Echuca-Moama Bridge
Mid-West 2 Options Traffic Modelling

FINAL REPORT FOR EES REFERRAL

SINCLAIR KNIGHT MERZ
SKM

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Document History and Status

Revision	Date issued	Reviewed by	Approved by	Date approved
1	5 Apr 2012	A. Carolan	C. McPherson	5 Apr 2012
2	26 Jun 2012	J. Taylor	J. Taylor	26 Jun 2012
3	11 Jul 2012	C. McPherson	C. McPherson	11 Jul 2012
4	18 Sep 2012	P. Hunkin	C. McPherson	18 Sep 2012
4A	24 Jan 2013	C. McPherson	C. McPherson	24 Jan 2013

Distribution of Copies

Revision	Quantity	Issued to
1	1	Andrew Milvain (VicRoads)
2	1	Andrew Milvain (VicRoads)
3	1	Andrew Milvain (VicRoads)
4	1	Andrew Milvain (VicRoads)
4A	1	Andrew Milvain (VicRoads)

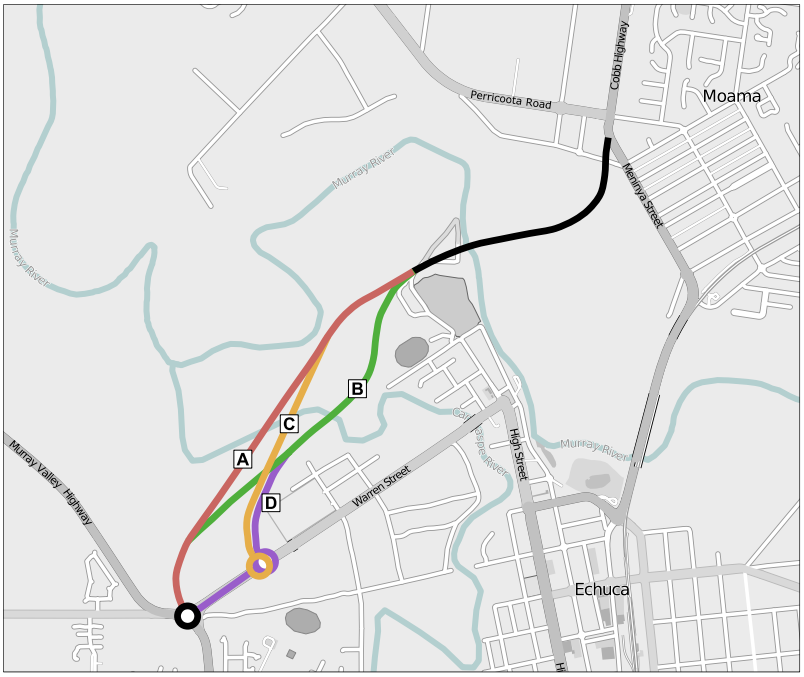
Printed:	25 January 2013
Last saved:	25 January 2013 04:30 PM
File name:	SB19740 Mid West 2 Traffic Modelling Report V4.0a.docx
Authors:	Craig McPherson, Antony Carolan
Project manager:	Craig McPherson
Name of organisation:	VicRoads
Name of project:	Echuca-Moama Bridge Mid-West 2 Options Traffic Modelling
Document version:	Revision 4A
Project number:	SB19740

Executive summary

This report describes the traffic modelling of the Mid-West 2 options for the Echuca-Moama Bridge Planning Study. The report assesses the potential traffic demands for the Mid-West 2 scenarios and evaluates the impacts on the Echuca and Moama road networks.

Options

Four option alignments were investigated for the Mid-West 2 scenario as shown in the figure below.



Assumptions

The analysis used the traffic model previously developed by SKM for the 2008-2010 Echuca-Moama bridge study. The model was updated to reflect changes in network and land use assumptions that have arisen since the original study. The principal changes were:

- inclusion of truck bans on several local streets in Moama;
- updates to the future distribution of dwellings to reflect the Shire of Campaspe's 2011 Echuca Housing Strategy;
- an increase in current employment in the business park north of Moama to match Murray Shire's employment estimates.

The analysis was carried out for a typical winter weekday, which is representative of baseline (non-tourist) traffic flows across the river. Bridge traffic volumes during peak tourist times such as holidays and special events were found to be about 30% higher than the baseline flows. For engineering capacity evaluation, this factor of 30% was taken into account.

Findings

The main findings from the study were as follows:

- The four Mid-West 2 options are expected to carry virtually identical traffic volumes, as the differences in travel times and distances between options are relatively minor.
- The Mid-West 2 bridge would primarily carry traffic to and from the Murray Valley and Northern Highways. Most Echuca town centre traffic will continue to use the existing bridge.
- Options 2A and 2B provide direct access to the Murray Valley Highway and are more convenient for drivers who wish to travel through Echuca and Moama without stopping.
- Options 2C and 2D are slightly less convenient for through traffic, but provide a shorter route for traffic wishing to access the historic port area.
- All intersections in the Mid-West 2 corridor are expected to operate well within capacity to at least 2038.

Maps showing forecast traffic volumes are provided in Appendix B.

An overall assessment of both traffic and economic outcomes will be completed after the option costs are confirmed.

1. Introduction

1.1. Purpose

This report describes the traffic demand modelling undertaken for the Mid-West 2 options for the Echuca-Moama Bridge Planning Study. The purpose of this report is to describe the potential traffic impacts of the four Mid-West 2 bridge options. An overall assessment of both traffic and economic outcomes will be completed after the option costs are confirmed.

1.2. Background

Population growth, accompanied by growth in business, tourism, jobs and personal travel, are expected to cause moderate increases to traffic volumes across the Murray River at Echuca-Moama.

The existing road bridge has operational limitations, particularly during peak tourist periods, and when wide loads or agricultural machinery need to cross the river. In these cases, traffic is often delayed because of the narrow width of the bridge. Over-dimensional vehicles are prohibited from crossing the bridge during morning, midday and evening peak periods. This is inconvenient and costly for business operations. The existing bridge also requires extensive rehabilitation which would result in partial closure of the bridge while work is being carried out.

A second Murray River crossing will provide an alternative access between Echuca and Moama, and will also provide relief for congestion on the existing bridge.

VicRoads has investigated a number of options for a second river crossing. These have been documented in previous studies (see Chapter 2). Four further options (the Mid-West 2 options) are now being considered as possible alternatives to the previously-investigated options.

1.3. The Mid-West 2 options

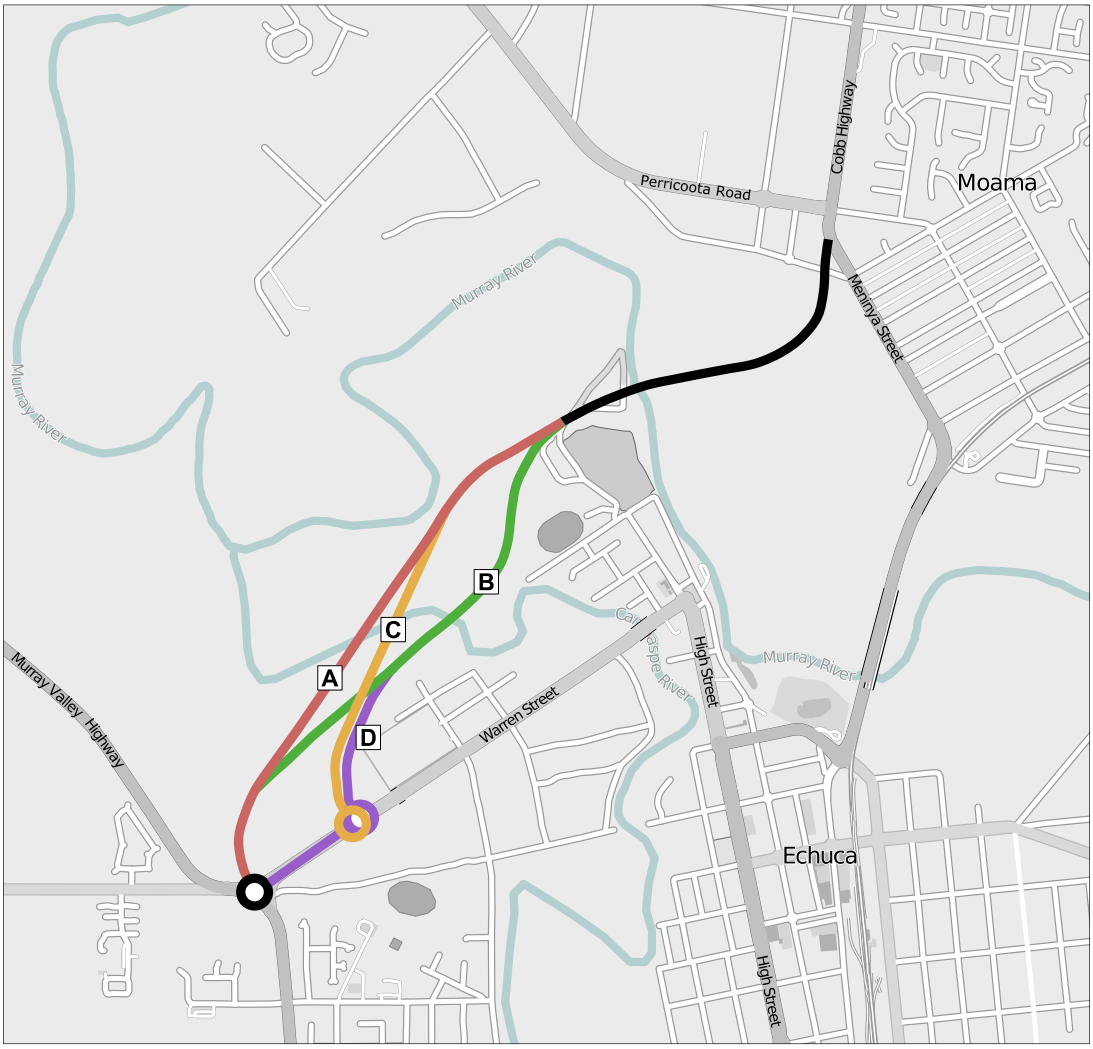
The four options considered in this study are shown schematically in Figure 1.

The main difference between the options is the configuration of intersections on the Echuca side of the river. Options 2A and 2B connect directly to the Murray Valley Highway, whereas Options 2C and 2D connect to Warren Street

From a traffic operation perspective, Options 2A and 2B are virtually identical; only the alignment of the bridge differs in these options. Similarly, Options 2C and 2D are mostly identical, with only slight differences in the bridge alignment.

Because of the similarity between options, this study assumes that the traffic impacts of Options 2A and 2B will be the same, and can therefore be modelled as a single option. Options 2C and 2D are also modelled as a single option for traffic forecasting purposes.

- Figure 1: Mid-West 2 option alignments

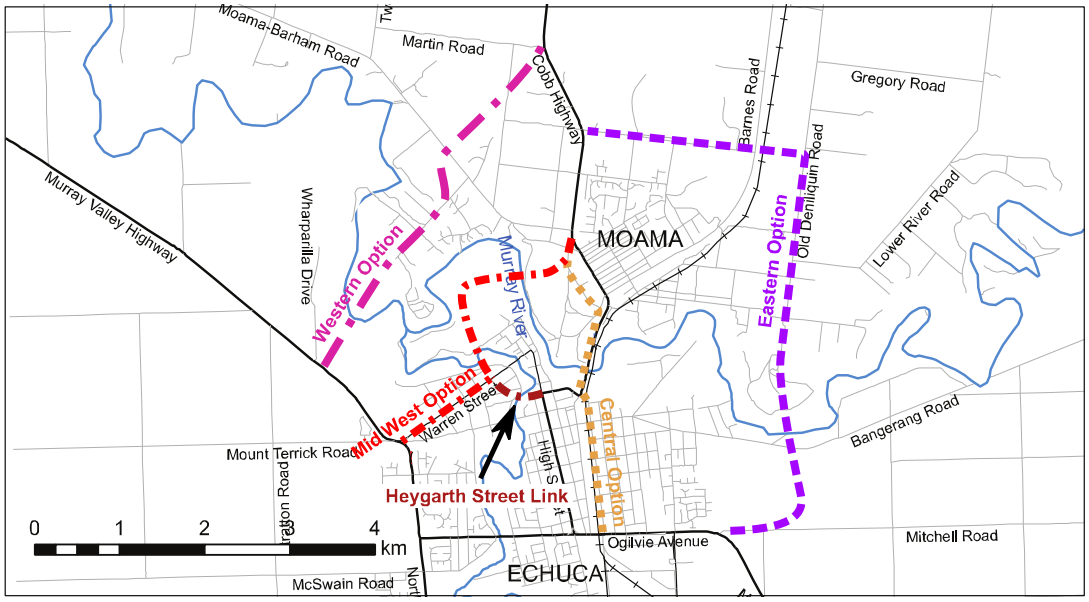


2. Previous traffic and economic study

SKM carried out the original Echuca Bridge traffic modelling study between 2008 and 2010. Full details of the study are provided in the report *Detailed Traffic Modelling for the Echuca - Moama Bridge Planning Study*[1].

Figure 2 illustrates the bridge locations investigated in the previous modelling study. The new Mid-West 2 options share a similar alignment to the original Mid-West option shown in Figure 2, but connect to Warren Street further to the west.

- Figure 2: Bridge options investigated in previous modelling studies



[1] Sinclair Knight Merz (2010), *Detailed Traffic Modelling for the Echuca - Moama Bridge Planning Study*, Final report, VicRoads, 29 October 2010.

Table 2.1 summarises the forecast bridge traffic volumes for 2038 and the benefit-cost ratio for each option.

- Table 2.1: Summary of forecast daily two-way bridge traffic for previously-modelled options (2038)

	Two-way daily volumes (2038)			Benefit-cost ratio*
Bridge option	Existing bridge	New bridge	Total	
Base (do nothing)	25,170	–	25,170	–
Western	20,210	6,030	26,240	1.8
Mid-West	15,010	11,400	26,410	2.0
Mid-West + Heygarth St link	13,800	12,650	26,450	1.9
Central	–	26,260	26,260	1.9
Eastern	22,270	3,690	25,690	0.9

* Benefit-cost ratios were calculated on the assumption that the new bridge would open in 2018 and costs were discounted to a 2008 base year. Traffic volumes were forecast on the basis of Murray and Campaspe Shire estimates of land use growth in 2008.

The new modelling undertaken for the Mid-West 2 options forecasts very similar volumes to the original Mid-West option, with only relatively small changes caused by the updates to land use and population growth assumptions. The following chapter describes the updated modelling assumptions in more detail.

3. Modelling assumptions

3.1. Traffic model

The model used for this study was the Echuca-Moama traffic model previously developed by SKM for the 2008-2010 bridge study. Details of the model can be found in the model validation report for the previous bridge planning study[2].

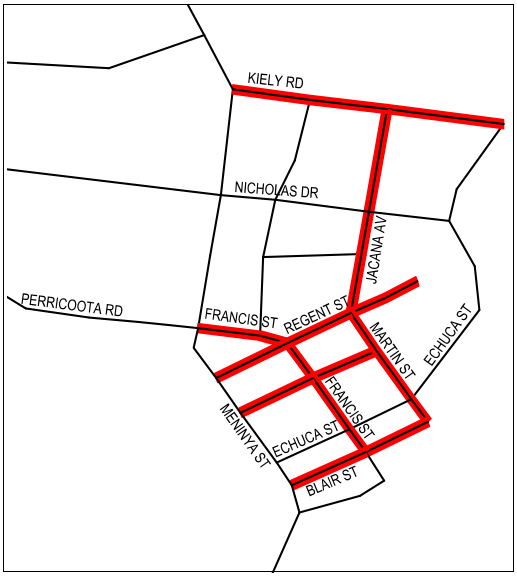
This chapter describes the changes that were made to the model to reflect the latest planning information from Campaspe and Murray Shire councils.

3.2. Network assumptions

The traffic model includes all major streets and highways in Echuca and Moama. Local streets are generally not included in the model except where they provide a connection to major traffic destinations. Figure 4 shows the road network used in the model.

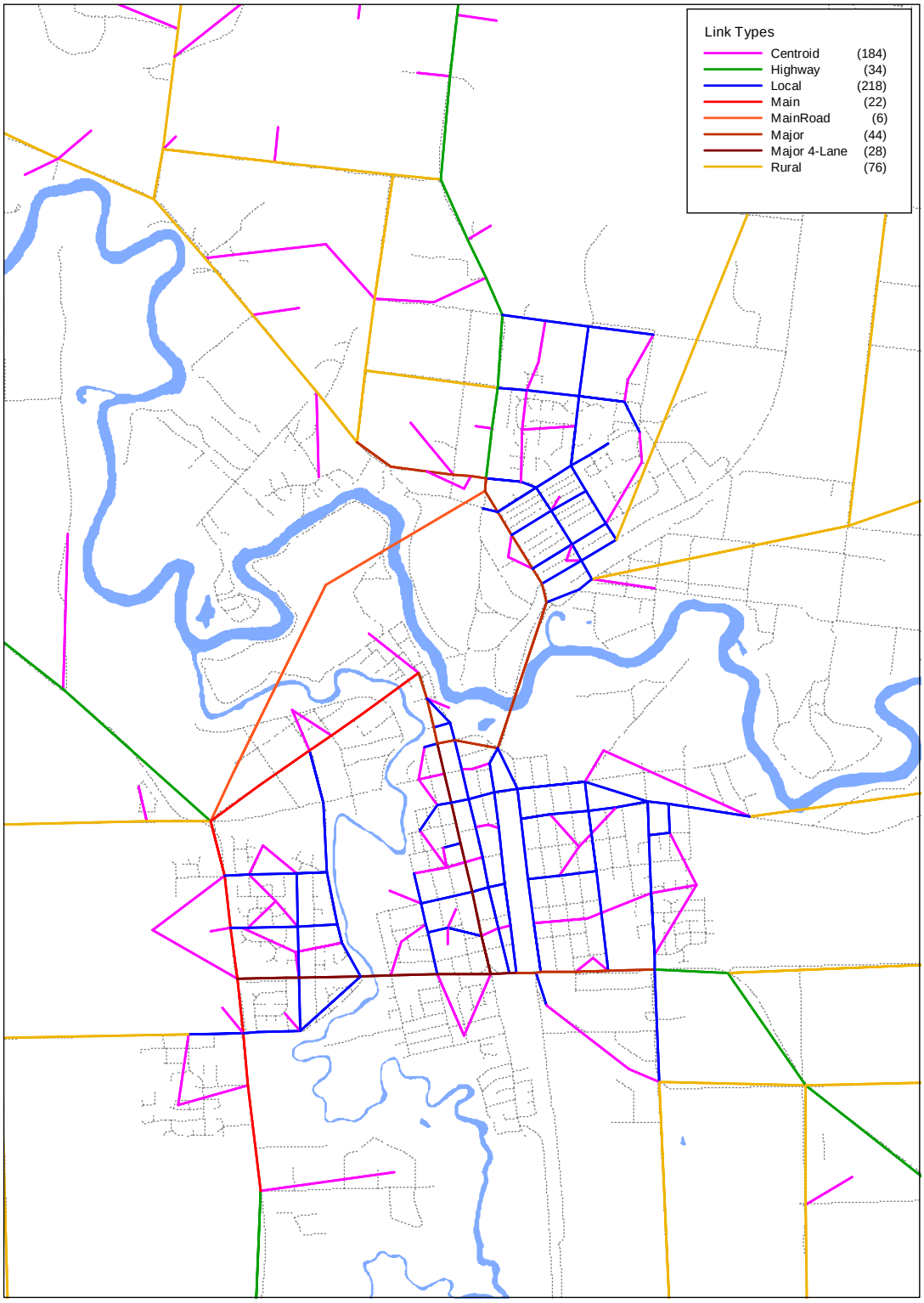
In all modelling of future traffic conditions, Francis Street is assumed to be connected to Perricoota Road and trucks are banned on the streets shown in Figure 3.

- Figure 3: Moama truck bans (shown in red)



[2] Sinclair Knight Merz (2009), *Detailed Traffic Modelling for the Echuca - Moama Bridge Planning Study*, Validation report, VicRoads, 7 May 2009.

■ Figure 4: Modelled road network



3.3. Land use and demographic assumptions

Population Growth

Echuca population forecasts in the original model were based on the Victoria in Future 2004 report, which was subsequently updated in 2008. The updated growth rate was slightly higher due to a small increase in fertility rates from 2004 to 2008.

In contrast, the NSW government has revised growth forecasts down for Murray Shire, of which the largest town is Moama. The result is that the net population forecasts for the combined Echuca-Moama region have remained similar, despite the small changes in the Victorian and NSW forecasts. The forecast populations for various years are listed in Table 3.1 to Table 3.3.

- Table 3.1 Moama population forecast

Year	Previous Forecast	Updated Forecast	Change in population forecast	% change in population forecast
2006	4678	4678	–	–
2008	5333	4994	-339	-6%
2023	7175	6683	-492	-7%
2038	8316	7535	-781	-9%

- Table 3.2 Echuca population forecast

Year	Previous Forecast	Updated Forecast	Change in population forecast	% change in population forecast
2006	12358	12358	–	–
2008	12600	12770	+170	+1%
2023	15638	16010	+372	+2%
2038	17895	18639	+744	+4%

- Table 3.3 Echuca-Moama combined regional population forecast

Year	Previous Forecast	Updated Forecast	Change in population forecast	% change in population forecast
2006	17036	17036	–	–
2008	17933	17765	-168	-1%
2023	22813	22694	-119	-1%
2038	26211	26174	-37	0%

Given the small changes in the forecast population growth for the region and the inherent uncertainties in long range population forecasts, it was considered appropriate to leave the overall population growth unchanged in the model. This also helped to maintain consistency with previous models.

Population Distribution

Residential plans for Moama have not changed since the original model was created, with housing growth still forecast to occur in the same areas. Therefore, the population projections for each zone in Moama have been kept the same as in the original model.

Campaspe Council released a new Echuca Housing Strategy in 2011. The strategy focused on residential growth with a new objective of encouraging infill development around the town centre. Maps of the greenfields and infill precincts are included in Appendix A. By matching these precincts to the corresponding transport zones, a potential lot yield was calculated for each zone. This was also done for zone 1 in the transport model, which is a low density residential area north-west of Echuca, not covered by the housing strategy. For zone 1, it was assumed that 60% of gross area could be used for lots with an average size of 4000m^2 per lot. Council staff confirmed that this was a reasonable assumption for the area's potential lot yield.

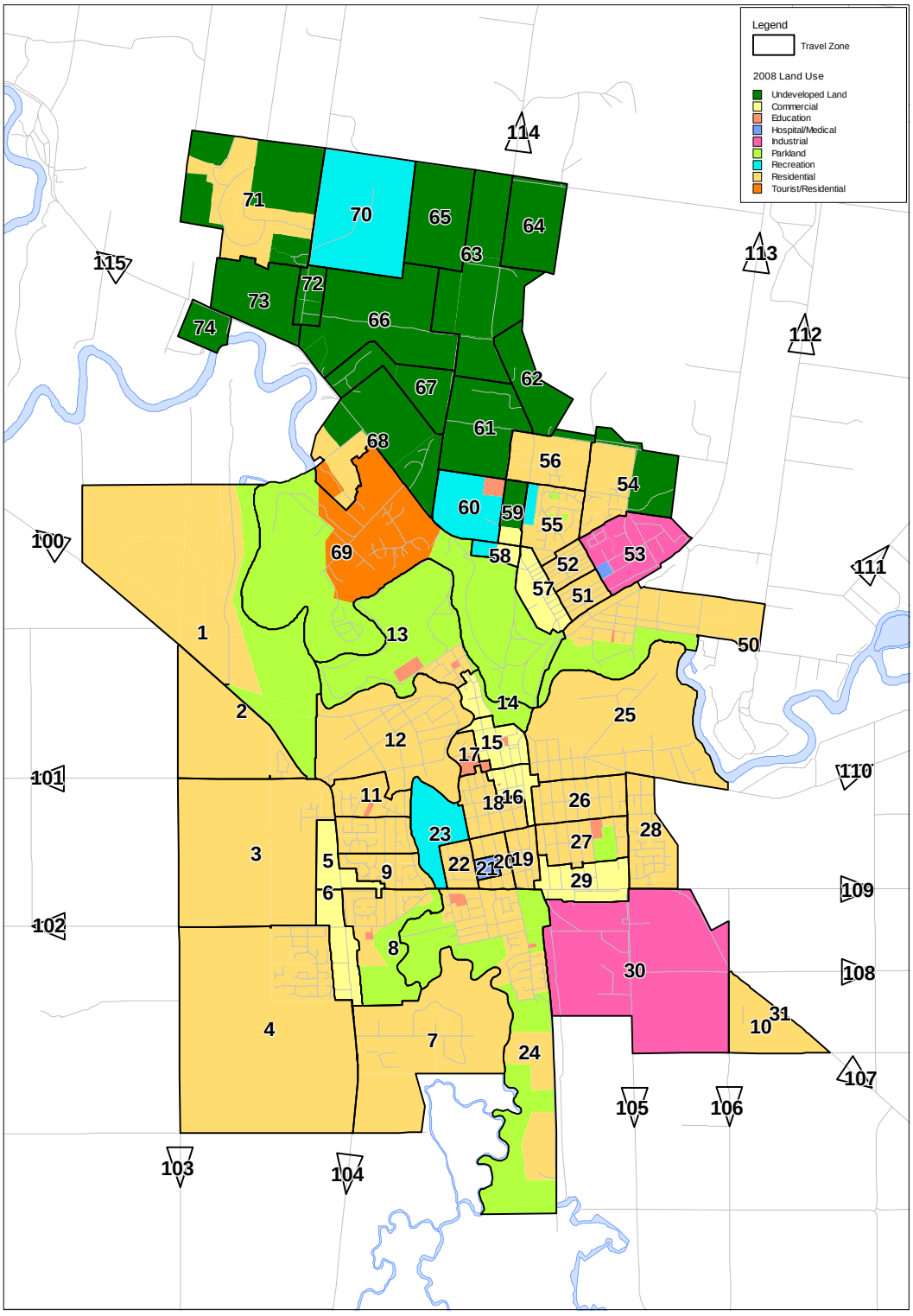
New dwelling demand for each forecast year was allocated to each zone based on the available spare capacity in the zone. Table 3.4 summarises the assumed distribution of new dwellings to Echuca zones. A map of the Echuca model zones is shown in Figure 5.

- Table 3.4: Assumed distribution of new dwellings in Echuca

Zone	Allocation of new dwellings	Zone	Allocation of new dwellings
1	4.51%	17	0.00%
2	11.94%	18	0.00%
3	20.50%	19	1.19%
4	51.46%	20	0.00%
5	0.00%	21	0.00%
6	0.00%	22	1.43%
7	0.00%	23	0.00%
8	1.69%	24	0.52%
9	0.00%	25	1.14%
10	0.00%	26	1.60%
11	0.00%	27	1.20%
12	0.00%	28	0.89%
13	0.00%	29	0.59%
14	0.00%	30	0.00%
15	0.89%	31	0.00%
16	0.45%		

Most population growth occurs in the greenfields precincts west of the Northern Highway (zones 1 to 4). However, in contrast to the original model, about 10% of population growth in Echuca is forecast to come from infill development near the current town centre.

■ Figure 5: Transport model land use zones



Employment Growth and Distribution

The original employment forecasts assumed that employment would grow at the same rate as population, with the original data taken from the 2006 census and distributed to the various employment districts.

While reviewing the model, Murray Shire advised SKM that it believed the Moama business park had been under-represented. Recent traffic counts on the Cobb Highway south of the business park supported this observation, with 4600 vehicles per day being observed in 2010 in comparison with the 2800 vehicles per day in the original model.

For these reasons, baseline employment at the business park was increased in line with current council estimates for 2012. Future growth of the business park was maintained at the previously-assumed values (average annual growth of 6.25% from 2008 to 2023, 0.92% from 2023 to 2038). To maintain overall employment growth rates in Echuca-Moama, employment in every other zone was decreased slightly by a uniform percentage. The new employment assumptions for the business park (zone 63) are shown in Table 3.5.

- Table 3.5: Employment assumptions for Moama Business Park (zone 63)

Year	Previous Employment Forecast (full-time equivalents)	Updated Employment Forecast (full-time equivalents)
2008	85	196
2023	211	487
2038	242	559

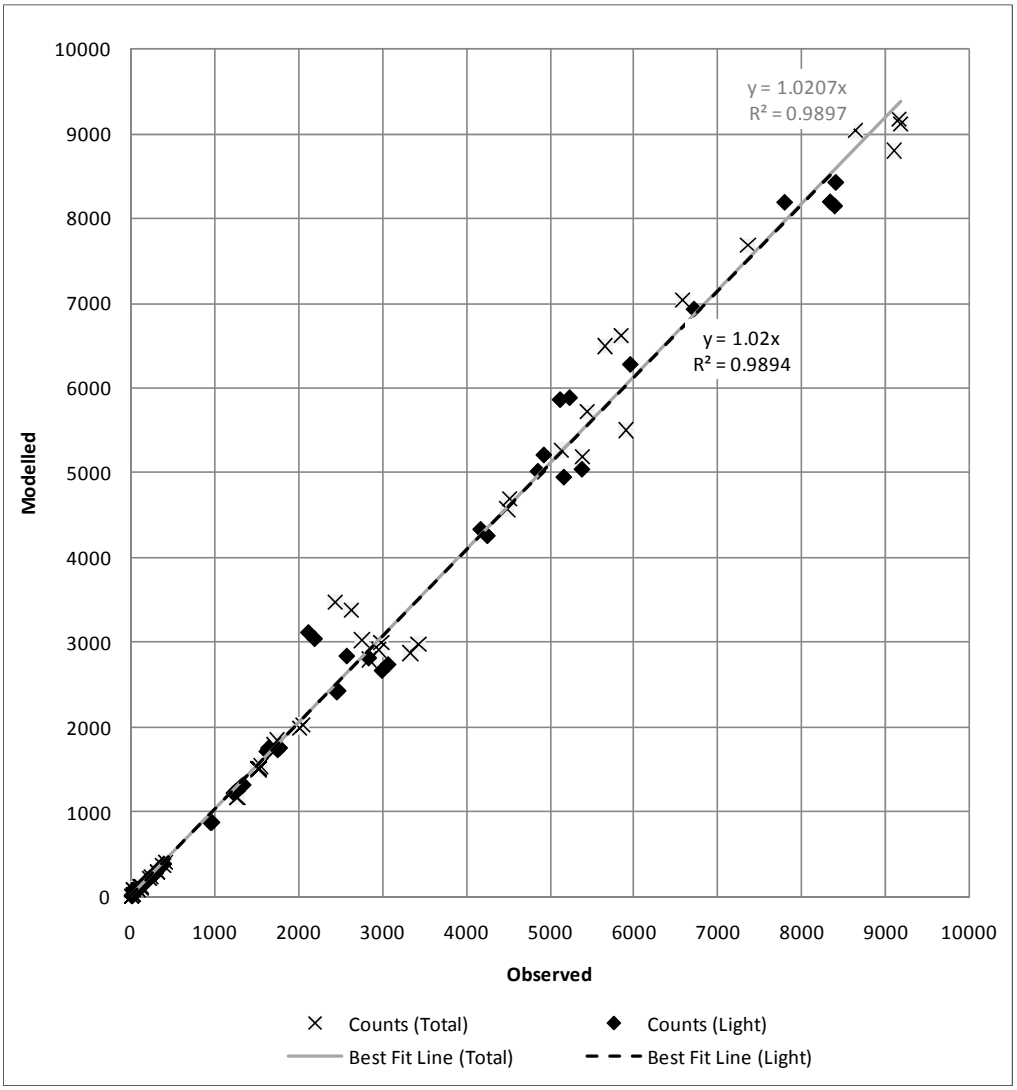
3.4. Model validation

The traffic model was validated as part of the previous traffic study and the validation is documented in the study report (see footnote on page 10). A graph of modelled and observed traffic volumes from the previous report is reproduced in Figure 6.

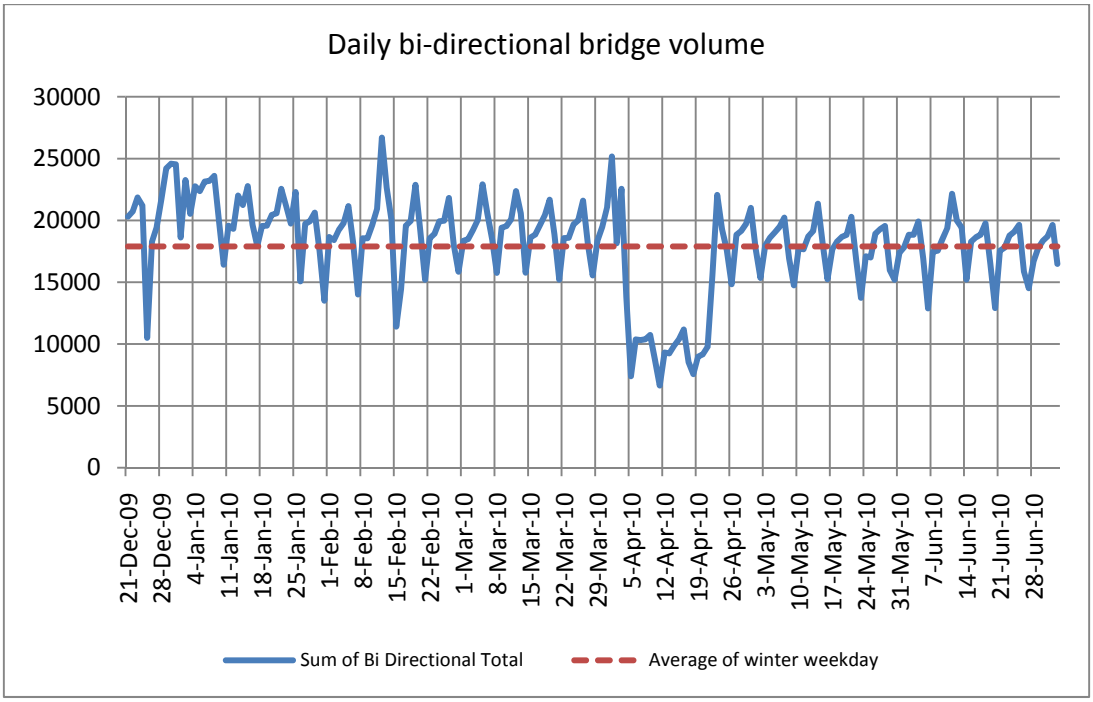
The original model generally exhibited a good fit with observed 2008 traffic volumes. A further check was completed as part of the new study to determine whether traffic volumes had changed substantially since 2008 and also to determine whether tourist-related traffic would have a significant impact on forecasts.

The original model was based on traffic levels and patterns during a winter weekday. This corresponded to approximately 17,900 bridge crossings in a 24-hour period. The latest traffic counts (see Figure 7) suggest that this number is still largely representative of an average winter weekday, but slightly underestimates average conditions during the summer months.

■ Figure 6: Modelled and observed link traffic volumes (daily light vehicles and total vehicles, 2008)



■ Figure 7: Two-way daily bridge volumes (2010)



Note that during April 2010 the southbound traffic counter failed, so results from that period should be ignored.

Traffic levels are generally at their highest during summer holidays, long weekends and special events. During peak periods, daily traffic volumes over the bridge can exceed 25,000 vehicles per day.

Holiday periods are also likely to have significantly different travel patterns, with more trips being generated at tourist attractions and accommodation precincts such as caravan parks and the historic port.

Given the relatively large daily and seasonal variation in traffic volumes, the present calibration of the model to a winter weekday is considered to be appropriate for economic evaluation purposes. However, for engineering design purposes, we have assumed that peak traffic volumes will be approximately 30% higher than the winter weekday average.

4. Traffic modelling results

4.1. Scenarios

Four road network configurations were modelled using the Echuca traffic model:

- Base case – the existing road network with no new bridge;
- Options 2A/2B - with the new bridge connecting directly to the roundabout at the Murray Valley Highway;
- Options 2C/2D - with the new bridge connecting to a new roundabout in Warren Street;
- Warren Street flooding scenario – with Warren Street assumed to be closed at the Campaspe River, causing bridge traffic to be diverted to the Murray Valley Highway.

Each network case was modelled with future growth assumptions to determine the potential traffic impacts of the new bridge. Table 4.1 summarises the scenarios modelled in this study.

Table 4.1: Modelled scenarios

Network configuration	2008	2011	2023	2038
Base case (do nothing)	●	●	●	●
Options 2A/2B			●	●
Options 2C/2D			●	●
Warren Street flooding			●	●

2008 was used as the base year for the modelling, with travel costs calculated in 2008 dollars. This was done so that later economic analysis would be broadly comparable with the previous economic study (which also used a base year of 2008).

4.2. Traffic forecasts

Appendix B contains a full set of network plots for each scenario with modelled daily traffic volumes. Table 4.2 provides a comparison of traffic volumes on key links in the network for each scenario. Table 4.3 provides a similar comparison for heavy vehicle flows.

- Table 4.2: Forecast bi-directional traffic volumes on key links (total vehicles)

Road	2008 Base	2011 Base	2023 Base	2023 Opt2A/B	2023 Opt2C/D	2023 flooding	2038 Base	2038 Opt2A/B	2038 Opt2C/D	2038 flooding
Old Bridge	17936	19423	22882	15147	15142	15140	25160	16777	16781	16823
New Bridge	–	–	–	8353	8357	8361	–	10096	10088	10072
Warren Street at Campaspe River	6020	6601	8200	4787	4777	–	9474	5474	5465	–
High Street south of Heygarth Street	9247	9836	11016	6163	6163	9099	11749	6717	6718	9464
High Street north of Heygarth Street	10398	11155	12422	9099	9089	11185	13763	10005	9995	12524
Ogilvie Avenue at Campaspe River	18121	19473	24071	19447	19450	24235	28189	22698	22710	28227
Meninya Street south of Regent Street	13284	13569	16385	11483	11493	11613	20400	12756	12763	13930
MVH, south of Warren Street	6857	7484	9582	14302	14297	12725	11125	17107	17091	15223

- Table 4.3: Forecast bi-directional traffic volumes on key links (heavy vehicles)

Road	2008 Base	2011 Base	2023 Base	2023 Opt2A/B	2023 Opt2C/D	2023 flooding	2038 Base	2038 Opt2A/B	2038 Opt2C/D	2038 flooding
Old Bridge	1380	1503	1806	1025	1026	1026	2027	1163	1163	1167
New Bridge	–	–	–	798	798	798	–	916	916	913
Warren Street at Campaspe River	362	388	449	193	193	–	497	209	209	–
High Street south of Heygarth Street	660	704	790	269	269	309	888	302	302	344
High Street north of Heygarth Street	484	517	551	297	297	260	608	322	322	281
Ogilvie Avenue at Campaspe River	1744	1842	2262	1732	1732	1925	2601	1994	1995	2207
Meninya Street south of Regent Street	977	1072	1372	960	961	961	1573	1084	1085	1083
MVH, south of Warren Street	697	737	903	1289	1288	1336	848	1517	1517	1659

Some of the key aspects of the traffic forecasts are as follows:

- Without a second crossing of the Murray River, average weekday traffic on the existing bridge is expected to increase from about 17,900 vehicles per day in 2008 to 25,200 by 2038. This represents total growth of about 40% over the 30-year period.
- With the construction of a second bridge, traffic volumes on the existing bridge are forecast to reach about 16,800 vehicles per day at 2038. This represents a reduction of about one-third of the traffic that would have otherwise used the bridge if a second river crossing was not available.
- The section of High Street north of Heygarth Street (near the historic port) presently carries over 11,000 vehicles on a typical weekday. This volume is forecast to grow to about 14,000 vehicles per day in 2038. Construction of a second bridge is forecast to remove about 25% of through traffic from this section of High Street.

4.3. Intersection analysis

The performance of several key intersections in Echuca and Moama was assessed using the SIDRA intersection analysis software package. The analysis was carried out using forecast 2038 traffic volumes, with daily volumes factored by 8.4% to represent a typical peak hour[3].

Detailed SIDRA outputs are provided in Appendix C, and the main queue and level-of-service indicators[4] are summarised in Table 4.4.

Table 4.4: Summary of intersection performance indicators (2038 peak hour)

Option	Intersection	Longest Queue (veh)	Level of Service
Option 2A/2B	Murray Valley Highway / Warren Street / New bridge (roundabout)	1.7	B
	Cobb Highway / New bridge / Meninya Street (signal)	8.7	B
	Cobb Highway / Perricoota Road / Francis Street (signal)	10.6	B
Option 2C/2D	Murray Valley Highway / Warren Street (roundabout)	1.8	B
	New bridge / Warren Street (roundabout)	2.3	B
	Cobb Highway / New bridge / Meninya Street (signal)	8.7	B
	Cobb Highway / Perricoota Road / Francis Street (signal)	10.6	B

[3] The conversion from daily to peak hourly volumes was derived from observed hourly traffic counts in the area and is consistent with the method applied in the original 2008-2010 study. Note that a peak factor of 0.95 was also applied in the SIDRA analysis to allow for a 5% higher flow rate in the busiest part of the peak period.

[4] Level of service is measured on a six-point scale from A (free-flowing conditions) to F (extremely congested). Levels A to C would generally be considered acceptable for most intersections.

All intersections operate well within their capacity under forecast 2038 conditions.

4.4. Findings

Comparison of Options 2A, 2B, 2C and 2D

The four Mid-West 2 options are expected to carry virtually identical traffic volumes, as the differences in travel times and distances between options are relatively minor.

Options 2A and 2B provide direct access to the Murray Valley Highway and are more convenient for drivers who wish to travel through Echuca and Moama without stopping. The intersection analysis indicates that the proposed roundabout on the Murray Valley Highway will operate well within its capacity. Queues and delays on each approach are not expected to be unreasonable within the evaluation period to 2038.

Options 2C and 2D are slightly less convenient for through traffic, but provide a shorter route for traffic wishing to access the historic port area. The modelling indicates that very little traffic will use the eastern section of Warren Street, as most traffic travelling between Moama and the Echuca town centre will prefer the more direct route provided by the existing bridge. The intersection analysis indicates that both roundabouts on Warren Street will operate well within capacity to 2038.

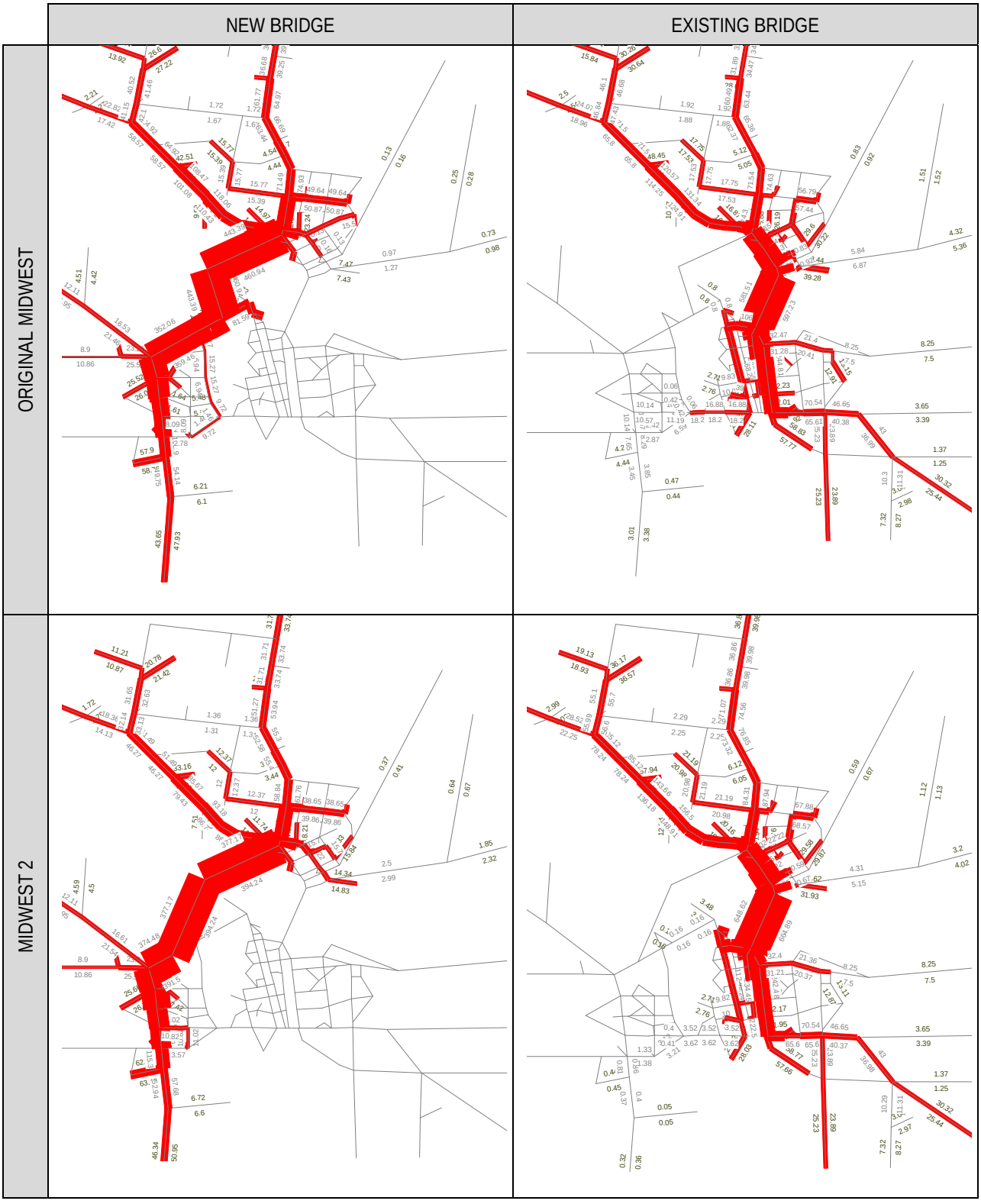
Comparison of Mid-West and Mid-West 2 options

The Mid-West 2 options are each expected to carry about 10%-15% less traffic than the Mid-West option assessed in the previous study. This suggests that the realignment of the proposed bridge further westwards will be marginally less attractive, but in most respects very similar to the original Mid-West option.

Figure 8 illustrates this situation in more detail. The diagrams show the modelled routes of traffic using the original Mid-West bridge, the new Mid-West 2 bridge and the existing bridge under forecast 2038 conditions. In these diagrams, only bridge traffic is shown (all other non-bridge traffic has been removed).

The diagrams confirm that most traffic travelling between Moama and the Echuca town centre will continue to use the original bridge. The new bridge will be used mainly by traffic on the Northern and Murray Valley Highways. The model suggests that the original Mid-West alignment may carry some traffic that is bound for the historic port area, but the new Mid-West 2 alignment is less likely to carry port traffic.

- Figure 8: Routes of vehicles using the original Mid-West alignment, the new Mid-West 2 alignment and existing bridge (2038)



5. Economic analysis

An economic assessment will be undertaken to assess the financial viability of each bypass option. The methodology will be undertaken in accordance with VicRoads' requirements with the appropriate sensitivity tests performed.

VicRoads has advised that the total estimates are currently being finalised in consideration of mitigation measures proposed by other specialist studies. Accordingly, the full economic assessment will be undertaken on final cost estimates.

6. Conclusion

This report has described the traffic assessment for the proposed Echuca-Moama Mid-West 2 bridge alignments. The main findings from the analysis are as follows:

- The four Mid-West 2 options are expected to carry virtually identical traffic volumes, as the differences in travel times and distances between options are relatively minor.
- The Mid-West 2 bridge would primarily carry traffic to and from the Murray Valley and Northern Highways. Most Echuca town centre traffic will continue to use the existing bridge.
- Options 2A and 2B provide direct access to the Murray Valley Highway and are more convenient for drivers who wish to travel through Echuca and Moama without stopping.
- Options 2C and 2D are slightly less convenient for through traffic, but provide a shorter route for traffic wishing to access the historic port area.
- All intersections in the Mid-West 2 corridor are expected to operate well within capacity to at least 2038.

An overall assessment of both traffic and economic outcomes will be completed after the option costs are confirmed.

Appendix A: Echuca Housing Strategy

This appendix provides excerpt maps from the Echuca Housing Strategy (2011) that show the assumed distribution of housing growth in and around the Echuca township.

Figure 4 - Echuca West Framework Plan

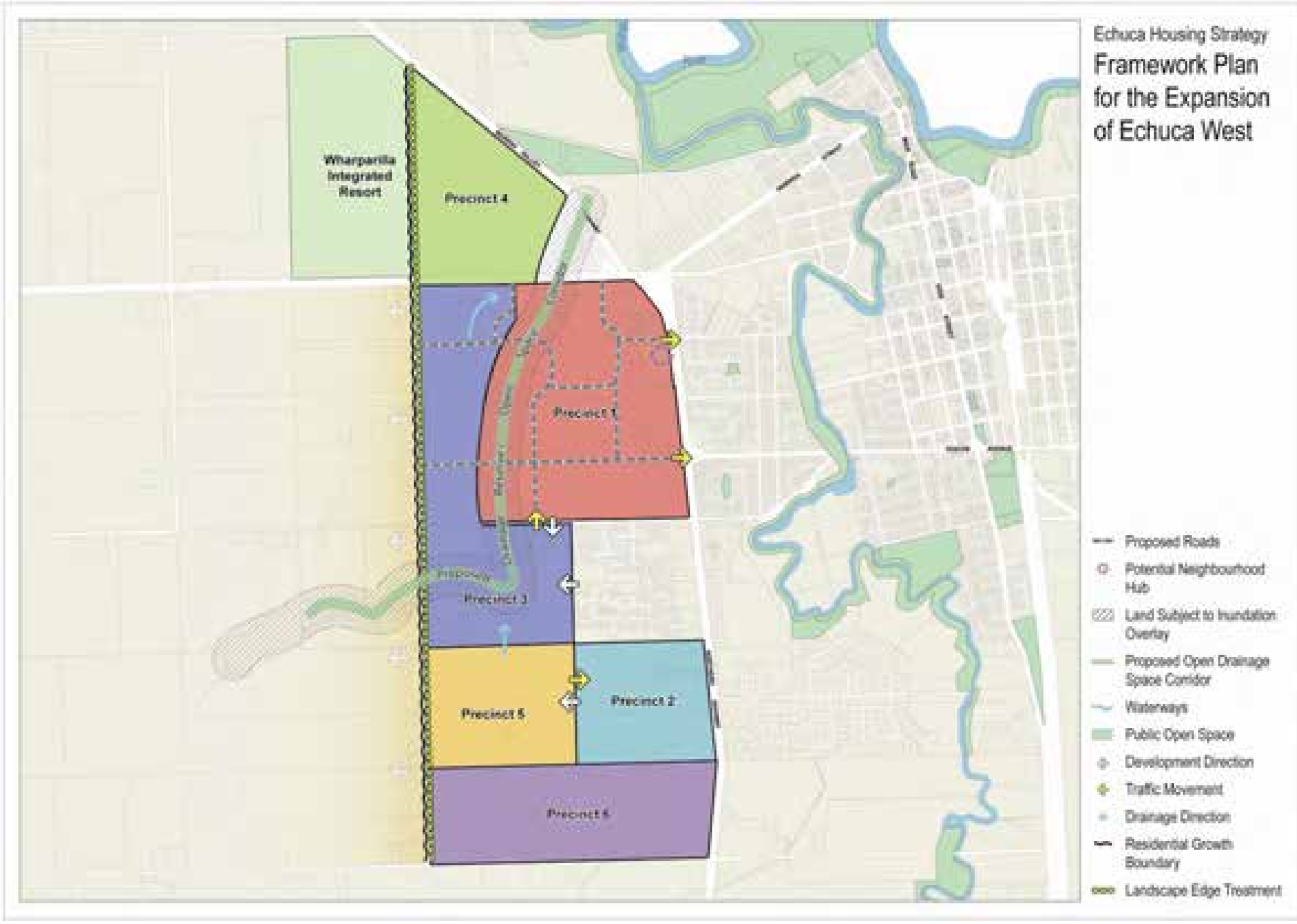


Figure 8 - Framework Plan for Infill Development