maximum Giveway Time** for the DPTI car has been modified to reflect the observed giveway behaviour. This is further discussed in section 4.2.1.

Table 3.1 shows the adjustments of the parameters related to vehicle characteristics.

**Table 3.1 Adjustment of vehicle parameters for DPTI car**

| Vehicle parameter | Standard value | Adjusted value |
|---|---|---|
| Deviation of maximum desired speed | 10 km/hr | 0 km/hr |
| Minimum desired speed | 80 km/hr | 110 km/hr |
| Maximum desired speed | 120 km/hr | 110 km/hr |
| Mean speed acceptance | 0.96 | 1.00 |
| Deviation of speed acceptance | 0.09 | 0.02 |
| Minimum speed acceptance | 0.75 | 0.98 |
| maximum speed acceptance | 1.12 | 1.02 |
| maximum give way time | 30s | 60s |

### 3.2.2 Road types

The parameter of **Visibility Along Main Stream** related to give way behaviour for all the road types has been increased from the standard value of 20 metres to be 150 metres to represent the observed driver behaviour.

In AIMSUN Mesoscopic model, the link capacity parameter influences a driver's perception of the travel costs for alternative routes. This parameter for all the road types has been modified in accordance with Austroads *Guide to Traffic Management (Part 3: Traffic Studies and Analysis 2009)* to aid in the calibration of route choices in the model.

The DPTI's AIMSUN template only provides a limited number of road types. Therefore, some new road types were created to better reflect various posted speed limits within the study area.

## 3.3 Base models

Models representing the following time periods for 2013 base year were developed:

- AM peak: 07.00–09.00
- PM peak: 15.45–17.45.

Both the peak periods were determined based on the surveyed turning movement counts and motorway flow counts.



Each model was also built with a one-hour warm up period to ensure a good representation of traffic conditions in the network at the beginning of the peak period. In addition, a one-hour cool down period was included to replicate the 'clear out' of the study area after the peak period.

## 3.4 Model network and zoning system

The model network is shown in Figure 3.1 using aerial photography as an overlay. The network includes the M31 Hume Motorway between B69 Narellan Road and SR89 Remembrance Drive, B88 Picton Road, SR 89 Remembrance Drive, B69 Appin Road, Wilton Road, Menangle Drive, and the M1 Princes Highway between B69 Appin Road and B88 Picton Road.

### 3.4.1 Zoning structure

The zoning layout is also highlighted in Figure 3.1. Zones are defined as locations where vehicle trips originate and terminate, i.e. trip ends.

The foremost component in defining the zoning structure for the AIMSUN Mesoscopic model was the existing structure utilised in the higher tier STM model. Aggregation and Disaggregation of these STM zones were undertaken where considered applicable.

Aggregation of the STM zones was undertaken for the outer (non-core) study areas, which are far away from the proposed development sites at Wilton and therefore, require less detailed modelling. These areas include Campbelltown, Narellan, Camden and etc.

There is only one zone (TZ 1450) in STM covering the whole core study area highlighted in blue in Figure 3.1. Therefore, additional zones were created in the AIMSUN model to provide a more realistic behavioural representation of vehicle trips entering and exiting this area.

In total, 41 zones have been coded into the model.

The following key intersections were also included in the model, which are shown below:

1. A9 Narellan Road/Camden Bypass
2. M31 Hume Motorway/A9 Narellan Road
3. SR89 Remembrance Driveway and Macarthur Road
4. B69 Appin Road/Church Street
5. B69 Appin Road/M1 Princes Highway
6. M1 Princes Highway/B88 Picton Road
7. M31 Hume Motorway/B88 Picton Road
8. Menangle Street/SR89 Remembrance Driveway
9. Menangle Road/Camden Road
10. M31 Hume Motorway/SR89 Remembrance Driveway
11. B88 Picton Road/Menangle Road
12. B88 Picton Road/Wilton Park Road, west of Menangle Road
13. B88 Picton Road/Pembroke Parade
14. B88 Picton Road/Almond Street
15. B88 Picton Road/Macarthur Drive
16. B88 Picton Road/Mount Keira Road
17. Wilton Road/Macarthur Drive
18. Wilton Road/Douglas Park Drive
19. B88 Picton Road/Wilton Park Road, east of Menangle Road (priority controlled)
20. A9 Narellan Road/Remembrance Driveway/A9 the Northern Road
21. B69 Narellan Road/Blaxland Road/Gilchrist Drive
22. B69 Narellan Road/B69 Appin Road/Oxley Street.

Noted that some dummy intersections were also coded in the model for the purpose of balancing midblock inflows and outflows.

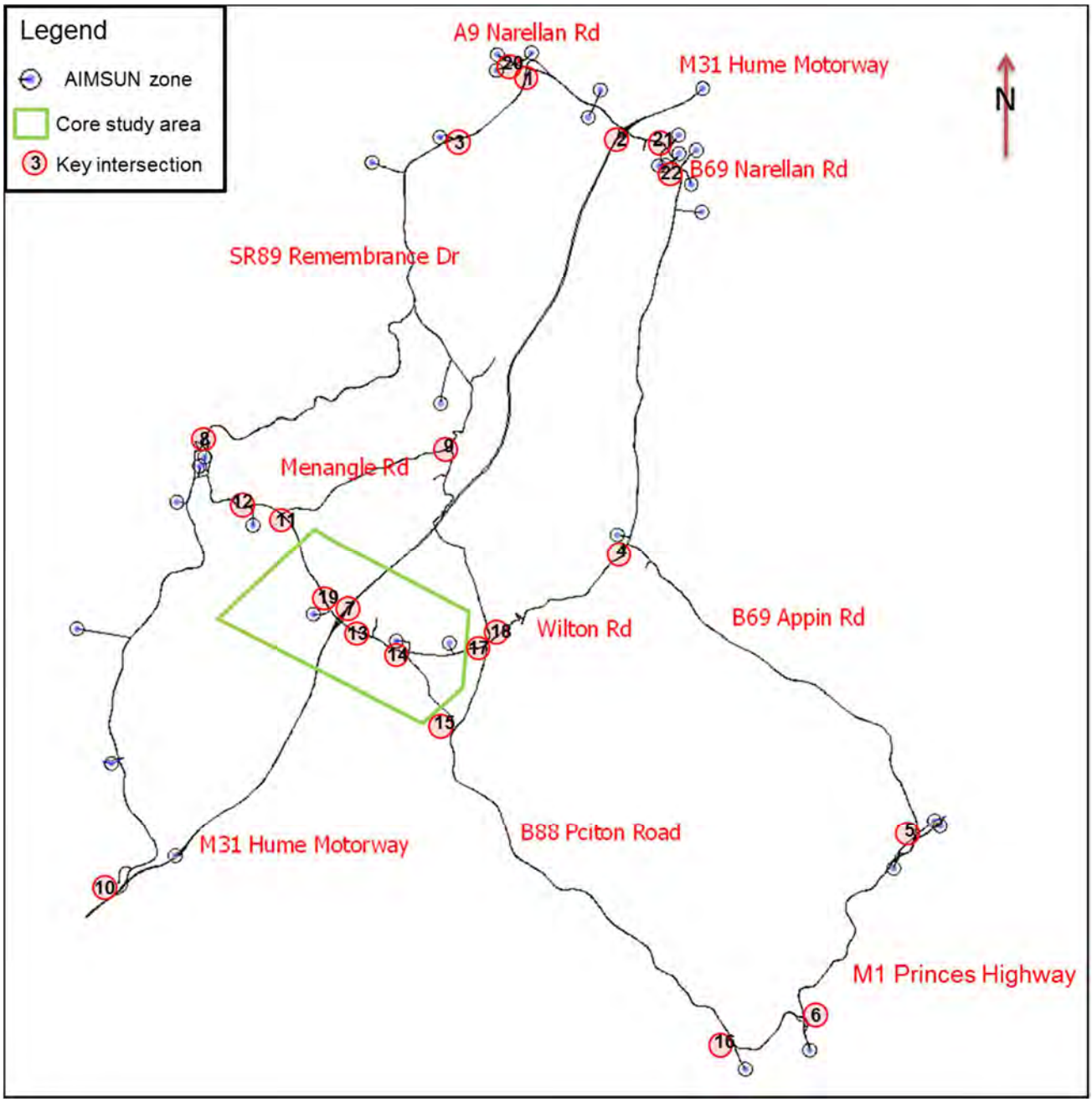



**Figure 3.1 AIMSUN model network and zoning system**

## 3.5 Traffic signals

Traffic signals were coded using the default AIMSUN fixed time method. The IDM phasing and phase timings were developed based on the information provided by RMS.

## 3.6 Base year traffic demand

The traffic demand matrices for 2013 AM and PM peak periods have been calculated from the following sources:

- STM cordon matrices
- classified intersection turning movement counts

- intersection SCATS counts
- motorway flow counts.

The methodology for the development of the base demand matrices is summarised below.

## 3.6.1 Demand matrix development

The cordon Origin-Destination (OD) demand matrices were extracted from the 2011 STM model, which cover the 2-hour AM peak and 2-hour PM peak. These demands were used as a base to develop the demand matrices suitable for the AIMSUN mesoscopic modelling.

### 3.6.1.1 OD Matrix adjustment at macroscopic level

In the first place, the STM cordon OD matrices were manipulated to reflect the AIMSUN zone structure. These STM matrices were considered coarse in the core study area with only one zone covering the area. Therefore, trip disaggregation was undertaken to better reflect trip generation and attraction within the area. For the outer study area, STM demand was aggregated based on the simpler AIMSUN zone structure within the area.

The demand matrices were then adjusted to the survey data using the Furness method in AIMSUN. Trip generation and attraction totals for each AIMSUN zone were formed from the surveyed turning movement counts, SCATS counts and motorway flow counts.



As the STM cordon matrices use the Passenger Car Unit (PCU) to represent demand, the collected turn counts data was converted into PCU based on the following factors specified in the Roads and Maritime Services *Traffic Modelling Guidelines (Version 1 February 2013, Section 10: Highway Assignment Modelling)*:

- one light vehicle equals one PCU
- one heavy vehicle equals two PCUs.

As part of the calibration process the matrices were further adjusted with the Static Adjustment function in AIMSUN to better match the surveyed counts.

The AM and PM regression plots for the initial static adjustment are provided in Figure 3.2 and 3.3 respectively. The regression plots show a good match between the adjusted matrices and the survey data.

***It should be noted that the adjusted OD matrices were further fine-turned at Mesoscopic level in the model calibration, which is discussed in section 4.2.3.1.***

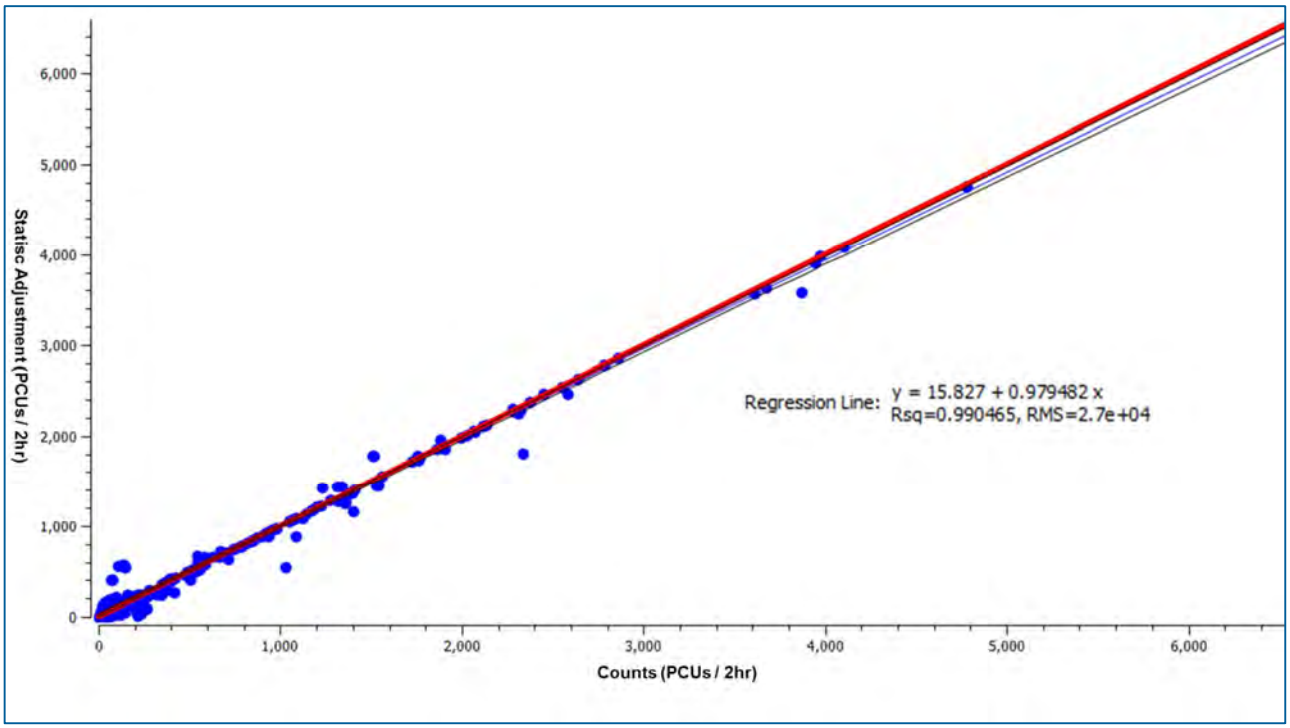



**Figure 3.2 2013 AM peak (7.00–9.00) Static Adjustment regression plot**

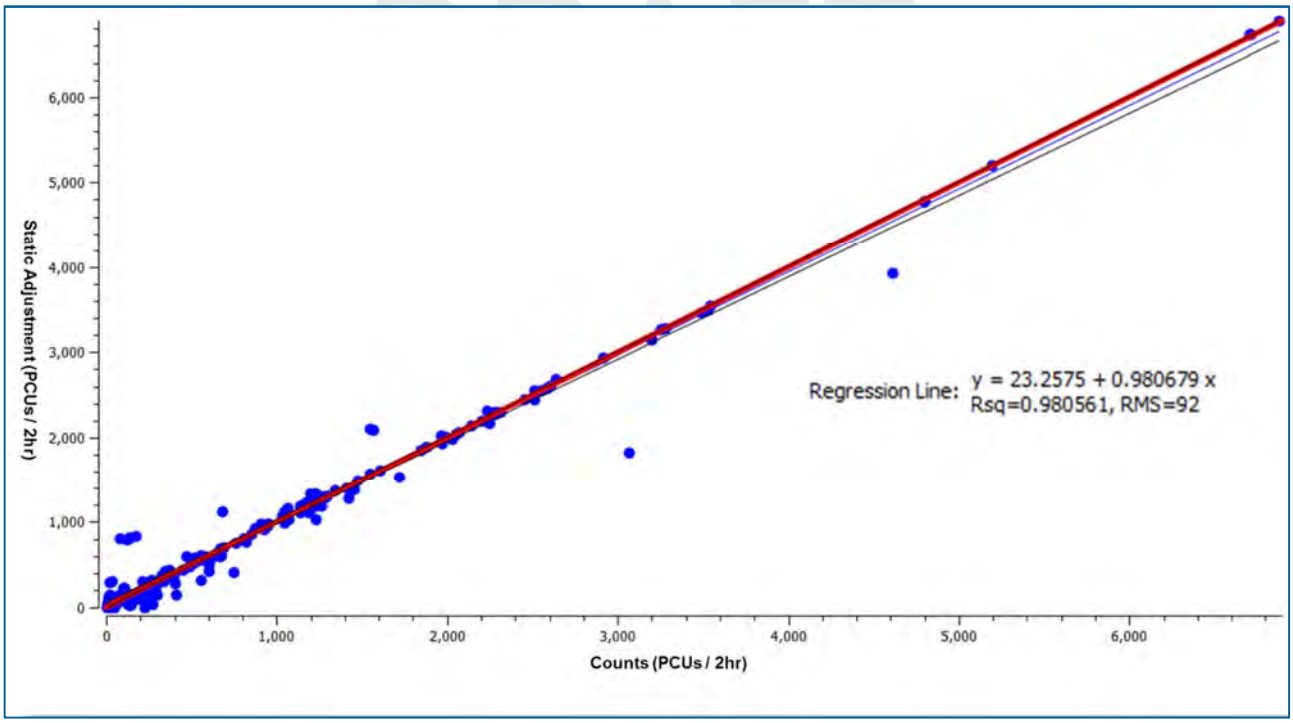



**Figure 3.3 2013 PM peak (15.45–17.45) Static Adjustment regression plot**

### 3.6.1.2 Demand profile

Demand profiles were developed for each of peak periods. These profiles specify the timing of proportional release of vehicles into the models. Hourly global profiles were estimated based on the surveyed turn counts and motorway flow counts data and then applied to all zones in the AIMSUN model.

## 3.7 Traffic assignment

Stochastic assignment with a feedback period of 5 minutes was adopted for the AIMSUN mesoscopic model. This assignment method uses dynamic travel cost information at both past and current points of time in the simulation to estimate the routing for each vehicle. Thus, each vehicle selects the optimal route when being released into model network. It then reacts to changes in traffic conditions and dynamically changes its current route to a lower cost route if available.

It should be also noted that by applying the stochastic assignment each vehicle in the model perceives their travel cost through the network slightly differently. This adds a random element to the cost calculation for individual drivers and provides more realistic representation of the actual drivers' behaviour in the model network.

The settings of traffic assignment used in the AIMSUN model are shown in Table 3.2.

**Table 3.2 Dynamic traffic assignment settings in the model**

| Item | Parameter | Value |
|---|---|---|
| Assignment method | Stochastic dynamic assignment | selected |
| Dynamic assignment | Cycle (feedback period) | 00:05:00 |
| | Number of intervals | 3 |
| | Attractiveness weight | 2 |
| | User defined cost weight | 1 |
| Route choice model | Route choice model | Proportional |
| | Initial K-SPs | 3 |
| | Max number paths in memory | 10 |
| | Max number of paths from path assignment results | 3 |
| | Maximum paths per interval | 3 |
| | Alpha | 4 |

# 4. Model calibration and validation

## 4.1 Introduction

After the initial model development, Parsons Brinckerhoff considered the base model calibration and validation. Model calibration entails matching observed traffic conditions with the AIMSUN model to provide confidence that the model is representative existing traffic conditions. Model calibration has focused on observed network conditions and observed traffic volumes.

Model validation, whilst similar to model calibration, consists of matching an independent set of data (not used in the model build process) with model outputs. In this case, travel time information has been used to validate the model.

Parsons Brinckerhoff has adhered to the Roads and Maritime Services *Traffic Modelling Guidelines (Version 1 February 2013, Section 10: Highway Assignment Modelling)* when calibrating and validating the AIMSUN model.

In line with good modelling practice the results of the calibration exercise were considered over five different seed values. It is considered that five seed values is sufficient for this modelling excesses.



## 4.2 Model calibration

### 4.2.1 Network calibration

A major element of successful calibration was to ensure the priority-controlled M31 Hume Motorway/B88 Picton Road interchange was being simulated accurately and the giveway operations at this location were realistically represented. Therefore, the default values of gap acceptance parameters including initial safety margin, final safety margin, maximum giveway time and visibility along main stream were adjusted to reflect the observed conditions during the site inspection.

### 4.2.2 Traffic assignment calibration

#### 4.2.2.1 Road/link hierarchy and localised link cost

Link hierarchy influences driver's perception of travel costs for alternative paths in the AIMSUN model. The link hierarchy/category was coded in the model in accordance with Roads and Maritime Services *Network and Corridor Planning (Practice Note 2, November 2008)* to reflect logical and realistic route choices.

In addition, the localised link costs have been adjusted on several locations within the model to aid in the further calibration of localised route choices. These locations include Macarthur Drive, Wilton Road, Douglas Park Drive, Menangle Road and Camden Road.

#### 4.2.2.2 Qualitative assessment of traffic assignment

As a part of model calibration process, qualitative assessment of traffic assignment was carried out using a combination of select link analysis and the visual check of travel routes for individual OD pair. The qualitative assessment shows the route choices are generally logical and realistic in both AM and PM models.

### 4.2.3 Traffic flow calibration

In reality, traffic volumes vary from day to day and from location to location. The GEH statistic was developed to cope with these types of different ranges in flows. Instead of comparing absolute or relative flow differences; a wide range of flows can confidently be deemed as being statistically accurate using the GEH formula. For example, where an absolute difference of 100 vehicles/hr can be important in a flow of 200 vehicles/hr, it is largely irrelevant in a flow of several thousand vehicles/hr.

GEH compares the differences between observed flows and modelled flows on a link by using the following formula:

$$GEH = \sqrt{(V_O - V_A)^2 / (0.5 \times (V_O + V_A))}$$

Where:

$V_O$ = Observed traffic flow (vehicles/hour)

$V_A$ = Assigned (or modelled) hourly traffic flow (vehicles/hour)

The calibration of traffic flows were undertaken in the following two steps to match the flows in the base model with the surveyed data for both peak periods:

- Step 1 – calibrating 2-hourly modelled flows within the whole study area against standard target criteria
- Step 2 – calibrating peak hourly modelled flows for the core area against standard target criteria.



Table 4.1 and 4.2 show the standard flow calibration criteria for the whole study area and core area respectively. These criteria are sourced from the Roads and Maritime Services *Traffic Modelling Guidelines (Version 1 February 2013, Section 10: Highway Assignment Modelling)*.

**Table 4.1 Mesoscopic modelling link and turn standard calibration criteria (network wide)**

| Item | Criteria |
|---|---|
| Turn volumes | Tolerance limits for individual turn volumes:<br>■ 85% of individual turn volumes to have a GEH <= 5.0<br>■ all individual turn volumes to have a GEH <= 10.<br>Plots of observed versus modelled flows:<br>■ R square value to be included with plots and to be >0.9<br>■ slope equation to be included with plots (intercept to be set to zero).<br>All counts RMSE should be 30.0 or lower. |
| Screenline volumes | Each of directional screenline total to have GEH < 4.0. |

**Table 4.2 Mesoscopic modelling link and turn standard calibration criteria (core area)**

| Item | Criteria |
|---|---|
| Turn volumes | Tolerance limits for individual turn volumes:<br>▪ 85% of individual turn volumes to have a GEH <= 5.0<br>▪ all individual turn volumes to have a GEH <= 10.<br>Plots of observed versus modelled flows:<br>▪ R square value to be included with plots and to be >0.9<br>▪ slope equation to be included with plots (intercept to be set to zero).<br>All counts RMSE should be 30.0 or lower. |

#### 4.2.3.1 OD matrix adjustment at Mesoscopic level

As discussed in section 3.6, the STM cordon demand matrices were initially adjusted using the Static Adjustment function in AIMSUN to match the surveyed flows at the macroscopic level of modelling.

As Mesoscopic AIMSUN modelling applies different techniques (e.g. shockwave and queue propagation algorithms) to assign the demand to the model network and accounts for more accurately vehicle interaction and time dependant capacity constraints, the demand matrices were further fine-tuned to meet standard target criteria in calibrating the Mesoscopic model.



#### 4.2.3.2 Network wide calibration results

The summary results of network wide flow calibration are presented in Table 4.3. The results show the calibration criteria have been met for each of the peak periods.

**Table 4.3 AM and PM peaks flow calibration summary**

| Peak period | Calibration criteria | Results |
|---|---|---|
| AM peak (7.00–9.00) | 85% of individual turn volumes to have a GEH <= 5.0 | 91% |
| | all individual turn volumes to have a GEH <= 10 | 100% |
| | R square value to be included with plots and to be >0.9 | 0.990 |
| | Slope equation to be included with plots (intercept to be set to zero) | included |
| | All counts RMSE should be 30.0 or lower | 11 |
| | 100% directional screenline total to have GEH < 4.0 | 100% |
| PM peak (15.45–17.45) | 85% of individual turn volumes to have a GEH <= 5.0 | 85% |
| | all individual turn volumes to have a GEH <= 10 | 100% |
| | R square value to be included with plots and to be >0.9 | 0.990 |
| | Slope equation to be included with plots (intercept to be set to zero) | included |
| | All counts RMSE should be 30.0 or lower | 12 |
| | 100% directional screenline total to have GEH < 4.0 | 100% |

More detailed information is provided in Appendix A.

#### 4.2.3.3 Calibration results for core area

The summary results of core area flow calibration are presented in Table 4.4. The results show the calibration criteria have been met for both AM and PM peak hours.

**Table 4.4 Flow calibration summary for the AM and PM peak hours**

| Peak period | Calibration criteria | Results |
|---|---|---|
| AM peak (7.00-8.00) | 85% of individual turn volumes to have a GEH <= 5.0 | 92% |
| | all individual turn volumes to have a GEH <= 10 | 100% |
| | R square value to be included with plots and to be >0.9 | 0.996 |
| | Slope equation to be included with plots (intercept to be set to zero) | included |
| | All counts RMSE should be 30.0 or lower | 8 |
| PM peak (16.45-17.45) | 85% of individual turn volumes to have a GEH <= 5.0 | 92% |
| | all individual turn volumes to have a GEH <= 10 | 100% |
| | R square value to be included with plots and to be >0.9 | 0.989 |
| | Slope equation to be included with plots (intercept to be set to zero) | included |
| | All counts RMSE should be 30.0 or lower | 11 |



More detailed information is provided in Appendix A.

## 4.3 Travel time validation

Once the AIMSUN model was calibrated, a data set separate to that used during the calibration process was used to validate the model. The method used was to compare the modelled travel times of vehicles through the network with the observed times.

The required criterion for travel time validation was:

- 95% of movements to have average modelled journey time to be within 15% or one minute (whichever is greater) of average observed journey time for full length of route.

The road sections that were subject to travel time validation for both peak periods are:

- B88 Picton Road between SR89 Remembrance Drive and Mount Keira Road (in both directions)
- M31 Hume Motorway between A9 Narellan Rd and Avon Dam Road (in both directions).

Note that the validation was undertaken for each peak period using the average of five seed runs.

### 4.3.1 Validation results

Table 4.5 and 4.6 show the validation summary results for each of the peak periods. As can be see, the validation criterion has been met for each peak period.

**Table 4.5 AM peak validation summary**

| Item | B88 Picton Road | | M31 Hume Motorway | |
|---|---|---|---|---|
| | eastbound | westbound | northbound | southbound |
| average observed travel time (s) | 1515 | 1361 | 1160 | 1121 |
| average modelled travel time (s) | 1418 | 1416 | 1092 | 1053 |
| difference (s) | -97 | 55 | -68 | -68 |
| % difference | -7% | 4% | -6% | -6% |
| 95% modelled travel time within 15% or 1 minute of observed travel time | Yes | Yes | Yes | Yes |

**Table 4.6 PM peak validation summary**

| Item | B88 Picton Road | | M31 Hume Motorway | |
|---|---|---|---|---|
| | eastbound | westbound | northbound | southbound |
| average observed travel time (s) | 1470 | 1380 | 1140 | 1020 |
| average modelled travel time (s) | 1415 | 1417 | 1098 | 1054 |
| difference (s) | -55 | 37 | -42 | 34 |
| % difference | -4% | 3% | -4% | 3% |
| 95% modelled travel time within 15% or 1 minute of observed travel time | Yes | Yes | Yes | Yes |



## 4.4 Model confidence and stability

### 4.4.1 Demand release

In addition to the above model calibration and validation, the quantitative assessment of model confidence was undertaken by checking demand release during both peak periods. The assessment results are shown in Table 4.7, which indicate that there was no vehicle left waiting in and outside of the network as a result of unrealistic congestion and all the demand were released at the end of both modelled periods.

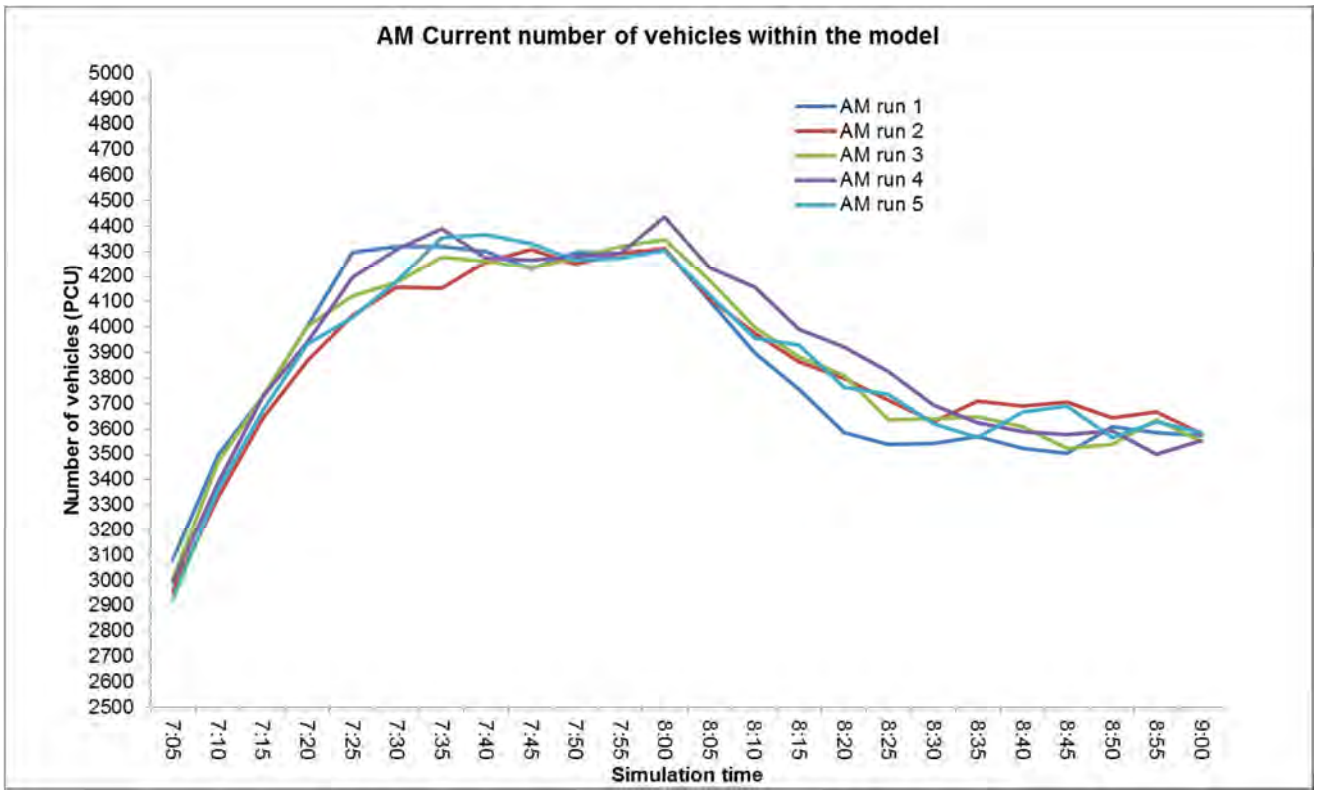
**Table 4.7 AM and PM peak network wide statistics**

| Item | AM peak | PM peak |
|---|---|---|
| vehicles lost (PCU) | 0 | 0 |
| unreleased vehicles (PCU) | 1 | 1 |

### 4.4.2 Model stability

A repeatability of model results across different seed values is an important consideration in the verification of model's stability. Although multiple seed runs were undertaken to produce a small level of variability for the purposed of assessing the impacts on model results, the results between the seed values should be relatively consistent.

The seed values used in the model calibration and validation process were also used to test the stability and sensitivity of the model. Figure 4.1 shows a comparison of the network vehicles within the model for each seed run in both peak periods. They show that the model is stable across the different seed values used for model reporting.



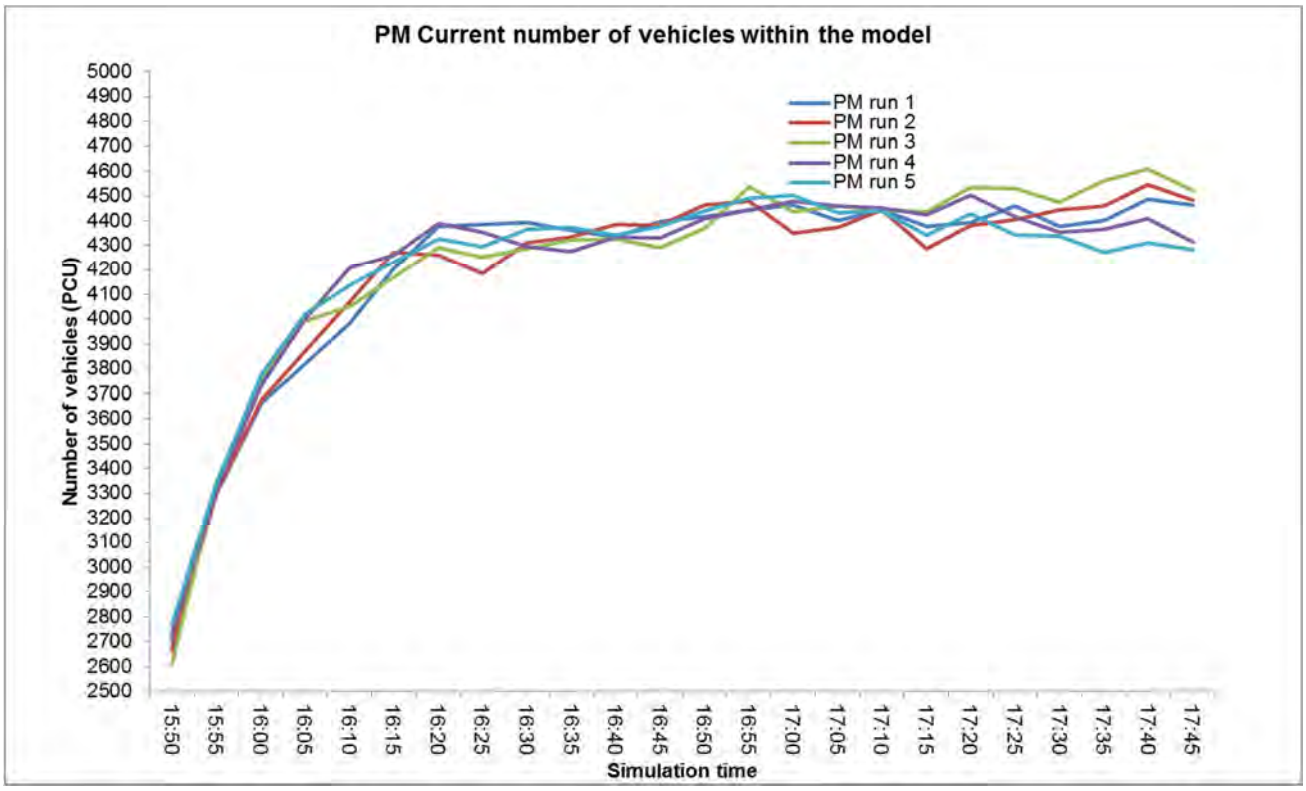



**Figure 4.1 AM and PM peak – current number of vehicles (current nV)**

# 5. Summary and conclusions

## 5.1 Summary

The AIMSUN mesoscopic models for the study area have been calibrated to the surveyed traffic flows and observed traffic conditions in accordance with the RMS modelling criteria.

Both the AM and PM AIMSUN models have been also validated to observed travel times in accordance with the RMS modelling criteria.

## 5.2 Conclusions

The model developed will provided a robust basis on which to consider the potential traffic impacts of the Wilton Junction New Town development.

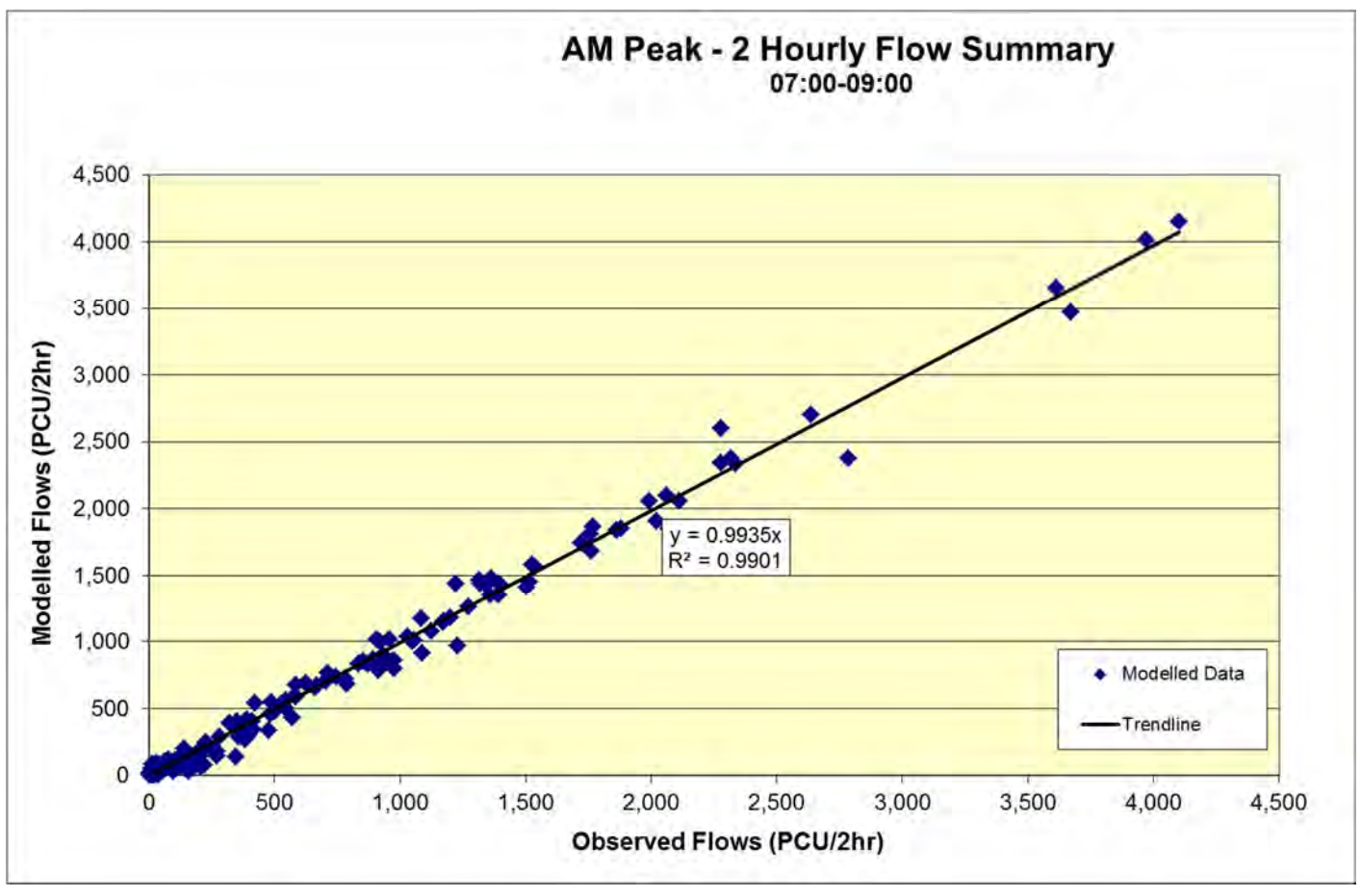
# Appendix A

Flow calibration results

# A1. AM peak network wide turn flow (PCU/2 hr) calibration results

| Intersection | Movement | Observed | Average modelled | Diff (Obs-Mod) | GEH |
|---|---|---|---|---|---|
| A9 Narellan Road / Remembrance Driveway / A9 the Northern Road | Remebrance Driveway SB RT | 135 | 132 | 3 | 0.16 |
| | Remebrance Driveway SB Thru | 836 | 830 | 6 | 0.14 |
| | Remebrance Driveway SB LT | 584 | 591 | -7 | 0.20 |
| | Narellan Road WB RT | 977 | 856 | 121 | 2.82 |
| | Narellan Road WB Thru | 893 | 869 | 24 | 0.56 |
| | Narellan Road WB LT | 977 | 801 | 176 | 4.17 |
| | Remebrance Driveway NB RT | 743 | 734 | 9 | 0.22 |
| | Remebrance Driveway NB Thru | 1172 | 1146 | 26 | 0.54 |
| | Remebrance Driveway NB LT | 48 | 64 | -16 | 1.55 |
| | Northern Road EB Thru | 915 | 787 | 128 | 3.11 |
| | Northern Road EB LT | 227 | 219 | 8 | 0.40 |
| A9 Narellan Rd / Camden Bypass | Narellan Road WB Thru | 2069 | 1850 | 219 | 3.49 |
| | Narellan Road WB LT | 922 | 996 | -74 | 1.69 |
| | Camden Bypass NB Through | 1723 | 1742 | -19 | 0.32 |
| | Camden Bypass NB LT | 788 | 683 | 105 | 2.73 |
| | Narellan Road EB RT | 383 | 267 | 116 | 4.55 |
| | Narellan Road EB Thru | 1862 | 1841 | 21 | 0.35 |
| M31 Hume Motorway / A9 Narellan Road (western intersection) | Narellan Road WB RT | 1224 | 1440 | -216 | 4.18 |
| | Narellan Road WB Thru | 3673 | 3473 | 200 | 2.37 |
| | Hume Motorway NB RT | 502 | 481 | 21 | 0.66 |
| | Hume Motorway NB LT | 416 | 340 | 76 | 2.75 |
| | Narellan Road EB Thru | 3973 | 4014 | -41 | 0.46 |
| | Narellan Road EB LT | 2786 | 2379 | 407 | 5.67 |
| M31 Hume Motorway / A9 Narellan Road (eastern intersection) | Hume Motorway SB RT | 1272 | 1259 | 13 | 0.26 |
| | Hume Motorway SB LT | 1199 | 1182 | 17 | 0.35 |
| | Narellan Road WB Thru | 3612 | 3655 | -43 | 0.50 |
| | Narellan Road WB LT | 244 | 207 | 37 | 1.74 |
| | Narellan Road EB RT | 369 | 333 | 36 | 1.37 |
| | Narellan Road EB Thru | 4101 | 4151 | -50 | 0.55 |
| B69 Narellan Road / Blaxland Road / Gilchrist Drive | Blaxland Road SB RT | 907 | 1014 | -107 | 2.44 |
| | Blaxland Road SB Thru | 660 | 654 | 6 | 0.18 |
| | Blaxland Road SB LT | 571 | 433 | 138 | 4.36 |
| | Narellan Road WB RT | 486 | 461 | 25 | 0.82 |
| | Narellan Road WB Thru | 1762 | 1681 | 81 | 1.38 |
| | Narellan Road WB LT | 26 | 80 | -54 | 5.22 |
| | Gilchrist Drive NB RT | 29 | 93 | -64 | 5.81 |
| | Gilchrist Drive NB Thru | 704 | 706 | -2 | 0.05 |
| | Gilchrist Drive NB LT | 1394 | 1349 | 45 | 0.85 |
| | Narellan Road EB RT | 1176 | 1152 | 24 | 0.51 |
| | Narellan Road EB Thru | 1994 | 2058 | -64 | 1.01 |
| | Narellan Road EB LT | 1360 | 1352 | 8 | 0.16 |
| B69 Narellan Road / B69 Appin Road / Oxley Street | Oxley Street SB RT | 363 | 374 | -11 | 0.40 |
| | Oxley Street SB Thru | 853 | 856 | -3 | 0.08 |
| | Oxley Street SB LT | 196 | 174 | 22 | 1.17 |
| | The Parkway WB RT | 353 | 337 | 16 | 0.61 |
| | The Parkway WB Thru | 411 | 404 | 7 | 0.25 |
| | The Parkway WB LT | 50 | 45 | 5 | 0.47 |
| | Appin Road NB RT | 44 | 55 | -11 | 1.11 |
| | Appin Road NB Thru | 2113 | 2059 | 54 | 0.84 |
| | Appin Road NB LT | 1050 | 1001 | 49 | 1.09 |
| | Narellan Road EB RT | 424 | 539 | -115 | 3.72 |
| | Narellan Road EB Thru | 280 | 292 | -12 | 0.49 |
| | Narellan Road EB LT | 389 | 416 | -27 | 0.95 |
| SR89 Remembrance Driveway and Macarthur Road | Remembrance Driveway ramp SB RT | 356 | 291 | 65 | 2.57 |
| | Remembrance Driveway ramp SB LT | 488 | 546 | -58 | 1.79 |
| | Remembrance WB Thru | 946 | 853 | 93 | 2.20 |
| | Remembrance WB LT | 349 | 404 | -55 | 2.00 |
| | Remembrance EB Thru | 2023 | 1907 | 116 | 1.86 |
| | Remembrance EB LT | 396 | 305 | 91 | 3.44 |
| B69 Appin Road / Church Street | Appin Road SB Thru | 79 | 115 | -36 | 2.60 |
| | Appin Road SB LT | 625 | 692 | -67 | 1.85 |
| | Church Street WB RT | 1125 | 1080 | 45 | 0.96 |
| | Church Street WB LT | 105 | 83 | 22 | 1.57 |
| | Wilton Road NB RT | 65 | 102 | -37 | 2.85 |
| | Wilton Road NB Thru | 136 | 75 | 61 | 4.20 |
| M1 Princes Highway / B69 Appin Road (northern intersection) | Appin Road SB Thru | 780 | 720 | 60 | 1.55 |
| | Appin Road SB LT | 122 | 65 | 57 | 4.15 |
| | Appin Road NB RT | 2 | 0 | 2 | 1.41 |
| | Appin Road NB Thru | 1228 | 970 | 258 | 5.49 |
| M1 Princes Highway / B69 Appin Road (southern intersection) | Appin Road SB Thru | 780 | 720 | 60 | 1.54 |
| | Appin Road SB LT | 15 | 0 | 15 | 3.87 |
| | M1 WB RT | 143 | 57 | 86 | 6.10 |
| | M1 WB LT | 2278 | 2598 | -320 | 4.58 |
| | Appin Road NB Thru | 1087 | 915 | 172 | 3.85 |
| B88 Picton Road/ M1 Princes Highway | M1 SB RT (left ramp) | 55 | 27 | 28 | 3.07 |
| | M1 SB Thru | 2336 | 2336 | 0 | 0.00 |
| | M1 NB Thru | 2637 | 2704 | -67 | 0.91 |
| | M1 NB LT | 1356 | 1462 | -106 | 2.00 |
| | Picton Road EB RT (ramp) | 1506 | 1411 | 95 | 1.76 |
| | Picton Road EB LT | 29 | 56 | -27 | 2.95 |
| B88 Picton Road/ Right turnaround facility | Picton Road WB Thru (from ramp) | 55 | 27 | 28 | 3.07 |
| | Picton Road WB Thru | 1321 | 1436 | -115 | 2.19 |
| | M1 NB RT | 25 | 27 | -2 | 0.22 |
| M31 Hume Motorway / B88 Picton Road (western intersection) | Picton Road WB RT | 1031 | 1036 | -5 | 0.12 |
| | Picton Road WB Thru | 582 | 592 | -10 | 0.28 |
| | Hume Motorway NB RT | 320 | 392 | -72 | 2.69 |
| | Hume Motorway NB LT | 119 | 108 | 11 | 0.70 |
| | Picton Road EB Thru | 528 | 531 | -3 | 0.10 |
| | Picton Road EB LT | 586 | 679 | -93 | 2.63 |
| M31 Hume Motorway / B88 Picton Road (eastern intersection) | Hume Motorway SB RT | 232 | 207 | 25 | 1.17 |
| | Hume Motorway SB LT | 933 | 901 | 32 | 0.74 |
| | Picton Road WB Thru | 1403 | 1422 | -19 | 0.36 |
| | Picton Road WB LT | 388 | 403 | -15 | 0.53 |
| | Picton Road EB RT | 135 | 155 | -20 | 1.16 |
| | Picton Road EB Thru | 711 | 768 | -57 | 1.48 |
| Menangle Street / SR89 Remembrance Driveway | Remembrance Driveway SB RT | 34 | 1 | 33 | 5.68 |
| | Remembrance Driveway SB Thru | 478 | 334 | 144 | 5.04 |
| | Remembrance Driveway SB LT | 178 | 57 | 121 | 7.88 |
| | Menangle Street WB RT | 76 | 65 | 11 | 0.91 |
| | Menangle Street WB Thru | 10 | 27 | -17 | 2.79 |
| | Menangle Street WB LT | 173 | 141 | 32 | 1.79 |
| | Remembrance Driveway NB RT | 347 | 138 | 209 | 9.50 |
| | Remembrance Driveway NB Thru | 870 | 834 | 36 | 0.88 |
| | Remembrance Driveway NB LT | 44 | 21 | 23 | 2.91 |
| | Menangle Street EB RT | 8 | 11 | -3 | 0.60 |
| | Menangle Street EB Thru | 4 | 13 | -9 | 2.25 |
| | Menangle Street EB LT | 19 | 1 | 18 | 3.96 |

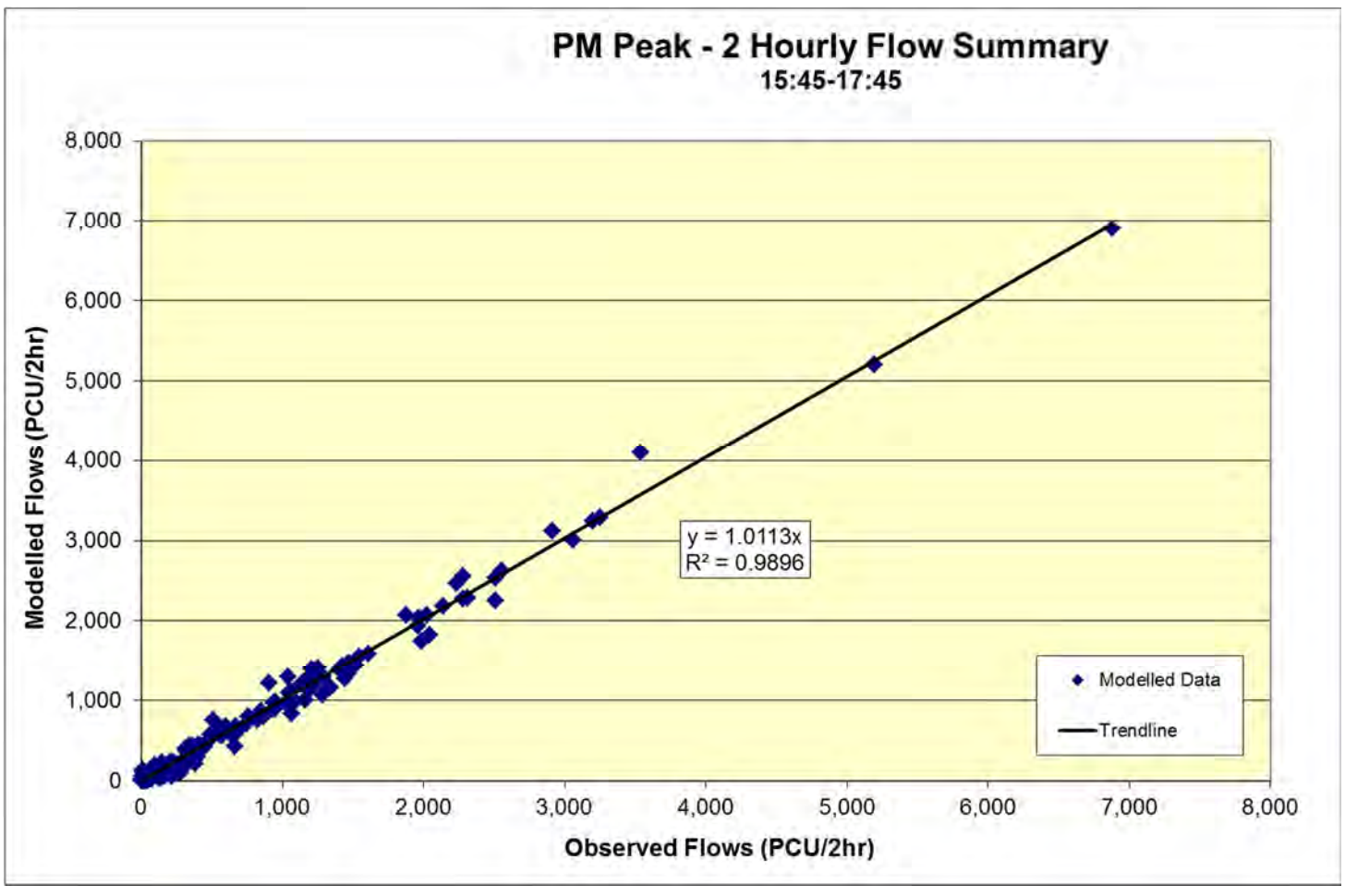
| | | | | | |
|---|---|---|---|---|---|
| **Menangle Road and Camden Road** | Menangle Road SB Thru | 211 | 150 | 61 | **3.22** |
| | Menangle Road SB LT | 121 | 63 | 58 | **4.29** |
| | Camden Road WB RT | 271 | 178 | 93 | **4.41** |
| | Camden Road WB LT | 31 | 47 | -16 | **1.85** |
| | Menangle Road NB RT | 40 | 20 | 20 | **2.55** |
| | Menangle Road NB Thru | 272 | 145 | 127 | **6.23** |
| **M31 Hume Motorway / SR89 Remembrance Driveway** | Hume Motorway SB Thru | 2061 | 2099 | -38 | **0.60** |
| | Hume Motorway NB Thru | 1767 | 1863 | -96 | **1.60** |
| | Hume Motorway NB LT | 141 | 200 | -59 | **3.19** |
| | Remembrance Driveway EB RT | 391 | 280 | 111 | **4.29** |
| **B88 Picton Road / Menangle Road** | Menangle Road SB RT | 97 | 27 | 70 | **6.24** |
| | Menangle Raod SB LT | 146 | 168 | -22 | **1.25** |
| | Picton Road WB RT | 147 | 107 | 40 | **2.52** |
| | Picton Road WB Thru | 545 | 562 | -17 | **0.52** |
| | Picton Road EB Thru | 959 | 1018 | -59 | **1.32** |
| | Picton Road EB LT | 165 | 61 | 104 | **6.93** |
| **B88 Picton Road/Wilton Park Road, east of Menangle Road** | Picton Road WB Thru | 670 | 672 | -2 | **0.06** |
| | Picton Road WB LT | 13 | 28 | -15 | **2.34** |
| | Wilton Park Road NB RT | 31 | 38 | -7 | **0.84** |
| | Wilton Park Road NB LT | 12 | 2 | 10 | **2.53** |
| | Picton Road EB RT | 25 | 7 | 18 | **3.23** |
| | Picton Road EB Thru | 1084 | 1173 | -89 | **1.87** |
| **B88 Picton Road and Pembroke Parade** | Pembroke Parade SB RT | 227 | 245 | -18 | **0.84** |
| | Pembroke Parade SB LT | 17 | 34 | -17 | **2.33** |
| | Picton Road WB RT | 24 | 51 | -27 | **3.14** |
| | Picton Road WB Thru | 1527 | 1580 | -53 | **0.95** |
| | Picton Road EB Thru | 1537 | 1564 | -27 | **0.49** |
| | Picton Road EB LT | 106 | 102 | 4 | **0.31** |
| **B88 Picton Road and Almond Street** | Almond Street SB RT | 265 | 170 | 95 | **4.55** |
| | Almond Street SB LT | 28 | 38 | -10 | **1.19** |
| | Picton Road WB RT | 26 | 10 | 16 | **2.71** |
| | Picton Road WB Thru | 1315 | 1465 | -150 | **2.85** |
| | Picton Road EB Thru | 1362 | 1482 | -120 | **2.25** |
| | Picton Road EB LT | 193 | 111 | 82 | **4.72** |
| **B88 Picton Road and Macarthur Drive** | Macarthur Drive SB RT | 11 | 47 | -36 | **4.76** |
| | Macarthur Drive SB LT | 140 | 90 | 50 | **3.33** |
| | Picton Road WB RT | 92 | 43 | 49 | **4.26** |
| | Picton Road WB Thru | 1337 | 1435 | -98 | **1.85** |
| | Picton Road EB Thru | 1392 | 1436 | -44 | **0.82** |
| | Picton Road EB LT | 14 | 81 | -67 | **6.87** |
| **B88 Picton Road and Mount Keira Road** | Picton Road WB Thru | 1354 | 1450 | -96 | **1.82** |
| | Picton Road WB LT | 10 | 6 | 4 | **0.94** |
| | Mt Keira Road NB RT | 10 | 21 | -11 | **2.01** |
| | Mt Keira Road NB LT | 68 | 75 | -7 | **0.60** |
| | Picton Road EB RT | 30 | 41 | -11 | **1.35** |
| | Picton Road EB Thru | 1515 | 1449 | 66 | **1.22** |
| **Wilton Road and Macarthur Drive** | Wilton Road SB Thru | 205 | 62 | 143 | **8.78** |
| | Wilton Road SB LT | 143 | 125 | 18 | **1.10** |
| | Macarthur Drive WB RT | 103 | 112 | -9 | **0.59** |
| | Macarthur Drive WB LT | 7 | 10 | -3 | **0.77** |
| | Wilton Road NB RT | 11 | 13 | -2 | **0.33** |
| | Wilton Road NB Thru | 220 | 76 | 144 | **8.34** |
| **Wilton Road and Douglas Park Drive** | Wilton Road SB RT | 40 | 86 | -46 | **4.07** |
| | Wilton Road SB Thru | 133 | 111 | 22 | **1.38** |
| | Wilton Road NB Thru | 160 | 156 | 4 | **0.23** |
| | Wilton Road NB LT | 160 | 32 | 128 | **9.28** |
| | Douglas Park Drive EB RT | 215 | 75 | 140 | **8.25** |
| | Douglas Park Drive EB LT | 48 | 25 | 23 | **2.69** |
| **B88 Picton Road/Wilton Park Road, west of Menangle Road** | Picton Road WB Thru | 542 | 506 | 36 | **1.10** |
| | Picton Road WB LT | 100 | 82 | 18 | **1.33** |
| | Wilton Park Road NB RT | 68 | 73 | -5 | **0.39** |
| | Wilton Park Road NB LT | 15 | 4 | 11 | **2.58** |
| | Picton Road EB RT | 18 | 27 | -9 | **1.37** |
| | Picton Road EB Thru | 1056 | 1012 | 44 | **0.97** |
| | Hume Motorway (under Picton Road) NB | 1881 | 1855 | 26 | **0.42** |
| | Hume Motorway (under Picton Road) SB | 1757 | 1811 | -54 | **0.90** |
| | Hume Motorway (near Remembrance Driveay) NB | 2320 | 2378 | -58 | **0.84** |
| | Hume Motorway (near Remembrance Driveay) SB | 2280 | 2341 | -61 | **0.89** |



# A2. PM peak network wide turn flow (PCU/2 hr) calibration results

| Intersection | Movement | Observed | Average modelled | Diff (Obs-Mod) | GEH |
|---|---|---|---|---|---|
| A9 Narellan Road / Remembrance Driveway / A9 the Northern Road | Remebrance Driveway SB RT | 226 | 205 | 20 | 0.98 |
| | Remebrance Driveway SB Thru | 1405 | 1389 | 16 | 0.29 |
| | Remebrance Driveway SB LT | 953 | 975 | -22 | 0.49 |
| | Narellan Road WB RT | 665 | 663 | 2 | 0.06 |
| | Narellan Road WB Thru | 1043 | 1290 | -247 | 5.11 |
| | Narellan Road WB LT | 1285 | 1073 | 212 | 4.37 |
| | Remebrance Driveway NB RT | 1220 | 1383 | -163 | 3.20 |
| | Remebrance Driveway NB Thru | 1213 | 1182 | 32 | 0.64 |
| | Remebrance Driveway NB LT | 94 | 134 | -40 | 2.61 |
| | Northern Road EB Thru | 1067 | 834 | 233 | 5.33 |
| | Northern Road EB LT | 187 | 183 | 4 | 0.20 |
| A9 Narellan Rd / Camden Bypass | Narellan Road WB Thru | 2553 | 2622 | -69 | 0.95 |
| | Narellan Road WB LT | 1875 | 2073 | -198 | 3.15 |
| | Camden Bypass NB Through | 1030 | 969 | 61 | 1.37 |
| | Camden Bypass NB LT | 448 | 416 | 32 | 1.07 |
| | Narellan Road EB RT | 945 | 889 | 56 | 1.30 |
| | Narellan Road EB Thru | 2309 | 2291 | 18 | 0.27 |
| M31 Hume Motorway / A9 Narellan Road (western intersection) | Narellan Road WB RT | 1209 | 1396 | -187 | 3.66 |
| | Narellan Road WB Thru | 6879 | 6905 | -26 | 0.22 |
| | Hume Motorway NB RT | 282 | 230 | 52 | 2.30 |
| | Hume Motorway NB LT | 411 | 451 | -40 | 1.37 |
| | Narellan Road EB Thru | 3250 | 3285 | -35 | 0.43 |
| | Narellan Road EB LT | 1340 | 1164 | 176 | 3.52 |
| M31 Hume Motorway / A9 Narellan Road (eastern intersection) | Hume Motorway SB RT | 2910 | 3121 | -211 | 2.71 |
| | Hume Motorway SB LT | 1199 | 1171 | 28 | 0.57 |
| | Narellan Road WB Thru | 5190 | 5199 | -9 | 0.09 |
| | Narellan Road WB LT | 576 | 565 | 11 | 0.31 |
| | Narellan Road EB RT | 340 | 268 | 72 | 2.93 |
| | Narellan Road EB Thru | 3197 | 3241 | -44 | 0.55 |
| B69 Narellan Road / Blaxland Road / Gilchrist Drive | Blaxland Road SB RT | 1470 | 1474 | -4 | 0.07 |
| | Blaxland Road SB Thru | 1194 | 1195 | -1 | 0.03 |
| | Blaxland Road SB LT | 822 | 759 | 63 | 1.57 |
| | Narellan Road WB RT | 659 | 566 | 93 | 2.65 |
| | Narellan Road WB Thru | 2025 | 2078 | -53 | 0.82 |
| | Narellan Road WB LT | 14 | 130 | -116 | 9.68 |
| | Gilchrist Drive NB RT | 123 | 174 | -51 | 2.96 |
| | Gilchrist Drive NB Thru | 850 | 865 | -15 | 0.35 |
| | Gilchrist Drive NB LT | 1607 | 1593 | 14 | 0.25 |
| | Narellan Road EB RT | 1543 | 1552 | -9 | 0.15 |
| | Narellan Road EB Thru | 1966 | 2033 | -67 | 1.07 |
| | Narellan Road EB LT | 942 | 965 | -23 | 0.53 |
| B69 Narellan Road / B69 Appin Road / Oxley Street | Oxley Street SB RT | 500 | 528 | -28 | 0.87 |
| | Oxley Street SB Thru | 2140 | 2183 | -43 | 0.65 |
| | Oxley Street SB LT | 635 | 583 | 52 | 1.48 |
| | The Parkway WB RT | 288 | 227 | 61 | 2.69 |
| | The Parkway WB Thru | 326 | 361 | -35 | 1.33 |
| | The Parkway WB LT | 76 | 90 | -14 | 1.06 |
| | Appin Road NB RT | 104 | 92 | 12 | 0.84 |
| | Appin Road NB Thru | 1207 | 1216 | -9 | 0.17 |
| | Appin Road NB LT | 514 | 752 | -238 | 6.68 |
| | Narellan Road EB RT | 906 | 1211 | -305 | 6.63 |
| | Narellan Road EB Thru | 553 | 603 | -50 | 1.48 |
| | Narellan Road EB LT | 346 | 434 | -88 | 3.16 |
| SR89 Remembrance Driveway and Macarthur Road | Remembrance Driveway ramp SB RT | 489 | 572 | -83 | 2.55 |
| | Remembrance Driveway ramp SB LT | 316 | 390 | -74 | 2.78 |
| | Remembrance WB Thru | 2279 | 2271 | 8 | 0.12 |
| | Remembrance WB LT | 546 | 664 | -118 | 3.38 |
| | Remembrance EB Thru | 1162 | 1005 | 157 | 3.37 |
| | Remembrance EB LT | 381 | 214 | 167 | 6.87 |
| B69 Appin Road / Church Street | Appin Road SB Thru | 144 | 222 | -78 | 4.10 |
| | Appin Road SB LT | 1135 | 1210 | -75 | 1.55 |
| | Church Street WB RT | 601 | 678 | -77 | 2.16 |
| | Church Street WB LT | 77 | 24 | 53 | 5.32 |
| | Wilton Road NB RT | 98 | 193 | -95 | 5.57 |
| | Wilton Road NB Thru | 175 | 70 | 105 | 6.71 |
| M1 Princes Highway / B69 Appin Road (northern intersection) | Appin Road SB Thru | 1180 | 1275 | -95 | 1.93 |
| | Appin Road SB LT | 103 | 75 | 28 | 2.07 |
| | Appin Road NB RT | 9 | 2 | 7 | 2.27 |
| | Appin Road NB Thru | 683 | 621 | 62 | 1.72 |
| M1 Princes Highway / B69 Appin Road (southern intersection) | Appin Road SB Thru | 1180 | 1274 | -94 | 1.91 |
| | Appin Road SB LT | 19 | 0 | 19 | 4.36 |
| | M1 WB RT | 134 | 51 | 83 | 6.14 |
| | M1 WB LT | 3541 | 4102 | -561 | 6.42 |
| | Appin Road NB Thru | 558 | 573 | -15 | 0.43 |
| B88 Picton Road/ M1 Princes Highway | M1 SB RT (left ramp) | 39 | 18 | 21 | 2.78 |
| | M1 SB Thru | 3062 | 3003 | 59 | 0.76 |
| | M1 NB Thru | 2282 | 2553 | -271 | 3.90 |
| | M1 NB LT | 1227 | 1328 | -101 | 1.99 |
| | Picton Road EB RT (ramp) | 1446 | 1273 | 173 | 3.33 |
| | Picton Road EB LT | 28 | 59 | -31 | 3.34 |
| B88 Picton Road/ Right turnaround facility | Picton Road WB Thru (from ramp) | 39 | 18 | 21 | 2.84 |
| | Picton Road WB Thru | 1214 | 1312 | -98 | 1.95 |
| | M1 NB RT | 15 | 16 | -1 | 0.14 |
| M31 Hume Motorway / B88 Picton Road (western intersection) | Picton Road WB RT | 746 | 706 | 40 | 1.06 |
| | Picton Road WB Thru | 1063 | 1114 | -51 | 1.08 |
| | Hume Motorway NB RT | 400 | 403 | -3 | 0.11 |
| | Hume Motorway NB LT | 150 | 166 | -16 | 0.88 |
| | Picton Road EB Thru | 470 | 500 | -30 | 0.97 |
| | Picton Road EB LT | 235 | 225 | 10 | 0.45 |
| M31 Hume Motorway / B88 Picton Road (eastern intersection) | Hume Motorway SB RT | 600 | 606 | -6 | 0.18 |
| | Hume Motorway SB LT | 871 | 795 | 76 | 1.87 |
| | Picton Road WB Thru | 1232 | 1214 | 18 | 0.37 |
| | Picton Road WB LT | 350 | 333 | 17 | 0.66 |
| | Picton Road EB RT | 116 | 104 | 12 | 0.80 |
| | Picton Road EB Thru | 757 | 800 | -43 | 1.09 |
| Menangle Street / SR89 Remembrance Driveway | Remembrance Driveway SB RT | 28 | 3 | 25 | 4.39 |
| | Remembrance Driveway SB Thru | 1092 | 996 | 96 | 2.10 |
| | Remembrance Driveway SB LT | 138 | 113 | 25 | 1.56 |
| | Menangle Street WB RT | 105 | 84 | 21 | 1.51 |
| | Menangle Street WB Thru | 8 | 24 | -16 | 2.83 |
| | Menangle Street WB LT | 372 | 424 | -52 | 1.84 |
| | Remembrance Driveway NB RT | 224 | 82 | 142 | 8.09 |
| | Remembrance Driveway NB Thru | 664 | 424 | 240 | 7.29 |
| | Remembrance Driveway NB LT | 18 | 6 | 12 | 2.50 |
| | Menangle Street EB RT | 25 | 35 | -10 | 1.34 |
| | Menangle Street EB Thru | 7 | 56 | -49 | 6.17 |
| | Menangle Street EB LT | 47 | 3 | 44 | 6.26 |

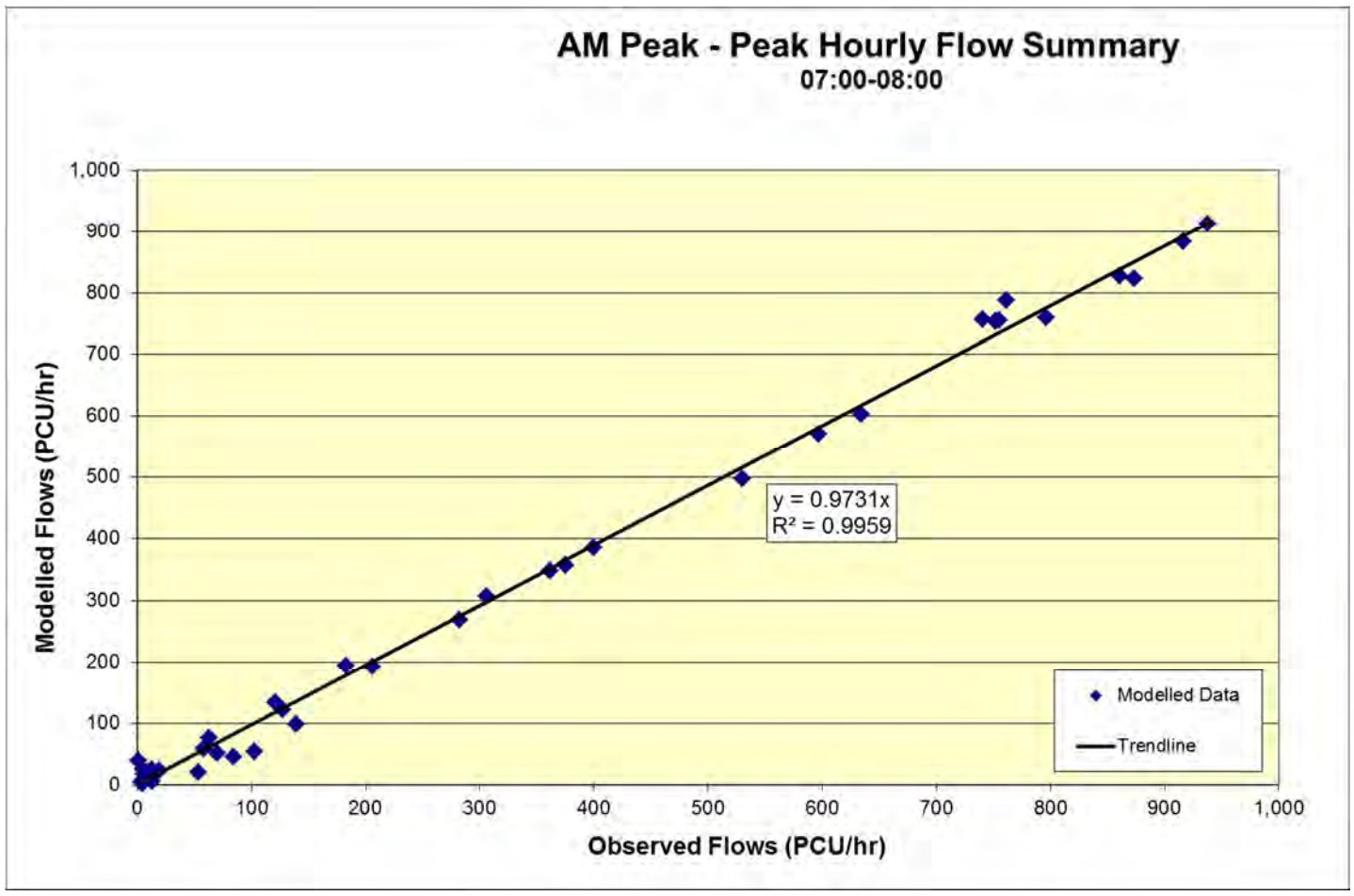
| | | | | | |
|---|---|---|---|---|---|
| **Menangle Road and Camden Road** | Menangle Road SB Thru | 274 | 86 | 188 | **9.90** |
| | Menangle Road SB LT | 259 | 132 | 127 | **6.43** |
| | Camden Road WB RT | 149 | 111 | 38 | **2.34** |
| | Camden Road WB LT | 42 | 59 | -17 | **1.67** |
| | Menangle Road NB RT | 48 | 101 | -53 | **4.34** |
| | Menangle Road NB Thru | 214 | 54 | 160 | **9.79** |
| **M31 Hume Motorway / SR89 Remembrance Driveway** | Hume Motorway SB Thru | 1987 | 1747 | 240 | **3.93** |
| | Hume Motorway NB Thru | 2234 | 2468 | -234 | **3.42** |
| | Hume Motorway NB LT | 396 | 290 | 106 | **4.03** |
| | Remembrance Driveway EB RT | 213 | 204 | 9 | **0.42** |
| **B88 Picton Road / Menangle Road** | Menangle Road SB RT | 183 | 103 | 80 | **4.72** |
| | Menangle Raod SB LT | 138 | 39 | 99 | **7.42** |
| | Picton Road WB RT | 144 | 115 | 29 | **1.80** |
| | Picton Road WB Thru | 1045 | 1094 | -49 | **1.06** |
| | Picton Road EB Thru | 560 | 651 | -91 | **2.60** |
| | Picton Road EB LT | 124 | 43 | 81 | **6.27** |
| **B88 Picton Road/Wilton Park Road, east of Menangle Road** | Picton Road WB Thru | 1167 | 1212 | -45 | **0.92** |
| | Picton Road WB LT | 53 | 65 | -12 | **1.12** |
| | Wilton Park Road NB RT | 32 | 44 | -12 | **1.36** |
| | Wilton Park Road NB LT | 19 | 3 | 16 | **3.30** |
| | Picton Road EB RT | 25 | 3 | 22 | **4.26** |
| | Picton Road EB Thru | 673 | 682 | -9 | **0.23** |
| **B88 Picton Road and Pembroke Parade** | Pembroke Parade SB RT | 145 | 125 | 20 | **1.22** |
| | Pembroke Parade SB LT | 21 | 112 | -91 | **7.88** |
| | Picton Road WB RT | 12 | 26 | -14 | **2.32** |
| | Picton Road WB Thru | 1423 | 1428 | -5 | **0.09** |
| | Picton Road EB Thru | 1518 | 1442 | 76 | **1.40** |
| | Picton Road EB LT | 245 | 146 | 99 | **5.01** |
| **B88 Picton Road and Almond Street** | Almond Street SB RT | 234 | 198 | 36 | **1.72** |
| | Almond Street SB LT | 46 | 23 | 23 | **2.77** |
| | Picton Road WB RT | 45 | 11 | 34 | **4.51** |
| | Picton Road WB Thru | 1196 | 1260 | -64 | **1.30** |
| | Picton Road EB Thru | 1251 | 1408 | -157 | **3.04** |
| | Picton Road EB LT | 267 | 142 | 125 | **6.19** |
| **B88 Picton Road and Macarthur Drive** | Macarthur Drive SB RT | 8 | 11 | -3 | **0.69** |
| | Macarthur Drive SB LT | 137 | 114 | 23 | **1.46** |
| | Picton Road WB RT | 64 | 24 | 40 | **4.21** |
| | Picton Road WB Thru | 1230 | 1272 | -42 | **0.85** |
| | Picton Road EB Thru | 1291 | 1299 | -8 | **0.15** |
| | Picton Road EB LT | 10 | 115 | -105 | **9.41** |
| **B88 Picton Road and Mount Keira Road** | Picton Road WB Thru | 1262 | 1318 | -56 | **1.11** |
| | Picton Road WB LT | 7 | 4 | 3 | **0.84** |
| | Mt Keira Road NB RT | 12 | 8 | 4 | **0.85** |
| | Mt Keira Road NB LT | 18 | 20 | -2 | **0.32** |
| | Picton Road EB RT | 42 | 41 | 1 | **0.11** |
| | Picton Road EB Thru | 1463 | 1329 | 134 | **2.53** |
| **Wilton Road and Macarthur Drive** | Wilton Road SB Thru | 269 | 171 | 98 | **4.68** |
| | Wilton Road SB LT | 122 | 116 | 6 | **0.42** |
| | Macarthur Drive WB RT | 64 | 128 | -64 | **4.63** |
| | Macarthur Drive WB LT | 8 | 9 | -1 | **0.34** |
| | Wilton Road NB RT | 10 | 12 | -2 | **0.34** |
| | Wilton Road NB Thru | 304 | 167 | 137 | **6.29** |
| **Wilton Road and Douglas Park Drive** | Wilton Road SB RT | 41 | 74 | -33 | **3.09** |
| | Wilton Road SB Thru | 170 | 166 | 4 | **0.20** |
| | Wilton Road NB Thru | 210 | 242 | -32 | **1.50** |
| | Wilton Road NB LT | 166 | 54 | 112 | **7.58** |
| | Douglas Park Drive EB RT | 223 | 121 | 102 | **5.51** |
| | Douglas Park Drive EB LT | 54 | 30 | 24 | **2.67** |
| **B88 Picton Road/Wilton Park Road, west of Menangle Road** | Picton Road WB Thru | 1188 | 1123 | 65 | **1.34** |
| | Picton Road WB LT | 53 | 72 | -19 | **1.68** |
| | Wilton Park Road NB RT | 79 | 87 | -8 | **0.59** |
| | Wilton Park Road NB LT | 28 | 10 | 18 | **2.92** |
| | Picton Road EB RT | 14 | 9 | 5 | **1.00** |
| | Picton Road EB Thru | 601 | 609 | -8 | **0.22** |
| | Hume Motorway (under Picton Road) NB | 1961 | 1936 | 25 | **0.40** |
| | Hume Motorway (under Picton Road) SB | 2046 | 1829 | 217 | **3.49** |
| | Hume Motorway (near Remembrance Driveay) NB | 2511 | 2532 | -21 | **0.30** |
| | Hume Motorway (near Remembrance Driveay) SB | 2512 | 2249 | 263 | **3.81** |



# A3. AM peak hourly turn flow (PCU/hr) calibration results for core study area

| Intersection | Movement | Observed | Average modelled | Diff (Obs-Mod) | GEH |
|---|---|---|---|---|---|
| **M31 Hume Motorway / B88 Picton Road (western intersection)** | Picton Road WB RT | 597 | 571 | 26 | **1.06** |
| | Picton Road WB Thru | 306 | 307 | -1 | **0.05** |
| | Hume Motorway NB RT | 183 | 194 | -11 | **0.79** |
| | Hume Motorway NB LT | 58 | 59 | -1 | **0.08** |
| | Picton Road EB Thru | 282 | 269 | 13 | **0.81** |
| | Picton Road EB LT | 375 | 357 | 18 | **0.96** |
| **M31 Hume Motorway / B88 Picton Road (eastern intersection)** | Hume Motorway SB RT | 127 | 122 | 5 | **0.43** |
| | Hume Motorway SB LT | 530 | 497 | 33 | **1.45** |
| | Picton Road WB Thru | 796 | 759 | 37 | **1.33** |
| | Picton Road WB LT | 206 | 192 | 14 | **0.98** |
| | Picton Road EB RT | 63 | 76 | -13 | **1.51** |
| | Picton Road EB Thru | 400 | 385 | 15 | **0.75** |
| **B88 Picton Road and Wilton Park Road, east of Menangle Road** | Picton Road WB Thru | 362 | 348 | 14 | **0.74** |
| | Picton Road WB LT | 6 | 17 | -11 | **3.20** |
| | Wilton Park Road NB RT | 19 | 22 | -3 | **0.75** |
| | Wilton Park Road NB LT | 5 | 2 | 3 | **1.60** |
| | Picton Road EB RT | 3 | 3 | 0 | **0.22** |
| | Picton Road EB Thru | 634 | 604 | 30 | **1.22** |
| **B88 Picton Road and Pembroke Parade** | Pembroke Parade SB RT | 121 | 133 | -12 | **1.06** |
| | Pembroke Parade SB LT | 9 | 20 | -11 | **2.89** |
| | Picton Road WB RT | 13 | 24 | -11 | **2.64** |
| | Picton Road WB Thru | 873 | 823 | 50 | **1.72** |
| | Picton Road EB Thru | 861 | 828 | 33 | **1.14** |
| | Picton Road EB LT | 70 | 51 | 19 | **2.44** |
| **B88 Picton Road and Almond Street** | Almond Street SB RT | 139 | 98 | 41 | **3.79** |
| | Almond Street SB LT | 11 | 21 | -10 | **2.42** |
| | Picton Road WB RT | 13 | 5 | 8 | **2.75** |
| | Picton Road WB Thru | 741 | 756 | -15 | **0.56** |
| | Picton Road EB Thru | 761 | 787 | -26 | **0.94** |
| | Picton Road EB LT | 103 | 54 | 49 | **5.53** |
| **B88 Picton Road and Macarthur Drive** | Macarthur Drive SB RT | 5 | 24 | -19 | **4.99** |
| | Macarthur DriveSB LT | 84 | 45 | 39 | **4.88** |
| | Picton Road WB RT | 53 | 20 | 33 | **5.54** |
| | Picton Road WB Thru | 752 | 754 | -2 | **0.06** |
| | Picton Road EB Thru | 755 | 755 | 0 | **0.01** |
| | Picton Road EB LT | 1 | 39 | -38 | **8.52** |
| | Hume Motorway (under Picton Rd) NB | 938 | 912 | 26 | **0.84** |
| | Hume Motorway (under Picton Rd) SB | 916 | 883 | 33 | **1.11** |

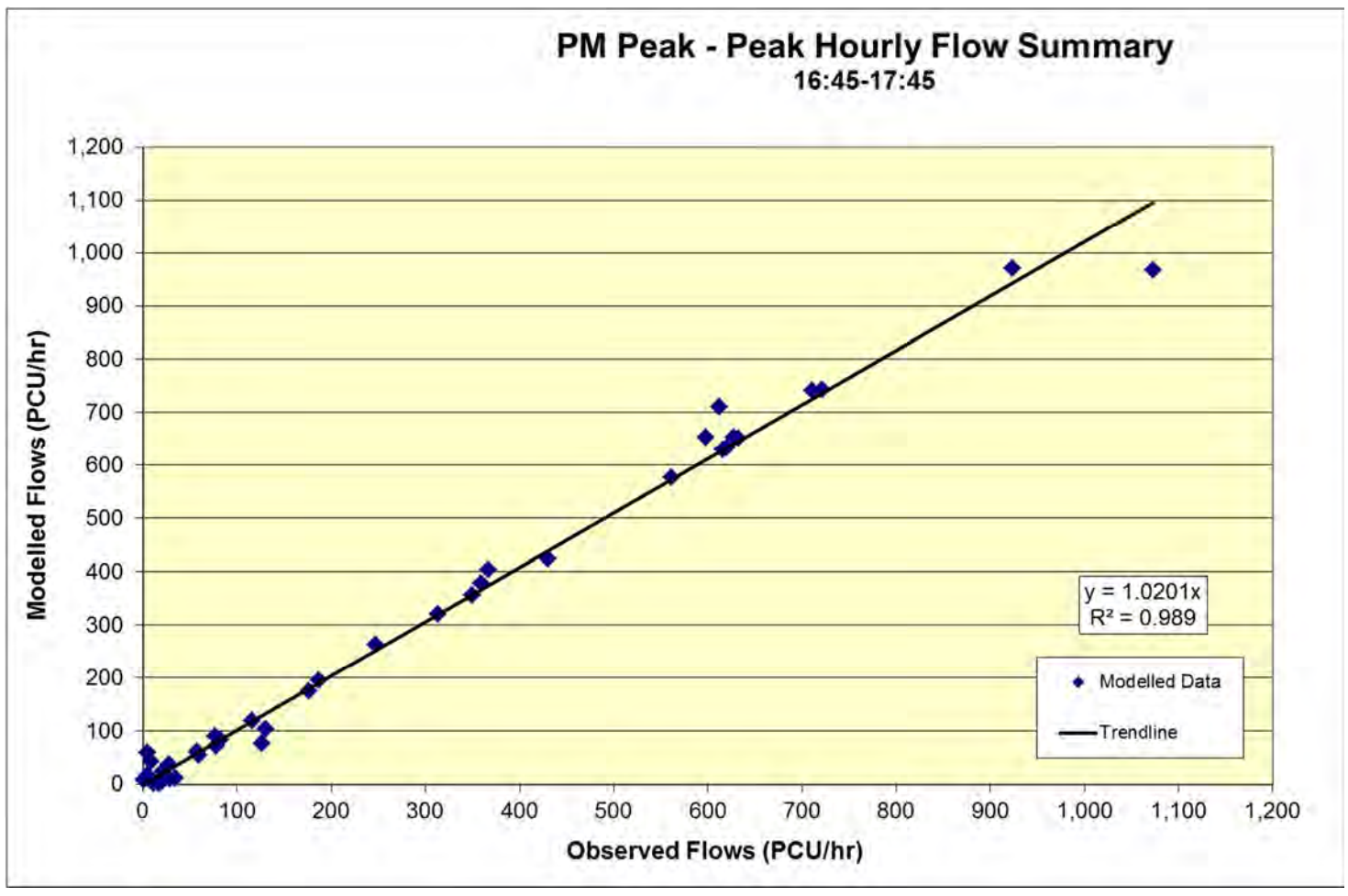




# A4. PM peak hourly turn flow (PCU/hr) calibration results for core study area

| Intersection | Movement | Observed | Average modelled | Diff (Obs-Mod) | GEH |
|---|---|---|---|---|---|
| M31 Hume Motorway / B88 Picton Road (western intersection) | Picton Road WB RT | 359 | 378 | -19 | 1.00 |
| | Picton Road WB Thru | 561 | 577 | -16 | 0.65 |
| | Hume Motorway NB RT | 187 | 195 | -8 | 0.55 |
| | Hume Motorway NB LT | 77 | 90 | -13 | 1.46 |
| | Picton Road EB Thru | 247 | 263 | -16 | 0.98 |
| | Picton Road EB LT | 116 | 119 | -3 | 0.31 |
| M31 Hume Motorway / B88 Picton Road (eastern intersection) | Hume Motorway SB RT | 313 | 322 | -9 | 0.48 |
| | Hume Motorway SB LT | 430 | 424 | 6 | 0.31 |
| | Picton Road WB Thru | 620 | 634 | -14 | 0.54 |
| | Picton Road WB LT | 176 | 175 | 1 | 0.06 |
| | Picton Road EB RT | 59 | 54 | 5 | 0.61 |
| | Picton Road EB Thru | 367 | 403 | -36 | 1.84 |
| B88 Picton Road and Wilton Park Road, east of Menangle Road | Picton Road WB Thru | 616 | 630 | -14 | 0.54 |
| | Picton Road WB LT | 28 | 38 | -10 | 1.77 |
| | Wilton Park Road NB RT | 21 | 24 | -3 | 0.71 |
| | Wilton Park Road NB LT | 11 | 2 | 9 | 3.43 |
| | Picton Road EB RT | 17 | 2 | 15 | 5.05 |
| | Picton Road EB Thru | 350 | 357 | -7 | 0.36 |
| B88 Picton Road and Pembroke Parade | Pembroke Parade SB RT | 78 | 71 | 7 | 0.83 |
| | Pembroke Parade SB LT | 9 | 43 | -34 | 6.61 |
| | Picton Road WB RT | 5 | 17 | -12 | 3.62 |
| | Picton Road WB Thru | 711 | 741 | -30 | 1.10 |
| | Picton Road EB Thru | 721 | 743 | -22 | 0.81 |
| | Picton Road EB LT | 82 | 84 | -2 | 0.20 |
| B88 Picton Road and Almond Street | Almond Street SB RT | 130 | 103 | 27 | 2.48 |
| | Almond Street SB LT | 29 | 11 | 18 | 4.14 |
| | Picton Road WB RT | 21 | 7 | 14 | 3.81 |
| | Picton Road WB Thru | 598 | 652 | -54 | 2.18 |
| | Picton Road EB Thru | 612 | 710 | -98 | 3.82 |
| | Picton Road EB LT | 126 | 76 | 50 | 4.95 |
| B88 Picton Road and Macarthur Drive | Macarthur Drive SB RT | 1 | 9 | -8 | 3.47 |
| | Macarthur DriveSB LT | 57 | 61 | -4 | 0.57 |
| | Picton Road WB RT | 34 | 12 | 22 | 4.59 |
| | Picton Road WB Thru | 632 | 652 | -20 | 0.78 |
| | Picton Road EB Thru | 628 | 653 | -25 | 1.00 |
| | Picton Road EB LT | 5 | 60 | -55 | 9.67 |
| | Hume Motorway (under Picton Rd) NB | 924 | 970 | -46 | 1.51 |
| | Hume Motorway (under Picton Rd) SB | 1073 | 968 | 105 | 3.30 |





# A5. Screenline flow calibration for AM and PM peaks

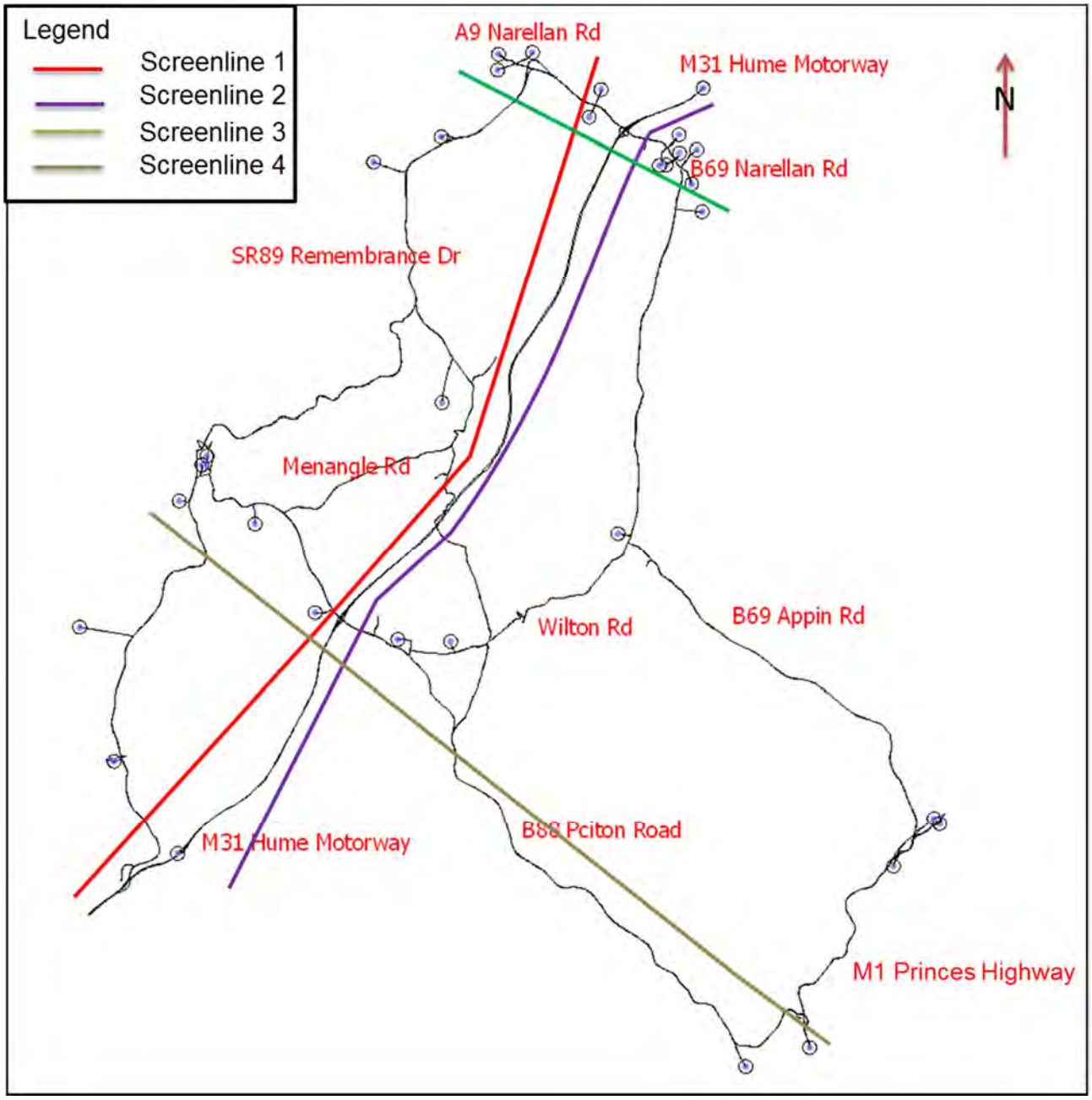



**Figure A5.1 Locations of the screenlines**

**Table A–1 Screenline calibration results for AM peak**

| Screenline | Direction | Observed flows (PCU/2hr) | Mean modelled flows (PCU/2 hr) | GEH |
|---|---|---|---|---|
| 1 | EB | 8527 | 8012 | 4.00 |
| | WB | 5131 | 4861 | 2.70 |
| 2 | EB | 7207 | 7095 | 0.94 |
| | WB | 5847 | 5805 | 0.39 |
| 3 | NB | 9216 | 9007 | 1.55 |
| | SB | 5554 | 5680 | 1.19 |
| 4 | NB | 9005 | 8992 | 0.1 |
| | SB | 8339 | 8136 | 1.58 |

**Table A–2 Screenline calibration results for PM peak**

| Screenline | Direction | Observed flows (PCU/2hr) | Mean modelled flows (PCU/2 hr) | GEH |
|---|---|---|---|---|
| 1 | EB | 5785 | 5532 | 2.38 |
| | WB | 9106 | 9049 | 0.42 |
| 2 | EB | 6295 | 6143 | 1.36 |
| | WB | 7539 | 7438 | 0.83 |
| 3 | NB | 6245 | 6194 | 0.46 |
| | SB | 9459 | 9765 | 2.21 |
| 4 | NB | 8222 | 8200 | 0.17 |
| | SB | 9937 | 9394 | 3.91 |

# Appendix D

Mid-block capacity sensitivity test

**Table D.1 Traffic volume forecasts (pcu/h) for 2013 existing and future 'no Wilton' scenarios – Heavy vehicles = 3 PCU**

| Intersection | Direction | 2013 Modelled | | 2024 No Wilton | | 2031 No Wilton | | 2036 No Wilton | |
|---|---|---|---|---|---|---|---|---|---|
| | | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak |
| Hume Highway, north of Picton Road | Northbound | 2,100 | 2,750 | 2,475 | 2,050 | 2,850 | 2,325 | 3,200 | 2,400 |
| | Southbound | 1,800 | 2,125 | 2,125 | 2,300 | 2,400 | 2,425 | 2,550 | 2,525 |
| Hume Highway, south of Picton Road | Northbound | 1,325 | 1,500 | 1,575 | 1,750 | 1,750 | 1,975 | 1,850 | 2,100 |
| | Southbound | 1,325 | 1,650 | 1,600 | 1,575 | 1,800 | 1,775 | 1,950 | 1,825 |
| Picton Road, at Nepean River bridge | Eastbound | 350 | 950 | 800 | 500 | 900 | 500 | 950 | 525 |
| | Westbound | 700 | 725 | 425 | 725 | 475 | 650 | 500 | 650 |
| Picton Road west of Hume Highway | Eastbound | 675 | 1,450 | 850 | 525 | 925 | 550 | 1,000 | 575 |
| | Westbound | 425 | 950 | 450 | 800 | 525 | 750 | 550 | 775 |
| Picton Road east of Hume Highway | Eastbound | 1,025 | 1,200 | 1,250 | 1,200 | 1,400 | 1,300 | 1,475 | 1,400 |
| | Westbound | 1,100 | 1,675 | 1,450 | 1,050 | 1,700 | 1,175 | 1,875 | 1,275 |
| Picton Road east of Pembroke Parade | Eastbound | 975 | 1,175 | 1,200 | 1,100 | 1,350 | 1,150 | 1,450 | 1,200 |
| | Westbound | 975 | 1,075 | 1,175 | 1,000 | 1,350 | 1,125 | 1,450 | 1,200 |
| Picton Road east of Almond Street | Eastbound | 950 | 1,400 | 1,175 | 1,025 | 1,325 | 1,100 | 1,425 | 1,150 |
| | Westbound | 900 | 1,025 | 1,025 | 925 | 1,050 | 1,025 | 1,075 | 1,075 |
| Picton Road east of Macarthur Drive | Eastbound | 900 | 1,275 | 1,125 | 900 | 1,225 | 1,000 | 1,325 | 1,050 |
| | Westbound | 900 | 1,050 | 1,000 | 975 | 1,100 | 1,025 | 1,125 | 1,100 |
| Wilton Road, at Broughton Pass | Northbound | 50 | 325 | 125 | 175 | 150 | 200 | 175 | 200 |
| | Southbound | 25 | 150 | 150 | 175 | 175 | 175 | 200 | 200 |

**Table D.2 Summary of link performance for 2013 existing and future 'without Wilton' scenarios – Heavy vehicles = 3 PCU**

| Intersection | Road type | Direction | 2013 Modelled | | 2024 No Wilton[1] | | 2031 No Wilton[1] | | 2036 No Wilton[1] | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak |
| Hume Highway, north of Picton Road | Freeway | Northbound | B | C | C | B | C | B | C | B |
| | | Southbound | B | B | B | B | B | C | C | C |
| Hume Highway, south of Picton Road | Freeway | Northbound | A | A | B | B | B | B | B | B |
| | | Southbound | A | A | B | B | B | B | B | B |
| Picton Road, at Nepean River bridge | 2-lane 2-way | Combined | C | D | D | D | D | C | D | C |
| Picton Road west of Hume Highway | Multi-lane arterial | Eastbound | A | B | A | A | A | A | A | A |
| | | Westbound | A | A | A | A | A | A | A | A |
| Picton Road east of Hume Highway | Multi-lane arterial | Eastbound | A | A | B | B | B | B | B | B |
| | | Westbound | A | B | B | A | B | B | C | B |
| Picton Road east of Pembroke Parade | 2-lane 2-way | Combined | E | E | E | E | E | E | E | E |
| Picton Road east of Almond Street | 2-lane 2-way | Combined | E | E | E | E | E | E | E | E |
| Picton Road east of Macarthur Drive | 2-lane 2-way | Combined | D | E | E | E | E | E | E | E |
| Wilton Road, at Broughton Pass | One lane bridge | Combined | E | E | E | E | A[2] | A[2] | A | A |

(1) Includes current approval for Bingara Gorge

(2) Cataract River Bridge at Broughton Pass widened to one lane in each direction

**Table D.3 Traffic volume forecasts (pcu/h) for 2013 existing and future 'with Wilton' scenarios – Heavy vehicles = 3 PCU**

| Intersection | Direction | 2013 Modelled | | 2024 with Wilton | | 2031 with Wilton | | 2036 with Wilton | |
|---|---|---|---|---|---|---|---|---|---|
| | | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak |
| Hume Highway, north of Picton Road | Northbound | 2,100 | 2,750 | 2,625 | 2,125 | 3,400 | 2,675 | 3,800 | 2,825 |
| | Southbound | 1,800 | 2,125 | 2,150 | 2,650 | 2,625 | 3,400 | 2,800 | 3,775 |
| Hume Highway, south of Picton Road | Northbound | 1,325 | 1,500 | 1,550 | 1,775 | 1,750 | 2,100 | 1,900 | 2,350 |
| | Southbound | 1,325 | 1,650 | 1,700 | 1,525 | 2,150 | 1,725 | 2,325 | 1,850 |
| Picton Road, at Nepean River bridge | Eastbound | 350 | 950 | 875 | 575 | 975 | 800 | 1,125 | 875 |
| | Westbound | 700 | 725 | 650 | 750 | 875 | 975 | 975 | 1,150 |
| Picton Road west of Hume Highway | Eastbound | 675 | 1,450 | 1,325 | 950 | 975 | 700 | 1,275 | 1,000 |
| | Westbound | 425 | 950 | 900 | 1,100 | 675 | 850 | 900 | 1,100 |
| Picton Road east of Hume Highway | Eastbound | 1,025 | 1,200 | 1,275 | 1,700 | 1,350 | 1,700 | 1,450 | 2,075 |
| | Westbound | 1,100 | 1,675 | 1,700 | 1,125 | 1,375 | 1,225 | 2,175 | 1,350 |
| Picton Road east of Pembroke Parade | Eastbound | 975 | 1,175 | 1,250 | 1,150 | 1,775 | 1,675 | 2,025 | 1,825 |
| | Westbound | 975 | 1,075 | 1,125 | 1,125 | 1,575 | 1,500 | 1,725 | 1,625 |
| Picton Road east of Almond Street | Eastbound | 950 | 1,400 | 1,450 | 1,125 | 2,100 | 1,375 | 2,300 | 1,500 |
| | Westbound | 900 | 1,025 | 1,075 | 1,250 | 1,225 | 1,675 | 1,325 | 1,775 |
| Picton Road east of Macarthur Drive | Eastbound | 900 | 1,275 | 1,325 | 1,050 | 1,875 | 1,175 | 1,950 | 1,275 |
| | Westbound | 900 | 1,050 | 1,100 | 1,250 | 1,250 | 1,600 | 1,275 | 1,700 |
| Wilton Road, at Broughton Pass | Northbound | 50 | 325 | 325 | 225 | 500 | 325 | 600 | 400 |
| | Southbound | 25 | 150 | 150 | 225 | 250 | 375 | 325 | 450 |

**Table D.4 Summary of link performance for 2013 existing and future 'with Wilton' scenarios – Heavy vehicles = 3 PCU**

| Intersection | Road type | Direction | 2013 Modelled | | 2024 with Wilton | | 2031 with Wilton | | 2036 with Wilton | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak | AM peak | PM peak |
| Hume Highway, north of Picton Road | Freeway | Northbound | B | C | C | B | C | C | D | C |
| | | Southbound | B | B | B | C | C | C | C | D |
| Hume Highway, south of Picton Road | Freeway | Northbound | A | A | B | B | B | B | B | B |
| | | Southbound | A | B | B | A | B | B | B | B |
| Picton Road, at Nepean River bridge | 2-lane 2-way | Combined | C | D | D | D | E | D | E | E |
| Picton Road west of Hume Highway | Multi-lane arterial | Eastbound | A | B | B | A | C | B | C | C |
| | | Westbound | A | A | A | A | B | B | C | D |
| Picton Road east of Hume Highway | Multi-lane arterial | Eastbound | A | B | B | B | B | B | B | C |
| | | Westbound | A | B | B | B | B | B | C | B |
| Picton Road east of Pembroke Parade | Multi-lane arterial | Eastbound | E | E | B | B | C | B | C | C |
| | | Westbound | | | B | B | B | B | B | B |
| Picton Road east of Almond Street | Multi-lane arterial | Eastbound | E | E | B | B | C | B | C | B |
| | | Westbound | | | A | B | B | B | B | C |
| Picton Road east of Macarthur Drive | 2-lane 2-way | Combined | D | E | E | E | E | E | F | E |
| Wilton Road, at Broughton Pass | One lane bridge | Combined | E | E | A[1] | A[1] | B[1] | B[1] | C[1] | C[1] |

(1) Cataract River Bridge at Broughton Pass widened to one lane in each direction

# Appendix E

Highway Capacity Manual (HCM) analysis

# E1. HCM analysis

An analysis of the expected levels of service to the north of the Picton Road overpass of M31 (Hume Highway) has been undertaken using the Highway Capacity Manual 2010 (Version 6.41). The analysis is based on the following:

- Year 2036 peak hour volumes in PCPH (i.e. heavy vehicle proportion already included in volumes).
- Level terrain.
- 100 km/hr free speeds on main carriageways and 80 km/hr on the ramps.
- Four lane divided main carriageway.
- One lane at the nose for the ramps.
- Merge and diverge lengths are as per the draft layouts.
- Random arrivals at the entry ramp noses.

Figure E1.1 shows locations at which the HCM analysis was undertaken. The analysis considered the northbound movements during the AM peak and the Southbound in the PM peak.

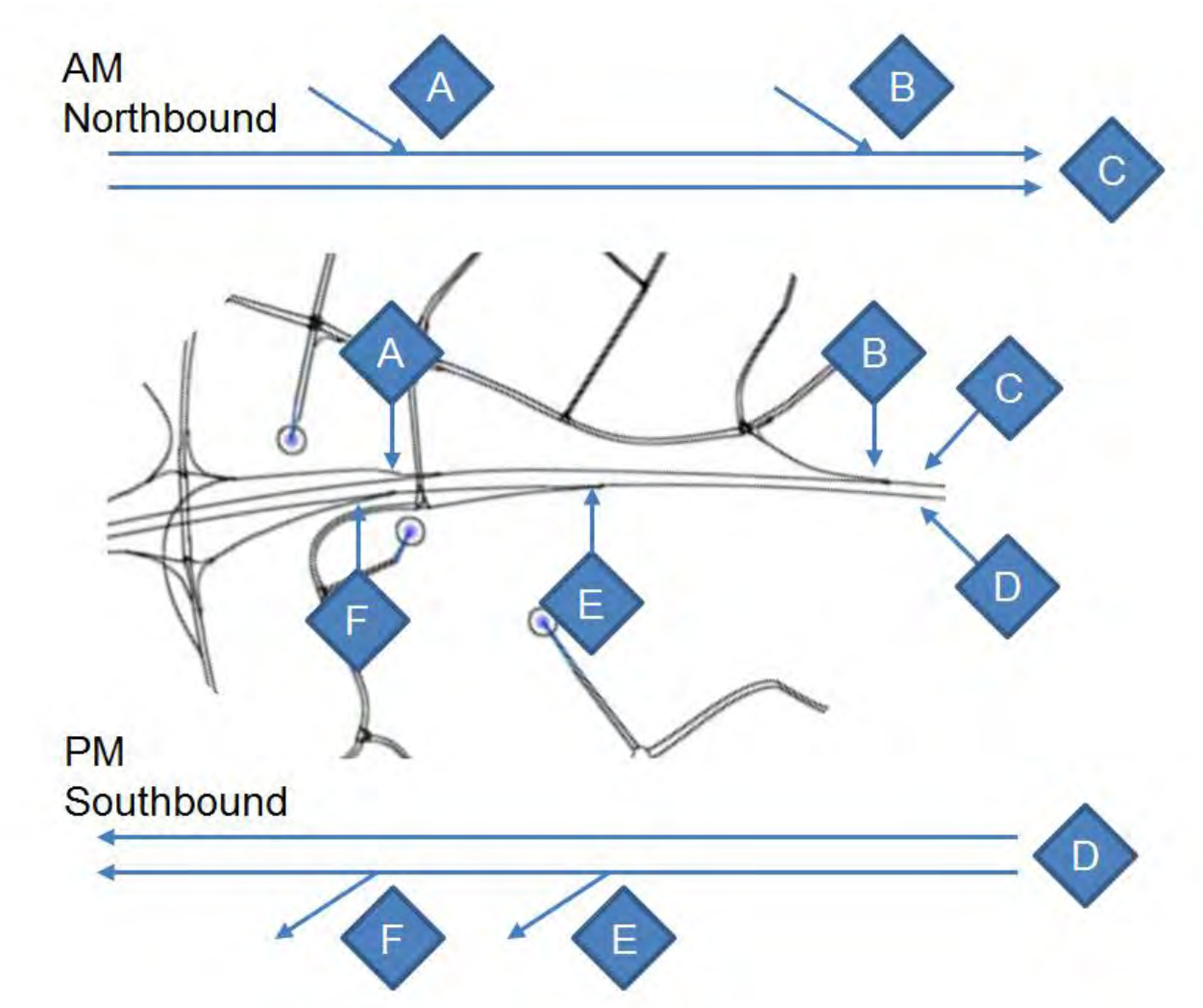



**Figure E1.1 HCM analysis locations**

The results are shown in the corresponding HCM worksheets attached. The analysis indicates:

- Northbound AM peak hour performance :
  - A: the Picton road entry ramp is expected to operate at LoS C at the merge
  - B: the new entry ramp is expected to operate at LoS D at the merge
  - C: the main carriageway is expected to operate at LoS D downstream of the two entry ramps
- southbound PM peak hour performance :
  - D: the main carriageway is expected to operate at LoS D upstream of the two exit ramps
  - E: the new exit ramp is expected to operate at LoS D at the diverge
  - F: the Picton road entry ramp is expected to operate at LoS C at the diverge.

These results indicate that from a planning perspective the proposed layout has sufficient capacity to meet the expected demand and would provide satisfactory operating conditions under the design year volumes.

The HCM analysis also highlighted that improvements and refinements could be made to the design to improve the operations further.

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | David Bohm | Freeway/Dir of Travel | North Bound |
| Agency or Company | File: A36NbEAM | Junction | North bound entry ramp A |
| Date Performed | 17/06/14 | Jurisdiction | Lane Scenario 1 |
| Analysis Time Period | AM Peak | Analysis Year | 2036 |
| Project Description | Wilton TMAP Rev F | | |

## Inputs

| Upstream Adj Ramp | | Downstream Adj Ramp |
|---|---|---|
| ☐ Yes ☐ On | Freeway Number of Lanes, N: 2 | ☑ Yes ☑ On |
| ☑ No ☐ Off | Ramp Number of Lanes, N: 1 | ☐ No ☐ Off |
| $L_{up}$ = ft | Acceleration Lane Length, $L_A$: 1000 | $L_{down}$ = 4100 ft |
| $V_u$ = veh/h | Deceleration Lane Length $L_D$: | $V_D$ = 1032 veh/h |
| | Freeway Volume, $V_F$: 1426 | |
| | Ramp Volume, $V_R$: 1466 | |
| | Freeway Free-Flow Speed, $S_{FF}$: 60.0 | |
| | Ramp Free-Flow Speed, $S_{FR}$: 35.0 | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 1426 | 1.00 | Level | 0 | 0 | 1.000 | 1.00 | 1426 |
| Ramp | 1466 | 1.00 | Level | 0 | 0 | 1.000 | 1.00 | 1466 |
| UpStream | | | | | | | | |
| DownStream | 1032 | 1.00 | Level | 0 | 0 | 1.000 | 1.00 | 1032 |

## Merge Areas

### Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = 1.000 using Equation (Exhibit 13-6)

$V_{12}$ = 1426 pc/h

$V_3$ or $V_{av34}$ 0 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 2892 | Exhibit 13-8 | | No |

### Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 2892 | Exhibit 13-8 | 4600:All | No |

### Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

$D_R$ = 21.1 (pc/mi/ln)

LOS = C (Exhibit 13-2)

### Speed Determination

$M_S$ = 0.321 (Exibit 13-11)

$S_R$ = 54.2 mph (Exhibit 13-11)

$S_0$ = N/A mph (Exhibit 13-11)

S = 54.2 mph (Exhibit 13-13)

## Diverge Areas

### Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

### Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

### Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

### Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$ = mph (Exhibit 13-12)

$S_0$ = mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | David Bohm | Freeway/Dir of Travel | North Bound |
| Agency or Company | File: B36NbEAM | Junction | North bound entry ramp B |
| Date Performed | 17/06/14 | Jurisdiction | Lane Scenario 1 |
| Analysis Time Period | AM Peak | Analysis Year | 2036 |
| Project Description | Wilton TMAP Revision F | | |

## Inputs

| Upstream Adj Ramp | | Downstream Adj Ramp |
|---|---|---|
| ☑ Yes ☑ On | Freeway Number of Lanes, N: 2 | ☐ Yes ☐ On |
| ☐ No ☐ Off | Ramp Number of Lanes, N: 1 | ☑ No ☐ Off |
| $L_{up}$ = 4100 ft | Acceleration Lane Length, $L_A$: 1000 | $L_{down}$ = ft |
| $V_u$ = 1466 veh/h | Deceleration Lane Length $L_D$: | $V_D$ = veh/h |
| | Freeway Volume, $V_F$: 2892 | |
| | Ramp Volume, $V_R$: 1032 | |
| | Freeway Free-Flow Speed, $S_{FF}$: 60.0 | |
| | Ramp Free-Flow Speed, $S_{FR}$: 35.0 | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | v = V/PHF x $f_{HV}$ x $f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 2892 | 1.00 | Level | 0 | 0 | 1.000 | 1.00 | 2892 |
| Ramp | 1032 | 1.00 | Level | 0 | 0 | 1.000 | 1.00 | 1032 |
| UpStream | 1466 | 1.00 | Level | 0 | 0 | 1.000 | 1.00 | 1466 |
| DownStream | | | | | | | | |

Merge Areas

### Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = 1.000 using Equation (Exhibit 13-6)

$V_{12}$ = 2892 pc/h

$V_3$ or $V_{av34}$ 0 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | 3924 | Exhibit 13-8 | | No |

### Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | 3924 | Exhibit 13-8 | 4600:All | No |

### Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$

$D_R$ = 29.3 (pc/mi/ln)

LOS = D (Exhibit 13-2)

### Speed Determination

$M_S$ = 0.448 (Exibit 13-11)

$S_R$= 51.9 mph (Exhibit 13-11)

$S_0$= N/A mph (Exhibit 13-11)

S = 51.9 mph (Exhibit 13-13)

Diverge Areas

### Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = using Equation (Exhibit 13-7)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | | Exhibit 13-8 | | |
| $V_{FO} = V_F - V_R$ | | Exhibit 13-8 | | |
| $V_R$ | | Exhibit 13-10 | | |

### Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | | Exhibit 13-8 | | |

### Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

### Speed Determination

$D_s$ = (Exhibit 13-12)

$S_R$= mph (Exhibit 13-12)

$S_0$= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)



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# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | *David Bohm* |
| Agency or Company | *File: C36NbAM* |
| Date Performed | *17/06/14* |
| Analysis Time Period | *AM Peak* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *North bound* |
| From/To | *Loc'n C at Local Overpass* |
| Jurisdiction | *Lane Scenario 1* |
| Analysis Year | *2036* |

Project Description *Wilton TMAP - Revision F*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *3924* | veh/h | Peak-Hour Factor, PHF | *1.00* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *0* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *1.000* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *2* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *60.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *60.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1962* | pc/h/ln |
| S | *57.6* | mph |
| D = $v_p$ / S | *34.1* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# BASIC FREEWAY SEGMENTS WORKSHEET

## General Information

| | |
|---|---|
| Analyst | *David Bohm* |
| Agency or Company | *File: D36SbPM* |
| Date Performed | *17/06/14* |
| Analysis Time Period | *PM Peak* |

## Site Information

| | |
|---|---|
| Highway/Direction of Travel | *South bound* |
| From/To | *Loc'n D at Local Overpass* |
| Jurisdiction | *Lane Scenario 1* |
| Analysis Year | *2036* |

Project Description *Wilton TMAP - Revision F*

☑ Oper.(LOS) ☐ Des.(N) ☐ Planning Data

## Flow Inputs

| | | | | |
|---|---|---|---|---|
| Volume, V | *3787* | veh/h | Peak-Hour Factor, PHF | *1.00* |
| AADT | | veh/day | %Trucks and Buses, $P_T$ | *0* |
| Peak-Hr Prop. of AADT, K | | | %RVs, $P_R$ | *0* |
| Peak-Hr Direction Prop, D | | | General Terrain: | *Level* |
| DDHV = AADT x K x D | | veh/h | Grade % Length Up/Down % | *mi* |

## Calculate Flow Adjustments

| | | | |
|---|---|---|---|
| $f_p$ | *1.00* | $E_R$ | *1.2* |
| $E_T$ | *1.5* | $f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$ | *1.000* |

## Speed Inputs

| | | |
|---|---|---|
| Lane Width | | ft |
| Rt-Side Lat. Clearance | | ft |
| Number of Lanes, N | *2* | |
| Total Ramp Density, TRD | | ramps/mi |
| FFS (measured) | *60.0* | mph |
| Base free-flow Speed, BFFS | | mph |

## Calc Speed Adj and FFS

| | | |
|---|---|---|
| $f_{LW}$ | | mph |
| $f_{LC}$ | | mph |
| TRD Adjustment | | mph |
| FFS | *60.0* | mph |

## LOS and Performance Measures

Operational (LOS)

| | | |
|---|---|---|
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | *1894* | pc/h/ln |
| S | *58.4* | mph |
| D = $v_p$ / S | *32.4* | pc/mi/ln |
| LOS | *D* | |

## Design (N)

Design (N)

| | |
|---|---|
| Design LOS | |
| $v_p$ = (V or DDHV) / (PHF x N x $f_{HV}$ x $f_p$) | pc/h/ln |
| S | mph |
| D = $v_p$ / S | pc/mi/ln |
| Required Number of Lanes, N | |

## Glossary

| | |
|---|---|
| N - Number of lanes | S - Speed |
| V - Hourly volume | D - Density |
| $v_p$ - Flow rate | FFS - Free-flow speed |
| LOS - Level of service | BFFS - Base free-flow speed |
| DDHV - Directional design hour volume | |

## Factor Location

| | |
|---|---|
| $E_R$ - Exhibits 11-10, 11-12 | $f_{LW}$ - Exhibit 11-8 |
| $E_T$ - Exhibits 11-10, 11-11, 11-13 | $f_{LC}$ - Exhibit 11-9 |
| $f_p$ - Page 11-18 | TRD - Page 11-11 |
| LOS, S, FFS, $v_p$ - Exhibits 11-2, 11-3 | |

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | David Bohm | Freeway/Dir of Travel | South Bound |
| Agency or Company | File: E36SbXPM | Junction | South Bound Exit E |
| Date Performed | 17/06/14 | Jurisdiction | Lane scenario 1 |
| Analysis Time Period | PM Peak | Analysis Year | 2036 |

Project Description Wilton TMP - Revision F

## Inputs

| Upstream Adj Ramp | | Downstream Adj Ramp |
|---|---|---|
| ☐ Yes ☐ On | Freeway Number of Lanes, N: 2 | ☑ Yes ☐ On |
| ☑ No ☐ Off | Ramp Number of Lanes, N: 1 | ☐ No ☑ Off |
| $L_{up}$ = ft | Acceleration Lane Length, $L_A$: | $L_{down}$ = 1400 ft |
| $V_u$ = veh/h | Deceleration Lane Length $L_D$: 400 | $V_D$ = 1452 veh/h |
| | Freeway Volume, $V_F$: 3787 | |
| | Ramp Volume, $V_R$: 825 | |
| | Freeway Free-Flow Speed, $S_{FF}$: 55.0 | |
| | Ramp Free-Flow Speed, $S_{FR}$: 35.0 | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | $v = V/PHF \times f_{HV} \times f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 3787 | 1.00 | Level | 0 | 0 | 1.000 | 1.00 | 3787 |
| Ramp | 825 | 1.00 | Level | 0 | 0 | 1.000 | 1.00 | 825 |
| UpStream | | | | | | | | |
| DownStream | 1452 | 1.00 | Level | 0 | 0 | 1.000 | 1.00 | 1452 |

## Merge Areas

### Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

### Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

### Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

### Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$ = mph (Exhibit 13-11)

$S_0$ = mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

## Diverge Areas

### Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 1.000 using Equation (Exhibit 13-7)

$V_{12}$ = 3787 pc/h

$V_3$ or $V_{av34}$ 0 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 3787 | Exhibit 13-8 | 4500 | No |
| $V_{FO} = V_F - V_R$ | 2962 | Exhibit 13-8 | 4500 | No |
| $V_R$ | 825 | Exhibit 13-10 | 2000 | No |

### Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 3787 | Exhibit 13-8 | 4400:All | No |

### Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

$D_R$ = 33.2 (pc/mi/ln)

LOS = D (Exhibit 13-2)

### Speed Determination

$D_s$ = 0.502 (Exhibit 13-12)

$S_R$ = 48.5 mph (Exhibit 13-12)

$S_0$ = N/A mph (Exhibit 13-12)

S = 48.5 mph (Exhibit 13-13)

# RAMPS AND RAMP JUNCTIONS WORKSHEET

## General Information / Site Information

| | | | |
|---|---|---|---|
| Analyst | David Bohm | Freeway/Dir of Travel | South Bound |
| Agency or Company | File: F36SbXPM | Junction | South Bound Exit F |
| Date Performed | 17/06/14 | Jurisdiction | Lane scenario 1 |
| Analysis Time Period | PM Peak | Analysis Year | 2036 |

Project Description Wilton TMP - Revision F

## Inputs

| Upstream Adj Ramp | | Downstream Adj Ramp |
|---|---|---|
| ☑ Yes ☐ On | Freeway Number of Lanes, N: 2 | ☐ Yes ☐ On |
| ☐ No ☑ Off | Ramp Number of Lanes, N: 1 | ☑ No ☐ Off |
| $L_{up}$ = 1400 ft | Acceleration Lane Length, $L_A$: | $L_{down}$ = ft |
| $V_u$ = 825 veh/h | Deceleration Lane Length $L_D$: 400 | $V_D$ = veh/h |
| | Freeway Volume, $V_F$: 2962 | |
| | Ramp Volume, $V_R$: 1452 | |
| | Freeway Free-Flow Speed, $S_{FF}$: 55.0 | |
| | Ramp Free-Flow Speed, $S_{FR}$: 35.0 | |

## Conversion to pc/h Under Base Conditions

| (pc/h) | V (Veh/hr) | PHF | Terrain | %Truck | %Rv | $f_{HV}$ | $f_p$ | $v = V/PHF \times f_{HV} \times f_p$ |
|---|---|---|---|---|---|---|---|---|
| Freeway | 2962 | 1.00 | Level | 0 | 0 | 1.000 | 1.00 | 2962 |
| Ramp | 1452 | 1.00 | Level | 0 | 0 | 1.000 | 1.00 | 1452 |
| UpStream | 825 | 1.00 | Level | 0 | 0 | 1.000 | 1.00 | 825 |
| DownStream | | | | | | | | |

## Merge Areas

### Estimation of $v_{12}$

$V_{12} = V_F ( P_{FM} )$

$L_{EQ}$ = (Equation 13-6 or 13-7)

$P_{FM}$ = using Equation (Exhibit 13-6)

$V_{12}$ = pc/h

$V_3$ or $V_{av34}$ pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☐ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☐ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_{FO}$ | | Exhibit 13-8 | | |

### Flow Entering Merge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{R12}$ | | Exhibit 13-8 | | |

### Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

$D_R$ = (pc/mi/ln)

LOS = (Exhibit 13-2)

### Speed Determination

$M_S$ = (Exibit 13-11)

$S_R$= mph (Exhibit 13-11)

$S_0$= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

## Diverge Areas

### Estimation of $v_{12}$

$V_{12} = V_R + (V_F - V_R)P_{FD}$

$L_{EQ}$ = (Equation 13-12 or 13-13)

$P_{FD}$ = 1.000 using Equation (Exhibit 13-7)

$V_{12}$ = 2962 pc/h

$V_3$ or $V_{av34}$ 0 pc/h (Equation 13-14 or 13-17)

Is $V_3$ or $V_{av34}$ > 2,700 pc/h? ☐ Yes ☑ No

Is $V_3$ or $V_{av34}$ > 1.5 * $V_{12}$/2 ☐ Yes ☑ No

If Yes, $V_{12a}$ = pc/h (Equation 13-16, 13-18, or 13-19)

### Capacity Checks

| | Actual | Capacity | | LOS F? |
|---|---|---|---|---|
| $V_F$ | 2962 | Exhibit 13-8 | 4500 | No |
| $V_{FO} = V_F - V_R$ | 1510 | Exhibit 13-8 | 4500 | No |
| $V_R$ | 1452 | Exhibit 13-10 | 2000 | No |

### Flow Entering Diverge Influence Area

| | Actual | Max Desirable | | Violation? |
|---|---|---|---|---|
| $V_{12}$ | 2962 | Exhibit 13-8 | 4400:All | No |

### Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

$D_R$ = 26.1 (pc/mi/ln)

LOS = C (Exhibit 13-2)

### Speed Determination

$D_s$ = 0.559 (Exhibit 13-12)

$S_R$= 47.7 mph (Exhibit 13-12)

$S_0$= N/A mph (Exhibit 13-12)

S = 47.7 mph (Exhibit 13-13)