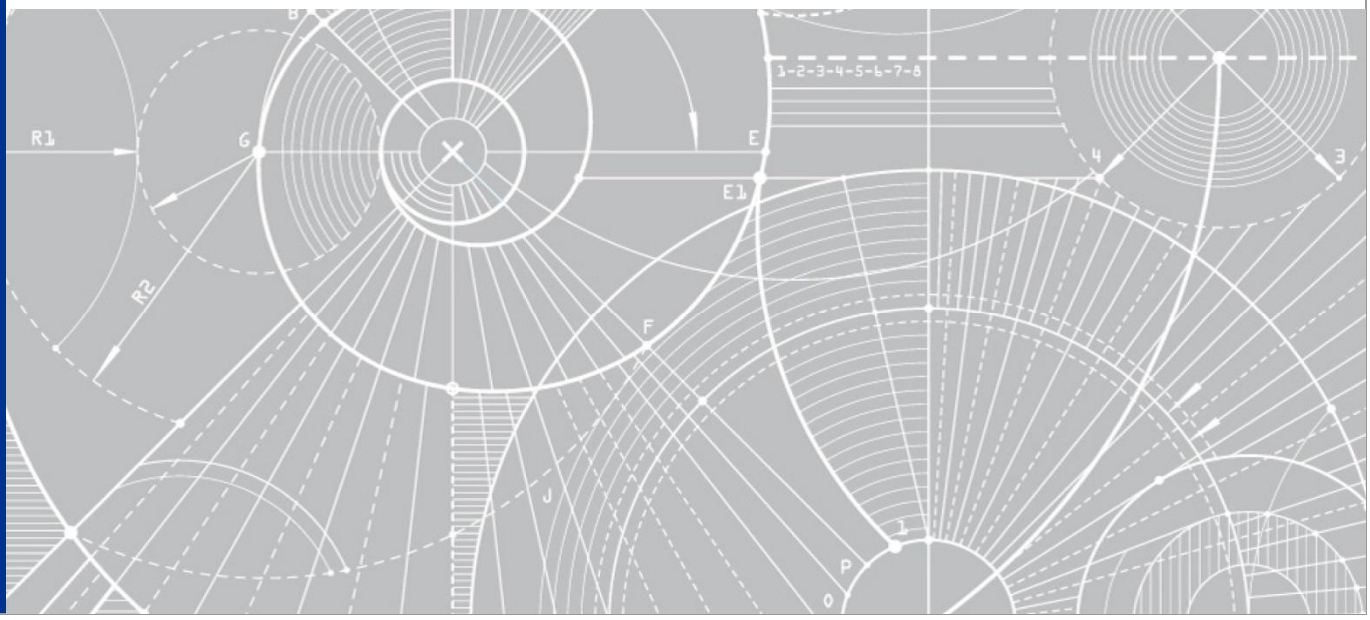
Echuca-Moama Bridge EES

VICROADS

Transport Impact Assessment

IS076300 | K

18 June 2015



vicroads
keeping victorians connected

JACOBS

Table of Contents

1. Introduction 1
   1.1 Project Overview 1
   1.2 Purpose of this document 1
2. Project Description 2
   2.1 Project Background 2
   2.2 The Project 3
   2.3 Project Objectives 3
   2.4 Preferred Alignment 4
   2.5 Study Area 6
3. Existing Conditions 8
   3.1 Information Sources 8
   3.2 Study Area Characteristics 8
      3.2.1 Existing Road Hierarchy 8
      3.2.2 Main Roads in the Mid-West and Existing Bridge Corridors 9
      3.2.3 Existing Traffic Volumes 14
      3.2.4 Intersection Analysis 20
      3.2.5 Crash Analysis 21
      3.2.6 Public Transport 25
      3.2.7 Walking and Cycling 27
4. EES Scoping Requirements 33
   4.1 EES Evaluation Objectives 33
   4.2 EES Scoping Requirements 33
5. Legislation, Policies and Guidelines 34
   5.1 Commonwealth 34
   5.2 State 34
      5.2.1 Victorian 35
      5.2.2 New South Wales 37
   5.3 Local 38
6. Transport Impact Assessment 39
   6.1 Benefits and Opportunities 39
   6.2 Traffic Impacts during Operation 39
      6.2.1 Transport Modelling 39

6.2.2 Scenario Tests 46
6.2.3 Base Case 46
6.2.4 Mid-West Option 50
6.3 Other Impacts 58
6.3.1 Public Transport 58
6.3.2 Pedestrians and Cyclists 58
6.3.3 Traffic Impacts during Construction 59
6.4 Risk Assessment 60
6.4.1 Methodology 60
6.4.2 Risk Significance 61
6.4.3 Risk Workshop 63
6.4.4 Mitigation Measures 65
7. Conclusion 66
8. Assumptions and Limitations 68
9. References 69

Appendix A: Traffic Forecasts

Appendix B: SIDRA Model Outputs (2014 Base, 2044 Mid-West)

Appendix C: VicRoads DCI Contract Specifications

Index of Figures

- Figure 2-1: Map of the preferred alignment 6
- Figure 2-2: Map of Echuca-Moama Transport Impact Assessment Study area..... 7
- Figure 3-1: Map of Road Hierarchy in Echuca Moama 9
- Figure 3-2 Warren Street.....10
- Figure 3-3 Heygarth Street 10
- Figure 3-4 High Street.....10
- Figure 3-5 Cobb Highway (South of river) 10
- Figure 3-6 Cobb Highway (North of river).....10
- Figure 3-7 Cobb Highway / Meninya Street.....10
- Figure 3-8 Murray Valley Highway (North of Warren St).....11
- Figure 3-9 Murray Valley Highway (South of Warren St) 11
- Figure 3-10 Typical cross section of Warren Street.....12
- Figure 3-11 Typical cross section of approach with Meninya Street 13
- Figure 3-12: Map of average weekday two-way traffic volumes (heavy vehicle counts in brackets) 15
- Figure 3-13: Map of destinations of southbound traffic movements (both cars and trucks) across existing bridge (source: Origin-Destination Survey, Austraffic, October 2008) 17
- Figure 3-14: Map of destinations of northbound traffic movements (both cars and trucks) across existing bridge (source: Origin-Destination Survey, Austraffic, October 2008) 18
- Figure 3-15: Line plot of two-way daily bridge volumes (2010 and 2013) 19
- Figure 3-16: Bar chart of annual crash rate in Echuca (1 July 2003 to 30 June 2013) 22
- Figure 3-17: Bar chart of monthly crash rate in Echuca (1 July 2003 to 30 June 2013) 22
- Figure 3-18: Map of aggregated crashes in Echuca (1 July 2003 to 30 June 2013) 23
- Figure 3-19: Map of crashes in Moama (1 July 2003 to 30 June 2013) 24
- Figure 3-20: Municipal Walking & Cycling Network - Echuca (2007).....29
- Figure 3-21: Revised Echuca public cycling network.....30
- Figure 3-22: Murray Shire Bicycle Plan (2004) 31
- Figure 6-1: Map of modelled road network 41
- Figure 6-2: Map of Moama truck bans (shown in red).....42
- Figure 6-3: Plot of Campaspe Shire Population Projection (Victoria in Future).....43
- Figure 6-4: Plot of Murray Shire Population Projection (New South Wales Population Projections) 43
- Figure 6-5: Plot of modelled and observed link traffic volumes (total vehicles and light vehicles, 2013/2014).....45
- Figure 6-6: Plot of forecast growth in two-way traffic on the existing bridge.....47
- Figure 6-7: Map of volume-capacity ratios in 2014 (base case road network).....48
- Figure 6-8: Map of volume-capacity ratios in 2029 (base case road network).....49
- Figure 6-9: Map of volume-capacity ratios in 2044 (base case road network).....50

- Figure 6-10: Map of volume-capacity ratios in 2029 (Mid-West Option) 54
- Figure 6-11: Map of volume-capacity ratios in 2044 (Mid-West Option) 55
- Figure 6-12: Map showing routes of vehicles using the Mid-West Option and existing bridge (2044) 56

Figure 6-13: Map showing destinations of truck trips from Moama industrial area (based on model forecasts in 2029) 57

- Figure A-9-1: Map of 2014 modelled daily traffic volume (existing road network). 71
- Figure A-9-2: Map of 2029 modelled daily traffic volume (existing road network). 72
- Figure A-9-3: Map of 2029 modelled daily traffic volume (Mid-West Option)..... 73
- Figure A-9-4: Map of 2038 modelled daily traffic volume (Mid-West Option)..... 74
- Figure A-9-5: Comparison map of 2038 daily traffic volumes between the model output from the current analysis and the previous study (Sinclair Knight Merz, 2012) 75
- Figure A-9-6: Map of 2044 modelled daily traffic volume (existing road network). 76
- Figure A-9-7: Map of 2044 modelled daily traffic volume (Mid-West Option)..... 77

Index of Tables

- Table 3-1 Characteristics of key roads inside the Study Area 11
- Table 3-2 Over-dimensional vehicle permitted travel times.....13
- Table 3-3: Summary of intersection performance indicators (2014 peak hour) 21
- Table 3-4: List of coach services 25
- Table 3-5: List of train services 26
- Table 3-6: List of regional bus services 26
- Table 6-1: Modelled Scenarios.....46
- Table 6-2: Forecast bi-directional traffic volumes on key links (total vehicles) 51
- Table 6-3: Forecast bi-directional traffic volumes on key links (heavy vehicles) ...52
- Table 6-4: Summary of intersection performance indicators (2044 peak hour) 58
- Table 6-5: Consequence Criteria 61
- Table 6-6: Likelihood Guide 62
- Table 6-7: Risk Significance Matrix.....63
- Table 6-8: Transport Risk Register 64
- Table 6-9: Environmental Management Measures 65

Glossary of Terms

Term	Definition
1 in 100 year flood	A flood which results from a storm which has a statistical probability of occurring once in every 100 years.
Access	The location by which vehicles and / or pedestrians enter and / or leave property adjacent to a road.
Afflux	A rise in upstream water level caused by introducing a constriction such as a bridge, into a stream, channel or floodplain.
Alignment Option	The location and geometric form of a carriageway in both the horizontal and vertical directions. For this impact assessment, the Alignment Option being assessed is the Mid-West Option.
Arterial Road	The nominated traffic routes (such as Murray Valley Highway or Cohuna-Echuca Road / Warren Street), for longer distance travel and larger vehicles.
At grade intersection	An intersection where all roads cross at the same level usually controlled by traffic signals or Stop or Give Way signs.
Attenuation	The reduction in the magnitude of sound pressure level during transmission over a distance or around a barrier.
Axle load limit	Restrictions on how much load can be carried on an axle, single or dual tyres, and on the vehicle or vehicle combinations.
Australian Height Datum (AHD)	The Australian standard height datum for calculating levels.
B-double	A twin trailer articulated vehicle with the second trailer pivoting on the back of the first.
Batter	In road construction, an artificial uniform slope created on the sides of fills or cuts. The proposed batters for the Project have a slope of 2:1 (vertical to horizontal). A batter is also known as an embankment.
Benefit Cost Ratio (BCR)	The ratio of the discounted benefits over the life of a project to the discounted capital costs, or the project's discounted total agency costs.
Bored pile	A steel or reinforced concrete post that is inserted vertically into the ground by drilling, or formed in the ground in a pre-bored hole, to support a load.
Bridge	A bridge is a structure built to cross an obstacle in the road network. The Project comprises bridges across the Campaspe River, the Murray River and some bridging components over the Campaspe/Murray River floodplains.

Term	Definition
Carriageway	That portion of a road or bridge devoted particularly to the use of vehicles, inclusive of shoulders and auxiliary lanes, such as the two-lane, two-way carriageway in the initial alignment.
Chainage	The distance of a point along a control line, measured from a datum point.
Clear Zones	An area within the recovery area which is ideally kept clear of hazards (or within which unmovable hazards are shielded). The width of the clear zone reflects the probability of an accident occurring at that location and the cost-effectiveness of removing hazards. The clear zone width is dependent on traffic speeds, road geometry and traffic volume.
Concept Design	Initial high-level functional layout of a concept, such as a road or road system, to provide a level of understanding to later establish detailed design parameters.
Construction Environmental Management Framework (CEMP)	A site or project specific plan developed to ensure that appropriate environmental management practices are followed during the construction and/or operation of a Project.
Construction Area	The area defined for the Project within the Right of Way that would be directly impacted by construction activities. activities.
Corridor	An area of travel between two points. It may include more than one major route and more than one form of transport. Two corridors were investigated prior to the development of the EES. These corridors were identified as the Mid-West 2 Corridor (which included the Mid-West 2A Option and Mid-West 2B Option) and the Mid-West Corridor, (which included the Mid-West Option).
Culvert	One or more subsurface adjacent pipes or enclosed channels for conveying surface water or a stream below road formation level.
Cut	The depth below the natural surface of the ground to the construction level.
dB(A)	The human ear is not equally sensitive to all parts of the sound frequency range and the scale most commonly used is the A-weighted decibel or dB(A). This unit most accurately reflects human perception of the frequency range normally associated with road traffic noise.
Deceleration lane	An auxiliary traffic lane provided to allow vehicles to decrease speed on the approach to an intersection.
Design speed	A speed fixed for the design and correlation of those geometric features of a carriageway that influence vehicle operation. The Mid-West Option has been designed to 90 kilometres per hour, for a posted speed limit of 80 kilometres per hour.
Driven Pile	A steel or reinforced concrete post that is driven vertically into previously unexcavated soil by striking it with a pile

Term	Definition
	driving hammer.
Earthworks	All operations involved in loosening, removing, depositing, shaping and compacting soil or rock.
Environmental Management Framework (EMF)	Outlines the environmental measures recommended to be adopted as part of the EES.
Environment	For the purpose of the EES, environment incorporates physical, biological, heritage, cultural, economic and social aspects.
Environment Effects Statement (EES)	A statement prepared at the request of the Victorian Minister for Planning, pursuant to the Victorian Environment Effects Act 1978, on the potential environment impact of a proposed development.
Fill	One or more of the following: 1. The depth from the pavement subgrade level to the natural surface. 2. That portion of road where the formation is above the natural surface. 3. The material placed in an embankment.
Floodway	Land that is identified as carrying active flood flows associated with waterways and open drainage systems.
Freehold land	Privately owned land.
General access vehicles	Under the national mass and loading arrangements, "general access" vehicles are those with unrestricted access to the road system. Provided these vehicles are registered and operators pay the registration charge appropriate to the vehicle configuration, no specific access restrictions apply and no additional permits are required.
Gradeline	The level and gradient of a road carriageway along the centreline.
Heavy vehicle	A vehicle with a gross vehicle mass (GVM) or aggregate trailer mass (ATM) of more than 4.5 tonnes.
High Productivity Freight Vehicles (HPFV)	Larger combination vehicles such as B triples and super B doubles that are restricted to specific arterial routes.
Higher Mass Limits (HML)	Allows for higher axle loading for various axle groups in compliance with National accreditation and restricted to specific routes.
Highway	A principal road in the road network with direct property access, such as the Murray Valley Highway.
Initial Alignment	For the purpose of this EES, the initial alignment comprises the construction of a two lane, two-way carriageway road including bridges across the Campaspe and Murray Rivers.
Intersection	The place at which two or more roads meet or cross.
Land use	The type of development permitted in an area: industrial, commercial, residential, recreational or a combination of some or all of these different uses.

Term	Definition
Level of service	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.
Local access path	Minor path generally located in a local or residential area that links road and/or off road cycling routes, and off road pedestrian paths, such as those paths within Victoria Park.
Major Road	A road to which is assigned a permanent priority for traffic movement over that of other roads.
Mid-West Alignment (Preferred Alignment)	The Mid-West Option extends from the Murray Valley Highway along Warren Street before diverting to the northwest where it crosses Campaspe Esplanade and the Campaspe River, then turns north-east to cross the Murray River north of the Victoria Park Boat Ramp. This alignment then extends north in New South Wales to cross Boundary Road in Moama and connect with the Cobb Highway at Meninya Street.
Mid-West 2A Alignment	The Mid-West 2A Option extends north/northwest on a new alignment from the intersection of the Murray Valley Highway and Warren Street, crosses the Campaspe River north of the Echuca Cemetery, before turning northeast towards Reflection Bend on the Murray River. This alignment then passes immediately south of Reflection Bend and crosses the Murray River north of the Victoria Park Boat Ramp, then extends north in New South Wales to cross Boundary Road in Moama and connect with the Cobb Highway at Meninya Street.
Mid-West 2B Alignment	The Mid-West 2B Option extends north/northwest on a new alignment from the intersection of the Murray River Highway and Warren Street, crosses the Campaspe River northeast of the Echuca Cemetery, before turning north towards the Echuca Sports and Recreation Reserve. This alignment crosses the Murray River north of the Victoria Park Boat Ramp, then extends north in New South Wales to cross Boundary Road in Moama and connect with the Cobb Highway at Meninya Street.
Mitigation Measures	Measures which are implemented to reduce an adverse impact caused by road construction and operation.
NSW TGD Guide	The NSW Traffic Generating Development Guide outlines all aspects of traffic generation considerations relating to traffic generating developments, and many of the requirements for traffic impact assessment in the guide are not relevant to the Project.
No Project Option	This assumes no additional bridge crossing of the Murray River and assumes existing road conditions and networks remain unchanged.
Overmass / over dimensional vehicle	Oversize and/or overmass vehicles are defined as Class 1 vehicles under the Heavy Vehicle National Law. A vehicle

Term	Definition
	or vehicle combination is considered to be oversize and/or overmass (OSOM) if it exceeds any general access mass or dimension limits.
PBS	The Performance Based Standards scheme offers the heavy vehicle industry the potential to achieve greater productivity and safety through innovative heavy vehicle and bus design. The scheme specifies four different performance levels. The on-road performance of the truck is matched to the environment it is travelling in: • Level 1: equivalent to General Access • Level 2: equivalent to B-double routes • Level 3: equivalent to Double road train routes • Level 4: equivalent to Triple road train routes
Preferred Alignment	The preferred alignment within Victoria is the Mid-West Option.
Property	A property is land owned by a single or more landowners. It may include multiple contiguous titles owned by the same registered proprietor.
PTV	Public Transport Victoria
Recovery Area	The area beside the traffic lane required for a run-off-road vehicle to stop safely or be brought under control before re-joining the traffic lane.
Review of Environmental Factors (REF)	A report prepared to satisfy the planning approval requirements of the Environmental Planning and Assessment Act 1979.
Right-of-Way	The Right-of-Way is a strip of land that is reserved through a planning scheme amendment for the public purpose of a road (road reserve) and encompasses sufficient land to construct and maintain the Project. The Right-of-Way for the Project comprises the sealed road surfaces (including shoulders / verges) and a 5m to 10m wide strip of land on either side of the road formation of the ultimate duplication. Note: In NSW, a Right-of-Way is known as a Road Reserve.
Right-turn lane	Right-turn lanes are used to provide space for the deceleration and storage of turning vehicles.
Risk Assessment	The processes of reaching a decision or recommendation on whether risks are tolerable and current risk control measures are adequate, and if not, whether alternative risk control measures are justified or would be implemented.
Roads and Maritime Services (Roads and Maritime)	Roads and Maritime Services is the co-proponent for the Echuca-Moama Bridge Project. Roads and Maritime Services is the NSW state government department responsible for the environmental assessment on the NSW component of the Project.
Roundabout	A channelised intersection at which all traffic moves clockwise around a central traffic island. The

Term	Definition
	roundabouts proposed as part of the Project are located at the Murray Valley Highway/Warren Street intersection, and on Warren Street. Both are three-leg roundabouts.
SCATS	An intelligent traffic control system that utilizes detector loops in conjunction with traffic signals. Can be used to measure and monitor traffic volumes
Scoping Requirements	The Scoping Requirements for the EES under the Victorian Environment Effects Act 1978 entitled 'The Second Crossing of the Murray River at Echuca-Moama', dated June 2014.
Service Road	A road designed or developed to be used, wholly or mainly, by traffic servicing adjacent land along the north west side of Warren Street as part of the Mid-West Option only.
Shared Path	A paved area particularly designed (with appropriate dimensions, alignment and signing) for the movement of cyclists and pedestrians.
SIDRA	SIDRA is a software package used for intersection (junction) and network capacity, level of service and performance analysis.
Spill Basins	Engineered basins designed to contain spills on the new carriageway, preventing contaminates from entering the floodplain.
Staged Construction	A construction sequence in which the initial alignment comprising a single traffic lane in each direction is constructed and then, should traffic demand warrant an increase in road capacity, the road and bridge structures are duplicated, providing two traffic lanes in each direction.
Study Area	The area identified by individual specialists to determine potential impacts for the Project relating to a specific discipline.
Super "T"	A type of bridge span construction where the load-bearing structure (usually reinforced concrete) has a T-shaped cross-section.
The Project	The Echuca-Moama Bridge EES (the Project) involves the construction and operation of a second road bridge crossing of the Murray and Campaspe Rivers at Echuca-Moama.
Title	A title is an official record of who owns a parcel of land. Adjoining titles in the same ownership are considered and assessed as a 'property' in the impact assessment.
Turning lanes	An auxiliary lane reserved for turning traffic, providing deceleration length and storage for turning vehicles.
Two Way Carriageway	A carriageway with two traffic lanes allotted for use by traffic in opposing directions.
Ultimate Duplication	For the EES, the ultimate duplication comprises the construction of a duplicated roadway and bridges. The ultimate duplication would be constructed if future traffic

Term	Definition
	demand warrants an increase in road capacity. The EES considers the potential impacts of the ultimate duplication.
Vic TIAR Guidelines	VicRoads guidelines for Traffic Impact Assessment reports, prepared to consider the traffic impacts arising out of proposed developments.
VicRoads	VicRoads (Roads Corporation) is the co-proponent for the Echuca-Moama Bridge Project. VicRoads is responsible for project management of the planning and would manage the construction of the Project.
Work Hours	'Work' is defined as any activity other than office bound duties, including the starting up of plant and machinery. Work for the Project would not be undertaken outside the hours of 7am or sunrise, whichever is the later, and 6pm or sunset, whichever is earlier. Work outside these hours requires prior consent.

Executive Summary

VicRoads, in partnership with New South Wales Roads and Maritime Services (Roads and Maritime), is undertaking planning activities for a second Murray River crossing at Echuca Moama. The second crossing, known as the 'Echuca-Moama Bridge Project' (the Project) would alleviate congestion on the existing bridge, provide an alternate access for traffic between the two towns and cater for road freight, including vehicles with Higher Mass Limits (HML) and High Productivity Freight Vehicles (HPFV).

On 14 June 2013, the Minister for Planning determined that an Environment Effects Statement (EES) would be required to assess the potential environmental effects of the Project within Victoria. As the Project extends into NSW, a Review of Environmental Factors (REF) would be required to assess impacts within New South Wales. This impact assessment has been prepared to inform the EES and REF.

This EES considers three (3) alignment options within Victoria comprising roads and bridges that provide an alternate access over the Murray and Campaspe Rivers between Echuca and Moama. The three alignments considered as part of this EES are identified as the:

- Mid-West Option;
- Mid-West 2A Option; and
- Mid-West 2B Option.

The Mid-West Option was determined to be the better performing option when considering a balance between environmental, social and economic considerations and was selected for detailed risk and impact assessment. The Mid-West Option utilises existing road reserves for part of its length, has the least impact on biodiversity and habitat values, cultural heritage values and satisfies the Project objectives. This report considers the impacts of the Mid-West Option and supports its selection as the preferred alignment.

This Transport Impact Assessment Report has been prepared in response to the Scoping Requirements for the Project. The assessment included review of previous investigations, consideration of the existing conditions, an options assessment, environmental risk assessment and impact assessment.

The transport-related impacts resulting from the Project up to 2044 include:

- A reduction of about 40% of the traffic that would have otherwise used the existing bridge if a second river crossing were not available;
- Improved river-crossing access for heavy (Higher Mass Limit) and over dimensional vehicles;
- Reductions in typical weekday daily traffic volumes (including trucks) by up to 41% on the existing bridge and the north-south route along High Street and Meninya Street;

- An increase in traffic volumes in Warren Street by about 57% immediately east of Murray Valley Highway;
- Negligible impacts on existing public transport, pedestrian and cycling activity; and
- Improved access and amenity for local traffic, cyclists and pedestrians, as well as the potential for improved road safety in and around the town centres.

1. Introduction

1.1 Project Overview

VicRoads, in partnership with Roads and Maritime, is undertaking planning activities for a second Murray River crossing at Echuca Moama. The Project, known as the Echuca-Moama Bridge Project would alleviate congestion on the existing bridge and provide an alternate access for residents and improved security of access for the local community, as well as catering for freight and agricultural machinery.

On 14 June 2013, the (Victorian) Minister for Planning determined that an Environment Effects Statement (EES) would be required to assess the Project's potential environmental effects within Victoria. As the Project extends into NSW, a Review of Environmental Factors (REF) would be required to assess impacts within New South Wales.

As part of the EES options assessment, the Mid-West Option was determined to be the best option in Victoria, and was selected by the Victorian Government as the preferred alignment for further detailed risk and impact assessment. The Mid-West Alignment uses existing road reserves for part of its length, has the least impact on biodiversity and habitat values, cultural heritage values and satisfies the Project objectives. This report focusses on Mid-West Alignment impacts only.

This Transport Impact Assessment has been prepared to inform the EES and REF. The EES is required to consider the potential effects of the Project on the environment, inform the public and other stakeholders and enable a Ministerial Assessment of the Project to inform decision makers. The purpose of the REF is to document the likely impacts of the proposal on the environment and to detail recommended protective measures to be implemented during construction.

The EES for the Project has considered three alignment options. As part of the options assessment for the EES, the Mid-West Option was identified as the better performing option and this impact assessment has been prepared based on the Mid-West Option (the Preferred Alignment).

1.2 Purpose of this document

The purpose of this Transport Impact Assessment report is to document the transport impacts and to outline the methodology, risks and proposed mitigation for the Project within Victoria and New South Wales.

2. Project Description

2.1 Project Background

The crossing of the Murray River at Echuca-Moama provides vital strategic access for the Murray Valley region's industries, workers, residents and visitors. This strategic role is demonstrated by the existing bridge at Echuca-Moama, which has been identified as one of the top three river crossings for freight tonnages and value of commodities in a comparison of Murray River bridges between the Snowy Mountains and the South Australian border.

The existing bridge was built in 1878 and originally included a road and rail crossing on the one structure. In 1989 a rail bridge was built parallel to the historic bridge to provide separation of rail and vehicle movements across the border. The existing road bridge remains as the only crossing point in the locality. The nearest alternative Murray River crossings at Barmah is approximately 36 km to the east by road and involves a round trip detour of 101 km, or via Barham which is approximately 86 km by road to the west and involves a round trip detour of 195 km.

The existing bridge structure is narrow with one lane in each direction and limited capacity to cater for the future regions traffic needs. The 7.3m wide carriageway bridge is rated for 42.5 tonne six axle semi-trailers and 62.5 tonne nine axle B-Doubles. It is not suitable for Higher Mass Limited Freight movements using 45.5 tonne six axle semi-trailers or 68 tonne nine axle B-Doubles. The existing bridge requires significant maintenance activities to sustain its operational role in the road network. These works would require a partial closure of the existing bridge for an extended period.

The existing Echuca-Moama Bridge does not have the capacity to provide a suitable level of service for the increasing volume of traffic in the area. The traffic flow over the bridge is often delayed during peak tourist periods, and when wide loads or agricultural machinery need to cross the river and the traffic has to be stopped because of the narrow width of the bridge. Population growth, accompanied by growth in business, tourism, jobs and personal travel, all combine to indicate significant future ongoing growth in travel across the river at Echuca-Moama.

The Project would result in a second crossing of the Murray and Campaspe Rivers and provide an alternative road access between Echuca and Moama, thereby relieving congestion traffic and load capacity issues impacting on the existing bridge. It would also enable 24-hour border crossing opportunities for oversized commercial vehicles which are currently restricted to designated off-peak crossing times on the existing bridge.

The Project comprising the Ultimate Duplication would provide sufficient area for two lanes in either direction. However, the initial alignment, which would be constructed in the first instance, would consist of a single lane in either direction. The road and bridges would be duplicated to the Ultimate Duplication (two lanes in either direction) once traffic warrants such works being undertaken.

Early investigations to provide for a second Murray River Crossing at Echuca-Moama commenced in 1965. Since then, VicRoads has undertaken extensive planning investigations including route options development and environmental impact assessments. Over the past 15 years, five corridors have been considered for an additional Murray River crossing. These investigations have included:

- An Environment Effects Statement (EES) / Environment Impact Statement (EIS) study in 2000/2001 which determined a Western Corridor as the option approved by the Planning Panel;
- Preparation of an Environmental Report in 2010 for a Mid-West corridor (this process was superseded in late 2010 following a change in Government); and
- The current EES process which formally commenced in 2013.

As a result of the investigations completed and stakeholder consultation conducted, VicRoads has amassed significant knowledge of existing environmental, social and economic conditions and community values in the Echuca-Moama region.

2.2 The Project

The Echuca-Moama Bridge Project (the Project) involves the construction and operation of a second road bridge crossing of the Murray and Campaspe Rivers at Echuca-Moama. The Project extends between Echuca (within Victoria) and Moama (in New South Wales) and is therefore subject to the provisions of the Victorian and New South Wales assessment and approvals processes. As part of the EES (within Victoria), the proposed alignment is assessed against a 'No Project' option, whereby it is assumed that the existing road conditions and networks remain unchanged and in NSW a Review of Environmental Factors (REF) is being prepared to consider the construction impacts of the Project.

The Project comprises a Right-of-Way sufficient to build a four lane road and duplicated bridges across both rivers. The Project includes an elevated roadway and extensive bridging across the Campaspe and Murray River floodplains, as well as changes to existing approach roads.

Construction of the Project will be staged to meet traffic demands and includes the Initial Alignment and an Ultimate Duplication. The Initial Alignment comprises two lanes (a single carriageway in either direction) and the Ultimate Duplication, which comprises the two lanes in both directions and duplicated bridges next to the bridges built during the Initial Alignment.

2.3 Project Objectives

The Project objectives are:

- To improve accessibility and connectivity for the community of Echuca-Moama and the wider region;

- To provide security of access with a second flood free crossing between Echuca and Moama;
- To enable cross border access for high productivity vehicles and oversized vehicles;
- Improve emergency services access between Echuca and Moama during emergency situations and major tourist and flood events;
- To provide road infrastructure that supports:
    - the local and regional economy of Echuca-Moama; and
    - the state (Vic and NSW) and national economies through improved connectivity of goods and services

2.4 Preferred Alignment

VicRoads undertook an assessment of alignment options based upon the information from previous assessments and existing conditions in the area. The result was the selection of a Preferred Alignment option for consideration by specialists. The Preferred Alignment was determined to be the better performing option when considering a balance between environmental, social and economic considerations. The Preferred Alignment is approximately 4.3km in length and utilises existing road infrastructure along part of Warren Street (Echuca-Cohuna Road), and when compared with other options, has the least amount of vegetation removal and least amount of raised road formation and bridging, reducing the overall cost of the Project. Refer to the Echuca-Moama Project EES Main Report for more details on the assessment of alignment options to support the selection of the Preferred Alignment.

The Preferred Alignment extends from the Murray Valley Highway along Warren Street before diverting to the northwest where it extends to the west of Victoria Park Oval. The Preferred Alignment then turns north-east to cross the Murray River before extending north to connect with the Cobb Highway. Figure 2-1 shows the preferred alignment.

More specifically, the Preferred Alignment, also known as the Mid-West Option comprises:

- a new roundabout at the intersection of the Murray Valley Highway;
- upgrade works along Warren Street, including widening of the road pavement, shoulder sealing, upgrading flood relief structures, line marking and intersection upgrades at Homan Street and Redman Street;
- construction of a new service road on the western side of Warren Street between Homan Street and Redman Street;
- line marking for a dedicated right-turn lane for traffic turning into Homan Street;
- construction of a new 'three-leg' roundabout approximately 120 m south of Campaspe Esplanade;
- construction of a new road extending north-west from Warren Street and construction of a new bridge across the Campaspe River and Crofton Street;

- construction of a new road extending north over part of the former Echuca College site and construction of a new road over a slab on the edge of an existing sand hill;
- a new road extending north-east over the western and northern tennis court in Victoria Park and to the north of the Echuca Caravan Park;
- construction of a new bridge over the Murray River near the existing boat ramp;
- construction of an elevated road east of the Murray River to connect with a realigned Meninya Street (the existing Cobb Highway) at a new signalised intersection; and
- signalising of the intersections at Cobb Highway and Perricoota Road / Francis Street.

The main construction activities associated with the Project would comprise:

- civil and structural works associated with the construction of new elevated roadway and bridges across the Murray and the Campaspe River;
- construction of earthworks and flood relief structures for the new Link Road across the Murray River and Campaspe River floodplains; and
- improvements to existing roads and intersections on approaches in Victoria and New South Wales, including the construction of a large diameter roundabout at the Murray Valley Highway / Warren Street intersection and traffic signals with Meninya Street and Perricoota Road in Moama.

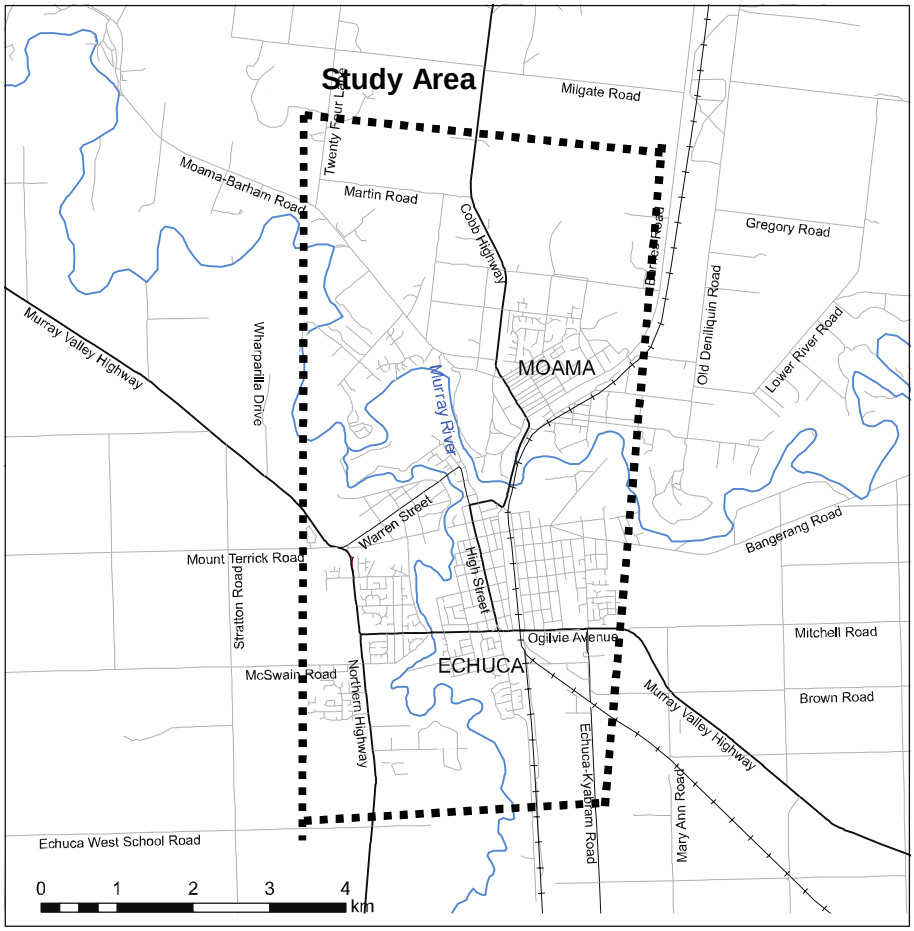
The Preferred Alignment is shown in Figure 2-1.

- Figure 2-1: Map of the preferred alignment

2.5 Study Area

The Study Area adopted for the development of this Transport Impact Assessment and traffic model extends just beyond the township boundaries, as shown in Figure 2-2. The area extends approximately 5 km by 7 km and covers all of the major roads into Moama and Echuca. The study area was determined by VicRoads and is the same as the Origin and Destination study undertaken in 2008.

- Figure 2-2: Map of Echuca-Moama Transport Impact Assessment Study area



3. Existing Conditions

This section provides a summary of existing traffic conditions, transport provision, issues and risks in Echuca and Moama.

3.1 Information Sources

Information for the assessment was derived from the following sources:

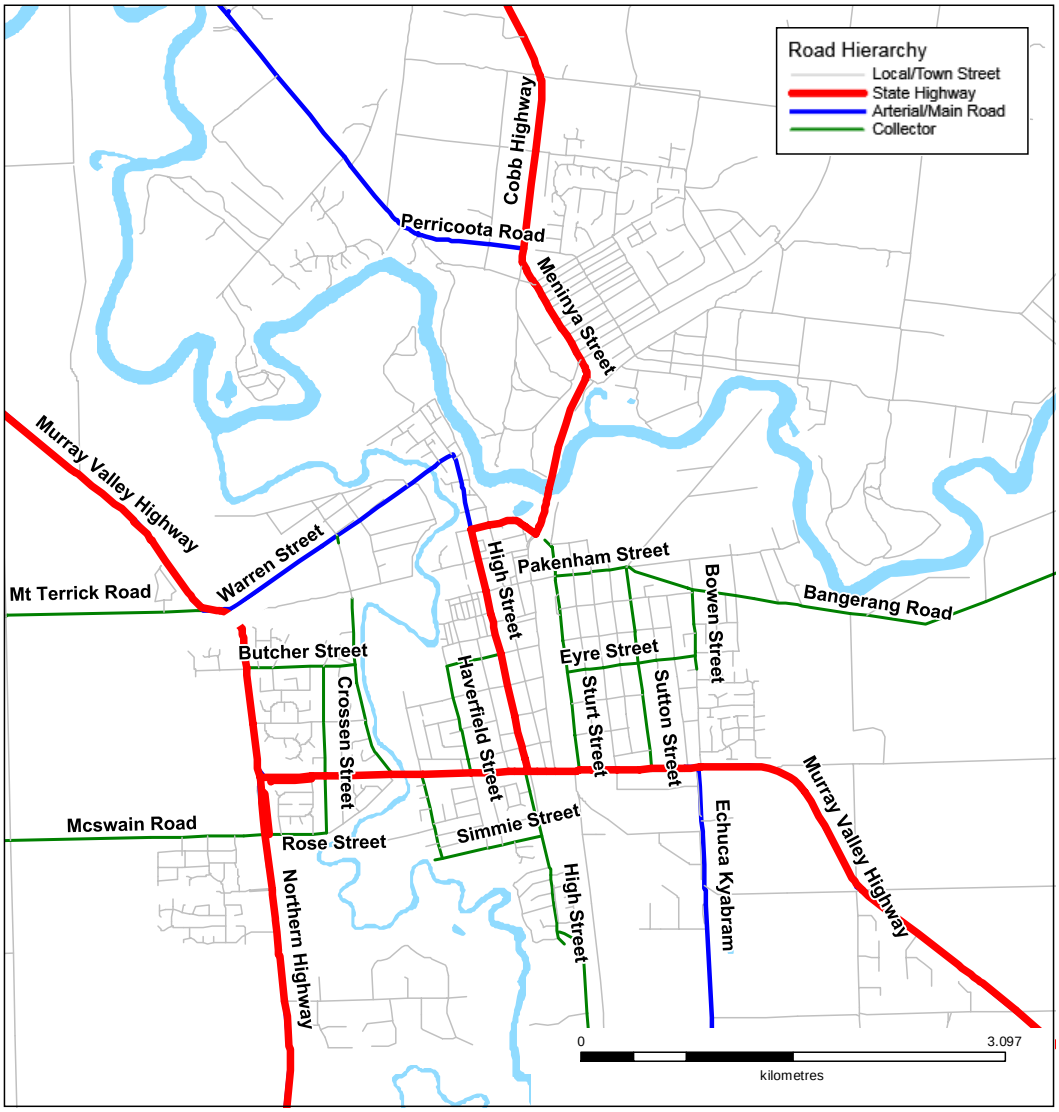
- Visiting Echuca and Moama, reviewing the transport network and discussing local issues with representatives of Campaspe Shire Council and Murray Shire.
- Current and historical traffic volumes provided by VicRoads, Roads and Maritime and Campaspe Shire Council and Murray Shire.
- Reviewing the road crash history in Echuca and Moama and determining particular crash hot spots.
- Campaspe Shire Council and Murray Shire strategic documents, policies and guidelines related to transport and land use.
- 2011 Census data (population, dwellings and place of work).
- Victoria in Future (2014 and 2008 population and dwelling size projection).
- NSW population projection (2014 and 2008).

3.2 Study Area Characteristics

3.2.1 Existing Road Hierarchy

The main highways in the Study Area are the Northern Highway connecting Echuca to the south, the Murray Valley Highway running east-west alongside the Murray River and the Cobb Highway which runs from Moama to the north. Figure 3-1 depicts the road hierarchy in Echuca and Moama.

- Figure 3-1: Map of Road Hierarchy in Echuca Moama



Source: Campaspe Shire Council and Murray Shire Council road hierarchy

3.2.2 Main Roads in the Mid-West and Existing Bridge Corridors

Photos of the main roads in the Mid-West and existing bridge corridors are shown in Figure 3-2 to Figure 3-9 and a description of each road is provided in Table 3-1.

- Figure 3-2 Warren Street

- Figure 3-3 Heygarth Street

- Figure 3-4 High Street

- Figure 3-5 Cobb Highway (South of river)

- Figure 3-6 Cobb Highway (North of river)

- Figure 3-7 Cobb Highway / Meninya Street

- Figure 3-8 Murray Valley Highway (North of Warren St)

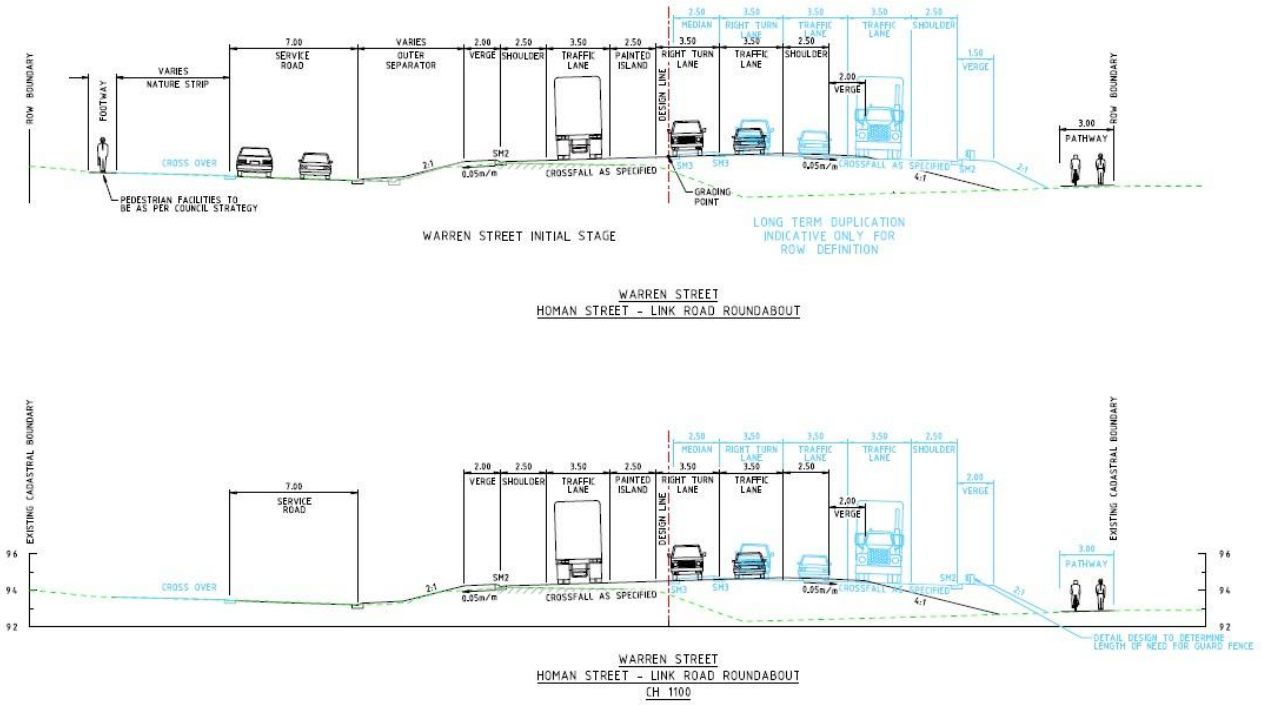
- Figure 3-9 Murray Valley Highway (South of Warren St)

- Table 3-1 Characteristics of key roads inside the Study Area

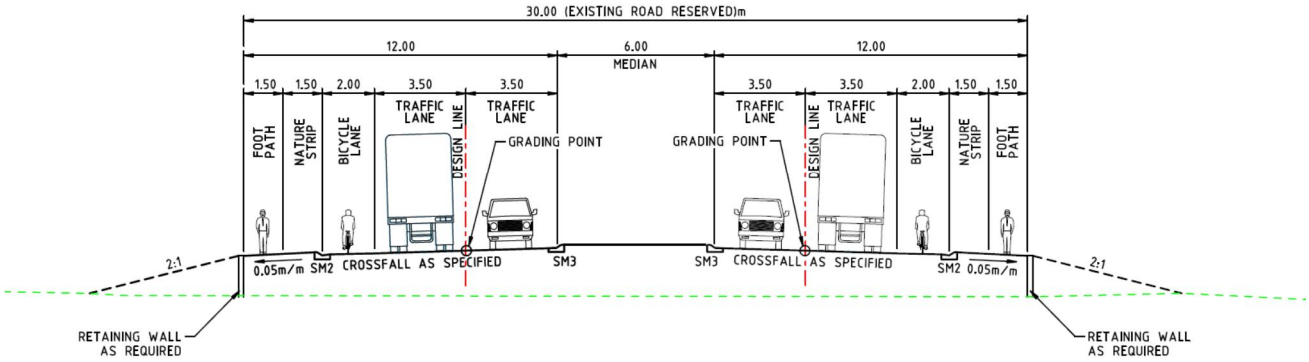
Road	Responsible Authority	Nos. Lanes	Speed Limit
Warren Street (Cohuna-Echuca Road)	VicRoads	• 1 traffic lane in each direction • No shoulders or pathway - unsealed	80 km/h west of Campaspe River
Heygarth Street (Northern Highway)	VicRoads	• 1 traffic lane in each direction • On street parking (angle) • Pedestrian path	50 km/h
High Street north of Heygarth Street (Cohuna-Echuca Road)	VicRoads	• 1 lane in each direction • On-road cycle lane • On street parking (angle) • Pedestrian path	50 km/h
High Street south of Heygarth Street	VicRoads	• 2 lanes in each direction • On-road cycle lane • On street parking (parallel) • Pedestrian	50 km/h 60 km/h 80 km/h
Cobb Highway – bridge (NSW) and Annesley Street / Northern Highway south of the Murray river (Vic)	VicRoads and Roads & Maritime Services, NSW	Murray Shire • 1 traffic lane in each direction • Pedestrian path Campaspe Shire • 1 traffic lane northbound, 2 southbound (south of the bridge) • No parking • Pedestrian pathway	50 km/h
Cobb Highway / Meninya Street	Roads & Maritime Services, NSW	• 1 traffic lane in each direction • On street parking (parallel) • Off-road cycle path • Pedestrian path	50 km/h
Murray Valley Highway	VicRoads	• 1 traffic lane in each direction	80 km/h

Road	Responsible Authority	Nos. Lanes	Speed Limit
South of Warren Street		• No shoulders or pathway – unsealed • No parking • No pedestrian path	
Murray Valley Highway (Ogilvie Avenue)	VicRoads	• 2 lanes in each direction • On-road cycle lane • On street parking (parallel) • Pedestrian path	60 km/h 70 km/h
Sturt Street	Campaspe	• 2 lanes in each direction • Sealed shoulders	60 km/h
Perricoota Road	Roads & Maritime Services, NSW	• 1 traffic lane in each direction • No shoulders of pathway – unsealed • No parking • No pedestrian path	50 km/h 80 km/h

- Figure 3-10 Typical cross section of Warren Street



- Figure 3-11 Typical cross section of approach with Meninya Street



Road Restrictions

The existing bridge structure can carry 42.5 tonne six axle semi-trailers and 62.5 tonne nine axle B-doubles. As such it is restricted from carrying Higher Mass Limits vehicles which allow nine-axle B-doubles to carry up to 68 tonnes. The existing bridge is included on the B-doubles network in Victoria with the nearest alternative crossings at Barham, 86 km to the west and Barmah, 36Km to the east, or Tocumwal 120km to the east for more direct connection to Sydney. Typically, larger freight transports such as road trains from New South Wales, which are not permitted on Victorian Roads in this area, separate part of their load within Moama prior to crossing the bridge. The movement of over-dimensional loads has been restricted to off-peak periods (the restricted time period specified in Table 3-2).

- Table 3-2 Over-dimensional vehicle permitted travel times

Location	Road or area	Travel not permitted
Moama Echuca Bridge	Cobb Highway	Mon – Fri 7.30am to 9.30am, and Noon to 1pm, and 3pm to 6pm. Sat – Sun 7.30am to 9am, and Noon to 1pm

For Moama, general access heavy vehicles[1] have unrestricted access to the road system. Any over dimensional or over mass load[2] must be approved by RMS prior to travel in Moama.

For Echuca, vehicles with performance base standards (PBS)[3] level 1 permits or general access vehicles are pre-approved to travel on arterial roads and state highways. A small number of local roads, such as Anstruther Street, also have pre-approval for PBS level 1 vehicles. Vehicles with performance base standards (PBS)

[1] http://www.rms.nsw.gov.au/business-industry/heavy-vehicles/road-access/general-access-vehicles.html
[2] http://www.rms.nsw.gov.au/business-industry/heavy-vehicles/road-access/restricted-access-vehicles/oversize-overmass.html
[3] https://www.nhvr.gov.au/files/fact-sheet-3-performance-based-standards.pdf

level 2A permits or B-Doubles are restricted from using arterial roads such as Warren Street but are pre-approved to travel on state highways. Road trains do not have pre-approval to travel on any roads in Echuca.

3.2.3 Existing Traffic Volumes

Road Traffic Counts

In 2008, traffic counts were obtained at 28 locations in the study area (refer to Figure 3-12). These locations were chosen by VicRoads specifically to form complete cordons, capturing external trips to Echuca and Moama as well as between the two town centres.

More recently in 2014, additional existing traffic counts were sourced from VicRoads and Murray Shire Council (refer to Figure 3.12). The average daily two-way traffic volumes at these sites are shown in Figure 3-12. The 2008 counts were obtained between June and September 2008 and so reflect an average working weekday during the winter period. The 2014 counts from Murray Shire were recorded during the month of August 2014. The most recent VicRoads tube counts were collected in 2013 and 2014. Sydney Coordinated Adaptive Traffic System (SCATS) counts[4] were also collected in the last week of August 2014. The SCATS data was not used as it did not capture all the relevant traffic movements required.

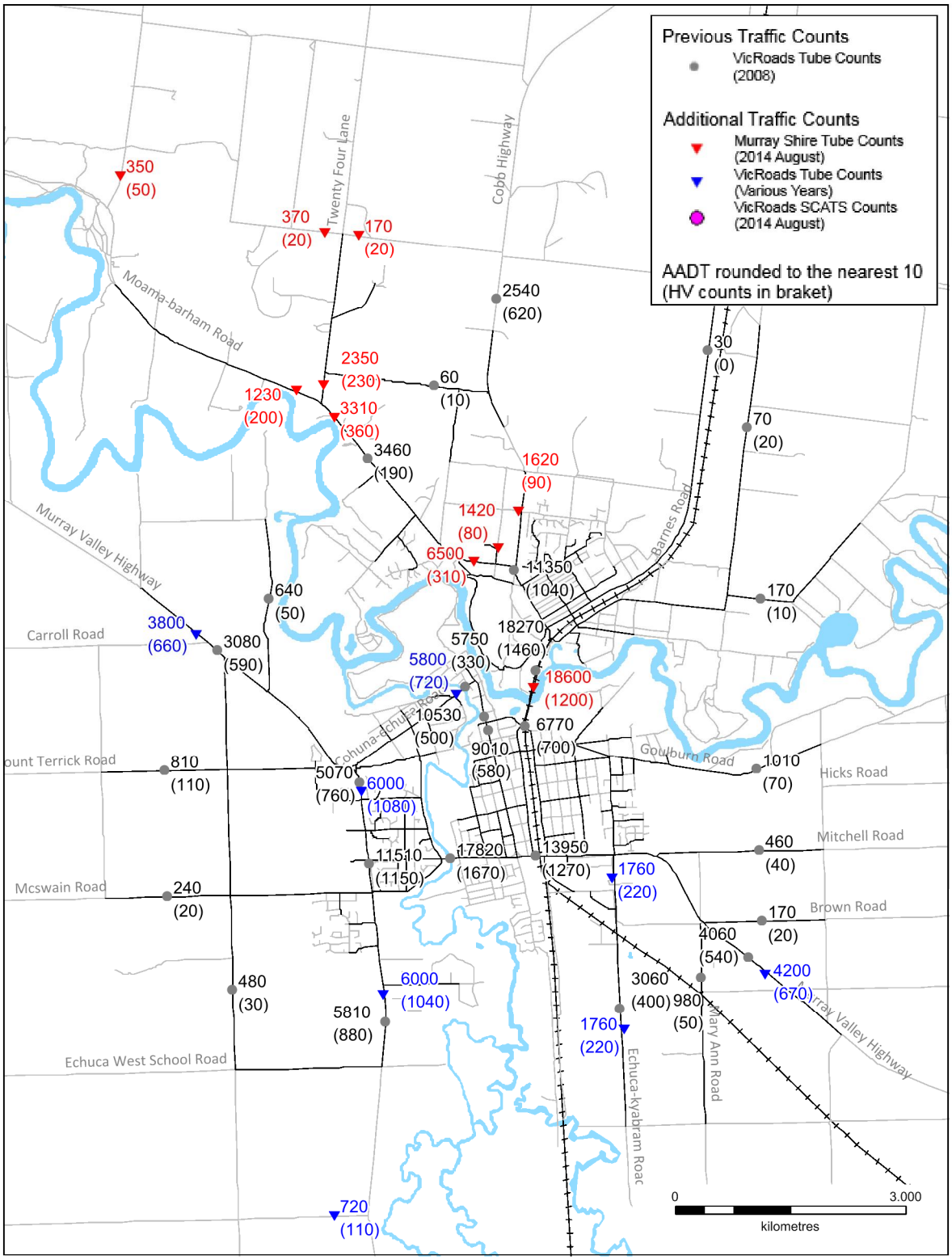
As indicated in Figure 3-12, the heaviest traffic volumes are on the main arterial routes through the town centres, including Ogilvie Avenue, High Street, Heygarth Street and Meninya Street. Northern Highway, Murray Valley Highway, Cobb Highway and Perricoota Road provide the main connections to regions outside the Echuca-Moama area.

For all the locations surveyed in both 2008 and 2014, there have been increases in the percentages of heavy vehicles (e.g. Warren Street and Murray Valley Highway in Echuca, and Perricoota Road in Moama).

Traffic volumes during holiday periods and weekends are higher in and around the town centres, given the seasonal tourist market that is an important part of the Echuca-Moama economy. This is evident from the seasonal volumes on the bridge (refer to Figure 3-15).

[4] SCATS counts are automated counts collected from traffic signals in the Echuca area.

- Figure 3-12: Map of average weekday two-way traffic volumes (heavy vehicle counts in brackets)



Echuca-Moama Bridge Traffic Volumes

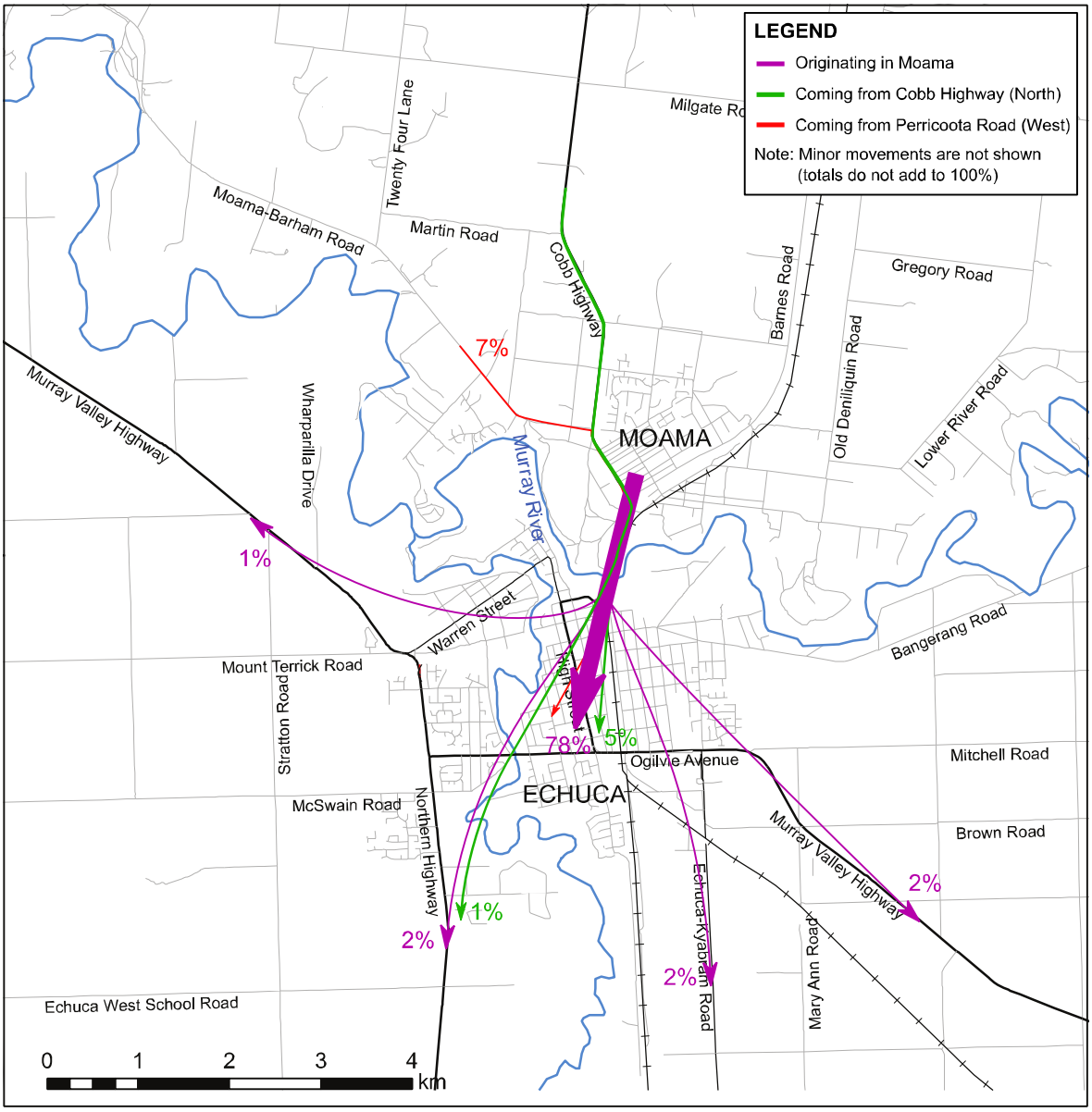
VicRoads survey undertaken in 2008[5] showed that the average two-way traffic volume for the existing bridge was 18,300 vehicles per day, of which 8% were trucks. Roads and Maritime Services traffic counts obtained on the bridge during the winter months of 2010 and 2013 showed similar levels of traffic and percentages of heavy vehicles.

An Origin and Destination survey (Austraffic, 2008) was conducted on Wednesday 15 October 2008 to determine the origins and destinations of traffic travelling through Echuca and Moama. Although this survey was carried out several years ago, traffic patterns in 2014 are assumed to be similar to those in 2008, given that the road network, population growth and land use have not changed significantly during the intervening years.

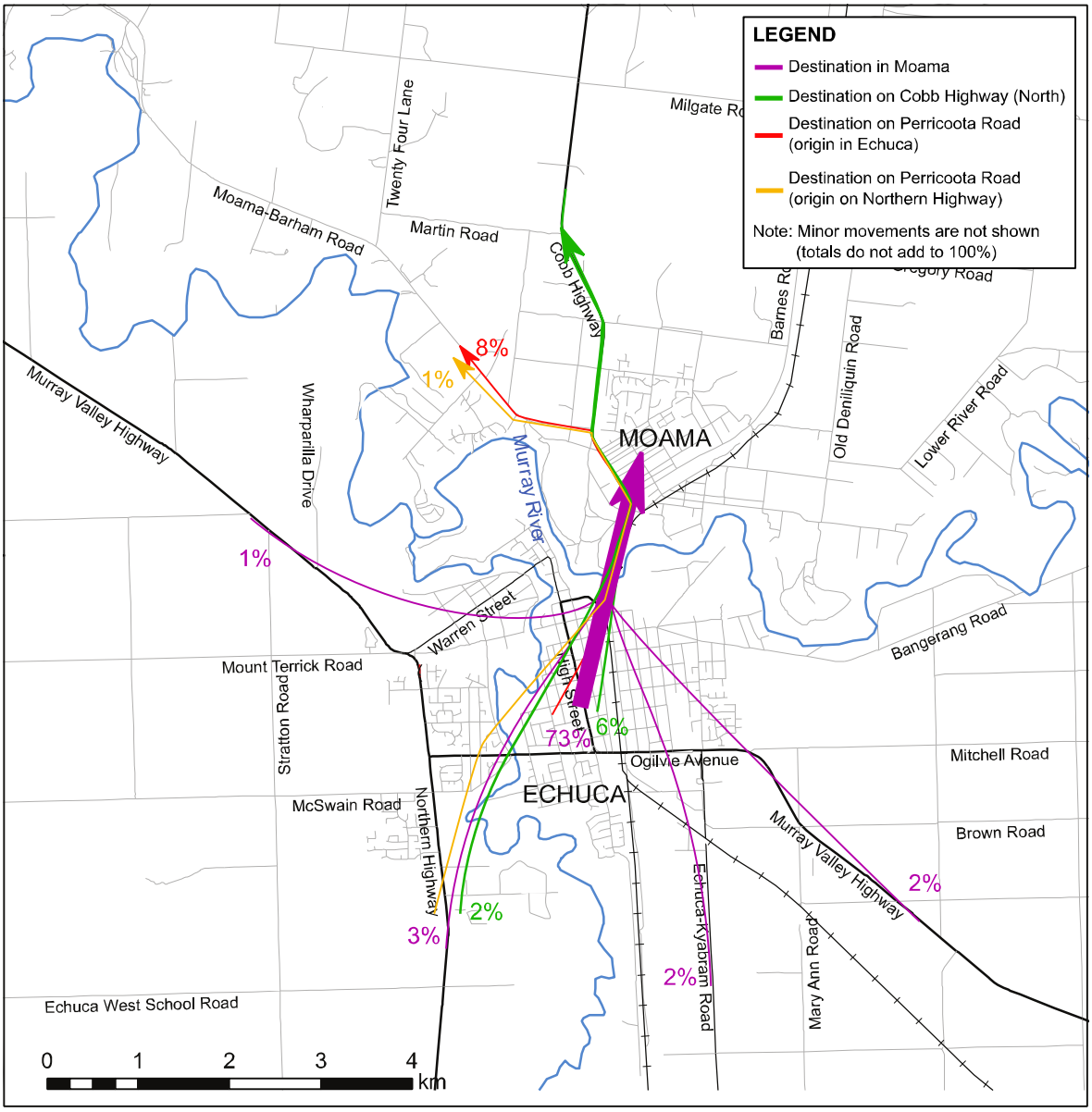
The destinations of traffic crossing the existing bridge according to the Origin and Destination Survey are shown in Figure 3-13 for southbound movements and Figure 3-14 for northbound movements. In these figures the percentages represent the proportion of vehicles starting and finishing their journeys in the indicated regions. For example, as shown in Figure 3-13, 78% of southbound vehicles start their journey in Moama and finish in Echuca. 7% of southbound vehicles enter the cordon along Perricoota Road and finish in Echuca. In the northbound direction shown in Figure 3-14 around 73% of vehicles start their trip in Echuca and finish in Moama. 8% start in Echuca and head outbound along Perricoota Road and 1% enters the cordon along the Northern Highway and travel out along Perricoota Road.

[5] Austraffic 2008 Echuca-Moama Bridge Planning Study Traffic Surveys August 2008 – Overview Report

- Figure 3-13: Map of destinations of southbound traffic movements (both cars and trucks) across existing bridge (source: Origin-Destination Survey, Austraffic, October 2008)



- Figure 3-14: Map of destinations of northbound traffic movements (both cars and trucks) across existing bridge (source: Origin-Destination Survey, Austraffic, October 2008)

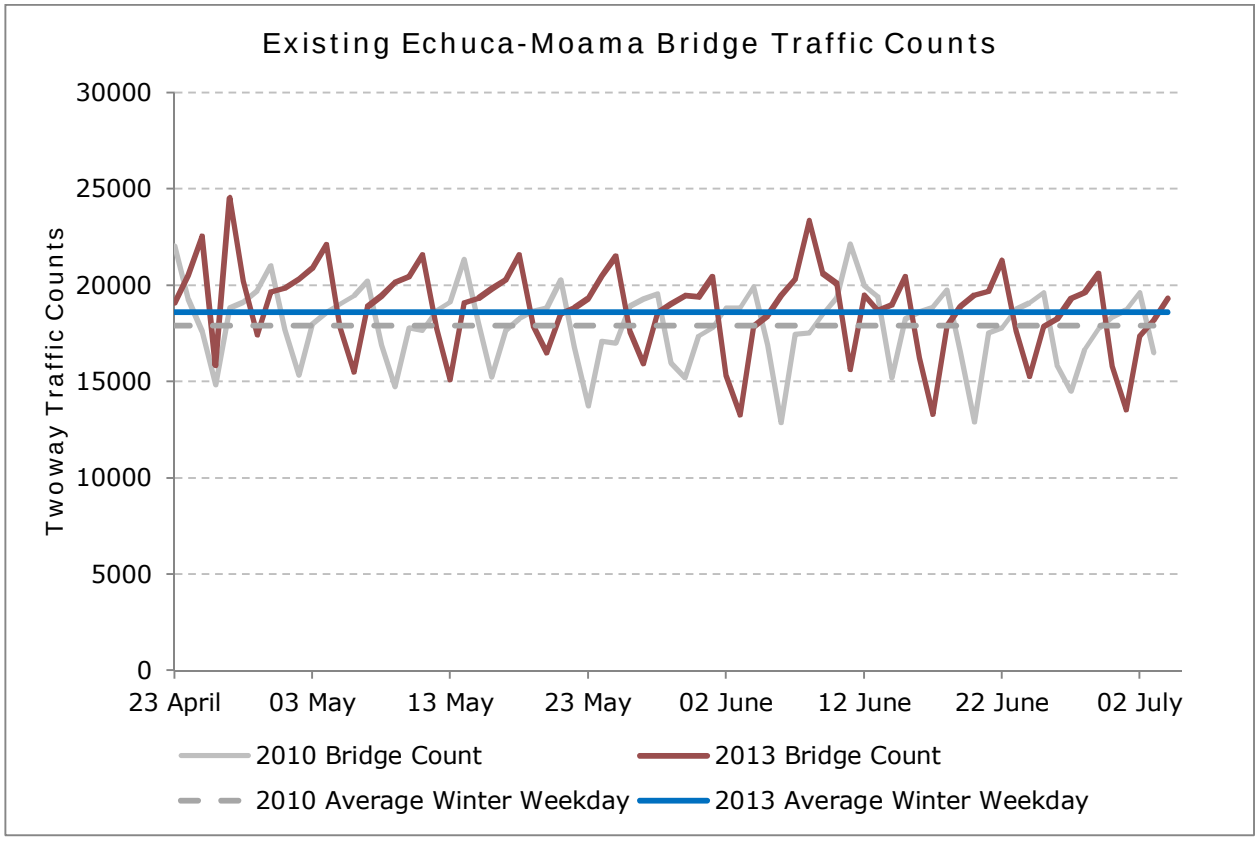


For existing bridge traffic in both directions, around three quarters of all traffic movements have origins and destinations within Echuca and Moama. Only a very small proportion of traffic – between 3% and 4% - start and finish outside of the townships of Echuca and Moama or want to bypass both towns completely.

Seasonal Variation

In addition to the 2008 surveyed traffic volumes, VicRoads traffic counts from December 2009 to July 2010 were obtained for the existing bridge. More recently, traffic counts from March 2013 to July 2013 were sourced from Roads and Maritime Services (see Figure 3-15).

- Figure 3-15: Line plot of two-way daily bridge volumes (2010 and 2013)



As indicated in Figure 3-15, the existing bridge traffic comparing the same period in 2010 with 2013 are of similar magnitude, with traffic averaging around 18,000 vehicles per day and fluctuating on weekends and school holidays. During peak periods, daily traffic volumes over the existing bridge can exceed 25,000 vehicles per day.

Holiday periods (*including summer, and public holidays)* also have significantly different travel patterns to average weekday travel patterns, with more trips being generated at tourist attractions and accommodation precincts such as caravan parks and the historic port.[6]

Echuca has the world's largest paddle steamer fleet[7] and is a popular destination for a range of water sports including the world's largest water-skiing race[8]. Traffic levels are therefore generally at their highest during summer holidays, long weekends and special events. Major annual events in the area include water ski boat race (Southern 80) and music festival (Riverboats) in February, wedding expo in May, Queen's Birthday steam rally in June, winter blues music festival in July, and the Deniliquin Ute Muster and Elmore & District field days in October. Most of these events happen over long weekends, typically with duration of between one and three days.

[6] Tourism research Australia (2013) Travel to Echuca/ Moama (year ending December 2013)
[7] http://www.echucamoama.com/paddlesteamer-river-cruises
[8] http://www.visitvictoria.com/Regions/The-Murray/Things-to-do/Outdoor-activities/Water-sports/Waterskiing

The traffic model for Echuca was calibrated to average winter weekday traffic, rather than peak traffic during high season. This is consistent with the Origin and Destination Study. The impact of this assumption on economic analyses and engineering design is discussed on page 45.

Heavy Vehicles

From correspondence with the major heavy vehicle depot operator (Omega Warehousing and Distribution) in Moama, it is understood that during grain and tomato harvest season the percentage of heavy vehicles travelling on arterial roads increases significantly (mid-November to mid-February for grain and February to early April for tomato harvest).

The major heavy vehicle depot is located approximately 300 metres from the existing bridge on Echuca Street in Moama. It provides large scale warehousing and is the termination point of the FL12 national road train route, where multi trailer road trains are split into single trailer trucks to travel to Melbourne. The depot services up to 85 road trains during a normal month, resulting in 360 truck bridge crossings (to and back from Melbourne) a month. The depot also has the only privately owned Commonwealth-certified weight bridge. During the harvest season (February to April), additional trucks travel from Echuca to the warehouse to be packaged, weighed and then transferred to factories.

3.2.4 Intersection Analysis

The performance of two key intersections in Echuca and Moama were assessed using the SIDRA intersection analysis software package. The analysis was carried out using modelled base year (2014) traffic volumes, with daily volumes factored by 8.4% to represent a typical peak hour[9].

Detailed SIDRA outputs are provided in Appendix B, and the main queue and level-of-service indicators[10] are summarised in Table 6-4.

The Murray Valley Highway / Warren Street priority intersection performs satisfactorily during peak traffic conditions.

On the other hand, a queue is expected to build up on Perricoota Road at Cobb Highway during peak traffic conditions. The worst level of service for Cobb Highway / Perricoota Road priority intersection occurred on the right turn out of Perricoota Road, due to the high right turning volume (332 vehicles per hour).

[9] The conversion from daily to peak hourly volumes was derived from observed hourly traffic counts in the area is consistent with the method applied in the previous studies (SKM, 2009 and 2010). 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.

[10] 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.

- Table 3-3: Summary of intersection performance indicators (2014 peak hour)

Intersection	Longest Queue (veh)	Worst Level of Service
Murray Valley Highway / Warren Street (Give-way Controlled Intersection)	0.8	B
Cobb Highway / Perricoota Road (Give-way Controlled Intersection)	42.7	F (right turn from Perricoota Road)

3.2.5 Crash Analysis

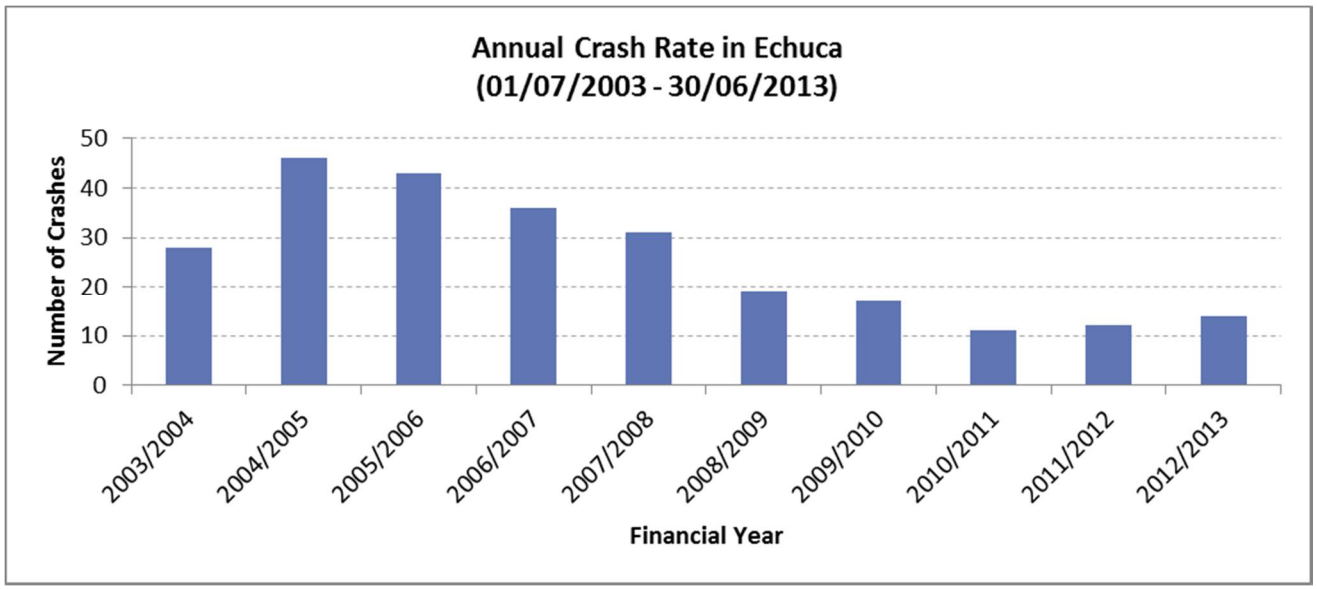
Crash data from Echuca and Moama for the last 10 years (1 July 2003 to 30 June 2013) was obtained from the VicRoads CrashStats database and Transport for NSW equivalent database respectively. The data was analysed and the key findings are summarised in the following sub-sections for each town.

Echuca

There were 257 injury crashes reported in the town of Echuca from 01 July 2003 to 30 June 2013. About 40% of these were serious injury crashes, including one fatality. The other 60% were classified as "other injury" crashes. About two thirds of the accidents were collisions between vehicles, with the rest of the crashes being collisions with fixed objects or pedestrians.

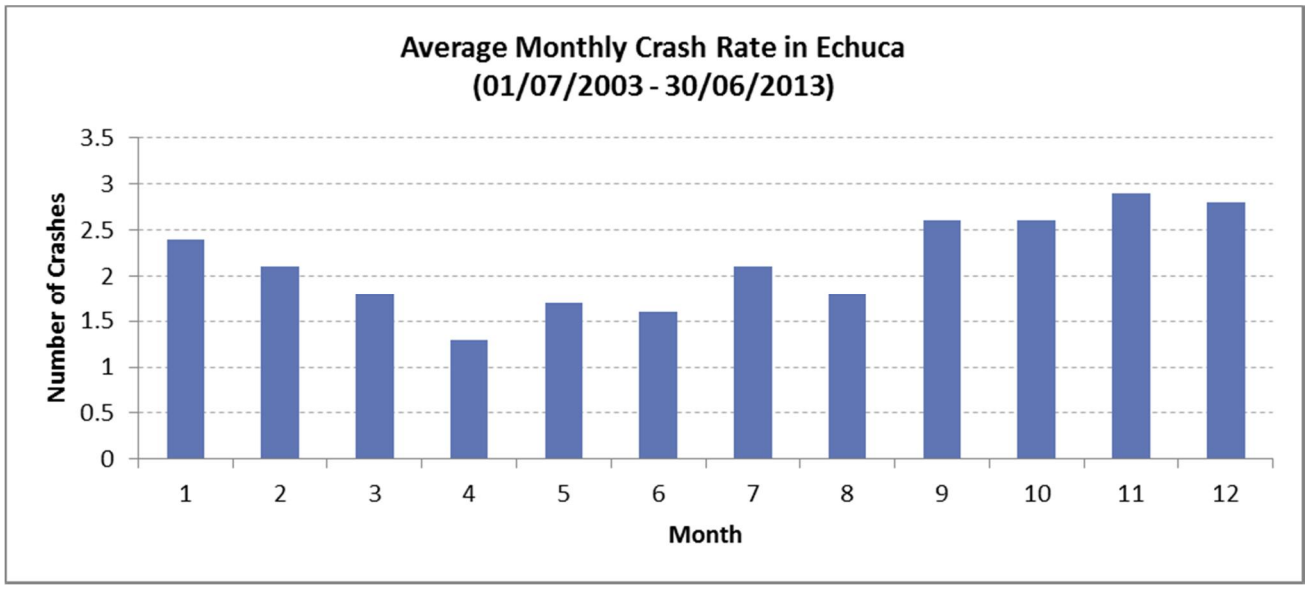
There was an increasing trend in the total number of injury crashes from 2003/2004. However, since 2005/2006, crashes have decreased from 46 crashes per annum to 14 crashes per annum in 2012/2013 (see Figure 3-16). This may in part be due to safety and intersection improvements undertaken in Ogilvie Avenue and High Street in 2009 and 2014

- Figure 3-16: Bar chart of annual crash rate in Echuca (1 July 2003 to 30 June 2013)



During the warmer months, the town attracts more tourist traffic. This is reflected in the total number of crashes, where on average, more crashes happened during the spring and summer months from September until December and January (see Figure 3-17).

- Figure 3-17: Bar chart of monthly crash rate in Echuca (1 July 2003 to 30 June 2013)



Across the day, the majority of the crashes happened during daylight hours, with more crashes in the afternoon than morning. Adverse weather conditions do not appear to have contributed significantly to crashes, as more than 90% of the crashes happened when the weather was clear and the road surface was dry.

Over 80% of crashes happened where the speed limit was less than or at 80km/h, with over 30% of crashes occurring inside 50km/h speed zones. Most crashes happened at or within close proximity to intersections. The intersections with the highest number of crashes occurred were:

- Murray Valley Highway / High Street signals (12 crashes)
- Murray Valley Highway / Haverfield Street signals (10 crashes)
- Highway Street / Pakenham Street signals (9 crashes)
- High Street / Heygarth Street roundabout (7 crashes)
- Murray Valley Highway / Northern Highway roundabout (7 crashes)

Figure 3-18 shows the aggregated number of crashes in Echuca during the 10-year analysis period. The sizes of the squares in the diagram indicate the total number of crashes at that location, with blue representing intersection crashes and red representing mid-block crashes.

Figure 3-18: Map of aggregated crashes in Echuca (1 July 2003 to 30 June 2013)

Moama

Overall there were 124 crashes reported in Moama from 1 July 2003 to 30 June 2013. These crashes were evenly split between non-casualty and injury crashes, which also included two fatal crashes. Similar to Echuca, over two thirds of the crashes in Moama involved two or more vehicles, with the remainder being single vehicle crashes.

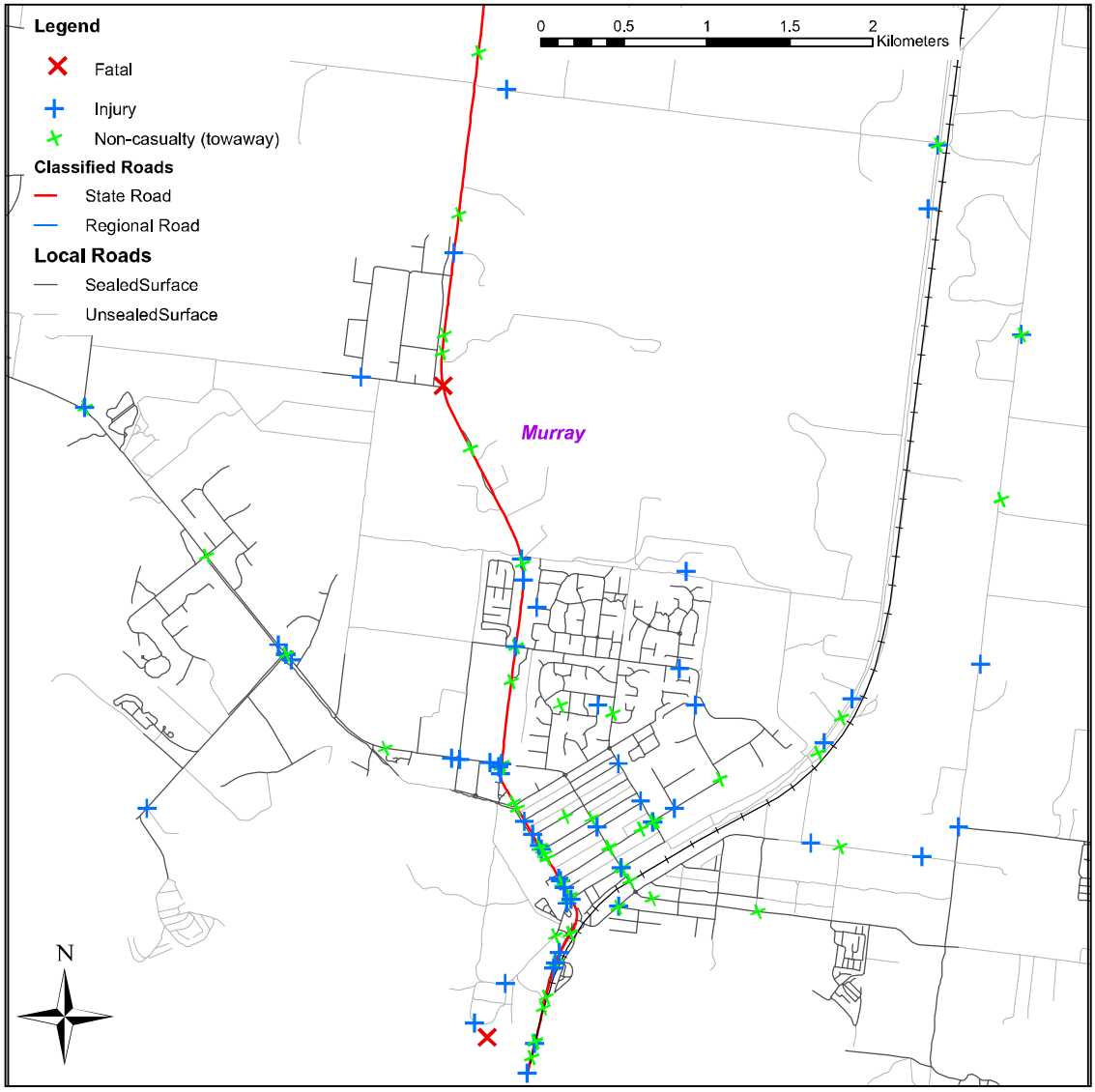
The total number of crashes has been relatively constant at about 13 crashes per year with no apparent trend in the 10 analysis years. Unlike Echuca, there was no clear correlation with the seasons and in the number of crashes. Similar to Echuca, most crashes happened during daylight hours, with more crashes in the afternoon than morning. Adverse weather conditions do not appear to contribute to crashes, as more than 90% of the crashes happened when the weather was clear and the road surface was dry.

Around 80% of crashes happened where the speed limit was less than or at 80km/h, with over 50% of crashes occurring inside 50km/h speed zone. Most of crashes appeared to cluster around Cobb Highway and Meninya Street.

There were three crashes on the existing Echuca-Moama bridge over the analysis period, of which one was an injury crash. Two of the rear end crashes happened during lunch time, with one "crash-into-object" happening during the evening. All of these crashes happened during public holiday or long weekend. As the existing bridge has two traffic lanes within a 7.4m wide carriageway between bridge barriers, during serious incident, traffic in both directions may be affected.

Figure 3-19 shows crashes in Moama occurred during the 10 year analysis period. Each cross represents a crash, with large red crosses for fatal, mid-sized blue plus signs for injury and small green crosses for non-casualty crashes.

- Figure 3-19: Map of crashes in Moama (1 July 2003 to 30 June 2013)



Summary

In summary, Echuca had more recorded crashes in comparison to Moama in the 10-year analysis period. However, the average number of crashes per annum has declined in Echuca in recent years, to similar levels of that in Moama. The crashes in Echuca generally increased during spring and summer while crashes in Moama do not appear to follow any seasonal pattern. Weather conditions did not appear to affect crash rates in each township and the majority of crashes occurred during afternoon time periods.

In Echuca, the highest number of accidents occurred around traffic signals and roundabouts on Northern Highway and Murray Valley Highway. In Moama, crashes were clustered along Cobb Highway and Meninya Street.

3.2.6 Public Transport

There are seven coach routes and one train route that serve Echuca and Moama based on November 2014 timetables (refer to Table 3-4 and Table 3-5). Five services are operated by V/Line and the remaining two services are operated by NSW TrainLink. The services operated by NSW TrainLink operate a less frequent service than the V/line services.

- Table 3-4: List of coach services

Operator	Route	Service Frequency
V/line	Melbourne to Echuca/Moama via Bendigo or Heathcote	Monday to Friday ▪ 3 services/day from Melbourne to Echuca/Moama ▪ 2 services/day from Bendigo to Echuca/Moama Saturday ▪ 2 services/day from Melbourne to Echuca/Moama ▪ 1 service/day from Bendigo to Echuca/Moama Sunday ▪ 1 service/day from Melbourne to Echuca/Moama ▪ 1 service/day from Bendigo to Echuca/Moama
	Echuca/Moama - Melbourne via Bendigo or Heathcote	Monday to Friday ▪ 1 service/day from Echuca/Moama to Melbourne ▪ 2 services/day from Echuca/Moama to Bendigo Saturday ▪ 1 service/day from Echuca/Moama to Melbourne ▪ 1 service/day from Echuca/Moama to Bendigo Sunday ▪ 1 service/day from Echuca/Moama to Bendigo
	Deniliquin - Melbourne via Moama, Echuca & Heathcote	Monday to Friday - 1 service each way per day

Operator	Route	Service Frequency
	Echuca/Moama - Melbourne via Shepparton	Monday to Friday - 3 services each way per day
	Kerang - Echuca via Cohuna	Operates on the first Tuesday and the third Friday of the month only
NSW TrainLink	733 / 734 Wagga Wagga – Lockhart – Echuca	Operates Mon, Wed, Fri, Sun – 1 service each way
	741 / 742 Echuca – Howlong – Albury	Operates Tues, Thurs, Sun – 1 service each way

- Table 3-5: List of train services

Operator	Route	Service Frequency
V/line	Melbourne – Echuca (via Bendigo or Heathcote)	Weekday - 1 service daily each way Saturday – 2 services each way Sunday – 2 services way

There are five regional bus services that are operated by Echuca Moama Transit and a further five services operated by Newton's Bus Services. Three of the services operate six days a week with between 9 and 17 services on weekdays and three services operate on a Saturday. All of Newton's bus services operate weekdays with four also operating on Saturdays.

- Table 3-6: List of regional bus services

Operator	Route	Service Frequency	
		Mon - Fri	Saturday
Echuca Moama Transit	Route 1: Echuca - Echuca South	13 services operating (3 operate on school days only) from 09:00 – 18:00	3 services operating from 10:00 – 14:00
	Route 2: Echuca - Echuca East	13 services operating (3 operate on school days only) from 07:45 – 17:30	3 services operating from 09:30 – 13:30
	Route 3: Echuca - Moama	17 services operating (7 on school days only) from 07:50 – 16:35	No services
	Route 4: Echuca – Cunningham Downs Retirement Village	9 services operating from 09:00 – 17:00	2 services operating from 09:00 – 11:00
	Route 5: Echuca - 24 Lane	3 services operating from 09:30 – 13:35	No services

Operator	Route	Service Frequency	
		Mon - Fri	Saturday
Newton's Bus Service	Route 938: North Route Echuca PO - Westwood Park	7 services operating from 07:55 – 15:25	2 services operating from 09:30 – 11:40
	Route 938: South Route Westwood Park – Echuca PO	9 services operating from 10:05 – 16:55	2 services operating from 09:30 – 13:00
	Route 938: East Route	6 services operating from 08:00 – 16:18	2 services operating from 09:55 – 12:03
	Route 938: West Route	2 services operating from 08:40 – 15:50	No services
	Route 938: Moama Route	13 services operating from 07:45 – 16:30	2 services operating from 10:20 – 12:35

There are several local school bus routes operating in Echuca and Moama. The latest bus routes Campaspe Shire Council and Public Transport Victoria (PTV) have on record were last updated in 2009. PTV have confirmed that Warren Street and the existing bridge are used by school buses, however, there are no dedicated bus stops within the town limits other than the designated stops at the individual schools. PTV have indicated that the current school bus routes are outdated and will be reviewed. However, it was confirmed that the new routes to be finalised are likely to follow the main roads as they approach the town centre but may divert onto other routes through the town centre.

3.2.7 Walking and Cycling

The purpose of the Campaspe Walking and Cycling Strategy (2007), (Walking Strategy) is; '*to identify a direction and opportunities for the future provision of walking and cycling paths and trails in the Shire for Campaspe, after consideration of local and regional issues*.'

The Walking Strategy aims to increase participation in walking and cycling by both residents and visitors to the Shire of Campaspe. It aims to encourage walking and cycling to work, recreational offerings, schools and shops and as a tourism activity. To support this aim the Campaspe Shire Council will promote existing paths and develop new safe and well-designed paths.

There are a number of existing cycle/walk tracks in the Echuca-Moama townships (refer to Figure 3-20 to Figure 3-22) including:

- Echuca (on road bicycle lanes) - High Street, Ogilvie Avenue, Pakenham Street, Sutton Street

- Echuca (off road bicycle paths) – Warren Street, Murray Valley Highway, Butcher Street, Cobb Highway and along Campaspe River
- Moama (designated walk/cycle track) – Perricoota Road, Boundary Road, Hunt Street, Blair Street

Recreational walking and cycling

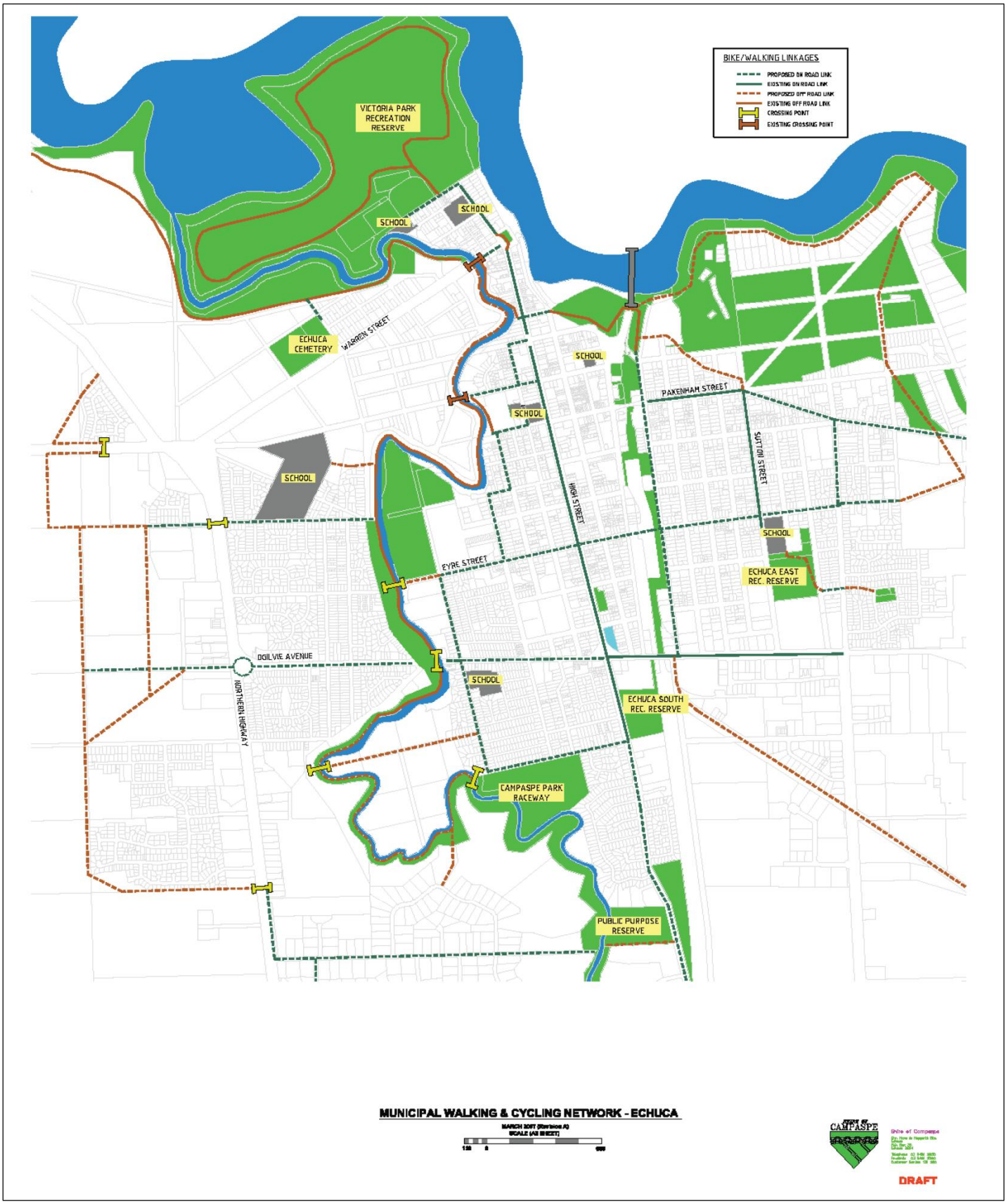
There are currently four existing self-guided cycling and walking routes[11] that are promoted widely in Echuca-Moama.

There are also a number of walking-only routes that are promoted as self-guided tourist routes:

- Banyule State Forest Ride (Banyule / River Village Forest)
- Historic Adventure (Scenic Drive / Wharparilla Flora Reserve)
- Moama Meander (Moama Bus Riverside)
- Campaspe River Ride (Campaspe Esplanade

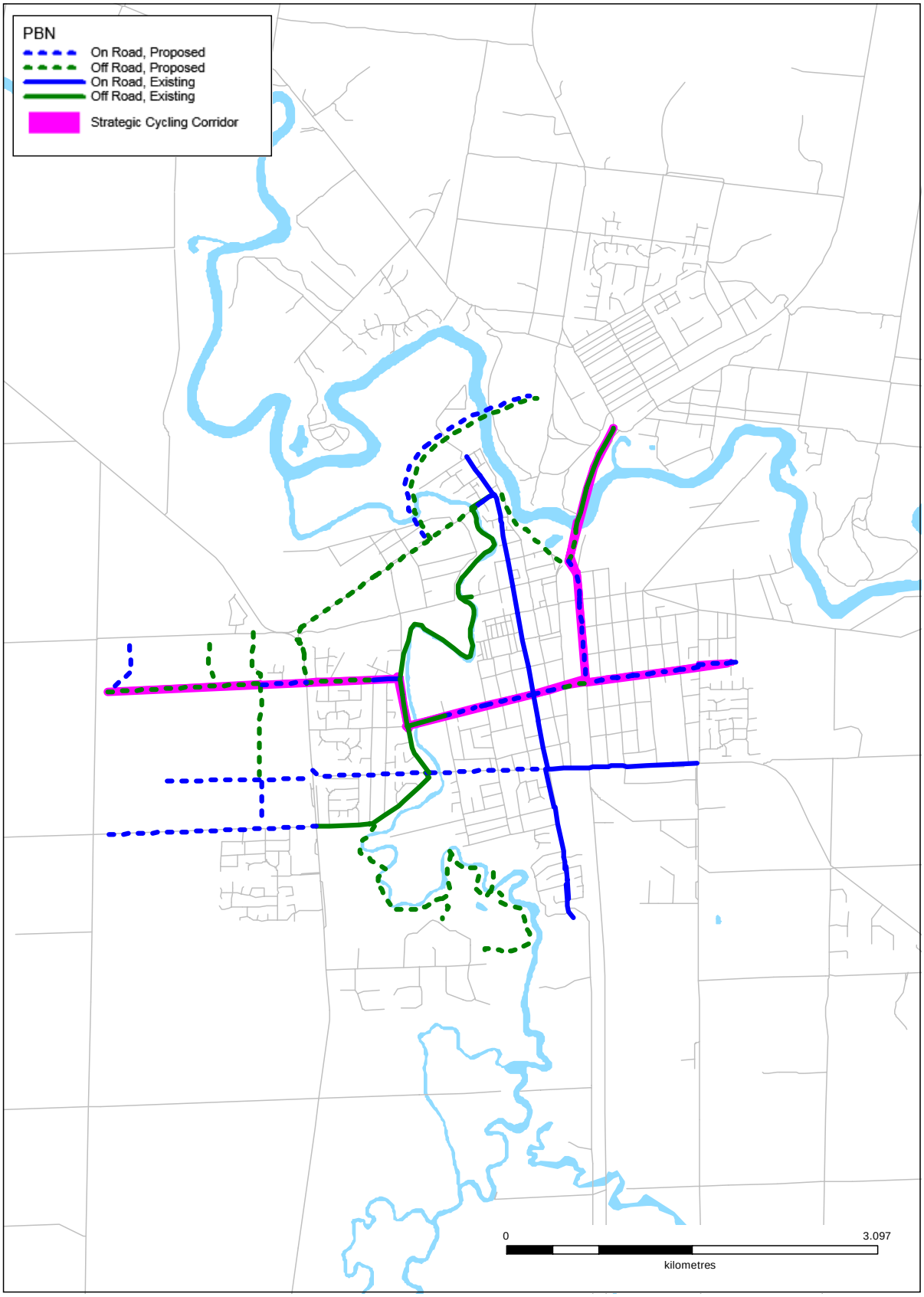
[11] http://www.echucamoama.com/bike-tracks

- Figure 3-20: Municipal Walking & Cycling Network - Echuca (2007)



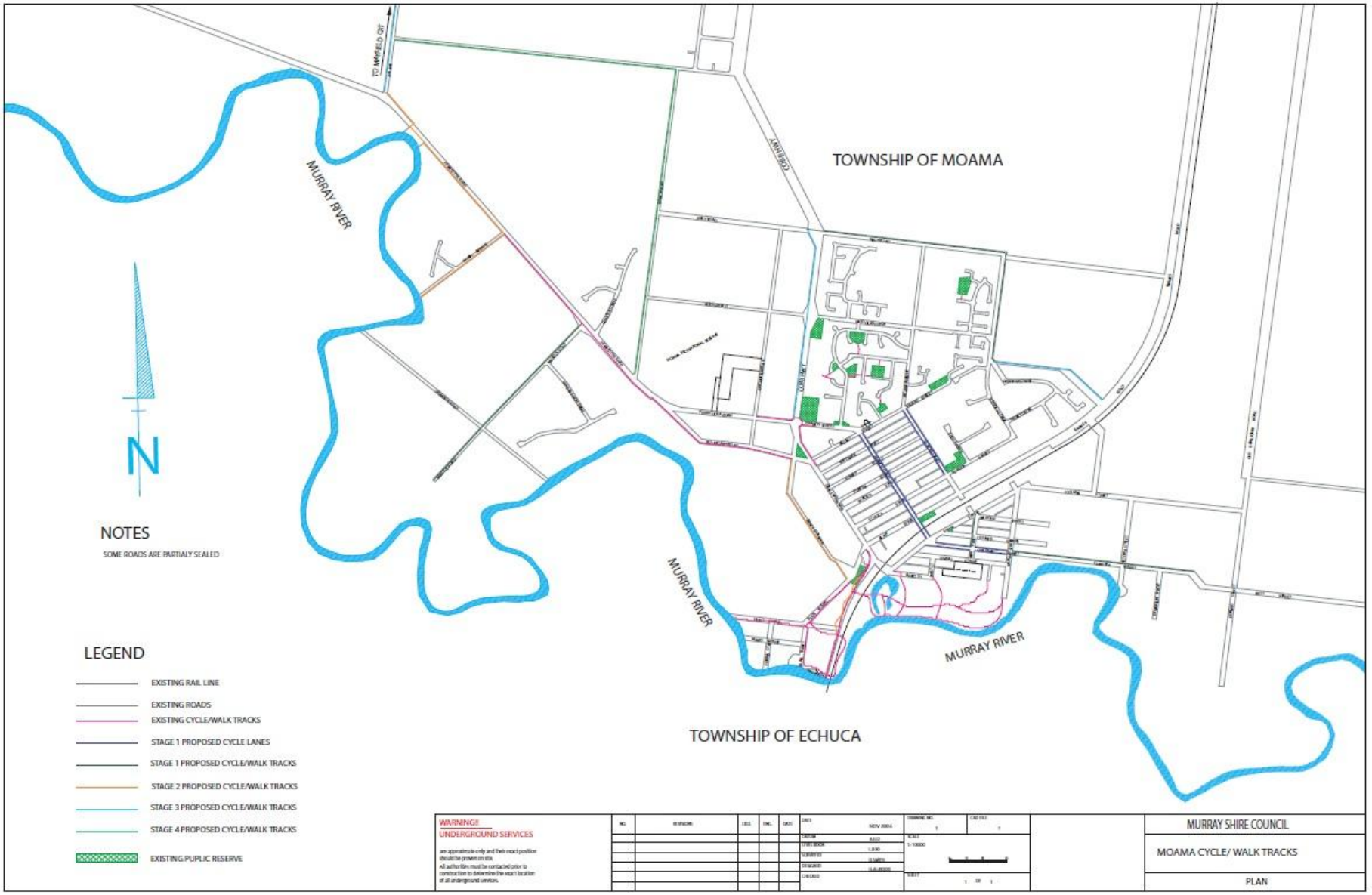
Source: Campaspe Walking & Cycling Strategy (2007), Campaspe Shire Council

- Figure 3-21: Revised Echuca public cycling network



Source: Provided by Campaspe Shire Council (2014) to reflect updates to the Echuca public cycle network since 2007.

- Figure 3-22: Murray Shire Bicycle Plan (2004)



Source: Murray Shire Council

Journey to Work

The 2011 census showed that 71% or 4,290 of Echuca's workers live within Echuca. Almost 29% of Echuca's workers live outside the Echuca with 9% travelling from the Moama, 3% from rest of New South Wales and 17% from rest of Victoria. For Moama, 28% of workers live within Moama, with the balance of Moama's workers comprising 14% travelling from the rest of New South Wales, 47% from Echuca and 11% from the rest of Victoria.

In 2011, 4,460 (74%) Echuca based workers travelled to work by car as the driver or passenger and a further 5% either walked or cycled. The rest of the Echuca residents either worked from home / did not go to work (17%), took other modes of transport (2%) or did not state mode (2%). Similarly in Moama, 106 (5%) residents cycled or walked to work and 1,691 (72%) travel to work by car. The rest of the residents either worked from home / did not go to work (19%), took other modes of transport (2%) or did not state mode (2%).

Almost 9% of Echuca's resident households and 6.2% of Moama's resident households do not own a car.

4. EES Scoping Requirements

4.1 EES Evaluation Objectives

For the transport aspects of the Echuca-Moama Bridge, the relevant draft evaluation objective as outlined in the EES Scoping Requirements is:

- To improve accessibility and connectivity for the people of Echuca-Moama and the wider region by providing for existing and future traffic safety and capacity needs.

4.2 EES Scoping Requirements

The EES Scoping requirements specific to the scope of this transport assessment are as follows:

- Characterise current traffic conditions including restrictions within the existing road network in the project area.
- Provide modelling projections of road network traffic flows in absence of the project.
- Potential design and use solutions to optimise linkages with the existing road network and enhance capacity and safety of a new crossing (including access for pedestrians and bicycles).
- Assess the effects of the project on the transport network (including in terms of road traffic volumes, freight vehicle types that may be accommodated and travel time outcomes).
- Briefly describe principles or approach to management of traffic conditions during the project's construction, including as part of the Environmental Management Framework (EMF).

5. Legislation, Policies and Guidelines

As part of this Transport Impact Assessment for the Project, it has been necessary to review and consider any relevant legislation, policies or guidelines that apply.

5.1 Commonwealth

National Land Freight Strategy Discussion Paper (2011)

The overarching purpose of the national land freight network strategy is to drive the development of efficient, sustainable freight logistics that balance the needs of a growing Australian community and economy, with the quality of life aspirations of the Australian people. The objectives under consideration aim to:

- Improve the efficiency of freight movements across infrastructure networks;
- Minimise externalities associated with such freight movements; and
- Influence policy making in areas relevant to freight.

The Echuca-Moama Bridge Project would assist in providing a more suitable freight link between the two states (to assist the agricultural industry), which would also be beneficial to the State and Regional economies.

5.2 State

The Traffic Impact Assessment forms part of the Echuca-Moama bridge EES in response to the EES Scoping Requirements issued by the Department of Transport, Planning and Local Infrastructure. The EES Scoping Requirements were placed on exhibition in May 2014 and then issued by the Minister for Planning in their final form on 30 June 2014.

The Scoping Requirements set out the specific environmental matters to be investigated and documented in the EES for the Project. Table 1 in Chapter 1 of the EES summarises the structure of the EES and the contents of each chapter.

As the proposed Mid-West Option Bridge traverses land in Victoria and NSW, the guidelines researched for this Transport Impact Assessment were:

- Victoria: Guidelines for Transport Impact Assessment Reports (TIAR) For Major Land Use and Development Proposals (Vic TIAR Guidelines)
- NSW: Guide to Traffic Generating Development (NSW TGD Guide)

The NSW TGD Guide and Victorian TIAR Guidelines outline GP TGDG all aspects of traffic generation considerations relating to traffic generating developments. Many of the requirements for traffic impact assessment in the guide are not relevant to the bridge Project, because they focus on traffic generation as a result of land use development.

In summary, both the Vic TIAR Guidelines and NSW TGD Guide relate more to the assessment of traffic generating development and are less relevant to the Mid-West

Option in respect of the Project. None the less, considerations were given to each respective guidelines and this Transport Impact Assessment has been structured in line with these guidelines where relevant.

5.2.1 Victorian

Transport Integration Act 2010

The *Transport Integration Act 2010* (TIA) is the guiding legislative framework for VicRoads and the entire transport portfolio. As well as ensuring integration and sustainability are core principles of Victorian transport agencies, the TIA aims to align corporate planning to the Department responsible for transport strategic priorities.

The TIA came into effect on 1 July 2010 and sets out the vision, objectives and principles for the Victorian transport system and it:

- introduces a core focus on an integrated and sustainable transport system
- sets out objectives for the transport system including economic prosperity and environmental sustainability
- recognises the importance of coordinated transport and planning
- recognises the importance of the *Victorian Transport Plan* as the State's plan for transport
- sets out decision-making principles and processes
- recognises the role and responsibilities of all transport agencies including VicRoads, V/Line and VicTrack
- acknowledges the role of "interface bodies" impacting on the transport system.

Plan Melbourne (2014) Metropolitan Planning Strategy (2014)

Plan Melbourne by the Victorian State Government provides direction for the future growth of Melbourne and improved connections between cities. Plan Melbourne, in conjunction with the Regional Growth Plans seek to identify land use and infrastructure initiatives to increase regional growth and support regional transport corridors. The transport links, including links through Echuca, connect industries to national and international markets.

Loddon Mallee North Regional Growth Plan (2014) (LMNRG Plan)

Rebalancing growth between Melbourne and regional Victoria is a key initiative in Plan Melbourne that will deliver productivity and employment benefits for the whole state.

Unlocking the growth potential of regional cities will create a state of cities with good transport connections between regional areas and Melbourne, renewal of regional city centres and improved services. The growth of regional centres will create greater employment opportunities, improved health and education services, and more choices for Victorians about where they live and work.

Regional Growth Plans will shape and guide the future of Victoria's regions to 2041. These plans identify strategic land uses and seek to improve integration with transport and infrastructure planning. The LMNRG Plan identifies key population growth areas and demographic change. Economic change and needs are also identified in the Plan.

Echuca has been identified as an area that will experience relatively significant future population growth, along with its twin NSW city, Moama. The Echuca-Moama river crossing is critical in serving populations along both sides of the river, particularly as services such as the new Echuca Hospital and education have been designed to meet the needs of the combined population of Echuca, Moama and the surrounding hinterland.

Campaspe Planning Scheme – Clause 18 transport[12]

Clause 18 of the State Planning Policy Framework states that planning should ensure an integrated and sustainable transport system that provides access to social and economic opportunities, facilitates economic prosperity, contributes to environmental sustainability, coordinates reliable movements of people and goods, and is safe.

Road Management Act (2004)(Vic) (RM Act)

The RM Act came into operation on 1 July 2004. The RM Act was developed to provide a more efficient and safer Victorian road network, and is the result of extensive stakeholder and community consultation.

The RM Act is based on the following key principles:

- clear allocation of road asset ownership and management;
- established processes and accountabilities for policy decisions and performance standards;
- provision of operational powers to achieve targets and performance standards; and clarification of civil liability laws for the management of roads.

Victoria's Road Safety Strategy 2013-2022

Victoria's Road Safety Strategy outlines the direction taken to reduce death and injuries on Victoria's roads, in particular key areas such as speed, drink driving and drug driving. It also outlines the approach to improving safety for vulnerable road users such as pedestrians, cyclists and motorcyclists.

It is accompanied by the first Action Plan (refer below), which outlines the priority actions the Government will take in the first four years to meet targets and the actions and decisions everybody on the road needs to take to successfully implement the action plan. Two more action plans will be released over the 10 years of the strategy.

Victoria's Road Safety Action Plan 2013-2016

This is the first of three Action Plans which sets out the steps to achieve the vision, targets and direction outlined in Victoria's Road Safety Strategy 2013–22.

The first Action Plan (2013-2016) presents the priority activities to reduce death and serious injury on Victorian roads by more than 30 per cent, reducing the road toll from 282 (2012) to below 200, and cases of serious injury from 5,500 to below 3,850. The

[12] http://planningschemes.dpcd.vic.gov.au/schemes/vpps/18_SPPF.pdf

actions in this Action Plan have been chosen as the most effective to get achieve the targets.

Victoria, the Freight State (2013)

Victoria – The Freight State (the Freight Plan) outlines the long term strategy to improve freight efficiency, grow productivity and better connect Victorian businesses with their markets, whether local, national or international.

The Freight Plan is supported by a series of key directions, strategies and actions intended to provide greater certainty to the private sector and to help inform business planning and investment decisions. The Freight Plan references and supports the Project in that it would assist efficiencies with key cross-border supply chains.

5.2.2 New South Wales

NSW Freight and Ports Strategy (2013)

The NSW Freight and Ports Strategy outlines how Transport for NSW will work with commercial interests and across government to provide an efficient network and a framework for managing growth. It highlights short, medium and long term tasks to improve freight movement on the network. This Strategy seeks to inform government and commercial investment decisions across all modes of transport and allow for the alignment of purpose.

The Bridges for the Bush program proposes to upgrade or replace key bridges in regional NSW at 17 locations to improve freight productivity in NSW, including the Murray River crossing at Echuca on Cobb Highway. Transport for NSW in consultation with Roads and Maritime has prepared a submission to Infrastructure Australia seeking half of the $290 million program cost to improve accessibility for High Productivity Vehicles in NSW.

NSW - Draft Murray Regional Strategy

The draft Murray Regional strategy identifies the NSW Government's key priorities for the region over the next 25 years. Prepared in consultation with key stakeholders, the draft strategy:

- outlines a co-ordinated approach to managing land use to facilitate growth and protect the environment so that the region continues to prosper and offer communities a high quality of life;
- sets a target for 13,900 new dwellings by 2036, the majority of this growth taking place within existing centres, close to infrastructure and services;
- recognises the important role of the Murray River, seeking to protect the river in a co-ordinated way, through interagency and cross border collaborations;
- identifies the key industries for the region and the need to strategically plan for them; both traditional activities such as agriculture and forestry as well as emerging sectors such as mining and agriculture.

Once finalised, the strategy will guide local planning in the ten local government areas of Albury City, Balranald, Berrigan, Conargo, Corowa, Deniliquin, Greater Hume,

Murray, Wakool, and Wentworth. It also recognises the importance of working cooperatively with the State of Victoria on settlement and cross-border issues.

Central Murray Transport Study Final Report (2011)

The study identifies that Echuca Bridge serves the greatest number of current passenger and freight journeys and that the existing bridge crossing is a nineteenth century structure now carrying heavy traffic for which it was not designed. Improvements in truck design, including the increasing use of high efficiency/high productivity vehicles can be restricted due to load limits on old bridges.

Murray Regional Strategy NSW (2009)

The Department of Planning NSW released a draft Murray Regional Strategy in 2009. This draft Strategy indicated that significant growth is planned for areas that are strongly linked with regional towns, for example Moama-Echuca. Where growth is anticipated, linking land use and infrastructure planning will be critical to support to growth and prosperity in these important regional centres.

The Project is consistent with the above State Government strategies with respect to key freight routes and ongoing upgrading and /or replacement of aged Murray River bridges, including the existing bridge at Echuca-Moama. Once realised, the Project would assist in providing alternate truck and heavy vehicle access over the Murray and Campaspe Rivers addressing the intention of the existing bridge and provide opportunities for improved economic benefits for the region and the Echuca-Moama township. These economic benefits would also result in indirect benefits for the community of Echuca-Moama.

5.3 Local

Reference to the Campaspe Walking and Cycling Strategy (2007) and Murray Shire Bicycle Plan (2004) can be found in Section 3.2.7.

6. Transport Impact Assessment

This Transport Impact Assessment Addresses the potential transport impacts of the construction and operation of the Project.

The transport impacts of the Project, together with proposed mitigation measures, are considered in detail through the environmental risk assessment process. The details of the risk assessment process undertaken for the Project are outlined in the EES.

Relevant sections of the environmental risk register are provided in this report and the identified impacts of the Mid-West Option are considered in detail in the following sections.

6.1 Benefits and Opportunities

The traffic modelling in section 6.2.1 has shown that the Mid-West Option would contribute to a reduction in through traffic volumes in the Moama and Echuca town centres. As a result, this may contribute to improved access and amenity for local traffic and pedestrians. The reduction in traffic may also contribute to improved road safety in and around the town centres.

6.2 Traffic Impacts during Operation

6.2.1 Transport Modelling

Previous Transport Models

In assessing the potential traffic demands for the Mid-West option, the traffic model previously developed by Sinclair Knight Merz (now Jacobs) for the 2008-2010 Echuca-Moama bridge study was used (SKM Traffic Model (2009)). The model was originally validated with observed traffic counts in 2008 and was used to forecast traffic volumes for an average non-holiday weekday in 2023 and 2038. Details of the model can be found in the model validation report for the previous bridge planning study (SKM Model Validation Report (2009))[13].

In 2012, the model was updated to reflect changes in network and land use assumptions that have arisen since the original study. Details on these changes can be found in the modelling report for the Echuca-Moama Bridge Mid-West 2 Options assessment[14].

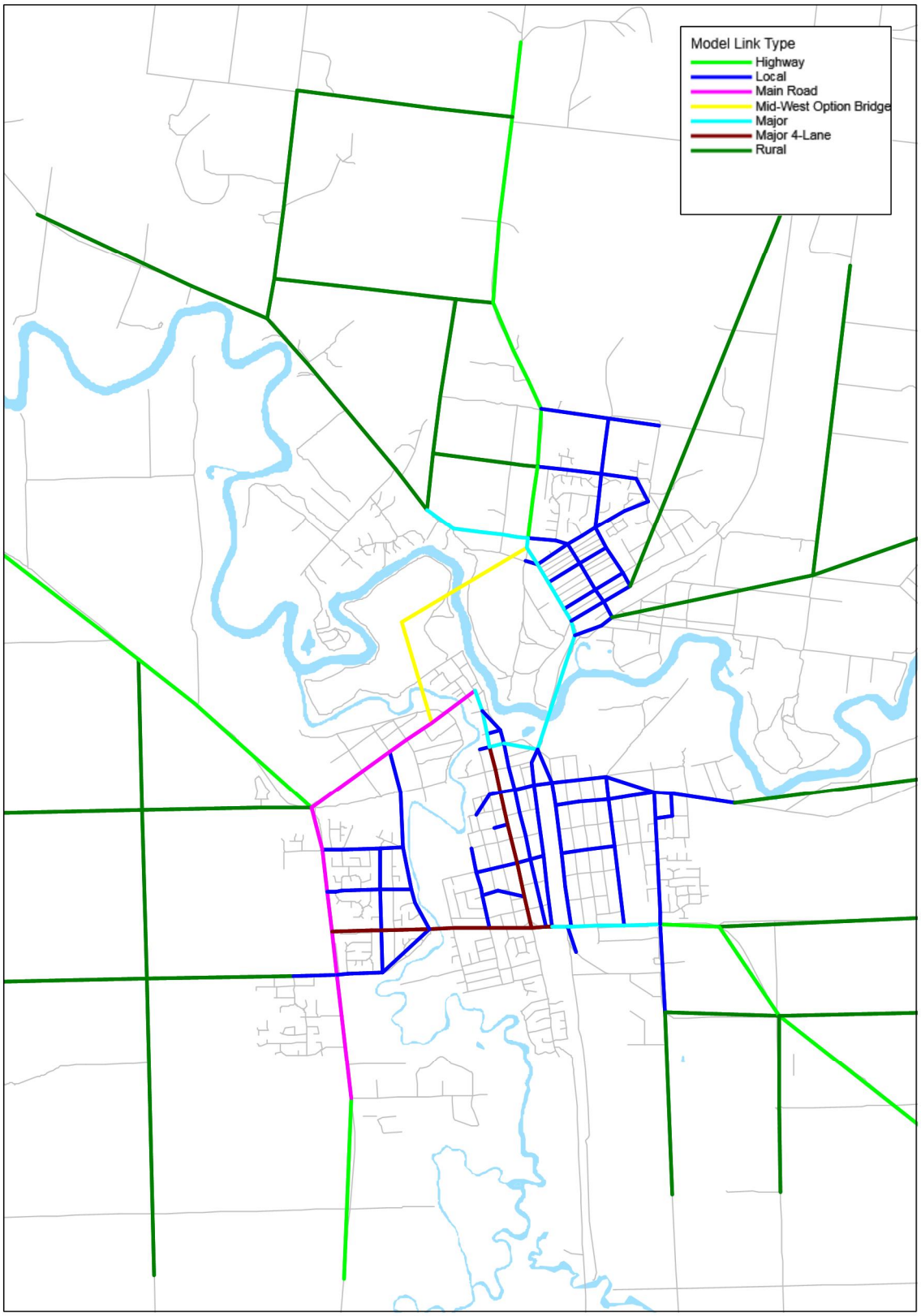
The model was further updated for this EES to incorporate the latest 2011 Census data and planning information from VicRoads, Roads and Maritime Services, Shire of Campaspe and Murray Shire Council.

[13] Sinclair Knight Merz (2009), *Detailed Traffic Modelling for the Echuca - Moama Bridge Planning Study*, Validation report, VicRoads, 7 May 2009.
[14] Sinclair Knight Merz (2012), *Mid-West 2 Options Assessment for Echuca-Moama Bridge Planning Study*, Modelling report, VicRoads, 25 January 2013.

Network Assumptions

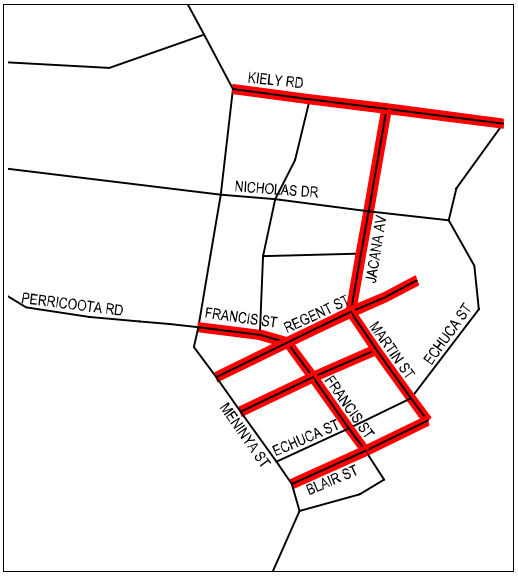
The traffic model includes representations of all major streets and highways in Echuca and Moama. Local streets are generally not included in the model except where they provide a connection to major traffic destinations. The base year network assumptions have remained largely unchanged from previous studies. This was confirmed in meetings with local council staff. Some minor updates were made to the Moama road network in the model to better reflect property access routes. Figure 6-1 shows the road network used in the model.

- Figure 6-1: Map of modelled road network



In all modelling of future traffic conditions, Francis Street in NSW is assumed to be connected to Perricoota Road and trucks are banned on the streets shown in Figure 6-2.

- Figure 6-2: Map of Moama truck bans (shown in red)



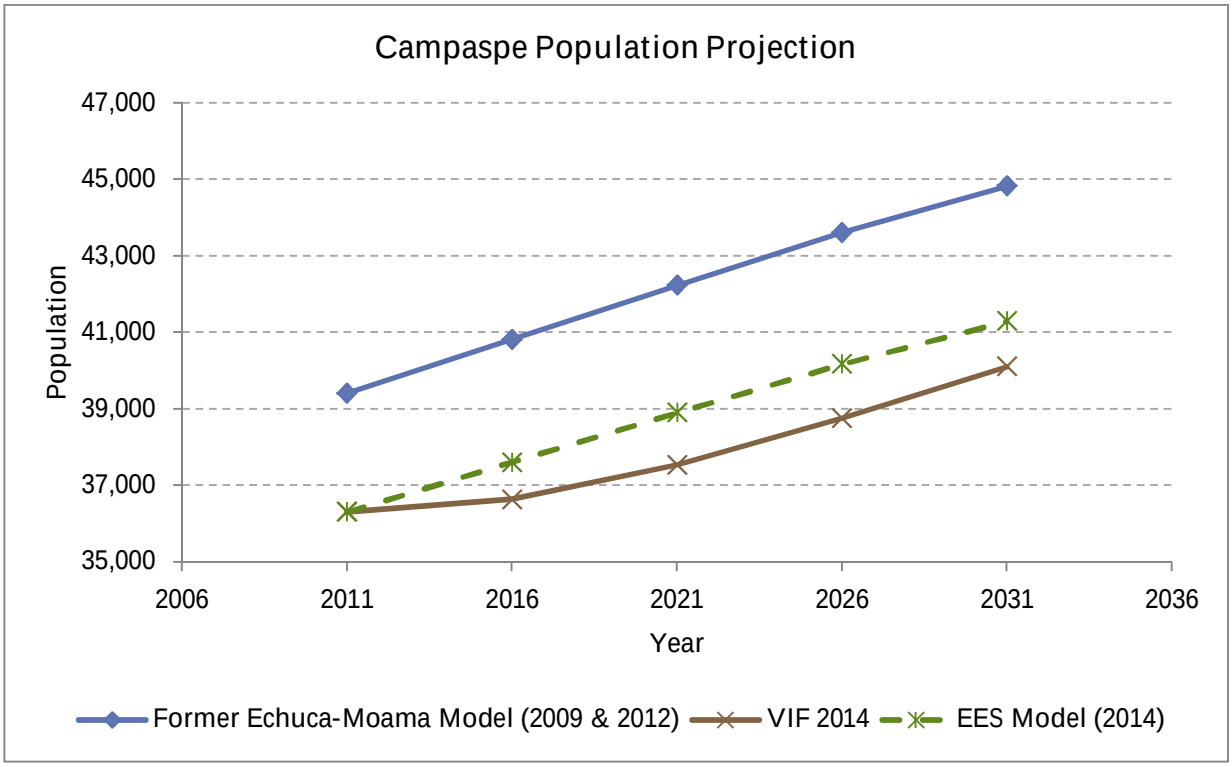
Land Use and Demographic Assumptions

Population Growth

Victoria in Future (VIF 2014) and the latest available NSW population projections were considered when updating the model land use inputs. VIF 2014 forecasts Victoria's population reaching 10 million by 2051, a higher value than the 8.7 million projected in VIF 2012. In regional Victoria, VIF 2014 forecasts slightly higher growth than VIF 2012.

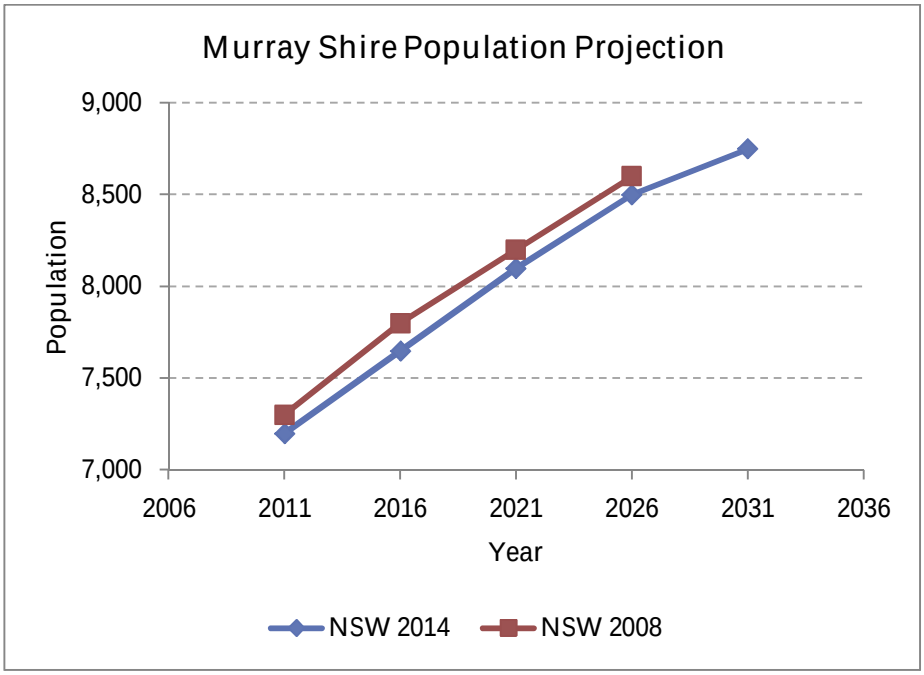
The VIF 2014 forecasts for the Shire of Campaspe were between 3,000 and 5,000 lower than the population projections used in the SKM Traffic Model 2009. To be consistent with this previous model, the model used for the purposes of this Transport Impact Assessment for the EES and the Project uses the same growth rates as in previously, but rebases the model to match actual 2011 population counts. This results in a slightly more conservative model (i.e. higher traffic growth) than if the raw VIF 2014 forecasts were applied (see the dashed line in Figure 6-3).

- Figure 6-3: Plot of Campaspe Shire Population Projection (Victoria in Future)



The NSW government has reduced growth forecasts for Murray Shire since the development of the SKM Traffic Model (2009) based on traffic counts observed in 2008 (see Figure 6-4).

- Figure 6-4: Plot of Murray Shire Population Projection (New South Wales Population Projections)



Population Distribution

The 2011 census data provides population and dwelling information at meshblock[15] level, which was aggregated and disaggregated to match with the land use zones used in the traffic model.

For Moama, maps of new lots released between 2008 and 2014 from Murray Shire Council were used with aerial photos to determine growth between the 2011 census year and 2014.

Residential strategies for Echuca and Moama have not changed since the last model update, with housing growth still forecast to occur in the same areas. Therefore, the distribution of population growth in each zone was kept the same as in the SKM Traffic Model (2012).

Employment Growth and Distribution

The employment data in the traffic model for this Transport Impact Assessment has been updated with 2011 census "place of work" data. Meshblock land use categories (e.g. residential, commercial) were used to distribute jobs to each zone in the model. The job distribution was based on meshblock area, so larger meshblocks were allocated proportionally larger numbers of jobs.

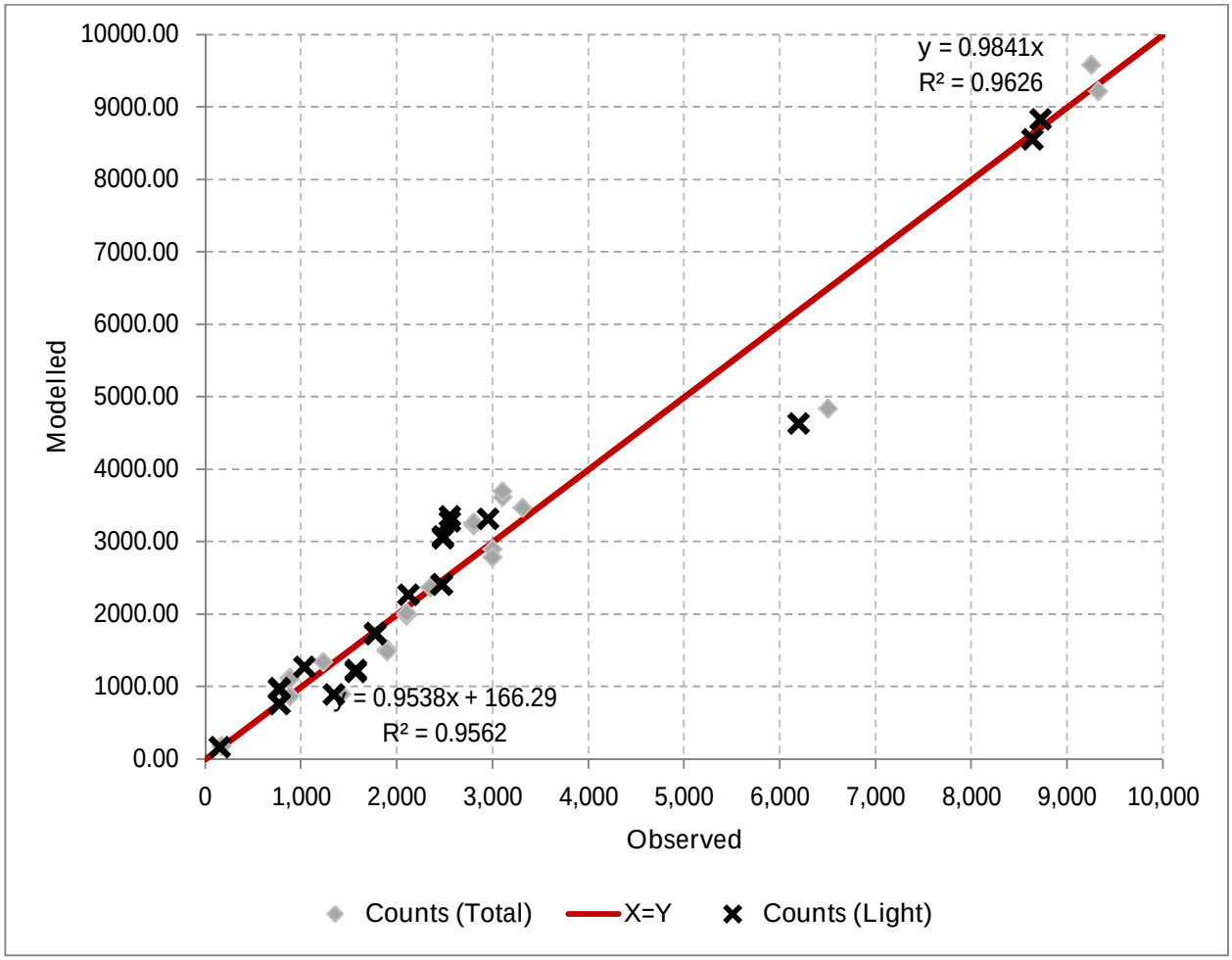
Consistent with the modelling used in the SKM Traffic Model (2009), it was assumed that employment would grow at the same rate as population. Special adjustments were made for rapid growth in areas such as Moama Business Park and school locations.

Model Validation

To validate the traffic model SKM Traffic Model (2009) and reflected in the SKM Validation Report (2009) to 2014 conditions, recent traffic counts (mainly winter counts in 2013 and 2014) were sourced from Murray Shire Council and VicRoads. Figure 3-12 shows the traffic count locations used for validating the model with indications on when the counts were taken in the legend, as well as the 2008 traffic counts used in the validation of this Transport Impact Assessment. Figure 6-5 shows a comparison of modelled and observed traffic volumes.

[15] Meshblocks are the smallest geographic unit for which Census data are available

- Figure 6-5: Plot of modelled and observed link traffic volumes (total vehicles and light vehicles, 2013/2014)



Note that traffic signal SCATS counts were provided by VicRoads at Murray Valley Highway / Butcher St, Northern Highway / Pakenham Street and Murray Valley Highway / Northern Highway intersections. As these counts did not capture all vehicles on each intersection approach, they were discarded and are not shown on the graph.

It is worth noting that the SKM Traffic Model (2009) was based on traffic levels on a winter weekday. This corresponds to approximately 18,000 bridge crossings in a 24-hour period. As indicated in Figure 3-15, the observed traffic counts fluctuate around weekends and school holidays. During peak periods, daily traffic volumes on the existing bridge can exceed 25,000 vehicles per day.

Given the relatively large daily and seasonal variation in traffic volumes, the present calibration of the model for the purposes of this Transport Impact Assessment to a winter weekday is considered to be appropriate for economic evaluation purposes. However, in considering the engineering design and development, it is suggested that peak traffic volumes be considered, which are approximately 30% higher than winter weekday average.

6.2.2 Scenario Tests

Scenarios

Two road network configurations were modelled using the updated traffic model for the purpose of this Transport Impact Assessment:

- Base case – the existing road network with no new bridge (the "No Project Option");
- Mid-West Option – with the new bridge connecting to a new roundabout in Warren Street and the opening of Francis Street in Moama.

Table 6-1 summarises the scenarios modelled in this study.

Table 6-1: Modelled Scenarios

Network Configuration	2014	2029	2038	2044
Base case (do nothing)	√	√		√
Mid-West Option (with Francis St Open)	√	√	√	√

The 2038 Option scenario was created so that a comparison could be made between the current analysis and the previous Echuca-Moama modelling studies (the SKM Verification Traffic Model Study (2009)). As the current study and traffic model for the purpose of this Transport Impact Assessment was based on 2011 Census data, which were lower than that used in the SKM Verification Traffic Model Study (2009), there was an overall reduction in forecast traffic volume in this assessment, especially for the Mid-West Option (see daily traffic volume comparison plot in Figure A-9-5).

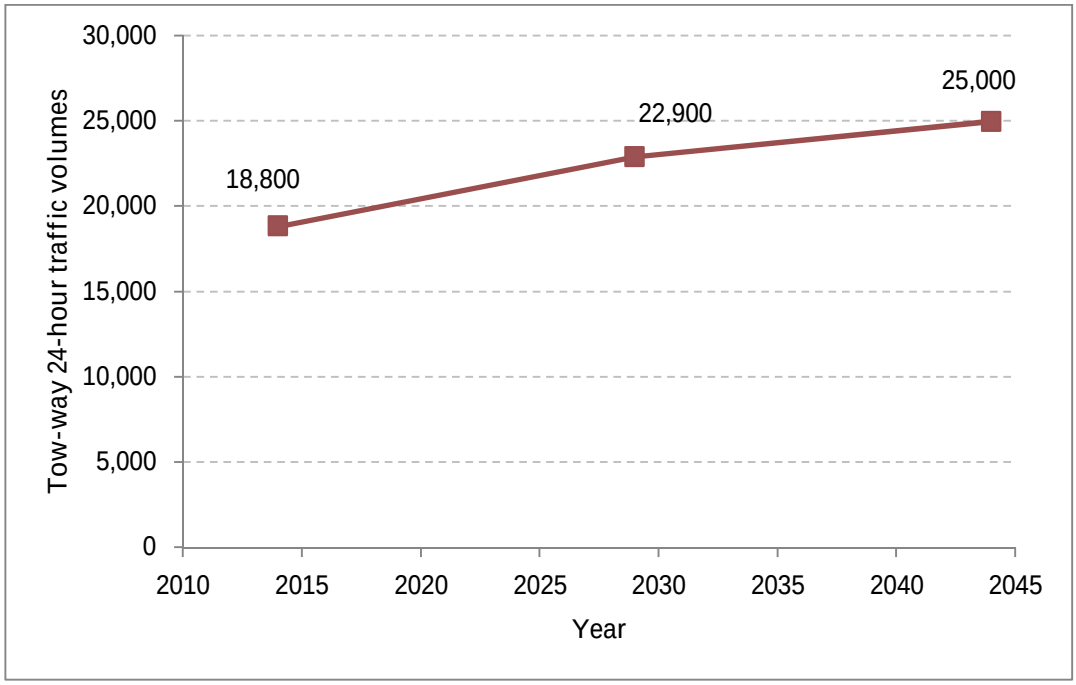
6.2.3 Base Case

Growth in Traffic on the Existing Bridge

The forecast growth in traffic on the existing Murray River bridge without the Mid-West Option in place is shown in Figure 6-6. This graph, based on counts undertaken in 2014 and forecasts for 2023 and 2038 suggests that traffic volumes on the existing bridge could increase to about 25,000 vehicles per day in 2044.

A summary of forecast traffic volumes on other roads in Echuca and Moama is provided in Table 6-2 (Forecast bi-directional traffic volumes on key links (total vehicles)) and Table 6-3 (Forecast bi-directional traffic volumes on key links (heavy vehicles). Appendix A contains maps of forecast traffic volumes for 2029, 2038 and 2044.

Figure 6-6: Plot of forecast growth in two-way traffic on the existing bridge



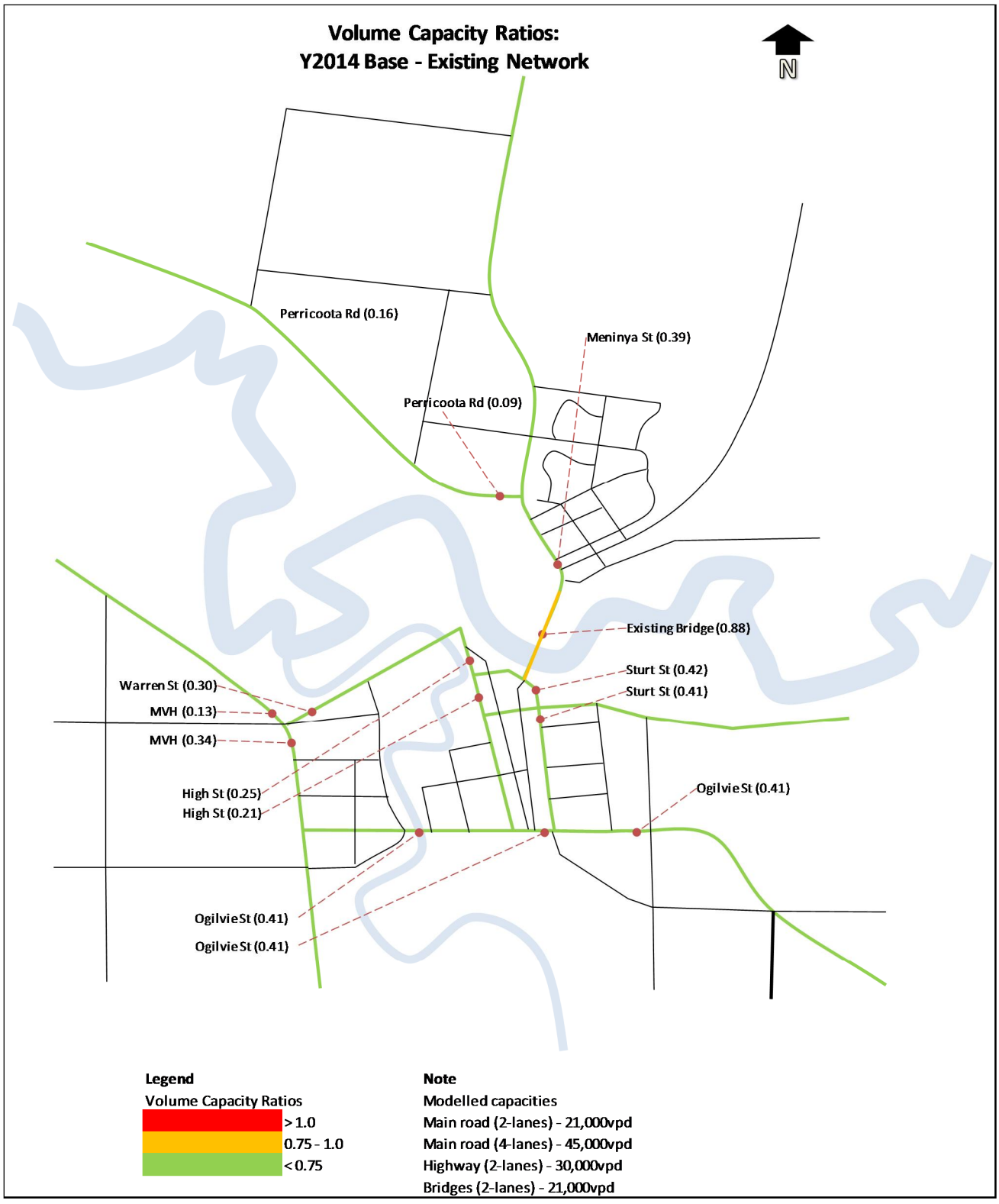
Bridge Capacity

To estimate future network performance, the ratio of traffic volume to road capacity[16] is typically used as a basic measure of congestion. Volume-capacity ratios less than 0.8 typically indicate a road operating well within its nominated capacity. Values between 0.8 and 1.0 indicate a road approaching capacity, often with stop-start traffic. Values above 1.0 indicate that traffic demand exceeds the capacity of the road, leading to extended queues forming during peak periods.

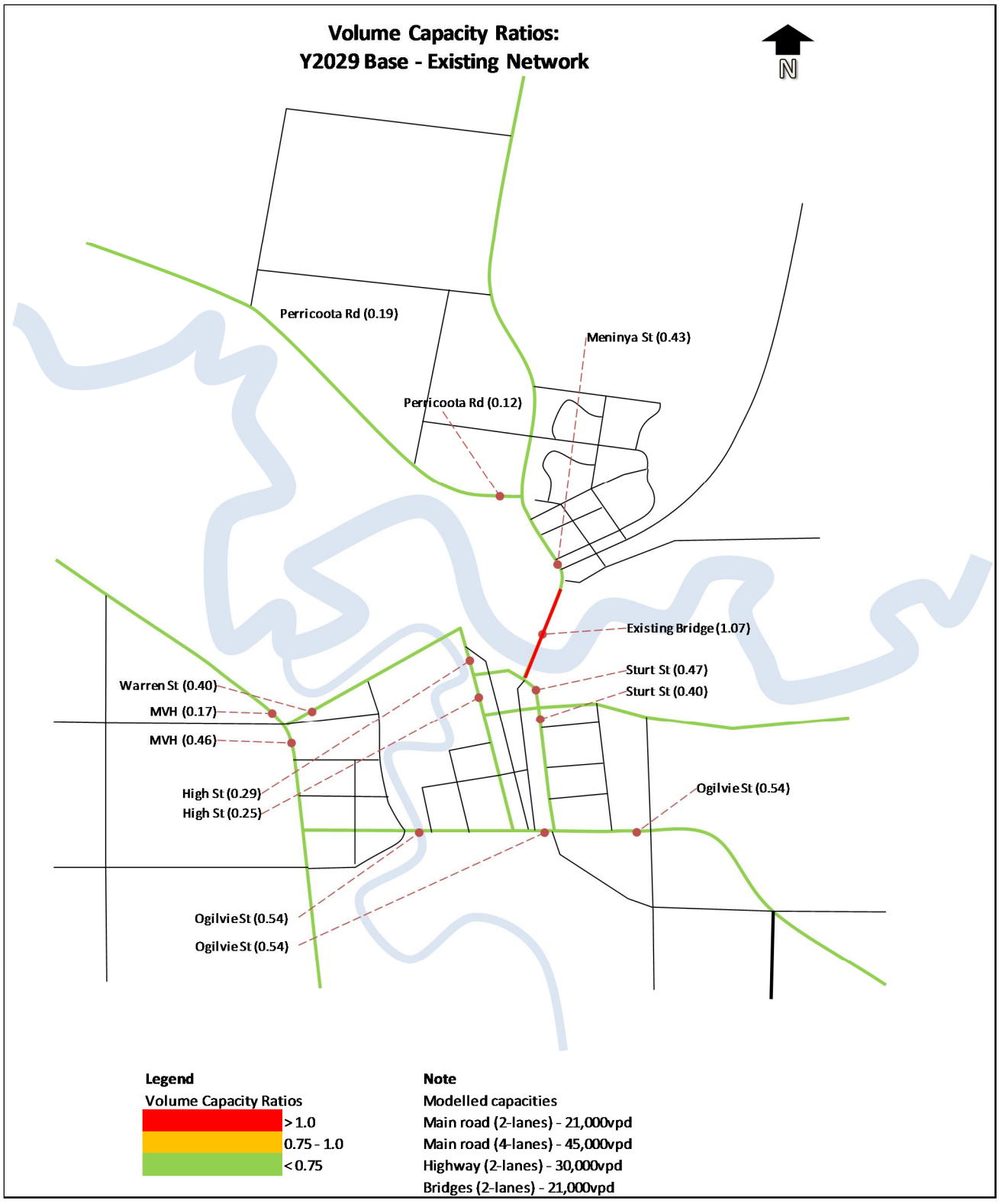
Figure 6-7 and Figure 6-9 show the forecast volume-capacity ratios for 2014, 2029 and 2044 for the "base case" (or "No Project Option") peak hours respectively. These indicate that the Echuca and Moama road networks would operate satisfactorily, but by 2029 the existing bridge would reach its capacity.

[16] Road capacity relates to the road type which defines number of lanes and lane capacity. More details on road type and capacity can be found in the report for the previous study (Sinclair Knight Merz, 2010).

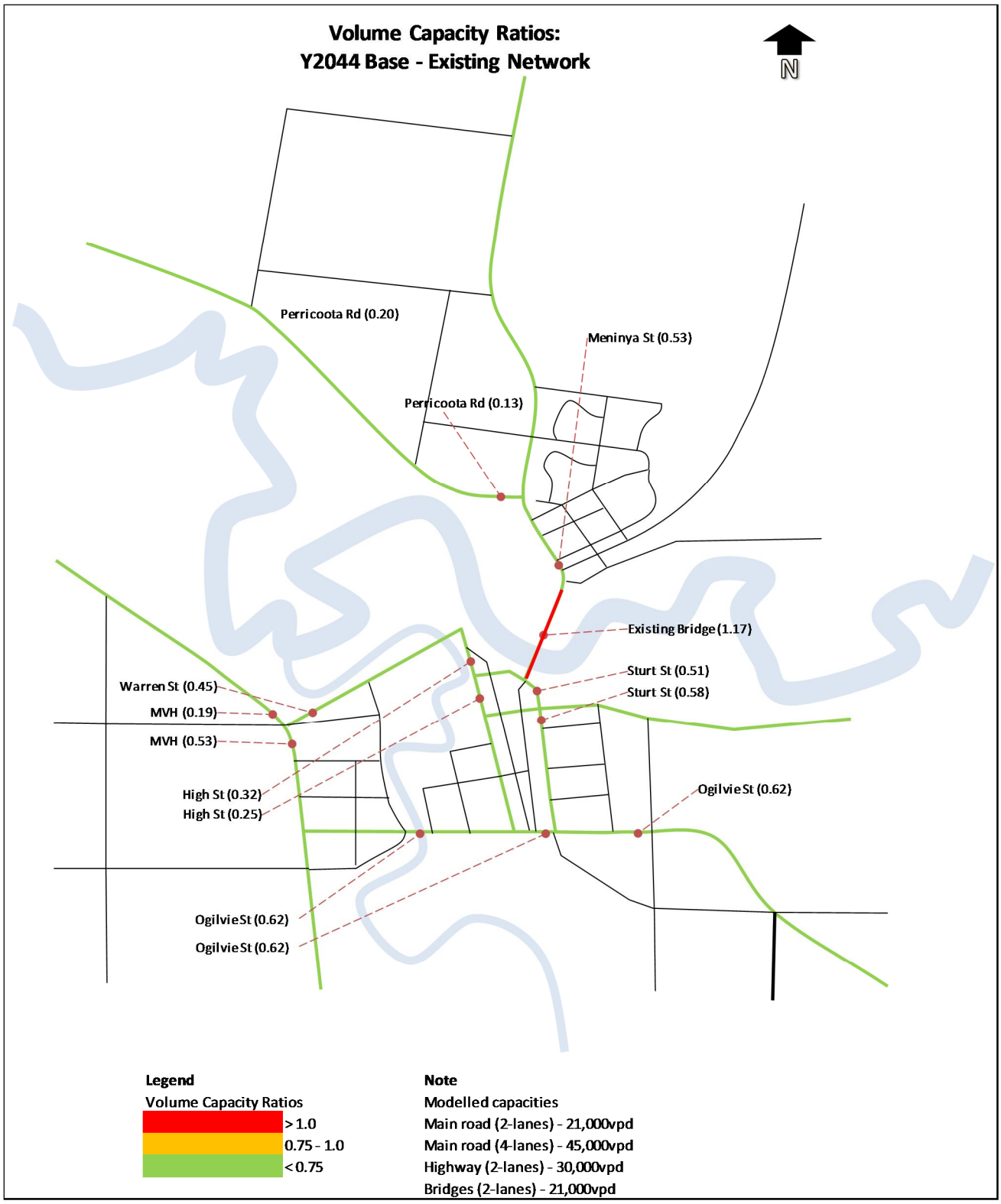
- Figure 6-7: Map of volume-capacity ratios in 2014 (base case road network)



- Figure 6-8: Map of volume-capacity ratios in 2029 (base case road network)



- Figure 6-9: Map of volume-capacity ratios in 2044 (base case road network)



6.2.4 *Mid-West Option*

Table 6-2 and Table 6-3 compare the forecast traffic volumes in the base case (i.e. No Project Scenario) and Mid-West Option scenarios for total vehicles and heavy vehicles respectively. Appendix A contains a set of maps for each scenario with modelled daily traffic volumes.

- Table 6-2: Forecast bi-directional traffic volumes on key links (total vehicles)

Year	2014	2029		2044	
Scenario	Do Nothing	Do Nothing	Mid West	Do Nothing	Mid West
Road Segment					
Existing Bridge	18,817	22,899	13,693 (-40%)	25,019	15,036 (-40%)
MidWest Bridge Option	0	0	9,814	0	11,447
Francis St Reopening	0	0	2,003	0	2,095
MVH, north of Warren Street	3,613	4,828	4,660 (-3%)	5,433	5,298 (-2%)
MVH, south of Warren Street	7,326	9,911	13,988 (41%)	11,428	16,368 (43%)
Warren St, east of MVH	6,440	8,465	12,788 (51%)	9,569	14,783 (54%)
Warren St, crossing Campaspe River	6,508	8,514	6,687 (-21%)	9,607	7,486 (-22%)
Heygarth St, west of Annesley St	10,988	13,259	4,009 (-70%)	13,646	3,670 (-73%)
Sturt St, east of Annesley St	5,949	6,687	6,818 (2%)	7,333	7,792 (6%)
High St, north of Heygarth St	10,748	12,557	7,324 (-42%)	13,705	7,903 (-42%)
High St, south of Heygarth St	9,506	11,164	7,034 (-37%)	11,369	7,125 (-37%)
Pakenham St, east of Annesley St	1,700	1,075	1,822 (70%)	2,787	2,498 (-10%)
MVH, south of McSwains Rd	9,195	14,181	14,185 (0%)	16,813	16,817 (0%)
Ogilvie St, crossing Campaspe River	18,697	24,415	20,191 (-17%)	27,898	23,012 (-18%)
Ogilvie St, crossing railway	14,427	18,634	17,819 (-4%)	20,017	19,703 (-2%)
Ogilvie St, east of Cornelia Ck Rd	5,675	7,402	7,402 (0%)	8,587	8,587 (0%)
Meninya St, north of Blair St	16,906	18,594	12,158 (-35%)	22,835	13,421 (-41%)
Cobb Hwy, south of Perricoota Rd	12,059	15,869	17,630 (11%)	17,195	19,931 (16%)
Perricoota Rd, east of Twenty Four Ln	3,477	4,075	4,120 (1%)	4,374	4,472 (2%)
Perricoota Rd, west of Racecourse Rd	5,176	6,669	6,757 (1%)	6,925	7,107 (3%)
Perricoota Rd, west of Cobb Hwy	3,914	5,119	5,258 (3%)	5,427	5,689 (5%)
Keily Rd, east of Cobb Hwy	0	0	0	0	0
Holmes St/Chanter St, east of Francis St	236	316	316 (0%)	359	359 (0%)

- Table 6-3: Forecast bi-directional traffic volumes on key links (heavy vehicles)

Year	2014	2029		2044	
Scenario / Road Segment	Do Nothing	Do Nothing	Mid West	Do Nothing	Mid West
Existing Bridge	1,424	1,853	1,056 (-43%)	2,065	1,189 (-42%)
MidWest Bridge Option	0	0	816	0	921
Francis St Reopening	0	0	0	0	0
MVH, north of Warren Street	594	792	624 (-21%)	877	752 (-14%)
MVH, south of Warren Street	689	906	1,263 (39%)	1,007	1,472 (46%)
Warren St, east of MVH	373	462	989 (114%)	507	1,097 (116%)
Warren St, crossing Campaspe River	373	463	234 (-49%)	507	241 (-52%)
Heygarth St, west of Annesley St	785	1,010	213 (-79%)	1,093	234 (-79%)
Sturt St, east of Annesley St	429	545	555 (2%)	620	644 (4%)
High St, north of Heygarth St	493	571	283 (-50%)	623	295 (-53%)
High St, south of Heygarth St	687	841	333 (-60%)	900	363 (-60%)
Pakenham St, east of Annesley St	19	24	24 (1%)	250	99 (-60%)
MVH, south of McSwains Rd	889	1,187	1,187 (0%)	1,347	1,347 (0%)
Ogilvie St, crossing Campaspe River	1,735	2,263	1,746 (-23%)	2,585	2,012 (-22%)
Ogilvie St, crossing railway	1,423	1,799	1,799 (0%)	1,889	1,977 (5%)
Ogilvie St, east of Cornelia Ck Rd	569	764	764 (0%)	898	898 (0%)
Meninya St, north of Blair St	1,195	1,584	1,006 (-36%)	1,855	1,134 (-39%)
Cobb Hwy, south of Perricoota Rd	1,051	1,435	1,509 (5%)	1,621	1,710 (6%)
Perricoota Rd, east of Twenty Four Ln	157	191	193 (1%)	214	217 (1%)
Perricoota Rd, west of Racecourse Rd	223	270	271 (0%)	301	304 (1%)
Perricoota Rd, west of Cobb Hwy	207	268	270 (1%)	303	308 (2%)
Keily Rd, east of Cobb Hwy	0	0	0	0	0
Holmes St/Chanter St, east of Francis St	20	26	26 (0%)	31	31 (0%)

The traffic forecasts indicate that:

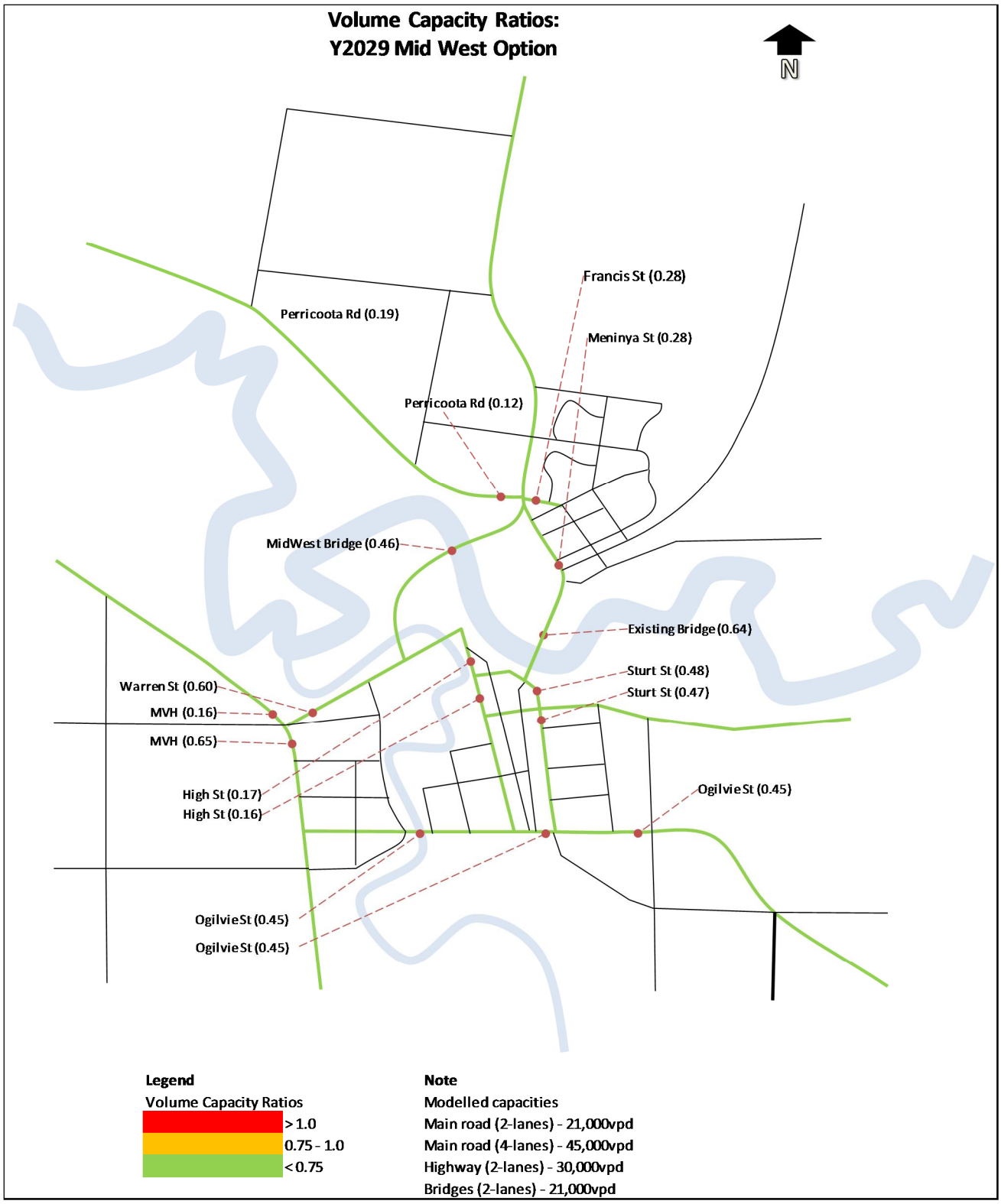
- Without a second crossing of the Murray River, average weekday total traffic on the existing bridge is expected to increase from about 18,800 vehicles per day in 2014 to 25,000 by 2044. This represents total growth of about 33% over the 30-year period. This is consistent with the population growth in the area and the traffic growth in Australia research (BITRE 2012), which states that the future long-term trend of aggregate traffic growth in Australian states/territories and capital cities will depend only on the growth rate of population.
- With the construction of a second bridge, total traffic volumes on the existing bridge are forecast to reach about 15,000 (Table 6-2) vehicles per day at 2044. This represents a reduction of about 40% of the traffic that

would have otherwise used the bridge if a second river crossing were not available.

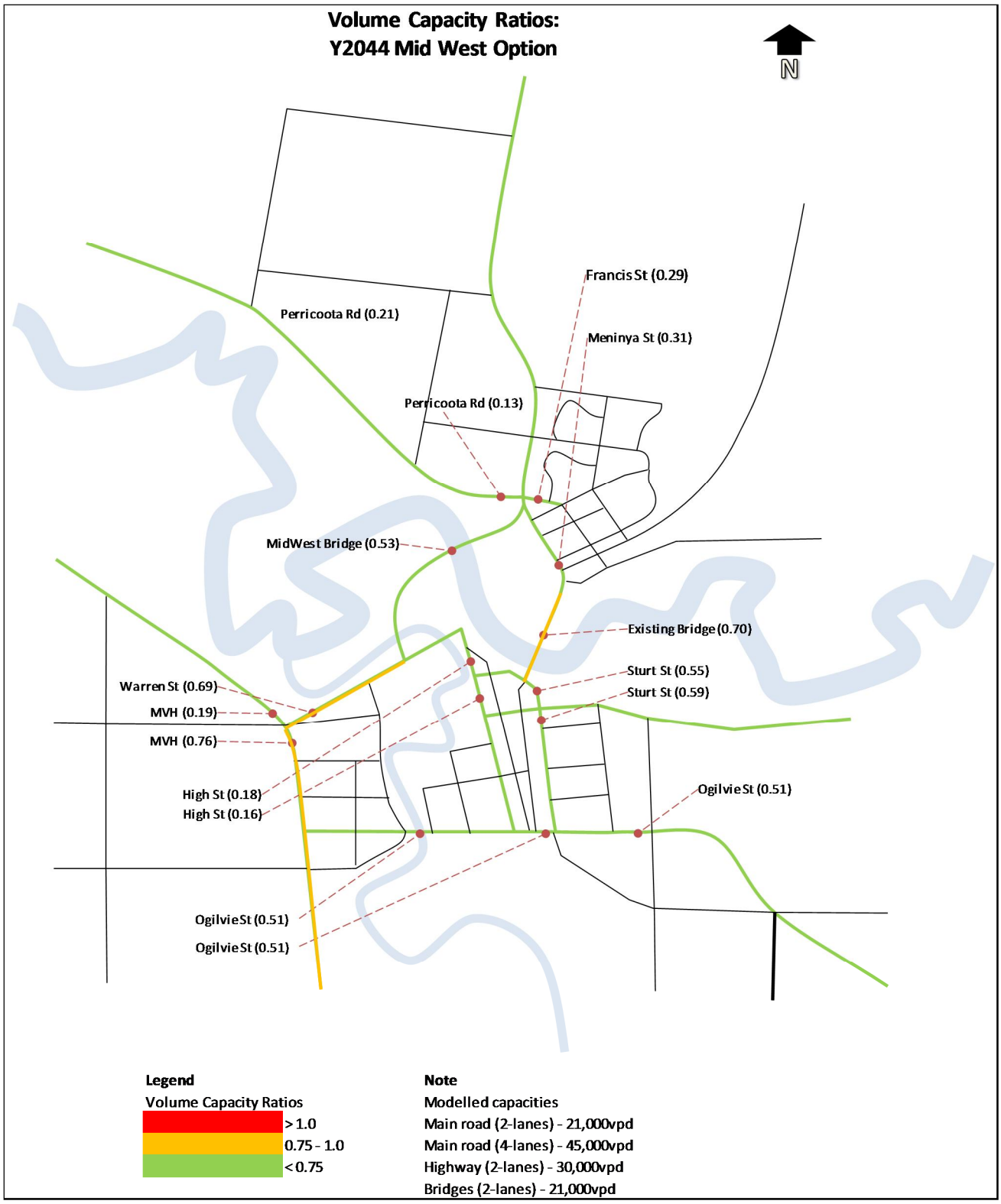
- The section of High Street north of Heygarth Street (near the historic Port) presently carries over 10,000 vehicles on a typical weekday. This volume is forecast to grow to about 13,700 (Table 6-2) vehicles per day in 2044 in the base case (or No Project Option Scenario). Construction of a second bridge is forecast to remove about 42% of traffic from this section of High Street.
- The section of Meninya Street north of Blair Street presently carries almost 17,000 vehicles on a typical weekday. This volume is forecast to grow to about 22,800 (Table 6-2) vehicles per day in 2044 in the base case (or No Project Option Scenario). Construction of a second bridge is forecast to remove about 41% of traffic from this section of Meninya Street.
- As traffic volumes through the Echuca town centre (e.g. High Street) are forecast to decrease with the operation of the second bridge, it is anticipated this would reduce road safety risks in the areas which have high level of pedestrian activities. Traffic volumes on the Mid-West Option corridor (e.g. Warren Street) are forecast to increase, which may have negative impacts on road safety along the corridor (e.g. increased interaction with wildlife, see item TT2 in Table 6-8). However, as intersections along Warren Street would be upgraded and widened to improve safety for turning vehicles, pedestrians and cyclists, any impact on the risk to road safety during operation is considered to be minor if not insignificant.

Figure 6-10 and Figure 6-11 show the forecast volume-capacity ratios for the Mid-West Option in 2029 and 2044 respectively. These indicate that the Echuca and Moama road networks would operate satisfactorily, and both bridges operate well within their design capacities noting that in 2044 it is predicted that even with the Mid-West Option in place, the existing bridge would have a volume capacity rated in the 0.75 – 1.0 range indicating a road approaching capacity.

- Figure 6-10: Map of volume-capacity ratios in 2029 (Mid-West Option)



- Figure 6-11: Map of volume-capacity ratios in 2044 (Mid-West Option)

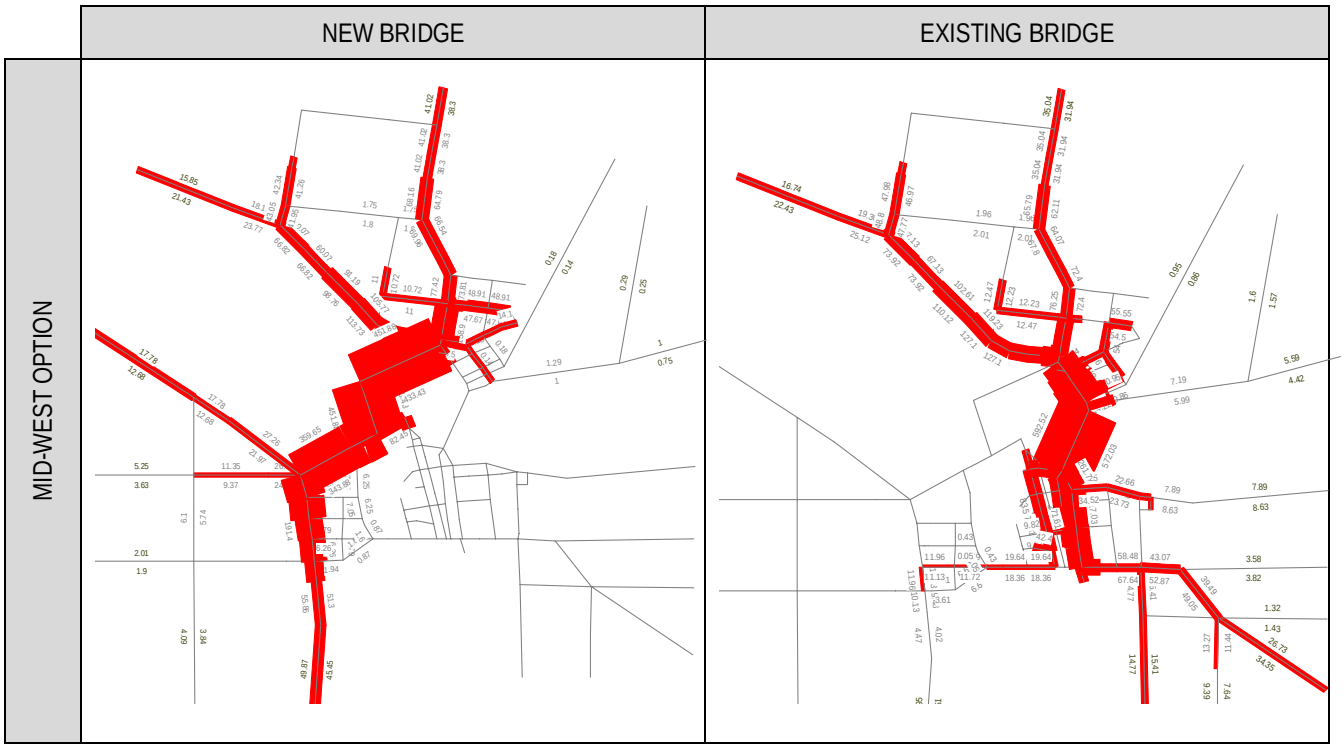


Bridge Traffic Routes

The diagrams in Figure 6-12 show the modelled routes of traffic using the Mid-West Option and the existing bridge under forecast 2044 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 the Moama town centre and Echuca town centre to the east of the Campaspe River would continue to use the existing bridge. The new bridge would be used mainly by traffic accessing the western areas of Echuca and Moama and the Northern and Murray Valley Highway to the west of Echuca. The model suggests that some traffic that is bound for the historic Port of Echuca area would shift to the new bridge.

- Figure 6-12: Map showing routes of vehicles using the Mid-West Option and existing bridge (2044)



Truck Movements in Moama

Trucks from the industrial area to the east of the Moama township would be directed to Echuca Street and Nicholas Drive, and banned from using the Francis Street connection and other local streets in Moama (see Figure 6-2).

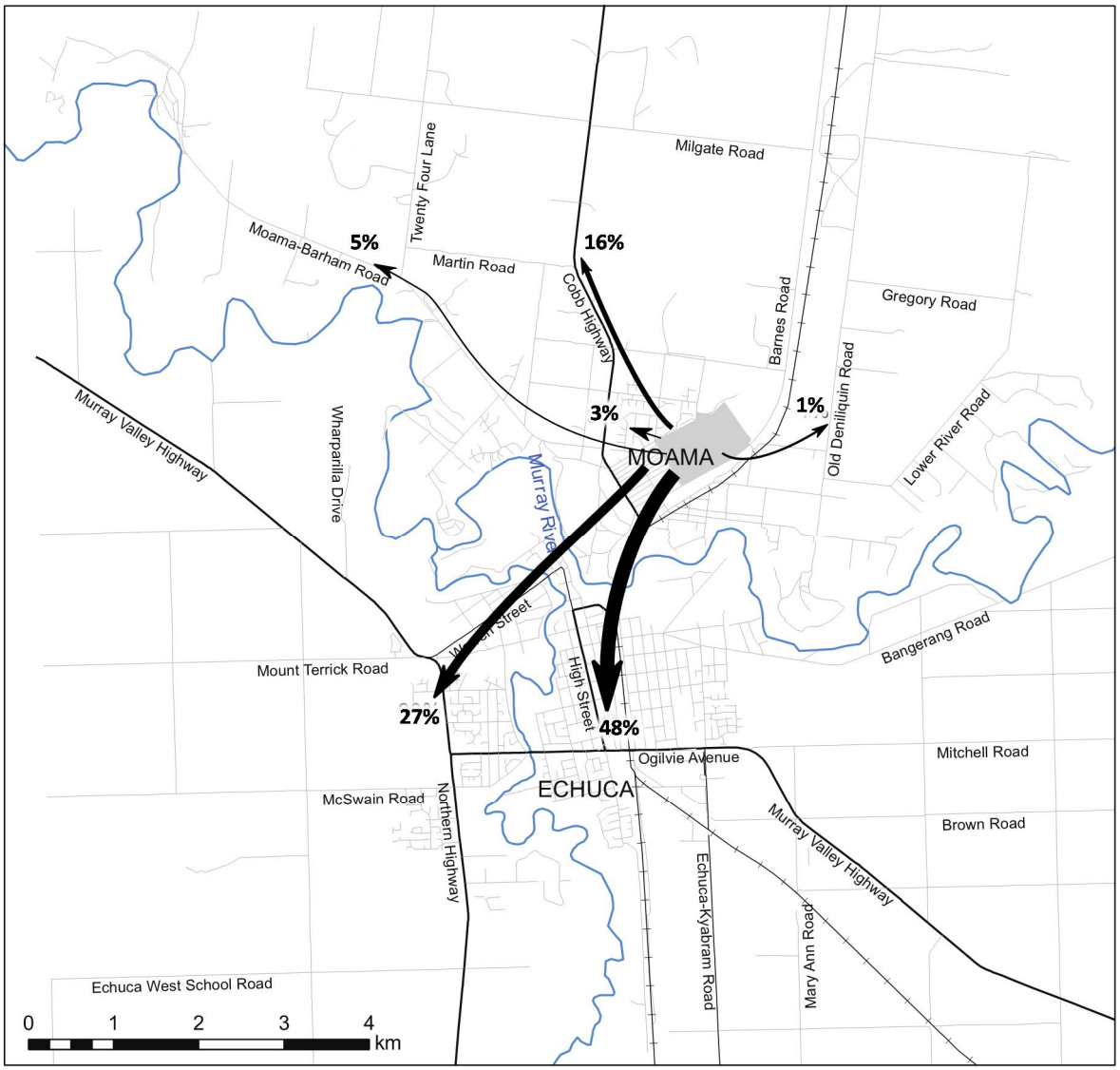
The updated traffic model for the purpose of this Transport Impact Assessment used a relatively simplistic treatment of truck movements, based on the assumption that truck traffic will be generated by only from travel zones with retail and/or employment land use. The limitations in the available data on truck travel patterns, particularly those generated from the industrial area in Moama, impose some uncertainty on the analysis that follows.

The industrial area in Moama is estimated by the model to generate approximately 160 truck movements on an average day in 2014. This is forecast to grow to around 200 movements in 2029. Of these movements, the model predicts that in 2029 around 27% will terminate in Echuca to the west of the Campaspe River or to the west or south of the township. The attractiveness of the Mid-West Option would be such that these movements will most likely be made on this proposed link rather than the

existing bridge. Another 48% of truck movements terminate in Echuca to the east of the Campaspe River or to the east or southeast of the town. There will be a continued reliance on the existing structure for the movement of freight accessing the industrial areas in the east of Moama and to the south east of the Echuca town centre. These movements are summarised in freight movements that bypass the two towns such as access between southern NSW and Victorian markets and ports would be likely to use the Mid-West bridge crossing (refer to Figure 6-13). Freight movements that bypass the two towns such as access between southern NSW and Victorian markets and ports would be likely to use the Mid-West bridge crossing.

Figure 6-13Seasonal movement of agricultural produce from southern NSW accessing processing plants in the industrial precinct of Echuca would most likely continue to use the existing bridge rather than take a less direct route via the Mid-West Option, however over dimensional or High Mass Limit vehicles are more likely to use to the Mid-West crossing. Freight movements that bypass the two towns such as access between southern NSW and Victorian markets and ports would be likely to use the Mid-West bridge crossing.

Figure 6-13: Map showing destinations of truck trips from Moama industrial area (based on model forecasts in 2029)



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 2044 traffic volumes, with typical peak hour volumes calculated as 8.4% of daily volumes.

Detailed SIDRA outputs are provided in Appendix B, and the main queue and level-of-service indicators are summarised in Table 6-4.

- Table 6-4: Summary of intersection performance indicators (2044 peak hour, Mid-West)

Option	Intersection	Longest Queue (veh)	Level of Service
Mid-	Murray Valley Highway / Warren Street (roundabout)	1.8	B

West Option	New Bridge / Warren Street (roundabout)	1.9	B
	Cobb Highway / New bridge / Meninya Street (signal)	6.2	B
	Cobb Highway / Perricoota Road / Francis Street (signal)	11.6	B

In all cases, each intersection performs satisfactorily during peak traffic conditions (level of service B). Upgrading the intersection at Cobb Highway / Perricoota Road would improve the intersection performance significantly when compared to the intersection performance during the base year (refer to Table 3-3). While the longest queue at Murray Valley Highway / Warren Street is forecast to be slightly larger at 2044 when compared with that in the base year (1.8 compared to 0.8 vehicles), this small increase in queue length is considered immaterial.

6.3 Other Impacts

6.3.1 Public Transport

Existing cross-town bus and regional coach services are expected to continue to use the existing bridge, as this provides a more direct route between the town centres of Echuca and Moama, and transport hubs such as the Echuca railway station. Improvements to Warren Street and its intersection with the Murray Valley Highway would improve safety and access along Warren Street. Additionally bus services would benefit from significantly reduced traffic volumes on key sections of the arterial network such as the existing bridge, High Street and Heygarth Street.

6.3.2 Pedestrians and Cyclists

The new bridge is not expected to have any significant impacts on existing pedestrian and cycle routes within and between Echuca and Moama and would provide significant benefits from an additional shared pathway along the length of the project and river crossings.

The project will include the construction of a new separate shared pedestrian/cyclist route along Warren Street and pedestrian/cyclist access along the new section and across the two bridges into NSW. The new shared pathway would connect to existing pedestrian and cycle paths and provide a second pedestrian and cycle crossing of the Murray River.

There would be minor deviation of the existing bike path across the sandhill to the north of the tennis courts and at Scenic Drive near the boat ramp, however, connectivity under the proposed road will maintain the overall connectivity of the bike path. In NSW, the project would close the existing bike path along Boundary Road, however the proposed traffic signals at the intersection of Meninya Street and the Cobb Highway would provide safe crossing point and reconnect to the existing path. The existing bridge would provide the most direct access between the two town centres and

an off-road path would be provided along the length of the project, connecting into existing pathways in Victoria and NSW.

6.3.3 Traffic Impacts during Construction

During construction, which was expected to last for three years, there will be movements of heavy vehicles resulting from the construction works, primarily associated with transport of construction machinery and equipment to and from the site, and import and disposal of materials (such as fill, pavements, and so forth.) using trucks.

In accordance with VicRoads policy, construction vehicles and machinery would be restricted to the highways and arterial roads wherever possible.

Construction vehicles would not typically use local roads and would likely access the Right of Way via the Murray Valley Highway in Victoria and the Cobb Highway in NSW and purpose built access tracks along the alignment (however, this would be dependent on traffic management plans developed in consultation with Shire of Campaspe and Murray Shire Council). These access tracks would be restricted to avoid environmentally and culturally sensitive areas (which would in turn be fenced off to prevent construction access) and are identified within the construction footprint.

The volume of construction traffic would ultimately depend on the program and staging of construction sections, where an increased rate of construction would result in higher traffic volumes on the network each day but over a shorter overall period. The sequencing of construction phases would depend on contractor's works program, construction methodology adopted, the time of year and the part of the Project.

VicRoads has indicated that the construction of the Project would generate traffic related to the following broad construction activities:

- set out and preparation of the construction corridor.
- relocation or protection of utilities and other services, where required.
- completion of drainage works.
- undertaking surface preparation, compaction and associated earthworks.
- construction of pavement, including verges, batters, kerb and channel, where required
- construction of bridge and culvert structures.
- application of flexible asphalt pavement and/or spray seal treatment.
- application of line markings, re-vegetation and installation of other road furniture

An accurate estimate of construction traffic generation cannot be made until a program and staging of construction has been developed. However, the construction of similar projects typically generates the greatest traffic volumes during the earthworks, bridging and pavement construction phases, and generally lower traffic volumes at other times. VicRoads expects that these phases could generate in the order of 100 – 150 truck trips per day across the workday. Less than 100 light vehicle trips per day

would be expected to be generated by worksite contractors accessing the site, typically expected to occur during early morning and late-afternoon periods.

Based on the above, at its peak, the construction of the Project would be typically expected to generate in the order of 250 vehicle trip ends per day, including 150 heavy vehicles.

It is not anticipated that night work would be required, although this would be considered in circumstances where it may reduce the impact on the public and local community.

It is recommended that construction traffic routes are designed to avoid disruption to local access roads. In addition, it is recommended that a communication strategy be implemented to inform all stakeholders of construction traffic impacts.

6.4 Risk Assessment

6.4.1 Methodology

The risk assessment for the Project included identification and management of Project risks and environmental risks. Project risks were identified by VicRoads before an environmental risk assessment was undertaken with key specialists. A summary of the Project risk assessment is outlined in Chapter 4 of the EES.

The environmental risk assessment developed for the EES included the development of impact pathways and mitigation measures that could reduce the impact of the Preferred Alignment.

A quantitative risk assessment was undertaken with key specialists. VicRoads and key members of the Project team developed a risk register based upon a detailed understanding of the Project and the Preferred Alignment. The risk register was sent to key specialists for review and consideration prior to attendance at a workshop held on 18 September 2014 to:

- review the consequence criteria developed;
- review the risks identified;
- identify any additional risks that need to be addressed; and
- develop detailed mitigation measures.

6.4.2 Risk Significance

The significance of risks was identified having regard to the consequence criteria and likelihood guide.

Consequence criteria was developed by VicRoads and reviewed by Project specialists to define a scale of magnitude from "insignificant" to "catastrophic" risks. The scale of magnitude was based on the spatial area affected and expected recovery time of the value impacted. Accordingly, insignificant consequences were generally situated within a localised area with a recovery time potential within the range of normal variability. Conversely, catastrophic consequence criteria describe scenarios involving a very high

magnitude event, affecting a state-wide area, or requiring over a decade to reach functional recovery.

The consequence criteria for the transport-related risks associated with the Project are outlined in Table 6-5.

- Table 6-5:Consequence Criteria

Aspect	CONSEQUENCE LEVEL				
	Insignificant	Minor	Moderate	Major	Catastrophic
Road safety (during construction)	No vehicle crashes occur during construction along the alignment	Property damage only (maximum of 3 instances during construction period)	More than 3 property damage crashes or up to 2 minor injury crashes during construction period	More than 2 minor injury crashes or at least one severe injury crash during construction period	At least one fatality crash during construction period
Road Safety (during operation)	Project delivers significant road safety benefits to all transport modes, as anticipated.	Project delivers road safety benefits to all transport modes to a lesser extent than anticipated.	Project does not deliver road safety benefits to transport modes in the Right of Way. Negligible adverse impacts to occurrence of casualty crash accidents.	Detectable adverse change in road safety conditions resulting in observable increase to occurrence of casualty crash accidents.	Significantly detectable adverse change in road safety conditions resulting in significant observable increase to occurrence of casualty crash accidents.
Traffic accessibility during construction	No change to access routes during construction	Minor diversions required (up to 250 metres) and less than 5,000 veh/day affected	Diversions of up to 1,000 metres required; or between 5,000 and 20,000 veh/day affected	Diversions of more than 1,000 metres required; or more than 20,000 veh/day affected	Properties inaccessible for an extended period (greater than two weeks)
Traffic conditions during construction	No change to traffic conditions	Decrease in the level of service to LOS D at one or two locations for at least one hour per day	Decrease in the level of service to LOS D at more than two locations for at least one hour per day	Decrease in the level of service to LOS E or F for at least one hour per day	Decrease in the level of service to LOS E or F for more than one hour per day

The significance of the risks was determined with regard to the Likelihood Guide (Table 6-6) and the Consequence Level (Table 6-5).

- Table 6-6:Likelihood Guide

Descriptor	Explanation
Almost Certain	The event is expected to occur in most circumstances
Likely	The event will probably occur in most circumstances
Possible	The event could occur
Unlikely	The event could occur but is not expected
Rare	The event may occur only in exceptional circumstances

- Table 6-7:Risk Significance Matrix

Likelihood	Consequence Level				
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	Low	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	High	Extreme
Possible	Negligible	Low	Medium	High	High
Unlikely	Negligible	Low	Medium	Medium	High
Rare	Negligible	Negligible	Low	Medium	Medium

6.4.3 Risk Workshop

A risk assessment workshop was held on 18 September 2014. The purpose of the workshop was to identify the most significant risks associated with each aspect of the project and assess potential risk-mitigation measures. For the transport elements of the project, construction and longer-term operational risks were considered.

Table 6-8 lists the risks identified during the workshop process, the consequences and likelihood of the risks occurring, and possible mitigation measures.

It was also noted at the workshop that the construction of the new bridge may help to reduce overall road safety risks by diverting through traffic away from the town centres of Echuca and Moama.

- Table 6-8:Transport Risk Register

Impact pathway	Description of consequences	Linkages	VicRoads Contract Specification Section 177 Reference	Mitigation measures to Manage Risk (as per Section 177 and Project Description)	Initial Risk			Additional Measures Recommended to Reduce Risk	Residual Risk		
					Consequence	Likelihood	Risk Rating		Consequence	Likelihood	Risk Rating
TT1. Construction of the project would disrupt or sever local access routes	Increased travel time and disruption to traffic movements	Social, Economic		Construction traffic routes to be designated and managed as part of the transport management plan. Construction routes are to be designed to avoid, where possible, disruption or severing of local access routes. Construction would be scheduled to avoid major event periods and locations. Communication strategy to be implemented to inform stakeholders of project traffic impacts.	Minor	Almost Certain	Medium	No additional controls.	Minor	Almost Certain	Medium
TT2. Road Safety impacts during operation	Potential for increased interaction with wildlife, new intersections, altered property access, pedestrian and bicycle interactions on bridge route.	Biodiversity & Habitat		Road safety audit to be completed on detailed design Provision for off-road shared facilities for bicycles and pedestrians. Interactions with wildlife to be monitored and consideration given to additional warning signage for motorists in areas of high wildlife activity.	Moderate	Possible	Medium	Items identified in Road Safety Audit are addressed prior to sign-off of detailed design.	Minor	Possible	Low
TT3. Changed road environment during construction results in general reduction to road safety	Increased risk of crashes at localised construction zones	Social	1160, 1180	Prepare a traffic management plan to identify, assess and eliminate reduce or mitigate road safety hazards and to be reviewed by VicRoads prior to implementation.	Minor	Possible	Low	Construction traffic routes to be designated and managed as part of the TMP. Communication strategy to be implement to inform stakeholders of project traffic	Minor	Rare	Negligible

6.4.4 Mitigation Measures

In order to mitigate the risks for the Project, standard VicRoads and Roads and Maritime environmental protection measures and some additional project specific measures have been identified for incorporation into the Environmental Management Framework (EMF). VicRoads, as the responsible proponent for the construction of the Project, would require the construction contractor to incorporate all of these measures from the Environmental Management Framework into the Construction Environmental Management Plan (CEMP).

Standard protection measures for the transport impact that would be adopted for this Project include the following Clauses of the VicRoads DCI contract specifications (attached as Appendix C):

- 1160
- 1180

There are several additional Project specific measures that have been recommended to avoid, mitigate and manage potential road safety and accessibility effects, reducing residual risks/impacts to an acceptable level. These additional measures and the responsibility for implementing them are outlined in Table 6-9.

Table 6-9:Environmental Management Measures

Risk No.	Risk Description	Management Measures	Responsibility
T1	Severance of local access routes	Construction traffic routes to be designated and managed as part of the transport management plan. Communication strategy to be implemented to inform stakeholders of project traffic impacts. Avoid construction during major events periods and locations.	Construction contractor, VicRoads, Roads and Maritime
T2	Road crashes during construction	Construction traffic routes to be designated and managed as part of the TMP in accordance with the relevant standards. Communication strategy to be implement to inform stakeholders of project traffic	Construction contractor
T3	Road crashes during operation	Items identified in Road Safety Audit are addressed prior to sign-off of detailed design	VicRoads, Roads and Maritime

7. Conclusion

This Transport Impact Assessment has shown that:

- Without a second crossing of the Murray River, average weekday traffic on the existing bridge is expected to increase from about 18,800 vehicles per day in 2014 to 25,000 by 2044. The existing bridge is expected to exceed its present capacity by 2029 in the "No Project Scenario".
- If the Preferred Alignment (Mid-West Option) is constructed, traffic volumes on the existing bridge are forecast to reach about 15,000 vehicles per day at 2044. This represents a reduction of about 40% of the traffic that would have otherwise used the bridge if a second river crossing were not available.
- The Preferred Alignment is forecast to reduce typical weekday daily traffic volumes by up to 40% on the existing bridge and the north-south route in the Port of Echuca area along High Street and Meninya Street. Truck volumes are expected to reduce by similar proportions in and around the town centres.
- With the Preferred Alignment operational, traffic volumes in Warren Street are forecast to increase by about 54% immediately east of Murray Valley Highway.
- Key intersections in the Study Area along Murray Valley Highway, Warren Street and Cobb Highway would perform satisfactorily during peak traffic conditions on the Preferred Alignment.
- No adverse effects on public transport, walking and cycling have been identified within or outside the Preferred Alignment.
- The new bridge would provide a second pedestrian and cycling river crossing and off road shared pathways along the length of the project.
- The new bridge would provide improved river-crossing access for heavy and oversize vehicles that are currently prohibited or otherwise restricted from using the existing bridge during peak periods.
- The existing bridge would continue to play an important role as the most direct connection between the Moama and Echuca town centres, and would attract mostly local traffic.
- The Preferred Alignment may contribute to improved access and amenity for local traffic and pedestrians. The reduction in traffic may also contribute to improved road safety in and around the town centres.
- Major events and access to local roads may be affected by the construction. Other risks may include increase in truck trips during construction, potential road safety issues with the increased interaction with wildlife on Mid-West Option corridor (e.g. Warren Street) and risks of crashes in the construction zone (from time to time). Mitigation measures have been identified to lower the risks during construction, with additional measures such as the implementation of a communication plan and

designated construction traffic route, resulting in the impact from the residual risks expected to be minor.

8. Assumptions and Limitations

The land use, population, employment and road network assumptions made during the modelling process were documented in section 6.2.1.

It should be noted that the forecasts are sensitive to assumptions about future population and employment growth, and the areas in which this growth occurs. Should these growth forecasts differ significantly, or should future growth be located in areas other than assumed in this study, then the traffic forecasts will differ accordingly.

The traffic forecasting approach assumes that future per-capita trip generation rates will be similar to present rates. It is possible that future technologies, energy prices and individual behaviours will influence vehicle trip generation. Should this occur there would be an influence on travel pattern as the community adapts to these changing circumstances.

9. References

Austraffic 2008 Echuca-Moama Bridge Planning Study Traffic Surveys August 2008 – Overview Report

Australian Bureau of Statistics (2011), Census of Population and Housing.

Beca (2011), Echuca Housing Strategy, Report for Campaspe Shire Council.

Bureau of Infrastructure, Transport and Regional Economics (2012), Traffic Growth in Australia – Report 127, March 2012.

Campaspe Shire Council (2007), Campaspe Walking and Cycling Strategy

Campaspe Planning Scheme – Clause 18 transport

Department of Planning (2009), Draft Murray Regional Strategy

Department of Transport, Planning and Local Infrastructure (2013),

Victoria, the Freight State (2013)

Department of Transport, Planning and Local Infrastructure (2014), Plan Melbourne

Department of Transport, Planning and Local Infrastructure (2014), Victoriain Future.

Department of Transport, Planning and Local Infrastructure (2014), Loddon Mallee North Regional Growth Plan (LMNRG Plan)

EW Russell and Associates (2011) Central Murray Transport Study Final Report

Infrastructure Australia (February 2011), National Land Freight Strategy Discussion Paper

MacPlan Australia (2009), Moama North West Master Plan, Report for Murray Shire.

Murray Shire (2004), Bicycle Plan Moama

Infrastructure Australia (2011), National Land Freight Strategy Discussion Paper

Transport for NSW (2013), Freight and Ports Strategy

RTA (2002), Guide to Traffic Generating Development

Regional Development Victoria (2014), Loddon Mallee North Regional Growth Plan

Road Management Act (2004)(Vic)

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

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

Sinclair Knight Merz (2012), Mid-West 2 Options Assessment for Echuca-Moama Bridge Planning Study, Modelling report, VicRoads, 25 January 2013.

State Government Victoria (2013), Victoria's Road Safety Strategy 2013-2022

State Government Victoria (2013), Victoria's Road Safety Action Plan 2013-2016

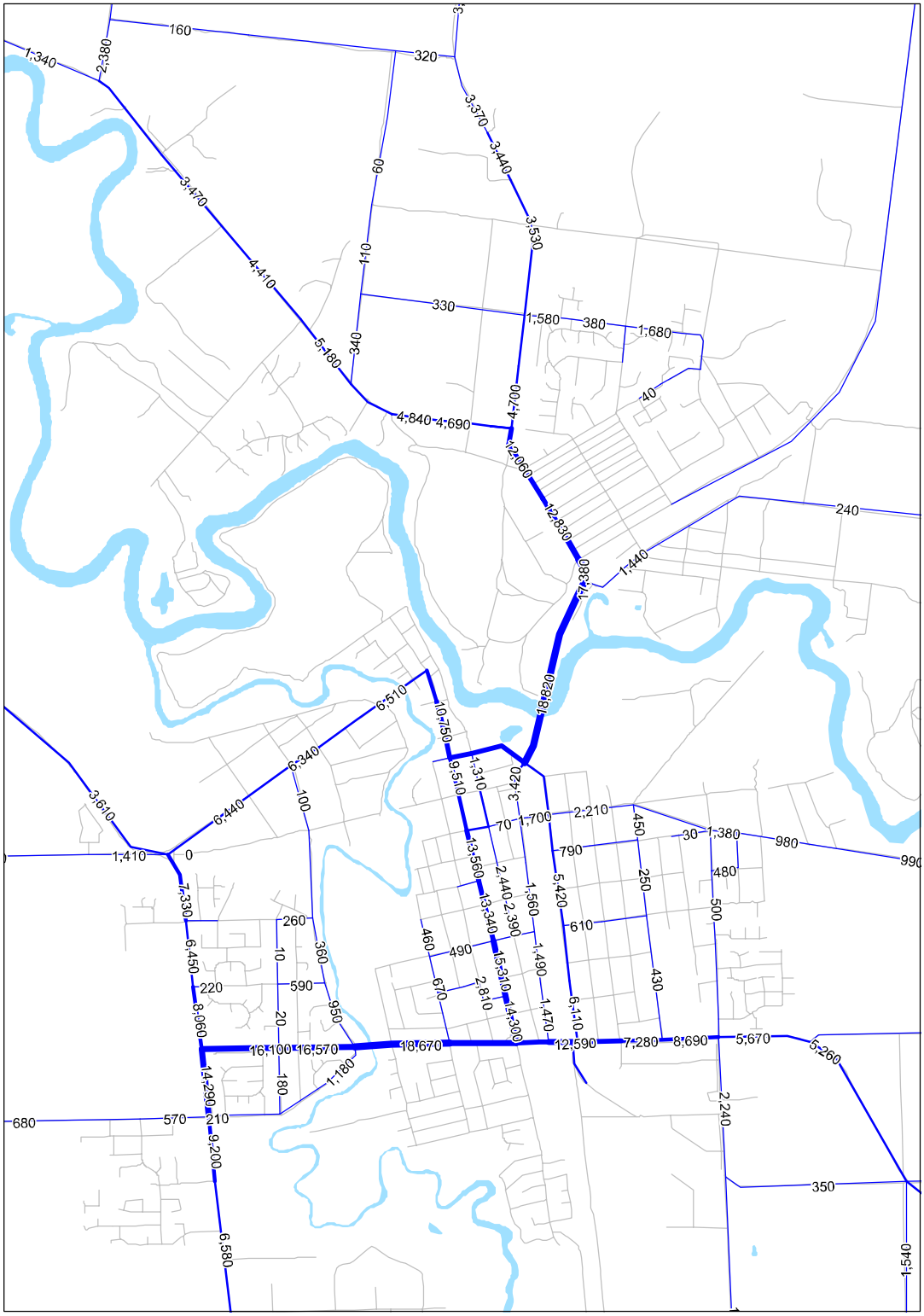
Transport Integration Act (2010)

VicRoads (2006), Guidelines for Transport Impact Assessment Reports (TIAR) For Major Land Use and Development Proposals (Vic TIAR Guidelines)

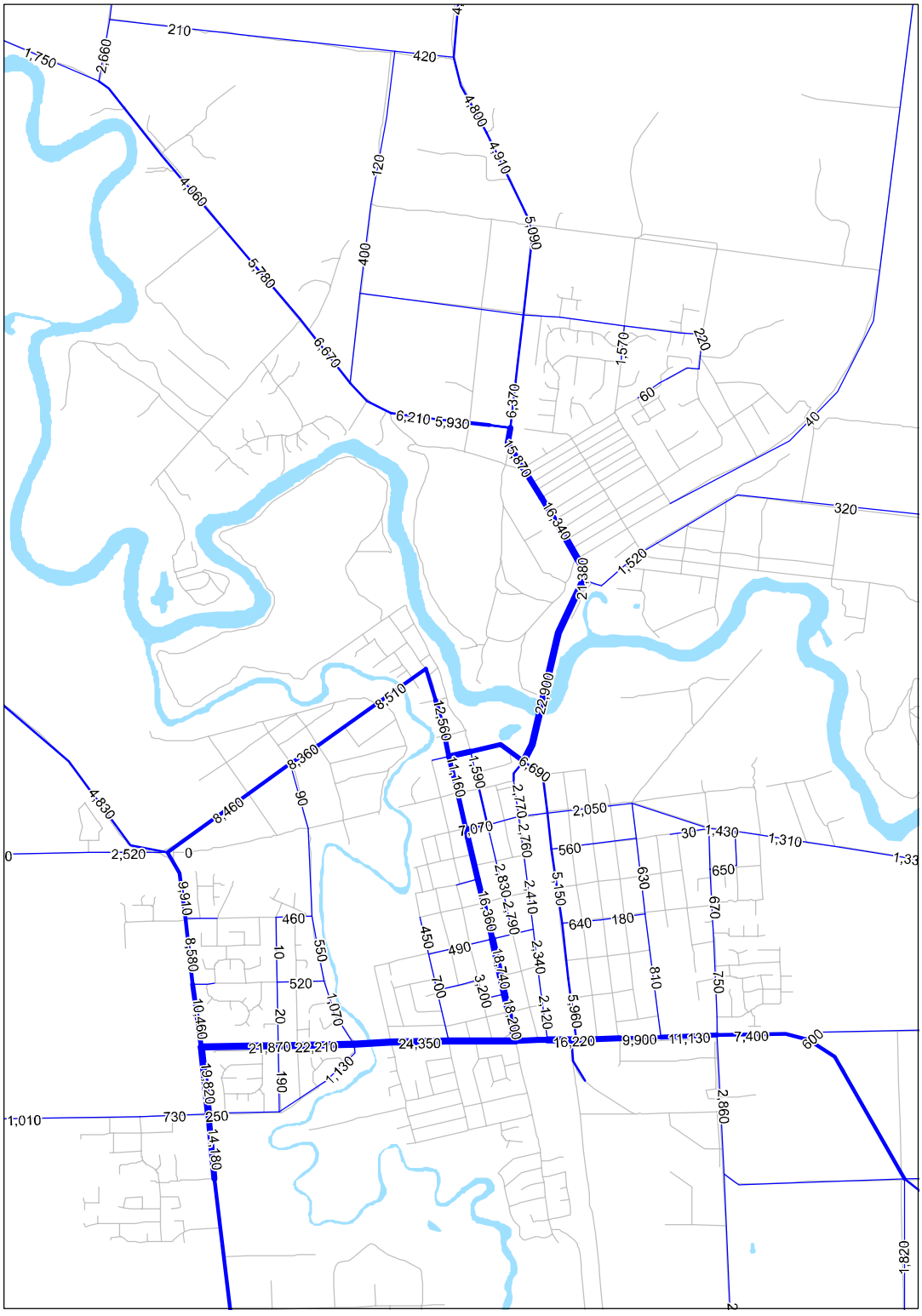
Appendix A Traffic Forecasts

Note traffic volumes on plot have been rounded to the nearest 10.

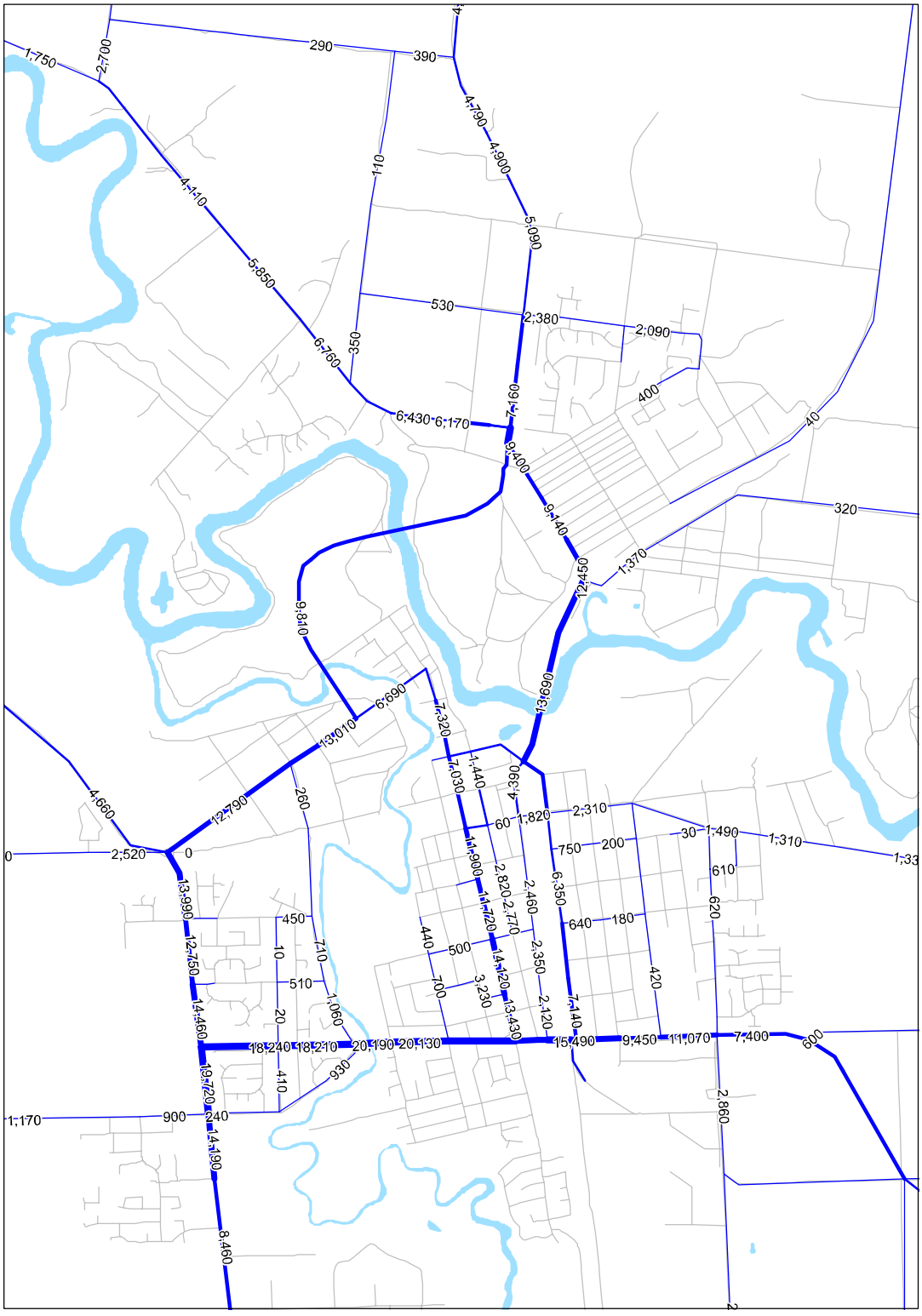
- Figure A-9-1: Map of 2014 modelled daily traffic volume (existing road network)



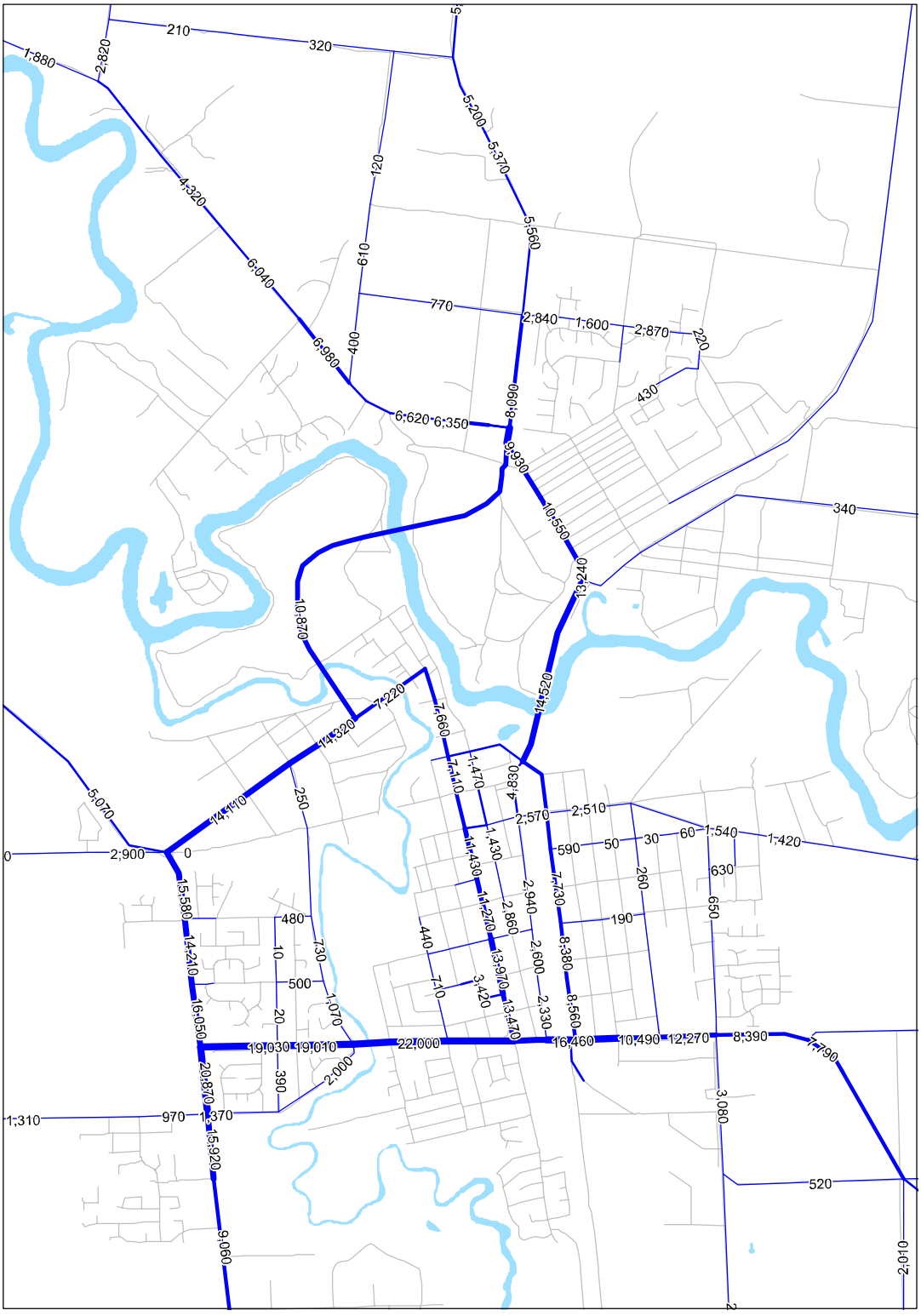
- Figure A-9-2: Map of 2029 modelled daily traffic volume (existing road network)



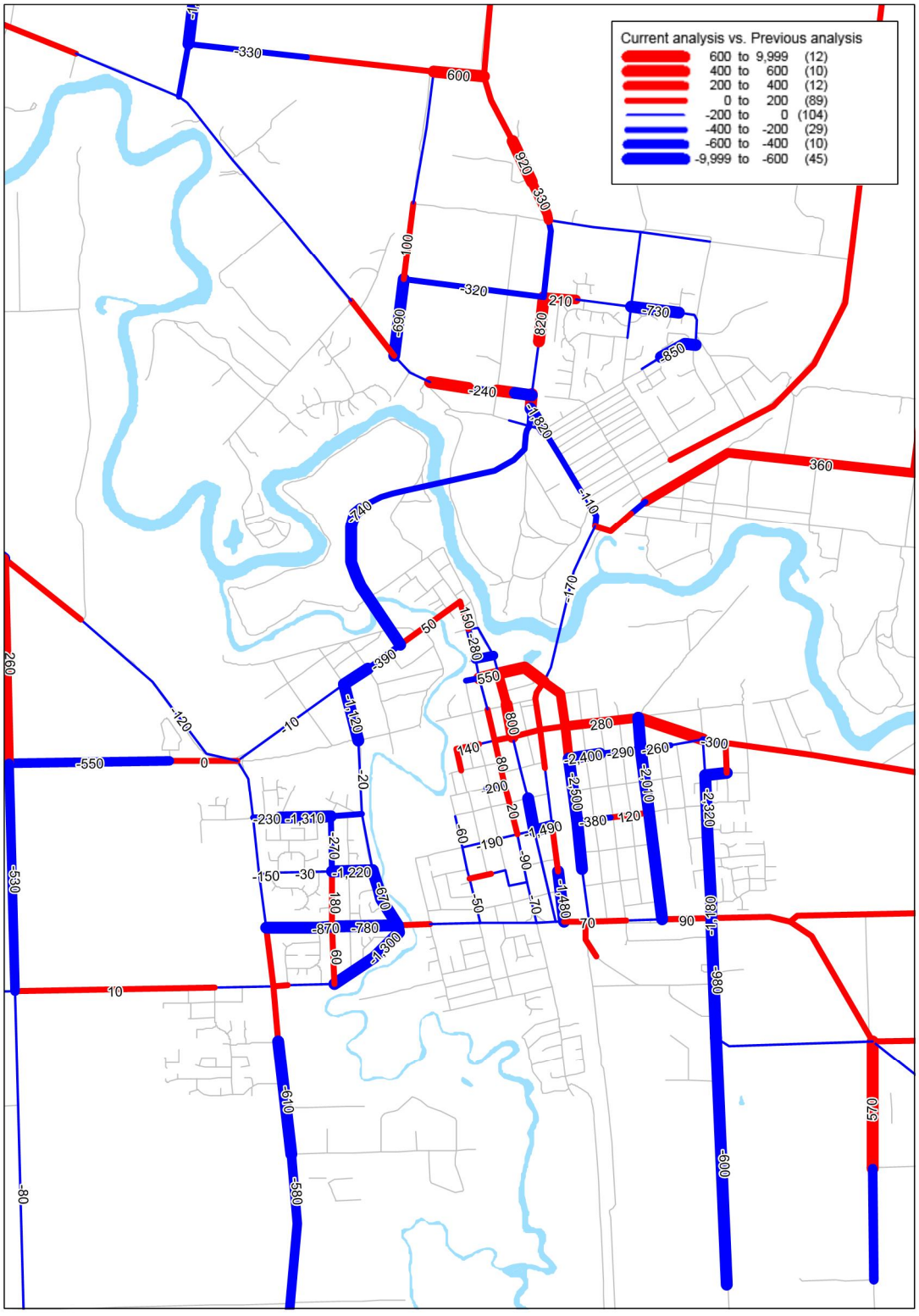
- Figure A-9-3: Map of 2029 modelled daily traffic volume (Mid-West Option)



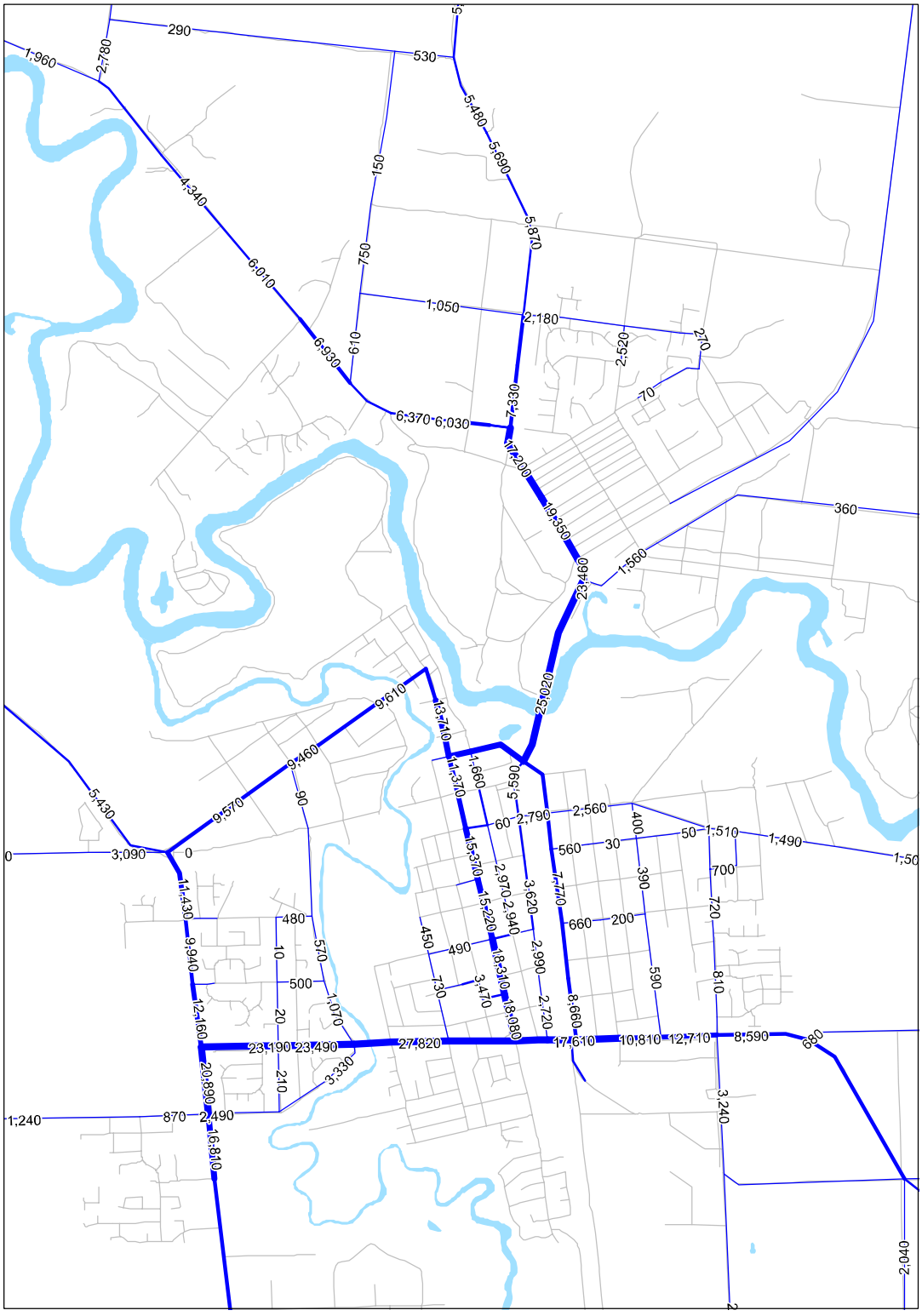
- Figure A-9-4: Map of 2038 modelled daily traffic volume (Mid-West Option)



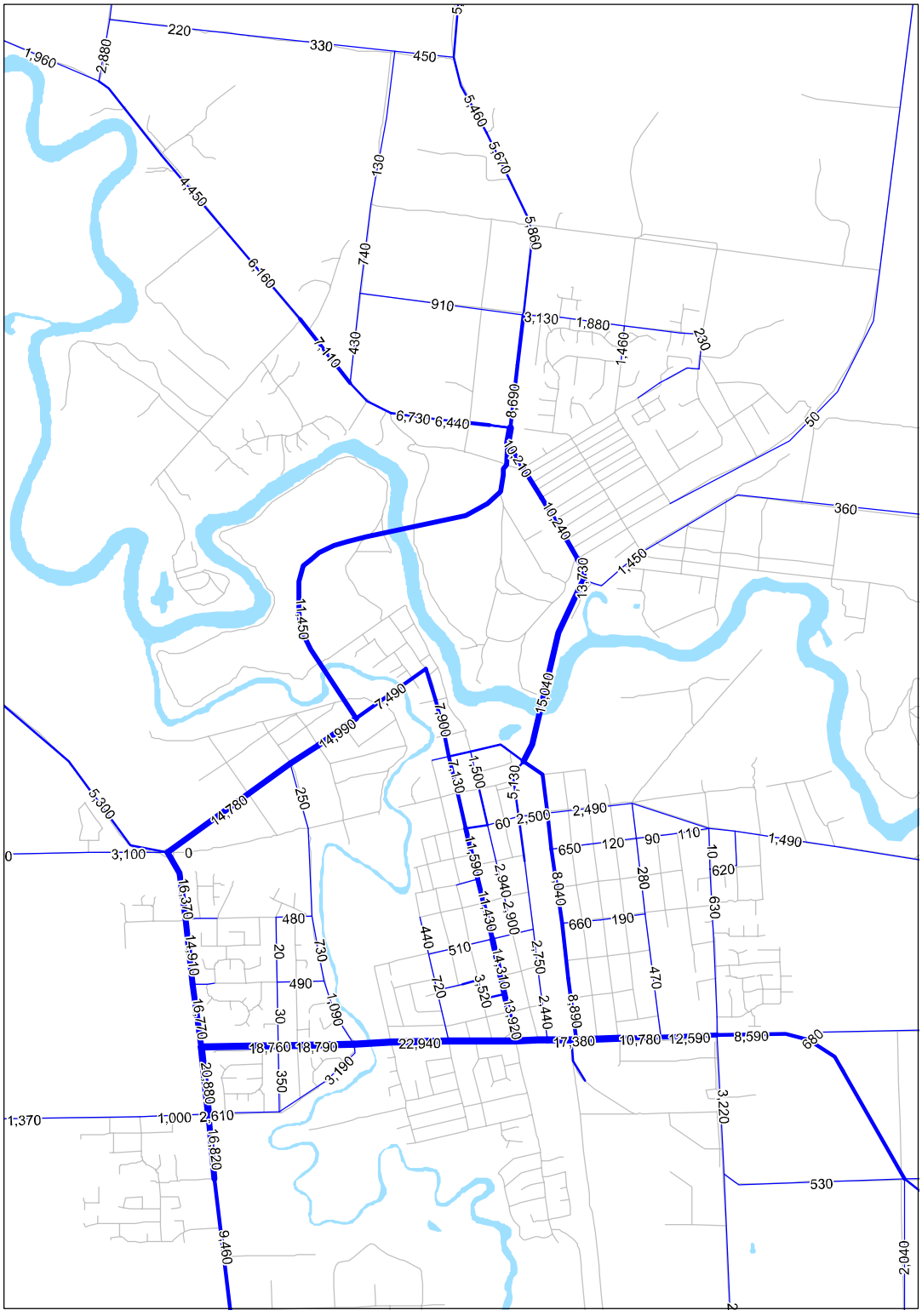
- Figure A-9-5: Comparison map of 2038 daily traffic volumes between the model output from the current analysis and the previous study (Sinclair Knight Merz, 2012)



- Figure A-9-6: Map of 2044 modelled daily traffic volume (existing road network)



- Figure A-9-7: Map of 2044 modelled daily traffic volume (Mid-West Option)



Appendix B SIDRA Model Outputs (2014 Base, 2044 Mid-West)

MOVEMENT SUMMARY

Site: MidWest - Bridge Rd_Warren St

Mid-West Option
Warren Street and New Bridge Road Roundabout
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Warren Street East											
5	T	254	3.3	0.146	7.9	LOS A	0.8	5.8	0.51	0.56	59.9
6	R	89	1.2	0.146	17.5	LOS B	0.8	5.4	0.52	0.82	53.4
Approach		343	2.8	0.146	10.4	LOS B	0.8	5.8	0.51	0.63	58.0
North: New Bridge Road											
7	L	87	1.2	0.102	10.6	LOS B	0.4	3.0	0.38	0.64	58.4
9	R	444	8.3	0.342	17.1	LOS B	1.9	14.2	0.42	0.72	52.2
Approach		532	7.1	0.342	16.0	LOS B	1.9	14.2	0.41	0.70	53.1
West: Warren Street West											
10	L	473	8.9	0.321	9.9	LOS A	1.9	14.1	0.25	0.57	59.4
11	T	249	3.8	0.201	8.6	LOS A	1.0	7.3	0.24	0.53	60.9
Approach		722	7.1	0.321	9.5	LOS A	1.9	14.1	0.25	0.56	59.9
All Vehicles		1597	6.2	0.342	11.8	LOS B	1.9	14.2	0.36	0.62	57.0

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: MidWest - Cobb Hwy_Perricoota Rd - w Francis

Mid-West Option
Perricoota Road and Cobb Highway Signals
Signals - Fixed Time Cycle Time = 50 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Francis Street											
1	L	59	0.0	0.043	7.3	LOS A	0.2	1.3	0.26	0.62	43.5
2	T	24	0.0	0.028	8.5	LOS A	0.3	2.3	0.59	0.43	40.5
3	R	11	0.0	0.016	15.3	LOS B	0.1	1.0	0.58	0.66	37.8
Approach		94	0.0	0.043	8.5	LOS A	0.3	2.3	0.38	0.57	42.0
East: Cobb Highway											
4	L	11	0.0	0.007	7.3	LOS A	0.0	0.2	0.25	0.60	43.5
5	T	392	12.1	0.338	14.4	LOS B	3.8	29.1	0.80	0.66	35.9
6	R	26	12.0	0.118	24.4	LOS C	0.5	4.2	0.81	0.72	32.8
Approach		428	11.8	0.338	14.9	LOS B	3.8	29.1	0.79	0.66	35.8
North: Perricoota Road											
7	L	25	12.5	0.019	8.7	LOS A	0.1	0.6	0.25	0.63	48.4
8	T	22	0.0	0.026	8.5	LOS A	0.3	2.1	0.59	0.42	46.5
9	R	484	5.0	0.763	24.4	LOS C	11.6	85.0	0.90	0.93	36.1
Approach		532	5.1	0.763	23.0	LOS C	11.6	85.0	0.86	0.89	36.9
West: New Bridge Road											
10	L	513	5.5	0.378	8.9	LOS A	2.2	16.1	0.36	0.69	47.9
11	T	411	12.6	0.356	14.5	LOS B	4.0	30.8	0.81	0.67	40.6
12	R	60	0.0	0.187	25.1	LOS C	1.2	8.6	0.83	0.75	35.6
Approach		983	8.1	0.378	12.2	LOS B	4.0	30.8	0.58	0.68	43.7
All Vehicles		2037	7.8	0.763	15.4	LOS B	11.6	85.0	0.69	0.73	39.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Movement Performance - Pedestrians

Mov ID	Description	Demand Flow ped/h	Average Delay sec	Level of Service	Average Back of Queue Pedestrian ped	Average Back of Queue Distance m	Prop. Queued	Effective Stop Rate per ped
P1	Across S approach	53	19.4	LOS B	0.1	0.1	0.88	0.88
P3	Across E approach	53	18.5	LOS B	0.1	0.1	0.86	0.86
P5	Across N approach	53	19.4	LOS B	0.1	0.1	0.88	0.88
P7	Across W approach	53	18.5	LOS B	0.1	0.1	0.86	0.86
All Pedestrians		212	18.9	LOS B			0.87	0.87

Level of Service (LOS) Method: SIDRA Pedestrian LOS Method (Based on Average Delay)
Pedestrian movement LOS values are based on average delay per pedestrian movement.
Intersection LOS value for Pedestrians is based on average delay for all pedestrian movements.

MOVEMENT SUMMARY

Site: Base - Cobb Hwy_Perricoota Rd

Base Option
Perricoota Road and Cobb Highway Priority
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Cobb Highway South											
1	L	366	5.2	0.271	6.7	LOS A	1.3	9.5	0.09	0.54	44.2
2	T	226	13.0	0.126	0.0	LOS A	0.0	0.0	0.00	0.00	51.3
Approach		593	8.2	0.271	4.2	NA	1.3	9.5	0.06	0.33	46.6
North: Cobb Highway North											
8	T	218	12.6	0.107	1.0	LOS A	0.7	5.6	0.30	0.00	54.3
9	R	17	12.5	0.107	10.1	LOS B	0.7	5.6	0.41	0.92	49.0
Approach		235	12.6	0.107	1.6	NA	0.7	5.6	0.31	0.07	53.9
West: Perricoota Road West											
10	L	16	13.3	0.040	11.4	LOS B	0.1	0.6	0.46	0.70	46.1
12	R	349	4.8	1.163	193.5	LOS F	42.7	311.2	1.00	3.37	9.5
Approach		365	5.2	1.163	185.6	LOS F	42.7	311.2	0.98	3.25	9.8
All Vehicles		1193	8.1	1.163	59.2	NA	42.7	311.2	0.39	1.17	22.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: MidWest - Murray Valley Hwy_Warren St

Mid-West Option
Warren Street and Murray Valley Highway Roundabout
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
South: Northern Highway											
1	L	178	14.8	0.146	7.3	LOS A	0.7	5.2	0.23	0.46	63.5
3	R	545	7.3	0.313	16.7	LOS B	1.8	13.2	0.24	0.66	53.5
Approach		723	9.2	0.313	14.4	LOS B	1.8	13.2	0.24	0.61	55.5
East: Warren Street											
4	L	531	6.5	0.244	10.1	LOS B	1.3	9.8	0.35	0.61	58.6
6	R	94	11.2	0.244	15.5	LOS B	1.3	9.6	0.36	0.67	54.0
Approach		624	7.3	0.244	10.9	LOS B	1.3	9.8	0.35	0.62	57.8
North West: Murray Valley Highway											
27	L	95	8.9	0.113	11.1	LOS B	0.5	4.0	0.55	0.69	58.1
29	R	167	13.2	0.167	16.8	LOS B	0.9	6.8	0.56	0.77	52.7
Approach		262	11.6	0.167	14.8	LOS B	0.9	6.8	0.56	0.74	54.5
All Vehicles		1609	8.8	0.313	13.1	LOS B	1.8	13.2	0.33	0.64	56.1

Level of Service (LOS) Method: Delay (HCM 2000).
Roundabout LOS Method: Same as Signalised Intersections.
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: Base - Murray Valley Hwy_Warren St

Base Option
Warren Street and Murray Valley Highway Priority
Giveway / Yield (Two-Way)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Northern Highway											
5	T	124	16.9	0.071	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
6	R	203	4.1	0.170	9.3	LOS A	0.7	5.4	0.33	0.66	47.4
Approach		327	9.0	0.170	5.8	NA	0.7	5.4	0.20	0.41	51.6
North: Warren Street											
7	L	200	3.7	0.197	8.6	LOS A	0.8	5.8	0.30	0.61	48.1
9	R	65	11.3	0.125	12.5	LOS B	0.5	3.7	0.49	0.76	44.9
Approach		265	5.6	0.197	9.5	LOS A	0.8	5.8	0.35	0.65	47.3
West: Murray Valley Highway											
10	L	65	8.1	0.037	7.7	LOS A	0.0	0.0	0.00	0.60	49.8
11	T	118	16.1	0.067	0.0	LOS A	0.0	0.0	0.00	0.00	60.0
Approach		183	13.2	0.067	2.8	NA	0.0	0.0	0.00	0.21	55.9
All Vehicles		776	8.8	0.197	6.4	NA	0.8	5.8	0.21	0.44	50.9

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
SIDRA Standard Delay Model used.

MOVEMENT SUMMARY

Site: MidWest - Bridge Rd_Meninya St

Mid-West Option
New Bridge Road and Meninya Street Signals
Signals - Fixed Time Cycle Time = 30 seconds (Practical Cycle Time)

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m	Prop. Queued	Effective Stop Rate per veh	Average Speed km/h
East: Cobb Highway											
4	L	442	8.3	0.420	9.7	LOS A	1.9	14.5	0.57	0.76	47.0
5	T	488	6.5	0.652	13.8	LOS B	3.8	27.8	0.97	0.85	40.7
Approach		931	7.4	0.652	11.8	LOS B	3.8	27.8	0.78	0.81	43.5
West: New Bridge Road											
11	T	516	6.9	0.691	14.3	LOS B	4.1	30.2	0.98	0.88	40.3
12	R	47	17.8	0.202	24.5	LOS C	0.7	5.7	0.95	0.72	36.3
Approach		563	7.9	0.691	15.1	LOS B	4.1	30.2	0.98	0.87	40.0
South West: Meninya Street											
30	L	43	14.6	0.043	10.6	LOS B	0.1	1.1	0.43	0.68	46.6
32	R	463	8.6	0.662	16.7	LOS B	6.2	46.6	0.87	0.87	41.3
Approach		506	9.1	0.662	16.2	LOS B	6.2	46.6	0.83	0.86	41.7
All Vehicles		2000	7.9	0.691	13.9	LOS B	6.2	46.6	0.85	0.84	42.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement
Intersection and Approach LOS values are based on average delay for all vehicle movements.
SIDRA Standard Delay Model used.

Appendix C VicRoads DCI Contract Specifications (Clauses1160 & 1180)

1160 TRAFFIC MANAGEMENT

1160.01 GENERAL

The management of traffic is a key requirement of the Contract. The objectives are to:

- minimise the impact on traffic
- provide a safe environment for the travelling public and construction personnel
- cater for the needs of all traffic
- communicate the purpose of the proposed traffic event
- communicate the arrangements for and impacts of any event affecting traffic.

In implementing traffic management, the Contractor shall ensure that only organisations pre-qualified with VicRoads at the:

(a) Traffic Management Plans (TMP) level are engaged or used to prepare and review Traffic Management Plans (including the risk assessment) for these works

(b) Traffic Guidance Scheme (TGS) level are engaged or used to set out, implement and monitor the Traffic Guidance Scheme required by the Traffic Management Plan at each phase of the works.

1160.02 DEFINITIONS

Traffic Management Strategy - the Contractor's overview for the management of traffic during various phases of the work under the Contract, and demonstrates the traffic staging methodology. The Traffic Management Strategy is the overarching parent document from which individual Traffic Management Plans are prepared.

Traffic Management Plan – the details of proposals for the management of traffic during the conduct of works or an event on roads (whether on the roadway or roadside) (RMA - 2004 Worksite Safety – Traffic Management Code of Practice (the Code)).

Traffic Guidance Scheme (TGS) – the physical deployment and arrangement of signs and devices, to warn traffic and guide it through, past or around a work area or hazard.

Traffic Event - any action that results in an impact on any traffic, including all changed conditions such as reduced lanes, shoulders or clearances, surface conditions or alterations to speed limits, signage or alignment.

1160.03 PERFORMANCE REQUIREMENTS

(a) Functional Requirements

The Contractor shall conduct all operations to minimise obstruction and inconvenience to the public, and shall not have under construction any greater length or amount of work than can be managed properly with due regard to the convenience of the public.

The Contractor shall be responsible for all works associated with traffic management including but not limited to any earthworks, drainage, pavement, line marking, signing, traffic barriers, communication, meeting any specific requirements of municipal councils and any temporary works.

The Contractor shall plan and undertake work under the Contract to avoid interaction between construction machinery and traffic. Where this is unavoidable, it shall be minimised and controlled. Appropriate traffic management and traffic control measures shall be provided at all times where construction machinery impacts or interacts with traffic.

The Contractor shall maintain all existing pedestrian movements through the Site at all times. Temporary pathways, as required, shall be provided and maintained by the Contractor to provide smooth, free-draining, clean and unimpeded access.

Proposals for lane and/or shoulder closures shall take into consideration the safety of traffic and will be required to minimise the number of lanes affected at any one time and will be expected to only close the minimum length of road or lane necessary.

The Contractor shall plan and undertake all works to avoid detours. Where alternative traffic arrangements are impracticable and may involve full lane closures, or an alternative route for a turning movement is temporarily not available, proposals for detours may be considered. In these situations, the detour routes shall provide the shortest acceptable path around the closure, take account of local sensitivities, the capacity of the detour route and the need for any mitigating works, and have the agreement of the municipal council(s) if the detour route includes any roads under the control of the municipal council(s).

Where a decrease in the pre-existing level of service on roads under the control of municipal councils outside of the Limit of Works is identified as a consequence of the works under the Contract, the Contractor shall obtain the agreement of the relevant municipal council to the decrease in the levels of service and/or any mitigation works including the communication plan proposed. A copy of the agreement shall be forwarded to the Superintendent.

The Contractor shall not unduly restrict access to properties and side roads.

(b) Operational Requirements

In addition to the above requirements and the principles stated in Clause 1160.04, the provision for traffic shall include the following requirements:

*** (i) Minimise the impact on the existing level of service for through traffic on ##(road/highway/freeway name):.

*** (ii) Provide a level of service required for speed restrictions of not less than ##: km/h for the duration of the work under the Contract.

*** The Superintendent may agree to worksite speed limits below ##: km/h, where such a reduction can be justified. Any additional work or costs resulting from such reductions shall be the responsibility of the Contractor.

(iii) Undertake all works to avoid peak hour disruptions as follows:

- highways and arterial roads - 6am to 9:30am and 3pm to 7pm Monday to Friday
- freeways - 5:30am to 9:30am and 2:30pm to 7:30pm Monday to Friday.

(iv) Not affect traffic on public holidays or on days of any planned major public events that may generate significant traffic movements in the vicinity of the Site that may generate significant traffic movements. This also includes major public events remote from the Site that may generate significant traffic movements through or in the vicinity of the Site.

(v) Maintain: ##(strikethrough one of the options below):

*** • not less than ##: No ##: metre wide sealed traffic lane(s), a ##: metre wide sealed outer emergency lane / shoulder and a ##: metre wide sealed inner shoulder available to traffic on each carriageway at all times

*** • not less than ##: No ##: metre wide sealed traffic lane(s) and a ##: metre wide ##:sealed/unsealed shoulder in each direction at all times.

*** (vi) ##(strikethrough this clause if inappropriate):Separate all work areas adjacent to ##(road/highway/freeway name): from public traffic areas by continuous road safety barriers. Road safety barriers shall be in accordance with the requirements of the Worksite Safety – Traffic Management Code of Practice.

(vii) Where earthworks and/or pavement construction is being carried out over part of the traffic carriageway:

- Steps or batters within 1.5 m of the travelled path of the carriageway shall be delineated. Where a step or batter forms a drop in level of more than 200 mm at a slope steeper than 1 in 6, continuous road safety barriers shall be used in addition to delineation.
- Where the level difference is in the form of a step or batter of less than 80 mm and is between the travelled paths, such step or batter shall be removed before the close of work each day and the full width of carriageway made available to traffic overnight. The removal of such step or batter shall be effected by shaping to a crossfall not steeper than 1 in 10.
- Prior to the close of work each day all steps between layers of unbound pavement material being placed shall be tapered to a slope not steeper than 1 in 10. No pavement steps shall have a height greater than 40 mm.

*** (viii) ##(strikethrough this clause if inappropriate):Provide a 'sight restriction screen' not less than ##: metres above the adjacent road surface on road safety barriers to prevent distraction for motorists passing through the works and to prevent worker access from the Site to the carriageways of the ##(road/highway/freeway name):.

*** (ix) Temporary pedestrian pathways shall have a width of not less than ##: metres and be sealed (bitumen, asphalt or concrete).

(x) Ensure all pre-existing pedestrian facilities including signalised crossings are maintained during the works to a standard not less than the pre-existing standard.

(xi) Where alterations to traffic signal phasing are proposed, the Contractor shall allow in the Traffic Management Plan not less than six weeks notice to the Superintendent to allow the traffic signal controller to be re-programmed.

(xii) Maintain the effectiveness of the existing signing, including directional and regulatory signs.

(xiii) Maintain a record of implementation and maintenance of the Traffic Guidance Schemes in accordance with the Code.

(xiv) Maintain access to commercial properties during trading hours, and consider the access requirements of individual owners/occupiers in the programming and execution of the Works.

(xv) Maintain the existing number of traffic lanes when traffic volumes exceed ##(1400): vehicles per lane per hour (v/l/h).

(xvi) Not cause delays in excess of ##: minutes, or create queue lengths in excess of ##: metres at any time.

(xvii) ##consider any items required from the list below and expand on the site specific requirements – delete unwanted items

:Any additional special delineation or lighting requirements

contraflow, detours

additional signage

any changes or variations to reference documents

special pedestrian conditions

other geometric requirements / restrictions (OD route requirements)

reduce the pre-existing level of service

parking / clearway restrictions

provision of additional VMS under a Provisional Quantity item

Requirements for debris barriers

public transport requirements, i.e. bus stops

permanent traffic counters

access for emergency response vehicles

1160.04 TRAFFIC MANAGEMENT PLANS

The Contractor shall prepare Traffic Management Plans for the management of individual Traffic Events that impact on traffic in accordance with the Traffic Management Strategy, the performance requirements included in this specification, the requirements of the Code, and the following principles:

(a) In planning and designing lane closure(s), the Contractor shall ensure that speed limits at worksites are relevant to the works to be constructed and can be considered by the public to be realistic and necessary. The reasons for speed limit decisions must be clearly documented.

(b) Worksite speed limits are to be adopted that are consistent with the limits specified in the Code and are not more than 20 km/h below the posted speed limit.

(c) The length of road or carriageway to be under a worksite speed limit shall be commensurate with assessed worksite hazards and shall be implemented only at times when work is being undertaken or the hazard exists.

(d) Where possible, the Contractor shall use Variable Message Signs to inform the public of the reasons for reduced speed limits.

(e) The Contractor shall inform the public of approaching speed limit reductions and where appropriate provide advance notice of future roadworks by use of any of the following methods -

- 'speed advisory sign' (SAS) trailers
- variable speed limit signs at long-term worksites
- display of VicRoads phone number (13 11 70) to allow reporting of hazardous or dangerous road conditions.

The Traffic Management Plan shall be in accordance with VicRoads Road Design Guidelines and Traffic Engineering standards as appropriate for the posted speed. Each Traffic Management Plan drawing shall be certified by the Contractor.

Where a discrepancy is identified between the requirements of this specification and the requirements of the Worksite Safety – Traffic Management Code of Practice, the Contractor shall adopt the more stringent requirements(s) as part of the work under the Contract.

The Contractor shall be responsible for obtaining all necessary approvals, and the co-ordination, implementation and other arrangements associated with Traffic Management Plans.

(a) Elements of a Traffic Management Plan

Each Traffic Management Plan shall include the following:

(i) an introduction describing the Traffic Management Plan, its purpose and justification for the proposed work method including alternative work methods considered

(ii) computer generated scaled drawings that clearly show the proposed traffic staging together with the measures to adequately control traffic

(iii) worksite safety management plan risk assessments in accordance with the Worksite Safety – Traffic Management Code of Practice

(iv) results of traffic analysis demonstrating that the proposed arrangement/s have sufficient roadway capacity

(v) the location and extent of any proposed road or lane closures or other event that impacts on traffic

(vi) the timing of any proposed road or lane closures or other event that impacts on traffic

(vii) any proposed signing and pavement markings, including any changes to the existing signing and/or pavement markings

(viii) traffic movements at intersections that are proposed to be prohibited and the traffic movements normally prohibited that are proposed to be allowed (if any)

(ix) modifications proposed to existing traffic control devices and on-road services including but not limited to traffic signals and traffic signal phasing, help phones, incident detection loops, control boxes and closed circuit television

(x) notification, including the submission of Memorandum of Authorisation, of any major traffic control items proposed or affected, which require installation, removal and/or alteration

(xi) the detours proposed, including details of the proposed signing scheme for such detours

(xii) measures proposed to mitigate the disruption to traffic, including traffic that is disrupted outside of the Limit of Work

(xiii) the agreement of relevant municipal councils where applicable

(xiv) an implementation program for the traffic event

(xv) a complete list of relevant contacts including Contractor's and Superintendent's representatives, emergency services, statutory authorities and service providers

(xvi) the findings and actions from a road safety audit

(xvii) arrangements for road safety audits after implementation of the Traffic Management Plan

(xviii) arrangements for the provision of temporary low clearance warning gauges in accordance with Clause 1160.06 (if applicable)

(xix) a Communication Plan as detailed below

(xx) ##any further contract specific requirements – consider the assessment of the risk of crashes, notification of emergency procedures for access to the Site in event of crashes:

(b) Communication Plan

The purpose of the Communication Plan is to identify the impacts associated with the proposed traffic event and develop appropriate communication strategies to address the impacts identified.

Appropriate strategies may include procedures to minimise the impact of the event on stakeholders and traffic, provide alternatives and confirm timing and duration of proposed works.

The Communication Plan shall provide, as a minimum:

(i) Advance Notification ##(in the paragraph below strikethrough 'static' or 'variable message' as appropriate):

*** • provision of ##:static and/or variable message signs in advance of the works to notify traffic - a minimum of one ##:static and/or variable message sign shall be provided on each road approach, placed continuously from seven days prior to the proposed traffic event

• preparation and submission of newspaper advertisements in accordance with Appendix C3 and public information relating to proposed traffic events

• provision of formal advice of the proposed traffic event to all relevant stakeholders, including but not limited to residents, businesses, schools, community groups, municipal council, road user groups, public transport, affected individuals and emergency services not less than seven days prior to the proposed traffic event

• submission of VicRoads Planned Road/Lane Closure Advice form in accordance with Appendix C2 for inclusion in roadworks bulletins

• liaison and co-ordination with responsible authorities for any adjacent works.

(ii) Notification during the Event ##(in the paragraph below strikethrough 'static' or 'variable message' as appropriate):

*** • provision of ##:static and/or variable message signs for the full duration of the traffic event

*** • preparation and submission of newspaper advertisements and public information to provide update(s) at intervals not exceeding ##: weeks duration and advice for VicRoads use for media interview/inquiries

• advice of any proposed amendments to the Communication Plan, including any extension of time to the duration of the event.

(iii) The message and panel format proposed for static and/or VMS signs in accordance with the Worksite Safety – Traffic Management Code of Practice.

*** (iv) ##(strikethrough inappropriate papers):Publication of newspaper advertisements in 'The Age' and 'Herald Sun', and/or regional daily papers for seven consecutive days prior to the work.

*** (v) Publication of newspaper advertisements in local weekly papers for two weeks prior to the works. These papers are ##(nominate appropriate papers):

(vi) Advice of the completion of the traffic event including the removal of any traffic management measures.

(vii) The nomination of a person who is responsible as the community contact for the traffic event.

(viii) ##any further contract specific requirements e.g. sealed traffic lanes:

##(strikethrough paragraph below if not required)

:*** VicRoads will arrange for publication of newspaper advertisements developed as part of the Communication Plan for each Traffic Management Plan and pay newspaper publication charges for these advertisements. In the event that the Contractor does not provide a final Traffic Management Plan in accordance with the timeframes detailed in Clause 1160.03(c), and the proposed works are consequently re-scheduled, the Contractor shall be responsible for all fees and charges associated with re-publication of advertisements.

(c) Process, Timeframes and Responsibilities

The following section describes the process, timeframes and responsibilities associated with the preparation and review of Traffic Management Plans.

The Contractor shall prepare and submit each Traffic Management Plan at not less than the following timeframes:

(i) six weeks prior to the commencement of the proposed traffic event – submit the preliminary Traffic Management Plan for the Superintendent's review

(ii) three weeks prior to the commencement of the proposed traffic event – submit the final Traffic Management Plan incorporating any comments arising from the Superintendent's review of the preliminary Traffic Management Plan.

The Contractor shall in the preparation of the Traffic Management Plan allow the following times for the Superintendent's review of each stage of the Traffic Management Plan:

(i) two weeks for the preliminary Traffic Management Plan

(ii) one week for the final Traffic Management Plan.

The timeframes for submission and review of Traffic Management Plans are detailed in Appendix C1.

The Superintendent may require as part of the review, joint meetings between the Contractor, the Contractor's Traffic Engineer who developed the Traffic Management Plan, the Contractor's Road Safety Auditor, and the Superintendent.

HP The Traffic Management Plan shall not be implemented as the Traffic Guidance Scheme until the Superintendent has completed the review of the final Traffic Management Plan and released this hold point.

1160.05 TRAFFIC GUIDANCE SCHEMES

(a) Implementation

The Contractor is responsible for ensuring that an agreed Traffic Management Plan is available 10 business days in advance of the proposed traffic event. If an agreed Traffic Management Plan is not available 10 business days prior to the proposed traffic event in accordance with Appendix C1, the Contractor shall re-schedule works at the Contractor's expense.

(b) Reviews

After the Traffic Guidance Scheme (TGS) has been implemented and prior to the commencement of construction works, the Contractor shall be responsible for reviewing the operation of the TGS and undertaking any amendments or changes necessary to ensure the TGS complies, operates and functions in accordance with the performance requirements of this Section 1160.

Any minor changes required to the TGS, as identified by the Contractor as a result of a review, must be implemented and recorded on the TMP by an organisation/person pre-qualified at the TGS level.

Any major changes required to the TGS, as identified by the Contractor as a result of a review, must be approved by an organisation/person pre-qualified at the TMP level and the Superintendent, and the TMP and TGS must be updated accordingly.

Where, in the opinion of the Superintendent, the TGS does not comply, operate or function in accordance with the performance requirements of this Section 1160, the Contractor shall remove the TGS until a suitable Traffic Management Plan is developed. Should the TGS not be removed, the Superintendent reserves the right to take action to make good the Site and remove the TGS. The costs incurred by the Superintendent in undertaking such action will be deducted from progress payments due to the Contractor.

Variable Message Signs shall be installed in accordance with the Worksite Safety – Traffic Management Code of Practice.

*** (c) Traffic Management Committee ##(strikethrough clause if not required):

A Traffic Management Committee may be convened by the Superintendent to meet on a regular basis and shall be attended by representatives of the Superintendent, Contractor and other relevant authorities. The Superintendent may require the Contractor's organisation/person that provided the Traffic Management Strategy and TMPs and implemented the TGSs respectively and the Contractor's Senior Road Safety Auditor to attend meetings.

The Traffic Management Committee may review the Traffic Management Strategy, Traffic Management Plans and associated Road Safety Audits. Any agreed improvements shall be incorporated into the Contractor's Traffic Management Strategy and current and/or future Traffic Management Plans.

1160.06 TRAFFIC MANAGEMENT PLAN AUDITS

The Contractor shall ensure that a Road Safety Audit is undertaken at the following times:

(a) at the final design stage for each proposed Traffic Management Plan not specifically covered by arrangements shown in AS 1742.3 and its various user guides;

(b) immediately upon implementing each TGS from an approved Traffic Management Plan;

(c) during the first morning and afternoon peak hours following the implementation of each TGS; and

(d) at any other time nominated in the Worksite Safety – Traffic Management Code of Practice.

The audit shall also review the appropriateness and operation of the Traffic Guidance Scheme to ensure compliance with the principles stated in Clause 1160.04.

Audits and auditors shall be in accordance with the requirements of Section 1180.

Within 2 business days of the Road Safety Audit being carried out, the Contractor shall forward a Road Safety Audit initial report and the Contractor's response to the report to the Superintendent.

The initial Road Safety Audit report shall be discussed with the Contractor's representative who developed the TMP and any necessary corrective actions shall be implemented as soon as possible after identification.

A detailed Road Safety Audit report and the Contractor's response to the report shall be submitted to the Superintendent within 5 business days of the Road Safety Audit being carried out.

Any minor changes required to the TGS, as identified by the detailed Road Safety Audit Report and agreed to by the Contractor, must be implemented and recorded on the TMP by an organisation/person pre-qualified at the TGS level.

Any major changes required to the TGS, as identified by the detailed Road Safety Audit Report and agreed to by the Contractor and the Superintendent must be implemented by an organisation/person pre-qualified at the TMP level and the TMP and TGS must be updated accordingly.

1160.07 EMERGENCY CLOSURES

Where a lane, carriageway or road needs to be closed due to an emergency situation, the Contractor shall immediately advise the Superintendent. The duration and extent of the emergency closure shall be kept to a minimum.

In advising the Superintendent the Contractor shall provide an explanation of the circumstances giving rise to the emergency situation and actions taken during the emergency situation.

1160.08 VERTICAL CLEARANCE FOR BRIDGEWORKS OVER ROADWAYS

(a) General

*** The Contractor shall provide a minimum vertical clearance for all structures over roadways in accordance with Part 2 of the VicRoads Road Design Guidelines. Notwithstanding this, a temporary minimum clearance of ## (edit height accordingly):4.5 metres may be provided over roads during construction subject to the approval of the Superintendent.

Where the vertical clearance during construction is less than the specified design clearance in the VicRoads Road Design Guidelines, the Contractor shall design, supply, erect and maintain temporary low clearance warning gauges in advance of the bridgeworks. The location, type and details of all low clearance warning gauges shall comply with the requirements of AS 1742.3 and Appendix C4 of this specification taking into account the safety of bridge workers and other traffic, traffic volume, and types of vehicles using the road, and suitable detours for high vehicles. In addition, the Contractor shall provide bridge clearance signs in accordance with AS 1742.3.

Details of the low clearance warning gauge proposal shall be submitted to the Superintendent for review in the relevant Traffic Management Plan/s.

The Contractor shall remove low clearance warning gauges and bridge clearance signs at the earliest possible time after the completion of the works. The Contractor shall arrange and provide traffic management during erection and removal of the low clearance warning gauges.

*** (b) Schedule of Details

Table 1160.081

Structure Location	Minimum Protection Level Required	Time for Review by Superintendent
##:	##:	##: weeks

1180 ROAD SAFETY AUDITS

The Contractor shall ensure that road safety audits are carried out in accordance with the Austroads Guide to Road Safety - Part 6: Road Safety Audit (2009) and by a company pre-qualified with VicRoads at the Road Safety Audit (RSAUDIT) Level. The Contractor shall be responsible for all costs associated with the completion of the audits and the implementation of the findings of the audits.

The audit team shall be lead by a VicRoads accredited Senior Road Safety Auditor from a company pre-qualified under the VicRoads Pre-qualification Scheme at the Road Safety Audit (RSAUDIT) Level. Other team members shall have undertaken appropriate training in road safety audits. Road safety auditors shall be independent of any other commitment or obligation to the Contractor or Consultant carrying out the design for the Contract.

Audits shall be conducted at the stages nominated in Table 1180.01. Road safety audits shall be completed and all issues raised in the audit responded to prior to commencement of the next stage of work. The Contractor shall ensure that road safety audits are incorporated into its Design Management Plan, its Construction Management Plan and the Contractor's Program.

Table 1180.01

Stage of Work	Timeframe for Road Safety Audit to be undertaken	Timeframe for Submission of Road Safety Audit Report
(a) preliminary design	within 5 business days of completion	within 10 business days of completion of the audit
(b) detailed design	within 5 business days of completion	within 10 business days of completion of the audit
(c) during construction, where traffic management measures are proposed	in accordance with Clause 1160.04	in accordance with Clause 1160.04
(d) pre-opening	3-5 business days prior to opening road to traffic	no later than 3 business days prior to opening road to traffic
(e) post-opening	24 hours after opening road to traffic	within 5 business days of completion of the audit

The Superintendent may request comment by the Senior Road Safety Auditor on road safety issues associated with the Contract.

The pre-opening road safety audit report shall identify issues which require rectification prior to opening the road to traffic.

The Contractor shall promptly address all issues raised in road safety audits, and shall prepare a written response to the audit that:

- details action taken/to be taken to address each issue raised;
- provides justification for proposals not to undertake action on particular issues raised; and
- highlights issues raised not considered to be the responsibility of the Contractor.

Where the Contractor proposes not to undertake action in response to identified issues, the written approval of the Superintendent shall be obtained to not undertake such action.

The Contractor shall provide to the Superintendent a copy of the road safety audit report together with the Contractor's written response to the report within the timeframes specified in Table 1180.01.

The Contractor shall prepare and maintain a register of all road safety audits. The register shall include:

- Audit stage and date;
- Summary of each issue;
- Status of action to address each issue; and
- Verification of completed actions.