West Belconnen

Technical Traffic Report

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Background

Riverview Projects (ACT) Pty Limited engaged AECOM to provide technical traffic advisory services on the likely impacts of the proposed West Belconnen urban development. The primary purpose of this report is to provide advice on the likely impacts of the development on existing roads and the planning for potential road upgrades to cater for expected traffic growth in the region.

The 2012 ACT Planning Strategy identifies the area of West Belconnen as a 'Future Urban Investigation Site'. It indicates that the location of the development will require careful consideration of the transport needs and requirements to facilitate a successful development.

A yield of approximately 11,500 residential dwellings, 30,000 residents, 4,400 jobs and 4,000 school enrolments is assumed at full development of West Belconnen. Access to the site will be via existing roads in the ACT, which will require upgrading over time as a result of expected traffic growth from the development. Previous traffic modelling has indicated that the primary area that will be impacted by traffic growth will be west of Kingsford Smith Drive and is therefore designated as the primary study area.

The key roads that will serve the proposed development are Southern Cross Drive, Drake Brockman Drive and Ginninderra Drive. William Hovell Drive and Florey Drive are also important. Currently, these roads are operating satisfactorily during peak periods, although there are some concerns regarding the number of crashes on William Hovell Drive.

It is anticipated that the completion of Ginninderra Drive will occur as part of the West Belconnen development. This will ensure better access to North Belconnen and Gungahlin. One of the key advantages of good access to North Belconnen is reduced travel times from the Emergency Services Centre in Charnwood to new housing and services in West Belconnen.

Outside of this project, there has been ongoing consultation with the local residents of Holt concerning the implementation of local area traffic management treatments (LATM) in the suburb. In the past, there has also been consultation for implementation of LATM in the nearby suburbs of Macgregor, Dunlop and Charnwood. Traffic modelling as part of this study indicates that the West Belconnen development will cause only minor increases in through traffic in these suburbs.

Key Outcomes

The analyses presented in this report highlight the future need to duplicate Stockdill Drive and Drake Brockman Drive (ie., construct an additional road carriageway to form a two-way two-lane road). Ultimately parts of William Hovell Drive, Southern Cross Drive and Ginninderra Drive will also need to be upgraded.

These analyses are based on a relatively significant shift to public transport in future, although the transport modelling indicates that this will be at lower levels than targeted in Transport for Canberra. The transport model predicts that by the year 2031 about 22% of non-walk trips will be made by public transport, bicycle and park and ride modes, which is about 6% less than the Transport for Canberra target for 2031.

The Government is committed to achieving the Transport for Canberra outcomes as part of its broader strategy for a more sustainable Canberra and these outcomes are closely aligned with the sustainability objectives set for the West Belconnen development. The assumptions in the current model results in mode splits that fall a bit short of the Government "Transport for Canberra" policy, resulting in higher traffic flow predictions and potentially bringing forward some of the works that may be required.

The modelling showed that the highest public transport movements out of West Belconnen will occur in the Stockdill Drive, Drake Brockman Drive and William Hovell Drive corridors. The traffic volumes will also be highest in these corridors and this presents potential conditions for implementing bus priority treatments in these corridors in future. The major bus passenger flow will remain on Southern Cross Drive east of Kippax and there will be increased traffic delays at signalised intersections along here, justifying future consideration of additional bus priority treatments in this section of road.

A key point is that about 35% of the bus passenger demand on Drake Brockman Drive from West Belconnen is destined for Kippax and 65% to William Hovell Drive and onto City. Also, the majority of growth in bus passenger demand via Kippax will be due to growth in public transport use by existing residents and workers in the area.

Parts of Drake Brockman Drive, Southern Cross Drive and William Hovell Drive are candidates for bus priority treatments. It will be hard to justify bus or transit lanes, especially early on when bus numbers are just starting to grow. They may be justified on Southern Cross Drive by post-2031 and on Drake Brockman Drive when West Belconnen is nearing full development, depending on the timing of future improvement works and actual public transport growth.

There are a number of other local streets in the study area that could be impacted by the development, particularly collector roads. New link roads between Parkwood Road and Stockdill Drive, to the west of the Belconnen Golf Course, will be provided as part of the new development. These will relieve potential rat-running pressure on local streets in Holt. There will be some increase in traffic on Spofforth Street, especially post 2031. Micro-simulation modelling indicates that traffic growth will be moderate and traffic volumes are predicted to be less than 2,500 vehicles per day, well within the capacity of this type of road.

The works required to service the West Belconnen development will benefit new and existing users of the road system in the area. As an indication, some analyses of 2041 (ultimate) transport modelling results indicate that West Belconnen traffic will represent:

- 71% of vehicles using Drake Brockman Drive west of Kingsford Smith Drive
- 39% of vehicles using Southern Cross Drive east of Florey Drive
- 33% of vehicles using Ginninderra Drive east of Florey Drive
- 36% of vehicles using William Hovell Drive south of Drake Brockman Drive

These results reflect a reduction in existing trips using these roads due to greater public transport use and a redistribution of trips, either to alternative destinations or alternative routes.

A summary of required external roadworks is provided in Table 1. More details are provided in Chapters 6 and 7 of this report.

Some specific comments with regards particular roads in the area follow.

Stockdill Drive

In the short-term (to 2021), Stockdill Drive between Spofforth Street and the Estate access will need to be upgraded to a suitable urban standard early in the development process. This will include the creation of a new intersection at the access to the development and realignment of Stockdill Drive to its final alignment, including changed priority at Spofforth Street. At the outset, bicycle and pedestrian facilities should be constructed along Stockdill Drive to link with existing facilities on Drake Brockman Drive and Spofforth Street.

Ultimately, at full development of West Belconnen, Stockdill Drive will carry about 24,000 veh/day and will require duplication. Micro-simulation modelling showed that buses could travel in mixed traffic with minimal traffic delays, provided duplication occurs in a timely manner (about the middle of the 2030's decade).

Drake Brockman Drive

By 2021, a service road and a new road carriageway should be built on Drake Brockman Drive between Spofforth Street and Macnaughton Street to cater for relatively large increases in traffic volumes. East of Macnaughton Street improvements to intersections via linemarking are likely to suffice in the short-term, but some minor widening at intersections will be required to incorporate new cycle lanes.

In the early part of the 2030's decade, Drake Brockman Drive east of Macnaughton Street will need to be duplicated and peak hour signal metering installed at the roundabout of Drake Brockman Drive with William Hovell Drive, to control the right turn from Kingsford Smith Drive into Drake Brockman Drive in the PM peak. The duplication of the western section may be delayed till the mid-2030's based on forecast traffic volumes, but it may be preferable for this work to be completed concurrently with works east of Macnaughton Street.

Ultimately there will be a high volume of buses and bus passengers on Drake Brockman Drive, especially near Macnaughton Street where peak hour bus passenger volumes could jump to 1,700 passengers per hour in the long-term (about 24 buses per hour). The micro-simulation modelling showed that buses could travel in mixed traffic with minimal traffic delays, provided the intersection with Macnaughton Street is signalised in the long-term. No bus priority works will be needed and pedestrian movements can be safely accommodated by a future median and new intersections signals at Macnaughton Street and Trickett Street.

Table 1: Summary of recommended external roadworks

Road	First stage (600 dwellings)	By mid-2020's (2,900 dwellings)	By mid-2030's (5,900 dwellings)	Ultimate
Stockdill Drive – Spofforth Street to Estate Access	- Realign Stockdill Drive - Widen pavement to accommodate on-road cycling - Change intersection priority at Spofforth Street			- Duplicate road
Drake Brockman Drive – Spofforth Street to Macnaughton Street	- Provide right turn storage at intersections and cycle lanes	- Construct new road carriageway and service road - Upgrade intersections	- Signalise Macnaughton Street intersection - Duplicate road - Signalise Trickett Street intersection	
Drake Brockman Drive – east of Macnaughton Street	- Provide right turn storage at intersections and cycle lanes	- Provide PM peak signal metering for right turn from Kingsford Smith Drive	- Duplicate road - Construct left-turn bypass lane from William Hovell Drive	
William Hovell Drive – Drake Brockman Drive to Coppins Crossing		- Safety improvements, subject to investigations - Signalise Coppins Crossing intersection		- Upgrade Coppins Crossing/ Coulter Drive intersections - Construct median barrier and duplicate road
Parkwood Road – Estate boundary to Spofforth Street		- Realign bend in road - Widen pavement to accommodate on-road cycling		
Southern Cross Drive – Spofforth Street to Kingsford Smith Drive		- Signalise Starke Street West intersection		- Construct southern service road west of Starke Street (West) and 1-lane roundabout at Beaurepaire Crescent - Provide eastbound queue jump lane for buses at Florey Drive intersection
Ginninderra Drive – Kerrigan Street to Florey Drive				- Construct intersection with Kerrigan Street - Provide right turn storage at Archdall Street and Lance Hill Drive intersections

Note: This only includes primary roadworks; more details are given in Chapter 7 of this report

Further modelling was undertaken to test the sensitivity of traffic volumes forecasts to changed assumptions for travel speeds on Drake Brockman Drive west of Macnaughton Street (the current 60 km/h instead of an increased limit of 80 km/h assumed in the modelling to date). These runs were instigated to determine potential impacts on traffic noise and rat running through local streets.

This modelling showed a shift in traffic from Stockdill Drive and Drake Brockman Drive to Parkwood Road. The shift will be more significant in 2041 and beyond. It would result in increased congestion on Parkwood Road and the western parts of Southern Cross Drive. No significant change is predicted on other arterial roads in the study area. Also, the changes to Southern Cross Drive are expected to be moderate, which is likely to mean some increased use of local streets such as Spofforth Street and Starke Street.

William Hovell Drive

William Hovell Drive is busy during the AM peak and it has had a high number of crashes between Drake Brockman Drive and Coulter Drive in recent years. There were 297 recorded crashes along William Hovell Drive between Drake Brockman Drive and Coulter Drive in the 10 year period 2004 to 2013, including intersection crashes. This highlights a pressing need for a review of safety and the identification of potential improvements; a need that exists independent of the West Belconnen project.

Traffic growth on William Hovell Drive is predicted to be slow, due to capacity constraints in this corridor and a shift to public transport use. The real constraint on this road is the Bindubi Drive intersection, which is planned to be upgraded post-2031. Coppins Crossing is likely to be signalised by 2021 and the timing of any upgrades here will influence decisions on widening William Hovell Drive west of Coppins Crossing. It is likely that this would involve an additional eastbound lane between Deep Creek and Coulter Drive, extending the existing two-lane section to the west of the intersection.

The implementation of bus priority treatments at signalised junctions along William Hovell Drive may be beneficial post-2031, as queues and delays along here increase with the development of Molonglo. It is dependent on actual bus numbers and patronage that are achieved in this corridor in future. Duplication of William Hovell Drive is likely to be justified by 2041 (ultimate), to provide extra capacity to enable improved bus operations. The timing and nature of these works are subject to ongoing investigations.

Parkwood Road

Residential development is not expected to occur along this road until post 2020, with the release of about 800 dwellings between 2020 and 2022, as well as possible commencement of development of the Centre. The existing road can cater for this increased traffic, but the bend in Parkwood Road west of Macfarlane Burnet Avenue should be realigned for safety reasons and as part of widening the road to provide facilities for on-road cycling. Off-road bicycle and pedestrian facilities will need to be constructed along Parkwood Road to link with existing facilities in West Macgregor.

Parkwood Road is expected to carry 14,000 veh/day at full development of West Belconnen and micro-simulation modelling shows that this can be serviced by a high standard two-lane two-way road. About 600 passengers per hour would also be carried on buses in the peak hours along this section of road, not sufficient to justify bus priority facilities nor light rail.

Southern Cross Drive

There will be small increases in traffic using Southern Cross Drive following commencement of development along Parkwood Road. By 2031 there will be a need for some improvements along Southern Cross Drive. Ultimately, consideration should be given to creating a service road on the southern side of Southern Cross Drive between Spofforth Street and Beaurepaire Crescent, requiring reconstruction of the existing road. As part of these works a single-lane roundabout should be constructed at the intersection with Beaurepaire Crescent, to provide improved local access and traffic safety, including access for service road residents as it enables U-turns.

The section of Southern Cross Drive between Starke Street West and Moyes Crescent will be busiest and most congested, due to its two-lane two-way cross-section and proximity to the Kippax Centre. Bus passenger flows will be very high east of Kippax by 2031, with about 2,700 passengers per hour being carried by buses towards Belconnen by then, representing about 40 buses per hour in the peak direction. Micro-simulation modelling indicates that Southern Cross Drive may ultimately need to be widened from east of the Holt Oval underpass to the existing dual lane section at Moyes Crescent and the intersection with Starke Street west signalised. This will also allow the introduction of a bus queue jump lane here.

Consideration should also be given to an alternative access to Kippax via Moyes Crescent and a potential new road connection east of Kippax, which could avoid the need for the bus queue jump lane and widening of Southern Cross Drive. This will be investigated as part of ongoing master-planning work for Kippax.

Ginninderra Drive

The completion of Ginninderra Drive for access to West Belconnen is expected to be provided post-2031. This will result in the need to provide improved turn facilities at existing intersections, but duplication will not be required.

The need for completion of Ginninderra Drive to provide access to West Belconnen could be brought forward if development in the vicinity of Parkwood Eggs occurs earlier in the development process than planned. It would also delay any potential needs for upgrading Southern Cross Drive.

The Ginninderra Connection will be a high cost connection and will have some adverse environmental impacts that will be relatively difficult to mitigate. An analysis of removing the Ginninderra Connection has been undertaken. This analysis points to not duplicating Parkwood Road or Southern Cross Drive if Ginninderra Connection does not proceed, but providing an additional southern service road on Southern Cross Drive (as currently recommended).

The duplication of Southern Cross Drive would attract additional traffic to Southern Cross Drive in the peak hour, with a subsequent reduction public transport and bicycle usage. It will be difficult to ameliorate traffic noise impacts, due to widening of the road bringing substantially more traffic closer to houses. The impacts on local streets will also be greater if Southern Cross Drive is duplicated.

Local Streets

Much of the traffic infiltration through Holt streets occurs as a result of Macgregor trips and not West Belconnen. The majority of West Belconnen traffic wanting to use Drake Brockman Drive will use internal roads within West Belconnen to access Drake Brockman Drive via Stockdill Drive. Post 2031, there will be some growth in the use of Spofforth Street by West Belconnen traffic, but traffic growth will be moderate and traffic volumes will be within the capacity of this type of road.

Prior to the construction of the Ginninderra Connection, there will be a moderate increase in trips from West Belconnen through local streets in Macgregor, accessing destinations in Dunlop and Charnwood. This will need to be monitored in future.

Next Steps

More detailed investigations are needed to determine:

- further investigations into the traffic and infrastructure implications of changing the speed limit restrictions along Drake Brockman Drive
- the form and timing of improvements along William Hovell Drive
- potential changes to access to Kippax via Moyes Crescent
- improvements needed to facilitate public transport
- the design of service roads on Drake Brockman Drive and Southern Cross Drive
- the design of the Stockdill Drive improvements to cater for development

The investigations of William Hovell Drive, Stockdill Drive and Drake Brockman Drive are highest priority. Potential changes to access to Kippax are to be investigated as part of the ongoing master planning work for Kippax.

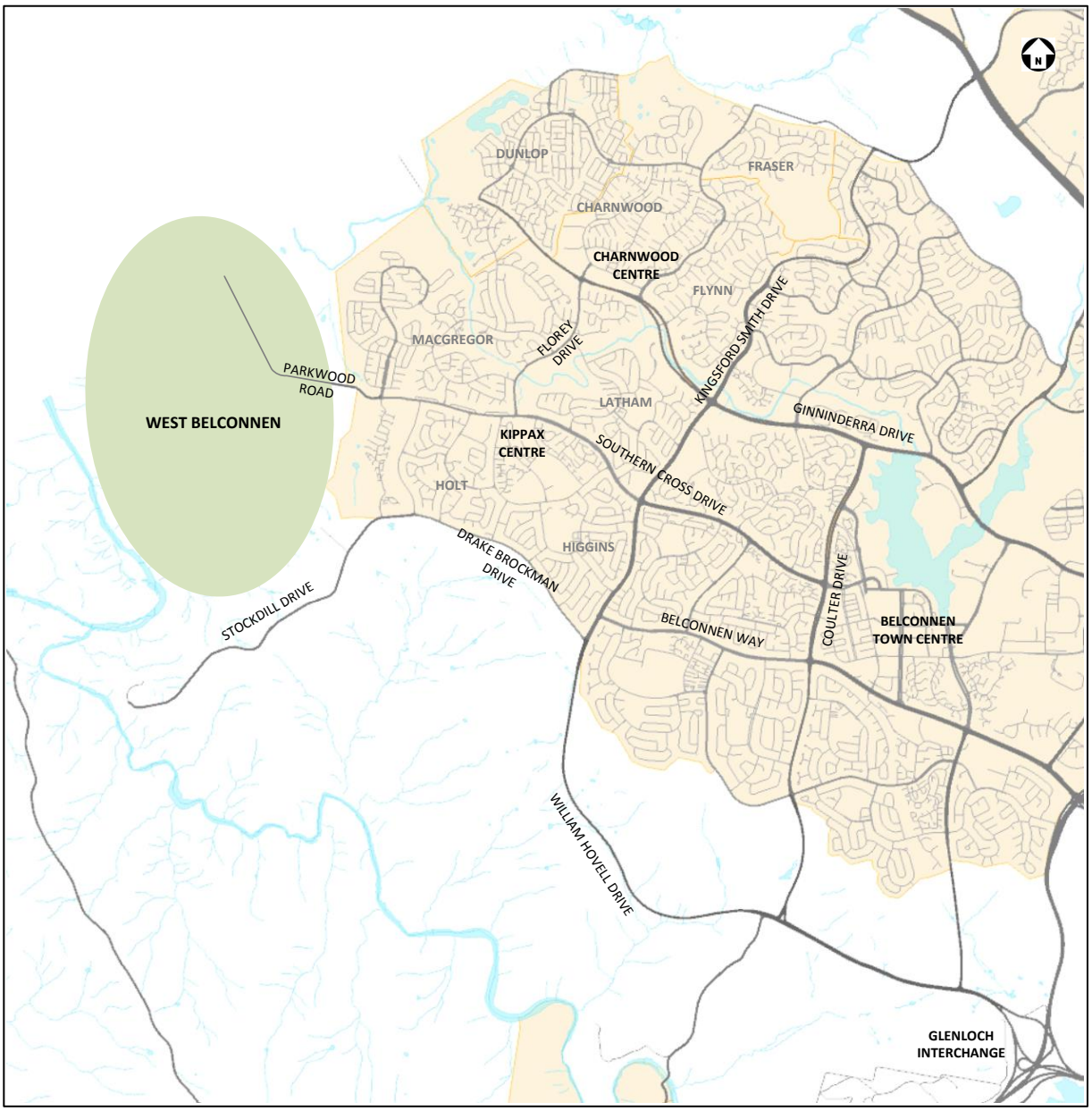
1.0 Introduction

Riverview Projects (ACT) Pty Limited, on behalf of the Land Development Agency and NSW land owners, engaged AECOM to provide technical traffic advisory services on the likely impacts of the proposed West Belconnen urban development. The primary purpose of this report is to provide advice on the likely impacts of the development on existing roads and the planning for potential road upgrades to cater for expected traffic growth in the region.

1.1 The Proposed Development

The location of the West Belconnen development is illustrated in Figure 1. The new area is the subject of the development of a Structure Plan and land-use rezoning. It spans both ACT and NSW, so is subject to different rezoning processes.

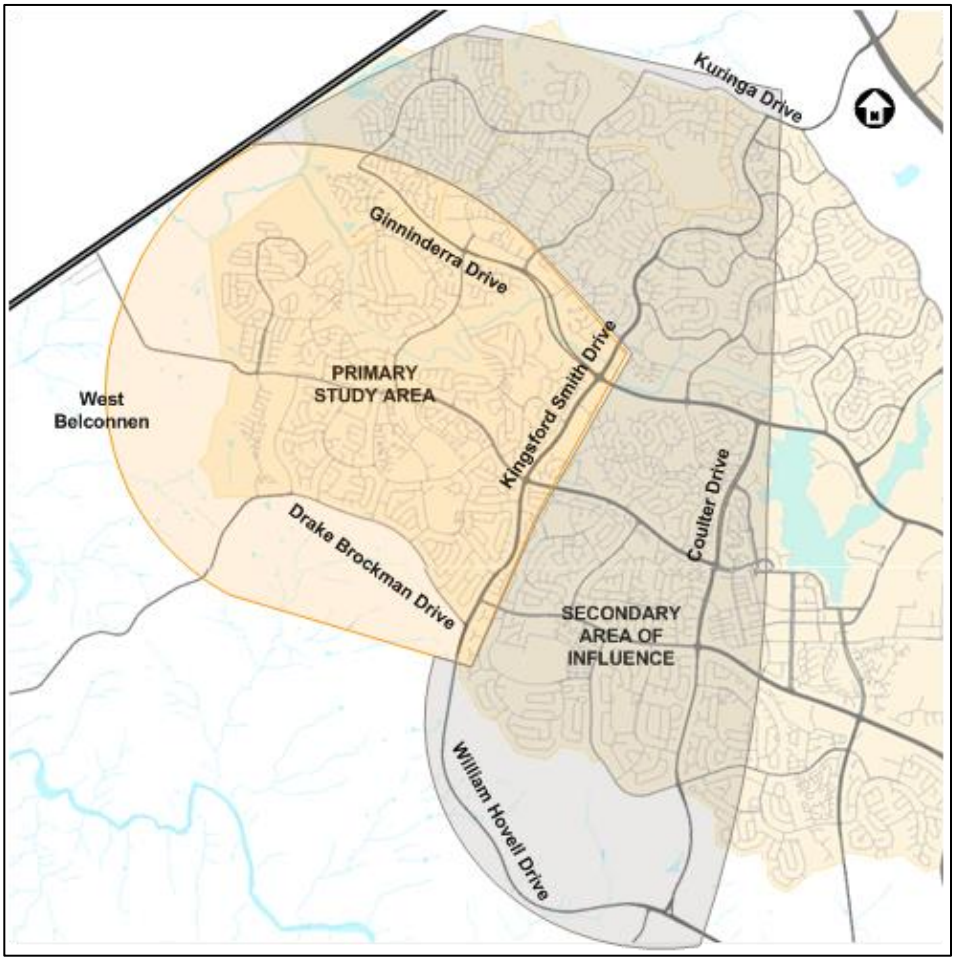
Figure 1: Site location



The 2012 ACT Planning Strategy identifies the area of West Belconnen as a 'Future Urban Investigation Site'. It indicates that the location of the development will require careful consideration of the transport needs and requirements to facilitate a successful development.

A yield of approximately 11,500 dwellings and 30,000 people is assumed for the development. Access to the site will be via existing roads in ACT, which will require upgrading as a result of expected traffic growth from the development. Previous traffic modelling has indicated that the primary area that will be impacted by traffic growth will be west of Kingsford Smith Drive and is the primary study area in Figure 2. There is also a secondary area of influence that extends further east (see Figure 2). These areas are the focus of the traffic assessment.

Figure 2: Primary and secondary study areas

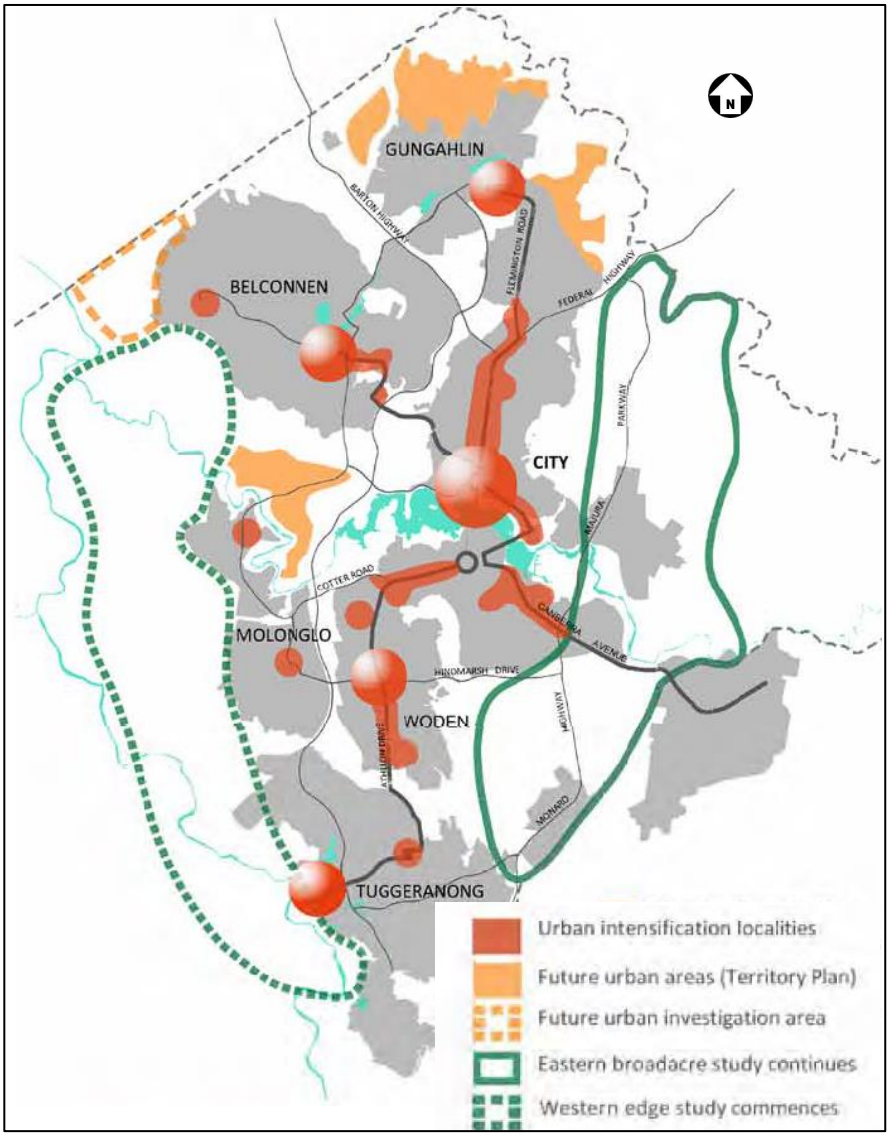


1.2 Policy Context

The 2012 ACT Planning Strategy identifies the area of West Belconnen as a 'Future Urban Investigation Site'. Figure 3 highlights the area presented in the ACT Planning Strategy. West Belconnen is denoted by the area contained within the broken orange line to the west of the existing district of Belconnen.

The ACT Planning Strategy indicate that the development will 'provide more cost effective and sustainable living options by improving the existing housing stock and establishing more choice in housing types'. It goes on to say that whilst providing a wide range of dwelling types to service the varying demand, it is important to note that the location of the development will require careful consideration of the transport needs and requirements to facilitate a successful development.

Figure 3: ACT Planning Strategy



Source: ACT Government (2012)

1.3 Previous Studies

Previous traffic studies that investigated the impacts of proposed development in West Belconnen assumed lower yields than the current plan. The most recent work by SMEC (2013) examined three development scenarios for West Belconnen, including a high growth scenario with a West Belconnen population of 24,300 people. For roads in the study area, SMEC concluded that:

- Duplication of Drake Brockman Drive may be necessary by 2031
- William Hovell Drive may require a second lane in the eastbound direction by 2021
- Southern Cross Drive will be over capacity by 2021

This was consistent with the outcomes of previous work, but lacked sufficient detail, which is addressed in this project. In particular, the key outputs from this project include a draft program of external roadworks and concept plans illustrating what changes are needed to external roads in the study area, as well as likely timing and more refined costs.

2.0 Purpose and Assumptions

2.1 Background

This report provides an outline of the external road improvements required as a result of expected traffic growth from development in the area. The primary influences on traffic growth will be West Belconnen, Kippax, Belconnen Town Centre and Molonglo.

The current master plan for West Belconnen is illustrated in Figure 4. The landuse estimates used in the modelling of West Belconnen are summarised in Table 2. The land-use data for 2021 and 2031 reflect a lot release rate of about 300 dwellings per year, whereas the assumed growth between 2031 and 2041 reflects a rate of 700 dwellings per year. The higher rate may not be achieved, so the traffic modelling results for 2041 may purport to a later year.

Figure 4: West Belconnen master plan (May 2014)

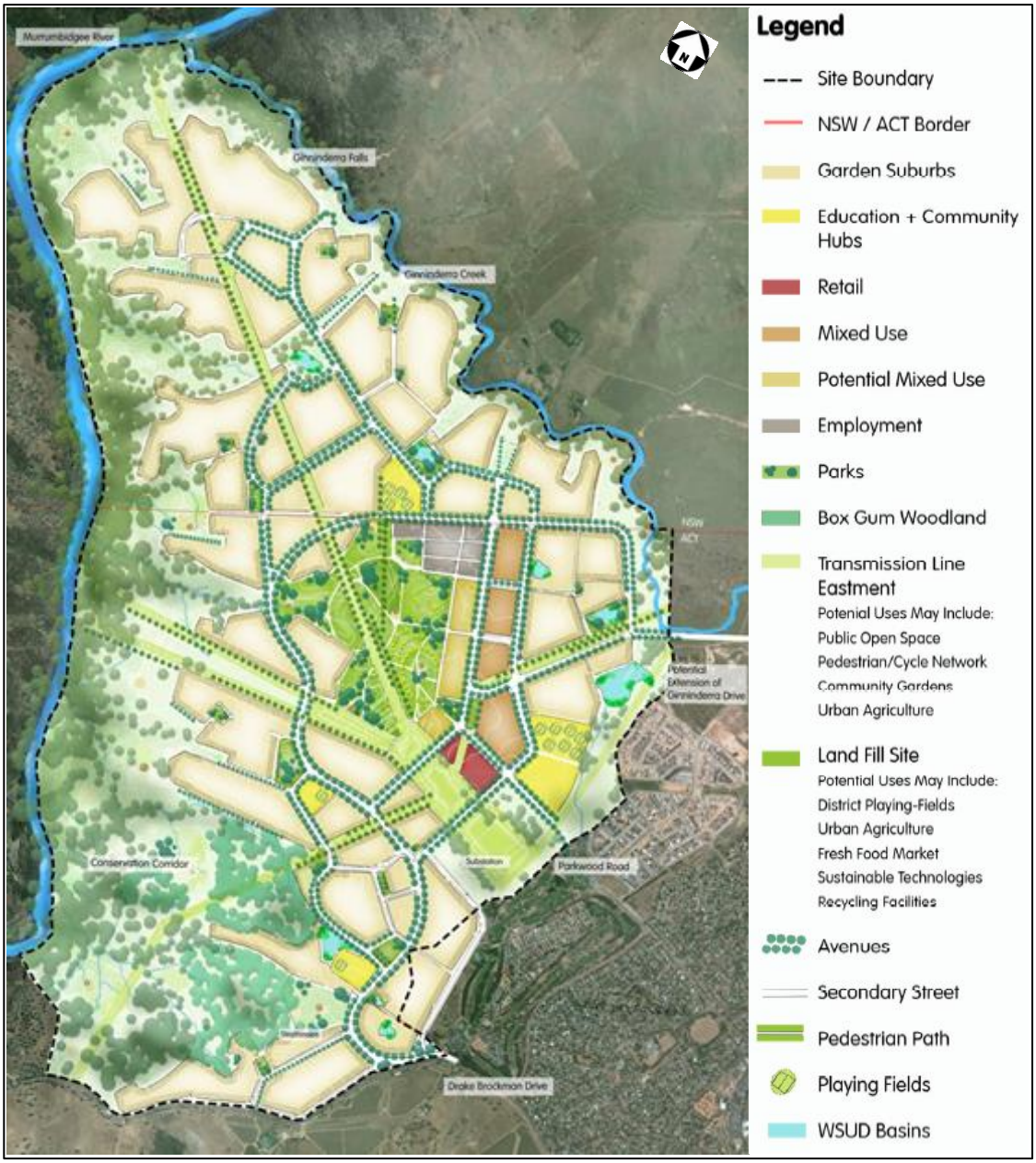


Table 2: West Belconnen landuse forecasts

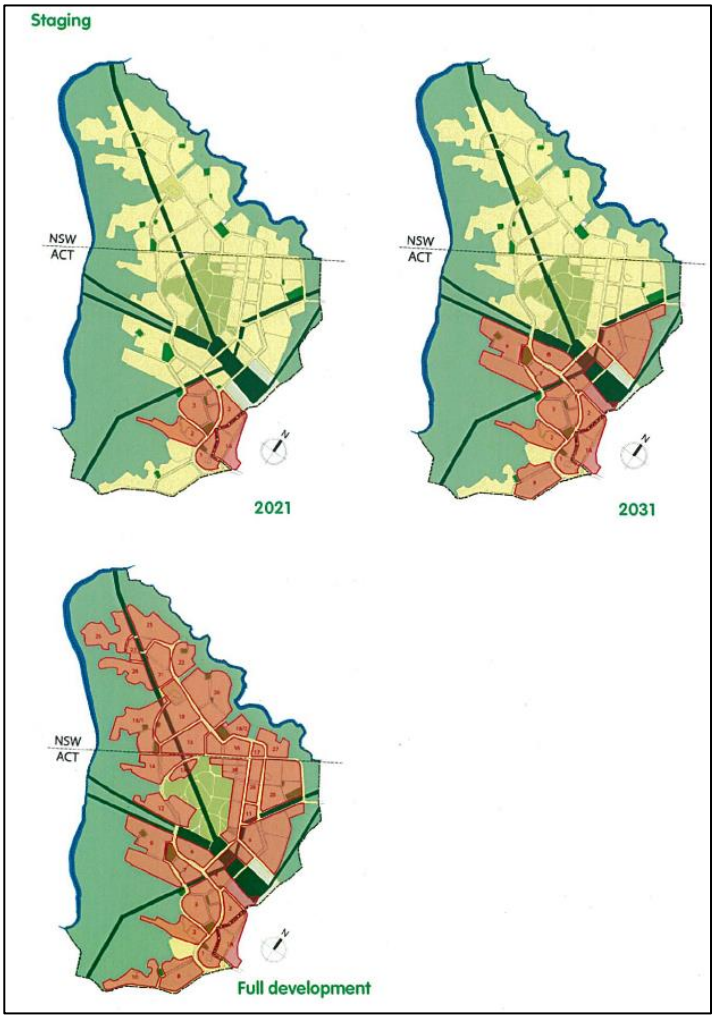
Use	2011	2016	2021	2031	2041 (Ultimate)
Population	0	0	4,680	11,700	29,900
Employment	320	350	438	1,624	4,380
Retail & services floorspace (m^2)	0	0	1,300	15,000	39,500
School enrolments	0	0	750	900	4,000

Note: 1. Retail & services includes retail, services, health, recreation and community uses (Urbis 2014)
2. School enrolments based on advice from Elton (2014)
3. Population estimates are based on 2.6 persons per dwelling

2.2 Staging Plan

The current plan for staging of development in West Belconnen is depicted in Figure 5. This formed the basis of the transport modelling for the various horizon years – 2021, 2031 and 2041 (ultimate or full development). Note that full development may not occur until about 2055, based on an expected lot release rate of 300 dwellings per year. However, for modelling purposes, it was assumed that it would be fully developed by 2041. This reflects a rapid growth rate between 2031 and 2041.

Figure 5: Staging of development

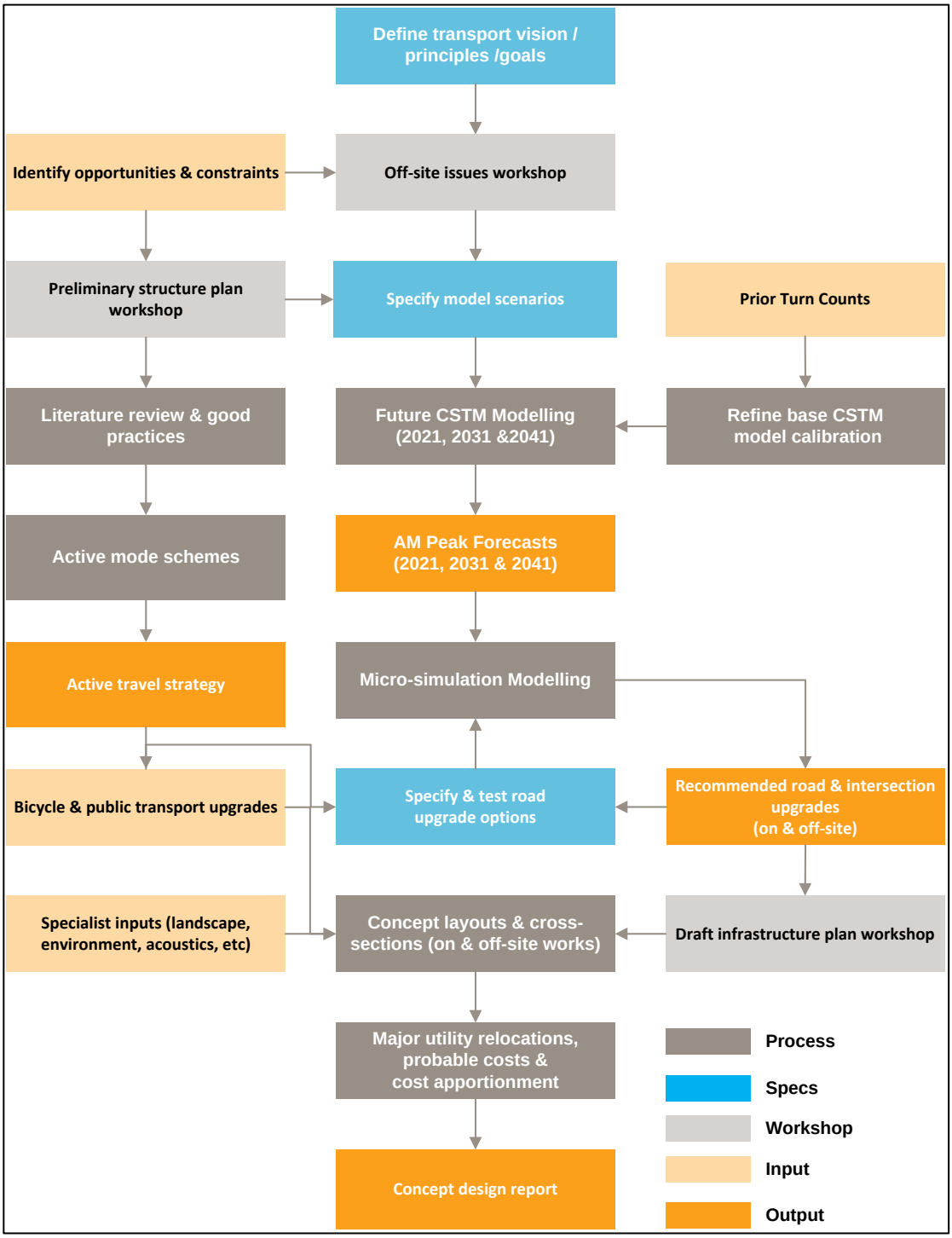


Source: Roberts Day (2014)

2.3 Overview of Approach

A summary of the primary tasks undertaken as part of the traffic and transport work on this project and their inter-relationships are shown in Figure 6. This report documents the results of the traffic modelling work and expectations for arterial road upgrades in the study area. McCormick Rankin Cagney (MRC) developed strategies for public transport and active modes, assisted by demand forecasts from the Canberra Strategic Transport Model (CSTM) modelling. Conversely, the active mode strategies feed into the development of the concept plans for arterial road upgrades.

Figure 6: Summary of project tasks



The CSTM model provides demand estimates that feed into the micro-simulation (Commuter) modelling. The micro-simulation modelling provides more detailed and accurate modelling of the road system, as well as clarity on intersection and bus priority needs that form part of future road upgrades in the area. The creation of road upgrade concepts for roads most impacted by the West Belconnen development can be developed following the testing of improvement options in the micro-simulation modelling. This enables more refined estimates of costing of required external road works.

A potential need for local area traffic management (LATM) is another aspect of the road system that can be more accurately assessed using the Commuter model. There has been ongoing consultation with the local residents of Holt concerning the implementation of LATM in the suburb. In the past, there has also been consultation for implementation of LATM in the nearby suburbs of Macgregor, Dunlop and Charnwood. There are concerns that the West Belconnen development could cause increased traffic in these suburbs.

2.4 Mode Use

A fundamental pillar of transport plans and policies in Canberra and other major cities is greater use of public transport and bicycle modes in future. This will lead to reduced car usage and less road upgrade needs. Thus, assumptions regarding mode use are critical to the work documented in this report.

Transport for Canberra (ACT Government 2012) has a 23% target for bus, bike and walk trips for the journey to work by 2016 and 30% by 2026. This incorporates targets of 7% for walking, 7% for cycling and 16% for public transport. It is equivalent to a 25% target for public transport and bicycle trips, if walk trips are excluded from the analysis.

In 2011, the mode shares for the journey to work (JTW) were 5% walking, 3% cycling and 7% public transport. That is, bicycle and public transport trips are expected to double over the next 15 years, whilst walk trips would also grow almost as quickly.

In 2031 the CSTM model estimates that about 21.6% of non-walk trips will be made by public transport, bicycle and park and ride modes. The equivalent 2031 target for these modes from Transport for Canberra is about 28% of non-walk trips, based on 25% in 2026. Hence, the current 2031 model is about 6% short of the intended mode use targets, so forecast traffic volumes will be higher.

In the ultimate scenario (2041) CSTM predicts about 22.4% of non-walk trips will be made by public transport, bicycle and park and ride modes. The equivalent 2041 target for these modes is about 34% of non-walk trips, extrapolating the Transport for Canberra targets. This is well above the forecast mode use; thus CSTM predicts greater use of the car mode than what transport policies would like to achieve. The achievement of such changes will require some significant changes in travel patterns and behaviour, some of which can be affected by alterations to the supply and cost of the transport system, but more fundamental changes take longer as they rely on changes to land-use patterns.

Mode use is an output from CSTM. It is largely dependent on relative travel times by car and bus, as well as parking charges. Relative travel times on public transport and in private cars can be altered by the inclusion of bus lanes and bus priority at intersections, which is reflected in CSTM's future networks. Increases in the real price of car parking at Canberra's employment centres is another key tool for changing mode use that is incorporated in future CSTM models. The CSTM parameter values do not vary much between the 2031 and 2041 (ultimate) models, resulting in an increased gap between target and forecast mode use.

The modelled estimates of future bicycle use are particularly low. This could be impacted by greater use of new technology that will enable higher speeds by minor modes and therefore greater use of minor modes (eg., electric bikes, electric mobility scooters and other mobility aids).

2.5 Strategic Model Version

The version of the Canberra Strategic Transport Model (CSTM) used in the production of traffic and public transport forecasts for this report was based on the model provided by ACT Government in March 2014 and the May 2014 master plan shown in Figure 4. The assumed parking charges in this model are summarised in Table 3.

Table 3: Assumed parking charges for CSTM runs

Year	City		Other Town Centres	
	HBW	HBE/OTH	HBW	HBE/OTH
2011	$11.25	$2.25	$5.63	$1.13
2021	$26.97	$6.74	$16.24	$4.06
2031	$32.88	$8.22	$19.81	$4.95
2041	$38.79	$9.70	$23.38	$5.84

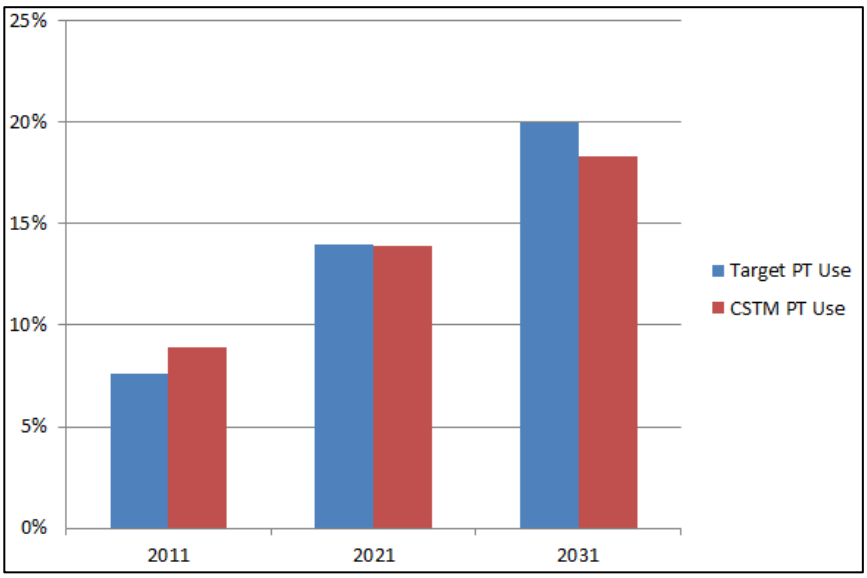
The assumed parking charges and resultant public transport use are higher than those used in more recent modelling elsewhere in Canberra, as shown in Table 9. However, the differences in overall car usage are relatively moderate, being in the range of 2 to 3% higher. Both sets of public transport and bicycle usage forecasts are below the Transport for Canberra targets. The difference between CSTM and target public transport use is summarised in Figure 7.

Table 4: Comparison of mode use estimates

Year	Car Mode Share		Public Transport Mode Share		Bicycle Mode Share	
	Current Model	Recent Model	Current Model	Recent Model	Current Model	Recent Model
2011	88.2%	88.2%	8.9%	8.9%	3.0%	3.0%
2021	82.7%	85.2%	13.9%	11.4%	3.3%	3.4%
2031	78.4%	81.6%	18.3%	14.9%	3.3%	3.4%
2041 (ultimate)	77.6%	79.8%	19.1%	16.7%	3.3%	3.4%

Note: Based on whole of Canberra and Queanbeyan estimates. The Current model forms the basis of traffic predictions in this report.

Figure 7: Comparison of CSTM and Transport for Canberra target public transport use



Note: The CSTM public transport use is based on the current model forecasts used in this report.

The Government is committed to achieving the Transport for Canberra outcomes as part of its broader strategy for a more sustainable Canberra and these outcomes are closely aligned with the sustainability objectives set for the West Belconnen development. The assumptions in the current model results in mode splits that fall a bit short of the Government "Transport for Canberra" policy, resulting in higher traffic flow predictions and potentially bringing forward some of the works that may otherwise be required, as noted in Section 4.2.

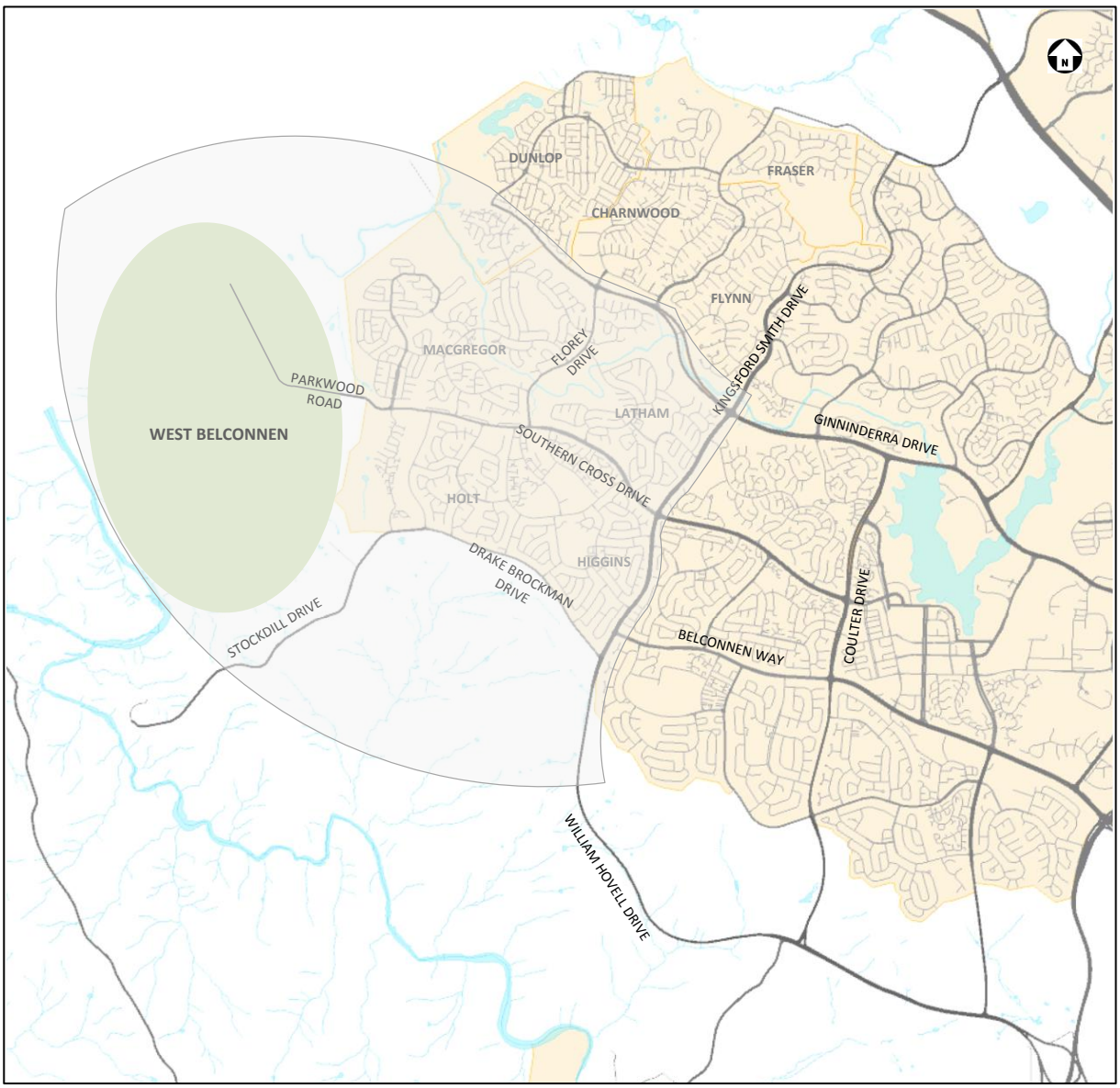
2.6 Ginninderra Drive Completion

The assessment of roads provided in this report assumes that Ginninderra Drive is completed by 2041 (ultimate).

2.7 Extent of Micro-simulation Modelling

The extent of the micro-simulation model area is as illustrated in Figure 8. It contains the existing road network bounded by Kingsford Smith Drive, Drake Brockman Drive, Spofforth Street and Ginninderra Drive, as well as the future West Belconnen development area. It effectively incorporates all of the access roads that are likely to require capacity improvements to cater for increased traffic due to the West Belconnen development.

Figure 8: Extent of micro-simulation modelled road network



2.8 Road Design Standards

Some road cross-sections for arterial road upgrades have been produced based on initial traffic forecasts with CSTM and probable needs for road widening. These are presented later in this report. Road design concepts for the full length of roads requiring future upgrading will be developed following the micro-simulation modelling.

The road design standards adopted for this project comply with the provisions detailed within relevant ACT Government and Austroads guidelines and standards. The road design work is based upon available information, which includes:

- Information gathered from construction (Works as Executed; WAE) drawings and during site visits;
- Location of utilities (supplied in electronic (CAD/DWG) format by utilities authorities);
- ACTMAPi 1 m digitised contours;
- Assessment of utilities is based on the Dial Before You Dig information. No potholing or on-site detection has been undertaken as part of this work. Therefore, relocation of utilities not mentioned in below sections may be required depending upon the confirmation of the alignment and cover of these utilities on-site.

3.0 Existing Situation

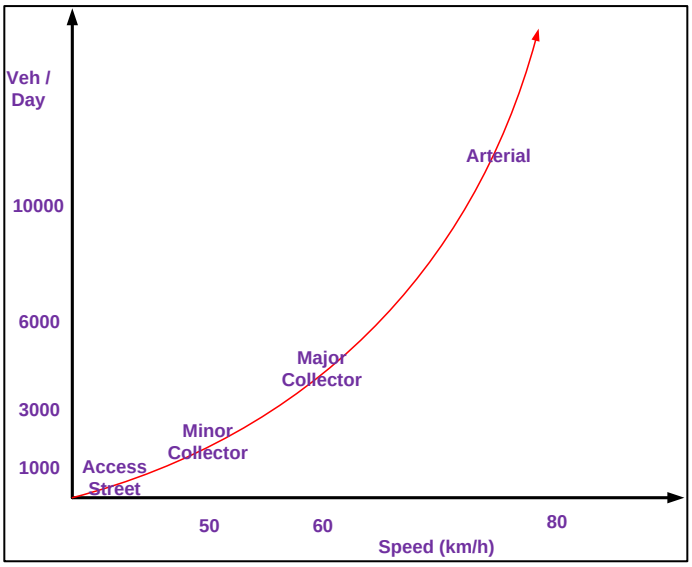
3.1 Road Hierarchy

The road hierarchy defines the primary purpose and function of the various roads in a road network. The ACT road hierarchy as defined in the ACT Estate Development Code has three broad categories:

- access streets (defined as rear lane, access street A and access street B),
- collector roads (defined as major or minor), and
- arterial roads.

The roads are described in terms of such variables as pavement and verge widths, traffic volumes, speed environment, property access, provision for pedestrians and intersection spacing. They carry different amounts of traffic at different speeds, as depicted in Figure 9. Access streets carry small amounts of traffic at low speed and primarily provide access to properties. Conversely, arterial roads carry large amounts of traffic at high speed and are the primary corridor for travel between different parts of the City. Collector streets connect the access streets to the arterial road network and provide a range of access and movement functions at moderate speeds.

Figure 9: Road hierarchy categories across traffic volume and speed ranges



Arterial roads predominantly serve longer distance travel within a district and through traffic from one district to another, and form the principal avenues of communication for metropolitan scale traffic movements. Traffic capacity is a function of the design of the road rather than being constrained by environmental objectives.

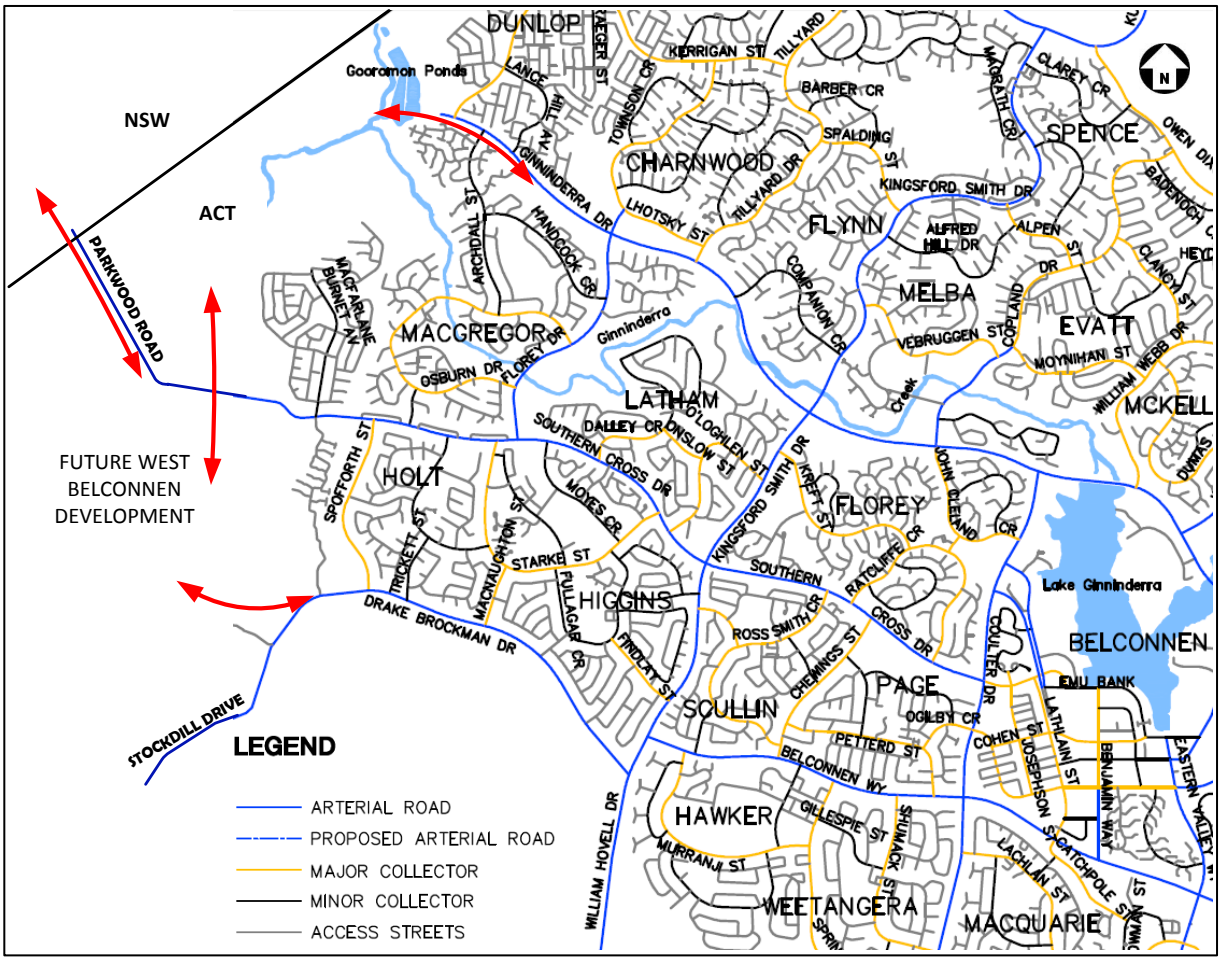
Major collector roads collect and distribute traffic within residential, industrial and commercial areas. The volume of traffic carried is constrained by environmental objectives – safety and traffic noise - rather than road geometry and reflects the limited area that they serve. Direct property access is still permissible but the level of traffic (desirably not greater than 6000 vpd) may dictate that access and egress arrangements should be such that vehicles can exit properties in a forward direction.

Minor collector roads collect and distribute traffic from access streets, linking to the major collector roads within the neighbourhood. They can also provide secondary connections direct to the external arterial road network. Traffic volumes (up to 3000 vpd) are compatible with direct property access.

The current road hierarchy in the area, as defined by TAMS, is shown in Figure 10. It shows the high importance of Ginninderra Drive, Southern Cross Drive, Drake Brockman Drive, Stockdill Drive and Florey Drive in the road hierarchy. They are all categorised as arterial roads. Macnaughton Street, Starke Street and Spofforth Street are defined as major collectors.

The key roads that will serve the proposed development are Southern Cross Drive, Drake Brockman Drive and Ginninderra Drive. William Hovell Drive and Florey Drive are also important.

Figure 10: Existing road hierarchy



Source: TAMS 2013

3.2 Major Traffic Generators

The major traffic generators in the vicinity of West Belconnen are Kippax (Holt) Group Centre, Charnwood Group Centre and Belconnen Town Centre, as shown in Figure 1. The location of other important generators in the local area including schools, district playing fields and a district park are shown in Figure 11.

The primary attractor to West Belconnen will be the Kippax Centre. It has a range of supermarkets, medical facilities, clubs, churches, restaurants and other personal attractions. The Kingsford Smith School on Starke Street in Holt will also be a key attractor in the early phases of West Belconnen's development, prior to the establishment of local schools there.

The Kippax Centre will experience growth as a result of the West Belconnen development. A recent study by Urbis (2014) indicates that an additional 500 retail jobs will be created in Kippax as a result of the West Belconnen development. The current Centre has about 8,300 m^2 of retail/commercial floorspace. Urbis (2014) predicts that West Belconnen residents will contribute to the expansion of Kippax to include:

- An additional supermarket
- Discount department store

- Additional specialty retail floorspace

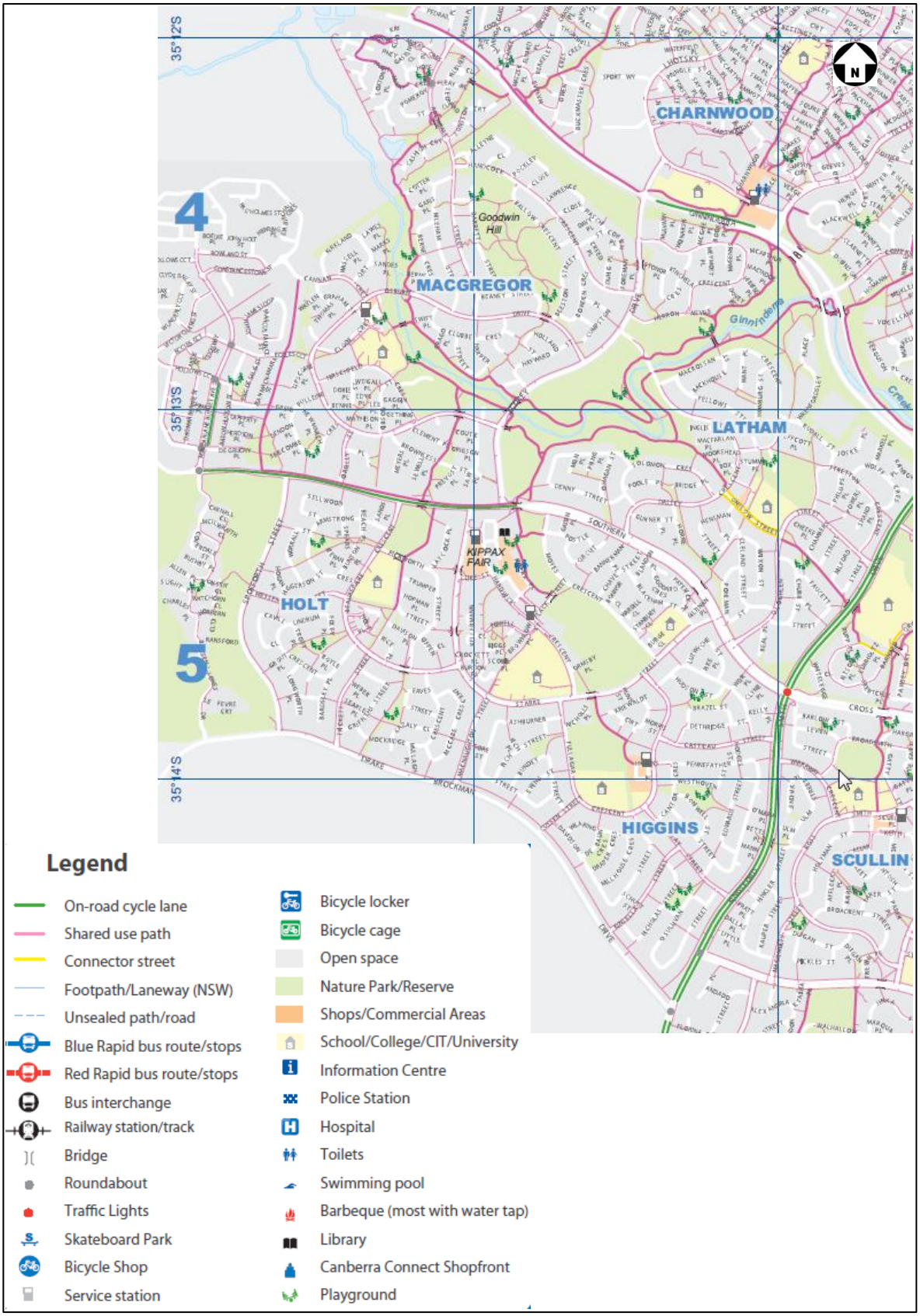
This could add around 13,300 m^2 of additional retail/commercial floorspace to the Kippax Centre, which is incorporated in the CSTM land-use assumptions.

Figure 11: Major traffic generators in the local area

3.3 Pedestrian and Bicycle Infrastructure

The existing pedestrian and cycle infrastructure in the local area is illustrated in the map in Figure 12. It shows a very well developed off-road (shared path) network. There are limited cycle lane facilities; the main ones being on Kingsford Smith Drive and parts of Southern Cross Drive.

Figure 12: Major pedestrian and bicycle infrastructure in the local area

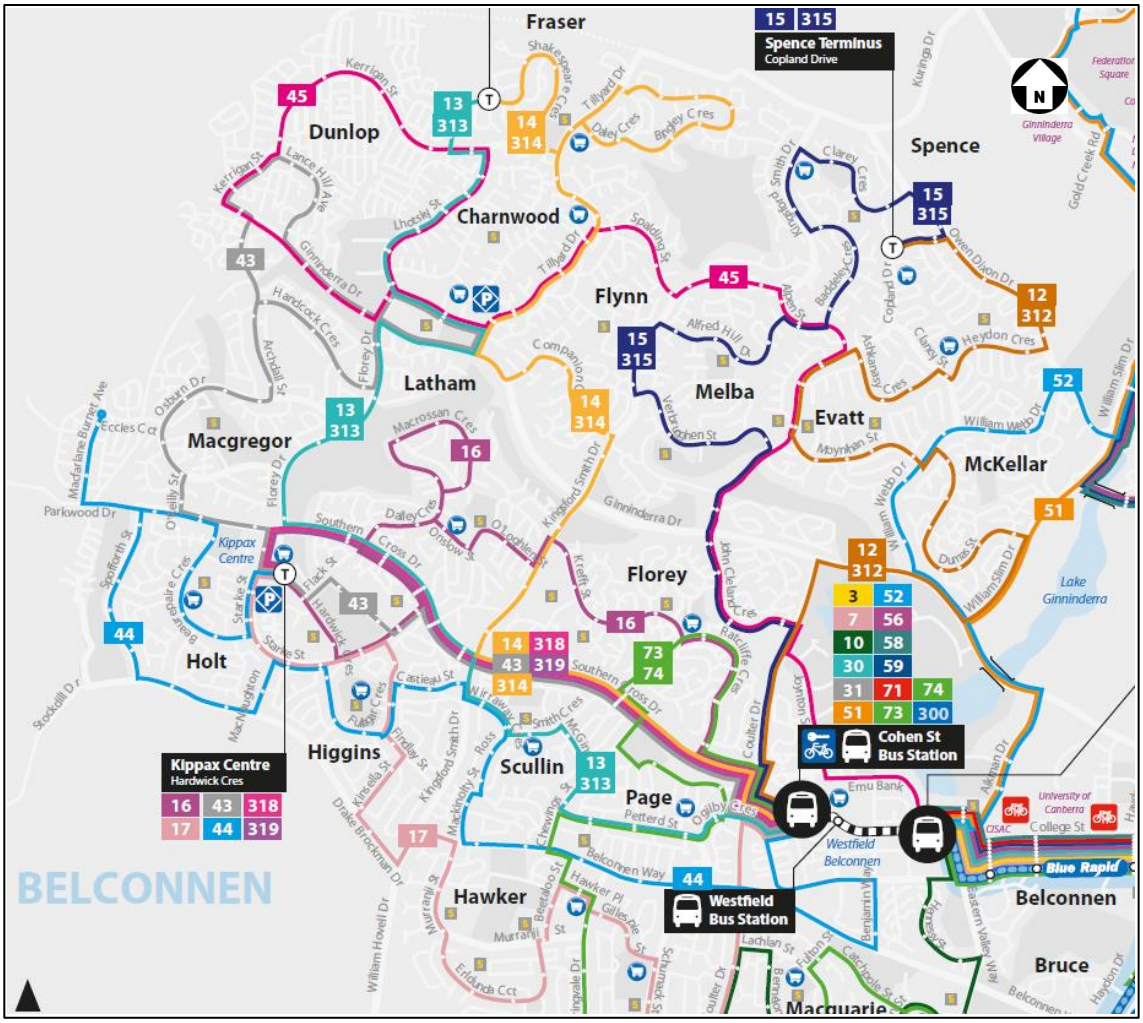


Source: TAMS (2014)

3.4 Public Transport Services

The weekday bus routes that operate in the local area are shown in Figure 13. The primary routes serving commuter travel are the Blue Rapid services (routes 318 and 319) that travel from Kippax Centre to Belconnen Town Centre via Southern Cross Drive, and continue to City and further destinations at 15 minute intervals on weekdays. Route 313 from Fraser also provides a high frequency service to the area via Florey Drive and Southern Cross Drive to Belconnen Town Centre and City.

Figure 13: Weekday bus routes



Source: ACTION (2014)

There are also two Xpresso services that provide relatively direct bus services from the area to City and the National Triangle. Route 703 travels from Fraser via Dunlop and Macgregor, via O'Reilly Street, Southern Cross Drive, Kingsford Smith Drive and Belconnen Way to City. Route 704 travels from Kippax Centre via Holt, Higgins and other South Belconnen suburbs to City via Barry Drive.

In addition, there are a number of local bus services that connect via Kippax Centre to Belconnen Town Centre via indirect suburban paths. These routes are low frequency; generally providing hourly services during the day with minor improvements in frequency during peak periods.

Southern Cross Drive is an important bus route, providing a number of connections between the Kippax Group Centre and Belconnen Town Centre. Bus stops are being upgraded and queue jump facilities are being provided at the intersection of Kingsford Smith Drive.

3.5 Roads and Traffic Conditions

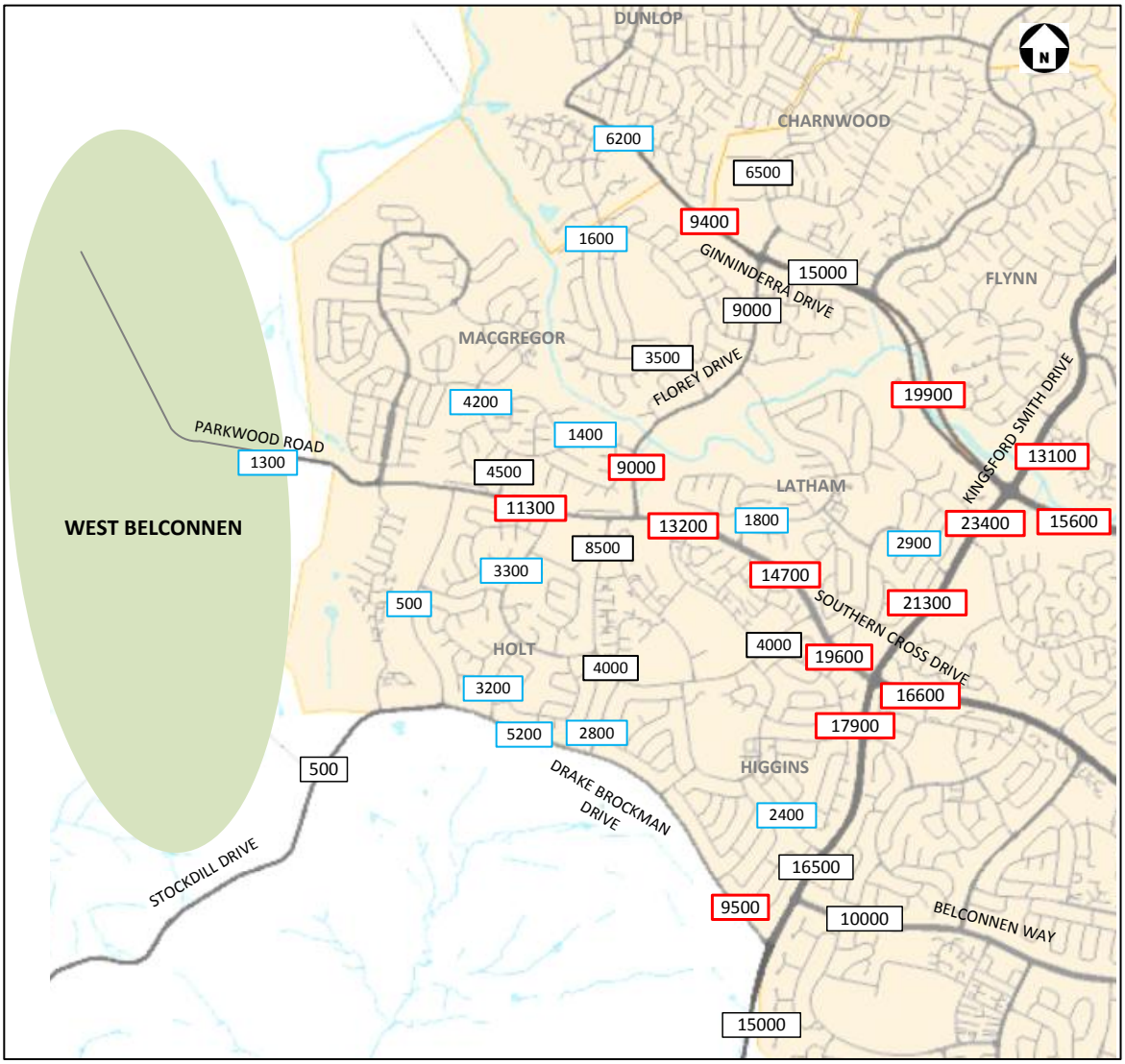
3.5.1 Traffic Data

Information on existing road conditions was obtained from a number of sources, including traffic surveys, site inspections and technical analysis of traffic data. There are three primary sets of quantitative data that are summarised in the following figures and tables:

- Daily traffic flows (Figure 14)
- Recorded traffic crashes in five year period 2009 to 2013 (Figure 15)
- AM and PM Peak hour intersection performance at major intersections in the area (Table 5 to Table 7)

A discussion of these results is included in a street by street assessment that follows the presentation of traffic data.

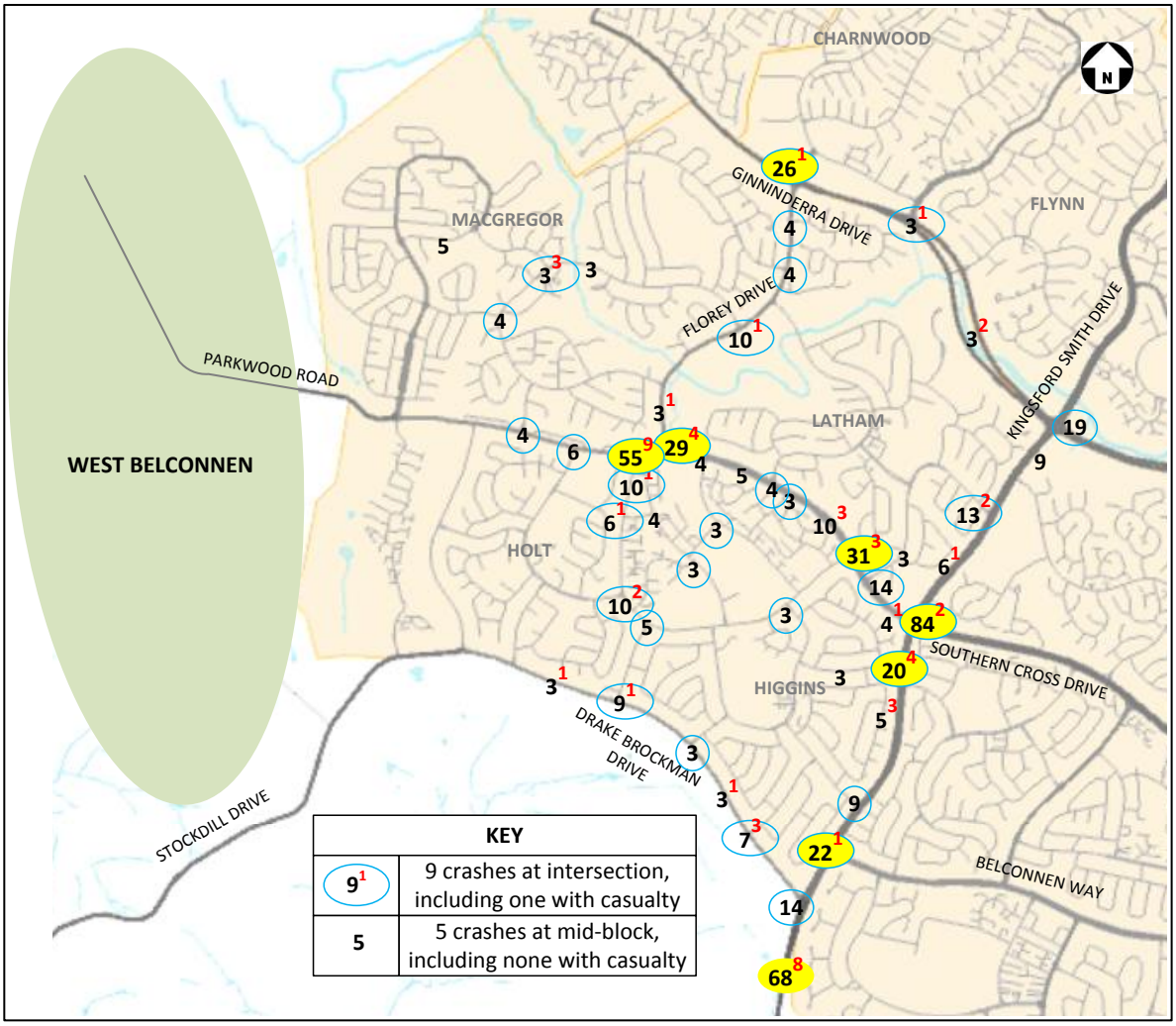
Figure 14: Daily traffic flows



Source: Sites shown with a red box based on recent 24/7 tube counts or SCATS counts; whilst others are derived from previous TAMS tube counts (shown in blue boxes) or derived from previous peak hour count data. The factoring of peak counts was based on some calculations of peak to daily traffic flows provided in Appendix A.

Note: There is a significant amount of additional data available for key intersections and local streets in the study area and these are being used in calibrating a base traffic model for the area and providing network performance data.

Figure 15: Recorded crashes in five year period 2009 to 2013



Note: Based on analysis of data for the suburbs of Holt, Higgins, Latham and Macgregor. This may result in some under-estimation of crashes at sites on Ginninderra Drive and Kingsford Smith Drive. Locations highlighted in yellow show relatively high crash occurrence.

Table 5: 2013 AM peak hour intersection delays and level of service

Intersection	Int. Ave Delay (s)	Int. LoS	Worst Approach
Kingsford Smith Drive-Southern Cross Drive	45.0	D	Southern Cross Drive WB – LoS E (58.8s)
Kingsford Smith Drive-Ginninderra Drive	41.6	C	Ginninderra Drive WB – LoS D (54.0s)
Southern Cross Drive-Florey Drive	23.5	B	Southern Cross Drive EB – LoS B (25.0s)
Drake Brockman Drive-William Hovell Drive-Kingsford Smith Drive	15.2	B	William Hovell Drive NB – LoS B (20.8s)
Belconnen Way-Kingsford Smith Drive	28.2	B	Kingsford Smith Drive SB – LoS C (34.3s)

Source: AECOM based on Commuter micro-simulation modelling, 2013 (see Chapter 5)

Note: The model was run with five different random seeds and results were averaged and tabulated.

Table 6: 2013 PM peak hour intersection delays and level of service

Intersection	Int. Ave Delay (s)	Int. LoS	Worst Approach
Kingsford Smith Drive-Southern Cross Drive	46.0	D	Southern Cross Drive EB – LoS D (50.4s)
Kingsford Smith Drive-Ginninderra Drive	26.1	B	Ginninderra Drive EB – LoS C (32.0s)
Southern Cross Drive-Florey Drive	23.7	B	Florey Drive – LoS C (40.0s)
Drake Brockman Drive-William Hovell Drive-Kingsford Smith Drive	22.2	B	William Hovell Drive NB – LoS B (25.7s)
Belconnen Way-Kingsford Smith Drive	18.7	B	Kingsford Smith Drive SB – LoS B (19.7s)

Source: AECOM based on Commuter modelling, 2013

Note: The model was run with five different random seeds and results were averaged and tabulated.

Note that the Level of Service (LoS) is a six-point scale (A to F) measuring the extent of delay, as shown in Table 7.

Table 7: Level of service indication and description

Level of Service (LoS)	Average delay per vehicle (sec/veh)	Description
A	< 14	Good operation
B	15-28	Good with acceptable delay
C	29-42	Satisfactory
D	43-56	Operating near capacity
E	57-70	At capacity; at signals, incidents will cause excessive delays
F	> 70	Extra capacity required

3.5.2 Stockdill Drive

Stockdill Drive is a relatively low standard 2-lane 2-way rural road with a speed limit of 60 km/h. It has a 6.6m pavement and a grassed shoulder. It currently serves the Belconnen golf club and existing residential development via Britten-Jones Drive, the Molonglo Water Quality Control Centre and a number of rural leases. It is not a through road, ending in a cul-de-sac prior to the Molonglo Gorge, at the access to the Molonglo Sewerage Treatment Works.

Stockdill Drive is a B-Double route to service the Molonglo Water Quality Control Centre. The existing road carries only 1,200 veh/day between Spofforth Street and Britten-Jones Drive and less than 500 veh/day west of Britten-Jones Drive. The current design of this road is adequate for its purpose.

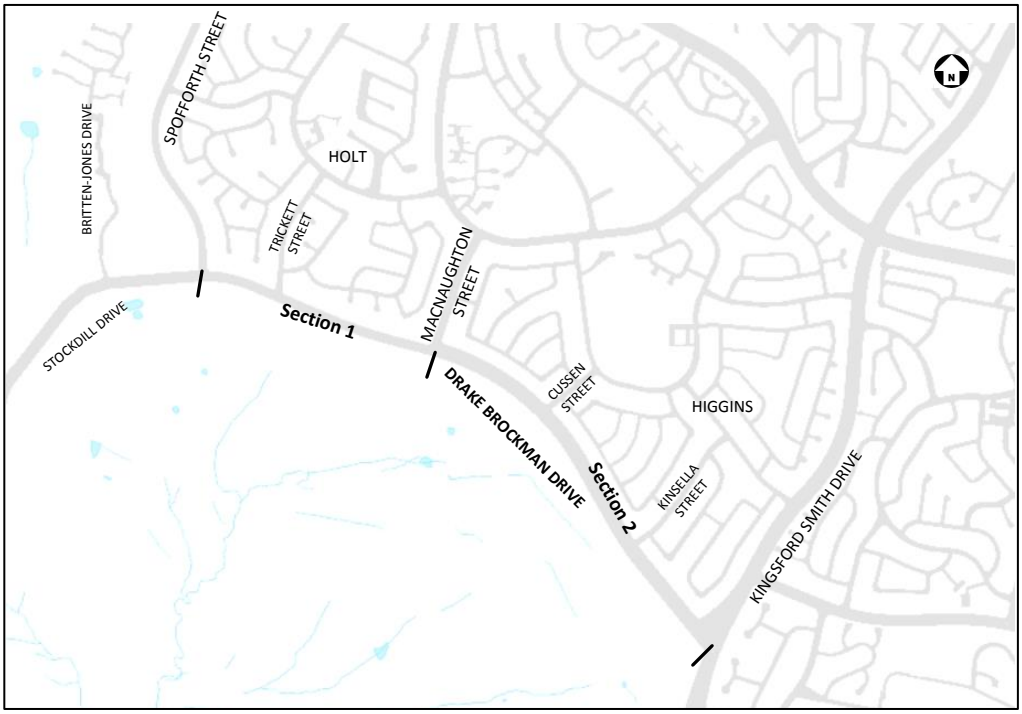
There are no apparent traffic safety problems on Stockdill Drive. Two collisions have occurred in the five year period 2009 to 2013, with one involving injury.

3.5.3 Drake Brockman Drive

Drake Brockman Drive is effectively an extension of Stockdill Drive, running from Spofforth Street in the west to the intersection of Kingsford Smith Drive and William Hovell Drive in the east. It is a 2-lane 2-way road and is classified as an arterial road (see Figure 10), but it varies in nature along its length.

It has two distinct sections either side of Macnaughton Street. These are shown in Figure 16.

Figure 16: Drake Brockman Drive sections



Section 1: West of Macnaughton Street

West of Macnaughton Street the posted speed limit is 60 km/h and there are direct driveway accesses to residential properties on the northern side of the road, whilst the southern side is rural land.

Current traffic flows in this section of vary from about 1,800 veh/day west of Trickett Street to 5,200 veh/day between Trickett Street and Macnaughton Street. The disparity in flows along here is partly due to the implementation of speed cushions on Spofforth Street and a diversion of traffic to other local streets in the area. The flows between Trickett Street and Macnaughton Street make driveway access for houses along here relatively difficult during peak periods.

Section 2: East of Macnaughton Street

East of Macnaughton Street the speed limit increases to 80 km/h, as there are no driveway accesses to residential properties. In this section of road the rear boundaries of homes are set back over 30 m from the northern side of the road. The southern side is primarily rural land.

Traffic flows east of Macnaughton Street vary from about 6,500 veh/day west of Cussen Street to 9,500 veh/day west of Kingsford Smith Drive. The peak directional flow on this section of road in the AM peak hour is about 800 veh/h, which is well below the capacity of this road.

The intersection at William Hovell Drive is the main constraint along here. It is currently operating satisfactorily in both peak periods, with average vehicle delays less than 25 seconds and an intersection level of service of B.

An analysis of recent crash data did not identify any locations with high crash incidence. A total of 42 collisions occurred in the five year period, with six of them involving injury. There were 34 crashes at intersections, with the majority of these (14) occurring at the intersection with Kingsford Smith Drive and William Hovell Drive. Most of the crashes involved property damage only (30) and rear-end collisions (23). Of the four crashes involving injury, there was one head-on near the intersection of Macnaughton Street and three other collisions at the intersection with Kinsella Street.

3.5.4 Parkwood Road

Parkwood Road is an arterial road with mostly rural frontages. It is a 2-lane 2-way rural road with a speed limit of 60 km/h. It has an 8.2m pavement and a grassed shoulder. There are occasional driveways to commercial developments. The alignment varies and the road has a relatively tight bend west of its intersection with Britten Jones Drive.

Parkwood Road currently serves existing residential development via Britten-Jones Drive and Macfarlane Burnet Avenue, an electricity sub-station, Parkwood Eggs, landscape centres, animal shelters, various industrial uses and a number of rural leases. It is not a through road beyond its roundabout intersection at Britten-Jones Drive and Macfarlane Burnet Avenue. It continues as a paved road across the NSW border, but then reverts to a gravel road prior to a cul-de-sac before the Molonglo Gorge, with accesses to NSW rural properties.

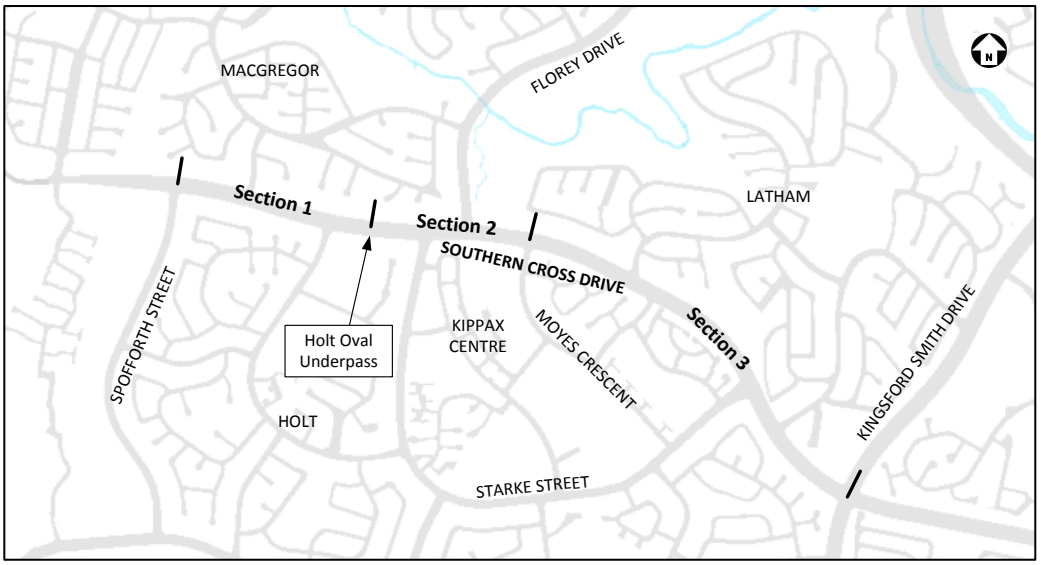
The existing road carries only 4,000 veh/day between Spofforth Street and Britten-Jones Drive and less than 1,500 veh/day west of Britten-Jones Drive. The current design of this road is adequate for its purpose.

There are no apparent traffic safety problems on Parkwood Road. Only one collision was recorded on Parkwood Road in the ACT in the five year period 2008 to 2013, not involving injury.

3.5.5 Southern Cross Drive

Southern Cross Drive is an arterial road with a 60 km/h speed limit. It varies in nature along its length. It has three distinct sections, as shown in Figure 17.

Figure 17: Southern Cross Drive sections



Section 1: Spofforth Street to Holt Oval Underpass

Between Spofforth Street and Florey Drive it is a 2-lane 2-way road with direct driveway accesses to residential properties on the southern side and provision for on-street parking, whilst houses on the northern side are accessed via service roads. The existing road pavement is relatively wide (12.4 m), allowing flexibility for on-road cycling and turn bays. Houses on the northern side are accessed via service roads.

Traffic volumes using Southern Cross Drive build up from west to east. At the western end (near Spofforth Street) volumes are about 6,200 veh/day, building to 11,300 veh/day west of Beaurepaire Crescent. The peak directional flow in the AM peak is about 660 veh/h between O'Reilly Street and Beaurepaire Crescent, which is about 63% of the theoretical capacity of this section of road. The flows along here make driveway access for houses on the southern side of the road relatively difficult during peak periods.

There were 257 crashes recorded between Spofforth Street and Kingsford Smith Drive in the five year period; the majority (224 crashes) were at intersections. This included three fatalities and 21 injury crashes. There were 10 recorded intersection crashes along this section of road.

Section 2: Holt Oval Underpass to Moyes Crescent

This section of road is somewhat similar in physical nature to Section 1. That is, it is a 2-lane 2-way road with direct driveway accesses to residential properties on the southern side, whilst houses on the northern side are accessed via service roads.

The main differentiator of this section of road is the increased traffic and pedestrian activity in the vicinity of the Kippax Centre. A new set of traffic signals have recently been installed at the intersection with Florey Drive, adjacent to the Kippax Group Centre. There have also been some improvements to the nearby intersection of Starke Street West.

Traffic volumes along this section of road vary from about 11,500 veh/day near the Holt Oval underpass to 13,200 veh/day east of Florey Drive.

A relatively large number of crashes have occurred at intersections along this section of road. The majority of crashes occurred at the western intersection adjacent to Kippax – 55 crashes with 9 involving injury. There has been some minor safety improvements (channelisation) implemented at this latter intersection recently. Two of the fatalities recorded along Southern Cross Drive between 2009 and 2013 occurred at the intersection with Florey Drive, which has since been signalised.

The signalised intersection with Florey Drive is currently operating satisfactorily in both peak periods, with average vehicle delays less than 25 seconds and an intersection level of service of B. It has significant spare capacity.

Section 3: Moyes Crescent to Kingsford Smith Drive

The road widens to a 4-lane divided carriageway to the east of Moyes Crescent, but the speed limit remains at 60 km/h. There are driveway accesses to local residential properties on northern side of the road, but properties are set-back a long distance from the road.

Existing traffic volumes are about 14,000 veh/day east of Moyes Crescent and they build to about 19,600 veh/day west of Kingsford Smith Drive. The peak directional flow in the AM peak is about 1,050 veh/h, which is well within the capacity for two lanes of traffic, but the real constraint is the signalised intersection at Kingsford Smith Drive.

A total of 155 crashes were recorded in this section of road. The highest incidence of crashes occurred at the signalised intersection with Kingsford Smith Drive. A total of 84 collisions occurred here, with two involving injury. The intersection of Starke Street (East) also had a high incidence of crashes – 31 crashes with 3 involving injury.

There was one fatal crash that occurred in this section of road between 2009 and 2013. It was a single vehicle run off road crash between O'Loghlen Street and Kingsford Smith Drive.

The signalised intersection with Kingsford Smith Drive is currently operating near capacity in both peak periods, with average vehicle delays of about 45 seconds and an intersection level of service of D. There is a proposal here for bus queue jump lanes on Southern Cross Drive. These have been designed to minimise delays to general traffic, to ensure that the intersection continues to operate below capacity.

3.5.6 Ginninderra Drive

Ginninderra Drive is an arterial road with a 2-lane 2-way road cross-section between Kerrigan Street and Tillyard Drive. It widens to a 4-lane divided road just west of Tillyard Drive. The speed limit varies from 60 km/h at its western end to 80 km/h east of Lance Hill Avenue.

The road has a very wide reserve and has limited access. Residential areas adjoin the road, but are well set back and have the rear of properties facing the road. The road widens at its intersections with Florey Drive and Tillyard Drive. A two-lane roundabout at Florey Drive has significant spare capacity.

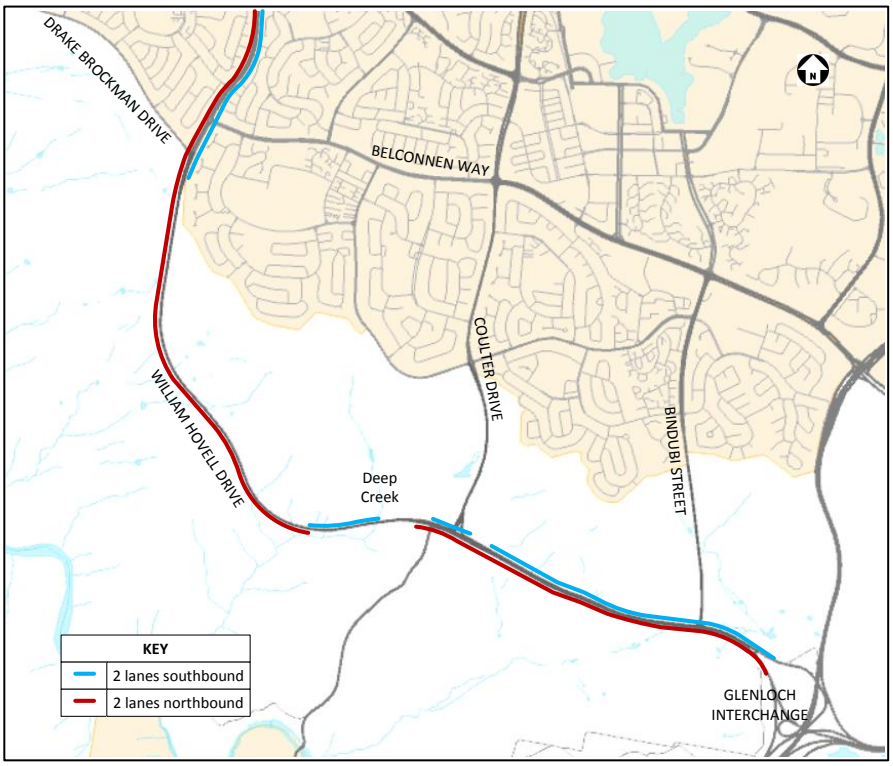
Traffic volumes along Ginninderra Drive build up from west to east. At the western end (near Kerrigan Street) volumes are about 4,500 veh/day, building to 9,400 veh/day east of Lance Hill Avenue and 15,000 veh/day east of Florey Drive. It is busiest between Companion Crescent and Kingsford Smith Drive, where existing traffic volumes are 19,900 veh/day. Ginninderra Drive and intersections along it currently have significant spare capacity.

3.5.7 William Hovell Drive

William Hovell Drive is a busy arterial road with three traffic lanes for most of its length between Drake Brockman Drive and Coppins Crossing. The speed limit is generally 90 km/h and there is no median barrier between the opposing lanes. The paved carriageway is about 15 m wide, so there is potential to utilise some of this pavement for future widening if the speed limit is reduced.

Southbound it merges from two lanes to one lane about 250 m south of Drake Brockman Drive and remains as one lane until widening to two lanes in a short 600 m section just west of Coppins Crossing. Northbound it is two lanes for most of its length, other than a 1 km section west of Coppins Crossing. This is illustrated in Figure 18.

Figure 18: Two lane sections on William Hovell Drive



The road currently carries about 15,000 veh/day between Drake Brockman Drive and Coppins Crossing. The single lane southbound currently carries about 1,400 veh/h in the AM peak. This equates to about 74% of the theoretical capacity of this road, so it still has some spare capacity in peak periods. The real constraint is downstream signalised intersections at Coulter Drive and Bindubi Street.

The two lane section west of Coppins Crossing is largely due to the need to provide a climbing lane. The terrain is quite steep, which would make widening the road relatively difficult and costly.

There were 297 recorded crashes along William Hovell Drive between Drake Brockman Drive and Coulter Drive in the 10 year period 2004 to 2013, including intersection crashes. Table 8 provides a breakdown of these crashes by general location and severity of crash. It highlights a relatively high number of serious crashes at mid-block locations, including one fatality. Only four of these crashes involved vehicles travelling in opposing directions and 66 (49%) involved only one vehicle.

Table 8: Recorded crashes on William Hovell Drive between Drake Brockman Drive and Coulter Drive – 2004 to 2013

Location	Property Damage	Injury	Fatality	Total
Drake Brockman intersection	37	1	0	38
Coppins Crossing intersection	53	7	0	60
Coulter Drive intersection	60	3	0	63
Mid-block	119	16	1	136
Total	**269**	**27**	**1**	**297**

Source: TAMS (2014)

The high volume of vehicles at high speeds on an undivided road through relatively steep terrain presents major concerns for safety along this section of road. The high number of crashes and the incidence of serious crashes points to the pressing need for a review of safety and the identification of potential improvements. One possible measure is to reduce the speed limit to 80 km/h (currently 90 km/h) and introduce speed cameras. Other measures include lighting and median barriers. The latter would involve some minor widening.

3.5.8 Florey Drive

Florey Drive is a two-lane two-way road with a 60 km/h speed limit. It has residential development and driveway access adjacent to the northbound lane. There are no driveway accesses and mostly open space adjacent to the southbound lane. It varies in width from about 12.2 to 12.8 m and includes cycle lanes in each direction.

Florey Drive is currently carrying about 9,000 veh/day. The flows along here make driveway access for houses on the western side of the road relatively difficult during peak periods.

There have been 77 crashes along Florey Drive in the period 2009 to 2013. The majority of these (71%) occurred at the primary intersections with Southern Cross Drive and Ginninderra Drive.

3.5.9 Kingsford Smith Drive

Kingsford Smith Drive is a dual carriageway road with two lanes in each direction and has an 80 km/h speed limit. The road has controlled intersection accesses and largely the rear property boundaries of residential uses adjoin the road.

Existing traffic volumes along Kingsford Smith Drive vary from about 16,500 veh/day north of Belconnen Drive to 23,400 veh/day south of Ginninderra Drive. Kingsford Smith Drive and intersections along it currently have adequate spare capacity.

3.5.10 Spofforth Street

The posted speed limit along Spofforth Street is 50 km/h and there are direct driveway accesses to residential properties on the eastern side of the street, whilst the western side is Belconnen Golf Course.

Current traffic flows are very light on Spofforth Street (about 500 veh/day), having been significantly reduced as a result of the introduction of speed cushions in December 2011 (by about 600 veh/day from 1,100 veh/day).

There have been only two recorded crashes on Spofforth Street in the five year period, one involving injury. Both crashes occurred at mid-block locations.

3.5.11 Other streets

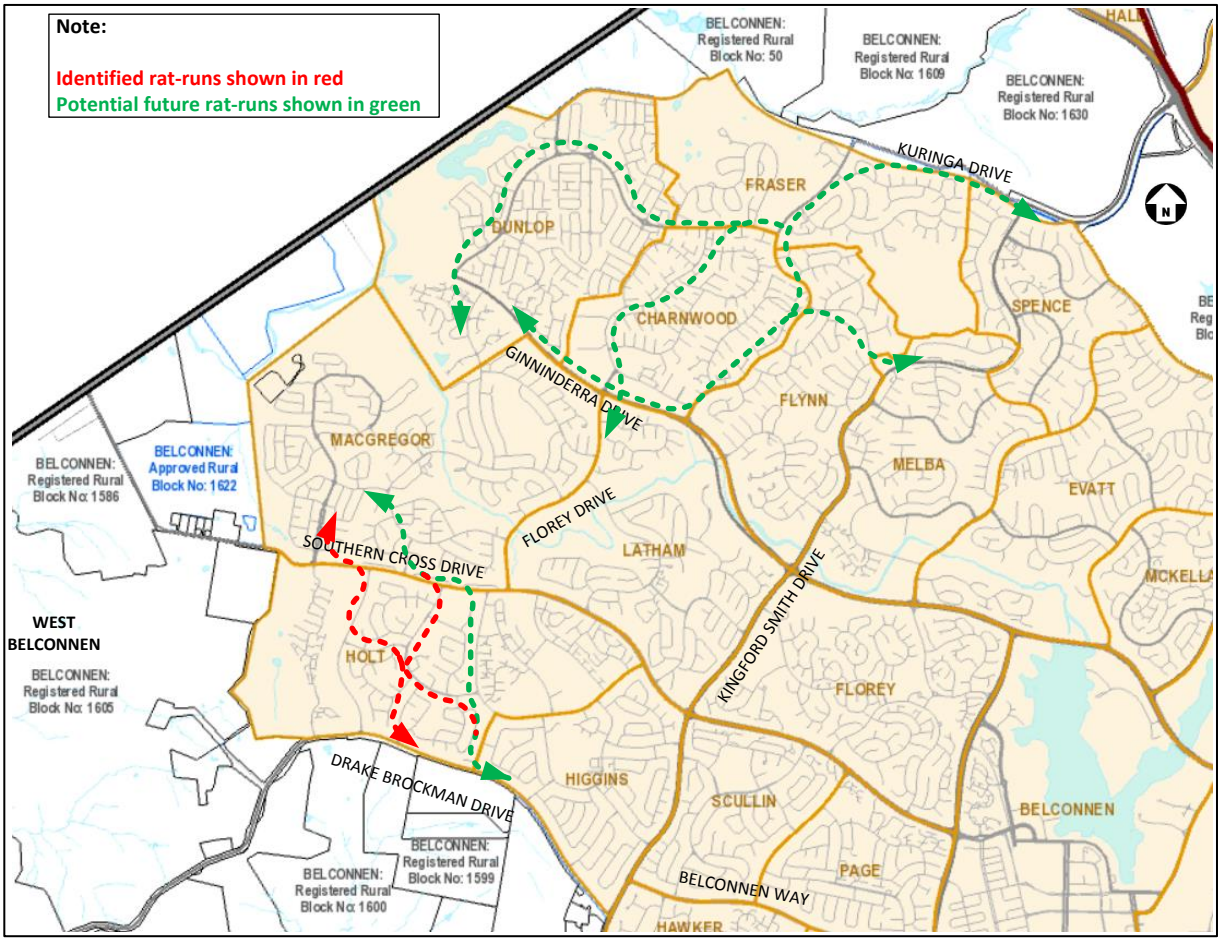
There are a number of other local streets in the study area that could be impacted by the development, particularly collector roads. These generally have direct access and residential frontages, although some sections of major collectors are limited access. Most local streets are signed as 50km/h, excepting major collectors signed as 60 km/h.

3.6 Local Area Traffic Management

There are a number of existing ‘rat running’ issues on local streets in the area, with most concern being raised in Holt. Much of the existing problems in Holt are associated with the new suburb of West Macgregor where development commenced in 2008 and consists of approximately 1,000 dwellings. Since its establishment localised and commuter traffic has been on the rise creating a number of ‘rat running ‘routes through the suburb of Holt as illustrated in Figure 19. There have also been some previous concerns regarding ‘rat running through Charnwood as a result of development in Dunlop. This is also illustrated in Figure 19.

The implementation of LATM works seems to have been quite successful in Dunlop and Charnwood, but there are concerns with those implemented in Holt. Whilst the measures implemented in Holt have been successful in reducing speeds and shifting traffic off Spofforth Street, residents indicate that the problem has just been shifted to other streets.

Figure 19: Map showing potential rat-runs in local suburbs



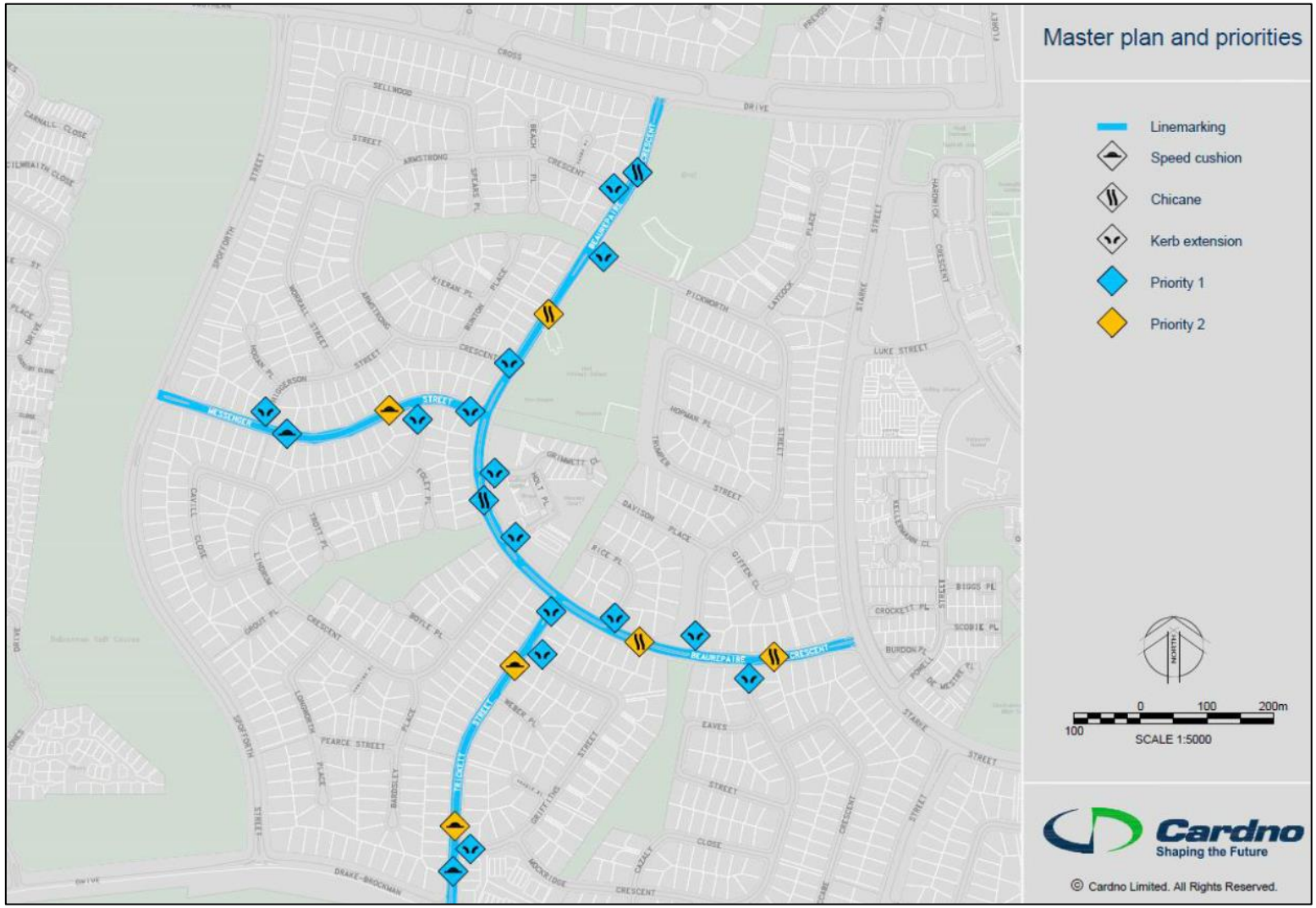
Earlier studies for TAMS showed that 15% of motorists on Spofforth Street travelled at 76 km/h or more in a 50 km/h zone. It was recommended that rubber speed cushions be installed on Spofforth Street at a maximum spacing of 100 metres to reduce travelling speeds and minimise its use as a short cut for traffic from West Macgregor.

Following the installation of speed cushions on Spofforth Street, Holt a post implementation evaluation study was completed in July 2012 to gauge the effectiveness of these traffic control devices. The study found that while the installation of speed cushions had been successful in the objective of reducing speed it also identified that a relatively large volume of traffic was being diverted onto other local side streets (about 600 veh/day); in particular Beaurepaire Crescent, Messenger Street and Trickett Street. In addition, the community also expressed concerns about excessive traffic speeds, irresponsible driver behaviour and road safety on these streets.

Cardno was subsequently commissioned by TaMSD to identify LATM measures needed on these streets. Cardno's recommendations are summarised in Figure 20. The Priority 1 works have recently been installed.

The West Belconnen project has the potential to impose further pressure on the local streets of Holt, Dunlop and Charnwood as larger volumes of traffic move through the area. There are a number of other local streets in the study area that could be impacted by the development, particularly collector roads. These generally have direct access and residential frontages, although some sections of major collectors are limited access. Most local streets are signed as 50km/h, excepting major collectors signed as 60 km/h.

Figure 20: Recommended LATM works in Holt



Source: Cardno (2013)

4.0 Travel Demand Forecasts from CSTM

Car and public transport demand forecasts from the Canberra Strategic Transport model (CSTM) are the primary focus of this Chapter. CSTM is a four step travel demand model that models AM peak hour transport movements in Canberra and Queanbeyan. It is maintained by ACT Government (ESDD) and in this project it has been modified by AECOM to incorporate the West Belconnen development. The model provides forecasts of traffic flows, public transport passenger movements and bicycle movements in the AM peak hour. It has recently been calibrated for ESDD by SMEC (2014) and it was further refined by AECOM for use in West Belconnen.

The model has been developed to provide forecasts for three time horizons – 2021, 2031 and 2041. The latter represents the ultimate development of West Belconnen, assuming that it grows quicker than normal post-2031 and is fully developed about 15 years earlier than expected.

In this project, the CSTM is used to produce:

1) A base year vehicle trip matrix for use in the development of a transport micro-simulation model of an existing urban area surrounding West Belconnen (see Figure 8). This went through a very detailed calibration process using peak hour traffic counts, as discussed in Section 5.1.

2) Estimates of growth in vehicular demand to enable the expansion of the calibrated base year micro-simulation model to forecast 2021, 2031 and 2041 AM and PM peak traffic conditions on roads in the modelled sub-area (Figure 8). This allowed more detailed and accurate modelling of the modelled area, for which results are provided in Chapter 6. Live models for each year are also available, to allow a visual understanding of roads and traffic in the area modelled.

3) AM peak hour public transport passenger flows on existing and proposed public transport routes in Belconnen. This assisted in planning the routes and likely numbers of buses to service West Belconnen. It also provided guidance as to potential locations for future bus priority facilities.

4) AM peak hour traffic flows on roads in the whole Belconnen District and surrounds. This provided preliminary traffic data to determine potential road upgrades needed to service West Belconnen, including data beyond the area modelled in the micro-simulation model. It also provides guidance as to what roads will be impacted by the West Belconnen development.

Some results from the CSTM follow, in the form of mode use, public transport passenger and traffic forecasts for 2021, 2031 and 2041.

4.1 Vehicular trip generation

Prior to presenting the results of the CSTM modelling, an overview is given of potential trip generation from West Belconnen and how it may vary with assumed mode split and trip self-containment[1].

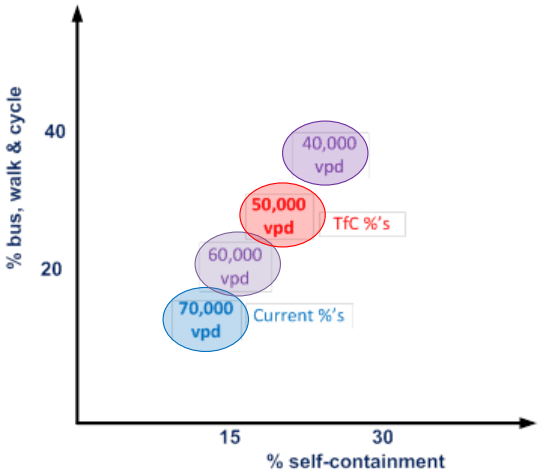
Previous traffic modelling assumed a potential population yield of up to 24,000 people in West Belconnen. However, the latest structure plan may accommodate 30,000 or more people. Previous modelling by SMEC (2013) predicted up to 4,800 veh/h into and out of West Belconnen in the peak hour, based on a 24,000 population scenario. This equates to about 48,000 veh/day.

AECOM have recently undertaken some analyses of potential trip generation using various assumptions for mode use and self-containment, based on populations of 24,000 and 30,000 people in the future West Belconnen development. The results of this for 24,000 population is summarised in Figure 21. It illustrates that there could be a wide variation in potential trip generation, depending on future mode use and self-containment. The SMEC prediction corresponds to a mode use consistent with the Transport for Canberra targets and relatively high self-containment (about 30%). If this is not achieved then trip generation will be higher; up to about 70,000 veh/day using current mode use and a relatively low self-containment of 15%.

The expected traffic volumes, in the range 50,000 to 60,000 veh/day at full development of West Belconnen represent about 4 to 5 traffic lanes in the peak periods. The number of lanes depends on the master plan design and the amount of side streets or parking along major roads entering the development area.

[1] Self-containment is the percent of total trips with both an origin and destination within West Belconnen.

Figure 21: Vehicular trip generation



Note: The blue sphere represents trip generation based on current mode use and the red sphere based on achieving TfC (Transport for Canberra) mode use targets (ACT Government, 2014)

A higher population level will mean more trips, although there may be more higher density development with lower average trip rates. In general terms, a 25% increase in population in West Belconnen may lead to a 20% increase in trips. It could result in a 10,000 to 15,000 veh/day increase in vehicle trips generated from West Belconnen, depending on what mode use is achieved in future. This increase is equivalent to almost one additional traffic lane in the peak periods.

4.2 Mode Use Forecasts

Transport for Canberra (ACT Government 2012) has a 23% target for bus, bike and walk trips for the journey to work by 2016 and 30% by 2026. This incorporates targets of 7% for walking, 7% for cycling and 16% for public transport. In 2011, these mode shares for the journey to work (JTW) are 5% walking, 3% cycling and 7% public transport. That is, bicycle and public transport trips are expected to double over the next 15 years, whilst walk trips would show slightly lesser growth.

Table 9 provides a summary of future mode use targets in accord with the targets indicated in Transport for Canberra, excluding walk trip targets. It includes potential targets for 2041 and the latest JTW mode share, derived by extrapolating a slow growth in sustainable transport mode use beyond the 2026 Transport for Canberra forecast year.

Table 9: Mode use targets

Mode	2011 JTW Mode share	2016 Target Mode Share	2026 Target Mode Share	2031 Target Mode Share^^^	2041 Target Mode Share^^^
Car^	89.6%	83%	75%	72%	66%
Public transport	7.6%	11%	17%	20%	25%
Park and Ride	NA	NA	NA	NA	NA
Bicycle	2.8%	6%	8%	8%	9%
Totals	100.0%	100%	100%	100%	100%

^ excluding external trips and car leg trips for Park and Ride

^^ excluding walking trips in this calculation as their number is unavailable

^^^ derived from Transport for Canberra (2012) targets

JTW – journey to work from 2011 ABS Census

Mode use is an output from the CSTM. A comparison of target and CSTM mode shares is given in Table 10. It shows that the gap between the CSTM results and target mode shares increases over time. The gap is most evident for bicycle use in all years and becomes more evident for public transport use in 2041 (ultimate).

Table 10: Comparison of mode use estimates

Year	Car Mode Share		Public Transport Mode Share		Bicycle Mode Share	
	Target	CSTM	Target	CSTM	Target	CSTM
2011	89.6%	88.2%	7.6%	8.9%	2.8%	3.0%
2021	79.0%	82.7%	14.0%	13.9%	7.0%	3.3%
2031	72.0%	78.4%	20.0%	18.3%	8.0%	3.3%
2041 (ultimate)	66.0%	77.6%	25.0%	19.1%	9.0%	3.3%

Note: Based on whole of Canberra and Queanbeyan estimates

The CSTM mode use forecasts are a function of the parameter values adopted in the model calibration, as well as assumptions such as parking charges, bus frequencies and road improvements that affect relative mode travel times. The parameter values do not vary much between the 2031 and 2041 (ultimate) models, resulting in an increased gap between target and forecast mode use. Also, the modelled estimates of future bicycle use are particularly low, which could be impacted by greater use of new technology that will enable higher speeds by minor modes and therefore greater use of minor modes (eg., electric bikes, electric mobility scooters and other mobility aids).

The 2031 model indicates that about 21.6% of non-walk trips will be made by public transport, bicycle and park and ride modes. The equivalent 2031 target for these modes from Transport for Canberra is about 28% of non-walk trips. Hence, the current 2031 model is about 6% short of the intended mode use targets, so forecast traffic volumes will be higher.

Table 10 shows that for the ultimate scenario (2041) about 22.4% of non-walk trips will be made by public transport, bicycle and park and ride modes. This is slightly higher than 2031 levels. The equivalent 2041 target for these modes from Transport for Canberra is about 34% of non-walk trips. Hence, the current 2041 model is well short of the intended mode use targets.

Forecast mode use estimates for West Belconnen and Canberra as a whole are given in Table 11 to Table 14, for 2011, 2021, 2031 and 2041 (ultimate).

Table 11: 2011 CSTM model mode use estimates

Mode	No. of person trips (Canberra)	No. of person trips (West Belconnen Wider)	No. of person trips (West Belconnen New)	Model Mode share (Canberra)	Model Mode share (West Belconnen Wider)	Model Mode share (West Belconnen New)
Car^	113,694	21,092	-	88.2%	88.4%	-
Public transport	10,646	2,045	-	8.3%	8.6%	-
Park and Ride	759	19	-	0.6%	0.1%	-
Bicycle	3,834	691	-	3.0%	2.9%	-
Total	128,933	23,847	-	100%	100%	-

Note: Excludes walk trips; West Belconnen areas defined in Figure 22

^ excluding external trips and car leg trips for Park and Ride

Table 12: 2021 CSTM model mode use estimates

Mode	No. of person trips (Canberra)	No. of person trips (West Belconnen Wider)	No. of person trips (West Belconnen New)	Model Mode share (Canberra)	Model Mode share (West Belconnen Wider)	Model Mode share (West Belconnen New)
Car^	128,400	17,977	1,623	82.7%	78.1%	85.8%
Public transport	20,873	4,384	206	13.4%	19.1%	10.9%
Park and Ride	766	76	4	0.5%	0.3%	0.2%
Bicycle	5,180	569	59	3.3%	2.5%	3.1%
Total	155,219	23,006	1,893	100%	100%	100%

Note: Excludes walk trips; West Belconnen areas defined in Figure 22
^ excluding external trips and car leg trips for Park and Ride

Table 13: 2031 CSTM model mode use estimates

Mode	No. of person trips (Canberra)	No. of person trips (West Belconnen Wider)	No. of person trips (West Belconnen New)	Model Mode share (Canberra)	Model Mode share (West Belconnen Wider)	Model Mode share (West Belconnen New)
Car^	138,685	17,814	3,393	78.4%	70.3%	73.9%
Public transport	31,485	6,894	1,050	17.8%	27.2%	22.9%
Park and Ride	802	60	12	0.5%	0.2%	0.3%
Bicycle	5,879	584	137	3.3%	2.3%	3.0%
Total	176,851	25,352	4,591	100%	100%	100%

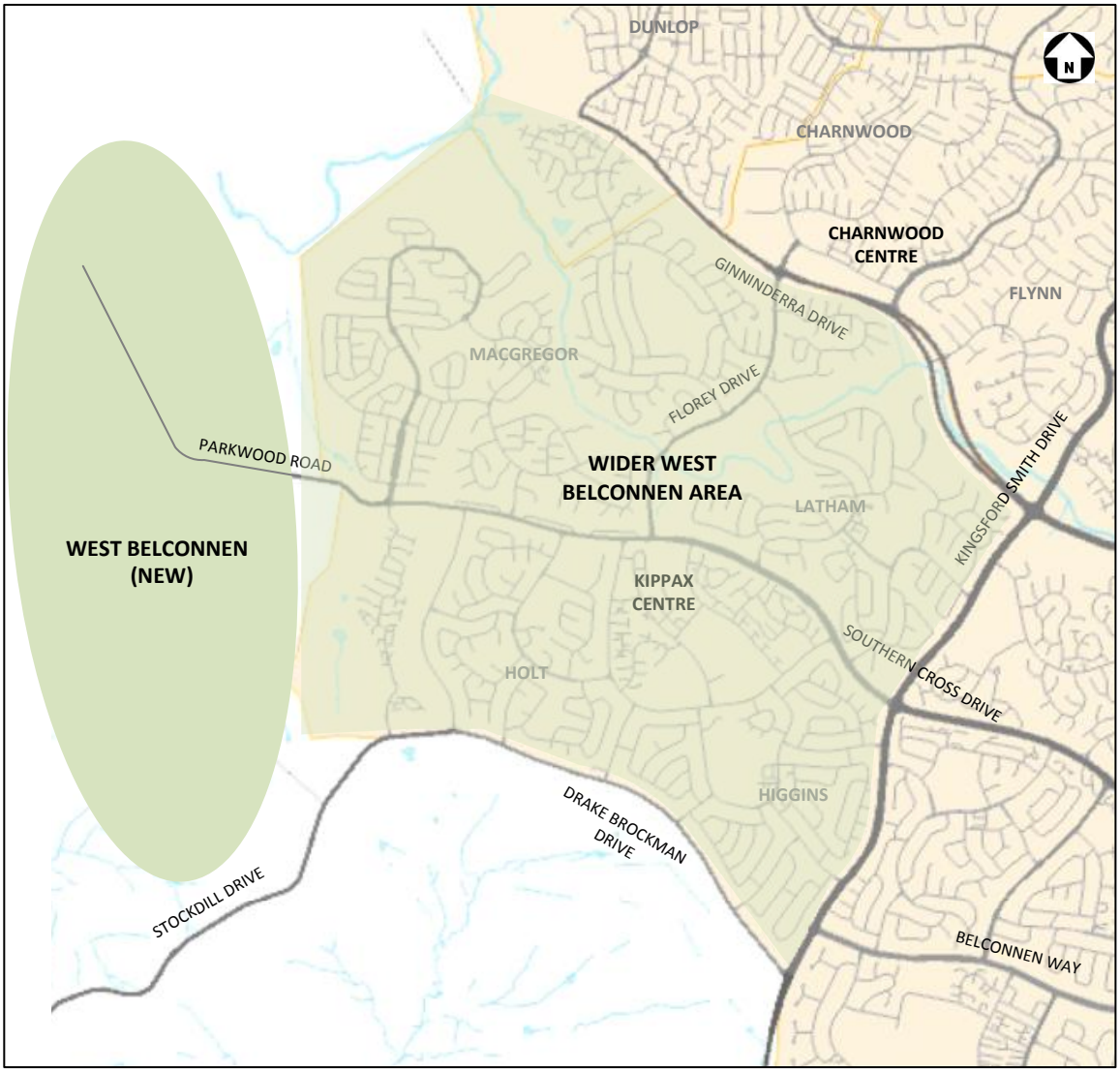
Note: Excludes walk trips; West Belconnen areas defined in Figure 22
^ excluding external trips and car leg trips for Park and Ride

Table 14: 2041 CSTM model mode use estimates

Mode	No. of person trips (Canberra)	No. of person trips (West Belconnen Wider)	No. of person trips (West Belconnen New)	Model Mode share (Canberra)	Model Mode share (West Belconnen Wider)	Model Mode share (West Belconnen New)
Car^	150,952	21,903	8,383	77.6%	69.3%	73.6%
Public transport	36,339	8,881	2,588	18.7%	28.1%	22.7%
Park and Ride	811	58	15	0.4%	0.2%	0.1%
Bicycle	6,431	784	397	3.3%	2.5%	3.5%
Total	194,534	31,627	11,383	100%	100%	100%

Note: Excludes walk trips; West Belconnen areas defined in Figure 22
^ excluding external trips and car leg trips for Park and Ride

Figure 22: West Belconnen areas used to define mode share



Note: The area shaded light green represents the West Belconnen Wider area used in Table 11 to Table 14, whilst the darker green oval represents West Belconnen New.

Table 11 to Table 14 show mode use estimates for West Belconnen as well as ACT as a whole; for existing West Belconnen suburbs and the future development area (see definition of areas in Figure 22). In 2021, this shows that public transport and bicycle use for West Belconnen will be lower than the average Canberra suburb and thus car usage will remain relatively high, but about 3% less than current levels. More noticeable changes in public transport use for West Belconnen are evident in the 2031 forecasts, with a 15 to 18% drop in car usage in West Belconnen from 2011 levels; a 3.6% higher drop in car usage in existing suburbs than newly created ones.

By 2041 (ultimate), public transport use in West Belconnen is forecast to be higher than the average Canberra suburb – 23% in the new development area, 28% in existing West Belconnen suburbs and 19% in the average Canberra suburb. The high public transport usage can be attributed to proximity to the Kippax public transport hub and proposed relatively high frequency high speed bus services between Kippax, Belconnen and City, as well as proposed frequent XPresso services to City and Parliamentary Triangle via William Hovell Drive.

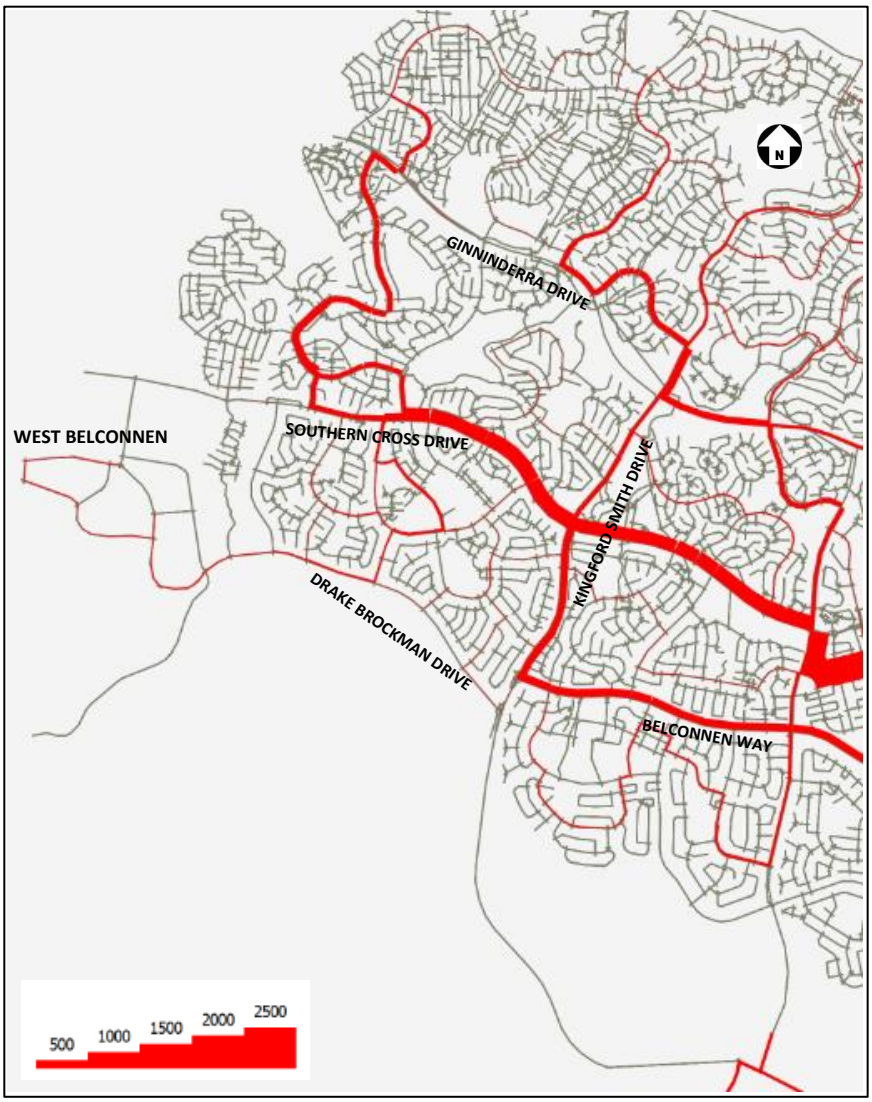
The higher public transport usage in West Belconnen will result in a substantial reduction in potential car usage, compared with current levels. Thus, there will be less cars generated from existing Belconnen suburbs, but increased cars due to new development in West Belconnen. This will result in less growth in traffic volumes on existing roads, consistent with sustainable transport objectives.

4.3 Bus Passenger Forecasts

Figure 23 to Figure 25 provide AM peak hour forecasts of bus passenger flows in the study area. These taken together with traffic conditions will provide guidance as to the likely need for future bus or transit lanes in the area.

Bus passenger flows exiting West Belconnen in the AM peak hour will be very low in 2021 (about 140 passengers per hour), with bus routes from West Belconnen focussed on Stockdill Drive and Kippax. However, there will be growth in bus passenger numbers in the local existing suburbs, due to a forecast shift to public transport. Bus passenger flows will be highest on Southern Cross Drive east of Kippax (see Figure 23).

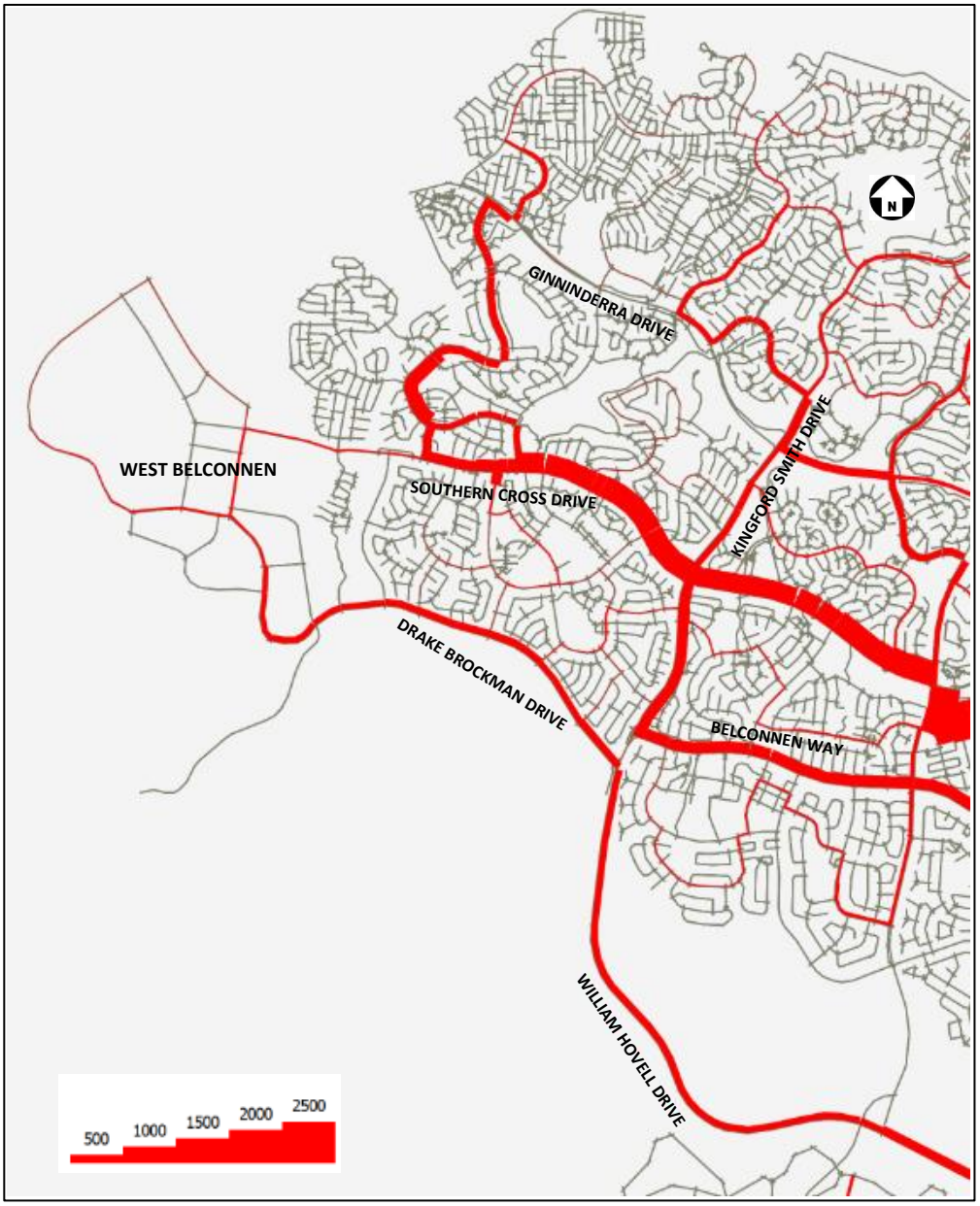
Figure 23: 2021 peak hour bus passenger flows



Note: The lines represent roads and the widths of the lines are proportional to the change in traffic flows; the wider the band the greater the volume. ***Source:*** *CSTM (May 2014)*

By 2031 there will be a noticable increase in bus passenger flows on Drake Brockman Drive, due to increased use of proposed XPresso services from West Belconnen to City (see Figure 24). Kippax will remain the primary focus for bus movements in the area. Passenger flows would continue to grow on Southern Cross Drive, with a doubling of passenger flows on bus services from Macgregor and Dunlop entering Kippax via O'Reilly Street and Southern Cross Drive. Subsequent micro-simulation modelling showed that bus priority improvements are justified at the existing signalised intersections on Southern Cross Drive with Florey Drive and Kingsford Smith Drive.

Figure 24: 2031 peak hour bus passenger flows



Note: The lines represent roads and the widths of the lines are proportional to the change in traffic flows; the wider the band the greater the volume. ***Source:*** *CSTM (May 2014)*

In peak hours, bus passenger movements are expected to increase to about 2,200 passengers per hour between Starke Street and Florey Drive (ie., about 30 relatively full buses per hour[2]), placing increased pressure on intersections on this section of Southern Cross Drive. Traffic and public transport volumes will be even higher between Florey Drive and Kingsford Smith Drive (ranging from 2,500 to 2,700 passengers per hour in the AM peak). This may be sufficient to justify consideration of a transit lane between Kippax and Belconnen Town Centre, although micro-simulation modelling indicates that bus queue jump lanes at key signalised intersections are likely to provide adequate priority.

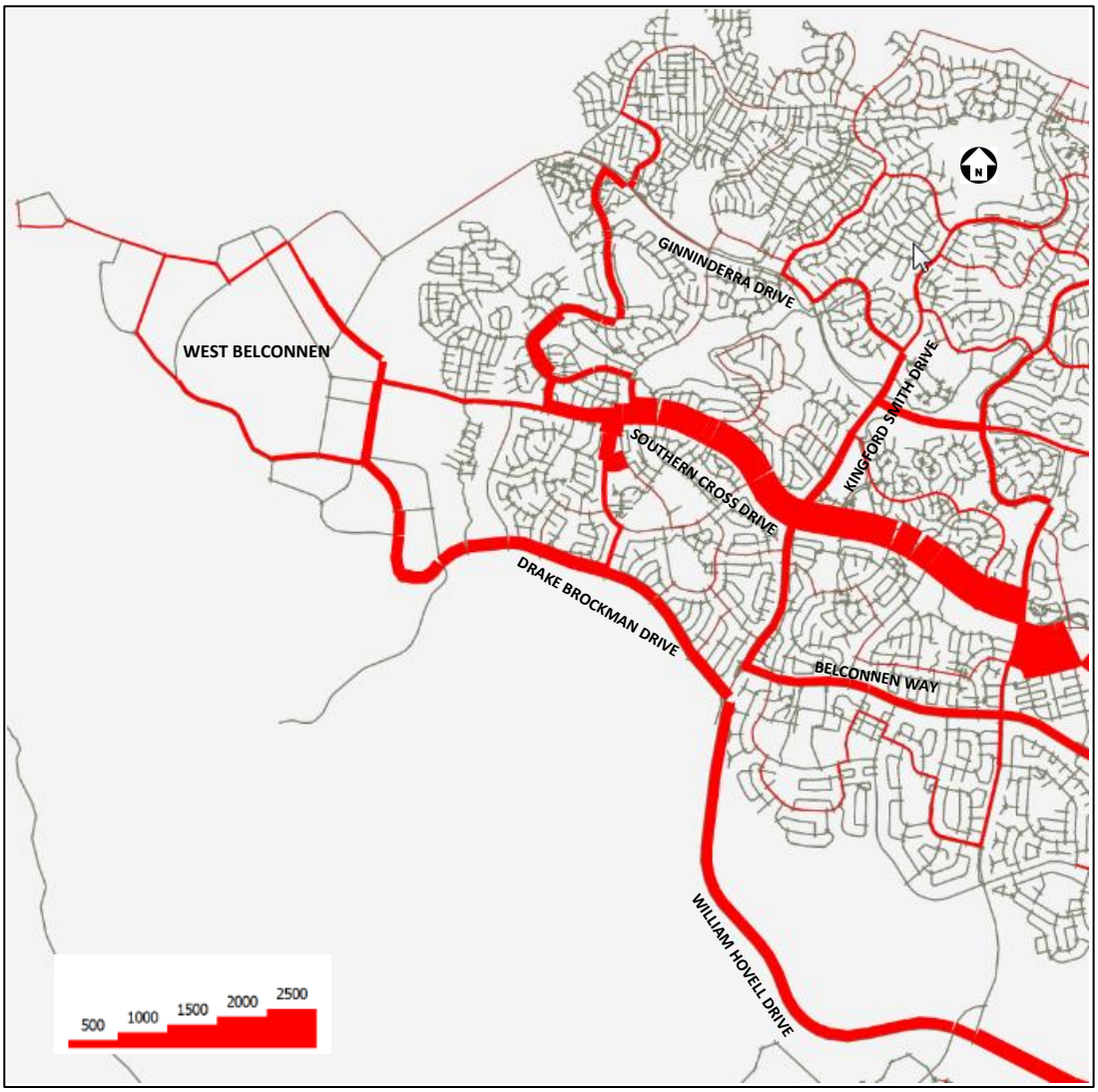
[2] This is based on an assumed average peak bus occupancy of 70 passengers. The current ACTION bus fleet varies in capacity from about 60 to 110 passengers per bus, with the larger buses plying the busy peak hour routes.

Consideration should also be given to an alternative access to Kippax via Moyes Crescent and a potential new road connection east of Kippax, to take pressure off the Starke Street West access to Kippax. This is being investigated as part of ongoing master planning work for the Kippax Planning Study.

The 2041 forecasts show a continuation of the growth trend seen in the 2031 results (see Figure 25). The majority of bus passenger movements out of West Belconnen will occur via Stockdill Drive (about 1,500 passengers per hour, or 20 relatively full buses per hour)

A key aspect of the 2041 forecasts is that the majority of the bus passenger demand on Drake Brockman Drive from West Belconnen is destined for William Hovell Drive and onto City (about 65% to City and 35% to Kippax). Micro-simulation modelling indicates that delays to buses along here are not likely to be significant, so bus priority treatments are not required here.

Figure 25: 2041 peak hour bus passenger flows



Note: The lines represent roads and the widths of the lines are proportional to the change in traffic flows; the wider the band the greater the volume. ***Source:*** *CSTM (May 2014)*

4.4 Traffic Flow Forecasts

4.4.1 Traffic Data

Traffic forecast data from the CSTM takes several forms. There are three primary sets of quantitative data that are summarised in the following figures:

- AM peak hour traffic flows for 2021 (Figure 26), 2031 (Figure 29) and 2041 (Ultimate; Figure 32)
- The changes in AM peak hour traffic flows from 2011 to 2021 (Figure 27), 2011 to 2031 (Figure 30) and 2011 to 2041 (Figure 33)
- Estimated AM peak hour volume to capacity ratios for years 2021 (Figure 28), 2031 (Figure 31) and 2041 (Ultimate; Figure 34)

In summary, the main observations from these traffic forecasts are as follows:

2021

The forecast 2041 AM peak hour traffic flows in the study area are depicted in Figure 26. The expected change in AM peak hour traffic flows between 2011 and 2021 are illustrated in Figure 27. It shows noticeable increases in traffic flows on Stockdill Drive and Drake Brockman Drive, ranging from 400 to 500 veh/h in the peak direction. There will be small increases in traffic using Southern Cross Drive, Belconnen Way and Spofforth Street (generally less than 200 veh/h).

Some reductions in traffic will occur on southern parts of Kingsford Smith Drive. This is because there will be less residents from the existing North Belconnen suburbs using Kingsford Smith Drive to access William Hovell Drive, but more heading north towards Barton Highway. This will occur because of increased use of William Hovell Drive and Parkes Way by Molonglo and new West Belconnen residents, causing some redistribution of trips by existing North Belconnen residents, as well as reduced peak hour car usage as an outcome of sustainable transport initiatives.

An indication of the amount of traffic congestion in the road network by 2021 is given by the plot of volume to capacity ratios in Figure 28. It indicates that the most of the roads in the study area will be operating within capacity in the AM peak hour.

2031

The forecast 2031 AM peak hour traffic flows in the study area are depicted in Figure 29. The expected change in AM peak hour traffic flows between 2011 and 2031 are illustrated in Figure 30. It shows noticeable increases in traffic flows on Stockdill Drive, Drake Brockman Drive and Parkwood Road. There will be relatively small changes in traffic on other roads.

Again, there will be a reduction in traffic using the southern part of Kingsford Smith Drive. Furthermore, there will be some reductions in traffic using local streets, other than some evidence of increased traffic through Macgregor and on Spofforth Street.

An indication of the amount of traffic congestion in the road network by 2031 is given by the plot of volume to capacity ratios in Figure 31. It indicates that the most of the roads in the study area will be operating within capacity in the AM peak hour.

2041

The forecast 2041 AM peak hour traffic flows in the study area are depicted in Figure 32. The expected change in AM peak hour traffic flows between 2011 and 2041 are illustrated in Figure 33. It shows noticeable increases in traffic flows on Stockdill Drive, Drake Brockman Drive, Parkwood Road, Ginninderra Drive and William Hovell Drive. There will be small increases in traffic using Southern Cross Drive, Belconnen Way and Spofforth Street (generally less than 400 veh/h).

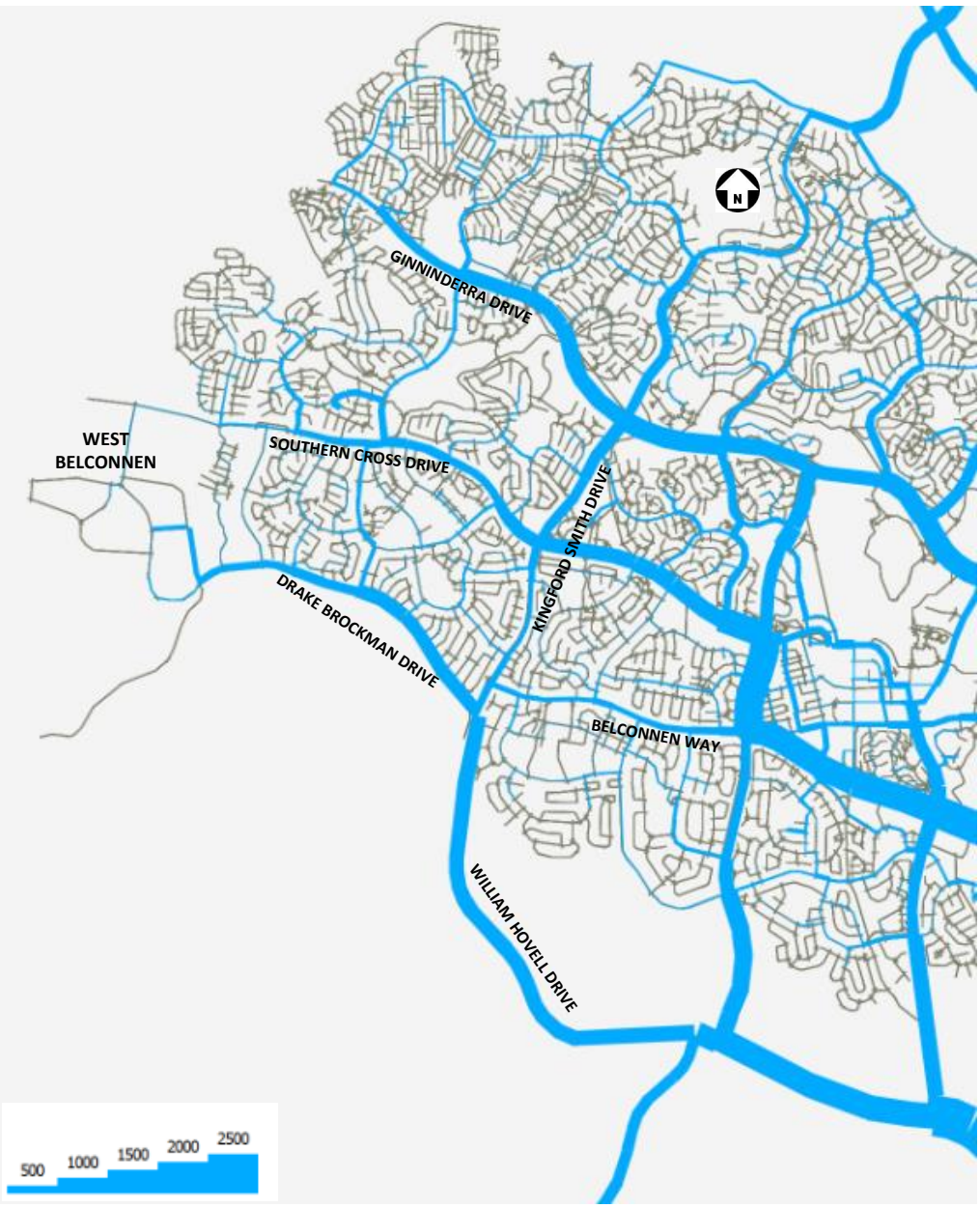
The reduction in traffic using the southern part of Kingsford Smith Drive is even more evident in 2041, partly due to the Ginninderra Drive Completion. This shows little change in traffic using Kerrigan Street.

An indication of the amount of traffic congestion in the road network by 2041 is given by the plot of volume to capacity ratios in Figure 34. It indicates that the most of the roads in the study area will be operating within capacity in the AM peak hour.

A more detailed street by street discussion of roads that will be affected by the West Belconnen development follows the presentation of the traffic forecasts.

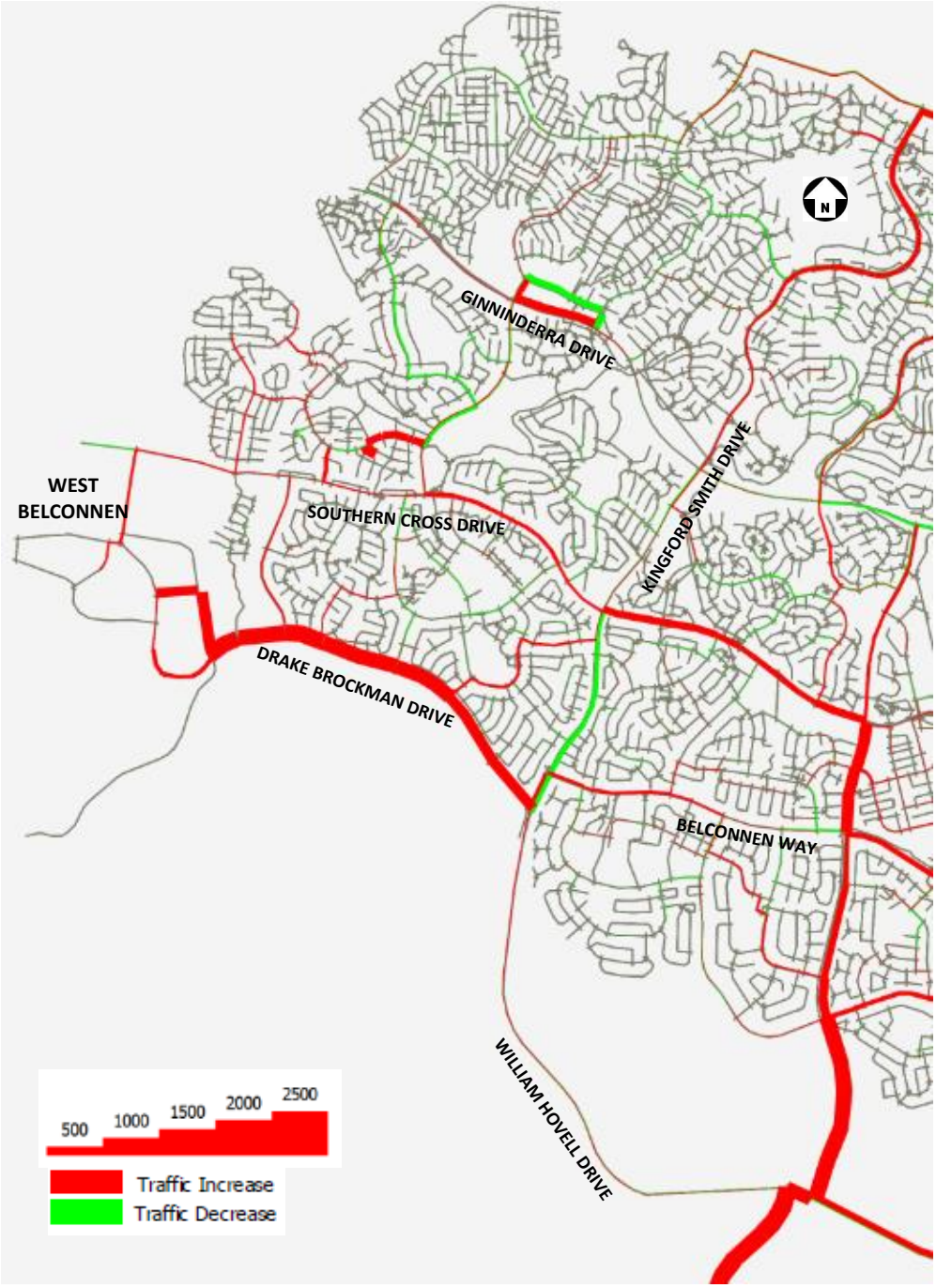
2021 Traffic Forecasts

Figure 26: 2021 AM peak hour flows



Note: The lines represent roads and the widths of the lines are proportional to the change in traffic flows; the wider the band the greater the volume. ***Source:*** *CSTM (May 2014)*

Figure 27: Changes in AM peak hour flows from 2011 to 2021



Note: The lines represent roads and the widths of the lines are proportional to the change in traffic flows; red lines denote increases and green lines decreases. ***Source:*** *CSTM (May 2014)*

Figure 28: 2021 volume capacity ratios

Note: The lines represent roads and the width of the lines are proportional to the link volume to capacity ratio, with capacities estimated using Austroads guidelines shown in Appendix B. The orange lines denote links that are near capacity and red lines links that are at or over capacity.

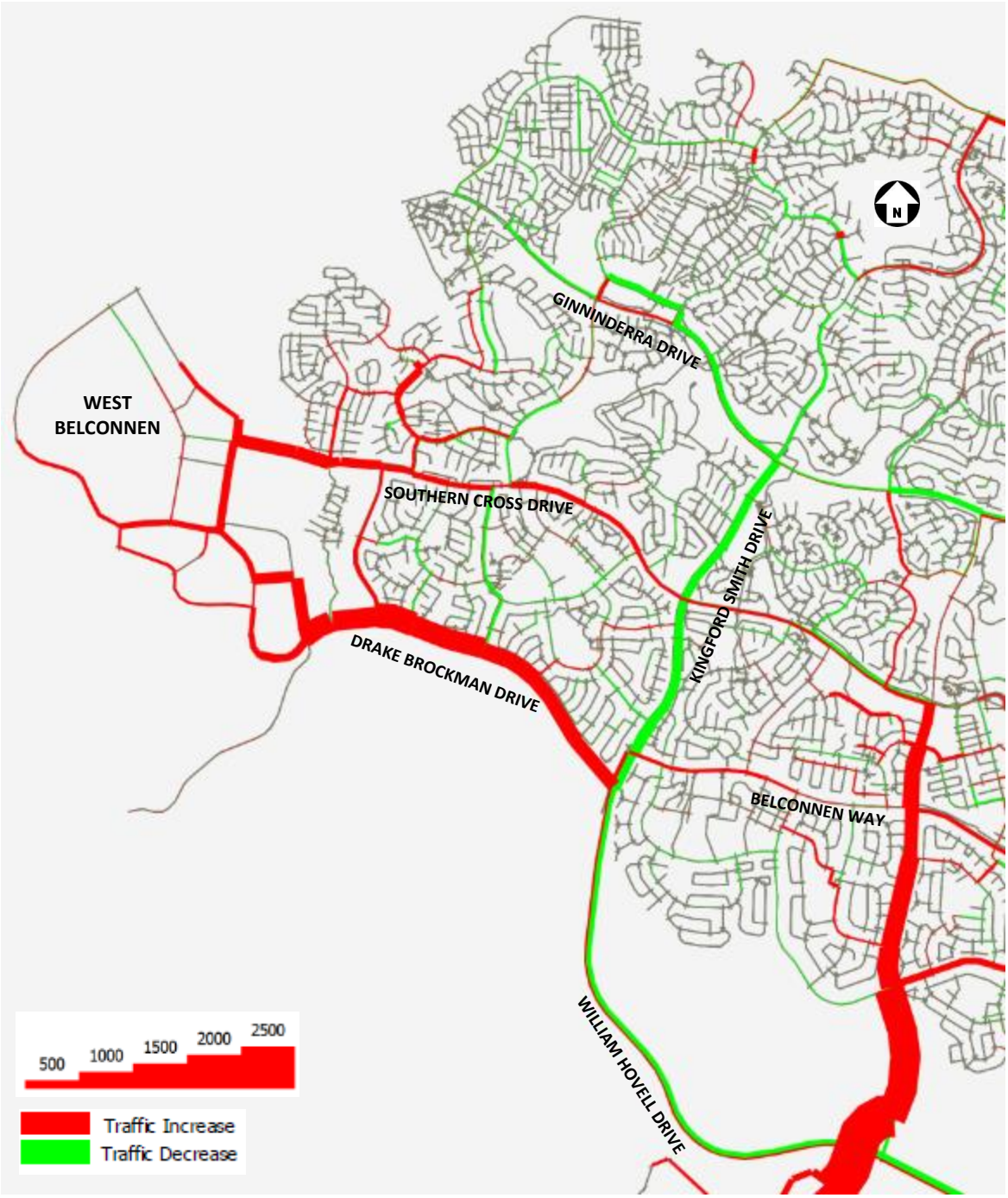
Source: *CSTM (May 2014)*

2031 Traffic Forecasts

Figure 29: 2031 AM peak hour flows

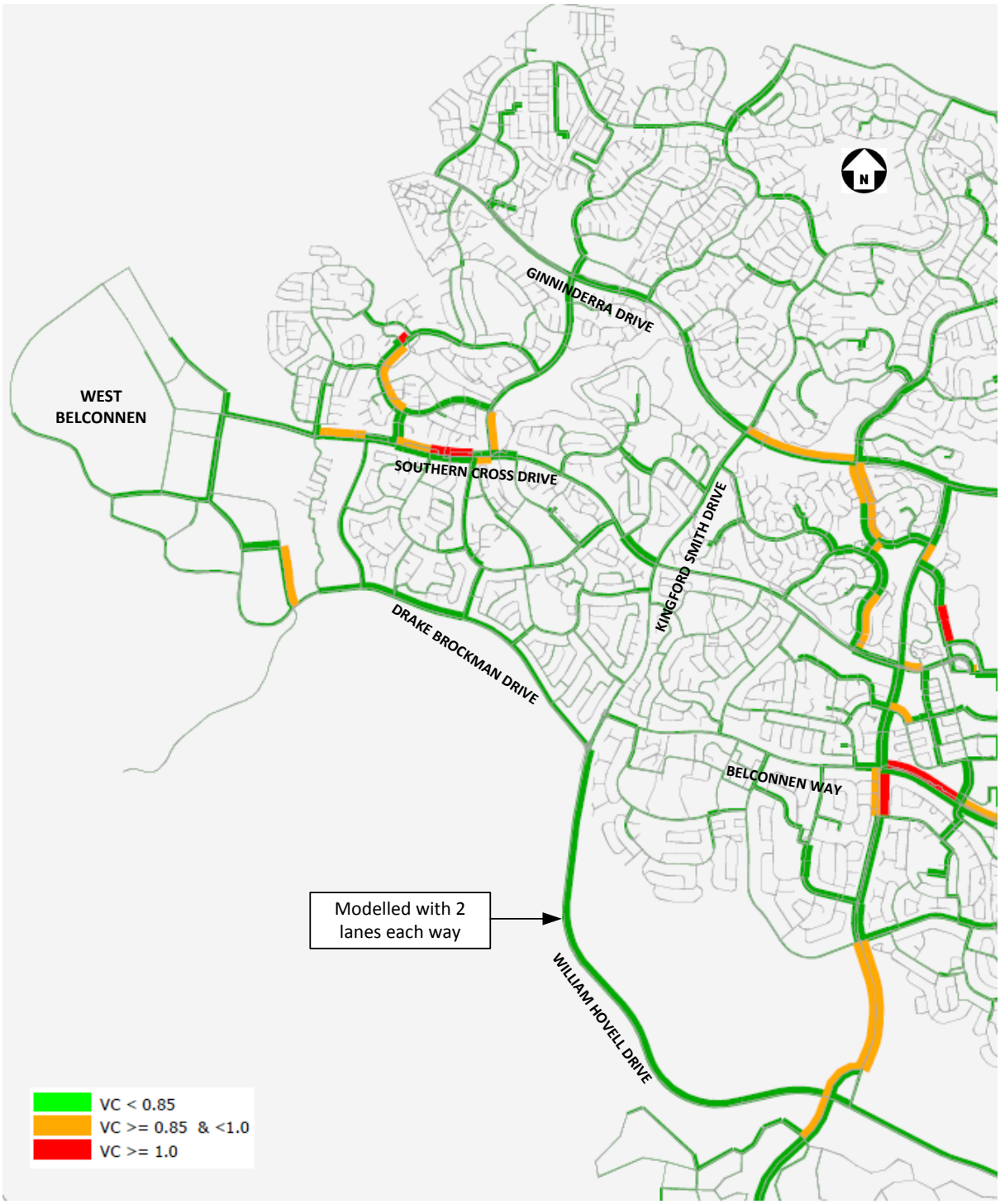
Note: The lines represent roads and the widths of the lines are proportional to the change in traffic flows; the wider the band the greater the volume. ***Source:*** *CSTM (May 2014)*

Figure 30: Changes in AM peak hour flows from 2011 to 2031



Note: The lines represent roads and the widths of the lines are proportional to the change in traffic flows; red lines denote increases and green lines decreases. ***Source:*** *CSTM (May 2014)*

Figure 31: 2031 volume capacity ratios

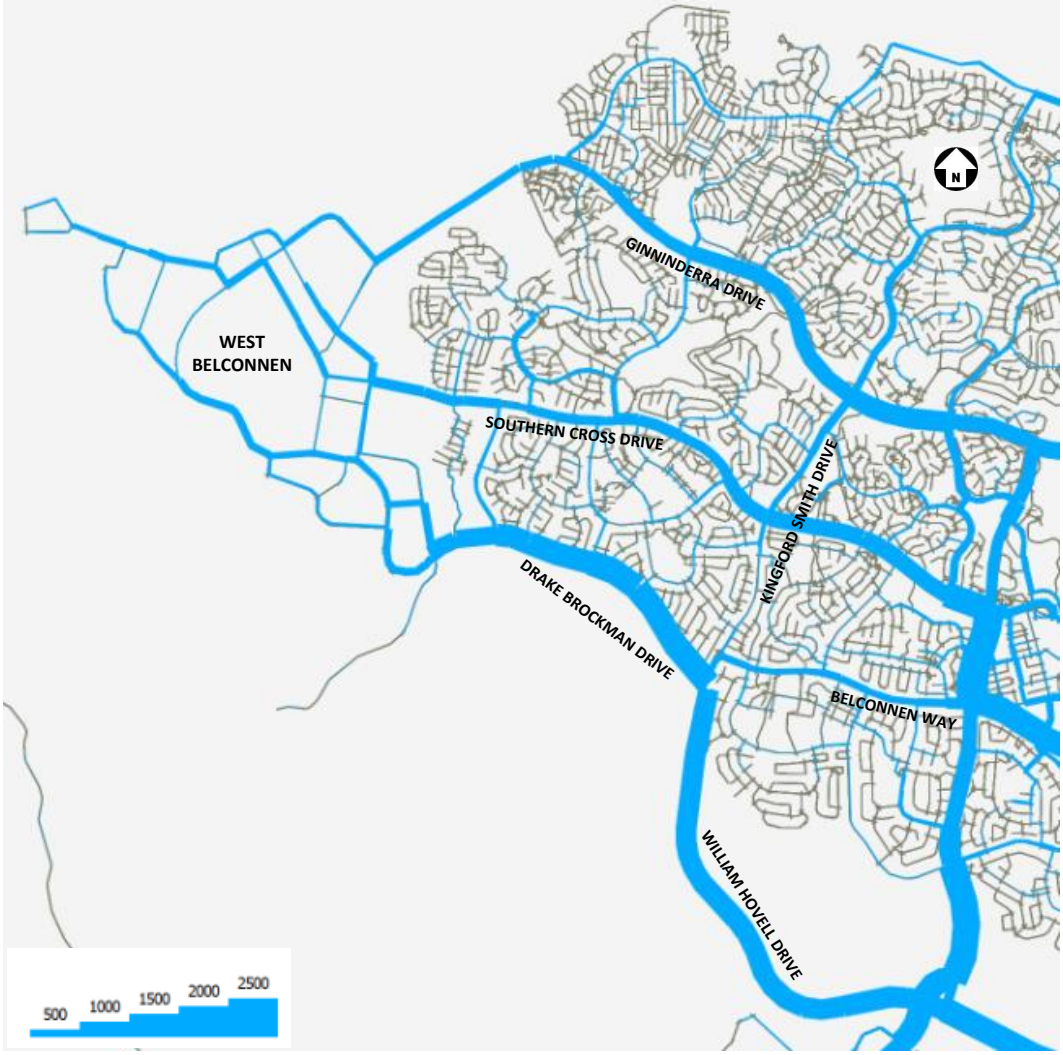


Note: The lines represent roads and the width of the lines are proportional to the link volume to capacity ratio, with capacities estimated using Austroads guidelines shown in Appendix B. The orange lines denote links that are near capacity and red lines links that are at or over capacity.

Source: *CSTM (May 2014)*

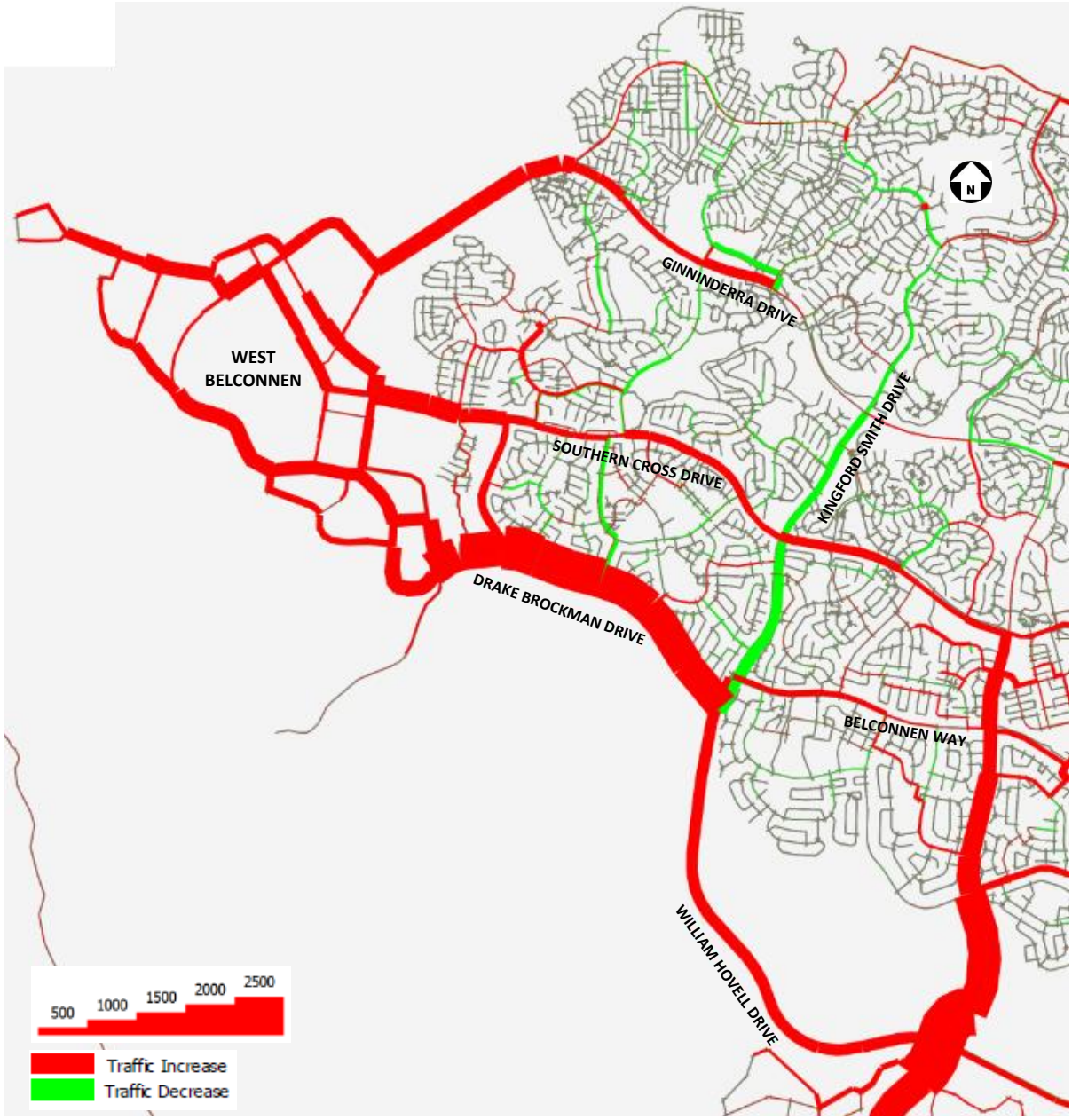
2041 Traffic Forecasts

Figure 32: 2041 AM peak hour flows



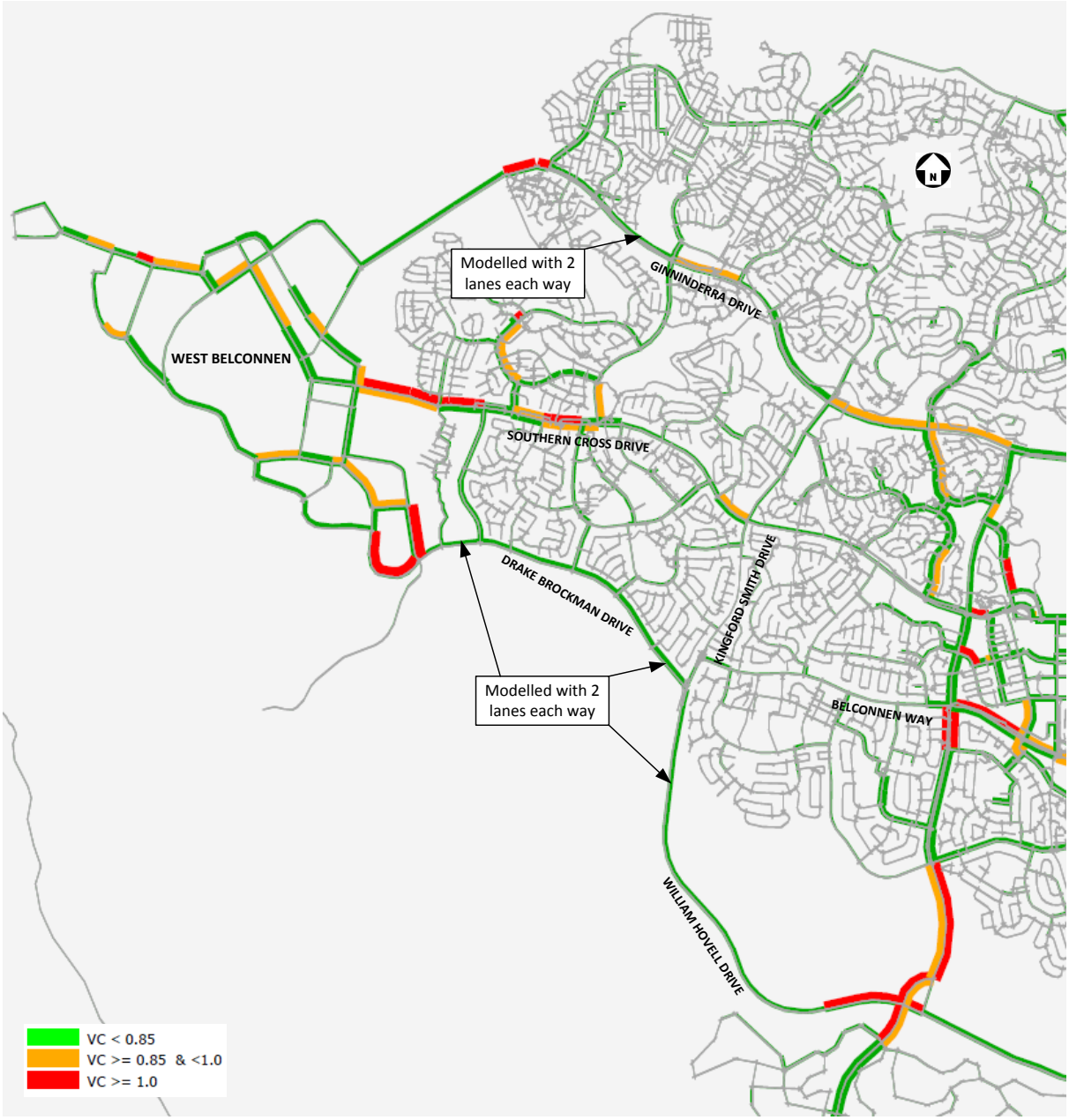
Note: The lines represent roads and the widths of the lines are proportional to the change in traffic flows; the wider the band the greater the volume. ***Source:*** *CSTM (May 2014)*

Figure 33: Changes in AM peak hour flows from 2011 to 2041



Note: The lines represent roads and the widths of the lines are proportional to the change in traffic flows; red lines denote increases and green lines decreases. ***Source:*** *CSTM (May 2014)*

Figure 34: 2041 volume capacity ratios



Note: The lines represent roads and the width of the lines are proportional to the link volume to capacity ratio, with capacities estimated using Austroads guidelines shown in Appendix B. The orange lines denote links that are near capacity and red lines links that are at or over capacity.

Source: *CSTM (May 2014)*

4.4.2 Stockdill Drive

The planned access to the new development will be a short distance west of Belconnen Golf Course. In the first stage of the development the main access will be formed about 1km west of the existing intersection with Britten-Jones Drive. The road will be reconstructed so that the access to the new urban area will become the main road and the southern section of Stockdill Drive will tee off it.

The first stage of development will incorporate about 680 residential dwellings and a possible school, representing a little over 2 years of expected housing demand. The existing road has adequate capacity to cater for the increased traffic due to the first stage of development (about 5,000 veh/day).

By 2021 it is assumed that about 1,800 dwellings would be developed, the school occupied and a local shopping centre formed on Parkwood Road. As part of the master plan, there would be a new road formed between Stockdill Drive and Parkwood Road. Traffic volumes on Stockdill Drive east of the Estate access will be approaching 10,000 veh/day by then. The existing road would still have the capacity to carry this amount of traffic, but intersection works would be necessary at Spofforth Street.

By 2031 about 4,500 dwellings would be developed, which represents a large proportion of the ACT portion of West Belconnen (63%). Traffic flows on Stockdill Drive east of the Estate access will then be about 13,000 veh/day and will be nearing capacity for the existing road. Intersections along Stockdill Drive will require upgrading to improve access and safety.

Ultimately, at full development of West Belconnen, Stockdill Drive will carry about 24,000 veh/day east of the Estate access. It will require duplication by the latter part of the 2030's decade, assuming an average of 300 dwellings occupied each year from 2016.

Peak hour bus passenger flows will gradually grow along Stockdill Drive, from 800 passengers per hour in 2031 to over 1,700 passengers per hour ultimately. These flows reflect the need for between 12 and 25 buses per hour in the AM peak. Micro-simulation modelling showed that there will be minimal delays to buses with the proposed dual lane carriageway here.

4.4.3 Drake Brockman Drive

Section 1: West of Macnaughton Street (see Figure 16)

The first stage of development will cause a noticeable increase in traffic using Drake Brockman Drive. West of Macnaughton Street traffic volumes will increase to about 8,500 veh/day, almost double current volumes in this section of road. This volume of traffic will create delays for residents accessing driveways and by 2021 consideration should be given to the construction of a proposed service road in this section of road and a new road carriageway, as well as local intersection works.

Traffic flows are predicted to increase to more than 12,000 veh/day by 2021 and 16,000 veh/day by 2031, which can be catered for by the proposed first stage of works. This section of road will be on the cusp of duplication by 2031, but capacity improvements at the intersection with Macnaughton Street and duplication east of there should suffice at that time. Buses and bus passenger volumes will start to pick up by 2031, with buses carrying about 900 passengers per hour in peaks in this section of road.

Ultimately, at full development of West Belconnen, this section of road will carry about 26,000 veh/day. It will require duplication in the middle part of the 2030's decade. Peak hour bus passenger volumes could jump to 1,700 passengers per hour here in the long-term (about 25 buses per hour), depending on actual achieved public transport usage.

Micro-simulation modelling documented in Chapter 5 shows that there will be minimal delays to buses with the proposed dual lane carriageway here. In the 2030's decade traffic signals will be provided at intersections with Trickett Street and Macnaughton Street, to enable safe movement of pedestrians to nearby bus stops, as well as safe side-street access during peak periods.

Section 2: East of Macnaughton Street (see Figure 16)

As a consequence of the first stage of development traffic using Drake Brockman Drive east of Macnaughton Street will increase from about 9,000 veh/day west of Kingsford Smith Drive to 12,000 veh/day. This increase in traffic will cause a moderate increase in delays at intersections along this section of road, as noted in Section 5.6, resulting in the need to improve access and safety at intersections.

Traffic flows are predicted to increase to more than 15,000 veh/day by 2021 and 18,000 veh/day by 2031, which can be catered for by the proposed first stage of works. Parts of this section of road could be widened then to reduce delays for buses in the AM peak. It is likely that the intersection with William Hovell Drive would need to have peak hour traffic signals to control queueing on William Hovell Drive in the PM peak; in particular, control of right turns from Kingsford Smith Drive into Drake Brockman Drive using signal metering.

Ultimately, at full development of West Belconnen, this section of road is predicted to carry more than 28,000 veh/day. It will require duplication in the early part of the 2030's decade. The capacity of the roundabout at William Hovell Drive would also need to be increased. Transport modelling indicates that in the long-term (2041 (ultimate)) about 1,400 passengers per hour will be carried on buses through this intersection in peak hours (about 20 buses per hour). The micro-simulation modelling documented in Chapter 5 indicates that buses will incur minimal delays with the proposed improvements here.

Some delays can be expected for pedestrians crossing Drake Brockman Drive between Kinsella Street and William Hovell Drive, especially after alighting buses in the evening peak. The estimated delay to pedestrians crossing the southern carriageway to the proposed median will be 22 s during the evening peak and will not require any additional facilities.

4.4.4 Parkwood Road

Residential development is not expected to occur along this road until post 2020, with the release of about 800 dwellings between 2020 and 2022, as well as possible commencement of development of the Centre. This is expected to add about 5,000 veh/day to traffic using Parkwood Road from the proposed development access west of Macfarlane Burnet Avenue; some of the 5,000 veh/day will divert through new internal roads to Stockdill Drive. The existing road can cater for this increased traffic, but the bend in Parkwood Road west of Macfarlane Burnet Avenue should be realigned for safety reasons and as part of widening the road to provide facilities for on-road cycling.

By 2031 about 8,500 veh/day will be using Parkwood Road west of Macfarlane Burnet Avenue and another 5,000 veh/day will use a new link from Parkwood Road to Stockdill Drive (west of the electricity substation). Traffic volumes on Parkwood Road will grow to about 9,000 veh/day west of Spofforth Street. The current design of this section of road is adequate to carry this volume of traffic.

Parkwood Road is expected to carry 14,000 veh/day at full development of West Belconnen, which can be serviced by a high standard two-lane two-way road. About 600 passengers per hour would also be carried on buses in the peak hours along this section of road, not sufficient to justify bus priority facilities nor light rail.

4.4.5 Southern Cross Drive

Section 1: Spofforth Street to Holt Oval Underpass (see Figure 17)

There will be small increases in traffic using Southern Cross Drive following commencement of development along Parkwood Road. By 2031 traffic using Southern Cross Drive between Spofforth Street and O'Reilly Street is predicted to increase by 3,000 veh/day to 9,000 veh/day. This can be readily accommodated by the current road design.

Traffic volumes will increase markedly east of O'Reilly Street. By 2031 traffic volumes on Southern Cross Drive crossing the Holt Oval underpass is predicted to increase to about 15,500 veh/day; an increase of 4,000 veh/day from current levels. The increase would be partly due to an expected diversion of West Macgregor traffic to Starke Street and Macnaughton Street, previously using Beaurepaire Crescent prior to proposed traffic management planned for implementation on Beaurepaire Crescent.

This traffic volume is relatively high for a 2-lane urban road, but there will be a relatively even directional distribution of traffic on Southern Cross Drive. The forecast peak direction traffic would be about 700 veh/h eastbound. Micro-simulation modelling shows that this can be accommodated in one lane.

There are expected to be small increases in traffic beyond 2031. By 2041 (ultimate), traffic using Southern Cross Drive east of Beaurepaire Crescent is predicted to increase to 16,000 veh/day. Consideration should be given before then to creating a service road on the southern side of Southern Cross Drive between Spofforth Street and Beaurepaire Crescent, requiring reconstruction of the existing road.

There will be problems turning right out of side roads east of O'Reilly Street during peak periods, which could lead to an increase in crashes unless intersections are upgraded. In the longer-term (by 2041), a roundabout is proposed to be installed at the intersection of Beaurepaire Crescent and Southern Cross Drive. This will improve local access and traffic safety, including access for service road residents as it enables U-turns.

Section 2: Holt Oval Underpass to Moyes Crescent (see Figure 17)

This section of road includes two busy intersections – Starke Street West and Florey Drive. Traffic conditions vary here depending on activity at the nearby Kippax Centre. Both intersections carry a relatively high number of vehicles, buses and pedestrians and this will grow.

There will be little growth in traffic to 2021. By 2031, traffic between the Holt Oval overpass and Starke Street is predicted to increase to about 15,600 veh/day. A significant proportion of this growth (about 50%) will be attracted to Starke Street resulting in the need to signalise this intersection; it may need to be signalised earlier for traffic safety reasons. Part of the attraction to Starke Street will be growth in Kippax and part will be rat-running towards Drake Brockman Drive to avoid proposed traffic management works on Beaurepaire Crescent. LATM measures may be necessary to ensure that this traffic is not attracted to Starke Street.

By 2031 there will be a large increase in public transport trips via Kippax, using this section of road; in particular the intersection with Starke Street West. In peak hours, bus passenger movements are expected to increase to about 2,200 passengers per hour between Starke Street and Florey Drive (ie., about 30 buses per hour).

Traffic and public transport volumes will be even higher east of Florey Drive. At this location, traffic volumes will increase to 14,500 veh/day and bus passenger volumes to about 2,500 passengers per hour.

This section of road should be widened to enable bus priority at Florey Drive, particularly in the eastbound direction. As part of this widening, consideration should be given to creating a service road on the southern side of Southern Cross Drive west of Starke Street (West).

Section 3: Moyes Crescent to Kingsford Smith Drive (see Figure 17)

There will be small increases in traffic using Southern Cross Drive following commencement of development. By 2031 traffic using Southern Cross Drive east of Moyes Crescent will increase to 16,000 veh/day. This can easily be accommodated by the existing road.

By 2031 there would be a 15% increase in traffic using the Kingsford Smith Drive intersection, which will result in this intersection operating near capacity in peak periods. Bus passenger flows would also be very high by 2031, with about 2,700 passengers per hour being carried by buses towards Belconnen by then, representing about 40 buses per hour in the peak direction.

4.4.6 Ginninderra Drive

Access to the area will be greatly improved with a Ginninderra Drive Completion. It would enable better connections to North Belconnen and Gungahlin, for cars, buses and emergency vehicles. The amount of traffic attracted to the road when it is included in the network (about 10,000 veh/day) indicates that it could be economically justified and will be serving important travel needs. One of the advantages of good access to North Belconnen is improved travel times from the Emergency Services Centre in Charnwood to future areas of West Belconnen located in NSW.

A new bus service to Charnwood and Gungahlin via the Ginninderra Drive Completion was included in the 2041 (ultimate) modelling. It was found to attract very few passengers from West Belconnen (about 30 passengers per hour in the AM peak). Hence, this new road connection would not provide much benefit for public transport services and no provision for bus priority will be needed along it.

The impacts of not providing the Ginninderra Drive Connection are summarised in Appendix F.

4.4.7 William Hovell Drive

Traffic growth on this road is predicted to be slow, due to capacity constraints at downstream intersections and a shift to public transport. Traffic flows on William Hovell Drive are expected to increase from 15,000 veh/day to 16,500 veh/day by 2021 (ie., an increase of about 10%). The southbound lane will be nearing practical capacity because there is only one lane available southbound and traffic flows exceeding 1,700 veh/hr are predicted in this lane in the AM peak hour.

The real constraint along William Hovell Drive is the Bindubi Street traffic signals and Glenloch interchange. Hence, any significant capacity improvements west of Bindubi Street along William Hovell Drive are difficult to justify in the short to medium term (to 2031), until such time as the downstream constraints are addressed. However, safety improvements are likely to be justified and should be the subject of more detailed investigations.

Coppins Crossing is likely to be signalised by 2021 and the timing of any upgrades here will influence decisions on widening William Hovell west of Coppins Crossing. It is likely that this would involve an additional southbound lane between Deep Creek and Coulter Drive, to extend the existing two-lane section of road (see Figure 18).

The implementation of public transport priority treatments may be necessary post-2031. Transport modelling indicates that in the long-term (2041 (ultimate)) about 1,440 passengers per hour will be carried on buses in this corridor in peak hours (about 20 buses per hour).

Traffic flows on William Hovell Drive are expected to jump to about 24,000 veh/day by 2041 (ultimate). Extra lanes may be needed in both directions by then, which could necessitate the construction of an additional carriageway. The extra capacity should enable improved bus operations. There will not be sufficient buses to justify a bus lane, but a queue jump lane may be warranted at downstream signalised intersections. The timing and nature of these works are subject to ongoing investigations.

4.4.8 Florey Drive

Florey Drive is currently carrying about 9,000 veh/day. It will experience a small increase in traffic between 2021 and 2031 (to 9,500 - 11,000 veh/day), but volumes will drop to below current levels when the Ginninderra Drive Completion is built.

4.4.9 Kingsford Smith Drive

As noted in Section 4.4.1, there will be some reductions in traffic using the southern parts of Kingsford Smith Drive. This is because of an expected lower car usage and redistribution and re-routing of trips in the Belconnen road network. The northern parts of Kingsford Smith Drive will become busier, as well as the short section between Belconnen Way and Drake Brockman Drive.

4.4.10 Spofforth Street

Small increases in traffic are expected on Spofforth Street to 2021, largely as a result of the implementation of proposed LATM measures in Holt (Figure 20). Traffic flows are expected to be less than 2,500 veh/day, reasonable for a major collector road and no additional upgrading will be necessary.

4.4.11 Other roads

There will be minimal changes on other roads in the study area. More details on these follow in Section 4.5 and Section 5.4.

4.5 Travel Patterns

Some select link assignments were undertaken to determine both local and regional travel patterns for trips generated by the West Belconnen development.

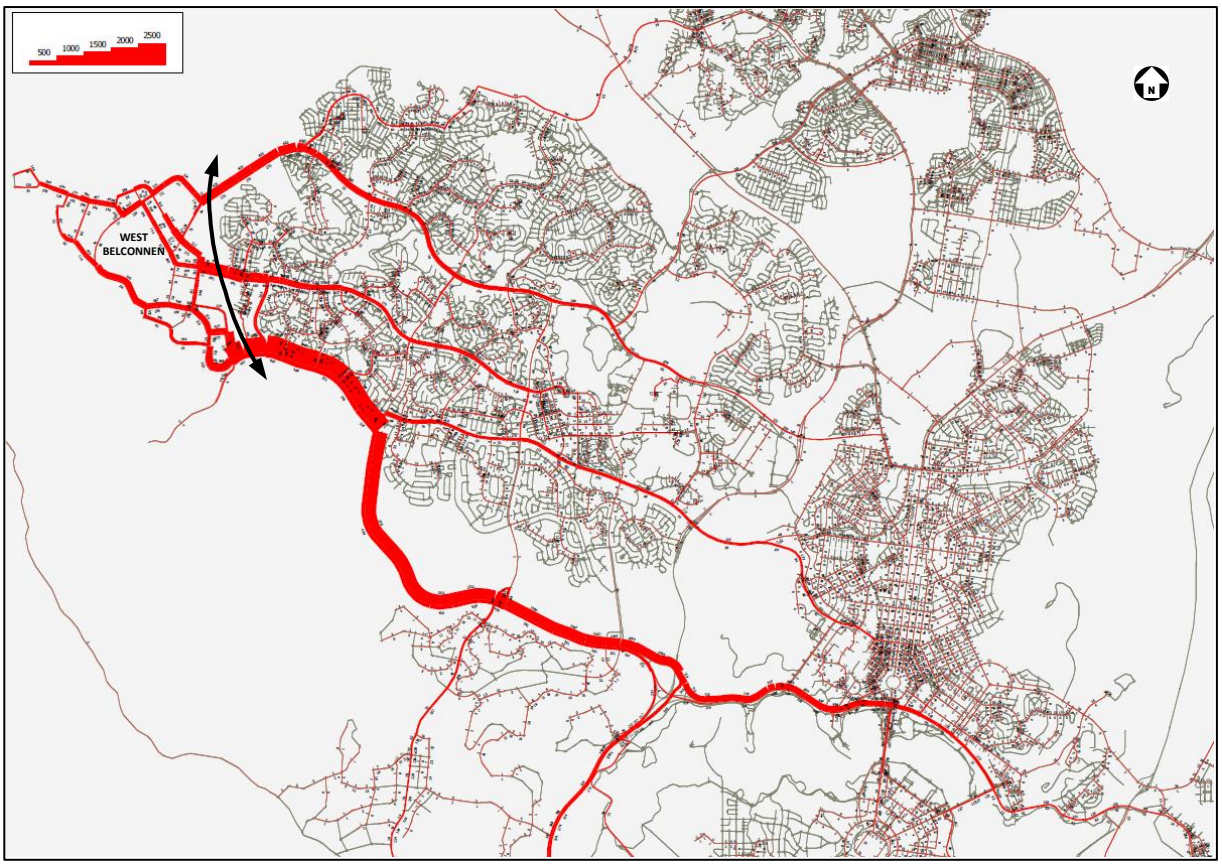
4.5.1 Regional traffic patterns

Figure 35 shows a select link assignment (SLA) for traffic exiting West Belconnen, via the three arterial road links that will serve the development. The select links used in this assignment are crossed by the black arrow. The SLA shows the traffic distributed to/from these links, with decreasing volumes at locations further away from the select links (shown by the width of the lines).

The overall distribution of two-way traffic entering and exiting West Belconnen is as follows:

- 1,090 veh/h via Ginninderra Connection (23% of West Belconnen traffic)
- 1,426 veh/h via Parkwood Road (30% of West Belconnen traffic)
- 2,256 veh/h via Stockdill Drive (47% of West Belconnen traffic)

Figure 35: 2041 AM peak hour SLA showing all traffic exiting West Belconnen



Source: AECOM, CSTM (May 2014); SLA is Select Link Assignment

The traffic will gradually disperse through the road network. East of Kingsford Smith Drive the key observations regarding traffic to/from West Belconnen are:

- 530 veh/h using Ginninderra Drive (11% of West Belconnen traffic)
- 484 veh/h using Southern Cross Drive (10% of West Belconnen traffic)
- 1,740 veh/h using William Hovell Drive and 573 veh/h using Belconnen Way (36% and 12% of West Belconnen traffic, respectively)

East of Coulter Drive, the key observations are:

- 397 veh/h using Ginninderra Drive (8% of West Belconnen traffic)
- 325 veh/h using Luxton Street and 211 veh/h using Coulter Drive (7% and 4% of West Belconnen traffic, respectively)
- 463 veh/h using Belconnen Way (10% of West Belconnen traffic)
- 1,448 veh/h using William Hovell Drive (30% of West Belconnen traffic)

These forecasts show that West Belconnen traffic will have minimal impact east of Kingsford Smith Drive, other than in the William Hovell Drive corridor. The modelling has illustrated that a considerable amount of traffic currently using Kingsford Smith Drive and William Hovell Drive will be displaced by traffic from West Belconnen. There will be a redistribution of traffic on alternative routes and to shoulder peak periods.

4.5.2 Local traffic patterns

Two select link assignments were undertaken with the CSTM to aid in the understanding of potential movements through local streets in the vicinity of Holt and Macgregor:

1) Traffic using Parkwood Road west of Macfarlane Burnet Avenue
2) Traffic using Drake Brockman Drive west of Kingsford Smith Drive

The location on Parkwood Road was chosen as this would show the potential extent of infiltration of West Belconnen trips through local streets. The location on Drake Brockman Drive was chosen as this would show the origin/destination of trips using this link via a local street route.

SLA's were done at each of these locations for 2021, 2031 and 2041 AM peak models. This will show the potential timing of changes that are likely to occur.

Parkwood Road Trips

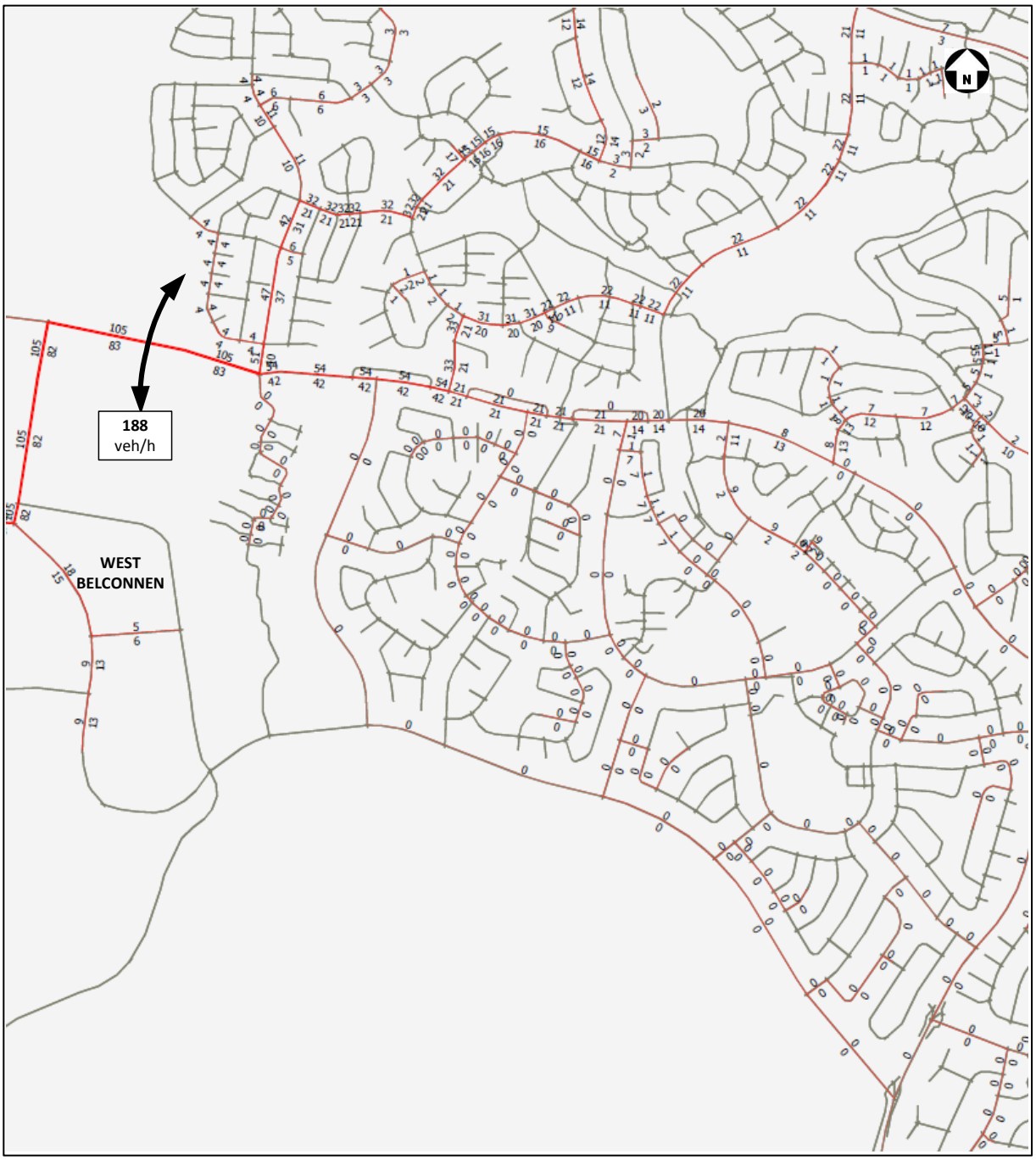
The SLA's for Parkwood Road are shown in Figure 36 to Figure 38. These show very little traffic infiltration through Holt, as the majority of traffic wanting to use Drake Brockman Drive will use internal roads within West Belconnen to access Drake Brockman Drive via Stockdill Drive. By 2031, there will be some growth in the use of Spofforth Street by West Belconnen traffic (see Figure 37). By 2041(Ultimate), there will be further growth in traffic using Spofforth Street, Starke Street and Macnaughton Street (see Figure 38). However, the extent of growth would be manageable – about 200 veh/h additional AM peak hour trips on Spofforth Street by 2041. Changes are likely to be much smaller outside of peak periods.

The other trip pattern evident from the 2021 and 2031 plots (Figure 36 and Figure 37) is a predicted increase in trips from West Belconnen through local streets in Macgregor, accessing destinations in Dunlop and Charnwood. This pattern is not evident in the 2041 plot (Figure 38), as Ginninderra Connection provides an important alternative route to Dunlop and Charnwood. The resultant volume of through trips on Macgregor streets is relatively moderate (generally less than 30 veh/h in 2021 and less than 100 veh/h in 2031). This will need to be monitored in future.

Drake Brockman Drive Trips

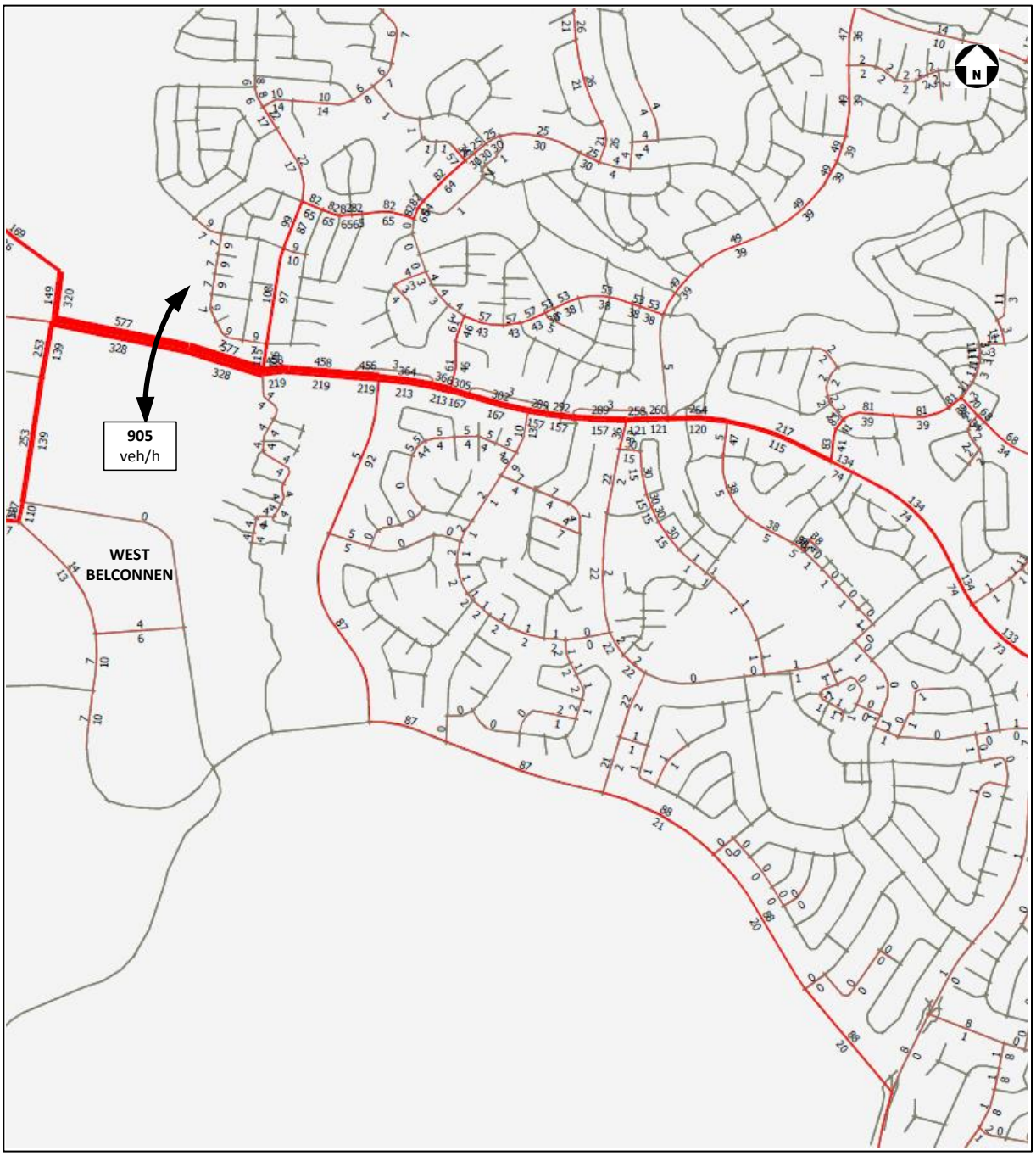
The SLA's for Drake Brockman Drive are shown in Figure 39 to Figure 41. It is clear from these plots that much of the traffic infiltration through Holt streets occurs as a result of Macgregor trips and not West Belconnen. There will be some infiltration from West Belconnen post 2021, slowly building as development occurs along the Parkwood road corridor. The plots show that about 110 veh/h in 2031 and 270 veh/h in 2041(Ultimate) would access Drake Brockman Drive via the Parkwood Road corridor and Holt local streets. Much of this additional traffic from West Belconnen will use Spofforth Street, whilst much of the Macgregor traffic will use Starke Street and Macnaughton Street to access Drake Brockman Drive.

Figure 36: 2021 AM peak hour SLA for Parkwood Road



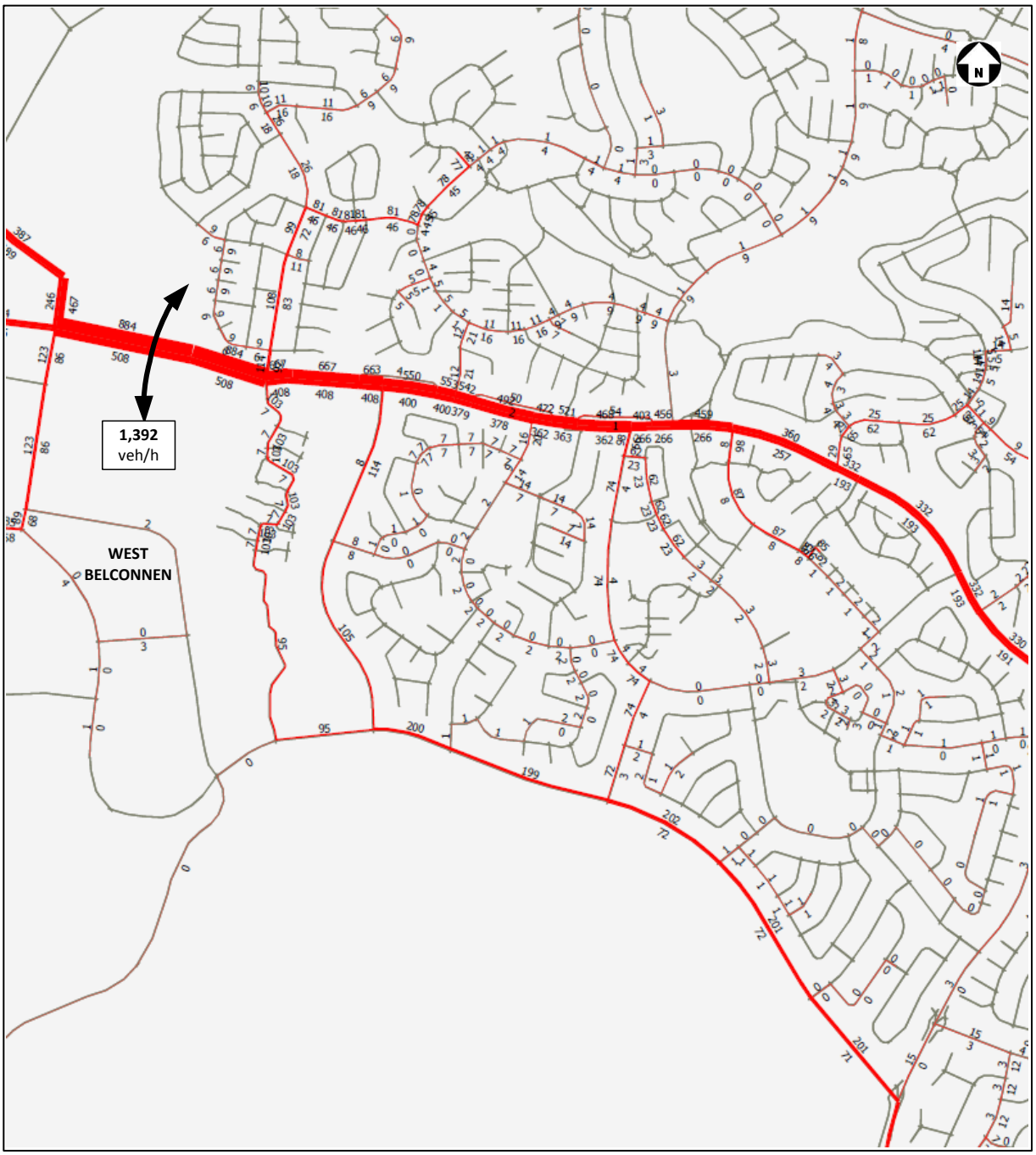
Source: AECOM, CSTM (May 2014); SLA is Select Link Assignment

Figure 37: 2031 AM peak hour SLA for Parkwood Road



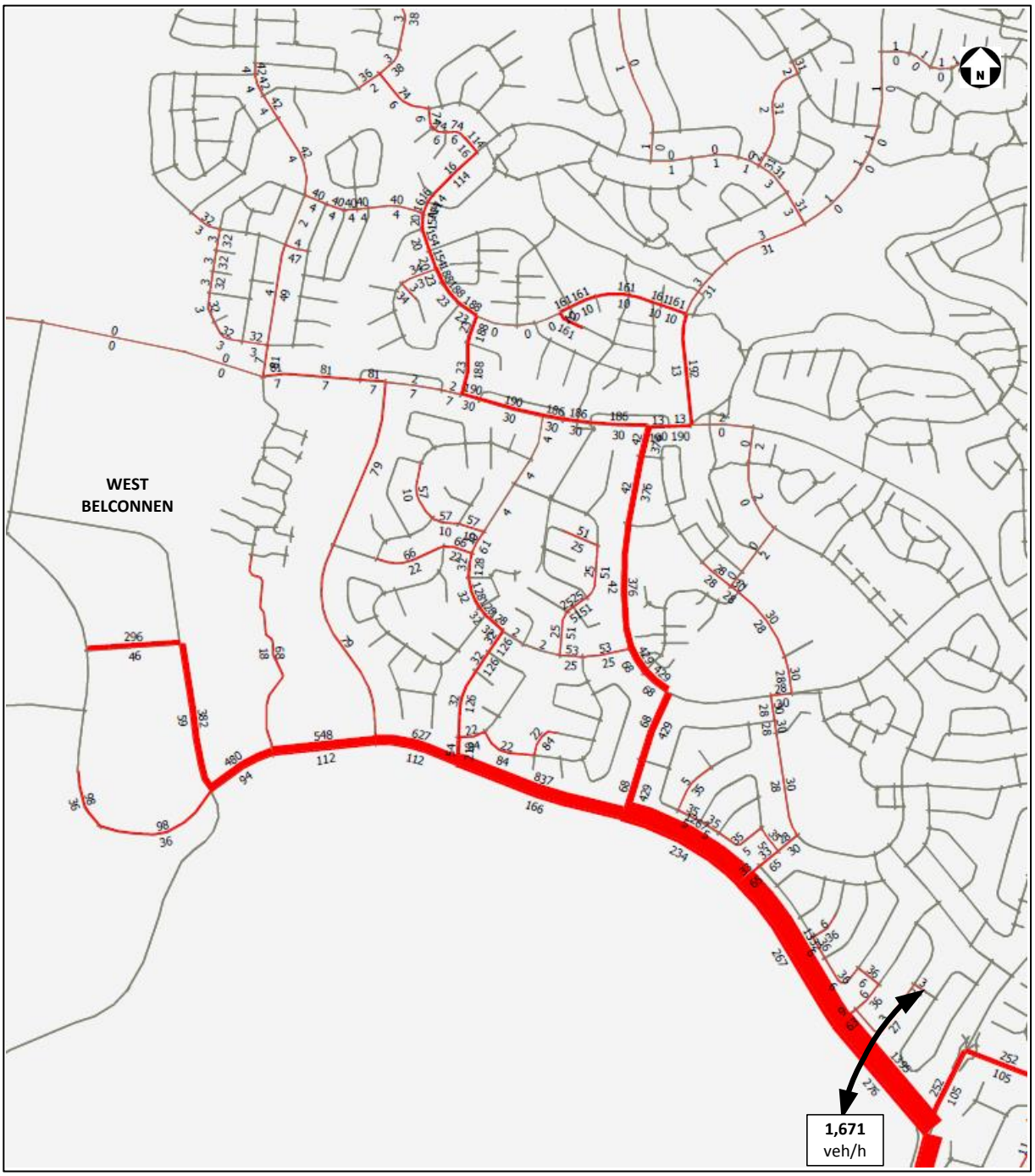
Source: AECOM, CSTM (May 2014); SLA is Select Link Assignment

Figure 38: 2041 AM peak hour SLA for Parkwood Road



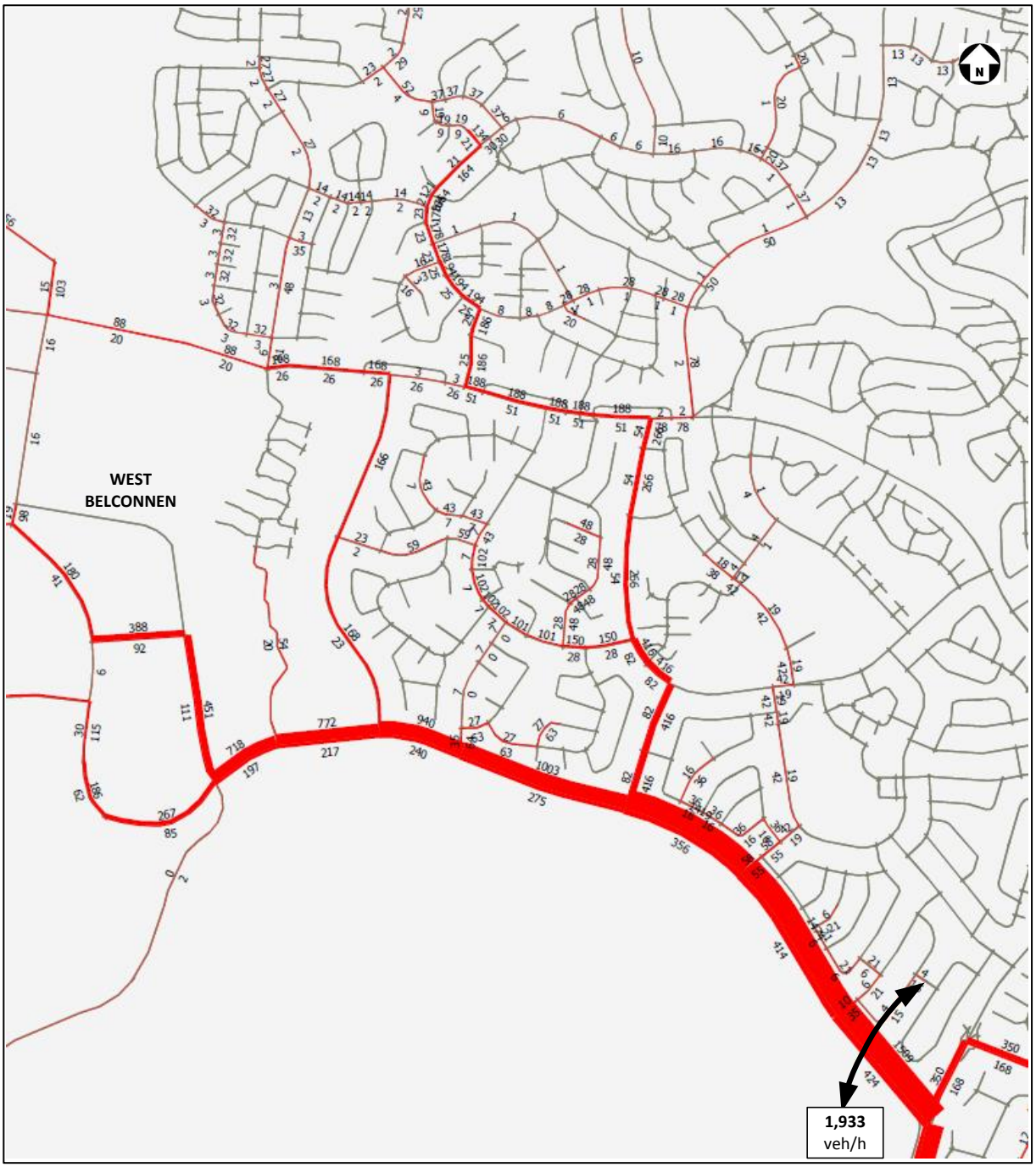
Source: AECOM, CSTM (May 2014); SLA is Select Link Assignment

Figure 39: 2021 AM peak hour SLA for Drake Brockman Drive



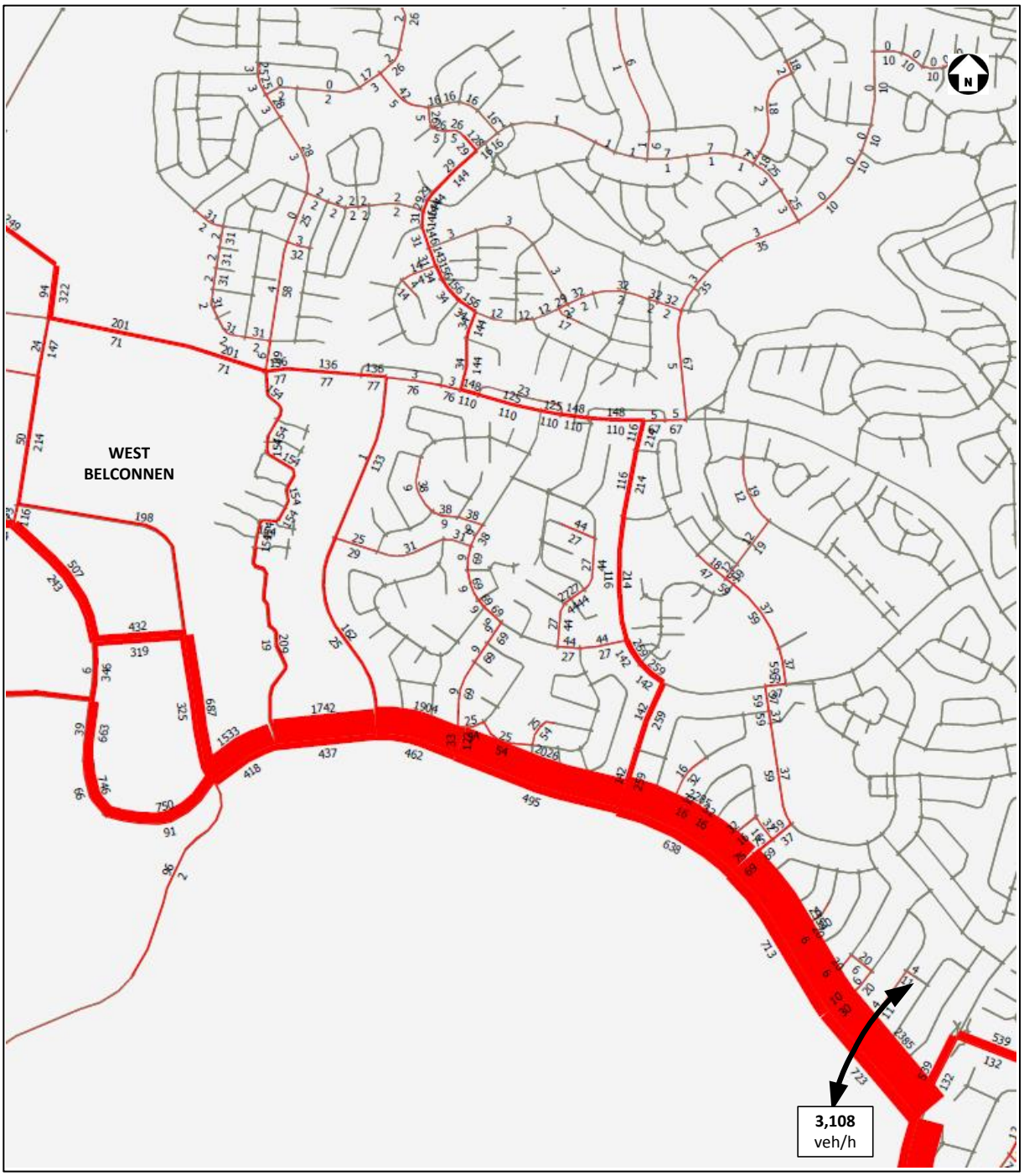
Source: AECOM, CSTM (May 2014); SLA is Select Link Assignment

Figure 40: 2031 AM peak hour SLA for Drake Brockman Drive



Source: AECOM, CSTM (May 2014); SLA is Select Link Assignment

Figure 41: 2041 AM peak hour SLA for Drake Brockman Drive



Source: AECOM, CSTM (May 2014); SLA is Select Link Assignment

5.0 Micro-simulation Modelling

5.1 Base Model Development and Calibration

5.1.1 Overview of model

To assist with the assessment of future infrastructure schemes at West Belconnen, a microsimulation (Commuter) model of the precinct has been developed. The Commuter software package, developed by Azalient, is a microsimulation tool which models the behaviour of people and vehicles in a study area. Rather than model vehicles from zone to zone, each trip in Commuter starts with a person and an area[3]. The person, according to their inherent behaviour, will choose from the available modes to access their destination.

The microsimulation modelling of the precinct needs to accurately represent traffic behaviour in the existing scenario so that informed decisions can be made about infrastructure provisions for the design years. In particular, the base year modelling should:

- Accurately reflect existing traffic volumes in the airport precinct;
- Accurately portray distribution and assignment of vehicles in the study area;
- Accurately reflect typical queuing behaviour; and
- Be regarded as 'fit-for-purpose'.

The study area contains the road network bounded by Kingsford Smith Drive, Drake Brockman Drive, Spofforth Street and Ginninderra Drive as illustrated in Figure 8. The modelled study area includes all of the access roads that are in the vicinity of the West Belconnen development.

Both manual observation turn counts and SCATS detector counts were used as a basis for developing the AM and PM peak hour flows. Based on the collective data, the peak AM and PM peak hours were determined to be 8:00 – 9:00 AM and 17:00 – 18:00 PM.

5.1.2 Sources of data and assumptions

Data used within the micro-simulation model includes:

- Intersection vehicle counts;
- Intersection pedestrian counts;
- Mid-block counts;
- Parking survey;
- SCATS data – signal timings, historical playback, and detector counts.

More details are given in Appendix C.

5.1.3 Network building

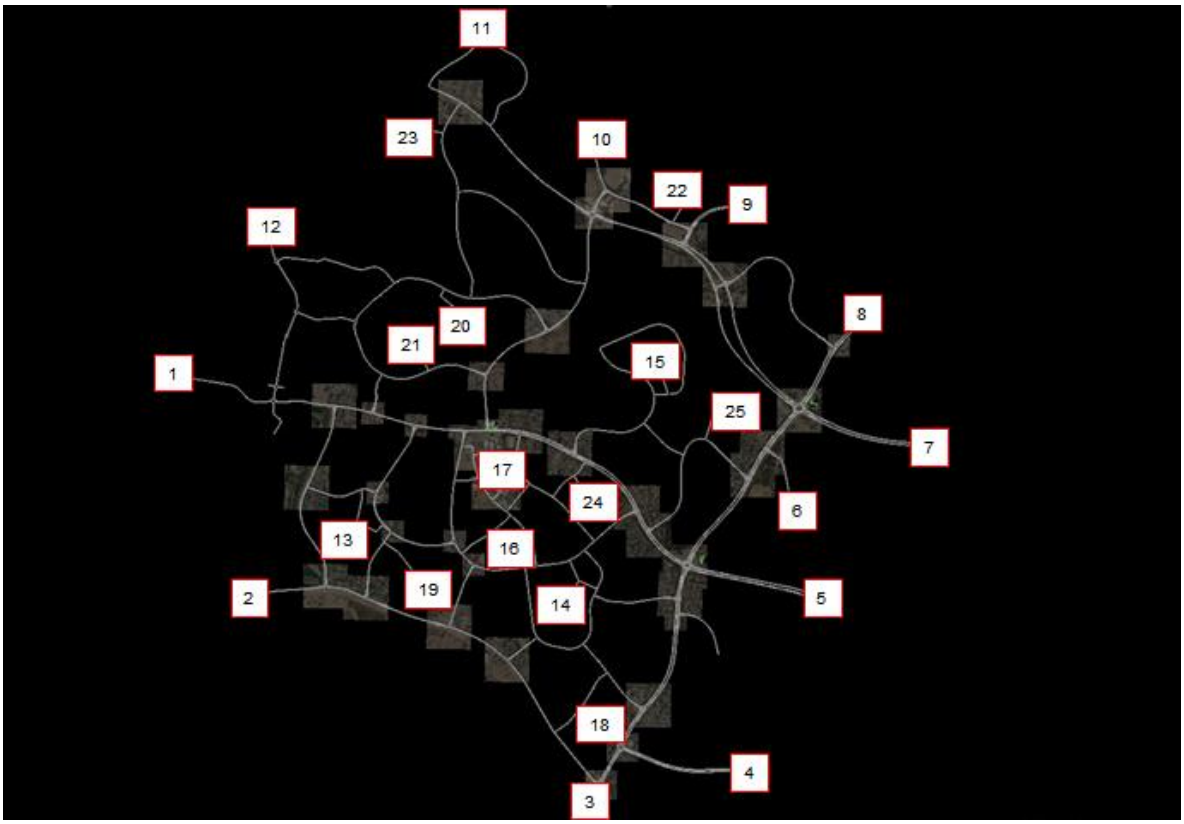
Aerial photography, obtained from publicly available satellite imagery, were used to develop network geometry with the following link and lane attributes:

- Number of lanes;
- Length of turning bays;
- Turn bans;
- Speed limits;
- Stop line locations; and
- Intersection blocking behaviour.

[3] Commuter 5.51 (64-bit version) was used in this study.

The modelled road network and external zone structure for the base (year 2013) West Belconnen Commuter model consists of 31 zones, as illustrated in Figure 42. Another 40 zones are included in future models representing the West Belconnen development.

Figure 42: Network and external zones



Source: © OpenStreetMap contributors, with edits by AECOM, 2013

For the development of the Commuter base model, the following assumptions were made:

- Route choice rules were applied to calibrate the travel behaviour of traffic for each of the modelled hours;
- Where localised behaviour factors do not achieve observed throughputs at signalised intersections, signal playback at the intersections were adjusted to optimise the throughputs;
- No vehicle travelled more than 10% faster than the signposted speed limit;
- 2% heavy vehicle proportion;
- No illegal turns were conducted;
- No pedestrian movements on road;
- Link parameters, lane choice and stream choice rules were used as required to optimise throughput and to reflect capacity from site observations and count data; and
- No vehicles were lost in accessing their destination.

5.1.4 Temporal information

Given the size of the network and limited fluctuations in traffic flows over the peak hours, a flat profile is assumed and applied for each of the modelled hours. A warm up and cool down of 30 minutes for each model was used. Demands for the 30 minute periods were 40% of the peak hour.

5.1.5 Traffic demand

The demand estimation tool within Commuter was utilised to develop demand matrices. For matrix development, a full set of turning volumes at all intersections in the study area, were established to balance the flows, such that no volumes are lost within the model. Where gaps in the data existed, older data was included, and ‘factored’ to match the downstream and upstream midblock volumes.

The balanced turn flows were then entered into the Commuter estimation tool to develop the initial demand matrices. The initial matrices were then adjusted manually based on the established vehicle routes. The estimation tool distributes traffic within the network according to the intersection turning proportions and the link categories. Following the OD matrices estimation process, the matrices were furnessed to ensure that the total trips in and out were balanced for each of the matrices.

5.1.6 Speed distribution

The default setting of the Commuter software distributes the designated speed based on a standard deviation. It was observed during the model building process that this may induce unlikely speed behaviour within the model, especially when a small proportion of slower vehicles may induce slow moving queues; particularly when a road link is constrained.

The ‘Driving Behaviour’ factors within the models were adjusted manually to simulate more realistic traffic behaviour (similar to the default Paramics software). This is achieved by setting the ‘Compliance’ factor to 1.1, to set the mean speed to 10% above the signposted speed limit, and the ‘Variability” factor reduced to 0.03 to reduce the variance of speeds.

5.1.7 Model calibration

The goals of the base West Belconnen micro-simulation model were that the model should satisfy the DMRB requirements regarding the GEH statistic.

The GEH Statistic is a formula used in traffic modelling to compare two sets of traffic volumes (traffic volumes derived from the simulation (for the "base year, base case" scenario) with the real-world traffic volumes). Using the GEH Statistic avoids errors that occur when using simple percentages to compare two sets of volumes since traffic volumes vary over a wide range. The use of GEH as an acceptance criterion for travel demand forecasting models is recognised in the UK Highways Agency's Design Manual for Roads & Bridges (DMRB), Volume 12, Section 2, as well as other references.

With micro-simulation modelling of base case scenarios, a GEH of less than 5.0 is considered a good match between the modelled and observed volumes. The GEH Statistic is calculated by the following formula:

$$GEH = \sqrt{\frac{2 \times (Modelled - Observed)^2}{(Modelled + Observed)}}$$

According to DMRB, 85% of the volumes in a traffic model should have a GEH less than 5.0. GEHs in the range of 5.0 to 10.0 may warrant further calibrating of the model. If the GEH is greater than 10.0, there is a high probability that there is a problem with either the travel demand model or the data.

To benchmark the network performance of the base models, representing the base 2013 flows, the models were calibrated to the balanced vehicles flows along key links and turn flows at intersections. Modelled link volumes were compared to observed traffic counts. It was confirmed that over 85% of the movements at the links were calibrated to below GEH 5.0 for the AM modelled hours.

The simulation has satisfied these criteria for both the AM and PM peak models. The base models:

- Have link and turn volume GEH results where none exceed a GEH of 10.0, and at least 93% of all GEH values are less than 5.0;
- Accurately portray queuing behaviour; and
- Have been verified by internal review.

As such, these models are considered fit for purpose for assessing infrastructure requirements to inform the Master Plan. More details are provided below.

Traffic volume calibration results

Observed counts were compared with model estimates at 48 mid-block (or link) locations in the modelled network. In the AM peak, a total of 98% of the modelled links achieved a GEH value under 5.0 with all turns under a GEH value of 10, thereby satisfying the link flow calibration criteria. In the PM peak, 100% of the modelled links achieves a GEH value under 5.0 with all turns under a GEH value of 10. This shows that the model is calibrated within acceptable criteria. The results of the link comparisons are provided in Appendix C.

In addition to the link flows, the turn flows at key intersections were calibrated for the AM and PM peaks. For both the AM and PM peak, a total of 93% of the modelled turn counts achieved a GEH value under 5.0 with all turns under a GEH value of 10. This shows that the model is calibrated within acceptable criteria. The results of the intersection turn flow comparisons are provided in Appendix C.

Queue length validation

The queue length measurements from the models were compared with site observations at a number of key intersections:

- Kingsford Smith Drive / Southern Cross Drive
- Kingsford Smith Drive / Belconnen Way/ Drake Brockman Drive
- Kingsford Smith Drive / Ginninderra Drive
- Southern Cross Drive near Kippax

The whole of the modelled area does not experience any significant delays or queuing at present and this is consistent with the modelled screen shots at major intersections. Some screenshots are given in Appendix C.

5.1.8 Intersection performance

For benchmarking and comparison to future network performance, the performance of key locations in the study area was recorded. The link delay measurements were gathered over the simulation period, for each peak hour, with the performance of the key intersections based upon the Level of Service. The intersection delays and Level of Service by approach at key intersections are summarised in Table 5 and Table 6.

5.2 Future Modelling

The modelling of future travel demand in Commuter used traffic demand data from EMME and started with the current road network. It was undertaken in a step-wise manner, as follows:

- *2021 Modelling:* Adding the primary new West Belconnen road links that are expected to exist by 2021, as well as any other local improvements, then loading 2021 demands onto this network for the AM and PM peaks. Any significant queueing in the network was addressed to create an upgraded 2021 network.
- *2031 Modelling:* Adding any additional West Belconnen road links that are expected to be created between 2021 and 2031 to the upgraded 2021 network, then loading 2031 demands onto this network for the AM and PM peaks. Any significant queueing in the network was addressed to create an upgraded 2031 network.
- *2041(Ultimate) Modelling:* Adding any additional West Belconnen road links that are expected to be created between 2031 and 2041 to the upgraded 2031 network, then loading 2041 demands onto this network for the AM and PM peaks. Unlike other years, the increased demand was added in three increments. Any significant queueing in the network for each increment in demand was addressed to create an upgraded 2041 network; this went through three iterations to produce a final upgraded 2041 (Ultimate) network.

The predicted increase in traffic demand from 2031 to 2041 (Ultimate) is considerable and modelling of the 2041 scenario was conducted in stages. It had the advantage of gradually releasing demand from the development and introducing changes to the road network in stages.

The processes and outcomes involved in producing the future traffic demands and updated road networks are described in this section (Sections 5.2). This is followed by the presentation of a summary of the results of the Commuter modelling in Sections 5.3 to 5.6.

5.2.1 Future Traffic Demand

Commuter traffic demand matrices were created from a cordoned area matrix from the CSTM. The cordoned area CSTM external zones were matched with Commuter zones and a matrix in correct format was entered directly into the AM peak micro-simulation model. As the CSTM has been built for the AM peak only, the following assumptions were used to develop PM demand matrices for Commuter:

- Volumes to and from all development zones were reversed,
- Volumes between Commuter base model zones were multiplied by a growth factor calculated by comparing CSTM 2011 and future matrices for each relevant future scenario.

Future Commuter models also include new bus services that are proposed to operate from the West Belconnen development and running to Belconnen and City via Southern Cross Drive and William Hovell Drive. Table 15 shows a summary of the number of new bus services connecting Belconnen area to City during the AM peak, based on CSTM bus passenger demands. In the 2021 scenario West Belconnen residents will have a frequent bus service taking them to Kippax, where they can catch one of the services heading to City. In the 2031 and 2041 (ultimate) scenarios it is possible to commute to City on one of the direct XPresso services proposed to be running via the Drake Brockman/William Hovell corridor or via a transfer at Kippax. It is assumed that bus frequencies will be the same in both the AM and PM peaks, but reversed in direction.

Table 15: Summary of future bus frequencies connecting to Belconnen and City by corridor

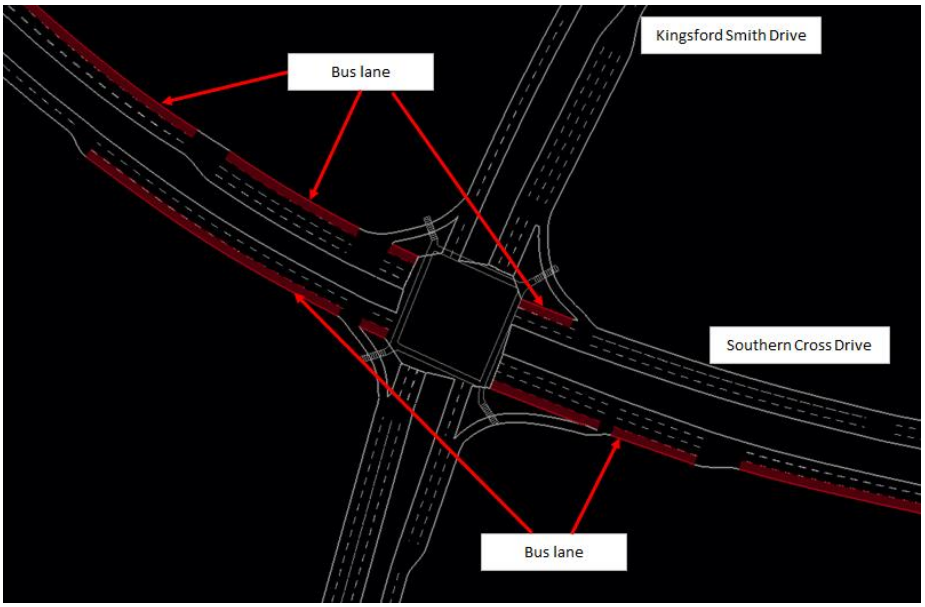
Corridor	2021	2031	2041
Kippax/Southern Cross Drive	27 buses/h	38 buses/h	51 buses/h
Drake Brockman Drive/William Hovell Drive	0	4 buses/h	16 buses/h

5.2.2 2021 Road Network

2021 road network in Commuter model does not have any improvements other than committed schemes within Belconnen, which include:

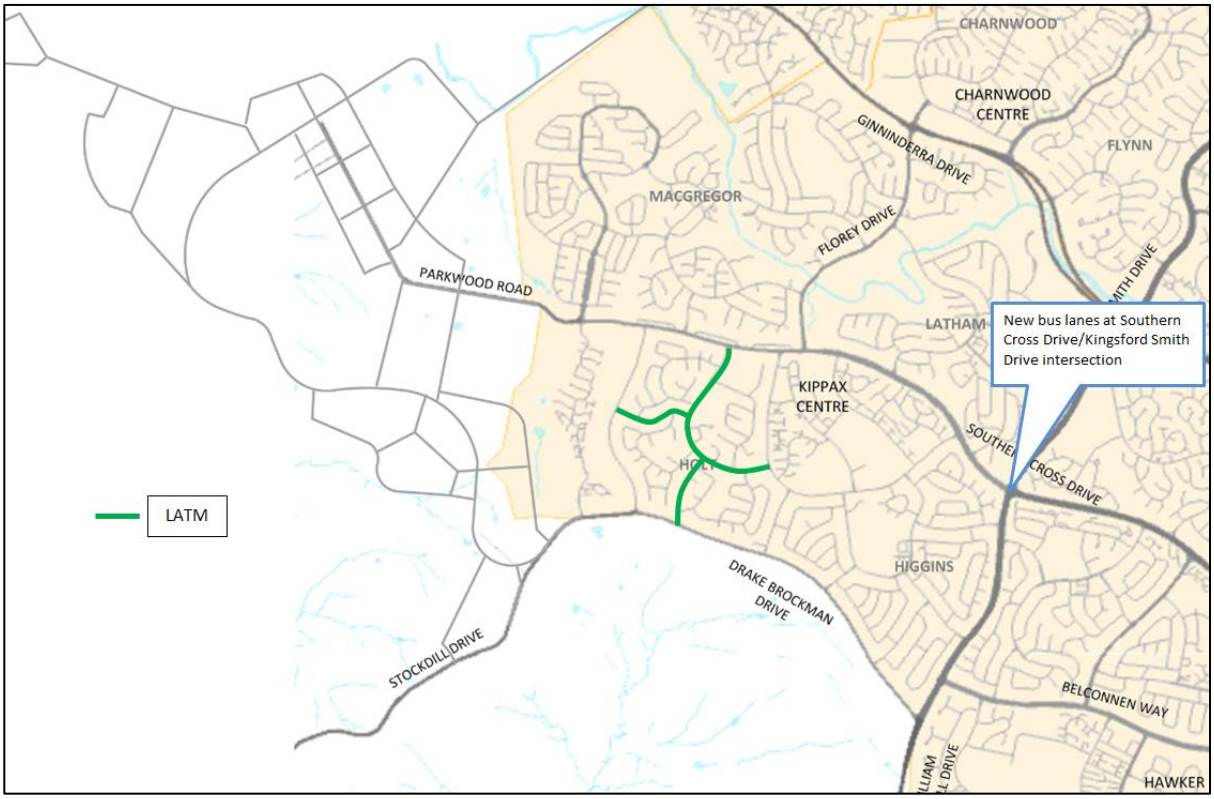
- Kingsford Smith Drive/Southern Cross Drive intersection bus lanes, illustrated in Figure 43
- Local Area Traffic Management (LATM) on Beaurepaire Crescent, Messenger Street and Trickett Street, as shown in Figure 44

Figure 43: Kingsford Smith Drive/Southern Cross Drive intersection layout with bus lanes



Source: AECOM Commuter (2014)

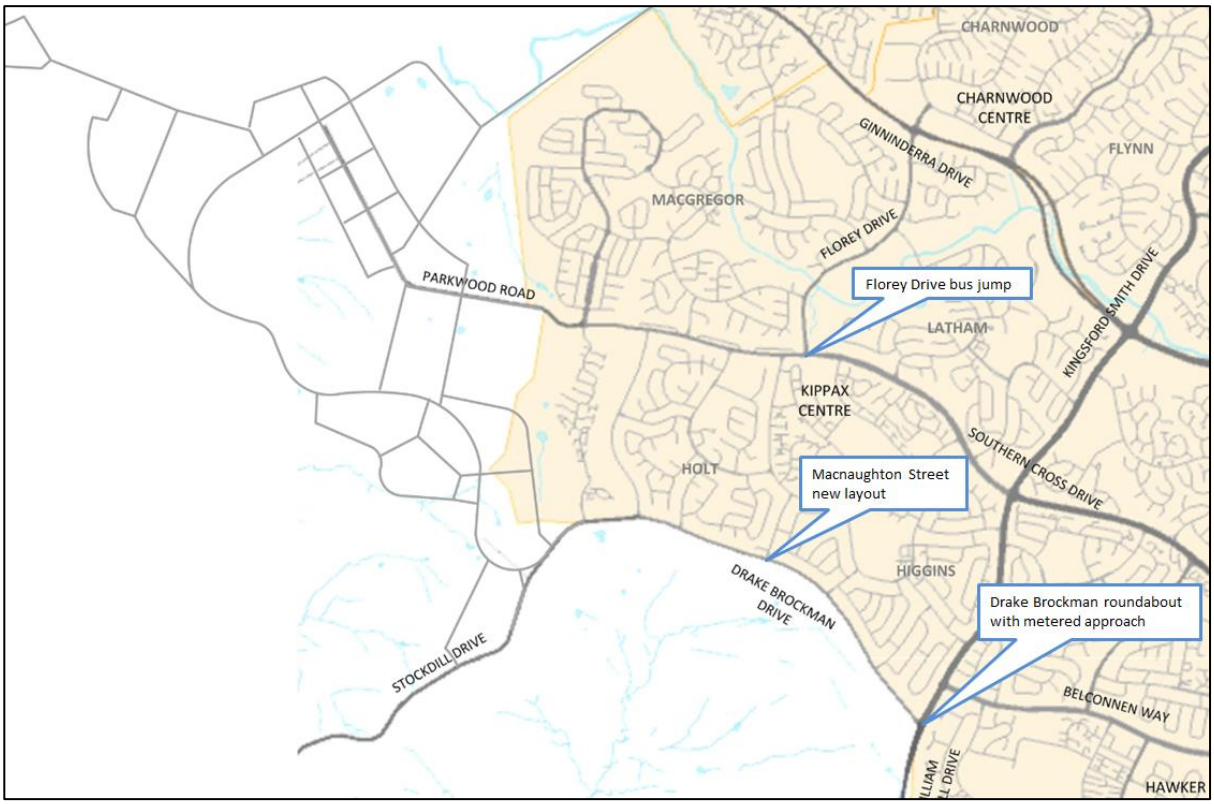
Figure 44: Overview of 2021 changes to road network



5.2.3 2031 Road Network

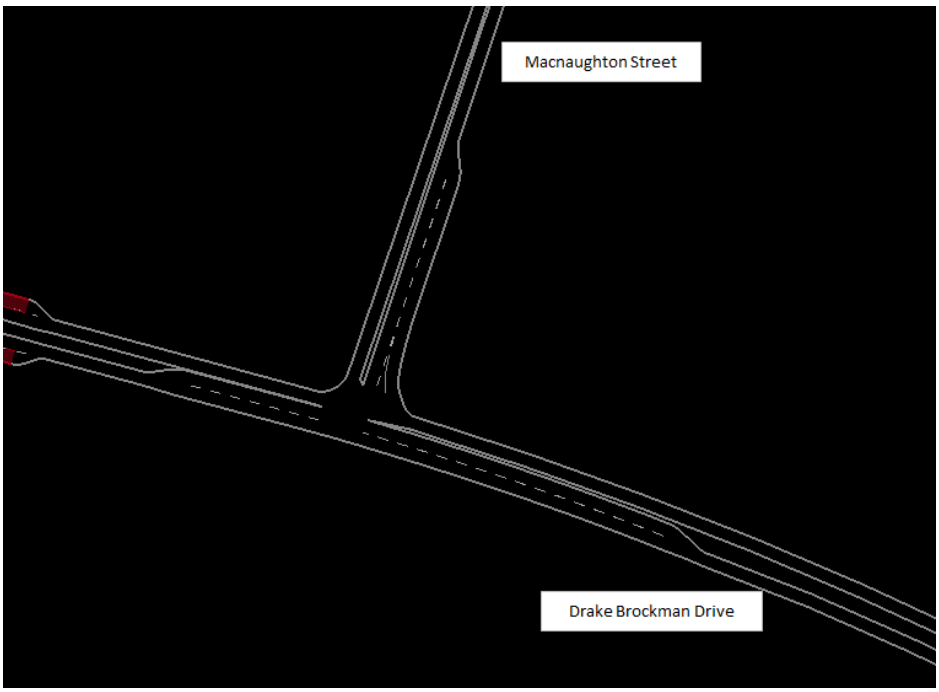
An overview of changes to the 2031 road network is shown in Figure 45 and a description of these follows.

Figure 45: Overview of 2031 changes to road network



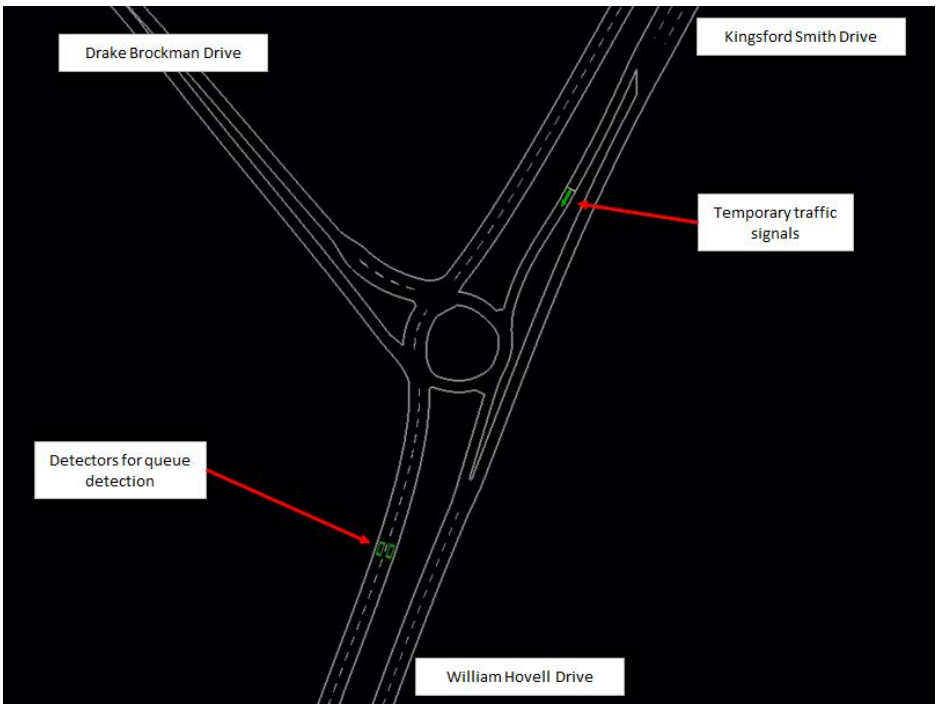
Drake Brockman Drive/Macnaughton Street intersection is converted to a “Seagull” layout, with 2 marked lanes on Macnaughton Street and dedicated lane for right turning traffic from Drake Brockman Drive. It also has a short lane for traffic turning right from Macnaughton Street, as shown in Figure 46.

Figure 46: Drake Brockman Drive/Macnaughton Street intersection new layout



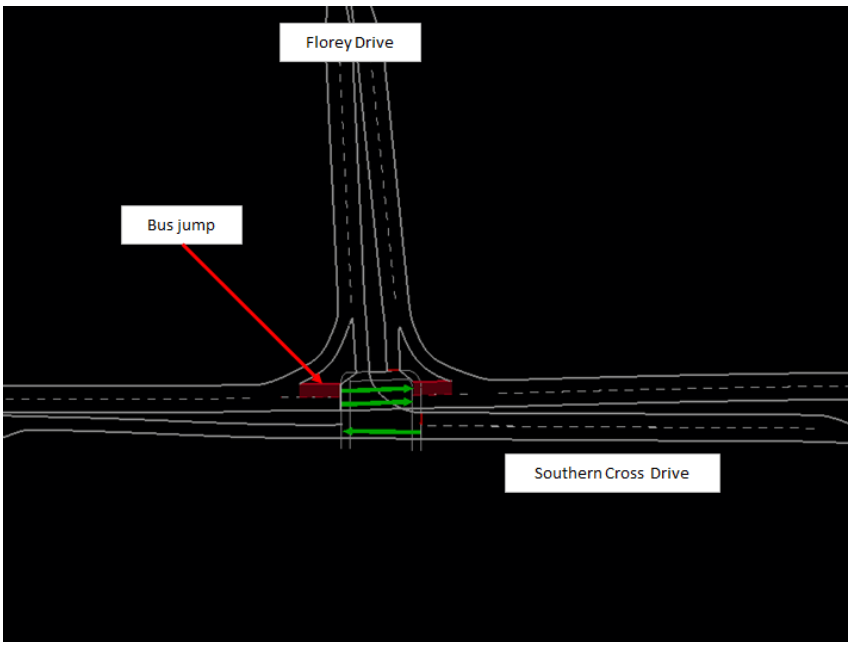
Drake Brockman Drive/Kingsford Smith Drive/William Hovell Drive roundabout has traffic signal metering to reduce queues and delays on the William Hovell Drive northbound approach. These traffic signals are temporary and activate only when long queues are detected on the northbound approach. If a queue reaches the detectors on the northbound approach the signals turn to red to delay traffic attempting to turn into Drake Brockman Drive from Kingsford Smith Drive.

Figure 47: Drake Brockman Drive/Kingsford Smith Drive/William Hovell Drive roundabout with metered approach



Southern Cross Drive/Florey Drive has a bus queue jump lane in the eastbound direction that allows buses to bypass potential traffic queues here. This provides a low level of priority to public transport here; buses do not force/ request right of way.

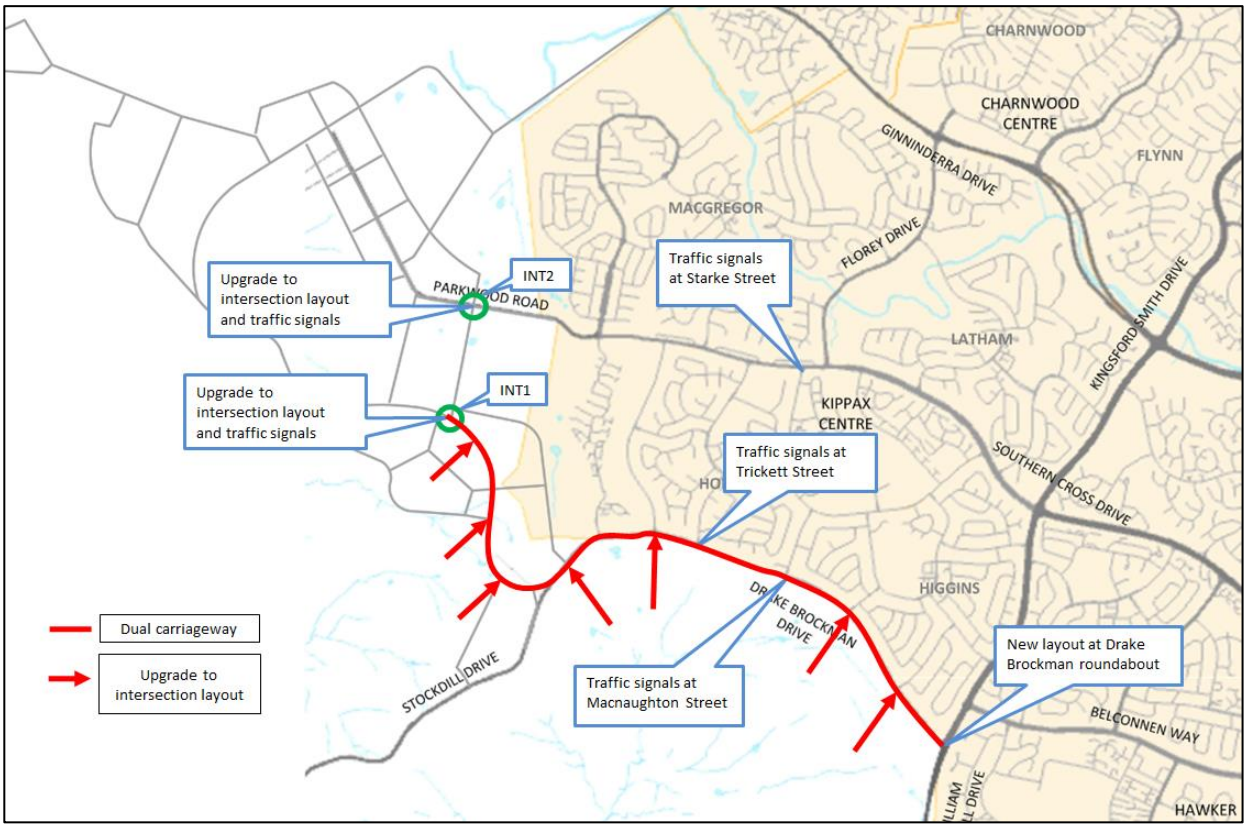
Figure 48: Southern Cross Drive/Florey Drive bus jump



5.2.4 2041 (Ultimate) Road Network

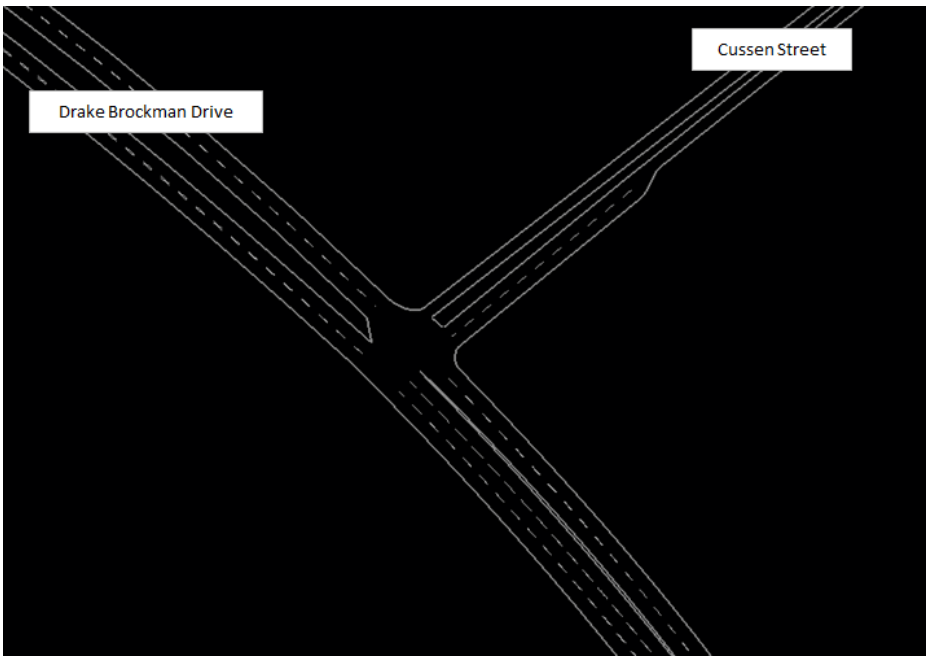
An overview of changes to the 2041 road network is shown in Figure 49 and a description of key features follows.

Figure 49: Overview of 2041 changes to road network



Drake Brockman Drive intersections with Kinsella Street, Cussen Street and Spofforth Street upgraded to new layout. Each intersection has two marked lanes on approach to Drake Brockman Drive, dedicated lane for right turning traffic from the main road and they all are priority controlled (see typical layout in Figure 50).

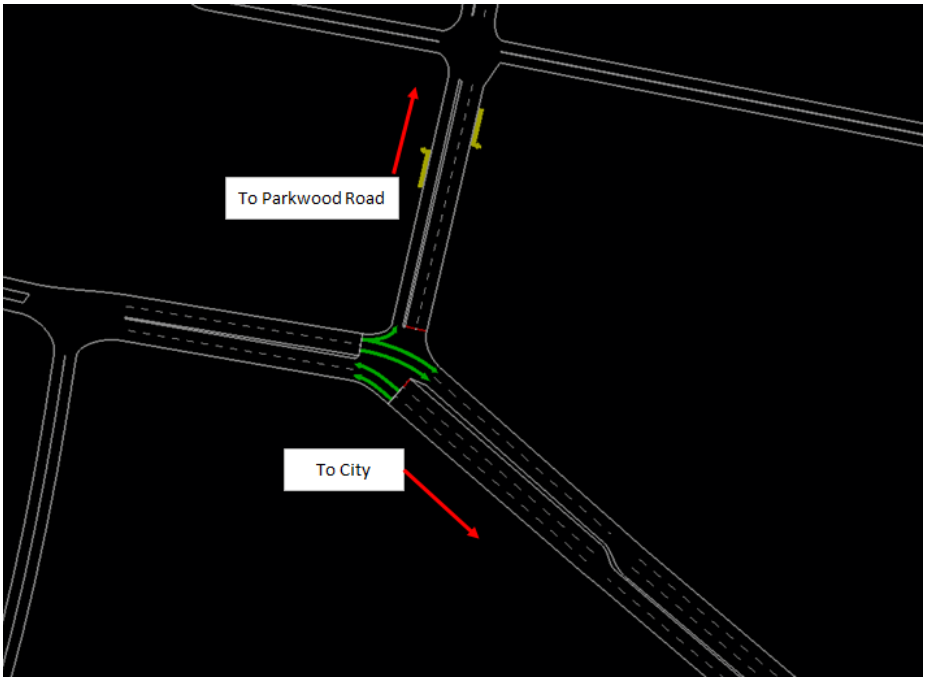
Figure 50: Example of priority controlled intersection on Drake Brockman Drive



Drake Brockman Drive intersections with Macnaughton Street and Trickett Street are upgraded to signalised intersections. Each intersection has two marked lanes on approach to Drake Brockman Drive and a dedicated turn lane for right turning traffic from the main road.

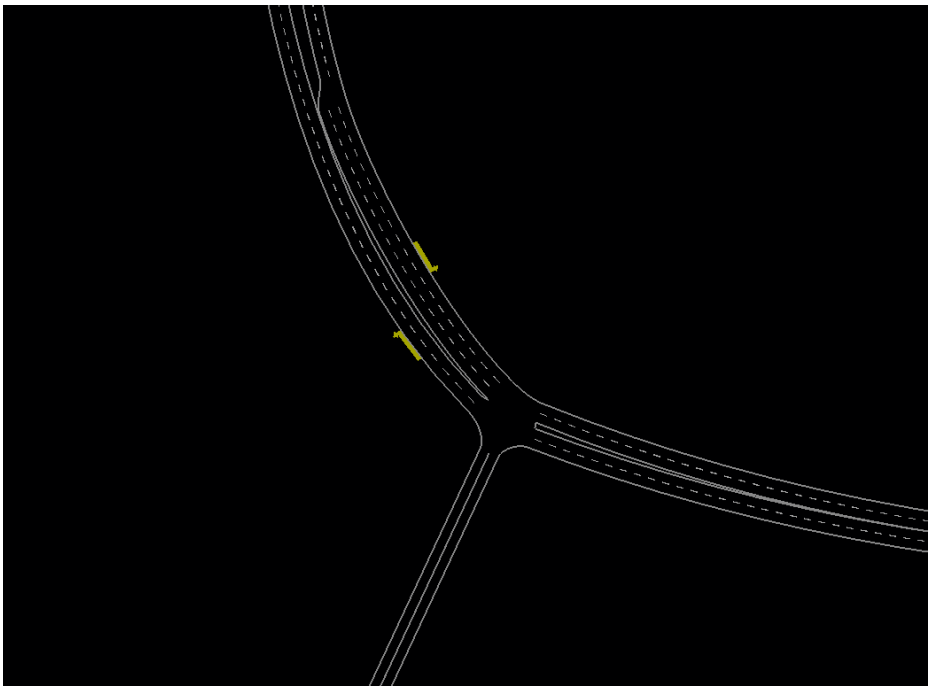
Intersection "INT1" within the West Belconnen development area is upgraded to a new layout and traffic signals control. It has two lanes on the northern approach, two lanes on the eastern and western arms of the intersection and a dedicated lane for right turning traffic (see Figure 51).

Figure 51: Indicative layout of intersection "INT1"



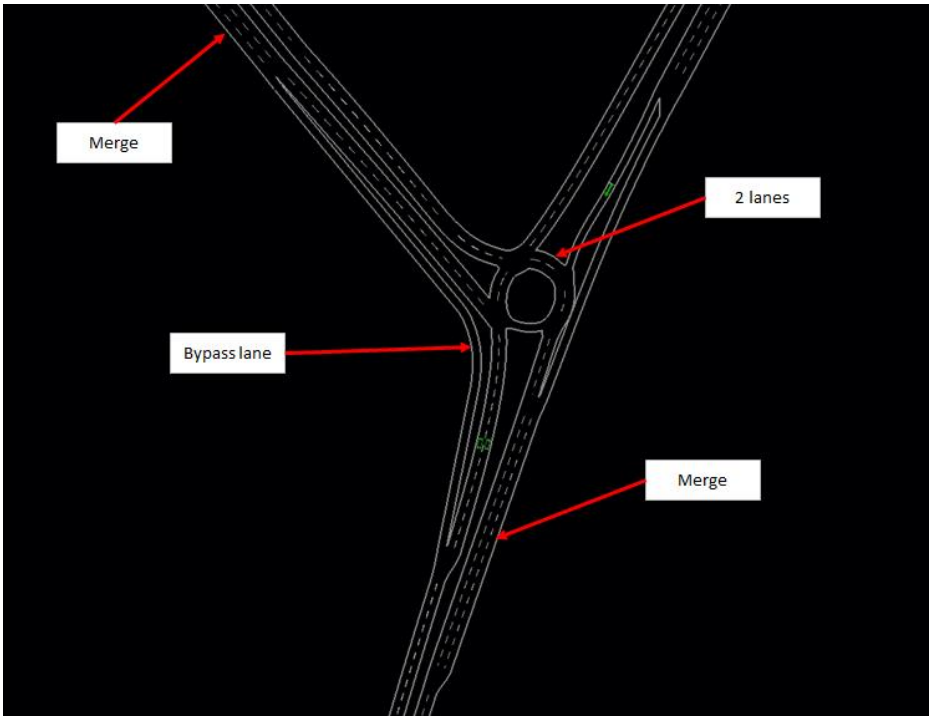
Intersections with heavy right turning traffic in section between intersection "INT1" and Spofforth Street are upgraded to a layout with a dedicated lane for right turning traffic in the City-bound direction (see Figure 52).

Figure 52: Example of intersection with dedicated right turning lane



Drake Brockman Drive/Kingsford Smith Drive/William Hovell Drive roundabout layout is upgraded. The roundabout has two lanes for traffic to City, which then merges with the existing southbound bypass from Kingsford Smith Drive. For traffic turning left from William Hovell Drive there is a bypass lane, which then merges with westbound traffic on Drake Brockman Drive. The design of the exit can be simplified to create one lane exiting the roundabout and removing the need for the merge on Drakeford Drive.

Figure 53: New layout of Drake Brockman Drive/Kingsford Smith Drive/William Hovell Drive roundabout

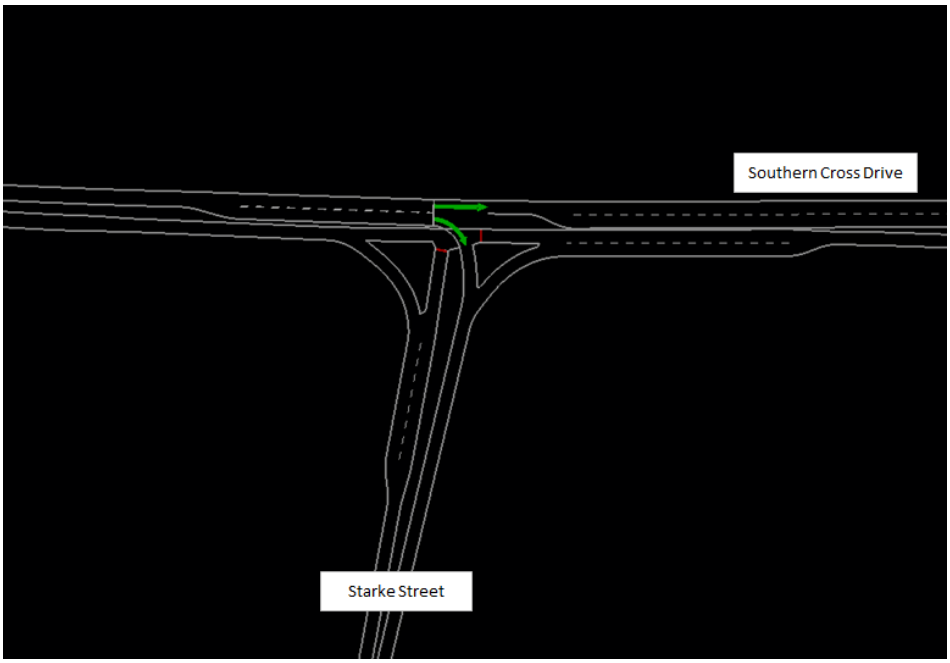


"INT2" intersection on Parkwood Road within the West Belconnen development site is upgraded to a signalised intersection with additional lanes on the northern and eastern arms of the intersection (see Figure 54).

Figure 54: Indicative layout of Parkwood Road intersection "INT2"

Southern Cross Drive/Starke Street (near Kippax) intersection upgraded to traffic signal controlled and coordinated with Southern Cross Drive/Florey Drive intersection (see Figure 55).

Figure 55: Southern Cross Drive/Starke Street intersection signalised layout

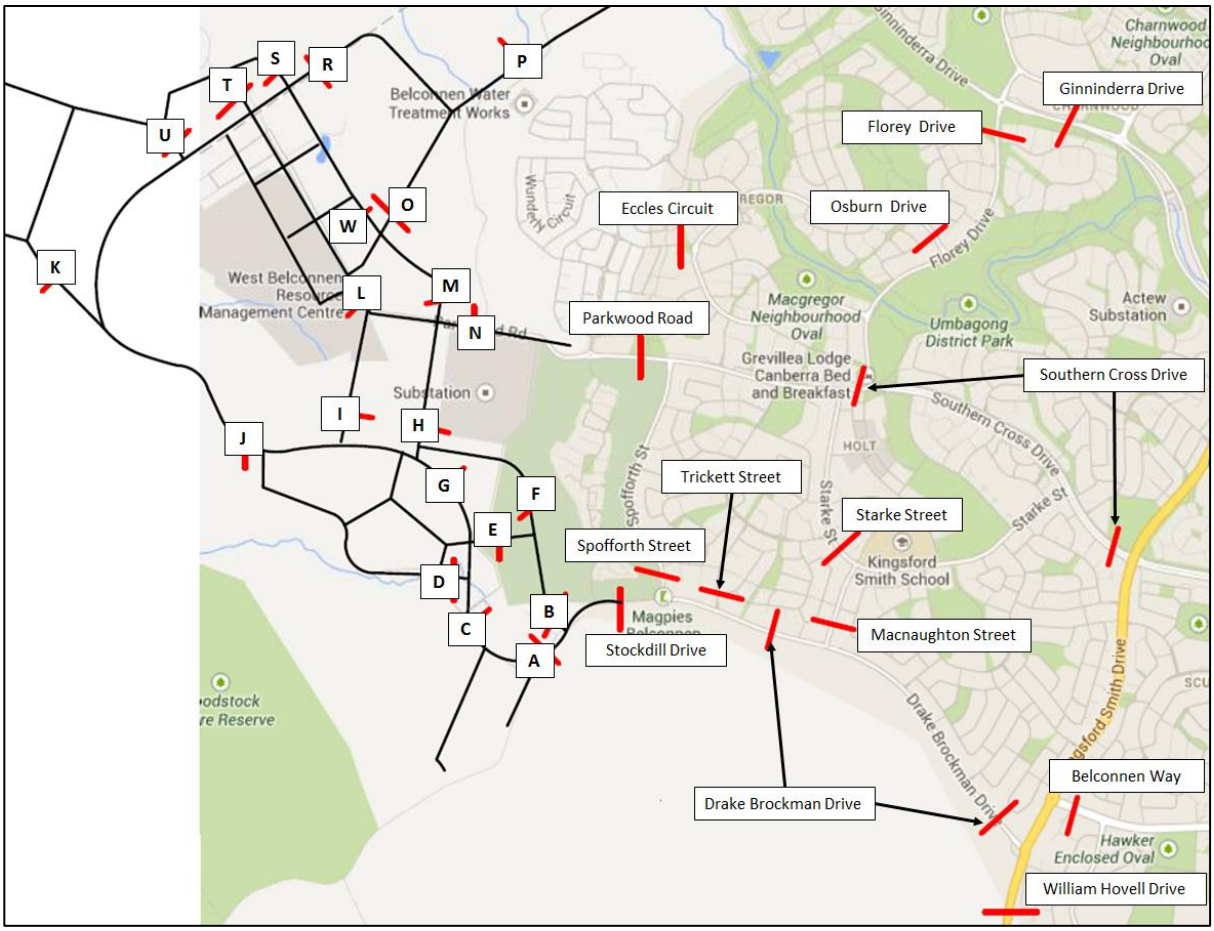


5.3 Traffic on External Road Corridors

5.3.1 Data Collection

To benchmark and compare future scenario volumes, a number of data collection points were defined across the existing road network as well as within the proposed development road network. The location of data collection points and their labels is shown in Figure 56. This map will be used as a reference for Commuter traffic forecasts provided in Sections 5.3 to 5.5 of this Chapter.

Figure 56: Location of data collection points in Belconnen and development



Source: © Google Maps, with edits by AECOM, 2014

5.3.2 Drake Brockman Drive and Stockdill Drive

The AM and PM peak hour traffic forecasts for key locations along Stockdill Drive and Drake Brockman Drive are given in Table 16 and Table 17. The observation of peak hour traffic operations in Commuter indicated that Stockdill Drive and Drake Brockman Drive will experience steady traffic volume growth in both peaks and it will be able to carry traffic in its existing form until 2031, when it is forecast to start approaching its maximum capacity for a 2-lane 2-way road. However, before then, there will be a need to upgrade intersections to formalise right turns and improve the amenity of residents with direct access to Drake Brockman Drive (ie., provision of a service road).

Prior to 2031 all intersections between Kingsford Smith Drive and Spofforth Street will need to be upgraded to a new layout. An appropriate layout for these intersections is 2 marked lanes on the side road approach and a dedicated lane for right turning traffic into the side road.

Table 16: Drake Brockman Drive and Stockdill Drive volume comparison – AM peak

Intersection	2013	2021	2031	2041
Stockdill Drive EB	117	717	1026	1834
Stockdill Drive WB	72	236	342	594
Drake Brockman Drive EB near Macnaughton	477	1163	1399	2168
Drake Brockman Drive WB near Macnaughton	135	280	400	663
Drake Brockman Drive EB near KSD	681	1316	1470	2230
Drake Brockman Drive WB near KSD	192	320	448	731

Table 17: Drake Brockman Drive and Stockdill Drive volume comparison – PM peak

Intersection	2013	2021	2031	2041
Stockdill Drive EB	108	335	447	683
Stockdill Drive WB	89	759	1095	1961
Drake Brockman Drive EB near Macnaughton	166	333	431	670
Drake Brockman Drive WB near Macnaughton	433	995	1205	2037
Drake Brockman Drive EB near KSD	215	367	449	719
Drake Brockman Drive WB near KSD	808	1290	1463	2180

Drake Brockman Drive will carry bus services from the development to Kippax and William Hovell Drive via the Macnaughton Street intersection. These services will be frequent and while buses to Kippax will have no problems with performing the left turn into Macnaughton Street, buses in the opposite direction (right turning from Macnaughton Street) will have problems finding a safe gap in traffic by 2031. Thus, the Macnaughton Street intersection is recommended to be signalised by 2031.

Beyond 2031, the Commuter modelling showed that the Trickett Street is likely to require signalisation in the longer-term. A left-turn bypass lane from William Hovell Drive would also be required.

5.3.3 Southern Cross Drive and Parkwood Road

The AM and PM peak hour traffic forecasts for key locations along Parkwood Road and Southern Cross Drive are given in Table 18 and Table 19. In the 2021 scenario Parkwood Road is not expected to experience any growth in traffic as the first stage of development will be accessed via Stockdill Drive. Observations in Commuter indicate that Parkwood Road can cater for the expected increases in traffic in its current 2-lane 2-way form.

Table 18: Southern Cross Drive and Parkwood Road volume comparison – AM peak

Intersection	2013	2021	2031	2041
Parkwood Road EB	302	302	533	933
Parkwood Road WB	68	35	203	336
SCD EB near Kippax	557	574	761	1036
SCD WB near Kippax	368	360	505	597
SCD EB near KSD	1206	1583	1303	1613
SCD WB near KSD	422	762	831	986

Table 19: Southern Cross Drive and Parkwood Road volume comparison – PM peak

Intersection	2013	2021	2031	2041
Parkwood Road EB	122	30	179	300
Parkwood Road WB	445	227	507	936
SCD EB near Kippax	580	520	541	616
SCD WB near Kippax	788	690	862	1274
SCD EB near KSD	640	603	601	648
SCD WB near KSD	1356	1214	1269	1559

Southern Cross Drive between Starke Street (near Kippax) and Kingsford Smith Drive will experience growth in traffic volumes after 2021, but the growth can be accommodated by the existing road layout. The intersections determine the road's capacity to carry increased traffic.

The intersection with Kingsford Smith Drive currently operates at a Level of Service D (in both peaks) and increased volumes on Southern Cross Drive will not adversely impair its operation. This can be attributed to adjustments to signal timing at this intersection, which were applied to reflect changes in flow patterns. Increased volumes at the Florey Drive intersection affected its operation, however, it moved from Level of Service B in 2013 to Level of Service C after 2021. For more details on Level of Service analysis refer to Section 5.6.

5.3.4 Ginninderra Drive

The AM and PM peak hour traffic forecasts for key locations along Ginninderra Drive are given in Table 20. The analysis of volumes on Ginninderra Drive shows that growth occurs in 2041 when the Ginninderra Drive Connection is provided. Observations in Commuter modelling showed no significant delays or queues in this corridor; therefore no improvements are proposed in this corridor.

The Ginninderra Drive/Kingsford Smith Drive signalised intersection will be affected by higher volumes in 2041, during the PM peak. However, this can be resolved by improved signal phasing or signal timing. For more details refer to Section 5.6.

Table 20: Ginninderra Drive volume comparison – AM and PM peak

Intersection	2013	2021	2031	2041
AM - Ginninderra Drive EB	1146	1228	1046	1406
AM - Ginninderra Drive WB	229	481	492	535
PM - Ginninderra Drive EB	570	587	492	597
PM - Ginninderra Drive WB	1016	1047	884	1296

5.3.5 Belconnen Way and William Hovell Drive

The AM and PM peak hour traffic forecasts for key locations along Belconnen Way and William Hovell Drive are given in Table 21 and Table 22. Analysis of volumes shows that from 2013 to 2021 some traffic shifted from Belconnen Way to William Hovell Drive and after 2021 volumes on Belconnen Way stay relatively steady in both directions. The forecast volume of traffic on Belconnen Way is well below the capacity for this type of road.

Traffic on William Hovell Drive currently experience some delays at the merge in the southbound direction during the AM peak and with queuing in the northbound direction during the PM peak. Increased volumes on William Hovell Drive will not worsen roundabout performance in the 2031 AM peak, but increased northbound flows approaching the roundabout during the 2031 PM peak will cause long queuing. Prior to 2031 it will be necessary to introduce a metered approach on Kingsford Smith Drive with temporary traffic signals activated by long queues on the northbound William Hovell Drive approach (see Figure 47). By 2041 traffic volumes running through the roundabout will exceed its capacity and it is proposed to upgrade the roundabout layout to accommodate 2 lanes on circulatory from Drake Brockman Drive to William Hovell Drive and a bypass lane for traffic from William Hovell Drive to Drake Brockman Drive (see Figure 53).

Table 21: William Hovell Drive and Belconnen Way volume comparison – AM peak

Intersection	2013	2021	2031	2041
Belconnen Way EB	709	454	457	681
Belconnen Way WB	302	193	237	200
William Hovell Drive NB	340	205	277	651
William Hovell Drive SB	1463	1690	1450	1937

Table 22: William Hovell Drive and Belconnen Way volume comparison – PM peak

Intersection	2013	2021	2031	2041
Belconnen Way EB	484	534	505	473
Belconnen Way WB	1046	1271	1146	1300
William Hovell Drive NB	1311	1399	1561	2267
William Hovell Drive SB	280	330	347	649

5.3.6 Florey Drive

The AM and PM peak hour traffic forecasts for key locations along Florey Drive are given in Table 23. In 2013 this road is flowing relatively freely. The analysis of forecast traffic shows no increase in peak hour traffic volumes, so traffic conditions on Florey drive are expected to remain relatively stable. In fact, some reduction in traffic growth is expected along Florey Drive due to increased public transport usage and the Ginninderra Drive Connection.

Table 23: Florey Drive volume comparison - AM and PM peak

Intersection	2013	2021	2031	2041
AM - Florey Drive NB	288	285	311	283
AM - Florey Drive SB	254	268	252	217
PM - Florey Drive NB	419	413	354	338
PM - Florey Drive SB	470	510	413	397

5.3.7 Spofforth Street

The AM and PM peak hour traffic forecasts for key locations along Spofforth Street are given in Table 24. Analysis of traffic on Spofforth Street shows that volumes will increase in future scenarios, however, this growth in not high and is well within the capacity of this type of road.

Table 24: Spofforth Street volume comparison – AM and PM peak

Intersection	2013	2021	2031	2041
AM - Spofforth Street NB	19	52	56	77
AM - Spofforth Street SB	33	121	93	121
PM - Spofforth Street NB	87	87	63	77
PM - Spofforth Street SB	13	68	70	102

5.4 Traffic on External Local Streets

5.4.1 Osburn Drive

Osburn Drive is a 2-lane 2-way road in the shape of a crescent, which at both ends connects to Florey Drive. This road provides access to many parts of Macgregor, but is not very congested. In 2031 it is forecast that AM peak traffic volumes will grow due to local growth in the area (see Table 25). This increased traffic volume can be accommodated by a road of this type.

Table 25: Osburn Drive volume analysis – AM and PM peak

Intersection	2013	2021	2031	2041
AM - Osburn Drive EB	360	296	564	529
AM - Osburn Drive WB	146	267	383	340
PM - Osburn Drive EB	208	222	200	187
PM - Osburn Drive WB	321	317	251	287

5.4.2 Eccles Circuit

Eccles Circuit is a 2-lane 2-way road providing access from Osburn Drive to West Macgregor. Analysis of future volumes shows that this road will remain unaffected by West Belconnen development with low traffic volumes recorded in every future scenario (see Table 26).

Table 26: Eccles Circuit volume comparison - AM and PM peak

Intersection	2013	2021	2031	2041
AM - Eccles Circuit EB	189	230	195	198
AM - Eccles Circuit WB	96	119	117	100
PM - Eccles Circuit EB	136	137	117	105
PM - Eccles Circuit WB	153	151	151	129

5.4.3 Trickett Street

Trickett Street is a 2-lane 2-way road, which provides a connection between Beaurepaire Crescent and Drake Brockman Drive in Holt. Analysis of future scenarios shows that in 2021 traffic volumes will increase in comparison to 2013, but after 2021 it will not experience any additional growth. In fact, in 2041 traffic in peak directions will be lower than in 2031 (see Table 27). In the long-term the Trickett Street intersection with Drake Brockman Drive is proposed to be upgraded to traffic signal controlled.

Table 27: Trickett Street volume comparison – AM and PM peak

Intersection	2013	2021	2031	2041
AM - Trickett Street NB	68	135	151	142
AM - Trickett Street SB	353	460	431	373
PM - Trickett Street NB	290	318	224	198
PM - Trickett Street SB	81	100	90	92

5.4.4 Starke Street

Starke Street is a 2-lane 2-way road in a shape of a crescent, which at both ends connects to Southern Cross Drive and can be used as connection between Southern Cross Drive and Drake Brockman Drive. Analysis of future traffic shows West Belconnen development has no negative impact on traffic volumes on Starke Street and will remain unaffected in scenarios until 2031 and slightly lower in the 2041 scenario (see Table 28).

Table 28: Starke Street volume comparison – AM and PM peak

Intersection	2013	2021	2031	2041
AM - Starke Street EB near Macnaughton	346	266	183	182
AM - Starke Street WB near Macnaughton	148	123	105	91
PM - Starke Street EB near Macnaughton	100	119	102	92
PM - Starke Street WB near Macnaughton	352	375	361	210

5.4.5 Macnaughton Street

Macnaughton Street is a 2-lane 2-way road, which provides a connection between Starke Street and Drake Brockman Drive. This road currently carries bus services, but with low frequency. In future scenarios Macnaughton Street will carry buses from the West Belconnen development to Kippax and buses to City running through Kippax.

Analysis of future traffic shows that Macnaughton Street will not have much traffic growth (see Table 29). However, 2031 observations in Commuter showed that it started experiencing problems with queuing on approach to Drake Brockman Drive. This queuing will be caused by increased traffic volume on Drake Brockman Drive, rather than Macnaughton Street. By 2041 it is proposed to upgrade the Macnaughton Street intersection to traffic signal controlled. Signalisation aims to reduce queuing and increase safety, especially to cater for the high number of buses that will use this intersection in future.

Table 29: Macnaughton Street volume comparison – AM and PM peak

Intersection	2013	2021	2031	2041
AM - Macnaughton Street NB	109	154	154	108
AM - Macnaughton Street SB	196	192	132	110
PM - Macnaughton Street NB	292	309	314	171
PM - Macnaughton Street SB	75	170	179	138

5.5 Traffic on Development Roads

Tables with forecast 2021, 2031 and 2041 AM and PM peak hour traffic volumes on proposed new roads within the West Belconnen development are provided in Appendix D. The main conclusions from the analysis of this data and observations of traffic operations in Commuter are summarised in Figure 49 and described in Section 5.2.4.

5.6 Intersection Performance

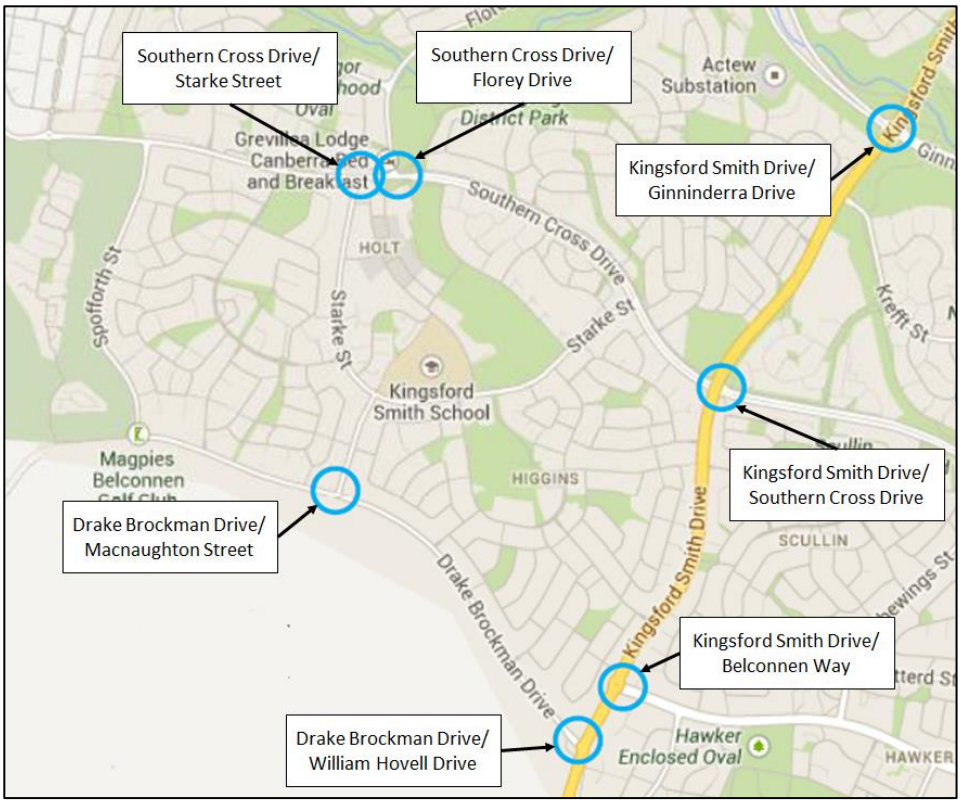
5.6.1 Delays at key intersections

In addition to traffic volumes, the performance of key intersections in the network was recorded in Commuter. These intersections are:

- Kingsford Smith Drive/Southern Cross Drive,
- Kingsford Smith Drive/Ginninderra Drive,
- Southern Cross Drive/Florey Drive,
- Drake Brockman Drive/William Hovell Drive/Kingsford Smith Drive,
- Kingsford Smith Drive/Belconnen Way,
- Southern Cross Drive/Starke Street (near Kippax), and
- Drake Brockman Drive/Macnaughton Street

The locations of these intersections are shown in Figure 57.

Figure 57: Location of intersections



Source: © Google Maps, with edits by AECOM, 2014

The results of the intersection analyses are summarised in Table 30 and Table 31, for the AM and PM peak hours respectively. A description of these results follows the tables.

Table 30: Comparison of intersection performance – AM peak

Intersection	2013	2021	2031	2041
Kingsford Smith Drive-Southern Cross Drive	D (44.8s)	D (43.1s)	D (45.4s)	D (47.6s)
Kingsford Smith Drive-Ginnindera Drive	C (41.7s)	D (44s)	D (42.5s)	C (38.8s)
Southern Cross Drive-Florey Drive	B (23.6s)	C (30.6s)	C (29.3s)	B (27.8s)
Drake Brockman Drive-William Hovell Drive-Kingsford Smith Drive	B (15.2s)	A (14s)	B (14.5s)	B (23.7s)
Belconnen Way-Kingsford Smith Drive	B (28.5s)	B (26.1s)	B (20s)	B (17.5s)
Southern Cross Drive-Starke Street	A (6.7s)	A (5.3s)	A (5.6s)	C (29.5s)
Drake Brockman Drive-Macnaughton Street	A (6.5s)	A (8.4s)	A (4.4s)	B (14.6s)

Table 31: Comparison of intersection performance – PM peak

Intersection	2013	2021	2031	2041
Kingsford Smith Drive-Southern Cross Drive	D (45.5s)	D (45.5s)	D (46s)	C (41s)
Kingsford Smith Drive-Ginnindera Drive	B (26.1s)	C (38.2s)	C (37.2s)	D (46.7s)
Southern Cross Drive-Florey Drive	B (23.9s)	C (33.3s)	C (30.1s)	C (35.9s)
Drake Brockman Drive-William Hovell Drive-Kingsford Smith Drive	B (22.2s)	F (91.5s)	C (31.3s)	B (17.4s)
Belconnen Way-Kingsford Smith Drive	B (18.7s)	B (18.8s)	B (17.6s)	B (22.3s)
Southern Cross Drive-Starke Street	B (14.6s)	A (8.4s)	A (8.4s)	B (21.1s)
Drake Brockman Drive-Macnaughton Street	B (18.1s)	B (24.1s)	A (5.7s)	A (8.6s)

Kingsford Smith Drive/Southern Cross Drive intersection in all scenarios consistently performed at Level of Service D. All arms will experience comparable delay, with Southern Cross Drive westbound being reported as the worst performing arm across all scenarios. Despite higher volumes on Southern Cross Drive, the intersection did not degrade its performance due to traffic signal timing adjustments in response to changed traffic patterns.

Kingsford Smith Drive/Ginninderra Drive intersection during the AM peak performed at Level of Service C/D and during PM peak at Level of Service B/D. This intersection recorded worse performance in future scenarios; however, Level of Service D is acceptable. The worst performing arms at this intersection were both Ginninderra Drive approaches.

Southern Cross Drive/Florey Drive intersection in all scenarios performed at Level of Service B/C. The worst performing arm in most cases is Florey Drive; however, this can be caused by a long cycle time and higher proportion of green time assigned to the Southern Cross Drive corridor.

Drake Brockman Drive/William Hovell Drive/Kingsford Smith Drive roundabout will perform well and experience low delays. Level of Service F was recorded during PM peak in 2021 reflecting long queuing on the William Hovell Drive northbound approach. In the 2021 scenario no improvements were proposed to this intersection, but a comparison with 2031 performance shows greatly improved operation, when metered roundabout was implemented.

Belconnen Way/Kingsford Smith Drive roundabout operates with very low delay at Level of Service A/B in all scenarios. The arm performing worse than others is always Kingsford Smith Drive southbound.

Southern Cross Drive/Starke Street intersection (near Kippax) in 2013, 2021 and 2031 scenarios is priority controlled and performs satisfactorily with low delays. As an approach, which has to give way to traffic on Southern Cross Drive, Starke Street is always reported as the arm with worse performance than the other two. In the 2041 scenario this intersection is upgraded to traffic signal control, which pushes its performance to Level of Service B/C, but also improves safety to all traffic from Starke Street (including a high number of buses).

Drake Brockman Drive/Macnaughton Street intersection, similarly to Starke Street in 2013, 2021 and 2031 scenarios it is priority controlled and operates with low delays. Macnaughton Street is reported as an arm that performs worse than the other two. In the 2041 scenario this intersection is upgraded to traffic signal control, which pushes its performance to Level of Service A/B, but safety for all traffic and buses is much improved. The worst performing arm in the 2041 scenario is Macnaughton Street with Level of Service F (in AM peak); however, this is a result of a long cycle time, out of which this approach gets a small proportion of green time. Despite long waiting time for green lights, queues clear every cycle.

For more detailed information about intersection performance refer to Appendix D.

5.6.2 Delays at local street accesses

The increased traffic on Southern Cross Drive and Drake Brockman Drive will cause some changes in delays exiting local streets serving adjacent suburbs. An analysis of AM peak intersection approach delays was undertaken in Commuter to determine the extent of these changes. The results of this analysis is summarised in Table 32 and Table 33.

Table 32: AM peak hour delays to traffic exiting side streets to Southern Cross Drive

Approach to Southern Cross Drive	AM Peak Hour Delays per Vehicle (s/veh)		
	2021	2031	2041
Spofforth Street	6	7	10
O'Reilly Street	3	4	12
Beaurepaire Crescent	2	4	36
Starke Street (West)	13	18	44
Florey Drive	21	19	26
Moyes Crescent	13	16	12
Dalley Crescent	6	6	6
Chave Street	12	12	14
Starke Street (East)	5	5	6
O'Loghlen Street	4	4	4

Table 33: AM peak hour delays to traffic exiting side streets to Drake Brockman Drive

Approach to Drake Brockman Drive	AM Peak Hour Delays per Vehicle (s/veh)		
	2021	2031	2041
Spofforth Street	12	19	31
Trickett Street	8	19	38
Macnaughton Street	21	25	49
Cussen Street	20	14	6
Kinsella Street	4	5	4

The results of the analysis of Southern Cross Drive accesses in Table 32 show some relatively small increases in delays to 2031. Greater increases in delays are expected in the longer-term (2041 or beyond), as new development occurs along Parkwood Road. Increases in delays will be most pronounced at Starke Street (West), Beaurepaire Crescent and Florey Drive. Each of these intersections will have new arrangements in future (by 2041):

- Bus queue jump lane at the Florey Drive signals
- New signals at Starke Street (West)
- New roundabout at Beaurepaire Crescent

These improvements will aid bus movements and safe access onto Southern Cross Drive at these locations.

The results of the analysis of Drake Brockman Drive accesses in Table 33 show some moderate increases in delays to 2031. Greater increases in delays are expected in the longer-term (2041 or beyond). Increases in delays will be most pronounced at MacNaughton Street, Trickett Street and Spofforth Street. Traffic signals are proposed at the MacNaughton Street and Trickett Street intersections to improve access at these locations.

5.7 Travel Times

An analysis of general traffic and bus travel times was undertaken in the AM peak Commuter models. This was done for two purposes:

1) To determine changes in general travel times along alternative routes between Parkwood Road and William Hovell Drive so as to determine the likelihood of redistribution of traffic through local streets in Holt.

2) To determine changes in travel times for buses along key bus routes in the study area so as to identify potential network constraints.

5.7.1 General travel times

Travel times were obtained for four alternative routes shown by different colours in Figure 58. Separate times were recorded for different road sections on each path, numbered from 11 to 19, which helps to highlight where changes in travel times are likely to occur.

Figure 58: Travel time routes and timing points for general traffic

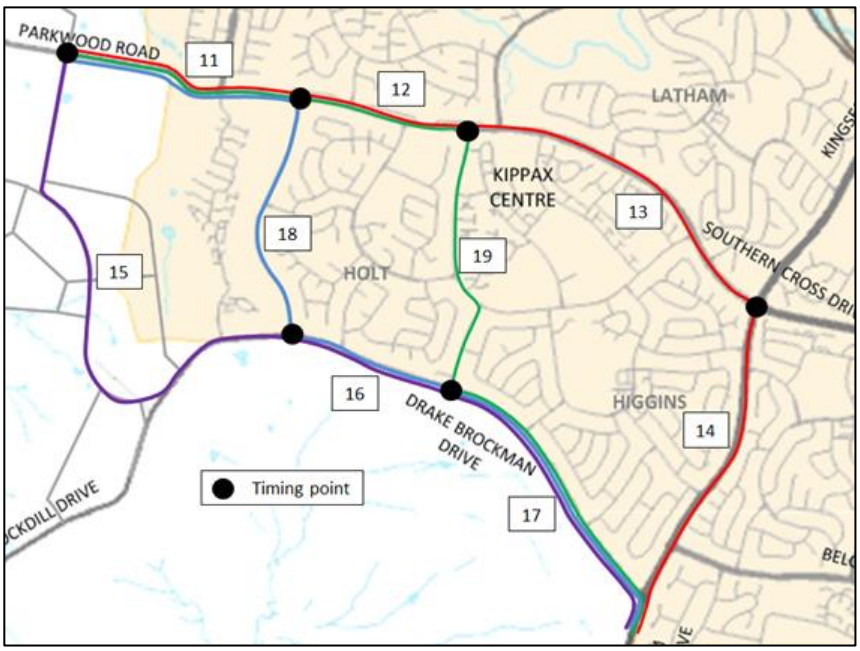


Table 34 provides a summary of AM peak hour travel times between Parkwood Road and William Hovell Drive, using the alternative routes shown in Figure 58. It shows that the red route is not likely to be chosen, but the other routes show similar travel times in 2021 and 2031. The blue route (via Spofforth Street) is likely to become the shortest route by 2041 (ultimate), although the purple route will remain competitive and there is the potential for some travellers to choose other collector streets within the new development area.

Table 34: AM peak hour travel times for alternative routes between Parkwood Road and William Hovell Drive

Route		Travel Time (s)		
		2021	2031	2041
15-16-17	Purple	315	326	398
11-18-16-17	Blue	319	329	381
11-12-19-17	Green	311	336	439
11-12-13-14	Red	395	388	455

A breakdown of travel times for the different road sections shown in Figure 58 is given in Table 35. The changes in travel times will be small to moderate to 2031. The most noticeable increase would occur on Section 19 (Starke Street West), which is likely to be due to increased turning delays at intersections along here. Greater changes in travel times will become evident in the longer-term (2031 to 2041). The most noticeable changes would be:

- Section 12: Southern Cross Drive between Spofforth Street and Starke Street
- Section 15: Riverview between Parkwood Road and Spofforth Street
- Section 19: Starke Street/Macnaughton Street between Southern Cross Drive and Drake Brockman Drive

Table 35: AM peak hour travel times by road section

Road Section		Travel Time (s)		
		2021	2031	2041
11	Parkwood Road to Spofforth Street	96	97	103
12	Southern Cross Drive between Spofforth Street and Starke Street	43	46	83
13	Southern Cross Drive between Starke Street and Kingsford Smith Drive	108	107	118
14	Kingsford Smith Drive between Southern Cross Drive and William Hovell Drive	148	138	151
15	Riverview between Parkwood Road and Spofforth Street	177	188	230
16	Drake Brockman Drive between Spofforth Street and Macnaughton Street	43	48	62
17	Drake Brockman Drive between Macnaughton Street and William Hovell Drive	95	94	106
18	Spofforth Street between Southern Cross Drive and Drake Brockman Drive	85	90	110
19	Starke Street/Macnaughton Street between Southern Cross Drive and Drake Brockman Drive	77	99	147

Note: Refer Figure 58 for location of sections.

5.7.2 Bus travel times

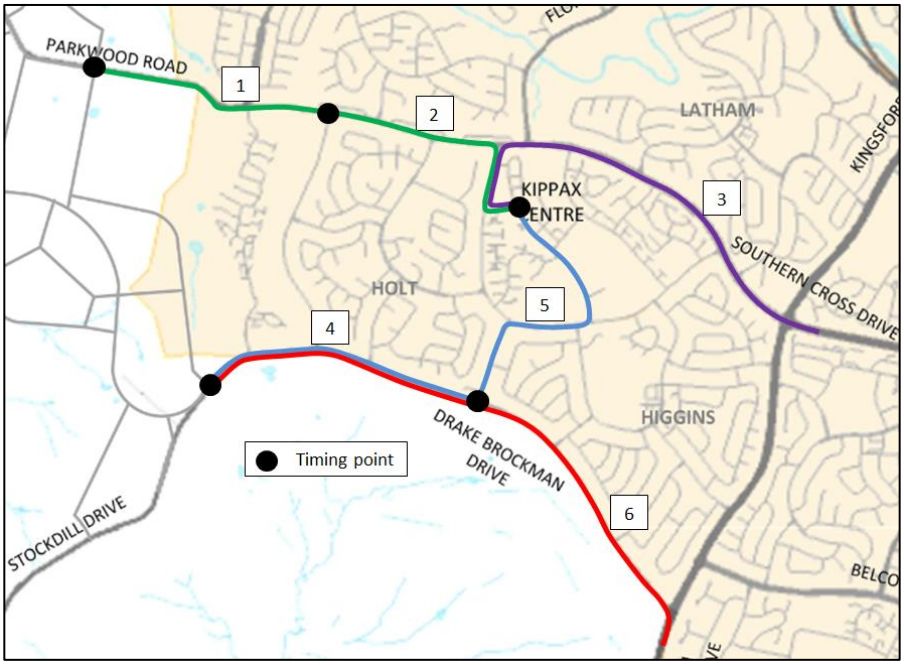
Travel times were obtained for four alternative routes shown by different colours in Figure 59. Note that these represent segments of actual routes, for travel within the modelled study area. Separate times were recorded for different road sections on each path, numbered from 1 to 6, which helps to highlight where changes in travel times are likely to occur.

Table 36 provides a summary of AM peak hour travel times for the alternative routes shown in Figure 59. It shows some moderate increases in travel times will occur on the green and purple routes between 2021 and 2031. More significant increases are predicted post 2031. Some of these changes will be due to the introduction of new traffic signals along some of these routes, as well as increased general traffic congestion.

Table 36: AM peak hour bus route travel times

Route Section		Travel Times (s)		
		2021	2031	2041
1-2	Green	200	220	296
3	Purple	277	299	331
4-5	Blue	270	273	297
4-6	Red	223	226	260

Figure 59: Travel time routes and timing points for buses



A breakdown of bus travel times for the different road sections shown in Figure 59 is given in Table 35. The changes in travel times will be small to moderate to 2031, with the highest increases expected to occur on Southern Cross Drive (Sections 2 and 3). Greater changes in travel times will become evident in the longer-term (2031 to 2041), justifying potential consideration of bus priority treatments on Southern Cross Drive. The most noticeable changes would be:

- Section 2: Southern Cross Drive between Spofforth Street and Kippax Centre
- Section 3: Kippax Centre to Kingsford Smith Drive
- Section 4: Drake Brockman Drive to Macnaughton Street

Table 37: AM peak hour bus route travel times

Section		Travel Times (s)		
		2021	2031	2041
1	Parkwood Road to Spofforth Street	90	95	105
2	Southern Cross Drive between Spofforth Street and Kippax Centre	110	115	191
3	Kippax Centre to Southern Cross Drive/Kingsford Smith Drive	277	299	331
4	Drake Brockman Drive to Macnaughton Street	123	123	150
5	Macnaughton Street/Drake Brockman Drive to Kippax Centre	147	150	147
6	Macnaughton Street/Drake Brockman Drive to William Hovell Drive	100	103	110

5.8 Impacts of Reduced Travel Speed on Drake Brockman Drive

Further modelling was undertaken to test the sensitivity of traffic volume forecasts to changed assumptions for travel speeds on Drake Brockman Drive west of Macnaughton Street (the current 60 km/h instead of an increased limit of 80 km/h assumed in the modelling to date). These runs were instigated to determine potential impacts on traffic noise and rat running through local streets.

Additional modelling was undertaken in Commuter for the 2031 and 2041 AM peaks, with changed travel speed assumptions on Stockdill Drive and Drake Brockman Drive west of Macnaughton Street. A comparison of traffic forecasts on existing arterial roads with the alternative travel speed assumptions is summarised in Table 38. It shows a shift in traffic from Stockdill Drive and Drake Brockman Drive to Parkwood Road. The shift will be more significant in 2041 and beyond. It would result in increased congestion on Parkwood Road and the western parts of Southern Cross Drive.

No significant change is predicted on other arterial roads in the study area. Also, the changes to Southern Cross Drive are expected to be moderate, which is likely to mean some increased use of local streets such as Spofforth Street and Starke Street.

Table 38: AM peak hour traffic forecasts on existing arterial roads with alternative travel speeds on Drake Brockman Drive

Road and direction of travel	2031 flows (veh/h)			2041 flows (veh/h)		
	80 km/h	60 km/h	Diff	80 km/h	60 km/h	Diff
Parkwood Road EB	533	620	87	933	1215	282
Parkwood Road WB	203	233	30	336	407	71
Southern Cross Drive EB near Kippax	761	829	68	1036	1113	-23
Southern Cross Drive WB near Kippax	505	530	25	597	683	86
Southern Cross Drive EB near Kingsford Smith Drive	1303	1337	34	1613	1668	55
Southern Cross Drive WB near Kingsford Smith Drive	831	847	6	986	1059	73
Stockdill Drive EB	1026	937	-89	1834	1520	-314
Stockdill Drive WB	342	310	-32	594	453	-141
Drake Brockman Drive EB near Kingsford Smith Drive	1470	1430	-40	2230	1962	-268
Drake Brockman Drive WB near Kingsford Smith Drive	448	440	-8	731	659	-72
Drake Brockman Drive EB near Macnaughton Street	1399	1260	-139	2168	1771	-397
Drake Brockman Drive WB near Macnaughton Street	400	360	-40	663	501	-162
Belconnen Way EB	457	458	1	681	679	-2
Belconnen Way WB	237	237	0	200	200	0
William Hovell Drive NB	277	277	0	651	651	0
William Hovell Drive SB	1450	1447	-3	1937	1871	-66
Ginninderra Drive EB	1046	1052	6	1406	1424	18
Ginninderra Drive WB	492	490	-2	535	535	0
Florey Drive NB	311	317	6	283	279	-4
Florey Drive SB	252	252	0	217	217	0

Note: Refer Figure 56 for a map showing the location of model count stations
EB – eastbound; WB – westbound; SB – southbound; NB - northbound

A comparison of traffic forecasts on existing local streets with the alternative travel speed assumptions is summarised in Table 39. It shows a mix of results, but overall moderate changes are predicted on local streets. Some increases in traffic are predicted on Spofforth Street and Starke Street, but a reduction in traffic using Trickett Street.

Table 39: AM peak hour traffic forecasts on existing local streets with alternative travel speeds on Drake Brockman Drive

Road and direction of travel	2031 flows (veh/h)			2041 flows (veh/h)		
	80 km/h	60 km/h	Diff	80 km/h	60 km/h	Diff
Osburn Drive EB	564	564	0	529	524	-5
Osburn Drive WB	383	385	2	340	337	-3
Starke Street EB near Macnaughton	183	234	51	182	238	56
Starke Street WB near Macnaughton	105	99	-6	91	146	55
Macnaughton Street NB	154	114	-40	108	132	24
Macnaughton Street SB	132	155	23	110	143	33
Trickett Street NB	151	146	-5	142	124	-18
Trickett Street SB	431	412	-19	373	262	-111
Spofforth Street NB	56	65	9	77	93	16
Spofforth Street SB	93	74	-19	121	177	56
Eccles Circuit EB	195	195	0	198	184	-14
Eccles Circuit WB	117	117	0	100	85	-15

Note: Refer Figure 56 for a map showing the location of model count stations
EB – eastbound; WB – westbound; SB – southbound; NB - northbound

A comparison of traffic forecasts on key new roads in West Belconnen with the alternative travel speed assumptions is summarised in Table 40. It shows a shift in traffic to Parkwood Road from the main southern boulevard that forms an extension of Stockdill Drive. A reduction in potential rat running through the Woodhaven Collector is also predicted. The reduction in traffic in the southern parts of the proposed development will have benefits to the proposed roads, including the possible reduction in the extent of duplication along the main southern boulevard.

Table 40: AM peak hour traffic forecasts on future West Belconnen streets with alternative travel speeds on Drake Brockman Drive

Road and direction of travel	2031 flows (veh/h)			2041 flows (veh/h)		
	80 km/h	60 km/h	Diff	80 km/h	60 km/h	Diff
A (Main Southern Boulevarde) WB	301	275	-26	523	420	-103
A (Main Southern Boulevarde) EB	848	785	-63	1576	1397	-179
G (Main Southern Boulevarde) SB	414	381	-33	998	858	-140
G (Main Southern Boulevarde) NB	136	129	-7	381	295	-86
B (Woodhaven Collector) SB	177	153	-24	257	120	-137
B (Woodhaven Collector) NB	38	33	-5	66	28	-38
H (North-South link road) SB	245	236	-9	508	308	-200
H (North-South link road) NB	210	253	43	350	314	-36

Road and direction of travel	2031 flows (veh/h)			2041 flows (veh/h)		
	80 km/h	60 km/h	Diff	80 km/h	60 km/h	Diff
M (North-South link road) SB	360	360	0	1079	1105	26
M (North-South link road) NB	201	200	-1	503	440	-63
N (Parkwood Road) EB	369	457	88	786	1070	284
N (Parkwood Road) WB	223	253	30	360	394	34

Note: Refer Figure 56 for a map showing the location of model count stations
EB – eastbound; WB – westbound; SB – southbound; NB - northbound

6.0 Future Road Needs

6.1 Introduction

This chapter draws together the outcomes from the previous two chapters, with regards future road requirements. It focusses on the physical preliminary road design needs for the various roads affected by the expected changes in traffic conditions in West Belconnen. The road design work is based on the information and standards highlighted in Section 2.8.

6.2 Stockdill Drive

Stockdill Drive will provide the initial access to new development in West Belconnen. The planned access to the new development will be a short distance west of Belconnen Golf Course. In the first stage of the development the main access will be formed about 1km west of the existing intersection with Britten-Jones Drive. The road will be reconstructed so that the access will become the main road and the southern section of Stockdill Drive will tee off it.

At the outset, bicycle and pedestrian facilities will need to be constructed along Stockdill Drive to link with existing facilities on Drake Brockman Drive and Spofforth Street. Bus stops will need to be incorporated into the development with the first services providing a shuttle between the development and Kippax at 10 minute intervals during peak periods.

It is expected that both on-road and off-road bicycle facilities will be provided as part of the first stage works, as the existing road has no sealed shoulders and the traffic lanes are too narrow for mixed traffic. Works proposed as part of first stage work on Stockdill Drive are as follows:

- Proposed pavement width to accommodate 1.5 m wide cycle lane in each direction, based on retaining a 60 km/h speed limit here
- New 1.5 m wide concrete path on the northern verge to provide path connectivity from the estate to existing path east of Spofforth Street

The potential cross-section for the first stage of works on Stockdill Drive is shown in Figure 60. It is expected that these works will need to be completed prior to servicing any residential blocks in the proposed development. As part of the first stage works, minor intersection works will also be required at Britten-Jones Drive and Spofforth Street. The latter intersection will require realignment and a change of priority.

Stockdill Drive will require duplication by the latter part of the 2030's decade, assuming an average of 300 dwellings occupied each year from 2016. The proposed cross-section for the ultimate works proposed along Stockdill Drive between Spofforth Street and the Estate entrance are shown in Figure 61. The works will include:

- Duplication on the southern side of the existing pavement
- 6.5 m wide median
- 2 x 3.5 m wide traffic lanes and 1.5 m wide cycle lane in each direction (if 60 km/h)
- Buses are expected to utilise the kerb side traffic lane and share with general traffic
- New 2.5 m wide concrete path on the northern verge to provide path connectivity from the estate to existing path east of Spofforth Street.
- Adjustment to a section of the southern side of the road reserve boundary where the existing road reserve width is narrower by approximately 14 m generally into the rural boundary, to be aligned with the road reserve boundary in adjacent sections so as to accommodate road duplication, batter work, relocation of existing utilities and installation of proposed water mains to supply the estate development.
- Intersection upgrades at Spofforth Street, Britten-Jones Drive and the access to the development.

It is anticipated that the relocated utilities in any first stage works would suit the ultimate upgrade (i.e. minimal impacts to these utilities in the ultimate works).

Figure 60: Potential First stage cross-section for Stockdill Drive

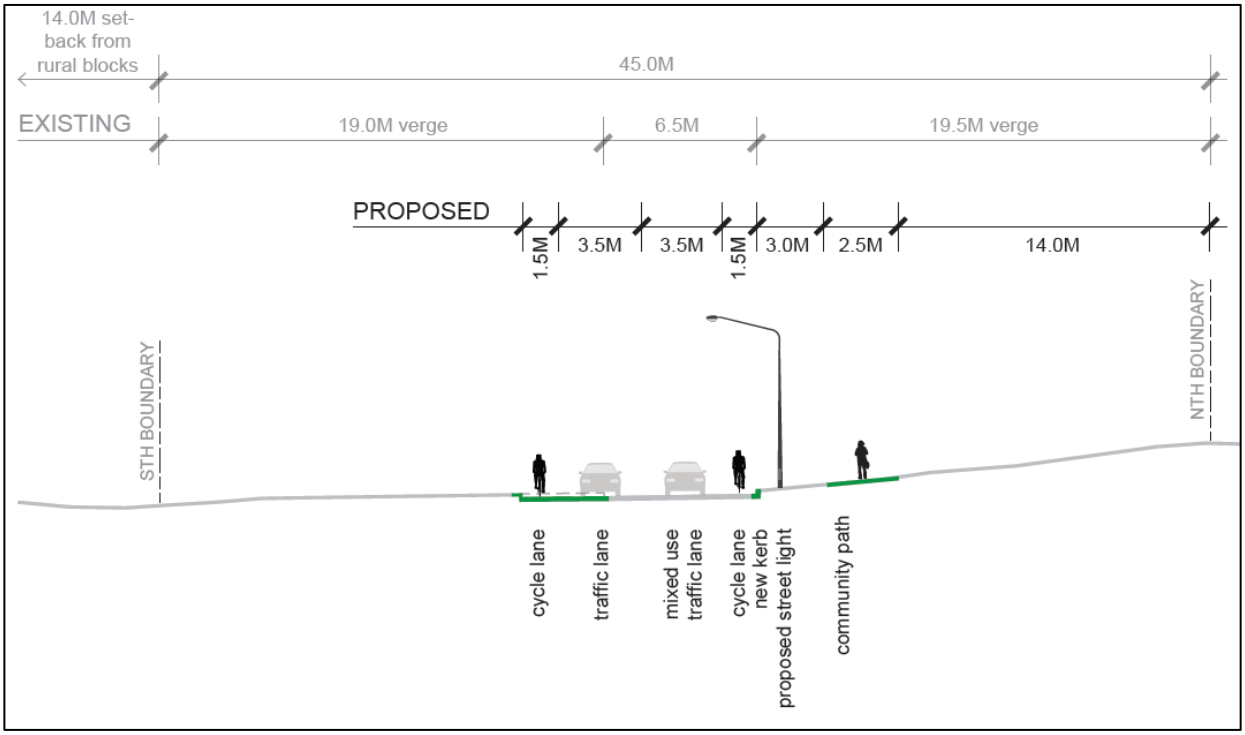
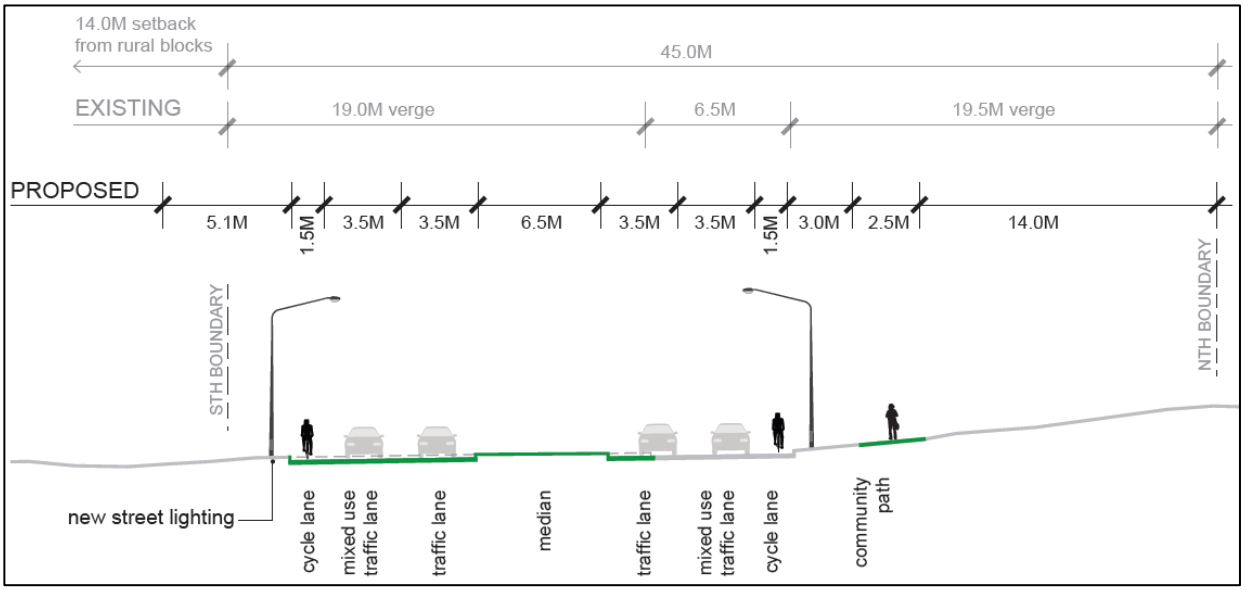


Figure 61: Potential ultimate cross-section for Stockdill Drive between Spofforth Street and the Estate entrance



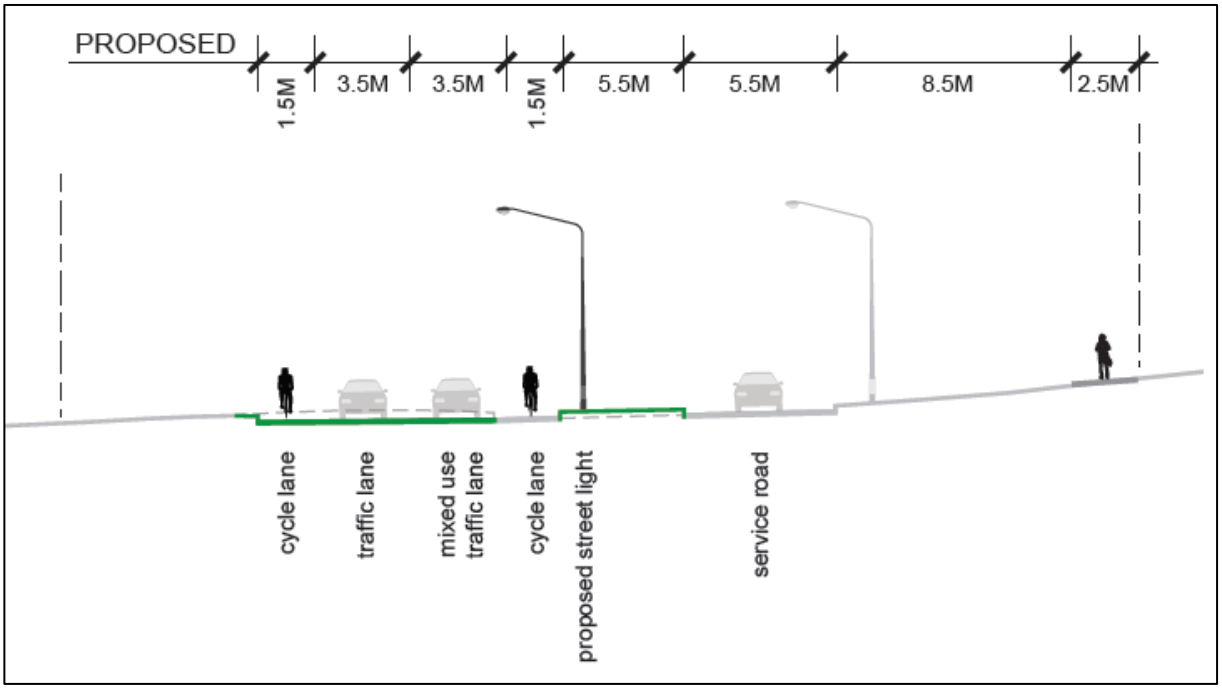
6.3 Drake Brockman Drive

6.3.1 Section 1: West of Macnaughton Street (see Figure 16)

The first stage of development will cause a noticeable increase in traffic using Drake Brockman Drive. West of Macnaughton Street traffic volumes will increase to about 8,500 veh/day, roughly double current volumes in this section of road. This volume of traffic will create delays for residents accessing driveways and by 2021 consideration should be given to the construction of a proposed service road in this section of road and a new road carriageway, as well as local intersection works.

The potential cross-section for the first stage works on Drake Brockman Drive between Spofforth Street and Macnaughton Street is shown in Figure 62.

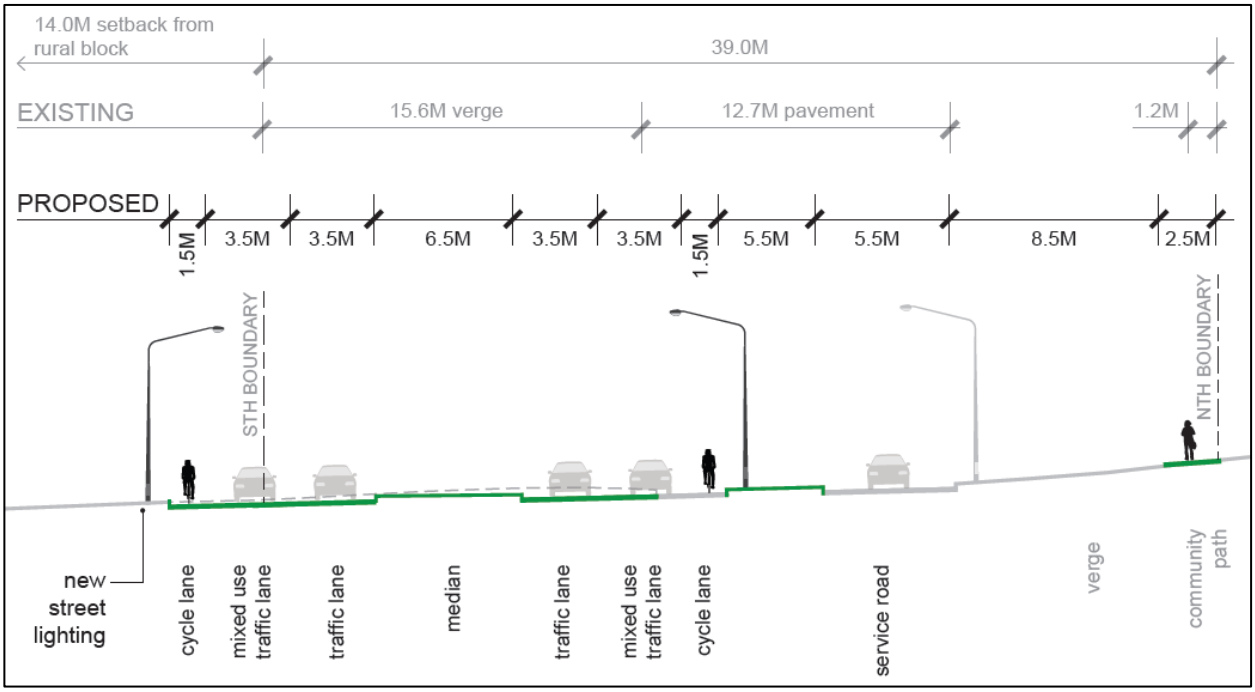
Figure 62: Potential First stage cross-section for Drake Brockman Drive between Spofforth Street and Macnaughton Street



This section of road will be on the cusp of duplication by 2031, but capacity improvements at the intersection with Macnaughton Street and duplication east of there should suffice at that time. It is likely to require duplication in the middle part of the 2030's decade.

The section of Drake Brockman Drive between Spofforth Street and Macnaughton Drive currently has direct property access onto Drake Brockman Drive on the northern verge. In addition to this, there are mature trees and landscaping treatments and a number of existing utilities along the northern verge of Drake Brockman Drive from Spofforth Street to Kingsford Smith Drive. The proposed ultimate works are therefore generally located south of the existing pavement, as shown in Figure 63. As noted a minor adjustment to the 14.0 m road reserve would be required on the southern side to accommodate the proposed ultimate road configuration.

Figure 63: Potential ultimate cross-section for Drake Brockman Drive between Spofforth Street and Macnaughton Street



The ultimate works proposed along Drake Brockman Drive between Spofforth Street and Macnaughton Street include:

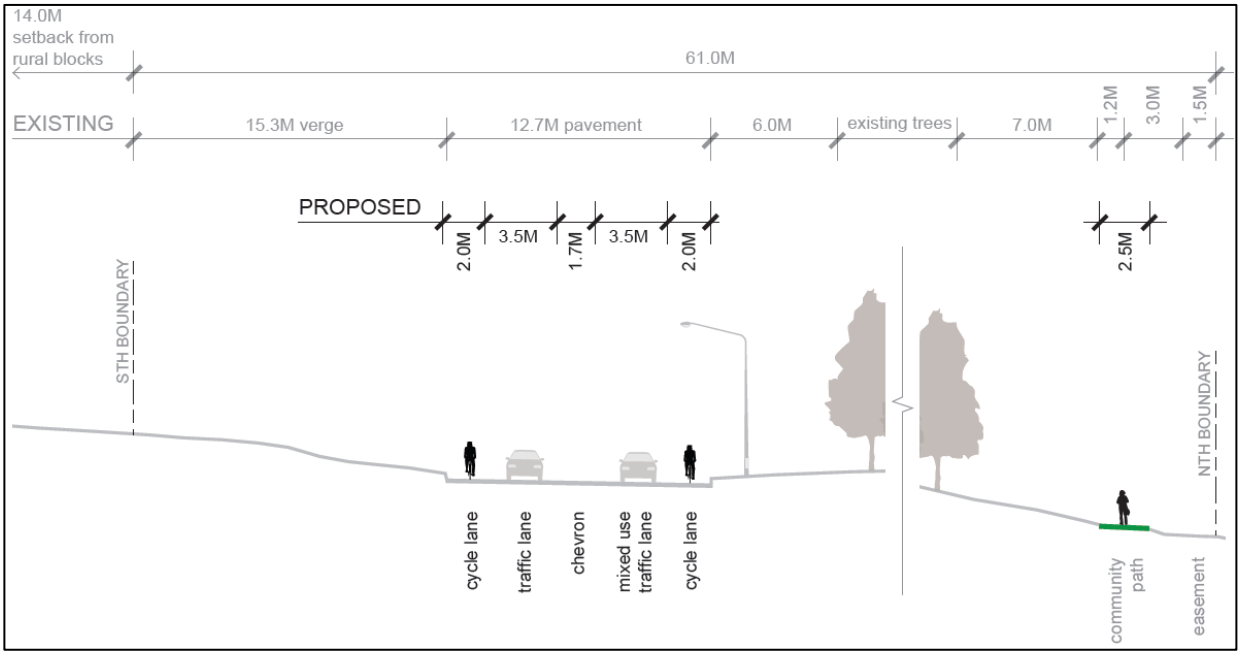
- 5.5 m wide service road on existing pavement to enable vehicles accessing these driveways safely. It is assume that the service road would be a one-way single lane, with an informal on-road parallel parking.
- 5.5 m outer separation between the carriageway and the service road
- New carriageways south of the existing pavement with a posted speed limit of 60 km/h
- 6.5 m wide median
- 2 x 3.5 m wide traffic lanes and 1.5 m wide cycle lane in each direction
- Buses are expected to utilise the kerb side traffic lane and share with general traffic
- Adjustment to section of the southern side of the road reserve boundary where the existing road reserve width is narrower by approximately 14 m into the rural boundary, to be aligned with the road reserve boundary in adjacent sections to accommodate road duplication, batter work, relocation of existing utilities and installation of proposed water mains to supply the estate development.
- Trickett Street and Macnaughton Street intersections will be signalised.

6.3.2 Section 2: East of Macnaughton Street (see Figure 16)

As a consequence of the first stage of development traffic using Drake Brockman Drive east of Macnaughton Street will increase from about 9,000 veh/day west of Kingsford Smith Drive to 12,000 veh/day. This increase in traffic will cause a moderate increase in delays at intersections along this section of road, resulting in the need to improve access and safety at intersections.

Upgrade works in the section between Macnaughton Street and Kingsford Smith Drive would mostly involve line-marking and the use of the existing pavement. The channelisation of right turns can be created by means of chevron line marking. Some road widening will be required at intersections to ensure that cycle lanes are adequately designed. The proposed lane arrangement is illustrated in Figure 64.

Figure 64: Potential First stage cross-section for Drake Brockman Drive between Macnaughton Street and Kingsford Smith Drive



Drake Brockman Drive will carry bus services from the development to Kippax and William Hovell Drive via the Macnaughton Street intersection. Buses right turning from Macnaughton Street into Drake Brockman Drive will have problems finding a safe gap in traffic by 2031. Thus, the Macnaughton Street intersection is recommended to be signalised by 2031.

By 2031, the Drake Brockman Drive/Kingsford Smith Drive/William Hovell Drive roundabout will need traffic signal metering to reduce queues and delays on the William Hovell Drive northbound approach, especially in the PM peak. These traffic signals will be temporary and will activate only when long queues are detected on the northbound approach.

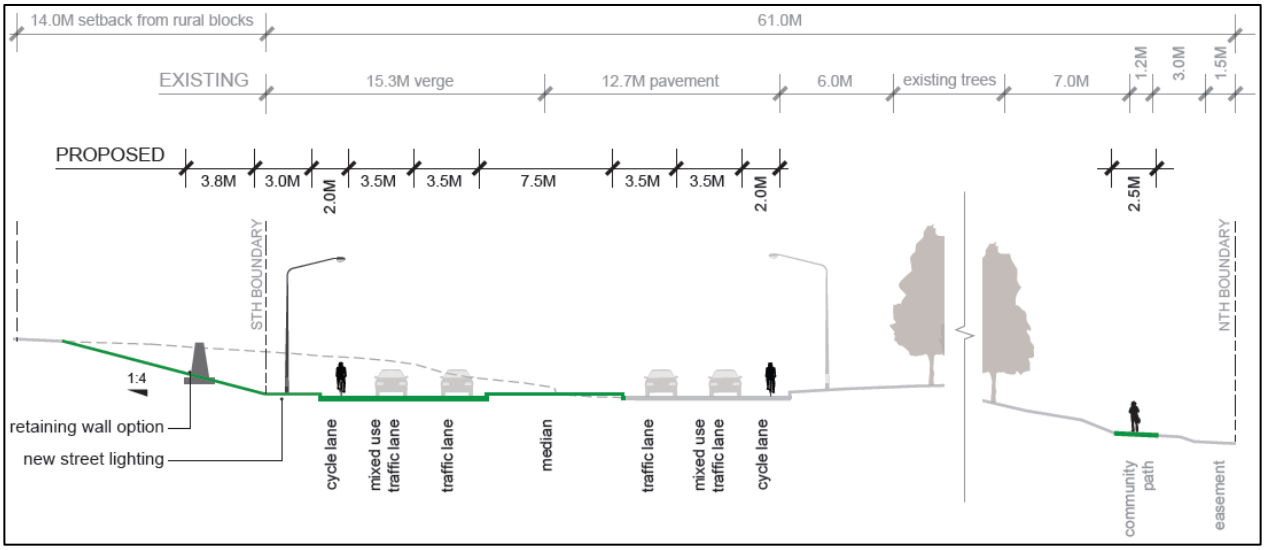
Beyond 2031, the Trickett Street intersection is likely to require signalisation in the longer-term. A left-turn bypass lane from William Hovell Drive would also be required at the Drake Brockman Drive/Kingsford Smith Drive/William Hovell Drive roundabout.

Drake Brockman Drive will require duplication in the early part of the 30's decade. The ultimate works proposed along Drake Brockman Drive between Macnaughton Street and Kingsford Smith Drive include:

- Duplication on the southern side of the existing pavement with a posted speed limit of 80 km/h
- 7.5 m wide median
- 2 x 3.5 m wide traffic lanes and 2 m wide cycle lane in each direction
- Buses are expected to utilise the kerb side traffic lane and share with general traffic
- Adjustment to section of the southern side of the road reserve boundary where the existing road reserve width is narrower by approximately 14 m into the rural boundary, to be in lined with the road reserve boundary in adjacent sections to accommodate road duplication, batter work, relocation of existing utilities and installation of proposed water mains to supply the estate development.

The proposed cross-section for these works is illustrated in Figure 65.

Figure 65: Potential ultimate cross-section for Drake Brockman Drive between Macnaughton Street and Kingsford Smith Drive



6.4 William Hovell Drive

The high volume of vehicles at high speeds on an undivided road through relatively steep terrain presents major concerns for safety along this section of road. The high number of crashes and the incidence of serious crashes points to the pressing need for a review of safety and the identification of potential improvements. One possible measure is to reduce the speed limit to 80 km/h (currently 90 km/h) and introduce speed cameras. Other measures include lighting and median barriers. The latter would involve some minor widening.

The main safety deficiency is the potential for crashes involving a kangaroo. Headlight glare is also an issue and slow downhill vehicles also leads to driver frustration with no overtaking permitted from the merge to south of Drake Brockman Drive and the climbing lane some 3.5 km away.

Traffic growth on this road is predicted to be slow, due to capacity constraints at downstream intersections and a shift to public transport. By 2021, the southbound lane will be nearing practical capacity because there is only one lane available southbound and traffic flows exceeding 1,700 veh/hr are predicted in this lane in the AM peak hour. The real constraint along William Hovell Drive is the Bindubi Street traffic signals and Glenloch interchange. Hence, any significant capacity improvements west of Bindubi Street along William Hovell Drive are difficult to justify in the short to medium term (to 2031), until such time as the downstream constraints are addressed.

Coppins Crossing is likely to be signalised by 2021 and the timing of any upgrades here will influence decisions on widening William Hovell west of Coppins Crossing. It is likely that this would involve an additional southbound lane between Deep Creek and Coulter Drive, to extend the existing two-lane section of road (see Figure 18).

The implementation of public transport priority treatments could be desirable post-2031. Queue jump lanes may be justified at Coppins Crossing or Bindubi Street, subject to more detailed investigations.

Extra lanes could be needed in both directions by 2041, which is likely to necessitate the construction of an additional carriageway. The extra capacity will enable improved bus operations. The timing and nature of these works are subject to ongoing investigations.

6.5 Parkwood Road

Development is not expected to occur along this road until post 2020, with the release of about 800 dwellings between 2020 and 2022, as well as possible commencement of development of the Centre. The existing road can cater for this increased traffic, but the bend in Parkwood Road west of Macfarlane Burnet Avenue should be realigned for safety reasons and as part of widening the road to provide facilities for on-road cycling. Off-road bicycle and pedestrian facilities will need to be constructed along Parkwood Road to link with existing facilities in West Macgregor. Bus stops will also need to be incorporated into the development with the first services providing a shuttle between the development and Kippax at 10 minute intervals during peak periods.

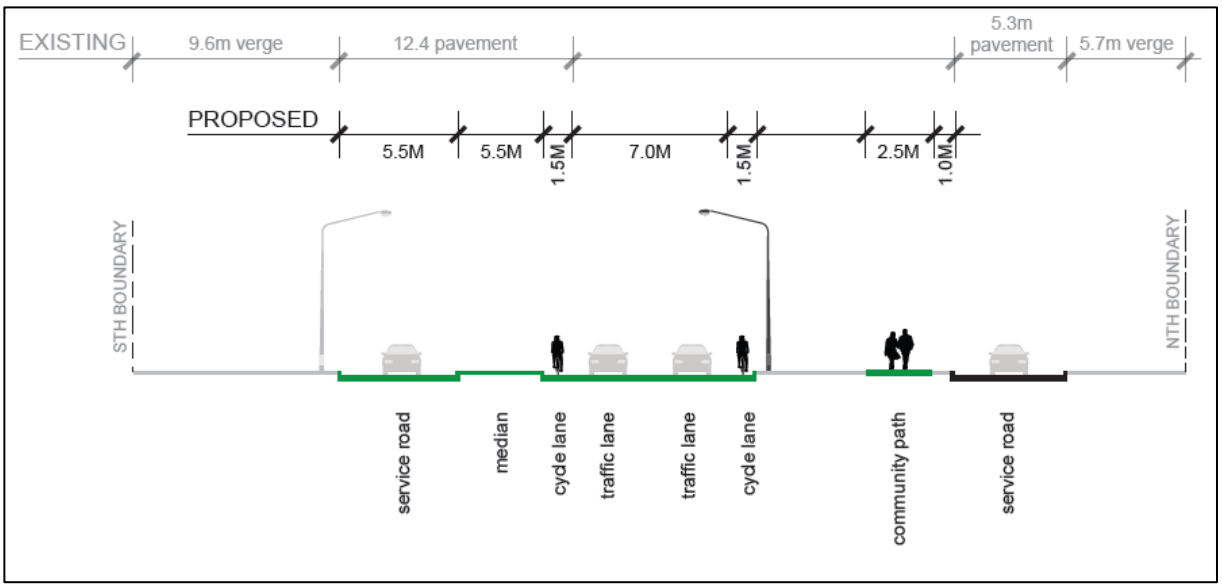
Parkwood Road is expected to carry 14,000 veh/day at full development of West Belconnen. The current design of this section of road is adequate to carry this volume of traffic. About 600 passengers per hour would also be carried on buses in the peak hours along this section of road, not sufficient to justify bus priority facilities nor light rail.

6.6 Southern Cross Drive

6.6.1 Section 1: Spofforth Street to the Holt Oval underpass (see Figure 17)

Traffic volumes will increase markedly east of O'Reilly Street, to about 16,000 veh/day east of Beaurepaire Crescent. This traffic volume is relatively high for a 2-lane urban road, but there will be a relatively even directional distribution of traffic on Southern Cross Drive and the road will continue to operate satisfactorily during peak periods. By 2041, consideration should be given to creating a service road on the southern side of Southern Cross Drive between Spofforth Street and Beaurepaire Crescent, requiring reconstruction of the existing road (see Figure 66). As part of these works, anew roundabout should be constructed at the intersection of Beaurepaire Crescent with Southern Cross Drive, to assist local access and safety, including improved access to proposed service roads by the provision for U-turns here.

Figure 66: Potential ultimate cross-section for Southern Cross Drive between Spofforth Street and Beaurepaire Crescent



6.6.1 Section 2: Holt Oval underpass to Moyes Crescent (see Figure 17)

This section of road includes two busy intersections – Starke Street West and Florey Drive. Both intersections carry a relatively high number of vehicles, buses and pedestrians and this will grow.

By 2031 there will be a large increase in public transport trips via Kippax, using this section of road; in particular the intersection with Starke Street West. In peak hours, bus passenger movements are expected to increase to about 2,200 passengers per hour between Starke Street and Florey Drive (ie., at least 30 buses per hour).

A queue jump lane is likely to be justified at the Southern Cross Drive/Florey Drive intersection in the eastbound direction that allows buses to bypass potential traffic queues here. In addition, the nearby intersection with Starke Street (West) will need to be signalised. An alternative access to Kippax via Moyes Crescent and a potential new road connection east of Kippax would postpone the need for the above works on Southern Cross Drive.

In the longer-term, consideration will also need to be given to providing a service road on the southern side of Southern Cross Drive, to the west of Starke Street.

6.6.2 Section 3: Moyes Crescent to Kingsford Smith Drive (see Figure 17)

By 2031 there will be a 15% increase in traffic using the Kingsford Smith Drive intersection, which will result in this intersection operating near capacity in peak periods. Bus passenger flows would also be very high by 2031, with about 2,700 passengers per hour being carried by buses towards Belconnen by then, representing about 40 buses per hour in the peak direction.

6.7 Ginninderra Drive

Ginninderra Drive is a major road corridor, initially built to service the original Y-Plan for Canberra. The completion of a link from West Belconnen to Ginninderra Drive is important for several reasons, but is not expected to be constructed until post-2031, to correspond with development in the eastern parts of West Belconnen.

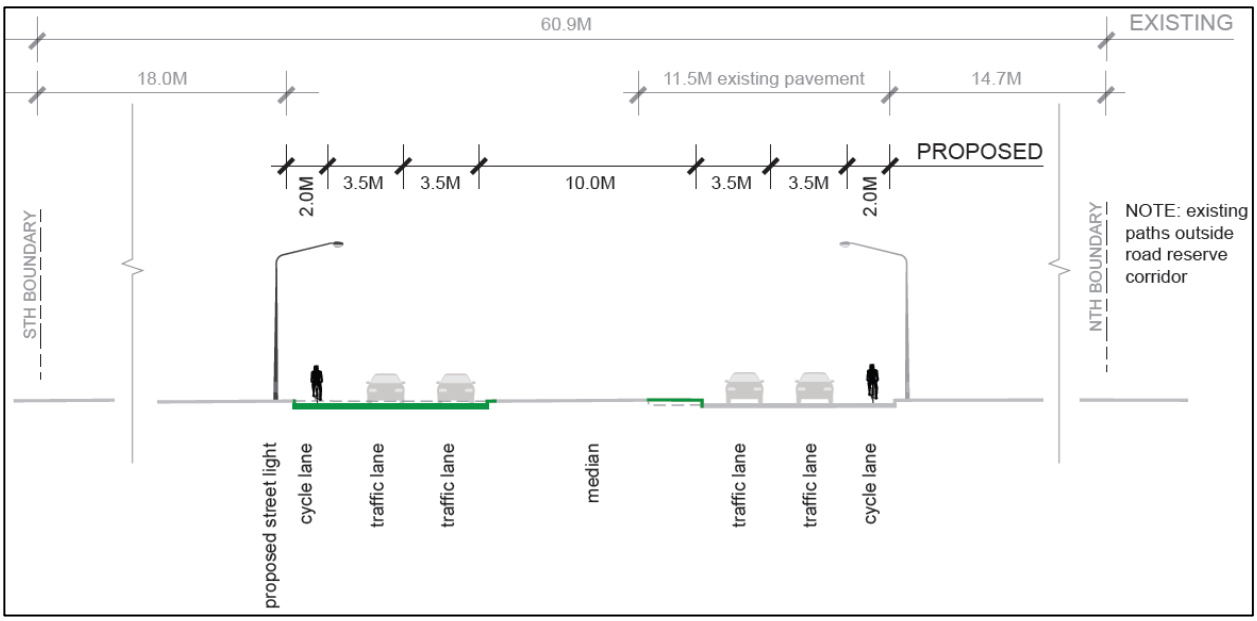
Access to the area will be greatly improved with a Ginninderra Drive Completion. It would enable better connections to North Belconnen and Gungahlin, for cars, buses and emergency vehicles. One of the advantages of good access to North Belconnen is improved travel times from the Emergency Services Centre in Charnwood to future areas of West Belconnen located in NSW.

The need for completion of Ginninderra Drive to provide access to West Belconnen could be brought forward if development in the vicinity of Parkwood Eggs occurs earlier in the development process than planned. It would also delay any potential needs for upgrading Southern Cross Drive.

Completion of the duplication of the section of Ginninderra Drive between Florey Drive and Tillyard Drive may be needed as a result of the Ginninderra Drive Completion and full development of West Belconnen, as it will come close to capacity by then. The proposed future cross-section is shown in Figure 67.

The impacts of not providing the Ginninderra Drive Connection are summarised in Appendix F.

Figure 67: Potential ultimate cross-section for Ginninderra Drive between Florey Drive and Tillyard Drive



7.0 Summary of Infrastructure Needs

A summary of the works needed to cater for increased traffic growth in the region are depicted in the maps in Figure 68 to Figure 71, for various stages of works. Table 41 provides some more detailed descriptions of these works. Intelligent Transport System (ITS) improvements are also likely to be needed in future, especially at key intersections. ITS will form part of future detailed design considerations.

Key points of differentiation between the recommended works and the results of the micro-simulation modelling are:

- It is likely that traffic signals will be required earlier at the intersections of Starke Street/Southern Cross Drive and Macnaughton Street/Drake Brockman Drive because of increased delays to right turning buses and the higher variability of traffic at Starke Street adjacent to the Kippax Centre. Hence, these works are shown in 2031 rather than ultimate.
- The proposed bus queue jump lane at the Florey Drive/Southern Cross Drive intersection may not be needed in 2031 if the Starke Street intersection is signalised and the signals linked. Also, there is the prospect that a new road link might be provided from Hardwick Crescent to Moyes Crescent as part of the future expansion of the Kippax Centre. This would provide an alternative access for buses, reducing the need for the queue jump lane at Florey Drive.
- The proposed signal metering at the intersection of Kingsford Smith Drive with Drake Brockman Drive would greatly benefit traffic operations in 2021, even though it was only included in the 2031 micro-simulation model.
- The proposed left turn bypass lane from William Hovell Drive onto Drake Brockman Drive would greatly benefit traffic operations in 2031, even though it was only included in the 2041 micro-simulation model.
- By 2041 (Ultimate) a roundabout is recommended at the intersection of Beaurepaire Crescent with Southern Cross Drive.

The works required to service the West Belconnen development will benefit new and existing users of the road system in the area. Some plots that illustrate the use of various external roads by West Belconnen traffic is provided in Appendix E. As an indication, some preliminary analyses of 2041 (ultimate) transport modelling results indicate that West Belconnen traffic will represent:

- 71% of vehicles using Drake Brockman Drive west of Kingsford Smith Drive
- 39% of vehicles using Southern Cross Drive east of Florey Drive
- 33% of vehicles using Ginninderra Drive east of Florey Drive
- 36% of vehicles using William Hovell Drive south of Drake Brockman Drive

These results reflect a reduction in existing trips using these roads due to greater public transport use and a redistribution of trips, either to alternative destinations or alternative routes.

Figure 68: Overview of proposed first stage of off-site works (600 dwellings)

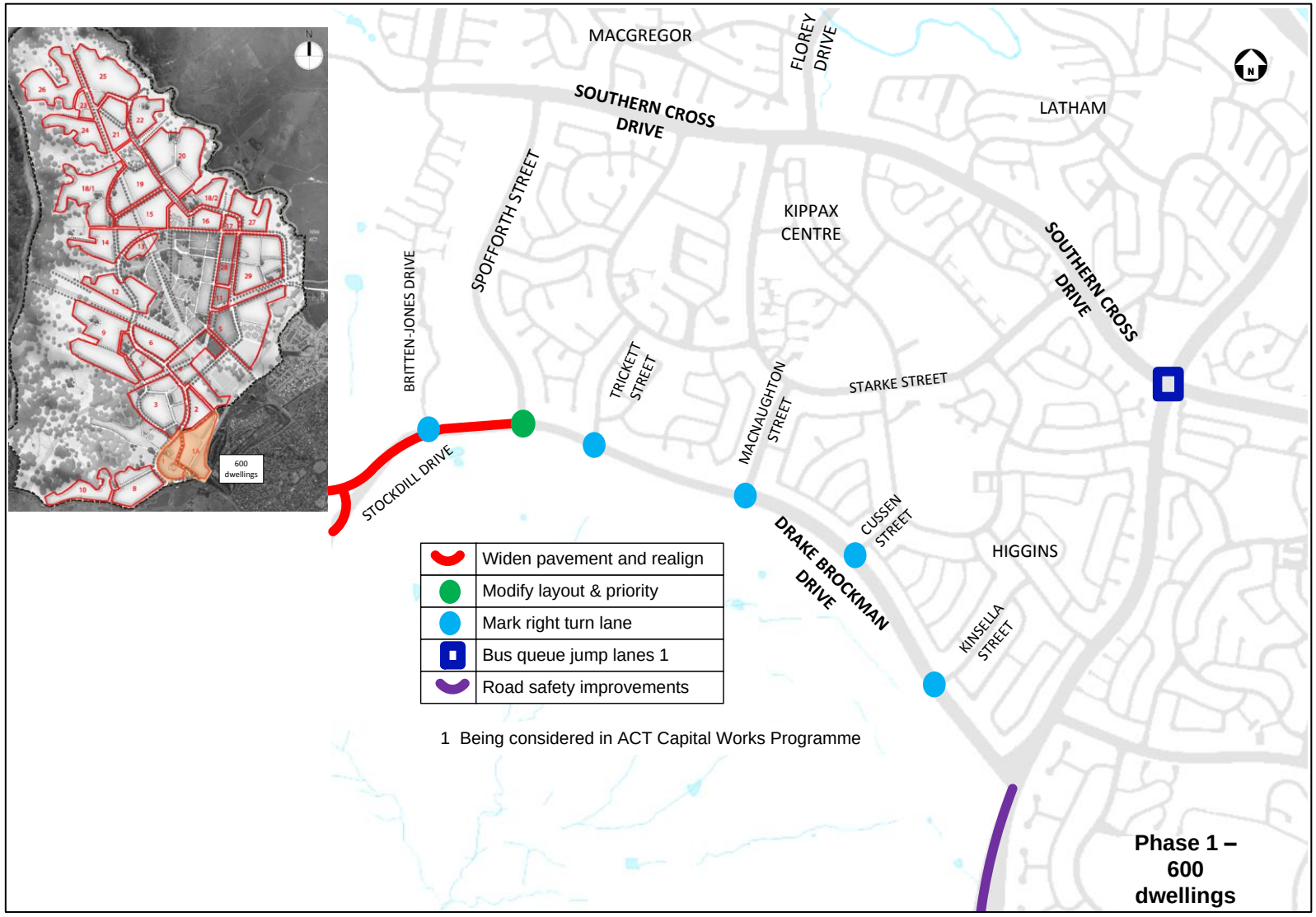


Figure 69: Overview of proposed off-site works by mid-2020's (2,900 dwellings)

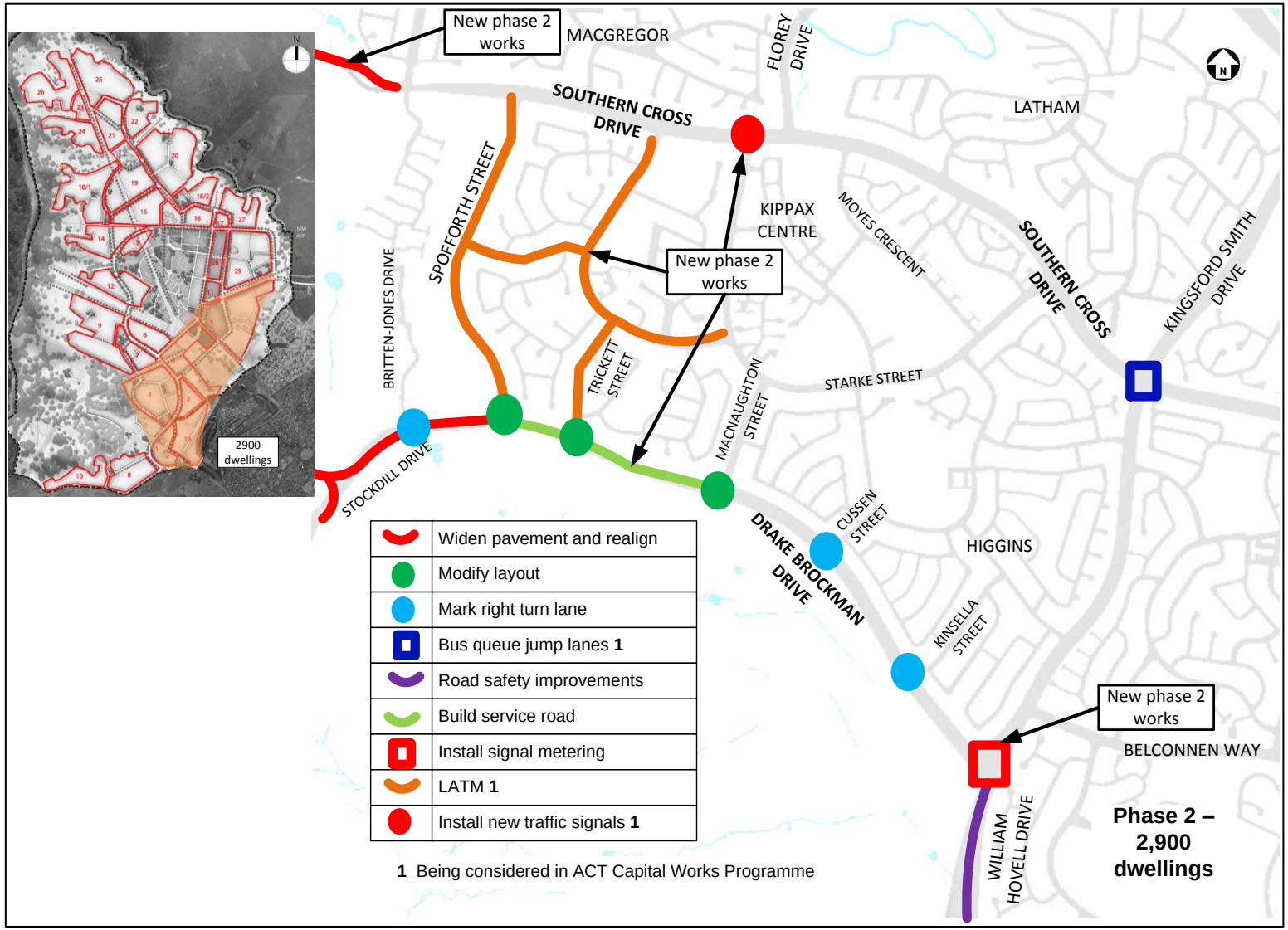


Figure 70: Overview of proposed off-site works by mid-2030's (5,600 dwellings)

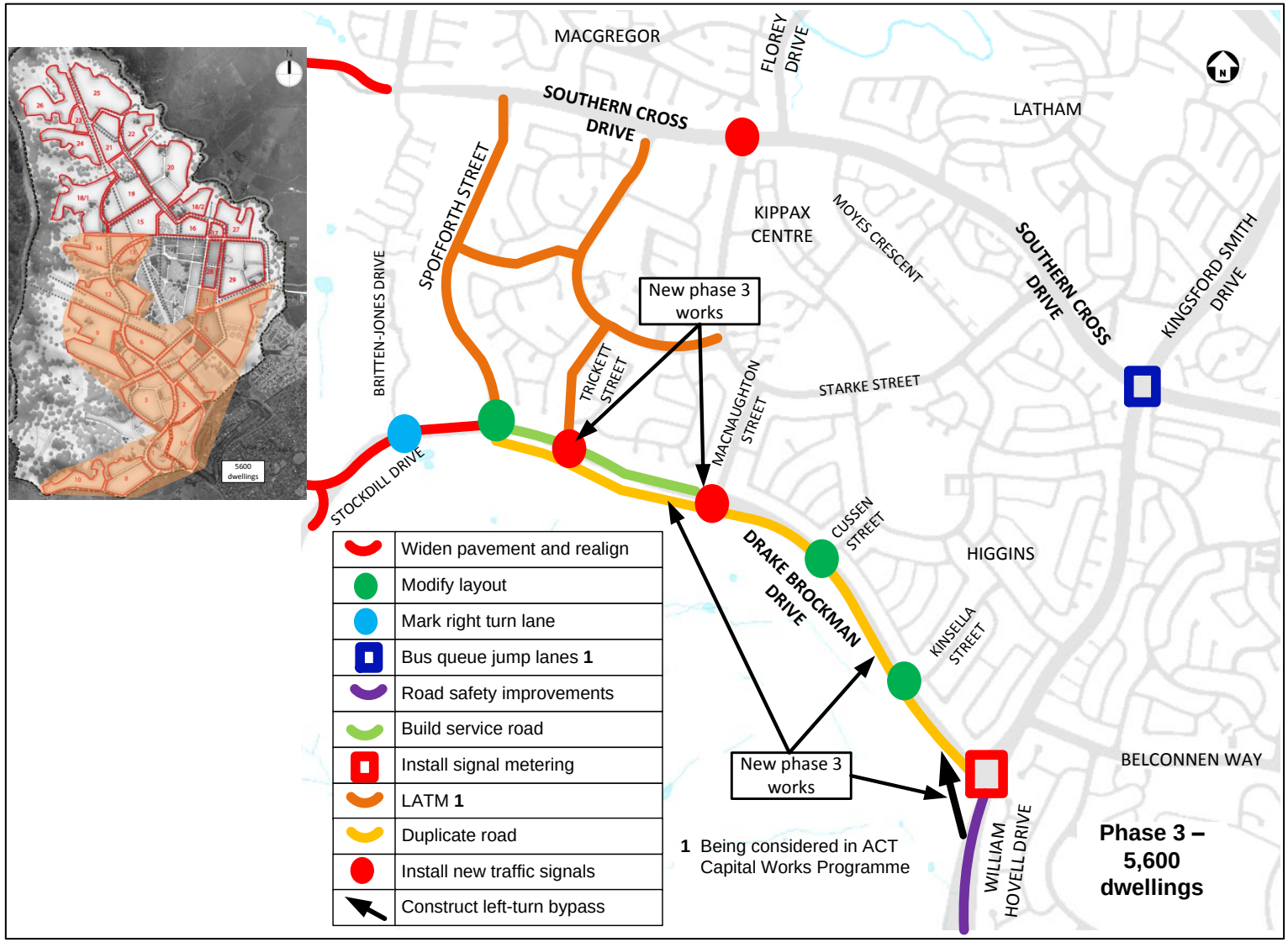


Figure 71: Overview of proposed ultimate off-site works

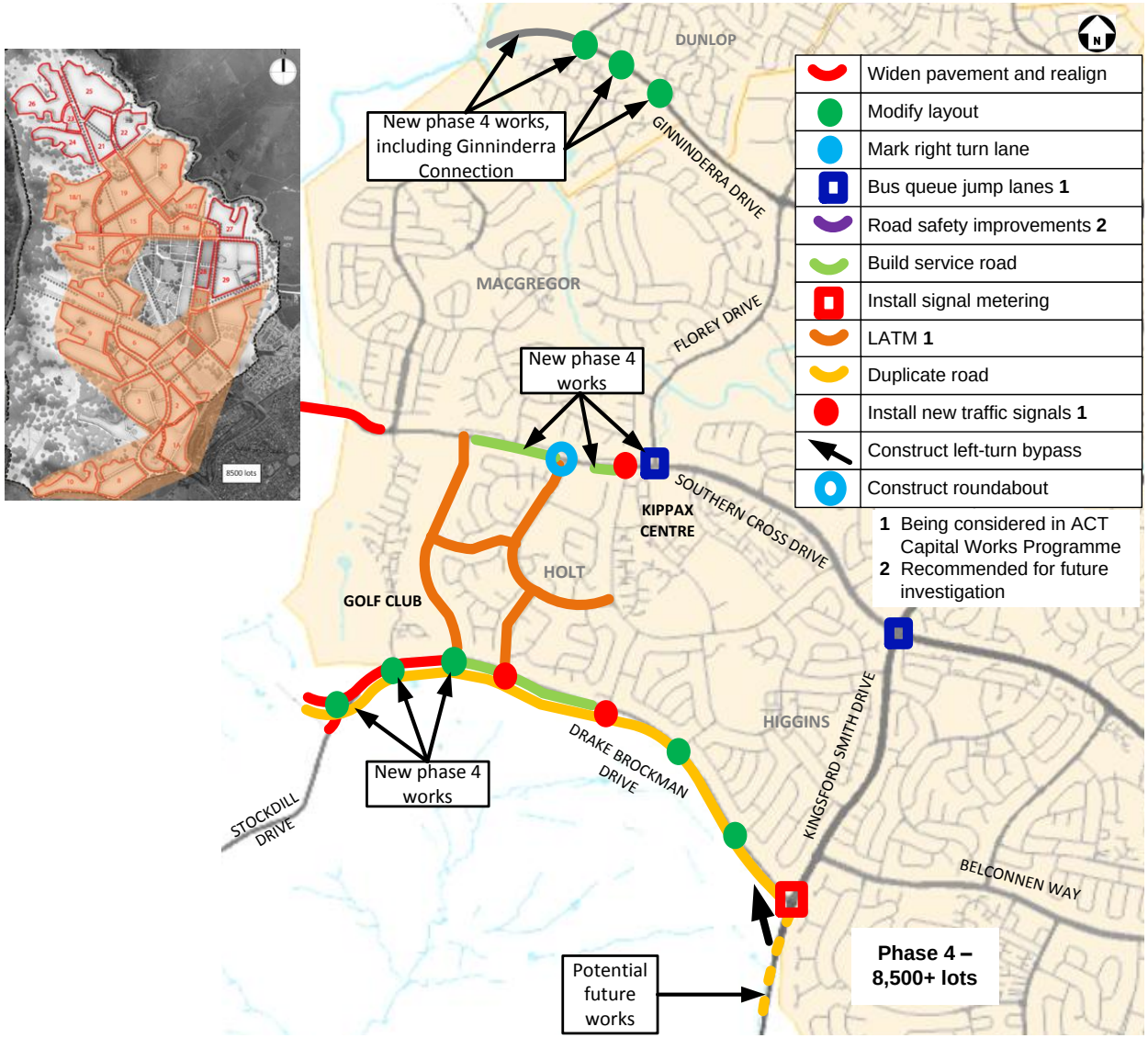


Table 41: Summary of major road works

Road	First stage of Development (600 dwellings)	By mid-2020's (2,900 dwellings)	By mid-2030's (5,600 dwellings)	By Ultimate (11,500 dwellings)
Stockdill Drive – Spofforth Street to Estate Access	- Create new intersection at estate access and realign Stockdill Drive - Widen pavement to accommodate on-road cycling (Figure 60) - New 1.5m concrete path on northern verge to connect to existing path on Spofforth Street - Provide right turn storage at the intersection with Britten-Jones Drive - Change intersection arrangements at Spofforth Street to give priority to Stockdill Drive - Relocation of 375 mm water main and gas main south of Drake Brockman Drive included as part of first stage of works is limited to west of Britten-Jones Drive			- Duplicate Stockdill Drive (Figure 61) - Upgrade intersections to suit duplication - Encroachment into the rural blocks on the southern side of Stockdill Drive
Drake Brockman Drive – Spofforth Street to MacNaughton Street	- Provide right turn storage at MacNaughton Street and Trickett Street intersections, making adequate provision for new cycle lanes	- Construct a new Drake Brockman Drive carriageway and service road (Figure 62) - Upgrade Trickett Street and MacNaughton Street priority intersections - Relocation of OH and UG HV cables - Encroachment into the rural blocks on the southern side of Drake Brockman Drive	- Duplicate Drake Brockman Drive (Figure 63) - Signalise Macnaughton Street intersection - Upgrade Trickett Street intersection to suit duplication and signalise - Relocation of 375mm water main south of Drake Brockman Drive between Trickett Street and MacNaughton Street - Encroachment into the rural blocks on the southern side of Drake Brockman Drive	

Road	First stage of Development (600 dwellings)	By mid-2020's (2,900 dwellings)	By mid-2030's (5,600 dwellings)	By Ultimate (11,500 dwellings)
		- Relocation of 375mm water main south of Drake Brockman Drive proposed in 2021 – Southern Cross Drive, Trickett St and MacNaughton St and the section between Spofforth and Trickett as these intersections are closer (based on distance)		
Drake Brockman Drive – east of MacNaughton Street	- Provide right turn storage at Cussen Street and Kinsella Street intersections (Figure 64), including minor widening to provide sufficient space for new cycle lanes	- Provide PM peak signal metering for right turn from Kingsford Smith Drive	- Construct left-turn bypass lane from William Hovell Drive and increase roundabout capacity for right turns out of Drake Brockman Drive - Duplicate Drake Brockman Drive (Figure 65)[4] - Upgrade Cussen Street and Kinsella Street intersections to suit duplication. Intersections remain unsignalised with eastbound acceleration lane. - Encroachment into the rural blocks on the southern side of Drake Brockman Drive	
William Hovell Drive – Drake Brockman Drive to Coppins Crossing		- Safety improvements[5] - Signalise Coppins Crossing intersection		- Upgrade intersections with Coppins Crossing and Coulter Drive [3] - Duplicate and construct median barrier[7]

[4] Construct early in 2030's decade.
[5] This could include improvements to lines and signs, lighting, reduced speed limit (to 80 km/h), speed cameras and potentially median barrier and minor road widening. Further investigations are required to determine suitable improvements and thus the associated construction costs.

Road	First stage of Development (600 dwellings)	By mid-2020's (2,900 dwellings)	By mid-2030's (5,600 dwellings)	By Ultimate (11,500 dwellings)
		- Widen eastbound approach to Coppins Crossing between Deep Creek and Coulter Drive (about 650 m) [6]		
Parkwood Road – estate boundary to Spofforth Street		- Realign bend in road from Britten-Jones Drive roundabout to the eastern boundary of the existing substation - Widen road to accommodate on-road cycling - New 1.5m concrete path on northern verge to connect to existing paths in West Macgregor - Works will encroach adjacent block		
Southern Cross Drive – Spofforth Street to Holt Oval underpass				- Construct southern service road and new two-lane road - Construct 1-lane roundabout at Beaurepaire Crescent intersection
Southern Cross Drive – Holt Oval underpass to Moyes Crescent		- Signalise Starke Street West intersection [8]		- Widen this section of road and upgrade intersections[9] - Provide eastbound queue jump lane for buses at Florey Drive intersection - Construct southern service road west of Starke Street

[7] Construct early in 2030's decade.
[6] Works are assumed to be part of Molonglo 3 project.
[8] Construct early in 20's decade.
[9] Construct early in 2030's decade and assume new road connection to Kippax via Moyes Crescent and reduced bus movements through Starke Street West

Road	First stage of Development (600 dwellings)	By mid-2020's (2,900 dwellings)	By mid-2030's (5,600 dwellings)	By Ultimate (11,500 dwellings)
Southern Cross Drive – Moyes Crescent to Kingsford Smith Drive				- No works proposed; depends on outcome regarding Moyes Crescent link to Kippax Centre
Ginninderra Drive – Kerrigan Street to Florey Drive				- Provide right turn storage at intersections with Archdall Street and Lance Hill Avenue - Construct intersection with Kerrigan Street with right turn storage to Kerrigan St
Ginninderra Drive – Florey Drive to Kingsford Smith Drive				- No works proposed

Note: 1. Assumes Kippax Centre extended towards Moyes Crescent with a new bus terminal accessed via there

2. Some intersection improvements along Stockdill Drive, Drake Brockman Drive and William Hovell Drive will incorporate bus priority treatments, to be determined in ongoing investigations.

Appendix A: Peak to Day Traffic Data

Road & Source	Location	Direction	AM	PM	Daily	Daily/AM	Daily/PM	Daily*2/(AM+PM)
Drake Brockman	Spofforth - Trickett	EB	130	73	1074	8.3	14.7	10.6
TTS (Dec 2013)		WB	67	133	1079	16.1	8.1	10.8
		Total	**197**	**206**	**2153**	**10.9**	**10.5**	**10.7**
Drake Brockman	Macnaughton - Trickett	EB	477	143	2637	5.5	18.4	8.5
TAMS (Oct 2012)		WB	108	403	2519	23.3	6.3	9.9
		Total	**585**	**546**	**5156**	**8.8**	**9.4**	**9.1**
Drake Brockman	Macnaughton - Cussen	EB	679	168	3623	5.3	21.6	8.6
TAMS (Sept 2010)		WB	151	627	3659	24.2	5.8	9.4
		Total	**830**	**795**	**7282**	**8.8**	**9.2**	**9.0**
Drake Brockman	West of Kinsella Street	EB	812	255	4790	5.9	18.8	9.0
TTS (Dec 2013)		WB	192	722	4609	24.0	6.4	10.1
		Total	**1004**	**977**	**9399**	**9.4**	**9.6**	**9.5**
Drake Brockman	West of William Hovell	EB	890	256	4861	5.5	19.0	8.5
TTS (Sept 2013)		WB	196	805	4678	23.9	5.8	9.3
		Total	**1086**	**1061**	**9539**	**8.8**	**9.0**	**8.9**
Parkwood Road	West of Britten-Jones	EB	66	71	664	10.1	9.4	9.7
TAMS (Aug 2013)		WB	70	76	644	9.2	8.5	8.8
		Total	**136**	**147**	**1308**	**9.6**	**8.9**	**9.2**
Southern Cross Drive	Spofforth - O'Reilly	EB	372	209	3075	8.3	14.7	10.6
TAMS (Oct 2012)		WB	170	311	3102	18.2	10.0	12.9
		Total	**542**	**520**	**6177**	**11.4**	**11.9**	**11.6**
Southern Cross Drive	O'Reilly - Beaurepaire	EB	674	344	5510	8.2	16.0	10.8
TTS (Dec 2013)		WB	275	783	5849	21.3	7.5	11.1
		Total	**949**	**1127**	**11359**	**12.0**	**10.1**	**10.9**
Southern Cross Drive	Starke - Florey	EB	534	435	5815	10.9	13.4	12.0
SCATS (Wed 8/9/13)		WB	407	716	6438	15.8	9.0	11.5
		Total	**941**	**1151**	**12253**	**13.0**	**10.6**	**11.7**
Southern Cross Drive	Florey - Moyes	EB	817	456	6351	7.8	13.9	10.0
SCATS (Wed 8/9/13)		WB	331	928	6871	20.8	7.4	10.9
		Total	**1148**	**1384**	**13222**	**11.5**	**9.6**	**10.4**
Southern Cross Drive	Chave - Starke	EB	854	451	7131	8.4	15.8	10.9
TTS (Dec 2013)		WB	404	916	7586	18.8	8.3	11.5
		Total	**1258**	**1367**	**14717**	**11.7**	**10.8**	**11.2**
Southern Cross Drive	West of Kingsford Smith	EB	1299	838	10460	8.1	12.5	9.8
SCATS (Wed 8/9/13)		WB	409	1337	9140	22.3	6.8	10.5
		Total	**1708**	**2175**	**19600**	**11.5**	**9.0**	**10.1**
Southern Cross Drive	East of Kingsford Smith	EB	1211	398	8239	6.8	20.7	10.2
SCATS (Wed 8/9/13)		WB	286	1268	8348	29.2	6.6	10.7
		Total	**1497**	**1666**	**16587**	**11.1**	**10.0**	**10.5**
Ginninderra Drive	Archdall - Lance Hill	EB	108	446	3030	28.1	6.8	10.9
TAMS (Nov 2010)		WB	516	188	3175	6.2	16.9	9.0
		Total	**624**	**634**	**6205**	**9.9**	**9.8**	**9.9**
Ginninderra Drive	West of Florey Drive	EB	802	280	4742	5.9	16.9	8.8
TTS (Sept 2013)		WB	191	747	4676	24.5	6.3	10.0
		Total	**993**	**1027**	**9418**	**9.5**	**9.2**	**9.3**
Ginninderra Drive	South of Companion Crescent	EB	417	1340	9727	23.3	7.3	11.1
TTS (Dec 2013)		WB	1423	597	10142	7.1	17.0	10.0
		Total	**1840**	**1937**	**19869**	**10.8**	**10.3**	**10.5**
Ginninderra Drive	East of Kingsford Smith	EB	1213	449	7677	6.3	17.1	9.2
SCATS (Wed 8/9/13)		WB	351	1095	7945	22.6	7.3	11.0
		Total	**1564**	**1544**	**15622**	**10.0**	**10.1**	**10.1**
Kingsford Smith	north of Ginninderra	NB	352	935	6569	18.7	7.0	10.2
SCATS (Wed 8/9/13)		SB	1006	384	6513	6.5	17.0	9.4
		Total	**1358**	**1319**	**13082**	**9.6**	**9.9**	**9.8**
Kingsford Smith	south of Ginninderra	NB	786	1588	11715	14.9	7.4	9.9
SCATS (Wed 8/9/13)		SB	1659	818	11659	7.0	14.3	9.4
		Total	**2445**	**2406**	**23374**	**9.6**	**9.7**	**9.6**
Kingsford Smith	north of Southern Cross Drive	NB	555	1501	10572	19.0	7.0	10.3
SCATS (Wed 8/9/13)		SB	1505	636	10743	7.1	16.9	10.0
		Total	**2060**	**2137**	**21315**	**10.3**	**10.0**	**10.2**
Kingsford Smith	south of Southern Cross Drive	NB	499	1391	8888	17.8	6.4	9.4
SCATS (Wed 8/9/13)		SB	1395	580	9059	6.5	15.6	9.2
		Total	**1894**	**1971**	**17947**	**9.5**	**9.1**	**9.3**
Florey Drive	north of Southern Cross Drive	NB	188	533	4429	23.6	8.3	12.3
SCATS (Wed 8/9/13)		SB	547	342	4532	8.3	13.3	10.2
		Total	**735**	**875**	**8961**	**12.2**	**10.2**	**11.1**
Florey Drive	Handcock - Herron	NB	325	436	4176	12.8	9.6	11.0
TAMS (July 2012)		SB	379	500	4487	11.8	9.0	10.2
		Total	**704**	**936**	**8663**	**12.3**	**9.3**	**10.6**

Road & Source	Location	Direction	AM	PM	Daily	Daily/AM	Daily/PM	Daily*2/(AM+PM)
Macnaughton	north of Drake Brockman	NB	60	220	1409	23.5	6.4	10.1
TAMS (Dec 2010)		SB	266	64	1410	5.3	22.0	8.5
		Total	**326**	**284**	**2819**	**8.6**	**9.9**	**9.2**
Beaurepaire	Armstrong - Pickworth	NB	100	247	1673	16.7	6.8	9.6
TAMS (Apr 2012)		SB	246	128	1668	6.8	13.0	8.9
		Total	**346**	**375**	**3341**	**9.7**	**8.9**	**9.3**
Spofforth Street	Drake Brockman - Messenger	NB	28	17	243	8.7	14.3	10.8
TAMS (Oct 2012)		SB	13	33	255	19.6	7.7	11.1
		Total	**41**	**50**	**498**	**12.1**	**10.0**	**10.9**
Trickett Street	Weber - Griffiths	NB	59	273	1567	26.6	5.7	9.4
TAMS (Oct 2012)		SB	345	95	1674	4.9	17.6	7.6
		Total	**404**	**368**	**3241**	**8.0**	**8.8**	**8.4**
Castieu Street	Dethridge - Hodges	EB	88	69	801	9.1	11.6	10.2
TAMS (Dec 2010)		WB	59	106	907	15.4	8.6	11.0
		Total	**147**	**175**	**1708**	**11.6**	**9.8**	**10.6**
Findlay Street	Kinsella - Crisp	EB	132	88	1156	8.8	13.1	10.5
TAMS (May 2012)		WB	71	161	1210	17.0	7.5	10.4
		Total	**203**	**249**	**2366**	**11.7**	**9.5**	**10.5**
Osburn Drive	Lipscomb - Eccles	NB	299	141	2065	6.9	14.6	9.4
TAMS (April 2013)		SB	86	315	2120	24.7	6.7	10.6
		Total	**385**	**456**	**4185**	**10.9**	**9.2**	**10.0**
Osburn Drive	Brownless - Luther	EB	77	57	679	8.8	11.9	10.1
TAMS (Oct 2011)		WB	62	105	753	12.1	7.2	9.0
		Total	**139**	**162**	**1432**	**10.3**	**8.8**	**9.5**
Archdall Street	Mileham - Barrett	NB	38	125	784	20.6	6.3	9.6
TAMS (July 2011)		SB	106	65	806	7.6	12.4	9.4
		Total	**144**	**190**	**1590**	**11.0**	**8.4**	**9.5**
O'Loghlen Street	Milford - Chambers	EB	112	94	976	8.7	10.4	9.5
TAMS (June 2010)		WB	82	116	1944	23.7	16.8	19.6
		Total	**194**	**210**	**2920**	**15.1**	**13.9**	**14.5**
Dalley Crescent	Gurner - Solomon	NB	58	97	893	15.4	9.2	11.5
TAMS (June 2010)		SB	81	82	937	11.6	11.4	11.5
		Total	**139**	**179**	**1830**	**13.2**	**10.2**	**11.5**
Luke Street	East of Starke Street	EB	159	209	2050	12.9	9.8	11.1
TTS (Sept 2013)		WB	134	253	2158	16.1	8.5	11.2
		Total	**293**	**462**	**4208**	**14.4**	**9.1**	**11.1**
Hardwick Crescent	East of Starke Street	EB	288	362	4312	15.0	11.9	13.3
TTS (Sept 2013)		WB	207	278	3344	16.2	12.0	13.8
		Total	**495**	**640**	**7656**	**15.5**	**12.0**	**13.5**
Hardwick Crescent	North of Flack Street	NB	248	339	3233	13.0	9.5	11.0
TTS (Sept 2013)	(both entries)	SB	272	383	3875	14.2	10.1	11.8
		Total	**520**	**722**	**7108**	**13.7**	**9.8**	**11.4**
Moyes Crescent	Postle - Flack	NB	45	101	872	19.4	8.6	11.9
TAMS (Dec 2010)		SB	69	72	741	10.7	10.3	10.5
		Total	**114**	**173**	**1613**	**14.1**	**9.3**	**11.2**

Appendix B: CSTM Link Road Capacities

Link Type	Description	Speed	Interrupted 1 Ln	Interrupted 2 Ln	Interrupted 3 Ln	Interrupted 4 Ln	Uninterrupted 1 Ln	Uninterrupted 2 Ln	Uninterrupted 3 Ln	Uninterrupted 4 Ln
111	Highway	110	-	-	-	-	2100	4600	7200	9200
110		100	-	-	-	-	2000	4400	6900	9200
109		90	-	-	-	-	1900	4200	6600	9000
108		80	-	-	-	-	1800	4000	6300	8600
107		70	-	-	-	-	1700	3800	6000	8200
210	Rural Arterial	100	1000	1900	2900	3900	2000	4400	6900	9200
209		90	1000	1900	2900	3900	1900	4200	6600	9000
208		80	900	1900	2900	3900	1800	4000	6300	8600
207		70	800	1700	2600	3500	1700	3800	6000	8200
206		60	700	1500	2300	3100	1600	3600	5700	7800
309	Rural Distributor	90	900	1800	2700	3600	1700	3400	5100	6800
308		80	900	1800	2700	3600	1700	3400	5100	6800
307		70	800	1600	2400	3200	1500	3000	4500	6000
306		60	700	1400	2100	2800	1300	2600	3900	5200
305		50	600	1200	1800	2400	1100	2200	3300	4400
409	Urban Arterial	90	1000	1900	2900	3900	1900	4200	6600	9000
408		80	900	1900	2900	3900	1800	3800	5800	7800
407		70	800	1700	2600	3500	1600	3400	5200	7000
406		60	700	1500	2300	3100	1400	3000	4600	6200
405		50	600	1300	2000	2700	1200	2600	4000	5400
404		40	500	1100	1700	2300				
508	Urban Distributor	80	900	1800	2700	3600	1700	3400	5100	6800
507		70	800	1600	2400	3200	1500	3000	4500	6000
506		60	700	1400	2100	2800	1300	2600	3900	5200
505		50	600	1200	1800	2400	800	1600	2400	3200
504		40	500	1000	1500	2000	700	1400	2100	2800
606	Local Street	60	700	1400	2100	2800	-	-	-	-
605		50	600	1200	1800	2400	-	-	-	-
604		40	500	1000	1500	2000	-	-	-	-
900	Shared Path	1	1	-	-	-	-	-	-	-
999	Centroid Connector	50	99999	-	-	-	-	-	-	-
603		30	450	900	1250	1800				

Appendix C: Base Year Micro-simulation Model Data

Input Data

AECOM commissioned classified intersection turn count surveys at various locations within the study area. Classified intersection turn counts were commissioned on the month of September 2013 at the following intersections:

- Archdall Street / Ginninderra Drive;
- Ginninderra Drive / Florey Drive;
- Lhotsky Street / Florey Drive;
- Parkwood Road / Britten Jones Drive;
- Spofforth Street / Southern Cross Drive;
- Starke Street / Southern Cross Drive;
- Stockhill Drive / Spofforth Street;
- Kingsford Smith Drive / Belconnen Way;
- Starke Street / Hardwick Crescent;
- Hardwick Crescent, within Kippax car park;
- Starke Street / Luke Street;
- Hardwick Street / Luke Street;
- Hardwick Street / Flack Street; and
- Moyes Crescent / Starke Street;

In addition, intersection turn counts were commissioned at the following locations on November 2013:

- Southern Cross Drive / O'Loghlen Street;
- Southern Cross Drive / Chave Street;
- Southern Cross Drive / Dalley Crescent;
- Southern Cross Drive / Beaurepaire Crescent;
- Southern Cross Drive / O'Reilly Street;
- O'Reilly Street / Osburn Drive;
- Osburn Drive / Eccles Circuit;
- Osburn Drive / Cannan Circuit;
- Osburn Drive / Florey Drive;
- Spoffort Street and Messenger Street;
- Beaurepaire Crescent and Messenger Street;
- Beaurepaire Crescent and Trickett Street;
- Beaurepaire Crescent and Starke Street;
- Starke Street and MacNaughton Street;
- Starke Street and Fullagar Crescent;
- Starke Street and Moyes Crescent;
- Fullagar Crescent and Cussen Street;
- Fullagar Crescent and Findlay Street;

  - Fullagar Crescent and Castieu Street;
  - MacNaughton Street and Drake Brockman Drive;
- Trickett Street and Drake Brockmand Drive;
- Ginninderrra Drive and Tillyard Drive;
- Kingsford Smith Drive and Krefft Street;
- Kingsford Smith Drive and O'Loghlen Street;
- Kingsford Smith Drive and Castieu Street; and
- Kingsford Smith Drive and Findlay Street.

Pedestrian activities adjacent to the Kippax retail precinct were observed during September 2013. These observations included the volume of pedestrians crossing at:

- Hardwick Crescent; and
- Starke Street.

SCATS information, provided by the Roads and Traffic Authority, for all of the signalised intersections in the study area, are summarised in Table 42.

Table 42: SCATS Data

Name of Data Set	Details	Date Recorded (or Extracted)
.IDM Files	Playback information – phase by phase – for a 24 hour period	Tuesday, 17 September 2013
SCATS Detector Counts	Summary of detector counts by detector number by 15 minute period.	18 September 2013

Source: AECOM, based on data provided by Roads and Traffic Authority, 2013

For the SCATS Detector Counts, it was assumed that the distribution of vehicles was consistent with the average day.

External zones

The external zone structure for the base year West Belconnen commuter models consists of 31 zones, as detailed in Table 43.

Table 43: Zone Structure

Zone Number	Description
1	Parkwood Road
2	Stockdill Drive
3	William Hovell Drive
4	Belconnen Way
5	Southern Cross Drive
6	Krefft Street
7	Ginninderra Drive
8	Kingsford Smith Drive
9	Tillyard Drive
10	Lhotsky Street
11	Kerrigan Street
12	Macfarlane Burnet Avenue
13	Lindrum Crescent

Zone Number	Description
14	Hunt Street
15	Fellows Street
16	Powell Street
17	Kippax Shopping Centre
18	Kinsella Street
19	Griffiths Street
20	Clubbe Crescent
21	Hirschfeld Crescent
22	Charnwood Place
23	Hugh McKay Crescent
24	Blackham Street
25	Stretton Crescent
26	Griffiths Street
27	Clubbe Crescent
28	Hirschfeld Crescent
29	Charnwood Place
30	Hugh McKay Crescent
31	Blackham Street

Source: AECOM, 2013

Link flow calibration statistics

Table 44: AM Peak Hour Link Flow Comparisons Calibration

Road and Direction of Travel	Model	Count	GEH
Parkwood Road EB	46	47	0.1
Parkwood Road WB	52	71	2.4
Stockdill Drive EB	108	117	0.8
Stockdill Drive WB	71	72	0.2
William Hovell Drive NB	274	340	3.8
William Hovell Drive SB	1547	1464	2.1
Belconnen Way WB	272	303	1.8
Belconnen Way EB	767	708	2.2
Southern Cross Drive WB	285	288	0.2
Southern Cross Drive EB	1042	1010	1.0
Kreft Street WB	216	219	0.2
Kreft Street EB	334	314	1.1
Ginninderra Drive WB	250	278	1.7
Ginninderra Drive EB	1100	1153	1.6

Road and Direction of Travel	Model	Count	GEH
Kingsford Smith Drive SB	758	801	1.5
Kingsford Smith Drive NB	319	387	3.6
Tillyard Drive SB	544	582	1.6
Tillyard Drive NB	241	273	2.0
Lhotsky Street SB	426	458	1.5
Lhotsky Street NB	186	218	2.2
Kerrigan Street SB	745	803	2.1
Kerrigan Street NB	124	118	0.5
Macfarlane Burnet Avenue SB	577	620	1.8
Macfarlane Burnet Avenue NB	125	162	3.1
Lindrum Crescent Out	257	275	1.1
Lindrum Crescent In	92	99	0.7
Hunt Street Out	228	250	1.4
Hunt Street In	180	176	0.3
Fellows Street Out	510	519	0.4
Fellows Street In	253	227	1.7
Powell Street Out	188	199	0.8
Powell Street In	163	154	0.7
Kippax Shopping Centre Out	386	408	1.1
Kippax Shopping Centre In	535	475	2.7
Kinsella Street Out	280	277	0.2
Kinsella Street in	100	125	2.4
Griffiths Street Out	350	343	0.4
Griffiths Street In	120	153	2.8
Ginninderra Drive EB, West of Florey Drive	802	867	2.3
Ginninderra Drive WB, West of Florey Drive	191	149	3.3
Drake Brockman Drive EB, West of Kingsford Smith Drive	785	681	3.8
Drake Brockman Drive WB, West of Kingsford Smith Drive	196	192	0.6
Luke Street EB, East of Starke Street	114	157	3.7
Luke Street WB, East of Starke Street	86	70	1.8
Hardwick Crescent EB, East of Starke Street	231	188	3.0
Hardwick Crescent WB, East of Starke Street	137	151	1.1
Hardwick Crescent EB, West of Flack Street	114	190	6.2
Hardwick Crescent WB, West of Flack Street	130	137	0.6

Source: AECOM, based on microsimulation modelling, 2013; average of 5 seed runs

Table 45: PM Peak Hour Link Flow Comparisons Calibration

Road and Direction of Travel	Model	Count	GEH
Stockdill Drive EB	103	108	0.4
Stockdill Drive WB	89	89	0.2
William Hovell Drive NB	1328	1311	0.6
William Hovell Drive SB	324	280	2.5
Southern Cross Drive WB	1153	1220	1.9
Southern Cross Drive EB	569	528	1.7
Krefft Street WB	140	136	0.3
Krefft Street EB	134	157	1.9
Ginninderra Drive WB	1162	1197	1.0
Ginninderra Drive EB	661	668	0.3
Kingsford Smith Drive SB	354	380	1.3
Kingsford Smith Drive NB	920	963	1.4
Tillyard Drive SB	306	321	0.9
Tillyard Drive NB	477	432	2.1
Lhotsky Street SB	280	280	0.0
Lhotsky Street NB	370	412	2.1
Kerrigan Street SB	200	206	0.4
Kerrigan Street NB	646	660	0.6
Macfarlane Burnet Avenue SB	250	251	0.1
Macfarlane Burnet Avenue NB	501	540	1.7
Lindrum Crescent Out	150	160	0.8
Lindrum Crescent In	210	220	0.7
Powell Street Out	168	174	0.5
Powell Street In	187	201	1.0
Kippax Shopping Centre Out	770	786	0.6
Kippax Shopping Centre In	900	872	0.9
Kinsella Street Out	137	131	0.5
Kinsella Street In	250	272	1.4
Ginninderra Drive EB, West of Florey Drive	280	308	1.7
Ginninderra Drive WB, West of Florey Drive	747	714	1.2
Drake Brockman Drive EB, West of Kingsford Smith Drive	256	215	2.7
Drake Brockman Drive WB, West of Kingsford Smith Drive	805	811	0.5
Luke Street EB, East of Starke Street	209	247	2.5
Luke Street WB, East of Starke Street	253	251	0.4
Hardwick Crescent EB, East of Starke Street	362	426	3.2
Hardwick Crescent WB, East of Starke Street	278	332	3.1

Road and Direction of Travel	Model	Count	GEH
Hardwick Crescent EB, West of Flack Street	211	202	0.7
Hardwick Crescent WB, West of Flack Street	225	204	1.4

Source: AECOM, based on microsimulation modelling, 2013; average of 5 seed runs

Intersection turn flow calibration statistics

Table 46: AM Peak hour turn flow calibration

Intersection	Turn	Model	Count	GEH
Drake Brockman Drive-William Hovell Drive-Kingsford Smith Drive	William Hovell Drive - Left	90	116	2.5
	William Hovell Drive - Through	184	225	2.9
	Drake Brockman Drive - Left	283	214	4.4
	Drake Brockman Drive - Right	484	467	1.0
	Kingsford Smith Drive - Through	1063	998	2.0
	Kingsford Smith Drive - Right	91	76	1.6
Kingsford Smith Drive-Belconnen Way	Kingsford Smith Drive NB - Right	270	222	3.1
	Kingsford Smith Drive SB - Left	497	489	0.4
	Kingsford Smith Drive SB - Through	878	961	2.7
	Belconnen Way - Left	101	116	1.4
	Belconnen Way - Right	171	186	1.1
Kingsford Smith Drive-Southern Cross Drive	Kingsford Smith Drive NB - Left	132	89	4.1
	Kingsford Smith Drive NB - Through	296	289	0.4
	Kingsford Smith Drive NB - Right	81	76	0.5
	Southern Cross Drive EB - Left	203	233	2.0
	Southern Cross Drive EB - Through	665	558	4.3
	Southern Cross Drive EB - Right	399	418	0.9
	Kingsford Smith Drive SB - Left	296	374	4.2
	Kingsford Smith Drive SB - Through	854	787	2.3
	Kingsford Smith Drive SB - Right	171	182	0.8
	Southern Cross Drive WB - Left	25	54	4.6
	Southern Cross Drive WB - Through	170	151	1.5
	Southern Cross Drive WB - Right	90	81	1.0
Kingsford Smith Drive-Ginninderra Drive	Kingsford Smith Drive NB - Through	267	224	2.8
	Kingsford Smith Drive NB - Right	217	221	0.5
	Ginninderra Drive EB - Through	834	772	2.2
	Ginninderra Drive EB - Right	697	773	2.8
	Kingsford Smith Drive SB - Through	722	588	5.2
	Kingsford Smith Drive SB - Right	36	44	1.3

Intersection	Turn	Model	Count	GEH
	Ginninderra Drive WB - Through	146	161	1.2
	Ginninderra Drive WB - Right	52	51	0.2
Kingsford Smith Drive-Findlay Street	Kingsford Smith Drive NB - Left	45	27	3.1
	Kingsford Smith Drive NB - Through	360	375	0.8
	Kingsford Smith Drive SB - Through	1201	1299	2.8
	Kingsford Smith Drive SB - Right	7	0	3.6
	Findlay Street - Left	42	40	0.3
	Findlay Street - Right	129	159	2.5
Kingsford Smith Drive-Castieau Street	Kingsford Smith Drive NB - Left	33	17	3.2
	Kingsford Smith Drive NB - Through	388	399	0.6
	Kingsford Smith Drive SB - Through	1108	1228	3.5
	Kingsford Smith Drive SB - Right	46	25	3.5
	Castieau Street - Left	81	54	3.4
	Castieau Street - Right	81	52	3.5
Southern Cross Drive-O'Loghlen Street	Southern Cross Drive NB - Through	452	401	2.4
	Southern Cross Drive NB - Right	33	20	2.5
	Southern Cross Drive SB - Left	23	19	0.8
	Southern Cross Drive SB - Through	937	1030	3.0
	O'Loghlen Street - Left	117	176	4.9
	O'Loghlen Street - Right	21	23	0.5
Southern Cross Drive-Starke Street, West of O'Loghlen Street	Southern Cross Drive NB - Left	185	150	2.7
	Southern Cross Drive NB - Through	288	271	1.0
	Southern Cross Drive SB - Through	774	846	2.5
	Southern Cross Drive SB - Right	11	17	1.5
	Starke Street - Left	10	8	0.8
	Starke Street - Right	186	203	1.2
Southern Cross Drive-Chave Street	Southern Cross Drive WB - Left	17	12	1.3
	Southern Cross Drive WB - Through	274	267	0.5
	Southern Cross Drive EB - Through	906	834	2.4
	Southern Cross Drive EB - Right	15	21	1.3
	Chave Street - Left	13	17	1.1
	Chave Street - Right	27	27	0.6
Southern Cross Drive-Dalley Crescent	Southern Cross Drive WB - Through	248	243	0.3
	Southern Cross Drive WB - Right	39	40	0.3
	Southern Cross Drive EB - Left	48	78	3.7

Intersection	Turn	Model	Count	GEH
	Southern Cross Drive EB - Through	798	675	4.5
	Dalley Crescent - Left	123	181	4.7
	Dalley Crescent - Right	29	95	8.4
Southern Cross Drive-Moyes Crescent	Southern Cross Drive WB - Left	27	10	3.8
	Southern Cross Drive WB - Through	287	328	2.3
	Southern Cross Drive EB - Through	936	735	6.9
	Southern Cross Drive EB - Right	38	53	2.2
	Moyes Crescent - Left	22	20	1.9
	Moyes Crescent - Right	23	20	0.7
Southern Cross Drive-Starke Street, West of Florey Drive	Southern Cross Drive WB - Left	239	271	2.0
	Southern Cross Drive WB - Through	119	96	2.2
	Southern Cross Drive EB - Through	405	398	0.6
	Southern Cross Drive EB - Right	167	144	1.8
	Starke Street - Left	47	55	1.1
	Starke Street - Right	133	159	2.2
Southern Cross Drive-Beaurepaire Crescent	Southern Cross Drive WB - Left	53	15	6.6
	Southern Cross Drive WB - Through	184	136	3.8
	Southern Cross Drive EB - Through	501	407	4.4
	Southern Cross Drive EB - Right	157	109	4.2
	Beaurepaire Crescent - Left	30	18	2.4
	Beaurepaire Crescent - Right	83	137	5.1
Southern Cross Drive-O'Reilly Street	Southern Cross Drive WB - Through	123	57	6.9
	Southern Cross Drive WB - Right	91	98	0.7
	Southern Cross Drive EB - Left	8	2	2.8
	Southern Cross Drive EB - Through	337	259	4.5
	O'Reilly Street - Left	321	258	3.7
	O'Reilly Street - Right	4	2	1.5
Southern Cross Drive-Spofforth Street	Southern Cross Drive WB - Left	6	0	3.5
	Southern Cross Drive WB - Through	97	59	4.3
	Parkwood Road EB - Through	323	252	4.2
	Parkwood Road EB - Right	10	50	7.3
	Spofforth Street - Left	1	9	3.6
	Spofforth Street - Right	15	10	1.5
Starke Street-Hardwick Crescent	Starke Street SB - Left	237	175	4.3
	Starke Street SB - Through	183	240	3.9

Intersection	Turn	Model	Count	GEH
	Hardwick Crescent - Left	48	31	2.7
	Hardwick Crescent - Right	117	120	0.3
	Starke Street NB - Through	68	94	2.9
	Starke Street SB - Right	17	13	1.2
Starke Street-Luke Street	Starke Street SB - Left	71	118	4.9
	Starke Street SB - Through	159	153	0.8
	Luke Street - Left	42	43	0.5
	Luke Street - Right	47	27	3.3
	Starke Street NB - Through	44	81	4.7
	Starke Street SB - Right	53	39	2.1
Starke Street-Beaurepaire Crescent	Starke Street SB - Through	176	157	1.5
	Starke Street SB - Right	22	38	3.0
	Beaurepaire Crescent - Left	51	42	1.3
	Beaurepaire Crescent - Right	136	169	2.7
	Starke Street SB - Left	57	107	5.6
	Starke Street SB - Through	59	78	2.3
Starke Street-Macnaughton Street	Starke Street EB - Through	192	172	1.5
	Starke Street EB - Right	171	174	0.8
	Macnaughton Street - Left	47	73	3.3
	Macnaughton Street - Right	41	36	0.9
	Starke Street WB - Left	26	22	0.8
	Starke Street WB - Through	40	75	4.6
Starke Street-Fullagar Crescent, West of Hardwick Crescent	Starke Street EB - Through	181	126	4.4
	Starke Street EB - Right	98	96	0.3
	Fullagar Crescent - Left	60	29	4.6
	Fullagar Crescent - Right	52	49	0.5
	Starke Street WB - Left	52	42	1.4
	Starke Street WB - Through	128	91	3.6
Starke Street-Fullagar Crescent, West of Moyes Crescent	Starke Street EB - Through	158	174	1.2
	Starke Street EB - Right	68	15	8.2
	Fullagar Crescent - Left	82	53	3.5
	Fullagar Crescent - Right	32	17	3.1
	Starke Street WB - Left	45	42	0.6
	Starke Street WB - Through	120	107	1.2
Starke Street-Moyes	Starke Street EB - Left	22	16	1.5

Intersection	Turn	Model	Count	GEH
Crescent	Starke Street EB - Through	165	175	0.8
	Moyes Crescent - Left	38	37	0.7
	Moyes Crescent - Right	42	18	4.3
	Starke Street WB - Through	119	131	1.1
	Starke Street WB - Right	38	34	0.7
Hardwick Crescent-Flack Street	Hardwick Crescent EB - Left	30	74	6.1
	Hardwick Crescent EB - Through	102	116	1.4
	Flack Street - Left	67	35	4.4
	Flack Street - Right	14	30	3.3
	Hardwick Crescent WB - Through	14	30	3.3
	Hardwick Crescent WB - Right	45	23	3.8
Moyes Crescent-Flack Street	Moyes Crescent WB - Through	26	39	2.3
	Moyes Crescent WB - Right	41	24	3.0
	Flack Street - Left	34	30	1.5
	Flack Street - Right	43	68	3.3
	Moyes Crescent EB - Left	73	41	4.3
	Moyes Crescent EB - Through	13	10	0.8
Drake Brockman Drive-Macnaughton Street	Drake Brockman Drive WB - Through	74	92	1.9
	Drake Brockman Drive WB - Right	48	54	0.9
	Macnaughton Street - Left	214	151	4.7
	Macnaughton Street - Right	5	44	7.9
	Drake Brockman Drive EB - Left	12	54	7.3
	Drake Brockman Drive EB - Through	505	423	3.8
Drake Brockman Drive-Trickett Street	Drake Brockman Drive WB - Through	40	71	4.1
	Drake Brockman Drive WB - Right	39	65	3.6
	Trickett Street - Left	407	347	3.1
	Trickett Street - Right	6	5	0.4
	Drake Brockman Drive EB - Left	5	4	0.5
	Drake Brockman Drive EB - Through	112	130	1.6
Drake Brockman Drive-Spoffoth Street-Stockdill Drive	Drake Brockman Drive - Through	58	67	1.1
	Drake Brockman Drive - Right	18	9	2.3
	Stockdill Drive - Left	5	10	1.8
	Stockdill Drive - Right	103	106	0.3
	Spofforth Street - Left	69	28	6.0
	Spofforth Street - Right	13	5	2.7

Intersection	Turn	Model	Count	GEH
Ginninderra Drive-Tillyard Drive	Ginninderra Drive WB - Through	259	190	4.6
	Ginninderra Drive WB - Right	195	205	0.7
	Ginninderra Drive EB - Left	46	101	6.4
	Ginninderra Drive EB - Through	1118	1044	2.2
	Tillyard Drive - Left	519	607	3.7
	Tillyard Drive - Right	25	39	2.4
Ginninderra Drive-Florey Drive	Ginninderra Drive WB - Through	143	74	6.6
	Ginninderra Drive WB - Right	168	155	1.0
	Florey Drive SB - Left	233	297	3.9
	Florey Drive SB - Through	183	150	2.6
	Ginninderra Drive EB - Left	99	118	1.8
	Ginninderra Drive EB - Through	732	748	0.6
	Florey Drive NB - Left	22	20	0.4
	Florey Drive NB - Through	389	268	6.7
Lhotsky Street-Florey Drive	Lhotsky Street EB - Through	115	107	1.0
	Lhotsky Street EB - Right	311	352	2.2
	Lhotsky Street WB - Left	105	97	0.8
	Lhotsky Street WB - Through	57	64	0.9
	Florey Drive - Left	129	156	2.2
	Florey Drive - Right	144	123	1.9
Osburn Drive-Cannan Crescent	Osburn Drive WB - Through	117	139	1.9
	Osburn Drive WB - Right	23	20	0.8
	Osburn Drive EB - Left	19	46	4.8
	Osburn Drive EB - Through	101	68	3.5
	Cannan Crescent - Left	81	114	3.4
	Cannan Crescent - Right	98	53	5.1
Osburn Drive-Eccles Circuit	Osburn Drive SB	262	192	4.6
	Osburn Drive NB	107	100	0.7
	Eccles Circuit	136	189	4.2
Osburn Drive-O'Reilly Street	Osburn Drive EB - Through	45	30	2.4
	Osburn Drive EB - Right	342	238	6.1
	Osburn Drive WB - Left	24	22	0.5
	Osburn Drive WB - Through	12	0	4.9
	O'Reilly Street - Left	63	100	4.1
	O'Reilly Street - Right	5	0	2.8

Intersection	Turn	Model	Count	GEH
Florey Drive-Osburn Drive	Florey Drive SB - Through	432	404	1.4
	Florey Drive SB - Right	28	15	2.8
	Florey Drive NB - Left	31	40	1.5
	Florey Drive NB - Through	186	216	2.1
	Osburn Drive - Left	38	30	1.4
	Osburn Drive - Right	98	105	0.7

Source: AECOM, based on microsimulation modelling, 2013; average of 5 seed runs

Table 47: PM Peak hour turn flow calibration

Intersection	Turn	Observed	Count	GEH
Drake Brockman Drive-William Hovell Drive-Kingsford Smith Drive	William Hovell Drive - Left	441	529	4.0
	William Hovell Drive - Through	887	783	3.6
	Drake Brockman Drive - Left	139	105	3.0
	Drake Brockman Drive - Right	139	109	2.7
	Kingsford Smith Drive - Through	185	172	1.0
	Kingsford Smith Drive - Right	28	25	0.6
Kingsford Smith Drive-Southern Cross Drive	Kingsford Smith Drive NB - Left	420	427	0.4
	Kingsford Smith Drive NB - Through	936	880	1.9
	Kingsford Smith Drive NB - Right	66	86	2.3
	Southern Cross Drive EB - Left	167	213	3.3
	Southern Cross Drive EB - Through	285	309	1.4
	Southern Cross Drive EB - Right	123	123	0.4
	Kingsford Smith Drive SB - Left	218	137	6.1
	Kingsford Smith Drive SB - Through	350	392	2.2
	Kingsford Smith Drive SB - Right	180	242	4.2
	Southern Cross Drive WB - Left	4	4	0.6
	Southern Cross Drive WB - Through	715	688	1.0
	Southern Cross Drive WB - Right	434	525	4.2
Kingsford Smith Drive-Ginninderra Drive	Kingsford Smith Drive NB - Through	651	552	4.0
	Kingsford Smith Drive NB - Right	153	130	1.9
	Ginninderra Drive EB - Through	406	452	2.2
	Ginninderra Drive EB - Right	140	158	1.5
	Kingsford Smith Drive SB - Through	299	272	1.6
	Kingsford Smith Drive SB - Right	33	15	3.7

Intersection	Turn	Observed	Count	GEH
	Ginninderra Drive WB - Through	630	532	4.1
	Ginninderra Drive WB - Right	248	234	0.9
Kingsford Smith Drive-Findlay Street	Kingsford Smith Drive NB - Left	112	114	0.3
	Kingsford Smith Drive NB - Through	1289	1371	2.3
	Kingsford Smith Drive SB - Through	428	450	1.0
	Kingsford Smith Drive SB - Right	32	61	4.2
	Findlay Street - Left	43	34	1.4
	Findlay Street - Right	57	44	1.8
Kingsford Smith Drive-Castieau Street	Kingsford Smith Drive NB - Left	30	30	0.3
	Kingsford Smith Drive NB - Through	1302	1371	1.9
	Kingsford Smith Drive SB - Through	436	498	2.9
	Kingsford Smith Drive SB - Right	41	17	4.4
	Castieau Street - Left	54	39	2.1
	Castieau Street - Right	24	1	6.4
Southern Cross Drive-O'Loghlen Street	Southern Cross Drive NB - Through	1180	1231	1.5
	Southern Cross Drive NB - Right	135	119	1.4
	Southern Cross Drive SB - Left	42	16	4.8
	Southern Cross Drive SB - Through	539	591	2.2
	O'Loghlen Street - Left	36	50	2.2
	O'Loghlen Street - Right	25	18	1.4
Southern Cross Drive-Florey Street	Southern Cross Drive EB - Left	285	282	0.2
	Southern Cross Drive EB - Through	254	299	2.7
	Southern Cross Drive WB - Through	530	576	2.0
	Southern Cross Drive WB - Right	357	351	0.5
	Florey Street - Left	162	170	0.9
	Florey Street - Right	179	207	2.0
Southern Cross Drive-Chave Street	Southern Cross Drive WB - Left	30	53	3.6
	Southern Cross Drive WB - Through	908	994	2.8
	Southern Cross Drive EB - Through	409	443	1.7
	Southern Cross Drive EB - Right	24	16	1.8
	Chave Street - Left	25	20	1.0
	Chave Street - Right	30	70	5.7
Southern Cross Drive-Dalley Crescent	Southern Cross Drive WB - Through	817	853	1.2
	Southern Cross Drive WB - Right	116	160	3.8
	Southern Cross Drive EB - Left	48	59	1.5

Intersection	Turn	Observed	Count	GEH
	Southern Cross Drive EB - Through	366	404	2.0
	Dalley Crescent - Left	67	55	1.5
	Dalley Crescent - Right	48	102	6.3
Southern Cross Drive-Moyes Crescent	Southern Cross Drive WB - Left	55	90	4.0
	Southern Cross Drive WB - Through	810	865	1.9
	Southern Cross Drive EB - Through	375	416	2.0
	Southern Cross Drive EB - Right	41	53	1.7
	Moyes Crescent - Left	77	61	1.9
	Moyes Crescent - Right	39	48	1.4
Southern Cross Drive-Starke Street, West of Florey Drive	Southern Cross Drive WB - Left	316	384	3.6
	Southern Cross Drive WB - Through	393	402	0.5
	Southern Cross Drive EB - Through	280	231	3.1
	Southern Cross Drive EB - Right	116	149	2.9
	Starke Street - Left	267	223	2.8
	Starke Street - Right	259	350	5.2
Southern Cross Drive-Beaurepaire Crescent	Southern Cross Drive WB - Left	67	96	3.2
	Southern Cross Drive WB - Through	593	535	2.5
	Southern Cross Drive EB - Through	302	290	0.7
	Southern Cross Drive EB - Right	71	65	0.7
	Beaurepaire Crescent - Left	186	194	0.5
	Beaurepaire Crescent - Right	94	90	0.4
Southern Cross Drive-O'Reilly Street	Southern Cross Drive WB - Through	393	371	1.1
	Southern Cross Drive WB - Right	386	358	1.5
	Southern Cross Drive EB - Left	17	16	0.4
	Southern Cross Drive EB - Through	174	118	4.6
	O'Reilly Street - Left	199	237	2.6
	O'Reilly Street - Right	2	1	1.1
Southern Cross Drive-Spofforth Street	Southern Cross Drive WB - Left	10	0	4.5
	Southern Cross Drive WB - Through	376	372	0.3
	Parkwood Road EB - Through	173	118	4.5
	Parkwood Road EB - Right	9	4	2.1
	Spofforth Street - Left	85	75	1.2
	Spofforth Street - Right	18	16	0.6
Starke Street-Hardwick Crescent	Starke Street SB - Left	370	373	0.2
	Starke Street SB - Through	115	161	3.9

Intersection	Turn	Observed	Count	GEH
	Hardwick Crescent - Left	59	37	3.2
	Hardwick Crescent - Right	244	295	3.1
	Starke Street NB - Through	282	278	0.5
	Starke Street SB - Right	32	54	3.3
Starke Street-Luke Street	Starke Street SB - Left	90	112	2.2
	Starke Street SB - Through	84	86	0.5
	Luke Street - Left	69	40	4.0
	Luke Street - Right	173	211	2.7
	Starke Street NB - Through	141	121	1.8
	Starke Street SB - Right	111	135	2.1
Starke Street-Beaurepaire Crescent	Starke Street SB - Through	81	30	6.9
	Starke Street SB - Right	72	96	2.6
	Beaurepaire Crescent - Left	56	35	3.2
	Beaurepaire Crescent - Right	82	55	3.3
	Starke Street NB - Left	134	100	3.1
	Starke Street NB - Through	196	221	1.7
Starke Street-Macnaughton Street	Starke Street EB - Through	94	57	4.3
	Starke Street EB - Right	69	43	3.5
	Macnaughton Street - Left	187	248	4.2
	Macnaughton Street - Right	46	43	0.5
	Starke Street WB - Left	19	32	2.6
	Starke Street WB - Through	143	103	3.6
Starke Street-Fullagar Crescent, West of Hardwick Crescent	Starke Street EB - Through	114	92	2.2
	Starke Street EB - Right	26	12	3.3
	Fullagar Crescent - Left	39	34	0.8
	Fullagar Crescent - Right	77	59	2.2
	Starke Street WB - Left	52	39	2.0
	Starke Street WB - Through	123	131	0.7
Starke Street-Fullagar Crescent, West of Moyes Crescent	Starke Street EB - Through	125	138	1.1
	Starke Street EB - Right	55	42	1.8
	Fullagar Crescent - Left	79	28	6.9
	Fullagar Crescent - Right	71	51	2.6
	Starke Street WB - Left	72	77	0.6
	Starke Street WB - Through	176	140	2.8

Intersection	Turn	Observed	Count	GEH
Starke Street-Moyes Crescent	Starke Street EB - Left	67	51	2.1
	Starke Street EB - Through	129	138	0.8
	Moyes Crescent - Left	53	32	3.2
	Moyes Crescent - Right	42	8	6.9
	Starke Street WB - Through	206	209	0.3
	Starke Street WB - Right	81	52	3.6
Fullagar Crescent-Cussen Street	Hardwick Crescent EB - Through	40	46	0.9
	Hardwick Crescent EB - Right	38	5	7.2
	Cussen Street - Left	6	31	5.9
	Cussen Street - Right	No data	No data	N/A
	Hardwick Crescent WB - Left	11	5	2.3
	Hardwick Crescent WB - Through	110	62	5.1
Fullagar Crescent-Findlay Street	Fullagar Crescent EB - Through	72	58	1.8
	Fullagar Crescent EB - Right	35	46	1.8
	Findlay Street - Left	84	62	2.6
	Findlay Street - Right	60	34	3.8
	Fullagar Crescent WB - Left	65	73	1.1
	Fullagar Crescent WB - Through	37	5	7.0
Drake Brockman Drive-Macnaughton Street	Drake Brockman Drive WB - Through	321	394	3.9
	Drake Brockman Drive WB - Right	218	256	2.4
	Macnaughton Street - Left	63	32	4.4
	Macnaughton Street - Right	25	42	3.0
	Drake Brockman Drive EB - Left	15	39	4.6
	Drake Brockman Drive EB - Through	131	127	0.4
Drake Brockman Drive-Trickett Street	Drake Brockman Drive WB - Through	111	155	3.8
	Drake Brockman Drive WB - Right	235	281	2.9
	Trickett Street - Left	98	75	2.5
	Trickett Street - Right	13	6	2.4
	Drake Brockman Drive EB - Left	18	10	2.1
	Drake Brockman Drive EB - Through	48	92	5.2
Drake Brockman Drive-Spofforth Street-Stockdill Drive	Drake Brockman Drive - Through	89	86	0.4
	Drake Brockman Drive - Right	91	74	1.8
	Stockdill Drive - Left	18	16	0.6
	Stockdill Drive - Right	85	92	0.8
	Spofforth Street - Left	19	11	2.2

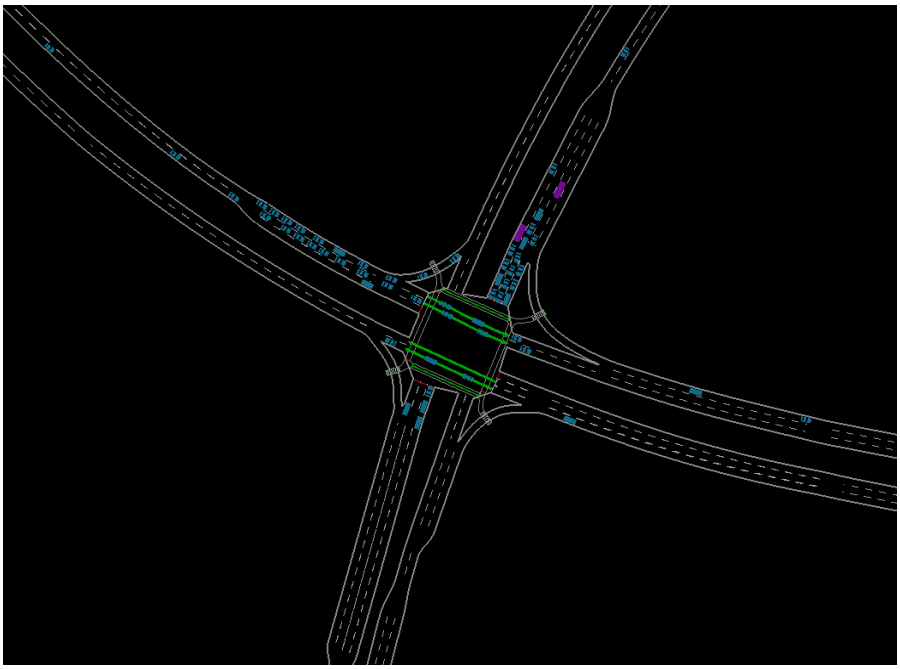
Intersection	Turn	Observed	Count	GEH
	Spofforth Street - Right	6	3	1.6
Ginninderra Drive-Tillyard Drive	Ginninderra Drive WB - Through	912	934	0.7
	Ginninderra Drive WB - Right	472	474	0.4
	Ginninderra Drive EB - Left	77	90	1.4
	Ginninderra Drive EB - Through	424	487	2.9
	Tillyard Drive - Left	251	302	3.0
	Tillyard Drive - Right	45	83	4.7
Kingsford Smith Drive-O'Loghlen Street	Kingsford Smith Drive SB - Through	713	731	0.7
	Kingsford Smith Drive SB - Right	124	122	0.2
	Kingsford Smith Drive NB - Left	179	144	2.8
	Kingsford Smith Drive NB - Through	1358	1481	3.3
	O'Loghlen Street - Left	89	95	0.6
	O'Loghlen Street - Right	35	45	1.5
Kingsford Smith Drive-Krefft Street	Kingsford Smith Drive SB - Left	70	64	0.8
	Kingsford Smith Drive SB - Through	760	793	1.2
	Kingsford Smith Drive NB - Through	1383	1492	2.9
	Kingsford Smith Drive NB - Right	64	94	3.4
	Krefft Street - Left	77	60	2.0
	Krefft Street - Right	63	76	1.6
Osburn Drive-Cannan Crescent	Osburn Drive WB - Through	124	87	3.6
	Osburn Drive WB - Right	72	75	0.7
	Osburn Drive EB - Left	133	115	1.7
	Osburn Drive EB - Through	138	108	2.7
	Cannan Crescent - Left	61	31	4.4
	Cannan Crescent - Right	40	74	4.5
Osburn Drive-Eccles Circuit	Osburn Drive SB exit	225	237	0.8
	Osburn Drive NB exit	271	223	3.0
	Eccles Circuit exit	205	154	3.9
Osburn Drive-O'Reilly Street	Osburn Drive EB - Through	40	18	4.0
	Osburn Drive EB - Right	185	218	2.4
	Osburn Drive WB - Left	18	20	0.5
	Osburn Drive WB - Through	30	31	0.9
	O'Reilly Street - Left	372	288	4.6
	O'Reilly Street - Right	31	85	7.0

Intersection	Turn	Observed	Count	GEH
Florey Drive-Osburn Drive	Florey Drive SB - Through	298	341	2.4
	Florey Drive SB - Right	37	39	0.8
	Florey Drive NB - Left	115	206	7.2
	Florey Drive NB - Through	526	430	4.4
	Osburn Drive - Left	28	39	1.8
	Osburn Drive - Right	43	37	1.0

Source: AECOM, based on microsimulation modelling, 2013; average of 5 seed runs

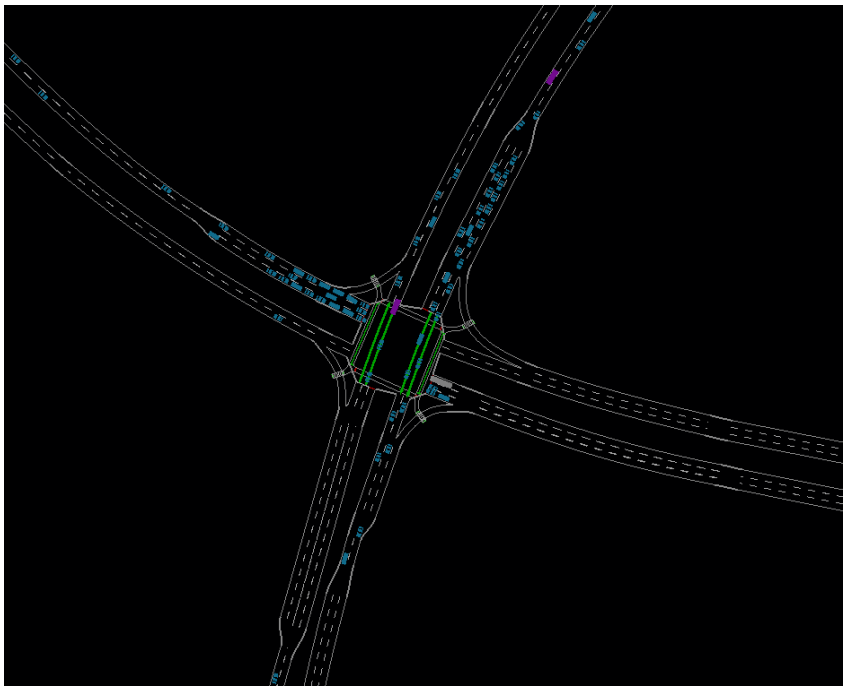
Model queue length screen shots

Figure 72: AM peak Kingsford Smith Drive / Southern Cross Drive eastbound queue



Source: AECOM, 2013

Figure 73: AM peak Kingsford Smith Drive / Southern Cross Drive southbound queue



Source: AECOM, 2013

Figure 74: PM peak Kingsford Smith Drive / Southern Cross Drive northbound queue

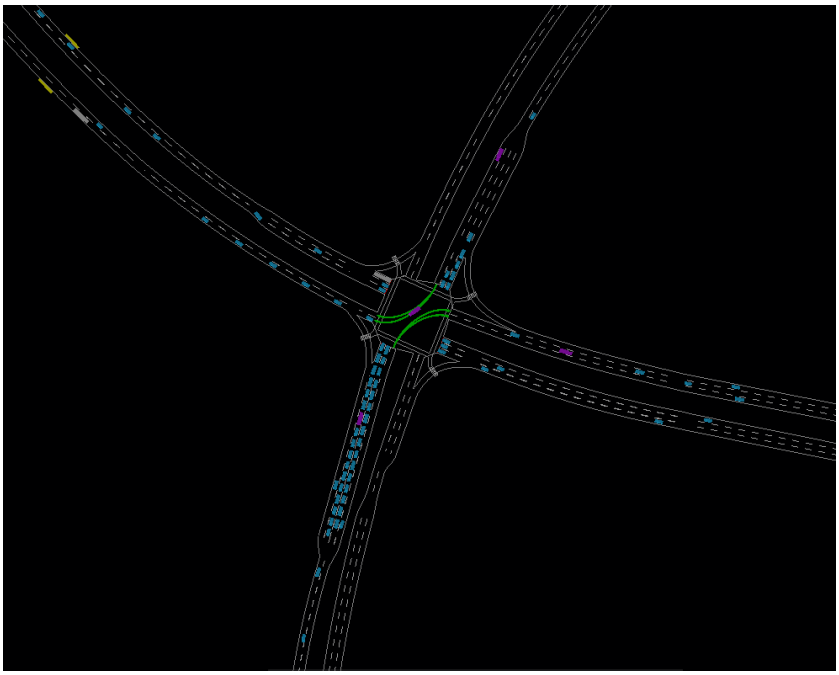


Figure 75: PM peak Kingsford Smith Drive / Southern Cross Drive westbound queue

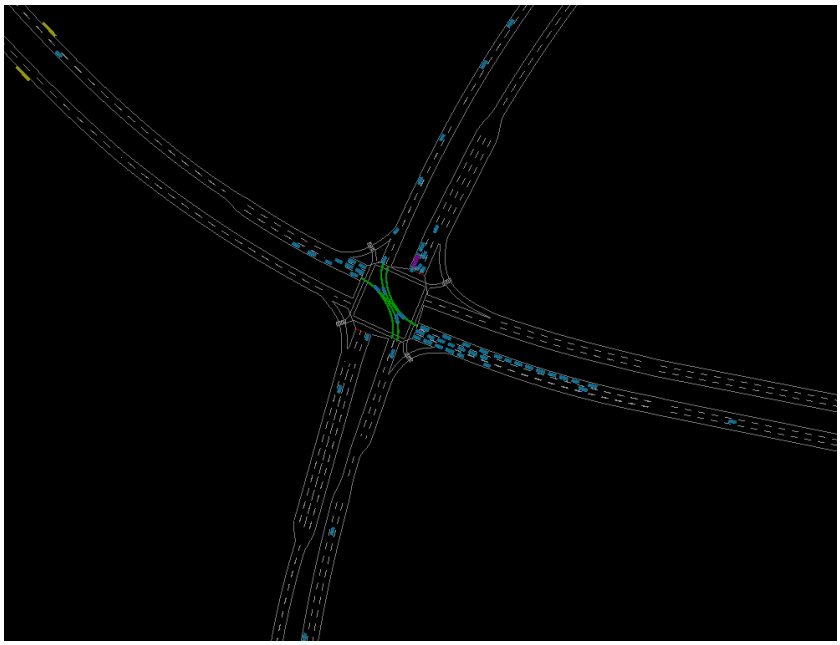
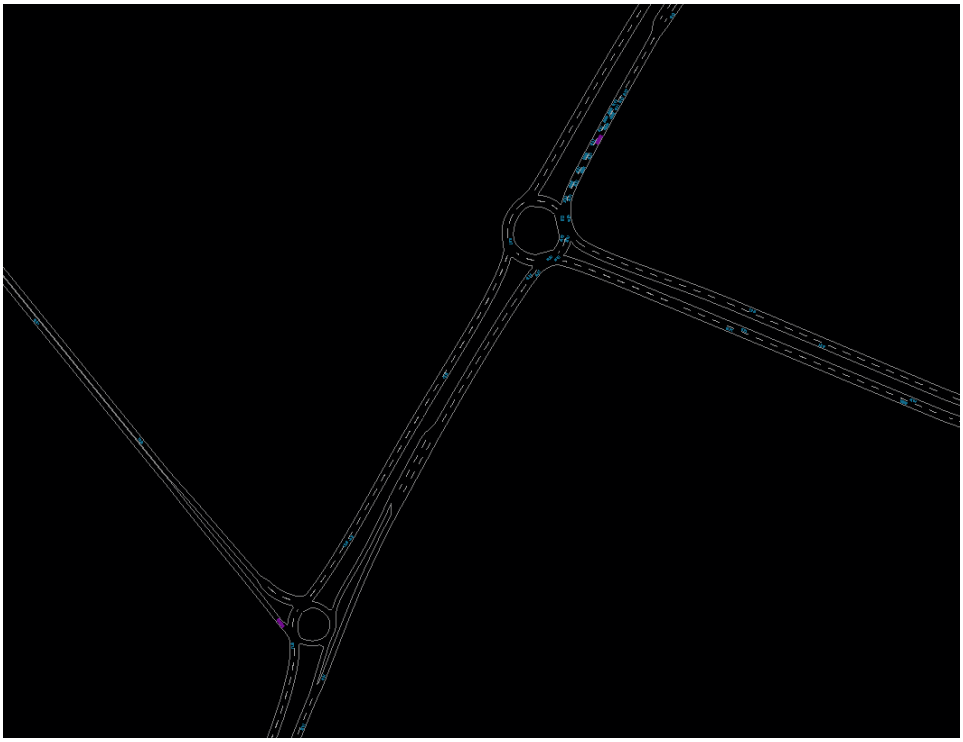
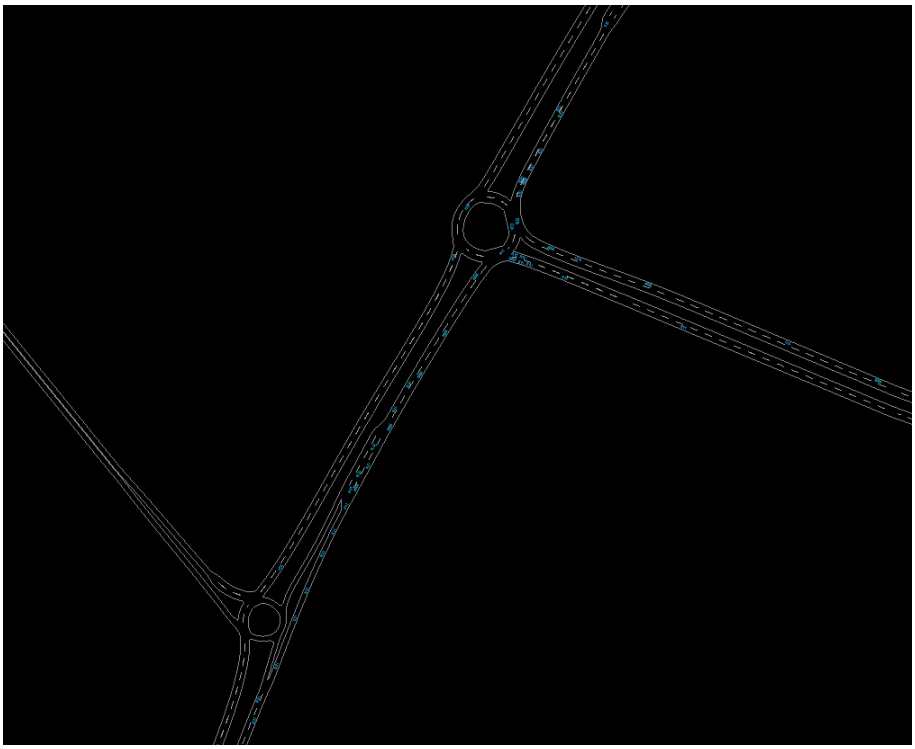


Figure 76: AM peak Kingsford Smith Drive / Belconnen Way / Drake Brockman Drive southbound queue



Source: AECOM, 2013

Figure 77: AM peak Kingsford Smith Drive / Belconnen Way / Drake Brockman Drive southbound queue



Source: AECOM, 2013

Figure 78: PM peak Kingsford Smith Drive / Belconnen Way / Drake Brockman Drive queue

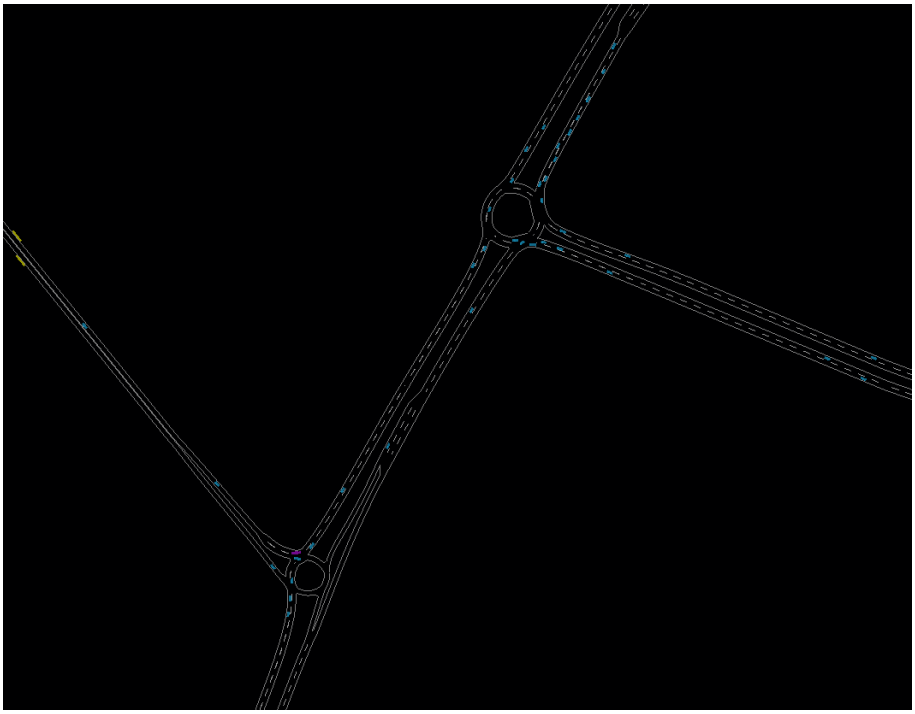
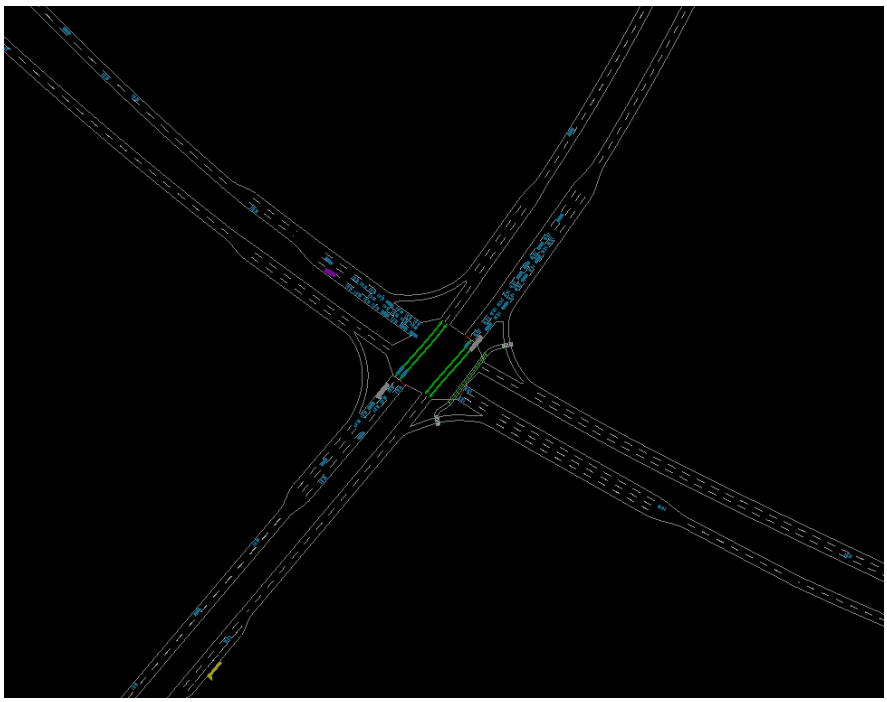
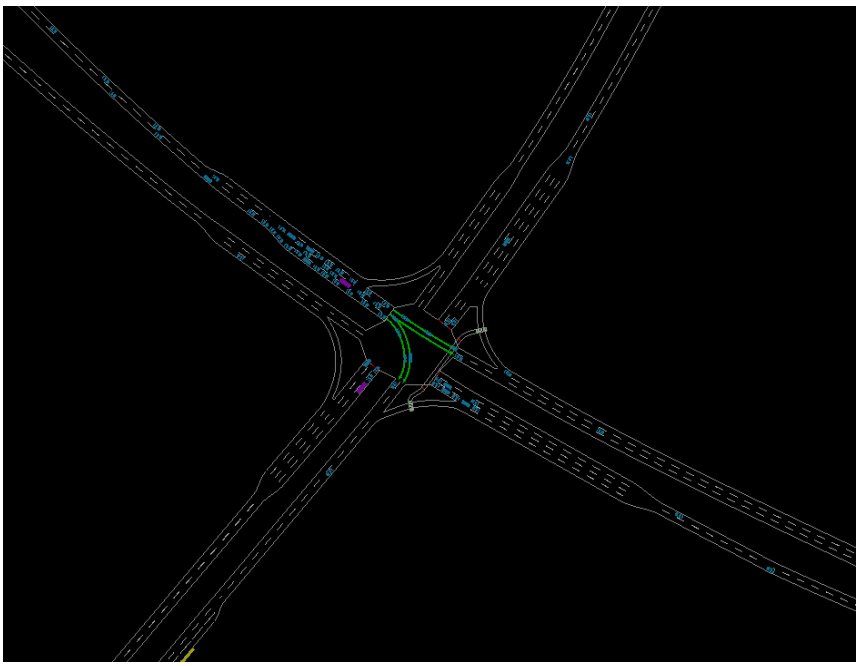


Figure 79: AM peak Kingsford Smith Drive / Ginninderra Drive southbound queue



Source: AECOM, 2013

Figure 80: AM peak Kingsford Smith Drive / Ginninderra Drive eastbound queue



Source: AECOM, 2013

Figure 81: PM peak Kingsford Smith Drive / Ginninderra Drive westbound queue

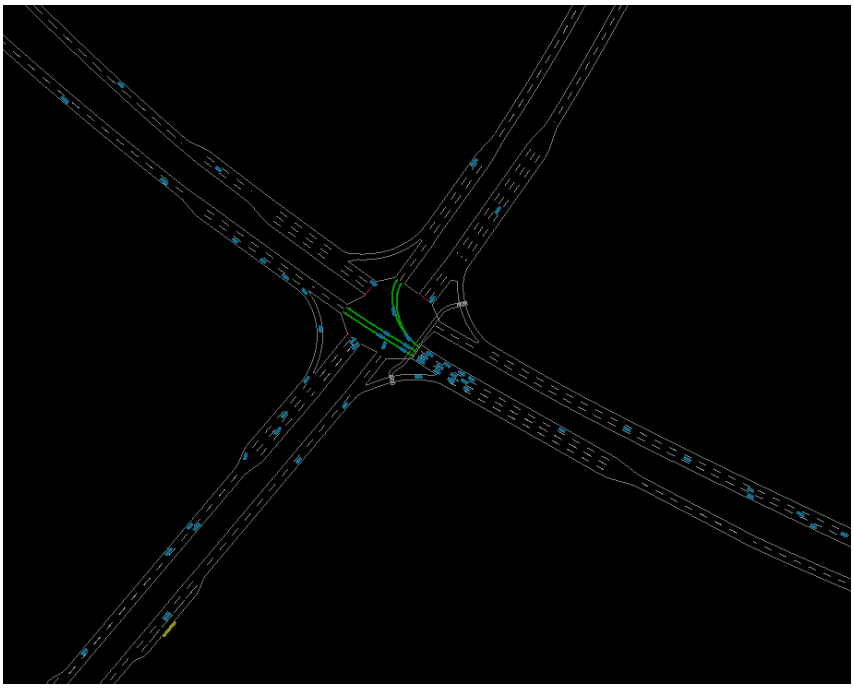
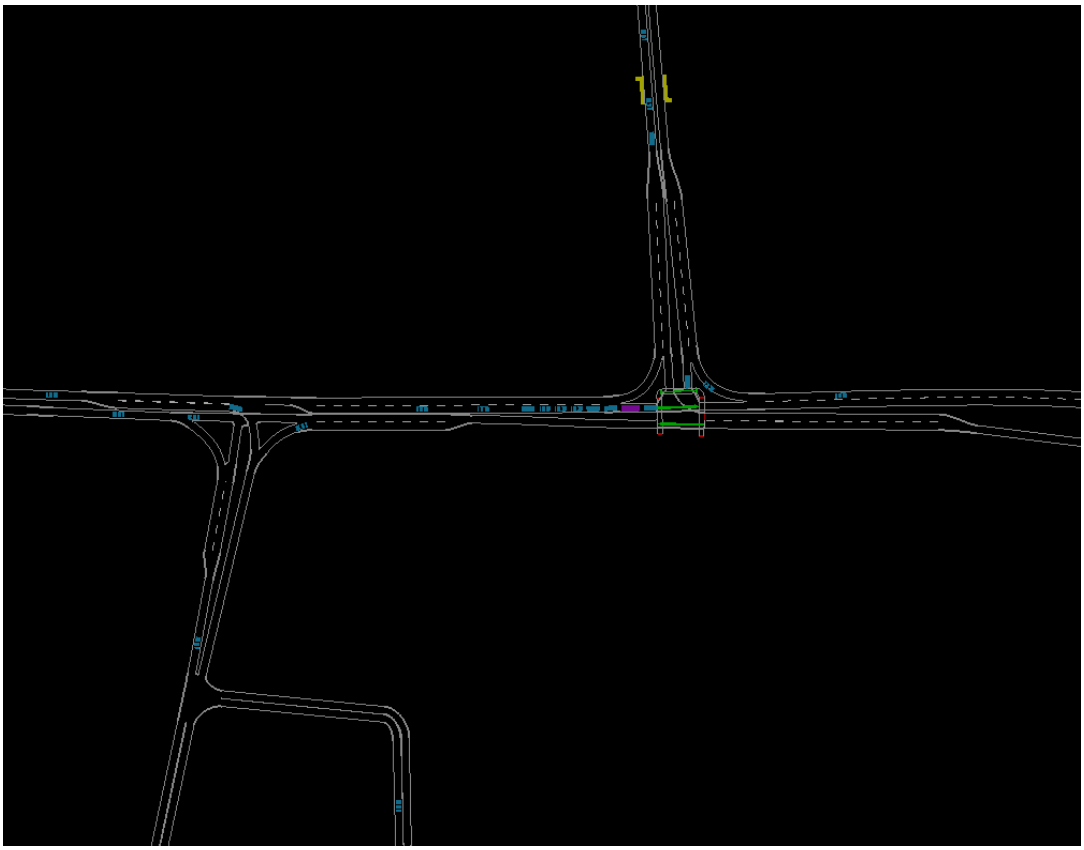
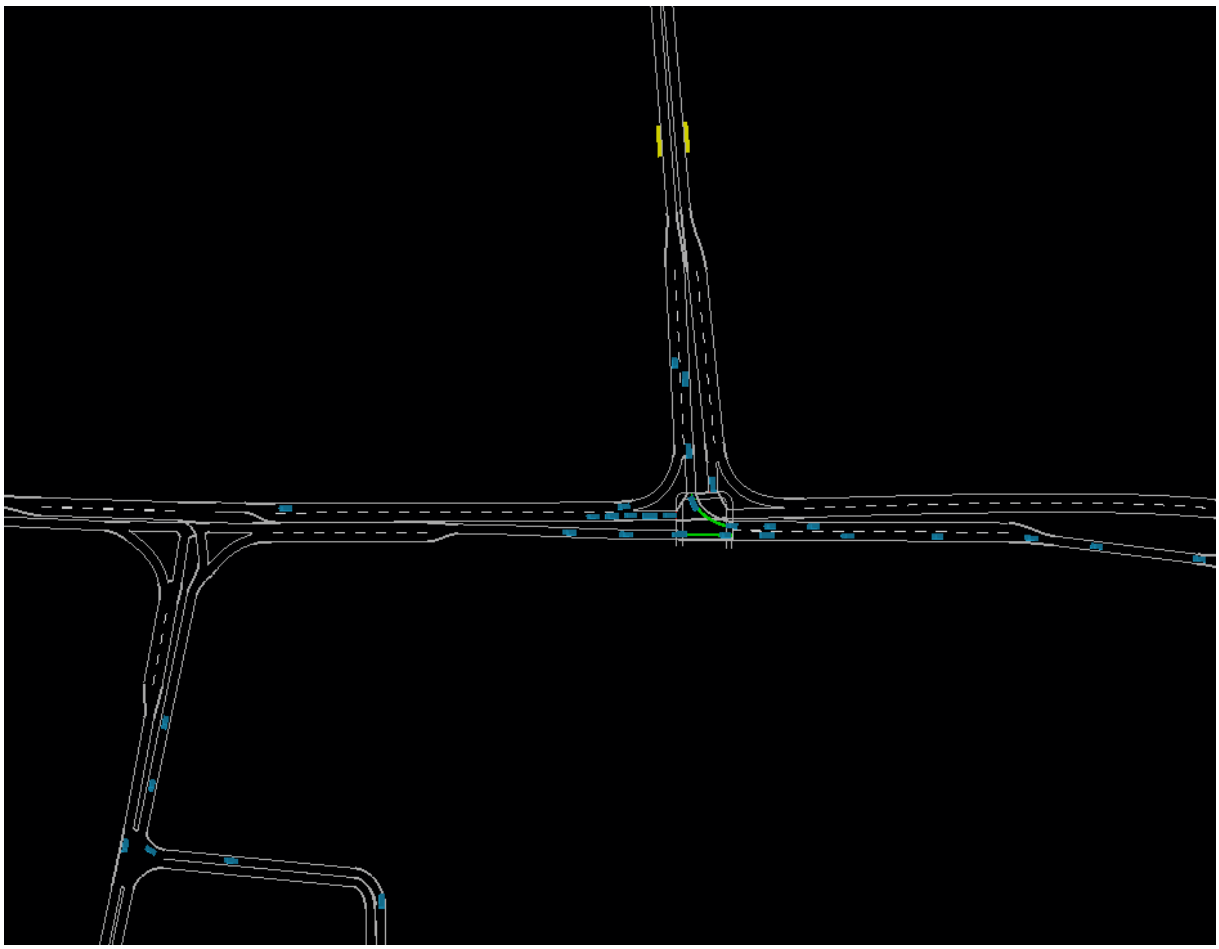


Figure 82: AM peak queue on Southern Cross Drive



Source: AECOM, 2013

Figure 83: PM peak queue on Southern Cross Drive



Intersection delays

Table 48: 2013 AM Intersection Delays and Level of Service by Approach

Intersection	Approach	Level of Service (Delay) 8:00- 9:00am	
Kingsford Smith Drive-Southern Cross Drive	Kingsford Smith Drive NB	D (46s)	D (45s)
	Southern Cross Drive EB	C (38.6s)	
	Kingsford Smith Drive SB	D (47.3s)	
	Southern Cross Drive WB	E (58.8s)	
Kingsford Smith Drive-Ginninderra Drive	Kingsford Smith Drive NB	C (35s)	C (41.6s)
	Ginninderra Drive EB	C (38.9s)	
	Kingsford Smith Drive SB	D (48.1s)	
	Ginninderra Drive WB	D (54s)	
Southern Cross Drive-Florey Drive	Southern Cross Drive EB	B (25s)	B (23.5s)
	Florey Drive	B (19.3s)	
	Southern Cross Drive WB	B (23.4s)	
Drake Brockman Drive-	William Hovell Drive NB	B (20.8s)	B (15.2s)

Intersection	Approach	Level of Service (Delay)	
		8:00- 9:00am	
William Hovell Drive-Kingsford Smith Drive	Drake Brockman Drive EB	A (12.4s)	
	Kingsford Smith Drive SB	B (14.9s)	
Belconnen Way-Kingsford Smith Drive	Kingsford Smith Drive NB	A (13.6s)	B (28.2s)
	Kingsford Smith Drive SB	C (34.3s)	
	Belconnen Way WB	B (20.2s)	

Source: AECOM based on Commuter modelling, 2013

Table 49: 2013 PM Intersection Delays and Level of Service by Approach

Intersection	Approach	Level of Service (Delay)	
		17:00- 18:00	
Kingsford Smith Drive-Southern Cross Drive	Kingsford Smith Drive NB	D (42.6s)	D (46s)
	Southern Cross Drive EB	D (50.4s)	
	Kingsford Smith Drive SB	D (47.5s)	
	Southern Cross Drive WB	D (46.6s)	
Kingsford Smith Drive-Ginninderra Drive	Kingsford Smith Drive NB	B (20.5s)	B (26.1s)
	Ginninderra Drive EB	C (32s)	
	Kingsford Smith Drive SB	C (29.1s)	
	Ginninderra Drive WB	C (28.7s)	
Southern Cross Drive-Florey Drive	Southern Cross Drive EB	C (36.1s)	B (23.7s)
	Florey Drive	C (40s)	
	Southern Cross Drive WB	B (16.1s)	
Drake Brockman Drive-William Hovell Drive-Kingsford Smith Drive	William Hovell Drive NB	B (25.7s)	B (22.2s)
	Drake Brockman Drive EB	A (11.5s)	
	Kingsford Smith Drive SB	A (14.3s)	
Belconnen Way-Kingsford Smith Drive	Kingsford Smith Drive NB	B (17s)	B (18.7s)
	Kingsford Smith Drive SB	B (19.7s)	
	Belconnen Way WB	B (19.6s)	

Source: AECOM based on Commuter modelling, 2013

Appendix D: Micro-simulation Model Traffic Forecasts

Data collection point	2013 AM count	2013 PM count	2021 AM count	2021 PM count
Ginninderra Drive EB	1146	570	1228	587
Ginninderra Drive WB	229	1016	481	1047
Florey Drive NB	288	419	285	413
Florey Drive SB	254	470	268	510
Osburn Drive EB	360	208	296	222
Osburn Drive WB	146	321	267	317
SCD EB near Kippax	557	580	574	520
SCD WB near Kippax	368	788	360	690
SCD EB near KSD	1206	640	1583	603
SCD WB near KSD	422	1356	762	1214
Belconnen Way EB	709	484	454	534
Belconnen Way WB	302	1046	193	1271
William Hovell Drive NB	340	1311	205	1399
William Hovell Drive SB	1463	280	1690	330
Drake Brockman Drive EB near KSD	681	215	1316	367
Drake Brockman Drive WB near KSD	192	808	320	1290
Starke Street EB near Macnaughton Street	346	100	266	119
Starke Street WB near Macnaughton Street	148	352	123	375
Macnaughton Street NB	109	292	154	309
Macnaughton Street SB	196	75	192	170
Drake Brockman Drive EB near Macnaughton Street	477	166	1163	333
Drake Brockman Drive WB near Macnaughton Street	135	433	280	995
Trickett Street NB	68	290	135	318
Trickett Street SB	353	81	460	100
Spofforth Street NB	19	87	52	87
Spofforth Street SB	33	13	121	68
Stockdill Drive EB	117	108	717	335
Stockdill Drive WB	72	89	236	759
Parkwood Road EB	302	122	302	30
Parkwood Road WB	68	445	35	227
Eccles Circuit EB	189	136	230	137
Eccles Circuit WB	96	153	119	151

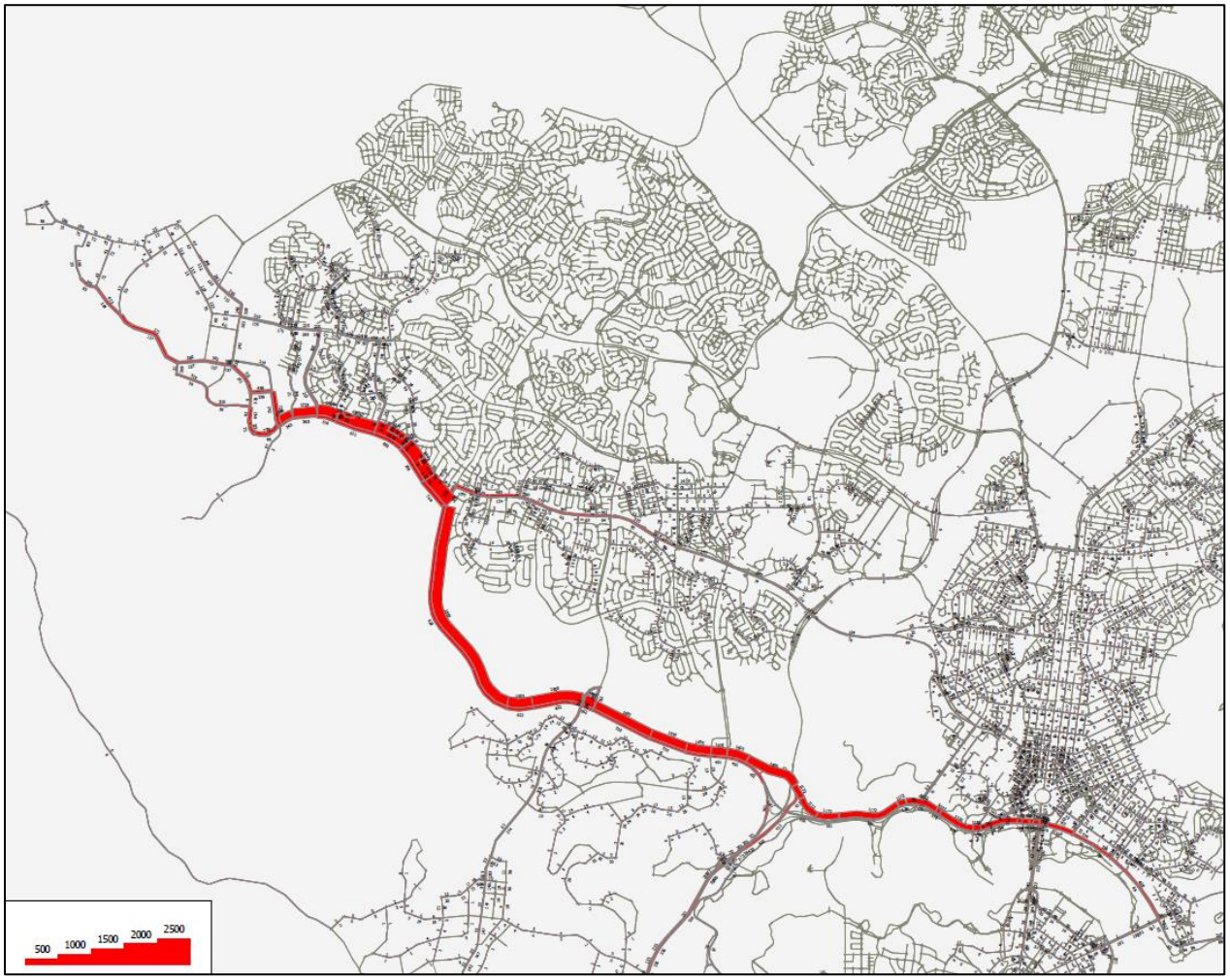
Data collection point	2031 AM count	2031 PM count	2041 AM count	2041 PM count
Ginninderra Drive EB	1046	492	1406	597
Ginninderra Drive WB	492	884	535	1296
Florey Drive NB	311	354	283	338
Florey Drive SB	252	413	217	397
Osburn Drive EB	564	200	529	187
Osburn Drive WB	383	251	340	287
SCD EB near Kippax	761	541	1036	616
SCD WB near Kippax	505	862	597	1274
SCD EB near KSD	1303	601	1613	648
SCD WB near KSD	831	1269	986	1559
Belconnen Way EB	457	505	681	473
Belconnen Way WB	237	1146	200	1300
William Hovell Drive NB	277	1561	651	2267
William Hovell Drive SB	1450	347	1937	649
Drake Brockman Drive EB near KSD	1470	449	2230	719
Drake Brockman Drive WB near KSD	448	1463	731	2180
Starke Street EB near Macnaughton Street	183	102	182	92
Starke Street WB near Macnaughton Street	105	361	91	210
Macnaughton Street NB	154	314	108	171
Macnaughton Street SB	132	179	110	138
Drake Brockman Drive EB near Macnaughton Street	1399	431	2168	670
Drake Brockman Drive WB near Macnaughton Street	400	1205	663	2037
Trickett Street NB	151	224	142	198
Trickett Street SB	431	90	373	92
Spofforth Street NB	56	63	77	77
Spofforth Street SB	93	70	121	102
Stockdill Drive EB	1026	447	1834	683
Stockdill Drive WB	342	1095	594	1961
Parkwood Road EB	533	179	933	300
Parkwood Road WB	203	507	336	936
Eccles Circuit EB	195	117	198	105
Eccles Circuit WB	117	151	100	129
A - WB	301	958	523	1644
A - EB	848	398	1576	568
B - SB	177	49	257	114

Data collection point	2031 AM count	2031 PM count	2041 AM count	2041 PM count
B - NB	38	134	66	310
C - EB	754	293	1462	471
C - WB	289	805	517	1473
D - EB	100	36	194	60
D - WB	18	46	45	127
E - EB	128	36	85	49
E - WB	32	109	23	161
F - SB	48	11	177	66
F - NB	7	23	40	156
G - SB	414	152	998	371
G - NB	136	393	381	1044
H - SB	245	222	508	391
H - NB	210	219	350	518
I - SB	31	31	69	87
I - NB	43	35	105	57
J - EB	158	69	733	237
J - WB	69	157	260	763
K - EB	0	0	510	178
K - WB	0	0	189	525
L - SB	27	58	116	185
L - NB	67	31	191	87
M - SB	360	209	1079	518
M - NB	201	362	503	1096
N - EB	369	218	786	341
N - WB	223	388	360	793
O - NB	40	45	75	80
O - SB	40	33	120	84
P - NB	71	62	758	320
P - SB	53	61	288	717
R - WB	5	8	169	540
R - EB	8	5	556	172
S - SB	0	0	580	193
S - NB	0	0	153	373
T - SB	0	0	38	26
T - NB	0	0	96	8

Data collection point	2031 AM count	2031 PM count	2041 AM count	2041 PM count
U - SB	0	0	694	278
U - NB	0	0	307	813
W - SB	188	136	995	463
W - NB	140	202	442	1048

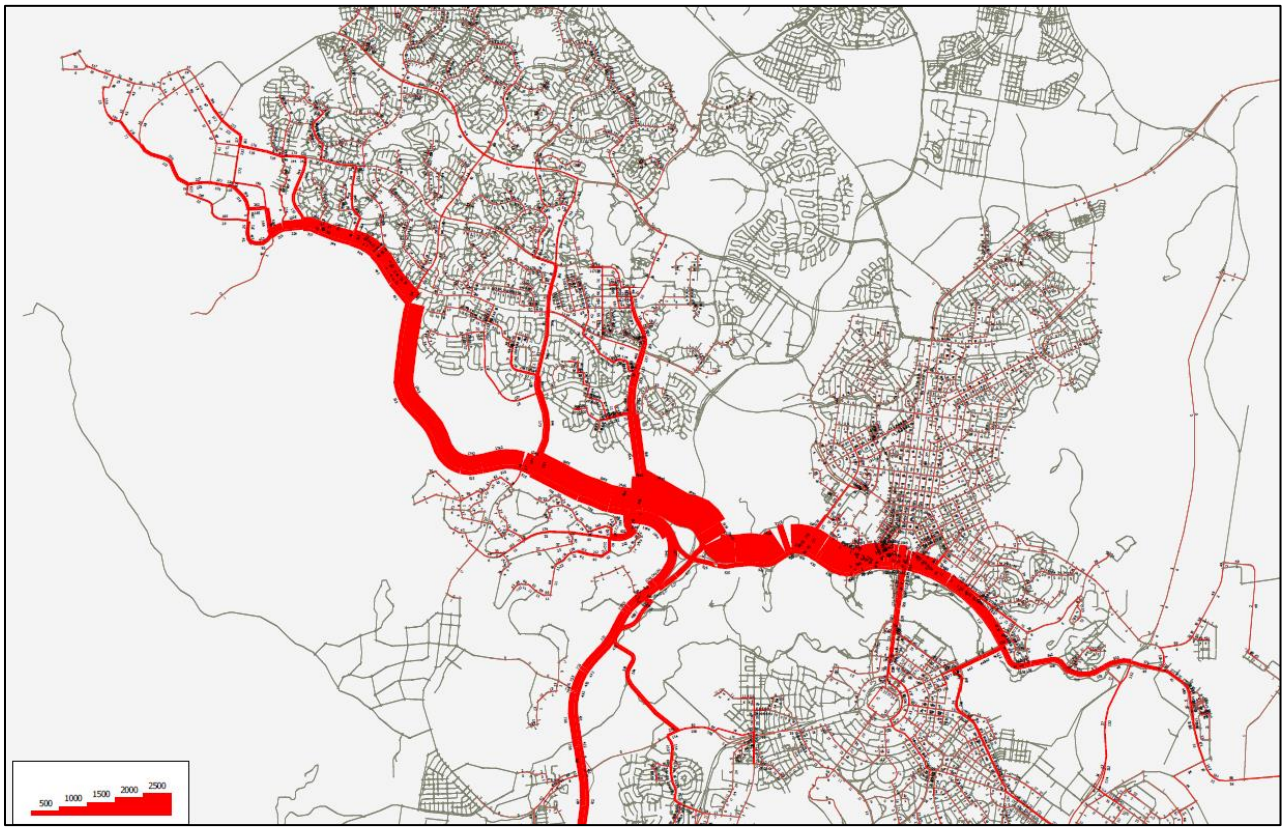
Appendix E: 2041 (Ultimate) CSTM Select Link Assignments

Figure 84: SLA showing all traffic using Drake Brockman Drive west of William Hovell Drive



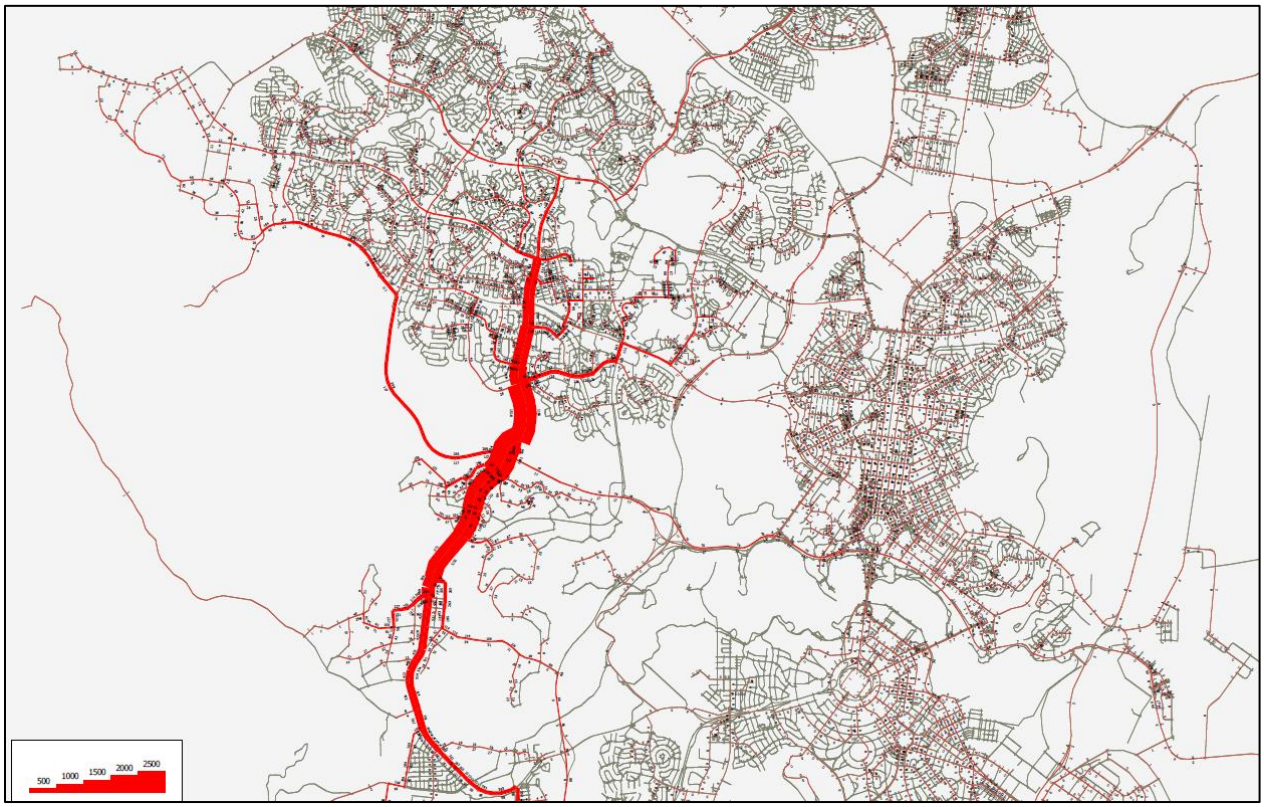
Source: AECOM, CSTM (May 2014); SLA is Select Link Assignment

Figure 85: SLA showing all traffic using William Hovell Drive west of Glenloch Interchange



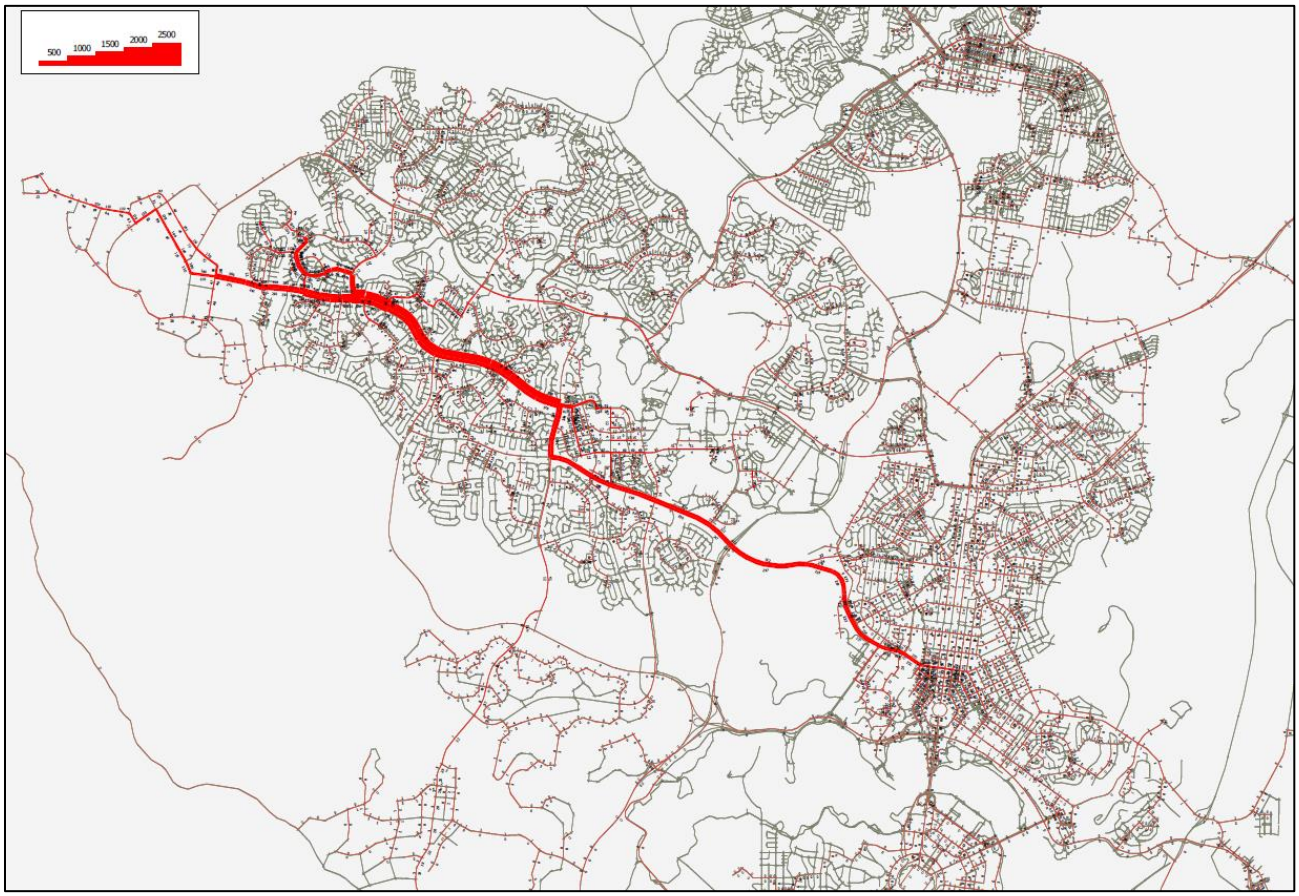
Source: AECOM, CSTM (May 2014); SLA is Select Link Assignment

Figure 86: SLA showing all traffic using John Gorton Drive south of William Hovell Drive



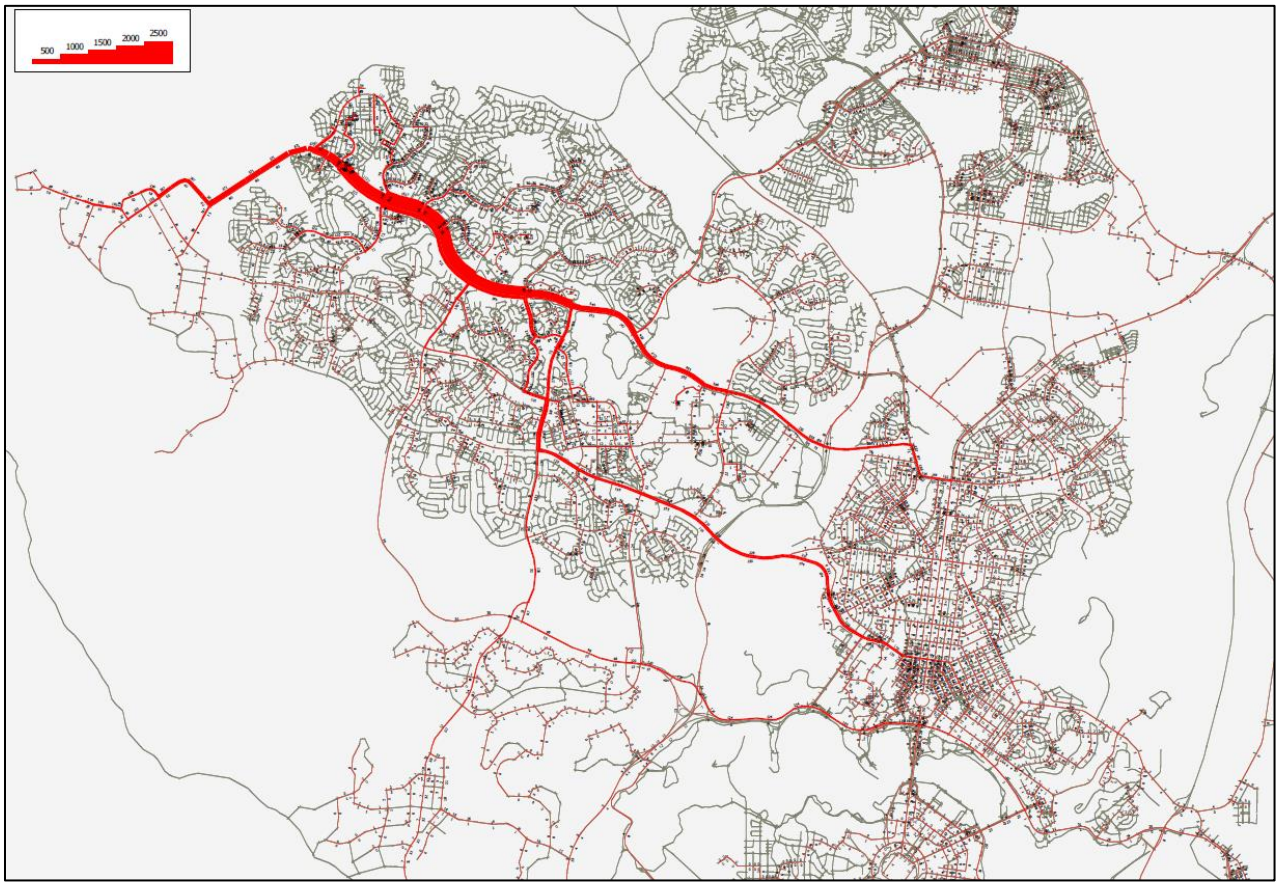
Source: AECOM, CSTM (May 2014); SLA is Select Link Assignment

Figure 87: SLA showing all traffic using Southern Cross Drive east of Florey Drive



Source: AECOM, CSTM (May 2014); SLA is Select Link Assignment

Figure 88: SLA showing all traffic using Ginninderra Drive east of Florey Drive



Source: AECOM, CSTM (May 2014); SLA is Select Link Assignment

Appendix F: Ginninderra Connection

1.0 Introduction

The Ginninderra Connection will be a high cost connection and will have some adverse environmental impacts that will be relatively difficult to mitigate. This appendix examines the traffic impacts of additional road works without the Ginninderra Connection.

2.0 Scope of Work

There are two elements to this work:

1) Strategic traffic modelling to determine the potential redistribution of traffic that will occur if the Ginninderra Connection is not built
2) Estimation of the order of costs of additional road works that will result from not building the Ginninderra Connection

This work relies on the results of strategic traffic modelling and a professional judgement of potential additional road works based on previous work. More detailed micro-simulation traffic modelling would provide more definitive guidance as to likely road works.

3.0 Traffic Modelling

Traffic modelling has been undertaken using the latest Canberra Strategic Transport Model used for the West Belconnen project. Model forecasts have been produced for three road network scenarios for 2041 Canberra landuses:

1) Base case with Ginninderra Connection
2) No Ginninderra Connection and no widening of Southern Cross Drive
3) No Ginninderra Connection but with duplication of Southern Cross Drive and an upgrade of Spofforth Street to reduce the risk of increased traffic on local streets in Holt with Southern Cross Drive duplicated

The outputs from this modelling are provided in Figure 90 to Figure 98. It includes plots of total traffic volumes, volume differences between scenarios and volume/capacity ratio. The latter is a measure of congestion. In the model, average travel speeds drop significantly as volumes approach the theoretical capacity of a road link; this is illustrated in Figure 89.

The main findings with regards removing the Ginninderra Connection are summarised in in Table 50. This is in the form of pros and cons for different roads or issues, with and without the duplication of Southern Cross Drive.

4.0 Conclusions

This analysis points to not duplicating Parkwood Road or Southern Cross Drive if Ginninderra Connection does not proceed, but providing an additional service road (as currently recommended). This will provide better local amenity and improved traffic operations with one lane each way, than the current road arrangements. There would be minimal additional traffic noise impacts, because of small changes in traffic flows expected on Southern Cross Drive and the relocation of the southern traffic lane further from houses. It would also provide opportunities to shift more people to public transport and cycle modes.

The duplication of Southern Cross Drive would attract additional traffic to Southern Cross Drive in the peak hour, with a subsequent reduction public transport and bicycle usage. It will be difficult to ameliorate traffic noise impacts, due to widening of the road bringing substantially more traffic closer to houses. One of the advantages of duplicating Southern Cross Drive would be less traffic on Southern Boulevarde, reducing the extent of duplication within the estate. This would somewhat offset the cost of duplicating Southern Cross Drive.

Both scenarios will result in substantial reductions in traffic using Ginninderra Drive between Kerrigan Street and Kingsford Smith Drive, removing the need for intersection upgrades along here. There will also be some noticeable changes on Stockdill Drive and Drake Brockman Drive, particularly if Southern Cross Drive is not duplicated. However, the increased traffic can be accommodated by the proposed road improvements along these roads.

There will also be changes in traffic using Belconnen Way, Kingsford Smith Drive and Florey Drive. However, the changes will be relatively small and can be readily accommodated on the roads that exist. The modelling also showed that there will be negligible changes to traffic using William Hovell Drive.

The impacts on local streets will be greater if Southern Cross Drive is duplicated. Potential impacts in Holt were reduced by assuming Spofforth Street would be upgraded in this scenario, adding to the costs.

Figure 89: Travel time reduction against volume/capacity ratio

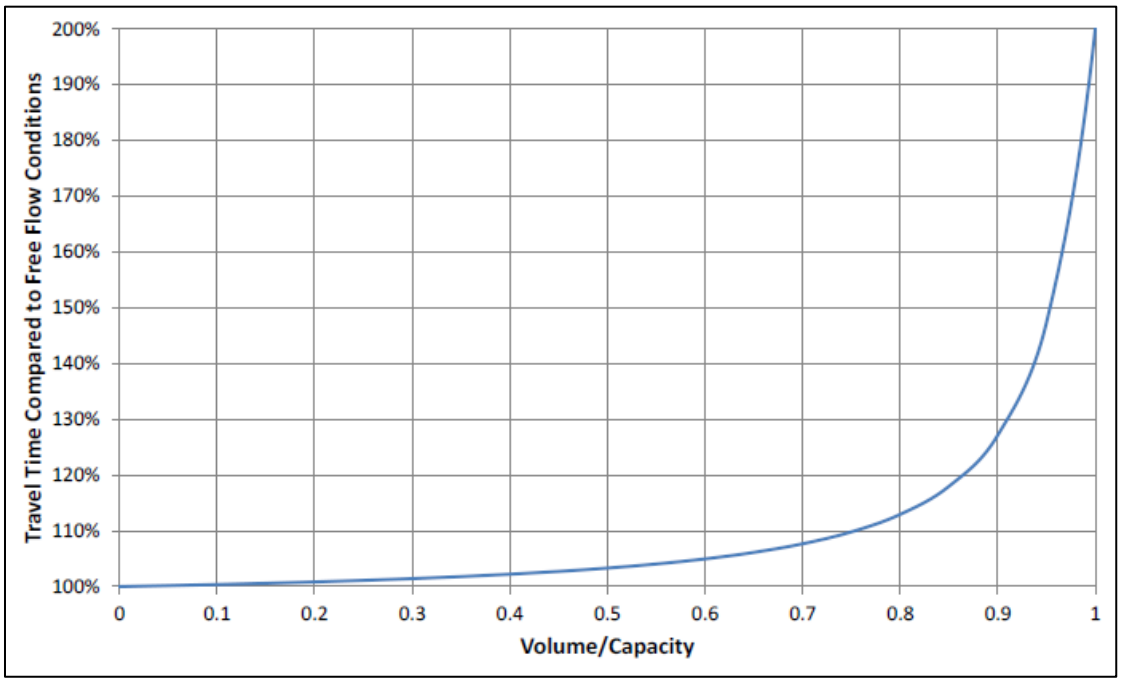


Table 50: Long-term benefits and impacts of removing the Ginninderra Connection, with and without duplication of Southern Cross Drive

Road or Issue	No Upgrading of Southern Cross Drive		Duplication of Southern Cross Drive	
	Pros	Cons	Pros	Cons
Parkwood Road	- There would be a moderate increase in traffic using Parkwood Road. This can be accommodated on the proposed upgraded 2-lane 2-way road.	- There would be some increased travel times in peak hours along here as a result of increased traffic and congestion, but will occur for small periods of time in the day.		- A large increase in traffic using Parkwood Road, justifying duplication. - High capital cost.
Southern Cross Drive	- There would be small increases in traffic using Southern Cross Drive. Thus, it would not be necessary to duplicate Southern Cross Drive. - An additional (southern) service road is needed between Spofforth Street and Starke Street (West), which would noticeably improve traffic operations and amenity along this section of road. This would be required with or without the Ginninderra Connection. - There will minimal additional traffic noise impacts, because of small changes in traffic flows and the relocation of the southern traffic lane further from houses.	- Some additional widening may be needed in the section between Holt Oval underpass and Moyes Crescent, mainly to enable bus priority at signalised intersections along here. - Low additional cost.		- A large increase in traffic using Southern Cross Drive, justifying duplication. - Major impacts during construction. Difficult to ameliorate noise impacts, due to widening of road to be closer to houses and substantial increase in traffic. - High capital cost.

Road or Issue	No Upgrading of Southern Cross Drive		Duplication of Southern Cross Drive	
	Pros	Cons	Pros	Cons
Stockdill Drive		- There would be a noticeable increase in traffic using the Stockdill Drive. This can be accommodated by the proposed 4-lane sections of road along here. There would be a moderate increase in travel times in peak hours along here, but for small periods of time in the day.	- There would be a noticeable reduction in traffic using Stockdill Drive, resulting in improved traffic operations during peak periods.	
Drake Brockman Drive		- There would be a noticeable increase in traffic using the Drake Brockman Drive. This can be accommodated by the proposed 4-lane sections of road along here. There would be a moderate increase in travel times in peak hours along here, but for small periods of time in the day.	- There would be a negligible changes in traffic using Drake Brockman Drive.	
Southern Boulevarde within the development	- The proposed road can cater for the increase in traffic.	- There would be a noticeable increase in traffic using the Southern Boulevarde within the development. There would be a moderate increase in travel times in peak hours along here, but for small periods of time in the day.	- The proposed road can cater for the increase in traffic.	- There would be a moderate increase in traffic using the Southern Boulevarde within the development. There would be a moderate increase in travel times in peak hours along here, but for small periods of time in the day.

Road or Issue	No Upgrading of Southern Cross Drive		Duplication of Southern Cross Drive	
	Pros	Cons	Pros	Cons
Ginninderra Drive	- A substantial reduction in traffic using Ginninderra Drive between Kerrigan Street and Kingsford Smith Drive. - No need for intersection upgrades on Ginninderra Drive, saving some costs.		- A substantial reduction in traffic using Ginninderra Drive between Kerrigan Street and Kingsford Smith Drive. - No need for intersection upgrades on Ginninderra Drive, saving some costs.	
Kingsford Smith Drive	- There will be some small increases in traffic on Kingsford Smith Drive south of Ginninderra Drive. This can readily be accommodated on the road that exists.		- There will be some small increases in traffic on Kingsford Smith Drive south of Ginninderra Drive. This can readily be accommodated on the road that exists.	
Florey Drive	- It would result in a small increase in traffic using Florey Drive. This can readily be accommodated on the road that exists.		- It would result in a small increase in traffic using Florey Drive. This can readily be accommodated on the road that exists.	
Belconnen Way	- It would result in a small increase in traffic using Belconnen Way. This can readily be accommodated on the road that exists.		- There would be negligible impact on Belconnen Way.	
William Hovell Drive	- There would be negligible impact on William Hovell Drive.		- There would be negligible impact on William Hovell Drive.	

Road or Issue	No Upgrading of Southern Cross Drive		Duplication of Southern Cross Drive	
	Pros	Cons	Pros	Cons
Local streets in Holt	- There would be negligible impact on traffic using local streets in Holt.		- There would be negligible impact on traffic using local streets in Holt.	- There would be some increase in traffic on Spofforth Street, which can be catered for by removing some of the speed cushions at low cost.
Local streets in Macgregor		- There would be some increased use of local streets in West Macgregor and Macgregor, avoiding delays at the traffic signals at Florey Drive and Southern Cross Drive, as well as future signals at Starke Street (West) and Southern Cross Drive. This can be managed by the implementation of Local Area Traffic Management (LATM) in streets likely to be affected.		- There would be some increased use of local streets in West Macgregor, catering for movements between West Belconnen and Dunlop. The speed of this traffic can be managed by the implementation of LATM in streets likely to be affected, but it would be difficult to divert this traffic to Florey Drive given travel distances involved.
Local streets in Latham		- There would be some increased use of local streets in Latham, avoiding delays at the traffic signals at Kingsford Smith Drive and Southern Cross Drive. This can be managed by the implementation of LATM in streets likely to be affected.		- There would be a large increase in the use of local streets in Latham, avoiding delays at the traffic signals at Kingsford Smith Drive and Southern Cross Drive. This can be managed by the implementation of LATM in streets likely to be affected.

Road or Issue	No Upgrading of Southern Cross Drive		Duplication of Southern Cross Drive	
	Pros	Cons	Pros	Cons
Local streets in Higgins		- Some increased in traffic using local streets in Higgins (between Drake Brockman Drive and Kingsford Smith Drive), to avoid traffic delays at the eastern end of Drake Brockman Drive. This can be managed by the implementation of LATM in streets likely to be affected.	- There would be negligible impact on these streets.	
Local streets in Dunlop and Charnwood	- A reduction of traffic using Kerrigan Street.	- A small increase in traffic using Lhotsky Street.	- A reduction of traffic using Kerrigan Street.	- A small increase in traffic using Lhotsky Street.
Public transport and bicycle use	- There will be increased public transport and bicycle usage, as well as a shift in car travel to shoulder peak periods. This will occur because of increased traffic delays on roads exiting West Belconnen.			- There will be reduced public transport and bicycle usage, as well as increased car travel in peak periods. This will occur because of improved accessibility and reduced traffic delays on roads exiting West Belconnen.

Figure 90: 2041 base case AM peak hour traffic flows – with Ginninderra Connection

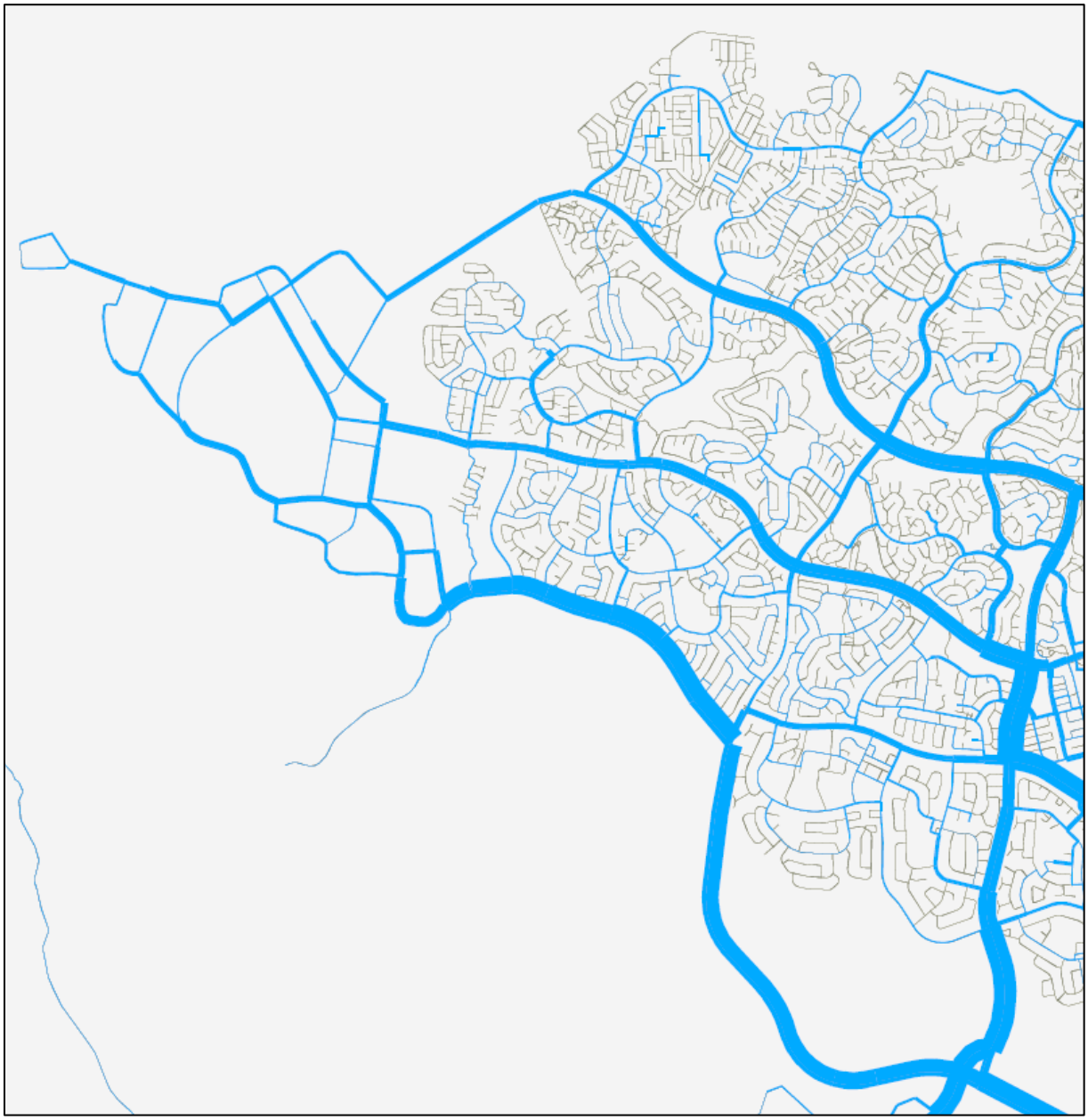


Figure 91: 2041 AM peak hour traffic flows – no Ginninderra Connection & no Southern Cross Drive upgrade

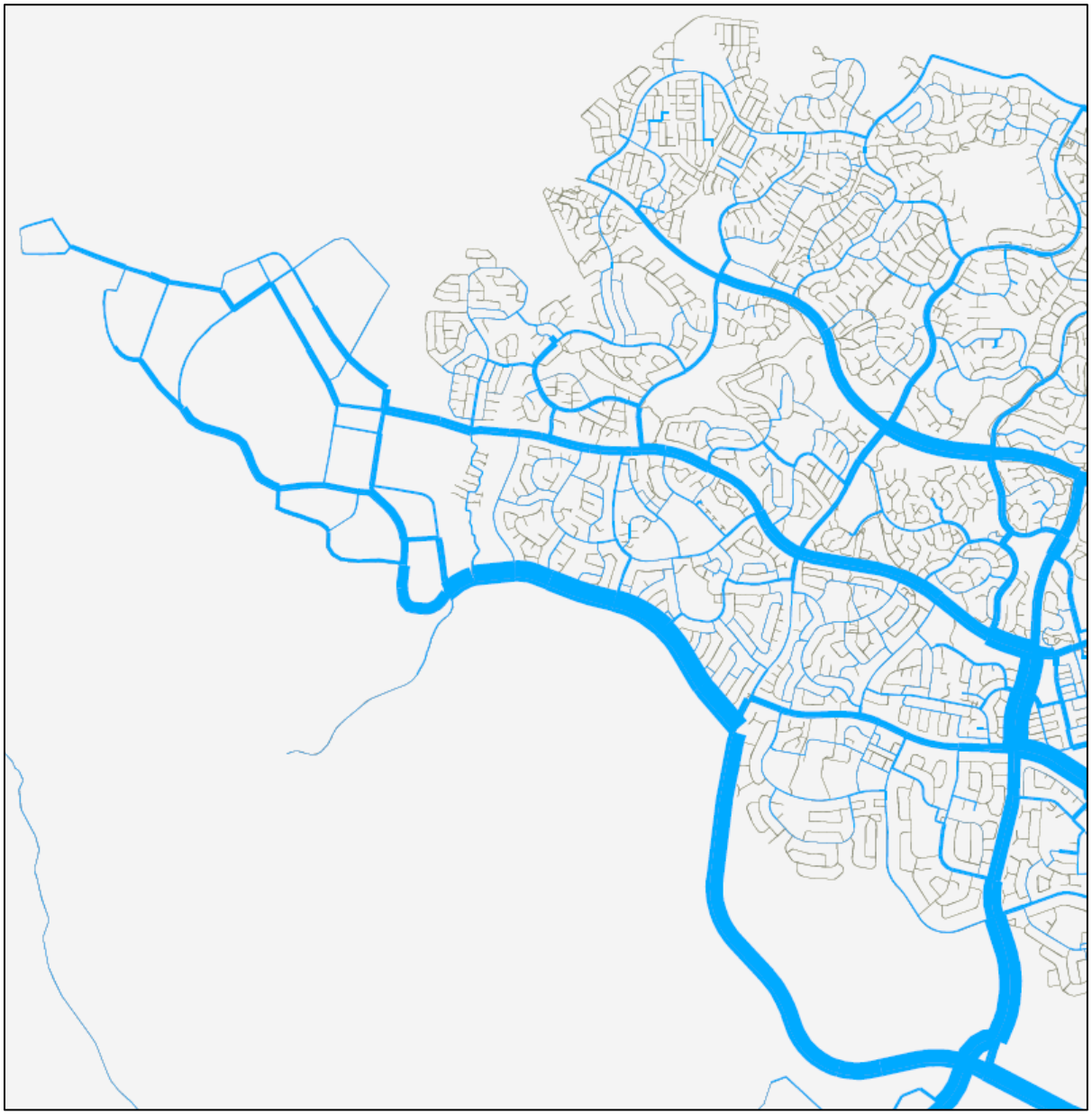


Figure 92: 2041 AM peak hour traffic flows – no Ginninderra Connection & Southern Cross Drive duplicated

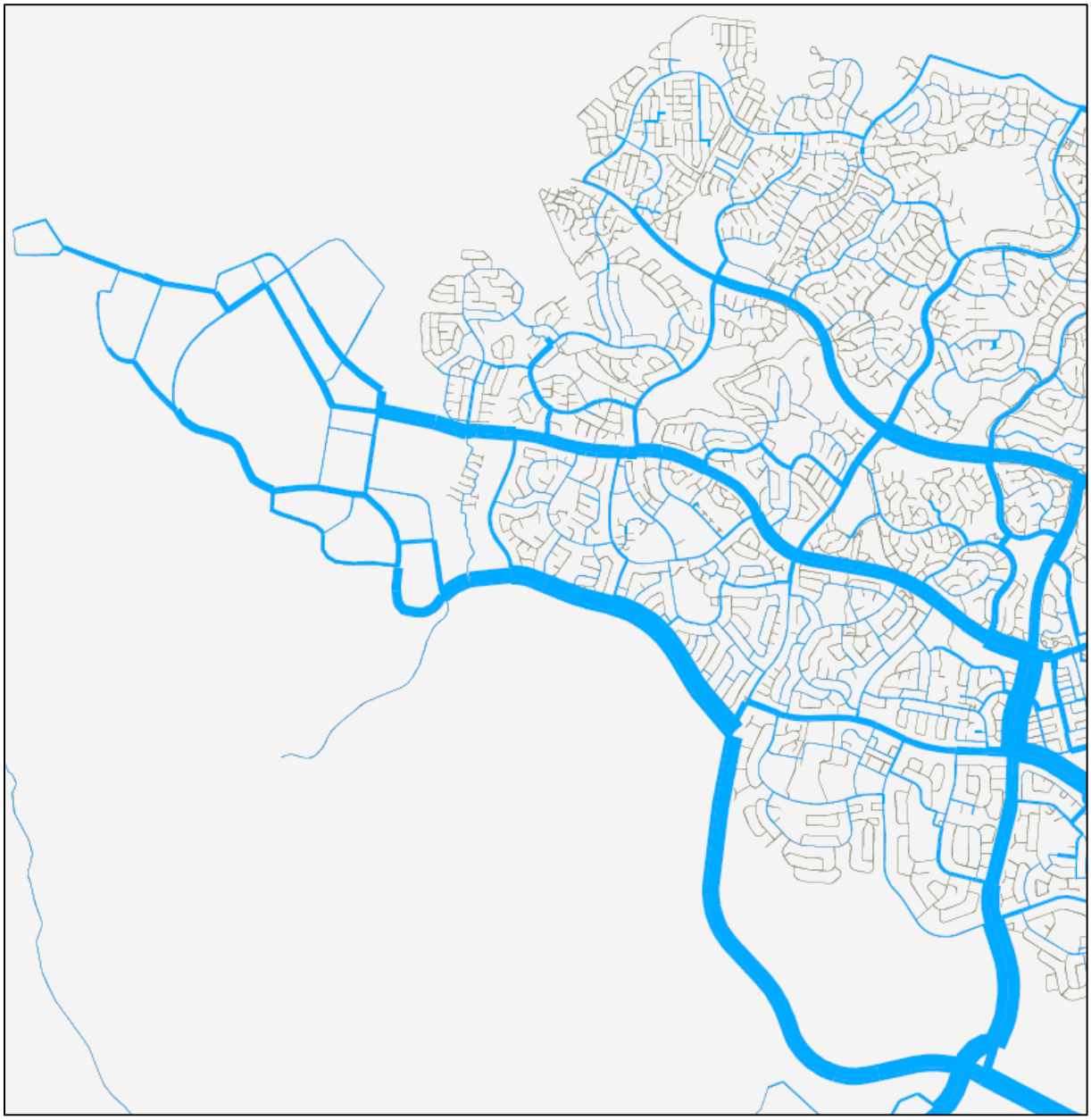


Figure 93: 2041 AM peak hour traffic flows – difference between scenarios 1 and 2

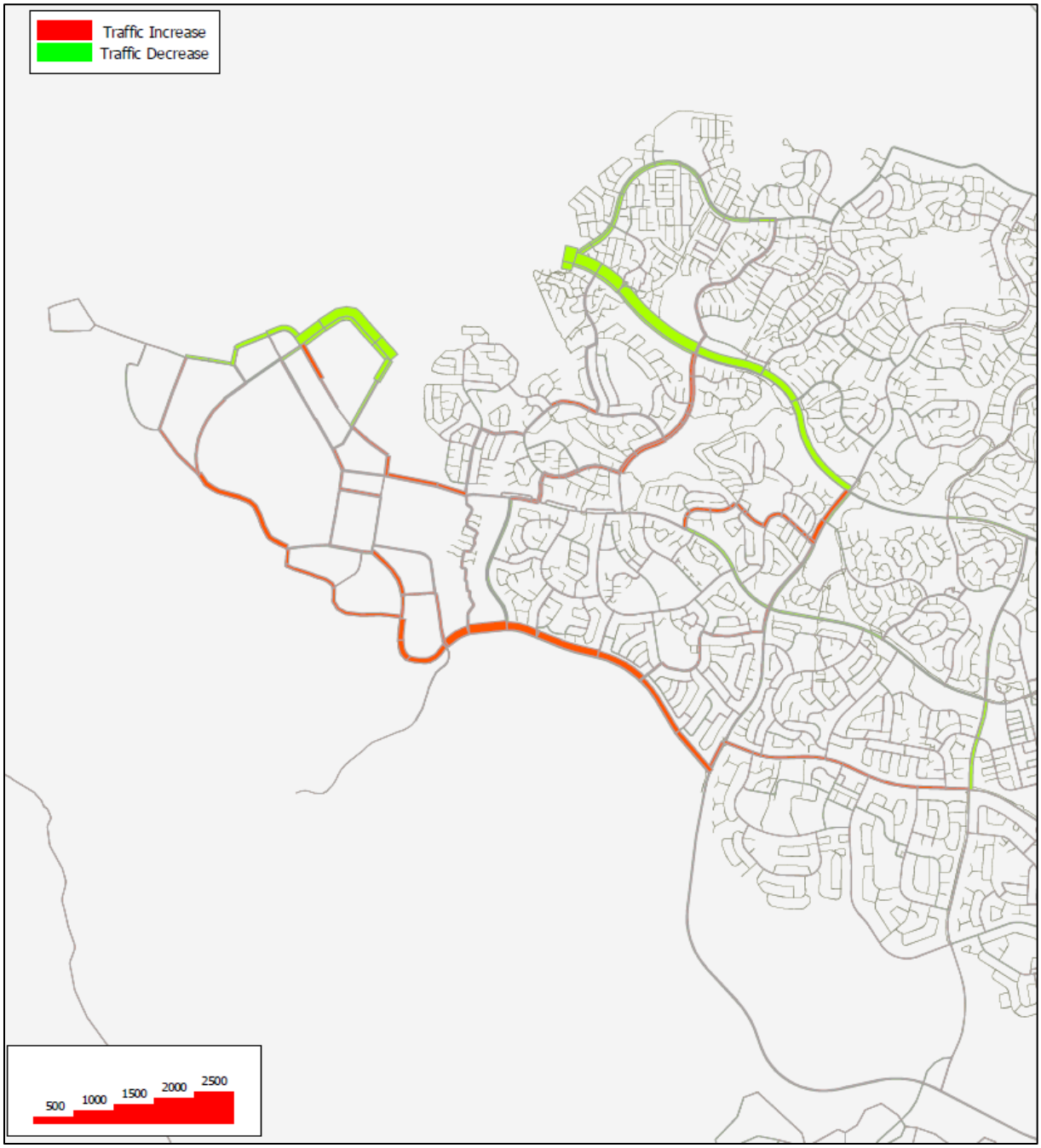


Figure 94: 2041 AM peak hour traffic flows – difference between scenarios 1 and 3

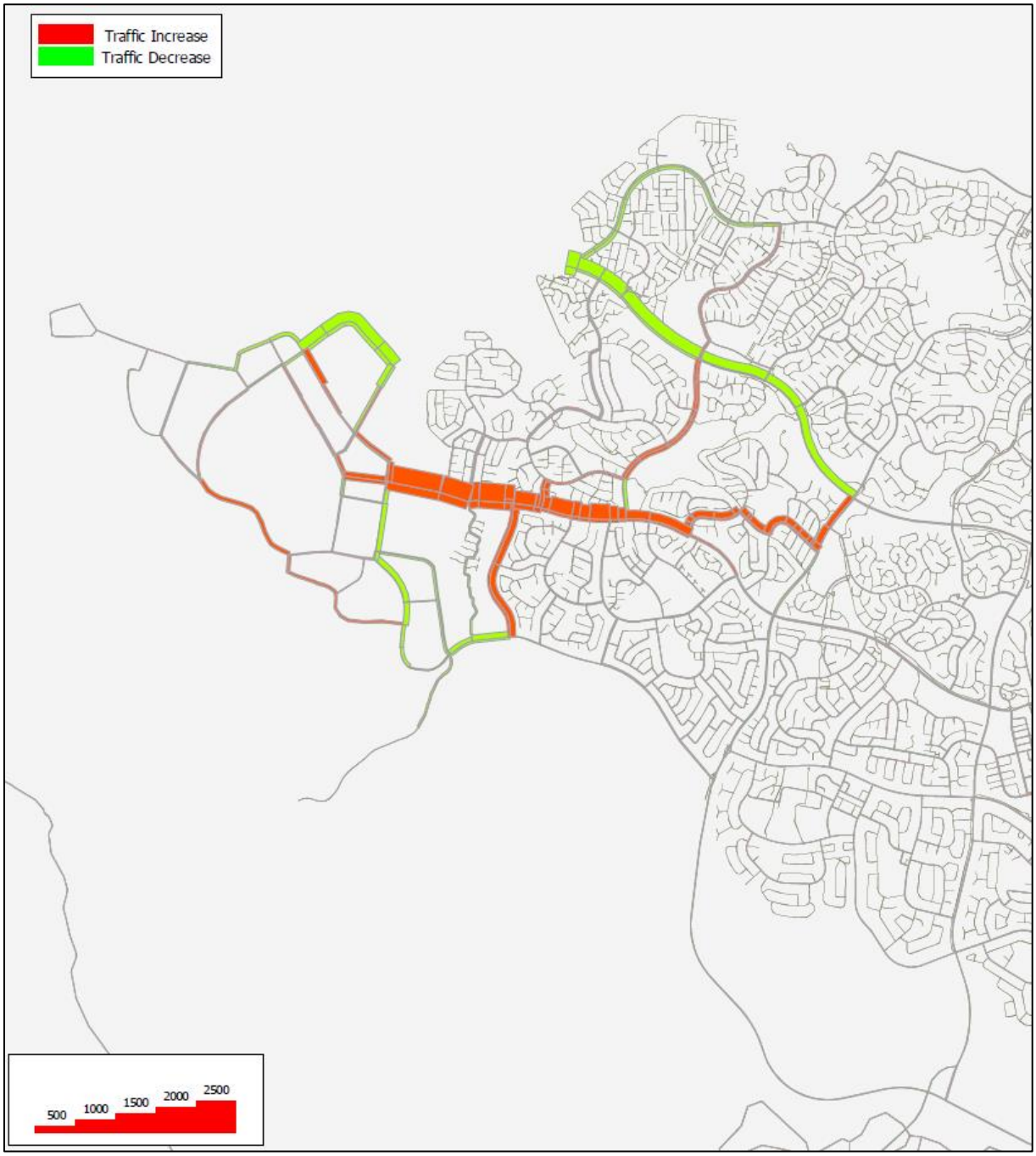


Figure 95: 2041 AM peak hour traffic flows – difference between scenarios 2 and 3

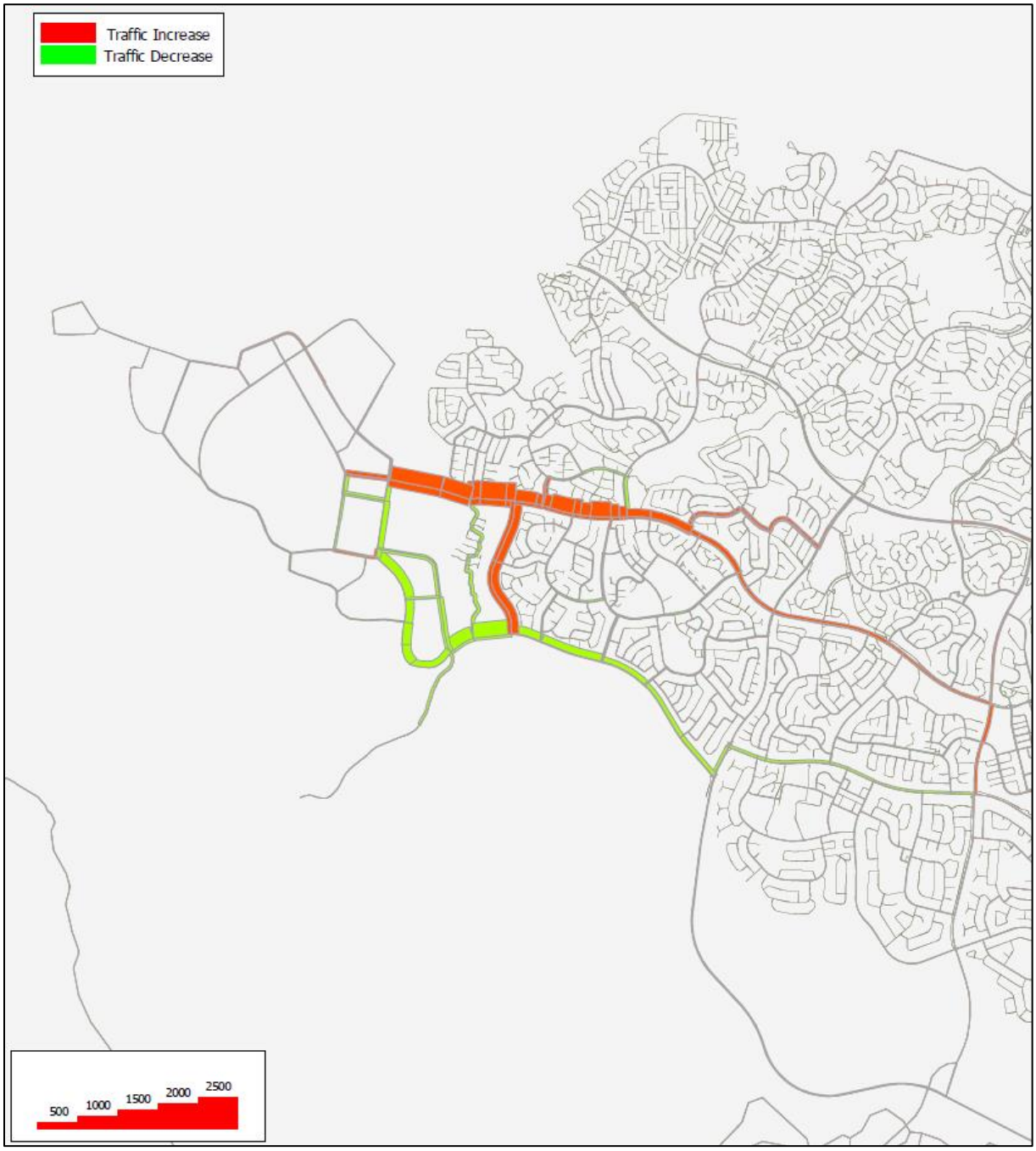


Figure 96: 2041 AM peak hour volume/capacity ratios – with Ginninderra Connection

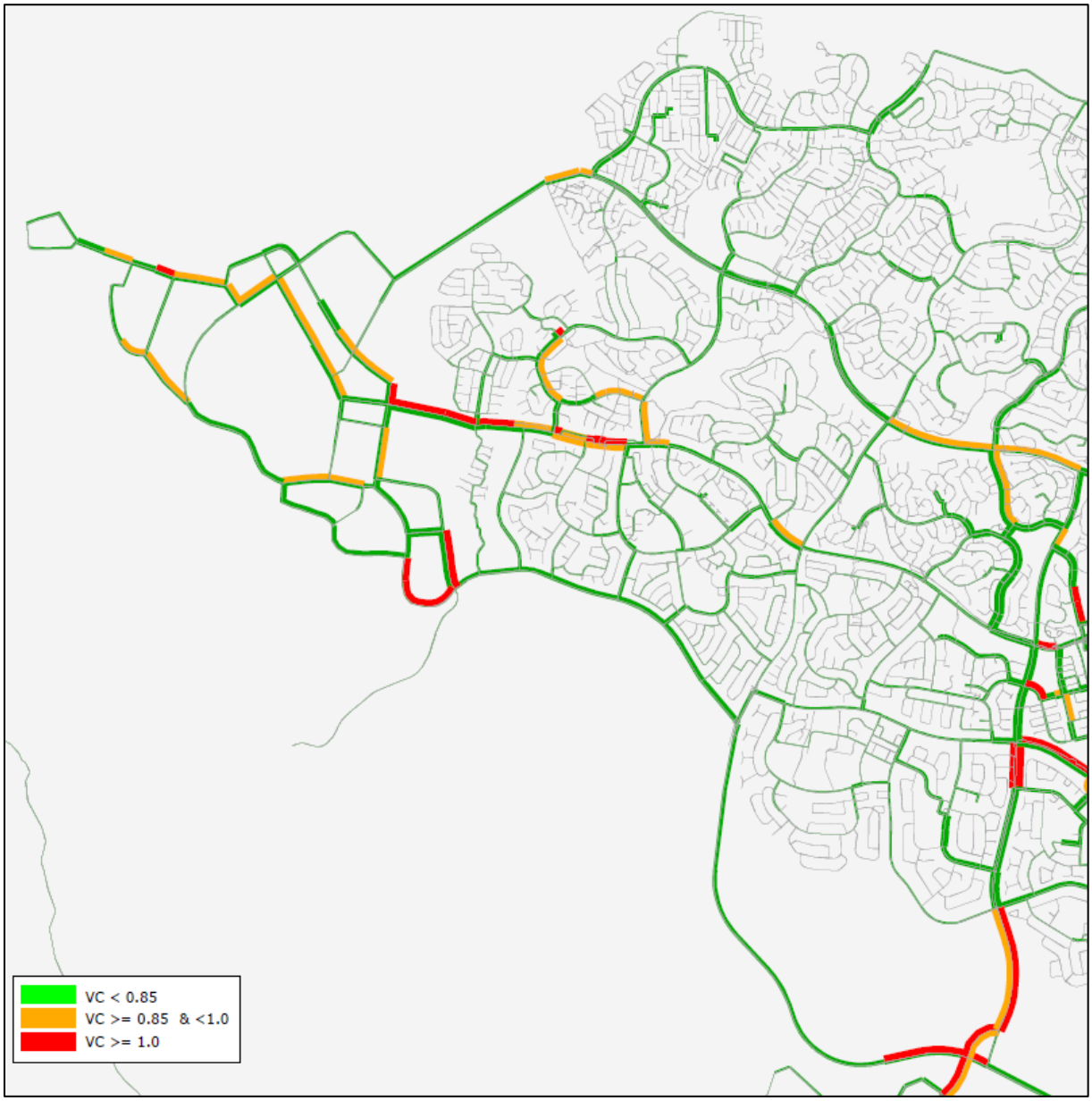


Figure 97: 2041 AM peak hour volume/capacity ratios – no Ginninderra Connection & no Southern Cross Drive upgrade

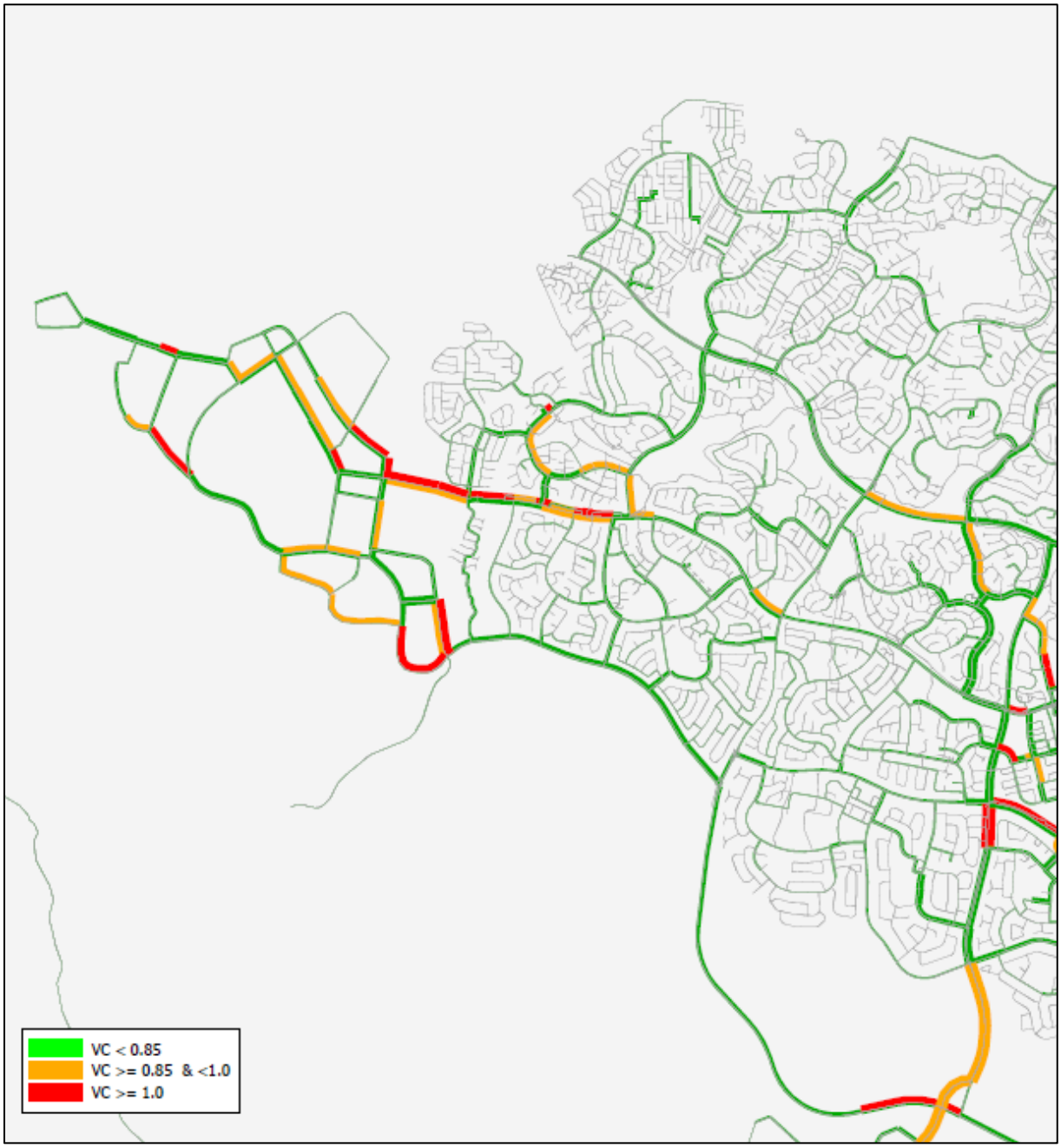


Figure 98: 2041 AM peak hour volume/capacity ratios – no Ginninderra Connection & Southern Cross Drive duplicated