Attachment 1

GOVERNMENT OF WESTERN AUSTRALIA

Department of **Transport**
Public Transport Authority
Main Roads Western Australia

TRANSPORT @ 3.5 MILLION

PERTH TRANSPORT PLAN

FOR 3.5 MILLION PEOPLE
AND BEYOND

FOR CONSULTATION

Department of Transport

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FOREWORD

The Government's objective in this plan is simple – establish what we need to do when it comes to transport infrastructure to ensure Perth remains one of the most liveable cities in the world.

While this document is built on extensive research and modelling by Government, it is just the start of a broader conversation with the community, business and industry about what we aspire Perth's transport network to look like into the future.

It has been many decades since Perth undertook a long term study of its transport requirements. The Stephenson-Hepburn Plan has served this city well as it has grown to its current level.

The last decade has shown how important Perth's transport system is and the pressures placed on it by rapid economic and population growth. Indeed, while Perth has a modern and effective transport system, we have started to see the levels of congestion on major roads and freeways, and crowding on trains and buses that are experienced in other cities.

With over two million people, Perth has a unique geography that stretches over 150 km along the coast from Yanchep in the north to beyond Mandurah in the south. As we move to a population of 3.5 million, nominally by 2050, we will require fundamental changes to the city's transport network to service growth areas and keep Perth moving.

It is clear that we need to plan for a transport network that will drive urbanisation around infrastructure and enable high levels of accessibility for work, education and other activities. *Transport @ 3.5 Million* is based on a significant shift in travel activity towards greater use of public transport in the peak periods and a continued shift to active transport (cycling and walking) for many trips. The priority investments will be within the city's Central Sector (within 15 -20 km of the Perth CBD) to promote higher density urban living and serve the major strategic centres. Whilst we need to accommodate urban expansion, we need to avoid the trap of retrofitting our transport infrastructure to urban sprawl.

Some major structural changes are needed to the network we see in Perth today – a new radial railway from the CBD to the north eastern suburbs via Morley, a major new orbital railway from Murdoch to Stirling, an inner city light rail network, new river crossings and a more substantial free-flowing freeway network to serve all parts of the city.

Another new feature will be to establish an underground CBD 'subway' to provide better connectivity in the city and encourage people to change their travel behaviour leading to higher public transport and active travel usage.

Cycling has grown rapidly in recent years, with trips on paths to the Perth CBD increasing by over 35 per cent in the last four years. To support ongoing growth in cycling, both for commuters and recreational cyclists, the Principal Shared Path network is proposed to be expanded from the current 172 km to over 850 km, linked by an interlocking network of strategic and local paths.

We have started to demonstrate the possibility of shifting throughput of traffic underground and there are potential benefits from improving the surrounding amenity of communities and property values from doing so. Whilst value capture has become topical recently in Australia it is possible that in the near future, developers, industry and local communities may work together to encourage further infrastructure and development once the potential value opportunity is better understood. Governments across the world are becoming increasingly capital constrained. It is important we become more innovative in how we fund future infrastructure.

It is also important that we focus on the customer experience when it comes to catching public transport. I want travellers to see public transport as a first class experience and a smart way to travel around our city. The new underground bus port is a statement of this, integrating new technology like dynamic stands and USB ports which make the journey easier. I want to understand what needs to be done to encourage more people to get on board our public transport network.

Transport @ 3.5 Million considers all modes of transport and is based on extensive research, knowledge, experience and predictive modelling. The mass transit network is based on independent advice from the Planning and Transport Research Centre (PATREC) led by Adjunct Professor Fred Affleck. The Plan takes into account many influencing factors, including future land use and employment distribution, changing demographics, social trends and expected advances in technology.

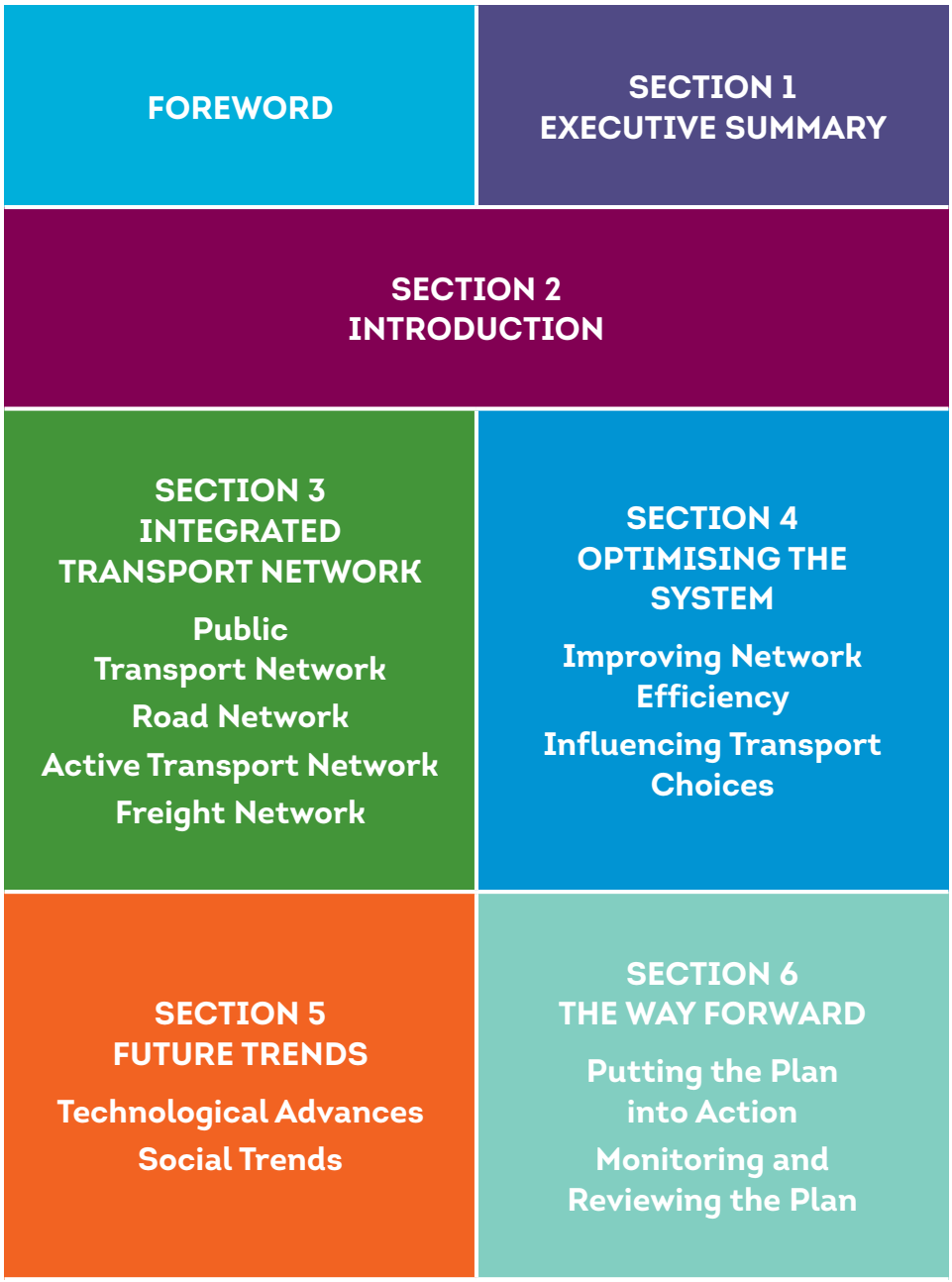
This plan will be a living document that continues to evolve as the city grows. Technological developments will change the way we plan and implement transport solutions as things that we cannot yet imagine are invented and impact the way we move around. The plan will be reviewed every five years to ensure it continues to meet the needs of Perth's growing population.

The plan is now being released to provide the opportunity for consultation with federal, state and local government bodies, business, industry, academia and the wider community. The plan will be reviewed based on feedback from a consultation period before being finalised.

I encourage you to consider *Transport @ 3.5 Million* and provide your feedback to the Department of Transport. In closing, I believe it is important to acknowledge Reece Waldock, Director General of Transport for his leadership in developing this plan. I believe he leaves an important and valuable legacy for generations to come.

Hon Dean C Nalder MLA
Minister for Transport

NAVIGATING TRANSPORT @ 3.5 MILLION



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EXECUTIVE SUMMARY

Perth is one of the most liveable cities in the world. *Transport @ 3.5 Million* and beyond is aimed at keeping it that way. Vibrant. Connected. Productive.

Transport @ 3.5 Million is modelled on the Western Australian Planning Commission's draft *Perth and Peel @ 3.5 Million* planning frameworks of where people will live and work. It also aligns with the *Perth and Peel Green Growth Plan for 3.5 Million*.

Planning a transport network for the long term is inherently challenging. We are forecasting the travel needs and behaviours of a society as far away from us today as 2016 was for transport planners in the 1970s. In addition to social and economic externalities, technology is an increasingly active influence and we will need to closely monitor its future impact on our transport choices.

Our Vision

A vibrant, connected and productive Perth will need a transport network that meets the following objectives:

- optimises use of the existing network and as it grows;
- integrates with land use and across the public transport, active transport and road networks;
- delivers high frequency, 'turn up and go' mass rapid transit connected with effective public transport feeder services;
- provides a safe, connected active transport network of primarily off-road cycleways and walkways; and
- maintains a free-flowing freeway and arterial road network for the efficient distribution of people and freight.

Outcomes

Delivering *Transport @ 3.5 Million* will:

- increase public transport use to
  - 11 per cent of all-day trips, including 65 per cent of peak period trips to the Perth CBD; and
  - 32 per cent of person kilometres travelled by motorised vehicles during peak periods;
- increase cycling and walking to 18 per cent of all-day trips; and
- reduce the mode share of car driver trips to 50 per cent of all-day trips, and to 29 per cent of peak period trips to the CBD.

TRIPS PER DAY	BASELINE – LAST CENSUS 2011	@3.5 MILLION	% INCREASE	@ 3.5 MILLION % MODE SHARE
	IN MILLIONS			
Car driver	3.6	6.3	75	50
Car passenger	1.4	2.6	86	21
Public transport	0.4	1.4	250	11
Cycling	0.1	0.5	400	4
Walking	0.8	1.7	112	14
Total	6.3	12.5	98	100

Figure 1: All-day trips now and in the future

MOTORISED TRIPS IN THE AM PEAK PERIOD @ 3.5 MILLION		
	MILLIONS	%
Car driver vehicle-kms	11.3	53
Car passenger person-kms	3.2	15
Bus persons-kms	1.6	8
Rail persons-kms	5.0	23
Light Rail Transit persons-kms	0.2	1
Total	21.3	100

Figure 2: Peak period motorised trips @ 3.5 million

Public transport

Perth's world class integrated public transport network will be optimised and expanded to make public transport the mode of choice for those travelling in peak periods to major centres. High frequency services connecting strategic activity centres will mean people choosing mass transit can 'turn up and go'.

New, higher capacity rail cars, improved signalling and increased station capacity will help get the most out of the existing rail network.

NEW RAIL LINES

The East Wanneroo Rail Link will be a new rail line servicing Morley, East Wanneroo and the northern suburbs. It will alleviate pressure on the Joondalup line and connect the north east sector to the wider mass transit network. A rail spur from Marshall Road to Ellenbrook is being considered in the very long term.

Cross city mobility will be improved with two new orbital routes. The Stirling-Murdoch Orbital will be mostly underground, linking specialist hospital and university centres and connecting to stations on the Joondalup, Fremantle and Mandurah rail lines. Ultimately it will continue on to the Armadale line via Thornlie and from Stirling to Morley.

Perth Light Rail will create an inner orbital route, providing high frequency services between UWA–QEII and Canning Bridge via the Perth CBD and Curtin University.

Beyond 3.5 million, a separate inner-city 'subway' will provide high capacity, high frequency short distance connections between central Perth, East Perth, West Perth, Northbridge, Leederville and other inner city centres. It is possible that elements of the subway could be undertaken in the development of radial lines through the CBD.

Existing rail lines will be extended to cater for growing suburbs, with the Joondalup line extending to Yanchep, the Armadale line to Byford, Midland line to Bellevue and Thornlie line to Cockburn Central.

Roads

Roads will continue to play a major role in Perth's transport system.

To get the most out of our freeways and expressways, new technologies will be used to manage traffic flow and provide drivers with real-time information on travel times, average speeds and road conditions.

The freeway network will consist of two long north-south spines, consisting of the Kwinana-Mitchell Freeways and Tonkin Highway, extending the full length of Perth. A new Whiteman-Yanchep Highway will join the spines in the northern suburbs. In the south, the Fremantle-Rockingham Highway will connect to the Kwinana Freeway near Rockingham and extend northwards via Stock Road.

The Reid and Roe Highways will create a ring around the central region and provide connections to the north, east and south.

NEW RIVER CROSSINGS

The Stock Road tunnel will run from Leach Highway to Mitchell Freeway providing a new, major north-south route bypassing the city centre.

Links around the city will be augmented with the new East-West Tunnel under Perth Water that will connect with a new bridge or tunnel west of the Causeway to the Narrows interchange. This link will enable better access to the city river front and divert some traffic from the Causeway.

Active transport

Active transport includes walking and cycling. *Transport @ 3.5 Million* increases today's 172 km of off-road commuter cycleways to 850 km.

Of the more than six million trips taken each day, cycling represents about 2 per cent and walking 13 per cent. Extending and connecting the active transport network will see the share of cycle trips double to 4 per cent and walking will increase to 14 per cent.

NEW GREEN BRIDGES

Green bridges will cater for active transport, improving connectivity across the rivers and over lakes.

The new Three Points Bridge will connect Chidley Point, Point Walter and Point Resolution, creating a 40-minute bike ride from Fremantle to Perth.

There will be three new bridges across the river between

Heirisson Island and Maylands, three over the Canning River between Salter Point and Waterford and bridges across Lake Joondalup and Lake Goollelal in the northern suburbs.

Freight

A strategic freight corridor from Muchea to the Fremantle Port Inner and Outer Harbours will be the core of the freight network. Perth Freight Link will be completed in full to the Inner Harbour; and Rowley, Anketell and Mundijong roads will be upgraded from this strategic corridor to the Outer Harbour.

The freight rail line will transport containers between the harbours and intermodal terminals. Rail and road routes will service the new Latitude 32 intermodal terminal, which will play a key role in any new container port development in the Outer Harbour, along with new intermodal terminals in Kewdale and South Bullsbrook.

From this strategic corridor, freight will access regional areas via the Great Northern Highway, Great Eastern Highway (including a new highway north of the existing route), and the Forrest, Albany and Brookton highways.

Influencing travel choices

In addition to optimising and growing the network, *Transport @ 3.5 Million* includes strategies to manage congestion and get the most from our infrastructure. By 3.5 million:

- *Travel plans* – major commercial and residential developments in and around activity centres will have plans to encourage sustainable travel options and manage traffic;
- *Parking strategies* – similar to the current Perth Parking Management Area, strategies will be introduced to promote public and active travel options;
- *Transport pricing* – we will engage with the Commonwealth and other States on national road pricing reforms and create a differential between peak and off-peak public transport fares to encourage changes in travel patterns that reduce overcrowding; and
- *TravelSmart and Your Move programs* – will be extended to more workplaces, schools and households to inform people about their travel choices and encourage voluntary changes in travel behaviour.

Future Trends

Future trends, particularly in technology, will be closely monitored to ensure we keep pace with change and grow our transport system in the most appropriate manner. Of particular interest will be how electric vehicles, automated vehicles and the internet of things influence transport in the future.

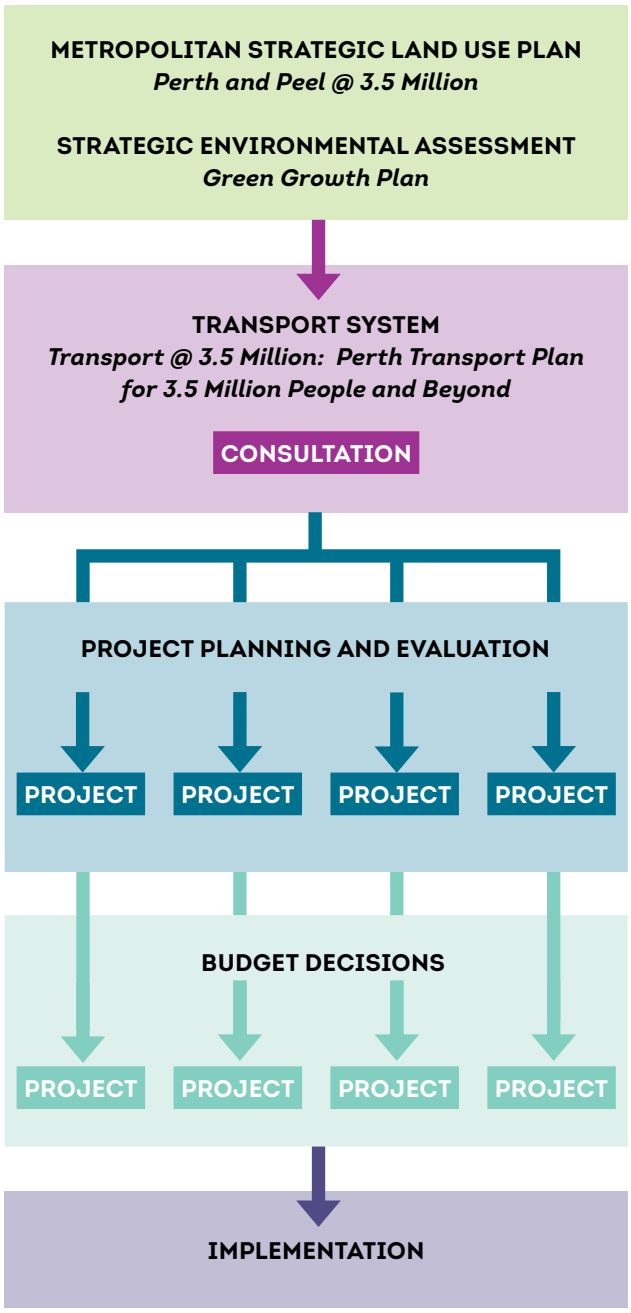


Figure 3: The Transport Planning Process

Implementing Transport @ 3.5 Million

Transport @ 3.5 Million sets the vision for a generational change to Perth's transport network. Many of the projects in the Plan are new and conceptual – these will be the subject of further examination in regard to scope, engineering and design, cost and funding, as well as timing. This will occur as part of the Government's usual planning and investment decision making processes.

Further modelling and analysis will be required over the decade as new information becomes available.

Transport @ 3.5 Million will be reviewed every five years to ensure it continues to meet the needs of Perth's growing population.

2

INTRODUCTION

Transport @ 3.5 Million provides a long term plan to guide development of a strategic, sustainable and robust transport network for Perth and Peel.

It describes a future transport network that provides people with more than one viable option for travelling to work, school and shops and for accessing services and recreational activities.

Transport @ 3.5 Million is an integrated plan that considers not just transport, but the intersection of transport, land use, health and environmental management. It considers how the public transport, active transport and road networks will work together to ensure the best transport, lifestyle and economic outcomes for Perth.

The plan will guide future investment, planning and policy decisions for the metropolitan transport system, as well as inform local government planning, industry, developers and the community.

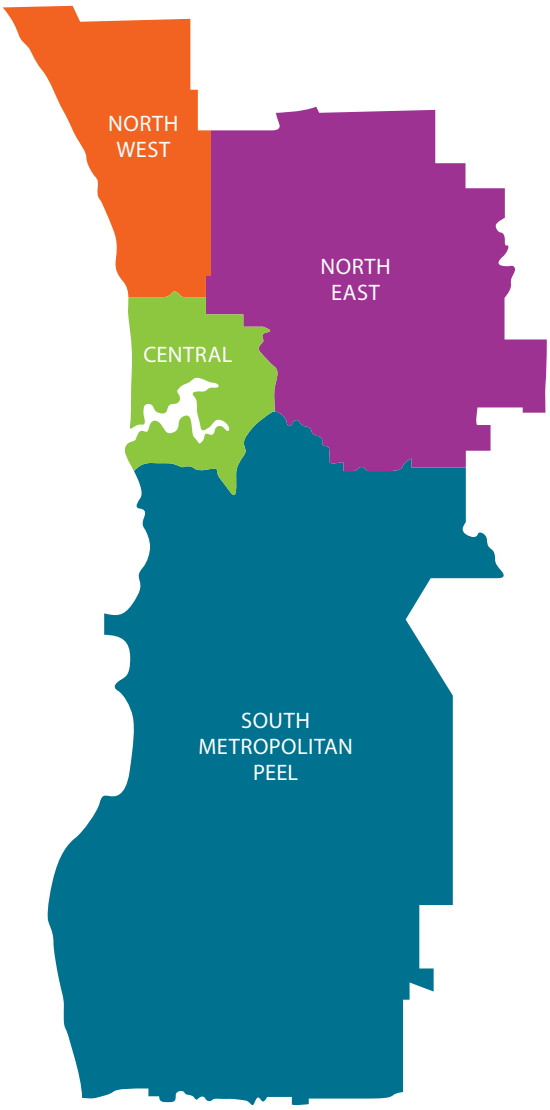
Vibrant. Connected. Productive.

Transport @ 3.5 Million has established five key objectives to support its vision of a vibrant, connected and productive city:

- optimise the use of the existing network and as it grows;
- integrate with land use and across the public transport, active transport and road networks;
- deliver high frequency, 'turn up and go' mass rapid transit connected with effective public transport feeder services;
- provide a safe, connected network of primarily off-road cycleways and walkways; and
- maintain a free-flowing freeway and arterial road network for the efficient distribution of people and freight.

Achieving these objectives by the time Perth reaches a population of 3.5 million will keep Perth liveable, enable economic growth and provide more viable transport options for residents and visitors.

Over the next 35–40 years, 800,000 new homes will be required to accommodate Perth's growing population.



REGION		2011	2050
NORTH WEST			
	People	322,486	740,318
	Jobs	80,566	229,089
	Homes	114,923	283,716
NORTH EAST			
	People	209,156	450,590
	Jobs	82,379	187,986
	Homes	76,547	179,101
CENTRAL			
	People	782,974	1.2m
	Jobs	540,000	780,000
	Homes	2050 infill target of 215,000 homes	
SOUTH METROPOLITAN PEEL			
	People	523,406	1.26m
	Jobs	143,971	437,725
	Homes	205,493	507,670

Figure 4: Perth's population, jobs and homes targets

(Source: Perth and Peel @ 3.5 Million - what will Perth and Peel look like in 2050? Western Australian Planning Commission, 2015)

Transport challenges

There are a number of challenges facing Perth as our city grows. The future transport network needs to adapt and, in many cases, influence how Perth grows to keep us vibrant, connected and productive.

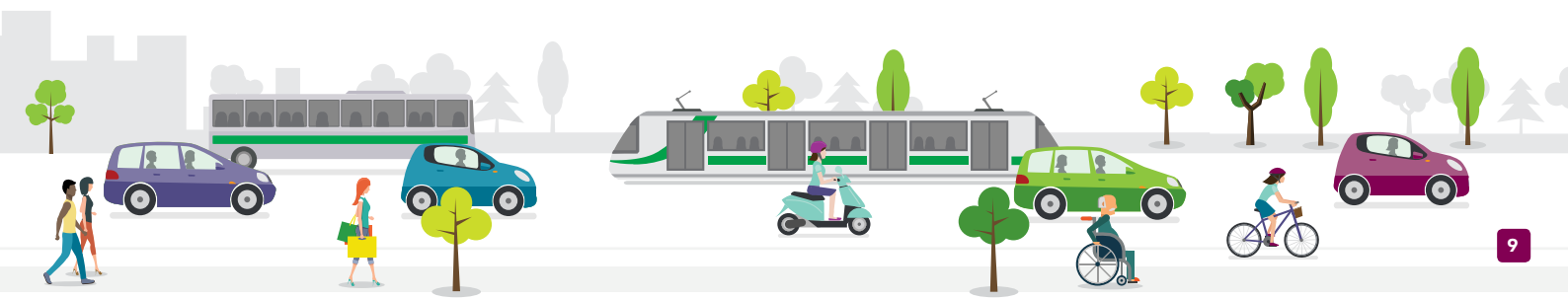
POPULATION GROWTH

Transport @ 3.5 Million is part of a suite of Government plans to prepare for a 70 per cent increase in Perth's population. This plan adopts the population projections, land use patterns and employment distribution targets set out in the Western Australian Planning Commission's (WAPC's) draft *Perth and Peel @ 3.5 Million* planning framework. It takes into account the environmental strategies identified in the *Perth and Peel Green Growth Plan for 3.5 Million*.

Over the next 35 – 40 years, 800,000 new homes will be required to accommodate Perth's growing population.

This will nearly double the number of trips made every day in and around Perth – leading to over 12 million trips per day. Freight and commercial traffic will also increase significantly, fuelled by industry, business and retail changes, including online shopping.

Increasing the share of trips made by public transport, walking and cycling will be critical to managing the travel demands of Perth's growing population. This is linked to providing timely infrastructure and efficient services to promote infill development around activity centres as well as new growth areas.



LOW DENSITY DEVELOPMENT

Perth is a low density city stretching over 150 km from north to south. Almost three quarters of new housing is on the metropolitan fringe, while most jobs are in the central region.

Low density suburbs disperse commuter demand. This creates a reliance on cars as the primary mode of travel. Low densities make it difficult to provide an efficient public transport network and expensive to deliver new and ever-expanding infrastructure.

The WAPC's *Perth and Peel @ 3.5 Million* land use planning framework sets the vision for a more sustainable city that limits urban sprawl. It sets a 47 per cent target for residential infill and is designed to encourage employment opportunities outside the CBD.

Transport @ 3.5 Million is predicated on the WAPC's land use plan. It aims to drive an increase in higher density living in the central area and around activity centres and provide access to new employment opportunities. Meeting the targets set out in *Perth and Peel @ 3.5 Million* is essential to the effectiveness of the future transport network proposed in this plan.

CONGESTION

Today, we make nearly seven million trips every day in and around Perth. Over five million of those trips are by car.

This proportion decreases during peak periods, however the majority of cars on the road during the peak contain a single person. This may be convenient for some people but it is also unsustainable, attracting significant infrastructure costs and impacting economic activity.

Congestion is not just inconvenient for private travellers, it impacts on freight and commercial vehicles by increasing the cost of business (e.g. loss of productivity and increased fuel costs). In 2015 the avoidable cost of congestion in Perth was estimated at $2 billion per annum. Without change, by 2030 this will more than double to between $4.4 billion and $5.7 billion per annum.[1]

While roads will continue to play an important role in Perth's transport system, particularly for those living in the outer suburbs, a key focus of this plan is providing more viable travel choices to keep Perth moving in the future.

Congestion will be managed by attracting more people to use public transport, improving traffic flows at congestion hot spots, boosting participation in cycling and walking, encouraging individuals to make informed travel choices, and making the investments contained in this Plan.

NETWORK EFFICIENCY

Providing more viable choices means we use our transport network more efficiently, sharing the load across modes and throughout the day.

The network has to be designed to accommodate the heaviest load. If we can 'spread the peak' so fewer people are travelling in the same direction at the same time and increase the proportion of people travelling by public transport, car-pooling, walking and cycling, then we can optimise the performance of the network and get the most value from our investments.

Technology will play an important role in optimising the network and informing travel choices before and during our journeys, by providing real-time information on travel times, average speeds and road conditions.

New technologies will be used to get more out of our public transport system and to manage traffic flows on our roads. These include improved rail signalling, which will enable higher frequency train services, real-time tracking of buses and traffic signal priority systems which work together to improve the reliability of bus services.

HEALTH AND THE ENVIRONMENT

By providing a transport system that supports active and public transport choices, we can improve economic, health and environmental outcomes for Perth.

Physical inactivity and obesity are major health concerns in Australian cities. Obesity added $2 billion in direct costs to Australia's health system in 2008.[2]

In 2013, two out of three people in Perth were classed as overweight or obese.[3] Active transport, such as walking and cycling, helps make physical activity a part of our daily routine.

Everyone can play a part in helping to improve air quality in Perth by choosing to walk, cycle and use public transport more often. In the future, the increasing use of electric-powered vehicles, especially when powered from renewable energy sources, will also help to keep our air clean and city liveable.

Transport accounts for 17 per cent of greenhouse gas emissions in Australia.[4] Incremental gains in the energy efficiency of vehicles are being outstripped by growth in vehicle numbers, particularly large private vehicles such as SUVs and 4WDs.

The Australian Government has set a target to reduce greenhouse gas emissions to 26-28 per cent below 2005 levels, by 2030.[5]

Perth will need to do its part in achieving this target, while also planning and delivering changes to the transport network that adapt to predicted climate change impacts, such as sea level rises and increasing frequency of extreme weather events.

1 BITRE (2015) Information Sheet 74:Traffic and congestion cost trends for Australian capital cities: https://bitre.gov.au/publications/2015/is_074.aspx

2 Access Economics (2008) The growing cost of obesity in 2008: three years on: https://www.diabetesaustralia.com.au/reports

3 National Health Performance Authority (2013) Overweight and Obesity Report: http://www.myhealthycommunities.gov.au/Content/publications/downloads/NHPA_HC_Report_Overweight_and_Obesity_Report_October_2013.pdf?t=1458259200026

4 Department of Environment (Cth) Quarterly Update of Australia's National Greenhouse Gas Inventory: June 2015: http://www.environment.gov.au/system/files/resources/cb14abbb-3a4b-406f-a22d-86f565674c3e/files/nggi-quarterly-update-jun-2015.pdf

5 Department of Environment (Cth) Paris Agreement: http://www.environment.gov.au/climate-change/international/paris-agreement

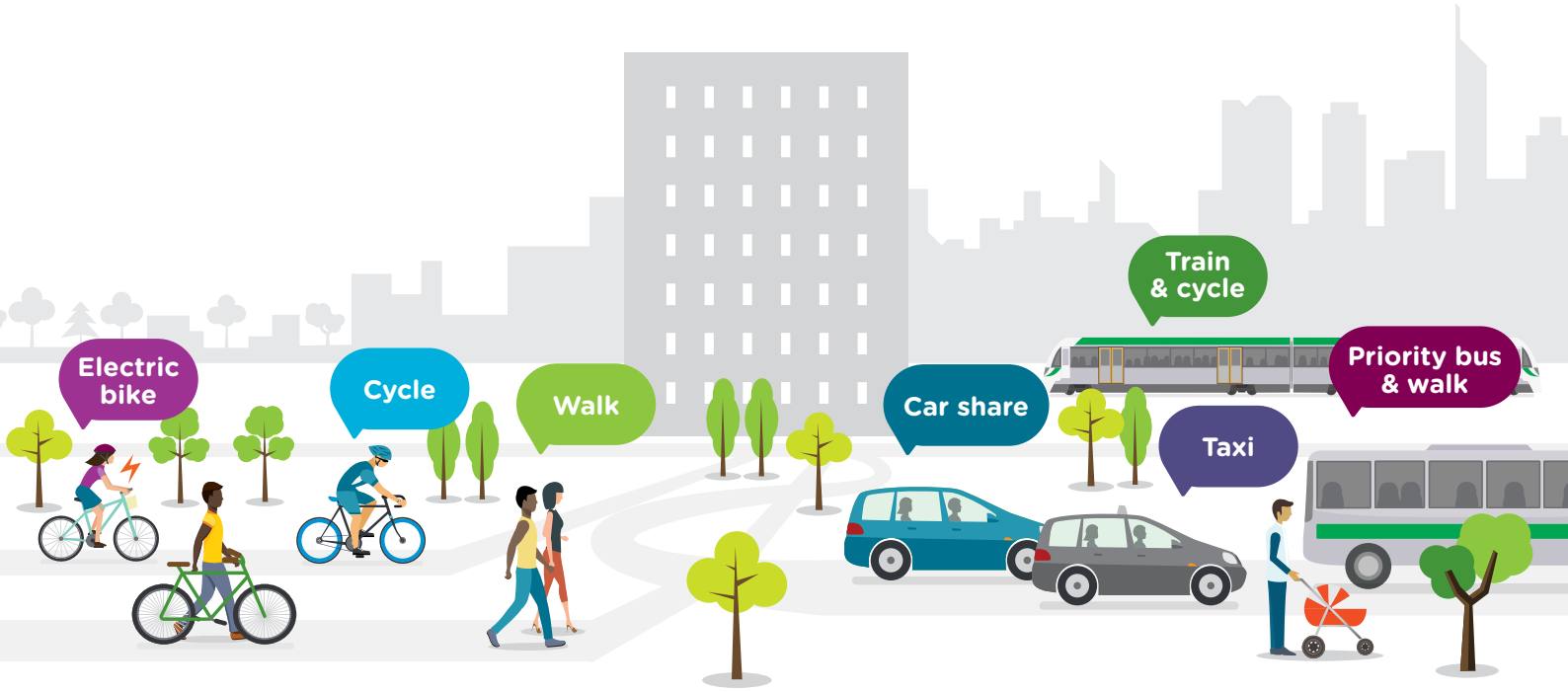


Figure 5: Your move, your choice

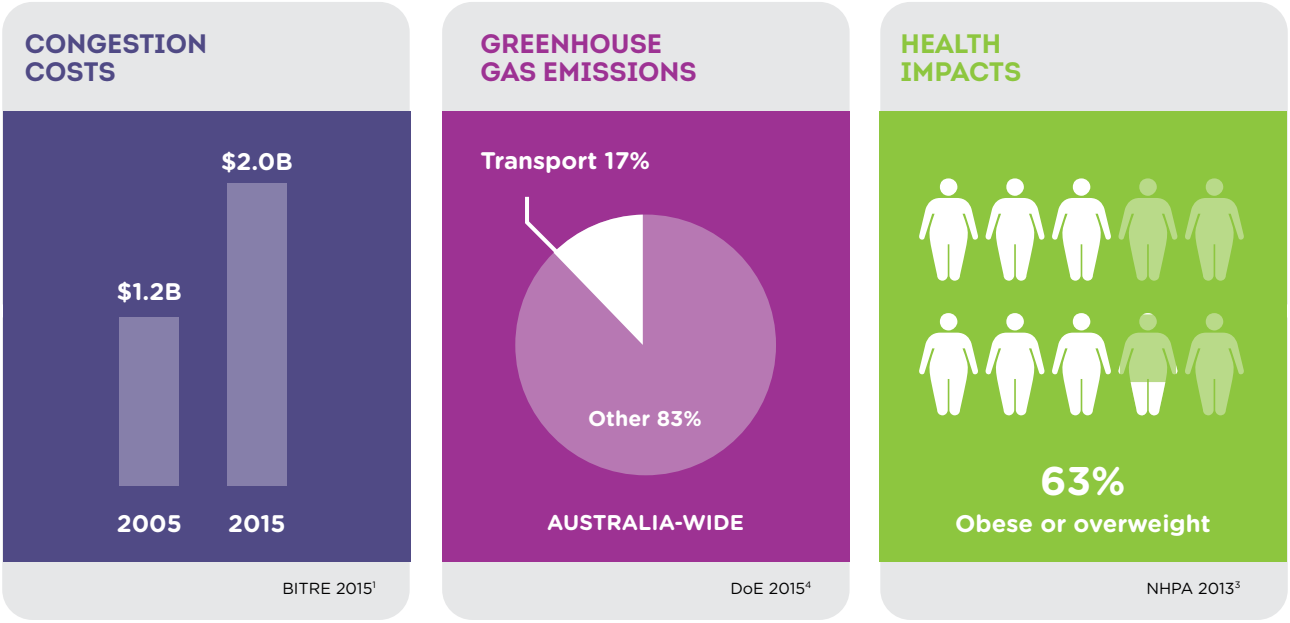


Figure 6: Congestion, environment and health

In 2015 the avoidable cost of congestion in Perth was estimated at $2 billion per annum. Without change, by 2030 this will more than double to between $4.4 billion and $5.7 billion per annum.[1]

3

INTEGRATED TRANSPORT NETWORK

Perth's integrated transport network will be expanded to provide more travel choices on more routes to keep Perth moving as the city grows.

Our city's future success will be based on how accessible, efficient and reliable the transport network is and how well we are able to manage congestion. More travel will be to and from activity centres that will increasingly cater for our work, education, health, social and recreational needs.

The integrated network for 3.5 million people:

- focuses on connecting major activity centres and encouraging transit-oriented development that is well-serviced by all modes of transport;
- prioritises active and public transport to meet the significant increase in travel demand that population growth will generate;
- completes the strategic road network and identifies ways to use the network more efficiently; and
- serves increasing freight demand with efficient links to ports, airports and intermodal hubs.

This section sets out major changes to our transport infrastructure that will allow the network to meet Perth's future needs. The next section identifies ways to optimise the transport system, so we get the most out of existing assets and future investments.

The Perth CBD will continue to be a major centre of employment. One of the biggest challenges will be to create more river crossings so that people can traverse the city without creating bottlenecks into the Perth CBD.

Although the network plans are presented separately (as public transport, road, active transport and freight network plans), they have been developed in a coordinated and integrated way.

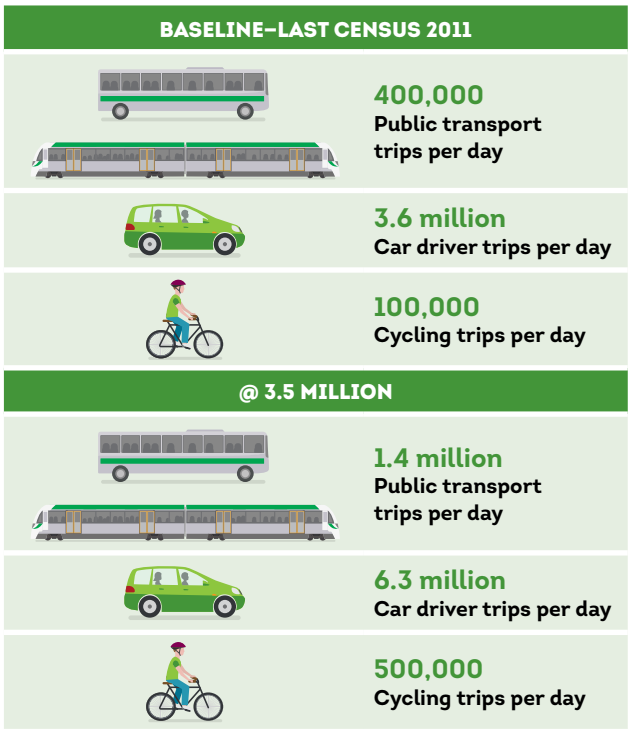


Figure 7: Comparison of public transport, car driver and cycling trips

The plan is based on the *Perth and Peel @ 3.5 Million* land use patterns, employment and housing distribution and aims to connect people to activity centres and connect freight from its origins to its destinations.

The plan is also consistent with the *Perth and Peel Green Growth Plan for 3.5 Million* and supports our environment, health, safety and social amenity by encouraging the uptake of public transport and more cycling and walking.

The public transport, active transport and road networks are complementary with active transport routes connecting to public transport and major strategic activity centres. The extended freeway network is mostly achieved by upgrading existing highways and, with new river crossings, will help to spread the traffic load as the city grows.

Underpinning the economy is our freight network. *Transport @ 3.5 Million* will keep our major industrial areas connected with ports and airports and provide clear access to major routes out of the city to keep Perth connected with regional areas and other states.

This overall network integration ensures that the right modes are servicing the right areas, so that we all have transport choices that will keep Perth vibrant, connected and productive in the future.

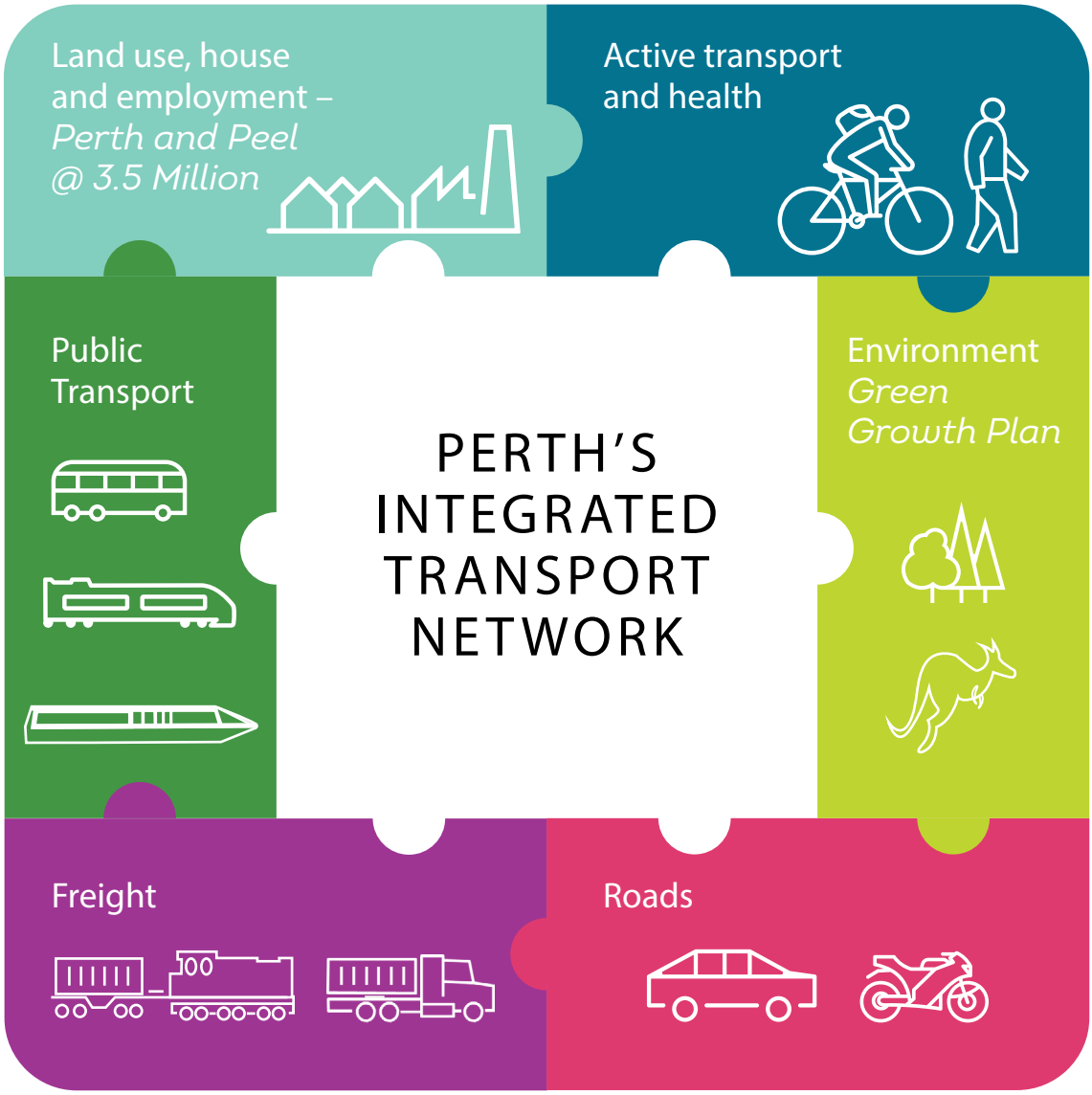


Figure 8: Perth's Integrated Transport Network

Attachment 1

The Integrated Mass Transit Network @ 3.5 Million and Beyond

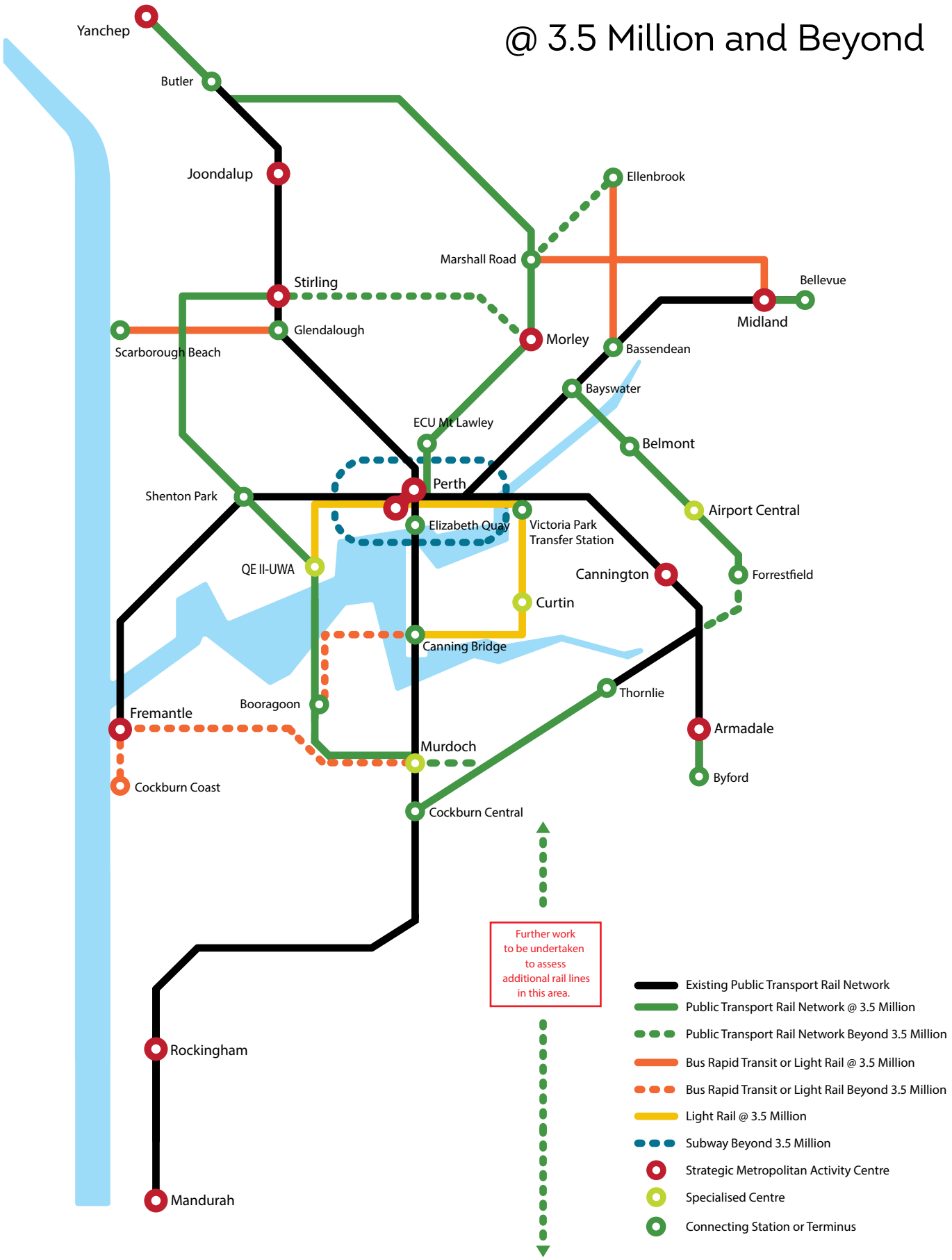


Figure 9: Map – The Integrated Mass Transit Network at 3.5 Million people and beyond

3.1 PUBLIC TRANSPORT NETWORK

At a glance

EAST WANNEROO RAIL LINK

A new suburban radial rail line to service Morley and East Wanneroo, connecting to the Joondalup line to service the far northern suburbs.

Stage 1 City to Morley and Marshall Road – by 2.7 million

Stage 2 Marshall Road to the Joondalup Line – by 3.5 million

Stage 3 Ellenbrook spur – beyond 3.5 million

STIRLING-MURDOCH ORBITAL

An orbital rail service connecting the significant activity centres of UWA-QEII and Murdoch (which includes Fiona Stanley Hospital and Murdoch University).

Stage 1 Stirling to UWA-QEII – by 3.5 million

Stage 2 UWA-QEII to Murdoch – by 3.5 million

Stage 3 Murdoch to Thornlie line – beyond 3.5 million

Stage 4 Stirling to Morley – beyond 3.5 million

RADIAL EXTENSIONS

Existing rail lines will be extended to cater for growing suburbs

Joondalup line to Yanchep – by 2.7 million

Midland line to Bellevue – by 2.7 million

Thornlie line to Cockburn Central – by 2.7 million

Armadale line to Byford – by 3.5 million

Forrestfield Airport Link to connect to Thornlie line – beyond 3.5 million

PERTH LIGHT RAIL

Light rail will provide an inner orbital link connecting UWA-QEII to Canning Bridge, via the Perth CBD, Victoria Park and Curtin-Bentley.

Stage 1 UWA-QEII to Curtin-Bentley – by 2.7 million

Stage 2 Curtin-Bentley to Canning Bridge – by 3.5 million

INNER-CITY SUBWAY SYSTEM

In the long term, a separate inner-city subway system will provide high capacity, high frequency, short distance connections between central Perth, East Perth, West Perth, Northbridge, Leederville and other inner city centres *– beyond 3.5 million*

BUS RAPID TRANSIT (BRT) OR LIGHT RAIL

BRT routes will connect Ellenbrook to Bassendean Station, Midland and the new East Wanneroo Rail Link; Glendalough Station to Scarborough Beach; and, in the very long term, Canning Bridge to Booragoon, and Murdoch Station to the Cockburn Coast via Fremantle. Light rail may be considered for some of these routes, as an alternative to BRT.

Ellenbrook to Bassendean Station, Midland and East Wanneroo Rail Link – by 2.7 million

Glendalough Station to Scarborough Beach – by 2.7 million

Canning Bridge to Booragoon – beyond 3.5 million

Murdoch Station to Fremantle and the Cockburn Coast – beyond 3.5 million

BUS PRIORITY MEASURES

Queue jumps, signal priority and bus only lanes will be provided for over 20 key corridors to cater for high volumes of passengers. These are in addition to any local area bus priority initiatives that may be required.

Public Transport Network Planning Principles

1. The network should **serve growth corridors** and link activity centres with the heavy rail network, supplemented by road-based light rail, bus rapid transit and bus priority services. Beyond the 3.5 million population horizon a subway system will be required in the central area, separate to the heavy rail system.
2. **New orbital links** should be provided for connections between activity centres and the radial network, and to enhance network capacity.
3. New radial and orbital links should be provided to enhance **network operating robustness**.
4. **New technology** should be employed to enhance the travelling experience and lift operating performance (capacity, frequency and/or speed).
5. Links to the Perth central area should aim to protect the efficient operation of existing **'through-routing'** rail-based services.
6. The passenger network should **avoid using transport freight corridors** so as to preserve space in road reserves for future growth in road freight. Passenger rail tracks and freight rail tracks must remain separate.
7. **New links should be placed in corridors,** provided they will not impact future capacity to accommodate freight vehicles (Principle 6) or compromise the quality of potential future transit-oriented development precincts, or otherwise be placed in tunnels.
8. New links in the network should strengthen the demand-based network structure aimed at achieving user-friendly high-frequency services, so that passengers can **'turn up and go'.**

Figure 10: Public Transport Network Planning Principles

Public transport is essential to moving large numbers of people during peak periods and alleviating the pressure on our roads. It also plays an important role in the mobility of people who do not have access to private vehicles.

As Perth's population grows towards 3.5 million, the number of trips by all modes (private vehicle, public transport, cycling and walking) will increase from nearly seven million to over 12 million trips a day.

Today the public transport system in Perth carries around six per cent of daily trips. In order to provide a more balanced and sustainable transport network, over the next 35–40 years this will need to increase to around 11 per cent. While this doesn't sound like much, it is a near four-fold increase in public transport usage, to around 1.4 million trips each day.

The public transport mode share in peak periods will need to do most of the heavy lifting. Today, around 13 per cent of commuters travel by public transport. This includes almost half of all journeys to work in the CBD. When the population reaches 3.5 million, public transport will account for around 65 per cent of peak period trips to the Perth CBD and over 70 per cent of work trips to the wider business district, including West Perth, East Perth and Northbridge.

Public transport has to service all parts of the metropolitan area, but it is most efficient and convenient in more densely populated areas where there is sufficient demand for high-frequency 'turn up and go' services.

Transport @ 3.5 Million focuses on connecting places where the highest numbers of people live and work, so that public transport is the preferred choice for peak period travel and a viable option at other times.

The Public Transport Authority will continue to develop Perth's world class integration of train, bus and ferry services, offering seamless connections between different modes of transport.

Rail network

Heavy rail is used to rapidly transport large numbers of people over long distances. Today, the average distance travelled per trip is 18.8 km by rail and 5.8 km by bus. By the time the population reaches 3.5 million these average distances are expected to rise to 26.8 km by rail and 10.6 km by bus.

Between 1988 and 2007, the State electrified and expanded the heavy rail network serving the Perth and Peel regions. The most recent extension (Joondalup line to Butler) was completed in 2014.

Today, Perth's heavy rail network consists of a five-branch radial, electrified network with 70 stations, covering 180 km and operating through the Perth CBD hub.

To accommodate a predicted near four-fold increase in the number of public transport trips, there will need to be significant and ongoing investment in the network. This will include a further expansion of the rail network to nearly 300 kilometres.

The Public Transport Rail Network @ 3.5 Million and Beyond

Perth and Peel

East Wanneroo Rail Link

- 1A Stage 1 City to Marshall Road – by 2.7 million
- 1B Stage 2 Marshall Road to Joondalup line – by 3.5 million
- 1C Stage 3 Spur to Ellenbrook – beyond 3.5 million

Stirling-Murdoch Orbital

- 2A Stage 1 Stirling to UWA-QEII – by 3.5 million
- 2B Stage 2 UWA-QEII to Murdoch – by 3.5 million
- 2C Stage 3 Murdoch to Thornlie – beyond 3.5 million
- 2D Stage 4 Stirling to Morley – beyond 3.5 million

Radial extensions

- 3 Joondalup line to Yanchep - by 2.7 million
- 4 Midland line to Bellevue - by 2.7 million
- 5 Armadale line to Byford - by 3.5 million

Other rail links

- 6 Cockburn Central to Thornlie - by 2.7 million
- 7 Forrestfield to Thornlie - beyond 3.5 million

Inner-city subway system

- 8 Connecting Perth, East Perth, West Perth, Northbridge, Leederville and other inner city centres - beyond 3.5 million

LEGEND

- Passenger Rail @ 3.5 million
- Passenger Rail beyond 3.5 million
- Passenger Rail in Tunnel @ 3.5 million
- Passenger Rail in Tunnel beyond 3.5 million
- Future Subway Network
- Perth Central Business District

*Maps for illustration purposes only.

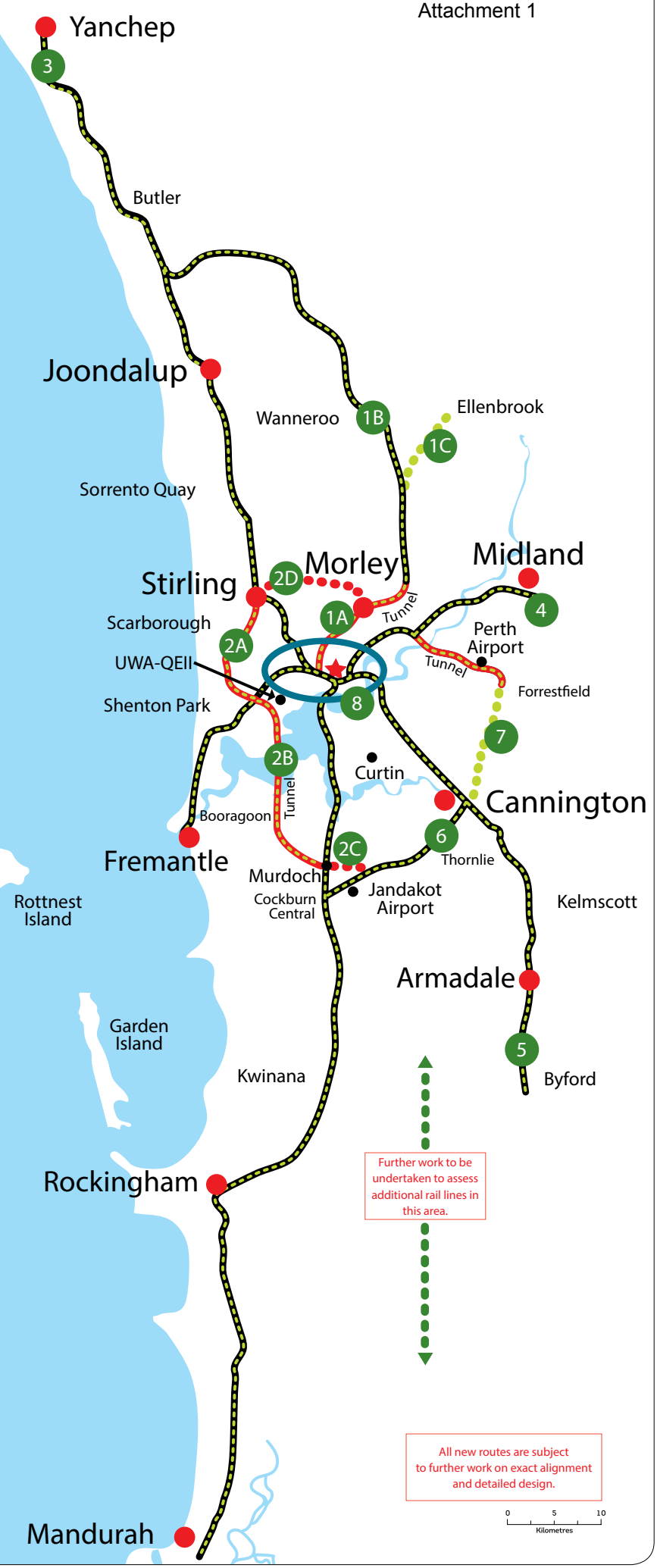


Figure 11: Map – The Public Transport Rail Network at 3.5 million people and beyond

The proposed changes are designed to promote public transport as a mode of choice and cater for the expected number of passengers travelling to work, education and other destinations during the morning peak period, when demand is highest. If the network can handle these peak periods it can readily meet demand during the rest of the day.

To make travel safer and more efficient for all road and rail users, wherever possible, high risk level crossings will be progressively replaced on existing lines by bridges or underpasses and new links will be designed without level crossings.

By a population of 2.7 million, enhancements to the existing rail network will include:

- the Forrestfield Airport Link;
- extending the Midland line to Bellevue;
- extending the Joondalup line to Yanchep; and
- connecting the Thornlie line to Cockburn Central, providing a link between the Armadale and Mandurah lines.

These will be the last extensions to the Joondalup and Midland lines.

To serve a population of 3.5 million, new heavy railways will include:

- the East Wanneroo Rail Link, built in stages to connect growing suburbs and strategic activity centres in the north east. Further investigation is required for station locations and to ensure integration with land use planning;
- the Stirling-Murdoch Orbital, connecting the significant activity centres of UWA-QEII and Murdoch (which includes Fiona Stanley Hospital and Murdoch University); and
- extending the Armadale line to Byford.

Beyond a population of 3.5 million, the East Wanneroo Rail Link will include a rail spur to Ellenbrook; the Stirling-Murdoch Orbital will be extended from Murdoch to Thornlie and Stirling to Morley; and the Forrestfield Airport Link will be extended to join the Thornlie line.

In the very long term, an additional heavy rail line will be needed in the southern region to meet the growing population in the Ravenswood Riverfront and the future Bunbury fast train.

Planning for 3.5 million is informed by detailed population and employment distribution data. Further planning and analysis will be required over the next decade to expand the plan towards a population of five million people.

FEATURE PROJECT

STIRLING-MURDOCH ORBITAL

Complementing Perth's robust radial rail network, new orbital services will provide easier access between major activity centres without requiring transfers through CBD stations.

The Stirling-Murdoch Orbital will connect to the Joondalup line at Stirling, the Fremantle line through a redeveloped station at Shenton Park, and the Mandurah line at Murdoch. The completed orbital, which will require extensive tunnelling, will ultimately allow travel eastward from Murdoch to the Armadale line, and Stirling to Morley, making a near complete circle around the CBD.

The Stirling-Murdoch Orbital will connect UWA-QEII, Murdoch (which includes Fiona Stanley Hospital, St John of God Murdoch private hospital and Murdoch University), Stirling, Shenton Park and Booragoon.

By providing direct opportunities for people destined mainly to the western suburbs and other destinations on the Fremantle rail line, this new orbital route will provide relief to the critical inner segment of the Joondalup line and Perth Underground Station, where capacity will be under most pressure in the future.

The Stirling-Murdoch Orbital has the potential to defer the need for a new road crossing the river.

Figure 12: Feature Project – Stirling-Murdoch Orbital Rail Link

FEATURE PROJECT

EAST WANNEROO RAIL LINK

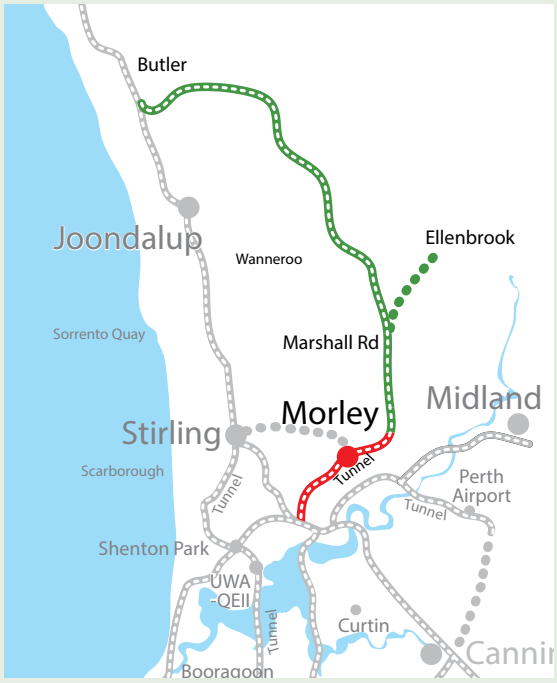
The East Wanneroo Rail Link is a new radial link in Perth's suburban railway system. The railway is expected to be delivered in three stages, with the first stage from the Perth CBD, via a tunnel to Morley, to a station near Marshall Road in Beechboro. The second stage connects to the Joondalup line. The third stage will see a rail spur built from Marshall Road to Ellenbrook.

The first and second stages will be required in full before the population of Perth reaches 3.5 million. The new railway will connect the north-east quadrant of the city to the wider rapid transit network and provide an alternative for some passengers currently using the Joondalup line.

This will result in significant gains in public transport mode share, reduce congestion on the surrounding road network and relieve pressure on complementary public transport services, such as the 950 Superbus.

The north east quadrant of Perth is currently not well-served by rapid transit. The popularity of routes such as the 950 Superbus highlights a strong demand for fast, reliable public transport in the area. As areas such as Morley continue to grow and develop as strategically important centres, a heavy rail line will be needed to move large numbers of people in and out of the area.

Stage 2 will give passengers travelling from Yanchep a choice of utilising either the Joondalup line or the East Wanneroo Rail Link. Modelling indicates the East Wanneroo Rail Link could account for over 20,000 CBD bound passengers



during the morning peak period, attracting many CBD-bound patrons in the far northern suburbs. The third stage - a rail spur to Ellenbrook - will be required when the population exceeds 3.5 million.

A potential southern extension of the East Wanneroo Rail Link from the city will be the subject of further review.

Figure 13: Feature Project – East Wanneroo Rail Link

The passenger rail network will expand from 180 km to nearly 300 km.

FEATURE PROJECT

PERTH LIGHT RAIL

Perth Light Rail will provide an inner orbital link, connecting UWA-QEII, via the central and eastern CBD, Victoria Park and Curtin-Bentley to Canning Bridge. A substantial portion of this route has already been planned.

The inner orbital design will provide opportunities for travellers to transfer to Perth Light Rail from the heavy rail radial network, the northern corridor at West Perth (with connection to Fremantle), the Perth Station Complex (including Perth Central and Perth Underground railway stations, and the Wellington Street Bus Station), the eastern CBD and Canning Bridge.

These opportunities for transfers will help to reduce congestion at the Perth Station Complex.

The 960 Superbus service from Mirrabooka to Curtin University and the new East Wanneroo Rail Link provide an effective public transport solution for the north-eastern suburbs.

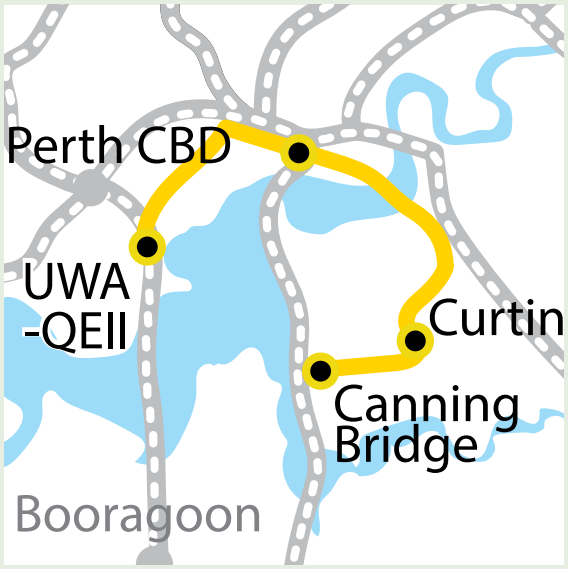


Figure 14: Feature Project – Perth Light Rail

Light Rail Transit (LRT) and Bus Rapid Transit (BRT)

LRT and BRT are used when the level of demand does not warrant an investment in heavy rail, but is too high for the regular bus system to operate efficiently in mixed traffic.

LRT and BRT usually operate in their own lane, separated from other traffic, providing a semi-rapid transport service.

By the time Perth's population reaches 2.7 million, the following routes will need to be serviced by either LRT or BRT:

- access between major activity centres at UWA–QEII through the Perth central area to Bentley–Curtin (Perth Light Rail);
- Ellenbrook to Bassendean Station, Midland and the new East Wanneroo Rail Link; and
- Glendalough Station to Scarborough Beach, via Scarborough Beach Road.

By time the population reaches 3.5 million, Perth Light Rail will be extended to Canning Bridge.

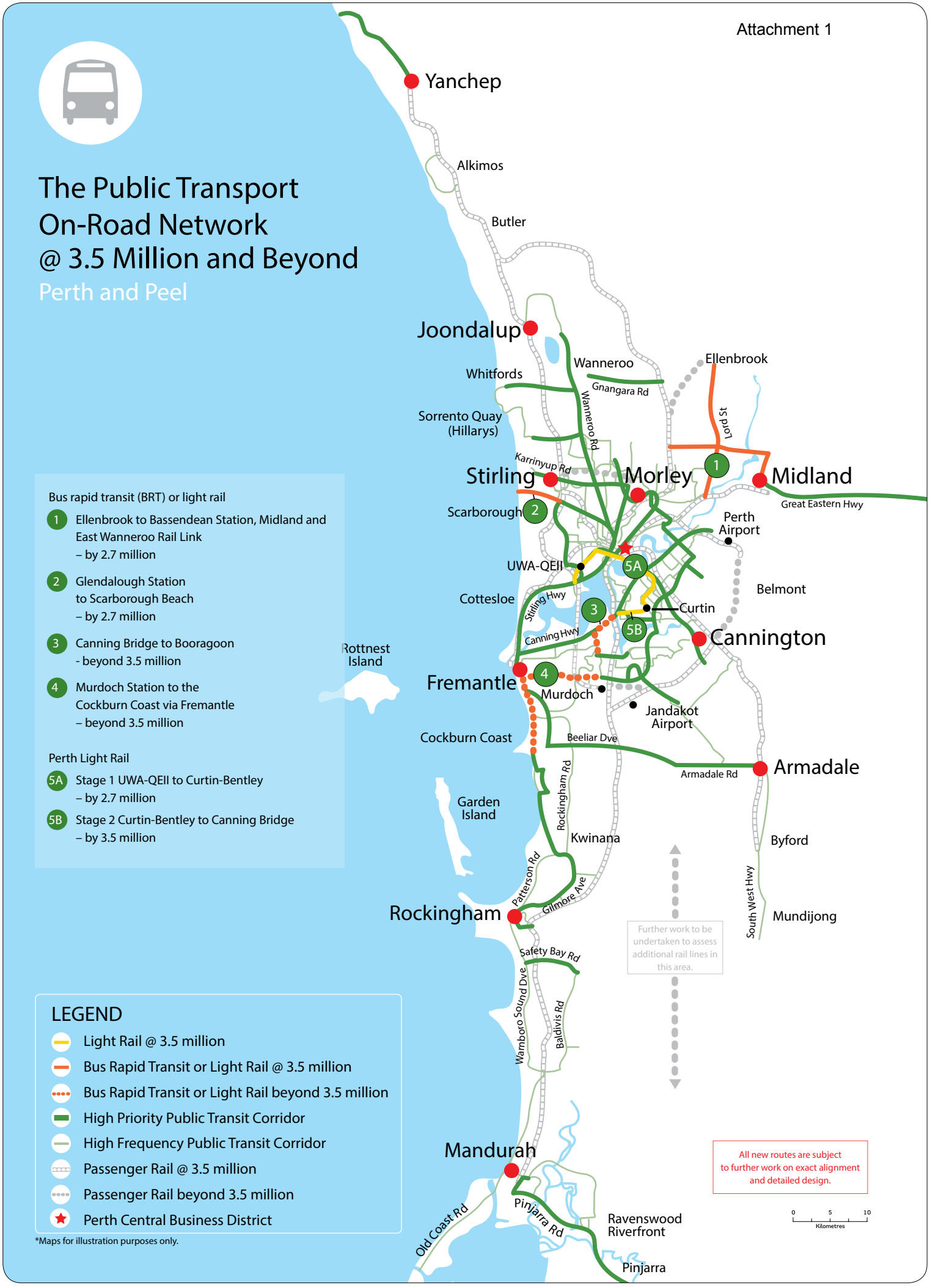
After the population grows beyond 3.5 million, LRT or BRT routes are proposed:

- from Canning Bridge to Booragoon, facilitating passenger transfers to the Stirling-Murdoch Orbital rail line; and
- connecting Murdoch Station to Fremantle and the Cockburn Coast.

When the population reaches 3.5 million, public transport will account for over 70 per cent of work trips to the wider Perth business district.

The Public Transport On-Road Network @ 3.5 Million and Beyond

Perth and Peel



Bus rapid transit (BRT) or light rail

1. Ellenbrook to Bassendean Station, Midland and East Wanneroo Rail Link – by 2.7 million
2. Glendalough Station to Scarborough Beach – by 2.7 million
3. Canning Bridge to Booragoon - beyond 3.5 million
4. Murdoch Station to the Cockburn Coast via Fremantle – beyond 3.5 million

Perth Light Rail

- 5A Stage 1 UWA-QEII to Curtin-Bentley – by 2.7 million
- 5B Stage 2 Curtin-Bentley to Canning Bridge – by 3.5 million

LEGEND

- Light Rail @ 3.5 million
- Bus Rapid Transit or Light Rail @ 3.5 million
- Bus Rapid Transit or Light Rail beyond 3.5 million
- High Priority Public Transit Corridor
- High Frequency Public Transit Corridor
- Passenger Rail @ 3.5 million
- Passenger Rail beyond 3.5 million
- Perth Central Business District

*Maps for illustration purposes only.

Figure 15: Map – The Public Transport On-Road Network at 3.5 million people and beyond

Inner City Subway

Beyond the 3.5 million population horizon, an underground inner city subway system will be required to distribute travellers between the Perth central core, East Perth, West Perth, Northbridge, Leederville and other inner city centres.

Subway systems serve a different function to suburban radial networks like the one we currently have in Perth. Subway systems typically carry large numbers of passengers short distances, usually within high density inner city areas. Subway stations are close together, so the services travel at lower maximum speeds and operate most efficiently with different rolling stock than our higher speed, long distance suburban trains.

Subway systems are very expensive to build and operate. Perth's inner core will need to be much larger and denser before this kind of investment would be justified. However, in order to ensure a subway system is a feasible option for the future, it is important to plan early. It is possible that elements of the subway system could be undertaken with the development of the radial links through the Perth CBD.

Early planning will help to minimise the cost of land acquisition and infrastructure relocation in the longer term and provide certainty as to the future of public transport in and around the inner city.

Bus network

The current bus fleet of nearly 1,500 buses provides a feeder service to Perth's trains, services outer residential growth areas and helps distribute people within and between activity centres.

Central Area Transit (CAT) buses provide a free distributor service for short trips, taking cars off the roads in the Perth CBD, Fremantle and Joondalup.

In key transit corridors where there are sufficiently high volumes of passengers, and there is a risk of delays, buses will be given priority by creating:

- *Queue jumps* – where a lane leading up to a junction is made for 'buses only' and the traffic signalling lets the buses through the junction first;
- *Signal priority* – where a traffic signal detects the oncoming bus and changes the light sequence to give it priority, or where traffic signals are coordinated to create a 'green wave' for traffic along a transit route; or
- *Transit lanes* – where a lane is allocated as a 'bus only' lane.

Modelling has shown that, by a population of 3.5 million, about 20 key corridors will have volumes that warrant some form of bus priority. This will be in addition to any local area priority initiatives introduced by local governments.

MAYLANDS BUS BRIDGE

By the time the population reaches 3.5 million, a bus bridge will connect the Maylands peninsula to Rivervale. By connecting the two sides of the river, new destinations and opportunities will be opened up to residents on the peninsula, as well as the growing areas of Rivervale and Belmont.

The bridge will save buses around eight kilometres of travel and bring cyclists at least five kilometres closer to destinations across the river.

Upon completion of the link, a new orbital bus route will connect the Glendalough, Maylands and Oats Street train stations, via Belmont Forum, and provide improved access to events at Perth Stadium and the entertainment precinct on the Burswood peninsula.

Ferries

Ferries in Perth will never carry the passenger volumes of trains, light rail or buses. Nevertheless it is important to note that there is a role for higher volume ferry services in the future.

Where faster, low wash ferries have been successful (e.g. Brisbane, Sydney), the key has been to have major attractions/destinations and medium to high density residential areas adjacent to the ferry jetties. A prime example is Brisbane River's Citycats which serve a range of key attractions along the river.

Elizabeth Quay is the first signal of a site which will generate demand moving forward for additional ferry services.

Further planning will be undertaken in coming years of opportunities for higher volume ferry services to sites including East Perth, Claisebrook Cove, new Perth Stadium, Coode Street, Canning Bridge, Point Walter and UWA.

3.2 ROAD NETWORK

At a glance

PERTH FREIGHT LINK

Constructed from the Great Northern Highway (Muchea) to Fremantle Port, including a tunnel between Winterfold Road (Hamilton Hill) and High Street (White Gum Valley).

NorthLink, Gateway, Roe 8, Fremantle Tunnel, and Fremantle Port Connect (Canning Highway to the Inner Harbour)
– by 2.7 million

EAST-WEST CITY LINK

A new bridge (or tunnel) connecting Canning Highway at Berwick Street to Riverside Drive at Plain Street, and a complementary tunnel connecting Riverside Drive at Plain Street with the Narrows Interchange and Mounts Bay Road.

Riverside Bridge (or tunnel) and East-West Tunnel – by 3.5 million

STOCK ROAD TUNNEL

Stock Road extended northwards from Leach Highway (as a freeway) linking with Stephenson Avenue at Jon Sanders Drive, with an extension tying in to Mitchell Freeway south of Reid Highway.

Stock Road Tunnel
– by 3.5 million

FREMANTLE-ROCKINGHAM HIGHWAY

Serves the Western Trade Coast strategic industrial centre and the Rockingham Industry Zone; freeway standard between Leach Highway and Kwinana Freeway, Mundijong Road.

Fremantle-Rockingham Highway, to be completed in stages – by 3.5 million

TONKIN HIGHWAY

Extended to tie in with the Perth Darwin National Highway in the north and Forrest Highway, Pinjarra, in the south.

Freeway standard between the Perth Darwin National Highway and Mundijong Road - by 3.5 million

Freeway standard Mundijong Road to Forrest Highway
– beyond 3.5 million

MITCHELL FREEWAY

Extended to tie in with Indian Ocean Drive in the north and upgraded to freeway standard:
- to Yanchep– by 3.5 million

- between Yanchep and Indian Ocean Drive
– beyond 3.5 million

PERTH-ADELAIDE NATIONAL HIGHWAY

Constructed between Roe Highway at Midland and Great Eastern Highway; freeway standard to Gidgegannup
to be completed in stages
– by 3.5 million

REID AND ROE HIGHWAYS

Existing highways upgraded to freeway standard; Roe Highway extended to link to Stock Road (Roe 8)
– by 2.7 million

ALL LANE RUNNING

Implemented on parts of the:

Mitchell and Kwinana Freeways – by 2.7 million

Tonkin, Reid and Roe Highways as required by demand - by 3.5 million

WHITEMAN YANCHEP HIGHWAY

Constructed to link Tonkin Highway around Gnangara Road with Mitchell Freeway at Pipidinny Road, Eglinton.
- by 3.5 million

Road transport will remain a dominant way for people and freight to move around Perth. Roads are the most extensive part of the transport network, with local, regional and national connections.

A significant amount of land is required to provide roads. As Perth's population grows that land becomes more constrained and more valuable. Our ability to increase the capacity of existing roads, and to provide new roads, will become more limited. We will have to find smarter, more efficient ways to optimise use of existing road infrastructure.

Transport @ 3.5 Million has been developed with these future constraints in mind and with a view to creating the most appropriate strategic links to complement the public and active transport networks. The planned road network expands Perth's core system of freeways to connect the north and south of the city, linking future population centres with each other and the city.

The future road network will continue to be efficient, safe, sustainable and resilient. It will service freight, commercial and private vehicles, as well as on-road public transport.

New river crossings

Existing road river crossings, especially those in close proximity to the Perth CBD, will be under increasing pressure as the population grows to 3.5 million. Two new river crossings are proposed.

EAST-WEST CITY LINK

The East-West City Link reduces traffic on the Swan River crossings east of the city, including the Causeway and Graham Farmer Freeway. Traffic on the Causeway will be substantially reduced, creating additional capacity for on-road public transport and active transport into the CBD.

The link keeps traffic travelling through, not to, the Perth CBD, relieving pressure on city roads and taking pressure off the Graham Farmer Freeway. This plays an important role in the distribution of traffic around the city.

The East-West City Link consists of two new connections: the Riverside Bridge (or tunnel, pending further investigations), which connects Canning Highway at Berwick Street to Riverside Drive at Plain Street east of the Perth CBD; and the East-West Tunnel, which connects Riverside Drive west of Plain Street with the Narrows Interchange and Mounts Bay Road.

Road Network Planning Principles

1. **Network efficiency and productivity:** the freeway and strategic freight road networks operate at acceptable levels of service during peak periods. The need for new road infrastructure is determined in the context of a balanced transport outcome, taking into account future public transport servicing key routes and operational efficiency measures, such as Managed Freeways, to maximise network performance.

2. **Road safety:** the road network supports the State's *Towards Zero* road safety targets through the provision of divided roadways and grade separation (bridges or underpasses that separate road from rail) at intersections.

3. **Transport integration:** the arterial road network accommodates an appropriate level of on-road transit priority for high volume transit routes. The level of transit priority provides a balanced network solution with due regard for both general and public transport vehicles.

4. **Sustainability:** the road network strives to avoid impacting land that is not already reserved in the Metropolitan Region Scheme.

5. **Network resilience:** the network will have alternative routes, spare capacity and good communications systems so it can respond quickly to any incidents and a changing environment.

Figure 16: Road Network Planning Principles

FEATURE PROJECT

EAST-WEST CITY LINK

As the city grows and traffic volume increases, more routes around the Perth central area will be needed to avoid unmanageable congestion through the city and to keep our city liveable. Besides trips into the city, a strong demand for trips across the city exists, and the Graham Farmer Freeway and city roads will have inadequate capacity to cater for this demand.

The two sections of the East-West City Link will substantially improve east-west connectivity for cross-city trips. This initiative links suburbs to the east (East Victoria Park, Kensington, Bentley, Redcliffe and Kewdale) with those to the west (Subiaco, QEII, UWA and Nedlands), as well as the freeway north, relieving pressure on Graham Farmer Freeway and city roads.

As the city provides for an increase in public transport, pedestrian and cycling trips, city roads will have less capacity to service private car demand.

The East-West Tunnel will carry in the order of 50,000 vehicles per day, significantly reducing volumes on Riverside Drive. This creates the opportunity to close Riverside Drive with remaining traffic using Terrace Road, enabling activation of the Perth waterfront.

The Canning Highway to Riverside Drive section, improves connectivity to the Perth CBD from suburbs east of the river. The Riverside Bridge section (which could alternatively be a tunnel, pending further investigations) will significantly reduce volumes on the Causeway, improving public transport operations.

A high level transport assessment showed that the East-West City Link generates few additional vehicle trips into the Perth CBD during the morning peak period. Cross-river demand increases as the link facilitates cross-city movement, improving access to work, shopping, educational and recreational opportunities.

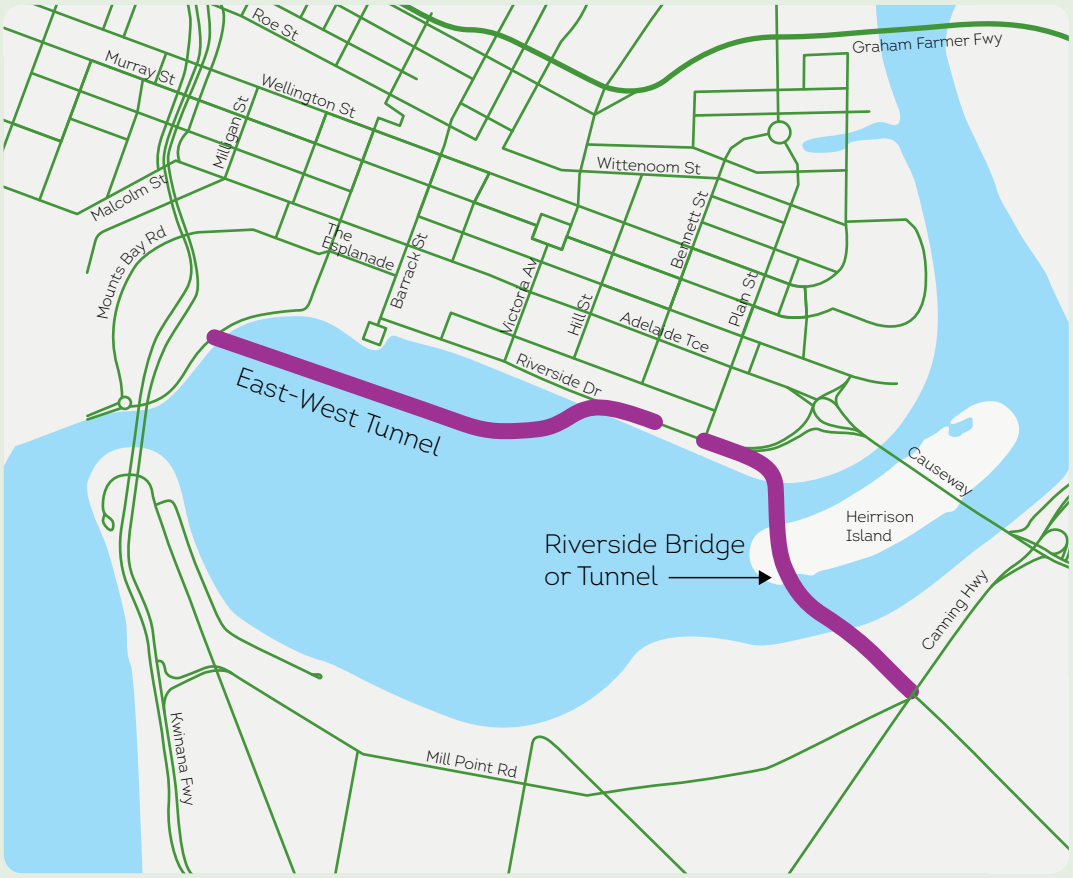


Figure 17: Feature Project – East-West City Link

STOCK ROAD TUNNEL

The Stock Road Tunnel reduces traffic on the Fremantle and Narrows bridges, and on sections of the Mitchell Freeway north of the city. It is expected to be tunnelled either in full or in part.

The tunnel connects to freeway standard roads at both ends. It facilitates good east-west distribution of traffic through connections north of the river at Railway Road, Underwood Avenue and Stephenson Avenue (at Jon Sanders Drive); and south at Leach Highway and Canning Highway.

The Railway Road connection will facilitate access to QEII Medical Centre; while the Mitchell Freeway connection to the north will reduce traffic volumes on Stephenson Avenue, making it easier for local traffic to access the Stirling activity centre.

FEATURE PROJECT

STOCK ROAD TUNNEL

Perth has developed as a north-south linear city with urban development concentrated between the Indian Ocean and the Darling Scarp. The Swan and Canning Rivers form a natural east-west constraint for the provision of essential north-south infrastructure networks including transport, particularly the road network. Very early transport planning for the Perth region (1950s/1960s) identified the need for additional high standard road crossings over the Swan River. These river crossings included a freeway concept to link Stock Road with Stephenson Avenue.

Modelling undertaken for this plan confirms the existing river crossings, especially those in close proximity to the Perth CBD, will not provide adequate capacity as the population grows. Extending Stock Road north to provide a new river crossing significantly improves access to work and education opportunities, especially for people in the southern suburbs. This link will complement developments at the Stirling activity centre.

The new route will extend Stock Road northwards from Leach Highway as a freeway linking to Stephenson Avenue at Jon Sanders Drive, with an extension tying in to Mitchell Freeway south of Reid Highway. This link will include two tunnels: one under the river from Leach Highway, surfacing north of the Fremantle rail line; and another between Underwood Avenue and Mitchell Freeway. The new route is forecast to carry around 100,000 vehicles per day.

The new river crossing will reduce projected traffic volumes on Stirling Bridge, the Fremantle Traffic Bridge and the Narrows Bridge.

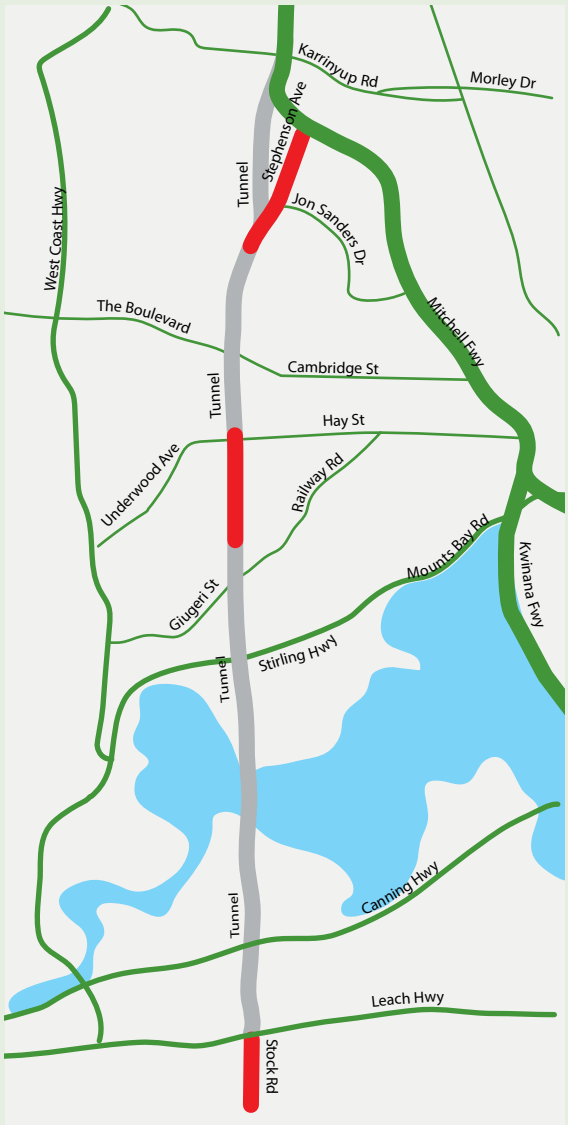


Figure 18: Feature Project – Stock Road Tunnel

The Freeway Network @ 3.5 Million and Beyond

Perth and Peel

River Crossings

1. East-West City Link: Riverside Bridge and East-West Tunnel – by 3.5 million
2. Stock Road Tunnel – by 3.5 million

Freeways

3. Mitchell Freeway extend to Indian Ocean Drive – by 3.5 million
4. Reid and Roe Highways: upgrade to freeway standard – by 2.7 million
5A. Tonkin Highway north: extend to Perth-Darwin National Highway; upgrade to freeway standard – by 3.5 million
5B. Tonkin Highway south: upgrade to freeway standard to Mundijong Road – by 3.5 million
5C. Tonkin Highway far south; extend from Mundijong Road to Forrest Highway, Pinjarra – beyond 3.5 million
6. Fremantle-Rockingham Highway: construct to freeway standard between Leach Highway and Kwinana Freeway at Mundijong Road – by 3.5 million
7. Mundijong Road: upgrade to freeway standard – beyond 3.5 million
8. Perth-Adelaide National Highway: construct between Roe Highway at Midland and Great Eastern Highway; freeway standard to Gidgegannup – by 3.5 million
9A. Whiteman-Yanchep Highway: construct to link Tonkin Highway with Mitchell Freeway; freeway standard between Tonkin Highway and Neerabup – by 3.5 million
9B. Whiteman-Yanchep Highway: upgrade to freeway standard Neerabup to Mitchell Freeway at Eglinton - beyond 3.5 million

LEGEND

- Freeway Network @ 3.5 million
- Freeway beyond 3.5 million
- Freeway in Tunnel
- Perth Central Business District

*Maps for illustration purposes only.

Figure 19: Map – The Freeway Network at 3.5 million people and beyond

The Freeway Network

The freeways and major highways will continue to serve as the principal high capacity distribution network for the metropolitan area. Managed Freeway solutions will be put in place to ensure a productive and efficient network.

By the time Perth's population reaches 2.7 million:

- all-lane running will be implemented on parts of Mitchell and Kwinana Freeways, providing additional lanes through conventional widening, interchange upgrades and the introduction of Managed Freeways;
- Reid Highway will be upgraded to freeway standard between Mitchell Freeway and Roe Highway, with freeway-to-freeway interchanges provided at Mitchell Freeway and Tonkin Highway; and
- to complete the inner metropolitan freeway ring, Roe Highway will be upgraded to freeway standard and extended from Kwinana Freeway to Stock Road (Roe 8).

By the time Perth's population reaches 3.5 million:

- Mitchell Freeway will be extended to tie in with Indian Ocean Drive in the north and be constructed to freeway standard to Toreopango Avenue, Yanchep;
- Tonkin Highway will be extended to tie in with the Perth Darwin National Highway in the north and Forrest Highway at Pinjarra in the south. It will be constructed to freeway standard between the Perth Darwin National Highway and Mundijong Road, with freeway-to-freeway interchanges at Reid and Roe Highways;
- the new Whiteman-Yanchep Highway will link Tonkin Highway around Gnangara Road with Mitchell Freeway at Pipidinny Road, Eglinton. It will be constructed to freeway standard between Tonkin Highway and Wattle Avenue north of Neaves Road in Neerabup. Tonkin Highway together with the Whiteman-Yanchep Highway will provide the second north-south distribution spine across the metropolitan area;
- the Fremantle-Rockingham Highway will follow the Stock Road and Rockingham Road alignments to Hope Valley and then a new alignment to Kwinana Freeway at Mundijong Road. It will provide high standard connectivity between the important industrial and commercial centres within the South Western Metropolitan Corridor. It will be constructed to freeway standard between Leach Highway and Kwinana Freeway at Mundijong Road. The Fremantle-Rockingham Highway will connect to the new Stock Road Tunnel;
- the Stock Road Tunnel will connect the Fremantle-Rockingham Highway with the Mitchell Freeway near the Stirling activity centre;
- the East-West City Link will provide improved east-west connectivity for cross-city trips by linking Canning Highway to the Narrows Interchange and Mounts Bay Road via the Riverside Bridge (or tunnel) and the East-West Tunnel; and
- Leach Highway will be upgraded to expressway standard between Tonkin Highway and Shelley Bridge. Orrong Road will be upgraded to expressway standard between Graham Farmer Freeway and Roe Highway.

To serve a population beyond 3.5 million:

- Mitchell Freeway will be upgraded to freeway standard between Yanchep and Indian Ocean Drive; and
- Whiteman-Yanchep Highway will be upgraded to freeway standard between Neerabup and the Mitchell Freeway in Eglinton.

Networks serving new urban areas and metropolitan centres

Major new urban areas include East Wanneroo and Alkimos to Two Rocks; Bullsbrook and the Ellenbrook / Swan Urban Growth Corridor; and Mundijong, Ravenswood Riverfront / Pinjarra. These new urban areas will be serviced by a network of arterials connecting with the planned freeway network.

- Demand generated by the East Wanneroo urban expansion will be serviced by the planned Whiteman-Yanchep Highway and a network of urban arterials. Two interchanges will be provided on Whiteman-Yanchep Highway between Gnangara and Neaves Roads to provide high-standard access to the area.
- The area from Alkimos to Two Rocks will be serviced by the Mitchell Freeway extension and Marmion Avenue, together with planned east-west arterials. The arterials include Lukin Drive, Romeo Road, Alkimos Drive, Pipidinny Road, Yanchep Beach Road, Toreopango Avenue, Reef Break Drive and Breakwater Drive, most of which will be constructed to 4-lane divided standard, connecting to Mitchell Freeway via interchanges.
- The Bullsbrook area, including the Ellenbrook / Swan Urban Growth Corridor, will be serviced by an upgraded Great Northern Highway, with links to Tonkin Highway (NorthLink) via Stock Road and the Neaves Road extension.
- Urban expansion in the Mundijong area will be serviced by the Tonkin Highway extension, as well as the upgrading of Thomas and Mundijong roads. Interchanges will be provided on Tonkin Highway at Thomas, Orton, Bishop and Mundijong roads to provide high-standard access to the area.
- The Ravenswood Riverfront / Pinjarra urban and industrial expansion area will be serviced by the Kwinana Freeway, Forrest Highway (which will be upgraded to freeway standard between Pinjarra Road and Greenlands Road), and the Tonkin Highway extension, including the Pinjarra Bypass. New and upgraded east-west arterials servicing the area include Mandjoorgoordap Drive, Lakes Road, Pinjarra Road and Greenlands Road.

3.3 ACTIVE TRANSPORT NETWORK

At a glance

CYCLING NETWORK

The current 172 km of off-road commuter and recreational cycleways will be extended to around 850 km.

Additional 185 km of off-road cycleways – by 2.7 million

Around 500 km additional off-road cycleways added – by 3.5 million

GREEN BRIDGES

Plan for new green bridges (cycling and pedestrian) to improve connectivity across rivers and lakes, reducing walking and cycling times.

- Three Points Bridge, connecting Chidley Point, Point Walter and Point Resolution;
- three bridges crossing the Swan River between Heirisson Island and Maylands;
- three bridges over the Canning River between Salter Point and Waterford; and
- two bridges across Lake Joondalup and Lake Goollelal in the northern suburbs

  – by 3.5 million

Perth has all the ingredients needed for a great cycling and walking city: a warm climate, flat topography and outstanding natural beauty.

As the city's population increases and more people live near activity centres, walking and cycling can play a big part in helping to reduce congestion, improve air quality and encourage more of us to live a healthy, active lifestyle.

There will also be more travel behaviour change programs in place to encourage walking and cycling.

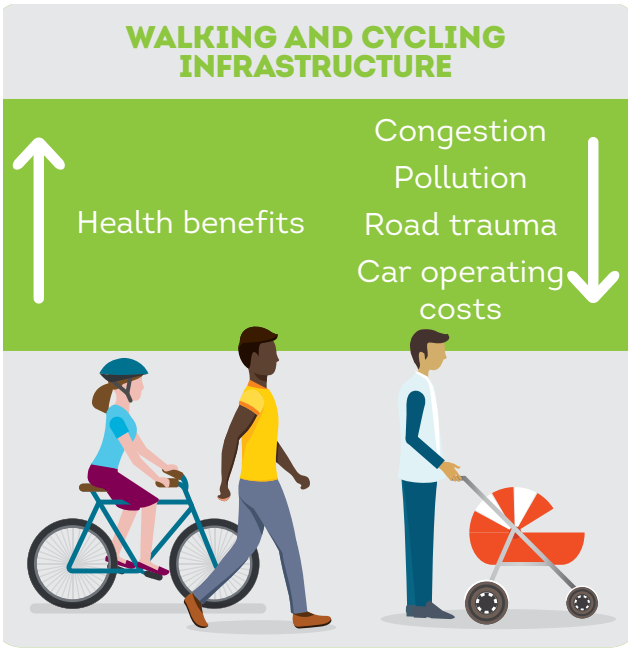


Figure 20: Benefits of walking and cycling

Around 400,000 car trips a day in Perth are less than one kilometre. Many of these trips could be taken on foot or by bicycle.

Attachment 1

Walking

Walking will become increasingly important as the city expands and more people choose to live within walking distance of activity centres and major transport hubs. Walking will be a primary option to access public transport, local shops and local services.

Walking can be encouraged through the provision of safe, visible, well-signed, comfortable footpaths that have trees to provide shade and ramps to help with wheelchair and pram access at intersections.

Pedestrian crossings, islands and technologies to lengthen the crossing time for seniors, people with disabilities and others needing more time to cross the road, all help to provide a safer walking environment.

Creating walkable neighbourhoods is primarily a local government responsibility, so this plan focuses on the cycling network. However, most of the off-road cycleways proposed will be shared paths that also benefit pedestrians.

The State Government will continue to work with local governments to provide a seamless active transport network for pedestrians, cyclists and other non-motorised modes of transport.

Cycling

As Perth grows to a population of 3.5 million, there will be more emphasis on providing high quality, safe and comfortable cycling infrastructure, especially around activity centres.

Many new off-road shared paths have been planned as part of the cycling network. Bike Boulevards will provide a safer way for cyclists to travel on the roads through some of Perth's older suburbs.

High quality end-of-trip facilities, including secure bike storage areas, changing rooms and showers are needed to support walking and cycling to work and activity centres. Some businesses in the city are already starting to replace car bays with end-of-trip facilities.

By the time Perth's population reaches 3.5 million:

- the gaps in the current off-road cycle network will be filled;
- the off-road cycle network will be further expanded and will include additional river crossings; and
- end-of-trip facilities will be available at all major activity centres.

The State Government's primary focus is providing off-road shared paths that connect local communities, activity centres and places of work.

Suburban connections for access to local shops and schools is primarily the responsibility of local governments. The State will continue to support and work with local governments in the development of safer streets.

OFF-ROAD CYCLEWAYS

The existing off-road cycle network consists of about 172 km of cycleway and, by the time the population reaches 3.5 million, will expand to around 850 km.

The current recreational cycling network is excellent in places, but has some substandard and missing sections. It is planned to complete and expand the recreational network:

- on both sides of the Swan and Canning Rivers, using boardwalks and floating pontoons, where necessary, to take the cycleways around heritage areas and places of environmental significance;
- along the ocean beachfront from Two Rocks in the north to Wannanup in the South, avoiding the industrial areas around Kwinana and Henderson; and
- around four regional park and wetland sites in the metropolitan area.

Some recreational cyclists enjoy riding in pelotons (groups). Work will be undertaken to investigate how to accommodate pelotons more safely, for example by creating a cycling route in the Darling Scarp.

Figure 21: Artist rendering of cycle boardwalk

Source: Floating cycleway by Waterarchitect van Bueren ©

Cycling Network Planning Principles

1 **Provide cycling infrastructure in a grid matrix layout,** with off road cycleways spaced approximately 5km apart, strategic routes approximately 2.5 km apart and local routes approximately 1.5 km apart.

2 **Separate cyclists from motorised vehicles** - provide protected bike lanes or create bike boulevards on low volume, low speed (30km/h) local roads, one block back from the arterial road.

3 **Separate cyclists from pedestrians,** particularly on routes where cyclists are likely to be travelling long distances and/or at high speeds, and along scenic coastal and river routes.

Figure 22: Cycling Network Planning Principles

ON-ROAD CYCLING NETWORK

The on-road strategic links feed into the main commuter routes and local networks are continually evolving to meet local needs.

With more people living near activity centres and train stations as the population grows, the on-road strategic network will need to be strengthened to meet demand. Routes will be assessed on a case-by-case basis, with the cycling network developed as appropriate to the local road architecture. For example, Bike Boulevards will be created in older suburbs to provide safer streets for cyclists.

Local area traffic management treatments, such as speed humps, will continue to be used to slow traffic speeds and reduce traffic volumes to make local routes safer for cyclists and pedestrians.

CYCLING IN THE CITY CENTRE

There are some excellent off-road cycleways leading to the city's fringes, but many stop short of the city centre. This leaves cyclists unprotected as they negotiate their way to central city offices, shops and tourist attractions.

In cities such as Sydney, Melbourne and Brisbane, protected cycle lanes have been provided by removing some street parking and traffic lanes. A similar approach will be gradually implemented in the Perth CBD. The development of more private end-of-trip facilities for cyclists (including secure bike storage areas, changing rooms and showers) will be encouraged, and the potential for public end-of-trip facilities in the CBD will be investigated.

As travel to and around the CBD becomes less reliant on private cars, the city will become increasingly cycle and pedestrian-friendly, adding to the vibrancy of the city centre.

FEATURE PROJECT

BIKE BOULEVARDS

A Bike Boulevard is a local street where cars and bikes can interact in a low speed environment, making local streets safer, which will encourage children and families to cycle more. Bike Boulevards have wide cycleways marked to give bicycles priority – but local traffic can still use the road at low speed. Bike Boulevards provide a safe route for cyclists travelling in older suburbs where streets are usually built in a grid pattern.

Bike Boulevards generally run parallel to a main road that may be too narrow or have too many busy intersections to accommodate a separate bicycle lane. Bike Boulevard pilot projects are operating in a number of local government areas. With the expected increase in the popularity of electric bikes, Bike Boulevards will be one way of making cycling safer through the suburbs.

Figure 23: What is a Bike Boulevard?
Source: Bike Boulevard by Urban Circus

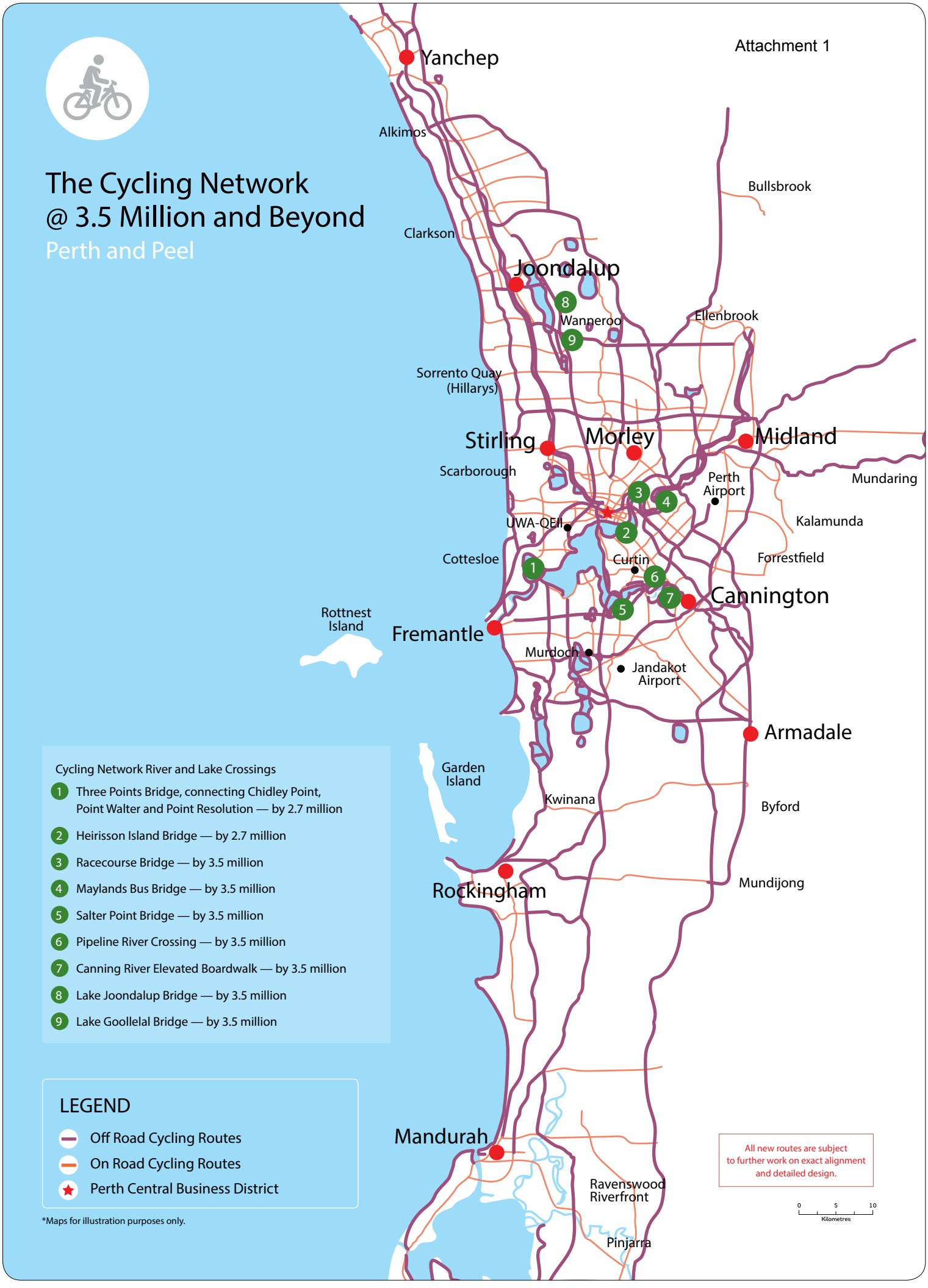


Figure 24: Map – The Cycling Network at 3.5 million people and beyond

NEW RIVER AND LAKE CROSSINGS

The Swan and Canning Rivers divide the city geographically and socially. With few river crossings, journeys to some activity centres are outside the range of most cyclists.

This plan proposes new green bridges that would accommodate active transport modes such as walking and cycling.

Lower Swan Connections

Three Points Bridge, connecting Chidley Point, Point Walter and Point Resolution, will provide a 40 minute cycle route from Perth to Fremantle, generating cycle tourism opportunities. This active transport bridge would be built sufficiently high so as not to impede yachts and boats.

Upper Swan Connections

Land use in East Perth and on the Burswood Peninsula will increase in both importance and density with trip attractors such as Riverside, the new Perth Stadium, Belmont Racecourse and the Crown Entertainment Complex generating some of the highest pedestrian and cycling demand of any area in Perth.

New river crossings will increase active transport in this area:

- *Heirisson Island Bridge*, parallel to the Causeway, provides a replacement off-road shared path when the Causeway is reconfigured to accommodate light rail;
- *Racecourse Bridge* links the Maylands Golf Course off-road shared path to Burswood Peninsula; and
- *Maylands Bus Bridge* links people from the south east corridor to ECU Mount Lawley and Morley activity centres.

These are in addition to the bridge currently under construction that will link pedestrians and cyclists from the city to the new Perth Stadium.

Additionally, the proposed Summers Street Bridge enables local traffic to access Burswood Peninsula from Plain Street and Summers Street. This bridge incorporates a shared path and improves access to the East Perth train station.

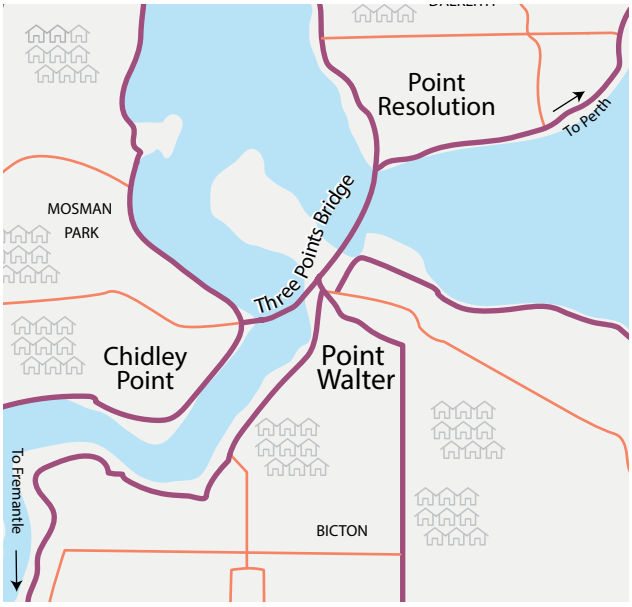


Figure 25: Three Points Bridge

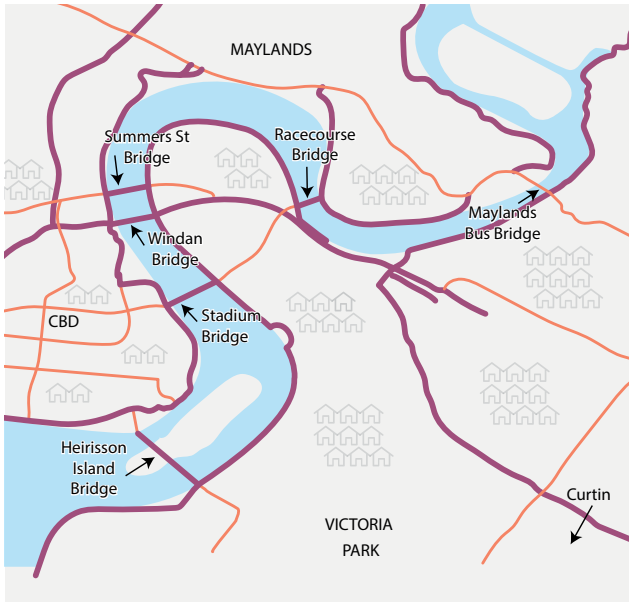


Figure 26: Upper Swan Connections

LEGEND

- Off Road Cycling Routes
- On Road Cycling Routes

The existing off-road commuter network consists of about 172 km of cycleway and, by the time the population reaches 3.5 million, will expand to around 850 km.

Upper Canning Connections

A number of important activity centres exist either side of the Canning River, including the Curtin-Bentley knowledge hub, Cannington activity centre and Canning Vale industrial area. The upper Canning crossings will enable better access between these areas and improve access to the network of recreational shared paths in the Canning River Regional Park:

- *Salter Point Bridge* linking Rossmoyne to Salter Point will take pressure from the Kwinana Freeway cycleway;
- *Pipeline River Crossing* will utilise the existing water/power corridor to provide a north-south link between Shelley and Curtin University; and
- *Canning River Elevated Boardwalk* linking Spencer Rd/Nicholson Road to the proposed Berwick Street strategic route.

Lake Crossings

Lake Joondalup and Lake Goollelal in the Yellagonga Regional Park separate Wanneroo residents from the Joondalup activity centre and restrict access to the Mitchell Freeway cycleway and train stations. The new crossings will improve access to these facilities, as well as the recreational shared paths within the Yellagonga Regional Park:

- *Lake Joondalup Green Bridge* linking cyclists and pedestrians directly to the town centre; and
- *Lake Goollelal Bridge* linking Darch with Kingsley and providing better access for cyclists and pedestrians to Greenwood Train Station.

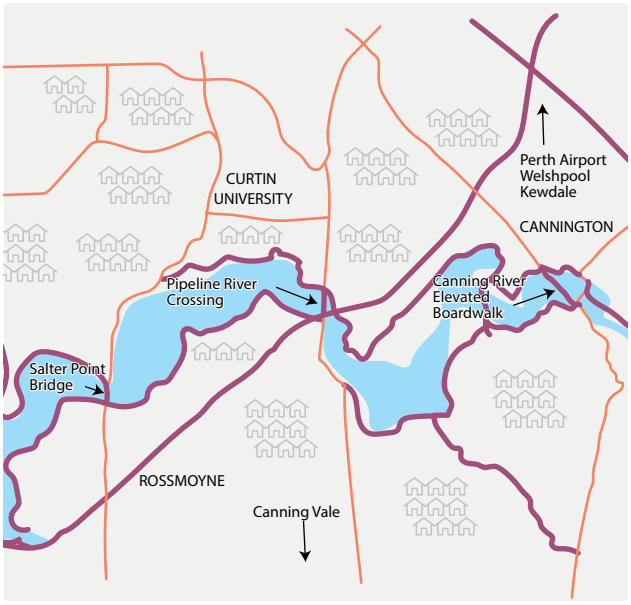


Figure 27: Upper Canning Connections

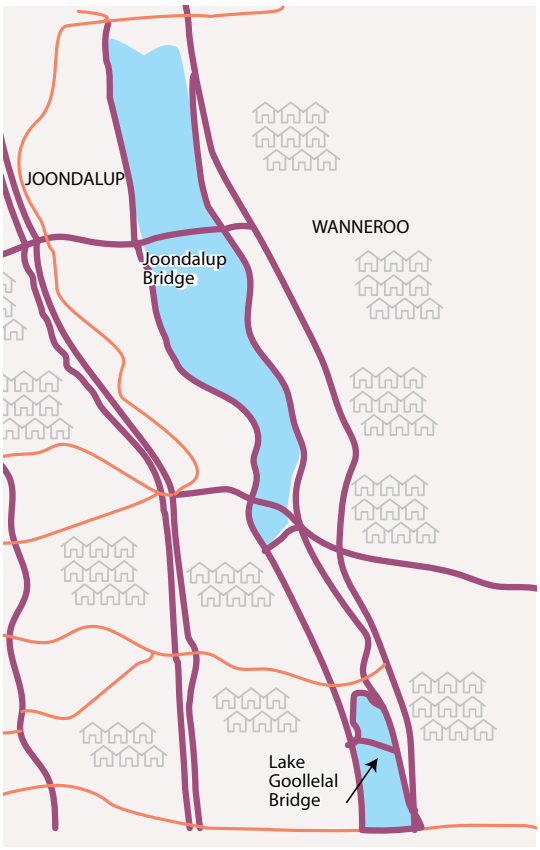


Figure 28: Lake Crossings

LEGEND

- Off Road Cycling Routes
- On Road Cycling Routes

3.4 FREIGHT NETWORK

At a glance

PERTH FREIGHT LINK

Constructed from the Great Northern Highway (Muchea) to Fremantle Port, including a tunnel between Winterfold Road (Hamilton Hill) and High Street (White Gum Valley).

NorthLink, Gateway, Roe 8, Fremantle Tunnel, and Fremantle Port Connect (Canning Highway to the Inner Harbour)
– by 2.7 million

ROWLEY ROAD, ANKETELL ROAD AND MUNDIJONG ROAD

Constructed to 4 lane divided standard, linking Tonkin Highway, Kwinana Freeway and the Fremantle-Rockingham Highway with the Western Trade Coast, including the future container port facility in the Port of Fremantle's Outer Harbour. Mundijong Road upgraded to freeway standard beyond a population of 3.5 million people.

Rowley, Anketell and Mundijong Roads
– by 3.5 million

FREIGHT RAIL UPGRADES

Duplicate the freight rail lines:
at Forrestfield/Kewdale
- by 2.7 million

and at Cockburn and Kwinana Triangles
- by 3.5 million

Construct a dedicated freight rail link over Swan River
- by 3.5 million

INTERMODAL TERMINALS

Develop intermodal terminals at Kewdale Terminal 2, Latitude 32 and South Bullsbrook
- by 3.5 million

SOUTHERN LINK ROAD

Connecting Mundijong Road with Brookton and Albany Highways
- beyond 3.5 million

LEVEL CROSSINGS

Remove level crossings in Canning Vale, Bibra Lake, Middle Swan and Midvale
- by 2.7 million

Freight Network Planning Principles

1. **Enable** metropolitan ports to achieve their optimum capacity
2. **Move** more of Perth's freight task by rail
3. **Expand** the metropolitan intermodal terminal system
4. **Strengthen** the high standard, high productivity road freight network to strengthen the economy
5. **Protect** transport infrastructure critical to economic prosperity

Figure 29: Freight Network Planning Principles

The Perth Freight Transport Network Plan comprehensively addresses Perth's future freight transport needs.

Significant expansion of the strategic road freight network will improve connectivity between the city's industrial areas and ports, and provide linkages out of the metropolitan area to serve demand from regional WA and interstate.

The noise and vibration associated with heavy vehicles is not compatible with residential development and so the plan aims to locate transit oriented developments (activity centres with passenger rail links and high density housing) away from strategic freight routes.

ROAD FREIGHT NETWORK

Within the metropolitan area, the primary road freight distribution network will include Tonkin Highway, Reid Highway, Roe Highway and the Kwinana Freeway. The planned improvement or construction of these roads are described in the Road Network section.

In addition to those improvements, by a population of 2.7 million:

- the Fremantle Tunnel (between Winterfold Road in Hamilton Hill and High Street in White Gum Valley) will link the end of Roe 8 with the intersection of Stirling Highway and High Street in Fremantle, while Fremantle Port Connect will complete the 'last mile' of the Perth Freight Link, extending from Canning Highway to Fremantle Port's Inner Harbour.

By a population of 3.5 million, access to the Outer Harbour will be enhanced by:

- Fremantle-Rockingham Highway that will connect with the Perth Freight Link and the new Stock Road tunnel; and
- The east-west routes of Rowley Road, Anketell Road and Mundijong Road, which will be built to a 4 lane divided standard, linking Tonkin Highway, Kwinana Freeway and Fremantle-Rockingham Highway with the Western Trade Coast.

To move freight to regional areas, by a population of 3.5 million:

- Perth-Adelaide National Highway will replace the section of Great Eastern Highway between Midland and Wundowie as the primary road freight link to the Eastern States; and
- NorthLink (extension of Tonkin Highway) will replace Great Northern Highway south of Muchea as the primary road freight route to the north west of the state.

Beyond a population of 3.5 million, the Southern Link Road, connecting Mundijong Road with Brookton and Albany Highways, will improve access to the Great Southern and Central Wheatbelt regions.

RAIL FREIGHT NETWORK

A number of enhancements will be made to the metropolitan freight rail network to accommodate the more than fourfold increase in international containers expected by mid-century.

By the time the population reaches 2.7 million, rail capacity will be increased by:

- duplicating the single-track sections at Forrestfield and Kewdale;
- identifying an additional rail option for the Kwinana Industrial Area to deal with capacity limits at the Kwinana Triangle; and
- removing the level crossings at Nicholson Road, Canning Vale; North Lake Road, Bibra Lake; Toodyay Road, Middle Swan; and Morrison Road, Midvale.

Freight rail alignments are being reviewed at Midland and Mundijong to improve urban outcomes.

By the time the population reaches 3.5 million, rail capacity will be further increased by:

- constructing a dedicated rail bridge in North Fremantle over the Swan River;
- providing transfer systems to support the development of future container port facilities in the Outer Harbour; and
- duplicating the track between Cockburn Triangle and the Latitude 32 Industry Zone, as well as between Latitude 32 and the Kwinana Triangle.

INTERMODAL TERMINALS

Fremantle Ports Inner and Outer Harbours will be connected by efficient road and rail links to a metropolitan intermodal freight terminal network, comprising:

- high capacity intermodal terminals in Kewdale and Forrestfield that serve the interstate and international rail freight markets, including a new open-access intermodal terminal facility at Kewdale Terminal 2;
- Latitude 32 Intermodal Logistics Centre, serving new container and general cargo port facilities in the Outer Harbour; and
- South Bullsbrook, serving the regions to the north and north-west of Perth.

Relevant elements of the State planning system are being reviewed to identify ways to better protect the freight network and manage its impacts on the community.

The metropolitan freight rail network will accomodate the more than fourfold increase in international containers expected by mid-century.

The Freight Network @ 3.5 Million and Beyond

Perth and Peel

Primary road freight routes

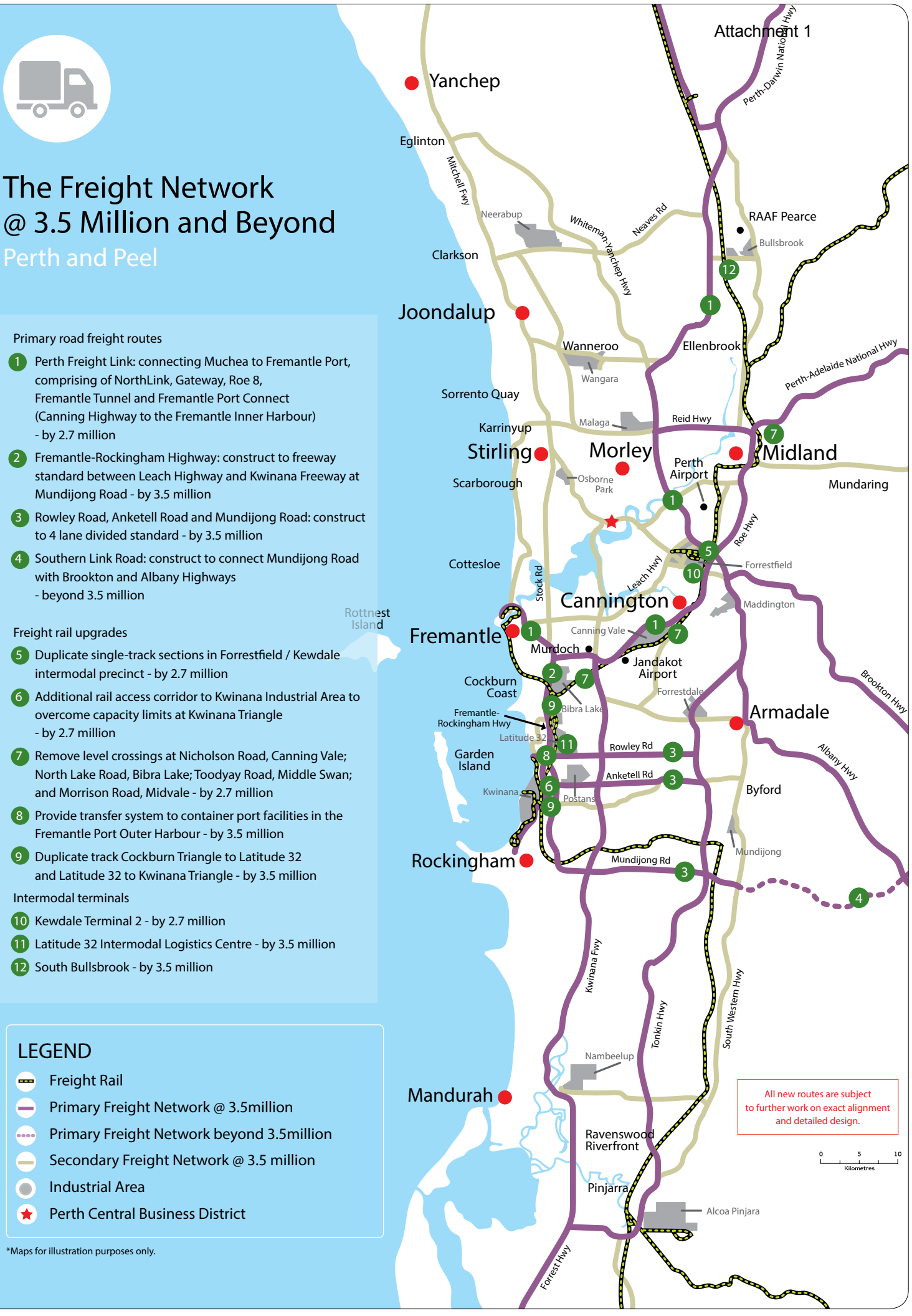
1. Perth Freight Link: connecting Muchea to Fremantle Port, comprising of NorthLink, Gateway, Roe 8, Fremantle Tunnel and Fremantle Port Connect (Canning Highway to the Fremantle Inner Harbour) - by 2.7 million
2. Fremantle-Rockingham Highway: construct to freeway standard between Leach Highway and Kwinana Freeway at Mundijong Road - by 3.5 million
3. Rowley Road, Anketell Road and Mundijong Road: construct to 4 lane divided standard - by 3.5 million
4. Southern Link Road: construct to connect Mundijong Road with Brookton and Albany Highways - beyond 3.5 million

Freight rail upgrades

5. Duplicate single-track sections in Forrestfield / Kewdale intermodal precinct - by 2.7 million
6. Additional rail access corridor to Kwinana Industrial Area to overcome capacity limits at Kwinana Triangle - by 2.7 million
7. Remove level crossings at Nicholson Road, Canning Vale; North Lake Road, Bibra Lake; Toodyay Road, Middle Swan; and Morrison Road, Midvale - by 2.7 million
8. Provide transfer system to container port facilities in the Fremantle Port Outer Harbour - by 3.5 million
9. Duplicate track Cockburn Triangle to Latitude 32 and Latitude 32 to Kwinana Triangle - by 3.5 million

Intermodal terminals

10. Kewdale Terminal 2 - by 2.7 million
11. Latitude 32 Intermodal Logistics Centre - by 3.5 million
12. South Bullsbrook - by 3.5 million



LEGEND

- Freight Rail
- Primary Freight Network @ 3.5million
- Primary Freight Network beyond 3.5million
- Secondary Freight Network @ 3.5 million
- Industrial Area
- Perth Central Business District

*Maps for illustration purposes only.

Figure 30: Map – The Freight Network at 3.5 million people and beyond

4

OPTIMISING THE SYSTEM

Transport infrastructure is expensive to build, maintain and operate efficiently. To get maximum value from it, we need to make it easy to understand and optimise its use so that we can move as many people as possible to where they want to go.

Transport @ 3.5 Million looks at how we will efficiently move people in and around Perth in the future by:

- improving network efficiency; and
- influencing travel behaviour.

Improving network efficiency

PUBLIC TRANSPORT NETWORK OPTIMISATION

The State Government has a plan for the future development of Perth's rail network, and it is just as important to have a plan for how to make the most effective and efficient use of it.

The Public Transport Authority will implement a Route Utilisation Strategy aimed at maximising the use of existing assets (including rail infrastructure, rolling stock and train control systems) and ensuring new initiatives are fully integrated with the existing network.

Over time, new higher capacity railcars, improved signalling and increased station capacity will help get the most out of rail corridors and valuable rail infrastructure. New technologies, such as improved signalling, will make it possible to reduce the headway between trains so they can safely operate closer together, enabling an increase in the frequency of services.

Where possible, high risk level crossings will be progressively replaced by bridges or underpasses to make travel safer and more efficient for all road and rail users.

Equipping Perth's bus fleet with Dynamic Stand Management and real-time tracking systems will enable buses to be allocated to stands on a variable or dynamic basis, maximising the utility of bus stand space and ensuring passengers are kept fully informed as to which stand their bus service will depart from.

Real-time tracking, which is currently being introduced, will facilitate the provision of traffic signal priority to buses, enabling greater timetable adherence and improving bus service reliability. It will also enable bus users to track the arrival time of their preferred bus service using smart phone apps.

MANAGED FREEWAYS

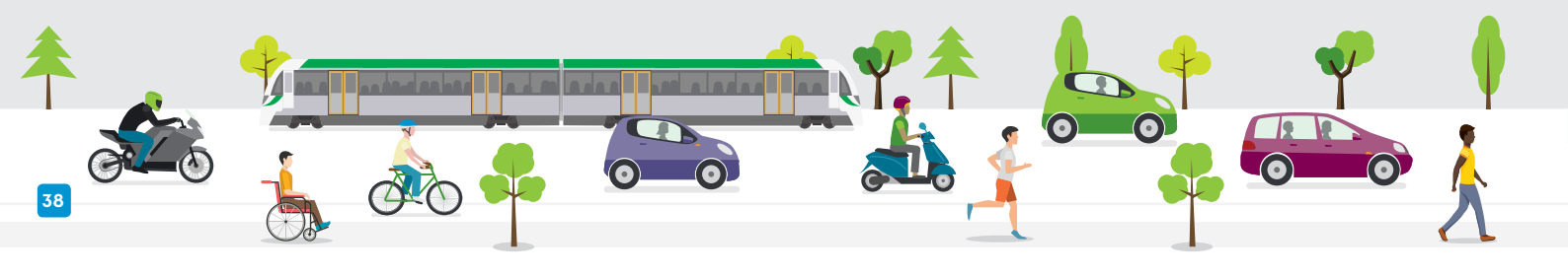
Managing traffic on our freeways is a key part of network efficiency.

The freeway network will be under increasing pressure as Perth's population grows. Sections of the network will need to run at high capacity to accommodate the number of vehicles predicted to use them.

Limited expansion is possible on the Kwinana and Mitchell Freeways between Roe and Reid Highways, and especially through the Perth CBD. Conventional widening will be undertaken where possible, interchanges will be upgraded and Managed Freeways will be introduced.

Main Roads' Managed Freeways strategy will ensure Perth has a productive, resilient freeway network that is capable of delivering maximum reliability, safety and sustainability benefits to the community.

The strategy will also provide improved travel information for road users. This will include real-time information on travel times, average speeds and road conditions, enabling road users to make better informed travel choices.



Managed Freeway tools include:

- variable speed limits and lane control signs being displayed from gantries indicating the speed limit for each lane on the freeway;
- closed circuit television and traffic detectors providing images and data to a control centre;
- electronic message signs providing warnings and advice;
- timing signs showing how long it will take to get to the next junctions; and
- ramp signalling that can control how many vehicles enter the freeway from particular junctions.

Managed Freeways help to keep traffic moving by controlling the speed of flow. Breakdowns can be quickly detected, emergency vehicles called, the lane closed, traffic diverted around the incident, the flow of traffic entering the freeway adjusted and motorists advised to seek alternative routes.

Where possible, laybys will be provided at regular intervals along the freeway and fitted with emergency phones so that motorists have a place of refuge if their car breaks down.

Other strategies, such as introducing High Occupancy Vehicle lanes (often referred to as 'car-pool lanes'), will be considered.

OTHER TECHNOLOGIES

Technology has opened new doors for monitoring vehicle movements. We can use this technology to better inform people's travel choices – often in real-time – and improve the efficiency of our transport system.

In-car navigation systems, mobile devices and detectors on roads and bridges can all transmit and receive data using wireless or bluetooth technologies. The data can include information about road conditions, weather, vehicle speeds, roadworks, accidents and other road activities.

The individual pieces of information build up a picture of what is happening on the transport network in real time. This information can be used to provide messages to travellers via the internet, mobile devices, in-car streaming and variable message road signs to help people have a more efficient journey. The technologies can be used to inform journeys made on foot, or by bike, public transport or car.

Collectively, these technologies are referred to as 'Intelligent Transport Systems' and will play an increasingly important role in managing our transport system.

Influencing travel choices

In general, the transport system is designed to have sufficient capacity to cater for the morning and afternoon peak periods. This is when the highest number of people are on the move, mainly travelling to and from work and school. At these times the transport system may be used to capacity, but at other times of the day the system may be underutilised.

By spreading out the times that we travel we can get better use from transport infrastructure, which means we could spend less time in traffic and get more value for money as we would not need to build new infrastructure so quickly.

Around the world, many tools have been used to influence or manage people's travel patterns and choices. Some of the tools provide incentives (such as cheaper transit fares at certain times of day or faster travel times for car-poolers), while others provide disincentives to drive (such as high parking fees or congestion charges).

These 'carrots' and 'sticks' work together to:

- reduce congestion;
- improve freight and business productivity;
- delay or avoid infrastructure investments; and
- provide social and environmental benefits.

Four tools have been selected for *Transport @ 3.5 Million*.

TRAVEL PLANS FOR NEW DEVELOPMENTS

A travel plan is a package of measures to encourage safe, healthy and sustainable travel options by people working for a specific organisation or at a particular site such as a large activity centre, shopping centre, large residential development or university.

These measures can include employers supporting car sharing, discounted public transport, cycle facilities or personalised journey planning.

All of these measures can contribute to significant reductions in single occupancy vehicle trips in peak periods.

Some developers already prepare travel plans voluntarily. As Perth grows towards 3.5 million people, travel plans will be increasingly implemented in new major commercial and residential developments in activity centres.

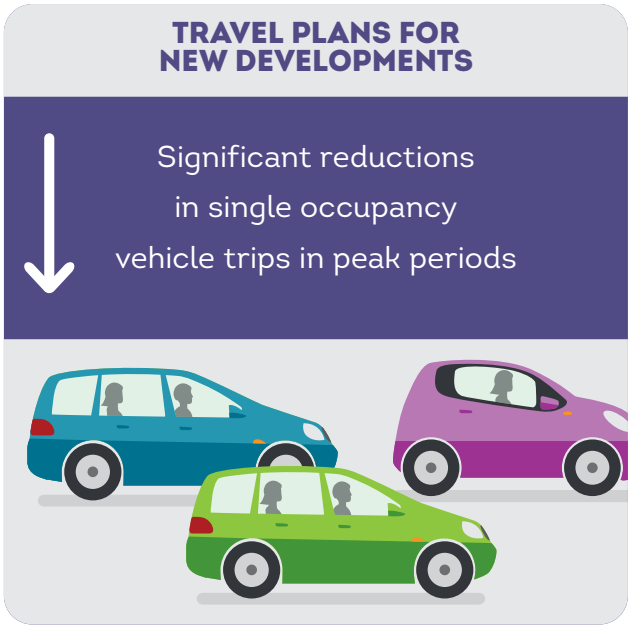
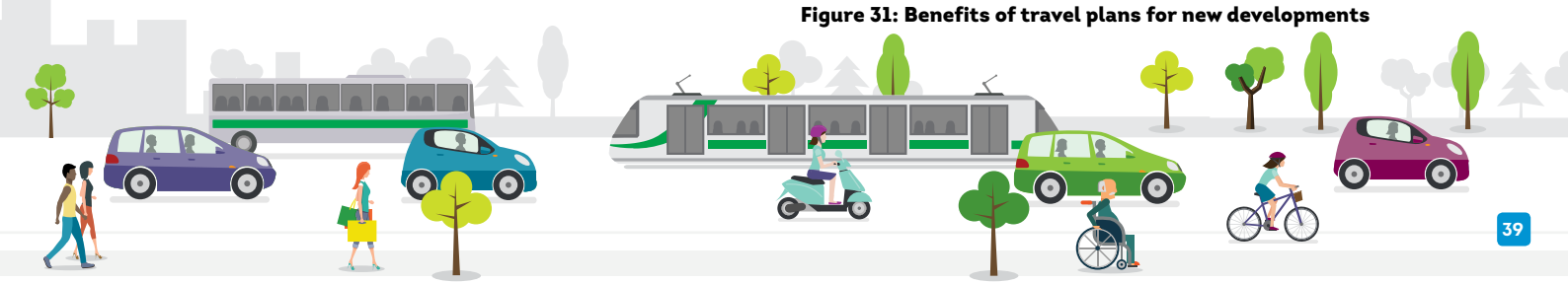


Figure 31: Benefits of travel plans for new developments



PARKING STRATEGIES

Effective parking strategies generally combine the use of long and short term parking charges or levies and may limit the number of parking spaces in a particular area (parking caps). These measures are designed to limit the use of private car trips to specific sites or areas.

If the need for car parks is reduced, this opens up the land for higher value uses such as transit oriented developments (where many people can live close to public transport links), public spaces and shared paths.

Parking strategies can reduce car travel to activity centres by up to 30 per cent when good transport alternatives are made available.

When the population reaches 3.5 million, parking strategies will have been introduced in activity centres and industrial areas (where there are high levels of density and employment) and be widely applied across Perth.

Local governments will be encouraged to implement strategies that develop active and public transport. For example, the existing Perth Parking Management Area supports the free CAT bus network in the Perth CBD.

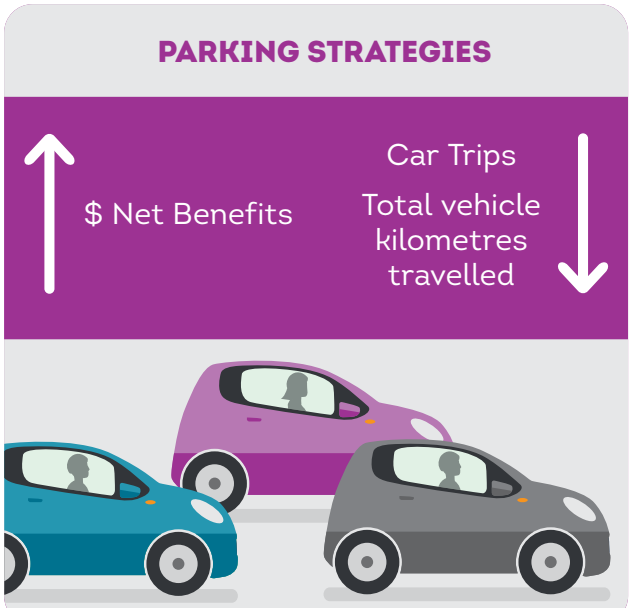


Figure 32: Benefits of parking strategies

TRANSPORT PRICING

Roads

The introduction of a Heavy Vehicle Charge on the Perth Freight Link route will enable Western Australia to realise significant economic reform of the freight industry by delivering the first ever revenue-generating dedicated freight route.

The development of the Perth Freight Link route will provide significant productivity gains for the freight and logistics industries. The heavy vehicle charge will recover a portion of the value from those gains to fund future state infrastructure needs.

The Australian Infrastructure Plan, released by Infrastructure Australia (IA) in February 2016, highlights that the current level of public sector expenditure, especially in the transport sector, may be unsustainable in the face of increasing fiscal pressures.

IA indicated that Australia needs to consider a broader system of transport pricing, both for roads and public transport, and recommended a national inquiry into road user charging reform.

In the event of such an inquiry, the State Government will engage with the Commonwealth and other States on this reform.

Public Transport

Introducing differential public transport fares for the peak period and non-peak times can shift travel patterns and 'spread the peak'.

As more people adjust their time of travel to take advantage of cheaper fares, this can result in less congestion, enable infrastructure to be used more efficiently, and defer or avoid the need for new infrastructure.

By the time Perth has 3.5 million people, a revenue-neutral time of day pricing scheme will be introduced, with non-peak fares being around 30 per cent lower than peak fares. Concessions will not be affected.

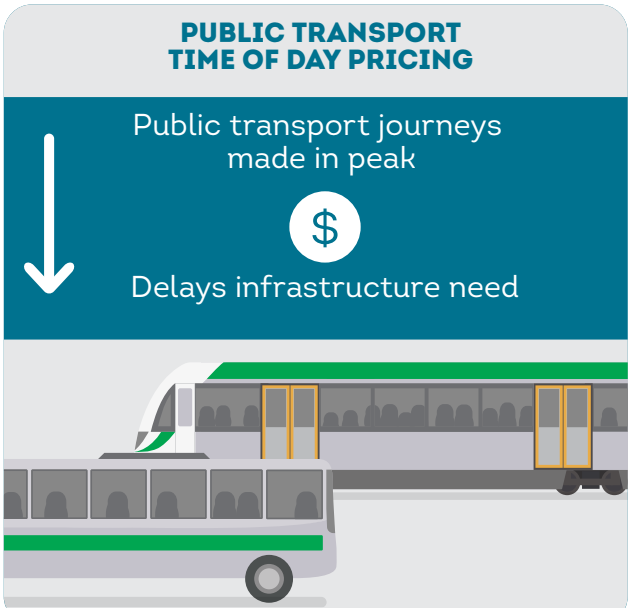


Figure 33: Benefits of public transport time of day pricing

TRAVEL BEHAVIOUR PROGRAMS

These programs use education, information and incentives to influence and assist people to voluntarily reduce their need to travel, particularly by car, and to increase walking, cycling and the use of public transport.

For example, the *Your Move* program implemented in the Cities of Cockburn and Wanneroo helps people to achieve their active transport and physical activity goals by providing tailored information and resources, as well as personalised phone coaching and feedback on progress. More people in these areas are now walking, cycling, using public transport and car-pooling.

Integrated travel behaviour programs will develop under *Transport @ 3.5 Million* to become:

- well-established across workplaces, households and schools in the metropolitan area;
- combined with all new significant public transport infrastructure projects or services, so people will be able to easily plan how to get the most from new transport developments; and
- targeted to congestion hotspots, activity centres, shopping centres and large infrastructure developments.

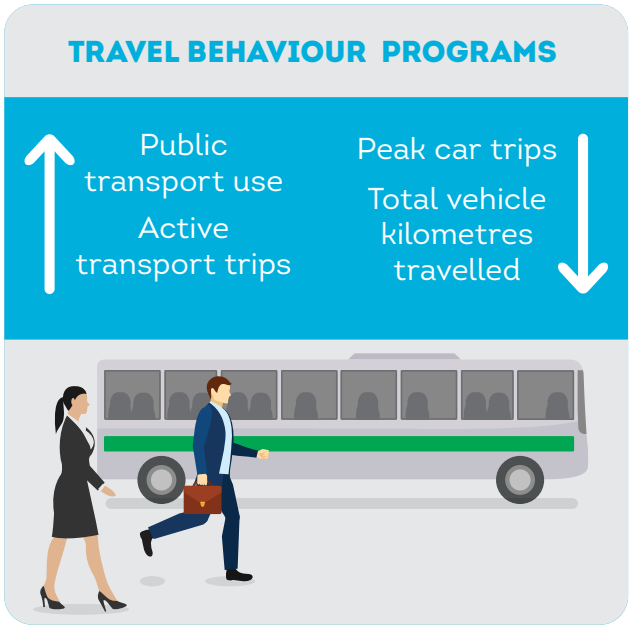


Figure 34: Benefits of travel behaviour programs

OTHER FACTORS INFLUENCING TRAVEL DEMAND

By integrating land use with transport, it is possible for more people to live and work closer to activity centres or along transport corridors where they can access public transport more easily, or simply walk or cycle to work.

Many other factors contribute to reducing congestion at peak times. For example:

- with improved technologies, more people are able to work from home for one or more days a week;
- more companies are providing flexible working hours or compressed working weeks, where employees work fewer but longer days or staggered shifts that spread the times of when people arrive or leave the worksite;
- school hours could be staggered with larger schools opting to have different start and finishing times for pre-primary students or those in specialist programs; and
- the use of real time travel information can help commuters to make informed choices about when they leave home to start their journey.

A range of emerging on-demand transport and related services are opening up new ways to travel and these opportunities will be investigated more closely:

- ride-sourcing services utilising app-based technology, providing safe, flexible and affordable personalised services to your door. These are currently being examined as part of an industry wide on-demand transport reform;
- car-sharing and bike-sharing schemes enabling people to have short term access to a car or bicycle for personal or business use;
- ride-sharing gives a modern twist to car-pooling, by using smart phone technology to match people travelling the same way;
- flexible transport solutions such as demand responsive transport, where dedicated vehicles are used to provide special services for people where demand is too low to support scheduled public transport services, or people with special needs; and
- unbundled parking in residential and commercial units where parking is rented or sold separately to the building space.

With so many changes in technology and society, there may be new ways of influencing travel demand in the future. While the top four tools outlined in *Transport @ 3.5 Million* will be the focus for coming years, new developments will be explored as they emerge.

5

FUTURE TRENDS

Predicting the future is not an exact science. There is considerable debate about the many ways in which different social and technological trends will change the ways we travel, and the way we plan and develop our transport network, in the future.

The future transport network set out in *Transport @ 3.5 Million* is based on extensive research, knowledge, experience and modelling. It takes into account many influencing factors, including future land use and employment distribution, changing demographics, social trends and expected advances in technology.

A key focus going forward will be to continuously identify and monitor influential trends and their underlying causes. *Transport @ 3.5 Million* will remain flexible and adaptive to respond effectively to the city's changing needs.

Here are some of the trends that may influence transport planning in the future.

Fully automated passenger vehicles are likely to impact on the way we travel.

Technological advances

There are many technologies that could influence how transport is managed in the future. The increasing role of the 'Internet of Things' and the introduction of fully automated passenger vehicles are likely to impact on the way we travel and the future shape of the transport network.

INTERNET OF THINGS

Millions of objects today contain sensors, unique identifiers and embedded microchips that enable them to communicate data to other objects through wireless technology. Together these objects form the 'Internet of Things' (IOT).

The advent of Cloud technology has meant that there is now a place where the large amounts of real time data from IOT objects can be stored, accessed and analysed to provide solutions that influence the way we live.

For example, the IOT can influence the transport system by providing real time data to communicate:

- Vehicle to Vehicle (V2V) – where a vehicle advises a vehicle behind of an upcoming traffic hazard;
- Vehicle to Infrastructure (V2I) – where vehicles communicate with traffic lights so they apply the most efficient light sequence to keep traffic flowing; and
- Vehicle to People (V2P) – via mobile devices and personal accessories so people know where a vehicle is on its journey to collect them or to make a delivery.

Already our mobile devices can alert us to the best time to leave for our next calendar appointment, based on time, distance and travel conditions. Many car drivers rely on GPS for directions, and for real-time information on traffic and roadworks.

Ultimately IOT technology could be extended to advise us of the best travel option having regard to transport conditions (on road, rail, and cycleways), our personal diary, budget, fitness, daily activity levels, and weather conditions. From this we may choose to walk, cycle, catch public transport or drive – or use the best combination of options.

AUTOMATED VEHICLES

The future of driverless vehicles has received considerable attention in recent years. Along with traditional car manufacturers, leaders in information technology, such as Google and Apple, have shown an interest in developing this technology. The Google Self Drive Project has clocked up over 1.6 million kilometres travelling around the United States.

In Australia, the first automated vehicle trials were held in Adelaide in November 2015. The Transport Portfolio is working closely with the RAC on the staged trial of a driverless, fully electric shuttle bus on Perth roads.

While the rise of driverless vehicles seems certain, the timing and impacts of this change are unknown.

What is clear is that the potential benefits of driverless vehicles will take time to materialise. Today's vehicles already contain some automated features. There are five internationally recognised levels of automated vehicle with the highest level having no driver and being fully 'autonomous'.

Figure 35: Automated shuttle bus trial

Source: RAC Western Australia

Many vehicles on the road today have Level 1 automation in the form of cruise control and some have Level 2 features that enable the vehicle to park automatically. Driverless trucks, operated from Perth, have been used on remote mine sites for years and in many countries driverless trains are used on rail systems.

The existing levels of automation provide benefits to the direct users, but the wider benefits of automation, such as reduced traffic and parking congestion, improved safety, independent mobility for non-drivers, energy conservation and reduced pollution, are unlikely to become significant until driverless vehicles outnumber human-operated ones.

At present, we cannot reliably predict how long it will take for driverless vehicles to reach critical mass to achieve these benefits, or what path the transition from human-operated to fully automated vehicles will take.

The journey may begin with vehicles owned by businesses and government, shifting professional drivers (in the public transport, trucking and taxi sectors) into more technology-oriented roles. Alternatively, it could be led by private demand through affluent early-adopters and non-drivers.

LEVEL	DESCRIPTION	EXAMPLES	IMPLICATION
0	Warning but no automation	Lane departure warning, blind spot warning	The driver is in full control but supported by systems
1	Function specific automation	Electronic Stability Control (ESC), Adaptive Cruise Control (ACC), Auto Emergency Braking (AEB)	The driver is always in control but safety systems take some corrective action if needed
2	Combined function automation	ACC and lane keeping assistance, self-parking	The vehicle can operate without driver input in some conditions
3	Limited self-driving automation	In normal conditions the vehicle can operate autonomously, but hands back control to driver at short notice in some conditions	
4	Full self-driving automation	Vehicles operate without requiring driver input; vehicles may or may not have a driver present	

Figure 36: Levels of vehicle automation

Source: US National Highway Traffic Safety Administration (NHTSA)

TRANSITION CHALLENGES

Irrespective of the exact timing, the transition to driverless vehicles will present significant planning and policy challenges.

While driverless vehicles offer many potential benefits, they also present risks to be managed. The integration of driverless vehicles into the wider transport system has the potential to improve the system, but also has potentially adverse consequences.

Driverless vehicles can operate more closely together, reducing the amount of road space required per vehicle. However, the appeal of 'Personal Rapid Transit' pods could attract people away from public transport, reducing the net benefit of driverless vehicles and potentially resulting in increased congestion in the long run. To avoid this, travel demand strategies and investment in alternate modes (including walking, cycling and public transport) will need to ensure driverless vehicles complement, rather than simply compete with, other transport options.

Other transition challenges include:

- identifying and implementing necessary legislative changes to enable and, where necessary, regulate driverless vehicles;
- considering the impact on personal identification, when people may no longer require a driver's licence;
- identifying innovative transport infrastructure funding mechanisms and transport pricing reforms, so that there is an equitable way of paying for use of transport infrastructure in the future, if there is a reduction in vehicle numbers (and hence registration revenue), driver's licences, and fuel consumption (reducing fuel tax revenue); and
- understanding impacts on insurance costs and liability for accidents involving driverless vehicles.

ENERGY

The transport sector accounts for over 27 per cent of Australian net energy consumption, slightly more than the electricity supply sector. Road transport accounts for over 72 per cent of transport energy consumption.[6]

Since 2000, Australia's dependence on imported liquid fuel and oil for transport has grown from around 60 per cent to over 90 per cent of our transport fuel demand.[7]

While transport consumes a significant amount of energy, it may also form part of our future energy solution. Public and commercial transport vehicles are often testing grounds for new energy technology, such as Perth's hydrogen fuel cell bus trials. Perth's trains use regenerative braking to return energy to the electrified network.

Electric vehicles can be re-energised at charging stations around the city – these charging stations will increase in number as electric vehicles become more common. In the future, charging stations might be readily available in car parks, for convenient recharging.

A number of new technologies are being trialled around the world to make better use of transport infrastructure, including solar roadways and inductive roads and railways that charge electric vehicles as they travel.

If these technologies advance, in the future Perth's extensive transport infrastructure might be used to collect and distribute clean energy to vehicles, signals and lighting.

	2013–14		AVERAGE ANNUAL GROWTH	
	Peta-joules	SHARE (per cent)	2013–14 (per cent)	10 YEARS (per cent)
Transport	1 589.2	27.3	1.1	1.8
Electricity supply	1 575.6	27.0	-2.8	-0.9
Manufacturing	1 186.2	20.2	-6.9	0.2
Mining	531.1	9.1	6.6	6.9
Residential	449.0	7.7	-1.4	1.0
Commercial	315.8	5.4	2.8	1.9
Agriculture	99.7	1.7	0.3	-0.2
Construction	26.7	0.5	7.1	-0.5
Other	58.0	1.0	-13.9	-2.6
Total	5 831.1	100.0	-1.5	0.9

Figure 37: Australian energy consumption by industry

Source: Department of Industry and Science (2015) Australian Energy Statistics, Table E

	2013–14		AVERAGE ANNUAL GROWTH	
	Peta-joules	SHARE (per cent)	2013–14 (per cent)	10 YEARS (per cent)
Road	1 156.9	72.8	-0.1	1.3
Air	303.0	19.1	4.9	4.6
Rail	52.0	3.3	-0.1	4.4
Water	53.0	3.3	6.2	-2.5
Other	24.3	1.5	-3.4	-0.1
Total	1 589.2	100.0	1.1	1.8

Figure 38: Australian transport energy consumption by subsector

Source: Department of Industry and Science (2015) Australian Energy Statistics, Table F

6 Department of Industry and Science (2015) http://www.industry.gov.au/Office-of-the-Chief-Economist/Publications/Documents/aes/2015-australian-energy-statistics.pdf

7 NRMA (2014) Australia's Liquid Fuel Security Part 2 https://www.mynrma.com.au/media/Fuel_Security_Report_Pt2.pdf

Social trends

While technological trends have clear potential to change the way we travel in the future, it is also important to consider the underlying factors that influence travel behaviours and, in many cases, create the impetus for new technologies.

Since the beginning of the 21st century, there has been a notable decline in per capita travel by car across most Western countries, including Australia. This is in marked contrast to the continuous growth experienced during the mid-to-late 20th century, when car ownership became common and affordable.

Today, younger people are less likely to have a driver's licence and more likely to defer learning to drive. Walking, cycling and catching public transport have become more socially acceptable within cities like Perth. These modes are encouraged by governments not just for transport efficiency, but for their health and environmental benefits.

There could potentially be fewer cars in car parks, due to car-pooling, car-sharing, ride-sourcing, ride-splitting and other ride-sharing arrangements that are re-shaping the way we think about transport.

As electric vehicles become more popular, air quality will improve and the need for charging stations (potentially from renewable resources) will increase.

These changing community preferences hold potential transport network benefits for all users, including those who continue to travel by car. If these choices are supported by increased urban living and suitable transport infrastructure (including better walking and cycling paths, bike parking, and public transport options), then there is considerable potential to reduce traffic congestion, slow down road expansion and reduce transport costs.

The changing nature of work could increase opportunities for working from home, telecommuting, and staggered work hours.

Expensive office space may be increasingly used for meetings and sharing ideas, while the 'work' takes place at home or at less expensive office hubs in the suburbs, reducing the demand for longer trips on the transport system.

Routine office, hospitality and manufacturing tasks may be performed by robots or automated computer systems, with a growth in IT employment to maintain these new technologies.

The growth in prefabrication and 3D printing may see a decrease in on-site labour, but an increase in jobs and deliveries of raw materials to industrial locations.

It is likely that retail trading hours will be fully deregulated over time and this may result in a shift to later opening hours. This could have the consequential effect of spreading the peak period on the transport network, reducing peak congestion.

Continued growth in products and services delivered to the home by mobile technology is expected, including online shopping and education, and even virtual doctors.

All of these factors continue to influence how, when and where we travel. The transport network has a role in both responding to and shaping social trends to help create and maintain a vibrant, connected and productive city.

The Transport Portfolio will continuously monitor social, economic and technological trends to ensure the plans of today meet the needs of tomorrow. This will include ongoing stakeholder engagement with local governments, academia, industry and the community so that plans reflect the best knowledge of the day and keep pace with the needs of our growing population and advances in technology.

6

THE WAY FORWARD

Transport @ 3.5 Million sets the vision for a generational change to Perth's transport network. The transport initiatives described in this plan, and listed in Appendix 1, will keep our city vibrant, connected and productive.

Many of the projects proposed in the plan are new and in the conceptual stage. They will be subject to further investigations as to scope, engineering and design, cost estimation, funding options and timing.

This will occur as part of the Government's usual planning and investment decision making processes.

TIMING

Due to the long term outlook of the plan, it is too early to determine the exact timing and priority of most projects. The plan is a guide for the future network – how and when different elements are delivered will be determined over the next three decades.

A broad estimate of project timings is provided in Appendix 1.

By optimising our existing network and services, which has already benefitted from significant investment, some of the infrastructure projects will not be required until the population approaches 3.5 million. That is, they will need to be delivered between 2030 and 2050, assuming current population projections are met.

ECONOMIC APPRAISAL

Government funding is likely to remain constrained into the future and investments must be carefully prioritised.

The immediate costs of new transport infrastructure, while high, will be evaluated in the context of long term growth, wider economic benefits and the cost of doing nothing.

The infrastructure proposed in this plan is significant. Funding implementation of the plan will require the assistance of the Australian Government.

In addition to public funding, the State will continue to partner with private industry and explore innovative funding opportunities, such as value capture, to help deliver the network Perth needs to keep it vibrant, connected and productive.

New investment in transport infrastructure can lead to significant increases in surrounding residential and commercial property values. Assessing value capture opportunities in the early part of project planning and evaluation will become the norm for major projects in the future.

CONSULTATION

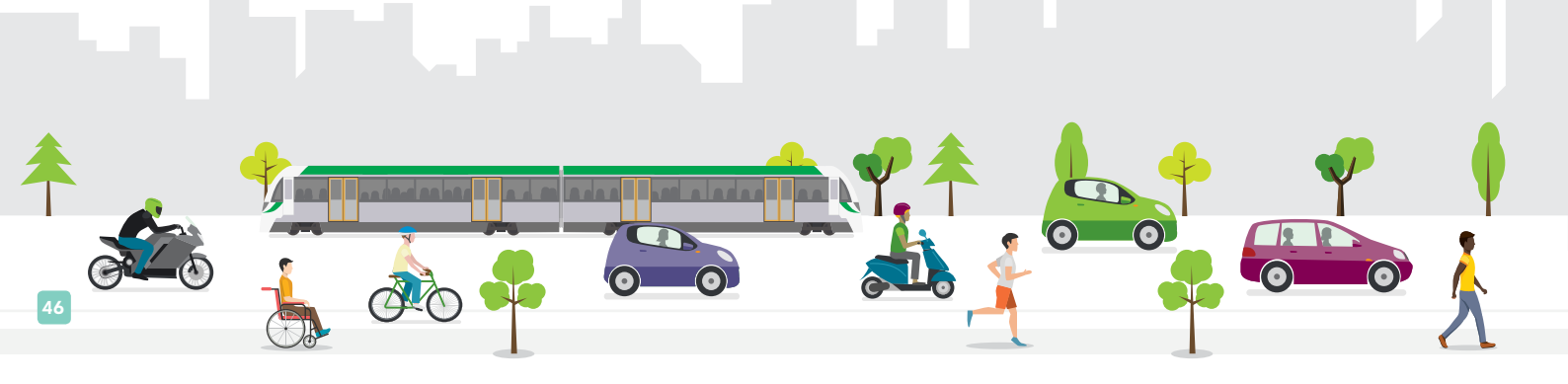
Transport @ 3.5 Million has been developed by the Transport Portfolio (Department of Transport, Public Transport Authority and Main Roads) in collaboration with the Departments of Planning, Treasury, and Premier and Cabinet. The Planning and Transport Research Centre of WA were independent advisors for the mass transit network.

The release of the plan provides opportunity for consultation with federal, state and local government bodies, business, industry, academia and the wider community.

There is not a single 'right way' to meet the travel demands of the future. This plan sets out what the Transport Portfolio considers to be the best option for future development and optimisation of the network, based on land use and employment targets, forecast travel demand and the objectives of the plan.

The plan will be reviewed based on feedback following a consultation period.

To have your say or for more information, visit www.transport.wa.gov.au/transportplan



MONITORING AND REVIEWING THE PLAN

Transport @ 3.5 Million is based on the land use targets established in *Perth and Peel @ 3.5 Million*. If those targets are not met, or change, the plan will need to adapt to accommodate this.

Similarly if technology changes more rapidly or in different ways than currently expected, changes to the plan may be necessary.

Influential trends will be monitored and the plan will be reviewed every five years to ensure it continues to meet the needs of Perth's growing population. The Transport Portfolio will also monitor delivery of the plan, ensuring it is implemented in a coordinated and integrated manner.

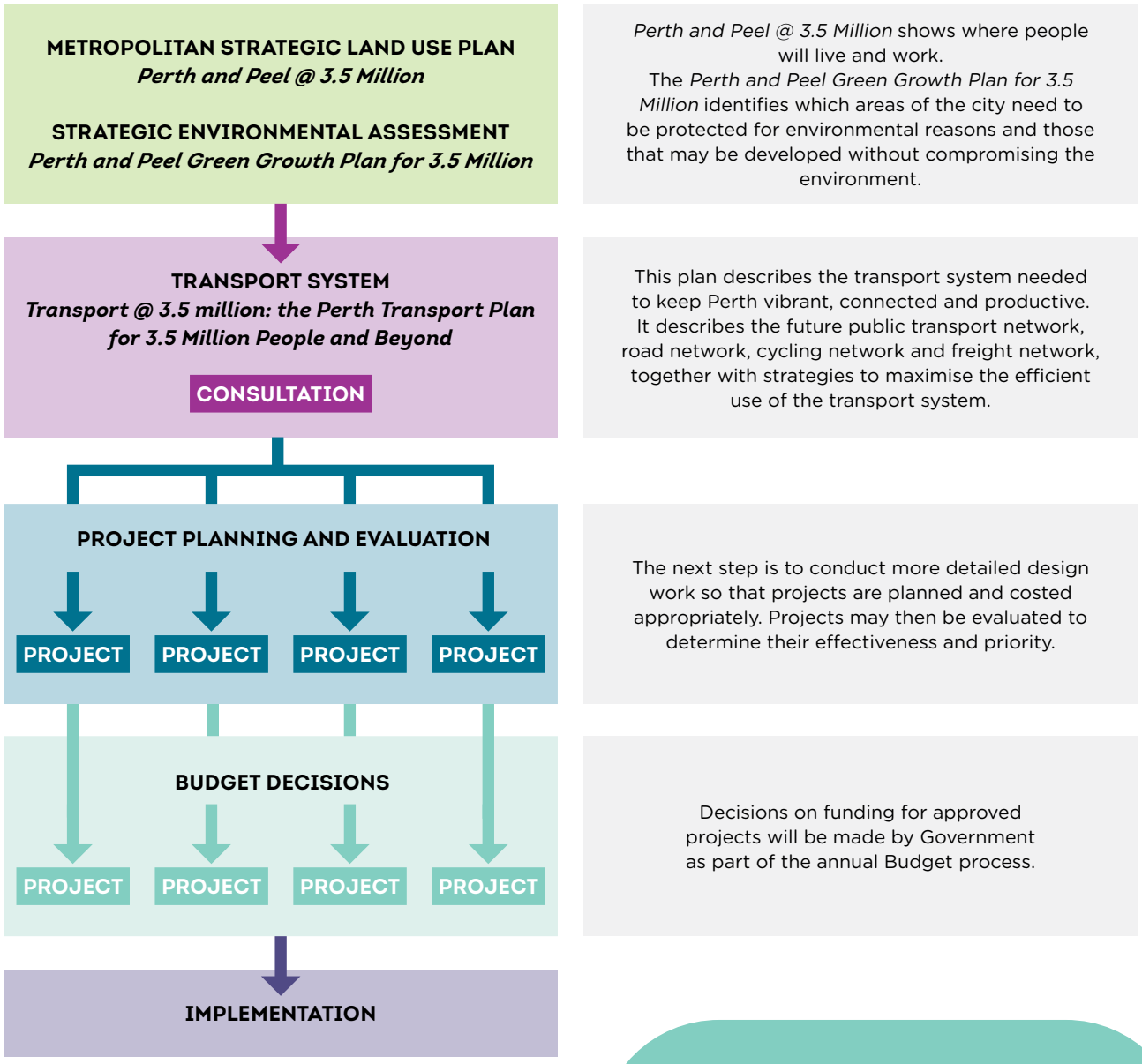
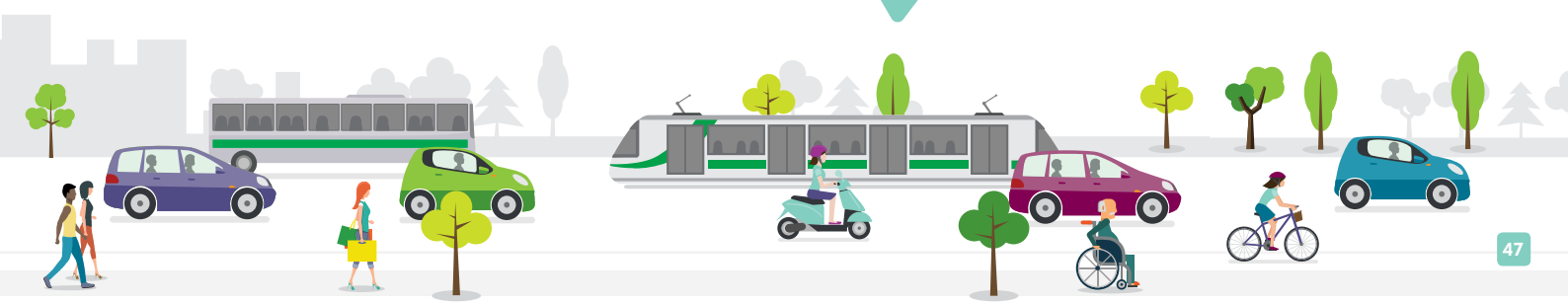


Figure 39: The Transport Planning Process

To have your say, visit
www.transport.wa.gov.au/transportplan



APPENDIX 1: ESTIMATED TIMELINES

A broad estimate of project timings is provided below. All projects are subject to further consultation and technical assessment.

ENHANCEMENT	BY 2.7 MILLION	BY 3.5 MILLION	BEYOND 3.5 MILLION
PUBLIC TRANSPORT NETWORK			
East Wanneroo Rail Link			
City to Marshall Road (via Morley)	✓		
Marshall Road to the Joondalup line		✓	
Ellenbrook spur			✓
Stirling-Murdoch Orbital Rail Link			
Stirling to UWA-QEII		✓	
UWA-QEII to Murdoch		✓	
Murdoch to Thornlie			✓
Stirling to Morley			✓
Extending radial rail lines			
Joondalup line extended to Yanchep	✓		
Midland line extended to Bellevue	✓		
Armadale line extended to Byford		✓	
Other rail links			
Forrestfield Airport Link	✓		
Cockburn Central to Thornlie	✓		
Forrestfield to Thornlie			✓
Southern Rail			✓
Subway-style inner city system			
Connecting Perth, East Perth, West Perth, Northbridge, Leederville and other inner city centres		✓ Partial	✓
Perth Light Rail			
UWA-QEII to Curtin-Bentley	✓		
Curtin-Bentley to Canning Bridge		✓	
Bus rapid transit (BRT) / Light rail transit (LRT)			
Ellenbrook to Bassendean Station, Midland and East Wanneroo Rail Link	✓		
Glendalough Station to Scarborough Beach	✓		
Canning Bridge to Booragoon			✓
Murdoch to Cockburn Coast via Fremantle			✓
Bus Bridge (Bus, cycling and walking)			
Maylands Bus Bridge		✓	

ENHANCEMENT	BY 2.7 MILLION	BY 3.5 MILLION	BEYOND 3.5 MILLION
ROAD NETWORK			
River Crossings			
East-West City Link (Riverside Bridge/Tunnel & East-West Tunnel)		✓	
Stock Road Tunnel		✓	
Freeways and Expressways			
All-lane running: implement on Mitchell and Kwinana Freeways	✓		
Reid and Roe Highways: upgrade to freeway standard	✓		
Mitchell Freeway: extend to Indian Ocean Drive and construct to freeway standard to Yanchep		✓	
Whiteman-Yanchep Highway: construct to link Tonkin Highway with Mitchell Freeway; freeway standard between Tonkin Highway and Neerabup		✓	
Fremantle-Rockingham Highway: construct to freeway standard between Leach Highway and Kwinana Freeway at Mundijong Road		✓	
Orrong Road and Leach Highway upgraded to expressway standard. Orrong Road between Graham Farmer Freeway and Roe Highway. Leach Highway between Tonkin Highway and Shelley Bridge		✓	
Mitchell Freeway: upgrade to freeway standard between Yanchep and Indian Ocean Drive			✓
Whiteman-Yanchep Highway: upgrade to freeway standard between Neerabup and Mitchell Freeway			✓
Mundijong Road between Kwinana Freeway and Tonkin Highway: upgrade to freeway standard			✓
Tonkin Highway			
Tonkin Highway: extend to Perth-Darwin National Highway in the north and Forrest Highway, Pinjarra in the south	✓ Partial	✓	
Tonkin Highway upgrade to freeway standard between the Perth-Darwin National Highway and Mundijong Road		✓	
Tonkin Highway far south: upgrade to freeway standard from Mundijong Road to Forrest Highway, Pinjarra			✓
CYCLING NETWORK			
Expand off-road network from 172 km to 850 km	✓ to 350 km	✓ to 850 km	
River and Lake Crossings			
Three Points Bridge, connecting Chidley Point, Point Walter and Point Resolution	✓		
Heirisson Island Bridge	✓		
Racecourse Bridge		✓	
Salter Point Bridge		✓	
Pipeline River Crossing		✓	
Canning River Elevated Boardwalk		✓	
Lake Joondalup Bridge		✓	
Lake Goollelal Bridge		✓	

ENHANCEMENT	BY 2.7 MILLION	BY 3.5 MILLION	BEYOND 3.5 MILLION
FREIGHT NETWORK			
Strategic road freight routes			
Perth Freight Link connecting Muchea to Fremantle Ports, comprising of NorthLink, Gateway, Roe 8, Fremantle Tunnel and Fremantle Port Connect (Canning Highway to the Fremantle Inner Harbour)	✓		
Rowley Road, Anketell Road and Mundijong Road: construct to 4 lane divided standard, linking Tonkin Highway, Kwinana Freeway and the Fremantle-Rockingham Highway with the Western Trade Coast, including the future container port facility in the Fremantle Port Outer Harbour		✓	
Perth-Adelaide National Highway: construct between Roe Highway at Midland and Great Eastern Highway; freeway standard to Gidgegannup	✓ Partial	✓	
Southern Link Road connecting Mundijong Road with Brookton and Albany Highways			✓
Freight rail upgrades			
Duplicate single-track sections in Forrestfield / Kewdale	✓		
Identify an additional rail option for the Kwinana Industrial Area to deal with capacity limits at the Kwinana Triangle	✓		
Remove level crossings at Nicholson Road, Canning Vale; North Lake Road, Bibra Lake; Toodyay Road, Middle Swan; and Morrison Road, Midvale	✓		
Construct a dedicated freight link in North Fremantle over the Swan River		✓	
Provide transfer systems to support the future container port facilities in the Fremantle Port Outer Harbour		✓	
Duplicate track between Cockburn Triangle and Latitude 32 Industry Zone, and between Latitude 32 and the Kwinana Triangle		✓	
Intermodal terminals			
Kewdale Terminal 2	✓		
Latitude 32 Intermodal Logistics Centre (serving new container and general cargo port facilities in the Fremantle Port Outer Harbour)		✓	
South Bullsbrook		✓	
OPTIMISING THE SYSTEM			
Improving network efficiency			
Implement Rail Route Utilisation Strategy	✓		
Implement Dynamic Stand Management and Real Time Tracking of buses	✓		
Implement Managed Freeways Strategy	✓		
Influencing travel choices			
Perth Freight Link Heavy Vehicle Charge	✓		
Travel plans for major new commercial and residential developments		✓	
Parking strategies introduced in activity centres and industrial areas		✓	
Differential public transport fares (off-peak at least 30% lower than peak)		✓	
Expanded travel behaviour change programs for workplaces, households, schools, congestion hot spots and activity centres		✓	

APPENDIX 2: GLOSSARY

TERM	DESCRIPTION
Active transport	Non-motorised travel modes, such as walking and cycling
Activity centre	Community focal points. They comprise uses such as commercial, retail, higher-density housing, entertainment, tourism, civic/community, higher education and medical services. Activity centres vary in size and diversity and are designed to be well-serviced by public transport. In Perth the largest activity centre is the Perth CBD and there are ten strategic activity centres in Yanchep, Joondalup, Stirling, Morley, Midland, Cannington, Fremantle, Armadale, Rockingham and Mandurah. Unless specified otherwise, for the purposes of this report, 'activity centre' includes **specialised centres** and **strategic metropolitan activity centres.**
All lane running	On freeways maximum use is made of the freeway corridor by using emergency lanes for traffic. Special laybys are provided for breakdowns and road management procedures are put in place so that incidents can be monitored and controlled.
Bus Rapid Transit (BRT)	Bus Rapid Transit is a high speed bus service with limited stops that operates in its own lane, separated from other traffic by kerbing or barriers and with 'station-like' passenger stops.
Car sharing	Car sharing schemes provide members with short term access to vehicles for personal and business use. Car sharing provides the benefits of private car ownership without the operating costs and responsibilities.
CBD	Central Business District.
End of trip facilities	Facilities that support the use of active transport, e.g. bike storage facilities, changing rooms and showers.
Expressway	A divided highway with bridges and underpasses at all interchanges, but some access (eg. left in, left out) between those interchanges. Some parts of a highway may be constructed to expressway standard.
Freeway standard	A divided highway with no access for traffic between interchanges and with bridges or underpasses at all intersections. Some parts of a highway may be constructed to freeway standard.
Green bridges	Bridges that are used by pedestrians and cyclists only.
High frequency public transit corridor	Where bus services are available at a frequency of five minutes in peak times and 15 minutes out of the peak times.
High priority public transit corridor	On busy roads where **high frequency public transit** is facilitated through the use of traffic signalling priority, queue jumps at traffic lights or bus lanes.
Infill development	The redevelopment of existing urban areas at a higher density than currently exists.
Latitude 32 Industrial Zone	Covering 1,400 hectares, Latitude 32 is a key component of the Western Trade Coast. It is the proposed site for a major logistics centre and intermodal terminal to support future container and general cargo operations in the Fremantle Port Outer Harbour.
Light Rail Transit (LRT)	A road based rail system that may be physically separated from other traffic (with intermittent crossings for vehicles and pedestrians) or operate on surface streets with mixed traffic.
Modes of transport	Different types of transport, e.g. walking, cycling, public transport (bus, train, ferry) and car.
Motorised transport	Modes of transport that are motor-driven (such as buses, trains and cars).

TERM	DESCRIPTION
Non-motorised transport	Modes of transport that are primarily powered by humans, such as walking and cycling (see also **active transport**).
Orbital	A circular route designed to allow movement from one side of the city to the other, often without going through the city centre.
Peak period	The time of day when most people are moving. Usually occurs once in the morning and once in the afternoon when people are going to or from work or school.
Primary freight network	A system of roads designed to carry freight vehicles that connects large strategic industrial centres, including ports and airports, and major regional and interstate roads. Also called the strategic freight network. (Compare with **secondary freight network**).
Radial	A route that starts or finishes at the city centre.
Ride-sharing	Car-pooling with friends for convenience.
Ride-sourcing	Ride sourcing companies such as Uber and Lyft provide app-based, on-demand services that are similar to taxis.
Ride-splitting	Where customers share a '**ride-sourcing**' journey and split the fare.
Secondary freight network	A system of roads designed to carry freight vehicles connecting major industrial areas. Also called the major freight network. (Compare with **primary freight network**)
Specialised Centre	Places that have strong specialised roles based around major institutions such as major hospitals, universities or airports within the centre. Specialised centres include Murdoch, UWA–QEII, Curtin-Bentley, Perth Airport and Jandakot Airport.
Strategic Metropolitan Activity Centre	A major centre of activity. At a population of 3.5 million people, besides the Perth Capital City, there are ten Strategic Metropolitan Activity Centres identified in the metropolitan area: Yanchep, Joondalup, Stirling, Morley, Midland, Cannington, Fremantle, Armadale, Rockingham and Mandurah.
Transit	Moving people from one place to another by public transport.
Transit oriented development (TOD)	Moderate-to-high intensity commercial, mixed-use, community and residential development close to train stations and/or high-frequency bus routes that encourage public transport use over private vehicles.
Travel demand management	Measures designed to influence travel behaviour and improve system efficiency.
TravelSmart program	The ***TravelSmart*** and ***Your Move*** programs help households, workplaces and local government make better travel choices, helping to reduce congestion and environmental impacts.
Turn up and go	Where public transport services are so frequent that passengers do not need to refer to a timetable.
Very long term	When the population of Perth grows beyond 3.5 million people.
Western Trade Coast	A strategic industrial centre comprising the Australian Marine Complex at Henderson, Kwinana Industrial Area, **Latitude 32 Industrial Zone**, and the Rockingham Industry Zone, which includes East Rockingham.
Your Move program	The ***Your Move*** and ***TravelSmart*** programs help households, workplaces and local government make better travel choices, helping toreduce congestion and environmental impacts.

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