Appendix A

Desire Line Analysis

Moreton Bay Regional Council

Caboolture West Planning Study

Desire Line Analysis Technical Paper

Draft 1 | 27 May 2013

Job number 229906-00

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Contents

1 Introduction

This discussion paper summarises the findings of our initial analysis of transport issues associated with the proposed Caboolture West development to inform a wider discussion on the land use and transport scenarios to consider.

The Moreton Bay Regional Strategic Transport Model (MBRSTM) was used to undertake a preliminary assessment of the level of travel demand associated with the proposed development. The purpose was to assess the potential desire lines of travel generated by Caboolture West and undertake an initial assessment of options for the transport network required to support that demand.

The paper is structured as follows:

- Section 1 provides discussion of some of the challenges associated with master planning new towns
- Section 2 provides an assessment of current and forecast travel demand in Caboolture and assesses the impact of the Caboolture West development
- Section 3 summarises the future transport issues associated with Caboolture West
- Section 4 outlines some of the transport issues associated with the proposed Caboolture West development
- Section 5 provides discussion around the development of scenarios identifying possible scenarios and outlines potential initiatives to be included in the scenarios.

1.1 Caboolture West

Caboolture West is located to the west of the Caboolture town centre and Morayfield, bounded to the north by the D'Aguilar Highway and to the south by the Caboolture River Road. The site is predominantly rural in nature and is traversed by several local roads including Old North Road and Bellmere Road. The proposed development could allow for up to 65,000 residents and employment of 20,000 full time equivalent jobs leading to a potential population in Caboolture of around 200,000. Alternative land use scenarios will be assessed as part of this study.

1.2 Challenges

Arup's experience from elsewhere highlights the challenges of developing a new town of such a size. There are many examples of planned development of this size around Australia and overseas from which much can be learnt. Some key issues to consider include:

- **Job creation**: New towns often struggle to attract employment in the early years. Without employment it can be difficult for towns to create a community and the town becomes a dormitory suburb that lacks character and activity during business hours. Early examples such as Melton and Sunbury in Melbourne are cases in point. Arup is currently involved in planning for a new suburb to the west of Melbourne called Eynesbury, 40km west of Melbourne,

which will ultimately lead to a population of 60,000. Eynesbury is recognised for innovative approaches to sustainability, particularly the supply of recycled water via a third pipe to all homes. Current planning for Eynesbury is very much focussed on creating jobs locally to support the township.

- **Integration with surrounding development**: The proposed development requires good access to and from surrounding development and activity centres and the regional transport network. There are challenges in Melbourne's north providing access to the significant development in the Plenty Valley and Craigieburn. The existing road system is not capable of accommodating the growth and since these areas do not contain high levels of employment there is an ever increasing high demand for regional travel during peak periods. Similar examples exist in Sydney's North West and South East growth areas where the regional transport network is at capacity. In all cases significant road and public transport improvements are proposed.
- **Grand plans that aren't delivered**: Some great ideas are never implemented due to market conditions or financial feasibility. Whilst many master plans set out with good objectives, they often aren't implemented. There are examples in Melbourne's south east where economic considerations have overtaken some integrated planning concepts. In Sydney the forecasts for employment at regional centres outside the CBD have generally not been met due to the dominance of service sector in the Sydney CBD. The key is to have a plan that is in tune with the market.

1.3 Assumptions

An initial assessment was undertaken of the impact of Caboolture West with an additional 65,000 population and 20,000 employment in the 2031 land use scenario for Moreton Bay. The key assumptions are summarised as follows:

- 2031 MBRSTM with Cab West full build-out projections;
- 65,000 persons, 26,000 dwellings;
- 19,500 jobs;
- Road network as per Draft Major Roads version 2;
- No significant public transport access to Caboolture West in addition to that already assumed in the 2031 base case; and
- 10 primary schools (7,000 enrolments) and 3 secondary schools (3,900 enrolments).

2 Review of travel demand trends

2.1 Introduction

The ABS census 2011 journey to work dataset and the South East Queensland Household Travel Survey (SEQHTS) for 2009 have been reviewed to provide an indication of current travel characteristics in Caboolture. MBRSTM has been used to forecast the likely impact of the Caboolture West development in 2031 on travel patterns. It should be noted that SEQHTS has a limited sample when focusing on a specific sub-area and that the analysis is unweighted. The SEQHTS

samples for households and trips are shown in **Table 1** for Moreton Bay and Caboolture compared to the whole region.

Table 1: SEQHTS samples in Moreton Bay and Caboolture

	Number of records
Households	**2009 dataset**
Total Survey	10,329
Moreton Bay - North (SA4)	729
Caboolture (SA3)	345
Trips - Origin	**2009 dataset**
Total Survey	79,790
Moreton Bay - North (SA4)	4,371
Caboolture (SA3)	2,196

2.2 Trip Generation

The MBRSTM forecasts that the Caboolture West growth area would generate about 333,500 trips over an average weekday 24 hour period based on the development assumptions identified in Section 1.3. This equates to about 9.5 trips per household.

The SEQ HTS provides a snapshot of existing travel characteristics in the region. **Table 2** shows that work commuting trips consist of about 16% of all travel in all localities. Hence, while consideration of work and education trips is important, as they often occur during peak travel periods and drive the capacity requirements of our transport network, they are a relatively small percentage of all travel purposes.

Table 2: Percentage of trips by purpose for Caboolture and Moreton Bay compared to South East Queensland (SEQHTS)

Purpose	**Trip Origin**		
	SEQ	**Moreton Bay - North (SA4)**	**Caboolture (SA3)**
Change Mode	0.35%	0.17%	0.26%
Accompany Someone	10.22%	10.33%	12.07%
Buy Something	15.69%	18.37%	18.74%
Pickup/Deliver Something	2.30%	2.82%	2.60%
Pickup/Dropoff Someone	12.20%	10.45%	11.30%
Education	10.43%	11.40%	11.70%
Work Related	6.70%	5.23%	5.15%
Direct Work Commute	19.82%	19.38%	19.67%
Personal Business	8.16%	8.81%	7.54%
Social	8.91%	9.34%	8.10%
Recreational	4.96%	3.61%	2.75%
Other Purpose	0.25%	0.09%	0.12%
TOTAL	**100%**	**100%**	**100%**

2.3 Trip distribution

2.3.1 Current trip distribution - commuting

Table 3 summarises the distribution of travel for journey to work trips from the 2011 Census. The Census indicates that the majority of those employed and living in Caboolture also work in Caboolture (51.6%) and an additional 20.4% work in the Moreton Bay area. Therefore, about 70% of journey to work travel is contained in the Moreton Bay area. This suggests a highly captive market for journey to work trips within Moreton Bay. Only a small percentage of people living in Caboolture work on the Sunshine Coast, whereas the remainder of the work commuting trips outside Caboolture are destined for Brisbane. This highlights the importance of maintaining strong transport connections between Caboolture and Brisbane.

Table 3: Destination of journey to work trips for Caboolture residents in 2011

Destination	Journey To Work Trips	Percentage of Total
Brisbane East	304	1.3%
Brisbane North	2793	11.9%
Brisbane South	317	1.4%
Brisbane West	171	0.7%
Brisbane Inner	2223	9.5%
Caboolture	12109	51.6%
Moreton Bay	4796	20.4%
Sunshine Coast	740	3.2%
Total	**23453**	

Source: ABS 2011 JTW Census
Note: Includes hinterland

2.3.2 Current trip distribution - all trips

Table 4 shows the current trip distribution based on the SEQHTS sample. Again a high percentage of trips are contained within the Moreton Bay area.

Table 4: Current trip distribution from 2007 and 2009 SEQHTS

Destination LGA	SA4 Origin	
	Moreton Bay	Caboolture
Brisbane City	7.88%	6.76%
Bundaberg Regional	0.04%	0.07%
Fraser Coast Regional	0.00%	0.00%
Gold Coast City	0.13%	0.19%
Gympie Regional	0.03%	0.00%
Ipswich City	0.16%	0.27%
Logan City	0.50%	0.42%

Moreton Bay Regional	88.90%	89.60%
New South Wales	0.04%	0.09%
Queensland Off Shore	0.14%	0.05%
Redland City	0.28%	0.00%
Scenic Rim Regional	0.05%	0.00%
Somerset Regional	0.02%	0.04%
Sunshine Coast Regional	1.84%	2.52%
TOTAL	**100%**	**100%**

2.3.3 Forecast trip distribution by direction

MBRSTM has forecast the trip distribution of private vehicle trips from Caboolture West by direction over a 24 hour period as outlined in **Table 5**. This analysis is based on the model select link assignment and forecasts a high level of containment of Caboolture West trips in Caboolture and Morayfield area.

Table 5: 2031 forecast trip distribution

Attractor	Distribution (%)
Brisbane	12%
East	7%
North	8%
West	4%
into Caboolture/Morayfield	69%

2.3.4 Forecast trip containment

In the model the forecast trip distribution is influenced by the distribution of land use and the transport network supplied. Travel time, including congestion effects, impacts on the forecast distribution of travel.

The MBRSTM forecasts that 31% of trips generated by Caboolture West will be captured internally. If this level of containment of travel is achieved we believe it would be at the higher end of the scale of what might be considered achievable, when compared to other master planned developments in Australia.

A paper, “Sustainable Australia: Containing Travel in Master Planned Estates”, 2005 assessed several master planned developments including Golden Grove in Adelaide, Caroline Springs in Melbourne, Harrington Park in Sydney and Forest Lake in Brisbane and concluded that journey to work containment was less than 14%. This highlights the challenges ahead to learn from past master-plans and develop and implement an achievable plan that encourages local travel.

This priority for transport planning purposes is likely to be not so much about self-containment within Caboolture West, but rather supporting a consolidated master plan of Caboolture creating a level of containment within Caboolture for travel, but still recognising the importance of regional connections.

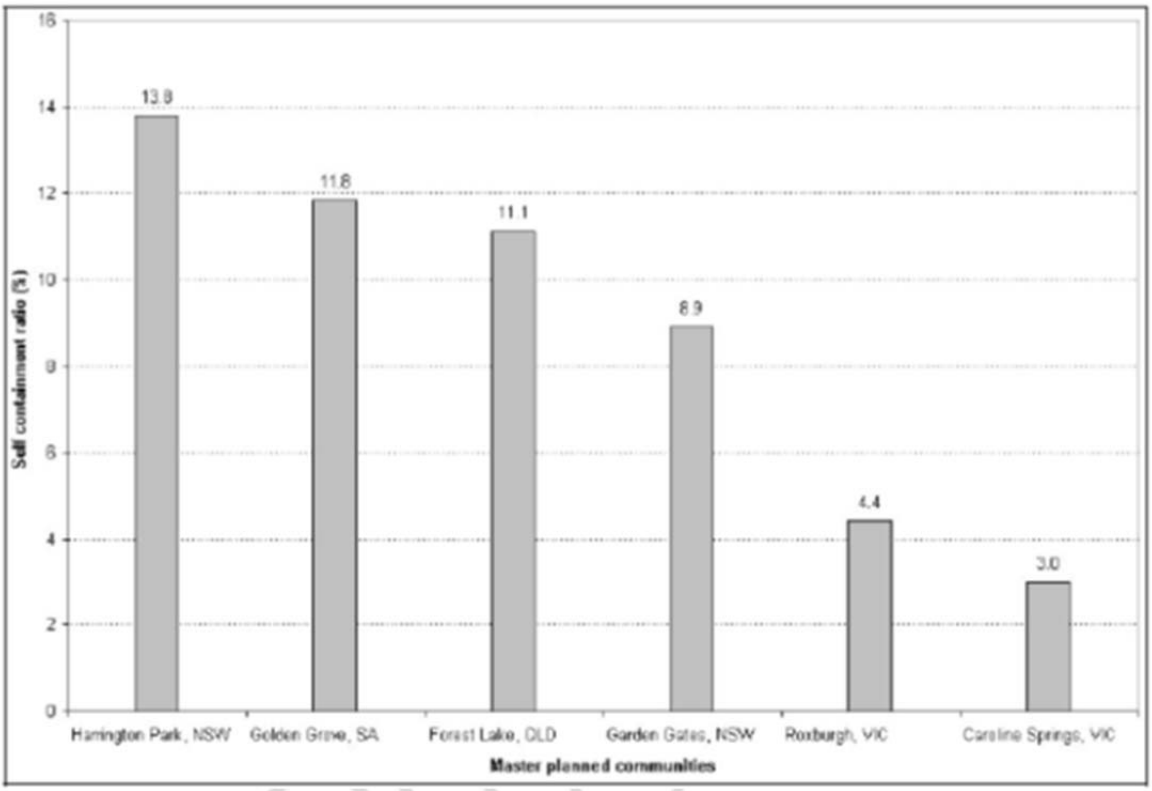

Figure 1: Travel self containment rates at other masterplanned developments.

2.4 Mode share

2.4.1 Current

The current mode share for the unweighted SEQHTS sample for 2009 is shown in **Table 6**. Not surprisingly it reveals that travel is currently dominated by the private motor vehicle.

Table 6: SEQHTS mode share

Mode	Trip Origin		
	Total Survey	Moreton Bay - North (SA4)	Caboolture (SA3)
Vehicle Driver	57.07%	59.34%	59.88%
Vehicle Passenger	23.61%	25.18%	24.69%
Motorcycle	0.58%	0.44%	0.50%
Walking	9.41%	7.15%	8.06%
Bicycle	1.33%	0.76%	1.11%

Taxi	0.36%	0.12%	0.00%
Train	2.91%	1.73%	2.20%
Ferry	0.14%	0.00%	0.00%
School Bus	1.64%	3.78%	3.07%
Public Bus	2.83%	1.19%	0.50%
Other	0.12%	0.30%	0.00%
TOTAL	**100%**	**100%**	**100%**

2.4.2 Forecast

MBRSTM forecasts the following mode share across all purposes for Caboolture West:

- 86% Car trips
- 5% Public Transport
- 9% Active Transport.

The mode share is influenced by the low level of public transport provision to Caboolture West assumed for the purposes of the desire line analysis. Clearly we would expect to achieve a higher mode split when considering new public transport strategies.

3 Future transport issues

3.1 Transport network issues

The model run has identified potential traffic levels generated by Caboolture West based on the draft major roads (version 2). **Figure 2** shows the assumed road network and **Table 7** shows the forecast traffic volumes as forecast by the model in 2031 for the one hour morning peak period. The following assumptions have been made to forecast the traffic volumes:

- The MBSTM disaggregates 24 hour demand to a two hour morning peak period. A factor of 60% has been applied to the two hour morning peak period to obtain the peak hour demand estimate.
- As discussed previously, the public transport mode split is low given that new public transport services to Caboolture West have not been included in the desire line analysis. A higher level of public transport provision would be expected which would reduce the demand for private vehicle travel to some extent.
- The traffic assignment is influenced by the assumed capacity of the road network. Further improvements to the road network – including the regional road network – would impact on the distribution and level of traffic demand forecast by the model. For example, a higher capacity road to the south may generate higher demands than forecast assuming the currently assumed road network configuration.

Assuming a rule of thumb, that urban arterial roads with traffic volumes above 1400 per hour in one direction require consideration of two lanes, the analysis suggests that the following roads may require two lanes (in each dierection) under this network configuration:

- Bellmere Road;
- River Bridge Road;
- Caboolture River Road; and
- Walkers Road.

This preliminary analysis should not drive the requirements for the road network, but rather inform it. A formal road hierarchy needs to be developed to consider all road users and the urban design framework for the development.

Figure 2: Assumed road network and traffic volume locations

Table 7: Forecast traffic volumes (2031 – one hour morning peak)

ID	Location	Peak One-Way Flows (1hr)	
		AM	PM
A	Old North Road (north)	890	1004
B	Williams Road extension	1149	1281
C	Bellemere Road bridge	1150	1483
D	River Road bridge	1237	1337
E	New Road 1 bridge	723	950

F	New Road 2 bridge	887	863
G	Old North Road (south)	193	222
	Sub-Total	**6229**	**7142**
H	D'Aguilar Hwy	1298	1375
I	King Street	1659	1199
J	Torrens Road	595	829
K	Caboolture River Road	1518	1944
L	Walkers Road	946	1471
M	Anderson Road	783	358

3.2 Impact on the wider Caboolture road network

The impact on the wider Caboolture Road network will be an important consideration, particularly the rail crossings (which are points of capacity constraint and safety concerns), Morayfield Road and central Caboolture.

The initial model run suggests Caboolture West would generate high traffic volumes on the wider Caboolture Road network as shown in **Figure 1**, noting that the traffic volumes are perhaps at the high end given the assumed low public transport provision. Nevertheless, intersection capacity at Kings Road/ Morayfield Road will be an issue, as will consideration of the management of traffic around central Caboolture.

An assessment of the volume against capacity of the road network(which is an indicator for the level of congestion) from the initial model run shown in **Figure 4** suggests that several links would be overcapacity during the morning peak including Morayfield Road and Kings Road.

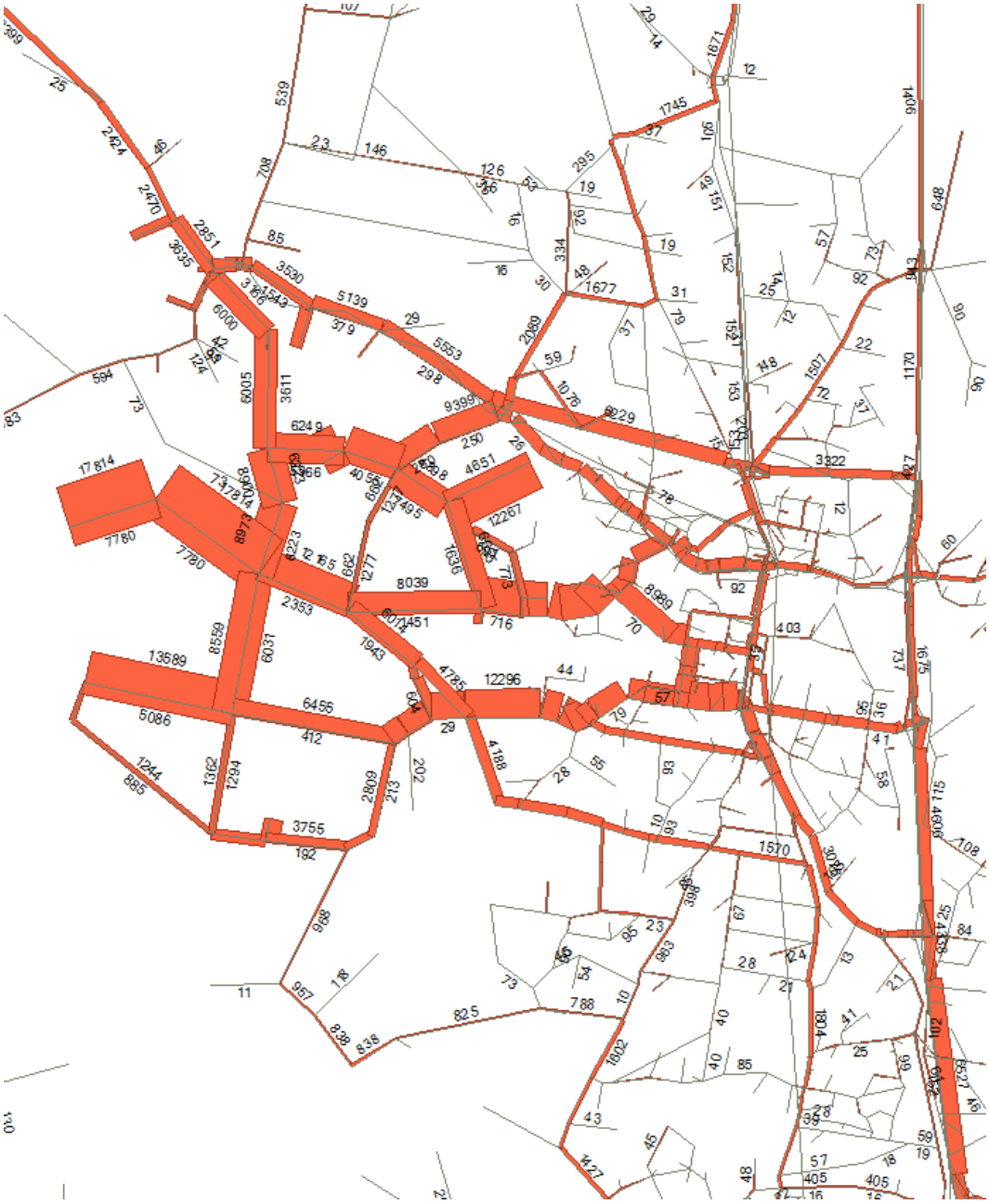

Figure 3: Traffic distribution from Caboolture West (24 hr, one direction).

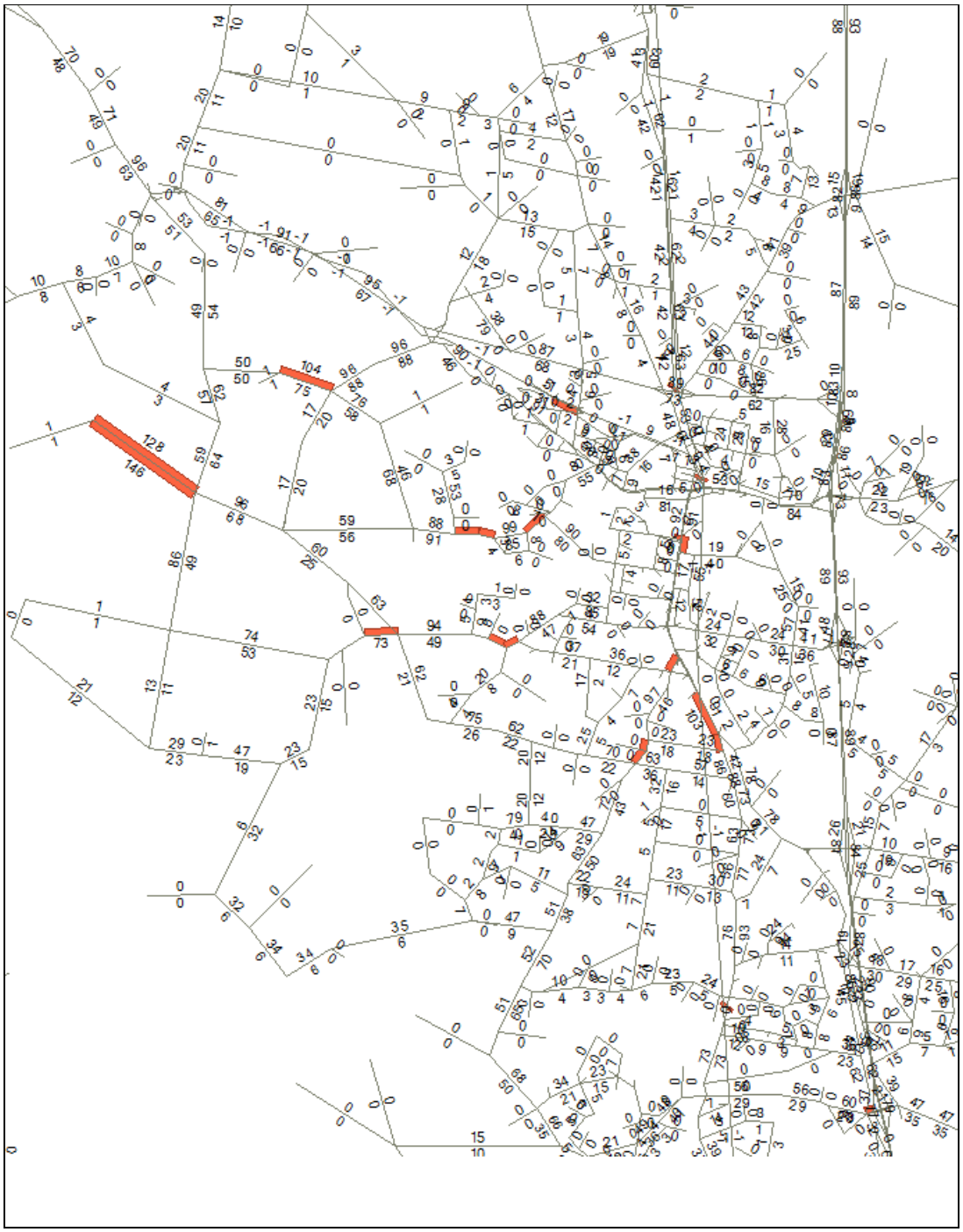

Figure 4: Link volume capacity ratio in 2031 with Caboolture West (links >100% highlighted in red)

3.3 Regional access

With respect to impacts on the regional road network, the initial MBRSTM run suggests the Bruce Highway to the south would experience traffic flows in the order of 6500 vehicles per day in one direction (13,000 bidirectional) due to the development south of Morayfield Road.

It is important to remember the importance of having good reliable regional and local access to attract business and employment.

3.4 Public transport access

Providing good and convenient public transport access to and within the site will be important to create a vibrant community and attract employment. More detailed analysis is required to define the public transport requirements, however, the desire line analysis usefully informs some important issues as discussed below:

- ***Site location:*** The site is remote from the main northern rail line to Brisbane. Commuter rail services terminate at Caboolture. We understand that there are limitations on capacity during peak periods. A key issue will be providing seamless access to the Northern rail line. The model suggests that about 12% of total travel demand will access the Brisbane area. Providing good public transport services would further increase the attractiveness of people travelling to Brisbane from Caboolture West.
- ***Service provision:*** We need to identify ultimate public transport network including key transport interchanges and nodes within the site. The ultimate development is forecast to generate about 333,500 trips daily. Assuming a 10% mode split over the day, which most likely would be a positive outcome, this could generate 33,500 trips daily. To service this by bus could require say 1000 buses, assuming an average occupancy of 30 across the day. Buses are well suited to servicing dispersed travel demand. However, key public transport corridors need to be identified based on where people will want to travel.
- ***Staging of public transport provision as demand grows:*** The size of the development, when considered with the overall forecast growth of Caboolture and Morayfield, requires consideration of a rapid transit network. The plan should consider a staging of public transport provision to establish market as the development proceeds, from bus services, to rapid bus to consideration of fixed rail options, if feasible.
- ***Integration with Caboolture and Morayfield:*** Given the objective to create a strong local community and encourage travel within Caboolture and Morayfield as much as possible, providing a good distributor public transport service will be vital. The model suggests that 69% of travel could be contained within the Caboolture and Morayfield area providing a key market for public transport. Understanding the concentrations of the demand will be important – for example around activity centres – Caboolture town centre and the Morayfield corridor.

4 Transport planning principles

4.1 Introduction

This section provides some background based on our experience and other published research from elsewhere to inform the development of transport network options for Caboolture West.

4.2 Accessibility targets

Increasingly cities are developing policies to provide more opportunities for people to live and work locally and importantly provide accessible services to minimise the need to travel regionally. Examples are the recent discussion paper in Melbourne's Metropolitan Planning Strategy outlining a 20 minute city and Sydney's plan has a target with respect to the proportion of metropolitan jobs accessible within 30 minutes travel.

4.3 Modes

This section outlines some principles around mode selection. **Figure 5** provides an indication of the typical patronage of different modes of public transport. Those principles suggest that a bus-based system might be best suited to service future demand at Caboolture West when referring to the daily forecast demand of 33,500 trips.

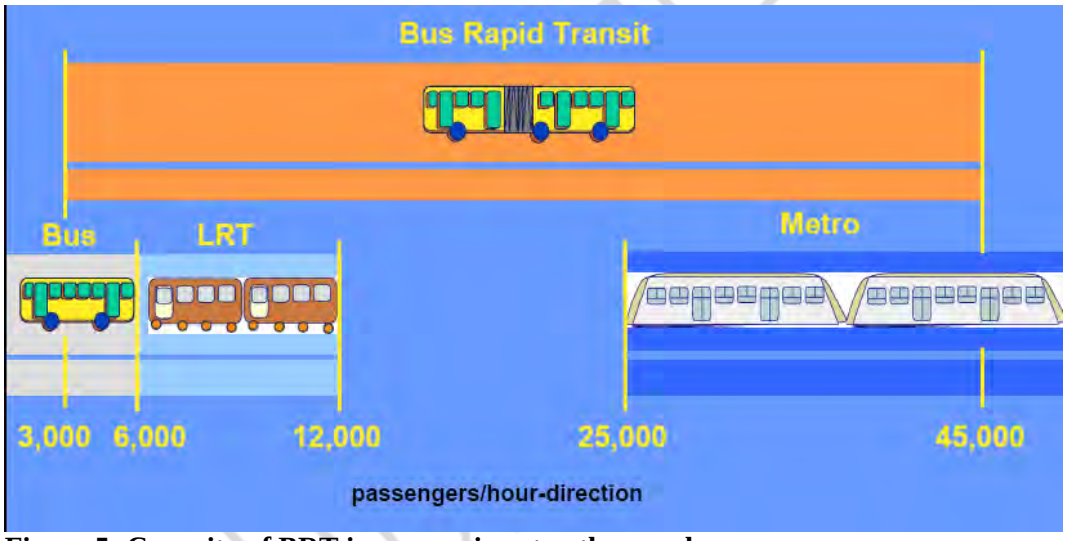

Figure 5: Capacity of BRT in comparison to other modes

Source: TRB, 2003. TCRP report 90 Bus Rapid Transit - Case Studies In Bus Rapid Transit

4.4 Public transport planning

This section outlines some broad principles for the development of a public transport system as a basis to consider future scenarios for Caboolture West.

The physical development of a city and the resulting land use pattern affects people's need to travel and their choice of mode. Research has shown that residents and employees in 'compact cities' tend to travel less, make fewer journeys by car and more trips on foot than those in lower density cities. Thus to achieve a fully integrated transport network, planning of transport and land use must be interconnected to better achieve more sustainable travel behaviours.

A role of public transport is to:

- support urban development by shaping settlement patterns;

- improve the efficiency and effectiveness of the overall transportation system by moving people to their chosen destinations;
- provide mobility and access to enable citizens to build communities (especially for those who do not have access to a car); and
- to provide environmentally sustainable transport choices as an alternative to car use.

To achieve a truly integrated transport network, integration needs to begin at the management level with co-ordination of transport infrastructure and service provision. This has shown to be vital in creating a seamless transport network for travellers.

4.4.1 Hierarchy of transit route functions and role of modes

It is useful to consider a hierarchy of transit route functions that spans across the needs of intensive transit / line haul routes, concentrated on key demand corridors through to lower demand more local access functions vital in providing coverage and accessibility across the urban area.

A network planning strategy develops appropriate ways to link these differing needs and functions to provide appropriate levels of service to customers in an efficient manner. This hierarchy is fundamentally spatial, but also needs to account for temporal elements as demand patterns alter over periods of a typical day.

Passenger needs may also vary at different levels of the hierarchy. For instance, short distance commuters favour high frequency, fast services, and are happy to stand if it means a reliable and frequent service, whereas, long distance commuters favour comfort over frequency and prefer express services that are able to move them long distances quickly.

In broad terms, particular modes and technologies are typically best aligned to different roles in this functional hierarchy. However it is possible for some modes to span across different levels of the hierarchy. Some typical roles for particular modes are:

- Rail-based rapid transit systems are able to move large numbers of people between population centres with few delays. Rail has been important in allowing cities to expand by providing a fast means of bringing commuters from peripheral suburbs into the city centre
- Buses are able to move large numbers of people, but are more flexible in their routes than rail. Supported by appropriate levels of infrastructure, such as Bus Rapid Transit measures, bus can act in a mass transit style, while having the flexibility to also serve in a more dispersed local access function
- Taxis also play an important role in providing mobility in situations where other forms of public transport are not attractive, available or appropriate.

The HiTrans guide[i] notes changes in network planning practices over time, and that by the end of 1990's a move towards a two-tier system of urban public transport networks had occurred.

The first level is the development of heavy trunk line services with high frequencies, priority measures and heavy demand. This requires the concentration of routes and often somewhat longer distances between stops than traditional bus services.

The second level of service must serve the rest of the city and region with a more flexible and dispersed form of operations.

A major task in network development is to find the right balance between the two types of services in space and time. A second challenge is to integrate the two levels of network into a single public transport network that caters for the different demands of the various user groups.

Figure 6 sets out an approach to achieving an appropriate overall network structure.

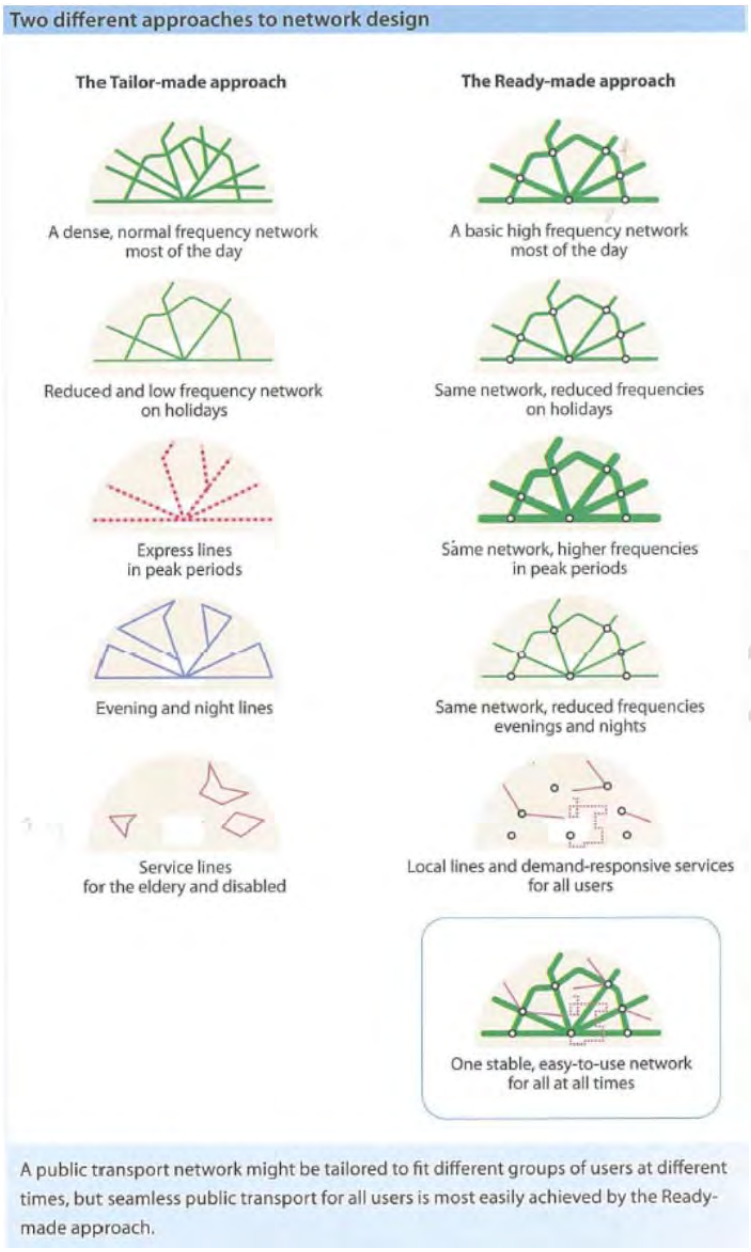

Figure 6: Hitrans[1] approach to network design

[1] HiTrans, 2005 – Best Practice Guide 2, Public Transport – Planning the networks

5 Scenario testing

MBRC wish to develop an integrated land use and transport plan for Caboolture West. At this initial stage of the plan's development it is important that a range of land use and transport network scenarios, which are consistent with the overall objectives of the plan and planning best practice, are developed and tested.

Arup has allocated 10 runs for this phase of modelling, including a base case run, to test various combinations of land use and transport network scenarios to aid in the identification of a preferred scenario.

The purpose of this section is to inform a wider discussion regarding the scenarios to test.

5.1.1 Land Use

We have allowed for the assessment of three alternative 2031 land use scenarios for which a base case and three alternative networks will be developed. This would need to address alternative Caboolture West development levels and external Moreton Bay development levels. Based on discussions so far, the following options could be considered:

- A higher population than 65,000 based on higher housing densities;
- Impact of employment not being attracted to the area;
- Alternative town centre scenarios – at this stage testing different levels of employment is probably more important than location of the town centre. Assessing the location of the town centre can perhaps be undertaken outside the model; and
- Alternative development scenarios in Caboolture and Morayfield.

We'd suggest it would be better to focus on ultimate scenarios rather than assess staging options during this phase of the project. The location of the town centre will be important in terms of local network planning, but less critical for the external road network. Therefore, we suggest that the scenarios for assessment using the model focus on the development size and the level of development on the wider Caboolture area.

Sensitivity tests we would suggest on the base case are:

- Lower employment in Caboolture West: Service employment to support neighbourhood only. Potentially higher employment in Caboolture to compensate or outside Caboolture;
- Lower population and employment in Caboolture West and higher development elsewhere in Caboolture/Moreton Bay (more infill in Caboolture if feasible); and
- A higher density population scenario to test the impact of higher density and potential for transit

This could lead to four alternative land use scenarios including the base case.

5.1.2 Transport Network and Services

We recommend the development of three themed scenarios. Other similar studies have employed themes around high and low investment or high and low public transport provision. In the case of Caboolture West, it would be worth considering the following:

- The level of regional accessibility: for example, via a new western distributor road. For public transport a high quality connection to the main north-south rail corridor. Perhaps a more node-based approach around the town centre.
- The level of integration, a connected network – a high level of integration with the Caboolture and Morayfield. Public transport services (buses) along several key routes, north and south.

In reality, a combination of the above will be required, however, it will be useful at this early stage to assess the implications of either approach and perhaps a combination of the two as the third option. It may not be necessary to test the three network options for each land use scenario as certain network options might not fit with the land use scenario. An example might be a lower employment scenario and a node-based approach.

Previous and current studies will such as Moreton Bay Integrated Transport Strategy (MITS) and the MBRC's Transport and Corridor's Strategy can inform the scenario development.

Some candidate projects that scenarios could consider are:

- new high frequency turn up and go bus network – local services to Caboolture, Morayfield, to the south.
- bus lanes and priority along key transport corridors such as Morayfield Road and King Street
- an eastern bypass of Morayfield
- upgraded crossings of the railway
- rapid transit link to from Caboolture West town centre to Caboolture railway station
- western distributor connecting the Bruce Highway to the D'Aguilar Highway
- increased traffic capacity at intersections along Morayfield Road to accommodate traffic from Caboolture West. Potentially a bypass could remove through traffic from that route addressing long term capacity issues.
- an inner city bypass to facilitate through movement around the town centre
- a new station at Caboolture North with park and ride
- consideration of alternative local road configurations. Whilst the strategy might be spread the load across the network, there may be efficiencies in identifying a primary access point/s to Caboolture dependant on demand profile.

Our initial view of three potential broad transport network scenarios to consider include:

- High connectivity with Caboolture: A highly connected public transport network with high frequency bus routes on arterial roads between major activity centres with priority where required. Several interchanges identified. Upgrades to access from Morayfield Road and Kings Highway
- High regional connectivity: Western distributor road connecting from the Bruce Highway in the south to the D'Aguilar Highway in the north. Strong connection to Caboolture West. Rapid transit connection (in own ROW) to Caboolture Railway Station with feeder bus routes. Augmented by a public transport distributor network.
- Lower public transport provision: to demonstrate the impacts of low public transport provision and addressing highway capacity. Road based public transport system based on activity nodes with primary access points to Caboolture west. Upgrade road network – access to Bruce Highway and Morayfield Road, traffic management in Caboolture town centre.

Appendix B

Scenario Assessment Working Paper

Moreton Bay Regional Council

Caboolture West Structure Plan Project

Strategic Transport Modelling: Working Paper 1- Scenario Tests

001-D

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Document Verification

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Contents

Appendices

1 Introduction

1.1 Background

Moreton Bay Regional Council has engaged Arup to assist in the planning and development of a Structure Plan for the Caboolture West growth area. Arup's scope is to undertake strategic transport modelling and to provide transport planning advice.

Caboolture West is located to the west of the Caboolture town centre and Morayfield, bounded to the north by the D'Aguilar Highway and to the south by the Caboolture River Road. The site is predominantly rural in nature and is traversed by several local roads including Old North Road and Bellmere Road. Provisionally, the proposed development could allow for approximately 65,000 residents and employment of 20,000 full time equivalent jobs.

1.2 Objectives

This working paper presents the strategic transport modelling results of a range of development and transport scenarios that have developed and tested to inform the Caboolture West Structure Plan. The scenarios include variation of size and mix of development, the road network connections and the level of public transport provision.

The scenarios include testing of the following:

- Two land use options;
- Three public transport options; and
- Two options for a southern connection (i.e. the West Moreton Corridor).

This working paper has been prepared to inform Council and Stakeholders of the outcomes of the strategic transport modelling that has been undertaken to date. It is envisaged that this work will be followed by further modelling of a preferred development option, which will include further refinements and option testing of land use and the road and public transport networks.

2 Modelling inputs and assumptions

2.1 Overview

MBRC's strategic transport model, the Moreton Bay Regional Strategic Transport Model Multi-Modal (MBRSTM-MM), and specifically, the 2031 policy model network assumption has been used as the basis of the modelling undertaken for the assessment of the Caboolture West development. The analysis assumes the following:

- The trend based model process has been used as a basis for this round of modelling. That is the calibrated model has been used without policy intervention.
- The networks and public transport networks developed for the policy based model were adopted as the base case without Caboolture West

This section outlines changes to the transport network and demographic data in the base policy model relating to the Caboolture West development. The changes in land use, transport infrastructure and/or public transport services have been developed by Arup in conjunction with the wider MBRC team. These changes are designed to inform the development of the Caboolture West Structure Plan by:

- Understanding the impacts of the size and mix of development that would occur;
- Identifying the road network connections that would be required; and,
- Identifying the level of public transport provision that would be required.

2.2 Demographics

Two land use scenarios have been tested as part of the assessment of the Caboolture West development; a large town scenario (LU-2) and a medium town (or sustainable town) scenario (LU-4).

The key demographic inputs for each of these scenarios are given in Table 1 below. The inputs used are the projected full build out demographic forecasts within Caboolture West, nominally predicted to occur by 2061 based on assumed development rates. An indication of the daily trips forecast to be generated by Caboolture West and the mode share as a result of the land use inputs and base case transport network assumptions is also provided.

A detailed breakdown of the key demographic inputs by zone is given in Appendix A.

Table 1: Demographic inputs

Demographic Input	Scenario: Large Town (LU-2)	Scenario: Sustainable Town (LU-4)
Population	80,275	62,348
Dwellings	29,725	23,085
Average Occupancy	2.70	2.70
Employment	17,818	14,823
Professional	3,926	3,340
Service	2,691	2,802
Construction & Industry	6,027	5,192
Retail	5,025	3,308
Other	148	181
Enrolments	15,500	14,400
Primary	6,600	5,500
Secondary	7,500	7,500
Tertiary	1,400	1,400
Trip Generation		
Daily Trips	192,804	149,184
PV	161,727 (83.9%)	124,618 (83.5%)
PT	17,770 (9.2%)	12,950 (8.7%)
Active	13,307 (6.9%)	11,616 (7.8%)

It should be noted that some model processes within the MBRSTM-MM require the population and employment figures reported in Table 1 to be broken down into finer categories (e.g. splitting the 5 employment categories into more detailed employment categories). Where this was required, proportions based on the South-East Queensland (SEQ) transport model were used.

2.3 Model zones

Disaggregation of the MBRSTM-MM zones was undertaken to enable a more accurate representation of the land use characteristics of the Caboolture West development.

A new zone map of the Caboolture West area is provided in Figure 1 with a list detailing the impacts to existing model zones also given in Table 2. All other zone boundaries remain the same as per the base MBRSTM-MM.

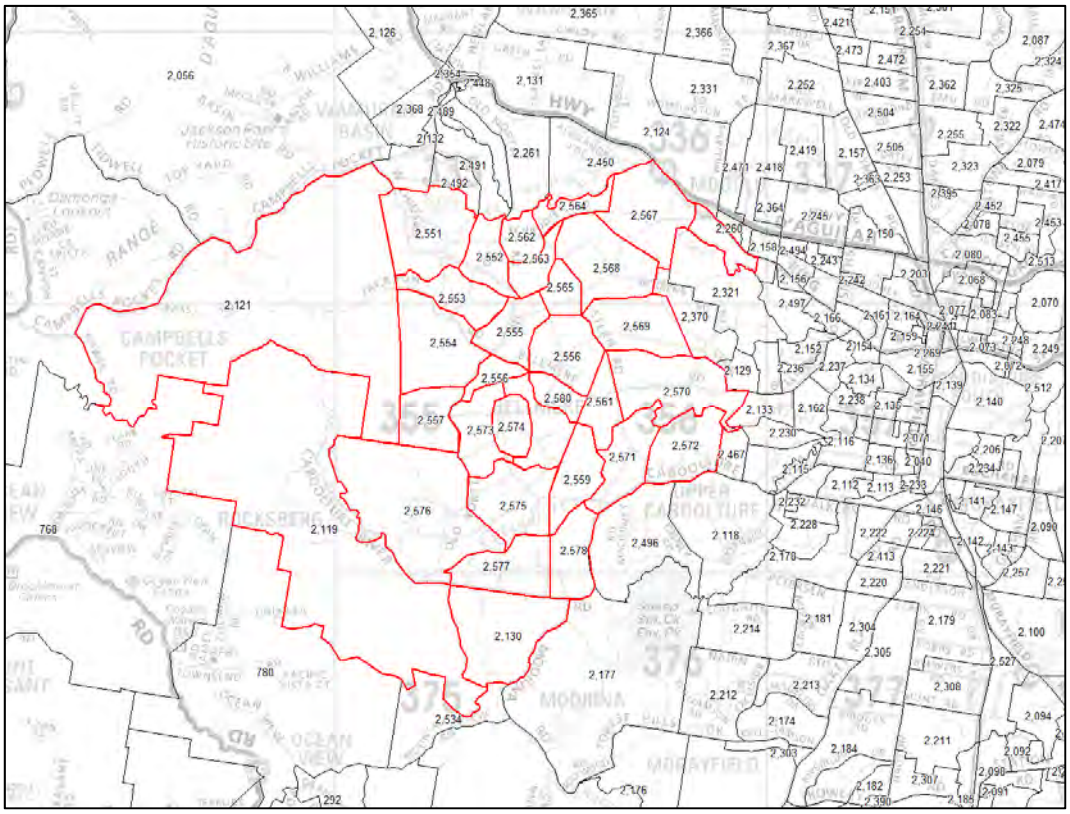

Figure 1: Updated zone boundaries for the Caboolture West area

Table 2: MBRSTM-MM zone disaggregation

Old MBRSTM-MM zone number	New MBRSTM-MM zone number	Comment
2114	2551	New Caboolture West zone
	2552	New Caboolture West zone
2119	2553	New Caboolture West zone
	2554	New Caboolture West zone
	2555	New Caboolture West zone
	2556	New Caboolture West zone
	2119	Remaining area outside Caboolture West
2120	2550	New Caboolture West zone
2121	2531	New Caboolture West zone
	2532	New Caboolture West zone
	2533	New Caboolture West zone
	2534	New Caboolture West zone
	2535	New Caboolture West zone
	2536	New Caboolture West zone
	2537	New Caboolture West zone
	2538	New Caboolture West zone
	2539	New Caboolture West zone
	2540	New Caboolture West zone
	2541	New Caboolture West zone
	2121	Remaining area outside Caboolture West
2127	2547	New Caboolture West zone
	2548	New Caboolture West zone
	2549	New Caboolture West zone
	2127	Remaining area outside Caboolture West
2128	2542	New Caboolture West zone
	2543	New Caboolture West zone
	2544	New Caboolture West zone
	2545	New Caboolture West zone
2130	2557	New Caboolture West zone
	2558	New Caboolture West zone
	2130	Remaining area outside Caboolture West
2369	2546	New Caboolture West zone

2.4 Highway networks

Two internal highway network scenarios have been developed for the assessment of the Caboolture West development that is related to the demographic scenario being modelled. A comparison of the internal networks for the Large Town and Sustainable Town scenarios is given in Figure 2. Additional detail on the internal road network (assumed road hierarchies, lanes and posted speeds) is given in Appendix B.

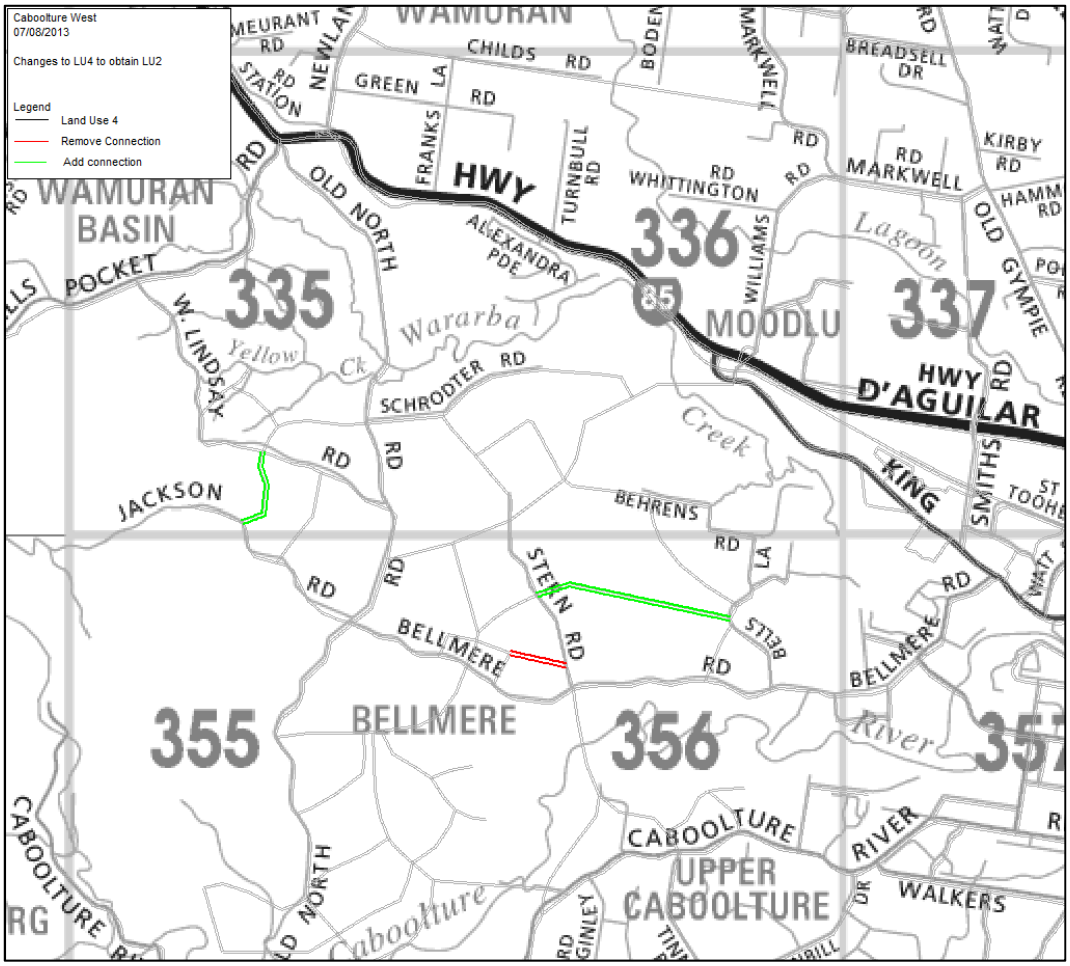

Figure 2: Internal (Caboolture West) road network

In addition to this, a number of different highway network options external to Caboolture West have been tested as part of the assessment. The highway networks developed are listed and described in Table 3 below.

Table 3: Highway network options

ID	Description
HWY-0	Existing network (as per 2031 policy model) outside of Caboolture West
HWY-1	Improved highway network connections to Caboolture West (see Figure 3) including: - New Caboolture River crossing at Petersen Rd - Duplication of new road north of town centre between Old North Rd and the King St / D'Aguilar Hwy / Williams Rd interchange (2 lanes to 4 lanes) - Duplication of Bellmere Rd between Old North Rd and King St (2 lanes to 4 lanes) - Duplication of Caboolture River Rd between Old North Rd and Grant Rd (2 lanes to 4 lanes)
HWY-2	HWY-1 plus the West Moreton Corridor assuming upgrades to improve existing connections to/from Narangba along the route of Lindsay Road, O'Brien Road, Station Road, Burpengary Road and Boundary Road (see Figure 4). The upgraded route assumes: - Four lanes with a posted speed of 70km/hr - Improved crossing of the rail line at Lindsay Road - Improved crossing of the rail line at Boundary Road to provide a high capacity connection to Narangba Road
HWY-3	HWY-1 plus the West Moreton Corridor as a new rural highway connection between Old North Road and Narangba Road (see Figure 5). The new connection assumes: - Four lanes with a posted speed of 80km/hr - Upgrade of Boundary Road to four lanes - Improved crossing of the rail line at Boundary Road
HWY-4	HWY-1 plus addition of C-Bahn infrastructure and BRT bus lanes* (see Figure 6)

* Bus lanes where incorporated by removing one lane of general traffic (where possible) and were applied for all modelled periods.

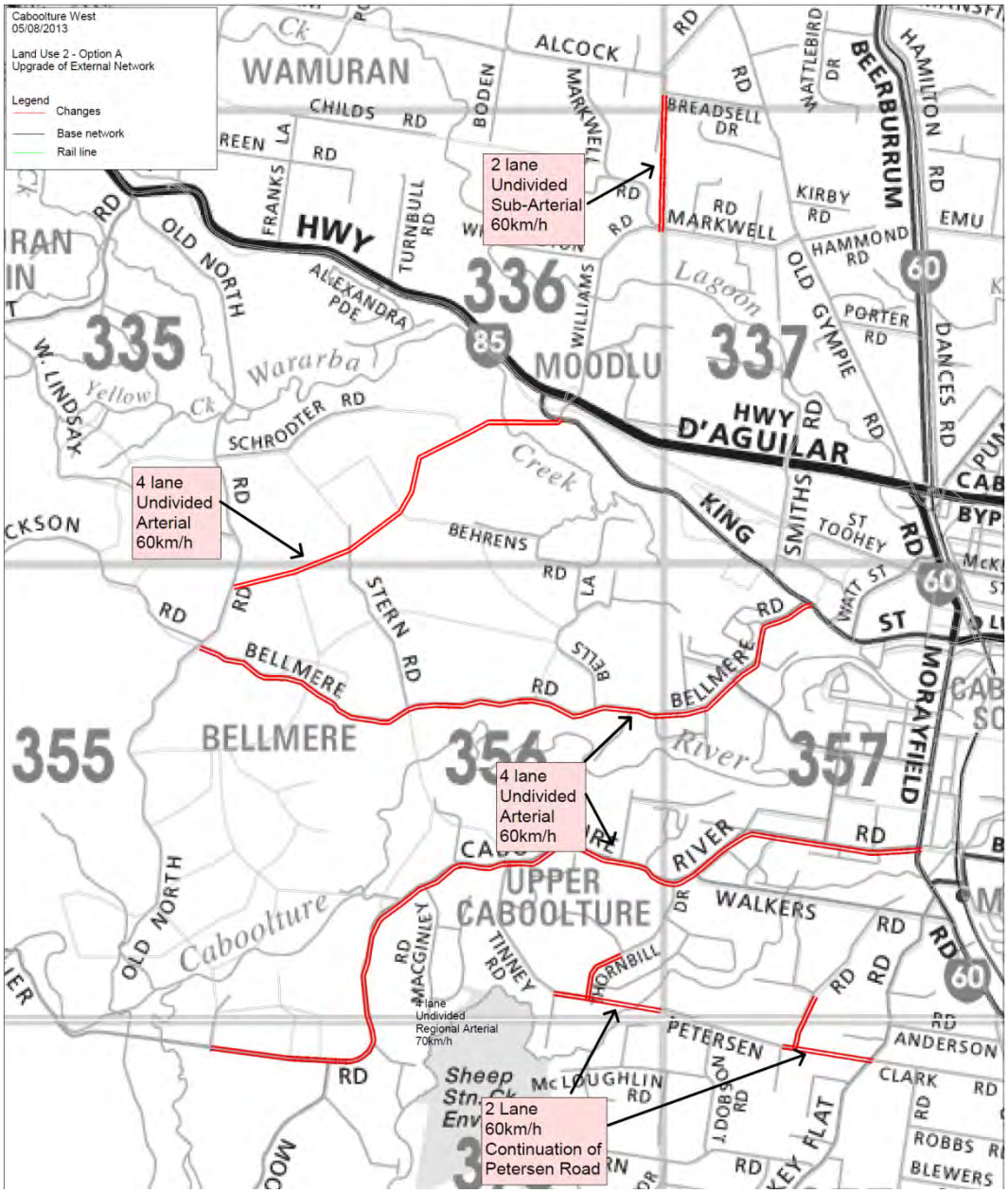

Figure 3: Improved highway network connections to Caboolture West

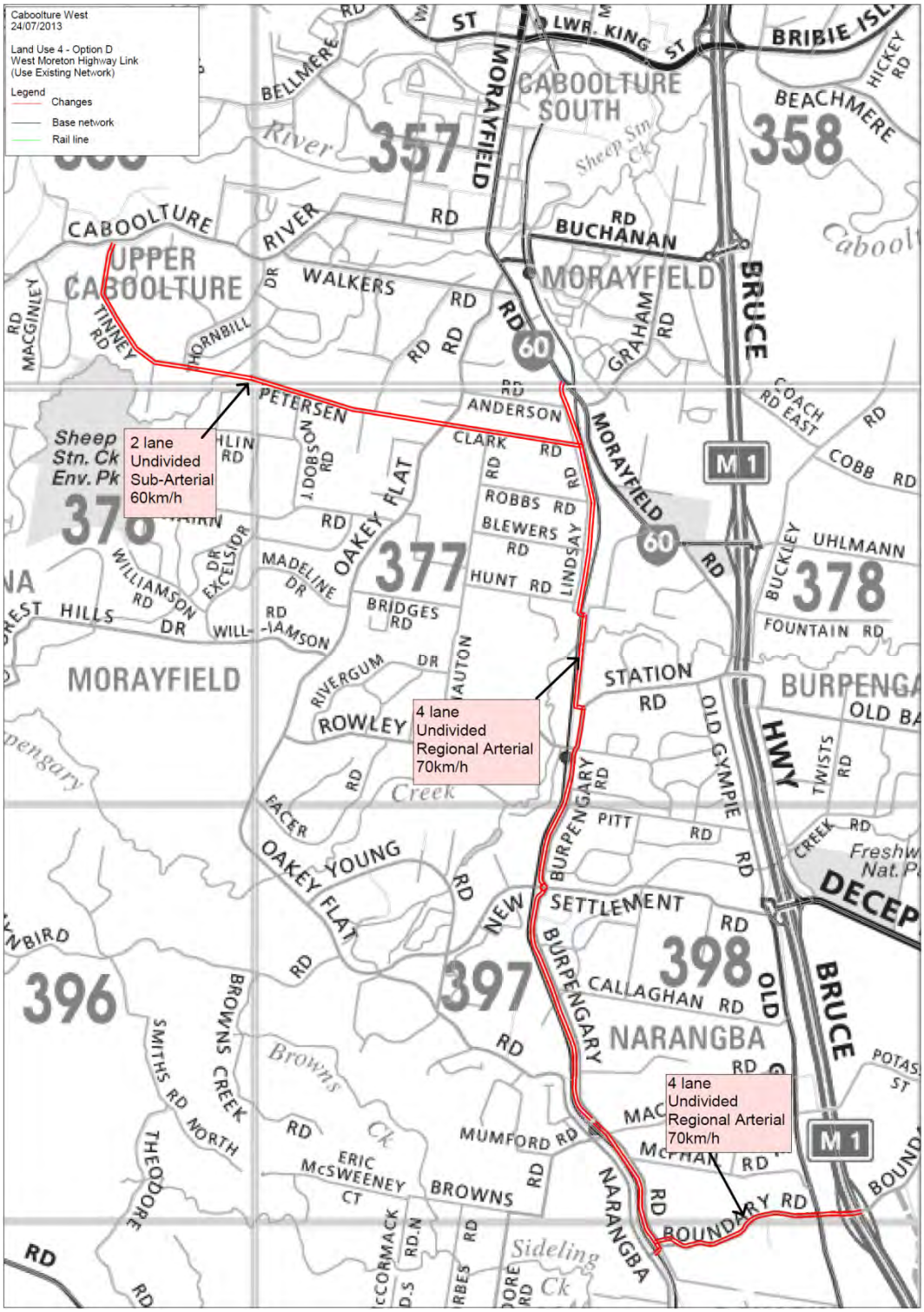

Figure 4: West Moreton Corridor assuming upgrades to improve existing connections

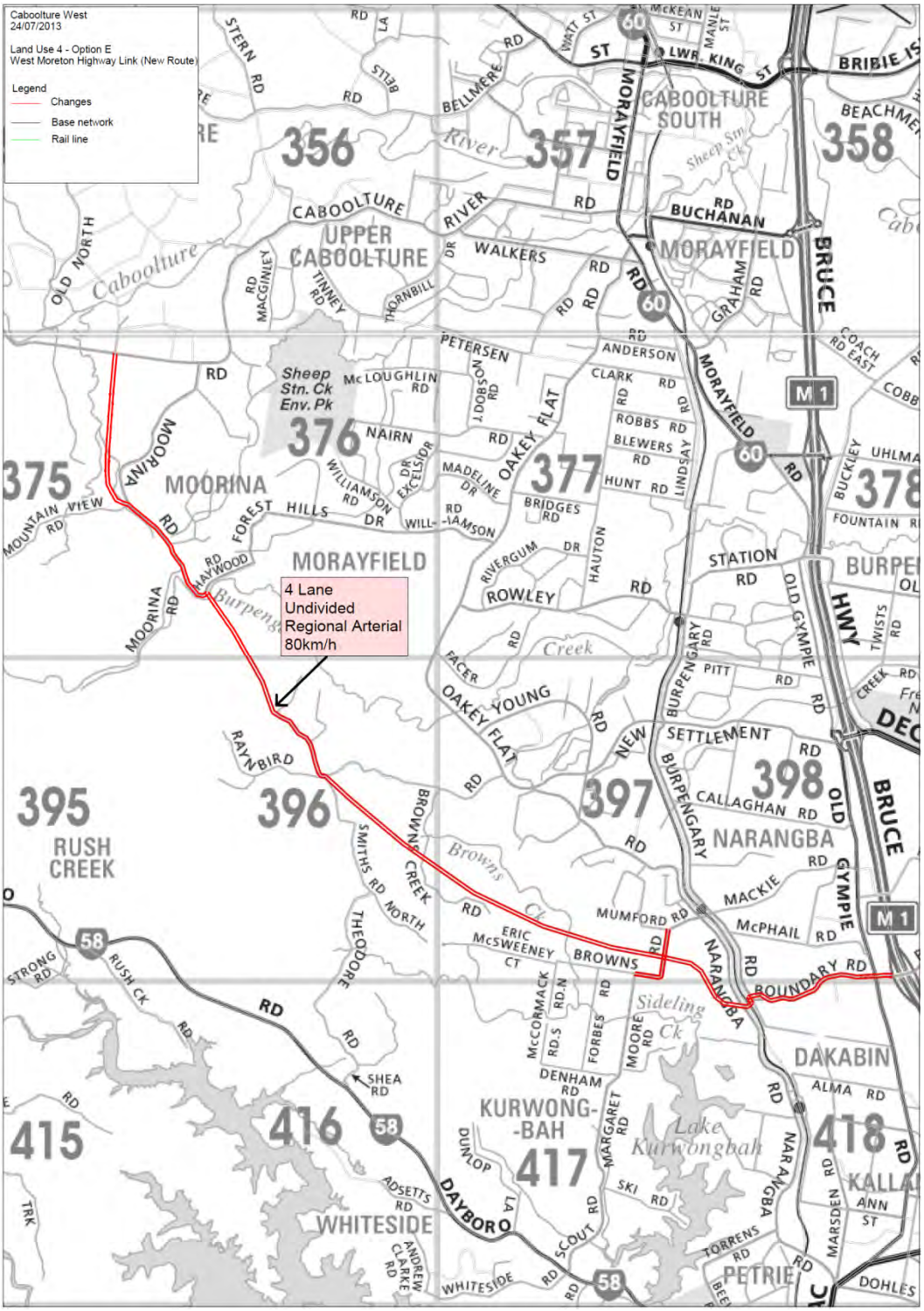

Figure 5: West Moreton Corridor assuming a new connection between Old North Road and Narangba Road

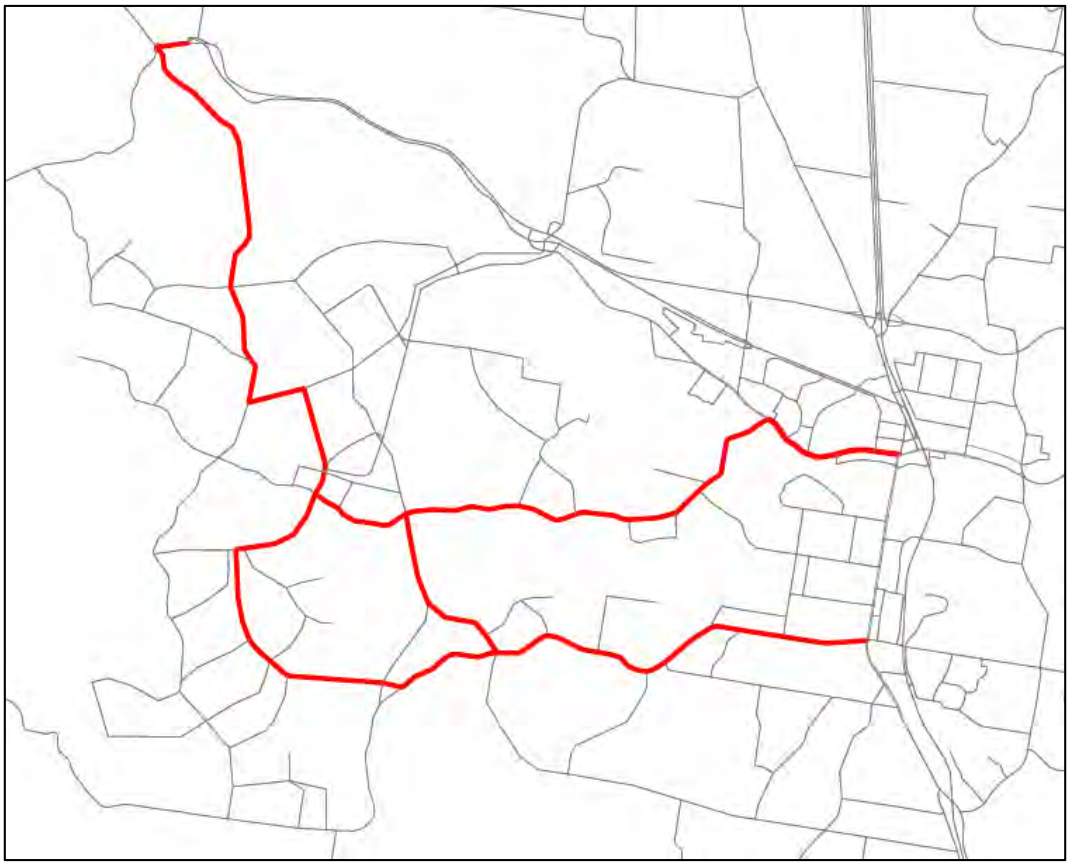

Figure 6: Bus lanes added as part of HWY-4 (shown in red)

2.5 Public transport networks

Three public transport network options have been developed and tested as part of the assessment of the Caboolture West development. The public transport networks tested are listed in Table 4 with additional detail (route diagrams and service headways given in Appendix C.

Table 4: Public transport network options

ID	Description
PT-A	**Base Level Public Transport Service** Combines with Highway Network 1 with services based on the 2031 policy model PT assumptions with the following changes: Modification and addition of new stops to suit internal Caboolture West network for the following routes: - MIT141, MIT142 - MIT151, MIT152 - CSQ061, CSQ062 Removal of the following routes: - WAMCAB, CABWAM Changes to service frequencies for the following routes: - MIT101, MIT102 (higher frequency peak, lower off-peak) - MIT051, MIT052 (higher frequency peak, lower off-peak) - MIT121, MIT122 (lower frequency for all peaks) - MIT141, MIT142 (lower frequency for all peaks) - MIT151, MIT152 (lower frequency for all peaks) - CSQ061, CSQ062 (lower frequency for all peaks)
PT-B	**High Frequency Public Transport Services** Combines with Highway Network 1 with services based on the 2031 policy model PT assumptions with the following changes: Modification and addition of new stops to suit internal Caboolture West network for the following routes: - MIT141, MIT142 - MIT151, MIT152 - CSQ061, CSQ062 Removal of the following routes: - WAMCAB, CABWAM
PT-C	**Rapid Public Transport Services** Combines with Highway Network 4 with services based on PT-B with the following changes: Added new services as follows: - C-Bahn services at 5/10 minute peak/off-peak frequencies (see Figure 7). Assumes average speed of 80km/h for busway sections. The C-Bahn services are all assumed to run on-road before travelling on the Guided Busway section between the Caboolture West Town Centre and Caboolture. The on-road routing was intended to cover as much of the Caboolture West catchment as possible. Further refinement of public transport routing would be undertaken during the next phase of assessment. - Local routes at 5/10 minute peak/off-peak frequencies (see Figure 7) to ensure less than 10 minute walk time to bus service.

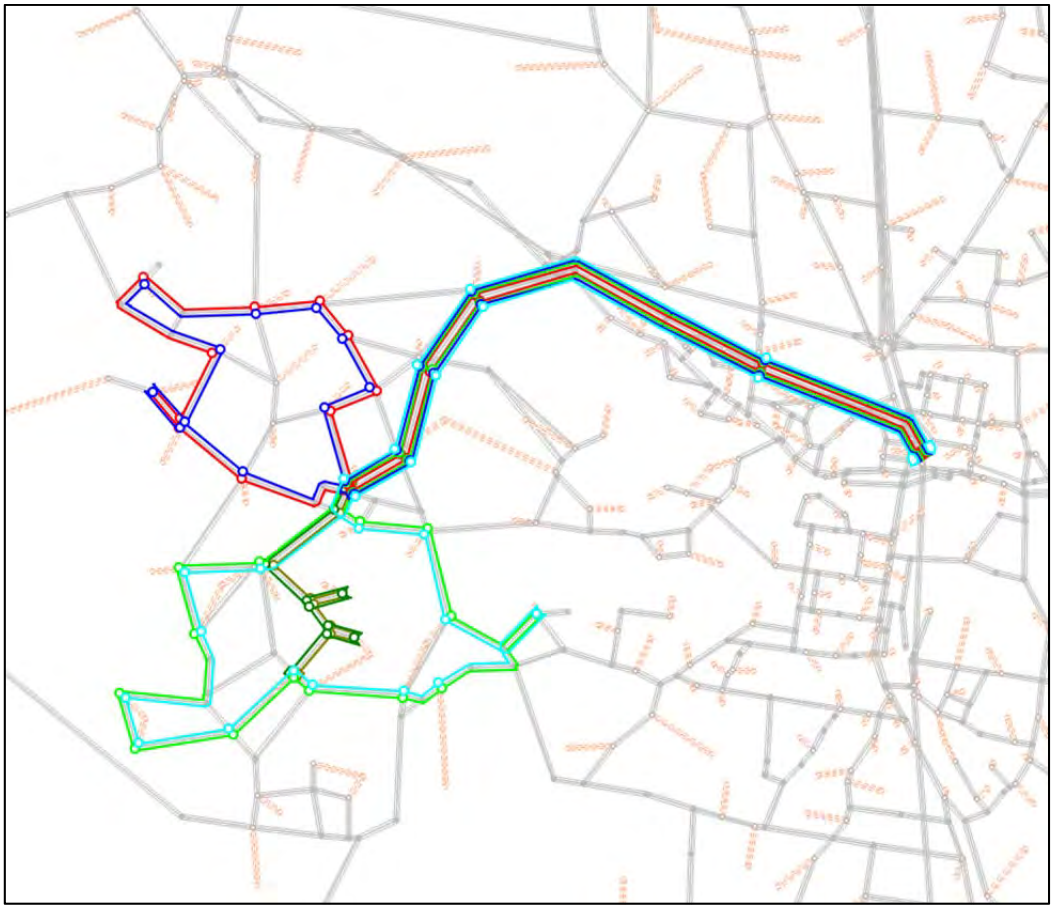

Figure 7: Public transport services added in as part of PT-C

3 Modelled scenarios

Ten scenarios were modelled to assess the Caboolture West development. The scenarios were developed by Arup and MBRC using a combination of the demographic, highway network and public transport network inputs described in Section 2.

The modelled scenarios are listed in Table 5.

Table 5: List of modelled scenarios

Scenario ID	Description	Land Use	Highway	Public Transport
S1	**Large town with do nothing road network and base level PT.** 2061 Large Town demographic inputs with 2031 policy model highway network. Lower service frequencies for PT than the 2031 policy model.	LU-2	HWY-0	PT-A
S2	**Large town with improved road network and base level PT.** 2061 Large Town demographic inputs with improvements to the 2031 policy model	LU-2	HWY-1	PT-A

Scenario ID	Description	Land Use	Highway	Public Transport
	highway network outside of Caboolture West. Lower service frequencies for PT than the 2031 policy model.			
S3	**Large town with West Moreton Rural Corridor and base level PT.** 2061 Large Town demographic inputs with improvements to the 2031 policy model highway network outside of Caboolture West and new connections to the south. Lower service frequencies for PT than the 2031 policy model.	LU-2	HWY-3	PT-A
S4	**Large town with improved road network and rapid PT.** 2061 Large Town demographic inputs with improvements to the 2031 policy model highway network outside of Caboolture West and BRT priority measures. 2031 policy model service frequencies with addition of C-Bahn and bus lanes.	LU-2	HWY-4	PT-C
S5	**Sustainable town with do nothing road network and base level PT.** As per S1 with 2061 Sustainable Town demographic inputs.	LU-4	HWY-0	PT-A
S6	**Sustainable town with improved road network and base level PT.** As per S2 with 2061 Sustainable Town demographic inputs.	LU-4	HWY-1	PT-A
S7	**Sustainable town with West Moreton Urban Corridor and base level PT.** 2061 Sustainable Town demographic inputs with improvements to the 2031 policy model highway network outside of Caboolture West and upgraded connections to the south. Lower service frequencies for PT than the 2031 policy model.	LU-4	HWY-2	PT-A
S8	**Sustainable town with West Moreton Rural Corridor and base level PT.** As per S3 with 2061 Sustainable Town demographic inputs.	LU-4	HWY-3	PT-A
S9	**Sustainable town with improved road network and high frequency PT.** 2061 Sustainable Town demographic inputs with improvements to the 2031 policy model highway network outside of Caboolture West. PT service frequencies as per the 2031 policy model.	LU-4	HWY-1	PT-B
S10	**Sustainable town with improved road network and rapid PT.** As per S4 with 2061 Sustainable Town demographic inputs.	LU-4	HWY-4	PT-C

4 Model results

For ease of tabulation and comparison of model results, this Section has been broken down into results for the Large Town scenarios (LU-2) and Sustainable Town (LU-4) scenarios.

High-level statistics (total trips, mode share and overall network) are provided for a 24hr period whilst details relating to the highway network and public transport network performance are provided for the AM peak period.

4.1 Large Town

4.1.1 Trips and mode share

Daily trip totals and mode share for the entire modelled network are given in Table 6 below. There is little variation in the travel mode share proportions as the number of trips to/from Caboolture West are a small proportion of the overall network trips.

Table 6: Trips and mode share, entire network

Scenario	Metric	PV	PT	Active	Total
S1	Trips	7,272,027	1,119,825	1,098,644	9,490,495
	%	76.6%	11.8%	11.6%	100%
S2	Trips	7,268,132	1,124,468	1,097,588	9,490,188
	%	76.6%	11.8%	11.6%	100%
S3	Trips	7,269,023	1,123,951	1,097,184	9,490,158
	%	76.6%	11.8%	11.6%	100%
S4	Trips	7,248,546	1,146,584	1,094,396	9,489,527
	%	76.4%	12.1%	11.5%	100%

Table 7 presents the same information as Table 6 with a focus on daily trips from Caboolture. It shows that the network changes have an impact on travel mode for residents of the proposed development with mode share proportions changing dependant on the schemes being implemented.

As expected, S4 shows the highest PT mode share as this scenario tested the most significant improvements to PT services and infrastructure.

Interestingly, whilst S2 and S3 are tests involving upgrades to the road network only, PT patronage increases by approximately 3% when compared to S1. This can be attributed to better bus travel times on the road network, which are described later in Section 4.1.4.2.

Table 7: Trips and mode share, Caboolture West

Scenario	Metric	PV	PT	Active	Total
S1	Trips	166,104	11,184	13,761	191,050
	%	86.9%	5.9%	7.2%	100%
S2	Trips	161,727	17,770	13,307	192,804
	%	83.9%	9.2%	6.9%	100%
S3	Trips	163,769	16,532	13,245	193,546
	%	84.6%	8.5%	6.8%	100%
S4	Trips	145,268	35,771	11,487	192,526
	%	75.5%	18.6%	6.0%	100%

The network improvements also affect travel modes in surrounding locations with PT mode shifts of +1.1% and +2.7% observed for Morayfield and Caboolture respectively when comparing S4 against S1.

Further analysis of the trips produced as part of the Large Town development scenarios also shows that a larger proportion of the trips are contained within Caboolture West when comparing against the containment of nearby localities.

This can be seen in the results reported in Table 8 with the containment of Caboolture West being approximately 15% higher than the containment of Morayfield and 11% higher than the containment of Caboolture. As a comparison, the information for the wider MBRC area is also provided. The locality boundaries used in this analysis can be seen in Figure 8.

Table 8: Proportion of trips contained within key localities (average of S1 to S4)

Locality	To/From	PV	PT	Active	Total
Caboolture West	External	122,997	17,838	1,455	142,289
	Internal	74,684	4,887	11,886	91,457
	% Internal	38%	22%	89%	39%
Morayfield	External	165,871	16,768	3,495	186,133
	Internal	45,254	1,730	11,581	58,565
	% Internal	21%	9%	77%	24%
Caboolture	External	164,873	18,900	3,523	187,297
	Internal	58,784	3,022	12,085	73,891
	% Internal	26%	14%	77%	28%
Wider MBRC area	External	776,434	119,379	7,179	902,991
	Internal	754,458	64,144	136,858	955,460
	% Internal	49%	35%	95%	51%

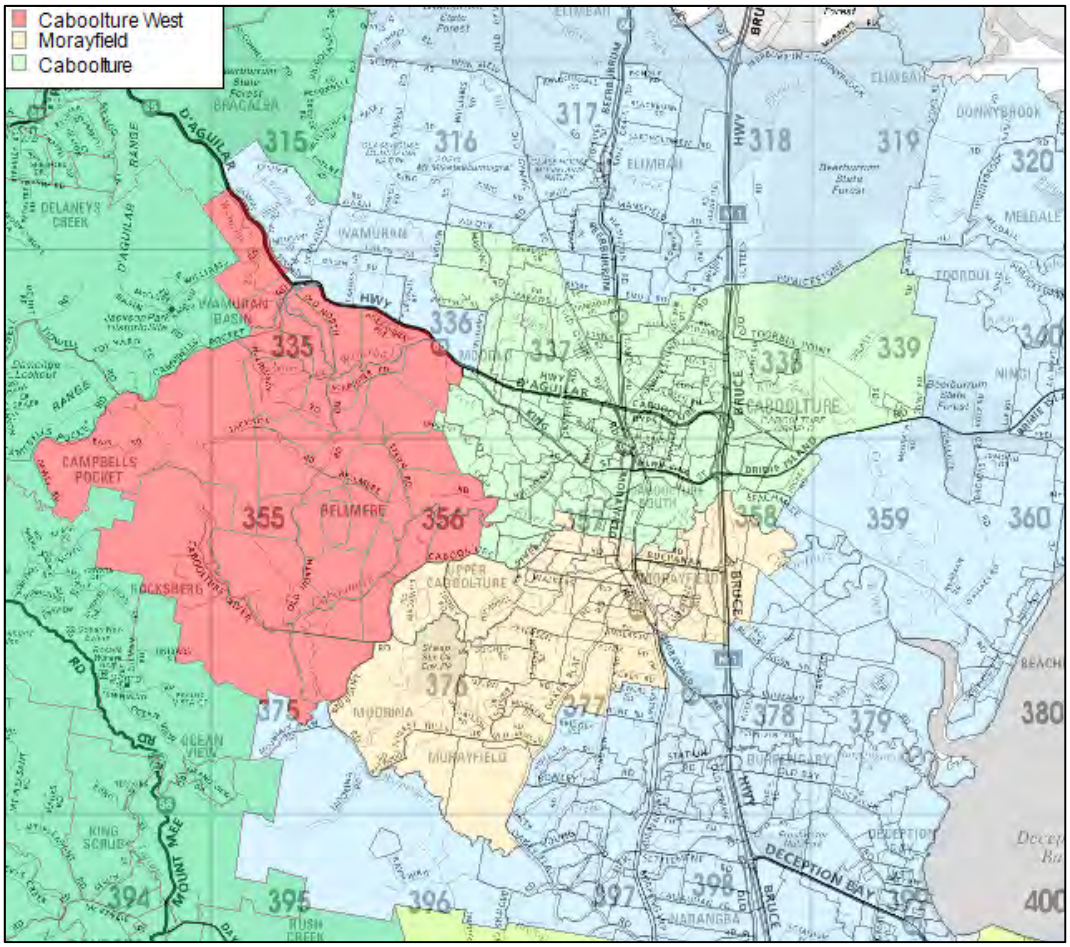

Figure 8: Locality definitions for containment analysis

4.1.2 Travel statistics

Figure 9 and Figure 10 show the vehicle kilometres and hours and passenger kilometre and hours travelled respectively for the four Large Town scenarios tested.

For road traffic, Vehicle Kilometres Travelled (VKT) and Vehicle Hours Travelled (VHT) decrease with increasing investment in road (S2 and S3) and public transport improvements (S4).

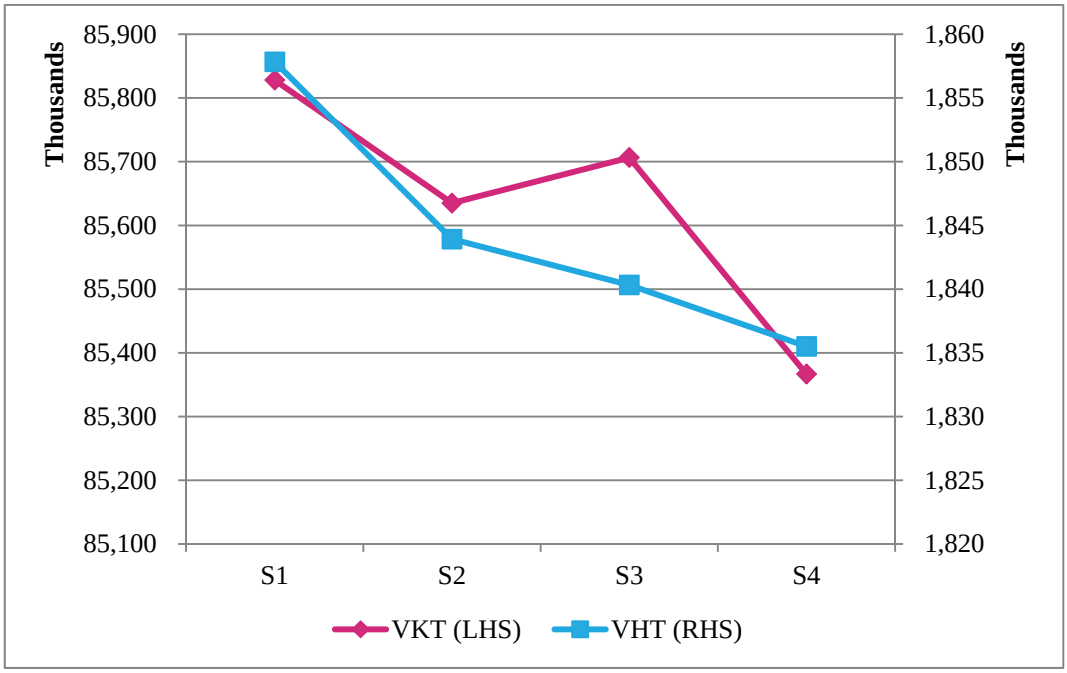

Figure 9: Vehicle kilometres and vehicle hours travelled, daily totals, entire network

For public transport users, the Passenger Kilometres Travelled (PKT) and Passenger Hours Travelled (PHT) show an opposite trend to the VKT and VHT results with the PKT and PHT increasing as investment in road and public transport increases.

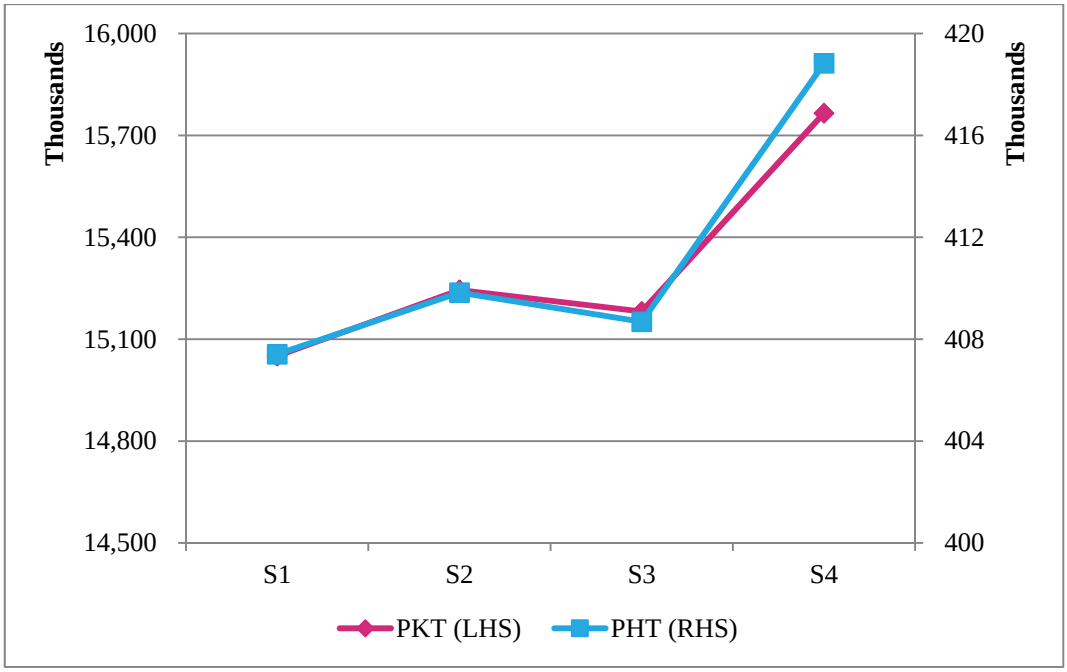

Figure 10: Passenger kilometres and passenger hours travelled, daily totals, entire network

The increases in PKT and PHT are due to increased patronage on bus and rail services with the bus travel mode accounting for roughly two thirds (in percentage terms) of the increase in PKT and PHT.

4.1.3 Highway network

4.1.3.1 Road traffic volumes and volume to capacity ratios

Plots of road traffic volumes and volume to capacity ratios for the AM peak period for the four Large Town scenarios modelled are given in Figure 12 to Figure 15. The bandwidths in the plots represent the relative magnitude of trips whilst the colours denote the volume and capacity (V/C) ratios as per Table 9.

Table 9: PT volume to capacity ratio colour scale

Colour	V/C Range
Green	< 0.50
Yellow	0.50 – 0.75
Orange	0.75 - 0.85
Light red	0.85 – 1.00
Dark red	> 1.00

The images show that significant congestion is forecast on key arterials within the Caboolture area and on key roads out of Caboolture West. The congestion would primarily occur in the peak travel direction with the main exception being Bruce Highway which shows V/C ratios greater than 1.0 in both directions along the majority of the route.

A summary of the proportion of road links within a given V/C ratio for the Caboolture West road network is also provided in Figure 11. The chart shows that S1 has a much higher proportion of links with a V/C ratio of 0.6-1.0 (that is the road network is forecast to be less congested) than all the other scenarios.

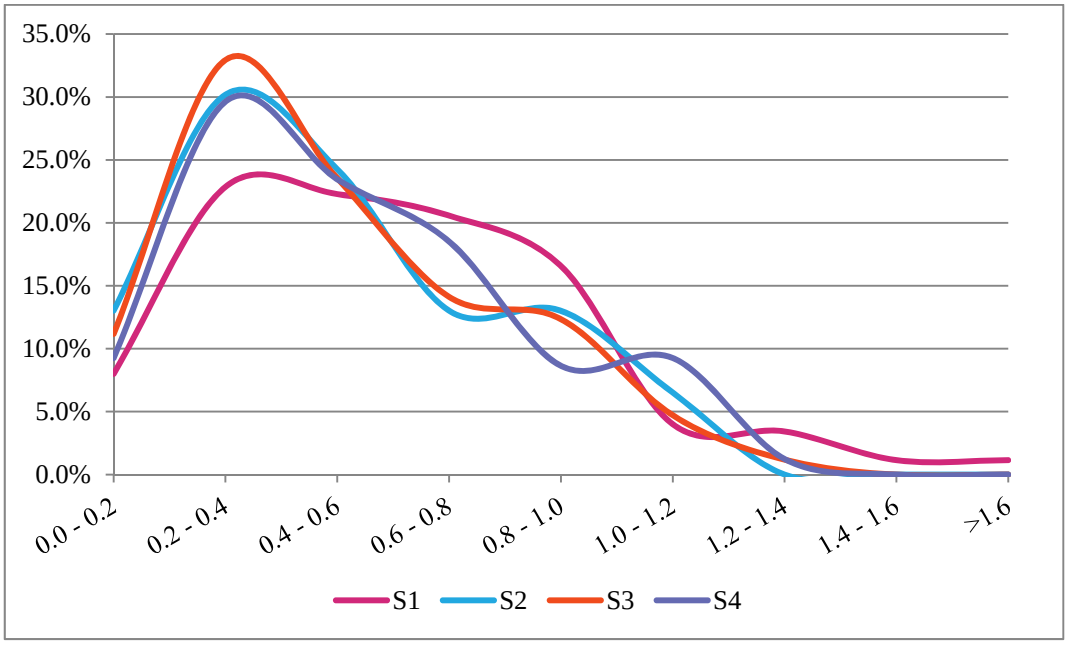

Figure 11: Volume to capacity distribution plot

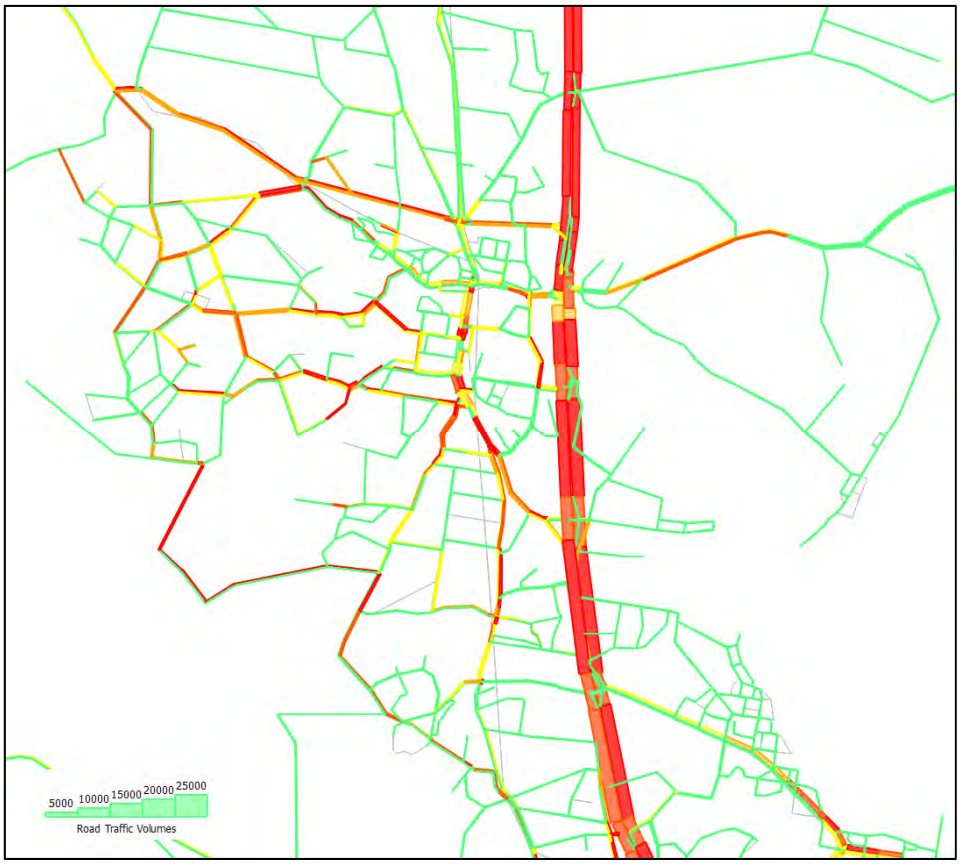

Figure 12: Road traffic volume and volume to capacity ratios, S1 AM peak

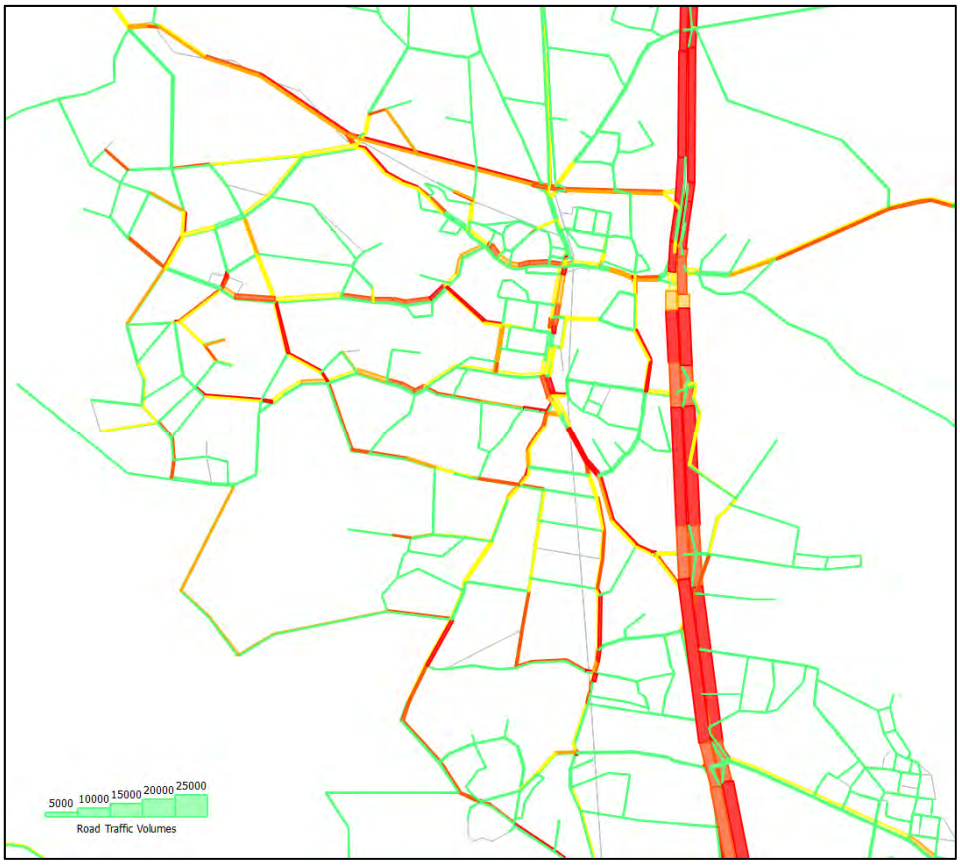

Figure 13: Road traffic volume and volume to capacity ratios, S2 AM peak

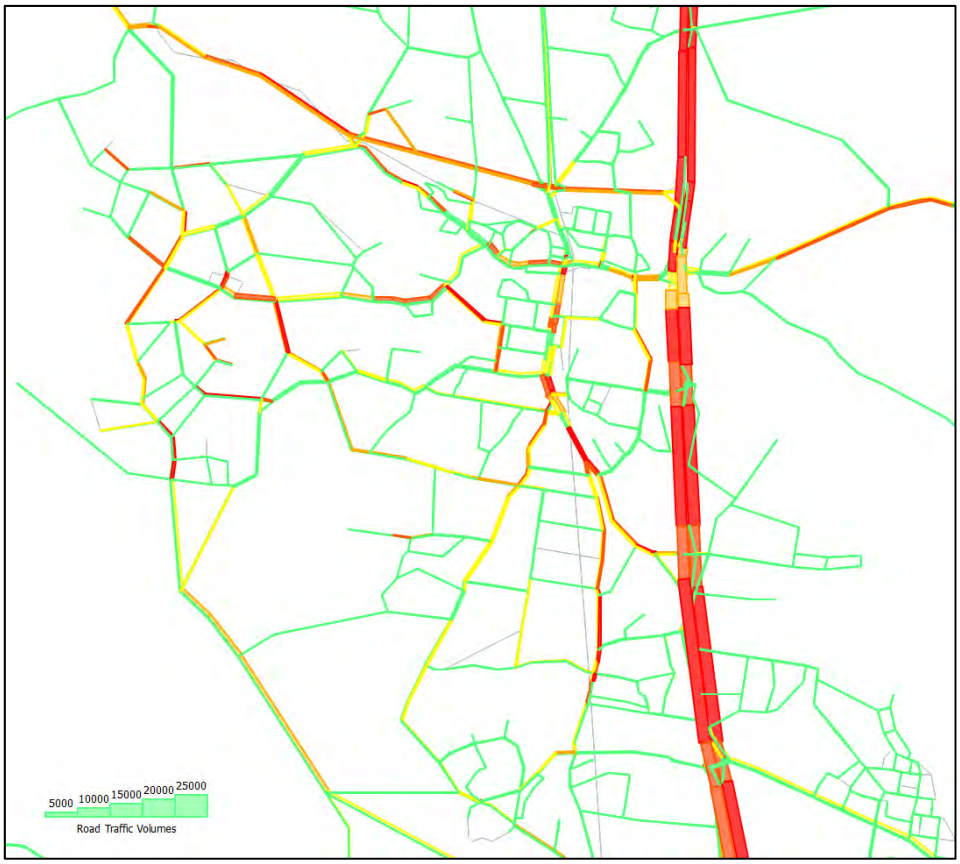

Figure 14: Road traffic volume and volume to capacity ratios, S3 AM peak

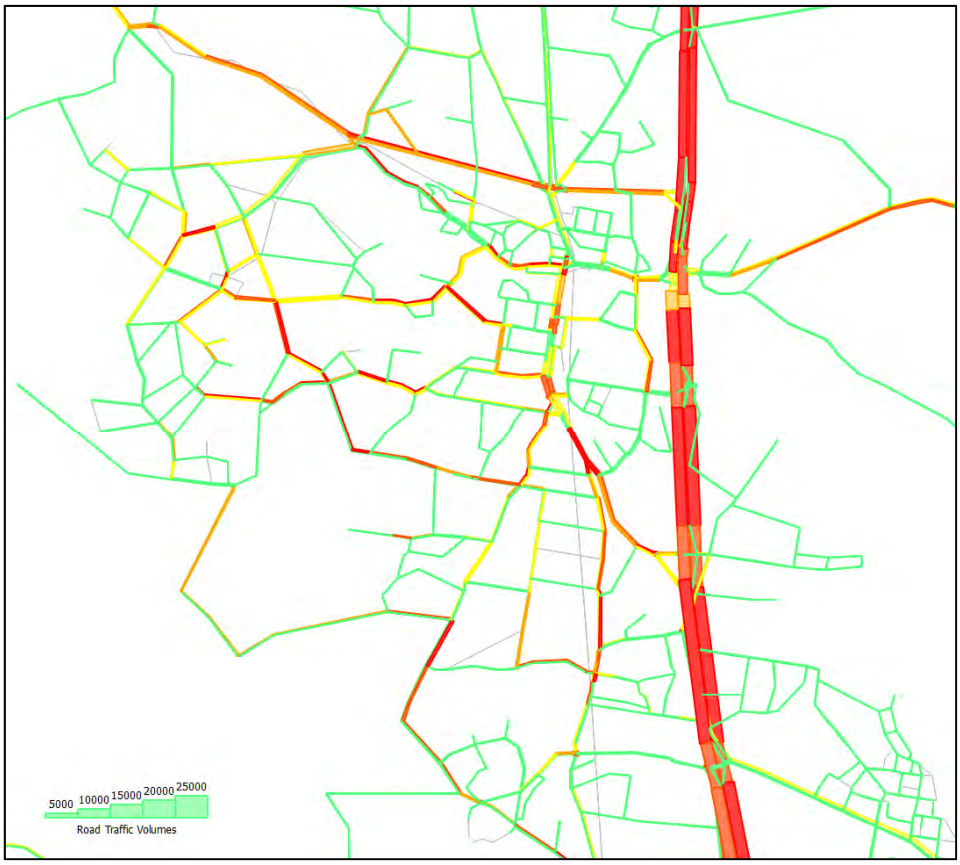

Figure 15: Road traffic volume and volume to capacity ratios, S4 AM peak

A comparison of the Scenario 2 (with improved highway network connections to Caboolture West) traffic volumes with the Scenario 1 (Do Nothing) traffic volumes for the AM peak period is also given in Figure 16 below.

The figure shows that the upgraded highway connections along Bellmere Road, Caboolture River Road and the new connection to D'Aguilar Highway attract a higher number of vehicles due to the increased capacity in the network. The additional river crossing also takes some traffic off the eastern part of Caboolture River Road.

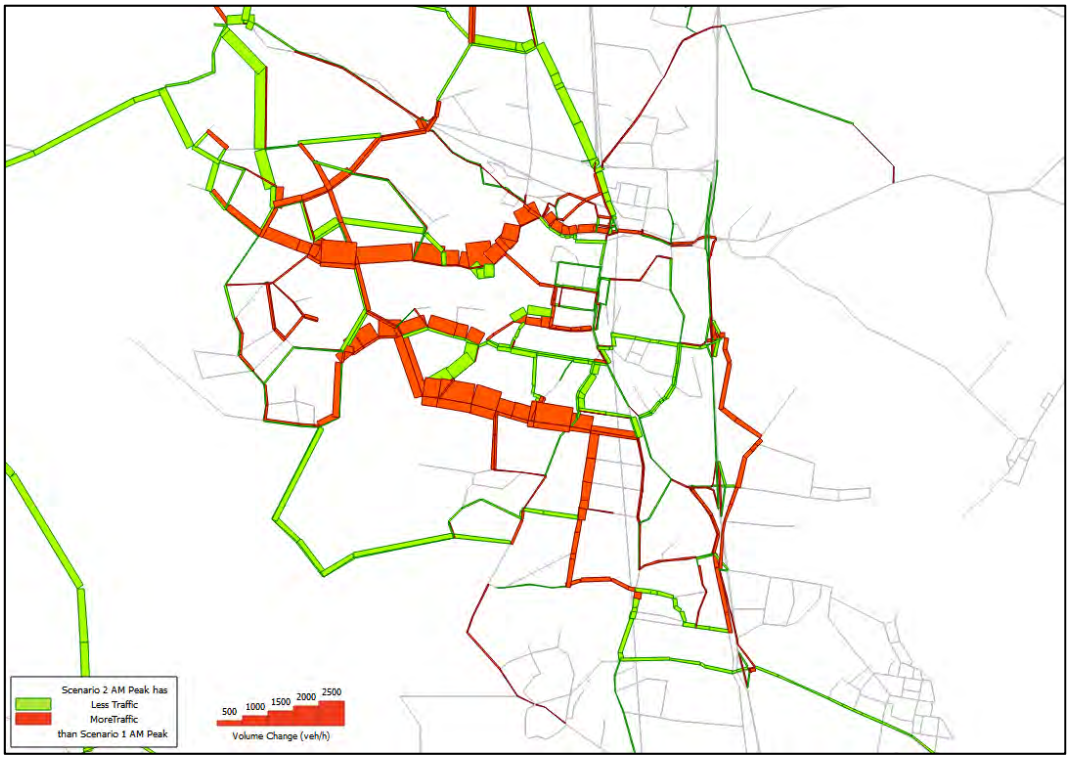

Figure 16: Scenario 2 minus Scenario 1, AM peak period

Further volume difference plots are provided for the Sustainable Town land use scenario options in Section 4.2.3.1.

4.1.3.2 Screen line volumes

Traffic volume results for traffic crossing screen lines as defined in Figure 17 below have been provided in Appendix D. The table show the AM and PM peak 2-hour volumes in passenger car units (PCUs) and the volume to capacity ratios on the links, assuming that peak hour flows are 60% of the 2-hour volumes.

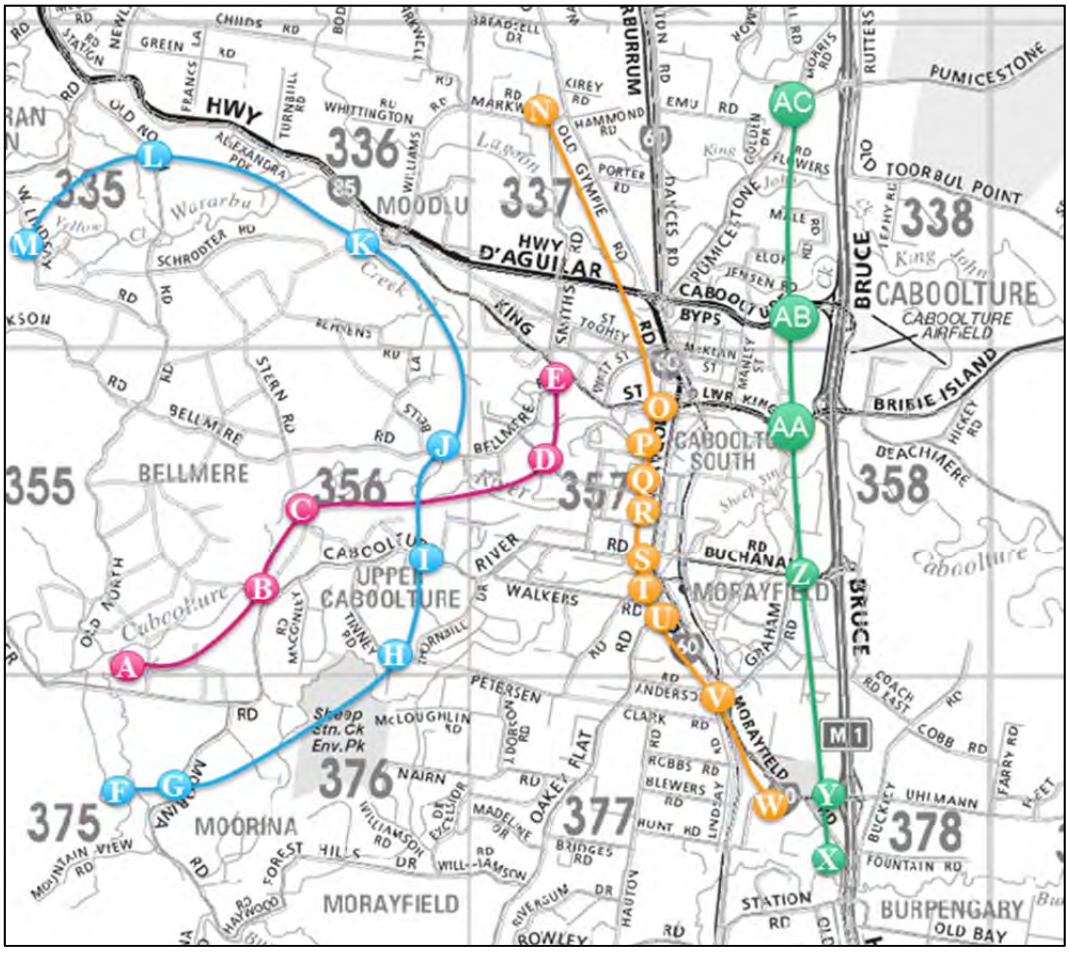

Figure 17: Traffic volume screen lines

4.1.3.3 Travel times

Travel times for three key routes between the Caboolture West Town Centre and Caboolture Railway Station were assessed to understand relative travel times between the modelled scenarios. The routes assessed are shown in Figure 18 with the results of the comparison given in Table 10.

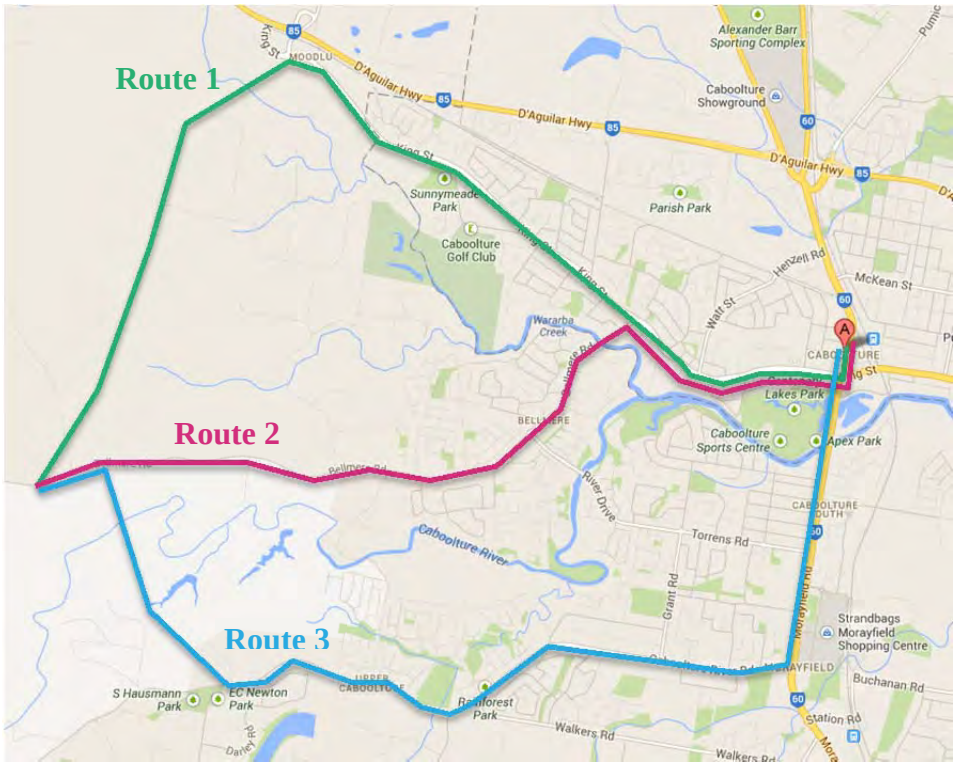

Figure 18: Travel time routes assessed

Table 10: Travel time comparisons for three key routes (in minutes)

	Eastbound			Westbound		
Scenario	Route 1	Route 2	Route 3	Route 1	Route 2	Route 3
S1	33.0	33.9	40.7	13.9	13.4	19.2
S2	16.7	14.4	22.4	13.5	12.8	18.8
S3	16.1	13.6	22.2	13.6	12.8	18.7
S4	18.6	21.3	27.9	13.7	13.5	18.9

The results show that the network improvements outside of Caboolture West (see HWY-1 improvements in Table 3) implemented as part of S2 and S3 greatly reduce travel times in the peak travel direction (eastbound) when compared to S1. This is due to alleviating congestion at key points along the assessed routes primarily at the locations listed below:

- Route 1 – Approach to Caboolture Connection Rd / Williams Rd / D'Aguilar Hwy interchange.
- Route 2 – Bellmere Rd between Bells Ln and River Dr
- Route 3 – Caboolture River Rd between Tinney Rd and Walkers Rd

S4 shows increased travel times on all routes compared with S2 and S3 due to the removal of traffic lanes along sections of the travel time routes for the provision of BRT lanes. The impact is reduced when comparing to S1 as S4 has lower traffic volumes due to the better PT provision.

Travel times in the non-peak direction (westbound) are very similar between all modelled scenarios.

4.1.4 Public transport network

4.1.4.1 PT volumes and volume to capacity ratios

The PT volumes and volume to capacity ratios for the four Large Town scenarios modelled are given in Figure 19 to Figure 22 below. Similar to the road traffic volumes and V/C ratios plots presented in Section 4.1.3.1, the bandwidths in the plots represent the relative magnitude of trips whilst the colours denote the V/C ratios as per Table 9.

The improved PT services runtimes due to the road network upgrades outside of Caboolture West in S2 and S3 are shown to increase patronage on routes travelling along Bellmere Rd and Caboolture River Rd when compared to S1. Some of the segments along Bellmere Rd and Caboolture River Rd are estimated to be over capacity[12].

The introduction of the C-Bahn services in S4 has the effect of taking away some patronage from other routes servicing Morayfield/Caboolture but overall has the impact of increasing PT trips. This is primarily due to the connectivity to Caboolture Railway Station which improves PT access from Caboolture West to the Brisbane CBD. When introduced, the C-Bahn service is forecast to operate at close to capacity (V/C ratio between 0.85 and 1.00) along the main trunk between the Caboolture West Town Centre and Caboolture Railway Station.

In most scenarios (with the exception of S4) the services from Wamuran to Caboolture along D'Aguilar Hwy and King St are shown to be over capacity and would benefit from PT service frequency improvements.

Comparisons of passenger volumes on the network in and around Caboolture West are also provided in Section 4.2.4.1 for the Sustainable Town scenarios.

[1] The Public transport V/C ratios are based on total volumes and total capacity. It is therefore based on grouping individual routes along sections where multiple routes exist along the same segment. The effect of this is that some routes may be greatly over capacity whilst others are under capacity.
[2] The MBRSTM-MM public transport assignment is an unconstrained assignment. This implies that the effects of crowding on mode choice are not taken into account.

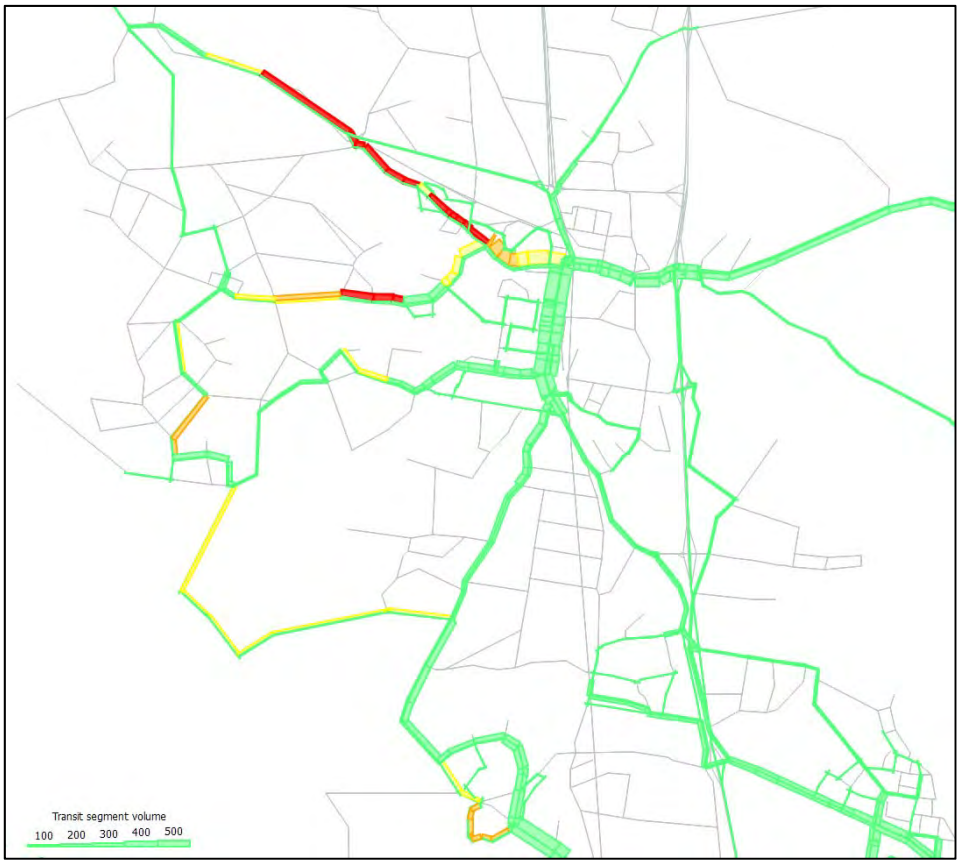

Figure 19: PT volume and volume to capacity ratios, S1 AM peak (excluding rail)

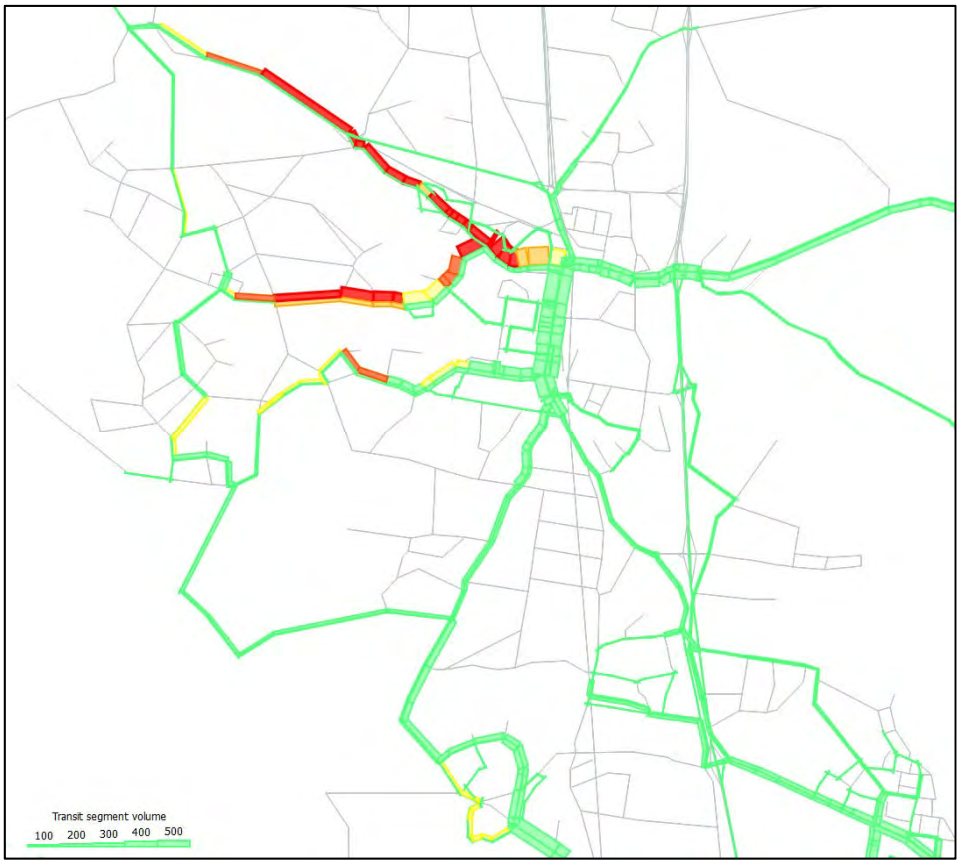

Figure 20: PT volume and volume to capacity ratios, S2 AM peak (excluding rail)

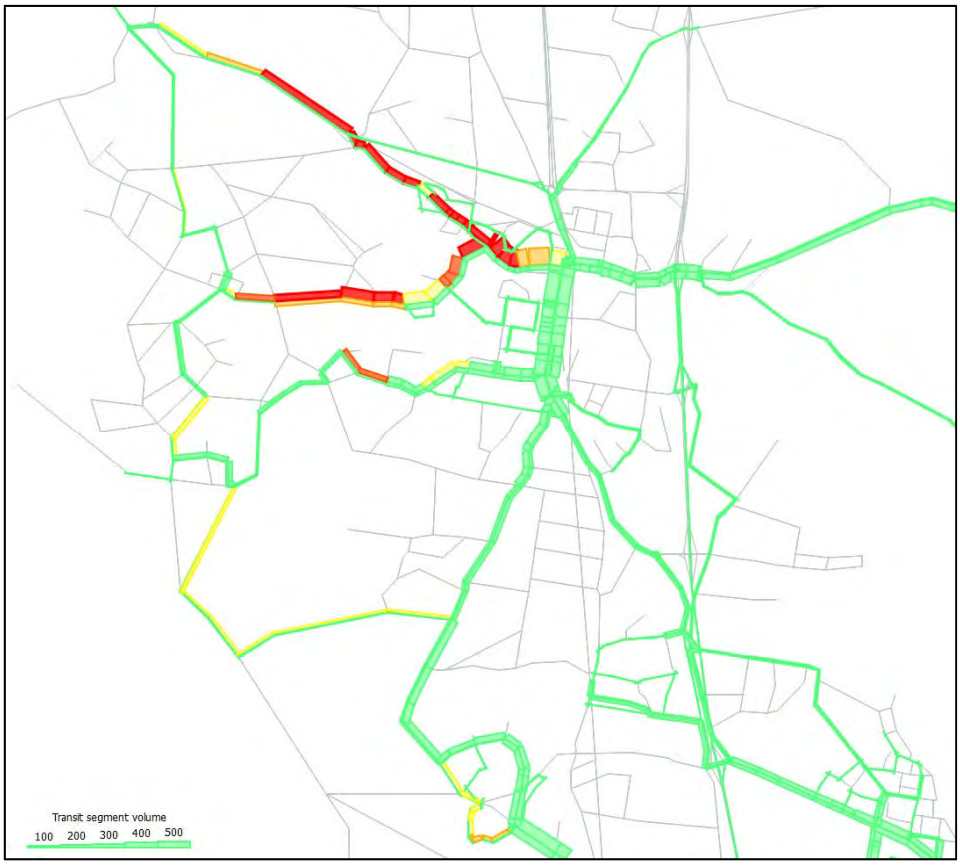

Figure 21: PT volume to capacity ratios, S3 AM peak (excluding rail)

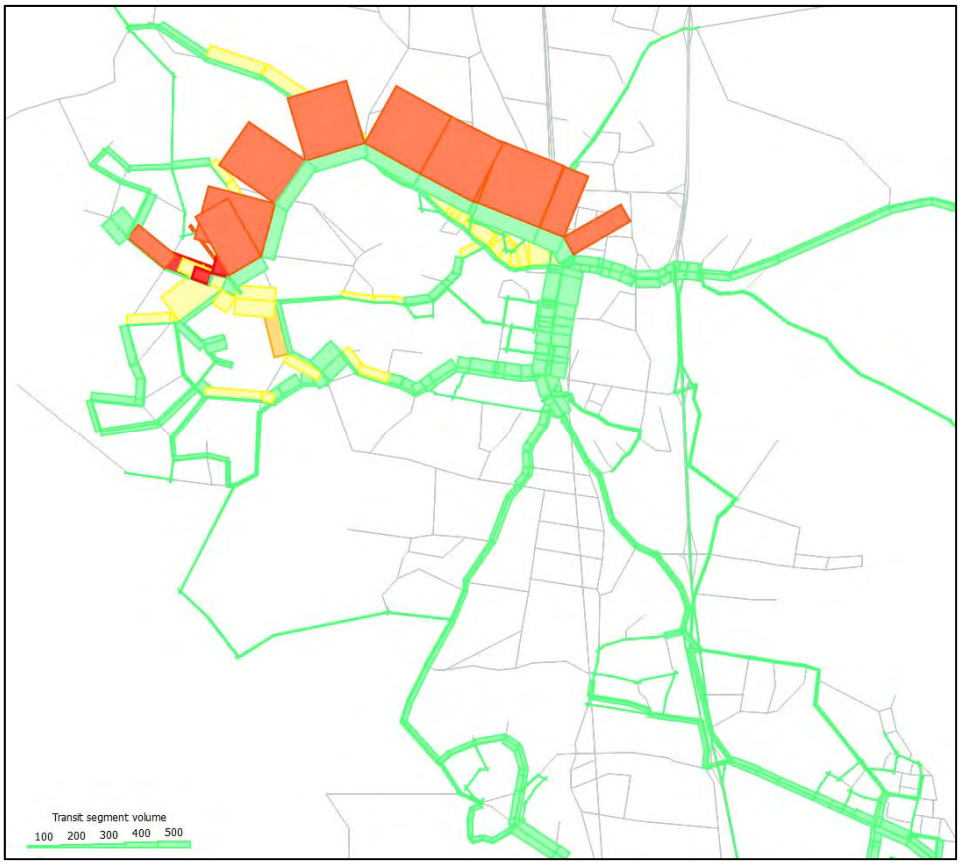

Figure 22: PT volume to capacity ratios, S4 AM peak (excluding rail)

4.1.4.2 Travel times

Public transport in-vehicle times are provided as a comparison for car travel times for services directly comparable to the routes reported in Section 4.1.3.3. A directly comparable route is one that is serviced directly by a PT service i.e. no interchange required.

The C-Bahn services have therefore been used as a comparison for travel time Route 1, whilst for Route 2, bus services CSQ062 (eastbound) and CSQ061 (westbound) were compared.

The results are presented in Table 11 and show that car travel times are forecast to be lower in both the eastbound and westbound directions for S1, S2 and S3 compared to public transport. In S4, the introduction of the C-Bahn services is predicted to greatly reduce the travel time by PT between Caboolture Town Centre and the Caboolture Railway Station below car travel time.

It should be noted that the PT travel times presented only include the 'in-vehicle' time component of a PT trip. It therefore excludes access/egress walk times and fares.

Table 11: PT in-vehicle times compared to car highway times (in minutes), AM peak (Caboolture)

	Eastbound			Westbound		
Scenario	**CSQ062**	**C-Bahn**	**Car**	**CSQ061**	**C-Bahn**	**Car**
S1	39.3	-	33.9	16.7	-	13.4
S2	17.9	-	14.4	16.1	-	12.8
S3	17.0	-	13.6	16.1	-	12.8
S4	-	8.5	18.6	-	8.5	13.7

A comparison of journey times for car and PT for trips between Caboolture West Town Centre and the Morayfield Shopping Centre has also been undertaken and is reported in Table 12. The route assessed for this comparison was via Bellmere Drive/River Drive/Torrens Road. There are no direct services between the Caboolture West Town Centre and the Morayfield Shopping Centre along this route. To make the analysis comparable, only the in-vehicle component of the total time of a PT journey has been recorded.

Table 12: PT in-vehicle times compared to car highway times (in minutes), AM peak (Morayfield Shopping Centre)

	Eastbound		Westbound	
Scenario	**PT CSQ062 & 320239**	**Car**	**PT CSQ061 & 320279**	**Car**
S1	49.0	36.3	21.5	14.0
S2	28.2	17.6	21.9	13.6
S3	26.4	16.9	21.0	13.6
S4	23.3	22.1	17.4	14.0

4.2 Sustainable Town

4.2.1 Trips and mode share

Daily trip totals and mode share for the entire modelled network are given in Table 13. The Sustainable Town results show similar trends to the results from the Large Town scenarios with very little variation recorded in the travel mode share proportions.

Table 13: Trips and mode share, entire network

Scenario	Metric	PV	PT	Active	Total
S5	Trips	7,227,853	1,117,143	1,095,310	9,440,307
	%	76.6%	11.8%	11.6%	100%
S6	Trips	7,225,979	1,119,722	1,094,383	9,440,084
	%	76.5%	11.9%	11.6%	100%
S7	Trips	7,225,736	1,120,144	1,094,182	9,440,062
	%	76.5%	11.9%	11.6%	100%
S8	Trips	7,226,254	1,119,738	1,094,073	9,440,065
	%	76.5%	11.9%	11.6%	100%
S9	Trips	7,221,749	1,124,864	1,093,584	9,440,197
	%	76.5%	11.9%	11.6%	100%
S10	Trips	7,209,504	1,138,519	1,091,507	9,439,531
	%	76.4%	12.1%	11.6%	100%

Comparing Table 13 with Table 6 shows that the Sustainable Town scenarios produce approximately 50,000 fewer trips per day than the Large Town scenarios and that mode share proportions remain very similar between comparative scenarios. Table 14 presents the same information as Table 13 with a focus on daily trips from Caboolture. It shows that the network changes have an impact on travel mode for residents of the proposed development with mode share proportions changing dependant on the schemes being implemented.

The results of the Sustainable Town scenarios exhibit similar trends to comparable Large Town scenarios. S10 shows the highest PT mode share as this scenario tested significant improvements to PT services and infrastructure.

Given the lower number of trips (and therefore less congestion on the road network), S10 shows less of a shift to PT when compared to S5 than the comparable Large Town scenarios (S4 compared with S1). Under the Large Town comparison, PT mode share increased by 12.7% whilst under the Sustainable Town scenarios a PT mode share increase of 10.8% was recorded.

Table 14: Trips and mode share, Caboolture West

Scenario	Metric	PV	PT	Active	Total
S5	Trips	125,917	10,359	12,038	148,314
	%	84.9%	7.0%	8.1%	100%
S6	Trips	124,618	12,950	11,616	149,184
	%	83.5%	8.7%	7.8%	100%
S7	Trips	125,010	12,744	11,627	149,380
	%	83.7%	8.5%	7.8%	100%
S8	Trips	126,242	12,015	11,524	149,780
	%	84.3%	8.0%	7.7%	100%
S9	Trips	122,418	15,554	11,261	149,233
	%	82.0%	10.4%	7.5%	100%
S10	Trips	112,053	26,468	10,014	148,535
	%	75.4%	17.8%	6.7%	100%

The network improvements also affect travel modes in surrounding locations with PT mode shifts of +1.1% and +2.9% observed for Morayfield and Caboolture respectively when comparing S10 against S5.

Further analysis of the trips produced as part of the Sustainable Town development scenarios also shows that a larger proportion of the trips are contained within Caboolture West when comparing against the containment of nearby localities.

This can be seen in the results reported in Table 15 with the containment of Caboolture West being approximately 15% higher than the containment of Morayfield and 10% higher than the containment of Caboolture. As a comparison, the information for the wider MBRC area is also provided. The locality boundaries used in this analysis can be seen in Figure 8.

Table 15: Proportion of trips contained within key localities (average of S1 to S4)

Locality	To/From	PV	PT	Active	Total
Caboolture West	External	99,665	13,548	781	113,994
	Internal	59,597	3,788	10,896	74,282
	% Internal	37%	22%	93%	39%
Morayfield	External	164,377	16,577	3,515	184,469
	Internal	45,769	1,786	11,649	59,205
	% Internal	22%	10%	77%	24%
Caboolture	External	161,857	18,086	3,523	183,466
	Internal	60,339	3,119	12,372	75,830
	% Internal	27%	15%	78%	29%
Wider MBRC area	External	754,707	113,454	6,533	874,693
	Internal	740,145	63,279	135,617	939,040
	% Internal	50%	36%	95%	52%

4.2.2 Travel statistics

Figure 23 and Figure 24 below show the vehicle kilometres and hours and passenger kilometre and hours travelled respectively for the six Sustainable Town scenarios tested.

For road traffic, VKT and VHT generally decrease with increasing investment in road (S6, S7 and S8) and public transport improvements (S9 and S10).

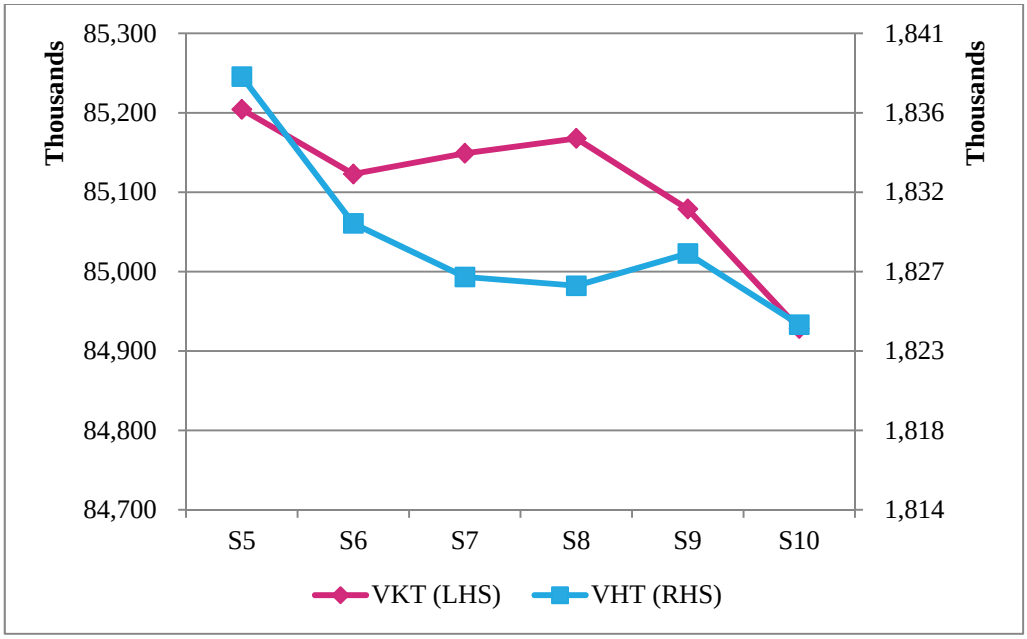

Figure 23: Vehicle kilometres and vehicle hours travelled, daily totals, entire network

For public transport users, the PKT and PHT show and opposite trend to the VKT and VHT results with the two metrics generally increasing as investment in road and public transport increases.

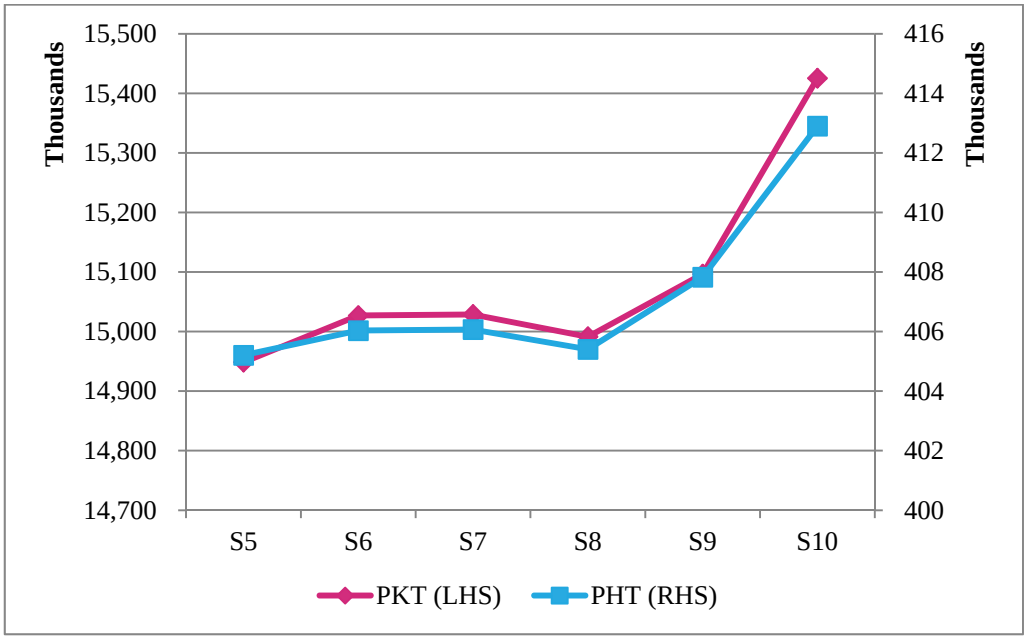

Figure 24: Passenger kilometres and passenger hours travelled, daily totals, entire network

The increases in PKT and PHT are due to increased patronage on bus and rail services with the bus travel mode accounting for roughly two thirds (in percentage terms) of the increase in PKT and PHT.

4.2.3 Highway network

4.2.3.1 Road traffic volumes and volume to capacity ratios

Plots of road traffic volumes and volume to capacity ratios for the AM peak period for the six Sustainable Town scenarios modelled are given in Figure 26 to Figure 31. The bandwidths in the plots represent the relative magnitude of trips whilst the colours denote the V/C ratios as per Table 9.

The results show very similar trends to those reported in Section 4.1.3.1 for the Large Town scenarios. However, the traffic volumes and V/C ratios tend to be lower due to the lower traffic levels generated by the Sustainable Town demographic inputs.

A summary of the proportion of road links within a given volume to capacity ratio for the Caboolture West road network is also given in Figure 25. The chart shows that S5 has a much higher proportion of links with a V/C ratio of 0.6-1.4 than all the other scenarios.

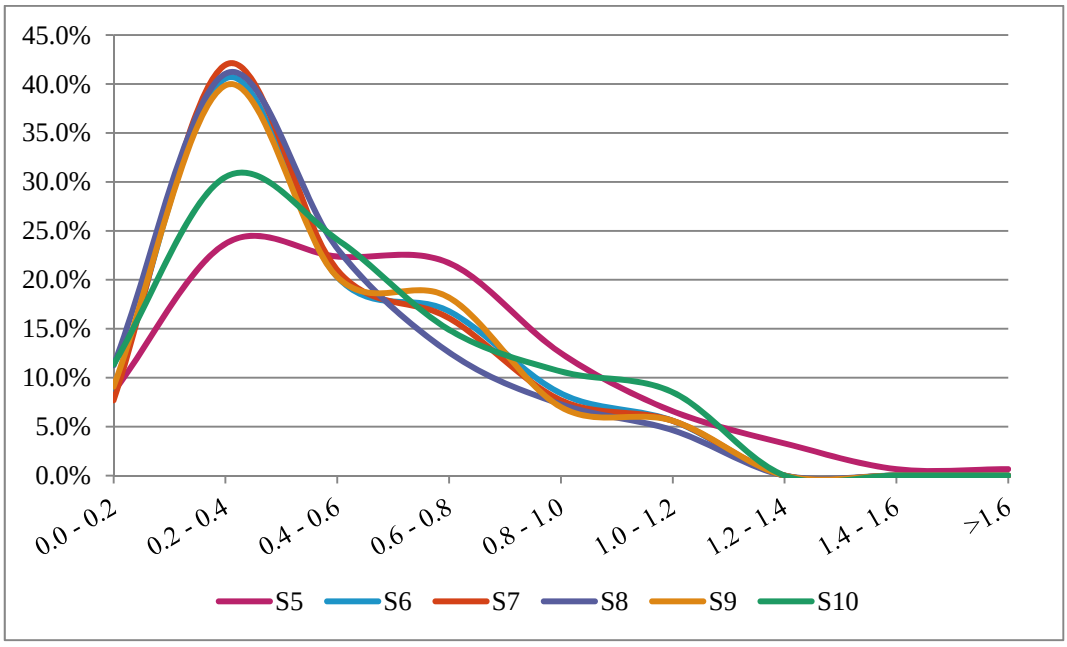

Figure 25: Volume to capacity distribution plot

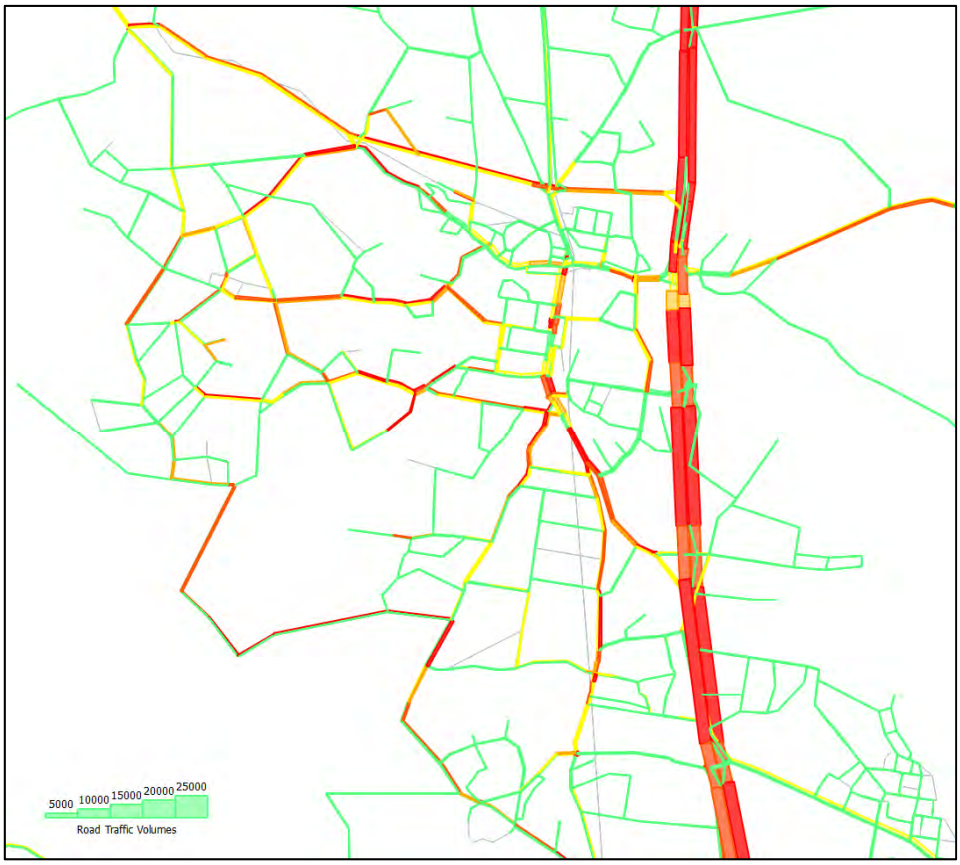

Figure 26: Road traffic volume and volume to capacity ratios, S5 AM peak

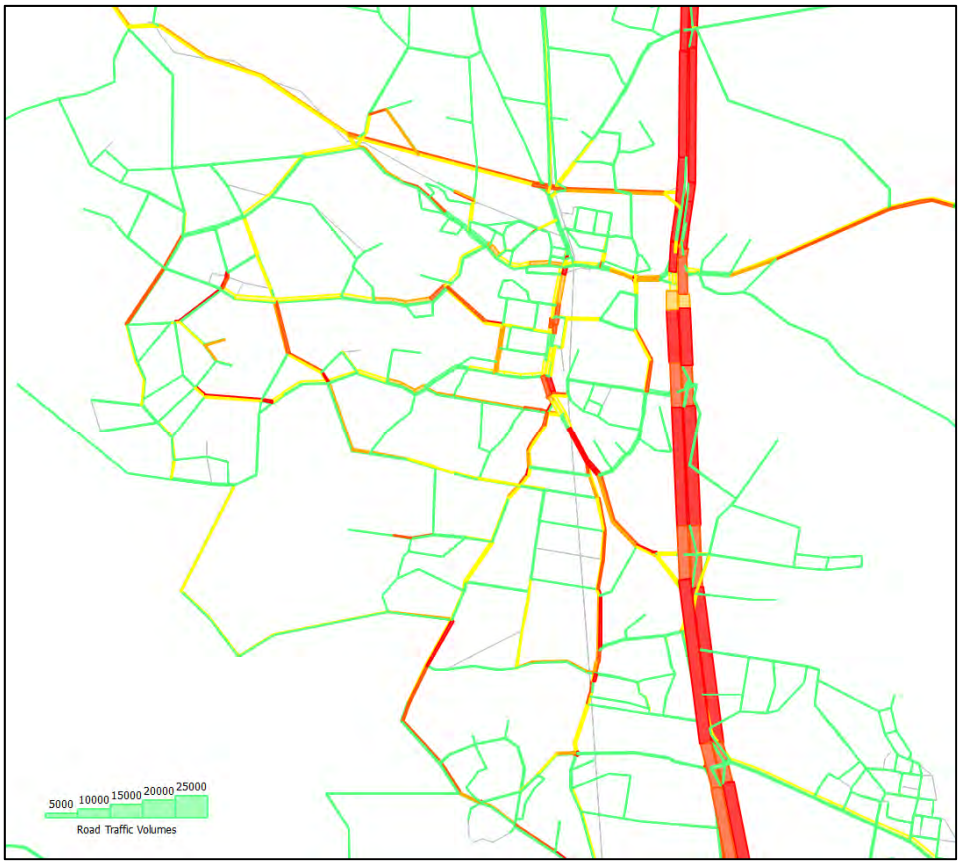

Figure 27: Road traffic volume and volume to capacity ratios, S6 AM peak

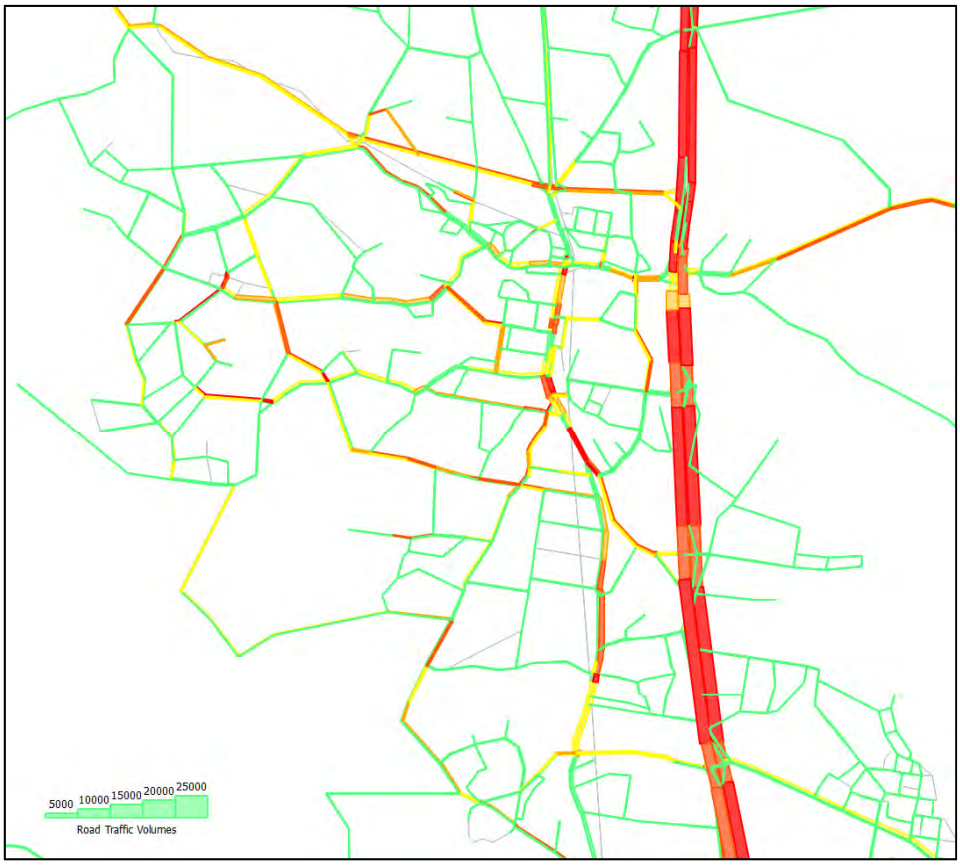

Figure 28: Road traffic volume and volume to capacity ratios, S7 AM peak

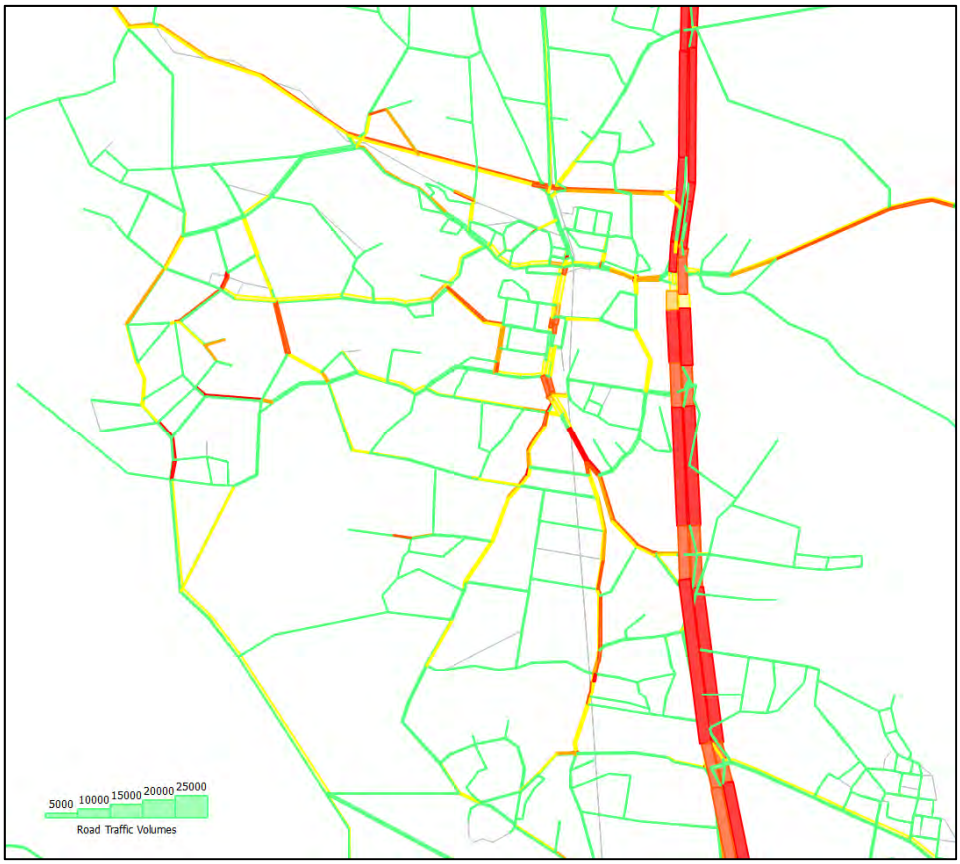

Figure 29: Road traffic volume and volume to capacity ratios, S8 AM peak

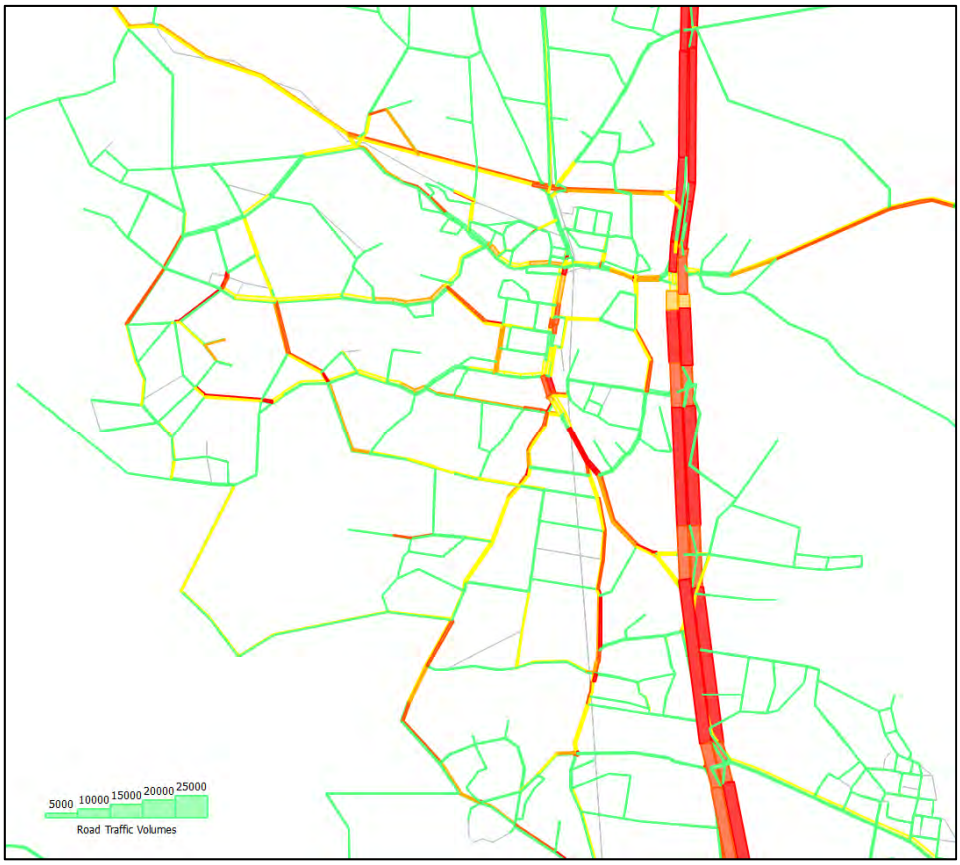

Figure 30: Road traffic volume and volume to capacity ratios, S9 AM peak

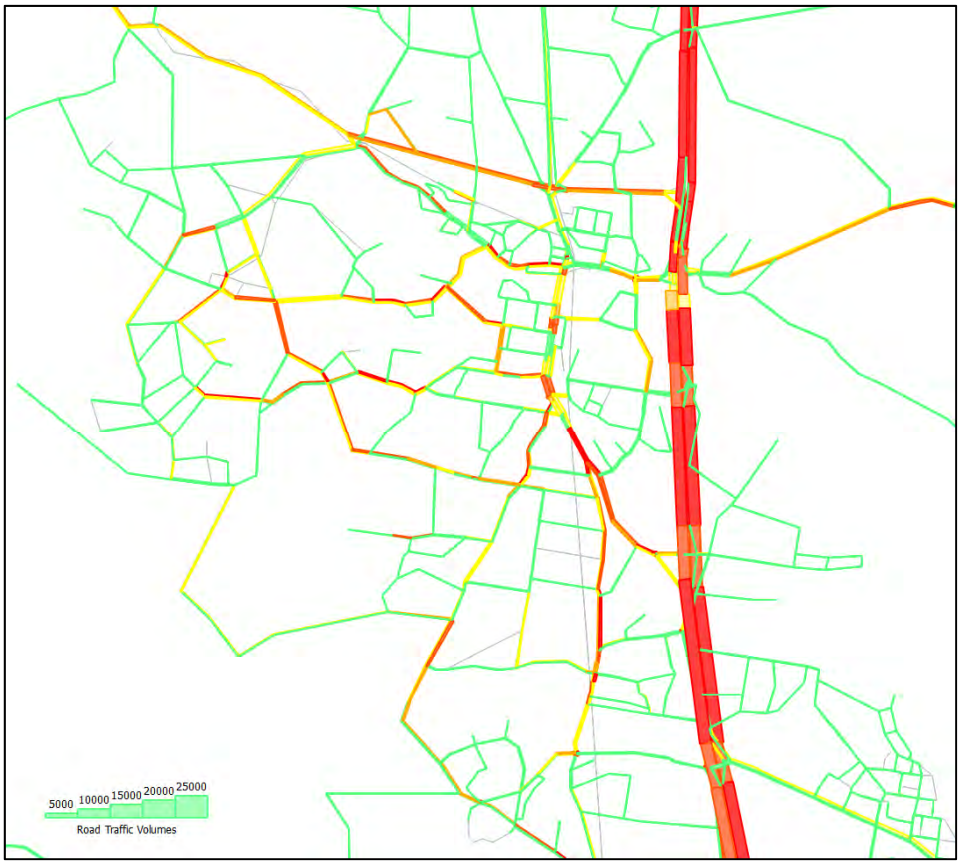

Figure 31: Road traffic volume and volume to capacity ratios, S10 AM peak

Volume difference plots for selected scenarios are also provided in Figure 32 to Figure 34 for the AM peak period. The plots show the impact of differing network assumptions on private vehicle numbers for the network in the Caboolture West area.

Figure 32 below shows the difference in traffic volumes between S6 (base level PT services and upgrades to road network outside Caboolture West) and S5 (base level PT services and existing network outside Caboolture West). It shows that the upgraded highway connections along Bellmere Road, Caboolture River Road and the new connection to D'Aguilar Highway attract higher traffic volumes due to the increased capacity in the network. The additional river crossing would also reduce traffic levels on the eastern part of Caboolture River Road.

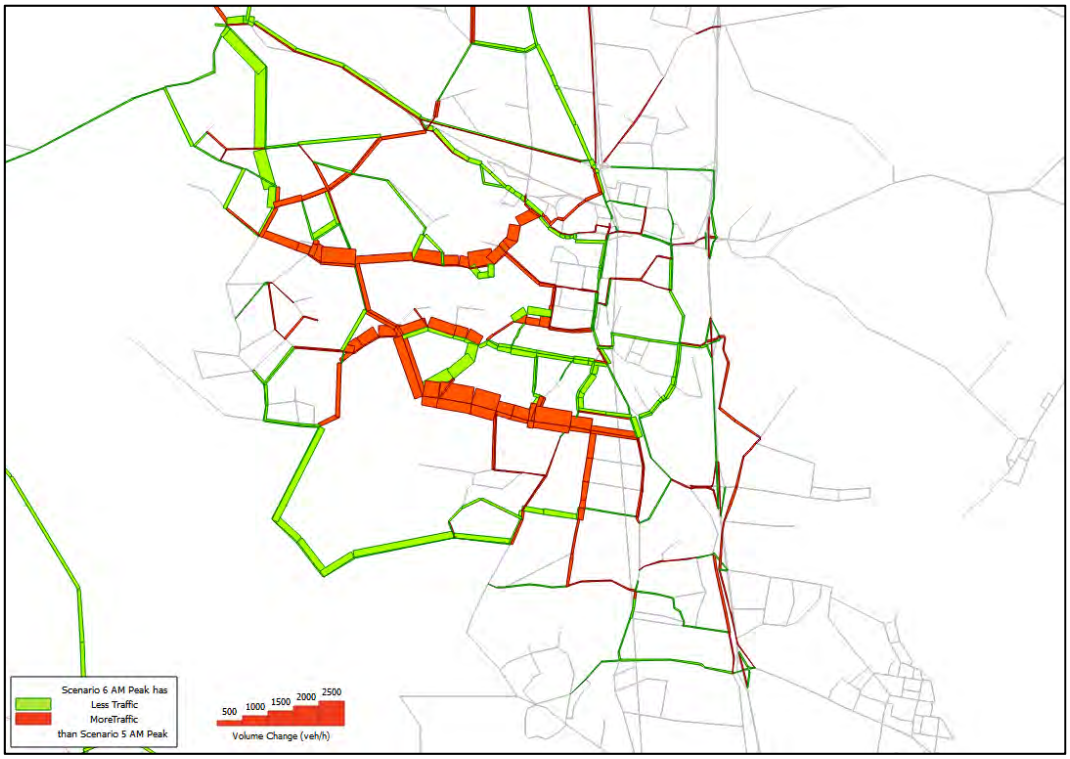

Figure 32: Scenario 6 minus Scenario 5, AM peak period

Figure 33 shows the effect of increased PT service frequencies on the highway traffic volumes by comparing S9 (improved PT service frequency and upgrades to road network outside Caboolture West) with S6 (base level PT services and upgrades to road network outside Caboolture West). It shows that the impact of this change on road traffic is minimal as the buses are still not that attractive due to poor run time associated with on-road running on a congested network.

The conversion of general traffic lanes to bus lanes in S10 however increases travel times for cars as there is decreased capacity on key parts of the network. The effect of this is shown in Figure 34 and shows that Bellmere Road and Caboolture River Road is forecast to carry fewer vehicles with the bus lanes in place with traffic likely to be diverted to other routes whilst other trips may switch to PT.

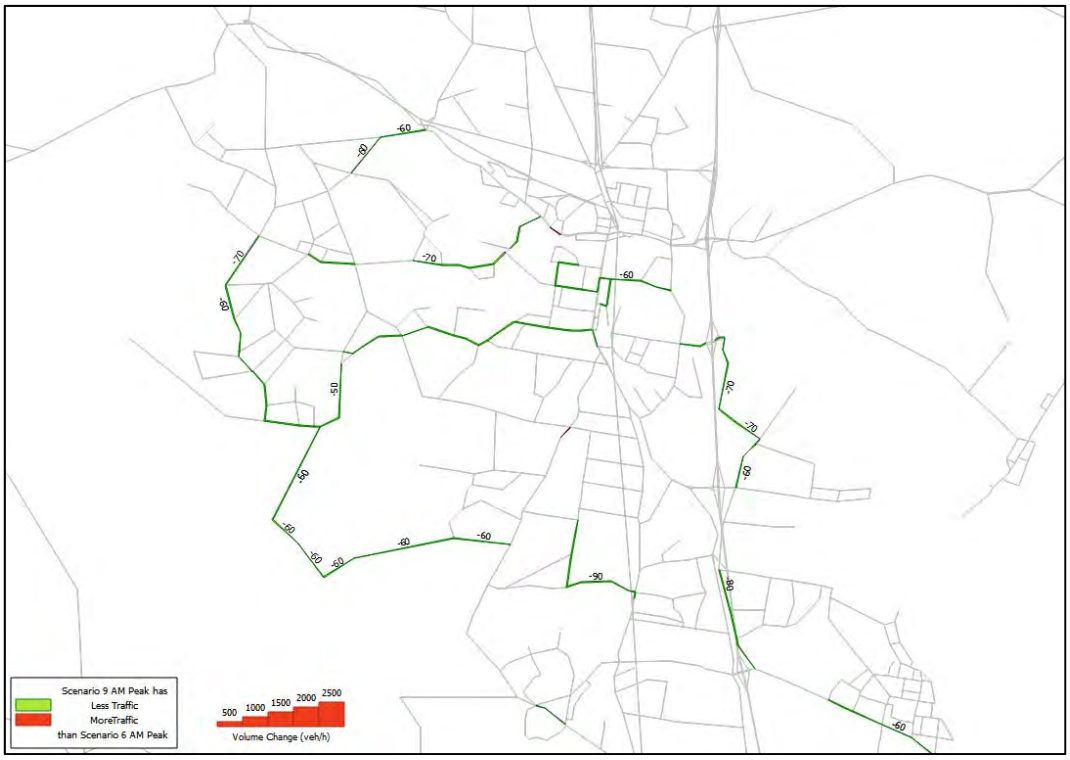

Figure 33: Scenario 9 minus Scenario 6, AM peak period

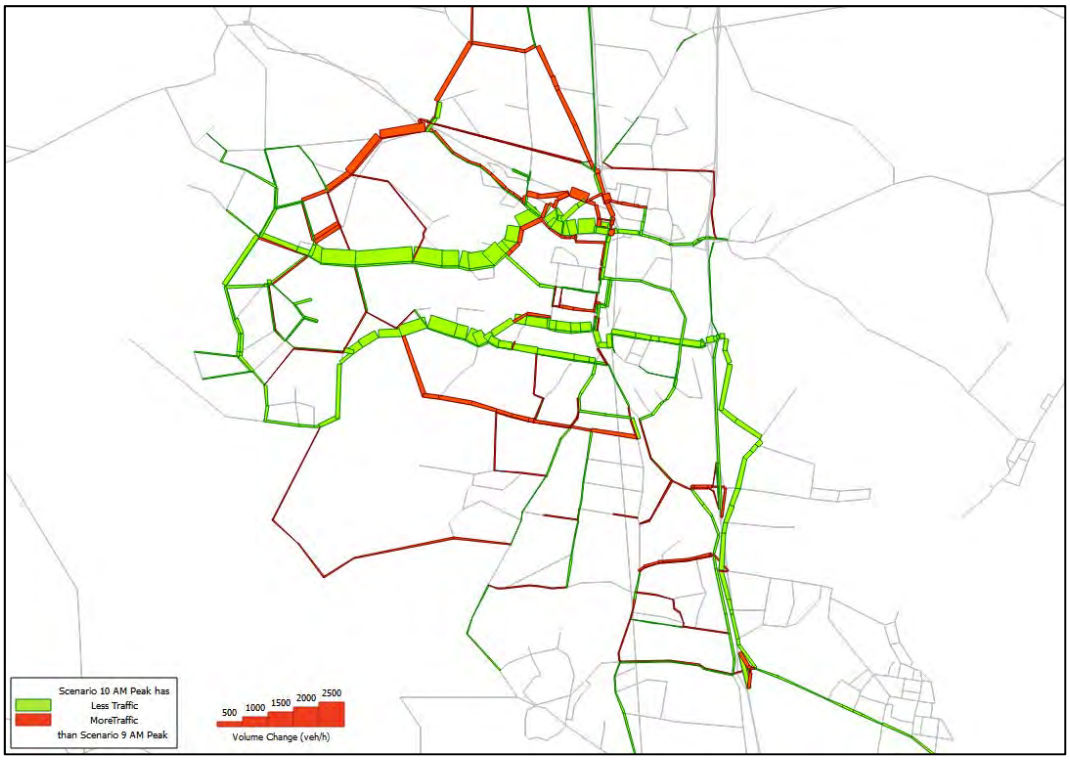

Figure 34: Scenario 10 minus Scenario 9, AM peak period

The impacts of the West Moreton Corridor options can also be seen in Figure 35 and Figure 42 below with the comparison showing that the new West Moreton Corridor has a bigger impact on Caboolture West than the upgraded West Moreton Corridor option.

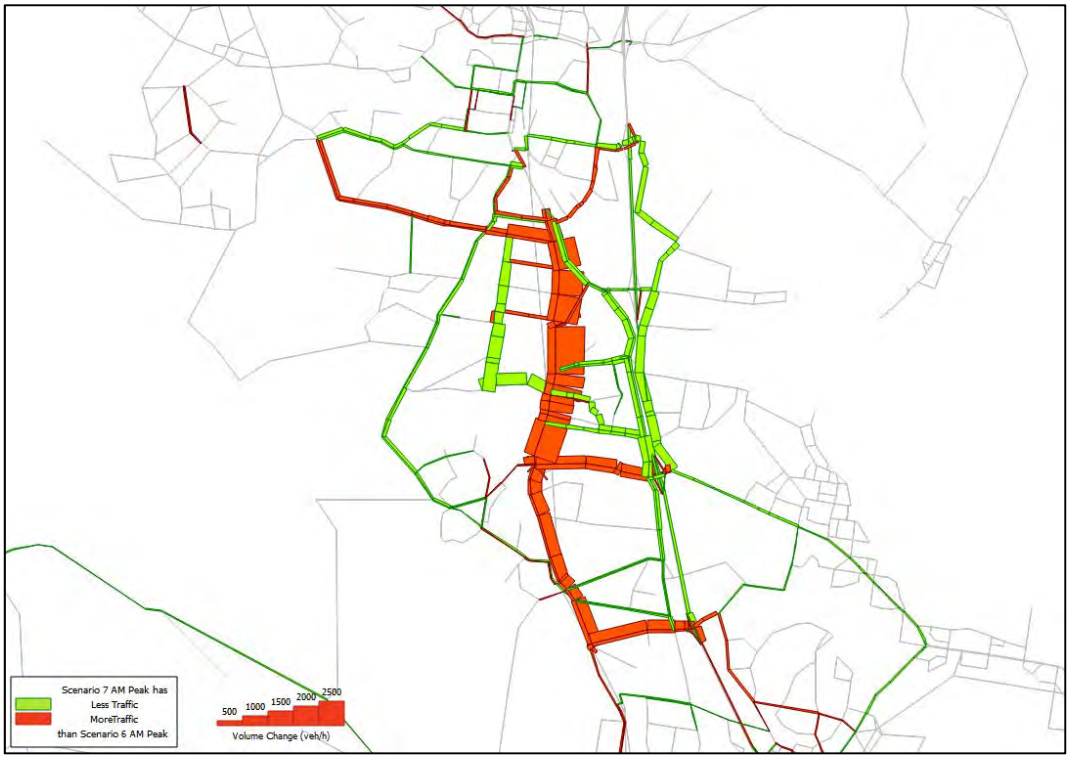

Figure 35: Scenario 7 minus Scenario 6, AM peak period

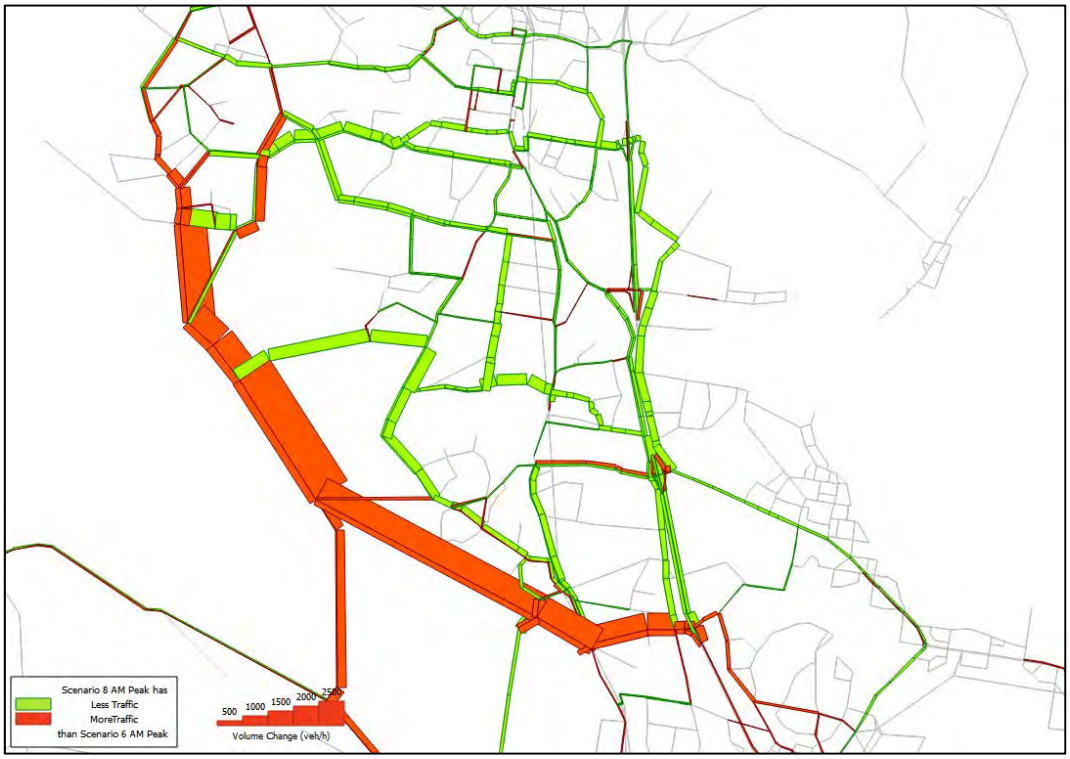

Figure 36: Scenario 8 minus Scenario 6, AM peak period

4.2.3.2 Screen line volumes

Traffic volume results for traffic crossing screen lines as defined in Figure 37 below have been provided in Appendix D.

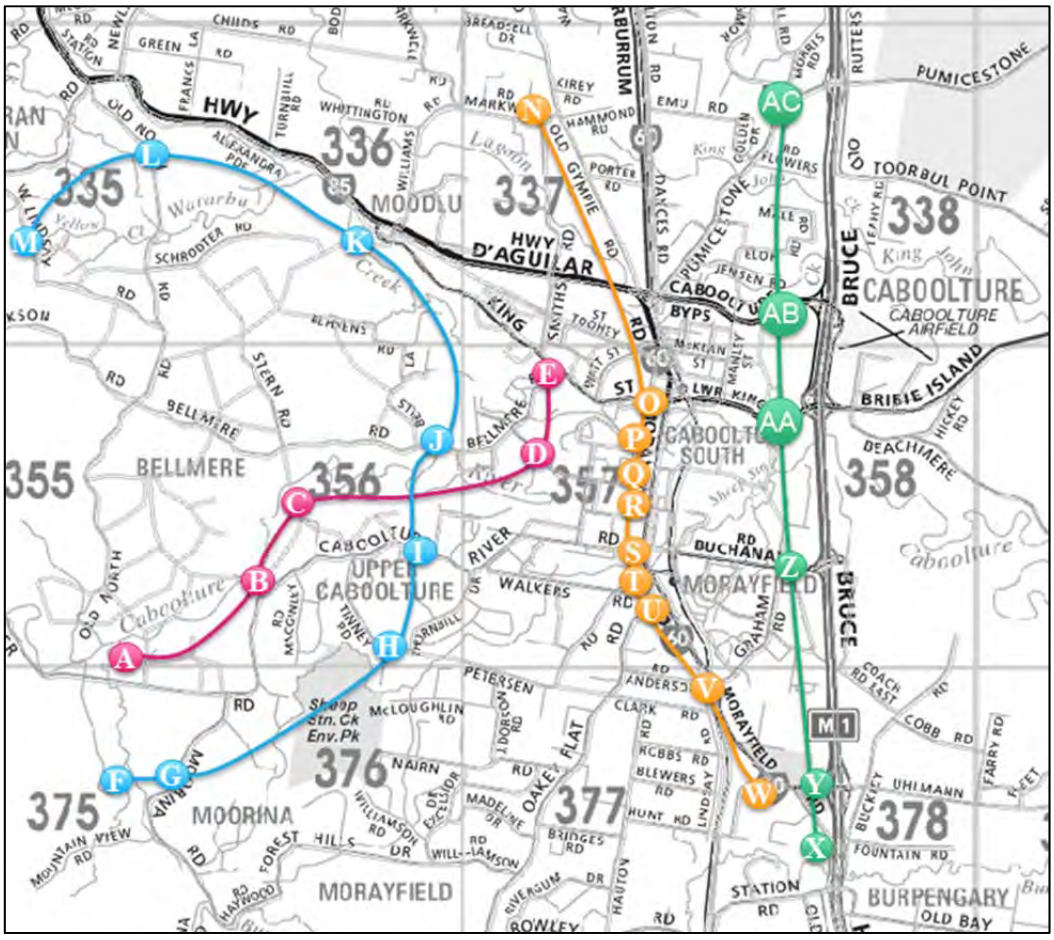

Figure 37: Traffic volume screen lines

4.2.3.3 Travel times

Travel times for three key routes between the Caboolture West Town Centre and Caboolture Railway Station were assessed to understand relative travel times between the modelled scenarios. The routes assessed are shown in Figure 18 with the results of the comparison given in Table 16.

Table 16: Travel time comparisons for three key routes (in minutes)

	Eastbound			Westbound		
Scenario	Route 1	Route 2	Route 3	Route 1	Route 2	Route 3
S5	27.6	29.0	34.9	13.7	13.3	18.8
S6	14.0	12.9	20.1	13.4	12.8	18.4
S7	14.2	12.9	19.9	13.4	12.8	18.5
S8	13.8	12.9	19.2	13.4	12.8	18.5
S9	14.0	12.8	19.9	13.4	12.8	18.4
S10	17.3	19.4	24.8	13.6	13.4	18.6

The results show very similar trends and bottleneck locations to those reported in Section 4.1.3.3 for the Large Town scenarios. However, the travel times are generally lower due to the lower traffic levels generated by the Sustainable Town demographic inputs.

4.2.4 Public transport network

4.2.4.1 PT volumes and volume to capacity ratios

The PT volumes and volume to capacity ratios for the six Sustainable Town scenarios modelled are given in Figure 38 to Figure 43 below. Similar to the road traffic volumes and V/C ratios plots presented in Section 4.1.3.1, the bandwidths in the plots represent the relative magnitude of trips whilst the colours denote the V/C ratios as per Table 9.

The improved PT services runtimes due to the road network upgrades outside of Caboolture West in S6, S7 and S8 are shown to increase patronage on routes travelling along Bellmere Rd and Caboolture River Rd when compared to S5. Some of the segments along Bellmere Rd and Caboolture River Rd are estimated to be over capacity.

The increase in PT service frequencies to reflect the 2031 policy model frequencies implemented as part of S9 has the effect of reducing congestion on the aforementioned travel segments whilst also increasing patronage.

The introduction of the C-Bahn services in S10 has the effect of taking away some patronage from other routes servicing Morayfield/Caboolture but overall has the impact of increasing PT trips. This is primarily due to the connectivity to Caboolture Railway Station which enables access from Caboolture West to the Brisbane CBD. When introduced, the C-Bahn service is forecast to operate at a good level of service (V/C ratio between 0.50 and 0.75) along the main trunk between the Caboolture West Town Centre and Caboolture Railway Station.

In most scenarios (with the exception of S9 and S10) the services from Wamuran to Caboolture along D'Aguilar Hwy and King St are shown to be approaching capacity and would benefit from PT service frequency improvements.

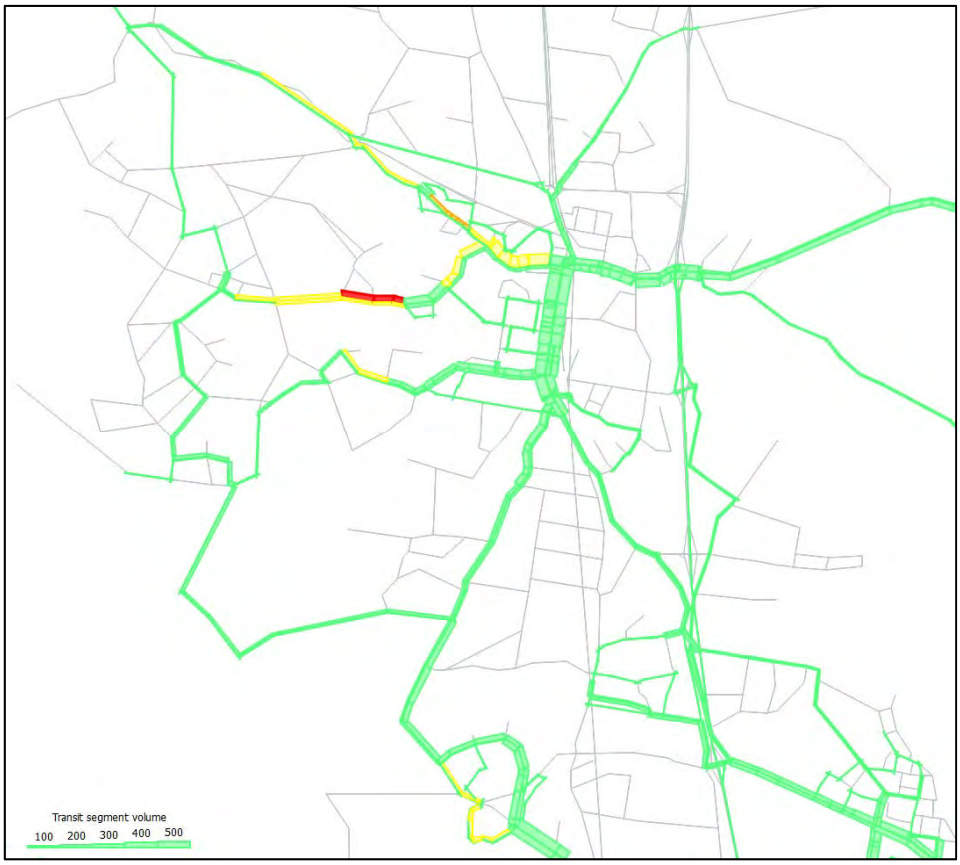

Figure 38: PT volume and volume to capacity ratios, S5 AM peak (excluding rail)

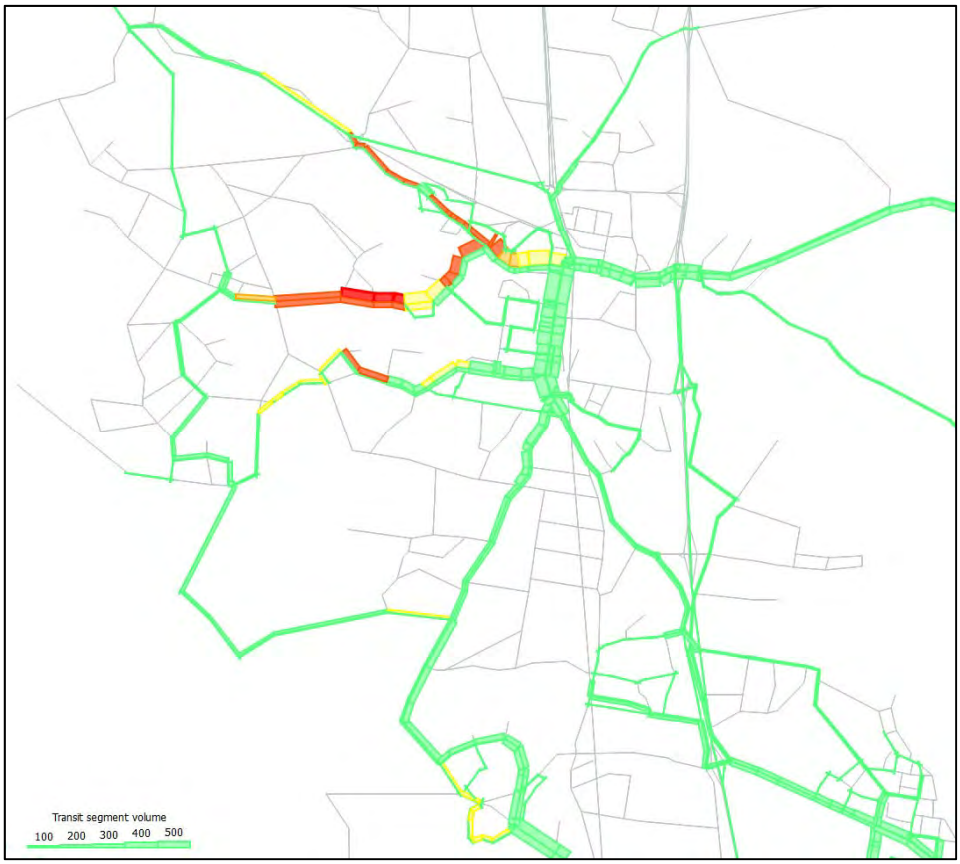

Figure 39: PT volume and volume to capacity ratios, S6 AM peak (excluding rail)

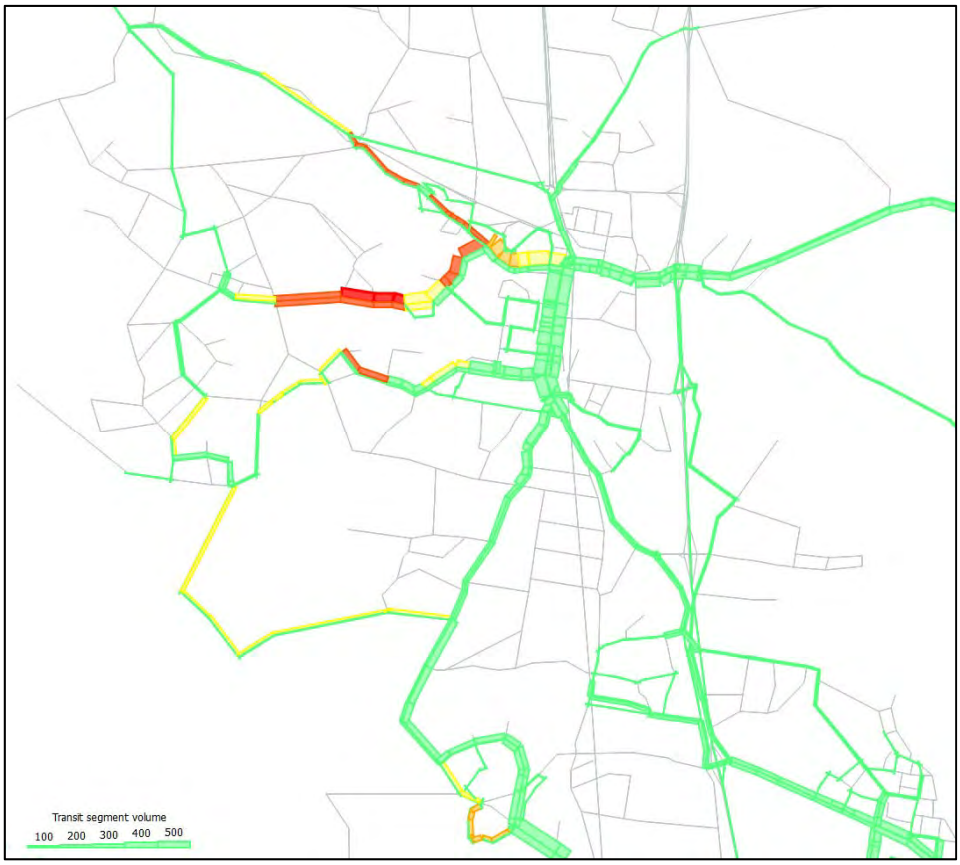

Figure 40: PT volume and volume to capacity ratios, S7 AM peak (excluding rail)

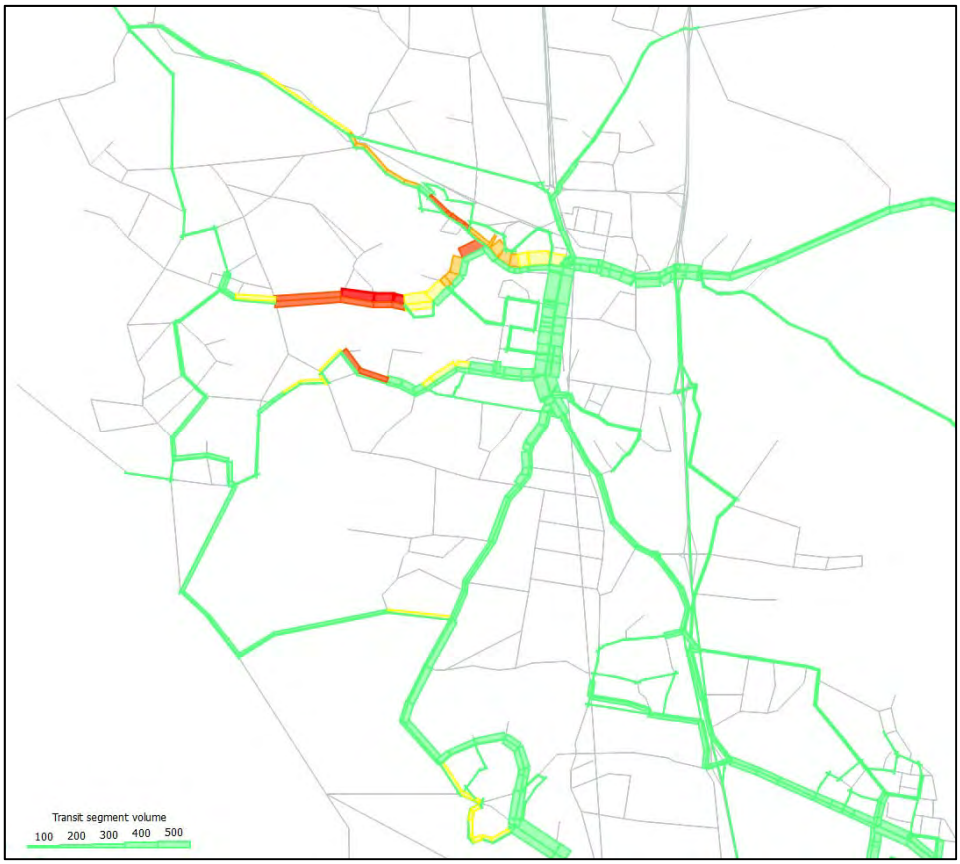

Figure 41: PT volume and volume to capacity ratios, S8 AM peak (excluding rail)

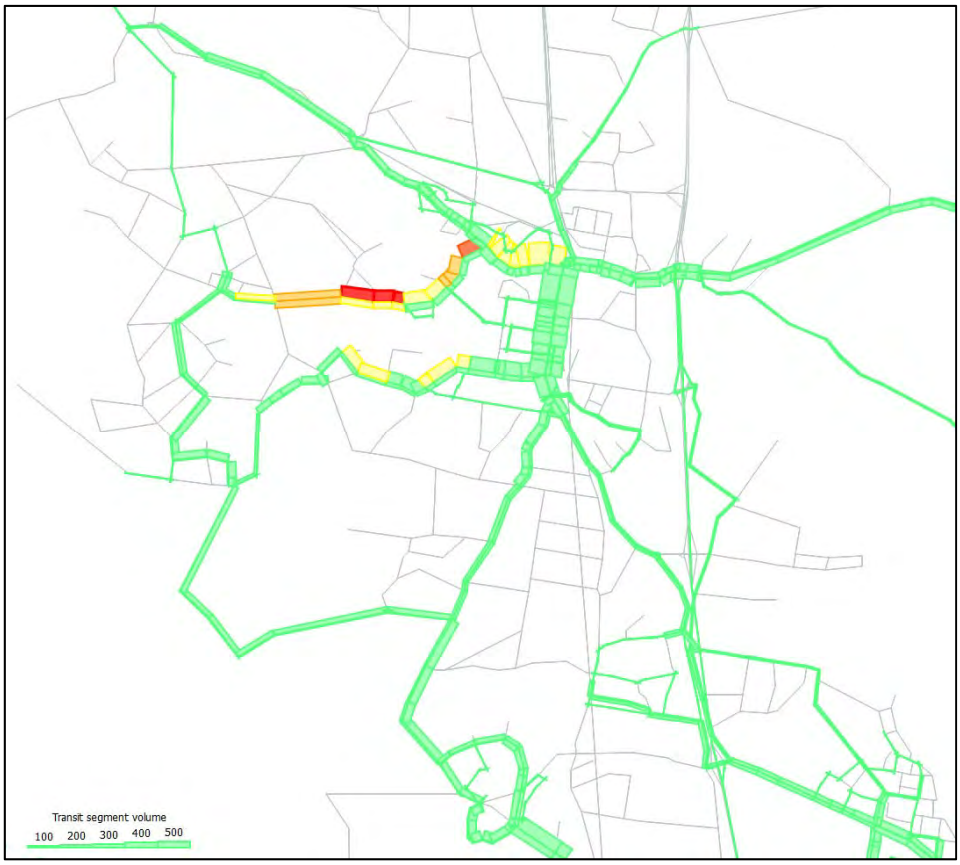

Figure 42: PT volume and volume to capacity ratios, S9 AM peak (excluding rail)

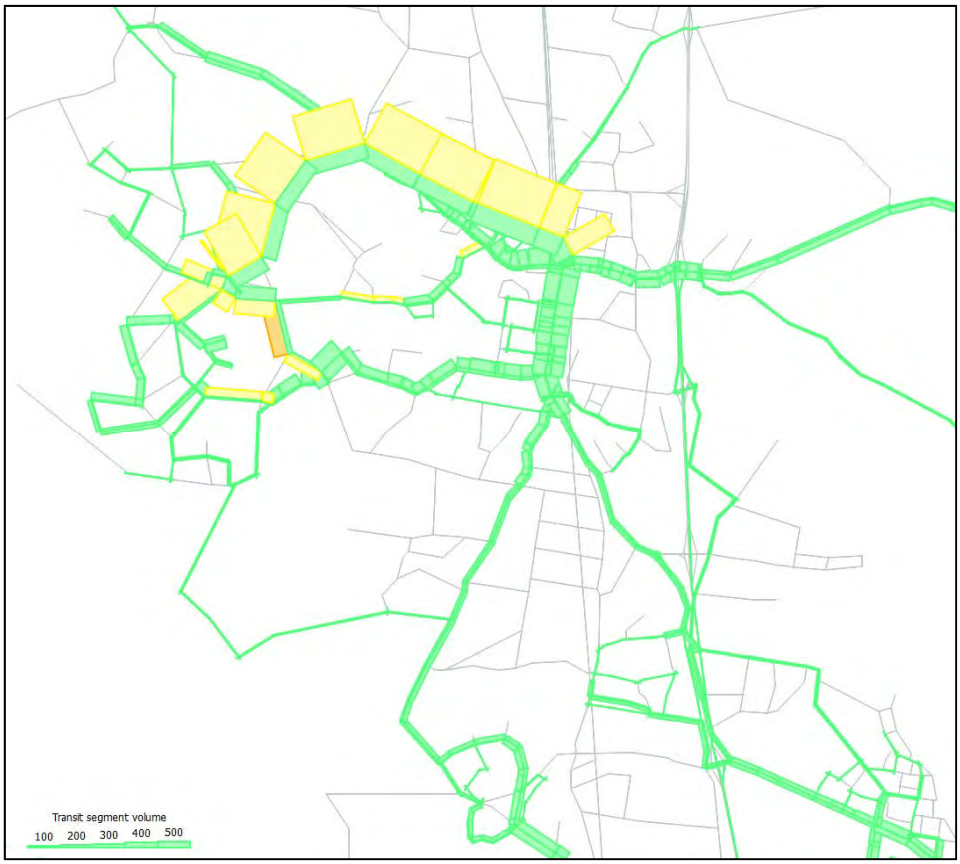

Figure 43: PT volume and volume to capacity ratios, S10 AM peak (excluding rail)

Public transport passenger volume difference plots for selected scenarios are also provided in Figure 44 and Figure 45 for the AM peak period. The plots show the impact of differing network and/or service provision assumptions on public transport patronage for the network in the Caboolture West area.

Figure 44 below shows the difference in passenger volumes between S9 (higher frequency PT and upgrades to road network outside Caboolture West) and S6 (base level PT services and upgrades to road network outside Caboolture West). The figure shows that the upgrade to the road network has the effect of increasing bus patronage as the travel times are lower due to decreased congestion.

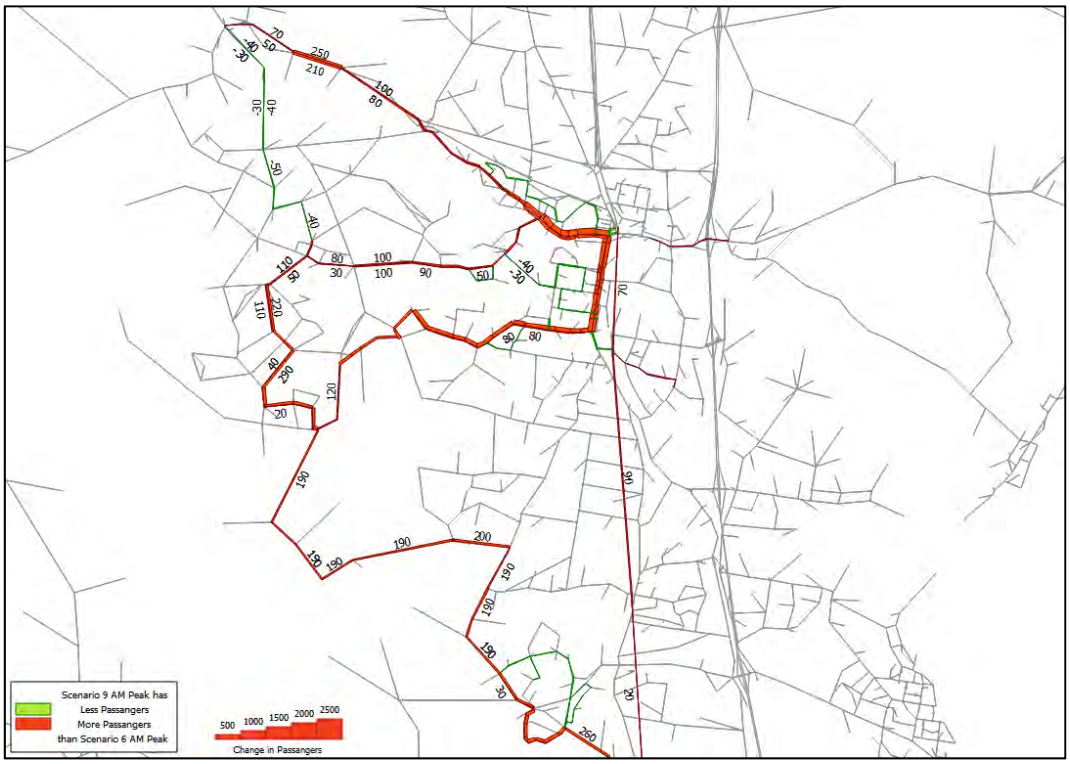

Figure 44: Scenario 9 minus Scenario 6, AM peak period

Comparing S10 (C-Bahn PT network with bus lanes and external road upgrade) with S6 (base level PT services and upgrades to road network outside Caboolture West) in Figure 45 shows that the effect on PT patronage is quite significant with a large uptake of the C-Bahn service. This is both to service trips to Caboolture or Morayfield but also towards Brisbane as indicated by the increase on the rail line south of Caboolture Railway Station.

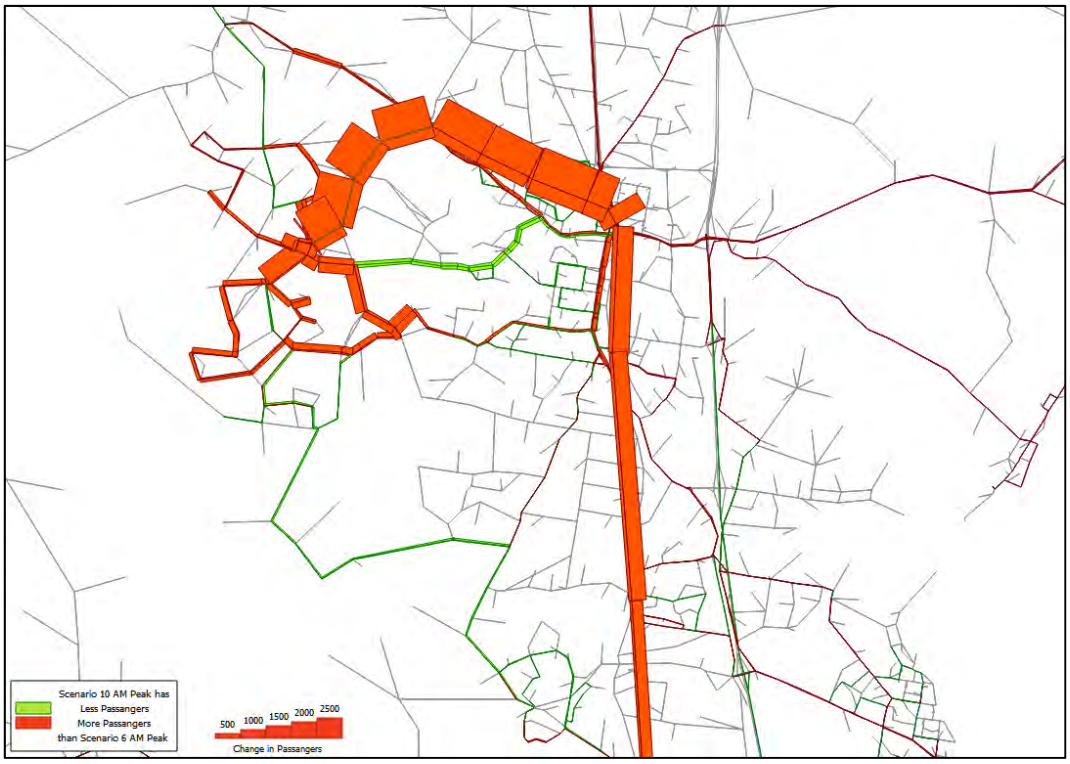

Figure 45: Scenario 10 minus Scenario 6, AM peak period

4.2.4.2 Travel times

Public transport in-vehicle times are provided as a comparison for car travel times for services directly comparable to the routes reported in Section 4.1.3.3. A directly comparable route is one that is serviced directly by a PT service i.e. no interchange required.

The C-Bahn services have therefore been used as a comparison for travel time Route 1, whilst for Route 2, services CSQ062 (eastbound) and CSQ061 (westbound) were compared.

The results are presented in Table 17 and show that car travel times are lower in both the eastbound and westbound directions for S5 to S9. In S10, the introduction of the C-Bahn services greatly reduces the travel time by PT between Caboolture Town Centre and the Caboolture Railway Station.

Travel times by PT are also lower in the peak direction than those reported for the Large Town scenarios due to fewer trips, and therefore lower road congestion, produced by the Sustainable Town scenarios.

It should be noted that the PT travel times presented only include the ‘in-vehicle’ time component of a PT trip. It therefore excludes access/egress walk times and fares.

Table 17: PT in-vehicle times compared to car highway times (in minutes), AM peak (Caboolture)

	Eastbound			Westbound		
Scenario	**CSQ062**	**C-Bahn**	**Car**	**CSQ061**	**C-Bahn**	**Car**
S5	34.0	-	29.0	16.6	-	13.3
S6	16.3	-	12.9	16.1	-	12.8
S7	16.3	-	12.9	16.1	-	12.8
S8	16.2	-	12.9	16.1	-	12.8
S9	16.2	-	12.8	16.1	-	12.8
S10	-	8.5	17.3	-	8.5	13.6

A comparison of journey times for car and PT for trips between Caboolture West Town Centre and the Morayfield Shopping Centre has also been undertaken and is reported in Table 18. The route assessed for this comparison was via Bellmere Drive/River Drive/Torrens Road. There are no direct services between the Caboolture West Town Centre and the Morayfield Shopping Centre along this route. To make the analysis comparable, only the in-vehicle component of the total time of a PT journey has been reported.

Table 18: PT in-vehicle times compared to car highway times (in minutes), AM peak (Morayfield Shopping Centre)

	Eastbound		Westbound	
Scenario	**PT CSQ062 & 320239**	**Car**	**PT CSQ061 & 320279**	**Car**
S5	40.0	30.4	21.4	13.9
S6	23.7	15.5	21.0	13.6
S7	23.5	15.4	21.0	13.5
S8	22.5	14.5	21.0	13.5
S9	23.5	15.3	21.0	13.6
S10	22.8	19.4	20.1	13.9

5 Summary of modelling outcomes

5.1 Travel markets

The results of the strategic modelling undertaken thus far have identified some key travel markets for the Caboolture West area. These primarily include:

- Between Caboolture West and Caboolture;
- Between Caboolture West and Morayfield;
- Between Caboolture West and Brisbane CBD; and
- Internal travel within Caboolture West.

The travel markets are primarily defined by the location of population/households, employment opportunities and educational facilities. Figure 46 shows the relative size of the demographics that generate trips for the Caboolture West, Caboolture and Morayfield area as forecast at 2061 for Caboolture West and 2031 for Caboolture and Morayfield (based on the Sustainable Town scenario).

The relative size of each pie chart represents the sum of all the demographics for a given zone whilst the colours represent the following land use categories:

- Blue = households
- Yellow = jobs (retail, service, professional, industry and other combined)
- Green = education enrolments (primary, secondary and tertiary combined)

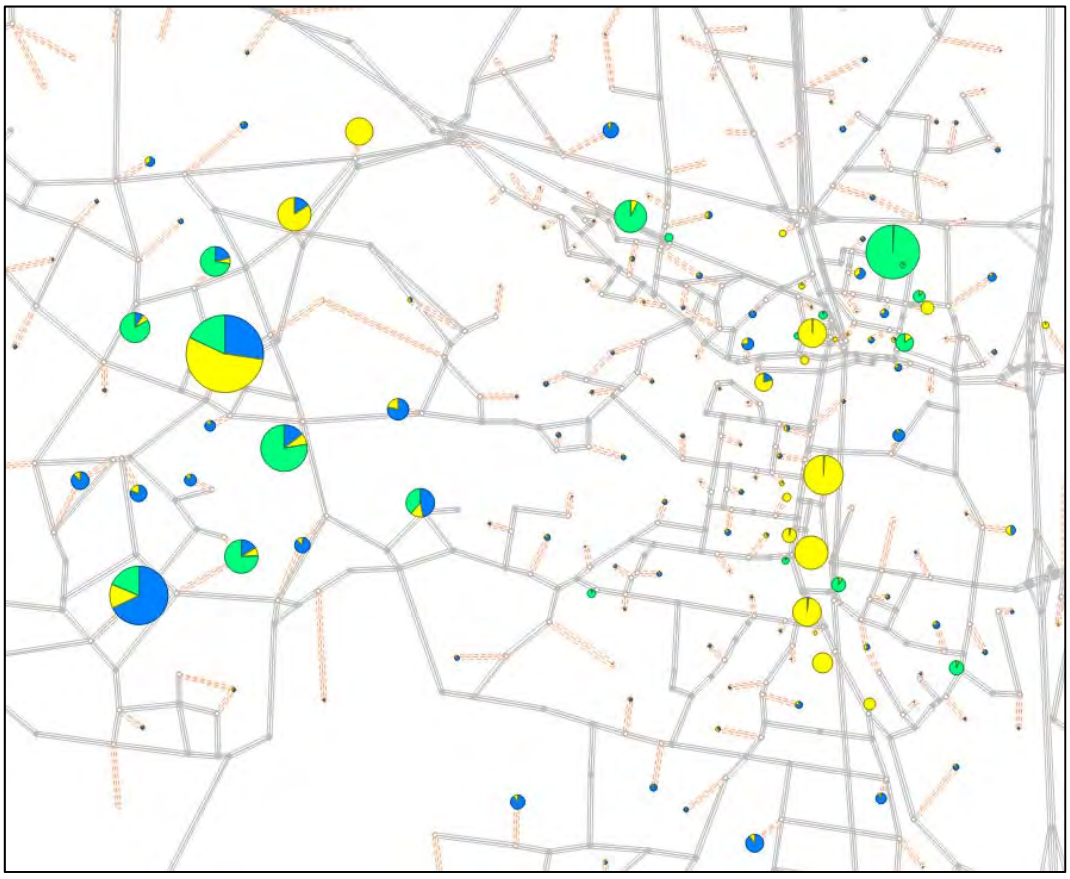

Figure 46: Land uses in the Caboolture West, Caboolture and Morayfield areas

Figure 46 shows that the most significant concentrations of household and educational facilities are centred in Caboolture West with the exception being a strong educational attractor northeast of Caboolture Railway Station). Employment opportunities are focused along Morayfield Road and in the Caboolture Town Centre (professional jobs) and north of the Caboolture Town Centre (for industrial jobs).

It should be noted that the size of the transport zones can skew some of this data (in general, larger transport zones are identified as bigger pie charts).

Whilst Figure 46 shows that Caboolture West is a significant development in the area Moreton Bay Regional Council area, it is small in comparison to the forecast land uses for the southwest, inner north and south eastern parts of Brisbane and the Brisbane CBD itself (see Figure 47).

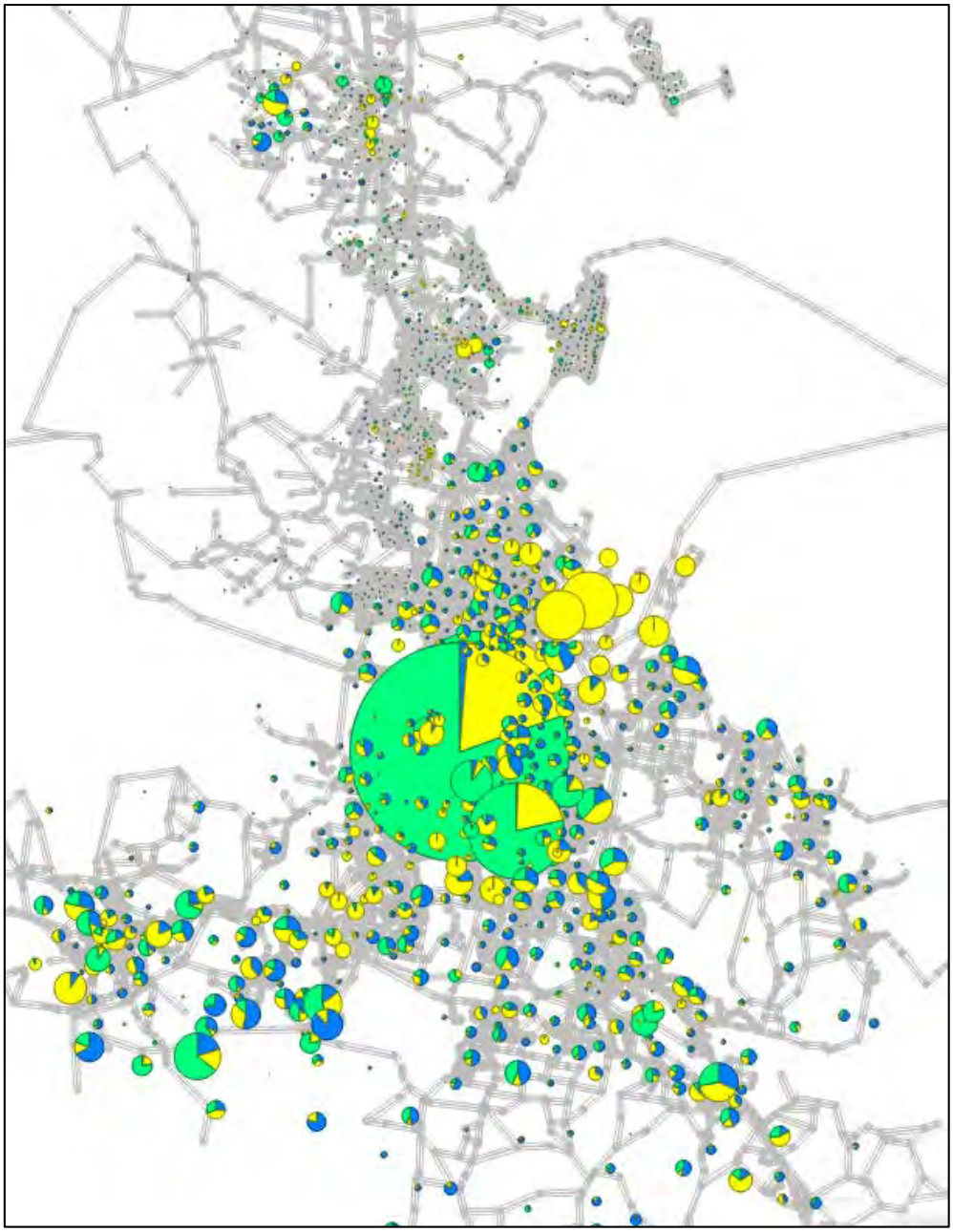

Figure 47: Wider area (at 1/3 scale of Figure 46)

It important to remember that the Caboolture West development is based on 2061 land use assumptions, whilst the remainder of the modelled area uses 2031 land use inputs.

Figure 46 and Figure 47 therefore show the land use inputs that influence trip making behaviour within the region. Whilst the land use inputs are fixed, the number of trips between different areas varies based on the trip purpose and the time of day that the trips are undertaken.

In general, the AM and PM peak periods are dominated by trips for the purpose of travelling between home and work. Areas in the figures above that have a high number of households or a high number of employment opportunities (particularly professional and industrial employment) will see a high number of 'Home-based work' trips being made in the peak periods. Trips of this nature also have a relatively higher average trip length than other trip purposes such as trips for educational purposes, shopping or recreational activities.

The AM and PM peak periods also tend to have a higher concentration of educational related trips when compared to the off-peak periods. These trips generally use the home as a base and concentrate on areas with a high number of educational facilities (i.e. areas with the potential for a high number of enrolments).

Whilst work and education related trips still occur in the off-peak periods, they are usually fewer than during the peak periods. Off-peak periods tend to be dominated by trip purposes such as shopping and recreation/social trips. The shopping and recreation/social trips generally occur between areas that have a high number of households and a high number of employment opportunities (particularly retail) and tend to be over a shorter distance than work related trips.

Table 19 provides an example of the total daily trips by trip purpose. Work commuting trips are only likely to account for 21% of all trips across the day, although they are much more significant across the peak travel periods.

Table 19: Trips by trip purpose, AM and day off-peak, Scenario 6

Purpose	Daily Trips	Proportion
Other Non-home-based	2,287,135	24%
Home-based Shopping	1,823,219	19%
Home-based Other	1,666,066	18%
Home-based Work (white-collar)	1,373,203	15%
Home-based Education (Primary and Secondary)	1,166,080	12%
Home-based Work (blue-collar)	519,248	6%
Work- based work	338,130	4%
Home-based Education (Tertiary)	267,003	3%

The predicted distribution of vehicular trips (private vehicle, freight and public transport) with origins or destinations within Caboolture West is shown in Table 20. This data shows that 36% of trips are predicted to be internal to the Caboolture West area. Seventy-five per cent of trips from Caboolture West are predicted to be contained with the "Caboolture City" area and 87% of trips contained within the

wider MBRC area. Approximately 9% of trips are predicted to travel to\from Brisbane and the remaining 3% to\from areas in the rest of South East Queensland.

Table 20: Regional Distribution of Caboolture West Trips, Scenario 6

Area	Number of Daily Trips	Proportion of Daily Trips
Caboolture West	63,100	36%
Caboolture City	132,500	75%
Wider MBRC area	156,000	87%
Brisbane	16,300	9%
Rest of SEQ	6,200	3%

5.2 Public transport network

The public transport network in the Caboolture West area needs to service the main travel markets identified in Section 5.1. Modelling of the public transport options has therefore been focused on improving the connectivity between the major activity areas.

For example, under Scenario 10:

- A rapid transit service such as the C-Bahn would provide a high-quality connection to Caboolture, Caboolture Railway Station providing interchange to rail for further destinations.
- The on-road sections of the C-Bahn also provides high-frequency services for travel within Caboolture West.
- Dedicated bus lanes along key corridors such as Bellmere Road and Caboolture River Road are aimed at improving services to Morayfield and Caboolture.

The analysis suggests that the provision of a high quality public transport service between the Town Centre and Caboolture that provides competitive travel times compared to the private vehicle would be attractive to travellers. We suggest that further assessments are undertaken to refine the future network requirements, both in terms of coverage and infrastructure required.

‘High-quality’ in this instance means not only frequent services but a segregation of PT services from private vehicles either via provision of bus lanes or the separate guided bus way system. Modelling has shown that providing frequency changes alone would not be enough to overcome the high in-vehicle travel times on public transport when services share congested road space with private vehicles.

We note that there are limitations in the modelling due to the size of the zones modelled for the Caboolture West area and the access from these zones to the road network. This ‘coarseness’ has a potential to overstate PT demand given the size of the zones, however, the trends appear logical given the congestion on the road network and the comparable travel times to private vehicles.

The demand elasticity[3] calculated from a sensitivity test on the S10 model run also shows that the response to changes in PT costs lead to sensible changes in PT demand. The sensitivity test decreased travel times on the main section of the C-Bahn services between Caboolture West Town Centre and Caboolture Railway Station by 10%. This in turn led to a decrease in the overall route in-vehicle time of 3.1%.

The decrease in time (or cost as defined in the model) led to a 1.8% increase in passengers boarding along the length of the route. This equates to an elasticity of -0.57 which is within typical ranges for PT service improvements (typical range of -0.3 to -0.8).

It should also be noted that the current structure of the MBRSTM-MM does not take parking capacities at rail stations into account. The proportion of P+R access compared to walk and other PT access to these sites (and potentially the overall PT mode share) could therefore be overstated.

We recommend that further assessment of the potential on-road public transport priority be undertaken in the next phase of assessment, for comparative purposes with a dedicated public transport corridor system such as the C-Bahn.

Further consideration should be given to extending the rapid transit network (either by on-road or dedicated corridor) to other activity centres.

5.3 C-Bahn

The implementation of C-Bahn has been shown to attract a large number of passengers. In the large town scenario, the service operated at close to capacity for the main trunk between Caboolture West and Caboolture Railway Station. In the sustainable town scenario, the uptake was not as pronounced, but the service still averaged approximately 4,100 passengers towards Caboolture over the same section in the AM peak period.

It should be noted that the high patronage could in part be attributed to the service running assumptions implemented in the modelling. The C-Bahn services were assumed to operate as a trunk service that captures all parts of the Caboolture West area (via normal on-road running) and then runs along the guided bus way infrastructure for the section between Caboolture West and Caboolture. This is different to the potential option of having bus feeder services running through Caboolture West and connecting to the C-Bahn services at the nominated stops along the guided bus way and implies that there is no interchange required to travel from most parts of Caboolture West to Caboolture.

Whilst different assumptions (including slower running speeds or higher fares) could potentially dampen demand, the service was coded as a highly attractive option to understand the potential market that could be attracted to a high-quality public transport service.

[3] Elasticity is a convenient, quantitative measure of travel demand response to price and service changes that influence demand. The price (or cost) elasticity of demand is loosely defined as the percentage change in quantity of commodity or service demand in response to a 1 percentage change in price. For instance, an elasticity of -0.3 indicates that for a 1 percentage increase in the price of a good or service, there is a 0.3 percentage decrease in the demand for that good or service.

Additional patronage could perhaps be generated by extending the guided bus way service further south with Caboolture West to capture key population areas and educational facilities. This could be tested in the model during development of the preferred option.

To understand the potential impact that extending the guided bus way may have, a comparative analysis of the running times for an on-road service and the potential running time for a guided bus way service (assuming 40km/h average running speed due to closer stop spacing) suggests that around 10 minutes of in-vehicle travel time could be saved (see Figure 48).

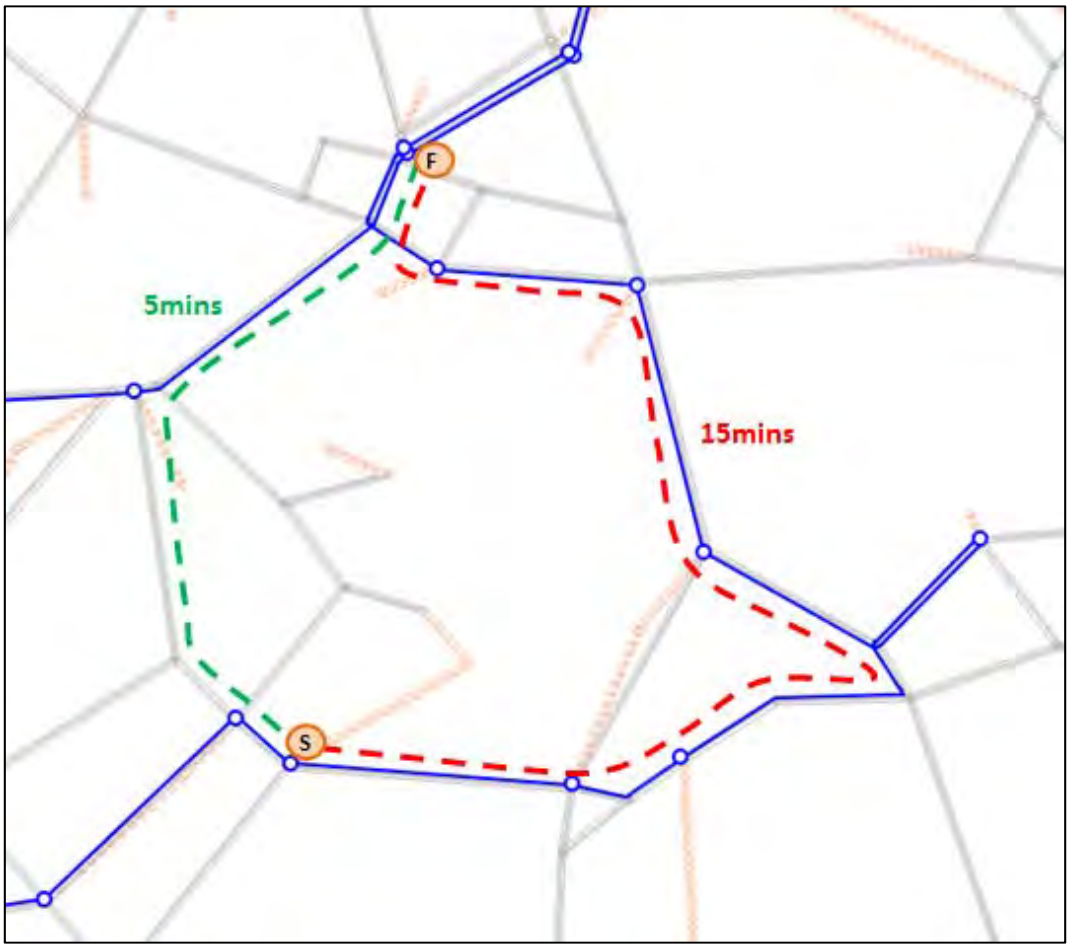

Figure 48: Comparative journey times from point ‘S’ to point ‘F’ via on-road (red dashed line) and bus way service (green dashed line)

Applying the concept of elasticity mentioned in Section 5.2 with a typical elasticity value of -0.3 implies a potential increase of 120 passengers on the approximately 600 passengers already using the on-road service during the AM peak period from point ‘S’.

It can be seen that extending the C-Bahn service further south could be beneficial for improving service quality to other parts of Caboolture West. Further benefits could also be achieved if changes to the land use strategy were investigated to develop density around new stops.

Any approach to extending the C-Bahn service from the currently proposed alignment could also be undertaken via a staged approach and only activated when areas of Caboolture West are built out. However, the overall strategy and

planning for the route needs to be considered early on in the process to ensure areas for the public transport corridor are reserved into the future.

5.4 Road network

Caboolture West is connected to the wider road network via 7 connections as identified in Figure 49. The traffic flows for the AM peak period along with the relative utilisation of each of the connections is provided in Table 21.

The analysis shows that the predominant movements are to the east via Williams Road, Bellmere Road and Caboolture River Road. This movement is driven not only by travel to Caboolture/Morayfield but also by travel to Brisbane as travellers to Brisbane head east and connect to the Bruce Highway.

The introduction of the new West Moreton link increases travel via Morina Road to the south and is likely to reduce level of traffic accessing the Bruce Highway via Bellmere Road, Caboolture River Road and Tinney Road (see Section 5.5 for more details), whilst the upgraded West Moreton link still relies heavily on Tinney Road and Caboolture River Road for access to Bruce Highway.

Figure 49: Key access routes for Caboolture West

Table 21: Traffic volumes on key routes servicing Caboolture West, Scenario 6 AM Peak

Location	Traffic Volume (both directions)	Proportion
A – West Lindsay Rd	224	1%
B – Old North Rd	886	4%
C – Williams Rd	5,217	24%
D – Bellmere Rd	6,002	28%
E – Caboolture River Rd	5,224	24%
F – Tinney Rd	2,597	12%
G – Moorina Rd	1,421	7%

Modelling has also shown that the key access points at C, D, and E are significantly over capacity if assuming 2 lane roads servicing the East-West movements. Increasing the capacity of East-West routes along Williams Road, Bellmere Road and Caboolture River Road by providing 4-lane cross-sections is essential to service the site and should be done in conjunction with provision of the connection to Petersen Road.

Even with 4-lane cross-sections along the aforementioned routes some parts of the network still experience significant congestion. The issue is exacerbated when combined with low PT service provision.

Internally, the local access road network performs relatively well with the exception of a few areas that would require increased capacity in addition to the 4-lane cross sections mentioned above. These areas are highlighted in Figure 50 below and are focused around key activity or population centres within the planned Caboolture West development.

Figure 50: Internal local access links requiring increased capacity

The transport modelling undertaken for the planned Caboolture West development has also highlighted that other key access routes show high levels of congestion during the peak periods. These areas include:

- River Drive and Grant Road;
- Morayfield Road between Caboolture and the Bruce Highway;
- Lindsay Road/Burpengary Road between Morayfield Road and New Settlement Road; and
- Bruce Hwy.

5.5 West Moreton link

Two options for a West Moreton link have been tested as part of the current analysis:

- A West Moreton link using upgraded existing infrastructure shown in Figure 4; and
- A West Moreton link via a new route as shown in Figure 5.

The results of the model runs suggest that the new West Moreton link has a greater impact in the Caboolture West area than the upgraded West Moreton link option. Figure 36 shows that the new link is mainly forecast to be used as a connection between Caboolture West and areas south of Narangba and will take

traffic off other routes such as Oakley Flat Road, Burpengary Road, Caboolture River Road and the Bruce Highway.

The upgraded link would facilitate easier movement between Caboolture West and areas south of Narangba (such as the Brisbane CBD) but it would also be used for local access movements between Caboolture West and areas such as Narangba and Burpengary. The diversion of Caboolture West traffic from local routes to the new link will also benefit local trips between Caboolture West and areas like Caboolture and Morayfield.

The modelling also indicates that the new West Moreton link option is not likely to have a great impact beyond the southern areas of Caboolture West and, given currently assumed land uses and patterns, it is not anticipated that the new link will increase through traffic in Caboolture West on Old North Road.

The upgraded West Moreton link option has a more localised impact (see Figure 35) and whilst traffic is forecast to increase on the upgraded sections of the route, other streets (such as Oakley Flat Road, Haughton Road and the Bruce Highway) are forecast to have lower traffic volumes.

Whilst it is anticipated that the Caboolture West development will be more self-sufficient and have a greater proportion of people working in the region also living in the region, it is forecast that the Brisbane CBD will remain a significant attractor into the future (see Figure 47). The modelling shows that the West Moreton link option(s) would accommodate longer distance trips destined for the south and, to some extent, local trips between Caboolture West and Caboolture/Morayfield.

It should be noted that the options for the West Moreton Link that have been tested as part of this Caboolture West study represent only two of a myriad of other options that may exist. It is understood that the State intends to undertake a study in to the possible West Moreton Link in the near future.

5.6 Freight access

Plots of commercial vehicle (CV) volumes forecast for the Caboolture West area are given in Figure 51 and Figure 52 below for medium and heavy trucks respectively. The volumes are provided for the AM peak period as forecast for Scenario 6 (Base Case) and show that:

- East-West CV traffic is primarily focused along D'Aguilar Highway.
- North-South CV traffic is primarily focused on Beerburrum Road (more significant is the Bruce Highway which has not been shown on the plot as it would dwarf the other routes).
- CV traffic in Caboolture West would primarily occur on roads servicing the industrial areas to the north of the Town Centre and the Town Centre itself using the new connection to the D'Aguilar Highway and Bellmere Road, and
- Medium truck volumes are forecast to be more significant than heavy commercial vehicle volumes.

Figure 51: Medium truck volumes

Figure 52: Heavy truck volumes

A plot of the proportion of trucks to total traffic volumes is also shown in Figure 53 and shows that within Caboolture West, the proportion of commercial vehicles to total traffic is generally small. The highest proportion of commercial vehicle traffic is forecast to be on the northern entry road from the D'Aguilar Highway in the vicinity of the industrial zone. It's worth noting that the higher proportion of commercial vehicle traffic on some roads around the Town Centre forecast by the model may be influenced by the size of the transport zones in the model resulting in over assignment on some links.

Figure 53: Proportion of trucks (medium and heavy combined) to total traffic

Appendix A

Demographic Inputs

A1 Large Town scenario (2061)

				Employment						Enrolments		
Zone	Population	Dwellings	Occupancy	Professional	Service	Construction & Industry	Retail	Other	Total	Primary	Secondary	Tertiary
2551	3558	1318	2.70	35	54	78	10	6	184	0	0	0
2552	3175	1176	2.70	32	48	70	9	5	164	0	0	0
2553	2410	893	2.70	24	37	53	7	4	124	0	0	0
2554	3062	1134	2.70	30	46	67	9	5	158	0	0	0
2555	776	287	2.70	8	223	17	2	1	251	0	2500	0
2556	907	336	2.70	9	14	20	3	2	47	0	0	0
2557	1349	500	2.70	13	20	30	4	2	70	0	0	0
2558	2737	1014	2.70	27	42	60	8	5	141	0	0	0
2559	1445	535	2.70	14	222	32	4	2	275	0	2500	0
2560	2495	924	2.70	22	33	48	6	4	112	0	0	0
2561	1830	678	2.70	17	296	36	5	3	357	1100	2500	0
2562	1625	602	2.70	38	103	38	133	3	314	0	0	0
2563	1058	392	2.70	11	16	23	3	2	55	0	0	0
2564	1701	630	2.70	17	26	37	5	3	88	0	0	0
2565	1743	646	2.70	17	166	38	5	3	230	2200	0	0
2566	5483	2031	2.70	2343	273	92	2044	0	4751	0	0	1400
2567	0	0	0.00	238	0	2019	446	0	2704	0	0	0
2568	1444	535	2.70	256	0	2172	480	0	2909	0	0	0
2569	1625	602	2.70	16	25	36	5	3	84	0	0	0

				Employment						Enrolments		
Zone	Population	Dwellings	Occupancy	Professional	Service	Construction & Industry	Retail	Other	Total	Primary	Secondary	Tertiary
2570	4600	1704	2.70	67	148	102	141	8	466	0	0	0
2571	3689	1366	2.70	37	56	81	10	6	190	0	0	0
2572	3648	1351	2.70	57	134	81	139	6	417	1100	0	0
2573	4234	1568	2.70	42	64	93	12	7	218	0	0	0
2574	3515	1302	2.70	52	125	70	137	5	389	0	0	0
2575	10799	4000	2.70	133	262	271	99	21	786	1100	0	0
2576	2676	991	2.70	26	40	58	7	5	137	0	0	0
2577	907	336	2.70	9	14	20	3	2	47	0	0	0
2578	563	209	2.70	6	80	12	2	1	100	1100	0	0
2121	64	17	3.78	0	2	2	0	10	13	0	0	0
2126	1060	393	2.70	80	7	3	70	0	160	0	0	0
2127	50	20	2.50	0	3	1	0	10	14	0	0	0
2130	101	36	2.80	0	3	2	0	10	15	0	0	0
2261	4460	1652	2.70	15	23	33	4	3	77	0	0	0
2354	0	0	0.00	121	41	12	721	0	896	0	0	0
2370	463	172	2.70	26	7	189	41	1	264	0	0	0
2448	0	0	0.00	76	26	8	451	0	560	0	0	0
2490	1021	378	2.70	10	15	22	3	2	53	0	0	0
2369	0	0	0	0	0	0	0	0	0	0	0	0
2128	0	0	0	0	0	0	0	0	0	0	0	0
2114	0	0	0	0	0	0	0	0	0	0	0	0
2120	0	0	0	0	0	0	0	0	0	0	0	0

A2 Sustainable Town scenario (2061)

				Employment						Enrolments		
Zone	Population	Dwellings	Occupancy	Professional	Service	Construction & Industry	Retail	Other	Total	Primary	Secondary	Tertiary
2551	889	329	2.70	9	14	20	2	2	46	0	0	0
2552	794	294	2.70	8	12	17	2	1	41	0	0	0
2553	603	223	2.70	6	9	13	2	1	31	0	0	0
2554	765	284	2.70	8	12	17	2	1	39	0	0	0
2555	776	287	2.70	8	183	17	2	1	211	0	2500	0
2556	907	336	2.70	9	14	20	3	2	47	0	0	0
2557	337	125	2.70	3	5	7	1	1	17	0	0	0
2558	2737	1014	2.70	27	42	60	8	5	141	0	0	0
2559	1445	535	2.70	14	222	32	4	2	275	0	2500	0
2560	2495	924	2.70	22	33	48	6	4	112	0	0	0
2561	1830	678	2.70	17	296	36	5	3	357	1100	2500	0
2562	1625	602	2.70	38	103	38	133	3	314	0	0	0
2563	1058	392	2.70	11	16	23	3	2	55	0	0	0
2564	1701	630	2.70	17	26	37	5	3	88	0	0	0
2565	1743	646	2.70	17	126	38	5	3	190	2200	0	0
2566	5737	2125	2.70	2020	307	171	1736	7	4242	0	0	1400
2567	0	0	0.00	319	227	1771	361	26	2704	0	0	0
2568	1444	535	2.70	335	238	1857	378	27	2834	0	0	0
2569	0	0	0.00	16	25	36	5	3	84	0	0	0
2570	4600	1704	2.70	67	148	102	141	8	466	0	0	0

				Employment						Enrolments		
Zone	Population	Dwellings	Occupancy	Professional	Service	Construction & Industry	Retail	Other	Total	Primary	Secondary	Tertiary
2571	3689	1366	2.70	37	56	81	10	6	190	0	0	0
2572	3648	1351	2.70	57	134	81	139	6	417	1100	0	0
2573	4234	1568	2.70	42	64	93	12	7	218	0	0	0
2574	3742	1386	2.70	40	107	44	134	3	328	0	0	0
2575	10799	4000	2.70	129	242	238	159	18	786	1100	0	0
2576	2601	963	2.70	26	40	58	7	5	137	0	0	0
2577	907	336	2.70	9	14	20	3	2	47	0	0	0
2578	563	209	2.70	6	80	12	2	1	100	0	0	0
2121	64	17	3.78	0	2	2	0	10	13	0	0	0
2126	0	0	0.00	0	0	0	0	0	0	0	0	0
2127	50	20	2.50	0	3	1	0	10	14	0	0	0
2130	101	36	2.80	0	3	2	0	10	15	0	0	0
2261	0	0	0.00	0	0	0	0	0	0	0	0	0
2354	0	0	0.00	0	0	0	0	0	0	0	0	0
2370	463	172	2.70	24	1	199	40	0	264	0	0	0
2448	0	0	0.00	0	0	0	0	0	0	0	0	0
2490	0	0	0.00	0	0	0	0	0	0	0	0	0
2369	0	0	0	0	0	0	0	0	0	0	0	0
2128	0	0	0	0	0	0	0	0	0	0	0	0
2114	0	0	0	0	0	0	0	0	0	0	0	0
2120	0	0	0	0	0	0	0	0	0	0	0	0

Appendix B

Caboolture West Network Details

B1 Caboolture West road network

The Figures in this appendix highlight key network inputs for the Caboolture West development. Due to the very minor differences between the Caboolture West network for the Large Town scenario and the Sustainable Town scenario, only one set of Figures have been produced.

It should also be noted that all highway links for the Caboolture West network have been coded as undivided roads.

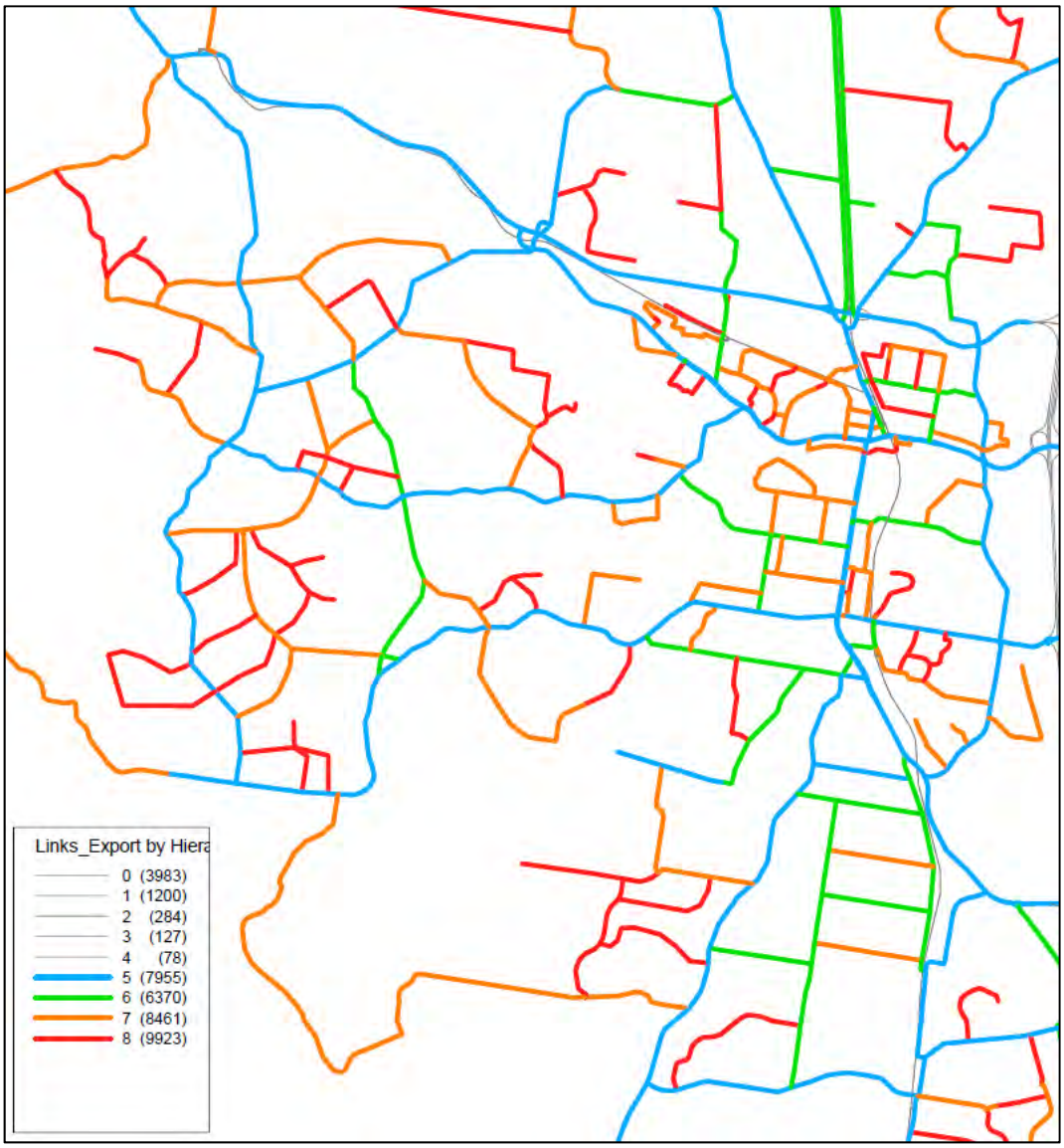

Figure 54: Caboolture West road hierarchy

Hierarchy Code	Description
5	Arterial
6	Sub-Arterial
7	Collector
8	Local

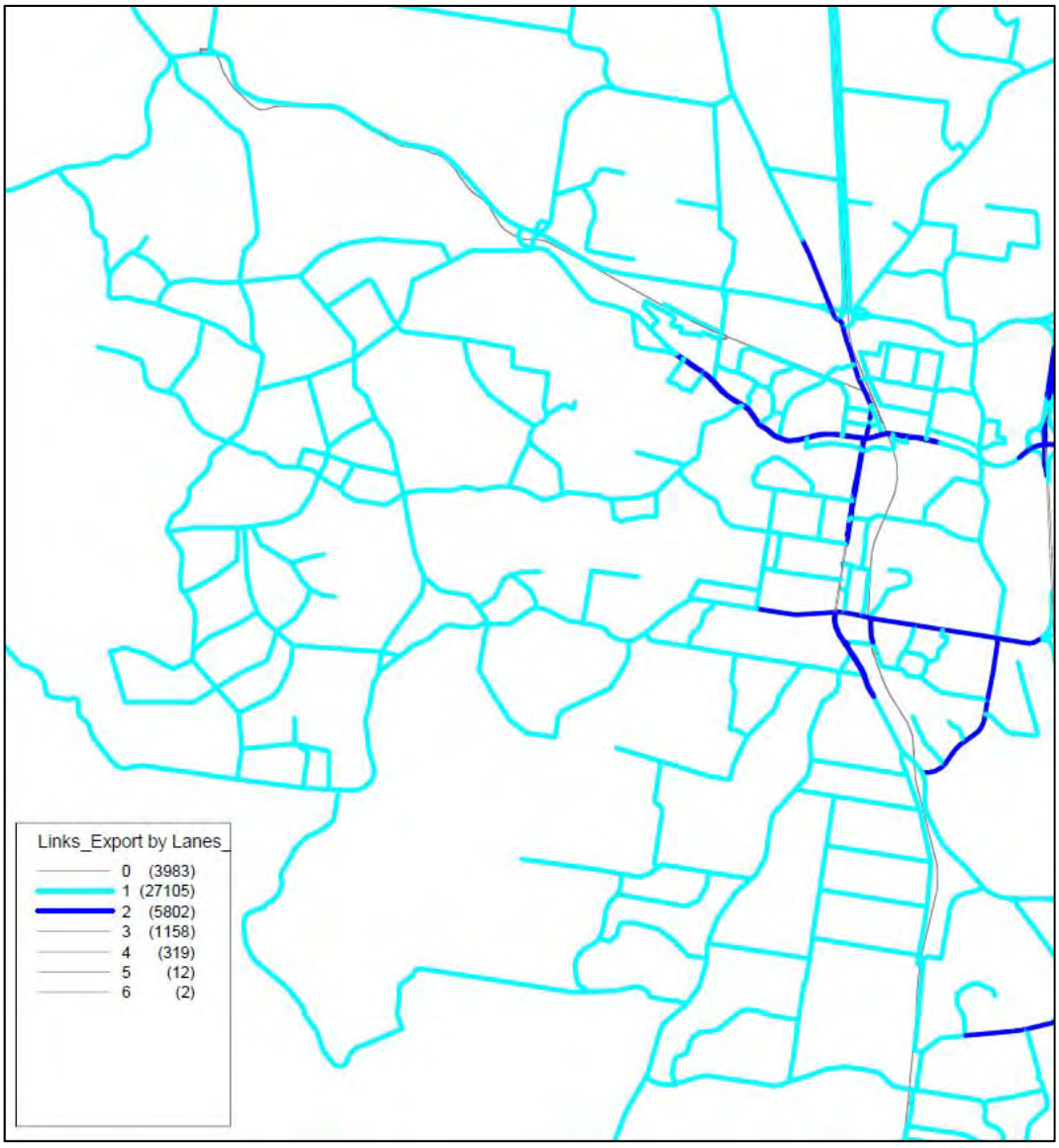

Figure 55: Caboolture West number of traffic lanes (no upgrades to external network)

Figure 56: Caboolture West number of traffic lanes (with upgrades to external network)

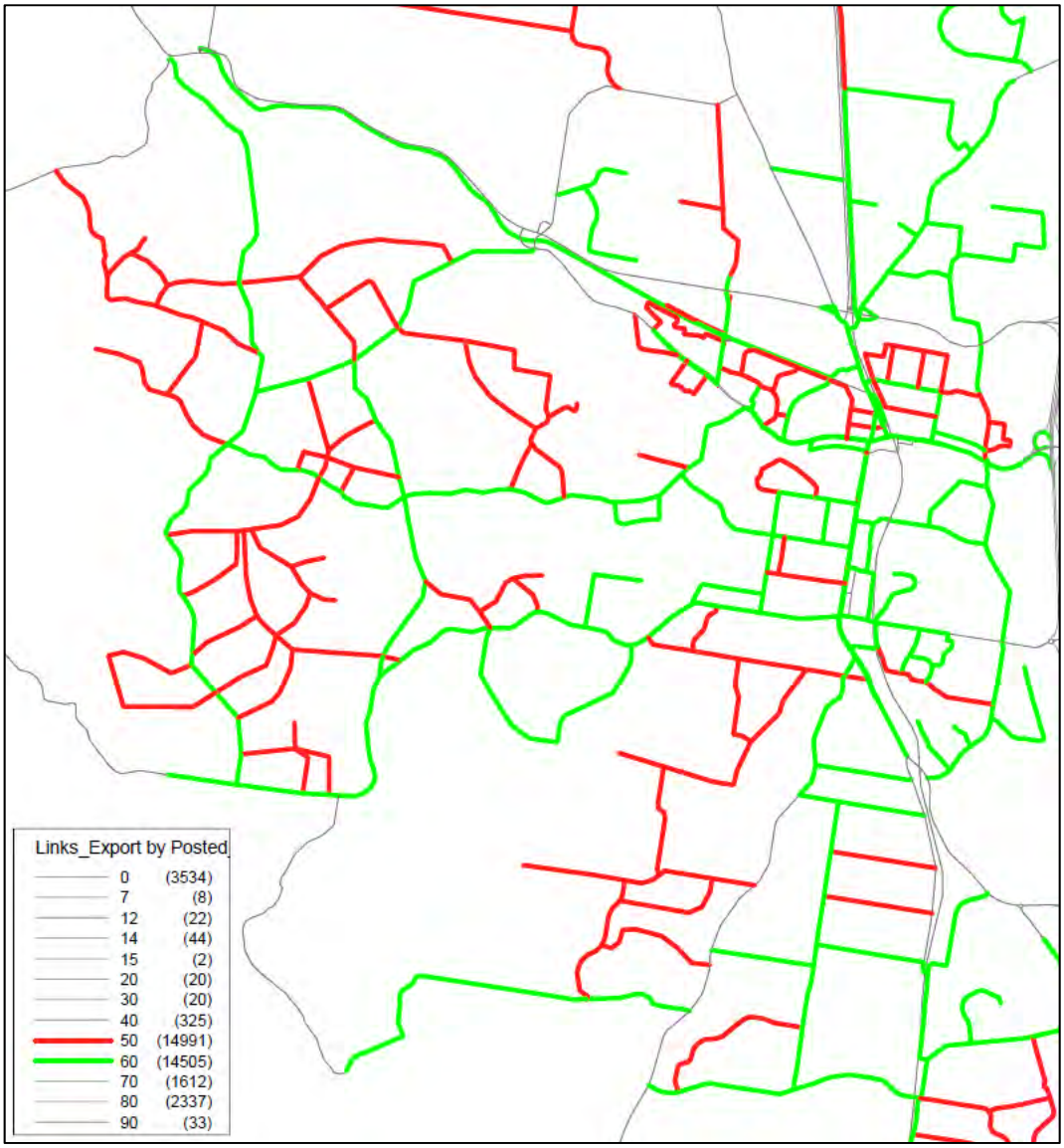

Figure 57: Caboolture West posted speeds

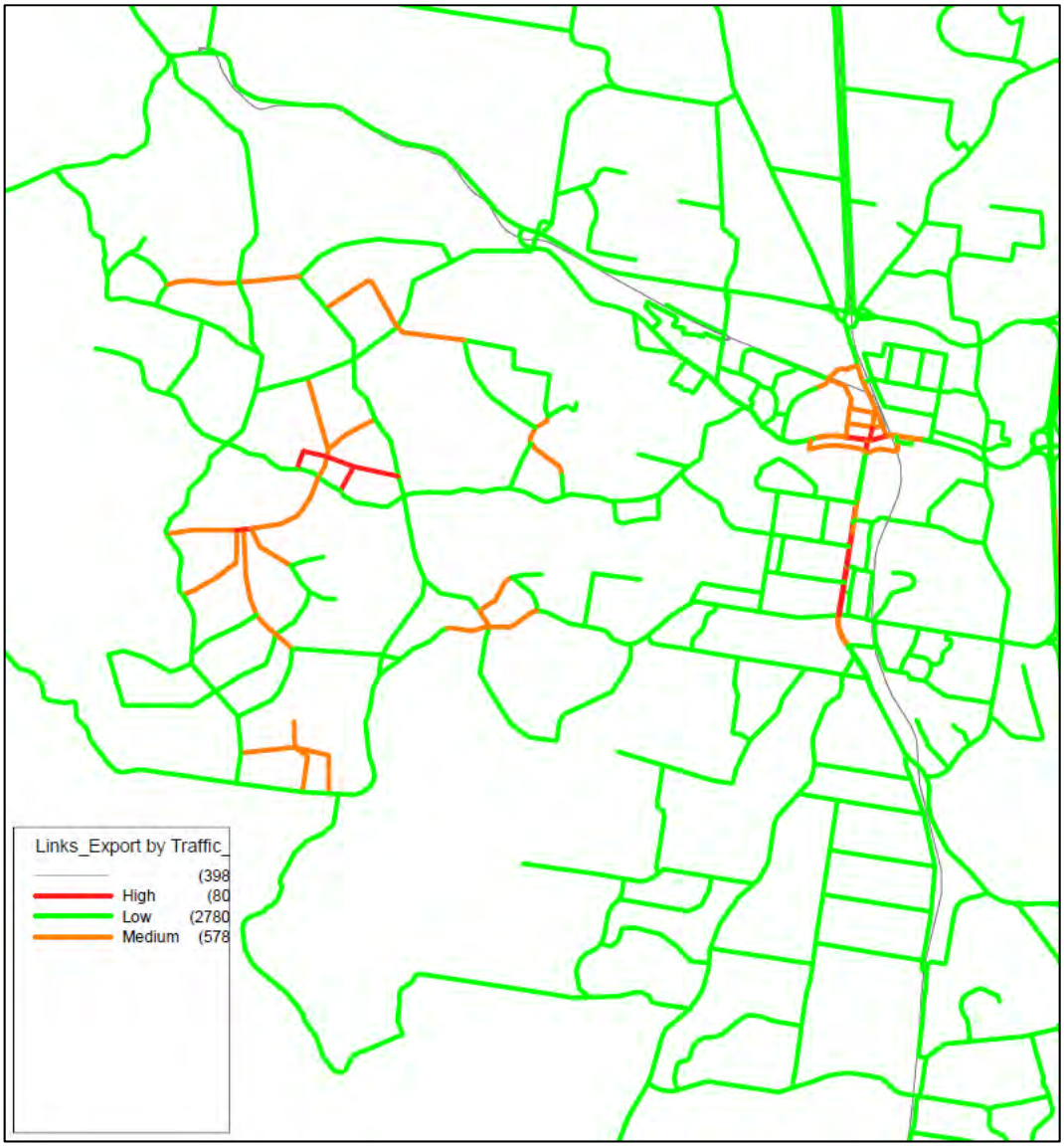

Figure 58: Caboolture West road impedance

Appendix C

Public Transport Network Details

C1 Caboolture West PT network

The Figures in this appendix highlight the travel routes for the key public transport network inputs for the Caboolture West development. Table 22 lists the service frequencies assumed for the key routes for each PT scenario identified in Section 2.5 with the values in bod red text implying a difference to the 2031 policy model inputs.

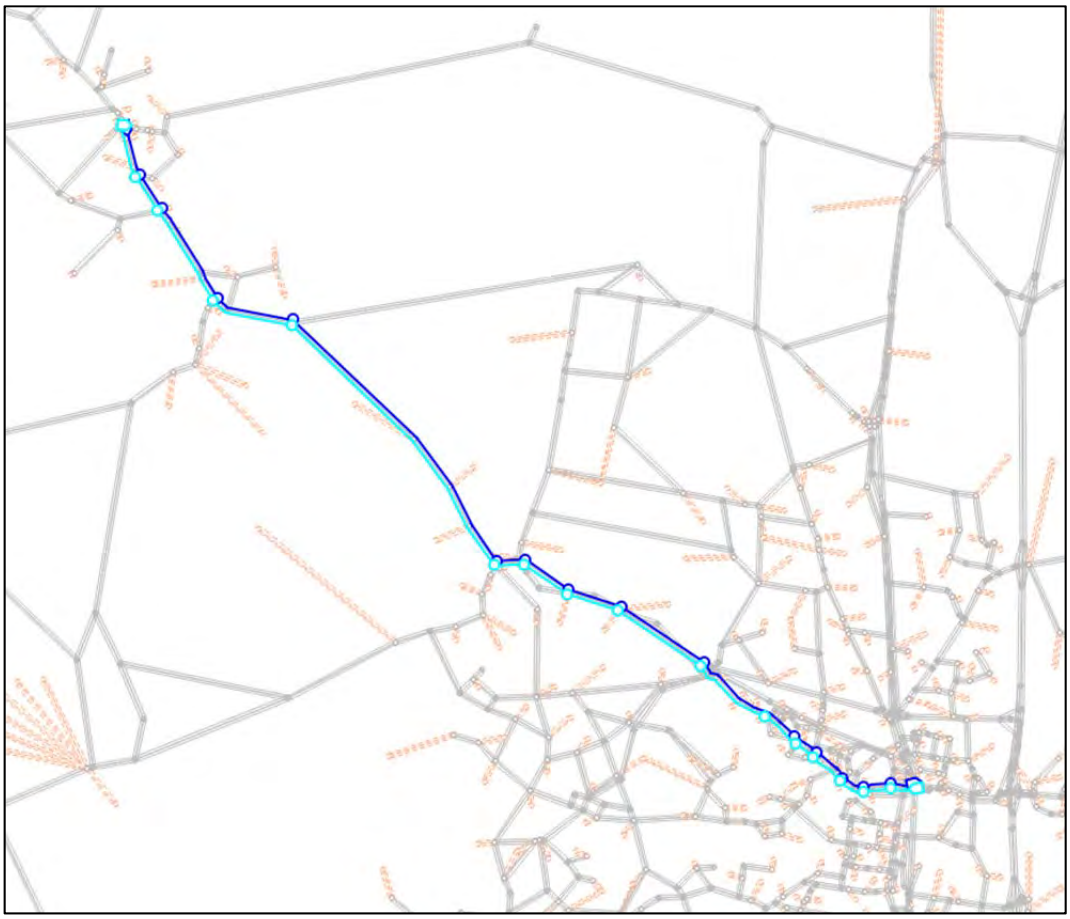

Figure 59: MIT101 and MIT102 (Woodford – Caboolture)

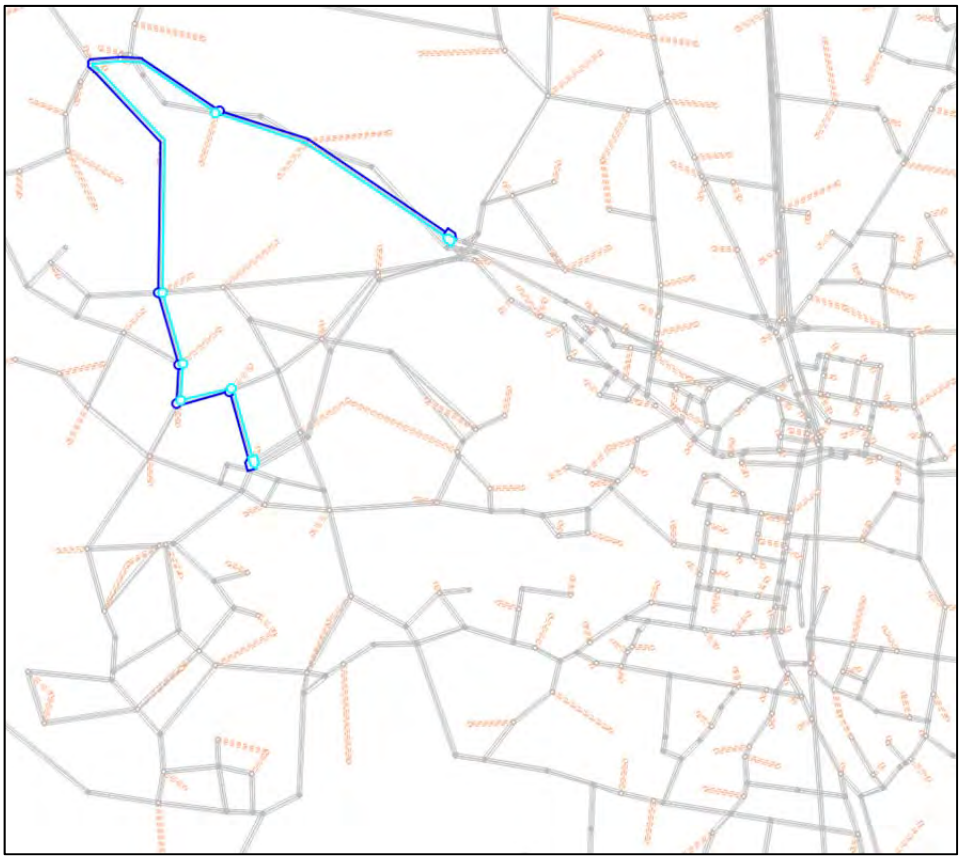

Figure 60: MIT051 and MIT 052 (Caboolture West – Moodlu, via Wamuran)

Figure 61: MIT121 and MIT122 (Moodlu – Caboolture, via D'Aguilar Hwy)

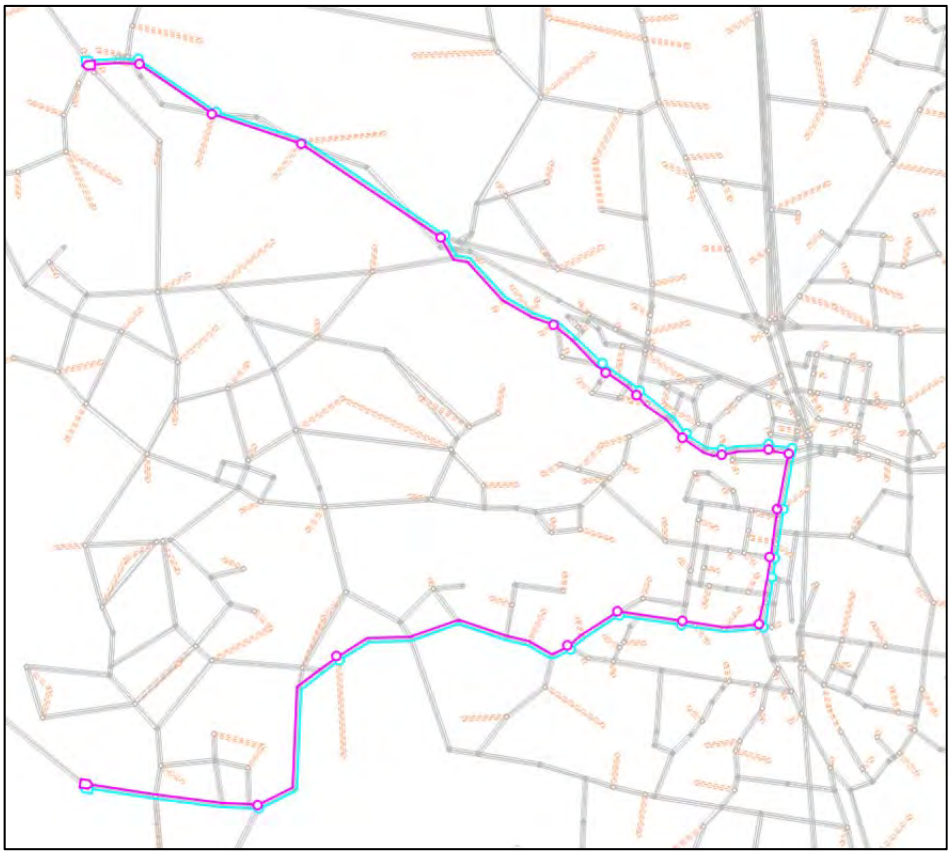

Figure 62: Original MIT141 and MIT142 (Wamuran – Rocksberg, via Caboolture)

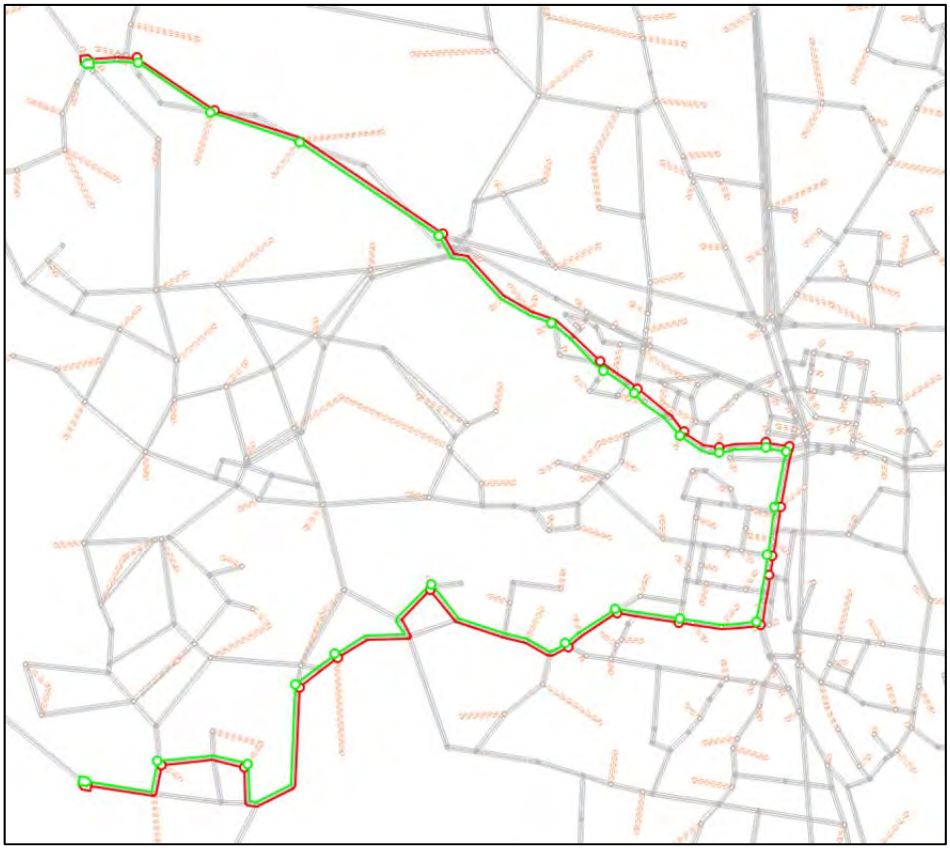

Figure 63: Caboolture West MIT141 and MIT142 (Wamuran – Rocksberg, via Caboolture)

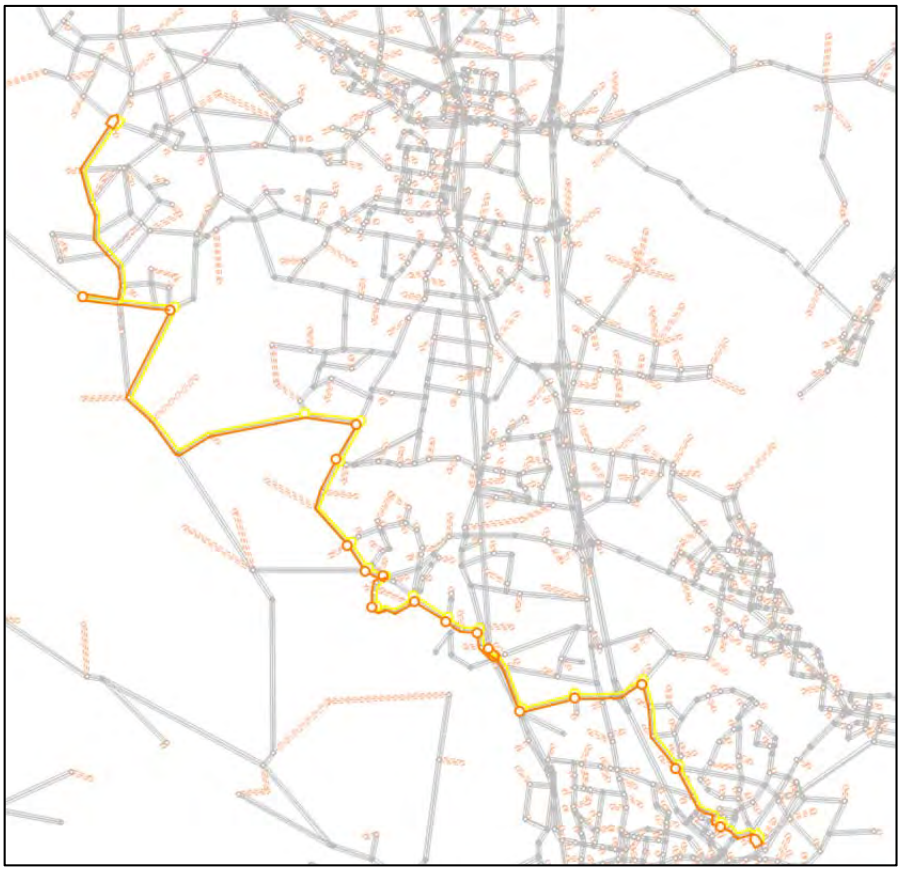

Figure 64: Original MIT151 and MIT152 (Caboolture West – North Lakes)

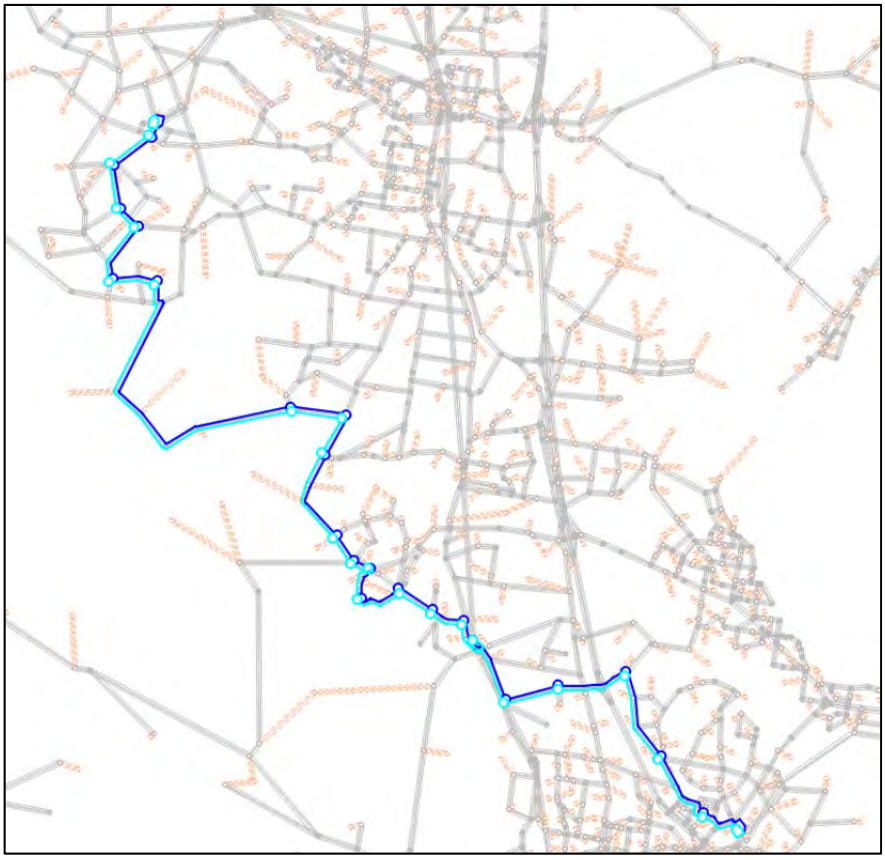

Figure 65: Caboolture West MIT151 and MIT152 (Caboolture West – North Lakes)

Figure 66: Original CSQ061 and CSQ062 (Caboolture West – Caboolture)

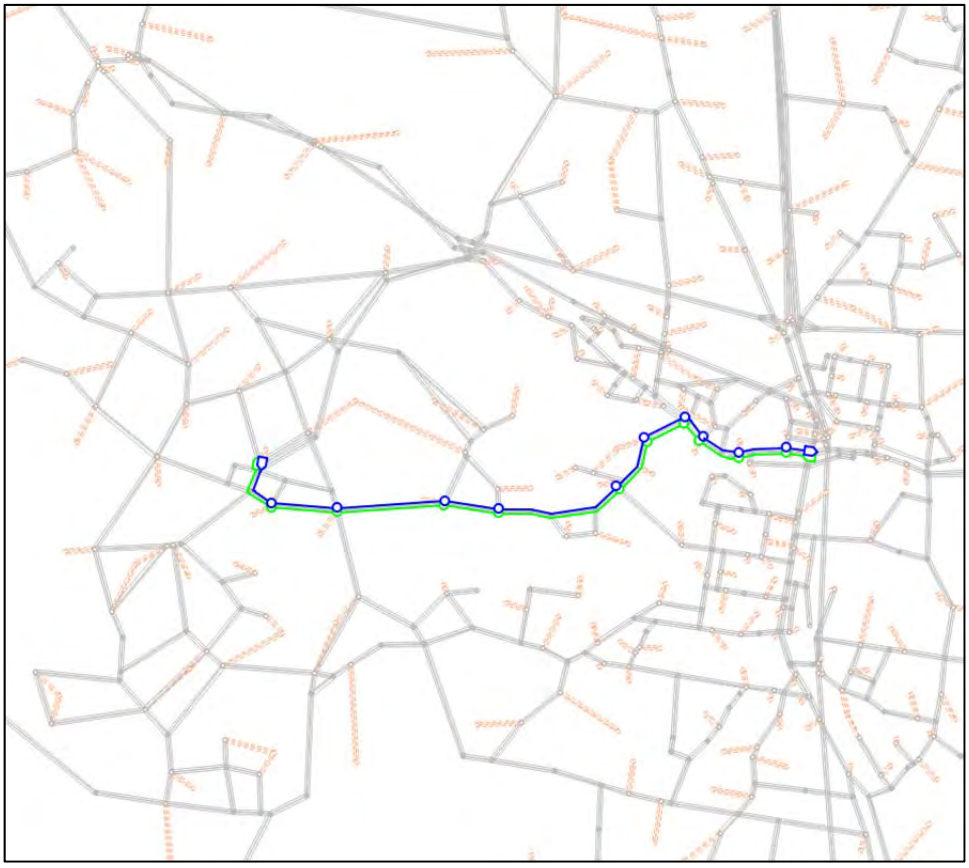

Figure 67: Caboolture West CSQ061 and CSQ062 (Caboolture West – Caboolture)

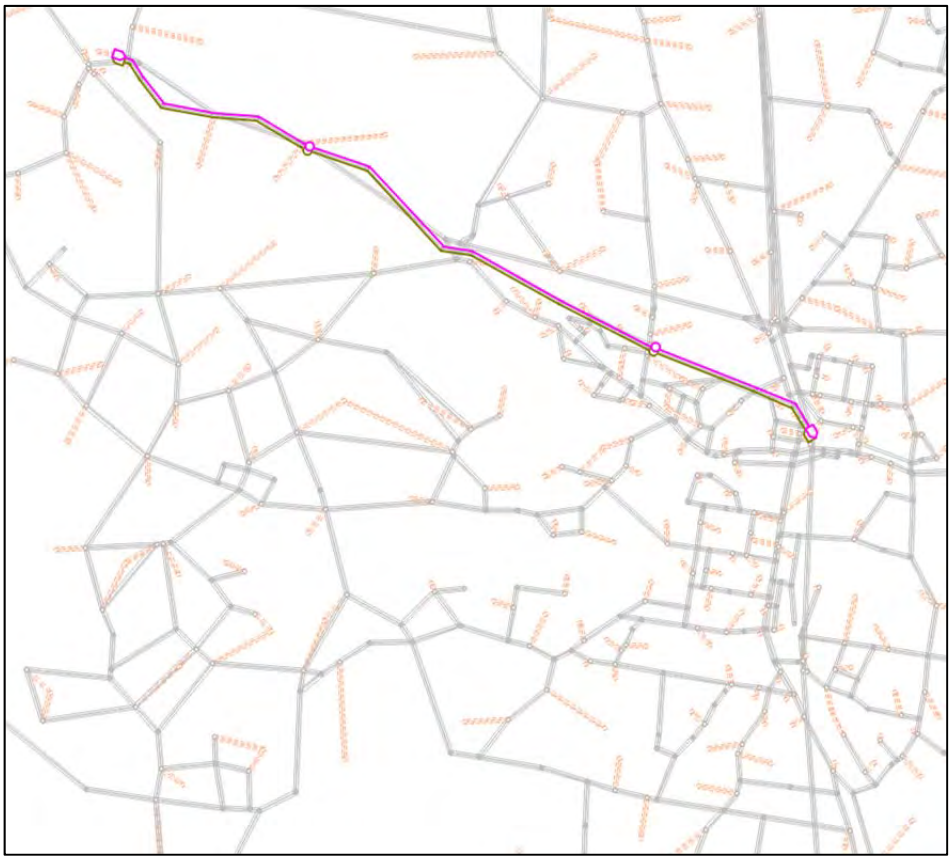

Figure 68: WAMCAB and CABWAM (Wamuran – Caboolture)

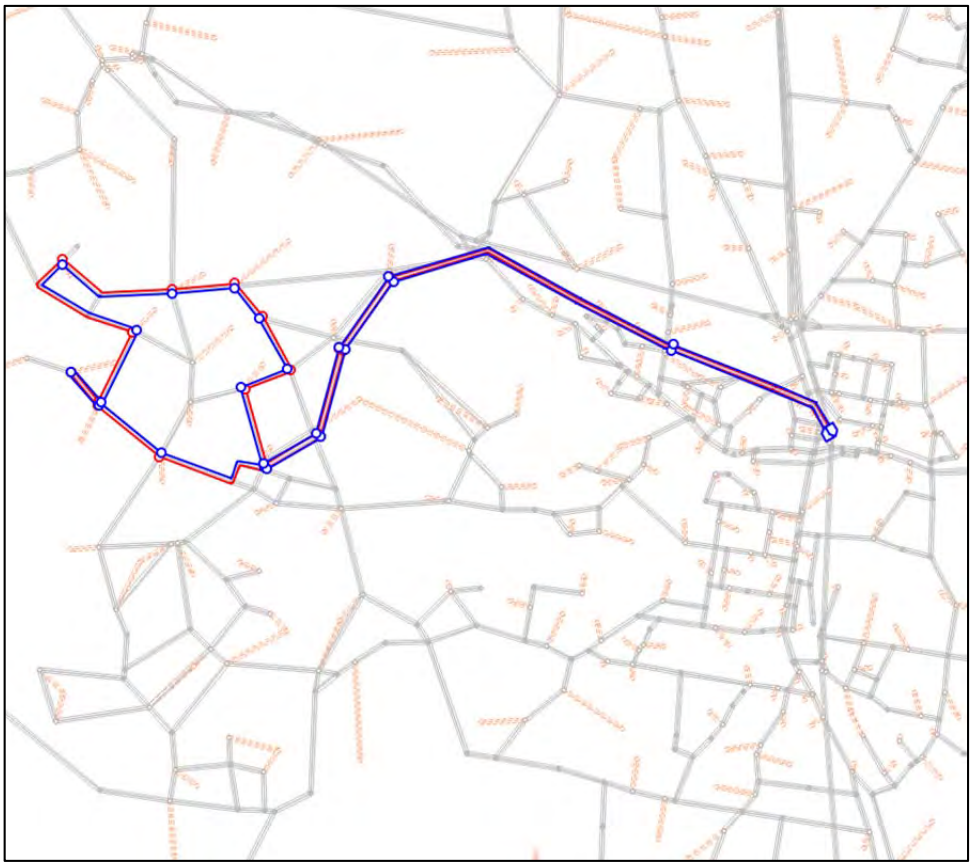

Figure 69: CBAH1N and CBAH2N (North Caboolture West – Caboolture)

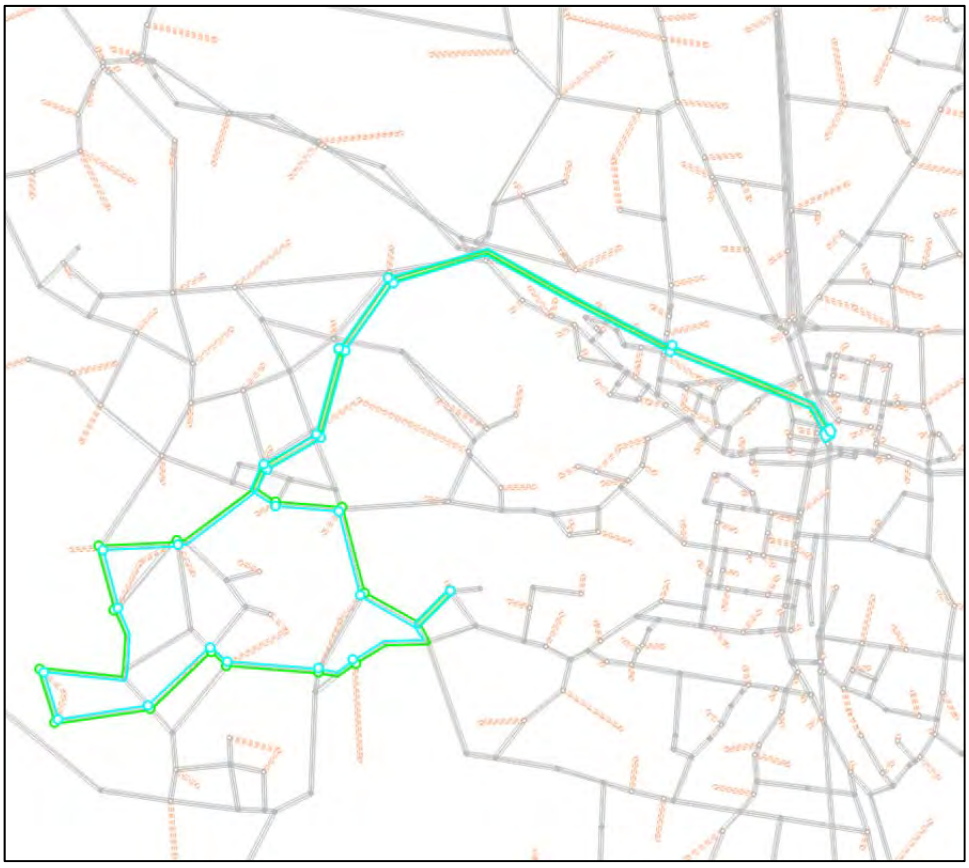

Figure 70: CBAH1S and CBAH2S (South Caboolture West – Caboolture)

Figure 71: CABLC1 and CABLC2 (Caboolture West local services)

Table 22: PT service frequencies for key routes

	PT Headways (minutes)															
	2031 Policy Model				PT-A				PT-B				PT-C			
Key Route	AM	OP	PM	EV	AM	OP	PM	EV	AM	OP	PM	EV	AM	OP	PM	EV
MIT101	30	120	60	15	30	**60**	**30**	**60**	30	120	60	15	30	120	60	15
MIT102	60	120	30	15	**30**	**60**	30	**60**	60	120	30	15	60	120	30	15
MIT051	60	60	60	15	**30**	60	**30**	**60**	60	60	60	15	60	60	60	15
MIT052	60	60	60	15	**30**	60	**30**	**60**	60	60	60	15	60	60	60	15
MIT121	5	15	5	15	**15**	**30**	**15**	**30**	5	15	5	15	5	15	5	15
MIT122	5	15	5	15	**15**	**30**	**15**	**30**	5	15	5	15	5	15	5	15
MIT141	5	15	5	15	**15**	**30**	**15**	**30**	5	15	5	15	5	15	5	15
MIT142	5	15	5	15	**15**	**30**	**15**	**30**	5	15	5	15	5	15	5	15
MIT151	5	15	5	15	**15**	**30**	**15**	**30**	5	15	5	15	5	15	5	15
MIT152	5	15	5	15	**15**	**30**	**15**	**30**	5	15	5	15	5	15	5	15
CSQ061	10	15	10	15	**15**	**30**	**15**	**30**	10	15	10	15	10	15	10	15
CSQ062	10	15	10	15	**15**	**30**	**15**	**30**	10	15	10	15	10	15	10	15
WAMCAB	5	15	5	15	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CABWAM	5	15	5	15	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
CBAH1N	0	0	0	0	0	0	0	0	0	0	0	0	**5**	**10**	**5**	**10**
CBAH2N	0	0	0	0	0	0	0	0	0	0	0	0	**5**	**10**	**5**	**10**
CBAH1S	0	0	0	0	0	0	0	0	0	0	0	0	**5**	**10**	**5**	**10**
CBAH2S	0	0	0	0	0	0	0	0	0	0	0	0	**5**	**10**	**5**	**10**
CABLC1	0	0	0	0	0	0	0	0	0	0	0	0	**5**	**10**	**5**	**10**
CABLC2	0	0	0	0	0	0	0	0	0	0	0	0	**5**	**10**	**5**	**10**

Appendix D

Traffic Volumes Across Screen Lines

D1 Large Town

Table 23: Volume and V/C summary for inbound traffic

		Scenario 1		Scenario 2		Scenario 3		Scenario 4	
ID	**Location**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**
	River Crossings								
A	Old North Road (south)	367	18%	277	14%	812	41%	290	15%
B	New Road 2 bridge	1,177	71%	1,100	66%	679	41%	1,253	75%
C	Stern Road Extension	1,878	98%	1,705	89%	1,789	93%	1,995	104%
D	River Road bridge	1,300	68%	1,582	83%	1,466	76%	1,449	76%
E	Bellmere Road bridge	1,093	55%	1,147	26%	1,099	25%	1,430	72%
	Total	5,815		5,811		5,846		6,416	
	Caboolture West Screenline								
F	New Southern Connection	-	-	-	-	627	14%	-	-
G	Moorina Road	165	10%	108	6%	288	17%	83	5%
H	Petersen Road	90	5%	912	55%	689	41%	977	59%
I	Caboolture River Road	1,722	86%	1,454	34%	1,292	30%	1,365	68%
J	Bellmere Road	1,793	90%	1,897	44%	1,754	40%	1,725	86%
K	Williams Road Extension	2,041	102%	2,411	56%	2,272	52%	2,493	58%
L	Old North Road	969	48%	1,064	53%	1,184	59%	937	47%
M	W. Lindsay Road	152	15%	156	16%	148	15%	136	14%
	Total	6,931		8,000		8,252		7,715	

		Scenario 1		Scenario 2		Scenario 3		Scenario 4	
ID	Location	PCU	V/C	PCU	V/C	PCU	V/C	PCU	V/C
	Morayfield Road Screenline								
N	Markwell Road	2,531	121%	2,509	120%	2,434	117%	2,542	122%
O	Caboolture Connection Road	1,284	31%	1,311	31%	1,278	31%	1,297	68%
P	Matthew Flinders Drive	130	8%	123	7%	124	7%	98	6%
Q	Torrens Road	905	47%	1,023	53%	939	49%	940	49%
R	Michael Ave	467	28%	451	27%	453	27%	419	25%
S	Caboolture River Road	1,363	29%	1,473	32%	1,495	32%	1,370	66%
T	Oakey Flat Road	397	21%	348	18%	396	21%	370	19%
U	Walkers Road	2,055	103%	1,823	91%	1,693	85%	1,708	85%
V	Lindsay Road	1,784	93%	1,771	92%	1,728	90%	1,825	95%
W	Gleeson Road	137	7%	174	9%	187	9%	214	11%
	total	11,053		11,005		10,728		10,785	
	Bruce Highway Screenline								
X	Burpengary Service Road	1,732	90%	2,008	105%	1,456	76%	1,511	79%
Y	Uhlmann Road	1,175	59%	1,334	67%	1,463	73%	1,331	67%
Z	Buchanan Road	1,776	38%	1,488	32%	1,433	31%	1,468	31%
AA	Lower King Street	1,983	95%	2,034	98%	1,996	96%	1,998	96%
AB	D'Aguilar Hwy	2,023	97%	1,985	95%	1,968	94%	1,968	94%
AC	Pumicestone Road	783	39%	851	43%	819	41%	841	42%
	Total	9,472		9,699		9,135		9,117	

Table 24: Volume and V/C summary for outbound traffic

		Scenario 1		Scenario 2		Scenario 3		Scenario 4	
ID	**Location**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**
	River Crossings								
A	Old North Road (south)	2,150	108%	2,343	117%	3,037	152%	1,801	90%
B	New Road 2 bridge	2,098	126%	2,193	132%	2,143	129%	2,050	123%
C	Stern Road Extension	1,998	104%	2,383	124%	2,516	131%	2,303	120%
D	River Road bridge	2,346	122%	2,375	124%	2,366	123%	2,333	122%
E	Bellmere Road bridge	2,351	118%	4,012	93%	3,744	86%	1,939	97%
	Total	10,945		13,305		13,807		10,426	
	Caboolture West Screenline								
F	New Southern Connection	-	-	-	-	2,934	65%	-	-
G	Moorina Road	2,049	123%	1,568	94%	1,471	88%	1,636	98%
H	Petersen Road	1,329	80%	1,904	114%	1,655	99%	2,041	122%
I	Caboolture River Road	2,995	150%	4,318	100%	2,742	63%	2,510	126%
J	Bellmere Road	3,568	178%	5,032	116%	4,774	110%	2,607	130%
K	Williams Road Extension	3,269	163%	3,385	78%	2,945	68%	4,412	102%
L	Old North Road	2,131	107%	1,090	54%	1,094	55%	1,018	51%
M	W. Lindsay Road	1,142	114%	333	33%	259	26%	255	25%
	Total	16,484		17,629		17,875		14,478	

ID	Location	Scenario 1		Scenario 2		Scenario 3		Scenario 4	
		PCU	V/C	PCU	V/C	PCU	V/C	PCU	V/C
	Morayfield Road Screenline								
N	Markwell Road	1,992	96%	2,017	97%	1,969	94%	2,081	100%
O	Caboolture Connection Road	3,949	95%	4,797	115%	4,531	109%	2,363	123%
P	Matthew Flinders Drive	1,025	61%	912	55%	850	51%	849	51%
Q	Torrens Road	1,294	67%	1,091	57%	820	43%	1,069	56%
R	Michael Ave	464	28%	306	18%	311	19%	588	35%
S	Caboolture River Road	3,285	70%	3,645	78%	3,191	68%	2,358	113%
T	Oakey Flat Road	2,441	127%	2,446	128%	2,432	127%	2,437	127%
U	Walkers Road	1,650	83%	1,926	96%	1,398	70%	1,591	80%
V	Lindsay Road	2,275	119%	2,267	118%	2,273	119%	2,385	124%
W	Gleeson Road	530	26%	403	20%	453	23%	493	25%
	total	18,904		19,810		18,227		16,215	
	Bruce Highway Screenline								
X	Burpengary Service Road	1,253	65%	1,335	70%	979	51%	1,266	66%
Y	Uhlmann Road	1,622	81%	1,543	77%	1,893	95%	1,897	95%
Z	Buchanan Road	2,962	63%	3,092	66%	2,107	45%	2,319	50%
AA	Lower King Street	2,066	99%	2,285	110%	1,923	92%	1,668	80%
AB	D'Aguilar Hwy	2,433	117%	2,391	115%	2,274	109%	2,411	116%
AC	Pumicestone Road	1,154	58%	1,141	57%	1,064	53%	1,085	54%
	Total	11,491		11,788		10,240		10,647	

D2 Sustainable Town

Table 25: Volume and V/C summary for inbound traffic

		Scenario 5		Scenario 6		Scenario 7		Scenario 8		Scenario 9		Scenario 10	
ID	**Location**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**
	River Crossings												
A	Old North Road (south)	284	14%	188	9%	182	9%	717	36%	199	10%	211	11%
B	New Road 2 bridge	1,225	73%	1,303	78%	1,310	79%	885	53%	1,303	78%	1,356	81%
C	Stern Road Extension	1,964	102%	1,846	96%	1,849	96%	2,041	106%	1,853	97%	1,964	102%
D	River Road bridge	1,297	68%	1,580	82%	1,524	79%	1,465	76%	1,600	83%	1,355	71%
E	Bellmere Road bridge	1,174	59%	1,160	27%	1,167	27%	1,211	28%	1,168	27%	1,571	79%
	Total	5,944		6,077		6,032		6,318		6,123		6,457	
	Caboolture West Screenline												
F	New Southern Connection	-	-	-	-	-	-	580	13%	-	-	-	-
G	Moorina Road	169	10%	97	6%	90	5%	264	16%	97	6%	72	4%
H	Petersen Road	84	5%	983	59%	1,166	61%	684	41%	980	59%	1,018	61%
I	Caboolture River Road	1,703	85%	1,346	31%	1,210	28%	1,211	28%	1,393	32%	1,288	64%
J	Bellmere Road	1,761	88%	1,846	43%	1,803	42%	1,762	41%	1,855	43%	1,656	83%
K	Williams Road Extension	1,994	100%	2,323	54%	2,295	53%	2,215	51%	2,297	53%	2,372	55%
L	Old North Road	501	25%	401	20%	432	22%	458	23%	416	21%	393	20%
M	W. Lindsay Road	104	10%	93	9%	92	9%	87	9%	92	9%	85	8%
	Total	6,315		7,087		7,088		7,260		7,130		6,885	

		Scenario 5		Scenario 6		Scenario 7		Scenario 8		Scenario 9		Scenario 10	
ID	**Location**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**
	Morayfield Road Screenline												
N	Markwell Road	2,503	120%	2,355	113%	2,367	114%	2,315	111%	2,355	113%	2,459	118%
O	Caboolture Connection Road	1,236	30%	1,236	30%	1,235	30%	1,198	29%	1,255	30%	1,236	64%
P	Matthew Flinders Drive	125	8%	125	8%	116	7%	116	7%	123	7%	100	6%
Q	Torrens Road	922	48%	1,015	53%	962	50%	916	48%	1,005	52%	937	49%
R	Michael Ave	428	26%	451	27%	455	27%	433	26%	440	26%	415	25%
S	Caboolture River Road	1,306	28%	1,500	32%	1,497	32%	1,472	32%	1,490	32%	1,327	64%
T	Oakey Flat Road	369	19%	400	21%	415	22%	417	22%	391	20%	421	22%
U	Walkers Road	2,012	101%	1,740	87%	1,556	78%	1,540	77%	1,743	87%	1,663	83%
V	Lindsay Road	1,702	89%	1,709	89%	2,219	49%	1,599	83%	1,717	90%	1,753	91%
W	Gleeson Road	111	6%	160	8%	337	17%	209	10%	161	8%	219	11%
	total	10,716		10,692		11,158		10,216		10,680		10,529	
	Bruce Highway Screenline												
X	Burpengary Service Road	1,616	84%	1,633	85%	1,365	71%	1,391	73%	1,603	84%	1,353	71%
Y	Uhlmann Road	1,117	56%	1,287	64%	1,262	63%	1,443	72%	1,286	64%	1,395	70%
Z	Buchanan Road	1,720	37%	1,532	33%	1,737	37%	1,401	30%	1,532	33%	1,452	31%
AA	Lower King Street	1,996	96%	2,036	98%	1,998	96%	2,048	98%	2,031	97%	1,983	95%
AB	D'Aguilar Hwy	1,977	95%	1,965	94%	1,962	94%	1,956	94%	1,968	94%	1,977	95%
AC	Pumicestone Road	796	40%	849	42%	814	41%	825	41%	847	42%	841	42%
	Total	9,221		9,303		9,138		9,063		9,267		9,000	

Table 26: Volume and V/C summary for outbound traffic

		Scenario 5		Scenario 6		Scenario 7		Scenario 8		Scenario 9		Scenario 10	
ID	**Location**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**
	River Crossings												
A	Old North Road (south)	1,903	95%	1,687	84%	1,643	82%	2,678	134%	1,608	80%	1,389	69%
B	New Road 2 bridge	2,058	123%	2,177	131%	2,190	131%	2,056	123%	2,167	130%	2,056	123%
C	Stern Road Extension	1,790	93%	2,204	115%	2,187	114%	2,264	118%	2,206	115%	2,087	109%
D	River Road bridge	2,190	114%	2,298	120%	2,283	119%	2,181	114%	2,289	119%	2,292	120%
E	Bellmere Road bridge	2,171	109%	3,271	75%	3,306	76%	3,084	71%	3,213	74%	1,941	97%
	Total	10,113		11,637		11,609		12,263		11,482		9,766	
	Caboolture West Screenline												
F	New Southern Connection	-	-	-	-	-	-	2,717	60%	-	-	-	-
G	Moorina Road	1,984	119%	1,324	79%	1,297	78%	1,032	62%	1,261	76%	1,361	82%
H	Petersen Road	1,176	71%	1,614	97%	1,941	101%	1,121	67%	1,571	94%	1,952	117%
I	Caboolture River Road	2,808	140%	3,878	90%	3,568	82%	2,895	67%	3,773	87%	2,405	120%
J	Bellmere Road	3,130	157%	4,156	96%	4,175	96%	3,830	88%	4,071	94%	2,452	123%
K	Williams Road Extension	2,900	145%	2,894	67%	2,893	67%	2,516	58%	2,831	65%	3,698	85%
L	Old North Road	1,579	79%	485	24%	481	24%	493	25%	485	24%	452	23%
M	W. Lindsay Road	405	40%	131	13%	124	12%	103	10%	126	13%	115	12%
	Total	13,981		14,482		14,479		14,707		14,119		12,436	
	Morayfield Road Screenline												

		Scenario 5		Scenario 6		Scenario 7		Scenario 8		Scenario 9		Scenario 10	
ID	**Location**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**	**PCU**	**V/C**
N	Markwell Road	1,802	86%	1,856	89%	1,849	89%	1,809	87%	1,873	90%	1,932	93%
O	Caboolture Connection Road	3,872	93%	3,923	94%	4,048	97%	3,611	87%	3,893	93%	2,383	124%
P	Matthew Flinders Drive	992	60%	943	57%	863	52%	944	57%	902	54%	899	54%
Q	Torrens Road	1,136	59%	1,209	63%	1,025	53%	862	45%	1,143	60%	1,091	57%
R	Michael Ave	329	20%	316	19%	310	19%	309	19%	313	19%	571	34%
S	Caboolture River Road	3,178	68%	3,316	71%	3,260	70%	2,929	63%	3,234	69%	2,359	113%
T	Oakey Flat Road	2,441	127%	2,450	128%	2,437	127%	2,440	127%	2,445	128%	2,439	127%
U	Walkers Road	1,683	84%	1,930	97%	1,532	77%	1,725	86%	1,897	95%	1,695	85%
V	Lindsay Road	2,323	121%	2,250	117%	2,568	57%	2,279	119%	2,250	117%	2,384	124%
W	Gleeson Road	563	28%	432	22%	516	26%	519	26%	440	22%	529	26%
	total	18,319		18,625		18,407		17,428		18,391		16,283	
	Bruce Highway Screenline												
X	Burpengary Service Road	1,255	65%	1,238	65%	755	39%	1,035	54%	1,231	64%	1,248	65%
Y	Uhlmann Road	1,623	81%	1,708	85%	1,529	76%	1,866	93%	1,735	87%	1,978	99%
Z	Buchanan Road	2,572	55%	2,662	57%	2,188	47%	1,930	41%	2,609	56%	1,994	43%
AA	Lower King Street	1,937	93%	2,011	97%	1,951	94%	1,878	90%	1,969	95%	1,712	82%
AB	D'Aguilar Hwy	2,334	112%	2,282	110%	2,274	109%	2,269	109%	2,274	109%	2,355	113%
AC	Pumicestone Road	1,035	52%	1,048	52%	1,017	51%	1,033	52%	1,060	53%	1,025	51%
	Total	10,756		10,949		9,713		10,011		10,878		10,312	

Appendix C

Public Transport Network Review

Technical Note

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Project title	Caboolture West	Job number	229906
cc		File reference	
Prepared by	Troy Howarth	Date	8 November 2013
Subject	Public Transport Review - DRAFT FOR COMMENT		

1 Introduction

Arup were commissioned to undertake strategic modelling of Caboolture West using the Moreton Bay Regional Strategic Transport Model. As part of the study, the public transport (PT) services surrounding Caboolture were reviewed. A number of coded routes were identified as being duplicated and therefore redundant, or potentially no longer appropriate, and a number of new routes were assumed to be required to service Caboolture West or other local growth areas. The public transport routes surrounding Caboolture are discussed in detail below.

2 Public Transport Network

The public transport network within the 2031 model consists of:

- Existing services provided in the base year, with headways growthed up to reflect increased future demand;
- Existing services adjusted for the future year scenario (ie. alterations to route and/or stopping patterns);
- New future services added through previous planning studies such as Connecting SEQ;
- New future services recommended by the Moreton Bay Integrated Transport Study (MITS);
- New future services required to service Caboolture West, proposed as part of this review; and
- New future services required to service other areas of Caboolture/Morayfield proposed as part of this review.

An all-inclusive view of the public transport network surrounding Caboolture, as currently modelled for the Caboolture West study, is provided in Figure 1. This view helps illustrate deficiencies or "pockets" of the network that are not currently modelled to be serviced in 2031 and areas where there are duplicate services. The routes are discussed in detail in the Table 1 with recommended actions to achieve a more suitable network.

Section 2.1 summarises the review of modelled PT routes in Table 1. A map of each of the individual routes is provided in section 2.2. Section 2.3 shows the proposed public transport network, taking into account the suggested changes from Table 1.

Caboolture West PT Network

The proposed PT network for Caboolture West is centred on the provision of the C-Bahn, supplemented by additional on-road routes. The C-Bahn would be a segregated bus corridor linking Caboolture town centre with Caboolture Station with further extension on-road to the Morayfield retail precent.

Two levels of C-Bahn services are assumed:

- Through routes would collect passengers in Caboolture West and continue directly on to the C-Bahn. These would be at 7.5 minute headways during peak periods, providing services on the C-Bahn at 2.5 minute average headways.
- Seven additional feeder services would collect passengers throughout Caboolture West, terminating at the C-Bahn. Passengers would then need to transfer to travel further, but the high frequency of through service on the C-Bahn would mean the transfer penalty is minimised.

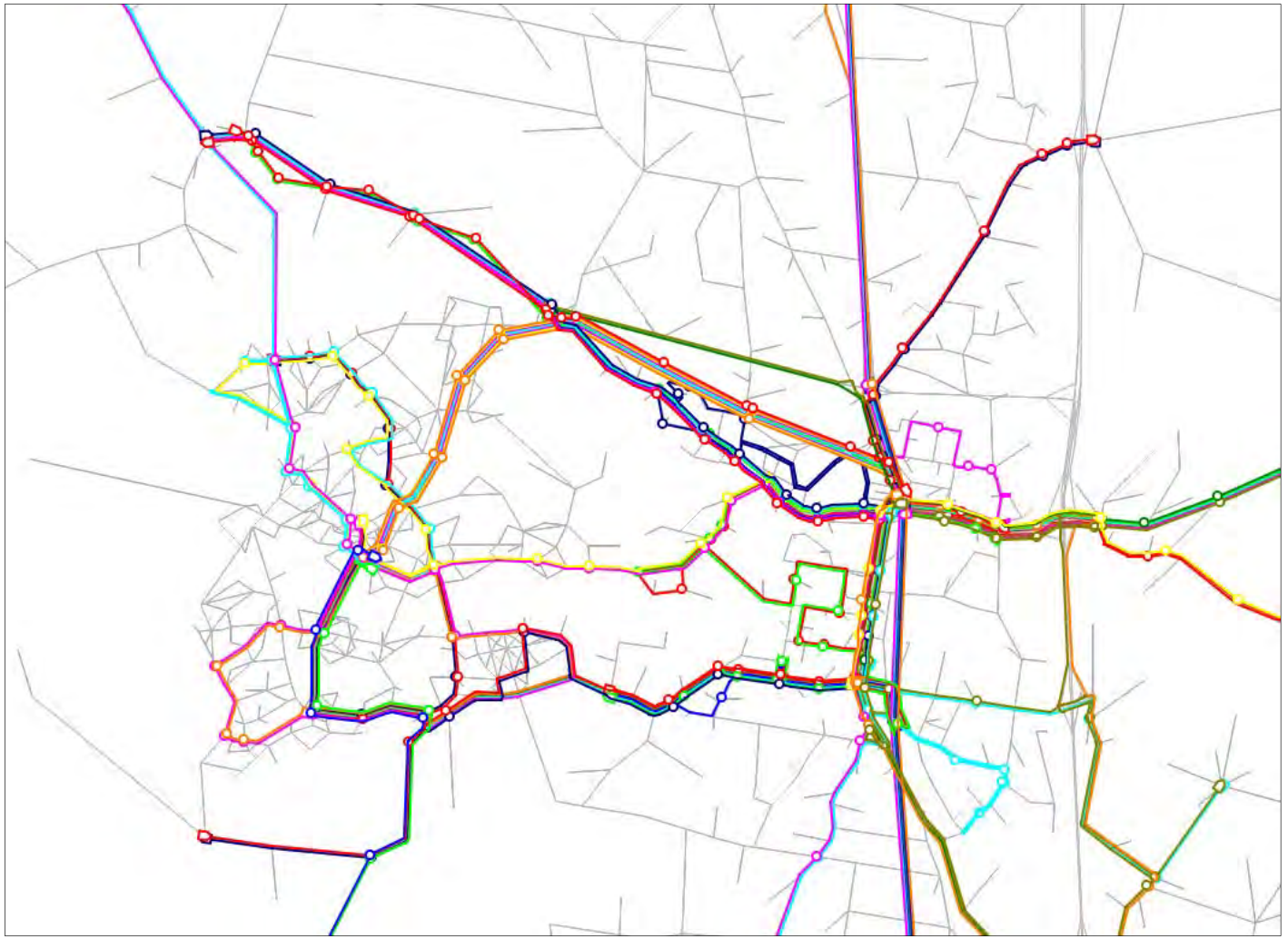


Figure 1 Caboolture 2031 PT Network

2.1 Public Transport Route Review

Table 1 PT Route Review (2031)

Line Number	Description	Headway AM	Headway OP	Headway PM	Headway EV	Notes	Suggested Action
Existing bus routes from base year carried forward							
253845	Caboolture Station - NW Caboolture The service is likely to be Translink route 651 that has been partially coded. This route services Caboolture Station, Morayfield Shopping Centre and North/West Caboolture.	15	20	15	20	Coded route does not match complete route 651	It is recommended that this service be extended in the model to service Morayfield Station.
253897	Caboolture - Beachmere The service is Translink route 652, servicing Caboolture Central, Caboolture Station and Beachmere.	24.36	12.18	24.36	22.73	Current Translink frequency is 60/60/60/60	Change frequency to 20/40/20/40
282341 318165	Caboolture - Bribie Island The service is Translink route 643, servicing Bongaree, Bribie Is Shopping Centre, Bribie Is Park 'n' Ride and Bellara.	999 12.18	999 999	24.36 24.36	22.73 68.2	Original line number in base year model was 282345. Original frequency was 60/999/120/336.	Change frequency to 10/15/10/15
317881 317940	Caboolture - Woorim via Caboolture-Bribie Island Rd The service is Translink route 640, servicing Woorim, Bongaree, Bribie Is park 'n' ride, Sandstone Point, Ningi and	12.18 12.18	12.18 12.18	12.18 12.18	17.05 17.05	Original line numbers in base year model were 282169/282134 with a frequency of 60/60/60/84 Frequency appears unreasonably high.	Change frequency to 20/30/20/30

Line Number	Description	Headway AM	OP	PM	EV	Notes	Suggested Action
	Caboolture Station.						
320239 320279	Caboolture - Morayfield The service is likely to be Translink route 653, servicing Caboolture to Morayfield via Bellmere all stops.	15 15	20 20	15 15	20 20	Similar to route 254580 in the original base year model but with a different stopping pattern. Caboolture West Project model includes a returning transit line. Returning transit line has different stops and terminal to the outbound line.	Amend Morayfield to Caboolture direction to match stopping pattern of opposing direction.
320325	Morayfield Station - Beacon Street The service is likely to be Translink route 656, servicing Morayfield station, Morayfield shopping centre, Upper Caboolture and Morayfield West.	15	20	15	20	Original route was 254579, with different stopping pattern. Original frequency in base year model was 60/52/30/84.	No change required
320494	Caboolture Central – Caboolture Hospital/TAFE/Uni The service is likely to be Translink route 655, servicing Caboolture station, TAFE/QUT/ East Caboolture and Caboolture Hospital. It is a loop service.	15	20	15	20	Original was 254056 -with different stopping pattern (original had more coverage). Original frequency was 40/60/40/67.20	Increase the frequency of service to 10/15/10/15
Future Year Lines							
CSQ061 CSQ062	Caboolture Central – Caboolture West Services a connection between Caboolture West and Caboolture Central via Bellmere.	15 15	30 30	15 15	30 30	This line was extended to Caboolture West Town Centre as part of earlier Caboolture West modelling.	Connect terminus to Caboolture Station
CSQ071 CSQ072	Caboolture - North Lakes Services a connection between Caboolture and Northlakes, with the route servicing the local network parallel to the Bruce Highway.	10 10	15 15	10 10	15 15	Appears to be an overly high frequency service	No change required. Consider frequency of 15/20/15/20
GF6561	Caboolture – Upper Caboolture	15	21.28	15	21.28	This transit line first appears in the 2031 MBRSTM model,	Remove.

Line Number	Description	Headway AM	Headway OP	Headway PM	Headway EV	Notes	Suggested Action
GF6562	Services Lower King St/ Mewett St to Upper Caboolture via Morayfield station	15	21.28	15	21.28	This route duplicates a number of other services.	
TNP051	Caboolture - Redcliffe	15	20	15	20	Original route may have been 260394 / 260456 with different stopping pattern. The original frequency was 30/30/30/84. It appears to duplicate HAAAS1/HAAAS2	Remove in favour of retaining HAAAS1 and HAAAS2
TNP052	Provides a connection between Caboolture and Redcliffe via Morayfield Road, Deception Bay Road and Anzac Avenue running express between Walkers Road and Zammit St.	15	20	15	20		
HAAAS1	Caboolture - Redcliffe via D'Bay	15	30	15	30	This route is similar to TNP051/052, with different stopping pattern. First appearing in future MBRC runs	
HAAAS2	The service is likely to be Translink route 660, servicing Caboolture station, Morayfield shopping centre, Burpengary Plaza, Deception Bay Shopping Centre, Peninsular Fair Shopping Centre and Redcliffe.	15	30	15	30		
MITS Lines							
MIT011	Caboolture - Bribie Island	5	15	5	15	This route is similar to 317940/317881 and 318615/282341.	Remove in favour of retaining 317940/317881 and 318615/282341.
MIT012	Provides connection between Caboolture train station and Bribie Island via Bribie Island Road, with a regular stopping pattern.	5	15	5	15		
MIT031	Caboolture to Elimbah East via	15	15	15	15	MIT031/032 routes are similar to MIT 131/132.	Combine routes to
MIT032	Pumicestone Rd	15	15	15	15		make one new route (MIT033/034)
MIT131	Caboolture to Elimbah East via	5	15	5	15		Combine routes to

Line Number	Description	Headway AM	Headway OP	Headway PM	Headway EV	Notes	Suggested Action
MIT132	Pumicestone Rd	5	15	5	15		make one new route (MIT033/034)
MIT033	Caboolture to Elimbah East via	5	15	5	15	A combined version of MIT031/032 and MIT131/132, with all stops catered for.	Amend to connect into Caboolture Station
MIT034	Pumicestone Rd	5	15	5	15		
MIT041	Caboolture Centre – Moodlu	60	60	60	15		Extend to Wamuran and increase frequency to 15/30/15/30
MIT042	Connection between Caboolture and Moodlu (Williams Rd) via King St	60	60	60	15		
MIT051	Cab West Town Centre – Moodlu	30	60	30	60	Route modified to service Caboolture West Town Centre, it provides a connection to Wamuran.	Amend to terminate at Wamuran
MIT052	Connection between Caboolture West and Moodlu via Wamuran	30	60	30	60		
MIT101	Caboolture Central - Woodford	30	60	30	60		
MIT102	Connection between Caboolture and Woodford via King St and D'Aguilar Highway	30	60	30	60		
MIT121	Caboolture - Moodlu	15	30	15	30	Route doesn't appear to serve a purpose.	Remove
MIT122	An Express service between Caboolture and Moodlu via D'Aguilar.	15	30	15	30		
MIT141	Rocksberg - Wamuran	15	30	15	30	Route modified to service additional stops at Caboolture West (along Caboolture River Road)	Remove Caboolture – Wamuran leg of route.
MIT142	Connection between Rocksberg and Wamuran via Morayfield,	15	30	15	30		

Line Number	Description	Headway AM	OP	PM	EV	Notes	Suggested Action
	Caboolture.						Provide route Rocksberg - Wamuran via Cab West TC using route ROKCAB and CABWAM
MIT151 MIT152	Caboolture West Town Centre - Northlakes Service between Caboolture West and Northlakes via Moonina Rd, Oaky Flat Rd, Narangba and Boundary Rd	15 15	30 30	15 15	30 30		
MIT161 MIT162	Caboolture - Narangba Connection between Caboolture Central and Narangba via Oakey Flat Road with regular stopping intervals.	5 5	15 15	5 5	15 15	Frequency appears to be too high.	Change frequency to 10/20/10/20
MIT172	Morayfield – Ningi Connection between Morayfield and Ningi stopping at Caboolture Central, and Beachmere	5	15	5	15	Route first appears in 2031_003P of MBRC work with no reverse link. The original frequency was 5/15/5/15. Frequency appears to be too high.	Change frequency to 10/20/10/20
New Caboolture West Lines							
CABWAM WAMCAB	Caboolture West to Wamuran Via D'Agular Highway	10 10	20 20	10 10	20 20		Add to model

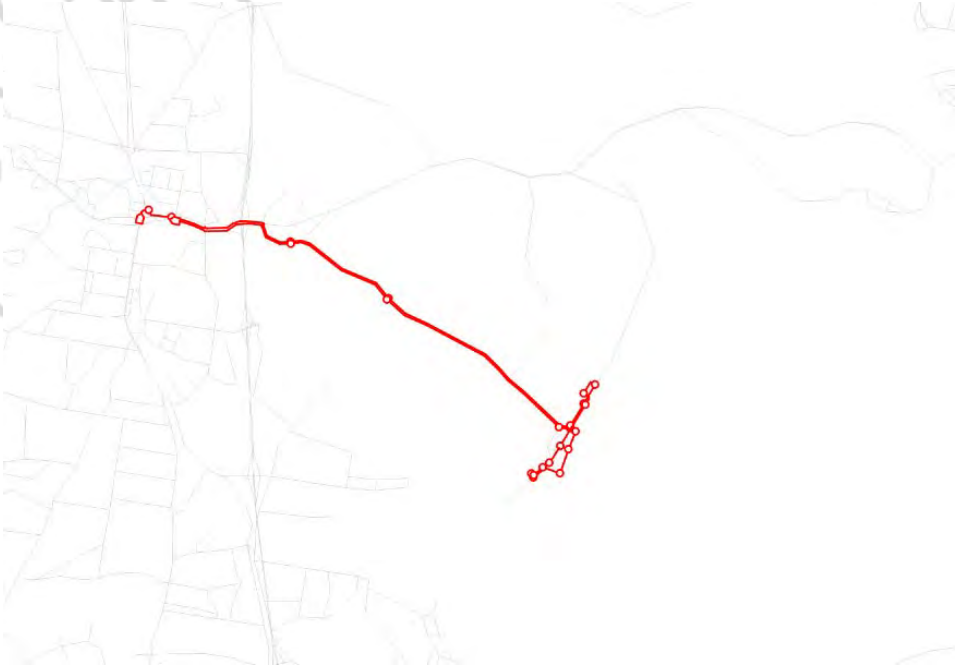
Line Number	Description	Headway AM	OP	PM	EV	Notes	Suggested Action
CBAH1O	C-Bahn Service	7.5	7.5	7.5	7.5	Utilising the C-Bahn to provide a regular and quick service between Caboolture and Caboolture West	Add to model
CBAH1I	Servicing a connection between Caboolture Shopping Centre and North-west region of Caboolture West	7.5	7.5	7.5	7.5		
CBAH2O	C-Bahn Service	7.5	7.5	7.5	7.5	Utilising the C-Bahn to provide a regular and quick service between Caboolture and Caboolture West	Add to model
CBAH2I	Servicing a connection between Caboolture Shopping Centre and South-west region of Caboolture West	7.5	7.5	7.5	7.5		
CBAH3O	C-Bahn Service	7.5	7.5	7.5	7.5	Utilising the C-Bahn to provide a regular and quick service between Caboolture and Caboolture West	Add to model
CBAH3I	Servicing a connection between Caboolture Shopping Centre and South-east region of Caboolture West	7.5	7.5	7.5	7.5		
CAB2BP	Caboolture West to Business Park, via Caboolture River Rd/ Buchanan Rd stopping at Morayfield train station.	10	15	10	15		Add to model
BP2CAB		10	15	10	15		
CABL1O	Cab West Local Feeder Service	7.5	15	7.5	15	Provides more coverage to Caboolture West, connecting regions not serviced by the C-Bahn service to Caboolture Town Centre for connection to C-Bahn.	Add to model
CABL1I	Servicing a connection between the South-East region of Caboolture West and Town Centre.	7.5	15	7.5	15		
CABL2O	Cab West Local Feeder Service	7.5	15	7.5	15	Provides more coverage to Caboolture West, connecting regions not serviced by the C-Bahn service to Caboolture Town Centre for connection to C-Bahn.	Add to model
CABL2I	Servicing a connection between the East region of Caboolture West and Town Centre.	7.5	15	7.5	15		
CABL3O	Cab West Local Feeder Service	7.5	15	7.5	15	Provides more coverage to Caboolture West, connecting regions not serviced by the C-Bahn service to Caboolture Town Centre for connection to C-Bahn.	Add to model
CABL3I	Servicing a connection between the North-East region of Caboolture West and Town Centre.	7.5	15	7.5	15		
CABL4O	Cab West Local Feeder Service	7.5	15	7.5	15	Provides more coverage to Caboolture West,	Add to model

Line Number	Description	Headway AM	Headway OP	Headway PM	Headway EV	Notes	Suggested Action
CABL4I	Servicing a connection between the North region of Caboolture West and Town Centre.	7.5	15	7.5	15	connecting regions not serviced by the C-Bahn service to Caboolture Town Centre for connection to C-Bahn.	
CABL5O	Cab West Local Feeder Service	7.5	15	7.5	15	Provides more coverage to Caboolture West, connecting regions not serviced by the C-Bahn service to Caboolture Town Centre for connection to C-Bahn.	Add to model
CABL5I	Servicing a connection between the North-West region of Caboolture West and Town Centre.	7.5	15	7.5	15		
CABL6O	Cab West Local Feeder Service	7.5	15	7.5	15	Provides more coverage to Caboolture West, connecting regions not serviced by the C-Bahn service to Caboolture Town Centre for connection to C-Bahn.	Add to model
CABL6I	Servicing a connection between the South-West region of Caboolture West and Town Centre.	7.5	15	7.5	15		
CABL7O	Cab West Local Feeder Service	7.5	15	7.5	15	Provides more coverage to Caboolture West, connecting regions not serviced by the C-Bahn service to Caboolture Town Centre for connection to C-Bahn.	Add to model
CABL7I	Servicing a connection between the South region of Caboolture West and Town Centre.	7.5	15	7.5	15		
ROKCAB	Rocksberg to Caboolture Town Centre	10	20	10	20		Add to model
CABROK		10	20	10	20		
New Caboolture City Lines							
MORLOP	Morayfield Loop	15	20	15	20	Service operates in a two-way loop	Add to model
LOPMOR	Servicing a two-way loop around Morayfield with connections at Morayfield Train Station, Caboolture Shopping Centre and servicing the local network.	15	20	15	20		
CABLOP	Caboolture Loop	15	20	15	20	Service operates in a two-way loop	Add to model
LOPCAB	Servicing a loop around Caboolture with connections at Caboolture Train Station, Caboolture Shopping Centre and	15	20	15	20		

Line Number	Description	Headway AM	OP	PM	EV	Notes	Suggested Action
	servicing the local network.						

2.2 PT Route Plots

253845 Caboolture Station - NW Caboolture

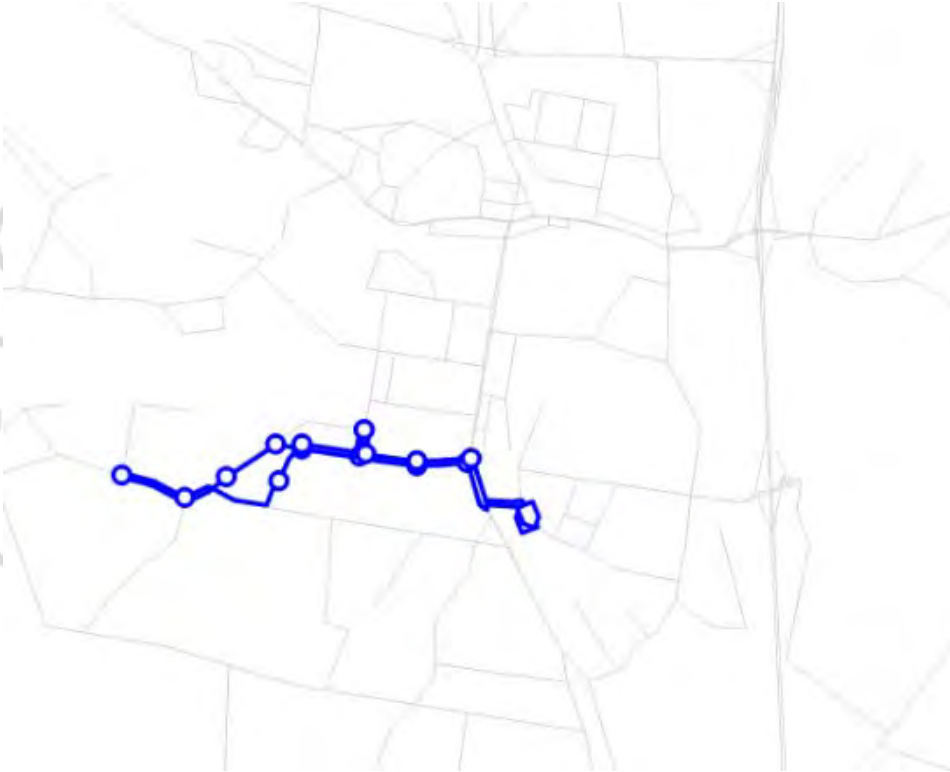


253897 Caboolture – Beachmere

282341/318165 Caboolture - Bribie Island

317881/317940 Caboolture – Woorim

320239/320279 Caboolture - Morayfield



320325 Morayfield Station - Beacon Station

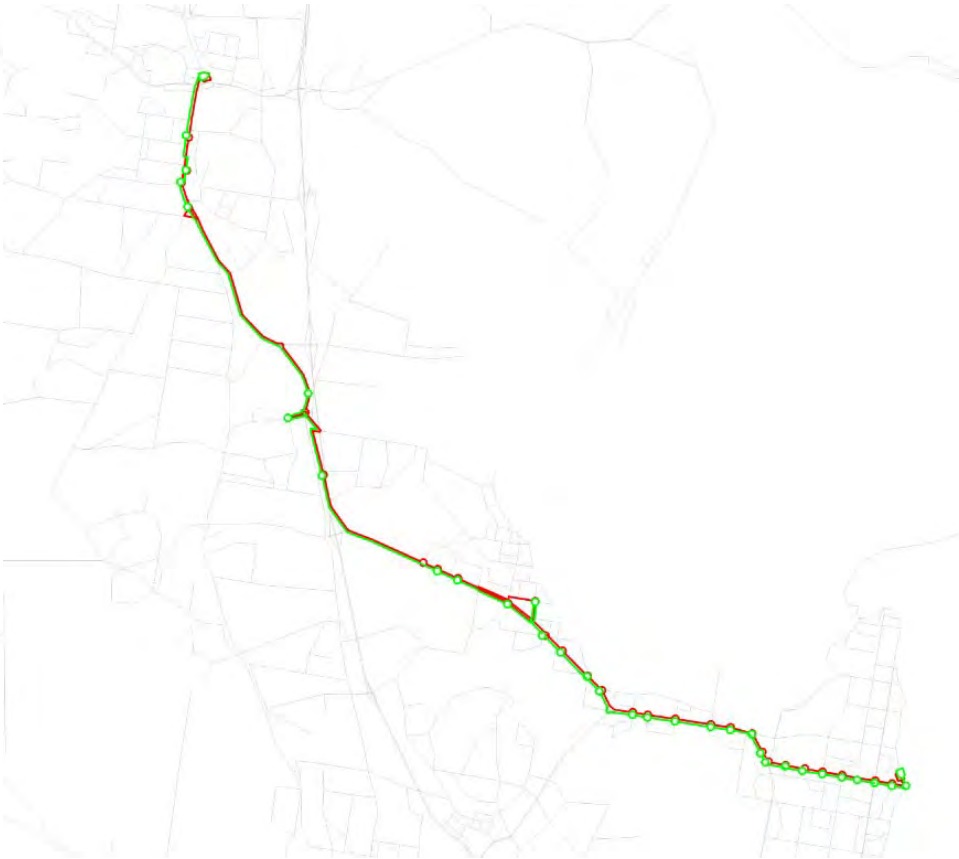
320494 Caboolture Central – Caboolture Hospital/TAFE/Uni

CSQ061/CSQ062 Caboolture Central – Caboolture West

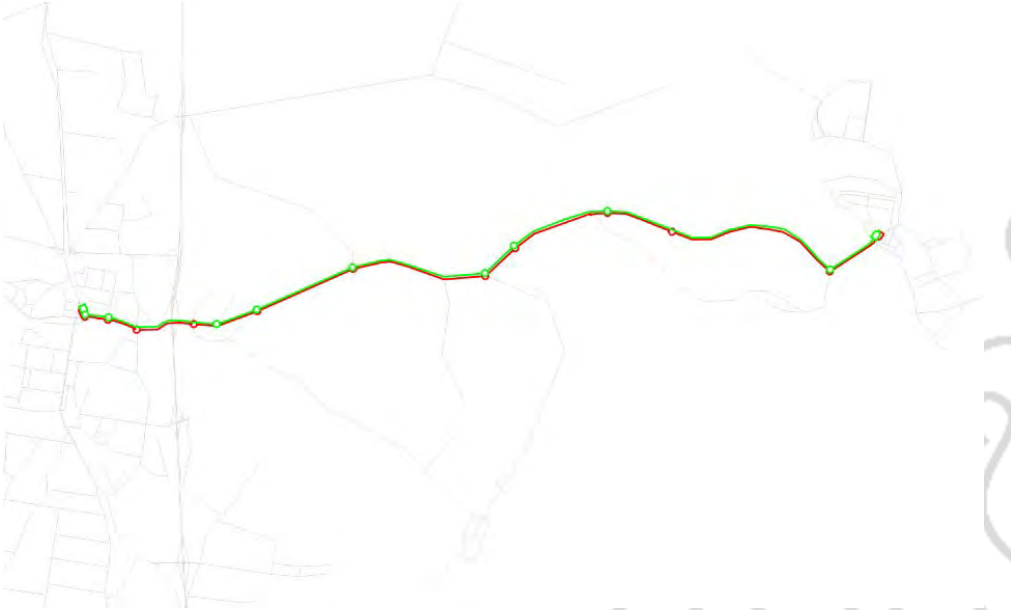
CSQ071/CSQ072 Caboolture - North Lakes

GF6561/GF6562 Caboolture – Upper Caboolture

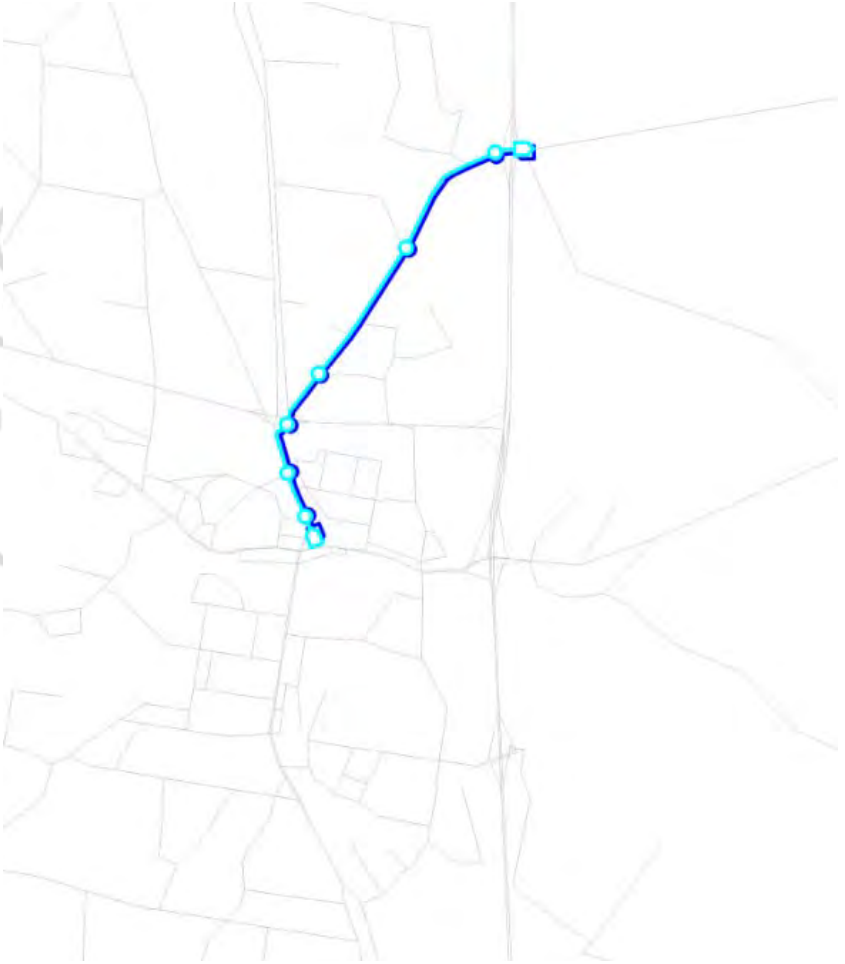
TNP051/TNP052 Caboolture - Redcliffe



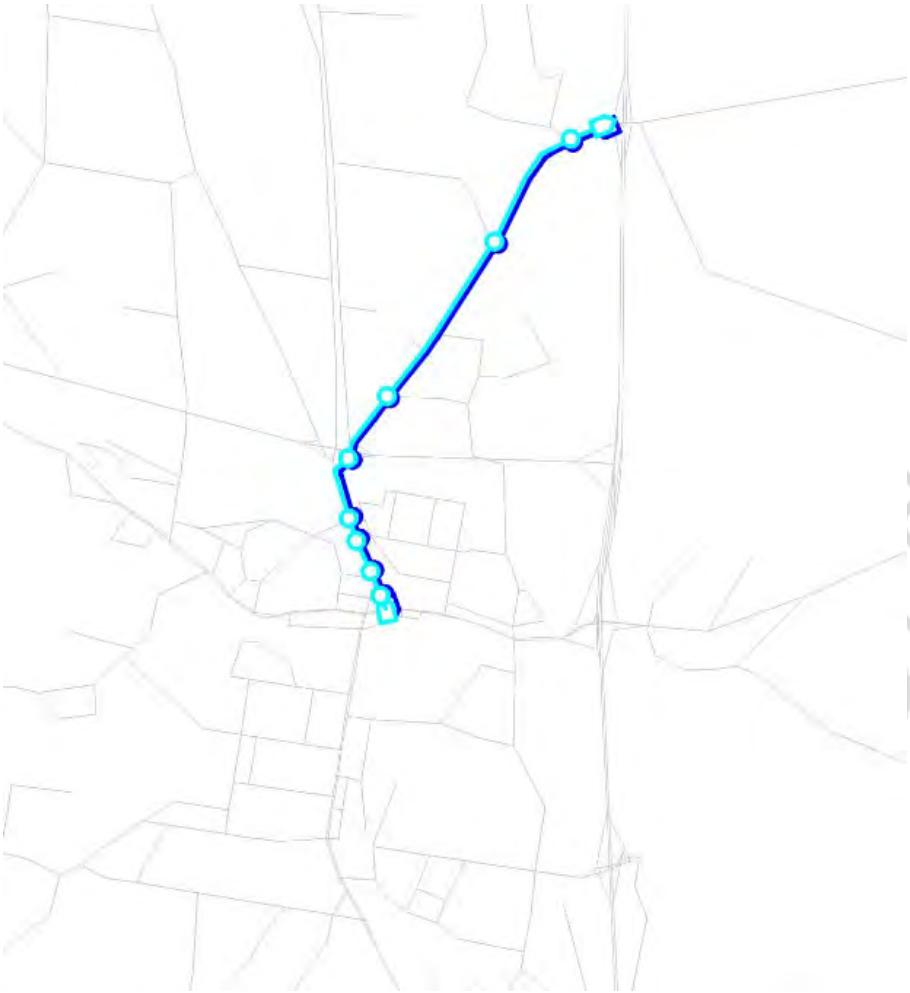
HAAAS1/ HAAAS2 Caboolture - Redcliffe



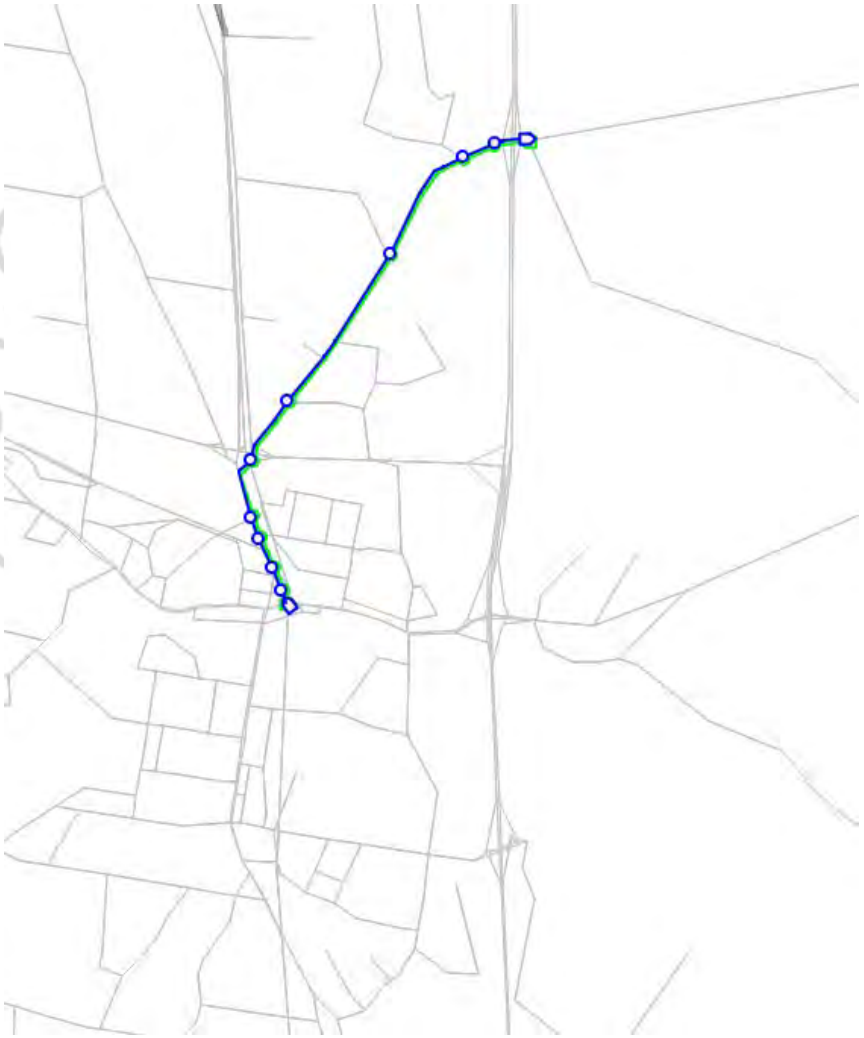
MIT011/MIT012 Caboolture - Bribie Island



MIT031/MIT032 Caboolture to Elimbah East



MIT131/MIT132 Caboolture - Elimbah East



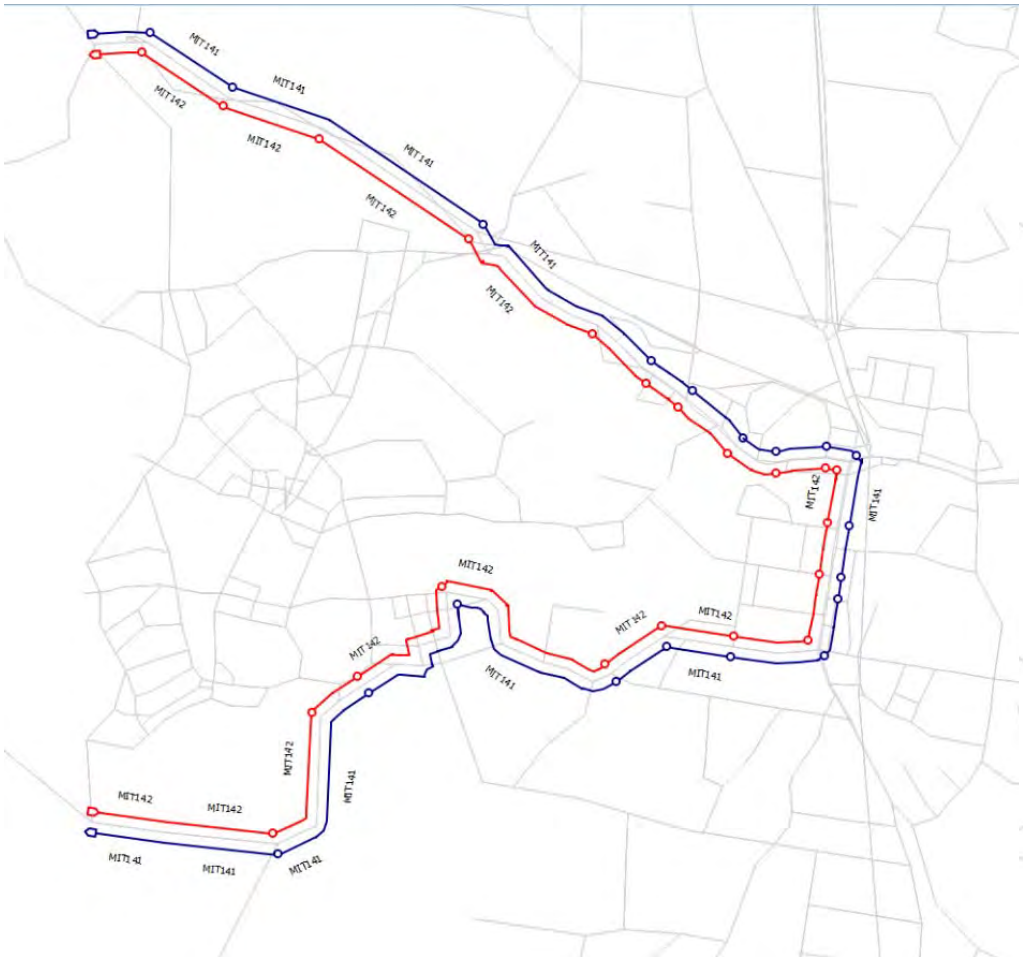
MIT033/MIT034 Caboolture - Elimbah East

MIT041/MIT042 Caboolture Centre – Moodlu

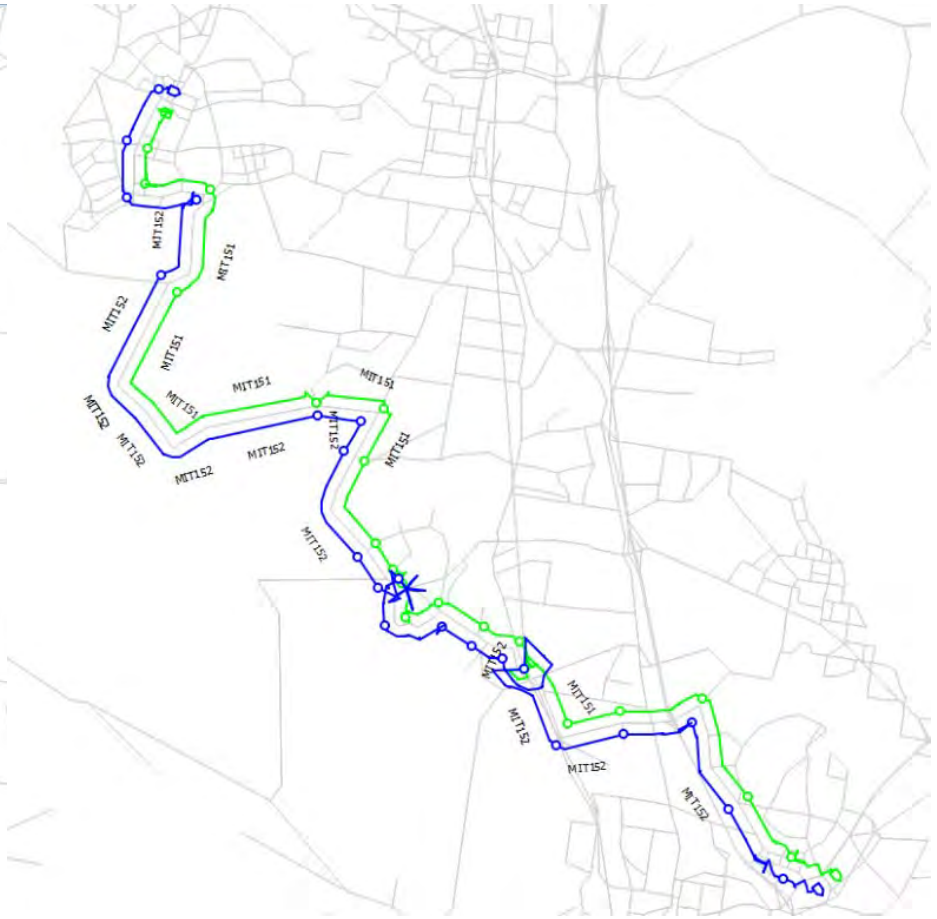
MIT051/MIT052 Cab West Town Centre – Moodlu

MIT101/MIT102 Caboolture Central - Woodford

MIT121/MIT122 Caboolture - Moodlu



MIT141/MIT142 Rocksberg - Wamuran



MIT151/MIT152 Caboolture West Town Centre - Northlakes

MIT161/MIT162 Caboolture - Narangba

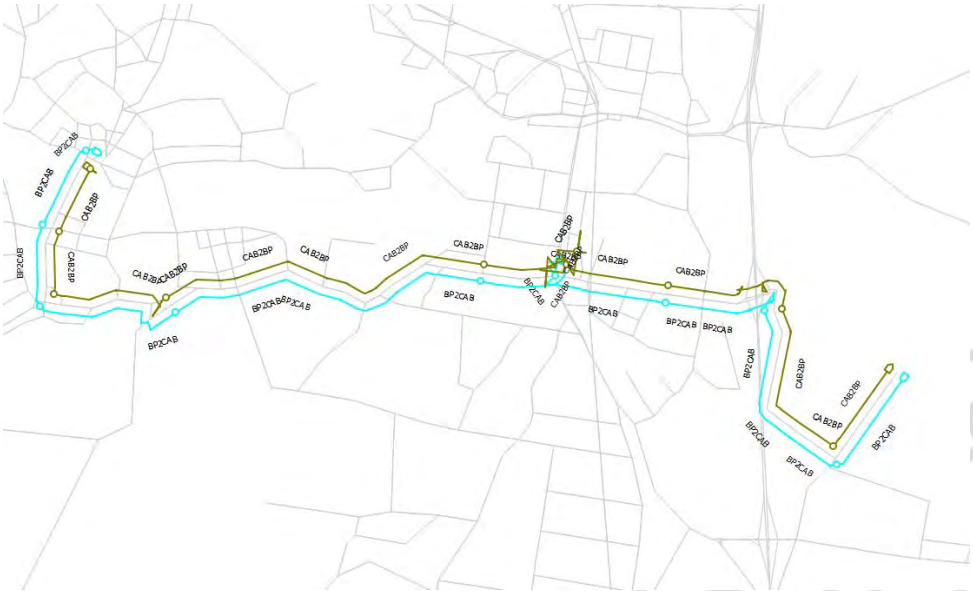
MIT172 Morayfield – Ningi

CABWAM/WAMCAB Caboolture - Wamuran

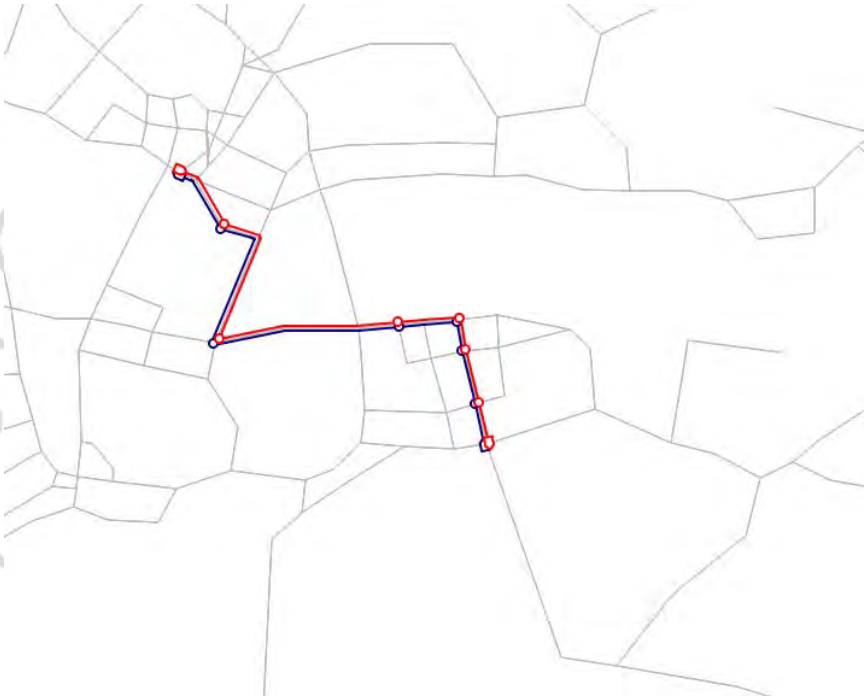
CBAH1I/ CBAH1O C-Bahn Service

CBAH2I/ CBAH2O C-Bahn Service

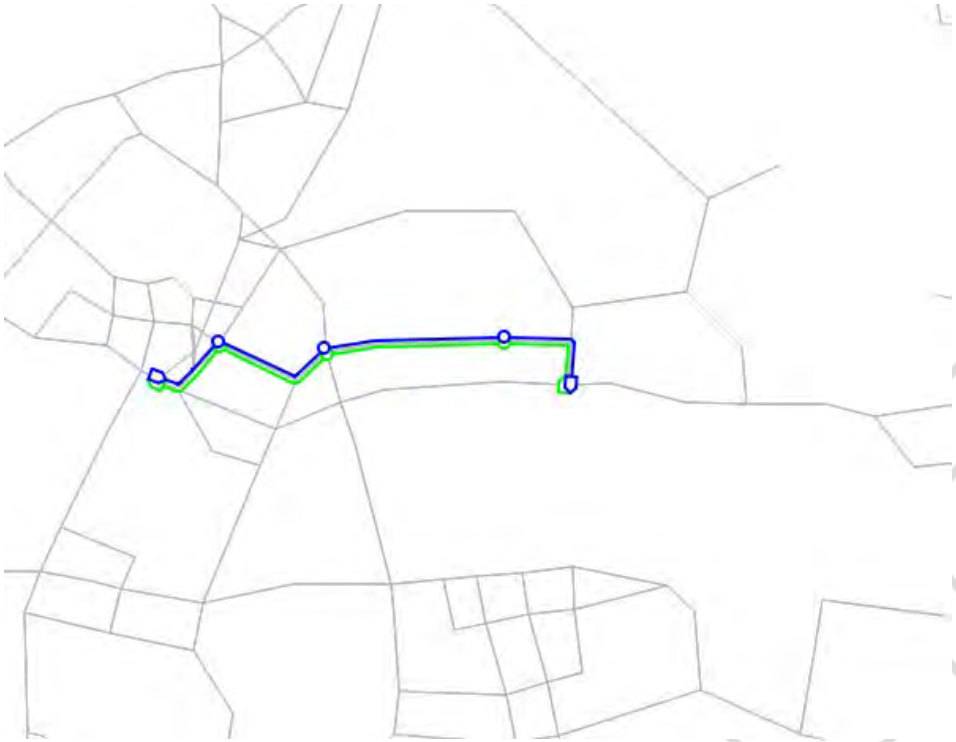
CBAH3I/ CBAH3O C-Bahn Service



CAB2BP/BP2CAB Caboolture West to Business Park



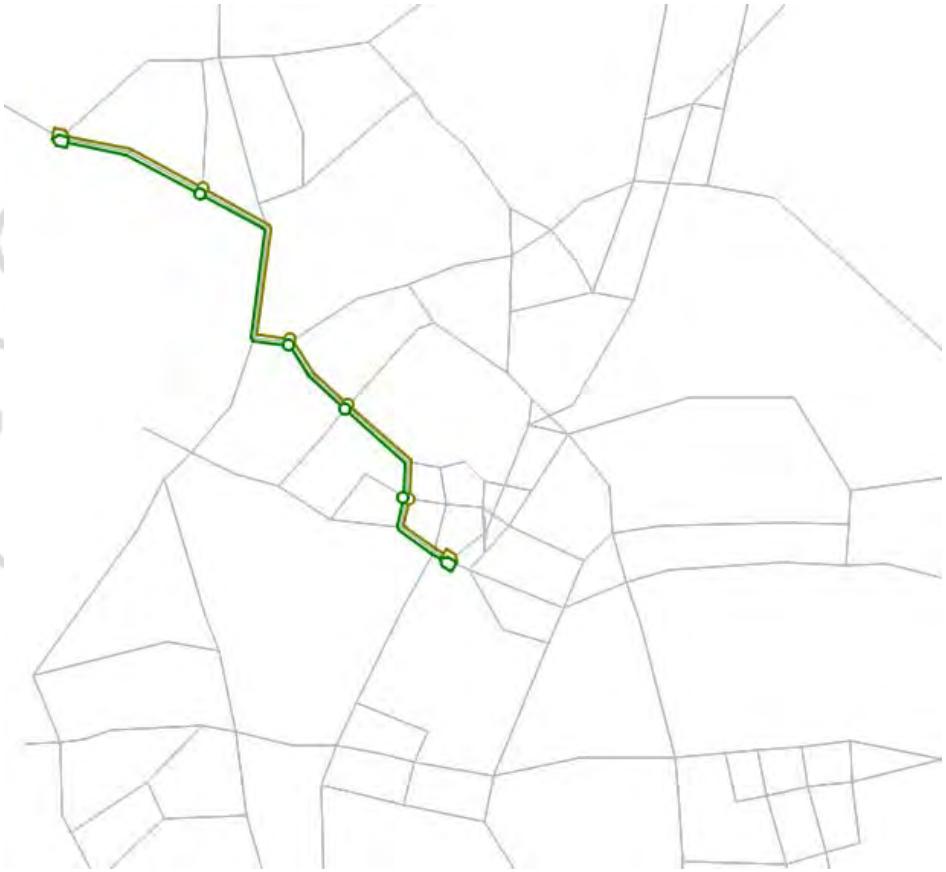
CABL1O/ CABL1I Cab West Local Feeder Service



CABL2O/ CABL2I Cab West Local Feeder Service

CABL3O/ CABL3I Cab West Local Feeder Service

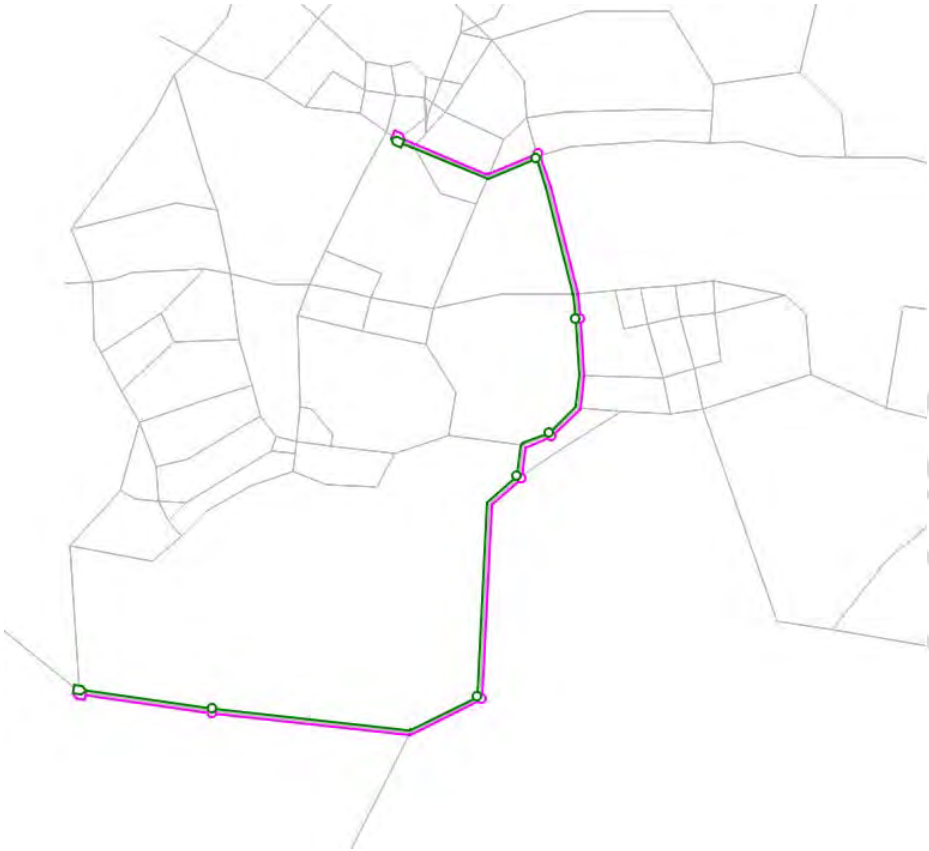
CABL4O/ CABL4I Cab West Local Feeder Service



CABL5O/ CABL5I Cab West Local Feeder Service

CABL6O/ CABL6I Cab West Local Feeder Service

CABL7O/ CABL7I Cab West Local Feeder Service



ROKCAB/CABROK Rocksberg - Caboolture Town Centre

MORLOP/LOPMOR Morayfield Loop

CABLOP/LOPCAB Caboolture Loop

2.3 Proposed Network

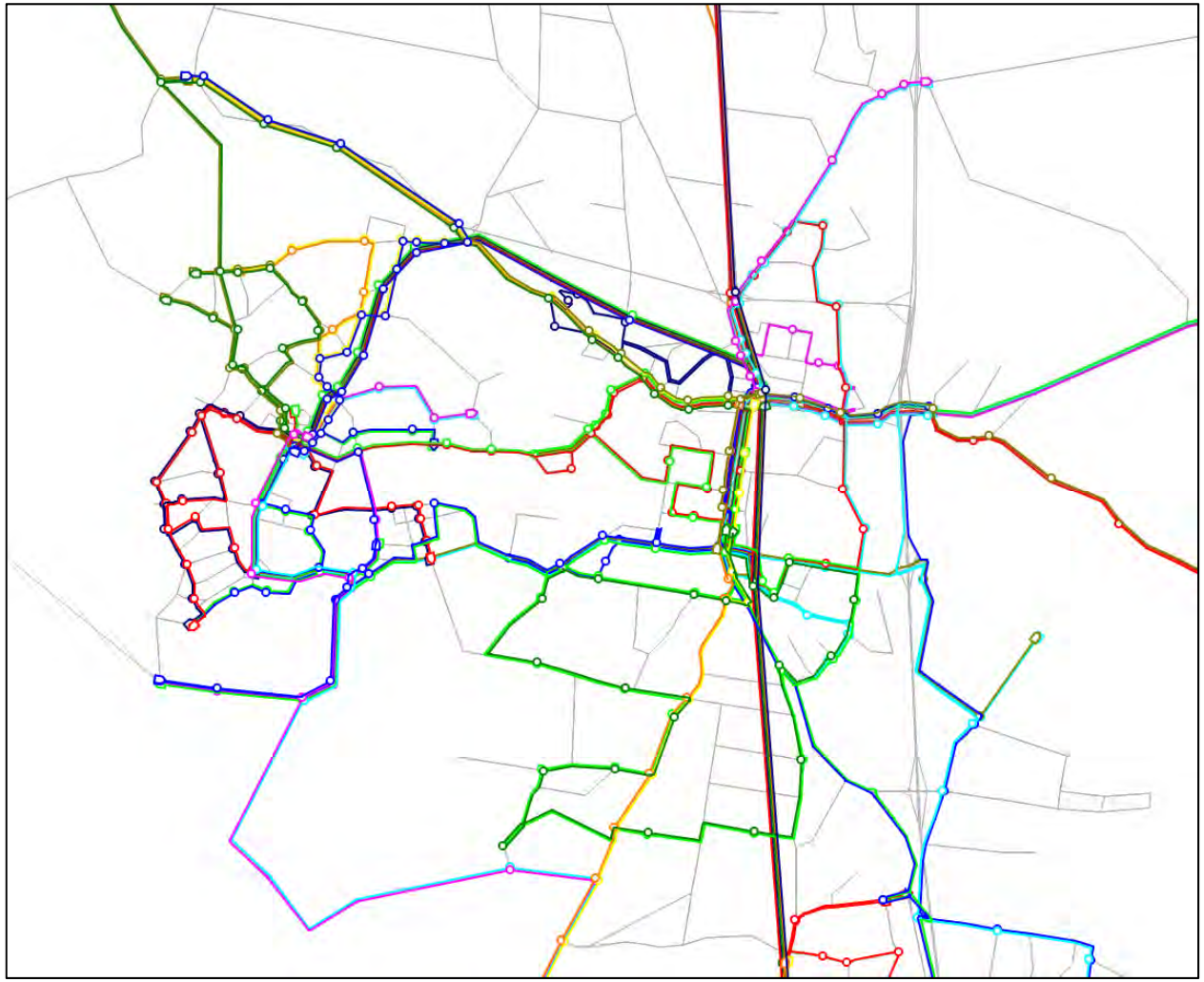


Figure 2 Proposed Network

Technical Note

229906 8 November 2013

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Troy Howarth	Roland Cathcart	Peter Dunn
Signature			

Appendix D

Road Network Analysis

Technical Note

ARUP

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Project title	Caboolture West	Job number	229906-00
cc		File reference	01TN
Prepared by	Vincent Chan	Date	5 December 2013
Subject	Comparison of layouts for external intersections requiring upgrades		

Table of Contents

Contents

1 Introduction

The purpose of this technical note is to present the layouts of intersections that require upgrades as a result of development in Caboolture West. This analysis assumed full development of Caboolture West assessed using a 2031 transport model.

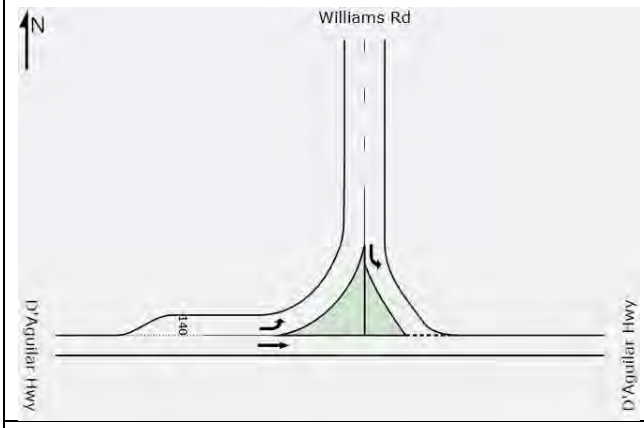
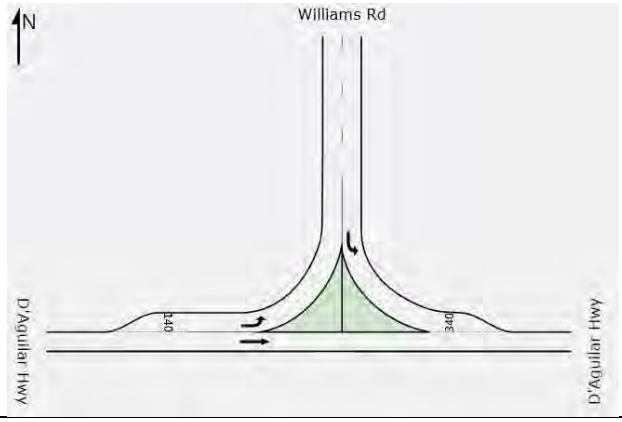
The layouts are presented in four sections below (Sections 2, 3, 4 and 5), categorised as follows:

- Section 2 compares the **existing and upgraded intersection** layouts for intersections where:
  - The intersection is not already expected to be upgraded;
  - The existing intersection would operate within capacity without Caboolture West; and
  - The existing intersection would operate above capacity with Caboolture West and therefore requires upgrading.
- Section 3 compares the **"expected upgrade" and "full upgrade"** intersection layouts for intersections where:
  - The intersection is already expected to be upgraded under current planning or assumptions;
  - The "expected upgrade" would operate within capacity without Caboolture West; and
  - The "expected upgrade" would operate above capacity with Caboolture West and therefore requires further upgrading.
- Section 4 compares the **"do minimum" and "full upgrade"** intersection layouts for intersections where:
  - The intersection is not already expected to be upgraded;
  - The existing intersection would operate above capacity without Caboolture West and therefore a "do minimum" upgrade is required; and
  - The "do minimum" would operate above capacity with Caboolture West and therefore requires further upgrading.
- Section 5 presents the "**expected upgrades" due to Caboolture West**. These are intersections that would be upgraded as a result of upgrading a road link (e.g. widening of Caboolture River Road to 4 lanes).

2 Comparison with Existing Layouts

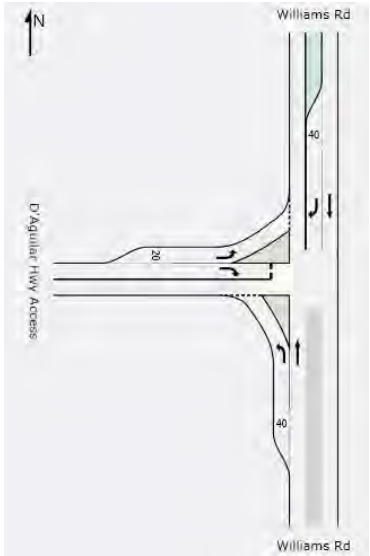
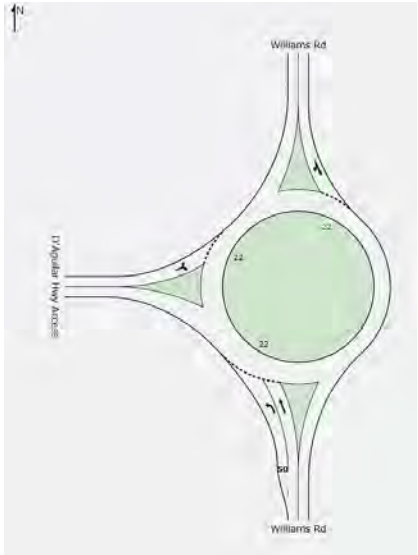
2.1 D'Aguilar Highway / Williams Road (node 16986)

This on-ramp is currently a "give way" arrangement (shown on the left below). The proposed upgrade is a continuous lane, with an acceleration lane and merge to the east. This would likely also necessitate reconstruction of the loop road connection to ensure an adequate radius can be provided.

	
Existing layout	Upgraded layout

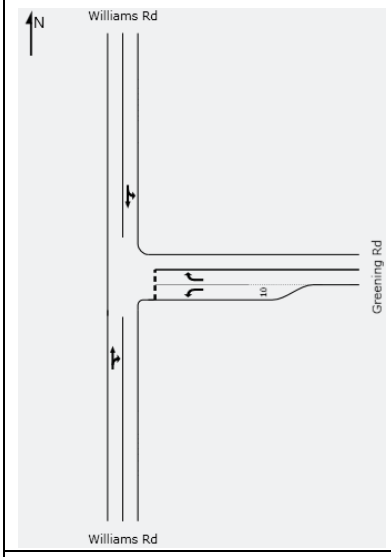
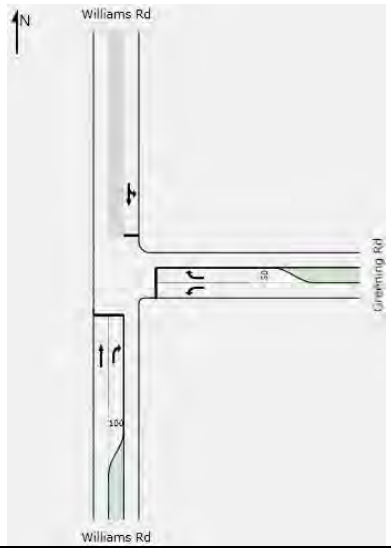
2.2 Williams Road / D'Aguilar Highway onramp (node 17036)

This intersection is currently a priority controlled intersection. The proposed upgrade is to convert this to a one-lane roundabout.

	
Existing layout	Upgraded layout

2.3 Williams Road / Greening Road (node 17074)

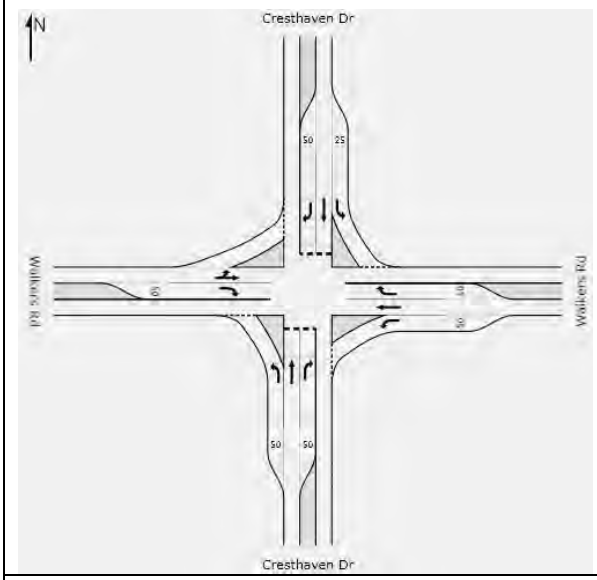
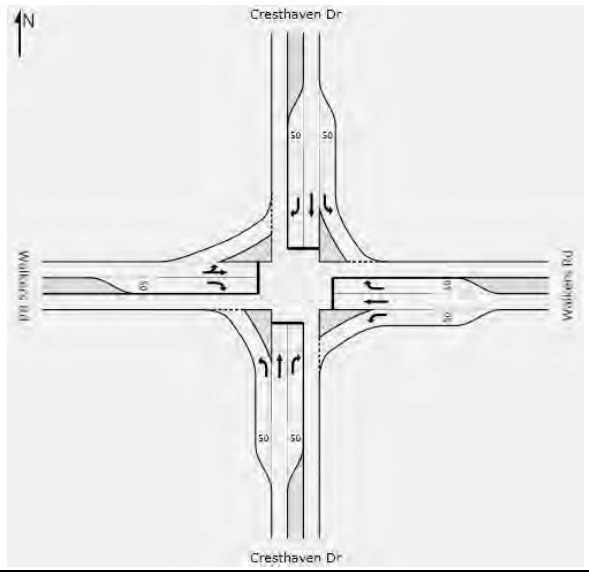
This intersection is proposed to be upgraded from being priority controlled to being signalised.

	
Existing layout	Upgraded layout

2.4 Walkers Road / Cresthaven Drive (node 17879)

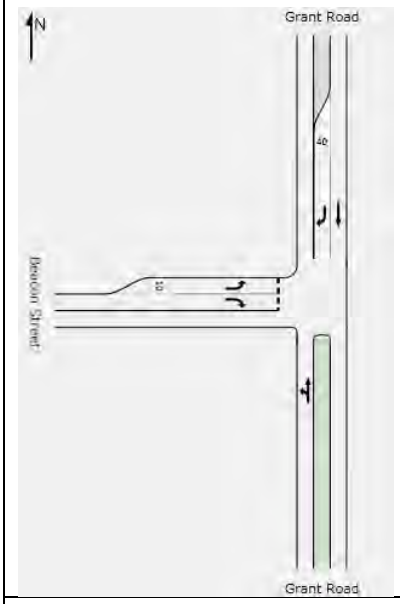
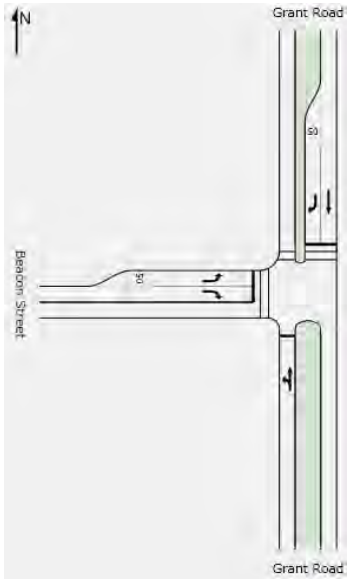
The existing intersection is a priority controlled intersection. It was assumed that a new approach from the south would be required in the future and that this would also be priority controlled.

In order to allow the intersection to operate satisfactorily with Caboolture West traffic, it was assumed to be signalised.

	
Existing layout	Upgraded layout

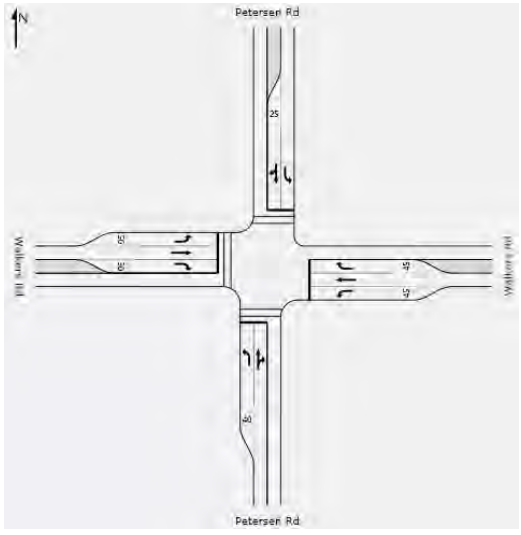
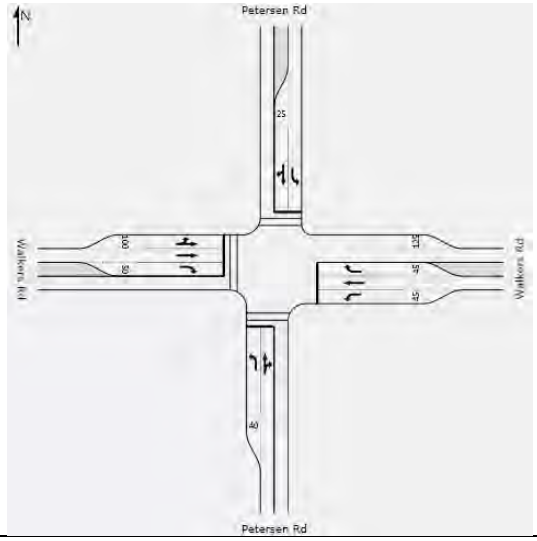
2.5 Grant Road / Beacon Street (node 18407)

The existing intersection is a priority controlled intersection. The proposed upgrade is to signalise the intersection.

	
Existing layout	Upgraded layout

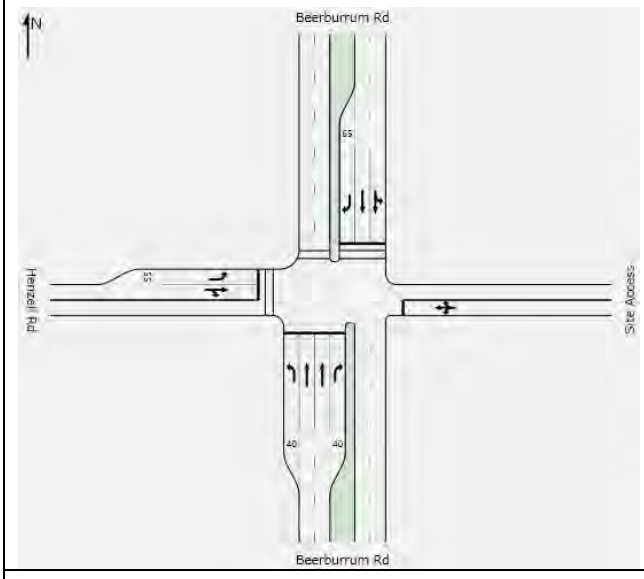
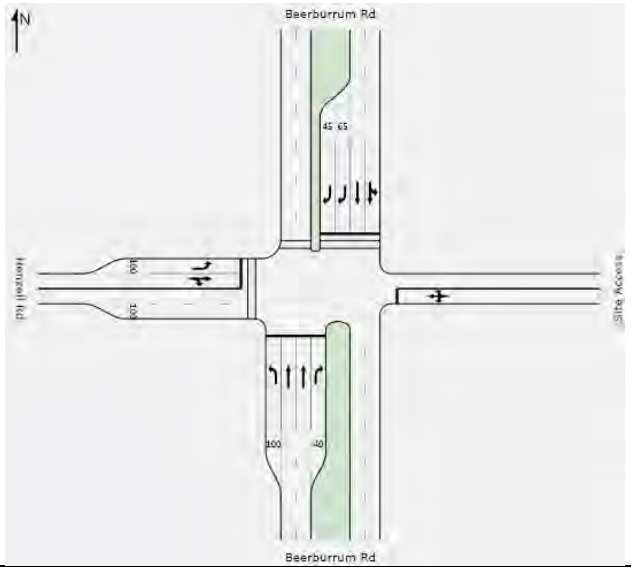
2.6 Walkers Road / Petersen Road (node 18889)

The existing intersection is a signalised intersection. The proposed upgrade introduces a short eastbound through lane.

	
Existing layout	Upgraded layout

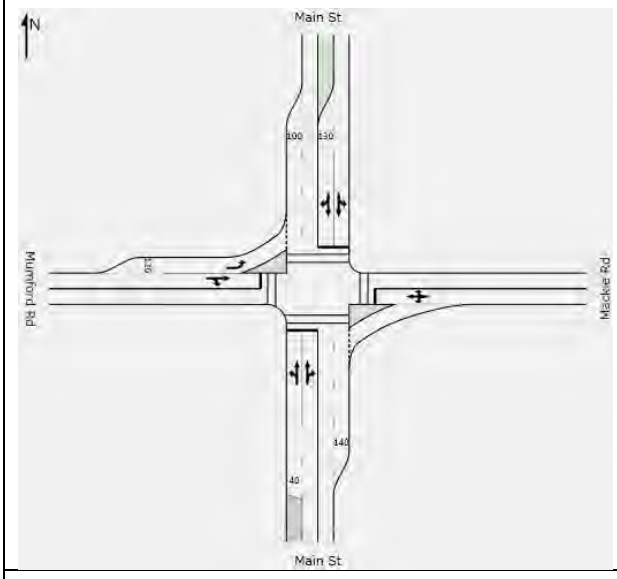
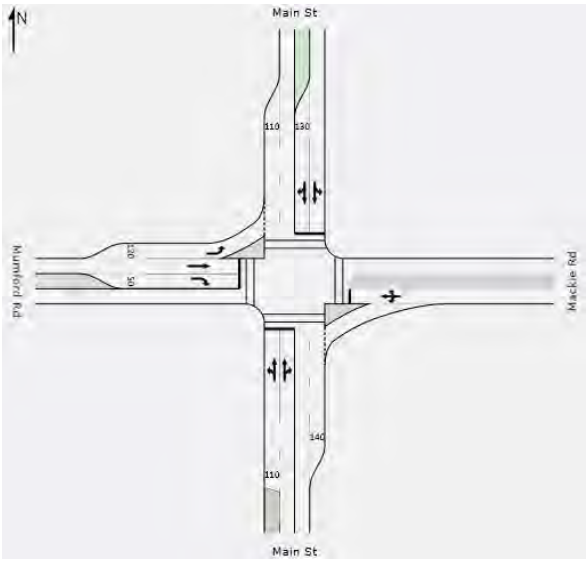
2.7 Beerburrum Road / Henzell Road (node 19505)

This is currently a signalised intersection. The proposed upgrade includes providing longer turn lanes on Henzell Road and a double right turn into Henzell Road (with a short second lane westbound).

	
Existing layout	Upgraded layout

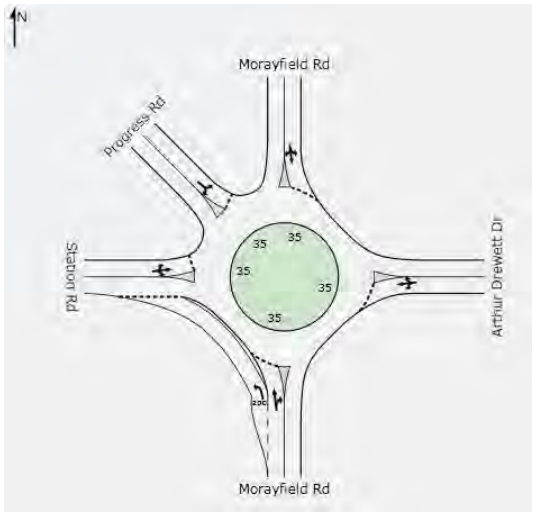
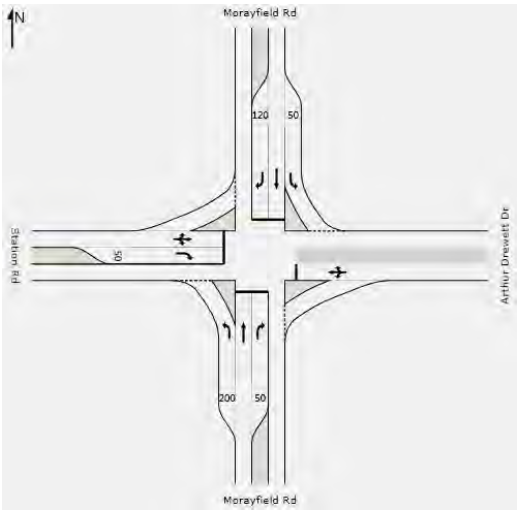
2.8 Narangba Road / Main Street / Mumford Road / Mackie Road (node 20533)

This intersection is currently a signalised intersection. The proposed upgrade includes lengthening short lanes on the northern and southern approaches, and providing a separate short right turn lane on the west approach.

	
Existing layout	Upgraded layout

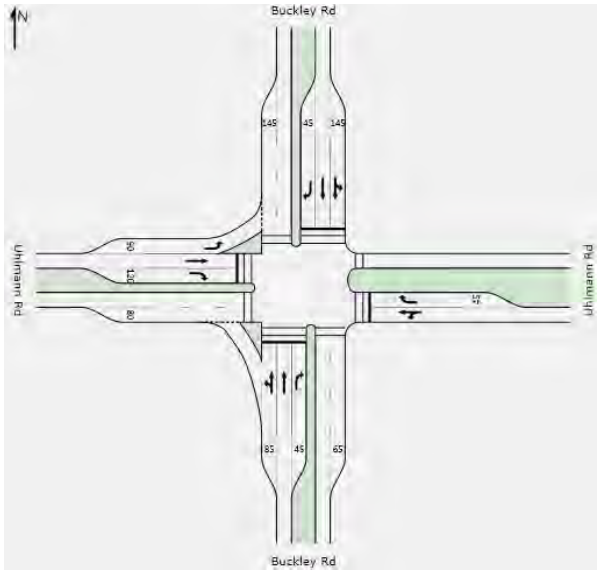
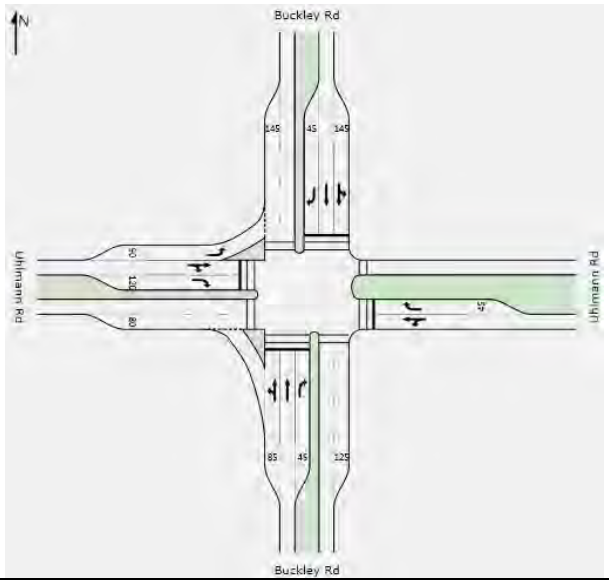
2.9 Progress Road / Arthur Drewett Drive (node 22241)

The current intersection layout is a one-lane roundabout with five approaches. The proposed upgraded layout involves signalising the intersection and removing the Progress Road approach from the intersection and redirecting access to be via Morayfield Road.

	
Existing layout	Upgraded layout

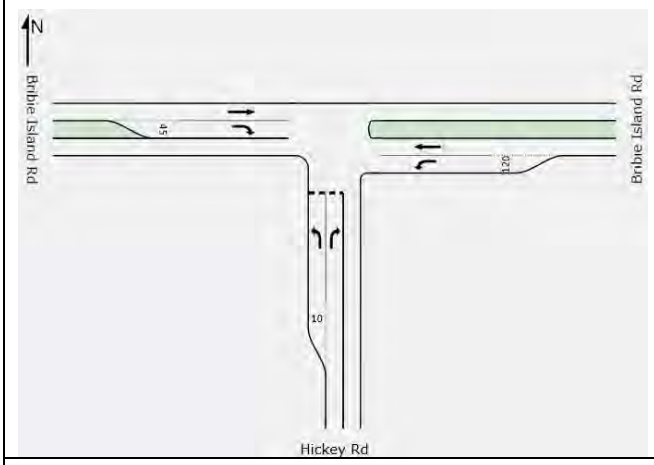
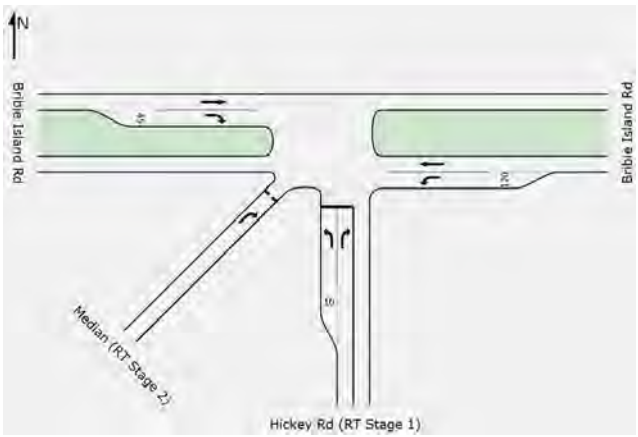
2.10 Uhlmann Road / Buckley Road (node 23040)

This intersection is currently signalised. The proposed upgrade involves re-assigning the through lane on the western approach to being a shared through/right turn lane, and providing a longer downstream short lane on the southern exit.

	
Existing layout	Upgraded layout

2.11 Bribie Island Road / Hickey Road (node 24614)

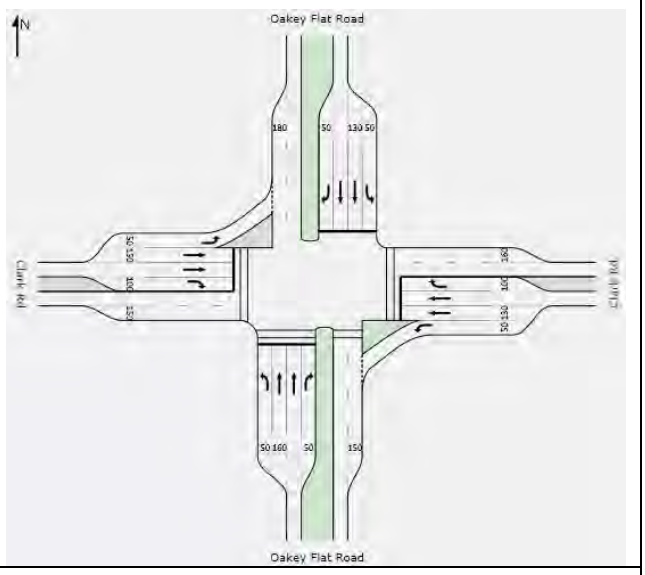
This intersection is currently a standard priority-controlled intersection. It is proposed to upgrade this intersection to a "seagull" arrangement.

	
Existing layout	Upgraded layout

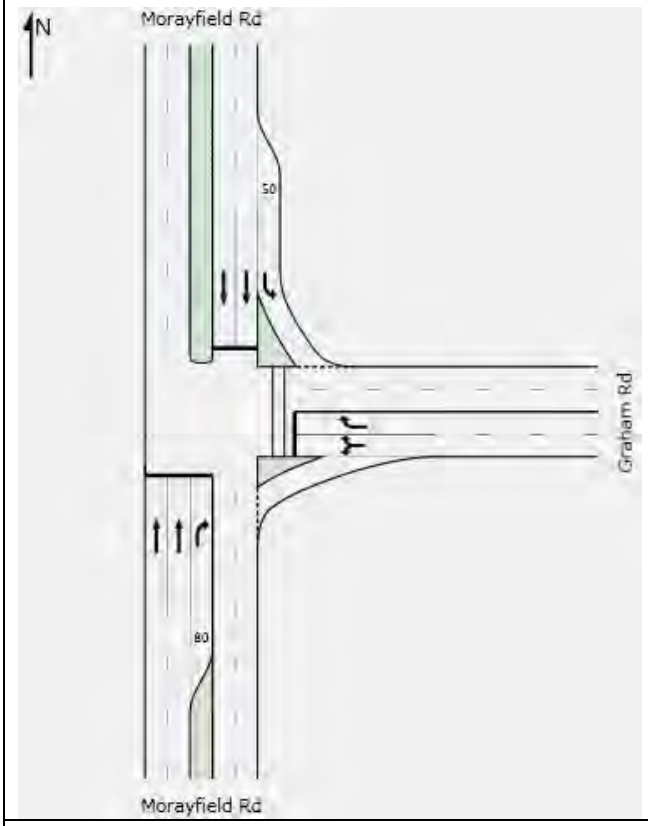
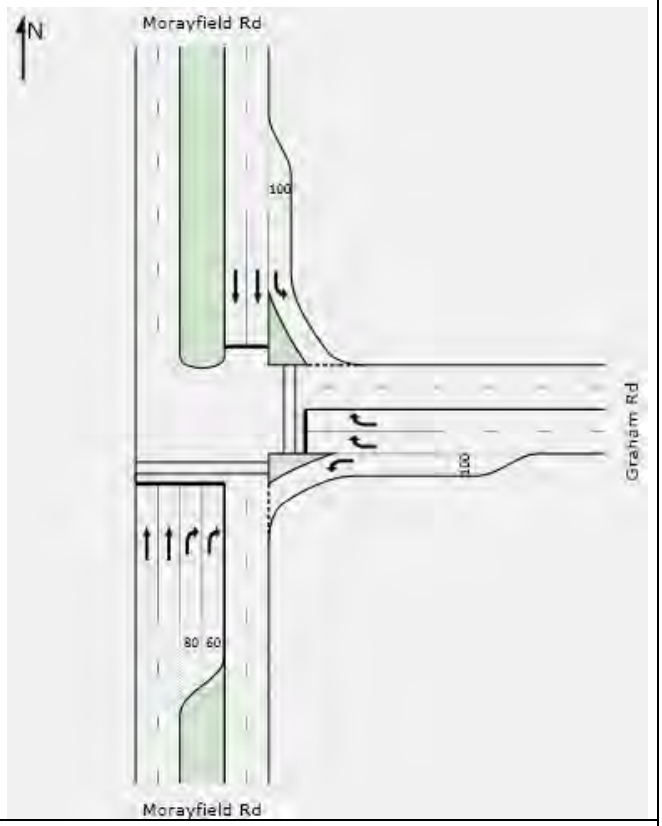
3 Comparison with Expected Upgrade

3.1 Oakey Flat Road / Clark Road (node 18794)

This intersection was expected to be signalised in the future. The signalisation of the intersection would be sufficient for the “no Caboolture West” scenario, but it would not be sufficient for the “with Caboolture West” scenario” when a new connection is provided to the west of the intersection. The proposed upgrade involves locally widening both Clark Road and Oakey Flat Road to four lanes.

	
Expected upgrade (without Caboolture West)	Expected upgrade (with Caboolture West)

3.2 Morayfield Road / Graham Road (node 20321)

	
Expected upgrade	Upgraded layout

4 Comparison with "Do Minimum"

4.1 Morayfield Road / Caboolture River Road (node 19267)

This intersection is currently a signalised intersection with four approaches. The traffic volumes through this intersection were found to be very high in both the "with Caboolture West" and "without Caboolture West" scenarios. As such, the "Do Minimum" layout required to accommodate the future "without Caboolture West" traffic is quite significant, with a widening of Morayfield Road south of the intersection to six lanes, a widening of Caboolture River Road west of the intersection to four lanes, and additional short lanes for through and turning traffic.

It was assumed that Buchanan Road would be upgrade to 4 lanes in the future and that a grade separated crossing over the rail line would be provided.

A further upgrade to the intersection was considered, which would operate over the desired standard of service (but still operate within 100% of capacity) in the "with Caboolture West" scenario. Further measures to increase the capacity of the intersection may need to be investigated. This may include rationalising turning movements, grade separation of movements or providing an alternative traffic route.

Such measures are beyond the scope of this study and would need to be considered as part of a holistic Morayfield traffic study.

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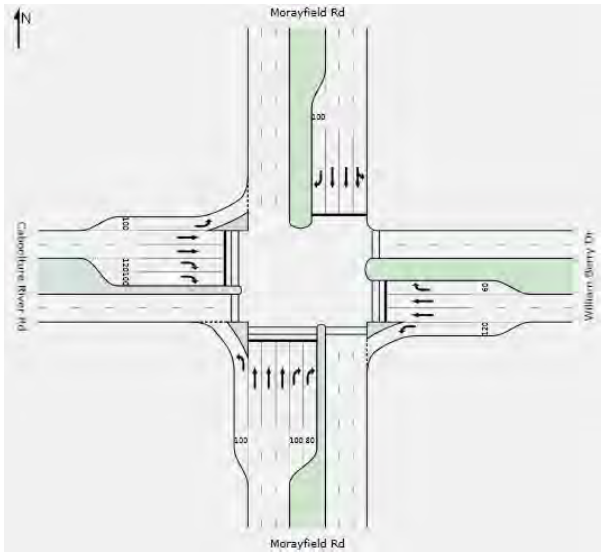
<td> 
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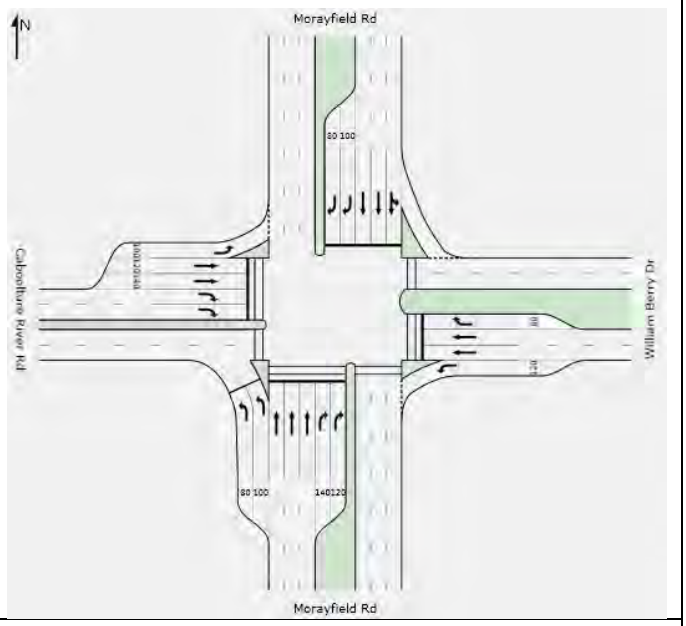
<td> 
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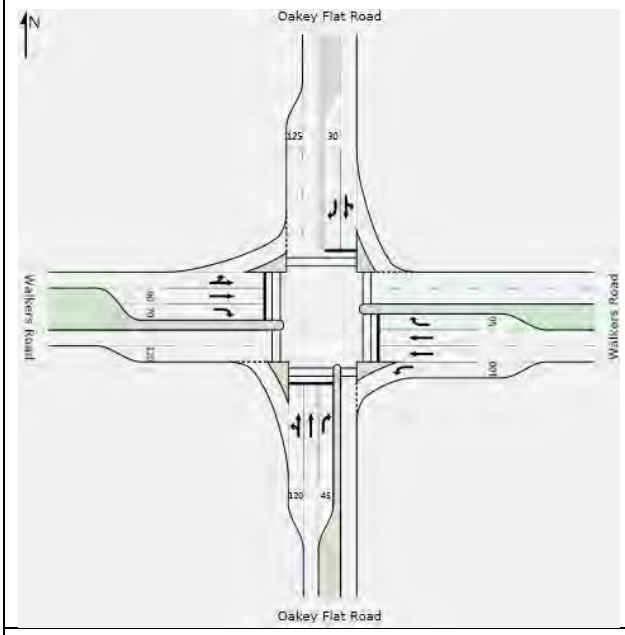
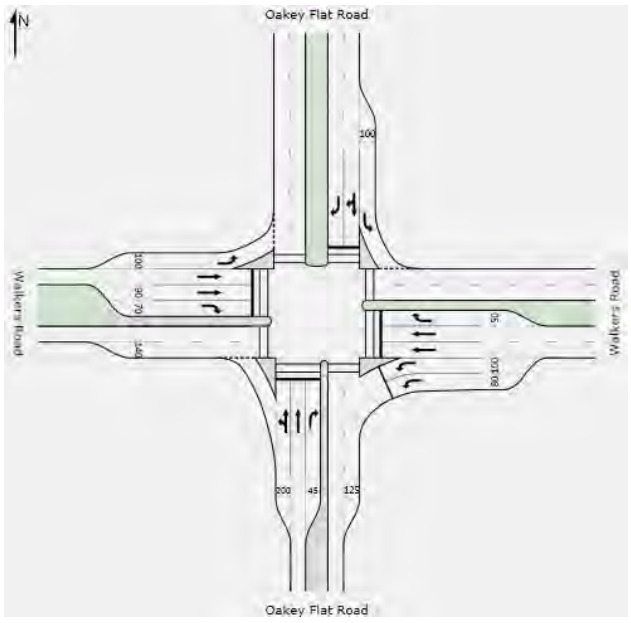
</tr>
<tr>
<td>"Do Minimum" layout</td>
<td>Full upgrade</td>
</tr>
</table>

4.2 Oakey Flat Road / Walkers Road (node 19325)

In addition to the "Do Minimum" layout required to accommodate traffic volumes in the "without Caboolture West" scenario, the "full upgrade" layout includes:

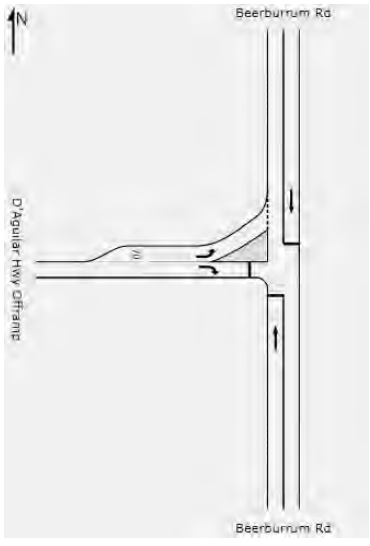
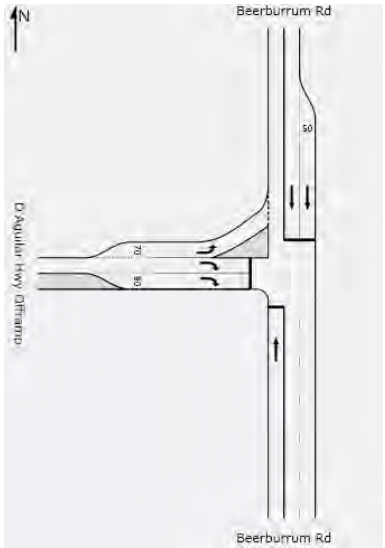
- Widening of Oakey Flat Road north of the intersection to four lanes;
- Additional short turning lanes from the east and west on Walkers Road; and

- Lengthened short lanes on all approaches.

	
"Do Minimum" layout	Upgraded layout

4.3 D'Aguilar Highway off-ramp / Beerburrum Road (node 19202)

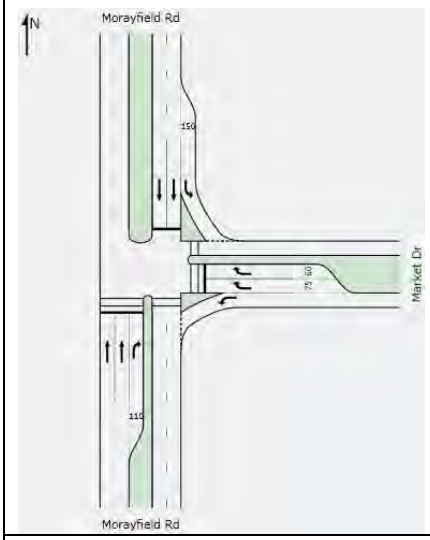
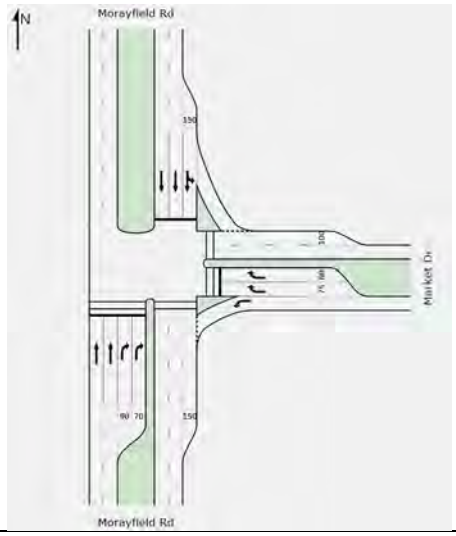
The additional traffic generated by the Caboolture West development causes this intersection to require a further upgrade compared to the "Do Minimum" scenario. This upgrade includes an additional right turn lane from the D'Aguilar Highway offramp, and a widening of Beerburrum Road southbound to two lanes south of the intersection.

	
"Do Minimum" layout	Upgraded layout

4.4 Morayfield Road / Market Drive (node 19473)

The current layout of this intersection would require some upgrades (including lengthening the right turn lane from the south and conversion of the left turn lane from the north to a slip lane) to accommodate the future "without Caboolture West" traffic. This is shown as the "Do Minimum" layout below on the left.

Additional short through and turn lanes are required in order to accommodate the Caboolture West traffic.

	
"Do Minimum" layout	Upgraded layout

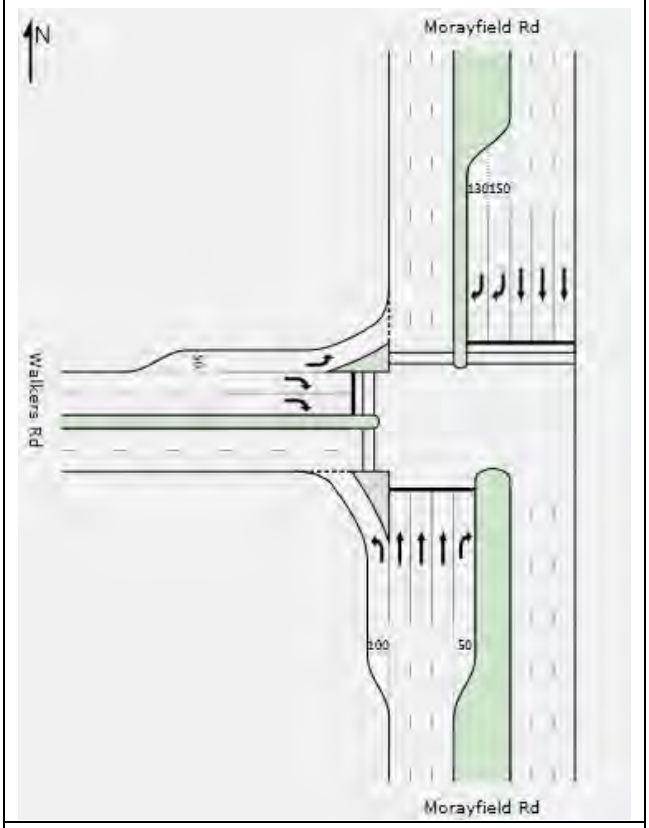
4.5 Morayfield Road / Walkers Road (node 19604)

This intersection is currently a signalised intersection with three approaches. The traffic volumes through this intersection were found to be very high in both the "with Caboolture West" and "without Caboolture West" scenarios.

As such, the "Do Minimum" layout required to accommodate the future "without Caboolture West" traffic is quite significant, with a widening of Morayfield Road north and south of the intersection to six lanes and additional short lanes for through and turning traffic.

It was considered that further expanding the intersection footprint for the "with Caboolture West" scenario would be unreasonable. Further measures to increase the capacity of the intersection would need to be investigated. This may include rationalising turning movements, grade separation of movements or providing an alternative traffic route.

Such measures are beyond the scope of this study and would need to be considered as part of a holistic Morayfield traffic study.

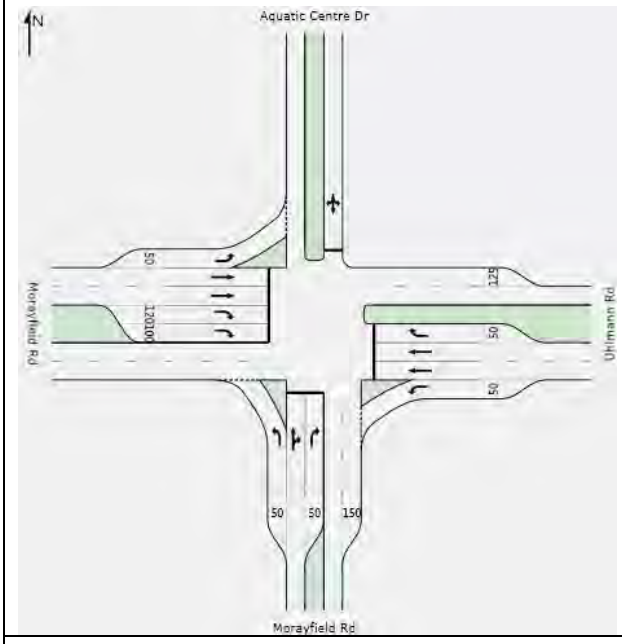
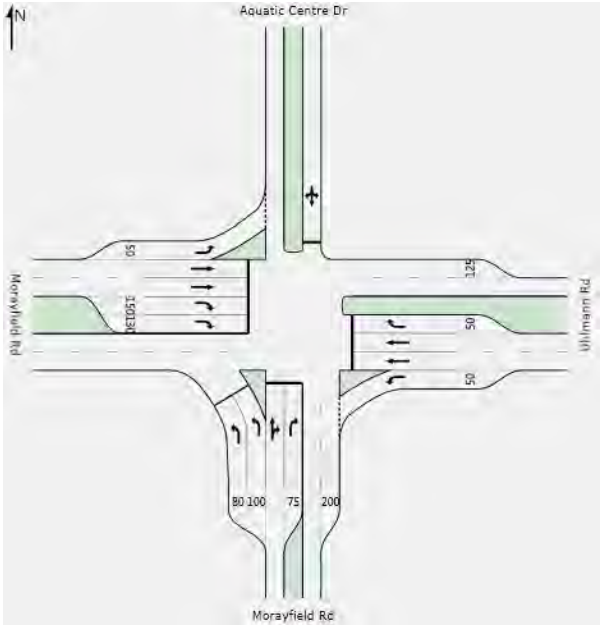


"Do Minimum" layout

4.6 Morayfield Road / Uhlmann Road (node 21583)

This intersection is currently a two lane roundabout with four approaches. Intersection assessment showed that the existing layout would not have sufficient capacity to cater for both the "without Caboolture West" traffic volumes.

A "Do Minimum" layout has been assumed which includes signalising the intersection. Further upgrades to the intersection would then be , required to cater for the "with Caboolture West" scenario. This full upgrade includes longer turn lanes and a double signalised left turn from the south.

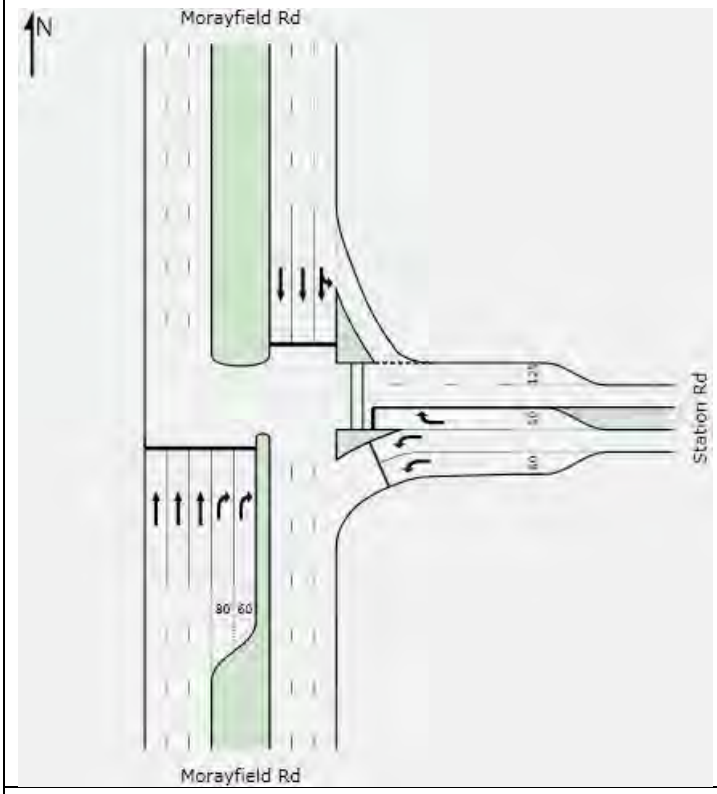
	
"Do Minimum" layout	Upgraded layout

4.7 Morayfield Road / Station Road (node 19393)

The Morayfield Road / Station Road intersection is currently a 2 lane roundabout. This was found to fail in the future under the "without Caboolture West" traffic volumes.

Therefore a Do Minimum upgrade was assumed, which included signalisation of the intersection. The number of lanes required for the intersection suggests that Morayfield Road would need 6 lanes in this location, requiring bridge structures on the northern side of the intersection to be widened (or replaced).

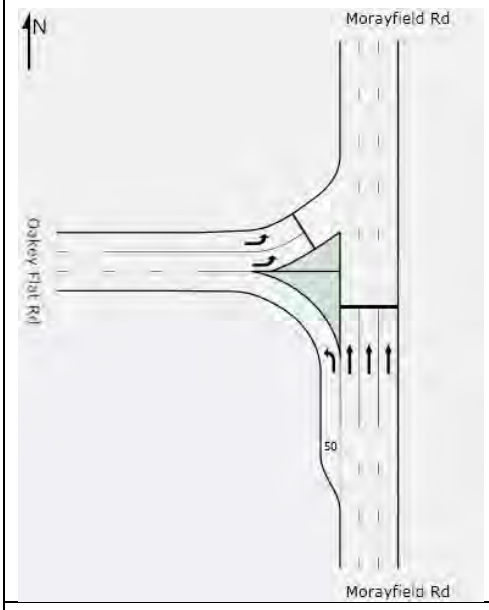
The Do Minimum case was found to operate satisfactorily in both the "with Caboolture West" and "without Caboolture West" scenarios.



"Do Minimum" layout

4.8 Morayfield Road / Oakey Flat Road (node 19463)

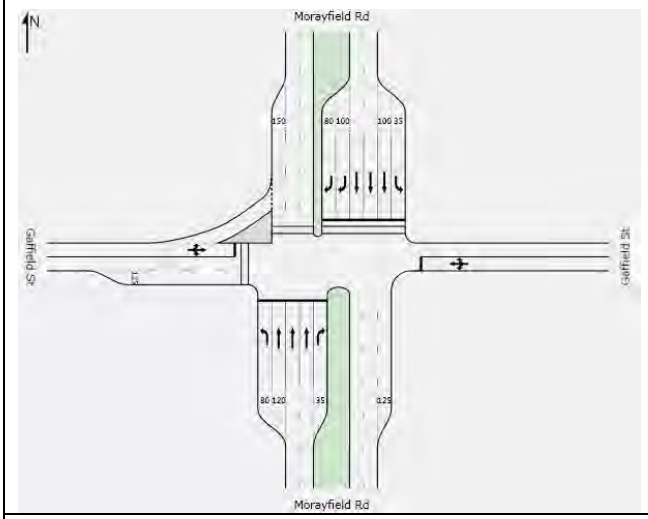
The Morayfield Road / Oakey Flat Road intersection is currently a priority controlled intersection, with a double left slip from Oakey Flat Road. This intersection was predicted to operate above capacity in the "with Caboolture West" and "without Caboolture West" scenarios. The "Do Minimum" upgrade included widening Oakey Flat Road to six lanes (three lanes northbound). This was found to operate satisfactorily in both the "with Caboolture West" and "without Caboolture West" scenarios.



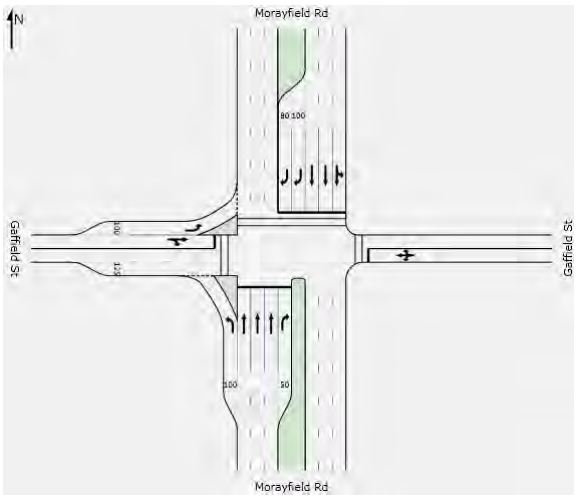
Upgraded layout

4.9 Morayfield Road / Shopping Centre Access near Gaffield Street (node 19709)

This intersection is currently signalised. The "Do Minimum" upgrade includes additional short through and turning lanes, however, this is not sufficient to cater for the Caboolture West traffic volumes. For those volumes, a full widening of Morayfield Road to six lanes is required.



"Do Minimum" layout



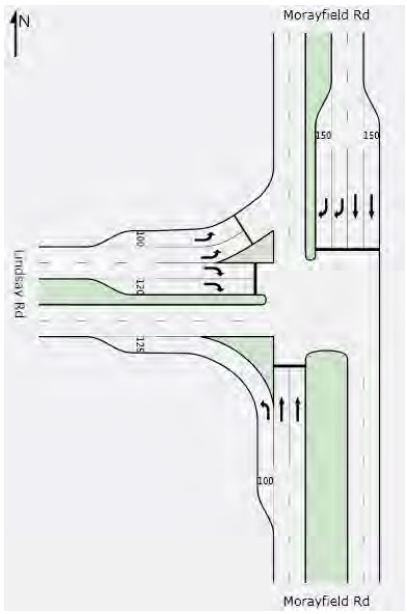
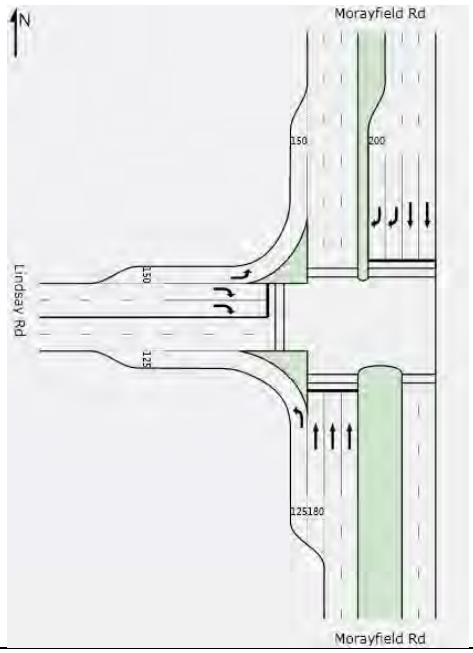
Upgraded layout

4.10 Morayfield Road / Lindsay Road (node 20038)

The existing Morayfield Road / Lindsay Road intersection is a four-way signalised intersection. As the traffic volumes using this intersection are increased significantly in the future (with or without

the development in Caboolture West), it was assumed that the shopping centre approach would be separated from this intersection to produce two T-intersections in order to provide sufficient capacity.

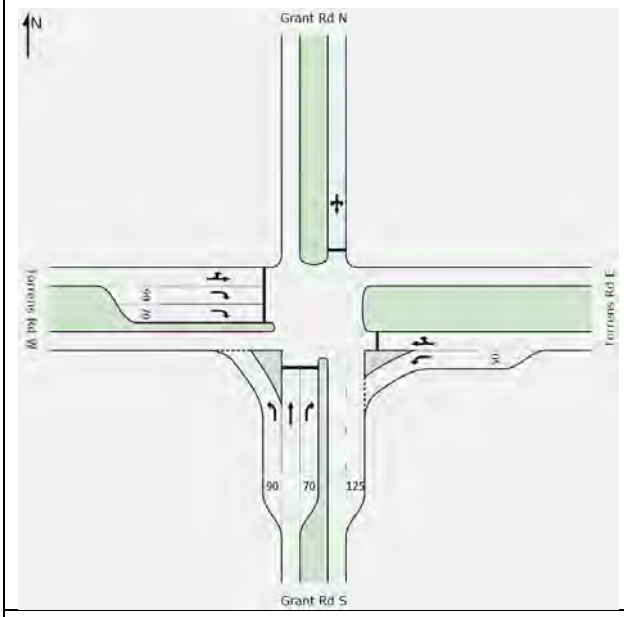
The Do Minimum case retains Morayfield Road as a four lane road at this intersection, however, this layout is not sufficient to accommodate the Caboolture West volumes. The full upgrade involves widening Morayfield Road to six lanes to the north of this intersection.

	
"Do Minimum" layout	Upgraded layout

4.11 Grant Road / Torrens Road (node 80460)

This intersection is currently a one lane roundabout. This layout is expected to operate satisfactorily in the future in the "without Caboolture West" scenario.

The additional traffic travelling between the western and southern approaches of this intersection due to Caboolture West require the intersection to be upgraded to a signalised intersection.



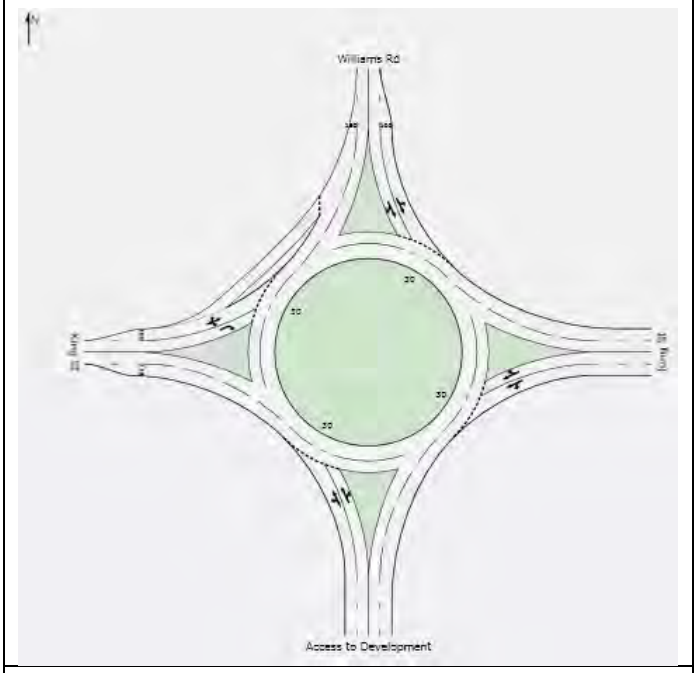
Upgraded layout

5 Expected Upgrades

This section presents the layouts of expected upgrades to intersections that are predicted to operate satisfactorily with Caboolture West traffic.

5.1 King Street / Williams Road / Access to Development (node 16974)

This intersection provides the northern access point for Caboolture West, and is expected to be upgraded from its current layout (a priority controlled intersection) to a two-lane roundabout. The expected layout is presented below.

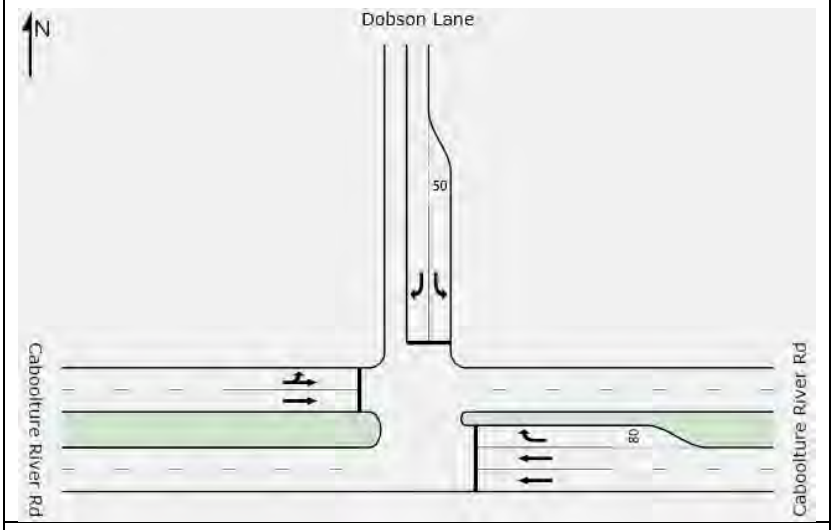


Upgraded layout

5.2 Intersections along Caboolture River Road

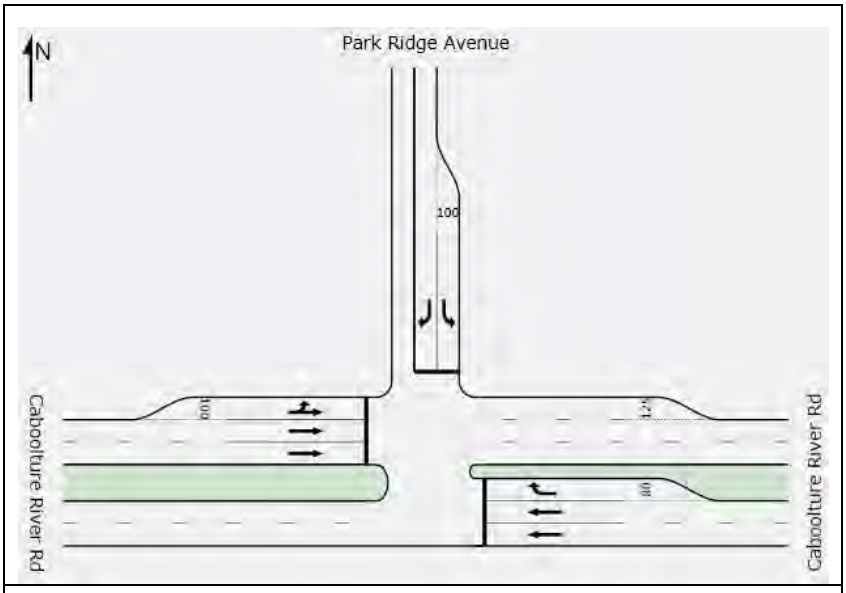
Caboolture River Road is expected to be widened to four lanes due to the Caboolture West development. The following intersections are expected to be signalised, and all are predicted to operate satisfactorily with the Caboolture West traffic volumes.

5.2.1 Caboolture River Road / Dobson Lane (node 17212)



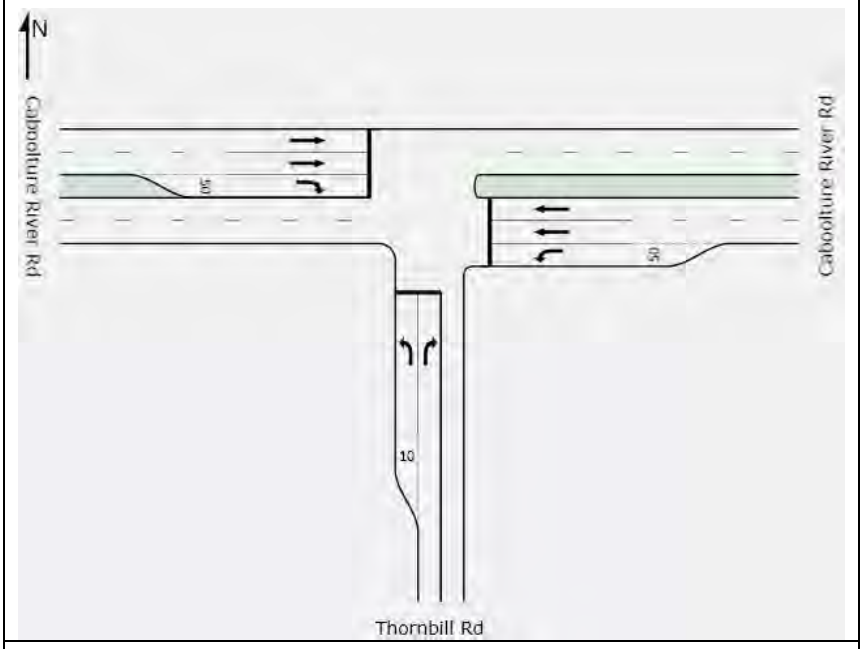
Upgraded layout

5.2.2 Caboolture River Road / Park Ridge Lane (node 17366)



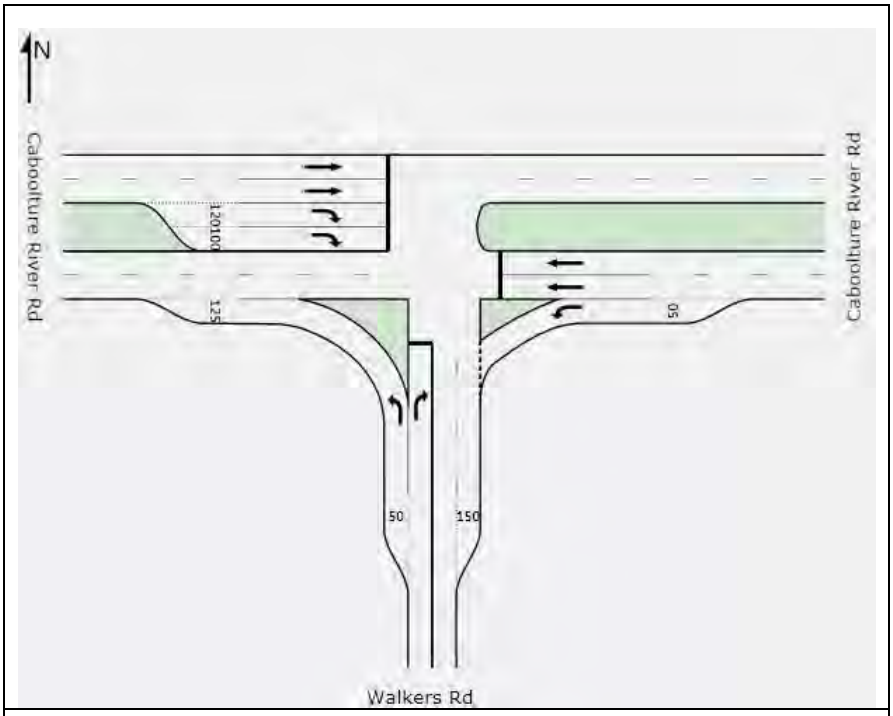
Upgraded layout

5.2.3 Caboolture River Road / Thornbill Drive (node 17491)



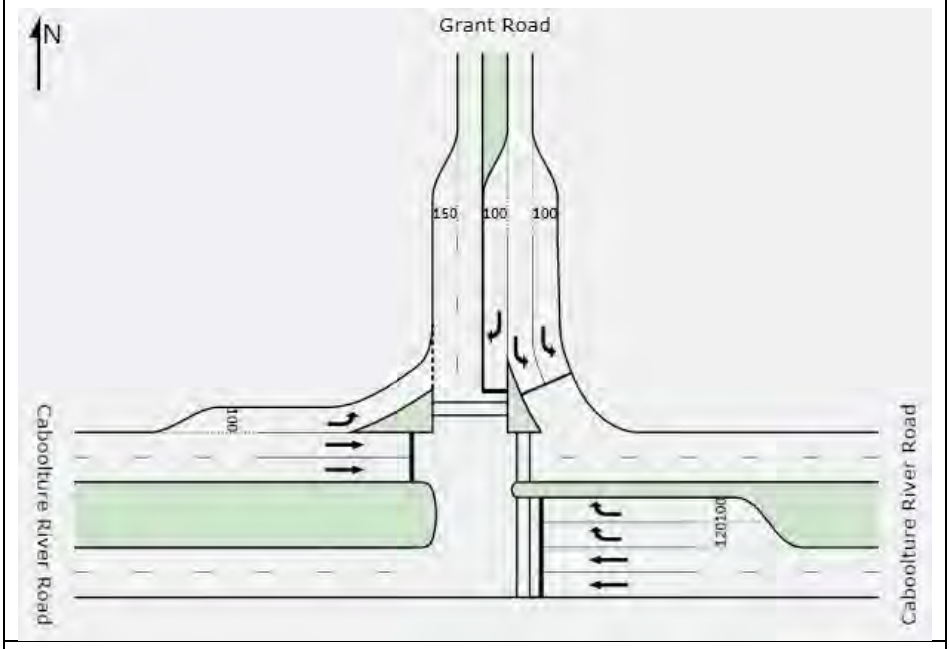
Upgraded layout

5.2.4 Caboolture River Road / Walkers Road (node 17599)



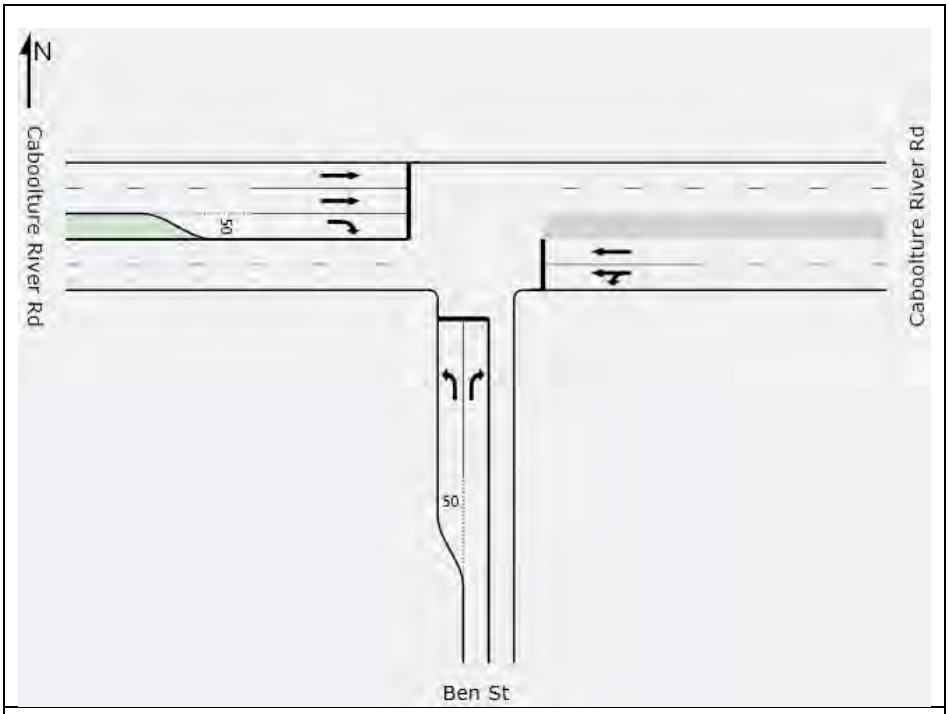
Upgraded layout

5.2.5 Caboolture River Road / Grant Road (node 18380)



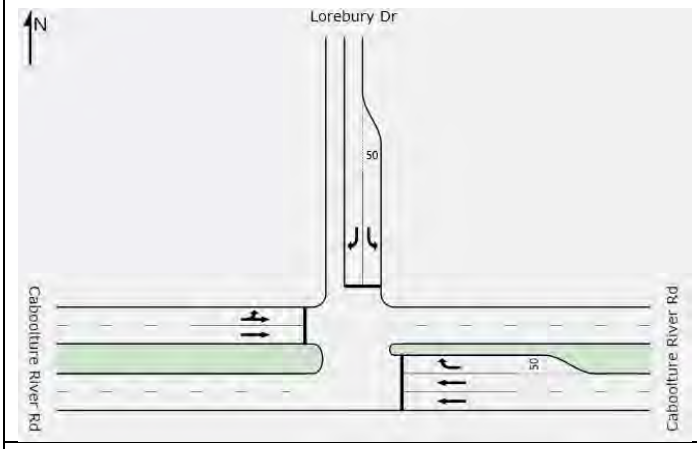
Upgraded layout

5.2.6 Caboolture River Road / Ben Street (node 18513)



Upgraded layout

5.2.7 Caboolture River Road / Lorebury Street (node 18832)

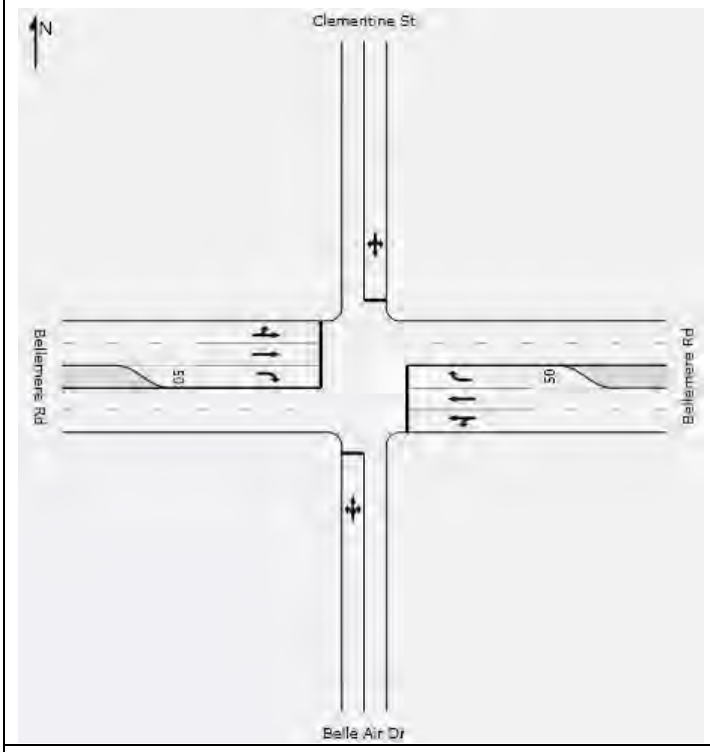


Upgraded layout

5.3 Bellmere Road

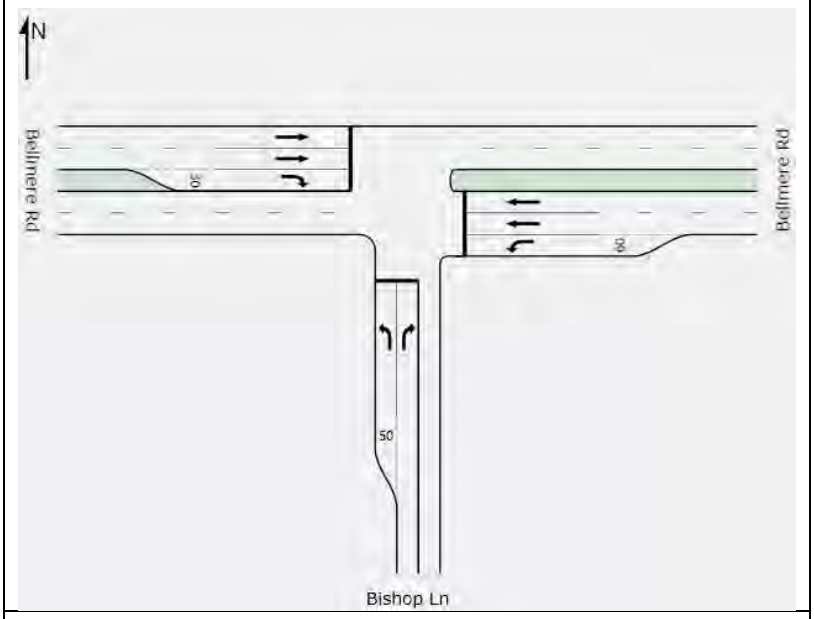
Bellmere Road is expected to be widened to four lanes due to the Caboolture West development. The following intersections are expected to be signalised, and all are predicted to operate satisfactorily with the Caboolture West traffic volumes.

5.3.1 Bellmere Road / Clementine Street / Belle Air Drive (node 17401)



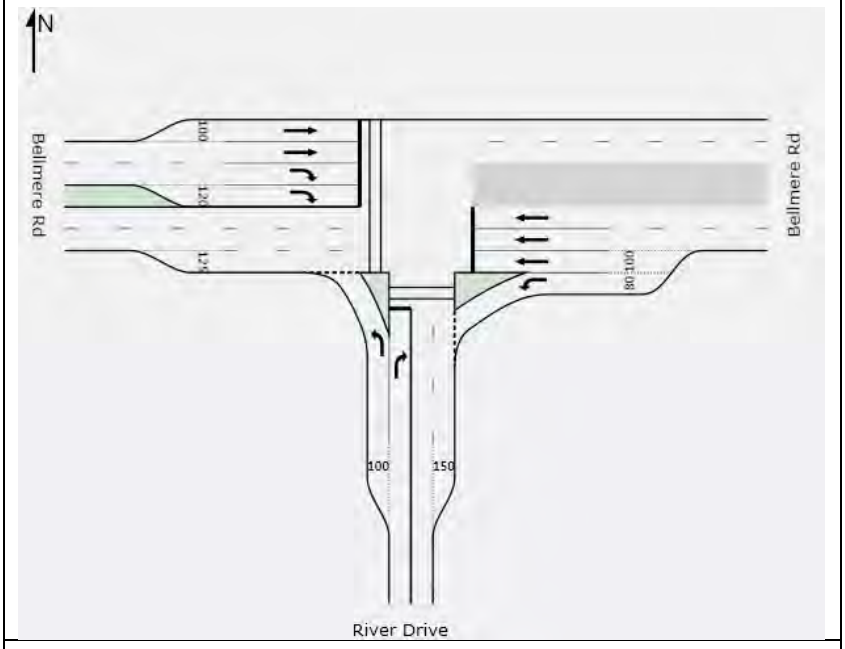
Upgraded layout

5.3.2 Bellmere Road / Bishop Lane (node 17677)



Upgraded layout

5.3.3 Bellmere Road / River Drive (node 80268)



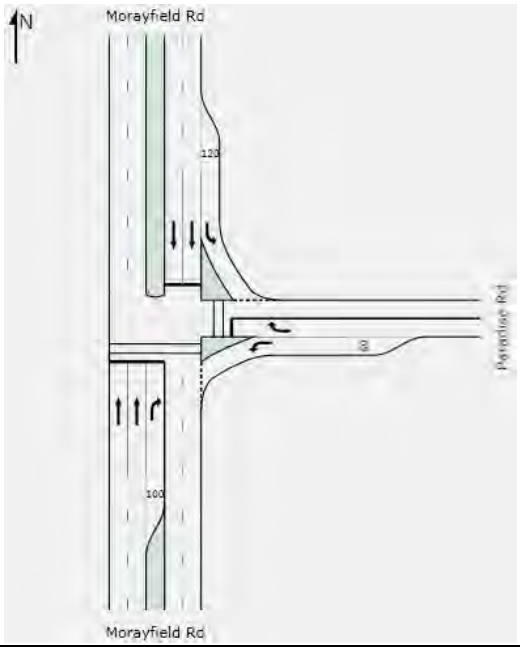
Upgraded layout

5.4 Morayfield Road

It was assumed that Morayfield Road would be widened to four lanes from Uhlmann Road to Lindsay Road, as per current TMR planning.

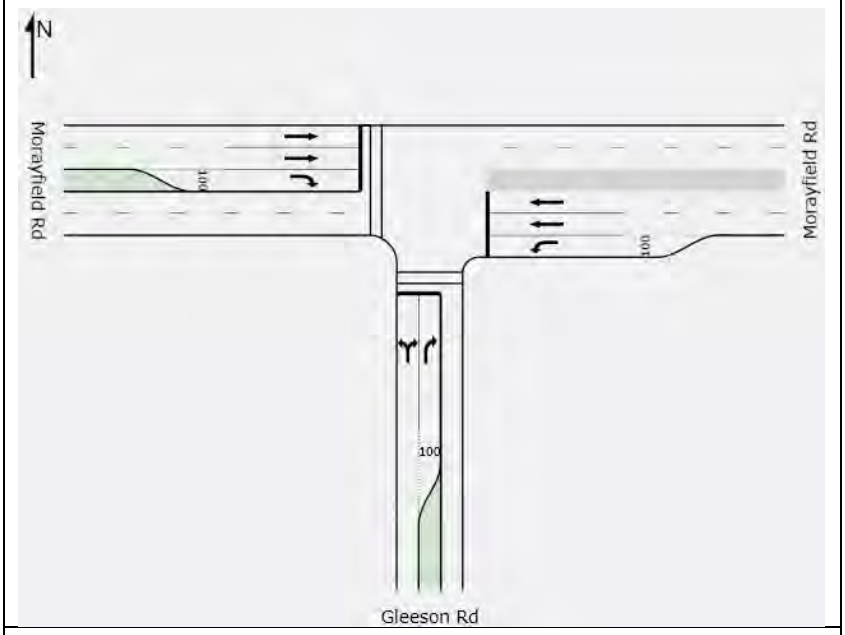
The following intersections were assessed with the widened Morayfield Road and found to operate satisfactorily.

5.4.1 Morayfield Road / Paradise Road (node 20636)



Upgraded layout

5.4.2 Morayfield Road / Gleeson Road (node 21104)

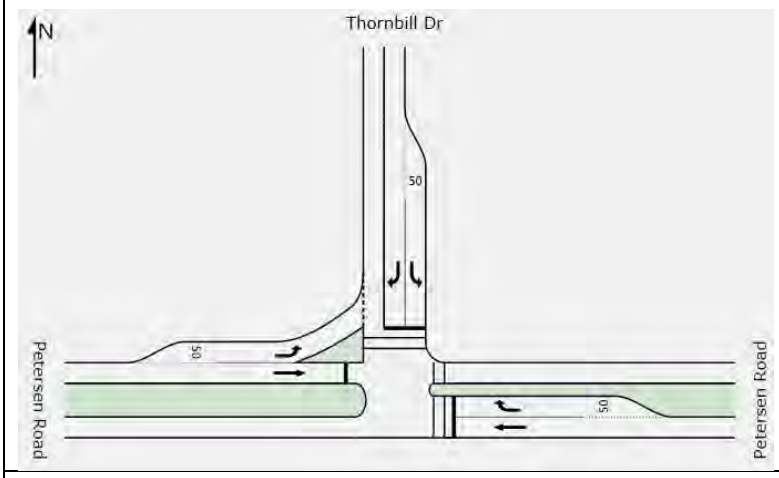


Upgraded layout

5.5 Petersen Road

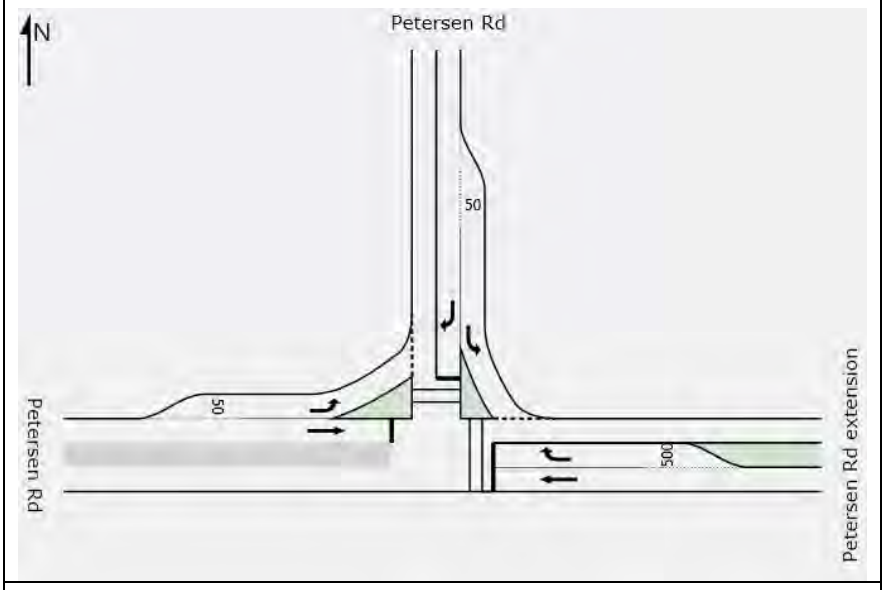
As part of the Caboolture West development, it was expected that Petersen Road would be extended to the east and connected with Clark Road. As part of this, it is expected that many intersections along the route would be signalised.

5.5.1 Petersen Road / Thornbill Road (node 70002)



Upgraded layout

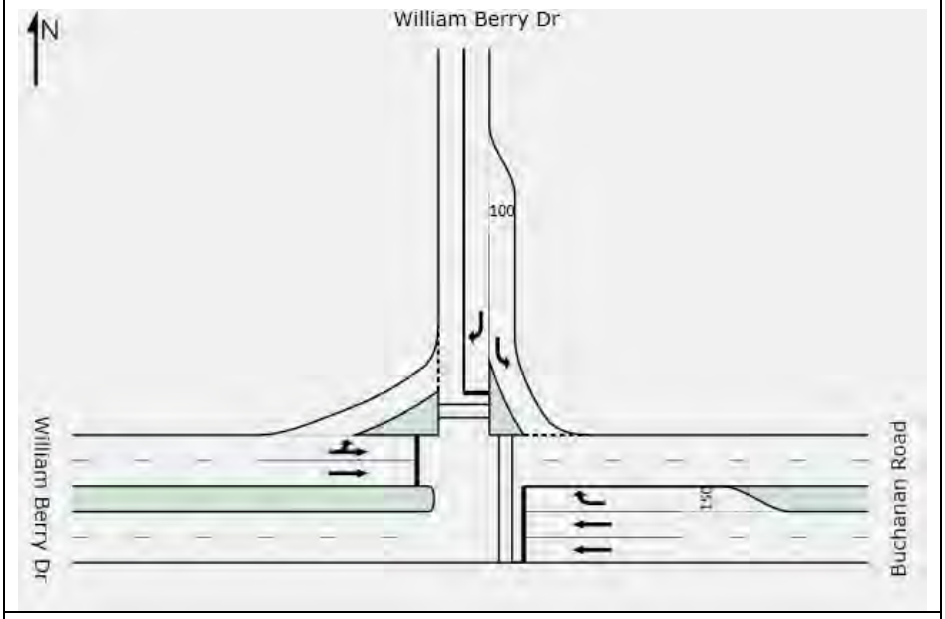
5.5.2 Petersen Road / Petersen Road extension (node 70003)



Upgraded layout

5.6 Buchanan Road / William Berry Drive (node 19995)

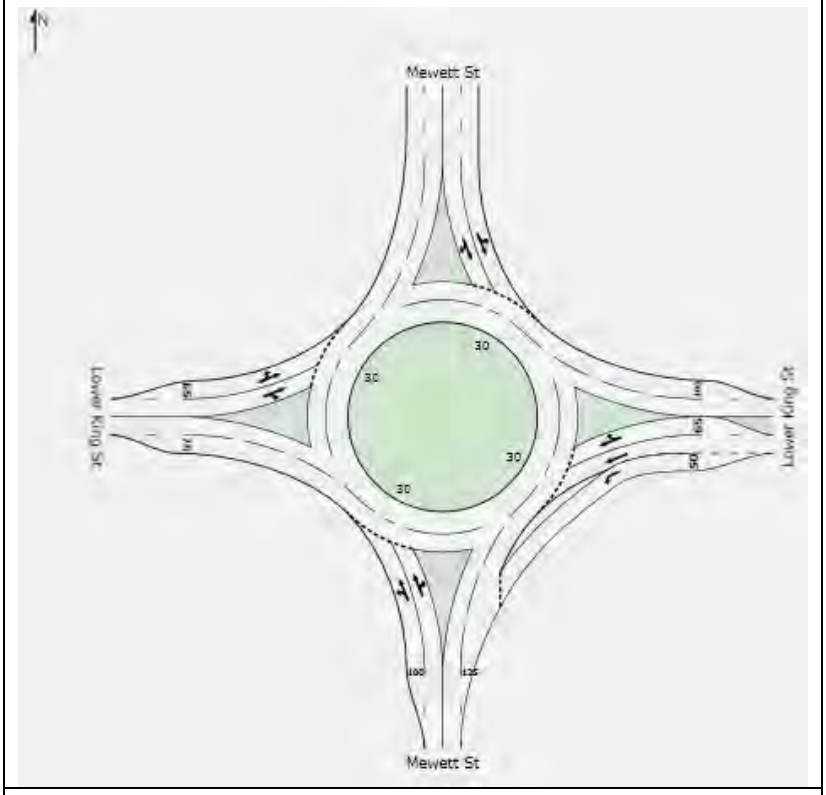
It is expected that Buchanan Road will be re-aligned to connect directly into William Berry Drive, with the resultant intersection signalised. This intersection is predicted to operate satisfactorily.



Upgraded layout

5.7 Lower King Street / Mewett Street (node 21057)

This intersection is currently a roundabout. It is expected to have some changes to accommodate the future fourth (southern) approach to the intersection.



Upgraded layout

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Vincent Chan	Roland Cathcart	Roland Cathcart
Signature			

Node Number	Intersection	A Does Existing Case work with CW?	B Does Expected Upgrade work with CW?	C Does A or B work without CW?	D If C = No, then Does a Do Min Upgrade work with CW?	E Is an Upgrade Required due to Cab West?	Flagging	Analysis assumptions	Upgrade Comments
19267	Morayfield Road / Caboolture River Road						Upgrade Required Due to Cab West		This intersection is quite congested. The full upgrade would allow the intersection to operate below capacity, but still above the desired standard of service. Further upgrades may be required if the desired standard of service is to be achieved. This could include grade separation or banning of movements.
19325	Oakey Flat Road / Walkers Road						Upgrade Required Due to Cab West		Add and lengthen short lanes
15135	D'Aguilar Hwy/ Bell St						Do Min Upgrade Required (upgrade without cabwest)		
15353	D'Aguilar Hwy/ Raaen Rd						Flagged Intersection - No Upgrade Required		
15703	D'Aguilar/ Gamgee Rd						Flagged Intersection - No Upgrade Required	Not tested further, as volumes on failing movement are very low (1vph right turn)	
15804	D'Aguilar Hwy/ Dellit Rd						Flagged Intersection - No Upgrade Required	Not tested further, as volumes on failing movement are very low (1vph right turn)	
15899	D'Aguilar Hwy/ R.Williams Rd						Flagged Intersection - No Upgrade Required	Not tested further, as volumes on failing movement are very low (2vph right turn)	
16014	D'Aguilar Hwy/ Campbells Pocket Rd						Do Min Upgrade Required (upgrade without cabwest)		
16090	Connector - D'Aguilar Highway / Wise Street						Flagged Intersection - No Upgrade Required	Not tested further, as volumes on failing movement are very low (14vph right turn)	
16157	D'Aguilar Highway / Atwood Street						Do Min Upgrade Required (upgrade without cabwest)		
16615	Connector - D'Aguilar Highway / County Drive						Do Min Upgrade Required (upgrade without cabwest)		
16951	D'Aguilar Highway / King Street						Do Min Upgrade Required (upgrade without cabwest)		
16974	King Street/ Willams Rd/ Access to development						Upgrade Required Due to Cab West	Off-ramp from D'Aguilar Hwy expected to be connected to Williams Rd	Upgrade to a roundabout layout expected as part of Caboolture West.
16986	D'Aguilar Highway / Williams Road						Upgrade Required Due to Cab West		On-ramp to become acceleration lane with merge. Reconsrtuction of loop road also required.
17036	Williams Rd/ Willliams St (access to D'Aguilar Hwy)						Upgrade Required Due to Cab West		Convert to a one-lane roundabout
17074	Williams Rd/ Green Rd						Upgrade Required Due to Cab West		Signalise intersection
17212	Caboolture River Rd/ Dobson Lane						Upgrade Required Due to Cab West		Caboolture River Rd expected to be upgraded to a four lane road as part of Caboolture West. New intersection appears to operate satisfactorily.
17366	Caboolture River Rd/ Park Ride Ave						Upgrade Required Due to Cab West		Caboolture River Rd expected to be upgraded to a four lane road as part of Caboolture West. New intersection appears to operate satisfactorily.
17401	Bellmere Rd/ Belle Air Drive						Upgrade Required Due to Cab West		Bellmere Rd expected to be upgraded to a four lane road as part of Caboolture West. New intersection appears to operate satisfactorily.
17460	Nairn Road / Excelsior Drive						Flagged Intersection - No Upgrade Required		
17491	Caboolture River Rd/ Thornbill Drive						Upgrade Required Due to Cab West		Caboolture River Rd expected to be upgraded to a four lane road as part of Caboolture West. New intersection appears to operate satisfactorily.
17599	Caboolture River Road/ Walkers Road						Upgrade Required Due to Cab West		Caboolture River Rd expected to be upgraded to a four lane road as part of Caboolture West. New intersection appears to operate satisfactorily.
17677	Bellmere Road/ Bishop Lane						Upgrade Required Due to Cab West		Bellmere Rd expected to be upgraded to a four lane road as part of Caboolture West. New intersection appears to operate satisfactorily.
17679	Nairn Road /J Dobson Road						Flagged Intersection - No Upgrade Required		
17732	Walkers Road/ Minimbah Drive						Flagged Intersection - No Upgrade Required		
17875	Petersen Road / Naomi Court						Flagged Intersection - No Upgrade Required		
17879	Walkers Road/ Cresthaven Drive						Upgrade Required Due to Cab West		Convert to roundabout or signalise
18073	Petersen Road/ Komraus Court						Upgrade Required Due to Cab West		Petersen Road link (through to Clark Road) assumed as part of Caboolture West. As part of this, intersections along Petersen Road are expected to be signalised.
18193	Walkers Rd/ Bristlebird Drive						Flagged Intersection - No Upgrade Required		
18323	Oakey Flat Road/ Nairn Road						Do Min Upgrade Required (upgrade without cabwest)		
18380	Grant Road - Caboolture River Road						Upgrade Required Due to Cab West		Caboolture River Rd expected to be upgraded to a four lane road as part of Caboolture West. New intersection appears to operate satisfactorily.
18407	Grant Road / Beacon Street						Flagged Intersection - No Upgrade Required		Signalise intersection
18442	Grant Road / Michael Avenue						Do Min Upgrade Required (upgrade without cabwest)		
18462	Connector - Grant Road / Gallipoli Court						Flagged Intersection - No Upgrade Required		Signalise intersection
18513	Caboolture River Road/ Ben Street						Upgrade Required Due to Cab West		Caboolture River Rd expected to be upgraded to a four lane road as part of Caboolture West. New intersection appears to operate satisfactorily.
18602	Connector - Oakey Flat Road / Burbury Road						Do Min Upgrade Required (upgrade without cabwest)		
18794	Oakey Flat Road / Clark Road						Upgrade Required Due to Cab West		Locally widen Oakey Flat Road and Clark Road to four lanes, signalise intersection
18832	Caboolture River Road/ Amy Street						Upgrade Required Due to Cab West		Caboolture River Rd expected to be upgraded to a four lane road as part of Caboolture West. New intersection appears to operate satisfactorily.
18889	Walkers Road / Petersen Road						Flagged Intersection - No Upgrade Required		Introduce short easbound through lane
18920	Beerburrum Road/ English Road/ Twin View Road						Do Min Upgrade Required (upgrade without cabwest)		
18926	English Road/ Lynch Road						Do Min Upgrade Required (upgrade without cabwest)	New intersection for park and ride	
18987	Beerburrum Road/ Smith Road						Do Min Upgrade Required (upgrade without cabwest)		
19036	D'Aguilar Highway / Old Gympie Road						Flagged Intersection - No Upgrade Required	This node represents the highway on-ramp merge, and was not assessed using SIDRA	
19202	D'Aguilar Hwy/ Beerburrum Road						Do Min Upgrade Required (upgrade without cabwest)		
19207	Walkers Road/ Koala Drive						Flagged Intersection - No Upgrade Required		
19257	Clark Road/ Hauton Road						Flagged Intersection - No Upgrade Required		Signalise
19327	Beerburrum Road/ Industry Drive						Do Min Upgrade Required (upgrade without cabwest)		
19363	Beerburrum Road/ Pringle Road/ McDougall Rd						Flagged Intersection - No Upgrade Required		
19367	Beerburrum Road / Pumicestone Road						Flagged Intersection - No Upgrade Required		
19393	Morayfield Road / Station Road						Flagged Intersection - No Upgrade Required		Operates satisfactorily with Morayfield Road widened to six lanes
19394	Morayfield Road / Torrens Road						Upgrade Required Due to Cab West	u-turn volume halved to take into account zoning near intersection.	
19473	Morayfield Rd/ Market Drive -Joins node 19448						Upgrade Required Due to Cab West		Add left slip into Market Drive, add short through southbound lane, add double right turn into Market Drive.
19463	Oakey Flat Road / Morayfield Road						Flagged Intersection - No Upgrade Required		Operates satisfactorily with Morayfield Road widened to six lanes
19494	Morayfield Rd/ Oaklands Drive -Joins node 19517						Flagged Intersection - No Upgrade Required	Extended 180sec cycle assumed in PM	
19505	Beerburrum Road / Henzell Road						Upgrade Required Due to Cab West		Introduce double right turn into Henzell Road, provide longer short lanes on Henzell Road
19593	Dickson Rd/ William Berry Dr						Do Min Upgrade Required (upgrade without cabwest)		

Node Number	Intersection	A Does Existing Case work with CW?	B Does Expected Upgrade work with CW?	C Does A or B work without CW?	D If C = No, then Does a Do Min Upgrade work with CW?	E Is an Upgrade Required due to Cab West?	Flagging	Analysis assumptions	Upgrade Comments
19604	Morayfield Road/ Walkers Road - part a						Upgrade Required Due to Cab West		The "Do Min" option includes widening Morayfield Road to six lanes, provision of double right turn lanes and additional short lanes. This intersection is quite congested, and would require significant changes to operate satisfactorily with/without Caboolture West. This could include grade separation or banning of movements.
19614	Morayfield Road / King Street						Do Min Upgrade Required (upgrade without cabwest)		
19658	Beerburrum Road / Hasking Street / James Street						Do Min Upgrade Required (upgrade without cabwest)		
19709	Connector - Morayfield Road / Shopping Centre access near Gaffield Street						Upgrade Required Due to Cab West		Operates satisfactorily with Morayfield Road widened to six lanes
19995	Buchanan Rd/ Berry Dr						Flagged Intersection - No Upgrade Required		Buchanan Road assumed to be widened to four lanes and realigned to feed into William Berry Drive. New intersection appears to operate reasonably.
20038	Morayfield Road / Lindsay Road						Upgrade Required Due to Cab West		Operates satisfactorily with Morayfield Road widened to six lanes
20136	Connector - Burpengary Road / Crendon Street						Flagged Intersection - No Upgrade Required	Burpengary Road assumed to be widened to four lanes as a West Moreton option	
20272	Lindsay Road / Hunt Road						Flagged Intersection - No Upgrade Required	Lindsay Road assumed to be widened to four lanes as a West Moreton option	
20278	Connector - Station Road / Jill Street						Flagged Intersection - No Upgrade Required	Station Road assumed to be widened to four lanes as a West Moreton option	
20283	Connector - Lindsay Road / Clark Road						Flagged Intersection - No Upgrade Required	Lindsay Road assumed to be widened to four lanes as a West Moreton option	
20307	Pumicestone Rd/ Ardrossan Rd						Flagged Intersection - No Upgrade Required		
20319	Station Road / O'Brien Road						Flagged Intersection - No Upgrade Required	Station Road and O'Brien Road assumed to be widened to four lanes as a West Moreton option	
20321	Morayfield Road / Graham Road						Upgrade Required Due to Cab West		Operates satisfactorily with Morayfield Road widened to four lanes. A double right turn from Morayfield Road to Graham Road is required for the "with Caboolture West" scenario.
20331	Lindsay Road / O'Brien Road / Adsett Road						Flagged Intersection - No Upgrade Required	Lindsay Road and O'Brien Road assumed to be widened to four lanes as a West Moreton option	
20384	Lindsay Road / Blewers Road						Flagged Intersection - No Upgrade Required	Lindsay Road assumed to be widened to four lanes as a West Moreton option	
20404	Charles Street / Lee Street						Flagged Intersection - No Upgrade Required	One way Lee Street works	
20447	Lindsay Rd/ Robbs Rd						Flagged Intersection - No Upgrade Required	Lindsay Road assumed to be widened to four lanes as a West Moreton option	
20533	Narangba Road / Main Street / Mumford Road / Mackie Road						Flagged Intersection - No Upgrade Required		
20588	Connector - Lower King Street / William Street						Do Min Upgrade Required (upgrade without cabwest)		
20636	Morayfield Road /Paradise Road						Flagged Intersection - No Upgrade Required		Operates satisfactorily with Morayfield Road widened to four lanes
20843	Connector - Lower King Street / Dux Street						Flagged Intersection - No Upgrade Required		
21057	Lower King Street / Mewett Street						Flagged Intersection - No Upgrade Required		Operates satisfactorily with signalised intersection (due to Mewett Street being extended to the south)
21104	Morayfield Road / Gleeson Road						Flagged Intersection - No Upgrade Required		Operates satisfactorily with Morayfield Road widened to four lanes
21178	Boundary Road / Narangba Road						Do Min Upgrade Required (upgrade without cabwest)		
21583	Morayfield Road / Uhlmann Road						Upgrade Required Due to Cab West		Operates satisfactorily with Morayfield Road widened to four lanes west of intersection and intersection signalised.
21955	Morayfield Rd/ Coutts Drive						Flagged Intersection - No Upgrade Required		
22191	Morayfield Rd/ Ogilvy Rd						Flagged Intersection - No Upgrade Required		
22241	Progress Rd/ Arthur Drewett Dr						Flagged Intersection - No Upgrade Required		
22937	Old Gympie Road / New Settlement Road						Do Min Upgrade Required (upgrade without cabwest)		
23040	Uhlmann Rd/ Buckley Rd						Upgrade Required Due to Cab West		Re-assign lanes on Uhlmann Road and extend short lanes
23250	Old Gympie Rd/ Callaghan Rd						Do Min Upgrade Required (upgrade without cabwest)		
23384	Old Gympie Rd/ Potassum St						Do Min Upgrade Required (upgrade without cabwest)		
23573	Bribie Island Road / Pasturage Road						Flagged Intersection - No Upgrade Required		
24614	Bribie Island Road / Hickey Road						Flagged Intersection - No Upgrade Required		
27076	Riverbank Future Development						Flagged Intersection - No Upgrade Required	New intersection for Riverbank, assumed to be sufficient	
27509	Bribie Island Road / Old Toorbul Point Road						Do Min Upgrade Required (upgrade without cabwest)		
28590	Caboolture-Bribie Island Road / The Abbey Place						Flagged Intersection - No Upgrade Required		
35939	Bribie Island Rd/ Bestman Rd						Flagged Intersection - No Upgrade Required		
70002	Petersen Rd/ Thornbill Dr						Upgrade Required Due to Cab West		Petersen Road link (through to Clark Road) assumed as part of Caboolture West. As part of this, intersections along Petersen Road are expected to be signalised. This intersection operates satisfactorily when signalised.
70003	Petersen Rd Extension/ Petersen Rd						Upgrade Required Due to Cab West		Petersen Road link (through to Clark Road) assumed as part of Caboolture West. As part of this, intersections along Petersen Road are expected to be signalised. This intersection operates satisfactorily when signalised.
70122	Stern Rd/ Behrens Rd (development)						Flagged Intersection - No Upgrade Required	New intersection for development assumed to be sufficient	
70125	Behrens Rd/ Development						Flagged Intersection - No Upgrade Required	New intersection for development assumed to be sufficient	
70165	Caboolture River Rd/ Development						Flagged Intersection - No Upgrade Required	New intersection for development assumed to be sufficient	
70184	Bellmere Rd/ Development						Flagged Intersection - No Upgrade Required	New intersection for development assumed to be sufficient	
70248	Caboolture River Rd/ development						Flagged Intersection - No Upgrade Required	New intersection for development assumed to be sufficient	
80229	Old Gympie Road / Boundary Road						Do Min Upgrade Required (upgrade without cabwest)		
80230	Old Gympie Road / Mackie Road						Flagged Intersection - No Upgrade Required		
80242	Buchanan Road / Graham Road / Weier Road						Do Min Upgrade Required (upgrade without cabwest)		
80249	Burpengary Road / Station Road / Rowley Road / Henderson Road						Flagged Intersection - No Upgrade Required	Burpengary Road and Station Road assumed to be widened to four lanes as a West Moreton option	
80268	Bellmere Road / River Drive						Upgrade Required Due to Cab West		Bellmere Rd expected to be upgraded to a four lane road as part of Caboolture West. New intersection appears to operate satisfactorily.
80460	Grant Road / Torrens Road						Upgrade Required Due to Cab West		Signalise
80491	Petersen Rd/ Dobson Rd						Flagged Intersection - No Upgrade Required		
100006	Caboolture Hwy/ Pumiceston Rd						Flagged Intersection - No Upgrade Required		
100555	Market Drive / Dickson Road						Do Min Upgrade Required (upgrade without cabwest)		
105052	Smiths Road / Del Rosso Road						Flagged Intersection - No Upgrade Required		
105057	Connector - Del Rosso Road / Tullawong State High School access						Flagged Intersection - No Upgrade Required		
105305	Greening Rd/ Cayenne Rd						Flagged Intersection - No Upgrade Required		
105417	Beerburrum Rd/ North Caboolture Station						Flagged Intersection - No Upgrade Required		

Appendix E

Staging Analysis

Technical Note

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Project title	Caboolture West	Job number	229906
cc		File reference	
Prepared by	Troy Howarth	Date	6 December 2013
Subject	Caboolture West Staging Years		

1 Introduction

Caboolture West is to be developed in stages over a 30 year period. Each stage of development will have its own impact on the surrounding network and will need to be investigated. This technical note was prepared to review the impact on the surrounding network at each staging year.

2 Development Staging

The staging years investigated were in 5 year increments from 2016 until ultimate build-out (2056). The development stages of Caboolture West can be seen in **Figure 1**. The development commences in the south-east quadrant and expands in the North-west direction. It is not until 2036 that the major Caboolture West town center is developed, resulting in a proportion of trips heading out of Caboolture West for employment that would otherwise be using Caboolture West.

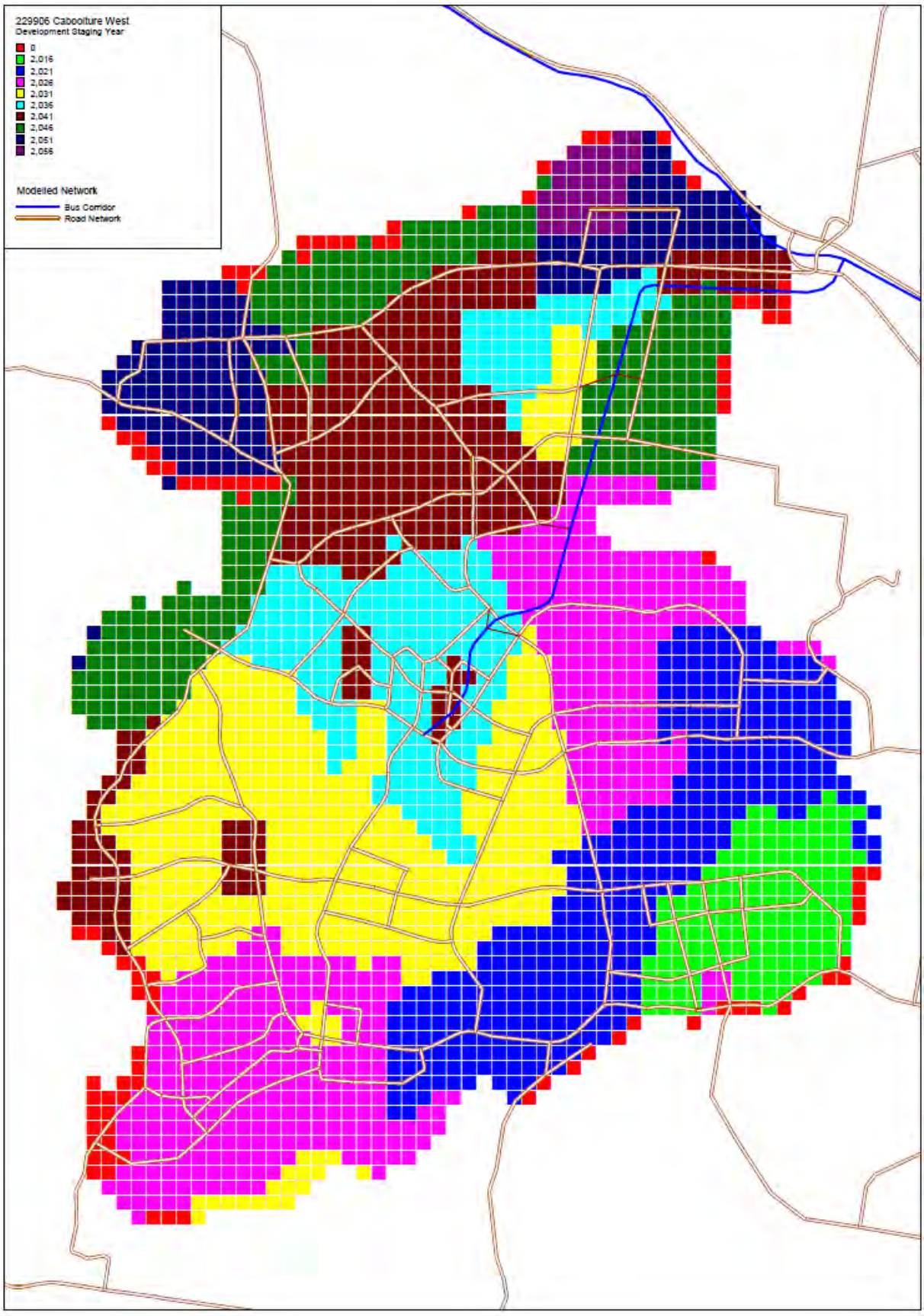


Figure 1 Development Staging Year

3 Demographics

The methodology applied involved integrating the Caboolture West staging year demographics into the 2031 wider model demographics. As can be seen in **Figure 2** and **Table 1** the 2051 and 2056 demographics are similar and as such have been combined as the "ultimate" year. The figures also highlight the increase in education and jobs around 2036 and 2041 when the town center is developed.

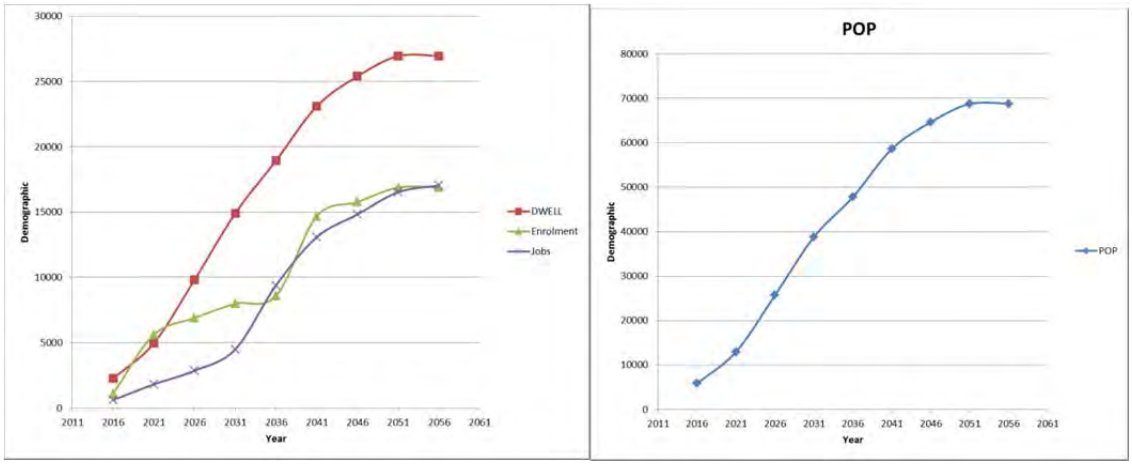


Figure 2 Demographic Data

Table 1 Proportion of total demographics in each staging year

	POP	DWELL	Enrolment	Jobs
2016	8%	8%	7%	4%
2021	19%	18%	33%	11%
2026	37%	36%	41%	17%
2031	56%	55%	47%	26%
2036	70%	70%	51%	55%
2041	85%	86%	87%	77%
2046	94%	94%	93%	87%
2051	100%	100%	100%	97%
2056	100%	100%	100%	100%

4 Network Assumptions

Results from EMME indicated potential congestion issues around D'Aguilar Highway and King Street, further deficiency analysis was conducted using the model output to calculate v/c ratios based on "back to fundamental" capacity constraints. The analysis indicated these connections have spare capacity with a maximum v/c of 70%. To ensure that trips weren't unfairly routing through King Street due to the modelled capacity constraint, D'Aguilar Hwy was upgraded to 4 lanes for the staging analysis. A comparison showing the difference in traffic volumes with 4 lane highway is shown in Figure 3. The upgrade shifts trips back to

D'Aguilar Highway that are routing away from D'Aguilar Highway and utilising King Street to either complete their journey into Caboolture city centre or to access the Bruce Highway.

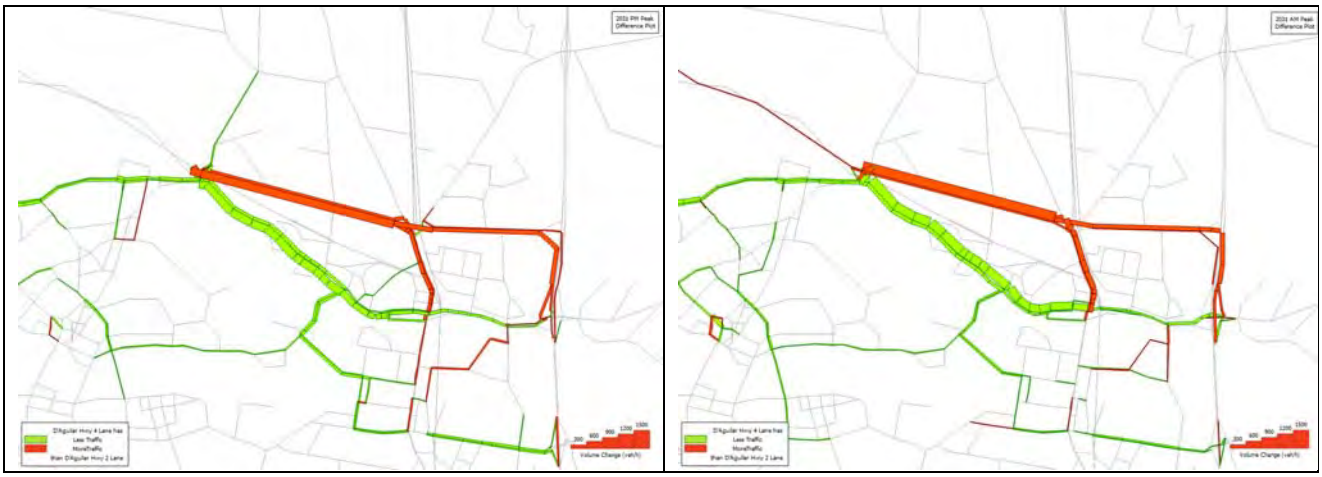


Figure 3 Comparison of upgrading D'Aguilar Hwy and King St to 4 lanes – AM and PM Peak respectively

5 Staging Years

The modelled road infrastructure will be upgraded in stages, with Petersen Road extension, C-Bahn services and the north-south connection through Caboolture West not modelled until 2036. This coincided with unlocking of development within the central business district. Further analysis of intersections along these routes was completed in SIDRA intersections to obtain ideal staging years, which is not covered in this technical note.

The model forecasts indicate heavy utilisation of Bellmere Road and Caboolture River Road, with the demand exceeding capacity in 2031. Relief is provided in 2036 with the introduction of Petersen Road connection. The Petersen Road connection is required in 2031 to re-distribute demand to ensure quality of service is maintained. The plots for each stage are contained in sections 4.1 to 4.8.

The plots will show the select link volumes for Caboolture West (bar width and value), with the colour illustrative of the V/C ratio for each of the proposed staging years. The V/C ratio is broken down into 5 bands and coloured according to **Figure 4**.

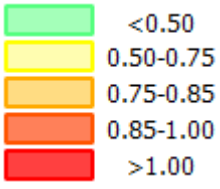
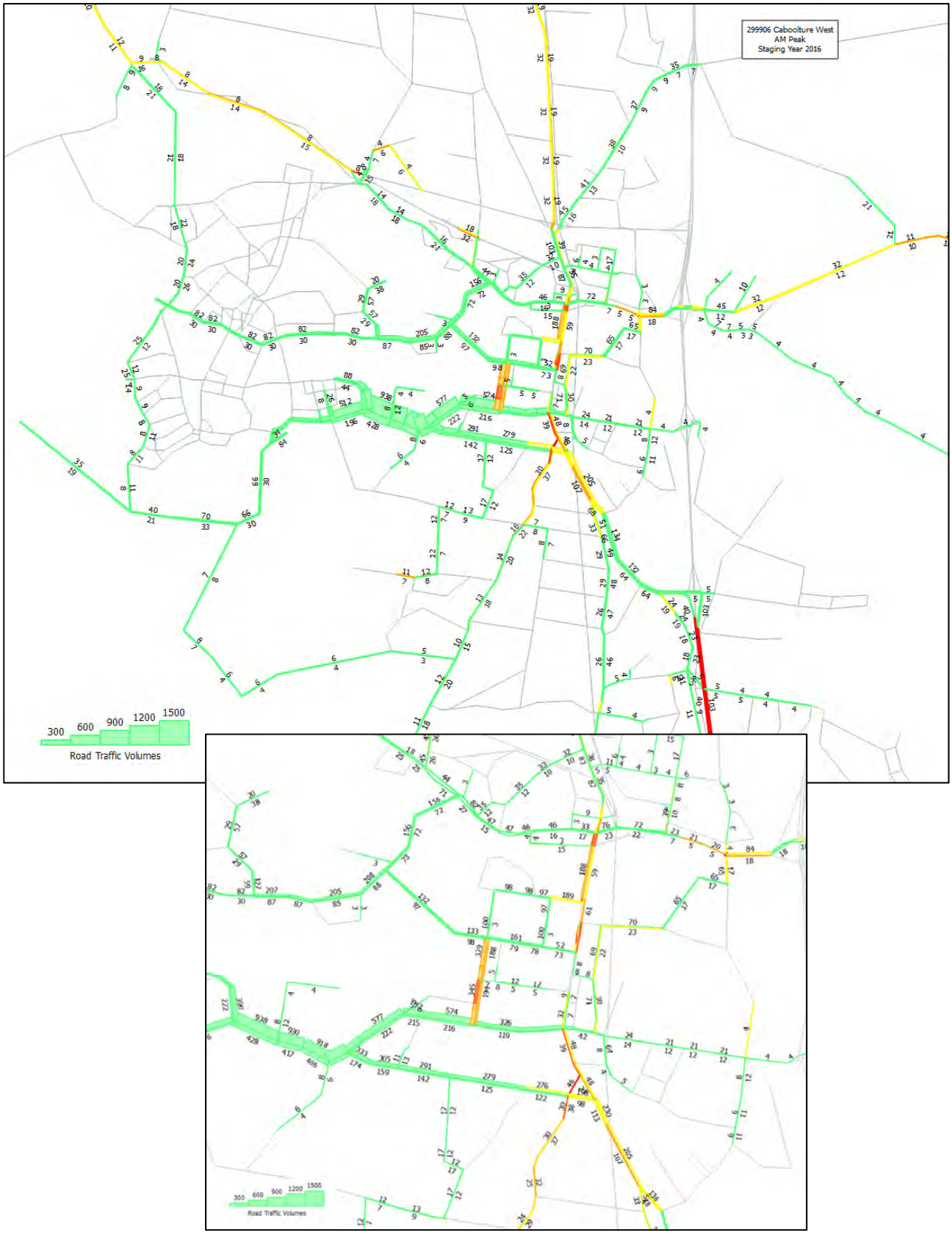


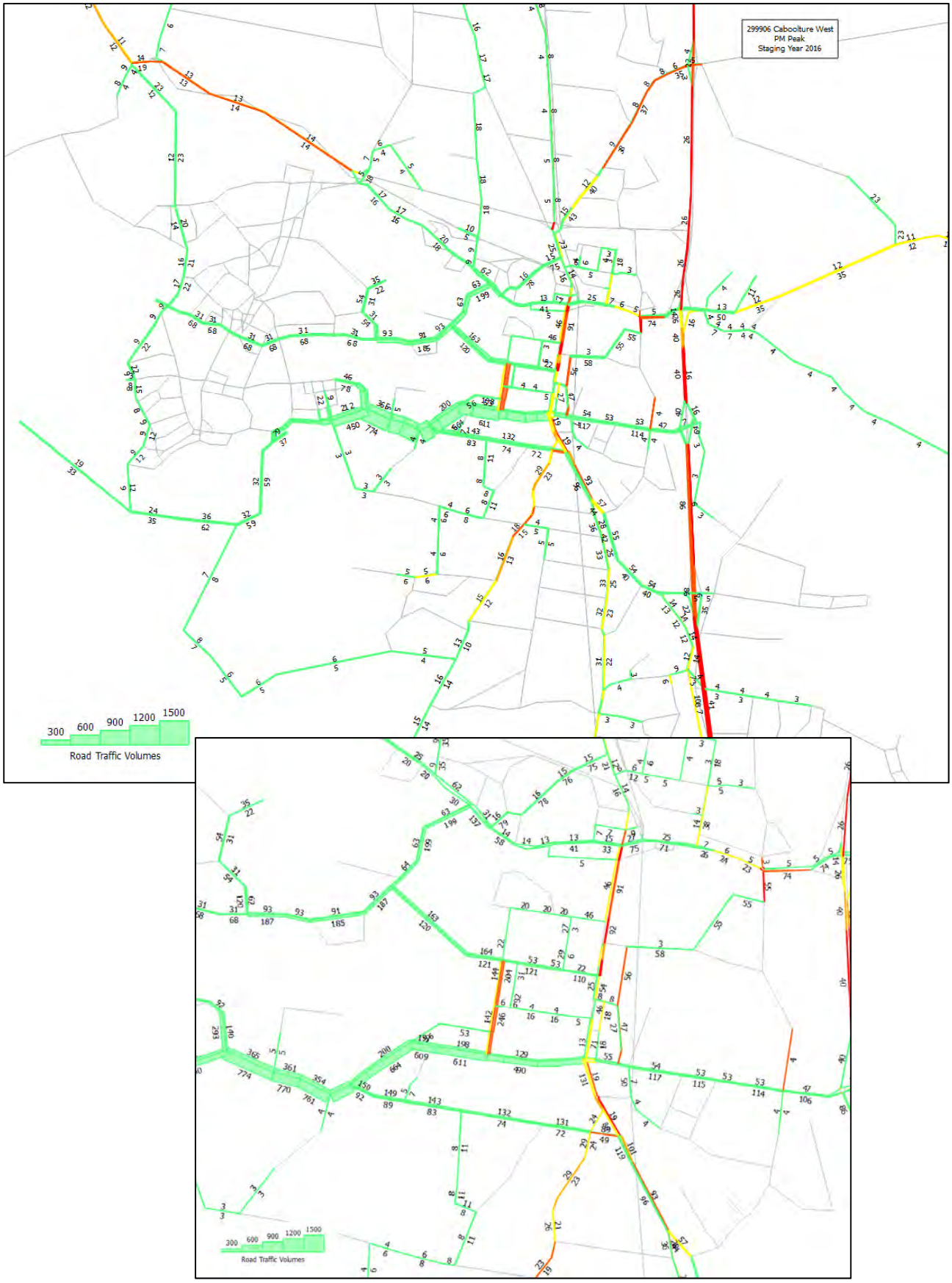
Figure 4 VC grading criteria

The results of the staging year analysis shown in Table 1 indicate a mode shift from public transport to car travel in 2041. This coincides with an increase in employment, and education. The modelled result also highlights an increase in PT in 2036 which coincides with the introduction of C-Bahn services.

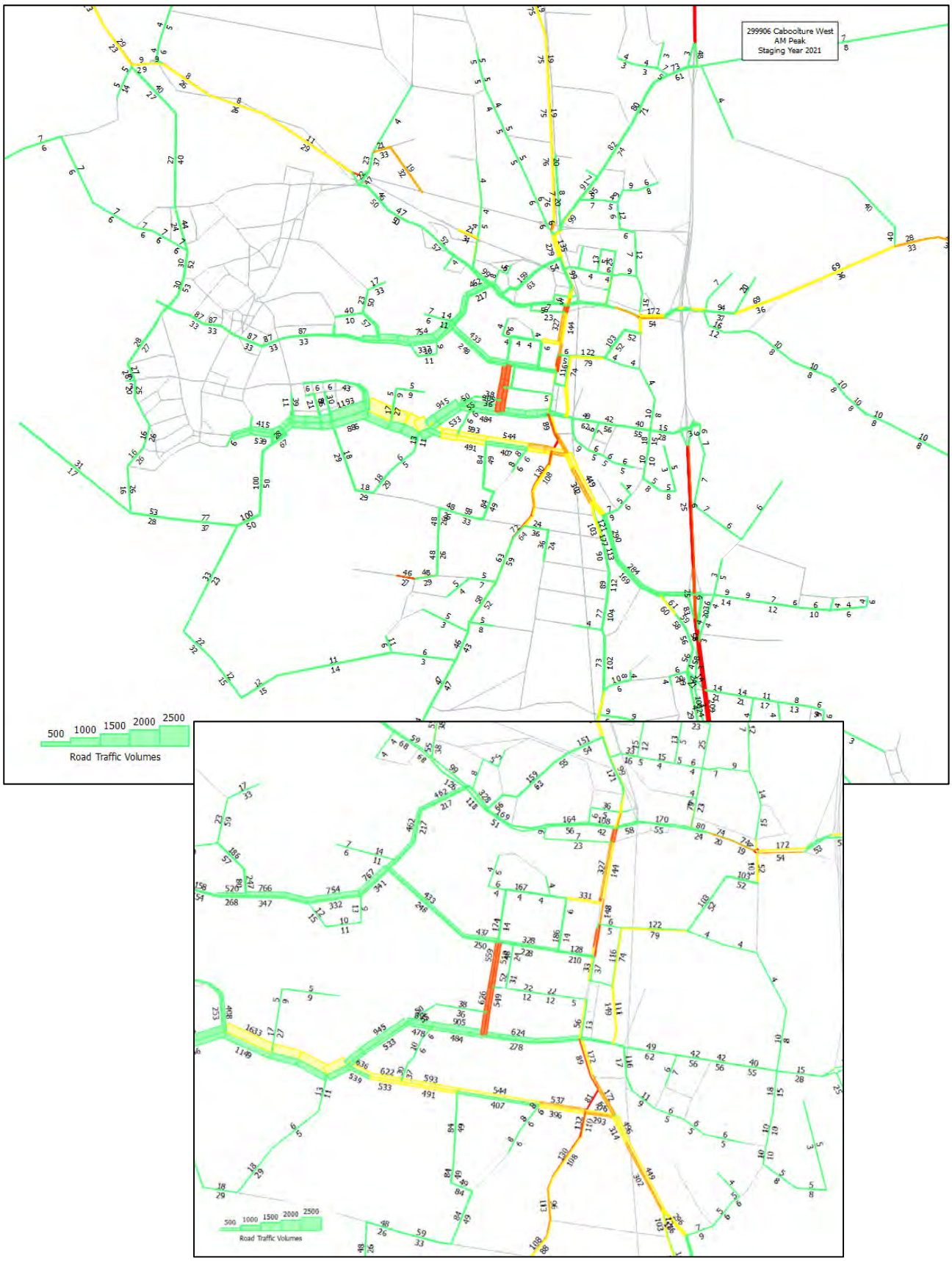
	Mode Share			
	Trip Gen (total)	PV	PT	Active
2016	11,584	75%	13%	12%
2021	30,197	76%	10%	14%
2026	73,313	78%	10%	12%
2031	108,810	75%	14%	11%
2036	139,001	72%	16%	12%
2041	181,388	74%	13%	13%
2046	198,424	74%	13%	13%
2051	-	-	-	-
2056	218,196	75%	13%	12%

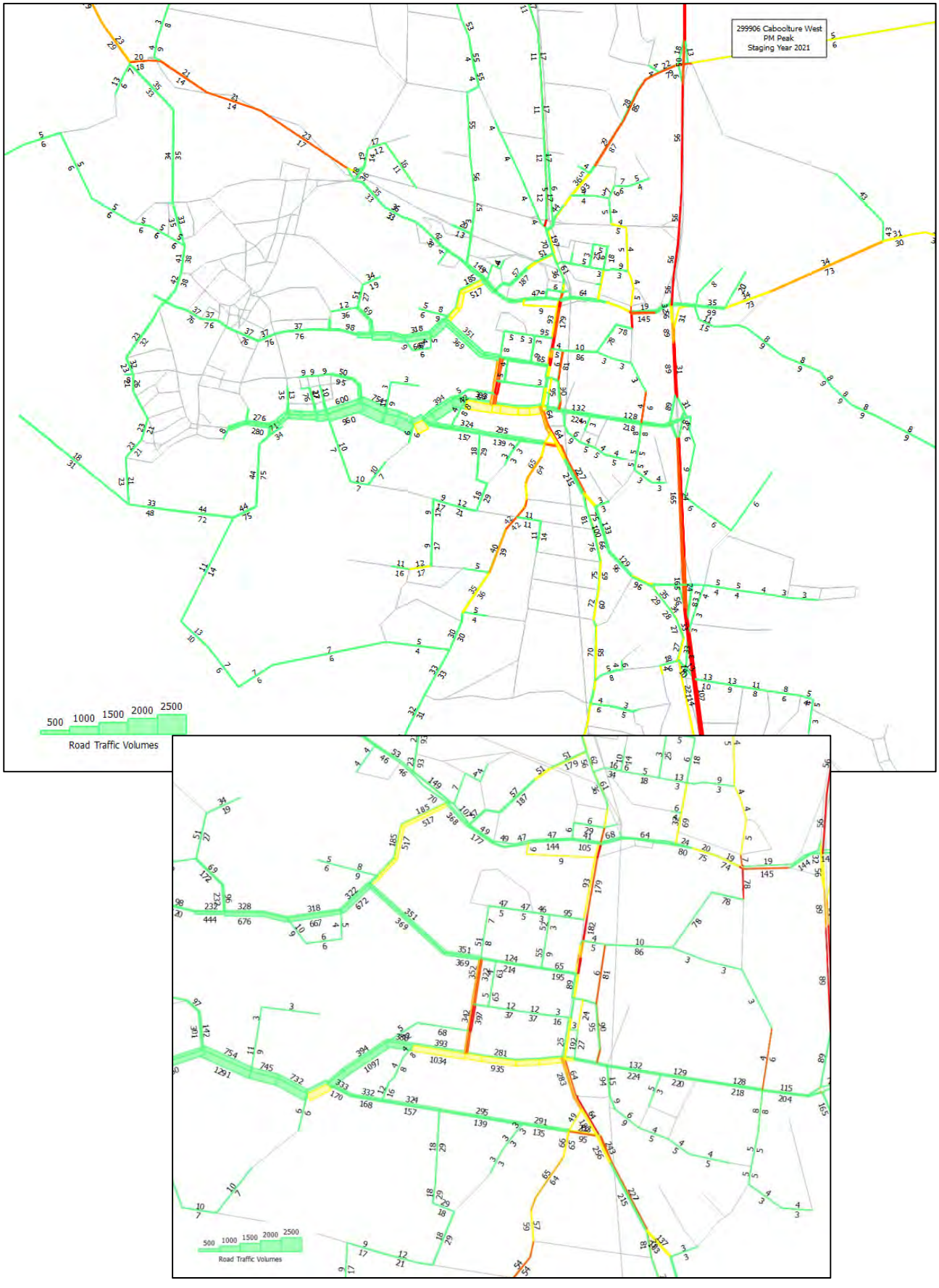
5.1 Staging Year 2016



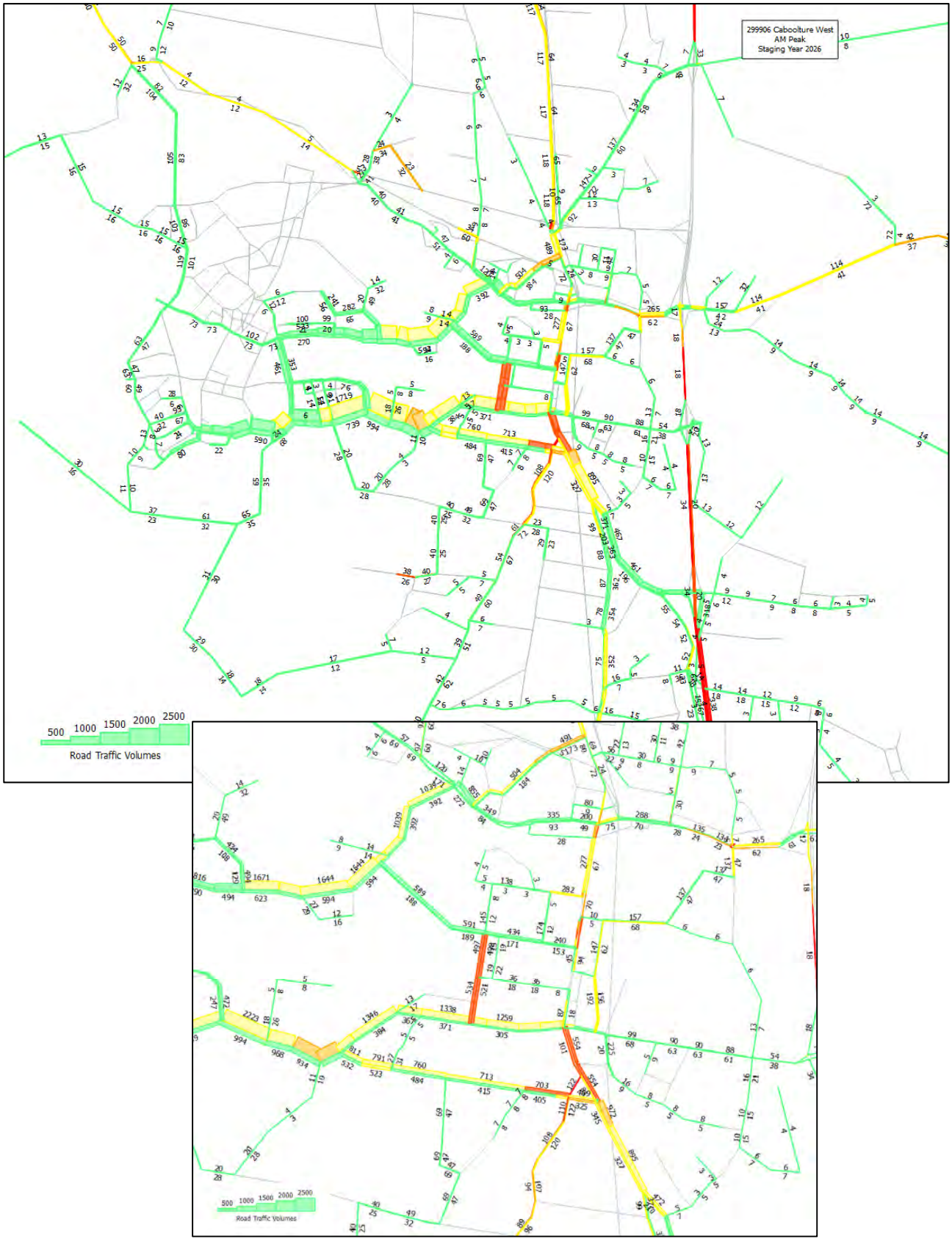

299906 Caboolture West
PM Peak
Staging Year 2016
300 600 900 1200 1500
Road Traffic Volumes

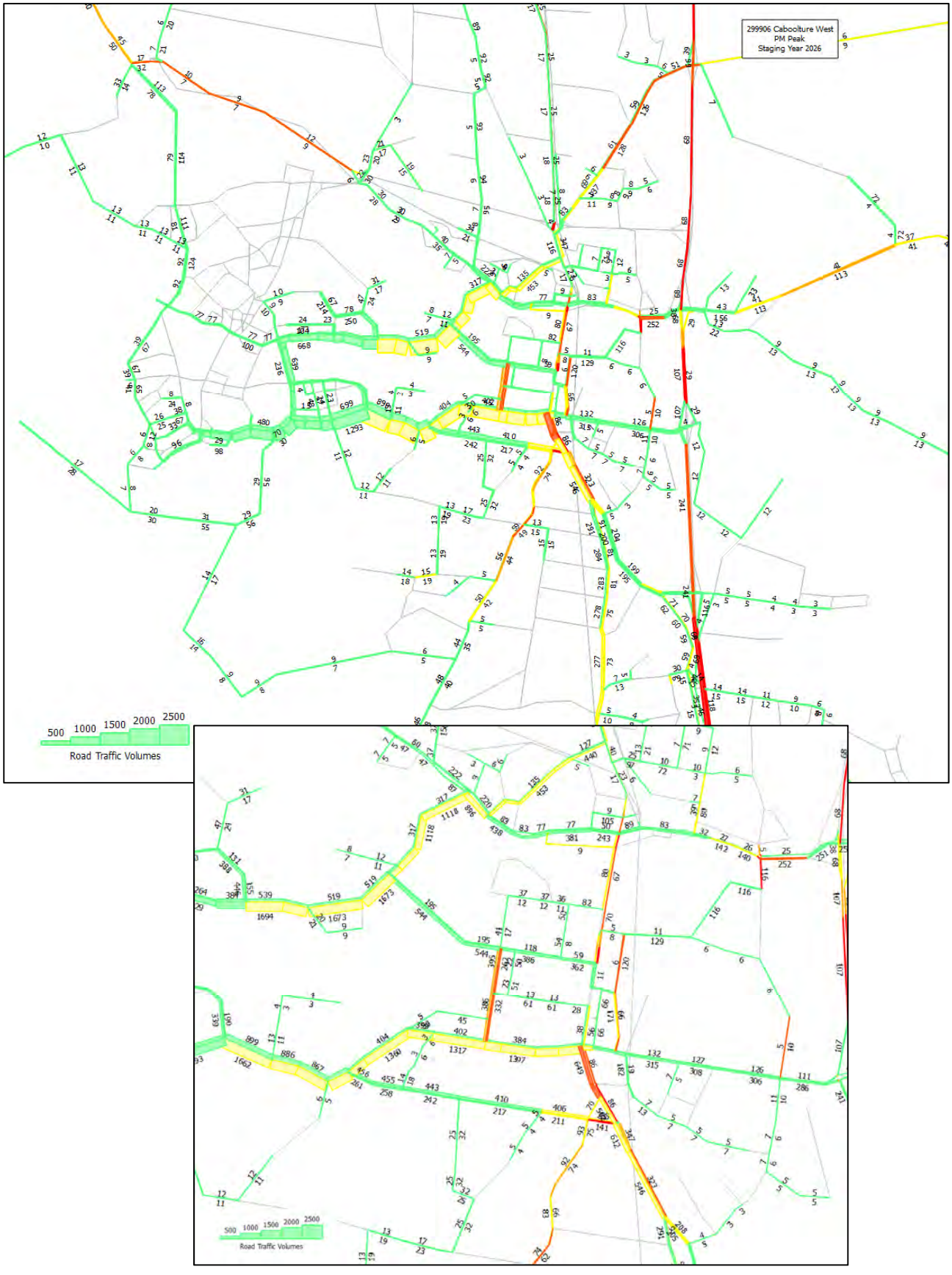
5.2 Staging Year 2021



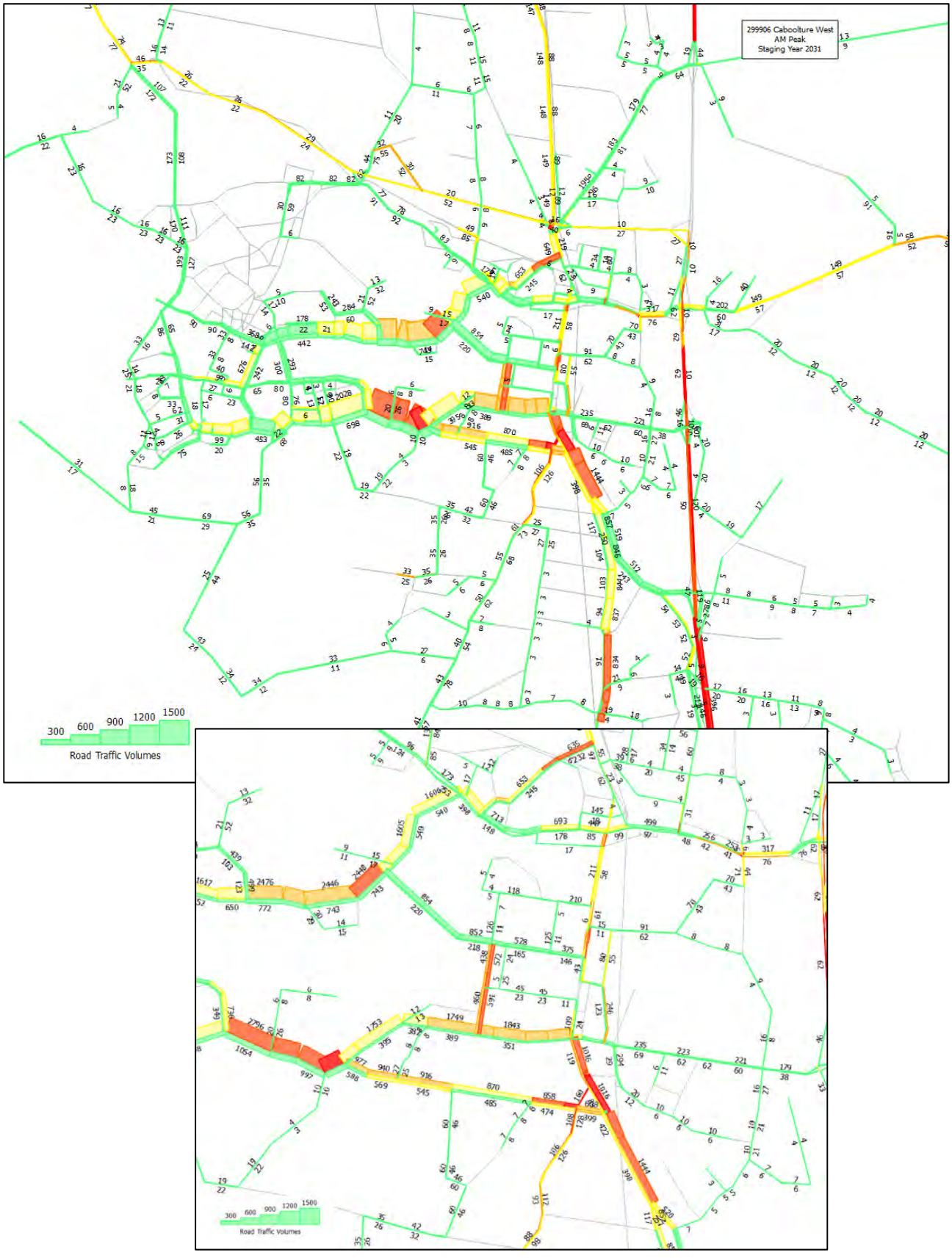

299906 Caboolture West
PM Peak
Staging Year 2021
500 1000 1500 2000 2500
Road Traffic Volumes
500 1000 1500 2000 2500
Road Traffic Volumes

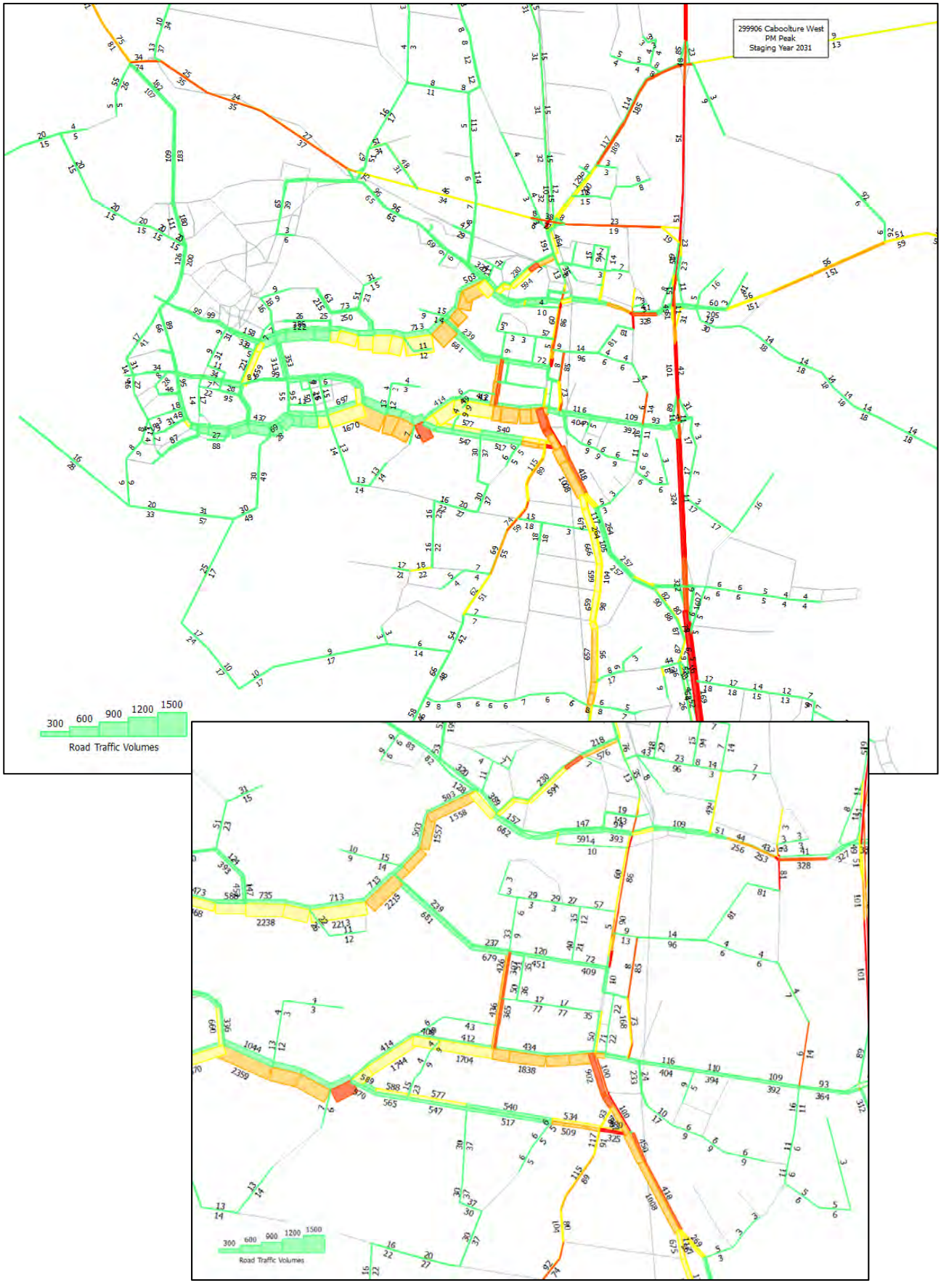
5.3 Staging Year 2026




299906 Caboolture West
PM Peak
Staging Year 2026
500 1000 1500 2000 2500
Road Traffic Volumes

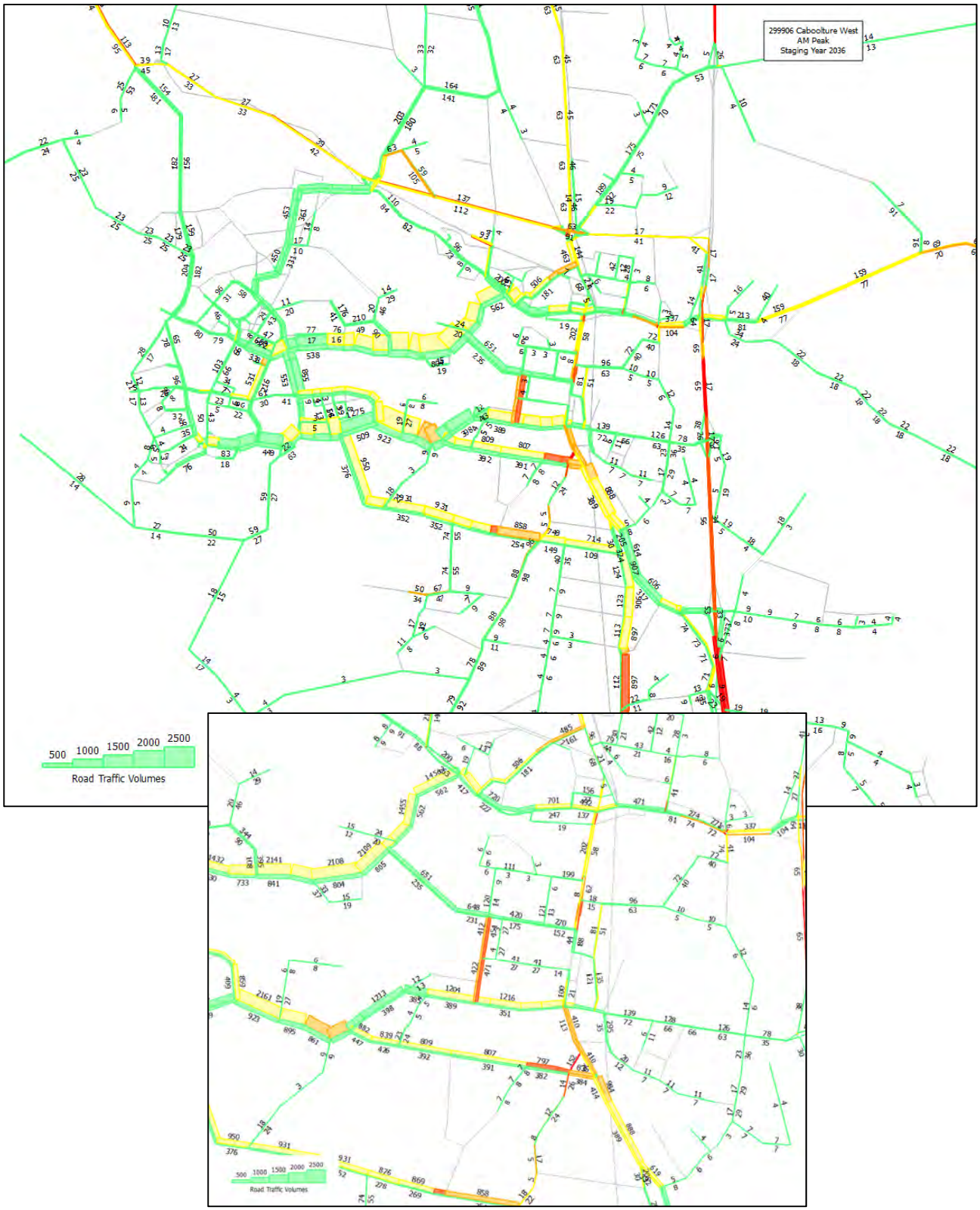
5.4 Staging Year 2031

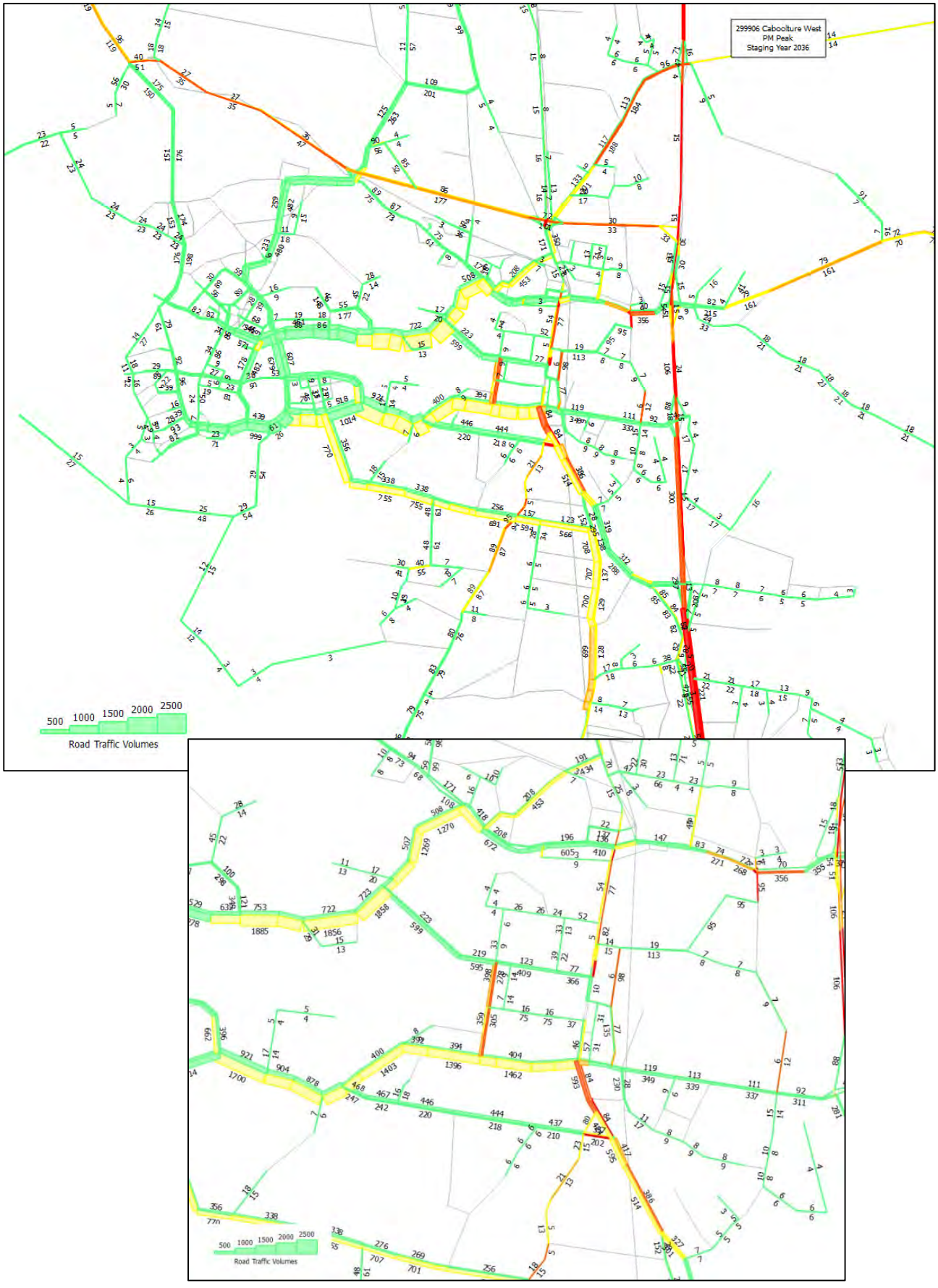



299906 Caboolture West
PM Peak
Staging Year 2031
300 600 900 1200 1500
Road Traffic Volumes

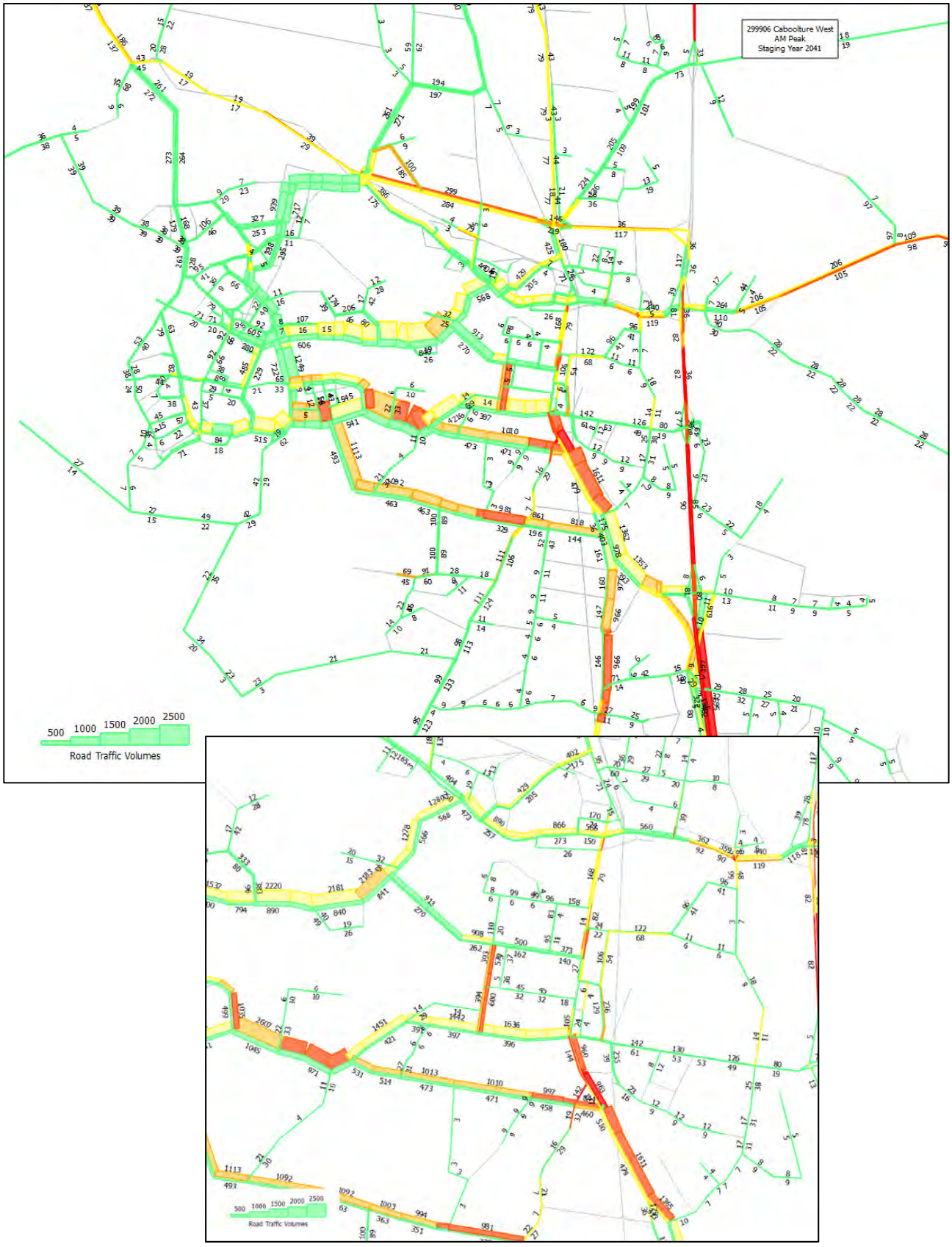
5.5 Staging Year 2036

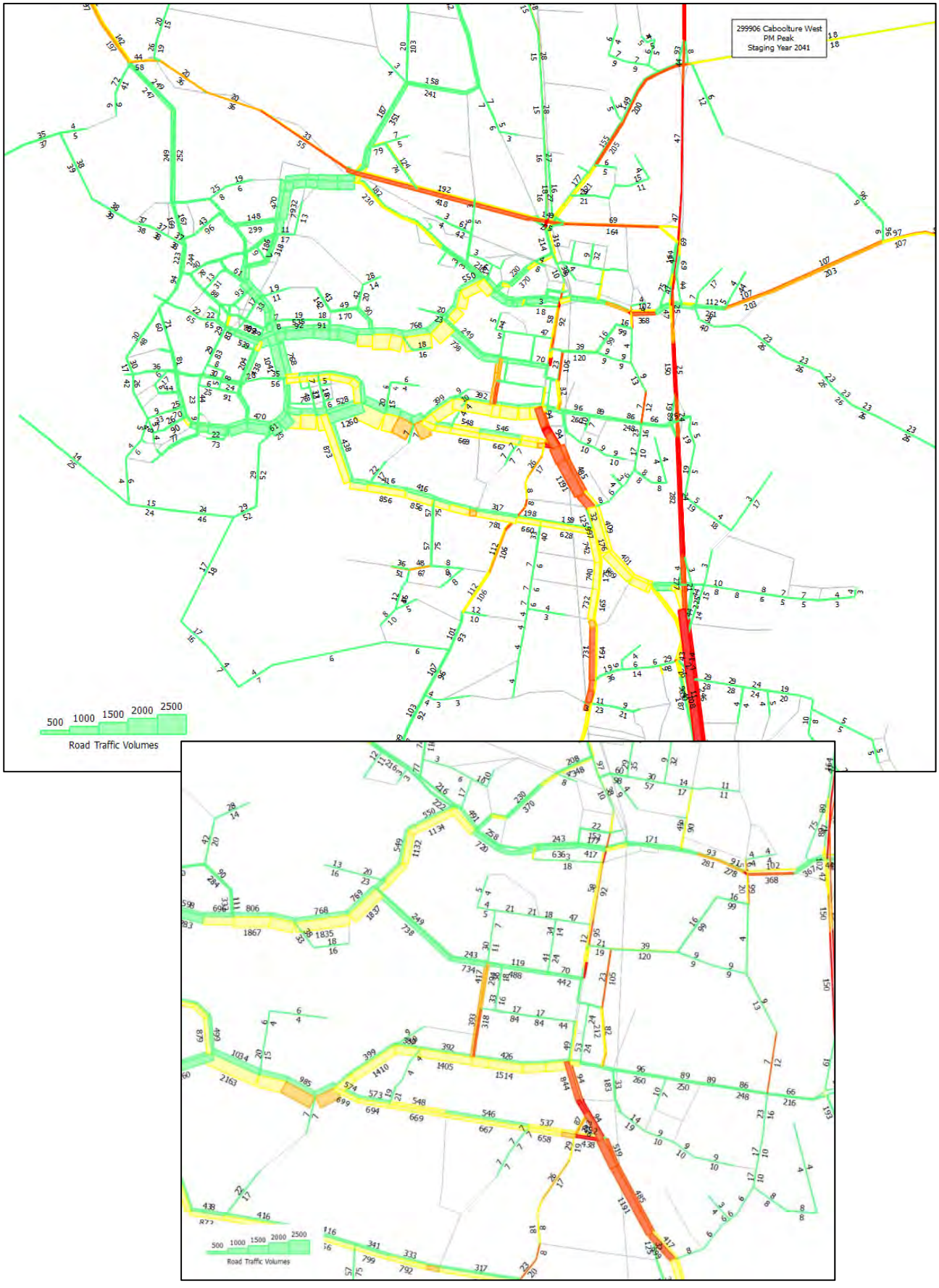
The introduction of the north-south Caboolture West connection relieves some of the pressure on Bellmere Road. In addition, the extension of Petersen Road Extension to Clark Road relieves pressure on Caboolture River Road.



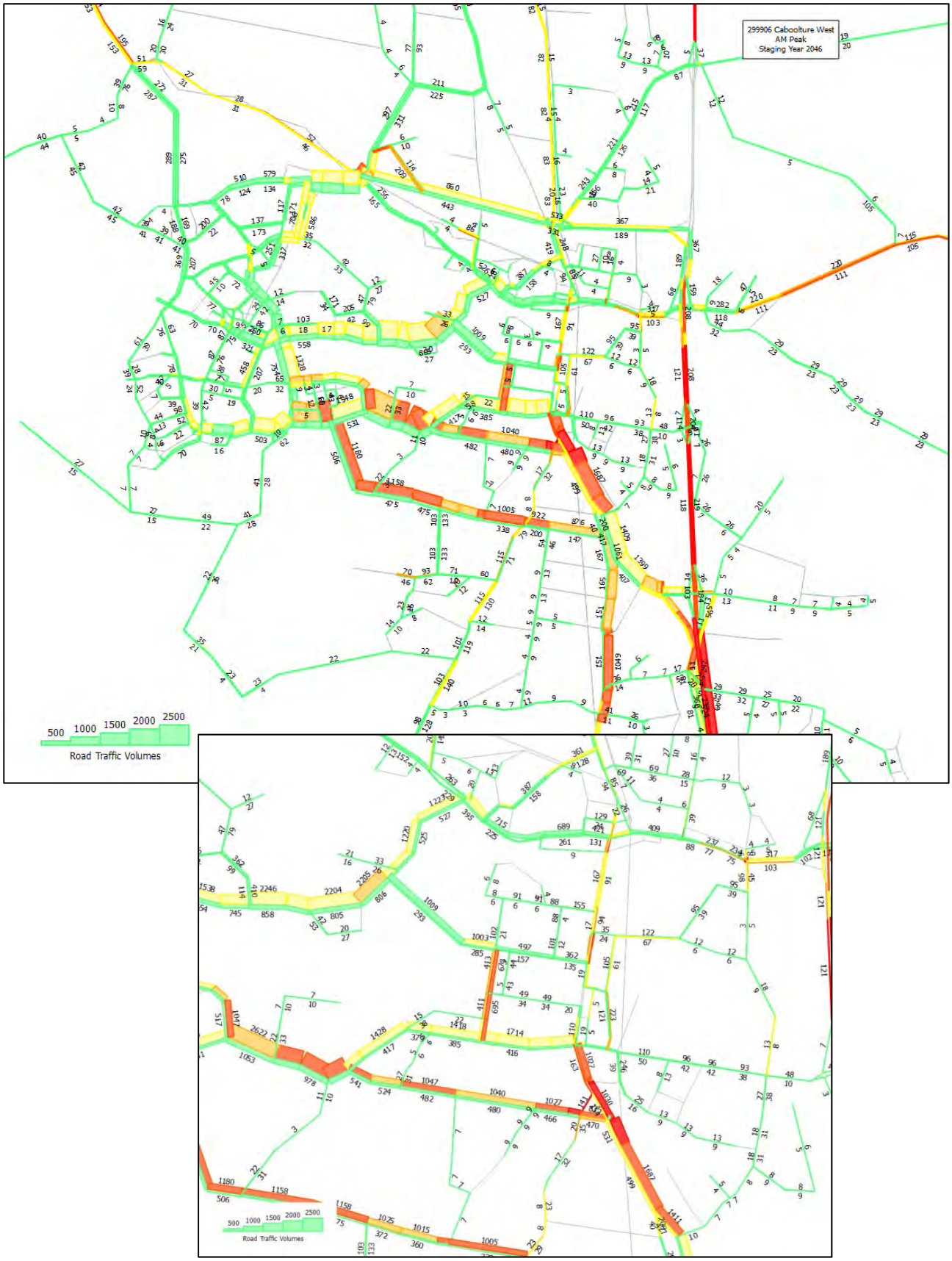

299906 Caboolture West
PM Peak
Staging Year 2036
500 1000 1500 2000 2500
Road Traffic Volumes

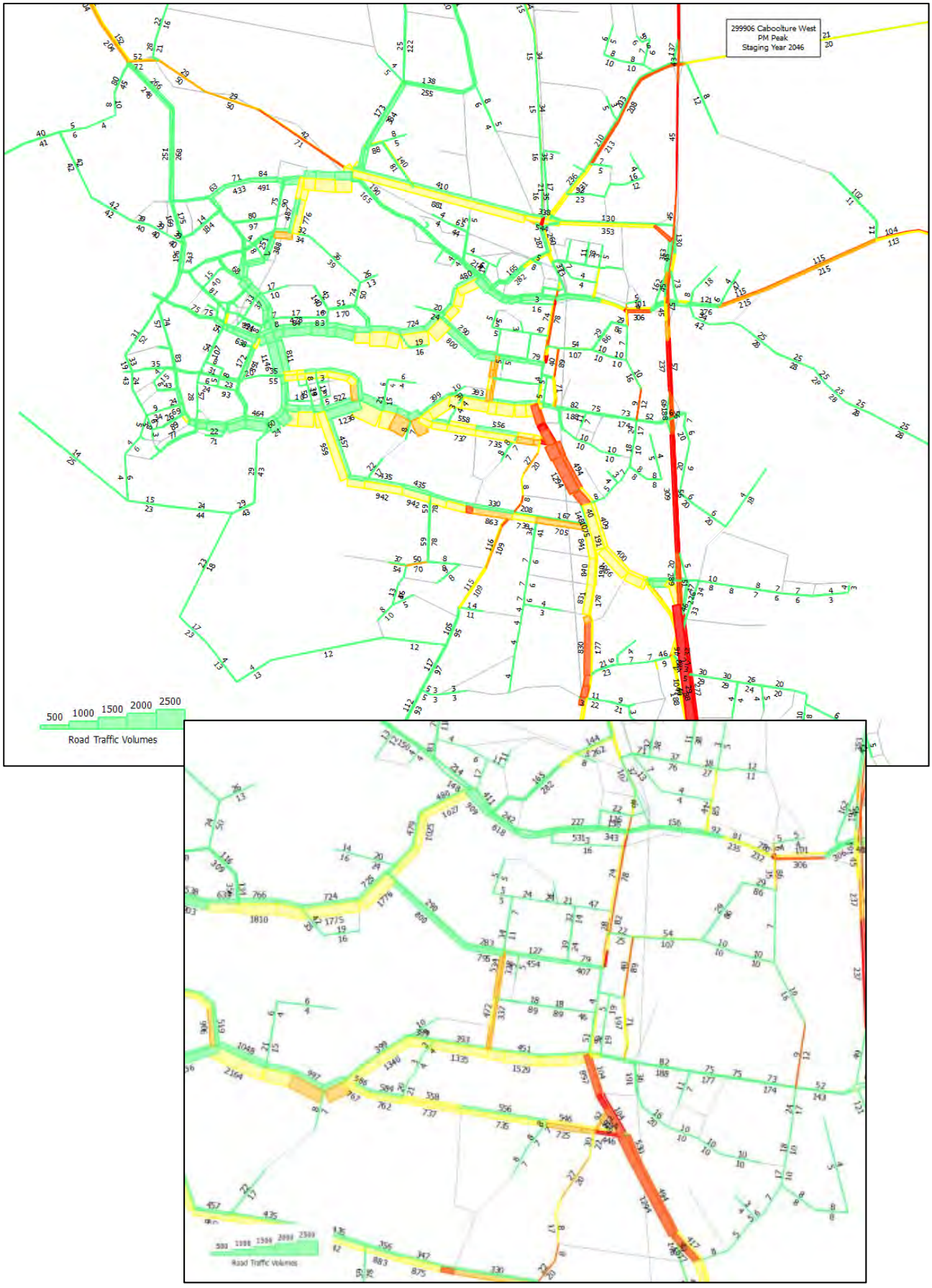
5.6 Staging Year 2041



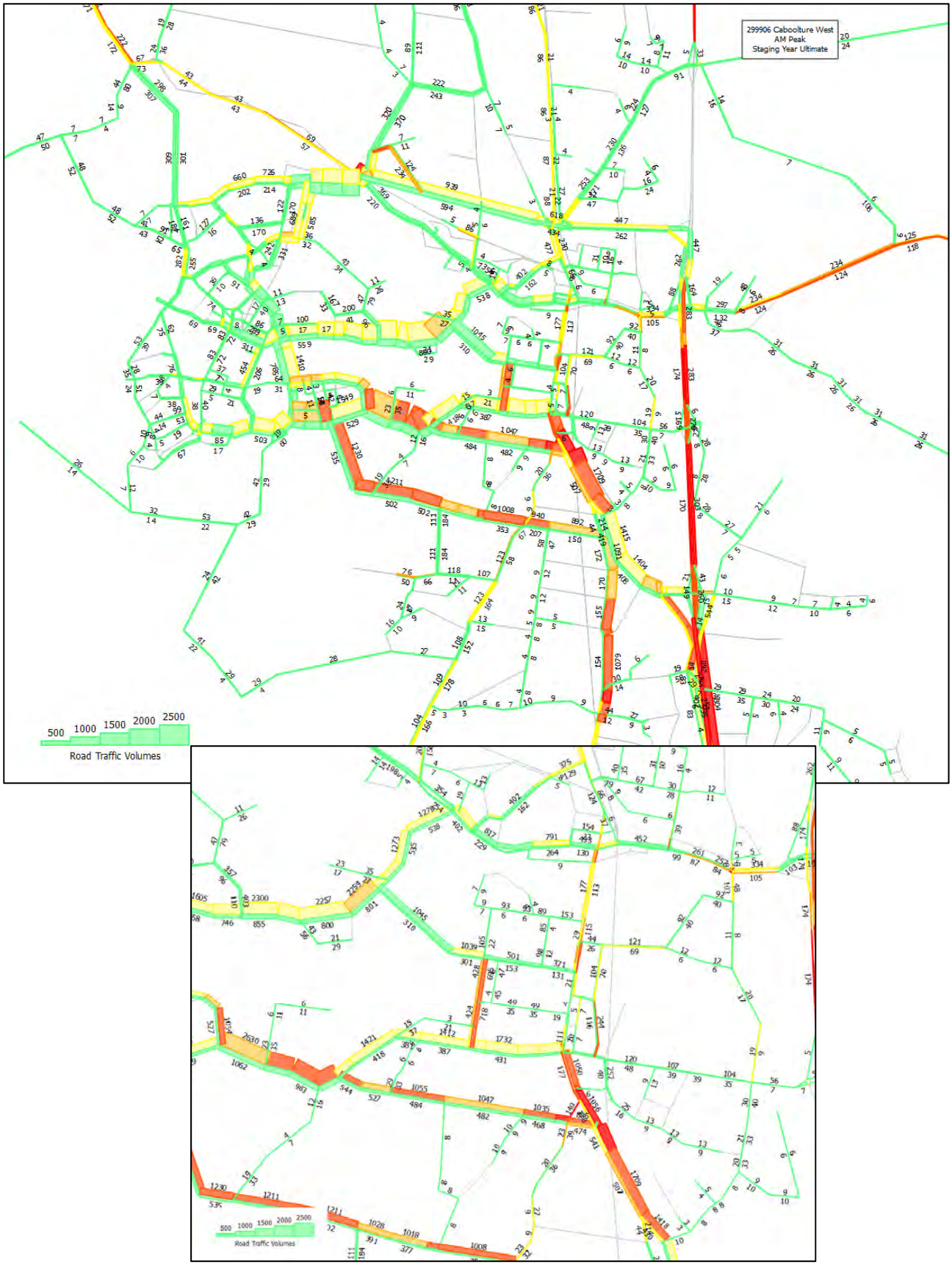

299906 Caboolture West
PM Peak
Staging Year 2041
500 1000 1500 2000 2500
Road Traffic Volumes

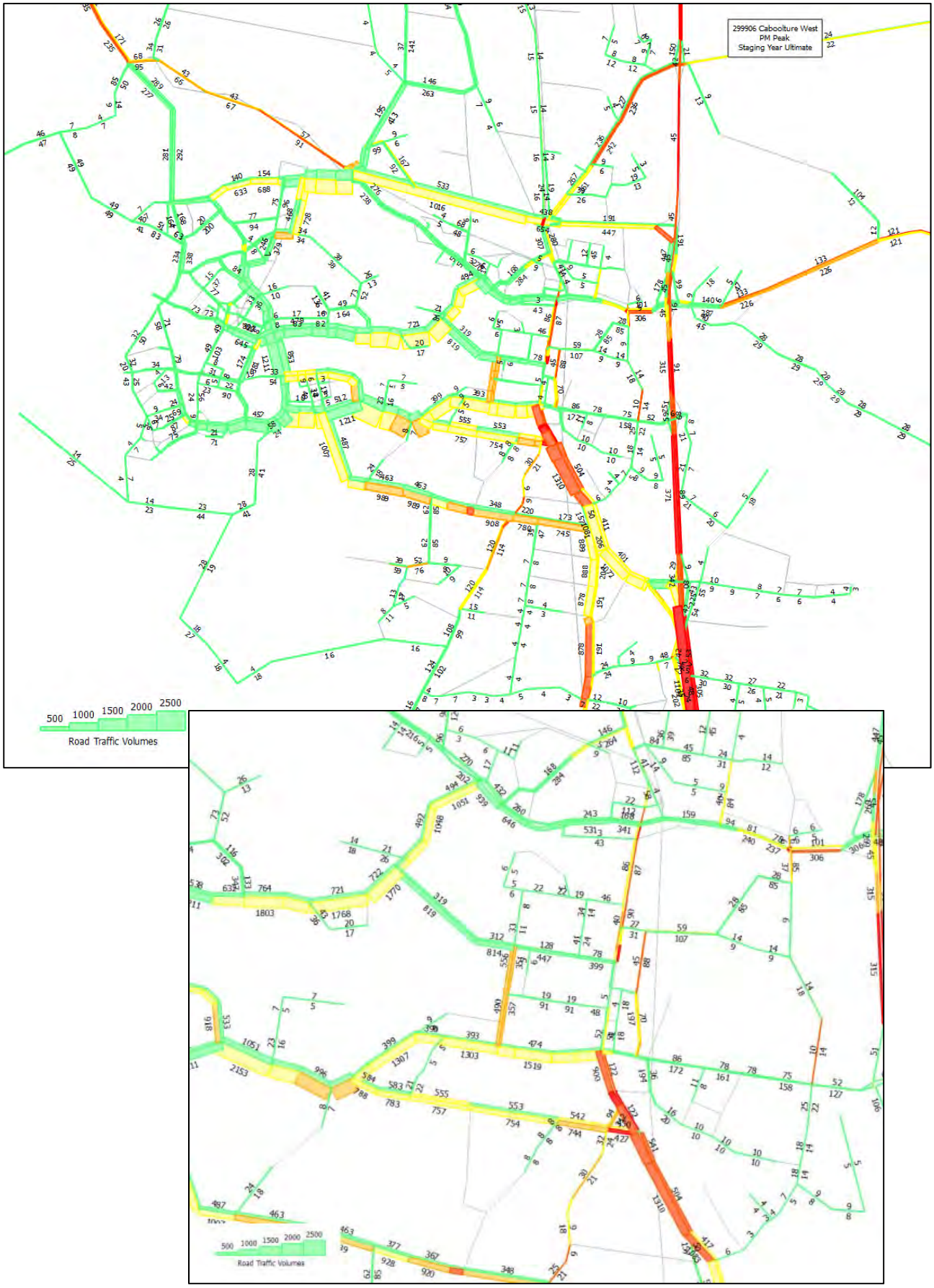
5.7 Staging Year 2046




299906 Caboolture West
PM Peak
Staging Year 2046
500 1000 1500 2000 2500
Road Traffic Volumes

5.8 Staging Year Ultimate




299906 Caboolture West
PM Peak
Staging Year Ultimate
500 1000 1500 2000 2500
Road Traffic Volumes
500 1000 1500 2000 2500
Road Traffic Volumes

Technical Note

229906 6 December 2013

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	Troy Howarth	Roland Cathcart	Peter Dunn
Signature			

		Staging Year (Do Min or Do nothing if there is no Do Min)								Staging Year (Upgrades for with Cab West)							Year upgrade	
Node	Intersection	2016	2021	2026	2031	2036	2041	2046	Ultimate	2021	2026	2031	2036	2041	2046	Ultimate	required	Notes
80268	Bellmere Rd/River Rd	-	✓	×	×	-	-	-	-	✓	✓	✓	✓	✓	✓	✓	2026	Upgrade doesn't work in 2031 but will be relieved after external road upgrades
16974	King St/ Williams Rd	-	✓	✓	-	-	-	-	-	-	-	✓	✓	✓	✓	✓	2036	At 2036 the intersection needs to be upgraded to allow for southern connection into Cab West
16986	D'Aguilar Hwy/ Williams Rd	-	✓	✓	✓	✓	×	-	-	✓	✓	✓	✓	✓	✓	✓	2041	
17036	Williams Rd/ D'Aguilar Hwy ramp	-	✓	✓	✓	✓	×	-	-	-	-	-	✓	✓	✓	✓	2041	
17074	Williams Rd/ Greening Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Small change in turn pocket length resolved issue
17212	Caboolture River Rd/ Dobson Ln	✓	×	×	×	×	×	×	×	✓	✓	×	✓	✓	✓	✓	2031	While it is failing in 2026, the failing movement is right out of a minor street with low volume. It's not until 2031 that a major movement fails. Also Petersen Rd Connection is required to ensure the upgrade doesn't fail in 2031.
17366	Caboolture River Rd/ Park Ridge Avenue	✓	×	×	×	×	×	×	×	✓	✓	✓	✓	✓	✓	✓	2026	While it is failing in 2021, the failing movement is right out of a minor street with low volume. It's not until 2026 that a major movement fails.
17401	Bellmere Rd/ Belle Air Dr	-	✓	✓	×	×	-	-	-	-	-	✓	-	-	-	✓	2031	
19267	Morayfield Rd/ Caboolture River Rd	-	×	×	×	-	-	-	-	-	-	✓	-	-	-	✓	2021	
17491	Caboolture River Rd/ Thornbill Dr	×	×	×	×	-	-	-	-	-	-	✓	-	-	-	✓	2021	While it is failing in 2016, the failing movement is right out of a minor street with low volume. It's not until 2021 that a major movement fails. Also with Cab West upgrade on boarderline in 2031 0.949
17599	Caboolture River Rd/ Walkers Rd	✓	×	×	×	-	-	-	-	-	-	✓	-	-	-	✓	2021	
17677	Bellmere Rd/ Bishop Lane	✓	✓	×	-	×	-	-	-	-	-	✓	-	-	-	✓	2026	
18380	Caboolture River Rd/ Grant Rd	✓	✓	×	×	×	-	-	-	-	-	✓	-	-	-	✓	2026	
18513	Caboolture River Rd/ Ben St	✓	✓	×	×	×	-	-	-	-	-	✓	-	-	-	✓	2026	Works but requires optimum cycle time (was fixed at 90 sec)
18832	Caboolture River Rd/ Lorebury Dr	×	×	-	×	-	-	-	-	-	-	✓	-	-	-	✓	2021	While it is failing in 2016, the failing movement is right out of a minor street with low volume. It's not until 2021 that a major movement fails. Also with Cab West upgrade on boarderline in 2031 0.949
19325	Oakey Flat Rd/ Walkers Rd	✓	×	×	×	-	-	-	-	-	-	✓	-	-	-	✓	2021	
16974	King St/ Williams Rd/ Access to Deve	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓	2036	Needs to be upgraded when new Cab West connection goes in
17879	Walkers Rd/ Cresthaven Dr	✓	×	×	×	✓	-	-	-	-	-	✓	-	-	-	✓	2021	
18073	Petersen Rd/ Komraus Ct	-	-	-	-	✓	×	-	-	-	-	-	-	✓	-	✓	2036	Petersen Connection doesn't open until 2031 - at 2036 a priority intersection will work, at 2041 it will need to be upgraded to signals
80460	Grand Rd/ Torrens Rd	×	×	×	×	-	-	-	-							✓	2016	Under 100% PFF and 55% peak hour conversion, existing layout works without Cab west. Do Some is a smaller signalised intersection
18407	Grant Rd/ Beacon St	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Reviewed! CW Working under do min/do nothing
18462	Grant Rd/ Gallipoli Court	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Reviewed! CW Working under do min/do nothing
18794	Oakey Flat Rd/ Clark Rd	-	-	-	✓	-	-	-	-	-	-	-	-	-	-	✓	2036	At 2036, the Petersen Road connection opens. The upgrade will be required at that point.
18889	Walkers Rd/ Petersen Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Reviewed! CW Working under do min/do nothing
19202	D'Aguilar hwy/ Beerburrum Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Reviewed! CW Working under do min/do nothing
19393	Morayfield Rd/ Station Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Reviewed! CW Working under do min/do nothing
21057	Lower King St/ Mewett St	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Reviewed! CW Working under do min/do nothing
22241	Progress Rd/ Arthur Drewett Dr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Reviewed! CW Working under do min/do nothing
21583	Morayfield Road/ Uhlmann Rd	-	-	-	-	✓	×	-	×	-	-	-	✓	-	-	✓	2041	
19257	Clark Rd/ Hauton Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Reviewed! CW Working under do min/do nothing
19394	Morayfield Rd/ Torrens Rd	-	✓	×	×	-	-	-	-	-	-	-	-	-	-	✓	2026	
19473	Morayfield Rd/ Market Drive	×	×	×	×	-	-	-	-	-	-	-	-	-	-	✓	2016	
19463	Oakey Flat Road/ Morayfield Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Reviewed! CW Working under do min/do nothing
19505	Beerburrum Rd/ Henzell Rd	-	✓	×	×	-	-	-	-	-	-	×	-	-	-	✓	2026	Can get the DoSomething design to work by extending northern approach right turn pocket
19604	Morayfield Rd/ Walkers Rd	×	×	×	×	-	-	-	-	-	-	×	×	×	×	×	2016	Can't get the DoSomething to work without major changes
19709	Morayfield Rd/ Gaffield St	-	-	-	✓	✓	×	×	-	-	-	-	-	✓	-	✓	2041	
19995	Buchanan Rd/ William Berry Dr	-	-	-	-	-	-	-	-	-	-	-	-	-	-	✓		New intersection for ultimate scenario. Only with Cab West scenario tested in SIDRA file, work would be required with or without cab west.
20038	Morayfield Rd/ Lindsay Rd	-	-	✓	×	✓	×	-	×	-	-	✓	-	-	-	✓	2031	Can be pushed back to 2041 if Petersen Road gets upgraded
20307	Pumicestone Rd/ Ardrossan Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Reviewed! CW Working under do min/do nothing
80230	Old Gympie Rd / Mackie Rd	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Reviewed! CW Working under do min/do nothing
70003	Petersen Rd / Petersen Rd extension	-	-	-	-	✓	✓	✓	✓	-	-	-	-	-	-	-	2036	Petersen Rd extension doesn't open until 2036. Signals works from then until ultimate
70002	Petersen Rd / Thornbill Dr	-	-	-	-	✓	✓	✓	✓	-	-	-	-	-	-	-	2036	Petersen Rd extension doesn't open until 2036. Signals works from then until ultimate
24614	Bribie Island Rd / Hickey Rd	-	-	-	✓	✓	✓	✓	✓	-	-	-	-	-	-	-	-	Reviewed! CW Working under do min/do nothing
23040	Uhlmann Rd / Buckley Rd	-	-	-	✓	✓	×	-	-	-	-	-	-	✓	-	✓	2041	
20533	Narangba Rd / Mumford Rd / Main St /	-	-	-	✓	✓	✓	✓	✓	-	-	-	-	-	-	-	-	Reviewed! CW Working under do min/do nothing
20321	Morayfield Rd / Graham Rd	-	-	-	✓	✓	✓	×	×	-	-	-	-	-	✓	✓	2046	

Legend

×	Fails
✓	Passes
-	not assessed
xxxx	no longer requiring cab west specific upgrade

Appendix F

Preliminary Internal Road Network Costs

Technical Note

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Project title	MBRC – Caboolture West Study	Job number	229906-00
cc		File reference	
Prepared by	David Weisfelt	Date	29 November 2013
Subject	Staging Cost Estimate - DRAFT		

1 Background

State Government declared Caboolture West as a Master Planned Area under the provisions of the Sustainable Planning Act on 17 February 2012. Council as part of the preparation of a Structure Plan to form part of the region's new Planning Scheme requires input on the concept design and development scenarios for the Caboolture West area. Moreton Bay Regional Council has engaged Arup to develop cost estimates for the stages of the Caboolture West internal trunk network.

2 Purpose of this note

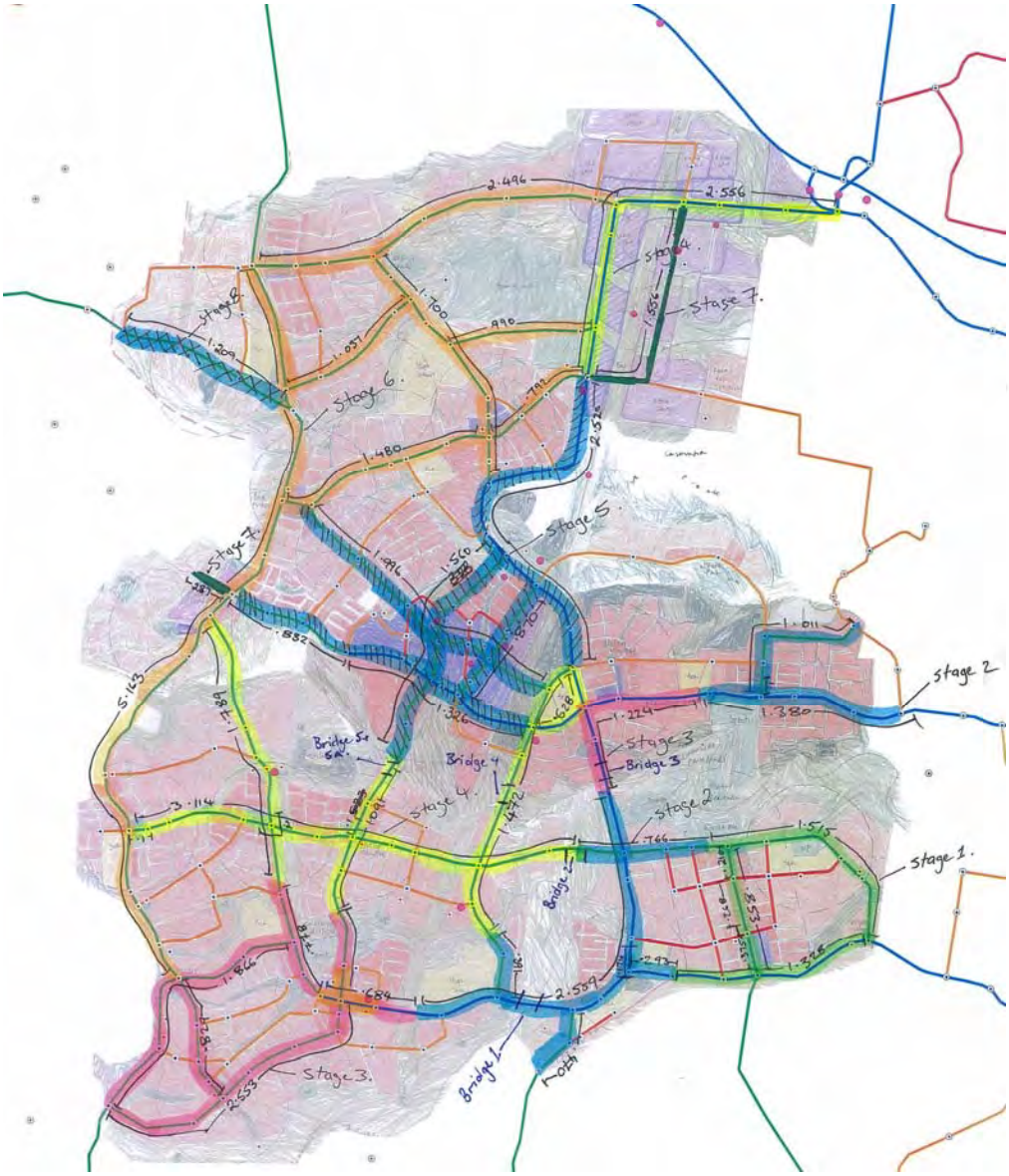
The purpose of this technical note is to document the process followed to develop the cost estimates for the strategic stages of Caboolture West internal trunk network. This note includes;

- A summary of the approach and assumptions used to develop the cost estimates; and
- Details of the cost estimate breakdown for each of the strategic stages.

The estimates are high level and are based on conceptual cross sections (provided by Moreton Bay Regional Council). For this reason the costs included in this note should be treated as indicative only until further investigations are undertaken. This may include but not limited to road design using detailed survey, geotechnical and hydraulics investigation, land resumption requirements and services relocation.

3 Study Area and staging

An estimate was developed for the eight stages identified in the Caboolture West Land Use Plan. This extended between the years of 2016 – 2051 within the Caboolture West work areas. Please see map below outlining the study extents.



4 Cross Sections

Each stage of development identified in Section 3 of this note was further divided into different road type cross sections based on advice from MBRC. This was done for the purpose of costing and included:

- Two Lane Boulevard ,
- Four Lane Boulevard,
- Four Lane Industrial, and
- Main Road.

In addition to the above, costings were undertaken for 5 bridges and 145 intersections.

5 Cost Estimate Approach and Assumptions

5.1 Approach and Sources

Under the direction of Moreton Bay Regional Council, the cost estimates were prepared using the cross sections and unit rates provided to Arup. Each cross section included the necessary items required to make up that particular road section at a linear metre rate. This rate was then applied over the road network to develop a high level estimate.

Information that was not provided and required input by Arup included:

- Bridge costs;
- Intersection costs;
- Escalation.

Sources used to calculate the costs associated with bridges and intersections were developed using the following:

- Rawlinsons Australian Construction Handbook – 2013;
- Recent Arup projects;
- Advice from the structures team; and
- Construction rates from recent tenders.

This resulted in a flat unit rate of $5,500 m/2 being applied to each bridge to cover all associated works. Intersections were developed on the basis of 3 leg and 4 leg arrangements with a unit rate of $50,000 per leg. It is noted that this rate covers all costs associated with the signalling equipment while pavement quantities are absorbed in the cross sections.

Escalation figures have been based off TMR's Project Cost Estimating Manual (fifth edition 2012).

5.2 Assumptions

- Unit rates provided by Moreton Bay City Council in the 'Caboolture West Typical Streets' spreadsheet are accurate for 2013 and valid for the local area;
- Cross Sections provided by Moreton Bay City Council in the 'Caboolture West Typical Streets' spreadsheet are accurate and include all required items;
- Staging was developed in accordance with the Caboolture West Landuse Plan, dated 14 November 2013. This information was considered accurate and divided accordingly;
- All rates include supply and installation;
- TMR escalation rates as per TMR Project Cost Estimating Manual are acceptable and include:
  - 2014: 10%
  - 2015: 10%
  - 2016: 9%
  - 2017 and beyond: 8%
- No resumption costs are required as Caboolture West area is considered a green field area.

5.3 Exclusions

The below items have not been taken into consideration in the estimate due to the high level scope of the study:

- Services investigation (Dial Before You Dig and above ground identification);
- Flood modelling and hydraulics assessment of the area;
- Land resumption requirements.

6 Unit Rates Review and Comments

A high level review was undertaken by Arup to validate the unit rates provided by Moreton Bay Regional Council. This was done with reference to the sources outlined in section 5.1 of this report. The revision concentrated on big ticket items that could have a major influence on the overall cost of the project.

The identified items are listed below in table 1 with recommended rates and comments.

Table 1 - A review of big ticket items for quality assurance purposes

Item	Rates Supplied	Recommended Rate	Comment
Corrector-sub base	$52.0/m3	$160/m3	Assuming Type 2.5
Sub-base	$74.0/m3	$170/m3	Assuming Type 2.3
Base	$75.0/m3	$180/m3	Assuming Type 2.1
Bitumen concrete	$200/tonne	$220/m3	Assuming DG14 Asphalt
Concrete pathway	$55/m2	$55/m2	Assuming 100mm with mesh reinforcement
Street lighting	$6500 each	$6500 each	This is accurate and no further action recommended.
Design and supervision	25%	25.6%	This is accurate and no further action recommended.

With exception to the unbound pavements (shown in red) the remaining sample of big tickets items appear to be relatively accurate. The items shown in red however are on average 2.5 times more than the rates supplied. This difference will play a major role in the overall cost of the project and will need to be further addressed.

7 Staged Cost Estimates

A summary of the cost estimates for the strategic stages of the Caboolture West internal trunk network attached to this note. The estimate has been broken into eight stages using five year intervals (from 2016 – 2051). The base estimate cost in today's dollars is displayed for reference with the appropriate escalation (as per TMR's cost estimating manual) applied to determine future costs.

8 Recommendations

As outlined in section 6 of this note, some of the unit rates for big ticket items may have been under estimated. For example, the rates supplied for the unbound pavements appear to be out by a factor of 2.5. This has been worked out using a range of sources (as listed in section 5.1) together with relevant engineering judgement. As this item plays a major role in the pavement profile it is evident the difference noted above will impact the overall cost estimate provided.

Therefore it is recommended a detailed analysis of the unit rates used to develop the cost estimates is undertaken in the future stages of the study.

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	David Weisfelt	Thomas Whiteley/Roland Cathcart	Peter Dunn
Signature			

Project Number **: 229906-00**

Local Authority **: Moreton Bay Regional Council**

Asset Name **: Caboolture West Study**

Location **: Caboolture West**

File: **Preliminary Cost Estimate for Stages 1-8**

Date**: 29/11/13**

Rev: **1**

ARUP

	Street Type	Length Inputs	Cost	
Stage 1 (2016)	Four Lane Boulevard	1328	$	6,931,115
	Two Lane Boulevard	1783	$	6,899,271
	Residential Neighbourhood	0	$	-
	Residential Rear Lane	0	$	-
	Neighbourhood Env Link	0	$	-
	Main Street	585	$	2,490,341
	Business Service Laneway	0	$	-
	Industrial Road	0	$	-
	Industrial Centre Turn Road	0	$	-
	Intersections (9)		$	1,450,000
	Base Estimate Cost of Stage 1		**$**	**17,770,727**
	Escalation 2016 @9.667% avg p.a		**$**	**23,437,812**

	Street Type	Length Inputs	Cost	
Stage 2 (2021)	Four Lane Boulevard	4058	$	21,179,567
	Two Lane Boulevard	2538	$	9,820,724
	Residential Neighbourhood	0	$	-
	Residential Rear Lane	0	$	-
	Neighbourhood Env Link	0	$	-
	Main Street	274	$	1,166,416
	Business Service Laneway	0	$	-
	Industrial Road	0	$	-
	Industrial Centre Turn Road	0	$	-
	Intersections (22)		$	3,450,000
	Bridge 1 Option A	185	$	-
	Bridge 1 Option B	120	$	22,572,000
	Base Estimate Cost of Stage 2		**$**	**58,188,707**
	Escalation 2021 @8.625% avg p.a		**$**	**112,763,709**

	Street Type	Length Inputs	Cost	
Stage 3 (2026)	Four Lane Boulevard	1908	$	9,958,259
	Two Lane Boulevard	6026	$	23,317,447
	Residential Neighbourhood	0	$	-
	Residential Rear Lane	0	$	-
	Neighbourhood Env Link	0	$	-
	Main Street	245	$	1,042,963
	Business Service Laneway	0	$	-
	Industrial Road	0	$	-
	Industrial Centre Turn Road	0	$	-
	Intersections (23)		$	3,850,000
	Bridge 3	105	$	19,750,500
	Base Estimate Cost of Stage 3		**$**	**57,919,169**

	Escalation 2026 @8.38% avg p.a		**$ 164,919,401**
Stage 4 (2031)	**Street Type**	Length Inputs	Cost
	Four Lane Boulevard	3184	$ 16,617,975
	Two Lane Boulevard	7466	$ 28,889,489
	Residential Neighbourhood	0	$ -
	Residential Rear Lane	0	$ -
	Neighbourhood Env Link	0	$ -
	Main Street	398	$ 1,694,283
	Business Service Laneway	0	$ -
	Industrial Road	0	$ -
	Industrial Centre Turn Road	0	$ -
	Intersections (26)		$ 4,650,000
	Bridge 2	130	$ 19,019,000
	Bridge 4	85	$ 12,435,500
	Bridge 5 & 5a	160	$ 23,408,000
	Base Estimate Cost of Stage 4		**$ 106,714,247**
	Escalation 2031 @8.278% avg p.a		**$ 446,468,276**
Stage 5 (2036)	**Street Type**	Length Inputs	Cost
	Four Lane Boulevard	3846	$ 20,073,094
	Two Lane Boulevard	5258	$ 20,345,692
	Residential Neighbourhood	0	$ -
	Residential Rear Lane	0	$ -
	Neighbourhood Env Link	0	$ -
	Main Street	1859	$ 7,913,749
	Business Service Laneway	0	$ -
	Industrial Road	0	$ -
	Industrial Centre Turn Road	0	$ -
	Intersections (25)		$ 4,200,000
	Base Estimate Cost of Stage 5		**$ 52,532,535**
	Escalation 2036 @8.217% avg p.a		**$ 322,935,163**
Stage 6 (2041)	**Street Type**	Length Inputs	Cost
	Four Lane Boulevard	0	$ -
	Two Lane Boulevard	13685	$ 52,953,745
	Residential Neighbourhood	0	$ -
	Residential Rear Lane	0	$ -
	Neighbourhood Env Link	0	$ -
	Main Street	770	$ 3,277,884
	Business Service Laneway	0	$ -
	Industrial Road	0	$ -
	Industrial Centre Turn Road	0	$ -
	Intersections (36)		$ 5,750,000
	Base Estimate Cost of Stage 6		**$ 61,981,629**
	Escalation 2041 @8.179% avg p.a		**$ 559,846,209**
	Street Type	Length Inputs	Cost
	Four Lane Boulevard	0	$ -
	Two Lane Boulevard	681	$ 2,635,111
	Residential Neighbourhood	0	$ -
	Residential Rear Lane	0	$ -
	Neighbourhood Env Link	0	$ -

Stage 7 (2046)	Main Street	0	$ -
	Business Service Laneway	0	$ -
	Industrial Road	1162	$ 3,655,054
	Industrial Centre Turn Road	0	$ -
	Intersections (2)		$ 300,000
	Base Estimate Cost of Stage 7		**$ 6,590,165**
	Escalation 2046 @8.152% avg p.a		**$ 87,462,286**
Stage 8 (2051)	**Street Type**	Length Inputs	Cost
	Four Lane Boulevard	0	$ -
	Two Lane Boulevard	1208	$ 4,674,324
	Residential Neighbourhood	0	$ -
	Residential Rear Lane	0	$ -
	Neighbourhood Env Link	0	$ -
	Main Street	0	$ -
	Business Service Laneway	0	$ -
	Industrial Road	0	$ -
	Industrial Centre Turn Road	0	$ -
	Intersections (2)		$ 350,000
	Base Estimate Cost of Stage 8		**$ 5,024,324**
	Escalation 2051 @8.132% avg p.a		**$ 97,976,280**

Appendix G

Preliminary External Road Network Costs

Technical Note

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Project title	MBRC – Caboolture West Study	Job number	229906-00
cc		File reference	
Prepared by	David Weisfelt and Thomas Whiteley	Date	06 January 2014
Subject	Caboolture West - External Works- Cost Estimate - DRAFT		

1 Background

State Government declared Caboolture West as a master planned area under the provisions of the Sustainable Planning Act on 17 February 2012. Council as part of the preparation of a structure plan to form part of the region's new planning scheme requires input on the concept design and development scenarios for the Caboolture West area. Moreton Bay Regional Council has engaged Arup to develop cost estimates for the external works along a number of key corridors and intersections that have been identified as critical links to the Caboolture West area. The intent of the upgrade is to ensure a satisfactory level of operation is maintained.

2 Purpose of this note

The purpose of this technical note is to document the process Arup has taken to develop the cost estimates for the Caboolture West External Road Network. This includes:

- Details of the identified corridors and intersections;
- The approach and assumptions made to develop estimates; and
- A breakdown of the cost estimates for each of the identified corridors and intersections.

The estimates provided in this note should be treated as indicative only. Estimates are based on high level assumptions and information provided to Arup by Moreton Bay Regional Council. Until further investigations have been undertaken, this note is only suitable for providing a guide to the user of this document. Further investigations to provide confidence in the estimates are recommended. This may include but not limited to: road design using detailed survey and an investigation of the existing services, pavement, geotechnical, environmental and hydraulic conditions.

3 Study Area

Figure 1 below outlines the extents of the Caboolture West External Road Network. It identifies the corridors and intersections that require upgrading to improve connectivity to the Caboolture West Area. This includes:

- Bellmere Road Corridor (blue),
- Caboolture River Road Corridor (green),
- Morayfield Road Corridor (orange),
- Petersen Road/Tinney Road/ Clark Road Corridor (pink), and
- Isolated intersections (brown).

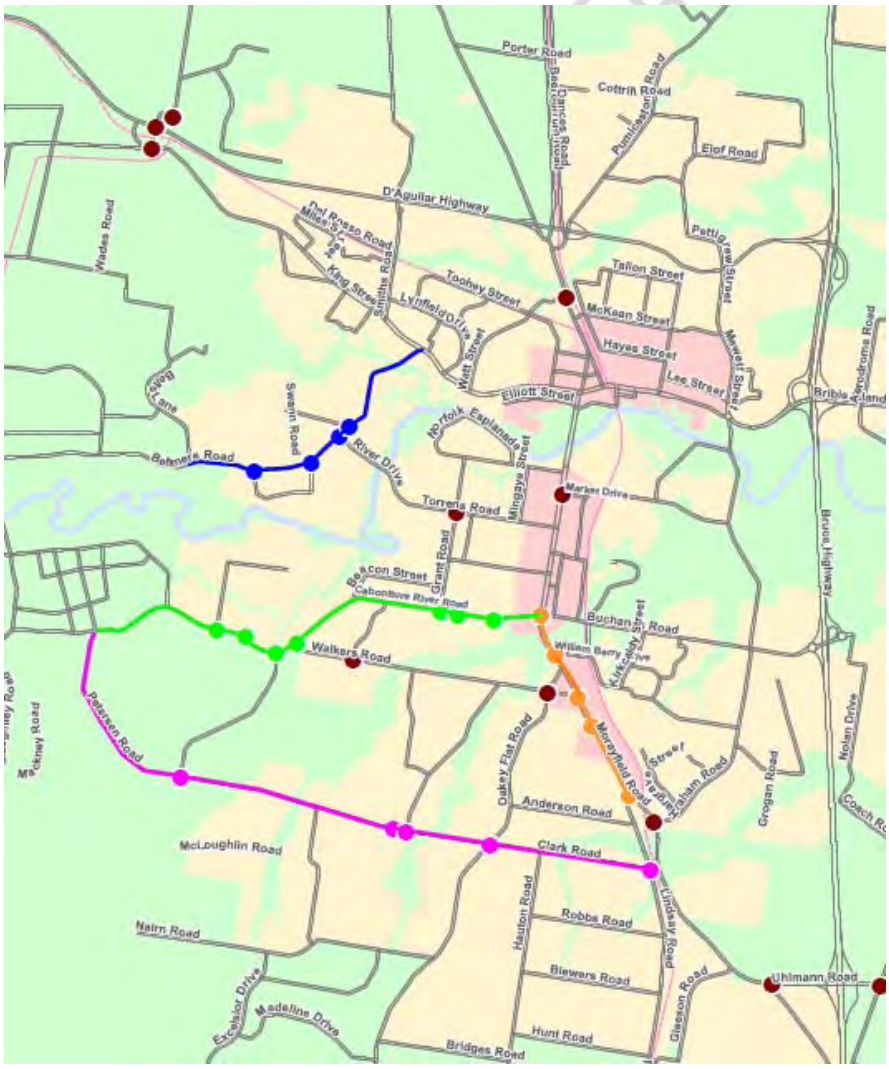

Figure 1 - Study area that identifies the critical corridors and intersection links to the West Caboolture Area that require upgrading

4 Corridor and Isolated Intersections

The following section outlines the proposed works for each of the identified corridors and intersections.

4.1 Bellmere Road Corridor

Length of corridor upgrade: 2928m

Bridges: 1 bridge (1332m2)

Resumptions: 0

Road/Intersection	Existing/Expected Conditions	Proposed Upgrade
Bellmere Road	2 lane arterial	4 lane arterial
Belle Air Drive	1 lane roundabout	Signalised (4 leg)
Bishop Lane	Un-signalised T intersection	Signalised (3 leg)
River Drive	2 lane roundabout	Signalised (3 leg)
Piggott Road	No signals	Signalised (3 leg)

4.2 Caboolture River Road Corridor

Length of corridor upgrade: 4135m

Bridges: 0

Resumptions: 1683m2

	Existing/Expected Conditions	Proposed Upgrade
Road		
Caboolture River Road	2 lane arterial road	4 lane arterial road
Intersections		
Dobson Lane	Un-signalised T intersection	Signalised (3 leg)
Park Ride Ave	Un-signalised T intersection	Signalised (3 leg)
Thornbill Drive	Un-signalised T intersection	Signalised (3 leg)
Walkers Road	Un-signalised T intersection	Signalised (3 leg)
Ben Street	Un-signalised T intersection	Signalised (3 leg)
Amy Street	Un-signalised T intersection	Signalised (3 leg)

4.3 Morayfield Road Corridor

Length of corridor upgrade: 2011m

Bridges: 1 bridge (800m2)

Resumptions: 0

	Existing/Expected Conditions	Proposed Upgrade
Road		
Morayfield Road	4 lane arterial	6 lane arterial
Intersections		
Station Road	3 leg round about	Signalised (3 leg)
Caboolture River Road	Signalised (4 leg) – Expected Do min upgrade	Do min layout for signals is sufficient. Pavement upgrade captured in corridor upgrade.
Oakey Flat Road	Left in left out	Signalised (2 leg)
Walkers Road	Signalised (3 leg) – – Expected Do min upgrade	Do min layout for signals is sufficient.
Shopping Centre access (Gaffield Street)	Signalised (4 leg) – – Expected Do min upgrade	Do min layout for signals is sufficient. Pavement upgrade captured in corridor upgrade.
Lindsay Road	Signalised (4 leg) – – Expected Do min upgrade	Remove Lindsay Road set of signals and reinstall to allow for widened corridor

4.4 Petersen Road/ Tinney Road/ Clark Road

Length of corridor upgrade: 5180m

Length of new corridor link (connecting Peterson and Clark Roads): 1686m

Bridges: 2 bridges (2695m2)

Resumptions: 12805m2

	Existing Conditions	Proposed Upgrade
Road		
Petersen/Clark/Tinney Roads	2 lane neighbourhood/arterial	2 lane sub arterial
Corridor link	Green field	2 lane sub arterial
Intersection		
Petersen Road/ Komraus Court	Un-signalised T intersection	Signalised (3 leg)
Petersen Road/ Thornbill Drive	Un-signalised T intersection	Signalised (3 leg)
Petersen Road / Peterson Road Extension	No intersection	Signalised (3 leg)
Clark Road /Oakey Flat Road/Clark Road Extension	Signalised (3 leg) – Recent upgrade	Additional leg (signalised 4 leg) with locally widened lanes at intersection captured in corridor upgrade
Clark Road/ Hauton Road	Un-signalised T intersection	Signalised (3 leg)

4.5 Isolated Intersections

Across the study area a number of isolated intersections require upgrades to ensure a satisfactory level of operation is maintained. The following intersections were included in the cost estimate.

Location	Existing/Expected Conditions	Proposed Upgrade
Williams Rd/King St	Un-signalised T intersection	Upgrade to double lane 4 leg roundabout
Williams Rd/D'Aguliar Highway	Left in left out with a hold line giveaway	On-ramp to become acceleration lane with merge. Reconstruction of loop road also required to ensure adequate geometry.
Williams Rd/ Williams Rd	Un-signalised T intersection	Upgrade to a single lane 3 leg roundabout
Walkers Road/Cresthaven Drive	Un-signalised (4 leg)	Signalised (4 leg) and lengthen slip lane
Walkers Road/Peterson Road	Signalised (4 leg)	Add an additional short eastbound through lane
Walkers Road/Oakey Flat Road	Signalised (4 leg)	Widening of Oakey Flat Road north of the intersection to 4 lanes, additional short turning lanes from the east and west on Walkers Road and lengthened short lanes on all approaches
Beerburrum Road/Henzell Road	Signalised (4 leg)	Provide longer turn lanes on Henzell Road and a double right turn into Henzell Road (with a short second lane westbound)
Uhlmann Rd/Buckley Rd	Signalised (4 leg)	Re-assigning the through lane on the western approach to being a shared through/right turn lane, and providing a longer downstream short lane on the southern exit
Morayfield Road/Market Drive	Signalised (3 leg)	Add additional through/left southbound with short through and additional right turn into Market Drive with short east bound lane.
Morayfield Road/Graham Road	Signalised (3 leg)	Additional pavement to accommodate a double right turn from Morayfield to Graham Road and slip lanes on both roads.
Morayfield Road/Uhlmann Road	Signalised (4 leg)	Additional pavement to accommodate a double left slip lane and longer right turn lanes.
Grant Road/Torrens Road	Signalised (4 leg)	Additional pavement to accommodate the increase length of turn lanes

5 Cross Sections

5.1 Identification

Each corridor identified in Section 3 of this note was divided into different road type cross sections based on advice from MBRC. This was done for the purpose of costing and included:

- New 2 Lane Sub Arterial
  - *New link road connecting Peterson Road with Clark Road*
- 2 Lane Sub Arterial Upgrade
  - *Upgrading Peterson Road, Clark Road and Tinney Road Corridor*
- 2 to 4 Lane Arterial Upgrade
  - *Bellmere Road corridor; and*
  - *Caboolture River Road corridors*
- 4 to 6 Lane Arterial Upgrade
  - *Morayfield Road corridor*

5.2 Formation

The following table outlines the assumed formation for each cross section:

Cross Section	New pavement width	New Arrangement	Existing pavement width (avg)	Existing Arrangement
New 2 lane sub arterial	13.5m	3.5m lanes, 2.5m parking (1 side), 2.0m bike lanes (both sides)	N/a	Greenfield
2 lane upgrade	13.5m	3.5m lanes, 2.5m parking (1 side), 2.0m bike lanes (both sides)	7.0m	2 x 3.0m lanes and 0.5m shoulders
2 to 4 lane upgrade	20.5m	3.5m lanes, 2.5m parking (1 side), 2.0m bike lanes (both sides)	9.0m	2 x 3.5m lanes and 1.0m shoulders
4 to 6 lane upgrade	24.5m	3.5m lanes, 1.0m shoulder (1 side), 2.5m parking (1	18.0m	4 x 3.5m lanes and 2.0m

		side).		shoulders (avg)

6 Cost Estimate Approach

6.1 Cross Sections

The cost estimates for the Caboolture West External Upgrades were prepared using the cross sections and unit rates provided to Arup by Moreton Bay Regional Council. This included the necessary items required to make up that particular road section at a linear metre rate (for a green field site). In the case of upgrading the external road network (which is non-greenfield), the 'main street' cross section was used as the base template and adjusted accordingly to account for existing infrastructure. Each section below will detail the approach used for each cross section type and the assumptions made.

6.1.1 New 2 lane sub arterial

The link road connecting Peterson Road to Clark Road is a greenfield site. For this reason the 'Main St' cross section provided to Arup was used with through lanes widened to 3.5m to satisfy the tie-ins to the adjacent roads.

6.1.2 2 lane upgrade

The existing Peterson Road, Clark Road and Tinney Road has varying road infrastructure within the road corridor (based on Google maps). This included, but is not be limited to, street lighting, kerbs, drainage, footpaths etc. It is likely the existing infrastructure could be retained in some instances while other instances would require removal and/or replacement. However due to high level nature of this cost estimate it was assumed that new infrastructure would be required along the entire length to ensure the latest standards are met. This 'conservative' approach was assumed to balance out the demolition requirements and therefore was not considered in the estimate.

The existing road pavement was assumed to contain suitable sub base material (for the width of the existing road) but with 30% un-suitable base material (requiring excavation). The profile of the existing pavement was also assumed to match the proposed pavement profile of a 'minor road' (25mm AC with 150mm base material) and would therefore require a deeper pavement.

6.1.3 2 to 4 lane upgrade

The existing Bellmere Road and Caboolture River Road corridors also have varying road infrastructure within the road corridor (based on Google maps). For the reasons outlined in the 2 lane upgrade above, it was assumed that new infrastructure would be required and the requirement for demolition would be omitted from the estimate.

The existing road pavement was assumed to contain suitable sub base material (for the width of the existing road) but with 30% un-suitable base material (requiring excavation). The profile of the existing pavement was also assumed to match the proposed pavement profile of a 'major road' (40mm AC with 150mm base material).

6.1.4 4 to 6 lane upgrade

Morayfield Road varies in form throughout its length from wide shoulders (with parking) and wide central medians to reduced verges and reduced medians. Being a TMR owned road, it would be common to reduce shoulder widths where possible to accommodate the 6 lanes (simple line marking exercise). Where this isn't possible, the large median (6m+) would be utilised to avoid widening along the sides (more complications with services).

However, for the purpose of this cost exercise (being conservative) it has been assumed that widening will be required along one side of the entire corridor.

The existing road pavement was assumed to contain suitable sub base material (for the width of the existing road) but with 30% un-suitable base material (requiring excavation). The profile of the existing pavement was also assumed to match the proposed pavement profile of a 'major road' (40mm AC with 150mm base material).

6.2 Bridge Costs

Bridge costs were not provided to Arup and were therefore calculated based on a $/m2 rate. Using advice from the Arup's structural team and past practice this rate equated to $5,500 per m2. This accounted for all costs associated with the construction of a bridge.

6.3 Intersection/Roundabout Costs

Intersection upgrades were developed on the basis of 3 leg and 4 leg arrangements with a unit rate of $50,000 per leg. It is noted that this rate covered all costs associated with the signalling equipment. Pavement quantities where applicable were absorbed in the cross sections upgrades.

Isolated intersections were individually assessed in regards to the requirement of additional pavement for the new layouts. The pavement profile used was equal to the pavement profile of the corresponding corridor.

Roundabouts were individually assessed with broad assumptions made in regards to lighting, drainage, demolitions, service relocations, pavement areas etc.

All rates used to develop the above estimates have been sourced from the following:

- Rawlinsons Australian Construction Handbook – 2013;
- MBRC provided unit rates;
- Recent Arup projects;
- Construction rates from recent tenders.

6.4 Escalation

Escalation figures have been based off TMR's Project Cost Estimating Manual (fifth edition 2012).

7 Resumptions

7.1 Minimum Width

For the purpose of this project it was assumed that the minimum corridor width required for a 4 lane road was 22.5m in order to minimise the number of land resumptions required. Below outlines the process in determining the land acquisition costs included in upgrading the Bellmere Road, Caboolture River Road, Morayfield Road, and Petersen Road/Tinney Road/ Clark Road corridors.

7.2 Land requirements

The acquisition of a number of properties is sometimes necessary to achieve the proposed road corridor or upgrade. Properties maybe partially or fully acquired depending on the impact on the individual property. The table below shows the criteria which determines whether affected properties will require a partial or full acquisition:

Property acquisition criteria:

Acquisition type	Criteria
Full Acquisition	Buildings or structures need to be demolished; Access or parking is significantly impacted; or Adequate setbacks between the road and building will no longer be achieved.
Partial Acquisition	Land is required but the premises can still adequately operate for its intended use.

For the purposes of this project, it was deemed that only residential properties were impacted and would require only partial acquisition.

7.3 Land acquisition costing

The following assumptions were used:

- Property values for the project area were determined using past property sales in the surrounding context of Caboolture and Caboolture South as the project area is a greenfield site;
- To determine current property values, only the sale dates in the past year (between 10 December 2012 to 10 December 2013) were used;
- As the sites impacted were predominately single unit dwellings, costs only included single unit dwellings;
- Sales included were defined as “Normal Sales”;
- Information is based on Pricefinder.com.au which has the following disclaimer:

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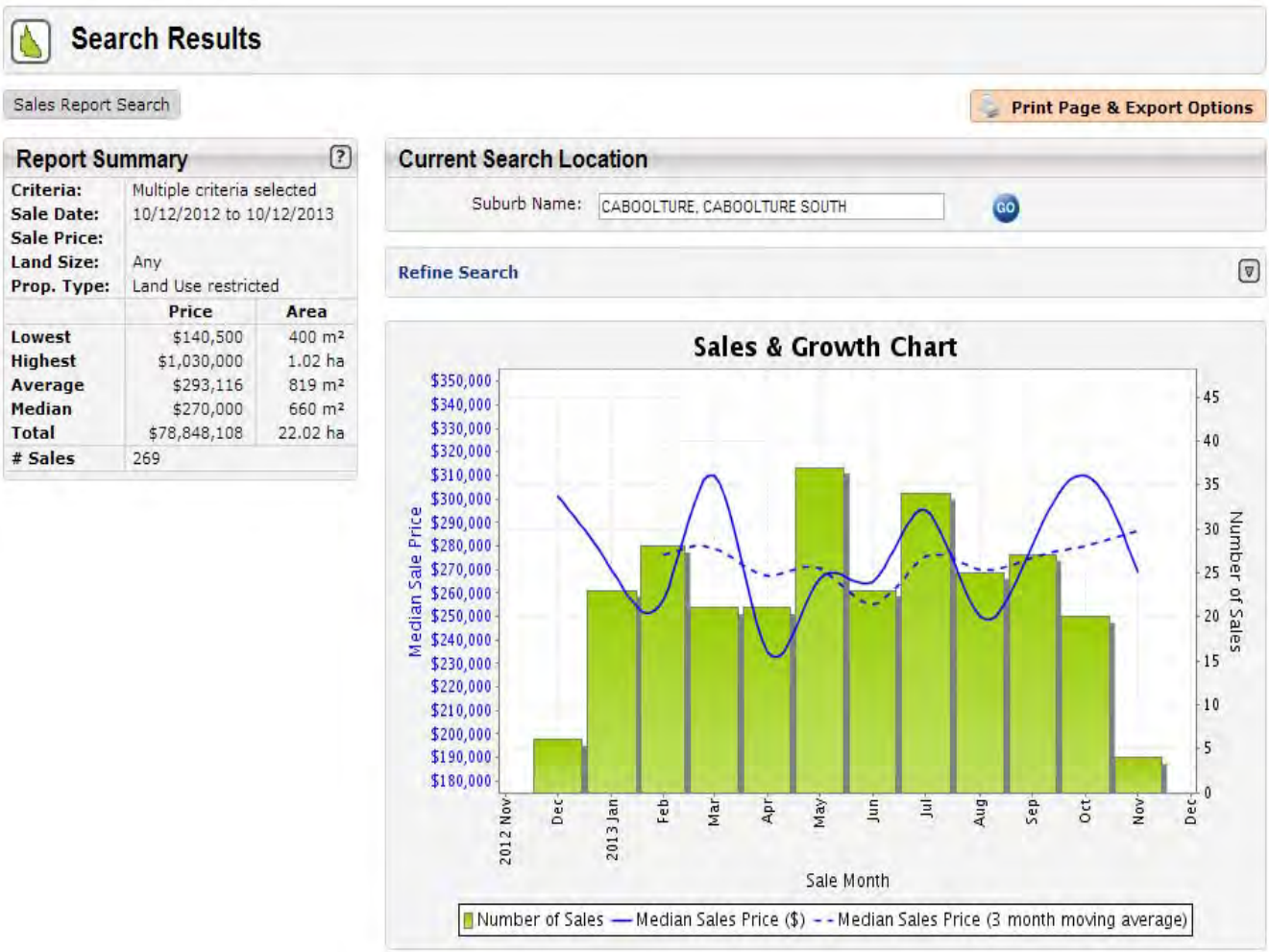
7.4 Data results

The image below displays the result from Pricefinder:



Key data points:

- Properties areas range from: 400sqm to 10,000sqm
- Number of property sales in the period: 269
- Valuation dates (of unimproved land values) occurred between 2011 and 2012.

The median property area and unimproved land values were used to avoid potentially being skewed by an outlier property sale.

Median property area	660sqm
Median unimproved land value	$170,000
Cost/sqm	$258 / sqm
Recommended Cost (25% contingency*)	$322 / sqm

*The recommended acquisition cost includes a 25% contingency to allow for any legal fees or other associated costs that may occur.

8 Assumptions

8.1 General

- Unit rates provided by Moreton Bay City Council in the 'Caboolture West Typical Streets' spreadsheet are accurate for 2013 and valid for the local area;
- Cross Sections provided by Moreton Bay City Council in the 'Caboolture West Typical Streets' spreadsheet are accurate and include all required items;
- Staging was developed in accordance with the Caboolture West Landuse Plan, dated 14 November 2013. This information was considered accurate and divided accordingly;
- All rates include supply and installation;
- TMR escalation rates as per TMR Project Cost Estimating Manual are acceptable and include:
  - 2014: 10%
  - 2015: 10%
  - 2016: 9%
  - 2017 and beyond: 8%

8.2 Exclusions

The below items have not been taken into consideration in the estimate due to the high level scope of the study:

- Services investigation (Dial Before You Dig and above ground identification);
- Flood modelling and hydraulics assessment of the area;

9 Unit Rates Review and Comments

A high level review was undertaken by Arup to validate the unit rates provided by Moreton Bay Regional Council in the first stage of the Caboolture West internal trunk network cost estimates. MBRC accepted and approved the use of the recommended unit rate changes.

The revised items are listed below with recommended rates and comments.

Item	Rates Supplied	Approved Recommended Rate	Comment
Corrector-sub base	$52.0/m3	$160/m3	Assuming Type 2.5
Sub-base	$74.0/m3	$170/m3	Assuming Type 2.3
Base	$75.0/m3	$180/m3	Assuming Type 2.1

In order to complete the cost estimates, Arup had to develop unit rates for additional items using the sources outlined in Section 6 of this note. Below is a summary of the additional unit rates used:

Item	Rate
Excavation of unsuitable material	$60/m3
Milling of existing surface	$100/m3
Removal and disposal of traffic signals/equipment	$12,500/leg
Installation of new traffic signal equipment	$50,000/leg
Energex power pole relocation	$13,000 each (used in the individual assessment of the roundabout cost and based on advice from previous jobs)

10 Corridor Cost Estimates

A detailed summary of the cost estimates for the Bellmere Road, Caboolture River Road, Morayfield Road, Petersen Road/Tinney Road/ Clark Road corridors and isolated intersections can be found in Appendix 2.

The estimate summarises the costs associated with the road upgrades, bridge upgrades, intersection upgrades and resumption requirements. This is then shown as an overall base estimate in 2013/2014 dollar value for the entire project.

To allow for design adjustments and further design development, a conservative 70% contingency has been applied to the base cost as per direction of the Department of Transport and Main Roads Project Cost Estimate Manual (refer to Appendix 1 of this tech note).

The final cost (inclusive of contingency) has been displayed for reference purposes as an escalated value in the predicted year of construction (using TMR's Project Cost Estimating Manual escalation figures).

11 Summary

Cost estimates for each road corridor upgrades are attached in Appendix 2.

To confirm and detail above cost estimates further works and investigations have to be undertaken during planning, concept and detail design stages for each intersection or road corridor.

Moreover further estimating works have to be undertaken during the next stages of design to include elements, like:

- Escalation factors throughout the whole strategy timeframe;
- Possible staging analysis and cost of each project stage;
- Benefit cost analysis for each corridor;
- Probabilistic cost estimate calculations (risk adjusted estimates to determine probability of the project cost not being greater than the estimate prepared), especially at the business case level of the projects; and
- First principle estimate for the construction stage of each project.

Cost estimates provided in this study are indicative only and should not be used for budget planning purposes.

DOCUMENT CHECKING (not mandatory for File Note)

	Prepared by	Checked by	Approved by
Name	David Weisfelt and Thomas Whiteley	Thomas Whiteley/Roland Cathcart	Peter Dunn
Signature			

A1 Contingency

STRATEGIC CONTINGENCY/ RISK TABLE

(Based on Appendix B from RTA's Project Estimating Manual)

Complete cells with green shading

Estimate Stage: **Strategic / Planning**

Project Location:	Moreton Bay, Caboolture West / Multiple locations
Project Description:	MBRC - Caboolture West Study

Task/activity	Comments	Highly Confident & Reliable	Reasonably Confident & Reliable	Not Confident & Not Reliable	Adopted Contingency
Project Scope	Is it well defined? Yes V No Λ	3%	4%	5%	5%
	Is there room to vary the works? Yes Λ No V	3%	4%	5%	5%
	Are there many options? Yes Λ No V	3%	4%	5%	5%
Risks	Are there Significant Risks? Yes Λ No V Political, Community, Technical, Financial.	5%	6%	8%	8%
	Has a detailed Risk analysis been done? Yes V No Λ	4%	6%	7%	7%
Constructability	Has a constructability review been undertaken? Yes V No Λ	3%	4%	5%	5%
	Is constructability a problem? Yes Λ No V	3%	4%	5%	4%
Key Dates	Are the Project dates known? Yes V No Λ	1%	2%	3%	3%
	Is the project planned for the distant future? Yes Λ No V	1%	2%	3%	3%
Information	Has investigation been Undertaken? Yes V No Λ Geotechnical, Heritage, Environmental, Technical, Hydraulic	9%	12%	15%	15%
Length of the Project	Is the Project Short? Yes Λ No V <1km Short >25km Long	4%	7%	10%	10%
	Total Contingency percentage to be adopted:				**70%**

A2 Summary of Cost Estimate

Project Number **: 229906-00**
Local Authority **: Moreton Bay Regional Council**
Asset Name **: Caboolture West Study**
Location **: Caboolture West**
File: **Preliminary Cost Estimate for External Roads**
Date**:06/01/14**
Rev: **3**
Revision Status: **Draft for Approval**

ARUP

Corridor name (Group 3)	Upgrade Location	Upgrade Required	Length of Alignment Upgrade (m)	Cost of Alignment Upgrade (AUD)	Bridge Structure (no)	Bridge Structure Area [m2]	Cost of Bridge Structure [AUD]	Resumption Area (m2)	Resumption Costs (AUD)	Intersections Upgrade Costs (AUD)	Final Cost [AUD]	Final Cost With Contingency (70%)	Year Required	Final Costs With Escalation*
Bellmere Road	Caboolture West to King Street	Widen to 4 Lanes	2928	$ 15,181,805	1	1332	$ 7,326,000	-	$ -	$ 650,000	$ 23,157,805	$ 39,368,269	2026	$ 112,097,451
Caboolture River Road	Caboolture West to Morayfield Road	Widen to 4 Lanes	4135	$ 21,440,152	-	-	$ -	1683	$ 541,926	$ 1,050,000	$ 23,032,078	$ 39,154,532	2021	$ 75,877,442
Morayfield Road	Caboolture River Road to Lindsay Road	Widen to 6 lanes	2011	$ 6,611,114	1	800	$ 4,664,000	-	$ -	$ 300,000	$ 11,575,114	$ 19,677,694	2021	$ 38,133,341
Petersen Road / Tinney Rd / Clarke Rd	Caboolture River Road to Lindsay Road	Upgrade to sub-arterial standard	5180	$ 18,259,775	-	-	$ -	12805	$ 4,123,049	$ 702,250	$ 23,085,074	$ 39,244,626	2031	$ 164,190,640
		Complete Missing Sections between Petersen Road and Clark Road and between Tinney Road and Petersen Road	1686	$ 7,093,682	2	2695	$ 14,822,500	-	$ -		$ 21,916,182	$ 37,257,509	2031	$ 155,876,991
Isolated Intersection Upgrades	Across the Caboolture Area	Intersection upgrades to operate satisfactory with Caboolture West	11							$ 3,313,656	$ 3,313,656	$ 5,633,215	varies	$ 31,387,779
										Total Costs	**$ 106,079,909**	**$ 180,335,845**		**$ 577,563,644**