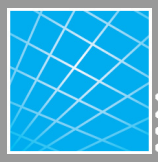
# ACT Strategic Public Transport Network Plan

## Final Report

### Territory and Municipal Services

30 June 2009



McCormickRankinCagney

Prepared by
McCormickRankinCagney
www.mrcagney.com

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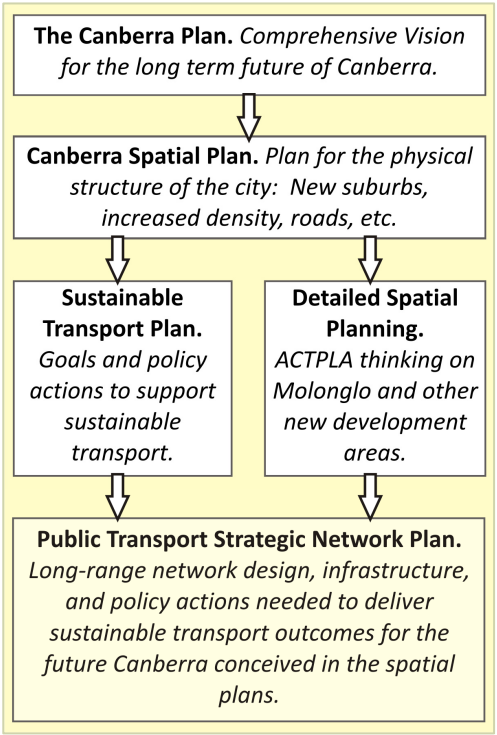
# Executive Summary

## Role of This Plan

This report, the *ACT Public Transport Strategic Network Plan*, defines steps that will need to be taken over the next two decades to achieve the ACT Government's sustainable transport goals, and to ensure competitive sustainable mobility for Canberrans into the future. This plan focuses on a study year of 2031, approximately 22 years in the future, but many of the improvements proposed will need to happen much sooner.

Figure i shows the relationship between this plan and other key planning documents that have preceded it.

Figure i: Relationship to Other Key Plans




The primary authority is the *Canberra Spatial Plan*, which defines the long-term structure of the city's growth, including where new suburbs and other land uses should be developed. This study aims to implement this vision, as expressed in the *Spatial Plan* and in more detailed land use planning that has been done to implement it, such as the detailed structure planning for the Molonglo and North Weston development area.

Another key source is the *Sustainable Transport Plan*, which sets long-term goals for the region's transport system covering all modes, including private cars, public transport, cycling and walking. The *Sustainable Transport Plan* expresses the ACT Government's intention to achieve, over the next two decades, a dramatic increase in the share of trips carried by public transport rather than private car.

This plan provides the necessary detail on the public transport impacts of these plans. The core question of this plan is:

*Given our long-term vision for the city and its growth, what must we do to achieve our sustainability goals as they relate to public transport?*

## Scope of This Plan

To answer this question, this plan went through the following major steps:

- Review best practices in long-range public transport planning that are relevant to Canberra, and set up a conceptual framework for long-range planning. (Chapter 2.)
- Analyse the ACT's long-term land use vision to determine its impacts for public transport. (Chapter 3.)

- Define a draft public transport network for 2031, based on the land use vision.
- Undertake detailed modelling of this network to estimate patronage in 2031.
- Revise the network based on route-by-route results of the modelling, to produce a final network, which is presented in Chapter 3.
- Conduct final modelling of the final network to provide a final estimate of 2031 patronage. (Chapter 4).
- Using the same model, estimate how the performance of the network would change in response to changes to the pricing of transport, specifically:
  - Dramatic increase in fuel prices.
  - Significantly higher parking costs in the CBD.
  - Free or reduced fares.
- Propose changes in the ACT Government policies to support the recommended Network and maximise its value. These include policies affecting land use, parking and short-term public transport service design. (Chapter 5).
- Identify infrastructure needs implied by the proposed network. (Chapter 6).
- Prioritise the recommended improvements. (Chapter 7).
- Study in greater detail the public transport needs of the new Molonglo and North Weston development area. (Chapter 8).

## *Key Types of Service*

The strategic network is constructed of four types of service, all designed to interconnect and work together to provide a complete mobility system for travel throughout the city:

- **RAPID** service is both frequent and fast all day. It serves widely spaced stops, generally between 0.5 and 2.0 km apart, so as to achieve a high average speed for long trips across the city. The existing "Intertown" linking Belconnen, City, Woden and Tuggeranong is an example of a Rapid.
- **FREQUENT LOCAL** service is frequent all day, but makes local stops every 200 - 400m and therefore runs more slowly. It is intended to serve local high-density corridors.

The Rapid and Frequent Local services, considered together, are called the Frequent Network.

- **PEAK EXPRESS** runs only during peak commute hours, and only in the peak commute direction (from home areas to work / school areas in the morning, and back in the afternoon). These routes have long nonstop segments to serve commute demand that exists only during the commute period. The existing "Xpresso" routes are an example of peak express services.

- **COVERAGE** service is all-day local service that circulates through low-density suburbs where patronage potential is low. These services exist to meet basic mobility needs citywide, but are not expected to achieve high patronage. As a result, they run at low frequencies, usually every 30 minutes during commute peaks and every 60 minutes midday and evening. (The exact level of these services is an important policy decision, discussed below.)

The latter two categories – Peak Express and Coverage – are indicated on some of this plan's maps in Chapter 3, but only to illustrate the general extent of such services, to estimate their cost, and to provide a background network that could be modelled to determine patronage. These route designs do not constitute long-term recommendations. The detailed design of Peak Express and Coverage services should be short-term planning decisions. Only the Frequent Network – the network of Rapid and Frequent Local services – is a specific long-term recommendation of this plan.

## *The Frequent Network: Managing the Two-Way Relationship of Transport and Land Use Planning*

The Frequent Network consists of those services that run every 15 minutes or better all day. These services are frequent enough that they can serve you whenever you want to travel, rather than expecting you to plan your day around their schedules. Figure ii shows the recommended Frequent Network for 2031.

The Frequent Network represents the ACT Government's highest investment in public transport services, and the locations where future development will enjoy the best public transport access. For this reason, the Frequent Network should be specifically defined in long-term planning so that other planning activities can respond to it. For example:

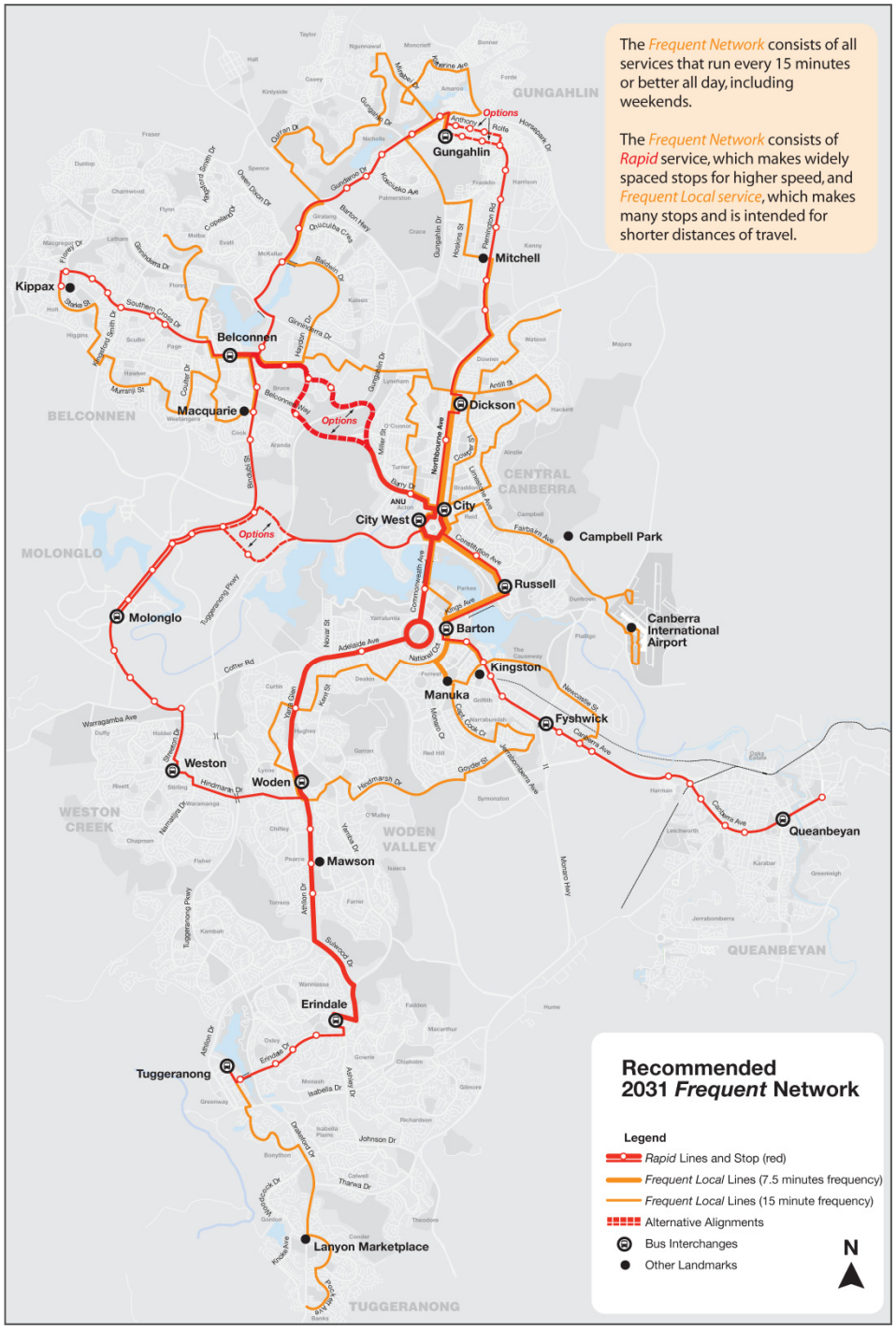
- Increased density of development is generally appropriate on the Frequent Network. The proposed Frequent Network has been designed to focus on areas where high density exists or is planned, but once adopted as policy, the Frequent Network can also be a guide to identifying other areas where dense development could be introduced efficiently without further increasing the need for public transport.
- Policies related to transit-oriented development would be focused on the Frequent Network. For example, building orientation and pedestrian access should be focused toward Frequent Network's stops. Parking requirements for new development can be lower on the Frequent Network, and maximum parking limits could even be considered.
- Road planning should consider the Government's interest in maintaining the speed and reliability of the Frequent Network. In particular, policy targets for the average speed of the Frequent Network should be adopted and monitored. In the future, these targets may imply the need for speed protection facilities, such as bus lanes or transit signals. Road planning activities that could reduce

public transport speeds – such as additional stop signs, signals or traffic calming features – would need to take these targets into account.

- Finally, the ACT Government should consider the Frequent Network when making its own locational decisions, and should encourage Commonwealth Government and private entities to do likewise. The message is simple: ***If you want good public transport in the long term, locate on the Frequent Network***.

The Frequent Network, in short, is a tool for managing the two-way relationship between transport planning and land use. The network has been designed in response to existing land use plans, but it also identifies new opportunities for land use thinking, and also for other activities of government, so that individual decisions about development and location lead to a more effective and efficient public transport system, and thus a more sustainable city.

**Figure ii:** Recommended 2031 Frequent Network



## *Buses or Light Rail?*

This plan takes no position on the question of whether certain corridors should be served by light rail as opposed to buses, but it does suggest the set of alignments that light rail might usefully serve. Light rail could be an option for any or all of the identified Rapid corridors, whose length and stopping patterns are similar to those of light rail transit worldwide. Light rail in the form of trams could also be considered for any of the Frequent Local corridors, which stop more frequently and are intended for shorter trips.

Meanwhile, the ACT Government has an urgent need to visualise the future geography of the PT system, and begin putting the policies in place to support it. Such policies, which will help guide decisions that are being made every day, are more effective the sooner they are implemented. *These policies cannot wait until a debate about the technology is resolved*. Final decisions about light rail projects will await complex decision-making processes involving many agencies, including the ACT Government, the National Capital Authority, and the Commonwealth in its various roles as regulator, funding source, and leading employer. By the time this debate is resolved, crucial opportunities will have been lost to help shape the city in a more sustainable way.

For this reason, this plan presumes bus-based services as the likely services in each corridor. More detailed planning for each corridor can consider the light rail option, or not, depending on the level of certainty at the time, but the implementation of mobility improvements should never be delayed by the potential for a light rail project. Instead, a bus-based service should be implemented when the mobility is needed, regardless of whether light rail is the ultimate intention.

## *Scale of Strategic Network*

The *Sustainable Transport Plan* envisions a dramatic increase in public transport mode share – i.e. the percentage of all trips that are made on public transport. While pricing can have some effect on these rates, improved service was identified as crucial to the achievement of a higher mode share.

To achieve this, two different types of network growth are needed:

- To maintain *current* levels of mobility, and thus to achieve the *current* mode share into the future, service will need to grow as population grows. This growth represents new routes for newly built suburbs and business parks, for example, as well as increased frequencies in areas where densities have increased. The net result of such growth is that an average citizen would have about the same amount and quality of service as they have today. Such growth would maintain a constant level of service *per capita*, and could be expected to maintain constant levels of mode share.

- To substantially increase the rate of public transport usage (not counting the impacts of external factors such as pricing) each individual citizen will need more service. In other worse, the *per capita* quantity of service will need to increase.

The recommended network for 2031 – including the specific Frequent Network and indicative levels for Peak Express and Coverage service – is an 88% increase over 2006 service levels, but only a 48% increase in *per capita* level of service.

## *Results: An Increased Role for Public Transport*

The modelling undertaken for this study shows that without changes in fuel prices, parking prices, or fares, the recommended network would increase the share of AM peak trips on public transport to 11.4% (from about 7.7% when last measured in 2006). This is a 48% increase in the rate of public transport usage, as the consequence of a 48% increase in the per capita quantity of service. We can conclude, then, that in the absence of other changes, improving the intensity of service will improve – at about the same pace – the rate at which Canberrans use it. This is not a surprising conclusion, but still an important one.

There are many reasons to believe that even better results could be achieved. These include the impact of pricing and the option of reducing low-patronage Coverage services.

Two important limitations of the ACT model must be kept in mind:

i. The model can estimate patronage only for the peak period. Thus, it does not properly evaluate the effects of growth in midday, evening, and weekend service. These services are part of the cost but not part of the calculated benefit.

ii. The model does calculate peak period travel for all trips – not just commutes to/from work – but there is no reliable current-year estimate for this figure. Such an estimate exists for work trips, and it is for this reason that the above calculation uses those terms.

## *The Impact of Pricing*

The estimate of 48% increase in public transport's mode share is *only* the impact of service improvement; it assumes no increase in fuel prices and parking costs. We then looked at how pricing could affect the mode share results of the recommended network. Three kinds of pricing impact were studied:

- Fuel prices. Levels studied were $1.00/litre, $2.50/litre, and $5.00/litre.
- CBD parking prices. These were studied at current levels, double the current levels, and four times the current levels.
- Fares. Existing fare levels and free fares were considered.

**Table i:** Modelling Scenario Results

| | Fuel Costs ($/L) | CBD Parking Factor[1] | Fare | Public Transport Mode Split | | |
|---|---|---|---|---|---|---|
| | | | | All Purposes | Work Trips Only | Work & School Trips |
| A. Base | $1.00 | 1 | Existing | 9.9% | 11.4% | 14.7% |
| B. Reference | $2.50 | 2 | Existing | 12.5% | 16.7% | 19.1% |
| C. High Parking Cost | $2.50 | 4 | Existing | 14.0% | 20.2% | 21.4% |
| D. High Fuel Cost | $5.00 | 2 | Existing | 16.6% | 25.1% | 25.9% |
| E. Free PT Fare | $2.50 | 2 | Free | 17.2% | 25.5% | 26.9% |

[1] A Parking Factor of 1 corresponds to the existing average parking costs of $1.40 per hour.

In looking at how the different prices could combine, we chose to focus first on a "Reference" scenario, which shows a mid-range estimate on fuel costs and parking prices. A fuel cost of $2.50/litre in 2031 is a conservative estimate, given that fuel prices, while very volatile, are widely expected to trend upward in the long term. Likewise, a mere doubling of CBD parking costs over more than two decades is a likely conservative estimate of the impact of the rapid increases in CBD density and thus in parking demand. While Scenario A represents roughly current levels of price – highly unlikely in 2031 – Scenario B represents conservative estimates that are credible for 2031. Even with just this much growth in the costs of driving, the patronage impact of the plan more than doubles.

Working from this Reference Scenario B, we then studied the impact of three price changes: a further doubling of CBD parking cost (Scenario C), a further doubling of fuel cost (Scenario D), or a shift to free fares (Scenario E). These produced the findings above.

As the table shows, these pricing changes cause substantial further changes in mode share. The doubling of CBD parking costs appears to have the weakest effect of the three, but this can be misleading, as we are comparing parking costs in the CBD only with patronage results Canberra-wide (a limitation of the current model). Obviously, CBD parking costs affect only patronage to CBD destinations, and if we could isolate this patronage effect, the impact would be much higher. Conversely, we would have higher mode share benefits Canberra-wide if increased parking costs were applied systematically wherever parking is scarce or expensive to build, including all the Town Centres, the Airport, and major Group Centres such as Kingston.

## *The "Coverage Cap": Limiting Low-Patronage Service*

A key decision to be made in response to this study is the level of low-patronage Coverage service that should be run in the long term. Coverage service is designed to circulate in low-density suburbs where patronage potential – both current and long-term – is predictably low.

For example, most Tuggeranong[1] and Weston suburbs would rely on Coverage services for their all-day and weekend access, while lower-density parts of Woden, Belconnen and Gungahlin would as well. Even within inner Canberra, certain suburbs with especially low density, such as Campbell and Red Hill, would be served only with Coverage service.

Coverage is intended to provide basic access to people who need it, rather than to compete with the car for patronage. As a result, Coverage service accounts for 47% of the operating cost of the Strategic Network, but only 16% of the patronage. Hypothetically, if no Coverage service were offered, over ¾ of the projected 2031

[1] Except for Bonython, Banks, and the Tuggeranong Town Centre.

mode share would still be achieved with only a negligible increase in quantity of service *per capita*.

Coverage service meets important goals dealing with quality of life and the needs of mobility-disadvantaged persons. These goals will continue to exist, but they are – and will continue to be – in conflict with the goal of high mode share. To manage this conflict, the ACT Government should consider adopting a "Coverage cap," a policy limit on the percentage of total resources that should be devoted to these permanently low-patronage services. A separate decision could be made to operate somewhat more service in low-patronage areas of known socio-economic disadvantage.

## *Infrastructure Needs*

Minimum infrastructure needs for the Strategic Network are relatively modest, but greater investment is recommended to improve the quality of the waiting and riding experience. Key strategic infrastructure needs and possibilities are shown in Figure iii.

Five new or relocated interchanges are recommended by this plan. All should be completed in the next five years. These interchanges are at strategic connection points in the network, and the efficiency of the network would be reduced without them. With the possible exception of City West, none are expensive off-street facilities comparable to the existing major interchanges.

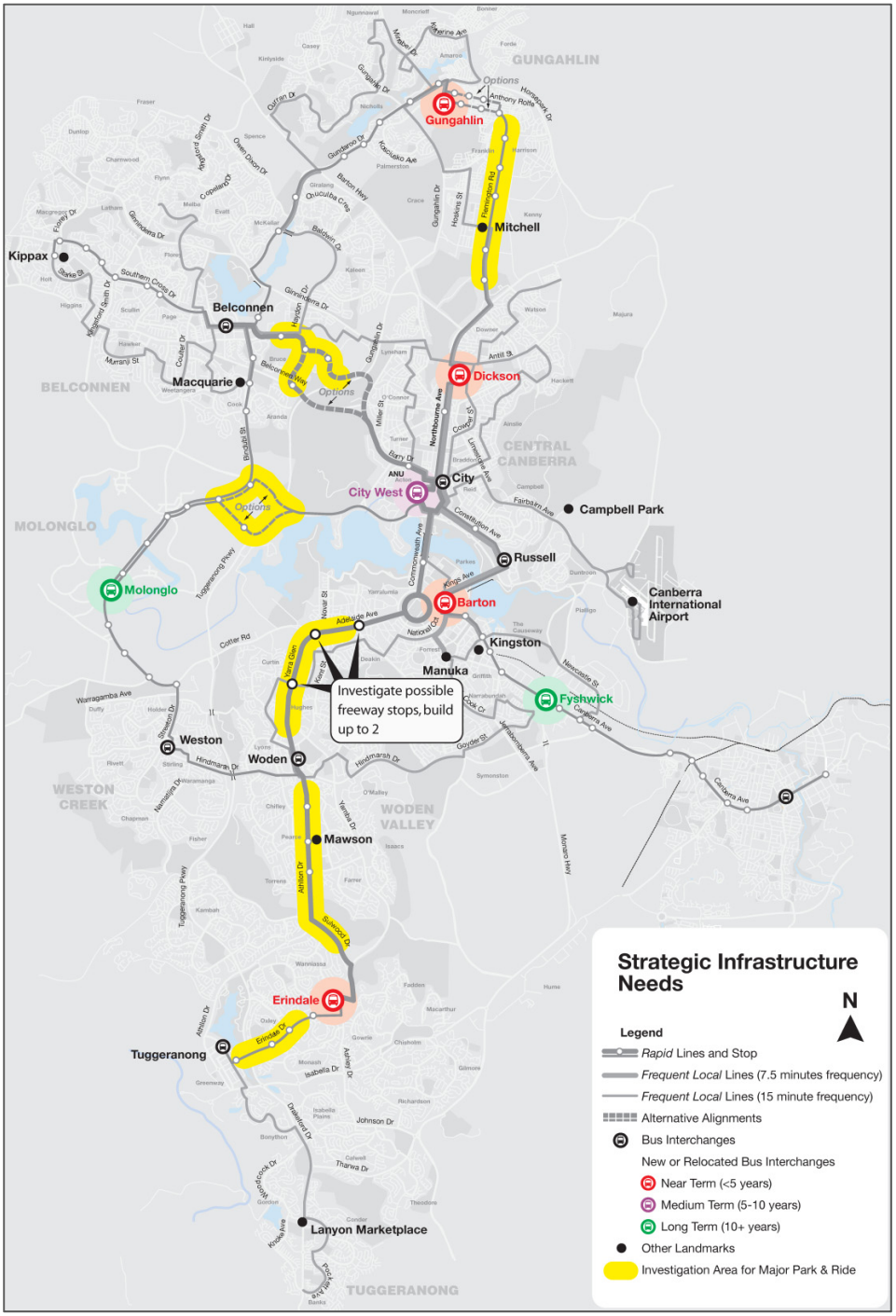
- City West Interchange is currently on a temporary site and needs a permanent one. City West has an important function as an access point to the Australian National University and the new dense development surrounding it. Significant capacity is also needed for end-of-line driver-break functions for the many lines ending in the city, which cannot be accommodated at the main City Interchange in Alinga Street.
- Gungahlin Interchange should be in the vicinity of Gozzard Street and Anthony Rolfe Avenue. This site needs to be identified and protected soon before development limits options any further.
- Dickson Interchange is a recommended new facility located on-street in Challis Street on the west side of Dickson. This interchange allows inner North Canberra and Bruce routes to connect with the Gungahlin-City Rapid, for travel between these areas and Gungahlin.
- Erindale Interchange is crucial to providing direct and efficient City access for Tuggeranong area suburbs. It can be developed using the existing bus zones on the east side of the shopping centre.
- Barton Interchange is a high-amenity on-street stop on National Circuit or possibly Macquarie Street. It should be located between Kings and Brisbane Avenues, so that buses from Russell to Kingston can service it efficiently without deviation.

Other long-term infrastructure needs will include:

- A Major Stops program, to provide a civilised waiting experience and to support the branding of the Rapid and Frequent Local networks.
- New Rapid stops along Adelaide Avenue and Yarra Glen to provide access to adjacent activity centres.

An investigation into possibilities for large-scale Park-and-Ride (100+ spaces) is also recommended. Figure iii suggests possible areas of focus.

**Figure iii:** Strategic Infrastructure Needs



Finally, two other areas of investment will need continuous review to ensure that they support the Frequent Network:

- The Frequent Network should have adopted standards for speed and reliability. As speed and reliability deteriorate due to increased car traffic, these standards would identify where and when new strategies or facilities are needed to protect the Frequent Network. Over time, these standards could lead to the introduction of exclusive lanes, queue jumps, preferential signals, or a range of other strategies. This plan does not anticipate those projects in detail; instead the projects should follow from the speed standards in shorter-range planning. All future road and intersection upgrade projects contemplated on the Frequent Network corridors should anticipate the possible need for such PT supportive measures.
- The pedestrian environment in the vicinity of Frequent Network stops has a crucial impact on the success of public transport in Canberra, because all public transport customers are also pedestrians. High standards for pedestrian environment should be established and maintained in these areas. For example, wherever there are transit stops on both sides of a street, it must be possible for a pedestrian to cross the street safely, as customers will typically arrive one on one side of the street but depart from the other.

## *An Agenda for Action*

This plan advises the ACT Government to take the following actions as soon as practical, and ideally within the next 2-3 years:

- Adopt a 2031 Frequent Network as a matter of policy, including:
  - Specific alignments of routes.
  - Operating speed standards.
  - Long-term goals for frequency and service span.
- Adopt a "Coverage Cap," a policy on the portion of the public transport operating resource that should be devoted to low-patronage Coverage service to meet social inclusion goals.
- Develop policies to guide future land use planning to avoid imposing undue costs and inefficiencies on public transport. In particular, establish development standards for all locations on the Frequent Network, including:
  - Identification of land uses that are appropriate or inappropriate, preferring land uses that generate high PT demand.
  - Reduction or elimination of minimum parking requirements, to support more efficient dense development where PT can support it.

- Develop policies and strategies to encourage locational decisions that place high-PT-demand activities on the Frequent Network, and low-demand activities off of it. These strategies should help to guide the ACT Government and Commonwealth locational decisions as well as private sector ones.
- Begin implementing simple branding strategies to make the Frequent Network visible and legible to the public as it comes into existence.
- Based on the "Coverage Cap," determine the long-term unfunded needs for public transport service, and begin a public discussion on how these might be funded.

# 1. Introduction

## 1.1 Background and Context

In 2001, the ACT Government began a comprehensive planning process, called *The Canberra Plan*, to envision the next 30 years of growth in the ACT and the government activities that this growth would require. The land-use and transport component of this vision is the *Canberra Spatial Plan*. The *Spatial Plan* proposes a pattern of urban growth intended to meet the needs of an expanding population and economic base over the next 30 years, and the transport infrastructure requirements accompanying this growth.

The key new idea in the *Spatial Plan* is a change in the planned physical extent of urbanization. The previous "Y-plan" envisioned Canberra growing in extended corridors beyond Gungahlin and Belconnen, producing a Y-shaped urban footprint. Instead, the Spatial Plan proposes a more compact form designed to minimize the total radius of the urban region. A key impact of this plan is to shift urbanization focus to Molonglo and North Weston, an undeveloped area relatively close to the City in the west. This change has major impacts for transport; for example, the Y-Plan would have loaded more demand onto the existing Intertown corridors, but the revised plan creates a new demand corridor into the City from the west.

The transport element of the *Spatial Plan* is called the *Sustainable Transport Plan*, completed in 2004. The *Sustainable Transport Plan* makes several key recommendations:

- It proposes specific targets for public transport mode share, and also for walking and cycling. The 2026 target is for a 16% journey-to-work mode share for public transport, and 7% each for walking and cycling.
- It sketches the backbone of a future public transport structure, a system of four Intertown Public Transport corridors. These fast and frequent services would be the direct links to Civic from each of the four Town Centres (Belconnen, Gungahlin, Woden, and Tuggeranong) and also to dense inner-city destinations such as Kingston and Manuka. This vision is refined in a supporting document, the *Public Transport Futures Feasibility Study*.
- It emphasizes the need for a range of capital investments in public transport, including busways, real time information, and interchanges.
- It emphasizes the long-term importance of considering public transport when designing new developments, citing the *National Charter of Integrated Land Use and Transport Planning.*

This report, the *Public Transport Strategic Network Plan*, is the necessary next level of detail. This plan identifies the specific steps that must be taken to move toward the goal of a more sustainable transport system.

## 1.2 Project Goals

The ACT Government's brief for this study identified the following goals:

- Address the Territory's targets for mode share while meeting existing and projected future needs.
- Integrate public transport with the land use objectives in the Canberra Spatial Plan, which will support current development proposals and which will ultimately lead to more optimal decisions about land release and associated land value. These proposed developments include the Molonglo Valley and East Lake, for which some planning work has been undertaken.
- Prioritise the implementation of public transport infrastructure, services and systems.
- Establish the relationship between the public transport network and other supporting policies such as parking (including Park-and-Ride), fare pricing, etc. and provide key recommendations regarding improvements to maximise public transport patronage.
- Provide a public transport planning tool that responds to land development options and is scalable with regard to development, population, service provision and infrastructure, and assists with integrated public transport planning.
- Provide a tool for longer term planning for the timing, staging and funding of capital works and operational costs, including fleet requirements.

## 1.3 Scope of this Report

To address these goals, this report develops a 25-year vision for the development of Canberra's public transport, aiming toward a future where public transport carries a much larger share of the travelling public than it does today. Key elements of this plan include:

- A proposed future PT network, with emphasis on services that are frequent enough to support high levels of dependence on PT. These services, called the Frequent Network, represent the highest level of investment in PT operations, and will also have the highest claim to infrastructure investments needed to protect the speed and reliability of those operations. This network is also a key tool in future thinking about more intensive land uses. (Network design principles are described in Chapter 2, and the network itself in Chapter 3).
- An estimate of the total volume of bus service (in terms of percentage growth in revenue hours[2]) that will be needed (Chapter 3).
- A discussion of critical decisions that will need to be made about the level of service that should be provided for "social inclusion" purposes, regardless of patronage (Section 5.1).
- Detailed demand modelling showing the consequences of this network in terms of patronage, and also the impacts on patronage of key external factors such as parking price and petrol prices, as well as impacts of fare policy (Chapter 4).

[2] A revenue hour is one bus (or train or tram) operating in service for one hour.

- Recommendations on policies regarding roadway design and PT preferences on the Frequent Network (Section 5.2).
- Recommendations on how the Frequent Network should influence land use planning, particularly the siting of dense developments, and of PT-dependent developments such as senior facilities (Section 5.2).
- Assessments of the region-wide infrastructure need, and next steps to be taken in developing PT infrastructure (Chapter 6).
- Preliminary ideas for the prioritisation and phasing of improvements (Chapter 7).
- A more detailed study of the PT needs of the Molonglo development area, including local as well as regional services (Chapter 8).

In addition to the sequence of the ACT Government studies discussed above, key ideas of this plan also support key goals of the National Capital Authority,[3] in particular:

- Amendment 56 provisions:
  - (c): *Provide "a flexible, efficient and sustainable public transport and pedestrian and bicycle systems that reduce car dependency."*
  - (d): *Develop "a sufficient density and mix of land uses to support public transport."*
  - (f): *Maintain "the ease and comfort of movement around the city to cater for a diversity of pedestrian, cycle, vehicular and public transport modes"*

## 1.4 Buses or Light Rail?

This plan takes no position on whether some corridors should ultimately be served with light rail.

There is an urgent need to visualise the future geography of the PT system, and begin putting the policies in place to support it. Such policies, which will help guide decisions that are being made every day, are more effective the sooner they are implemented. *These policies cannot wait until ultimate technology is selected.* Final decisions about light rail projects will await complex decision-making processes involving many agencies, including the ACT Government, the National Capital Authority, and the Commonwealth in its various roles as regulator, funding source, and leading employer. By the time this debate is resolved, crucial opportunities will have been lost to help shape the city in a more sustainable way.

For this reason, this report defines the major corridors of the Frequent Network, but does not attempt to advocate for a particular technology in these corridors. In some cases, a corridor is impossible to visualise without discussing a technology, and in these cases we generally refer to buses. In some cases too – notably the Belconnen Transitway project – important existing planning work has been done with buses in mind, and this work is cited as appropriate.

[3] See http://www.nationalcapital.gov.au/planning_and_urban_design/national_capital_plan/

In general, we speak of buses because the plan must be implementable with buses if light rail fails to gain the necessary consensus and funding. If light rail does proceed, this study will have laid out the framework of major corridors from which rail planning and design can begin, and will have defined PT-supportive policies that are critical to a sustainable transport future, regardless of the ultimate PT technology used.

# 2. Service Types and Design Policies

Effective network design begins with a clear understanding of the purpose of each service, and the principles to be used in designing to meet that purpose. This chapter lays out that background, considering the following questions:

- What types of services should be contemplated in the study year?
- What are the most important categories or distinctions among these services, for planners, operators, and the public?
- Which types of service are right for each geographical situation and development type?
- What are the principles of network design that should govern the network?

The key elements of this chapter are:

- Service Purpose (Sections 2.1 and 2.2). A clarification of the role of patronage goals, as opposed to minimum coverage standards, and the strategies that follow from these purposes.
- Service Types (Section 2.3). A recommended system of types or brands of service, based on the distinctions that matter most to the customer and affect patronage most profoundly.
- Network Design Principles (Section 2.4). Network design principles describe how different service types work together to form a complete network that is competitive for many kinds of trips.

Further detail on service design policy questions can be found in Chapter 5. The focus in this chapter are on standards that were used to design the Strategic Plan network presented in Chapter 3.

This chapter draws on several sources:

- Explicit direction provided in the brief for this project.
- Policies explicit or implied in the *Sustainable Transport Plan*.
- The Canberra *Public Transport Futures Feasibility Study*, KBR, 2004.
- Existing and past policies used by ACTION.
- Best practices in service design and service branding from North America and Europe as well as Australasia.

## 2.1 Clarifying Service Purpose

### 2.1.1 Patronage Goals vs. Coverage Goals

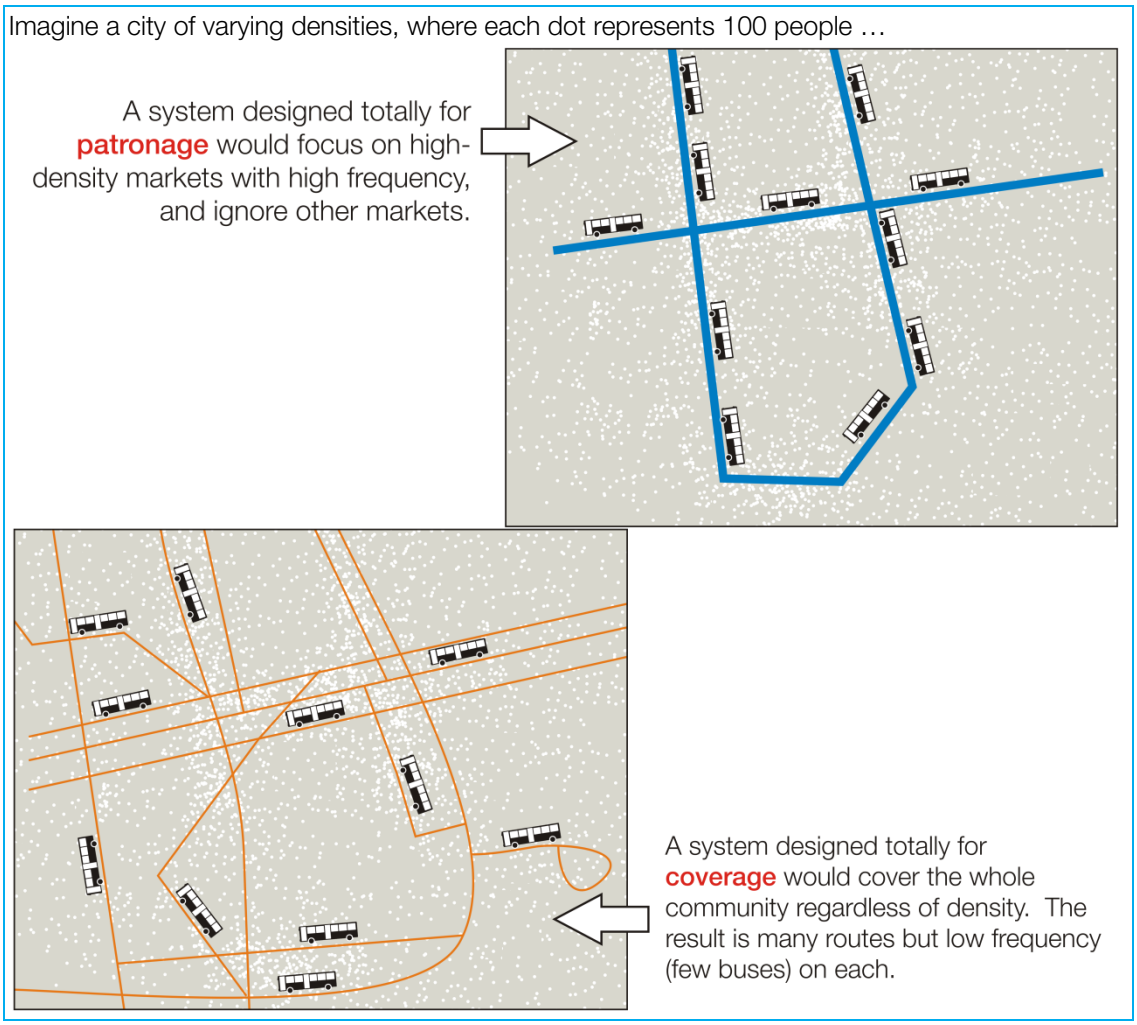
A service policy must begin with a clear understanding of the purpose of public transport. Why run public transport at all? What goals does public transport help a community to meet?

Public transport provides many kinds of benefits, including environmental, social, and economic ones. However, not all of these benefits arise from the same public transport service. In particular, service design quickly encounters a tension between goals that rely on *patronage* and goals that rely on *coverage.* For any particular goal of public transport, it is important to ask the question: "Is this goal met by maximizing patronage, or by maximizing coverage?"

- Coverage-related goals are met when public transport is available, even if it is not heavily used. Most of the social goals of public transport – such as basic mobility for persons who do not have the option of driving – are coverage-related. Demands for "equitable" distribution of service – where this means extending service into a low-patronage area because ratepayers there are supporting it – are also coverage goals. *The measure of a coverage goal is usually a Minimum Coverage Standard, which generally takes the form: "___% of residents and jobs should be within ___ meters of service."* Chapter 5 reviews the ACT's Minimum Coverage Standards and recommends revisions..
- Patronage-related goals are met when people ride public transport, and are met to a higher degree the more people ride. Most of the environmental and economic goals for public transport, including all the benefits that follow from reducing car trips, depend on how many people ride public transport, not how much public transport is available. Financial viability of public transport also varies with patronage, since patronage provides fare revenue which reduces the need for public subsidy. *Patronage measures generally express patronage per unit of service, e.g. boardings per service km*, but measures dependent on fare revenue, such as subsidy/passenger, also express patronage goals.

Figure 2.1 illustrates the difference. In these drawings, each dot represents 100 people, so more crowded dots indicate higher density. If patronage were the only goal, we would concentrate all our resources on the dense area where patronage potential is highest, running high frequencies there, but we would ignore the smaller markets. By contrast, a totally coverage-oriented network ignores the difference in density and focuses on covering the entire area. This requires running many routes, and as a result there are few buses on each route, i.e. a poor frequency that will not attract many riders.

Figure 2.1: Patronage vs. Coverage in Service Design




In high-density areas with a good pedestrian network, it is generally possible to design a high-patronage network that also provides complete coverage. As densities decrease, however, the demands of patronage and coverage diverge. In a typical car-oriented, low-density outer-suburban area, for example, the highest patronage comes from narrowly specialized commuter express services that run from park-and-ride facilities, providing almost no coverage at all, while the coverage standard requires an all-day local network which usually has relatively low patronage by system-wide standards. *As densities decrease, patronage and coverage become competing goals.*

This observation leads to two fundamental strategies that drive this service policy:

- Work to expand the network that achieves both patronage and coverage. Since the ability to achieve both patronage and coverage with the same service depends on urban density and design, this is a long-term development-driven process. However, the ACT Government can support and guide this process by clearly defining a range of high-patronage service products and clarifying the necessary conditions for each. These service policies are a step in that direction.

- Maintain policies that clarify the minimum levels of coverage, and monitor their impact on patronage. ACTION's minimum coverage standard establishes a level of coverage to be provided. However, as the urban footprint grows, the quantity of service that must be devoted to meeting this standard increases as well, which will come at the expense of services justified by patronage. It may be appropriate to cap the quantity of coverage-oriented service as a percentage of total service as a matter of policy. Chapter 5 explores this issue in more detail.

## 2.2 System of Service Types

### 2.2.1 Proposed Branding Distinctions

#### 2.2.1.1 Background

Australian public transport systems categorize their systems in many ways, including:

- **Technology and infrastructure** distinctions, such as rail, bus, and ferry. These distinctions are obvious, but they are often misread as indicators of the level of service. All three modes are capable of the same broad range of speeds, and all can be frequent or infrequent, and peak-only or all-day. *This plan proceeds on the assumption, expressed in the* Sustainable Transport Plan*, that buses are to be the mode of transport, but there would be no difference to the structure if rail were used.*
- **Network structure distinctions**, reflected in terms such as "intertown," "radial," "trunk," "orbital," and "feeder." These can be helpful in understanding network structure, but they describe distinctions that will be apparent anyway on network maps. Some of these terms can lead to an overly narrow understanding of the purpose of a route. A successful route may be radial for one major town centre but a feeder for travel to another. Network structure terms are used carefully in this study, and are not used to define service types. Where a service type is used only for a specific network purpose, such as the Intertown corridors, this correlation is noted.
- **Speed and access distinctions**. Fewer stops generally mean higher speed. Higher speed, limited-stop services are often given distinct "brands" because they have greater appeal to persons travelling longer distances.
- **Frequency and span distinctions**. Is the service coming when I need it? The answer to this question lies in frequency ("how often does service operate?") and span ("during what hours is it running at all?") Frequency and span are the foundation of public transport convenience, especially for corridors designed to serve high-density mixed-use development that generate demand at all hours.

*This study uses the last two distinctions as the foundation of the system of service types.* Frequency/span and speed/access are fundamental to determining whether a service is useful to any given market. The remainder of this section outlines the role each of these distinctions plays, and how the system of service types incorporates them.

#### 2.2.1.2 Proposed Frequency/Span Distinctions

While there are many gradations of frequency and span, best practice planning seems to recognize two distinctions as fundamental:

- High vs. low *frequency*
- Peak-only vs. all-day *span*

These two distinctions enable us to divide services into three large categories that are obviously relevant to Canberra:

- The **Frequent Network** refers to service that (a) runs so frequently that you do not need to refer to a timetable, usually every 15 minutes or better, and (b) runs for a long service day, usually at least 15 hours per day, 7 days per week. Many public transport agencies in North America and Europe are defining bus services in this category as a distinct brand which forms the backbone of the public transport network in high-density areas.
- **Standard** frequency, refers to all-day service at lower frequencies, usually 30-60 minutes. It runs at least 12 hours a day on weekdays, but evening and weekend service may be limited.[4] This service level is appropriate for areas of low demand spread across the day. Most low-patronage services operated for social purposes fall in this category.
- **Peak-Only** is any service that runs only for a few hours a day, to serve a market of brief high demand. Commuter express service and school service are two examples.

One advantage of looking at services this way is that there is a direct and obvious link between these categories and some key popular concerns about public transport. In particular:

- *Land Use Synergies and Reduced Car Dependence.* Frequent all-day service is the foundation of most transit-orientated development. It is also necessary if people are to voluntarily choose to own fewer cars as part of the trade-off of life in a dense city. High frequency both supports and requires high density and pedestrian-friendly urban design.
- *Broad vs. Specialized Markets*. Peak-only is the most specialized category of service, appealing narrowly to those who can commit to going and returning in the scheduled range of times. High-frequency service is the broadest category, capable of serving peak commuters while also serving many other kinds of trips. Serving a broad market is the key to creating public transport services that feel widely owned as elements of civic infrastructure.
- *Simplicity vs. Complexity*. Peak-only service tends to consist of many routes with just a little service on each route. These routes can overlap each other and also overlap the all-day network. As a result, peak-only service is a major contributor to the overall complexity of a public transport system. All-day high-frequency services are easy to make simple (though this is also related to the role of connectivity, discussed below). Simplicity is an important issue if we want customers to be able to use public transport for a range of purposes. In a complex system, customers learn how to make a single trip that they make routinely, but learning to make any other trip is simply not worth the effort required.

[4] Evening and weekend service levels are determined by the minimum coverage standard.

This discussion is not meant to disparage low-frequency and peak-only services, but merely to put them in context. Low-frequency service has a fundamental social role in low-density areas that cannot support a high frequency. Peak-only service will continue to be needed in places where dramatic spikes in demand occur over a short period. However, only the Frequent Network service is comprehensive. Only this category appeals to people who are highly sensitive to waiting time, and who need to travel at any time of day. High-frequency service also serves some of the social and peak-commute goals of the other types, but the opposite is not true. For this reason, it is appropriate to think of the Frequent Network category as foundational, and the other two categories as supplements to it.

Public transport has a particular challenge serving the complex, multiple-stop trip that is increasingly common in professional lives. The trend toward households where both parents work, and also to single-parent households, means that a working parent must also meet his/her children's commuting needs, whether to school or daycare. As jobs become more complex, work may also involve time-sensitive travel during the day, for meetings or other purposes. These factors can easily convince people that only their car can serve their needs.

A key purpose of the all-day Frequent Network is to provide a foundation where all of these complexities can be served on public transport – just as they are on the London Underground. Just as a London commuter may choose a childcare provider in part for its proximity to an Underground stop, the Frequent Network is meant to be a preferred location for businesses that want public transport users as customers, and for the residences of those users. This in turn will support further development intensification that will put more of life's daily needs on the network, so that public transport can be used for all kinds of trips during the day and evening.

The other key response to this complexity of travel needs is to ensure that different modes of transport work effectively together. The best solution for a certain commuter may not be 100% public transport; it may be a mixture of Park-and-Ride, carpooling, cycling, walking or other modes. Chapter 6 considers the infrastructure requirements of this integration, as it affects public transport infrastructure.

#### 2.2.1.3 Proposed Speed / Access Distinctions

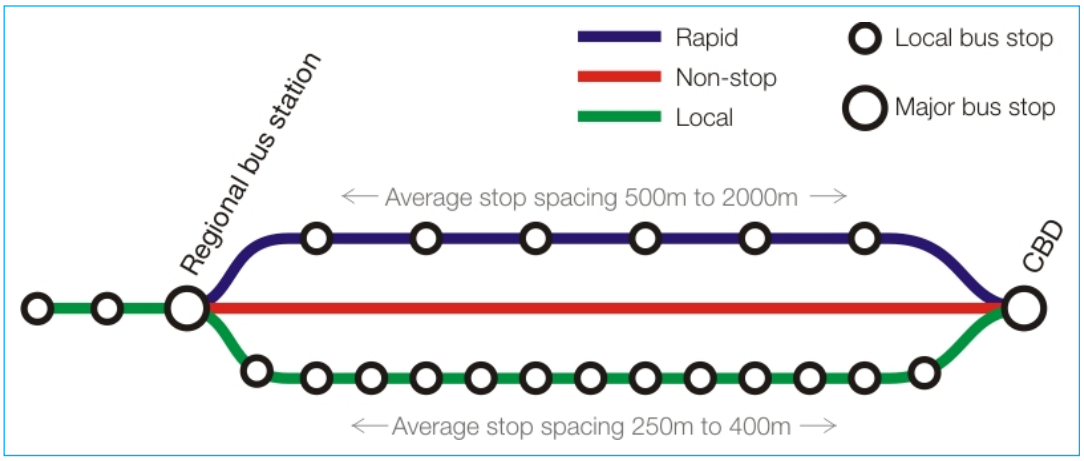
Speed / Access distinctions refer generally to how fast a public transport vehicle runs, and how often it stops. There are four broad categories, in a spectrum from fastest and least accessible to slowest and most accessible.

- **Nonstop** service has a long segment with no stops. Peak-only commuter express service is the most common example. Nonstop service requires a very concentrated market all making the same nonstop trip, so it is rare outside of the peak period.
- **Rapid** service makes regular but widely-spaced stops, typically in the range of 0.5 - 2 km. (The word "station" or "terminal" is often associated with a Rapid service). A common bus-industry term for Rapid service is *limited*-stop, but that term emphasizes the negative. The term "Rapid" is used here to emphasize the positive: limited stops mean faster operation.

- **Local** service stops every 250-400m or less along most of its length, with the purpose of providing continuous access within walking distance of every point on the route.
- **Flexible** service encompasses all services that deviate on demand in order to penetrate hard-to-reach or low-density areas, or to provide door-to-door service to persons with mobility limitations. Flexible services represent the extreme of access at the expense of speed.

As with frequency / span, there are many fine distinctions in speed and access, but the distinctions outlined above seem to be the most fundamental in industry practice, and the most relevant to Canberra. These distinctions, combined with the frequency / span distinctions above, form the basis of the proposed structure.

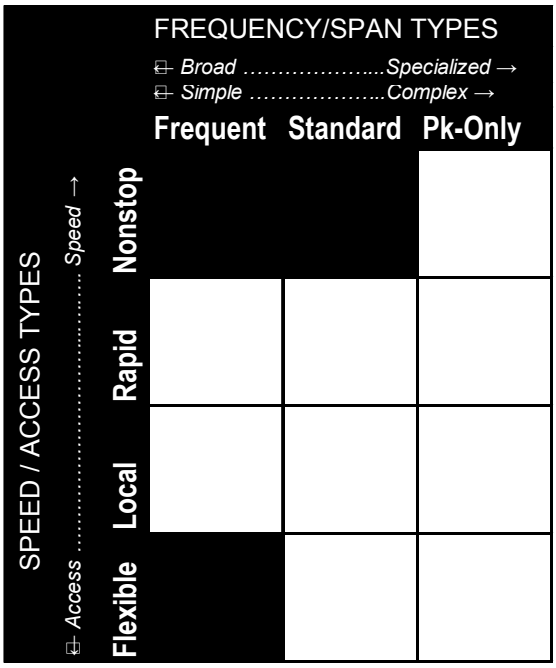
Figure 2.2: Visualisation of Service Type Stopping Patterns




## 2.2.2 Proposed Structure of Service Types

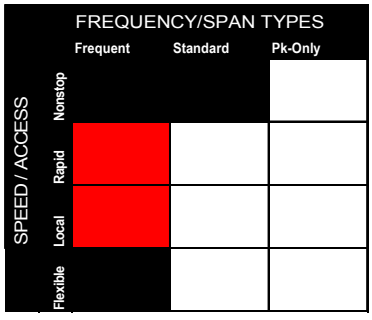
The preceding section presented three proposed gradations of frequency/span and four proposed gradations of speed / access. Combinations of these could, in theory, yield up to twelve brands, as shown in the following figure. However, a few of these combinations rarely appear in practice, so these are blacked out to reveal nine possible permutations that could be the basis of useful brands.

Figure 2.3: Proposed Frequency and Speed Distinctions




Each of these cells describes a service with some distinct relevance to a total public transport network. The rest of this section discusses the most important of these distinctions, and introduces terms to describe them. *Throughout this report, the capitalized words Frequent, Frequent Network, Standard, Peak-only, Commuter Express, Flexible, Local, Rapid, and Nonstop all refer to the definitions presented in this chapter.* Individual words are defined in the sections above and their permutations in the following section.

### 2.2.2.1 The Frequent Network: Frequent Rapid and Local Service




For all the reasons discussed above, the most important distinction of all is the idea of Frequent Network service. Services that run frequently for a long span should be identified and clearly presented in a way that is distinct from the rest of the network, so that the simplicity, comprehensiveness, and convenience of these services is immediately apparent.

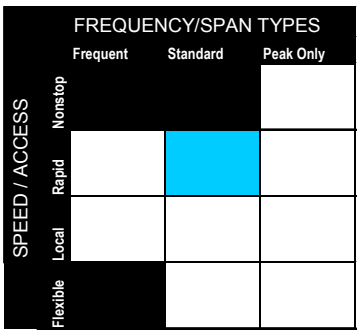
This report uses the term *Frequent Network* to refer to all services in this category. Frequent service has two distinct components, which also deserve to be distinguished:

- *Frequent Rapid* is similar to the existing Intertown, especially on their busiest segments between Belconnen, Civic, and Woden. Frequent Rapid service gathers its high all-day market not just from its walking catchment, but also from connecting local-stop services and Park-and-Ride.

- *Frequent Local* service is the basis for an important new brand and service category. This service provides "turn up and go" convenience for relatively short trips, usually under 5 km or so. This concept is likely to be relevant to higher-density areas around Civic, Parliament Hill, and Kingston/Manuka, and possibly also in other areas of the region.

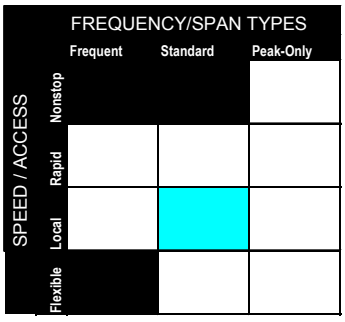
In terms of the service purposes outlined in Section 2.1, the Frequent Network's purpose is patronage, not coverage. However, the patronage goals are to be measured in a long-term and big-picture way that preserves the simplicity of the network. On the Frequent Network, for example, it is important not to reduce frequencies or service spans beyond the policy minimum (even though patronage may be low on certain hours and on certain segments) because the brand reflects a commitment to "turn up and go" convenience that cannot be compromised, and which has larger long-term patronage benefits through its simplicity and its potential to influence urban form.

#### 2.2.2.2 Standard Rapid Service




Wherever high-frequency service cannot be justified but there is an all-day demand for travel over long distances, the default would be a less-frequent but still Rapid service. No services of this type are envisioned in the ACT in this study, although they may arise in the future.

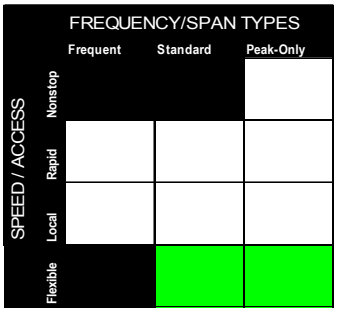
#### 2.2.2.3 Standard Local or "Coverage" Service




Standard Local service is the conventional local bus service operating in secondary markets, including coverage to lower-density areas and sometimes in dense but hard-to-serve areas. In terms of the trade-off presented in Section 2.1 above, the purpose of this service is coverage rather than patronage. For this reason, this service is referred to "Coverage" service in this study.

Coverage service operates all day in secondary markets, generally connecting with Frequent or Regional Link services. For this reason, they are often categorized as "feeders," but that term defines their role too narrowly. A well-designed Coverage service works both as a feeder and also as local circulation with a community.

### 2.2.2.4 Flexible Service

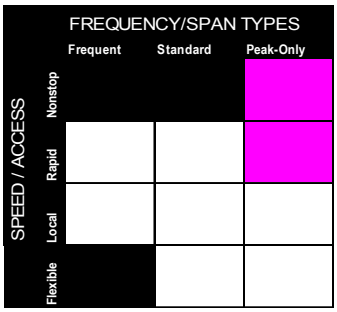



Some low-density areas can benefit from flexible-route services which operate demand-responsively in a fixed area while also serving an interchange at regular intervals for connection to the rest of the network. These have been tried in the past in Canberra, and may still have a role in the future.

Most flexible service is all-day, but there are occasions where the only demand in a low-density area occurs during peak hours, so peak-only flexible service is at least theoretically imaginable. Flexible services are also sometimes used specifically at low-demand times such as the late evening.

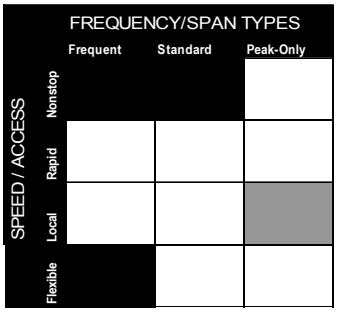
This study does not recommend particular flexible services, mostly because there is no value in identifying them in a long-term study. Flexible service options should be considered in the course of short-term planning as a way of meeting Coverage service obligations and/or maintaining service in an area in low-demand weekend times.

### 2.2.2.5 Peak Nonstop or Rapid Service: "Peak Express"




Peak-only commuter service corresponds to today's "Xpresso" brand, which provides nonstop trips to major employment centres from distant residential areas or Park-and-Rides. However, this service must be understood as supplemental to the all-day network. Where a market is adequately served by an all-day service, there is no need for a commuter express bus to do the same thing. For this reason, progressive expansion of the all-day network will entail revisions to peak-only services.

### 2.2.2.6 Peak Shuttle and School Services

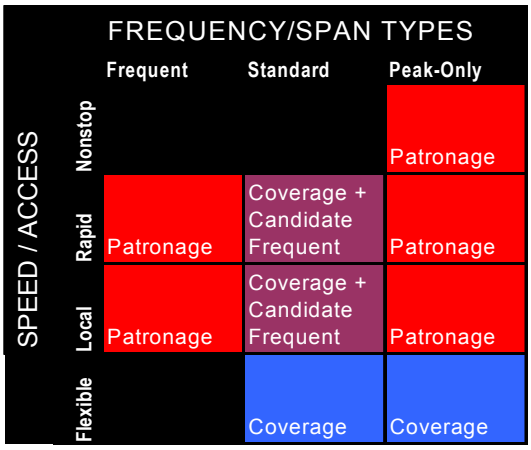



Peak-only Local services are usually shuttles for relatively short trips to destinations that produce high demand over a short period – typically business-park worksites and schools. Obviously, schools and worksites located on the Frequent Network will have the best access and will not require these shuttles to the same degree. This study does not identify services of this type, but they may arise in shorter-range planning, especially for business parks, though the best results are achieved if these business parks are designed so that such shuttles are not needed.

## 2.2.3 Service Types and Service Purpose

The proposed system of brands helps to clarify the role of different kinds of service in achieving the competing goals of patronage and coverage. Figure 2.4 below illustrates the extent to which each kind of service is generally motivated by patronage (red) or coverage (blue and purple). Purple cells denote service that is mostly motivated by coverage, but which may include strong markets that are candidates to be upgraded to the Frequent Network. *Candidates for the Frequent Network should be identified in advance*, in coordination with long-range land use planning, to help organize thinking about land use and road improvements that may be needed to support Frequent Service. Defining a future Frequent Network is one of the important products of this study.

Figure 2.4: Typical Purpose of Each Service Type




A network designed exclusively for maximum patronage would consist mainly of the Frequent Network, supplemented by Peak-Only express services as capacity and demand require. In most urban public transport systems, the top-performing routes are in the Frequent and Peak-Only categories.

Lower frequency service tends to have a lower patronage potential, so it follows that the Standard-frequency category aligns with the goal of coverage rather than patronage. However, most corridors that could be upgraded to Frequent Network service are in this category.

Flexible service is a tool for optimizing the coverage of low-patronage services. A network designed exclusively for maximum patronage would not serve the low-density areas where flexible service is an option.

## 2.3 Network Design Principles

The Network Design principles, based industry best practice, are designed to maximize patronage in the long term while also meeting minimum standards of coverage. The keys to this goal are:

- *Provides the highest possible frequency, span, and speed* to the largest possible market, which tends to be areas developed at higher densities with more pedestrian-friendly design.
- *Work together as a single network*, by emphasizing connectivity, not duplication.
- *Meet all capacity needs*, through additional peak services but also through innovative design.
- *Optimise the use of limited resources*, including not just operating cost and fleet but also the limited capacity of bus rights of way, bus interchanges, bus stops, and of the Civic and Town Centre road networks. Expansions of bus capacity will be needed, but are difficult to justify if existing capacity is not being used optimally.
- Design and present the system to be as simple as possible.

The following principles and policies all follow from these goals.

### 2.3.1 Building Frequent and Faster Services

#### 2.3.1.1 Prefer Frequent and Faster Services

To support the long-term growth of patronage, including city-building activities that reinforce patronage, it is important to maximize services that are attractive to the broadest possible spectrum of customers. When considering multiple service ideas for the same area, then, planning should prefer the option that creates a more extensive Frequent Network, and that provides more Rapid as opposed to Local service. For example:

- Where two less-frequent lines can be combined to create one Frequent Network line, while still observing the minimum coverage standard, this is virtually always the right decision.
- If a Frequent Local service gathers most of its patronage at a few major stops, it can be replaced by a Frequent Rapid stopping only at those stops, with less-frequent supplementary local service to maintain minimum coverage.

#### 2.3.1.2 Prefer Frequency over Speed, Except for Busy Peak Services

It has been widely observed that waiting time is more onerous than time spent on board a public transport vehicle. The guideline often used in modelling is that the each minute spent waiting is about twice the disincentive as a minute spent on board.

For this reason, the ACT Government should be willing to contemplate replacing fast but infrequent services with services that are slightly less fast but substantially more frequent. This opportunity often arises with the possibility of combining one or more Peak-Only Commuter lines into a Rapid line which may make more stops, but runs a substantially longer service day.

In planning the all-day network, planners often confront a trade-off between service that is faster but less frequent and service that is more frequent but not as fast. The thought process on this trade-off is as follows:

- Is the market clearly dominated by people who are all wanting to leave at the same time, and thus do not experience frequency as the determinant of their wait time? (For example, commuters leaving their jobs at 5:10 PM every day care only about whether there is a bus then, not how often the buses are operating. Some Local services may be also dominated by school trips that all leave at the same time, and are thus insensitive to frequency). If so, this is a reason to prefer the faster-but-less-frequent service so long as its patronage is high.
- Which option is better for optimizing *actual average travel time*? Actual average travel time is half of the headway (e.g. 15 minutes if frequency is 30 minutes) plus the in-vehicle travel time. If the more frequent but slower service prevails on this measure, it is usually the right choice.
- Which option is better for optimizing *perceived average travel time*? Perceived travel time weights waiting time about twice as heavily as in-vehicle time. Average wait time is half the headway, so perceived wait time is twice that, or the entire headway. Perceived travel time is thus the entire headway plus the in-vehicle travel time. If the faster but less frequent prevails, it is the right choice.
- If one option is better on actual average travel time, and the other is faster on perceived average travel time, then other considerations, such as the goal of expanding the Frequent Network, should guide the outcome.

## 2.3.2 Connectivity

A public transport system cannot provide direct, no-change service between everywhere and everywhere else, or even between everywhere and the major regional destinations at Civic and the Parliamentary Triangle. This is possible in smaller cities with a single overwhelming CBD, but as cities grow the commitment to no-change service becomes a source of complexity and an obstacle to efficient design, while also exacerbating CBD bus congestion.

### 2.3.2.1 Number of Connections Required

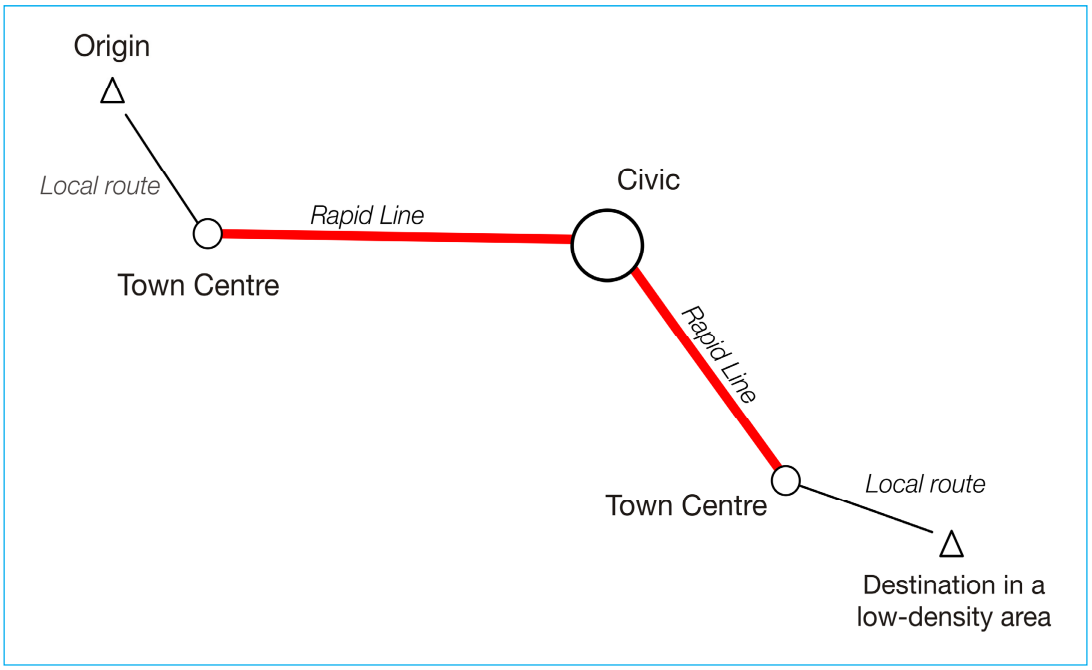
An effective network will provide direct CBD service from through most of the central suburbs of Civic and Parliament Hill, and from all of the Town Centres. However, worst-case expectations of connectivity should be as shown in Table 2.1.

Table 2.1: Recommended Connection Policy

| To travel from anywhere to: | The maximum number of connections required is: |
|---|---|
| Nearest Town Centre | 0 |
| Civic | 1 |
| A Town Centre on the opposite side of the region, OR a major employment centre in Parliamentary Triangle | 2 |
| Anywhere in Canberra | 3 |

This standard describes the worst case, typically experienced by someone in a low-density area beyond walking distance to any major corridor or shops. The following figure shows how this worst-case trip would work:

Figure 2.5: Worst-Case Trip Under Connection Policy




From an origin on any local route, it is possible to get directly to a town centre, including local-serving shops and an interchange with a Rapid line to the CBD. Ideally, the shops and interchange are in the same place, but if they are not, each local line must be designed to serve both the shops and the interchange. (Co-locating shops and interchanges is one of the major priorities of good station-area planning and large scale transit-oriented development).

With one connection at the interchange, it is possible to get to Civic, usually via a Rapid line. In practice, it is also possible to get most other destinations in the same part of the region, via other routes at the same interchange. In most cases, too, the Rapid lines shown in the above diagram will be continuations of the same line, so that in many cases it will not be necessary to transfer within the Rapid network. In the *worst* case, however, it may be necessary to transfer

once within the Rapid network to reach the general area of the destination and then once more to reach a point on a local route.

The worst case trip is quite rare. Most trips are not travelling between low-density areas on opposite sides of the region. In a well-designed network, most passengers reach their destination in no more than one connection.

#### 2.3.2.2 Connection Timing for Standard-Frequency Service

The principle of timing is that once you are on the network, it should not be necessary to wait long for any connection. To this end, schedule coordination for major connections should be planned, where possible, whenever frequencies are worse than every 15 minutes. One of the major advantages of the Frequent Network is that connections do not need to be timed.

Schedule coordination for less frequent service is difficult to achieve in many cases. A schedule may be determined by one connection in a way that precludes another connection. Wherever possible, schedule coordination should be optimized for the pattern of travel that has the greatest patronage. In addition, opportunities should be sought to create timed-transfer pulses, where buses from multiple routes meet at an interchange at the same time, so that passengers can connect from any route to any other. The potential for timed-transfer should be considered as interchanges are being planned, since the requirement that several buses be present at once can affect the design capacity.

### 2.3.3 Integration, not Duplication

To achieve simplicity and maximize frequency, the plan must avoid offering multiple services that compete for the same market. Where multiple services operate connecting the same points, they must serve clearly differentiated markets *that could not be served more efficiently by a single combined service.* The proposed connection standard is also a basis for dramatically improved integration, since it provides the basis for replacing some direct-to-Civic services with service connecting to a Rapid line.

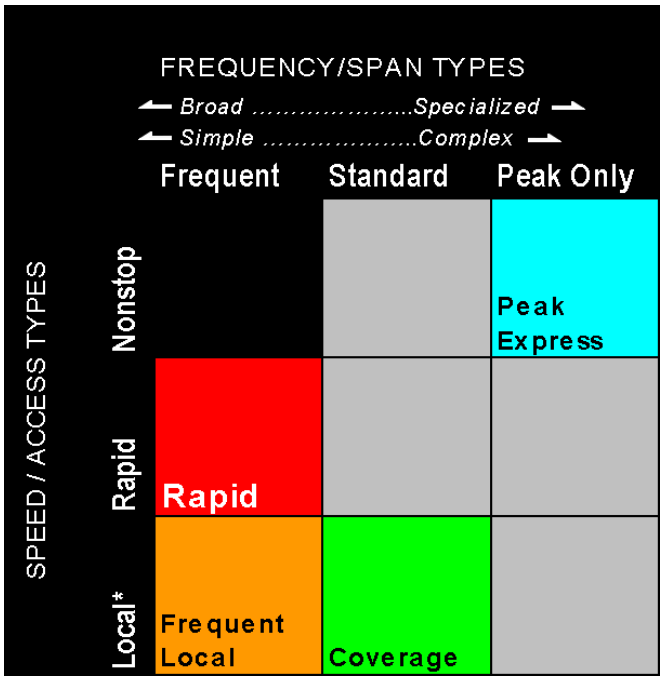
### 2.3.4 Anchoring

Most service types are appropriate to a particular kind of density along the length of the route. However, all public transport routes benefit from higher demand at endpoints. We say a route is *anchored* when it ends at a major destination so that there is a high demand for service all the way to the end of the route. Where a route does not have a strong anchor – for example when the route simply runs out into a low-density area and turns around – the result is underused capacity on the outer end of the route. This is not a major problem on Standard-frequency or Peak-only routes, because relatively little service is involved, though even in these cases anchoring is preferable. On the Frequent Network, however, large amounts of service are at stake, and the unused capacity on the outer end of a route becomes more problematic. Every route has two ends, and both benefit from strong anchoring.

## 2.4 Recommended Service Types

Based on these considerations, we can distil our structure of nine service types into four that are especially likely to be relevant to Canberra. These are shown graphically in Figure 2.5.

Figure 2.6: Relationship of Four Main Proposed Service Types




*Coverage services may also be provided by flexible services.

Table 2.2: Definition of Service Types

| Service Type | Prevailing Frequency | Service Span | Stopping Pattern | Purpose | Example in Existing System |
|---|---|---|---|---|---|
| **Rapid** | Every 15 min or better all day | All day and evening, 7 days a week. | Widely spaced "stations" (every 500-2000m) | All-day high-speed mobility in dense corridors, analogous to the metro or rapid transit system in a major city. | Intertown (300-series) between the Town Centres. |
| **Frequent Local** | Every 15 min or better all day | All day and evening, 7 days a week. | Local stops every 250-400m | All-day local mobility in linear dense corridors. | Northbourne Avenue between City and Dickson |
| **Peak Express** | Depending on demand. | During peak period only. Generally runs only in the peak direction. | Long nonstop segment. | Direct service from residential or Park-and-Ride area to one or more distant worksites. Supplements but does not compete with Rapids. | "Xpresso" routes (700-series) |
| **Coverage** | 30-60 min | All day, with some evening and weekend service. | Local stops every 250-400m | Access to low-density urban areas, for purposes of equity and social inclusion. Low patronage potential. | Local services in low-density outer suburbs. |

Briefly:

- **Rapid** is service that runs frequently all day, and makes widely-spaced stops, similar to the existing Intertown. This corresponds to what we have called "Frequent Rapid" up to this point. Hereafter the term Rapid means this particular service type only.
- **Frequent Local** service runs frequently all day but operates over shorter distances, making closely-spaced stops intended to serve all development along the route.
- **Peak Express** runs nonstop over long distances, and only during the peak period. Typically it runs in only one direction. This service corresponds to the current "Xpresso" brand. This service must be justified by high patronage on a particular corridor that (a) cannot be served effectively by the all-day network and (b) is sufficiently concentrated in the peak period to justify peak-only service.
- **Coverage** service runs all day and low frequencies, to cover low density areas. We have deleted the "Flexible" row of the table and simply note that Flexible service is one option for providing Coverage services.

The grey-shaded cells in Figure 2.6 are categories that are unlikely to have wide application. It is possible that one or two services of each type might be created, but there is no need to be specific about them in a Strategic Plan. Note that this plan is geographically specific only about Frequent services, the left hand column of Figure 2.6. The two services in this column (Rapid and Frequent Local) are jointly called the Frequent Network, and are one of the most important concepts in this plan.

# 3. Recommended Strategic Network

## 3.1 Introduction

To achieve larger goals of sustainability, the *Sustainable Transport Plan* (STP) calls for a dramatic increase in the share of travel in the ACT that occurs on public transport, from under 7% in 2001 to 16% in 2026. Such a large increase in public transport mode share will clearly require much more intensive service than is offered today. To provide a starting point for assessing the potential for achieving those goals, this chapter describes a conceptual Strategic Network of public transport services, designed to fit the development patterns outlined in the *Canberra Spatial Plan* and to be appropriate in scale to the STP mode share target. Although the STP referred to 2026, the study year of this Strategic Network is 2031, reflecting the year for which current population and employment projections are available.

The network presented here has gone through the following iterations:

- An initial draft network was developed in July 2007, based on projected patterns of density for 2031. This network drew on several sources:
  - Explicit direction provided in the brief for this project.
  - Policies explicit or implied in the Sustainable Transport Plan.
  - The Canberra Public Transport Futures Feasibility Study, KBR, 2004.
  - Existing and past policies used by ACTION
  - Best practices in service design and service branding from North America and Europe as well as Australasia
- Model runs were conducted on the draft network using the EMME model. These runs generated patronage estimates for every route in the network.
- Concurrently, comments on the network were invited through this project's Steering Committee, which includes representatives of both TAMS and ACTPLA as well as ACTION operational planners.
- The modelling results by route, along with other comments, were used to revise the network. In particular, we identified two types of problematic segments:
  - *Segments with very low patronage*. In some cases, these services were reduced or eliminated. In other cases, service was retained. The key issue in making this decision was whether cutting the service would undermine other services, or reduce the simplicity and clarity of the network as a whole.
  - *Segments that were overloaded.* An overload is defined as a situation where the per-hour patronage riding through a segment exceeded the capacity on that segment, where the capacity consists of the number or buses per hour times the number of people who can comfortably fit on a bus (including standees). In these cases, one or more of the following steps were taken, typically in this order:
    - Articulated buses were substituted for standard buses.
    - Frequencies were increased.
    - In a few cases, services were redesigned or extended.

- Finally, the revised network was run through the model again. This final modelling found that the revisions had successfully eliminated all overloadings. At this point, the network was considered to be final for the purposes of this study.

This chapter describes in detail the Strategic Network resulting from this process, which stands as this report's recommendation for the purposes of long-range planning.

The Strategic Network uses the service categories and network design principles outlined in the previous chapter, "Proposed Service Design Policy," as summarised in Section 2.4. (Capitalised words for service types, such as Rapid, Local, Frequent, Peak Express, etc., all have explicit definitions in that chapter). The Strategic Network has consists of three parts:

- A *Frequent Network* of routes running every 15 minutes or better all day, designed to serve the high-patronage markets throughout Canberra and to account for the majority of patronage. As outlined in the previous chapter, these routes are of two types:
  - *Rapid* services, which run at relatively high speed with infrequent stops. Rapid services are designed to be the simple and legible backbone of the network, designed to provide most of the long-distance or "intertown" mobility within the city.
  - *Frequent Local* services, which provide local-stop service in dense areas.
- Policies and assumptions on the extent of service coverage to areas not served by the Frequent Network.
- A collection of *Peak Express* services, running during peak periods only.

For modelling purposes, of course, the Strategic Network had to be defined to street-by-street detail. However, the level of specificity of the recommendations varies by service type:

- The Frequent Network, consisting of the *Rapid* and *Frequent Local* services, is a specific recommendation of exact routings. These routings may need further refinement, but we contend that it is important to fix these routings as a matter of long-term policy, so that land use and infrastructure planning can take them into account. The need for this specificity is discussed further in Chapter 5.
- The *Peak Express* and *Coverage* services are an indication of the overall quantity and distribution of these services. Some of these services have infrastructure impacts that may cause certain aspects of them to be fixed. (For example, the location of Park-and-Ride facilities must be worked out together with the Peak Express routes that serve them). In general, though, these two categories are indicative of a general level and extent of these services, not a specific street-by-street recommendation.

## 3.2 Projected 2031 Density and Design

Public transport patronage is overwhelmingly governed by the pattern of development, specifically:

- **Density**. How many residents, jobs, and other trip-generating activities are located within 500m of a bus stop? Density of activity – that is, activity per fixed unit of area such as the bus stop radius – is what determines the overall size of the potential market for which public transport is competing. The presence of major destinations such as school and shopping centres must also be assessed.
- **Design**. For a given density, two aspects of design have a major impact:
  - Are the residents, jobs, and other trip-generating activities connected to the bus stop by a safe and reasonably pleasant pedestrian network?
  - Does the bus stop lie on a viable high-quality bus route, or is the viability of the bus route restricted by the nature of the surrounding development or road infrastructure?

This section explains how these factors influenced the Strategic Network.

### 3.2.1 Population and Employment Density

Figure 3.1 and Figure 3.2 show the planned 2031 values for population density and employment density – the two most important variables that indicate high demand for public transport. Viewing these two maps together, several patterns stand out:

- The largest area of high density is the City area north of the lake, including Civic, Acton, Braddon, Turner, O'Connor, Lyneham, Ainslie, and Dickson. These areas are organised around the key spine of Northbourne Avenue, which is continuously lined with high density all the way from Civic to Dickson, inclusive.
- The Parliamentary Triangle is a dominant area of high employment density, focused especially in Russell and Barton. The public service jobs in this area produce an especially intense peak demand.
- There is a large area of high density in the southeast focused on Kingston and Manuka. The area generally between Canberra Avenue on the south and the lake and rail line on the north. Parts of this area are built continuously to two to three storeys or more, sufficient to support high-quality public transport.
- Outside these core areas, the largest areas with high density of both population and employment are the Woden and Belconnen Town Centres.
- The next largest areas with high density of both population and employment are the Gungahlin and Tuggeranong Town Centres, along with Queanbeyan.
- Group Centres with especially significant projected population and employment density – though on a lower scale than in Town Centres – include Dickson, Erindale in Wanniassa, Kippax in Holt, Cooleman Court in Weston and Lanyon Marketplace in Conder.

- There are scattered patches of high density in many other parts of the city, but these tend to be interspersed with low-density or rural areas, so it is harder to design public transport to serve them at a high standard of quality.

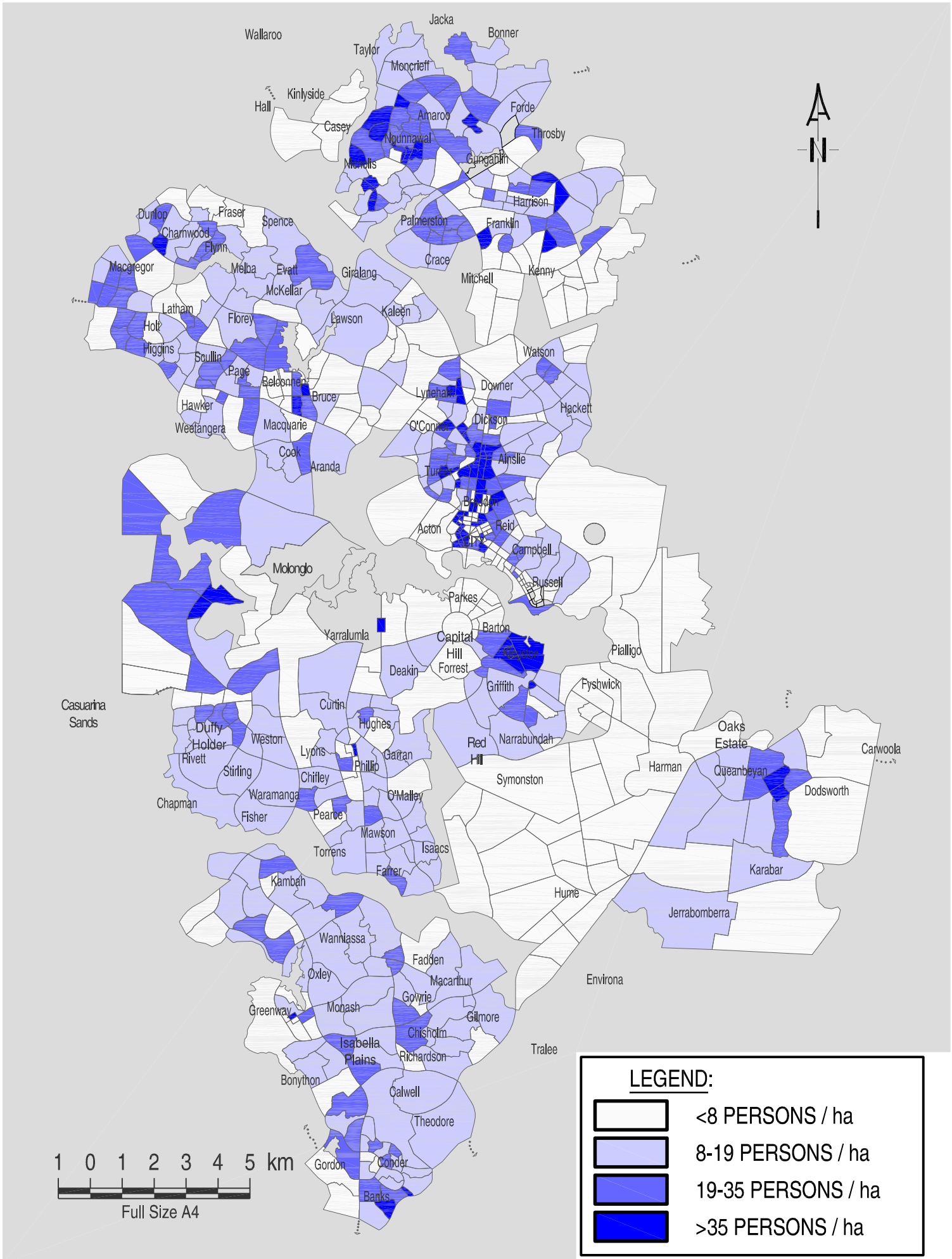
### 3.2.2 Major Retail Destinations

Retail space is an important indicator for the intensity of shopping trips and is displayed on Figure 3.3. The indicator is not perfect, because shops that sell relatively large objects, such as car dealers and lumber yards, may have relatively few customers per square metre. However, of the indicators that can be projected for 2031, this is the best available measure of shopping activity. In addition to Civic and the Town Centres, this map of retail space highlights the importance of the Group Centres at Dickson, Erindale, Weston, Mawson, Macquarie, Hawker, and Kippax in Holt. It also highlights Gold Creek and Mitchell in the Gungahlin district.

In addition, of course, Fyshwick stands out as a large area of retail. By 2031 Fyshwick will feel less isolated from rest of the city, due to the growth of East Lake and the completion of Newcastle Street. While Fyshwick will probably retain its car-oriented character, it is also likely to continue to provide shopping opportunities that are unique in the region, as well as a concentration of service sector jobs. The Newcastle Street connection from pedestrian-oriented East Lake will almost certainly create a need to make Fyshwick more pedestrian-friendly and thus more friendly to public transport.

Hume shows a similar pattern to Fyshwick, but Hume's smaller size and greater remoteness will make it very hard to serve with high-quality public transport, so the Strategic Network considers this a very low priority.[6]

[6] Development of the Eastern Broadacre area will eventually grow the Hume market to the point that it can be served, but the viability of such service depends on the physical configuration of the Eastern Broadacre development.

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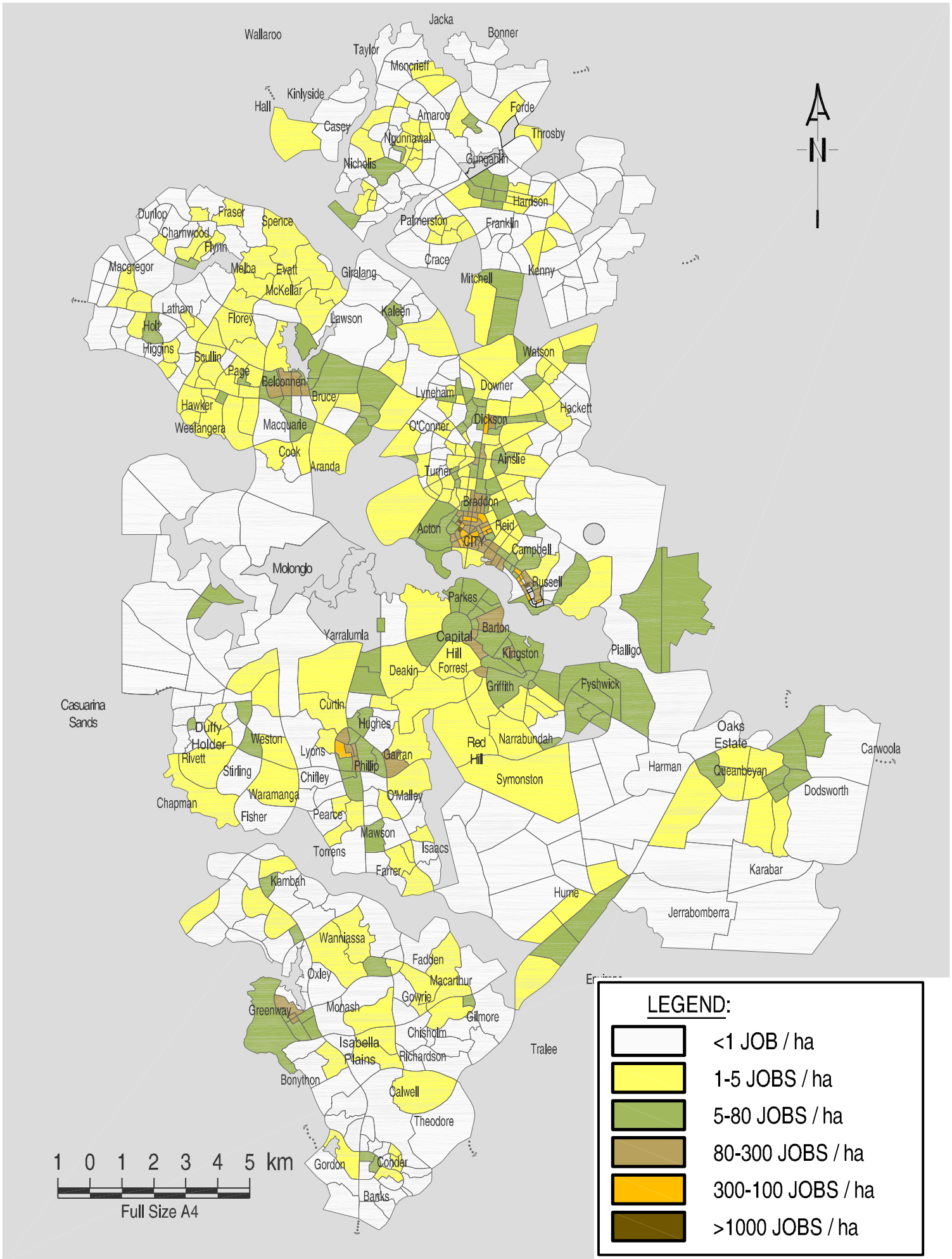
# 2031 POPULATION DENSITY

**FIGURE 3.1**

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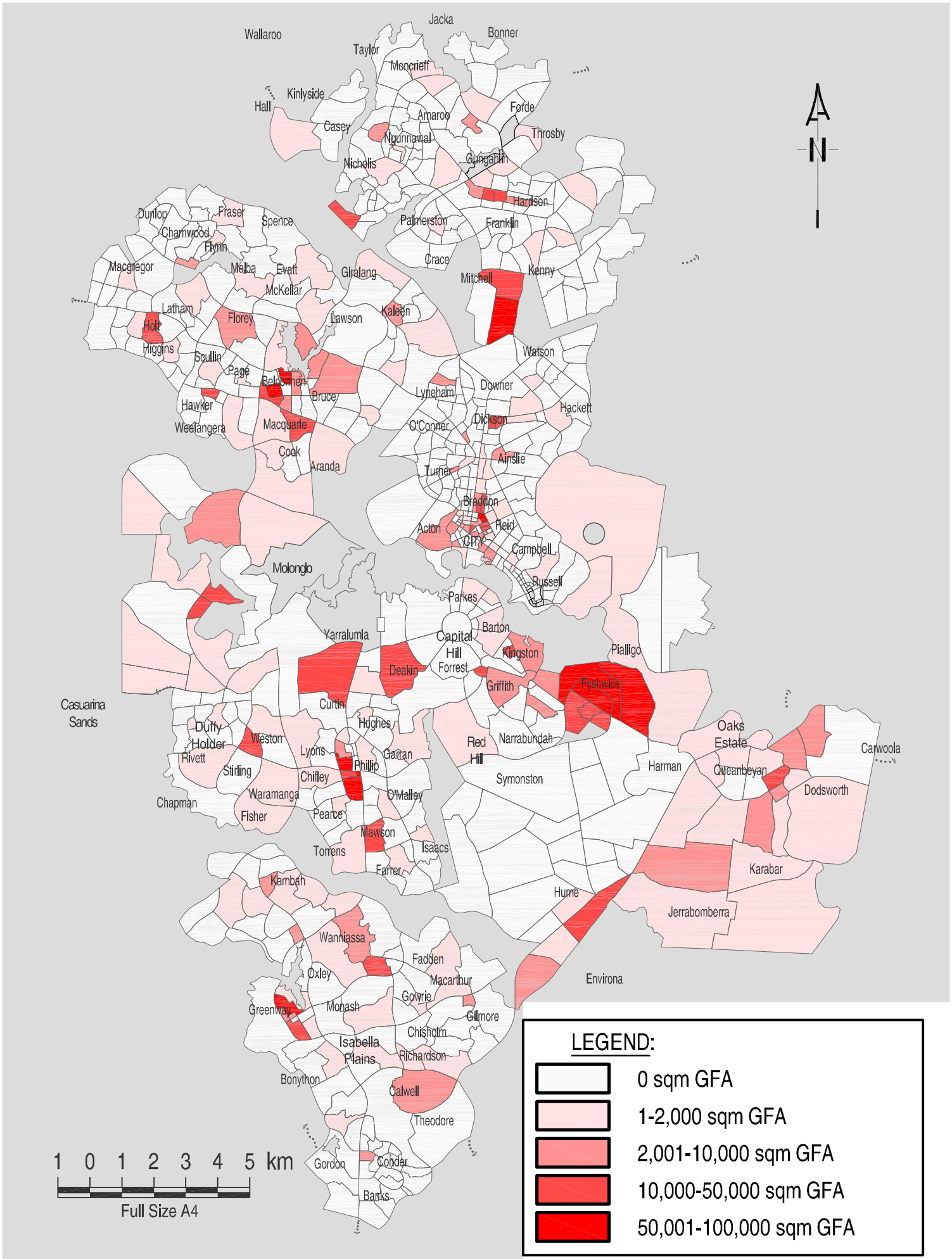
**2031 EMPLOYMENT DENSITY** **FIGURE 3.2**

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**2031 RETAIL SPACES** **FIGURE 3.3**

### 3.2.3 Tertiary Enrolments

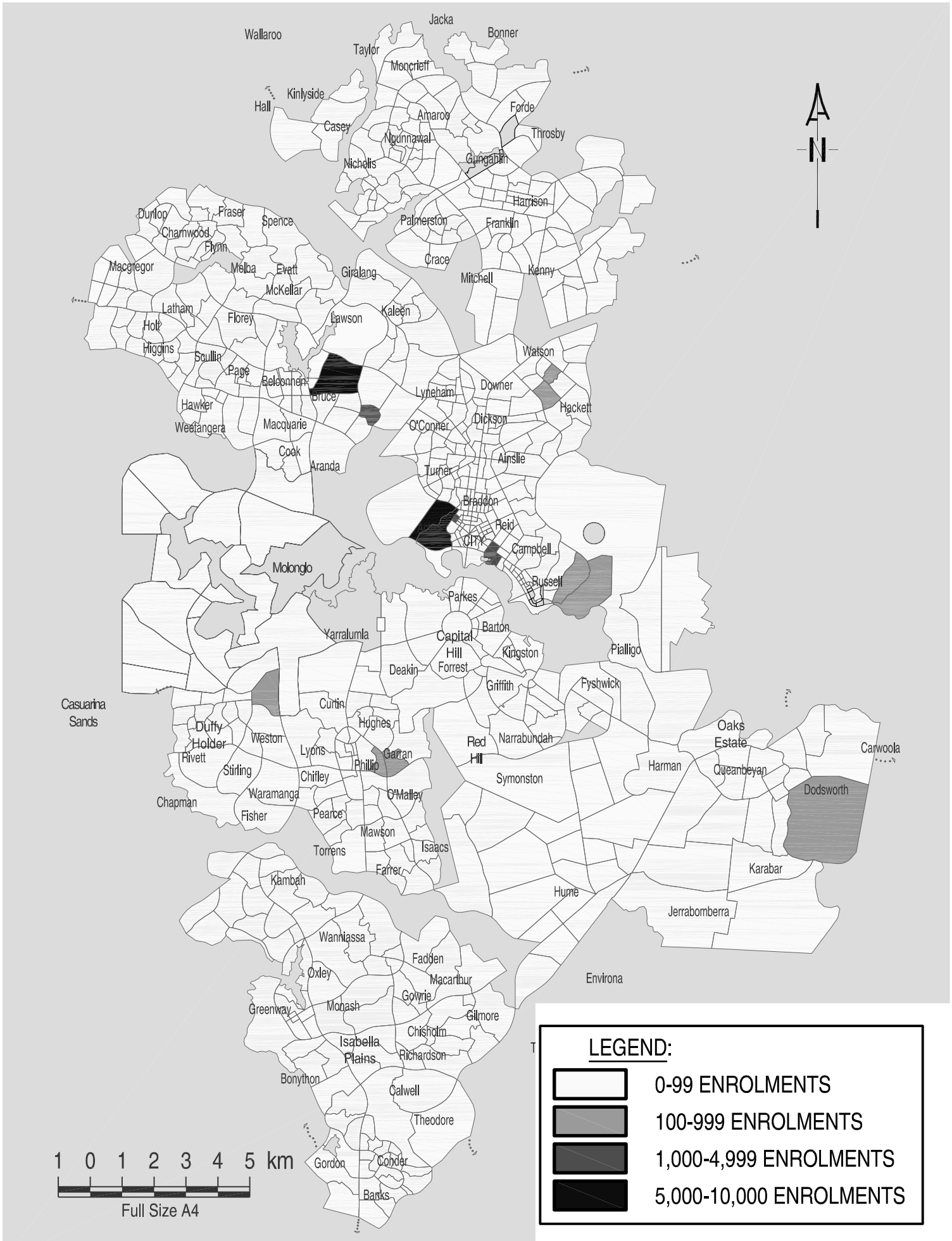
Universities and other tertiary institutions are powerful drivers of public transport demand. They serve such high concentrations of students that they often need to constrain parking and encourage public transport use. As Figure 3.4 indicates, the strongest university markets in 2031 will continue to be in Acton (the main campus of ANU) and Bruce, which includes the University of Canberra, the Canberra Institute of Technology main campus, and the Australian Institute of Sport.

A key consideration for universities is the low income of many students. Most university students live on limited budgets, as they are not working full-time and their part-time work is usually relatively low-paying. For this reason, many students welcome options that relieve them of needing to own a car. These factors, combined with the limitations on parking that are likely to be common by 2031, argue for a strong focus on these institutions. All major tertiary institutions should be on the Frequent Network.

### 3.2.4 School (Primary and Secondary) Enrolments

Figure 3.5 shows the locations of the primary and secondary schools in terms of density of enrolment. While shown as features of a zone, these figures typically reflect one or two schools in each zone, whose locations are known. These facilities do not have to be on the Frequent Network, since their demand is overwhelmingly concentrated at start and end times[7]. These extreme peaks of demand, which can overwhelm regular bus services, usually require dedicated services. Apart from these peaks, secondary schools generate a fairly light demand that can be served by lower-frequency all-day service.

[7] By contrast, tertiary students tend to arrive and depart throughout the day on individual class schedules. Tertiary institutions may generate a strong morning peak, but also generate high all-day demand due to the diverse schedules of the students. This is the most important reason why tertiary schools are an important consideration for designing the all-day Frequent Network, while secondary schools usually support only school-peak service combined with a lower-frequency all-day service.

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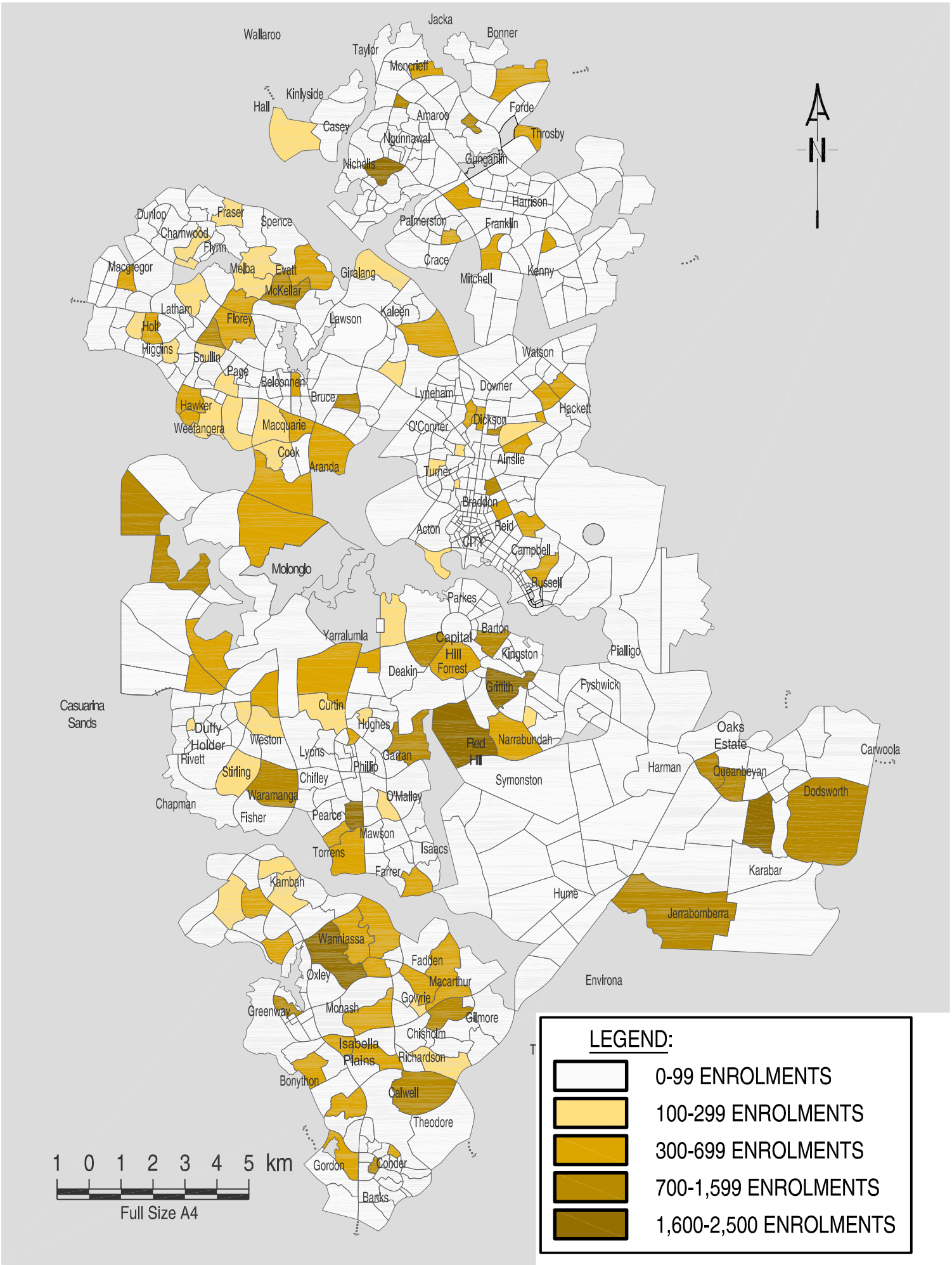
**2031 TERTIARY ENROLMENTS** **FIGURE 3.4**

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**2031 SCHOOL ENROLMENTS** **FIGURE 3.5**

### 3.2.5 Design for Pedestrian Access and Experience

Design for the pedestrian experience is an intentionally broad category, encompassing everything about a built environment that affects the pedestrian experience to, from, and at the bus stop. A detailed quantitative assessment of existing design is beyond the scope of this project, but it is important to highlight certain aspects of the issue that are crucial to public transport at Canberra's scale:

- *Connectivity of pedestrian network*. What is the average ratio of walking distance to air distance for walks to and from the bus stop? What percentage of the 500m radius area is within 500m walk, given limitations imposed by the street pattern?
- *Building orienta*tion. Is the front door of the building facing toward the bus stop, or must a passenger walk around the building to access it, producing a longer walk?
- *Pedestrian-friendly design*. Are the pedestrian routes safe and reasonably pleasant to use? Common problems in this area include:
  - Pedestrian paths too close to high-speed traffic.
  - Absence of crosswalks at bus stops. (At most bus stops, the two directions of service are on opposite sides of the street, so every round trip requires crossing the street once at or near the bus stop).
  - Security issues such as poor lighting.

In general, the pedestrian experience is better at higher densities, since higher density means more pedestrians. However, there are examples of dense employment centres that are not especially pedestrian-friendly. One obvious example is any institution that is set back from the road, requiring walking across the car park to reach the bus stop. Discontinuous road networks requiring long out-of-direction walks are another common problem, not just in low-density suburbs but also in employment areas such as Fyshwick and Hume.

Of course, Canberra has many examples of excellent pedestrian networks. These can be found both in the older parts of the city such as Kingston, where there is a complete grid of minor streets, and also in some recently built suburbs, where the street pattern may be circuitous for cars but there are numerous connections for pedestrians and bicycles only. Canberra's generous parkland corridors usually provide many pedestrian linkages but limited car access.

In general, the proposed Frequent Network puts particular emphasis on places with both high density and a thoroughly connected pedestrian network. These areas include:

- The Northbourne Avenue axis between Civic and Dickson inclusive, and including most of Acton, Ainslie, Braddon, Turner, O'Conner, Lyneham, and Dickson.
- The inner southeast area, especially Kingston, Barton, and parts of Griffith and Narrabundah.
- The Town Centres. Gungahlin's incomplete Town Centre features a very dense street grid that will make it especially attractive for pedestrian access to public transport.

### 3.2.6 Design for Service Efficiency

Design for pedestrian access invokes a well-established body of expertise in the planning profession. Equally important, but far less understood, is design for public transport efficiency. Pedestrian access is about the internal design of individual suburbs. Public transport efficiency is determined at a larger scale, by how the suburbs relate to each other, to their Town Centres, and to the roadway network.

From a public transport planning standpoint, what matters is not just the density and design of one development or suburb, but rather the average of these things over the entire distance that a logical bus route must cover. In developing a conceptual Frequent Network, we have encountered numerous cases where individual suburbs, even Group Centres, may justify service themselves, but their service is relatively expensive because their bus route must run long distances through empty space or low-level development to connect the market to the rest of the region.

If the Frequent Network appears to be ungenerous to certain apartment areas and Group Centres, this problem is always the reason. For example, we propose a Frequent Rapid line to Kippax Group Centre because Southern Cross Drive offers several concentrations of apartments located along a direct route to Kippax. Those apartments and Kippax can share a single route, which means the resulting route can be of a higher quality. By contrast, we do not propose Frequent Network service to the Charnwood Group Centre because there is no comparable apartment market along Ginninderra Drive, nor is it possible to stop there. Instead, service to Charnwood must run either non-stop on Ginninderra Drive or circuitously through other suburbs, yielding a smaller market potential in either case.

The key to public transport efficiency is the ability to serve *multiple major origins and destinations* while operating *quickly* over the *shortest possible distance*. The Strategic Network offers the best service where both development and roadway patterns allow for this kind of efficiency, as well as for good pedestrian access. Chapter 5 offers further recommendations on how future land use planning should use the Strategic Network, to improve the efficiency of public transport services for newly developed areas.

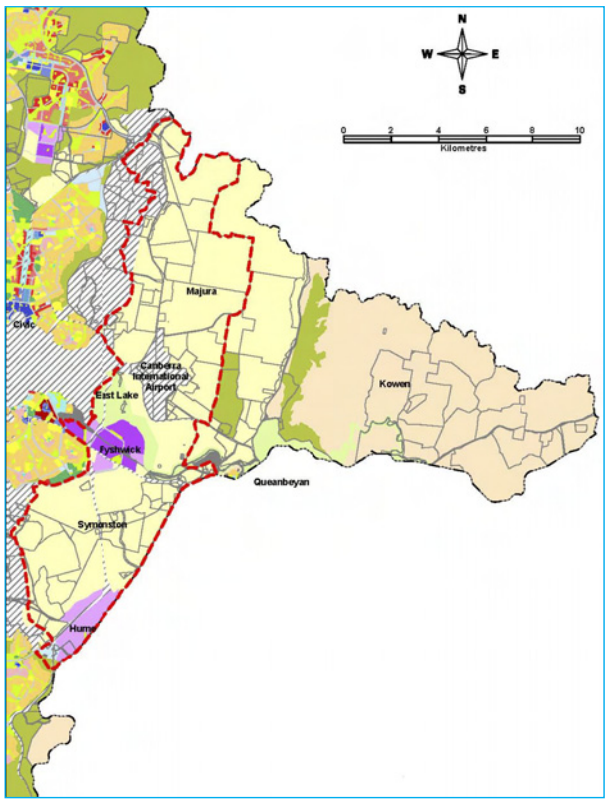
### 3.2.7 Additional New Growth Areas: Eastern Broadacre and Vicinity

ACTPLA has recently initiated the Eastern Broadacre Planning Study.[8] This project looks at a future employment corridor generally in the east of the ACT. The corridor includes areas on both sides of Monaro Highway between Hume and the Airport, and also areas on both sides of Majura Road between the Airport and the Federal Highway.

Services for these areas are not included in the Strategic PT Network, because these areas were not included in the 2031 development projections on which this plan is based. Separate study will be needed to determine if Frequent Network service should be extended into this area, and what mixture of Peak Express and Coverage services will be needed.

[8] ACTPLA"s overview of the study is at http://www.actpla.act.gov.au/__data/assets/pdf_file/0014/10058/Eastern_Broadacre.pdf

Figure 3.6: Eastern Broadacre Study Area




It is easy to imagine this area supporting a new eastern circumferential Rapid extending from Gungahlin along Majura Road to the Airport area, and on south to Hume, Chisholm, and Tuggeranong. However, the viability of such a corridor will depend entirely on the configuration of development and the design of roadways serving the study area.

These planning areas need the same type of public transport analysis as is presented in Chapter 8 for Molonglo. Until this analysis is done, it is premature to speculate about the levels of service they would support or the infrastructure they would require. As a relatively low-density employment area, Eastern Broadacre will require very careful design of both development and roadways if attractive public transport is to be possible. This study should be commenced soon, while development ideas are still fluid, so that the development implications of public transport goals can be factored into the development design.

Typical suburban office park development, exemplified by recent developments on the airport perimeter, can present almost insurmountable barriers to public transport. The most common problem is that these developments typically require buses to circulate through them at low speed in ways that make bus service unacceptable to patrons riding through to other destinations. As a result, each development requires its own routes terminating there, and the consequence of this is that resources are divided among many overlapping routes, yielding poor frequencies and service spans. All of these problems can be seen on the Airport perimeter today, and at other cul-de-sac employment sites such as Campbell Park.

Substantially new and innovative thinking will be required to produce an Eastern Broadacre plan that does not replicate these common problems of business parks worldwide.

## 3.3 Principles of Design

This section expands on the discussion of Network Design Principles in Chapter 2, and shows how these principles lead to the Strategic Network presented at the end of this chapter.

### 3.3.1 Rapid vs. Local Service

The Frequent Network consists of two types of service:

- Rapid service is designed for relatively fast travel over long distances between major destinations. In general, Rapid services stop about once per kilometre on average, but the spacing may be wider or closer. Rapid service is used:
  - To serve high-patronage markets where most trip lengths are over 10 km; and
  - In corridors where it is physically not possible to stop every 250m, typically due to a limited-access roadway or a very wide spacing of development.
- Local service is designed for local travel along a high-demand corridor. Local service stops are not marked on the map, but can be assumed to average every 250m, and to include every Rapid stop or interchange point.

If Rapid and Local service seem equally appropriate to a situation, preference is given to Rapid service because it operates more quickly and therefore yields more mobility at a lower operating cost. Local service is proposed only where the development pattern is continuous, thus requiring frequent stops, and overall trip distances being served are relatively short. In cases where there is a need for frequent stops but also many long trips – as on Northbourne Avenue – Rapid and Local service are overlaid to meet both needs

### 3.3.2 A Network of Connections

Although everyone wants direct service from their front door to their destination, a system that tried to provide direct service from everywhere to everywhere else would be an incomprehensible tangle of overlapping lines, all running too infrequently to be attractive. A core idea of every Frequent Network is that these services are so good that they are worth the inconvenience of changing in order to use them. Connection standards are discussed in detail in the Chapter 2.

### 3.3.3 Through-routing

In some cities, it makes sense to define Rapid and Local service as entirely separate, and Frequent Network service as entirely separate from less-frequent service. In those situations, a bus would never flow through from a Rapid segment into a Local segment, or from a Frequent Network segment onto less-frequent branches; instead, passengers would be required to change buses to shift from one service type to another. Fully separate services for each service

type allow for distinct differences in the "look and feel" of each type. For example, different types of vehicle can be used for Rapid vs. Local services, and for frequent vs. infrequent services, only if a bus never flows through from one to another.

In both short-range and long-range planning, this ability to flow through from one type of service to another has been a topic of debate in Canberra. ACTION bus services on the Belconnen-Civic-Woden-Tuggeranong "Intertown" spine formerly ran as an independent line, but in 1998 they were recombined with locals so that buses flow through from the frequent spine onto multiple local feeders. ACTION's Network '08 study, completed during the same period as this Strategic PT Network Plan, considered the possibility of undoing this through-routing, because it was yielding very long routes that were difficult to operate reliably. The final network implemented in 2008 retained the through-routing and took other steps to increase speed and reliability, but ACTION holds open the possibility of severing these through-routes in the future if speed and reliability require it. For example, on the current redesign of the Belconnen Interchange, ACTION has sought a physical design that could be operated either with through-routing or without, so that the option is preserved.

On the longer-range planning front, the same flow-through issue has figured in debates about buses vs. light rail, since one of the advantages of buses over light rail is the ability to use the same vehicle on the high-frequency spine and on a feeder segment.

The advantages of flow-through are obvious; some passengers are spared from having to change vehicles, which passengers always resist. Running the Rapid network as independent requires passengers to change at the outer Town Centres, but it has other advantages. It allows vehicle type and branding to be customised for the Rapid, making the Rapid more visible as a distinct product. The last two decades' development of Bus Rapid Transit have shown an almost even split on this question. Projects such as the Adelaide O-Bahn and Brisbane Busway allow buses to flow through from the Rapid facility to local routes. By contrast, the Gold Coast Rapid Transit Project assumed that Rapid service would be kept separate from vehicles, with its own distinct vehicles, even if Bus Rapid Transit is the chosen mode. North America and Latin America both have many examples of entirely separate Bus Rapid Transit products, where passengers must change between Rapid and local service.

To remain relevant on all sides of that debate, the conceptual Frequent Network presented here *assumes but does not require* that buses from Rapid segments could flow through to Local segments, and that buses from Frequent Network routes could flow through to various less-frequent feeder routes, reducing but not eliminating the need for passengers to change. For example, the proposed network includes a Rapid route between the City and Tuggeranong Town Centre and a Frequent Local route from there to Conder and Banks. We observe that it may be logical for the Rapid bus to simply continue as the Local in this case, and vice versa. However, future choices about Rapid technology, branding, and marketing may require that this not be the case, and our network is adaptable to that case without revision.

The rest of this chapter describes the thinking that led to the conceptual Frequent Network, beginning with the broadest citywide issues and then focusing on local networks for each area.

### 3.3.4 Speed Assumptions

For the purposes of strategic modelling, some assumptions were needed about the average speed of the various types of services, including stops and all other sources of delay. The following speeds were assumed, based on the types of roadways where each type of service most typically operates, and the level of priority that should ultimately accompany each type of service.

Table 3.1: Vehicle Speed Assumptions for Different Service Types

| | Average Speed (km/h) | | |
|---|---|---|---|
| | Peak | Base | Evening |
| Rapid | 40 | 40 | 40 |
| Local | 20 | 20 | 24 |
| Express | 35 | | |
| Coverage | 15 | 20 | 24 |

In the case of Rapid and Frequent Local, these speeds form a reasonable target to drive policies that support speed and reliability, as discussed in Chapter 5. The high Rapid speed is based on the assumption that exclusive lanes and other priority features, as required, will be introduced to protect a consistent operating speed. Frequent Local speed is also important, but as these will always be in mixed traffic, a degradation of performance during the peak is still reasonable to assume.

## 3.4 Rapid Network: Connecting Town Centres

### 3.4.1 Overview

Rapid service is the highest level of continuous mobility offered by the network. Rapids run frequently all day, with widely-spaced stops (800-1000m on average) that have the look and feel of stations rather than ordinary bus stops. The term Rapid roughly corresponds to the existing term “Intertown“. However, we recommend using terms that refer to the quality of the service rather than its function in the network, to yield a less technical terminology that describes and promotes the customer experience of the service. Rapids are indeed rapid, both in their speed of operation and the short waiting time required to use them. They are also the simplest part of the network, easy to remember and count on. They are also the most obvious candidates for eventual transition to higher capacity modes, including busways and/or light rail.

The citywide Rapid network, presented on Figure 3.7, is generally designed to connect Town Centres to each other. Town Centres are important for two reasons:

- They are major trip generators, because of the high density of activity mapped in Figure 3.1, 3.2 and 3.3.
- They are major interchange points. Trips from suburbs not on the Frequent Network would have lower-frequency local service to their Town Centre, where they could connect to the

Frequent Network.[9] A Town Centre makes a good interchange point if it is "on the way" for trips between Civic and a large area of the city.

Town Centres attract the highest level of service if they excel in both of these functions. Belconnen and Woden stand out in this regard, because they offer both high density of activity and a convenient interchange point. Belconnen is the interchange point for all of the suburbs north and west of there, while Woden is the interchange point for Weston and many suburbs to the south. For this reason, the highest level of service, Rapid service every 7.5 minutes all day, connects these two centres to the City and to each other.

Half of this service (i.e. every 15 minutes all day) is recommended to continue to Kippax via Southern Cross Drive. This extension is designed to provide a Rapid level of service to the numerous apartment areas that back up against Southern Cross Drive and have access to stops there. Kippax would become a major stop, with some interchange functions between this Rapid and the Local and Coverage services in the same area, notably routes serving Holt, Dunlop, and other suburbs of Belconnen's far west.

Rapid services for the new development area at Molonglo are discussed in greater detail in Section 8.2.

### 3.4.2 Belconnen-City Busway Assumption

The Belconnen-City segment of this spine has been the subject of a detailed study for a possible busway project. The ACT Government has not scheduled or funded that project, but is proceeding with actions to protect its option to build the project in the future.

From the standpoint of this study, the busway project has two very different benefits:

- It protects the running time of the route from further degradation due to traffic congestion.
- It brings high-frequency Rapid service to several major destinations in Bruce that are on the current Belconnen-City bus route, notably Canberra Institute of Technology, Australian Institute of Sport, and Canberra Stadium. All of these destinations would have a direct no-change service not just to Belconnen and Civic, but also to Woden and Tuggeranong.

The *Belconnen to City Busway Final Report on Route Selection*[10] retains two options for the busway alignment, one via Haydon Drive and a "Northern Alignment" running along the southern edge of Bruce and crossing the hills to connect with Barry Drive at the west end of O'Connor. This route selection should be resolved sooner rather than later, in order to provide sufficient fixity to the Frequent Network.

[9] During peak periods, some of these markets would also have Peak Express service to major employment destinations and interchanges.
[10] Brown Consulting, Purdon Associates, and Parsons Brinckerhoff, November 2005

### 3.4.3 Role of Gungahlin and Tuggeranong

Gungahlin and Tuggeranong Town Centres support a lower order of service than Woden and Belconnen do.

Even in the 2031 projections, Gungahlin lacks the development intensity of the older Town Centres. For Gungahlin, the proposed level of service is every 15 minutes all day on two separate routes, one to Civic and another direct to Belconnen. Gungahlin-Civic service would be Rapid along Northbourne Avenue, making only one stop between Dickson and Civic (at Macarthur Avenue. Two options are shown within central Gungahlin, for reasons discussed in Section 6.1.

Tuggeranong Town Centre's disadvantage is that it is not "on the way" for most trips between the City and Tuggeranong residential suburbs, because it lies on the western edge of its market area rather than between its market area urban core. For Tuggeranong, we therefore recommend redesigning the Rapid link so that it operates via Erindale at all times, as it already does on weekends. Erindale would become this area's primary interchange, though some interchange activity could still occur in Tuggeranong Town Centre. Erindale is much better positioned to be the primary place where Tuggeranong-area feeder routes connect with the Rapid service, because it is "on the way" for the passenger trips in question. An interchange at Erindale also reduces the need for Tuggeranong-area feeder to routes to run direct to Woden, as many do today.

Most of the Tuggeranong market area would be on Coverage routes designed to serve Tuggeranong Town Centre at one end and Erindale at the other. This arrangement seems the best way to reflect the balance between Tuggeranong Town Centre, which is more developed but less central, and Erindale, which is less developed but much more central as an interchange point.

Tuggeranong Town Centre would continue to be an important destination on the Rapid network, as it remains a concentrated activity centre and also includes a number of vital government services.[11]

A new interchange at Erindale is therefore an important short-term priority, and is discussed further in Section 6.1.3.

### 3.4.4 Queanbeyan and Cross-Border Issues

Queanbeyan is assumed to be roughly comparable to Gungahlin in its intensity as a centre, and for this reason we suggest a 15-minute all-day frequency. This study assumes, at this level of design, that jurisdictional barriers to integrated service between the ACT and NSW have been removed, so that:

- Buses to/from Queanbeyan can also serve local trips within the ACT along the same route, eliminating the need for overlapping services by each jurisdiction.

[11] Key social service facilities in Tuggeranong Town Centre include the Tuggeranong Child and Family Centre, Tuggeranong Health Centre, Tuggeranong Library and Tuggeranong Community Centre.

- Fares are constant, and connections free of charge, for travel within the ACT, and ideally also in Queanbeyan.[12]
- A unified information system covers the entire network including NSW areas, presenting them as a single network from the customer's point of view.

In practice, these steps would require a formal agreement between the ACT Government and the NSW Ministry of Transport. They should be pursued because they would provide greater potential markets for both ACT and NSW operators, by allowing the two to support each other as a system.

In recent times, a cross-border taxi region has been introduced between the ACT and Queanbeyan demonstrating both Governments' willingness to embrace such initiatives that clearly serve the public interest on both sides of the border.

Finally, we note that the design of the Queanbeyan-City Rapid is a significant departure from previous thinking, which envisions this corridor running via the Airport.[13] The key reasons for this are as follows:

- As currently configured, most Airport area employment business parks are not located on a direct route between Queanbeyan and the City. Instead, they tend to be on cul-de-sac street patterns, requiring deviations that would be unacceptable for through-travellers. This is a major reason why overall patronage potential from the Airport area is low, as this area is currently conceived.
- The southern alignment provides a direct link from Queanbeyan to Fyshwick, Kingston, and Barton, all of which are more likely to attract all-day demand from Queanbeyan than the airport area. Barton is also an important interchange point for other parts of South Canberra and Woden.
- While the northern alignment may appear more direct within the ACT, the southern alignment is more direct for Queanbeyan. Most of Queanbeyan lies to the west of where the northern alignment would enter the city, and would thus find this routing out-of-direction for travel to the City.

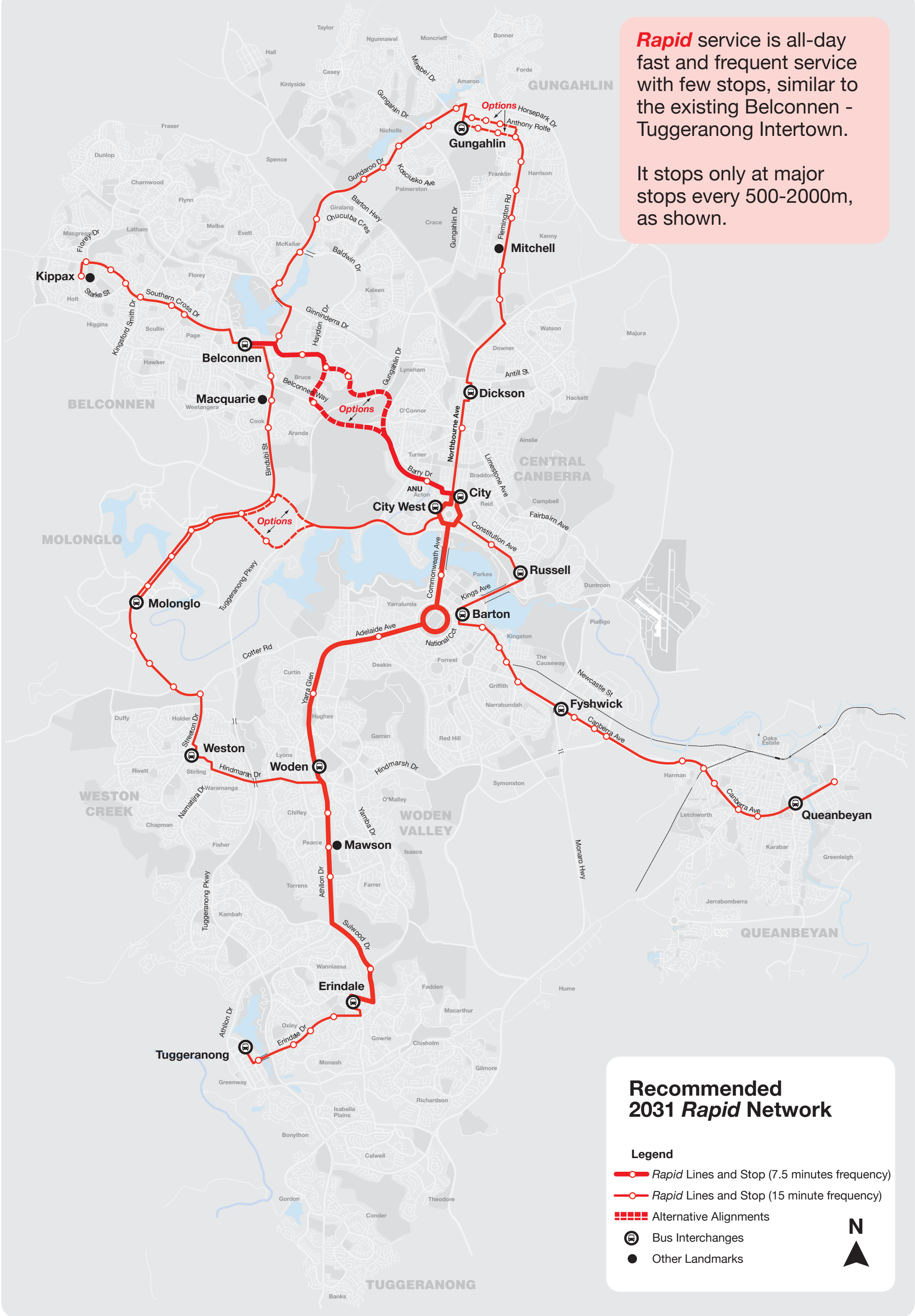
It is tempting to imagine that there will always be good service on both alignments, but to do so is to divide the market and thus weaken the case for Rapid service on any one alignment. We recommend the southern alignment, linking Queanbeyan and the City via Fyshwick, Kingston, Barton, and Russell. Queanbeyan-Airport service is envisioned in the Peak Express category. Demand for air travellers from Queanbeyan is probably best met by a commercial service, potentially demand-responsive on the Queanbeyan end.

[12] This issue, with its revenue implications, is often the hardest to agree on. At a minimum, the ACT Government should require a constant fare and free connections ACT-wide, but if necessary, a surcharge on that fare could be required for travel into NSW. There are also jurisdictional issues such as operator accreditation and regulatory enforcement to consider.

[13] For example the National Capital Authority's Amendment 44 shows a transport corridor with this alignment. See http://www.nationalcapital.gov.au/planning_and_urban_design/national_capital_plan/

***Rapid*** service is all-day fast and frequent service with few stops, similar to the existing Belconnen - Tuggeranong Intertown.

It stops only at major stops every 500-2000m, as shown.




## Recommended 2031 *Rapid* Network

**Legend**

- *Rapid* Lines and Stop (7.5 minutes frequency)
- *Rapid* Lines and Stop (15 minute frequency)
- Alternative Alignments
- Bus Interchanges
- Other Landmarks

N

## 3.5 Frequent Local Network

Frequent Local service is designed for continuous areas of medium to high density, where high demand can be expected all day. Inner parts of Canberra, which have some of the highest densities and most connective pedestrian networks, support an extensive network of these services, but some Frequent Local services have been identified in Belconnen, Tuggeranong, and Gungahlin as well.

The proposed Frequent Local services, combined with the Rapid network, form the "Frequent Network," the set of services that would run every 15 minutes or better all day. Figure 3.8 shows the Frequent Network. The following subsections describe how the Frequent Local services were designed.

### 3.5.1 Northbourne Avenue Service Concept

Between Civic and Dickson, Northbourne Avenue would have very frequent Local service, every 7.5 minutes all day, to allow customers to travel easily between all of the major destinations on this segment. The current spacing of stops on this segment is appropriate for the Local service. Gungahlin-City Rapid buses would pass through every 15 minutes, making more limited stops appropriate to a Rapid service. Between Dickson and Civic Interchanges, the only other Rapid stop would be at Macarthur Avenue / Wakefield Avenue.

The Local and Rapid services on Northbourne Avenue would flow through to Russell, Barton, Manuka and Kingston, providing many opportunities for no-change travel between these major centres of Canberra's inner city.

### 3.5.2 Local Lines in the Inner North

There appear to be six major opportunities for Frequent Local lines in the inner part of Canberra north of the lake, apart from Northbourne Avenue:

- A north-south route generally to the east of Northbourne Avenue between Dickson and Civic, focused on Ainslie Shops and Ainslie Avenue density.
- A north-south route generally to the west of Northbourne Avenue, serving Lyneham, Turner, and O'Conner.
- A local link between Dickson and Hackett, where there is considerable density, via Antill Street. This segment could flow through to one of the north-south routes to provide continuous service between Hackett and Civic.
- A local link between Dickson, Downer, and Watson, where there is considerable density. Again, this bus could flow through to one of the north-south routes to provide continuous service between Watson and Civic.
- A direct bus between Dickson, Bruce, and Belconnen. Much of this connection is non-stop, so the route could conceivably be branded as a Rapid, but for now we show it as a Local because it would make local stops through Bruce. It generally serves more northerly parts

of Bruce than the Option 1C Belconnen-City Busway. If the Belconnen-City Busway went on a Haydon Drive alignment, bypassing Bruce, this local line would take a more southerly path through Bruce to serve CIT, AIS, and the Stadium.

- Finally, a line is clearly needed extending east from Civic to serve Campbell Park offices and the War Memorial. It appears to be most efficient to combine this service with a service to the Brand Depot and Airport, creating a continuous Fairbairn Avenue route. The route would deviate via Campbell Park offices only at days and times that the offices were open.

### 3.5.3 City West Interchange and ANU

We have not specified a particular ANU circulator service, and continue to show a successor to today's Route 3 running through the west side of the campus and serving the Australian Museum. These routings should be reviewed in consultation with the ANU and Museum.

We also assume that several Frequent Local routes[14] would be extended from Civic interchange to a City West interchange to provide better access to ANU and surrounding development. While the current City West interchange is to be closed in 2010, another interchange with the same function will need to be developed. Section 6.1 discusses this situation in more detail.

### 3.5.4 Southeast Local Lines and East Lake

In addition to the Queanbeyan Rapid corridor, the southeast inner-city of Canberra would support several frequent routes, designed mainly for access to the major high-density areas of Barton, Kingston, and Griffith, but also for the unique retail and service centre at Fyshwick.

From City interchange, Local service would extend every 7.5 minutes along Constitution Avenue to Russell, then over the Kings Avenue bridge to Barton and Manuka.

From here, half of the service (every 15 minutes) would proceed via Eyre/Giles Avenues to Kingston, and on into the East Lake area. The primary public transport axis of East Lake should be Newcastle Street. When this street is connected through to Fyshwick, the Local service can then continue into Fyshwick and finally end at a new interchange point with the Queanbeyan Rapid. This route would not provide all the coverage of Fyshwick that exists today, so some circulator service would also be needed outside the Frequent Network. However, Newcastle Street provides a good balance of pedestrian access for customers with directness for the bus. A Frequent service here would be worth walking to for much of Fyshwick north of the rail line.

The other branch of the service from City interchange would continue south from Manuka to serve the Griffith Shops and the dense housing on McIntyre Street in Narrabundah. This route would then continue west across Goyder Street and Hindmarsh Road to Canberra Hospital and the Woden Town Centre. This route is the logical way to serve most trips between the dense Kingston/Manuka area and most destinations in the Woden, Tuggeranong, and Weston Creek

[14] These would be the routes serving (a) Fairbairn Avenue and the Airport, (b) Dickson via Ainslie, and (c) Dickson via Lyneham.

areas, all via connections at Woden Town Centre. This is a very large catchment area, probably sufficient to justify this fast operation across open space.

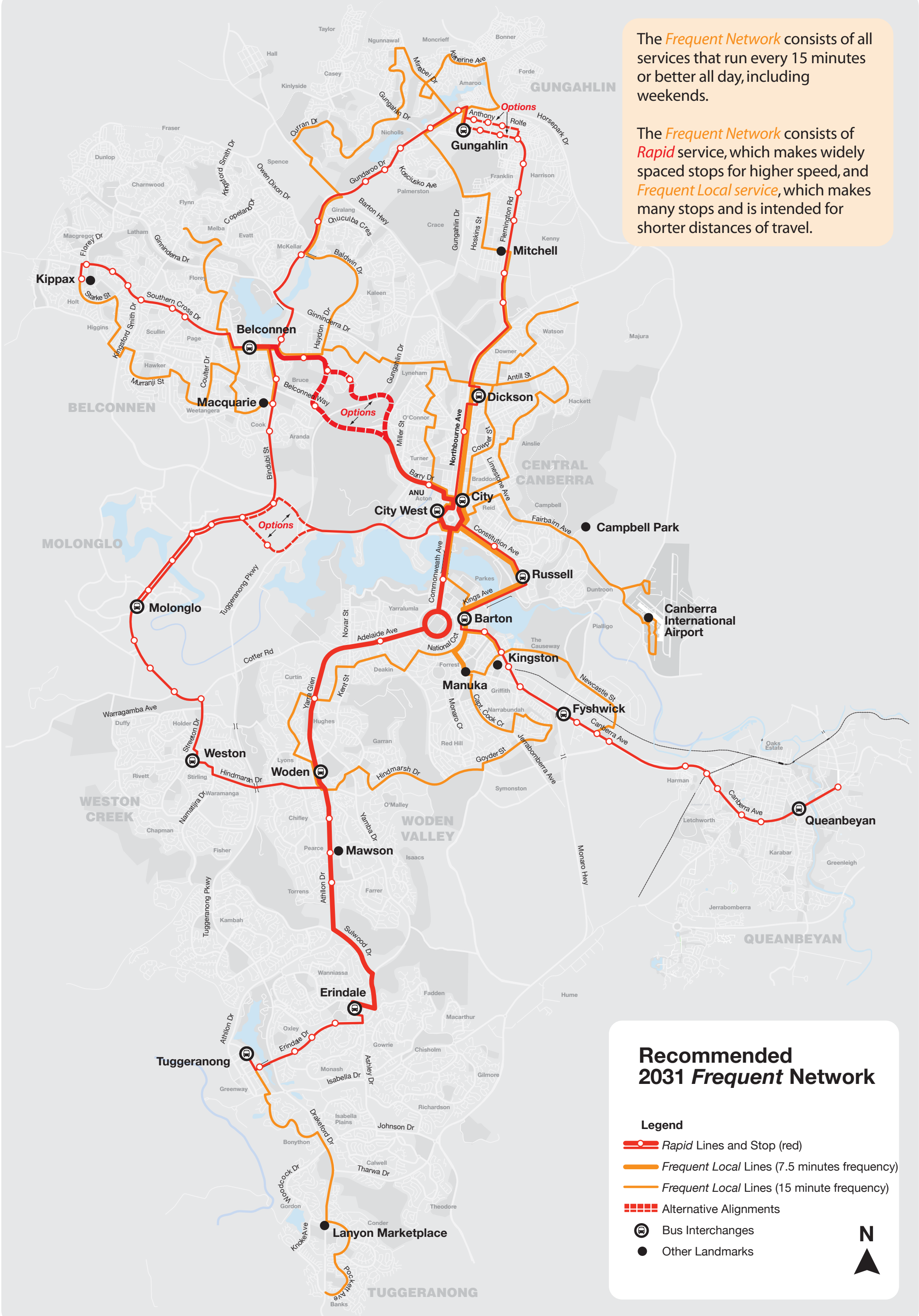
### 3.5.5 Southwest Local Line

A single Frequent Local line is proposed for the inner southwest and the western parts of the Parliamentary Triangle. From Civic the line would cross the Commonwealth Avenue bridge, then use King Edward Terrace, Parkes Place, Walpole Circle and National Circuit to the Barton interchange (discussed further below). It would then continue around National Circuit to Melbourne Avenue in Forrest and proceed via Melbourne Avenue and ACTION's existing Route 2 alignment to serve Deakin Shops, Denison Street (including John James Hospital), Curtin Centre, and then on into Woden for connections to Rapid and Local services.

### 3.5.6 Belconnen and Gungahlin

The initial round of modelling found several high-demand segments in Belconnen and Gungahlin that appeared to justify Frequent Local service, so the following services are recommended:

- An east-west route across the southern part of Belconnen, serving Belconnen Interchange at one end and Kippax at the other, and generally covering Weetangera, Hawker, Higgins, and Holt.
- A short circulator route connecting high-density areas of Macquarie and Cook to Belconnen Interchange.
- A route extending from Belconnen Interchange via John Clelland Crescent and Copland Drive to Evatt, then via Verbrugghen Street to Melba. This route is actually composed of two Coverage routes that both serve this segment, before diverging to serve different parts of Spence, Flynn, Charnwood and Fraser.
- A route from Belconnen Interchange to Gungahlin Interchange, via parts of Lawson, Kaleen, Ngunnawal, and Nicholls.
- Two two-way loop routes serving new northern and eastern areas of Gungahlin.


The *Frequent Network* consists of all services that run every 15 minutes or better all day, including weekends.
The *Frequent Network* consists of *Rapid* service, which makes widely spaced stops for higher speed, and *Frequent Local service*, which makes many stops and is intended for shorter distances of travel.
Recommended 2031 *Frequent* Network
Legend
*Rapid* Lines and Stop (red)
*Frequent Local* Lines (7.5 minutes frequency)
*Frequent Local* Lines (15 minute frequency)
Alternative Alignments
Bus Interchanges
Other Landmarks
N
Kippax
Belconnen
Macquarie
Gungahlin
Mitchell
Dickson
City
City West
ANU
Campbell Park
Russell
Canberra International Airport
Barton
Kingston
Manuka
Fyshwick
Queanbeyan
Molonglo
Weston
Woden
Mawson
Erindale
Tuggeranong
Lanyon Marketplace
Options
BELCONNEN
GUNGAHLIN
CENTRAL CANBERRA
MOLONGLO
WESTON CREEK
WODEN VALLEY
QUEANBEYAN
TUGGERANONG
Taylor
Ngunnawal
Moncrieff
Bonner
Hall
Casey
Kinlyside
Amaroo
Forde
Fraser
Dunlop
Spence
Nicholls
Franklin
Harrison
Charnwood
Palmerston
Flynn
Giralang
Crace
Kenny
Melba
Evatt
Latham
McKellar
Kaleen
Holt
Higgins
Scullin
Page
Hawker
Bruce
Lyneham
Watson
Majura
Downer
Weetangera
Cook
Aranda
O'Connor
Hackett
Ainslie
Turner
Braddon
Reid
Campbell
Parkes
Duntroon
Yarralumla
Pialligo
The Causeway
Deakin
Forrest
Curtin
Griffith
Narrabundah
Hughes
Garran
Red Hill
Symonston
Harman
Oaks Estate
Letchworth
Karabar
Greenleigh
Jerrabomberra
Lyons
Stirling
Rivett
Waramanga
Chifley
Chapman
Fisher
O'Malley
Pearce
Isaacs
Torrens
Farrer
Kambah
Wanniassa
Fadden
Hume
Macarthur
Oxley
Gowrie
Chisholm
Monash
Gilmore
Greenway
Isabella Plains
Richardson
Bonython
Calwell
Gordon
Conder
Theodore
Banks
Curran Dr
Gungahlin Dr
Mirrabei Dr
Katherine Ave
Anthony
Rolfe
Horsepark Dr
Gundaroo Dr
Kosciusko Ave
Barton Hwy
Chuculba Cres
Baldwin Dr
Florey Dr
Macgregor Dr
Ginninderra Dr
Starke St
Southern Cross Dr
Kingsford Smith Dr
Owen Dixon Dr
Copeland Dr
Gungahlin Dr
Hoskins St
Flemington Rd
Haydon Dr
Coulter Dr
Murranji St
Belconnen Way
Miller St
Northbourne Ave
Cowper St
Limestone Ave
Barry Dr
Antill St
Commonwealth Ave
Constitution Ave
Fairbairn Ave
Kings Ave
Novar St
Adelaide Ave
National Cct
Cotter Rd
Yarra Glen
Kent St
Monaro Cr
Capt. Cook Cr
Newcastle St
Canberra Ave
Goyder St
Jerrabomberra Ave
Hindmarsh Dr
Streeton Dr
Warragamba Ave
Duffy
Holder Dr
Namatjira Dr
Yamba Dr
Athllon Dr
Tuggeranong Pkwy
Monaro Hwy
Sulwood Dr
Erindale Dr
Ashley Dr
Isabella Dr
Drakeford Dr
Johnson Dr
Tharwa Dr
Woodcock Dr
Knoke Ave
Pockett Ave
Bindubi St
Tuggeranong Pkwy

### 3.5.7 Tuggeranong

The suburbs of Tuggeranong are mostly not dense enough to support Frequent Local lines, so they would be covered by less frequent Coverage services, connecting to the Rapid network at both Erindale and Tuggeranong interchanges. The one exception appears to be a corridor from Tuggeranong Town Centre through Bonython to Lanyon Market Place in Conder, where there are significant concentrations of apartments on a reasonably linear route.

## 3.6 Peak Express Services

The Frequent Network shown in the previous section is a very specific recommendation, which should be solidified in long-range plans and made resistant to change, so that land use activities can occur in response. By contrast, the remaining two categories, Peak Express and Coverage, are presented as "indicative". In other words, the 2031 network will need to provide services like these in roughly the areas indicated, but the details may be quite different to what is shown here.

The role of Peak Express service is to supplement the all-day network in cases where there is a high demand for a direct link during certain hours of the day. The necessary conditions for a Peak Express service are:

- Home End: Some combination of dense housing, Park-and-Ride capacity, and interchanges served by local buses.
- Work or Activity End: A concentration of jobs or school enrolments in the immediate vicinity of one or two stops, possibly combined with an interchange providing connections to other worksites.
- A market that is not served reasonably directly by the all-day Rapid network.

Peak Express service is usually useful only in one direction at a time. This makes it expensive to operate, as buses must return empty from each Peak Express trip. For this reason, Peak Express service should be provided only in very strong markets that can generate full loads through much of the peak period.

### 3.6.1 Home End – Market and Service Characteristics

Express services generally originate in an area with some dense development supplemented by Park-and-Ride and sometimes connecting local buses. A good rule of thumb is that the home end area must have development at the Group Centre scale or larger, plus Park-and-Ride opportunities where feasible. In the ideal arrangement, the morning bus begins in a moderately dense residential area, runs a short distance to a Group Centre, with emphasis on its apartment areas, then serves a Park-and-Ride before running nonstop to the Work End destination. This sequence means that the Park-and-Ride has the most direct service, which is usually necessary in order to attract the more discretionary Park-and-Ride commuter. A good example is the very successful existing Route 703,[15] which begins in Dunlop, operates locally through Macgregor to

[15] Route 703 achieves 1.78 passengers/km, the fourth highest in the system, and 49.44 passengers per hour, the fifth highest in the system.

Kippax, then serves the Kippax Park-and-Ride and runs directly to Civic, Russell, and Barton. Park-and-Rides are discussed further in Chapter 6.

### 3.6.2 Work End – Market and Service Characteristics

Existing high-patronage Express services all run to Civic and/or the Parliamentary Triangle. Many of the most successful existing commuter-oriented Peak Express services[16] run around the north and east sides of the triangle, serving Civic, Russell, and Barton exchanges. While it is possible that other future employment sites will rise to this level, employment projections suggest that Civic, Barton, and Russell will continue to dominate, especially when we consider that Peak Express service is intended for the regular peak-period commutes characteristic of office workers. Retail and service-oriented employment concentrations, such as Fyshwick, have shifts starting and ending throughout the day and therefore tend to rely more on all-day services than on Peak Express.

Civic will have direct service via the all-day network from all Town Centres and most Group Centres. Thus the most likely market for supplementary Peak Express service will be:

- Town Centres (or major public transport hubs such as Erindale) to Barton and Russell, where this movement is not served by the all-day Rapid network
- Group Centres and Park-and-Rides to Civic, Barton, and Russell, where the all-day Rapid network does not serve the market:

Within these general patterns, it may make sense for certain routes to vary the basic design to take advantage of localised opportunities, such as a medium sized employment centre or Park-and-Ride opportunity that is easily served en route with a slight deviation. However, only the very large and concentrated office employment centres will justify the existence of these routes.

### 3.6.3 Belconnen-Woden and Belconnen-Tuggeranong Links

The first draft of the Strategic Network included two-way Peak Express services running nonstop Belconnen-Woden and Belconnen-Tuggeranong. The purpose of these services was to provide an attractive route for bypassing the City when commuting between Belconnen and southern parts of Canberra. These point-to-point routes would of course require very high levels of transferring, since they would get much of their patronage from connecting routes at each interchange.

The modelling indicated that these routes would perform very poorly. This conclusion echoes the current performance of similar services operated by ACTION today. In brief, direct travel between the Belconnen and Woden interchanges continues to go primarily via the main Belconnen-City-Woden Rapid service, because that service's very high frequency overwhelms the travel time advantage of a direct Belconnen-Woden link. As for the Belconnen-Tuggeranong link, the market appears to be too small to support such a long nonstop service along the Tuggeranong Parkway.

[16] Numbered in the 700-series at ACTION.

The recommended network does include a future Rapid service running Belconnen-Molonglo-Weston-Woden, intended to be the north-south service for Molonglo. However, this rapid is not intended to capture the main Belconnen-Woden market, which would probably continue to be served via the very frequent Rapid running through the City.

### 3.6.4 Airport Area Market

ACTION is currently experimenting with new "Xpresso" services for the business parks and other destinations around Canberra Airport, including Brindabella Business Park, Majura Business Park, Brand Depot, and the RAAF area on the airport's east side.

The Strategic Network does not reflect all of these services, because their patronage potential, both long and short term, is quite poor.[17] The locations of these developments on various fringes of the airport mean that there is no efficient routing that will serve all of them, so the market would be divided among multiple routes for a less efficient network overall. For example, it would be necessary to run one set of routes from each origin area to employment centres on the west side of the airport, and a different set to the south and east sides, because deviating via the west side on the way to the south side would produce an route that is unacceptably indirect for the professional commuter. Future development plans at the airport need to give a higher level of consideration to public transport, to avoid continuing a development pattern that relies exclusively on the private car for its viability.

Given the airport development as it stands, the appropriate level of service appears to be a single Frequent Local between the Airport terminal (including Brindabella Business Park) and the City, generally via Fairbairn Avenue. While this is not ideal, the frequency and all-day pattern of this service offers the best prospects for building basic patronage out of this hard-to-serve area. In addition, Peak Express lines are suggested running to the Airport business parks from Queanbeyan, and a service running Woden – Barton – Airport, both circulating through Brindabella and Majura business parks.

Another option that should be considered is to organise the Airport area services around a single interchange point – logically the Airport terminal – and develop a system of shuttles to that point from the other employment areas. These shuttles could even be partly funded by the employment areas, since the need for them is a result of those areas' pattern of development. Such a system would create a single point with enough patronage potential that it might support better Peak Express services from various origin areas, though the required transfer would still suppress this potential somewhat.

[17] For example, ACTION the current Xpresso operations to the Airport are averaging well below 0.5 boardings per km, except for the direct Airport-City service where the best trips are at 1.0 boardings per km. No single trip of these services carries over 14 passengers, less than half of a seated load, and a majority of trips have fewer than 10 passengers. These are poor performances by almost any standard for expensive peak-only services.

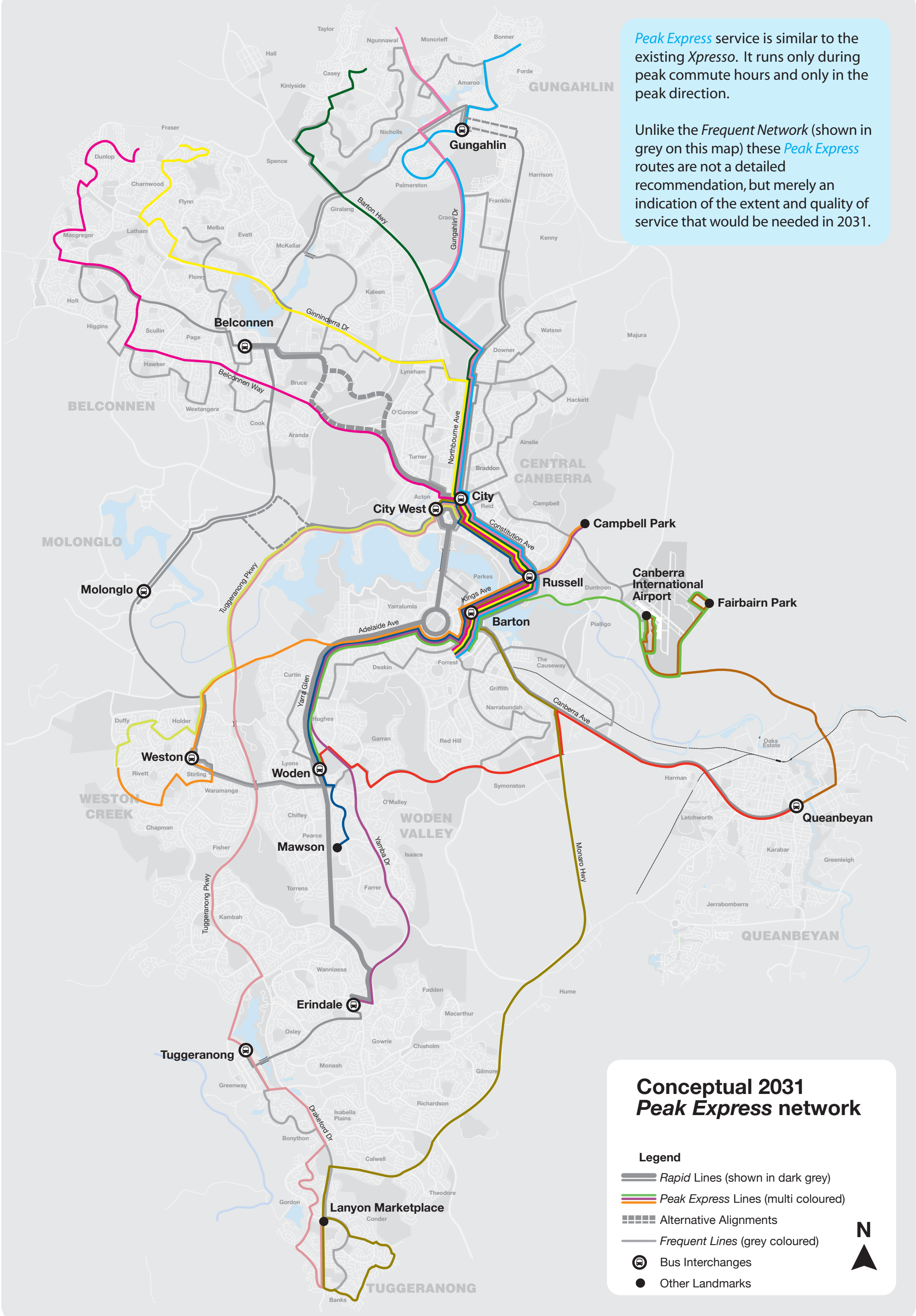
### 3.6.5 Recommended Routes

Based on the above considerations, the following commuter-oriented Peak Express routes are recommended as part of the 2031 Strategic Network. These routes are displayed on Figure 3.9. Again, this is not intended to be the last word on what Peak Express service will look like in the future. Whereas the Frequent Network does need to be fixed well in advance, there is considerable flexibility to adjust the Peak Express network in the course of short-term planning.

These services would run an average of four hours per day, two in the morning and two in the afternoon. (At other times of day, the all-day network would provide a way to make these same trips, but often with more stops and sometimes requiring a connection). The arrows indicate the primary direction of the service during the morning peak; afternoon peak service would run the opposite direction.

- Queanbeyan → Fyshwick Interchange → Canberra Hospital → Woden
- Mawson → Swinger Hill → Woden → Barton → Russell → Civic → City West[18]
- Erindale → Canberra Hospital → Barton → Russell (via Yamba Drive, Adelaide Avenue)
- Gordon → Bonython → Tuggeranong Town Centre → City West → Civic (via Tuggeranong Parkway, like existing Route 787 with Town Centre added)
- Banks → Lanyon Market Place → Calwell → Kingston → Barton → Russell → Civic → City West (via Monaro Hwy, like existing Route 788)
- Rivett → Stirling → Weston → Barton → Russell (via Adelaide Ave)
- Rivett → Duffy → Holder → Civic (via Tuggeranong Parkway, like existing Route 729)
- Dunlop → Macgregor → Kippax → ANU → Civic → Russell → Barton (via Belconnen Way, Barry Drive, similar to existing Route 703)
- Fraser → Charnwood → Dickson → Northbourne & Macarthur → Civic → Russell → Barton (via Ginninderra Drive, Northbourne Avenue, similar to Existing Route 702)
- Casey → Nicholls → Gold Creek → Dickson → Northbourne & Macarthur → Civic → Russell → Barton (via Barton Hwy, Northbourne Avenue)
- Moncrieff → Ngunnawal → Dickson → Northbourne & Macarthur → Civic → Russell → Barton (via Gungahlin Drive, Northbourne Avenue)
- Bonner → Gungahlin Town Centre → Palmerston → Northbourne & Macarthur → Civic → Russell → Barton (via Gungahlin Drive, Northbourne Avenue)
- Woden → Barton → Airport → Airport Area Business Parks
- Queanbeyan → Airport Area Business Parks → Airport

[18] ACTION's current Route 720 serving Mawson and Stringer Hill is the top-performing express route in the existing system, and ranks third among all routes system-wide, at 1.79 passengers/km and 51.51 passengers/hour.


*Peak Express* service is similar to the existing *Xpresso*. It runs only during peak commute hours and only in the peak direction.
Unlike the *Frequent Network* (shown in grey on this map) these *Peak Express* routes are not a detailed recommendation, but merely an indication of the extent and quality of service that would be needed in 2031.
Conceptual 2031
*Peak Express* network
Legend
*Rapid* Lines (shown in dark grey)
*Peak Express* Lines (multi coloured)
Alternative Alignments
*Frequent Lines* (grey coloured)
Bus Interchanges
Other Landmarks
N
Gungahlin
Belconnen
City
City West
Campbell Park
Russell
Canberra International Airport
Fairbairn Park
Barton
Molonglo
Weston
Woden
Mawson
Erindale
Tuggeranong
Lanyon Marketplace
Queanbeyan
GUNGAHLIN
BELCONNEN
CENTRAL CANBERRA
MOLONGLO
WESTON CREEK
WODEN VALLEY
QUEANBEYAN
TUGGERANONG
Barton Hwy
Ginninderra Dr
Belconnen Way
Gungahlin Dr
Northbourne Ave
Constitution Ave
Kings Ave
Adelaide Ave
Tuggeranong Pkwy
Yarra Glen
Canberra Ave
Monaro Hwy
Yamba Dr
Drakeford Dr
Taylor
Ngunnawal
Moncrieff
Bonner
Forde
Hall
Casey
Kinlyside
Amaroo
Fraser
Dunlop
Charnwood
Flynn
Spence
Nicholls
Palmerston
Harrison
Franklin
Giralang
Kenny
Macgregor
Latham
Melba
Evatt
McKellar
Florey
Kaleen
Holt
Higgins
Scullin
Page
Watson
Majura
Hawker
Downer
Lyneham
Bruce
Hackett
Weetangera
O'Connor
Cook
Aranda
Ainslie
Turner
Braddon
Acton
Reid
Campbell
Parkes
Duntroon
Yarralumla
Pialligo
Deakin
Forrest
The Causeway
Curtin
Griffith
Narrabundah
Hughes
Garran
Red Hill
Oaks Estate
Harman
Symonston
Lyons
Stirling
Rivett
Waramanga
Chapman
Chifley
O'Malley
Letchworth
Karabar
Greenleigh
Pearce
Fisher
Isaacs
Jerrabomberra
Torrens
Farrer
Kambah
Wanniassa
Fadden
Hume
Macarthur
Oxley
Gowrie
Chisholm
Monash
Gilmore
Greenway
Richardson
Isabella Plains
Bonython
Calwell
Theodore
Gordon
Conder
Banks
Duffy
Holder

## 3.7 School Services

In the Strategic Network, school services will be served much as they are today. Schools whose transport needs are not met by the rest of the bus system are provided with direct services tailored to their needs, so long as they generate sufficient patronage. These express services cannot be designed far in advance, because they depend on the actual pattern of school enrolments that cannot be anticipated in the long term. As a result, the Strategic Network is silent on the design of school services, though we note their role in the overall cost of the network, as presented below.

Where schools are located in proximity to bus routes it remains an option to increase frequency at school peak time (thus providing more travel options for all travellers, or to provide dedicated school bus services for the purpose of separating school students from other commuters. Both options have benefits and disbenefits.

## 3.8 Coverage Services

The Frequent Network is necessarily focused on the areas of highest density. The remainder of the urban area would have a basic level of service as defined by the Minimum Coverage Standard. This service would cover all areas built to a minimum density that includes almost all developed suburbs.

These services would generally connect each area into the nearest Town Centre, but would be designed to provide access to major Group Centres as well. For example, most of the suburbs in the Tuggeranong district (e.g. Monash, Isabella Plains, Chisholm etc) would have all-day routes with one end at Tuggeranong Town Centre and the other end at Erindale.

Coverage service is not intended to attract high patronage. Instead, the purpose is to provide basic all-day access, primarily for transit-dependent persons. No specific design work was done on these services. The services shown in the final network (see next section) are purely for costing purposes, and to suggest the extent of coverage that would be provided.

The overall quantity of Coverage service is an important policy decision. For purposes of discussion, this plan assumes that Coverage service would run every 30 minutes peak and every 60 minutes midday, evening, and weekend.

## 3.9 Summary of Recommended Network

The recommended final network, reflected all of the improvements discussed in this report, is shown in Figure 3.10. The key features for each service type are as shown in . Note that in this table, the terms Peak, Base, and Eve are as defined by the “Span of Service (hours)” columns. For example, the last row means that Coverage service runs every 30 minutes for 6 hours/weekday (the “peak”), every 60 minutes for 8 hours/weekday (the “base,” which can be both midday and early evening), and every 60 minutes for 4 hours/weekday (the later evening).

Table 3.2: Characteristics of Recommended Network – Speed, Frequency and Span of Service

| Type | Average Speed (km/h) | | | Frequency (mins) | | | Span of Service (hours) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Hours/Weekday | | | Hours/Sat. | | Hours/Sunday | |
| | Peak | Base | Eve | Peak | Base | Eve | Peak | Base | Eve | Base | Eve | Base | Eve |
| Rapid | 40 | 40 | 40 | 3-15 | 15 | 30 | 6 | 6 | 6 | 12 | 6 | 9 | 9 |
| Frequent Local | 20 | 20 | 24 | 15 | 15 | 30 | 6 | 6 | 6 | 12 | 6 | 9 | 9 |
| Peak Express | 35 | | | 30 | | | 4 | | | | | | |
| Coverage | 15 | 20 | 24 | 30 | 60 | 60 | 6 | 8 | 4 | 12 | 6 | 9 | 9 |

Again, only the Frequent Network (the Rapid and Frequent Local layers) are specific recommendations. The other two categories, Peak Express and Coverage, are simply indications of the approximate service area and cost that could be anticipated.

The system represents approximately 88% growth in total revenue hours[19] over 2006 levels. (A revenue hour is one bus operating in service for one hour.) The revenue hour is a reasonable proxy for operating cost, as the dominant factor in operating costs is labour, which obviously varies by the hour. It would be pointless to project an operating cost in dollars so far in the future, as there is no predicting how labour costs will change. However, there is one reason to suspect that the cost of a revenue hour might go down: The Strategic Network increases midday and evening service much more than peak service, and for this reason, a much larger share of it can be run with efficient long shifts than is the case today. Long shifts mean less time spent driving back and forth to the depot – an activity that consumes pay hours but does not produce revenue hours. This feature of the plan also means better utilisation of fleet. The current fleet requirement of 348 would rise to about 400[20] under the plan, an increase of only 14% despite an almost 90% increase in overall quantity of service.

Table 3.3 presents this growth in the context of growth in population, and also in the context of the mode share benefit found. (All these figures exclude Queanbeyan[21] and include school services, projected to grow at 10% over the 2006-31 period).

Table 3.3: Growth in Population, Service Levels and Mode Share

| Year | Population | | Revenue Hours | | Revenue Hours/Capita | | Work Mode Share | |
|---|---|---|---|---|---|---|---|---|
| | Total | Change | Total | Change | Total | Change | Total | Change |
| 2006 | 333,940 | | 648,770 | | 1.94 | | 7.7% | |
| 2031 | 424,015 | 27% | 1,221,191 | 88% | 2.88 | 48% | 11.4% | 48% |

A 48% increase in per-capita quantity of service yields a 48% increase in work mode share. However, work mode share is not the total picture of mode share. It is used here only because it is the only element for which a 2006 estimate is available. Mode share for all trips is likely to be higher due to school trips, which tend to be more PT-dependent.

[19] A revenue hour is one bus operating in service for one hour. It is a reasonable proxy for network operating cost.
[20] This estimate is approximate because school services were not considered in detail in this study.
[21] Since several services cross the border between the ACT and Queanbeyan, simplifying assumptions were needed in accounting for the cost of these services. The Rapid service to Queanbeyan was assigned entirely to the ACT network costs that appear here. (In practice, some form of cost-sharing would be in order for this service.) Intra-Queanbeyan and Queanbeyan-Airport services were excluded. The indicative lines shown in Queanbeyan do not constitute a recommendation and would be entirely outside the ACT Strategic Plan network. They are shown merely to indicate that such services would need to exist.

Table 3.4 shows the breakdown of the network's key cost drivers by Service Type.

Table 3.4: Revenue Hours and Vehicles by Service Type

| | Revenue Hours | | Peak Vehicles | | Share of AM Peak Patronage |
|---|---|---|---|---|---|
| | Hours | Percent | Vehicles | Percent | |
| Rapid | 261,972 | 22% | 91 | 26% | 36% |
| Local | 316,146 | 27% | 97 | 28% | 21% |
| Express | 48,768 | 4% | 48 | 14% | 27% |
| Coverage | 545,937 | 47% | 112 | 32% | 16% |
| Total | 1,172,823 | | 348 | | |

Note that if high mode share for low service growth is the goal, Coverage service could be reduced. Coverage services amount to 47% of the total service in 2031 but only 16% of the patronage. This difficult trade-off is discussed in detail in Chapter 5.

Clearly, large increases in mode share, such as the *Sustainable Transport Plan* envisions, will require a new level of investment in public transport service – enough to expand PT faster than population. A network that grows at or below the rate of population growth cannot be expected to achieve dramatic mode share improvements. We recommend focusing on the revenue hours per capita measure when discussing individual short-term service changes, because it helps to conceptually separate growth into a portion needed to keep up with population and a separate factor needed to increase service intensity in pursuit of greater mode share. When revenue hours per capita fall, the region is moving away from its mode share target. Rising revenue hours per capita represent movement toward the target.

| | Rapid | Frequent Local | Peak Express | Coverage |
|---|---|---|---|---|
| **Frequency (minutes)** | | | | |
| Peak | 4-10 | 15 | 30 | 30 |
| Day | 15 | 15 | ns | 60 |
| Eve | 30 | 30 | ns | 60 |
| **Hours/Weekday** | | | | |
| Peak | 6 | 6 | 4 | 6 |
| Day | 6 | 6 | ns | 8 |
| Eve | 6 | 6 | ns | 4 |
| **Hours/Saturday** | | | | |
| Peak | | | | |
| Day | 12 | 12 | ns | 12 |
| Eve | 6 | 6 | ns | 6 |
| **Hours/Sunday** | | | | |
| Peak | | | | |
| Day | 9 | 9 | ns | 9 |
| Eve | 9 | 9 | ns | 9 |

ns - no services at these times

# 2031 Strategic Network

**Legend**

- *Rapid* Lines and Stop
- *Frequent Local* Lines
- *Peak Express* Lines*
- *Coverage* Lines*
- Alternative Alignments
- Bus Interchanges
- Other Landmarks

N

*NOTE: The *Rapid* and *Frequent Local* services are specific recommendations that should be defined in policy. The *Peak Express* and Coverage layers indicate the generally quantity and extent of these services, but exact routes would be developed in the short-range planning process.

Kippax
Belconnen
Macquarie
Gungahlin
Mitchell
Dickson
City
City West
ANU
Barton
Kingston
Manuka
Fyshwick
Russell
Campbell Park
Canberra International Airport
Fairbairn Park
Queanbeyan
Molonglo
Weston
Woden
Mawson
Erindale
Tuggeranong
Lanyon Marketplace
Options
BELCONNEN
GUNGAHLIN
CENTRAL CANBERRA
MOLONGLO
WESTON CREEK
WODEN VALLEY
QUEANBEYAN
TUGGERANONG

# 4. Modelling and Sensitivity

## 4.1 Background

The Strategic Network Plan and Future Service Plan was prepared and evaluated based on Canberra's future planning horizon of 2031. The long range planning model maintained by TAMS is currently implemented in the EMME platform and has been developed to provide future travel demand forecasts for the 2001, 2021 and 2031 planning horizons. Discussions with ACT planning staff provided an opportunity to update the future planning horizon in concert with the most recently available growth projections for the region.

In this regard, particular attention was placed on recently released revisions to Canberra's growth plan primarily associated with the development of the Molonglo Valley as well as to a lesser extent some additional revisions to the East Lake Area.

The purpose of this Chapter is to provide an overview of the data inputs (future demographics and growth projections) associated with the planning horizon, the outputs obtained (PT patronage estimates), the modelling assumptions (generalised cost parameters) and to highlight key findings obtained as a result of the modelling work carried out to date.

## 4.2 ACT Model and Primary Data Review

The growth plan for 2031 was reviewed and the ACT model was updated to reflect the current long range growth plan and development pattern for 2031. The demographic and land use data used in the model to develop future projections of person trips are population, employment, retail and school enrolment levels and each of these variables are provided for each of the planning horizons modelled at the traffic zone level of aggregation.

The ACT Model currently consists of more than 750 traffic zones and the input data was developed at this disaggregate level. As noted previously, two primary regions, Molonglo Valley and East Lake Area, required detailed attention to update the demographic projections as well as to update the model with respect to the road network and traffic zone system serving the development pattern for the revised growth plan. Figure 4.1 and Figure 4.2 provide an overview of the adjustments initiated to reflect the current future 2031 demographic growth plan for Canberra. These adjustments were based on planning projections provided by planning staff and are detailed in Appendix A.

Figure 4.1: Molonglo Valley Primary 2031 Land Use Adjustments

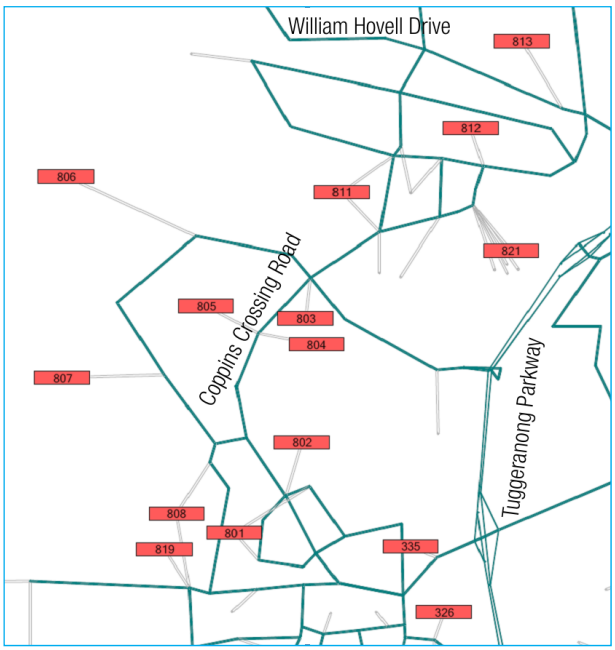
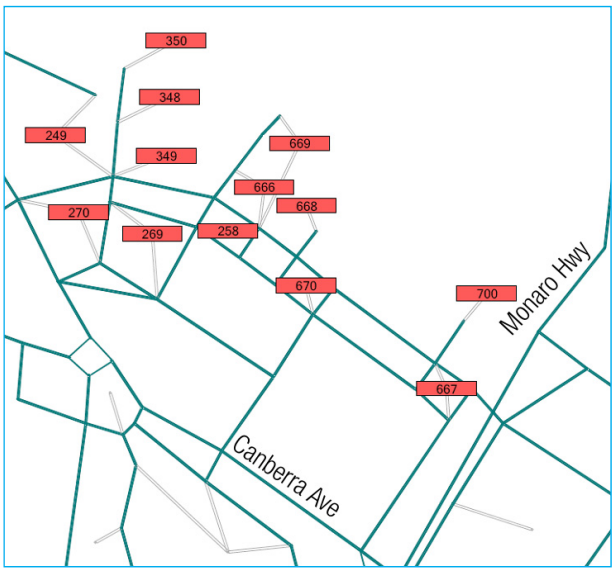


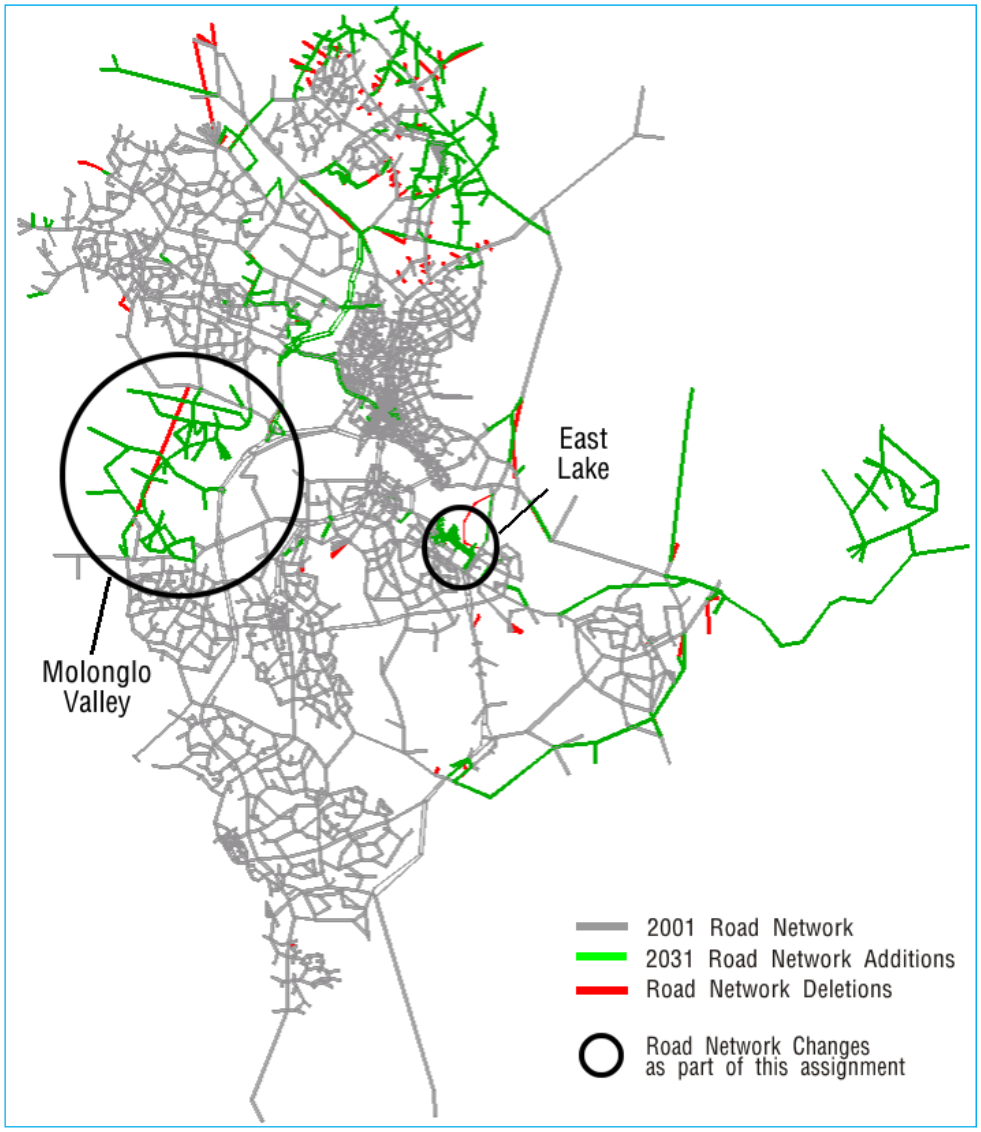

Figure 4.2: East Lake Primary 2031 Land Use Adjustments




As noted, the future development of Molonglo Valley required the addition of traffic zones as well as road network to reflect future plans to serve the projected growth and development pattern. A comparison of the planned major road network against that identified in the ACT model for the 2001 base year is highlighted in Figure 4.3. The majority of the road network supply identified in Figure 4.3 had been added to the modelling framework as part of previous work undertaken by ACT. The two regions where additional road network adjustments were implemented as part of this assignment are highlighted in Figure 4.3. It is noted that in some cases the removal of road network (i.e. Molonglo Valley) actually reflects a realignment and increased detail associated with the proposed road network to serve the proposed development. In this respect while some road links represent more detailed future plans (replacing previous modelled network links) there are a

number of cases where the addition of road network was carried out to provide adequate connections between the new developments and the current modelled road networks.

Figure 4.3: 2031 Road Network Changes




A summary of the projected 2031 planned growth by district is outlined in Table 4.1 and indicates the relative growth over base year (2001) data. Key land use variables applied in the modelling framework related to the growth in AM peak period travel demand are population and employment. As highlighted in Table 4.1, the future 2031 growth plan reflects approximately 33 % growth in population and 59 % growth in employment City-wide when compared against the base year 2001 demographic estimates. Negative growth, noted for a number of districts, often reflects aging of the population and the associated changes in household size as well as changes in demographic patterns as neighbourhoods age. The planning model relies on population growth as the key indicator of person trip growth and actually uses the employment projections as a means to distribute trips rather than in some models also considered in the trip generation stage of the modelling process. In addition to changes in population and

employment levels, demographic projections for both the retail sector as well as school enrolments were also included to provide a basis to forecast specific travel markets and projected person trip travel related to trip purposes associated with each of these sectors during the AM peak period.

Over the planning period to 2031, the major population growth is planned for Gungahlin, North Canberra, Molonglo Valley and East Lake. With respect to increased employment, North Canberra is anticipated to continue to provide for much of the employment opportunities within the region followed by the emergence of Fyshwick as a major employment district. Taken together, inner North Canberra and South Canberra will provide for almost half the jobs in the region, and so will continue to dominate the pattern of commuter flows.

Table 4.1: District 2031 Land Use Projections

| | Population | | | Employment | | | Retail | School Enrolment | Tertiary Enrolment |
|---|---|---|---|---|---|---|---|---|---|
| | 2001 | 2031 | % Change | 2001 | 2031 | % Change | 2031 | 2031 | 2031 |
| Gungahlin | 23,250 | 72,300 | 211% | 5,615 | 12,050 | 115% | 196,305 | 6,425 | 0 |
| Belconnen | 82,765 | 81,275 | -2% | 24,925 | 28,010 | 12% | 269,685 | 11,280 | 12,750 |
| North Canberra | 37,840 | 55,200 | 46% | 52,735 | 111,595 | 112% | 301,740 | 6,725 | 21,900 |
| South Canberra | 20,415 | 25,500 | 25% | 40,040 | 34,310 | -14% | 115,090 | 7,700 | 0 |
| Woden | 54,195 | 49,425 | -9% | 25,205 | 27,660 | 10% | 249,170 | 7,185 | 1,200 |
| Fyshwick | 460 | 940 | 103% | 1,445 | 38,060 | 2538% | 314,250 | 0 | 0 |
| Tuggeranong | 87,720 | 73,400 | -16% | 18,920 | 19,315 | 2% | 190,040 | 12,775 | 0 |
| Queanbeyan | 31,250 | 39,100 | 25% | 9,150 | 9,335 | 2% | 73,200 | 6,300 | 500 |
| Molonglo | 10 | 44,345 | >5000% | 460 | 2,604 | 465% | 35,730 | 4,125 | 550 |
| East Lake | 1,120 | 9,955 | 789% | 1,600 | 3,671 | 129% | 82,000 | 0 | 0 |
| TOTAL | 339,025 | 451,440 | +33% | 180,095 | 286,610 | +22% | 1,827,210 | 62,515 | 36,900 |

Note: All District Land Use Variables Rounded to nearest 5.

The ACT model relies on a number of parameters to reflect travel behaviour as observed in the previous household travel survey. The generalised cost function variables implemented in the ACT model is summarised in Table 4.2.

Table 4.2: ACT Model – Primary Generalised Cost Elements

| Elements | Key Influencing Factors | Base Year Value |
|---|---|---|
| Travel time | Distance, Operating speeds, Lane Capacity (Volume Delay Functions) | Defined for each link |
| | Traffic volumes | Identified through network assignments |
| Operating cost | Fixed vehicle operating cost | $ 0.13 /km |
| | Fuel price ($/L)<br>Fuel cost per km ($/km) | $ 1.03 /L<br>$ 0.09 /km |
| | Value of time | 10$/hr |
| Road user charges | Parking charges | Defined by area and factored with the Parking Charge Factor |
| | Public Transport Fares | Based on base year Fares |
| | Tolls, etc. | Not implemented in current modelling framework |

The generalised cost equation for public transport in addition to the cost of the fare also includes the following variables and weights outlined in Table 4.3.

Table 4.3: ACT Model – PT Generalised Cost Elements

| Variable | Weight |
|---|---|
| Walk time | 1.15 |
| Wait time | 1.2 |
| Boarding time | 1.1 |
| Travel time | 1 |

The transfer penalty at major interchanges is equal to 5 min. Transfer penalties at other stops is calculated based on the average headway at the stop. In addition to the transfer penalty, a boarding penalty is also applied (approximately two seconds per passenger).

The weights and penalties are typically calibrated based on observed travel behaviour and consequently reflect PT users perception of various delays associated with public transport use. These values are typically held constant across the planning horizon; however, fares may be adjusted to reflect typical costs associated with PT travel.

## 4.3 Future 2031 PT Network Plan

The PT Network Plan described in Chapter 3, and illustrated in Figure 3-10, was created within the ACT EMME model. The purpose of the base PT network plan was to provide a basis for identifying potential PT patronage levels based on a comprehensive plan for public transport to serve the planned development pattern as articulated with the 2031 growth scenario. It is noted

that the future PT network plan is focussed on the AM peak period as that is the time period currently modelled by the ACT EMME model.

## 4.4 Future PT Patronage Levels and Scenarios

The ACT EMME model was applied based on the assumptions identified in the previous sections. In addition, as a means to identify the sensitivity of the existing model to changes in key factors impacting on individuals travel behaviour, a number of model runs were undertaken based on the future 2031 planning horizon. The 2031 planning horizon was modelled with particular focus on each of the following factors:

- Value-of-time
- Fuel price
- Parking charges
- Public transport fare

It is noted that changes to key inputs within the modelling framework while intended to influence the attractiveness of public transport can also impact other aspects of the modelling framework. For example, significant increases in overall travel costs can impact on the distribution of trips among various travel districts, as travel costs increase an unintended impact may be higher levels of district internalization (i.e. more trips remain within the district as live/work relationships increase dramatically to avoid higher travel costs between districts). Sensitivity testing of the model's capability to simulate changes in mode splits was carried out based on the five (A through E) scenarios identified in Table 4.4.

Table 4.4: Cost Function Scenarios

| | Value of Time | Fuel Costs | Parking Factor | Public transport Fare |
|---|---|---|---|---|
| A. Base Scenario | $ 10/hr | $1 /L | 1 | Existing Fare Structure |
| B. Reference Scenario | $ 10/hr | $2.5 /L | 2 | Existing Fare Structure |
| C. High Parking Cost Scenario | $ 10/hr | $2.5 /L | 4 | Existing Fare Structure |
| D. High Fuel Cost Scenario | $ 10/hr | $5 /L | 2 | Existing Fare Structure |
| E. Free PT Fare Scenario | $ 10/hr | $2.5 /L | 2 | Free Fare Structure |

It was noted that the base model identified an existing value of time (VOT) of approximately $10/hr and that increases in the VOT had a relative impact on both PT and Car travel proportionally. As noted previously with respect to significant increases in travel costs, the VOT corrected for annual inflation over the planning period negatively impacted on trip distribution.

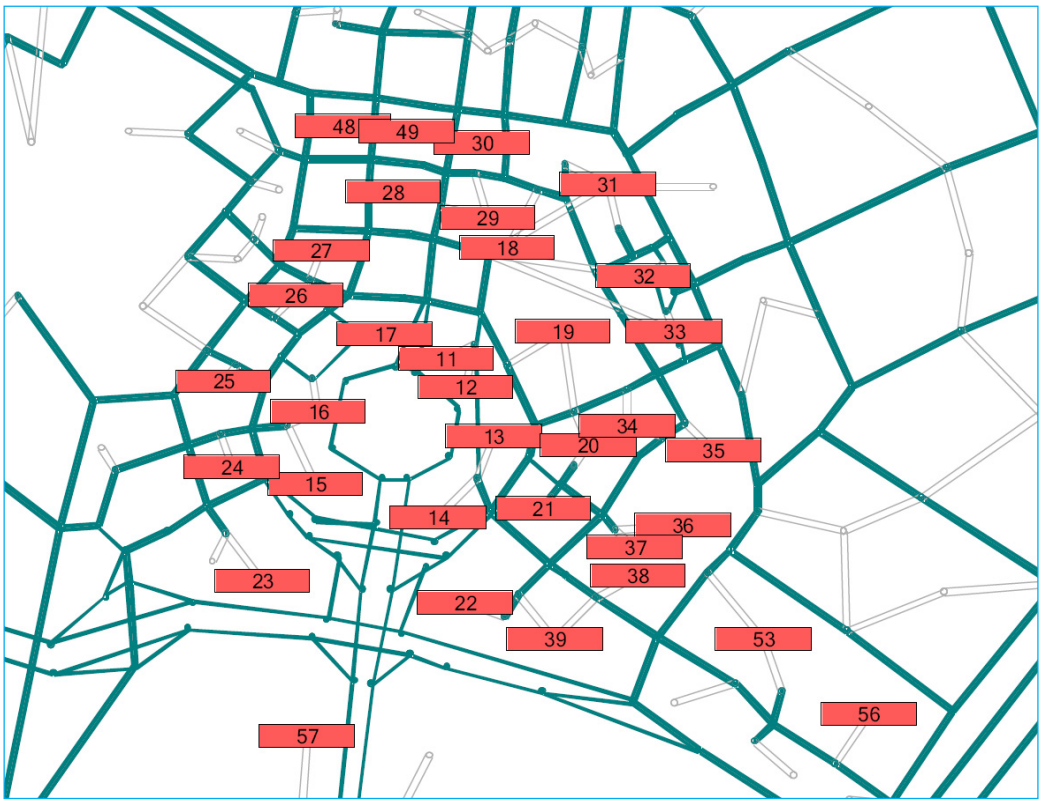
A review of the trip distribution at the district level indicated that unrealistic levels of trip internalization were modelled when compared with base year observed trip distributions for any scenario where VOT had been increased in response to annual inflation rates. Consequently, all

scenarios retained a $10/hr value of time to ensure only reasonable changes to overall trip distribution patterns and district internalisation occur over the planning period.

In general, each of the scenarios are summarised in Table 4.5 and can be described briefly as:

- *Scenario A - Base Scenario* represents a "do nothing and current-conditions scenario" with respect to the existing travel costs and their impact on travel behaviour. This scenario reflects current relative costs among the various cost parameters modelled in the generalised cost function. The overall number of trips attracted to PT is 28,750 and reflect a PT mode split of approximately 9.9% overall and 11.4% when only work trips are considered.
- *Scenario B - Reference* represents the most likely (reasonable) increases in various cost parameters based on an assessment for the past observed changes to each of the cost factors. In this scenario, road user costs are anticipated to double over existing levels while public transport fares do not increase, so that the cost trade-off for most users shifts in favour of public transport. The overall number of trips attracted to PT is 36,150 and reflect a PT mode split of approximately 12.5% overall and 16.7% when only work trips are considered.
- *Scenario C - High (CBD) Parking Costs* represents reasonable increases in various road user cost parameters with an additional doubling of the parking costs over the reference scenario. (The Reference scenario also doubled existing parking charges, so this scenario reflects a factor of 4 over existing parking charges.) It is crucial to note that the ACT model has the capability to model parking charges only for a relatively small geographically centralised area within North Canberra, including the CBD and City West, as shown in Figure 4-4.. Nevertheless, despite the rather localised geographic impact of the parking charges it is worthy to note that more than 1 in 3 of future jobs over the planning period will be located in North Canberra and consequently the impact of increased parking costs certainly impacts PT patronage levels, particularly for the radial travel demand pattern generally associated with strong centralised employment growth. The overall number of trips attracted to PT is 40,400 and reflect a PT mode split of approximately 14% overall and 20.2% when only work trips are considered. Greater results would clearly be achieved if parking charges could be modelled in other constrained areas, such as the Town Centres, major Group Centres, and the Airport.

Figure 4.4: ACTPLA Planning Model- Traffic Zones in North Canberra with Parking Charges Implemented




- *Scenario D- High Fuel Costs* represents significant increase above what may be considered reasonable for fuel costs. This scenario evaluated the impact of fuel costs reaching approximately $5 per litre which represents a significant increase over current fuel costs estimated at approximately $1.03 per litre. The overall number of trips attracted to PT is 47,950 and reflect a PT mode split of approximately 16.6% overall and 25.1% when only work trips are considered.
- *Scenario E- Free PT Fares* represents (reasonable) increases in various cost parameters affecting road users with an elimination of PT fares in the urbanised area. This is the most optimistic public transport scenario among each of the alternatives evaluated. The overall number of trips attracted to PT is 49,850 and reflect a PT mode split of approximately 17.2% overall and 25.5% when only work trips are considered.

Table 4.5: Comparison of Alternative Road User Costs and PT Patronage Levels

| Scenario | Fuel Costs ($/L) | Parking Factor[1] | Public Transport Fare[2] | Forecast PT Patronage (Linked Trips) | Public Transport Mode Split | | |
|---|---|---|---|---|---|---|---|
| | | | | | All Purposes | Work Trips Only | Work and School Trips |
| A. Base | 1 | 1 | Existing | 28,750 | 9.9% | 11.4% | 14.7% |
| B. Reference | 2.5 | 2 | Existing | 36,150 | 12.5% | 16.7% | 19.1% |
| C. High Parking Cost | 2.5 | 4 | Existing | 40,400 | 14.0.% | 20.2% | 21.4% |
| D. High Fuel Cost | 5 | 2 | Existing | 47,950 | 16.6% | 25.1% | 25.9% |
| E. Free PT Fare | 2.5 | 2 | Free | 49,850 | 17.2% | 25.5% | 26.9% |

1. Existing average parking costs of $1.4
2. Existing average PT fares of approximately $2.5

It is important to note that none of these modal split figures is exactly comparable to the *Sustainable Transport Plan (STP)* target of 16%, because the latter refers to journey-to-work trips made all day while the ACT model produces answers only for the AM peak. However, the universe of journey-to-work trips is dominated by trips that occur in the peaks, the "Work Trips Only" figure in the above table comes close to being comparable to the STP target.

## 4.5 Observations and Findings

The following key conclusions and observations can be made:

- The demographic projections of population and employment growth to the 2031 planning horizon show that almost all future growth is expected to occur in the northern two-thirds of the city, excluding Woden, Tuggeranong, and most of Weston. This reality must be kept in mind when considering the Strategic Network, which correspondingly makes relatively little investment in new services in Woden, Tuggeranong, and Weston suburbs.
- By 2031 Canberra is likely to meet the *Sustainable Transport Plan* target of 16% mode split for public transport on journeys to work, assuming that (a) the Strategic Network is implemented and (b) parking and fuel costs grow modestly but not dramatically over the next 22 years, as envisioned by the Reference scenario (Scenario B). While the patronage estimates from the model are not exactly comparable to the STP target, they are quite close.
- About half of the projected mode share growth is due to the Strategic Network, as indicated by Scenario A. The other half of the projected mode share growth comes from the estimated growth in parking and fuel costs included in Scenario B. (Scenario B assumes that 2031 fuel prices are 2.5 times what they are now, and that 2031 CBD parking prices are double what they are now.)
- The PT growth for the high parking and high fuel cost scenarios also targets the work trip purpose. It is also noted that aggressive increases in fuel prices resulted in a significant reduction in overall average trip distances, indicating (possibly unrealistic) increases in the

live/work relationships within districts. An aggressive increase in parking cost resulted in more PT users as well as more passengers per private car.

- The ACT model currently assumes parking charges only in the CBD; this capacity should be updated to permit parking charges to be modelled anywhere.
- The evaluation of a reduction of public transport fares to zero (free fare) indicates a corresponding increase in mode shares. The overall PT patronage levels achieved for this alternative are the highest achieved among all alternatives evaluated.
- Overall based on the EMME modelling of the 2031 planning horizon, opportunities exist to define a reasonable set of cost parameters when taken together with the future proposed PT network plan and services design would achieve a PT mode share of 16% for work trips. Since work trips are mostly on the AM peak, achieving an AM PT share of 16% probably implies achieving the *Sustainable Transport Plan (STP)* journey to work PT share of 16% for all-day travel, though the two estimates are not exactly comparable.

# 5. Policy Recommendations

The strategic modelling presented in the preceding chapter shows the broad range of patronage and mode share goals that could be achieved by the proposed expansion of services, and how this performance is affected by key variables such as CBD parking costs, fuel prices, and fares. Earlier chapters have also emphasised the importance of policy tools such as the Frequent Network.

This chapter provides more detail on the key policy decisions that are likely to be needed to grow the network in the right direction. This chapter contains sections on:

- The level of Coverage services – an important policy question that will largely determine the total cost of the Strategic Network.
- The Minimum Coverage Standard, which defines what percentage of population and jobs should be covered by the network.
- Policies that use the Frequent Network to co-ordinate activities of various agencies and actors toward a more sustainable transport network.
- Parking policy and its impact on sustainable transport goals.
- Fare policies and their impact on sustainable transport goals.

## 5.1 Level of Coverage Services ("Coverage Cap")

In assessing the level of investment needed to achieve a mode share target, it is important to think specifically about the level of Coverage services. The Coverage service category is designed to represent services operated for reasons of lifeline access or equity, rather than for the goal of maximum patronage, so this service adds to the level of investment required but not significantly to the mode share achieved.

The breakdown of the network's non-school operating cost by service type is as shown Table 5.1.[23]

Table 5.1: Service Cost vs. Patronage by Service Type

| Service Category | Share of Service Cost | Share of AM Peak Patronage |
|---|---|---|
| Rapid | 22% | 36% |
| Freq. Local | 27% | 21% |
| Peak Express | 4% | 27% |
| Coverage | 47% | 16% |

[23] Strictly speaking, this is a breakdown of revenue hours (one revenue hour equals one bus and driver in service for one hour). Revenue hours are a reasonable proxy for total operating cost at this strategic level of planning.

Note again that Peak Express service has an unfair advantage in this comparison, as it runs only during the peak period, and this is the only period for which the model can currently estimate patronage. Still, the performance of the Coverage services relative to the other all-day services makes the point that Coverage service is not intended for high patronage, or even to make a significant contribution to citywide mode share. In the modelling results, Coverage services accounted for 47% of service but only 16% of patronage.

The ultimate level of growth required depends heavily on how much the ACT Government chooses to invest in Coverage service, which represents investments that would not be made if patronage were the only goal. If all services were judged only on the patronage they achieve, or their contribution to overall mode share, Coverage services would largely be deleted. Thus, *the quantity of Coverage service is a policy decision about how much service to operate despite low patronage,* in pursuit of other goals such as equity or social inclusion.

In the extreme case, if the ACT Government decided that patronage and mode share were the only goals of public transport, the entire Coverage category could probably be cut with only marginal overall impact on patronage. In this extreme case of deleting the 47% of services that are devoted to Coverage in the final plan, *revenue hours per capita would not rise at all while most of the mode share benefit would still be achieved*.

Fundamentally, the quantity of low-patronage service (for which Coverage service is a reasonable proxy at this long-range planning level) will be an expression of how much the ACT Government values non-patronage benefits such as social inclusion, lifeline mobility, or “equity” for lower-density suburbs that lack the demand to support high-patronage services. The ACT Government should facilitate a broader debate on this question, by exploring the consequences of higher or lower levels of investment in Coverage service. This debate should lead to an the ACT Government policy that specifies the amount of service that should be provided for coverage purposes, i.e. service provided to low-density areas despite the predictable and permanent low patronage that follows from these low densities.

The basic decision about how much low-patronage Coverage service to provide is a value judgment about how to balance competing goods. *It has no technical answer*, so it is a decision that only elected representatives can make, and for this reason, this report makes no recommendation about what the decision should be. The judgment involves weighing the competing value of two sets of benefits, as shown in Table 5.2.

Table 5.2: Trade-off between Patronage and Coverage Goals

| | Patronage Goal | Coverage Goal |
|---|---|---|
| Statement of goal: | Deploy services so as to maximise patronage per unit of service provided. | Deploy services so that all developed areas have access to a basic level of service. |
| Effect on service design: | Offer concentrated high-quality services only where demand is high, and little or no service elsewhere. | Spread out service so that there is a little bit everywhere. |
| Service types meeting this goal: | Frequent Network (Rapid and Local)<br>Peak Express | Coverage services |
| Larger goals supported by this goal: | Greenhouse-gas reductions<br>Air quality<br>Congestion reduction and/or reduced roadway needs due to vehicle trip reduction.<br>Liveability of dense development<br>Low per-rider subsidy requirement. | Social inclusion<br>Senior-disabled mobility needs<br>“Equitable” distribution of services |

The environmental benefits of public transport – such as emissions reductions, reduced dependence on fossil fuels, and the liveability of high-density development – are all met by patronage. Full public transport vehicles meet these goals, while empty ones detract from them. Fiscally conservative goals, such as the desire to maximise the ratio of costs paid by fare revenue, also depend on patronage. To the extent that these goals take precedence, Coverage services should be kept to a minimum so as to maximise the resources devoted to the high-patronage services.

By contrast, goals such as social inclusion and ,mobility for senior and disabled persons tend to be met by the provision of Coverage services to all parts of the community despite the low patronage on many of those services. Coverage services tend also to be justified by the *severity of the need* that some people have for these services, rather than the *number of customers* who would benefit. When a low-patronage service is retained because of the comments of a few people who have an intense need for the service, then we are in the presence of the Coverage goal.

We recommend that the ACT Government initiate a study to more precisely quantify this trade-off and develop policies for both the short and long term. These policies would:

- Define a cap the total quantity or percentage of resources to be devoted to the goal of maintaining coverage despite low patronage, hereafter referred to as the Coverage Cap. This would implicitly release the remainder of resources to be devoted to maximum patronage – service that would therefore be allocated to the Rapid, Frequent Local, and Peak Express service types.
- As a consequence of the Coverage Cap, refine the Minimum Coverage Standard, adjusting the overall quantity and/or quality standards for Coverage service. The next section discusses this issue in detail.

A long-term policy is needed so that the cost of Coverage services can be costed into the long-term financial plan for achieving the Strategic Network. A short-term policy is also needed, to guide ACTION in the ongoing development of its services.

In the currently proposed network Coverage amounts to 47% of the total. This is the consequence of a network that meets current Minimum Coverage Standards (see Section 5.2) and that also aims to offer complete evening and weekend service on the Coverage network. The service levels (see section 3.6) on Coverage services are:

- 30-minute frequencies during the weekday peak.
- 60-minute frequencies during the midday.
- 60-minute frequencies during the evening.
- Service span of 18 hours per day (e.g. 5:00 AM – 11:00 PM) seven days a week.

A revised policy could move this 47% figure up or down. A higher figure would mean greater frequencies and longer spans of service on the Coverage network, and possibly also more Coverage routes at the low-density margins of the city. A lower figure would reduce the extent, frequency, and/or span of service of the Coverage routes. For example, the effect might be to eliminate weekend Coverage services, eliminate evening Coverage services, or move Coverage routes further apart for a higher walking distance standard.

Demand-responsive services are sometimes cited as though they solve this policy problem, but they do not. Demand-responsive service is simply another way of providing Coverage service; it can occasionally perform better than a Coverage-oriented fixed route but it never increases patronage to levels achieved by Patronage-oriented services in high-patronage areas. In general, demand-responsive service should be considered if it offers the potential of achieving greater coverage for a given service cost, without detracting from other patronage. These benefits, however, do not change the underlying need to define, as a level of policy, the resources the ACT Government wants to devote to these low-patronage services.

Finally, it is important to note that the trade-off between Patronage goals and Coverage goals is most extreme in low-density areas, especially those with disconnected street patterns, as these areas would not be served at all if Patronage were the only goal. A long-term policy to reduce the pain of this trade-off would need to focus on influencing the location of home, work, and activity centres for people who are likely to become dependent on public transport – especially seniors, persons with disabilities, and persons of low income. To the extent that these land uses locate on the Frequent Network, the problem is solved, as this network will have good service in any case. This is one of several reasons for the second policy thrust: organising land use and other planning around the Frequent Network, as discussed in Section 5.3.

## 5.2 Minimum Coverage Standards

Walter Burley-Griffin once said that "no one should walk more than four blocks to catch a tram." Statements of this form, when codified as policies, are called *Minimum Coverage Standards*. A modern one typically takes the form: "___% of population or jobs shall be within ___m of service", or of service with a specified level of quality.

It is important to note that services designed for high patronage do not need Minimum Coverage Standards as their justification. Minimum Coverage Standards are relevant primarily when we are thinking about Coverage objectives, as opposed to Patronage objectives. These standards describe the extent of service that should be run *despite low patronage.* Services not required by these standards should be provided only if patronage is high.

For this reason, the Minimum Coverage Standard is actually an expression of the Coverage Cap. This section discusses the key parts of a Minimum Coverage Standard, and how to assemble one.

### 5.2.1 Existing Standards

Currently, the Minimum Coverage Standard used by ACTION in bus service planning differs slightly from one in the legislation governing suburb design. Obviously, this difference is a problem in itself, and is an example of the need to improve the co-ordination of land use and transport activities. The rest of this section develops ideas about how to craft such a standard.

The existing policies are as follows.

#### 5.2.1.1 ACTION

ACTION's current Minimum Coverage Standards are expressed in Schedule 2, "Minimum Service Levels" of the ACTION agreement dated 1 June 2006. This document states:

> *Because of spatial and urban design characteristics, it may be that some areas should be excluded from these criteria. These areas will be agreed by negotiation with the Purchaser.*
>
> *As a general guide, primary and feeder service routes* [corresponding to all-day Coverage service or better in this chapter's scheme] *should be designed so that:*
>
> - *95% of residences are within 500 metres (600 metres at nights, weekends, and public holidays)*
> - *85% of major employment centres are within 500 metres*
> - *85% of major retail and major recreational areas are within 500m*
> - *For at least 85% of all passenger journeys, the point-to-point travel distance is no more than 30% longer than the comparable distance by private vehicle.*

#### 5.2.1.2 Future Urban Areas Residential Subdivision Development Code

The legislation governing the development of future subdivisions specifies the following:[25]

> *4.1 Bus Stop Location and Design*
>
> *R43.*
>
> *a) At least 90% of dwellings are within 400 m safe walking distance from an existing or potential bus route, or 200 m safe walking distance from an existing or proposed demand-responsive or community bus service route. In addition, at least 90% of dwellings are within 500 m from the nearest existing and proposed bus stop.*
>
> ***OR***
>
> *b) at least 90% of dwellings are within 750 m of a high frequency trunk service bus stop that has, or is projected to provide, a minimum of eight outbound buses an hour during the morning peak.*
>
> *R45. Bus stops are located within 400 m of sporting, community, retail and educational facilities.*

Clause (b) was added recently and responds to Action 7.4 of the *Sustainable Transport Plan*, which reads "Revise planning guidelines for access to public transport to include frequency and travel time criteria in addition to walk distances to bus stops."

### 5.2.2 Relationship to Service Purpose

There are actually two agendas at work in the existing standards above, corresponding to the two service purposes described in Section 2.1, and they should be separated:

- For the purposes of ***Coverage*** (regardless of patronage), a standard needs to describe what percentage of the population and jobs will have some access to basic public transport. This standard drives decisions about how much service to offer in the most hard-to-serve areas with the lowest patronage potential, and also drives the development of low-density suburb designs to configure development such that this service can be provided efficiently. The Minimum Coverage Standard is appropriate to this kind of service because *the purpose of the service is the coverage itself*, not the patronage it generates.
- For the purposes of ***Patronage,*** service design should not be driven by anything resembling a Minimum Coverage Standard because Coverage is not the purpose of these services. These services include the all-day Rapid and Frequent Local categories, jointly called the Frequent Network, and also the peak-only Peak Express category. These services should be justified by either (a) their current patronage or (b) their potential to achieve high patronage in the future once planned development builds in around them.

In the Strategic Plan, the 2031 Frequent Network covers all parts of the region that appear, in 2031, to have the potential to generate high patronage. For the peak, the network also provides supplementary Peak Express services, again based on where high patronage could be

[25] http://www.legislation.act.gov.au/ni/2008-27/copy/56726/pdf/2008-27.pdf , page 22.

expected. These service categories are designed for maximum patronage and would be assessed, in the long term, based on that outcome, not on the percentage of the residences and jobs that they cover.

In designing the network for the purposes of this Strategic Plan, we looked at the 2031 development pattern with an eye to development types that have a proven ability to generate patronage – notably high density development with well-connected street patterns. The extent of the Frequent Network matches the extent to which that development appears to exist in 2031, while the proposed Peak Express services follow other markets that 2031 development suggests would be high-patronage in that year.

At no time in this process were we implementing any particular standard about what percentage of the population and jobs should be on the network. We want this percentage to be as high as possible, but only up to a point where the network can provide efficient and attractive service. We would not, for example, deviate a high-frequency route into a low-patronage area solely because those residents were just enough to bring our network up to a pre-defined Minimum Coverage Standard, because the result would be a less attractive and thus lower-patronage route, and that would contradict the main objective of these patronage-oriented services.

However, it is still very useful to cite the percentage of population and jobs that are on the Frequent Network, and also on the Peak Express system, for two reasons:

- In short-term service planning, this percentage is a useful statistic in comparing each stage of network development to the next, proposed one. This percentage will continuously improve as more of the projected Strategic Plan comes into existence through successful service successive service changes.
- A description of this percentage for the 2031 network should be a policy target for the land use and development activities of ACTPLA. This Strategic Plan, and policy actions to follow from it, will define a 2031 network based on the current level of detail about where 2031 densities will be. This Strategic Plan's Frequent Network should be analysed to determine the percentage of population and jobs that are within 500m of its stops, and this, in turn, should be a target that guides more detailed development design on that network.

### 5.2.3 Residential Coverage Standard

ACTION's current residential coverage standard is that *95% of residents should be within 500 m* of all-day bus route running no worse than hourly. The standard in the Future Urban Areas Residential Subdivision Development Code says 90% of dwellings should be within 500 metres of a bus stop, or 750m from a stop with high-quality service. This standard, whatever it is, has an enormous impact on the overall quantity of service that must be provided to meet coverage needs.

Constructing a new coverage standard requires answering five questions:

- Do we measure the distance to a stop or a route?
- Do we measure walking distance or air distance?

- What should the maximum distance be?
- What level of service quality (frequency, span of service, speed) is sufficient?
- What percentage of residents should be within the standard?

The following positions are recommended, and are discussed in detail in the subsections following:

- A coverage standard should refer to viable bus stops, not routes.
- A coverage standard should refer to walking distance as it guides the design of new developments, but air distance when guiding the design of services to communities already built.
- For purposes of a coverage standard, 500m is a reasonable walking distance to any Coverage service, or 750m to a Frequent Network service.
- The percentage of residents within this distance should be the result of a decision about what percentage of resources to devote to Coverage-oriented service (see Section 5.1).

#### 5.2.3.1 Distance to Stops or Routes?

Until recently, effective coverage standards usually measured the distances to routes rather than stops. This reflected the limitations of the available analysis tools, especially prior to the advent of Geographic Information Systems (GIS). Today, the ACT Government has a GIS database showing the exact location of every stop, and the GIS capabilities to measure distances from each, so stops should be used. Measuring distances to stops rather than routes is important, because routes should be designed with their specific stop locations in mind, and in the interests of speed, stop spacing should be as wide as possible while meeting the goals of each type of service. In planning new developments, it is especially important that stop locations be selected in advance so that development and pedestrian infrastructure can be oriented with these locations taken into account.

Standards defining distance to a stop are also useful for short-term service planning where stop location as an issue, as they can help decide the question of where a stop should be located, and/or whether a stop should be moved to serve some other purpose.

#### 5.2.3.2 Walking Distance or Air Distance?

The recommendation is that a coverage standard should refer to walking distance as it guides the design of new developments, but air distance when guiding the design of services to communities already built.

This recommendation sounds counter-intuitive, but it reflects several key realities:

Compliance with a standard based on walking distance is nearly impossible to measure when planning bus routes in existing suburbs. Such an analysis would require not just a detailed map of every pedestrian link in the ACT, but also the exact location of every residence and job, The calculation would be sensitive to such small differences in distance that the usual analytical short

cuts – such as assuming that the houses in a zone are distributed equally over the zone's area – would be unacceptable. Air distances imply a less precise calculation where the same assumption is more reasonable.

In addition, measuring coverage in existing suburbs based on walking distance has a perverse consequence: it requires far more resources to be spent in suburbs with poor pedestrian networks than in suburbs with good ones. A labyrinthine suburb where average walking distances were three times the air distance would require twice as many route-km of service as one where the ratio of walk distance to air distance was only 1.5, all to serve the same number of people.

When considering residential coverage in existing suburbs, then, the recommended principle is that *people must take some responsibility for the design of the community where they choose to live.* An air-distance standard captures this fact, while also being much more readily measurable.

There is an unavoidable tension between the general principles articulated above and the need to meet the needs of people with mobility limitations. Where appropriate, exceptions can be made for specific locations where special-needs customers are concentrated, including seniors and disabled persons for whom walking distance is more of a hardship. We also recommend adding an explicit statement that service will be provided to concentrations of seniors and disabled persons, such as residences, medical facilities, and activity centres.

#### 5.2.3.3 What Distance is Acceptable?

There is a widely-held industry rule-of-thumb that an acceptable distance from a residence to public transport service is about 400m. However, this standard dates from a time when distance was usually measured to routes rather than stops. It would be reasonable to raise this to 500m when calculating distance to stops, as the existing standard from the Future Urban Areas Residential Subdivision Development Code (R43) already does, but with an exception described in the next subsection.

#### 5.2.3.4 What Quality of Service is Acceptable?

There is also ample industry experience that people can be asked to walk further to better service. For this reason, we recommend keeping the spirit of Code's clause (b), which suggests that a walking distance of up to 750m is acceptable for a stop with high-quality service. However, the definition of high quality in the Code, "a minimum of eight outbound buses an hour during the morning peak," should be changed to "located on the Frequent Network." There are two reasons for this:

- The Frequent Network is designed to be fixed for the long-term so that land use can plan around it. The Peak Express network – which could satisfy the current standard – is meant to be readily adjustable in light of actual patronage, so it alone should not be the basis for land use intensification. For the standard to be useful to land use planning, it needs to refer to a category of service that is intended to be fixed in the long term.

- As Canberra grows denser, and as professional lives grow more complex, the relative importance of the peak will decline, and all-day service will become more critical. For this reason, a standard referring only to peak service will be less appropriate. It is especially critical that land use planning not be done around peak-only services, not just because they are easily changed (the previous point) but because they are insufficient to support all the needs of daily life, as the Frequent Network aims to do.

Obviously, these changes may have the effect of lowering the percentage of residences within the standard, which leads to the last element of the definition.

#### 5.2.3.5 What Percentage of Residents Should Be Within the Standard?

Typical standards range from 80% to 95% of dwellings within the standard. Here again, the standard should be different when designing new suburbs than when designing service for existing suburbs.

For a new suburb, the percentage should be very high. The assumption here should be that a new network of services would be designed with the suburb – using the thought process illustrated in Chapter 8 for the Molonglo area – so the suburb design should be able to ensure a high level of coverage with the minimum necessary number of route-km of service. A standard of 95% should be used for this purpose.

As it affects existing suburbs, however, this percentage is the crucial question that drives the subsidy requirements of the Strategic Plan network, because it determines what percentage of the system's resources must be devoted to low-patronage Coverage service. As we discuss in Section 5.1, this question should be approached in the other direction: First, what percentage of resources can be devoted to Coverage, and second, what percentage of residents end up within the target distance of service as a result. Such an analysis should also look at night and weekend service levels for Coverage services.

Reaching this decision will require a small decision-paper analysis showing a few sample levels for the percentage of resources devoted to Coverage, and the percentage of residents that end up covered in each case. Table 5.3 presents what this analysis might look like. *This table shows what the study result would look like. The data in the table is fictitious, and is presented only for this purpose.*

Table 5.3: Illustration of Analysis Showing Relationship of Coverage Cap and Minimum Service Standard (Hypothetical Data, Intended Only to Illustrate Analysis)

| If the Coverage Cap (percentage of total resources to be devoted to coverage) is set at … | … this implies that this percentage of residents and jobs are within 500m of a Coverage service stop, or 750m of a Frequent Network stop | … where Coverage service offers, at a minimum, this level of evening service … | … and this level of Saturday service … | … and this level of Sunday service. |
|---|---|---|---|---|
| 40% | 90% | Hourly until midnight | Hourly for 12 hours | Hourly for 9 hours |
| 40% | 95% | Hourly until 9 PM | No service | No service |
| 30% | 95% | Hourly until midnight | Hourly for 12 hours | Hourly for 9 hours |
| 25% | 85% | Hourly until midnight | Hourly for 12 hours | Hourly for 9 hours |
| 20% | 85% | Hourly until 9 PM | No service | No service |

This analysis would form the basis for a Government decision on the Coverage Cap, which would determine the standards for the percentage of residents/jobs served and the evening / weekend characteristics of Coverage services. This analysis should be done for 2031 using the projected land use, and separately for the existing system and land use.

### 5.2.4 Employment and Retail

The thought process presented here would be identical to the one used for residential. The same considerations should apply on the questions of walking versus air distance, and of measuring to stops vs. routes. We do recommend dropping the option of a 750m distance from Frequent Network stops.

### 5.2.5 Travel Distance Standard

We recommend dropping any explicit travel distance standard for several reasons:

- Travel time is ultimately more significant than travel distance, and travel time must be considered as including waiting time, which is a function of frequency, especially outside the peak hour.
- Waiting time is especially onerous. It should be possible to propose trade-offs such as making a service much more frequent at the expense of making it slightly more circuitous. A strict enforcement of a travel distance standard would prevent achievement of some of these trade-offs even if they were beneficial for overall travel time.
- The construction of new roadways such as Gungahlin Drive Extension may cause previously compliant services to become non-compliant because travel distances by private car have become shorter. This sets up a conflict between roadway and PT investments that is probably not helpful.

Note also that the definition of the Frequent Network (Section 5.3) includes an operating speed standard which is relevant to the overall travel time.

### 5.2.6 Summary of Recommendations on Coverage Standards

For the purposes of short-term planning of public transport services, the Minimum Coverage Standard should be as follows, where the blanks indicate number to be determined based on the Government decision on the Coverage Cap:

> *___% of dwellings shall be within 500m air distance of a stop on a Coverage route, or 750m air distance of a stop on the Frequent Network. Minimum service levels for a Coverage route are as derived from the Coverage Cap, but at a minimum include service at least hourly for at least 12 hours per weekday.*

For the purposes of the design of new suburbs, the standard is the same but uses walking distances instead of air distances.

Similar wording should apply to jobs.

> *___% of jobs shall be within 500m air distance of a stop on a Coverage route, or 750m air distance from a stop on the Frequent Network. .*

For all new development, the standard is identical but uses walking distance instead of air distance.

Again, the percentage of population and jobs meeting the standard would be set in response to the Coverage Cap, to form the target for planning services in existing areas. *The Government is encouraged to set higher targets for this percentage as it pertains to new developments, both residential and industrial.*

## 5.3 Frequent Network Policies: Coordinating Actions of Government toward Sustainable Transport

### 5.3.1 Overview

The Frequent Network, consisting of planned Rapid and Frequent Local services, is the network where you can choose to rely on public transport for most of your mobility needs. On this network, service runs frequently enough throughout the day that you never need to use a timetable, or plan your trip around a bus schedule.

Because of this clear quality distinction, the Frequent Network is also a crucial policy tool that can co-ordinate the efforts of several areas of government toward the common goal of sustainable transport, including:

- Land use planning and development design.
- Road planning, design, and signalisation.

- Public transport operations and short-range planning.
- Locational decisions by other government agencies, particularly those dealing with the public and those that serve groups that may be especially dependent on public transport.

Put simply, all of these functions need to be working with the same policy map (a final adopted network map similar to Figure 3.8) showing where the highest-quality services will be in the future, so that:

- Land use planners can orient future PT-oriented density toward the network.
- Development design can orient specific buildings and pedestrian paths toward the network's stop locations.
- ACTION can evaluate short-term planning issues according to how well the lead in the direction of the policy network.
- Government agencies, health services, senior organisations, and other key institutions can be encouraged to locate on the Frequent Network if they want high-quality services - and to not expect such services if they do not.

This level of co-ordination is crucial to achieve the full benefits of the Frequent Network's intense level of service, and to avoid creating new patterns of development, or locational decisions, that make efficient public transport service impossible.

### 5.3.2 Defining, Adopting, and Updating the Network

the ACT Government should refine, consult on, and then adopt as policy:

- A 2031 Frequent Network, representing the intended geography of the network in the long term. (The year of this long-range network should roll forward to remain 20-30 years in the future, matching a year for which population and employment data exist).
- A rolling five-year plan for the Frequent Network, specifying its geographical extent, and the intensity of its services (frequency and span) for implementation over the next few years. This network should form a basis for programming of expenditures on public transport, as well as offering a high degree of confidence to developers that the specified corridors will be served.
- Specific rules on how the Frequent Network can be revised.
- Specific statements on how the Frequent Network should guide the activities of Government.

Obviously, this policy development should involve some stakeholder outreach. Agencies and institutions whose work will be affected by the Frequent Network policy will need opportunity to comment on the network and its supporting policies. Outreach to the general public may also be in order.

For the long term, the 2031 Frequent Network presented in this report is the starting point. It includes a network geography (the extent and alignment of Rapid and Frequent Local lines) as

well as a definition of service quality (frequencies of 15 minutes or better all day, including weekend days, with evening service every 30 minutes or better, and a total span of 18 hours per day, seven days per week)..

The five-year Frequent Network should be based on the existing network plus near-term priorities for improvement, based on patronage and on the patterns of development actually occurring. A starting point for this network exists today. Since June 2008 there has been service every 15 minutes or better all day on weekdays service on the following segments:

- The Intertown or Rapid linking Belconnen, City, Woden, and Tuggeranong
- Northbourne Avenue between Mitchell and the City
- A routing linking the City, Russell, Barton, Kingston, and Manuka.
- A routing linking the City, Parkes, Parliament House, and Deakin.

A five-year plan should build on this starting point, adding corridors and service quality in the direction defined by the long-term network.

### 5.3.3 Revising the Frequent Network

To serve its function, the Frequent Network must offer a high level of confidence that service will actually develop as described, in the timeframe specified. For this reason, the 20-30 year Frequent Network should be expanded and solidified in policy only where that high level of confidence can be achieved. *The Frequent Network should grow over time, but segments should not be removed from it, except in the most exceptional circumstances.*

If there are reasons for uncertainty about a particular alignment within the network (e.g. the two alternatives for the Belconnen Transitway, and the two possible routings for the City-Molonglo Rapid through the Glenloch Interchange area), the policy network should show the precise area of uncertainty, and enumerate the options existing there, so that the network remains as specific as it can be at every point.

### 5.3.4 Frequent Network Policies: Operating Speed and Reliability

As communities grow, general car traffic increases, and this often slows the public transport system down. At the very time that public transport needs to be offering higher quality services to compete with the private car, its service can actually deteriorate due to these traffic impacts. Success in the public transport service can also cause this problem, as more passengers may mean slower boarding times. Governments often attempt to intervene to improve speeds, but these interventions can be controversial, especially when they require taking road space from another mode or function, such as on-street parking or general purpose lanes.

Operating speed is especially crucial because it is a “squared” value, i.e. it produces two independent benefits:

- Faster service competes better with the private car, and hence can attract more passengers.
- Faster service is cheaper to operate, since the number of buses needed to run a route depends on the route's round trip cycle time. Thus, faster service can run more frequently at the same cost, and this in turn attracts more passengers, independently of the first factor.

For these reasons, declines on operating speed can have dramatic negative effects on an operator's bottom line, and on the ability to meet patronage goals at a given level of cost.

To combat this problem, the ACT Government should define, as a matter of policy, the level of operating speed that is acceptable on the Frequent Network. (Speed and reliability are both important, but reliability is much harder to measure objectively, and most interventions that improve speed improve reliability as well; for these reasons, speed is the primary focus here). Operating speed in this sense includes all of the causes of delay when a bus is in service, including passenger stops, signals, and congestion. Current speeds are easy to assess by comparing existing scheduled travel times with the distance covered.

Operating speed is not about "speeding" in the sense of driving fast. Public transport should never have to exceed the speed limit. Instead, these standards are mostly about limiting delay.

For the purposes of the strategic modelling in this report, we used speeds of 40 km/hr for Rapid service and 20 km/hr (peak) for Frequent Local service. These speeds could be refined to differ for different segments according to the design of the street. For example, the City of Seattle in the USA sets its operating speed standards at 30% of the speed limit, so that it varies with the designed speed of the roadway.

The purpose of an operating speed standard is to provide a method for identifying and rectifying deficiencies, so that the Frequent Network is not allowed to slow down. Deficiencies on the Frequent Network, compared to the speed standard, should trigger a study of possible remedies, which could include the following:

- Capital projects – ranging from busways to road widenings to simple queue-jumps – can be assessed and prioritised in terms of whether they are necessary to support the speed standard, and when.
- Signal priority technologies and policies can be assessed and prioritised in terms of the standard, and also in terms of their impact on pedestrians around stops.
- Speed-protection projects that have negative effects on other users – such as on-street parking removals – can be politically easier when framed as acts that protect a citywide Frequent Network, rather than just trying to speed up service at one location.
- Projects that speed up service citywide – such as fare technology changes that speed boarding – can be assessed in terms of whether they help achieve the standard.
- The standard, in turn, can be marketed as a feature of the services in question – especially Rapid services where the highest levels of speed and frequency must be delivered.

- The standard may be an important reason for not adding further stops to a route upon request. This is a common issue on Rapid services, where the wide stop spacing is crucial to achieving the high speed.

Philosophically, speed standards must be described as the Government's commitment to a Frequent Network that is consistently fast and reliable across all of Canberra. Many ideas to improve speed in a deficient segment will have local impacts and incur local opposition. To navigate these issues, it is important to emphasise that the benefit of achieving the standard is a city-wide benefit, because it yields a consistent brand of service that has the same meaning all over the city.

### 5.3.5 Frequent Network Policies: Pedestrian Access

For the functions of road design and signalisation, the Frequent Network signifies the following:

- Roads used by the Frequent Network must be pedestrian-friendly, especially in the vicinity of stops.
- Because most passengers must use stops on both sides of the street to make a return trip, street crossings must be safe wherever Frequent Network services stop.

For these reasons, the Frequent Network definition must be quite specific about the locations of stops, especially on the Rapid network. (See Chapter 6 for more on amenity at major stops). Rapid stops should always be accompanied by a designated road crossing, either signal or zebra, especially since the roads used by Rapids tend to have higher speed limits. (Signalised crossings, of course, must also be assessed for impact on the Rapid's own speed standard; in some cases, Rapids may need appropriate priority at these and signals, especially where no intersecting signal progression is involved). On Frequent Local routes, signals or zebra crossings must also be provided at stops, wherever the safety of the street crossing is in question.

### 5.3.6 Frequent Network Policies: Land Use Planning, Development Design, and Locational Choices

For every resident or institution, the quality of public transport depends overwhelmingly on their location, and especially on:

- Development density.
- Continuity and completeness of the pedestrian network, which determines whether a stop that is physically nearby can actually be walked to.

However, these fundamental features cannot be assessed one development parcel at a time. A viable public transport route is a series of places that:

- Have adequate density and pedestrian network;
- Form a logical routing for which a right-of-way or roadway is available;
- Can be operated at the speed standard; and

- Terminates in major nodes such as Town Centres.

Thus, the overall average density of a development area says nothing about its friendliness to public transport. It is not just the densities but how they are arranged in the larger urban structure that determines if public transport is viable.

The Frequent Network, then, is a crucial tool for achieving an urban structure that supports efficient public transport. It defines the corridors where the Government wants to make high-quality service work, and therefore guides development activities to orient their densest or highest-demand elements so that public transport can serve them efficiently. Obviously, to do this, the Frequent Network needs to be aligned with many other policy considerations that guide land use, but this harmonisation should happen as the Network is being developed.

An example of this process at work can be found in Chapter 8 of this report, on the detailed service plan for the Molonglo development area. In the course of consultations with this study's team and ACTPLA, we began by identifying the optimal alignment for Rapid services through the area, based on ACTPLA's draft land use concept. Then we observed that given this alignment, certain dense centres within the development would have much better public transport access if they were shifted slightly to lie on or near this alignment. ACTPLA reviewed this feedback and we reached a consensus on which centres could be shifted, and how. Based on these decisions, we developed a network that served all the centres, and that was dramatically more efficient – in terms of the quality of mobility it could offer for each dollar of public investment – than it would have been if our plan had simply replied passively to the land use plans as they stood.

The Frequent Network is equally useful at more detailed levels of development design. Patronage depends heavily on the customer's ability to walk easily between the public transport stop and the destination – often including crossing the street at the stop location. Development design largely determines how easy this will be. On the Frequent Network, buildings should be encouraged to orient toward the public transport street to minimise these distances, and should route any necessary walks through attractive environments rather than simply across surface car parks.

Anyone making a locational decision should be encouraged to consider the public transport impacts of their action. One reason developers should want to build on the Frequent Network is that the same network can guide many private parties in deciding where to live or do business, because it will represent a high level of mobility continuing indefinitely into the future. As noted in the previous section, the network is especially crucial to the locational decisions of agencies and entities that deal with people who are potentially dependent on public transport, such as seniors, persons with disabilities, and low-income persons, so as to avoid expanding the need for low-patronage Coverage services. Such agencies should be assured of good service if they locate on the Frequent Network, and should be warned not to expect good public transport if they do not.

Finally, of course, many of the most consequential locational decisions in the ACT are made by Commonwealth Government. The ACT should advocate for legislative action to direct Commonwealth locational decisions toward the Frequent Network, and/or to bear some of the

cost of extending the Frequent Network to new areas where the Commonwealth chooses to locate major employment.

In forming policy around locational decisions, it is important to note that the cost of purchasing land or renting space is often related to the ease of access, which means that sites in remote industrial parks where public transport cannot be of much use – such as Hume – will appear to be cheaper. Policies are needed – for the ACT Government, the Commonwealth and other key players – to weigh this savings against the higher transport costs associated with high dependence on private cars at those sites, and the carbon emissions and other environmental consequences of that choice.

## 5.4 Parking Policies

Parking is a large issue that should not be governed purely by a public transport plan, but it does have an important nexus with patronage. The following observations largely support thinking that is being done concurrently in the *Draft ACT Parking Strategy.*

The modelling presented in Chapter 4 shows that parking prices do have a significant impact on personal transport decisions, as reflected in mode share. A doubling of these prices – *in the CBD area only* – was responsible for increasing citywide mode share by 1.5 percentage points. Given this, it is not unreasonable to suppose that a shift of five percentage points or more would result from a consistent pricing of parking in all areas where land values are high and parking therefore naturally expensive to provide, including not just the CBD but the Parliamentary Triangle, the Town Centres, the major universities, the airport, and some of the busier Group Centres such as Kingston and Dickson.

Adding new parking charges, especially for employees, is extremely controversial, but a simple fairness argument can be made. Parking does have an intrinsic value due to the land area it consumes and/or expensive structures it requires, in addition to operational costs such as security. Providing this valuable service for free is effectively a subsidy to employees or customers who choose to travel by car.

Looked at this way, another obvious solution is the “cash-out,” in which the employer or merchant provides transport of comparable value for the person who chooses to use public transport – most obviously in the form of some sort of fare subsidy. This tool is now fairly common in urban areas of North America. In the longer term, of course, any system for increasing the fairness of parking costs would also have the effect of reducing parking requirements for new development.

## 5.5 Fare Policies

The modelling presented in the previous chapter shows that free fares make a dramatic difference to mode share, as might be expected. (The *ACT Transport Demand Elasticities Study*[26] found that 20-25% of the variation in public transport patronage can be attributed to fares). Shifting from the current fare to a free fare adds almost five percentage points to the all-purpose mode share. However, fares currently bring in about $17 million in annual revenue, which would need to be replaced with other sources.

Arguments for free public transport are easy to make. To the extent that predominantly car-based infrastructure is funded by the general public – or was for many years in the past – free transit can be presented as a compensating subsidy designed to counter the negative effects of that infrastructure, or as an expression of fairness to people who choose to use public transport. Even without these philosophical angles, the simple fact that cutting fares will increase patronage makes fare reduction an obvious lever for influencing behaviour in ways that benefit the environment and economy.

Free-fare systems do exist. They include:

- Island Transit, Island County (Oak Harbor), Washington, USA
- Skagit Transit, Skagit County, Washington, USA
- Chapel Hill and adjacent Carrboro, North Carolina, USA
- City of Commerce, California, USA (a small industrial city in Los Angeles County). Fares are free on the municipal circulator, but not on Los Angeles MTA services that run through the city.
- Hasselt, Belgium

It is crucial to note, though, that these are all small communities and/or rural areas. The largest are Hasselt, Belgium and the Chapel Hill area, both with urban populations of about 70,000. There are several reasons why free fares have developed only in these settings:

- Fare revenue was lower than the cost of fare collection. This was an important consideration in the rural systems. Systems covering large rural area generally have sparse ridership at most times of day, and may also have complex fare systems that are expensive to administer. Large rural areas also present security challenges.
- A large body of fare revenue was coming from a major university whose students dominated the system's ridership. The 2002 shift to free fares in Chapel Hill[27] occurred in the context of a pre-existing university pass that was free to students. The key to the shift to free fares was that the University agreed to continue the level of subsidy to the transit system that had underwritten the mandatory student passes, but simply re-described this as a direct

[26] Booz Allen Hamilton, 2003. See http://www.tams.act.gov.au/move/sustainable_transport_plan_actions/sustainable_transport_plan/sustainability/public_transport .

[27] The Chapel Hill case is discussed at length in TCRP: *Report 94: Fare Policies, Structures, and Technologies,* p. 90ff. Found at http://trb.org/publications/tcrp/tcrp_rpt_94.pdf

operating subsidy to the transit agency in return for intensive service. Both municipal governments also made a direct contribution representing fares previously paid by their residents.

*There are no examples of permanent system-wide free fares in a service area as large as Canberra*. The idea is periodically studied in San Francisco, most recently in 2007 on the direction of Mayor Gavin Newsom.[28] Key conclusions were that:

- Substantial additional service and peak fleet would be needed to handle the surge of ridership, and complaints of overcrowding would rise dramatically.
- Large cities that have tried eliminating off-peak fares in the past have encountered problems with on-board behaviour, sometimes motivating bus drivers to petition for the restoration of fares.

Free fares make the public transport system part of the "commons," public places like streets and parks, open to everyone. There is an obvious risk that social problems already evident in streets and parks will move into the buses and trains, especially in bad weather when buses provide shelter. Given Canberra's demographics, the effects of free fares would probably be less onerous than in a large city like San Francisco, but possibly more severe than in the isolated University-based communities that have tried it successfully.

As ACT further improves its modelling capability, it should be possible to estimate the sensitivity to various intermediate fare levels, including increases or decreases. The ACT Government should use this capability to assess the long-term cost-effectiveness of fare reductions – possibly as a trade-off against service additions of the came cost – in achieving mode share goals.

Fares remain an important policy lever. For example, the parking cash-out idea works well only if there is a fare for the cash-out to reduce. Several agencies, especially in Canada, have extensive "University pass" systems that provide free or highly discounted public transport to university students. These are often partly funded by the universities in question, who benefit from dramatically reduced parking requirements for their students. These programs should be explored for application to Canberra. University students are an especially rich target for mode shift because their patronage tends to be spread out throughout the day – rather than confined to sharp peaks as secondary school ridership is – and this makes it far less expensive to serve. University programs also often become a model to other entities in the community, such as large employers, seeking a similar benefit for their staff.

[28] For a *San Francisco Chronicle* article reviewing the study and its conclusions, see http://www.sfgate.com/cgi-bin/article.cgi?f=/c/a/2007/03/08/BAG4POHIFR1.DTL

# 6. Infrastructure Needs

A substantial growth in service, such as the Strategic Network envisions, will entail further investments in public transport infrastructure. These projects generally have one or more of the following justifications:

- They enable ***connectivity***, making it possible for multiple services to work together to serve various possible trips.
- They protect the ***speed and reliability*** of the Frequent Network, and sometimes also of Peak Express services.
- They provide certain areas with ***improved access*** to the Frequent Network and/or Peak Express services, thus expanding the network's reach and often reducing the need for low-patronage Coverage services.
- They sustain an overall consistent level of ***amenity***, which helps to make the public transport passenger feel both safe and welcome.

While some infrastructure projects clearly begin with one of these purposes, all projects should be assessed for the capability to improve all of these things. For example, a project intended to improve access to the Frequent Network must do this without undermining the speed and reliability of that network; indeed, the need to do both is often the core of the justification for an infrastructure project. Table 6.1 suggests the correspondences between each type of infrastructure (on the left) and the various categories of benefit (across the top). The symbol √√√ means that this benefit is the primary justification of this type of infrastructure, while the symbol √ indicates that this benefit is an important consideration in this type of infrastructure, though not its primary justification.

Table 6.1: Benefits of Various Types of Major Infrastructure

| | Connectivity | Speed, Reliability | Access | Amenity |
|---|---|---|---|---|
| Interchanges | √√√ | √ | √ | √ |
| Major Stops | √ | √ | √ | √√√ |
| Freeway Stops | √ | √√√ | √√√ | √ |
| Park-and-Ride | | √ | √√√ | √ |

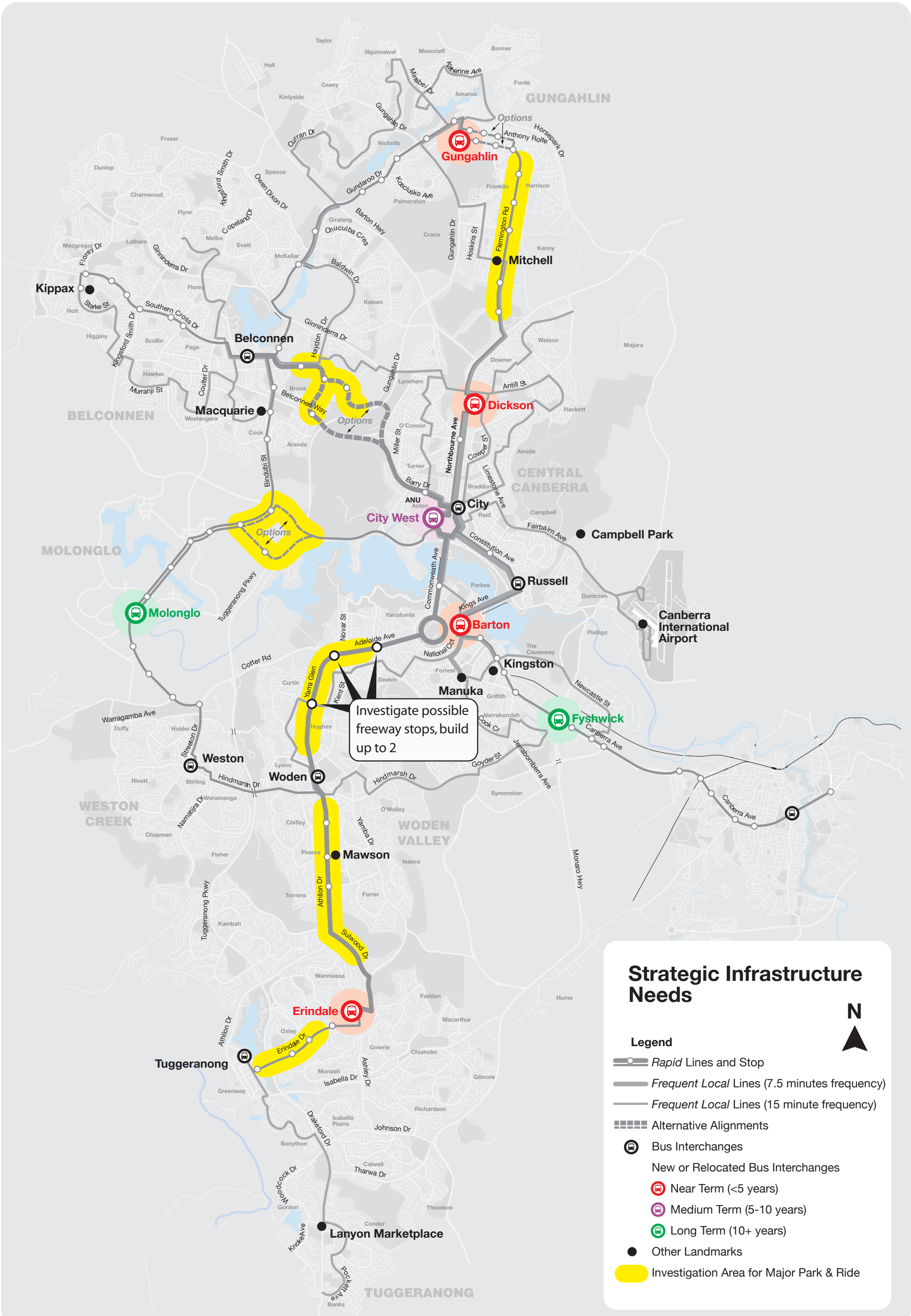
In other words:

- **Interchanges** are primarily sites of connectivity. However, these sites are inevitably points with very high levels of public transport service, since many different services converge there. For this reason, these facilities should be integrated into major development that can also take advantage of this mobility, thereby increasing the range of destinations that have direct access at this point. In these facilities, speed/reliability is a crucial issue, especially for the Rapid services and secondarily for the Frequent Locals. Amenity investments in interchanges are also important because of the high number of customers affected. In

short, the quality of interchanges does much to determine the public perception of the quality of the public transport experience.

- **Major stops** serve primarily as points of access to the system in places of high demand. Amenity is important given the number of customers originating at these points. Speed and reliability are important considerations for the Rapid service involved, and also for any Frequent Locals that may be present.
- **Freeway stops** are a special case where Rapid service is operating on a limited-access roadway (e.g. Adelaide Avenue) but a Major Stop is desirable. These specially designed facilities serve to marry the goal of access with the goal of speed and reliability for the Rapid service, by providing the access without requiring the Rapid to deviate.
- **Park-and-Rides** are a specialised access tool designed to bring customers from a wide low-density area to points where they can use Rapid or Peak Express services. Important considerations include amenity for the customer and the speed/reliability of the services in question.

This chapter outlines the areas of major infrastructure investment that are likely to be crucial to the success of the Strategic Network. Figure 6.1 provides a map of these major infrastructure ideas, and how they relate to the Frequent Network.


Taylor
Ngunnawal
Moncrieff
Bonner
Hall
Casey
Kinlyside
Forde
GUNGAHLIN
Amaroo
Nicholls
Options
Anthony Rolfe
Horsepark Dr
Gungahlin
Fraser
Dunlop
Spence
Franklin
Harrison
Charnwood
Palmerston
Flynn
Giralang
Crace
Kenny
Mitchell
Latham
Melba
Evatt
McKellar
Kaleen
Kippax
Holt
Higgins
Scullin
Page
Belconnen
Watson
Majura
Downer
Hawker
Bruce
Lyneham
Antill St
Dickson
Hackett
BELCONNEN
Weetangera
Macquarie
Cook
Aranda
O'Connor
Ainslie
Turner
CENTRAL CANBERRA
Barry Dr
Braddon
ANU
Acton
City
Reid
Campbell
City West
Campbell Park
MOLONGLO
Parkes
Russell
Duntroon
Molonglo
Yarralumla
Barton
Canberra International Airport
Pialligo
The Causeway
Kingston
Forrest
Manuka
Griffith
Deakin
Curtin
Hughes
Narrabundah
Fyshwick
Investigate possible freeway stops, build up to 2
Warragamba Ave
Duffy
Holder
Weston
Lyons
Woden
Rivett
Stirling
Waramanga
WESTON CREEK
Chapman
Chifley
O'Malley
WODEN VALLEY
Symonston
Fisher
Pearce
Mawson
Isaacs
Torrens
Farrer
Kambah
Wanniassa
Fadden
Hume
Erindale
Macarthur
Oxley
Gowrie
Chisholm
Tuggeranong
Monash
Gilmore
Greenway
Richardson
Isabella Plains
Bonython
Calwell
Gordon
Theodore
Conder
Lanyon Marketplace
Banks
TUGGERANONG
Flemington Rd
Northbourne Ave
Barton Hwy
Gungahlin Dr
Hoskins St
Kosciusko Ave
Gundaroo Dr
Curran Dr
Mirrabei Dr
Katherine Ave
Florey Dr
Ginninderra Dr
Baldwin Dr
Southern Cross Dr
Starke St
Kingsford Smith Dr
Haydon Dr
Coulter Dr
Murranji St
Belconnen Way
Options
Miller St
Cowper St
Limestone Ave
Fairbairn Ave
Constitution Ave
Commonwealth Ave
Kings Ave
Adelaide Ave
National Cct
Novar St
Yarra Glen
Kent St
Cotter Rd
Tuggeranong Pkwy
Streeton Dr
Hindmarsh Dr
Namatjira Dr
Yamba Dr
Athllon Dr
Sulwood Dr
Erindale Dr
Ashley Dr
Isabella Dr
Drakeford Dr
Johnson Dr
Woodcock Dr
Knoke Ave
Pockett Ave
Newcastle St
Canberra Ave
Goyder St
Jerrabomberra Ave
Cook Cr
Monaro Hwy
Bindubi St
Barry Dr
Options
Molonglo
Tuggeranong Pkwy
Athllon Dr
Erindale Dr
Sulwood Dr
Yarra Glen
Flemington Rd
Northbourne Ave
Strategic Infrastructure Needs
N
Legend
Rapid Lines and Stop
Frequent Local Lines (7.5 minutes frequency)
Frequent Local Lines (15 minute frequency)
Alternative Alignments
Bus Interchanges
New or Relocated Bus Interchanges
Near Term (<5 years)
Medium Term (5-10 years)
Long Term (10+ years)
Other Landmarks
Investigation Area for Major Park & Ride

## 6.1 Major Interchanges

### 6.1.1 City and City West

Despite considerable study, no better site has been found for the City Interchange than the existing one at Alinga Street. The existing facility appears to be adequately sized for the Strategic Network, since the primary impact of the network will be higher frequencies rather than more routes. Changes in the style of operation – including off-board ticket sales and the shift of layover to other locations – will be needed in the long run to shorten the dwell time in the terminal and this increase the throughput of buses there. Thus, in 2031, the interchange will have more buses pouring through it all day, and more passengers using those buses, but it will not see an increase in the number of buses terminating and dwelling there. It is the terminating and dwelling buses that would largely drive the need for a much larger facility.

Layover removed from City Interchange would need to be shifted to other nearby sites. A recent study of short-term layover needs in the CBD[29] identified three such sites which may be useful in the medium-term. These sites are:

- University Ave. between Marcus Clarke St. and Childers Street (9 on-street bays)
- Nangari Street (8 on-street bays)
- A site adjacent to the Canberra Olympic Pool and Health Club (5 bays)

However, the use of curb space for storage of terminating buses will always come into conflict with a range of other values, including demands for on-street parking, pedestrian amenity, and overall quality of streetscape. In the Sydney CBD, for example, there is ongoing controversy about the volumes of buses that park on streets around Circular Quay, which conflict with other commercial and streetscape goals for this high-visibility area. This is likely to be a long-term issue for Canberra, especially on the University Avenue site that affects the ANU.

The best long-term solution is to build an adequate and permanent City West / ANU bus terminal, located in the vicinity of the current City West site or possibly somewhat south of there. This terminal would be the end-of-line facility for all buses approaching the city from the east or south and not flowing through to other destinations.

While it would be possible to disperse the terminal function over several locations, this makes the resulting services much less useful for circulation within the CBD. A concentrated facility in the City West area would have buses departing every few minutes all-day, thus creating a “shuttle” effect between City West and City Interchange without requiring new operating costs to run a shuttle service.

In general, benefits to both ANU and the dense City West area should be a key consideration in the siting of a facility. A well-chosen location could give these areas direct service to large areas of Canberra as well as an extremely frequent “shuttle” link to City Interchange.

[29] Canberra City Bus Study: City West and City Interchange Options Analysis. Parsons Brinckerhoff, April 2009.

A major terminal in an inner-city area would probably take the form of a ground-floor or lower-level facility with other development above it. Such a facility can provide an appropriate indoor waiting and departure area for passengers, and a separate layover area with driver break facilities.

The only site that is already protected from other development is on the west side of Marcus Clarke Street between Rudd Street and Barry Drive. This location was reserved as a future Belconnen T-Way station. While this function could be combined with the City West interchange function, this would not provide the adequate frequency into the southern part of the City West area.

City West terminal is the most substantial new station or interchange facility required by this plan. There is an urgent need to identify a permanent site and design that will be adequate for the long-term needs of the CBD.

### 6.1.2 Belconnen

As part of a major redevelopment of the Belconnen Town Centre, the current Belconnen Interchange is being replaced by an on-street facility combined with two terminal points, one to the east and one to the west. The idea of this plan is buses to/from the west would terminate at the eastern terminal, while those to/from the east would terminate at the western terminal. Interchanges would occur mostly at the on-street stops between the terminals, where the two categories of service would overlap. (Services could also flow through the interchange and continue without terminating, as the Rapid services to/from Kippax would do for example). This arrangement appears adequate for the 2031 service level at Belconnen, since as in City Interchange, the primary growth will be in frequencies rather than numbers of terminating routes. This project is already established and funded.

### 6.1.3 Erindale

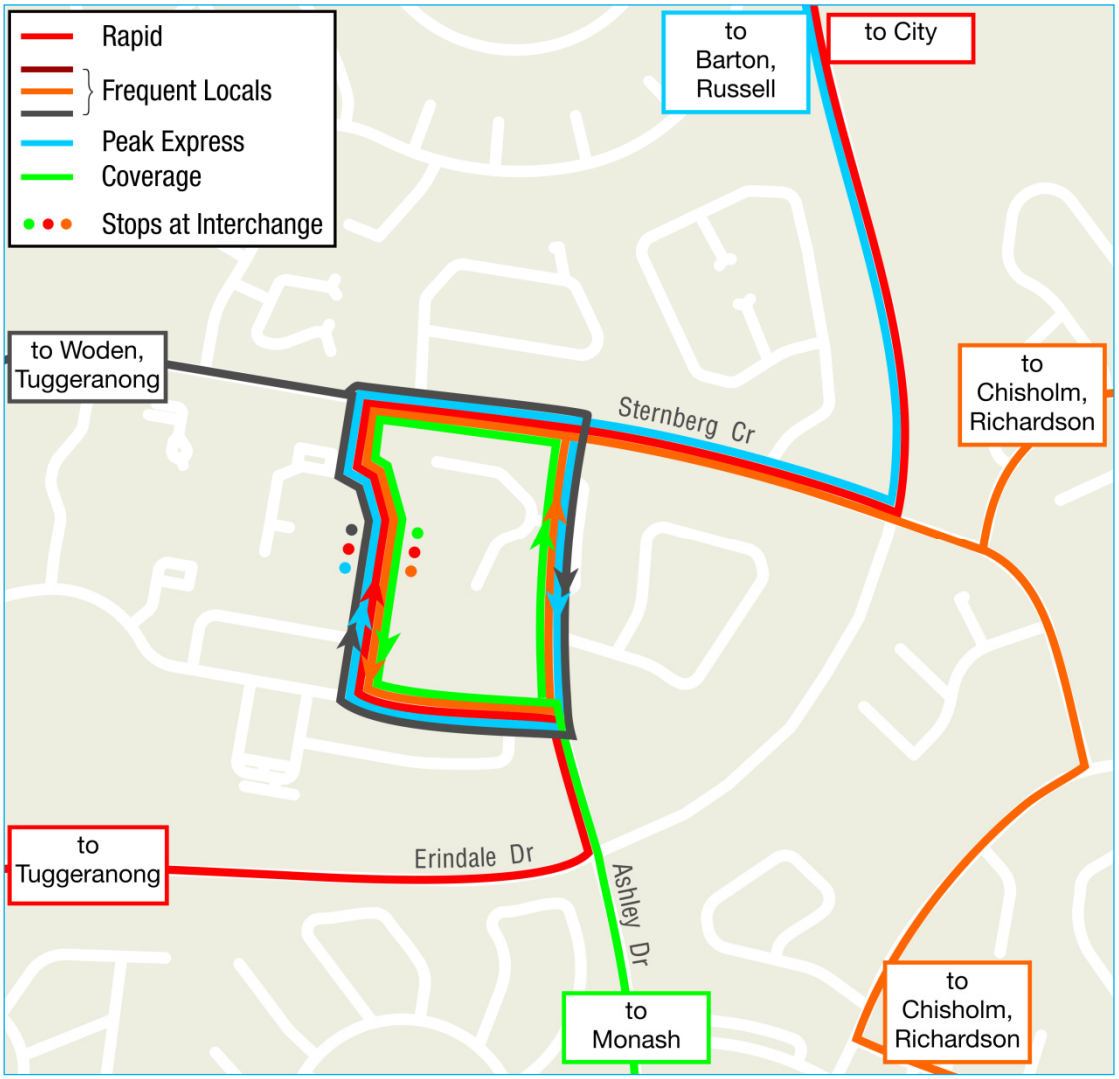
An interchange at Erindale is a key short-term priority. The existing network for eastern Tuggeranong suburbs is not especially effective, in part because Tuggeranong Interchange is too far west to be useful as an interchange point. As a result, some eastern Tuggeranong routes must extend all the way to Woden Interchange to make a reasonable connection.

The Strategic Network therefore proposes that the City-Woden-Tuggeranong Rapid service should operate via Erindale at all times of day, as it already does on weekends. A new Erindale Interchange would then provide a direct connection between these Rapids and the Tuggeranong local network. Tuggeranong's suburbs would mostly be served by U-shaped Coverage routes with one end at Erindale and the other at Tuggeranong Interchange, so that the entire area would still have through service to both destinations.

The relatively simple interchange functions at Erindale could probably be met with a modest upgrade of the existing on-street facility east of the shopping centre, possibly with the addition of some nearby layover zones for the routes terminating there. The existing sawtooth bus bays will

provide adequate space for future use. It is proposed to provide quality shelters, signage, lighting and other associated minor infrastructure. An indicative budget of up to $400k should be allowed. Figure 6.2 shows a possible service configuration should the facility be provided.

Figure 6.2: Erindale Interchange Concept



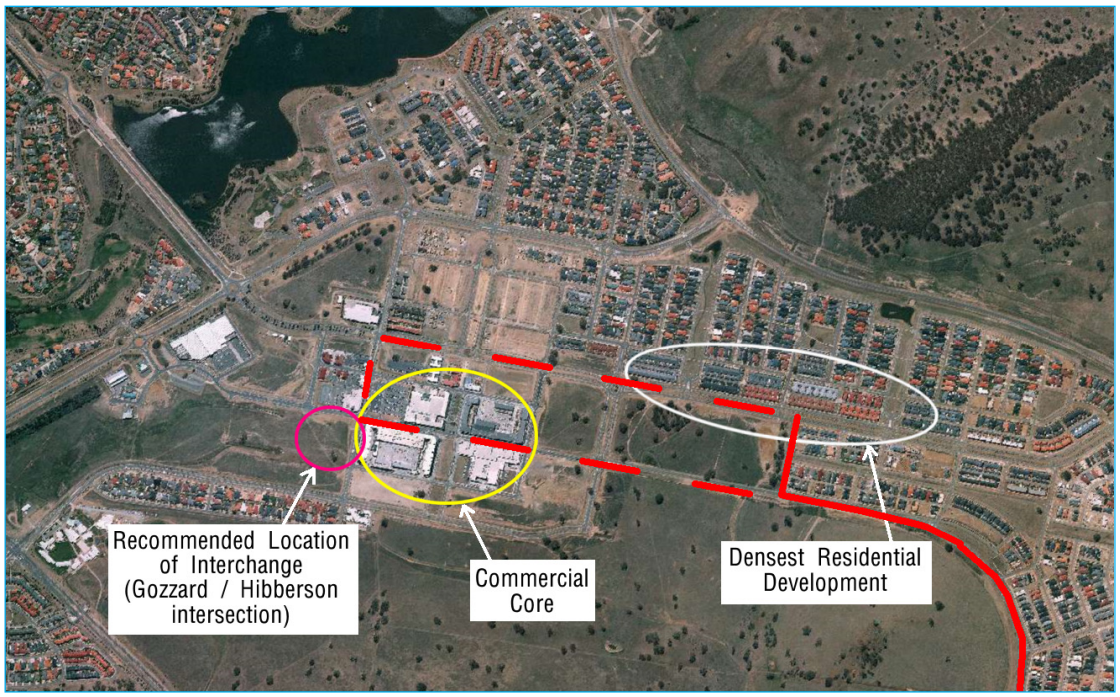

## 6.1.4 Gungahlin

The lack of an interchange in Gungahlin will become increasingly problematic as the area's remaining suburbs develop. Such an interchange needs to be created adjacent to the town centre, so that routes converging there also converge on the town centre for local access to shopping and activities there.

The interchange will need to be selected along with a final route for the Gungahlin - City Rapid through the area. Figure 6.3 illustrates the problem. If the Rapid from the City approaches via Flemington Road and proceeds directly down Hibberson Street, the result is a direct route but one that misses the densest residential areas on Anthony Rolfe Avenue. If the Rapid deviates up

to Anthony Rolfe Avenue, it will miss the commercial centre or serve it only by a circuitous routing. No solution is optimal. The best may be to follow Anthony Rolfe Avenue as far as Gozzard Street, then turn back south to an interchange at the west end of the commercial core, near the intersection of Gozzard and Hibberson Streets. For now, both options are shown. More detailed planning in Gungahlin will be needed to finalise the route and the interchange location.

Figure 6.3: Gungahlin Interchange Location Issue




Gungahlin Interchange can probably be an on-street facility similar to what is now conceived at Belconnen, but on a smaller scale. However, the street needs to be selected, and appropriate terminal locations also identified to meet the needs of the Strategic Network.

A new on-street interchange will most likely require the re-laying of kerb and some pavement modifications. A minimum capacity of six bus bays should be allowed. An indicative budget of up to $1M should be allowed.

## 6.1.5 Woden

The existing Woden Interchange is adequate in size and configuration to meet the needs of the Strategic Network, since the overall number of routes serving Woden is not expected to increase substantially. Whilst the existing interchange will not require significant works, a budget of up to $100k is suggested to allow for improvements to the facility, predominantly to improve the passenger waiting environment.

Redesigns of the facility in the context of redevelopment – similar to the Belconnen scheme – may also be viable as long as they retain the layover capacity and protect the speed/reliability of the Rapid and Frequent Local services.

### 6.1.6 Dickson

The inner city's Frequent Local lines are most effective if they serve strong destinations and make strong connections at both ends. For the suburbs just north of Civic, the best opportunity to do this is clearly at Dickson. Dickson is a logical endpoint for many routes, and thus a logical interchange point, for several reasons:

- It has a large and diverse concentration of employment, shopping and activities, including not just retail but also government offices serving the public.
- It is at the northern end of the area of continuous high density extending north of Civic, so local routes serving that area logically end near here and can easily be designed to converge on this point.
- Rapid service between Civic and Gungahlin can easily stop here, benefiting from the direct connection to many local lines.

The Dickson interchange need should be the subject of more detailed study. Briefly, however, Challis Street appears to offer a near-ideal location for a simple on-street interchange. This street is uniquely suited to functioning as an interchange for several reasons:

- It is close enough to Northbourne Avenue that City-Gungahlin buses could be deviated through Challis Street without an unreasonable delay to through passengers. The bus movements involved in running through Challis Street are workable and reasonably efficient, both geometrically and in terms of signalisation.
- Local lines terminating at this location can make an easy anticlockwise loop using Challis Street in one direction and Northbourne Avenue in the other.
- The street is lined with offices, including government offices that interact with the public, providing a range of all-day demand. The only negative related to this land use is that security will be an issue in the evening and weekends; this is a reason to focus on the northern end of the street, closer to the shops, where there will be more evening and weekend activity. Lighting will be a key issue in the evening.
- The major commercial destinations of Dickson are immediately adjacent, but not fronting directly onto the street. Removing parking for bus zones is often difficult directly in front of retail businesses, but much easier in front of offices.

There are three possible configurations for a Dickson Interchange:

- Concept 1. Buses on both sides of Challis Street, with zebra crossings connecting the two sides. This arrangement would mean that buses in both directions on Northbourne Avenue would deviate through Challis Street.
- Concept 2. Buses northbound on Challis Street, southbound on Northbourne Avenue, with an attractive and well-lit pedestrian connection between the two. These stops would be about 160m apart, which is a tolerable worst-case distance for connections. This configuration would require the creation of a pedestrian link between buildings on one of the government-owned parcels. While this avoids the need to deviate southbound Northbourne Avenue buses, security problems may be greater in this case.
- Concept 3. Northbourne Avenue Rapid and Xpresso services remain on Northbourne through the area. To bring connecting local buses close enough to the Rapid stop, this scenario requires an off-street bus interchange between Northbourne Avenue and Challis Street, and a new signalised pedestrian crossing of Northbourne Avenue. This scenario is the most expensive in capital terms, but also has the least impact on capital costs and running times for any future fixed guideway service – such as busway or light rail – that might be developed in the Northbourne Avenue median, because it does not require the Rapid service to leave the median.

The three figures below illustrate the options, and also show how buses from the various routes could circulate through the area. The suggested designs reflect the need to balance the speed of Northbourne Avenue Rapid services with access to the Dickson commercial area and the need to encourage connections between Rapid and local service.

Based on a preliminary review in the field, the two-way operation on Challis Street appears to create a more attractive and versatile facility in the short term. It requires so little capital investment that it should be considered a viable interim arrangement that could be created quite soon. However, all three options should be considered in a more detailed study to develop a Dickson interchange. The third option, creating a new off-street interchange, should be considered a necessary and intrinsic part of any City-Gungahlin rapid transit proposal that would remain in the Northbourne median through this area, because it is the only way to provide connecting local bus stops reasonably close to that service. *It may therefore be appropriate to acquire an interchange site and protect it from development.*

Dickson is recommended as a near-term priority, because it serves an area where the network is relatively mature and ready to benefit from the new connectivity provided. Gungahlin also benefits from the new connectivity, for access to key destinations in Inner North Canberra including Bruce, so this interchange is, in part, a Gungahlin-related improvement.

Figure 6.4: Dickson Interchange Concept 1: Rapid Services Operating Two-Way on Challis

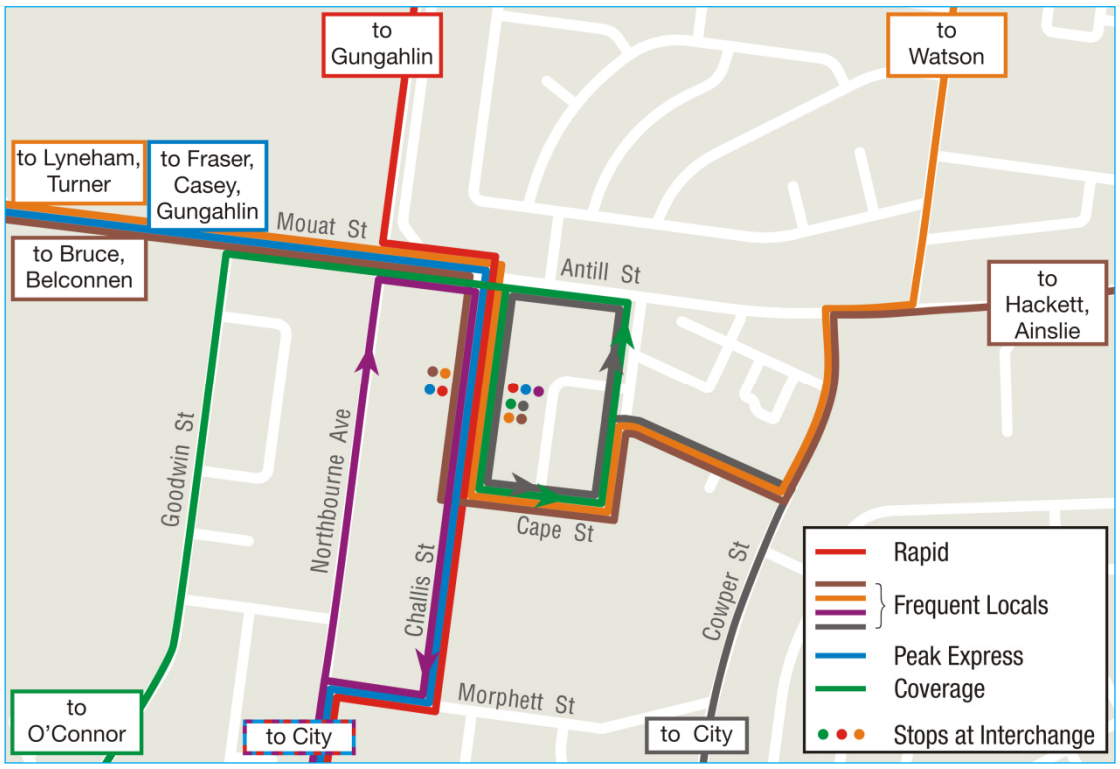



Figure 6.5: Dickson Interchange Concept 2: Southbound Rapid on Northbourne

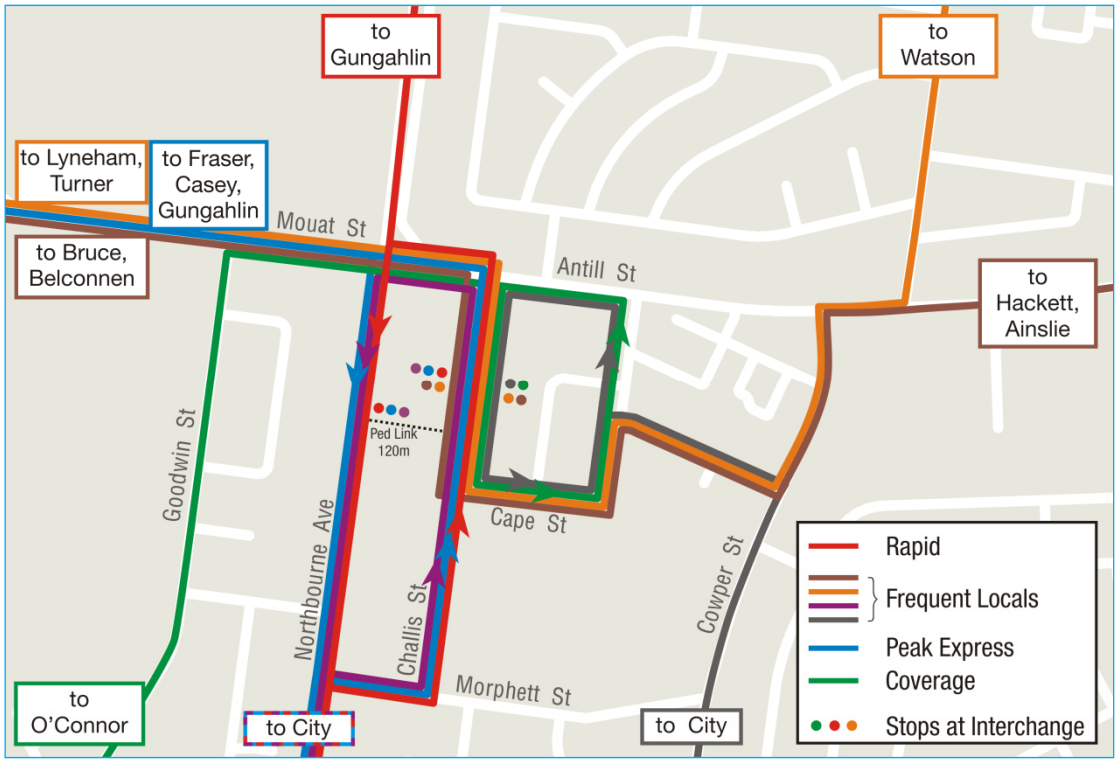
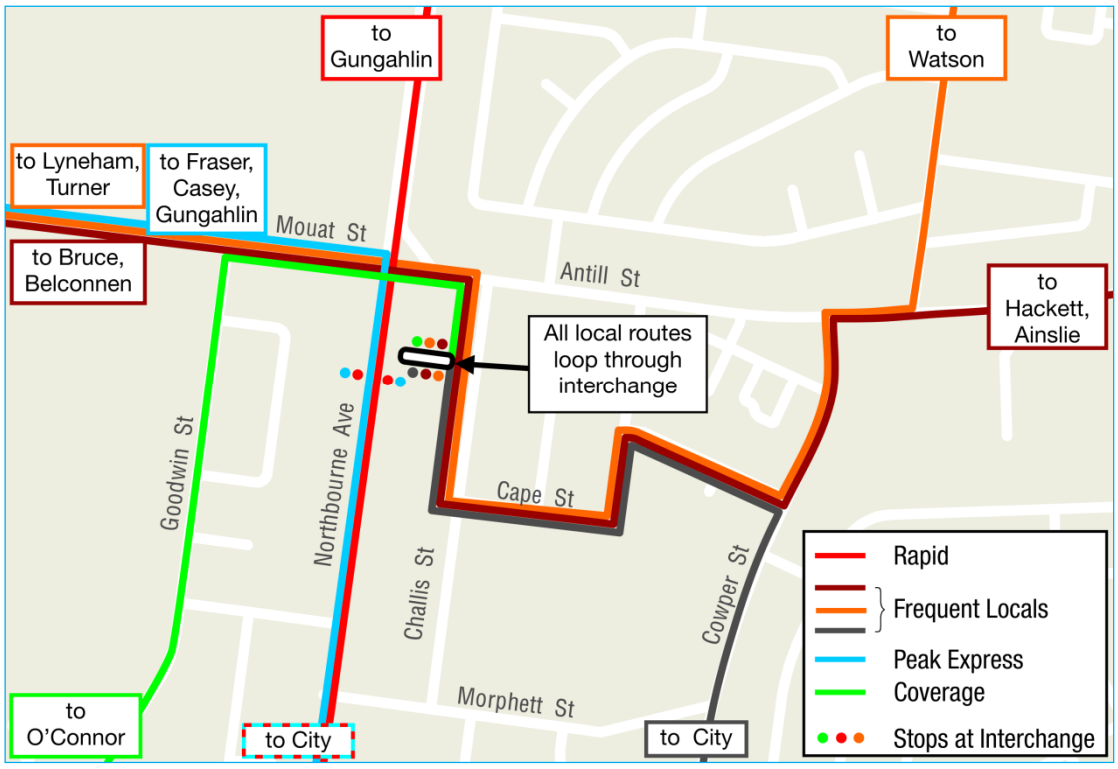


Figure 6.6: Dickson Interchange Concept 3: Rapid Two-Way on Northbourne, with Off-Street Local Bus Interchange




## 6.1.7 Barton

Many ACTION services currently converge on the block of National Circuit between Brisbane and Sydney Avenues. Much of this service is aimed at adjacent employment destinations, but there are also important interchange functions here, and these will increase in the Strategic Frequent Network.

The focal point of this interchange should be moved north to the block between Kings and Brisbane Avenues. This would permit Rapid service via Brisbane Avenue and Wentworth Street to approach more directly – an important consideration given the speed sensitivity of this service. The interchange would continue to consist of stops on opposite sides of the street, but a zebra crossing or crossing signal should also be provided. A pair of high-quality, double length bus shelters and associated infrastructure is envisaged. An indicative budget of up to $200k should be allowed.

This is a near-term need, in the next five years.

### 6.1.8 Fyshwick

Frequent Local service to Fyshwick would end at Whyalla Street and Canberra Avenue. At this point, pedestrian improvements should be made so that it is possible to connect between this Local and the Queanbeyan Rapid. This does not require an off-street interchange, although that is one solution. The need here is relatively long-term, triggered by the connection of Newcastle Street to East Lake, which will permit the construction of the Frequent Local serving East Lake and Fyshwick. However, the site should be identified and protected soon given development pressures in this area.

### 6.1.9 Molonglo, East Lake Eastern Broadacre and Other New Growth Areas

A Molonglo interchange is an important feature of the Molonglo and North Weston development area, and is discussed in detail in Chapter 8.

The East Lake growth area adjacent to Fyshwick will be served by a Rapid stop on Wentworth Avenue and also by Frequent Local service flowing through the area on Newcastle Street. Standard major stop infrastructure (Section 6.2) will be adequate here. Completion of the Newcastle Street connection between East Lake and Fyshwick is an important necessary condition for effective service.

New growth areas in Eastern Broadacre and Queanbeyan have produced suggestions for new interchanges at the junction of Isabella Drive and Monaro Highway, and also at Jerrabombera, just east of Hume in NSW. Such proposals would need to be supported by a detailed PT study for the Eastern Broadacre area, ideally integrated with thinking about adjacent NSW development. This study would need to show that planned development, and its configuration and roadways, will support PT service of sufficient quality. This issue is discussed further in Section 3.2 above.

## 6.2 Major Stops

### 6.2.1 Necessary Conditions

Major stops, receiving the highest level of amenity, should occur wherever one of the following is true:

- The stop is served by a Rapid. (i.e. All Rapid Stops are Major stops)
- Two Frequent Network routes (Rapid and/or Frequent Local) meet in a way that makes it logical place for connections to occur between them.
- Total daily boarding activity exceeds 50 passengers.

These two standards provide a threshold that can be used to program Major Stops as the network and its patronage grows. Major Stops may also be created in other locations as part of an urban design vision, such as the "identified main avenues" described in National Capital Authority's Amendment 44.[30]

A Major Stop usually consists of several stops located in adjacent positions on intersecting streets. Each of these constituent stops should have:

- Generous shelters with some architectural distinction that advertises the service and its permanence.
- Signage and possibly other design features that advertise the Rapid brand, and/or the Frequent Network, as a distinct and superior product standing out from the complexity of the background network.
- Design with attention to comfort at very high and very low temperatures.
- Built-in lighting, unless lighting in the area is already bright enough to read by.
- Appropriate signage and other wayfinding to direct connecting passengers between services.
- A complete information display, including both system-wide maps and timetables for the routes in question.
- Real-time information about arrivals and departures. (This should be actually be possible at all stops, via a system that customers can contact by mobile phone). Real-time displays may be in order at Major Stops if the phone-based system fails to develop for any reason.

Special consideration should be given to Major stops served by Rapids, or by the entire Frequent Network.

The cost of upgrading or creating major stops will depend upon site specific conditions. Each individual stop and associated shelter structure may cost from $20k to $100k, depending on the specific works required (excavation, footings, re-laying footpaths etc). For the quality of stop depicted in Figure 6.7 an average cost of approximately $30k should be anticipated. It may be appropriate to invest in a more expensive stop custom-designed for Canberra.

[30] Amendment 44 envisions "identified main avenues of Constitution, Northbourne, Commonwealth, Kings, University, Sydney, Brisbane, and part of Canberra and Wentworth Avenues as multi-use boulevards providing corridors of higher-density mixed-use development, public transport, broad tree-lined footpaths with potential for outdoor dining and street parking." http://www.nationalcapital.gov.au/planning_and_urban_design/national_capital_plan/

Figure 6.7: Example of High Quality Bus Stop Infrastructure Available in Australia


Major stops served by Rapids should also have bicycle racks, as cycling is often a logical way to travel between low-density home areas and a Rapid stop. The ACT Government should also look for opportunities to encourage the development of "bike stations." A bike station is typically a small bicycle repair and accessories business that occupies a small storefront adjacent to a Major Stop. Sometimes, these retail opportunities are built into the PT infrastructure itself, at major off-street interchanges for example.[31] Bike stations are able to provide secure storage for bicycles for a day, allowing cyclists to leave their bicycle in a secure location while completing their trip on public transport.

Several North American agencies have created a distinct Rapid brand. The Metro Rapid of Los Angeles is the largest and most successful example. In this concept, a separate "look and feel" is created for the Rapid product, including distinct stop/shelter designs, on-board signage, and unifying colour scheme. In the Los Angeles example, distinctive fleet was used for the Rapid, with its own paint scheme; this may be less appropriate for Canberra, especially if the goal is to retain the flexibility to run buses through from Rapid segments into Local segments.

[31] A fine example of a bike station built into an interchange can be found at King George Square busway station in the Brisbane CBD.

Figure 6.8: Los Angeles Metro Rapid Branding Elements


Another approach that may be appropriate in Canberra is to apply a consistent branding to the entire Frequent Network. Several North American agencies have developed this kind of branding, as has TransAdelaide in Adelaide. TransLink in Brisbane is currently working with similar ideas.

However the branding is approached, the following should principles should be kept in mind throughout the design of infrastructure, signage, and other information;

- The Rapid system is the backbone of the network and the service most likely to be useful to a customer. Customers should be able to quickly recognise a Rapid service, through infrastructure design, signage, and all other parts of the information system.
- The Frequent Network (Rapid plus Frequent Local) represents the entire network where passengers can travel without consulting a timetable or waiting more than 15 minutes. This network, too, should be easy to recognise, even as the Rapids can be recognised within it.

## 6.3 Possible Freeway Stops on Adelaide Avenue and Yarra Glen

On the Rapid segment between Civic and Woden, there are few opportunities to stop, as most of the corridor is limited-access freeway. To increase patronage opportunities, however, it may

be appropriate to explore the possibility of building "flyer stops" into the freeway interchanges. These stops should be considered at:

- Hopetoun Crescent, Deakin.
- Kent/Novar Streets, Deakin/Yarralumla.
- Carruthers Street, Curtin/Hughes.

The first and third of these are shown in the Plan as likely new stops. Kent/Novar is the hardest of the three to design due to the Cotter Road interchange*. All three should be investigated with the goal of selecting the best two for construction.* Three stops is probably excessive in this area. The time delay associated with these stops must be weighted heavily, as this is the peak load point (the point with the highest number of through-riding passengers ) in the south half of Canberra.

As with the stops on arterial roads discussed above, a fast Rapid service at these locations could attract walk trips from a fairly large surrounding area, because the service would be so much faster than any local services in the area could provide. The Deakin stop would be adjacent to the Deakin Shops and a potential connection to a Frequent Local route. The Carruthers Street stop would be within walking distance of the Curtin Shops, and also several schools and some other dense development. A Kent/Novar stop has the best access to the employment area along Kent and Denison Streets, and is also a Frequent Local connection.

These freeway stops could take any of three forms:

- *High capital cost, moderate delay for buses*. A ramp to/from the fast lanes would transition to the grade of the intersecting street, and cross that street at grade with a signal. Stops would be on the far side of this intersection, at the beginning of the ramp returning to the freeway.
- *Low capital cost, greater delay*. () Buses would exit via the off-ramps and cross the intersecting street at grade, at a signalized intersection that would also serve car traffic entering and exiting the freeway. They would stop on the far side of this intersection, at the beginning of the ramp returning to the freeway.
- *High capital cost, minimal delay, but poor access*. () Stops could be built at the grade of the freeway, so that buses could stop on the freeway, between the off-ramp and the overpass/underpass. This can be done either on the side or in a wide median in the context of median busways, such as exist on Sydney's M2 freeway (See ). Pedestrian facilities (long ramps and/or lifts) would be required to transition between the freeway level and the level to the intersecting street, with a signal or zebra crossing for crossing that street.

These opportunities should be studied in conjunction with longer-term thinking about any busway or bus lane facilities that may be needed on these Rapid segments.

Figure 6.9: Low-Cost, High-Delay Freeway Stop Option, Using Existing Ramps

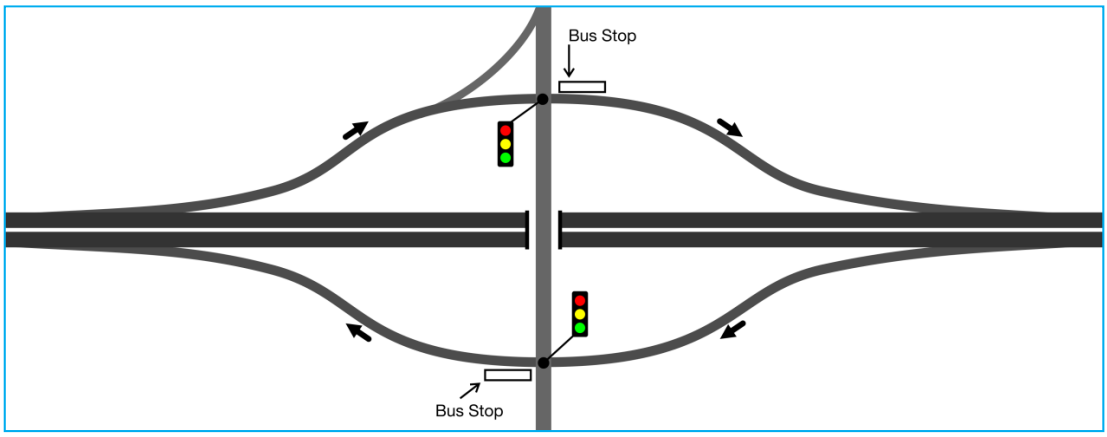



Figure 6.10: High-Cost, Low-Delay Solution: Stops at Freeway Grade

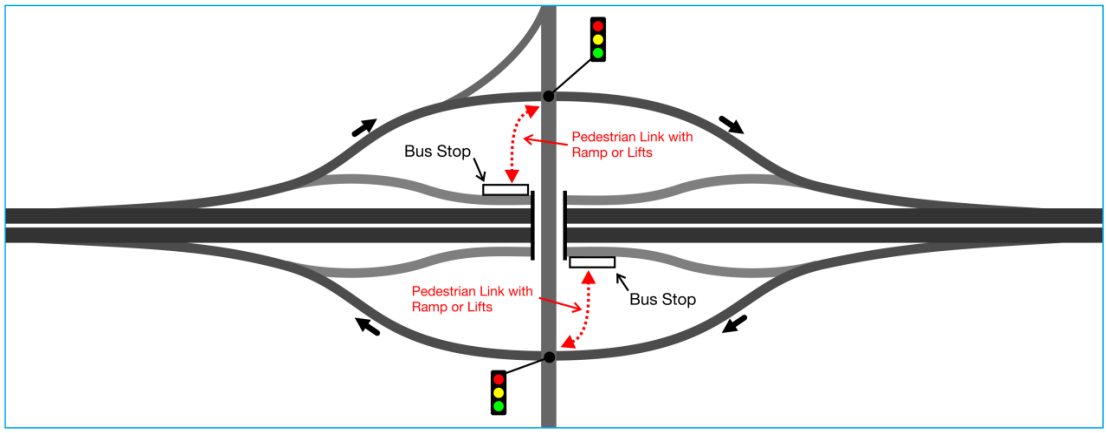



Figure 6.11: Example of Median Bus Lane Stop, M2 Motorway at Barclay Road, Baulkham Hills, Sydney. Note that bus lanes cross over each other on either side of the stop, so that buses stop on a centre island.

## 6.4 Park-and-Ride

### 6.4.1 Market and Potential

Park-and-Rides can be an important access option, but they have a very specific market. A Park-and-Ride customer is someone with access to a car and a reason not to drive it all the way to their destination. In denser and more congested urban areas such as Sydney or Melbourne, there are many such customers, because driving into the urban core is obviously expensive and inconvenient. In Canberra, driving is relatively easy throughout the region even during the peak commute period, so for a person with a car, the primary reason to use Park-and-Ride instead of driving is to avoid costs. Some may also be motivated by a desire to use their travel time in ways that they cannot do by driving, but most people will not be motivated to undertake the inconvenience of getting out of the car and onto a bus unless there is a clear financial benefit, given the lack of benefit in travel time.

This market will vary substantially based on varying assumptions about the cost of driving, especially:

- **Parking costs**. The increased development of the Civic area especially may cause parking costs to rise naturally due to market forces, unless held down as a matter of public policy. In denser cities, high CBD parking costs are often prohibitive for daily commuters, and help to motivate use of public transport, often via Park-and-Ride. Similar factors may eventually lead to higher parking costs in Town Centres and in some inner commercial areas such as Kingston and Manuka.
- **Fuel costs**. A dramatic increase in the price of petrol – widely predicted in a range of scenarios[32] – could change the costs of the daily commute to the point where many people on tight budgets would look at Park-and-Ride as a means of avoiding those costs.

Even in larger cities where congestion and parking costs may be adequate to push motorists to use Park-and-Ride, the supply of these facilities is limited, and state policies often intentionally limit their development and growth. For example, the Park-and-Ride policy of TransLink in South East Queensland explicitly ranks Park-and-Ride as a lower priority for public investment than pedestrian access, cycle access or Kiss-and-Ride, since all of these other modes are more efficient at bringing customers to the service relative to the costs of accommodating them. The large land requirements of Park-and-Ride will continue to limit its development below the level that many citizens would consider ideal. *None of the patronage estimates presented in this report are based on the assumption of major Park-and-Ride facilities.* The overall patronage benefits of Park-and-Ride make only a marginal contribution to overall system patronage.

[32] These scenarios include naturally dwindling oil supplies, instability in oil-producing regions, and the possibility that climate change will trigger emissions-related costs that could be tied to fuel consumption, and hence expressed in the price of petrol.

## 6.4.2 Existing Sites and Utilisation

With parking and fuel costs both relatively low, Park-and-Ride is currently quite limited. Currently, there are three Park-and-Ride lots in Town Centres. Because other parking in the same areas is paid, these lots require permits provided by ACTION to the customer on request. ACTION has the following data on the use of these permits:

- Belconnen. 50 parking spaces, full utilisation. This is the only consistently full Park-and-Ride in the region, so actual demand is probably higher than the 50 spaces provided
- Woden. 140 spaces, of which roughly 100 are used.
- Tuggeranong, 50 spaces, but usually no more than about 40 in use.

There are fifteen smaller Park-and-Ride lots around the region, not requiring permits, mostly with low utilisation.

The utilisation of these facilities matches industry experience, which is that:

- The quality of service provided, including all-day service, is an important determinant of use. Belconnen and Woden have the highest utilisation because they have frequent all-day service.
- The Park-and-Ride must be on the way to the commute destination for many commute trips.

Where possible, future Park-and-Ride planning should look for locations on the Frequent Rapid network. However, Park-and-Ride does not need to be at the same Town Centre stop as the bus interchange. In fact, Park-and-Ride requires a low land value that generally requires looking outside the Town Centres. The ideal location appears to be where the Rapid service to the City is especially fast, often just downstream of the interchange.[33]

## 6.4.3 Possible Major Sites

The observations above would suggest that viable larger Park-and-Rides (100 spaces or more) might be created, if space permits, in the following general areas (refer Figure 6.1 near the beginning of this chapter).

- Woden. A site on the north edge of the Town Centre would provide customers a very fast trip into the City, while a site further out would require most trips to go through the inevitably slower operations around the Woden Interchange. There may be Park-and-Ride opportunities associated with the freeway stops discussed above. If not, the next best option would be along Athllon Drive south of Woden Interchange (which would also draw from Tuggeranong). However, even these locations must be weighed against the patronage potential of redevelopment at those stops.

[33] This observation is consistent with the March 2007 Draft ACT Parking Strategy, which states: *"park-and-ride locations should be reviewed, with a view to identifying locations close to transit routes but outside town centres to maximise parking availability in town centres and minimise the distance people need to drive before taking transit services to reach their destinations."* (p. iv)

- **Belconnen**. A site on the Belconnen-City Rapid east of the Belconnen Interchange (but outside the Town Centre) would be ideal, but it's quite likely that no viable site exists, given the parking and development pressures associated with the three universities in that segment (Univ. of Canberra, CIT, ANU). Failing this, a site along Southern Cross Drive would be best, east of Kingsford Smith so that a large part of Belconnen would find it useful. If that proved impossible, any Park-and-Ride in Belconnen would need to be at a small scale distributed at several locations, with emphasis on Peak Express stops that also have some Coverage service for all-day access. Kippax may remain a good Park-and-Ride location, specialised around the needs of far west Belconnen, given its position on a proposed Rapid corridor.
- **Gungahlin** presents a number of opportunities along Flemington Road between the Town Centre and the intersection with the Federal Highway.
- In **Tuggeranong**, it may be appropriate to look for new Park-and-Ride opportunities along the proposed Rapid routing via Erindale, and particularly between Erindale and Woden where the Rapid frequency will be especially high.
- **Molonglo** would benefit from interim Park-and-Ride opportunities, initially oriented toward its short-term focus on Cotter Road (see Chapter 8). A long-term Park-and-Ride may be in order at the north-eastern corner of Molonglo, which could also draw from parts of Belconnen.
- Finally, a Park-and-Ride on the west edge of Queanbeyan (which could potentially be in either NSW or the ACT) would probably find a market, if located on the Rapid linking Queanbeyan to Kingston, Barton, Russell, and the City.

### 6.4.4 Interim Park-and-Ride Options

Park-and-Ride is often useful as an interim strategy, before the public transport network for an area has been completely filled in. Where intended for interim purposes, Park-and-Ride can sometimes be created inexpensively on a site intended for eventual development. This is often the best opportunity for Park-and-Ride, because in the long run, any site on the Rapid network is likely to have a higher long-term value as a possible site for dense development, which would generate more patronage than the Park-and-Ride. Some agencies contemplate major permanent Park-and-Ride only where there is no development potential for some environmental reason, in flood plains for example.

### 6.4.5 Opportunity-Driven Park-and-Ride

It may not be possible to site significant Park-and-Ride capacity along the principles outlined above, given the development potential and/or existing uses around Rapid stops. For this reason, smaller "opportunity-driven" parcels may have a role. These are typically existing land uses with parking that is never full during the normal working day. Common examples include:

- Houses of worship, whose parking is full only during religious services that happen during the weekend.

- Cinemas and other evening entertainment venues, whose parking is full only in the evening and / or on weekends.
- Underutilised parking at commercial centres (typically an interim arrangement pending redevelopment).

In the United States, there is considerable experience with developing these opportunity sites. These arrangements typically involve agreements between the government and the site owner. The government typically provides the shelters and ensures that it is safe to cross the road so that passengers can access the service in both directions. Often, the deal also involves indemnification of the property owner for any liabilities that may arise from use by public transport patrons. Maintenance is usually best done by the property owner, though there are various arrangements. Substantial rent payments to the property owner are unusual; typically, the property owner is motivated by a desire to support sustainable transport, and sometimes also from the security benefits of having more activity at their site outside of their own busiest hours.

### 6.4.6 Bike-and-Ride, Kiss-and-Ride

In 2008, TAMS commissioned a feasibility study to determine key potential locations for bike-and-ride and kiss-and-ride facilities consistent with ACT's sustainable transport strategies. The study will be completed in 2009 and the study outcomes will include preliminary accessibility plans of the recommended locations, a business case and a final report.

# 7. Prioritisation

It would be premature to lay out an exact phasing for all of the service and infrastructure needs of this plan, because certain elements of the plan hinge on policies that have yet to be refined and adopted. Instead, this chapter looks at the three key areas of activity in the plan – policy, infrastructure, and service, and proposes (a) important near-term priorities for the first five years of action and (b) the events that should trigger action on the remaining items.

## 7.1 Prioritisation of Policies

The following policies should be developed and adopted as soon as possible, and certainly within the next three years. They will proceed most logically if they are done in this order.

- Extent of Coverage Services
- Long-Term Frequent Network
- Frequent Network Operating Speed Policy
- Five-Year Frequent Network

There is some flexibility in the sequence, but the Five-Year Frequent Network, which requires some financial constraint, should not be settled without a policy in place on the extent of coverage services.

Reviews of fare policy can occur at any time.

## 7.2 Prioritisation of Services

Assuming that the level of coverage service remains at 47% of the total, the Strategic Network represents a 48% increase in *per capita* levels of service. Assuming, broadly, that Government resources grow with population, this percentage represents the additional increment of funding that will need to be found, from a new or expanded source.

To justify such funding, early improvements in service must be in areas that show significant benefits in patronage, and that work to improve the perception of public transport as being widely attractive and useful, not just for peak commuters or people who have no alternative.

Early development of the Frequent Network is a key strategy in this direction. The sequence of steps would be as follows.

- Complete the Belconnen and Tuggeranong redesigns sketched as part of the Network '08 changes, as soon as the Belconnen and Erindale interchanges are functional (see next section). These redesigns improve the efficiency of the Coverage network in those areas, and also create routes that can grow into future Frequent Network services as specified in

Chapter 3. At this point, the overall network structure for already-built areas will be largely stabilised.

- Refine the public branding of the Frequent Network. One possible branding idea is to identify these corridors as the "Red Line," "Blue Line" etc., giving them the same kind of easy legibility that a subway network has in a major city. Each "line" would also be made up of many routes running together, but this terminology would mean that customers who want to ride along the frequent segment do not need to know or care about the route numbers.

The above steps should be complete in the first 3 to 5 years of the plan.

- Starting with the densest areas and moving outward, gradually bring the entire proposed Frequent Network up to the standard of 15 minute service all day, in all areas where this network depends on development that already exists. (This would be the entire Frequent Network as presented in this report, with the exception of the Molonglo network, and possibly some Gungahlin segments that are oriented toward suburbs not yet built). Add these corridors to the publicly branded Frequent Network as this is done.
- Concurrently, develop any special branding for the Rapid network. As proposed Rapid services reach high frequencies, introduce them as Rapids but also standardise their stop spacing so that it matches the Rapid guidelines of roughly one stop every km.
- Begin working with the NSW Ministry of Transport to define a long-term structure and division of labour for the Queanbeyan services, such that services between Queanbeyan and Canberra could also make local stops within the ACT. This is an important step toward creating a high-frequency service that integrates Queanbeyan. If for any reason the necessary service agreements cannot be reached, proceed with the Frequent Network service as defined in this plan but terminating in the vicinity of Kingston.
- Extend the 15 minute service level to weekends, and complete the evening span, so that the Frequent Network reaches its ultimate definition.

Concurrently, as growth occurs in other areas, the proposed services for those areas should begin, initially as Coverage services and eventually building toward their ultimate level. While it is important for public transport to be available early in the development process, it is also important for service not to get so far ahead of development that it comes to appear as an obvious waste of resources.

Note that the first two steps in this sequence do not require significant new operating funds. The significant branding task that begins in Step 2 should be broadly aimed not just at promoting the Frequent Network, but also at improving the clarity and legibility of the entire system, so that a larger share of the public perceives it as potentially useful. That shift will be critical to building longer-term support for new sources.

## 7.3 Prioritisation of Infrastructure

### 7.3.1 Short Term Priorities

The following infrastructure items should be developed within the next 3 to 5 years. The reasons for this priority are indicated on each item:

- In accordance with the policies outlined in Section 7.1 and the *Sustainable Transport Plan*, undertake modelling and assessment of Transitways and other bus speed/reliability infrastructure to maintain the operating speed standard of the Frequent Network.
- **Belconnen Interchange**. (Section 6.1.2) The new facility, consisting of a segment of street with major stops and layover terminals at each end, is already largely committed.
- **City West / ANU Terminal Replacement**. (Section 6.1.1) An interim arrangement is needed prior to the closure of the current site in 2010. This may consist of a series of on-street layover locations as discussed in Section 6.1.1. Meanwhile, a plan must also be developed to create a permanent terminal site for routes ending in the CBD, ideally in City West near ANU.
- **Erindale Interchange**. (Section 6.1.3) This is a relatively low-cost on-street facility, and is needed for the short term service plan for the Tuggeranong area.
- **Gungahlin Interchange**. (Section 6.1.4) A study is needed to pin down the location and configuration of this facility before the options are constrained by further development. This study is being undertaken by ACTPLA as part of the Gungahlin Town Centre Planning Study. The interchange is needed before the network can reach its final form, and particularly before any circulators can be created within Gungahlin, such as this plan envisions.
- **Dickson Interchange**. (Section 6.1.6) This on-street facility is justified largely by areas where development is already complete and relatively dense, though its market will grow stronger as Gungahlin grows. The Challis Street options need detailed study to determine how and where buses would circulate and stop, what provisions they would need for access/egress (especially northbound Northbourne Ave buses) and how the pedestrian flows would work, between the buses and between the interchange and Dickson shops. This relatively low-cost facility offers potentially large benefits in an area of high patronage potential.
- **Adjustment of Barton Interchange**. (Section 6.1.7) The relocation of the primary interchange stop to between Kings and Brisbane Avenues will smooth the flow of several bus routes serving the southeast, and the need for this will grow as these routes become more frequent.
- First steps in a **major stops program**. (Section 6.2) Distinctive signage should be provided at all Frequent Network stops, consistent with the branding scheme for that network, and a major stops program for key stops on that network should be underway within the 3 to 5 year window.

- First steps in a **Park-and-Ride program**. (Section 6.4) A region-wide review of Park-and-Ride opportunities on the Rapid and Peak Express networks should be completed, leading to a capital program for any major facilities and a program for ongoing development of opportunity-driven and temporary sites.

### 7.3.2 Later Priorities and Triggers

The sequence of infrastructure improvement beyond the initial steps above should be driven by the policies outlined in Section 7.1 above, and the actual phasing of development. For example:

- **Transitways** and other bus speed/reliability infrastructure should develop in response to the need to maintain the operating speed standard on the Frequent Network. Modelling process will be needed to identify future operating speed problems far enough in advance to develop these strategies as capital projects, especially for major capital such as transitways.
- **Light rail** projects, if pursued, will replace Rapid corridors and proceed on their own timeline. Emphasis should be placed on corridors where light rail is superior to bus options in speed/reliability, capacity, or patronage potential.
- **Freeway stops** on Adelaide Avenue and Yarra Drive (see Section 6.3) should be developed in the 5 to 10 year range assuming that they have not been superseded by transitway and/or light rail plans for the City-Woden Rapid segment.
- The **major stops program** should continue into the future, improving stops as their patronage and/or service passes the required thresholds (see Chapter 6).
- **Fyshwick interchange** (Section 6.1.8) will be needed at a location along Canberra Avenue on the south edge of Fyshwick where the Queanbeyan-City Rapid can connect to the Fyshwick Frequent Local. This should be created at the point when Newcastle Avenue is connected through between Fyshwick and East Lake (at least as a PT connection if not a full roadway). The site should be identified sooner.
- A **Park-and-Ride program** will also need to continue, especially to revise Park-and-Ride arrangements in light of ongoing development.

Molonglo-related infrastructure and services should appear in step with development, as outlined in Chapter 8.

## 7.4 Indicative Phasing and Targets

The actual phasing of the Strategic Plan will depend on a range of unforeseeable events, and there is considerable flexibility in the sequence with which its elements can be delivered. Table 7.1, however, provides an illustration of how the plan might proceed. Detail is concentrated on the first five year increments for which short-term actions are in order. Phasing for Molonglo cannot be tied to years as it depends on the phasing of development; Molonglo phasing is discussed in the next chapter.

Table 7.1: Phased Delivery of the Strategic Plan

| No later than: | PT Mode Share Target (AM Peak work trips) | Minimum Infrastructure Improvements | Policies and Service Products |
|---|---|---|---|
| 2006 | 8% | | |
| 2011 | 9.0% | • Interim functional interchanges at Dickson, Erindale.<br>• Belconnen stations in progress, complete by 2010. | Policies<br>• Extent of Coverage Services<br>• Long-Term Frequent Network<br>• Frequent Network Operating Speed Policy<br>• Five-Year Frequent Network<br><br>Services<br>• Revise weekend network to match weekday patterns.<br>• Belconnen and Tuggeranong network designs implementing Frequent Network.<br>• Creation of Frequent Network branding, applied to services that meet standard. |
| 2016 | 10.9% | 2012-2014:<br>• Gungahlin Interchange<br>• Dickson Interchange<br>• Erindale Interchange.<br>• Barton Interchange<br>• Major stops program.<br>• Park and Ride program.<br><br>2014-2016<br>• Adelaide Avenue stops (unless full transitway is planned))<br>• Molonglo Centre Interchange | • Complete harmonisation of ACTION route network with Strategic Plan (not necessarily at ultimate frequencies) by 2014<br>• Ongoing frequency and span improvements.<br>• 0.8m annual revenue hours by 2016. |
| 2021 | 12.8% | Infrastructure as triggered by Operating Speed Policy. | • All Rapid corridors except Molonglo fully implemented.<br>• Ongoing frequency and span improvements.<br>• 0.9m annual revenue hours by 2021. |
| 2026 | 14.8% | Infrastructure as triggered by Operating Speed Policy. | • Ongoing frequency and span improvements.<br>• 1.0m annual revenue hours by 2026. |
| 2031 | 16.7% | Infrastructure as triggered by Operating Speed Policy. | • Strategic network (1.1m annual revenue hours) complete by 2031. |

# 8. Molonglo Public Transport Assessment

## 8.1 Overview

As part of the *Canberra Spatial Plan*, the Molonglo area between Belconnen and Weston was identified as a new area for urban growth. Current ACTPLA plans[34] call for a community with an ultimate build-out population of between 55,000 and 70,000. This chapter addresses the ultimate public transport needs of Molonglo, and considers:

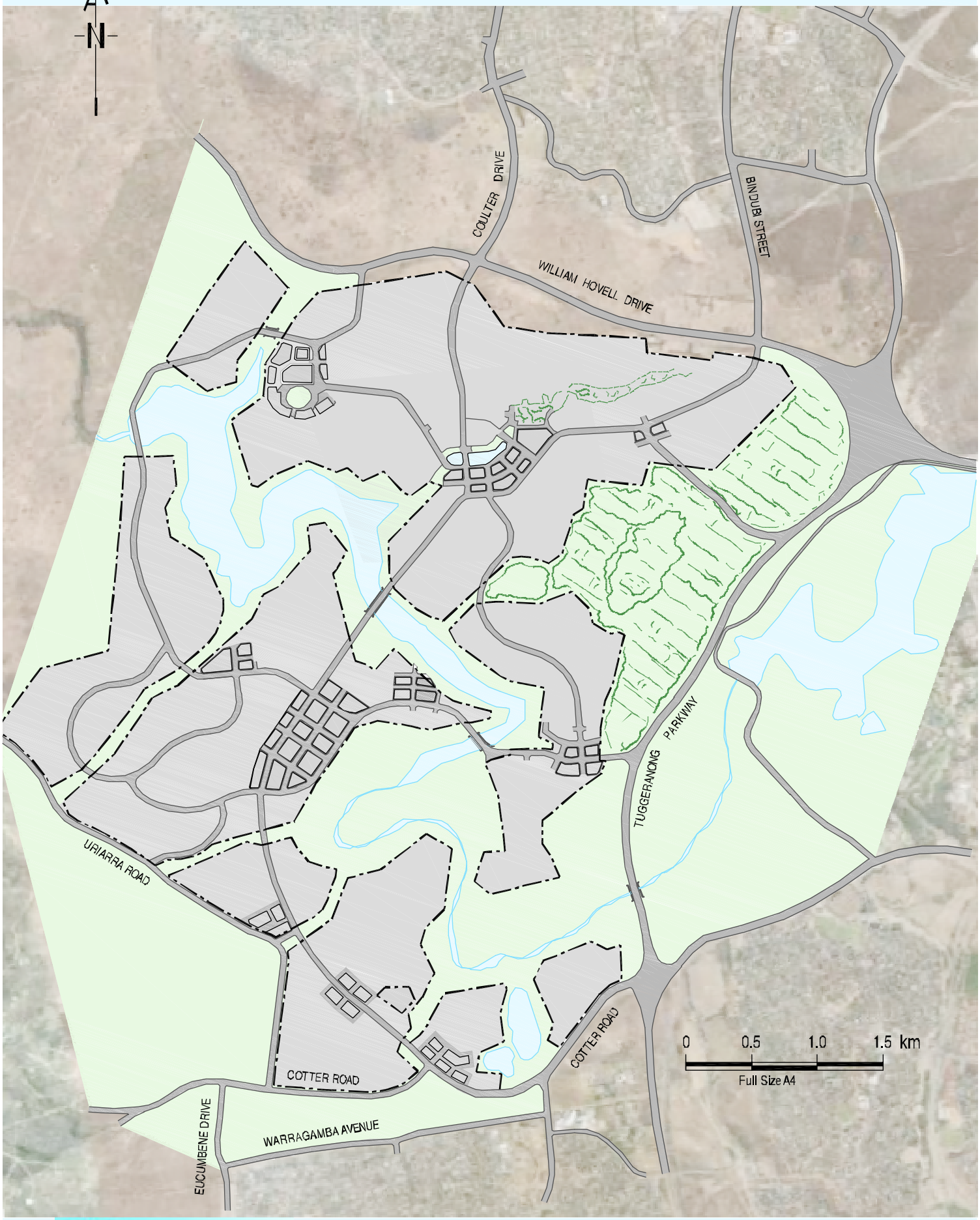
- Recommended routings for major public transport services.
- Optimum urban form to provide conditions for high-patronage service.
- Interchanges and other key infrastructure requirements.
- Recommended phasing of services.

To help guide the planning of this area, this chapter goes to a higher level of detail for this area, including detailed design of minor "Coverage" services, so as to provide the greatest possible level of certainty about what will be required to serve Molonglo effectively.

Figure 8.1 is a conceptual diagram of the Molonglo development area.

The public transport concept for Molonglo is shown in Figure 8.2 and explained in detail in this chapter.

[34] ACTPLA Molonglo and North Weston Fact Sheet, 2007, at http://www.actpla.act.gov.au/__data/assets/pdf_file/0006/6279/Molonglo_and_north_weston.pdf




McCormickRankinCagney

**MOLONGLO**
**DEVELOPMENT CONCEPT**

**FIGURE 8.1**

# 8.2 Regional Links: Rapid and Peak Express

## 8.2.1 Corridors

The Strategic Network Presented in Chapter 3 identifies two Rapid[35] corridors for Molonglo:

- A main corridor linking Molonglo to the City via Parkes Way
- A secondary corridor linking Belconnen and Woden via Molonglo and Weston

Both corridors are identified as Rapid, but by citywide standards their service levels will be close to the minimum standard for that product. The intensity of a particular service – in terms of frequency and span – is based on the number of different trips that will find the service useful. The Belconnen-Civic link, for example, supports very high levels of service because so many different kinds of trips can make use of it. For example, the link is useful to all of greater Belconnen, via the Belconnen interchange, and also serves Canberra's two largest universities. Most travel from Belconnen to southern and eastern Canberra also logically flows via this link. So there is a large and diverse market that can all benefit from a single corridor.

Molonglo's geography is quite different. It is smaller than greater Belconnen, even at build-out, and it needs four separate corridors to connect it to the rest of the region:

- A Parkes Way link to Civic (proposed as the City-Molonglo Rapid corridor)
- A link to Belconnen (proposed as part of the Belconnen-Molonglo-Woden Rapid) via Bindubi Street. This is a revision to previous proposals, reflected in the Territory Plan Variation 281 (V281), which show this alignment going via Coulter Drive.[36]
- A link to Weston and Woden (proposed as part of the Belconnen-Molonglo-Woden Rapid) via Streeton Drive
- A peak-period link to Barton and on to Russell, because none of the other three corridors are direct enough to also serve this movement, which logically flows via Cotter Road and Adelaide Avenue for most of Molonglo. This is proposed as a Peak Express service.

Molonglo's PT demand will inevitably be divided among these corridors, producing a lower level of service on any one of them. This diffusion of market is an unavoidable consequence of Molonglo's close-in location. For example, if Molonglo's population had instead been accommodated according to the old "Y-Plan", it would have been placed northwest of Belconnen. This would have permitted an extension of the City-Belconnen corridor to the new development area, and the resulting corridor would have been very concentrated, supporting a very high level of service, because trips from the new area to anywhere in Canberra would have found it useful. This comment is not a critique of the Molonglo development strategy in the *Canberra Spatial Plan*, but merely an observation that the many environmental and social benefits of Molonglo's close-in location do come at a cost in terms of public transport, because

[35] The term "Rapid" is defined in Chapter 3 and corresponds roughly to "Intertown Public Transport" or IPT in previous documents. It denotes routes that serve widely spaced stops for a relatively high operating speed, and running frequently all day including evenings and weekends.

[36] Bindubi Street is recommended because (a) it allows the Belconnen-Woden Rapid to cover more of northern Molonglo and (b) it provides for a more direct routing into Belconnen..

the demand must be divided across several corridors instead of being concentrated on one of them.

To serve the four identified corridor directions, then, Molonglo will need the two Rapids, City-Molonglo and Belconnen-Molonglo-Woden. In addition, there will need to be a peak-express link between Molonglo and Russell-Barton via Cotter Road and Adelaide Avenue, similar to current 700-series "Xpresso" routes.

### 8.2.2 Alignment within Molonglo

Molonglo is organised around a North-South Arterial that flows through the development area in roughly a "C" shape. Molonglo's main Group Centre is near the westernmost point of the "C" south of the Molonglo River crossing. A secondary "North Molonglo Group Centre" is also planned on this arterial in the northern part of the development. Lesser centres – typical of the small suburb-level commercial centres that existing throughout Canberra – are also located throughout the development area, as shown in Figure 8.1. These have been sited to be efficiently served by either the Rapid or a single Frequent Local service described below.

The regional links for Molonglo have been designed to serve these Group Centres directly while also touching as many of the other centres as possible. The goal is to maximise the extent to which major PT destinations (dense residential areas and jobs) lie directly on the Rapid services, so that an interchange with local service is not required to travel between these places and the rest of Canberra. In consultations between this study's team and ACTPLA, proposed adjustments have been made to the locations of some of the lesser centres with the intention of siting the denser development directly on the Rapid corridor.

An alternative approach, proposed earlier in the thinking of the *Molonglo Roads Study*, suggested that major PT service should run along the east-west arterial, which runs directly from the Molonglo Group Centre to meet Cotter Road near its junction with Adelaide Avenue. The problem with this alignment is that while it's optimal for the Group Centre it does not serve enough of Molonglo's other centres directly. Areas north of the river, for example, would never find this alignment useful as a route to the City, and would therefore continue to need a Parkes Way service. The result would be a further diffusion of services among even more corridors, thus supporting even less service on any one of them.

In the case of the link to Belconnen, an alignment via Bindubi Street is recommended. This is a revision to the plan shown in Territory Plan Variation 281, which showed this link running via Coulter Drive. The purpose of this change is to expand the extent to which this corridor serves developed area within Molonglo. It also has a side effect of providing direct service to a point close to the University of Canberra, as it approaches the Belconnen Interchange from the east.

Also, contrary to some earlier thinking, the Belconnen - Woden Rapid is routed via Weston and the Group Centre at Cooleman Court. This provides better local mobility between these closely related areas, and allows the Belconnen-Woden Rapid to take over the role of the direct frequent link between Weston and Woden.

### 8.2.3 Peak Express: Molonglo – Barton – Russell

Peak express service will be needed to connect Molonglo to the main government employment centres of Barton, continuing on to Russell. Barton would be a major interchange point, where customers could change to reach other employment sites such as Parkes, Parliament House, Kingston, and Fyshwick.

Like today's "Xpresso" services, this would be peak-only service operating only in the peak direction.[37] This service would follow the North-South arterial from Molonglo Group Centre south through North Weston and then along Cotter Road and Adelaide Avenue.

This service is intended mainly for customers originating at the Molonglo Group Centre and points south. Customers originating north of the Molonglo River would reach Barton and Russell via the Rapid to Civic and then any of several frequent local services.

### 8.2.4 Stopping Patterns

Rapid and Peak Express services flowing through Molonglo would stop about every 800m on average. These stopping patterns are shown on the network maps in Chapter 3. Typical stop-spacing for a local service is about 250m, but effective long-distance links must stop less often in order to run at a reasonable and attractive speed. By specifying a wider stop spacing in an early stage of the design of the development, the intention is to organise the land uses and pedestrian paths so that they can make use of stops spaced every 800m, rather than requiring a closer stop spacing that would lead to a slower and less attractive service.

### 8.2.5 Recommended Plan Revisions

The Rapids identified in this section, and in Figure 8.2, should be added to the Intertown Public Transport network in the *Territory Plan*, the *Metropolitan Plan,* and the *National Capital Plan*. Rapid corresponds to "ITP" in the language of those plans.

The alignment of the Rapid link between Molonglo and Belconnen has also been revised from the version shown in *Territory Plan Variation 281*, in that it follows Bindubi Street rather than Coulter Drive. This change should also be reflected in future plans describing the Rapid or "IPT" network.

[37] See Section 2.3.2 for detailed description of service categories.

## 8.3 Local Services within Molonglo

Figure 8.2, developed in consultation with ACTPLA, shows a development pattern in which high-demand areas, such as areas of employment or dense housing, are located on the regional links to the extent possible. The purpose is to maximise the mobility of these areas by giving them direct no-interchange service to the other major centres of Canberra, and to maximise the patronage on these regional links by making them useful for both regional and local (intra-Molonglo) travel.

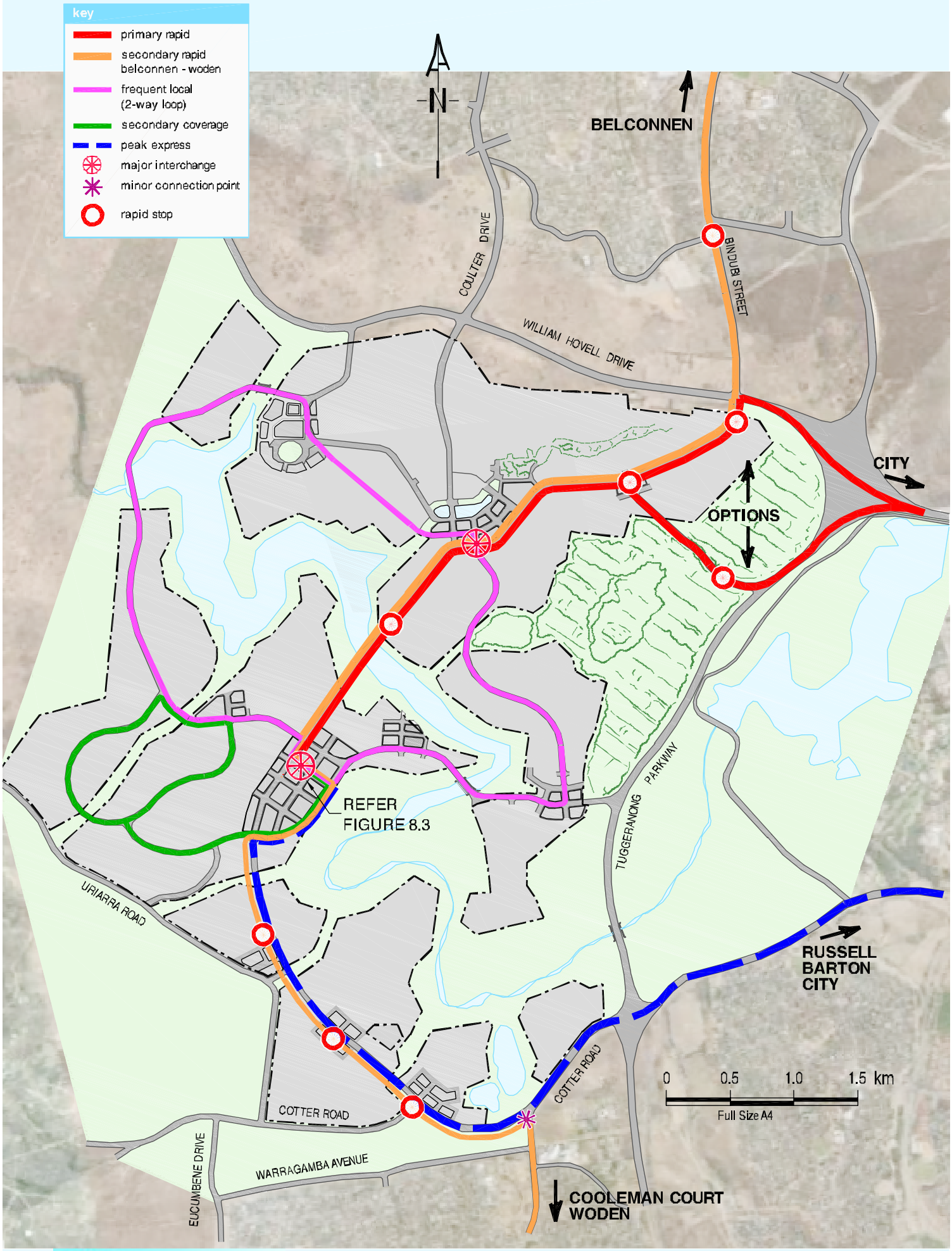
Local services, then, are needed only where significant development is proposed more than 400m from one of the Rapid corridors. Where these local services provide the only service to a commercial centre, the local services are recommended to be of the Frequent Local type, while if the service covers only a low-density residential, the Coverage type of service is more appropriate.

### 8.3.1 Frequent Local Two-Way Loop

The design of Molonglo's development pattern as it stands seems to require only one Frequent Local service. This would be a simple two-way loop, designed to provide direct service between all of the lesser centres and the two Group Centres. The Group Centres, then, would be the site of small interchanges (discussed further below) where this local service would connect with the regional services described above.

The two-way loop structure is recommended because it maximises the opportunity for relatively direct travel within Molonglo. For example, it gives its entire service area a reasonably direct trip to either of the Group Centres, rather than focusing on just one of them.

Of course, this loop also presumes a road crossing across the river on the far western edge of Molonglo, which would a bridge or a dam forming a lake. This crossing would be an important element. Without it, the local service would need to double back on itself in a way that would be considerably less effective. This crossing will also relieve some pressure on the North-South arterial for private car traffic.




McCormickRankinCagney

# MOLONGLO (AT BUILDOUT) PUBLIC TRANSPORT CONCEPT

FIGURE 8.2

### 8.3.2 Coverage Service

Coverage service – which is by definition the lowest-patronage and least efficient service offered – should be minimised as a basic consequence of any good urban design. In Molonglo as currently conceived, there should be only one area in the southwest that requires a small Coverage route, as shown in Figure 8.2. In northern parts of Molonglo, it should be possible to avoid needing a Coverage route, so long as the arterials used by the Rapid and Frequent Local services are located within a reasonable walking distance of all or most of the developed area[38]. This requires that the position of these streets be central to the development to the maximum extent possible.

## 8.4 Infrastructure Requirements

The infrastructure requirements of public transport in Molonglo will take several forms:

- **Provisions to protect speed and reliability**. These include busways, on-street bus lanes, and/or signal and stop design features that give appropriate precedence to public transport.
- **Interchanges**. These are locations where connecting from one bus to another is intended to be pleasant and safe. These would be located in the two Group Centres.
- **Stop Amenities**. Facilities located at all or most bus stops.

### 8.4.1 Protections for Speed and Reliability

Public transport must be able to operate at an adequate speed, and that speed must be predictable. These two features, speed and reliability, are crucial to any service that expects to compete with the convenience of the private car. There are a range of tools that can be applied to this problem, with a focus on bus transport.

These tools are described in Chapter 6, which deals with infrastructure in general. They include, in declining order of capital cost and effectiveness:

- Fully-separated transitways.
- Transit lanes on streets and highways.
- Signal pre-emptions and queue-jumps.
- Curb extensions.

Different solutions may be applied on different parts of a corridor. The approach presented in Chapter 6 focuses on setting an operating speed standard for each service type, and then studying each situation in the network to determine which solution is best to meet the standard in that local situation.

The potential to protect speed and reliability is an important consideration in selecting a corridor alignment. Thus, in the case of the City-Molonglo link, we show two possibilities for the routing

[38] See Section 2.5 for detail on policies on acceptable walking distance (Minimum Coverage Standards)

through the area of the International Arboretum and the Glenloch Interchange. More detailed study is needed to determine which option can be made reliable, and so we show both options to permit the best one to be selected based on that future work. It is important to resolve the question relatively soon, however, as the selection of an alignment here has other localised impacts[39] that must be taken into account..

The following are likely to be the minimal requirements for effective operation:

- **Within Molonglo**. A continuous reservation along the Rapid alignments within Molonglo, including the North-South Arterial and the connector road that connects to Bindubi Street, so that transit has a reserved lane (shared with turns) when it is needed. (See discussion below.)
- **Between Molonglo and the City.** Rapid corridor segments crossing open space with relatively few intersections often do not need their own continuous lane, because most road congestion on these segments is related to roadway interchanges and their related merging activity. Exclusive lanes[40] are only needed on those portions of a roadway where queuing of private vehicles can be expected. For this reason, the first priority should be to ensure a fast and reliable way for transit to bypass interchange congestion. For example, on the City-Molonglo Rapid, it is important to identify a long-term means of avoiding congestion in the Glenloch Interchange and again at the Edinburgh Ave ramps where the service accesses the City. We show two options for the alignment at Glenloch Interchange in order to maximise flexibility in meeting this requirement. A flyover roadway bypassing Glenloch interchange may ultimately be necessary to protect the speed and reliability of this connection.[41] Further work on east-west connections – including both public transport and private vehicles, should fill in this detail as soon as possible.
- **Other Regional Connections.** Similar considerations apply to Bindubi Street between Molonglo and Belconnen, and also to Cotter Road. In these cases, queue-jump lanes at signals are likely to be adequate to protect speed and reliability. These will be especially critical at intersections where long queues as possible, such as Bindubi Street's approach to Belconnen Way[42].
- **On Approaches to Centres.** The interchange design for the Molonglo Group Centre attempts to route all buses onto the same streets, to the extent possible, and these streets become correspondingly crucial for speed and reliability. Continuous bus lanes and signals should be included on these approach/departure routes. Similar considerations may apply to the Frequent Local loop on its approaches to the North Molonglo Group Centre. Finally, of course, the proposed Rapids must be kept in mind in planning for adjacent Town Centres and the City, since in some cases they imply new approach routes (e.g. Edinburgh Ave and

[39] These issues include (a) potential integration of the busway with tourist destinations such as the Arboretum. One major advantage of the southern alignment is the opportunity to provide a rapid stop at a "front entrance" of the Arboretum, thus dramatically increasing access for both tourists and Canberrans. Planning of the Arboretum's entrance and visitor centre areas should ensure a pedestrian-friendly entrance experience that avoids long walks across car parks.
[40] See also Chapter 6. These lanes can also be made available to other high-occupancy vehicles, or to toll-paying vehicles, but only with (a) strict automated enforcement and (b) a policy that automatically adjusts tolls and/or the required number of persons per vehicle to maintain free flow in these lanes.
[41] This option also suggests the possibility of using all or part of Lady Denman Drive as a Rapid Bus alignment, but this requires a relatively high-speed roadway that may conflict with this street's current emphasis on recreation and tourism.
[42] The intersection of William Howell Drive and Bindubi Street is expected to be grade-separated.

Marcus Clarke Avenue[43] in the City) which will have a high sensitivity to traffic-induced delays to public transport.

On the North-South Arterial, Rapid buses can operate in a kerbside lane with these features:

- The lane is designed so that it can be made bus-only on approach to signals, with a queue-bypass at the signal.
- The lane is identified in policy as one that can be converted to bus-only if/when operating speed standards require it.
- A pocket lane for left-turning traffic is provided on the near-side of intersections, so that queuing left-turning traffic does not block the bus. The length of this pocket should depend on modelling of turning movements at the intersection.
- Rapid-stops are generally far-side to avoid conflicts with left-turning traffic, though there may be an exception at the North Molonglo Group Centre as discussed below.

## 8.4.2 Interchanges

The network as shown in Figure 8.2 has two substantial interchange points, located in the two Group Centres. In each case, this will be where the Rapid services connect with the Frequent Local loop, and also with any secondary Coverage services.

Design of these interchange locations will require careful attention to several issues:

- Ensuring quick and reliable access for buses arriving and departing. Particular attention to routes that are flowing through the site but not ending there, so that customers riding through are not taken on circuitous movements at the interchange.
- Ensuring a safe and pleasant environment for waiting customers, as at any stop. All stops should have adequate shelter and lighting, and where possible, there should be commercial activity facing the stop or as close to the stop as possible.
- Ensuring a safe and pleasant walk from one bus to another at the interchange. Ideally a street crossing should not be necessary on this walk, but if it is, lines of sight should be clear between the two connecting vehicles, so that drivers can see connecting passengers as they walk from one vehicle to the other. Covered walkways for these walks should be provided where feasible.[44] If a signalised street crossing is required, there should be a place to take shelter from rain while waiting for the signal.

It is often tempting to locate transit interchanges "out of the way," where these requirements can be met by purpose-built facilities. However, interchanges represent points with very high levels of PT access, so it makes sense for them to be right at locations of high demand. Reconciling these two impulses requires clever design solutions that are appropriate to each location. (In

[43] Marcus Clarke is recommended over London Cct for two reasons: (a) optimal penetration of the City West precinct and the eastern edge of the ANU, and (b) service to City West interchange, providing an alternate interchange point for many interchange movements. However, if this street became too slow or unreliable, London Cct could be considered as an alternative. Relocation of the City West Interchange (see 6.1.1) may also impact this recommendation.

[44] In commercial centres where most interchanging would occur, these can often be provided through requirements for awnings or other coverings built into the design.

some cases, the solution may be some form of grade separation, but this is not likely to be the case on the scale of Molonglo).

Small interchanges, such as Molonglo requires, often benefit from being integrated into the streetscape. The following ideas are obviously preliminary, but show how such a centre might work in each case.

#### 8.4.2.1 Main Molonglo Group Centre Interchange

In the main Group Centre, one interchange concept with some promise involves integrating the interchange function into a small civic plaza, which may be a park or may combine park and commercial elements. In this concept, presented on Figure 8.3a, buses from the various routes would all pull up on opposite sides of a small plaza, which could be integrated into the streetscape of the centre. The streets on either side of the plaza would be designed to connect through to the North-South Arterial (at the northwest end) and a parallel arterial at the southeast end. A pedestrian mall, if desired, would through the commercial core and would intersect the plaza at its midpoint.

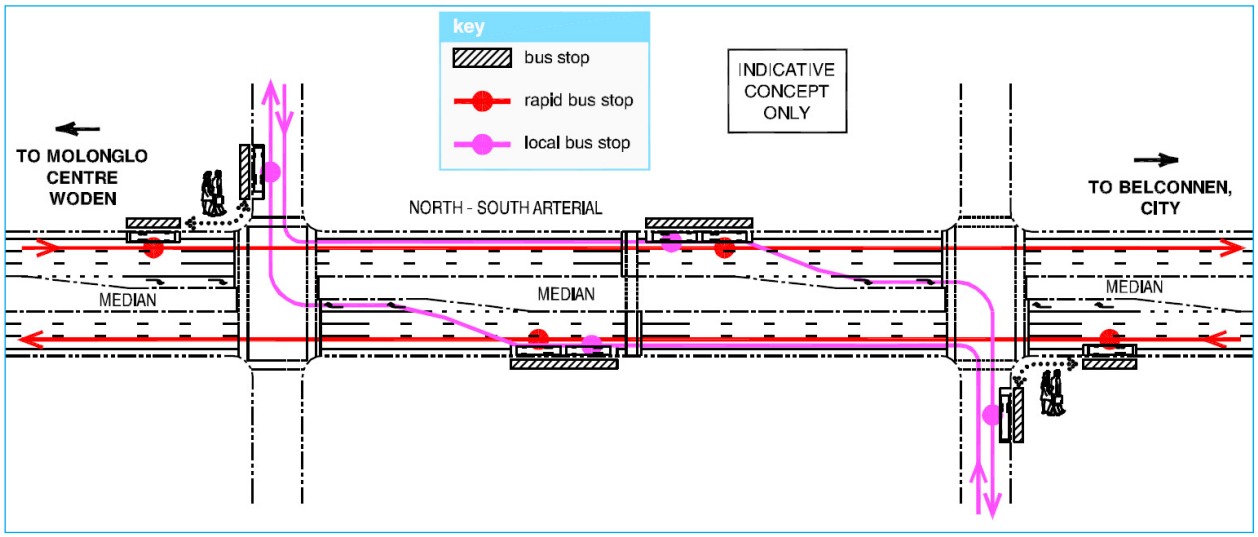
This conceptual design achieves the requirements of the interchange while also participating in the street life of the centre, which makes for better security and lets passengers feel that they are being brought to the centre's "front door". Note also that bus services alongside the plaza would be in the reverse of the usual traffic couplet configuration. That is, the street running one-way toward the northwest would be to the east of the one running southeast, so that buses would stop on the plaza side of the street in both directions. This would mean that passengers can walk from any bus to any other without needing to cross the street.

Figure 8.3a: Molonglo Group Centre Interchange Concept

### 8.4.2.2 North Molonglo Interchange

At the North Molonglo centre, it may be possible to organise the interchange function into two Rapid stops on opposite sides of the North-South Arterial, where there is a safe means of crossing the street (either a zebra crossing or signal). In this configuration, the northbound Rapid and clockwise Frequent Local would stop together on one side of the street, while the southbound Rapid and anticlockwise Frequent Local would stop together on the other. This arrangement, shown on Figure 8.3b, would likely be adequate for many years.

Figure 8.3b: North Molonglo Interchange Concept




The phasing scheme discussed in Section 8.5 below implies that the North Molonglo Interchange is needed only very late in the sequence of development, when the Frequent Local is created. This is beyond the study year for the rest of this Strategic PT plan.

## 8.4.3 Stops

The entire network proposed for Molonglo will have about 126 individual stops. All stops will require:

- A safe and reliable means for a bus to stop, and to continue from the stop. This is not a problem where a bus is operating in a curb lane, but it can be a problem when operating in a traffic lane with an adjacent parking lane, because if a bus pulls out of traffic at a stop it can have trouble getting back in. The best practice is to build a “bulb” or “curb extension” to permit the bus to stop in the travel lane.
- Adequate lighting for safety. This can be achieved by co-locating standard street lighting in a low-patronage area. Busier stops should have their own lighting, as noted below.
- Appropriate means of pedestrian access to the surrounding area. A key issue here is that bus stops must be readily accessible from both sides of the street, so it must be safe to cross the street at or very near the stop location. Ideally, signals or zebra crossings should be provided at each case. *Never place a bus stop at a point where it is unsafe to cross the arterial.*

- A means of determining when the next service is coming. In addition to posted timetable information, which is already standard at ACTION, stops should have some form of "real-time" information. Given the ubiquity of mobile phones, the best practice in this area no longer relies on expensive electronic displays at every stop; instead, each stop has a posted identifying number. Customers can contact the PT operator by mobile phone, key in this number, and get automated voice information about when the next service is expected, based on its actual location.

Of the 126 stops, 28 will be relatively major. These include all 22 of the Rapid stops, and about six of the Frequent Local stops. These stops should have a higher standard of amenity, including shelters with internal lighting. These shelters could reflect a system-wide standard that represents the Rapid system.

The design of the North-South Arterial includes signals approximately every 800m, which allows for two-way coordinated phasing of traffic. These signalised intersections would generally be the locations of Rapid stops. These stops must be located close to the signal for easy access to the signalised pedestrian crossing; if placed too far from the signal, they can encourage unsafe pedestrian crossings at other points. Many other locations on the arterial feature pedestrian under-crossings and these could also be considered as stops, though in the long term an 800m spacing is ideal.

All stops on 4-6 lane arterials should be in the kerbside travel lane. If on-street parking is provided, the stop should be in the leftmost travel lane and the kerb should be extended across the parking lane for the length of the stop. ("Pull-outs", in which the bus pulls out of traffic to stop and must then merge back in, are not recommended). At a bus stop, the kerbside lane should be wide enough that a cyclist can pass a stopped bus without leaving the lane, but not so wide that a car can do so.

On 2 lane collector streets or unmarked streets, it should be possible for the bus to stop such that traffic can pass it in both directions, but so that a bus can exit the stop easily.

For in-lane stops, the length of the stop (defined as the area where the kerb is straight, the footpath is continuous with the kerb, and no other stopping is permitted) should be 20m for Rapid stops, which may be served by articulated buses. For Local and Coverage route stops, 12m of straight kerb is usually sufficient. Interchange stops must be longer if more than one bus is expected to be there at a time. These distances are general guidelines only; ACTION should be consulted on the precise geometrics.

Pull-out stops require additional length free of obstruction so that buses can enter and exit the stop. The length needed depends on the width of the pull-out lane. ACTION maintains a set of detailed geometric standards showing the distances needed for each type of stop, which should be consulted in these cases.

## 8.5 Phasing

The phased development of Molonglo will require a series of interim service patterns, many running for years. This section discusses the sequence of phasing, and its impacts on public transport.

ACTPLA plans to develop Molonglo generally proceeding south to north. The following sections discuss the sequence of phasing, and the resulting sequence in which the PT network would come into being. Under this phasing, the complete Molonglo-City Rapid comes into full existence only in about 2030, since only by that date is enough of the development in place.

### 8.5.1 Phase 1

The most advanced development planning has occurred for the three southernmost suburbs, now called Coombs, Wright, and North Weston.[45]

Three steps are recommended at this stage and are shown in Figure 8.4.

- Create an all-day City-oriented service, running every 30 minutes all day with peak service as dictated by demand. (This is technically a "Coverage" level of service, although the intention here is for this market to grow into a Rapid). This service would run from Coombs / Wright via Cotter Road, Adelaide Avenue, Commonwealth Avenue, and direct to the City Interchange. *This is an interim service, necessitated by the south-to-north development pattern. It would eventually be removed as Molonglo approaches build-out.*
- Create a Peak Express ("Xpresso") from Coombs / Wright to Barton and Russell, running peak-only at headways dictated by demand. Initial service would probably be every 30 minutes for two hours on each peak.
- Create a Coverage service from Coombs / Wright to Woden via Weston Creek (Cooleman Court). This would form the first segment of an eventual Belconnen-Molonglo-Woden service.

These estimated service levels reflect the expectation that the new Molonglo suburbs will be more PT-oriented, and thus generate higher mode share, than similar suburbs developed in the late twentieth century. They also reflect the likelihood that external factors will increase the cost of driving a private car and thus cause further mode shift toward PT.

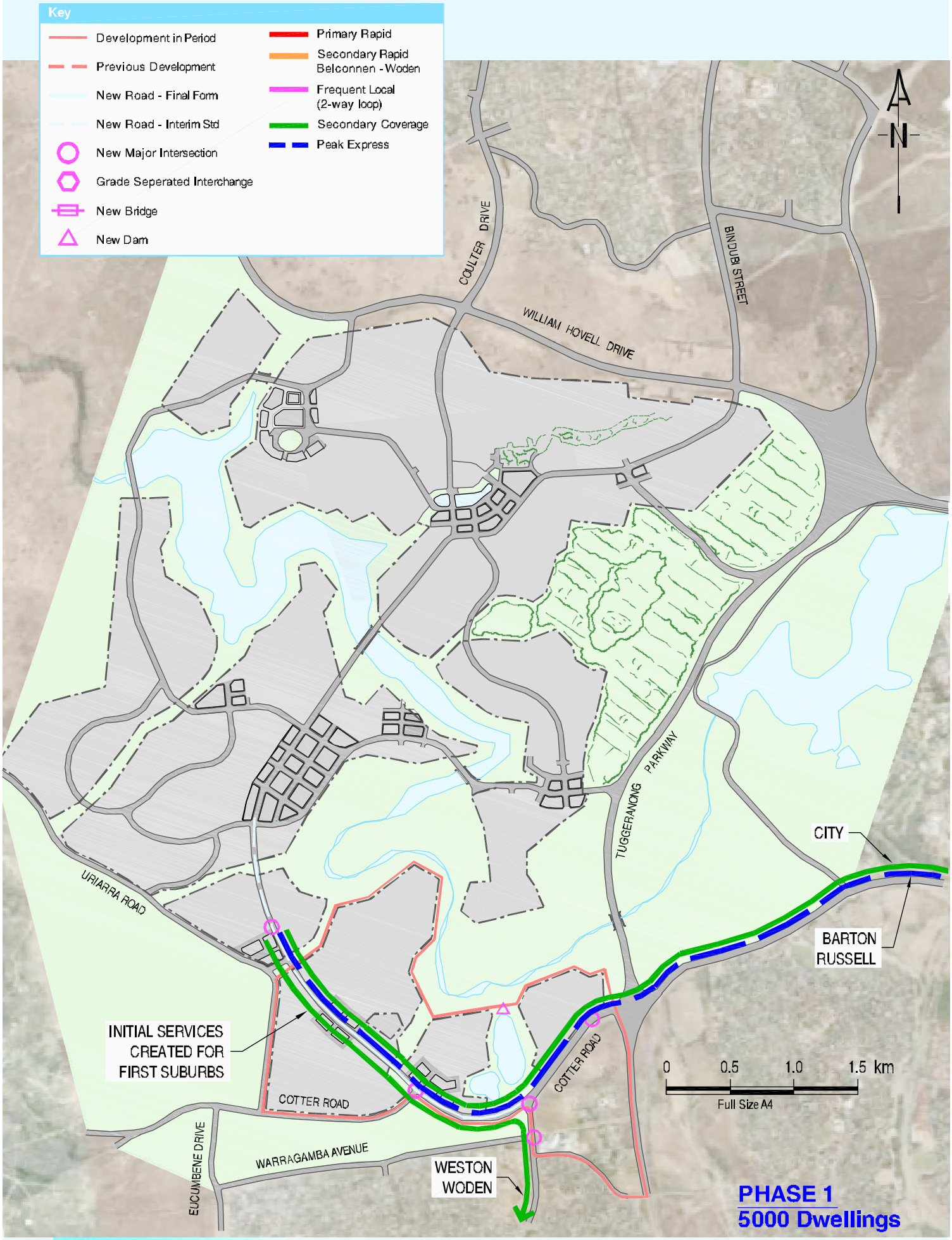
### 8.5.2 Phase 2

Phase 2 adds suburbs north and west of Coombs / Wright, including the southernmost part of the eventual Molonglo Group Centre. Refer to Figure 8.5.

At this stage, all of the services ending at Coombs / Wright would be extended to the Molonglo Group Centre, using the future interchange site as a terminus.

The interchange within the Molonglo Group Centre should be developed at this time; initially it will serve primarily as a terminal and layover point for the City - Molonglo and Molonglo – Barton - Russell services.

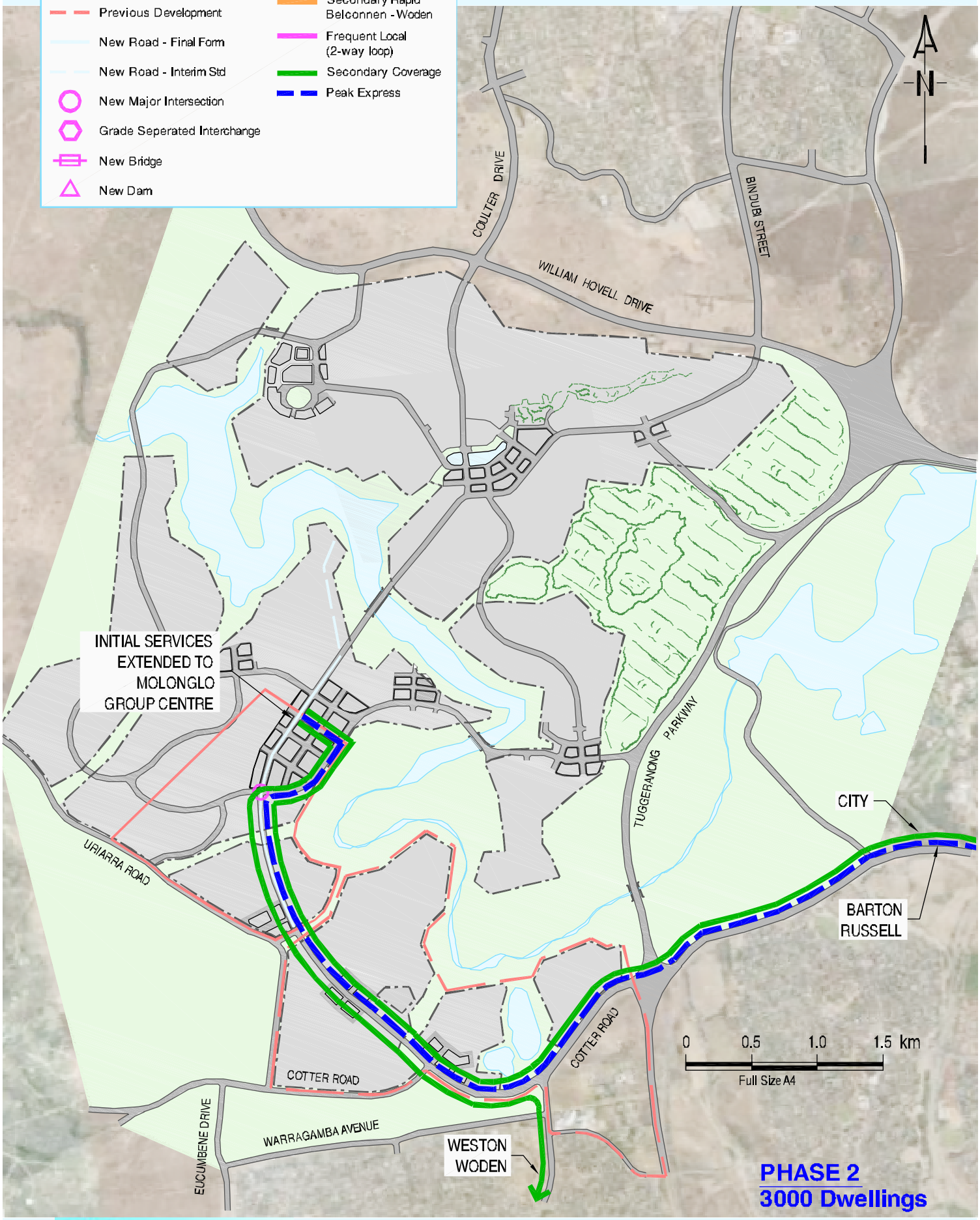
[45] All information in this section on development size and phasing was provided by ACTPLA. As always, these are only estimates, and actual development years will depend on patterns of demand.




McCormickRankinCagney

# MOLONGLO LONG TERM PUBLIC TRANSPORT CONCEPT

FIGURE 8.4

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# MOLONGLO LONG TERM PUBLIC TRANSPORT CONCEPT

FIGURE 8.5

### 8.5.3 Phase 3

Phase 3 adds the area generally west of the Molonglo Group Centre. The North-South Arterial would also be completed at this stage, in an interim form. Two changes would occur at this point, as indicated in Figure 8.6:

- Create the complete Belconnen-Molonglo-Weston-Woden route, initially as a half-hourly "Coverage" service. This will provide basic access to Belconnen and Woden from the developed area, at a level consistent with the level of development. The route would be in its final form except for the road segment between the North Molonglo Group Centre and the intersection of Bindubi St and William Howell Drive, so the route would initially bypass this section via William Howell Drive.
- Create a simple loop Coverage service for the newly developed area. At this early stage, the loop could be connected to the City-Molonglo service (via the Molonglo Group Centre interchange) so that this area would have through service to the City. However, it is important to note that this connection would eventually be removed when the full network comes into being.

### 8.5.4 Phase 4

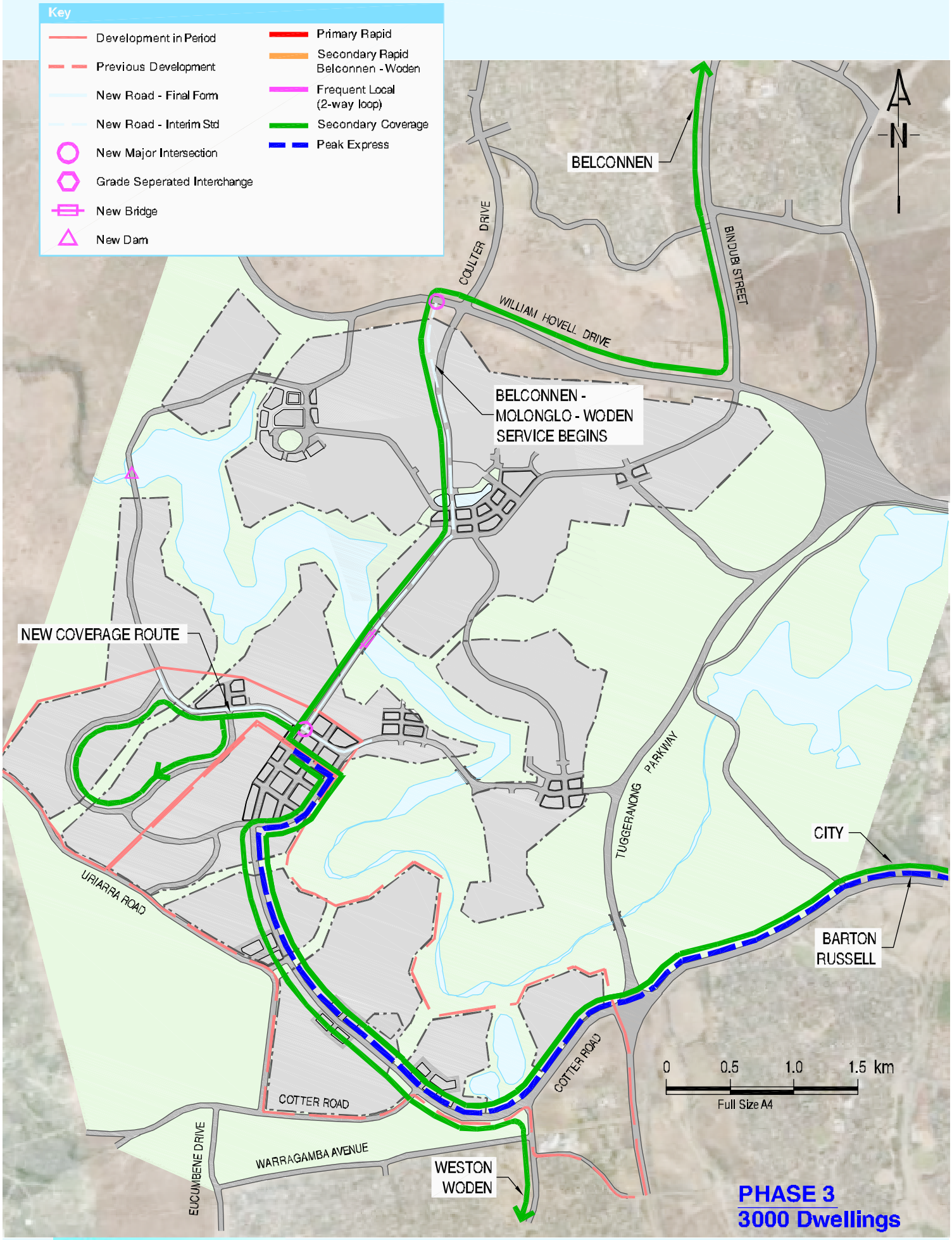
Phase 4 adds the North Molonglo Group Centre and completes the roadway from that centre to the intersection of William Howell Drive and Bindubi Street, refer Figure 8.7. At this stage:

- Revise the Belconnen – Molonglo - Woden service to run via the new road between the North Molonglo Group Centre and Bindubi Street.
- Upgrade this service to a minor Rapid, with service every 15 minutes all day.
- Introduce a City - Parkes Way - Molonglo service, initially at an interim level running every 30 minutes all day. This service is designed to gradually shift the market from the Cotter Road service to the Parkes Way service as Northern Molonglo develops.

### 8.5.5 Phase 5 (2031 Strategic Network)

This stage completes development northeast of the North Molonglo Group Centre and is shown in Figure 8.8.

This stage requires no new routes. At this time, the City - Parkes Way - Molonglo service can be upgraded to Rapid, with service every 15 minutes all day and peak service as required. The City - Cotter Road - Molonglo service can begin to be curtailed consistent with the buildout network shown in Figure 8.2.

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# MOLONGLO LONG TERM PUBLIC TRANSPORT CONCEPT

FIGURE 8.6

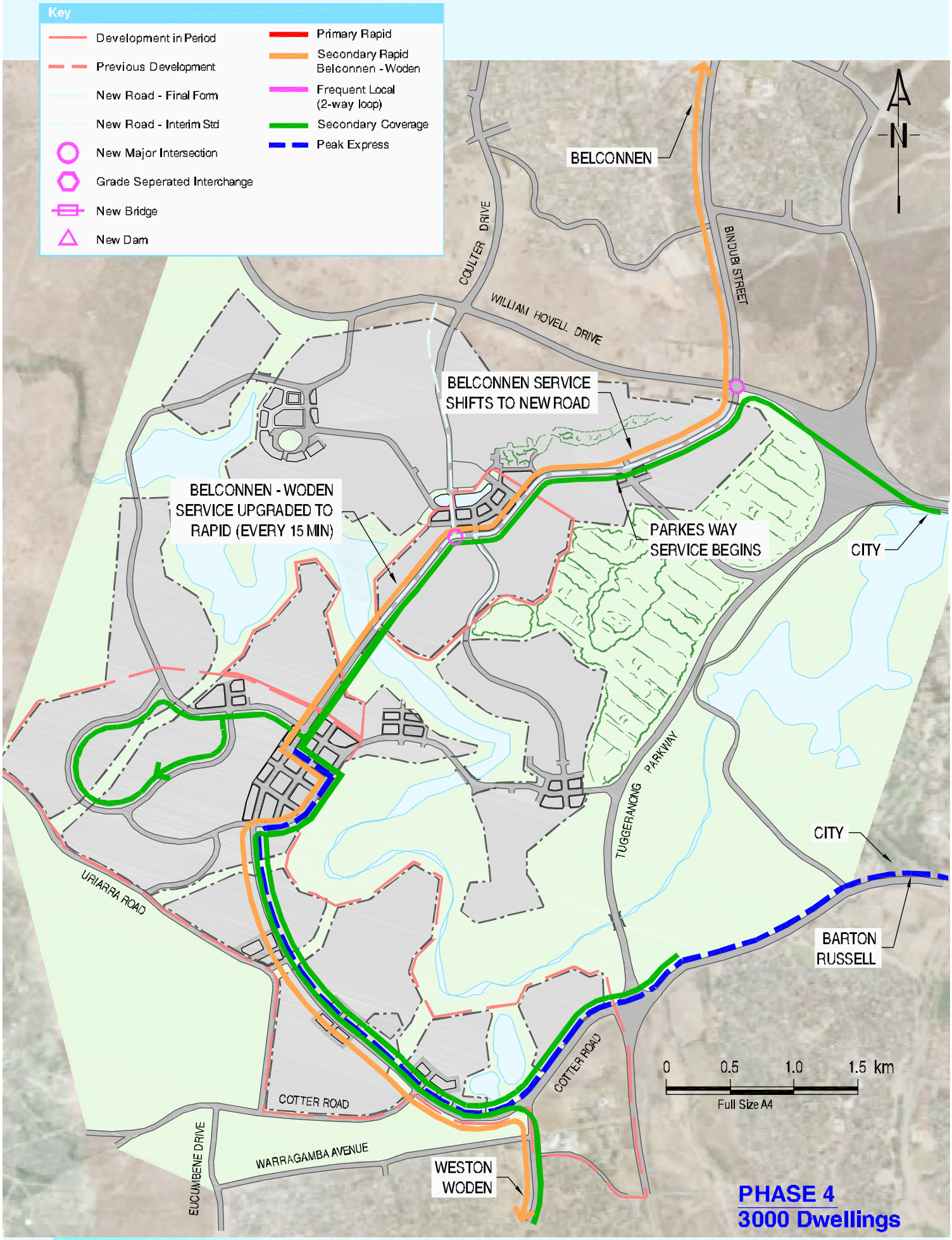


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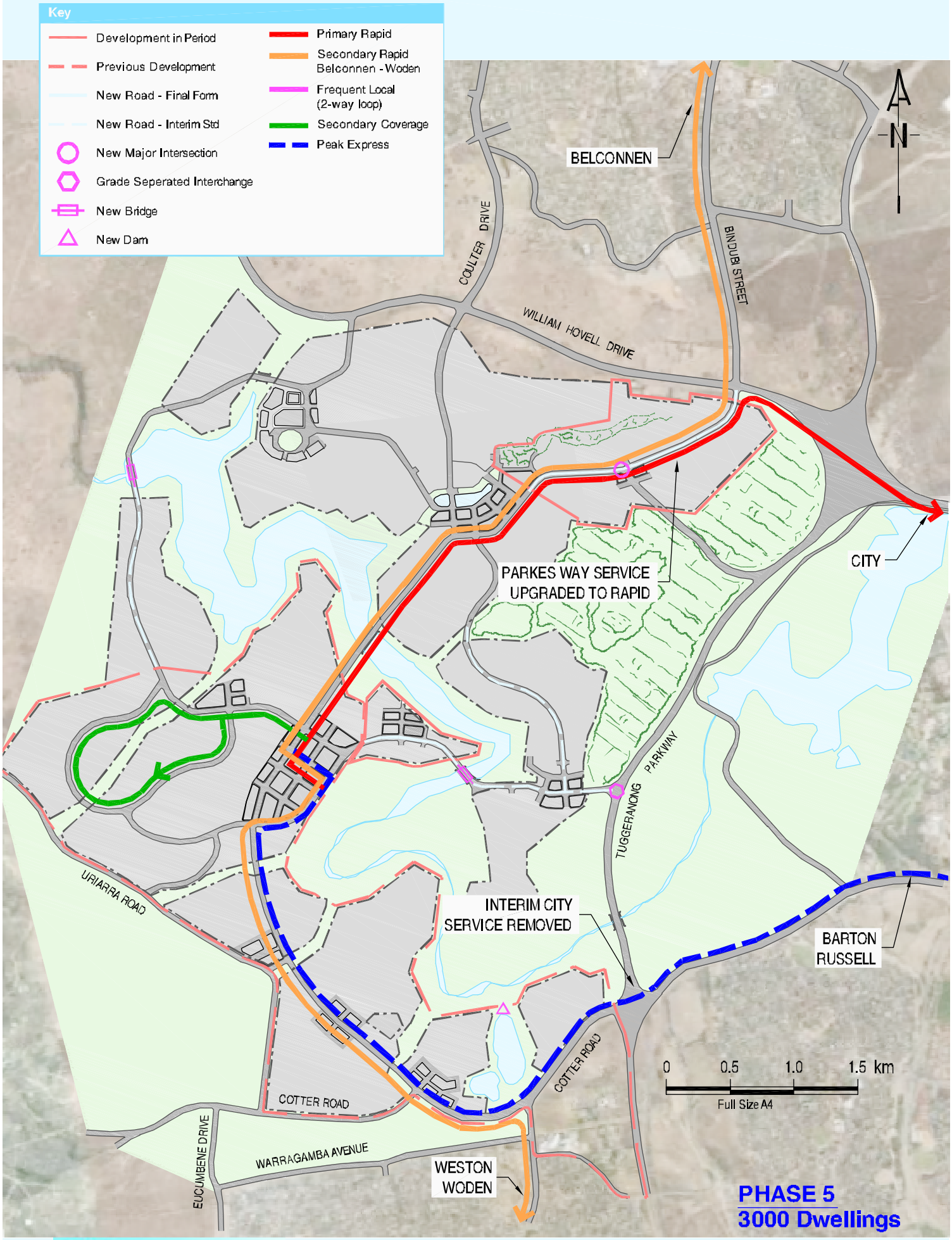
FIGURE 8.7

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# MOLONGLO LONG TERM PUBLIC TRANSPORT CONCEPT

FIGURE 8.8

This phase brings us to the study year of the other parts of the Strategic PT Network Plan. Molonglo development continues through three further phases until it reaches buildout about a decade later.

### 8.5.6 Phase 6

This phase, as shown on Figure 8.9 adds the suburb directly east of the Molonglo Group Centre. This is an area of relatively high density.

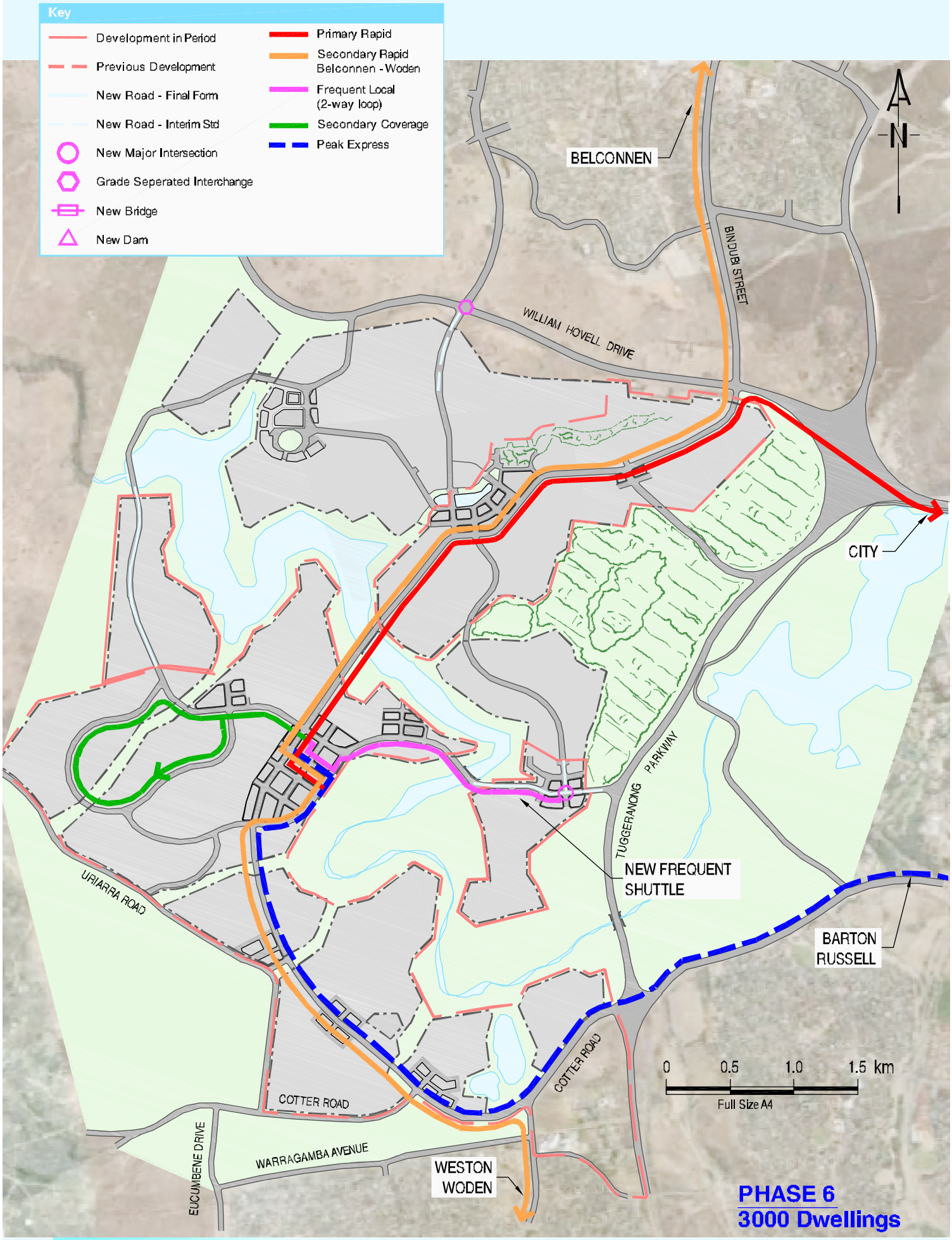
Initially, a Frequent Local shuttle would be needed between this area and the Molonglo Group Centre. Later, this will be revised to create the two-way Frequent Local loop.

### 8.5.7 Phase 7

Figure 8.10 present Phase 7 which completes the roadways needed to create the Frequent Local loop. This loop would be added at this stage, and the Coverage route in the southwest part of Molonglo would be redesigned to its final design as shown in Figure 8.2. At this stage, the entire network should be complete, although final patronage expectations would depend on completion of Phase 8.

### 8.5.8 Phase 8

No further network changes would be required at this stage.

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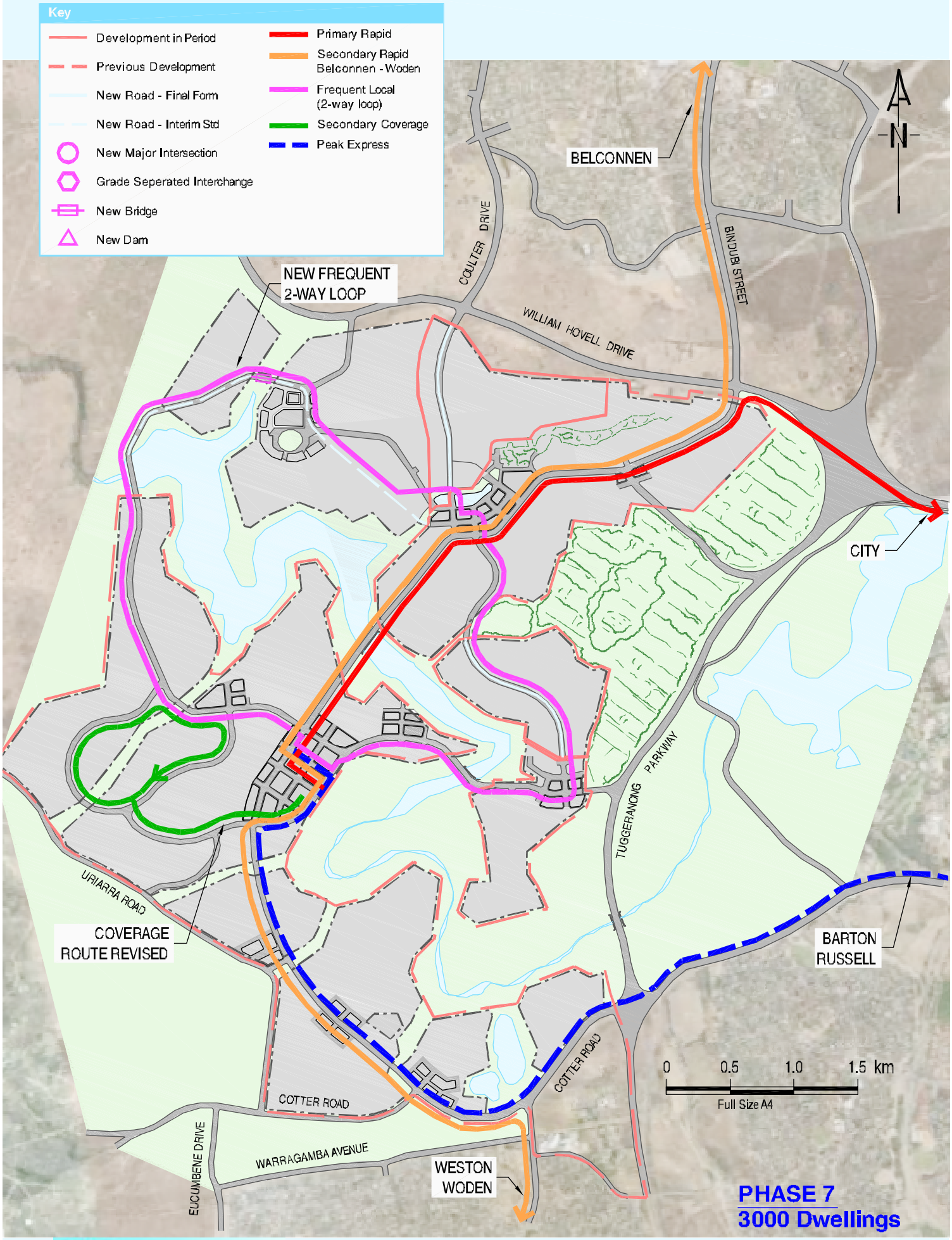
# MOLONGLO LONG TERM PUBLIC TRANSPORT CONCEPT

FIGURE 8.9

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# MOLONGLO LONG TERM PUBLIC TRANSPORT CONCEPT

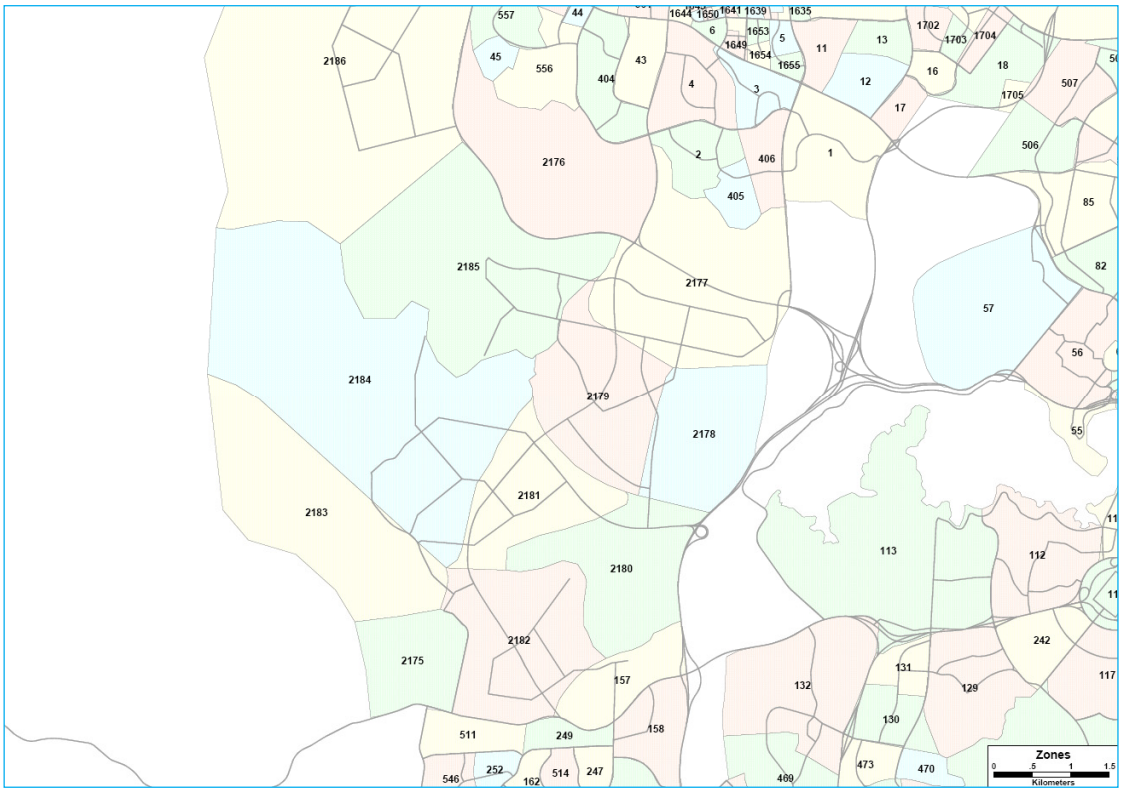
FIGURE 8.10

# Appendix A

## Molonglo & East Lake Land Use Data

Molonglo Land Use (2031)

| | ACTPLA Traffic Zone | Population | Employment | Retail Space | School & Tertiary Enrolment |
|---|---|---|---|---|---|
| SE1 | 326 | 1,107 | 217 | | 844 |
| SE2 | 335 | 2,191 | 531 | 473 | |
| S1 | 801 | 1,628 | 50 | 338 | 531 |
| S2 | 802 | 1,628 | 50 | 338 | 531 |
| C1 | 803 | 3,066 | 603 | 12,063 | |
| C2 | 804 | 3,066 | 603 | 12,063 | |
| C3 | 805 | 4,859 | 84 | 743 | 772 |
| W1 | 806 | 4,859 | 84 | 743 | 772 |
| SW3 | 807 | 9,274 | | | |
| SW1 | 808 | | 10 | 241 | |
| C4 | 811 | 6,604 | 113 | 3764 | |
| NE1 | 812 | 2,258 | 80 | 1,496 | 531 |
| NE2 | 813 | 2,258 | 80 | 1,496 | 531 |
| SW2 | 819 | | 10 | 241 | |
| E1 | 821 | | | 483 | |



East Lakes Land Use (2031)

| ACTPLA Traffic Zone | Population | Employment | Retail Space | School & Tertiary Enrolment |
|---|---|---|---|---|
| 249 | 3,088 | 338 | | |
| 258 | 798 | 1,448 | 2,895 | |
| 269 | 2,162 | 110 | 3,860 | |
| 270 | 1,222 | 228 | 2,895 | |
| 348 | 1,531 | | | |
| 349 | 2,248 | 303 | | |
| 350 | 1,148 | | | |
| 666 | 387 | | | |
| 667 | | 965 | 33,775 | |
| 668 | 763 | | | |
| 669 | 407 | | | |
| 670 | 427 | 152 | 1,930 | |
| 700 | | | 33,775 | |