PROOF OF CONCEPT | FREMANTLE – MURDOCH

PUBLIC TRANSPORT CONNECTION

SOUTH WEST GROUP

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1. EXECUTIVE SUMMARY: FREMANTLE – MURDOCH DEDICATED TRANSPORT LINK

This project aims to address the limited approach to transport planning in Metropolitan Perth that has perpetuated urban sprawl and led to incremental transport infrastructure investment. It proposes the strategic use of land and transport infrastructure as a facilitator of community wellbeing and economic development. It is an opportunity to guide development of future residential infill intelligently and to transition to a greater use of public transport and a more sustainable urban development pattern.

It aims to address the inadequate urban growth in this corridor and to reverse the current growth trend that, if unchanged, will fail to realise urban consolidation potential, increasing pressure to accommodate growth through less sustainable urban expansion. Currently the corridor has poorly connected employment and activity centres meaning that employment opportunities in the area are limited, constraining the attractiveness of the corridor for urban consolidation. Furthermore, the high level of car dependency places considerable pressure on the existing road network.

A high quality public transport link will act as a catalyst for residential and commercial development in appropriate areas by providing certainty and an impetus for investment. Clearly, Perth is not meeting its targets in terms of its public transport share nor its urban infill targets, and needs to reverse its progression as a car dominated and sprawled city. We need to change the approach.

This document shows how we can marry a strategic land-use intensification plan with reasonable development density around well-considered nodes along a high quality dedicated mass transport solution. The transit solution is expected to accelerate achievement of the aspirations within Planning Strategy Perth and Peel @3.5 million by creating a network of connected activity centres that deliver local employment, greater housing affordability and lifestyle choices.

The transit corridor is book-ended by the Strategic Metropolitan Centre of Fremantle and the Specialised Centre of Murdoch. Key to the project is unlocking the underutilized land and aging housing stock at, and in between, the two ends of the route in order to achieve Western Australia's residential infill targets. Aspirational planning changes have already been made for some of the future nodes within the corridor; but a catalyst is needed to attract investment and accelerate positive change. That catalyst is a high quality mass transit solution that addresses the flaws in the radial design of the Perth rail network and provides an attractive and sustainable alternative to private vehicle use.

With such investment, the corridor could comfortably accommodate an additional 6,500 dwellings in the short-term following transport infrastructure investment, and another 5,500 in later stages. This would significantly contribute to Western Australia's infill target of 47% of new dwellings within the existing metropolitan footprint.

1. EXECUTIVE SUMMARY: FREMANTLE – MURDOCH DEDICATED TRANSPORT LINK

The transit solution improves travel times and accessibility within the corridor, increasing the catchment area for Fremantle and Murdoch Activity Centres. It will encourage a large amount of the current 23,000 students and 1,700 staff of Murdoch University to shift modes from private vehicles to public transport. It will achieve the same for Notre Dame University's 6,500 students and 800 staff (for those that live within the catchment area).

The use of South Street is vital due to its status within the sub-regional framework as a major activity and growth corridor, and its capacity to benefit a significant number of people. It provides the most practical option from a transport engineering perspective and offers the greatest opportunities for sustainable residential and commercial development.

This document presents one of many strong options for connecting to the Fremantle train station at the western end and the Murdoch train station (and beyond) at the eastern end. Station locations are intended to integrate with the communities they serve and connect existing and emerging activity centres. The link will provide better access to community and social infrastructure, thereby improving the health and wellbeing of the current and future communities.

This is an advocacy document that is intended to present a compelling case that convinces the West Australian State Government to prioritise planning for high-quality public transport within this region. It is a proof of concept that presents a strong option that the State Government can build upon when assessing all options through a detailed business case and meaningful planning for such a catalytic project.

It is not intended to be an exhaustive examination of all options and scenarios, nor is it a full business case – it is a proof of concept that is prepared with professional rigour from a transport engineering perspective and a land intensification perspective. The full transport engineering report is available via www.southwestgroup.com.au.

From here, based on the analysis within this document and supporting material, we ask that the State Government make a public commitment that:

1. the proposed transport link has strong merit
2. it will be meaningfully included in future stages of Metronet (or its equivalent), and
3. it will budget appropriately in 2021/22 financial year for development of a full business case.

2. DEFINING THE PROBLEM

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This problem definition relates to a study area stretching from the Bull Creek District Shopping Centre to the Port of Fremantle. It includes the area between Leach Highway and the southern boundary of the City of Melville and most of the City of Fremantle (excluding North Fremantle).

At a strategic level, the problem relates to a growing population that has limited access, via high-quality public transport, to major places of work, recreation and entertainment. Density levels are low and the area offers great opportunity for appropriate residential infill if public transport connection can be delivered and used to connect existing and emerging activity centres.

The study area has a 2020 population of 75,000 people with a projected growth to 2036 of over 16,000 additional residents. The largest population growth is expected at Murdoch and Fremantle (see Figure 1). The study area is located within the South West Metropolitan Region (SWMR) and sits within the Central Sub Region within the planning framework established under Perth and Peel @ 3.5 million.

Figure 1. Study Area Population

Location	2020 Population	2036 Population
Leeming	8,569	8,956
Bull Creek	8,222	8,848
Murdoch	3,963	7,570
Bateman	3,949	4,105
Winthrop	6,129	6,319
Kardinya	9,147	10,295
Willagee	5,523	8,306
Sub Total City of Melville	45,502	54,399
Samson	2,107	2,109
Hilton-O'Connor	4,832	4,934
White Gum Valley	3,349	3,286
Beaconsfield	5,546	6,857
South Fremantle	3,393	3,950
Fremantle	10,358	15,895
Sub Total City of Fremantle	29,585	37,031
Study Area Total	75,087	91,430

Source: Forecast ID

The corridor between Murdoch and Fremantle is one of three major east west transport corridors traversing the City of Melville and linking to Fremantle (see Figure 2). It is largely covered by Sections 1 and 2 in Corridor 19 in the Major Transport Corridor Review undertaken by the Public Transport Authority (PTA) in 2018.

The PTA Review of Corridor 19 identified slow bus average travel time (less than 30 kph) and low occupancy (7.94%) in the 130 buses that travel each day between Murdoch Train Station and the City of Melville western boundary (Section 2 in Figure 3). The PTA Review also identified that bus journey times are negatively impacted by the lack of priority at intersections and traffic congestion.

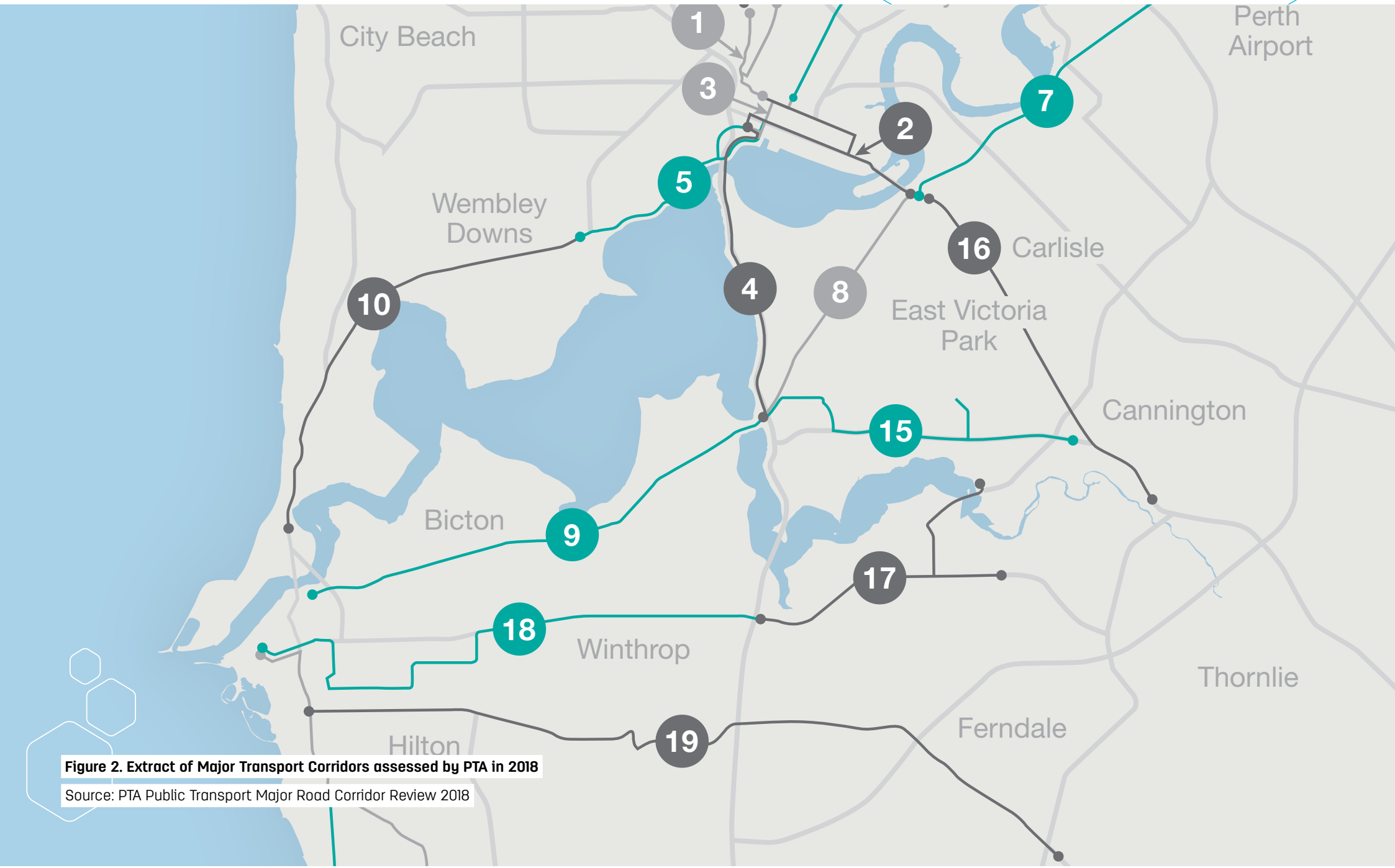


Figure 2. Extract of Major Transport Corridors assessed by PTA in 2018

Source: PTA Public Transport Major Road Corridor Review 2018

THE URBAN DEVELOPMENT PROBLEM

Development targets for infill have been set under Perth and Peel @ 3.5 million to support a sustainable and resilient city. These targets are a split of 47% infill and 53% greenfield development. Progress towards these targets is reported in the Department of Planning Urban Growth Monitor. The Central Sub Region has an infill target of 124,880 dwellings between 2011 to 2031 or 6,244 dwellings a year.

The 2020 Urban Growth Monitor reports that performance to 2018 has been 4,534 dwellings a year, well short of the target. Infrastructure Australia in their 2019 Audit Report state that 70% of Metropolitan Perth development has been greenfield development.

This is consistent with the 2020 Urban Growth Monitor which reports of the 118,460 dwellings constructed between 2015 and 2018, 81,880 or 69% were constructed in greenfield areas.

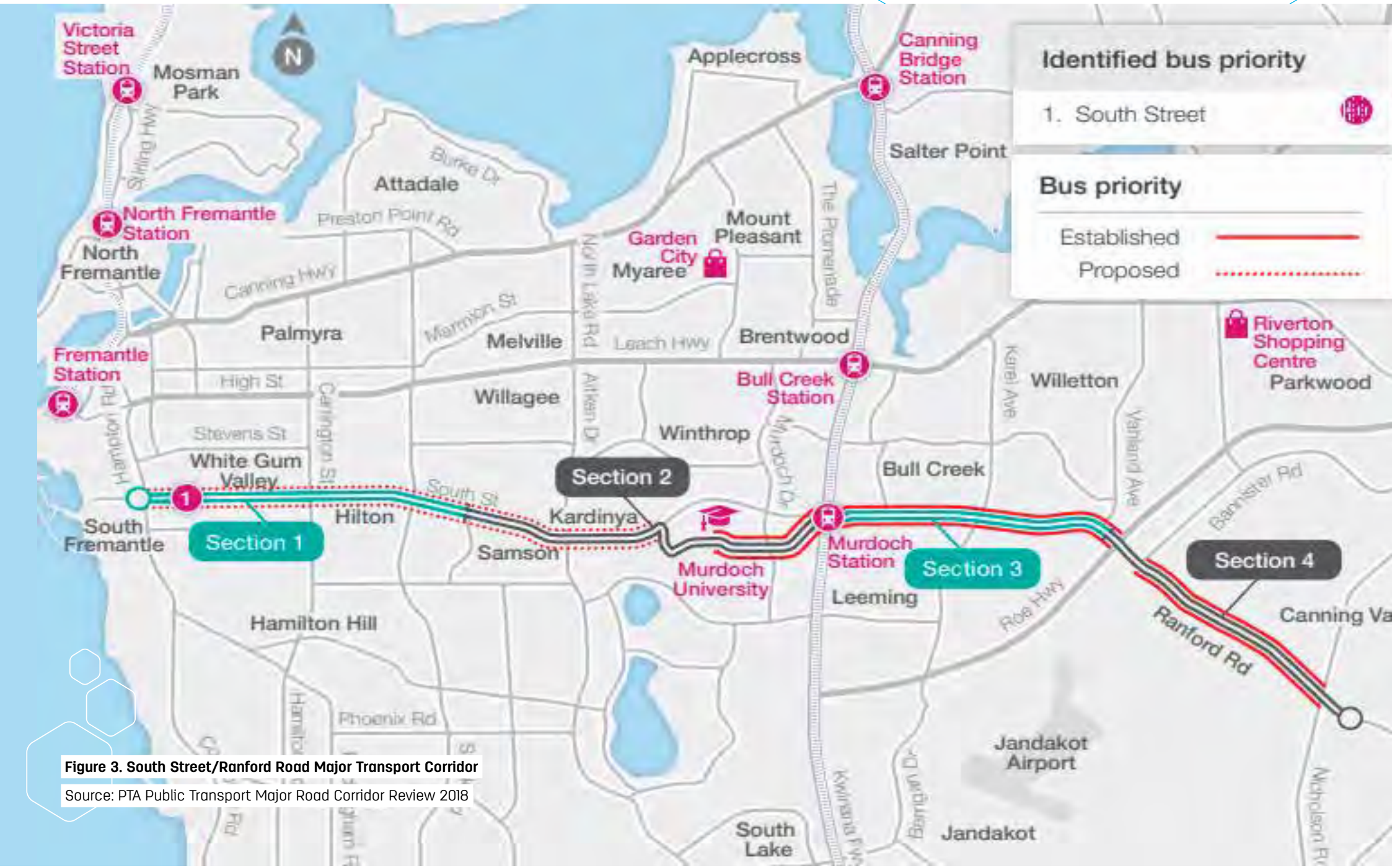


Figure 3. South Street/Ranford Road Major Transport Corridor

Source: PTA Public Transport Major Road Corridor Review 2018

THE TRANSPORT PROBLEM

Public transport in the South West Metropolitan Region (SWMR) is not acting as transformational infrastructure to promote coordinated corridor development; whereas it should support the creation of local jobs, provide support for focussed nodal investment and meet the infill targets under Perth and Peel @3.5 million. The historic layout of the public transport system has meant that the region is poorly served with east west public transport links to connect the radial rail corridors. One of the transport links (Canning Highway West) is identified as one of the worst performing corridors in the PTA 2018 Public Transport Major Road Corridor Review.

Limitations on expansion of regional transport corridors and the projected high cost of regional congestion require intervention to support economic growth and regional amenity. The SWMR is growing faster than Metropolitan Perth and this growth is projected to continue for the next thirty years.

Well over half of Perth's population growth has been more than 20 kilometres from the Perth CBD. The Fremantle Murdoch corridor falls within a 20 kilometre radius for Perth where growth should be stimulated to constrain greenfield development and make development more sustainable (see Figure 4).

Figure 4. Annual population change by distance (km) from CBD, Perth

Source: Charting Transport, https://chartingtransport.com/2019/01/08/where-is-population-growth-happening-in-australia/

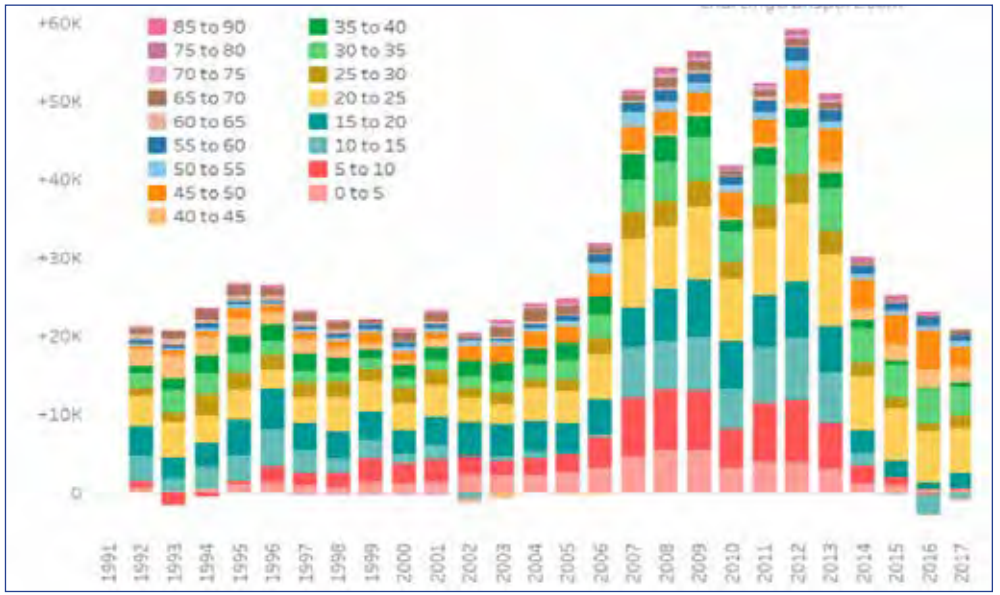
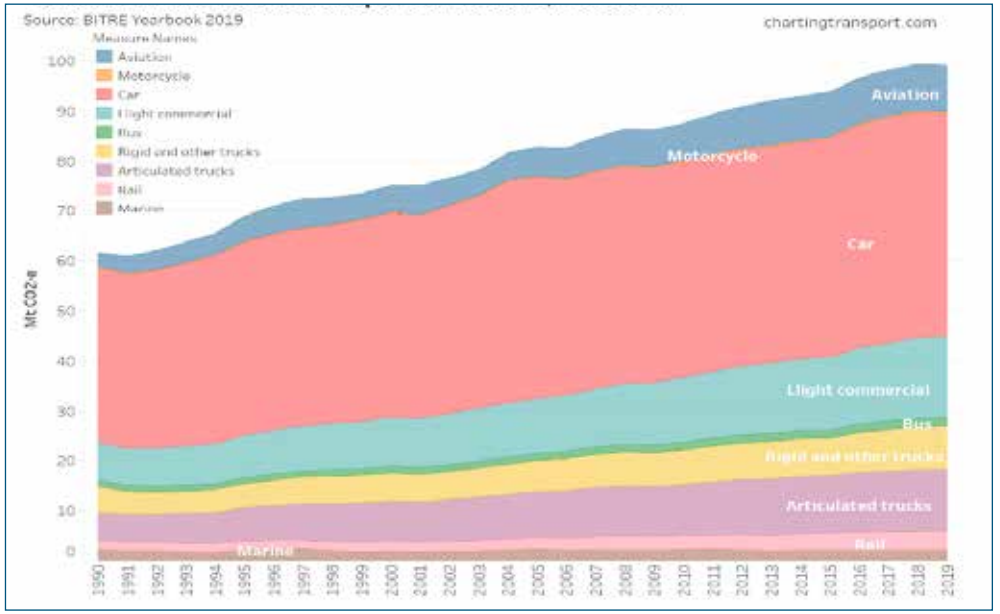


Figure 5. Perth vehicle kilometres travelled compared to population
Source: BITRE Infrastructure Statistics Yearbook 2019

Year	Perth VKT (billion vehicle kilometres)	Perth Population (million people)	Ratio (billion VKT to million people)	VKT per person per year (kilometres)
2008/09	16.26	1.712	9.50	9,500
2009/10	16.30	1.753	9.30	9,300
2010/11	16.56	1.804	9.18	9,180
2011/12	16.96	1.862	9.11	9,110
2012/13	17.20	1.912	9.00	9,000
2013/14	17.61	1.941	9.07	9,070
2014/15	18.06	1.964	9.20	9,200
2015/16	18.68	1.982	9.42	9,420
2016/17	18.97	2.000	9.49	9,490
2017/18	19.04	2.019	9.42	9,420
2018/19	18.71	2.045	9.15	9,150
% Increase 2008/09 to 2018/19	15.06%	19.45%		

At a high level Perth's public transport system is currently struggling to increase mode share and there is an unsustainable reliance on private motor vehicles. Vehicle Kilometres Travelled (VKT) are still over 9,000 per person (see Figure 5) which presents a challenge to managing congestion into the future.

Figure 6. Domestic non-electric transport emissions, Australia
Source: Charting Transport using data from the BITRE Yearbook 2019

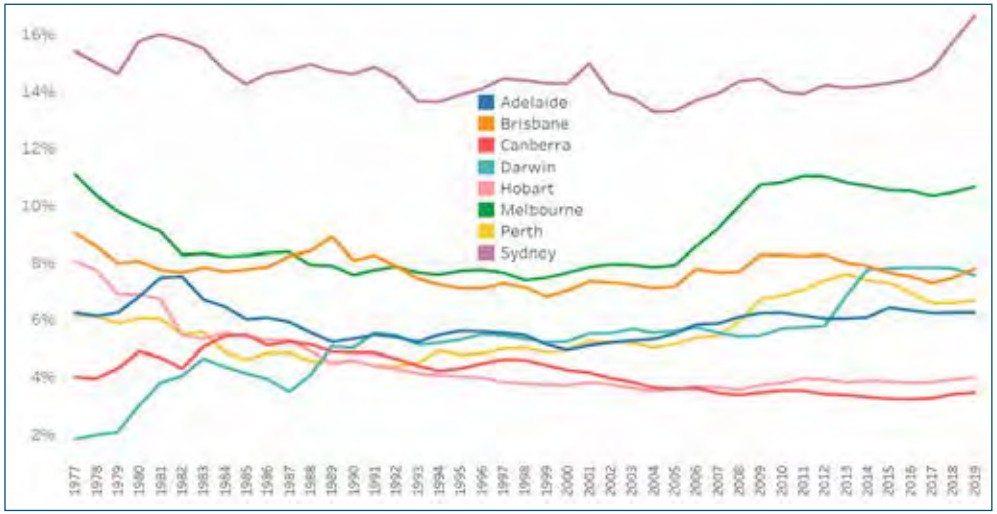


The largest contributor to VKT are journeys taken in private vehicles. In 2018/19 Perth had 25.30 Billion VKT passenger kilometres of which 20.69 Billion or 81.7% were undertaken in private vehicles. Only 1.73 Billion or 0.7% were on bus or heavy rail (2019 BITRE Yearbook).

If emissions are to be managed, the growth of the region should be used as an opportunity to promote travel by public transport.

Perth's public transport mode share is low at 6.8% (see Figure 7). Infrastructure Australia projects only marginal mode share growth in public transport for Perth and crush capacity being reached in 2031 (Veitch Lister Consulting).

Figure 7. Estimated mass transport share of motorized passenger kilometres
Source: Charting Transport using data from the BITRE Yearbook 2019



Murdoch Activity Centre is projected to grow to be the largest location of jobs outside of the Perth CBD with 35,000 workers, 44,000 students and 22,000 residents according to the WA State Government. Significant employment growth is also forecast for the City of Fremantle. The 2016 ABS Census identified over 50,000 workers travelled to the SWMR each day from outside of the region and only 56,000 lived in the same SWMR local government area as they were employed in (see Figure 8). Increasing the number of workers that live closer to their place of employment will impact congestion and encourage the use of public transport.

Figure 8. 2016 ABS residential location of SWMR workers

Item	Number of Workers	Per Cent of Workers
Lived and Worked in the SWMR	99,952	66.3%
Lived and Worked in the same SWMR LGA	56,274	37.6%
Lived in the SWMR but worked in a different LGA	43,228	28.7%
Worked in the SWMR but lived outside	50,862	33.7%
Total	150,814	100.0%

This project seeks to address the major regional problems listed in Figure 9.

Figure 9. Problems addressed by project and links to opportunities and benefits

Problem	KPIs or how quantified	Solution
South Street is the second most congested major route in Perth	Annual Congestion Cost sourced from MRWA	Promote local housing choice and availability and 10% public transport mode share
High car dependency in the SWMR	Mode Share	
Inadequacy of existing transport system to cope with projected SWMR population and economic growth	Infrastructure Australia projections	Take advantage of growth to use public transport as transformational infrastructure and create attractive living locations close to employment
Most workers do not live locally	ABS Journey to Work	
Poor east west public transport links	Public transport patronage and 2018 PTA Review	Higher quality public transport link between Murdoch and Fremantle with competitive travel times, attractive station/stop precincts
Murdoch Activity Centre failing to reach planned Public Transport Mode Share	Opening of Fiona Stanley Hospital and expansion of SJOG Murdoch only gave limited lift in Public Transport use	
Slow public transport travel times between Fremantle and Murdoch	PTA Timetables and 2018 PTA Review	
Poor resilience of existing public transport network	Chaos experienced with power failures, accidents and congestion	Link the heavy rail stations of Fremantle and Murdoch and provide public transport priority to reduce the number of incidents that can impact public transport
Sub optimal corridor development from incremental development along Fremantle Murdoch Corridor	Forecast ID shows most growth is at Fremantle and Murdoch with limited growth in between	Focussed investment will be triggered by a commitment to develop nodes and upgrade public transport

3. STRATEGIC ALIGNMENT

STRATEGIC AND POLICY ALIGNMENT – SUMMARY TABLE

Figure 10. Strategic alignment summary table

Plan Policy or Strategy	Date	Body	Comment
Perth and Peel @ 3.5 Million	2018	State Government	Fremantle is a Strategic Metropolitan Centre and Murdoch is a specialised centre Link between Fremantle and Murdoch is identified as an Urban Corridor
Perth and Peel @ 3.5 Million Central Sub Region Planning Framework	2018	State Government	47% of new dwellings as an infill target 215,000 new dwellings in the Central Sub Region by 2050
Perth and Peel @ 3.5 Million – The Transport Network	2018	State Government	Fremantle to Murdoch has been identified as a High Priority Transit Route
State Planning Policy 4.2 Activity Centres for Perth	2010	State Government	Fremantle is a Strategic Metropolitan Centre and Murdoch is a specialised centre
Murdoch Specialised Activity Centre Structure Plan	2014	State Government	Is based on major public transport infrastructure in an east west direction
Murdoch Health and Knowledge Precinct		State Government through Development WA	A well designed connected centre providing 35,000 jobs for education facilities for 44,000 students and homes for 22,000 residents
Inner City Light Rail Problem Definition	2019	State Government through Metronet	Stage 1 Submission to Infrastructure Australia
City of Fremantle Integrated Transport Strategy	2015	City of Fremantle	The City of Fremantle believes that Light Rail is capable of providing sufficient capacity to serve Fremantle and the surrounding growing regional centres
Murdoch University Masterplan	2016	Murdoch University	Makes provision for Light Rail or bus rapid transit through the site
Perth Rail Growth Plan		State Government through PTA	PTA Plan for rail capacity growth to 2051 and beyond
Public Transport Major Road Corridor Review	2018	State Government through PTA	The corridor between Fremantle and Murdoch is identified as part of Corridor 19 in the review. Bus priority lanes proposed for the full length of South Street
Australia Infrastructure Audit	2019	Infrastructure Australia	Seeks to align transport infrastructure with universities and hospitals
Planning Liveable Cities	2018	Infrastructure Australia	Our cities need more high quality, high density development supported by adequate infrastructure
Future Cities – Planning for our growing population	2018	Infrastructure Australia	Australian governments should increase investment in public transport infrastructure

‘METRONET 2.0’

Figure 11. Metronet map (not current) with east-west connection

Notionally, the proposed east-west link was included in early versions of the Metronet program but has since been removed. This project concept advocates for the re-introduction of this important east-west connection into the Metronet (or equivalent) program.

Figure 12. Excerpt from Perth and Peel @3.5 million

Perth and Peel @3.5 Million 2018 (State Government)

Fremantle is a Strategic Metropolitan Centre and Murdoch is a specialised centre under the activity centre under Perth and Peel @ 3.5 Million.

Furthermore, the link between Fremantle and Murdoch is identified as an urban corridor under Perth and Peel @ 3.5 Million.

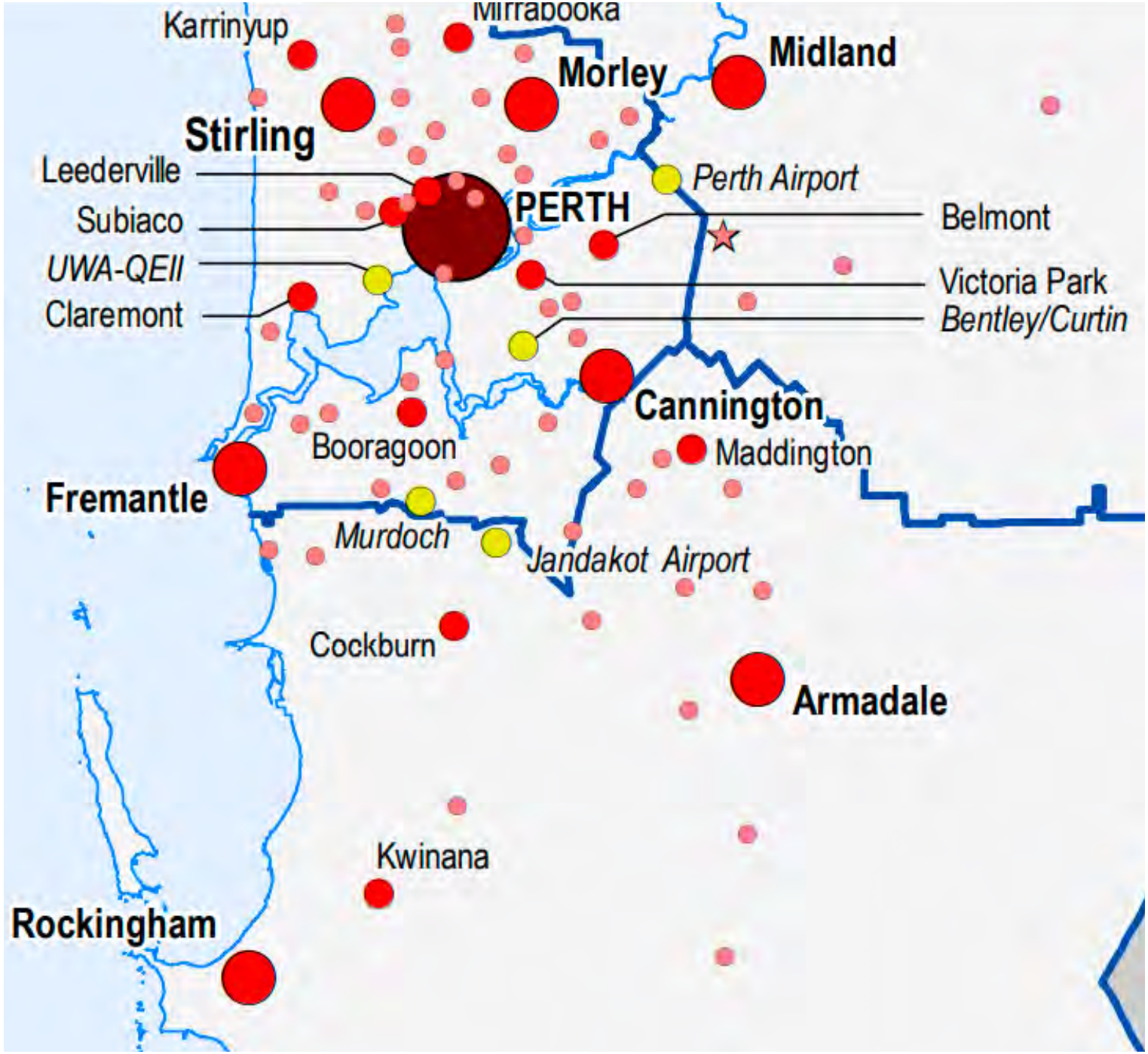


Figure 13. Urban corridor map

The stated objective is: "Ensure existing and planned high-quality, high-frequency public transit corridors connecting quality residential land uses with station precincts, activity and industrial centres.

Focus higher-density residential development along high frequency public transit corridors and around station precincts."

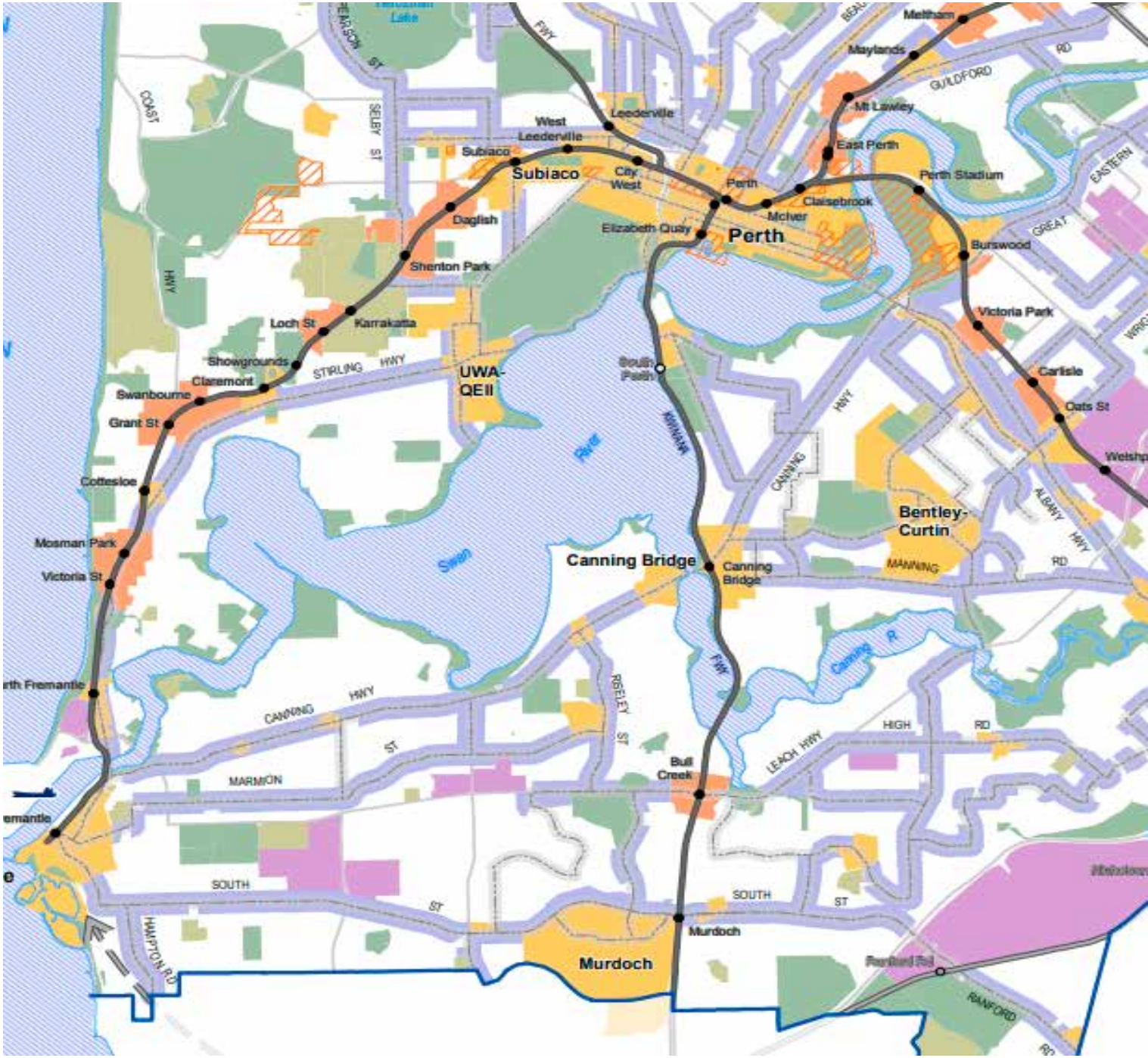
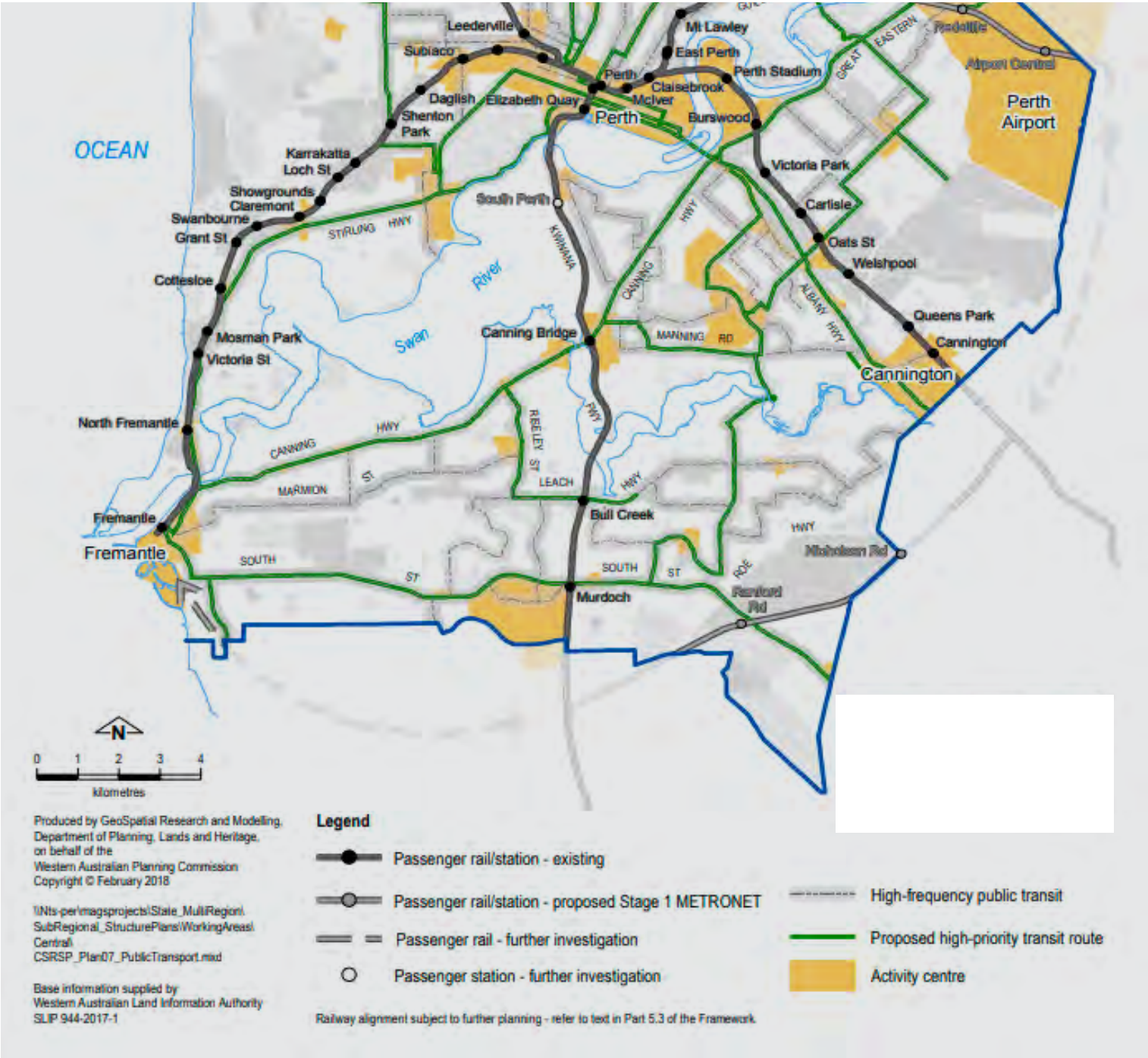


Figure 14. Transport network map

Perth and Peel @3.5 Million - The Transport Network 2018 (State Government)

South Street and the link between Fremantle and Murdoch are identified as proposed high priority transit routes in Perth and Peel @ 3.5 Million.



Additional strategic alignment includes:

Publication	Comment
Murdoch Specialised Activity Centre Structure Plan 2014 (State Government)	"There will be a dynamic shift in the approach to transport planning and the introduction of major public transport infrastructure in an east-west direction will transform Murdoch from being an origin of public transport trips and a redirector of traffic, to a centre which is both an origin and destination."
Murdoch Health and Knowledge Precinct (State Government through Development WA)	"The Murdoch Activity Centre will become the Southern Corridor's home to health research, medical care, higher education and innovative business development, delivering economic benefits for all Western Australia. Just 12km south of Perth's CBD, the Murdoch Activity Centre will offer a new city centre, providing jobs for 35,000 Western Australians, education facilities for 44,000 students and homes for 22,000 residents. The ambitious project is part of the State Government's planning strategy to manage population growth in Perth, and meet demand for well-designed, connected centres where people can work close to home."
Murdoch University Masterplan (Murdoch University)	"The key initiatives of the Strategic Masterplan include: 1. Develop cutting-edge learning, teaching and research facilities in the Academic Core 2. Create a physical chain linking with our Murdoch Specialised Activity Centre neighbours, integrating the State's Health Campus with the university's broader life sciences 3. Extend the Broadwalk as an iconic pedestrian and cycle boulevard connecting all precincts to Murdoch Station 4. Protect and restore the campus ecological networks with their wealth of biodiversity 5. Uphold the campus farm and surrounding living lab as an asset of our university 6. Prioritise Discovery Way as the primary gateway for public and private transport, including provisions for future rapid bus and Light Rail along with a clear university arrival point at a Southern Plaza."
Public Transport Major Road Corridor Review 2018 (State Government through Public Transport Authority)	The corridor between Murdoch and Fremantle is part of Corridor 19 identified in this review. 1. "The corridor supports the movement of daily commuters travelling to Fremantle, Murdoch University, Fiona Stanley Hospital, and Canning Vale industrial areas. With both residential and commercial density increasing in these areas, pressure on the corridor to connect key destinations will continue to grow.... The PTA will review and implement identified future opportunities in partnership Main Roads WA, as well as relevant Local Government Authorities - the City of Canning, City of Melville, and City of Fremantle."
Australia Infrastructure Audit 2019 (Infrastructure Australia)	"Aligning the delivery of transport infrastructure with housing, employment growth and other key infrastructure that influences the demand for transport, such as schools, universities and hospitals, is a particularly complicated task that requires whole of government coordination."
Planning Liveable Cities 2018 (Infrastructure Australia)	"Our cities will need more high-quality, higher-density development supported by adequate infrastructure." "We need to better assess the full range of infrastructure required to make places liveable before they grow. 'Place-based' approaches to infrastructure planning and delivery provide governments with a cross-sectorial view of the needs of a community and identify options to address them."
Future Cities – Planning for our growing population 2018 (Infrastructure Australia)	"Australian governments should take an active role in developing employment centres in our largest cities. A well-planned network of employment centres can help to improve a city's economic performance but directing the location of jobs in large cities can be difficult. Governments have an opportunity to make better use of tools and levers to achieve their strategic economic plans and enable labour and capital to access one another efficiently. Key levers include: 1. Providing strategic transport infrastructure to ensure employment centres are easily accessible 2. Providing fiscal incentives for employers to move to strategic urban centres, subject to appropriate assessment to ensure this use of taxpayer money benefits the city 3. Strategically re-purposing underutilised government land to support the growth of new employment centres. 4. Australian governments should increase investment in public transport infrastructure in cities experiencing significant population growth. Investment in mass transit is crucial to reducing congestion, increasing accessibility and reducing the rate of emissions growth. This is particularly relevant for higher density areas where space is limited. Governments should prioritise: 5. High-capacity public transport trunk routes linking key centres and transport nodes 6. Regular and reliable feeder public transport routes, designed to connect to trunk routes and maximise the reach of the network 7. Prioritisation of road space for high occupancy vehicles including trams and buses 8. Walking and cycling as principal means of transport within centres and to transport nodes."

4. REFINING THE TRANSPORT OPTIONS

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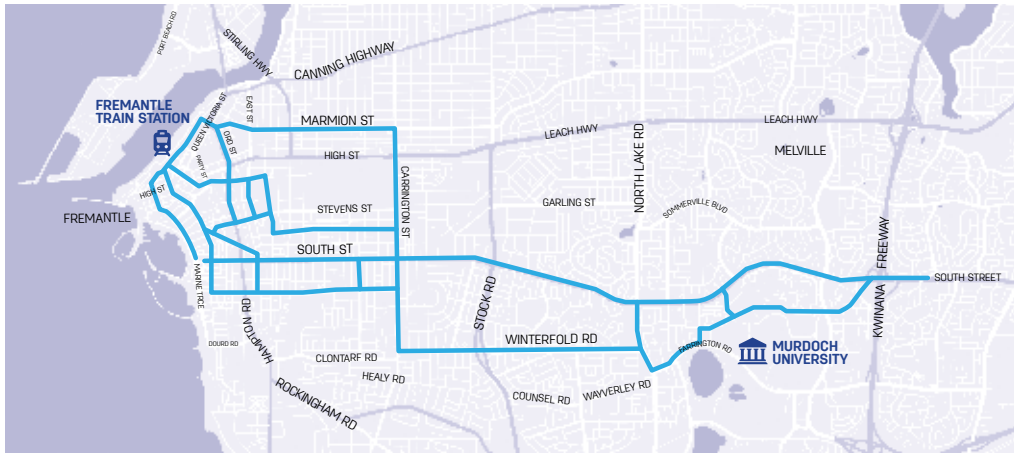
The South West Group, and the Cities of Fremantle and Melville engaged consultant's Arup to examine the major opportunities and constraints along the proposed transport corridor across a range of issues. Arup's analysis was undertaken based on four different transport technologies:

1. Guided buses
2. Rapid bus transport
3. Trackless Trams
4. Fixed rail including Light Rail

The work was premised on the desire to connect to both Fremantle and Murdoch Train Stations.

Arup's work largely examined the proposed project from a transport engineering point of view. Additional analysis was undertaken to marry the most desirable transport options with the greatest land intensification opportunities. A total of 19 long list infrastructure options were assessed against the defined multi-criteria analysis metrics. These were later worked into a refined long list of four options, and finally two shortlisted options.

Collectively, the long-list options covered the following network.

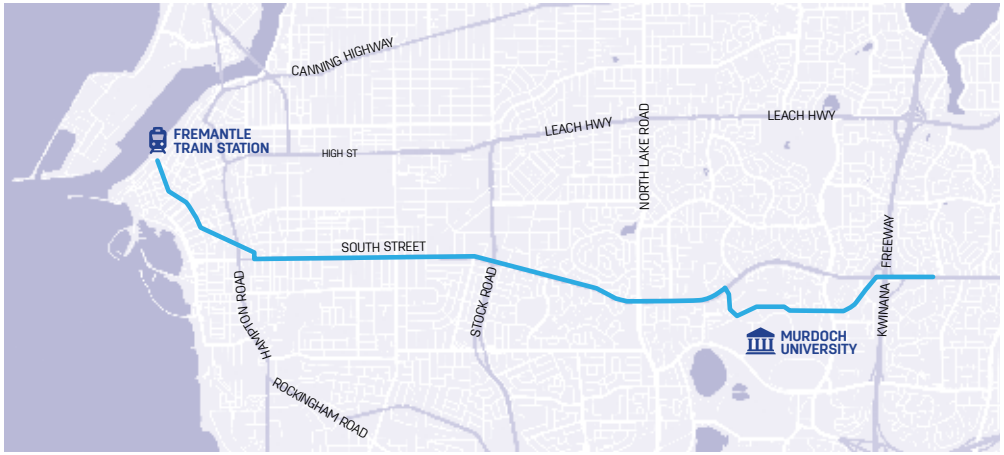


The preferred option is presented within the report. Arup's comprehensive report is available from www.southwestgroup.com.au and key points have been summarized within this document.

5. CONNECTING FREMANTLE AND MURDOCH THE CONCEPT ITSELF

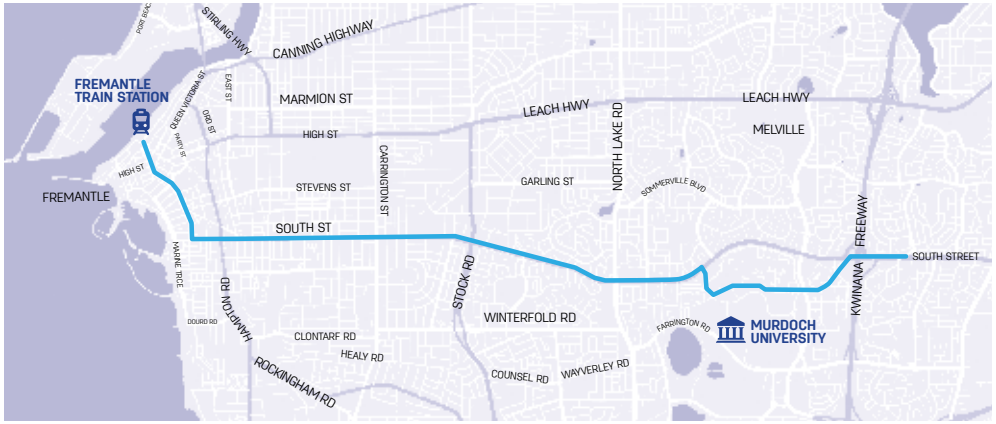
5. CONNECTING FREMANTLE AND MURDOCH - THE CONCEPT ITSELF

CORE TRANSPORT OPTION



This Proof of Concept includes a Trackless Tram (TT) or Light Rail (LRT) or equivalent transport technology service that runs westbound on South Street from Bull Creek Shopping Centre across the Kwinana Freeway bridge before turning into Barry Marshall Parade and entering the Murdoch University campus on Discovery Way. It then follows the Murdoch University Masterplan alignment through the campus before re-entering South Street and heading westbound towards Fremantle.

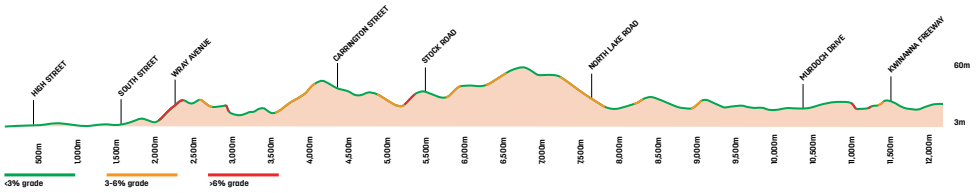
It continues along South Street for several kilometres, before heading north towards Fremantle Station via Wray Avenue and the famous Fremantle "Cappuccino Strip". An alternate entry to Fremantle (shown below) bypasses the Wray Avenue intersection and connects with South Terrace before heading north towards the Fremantle Station along the "Cappuccino Strip".



The service would perform the reverse journey, heading from Fremantle Station back to Murdoch Station and continuing east to the Bull Creek District Shopping Centre. The route is approximately 12 kilometres in length in total. Travel times are expected to be quicker than private vehicle use for a comparable journey. The use of South Street provides the most practical option from a transport engineering perspective and also offers the greatest opportunities for sustainable residential and commercial development.

Gradients

Trackless Tram technology and Light Rail are considered to be ideal for this route as it consists of a generally straight alignment within a wide road corridor for the majority of the journey. Gradients are within acceptable ranges for both Trackless Trams and Light Rail. It is likely that given existing physical constraints within the Fremantle city centre, particularly along Market Street, the service would require sharing the route with existing vehicle traffic for a small section of the approach in to Fremantle.



Cross sections

Typical cross sections achievable along the corridor will depend partly on the mode chosen but also the existing constraints and opportunities such as available road space, turning conflicts from side streets or properties, and desired amenity outcomes. The chosen cross section will also dictate the type of station or stop type possible. It is also possible that any combination of these three cross-sections will be implemented along the corridor, dictated by the existing constraints and desired station outcome.

Characteristics of median-running transit priority (top right)

- Uses existing road space and reduces mixed traffic by one lane in each direction
- Avoids conflict points with traffic turning to/ from side streets and properties
- Spatially efficient stations can be placed within the median serving both directions of travel.

Characteristics of separated corridor transit priority (centre right)

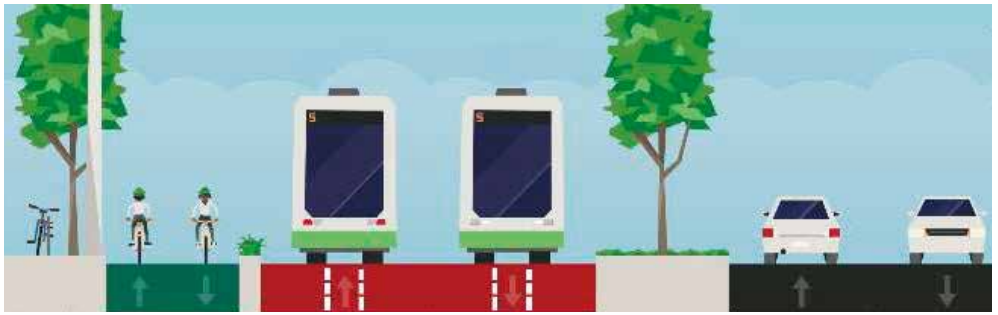
- Reconfiguration of road to run service down one side
- Enhances place and amenity outcomes along the corridor
- Opportunity to integrate with adjacent land use.

Characteristics of kerbside-running transit priority (botom right)

- Avoids pedestrian crossings between kerbside and median by direct boarding/alighting onto sidewalk.

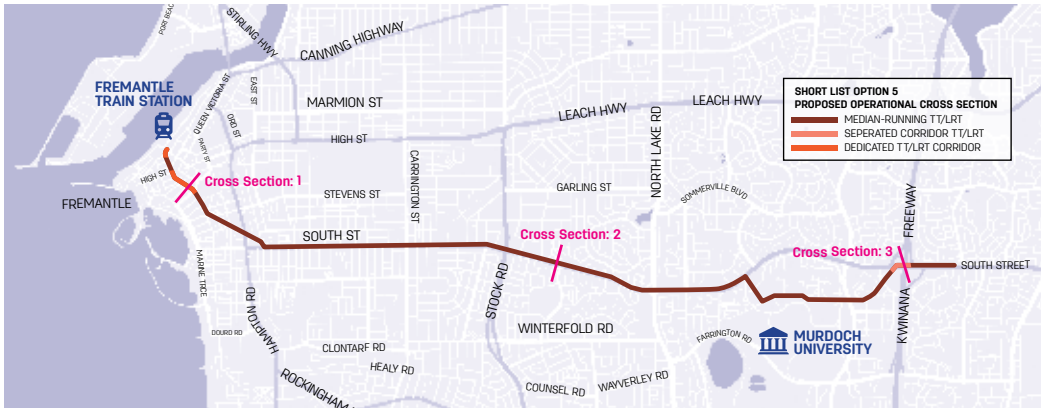
Cross Section 1

Cross Section 2



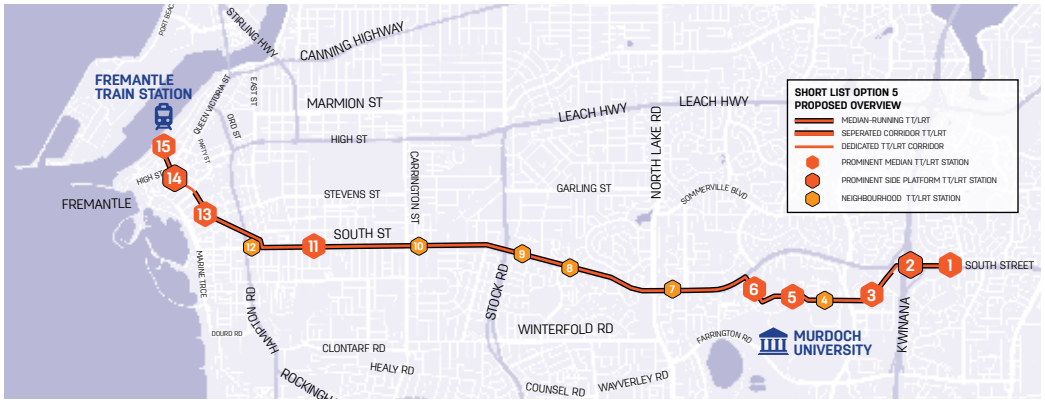
Cross Section 3

Route with likely cross sections



INDICATIVE STATIONS

Notionally the route has fifteen stops between Fremantle and Bull Creek District Centre, to the east of Murdoch Station. Not all stops need to be in place from commencement of the service. They could be added at later stages depending on the desired patronage for each precinct and/or the rate of residential development expected. Indicative stations are shown below.



ID	STOP / STATION	KM	DESCRIPTION	ID	STOP / STATION	KM	DESCRIPTION
1	Stockland Bull Creek District Shopping Centre	0.0km	North East Quadrant of Murdoch Activity Centre with Bull Creek District Shopping Centre	9	O'Connor	6.45km	O'Connor industrial area and Samson residential area
2	Murdoch Rail Station	0.70km	Busiest heavy rail station outside of the Perth CBD. New Medi-Hotel development in catchment as part of the Murdoch Health and Knowledge precinct	10	Hilton	7.70km	Just east of Carrington Road. Limited redevelopment
3	Marshall	1.5km	Northeast on Barry Marshall Parade to achieve a centrally located station within the St John of God and Fiona Stanley Hospital precinct.	11	Beaconsfield	8.90km	Lewington Street. Major redevelopment of Department of Housing residential land to R80 and redevelopment of Challenger TAFE site
4	Discovery 1	1.95km	On Discovery Drive west of Campus Drive to serve Murdoch University Development area and east campus	12	Wray Avenue	9.80km	Wray Avenue 9.80km Corner Wray Avenue and South Street. Mixed use
5	Discovery 2	2.45km	On Discovery Drive near Amenities Building to serve the main campus	13	Fremantle Hospital	10.80km	Fremantle Hospital with redevelopment opportunities from site and adjoining oval
6	St Ives	3.15km	On Discovery Drive near existing bus station serving students accommodation and St Ives retirement village	14	Market Street	11.30km	Near Collie Street.
7	Kardinya	4.35km	Kardinya Park Shopping Centre having 13,709sqm of retail floor space with major redevelopment opportunity	15	Fremantle Rail Station	11.80km	Major heavy rail station within walking distance of business district
8	Plane Tree Grove / Samson	5.65km	Start of O'Connor mixed commercial and residential. Services Kardinya and Samson				

Key assumptions

- Trackless Tram (TT) or Light Rail (LRT) from Bull Creek Shopping Centre to Fremantle Station – approx. 12km
- Median-running TT/ LRT between Bull Creek Shopping Centre and Murdoch Station approx. 500m
- Separated corridor TT/ LRT between Murdoch Station and Barry Marshall Parade – approx. 400m
- Median-running TT/ LRT between Barry Marshall Parade and Norfolk Street – approx. 10.5km
- Shared or dedicated TT/ LRT between Norfolk Street and High Street – approx. 400m
- Median-running TT/ LRT between High Street and Phillimore Street – approx. 300m
- Shared or dedicated TT/ LRT on approach to Fremantle Station – approx. 50m.

Station typologies

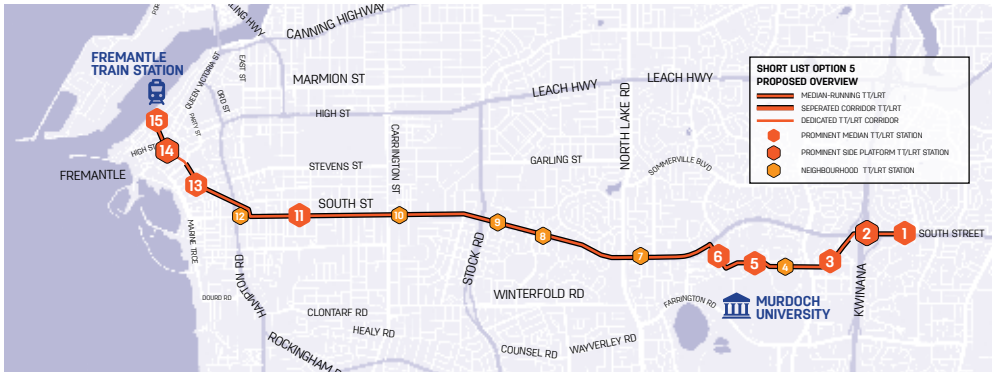
- prominent median TT/ LRT stations (Bull Creek Shopping Centre, Murdoch University (central), Kardinya Park, Fremantle Station)
- prominent side platform TT/ LRT stations (Murdoch Station, Market Street)
- neighbourhood TT/ LRT stations (Hospital, Murdoch University (east), Murdoch University (west), Plane Tree Grove, O'Connor, Hilton, Lewington Street, Wray Avenue, South Terrace (Alma Street)).

Total one-way journey time – 26-minutes

Average entire journey speed – 26.5kph: Despite the one-way journey time appearing long, this will only exist of passengers with a destination of Fremantle or Murdoch Station when travelling from the other end of the line. It should be considered that passengers using the service to transfer at either Murdoch or Fremantle to continue their journey, will travel from their origin to their closest respective terminus. In theory then, the longest passengers are likely to travel when factoring in a transfer at either Murdoch or Fremantle Station, is half this total travel time, i.e. 13-minutes.

LAND INTENSIFICATION + CONNECTING ACTIVITY CENTRES

As well as delivering significant improvements to the public transport network, the service would provide opportunity to link existing and emerging activity centres. The key to the project is unlocking the underutilized land in between the two ends of the route in order to achieve Western Australia's residential infill targets.



Some of the new developments that would immediately benefit from the transport link include:

1. Bull Creek District Centre with around 500 new dwellings
2. Murdoch University with around 1,500 new dwellings
3. Kardinya activity centre that is developing as a commercial and residential hub
4. Heart of Beaconsfield with around 1,200 new dwellings planned for that project
5. The former TAFE site immediately to the South of Beaconsfield where opportunity exists for residential or mixed-use development
6. Closer to Fremantle is the Knutsford precinct with approximately 1,000 dwellings
7. And approaching the Fremantle City Centre, there are significant development opportunities at Fremantle Oval and Fremantle Hospital.

In the long term, the Murdoch Health and Knowledge Precinct will eventually be home to up to 1,200 dwellings for 2,400 residents as well as 45,000 square metres of health, retail and commercial space to complement the emerging health and education precinct.

The broader Murdoch Activity Centre will offer a new city centre, providing jobs for 35,000 Western Australians, high quality education facilities for 44,000 students and homes for 22,000 residents.

With such investment, the corridor could comfortably accommodate an additional 6,500 dwellings in the short-term following transport infrastructure investment, and another 5,500 dwellings in later stages. This will significantly contribute to the State Government's residential infill targets for the central sub-region shown below.

WHERE PERTH'S NEW HOMES WILL BE BUILT

(by sub-region)

	ESTABLISHED DWELLINGS (2011)	NEW INFILL	NEW GREENFIELDS	PROJECTED DWELLINGS (2050)
Central	332,470	213,130	0	545,600
North West	114,920	48,590	120,00	283,710
North East	76,550	39,900	62,660	179,110
South and Peel	205,490	75,510	226,670	507,670
Total	729,430	377,130	409,530	1,516,090

Source: Perth and Peel@3.5 million

CONNECTING COMMUNITIES

As well as encouraging managed growth of residential areas, the route will improve accessibility to important community and recreational hubs. The list below includes community facilities considered to be within walking distance of the proposed route:

- **Bruce Lee Oval, South Street Beaconsfield**
  - Hilton Park Junior Cricket Club
  - Fremantle 5-a-side Soccer
  - Various community events
- **Fremantle Arts Centre, Fremantle**
- **Fremantle Hospital, Fremantle**
- **Fremantle Leisure Centre, Fremantle**
- **Fremantle Oval, Fremantle**
  - WAFL games
  - AFLW games
  - Various community events
- **Fremantle PCYC, Paget Street Beaconsfield**
- **Fremantle Prison, Fremantle**
- **Hilton Park / Ken Allen, Shepherd Street Beaconsfield**
  - Fremantle City Football Club
  - Hilton Palmyra Cricket Club
  - Fremantle Roosters Rugby League Club
  - Fremantle Touch Rugby Club
  - Hilton Park Bowling Club
  - Fremantle Men's Shed
- **Kardinya Shopping Centre, Kardinya**
- **Murdoch St Ives Retirement living, Murdoch**
- **Schools**
  - Hilton Primary School
- **South Street and Carrington Street intersection**
  - Dick Lawrence Oval
  - Fremantle City Dockers Junior Football Club
  - Hilton Park Junior Cricket Club
- **Stevens Reserve, Swanbourne Street Fremantle**
  - Fremantle District Cricket Club
  - Fremantle Cockburn Hockey Club

SUMMARY OF ENGINEERING OPPORTUNITIES AND CONSTRAINTS

The table below shows a summary of the key opportunities and constraints identified within the study area.
The topics are detailed in the final report accessible via the South West Group's website.
In summary, all constraints identified can be addressed in a relatively straightforward manner.

Table 15 – Identified opportunities and constraints

THEME/ MODE	OPPORTUNITY	CONSTRAINT	UNAVOIDABLE CONSTRAINT
Services/ utilities	• Identification early can result in better organised financial and programme implications associated with altering these assets	• High number of possible infrastructure constraints centred around South Fremantle, Beaconsfield, O'Connor and Fiona Stanley Hospital	• Western Power's 132 kV Overhead Transmission Powerlines will increase difficulty of the solution progressing.
Aboriginal and Australian/European heritage	• Low number of heritage listed areas within the middle and eastern portion of the study area	• Numerous heritage listed land parcels within the Fremantle Town Centre that will need to be avoided for any proposed alignments	• North Lake and Bibra Lake have been defined as one of the most significant aboriginal heritage sites south of the Swan River and will likely stop the progression of options along this section of Farrington Road.
Environmental sites	• Low number of environmentally sensitive land parcels within the western segment of the study area	• Highly biodiverse land parcels in CoM likely present constraint on approvals • Acid Sulfate Soils (ASS) east of Murdoch University and in close proximity to the Swan River	• Bush Forever and high risk ASS area within North Lake and Bibra Lake likely to stop progression of options along this section of Farrington Road.
Land use	• Diverse range of centres in Fremantle (Strategic) and Murdoch (Specialised) • High number of Government owned land parcels • Significant urban development planned at a strategic level for both LGAs	• High number of private land parcels adjacent to major road reserves which may restrict widening opportunities along the corridor or space available for stations	• The section immediately west of the freeway (hospitals and Murdoch University should align with the planning already done by Murdoch Activity Centre (MAC).
Public Transport	• Existing bus routes operating under capacity allowing potential for consolidation of services • Space proofing of BRT/ LRT already undertaken within Murdoch University • Future planned Bus Priority infrastructure	• Capacity constraints already evident at Murdoch station • Limited existing bus priority leading to relatively slow services connecting • East-west between Fremantle and Murdoch Activity Centres	• Limited capacity on rail services at Murdoch Station during peak hours unavoidable as patronage is generated from outside of the study area.
Roads	• High cross section widths of Primary Distributors and Distributor A roads between Kwinana Freeway and Stock Road potentially allowing for introduction of a new mass rapid transit connection • Mode choice behaviour change potential with the introduction of a new frequent mass rapid transit mode	• Numerous geometric constraints within historical road network of Fremantle • Longitudinal gradient constraints within Murdoch University and along South Street • High projected traffic volumes and associated congestion which could be potentially relieved with a mode shift towards public transport • Existing congestion issues at key signalised intersections on South Street	• High Street between Stirling Street and Carrington Street is 'out of play' and cannot be considered as part of an alignment (under development already as part of the WA governments "congestion busting" plan to improve efficiencies for freight traffic) • Longitudinal gradient constraints within Murdoch University and along South Street.
Active Transport	• Potential to integrate with existing and proposed planning undertaken by the LGAs & DoT	• Lack of north-south protected crossing points for pedestrians and cyclists along South Street • Significant gaps in active transport infrastructure along South Street • Low integration of infrastructure between LGAs	• Active transport infrastructure likely to be implemented in line with prepared CoM and CoF Bike Plans. Alignment may lead to slight alterations however.

Source: Perth and Peel@3.5 million

6. EXPECTED WIDER ECONOMIC AND SOCIAL BENEFITS

6. EXPECTED WIDER ECONOMIC AND SOCIAL BENEFITS

Some of the wider economic and social benefits that the project is expected to generate are listed below, categorised by transport, economic, and social and environmental benefits. At this stage of the process, no attempt has been made to financially quantify these benefits. Such analysis should be undertaken as part of a detailed business case.

TRANSPORT BENEFITS

- Avoidable costs (e.g. redundant and low occupancy bus services)
- Travel time savings and consistency of travel time for public transport users and road users
- Increase in public transport fare revenue
- Improved reliability of public transport services
- Improved network resilience and functionality
- Reduction in vehicle crashes
- Enhanced mode sharing and encouragement of active travel options such as walking and cycling to access the public transport network
- Higher road space productivity of public transport

ECONOMIC BENEFITS

- Potential increase in property values due to improved amenity and higher density development
- Urban renewal opportunities focussed on station/stop nodes
- Accelerated targeted and coordinated residential infill, private investment and urban renewal
- Increased local employment, labour supply and mobility
- Agglomeration benefits from improved accessibility within the corridor
- Improved access to local businesses for customers and staff
- Improved economic competitiveness and improved reliability of work attendance
- Limits negative impacts of population growth
- Assists with sustaining Fremantle's role as a tourist, recreation, employment and services centre
- Assists with Murdoch's developing role as a health, education and services hub
- Assists with managing negative impacts of car parking at nodes
- Provides a model for activity corridor development within Metropolitan Perth
- Savings to residents from reduced car ownership

SOCIAL AND ENVIRONMENTAL BENEFITS

- Environmental and sustainability benefits through reduction in environmental emissions
- Increased potential to generate housing equity and housing diversity
- Improved connectivity to social, community and recreational services as well as employment opportunities, education and professional development and health services
- Protection of regional scale natural areas by concentrating and managing development in the serviced area
- Equity of access for unemployed, elderly, disabled and those at risk of social isolation
- Underpins liveability, community engagement and social cohesion
- Reduces pressure for greenfield and low density urban developments at the fringe of the Perth Metropolitan Area.

7. NEXT STEPS

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From here, based on the analysis within this document and supporting material, we ask that the State Government make a public commitment that:

1. the proposed transport link has strong merit
2. it will be meaningfully included in future stages of Metronet (or its equivalent), and
3. it will budget appropriately in 2021/22 financial year for development of a full business case.


SOUTH WEST
GROUP