

ROAD INFRASTRUCTURE INVESTMENT PRIORITISATION FINAL REPORT

Prepared for Transport Canberra and City Services

ACT Transport Corridors

Final Report

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EXECUTIVE SUMMARY

Executive Summary

This study was commissioned to prioritise transport infrastructure investment in the Capital Region. The project objective is to develop a prioritised road infrastructure investment list informed by understanding of the Capital Region economic and social dynamics, transport requirements and micro-simulation options testing.

This document provides an outline of the process undertaken during the project, consideration of the analysis framework, criteria and their measurements, guidance for sourcing Australian Government infrastructure funding, regional context and social and economic drivers. It also outlines the recommended project priorities and provides some commentary on the sensitivity of results for various criteria weightings.

The process is summarised in Figure ES-1.

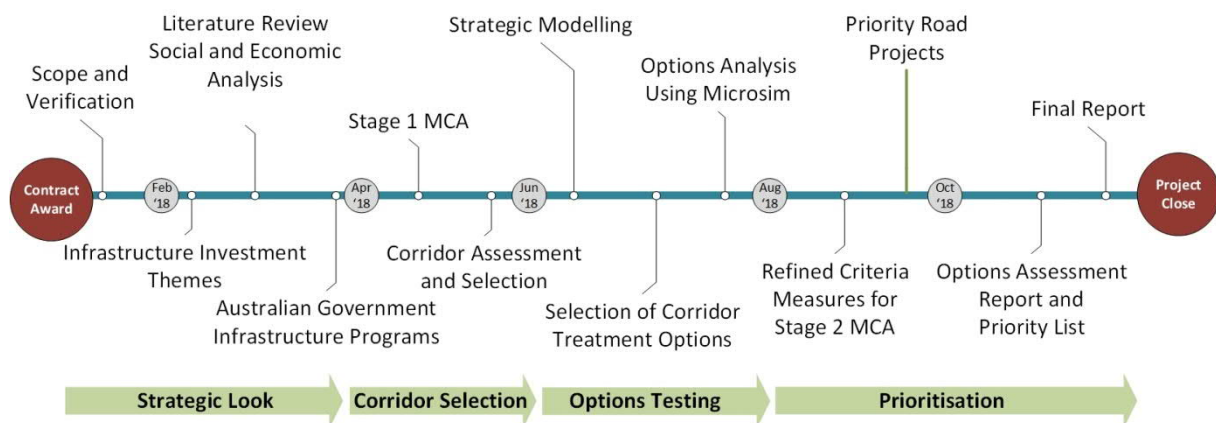


Figure ES-1 Assessment process

Strategic Look

The strategic look included a review of Australian Government infrastructure funding programs and social and economic drivers for the region.

Infrastructure Funding

Funding is essential to the delivery of transport infrastructure. It can be sought from multiple sources including all tiers of government and at times, from the private sector. Funding is generally linked to key strategic objectives, policy commitments and desired outcomes for regions.

The bulk of Commonwealth funding for infrastructure projects is awarded under the National Land Transport Act 2014 (the Act), which allows the Minister for Infrastructure and Transport to award funding for 'Investment Projects'. In addition to the funding provided under the Act, the Commonwealth funds infrastructure through several programs, primarily administered by the Department of Infrastructure, Regional Development and Cities (DIRDC). The Department aims to be well informed of the need, benefits and objectives for the funding of new projects.

The ability of the ACT Government to maximise funding success is underpinned by the ability to effectively demonstrate linkages between analysis and infrastructure project assessment with government policy objectives and other key funding drivers. These objectives, drivers and other specific application requirements to secure funding from these sources are varied.

An analysis of potential project investment programs and criteria by which Australian Government match funding is allocated highlighted several key factors that maximise funding success. It showed that the following factors are common across multiple programs:

- Impact of project (productivity, employment, housing, planning and development, etc.)
- Benefit (economic, environmental, social, etc.)

- Alignment to government policy / objectives
- Delivery considerations (capacity, risks, etc.)
- Solution overview and consideration of innovative approaches
- Well-articulated narrative for project need / problem statement
- Funding amount requested / other funding contributions secured.

Social and Economic Drivers

Canberra and the surrounding local government areas in south-east NSW is one of the fastest growing regions in Australia. However, the region's ability to capitalise on its competitive advantages is constrained by several factors not least of which are the impacts of the ACT-NSW border and variability in transport infrastructure capacity and capability. The ACT and NSW and surrounding local Governments having increasingly been acknowledging the importance of transport infrastructure on the growth and development of the region.

By 2036, the combined population of the ACT and the local government areas within an hour's commute of Canberra will be approximately 680,000 people - a larger population than the Gold Coast today. By this time the Canberra Airport and to a lesser extent the Port of Eden will be a major driver of economic growth through increasing access to national and international export markets and tourism.

Canberra and the Capital Region have many existing and potential economic drivers. Canberra and the wider Capital Region are forecast to increase by about 192,000 people by 2036. Public administration was worth \$10 billion to the ACT economy in 2016/17 and employs 71,600 people from the surrounding region and it is expected to continue to grow. Agriculture added \$10.6 billion to the NSW economy in 2016/17 which was an increase from \$8.8 billion in the previous year. There has been a sizeable increase in the gross value of livestock products which now represents the majority commodity in the Capital Region. The south coast continues to contribute a sizeable proportion of oyster production to the NSW economy.

Canberra acts as an employment hub for the surrounding region with 24% of the Capital Region's labour force working within the ACT's borders. Of these workers, 20,500 indicated they drove to work according to the 2016 Census. The largest employer of commuters was public administration and safety, followed by health care.

Transport for NSW's *Draft Future Transport Strategy 2056* identified Canberra as one of three Global Gateway Cities. Figure ES-2 shows several national, state and regional links to Canberra. As a Global Gateway City, Canberra's catchment will continue to grow to a population of over one million people, who are reliant on Canberra to provide major health services (Canberra Hospital), major education facilities (Australian National University, University of Canberra etc.), major commercial core (City Centre), and global connectivity (Airport). Transport investment should focus on serving this growth and ensuring that regional connections support the new economic and employment opportunities generated by an increasing population. However, to realise the region's social and economic opportunities the concept of a borderless region must be achieved in practice.

Key regional employment sectors are tourism, health care and social assistance, manufacturing, construction, information technology, public administration, education and training, primary industries and renewable energy. Tourism is a key industry which impacts on the transport network through increased demand and congestion of strategic road networks during peak seasons and holiday periods (e.g. Kings Highway, Monaro Highway).

The growing importance of Canberra Airport to the regional economy stands out as a key economic driver. Canberra Airport is positioned to become a central freight hub for the region due to its lack of curfew and road connection to Sydney. It is expected to generate over 21,000 jobs by 2030 and contribute \$2.4 billion per year to the regional economy. There is a need to improve freight corridors throughout the region to best utilise this international gateway.



Figure ES-2 Regional NSW network showing links between regional cities and regional centres

Source: NSW Government, Draft Regional NSW Services and Infrastructure Plan, 2017

Corridor Selection and Option Testing

Corridor selection and option testing involved a two staged multi criteria analysis (MCA) process to identify seven priority transport corridors and ultimately prioritise 22 improvement options. Five categories of criteria were created and agreed for the assessment of priorities for corridors and treatment options:

- Productivity and economic growth
- Alignment to outcomes / objectives for the region
- Connectivity and liveability
- Sustainability and resilience
- Feasibility.

Each corridor and improvement option was assessed against 39 qualitative and quantitative assessment criteria measures. Strategic and micro simulation traffic modelling, crash analyses, GIS data mapping, high-level constructability reviews and cost assessments were undertaken to inform key criteria measures.

Seven priority corridors were chosen from 22 corridors shown in Figure ES-3. The warmer colours indicate a higher MCA score and thus higher priority for investigation. The seven corridors short-listed for further analysis were:

- Corridor 1 – Barton Highway (ACT), incorporating Barton Highway between the ACT/NSW border and GDE
- Corridor 4 – Morisset Road Extension, incorporating Morisset Road, Sandford Street and Gungahlin Drive between Sandford Street and Barton Highway
- Corridor 5 – The Y-Connection, incorporating Barton Highway between GDE and Federal Highway, Federal Highway between Morisset Road and Barton Highway, Northbourne Avenue between Barton Highway and Mouat Street, Ellenborough Street between Barton Highway and Ginninderra Drive and Mouat Street
- Corridor 9+10 – Glenloch, incorporating Glenloch interchange, William Hovell Drive, Tuggeranong Parkway between Cotter Road and Glenloch interchange and Parkes Way between Glenloch interchange and Commonwealth Avenue
- Corridor 11 – Parkes Way, incorporating Parkes Way and Morshead Drive between Commonwealth Avenue and Majura Parkway
- Corridor 12 – Pialligo Avenue, incorporating Pialligo Avenue between Majura Parkway and the ACT/NSW border
- Corridor 14 – Monaro Highway North, incorporating Monaro Highway between Isabella Drive and Pialligo Avenue.

Note that the Federal Highway (19), Barton Highway in NSW (20) and Northbourne Avenue (6) corridors all scored highly in the Stage 1 MCA but were excluded from further analysis because they have significant recent or current committed works. Furthermore, the Y-connection ranked lowly in the MCA but was included due to its strategic importance in the regional road network, connecting the Barton Highway, Federal Highway and Northbourne Avenue.

The options were developed in consultation with key stakeholders and were designed to address specific issues or problems identified in each corridor. The intent of this study is to identify high level priorities for plausible improvement options. The shortlisted options and resultant option rankings from the MCA analysis is summarised in Figure ES-4.

The ranking of options was based on criteria weightings agreed with the Working Group. In comparing options, several MCA scenarios were tested with different weightings for key criteria to test the rigour of the results and to see which options were sensitive to various criteria.

The top six options (or projects) and their indicative construction costs are:

1. Barton Highway / Gundaroo Drive / William Slim Drive interchange (grade-separation) - \$87.6M
2. Monaro Highway upgrade Hume, to enable an increased speed limit of 100 km/h between Hindmarsh Drive and to north of Johnson Drive, including grade-separation of key intersections and changes in local road accesses - \$191.9M
3. Lanyon Drive / Monaro Highway interchange (grade-separation) - \$59.2M
4. A package of works to complete the northern leg of the orbital freight route link between Barton Highway and Federal Highway via GDE, Sandford Street and Morisset Road - \$63.9M
5. Pialligo Avenue duplication (NSW border to Airport) - \$108.7M
6. Extend Ginninderra Drive to Northbourne Avenue and constrain Mouat Street access - \$34.6M.

A description and sketches of these options is given in Appendix B.

The projects ranked lower than the top six have merits and should be considered for delivery following progressing of the six highest priority projects.

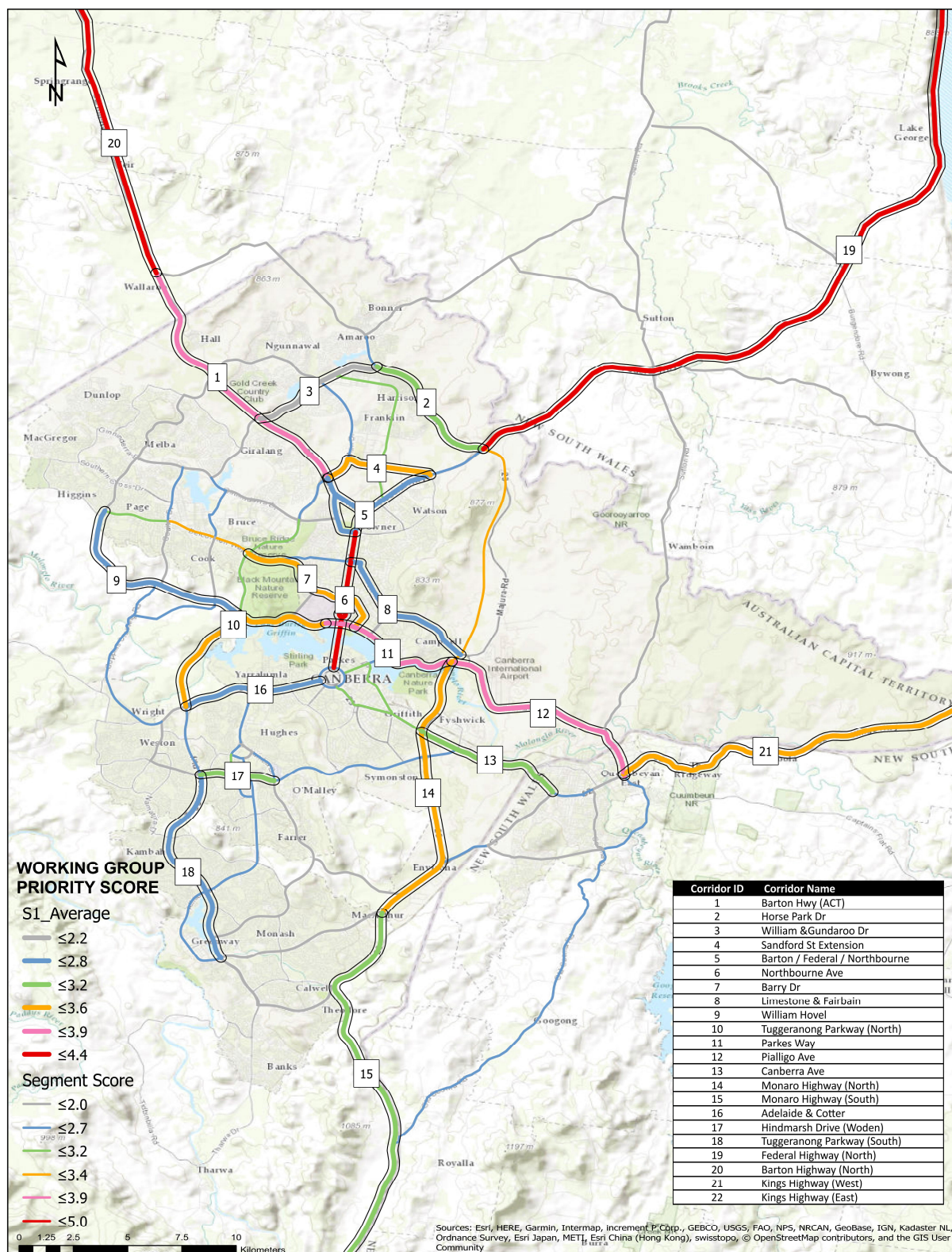


Figure ES-3 Initial priority corridors

*Note: Corridors 15, 19, 20 and 21 extend into NSW, beyond the extent of this map.
Corridor 22 is external to the east of this map, between Bungendore and Braidwood.*

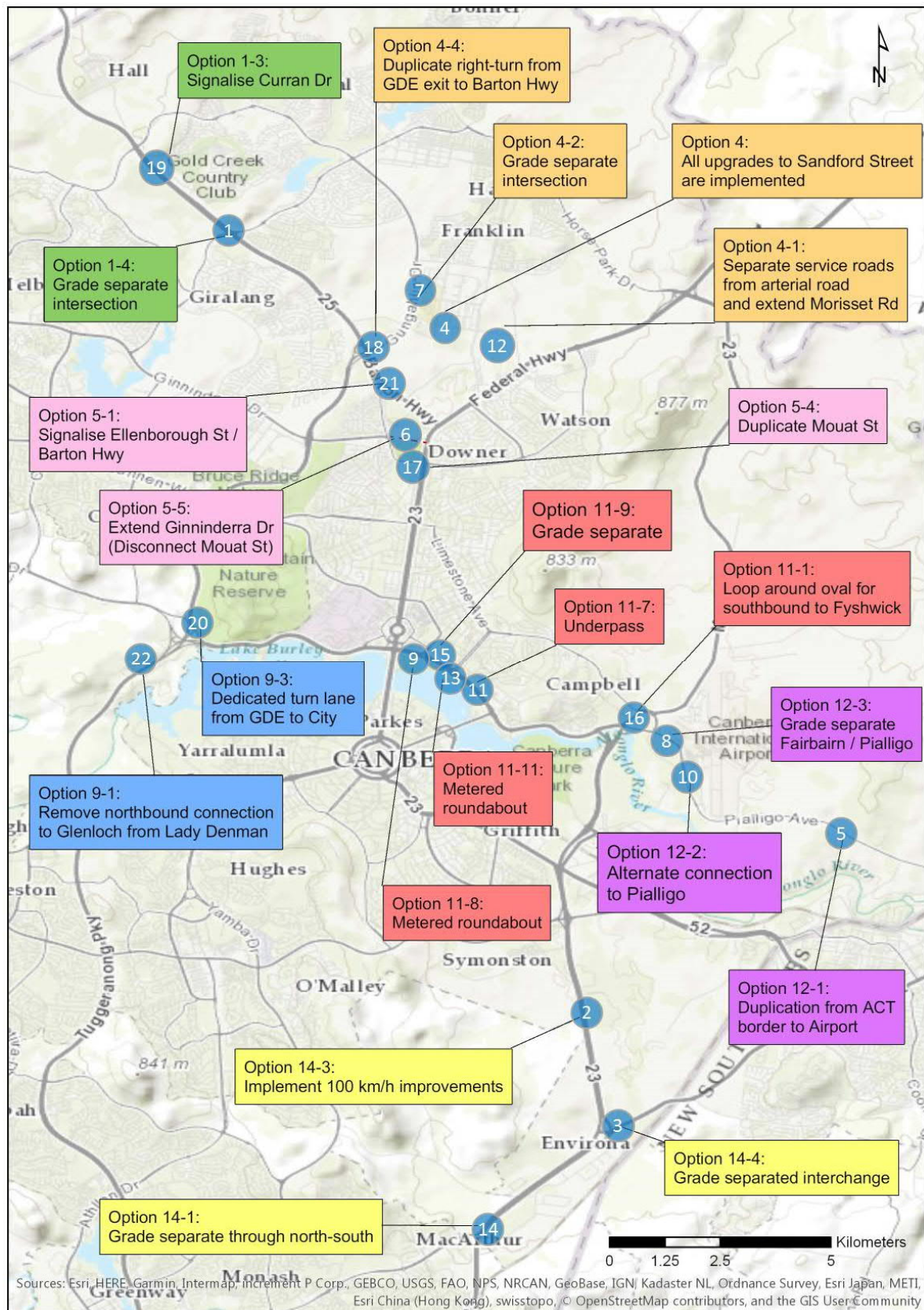


Figure ES-4 Option rankings

Note: One (1) is the highest ranked option and 22 is lowest

The above cost estimates do not include allowance for:

- Design and management fees
- Utility relocation; their impacts and relocation costs
- Property resumptions
- Environmental constraints, e.g. sensitive areas or impacts.

However, GST and a 40% construction contingency have been included.

Sensitivity tests with an emphasis on particular criteria or objectives showed a good correlation between the top six rankings across the scenarios, as indicated in Table ES-1 and Figure ES-4. The graph in Figure ES-5 shows the relationship between the scores for Scenario 1 (WG Priority) and other scenarios. It has two y-axes. The left-hand axis refers to the MCA scores in the coloured bars, whilst the right-hand axis refers to scores for Scenario 1 only. The difference between the black line and the score totals shows a relatively small variation in the sum of the scores for all scenarios compared with the Scenario 1 (WG) scores. This shows a consistent pattern, reflecting small differences in the scores for different options across different scenarios, giving added confidence in the top six results.

Table ES-1 MCA analysis of options

Project Description	1 – WG Priority	2 Freight	3 Safety	4 Productivity	5 Domestic	6 Cost	Average Ranks (Based on Score)
Barton/Gundaroo Grade Separate (1-4)	1	2	2	1	5	10	1
100km/h Monaro Improvements (14-3)	2	4	1	7	14	21	3
Lanyon/Monaro Grade Separate (14-4)	3	1	4	2	11	3	2
Sandford/Morisset (4 All Upgrades)	4	6	17	13	7	22	13
Pialligo Duplication (12-1)	5	12	3	5	12	20	7
Extend Ginninderra (5-5)	6	19	12	10	6	4	9
Sandford/GDE Grade Separate (4-2)	7	11	11	16	15	6	11
Fairbairn/Pialligo Grade Separate (12-3)	8	3	5	3	9	13	5
Coranderrk/Parkes Metered R-about (11-8)	9	7	6	6	1	1	4
Alternate connection to Pialligo (12-2)	10	5	7	4	10	2	6
Anzac/Parkes underpass (11-7)	11	16	16	9	2	17	10
Extend Morisset to Federal (4-1)	12	9	21	19	17	14	18
Anzac/Parkes Metered R-about (11-11)	13	13	13	8	4	5	8
Isabella/Monaro Grade Separate (14-1)	14	8	8	14	18	18	16
Coranderrk/Parkes Grade Separate (11-9)	15	17	10	11	3	19	12
EB-SB Loop Morshead to Monaro (11-1)	16	14	9	12	13	16	14
Duplicate Mouat (5-4)	17	21	20	21	16	15	21
GDE Extra SB-WB Right turn to Barton (4-4)	18	20	18	18	20	12	19
Curran/Barton Signals (1-3)	19	10	15	17	21	8	17
GDE Free SB-EB Left Turn to Parkes Way (9-3)	20	18	14	15	8	7	15
Ellenborough/Barton Signals (5-1)	21	22	22	22	22	11	22
Remove NB link from Lady Denman to GDE (9-1)	22	15	19	20	19	9	20

Note: 1. Options shown in order of rank from highest to lowest 2. WG is Working Group
3. All corridor 4 options include Morisset Road extension.

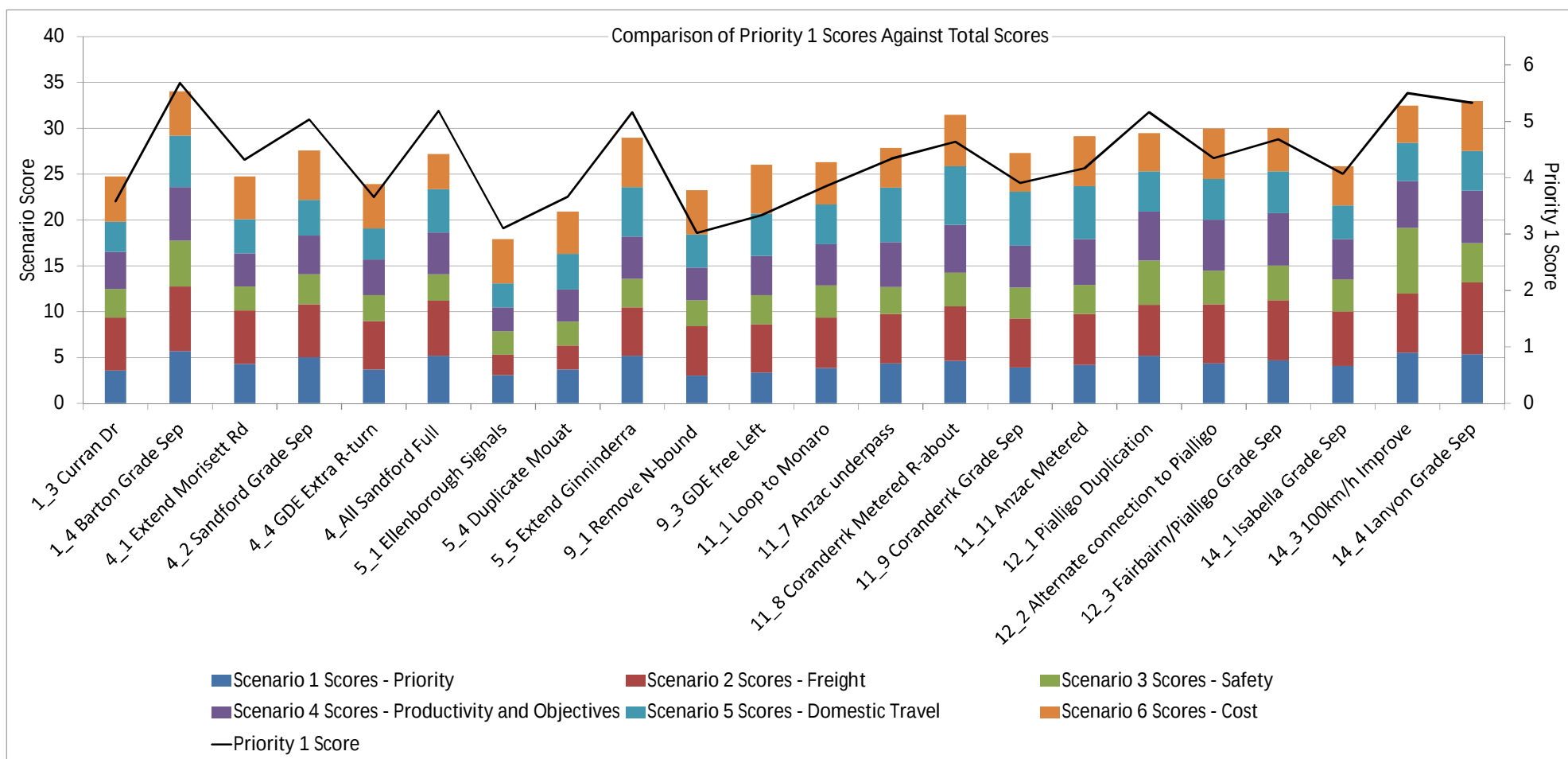


Figure ES-5 MCA scores summary comparison

Prioritisation

This prioritisation process results in the following work recommendations to be undertaken:

1. Feasibility and preliminary design study for a future overpass of the Barton Highway / William Slim Drive / Gundaroo Drive roundabout. The recently installed signals have significantly reduced delays and crashes here. Grade-separation will become a stronger consideration in future with development of the CSIRO land and duplication of Barton Highway in NSW.
2. A detailed feasibility study of the Monaro Highway corridor between Isabella Drive and David Warren Road to examine options and determine a preferred design for a 100 km/h roadway and a staged implementation plan. This should include the investigation and recommendations for a future road reserve to connect Isabella Drive with Dunns Creek Road and the impacts of these upgrade work on sections of Monaro Highway north of Hindmarsh Drive.

This project indicates that grade-separation at Lanyon Drive is the highest priority work in this corridor. It should be considered with a new connection between Lanyon Drive and David Warren Road, with the David Warren Road access at Monaro Highway modified.

3. Feasibility study for the Morisset Road Extension, including design and investigations of options for upgrading Sandford Street and an improved connection between Barton Highway and Federal Highway. This option is of significant strategic importance in terms of future freight and traffic safety benefits. Importantly, it would complete the Orbital Freight Route and provide an improved strategic freight connection between Barton Highway, Federal Highway, Majura Parkway, Monaro Highway, Pialligo Avenue and Kings Highway. It will help better accommodate heavy vehicle movements between the Barton Highway in the north-west and the Canberra Airport and Monaro Highway in the south-east in the medium to long term.
4. Update the PSP design of the Pialligo Avenue corridor between the ACT-NSW border and the intersection with Fairbairn Avenue and Beltana Road, including an examination of alternative options for connections to Pialligo, Fyshwick and Symonston. The focus of the updated design would be duplication between the ACT-NSW border and Brindabella Circuit. The investigation should recommend an implementation plan for Pialligo Avenue duplication and future connections.

In addition, the following studies should be instigated:

- Feasibility study to investigate the Ginninderra Drive Extension and constrained Mouat Street access to simplify the signal phasing at the intersection of Mouat Street, Antill Street and Northbourne Avenue. This should be compared with an option to duplicate Mouat Street. A preliminary concept design could be developed to form a basis for discussions with Yowani Golf Club, if the Ginninderra Drive Extension option is verified as being more important than duplicating Mouat Street.
- Feasibility study to investigate intersection improvements at the Sandford Street and Gungahlin Drive intersection including a grade separated interchange.
- Feasibility study of options to improve the capacity and operations of Monaro Highway between David Warren Road and Fairbairn Avenue, to upgrade to a 100 km/h speed limit. This would include consideration of a potential future Symonston Road interchange, improvements to the weave between Hindmarsh Drive and Canberra Avenue, improvements to the Newcastle Street and Morshead Drive ramp operations and the proposed eastbound to southbound loop from Morshead Drive to Monaro Highway.
- A detailed feasibility study for the implementation of metered traffic signals at the Parkes Way roundabouts at Coranderrk Street and Anzac Parade. Both intersections need to be treated to avoid adverse impacts of shifting the bottleneck and having an overall detrimental effect on broader network performance.
- Extend the current analyses and investigations in the next stage of this project to examine complementary projects and a potential package of projects to include in a program of works (e.g. similar to Easing Sydney Congestion program).

- Design study for an additional overtaking lane on Monaro Highway between Old Cooma Road and the NSW border. It is a key strategic link to south-east NSW, the snow-fields, the port of Eden and Eastern Victoria. Previous studies have shown that it has a poor safety record and highly variable traffic volumes causing traffic congestion at times and is worthy of more detailed investigation.
- A heavy vehicle route network study of ACT and regional connections to identify a clear road hierarchy for freight movements, including recommendations to reduce traffic conflicts on Northbourne Avenue and the light rail route. This review should collect data on heavy vehicle movements in the ACT and region, fill gaps in the current freight network and provide recommendations for network development to support freight movements. For example, Pialligo Avenue is a crucial link to the east to Kings Highway from Canberra Airport, but has a relatively low status in the current freight strategy. Also, there needs to be investigation into what route for heavy vehicle movements between the Barton Highway, the Airport and Monaro Highway should be favoured in terms of policy and infrastructure funding. While preference for freight movements are the national key freight routes (Barton Highway, Federal Highway, Majura Parkway and Monaro Highway), alternative options need to be investigated to connect the national key freight routes to Canberra Airport and major freight destinations.



1.0

INTRODUCTION

1.0 Introduction

1.1 Background

This study was commissioned to ensure that the ACT Government and other key stakeholders, including the Australian Government have an evidence base against which they can evaluate and prioritise future transport infrastructure investment in the region. The project primarily focussed on C+1, namely Canberra and the local government areas and towns within a one-hour commute. This includes the local government areas of Queanbeyan-Palerang, Goulburn-Mulwaree, Yass Valley and Snowy Monaro but was cognisant of the important economic and social drivers outside of this radius.

This project revolved around a series of stakeholder meetings and a two-stage multi-criteria analysis (MCA) of corridor and infrastructure investment priorities. Meetings discussed project and policy objectives, key social and economic drivers for the ACT and region, assessment criteria to be used for selection of priority transport corridors and a prioritised road infrastructure investment list. Seven key transport corridors were selected for detailed traffic modelling and assessment. A road infrastructure investment priority list has been produced and further actions recommended.

1.2 Project objective

The primary objective of this project is to develop a prioritised road infrastructure investment list for the ACT and region using transport, economic, social and environmental indicators. In addition, in consultation with ACT Government, this project is to:

- Develop an in-depth understanding of the region's economy and related road transportation infrastructure requirements, including the serviceability and capacity of the current infrastructure to 2031.
- Foster relationships with key regional economic and transportation stakeholders to help ensure a collaborative approach to determining infrastructure priorities and the achievement of funding.
- Model and evaluate road transport infrastructure investment options to assist in determining funding priorities through shared and collaborative stakeholder workshops.
- Develop and refine investment prioritisation criteria for regional and local transport infrastructure through workshoping in collaboration with key stakeholders.
- Produce documents for circulation to ACT and Australian Government stakeholders, forming a basis for directions for future works programs and priorities.

1.3 Report purpose

This report outlines the processes and outcomes of achieving the project objective. It is a summary report to inform stakeholders of the project, including an outline of background processes and recommendations. It summarises key aspects of previous reports produced as part of this project, as follows:

- Part 2 – Literature Review (AECOM 2018a)
- Part 3 – Australian Government Infrastructure Investment Programs (KPMG 2018)
- Part 4 – Regional Social and Economic Analysis (AECOM 2018b)
- Part 5 – Regional TransCAD Model Development (AECOM 2018c)
- Part 6 – Traffic Modelling Report (AECOM 2018d)
- Part 7 – Road Infrastructure Investment Prioritisation (AECOM 2018e).

More details are provided in the respective reports.

1.4 Report structure

The report is structured as follows:

- Chapter 2 provides an outline of the research, analysis and processes undertaken through the project
- Chapters 3 and 4 summarise some of the background research and analysis undertaken to inform the project with regards to regional policy objectives and drivers
- Chapter 5 describes the Stage 1 MCA analysis and criteria to identify priority corridors in the region
- Chapter 6 describes the Stage 2 MCA analysis and criteria to identify priority options
- Chapter 7 provides recommendations from this project.



2.0

ANALYSIS FRAMEWORK

2.0 Analysis framework

The analysis framework used in this project is depicted in Figure 1. It is an evidenced based transport process involving:

- A social and economic analysis of regional drivers
- Development of a broad range of regional and domestic investment criteria
- Regional and domestic traffic modelling and testing
- Development of prioritised program of works using a multi-criteria analysis (MCA) method.

This process was supported by GIS mapping of transport, accessibility and economic indicators.

A two stage MCA process was used in this project, as follows:

1. **Stage 1 MCA** – strategic level assessment to identify transport corridors which are likely to offer the best social and economic growth potential within the region.
2. **Stage 2 MCA** – more detailed assessment to determine works priorities for the short-listed corridors.

The primary steps in this process were:

- Selection of assessment criteria and their relative weightings in early stakeholder meetings
- Establishing criteria measures and scores in a Stage 1 MCA conducted to select seven key corridors for more detailed assessment
- Developing and assessing options for road improvements in the seven corridors, including micro-simulation traffic modelling of short-listed options
- A Stage 2 MCA to develop an infrastructure investment priority list and further recommended actions.



Figure 1 Assessment framework

2.1 Government policy objectives and infrastructure programs

Funding is essential to the delivery of transport infrastructure. It can be sought from multiple sources including all tiers of government and at times, from the private sector.

There are also a number of government objectives that influence the delivery of infrastructure. Funding is generally linked to key strategic objectives, policy commitments and desired outcomes for regions. There are also a number of government objectives that influence the delivery of infrastructure. These have been reviewed as part of this project and are outlined in Chapter 3, together with a list of opportunities for Australian Government 'match' funding for transport infrastructure and insights into the factors critical to securing funding.

2.2 Social and economic drivers

There is an extensive body of literature and studies available regarding transport, land use planning and economic development in Canberra and the surrounding regions. This includes literature that is jurisdiction-specific and other documents that cover the region more broadly.

Drawing upon the outcomes of a literature review and other information sources, the consultant team prepared a regional social and economic analysis of the Canberra region. The analysis is focussed on the region's key social and economic drivers and associated transportation requirements. It also flags known priorities of the various governments and key stakeholders.

The analysis aims to identify existing and emerging social and economic drivers. It also highlights where improved transport infrastructure can increase productivity and address other constraints and challenges. This can assist with building business cases that incorporate both tangible and intangible benefits.

The outcomes of this analysis are outlined in Chapter 4.

2.3 Strategic modelling

To better understand the existing and future travel demand for the ACT and region transport network, the Canberra Strategic Transport Model (CSTM) has been extended to include roads and towns within about one hour of Canberra (see Figure 2). It includes the main regional roads that service the regional area, Yass to the northwest, Gunning to the north, Goulburn to the northeast, and Bungendore to the east. Murrumbateman and Gundaroo are also part of the extended model coverage.

A base model was calibrated for 2016 travel demands and a future model representing future 2031 demands produced. The strategic model was used to:

- Provide future travel demand and operational data for use in the Stage 1 MCA
- Determine growth in travel demand for assessment of options in the priority corridors modelled in micro-simulation.

Key outputs from this modelling and considerations for corridor prioritisation are outlined in Chapter 5.

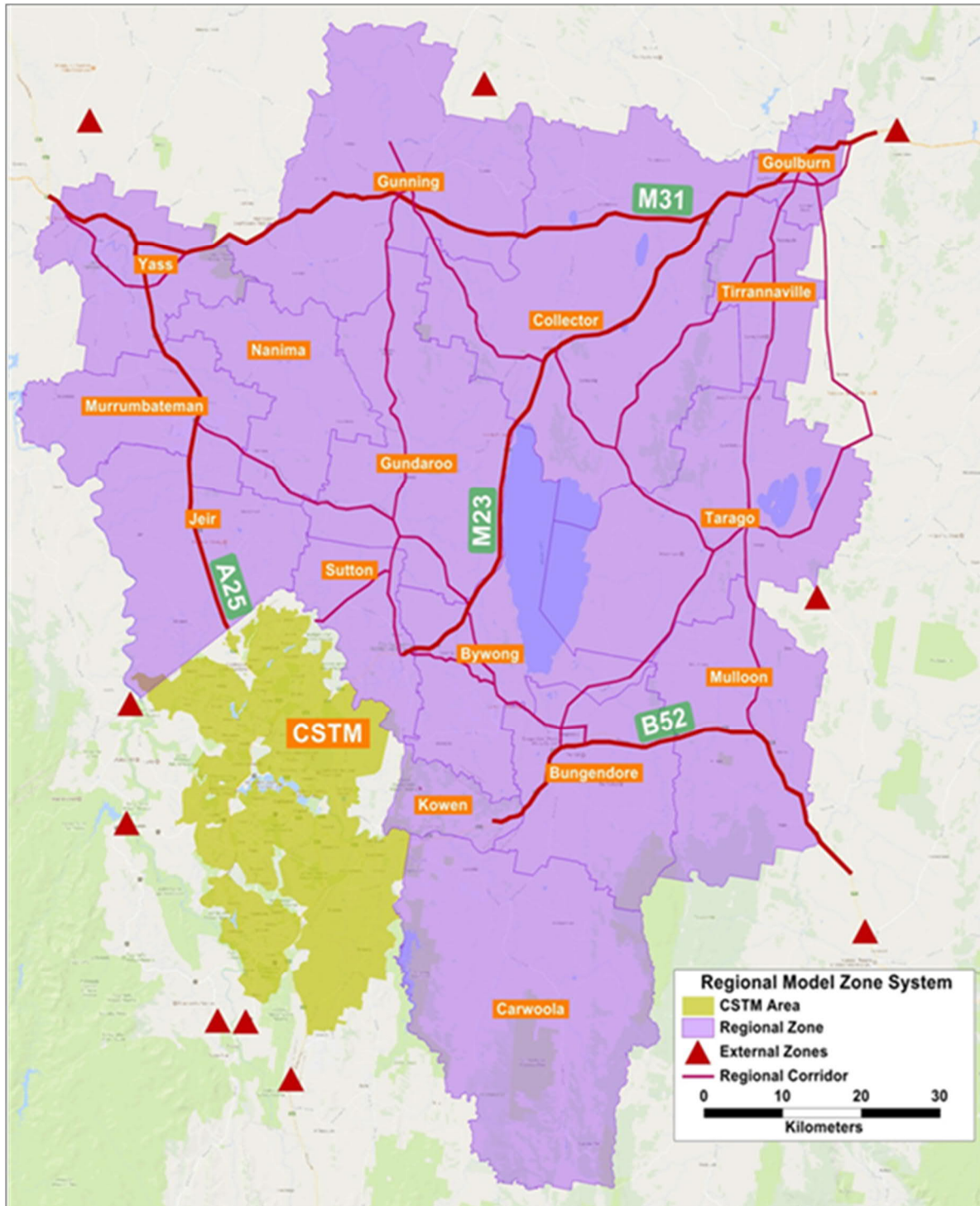


Figure 2 Regional zone system and modelled road network

2.4 Corridor prioritisation (Stage 1 MCA)

Corridor prioritisation started from the identification of roads of strategic importance in the ACT and regional road network (Figure 3). These were identified by examining maps of the road hierarchy, freight routes and the locations of key activity centres and then broken into a number of relatively homogeneous road segments for the purpose of assigning scores to each criterion.

The Stage 1 MCA identified 21 priority corridors and short-listed seven corridors for the development and detailed assessment of upgrade options in each corridor.

The MCA process involved four key tasks:

1. Identification of assessment criteria
2. Criteria weightings
3. Criteria scores – raw and weighted
4. Sensitivity testing of weights.

The MCA process was used to determine priorities for different corridors. It can also be used to assess alternative improvement options within a corridor.

2.4.1 Identification of assessment criteria

Criteria were developed by the consultant team by workshopping it with key stakeholders. Five criteria categories were created and agreed as being relevant to the assessment of priorities for corridors and options. For each category, a set of criteria were defined. Table 1 provides a list of categories and criteria as an outcome of stakeholder discussions. The definitions of assessment categories and criteria are given in Appendix A.

2.4.2 Criteria weightings

The relative importance of each criteria category was agreed at a Project Coordination Group (PCG) workshop on 12 February and reviewed at a Steering Committee Meeting (SCM) workshop on 14 February 2018 (see Table 2). The importance of each criterion was then defined by the consultant team so that the category weightings generally aligned with the importance of categories from the PCG and SCM. The weightings reflect the consultant team's understanding of the relative importance of the individual criteria, based on their alignment with government policies, objectives and strategies.

2.4.3 Criteria scores

Road segments were scored using a combination of objective/quantifiable criteria (e.g. travel time savings, crashes and cost criteria) and qualitative criteria (e.g. alignment with transport strategies). For each road segment evaluated, a relative score for the perceived performance of that segment for each of the criteria is needed.

Criteria can be scored on either a relative or ordinal scale. An ordinal ten-point scale has been adopted for this project and this was used for both qualitative and quantitative criteria. Objective criteria are readily defined, but not all qualitative criteria. The latter are more subjective.

Qualitative criteria were assessed on a 0-10 scale using an informed assessment of the likely impact/alignment/outcome of each criterion for each road segment. For the quantitative criteria, scores were transformed such that the maximum value for each criterion was changed to 10 and the minimum value was changed to 0, with intermediate values scaled between 0 and 10. This transformation then kept the ranking of segments consistent.

A weighted MCA score is calculated by factoring the criterion weighting by the raw score for each criterion on each road segment. These are then summed to determine an overall score for a corridor. Corridors (or options) with higher overall scores were prioritised.

Sensitivity testing was undertaken against the agreed weightings to ensure stability in corridor selection. A number of scenarios were tested with different weightings for key criteria to test the rigour of the results and to see which corridors are sensitive to various criteria.

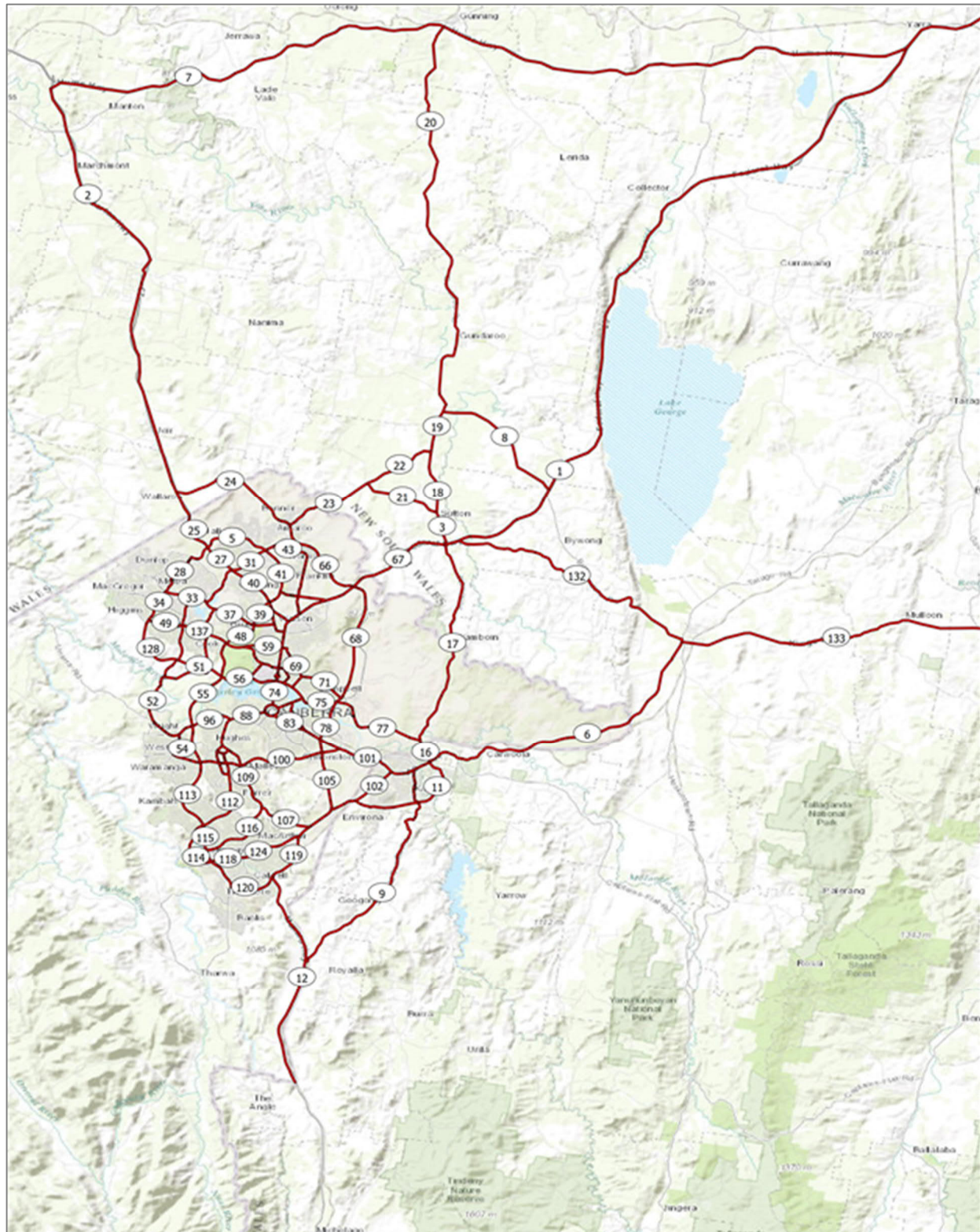


Figure 3 Roads of strategic importance

Note: The circled numbers are termed road segments used in assigning criteria scores in the MCA process.

Table 1 Categories and Criteria

Category	Criteria
Alignment to outcomes/objectives for the region	Improves user safety for all modes
	Facilitates ACT plans and strategies
	Facilitates relevant Commonwealth, State, Regional, and Local Government plans and strategies
	Engages stakeholder and partner support
Connectivity and liveability	Serves land use planning including growth areas
	Facilitates borderless regional transport network
	Links to activity centres and key destinations
	Protects urban amenity
Productivity and economic growth	Supports freight efficiency
	Benefits existing and emerging industries
	Provides travel time savings and reliability
	Provides opportunities to access jobs and markets
Sustainability and resilience	Supports active and public transport use
	Protects environment (environment impacts and benefits)
	Protects community (social impacts and benefits)
	Improves resilience of transport network
	Provides whole of life benefits including facilitating staging and future proofing
Feasibility	Provides clear problem statement
	Affordability
	Ease of construction and staging
	Potential for co-contributions

Source: AECOM (2018a)

Table 2 Relative importance of categories for Stage 1 MCA

Category	PCG		Steering Committee		Stage 1 MCA	
	Rank	Votes	Rank	Votes	Applied Voted	Resulting %
Alignment to Objectives for the Region	1	13	2	7	7	26%
Connectivity and Liveability	2	9	3	10	10	37%
Productivity and Economic Growth	3	6	1	8	8	30%
Sustainability and Resilience	3	6	4	2	2	7%
Feasibility ¹	5	5	5	6		0%

¹ Feasibility was not considered as part of the Stage 1 MCA as actual projects within possible corridors were not known then.

2.4.4 Priority corridors

The Stage 1 MCA commenced at a micro level using road links or segments, which can be amalgamated in various ways to form corridors. It identified 22 priority corridors and short-listed seven corridors for the development and assessment of upgrade options in each corridor.

The 22 corridors and overall MCA scores based on project Working Group (WG) criteria priorities are shown in Figure 4. The warmer colours indicate a higher MCA score and thus higher priority for investigation. More details of the corridor analysis are included in Chapter 5.

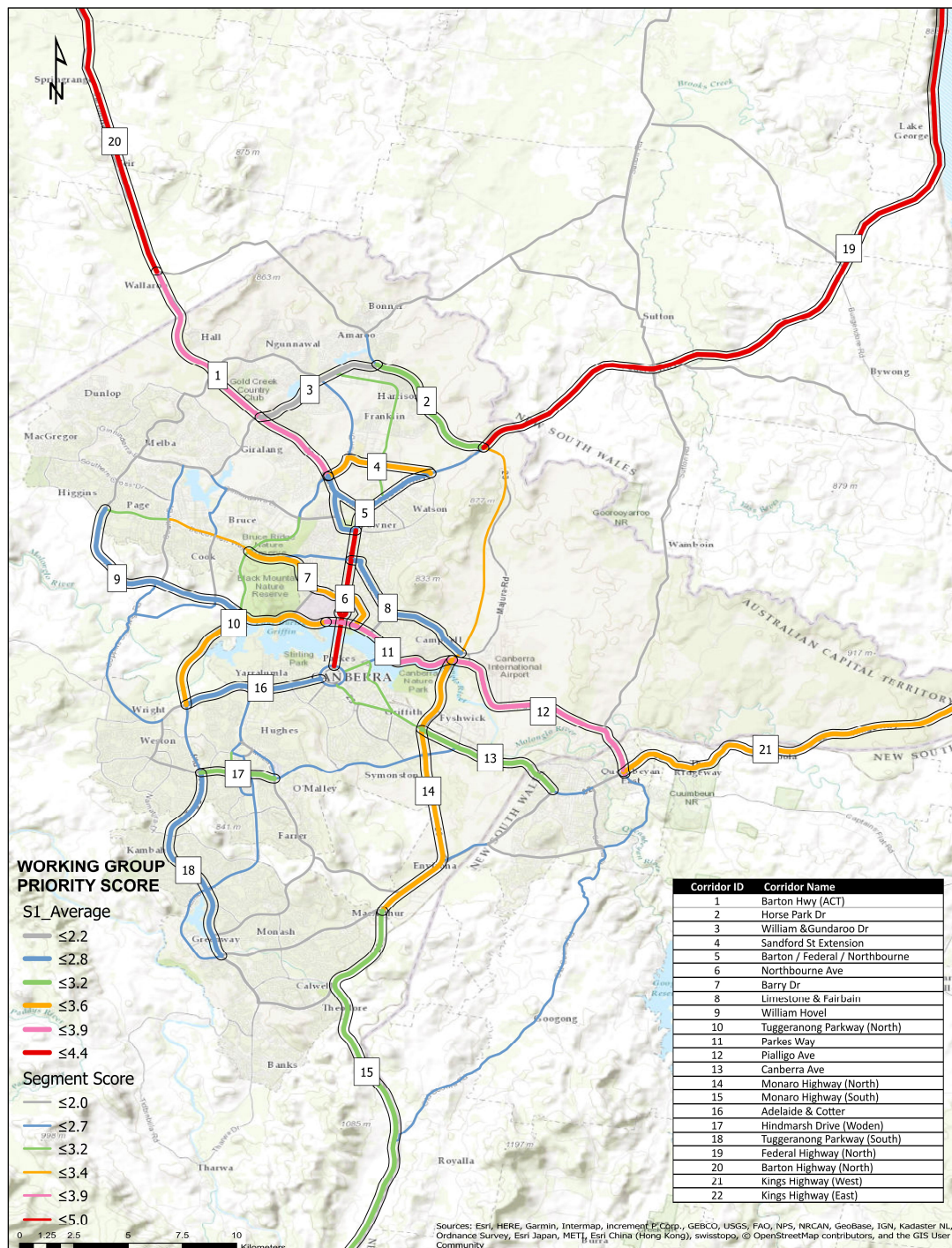


Figure 4 Initial priority corridors

Note: Corridors 15, 19, 20 and 21 extend into NSW, beyond the extent of this map.

Corridor 22 is external to the east of this map, between Bungendore and Braidwood and had the lowest average score.

2.5 Micro-simulation traffic modelling

The seven short-listed corridors were split into two micro-simulation traffic modelling packages – a northern and a southern package. The southern package shown in Figure 5 includes:

- Corridor 9+10 – Glenloch, incorporating Glenloch interchange, William Hovell Drive, Tuggeranong Parkway between Cotter Road and Glenloch interchange and Parkes Way between Glenloch interchange and Commonwealth Avenue
- Corridor 11 – Parkes Way, incorporating Parkes Way and Morshead Drive between Commonwealth Avenue and Majura Parkway
- Corridor 12 – Pialligo Avenue, incorporating Pialligo Avenue between Majura Parkway and the ACT/NSW border
- Corridor 14 – Monaro Highway North, incorporating Monaro Highway between Isabella Drive and Pialligo Avenue.



Figure 5 Aimsun Model Package 1 – Southern Area

The northern package shown in Figure 6 includes:

- Corridor 1 – Barton Highway (ACT), incorporating Barton Highway between the ACT/NSW border and GDE
- Corridor 4 – Morisset Road Extension, incorporating Morisset Road, Sandford Street and Gungahlin Drive between Sandford Street and Barton Highway
- Corridor 5 – The Y-Connection, incorporating Barton Highway between GDE and Federal Highway, Federal Highway between Morisset Road and Barton Highway, Northbourne Avenue between Barton Highway and Mouat Street, Ellenborough Street between Barton Highway and Ginninderra Drive and Mouat Street.

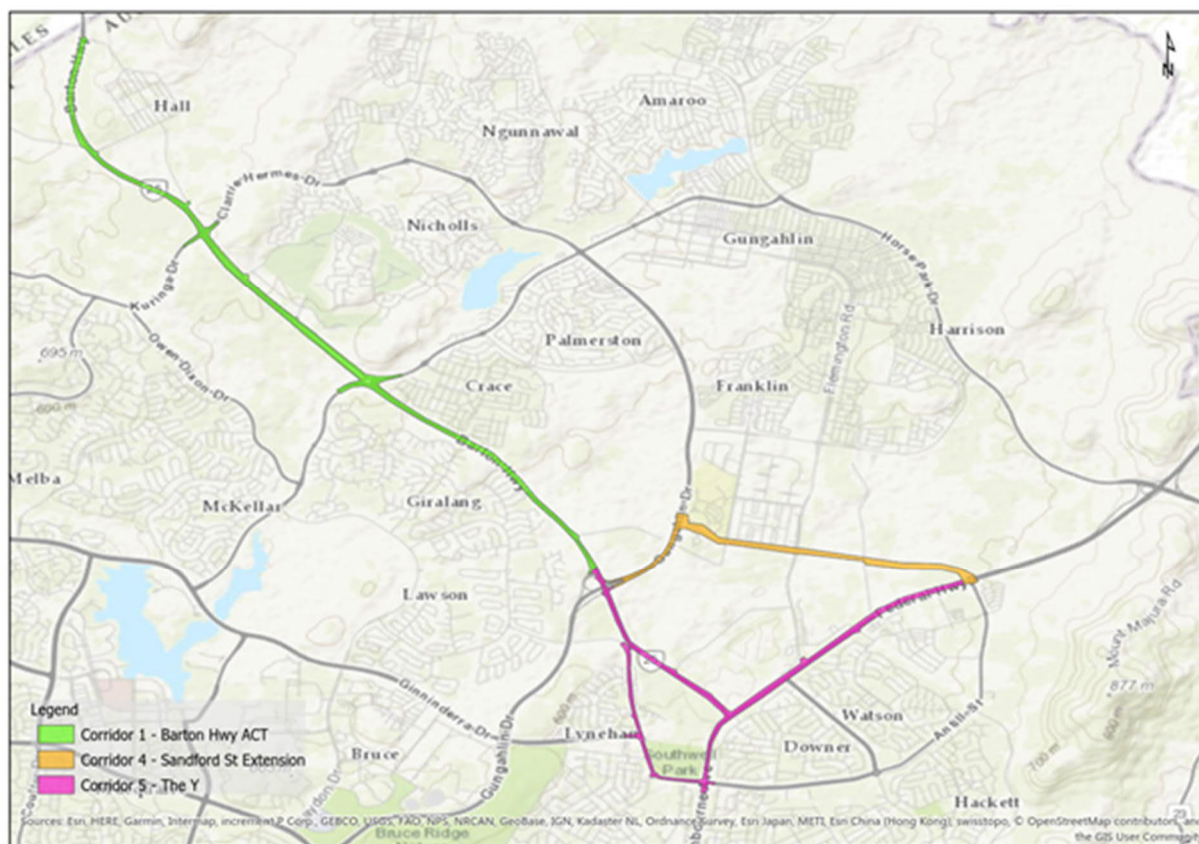


Figure 6 Aimsun Model Package 2 - Northern Area

Model development was tailored to fit the project requirement for a rapid high-level assessment tool capable of distinguishing the scale of benefits for each of the options to be tested and provide indications of option benefits in terms of travel time savings and reduced traffic congestion levels.

Modelling was undertaken in three phases for both the AM and PM peaks:

- Phase 1 – Base year (2018) model development and calibration
- Phase 2 – Future 2031 base case analysis
- Phase 3 – Future 2031 option case analysis.

The base models were calibrated against a large number of tube classification counts and SCATS counts collected in 2017 and 2018, which were made consistent using the best data available. The models are suitable for comparing strategic network options for the purposes of this project.

2.6 Option development

Ideas for options in the priority corridors were developed in a collaborative process involving the AECOM team, the Working Group (WG) and Project Control Group (PCG). The steps involved in this process were:

1. Workshops to discuss selection of the priority corridors and potential constraints and improvement opportunities in these corridors (WG & PCG – May 2018).
2. Development of options to address constraints and opportunities, including an initial ranking of options using a mini-MCA with safety, capacity and indicative cost criteria (AECOM – June 2018).
3. Workshops to discuss options and rankings (WG & PCG – July 2018).
4. Meeting with WG to agree on extent of micro-simulation models and options to be assessed (August 2018).
5. Refinement of options descriptions and concept sketches for inclusion in micro-simulation models.

The location and a summary description of the options are provided in Chapter 6.

2.7 Option prioritisation (Stage 2 MCA)

Another more detailed MCA was undertaken following option development and micro-simulation traffic modelling of options. This used the same categories and similar criteria as for the Stage 1 MCA, but additional data was available specific to each option being assessed.

The MCA process for selecting priority infrastructure options is like that used for the Stage 1 MCA process for selecting priority corridors. It included the following tasks:

1. Revise criteria scores against which the options are to be assessed
2. Score the relative importance (weightings) of each criterion for each option
3. Review each option against Stage 2 MCA scores, including sensitivity testing.

2.7.1 Criteria weightings

The relative importance of each category (weightings) for the Stage 2 MCA was agreed through a collaborative approach at project Working Group (WG) workshops on 12 and 18 September 2018. This was a modified version of the weights agreed to be used in the Stage 1 MCA, taking account of feasibility (e.g. construction cost) in assessing options.

The resultant weightings are shown in Table 3. A higher weighting was given to feasibility and productivity, with a resultant reduction in the weighting for connectivity. The importance of each criterion was then defined by the consultant team so that the category weightings generally aligned with the importance of the categories in Table 3.

Table 3 Relative importance of categories for Stage 2 MCA

Category	Stage 2 MCA %
Alignment to Objectives for the Region	25%
Connectivity and Liveability	10%
Productivity and Economic Growth	44%
Sustainability and Resilience	5%
Feasibility	16%

Sensitivity tests for alternative weighting scenarios were undertaken to test the rigour of the results and to see which options were sensitive to various criteria. These are described in Chapter 6.

2.7.2 Criteria scores

There was a total of 37 criteria measures used in the Stage 2 MCA. Nine new or updated measures were created as part of the Stage 2 MCA, accounting for micro-simulation modelling results, option costs and impacts, and additional heavy vehicle volume data. Raw data from the corridor analysis was used for the remaining 28 criteria measures.

Criteria data for corridors is associated with road segments defined in Figure 3. Options can be adjacent to one or more segments. The maximum road segment criteria measure associated with each option was generally used in the Stage 2 MCA analysis, except for some criteria that could be better defined once an option was selected (e.g., environmental impacts, utility impacts).

2.7.3 Priority options

The output of the Stage 2 MCA was an infrastructure investment priority list. The Stage 2 MCA was used to analyse 22 options, including a combined option for corridor 4 (All upgrades Sandford/Morisset). It identified six priority options for future investigation and design, as described in Chapter 6. The lower priority projects also have merits and should be considered for delivery following progressing of the six highest priority projects.



3.0

GOVERNMENT INFRASTRUCTURE PROGRAMS

3.0 Government Infrastructure Programs

3.1 Policy objectives

The project objective has been described in Section 1.2. There are also a number of government objectives that influence the delivery of infrastructure. Some of these are outlined below and more detail is provided in the documents produced in Parts 2 to 4 of this project (AECOM 2018 a, b; KPMG 2018).

Funding is essential to the delivery of transport infrastructure. It can be sought from multiple sources including all tiers of government and at times, from the private sector. Funding is generally linked to key strategic objectives, policy commitments and desired outcomes for regions.

3.1.1 Australian Government

Australian Government programs are guided by six purposes as outlined in the Department of Infrastructure, Regional Development and Cities (DIRDC) 2017-18 Corporate Plan:

- Keeping transport secure
- Supporting economic growth through transport
- Making travel safer
- Increasing transport access
- Supporting regional development and local communities
- Providing good governance in the territories.

There are also a number of more specific objectives relating to individual roads programs, such as:

- Minimise environmental impacts
- Provide economic benefit (e.g. increasing the number of jobs, using local suppliers and goods, increasing the efficiency of a transport system or service delivery).
- Provide social benefit (e.g. improving regional amenity, improving community connections, providing opportunities for knowledge creation, efficiency and effectiveness of and access to local government services and facilities, addressing disadvantage or social equity and community cohesion)
- Improve road safety and access for better economic and social outcomes for community
- Improve the efficiency and safety of the network and productivity for heavy vehicle operations
- Drive tourism demand
- Improve the liveability, productivity and sustainability of cities.

The ability of the ACT Government to maximise funding success through the Australian Government is underpinned by effectively demonstrating linkages between analysis and infrastructure project assessment with government policy objectives and other key funding drivers.

3.1.2 ACT Government

The *ACT Planning Strategy: Planning for a Sustainable City* establishes how the Territory will develop into the future to meet the aspirations of the people and the environmental, social and economic challenges of the 21st century. Four transport strategies to achieve these aspirations are:

- Improve everyone's mobility and choice of convenient travel by integrating the design and investment of the various networks and transport systems with the land uses they serve.
- Ensure everyone has convenient access to a range of facilities, services and opportunities for social interaction by reinforcing the role of group and local centres as community hubs.
- Improve the city's efficiency, resilience to change and environmental sustainability by designing and incorporating innovative technologies and 'clean' initiatives into the physical infrastructure.

- Facilitate the development of a more prosperous region and a diverse economy by enhancing our travel and information networks and creating opportunities for a range of new enterprises.

Transport for Canberra: Transport for a Sustainable City (ACT Government, March 2012) is the primary policy document guiding the development of the ACT's transport system and the foundation of transport planning for the next 20 years, although it is currently being refreshed. Six principles guide the *Transport for Canberra* policies:

- Integration with land use planning.
- Active travel like walking and cycling are the easy way to get around.
- Provides sustainable travel options and reduces transport emissions.
- Safety for moving people however they get around.
- Accessibility for everybody whatever their level of mobility at any time or place.
- Efficient and cost effective, providing value for money for the government, business and the community by managing travel demand across the whole transport system.

3.1.3 NSW Government

The *Draft Future Transport Strategy 2056* sets out the vision, strategic directions and customer outcomes for the infrastructure and services plans for Greater Sydney and Regional NSW. The strategy is focused on six state-wide outcomes for the future mobility of NSW, shown in Figure 7. The aim is to positively impact the economy, communities and environments of the state, with these six outcomes set to be the focus of every planning decision.



Figure 7 Six customer and network outcomes

Source: NSW Government, *Draft Future Transport Strategy 2056*, 2017

The draft Plan highlights the following objectives for transport in Regional NSW:

- A safe, secure and resilient transport system that efficiently connects communities
- A transport system that improves productivity and supports regional economies and communities
- An equitable transport system that helps to vitalise our communities
- Accessible transport options for all customers
- A regional transport system that is reliable, flexible, personalised and responsive to customer needs
- A transport system that is affordable and makes best use of resources and assets.

More specific objectives in relation to freight transport include:

- Increase access for freight across the road and rail network
- Protect existing freight precincts and ensure sufficient future land use
- Ensure safe, efficient and sustainable freight access to places.

3.2 Funding program objectives

As part of this project KPMG (2018) undertook a review of funding sources available to assist funding transport infrastructure in ACT. The primary purpose of this review was to provide clarity regarding the different 'match' funding sources available in an ACT context, as well as to provide an overview of the specific criteria that are required to be met to maximise funding success.

The KPMG report explores the following:

- Overview information relating to the Infrastructure Investment Program: Funding Allocations
- The key characteristics of current 'match' funding programs relevant to the ACT (and connections to NSW) including:
 - Transport specific infrastructure investment programs
 - Investment programs that have a broader application, but may be utilised in a transport context.

The bulk of Commonwealth funding for infrastructure projects is awarded under the National Land Transport Act 2014 (the Act), which allows the Minister for Infrastructure and Transport to award funding for 'Investment Projects'. In addition to the funding provided under the Act, the Commonwealth funds infrastructure through a number of programs, primarily administered by the Department of Infrastructure, Regional Development and Cities (DIRDC).

The ability of the ACT Government to maximise funding success is underpinned by the ability to effectively demonstrate linkages between analysis and infrastructure project assessment with government policy objectives and other key funding drivers. These objectives, drivers and other specific application requirements to secure funding from these sources however is varied.

3.2.1 Infrastructure investment programs

A number of Commonwealth programs allocate a pool of funding to each state and territory for them to apportion to individual projects. Commonwealth infrastructure programs that have specific allocations for roads in the Australian Capital Territory are summarised in Table 4.

Table 4 Infrastructure Investment Program Allocations

Program	Objective
Roads to Recovery (R2R) Program	To improve road safety and access for better economic and social outcomes
Financial Assistance Grant	To improve the capacity of local governing bodies to provide their residents with an equitable level of services

Program	Objective
Infrastructure Investment: Road Component	To fund nationally significant road projects that will improve the efficiency and safety of the network
Interstate Road Transport Scheme	To fund maintenance of roads due to heavy vehicle use
Tourism Demand Driver Infrastructure	To fund tourism infrastructure projects that drive demand and contribute to the Tourism 2020 goal of doubling tourism expenditure

3.2.2 Match funding programs

There are also a number of 'match' funding programs for transport infrastructure projects. Those relevant to the ACT are shown in Figure 8 and objectives of the three key match funding programs in relation to roads are summarised in Table 5.

PROGRAM	AVAILABLE FUNDING	PROGRAM STATUS
National Rail Program	A total of \$10 billion will be spent across the funding period. No ACT specific allocation for FY18.	Not yet open
Black Spot Program	FY18: \$1.4 million (ACT Allocation)	Ongoing
Faster Rail (funding for business case development)	\$20 million	Current round closed with no additional funding announced
Heavy Vehicle Safety and Productivity Program	FY14 – FY21: \$328 million	Round 6 now open
Bridges Renewal Program	FY18: \$0.5 million (ACT Allocation)	Ongoing

Figure 8 Transport match funding programs

Source: KPMG, 2018

Table 5 Match funding programs for roads

Program	Objective
Black Spot Program	To reduce crashes on Australian roads
Heavy Vehicle Safety and Productivity Program	To upgrade roads to improve safety and productivity for heavy vehicle operations
Bridges Renewal Program	To upgrade and replace bridges to improve access for local communities and facilitate higher productivity vehicle access

3.2.3 Other relevant funding programs

A number of other programs have been identified by KPMG (2018) as providing funding for general infrastructure projects. Those relevant to the ACT are shown in Figure 9 and objectives of these funding programs are summarised in Table 6.



Figure 9 Other funding programs

Source: KPMG, 2018

Table 6 Objectives of other funding programs

Program	Objective
Building Better Regions Fund	To fund infrastructure that will result in regional economic development
Regional Growth Fund	Specific details of this program are yet to be finalised
Smart Cities and Suburbs Program	To encourage organisations to deliver collaborative smart city projects that improve the liveability, productivity and sustainability of Australian cities, suburbs and towns
City Deals	An instrument for bringing different levels of government together, to agree on a suite of objectives and interventions to achieve them, then allocating funding accordingly to the Deal.

City Deals are an opportunity to deliver better outcomes through a coordinated investment plan for cities and regions. City Deals are an agreement between all tiers of government to prioritise investment, and subsequently specific infrastructure projects, that deliver agreed local outcomes that are linked to national and state priorities. City Deals are currently a key priority of the Australian Government. Through the Smart Cities Agenda, there is a commitment to deliver a City Deal for each capital city in Australia. While works on an ACT or Canberra City Deal has not yet commenced, this commitment by the Australian Government provides an opportunity to ensure that policy objectives and project programs are effectively aligned.

3.2.4 Maximising funding success

KPMG's analysis of potential project investment programs and criteria by which match funding is allocated highlighted a number of key factors that maximise funding success. These factors are common across multiple programs and Figure 10 provides a thematic indication of the overarching requirements for any match funding application.

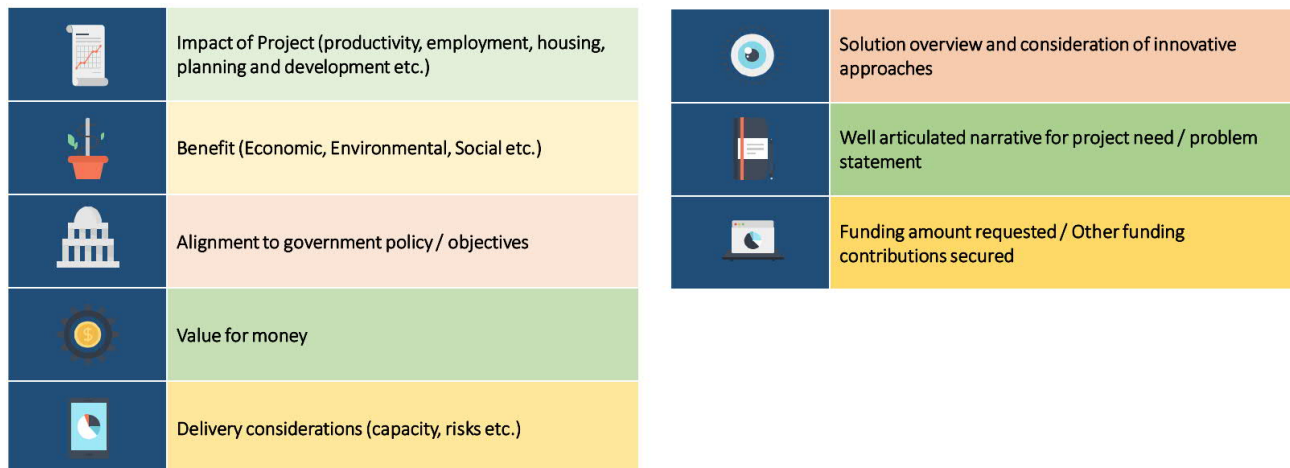


Figure 10 Factors for maximising funding success

Source: KPMG, 2018

In addition to the publicised assessment criteria for each program, there are a number critical success factors that have been identified as particularly imperative to match funding application success. These are summarised in Figure 11.

More detail is provided in the KPMG report (2018) with regards specific criteria of each match funding program. It also provides an indication of the alignment between each specific program criterion and the key factors that maximise funding success.

	Having in place strategic land use, economic, infrastructure and transport plans that articulate the vision and goals for the jurisdiction.
	Documented forward road and transport investment program/s which identify and position projects that may be eligible for Australian Government funding .
	Robust project and program assurance frameworks.
	Mature and trusted relationships with Department officials at officer and political level.
	Being able to articulate how projects align with Australian Government priorities and programs and Government interests more generally.
	Knowing what 'match' funding programs are available and 100% compliance with their application process, frameworks and timeframes.
	Demonstrating collaboration and agreement between different jurisdictions and different levels of government on proposed projects.
	Approaching submissions strategically , both in terms of deciding which pools of funding to pursue and in terms of timing funding application submissions.
	Demonstrating a willingness to be flexible when applying for funding and have a number of alternative options available.
	Demonstrating a willingness to contribute to the funding and financing of the project, or securing contributions from third parties.
	Ensuring the application is clearly and effectively presented , with diagrams, maps, charts and other visual media used where appropriate.
	Having a strong narrative to support both the need for the proposed project and the outcomes/benefits it will generate.

Figure 11 Critical success factors for program funding

Source: KPMG, 2018



4.0

SOCIAL AND ECONOMIC DRIVERS

4.0 Social and Economic Drivers

4.1 Regional context

Canberra and the surrounding local government areas in south east NSW is one of the fastest growing regions in Australia. However, the regions ability to capitalise on its competitive advantages is constrained by several factors not least of which are the impacts of the ACT-NSW border and variability in transport infrastructure capacity and capability. The ACT and NSW and surrounding local Governments have increasingly been acknowledging the importance of transport infrastructure on the growth and development of the region.

By 2033, the combined population of the ACT and the local government areas within an hour's commute of Canberra will be approximately 660,000 people – a larger population than the Gold Coast today. By this time, the Canberra Airport and to a lesser extent the Port of Eden will be a major driver of economic growth through increasing access to national and international export markets and tourism.

A literature review that formed part of this project (AECOM 2018a) details relevant transport and land use literature in the ACT and surrounding NSW, and provides an overview of the relevant Australian Government, ACT Government and NSW Government infrastructure drivers and plans. Together with the regional, social and economic analysis (AECOM 2018b), the literature review assists the ACT Government to better understand the region's transportation productivity requirements and key social and economic drivers, in the context of optimising the social and economic development of the region.

The NSW Government has identified Canberra as a Global Gateway City that will provide the state-level services and facilities required to support the growing population in NSW and drive economic growth. The increasingly important role of the Canberra Airport in terms of driving economic growth was repeatedly emphasised. Improved transport will broaden the city's catchment, improving access to major service precincts, advanced industries and international infrastructure for the purposes of travel and trade.

As a Global Gateway City, Canberra's catchment will continue to grow to a population of 1 – 1.5 million people, who are reliant on Canberra to provide major health services (Canberra Hospital), major education facilities (Australian National University, University of Canberra, etc.), major commercial core (City Centre), and global connectivity (Airport). The City Centre will be supported by a number of strategic centres within the metropolitan area such as Belconnen, a regional city at Queanbeyan, and regional centres within the broader region such as Goulburn and Bega. Transport investment should focus on serving this growth and ensuring that regional connections support the new economic and employment opportunities generated by an increasing population.

The growing importance of Canberra Airport to the regional economy stands out as a key economic driver throughout the documents. There is a need to improve freight corridors throughout the region to best utilise this international gateway. Improved transport will broaden the city's catchment, enabling efficient access to major service precincts, advanced industries and international infrastructure for the purposes of travel and trade. Planning for an efficient movement network as though there is no ACT-NSW border is critical.

Key regional employment sectors identified in the literature are tourism, health care and social assistance, manufacturing, construction, Information Technology, public administration, education and training, primary industries and renewable energy. Tourism is highlighted in many of the documents as a key industry which impacts on the transport network through increased demand and congestion of strategic road networks during peak seasons and holiday periods (for example Kings Highway, Monaro Highway). The Snowy Mountains contributes around \$429 million to the NSW South East and Tablelands economy each year and there are plans to develop it into a year-round alpine destination. Canberra's international tourist numbers reached 200,000 per year for the first time in June 2016, and the ACT recorded the highest growth rate of international visitors in Australia out of all of the states and territories.

Many policy and infrastructure documents recognise the interconnectedness of Canberra and its NSW local government neighbours. Productivity is a key feature of many of the documents, with the need to improve freight corridors identified as a key way to achieve it. Productive regional industries and connected regional communities are identified in the NSW State Infrastructure Strategy as a target, with a strategic objective to improve regional producers' access to domestic markets and international gateways through investments which support freight productivity.

Traffic congestion generated by peak season and holiday road users is associated with safety issues such as driver frustration, fatigue and dangerous overtaking. As these highways are also freight movement corridors, congestion also negatively impacts freight-dependent industries. It is estimated that diverted freight travel will cost NSW businesses almost \$1 billion over the next 20 years and require an additional 900,000 driver hours. Local road infrastructure 'pinch points' can constrain freight network connections, imposing higher costs on business and communities.

The literature suggests upgrades to regional road and transport infrastructure to ensure efficient and safe links within the Canberra Region, and to support growth in business and freight including upgrade of the Kings Highway and duplication of the Barton Highway. It is noted that investment in freight transport infrastructure often returns a 'double dividend', in that it also improves safety and passenger transport outcomes.

Productivity, sustainability, liveability and governance are the key benchmarks for national policy development. Table 7 illustrates NSW and ACT transport goals in the context of these national benchmarks and adopts corridor investigation categories for this project based on the strategic intent of each jurisdiction.

Table 7 Transport goals by jurisdiction

National	NSW	ACT	Adopted for Project – Corridor and Option Analysis
Productivity	Growing the economy	Efficient and cost-effective	Productivity and economic growth
Liveability	Successful places	Integrated with land-use	Connectivity and liveability
	Accessible services	Accessible for everybody	
Sustainability	Sustainability	Sustainable transport solutions	Sustainability and resilience
	Safety and performance	Safe for all users	
		Promotes active transport	
Governance	Customer focussed		Alignment to objectives for the region
			Feasibility

Source: National (Australian Government 2016), NSW (Transport for NSW, 2017), ACT (ACT Government, 2012)

Further details of the key findings and outcomes of infrastructure development drivers from various perspectives arising from the literature review follows in Sections 4.1.1 to 4.1.6, under the following headings:

- ACT-NSW MoU on regional collaboration
- Australian Government infrastructure plans
- ACT Government infrastructure plans
- NSW Government infrastructure plans
- Regional organisations' infrastructure plans.

The Part 2 report (AECOM 2018a) provides additional details.

4.1.1 ACT-NSW MoU on regional collaboration

The region's prosperity relies on an efficient transport network, a healthy rural and natural environment, and collaborative cross-border relationships. The interconnectedness of Canberra with its NSW local government neighbours is highlighted throughout the literature. However, in order to realise the region's social and economic opportunities the concept of a borderless region must be achieved in practice.

The 2016 recommitment to the ACT-NSW Memorandum of Understanding on Regional Collaboration (originally signed in 2011) includes economic development as a priority action area. The MoU reflects the desire to pursue a regional approach on a range of areas in recognition of the mutual benefits and increased opportunities that emerge through such collaboration. It has an objective of "supporting tourism and freight opportunities for the ACT and South East region, including through shared planning, transport and freight data, co-funded export and tourism industry development initiatives and collaboration between VisitCanberra and Destination NSW to develop tourism product for an international market".

Similarly, the Canberra Region Joint Organisation (CRJO) (formerly SEROC) which includes the Bega Valley, Eurobodalla, Hilltops, Goulburn Mulwaree, Queanbeyan-Palerang, Snowy Monaro, Upper Lachlan and Yass Valley Councils along with the ACT Government is in the process of developing a Canberra Region Economic Strategy (CREDS) aligning a focus on 'creating jobs' and 'building infrastructure'.

4.1.2 Australian Government infrastructure plans

The Australian Government released the *Smart Cities Plan* in 2016 to position Australian cities to succeed in the 21st Century economy. It sets out the Australian Government's vision for Australian cities (regional and metropolitan) and their plan for maximising cities' potential. The *Smart Cities Plan* indicates that the Australian Government will prioritise projects that meet broader economic and city objectives such as accessibility, jobs, affordable housing and healthy environments.

The *Australian Infrastructure Plan* (Australian Government, 2016) helps guide reforms in a regional context. This Plan is guided by four headline aspirations – (i) productive cities, productive regions; (ii) efficient infrastructure markets; (iii) sustainable and equitable infrastructure; and (iv) better decisions and better delivery. In relation to smaller cities such as Canberra, the Plan aims to help the smaller capitals grow their populations. The Plan suggests that Governments should investigate options to grow the population of our smaller cities beyond that suggested by current projections. Fast growing regional cities such as Canberra-Queanbeyan are the economic and service centres for their regions and have transport links to other capital cities, giving them access to a large base of suppliers and customers; and will continue to grow rapidly provided they have better infrastructure and access to skilled workforces.

In late 2016, the Australian Government announced it will develop a *National Freight and Supply Chain Strategy* to increase the productivity and efficiency of Australia's freight supply chain. The Strategy is in response to Infrastructure Australia's Australian Infrastructure Plan. The document titled, *Inquiry into National Freight and Supply Chain Priorities, Discussion Paper*, released in 2017, will inform the development of the strategy and determine how to best lift the productivity and efficiency of Australia's freight supply chain.

The Australian domestic freight task has been increasing strongly for the last 40 years. The domestic freight task increased by 50 per cent in the 10 years to 2016 and is forecast to grow another 26 per cent by 2026. The freight sector is also a significant driver of national economic outcomes.

Air freight is comparatively small by volume but is also growing at a rapid rate and is high in value. In the 10 years to 2015-16, international air freight volumes rose 37 percent to almost one million tonnes.

The major outbound airfreight products by weight in 2011 were perishable food, including meat, vegetables, fruit, fish and crustaceans. These represented over 40% of Australia's outbound air freight by weight. As they often come from regional locations and are perishable, such products require reliable supply chains to reach their international destinations. Major air freight imports by weight were office machines, manufactured products, clothing, other machinery and electrical items. The high value of air freight means that the value of trade value flowing through city airports can be similar to sea ports, although the volumes through seaports are much larger.

4.1.3 ACT Government infrastructure plans

The ACT Government's policy framework includes strategies (such as the *ACT Planning Strategy 2012*) notes that the ACT must work collaboratively with its regional neighbours to invest in transport networks, communication systems and urban settlement patterns that support the diversification of the economy and liveability of the City and region. The associated *Transport for Canberra* plan is intended to help guide a reduction in traffic congestion and greenhouse gas emissions while increasing the number of people using active travel and public transport.

The Strategy notes that the ACT must work collaboratively with our regional neighbours to invest in transport networks, communication systems and urban settlement patterns that support the diversification of the economy. For example, Canberra Airport, the rail infrastructure at Goulburn and the national highways into and out of the ACT provide a good basis for the distribution of freight to regional and international markets. Supporting Canberra Airport to operate over 24 hours will give the region a logistical advantage in the distribution of goods and produce.

The Strategy also notes that good accessibility is critical to any city and region's liveability. It ensures that everyone has the capacity to participate in community life – to get to work, services and social activities. Good accessibility means people have a choice of convenient travel options. With Canberra's very good road infrastructure and high levels of car ownership, 'ease of getting around' is considered one of the city's best features but it is also a challenge to maintain.

The Strategy notes that the development of a more prosperous region and diverse economy can be facilitated by promoting the liveability of Canberra and the knowledge and administrative based industries that have grown up around the business of delivering good government. This strong basis in Canberra, combined with the diverse agricultural region, provides opportunities to build complementary economic activities to develop and promote regional products that offer greater diversity in employment and expand on tourism.

The plan notes that expanding travel and freight connections will improve access to other regional, national and international markets. As well as lobbying for a high-speed rail, the region must take a strategic, coordinated approach to investing in air, road and other rail connections. A high-speed rail to Sydney and Melbourne will link Canberra to these commercial and financial capitals and make the region more accessible for tourism and more attractive to people seeking a lifestyle change.

The *Building an Integrated Transport Network – Freight* (Freight Strategy) study (ACT Government, 2016) aims to provide a strategic framework for freight to guide ACT's development of more sustainable, productive and safer freight services. It proposes a future orbital freight network which links to national and regional freight routes, as shown in Figure 12.

The proposed Morisset Road connection to Federal Highway is a key missing link in this network. Connections through Queanbeyan to Kings Highway and to Monaro Highway are also important and need greater emphasis in policy documents. In particular, Pialligo Avenue, a B-double vehicle route should be given more importance in the freight network. Canberra Avenue, while also a B-double vehicle route, is part of the planned intertown public transport route between Canberra and Queanbeyan. In contrast, Pialligo Avenue is not suited to public transport and provides the most direct connection between Canberra Airport and Kings Highway. This would complete an east-west freight route between Barton Highway, the Airport, Monaro Highway and Kings Highway, via Pialligo Avenue.

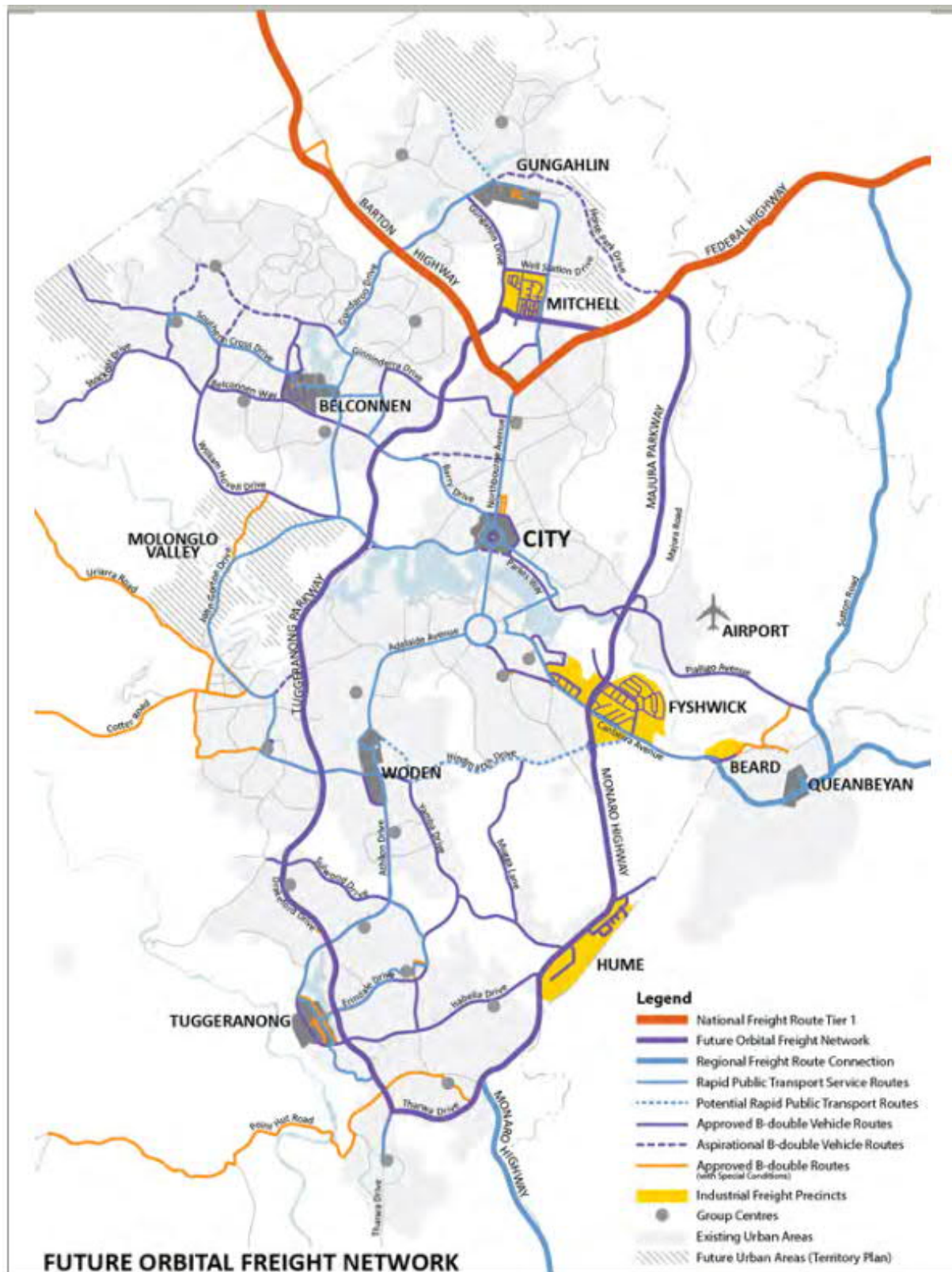


Figure 12 ACT future orbital freight network

Source: ACT Government, 2016

By volume, nearly all freight into and out of the ACT is road based, with more imports into the territory than exports. The majority of this comes from New South Wales as shown in Figure 13. Freight from NSW to the ACT is forecast to increase 720 million tonne-kilometres (tkm) from a 2007 estimate to 1,422 tonne-kilometres in 2030, at an average annual growth rate of 3.1%. Nationally, freight volumes are expected to double during the 2007 to 2030 period. Hence, the focus for infrastructure improvement for the ACT does not only highlight the freight network within the ACT, but also the freight routes that connect ACT to the national freight network.

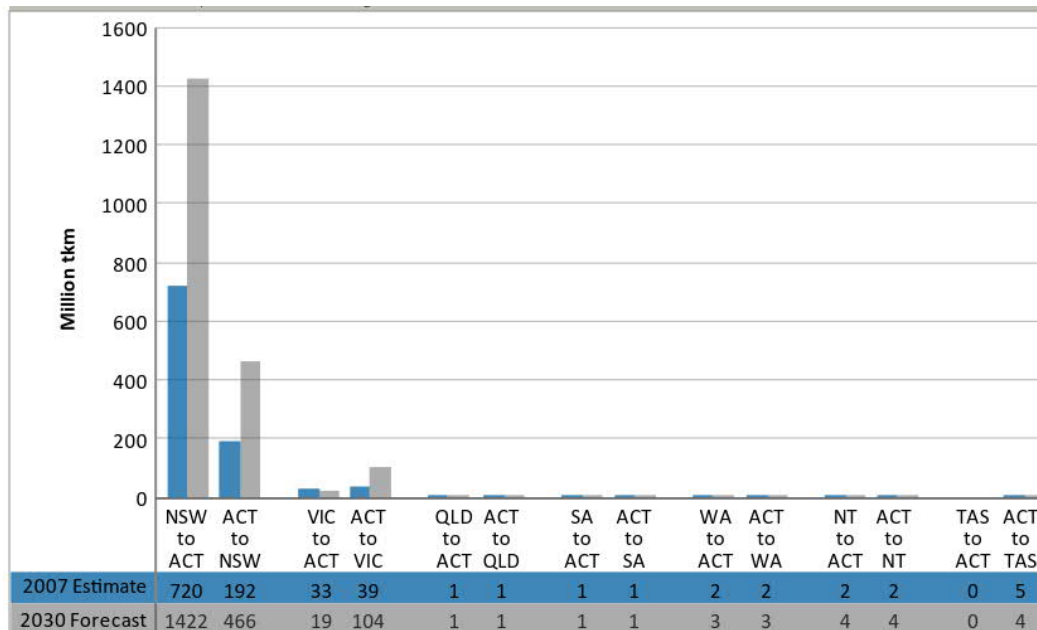


Figure 13 Interstate freight estimates and forecasts into and out of the ACT

Source: BITRE Interstate freight in Australia, Research Report 120, 2010

Improving the ability to move freight across the ACT border will provide better access to the international gateway of Canberra Airport. The Canberra Airport is recognised as a significant driver of economic development in the region in nearly all of the literature reviewed, with international flights and the airport's curfew-free operation providing an opportunity to attract new investment and industries. The airport's location is highly suitable for an international freight hub which would strengthen the region's competitive advantage as the freight transport and logistic hub of south eastern Australia.

4.1.4 NSW Government infrastructure plans

The NSW Government is investing in regional NSW through Rebuilding NSW. This includes spending \$6 billion in regional NSW, including \$2 billion for regional freight corridors, \$400 million to fix country rail, \$1 billion for regional water security and \$300 million for regional tourism and the environment.

The NSW Government's *State Infrastructure Strategy* (Infrastructure NSW, 2012) is a 20-year infrastructure investment plan that places strategic fit and economic merit at the centre of investment decisions. A target area under the Strategy is productive regional industries and connected regional communities. Strong population growth is predicted for the region over the next two decades, and the Strategy indicates that transport investment should focus on ensuring that regional connections support the new economic and employment opportunities generated by an increasing population.

Transport for NSW's *Draft Future Transport Strategy 2056* (Transport for NSW, 2017) identifies 19 regional cities and 27 regional centres in NSW. The 19 regional cities include Global Gateway Cities (Greater Newcastle and Canberra), which serve extended catchments around Canberra-Queanbeyan and the Hunter. Improved transport will broaden the catchment around each of these Global Gateway Cities, improving access to major service precincts, advanced industries and international infrastructure for the purposes of travel and trade.

The future regional NSW road network will be planned around a 'hub and spoke' model, as shown in Figure 14. The network will support local towns and Regional Cities and Centres and help make them better places to live, visit and do business. Investment priorities in regional NSW are guided by a vision for the growth and vibrancy of the regional cities and centres, with a focus on road upgrades and bypasses to improve liveability and road safety, and an expanded regional public transport network.



Figure 14 Regional NSW network showing links between regional cities and regional centres

Source: NSW Government, Draft Regional NSW Services and Infrastructure Plan, 2017

The *NSW Transport Strategy* places an emphasis on the importance of providing stronger links between regional cities and centres, rather than focussing on connections to Sydney or the interstate capitals. Along with this shift in focus, the draft Plan identifies Canberra as one of three Global Gateway Cities.

Key aspects of the Strategy's rationale behind Canberra as a Global Gateway City are:

- The Greater Canberra catchment will continue to grow to a population of between 1 – 1.5 million people.
- The plan notes that Canberra's federal government service functions and international air connections allow it to provide a broader range of services and amenities than the adjacent Regional Cities of Wagga Wagga and Albury/Wodonga.
- Canberra will play a dual role as the Global Gateway and major services hub for parts of the Murray-Murrumbidgee region, with key connectivity to the Regional City of Wagga Wagga.

- People living in the Greater Canberra catchment will rely on Canberra as their major city, providing major health services (Canberra Hospital), major education facilities (Australian National University, University of Canberra etc.), major commercial core (City Centre), and global connectivity (Airport).

Canberra as a Global Gateway City will provide the state-level services and facilities required to support the growing population in NSW. Canberra and Queanbeyan in particular will serve a broad catchment covering a significant portion of NSW to the north, south and south-east. In the plan, an emphasis has also been placed on the importance of providing stronger links between regional cities and centres, rather than focussing on connections to Sydney or the interstate capitals.

For the South-East and Tableland region where Canberra is situated, the NSW Government has proposed several policy, service and infrastructure initiatives for investigation. The Barton Highway duplication has been seen as necessary to ease congestion, improve safety and increase freight productivity along the route. The *Plan* also identifies east-west connections between inland and coastal areas as supporting population growth, increasing tourism and supporting trade links to the inland regions. These connections include Canberra to Batemans Bay (Kings Highway), and Canberra to Bega via Cooma (Monaro Highway).

A connected and prosperous economy is one of four goals in the South East and Tablelands Regional Plan 2036 (NSW Department of Planning and Environment, 2017). The *Plan* takes a cross border approach to economic investment, infrastructure delivery, servicing provision and housing development to facilitate sustainable growth and optimise economic prospects. The region's prosperity relies on an efficient transport network, a healthy rural and natural environment, and a collaborative relationship with the ACT.

Figure 15 shows significant freight movement between Canberra, Yass and Wagga Wagga via the Barton and Hume Highways and Canberra and Goulburn via the Federal Highway. This highlights the importance of the region's east-west road corridors.

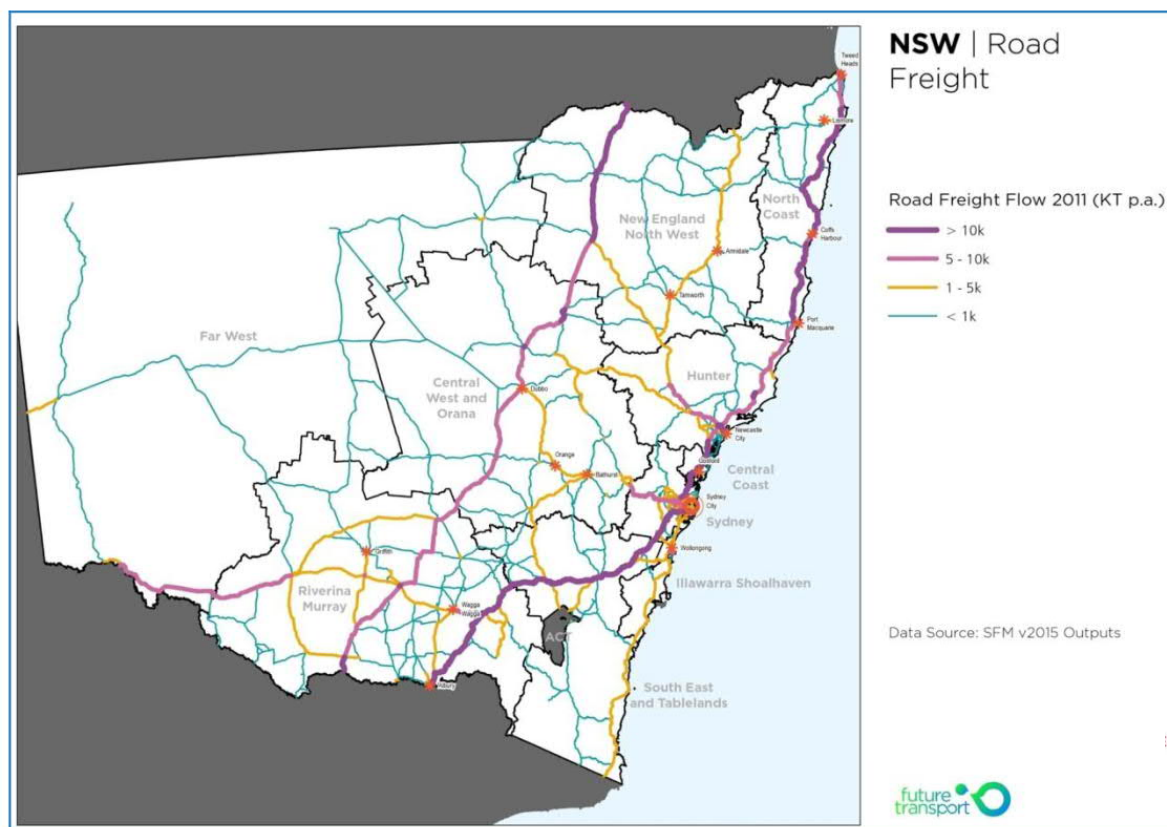


Figure 15 NSW road freight flow 2011

Source: NSW Government Draft Future Transport Strategy, 2017

The *Draft NSW Freight and Ports Plan* (2017) is a supporting plan for *Future Transport 2056* with the goal of “moving goods in an efficient, safe and environmentally sustainable manner, providing successful outcomes for communities and industry”. Freight volumes are forecast to double in Greater Sydney over the next 40 years with a corresponding 25% increase in regional freight volumes.

Access to global gateways at the Port of Eden and Canberra Airport are providing greater exposure to national and international tourism and export markets. Improved connections to Port Kembla, Port Botany, the Port of Melbourne and Western Sydney Airport will give the region a competitive advantage.

The strategic objective for regional transport is to improve regional producers' access to markets through investments supporting freight productivity. While road freight productivity has more than doubled over the past 40 years, it has now slowed. Infrastructure improvements along major road freight corridors are needed to allow larger vehicles to move between regional centres, communities and gateways safely and efficiently. These improvements include bridge upgrades, overtaking lanes and driver rest areas.

Key trends driving and impacting freight demand identified in the *Freight and Ports Plan* are:

- Service expectations – the expansion of services to ‘anywhere delivery’ with faster and more flexible options will place more pressure on the cost structures and competitiveness of service providers.
- Population growth – increasing consumer demand in areas of population growth will influence the origin and destination of freight flows.
- Urban encroachment – developments around key freight precincts change traffic patterns, increase congestion, and create barriers to 24/7 operations.
- Heavy vehicle regulations – balancing safety and community expectations with increasing demand for the use of heavier and longer vehicle combinations.
- Decline in manufacturing – greater reliance on imports increases the demand for containerised freight movements from the port to the warehouse facilities.
- Growth in agriculture demand – increasing freight access required between regional centres and gateway ports.
- Last mile challenges – reduce freight access:
 - freight corridors passing through multiple jurisdictions
 - business practices and planning approvals
 - restrictions on movement of trucks to retail and commercial precincts
 - online purchases alter distribution patterns by taking the retailer out of the equation.

The *South East and Tablelands Regional Plan 2036* highlights that the strategic transport links are critical for improving productivity particularly through supporting higher productivity vehicles by removing height and weight restrictions on major routes and addressing the constraints on narrow bridges. In the commuter zone, typically considered to be Canberra plus one hour (C+1)², increased productivity can be achieved via reducing traffic congestion. The region's prosperity relies on an efficient transport network, a healthy rural and natural environment, and collaborative cross-border relationships.

Local road infrastructure can constrain freight network connections, imposing higher costs on business and communities. Addressing these network ‘pinch points’ can enable more direct routes to market and allow the use of more efficient freight vehicle configurations. Without investment, these pinch points will continue to require diversions of freight traffic and more freight vehicles will be needed to carry the same volume of freight, imposing higher costs on business and the community.

² C+1 region constitutes a region roughly within one hour's commute of Canberra

The *Plan* highlights that Canberra Airport will drive economic growth in the region. It is expected to generate over 21,000 jobs by 2030 and contribute \$2.4 billion per year to the regional economy. Networking Canberra Airport's international operations into the regions other airports, including those in Moruya and Merimbula, will increase exposure to other markets. Existing master plans aim to develop transport, tourism and commercial precincts around these regional airports.

The plan also highlights that the Port of Eden is the third deepest natural harbour in the Southern Hemisphere, making it ideal for large vessels. This working port is a premier location for whale watching, an emerging cruise destination and home to one of the largest fishing fleets in NSW. The port accommodates a Royal Australian Navy wharf and is the primary woodchip export site in Australia, supporting a strong timber industry in the region. General cargo is processed at the multipurpose wharf in Twofold Bay and the port includes an eight-hectare cargo storage facility. The \$44 million extension of the breakwater wharf will allow more cruise vessels to visit. Investment in the Port of Eden will benefit from additional landside infrastructure including a cruise terminal, more diverse local tourism services, and improved connections to Canberra Airport.

The plan highlights that some freight routes across the ACT border are inefficient, and this will intensify as the South East and Tablelands grows. Improving the ability to move freight across the ACT border will better enable producers to access export markets through the airport. In particular, it is important to improve east-west B-double access along major highways and key regional and local roads connecting the South Coast to Sydney, Canberra and Melbourne.

4.1.5 Regional organisation infrastructure plans

The South East Australian Transport Strategy Inc. (SEATS) aims to stimulate and facilitate investment in transport and infrastructure in South Eastern New South Wales (NSW), Eastern Victoria (VIC), and the Australian Capital Territory (ACT) region. SEATS members have identified a number of projects as being of vital importance to south-eastern Australia. These priority projects contribute significantly to the region's economic and social drivers, including more efficient freight movement, which contributes to interstate and international trade. Of note in the ACT region is Kings Highway and Canberra Airport.

Destination 2030 (Elton Consulting Canberra, 2016) outlines the Canberra Business Chamber's vision for Canberra and the region. It identifies the following key actions for the region:

- Create a coalition of existing organisations to establish a 'Committee for Canberra' to champion the city and region and provide independent research and advocacy to support Canberra as a leading liveable city for all.
- Support major infrastructure and development projects to drive economic growth and new business opportunities.
- Deliver an Asian Market strategy for trade, business and tourism with quality supporting infrastructure.
- Leverage connections with national and international representative bodies to build Canberra's status as a globally recognised city for business, trade and education.
- Upgrade regional road and transport infrastructure to ensure efficient and safe links within the Canberra Region and to support growth in business and freight including upgrade of the Kings Highway and duplication of the Barton Highway.

The 2017-2020 Regional Development Australia Southern Inland (RDASI) Strategic Plan provides a path to generate jobs and growth in the Southern Inland region and has been designed to be a valuable reference source of regional information that business leaders and all levels of government can use for infrastructure and investment decisions. The Strategic Plan identifies the regions' key employment sectors as follows:

- **Manufacturing** - Manufacturing is one of the key industries within the Southern Inland Region. Goulburn has a significant manufacturing base, with focus on primary production and processing for export. Hi-tech product manufacturing is a regional strength with local companies producing a range of high technology products.

- Tourism – the Snowy Mountains contributes around \$429 million to the regional economy, each year and accounts for 27 per cent of the broader regions total economic contribution from tourism. Canberra's tourism trends are inextricably linked to the Southern Inland Region, given the proximity of the region to the Capital. The June 2016 Quarterly Tourism Research Australia International Visitor Survey revealed that Canberra's international tourist numbers reached 200,000 per year for the first time, and the ACT recorded the highest growth rate of international visitors in Australia out of all of the states.
- Health care and social assistance - The health care and social assistance industry was the largest growth industry for employment in Australia between 2006 and 2013, creating more than 300,000 jobs.
- Construction - The construction industry is the fourth largest employer of residents of the Southern Inland Region, reflecting the housing boom of the early 2000's that saw the rapid urban development of the ACT and surrounding regions.
- Information technology - The most significant growth in this sector occurred within QPRC. The majority of the employment in this industry, however, is within Canberra as 56 per cent of residents within this LGA commute to Canberra for work.
- Public administration - 20 per cent of workers in the region access employment in the ACT, of which 36 per cent are employed in public administration.
- Education and training - In the 2011 census school education was in the top five industries of employment for every LGA in the Southern Inland Region. This ranking would be higher if it also incorporated people employed in early childhood education/child care and in tertiary and vocational education.
- Primary industries and renewable energy
 - Agricultural land in the Capital region occupies 63 per cent of the land area. The most common land use by area (46 per cent) is grazing modified pastures. In 2014 the agriculture and forestry sector employed 6500 people, or 7 per cent of the region's workforce. In 2012–13 (the most recent year for which ABS data are available), the gross value of agricultural production (GVAP) in the Capital region was \$782 million, or 6 per cent of the total GVAP in NSW (\$12.1 billion).
 - According to research by the Climate Council Australia (2017), increasing the renewable energy target to 50 per cent rather than the business as usual trajectory (34 per cent renewables by 2030) would create almost 50 per cent more employment in the sector for a total of 28,000 jobs nationally. NSW is estimated to have the largest net growth in jobs with around 11,000 positions. Of these, it is likely that the majority will be in the ACT-NSW border region, the Central Tablelands, the Snowy Monaro region, the South Coast and the New England Tablelands.

Canberra Regional Joint Organisation (CRJO) has outlined the need for cross-border collaboration in the region. The region experiences economic interdependencies and service delivery, particularly in the areas of health and education. Integration of transport networks through joint construction of key infrastructure will be a priority as the population in the surrounding council areas continues to increase.

It is estimated that, 25,000 NSW residents cross the border into the ACT for work each day and 7,000 go in the opposite direction. About one in ten children enrolled in ACT schools live in NSW. About a quarter of those in ACT hospitals and a third of those on ACT waiting lists, live across the border.

The CRJO submission notes that this cross-border dependence is not limited to the Queanbeyan, Murrumbateman, Yass and Goulburn-Mulwaree communities that sit just beyond the ACT border. There are also strong associations and flows for education and health care between the south coast LGAs, especially Batemans Bay and Narooma and between the Southern Tablelands and the Snowy Statistical Divisions.

4.2 Social characteristics

4.2.1 Population and employment

The forecast growth in population to 2036 for Canberra and the Capital Region³ are shown in Table 8 and Table 9, respectively. Canberra and the wider Capital Region are forecast to increase by a combined 191,875 people by the year 2036. Canberra represents about 73% of this growth (.id 2018). The Capital Region is forecast to experience an increase of 21,819 of over 75-year-old people, representing 40% of the region's forecasted population increase.

Table 8 Canberra population and household forecast 2016 to 2036

Canberra	Forecast year				
	2016	2021	2026	2031	2036
Population	396,551	428,666	463,743	499,442	536,043
Change in population (5yrs)		32,115	35,077	35,699	36,601
Average annual change		1.62	1.64	1.54	1.47
Households	155,073	171,055	186,977	203,011	219,137
Average household size	2.56	2.51	2.48	2.46	2.45

Australian Bureau of Statistics, 2016, Population and household forecasts, 2016 to 2036, cat no. 3236.0

Table 9 Capital Region population and household forecast 2016 to 2036

Capital Region	Forecast year				
	2016	2021	2026	2031	2036
Population	224,110	234,557	246,144	258,754	276,493
Change in population (5yrs)		10,446	11,587	12,610	17,739
Average annual change		0.92	0.97	1.00	1.33
Households	92,992	98,256	103,737	109,554	116,780
Average household size	2.36	2.34	2.33	2.32	2.32

Population and household forecasts, 2016 to 2036, prepared by .id the population experts, December 2017

There is expected to be a considerable increase in the number of dwellings within Queanbeyan and Yass Valley Council area between 2016 and 2036 which may create further pressure on ACT infrastructure should families elect to commute to the ACT for work. The forecast change in dwellings in the Capital Region is summarised in Table 10.

Table 10 Capital Region forecast change in dwellings 2016 to 2036

Capital Region Area	Change in dwellings between 2016 and 2036	
	number	%
Capital Region	+26,915	+24.3
Bega Valley Shire	+3,362	+19.0
Eurobodalla Shire	+5,132	+21.7

³ Capital Region is defined by ABS to include Queanbeyan, Snowy Mountains, South Coast, Goulburn-Mulwaree and Young-Yass.

Capital Region Area	Change in dwellings between 2016 and 2036	
Goulburn Mulwaree Council area	+3,359	+24.4
Hilltops Council area	+977	+10.9
Queanbeyan-Palerang Regional Council area	+8,297	+34.2
Snowy Monaro Regional Council	+1,185	+10.1
Upper Lachlan Shire	+352	+8.1
Yass Valley Council area	+4,251	+64.8

Population and household forecasts, 2016 to 2036, prepared by .id the population experts, December 2017

The Yass Settlement Strategy indicates a potential for increasing residential subdivision in Yass and Murrumbateman which is anticipated to significantly add to the amount of traffic on the Barton Highway across the ACT border. Roads and Maritime Services have recently committed to duplicating Barton Highway for about 10 km starting from the ACT border. Further duplication and a bypass of Murrumbateman will be considered in future.

ABS (2016) shows that the major employment industries in both the ACT and the Capital Region are Central Government Administration, Defence and Hospitals. In the years up to 2022, both Canberra and the Capital Region will experience growth in health sector and public administration employment. In this period, the ACT and Capital Region is expected to experience increased employment growth of 22,700 people (Department of Jobs and Small Business, 2017).

As of the 2016 Census, there were 2,717 Queanbeyan-Palerang LGA residents whom indicated their place of work as Canberra Airport, Duntroon, Campbell, Russell, Majura and Parkes. As drivers, it is probable these residents would utilise Pialligo Avenue to travel to their place of work. It is also likely that any residents of Central Queanbeyan, Queanbeyan East, Greenleigh and The Ridgeway with a place of work in central Canberra would use Pialligo Avenue as their primary choice of road.

Pialligo Avenue is the primary link to Canberra Airport from Queanbeyan and the region served by Kings Highway. Traffic volumes along Pialligo Avenue are likely to increase, requiring duplication, due to growth in economic activity at Canberra Airport and surrounds, in combination with Canberra's growing housing affordability issues resulting in some Canberra workers moving to the Queanbeyan-Palerang region.

4.2.2 Crossing borders

A significant proportion of residents in the Capital Region work in Canberra. The 2016 Census demonstrates that more than 20 per cent of workers in the region access employment in the ACT, 8,480 (34 per cent) of which are employed in public administration. In total, 25,029 jobs in the ACT are filled by workers living in NSW. The number of people living in NSW and working in the ACT is highest in the close commuter zones – Queanbeyan-Palerang and Yass Valley, as shown in Figure 16.

Of those that indicated they lived within the Capital Region and worked within the ACT, 35% were employed within the Public Administration and Safety industry. This was followed by Health Care and Social Assistance (10%), Professional, Scientific and Technical Services (8%), and Education and Training (8%).

The vast majority of those working in the ACT commute from Queanbeyan region (18,811 people) followed by the Young – Yass region (4,368). This is illustrated in Figure 17.

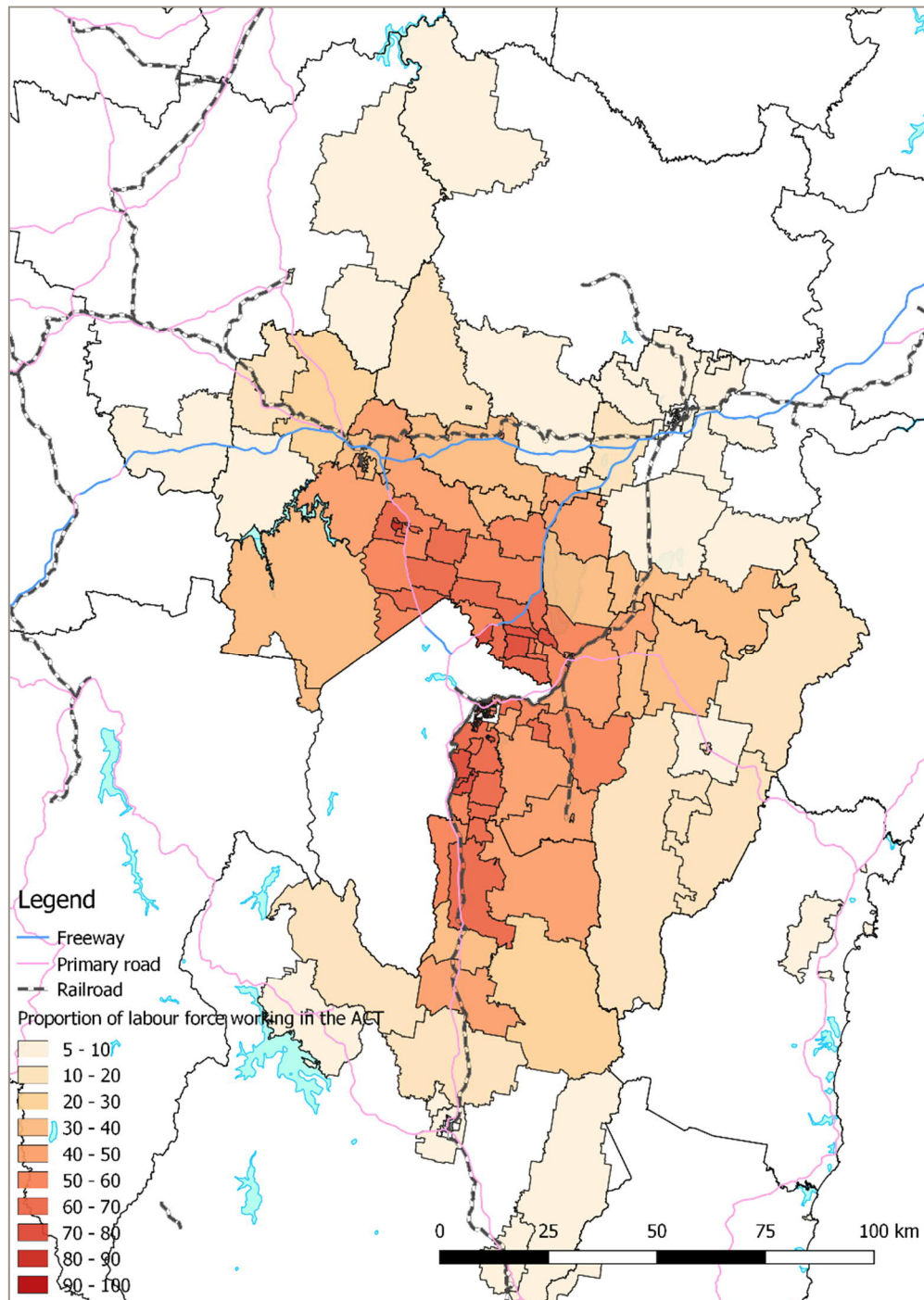


Figure 16 Labour force living in Capital Region and working in the ACT

Australian Bureau of Statistics, 2016, Census journey to work SA1 (AECOM 2018b)

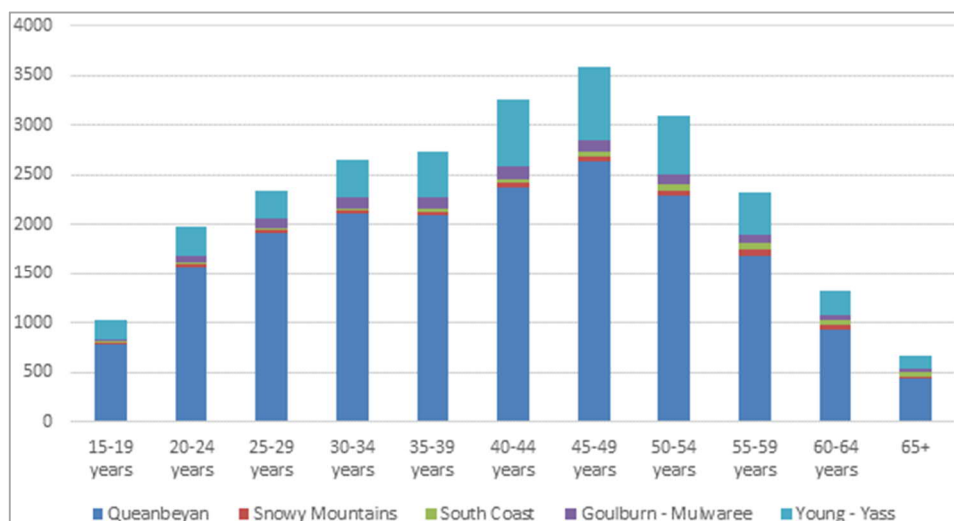


Figure 17 Commuters to the ACT by age group and region origin 2016

Australian Bureau of Statistics, 2016, Census journey to work

The location of work for people residing in the Capital Region is illustrated in Figure 18. In the 2016 Census, the majority of Capital Region workers had jobs in Central Canberra, Woden or Majura.

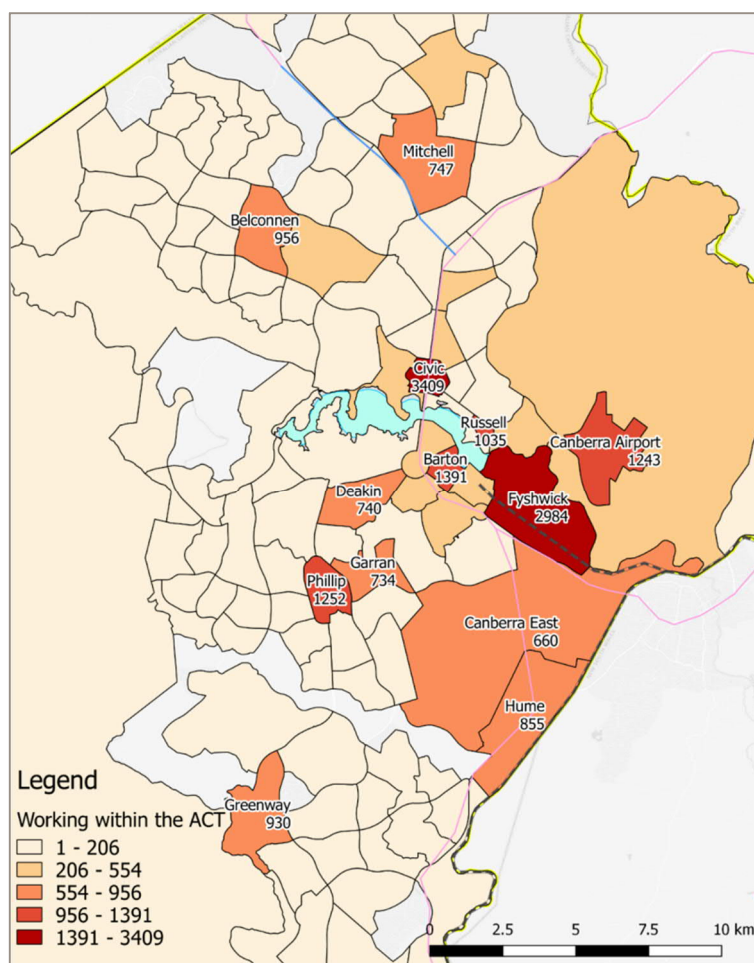


Figure 18 Locations of employment for commuters to the ACT 2016

Australian Bureau of Statistics, 2016, Census journey to work SA2

4.3 Economic drivers

Canberra and the Capital Region have many existing and potential economic drivers. Public administration was worth \$10 billion to the ACT economy in 2016/17 and employs 71,600 people from the surrounding region (ABS 2016). Agriculture added \$10.6 billion to the NSW economy in 2016/17, which was an increase from \$8.8 billion in the previous year (ABS 2016). There has been a sizeable increase in the gross value of livestock products that now represents the majority commodity in the Capital Region and the south coast continues to contribute a sizeable proportion of oyster production to the NSW economy.

Canberra has the opportunity to capitalise on the Australian Government's announcement of a national space agency, a sector estimated to be worth \$12 to 18 billion by 2020 (Space Foundation 2015). The ACT's commitments to renewable energy and the announcement of the Snowy Hydro expansion will attract investment and further employment. Defence, the digital economy, higher education, tourism, health science, and construction are sectors that will also drive the region's economy.

Further details of the key findings of the analysis of economic drivers in the ACT and region follows in Sections 4.3.1 and 4.3.2, for ACT and NSW industries, respectively. The Part 4 report (AECOM 2018b) provides additional details.

4.3.1 Major ACT industries

Over the past six years, public administration and safety has remained as the top contributor to the ACT's Gross State Product (GSP). This is followed by Health care and social assistance (12%), Professional, scientific and technical services (11%), and dwelling ownership⁴ (8%), as shown in Table 11.

Table 11 Top 10 Contributors to the ACT Gross State Product

ACT Industry	2016/2017		2010/11		Change (\$m)
	\$m	%	\$m	%	2010/11 to 2016/2017
Public administration and safety	9952	29%	7958	30%	+1,994
Health care and social assistance	4062	12%	3022	11%	+1,040
Professional, scientific and technical services	3929	11%	2303	9%	+1,626
Ownership of dwellings ⁴	2828	8%	2240	8%	+588
Construction	2279	7%	1912	7%	+367
Education and training	2149	6%	1738	7%	+411
Information media and telecommunications	1273	4%	1161	4%	+112
Retail trade	1258	4%	981	4%	+277
Financial and insurance services	1180	3%	875	3%	+305
Administrative and support services	1014	3%	782	3%	+232

Australian Bureau of Statistics, 2017, State Accounts, cat no. 5220.0

⁴ Ownership of dwellings consists of landlords and owner-occupiers of dwellings. Owner-occupiers are regarded as operating a business that generates a gross operating surplus. The imputation of a rent to owner-occupied dwellings enables the services provided by dwellings to their owner-occupiers to be treated consistently with the marketed services provided by rented dwellings to their tenants. Owner-occupiers are regarded as receiving rents (from themselves as consumers), paying expenses, and making a net contribution to the value of production which accrues to them as owners.

Canberra is headquarters for the Department of Defence, key national security, intelligence and border protection agencies, law enforcement and the Australian Federal Government. The Department of Defence has one of the highest budgets of any Australian government agency, with approximately 15 per cent of its total Australian expenditure occurring in the ACT region.

A mainstay of the local economy, the ACT's world-class health services (including research) and array of state-of-the-art sporting facilities are renowned both in Australia and internationally. ACT private sector employment in health accounts for 18,000 jobs (and is growing at around 3.3 per cent per annum), making Canberra's health and sport science sector a solid area of growth offering a range of investment opportunities.

International flights have recently commenced from Canberra Airport and it is positioned to become a central freight hub for the region. With an excellent road connection to Sydney (and potentially high-speed rail) and 24-hour curfew-free status, Canberra Airport, unlike the other major curfew-free airports on the east coast (Melbourne and Brisbane), can in effect provide night time freight services to Sydney because it is only three hours away by road. Freight arriving at night in Canberra arrives in Sydney at the beginning of the business day.

Population growth in Asia and the emergence of the Asian middle class is creating considerable demand for the high quality clean and green products produced in the region. Canberra Airport gives the region the ability to transport produce from Canberra to Singapore and beyond to 11 Chinese cities. For example, live oysters from the South Coast can be exported to Asia within 30 hours of being harvested. The airport is estimated to generate over 21,000 jobs by 2030 and contribute \$2.4 billion per year to the regional economy. However, some freight routes across the ACT border are inefficient including the east-west access and connections to the south coast, central west and Snowy Valley LGA. Improving the productivity of the freight network by improving travel times and freight capacity will bring considerable additional economic benefits.

An analysis undertaken by ACIL Tasman (2011) forecast that by 2030 the activities associated with the airport precinct (aviation, tourism and non-aviation) will generate or enable:

- A cumulative increase in real economic output for Canberra and surrounding region of up to \$3.4 billion in 2010 dollars
- A net employment increase of about 28,400 full-time employees in Canberra and the surrounding region.

In addition, the emergence and development of the freight hub at Canberra Airport is expected to induce economic activities associated with the establishment of just-in-time industries around the airport.

Over 12 million tonnes of commodities were carried by all ACT freight vehicles in the 12 months ending June 2012. Canberra Airport handles a small amount of air freight at present but aims to become a regional freight hub with the expected commencement of an overnight express service to meet the increasing demand for time-sensitive, door-to-door freight. The largest proportion of freight movement relates to construction, followed by manufactured goods, tools of trade and other commodities. The ACT freight task is expected to double in the next 20 years, consistent with national trends.

The major outbound airfreight products by weight in 2011 were perishable food, including meat, vegetables, fruit, fish and crustaceans. Such products represented over 40% of Australia's outbound airfreight by weight and require reliable supply chains to reach their international destinations. Networking Canberra Airport's international operations with other airports in the region, including Moruya and Merimbula, will increase market exposure (for example, shellfish exports to the booming Asian market). The increased demand for 'clean and green' food products and continued growth and development of regional food production also creates significant economic opportunities to be harnessed using the 'CBR Region' brand as an economic development identity for the region.

According to the *2014 Canberra Airport Master Plan*, with the establishment of Canberra Airport as a freight hub, increases in associated road freight are expected to be limited. It is estimated that in a five-year time frame, one to three additional B-doubles or equivalent will operate to Sydney overnight. This is in addition to six weekly B-doubles or equivalent servicing freight from a three times weekly international freighter aircraft. By the end of the 20-year period of the *2014 Master Plan*, it is expected that there will be 20 B-doubles or equivalent operating overnight and 40 B-doubles or equivalent transporting freight from the thrice daily international freight aircraft.

Canberra has one of the most ambitious emission reduction targets in Australia of 40% below 1990 levels by the year 2020 and currently holds a ten-year lead on other cities and regions in the country. The Clean Energy Council estimates that the large-scale component of the Australian Renewable Energy Target alone will generate approximately \$10 billion in investment and create 6,500 new jobs by the end of the decade. To date, the ACT Government has attracted \$1.5 billion in renewable energy investment while there is expected to be a 400% increase in jobs in the renewable energy sector.

The Australian Government is the largest consumer of Information and Communications Technology (ICT) products and services in the nation. Being at the heart of government, the digital economy and e-government sector is a major competitive force and represents another opportunity for investment in the ACT economy. ICT provides the services and expertise that power Canberra's knowledge-based economy and the sector fosters over 1,000 local businesses.

Canberra is the innovation and education capital of Australia, carrying an estimated 45,000 tertiary students and academic staff across five university campuses. As a proportion of the ACT economy, the innovation and higher education sector is around three times the national average.

The tourism and hospitality services sector contributes around \$1.62 billion to the ACT economy and supports an estimated 14,700 jobs across 6,800 businesses and organisations. In the year ending June 2016, the ACT exceeded national growth rates with 4.5 million domestic visitors (up from 3.8 million) and 203,000 international visitors (up from 179,000).

4.3.2 Major NSW industries

Value added by industry is an indicator of business productivity in the Capital Region. It shows how productive each industry sector is at increasing the value of its inputs. It is a more refined measure of the productivity of an industry sector than output (total gross revenue), as some industries have high levels of output but require large amounts of input expenditure to achieve that.

In 2015/16, Public Administration and Safety was the most productive industry within the Capital Region, generating \$769 million. This was followed by Health Care and Social Assistance (\$738.8m), Construction (\$730.1m) and Agriculture, Forestry and Fishing (\$704.5m), as shown in Table 12.

Table 12 Top 10 Contributors to the Capital Region Economy

Capital Region Industry	2015/16			2010/11			Change (\$m)
	\$m	%	NSW%	\$m	%	NSW%	2010/11 to 2015/16
Public Administration and Safety	769.0	10.1	6.1	777.2	10.7	6.2	-8.2
Health Care and Social Assistance	738.8	9.7	7.8	594.4	8.2	7.2	+144.3
Construction	730.1	9.6	7.4	707.4	9.7	6.6	+22.7
Agriculture, Forestry and Fishing	704.5	9.2	1.7	743.1	10.2	2.1	-38.6
Manufacturing	506.9	6.6	7.1	590.7	8.1	9.6	-83.7
Retail Trade	498.0	6.5	5.2	461.5	6.3	5.0	+36.5
Electricity, Gas, Water and Waste Services	489.2	6.4	2.9	470.8	6.5	3.2	+18.4
Accommodation and Food Services	470.5	6.2	3.3	452.2	6.2	3.4	+18.3

Capital Region Industry	2015/16			2010/11			Change (\$m)
Education and Training	455.7	6.0	5.7	446.5	6.1	6.1	+9.1
Transport, Postal and Warehousing	357.0	4.7	5.1	300.2	4.1	5.2	+56.8

National Institute of Economic and Industry Research (NIEIR) ©2016 Compiled and presented in economy.id by .id the population experts

Agriculture added \$10.6 billion to the NSW economy in 2016/17, which was an increase from \$8.8 billion in the previous year. Agricultural land in the Capital Region occupies 33,332 square kilometres, or 64 per cent of the region. The most common land use by area is grazing modified pastures, which occupies 25,177 square kilometres or 49 per cent of the Capital Region.

The majority of farm land within the Capital Region is occupied by livestock farming which makes up 76.7% of all farms. There has been a sizeable increase in the gross value of livestock products that now represents the majority commodity in the Capital Region, as shown in Table 13.

Table 13 Capital Region commodity value

Commodity description	2015/16		2010/11 (adjusted)		Change	
	Gross value (\$m)	Local value (\$m)	Gross value (\$m)	Local value (\$m)	Gross value (\$m)	Local value (\$m)
Total agriculture	859.5	807.3	716.6	667.5	143.0	139.8
Total value of crops	164.0	151.2	190.9	175.4	-26.9	-24.2
Broadacre crops - Total	111.7	102.5	167.4	151.9	-55.7	-49.4
Hay - Total	21.2	21.2	23.5	23.5	-2.3	-2.3
Nurseries, cut flowers or cultivated turf - Total	7.8	7.0	9.8	9.0	-2.0	-1.9
Fruit and nuts (excluding grapes) - Total	13.6	12.1	16.1	14.2	-2.4	-2.2
Fruit and nuts - Grapes - Total	1.7	1.7	1.7	1.7	0.0	0.0
Vegetables for human consumption - Total	7.8	6.6	6.4	5.4	1.5	1.2
Livestock products - Total	269.5	259.0	214.6	207.4	54.9	51.6
Livestock slaughtered and other disposals - Total	426.0	397.1	311.1	284.5	115.0	112.6

Australian Bureau of Statistics, 2016, Value of Agricultural Commodities Produced cat no. 7503.0

As a total of the NSW agricultural value, the Capital Region represents 39.9% of cherry production, 33% of plum production and 18.2% of cereal crops and wool. The majority of this production occurs within the Yass-Young region.

The South Coast supplies oysters, mussels and scallops to international as well as domestic markets, having an international reputation as being safe, sustainable and of high quality. Live oysters now can be delivered to Asia within 30 hours of harvesting.

In 2016/17, Oyster production was worth \$45.3m to the NSW economy. The Capital Region represented \$16.3m (35.9%) of this production.

International and domestic demand exceeds supply, requiring the industry to expand production, while retaining its premium quality. The south coast continues to contribute a sizeable proportion of oyster production to the NSW economy.

In NSW, 67 billion tonne kilometres of freight is moved annually, and the value of the products carried exceeds \$200 billion. PricewaterhouseCoopers Australia (2009) revealed that it is expected that in 2020 Australia's freight task will be double what it was in 2006 and by 2050 it will be triple its current size.

The 2013 NSW Freight and Port Strategy identifies a potential for a proposed terminal in Goulburn Mulwaree. The establishment of intermodal terminals is a significant opportunity for the Capital Region.

The Hume Highway is the busiest freight corridor in Australia, from Sydney to Melbourne. Freight travelling through the region connects to the Illawarra and Port Kembla, Port Botany, the ACT, and the Central West and Western NSW.

The Hume, Federal, and Monaro highways provide north-south connections into Victoria, Canberra, Sydney and the Illawarra region. The Barton, Kings and the Snowy Mountains highways provide east-west road connections into the Murray-Murrumbidgee region and Canberra from the eastern part of the Capital Region and the far south coast.

An upgrade to the Snowy Hydro is estimated to cost \$3.8-\$4.5 billion and create up to 5,000 jobs across the Capital Region at its peak. Completion of the scheme is expected to result in a 2,000 MW generation capacity and 350,000 megawatt hours of storage. Since its announcement, Snowy Monaro Regional Council have reported a subsequent increase in employment and economic activity.

Renewable energy can successfully drive economic development in regional communities. Constructing, operating and maintaining large scale power such as wind farms and solar farms results in a range of direct employment opportunities. In addition, there can also be flow on benefits with renewable energy projects supporting the creation of many more indirect jobs along the supply chain – in construction, manufacturing and services.

Tourism within the Capital Region on average added \$1.5b to the regional economy, as shown in Table 14. In 2016, over one million visitors to the Snowy Mountains spent \$500 million and 14 cruise ships brought 19,258 passengers into Eden.

Table 14 LGA visitor four-year average ending December 2016

Local Government Area	Visitors	Spend (m)
Yass Valley	377,000	50
Snowy Monaro	1,056,000	521
Hilltops	414,000	79
Eurobodalla	1,216,000	350
Bega Valley	858,000	382
Queanbeyan-Palerang	509,000	97
Goulburn	619,000	102
Total	5,049,000	1581

Tourism Research Australia, 2017



5.0

CORRIDORS ANALYSIS

5.0 Corridors Analysis

5.1 Regional context

A range of land-use, traffic and transport data was analysed and used in the corridor analysis and determining corridor priorities. A summary of some of the key road network data, including road hierarchy, traffic volumes, heavy vehicle volumes and traffic crashes is presented below to provide an overview of road and traffic conditions in the ACT and region. More details are available in supporting reports associated with this project.

5.1.1 Road hierarchy

Road hierarchy forms a key basis for determining corridor priorities. For the purposes of this project, an integrated version of the NSW and ACT road hierarchies has been defined as follows:

Auslink road:

- Roads that form part of the Australian Government's National Land Transport Network

Primary road:

- State Roads in NSW
- National key freight route (see Figure 19)
- Roads on the ACT Orbital Freight Route (see Figure 19)
- National approach routes in the ACT.

Secondary road:

- Regional roads in NSW
- Primary arterial roads in the ACT.

Maps illustrating a hierarchy of roads in the region based on these definitions are given in Figure 20 overleaf.

5.1.2 Roads of National Importance

Auslink roads are highest in the road hierarchy but in the ACT, roads of national importance are also important considerations in helping to determine corridor priorities. The National Capital Plan defines areas that have the special characteristics of the National Capital to be 'Designated Areas'. In these areas, approval of works is the responsibility of the NCA.

There are also some areas outside of the 'Designated Areas' that are important to character of the National Capital that are subject to Special Requirements under the National Capital Plan. This includes land adjacent to main avenues and approach routes, shown in Figure 21.

5.1.3 Traffic volumes and capacity

Future 2031 AM peak hour traffic forecasts from the strategic modelling of the ACT and region are shown in Figure 22 and Figure 23. These are based on the modelling report in the Part 5 report for this project (AECOM, 2018c).

The forecasts for regional roads external to Canberra and Queanbeyan (Figure 22) show that the highest flows will occur on Barton Highway and Federal Highway. Roads and Maritime Services (RMS) currently has funding to commence construction of the duplication of part of Barton Highway between the ACT and Murrumbateman, which is the section of road with the highest traffic demand in future (RMS 2018).

The forecasts for Canberra roads (Figure 23) shows high volumes on the parkways, Barton Highway and Commonwealth Avenue bridge.

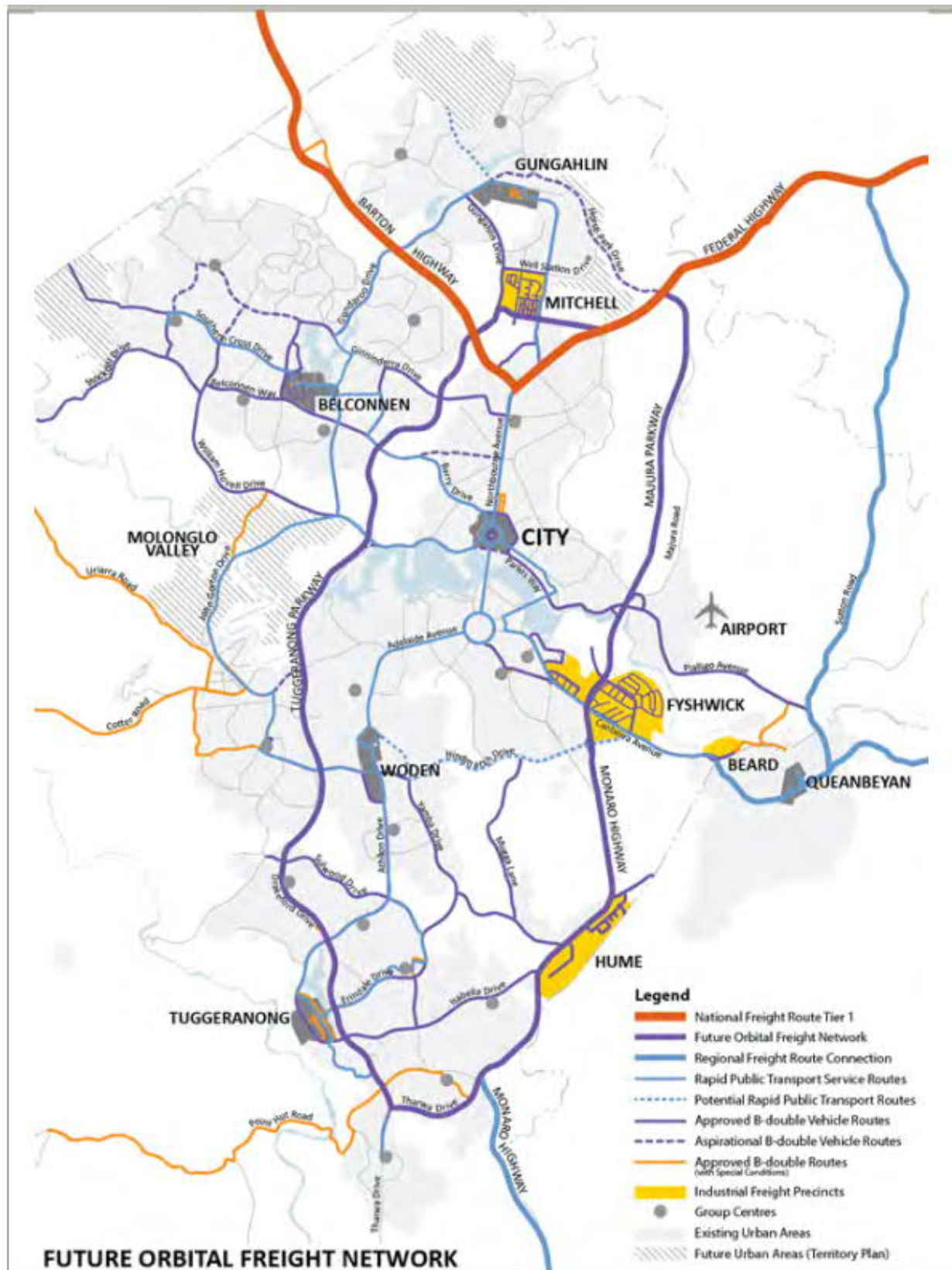


Figure 19 ACT future orbital freight network

Source: ACT Government, 2016

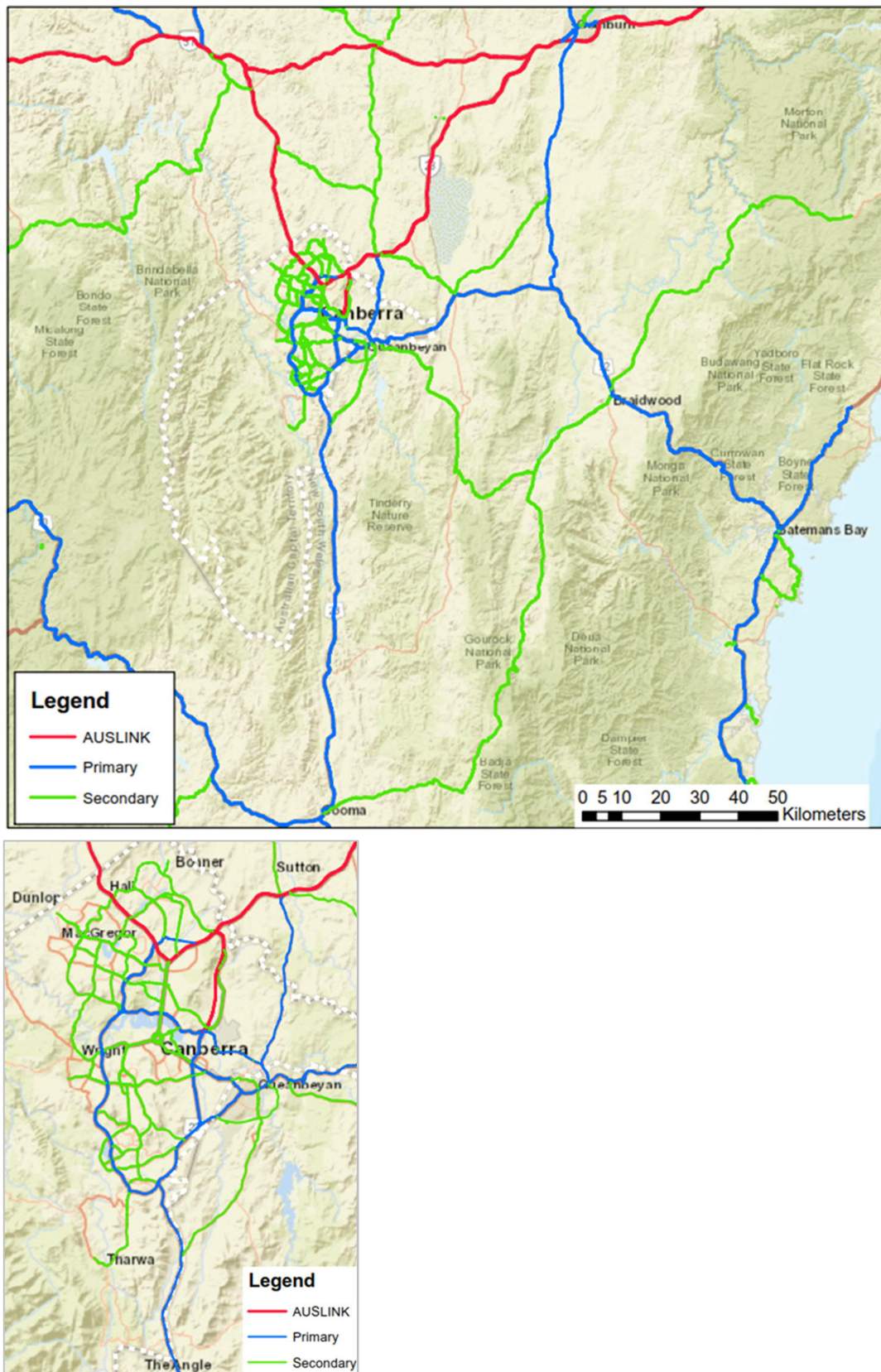


Figure 20 AUSLINK, Primary and Secondary Roads in the Region

Source: AECOM, January 2018

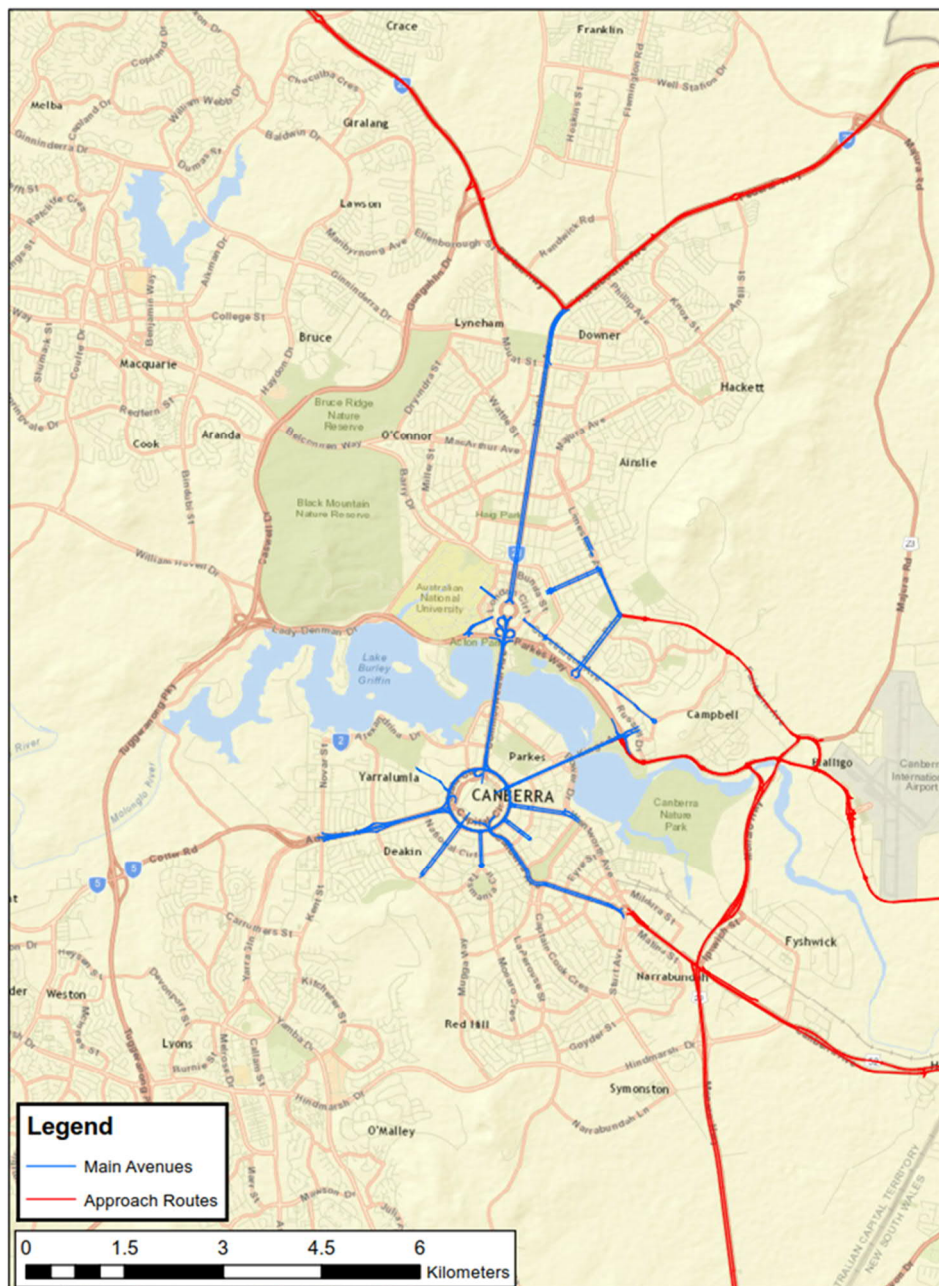


Figure 21 Roads of National importance in ACT

Source: NCA, 2018

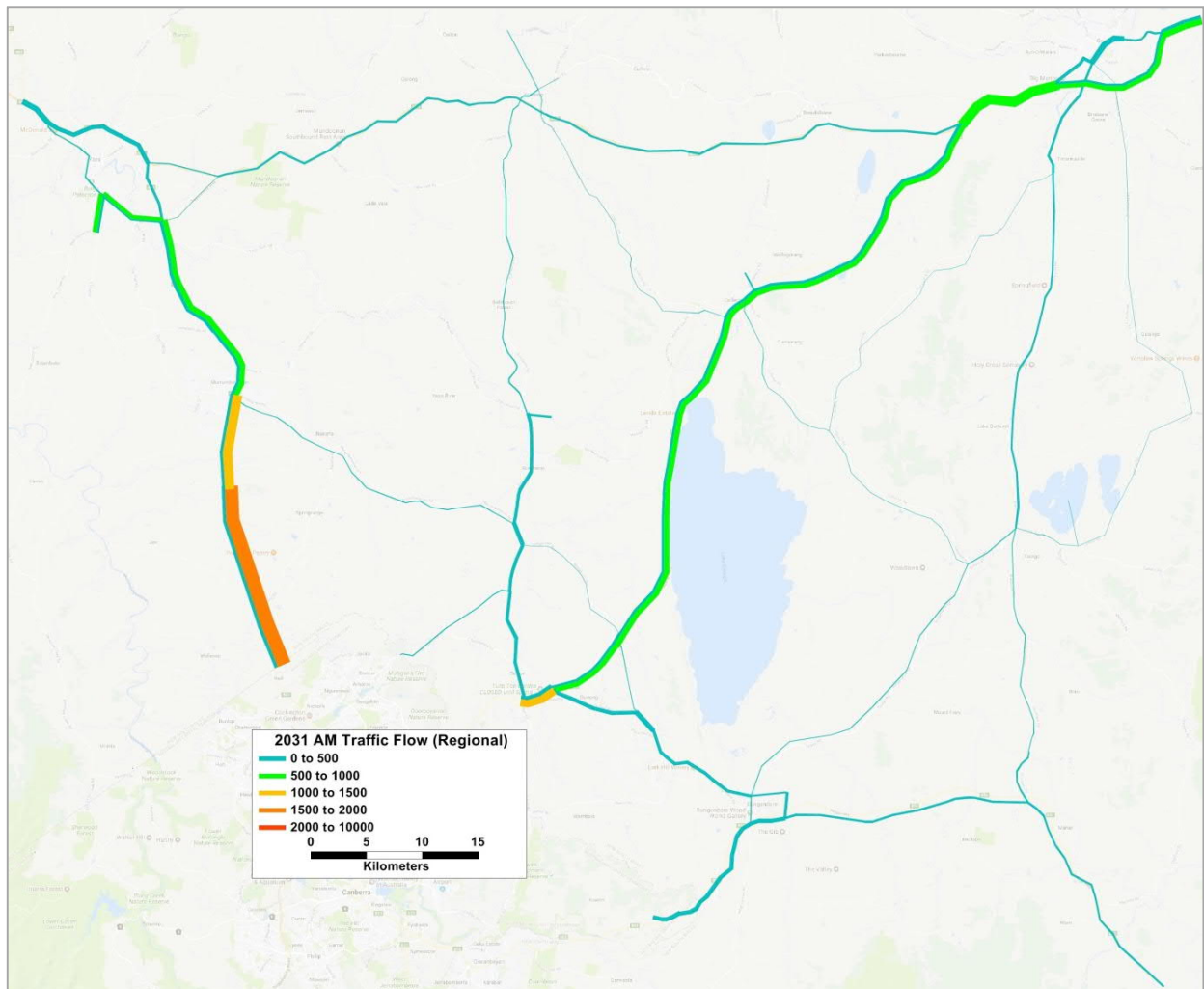


Figure 22 Regional-CSTM Forecast 2031 AM Traffic Flow – Regional Roads

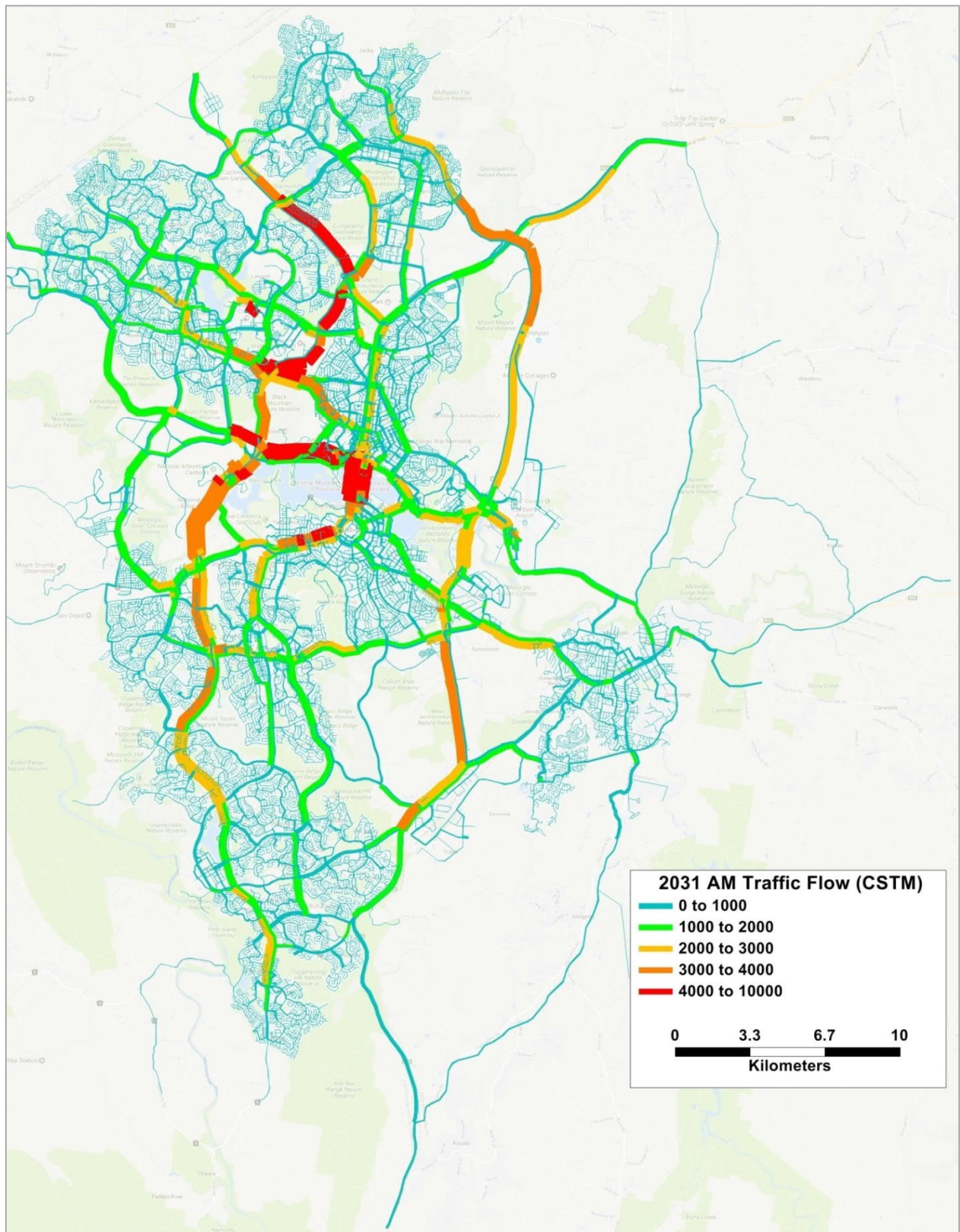


Figure 23 Regional-CSTM Forecast 2031 AM Traffic Flow – Canberra Roads

A plot of 2031 volume-capacity ratios provides an indication of the locations of traffic congestion (Figure 24). Links with a red or orange colour (i.e. $V/C > 0.75$) are near or over capacity in the AM peak. These are quite scattered and include parts of a number of arterial roads throughout the ACT and Queanbeyan. It highlights the need for increased traffic capacity on the following roads in future, including parts of:

- William Slim Drive
- Kuringa Drive
- Parkwood Drive
- Drake Brockman Drive
- William Hovell Drive
- Coulter Drive
- Bindubi Street
- Barton Highway
- Tuggeranong Parkway
- GDE – Gungahlin Drive
- Fairbairn Avenue
- Pialligo Avenue
- Monaro Highway
- Athllon Drive.

5.1.4 Heavy vehicle movements

An analysis has been undertaken of heavy vehicle volumes on Canberra roads using 2017-18 classified tube count surveys. The results of this analysis is illustrated in the form of average daily truck volumes Figure 25 to Figure 27 for the three types of heavy vehicles – medium rigid, single-articulated and multi-articulated.

Figure 25 shows the medium rigid volumes for sites where data was available. It shows high volumes on the Parkways, Federal Highway, Barton Highway, Northbourne Avenue, Adelaide Avenue and Horse Park Drive. Hindmarsh Drive, Pialligo Avenue and Lanyon Drive also carry relatively high volumes.

Figure 26 shows the single-articulated volumes for sites where data was available. It shows high volumes on the Parkways, Barton Highway, Northbourne Avenue, Hindmarsh Drive, Limestone Avenue and Lanyon Drive. Federal Highway, Pialligo Avenue and Johnson Drive also carry relatively high volumes.

Figure 27 shows the multi-articulated volumes for sites where data was available. It shows high volumes on the Parkways, Federal Highway, Barton Highway, Northbourne Avenue, Horse Park Drive, Hindmarsh Drive, Limestone Avenue and Lanyon Drive. Pialligo Avenue also carries relatively high volumes.

In summary, the surveys show that there are high heavy vehicle volumes on the Parkways, Federal Highway, Barton Highway, Northbourne Avenue, Horse Park Drive, Hindmarsh Drive, Limestone Avenue and Lanyon Drive. Volumes are also relatively high on Adelaide Avenue and Pialligo Avenue.

5.1.5 Crash rates

Crash data for Canberra and region has been analysed for a five-year period from January 2012 to December 2016. The results of this analysis are shown in Figure 28, expressed as a weighted crash score per kilometre for each segment of the road network. The warmer colours show higher crash rates. The analysis showed that crash rates on rural regional roads are generally lower than the rates on Canberra roads, where traffic volumes and conflicts are higher.

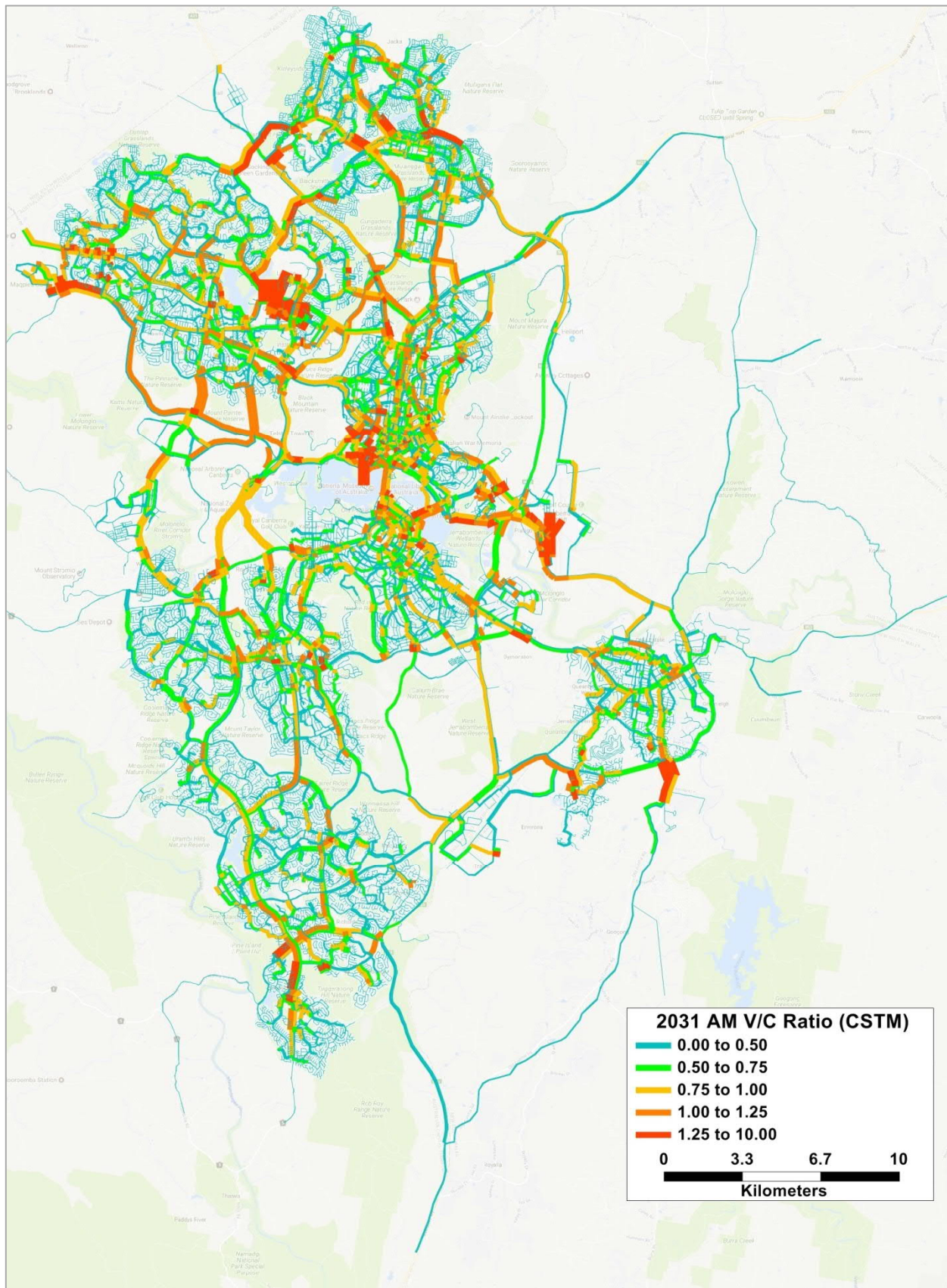


Figure 24 Regional-CSTM Forecast 2031 AM V/C Ratio – Canberra Roads

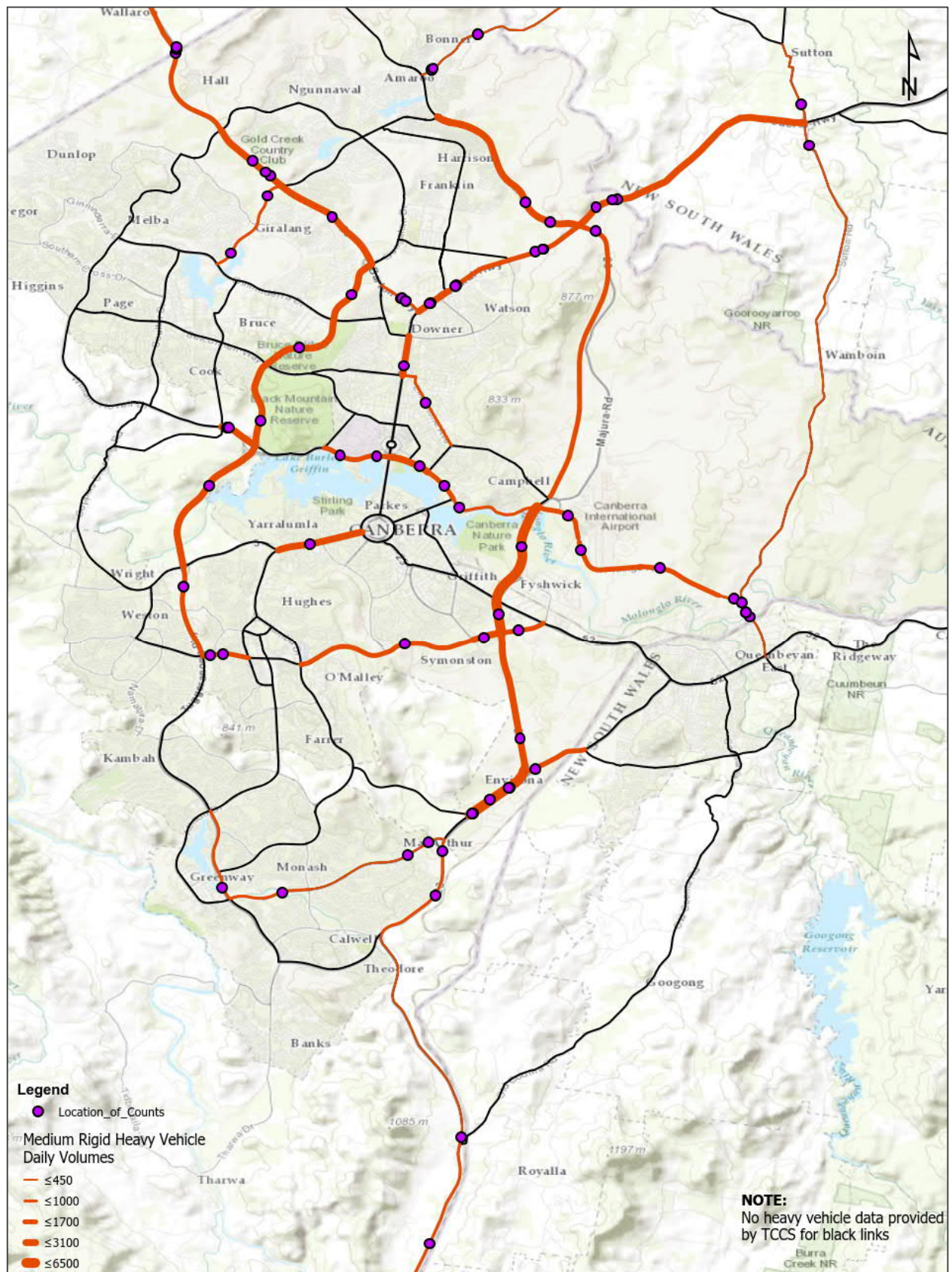


Figure 25 Medium rigid heavy vehicle daily volumes and count locations

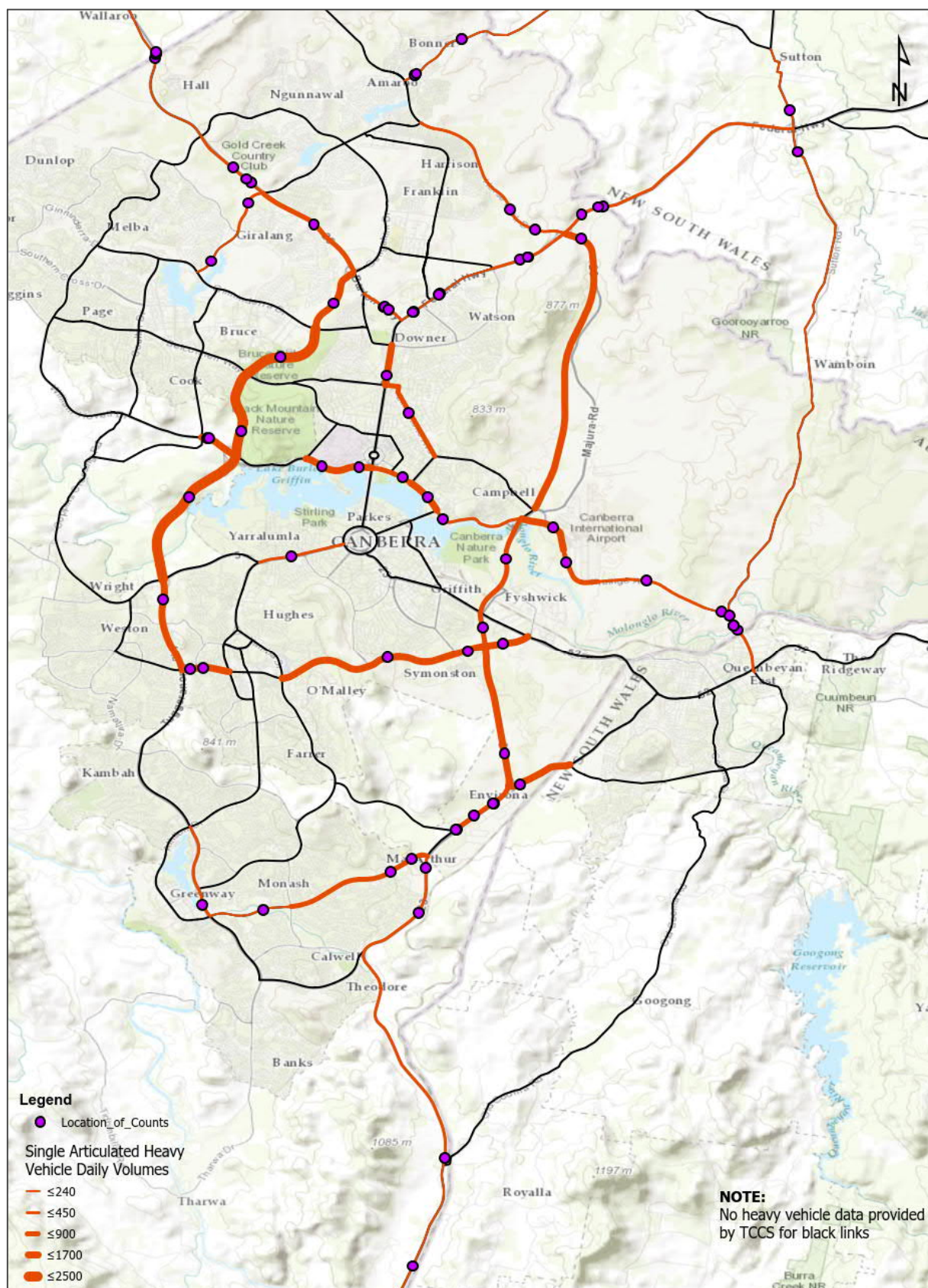


Figure 26 Single articulated heavy vehicle daily volumes and count locations

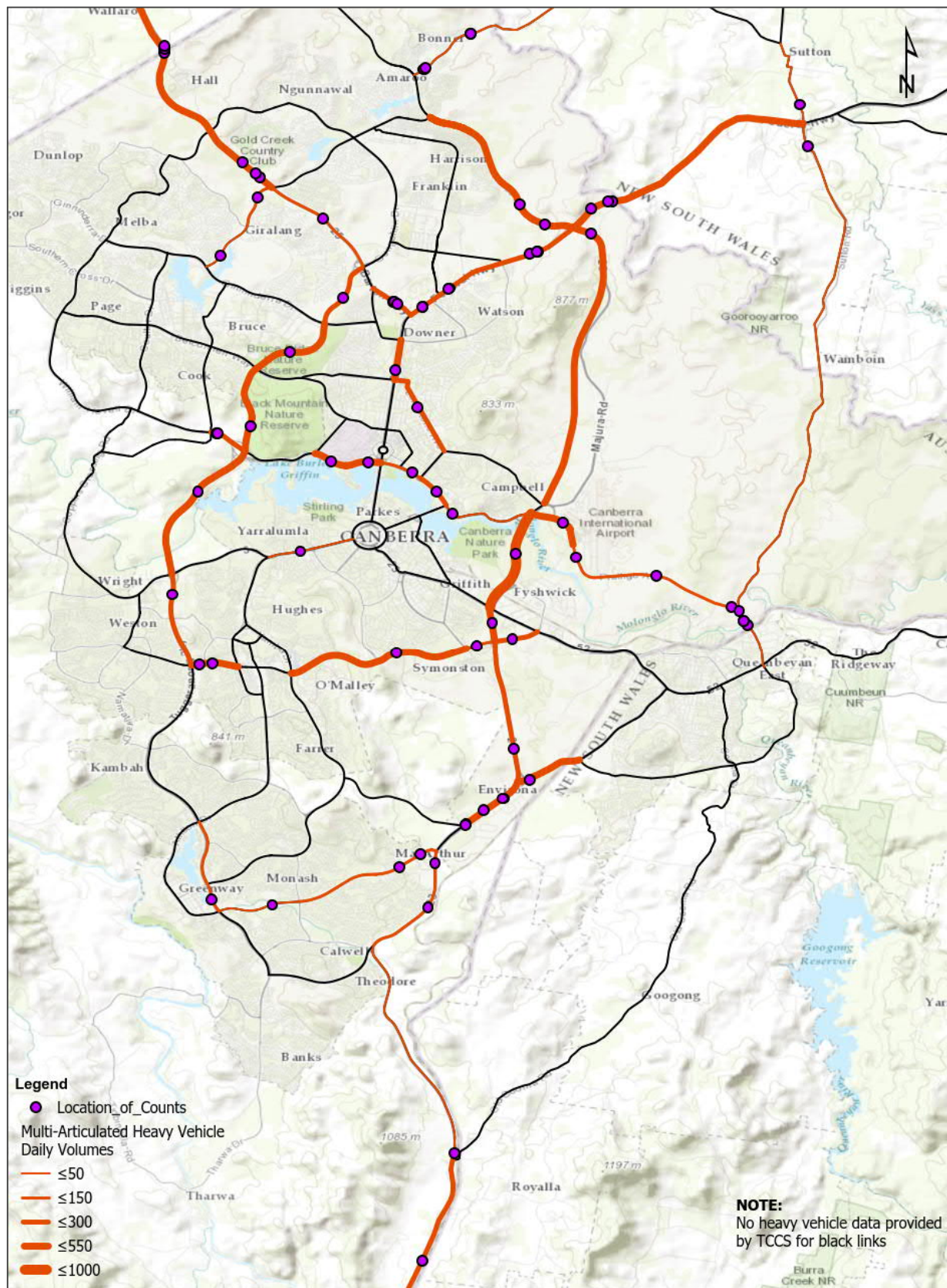


Figure 27 Multi-articulated heavy vehicle daily volumes and count locations

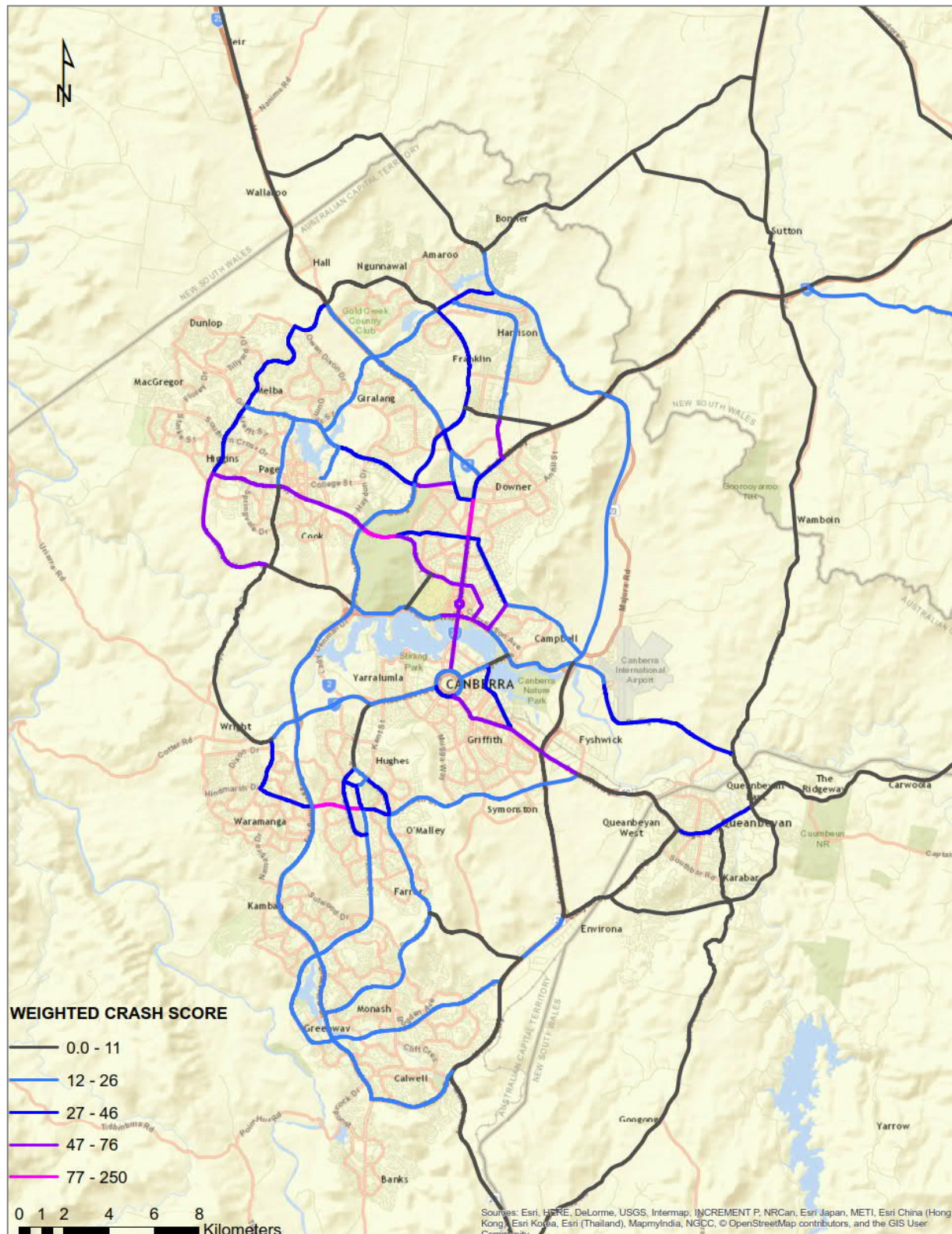


Figure 28 Crash score per km – ACT and region

Note: 1. Based on an analysis of a five-year period of crash data from January 2012 to December 2016

2. Crash score is calculated by factoring fatal crashes by 16, injury crashes by 4 and property damage crashes by 1.

Road corridors with highest crash rates are:

- Northbourne Avenue – Commonwealth Avenue
- Belconnen Way – Barry Drive – Cooyong Street
- Canberra Avenue west of Hindmarsh Drive
- Anzac Parade
- Parts of William Hovell Drive, Hindmarsh Drive, Ginninderra Drive and Flemington Road.

5.2 Defining a corridor

Roads and Maritime Services has a set of practice notes for network and corridor planning⁵ which assist how to go about defining a transport corridor. The concept of a 'corridor' is used to describe travel in terms of desired movement through and within a broad geographical band or area rather than along a specific route or by a specific mode. Within a corridor there may be a number of key route and mode options, especially in urban networks, or there may be only one, as in many rural areas.

The practice notes indicate that a 'corridor' may be thought of as:

- A geographic band or area linking two points, to serve existing and forecast transportation of people and goods
- Comprising the relevant modal networks, which may include parkways, arterial roads, freight rail, passenger rail, light rail, transitways, bus routes, bicycle and pedestrian facilities, that provide competing and complementary transport functions
- Connecting major sources of trips that shape the transport function and role of the corridor, including residential, employment, educational, agricultural, medical, industrial and trade centres
- Having built and natural characteristics and community context
- Being located within a broader land-use and transport system.

The end points are the important determinants of the corridor. There may be alternative competing routes or mode infrastructure that could form part of the same corridor, especially in an urban context.

Consideration against the project objectives were also factored into corridor selection. This process sought to provide identifiable road sections where options could be assessed in a micro-simulation model and clear benefits determined against identified deficiencies or opportunities.

5.3 Corridors for MCA analysis

The Stage 1 MCA commenced at a micro level using data for road links or segments (Figure 3), which can be amalgamated in various ways to form corridors. MCA scores for each road segment across all criteria were mapped in GIS. Many of the criteria scores are derived from GIS data and the 2031 CSTM. Some of the model and GIS data that formed the basis of the MCA are given in AECOM (2018e).

An initial map of MCA scores was based on the consultant team's best estimate of criteria weightings (see Figure 29). This map was then examined to define contiguous and relatively homogeneous corridors with relatively high MCA scores, resulting in 22 corridors being identified for more detailed analysis. This is shown in Figure 4.

⁵ RTA (2008) Network and Corridor Planning, Practice Notes, August 2008

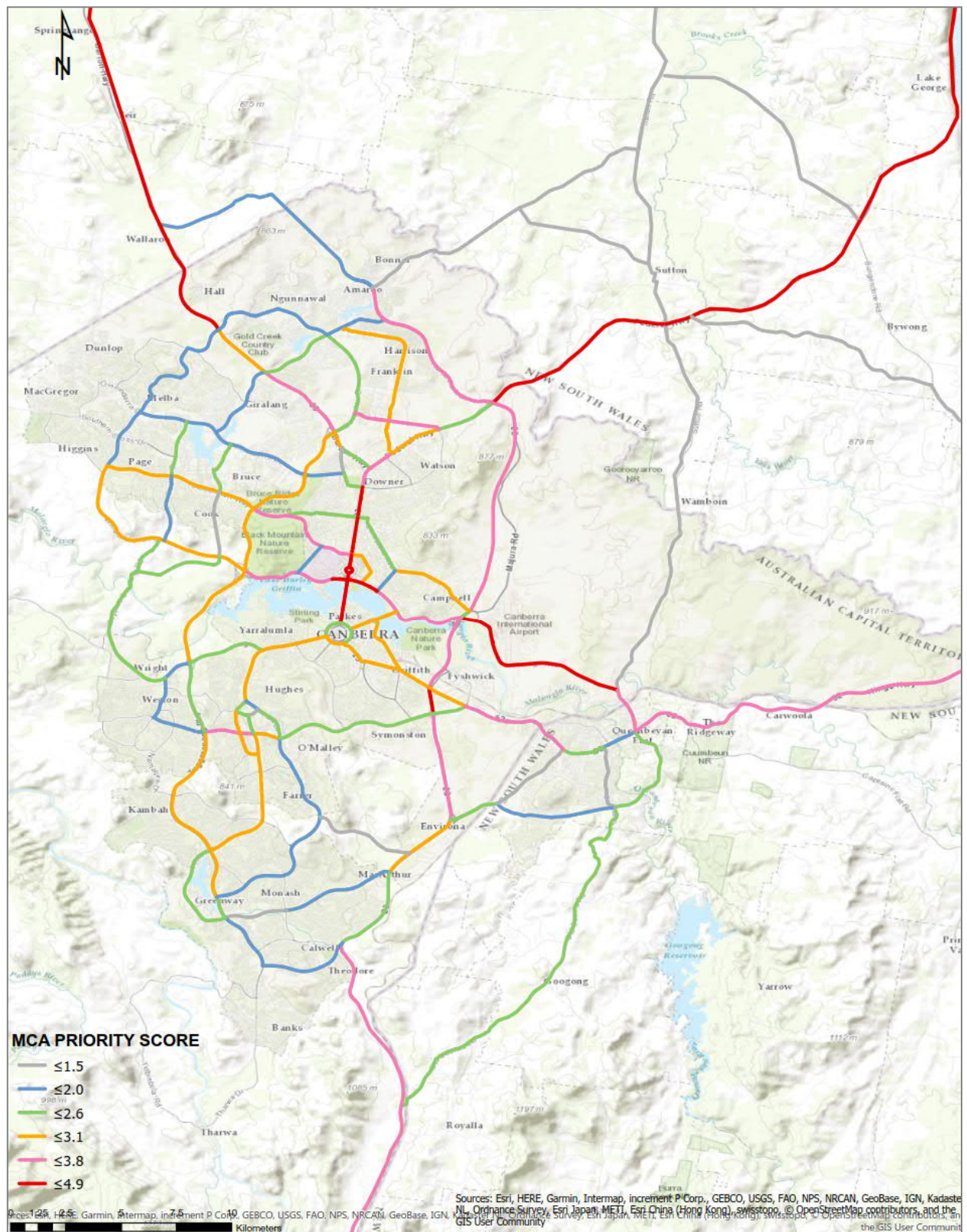


Figure 29 Initial MCA map

5.4 Corridor priorities

To determine which corridors were most important, the scenario weightings were applied to the raw scores to produce overall scores for each of the 22 corridors. Corridors were then ranked based on total MCA score, from 1 (highest score) to 22 (lowest score).

Five scenarios were developed to test the sensitivity of the selection of corridors to alternative criteria weightings:

1. Balanced Priority – team weightings with emphasis on 'productivity and economic growth' than 'alignment to objectives for the region' categories
2. Freight - 'supports freight efficiency' criteria are heavily weighted in this scenario
3. Safety - 'improves user safety for all modes' criteria are heavily weighted in this scenario
4. Steering Committee – category weightings that align with Steering Committee votes from Table 2
5. Domestic Travel – similar category weightings to PCG for 'connectivity and liveability' and 'sustainability and resilience' categories, but greater weighting for 'productivity and economic growth' than 'alignment to objectives for the region'.

Table 15 summarises the weightings for each criteria category and corridor scenario.

Table 15 Summarised breakdown of the scenario weightings based on assessment criteria categories

Criteria Category	Scenario 1 Balanced Score	Scenario 2 Freight	Scenario 3 Safety	Scenario 4 Steering Committee	Scenario 5 Domestic Travel	Average
Alignment to Objectives for the Region	27.0%	13.0%	62.5%	26%	17%	29.1%
Connectivity and Liveability	14.5%	10.0%	6%	37%	23.5%	18.2%
Productivity and Economic Growth	48.0%	76.5%	26%	30%	43.5%	44.8%
Sustainability and Resilience	7.0%	0.5%	2.5%	7%	16%	6.8%
Feasibility	3.5%	0.0%	3.5%	0%	0%	1.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

5.5 Outcomes of corridor analysis

The results of the Stage 1 MCA are summarised in Table 16, sorted by average score across all scenarios. It shows that the three most important corridors are Northbourne Avenue, Barton Highway (NSW) and Pialligo Avenue. Other important corridors from the Stage 1 MCA include Parkes Way, Barry Drive and Barton Highway (ACT).

A corridor assessment workshop was conducted with the PCG on 18 May 2018 and subsequent Working Group meetings to decide on a short-list of seven corridors. It considered the results of the Stage 1 MCA shown in Table 16 and recent construction work undertaken or being undertaken in corridors. A summary of the outcomes of these discussions for the twelve top corridors based on average score is included in AECOM 2018e.

Table 16 Summary of corridor ranking by scenario

Corridor Description	Corridor ID	Scenario 1: Balanced Priority	Scenario 2: Freight	Scenario 3: Safety	Scenario 4: Steering Committee	Scenario 5: Domestic Travel	Average
Northbourne Avenue	6	3	16	3	1	1	3.0
Barton Highway (NSW)	20	1	1	6	6	15	4.6
Pialligo Avenue	12	4	5	7	5	8	5.2
Parkes Way	11	5	11	4	2	2	5.6
Barry Drive	7	10	18	1	3	3	6.0
Barton Highway (ACT)	1	7	6	9	10	12	6.4
Federal Highway (North)	19	2	2	14	4	19	8.0
Monaro Highway (North)	14	12	4	13	15	11	8.8
Tuggeranong Parkway (North)	10	13	12	11	12	6	8.8
Horse Park Drive	2	6	8	8	8	5	9.8
Hindmarsh Drive (Woden)	17	15	19	2	9	4	10.2
Canberra Avenue	13	17	13	10	14	10	11.0
Kings Highway (West)	21	8	7	17	13	21	12.8
Morriset Road Extension	4	11	3	12	11	18	13.0
Tuggeranong Parkway (South)	18	19	20	20	17	9	15.2
Monaro Highway (South)	15	16	14	16	16	20	15.4
Limestone Avenue & Fairbairn Avenue	8	21	17	15	21	17	16.2
Kings Highway (East)	22	14	9	19	22	22	16.6
Adelaide Avenue & Cotter Road	16	22	21	21	20	13	18.0
Barton Highway / Federal Highway / Northbourne Avenue triangle	5	18	15	18	18	16	18.4
William Hovell Drive	9	20	22	22	19	14	18.6
William Slim Drive & Gundaroo Drive	3	9	10	5	7	7	21.4

Note: Corridor ID is shown in Figure 4

Table 17 summarises the outcomes of the corridor priorities appraisal and recommendations for seven short-listed corridors to be modelled and evaluated in more detail. The seven corridors short-listed for further analysis were:

- Corridor 1 – Barton Highway (ACT), incorporating Barton Highway between the ACT/NSW border and GDE
- Corridor 4 – Morisset Road Extension, incorporating Morisset Road, Sandford Street and Gungahlin Drive between Sandford Street and Barton Highway
- Corridor 5 – The Y-Connection, incorporating Barton Highway between GDE and Federal Highway, Federal Highway between Morisset Road and Barton Highway, Northbourne Avenue between Barton Highway and Mouat Street, Ellenborough Street between Barton Highway and Ginninderra Drive and Mouat Street
- Corridor 9+10 – Glenloch, incorporating Glenloch interchange, William Hovell Drive, Tuggeranong Parkway between Cotter Road and Glenloch interchange and Parkes Way between Glenloch interchange and Commonwealth Avenue
- Corridor 11 – Parkes Way, incorporating Parkes Way and Morshead Drive between Commonwealth Avenue and Majura Parkway
- Corridor 12 – Pialligo Avenue, incorporating Pialligo Avenue between Majura Parkway and the ACT/NSW border
- Corridor 14 – Monaro Highway North, incorporating Monaro Highway between Isabella Drive and Pialligo Avenue.

Two of the corridors did not rank highly in the Stage 1 MCA but were included for strategic planning reasons. In particular, the Morisset Road Extension which forms part of the Orbital Freight Route and the “Y” corridor which forms a key link between Federal and Barton Highways. Also, whilst William Hovell Drive was not highly ranked it was combined with the relatively high ranked corridor of Tuggeranong Parkway North.

Note that the Federal Highway (19), Barton Highway (20) and Northbourne Avenue (6) corridors all scored highly in the Stage 1 MCA but were excluded from further analysis because they have significant recent or current committed works. Furthermore, the Y-connection ranked lowly in the MCA but was included due to its strategic importance in the regional road network.

Table 17 Corridor priority summary

Corridor	Comments	Decision
Northbourne Avenue	Northbourne Avenue ranked first overall. It carries a high volume of traffic and is an important route in terms of active travel and public transport. However, significant work is already occurring in this corridor and is not a priority for further investigations.	Do not include in short-list
Barton Highway (NSW)	Barton Highway (NSW) was ranked second overall. This corridor is already a subject of detailed investigations by Roads and Maritime Services and is not a priority for further investigations.	Do not include in short-list
Pialligo Avenue	Pialligo Avenue ranked third overall. It is a key connector from NSW to the Airport and jobs in Central Canberra. With increasing development in Queanbeyan and the extension of Ellerton Drive, it is a priority corridor for further investigation.	Include in short-list
Parkes Way	Parkes Way ranked fourth overall. It is an important corridor for freight movement and domestic travel, although has some height and weight restrictions affecting B-Double access. Congestion is of concern due to high traffic volumes as it provides connectivity to job centres as well as the Airport and logistics hub.	Include in short-list

Corridor	Comments	Decision
Barry Drive	Barry Drive ranked fifth overall. It is an important public transport route between Belconnen and City. It has recently been the subject of detailed investigations and road widening.	Do not include in short-list
Barton Highway (ACT)	Barton Highway (ACT) was ranked sixth overall. The road carries a high volume of local traffic as well freight from interstate and will be impacted by the future CSIRO development and growth in NSW.	Include in short-list
Federal Highway (North)	The Federal Highway ranked seventh overall. The highway is currently operating well and does not require investigation.	Do not include in short-list
Monaro Highway (North)	Monaro Highway ranked eighth overall. It is an important freight route, experiencing significant traffic congestion in peaks and traffic growth from Queanbeyan. Funding has recently been approved to investigate options to upgrade this section of road.	Include in short-list
Tuggeranong Parkway (North)	Tuggeranong Parkway (North) ranked ninth overall. It may be worth consideration due to the proposed east-west arterial road from Molonglo and the potential need for extra capacity to Parkes Way towards City.	Include in short-list, as agreed post-workshop
Horse Park Drive	Horse Park Drive ranked tenth overall. It is important in terms of domestic travel and provides a link between Gungahlin and activity centres such as Fyshwick and the Airport. Duplication of Horse Park Drive will soon be completed, so this corridor is not a priority for further investigations.	Do not include in short-list
Hindmarsh Drive (Woden)	Hindmarsh Drive ranked eleventh overall. There are not many opportunities to improve traffic operations in this corridor.	Do not include in short-list
Canberra Avenue	Canberra Avenue ranked twelfth overall. However, it is an important public transport route to Queanbeyan and an expanded red rapid to Queanbeyan CBD.	Do not include in short-list
Kings Highway (West)	Kings Highway (West) ranked thirteenth overall. It is being investigated by Roads and Maritime Services as part of the development of an upgrade strategy for Kings Highway.	Do not include in short-list
Morisset Road Extension	The Morisset Road Extension ranked fourteenth overall. It is a missing link in the proposed Orbital Freight Route, so is considered important to investigate.	Include in short-list
Tuggeranong Parkway (South)	Tuggeranong Parkway (South) ranked fifteenth overall.	Do not include in short-list
Monaro Highway (South)	Monaro Highway (South) ranked sixteenth overall. It has recently been investigated by (NSW section) and AECOM (ACT section) and funding for additional passing lanes has occurred for the NSW section and recommended for the ACT section.	Do not include in short-list
Limestone & Fairbairn Avenue	Limestone Avenue and Fairbairn Avenue ranked lowly.	Do not include in short-list

Corridor	Comments	Decision
Kings Highway (East)	Kings Highway (East) ranked lowly. It is being investigated by Roads and Maritime Services as part of the development of an upgrade strategy for Kings Highway.	Do not include in short-list
Adelaide Avenue & Cotter Road	Adelaide Avenue and Cotter Road ranked lowly. It is currently the subject of detailed investigations for light rail and AECOM recently examined the feasibility of the Mint Interchange.	Do not include in short-list
Barton Highway / Federal Highway / Northbourne Avenue	The Barton Highway / Federal Highway / Northbourne connection, also known as the "Y" ranked lowly. The Y currently feeds interstate freight towards Northbourne Avenue as well as traffic from Yass and Goulburn, so is considered worthy of investigation.	Include in short-list
William Hovell Drive	William Hovell Drive ranked lowly. It is currently the subject of other ACT Government studies (Bindubi Street interchange and duplication between Drake Brockman Drive and Coulter Drive).	Include in short-list, as agreed post-workshop
Gundaroo Drive	Gundaroo Drive ranked lowly and is currently being duplicated.	Do not include in short-list

A long-exposure photograph of a modern building at night. The building has a glass facade reflecting city lights and is illuminated from within. In the foreground, a road shows light trails from moving vehicles, creating a sense of motion. The sky is a deep blue, suggesting twilight.

6.0

OPTIONS ANALYSIS

6.0 Options Analysis

6.1 Option development

The development of options built on the corridor assessment workshops with the Working Group (WG) and Project Control Group (PCG) in May 2018 that discussed potential constraints and improvement opportunities in these corridors. Three of the corridors not discussed in these workshops were added to the short-list of corridors to investigate in more detail – the 'Y', Morisset Road Extension and William Hovell Drive. The opportunities and constraints in these additional corridors were considered internally by AECOM and later discussed in WG and PCG workshops in July 2018.

An investigation of each of the seven short-listed corridors was undertaken in preparation for the July workshops. This included for each corridor:

- Corridor constraints and issues
- Opportunities to address constraints and issues
- A list and description of potential improvement options and the issues that they could address
- Preliminary sketches of options
- An initial ranking of options using a mini-MCA with safety, capacity and indicative cost criteria.

A total of 21 options were short-listed for detailed assessment following discussions with the WG as shown in Figure 30.

6.2 Option descriptions

A summary description of the selected options for analysis and key issues addressed by the options is given in the following tables (Table 18 to Table 24). The option numbers can be cross-referenced against the options map in Figure 30.

More detailed descriptions and sketches of key options is included in Appendix B.

Table 18 Barton Highway (ACT) – Corridor #1

Option number	Option	Key issues to address
1-3	Signalise the intersection of Curran Drive and Barton Highway	2 lane cross-over, safety, queuing of right turn; platooning to improve bus service at Gold Creek Road intersection
1-4	Grade separation at William Slim Drive/ Barton Hwy/Gundaroo Drive	Improve capacity and safety, improve freight travel time and reliability

Table 19 Morisset Road Extension – Corridor #4

Option number	Option	Key issues to address
4-1	Separate service roads from arterial road through Mitchell and extend Morisset Road	Reduce conflict and congestion, improve travel time and accommodate more freight
4-2	Grade-separate Sandford Street / GDE intersection and extend Morisset Road	Increase capacity, improve safety
4-4	Duplicate right-turn from GDE exit to Barton Highway and extend Morisset Road	Increase capacity, reduce queue lengths
4 All	Inclusion of all corridor 4 options to capture impacts of whole road link	Reduce conflict and congestion, improve travel time and accommodate more freight, Increase capacity, improve safety

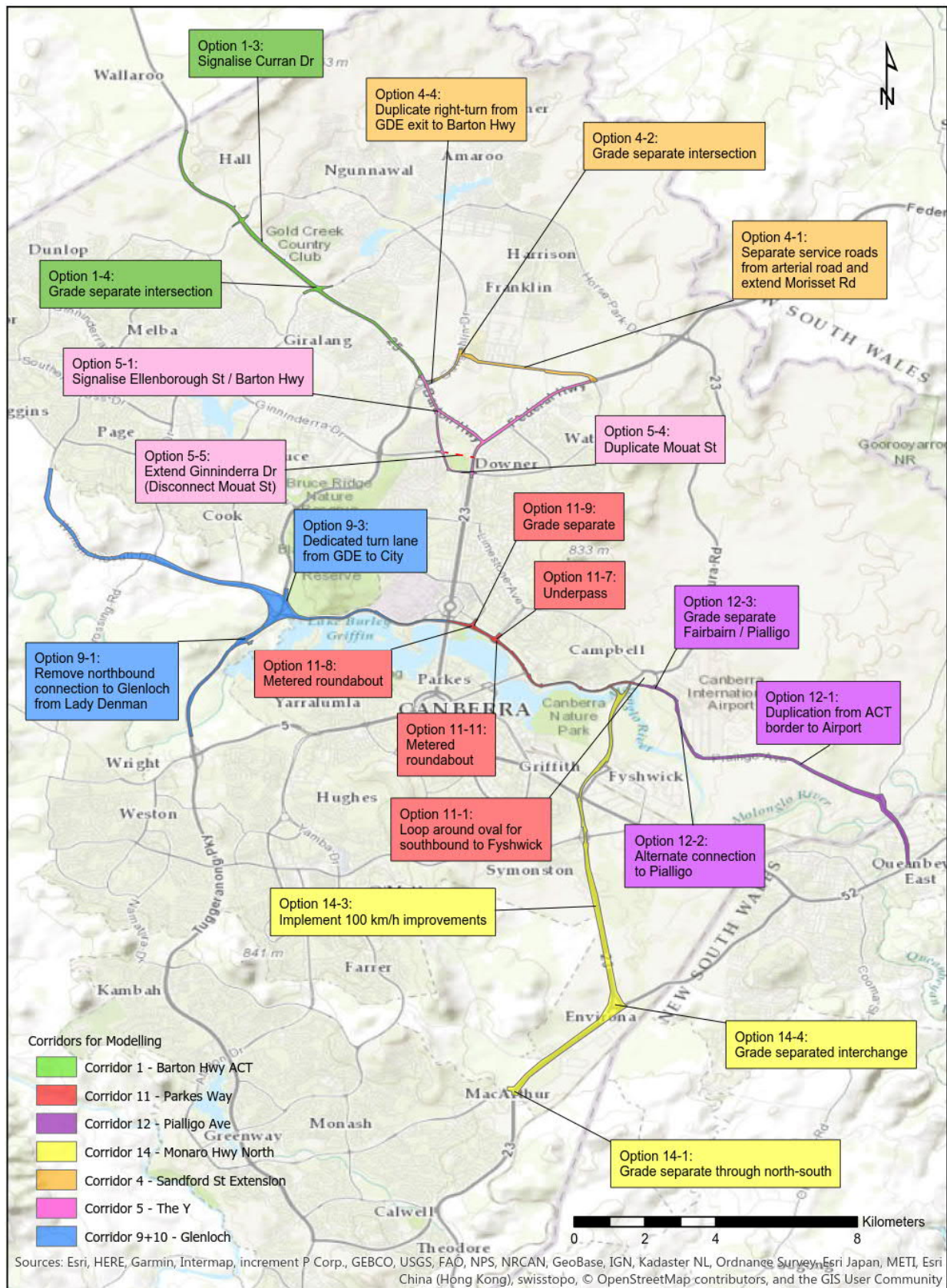


Figure 30 Options map

Table 20 The Y– Corridor #5

Option number	Option	Key issues to address
5-1	Signalise Ellenborough Street/Barton Highway intersections and allow all turns	Ease right turn queue, reduce merge issue
5-4	Duplicate Mouat Street, removing bottleneck at Sullivans Creek bridge	Increase capacity, reduce weave conflict, improve safety
5-5	Extend Ginninderra Drive to Northbourne Avenue and disconnect Mouat Street west of Northbourne Avenue	Remove need to duplicate Mouat Street, divert traffic to enter Northbourne Avenue earlier, offset conflicts

Table 21 Glenloch Interchange– Corridor #9

Option number	Option	Key issues addressed
9-1	Remove northbound ramp connection to GDE from Lakeside interchange	Weaving issue, ease congestion from Lady Denman, rat running on Lady Denman
9-3	Dedicated southbound turn lane from GDE to City lane	Weaving issue, capacity, congestion

Table 22 Parkes Way – Corridor #11

Option number	Option	Key issues addressed
11-1	Provide clover leaf free left turn around RMC sports oval to link in with southbound acceleration lane. This would remove need for signalised right turn from Morshead Drive to Monaro Highway southbound.	Reduce queuing, reduce conflict, improve travel time reliability to/from airport.
11-7	Provide east-west grade separated underpass at Anzac Parade/Parkes Way with existing roundabout to provide at grade tie-ins.	Ease disruption to through traffic and improve travel time, improve capacity and safety, improve travel time reliability. (note underpass intended to be designed so it does not impact visual amenity along Anzac Parade)
11-8	Provide signals to create a metered roundabout at Coranderrk Street/Parkes Way – maintaining the west bound bypass lane.	Ease congestion, reduce queuing, improve travel times (especially for east bound traffic movements).
11-9	Provide east west grade separated interchange at Coranderrk Street/Parkes Way.	Ease disruption to through traffic and improve travel time, improve capacity and safety, improve travel time reliability.
11-11	Provide signals to create a metered roundabout at Anzac Parade/Parkes Way – maintaining the west bound bypass lane.	Better control on traffic movements and ability improve travel time for set movements, (note signal intended to be slimline and set back slightly from current hold lines so it does not impact visual amenity along Anzac Parade)

Table 23 Pialligo Avenue – Corridor #12

Option number	Option	Key issues addressed
12-1	Duplication from ACT Border to the airport at Brindabella Circuit including intersection upgrades.	Increase capacity, safety
12-2	Implement new connection to Pialligo at Kallaroo Road via Brindabella Circuit roundabout; including removing connection to Pialligo at Beltana Road.	Improve capacity and reduce delays and queuing at Pialligo Avenue/ Beltana Road/ Fairbairn Avenue, provide secondary / alternate access point to Pialligo
12-3	Implement a grade separated interchange at Pialligo Avenue/Fairbairn Avenue (removing Beltana Road connection at this location)	Queuing, congestion, travel time, safety

Table 24 Monaro Highway (North) – Corridor #14

Option number	Option	Key issues addressed
14-1	Grade-separate north-south movement at the Isabella Drive/Monaro Highway intersection	Capacity, safety and travel time improvements (part of broader Canberra bypass)
14-3	Implement improvements to enable 100 km/h on Monaro Highway between Isabella Drive and the Alexander Maconochie Centre access	Ability to increase speed limits, improve capacity and safety, improve travel time and reliability (part of Canberra bypass)
14-4	Implement interchange at Lanyon Drive	Ability to increase speed limits, improve capacity and safety, improve travel time and reliability (part of broader Canberra bypass)

6.3 Options analysis

The intent of this study is not to determine and refine the most cost-effective solution for each corridor but rather to identify high level priorities for plausible options. The analysis of options included:

- Development of concept sketches for purposes of traffic modelling, costing and assessing potential physical impacts
- Micro-simulation modelling
- Analysis of crash cost savings
- Review of MCA scores from previous corridor analysis
- Scoring new qualitative option assessment criteria.

This provided important data for the Stage 2 MCA, both for new criteria used in the options analysis and the refinement of criteria scores from the previous corridors analysis.

6.3.1 Micro-simulation modelling

The extent of the micro-simulation models and the options to be assessed were agreed at a meeting with the WG in August 2018. This is outlined in Section 2.5.

A summary of the key results from the modelling that were used in the Stage 2 MCA are summarised in Table 25, averaged for 2031 AM and PM peak models. Three parameters are shown:

- Difference in daily peak hour travel costs – these were calculated from change in network travel times and travel distances with and without the option, converted to dollars using economic parameters from TfNSW (2017).
- Average percent difference of approach route travel time – these were calculated from the change in network travel times averaged for AM and PM peak hour periods
- Average percent difference of approach route delay time – these were calculated from the change in network travel times averaged for AM and PM peak hour periods.

Table 25 Key 2031 traffic model results

Option	Difference in Daily Peak Hour Travel Costs (\$/hr) ¹	% Difference in Average Travel Time ²	% Difference in Average Delay ³
1-3 Curran/Barton Signals	-226	-2%	-5%
1-4 Barton/Gundaroo Grade Separate	-1,176	-27%	-84%
4 All Upgrades Sandford/Morisset	-7,277	-43%	-80%
4-1 Extend Morisset to Federal	-4,280	-17%	-52%
4-2 Sandford/GDE Grade Separate	-9,180	-6%	20%
4-4 GDE Extra SB-WB Right turn to Barton	1,109	12%	4%
5-1 Ellenborough/Barton Signals	-109	-4%	-16%
5-4 Duplicate Mouat	-524	-3%	-4%
5-5 Extend Ginninderra	-6,358	-22%	-73%
9-1 Remove NB link from Lady Denman to GDE	5,420	-4%	-27%
9-3 GDE Free SB-EB Left Turn to Parkes Way	4,705	2%	13%
11-1 EB-SB Loop Morshead to Monaro	3,330	-9%	-28%
11-7 Anzac/Parkes underpass	2,093	-77%	-90%
11-8 Coranderrk/Parkes Metered R-about	4,066	-30%	-38%
11-9 Coranderrk/Parkes Grade Separate	6,693	-30%	-47%
11-11 Anzac/Parkes Metered R-about	5,434	-48%	-55%
12-1 Pialligo Duplication	-2,340	-2%	-13%
12-2 Alternate connection to Pialligo	6,107	-11%	-29%
12-3 Fairbairn/Pialligo Grade Separate	2,217	-11%	-29%
14-1 Isabella/Monaro Grade Separate	3,074	-7%	-77%
14-3 100km/h Monaro Improvements	2,654	-13%	-46%
14-4 Lanyon/Monaro Grade Separate	-418	-8%	-70%

¹ Average network travel cost difference for the AM and PM peak hour calculated from change in network travel times (Vehicle Hours Travelled VHT) and travel distances (Vehicle Kilometres Travelled VKT) with and without the option, converted to dollars using economic parameters from TfNSW (2017)

² Calculated from the change in approach route travel times averaged for modelled AM and PM peak hours

³ Calculated from the change in approach delay times averaged for modelled AM and PM peak hours

Note: The cells highlighted in green indicate the top three options with most travel time and cost benefits, while the red cells are the bottom three options for these criteria.

The cells highlighted in green indicate the top three options with most travel time and cost benefits, while the red cells are the bottom three options for these criteria. In terms of savings in travel costs the top three projects are:

- Sandford/GDE Grade Separate (includes extension of Morisset Road)
- All corridor 4 works including upgrades of Sandford Street and Morisset Road connection
- Extend Ginninderra Drive

From a network perspective these make sense as all three are introducing a new road link into the network. Other works with relatively high travel cost savings are Pialligo Avenue duplication and Barton Highway / Gundaroo Drive grade separation. Both of these improve network flows and do not appear to have adverse impacts on the broader network.

Other works such as the Monaro Highway upgrades and works on Parkes Way have beneficial localised network travel times and reductions to delays but when considered more broadly move the bottle neck to another location which can result in a reduction to performance in other areas of the network. Any significant road improvements are recommended to consider broader network issues. The purpose of this study was to identify priority corridor links and options within those corridors. Detailed analysis of a particular project or suite of projects would form part of the next stage of works progressing the prioritise projects and developing concept designs.

More details of the assumptions and results from the micro-simulation modelling are given in the Part 6 documentation for this project (AECOM 2018d).

6.3.2 Crash costs

A summary of results from the analysis of expected crash cost savings are summarised in Table 26. The cells highlighted in green indicate the top three options with most crash cost savings, while the red cells are the bottom three options for this criterion.

In terms of savings in crash costs the top three projects are:

- 100 km/h Monaro Highway improvements
- Barton Highway/Gundaroo Drive grade separation
- Pialligo Avenue duplication.

Other works with relatively high crash cost savings are Coranderrk Street grade separation and Ellenborough Street signals.

Table 26 Monaro Highway (North) – Corridor #14

Option	Savings in Crash Costs (in \$/year) ¹
1-3 Curran/Barton Signals	25,900
1-4 Barton/Gundaroo Grade Separate	220,900
4 All Upgrades Sandford/Morisset	1,000
4-1 Extend Morisset to Federal	31,200
4-2 Sandford/GDE Grade Separate	1,000
4-4 GDE Extra SB-WB Right turn to Barton	33,200
5-1 Ellenborough/Barton Signals	107,300
5-4 Duplicate Mouat	84,600
5-5 Extend Ginninderra	15,000
9-1 Remove NB link from Lady Denman to GDE	11,900
9-3 GDE Free SB-EB Left Turn to Parkes Way	30,800

Option	Savings in Crash Costs (in \$/year) ¹
11-1 EB-SB Loop Morshead to Monaro	81,100
11-7 Anzac/Parkes underpass	17,000
11-8 Coranderrk/Parkes Metered R-about	66,800
11-9 Coranderrk/Parkes Grade Separate	109,900
11-11 Anzac/Parkes Metered R-about	8,100
12-1 Pialligo Duplication	155,400
12-2 Alternate connection to Pialligo	2,500
12-3 Fairbairn/Pialligo Grade Separate	38,200
14-1 Isabella/Monaro Grade Separate	66,700
14-3 100km/h Monaro Improvements	607,800
14-4 Lanyon/Monaro Grade Separate	66,100

¹ Calculated using recent five years of crash data at each site and expected reduction in crash rates as per AGRS08-15 Guide to Road Safety Part 8 Treatment of Crash Locations, then converted to dollars per year

Note: The cells highlighted in green indicate the top three options with most savings in crash costs, while the red cells are the bottom three options for this criterion.

6.3.3 Construction costs

The following high-level estimation of probable construction costs to upgrade various sections of the ACT's major transport corridors are generally based on the following design parameters:

- Barton and Monaro Highways: 110 km/h Design Speed
- All other roads: 70 or 90 km/h Design Speed depending on function of road in the road hierarchy.

The estimates do not include allowance for:

- Design and management fees
- Utility relocation; their impacts and relocation costs
- Property resumptions
- Environmental constraints, e.g. sensitive areas or impacts.

However, GST and a 40% construction contingency have been included.

A summary of the estimated construction costs is given in Table 27. The cells highlighted in green indicate the top three options with least construction cost, while the red cells are the bottom three options for this criterion.

In terms of construction costs the three projects with the lowest estimated costs are:

- GDE free southbound to eastbound left turn to Parkes Way
- Coranderrk Street metered roundabout
- Anzac Parade metered roundabout.

Table 27 Construction cost estimates

Option	Cost (\$M)
1-3 Curran/Barton Signals	6.1
1-4 Barton/Gundaroo Grade Separate	87.6
4 All Upgrades Sandford/Morriset	63.9
4-1 Extend Morisset to Federal	50.7
4-2 Sandford/GDE Grade Separate	1.8
4-4 GDE Extra SB-WB Right turn to Barton	116.4
5-1 Ellenborough/Barton Signals	0.5
5-4 Duplicate Mouat	8.5
5-5 Extend Ginninderra	34.6
9-1 Remove NB link from Lady Denman to GDE	1.1
9-3 GDE Free SB-EB Left Turn to Parkes Way	0.2
11-1 EB-SB Loop Morshead to Monaro	12.9
11-7 Anzac/Parkes underpass	100.7
11-8 Coranderrk/Parkes Metered R-about	0.2
11-9 Coranderrk/Parkes Grade Separate	82.7
11-11 Anzac/Parkes Metered R-about	0.2
12-1 Pialligo Duplication	108.7
12-2 Alternate connection to Pialligo	4.3
12-3 Fairbairn/Pialligo Grade Separate	57.1
14-1 Isabella/Monaro Grade Separate	64.4
14-3 100km/h Monaro Improvements	191.9
14-4 Lanyon/Monaro Grade Separate	59.2

Note: 1. An outline of the assumptions for each of these options is given in AECOM (2018e).

2. The cells highlighted in green indicate the top three options with least construction costs, while the red cells are the bottom three options for this criterion.

6.3.4 Review of corridor MCA scores

There were 28 criteria used in the Stage 2 options MCA analysis that relied on the original data for the Stage 1 corridors MCA analysis. Most of these continued to be based on the road segments GIS analysis, summarised in previous chapters. The maximum score for those segments adjacent to each option were generally used in the Stage 2 MCA.

Three new qualitative criteria were introduced in the Stage 2 MCA and scores applied. These criteria were:

- Engages stakeholder and partner support
- Provides whole of life benefits
- Provides clear problem statement.

A description of these criteria and how they were scored is given in the Part 7 report for this project (AECOM 2018e).

6.4 Option priorities

A number of scenarios were tested with different weightings for key criteria. The weightings and measurements were agreed with the Working Group through a number of meetings and interactive sessions. These scenarios were developed to test the rigour of the results and to see which options were sensitive to various criteria.

Six scenarios were selected, as follows:

1. Scenario 1 – WG Priority - Working Group recommendation
2. Scenario 2 – Freight – focus on freight and heavy vehicle efficiency
3. Scenario 3 – Safety – heavy weighting on safety
4. Scenario 4 – Productivity and Objectives focus
5. Scenario 5 – Domestic Travel – focus on access and travel criteria
6. Scenario 6 – Cost – heavy weighting on cost and feasibility.

The weightings are summarised in Table 28.

Table 28 Criteria weightings for scenarios

Criteria	Scenario 1 WG Priority	Scenario 2 Freight	Scenario 3 Safety	Scenario 4 Productivity	Scenario 5 Domestic Travel	Scenario 6 Cost	Average Percentage
Productivity and Economic Growth	44.0%	74.5%	29.0%	38.0%	40.5%	29.0%	42.5%
Alignment to objectives for the region	25.0%	4.0%	48.5%	18.0%	10.0%	11.0%	19.4%
Connectivity and liveability	10.0%	10.0%	6.0%	26.0%	23.0%	4.5%	13.8%
Sustainability and resilience	5.0%	0.5%	3.5%	7.0%	16.5%	6.5%	6.5%
Feasibility/Cost	16.0%	11.0%	13.0%	11.0%	10.0%	49.0%	18.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Criteria measures are described in Appendix A. A key objective of safety is included in 'Alignment to the objectives for the region.'

Figure 31 shows the ranking of options on Scenario 1 (WG recommendation). The top six are:

1. Barton Highway / Gundaroo Drive / William Slim Drive interchange (grade-separation) - \$87.6M
2. Monaro Highway upgrade Hume, to enable an increased speed limit of 100 km/h between Hindmarsh Drive and to north of Johnson Drive, including grade-separation of key intersections and changes in local road accesses - \$191.9M
3. Lanyon Drive / Monaro Highway interchange (grade-separation) - \$59.2M
4. A package of works to complete the northern leg of the orbital freight route link between Barton Highway and Federal Highway via GDE, Sandford Street and Morisset Road - \$63.9M
5. Pialligo Avenue duplication (NSW border to Airport) - \$108.7M
6. Extend Ginninderra Drive to Northbourne Avenue and constrain Mouat Street access - \$34.6M.

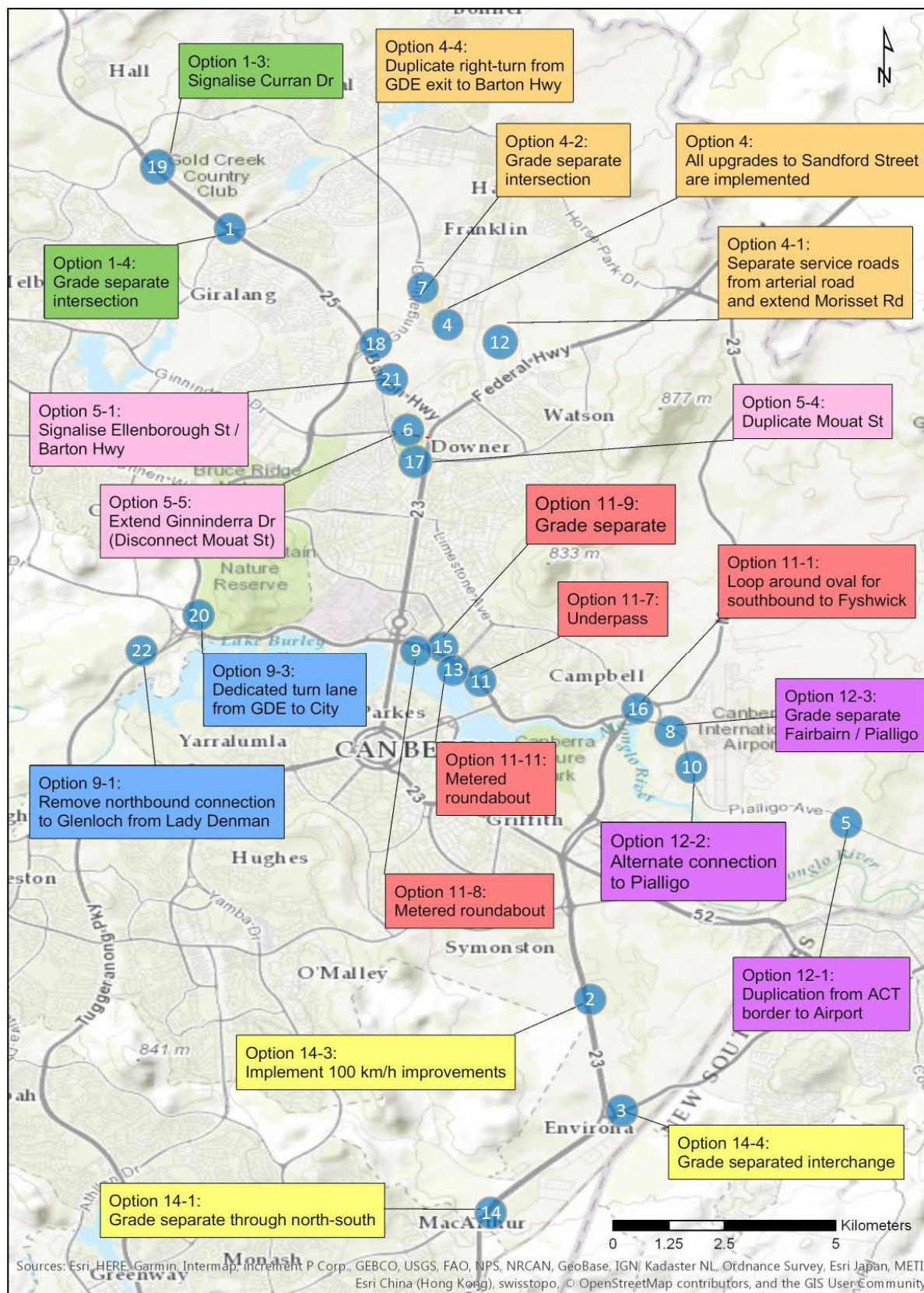


Figure 31 Options ranking

Note: One (1) is the highest ranked option and 22 is lowest

The results of the MCA in Table 29 show a good correlation between the top six rankings across the scenarios. A summary graph showing the relationship between the scores for Scenario 1 and other scenarios is provided in Figure 32. It has two y-axes. The left hand axis refers to the MCA scores in the coloured bars, whilst the right hand axis refers to scores for Scenario 1 only. The difference between the black line and the score totals shows a relatively small variation in the sum of the scores for all scenarios compared with the Scenario 1 (WG) scores show a consistent pattern, reflecting small differences in the scores for different options across different scenarios, giving added confidence in the results.

Table 29 Ranking of projects for different scenarios

Project Description	1 – WG Priority	2 Freight	3 Safety	4 Productivity	5 Domestic	6 Cost	Average Ranks (Based on Score)
1-4 Barton/Gundaroo Grade Separate	1	2	2	1	5	10	1
14-3 100km/h Monaro Improvements	2	4	1	7	14	21	3
14-4 Lanyon/Monaro Grade Separate	3	1	4	2	11	3	2
4 All Upgrades Sandford/Morisset	4	6	17	13	7	22	13
12-1 Pialligo Duplication	5	12	3	5	12	20	7
5-5 Extend Ginninderra	6	19	12	10	6	4	9
4-2 Sandford/GDE Grade Separate	7	11	11	16	15	6	11
12-3 Fairbairn/Pialligo Grade Separate	8	3	5	3	9	13	5
11-8 Coranderrk/Parkes Metered R-about	9	7	6	6	1	1	4
12-2 Alternate connection to Pialligo	10	5	7	4	10	2	6
11-7 Anzac/Parkes underpass	11	16	16	9	2	17	10
4-1 Extend Morisset to Federal	12	9	21	19	17	14	18
11-11 Anzac/Parkes Metered R-about	13	13	13	8	4	5	8
14-1 Isabella/Monaro Grade Separate	14	8	8	14	18	18	16
11-9 Coranderrk/Parkes Grade Separate	15	17	10	11	3	19	12
11-1 EB-SB Loop Morshead to Monaro	16	14	9	12	13	16	14
5-4 Duplicate Mouat	17	21	20	21	16	15	21
4-4 GDE Extra SB-WB Right turn to Barton	18	20	18	18	20	12	19
1-3 Curran/Barton Signals	19	10	15	17	21	8	17
9-3 GDE Free SB-EB Left Turn to Parkes Way	20	18	14	15	8	7	15
5-1 Ellenborough/Barton Signals	21	22	22	22	22	11	22
9-1 Remove NB link from Lady Denman to GDE	22	15	19	20	19	9	20

Note: 1. Options shown in order of rank from highest to lowest 2. WG is Working Group
3. All corridor 4 options include Morisset Road extension.

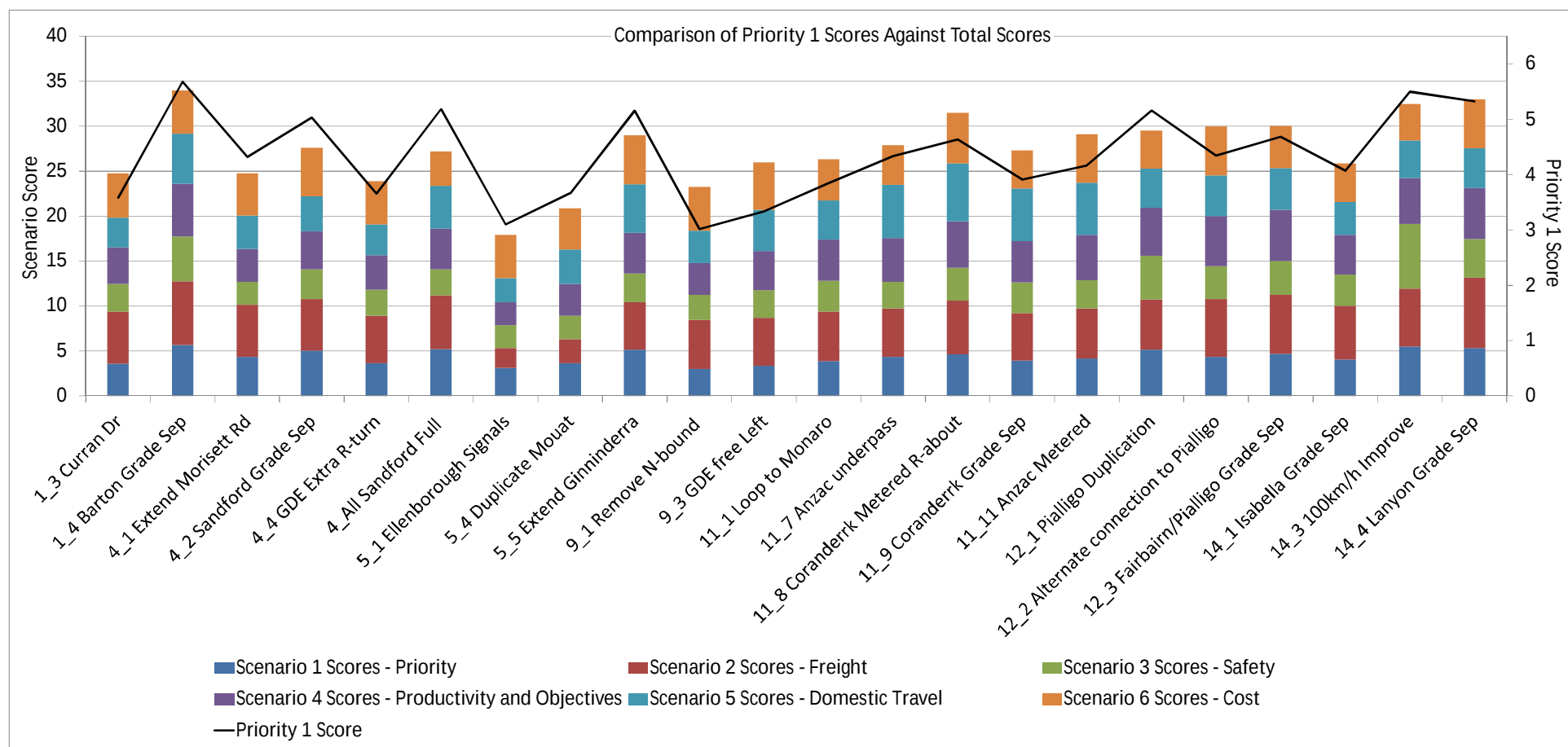


Figure 32 MCA scores summary comparison

A description of the outcome of the MCA analysis for the top six ranked options follows. The lower priority projects also have merits and should be considered for delivery following progressing of the six highest priority projects.

6.4.1 Option 1-4 Barton Highway / Gundaroo Drive Grade Separation

This ranked first in the WG scenario and first on average. It also ranked very highly (first or second) in terms of freight, productivity and safety. The only scenario where it ranked poorly was cost (tenth).

This option is considered a long-term solution to traffic safety and congestion issues at this intersection. The recently installed signals have significantly reduced delays and crashes here. Grade-separation may become a stronger consideration in future with development of the CSIRO land and duplication of Barton Highway in NSW.

6.4.2 Option 14-3 100 km/h Monaro Highway improvements

This ranked second in the WG scenario and third on average. It also ranked highly (first to fifth) in terms of freight, productivity and safety. It is the highest cost option and ranked lowly in the cost scenario. This option warrants further investigation, especially with regards potential staging to spread potential expenditure.

6.4.3 Option 14-4 Lanyon Drive / Monaro Highway grade separation

This ranked third in the WG scenario and second on average. It also ranked highly (first or second) in terms of freight, productivity and safety. It would provide substantially more benefits than other options in terms of freight and productivity. This option warrants further investigation.

6.4.4 Option 4 All Upgrades Sandford Street and Morisset Road

This ranked fourth in the WG scenario and thirteenth on average. It also ranked well in the freight and domestic travel scenarios (sixth or seventh). This option warrants further investigation.

It is of significant strategic importance in terms of future freight and traffic safety benefits. Importantly, this link would complete the Orbital Freight Route.

6.4.5 Option 12-1 Pialligo Avenue duplication

This ranked fifth in the WG scenario and seventh on average. It also ranked well in the safety and productivity scenarios (third or fifth) indicating that it is worth further investigation.

It could rank higher if given more importance in relation to freight movement and attract more heavy vehicles. Of all the scenarios, the freight scenario showed most sensitivity to changes in criteria values, as the scoring profile for this scenario is relatively flat for many options (see Figure 33).

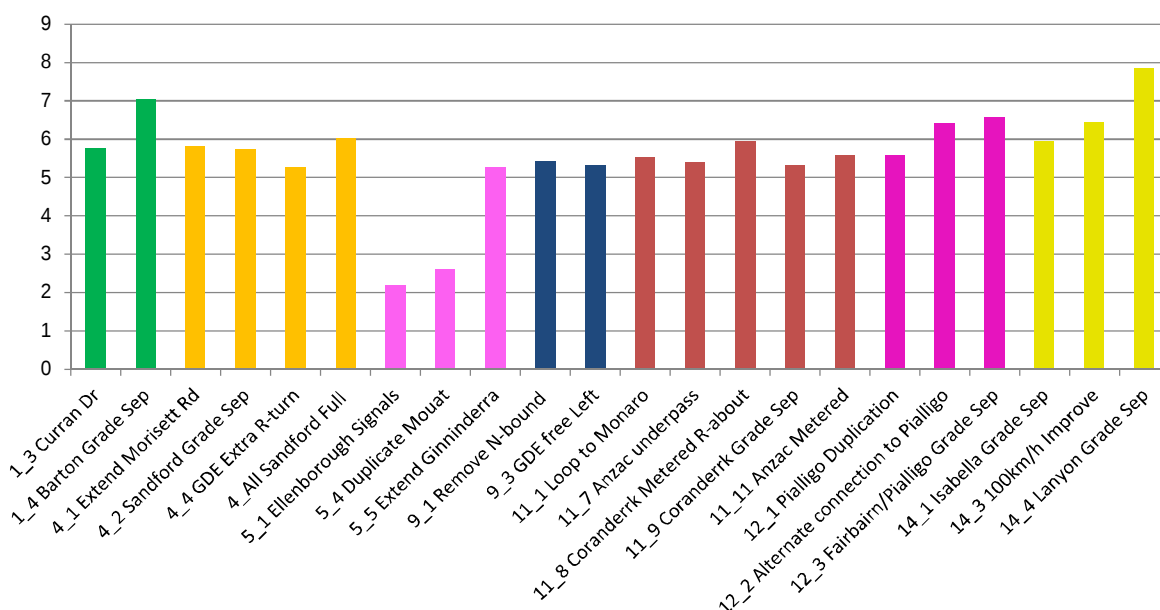


Figure 33 MCA scores for freight scenario

Although Pialligo Avenue ranked twelfth in the freight scenario, it had a very similar score to the Sandford Street and Morisset Road options that ranked sixth in the freight scenario. The Sandford Street and Morisset Road options were higher because they form part of the Orbital freight route, even though heavy vehicle volumes on Sandford Street are similar to Pialligo Avenue.

Two factors could readily push Pialligo Avenue into the top six for freight:

- Growth in truck volumes using Pialligo Avenue, as currently truck volumes are moderate east of the airport
- A strategic policy decision to upgrade Pialligo Avenue in the freight network hierarchy, as it is the key connection between Canberra Airport and Kings Highway to the east.

This option is worthy to investigate in more detail, including possible consideration of additional works in relation to an alternative access to Pialligo and in future across Molonglo River to Fyshwick and Symonston. Such a link and growth in the airport would significantly foster freight and increased productivity in this corridor.

6.4.6 Extend Ginninderra Drive

This ranked sixth highest in the WG scenario and ninth on average. It also ranked high in the cost and domestic travel scenarios (fourth and sixth), as both of these scenarios included a sizeable proportion of travel cost savings in the scoring. This option did not rank highly in terms of freight or productivity; the latter scenario including a sizeable proportion of freight criteria in the scoring.

This option has the most risks of the top six and it may lead to adverse impacts on adjacent land-uses and access. The design of the crossing of Sullivans Creek would be an important consideration, as well as connectivity via Mouat Street to Dickson and changes to the design of the Northbourne Avenue/Swinden Street intersection.

Many of these risks could be allayed through the design. However, the main concern will be negotiating an agreement with Yowani Golf Club. A preliminary concept design could be developed to form a basis of discussions with Yowani.

6.4.7 Other options

The corridor and options analysis revealed a number of other options worthy of further investigation, as well as potential complementary projects. Options warranting further investigation are:

- A number of options that form part of combined options for Monaro Highway or Sandford Street and Morisset Road upgrades.
- Fairbairn Avenue/Pialligo Avenue grade separation in conjunction with an alternate connection to Pialligo. These options ranked fifth and sixth on average score, although slightly lower in the WG scenario (eighth and tenth). These options are worthy for further investigation as part of an overall study of Pialligo Avenue.
- The Coranderrk Street / Parkes Way metered signals option which ranked highly in many scenarios. It ranked ninth in the WG scenario and fourth on average and should be investigated in conjunction with the proposed signals at the Anzac Parade roundabout. They are likely to produce significant benefits if delivered together.
- An additional overtaking lane on Monaro Highway between Old Cooma Road and the NSW border. This section of Monaro Highway had a moderate MCA score in the corridor assessment (Figure 4). It is a key strategic link to south-east NSW, the snow-fields, the port of Eden and Eastern Victoria. Previous studies have shown that it has a poor safety record and highly variable traffic volumes causing traffic congestion at times and is worthy of more detailed investigation.
- Kings Highway east of Queanbeyan is an important strategic link to the south coast and serves a growing area, including parts of ACT that includes Kings Highway. The corridor assessment for this link showed a moderate MCA score (Figure 4).

Complementary projects are projects that are best combined rather than considered in isolation. Some examples of these are:

- The metered signals options on Parkes Way. Implementing both projects at Anzac Parade and Coranderrk Street will be more effective than at one location.
- The grade-separation options at Coranderrk Street and Anzac Parade on Parkes Way cannot be considered in isolation. They would need to be implemented as a package, including works where Parkes Way intersects with Commonwealth Avenue and Edinburgh Avenue (i.e. City to the Lake infrastructure proposals).
- The grade-separation options along Monaro Highway cannot be considered in isolation. The Lanyon Drive interchange should be considered together with a new connection between Lanyon Drive and David Warren Road, with the David Warren Road access at Monaro Highway modified. It should also form part of an overall staged strategy for Monaro Highway. The impact of these upgrades on other parts of Monaro Highway should also be considered. Improvements to Monaro Highway in Hume could adversely impact Monaro Highway north of Hindmarsh Drive, particularly the section between Hindmarsh Drive and Canberra Avenue where there is a relatively short weaving section and high volumes in peak hours.
- The Sandford Street and Morisset Road improvements cannot be considered in isolation. The extension of Morisset Road to Federal Highway will complete a missing link in the Orbital Freight route. However, the connection to Gungahlin Drive will also need to be upgraded, including the link between Hoskins Street and Gungahlin Drive. An alternative access arrangement to the cemetery and crematorium will need to be investigated.
- The benefits of the duplication Pialligo Avenue can be enhanced by increasing the capacity of the intersection with Fairbairn Avenue and Beltana Road, including an examination of alternative options for connections to Pialligo.



7.0

RECOMMENDATIONS

7.0 Recommendations

As a result of these analyses, it is recommended that the following work be undertaken as a priority:

1. Feasibility and preliminary design study for a future overpass of the Barton Highway / William Slim Drive / Gundaroo Drive roundabout. The recently installed signals have significantly reduced delays and crashes here. Grade-separation will become a stronger consideration in future with development of the CSIRO land and duplication of Barton Highway in NSW.
2. A detailed feasibility study of the Monaro Highway corridor between Isabella Drive and David Warren Road to examine options and determine a preferred design for a 100 km/h roadway and a staged implementation plan. This should include the investigation and recommendations for a future road reserve to connect Isabella Drive with Dunns Creek Road and the impacts of these upgrade work on sections of Monaro Highway north of Hindmarsh Drive.

This project indicates that grade-separation at Lanyon Drive is the highest priority work in this corridor. It should be considered with a new connection between Lanyon Drive and David Warren Road, with the David Warren Road access at Monaro Highway modified.

3. Feasibility study for the Morisset Road Extension, including design and investigations of options for upgrading Sandford Street and an improved connection between Barton Highway and Federal Highway. This option is of significant strategic importance in terms of future freight and traffic safety benefits. Importantly, it would complete the Orbital Freight Route and provide an improved strategic freight connection between Barton Highway, Federal Highway, Majura Parkway, Monaro Highway, Pialligo Avenue and Kings Highway. It will help better accommodate heavy vehicle movements between the Barton Highway in the north-west and the Canberra Airport and Monaro Highway in the south-east in the medium to long term.
4. Update the PSP design of the Pialligo Avenue corridor between the ACT-NSW border and the intersection with Fairbairn Avenue and Beltana Road, including an examination of alternative options for connections to Pialligo, Fyshwick and Symonston. The focus of the updated design would be duplication between the ACT-NSW border and Brindabella Circuit. The investigation should recommend an implementation plan for Pialligo Avenue duplication and future connections.

In addition, the following studies should be instigated:

- Feasibility study to investigate the Ginninderra Drive Extension and constrained Mouat Street access to simplify the signal phasing at the intersection of Mouat Street, Antill Street and Northbourne Avenue. This should be compared with an option to duplicate Mouat Street. A preliminary concept design could be developed to form a basis for discussions with Yowani Golf Club, if the Ginninderra Drive Extension option is verified as being more important than duplicating Mouat Street.
- Feasibility study to investigate intersection improvements at the Sandford Street and Gungahlin Drive intersection including a grade separated interchange.
- Feasibility study of options to improve the capacity and operations of Monaro Highway between David Warren Road and Fairbairn Avenue, to upgrade to a 100 km/h speed limit. This would include consideration of a potential future Symonston Road interchange, improvements to the weave between Hindmarsh Drive and Canberra Avenue, improvements to the Newcastle Street and Morshead Drive ramp operations and the proposed eastbound to southbound loop from Morshead Drive to Monaro Highway.
- A detailed feasibility study for the implementation of metered traffic signals at the Parkes Way roundabouts at Coranderrk Street and Anzac Parade. Both intersections need to be treated to avoid adverse impacts of shifting the bottleneck and having an overall detrimental effect on broader network performance.
- Extend the current analyses and investigations in the next stage of this project to examine complementary projects and a potential package of projects to include in a program of works (e.g. similar to Easing Sydney Congestion program).

- Design study for an additional overtaking lane on Monaro Highway between Old Cooma Road and the NSW border. It is a key strategic link to south-east NSW, the snow-fields, the port of Eden and Eastern Victoria. Previous studies have shown that it has a poor safety record and highly variable traffic volumes causing traffic congestion at times and is worthy of more detailed investigation.
- A heavy vehicle route network study of ACT and regional connections to identify a clear road hierarchy for freight movements, including recommendations to reduce traffic conflicts on Northbourne Avenue and the light rail route. This review should collect data on heavy vehicle movements in the ACT and region, fill gaps in the current freight network and provide recommendations for network development to support freight movements. For example, Pialligo Avenue is a crucial link to the east to Kings Highway from Canberra Airport, but has a relatively low status in the current freight strategy. Also, there needs to be investigation into what route for heavy vehicle movements between the Barton Highway, the Airport and Monaro Highway should be favoured in terms of policy and infrastructure funding. While preference for freight movements are the national key freight routes (Barton Highway, Federal Highway, Majura Parkway and Monaro Highway), alternative options need to be investigated to connect the national key freight routes to Canberra Airport and major freight destinations.

A photograph of a park or urban landscape. In the foreground and middle ground, several tall, black, modern light poles are visible. Each pole has a horizontal arm extending from it, with a light fixture at the end. The poles are arranged in a row, receding into the distance. To the right of the poles, there are trees with bright yellow autumn leaves. The ground is covered with fallen yellow leaves. In the background, there are some benches and a paved path. The sky is blue with some white clouds. A large black rectangular box is overlaid on the left side of the image, containing the word "REFERENCES" in white capital letters.

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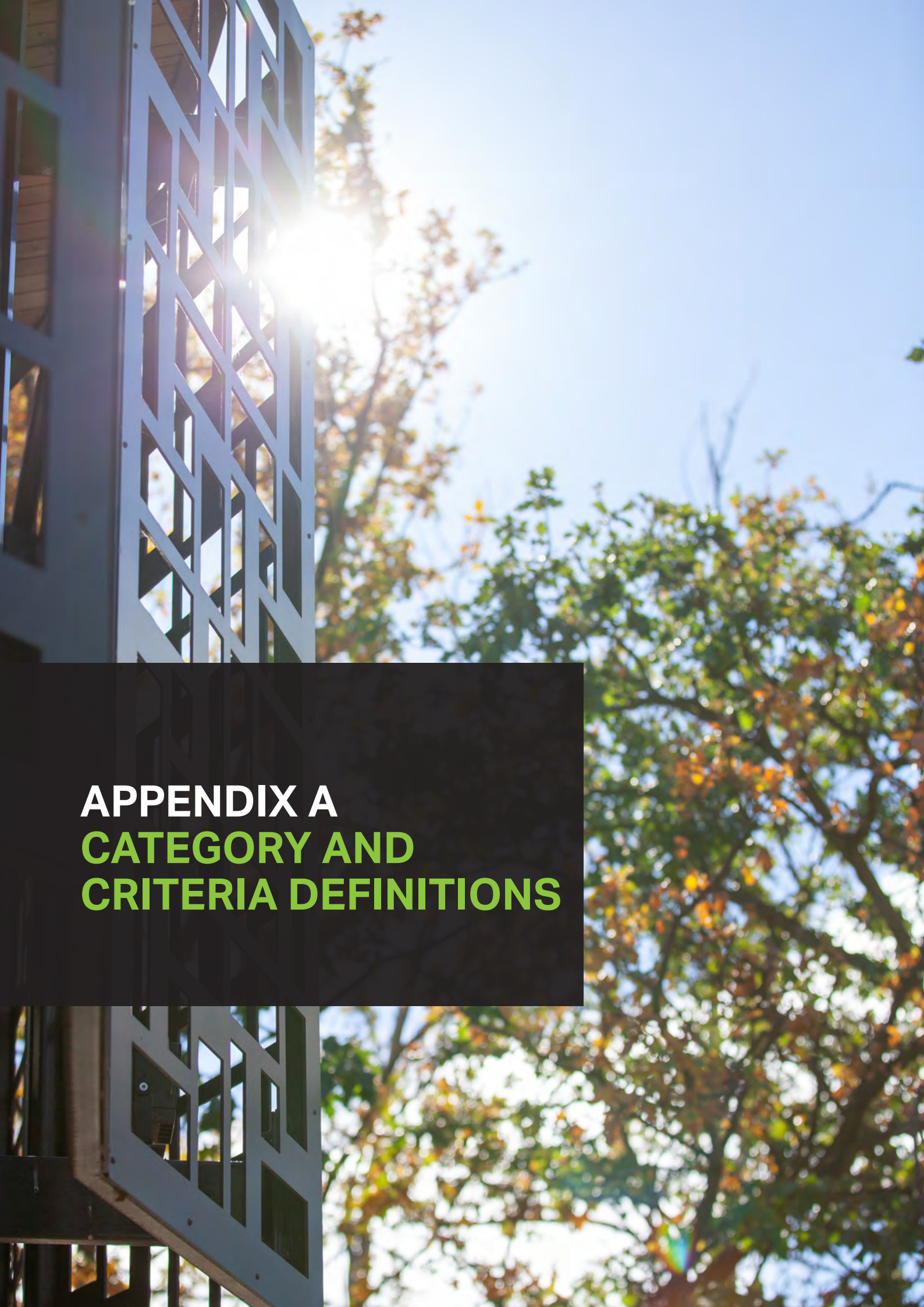
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APPENDIX A **CATEGORY AND** **CRITERIA DEFINITIONS**

Appendix A Category and criteria definitions

Table 30 Categories and Criteria

Category	Criteria
Productivity and Economic Growth	Supports freight efficiency
	Benefits existing & emerging industries
	Provides travel time savings and reliability
	Provides opportunities to access jobs & markets
Alignment to outcomes / objectives for the region	Facilitates ACT plans & strategies
	Aligns with Commonwealth, NSW, Regional, & Local Government plans & strategies
	Stakeholder support and partner engagement
Connectivity and liveability	Serves land use planning including growth areas
	Borderless regional transport network
	Links to activity centres & key destinations (Place & Destination)
	Protect urban amenity
Sustainability and resilience	User safety across all modes
	Active and public transport opportunities & impacts
	Environmental impacts & benefits
	Social impacts & benefits
	Improves resilience of transport network
	Whole of life benefits including staging, management and future proofing
Feasibility	Clear problem statement
	Order of cost
	Physical constructability & staging
	Potential for co-contributions

Table 31 Category Definitions

Category	Definition
Productivity and economic growth	Extent to which the project or corridor will improve access to jobs, improve productivity through travel time savings or benefit tourism, trade and freight in the region.
Alignment to outcomes / objectives for the region	Alignment of the project or corridor with policy and strategic thinking, supporting broader regional outcomes. This includes consistency with current Commonwealth, State and Territory planning and policies.
Connectivity and liveability	Degree to which the project or corridor will improve access to employment centres, commercial precincts and other activity centres at a regional and domestic level. This includes access to social, sporting and education facilities that provide benefits to regional and remote communities or supports lower socio-economic communities and enables growth.
Sustainability and resilience	Degree to which the project or corridor will impact on the natural and built environment, increases redundancy in the transport network and reduces the risk or impact of disruptions including natural disasters or major incidents.
Feasibility	The likely physical constructability and financial feasibility for funding the project or corridor works.

Table 32 Criteria Definitions and Indicators

Criterion	Definition & Indicators
Productivity and economic growth	
Supports freight efficiency	- Benefits heavy vehicle (including HPVs) and goods movements on strategic freight links including addressing deficiencies or gaps. - Supports destination hubs, freight hubs, Canberra freight hub, People and Freight, last mile, and corridor protection. - Heavy vehicle volumes, growth opportunities and link performance will be used as indicators to inform freight benefits.
Benefits existing & emerging industries	- Improves access to industries serving the regional population, particularly tourism. - Facilitates regional economic diversification. - Primary arterial routes to the coast, snow or other regional or national attractions.
Provides travel time savings and reliability to commuters	- Reduces travel times and improves travel time reliability through improvements to transport infrastructure. - Volume capacity ratio from CSTM for comparing corridors and network travel time savings for projects.
Provides opportunities to access jobs & markets	- Improves access or opportunities access to jobs and markets. - Primary job locations and journey to work desire lines from ABS data and anticipated growth in jobs and population.
Alignment to outcomes / objectives for the region	
Facilitates ACT plans & strategies	- Facilitates objectives identified in ACT planning and policy documents. - Cross-border access to jobs, industries and services.

Criterion	Definition & Indicators
Aligns with Commonwealth, NSW, Regional, & Local Government plans & strategies	- Facilitates relevant Commonwealth, State and Local Government plans, policies and objectives. - Road hierarchy and classification.
Stakeholder support and partner engagement	- Achieves community, stakeholder and industry support for the project. - Expected project risks and impacts such as environmental or economic concerns.
Connectivity and liveability	
Serves land use planning including growth areas	- Alignment with land use plans, including and serving future growth areas. - Potential impact on adjoining land-use. - Serves future growth areas. Traffic data from the CSTM will help identify the needs to service future growth.
Borderless regional transport network	- Provides increased capacity for cross border transport links or improves ability for cross border travel (all modes). - Facilitates integration of public transport services across the border for a borderless user experience. - Need for increased road capacity for cross-border transport links link.
Links to activity centres & key destinations (Place & Destination)	- Improves access to activity centres visited on a regular or daily basis. - Serves or is in close proximity to major activity centres (e.g. shopping centre, recreation area). - Improves access to key destinations visited occasionally. - Serves or is in close proximity to key destinations (e.g. hospital, airport, major tourism attractions).
Protects urban amenity	Improves urban amenity through improved road environment consistent with land-use planning objectives (e.g. less heavy vehicles through commercial centres or on residential streets, better active transport linkages and environment). Addresses existing deficiencies in amenity – place
Sustainability and resilience	
User safety across all modes	- Improves road safety for all users across all modes of transport. - Recent crash rates and potential for reducing these.
Active and public transport opportunities & impacts	- Improves public transport and active travel conditions or performance. - Project or corridor aligns with major public transport routes or adjacent to land-uses which could benefit active and/or public transport.
Environmental impacts & benefits	- Environmental impacts and benefits of project or corridor augmentation. - Perceived or estimated impacts on flora/fauna, noise, vegetation values, heritage, etc.
Social impacts & benefits	- Social impacts and benefits of project or corridor augmentation. - Perceived or estimated impacts on access, amenity, noise, community, etc.

Criterion	Definition & Indicators
Improves resilience of transport network	- Impacts of a major incident (e.g. flood, fire, explosion) on network performance. - Provision of back up routes or an alternative corridor - Contribution to the robustness of the regional transport network - Construction & delivery standard appropriate to the locality, intended use and lifespan of the proposed infrastructure - Location of network constraints, especially roads subject to flooding. Use of CSTM to quantify the impact of a major incident.
Whole of life benefits including staging, management and future proofing	- Ability to optimise asset life and implement efficient project staging and maintenance. - Future adaptability to disruptive technologies. - Longevity of project works and ability to stage construct to minimise impacts to road users. - Future proofing by protecting corridors, managing land-use and growth impacts.
Feasibility	
Value for money	- Expected benefits of project in relation to estimated capital cost. - Capital cost to be derived from project concept design and benefits from an economic analysis. A perceived value may be determined at a corridor evaluation level.
Clear problem statement	- Able to clearly demonstrate the project need and intended function of corridor. - Identification of improved productivity, connectivity, safety or capacity.
Order of cost	- Perceived project cost over the life of the project. - Costs relative to budget scale – greater detail at project concept design.
Physical constructability & staging	- Feasibility of corridor construction given potential constraints. - Likely engineering risks of project or corridor, such as terrain, geology, watercourses. - Jurisdictional differences & cross-border differences
Potential for co-contributions	- Potential for co-contributions for funding project. - Review likely sources of funding.



APPENDIX B

OPTION DESCRIPTIONS

Appendix B Option Descriptions

Corridor 1 - Barton Highway (ACT)

Two upgrade options have been proposed for Corridor 1 and these are described in Table 18.

Table 33 Proposed upgrade options for Corridor 1

Option number	Option	Key issues to address
1-3	Signalise the intersection of Barton Highway and Curran Drive	Two-lane cross-over, safety, queuing of right turn; platooning to improve bus service at Gold Creek Road intersection
1-4	Grade separation at Barton Highway – William Slim Drive/Gundaroo Drive	Improve capacity and safety, improve freight travel time and reliability

The following sections provide brief descriptions of the Corridor 1 options, including a conceptual sketch of each to illustrate how they can be implemented.

Option 1-3 Curran Drive Signals

Option 1-3 upgrades the existing priority-controlled intersection to a signalised one. This is expected to improve safety, as well as introduce platooning and sufficient gaps for the nearby priority-controlled intersection at Gold Creek Road. The concept design layout of this option is shown in Figure 34.

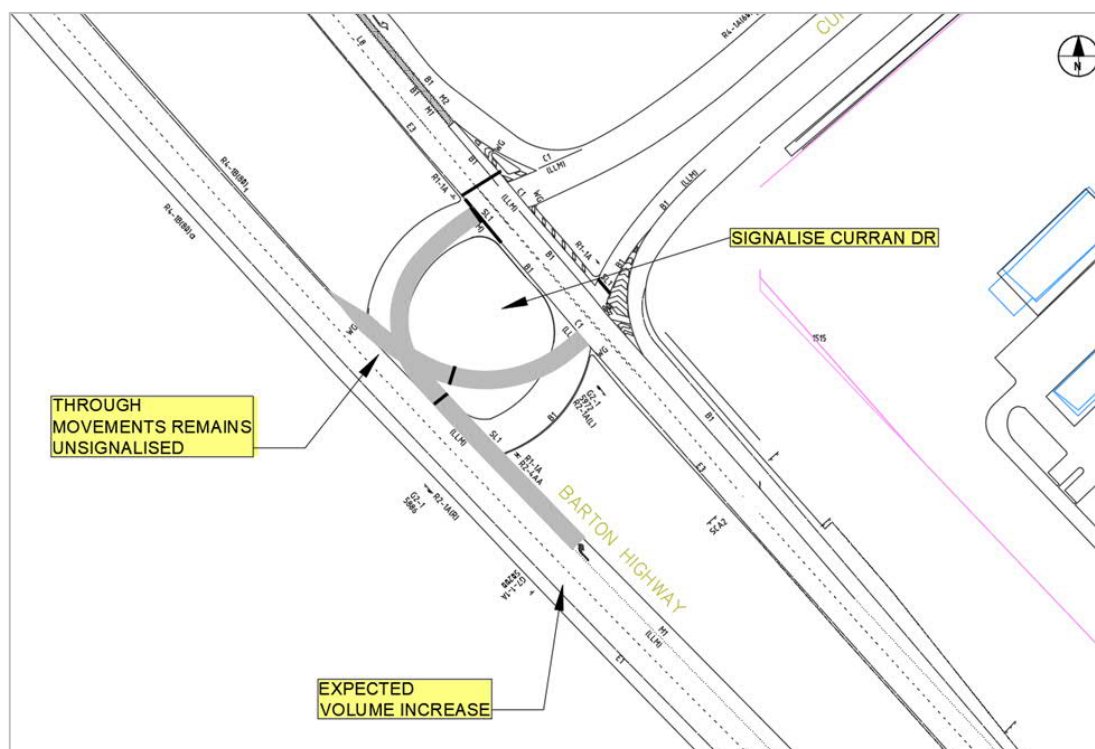


Figure 34 Option 1-3 Signalise the intersection of Barton Highway and Curran Drive

Option 1-4 Barton Highway/Gundaroo Drive Grade Separation

The expected future growth of traffic on Barton Highway due to development at Murrumbateman and existing CSIRO land is expected to put a large strain on the operation of the intersection of William Slim Drive / Barton Highway / Gundaroo Drive. To improve the operation of this intersection, this option considered a fly-over along Barton Highway.

A flyover is proposed to facilitate free-flow on Barton Highway with a new bridge to extend over the existing waterway. The existing traffic lights would remain to facilitate the east-west traffic along William Slim Drive and Gundaroo Drive and conflicts with turning traffic to/from Barton Highway (see Figure 35).

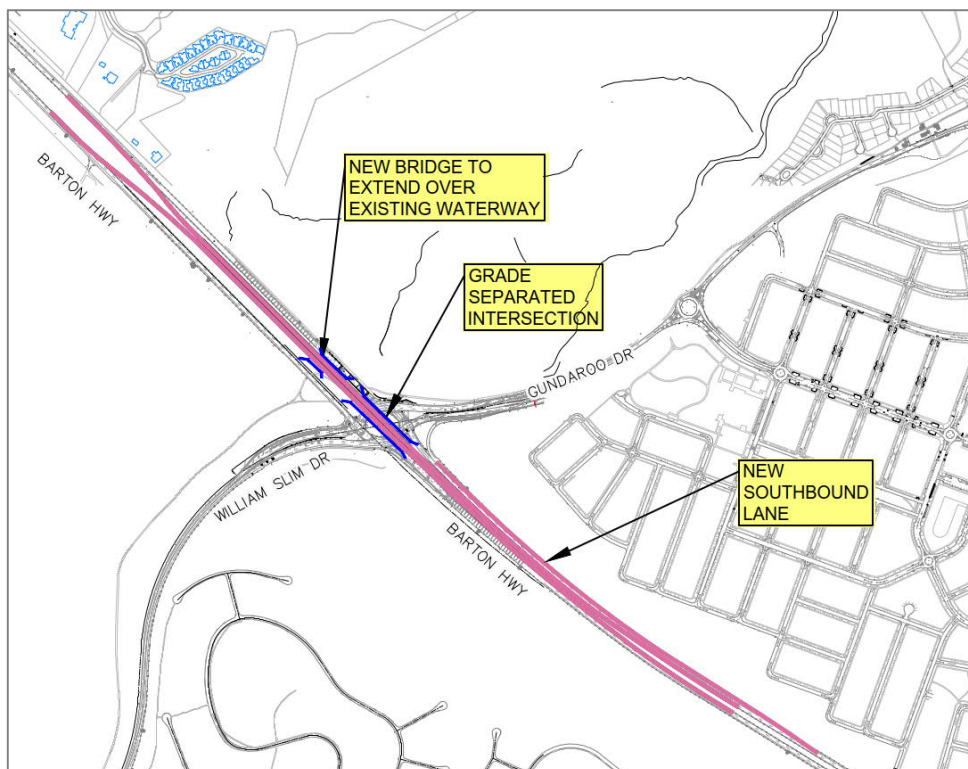


Figure 35 Barton Highway overpass

Corridor 4 – Morisset Road Extension

Four options were modelled in Corridor 4. Three individual options have been proposed and the fourth option is a combination of all three. A description of each option is shown in Table 34 and more detailed descriptions and sketches follow.

Table 34 Proposed upgrade options for Corridor 4

Option number	Option	Key issues to address
4-1	Separate service roads from arterial road through Mitchell and extend Morisset Road	Reduce conflict and congestion, improve travel time and accommodate more freight
4-2	Grade-separate Sandford Street – Gungahlin Drive intersection and extend Morisset Road	Increase capacity, improve safety
4-4	Duplicate right-turn from Gungahlin Drive exit to Barton Highway and extend Morisset Road	Increase capacity, reduce queue lengths
4	Combination of Options 4-1, 4-2 and 4-3	As above

Option 4-1 Sandford Street Service Roads and Morisset Road Extension

The Morisset Road extension has been proposed to accommodate more freight and address issues related to congestion and travel time. Upgrades to Sandford Street between Hoskins Street and Flemington Road are also proposed incorporating the addition of service roads to reduce conflict (Figure 36). This option assumes this section of Sandford Street and Morisset Road would then function as an arterial road with a new speed limit of 80 km/h.

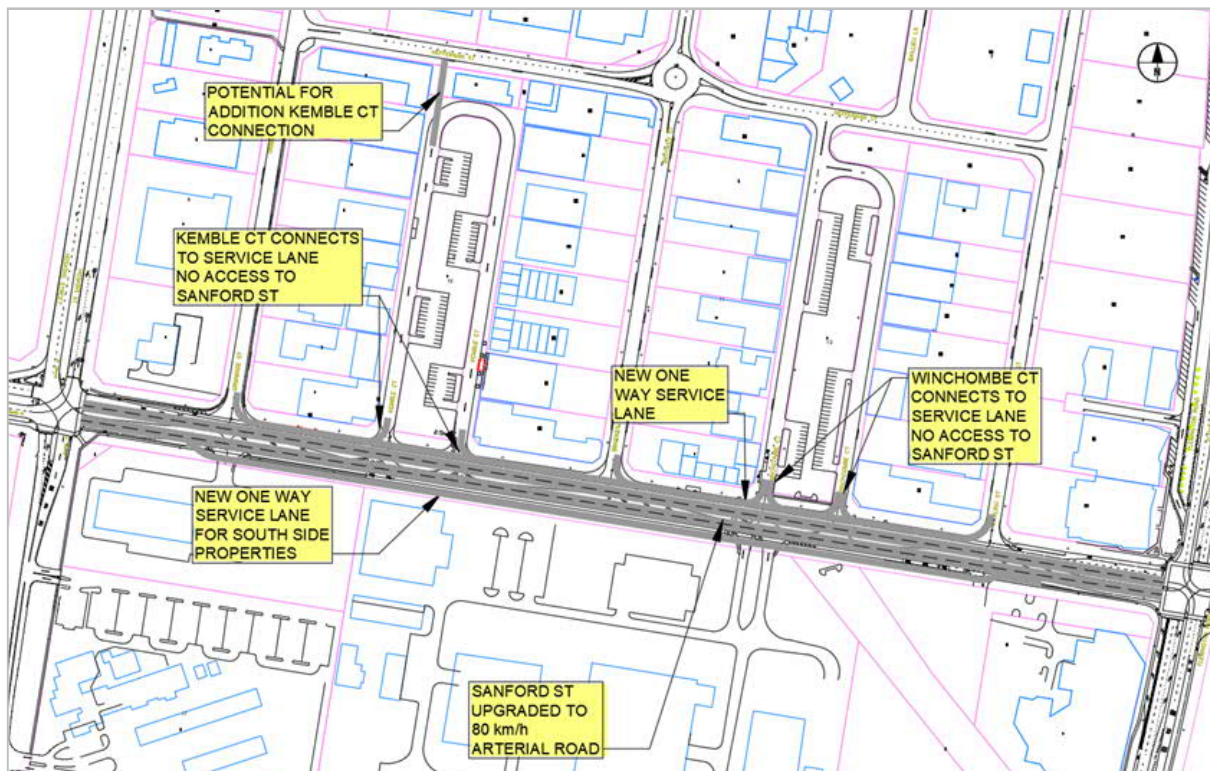


Figure 36 Option 4-1 Separate service roads from arterial road through Mitchell and extend Morisset Road

Option 4-2 Grade separation at the Gungahlin Drive/Sandford Street intersection and Morisset Road Extension

Grade separation at the Gungahlin Drive/Sandford Street intersection has been proposed to improve safety and increase capacity. The flyover is proposed to be built along Gungahlin Drive to reduce traffic congestion here and enable improved flow of heavy vehicles between Sandford Street and Gungahlin Drive (Figure 37).

The modelling of this option also assumed:

- Alternate access arrangements to Norwood Park Crematorium and Gungahlin Cemetery
- Change to the function of Sandford Street between Gungahlin Drive and Hoskins Street to enable an 80 km/h speed limit on this section of road
- Upgrades to Morisset Road including an extension to Federal Highway and an 80 km/h speed limit between Flemington Road and Federal Highway.

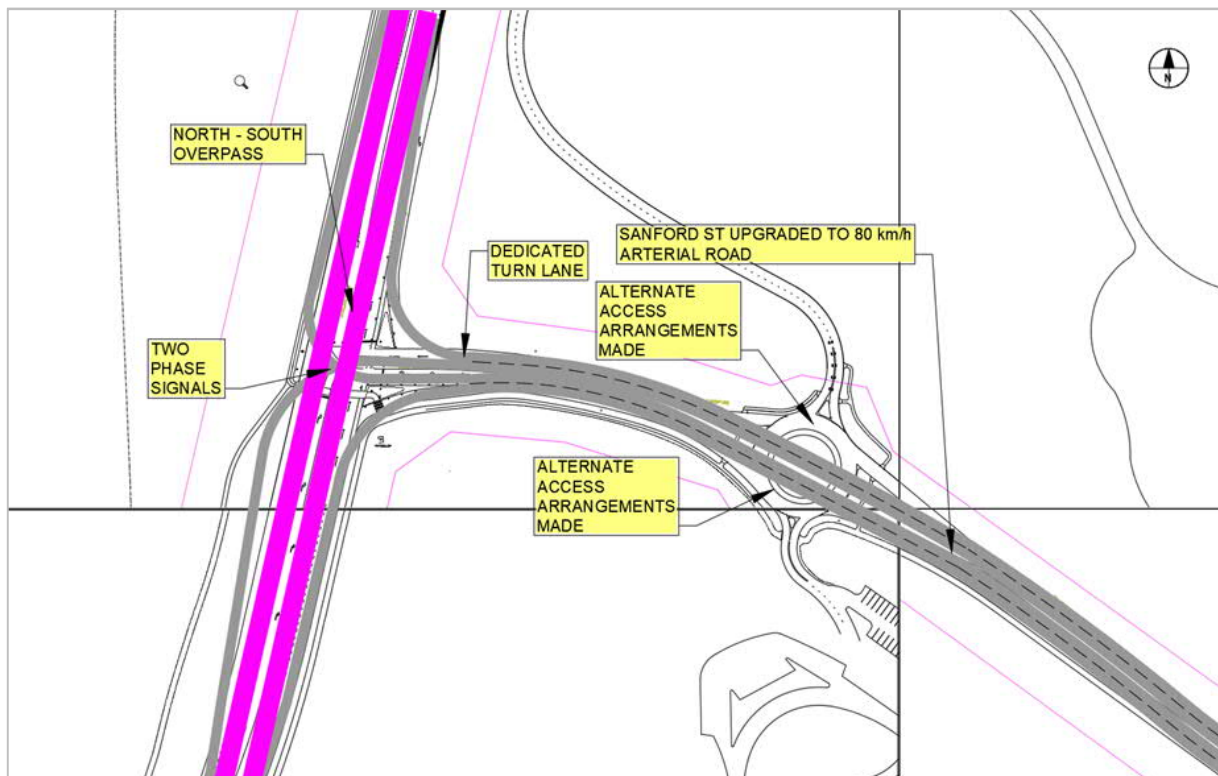


Figure 37 Option 4-2 Grade-separate Sandford Street – Gungahlin Drive intersection

Option 4-4 Grade separation at the Gungahlin Drive/Sandford Street intersection and Morisset Road Extension

The duplication of the right-turn from Gungahlin Drive to Barton Highway is to increase capacity and reduce queue lengths at the intersection (Figure 38). This is proposed to be done in conjunction with an upgrade of Morisset Road including:

- The Morisset Road extension to Federal Highway and an increase in traffic via this route
- Upgrades to Morisset Road to enable an 80 km/h speed limit between Flemington Road and Federal Highway.

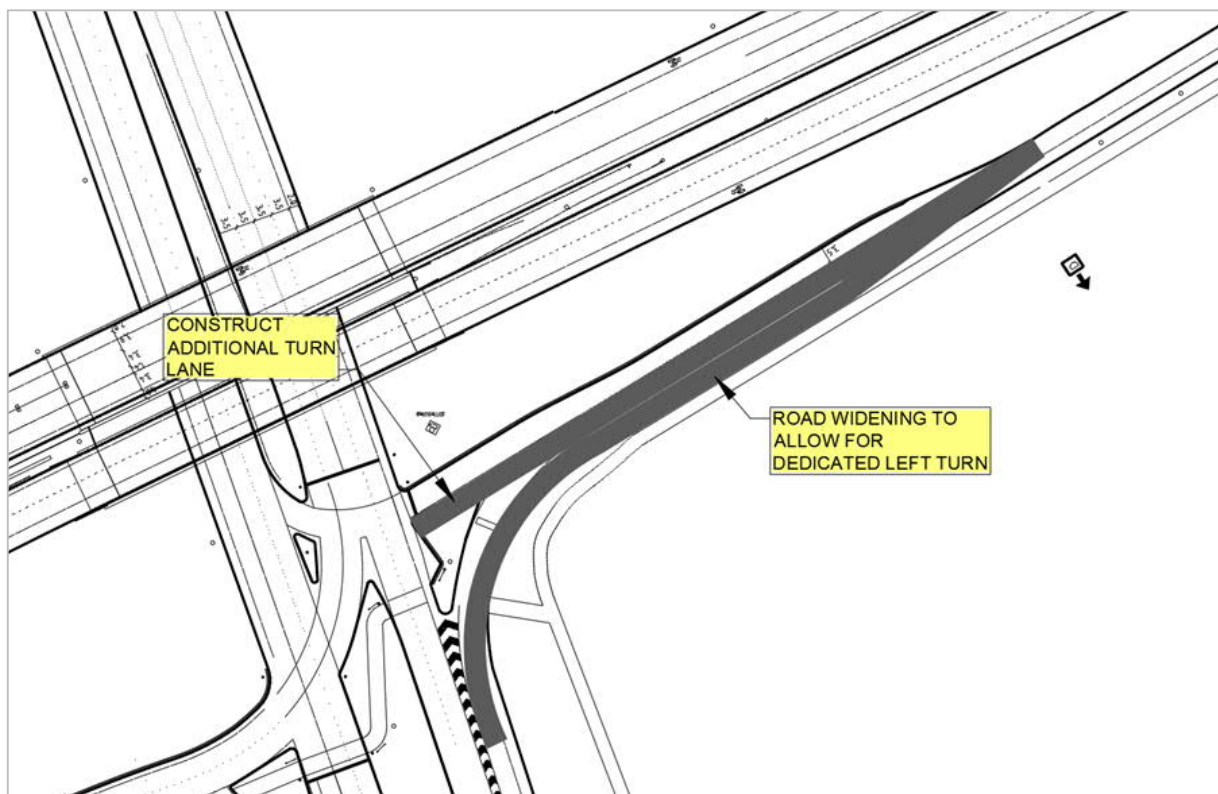


Figure 38 Option 4-4 Duplicate right-turn from Gungahlin Drive exit to Barton Highway

Option 4 All Upgrades Sandford Street and Morisset Road

This option helps complete the ACT Orbital Freight Route, shown in Figure 19. It provides an improved arterial road connection between Barton Highway, Federal Highway and Majura Parkway, bypassing traffic congestion in the section of Federal Highway that will carry light rail vehicles. It will improve regional road connections to all parts of NSW surrounding ACT, including Monaro Highway and Kings Avenue via Pialligo Avenue.

Figure 39 provides an overview of the upgrade components included in this option. Further descriptions and diagrams showing these components follow below.

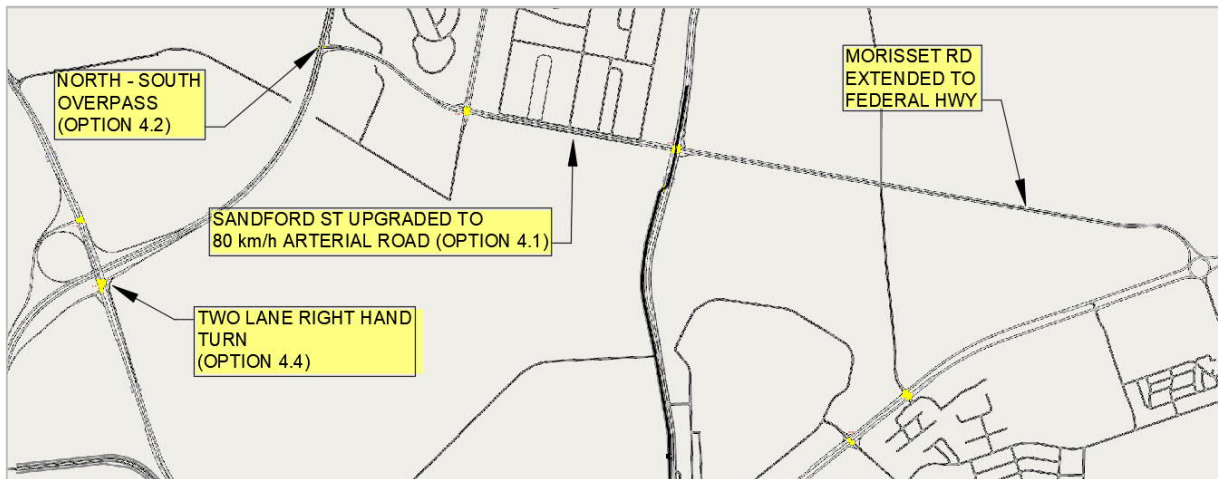


Figure 39 Sandford Street upgrade – option components

The following network modifications were included in the modelling of this option:

- Extension of Morisset Road to Federal Highway via a fourth leg to the Antill Street roundabout
- Sandford Street and Morisset Road upgraded to a 80 km/h arterial road
- New service roads on Sandford Street between Hoskins Street and Flemington Road, reducing access to side-streets and driveways through Mitchell (see Figure 36)
- Gungahlin Drive flyover at the intersection with Sandford Street and alternate access arrangements to Norwood Park Crematorium and Gungahlin Cemetery (see Figure 37)
- Construction of an additional right turn lane from Gungahlin Drive to Barton Highway (see Figure 38).

Corridor 5 – The Y: Barton Highway/Federal Highway and Ellenborough Street/Mouat Street

Three options were developed for Corridor 5, described in Table 35. Brief descriptions and conceptual sketches of the Corridor 5 options follows to illustrate how they can be implemented.

Table 35 Proposed upgrade options for Corridor 5

Option number	Option	Key issues to address
5-1	Signalise Ellenborough Street/Barton Highway intersections and allow all turns	Ease right turn queue, reduce merge issue
5-4	Duplicate Mouat Street, removing bottleneck at Sullivans Creek bridge	Increase capacity, reduce weave conflict, improve safety
5-5	Extend Ginninderra Drive to Northbourne Avenue and disconnect Mouat Street west of Northbourne Avenue	Remove need to duplicate Mouat Street, divert traffic to enter Northbourne Avenue earlier, offset conflicts

Option 5-1 Signalisation of Ellenborough Street/ Barton Highway Intersection

This option involves signalisation of both ends of the link between Ellenborough Street and Barton Highway (Figure 40). This is intended to improve access and safety at this location. The signals would be coordinated to manage queues.

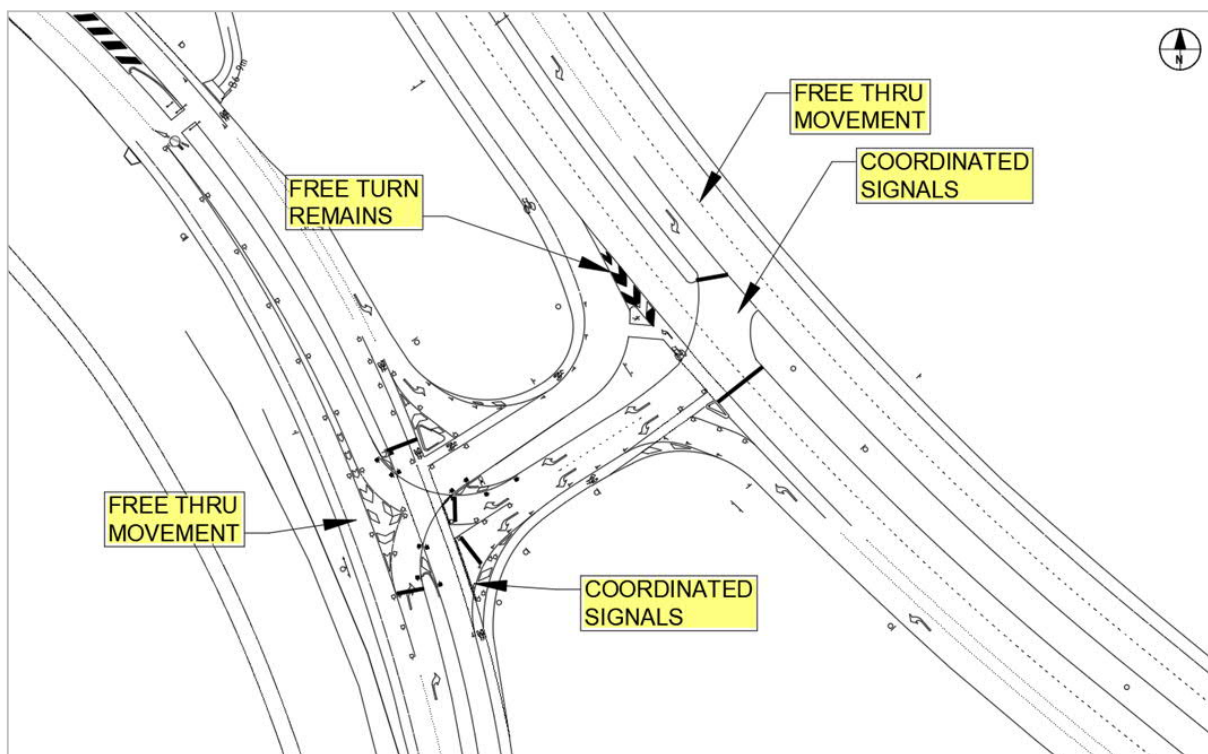


Figure 40 Option 5-1 Signalise Ellenborough Street/Barton Highway intersections and allow all turns

Option 5-4 Mouat Street Duplication

The Mouat Street duplication has been proposed to improve capacity and safety along the road. The duplication will remove the bottleneck at Sullivans Creek Bridge heading westbound (Figure 41).

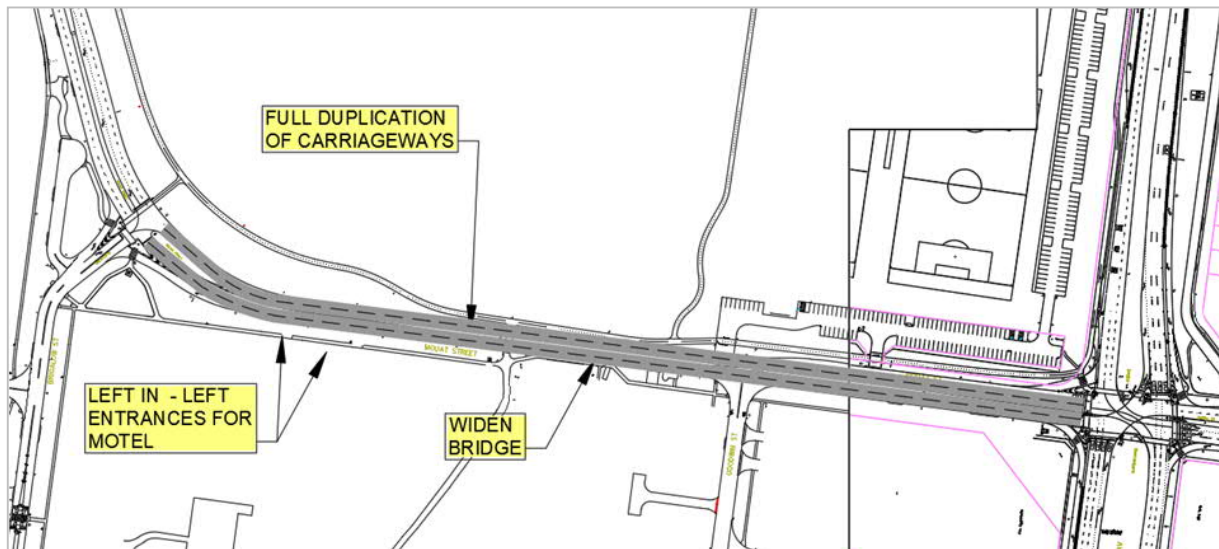


Figure 41 Option 5-4 Duplicate Mouat Street, removing bottleneck at Sullivans Creek bridge

Option 5-5 Extend Ginninderra Drive and Restrict Mouat Street

Major delays and queues exist in the AM Peak at the eastern end of Ginninderra Drive and on Mouat Street through to the intersection with Northbourne Avenue. Long delays and queuing is also experienced on the southbound approach to the Northbourne Avenue/Mouat Street Intersection.

The major conflict and cause of delays in the area is the four-way intersection of Northbourne Avenue/Mouat Street/Antill Street, having to cater for major flows in all movements. Right turns at the intersection of Brigalow Street/Mouat Street also causes long queues and delays during school terms.

The extension of Ginninderra Drive to Northbourne Avenue and changes to Mouat Street can reduce the load on the Northbourne Avenue/Mouat Street/Antill Street intersection. This option proposes to effectively create two T-intersections on Northbourne Avenue, simplifying the intersection with Northbourne Avenue/Mouat Street/Antill Street (see Figure 42).

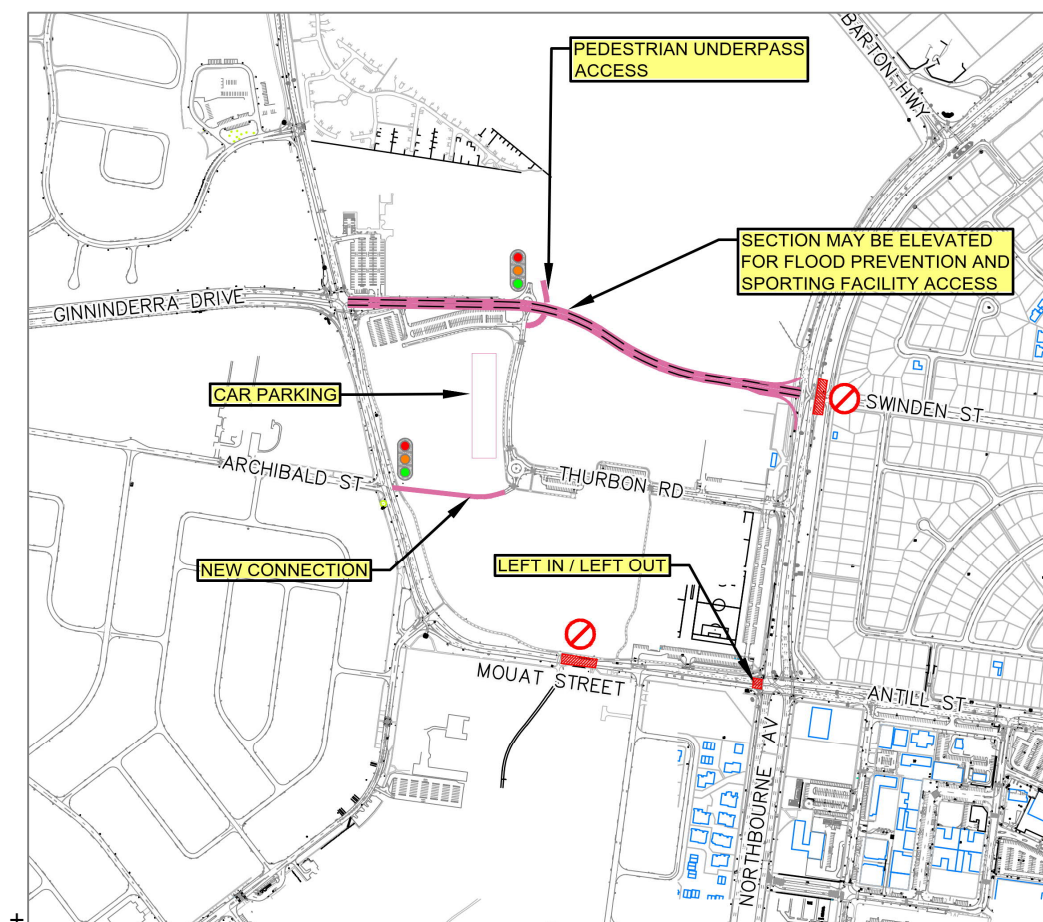


Figure 42 Ginninderra Drive extension

This option removes the need to duplicate Mouat Street as it will divert traffic to Northbourne earlier.

The following modifications have been considered in the modelling of this option:

- Mouat Street to be either closed or configured as left in/left out at Northbourne Avenue
- Mouat Street to be closed to vehicular traffic at the bridge over Sullivans Creek to encourage Belconnen traffic to use the new extension
- Closure of access from Swinden Street to Northbourne Avenue, with access from Swinden Street to service roads parallel to Northbourne Avenue
- Additional service road from Archibald Street to the roundabout on Thurbon Road to improve access to Hockey Centre and Sporting Fields

- New extension to Ginninderra Drive to be elevated over Sullivans Creek for drainage and service road access to rear of Tennis Centre
- Remove all carpark access for Tennis Centre and Hockey Centre from Ginninderra Drive Extension as they will have access from other roadways
- Arrangements for access to proposed Golf Course redevelopment at the eastern end would need to be considered in detailed design.

Initial investigation indicates that a new intersection at Swinden Street would be feasible without adversely impacting light rail operations in Northbourne Avenue. The comparative modelling indicated this option to have significant improvements to traffic movements on Northbourne Avenue with reduced delays and queuing.

The existing 'rat running' from Barton Highway and Ellenborough Street through Lyneham would be expected to continue. However, it is not expected to grow as a result of extending Ginninderra Drive and reducing traffic congestion on Mouat Street.

Corridor 9+10 – Glenloch Interchange and Approaches

The options considered for this corridor are summarised in Table 36. This corridor combines the Glenloch Interchange and William Hovell Drive corridors that were identified in the corridor-level assessment. The proposed upgrade options aim to address problems around Glenloch Interchange, particularly weaving and capacity issues in both the northbound and southbound directions.

Table 36 Proposed upgrade options for Corridor 9+10

Option number	Option	Key issues addressed
9-1	Remove northbound ramp connection to Tuggeranong Parkway from Lakeside interchange	Weaving issue, ease congestion from Lady Denman, rat running on Lady Denman
9-3	Dedicated southbound turn lane from GDE to Parkes Way	Weaving issue, capacity, congestion

The following sections provide brief descriptions of the options, including a conceptual sketch of each to illustrate how they can be implemented.

Option 9-1 Remove Northbound Ramp Link Between Lakeside Interchange and Tuggeranong Parkway

This option proposes the removal of northbound connection from Lady Denman Drive to Glenloch Interchange at the Forest Drive/Lady Denman Drive intersection (Figure 43). The aim is to improve safety and capacity by addressing weaving issues at the northbound section of Tuggeranong Parkway between the Lakeside and Glenloch interchanges.

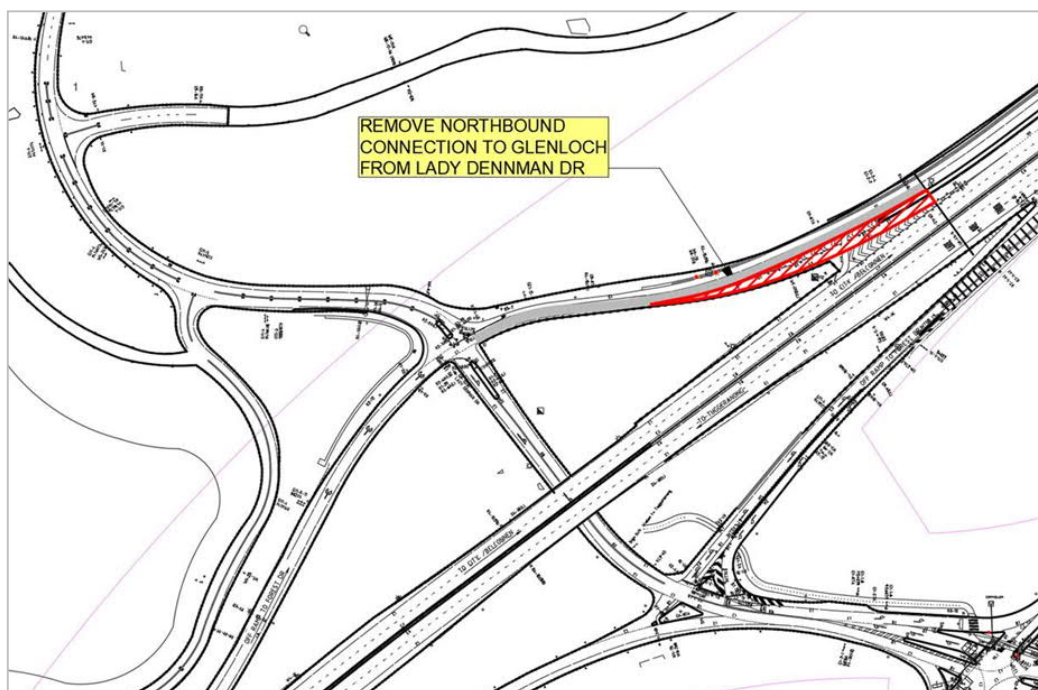


Figure 43 Option 9-1 Remove northbound ramp connection to Tuggeranong Parkway from Lakeside interchange

Option 9-3 Southbound Turn Lane from GDE to Parkes Way

This option includes the provision of a dedicated left turn lane from on Glenloch Interchange from Gungahlin Drive Extension to Parkes Way. To facilitate this, the two eastbound lanes coming from William Hovell Drive will merge to one lane before entering Parkes Way (Figure 44).

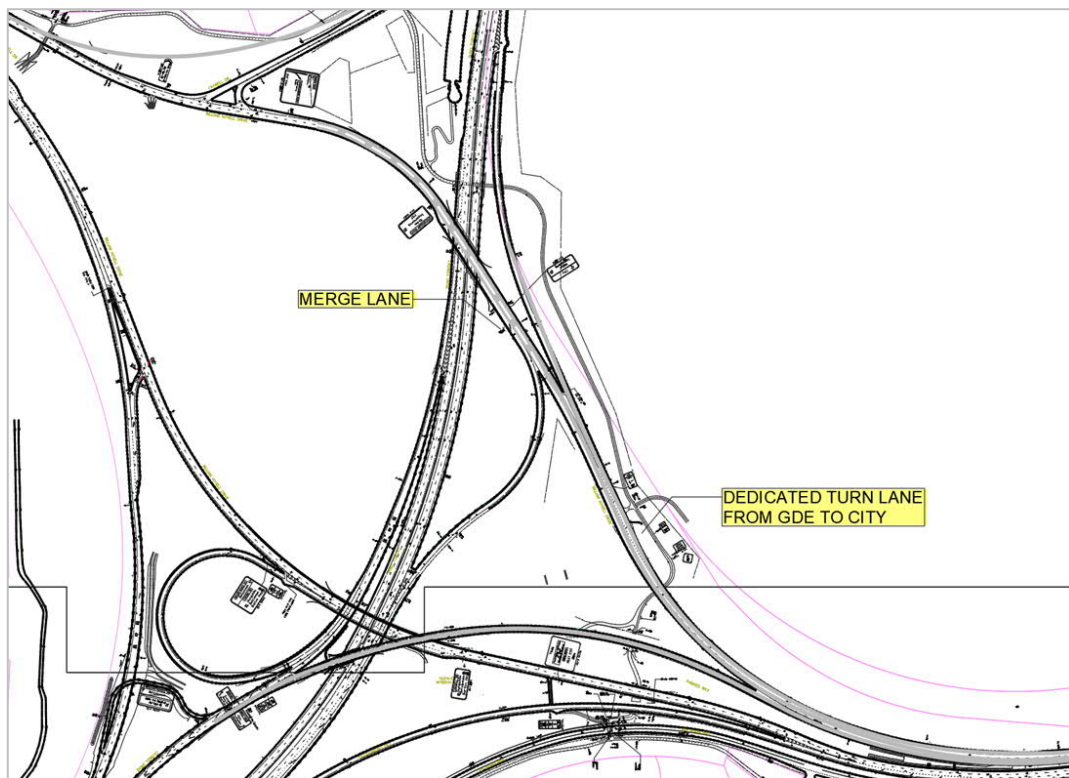


Figure 44 Option 9-3 Dedicated southbound turn lane from GDE to Parkes Way

Corridor 11 – Parkes Way

The options considered for this corridor are shown in Table 37. The current traffic performance in the Parkes Way corridor is already quite poor during peak periods, and this is expected to get worse when demand increases. These options were developed to address potential congestion issues in the future.

Table 37 Proposed upgrade options for Corridor 11

Option number	Option	Key issues addressed
11-1	Provide clover leaf free left turn around RMC sports oval to link in with southbound acceleration lane. This would remove need for signalised right turn from Morshead Drive to Monaro Highway southbound.	Reduce queuing, reduce conflict, improve travel time reliability to/from airport.
11-7	Provide east-west grade separated underpass at Anzac Parade/Parkes Way with existing roundabout to provide at grade tie-ins.	Ease disruption to through traffic and improve travel time, improve capacity and safety, improve travel time reliability. (note underpass intended to be designed so it does not impact visual amenity along Anzac Parade)
11-8	Provide signals to create a metered roundabout at Coranderrk Street/Parkes Way – maintaining the west bound bypass lane.	Ease congestion, reduce queuing, improve travel times (especially for east bound traffic movements).
11-9	Provide east west grade separated interchange at Coranderrk Street/Parkes Way.	Ease disruption to through traffic and improve travel time, improve capacity and safety, improve travel time reliability.
11-11	Provide signals to create a metered roundabout at Anzac Parade/Parkes Way – maintaining the west bound bypass lane.	Better control on traffic movements and ability improve travel time for set movements, (note signal intended to be slimline and set back slightly from current hold lines so it does not impact visual amenity along Anzac Parade)

The following sections provide brief descriptions of the options, including a conceptual sketch of each to illustrate how they can be implemented.

Option 11-1 Southbound Loop from Morshead Drive to Monaro Highway

Option 11-1 would remove the signalised right turn from Morshead Drive to Monaro Highway southbound. This would be done by a loop around the oval that links in with the Monaro Highway southbound acceleration lane (Figure 45). This option addresses queueing and conflict issues.

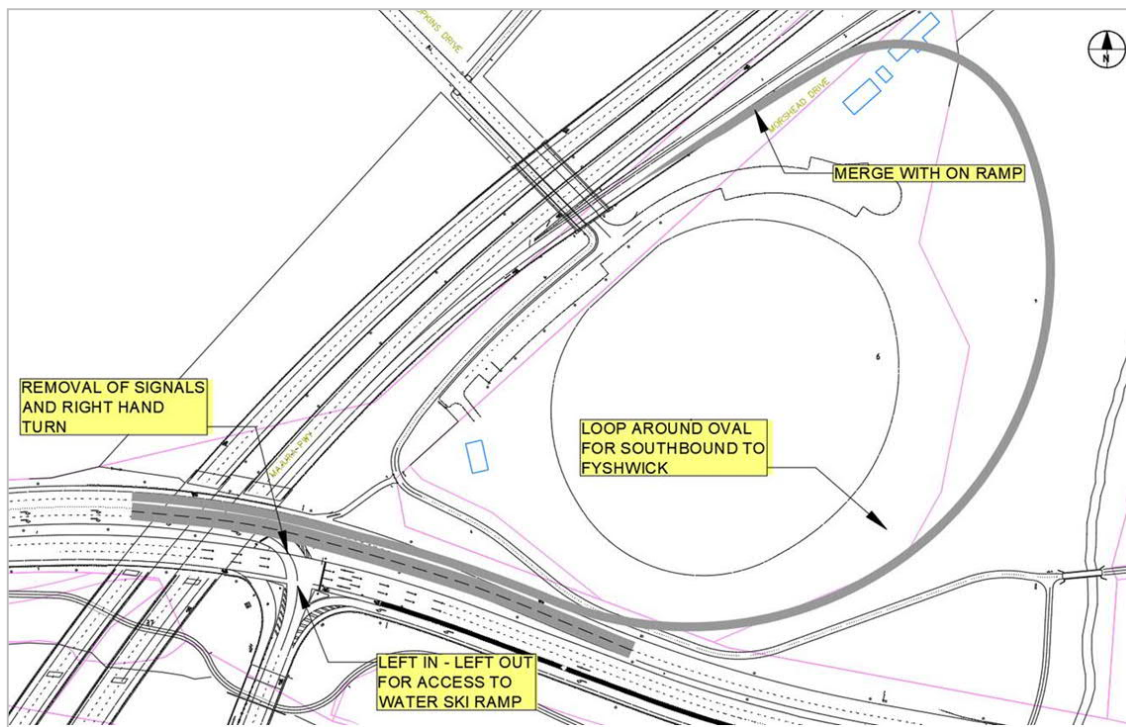


Figure 45 Option 11-1 Provide clover leaf free left turn around RMC sports oval to link in with southbound acceleration lane

Option 11-7 Parkes Way Underpass of Anzac Parade

Option 11-7 would ease disruption to through traffic and improve travel time, capacity and safety on Parkes Way. This would be achieved by an east-west underpass at Anzac Parade/Parkes Way roundabout (Figure 46). The intended underpass design will not impact the visual amenity along Anzac Parade.

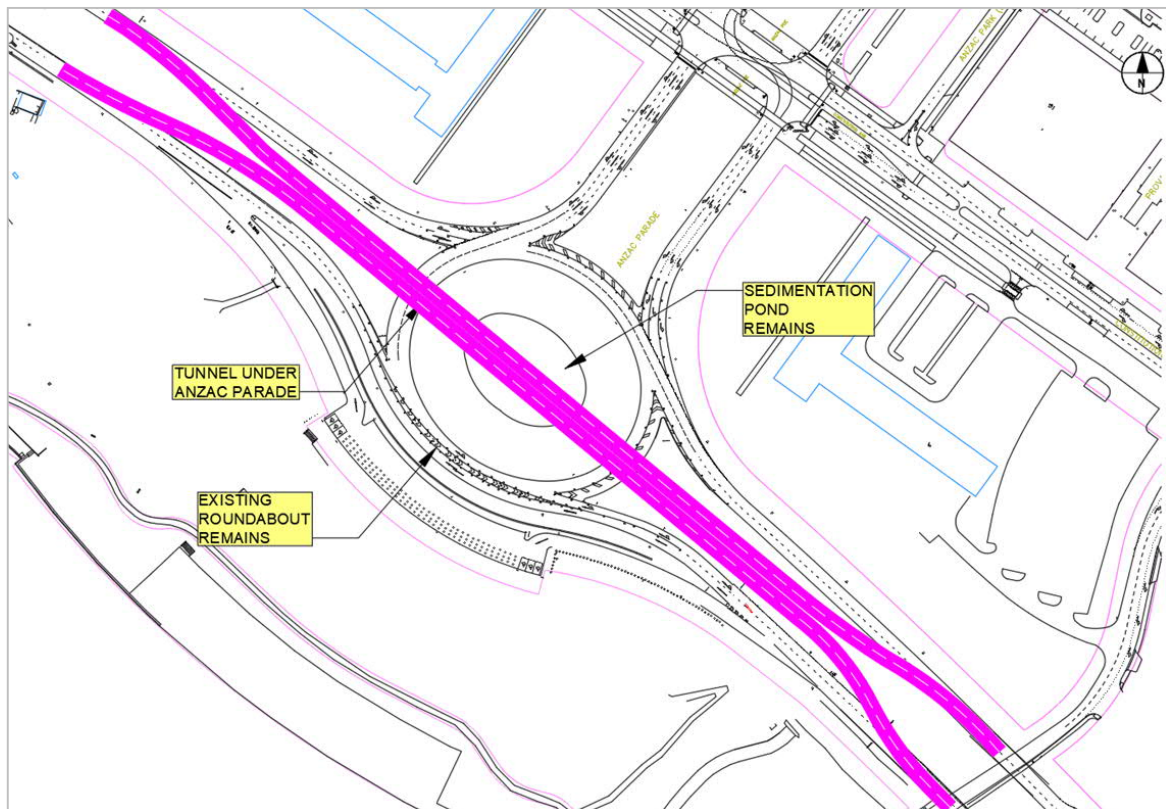


Figure 46 Option 11-7 Provide east-west grade separated underpass at Anzac Parade/Parkes Way with existing roundabout to provide at grade tie-ins

Option 11-8 Coranderrk Street/Parkes Way Intersection Metered Signals

By providing signals to create a metered roundabout at the Coranderrk Street/Parkes Way intersection while maintaining the westbound bypass lane, this option aims to ease congestion, reduce queuing and improve travel times, especially for eastbound traffic (Figure 47).

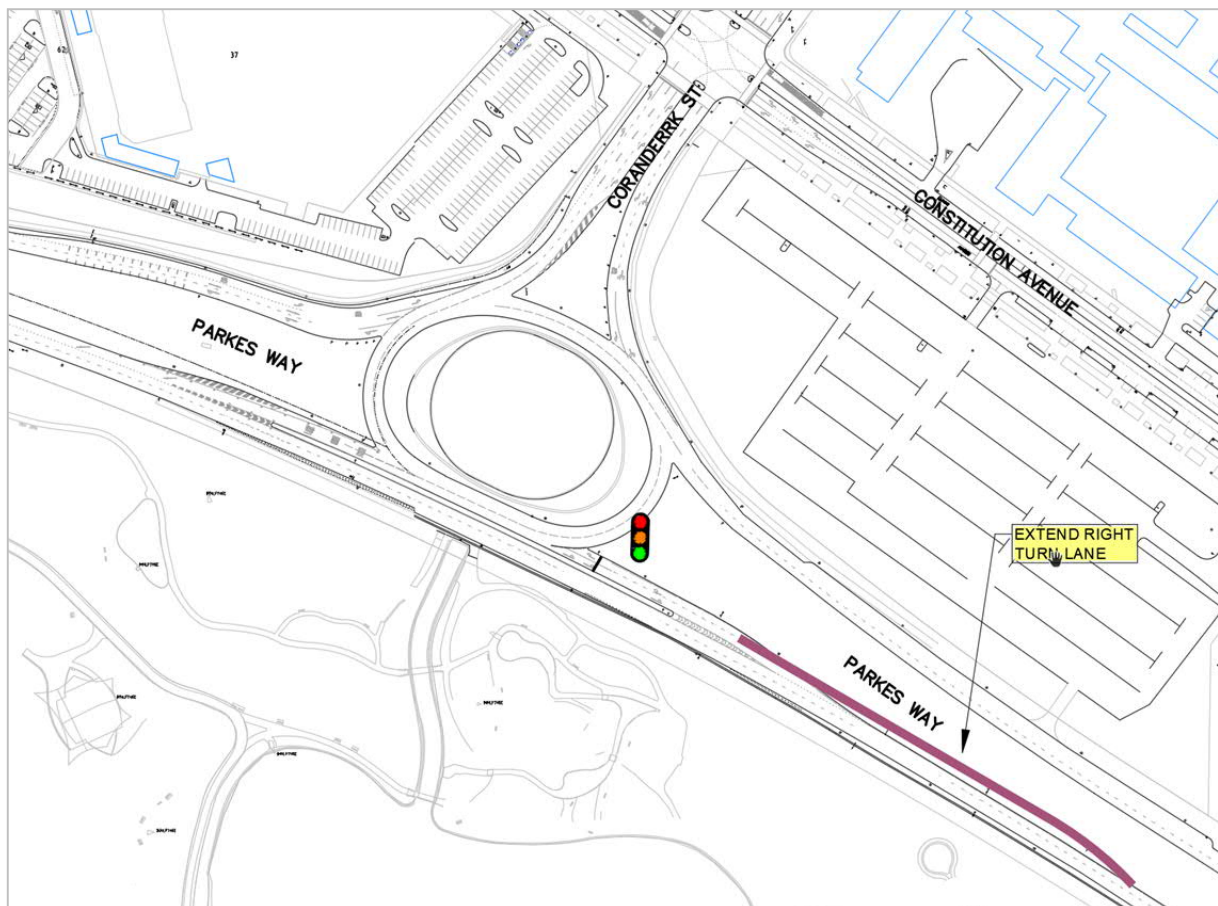


Figure 47 Option 11-8 Provide signals to create a metered roundabout at Coranderrk Street/Parkes Way – maintaining the west bound bypass lane

Option 11-9 Coranderrk Street/Parkes Way Intersection Grade-Separation

This option proposes a grade separated interchange at Coranderrk Street/Parkes Way (Figure 48). It would ease disruption to through traffic and improve travel time, capacity and safety.

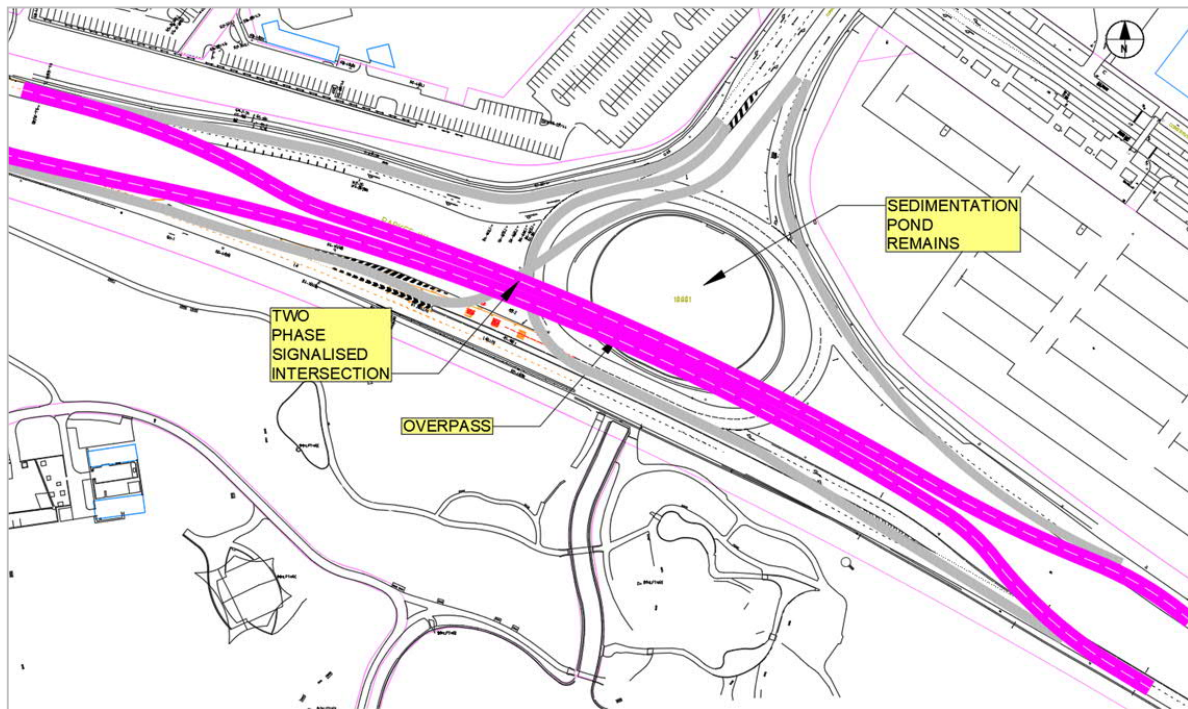


Figure 48 Option 11-9 Provide east west grade separated interchange at Coranderrk Street/Parkes Way

Option 11-11 Anzac Parade/Parkes Way Intersection Metered Signals

This option introduces a metered roundabout at Anzac Parade/Parkes Way while maintaining the westbound bypass lane. This would address disruption to through traffic and will see better control on traffic movements and improved travel times for set movements (Figure 49).

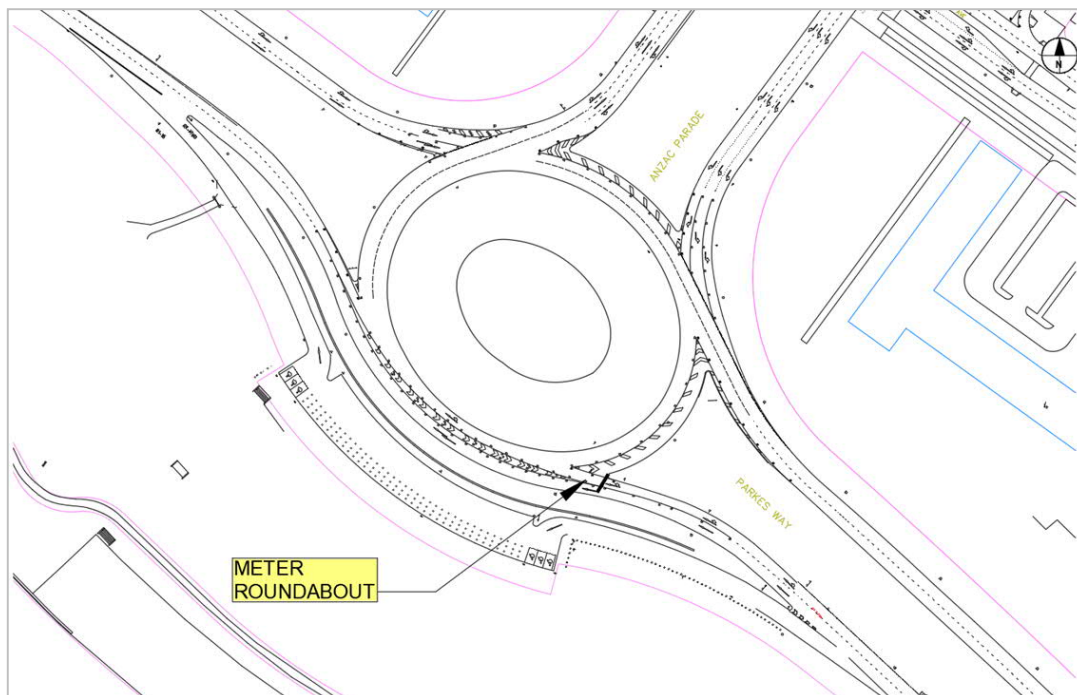


Figure 49 Option 11-11 Provide signals to create a metered roundabout at Anzac Parade/Parkes Way – maintaining the west bound bypass lane

Corridor 12 – Pialligo Avenue

The options considered for this corridor are shown in Table 38. Each of these options aim to improve traffic performance along the Pialligo Avenue corridor. Brief descriptions and conceptual sketches of these options follow the table.

Table 38 Proposed upgrade options for Corridor 12

Option number	Option	Key issues addressed
12-1	Duplication from the ACT-Queanbeyan border to Brindabella Circuit, including intersection upgrades	Increase capacity, safety
12-2	New link road to Pialligo between Kallaroo Road and the Brindabella Circuit roundabout, including the removal of the Beltana Road link to Pialligo Avenue	Improve capacity and reduce delays and queuing at Pialligo Avenue/Beltana Road/Fairbairn Avenue, provide secondary/alternate access point to Pialligo
12-3	Grade separation at the Pialligo Avenue/Fairbairn Avenue intersection, including the removal of the Beltana Road connection to Pialligo Avenue	Queuing, congestion, travel time, safety

Option 12-1 Pialligo Avenue Duplication

Duplication of Pialligo Avenue has been considered for some time and investigation has preceded this study to the extent that design drawings for duplication exist at the eastern end of Pialligo Avenue from approximately Oaks Estate Road to Capital Terrace in NSW. This project is important for increasing regional access and safety from Queanbeyan and Kings Highway. A schematic drawing of this option is shown in Figure 50. The following network modifications have been considered in the modelling of this option:

- Duplication of bridge over the Molonglo River
- Signalisation of the intersection with Sutton Road and the entry to Canberra Concrete Recyclers.

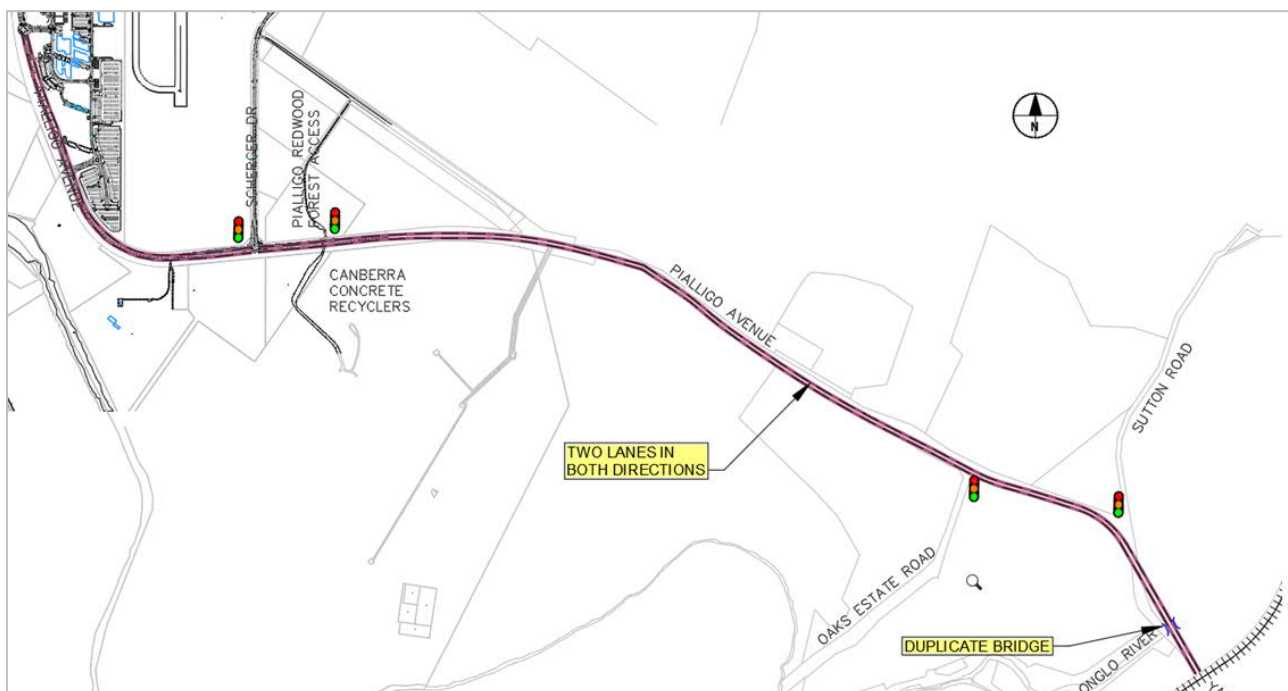


Figure 50 Pialligo Avenue duplication

Option 12-2 Alternate Pialligo Access

This option provides an alternate access to Pialligo via a new link road between Kallaroo Road and the Brindabella Circuit/Pialligo Avenue roundabout (Figure 51).

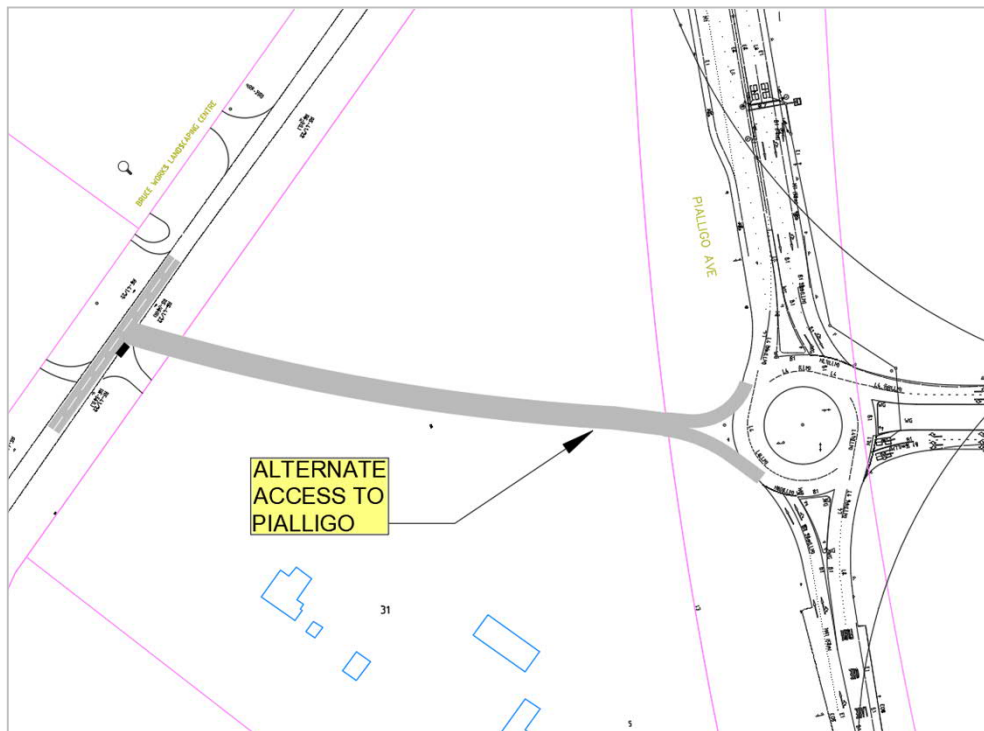


Figure 51 Option 12-2 New link road to Pialligo between Kallaroo Road and the Brindabella Circuit roundabout, including the removal of the Beltana Road link to Pialligo Avenue

Option 12-3 Fairbairn Avenue/Pialligo Avenue Intersection Grade-Separation

This option proposes an overpass facility for Pialligo Avenue in both directions and modifying the configuration of Fairbairn Avenue/Pialligo Avenue intersection to two phase signals only (Figure 52). This option would also involve an alternate access to Pialligo Avenue through a new link road between Kallaroo Road and the Brindabella Circuit/Pialligo Avenue roundabout (as per Option 12.2).

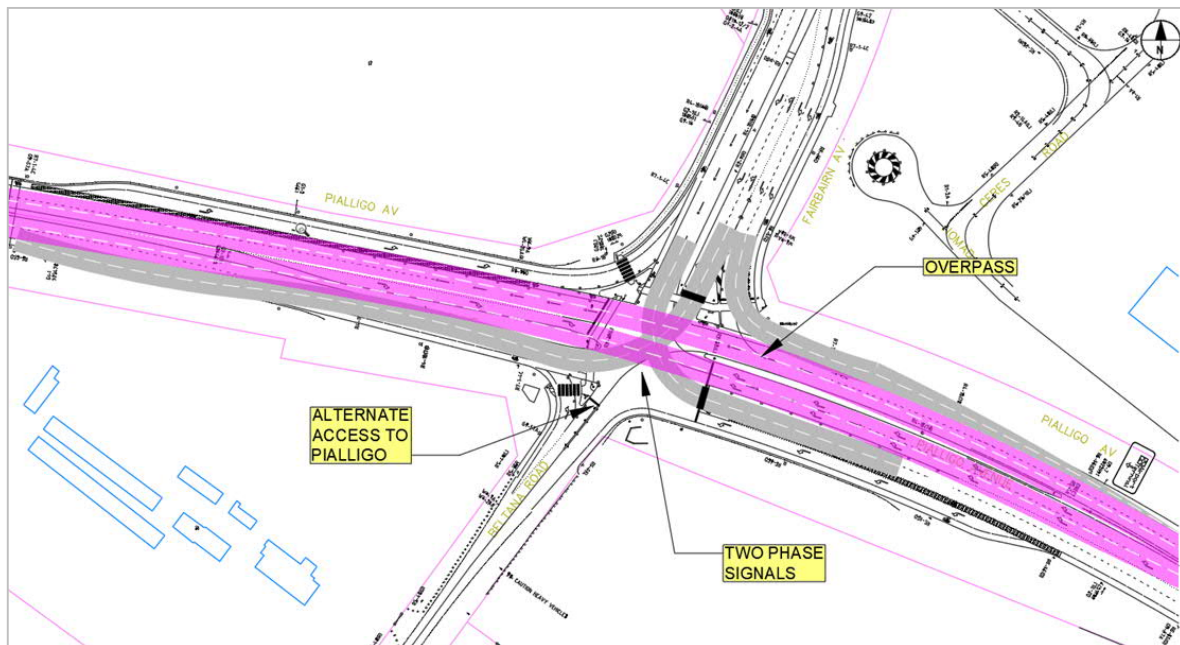


Figure 52 Option 12-3 Grade separation at the Pialligo Avenue/Fairbairn Avenue intersection, including the removal of the Beltana Road connection to Pialligo Avenue

Corridor 14 – Monaro Highway North

The options considered for this corridor are shown in Table 39. These are expected to improve traffic flow and performance along the Monaro Highway corridor, particularly the section between the Alexander Maconochie Centre and Isabella Drive.

Table 39 Proposed upgrade options for Corridor 14

Option number	Option	Key issues addressed
14-1	Grade-separate north-south movement at the Isabella Drive/Monaro Highway intersection	Capacity, safety and travel time improvements (part of broader Canberra bypass)
14-3	Implement improvements to enable 100 km/h on Monaro Highway between Isabella Drive and adjustments to Alexander Maconochie Centre	Ability to increase speed limits, improve capacity and safety, improve travel time and reliability (part of Canberra bypass)
14-4	Implement interchange at Lanyon Drive	Ability to increase speed limits, Improve capacity and safety, improve travel time and reliability (part of broader Canberra bypass)

Option 14-1 Isabella Drive/ Monaro Highway Intersection Grade-Separation

This option proposes a grade separated facility for Monaro Highway northbound at the Monaro Highway/Isabella Drive roundabout and the closure of the northbound exit lane (Figure 53).

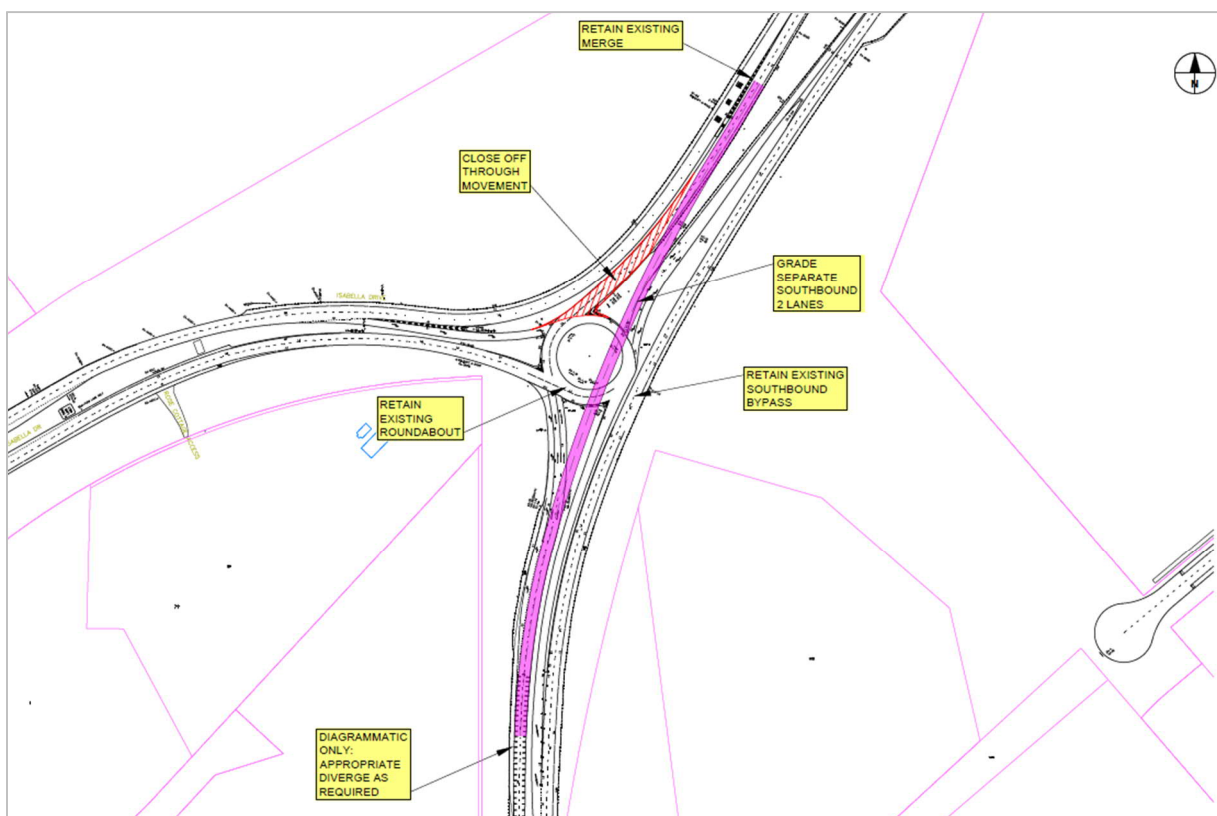
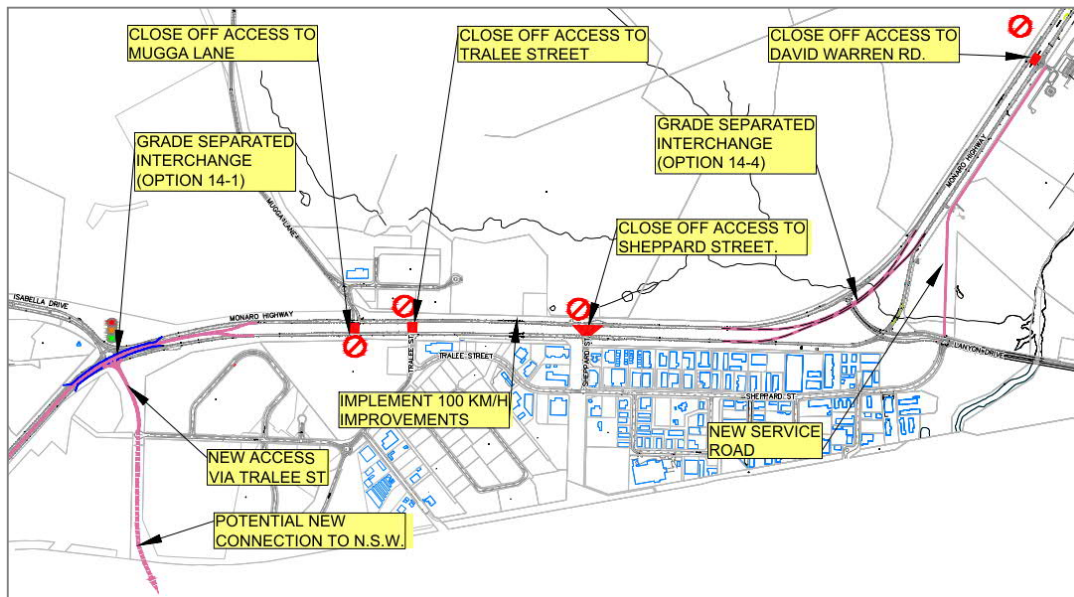


Figure 53 Option 14-1 Grade-separate north-south movement at the Isabella Drive/Monaro Highway intersection

Option 14-3 100km/h Monaro Highway Improvements

Monaro Highway is a major freight and tourism route, and it also carries a large number of commuters from Queanbeyan and Canberra's southern suburbs. A reduction in travel times and congestion on this route would have significant local and regional benefits.

This option considered improvements to increase the speed limit for the Monaro Highway from Isabella Drive to north of David Warren Road from 80 km/h to 100km/h. The modelled option for Monaro Highway is illustrated in Figure 54.



Note: Left-in left-out arrangements proposed at Sheppard and Tralee Streets

Figure 54 Monaro Highway 100 km/h improvements

The following network modifications have been considered in the modelling of this option:

- Removal of traffic signals at David Warren Road. David Warren Road to become left in/left out only. To facilitate this, an extension of the existing service road past the emergency service site to a new connection to Lanyon Drive would be provided.
- Grade separated interchange at Lanyon Drive. The arrangement for this is discussed in Section 6.2.3.
- Removal of traffic signals at Sheppard Street. Sheppard Street would become left in/left out only. Access to Hume would be via Lanyon Drive and a new connection at Tralee Street.
- Tralee Street to become left in/left out only.
- Removal of traffic signals at Mugga Lane. Mugga Lane to become left in/left out only. Access to Mugga Lane to and from Hume would be via a new connection at Tralee Street to Isabella Drive. An alternate option would be to create an overpass from Mugga Lane to Tralee Street.
- Grade separated interchange at Isabella Drive to cater for both northbound and southbound traffic. The existing roundabout could be converted to a signalised intersection or the existing roundabout could be modified. This would be confirmed in detailed design.
- New connection from eastern end of Tralee Street to Isabella Drive. This connection would also cater for possible future connection to Dunns Creek Road in Queanbeyan.

Option 14-4 Lanyon Drive/Monaro Highway Grade Separation

The intersection of Monaro Highway and Lanyon Drive currently experiences large delays and long queues. The MCA indicated that this is the third highest ranked option in regards safety improvements. The major conflict is between traffic entering or exiting Lanyon Drive via the northbound carriageway of Monaro Highway.

To eliminate this conflict, a bridge is proposed over the existing Lanyon Drive. The modelled option configured the bridge to handle both northbound and southbound Monaro Highway traffic (shown in Figure 55) but a cheaper option would be to construct an overpass for the southbound traffic only and use the existing road infrastructure for the northbound traffic. The final configuration will be determined in the detailed design of this option.

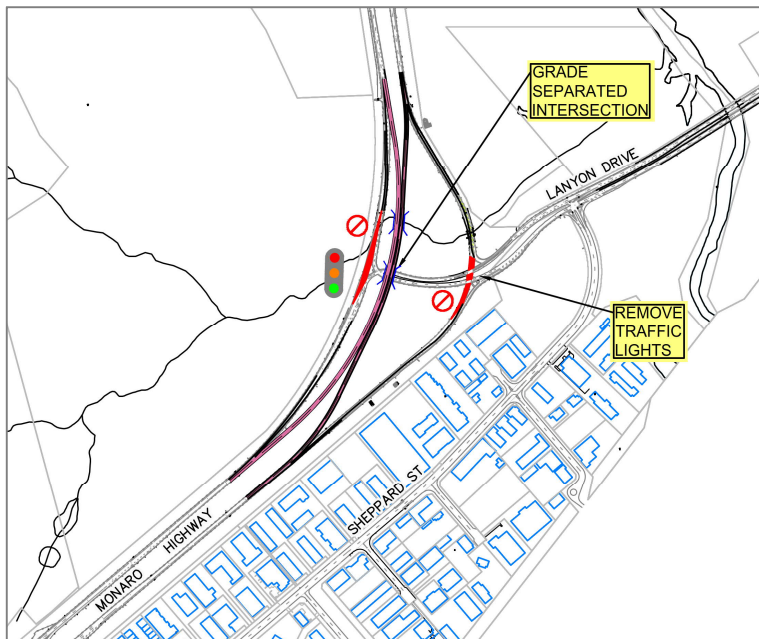


Figure 55 Lanyon Dr Grade Separation

The option chosen for modelling will result in minimal conflicts to northbound and southbound traffic on Monaro Highway, significantly improving traffic safety here.

The existing eastern signals would be retained but the western signals and the at-grade southbound leg would be removed. This would reduce delays to Lanyon Drive traffic, as traffic would only be delayed by a single two-phase set of signals rather than the existing two sets of signals they currently contend with.