Project Proposal Report

Delivery

Mitchell Freeway Widening (Hodges Drive to Hepburn Avenue)

September 2020

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EXECUTIVE SUMMARY

The Mitchell Freeway is a primary distributor and forms part of the Perth Freeway system, providing a vital artery in the Perth metropolitan road network. This key link stretches along the north-west region of the Perth Metropolitan area.

Mitchell Freeway is currently characterised by its poor and unreliable traffic performance during peak periods, negatively impacting upon Perth's productivity levels. As the city has continued to develop and grow over the past 2 decades, demand has outstripped the capacity of the freeway system, highlighting the need to manage the flow of people onto, through and out of the freeway corridor to optimise its performance.

Recent data highlights certain sections of the freeway which exhibit deteriorating reliability, efficiency and productivity of freeway traffic. The sections requiring immediate attention include the section of Mitchell Freeway southbound between Hodges Drive off-ramp and Hepburn Avenue on-ramp. This section is 8.8km long (SLK 26.30 – 17.50) and has two freeway traffic lanes up to Hepburn Avenue on-ramp. After Hepburn Avenue on-ramp, there are three traffic lanes on Mitchell Freeway.
There is also high travel demand by commercial & freight vehicles (Austroads Class 3 – 12) travelling this section of Mitchell Freeway southbound, comprising 6.6 per cent of the total traffic (based on 2019 traffic volume data from MRWA Traffic Map at Mitchell Freeway southbound, south of Ocean Reef Road – Site 50130). This figure is greater than the average statistic across the Perth capital city network (5.1 per cent).

In terms of road safety, in the period 2014 – 2018 there were 343 crashes in the project area with an associated estimated cost of more than $12 million (when measured using a willingness-to-pay approach). Therefore road safety issues are significant within this problem area.

The bottleneck near Hodges Drive is another concern. This bottleneck is caused by the current freeway configuration of three lanes merging to two lanes with traffic entering from Hodges Drive generating additional congestion. At the worst performing time interval (07:15am), current speeds fall to an average of 37 km/h compared to the posted limit of 100km/h. When compared to the Mitchell Freeway average, there is a maximum additional travel time of approximately 5.7 minutes at 06:15am, with an average speed of 38.5km/h or 49 percent lower than the average speed of 57.4km/h across the freeway at this time

Traffic volume projections and modelling undertaken by Main Roads WA indicate that there is an opportunity to ease congestion by increasing freeway traffic lanes from two to three from Hodges Drive to Hepburn Avenue to meet 2031 demand.

The scope of the work includes construction of an additional freeway traffic lane to Mitchell Freeway southbound by widening at the median between Hodges Drive off-ramp and Hepburn Avenue on-ramp. It also includes the widening the on-ramps of Hodges Drive, Ocean Reef Road, Whitfords Avenue and Hepburn Avenue for the on-ramp signal civil provisioning work. In addition, the infill and replacement of safety barriers is included in this scope

The project benefits are:

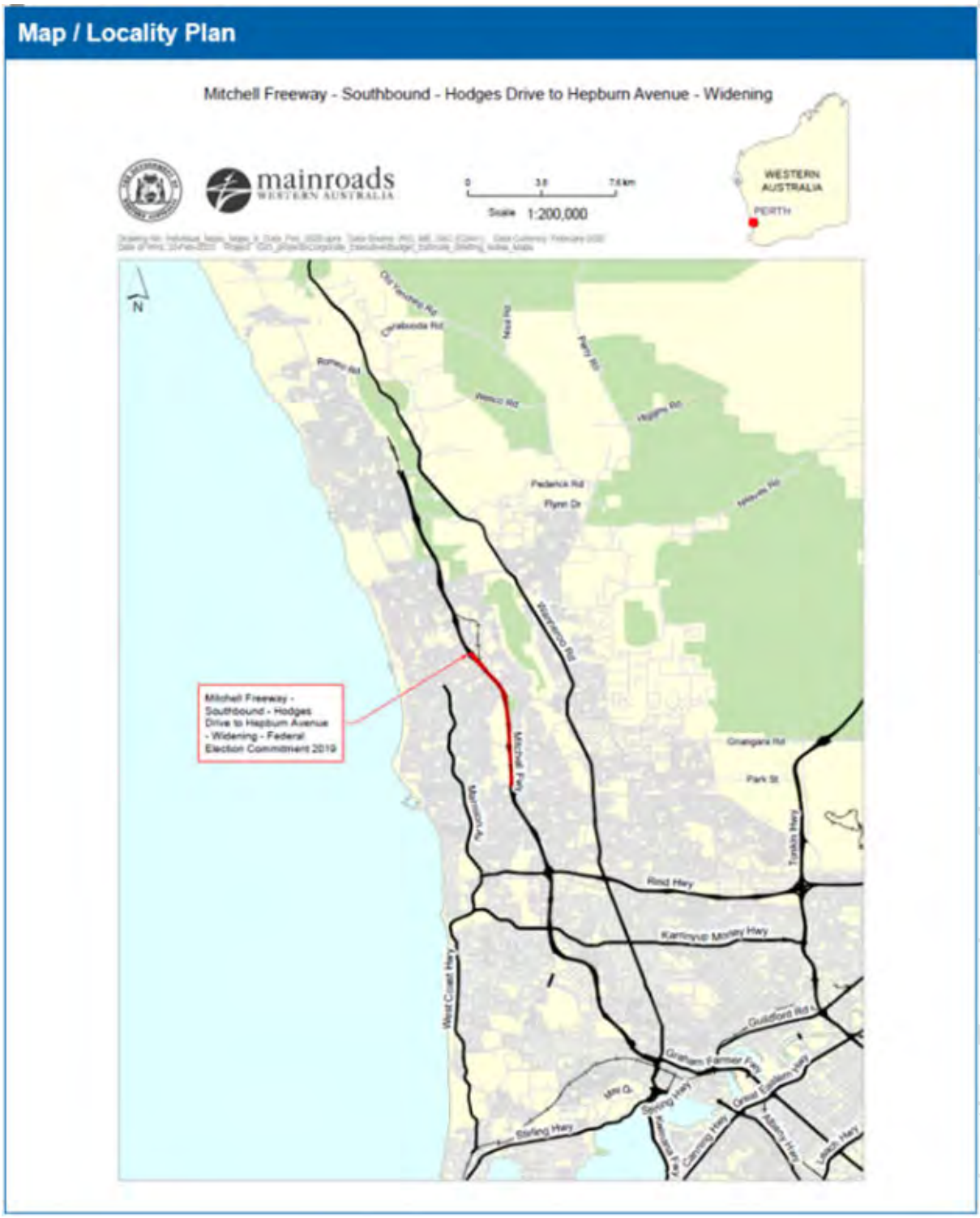
- Travel Speed: Improve average travel speeds during peak periods
- Reliability: Improve reliability of journey times compared to current levels
- Efficiency: Improve efficiency by improving average speed during peak periods
- Productivity: Improve operational capacity to relieve identified bottlenecks primarily through short-to-medium term, low-cost improvements
- Safety: Improve road safety.

On 20 November 2020, Honourable Prime Minister, Honourable Premier of Western Australia, Honourable Minister for Finance, Senator for Western Australia, Honourable Minister for Population, Cities and Urban Infrastructure and Honourable Minister for Transport, WA in a joint media statement announced a $940 million boost to WA economy from additional Federal and State infrastructure funding over the next four years. A total of $76 million ($38 million Federal, $38 million State) has been committed for Mitchell Freeway (Hodges Drive to Hepburn Avenue) widening southbound

The PPR is seeking approval of Mitchell Freeway (Hodges Drive to Hepburn Avenue) widening southbound project and release of $36.5 million of Federal funding at P50 estimate of $73 million. The state Government will contribute 50% of the project cost i.e $36.5 million. The P90 estimate of the project is $76 million. The difference between P90 and P50 estimate be kept as a contingency.

Locality Plan

Figure 1 Locality Plan



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A. PROJECT OVERVIEW

Proponent Details

A1 Entity Name

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A3 Project Partners

Australian Government

Western Australian Government

Project Details

A4 Project Name

Mitchell Freeway Widening (Hodges Drive to Hepburn Avenue)

A5 Project Identification (ID)

100942-18WA-UCO

A6 Project Summary

Rational

The Mitchell Freeway is a primary distributor and forms part of the Perth Freeway system, providing a vital artery in the Perth metropolitan road network. This key link stretches along the north-west region of the Perth Metropolitan area.

Mitchell Freeway is currently characterised by its poor and unreliable traffic performance during peak periods, negatively impacting upon Perth's productivity levels. As the city has continued to develop and grow over the past 2 decades, demand has outstripped the capacity of the freeway system, highlighting the need to manage the flow of people onto, through and out of the freeway corridor to optimise its performance.

Recent data highlights certain sections of the freeway which exhibit deteriorating reliability, efficiency and productivity of freeway traffic. The sections requiring immediate attention include the section of Mitchell Freeway southbound between Hodges Drive off-ramp and Hepburn Avenue on-ramp. This section is 8.8km long (SLK 26.30 – 17.50) and has two freeway traffic lanes up to Hepburn Avenue on-ramp. After Hepburn Avenue on-ramp, there are three traffic lanes on Mitchell Freeway.

This section of Mitchell Freeway experiences high traffic volumes in the AM peak period, leading to its poor and unreliable traffic performance.

The problem experienced on Mitchell Freeway Southbound is unreliable and inefficient performance during AM peak periods resulting in significant avoidable social and economic costs, highlighting a growing need for improved freeway function.

Speed-Flow-Occupancy data shows a significant drop in speed accompanied by high hourly flow and high occupancy during AM peak hours. The proposed section of Mitchell Freeway is currently suffering up to a 49 per cent drop in speed during the respective peak period.

Traffic volume analysis was undertaken and the results indicated freeway breakdown and overall sub-optimal performance during peak periods – conditions consistent with an unmanaged freeway within the problem area. The high level of unmanaged demand on the Mitchell Freeway southbound is resulting in unstable traffic flow across this key corridor, leading to frequent flow breakdown and recurrent congestion with longer and more unreliable travel times for road users, leading to an increasing cost of congestion.

There is also high travel demand by commercial & freight vehicles (Austroads Class 3 – 12) travelling this section of Mitchell Freeway southbound, comprising 6.6 per cent of the total traffic (based on 2019 traffic volume data from MRWA Traffic Map at Mitchell Freeway southbound, south of Ocean Reef Road – Site 50130). This figure is greater than the average statistic across the Perth capital city network (5.1 per cent, see Table 2).

In terms of road safety, in the period 2014 – 2018 there were 343 crashes in the project area with an associated estimated cost of more than $12 million (when measured using a willingness-to-pay approach). Therefore road safety issues are significant within this problem area.

The bottleneck near Hodges Drive is another concern. This bottleneck is caused by the current freeway configuration of three lanes merging to two lanes with traffic entering from Hodges Drive generating additional congestion. At the worst performing time interval (07:15am), current speeds fall to an average of 37 km/h compared to the posted limit of 100km/h. When

compared to the Mitchell Freeway average, there is a maximum additional travel time of approximately 5.7 minutes at 06:15am, with an average speed of 38.5km/h or 49 percent lower than the average speed of 57.4km/h across the freeway at this time

Traffic volume projections and modelling undertaken by Main Roads WA indicate that there is an opportunity to ease congestion by increasing freeway traffic lanes from two to three from Hodges Drive to Hepburn Avenue to meet 2031 demand. Under the project it is proposed to provide widening of the Mitchell Freeway between the Hodges Drive off-ramp and the Hepburn Avenue on-ramp, with an additional merge lane to be provided from the Hepburn Avenue on-ramp for a total length of 500m.

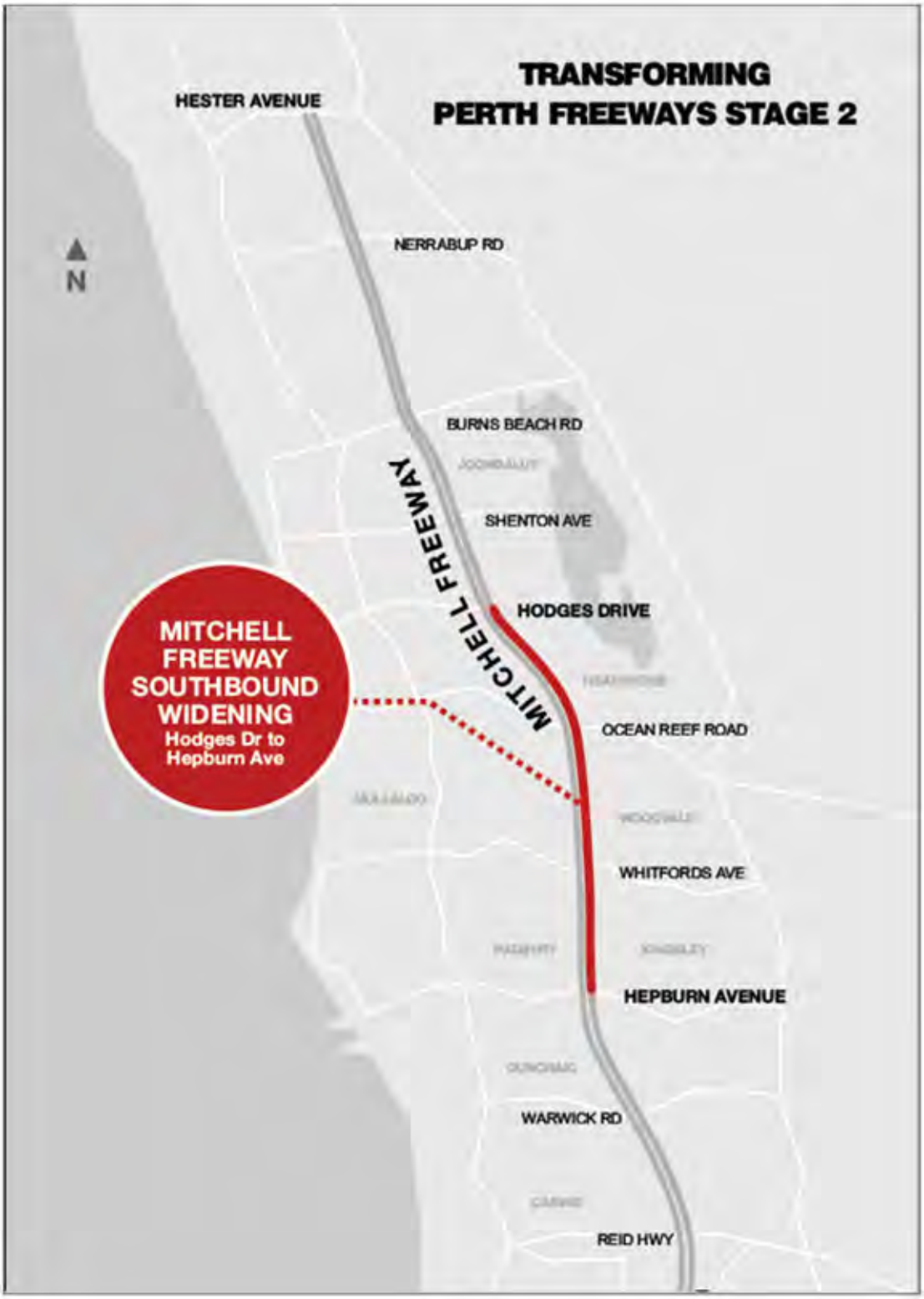
Project Objective

The objectives of the project are described in the following table:

Objective	Definition	Objective
Travel Speed	Average travel speed along the network	Improve average travel speeds during peak periods
Reliability	Proportion of network that operates within 20% of travel speed variability (ratio of standard deviation to mean travel speed)	Improve reliability of journey times compared to current levels
Efficiency	Proportion of network that operates within 20% of posted speed limit	Improve efficiency by improving average speed during peak periods
Productivity	Proportion of network operating at maximum productivity (max speed = 80km/h x max flow = 2000 pc/lane/h)	Improve operational capacity to relieve identified bottlenecks primarily through short-to-medium term, low-cost improvements
Safety		Improve road safety along Mitchell Freeway

Location

Figure 2 Location Map



Key benefits

The project benefits are:

- Travel Speed: Improve average travel speeds during peak periods
- Reliability: Improve reliability of journey times compared to current levels
- Efficiency: Improve efficiency by improving average speed during peak periods
- Productivity: Improve operational capacity to relieve identified bottlenecks primarily through short-to-medium term, low-cost improvements
- Safety: Improve road safety

Progress to date

Expressions of Interest for this Project closed on 21 April 2020. The evaluation of these Applications resulted in three shortlisted Applicants. Request for Proposals were issued to the shortlisted Applicant's on 22 June 2020 and are due to close on 8 September 2020.

The 100% design of the base contract works has been completed with the intent that this design package, issued to Proponents as Reference Information, will expedite the design process of the successful Contractor so that works can commence on site as soon as possible after the contract award date.

A7 Geographical Coordinates

Geographical references of the work are shown below:

Location	Co-ordinates	
	Latitude	Longitude
Intersection of Mitchell Freeway and Hepburn Avenue	-31.817237	115.782958
Intersection of Mitchell Freeway and Hodges Drive	-31.755140	115.76061

A8 Corridor and section of the National Land Transport Network (if applicable)

N/A

A9 Related Projects

Mitchell Freeway southbound widening from Cedric Street to Vincent Street

Mitchell Freeway southbound widening from Cedric Street to Vincent Street forms part of over all plan to transform Perth's freeways to accommodate population and economic growth into the future. The upgrades to Mitchell Freeway southbound form part of a $2.3 billion package of road and rail infrastructure works funded by the State and Commonwealth Governments. The State and Australian Governments are providing a total of $40 million for this project. The scope of the work includes -

- Build an additional 7 km lane on Mitchell Freeway southbound from Cedric Street to Vincent Street
- Complete the missing shared path link from Glendalough Station to Hutton Street
- Improve median barriers between the railway line and traffic lanes with existing barriers being replaced with concrete barriers
- Provision of noise and screen walls where required

The project will provide four continuous lanes from Erindale Road through to Vincent Street and improve travel times and safety for Perth road users, particularly in the morning peak. The project will also increase capacity at Hutton Street off-ramp and Vincent Street off-ramp. The key benefits of the project are:

- Provide capacity for additional vehicles on the freeway
- Improve traffic flow and journey times for road users, particularly during their morning commute
- Improve safety by reducing stop/start conditions from lane merging
- Create four continuous freeway lanes from Erindale Road to Vincent Street

A Design and Construct contract was awarded in June 2018. The planned works will be completed by early May 2020.

Mitchell Freeway Extension from Hester Avenue to Romeo Road

The Australian and Western Australian Government have committed a total of $215 million for this project. Each government will contribute 50% of the total project cost. This extension is part of a suite of transport infrastructure improvements designed to support the expansion of Perth's fast growing outer northern suburbs. It will alleviate pressure on the local road network, reduce travel times and improve safety and connectivity for people living and working in the region now and into the future. The extension of the Mitchell Freeway to Romeo Road will provide direct access to and from the Alkimos Regional Centre via Romeo Road, improve connectivity in the northern suburbs, and support the expansion of Perth's fast growing outer northern suburbs. A new rail station is being constructed at Alkimos as part of the METRONET Yanchep Rail Extension project. Additionally, the project will ease congestion for the residents of Perth's northern suburbs and accommodate housing and commercial opportunities in the high-growth northern corridor. The scope of the work includes –

- Extension of Mitchell Freeway from Hester Avenue to Romeo Road (approximately 5.6 km) with two traffic lanes in each direction and allowance for future widening.
- New interchanges at Lukin Drive and Romeo Road
- Rail tunnel under the freeway northbound lanes for the Butler train line.
- Principal shared path on west side of freeway from Hester Avenue to Romeo Road.
- Construction of Romeo Road from Marmion Avenue to Wanneroo Road.
- Duplication of Wanneroo Road for 1.8 km from Romeo Road to Trian Road.

Expressions of interest sought from industry on 5 November 2019. Notification of preferred proponents advised early March 2020. Construction commencement anticipated end of 2020.

Mitchell Freeway northbound widening from Hutton Street to Cedric Street

The Mitchell Freeway northbound widening from Hutton Street to Cedric Street project is funded by the State government. The estimated cost of the project is $15 million. The scope of the work includes –

- Widen the 2 km section of Mitchell Freeway northbound to add a fourth lane between Hutton Street and Cedric Street.
- Construct double exit lanes at the Cedric Street off-ramp to improve traffic flow for road users accessing Ellen Stirling Boulevard (IKEA).
- Install 5.3 km of high standard concrete barriers along the rail reserve between Glendalough Station and Erindale Road.
- Upgrade street lighting.
- Modify CCTV camera locations and vehicle detection stations.

These works are anticipated to:

- Improve average travel speeds during peak periods.
- Improve reliability of journey times
- Improve operational capacity to relieve the bottleneck at the Cedric Street exit ramp
- Improve road safety along Mitchell Freeway by preventing tail backs that extend on to the freeway mainline from Cedric Street off ramp (particularly due to traffic accessing IKEA).
- Improve the level of separation between the Freeway and the PTA rail reserve to prevent vehicle incursions from the Freeway into the rail reserve.

Road works has been commenced in November 2019 and expected to be completed in September 2020.

Transforming Freeway

The State and Australian Government has committed a total of $100 million to implement the Transforming Perth Freeways project. The Transforming Perth's Freeways (TPF) strategy is designed to unlock investment in a 'just in time' approach (currently in six phases), ensuring that Mitchell and Kwinana freeways are progressively developed as they reach their capacity within the planning horizon (forecast 2.7 million people). TPF Phases 2 and 3 include the rollout of Smart Freeway technology on Mitchell and Kwinana Freeways, as well as widening of key bottlenecks and other transport upgrades, to maximise the productivity of moving people and goods throughout Perth's principal road corridor by 2026.

The project consists two parts –

- $70m for completion of design and construction of a Southbound Mitchell Freeway Smart Freeway including Coordinated Ramp Signals
- $30m for the Road Network Operations Centre Control and Data systems enhancements of Smart Freeways operations, building resilience and redundancy in the Traffic Control System (TCS) environment, training for users and creation of policies and guidelines for the new systems

The design and construction of the Smart Freeway will incorporate identification of ITS technologies with stakeholder engagements to ensure that all devices are fit for purpose and will incorporate existing and future operational needs. This will include coordinated ramp signals and roadside technologies to manage the current and future traffic demand for this

section of southbound Mitchell Freeway. Control and Data System development will incorporate:

- Advancements to real time operator monitoring and response capabilities with the integration of new data streams. Upgrading existing system functionalities to facilitate improved and optimally integrated operations. Advanced network performance reporting facilities.
- Improve the reliability of Smart Freeway operations through strengthening resilience and redundancy of the TCS network, infrastructure and applications.
- Creation of procedures and policies to ensure effective use of the new system.
- Training of Operations and Maintenance staff on how best to use the new system to maximise the ability to manage the freeway

The project is scheduled to commence in 2020-21 and completed in 2024-25.

Mitchell Freeway Southbound Hodges Drive to Hepburn Avenue additional works

Project development activities have identified the below additional scope items which have a high probability of being delivered under the same contract:

- Resurfacing of Mitchell Freeway southbound dense grade asphalt, as required along the length of the works - funded by Main Roads Metropolitan Region maintenance budget.
- Resurfacing of additional open grade asphalt on the Mitchell Freeway southbound, south of Reid Highway interchange – funded by Main Roads Metropolitan Region maintenance budget.
- Drainage improvements on the verge side of Mitchell Freeway southbound near Beach Road – funded by Main Roads Metropolitan Region maintenance budget.
- Construction of Principal Shared Path from Hepburn Avenue to Warwick Station on the eastern side of Mitchell Freeway, including the installation of Noise Walls to mitigate noise levels from future Freeway widening projects – amenity/noise walls funded by Western Australian State Government Recovery Plan.
- Works to address the location of the Greenwood advertising billboard in relation to the Hepburn Avenue southbound on ramp merge – Scope of the work is under investigation and a source of funding for this additional works (if required) will be considered once the scope is further defined.

These additional works will be funded from various sources as mentioned above.

B. PROJECT SCOPE

B1 Problem/ Opportunity Statement

The following information presents the supporting quantitative and qualitative data from available sources demonstrating the current congestion problems on the proposed section of Mitchell Freeway and the evidence and root causes/drivers of the current problem.

Freeway demand outstrips capacity

The Perth northern corridor is projected, in the absence of additional capacity, to become the most congested corridor in Australia, with demand expected to exceed capacity well before 2031.

As the freeway network currently exceeds its capacity (especially during peak hours), it is envisaged that the functionality (e.g. time and monetary obligations) of commercial and industrial logistics deteriorates owing to the geographical constraints the freeways present to key business and industrial areas as Perth's main road arteries.

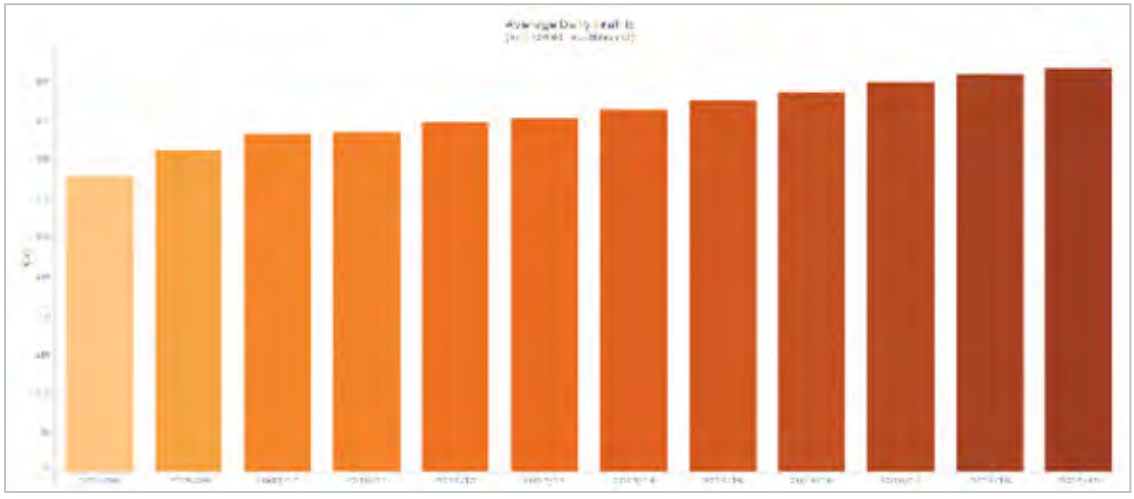
Historic and Continuing Population Growth

Perth has experienced significant population growth over the last ten years, which has placed increased pressure on existing transport infrastructure. In the ten years to December 2018, Western Australia's population rose over 15 per cent to just over 2.6 million. WA's steady population growth has been most acutely felt in Perth, where almost 80 per cent of the State's population resided as of 2016.

Congestion in the proposed section of Mitchell Freeway is expected to be driven by continued population growth in the North West sub-region. Between 2011 and 2050 the North West sub-region is predicted to record growth of 230 per cent, second only to the South West sub region (WAPC & DoP 2018 Perth and Peel@3.5million). This growth is expected to place further pressures on the freeway performance along the proposed section of Mitchell Freeway.

Data has been extracted from the permanent traffic count site on Mitchell Freeway between Ocean Reef Road and Whitfords Avenue (Site 50130, south of Ocean Reef Rd) between 2008/9 – 2018/19 to understand trends in traffic growth through the project area.

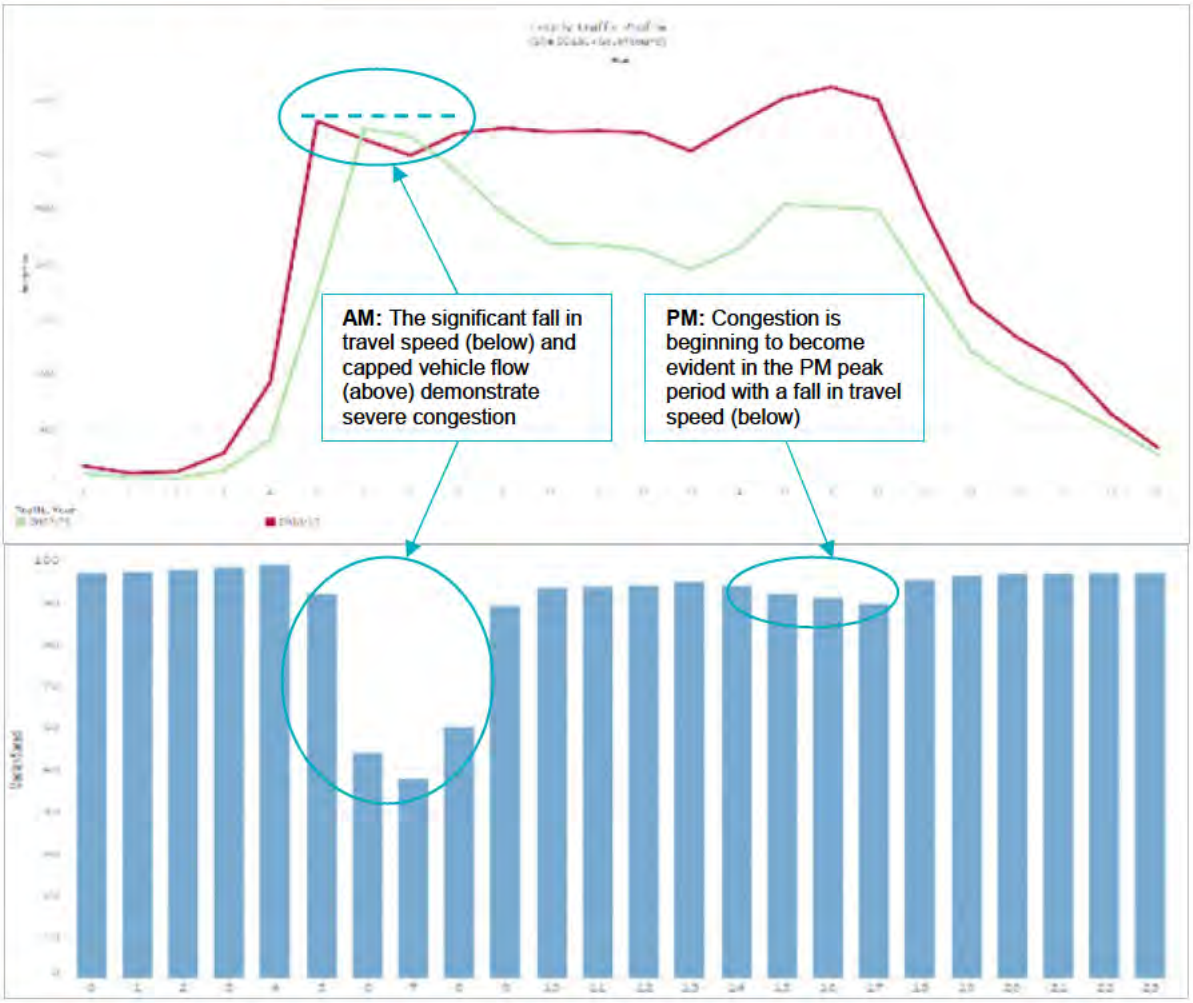
Figure 3 Daily traffic growth (2007/8 – 2018/19) from collection site 50130 located between Ocean Reef Rd and Whitfords Ave



Average Daily Traffic (ADT) in the project area has increased 36% since 2008

It is clear from Figure 3 that there has been a steady increase in demand through the project area between 2007/8 – 2018/19, with flows increasing from just under 38,000 Vehicles Per Day (VPD) to over 51,000 VPD. This represents an increase of 36 per cent over the 11-year period or 2.8 per cent annual average growth. It is also of interest to understand how the use of the asset has changed over time, Figure 3 shows the flow profile between 2007/8 and 2018/19 for data that was collected from collection site 50130 located between Ocean Reef Rd and Whitfords Ave.

Figure 4 Hourly flow and speed profile comparison (2007/8 – 2018/19) from collection site 50130 located between Ocean Reef Rd and Whitfords Ave



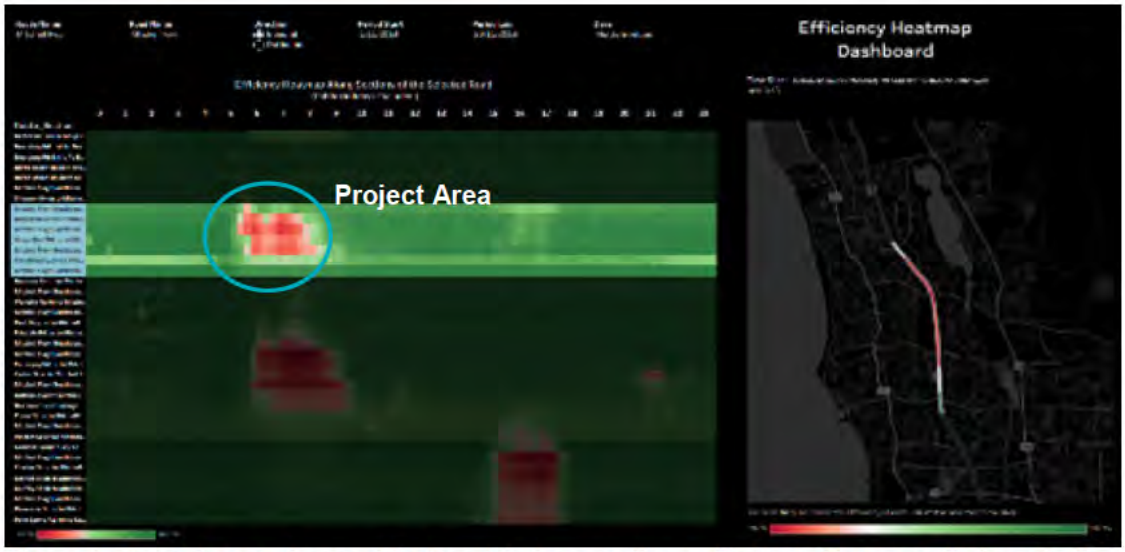
Severe congestion has resulted in a significant reduction in travel speed and a 'break down' of vehicle flow evident in the fact that morning peak period flow rates have remained relatively flat since 2008 and are now below afternoon peak levels. The results demonstrate that the project area is at peak capacity in the morning peak period.

In earlier years the CBD centric pattern of travel is clear with a prominent AM peak in the south (city) bound direction. As land use and job opportunities have intensified in other major metropolitan areas, such as Joondalup, the role has changed with heavier southbound flows seen in the afternoon. Comparing the AM peak period between both years, a clear plateau is evident in vehicle flow (vehicles per hour) combined with a significant fall in travel speed. The results clearly demonstrate the 'bottleneck' effect seen in the project area, with congestion expected to continue to increase in the AM and PM peak periods looking forward.

Congestion

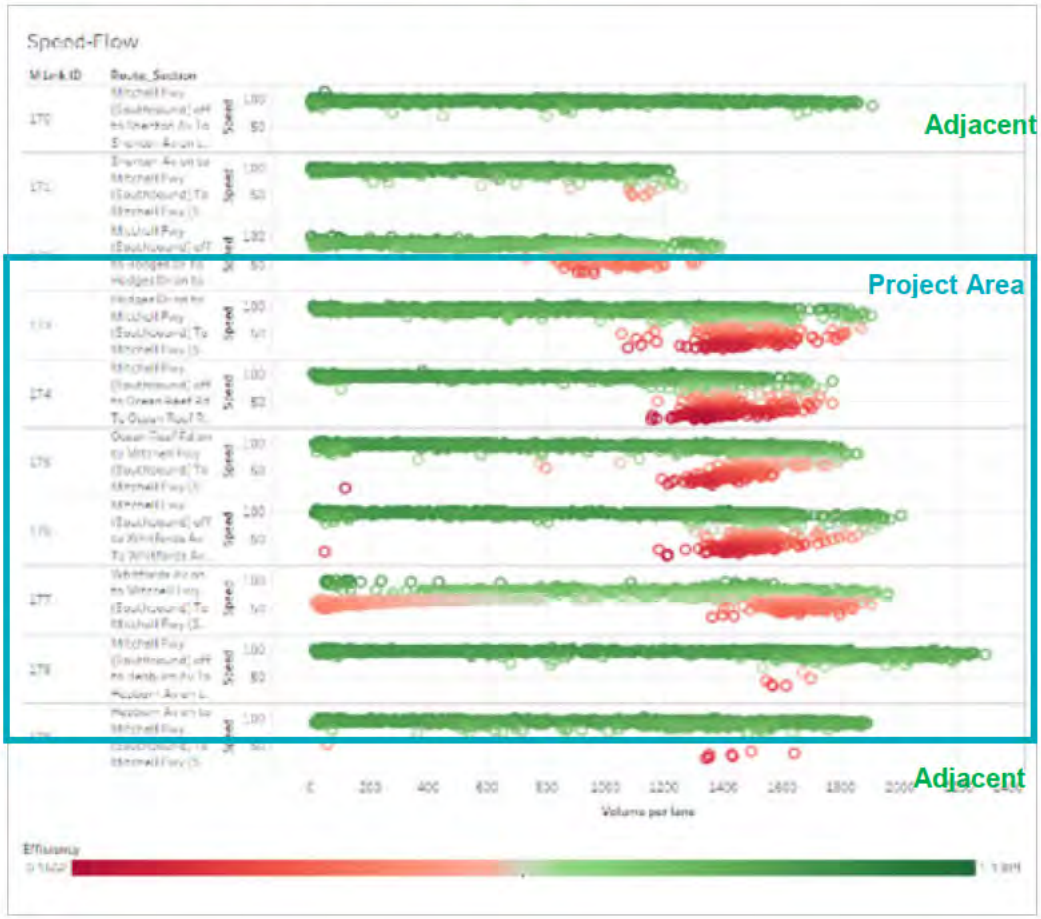
Analysis of traffic flow through the project area using the Main Roads NetPres system during the month of November 2018 indicates a deterioration in conditions from approximately 06:00 through to 08:30.

Figure 5 NetPres heat plot (November 2018)



The project area is one of several 'hot spots' of congestion as illustrated by poor efficiency in the AM peak period.

Figure 6 NetPres speed-flow curves (November 2018)



The above plots graphically illustrate the collapse in traffic speed and flow per segment at particular traffic volumes, with the project area creating a 'bottleneck' when compared to adjacent segments.

Reviewing these segments in more detail, Figure 6 provides a view of the performance of the project area with increasing traffic volume. The highlighted segments representing the project area show flow collapse with significant falls in both speed and flow. Note how these compare to neighbouring segments shown, which exhibit much more stable flow. This clearly indicates the bottleneck that currently forms due to insufficient capacity in the project area.

Performance Comparison

To better understand the relative performance of the project area, average speed and travel time data has been extracted from NetPres for the month of November 2018 and compared against data for the full length of the Mitchell Freeway from Hester Avenue to Vincent Street (all of which has a posted 100km/h speed limit).

It can be seen from Figure 4 to Figure 6 that performance issues are limited largely to the AM peak and as such comparison here is against those conditions. Table 1 summarises in 15-minute increments how current conditions through the project area compare to the average performance of Mitchell Freeway.

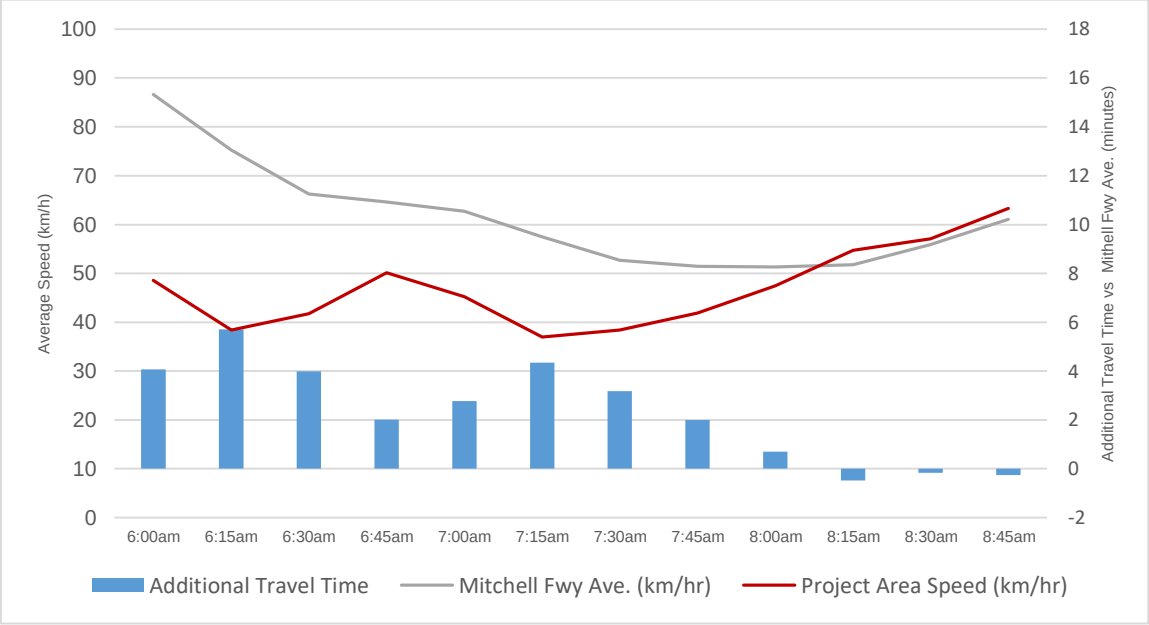
Table 1 Project area performance comparison

Time	Mitchell Freeway Average (km/h)	Project Area Speed (km/h)	% Reduction vs Average	Additional Travel Time (minutes)
06:00	86.6	48.6	44%	4.1
06:15	75.2	38.5	**49%**	**5.7**
06:30	66.3	41.8	37%	4.0
06:45	64.6	50.2	22%	2.0
07:00	62.7	45.2	28%	2.8
07:15	57.5	**37.0**	**36%**	**4.3**
07:30	52.7	38.4	27%	3.2
07:45	51.4	41.9	19%	2.0
08:00	51.3	47.5	7%	0.7
08:15	51.8	54.8	-6%	-0.5
08:30	55.9	57.1	-2%	-0.2
08:45	61.1	63.3	-4%	-0.3

At its worst, the average speed in the project area drops to 37km/h compared to the posted speed limit of 100km/h. Compared to the Mitchell Freeway average, speed is reduced by up to 49 per cent, translating to additional travel time of 5.7 minutes.

It can be seen from Table 1 that the worst performing time interval, in terms of travel speed, is 07:15 where current speeds fall to an average of 37 km/h. In terms of additional travel time, the significantly earlier onset of congestion in the project area results in a maximum speed reduction of 49 per cent versus the Mitchell Freeway average. This leads to additional travel times of upwards of 5 minutes. Figure 6 summarises these results graphically.

Figure 7 Project performance comparison



The average traffic speed in the project area is significantly lower than the Mitchell Freeway average during the morning peak period. This translates to significantly higher travel times for road users.

The project therefore provides the opportunity to address the traffic bottleneck caused in the location, with three lanes merging to two near Hodges Drive. Based on ROM24 strategic modelling, the project is expected to deliver an initial 37 percent increase in travel speed within the project area over the AM peak period, translating to an estimated 4 minute travel time improvement. The quantified benefits of this improvement are provided in more detail in Section 8.3 Economic Analysis.

The information contained in this business case, including the travel time benefits used as the basis of the economic analysis, is sourced from the strategic traffic modelling assessment using the ROM24 model as is normal for preparation of a business case. However, in parallel to this traffic modelling exercise, an assessment has been undertaken using collected traffic data and journey times for this section of freeway (from NetPReS) for 2019 calendar year.

This data analysis indicates that once the congestion bottleneck from Hodges Drive to Hepburn Avenue is removed by this proposed project, the forecast travel time saving from Shenton Avenue to Warwick Road is up to 6 minutes for over 15,0000 road users currently travelling southbound on Mitchel freeway in the morning peak period. This analysis, based on real collected data, provides additional assurances that the modelled travel time savings used in the economic assessments in this business case are conservative.

Future Economic Growth and Regional Development

Following the recent near doubling in growth due to unprecedented levels of investment, the WA economy has now transitioned to the production phase/export phase of growth. In the short term, there has been an easing in overall economic growth, which is expected to lift gradually over time, particularly given the recent fall in the Australian dollar and rising commodity prices. The gradual recovery of Gross State Product (GSP) over the forward estimates period is in part due to strong increases in export volumes that will help to offset weakness in the domestic economy.

These economic drivers are particularly important from a road transport perspective, as they tend to generate growth in population (and associated private vehicle movements) and demands associated with the freight task.

As identified by the 2019 Australian Infrastructure Audit, congestion is the dominant challenge in cities and infrastructure networks, with the daily commuter task growing strongly. As a result of continuing economic and population growth in Perth, and projected high levels of land use development and employment activity particularly around key activity centres, the increase in the cost of congestion on Mitchell freeway is forecast to increase 71 per cent by 2031 (Urban Transport Crowding and Congestion, Supplementary Report to the Australian Infrastructure Audit 2019).

Growth in Travel Demand

The corridor serves a range of key travel demands. The railway, freeway and active transport corridors function as a commuter route to the CBD and inner city employment. The freeway also provides a route for commercial vehicles and motorists who need to travel to/from the city and industrial areas.

Levels of vehicle ownership continue to grow, which has been a supporting factor in the continued increase in traffic demand across the road network. The number of motor vehicle registrations in WA increased by over 3 per cent between 2014 and 2018 (from 2.1 million to 2.2 million registrations).

Factors such as increasing urban sprawl, CBD-centric employment, and climate, have contributed to high dependency on the use of private vehicles in Perth – a current share of around 80 per cent of all trips (latest 2016 ABS Census). The requirement to enhance the capacity of Perth's road infrastructure is therefore considered prominent to meet this demand owing to high reliance on private vehicles.

Demand on Freight Transport System

Congestion affects freight as well as passenger networks. Most of Perth's freight task is carried on the road network. This will continue to be the case, particularly for short haul freight due to its cost advantages, and as the majority of freight movements in urban areas cannot be readily serviced by rail. The freeway network plays a major role in this freight task. While the Perth Freight Transport Network Plan focuses on more concentrated patterns of freight movements on higher capacity routes, carried by larger vehicles, the important role played by light commercial vehicles and the large number of trips made by these vehicles should be acknowledged.

Commercial vehicle traffic (such as vans, trucks and buses) is forecast to grow substantially, being more closely linked to increases in economic activity, with metropolitan VKT averaging growth in the range of 2.5–2.9 per cent per annum for the lower to upper baseline scenario range compared to private car traffic at 1.4–2.1 per cent per annum over the period to 2030 (BITRE Information Sheet 74, 2015). The light commercial vehicle fleet is critical for services that support key industries across the economy, particularly retail and manufacturing, contributing to 20 per cent of the total vehicle kilometres travelled in the Perth area in 2018 (an increase from 16 per cent in 2014). As evidenced in Table 2, commercial vehicles and trucks contributed to 24 per cent of total kilometres travelled in the capital city area (2018 data). This freight task cannot be serviced by public transport, therefore reliable road performance is critical for efficient and cost effective freight and business outcomes.

Table 2 Total kilometres travelled in the Perth capital city – by type of vehicle

	2014		2018	
	Million km	% of total	Million km	% of total
Passenger vehicles	11,414	77%	12,834	74%
Motor cycles	195	1%	138	1%
Light commercial vehicles	2,412	16%	3,395	20%
Rigid trucks	540	4%	605	3%
Articulated trucks	140	1%	193	1%
Non-freight carrying trucks	8	0.1%	12	0.1%
Buses	141	1%	141	1%
Total	14,850		17,318	

Source: ABS Survey of Motor Vehicle Use, Australia

The commercial & heavy vehicles (Austroads Class 3 – 12) vehicles travelling the subject section of Mitchell Freeway southbound comprise 6.6 per cent of the total traffic (based on 2019 traffic volume data from MRWA Traffic Map at Mitchell Freeway southbound, south of Ocean Reef Road – Site 50130). This figure is comparatively greater than the average statistic across the Perth capital city road network (5.1 per cent according to Table 2), indicating the significance of the commercial and heavy vehicle task in the area of the project improvement and potential to impact productivity if no improvement is made.

High Concentration of the City's Total Workforce in the CBD

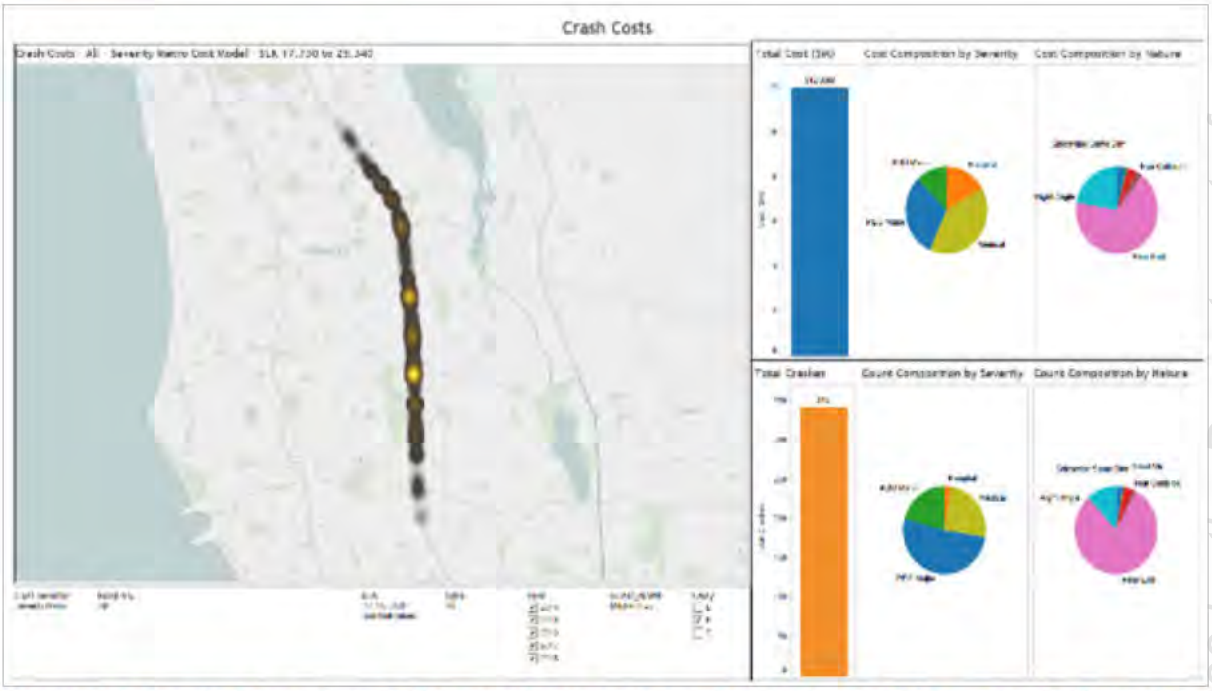
Approximately 15 per cent of Perth's employment across the greater metropolitan area is in the city itself, representing the highest concentration of CBD-centred employment of all major Australian capital cities. In 2011 more than 60 per cent of the jobs in the metropolitan area were located in the Central sub-region. The Central sub-region will continue to play a primary role well into the future and is expected to accommodate 50 per cent of employment in 2050, with the North-West sub-region serviced by the Mitchell Freeway also expected to experience high growth, increasing from 80,570 jobs in 2011 to 224,130 jobs by 2050 (Perth and Peel@3.5 Million, 2018).

The dominance of the central area as a major employment centre for much of Perth's white collar and service industries, along with a predominance of private car usage, has resulted in significant peak periods of traffic congestions, i.e. inbound to the CBD during the morning.

Road Safety is Compromised

Congestion characterised by frequent stop-start conditions on the Mitchell Freeway southbound is directly contributing to an increasing number of rear end crashes compromising road user safety and causing both social and economic costs to the community. Figure 7 summarises the latest five years of crash data in the project area (2014 – 2018).

Figure 8 Road Crashes 2014 – 2018



Congested stop-start conditions in the project area have resulted in a total of 343 crashes in the past five years, of which 94 resulted in hospitalisation or other medical treatment.

Analysis of this data shows that there have been 343 crashes with an associated estimated cost of more than $12 million when measured using a willingness-to-pay (WTP) approach.

A breakdown of crash severity and cost is provided in Table 3 below.

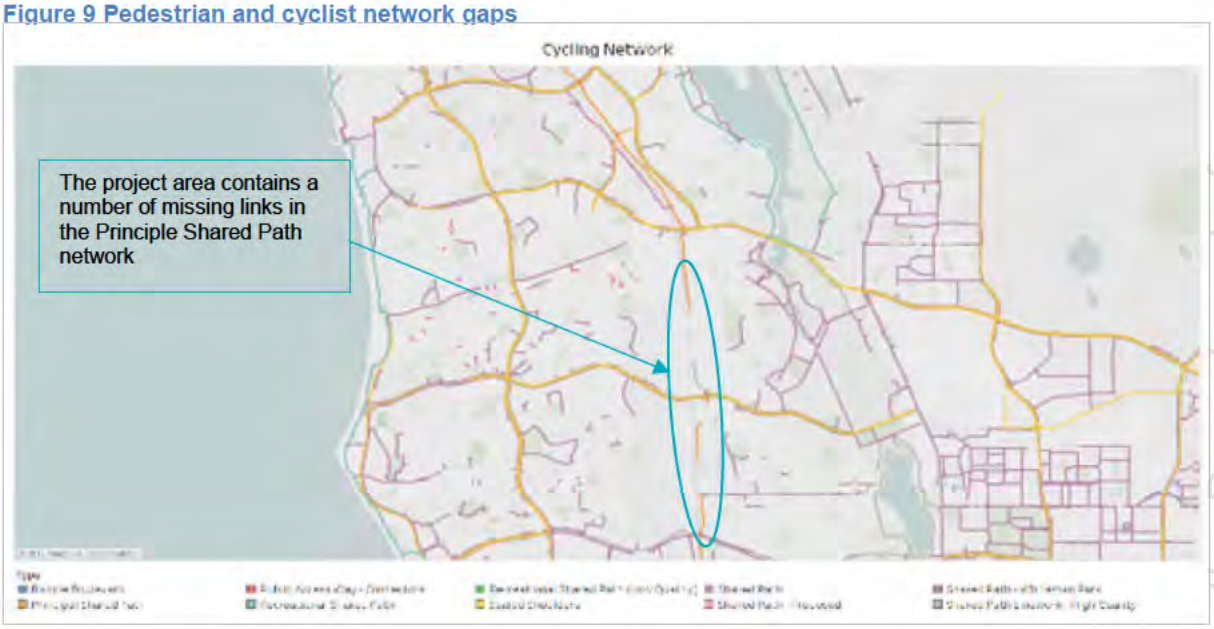
Table 3 Crash statistics (2014 to 2018)

Crash Severity	Number	Cost ($million)
PDO Minor	72	$2.3
PDO Major	177	$5.7
Medical	85	$7.4
Hospitalisation	9	$3.1

Pedestrian and Cyclist Safety

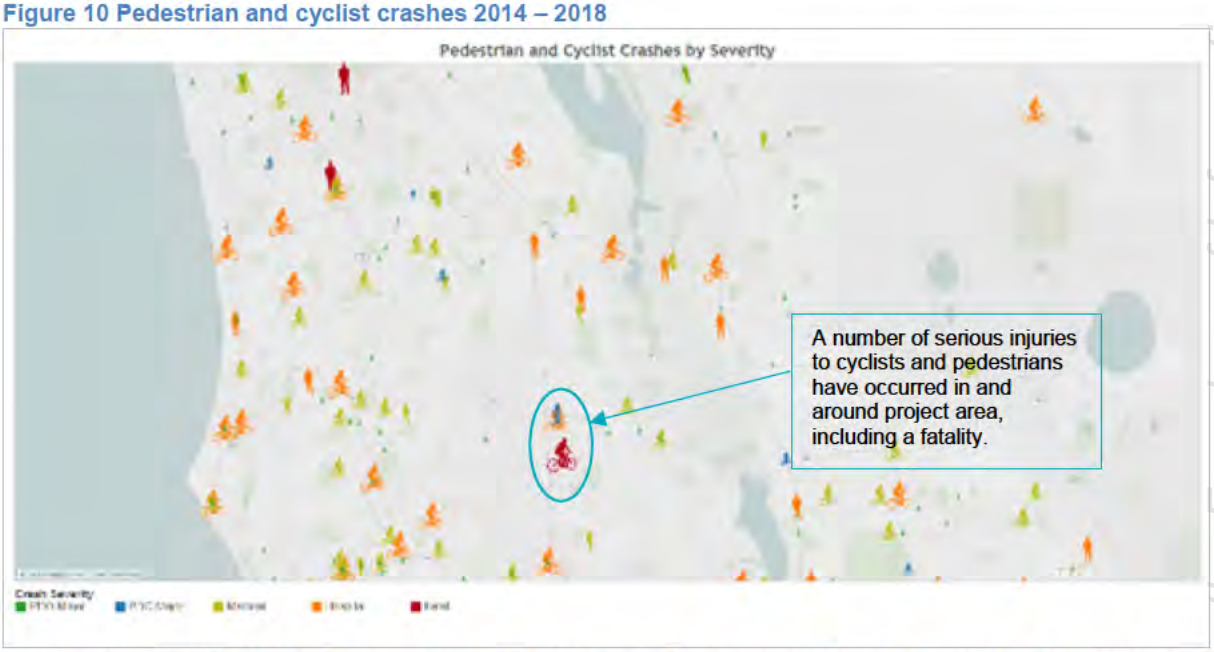
The Principle Shared Path (PSP) network is shown in Figure 9 where it can be seen that a number of significant gaps exist in the project area.

Figure 9 Pedestrian and cyclist network gaps



When reviewing crashes involving cyclists and pedestrians (Figure 10) it can be seen there has been a cluster of crashes in the areas where the network is discontinuous. The discontinuous PSP in the project area leads to the need for cyclists to interact with motorists and cross the busy Whitfords Avenue interchange on-road, where two cyclist crashes have occurred (one involving a hospitalisation). There has also been one fatal cyclist crash on the local road network on Twickenham Drive, with cyclist currently being forced to use local roads in discontinuous sections of the PSP.

Figure 10 Pedestrian and cyclist crashes 2014 – 2018



Three serious incidents involving cyclists and pedestrians have occurred in, or adjacent to, the project area in the past five years, including one fatal crash.

The project provides the opportunity to create a continuous PSP and thereby minimise risks involved with pedestrian and cyclist interactions with vehicles.

B2 Options Evaluation

The project option was qualitatively assessed against the base case option.

Decision Criteria

The criteria for the evaluation was as follows:

- Improved average travel speed during AM peak hours
- Improved road safety
- Improved operational capacity to relieve bottleneck at Hodges Drive
- Value for money (benefits exceed costs)
- Strategic alignment with the future smart freeway

Options Analysis

The options considered were as follows:

Option 1 Base Case (Do nothing/retain the current freeway configuration):

Scope: The base case is to retain the current number of lanes at Mitchell Freeway southbound between Hodges Drive off ramp and Hepburn Avenue on ramp. Maintenance of the status quo requires no capital expenditure.

Outcomes: Although this option avoids the project capital outlay, it is unfeasible due to unsustainable traffic congestion during AM peak hours. In the future, congestion impacts are expected to spread to other times as traffic volumes continue to grow. This option does not address any of the decision criteria.

Recommendation: This option fails to achieve the required design or safety outcomes and should therefore be discarded.

Option 2 Additional southbound median lane between Hodges Drive and Hepburn Avenue with widening of on-ramps

Scope: The option is to add an additional freeway traffic lane to Mitchell Freeway southbound by widening at the median between Hodges Drive off-ramp and Hepburn Avenue on-ramp. This option includes the widening the on-ramps of Hodges Drive, Ocean Reef Road, Whitfords Avenue and Hepburn Avenue for the on-ramp signal civil provisioning work. In addition, the infill and replacement of safety barriers is included in this scope.

Outcomes: This option fulfils the requirements to ease traffic congestion in the AM peak hours with other positive outcomes such as:

- no requirement to modify off-ramps within the project area;
- no requirement for concrete barriers on the verge side to protect existing bridge and retaining structures;
- no requirement to reduce shoulder widths at Whitfords Avenue Bridge;
- minimised requirement for light pole modification and relocation. Light poles are located in the Eastern verge;
- minimised impacts on existing services. Existing services such as Vocus, Telstra and MRWA lighting are largely located on the eastern verge; and

- reduced environmental impact and clearing extents. Existing vegetation is largely located on the eastern verge.

As part of the future Smart Freeway initiatives, all the on-ramps for inbound freeway carriageways towards Perth CBD (i.e. Kwinana Freeway northbound and Mitchell Freeway southbound) are required to accommodate ramp metering, therefore on-ramp widening is inevitable for the installation of associated ITS. This option fulfils these requirements.

Recommendation: This options fulfils the required decision criteria and has therefore been recommended.

Option 3: Additional southbound median lane between Hodges Drive and Hepburn Avenue, with no widening of on-ramps

Scope: The option is to add an additional freeway traffic lane to Mitchell Freeway southbound by widening at the median between Hodges Drive off-ramp and Hepburn Avenue on-ramp. This option does not include widening the on-ramps of Hodges Drive, Ocean Reef Road, Whitfords Avenue and Hepburn Avenue for the on-ramp signal civil provisioning work. In addition, the infill and replacement of safety barriers is included in this scope.

Outcomes: As part of the future smart freeway initiatives, all the on-ramps for inbound freeway carriageways towards Perth CBD (i.e. Kwinana Freeway northbound and Mitchell Freeway southbound) are required to accommodate ramp metering, therefore on-ramp widening is inevitable for the installation of associated ITS. Although this option is cheaper than the recommended option due to reduced scope, the exclusion of civil provisioning work for on-ramp widening does not align with the future smart freeway strategy.

Recommendation: This option fulfils the requirements to ease traffic congestion in the AM peak hours but does not meet longer term strategic objectives and thus is not considered to be feasible.

Option 4: Additional southbound verge lane between Hodges Drive and Hepburn Avenue, with widening of on-ramps

Scope: The option is to add an additional freeway traffic lane to Mitchell Freeway southbound by widening at the verge side between Hodges Drive off-ramp and Hepburn Avenue on-ramp. This option includes the widening the on-ramps of Hodges Drive, Ocean Reef Road, Whitfords Avenue and Hepburn Avenue for the on-ramp signal civil provisioning work. In addition, the infill and replacement of safety barriers is included in this scope.

Outcomes: While this option fulfils the criteria to ease traffic congestion in the AM peak hours there are a number of factors that make it a less desirable option:

- requirement to modify off-ramps within the project area;
- requirement for concrete barriers on the verge side to protect existing bridge and retaining structures;
- requirement to reduce shoulder widths at Whitfords Avenue Bridge;
- requirement for light pole modification and relocation. Light poles are located in the eastern verge;
- identified impacts on existing services. Existing services such as Vocus, Telstra and MRWA lighting are largely located on the Eastern verge and will therefore require modification; and

- environmental impact has been identified and clearing extents required. Existing vegetation is largely located on the eastern verge and will therefore require modification.

As part of the future smart freeway initiatives, all the on-ramps for inbound freeway carriageways towards Perth CBD (i.e. Kwinana Freeway northbound and Mitchell Freeway southbound) are required to accommodate ramp metering, therefore on-ramp widening is inevitable for the installation of associated ITS. While this options fulfils these requirements it does so which a much larger impact and extent of changes required.

Recommendation: While this option has fulfilled design criteria, the extent of changes and impacts far exceed that of the first option and therefore is not recommended

Decision Matrix

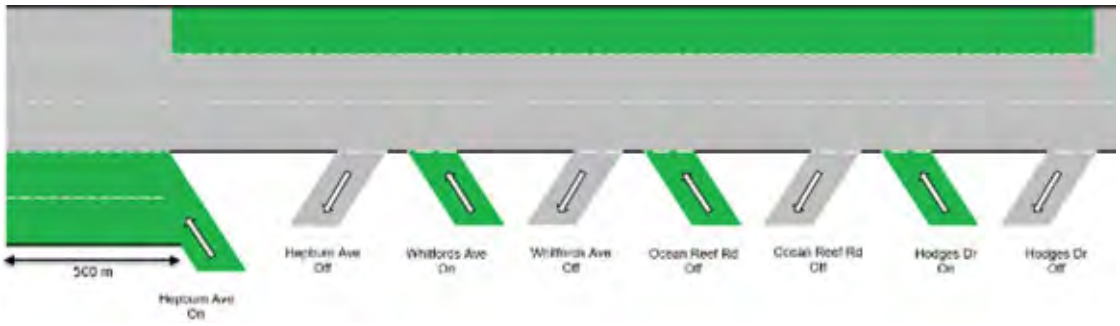
The matrix below summarises the reasons for accepting or rejecting each option against the deliverability criteria established in Section 7.1 and drives the selection of the preferred option.

Table 4 Decision matrix for shortlisted options

Decision Criteria	Option 1 Base Case	Option 2 Recommended	Option 3	Option 4
Improved average travel speed during AM peak hours	No	Yes	Yes	Yes
Improved road safety	No	Yes	Yes	Yes
Improved operational capacity to relieve bottleneck at Hodges Drive	No	Yes	Yes	Yes
Value for money	No	Yes	Yes	No
Strategic alignment with the future Smart Freeway	No	Yes	No	Yes
Improved facilities to provide better travel information	No	Yes	Yes	Yes
Accepted/Rejected	**Rejected**	**Accepted**	**Rejected**	**Rejected**

B3 Scope of Project Phase

The project is to add an additional freeway traffic lane to Mitchell Freeway southbound between Hodges Drive off ramp and Hepburn Avenue on ramp as shown below:

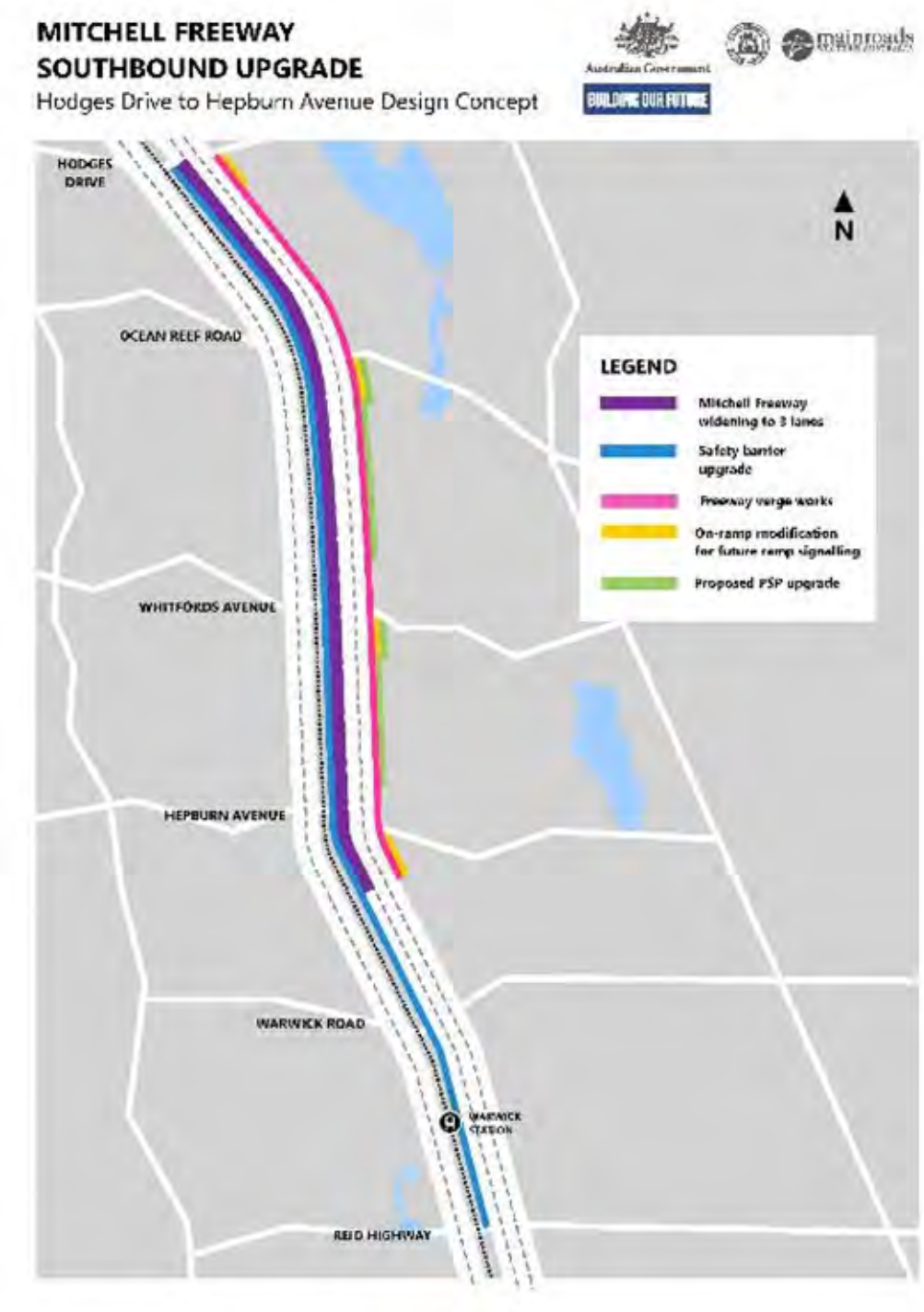


This section is approximately 8.8 km long and includes the following scope:

- Widening in the median between Hodges Drive off ramp and Hepburn Avenue on ramp to have 3rd 3.5m freeway traffic lane.
- Installation of eight emergency stopping bays with emergency telephones.
- Widening of all four on ramps between Hodges Drive and Hepburn Avenue to allow for future Ramp Metering.
- Installation of Safety Barriers for the length of the project in both the median and verge, with additional barriers to be installed up to Reid Highway to fill the gaps that currently exist.
- Installation of Noise Walls.
- Installation of Retaining Walls.
- Installation and upgrade of PSP connections.
- Lighting
- Drainage requirements
- Revegetation and landscape works

The design concept is as follows:

Figure 11 Design Concept



B4 Eligibility under the National Land Transport Act 2014

The project is eligible for approval as an Investment Project under the National Land Transport Act 2014, Part 3, Section 10 (a). The project is for the construction of an existing road that is in the State of Western Australia.

C. PROJECT COSTS

C1 Project Cost Breakdown

The project estimate is attached in Appendix 1.

The Project Cost Break Down is attached in Appendix 2.

C2 Total Outturn Cost breakdown

The cost summary for the delivery of the Project is shown below:

	P50 ($m AUD)	P90 ($m AUD)
Base Cost Estimate	58.45	58.45
Contingency	10.98	14.61
Total Project Cost Estimate	69.43	73.06
Escalation	72.67	76.46
Sunk cost	-	-
Total Outturn Cost Estimate	72.67	76.46

C3 Budget profile for the Project

The proposed funding profile and sources for the Project is shown in the table below:

Financial Year Forecast Milestone Requirement *

P50/P90 Outturn (or Actual as appropriate)		2020-21 ($m)	2021-22 ($m)	2022-23 ($m)	2023-24 ($m)	Balance of Commitment ** ($m)
	Australian Government contribution	19.00	15.75	1.75		1.50
	State Government contribution	19.00	15.75	1.75		1.50
	Other contribution (provide detail)					
	Total	38.00	31.50	3.50		3.00

*Payment of Australian Government funding will be subject to the achievement of Project milestones determined in consultation between Commonwealth and state officials.
**To be made available on demonstrated need.

Milestone Schedule

Mitchell Freeway widening (Hodges Drive to Hepburn Ave)
Payment Milestone schedule
Project ID: 100942-18WA-UCO

Payment Milestone No.	Description	Claim for Payment Date	Expenditure to meet milestone	Cumulative expenditure	Payment needed to cover expenditure to milestone			Payment to cover cash flow needed for next milestone			Total milestone payment			Cumulative total milestone payments			Year	Annual total	
					Total	Cwlth	State	Total	Cwlth	State	Total	Cwlth	State	Total	Cwlth	State		Cwlth	State
1	Award contract	Oct-20	3.50	3.50	3.50	1.75	1.75	9.00	4.50	4.50	12.50	6.25	6.25	12.50	6.25	6.25			
2	Commence construction	Mar-21	12.00	15.50	3.00	1.50	1.50	22.50	11.25	11.25	25.50	12.75	12.75	25.50	12.75	12.75	2020/21	19.00	19.00
3	Median Widening Complete	Oct-21	30.00	45.50	7.50	3.75	3.75	13.50	6.75	6.75	21.00	10.50	10.50	21.00	10.50	10.50			
4	Verge Works Complete	Jan-22	18.00	63.50	4.50	2.25	2.25	6.00	3.00	3.00	10.50	5.25	5.25	10.50	5.25	5.25	2021/22	15.75	15.75
5	Practical Completion	Aug-22	8.00	71.50	2.00	1.00	1.00	0.75	0.38	0.38	2.75	1.38	1.38	2.75	1.38	1.38			
7	Post completion report and project close out	Apr-23	1.50	73.00	0.75	0.38	0.38	0.00	0.00	0.00	0.75	0.38	0.38	0.75	0.38	0.38	2021/22	1.75	1.75
	P50 Total		73.00		21.25	10.63	10.63	51.75	25.88	25.88	73.00	36.50	36.50					36.50	36.50
	Contingency P50 to P90		3.00					3.00	1.50	1.50	3.00	1.50	1.50					1.50	1.50
	Committed fund Total		76.00		21.25	10.63	10.63				76.00	38.00	38.00					38.00	38.00

C4 What is the status of the State Government funding outlined above?

The State Government has committed funding for this project and included within the State budget.

D. BENEFITS

D1 Expected positive outcomes and benefits

Benefit cost ratio (BCR) is the economic evaluation module of Main Roads ROM24 model and is based on the ATAP Guidelines – this tool was used to generate the underlying benefit stream. A BCR estimate for the Project Case of approximately 12 has been calculated based on a central discount rate of 7 per cent (real) as shown in Table 7 below. The main assumptions used in the preparation of the BCR are:

- Costs and benefits are presented in real terms
- ROM24 strategic transport model was used to generate the base demand matrices that were used for traffic assignment (see Appendix H for more detail)
- Reference years modelled were 2021 and 2031, adopting Infrastructure Australia (IA) agreed networks
- Costs and benefits have been discounted over a 30 year assessment period, with the first year of operation in 2023
- 50 per cent of benefits were conservatively assumed the first year of project operation
- Benefits were capped at 2031, rather than extrapolating the 2021 to 2031 trend
- Source of parameter values are ATAP 2016 PV2
- The cost-benefit analysis was undertaken using three discount rates; 4%, 7% and 10%
- 2019 was used as the reference year for discounting
- A cost expansion factor of 338 days has been used for all vehicle types and time periods

Table 5 BCR Outputs Recommended Option

Benefits/Costs	Discount Rate		
	4%	7%	10%
BENEFITS			
Car: Private Use	**$642,079,459**	**$405,659,318**	**$271,577,825**
Travel Time Savings	$421,901,044	$266,799,496	$178,788,414
Vehicle Operating Costs	$220,178,415	$138,859,822	$92,789,411
Car: Business Use	**$227,075,692**	**$143,529,605**	**$96,135,185**
Travel Time Savings	$187,609,750	$118,639,637	$79,503,121
Vehicle Operating Costs	$39,465,942	$24,889,968	$16,632,064
Light Commercial Vehicles (Class 1-2)	**$118,083,585**	**$75,296,461**	**$50,895,797**
Travel Time Savings	$77,751,122	$49,648,408	$33,608,120
Vehicle Operating Costs	$40,332,462	$25,648,052	$17,287,677
Heavy Commercial Vehicles (Class 3-12)	**$100,258,928**	**$63,793,842**	**$43,025,529**
Travel Time Savings	$62,982,726	$40,044,091	$26,985,782
Vehicle Operating Costs	$37,276,202	$23,749,751	$16,039,747
Other Benefits	**-$7,965,570**	**-$5,094,436**	**-$3,454,088**
Crash	$2,174,086	$1,450,641	$1,025,359
Environmental	-$10,139,656	-$6,545,077	-$4,479,446
TOTAL BENEFITS	**$1,079,532,094**	**$683,184,790**	**$458,180,248**
COSTS			
Maintenance Cost	$942,378	$620,963	$434,181
Capital Expenditure	$63,105,868	$56,940,339	$51,535,064
COST-BENEFIT ANALYSIS			
BCR	17.09	11.99	8.88
NPV	$1,015,483,849	$625,623,488	$406,211,003
FYRR	0.29	0.28	0.28
PRODUCTIVITY METRICS			
Productivity Benefits	$445,418,204	$282,619,908	$190,056,510
Productivity Benefit Intensity	41%	41%	41%
Productivity BCR	7.04	4.95	3.68

The land use forecasts used as an input to the modelling process are a key driver for the projected travel demand, and consequently, the projected benefits of the initiative. The uncertainty associated with future year land use forecasts presents a risk that the projected benefits will not be delivered by the initiative. For this business case, benefits beyond the final reference year (2031) were modelled using a linear trend (extrapolated), however due to the above risk, the presented BCR is modelled assuming that at 2031 the benefits plateau as the demand on the improved road network will likely have met or exceeded capacity.

The results of the ROM24 model were interrogated to provide the estimated change in performance comparing the Project Case and Base Case scenarios. The results of the modelling are provided in Table 8 over-leaf.

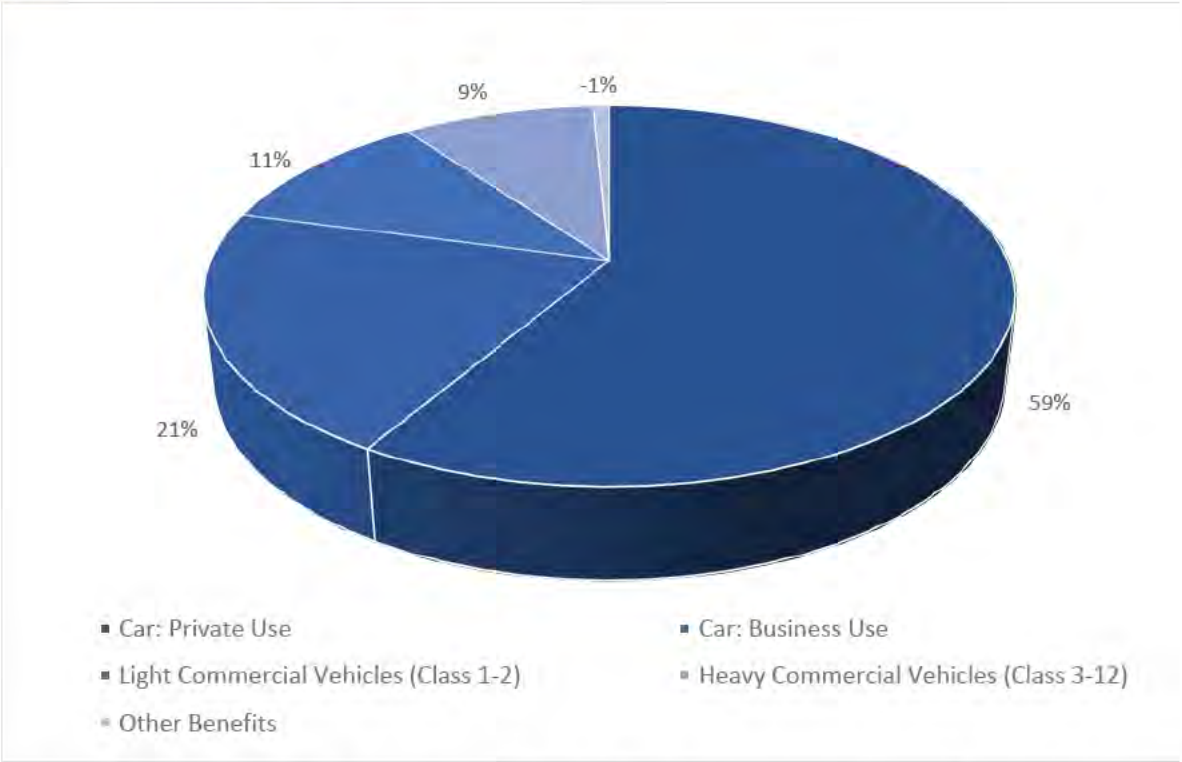
Table 6 Summary of key traffic modelling results

Year	Serviced Daily Traffic Volume		Increase in Speed in AM Peak Period
	Base Case	Project Case	
2021	48,880	60,000	37%
2031	53,200	67,300	34%

Based on link Ocean Reef Road to Whitfords Avenue

In summary, the project case is expected to deliver a 23 percent increase in vehicle flow with a 37 percent increase in travel speed over the AM peak period shortly after opening. Followed by a 27 percent increase in vehicle flow and a corresponding 34 percent increase in travel speed over the AM peak period at 2031. Approximately 59 per cent of all expected benefits are expected to accrue from private travel time and vehicle operating cost savings. Figure 11 below sets out the allocation of modelled benefits.

Figure 12 Accrual of expected benefits



Negative environmental and crash benefits are not unexpected as the ROM24 model will attribute a cost per VKT for air pollution, greenhouse gases and crashes. As there is substantial increase in VKT due to the capacity and travel time increases afforded by the project improvements, the environment and crash costs increase.

D2 Summary of the BCR:

Summary Measures (P50)

		4% Discount rate	7% Discount rate	10% Discount Rate
Present Value Cost*		$60.53M	$54.39M	$49.09M
Present Value Benefits	Standard benefits	$1,079.53M	$683.18M	$458.18M
	Standard benefits with WEBS			
	Standard benefits with WEBS and other benefit categories			
Benefit Cost Ratio**	Standard benefits	18.10	12.69	9.41
	Standard benefits with WEBS			
	Standard benefits with WEBS and other benefit categories			

Summary Measures (P90)

		4% Discount rate	7% Discount rate	10% Discount Rate
Present Value Cost*		$64.05M	$57.56M	$51.97M
Present Value Benefits	Standard benefits	$1,079.53M	$683.18M	$458.18M
	Standard benefits with WEBS			
	Standard benefits with WEBS and other benefit categories			
Benefit Cost Ratio**	Standard benefits	17.09	11.99	8.88
	Standard benefits with WEBS			
	Standard benefits with WEBS and other benefit categories			

** Includes Maintenance Costs*

*** Benefits in the BCR are nett of maintenance costs, i.e. treats maintenance as a component of the numerator*

D3 Benefit Indicators

Benefits indicator table

Benefit Area	Benefit indicator and units	Value
Reliability/ amenity	Public Transport reliability (standard deviation hours per annum)	N/A
	Journey time reliability (standard deviation hours per annum)	N/A
Safety	Number of avoided accidents (average annual)	
	Number of avoided serious injuries (average annual)	
	Number of avoided fatalities (average annual)	
Active transport benefits	Additional kilometres of walk and cycle paths (kilometres)	N/A
	Increased walking and cycling activity (number of trips by mode and average kilometres per annum)	N/A
Commuter time savings (daily commute to work)	Minutes saved by commuters on their daily commute to work based on a sample of commutes along the relevant corridor (average annual)	Average daily VHT savings (all users): 2590
	Average number of commuter trip (annual)	
Leisure time savings	Average time savings for people on trips for leisure activities (minutes)	
	Average number of leisure trips (annual)	
Freight / business time savings	Average time savings for business trips, including freight (minutes)	
	Average number of business and freight trips (annual)	
Vehicle Operating Costs – all values are undiscounted	Average change in vehicle operating costs for freight and business operators (annual)	Car – business use: $2.70M Light Commercial Vehicle: $2.74M Heavy Commercial Vehicle: $2.52M
	Average change in vehicle operating costs for passengers (annual)	Car – private use: $15.08M
Freight and Business Productivity	Average annual value of the sum of reduced vehicle operating costs, time savings and travel time reliability for freight and business users	N/A
Construction Jobs	Number of jobs supported by the Project during the construction phase of the Project (average per annum FTE)	530 jobs
Operations Jobs	Number of jobs supported by the Project during the operational phase of the Project (average per annum FTE)	N/A

D4 Benefit Net Present Value (NPV)

The benefit net present value is shown below:

Benefit Component		Present Value of all Benefits ($m)	Year 10 Only: Year 10 Benefits in $m (10 years after construction complete)	Year 10 Benefits as a percentage of total benefits
Travel Time Savings	Passenger (all users)	$266.80	$31.34M	39%
	Business (all users)	$168.29	$19.53M	24%
	Freight (all users)	$40.04	$4.60M	6%
	Total Travel Time Savings	**$475.13M**	**$55.47M**	
Reduced Vehicle Operating Costs (resource costs)	Passenger (all users)	$138.86	$16.49M	21%
	Business (all users)	$50.54	$5.90M	7%
	Freight (all users)	$23.75	$2.70M	3%
	Total Reduced Operating Costs	**$213.15M**	**$25.10M**	
Accident Reduction	Passenger (all users)			
	Business (all users)			
	Freight (all users)			
	Total Accident Reduction	**$1.45M**	**$0.13M**	0.17%
Environmental Benefits	Reduced Greenhouse Emissions			
	Reduced Local Pollution			
	Reduced Noise			
	Other (i.e. Biodiversity)			
	Total Environmental Benefits	**-$6.55M**	**-$0.70M**	-1%
Reduced Maintenance Costs	Routine (Annual)			
	Periodic			
	Rehabilitation			
	Total Reduced Maintenance Costs	**-$0.62M**	**-$0.06M**	-0.08%
Other standard benefits (reliability, crowding, tolls/fare box)				
TOTAL STANDARD BENEFITS*		**$682.56M**	**$79.94M**	
Wider Economic Benefits	Agglomeration Benefits	N/A	N/A	N/A
	Other Wider Economic Benefits	N/A	N/A	N/A
	Total Wider Economic Benefits	N/A	N/A	N/A
Other Benefits (i.e. City shaping)	*(add category as required: such as heavy vehicle productivity)*	N/A	N/A	N/A
	(add category as required)	N/A	N/A	N/A
	Total Other Benefits	N/A	N/A	N/A

**Total Standard Benefits should equal sum of total benefits.*

Travel Time Savings (VTT)

Travel time savings are calculated by assessing the differences in Vehicle Hours Travelled (VHT) between the “Do Minimal” and “Project Case” models for various vehicle classes.

For each model scenario, VHT is calculated based on the sum of Link Travel Time multiplied by vehicle volume.

Monetisation of VHT differences is calculated using standard ATAP Guideline inputs that stipulate:

- Vehicle occupancy rates
- Value of time per occupant
- Freight time values

(Base Case VHT - Project Case VHT)* VOT Parameter*Day to Annual Expansion

Value of Time (VOT) parameters used are:

Car Private	$25.48
Car Business	$63.22
LCV	$25.41
C3 - C5	$34.81
C6 - C9	$66.68
C10 - C12	$105.73

Vehicle Operating Costs (VOC)

Vehicle Operating Cost savings are calculated by assessing the differences in Vehicle Operating Costs between the “Do Minimal” and “Project Case” models for various vehicle classes.

Use is made of the free-flow and stop-start VOC models stipulated in the ATAP Guidelines.

For each network every link is assessed for its operating speed and an appropriate VOC model selected

The following VOC parameters are adopted in the analysis:

Car Private	VOC Parameters - 4. Courier Van-Utility
Car Business	VOC Parameters - 4. Courier Van-Utility
LCV	VOC Parameters - 7. Medium Rigid
C3 - C5	VOC Parameters - 11. Artic 5 axle
C6 - C9	VOC Parameters - 14. B-Double
C10 - C12	VOC Parameters - 4. Courier Van-Utility

D5 Traffic and use assumptions

		First year after Project completion	10 years following Project completion	30 years following Project completion
Users of existing infrastructure in Base Case	Driver+ Passenger Trips / VKT	6618368 / 63066802	8112971 / 76690403	8112971 / 76690403
User of new/ upgraded infrastructure in Project Case	Driver+ Passenger Trips / VKT	6619437 / 63157477	8114440 / 76832776	8114440 / 76832776
Users diverted from the rest of the highway network *				
Users diverted from other transport modes (where possible).	PT+Walk+Cycle Trips	802	1481	1481
Generated trips	Total Trips	Negligible due to project scale	Negligible due to project scale	Negligible due to project scale

* Not possible to determine – all VKT and trips are model wide statistics and include route and mode choice changes – any reported changes would include both impacts

E. FINANCING AND PROCUREMENT

E1 Alternative funding and/or financing opportunities

If the total estimated project cost greater than $50 million, please outline the process for considering alternative funding and/or financing opportunities and the outcome of the considerations.

The provision of the widening is not conducive to a private financing arrangement. Future consideration of innovative funding and financing models will be in line with State Government policy.

Private financing is not considered appropriate for this project as:

- The widening applies to an existing state road which is used by the public and commercial vehicles, and thus the upgrade project provides improvements which are also a public good; and
- The application of user charging is not current State government policy

E2 Private funding or financing

If the estimated Project cost is less than $50 million was private funding or financing investigated proportional to the size of the project. If so, please provide a summary of how it has been considered and the outcome of the considerations?

N/A

E3 Procurement method

What is the preferred procurement method for the Project? Please outline the specific details of the contracting method (design and construct for example) and why it was chosen. If over $50 million, how was a Public Private Partnership considered in line with the National Public Private Partnership Guidelines?

A Delivery Methodology Workshop involving industry representatives was held on 16 December 2019. NEC4 (New Engineering Contract) was determined as the best contract delivery methodology for the Project.

It is proposed that the Project be delivered as a modified NEC4 Engineering and Construction Contract Option C: Target Contract with Activity Schedule. The NEC3 form of contract was utilised by Main Roads for the construction of the Pithara Section of Great Northern Highway and the Northam-Pithara Road. The WA Road Construction and Maintenance Industry Advisory Group advocates strongly for this form of contract to be more widely utilised by Main Roads.

NEC4 has been developed in the UK for the appointment of a contractor for engineering and construction project work. It provides a modern method for clients, designers, contractors and project managers to work collaboratively to achieve their objectives. Option C is an Activity Schedule target cost contract which effectively means the financial risks are shared between the Client (Main Roads) and the Contractor. The contract is based on a 'target' price which is

the total of prices for each Activity included in the contracts Activity Schedule. The Contractor is then paid for all defined (actual) costs, plus a Fee and the Client (Main Roads) and Contractor shares the pain or gain if the total costs are over or under the 'target' price.

E4 Tender exemption

A tender exemption is not being sought for this project.

E5 Project Timeline

The project timeline is as follows:

Activity	Timeline
Early Tender Advice placed in "Tenders WA"	14 January 2020
Advertise Request for EOI in "Tenders WA"	9 March 2020
Industry Briefing	13 March 2020
Request for EOI closes	21 April 2020
Request for Proposal issued to Shortlisted Applicants	22 June 2020
Request for Proposal closes	8 September 2020
Award Contract	October 2020
Commence construction	February 2021
Practical Completion	April 2022
Landscaping and revegetation complete	April 2022

F. RISK AND SUSTAINABILITY

F1 Major risks, and proposed mitigation strategies

Risk management is an integral part of this project, with identified risks and mitigation strategies updated on a regular basis. A formal risk workshop conducted in November 2018 identified key project risks within the following areas:

Project Management
Project Costs / Funding/Procurement
Project Team Capabilities
Safety, Health and Wellbeing
Project Stakeholders
Environmental / Heritage / Legal and Regulatory
Delivery Requirements
Quality
Weather
Other

The output from the risk workshop has been incorporated into the existing risk register which will continue to be central to the project's effective management of risk throughout the Development phase. The risk register will be a vital tool in ensuring the ongoing management of risk as the project transitions into Delivery. Future risk workshops will be scheduled once the contract is awarded, to continue to identify, refine and manage new risks.

The table below provides an outlines of the key mitigation strategies in place in order to manage residual risk levels down to acceptable levels. A full risk analysis can be found at Appendix 3.

F2 Major dis-benefits of the project and impact to the community and environment.

Nil

F3 Sustainability strategies

Main Roads has embedded sustainability in all their activities to seek economic, social and environmental benefits and operate a sustainable road transport system in partnership with others. Main Roads internal sustainability procedures will therefore be implemented for the project.

G. STAKEHOLDER ENGAGEMENT

G1 and G2 Public and stakeholder participation and consultation

Below is the summary of stakeholder analysis conducted for the project:

Stakeholder	Interest/Context	Position
Main Roads WA (MRWA) Network Operations Planning & Technical Services Road and Traffic Engineering Branch Environmental Branch Metropolitan Region Supply and Transport Road Safety Branch	All aspects of project management resources from various Main Roads branches will be coordinated and collaborated to deliver the project. Main Roads has previously developed communications tools and stakeholder engagement strategies for road projects. These strategies consider the projects from concept development through to implementation, and take into account both internal and external stakeholder requirements. Stakeholder mapping was aimed to identify and understand the key stakeholders whose influence and support will be vital to the successful implementation of any initiatives that might progress under this project.	Support
Department of Transport (DoT)	DoT is responsible for regional transport planning and this project is consistent with the "Perth Transport Plan for 3.5 Million People and Beyond" (DoT August 2016).	In principle support – further consultation will be undertaken as project progresses.
Public Transport Authority (PTA)	The project will install concrete safety barriers along the project section of the Mitchell Freeway at the median. This will improve safety of PTA trains and other assets.	In principle support – further consultation will be undertaken as project progresses.
Department of Planning, Lands and Heritage (DPLH)	Being responsible for Perth and Peel@3.5million Plan and other related sub-regional planning frameworks, effective communication with Department of Planning, Lands and Heritage will enhance the social, economic, environmental impacts of the road development.	In principle support – further consultation will be undertaken as project progresses.
Local Governments (City of Joondalup and City of Wanneroo)	The project is located within the City of Joondalup (and close proximity to the City of Wanneroo) and will reduce travel times and improve trip time reliability for vehicles travelling southbound on Mitchell Freeway during peak hours. Thorough consultation with Local Governments is required during the design process regarding detailed adjustments to the existing road network. Local case studies may also provide informative strategic directions in the early planning phase.	Consultation will be undertaken as project progresses.
Local community including residents, schools and businesses	**The project does not require land acquisition and will reduce travel time, improve trip time reliability and safety for local residents and visitors to the local businesses.** **Feedback obtained from business/community representatives through, for example, a Driver**	**Consultation will be undertaken as project progresses, after specific stakeholders are**

Stakeholder	Interest/Context	Position
	Comprehension Study, will be pivotal to understand the behaviour of and desired outcomes by the end users. **A Community Perception survey was undertaken in April 2016 by Metrix, on behalf of MRWA, which identified the following findings relevant to this project:** - Recognition that road freight efficiency is impacted by traffic congestion; - Agreement that drivers have a responsibility to take actions to ease traffic congestion; - Whilst a significant number of road users (65%) state that the use of public transport could have a significant influence on easing congestion, only half of them (53%) currently change their mode of transport to avoid traffic congestion; - Road upgrades and use of technology to actively monitor and manage traffic conditions are among the top three specific initiatives regarded as key priorities to address and manage traffic congestion; and - The top three suggestions on how to ease or better manage traffic congestion are improve/provide more/sync traffic lights, add more lanes, and 'better drivers' education.	**identified for this project.**

G3 Public recognition signage plan

A Public Recognition Signage Plan will be prepared in accordance with the applicable guidelines and will be forwarded to the Department of Infrastructure, Transport, Regional Development and Communications for approval.

H. COMPLIANCE

H1 Commonwealth or State legislation triggered by the Project.

The following legislations will be triggered by the project:

State Legislation

- Environmental Protection Act 1986
  - Environmental Protection (Clearing of Native Vegetation) Regulations 2004
  - Environmental Protection (Noise) Regulations 1997
- Rights in Water and Irrigation Act 1914

H2 Compliance with the Building Code 2016

Does the Building Code 2016 apply to his project? If so, please confirm compliance.

YES –compliance with the Building Code 2016 will be ensured.

H3 Building and Construction WHS Accreditation

Does the Australian Government Building and Construction WHS Accreditation Scheme apply to this Project? If so, please confirm compliance.

YES – All requirements set under the Australian Government Building and Construction WHS Accreditation Scheme will be met.

H4 Indigenous Participation Plan

If the Project has an Australian Government funding contribution of equal to or greater than $7.5 million, has an Indigenous Participation Plan been attached?

YES – an Indigenous Participation Plan is attached in Appendix- 4.

H5 Local Industry Participation Plan

If the Project is more than $20 million, a Local Industry Participation Plan must be provided to the Department.

The Local Industry Participation Plan will be prepared and made available to the Department

H6 IA Submission

Is the proposed Australian Government contribution $100 million or greater. If yes, has the Business Case been submitted to Infrastructure Australia for review?

Not applicable

I. SIGN OFF

X _____

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s22(1)(a)(ii)

Director Budget and Investment Planning
Main Roads Western Australia

J. ATTACHMENTS

Appendix 1 – Project Estimate

Appendix 2 - Project Cost Breakdown

Appendix 3 – Risk Management Plan

Appendix 4 – Indigenous Participation Plan

Risk Registar

Risk Reference Number	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans (including who and when)
				Consequence Rating	Likelihood Rating	Level of Risk		
1	**PROJECT MANAGEMENT (Scope, Timeframes, Objectives, Design)**							
1.1	Scope uncertainty	Late changes. Pressure for other inclusions. Project overlap. ITS scoping requirements are not clear.	Pre-qualification issues and EOI impacts. Tender delays. Reputational damage.	Moderate (3)	Likely (4)	**High 12**	1-3. PTS with IDD support 4. Bassam Abu Shamleh	1. Continue to liaise closely with other MRWA Directorates throughout scoping definition. 2. Complete the preliminary design for all potential scope inclusions. 3. Get scope approval from the Project Owner following the proposed procurement method but prior to going to public tender. 4. Bassam to urgently provide ITS scoping provisions for this project.
1.2	Scope creep occurs after procurement commences.	Ongoing negotiation and cost variance. ITS inclusions result. Footbridge impacts.	Major cost increase result with funding shortfall. Value for money does not result.	Major (4)	Possible (3)	**High 12**	1-3. PTS with IDD support	1. Make provision in the proposed procurement method to include subsequent scope items. 2. Seek to define and commit to scope prior to going to public tender. 3. Make provision in the selection criteria for the potential for late scope inclusion to result including structural work inclusions.
1.3	Information available to prospective tenderers is incomplete	Unavailable or incomplete data cannot be sourced prior to public tender Probity issues for those previously involved in design works	Subsequent claims result. Responses are not fully informed. Pricing unknowns and qualifications result	Moderate (3)	Unlikely (2)	**Low 6**	1-5. PTS with IDD support	1. Identify likely information gaps and needs 2. Ensure identified information gaps are filled prior to going to public tender. 3. Develop supporting strategies for information that cannot be provided in a timely way to minimise impacts for tender assessment and award. 4. Issue addenda where unavoidable to provide the best available information for costing purposes 5. Discontinue external design works prior to issue of RFP and provide all information to Proponents.

Risk Reference Number	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans (including who and when)
				Consequence Rating	Likelihood Rating	Level of Risk		
1.4	Drainage - Connection to local government drainage systems Excalibur where local road modifciations are required. Warwick to Hepburn close to existing local roads	Local government not permitting the PSP drainage connect to local government drainage systems	Impact on drainage design, finding suitable locations for runoff to be dispersed and cost	Minor (2)	Possible (3)	Low 6	1. PTS with IDD support 2. IDD	1. Consult and liaise with local government during detailed design 2. Include LGA requirements in SWTC
1.5	Underpass - 5.0m for PSP cannot be achieved	Physical width of underpass not wide enough to meet design requirements for PSP	Width of PSP being less than minimum requirements. Structural works to underpass required, increasing cost	Moderate (3)	Possible (3)	Medium 9	1. PTS with IDD support	1. Assess and review detailed design
1.6	Underpass - 2.7m vertical clearance cannot be achieved	Physical dimensions of the underpass does not allow the minimum vertical clearance of 2.7m to be achieved.	The vertical clearance to remain at the existing height of 2.5m.	Moderate (3)	Possible (3)	Medium 9	1. PTS with IDD support	1. Assess and review detailed design
2	**PROJECT COSTS / FUNDING / PROCUREMENT**							
2.1	Procurement method is not supported by industry.	Industry non preferred method of procurement is chosen. Never done NEC4 before.	Mid-tier contractors miss out on high value contracts due to the chosen procurement method. Limited growth in experience within the industry.	Moderate (3)	Unlikely (2)	Low 6	1-2. IDD	1. Liaise closely with industry through procurement workshop and stakeholder workshops. 2. Review contractor and industry workloads to test likely resource availability.
2.2	Tendered costs exceed available budget.	Cost estimates only prepared for partial works. Govt seeking flexibility to include other scope items.	Scope reduction. Request for additional funds. Delays to secure additional funds.	Moderate (3)	Possible (3)	Medium 9	1-3. PTS with IDD support	1. Manage scope and cost to deliver within budget. 2. Plan and design for, but defer some works or seek additional funding if required. 3. Seek priced options as part of the tender process for inclusion subject to available funding.

Risk Reference Number	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans (including who and when)
				Consequence Rating	Likelihood Rating	Level of Risk		
3	**PROJECT TEAM CAPABILITIES (Resources, Systems, Processes)**							
3.1	MRWA team capacity is diluted across multiple projects.	Competing priorities. Lack of NEC4 experience.	Procurement delays result. Supervision capacity is limited during construction.	Moderate (3)	Unlikely (2)	**Low 6**	1. IDD	1. Forward resource planning.
3.2	Reliance on work by PTS for the 100% design status of median widening.	Lack of capacity to complete the required works.	Tender delays result. We go to tender with incomplete work with associated risk..	Moderate (3)	Possible (3)	**Medium 9**	1. PTS 2-3. IDD	1. Document project status and gaps progressively and at handover. 2. Address gaps early in the delivery process. 3. Complete Project due diligence report to highlight any gaps.
4	**SAFETY, HEALTH and WELLBEING (Project Specific OHS risks)**							
4.1	The contractor's workforce is at risk in a constrained work space close to PTA rail.	Median access is required.Widening is required both sides of the freeway lanes.Rail interface management is problematic.Bridge and ramp complexity.High traffic volumes in proximity.No space for gawk screens.	Death or serious injury.Road user complaints or criticism.Pressure to change work practices.Ongoing negative media scrutiny.	Major (4)	Unlikely (2)	**Medium 8**	1. Delivery Contractor2. IDD	1. Contractor to establish and adopt sound Staging Plan and Safety Management Plan.2. Ensure the contractor delivers in accordance with the plan.
4.2	Freeway crash frequency increases during construction.	Road user inattention. Freeway users are distracted by project works.	Death or serious injury. Traffic delays and congestion from minor crashes.	Moderate (3)	Possible (3)	**Medium 9**	1. Delivery Contractor 2. IDD	1. Contractor to establish and adopt sound Staging Plan and Traffic Management Plan. 2. Require the use of hoardings to limit sight lines to work areas with associated distraction potential.
4.3	Batter slope failure and erosion occurs over time.	Widening steepens existing batter slopes. Removal of vegetation on slopes during clearing.	Stone and sand on PSP. Cyclist or pedestrian death or serious injury. Pressure for more retaining walls and increased cost.	Major (4)	Unlikely (2)	**Medium 8**	1-2. IDD	1. Include slope guideline in SWTC. 2. Complete geotechnical assessment for slopes affected by widening works.

Risk Reference Number	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans (including who and when)
				Consequence Rating	Likelihood Rating	Level of Risk		
4.4	COVID-19 impacts upon project resource availability.	Supply chain disruption. Temporary loss of human resource. Force majeure event for all projects.	Procurement delays with offshore production and shipping required. Key personnel unavailable for a period of time. Project timeline slippage.	Major (4)	Unlikely (2)	**Medium 8**	1-3. IDD	1. Identify high risk and long lead items and program accordingly. 2. Provide an appropriate level of time contingency in the delivery schedule. 3. Consideration for COVID-19 in contract documents.
5	**PROJECT STAKEHOLDERS**							
5.1	Broader community and local residents are not aware of need for and extent of clearing of vegetation and other impacts.	Scope uncertainty delays communication. City of Stirling policy goals for tree retention with competing goals.	Stakeholder criticism and backlash. Reputational damage. Ministerial intervention. Community outrage results.	Minor (2)	Likely (4)	**Medium 8**	1-6. IDD	1. Prepare and adopt a sound Community and Stakeholder Engagement Plan. 2. Ensure regular, diverse and ongoing communications with road users and other stakeholders. 3. Advise directly affected residents of planned noise monitoring at noise logger installation points. 4. Advise affected LGA's of planned works. 5. Arrange for first community Newsletter distribution prior to construction. 6. Establish communications protocols for adoption throughout the project life.
5.2	Construction impacts for PSP users.	Significant PSP detours are required. Constrained site. Major freeway upgrade occurs yet PSP remains at grade.	PSP closures. PSP detours from the freeway corridor to the local road network and back again. PSP user complaints and criticism. Lighting of temporary detours is inadequate or unsafe.	Moderate (3)	Almost Certain (5)	**High 15**	1-3. IDD.	1. Maintain existing cycling levels of service at all times if possible. 2. Ensure detours are safe and well communicated in advance of changes. 3. Clearly define the contractor's communications and consultation responsibilities.

Risk Reference Number	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans (including who and when)
				Consequence Rating	Likelihood Rating	Level of Risk		
5.3	Consultation with PTA is protracted and ongoing.	Unreasonable site access conditions. Conflicting design requirements. Required clear zones limit construction opportunities. PTA's strategic objectives don't align with MRWA. Rail safety standards change.	Scope expands. Costs escalate. ORS requirements impact upon scope and design.	Moderate (3)	Likely (4)	**High 12**	1-11. IDD	1. Meet with and continue to liaise with PTA throughout the project life. 2. Involve PTA in key design, safety in design and access decisions. 3. Ensure contractor has working in rail reserve accreditation. 4. Ensure contractor provides a Rail Safety Plan for approval by PTA and Office of Rail Safety prior to commencing works 5. Require contractor to nominate their Rail Safety Manager at EOI stage. 6. Seek early advice from PTA on potentially affected rail infrastructure - communications, drainage, barriers and signalling, etc. 7. Establish agreed requirements with PTA for the use of appropriate traffic management devices. 8. Seek urgent advice from PTA with regard to current policy requirements for rail protection. 9. Seek advice from Terry Bailey with regard to earlier communications and commitments regarding rail protection. 10. Avoid the potential to create precedent use of concrete barriers on this project if possible 11. Seek 50/50 funding for safety barrier upgrades
5.4	Industry capacity is lacking to deliver with concurrent works running.	Market becomes flooded.Industry lacks the resources needed for a project of this scale.Cost estimating assumptions are flawed.	Cost escalates.Available workforce lacks competency and experience.B team results with increased supervision and information requirement.	Moderate (3)	Possible (3)	**Medium 9**	1-4. IDD	1. Include weighted criteria to reflect the need for highly skilled and experienced workforce in a high traffic/operating passenger rail setting.2. Make provision for MR site supervision capability and SO/s.3. Conduct tenderer information session and highlight the critical need for a highly skilled team and explaining the construction context.4. Confirm availability of the proposed construction team at the time of RFP with significant weighting.

Risk Reference Number	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans (including who and when)
				Consequence Rating	Likelihood Rating	Level of Risk		
5.5	Customer expectations are not met	Traffic throughput improves here with the bottleneck moving elsewhere along the freeway. The PSP level of service remains unchanged with network gaps remaining.	Stakeholder criticism. Reputational damage.	Minor (2)	Possible (3)	**Low 6**	1-4. IDD	1. Continue to consult with DoT and other cycling stakeholders. 2. Prepare and proactively adopt a Stakeholder Engagement Plan with dedicated resources by MR and Contractor. 3. Include messaging of planned wider network improvements and initiatives. 4. Require Contractor to nominate a suitably qualified Comms Mgr at EOI.
5.6	Ministerial expectations are not met	Anticipated jobs to market don't result quickly. Consequential effects result for other sections of the freeway and the local road network. Contract is not awarded by the end of Oct 2020 with delays to approvals and ongoing project development.	Flow on effects. Stakeholder criticism. Reputational damage. Job forecasts not met.	Moderate (3)	Possible (3)	**Medium 9**	1-3 IDD with PTS	1. Collaborate with internal stakeholders to address outstanding matters - IDD, PTS, Metro Region and Network Operations. 2. Establish regular meetings of internal stakeholders with appointed champions for all key functional needs. 3. Meet with Craig Peak to identify and include Metro scoping requirements in the EOI
5.7	PTA signalling and communications are disrupted resulting in unplanned rail closures.	Provision of future ramp signalling in proximity to PTA services.	Embarrassment. Reputation damage. Community backlash. Commercial claim. Temporary rail closure. Train passenger outrage and train to bus transfer required.	Moderate (3)	Possible (3)	**Medium 9**	1. IDD 2. Delivery Contractor	1. Liase with PTA on a regular basis 2. Undertake high risk activities outside peak hours and ensure all relevent checks have been undertaken and approvals are in place.
5.8	Metro Region Directorate expectations are competing or mutually exclusive.	Different priorities and expectations and programs.	Further disruption to commuters for resealing or other subsequent tasks.	Moderate (3)	Unlikely (2)	**Low 6**	1-3. PTS	1. Conduct regular meetings with Directorate champions. 2. Identify and include relevant scope items where appropriate. 3. Identify works planned by other Directorates potentially disrupting completed works. 4. Discuss with Metro Region via Craig Peak

Risk Reference Number	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans (including who and when)
				Consequence Rating	Likelihood Rating	Level of Risk		
5.9	The community expects continuous off road grade separated PSP facilities to result from this project.	Not currently included in scope or funded. Additional design and potential environmental lead times. Stakeholders (Stirling, Joondalup, DBCA, DoT) do not support the proposed design solution.	Delays to the project. Additional project funding.	Minor (2)	Possible (3)	Low 6	1. PTS	1. Communicate with DoT to define scope of works 2. Communicate scope of works and justification with stakeholders (cycling groups), including ultimate plan.
5.10	Community pressure to add or modify noise wall design in a constrained site	Community expectations. Amenity walls not meeting community expectations. Works south of Hepburn Ave do not require noise walls to comply with SPP5.4 with community pressure to do so. Community expectation that PSP's and noise walls go together as a package. Anti-social behaviour concerns with greater public access.	Pressure for scope change. Unfunded cost.	Minor (2)	Likely (4)	Medium 8	1-2. IDD with PTS	1. Undertake noise assessment 2. Communicate with local residents early in Project.
5.11	Significant traffic congestion and delays occur during construction.	Extent and duration of the project works.Rolling lane closures along the freeway.Widening required both sides of the freeway lane.Ramp geometry changes	Complaints and criticism.Road user frustration.Network operations impacts of rat running.Unforeseen requirements arise.	Moderate (3)	Almost Certain (5)	High 15	1-2. IDD3. Delivery Contractor with IDD	1. Establish a sound Community and Stakeholder Engagement Plan.2. Ensure regular, diverse and ongoing communications with road users and other stakeholders.3. Ensure works on freeway are carried out and can be completed outside of peak times, based on traffic numbers and traffic flow.

Risk Reference Number	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans (including who and when)
				Consequence Rating	Likelihood Rating	Level of Risk		
6	**DESIGN RISKS**							
6.1	Geometry review not undertaken for future 'all lane running' scenario.	Potential space proofing issues. Wheel paths may with within pavement join lines. Reduced shoulder width results.	Additional pavement widening. Insufficient clearance to existing bridge abutments. Non preferred lane widths required. Premature pavement failure. Ultimate configuration result in a longitudinal pavement join on a wheel path.	Major (4)	Possible (3)	**High 12**	1. IDD and PTS with the Design Contractor.	1. To be undertaken at detailed design stage. 2. Allow Paul Fourie to review final design.
6.2	Working widths and access reviews not undertaken.	Maintenance accessibility issues	Non ideal breaks in the safety barrier. Maintenance crews working in non ideal situations. Maintenance works under additional traffic management situations causing delays to traffic. Constructability and maintainability are difficult or not possible.	Moderate (3)	Unlikely (2)	**Low 6**	1. IDD and PTS with the Design Contractor.	1. To be undertaken at detailed design stage.
6.3	Drainage basin sizing and landscaping design require additional land.	Incorrect drainage basin sizing. Lack of space available for drainage purposes Lack of options and use of shared drainage solutions.	Additional land take requirements. Additional clearing. Extremely high drainage costs results.	Moderate (3)	Possible (3)	**Medium 9**	1. IDD and PTS with the Design Contractor.	1. To be undertaken at detailed design stage.
6.4	An emergency telephone is required at the PTA gates on the median side	Encourages drivers to use PTA access gates as emergency stopping bays.	Potential for additional accidents as PTA gates are not designed for an emergency stopping bay.	Major (4)	Possible (3)	**High 12**	1. IDD and PTS with the Design Contractor.	1. To be undertaken at detailed design stage.

Risk Reference Number	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans (including who and when)
				Consequence Rating	Likelihood Rating	Level of Risk		
6.5	Location of noise walls requires significant clearing	Additional environmental approvals required.	Longer lead times for environmental approvals. Reduced native bushland. Can't establish environmental impacts and seek the enabling approvals.	Major (4)	Possible (3)	**High 12**	1. IDD and PTS with the Design Contractor.	1. Consider aligning the noise wall with future PSP to reduce construction footprints using areas clear of significant remnant vegetation. 2. Allow for construction room when applying for environmental approvals
6.6	Additional services are installed between the date of the Class B survey and project construction date.	New services are potentially struck.	Death or serious injury during construction. Relocation costs. Extended service outage.	Major (4)	Unlikely (2)	**Medium 8**	1. IDD with the Contractor.	1. Further services investigation (Class A potholing) prior to construction. 2. Pothole services within PTA Corridor
6.7	Concept design is not viable due to a significant oversight.	Strategies have only been prepared for key design aspects. Refinement and further design details have not been considered at this stage. Unforeseen land requirements result.	Conservative design that doesn't identify opportunities for cost savings. The design does not consider or identify all constructability and maintenance issues. Not all stakeholders have been contacted and/or considered at this stage resulting in future design changes. Stakeholder criticism and complaints. Pre-qual level is set too low and the contractor lacks the expertise to complete the required works	Moderate (3)	Possible (3)	**Medium 9**	1. IDD with PTS Support 2. Design Contractor 3. RTE	1-2. Design refinement and detailing to be progressed at the detailed design stage with PTS involvement. 3. RTE to progress design for widening to 100%
6.8	A key design limitation is discovered during delivery.	Design assumption or flaw. Lack of key resource. Verification process does not pick up existing issue.	Significant unfunded work inclusion results with major variation. Claim dispute results.	Major (4)	Unlikely (2)	**Medium 8**	1. IDD	1. Undertake detailed review of design and reference information supplied. 2. SSO to undertake due diligence

Risk Reference Number	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans (including who and when)
				Consequence Rating	Likelihood Rating	Level of Risk		
7	**CONSTRUCTION RISKS**							
7.1	Existing pavement is compromised during construction due to insufficient (temporary) drainage	Ponding and moisture ingress issues.Box out required in proximity to existing pavement.Compaction access limited with poor compaction resulting.	Pavement damage and additional pavement works.Extension to project program.	Moderate (3)	Possible (3)	**Medium 9**	1-2. IDD	1. Adopt a summer construction programme.2. Install additional drainage/subsoil drains.
7.2	Dust, noise and other impacts of clearing and construction.	Poor dust suppression measures. Carelessness. Proximity to residential land.	Resident complaint and criticism.	Moderate (3)	Possible (3)	**Medium 9**	1. IDD	1. Address in relevant management plans.
7.3	Seasonal weather impacts upon delivery.	Prolonged rainy and windy weather impacts construction staging and completion.	Dry-back cannot be achieved in a timely way to match the project program.	Moderate (3)	Possible (3)	**Medium 9**	1. IDD	1. Address in relevant management plans.
7.4	Suitably skilled asphalt personnel not available to the project	Many competing projects	Poor surfacing outcomes result.	Major (4)	Possible (3)	**High 12**	1. IDD	1. Address in relevant management plans and site supervision.
7.5	Demand for key enabling material or equipment eg barriers is exceeded	Competing projects	Sub-standards solutions result. Productivity is poor. Rework results. Costs escalate.	Moderate (3)	Possible (3)	**Medium 9**	1. IDD	1. Address in relevant management plans and site supervision.
7.6	The poor quality of the existing freeway surfacing limits the effectiveness of subsequent surfacing solutions.	Open graded asphalt is layed over cracked or poor quality surfacing.	Surfacing life diminishes. Resurfacing required earlier than anticipated. Project costs escalate to remediate poor quality existing surfacing.	Moderate (3)	Possible (3)	**Medium 9**	1. IDD with MEB and Metro	1. Investigation condition of the existing pavement. 2. Propose pavement design and include requirements in SWTC.
8	**ENVIRONMENT / HERITAGE / LEGAL AND REGULATORY Hazards and Waste, Environmental Planning Approvals, Land, Legal)**							

Risk Reference Number	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans (including who and when)
				Consequence Rating	Likelihood Rating	Level of Risk		
8.1	Over-clearing results.	Approvals are protracted. Extent of clearing not clearly known or marked in the field. Contractor error.	Stakeholder criticism. Non-compliance with conditions of approval. Project commitments are not fulfilled. Reputational damage results.	Major (4)	Possible (3)	**High 12**	1-2. IDD with Delivery Contractor	1. Address in Environmental Management Plans and Site Plans 2. Monitor clearing on Site.
8.2	The adjacent Bush Forever site is impacted	Scope change impacts upon the Bush Forever site. Long lead times in approvals.	Delays to project.	Moderate (3)	Possible (3)	**Medium 9**	1. IDD and delivery Contractor.	1. Monitor
8.3	Increase in noise levels with opportunity to provide early relief.	Complaints from local residences	Complaints and criticism.	Major (4)	Possible (3)	**High 12**	1. IDD and delivery Contractor.	1. Complete the noise modelling early and construct noise walls early where possible.
8.4	All remnant verge vegetation is lost for some sections.	Site spatial constraints	Complaints and criticism. Community outrage	Moderate (3)	Possible (3)	**Medium 9**	1. IDD and delivery Contractor.	1. Address in Environmental Management Plans and Site Plans 2. Monitor clearing on Site.
8.5	The enabling environmental approvals are not received in a timely way.	Unknown or ill defined scope Long lead time for federal approvals. Extended investigative work is required. Existing survey is inadequate	Delays to optional works. Optional works not included within the scope of this contract as a result of delays.	Moderate (3)	Possible (3)	**Medium 9**	1-2. IDD with PTS	1. Define scope 2. Seek environmental approvals by allowing for any works that may be potentially included in the scope. Allow for construction tolerances.
9	**DELIVERY REQUIREMENTS (Services, Traffic Management, Geotechnical Conditions, Materials, Water Supply**							
9.1	Western Power lead times for required service relocation works are protracted after award of contract.	Pre-requisite works are delayed. PSP works require minor service relocation	Contractual dispute and claims result. Project works are delayed.	Moderate (3)	Possible (3)	**Medium 9**	1-2. IDD	1. Determine in design stage whether any impacts to Western Power. 2. Liase with Western Power prior to contract award.

Risk Reference Number	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans (including who and when)
				Consequence Rating	Likelihood Rating	Level of Risk		
9.2	Existing drainage issues are exacerbated.	Modification to current drainage does not consider consequential impacts.	Reputational damage. Crashes result. Traffic bottlenecks result. Localised flooding.	Moderate (3)	Unlikely (2)	Low 6	1. IDD and PTS 2-4. IDD and Delivery Contractor.	1. Assess drainage at design stage and undertake thorough design review. 2. Monitor drainage implications of traffic management 3. Ensure no works are left at the end of each shift that could create a hazard if it rains. 4. Plan for sealing and asphalt works in summer.
9.3	Works area site not efficiently located.	Limited sites available. Local roads used to access freeway from available entry points.	Extended lead distances. Fill and other material spills onto local roads. Complaints result.	Moderate (3)	Unlikely (2)	Low 6	1. IDD and delivery contractor with PTS input.	1. Limit use of local roads to access the work site.
9.4	Service authorities seek an opportunity to expand their asset maintenance activities or expand their level of service.	Planned future works are brought forward by this project.	Delays to this project result with unfunded costs.Traffic management benefits and opportunities result to align work to minimise disruption.	Moderate (3)	Unlikely (2)	Low 6	1-2. IDD with Delivery Contractor	1. Liase with other service authorities early2. Communicate with service authorities
9.5	The enabling approvals are not obtained in a timely way.	Unknown or ill defined scope Land ownership requirements not established for DA's. Additional investigative work is required. Existing survey is inadequate.	Delays to project works. Delays to optional works. Optional works not included within the scope of this contract as a result of delays.	Moderate (3)	Possible (3)	Medium 9	1-2. IDD with Delivery Contractor	1. Liase with stakeholder early 2. Communicate with stakeholders on an ongoing basis.
10	**QUALITY (Material quality, Building processes / ITP, storage / laydown area, Delivery)**							
10.1	Excessive materials wastage	Additional need for resources if suitable site material is not recycled.	Added costs, materials usage and landfill.	Moderate (3)	Unlikely (2)	Low 6	1. IDD with contractor	1. Monitor material handling on site
10.2	Sustainability opportunities are overlooked.	The use of recycled concrete or other materials is not adopted.	Lost opportunity to achieve broader goals. Delays or other costs result.	Moderate (3)	Unlikely (2)	Low 6	1. IDD with contractor	1. Prepare sustainability report and recycling opportunities register

Risk Reference Number	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans (including who and when)
				Consequence Rating	Likelihood Rating	Level of Risk		
10.3	Concurrent ITS initiatives are planned for this section of freeway during the same period.	Two contractors in proximity. Multiple designers working in proximity but not integrated.	Lost efficiency. Accountabilities are blurred. Ongoing road user disruption. Timing differences and scope variation result. Designs are not consistent or complementary.	Moderate (3)	Possible (3)	**Medium 9**	1. IDD, PTS and RNOC. 2-3. IDD with RNOC	1. Designers of each package of work to meet and coordinate designs to ensure they tie-in to each other. 2. Plan and coordinate any overlapping works 3. Communicate to Stakeholders and road users of multiple work fronts.

National
Urban Congestion Fund

Project Proposal Report

Transforming Freeways – Widen and Introduction of ITS (Kwinana and Mitchell Freeways)

Delivery

January 2021

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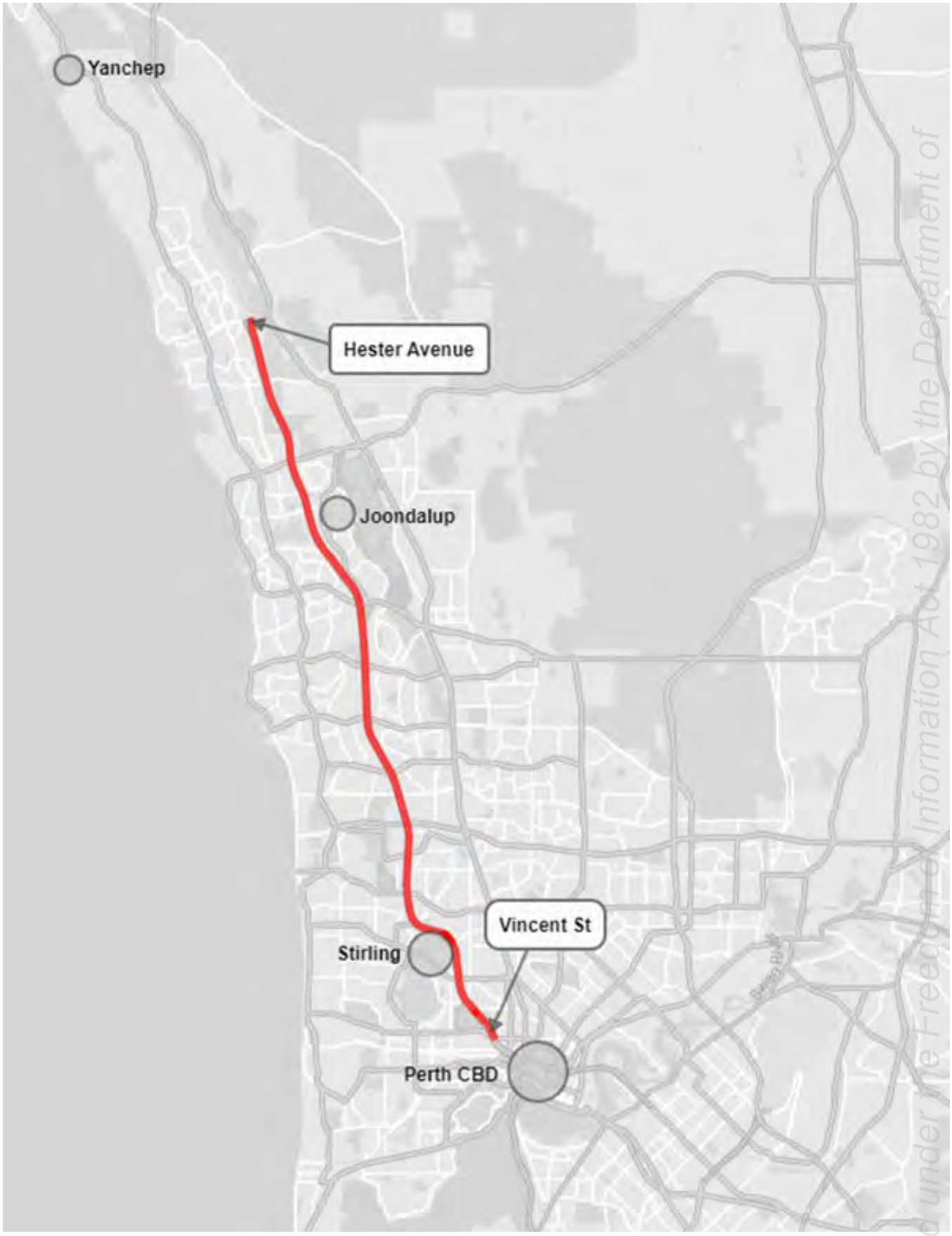

Figure 1: Transforming Freeways – Mitchell Freeway Southbound – overview map

EXECUTIVE SUMMARY

Mitchell Freeway provides the primary road connection between the Perth CBD, the Strategic Metropolitan Centres of Stirling, Joondalup, the emerging Strategic Metropolitan centre of Yanchep, and a range of other smaller activity centres. By doing so, it provides the primary link to Perth's largest employment centres for both business and residents and is a critical enabler for the planned growth of Perth's northern suburbs.

Severe congestion Southbound on the Mitchell Freeway is placing a growing constraint on the efficient and reliable movement of people and goods within the Perth Metropolitan Area. The freeway is currently unmanaged and experiences a high level of peak-period traffic demand. Coupled with physical space and capacity constraints, these factors result in poor performance of the freeway, negatively affecting the performance of the wider transport network.

Three core problems and opportunities currently apply to the Mitchell Freeway southbound:

- The Freeway underperforms in peak periods.
- The ability to increase the capacity of the freeway is constrained at critical points where congestion is currently experienced.
- A significant opportunity exists to modernise the freeway by increasing the adoption of innovative technologies.

The Project will address these issues by:

- Improving person throughput across the freeway corridor by increasing capacity.
- Improving travel times across the corridor during peak periods.
- Improving the reliability of travel times by reducing the likelihood and severity of flow breakdown.
- Improving safety outcomes on the corridor, reducing the number of rear-end collisions and mitigating the impact that accidents have on traffic flow in peak periods.
- Improving traveller wellbeing by providing road users with a continuum of information to enable them to make informed decisions regarding their journey.
- Through innovation, intend to reduce the cost to the State of providing new infrastructure to manage the future transport task.

With this objective in mind, the following options were considered for assessment:

- Introduction of a Managed Freeway, involving the application of only Coordinated Ramp Signals
- Smart Managed Freeway, involving the application of a suite of complementary smart freeway technologies, in addition to Coordinated Ramp Signals
- Traditional Widening, involving the construction of additional lanes to increase the physical capacity of the freeway in areas available.
- Mode Shift, involving measures aimed at encouraging road users to switch to alternative modes of travel through the provision of improved PSP links and behavioural change programs.

The option chosen for delivery was Smart Freeway – with selective application of technologies.

This option was selected on the basis that the identified Mitchell Freeway Southbound lane widening works will be implemented in the following stage (Stage 4) of the Transforming Perth Freeways program under a separate package of works. This approach rationalises the works into discrete packages that are more suitable for the design and implementation process and ensures that the works can be delivered within the available budget and time frames required.

This PPR is seeking funding approval to the P50 estimate to the value of $128.0 million, being $64.0 million from the Commonwealth to supplement the State funding of $64.0 million. The remaining funds to the P90 level are to be retained as contingency.

A PROJECT OVERVIEW

Proponent Details

A1 ABN/ACN and Registered Entity Name

Main Roads Western Australia
PO Box 6202
East Perth Western Australia

ABN 50 860 676 021

A2 Primary Project Contact Details

Manager Project Programming: s22(1)(a)(ii)
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Project Programming Manager: s22(1)(a)(ii)
Telephone: 08 9323 s22(1
E-mail: s22(1)(a)(ii) @mainroads.wa.gov.au

A3 Project Partners

N/A

Project Details

A4 Project Name

Transforming Freeways – Widen and Introduction of ITS (Kwinana and Mitchell Freeways)

A5 Project ID

100455-18WA-UCI

A6 Project Summary and Progress to Date

Overall Scope of the project is:

The Project involves the investigation, design and construction of the Transforming Freeways for the Mitchell Freeway Southbound including the following:

- Civil works including:
  - Ramp widening up to three lanes at the widest point
  - Realignment of PSP as impacted by widening of on-ramp
  - Installation and/or replacement of safety barrier where impacted by ramp widening or where required to protect from new hazards
  - Earthworks
  - Mill out of existing asphalt surfacing, resurfacing and line marking (where new line marking is required).
  - Modifications to existing drainage network to facilitate the proposed widening works.
- Standard systems to be installed for the full project extent include:
  - Co-ordianted Ramp signalling ramp metering equipment
  - Variable speed limit signs

  - CCTV cameras
  - Dynamic signage at on-ramps and interchange approaches
- Stephenson Avenue, Powis Street and Vincent Street will have “max-fit” scenarios, where the ramp storage cannot be increased any further due to geometrically constraints. These ramps will have to be managed operationally, including the addition of:
  - Lane Use Management gantries
  - Automatic incident detection
- Provision of emergency stopping bays on the verge side of Mitchell Freeway
- Upgrading of the operational traffic control systems to future-proof smart operation of the road network

Progress to Date

Discipline	Hester Ave to Warwick Rd	Reid Hwy to Vincent St
Traffic Studies	ROM modelling has been completed to inform ramp design requirements for 15% reference design. Microsimulation is in progress.	ROM modelling has been completed to inform ramp design requirements for 15% reference design. Microsimulation is in progress.
Ground Surveys	Existing ground survey has been checked for its accuracy and suitability. Some additional digital ground survey for the project has been completed. Some additional survey may be required during detailed design. Underground utility surveys for the whole project is currently being undertaken.	Existing ground survey has been checked for its accuracy and suitability. Some additional digital ground survey for the project has been completed. Some additional survey may be required during detailed design. Underground utility surveys for the whole project is currently being undertaken.
Preliminary Environmental Impact Assessments	Environmental surveys and preliminary impact assessments in progress.	Environmental surveys and preliminary impact assessments in progress.
Heritage	AHRA complete with no further heritage actions required. This project will not impact upon known Aboriginal heritage places within or in close proximity to the project area. The entire project was covered by existing ethnographic and archaeological surveys.	AHRA complete with no further heritage actions required. This project will not impact upon known Aboriginal heritage places within or in close proximity to the project area. The entire project was covered by existing ethnographic and archaeological surveys.
Prelim Design – Roads	15% Reference Designs completed November 2020 and issued to project team	15% Reference Designs in progress. Draft due mid January 2021 to be reviewed and updated by mid March 2021
Prelim Design – Bridges	N/A	N/A
Prelim Design – PSP’s	15% Reference Designs completed November 2020 and issued to project team.	15% Reference Designs in progress. Draft due mid January 2021 to be reviewed and updated by mid March 2021.
Prelim Design – Noise Walls / Retaining Walls	No noise walls in scope. Retaining wall locations identified in 15% Reference Designs completed November 2020 and issued to project team. Structural design to be completed by delivery team.	No noise walls in scope. Retaining wall locations identified in 15% Reference Designs. Draft due mid January to be reviewed and updated by mid March. Structural design to be completed by the delivery team.

Prelim Design – Barriers	15% Reference Designs completed November 2020 and issued to project team.	15% Reference Designs in progress. Draft due mid January 2021 to be reviewed and updated by mid March 2021.
Prelim Design – General Arrangements	15% Reference Designs completed November 2020 and issued to project team.	15% Reference Designs in progress. Draft due mid January 2021 to be reviewed and updated by mid March 2021.
Geotechnical	Desktop geotechnical assessment completed to check suitability of existing geotechnical information along the corridor. A large amount of existing information is available from previous projects and Project Development work completed in 2018. The delivery contractor may be required to conduct additional geotechnical investigations for gantry footing design once gantry locations are confirmed.	Desktop geotechnical assessment completed to check suitability of existing geotechnical information along the corridor. A large amount of existing information is available from previous projects and Project Development work completed in 2018. The delivery team may be required to conduct additional geotechnical investigations for gantry footing design once gantry locations are confirmed.

A7 Geographical Reference

Coordinates of key reference points for the pilot projects from the program are presented in Table 1 below:

Table 1: Project Coordinates

Location	Latitude	Longitude
Transforming Freeways – Mitchell Freeway Southbound – Start	-31.671	115.733
Transforming Freeways – Mitchell Freeway Southbound – End	-31.932	115.836

A8 National Land Transport Network

The section of civil construction on the Transforming Freeways –Mitchell Freeway Southbound is not part of the National Land Transport Network (NLTN) but is a road of significance that demonstrates alignment with National and State road network strategies.

A9 Related Projects

Mitchell Freeway Southbound Widening – Hodges to Hepburn

Mitchell Freeway Extension – Hester Ave to Romeo Rd

Stephenson Avenue Extension

B PROJECT SCOPE

B1 Problem/Opportunity Statement

Problem Identification

The Transforming Perth's Freeway program involves a range of planned works, technologies and programs to be delivered by 2031, with the aim of addressing key capacity issues and enabling better use of the existing north-south freeway corridor, including the Mitchell Freeway and Kwinana Freeways and the Joondalup and Mandurah rail lines.

Within this corridor, Mitchell Freeway provides the primary road connection between the Perth CBD, the Strategic Metropolitan Centres of Stirling and Joondalup, the emerging Strategic Metropolitan centre of Yanchep, and a range of other smaller activity centres. By doing so it provides the primary link to Perth's largest employment centres for both business and residents and is a critical enabler for the planned growth of Perth's northern suburbs.

Severe congestion on the Mitchell Freeway Southbound is placing a growing constraint on the efficient and reliable movement of people and goods within the Perth Metropolitan Area. The freeway is currently unmanaged and experiences a high level of peak-period traffic demand. Coupled with physical space and capacity constraints, these factors result in poor performance of the freeway, negatively affecting the performance of the wider transport network.

For road users, the impact of this congestion is longer and more unreliable trips. However, at a strategic level, this congestion represents a growing negative externality that creates a major barrier to maintaining population growth, quality of life and economic prosperity.

Transport is critical to how our cities function and is an enabler of urban development, population growth, economic activity, leisure activities and social interactions. With the population of Perth's North-West corridor expected to grow from approximately 600,000 people today to 1 million people by 2050,[1] the management and improvement of Mitchell Freeway is a critical consideration in maintaining the long-term economic and population growth of Perth and, in-turn, Western Australia's contribution to national GDP.

In defining the issues, the Transforming Perth's Freeway program has identified three core problem and opportunity statements that apply to the current project:

1) The Freeway underperforms in peak periods.

Mitchell Freeway Southbound is currently unreliable and inefficient during peak periods, resulting in significant avoidable social and economic costs. On-ramps are currently uncontrolled, meaning large volumes of traffic can enter the freeway at once, severely disrupting mainline traffic flow. While traffic volumes and average congestion levels are higher closer to the CBD, there are also several congestion hotspots further from the city that lead to long delays during peak periods.

2) The ability to increase the capacity of the freeway is constrained at critical points where congestion is currently experienced.

The freeway is physically constrained by existing infrastructure, urban development and local geography, making traditional capacity upgrades – such as lane widening – challenging in certain areas. Few alternative routes can provide equivalent motorway functionality to the Mitchell Freeway. An alternative solution is therefore required to increase the capacity of the road network in these areas.

3) A significant opportunity exists to modernise the freeway by increasing the adoption of innovative technologies.

There are significant opportunities to reduce forecast growth in congestion through the adoption of Smart Freeway technologies that allow for improved use of existing infrastructure and optimisation of traffic flow.

Smart Freeway technology is currently being implemented according to Main Roads WA, Managed Freeways Policy, outlined in the *Managed Freeways Provision Guidelines*. The policy framework guides overall planning, project development, delivery and ongoing operation of Managed Freeways in Western Australia.

[1] Based on planned population projections in Perth and Peel@3.5million, 2018

Smart Freeway technologies have proven to be effective in other Australian and international cities. For example, the implementation of CRS – which uses a suite of algorithms to control traffic flows entering the freeway via on-ramps – is likely to have a material impact on congestion levels. Road agencies around the world are continuing to deploy new technologies to increase network efficiency within the constraints of existing infrastructure.

Population and Activity Centre Growth

Population growth is a root cause of the identified challenges, as - in the absence of upgrades to road capacity - the volume of traffic on the Mitchell Freeway is expected to increase as population grows.

The population of Perth grew by 29% in the ten years to 2016 according to the ABS Census. Forecasts from the State government suggest that Perth's population could increase by a further 35%, to 2.7 million, by 2031.

Nearly 50% of the population of metropolitan Perth currently live in the suburbs serviced by the Mitchell and Kwinana Freeways with many more relying on the corridor for their daily commute to jobs and other opportunities in Perth's city centre.[2] The total growth in the North-West and Central Sub-region is summarised below.

Table 2. Summary relevant Perth sub-region population growth projections to 2050

Sub-region	2011 Population	2050 Population	Growth (%)
North-West	322,490	740,330	130%
Central	782,990	1,250,990	60%
Total	1,105,480	1,991,320	80%

Source: Perth and Peel@3.5million (2018)

Within the Central sub-region, Mitchell Freeway Southbound services the City of Stirling, which currently accommodates 221,000 residents. This heavily populated region will experience continued growth through urban infill. The majority of growth in the North-West sub-region will occur at the northern extent of the project area and will be serviced by a combination of the current Yanchep Rail Extension (Metronet) and future planned extensions of the Mitchell Freeway to Romeo Road (by 2026) and Yanchep Beach Road (by 2031).

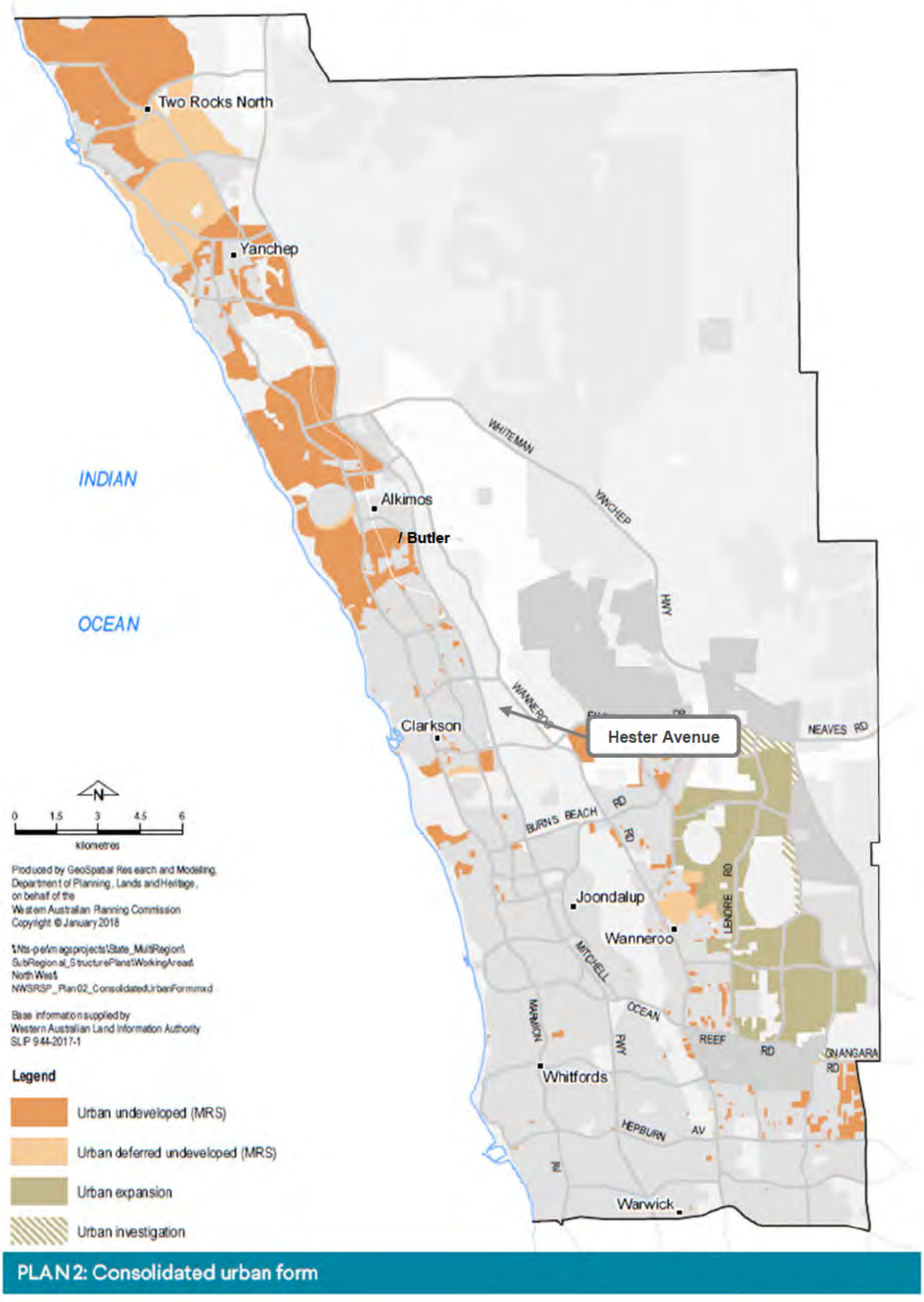
Key concentrations of growth within the North-West corridor include:

- Yanchep: 97,445 new residents (471% growth)
- Carramar: 17,135 new residents (100% growth); and
- Butler – Merriwa - Ridgewood: 13,405 new residents (55% growth)

The planned northern growth areas are highlighted in the Perth and Peel@3.5million, *North-West Sub-regional Planning Framework*, shown over-leaf. This plan shows the large extents of Urban Undeveloped and Urban Deferred Undeveloped land set aside for future development under the Metropolitan Regional Scheme (MRS), which defines the future use of land and provides the legal basis for planning in the Perth metropolitan region.

[2] WA Tomorrow Population Report No. 11

Figure 1. Future development lands north of the project area as outlined under the MRS



PLAN 2: Consolidated urban form

Demand

Mitchell Freeway Southbound is experiencing high and increasing demand, with the corridor typically servicing approximately 50,000[3] VDP, with up to 70,000[4] VPD approaching the CBD.

Critical parts of the freeway are currently operating above planned capacity during peak periods, and without intervention, this problem is expected to worsen. Travel demand modelling conducted under the TPF program development demonstrates that much of the freeway will be operating at or slightly above planned capacity by 2021 under a base case scenario. There are also key sections of the freeway that are expected to be operating significantly over planned capacity by this time. This includes the section south of Whitfords Avenue and immediately south of Vincent Street, where volumes are at least 125% higher than capacity during peak morning periods.

By 2031, projected increases in traffic volumes are expected to exacerbate the problem. The modelling suggests that much of the Mitchell Freeway would operate at around 110% of planned capacity during morning periods with some areas, such as south of Whitfords Avenue, operating at 134% of planned capacity. Results for sample locations are summarised in Table 3 below.[5]

Table 3. Forecast volume to capacity ratios for selected points on Mitchell Freeway

Location	2021	2031
South of Whitfords Avenue	129%	134%
South of Reid Highway	119%	126%
South of Vincent S	125%	128%

Travel Time

Modelling conducted in support of the project further highlights the increasing severity of the problem under a do-nothing scenario. Table 4 below shows that travel speeds on Mitchell Freeway Southbound are expected to drop a level at which demand is expected to transfer and rapidly rise on alternative routes. This spill-over of demand is expected to cause a significant increase in travel time on Wanneroo Road and Marmion Avenue, with additional travel time increasing by 14 per cent and 19 per cent respectively.

Table 4. Forecast AM peak travel time and speeds

Corridor	2021		2041	
	Travel Time (min)	Ave. Speed (km/hr)	Travel Time (min)	Ave. Speed (km/hr)
Mitchell Freeway	48	41	48	41
Wanneroo Road	50	39	57	34
Marmion Avenue	39	42	46	35

Source: Main Roads Western Australia (2020)

[3] Based on 24hr network performance site (50130) south of Ocean Reed Rd

[4] Based on vehicle count site (3732) south of Hutton St

[5] Main Roads Western Australia, *Transforming Perth's Freeways Strategic Program: Phase 2 and 3 Infrastructure Australia Business Case*, 2020

Corridor Congestion

Results of the Infrastructure Australia, *Australian Infrastructure Audit 2019*, show that the Mitchell Freeway is expected to remain the most congested corridor in Greater Perth by user experience, and the second most congested (second to Kwinana Freeway) by total vehicle delays, for the foreseeable future.

In addition, the adjacent southbound corridors of Wanneroo Road and Marmion Avenue were also found to suffer from severe congestion issues during the AM peak period that will increase rapidly to 2031. These results are summarised in Table 5 and Figure 2 below.

Table 5. Summary of AM peak congestion ratings from the Australian Infrastructure Audit 2019

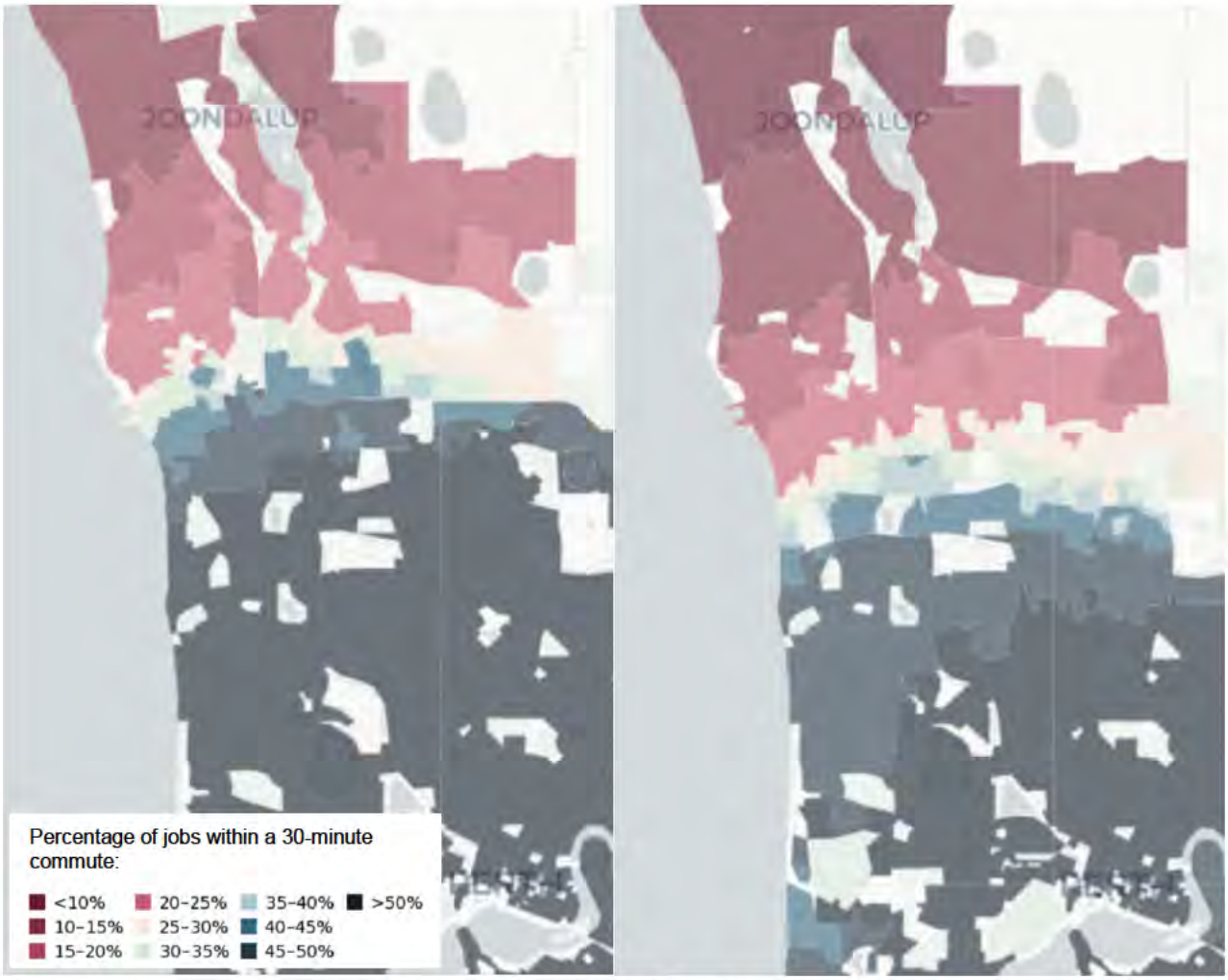
Corridor	User Experience		Total Vehicle Delays	
	Share of journey time due to congestion	City Rank	Total delay hours	City Rank
2016				
Mitchell Freeway	51%	1	3,000	2
Wanneroo Road	35%	5	1,100	6
Marmion Avenue	34%	6	1,300	5
2031				
Mitchell Freeway	62%	1	5,200	2
Marmion Avenue	54%	2	4,100	3
Wanneroo Road	53%	3	2,500	6

Figure 2. Side-by-side comparison of congestion by corridor between 2016 (left) and 2031 (right)

Source: Infrastructure Australia, Urban Transport Crowding and Congestion Maps (2020)

The impact of this increasing congestion is to limit resident's access to employment centres within a reasonable travel time. This effect is illustrated in Figure 3 displaying the marked decrease in the percentage of jobs accessible within a 30-minute commute, which has been found to be the acceptable threshold for resident's journey to work, beyond which behaviours change to adapt. Travel time and access to employment are major factors that influence resident's locational preferences, increases in travel time due to congestion therefore place a constraint on continued urban growth.

Figure 3. Side-by-side comparison: access to employment in the North-West Corridor between 2016 (left) and 2031 (right)



Source: Infrastructure Australia, Urban Transport Crowding and Congestion Maps (2020)

The effect of investment in the Mitchell Freeway will therefore be to increase the spatial extent of the residential catchments of Perth's major employment centres, particularly the CBD, with the flow-on benefits including:

- **Improved liveability and public amenity** through improved access to a wider range of employment opportunities and services
- **Increased housing supply**, supporting broader efforts to improve housing affordability
- **Productivity growth**, through improved transport network efficiency and the movement of freight
- **Long-term sustainability of public infrastructure,** through the improved utilisation of existing assets

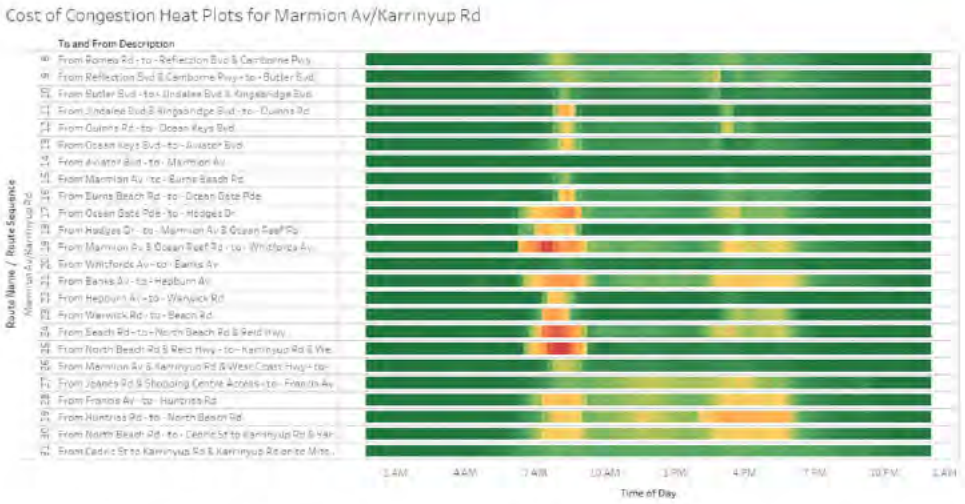
Cost of Congestion

Additional time spent on congested roads has a significant opportunity cost, taking away from more productive work time and social activities. The cost of congestion is calculated by analysing travel speeds for each hour of the day, speeds below 70% of the posted speed limit contribute towards the total cost of congestion calculated using accepted guidelines.[6]

Data provided by Main Roads Western Australia, Network Operations, shows the distribution of the cost of congestion problem over time on the primary southbound routes providing access to the CBD.

Figure 4. Distrubution of Cost of Congestion for key southbound routes

[6] Main Roads Western Australia, *Cost of Congestion Analysis Perth Metropolitan Road Network,* 2019



For Mitchell Freeway Southbound, the total current cost of congestion is estimated at over $40 million per year[7], having grown by six per cent over the past five years.

Forming part of the interconnected North-West transport corridor, the poor performance of the Mitchell Freeway also impacts congestion on alternative routes. In addition to the above, the cost of congestion on Wanneroo Road and Marmion Avenue totals $33 million and $21 million per year respectively. Combined, these three key corridors account for $94 million in congestion costs each year, with this figure expected to grow over time. The improvement of conditions on Mitchell Freeway will lead to a reduced cost of congestion across all three interrelated corridors.

Safety

In 2019, WA's road network averaged 6.2 fatalities per 100,000 population, compared to the national average of 4.7 per 100,000 population.[8] In the five years to 2019 Mitchell Freeway Southbound to Vincent Street experienced a total of 1,200 crashes, including 2 fatalities, at a total cost of $11.1 million per year. This data is summarised in Table 6 below.

Table 6. Crash data for Mitchell Freeway Southbound, 2015 to 2019

Severity	Count	Cost
Fatal	2	$15,277,942
Hospital	34	$10,427,902
Medical	246	$18,491,820
PDO Major	637	$8,002,631
PDO Minor	281	$3,530,203
Total	**1,200**	**$55,730,498**

Source: Main Roads Western Australia

Congestion on the Mitchell Freeway is characterised by stop-start traffic that directly contributes to increased vehicle accidents. Congestion also leads to increased prevalence of unsafe driver behaviour,

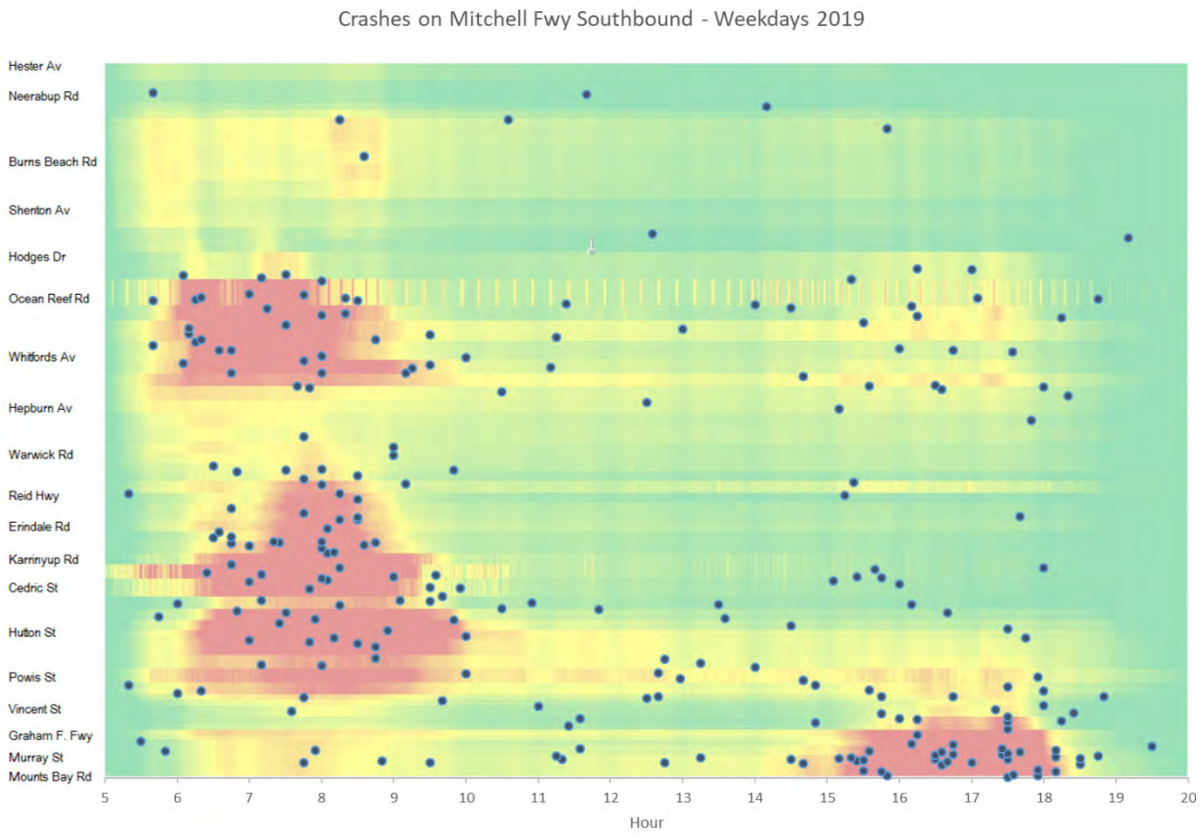
[7] Based on five year average

[8] Bureau of Infrastructure, Transport, Cities and Regional Development, *Monthly Road Deaths,* 2020

including frequent lane changing, lapses in concentration and less courteous driving. The impact of such behaviour is amplified due to the unstable nature of traffic flow.

Accident data for the Mitchell Freeway shows that vehicle collisions are highly correlated with traffic congestion. The Reid Highway to Powis Street on-ramps, for example, are associated with high levels of congestion and a large number of vehicle accidents (see Figure 5). In the five years to 2019, 74% of crashes on Mitchell and Kwinana Freeways were rear-end collisions occurring within the same lane.

Figure 5. Mitchell Freeway Southbound, crash and congestion overlay



The Opportunity - Smart Freeway Technology

In recent years, transport authorities in Australia have increasingly leveraged technologically driven freeway management strategies to reduce congestion. As land surrounding freeways in large metropolitan cities becomes scarce, sophisticated solutions to better manage freeway traffic has made congestion management more sustainable, not only in Australia but worldwide.[9]

Major urban centres including Sydney, Melbourne and Brisbane have successfully implemented Smart Freeway technologies on freeways to reduce congestion. The technology has led to increased freeway capacity, improved travel time reliability, and higher traffic speeds in peak periods.

Coordinated Ramp Signals (CRS) are one strategy used to regulate the volume of traffic entering the freeway at a given time as part of broader Smart Freeway initiatives. CRS controls freeway access across multiple entrances to maintain steady traffic flow and prevent frequent stop-start conditions. On the M1 motorway in Melbourne, for example, CRS increased freeway capacity by 16 to 19 per cent and

[9] Ramp metering solutions have improved traffic flows in United States and Europe. Bureau of Infrastructure, Transport, Cities and Regional Development (BITRE), Costs and benefits of emerging road transport technologies (2017)

significantly reduced crash rates.[10] In Brisbane, the implementation of a dynamic CRS on six on-ramps of the M1 and M3 freeways delivered significant improvements to road operation (compared to fixed-rate ramp metering) including:[11]

- An increase of 7% in average AM peak inbound travel speeds
- A 4% increase in average AM peak inbound traffic flow
- An 8% increase in AM peak inbound travel productivity
- A 37% improvement in the proportion of AM peak inbound trips with good reliability

Across various studies, the literature shows that ramp metering can reduce the number of primary accidents by 24 to 50 percent, reduce total travel time by increasing vehicles speeds be eight to 26 per cent and increase vehicle throughput by between five to 10 per cent. Other examples of their application in Australia are summarised below.

Table 7. Summary of Coordinated Ramp Signals application in Australia

City	Ramp Signal Location
Sydney	M4 Western Motorway (Wallgrove Road on-ramp) M5 East Motorway (Kingsgrove Road on-ramp) Citywest Link to Anzac Bridge
Melbourne	The Eastern Freeway Monash Freeway Monash-CityLink-West Gate M1 Upgrade – a 62 CRS system
Brisbane	Pacific Motorway (M1 and M3 Freeways)

Source: BITRE (2017)

In addition to CRS, VSL signs also provide freeway management teams with the flexibility to vary speed limits in line with demand. It enables speed control to:[12]

Reduce the risk of flow breakdown on the freeway and increase mainline productivity
Provided mainline and off-ramp queue protection
Support CRS sustain existing capacity, and
Support incident, event, and congestion management at critical bottleneck locations

VSL sign implementation in Queensland has significantly improved traffic outcomes such as travel time and time-to-collision. Time-to-collision reduced by up to 39% in a microsimulation model of Queensland Freeway. The same study also found VSL signs reduced travel time by up to 4.2 seconds per vehicle for traffic exiting the freeway.[13]

[10] VicRoads, Managed Motorways Framework, Network Optimisation and Operations Rationale and Technical Requirements (2017) – Figure 2.6

[11] Faulkner et al, *Evaluation of HERO Coordinated Ramp Metering Installation at the M1/M3 Freeway in Queensland, Australia* (2013)

[12] Main Roads Western Australia, *Managed Freeways Provision Guidelines*, *Smart Roads Managed Freeways*, 2012

[13] Gongbin Qian and Brian Lee, *Variable speed limits for motorway off-ramp queue protection* (IEEE Intelligent Transportation Systems Magazine, 2017).

B2 Options Evaluation

Options Development

Having been developed under a multi-agency approach, the TPF Phase 2 and 3 program involved a rigorous options development and assessment process that considered a range of interrelated transport modes and initiatives including:

- Smart Freeway technology, such as Coordinated Ramp Signals (CRS), Variable Speed Limits (VSL) and All Lane Running (ALR)
- Road optimisation in the CBD, involving a new Collector Distributor system, additional Smart Freeway Technologies and additional bridge structures in the CBD
- Additional lanes on both Mitchel and Kwinana Freeway
- Station upgrades for both Canning Bridge and Stirling stations
- Active Transport, involving the completion of critical gaps in the existing 'cycle freeway' network along Mitchell Freeway and around the CBD
- Your Move, a behavioural change program to balance travel demand across several modes of transport for the Freeway Corridor

Forming part of the program, the current project considers the prioritisation of program-endorsed works and initiatives with the objective of improving freeway, capacity and utilisation.

With this objective in mind, the following options were considered relevant for assessment:

A) Managed Freeway, involving the application of Coordinated Ramp Signals from Hester Avenue to Vincent Street, without additional smart freeway technologies

B) Smart Freeway, involving the application of a suite of complementary smart freeway technologies, in addition to Coordinated Ramp Signals, involving:

- Coordinated Ramp Signals
- Automatic Incident Detection & CCTV
- SVD Emergency Vehicle
- Dynamic messaging (every 2nd gantry)
- Lane Use Management System
- Variable Speed Limit Signs

C) Traditional Widening, involving the construction of additional lanes to increase the physical capacity of the freeway.

D) Mode Shift, involving measures aimed at encouraging road users to switch to alternative modes of travel through the provision of improved PSP links and behavioural change programs.

Decision Criteria

A multi-criteria analysis (MCA) process was conducted to refine the identified options down to a shortlist of preferred options for detailed cost-benefit analysis. Each option was evaluated against asset of assessment criteria agreed at an options assessment workshop conducted in August 2020.

Participants initially agreed on six broad criteria, in-line with the program level criteria, with further sub-criteria developed under each broad criteria together with 'key considerations' to assist stakeholders in assessing each option. The 'key considerations' provided guidance as to the nature of the issues that ought to be considered under each criteria.

Weightings for the criteria were also discussed and assigned by the workshop participants and reflect:

- The importance placed on various aspects of the identified opportunities and problems
- The desired outcomes
- The means (cost and achievability) by which those are achieved.

The final criteria used to assess the options are shown in Table 8 below, along with the detailed sub-criteria and weights.

Table 8. Options assessment criteria

Criteria	Sub-criteria	Sub-criteria weight	Key considerations	Combined weight
A. Strategic Alignment	Supports future infrastructure and planning initiatives in the north-south transport corridor	10%	Extension of Mitchell Freeway beyond Hester Avenue Transforming Perth's Freeways Phase 1 projects Transport @ 3.5million and Perth and Peel @ 3.5 million Other local plans. Smart Freeway Policy 20-year plan Related projects – list to be provided	10%
B. Improving Corridor Capacity	Improves the performance of the north-south transport corridor to meet the near-term transport task	20%	Current and future demand profile for corridor Cost of congestion Likelihood and severity of flow break-down Travel time reliability Resilience of the corridor to crash incidents	20%
C. Improving Safety	Reduces road safety risks	10%	Number of crashes, particularly fatalities and serious injuries.	10%
D. Improving environment and amenity	Minimises environmental impact and optimises amenity Improves the user experience of the north-south transport corridor	10%	Cost of environmental externalities and emissions User groups Cyclists PT users Private vehicles Commercial / freight vehicles.	10%
E. Value for money	Minimises upfront capital costs	10%	Upfront capital expenditure relative to estimated current cost of the problem	30%
	Minimises operating costs and replacement capital costs	10%	Renewal costs and maintenance costs relative to estimated cost of the problem	
	Includes opportunities for cost recovery/ revenue generation	10%	Revenue sources for the State Government via opportunity for the State Government	

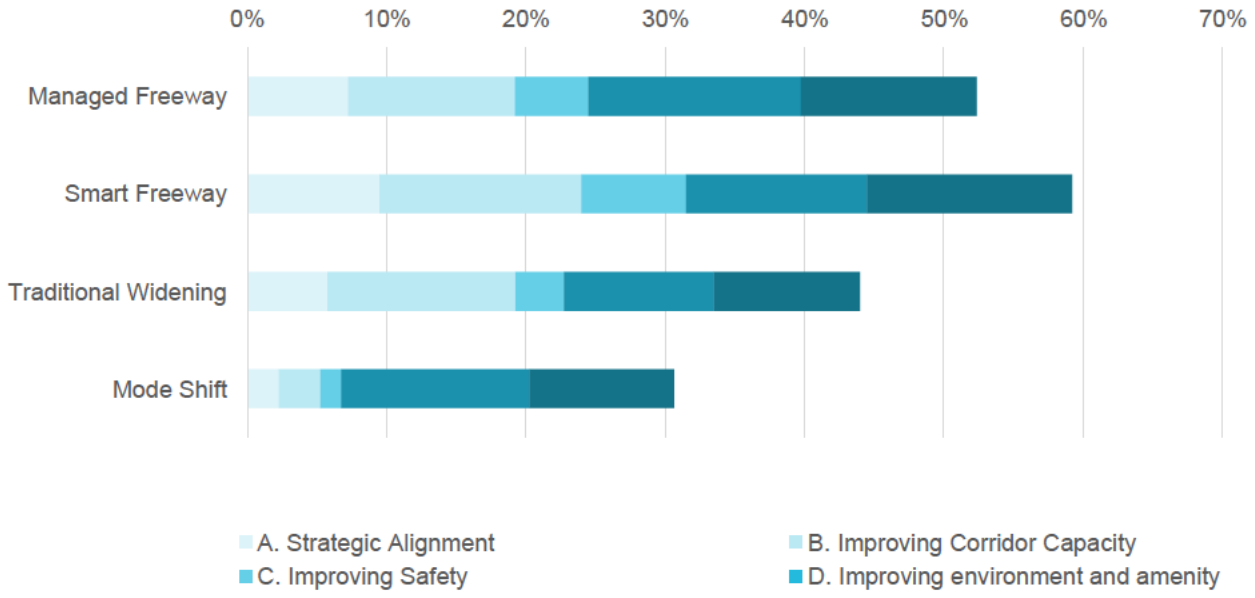
Criteria	Sub-criteria	Sub-criteria weight	Key considerations	Combined weight
F. Achievability	Minimises construction risks	5%	Construction timeline Implementation risks (e.g. conflicts with other infrastructure owners etc.) Allows flexibility for future expansion	20%
	Minimises operational risks	5%	Operating risks e.g. incident management, response time and human or system error	
	High likelihood of community acceptance	10%	Potential opposition from the community, including: Local Government Industry Broader community	

Options Analysis

The assessment was carried out by the participants involved in the initial options development workshop and was undertaken using a survey distributed following the workshop. The outcome of the evaluation is illustrated in Figure 6.

Participants assessed 'Managed Freeway' and 'Smart Freeway' as the highest-scoring options, scoring 66 per cent and 58 per cent respectively.

Figure 6. MCA workshop results



These reflect the key strengths and weaknesses of each option discussed and captured in the options assessment workshop, as summarised in Table 9.

Table 9. Summary of key strengths and weaknesses for the identified project options

Option	Strengths / Opportunities	Weaknesses / Threats
A) Managed Freeway Application of Coordinated Ramp Signals only, without additional smart freeway technologies (see Option 2 below)	Manages freeway demand/entry Partially manages flow breakdown Partially manages congestion Safety improvements Improves utilisation of existing assets	Medium-high capital cost Medium operational cost due to automation Unmanaged mainline operation Does not future proof mainline operations
B) Smart Freeway Application of a suite of complementary smart freeway technologies, involving: Coordinated Ramp Signals Automatic Incident Detection & CCTV SVD Emergency Vehicle Dynamic messaging (every 2nd gantry) Lane Use Management System Variable Speed Limit Signs	Manages freeway demand/entry Manages flow breakdown Manages congestion Enhanced safety improvements Maximises utilisation of existing freeway assets Improves ramp metering effectiveness Improves reliability of system Enables future All-Lane-Running	High capital cost Medium operational cost due to automation Underutilisation of ITS assets until ultimate configuration
C) Traditional Widening Additional lane constructed at identified 'bottleneck' sections	Increases capacity over constructed segments Low operational/maintenance cost	High capital cost (per km) Partial solution only, does not address congestion issues for majority of freeway length Likely to defer congestion to other segments Does not address weaving issues Cannot be used with limited space areas closer to the city Construction phase congestion
D) Mode Shift Programs* Combination of priority PSP links, and behavioural change programs	Encourages behavioural change Improves utilisation of existing assets Active travel health benefits	Medium-high ongoing operational cost of programs Limited ability to address large-scale congestion issues over full extent of freeway

*It is noted that overall TFP includes significant investment in programs and PSP links

Options Refinement

Two project options were selected for detailed cost-benefit analysis subsequent to the identification and assessment process described above. They were:

Option 1: Smart Freeway - with selective application of technologies

This option considers the application of Coordinated Ramp Signals for the full length of Mitchell Freeway Southbound in combination with the selective application of additional Smart Freeway technologies within the more congestion portion of the freeway approaching the Perth CBD. This option provides improved value for money as the full suite of technologies are only applied in the highly congested segments from Cedric Street to Vincent Street. This portion of Mitchell Freeway Southbound varies from three to four lanes and experiences the highest traffic volume, with up to 70,000 VPD on average for weekdays. It is also physically constrained, meaning that traditional widening cannot be implemented. The application of Smart Freeway technologies is therefore a key enabler to future additional capacity via the application of All Lanes Running.

Option 2: Smart Freeway - with additional widening

Option 2 builds on Option 1 above and considers the additional construction of traditional widened in applicable sections of Mitchell Freeway Southbound to achieve extended segments of additional lane capacity. These sections are:

- Reid Highway to Erindale Road, extending four lane capacity north of Erindale Road by approximately 1.3km
- Burns Beach Road to Shenton Avenue, extending three lane capacity north of Shenton Avenue by approximately 1.8km

B3 Project Scope

Overall Scope of the project is:

Under the project, Coordinated Ramp Signals and associated ITS will be installed on all southbound on-ramps from Hester Avenue to Vincent Street. In addition, a Lane Use Management System and Automatic Incident Detection System will be installed from Stephenson Avenue to Vincent St. With the exclusion of Hodges Drive to Hepburn Avenue, this will require civil works to increase the capacity of on-ramps, with the full scope of works summarised as follows:

- Civil works including:
  - Ramp widening up to three lanes at the widest point
  - Realignment of PSP as impacted by widening of on-ramp
  - Installation and/or replacement of safety barrier where impacted by ramp widening or where required to protect from new hazards
  - Earthworks
  - Mill out of existing asphalt surfacing, resurfacing and linemarking (where new linemarking is required).
  - Modifications to existing drainage network to facilitate the proposed widening works.
- Standard systems to be installed for the full project extent include:
  - ITS ramp metering equipment
  - Variable speed limit signs
  - CCTV cameras
  - Dynamic signage at on-ramps and interchange approaches
- Stephenson Avenue, Powis Street and Vincent Street have “max-fit” scenarios to be managed operationally, including the addition of:
  - Lane Use Management gantries
  - Automatic incident detection
- Provision of four emergency stopping bays on the verge side of Mitchell Freeway

- Upgrading of the operational traffic control systems to future-proof smart operation of the road network

The works will consist of three works packages.

1. The Northern section will include all works between Hester Avenue and Warwick Road;
2. The Southern section will include works between Reid Highway and Vincent Street (excluding Stephenson Avenue); and
3. The Stephenson Avenue section, which involves construction of smart freeway elements into the Stephenson Avenue south bound on-ramp when it is constructed.

B4 National Land Transport Act 2014

This project is eligible for approval as an Investment Project under Part 3, Section 10 of the National Land Transport Act 2014.

C PROJECT COSTS

C1 Project Cost Breakdown

C2 Outturn Costs

The P50 and P90 estimate for the project is detailed in the following table.

Table 9 – Project TOC Summary

	P50	P90
Base Cost Estimate	$92.1 m	$92.1 m
Contingency	$16.4 m	$26.2 m
Total Project Cost Estimate	$108.5 m	$118.3 m
Escalation	$19.6 m	$21.3 m
Total	**$128.1 m**	**$139.6 m**

C3 Budget Profile

The proposed funding profile for the Project is shown below in Table 10. The financial requirement for the development and construction activities comprises $70.0 million of Commonwealth funds and $70.0 million of State funds.

Table 10: Budget profile ($M)

	Financial Year	2020/21 $m	2021/22 $m	2022/23 $m	2023/24 $m	Balance of Commitment $m
Outturn	Commonwealth ($ million)	2.19	20.43	38.25	3.13	6.00
	State ($ million)	2.19	20.43	38.25	3.13	6.00
	Other Contribution					
	Total ($ million)	4.38	40.86	76.50	6.26	12.00

C4 What is the status of the State Government funding outlined above?

The State Government has already committed funding in the State budget paper.

Milestone Payment Schedule

Table 11 shows the Milestone Payment Schedule for the development and construction works to the value of $140.0 million.

Table 11: Payment Schedule

Project: Transforming Freeways – Widen and Introduction of ITS (Mitchell Freeway Southbound)
PAYMENT MILESTONE SCHEDULE

	Description	Claim for Payment Date	Expenditure to meet milestone	Cumulative expenditure	Payment needed to cover expenditure to milestone			Payment to cover cash flow needed for next milestone Period			Total milestone payment			Cumulative total milestone payments			Year	Annual total	
					Total	Cwlth	State	Total	Cwlth	State	Total	Cwlth	State	Total	Cwlth	State		Cwlth	State
1	15% design for northern section complete	Mar-21	3.28	3.28	3.28	1.64	1.64	1.10	0.55	0.55	4.38	2.19	2.19	4.38	2.19	2.19	20/21	2.19	2.19
2	100% design for northern section complete	Jul-21	1.44	4.72	0.34	0.17	0.17	1.40	0.70	0.70	1.74	0.87	0.87	1.74	3.06	3.06	21/22		
3	15% design for southern section complete	Oct-21	1.92	6.64	0.52	0.26	0.26	1.40	0.70	0.70	1.92	0.96	0.96	1.92	4.02	4.02	21/22		
4	85% design for southern section complete	Dec-21	1.90	8.54	0.50	0.25	0.25	10.90	5.45	5.45	11.40	5.70	5.70	11.40	9.72	9.72	21/22		
5	100% design for southern section complete	Feb-22	14.50	23.04	3.60	1.80	1.80	22.20	11.10	11.10	25.80	12.90	12.90	25.80	22.62	22.62	21/22	20.43	20.43
6	Northern section 50% complete	Jul-22	29.56	52.60	7.36	3.68	3.68	22.20	11.10	11.10	29.56	14.78	14.78	29.56	37.40	37.40	22/23		
7	Southern section 50% complete	Dec-22	29.58	82.18	7.38	3.69	3.69	22.20	11.10	11.10	29.58	14.79	14.79	29.58	52.19	52.19	22/23		
8	Northern section complete	May-23	29.56	111.74	7.36	3.68	3.68	10.00	5.00	5.00	17.36	8.68	8.68	17.36	60.87	60.87	22/23	38.25	38.25
9	Southern section complete	Oct-23	13.30	125.04	3.30	1.65	1.65	2.20	1.10	1.10	5.50	2.75	2.75	5.50	63.62	63.62	23/24		
10	Submit Post Completion Report	May-24	2.96	128.00	0.76	0.38	0.38	0.00	0.00	0.00	0.76	0.38	0.38	0.76	64.00	64.00	23/24	3.13	3.13
	P50 Total		128.00		34.40	17.20	17.20	93.60	46.80	46.80	128.00	64.00	64.00					64.00	64.00
	P50 to P90 Contingency		12.00		12.00	6.00	6.00				12.00	6.00	6.00					6.00	6.00
	P90/ Committed fund Total		140.00		34.40	17.20	17.20				140.00	70.00	70.00					70.00	70.00

D BENEFITS

D1 Expected Positive Outcomes and Benefits

Objectives

The following key project objectives were developed in response to the identified problems and opportunities discussed above.

- Improve person throughput across the freeway corridor by increasing capacity.
- Improve travel times across the corridor during peak periods.
- Improve the reliability of travel times by reducing the likelihood and severity of flow breakdown.
- Improve safety outcomes on the corridor, reducing the number of rear-end collisions and mitigating the impact that accidents have on traffic flow in peak periods.
- Improve traveller wellbeing by providing road users with a continuum of information to enable them to make informed decisions regarding their journey.
- Reduce the cost to the State of providing new infrastructure to manage the future transport task.

The future network should aim to provide Main Roads with the ability to better manage and optimise traffic flow across the corridor and provide an enhanced ability to respond to network disturbances, which if left unmanaged will lead to significant reductions in vehicle throughput and speed. The preferred option will make best use of the network, whilst providing Main Roads with the ability to maintain the operational performance of the corridor as traffic demand grows.

Benefits

- Reduction in the number of KSI (Killed / Serious Injury) crashes;
- Increased and more consistent average speed over the project area resulting in reduced fuel consumption and reduced travel times; and
- Reduced vehicle wear and tear.

D2 Summary of BCR

Table 12: Summary Measures (P50) for Transforming Freeways - Mitchell Freeway Southbound

		4% Discount rate	7% Discount rate	10% Discount rate
Present Value Cost	Capital expenditure plus maintenance costs	192.7	162.5	143.0
Present Value Benefits	Standard Benefits	642.8	398.4	263.4
	Standard Benefits with WEBS			
	Standard Benefits with WEBS and other benefit categories			
Benefit Cost Ratio	Standard Benefits	3.3	2.5	1.8
	Standard Benefits with WEBS			
	Standard Benefits with WEBS and other benefit categories			

Table 13: Summary Measures (P90) for Transforming Freeways – Mitchell Freeway Southbound

		4% Discount rate	7% Discount rate	10% Discount rate
Present Value Cost	Capital expenditure plus maintenance costs	204.0	173.2	153.3
Present Value Benefits	Standard Benefits	642.8	398.4	263.4
	Standard Benefits with WEBS			
	Standard Benefits with WEBS and other benefit categories			
Benefit Cost Ratio	Standard Benefits	3.2	2.3	1.7
	Standard Benefits with WEBS			
	Standard Benefits with WEBS and other benefit categories			

D3 Benefit Indicators

Table 14: Benefits indicator table

Benefit Area	Benefit indicator and units	Value
Reliability/ amenity	Public Transport reliability (standard deviation hours per annum)	
	Journey time reliability (standard deviation hours per annum)	
Safety	Number of avoided accidents (average annual)	65 (assumed 31% reduction in crashes based on impact of CRS on Monash Freeway VicRoads Managed Motor Freeway Framework mentioned above)
	Number of avoided serious injuries (average annual)	1.9 (assumed 31% reduction in crashes based on impact of CRS on Monash Freeway VicRoads Managed Motor Freeway Framework mentioned above)
	Number of avoided fatalities (average annual)	0.1 (assumed 31% reduction in crashes based on impact of CRS on Monash Freeway VicRoads Managed Motor Freeway Framework mentioned above)
Active transport benefits	Additional kilometres of walk and cycle paths (kilometres)	
	Increased walking and cycling activity (number of trips by mode and average kilometres per annum)	
Commuter time savings (daily commute to work)	Minutes saved by commuters on their daily commute to work based on a sample of commutes along the relevant corridor (average annual)	Approx. 6 min (assumed 19% increase in speed based on impact of CRS on Monash Freeway

		VicRoads Managed Motor Freeway Framework mentioned above)
	Average number of commuter trip (annual)	14 million
Leisure time savings	Average time savings for people on trips for leisure activities (minutes)	
	Average number of leisure trips (annual)	
Freight / business time savings	Average time savings for business trips, including freight (minutes)	
	Average number of business and freight trips (annual)	
Vehicle Operating Costs	Average change in vehicle operating costs for freight and business operators (annual)	4.2 reduction
	Average change in vehicle operating costs for passengers (annual)	7.0 reduction
Freight and Business Productivity	Average annual value of the sum of reduced vehicle operating costs, time savings and travel time reliability for freight and business users	16.2
Construction Jobs	Number of jobs supported by the Project during the construction phase of the Project (average per annum FTE)	70 FTE per annum
Operations Jobs	Number of jobs supported by the Project during the operational phase of the Project (average per annum FTE)	9 FTE per annum

D4 Benefit Net Present Value (NPV)

Table 15: The benefit net present value is shown below:

Benefit Component		Present Value of all Benefits ($m)	Year 10 Only:	
			Year 10 Benefits in $m (10 years after construction complete)	Year 10 Benefits as a percentage of total benefits
Travel Time Savings	Passenger (existing/ new users)	170.5	7.1	43%
	Business (existing/ new users)	75.8	3.1	19%
	Freight (existing/ new users)	66.3	2.7	17%
	Total Travel Time Savings	**312.5**	**12.9**	**79%**
Reduced Vehicle Operating Costs (resource costs)	Passenger (existing/ new users)	58.6	2.4	15%
	Business (existing/ new users)	10.5	0.4	3%
	Freight (existing/ new users)	22.9	0.9	6%
	Total Reduced Operating Costs	**92.0**	**3.7**	**23%**
Accident Reduction	Passenger (existing/ new users)			
	Business (existing/ new users)			
	Freight (existing/ new users)			
	Total Accident Reduction			
Environmental Benefits	Reduced Greenhouse Emissions			
	Reduced Local Pollution			
	Reduced Noise			
	Other (i.e. Biodiversity)			
	Total Environmental Benefits	**-6.1**	**-0.3**	**-2%**
Reduced Maintenance Costs	Routine (Annual)			
	Periodic			
	Rehabilitation			
	Total Reduced Maintenance Costs			
Other standard benefits (reliability, crowding, tolls/fare box)				
TOTAL STANDARD BENEFITS*		**398.4**	**16.4**	**100%**
Wider Economic Benefits	Agglomeration Benefits			
	Other Wider Economic Benefits			
	Total Wider Economic Benefits			
Other Benefits (i.e. City shaping)	*(add category as required: such as heavy vehicle productivity)*			
	(add category as required)			
	Total Other Benefits			

**Total Standard Benefits should equal sum of total benefits.*

D5 Traffic and Use Assumptions

Table 16: Traffic and Use Assumptions

		First year after Project completion	10 years following Project completion	30 years following Project completion
Users of existing infrastructure in Base Case	Passenger (VKT)	1,053,748	1,152,682	1,350,551
	Business (VKT)	256,558	280,646	328,821
	Freight and business (VKT)	366,061	409,965	497,773
User of new/ upgraded infrastructure in Project Case	Passenger (VKT)	1,114,585	1,222,045	1,436,966
	Business (VKT)	271,370	297,534	349,861
	Freight and business (VKT)	381,784	428,741	522,655
Users diverted from the rest of the highway network	Passenger (trips / VKT)			
	Business (trips / VKT)			
	Freight and business (trips / VKT)			
Users diverted from other transport modes (where possible).	Passenger (trips / VKT)			
	Business (trips / VKT)			
	Freight and business (trips / VKT)			
Generated trips	Passenger (trips / VKT)			
	Business (trips / VKT)			
	Freight and business (trips / VKT)			

E PROCUREMENT

E1 Alternative Funding and/or Financing Opportunities

There is no alternative funding to the shared commitment of the Commonwealth and State Governments.

E2 Private Funding or Financing

The upgrade and improvements to the Mitchell Freeway southbound traffic lanes and on-ramps is not conducive to a private financing arrangement. Future consideration of innovative funding and financing models will be in line with State Government policy.

Private financing is not considered appropriate for this project as the proposed improvements are to existing public roads which are used by the public and commercial vehicles, and thus the upgrade project provides improvements which are also a public good.

E3 Preferred Procurement Method

The scope will be delivered through a number of different contract methods. The Southern Section will be delivered through an Alliance contract, the Northern Section will be delivered through a NEC4 contract, and the Stephenson Avenue section will be delivered through a design and construct contract. All will be determined by a public open tender.

It is proposed that the Northern Section be delivered in conjunction with the Mitchell Freeway Southbound Widening – Hodges to Hepburn project under the same contract. The reasoning for this is that the works for both of these are within the same section of Mitchell Freeway and will incorporate the same onramps and share construction zones. Given this if works for both projects are undertaken under one project it is anticipated that significant savings would be achieved and disruption to traffic would be minimised.

For the same reason, the Stephenson Avenue section is proposed to be delivered at the same time as the Stephenson Avenue Extension project under the same contract.

E4 Tender Exemption

A tender exemption is being sought for the Northern section which is proposed to be delivered in conjunction with the Mitchell Freeway Southbound Widening – Hodges to Hepburn project under the same Contract. The estimated Contractor's cost for the Northern section is $36.3 million of the total committed value of $140.0 million. This exemption is requested on the basis that the works should be exempted from public tender under the National Land Transport Act 2014: Clause 24 (1)(c)(v) – 'The works will contribute to employment in a Region.'

A request for tender for the Mitchell Freeway Hodges to Hepburn project was out to the market, and three proponents had been selected to provide a tender. Prior to the closing of this tender, the proponents had been requested to provide a price to construct the Northern section of the Transforming Freeway project.

This section of the project can be fast tracked to be delivered at the same time as the adjacent Mitchell Freeway Southbound – Hodges to Hepburn project. This is consistent with the Commonwealth and State government's commitments to fast-track priority shovel-ready projects to kick start the economic recovery of Western Australian post COVID 19 and will support local jobs and local businesses for hard working Western Australians.

The Southern and Stephenson Avenue Sections will not require a tender exemption.

E5 Project Timeline

The Proposal seeks to release funding for project delivery. More broadly, the key milestones for the Project is detailed in Table 17, 18 and 19 below:

Table 17 - Key milestones and critical path items for Northern Section Hester Ave to Warwick Rd under NEC4

Milestone	Target Date
Complete development	February 2021
Award Contract	January 2021
Commence construction	April 2021
Complete construction	May 2023

Table 18 - Key milestones and critical path items for Southern Section Reid Hwy to Vincent St under Alliance (excluding Stephenson Ave)

Milestone	Target Date
Complete development	July 2021
Award Contract	September 2021
Commence construction	October 2021
Complete construction	October 2023

Table 19 - Key milestones and critical path items for Stevenson Ave under Design and Construct

Milestone	Target Date
Complete development	February 2021
Award Contract	June 2021
Commence construction	July 2021
Complete construction	June 2023

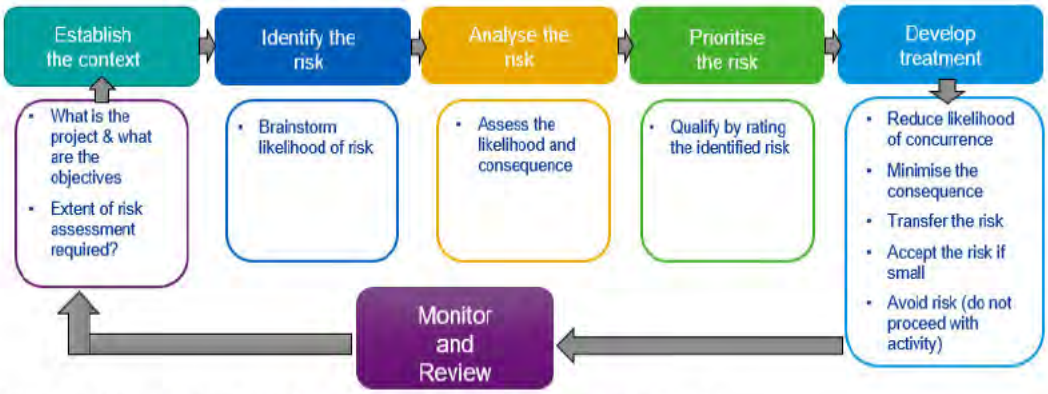
F RISK AND SUSTAINABILITY

F1 Major Risks

Risk management has been integral to the planning and development of the project, with identified risks and mitigation strategies updated at regular intervals. The risk management for the project has been able to draw upon the extensive risk management and development works undertaken for previous similar projects.

A preliminary project risk register has been developed for the project, based on Main Roads risk management process, which is consistent with the approach outlined in AS/NZS 31000: 2009 Risk Management – Principles and Guidelines Standard. The risk management approach outlined below, aligns with the context within which Main Roads operates, taking account of the regulatory, financial, safety, political, economic environment, compliance requirements, reputational exposures, community expectations and other governance needs.

Figure 2 Main Roads Risk Management process



Source: Main Roads WA Risk Management Framework 2017

Risk management workshop has been undertaken and the risk register provided in **Table 18** highlights the risks identified and details on potential mitigation strategies.

Table 18 – Key Risks and Mitigation Strategies

Risk No	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans
				Consequence Rating	Likelihood Rating	Level of Risk		
1								
1.1	Lack of coordination between 3 projects/ contractors in same area (i.e. the 3 concurrent Mitchell Freeway projects that are delivering Smart Freeways scope) (e.g. ITS integration; civil coordination; compatibility)	Contractual and engagement terms, KPIs etc are different for Alliance, NEC4 and D&C contracts. Concurrent delivery of Smart Freeways across 3 different contract types adds to challenge and complexity. Need for ongoing communication. 3 different contract types lead to different management practices. Timeframes to resolve issues will be different. Lack of interface management across 3 projects.	Inability to resolve issues across three different contract types. Delay or additional costs.	Major (4)	Likely (4)	Very High(16)	IDD, Network Ops, PTS, Metro, Budget and programming	- Ability to use PAA and Deed to mandate requirements. - Clear objectives agreed across all parties - Specify the PC dates with consideration given to most optimal sequence in opening. (work with Network Ops) - Mandate certain hardware/ software components that guarantee compatibility - Coordination body to manage multiple ITS projects - Interface management across all 3 projects - Coordinating group across all 3 projects to provide consistent oversight. Eg an overarching Interface Group that each project's Steering Group/ Project Working Group must report to.. - Working groups with representation from each project and Main Roads (Interface Manager): Design, Program, Construction, Testing and commissioning, Procurement, Data sharing, Traffic management - Consider incentives to come to amicable solutions. Dispute resolution system required. - Common dedicated testing facility - KPIs to drive the interactions between the projects.

Risk No	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans
				Consequence Rating	Likelihood Rating	Level of Risk		
1.2	Unclear governance structure to approve decisions to overall freeway works.	Complexity not considered or planned for across projects	Project delay, rework, contract difficulties	Major (4)	Likely (4)	Very High(16)	PTS	-Develop governance model to enable coordination and collaboration across projects for decision making and technical aspect. - Dispute resolution system required. - KPIs to drive the interactions between the projects.
1.3	Poorly defined or un-approved scope	Accelerated design timeframes due to Fast tracking of project. Varying levels of design not talking to each other, use of interim design outputs to facilitate site activities. Overlap of design and construction phases. Staggering the civil design (and construction) ahead of the other design (and construction) disciplines. Project Development is progressed without a finalised scope due to lack of decision by Project Owner or unclear governance	Final PD deliverables do not completely inform construction requirements leading to extensive re-design PD deliverables (e.g. geotech, enviro) do not cover all areas required leading to additional surveys (cost and time lost) Coordination issues throughout the entire project life. Missing certain items in design.	Moderate (3)	Possible (3)	Medium (9)	PTS, IDD, Metro, Budget and programming	Governance and processes adhered to as a part of design and construction. Must be staggered and completed in chainage lots rather than discipline lots.
1.4	Untimely decision making and commitment from the Board.	Lack of ITS technical representation at AMT and Board level meetings.	Reduced quality, increased cost	Moderate (3)	Possible (3)	Medium (9)	Network Ops, IDD, Metro	Reduce the number of participants of the AMT and board meetings. Have technical representation at these meetings (particularly for ITS discipline).

Risk No	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans
				Consequence Rating	Likelihood Rating	Level of Risk		
1.5	Alliance culture not upheld by every member of the Alliance.	Expectations and goals are not aligned with the Alliance principals. Some members, profit and cost seen as more important than collaboration and delivering high quality and cost effective infrastructure	Reduced quality, increased cost	Moderate (3)	Possible (3)	Medium (9)	IDD	Ensure members align their expectations and goals with delivering high quality and value for money infrastructure, rather than profits and cost. Reflect in PAA
1.6	Scope creep and bad management of change	Major scope changes during design and construction	Re-work and an inability to track costs. ITS requirements/ scope delivery delay	Moderate (3)	Possible (3)	Medium (9)	IDD	Lock the base scope early so that variations to the original scope are clearly identifiable.
1.7	3 contractors not working to same goal	3 contracts are not aligned (e.g. using opposing Concept of Operations)	Various (e.g. Testing, commissioning, operations)	Major (4)	Likely (4)	Very High(16)	Network Ops, IDD, Metro	- Clear objectives agreed across all parties - KPIs to drive the interactions between the projects - Mandate digital modelling across projects - Common dedicated testing facility
1.8	Delivery requirements/ outcomes not aligned between contracts	Three contracts awarded (Alliance, D&C, NEC4) to deliver the project scope	Impact on testing and commissioning handover	Moderate (3)	Likely(4)	High (12)	IDD	-Develop governance model to enable coordination and collaboration across projects for decision making and technical aspect. - Dispute resolution system required. - KPIs to drive the interactions between the projects.

Risk No	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans
				Consequence Rating	Likelihood Rating	Level of Risk		
1.9	Environmental approvals are delayed due to increased level of assessment	Environmental impacts currently unknown (surveys underway). Significant environmental findings from Spring surveys lead to upgraded requirement from Veg Clearing Permit to Referral, and possible formal assessment. E.g. Black cockatoo habitat may mean Commonwealth Approval required - EPBC Act.	Significant increase in approvals timeframe in some project locations (e.g. Approval of some sections to Commonwealth - mid 2021)	Moderate (3)	Possible (3)	Medium (9)	PTS	If formal assessment is required, break up into packages to progress construction in areas with shorter approvals timeframes. Manage schedule changes - coordinate across 3 projects
1.10	PTA approvals to work in rail corridor are delayed	PTA timeframes longer than expected.	Delay in some project locations	Moderate (3)	Likely(4)	High (12)	IDD	- PTA representative embedded in Alliance - Minimise rail corridor impacts through design - eg smaller footings for gantry etc.
1.11	PTA approvals to work in rail corridor are not sought in time	Design detail not sufficient. Approval requirement not identified early.	Delay to construction timeframe in some locations. Possible knock on effects to other work packages.	Moderate (3)	Likely(4)	High (12)	IDD	- Review process at xx% design. Specialist involvement.
1.12	Design not signed off by PTA	Conflicting requirements for PTA station access vs ramp configuration.	Delay to construction timeframe in some locations. Possible knock on effects to other work packages.	Moderate (3)	Likely(4)	High (12)	PTS, IDD	- Review process at xx% design. Specialist involvement.

Risk No	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans
				Consequence Rating	Likelihood Rating	Level of Risk		
2	**PROJECT COSTS / FUNDING / PROCUREMENT**							
2.1	Range of different ITS technologies selected by contractors - different device type, manufacturer/ suppliers, model, local support, warranty.	Consistent technologies not specified across 3 projects.	Complicates testing, commissioning, operations and maintenance.	Major (4)	Likely (4)	Very High(16)	Network Ops, IDD, Metro	Principal supply of equipment, Needs options assessment.
2.2	Delay to supplies due to COVID	Restrictions overseas due to COVID extend timeframes for supply	Additional costs, delay to program	Moderate (3)	Likely(4)	High (12)	IDD	Research local supply chains Research alternate supply chains.
2.3	Competition with resources industry for supplies and skills	Resources industry flat out - getting equipment and skills ahead of State projects.	Quality; Delay; Cost	Moderate (3)	Likely(4)	High (12)	IDD	Research local resourcing opportunities as well as mentoring/training programs.
3	**PROJECT TEAM CAPABILITIES (Resources, Systems, Processes)**							
3.1	Lack of skilled personnel (ITS, Skilled construction etc) in WA	Large ITS projects are rare in WA, so need specialists from east coast.	Increase in costs, delay, decrease in quality.	Moderate (3)	Likely(4)	High (12)	IDD	Investigate construction completed for completed Smart freeways Kwinana stage 1 and incorporate lessons learned to ensure constructability using local companies using clear scoping, co-ordination, and support during construction.

Risk No	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans
				Consequence Rating	Likelihood Rating	Level of Risk		
3.2	Staff retention - Continual changes in resources and key personnel	Moved out of project onto another, possibly of greater interest. Increased demand due to number of projects underway.	Inefficiencies and re-questioning of scope items that were part of our project	Moderate (3)	Possible (3)	Medium (9)	IDD	High level resource planning to be agreed internally as well as possible contractual items to mitigate against de-prioritisation of this project against other projects.
4	**SAFETY, HEALTH and WELLBEING (Project Specific OHS risks)**							
4.1	Lack of skilled personnel (ITS, Skilled construction etc) impacts on safety	Too many trainees on projects per experienced supervisor	Incidents on site.	Major (4)	Possible (3)	High (12)	IDD	Ensure there is the agreed ratio of supervisor to trainees ie,1:10 or 1:4 that is acceptable to industry standards
4.2	Drainage - placement of ITS installations may impede drainage	Lack of coordination between ITS and Civil design teams	Aqua plaining accidents - can be managed	Moderate (3)	Possible (3)	Medium (9)	PTS, IDD	Design to account for possible aqua plaining regarding positioning of ITS infrastructure. Construction civil and ITS teams to have precise agreed drawings as well as regular meetings to limit lack of co-ordination.
4.3								
5	**PROJECT STAKEHOLDERS**							

Risk No	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans
				Consequence Rating	Likelihood Rating	Level of Risk		
5.1	Expectations - varied benefits across different users and for LGAs	Different characteristics of Mitchell Freeway will mean different bottlenecks and varied outcomes. Benefits not as clear-cut as for recent Kwinana Freeway project. Project benefits not equal for all origins and destinations (eg Hester vs Vincent origin)	Poor media coverage and user dissatisfaction upon opening.	Major (4)	Possible (3)	High (12)	Network Ops, IDD,	- Coordinate opening of additional lane with whole of Smart Freeway 'switch on'. - Communicate benefit clearly, noting the range of benefits types - safety, reliability, not just time savings (as not all users will save time) - Localise messaging to set expectations for typical journeys from that area. - Consult with LGAs regarding potential impacts to local network.
5.2	Local governments publicly not supporting project	Some LGAs have delivered different technologies in their areas.	Lack of LGA support can increase delivery challenge.	Moderate (3)	Unlikely (2)	Low (6)	PTS, IDD	Start early engagement with LGA's and look for possible alignment and benefits to both parties to increase support for the project.
5.3	Noise mitigation and access - community expectations	Expectation for noise mitigation along whole project area. Community may expect noise mitigation to extend along whole project area. The needs of communities around each ramp may be different.	(Is currently an issue with stakeholders esp in Southern Section). North of Warwick ok. Erindale to Karrinyup may be problem.	Minor (2)	Likely (4)	Medium (8)	PTS, IDD	Start early engagement with LGA's and look for possible alignment and benefits to both parties to increase support for the project. Consider transparency, with regards to noise/environmental investigations with stakeholders to gain support.
5.4	PTA passenger access and parking at stations will be of concern (during construction)	Insufficient PTA operational interface during design & construction - bus/ rail/ car parking	Project delay. Public inconvenience	Moderate (3)	Possible (3)	Medium (9)	IDD	Start early engagement with PTA and Public transport patrons to ensure sufficient notice is given for alternative plans during construction activities.

Risk No	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans
				Consequence Rating	Likelihood Rating	Level of Risk		
6	**ENVIRONMENT / HERITAGE / LEGAL AND REGULATORY Hazards and Waste, Environmental Planning Approvals, Land, Legal)**							
6.1	Drainage at key locations requires additional ongoing maintenance/ cost	Drainage solution is not optimised at key locations (e.g. Warwick Road)	Ongoing maintenance costs	Moderate (3)	Possible (3)	Medium (9)	PTS, IDD	Ensure drainage strategy is reviewed using a vigorous process to ensure solution presented is the most optimised at the time with the information and funds available.
6.2	Removed pavement, signs, barriers etc sent to landfill	Waste not assessed as resource during design	Waste to landfill. Recycling and reuse opportunities missed.	Moderate (3)	Possible (3)	Medium (9)	IDD	During constructability review, take every opportunity to innovate and reuse as much waste as possible.
6.3	Drainage - Ocean Reef Road (Edgewater Station), Beach Road (Warwick Station),	Additional drainage not provided for when existing road was widened. Not in current scope, not estimated for.	Operation of Freeway	Moderate (3)	Possible (3)	Medium (9)	IDD	During Design review, take every opportunity to ensure that drainage is considered and does not impede on the operation of the freeway.
6.4	Project has a high carbon emission construction footprint a large	Procurement of materials for construction with high embodied energy	Contribution to Main Roads' carbon footprint and global CO2 levels	Moderate (3)	Likely (4)	High (12)	IDD	During constructability review, take every opportunity to innovate and consider how the project can maintain a carbon neutral position as possible.
7	**DELIVERY REQUIREMENTS (Services, Traffic Management, Geotechnical Conditions, Materials, Water Supply)**							

Risk No	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans
				Consequence Rating	Likelihood Rating	Level of Risk		
7.1	Unable to provide an exact location of ITS Cabinets	Lack of coordination between ITS and Civil design teams	New delivery contractors/sub contractors unable to find and or do work on.	Minor (2)	Possible (3)	Low (6)	Network Ops, PTS, IDD,	Ensure civil works general arrangement drawings incorporate electrical and ITS design
7.2	Clashes with location of electrical and ITS assets	Lack of coordination between ITS and Civil design teams	Trees having to be cut or signs having to be moved to ensure camera or incident detection coverage, sometimes post-design which could include additional environmental approvals, time lost	Minor (2)	Possible (3)	Low (6)	Network Ops, IDD,	During Design review, take every opportunity to ensure that ITS functional requirements are met through design to mitigate against changes during construction that could have cost and time implications.
7.3	Designs are completed that are not possible/practical to construct	Not conducting Constructability review; Lack of coordination between ITS and Civil design teams; Manufacturing/construction drawings lack sufficient information	Instances where the design is not constructable	Minor (2)	Possible (3)	Low (6)	PTS, IDD	Make constructability review a mandatory step before releasing a design package. Have experienced construction SME's be a part of the review process to ensure constructability.
7.4	Insufficiently coordinating all assets into one PIT (Pre Installation Testing) facility to manage successful transition from construction to operation	Significant size and cost of facility	Delays, available space, management of 3 contracts	Major (4)	Almost certain (5)	Very High (20)	Network Ops, IDD,	Principal supply of equipment lists, Needs options assessment.

Risk No	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans
				Consequence Rating	Likelihood Rating	Level of Risk		
7.5	Managing access and egress - massive project under traffic. 16 ramps, freeway users, ramp users, PTA car parks	Night works may not finish on time	Congestion during construction	Major (4)	Almost certain (5)	Very High (20)	Network Ops, IDD,	Have a comprehensive construction schedule as well as regular co-ordination meetings to ensure required access for all projects. Create extensive construction plans to ensure completion of night works. Have mitigation plans should works overrun and congestion be a risk to the public.
7.6	Disruptions to road users during construction is uncoordinated (traffic management)	Management of Traffic Management across 3 projects. Some TM must extend into other project's areas - JV, CP	Traffic congestion	Moderate (3)	Likely (4)	High (12)	Network Ops, IDD,	Have a comprehensive Traffic Management plans as well as regular co-ordination meetings to ensure required access for all projects.
8	**QUALITY (Material quality, Building processes / ITP, storage / laydown area, Delivery)**							
8.1	Insufficient resiliency/ reliability in the Traffic Control System (TCS). Must design out single point of failure in the system.	High level planning not done/ implemented	Smart Freeway system failure in operation - unmanaged traffic. Traffic congestion.	Moderate (3)	Possible (3)	Medium (9)	Network Ops, IDD,	Address via Traffic Control System (TCS) High level Remediation Plan (funded from project).
8.2	Traffic Control System (TCS) being disrupted by one project and affecting other projects and operations	Projects operating well outside area could cause cut in connection (e.g. Tonkin Gap). No redundancy with PTA for projects in North. MR limited resources to review designs and coordinate with other projects.	Smart Freeway system failure in operation - unmanaged traffic. Traffic congestion.	Major (4)	Possible (3)	High (12)	Network Ops, IDD,	Should be design activity to stage works - not just design how it looks at the end in order for smooth transition. Some tools are available to simulate and model whole system scheduled works.

Risk No	Project Risk	Causes	Resulting In	Residual Risk			Risk Owner	Treatment Action Plans
				Consequence Rating	Likelihood Rating	Level of Risk		
8.3	Incompatibility of ITS systems	3 contractors supply different technology - no whole of system testing	Degraded operation. Worst case not able to commence operation.	Major (4)	Possible (3)	High (12)	Network Ops, IDD,	- Mandate digital modelling across projects - Common dedicated testing facility
8.4	Drainage - waterlogging of in-ground pits Near Lake Monger.	High water table	Maintenance is more difficult, possibly less safe.	Minor (2)	Possible (3)	Low (6)	Network Ops, IDD,	Check if existing switchboards have RCDS

F2 Major Dis-Benefits of the Project

Nil

F3 Sustainability Strategies

Main Roads has embedded sustainability in all their activities to seek economic, social and environmental benefits and operate a sustainable road transport system in partnership with others. Main Roads internal sustainability procedures will therefore be implemented for the project.

G STAKEHOLDER ENGAGEMENT

G1 & G2 Public and Stakeholder Participation and Consultation

A Community and Stakeholder Engagement Plan (CSEP) will be developed for this project which will determine the risks, expected issues and mitigation, communication activities and tools. This includes pre-construction communication and engagement to ensure directly impacted stakeholders have an understanding of the project prior to construction starting.

The plan focuses on project process, rationale and progress to local businesses, local property owners, local residents, Local Government Authorities (LGAs), community and environmental organisations, road users and others to:

- To raise stakeholder awareness of the project.
- To minimise disruption to road users as far as possible.
- To address specific concerns of directly affected landowners and stakeholders.
- To provide consistent, factual and accurate information to all stakeholders from pre-construction through to post-construction.
- To determine and monitor community opinion or concerns (through feedback, media channels etc) following provision of relevant information to outlets listed in the plan.

Assessment of the risks and mitigation will help to determine the level of participation required.

A preliminary list of the key stakeholders likely to be included in the stakeholder engagement plan is provided in Table 19.

Table 19 – Key Stakeholders

Stakeholder	Interest/Context
Main Roads WA (MRWA) Network Operations Planning & Technical Services Road and Traffic Engineering Branch Environmental Branch Metropolitan Region Supply and Transport Road Safety Branch	All aspects of project management resources from various Main Roads branches will be coordinated and collaborated to deliver the project. Main Roads has previously developed communications tools and stakeholder engagement strategies for road projects. These strategies consider the projects from concept development through to implementation, and take into account both internal and external stakeholder requirements. Stakeholder mapping was aimed to identify and understand the key stakeholders whose influence and support will be vital to the successful implementation of any initiatives that might progress under this project.
Department of Transport (DoT)	DoT is responsible for regional transport planning and this project is consistent with the Perth Transport Plan for 3.5 Million People and Beyond.
Public Transport Authority (PTA)	The project is being undertaken in the Mitchell Freeway / Joondalup Rail Line corridor.
Department of Planning, Lands and Heritage (DPLH)	Being responsible for Perth and Peel@3.5million Plan and other related sub-regional planning frameworks, effective

	communication with Department of Planning, Lands and Heritage will enhance the social, economic, environmental impacts of the road development.
Local Governments (City of Joondalup, City of Wanneroo, City of Stirling and City of Vincent)	The project extent is within the four Local Government aras and will reduce travel times and improve trip time reliability for vehicles travelling southbound on Mitchell Freeway during peak hours. Thorough consultation with Local Governments is required during the design process regarding detailed adjustments to the existing road network.
Local community including residents and businesses	Feedback obtained from business/community representatives through will be important to understand the behaviour of and desired outcomes by the end users.

Engagement with stakeholders will be guided by communications and stakeholder engagement activities that create awareness and provide opportunities for stakeholders to influence project outcomes. As the project develops, stakeholder and community opinion may influence key project design and construction decisions related to road design.

Key project engagement objectives are to:

- Inform/update stakeholders about the project including program timeframe, engagement opportunities and project scope.
- Identify issues or impediments to the project.
- Exchange information about the project with stakeholders, detail who will be impacted, where and when and potential impacts on the residents, property owners, road users and other stakeholders.
- Use concerns and preferences to identify appropriate actions that can be implemented to assist with the project and minimise impacts.
- Use concerns and preferences to inform targeted communications for stakeholders.
- Identify/update project stakeholder details.

G3 Public Recognition Signage Plan

Public Recognition Signage will be prepared in accordance with the applicable guidelines and will be forwarded to the Department of Infrastructure, Transport, Regional Development and Communications for approval.

H COMPLIANCE

H1 Commonwealth and State Legislation Triggers

The project delivery works will be carried out in accordance with environmental approvals and associated conditions issued by any relevant Authority (Local, State and Commonwealth). The following Acts will be followed for environmental clearance approvals:

- Environmental Protection Act 1986 and
- Environmental Protection and Biodiversity Conservation Act 1999.

  Aboriginal Heritage Act 1972 will be followed to identify any heritage issues within the project site.

H2 Compliance with the Building Code 2016

Main Roads will ensure compliance with the Building Code 2016.

H3 Building and Construction WHS Accreditation

The Australian Government Building and Construction WHS Accreditation Scheme applies to the project. All requirements under the Scheme will be met.

H4 Indigenous Participation Plan

The project value is equal or greater than $7.5 million, and therefore an Indigenous Participation Plan will be required. The IPP is within Appendix 1.

H5 Local Industry Participation Plan

A Local Industry Participation Plan will be prepared and made available to the Department of Employment, Skills, Small and Family Business for compliance.

H6 IA Submission

An IA submission is not required for the project as the Australian Government contribution is not $100 million or greater.

APPENDIX 1 – SUPPORTING INFORMATION

- Estimate
- Indigenous Participation Plan

mainroads WESTERN AUSTRALIA

NATIONAL INFRASTRUCTURE INVESTMENT PROGRAM

Project Proposal Report

Mitchell Freeway Southbound Widening – Cedric Street to Vincent Street

DELIVERY

February 2018

Contents

Mitchell Freeway Southbound Widening – Cedric Street to Vincent Street

Executive Summary

This Project Proposal Report (PPR) is seeking funding approval for $28.5 million Commonwealth funding for the delivery of an additional southbound lane on Mitchell Freeway, between Cedric Street off ramp to Vincent Street off ramp. The estimated project cost at P50 level is $35.6 million with the State to contribute $7.1 million. The remaining Commonwealth funds are to be held in contingency for the project.

The Mitchell Freeway currently carries some of the highest traffic demands in Perth, up to 180,000 vehicles per day and thus experiences poor performance, particularly during three to four hours in each peak period. The Infrastructure Australia audit report of 2016 predicts that by 2031, the Mitchell Freeway will have the highest delay cost in Australia. A significant contributor to the congestion is the presence of lane mergers, reducing the available lane capacity, and sending a congestion shockwave to upstream traffic. Mitchell Freeway (southbound) from Cedric Street to Vincent Street is particularly congested in the morning peak, due to a number of bottlenecks created from four lanes merging into three lanes at two locations along this section of road.

With acute congestion, safety decreases. The predominant crash type on the Mitchell Freeway is rear end, representing 74% of all crashes. Sideswipe same direction crashes account for a further 17% of crashes. Both these crash types are symptomatic of congested conditions.

This is a 'now' problem and action is required to address these congestion hotspots. The Project will target high impact, low cost, freeway capacity improvement that can be delivered relatively quickly and help alleviate congestion during peak periods at critical points on the Mitchell Freeway. This involves the removal of two lane merges and the construction of 7km of additional lane, creating four continuous lanes from Erindale Road to Vincent Street.

Implementing this project produces a strong Benefit Cost Ratio (BCR) of 9:1, with over $375 million in benefits. Travel speeds are estimated to improve by up to 30kmp/h for vehicles driving through the project area in the morning peak, increasing productivity and reliability of the freeway.

This project forms part of Main Roads overall plan to transform Perth's freeways to handle population and economic growth and is categorised as one of the most urgently needed projects. By building this stage first, future capacity improvements further north are possible as the freeway will be able to cope with the "unleashed demand" by removing the lane merge bottleneck.

In May 2017, the Premier of Western Australia, Mark McGowan and the Minister for Transport, Rita Saffioti announced a suite of 18 priority road and rail projects, jointly funded by the Commonwealth and State governments, designed to reduce congestion and improve safety. The $40 million Mitchell Freeway widening project was committed for funding as part of this package.

Project Locality

A. PROPONENT & PROJECT DETAILS

A.1 Entity Name

Main Roads Western Australia
PO Box 6202
EAST PERTH WA

ABN: 50 860 676 021

A.2 Primary Project Contact

Manager Project Programming: s22(1)(a)(ii)
Telephone: 08 9323 s22(1)
E-mail: s22(1)(a)(ii) @mainroads.wa.gov.au

Congestion Program Director s22(1)(a)(ii)
Telephone: 08 9323 s22(1)
E-mail: s22(1)(a)(ii) @mainroads.wa.gov.au

Project Director: s22(1)(a)(ii)
Telephone: 08 9323 s22(1)
E-mail: s22(1)(a)(ii) @mainroads.wa.gov.au

A.3 Project ID

To be confirmed

A.4 Project Name

Mitchell Freeway Southbound Widening – Cedric Street to Vincent Street

A.5 Project Partners

Nil.

A.6 Project Scope

The project will address congestion issues currently experienced on the Mitchell Freeway southbound between south of Erindale Road which is caused by successive lane merges forcing four lanes to merge to three. The project will remove these lane merges and create additional capacity by building an additional 7km lane on Mitchell Freeway southbound from Cedric Street off ramp to Vincent Street off ramp. This will create four continuous lanes from Erindale Road through to Vincent Street assisting to reduce congestion and improve travel times and safety for Perth road users, particularly in the morning peak.

The Project involves investigation, design and construction relating to the following:

- Approximately 2.7km of widening into the eastern verge of Mitchell Freeway southbound carriageway between Cedric Street off ramp and Hutton Street off ramp to accommodate a new traffic lane;
- Approximately 3.0km of widening into the western median of Mitchell Freeway southbound carriageway between Hutton Street off ramp and Powis Street on ramp to accommodate a new traffic lane;
- Approximately 1.2km of widening into the eastern verge of the Mitchell Freeway southbound carriageway between Powis Street on ramp and Vincent Street off ramp to accommodate a new traffic lane; and
- Provision of emergency stopping bays.

The work will involve typical civil construction activities such as retaining structures, barriers, street lighting and drainage to ensure successful operation.

Figure 1 – Project location detail

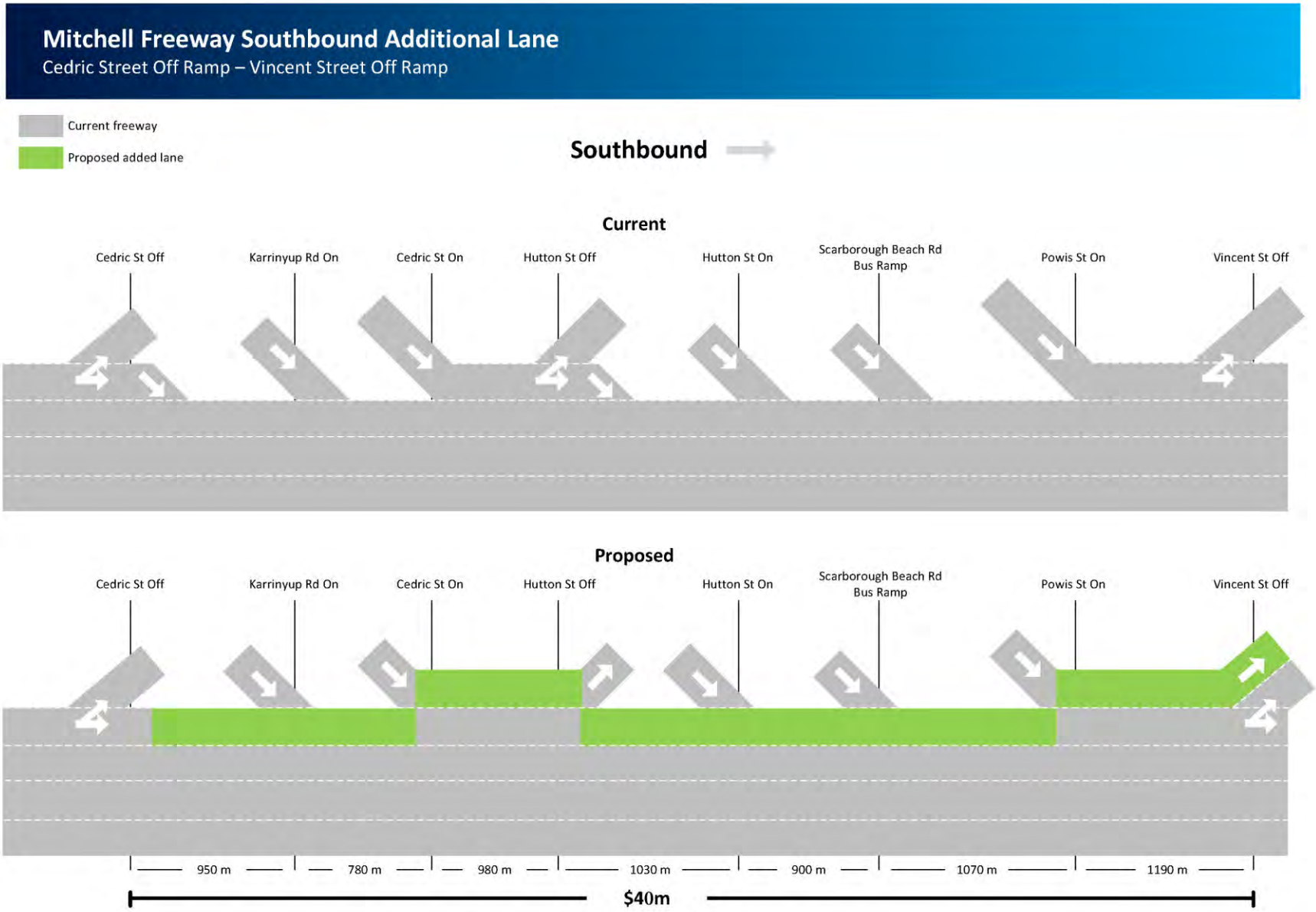


Figure 2 – Lane configuration (current layout compared to proposed)

A.7 Related Projects or Works

A strategy to transform the Mitchell and Kwinana Freeways has been devised to address sustaining population and economic grow in the Perth Metropolitan area. The Mitchell Freeway widening project forms part of the highest priority stage.

As part of the $2.3 billion package of road and rail infrastructure works announced on 7 May 2017 and funded by the State and Commonwealth Governments, 17 other projects will be constructed, however none in close proximity. These works will be delivered independently of each other.

Additional Principal Shared Path Scope
The current Principal Shared Path (PSP) network that runs parallel to the freeway consists of multiple gaps which prevent safe, continuous travel for users. Works have been defined as the investigation, design and construction of PSP infrastructure adjacent to Mitchell Freeway Southbound Widening works from Hutton Street to Glendalough Train Station. On 4 September 2017 the State Government announced funding to complete this missing PSP link. Constructing the PSP at the same time as the freeway widening work will provide a unique opportunity for cost savings, and reduced disruption for travellers. The PSP works will be awarded and constructed with the freeway widening, but will be funded separately by the State.

Freeway Safety Barriers
The Mitchell Freeway has legacy safety barriers separating the freeway and rail dating back to the early 1990s that were installed as part of the creation of the northern suburb railway line. The barriers are maintained by the Public Transport Authority (PTA). Recent breaches of these barriers has highlighted the need to provide a higher grade of protection to both motorists and rail assets. PTA will fund these works, which will be undertaken during the construction of the freeway widening to reduce costs and minimise future disruption to road users if a separate construction contract was to be implemented.

A.8 Geographical References

The project extent is detailed in the Project Locality map, and details provided in A.6. Coordinates of key reference points for the project are presented below.

Location	Latitude	Longitude
Mitchell Freeway at Cedric Street Off Ramp	-31.8852	115.8012
Mitchell Freeway at Hutton Street Off Ramp	-31.8988	115.8180
Mitchell Freeway at Powis Street On Ramp	-31.9249	115.8289
Mitchell Freeway at Vincent Street Off Ramp	-31.9325	115.8365

Table 1 – Key Reference Points for the project

A.9 Project Summary

Problem Identification

The Mitchell Freeway southbound traffic experiences severe traffic delay in the AM peak due to two lane merges situated close together, Cedric St and Hutton Street. This causes stagnant traffic for 6km from Erindale Road to Powis Street, crippling the performance of this core southbound artery.

Without investment the extent of congestion in 2021 will increase significantly, with reliability to fall below 40%. Along with acute congestion comes safety decreases. The predominant crash type on the Mitchell Freeway is rear end, representing 74% of all crashes. Sideswipe same direction crashes account for a further 17% of crashes. Both these crash types are symptomatic of congested conditions.

The Mitchell Freeway road corridor is critical for the effective movement of road users and was identified

by the Infrastructure Australia Audit of 2016 as being the most congested road corridor in Australia by 2031 if nothing was done. To avert this outcome, action is required now.

The Solution

The proposed solution is to remove the two lane merges and provide additional capacity at the southern section of Mitchell Freeway to alleviate congestion during the morning peak period. This would create four continuous lanes from Erindale Road through to Vincent Street, removing traffic flow degradation from Reid Highway.

This project is aligned to a wider strategy to transform Perth's freeway network. By adding additional capacity first to the southern section, the road network will be able to cope with the "unblocked bottleneck" widening from Cedric to Hutton St and any future widening further north.

Objectives

The primary objectives of the Project are:

- Efficiency – Reduce journey times
- Reliability – Improve journey time reliability
- Safety – Manage safety risk to road users
- Customer – Improve traveller experience

Other objectives in respect of the Project include:

- completion of the Project Works by the completion date;
- minimisation of the financial cost to Main Roads while realising a net benefit to the community;
- undertaking the Project in an environmentally and socially sensitive manner;
- minimisation and clear definition of Main Roads exposure to Project risks;
- completion of the Project in accordance with Main Roads' requirements and standards;
- provision of the opportunity for Proponents to demonstrate innovative approaches to design and construction of the Project Works.
- minimisation of disruption and inconvenience to all stakeholders including road users during construction works;
- design and construction of the Project Works to be compatible with the ultimate interchange configurations planned for Mitchell Freeway; and
- delivery of part of Main Roads overall plan to transform Perth's freeways to keep up with population and economic growth.

Benefits

Implementing this project produces a strong Benefit Cost Ratio (BCR) of 9:1, with over $375m in benefits. Travel speeds are estimated to improve by up to 30kmp/h for vehicles driving through the project area in the morning peak, increasing productivity and reliability of the freeway. Safety benefits are anticipated as the Project will reduce the need for lane merging, lowering the risk of 'rear-end' and 'side swipe' crashes.

Progress to Date

Significant works have been undertaken to prepare the project for delivery including a full digital survey model for the project site, concept design and geotechnical investigation. Further detailed information will be available during the Request For Proposal (RFP) procurement phase.

A.10 National Land Transport Network

The section of civil construction on the Mitchell Freeway (Cedric Street to Vincent St) is not part of the Perth Urban Corridor of the National Land Transport Network (NLTN) Network.

Main Roads 2017/18 Strategic Asset Plan (SAP) summarises the organisation's investment needs over the next 10 years. The SAP also highlights issues and risks that are likely to impact service delivery into the future. The delivery of congestion solutions on the Mitchell Freeway is listed as a priority in Main Roads 2017/18 Strategic Asset Plan.

A.11 Primary Project Category

The Project is eligible for funding as a National Project under the National Land Transport Act 2014, Part 3, Division 1, Section 10 (a). The project is for the construction of an existing road that is in the State of Western Australia.

B. PLANNED OUTCOMES AND OUTPUTS

B.1 Evidence of the Problem/Opportunity

The Mitchell Freeway southbound to the north (upstream) suffers from daily acute congestion particularly during the AM peak when efficient movement of people is most critical. The freeway bottlenecks at Cedric Street and Hutton Street are caused by the 4 to 3 lane drop arrangement at the merge, where capacity is insufficient to meet surging demand leading to stationary/slow moving traffic for 4-5km upstream. This problem occurs on a daily basis, significantly reducing vehicle throughput and speed along the corridor for 3.5 hours across the AM peak.

When combined with high on ramp flows from multiple entries situated close together and weaving, the congestion resulting from these bottlenecks very quickly creates a moving queue with a shockwave that travels upstream as far as Erindale Road affecting the entire corridor performance. Freeway flow improves 4km downstream from Vincent Street. As the primary travel corridor for the northern suburbs of Perth, long travel times and degraded reliability compel commuters to use parallel secondary routes which are unable to effectively manage the additional demand.

B.2 Baseline Data

Travel Speeds

The Heat Plot (figure 3), based on vehicle detection station data, shows the extent of congestion along the corridor averaged across all working days between February and October 2016. Heavy congestion is highlighted by the red and orange colouration on the chart from 06.00am - 09.30am between Erindale Road and Powis Street.

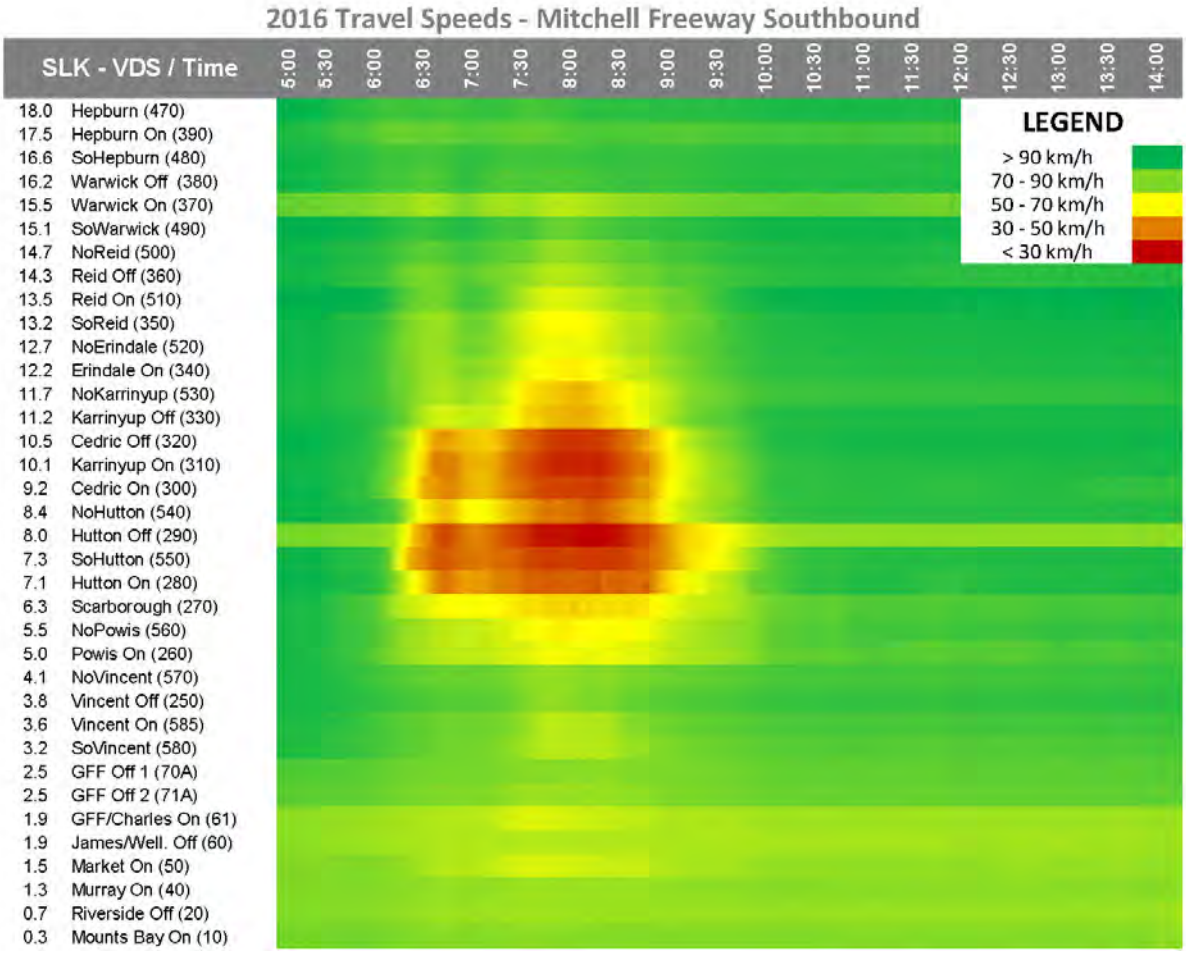


Figure 3 - Travel speeds (Heatplot) in km/h

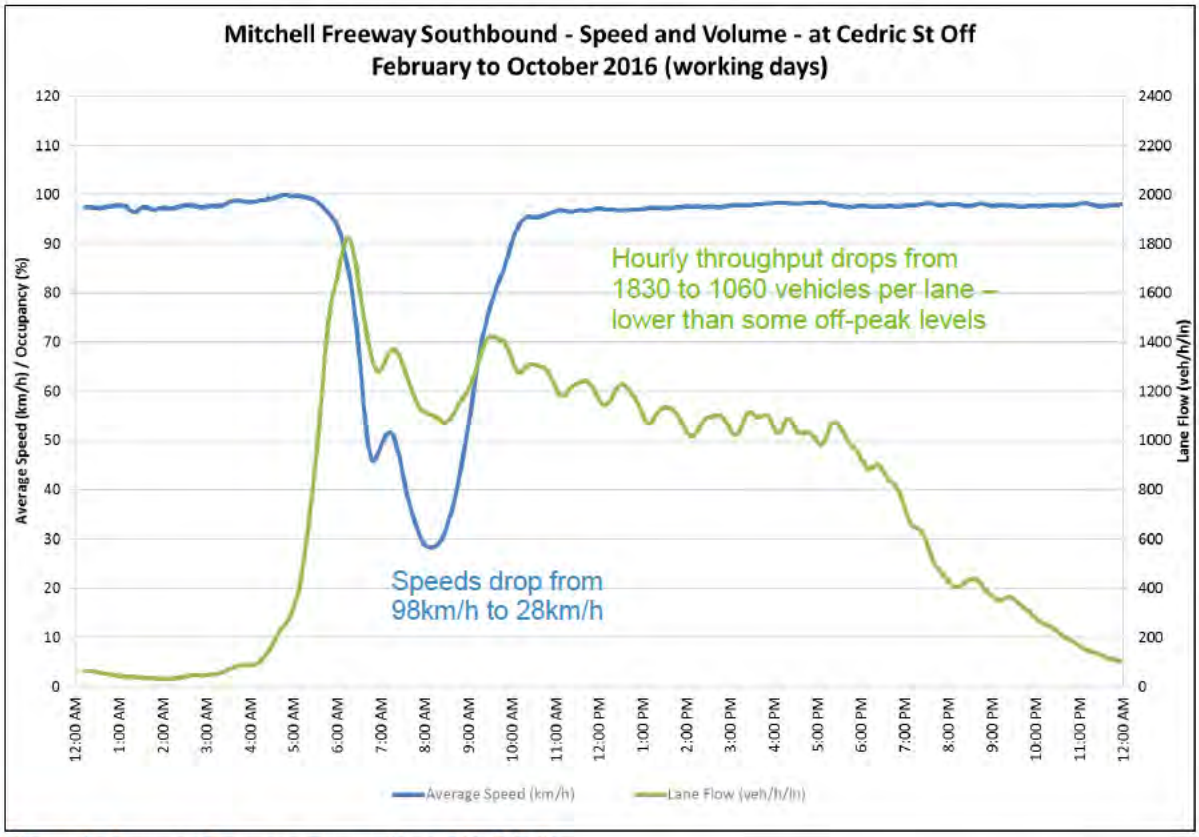


Figure 4 - Impact of recurrent congestion at Cedric St

Figure 4 shows the impact of recurrent congestion on freeway throughput, averaged across all work days between February and October 2016. The following paragraph explains the graph as part of a worked example.

At the start of the AM peak (circa 05.30am) average speed of traffic south of Erindale Road is still travelling at around 98km/h and traffic is flowing smoothly. Throughput has increased from low levels overnight, before peaking at around 1800 (veh/h/ln) around 06.10am. Insufficient capacity at the merge with the Cedric Street entry ramp causes the flow rate to fall around 40% to 1060 (veh/h/ln) and for speeds to fall to 28km/h. Vehicle throughput and speeds do not recover until after the AM peak, which represents a significant loss in productivity of this vital state asset.

Poor driver behaviour is also a contributing factor to the congestion problem. Frequent lane changing, driving too close to the car in front (often causing stop-start conditions) and not merging correctly are all impacting road capacity and increasing levels of congestion.

Current network conditions lead to a situation where there is an increased likelihood of congestion related crashes, whose impact on the network is amplified due to the unstable nature of the mainline traffic flow.

Crash Severity	2012-2016	%
Fatal	0	0%
Hospital	17	2.4%
Medical	147	20.8%
Physical Damage	543	76.8%

Table 2 – Recorded crash severity on the Mitchell Freeway southbound from 2012-2016

Crash Type	2012-2016	%
Rear End	518	73.3%
Sideswipe	125	17.7%
Right Angle	1	0.1%
Hit Object	16	2.3%
Other	47	6.6%

Table 3 – Recorded crash type on the Mitchell Freeway southbound from 2012-2016

Traffic Modelling – Speeds and Journey Times

To understand the nature of the problem into the future (with and without investment); traffic modelling has been undertaken to determine future corridor performance levels. The predicted land use used to underpin the 2021 traffic modelling is consistent with the state governments planning outlook and supported through consultation with local authorities. Traffic modelling has been supplemented by an extensive study of the current network and a review of the current levels of congestion and journey time reliability.

The table below highlights the modelled expected journey times from major interchanges on the freeway. Without any intervention on the southbound carriageway, travel times are predicted to become far longer.

Section	Scenario	Travel Speed (km/h)	Efficiency	Reliability	Productivity
Central (Reid Hwy – Vincent Street)	2015	55	41%	41%	41%
	2021 Do Nothing	55	41%	41%	41%
	2021 With Project	89	94%	94%	94%
Route Summary	2015	71	58%	65%	58%
	2021 Do Nothing	52	36%	36%	36%
	2021 With Project	69	60%	64%	60%

Table 4 - Traffic modelling of current and future years

Microsimulation traffic modelling was undertaken to further assess the Project's effect on journey times. The figure below highlights the impact of doing nothing by 2021, with travel times in the AM peak from Erindale Road to Vincent Street increasing by seven minutes compared to today. With the construction of the additional lane on Mitchell Freeway, traffic modelling predicts that journey times will be faster in 2021 than they are currently, an almost nine minute improvement on the do nothing case.

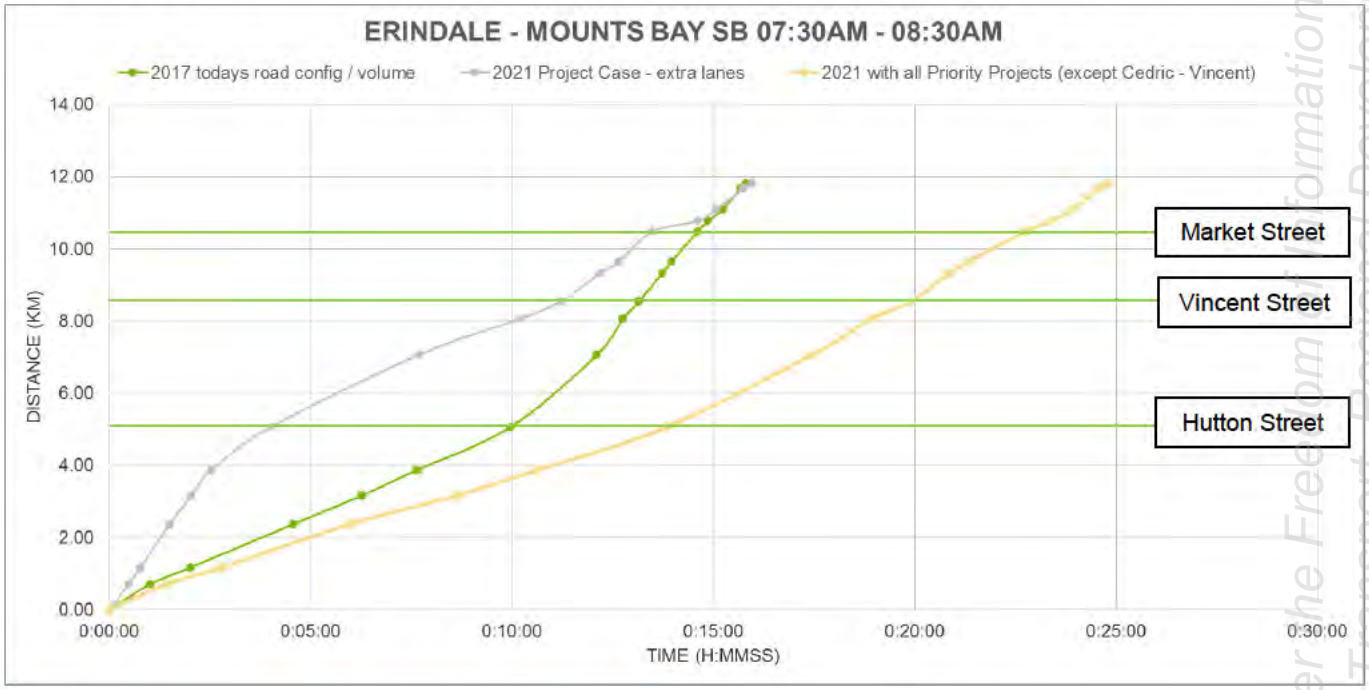


Figure 5 – Travel times based on microsimulation traffic modelling

Productivity

Perth's freeways should enable the expeditious movement of people and the distribution of goods and services to support Western Australia's economy. An inefficient, congested road network results in delay costs and poor reliability, which in turn reduces productivity. A freeway is productive when the optimum traffic flow (throughput) is at or near theoretical capacity and speed is maintained within 80% of the speed limit. Figure 6 highlights the unproductive length of the Mitchell Freeway in the morning peak period.

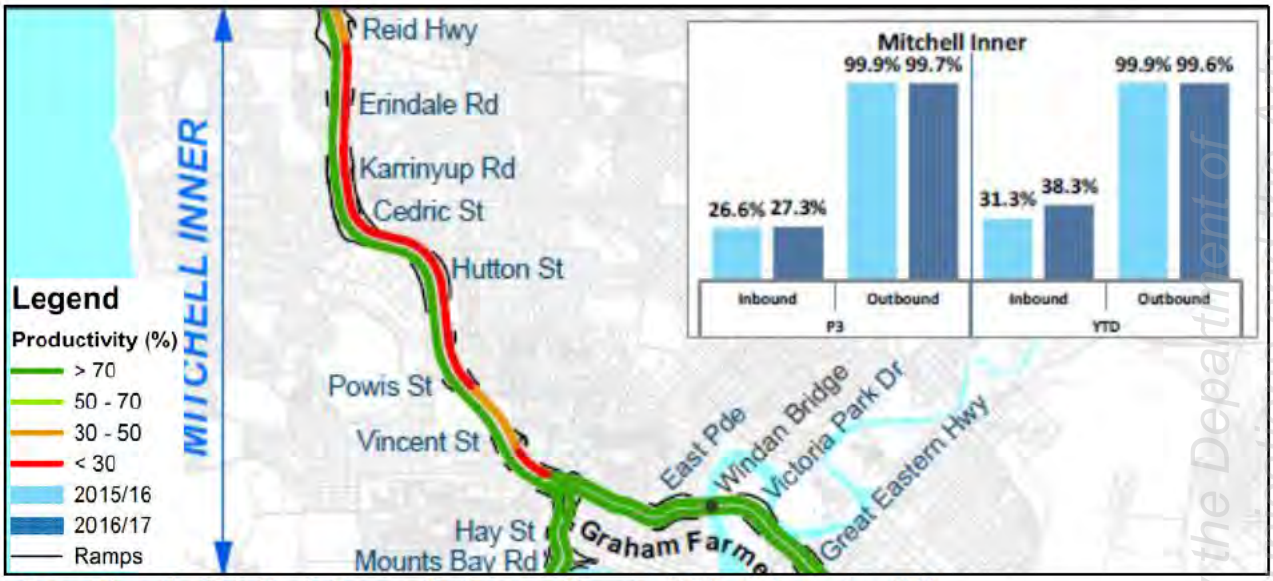


Figure 6 - Extract from the Main Roads Freeway Performance Report – AM Peak, September 2016

B.3 Performance Objectives and Intended Outcomes

The project is expected to significantly improve the productivity and efficiency of the Mitchell Freeway. Currently, the freeway is constrained by four lanes merging into three at Cedric and Hutton streets, creating a significant shockwave extending north to Erindale Road and south to Vincent Street during peak periods. The productive potential of the project is expected to increase throughput by up to 1800 additional vehicles per hour following completion of the works. This leads to significant time savings for all road users. In addition, a reduction in congestion also decreases the occurrence of rear end and sideswipe crashes.

The primary objectives of the project are as follows:

- Reduced congestion – reduced congestion, queuing and travel times for road users.
- Greater travel reliability – greater reliability of travel times and throughputs supporting the reliable movement of people and freight.
- Greater efficiency – greater efficiency of vehicle movements through improved infrastructure that better caters for demand.
- Improved safety – improvement in overall safety through the upgrade of the road infrastructure.

In undertaking the project, Main Roads will also seek to ensure that the project is consistent with longer term sustainable transport planning that enables efficient network operations to be maintained into the future whilst meeting more immediate needs;

- undertake the project in a safe and environmentally sensitive manner;
- minimise the financial cost to Main Roads while maximising the net benefit to the community;
- ensure minimisation and clear definition of Main Roads exposure to project risks; and
- complete the project in accordance with Main Roads requirements and standards.

B.4 Proposed Specific Transport Indicators

Proposed transport performance indicators available for comparative purposes following the completion of the project include:

- Traffic volumes and composition on Mitchell Freeway Southbound between Cedric Street and Vincent Street.
- Average journey times and variance in journey times on Mitchell Freeway Southbound between Cedric Street and Vincent Street.
- Reported crash history on Mitchell Freeway Southbound between Cedric Street and Vincent Street.

C. PROJECT APPROACH AND TIMING

C.1 Private Financing

The provision of an additional lane on Mitchell Freeway is not conducive to a private financing arrangement. Future consideration of innovative funding and financing models will be in line with State Government policy.

Private financing is not considered appropriate for this project as:

- The improvements along the Mitchell Freeway are on an existing state road which is used by the public and commercial vehicles, and thus the upgrade project provides improvements which are also a public good;
- Direct industry contributions or a heavy vehicle user-pays system would require wider implementation considerations and this would substantially delay the project; and
- The application of user charging is not current State government policy.

C.2 Procurement Method

This project will be procured by a Design and Construct contract. This delivery methodology will provide the best opportunity to obtain value for money for these works. Prequalification has been set at R4/B3 due to the complexity of working in a freeway environment and the structural work associated with PSP construction.

C.3 Critical Path and Timing

The proposed key milestones and critical path items for the project are outlined below.

Key Milestones	Target Date
Closing of EOI submissions	August 2017
Issue RFP	October 2017
Closing of RFP submissions	February 2018
Approve Preferred Proponent	March 2018
Execute contract	April 2018
Construction commence	Mid 2018
Construction complete	Late 2019
Defect period concludes	Late 2024

Table 5 – Proposed key milestones and dates

C.4 Assumptions

The key milestones and critical path items for the delivery of the Mitchell Freeway widening works are outlined in table above. Major risks to meeting project timeline milestones are outlined in Section E of this PPR.

Other Commonwealth and State Legislation triggers are outlined in section E2 of this PPR which includes requirements for environmental land offset and potential impact on Aboriginal heritage sites and non-indigenous heritage places.

The delivery of the project is not dependent on any other projects.

C.5 Payment Milestones

A Milestone Payment Schedule for the Project is currently being developed and will be forwarded once a construction schedule has been finalised. An indicative schedule is shown below.

Mitchell Freeway Southbound Widening – Cedric Street to Vincent Street

PAYMENT MILESTONE SCHEDULE

Payment Milestone No.	Description	Claim for Payement Date	Expenditure to meet milestone	Cumulative expenditure	Payment needed to cover expenditure to milestone			Payment to cover cash flow needed for next milestone			Total milestone payment			Cumulative total milestone payments			Year	Annual total	
					Total	Cwlth	State	Total	Cwlth	State	Total	Cwlth	State	Total	Cwlth	State		Cwlth	State
1	Contract Award	Apr-18	1.6	1.6	1.6	1.3	0.3	7.1	5.7	1.4	8.7	7.0	1.7	8.7	7.0	1.7	2017/18	7.0	1.7
2	Construction 25% complete	Aug-18	9.5	11.1	2.4	1.9	0.5	10.1	8.1	2.0	12.5	10.0	2.5	21.2	17.0	4.2			
3	Construction 50% complete	Jan-19	13.5	24.6	3.4	2.7	0.7	5.4	4.3	1.1	8.8	7.0	1.8	30.0	24.0	6.0			
4	Construction 75% complete	Apr-19	7.2	31.8	1.8	1.4	0.4	2.0	1.6	0.4	3.8	3.0	0.8	33.7	27.0	6.7	2018/19	20.0	5.0
5	Practical completion	Aug-19	2.6	34.4	0.7	0.5	0.1	0.9	0.7	0.2	1.6	1.3	0.3	35.3	28.3	7.1			
6	Post Completion Report	Apr-20	1.2	35.6	0.3	0.2	0.1	0.0	0.0	0.0	0.3	0.2	0.1	35.6	28.5	7.1	2019/20	1.5	0.4
7																			
8																			
	P50 Total		35.6		10.1	8.1	2.0	25.5	20.4	5.1	35.6	28.5	7.1					28.5	7.1
	Contingency		4.4		4.4	3.5	0.9				4.4	3.5	0.9					3.5	0.9
	Committed fund Total		40.0		14.5	11.6	2.9	25.5	20.4	5.1	40.0	32.0	8.0					32.0	8.0

D. FINANCIAL ANALYSIS

D.1 Budget Profile & Cash Flow

The Commonwealth and State Governments committed in May 2017 to invest $40m in the Mitchell Freeway widening project. The proposed funding profile and sources for the project are shown below and reflects the current competitive nature of the road construction market in Western Australia and the likelihood of the cost outcome at the P50 funding level. As contract award is estimated to occur in early 2018 the market is unlikely to change dramatically.

Note that the proposed funding listed below excludes PSP construction (funded separately by the State) and is based on the estimated milestone payments from C.5, not yearly expenditure.

Financial Year Cash Flow

	Financial Year	2017/18 $m	2018/19 $m	2019/20 $m	Total $m
	Committed Funding	5	24	11	40
P50 Estimated Outturn (or Actual as appropriate)	Commonwealth	7.0	20.0	1.5	28.5
	State	1.7	5.0	0.4	7.1
	Other contribution (provide detail)	-	-	-	-
	Total ($ million)	**8.7**	**25.0**	**1.9**	**35.6**

Table 6 – Proposed Financial Year Cash Flow

Project Phase Cash flow

		Development	Delivery	Total
	Approximate Dates	2016/17 – 2017/18	2018/19 onwards	
	Committed Funding	5	35	40
P50 Estimated Outturn (or Actual as appropriate)	Commonwealth	7.0	21.5	28.5
	State	1.7	5.4	7.1
	Other contribution (provide detail)	-	-	
	Total ($ million)	**8.7**	**26.9**	**35.6**

Table 7 – Project phase cash flow

D.2 Outturn Costs

A cost estimate has been produced (September 2017) for both a 50% probability of not being exceeded (P50) and a 90% probability of not being exceeded (P90).

The high level cost estimates for base cost and contingencies can be summarised as:

Component	P50	P90
Base Cost	$30.3m	$30.3m
Contingencies	$3.4m	$5.6m
Escalation, rise and fall	$1.6m	$1.8m
Sunk costs	$0.3m	$0.3m
Total	**$35.6m**	**$38.0m**

D.3&D.4 Approach to Cost Escalation/Escalation Rates

Escalation is defined as an additional allowance to cover for inflation of costs in future years up to contract award date. It has been calculated using rates provided from an independent estimator which are in line with Commonwealth practice.

D.5, D.6 & D7 Benefit Cost Analysis

A Benefit Cost Analysis (BCA) for the project was undertaken based on revised cost estimates prepared. The approach taken was consistent with the relevant project appraisal guidelines including the Austroads' Guide to Project Evaluation, Australian Transport Council's National Guidelines for Transport System Management and Infrastructure Australia's Reform and Investment Framework.

These results are summarised in the tables below, and showed that the project is economically viable, with a benefit cost ratio (BCR) of 9.13 based on a 30 year assessment period and 2017 cost estimate.

	Discount Rate		
Cost/Benefit ($m)	**4%**	**7%**	**10%**
Car: Private Use	**313.62**	**173.53**	**99.06**
Travel Time Savings	217.12	125.71	76.36
Vehicle Operating Costs	96.50	47.82	22.70
Car: Business Use	**113.85**	**64.47**	**38.03**
Travel Time Savings	96,55	55.90	33.96
Vehicle Operating Costs	17.30	8.57	4.07
Light Commercial Vehicles (Class 1-2)	**97.61**	**62.45**	**42.61**
Travel Time Savings	63.14	41.02	28.43
Vehicle Operating Costs	34.47	21.43	14.18
Heavy Commercial Vehicles (Class 3-12)	**101.68**	**64.63**	**43.80**
Travel Time Savings	49.76	31.67	21.50
Vehicle Operating Costs	51.92	32.95	22.30
Other Benefits	**20.96**	**10.11**	**4.55**
Crash	26.20	14.44	8.20
Environmental	-5.24	-4.33	-3.65
Total Benefits ($m)	**647.72**	**375.20**	**228.05**
Maintenance Cost	1.00	0.72	0.55
BCR	***15.77***	***9.13***	***5.55***

Table 8 – Benefit Cost Analysis

Results
Quantitative economic analysis has been undertaken using Main Roads' BCRatio module within the Strategic Regional Operations Model (ROM). The benefits analysis was based on a ROM 2021 network, and the latest 2016 and future land use projections were used to generate traffic demand. The BCR quoted is inclusive of capital and recurrent costs.

Vehicle Operating Costs
Induced travel demand is the increase in demand for travel that results from people changing their travel behaviour in response to improved transport services or infrastructure. Failure to account for the effects of induced travel demand can significantly underestimate traffic, and overestimate the economic benefit of the project.

While traditionally the effects of induced travel demand have not been able to be considered as part of the cost-benefit analysis of road projects, with the introduction of the ROM24 model Main Roads is now in a position to do so.

Crash
BCRatio utilises historical crash rates (per VKT) for a variety of road types currently in use to inform the results.

Environmental
Negative environmental benefits are not unexpected as the ROM24 model will attribute a cost per VKT for air pollution and greenhouse gasses. As there is a substantial increase in VKT due to the project's improvement to travel times, the environmental cost increases.

Sensitivity Tests

ROM24 takes into consideration induced demand (from change of route, destination, and mode) as a consequence of the project case. As it is a strategic network wide model, traffic using the improved freeway will result in traffic performance improvements on other routes, for example a reduction of vehicles 'rat running' through local roads, instead using a fit for purpose road network designed to cater to high volumes safely.

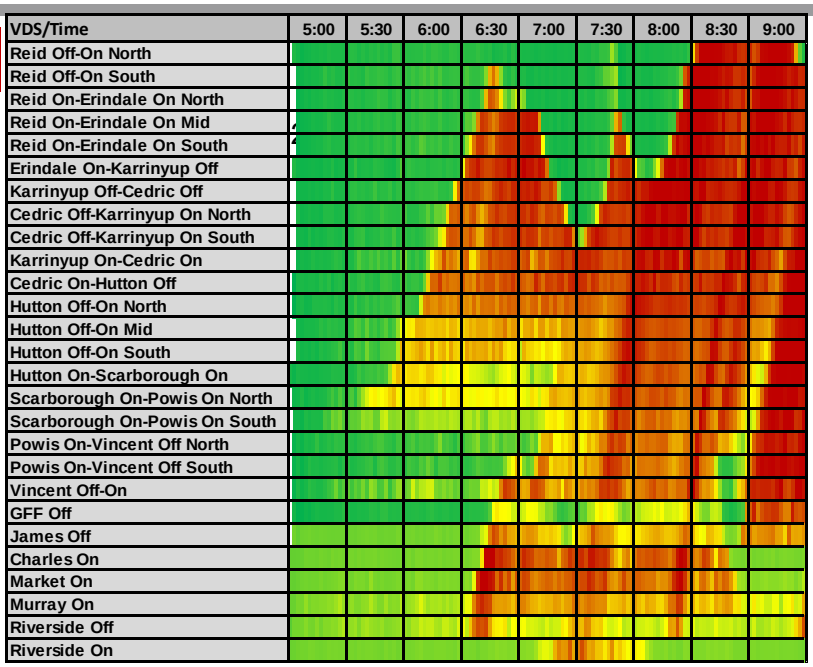
The BCR is assessed over a 30 year period, with funded projects up to the year 2021 included in the ROM24 strategic model. No projects have been included beyond this point as they are unfunded.

Sensitivity testing has been conducted with results below, however Main Roads is cautious in using these values as they contradict the method used by ROM24 and disregard ongoing network benefits.

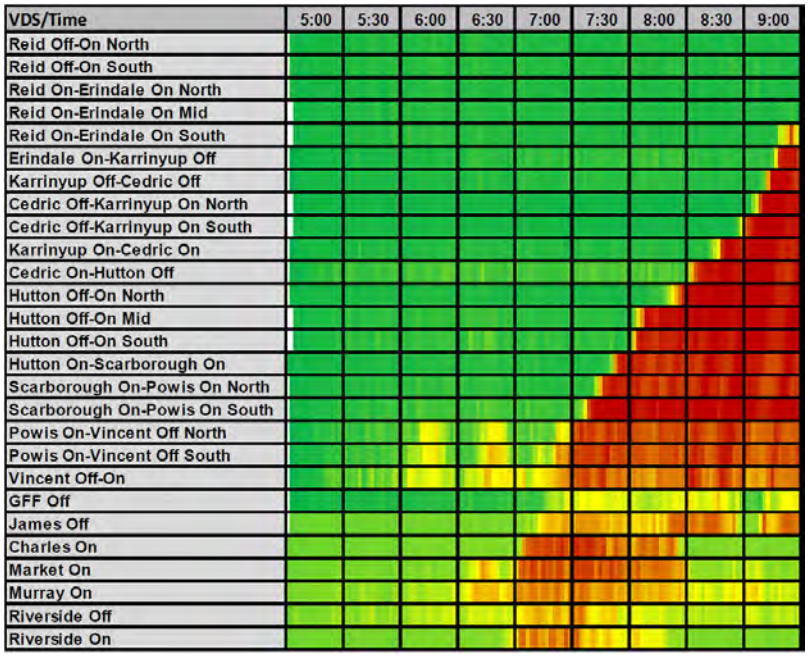
- Where the benefit stream ceased at year 10 resulted in a BCR of 1.3.
- Where the 30 year benefits are reduced by 30% and the costs to build and maintain the project increase by 30%, the BCR dropped from 9.1 to 4.8, highlighting that the project is still viable under these circumstances.

Recent micro simulation traffic modelling of travel speeds in 2031 showed travel speed improvements are maintained compared to the 2021 do nothing, with access to the CBD becoming constrained. The below compares 2021 to 2031 travel speeds on Mitchell Freeway (AM), with the introduction of the project. This is based on the assumption that no further investment is made on the freeway beyond the current committed projects. This is unlikely due to the current Transforming Perth's Freeways strategy identifying improvements to the CBD and Kwinana Freeway southbound as the next highest priorities by 2026 for which project development is underway.

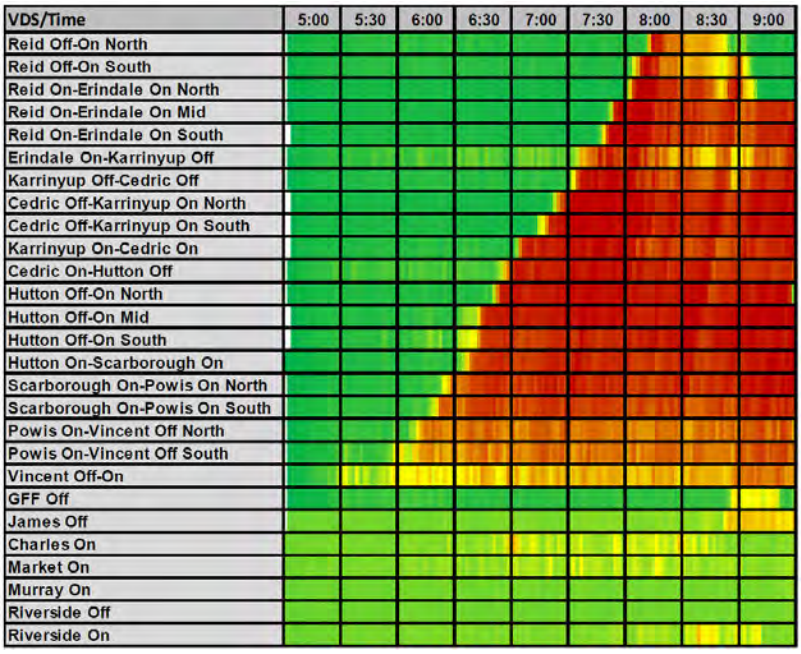
2021 – Do nothing



2021 – With Project



2031 – With Project



D7.1 Project Benefits

Benefit component		Present value of all benefits in $m	Year 10 only: Year 10 benefits in $m (10 years after construction completion)	Year 10 only: Year 10 benefits as a percentage of total benefits	Underlying Physical Quantity: eg actual time savings in hours, total vehicle kms travelled, number of accidents/fatalities/injuries avoided, etc
Travel time savings	Passenger Vehicles	181.61	6.19		640k vehicle hours for passenger vehicles saved over 10 years at a value of approximately $31.22/hr/veh
	HCV	72.70	2.85		480k vehicle hours for HCV saved over 10 years at a value of approximately $49.12/hr/veh
	Total travel time savings	254.31	9.04	71%	
Reduced vehicle operating costs	Passenger Vehicles	56.39	1.44		
	HCV	54.38	2.07		
	Total user benefits	110.77	3.51	27%	
Generated travel benefits	Passenger Vehicles				
	HCV				
	Total road user benefits				
Accident reductions	*Total accident reduction benefits*	14.44	0.46	4%	Removal of two short lane merges reduces weaving and stop start conditions and subsequent crashes
Environmental benefits	Passenger Vehicles				
	HCV				
	Reduced Noise				
	Total environmental benefits	-4.32	-0.21	-1%	See previous page
Reduced maintenance costs	*Reduced maintenance costs*	-0.72	-0.03	< -1%	Approx. 7 lane kilometres of additional pavement requires maintenance
TOTAL STANDARD BENEFITS	***Total standard benefits***	374.45	12.77	100.00%	
Wider economic benefits (WEB)	Agglomeration benefits				
	Other wider economic benefits				
	Total wider economic benefits				
Other benefits	*Other benefits*				

D.8 – D.11 Options Evaluation

Decision Criteria

The criteria used to assess the options and select the preferred alternative are outlined in the table below.

Decision Criteria	Relative Importance
Reduces congestion, queuing and travel time	Long delays and congestion are currently experienced along this section of the Freeway. Project options should improve the overall flow of traffic when traversing, entering, or exiting the Freeway. The project should provide capacity to meet the short and medium term traffic demand, resulting in an acceptable level of service in the peak traffic periods.
Improves productivity and efficiency of Mitchell Freeway within the existing freeway constraints	The Mitchell Freeway is the major arterial route to service the northern suburbs of Perth. The project option should ensure effective utilisation of the road asset to foster economic development through increased speed and flow, whilst constrained within the existing freeway road reserves.
Improves overall safety for road users	There is a high crash rate along this section of the Freeway, an issue which this project should take all reasonable steps to address.
Provides greatest economic benefit	Value for money: In addition to being a technical endeavour, the roadworks are an investment and should provide project stakeholders with value-for-money outcomes. At a minimum, the preferred project option should return benefits that exceed cost. Ideally, the chosen option should also maximise economic benefits, relative to competing alternatives.

Table 9 – Decision Criteria

In addition to the decision criteria it was necessary to include measures to assess the practicality and 'deliverability' of each option. These can be found in the table below and act as constraints on the decision making.

Deliverability criteria	Required performance
Addresses urgency of the problem by providing substantial benefits within the short-medium term	Substantial benefits must be provided within 2-3 years of the investment decision to preserve the reputation of the project.
Minimises impact on the surrounding environment	Construction footprint to limit as close as possible to the current road reserve
Project has necessary stakeholder support to proceed	Key stakeholders are either supportive or neutral in their views on the project
Uses well established techniques that have a very high probability of achieving benefits	Introduction of new management techniques for must be supported by strong evidence
Able to be operated successfully from opening	Main Roads must have or develop capability for any new management techniques.

Table 10 – Decision criteria based on successful project delivery

Options Generation

Following the establishment of decision criteria previously outlined, the generation of options was undertaken in two phases: strategic responses and project options.

Strategic responses – demand management

Demand management responses seek to address the problem by changing the patterns of demand, such as through changing the route of travel, mode of travel, time of travel or the destination of travel. One significant challenge for demand management responses is that in order to achieve satisfactory performance across the corridor in question, the peak period traffic demand for the freeway needs to be reduced to off peak period levels.

There is already well patronised, high-quality public transport in this corridor, meaning that some effective demand management is already in place. Additionally, the timing of entry ramp volumes indicates that people have already shifted travel from the middle of the peak to far earlier i.e. 06.00-06.30.

Although changes to land use allows for some further demand management, the effects of this are most evident in the longer term and hence would not satisfy the need to provide relief within a shorter period from the investment decision (2-3 years).

- Response Option 1 – Increase vehicle occupancy

To achieve this short term improvement demand management will be further considered in the project options through inclusion of an option benefiting high occupancy vehicles (HOV). Due to the commuting composition of road users, a HOV strategy is designed to entice road users to consider more efficient vehicle occupancy through incentives such as faster travel time enabled by a dedicated lane.

- Response Option 2 – Alternative route choice/demand

The alternative parallel routes in this area are well maintained distributor roads which experience high demand in peak periods as they pass through strategic centres. The required substantial reduction of demand would be very difficult to achieve without resorting to aggressive measures including pricing or vehicle restrictions such as time of day or specific limits such as the “odds & evens” schemes that restrict licence plates on certain days.

Strategic responses – supply management

The current cause of the congestion in the investigation area is primarily linked to high volumes of traffic entering the freeway network and lane merges creating capacity constraints that can’t be recovered from within peak periods.

- Response Option 3 – Redistribute capacity

The first strategic supply management response to be considered targets reducing the entering volume the freeway, allowing the redistribution of the available capacity to traffic already on the Mitchell Freeway. The extent of the required reduction would be dramatic; e.g. from the current >1000 veh/h down to less than 600 veh/h at Cedric Street. Achieving this through demand management would require highly aggressive measures. This means that reducing the volume entering from Erindale Road, Karrinyup Road, Cedric Street and Hutton Street would require physical restrictions. The expected result would be current delays experienced on the Mitchell Freeway would be shifted onto the already congested parallel arterial roads and therefore this response would not achieve the objective service targets.

- Response Option 4 – Increase freeway capacity between Cedric Street and Vincent Street

The requirement to minimise impacts on the environment means that this additional capacity would need to come through adding to the existing road pavement within the current road reserve. The volumes on the existing lanes south of Vincent Street are already reasonably efficient across four lanes; the main delays and lost productivity occurs south of Erindale Road.

Options Analysis

A multi criteria assessment (MCA) of potential options and their impact against economic, social and environmental considerations was undertaken and is summarised in the table below.

The factors considered were:

- economic - whether an option supports expected growth and improves freight efficiency.
- social - whether an option improves safety for vehicles and local residents.
- environmental – whether an option minimises negative impacts of traffic growth on the local community and environment.

Capital and operational considerations were also a factor but were not quantitatively assessed for options other than the preferred approach. However, both asset and non-asset options were considered and a short list prepared with reference to the performance of each option against the set criteria.

	Supports expected growth and improves freight efficiency	Safety increased for vehicles and local residents	Negative impacts of traffic growth on local community and environment minimised	Short Term Achievability	Consider (Yes or No)
Increase vehicle occupancy	Low	Low	Low	High	No
Alternative route choice/demand	Low	Low	Low	Low	No
Redistribute capacity	Low	High	Low	Low	No
Increase freeway capacity	High	High	High	High	Yes

Table 11 – Assessment of potential options based on likelihood

A short list was prepared with reference to the performance of each option against the set criteria. One option emerged from that assessment for further consideration, being investment in road expansion.

Preferred Option - Investment in Road Expansion

This option examines capital investment in the Mitchell Freeway to expand the capacity of the existing road in the northern suburbs of Perth between Cedric Street and Vincent Street and address safety issues. The option involves:

Option	Description	Longevity
Base Case	Do Nothing	Failing at current volumes
Option 1	4km road widening from Hutton Street to Vincent Street	Only addresses current traffic volumes from Hutton Street, south.
Option 2	Option 1 + 3km additional road widening from Cedric Street to Hutton Street	Addresses the current congestion and allows for future growth
Option 3	Option 2 + additional road widening through the CBD to provide three continuous lanes	Addresses the current congestion and allows for long term growth.

Table 12 – Option Detail

Decision Matrix

The decision matrix below compares the performance of each shortlisted option against the decision criteria and drives the selection of the preferred option.

Decision Criteria	Base Case	Option 1	Recommended (Option 2)	Option 3
Reduce congestion, queuing and travel time	No	Partial	Yes	Yes
Improves productivity and efficiency of Mitchell Freeway within the existing freeway constraints	No	Partial	Yes	Yes
Improves overall safety for road users	No	Yes	Yes	Yes
Provides greatest economic benefit	No	Yes	Yes	No
Addresses urgency of the problem by starting to provide substantial benefits within the short-medium term	No	Partial	Yes	Yes
Minimises impact on the surrounding environment	Yes	Mostly	Mostly	Mostly
Project has necessary stakeholder support to proceed	n/a	Yes	Yes	Yes
Uses well established techniques that have a very high probability of achieving benefits	n/a	Yes	Yes	Mostly
Able to be operated successfully from opening	n/a	Yes	Yes	Mostly
Outcome	**Rejected**	**Non Preferred**	**Recommended**	**Non Preferred**

Table 13 – Decision matrix for shortlisted options

The strong performance of all options in the decision matrix reflects that the shortlisting process has already excluded alternatives that do not meet the decision criteria.

Comparison of Options

Option 1 provides substantial congestion mitigation within the assessment period, including a significant travel time saving by 2021 compared to the no investment case. However, it does not address all areas of congestion, with traffic flow breakdown and the associated loss of efficiency and throughput continuing to occur between Erindale Road and Cedric Street.

Option 2 builds upon the benefits of Option 1 by addressing this area of congestion, providing further travel time savings. Commuter efficiency gains are maintained over a longer time horizon due to the additional lane capacity. The incremental investment required for Option 2 is small, and cost savings by removing the need to mobilise construction crews twice are substantial, contributing to Option 2 having a much stronger BCR than Option 1 in isolation.

Option 3 improves the corridor performance through the project's expanded geographical extent. Benefits are realised by catering for future growth in the northern suburbs of Perth and the improved movement into the CBD. The extended widening is a longer term solution, contingent on further works south of the CBD to remove bottlenecks. The large scale investment for Option 3 however, performs lower in areas of the deliverability criteria due to the high additional costs and potential to use new technologies. Although the corridor is estimated to experience significant growth in the medium-long term, the additional lane capacity through the CBD is best deferred until after project opening to provide the opportunity to further analysis the corridor performance and new Smart Freeways technology.

Following the assessment of the three options against the decision criteria the recommended option is Option 2.

Economic Comparison

High level cost estimates have been undertaken for option 1 and 3 and were not deemed suitable for further economic assessment as their constraints and longevity where identified as clearly lower than the preferred option. Traffic modelling was undertaken which supports this decision.

Option 1 does not adequately address today's problem, which would not be supported. Option 3 is a complex solution, which high level cost estimates place the project at over $250m. Due to significant structural interfaces it would require extensive investigations to produce a more detailed assessment and would not be cost effective to undertake this to achieve the objectives of the project. Another factor is the achievability of scheduling such significant works on the freeway and the increased disruption to motorists.

E. RISK AND GOVERNANCE

E.1 Project Risk

Risk management has been integral to the planning and development of the project, with identified risks and mitigation strategies updated at regular intervals. The risk management for the project has been able to draw upon the extensive risk management and development works undertaken for previous freeway widening, whilst recognising the nuances of implementing in the Mitchell Freeway southern corridor.

A formal Develop Phase risk workshop was held in June 2017. During this forum key discipline leads from across the organisation (project team, maintenance, road safety, asset management and civil specialists) were brought together to identify the key project risks against the following key areas:

- Project Management;
- Funding and Procurement;
- Capabilities;
- Safety, Health and Wellbeing;
- Stakeholder;
- Environment;
- Heritage;
- Legal and Regulatory;
- Quality;
- Maintenance / Asset management;
- Construction;
- Civil Design;
- Traffic management and data;
- Pavement / Geotech;

The output from the risk workshop was used to formalise the risk register and create a baselined document that has been central to the project's effective management of risk throughout the Develop Phase. The risk register which includes ongoing and future risk mitigation strategies will be a vital tool in ensuring an effective management of the Deliver Phase of the project. Future risk workshops are planned to continue to identify, refine and manage new risks.

A summary of the key solution and delivery risks are outlined along with the required mitigation strategies.

The core areas of delivery and stakeholder risk surround the following key topics:

- Construction impacts;
- Deliverability;

The table overleaf provides an outline of the key mitigation strategies in place in order to manage residual risk levels down to acceptable levels (further detail is available in Appendix 3).

Potential Risk	Mitigation Strategies
Delivery Risks	
Scope creep occurs after procurement commences.	• Make provision in the procurement documentation to include subsequent scope items. • Seek to define and commit to scope prior to going to RFP.
Information available to prospective tenderers is incomplete.	• Identify likely information gaps and needs. • Ensure identified information gaps are filled prior to going to RFP. • Develop supporting strategies so that information can be provided in a timely way to minimise impacts for tender assessment and award.
Stakeholder Risks	
Broader community and local residents are not aware with clearing of vegetation and other impacts	• Prepare and adopt Stakeholder Management Plan. • Establish sound web based information. • Advise directly affected residents of planned noise monitoring at noise logger installation points. • Advise affected Local Government Authorities of planned works in advance of procurement. • Arrange for first community Newsletter distribution to occur early to inform and educate. • Establish communications protocols for adoption throughout the project life.
Construction impacts for road users	• Identify Network Operations requirements for lane closures and network operational matters for inclusion in procurement documentation. • Include and heavily weight Contractor competency and capability in the EOI assessment process. • Clearly define communications requirements for contractors throughout construction.

Potential Risk	Mitigation Strategies
Consultation with service agencies is protracted with unreasonable expectations.	• Meet with and continue to liaise with agencies throughout the project life. • Involve agencies in key design, safety in design and access decisions. • Ensure contractor has all appropriate working accreditations. • Ensure contractor provides a Rail Safety Plan for approval by PTA and Office of Rail Safety prior to commencing works • Require contractor to nominate their Rail Safety Manager at EOI stage. • Seek early advice from agencies on potentially affected infrastructure - communications, drainage, barriers and signalling, etc. • Establish agreed requirements with agencies for the use of appropriate traffic management devices. • Seek urgent advice from agencies with regard to current policy requirements for rail protection.
Industry capacity is lacking to deliver with concurrent works running	• Include weighted criteria to reflect the need for a highly skilled and experience workforce in a high traffic/operating passenger rail setting. • Make provision for Main Roads site supervision capability and Surveillance Officers. • Conduct tenderer information session and highlight the critical need for a highly skilled team and explaining the construction context. • Confirm availability of the proposed construction team at the time of RFP with significant weighting.
Customer expectations are not met	• Prepare and proactively adopt a Stakeholder Engagement Plan with dedicated resources by Main Roads and Contractor. • Include messaging of planned wider network improvements and initiatives.

Table 14 – Key risk mitigation strategies

E.2 Environmental or Cultural Legislation

The construction and project development works will be conducted in accordance with environmental approvals and associated conditions issued by any relevant Authority (Local, State and Commonwealth). Main Roads has conducted an environmental impact assessment of the project. This determined that the entire project area had been previously disturbed and all vegetation within the project area had been planted by Main Roads as part of earlier freeway construction works. The most significant environmental impacts of the project were determined to be traffic noise post-construction, potentially intercepting contaminated materials during construction and the loss of amenity from clearing landscaped vegetation. All of these are manageable and do not require permits or approvals.

A heritage assessment was conducted for the project. This determined that there are no known or suspected sites of Aboriginal significance within the project area.

E.3 Sustainability Strategies

Main Roads has embedded sustainability in all their activities to seek economic, social and environmental benefits and operate a sustainable road transport system in partnership with others. Where practicable, the project will be compliant with Main Roads standards and guidelines for sustainable practices.

Sustainability initiatives are to be incorporated in the construction contract to ensure longevity of the project and to create positive benefits for all stakeholders.

E.4 Tender Exemption

A tender exemption is not being sought for this project.

E.5 Public and Stakeholder Participation

Engagement with stakeholders is being guided by communications and stakeholder engagement activities that create awareness and provide opportunities for stakeholders to influence project outcomes. As the project develops, stakeholder and community opinion may influence key project design and construction decisions related to road design, noise and other environmental considerations, access, landscaping, way finding, pedestrian and cyclist amenity and project aesthetics.

Key project engagement objectives are to:

- Inform/update stakeholders about the project including program timeframe, engagement opportunities and project scope.
- Identify issues or impediments to the project.
- Exchange information about the project with stakeholders, detail who will be impacted, where and when and potential impacts on the residents, property owners, road users and other stakeholders.
- Drive stakeholders to the project website for project updates.
- Identify, record and action concerns and preferences about the freeway widening.
- Use concerns and preferences to identify appropriate actions that can be implemented to assist with the project and minimise impacts.
- Use concerns and preferences to inform targeted communications for stakeholders.
- Identify/update project stakeholder details.

A stakeholder engagement plan will be produced by the Contractor during the delivery stage of the Mitchell Freeway – Southbound Widening (Cedric Street to Vincent Street) project and will complement the activities implemented as part of the project development Community and Stakeholder Engagement Plan.

The Community and Stakeholder Engagement Plan is currently being implemented. The following table summarises the activities underway or planned during the project development and early delivery phase of the project.

Activity	Objective / issues	Target date
Direct mail (Proactive)	• Description of works • What, when, why • Noise monitoring assessments • Develop stakeholder contact list • Reference – Stakeholder Reference Group • Arrange face to face if required • Call to action to register details for project stakeholder list for future email alerts	During EOI
Phone or email (Reactive)	• In response to issues raised, questions asked or project preferences • Stakeholder Reference Group	At all times
Face to face (meetings, one to one discussions) (Proactive)	• Identify and action any issues • Provide advice related to works and impacts • City of Stirling and Town of Vincent – executive and elected members	As required
Ministerial media statement (Proactive)	• Project overview • Project progress • Significant milestones – EOI, RFP, Contract award	Announcing EOI Announcing RFP Award of Contract Milestone announcements
Briefings (Proactive and reactive)	• Project overview • Project context • Partial land acquisition • Community and stakeholder information sessions	In response to project overview direct mail and be invitation / request September to December 2017
Stakeholder Construction Reference Group (Proactive)	• Inform project team regarding project issues affecting stakeholders • Identify project preferences and develop delivery items for construction	Pre-Request for Proposal period December 2017
Briefing note (Proactive and reactive)	• Project status • Project issues • Project engagement • Requirements for land acquisition	As required
Project update (Proactive)	• Detail project progress and timeframes • Project context and key benefits	As required
Website (Main Roads external project page and Transforming Perth freeways website)	• Project overview • Community benefits • Project program	Key milestones As required
CIC update email (Proactive)	• Project overview • Project work program	As required
Traffic Operations Centre information update (Proactive)	• Aligned to delivery impacts and potential clashes with other projects	As required

Table 15 – Communications plan outline

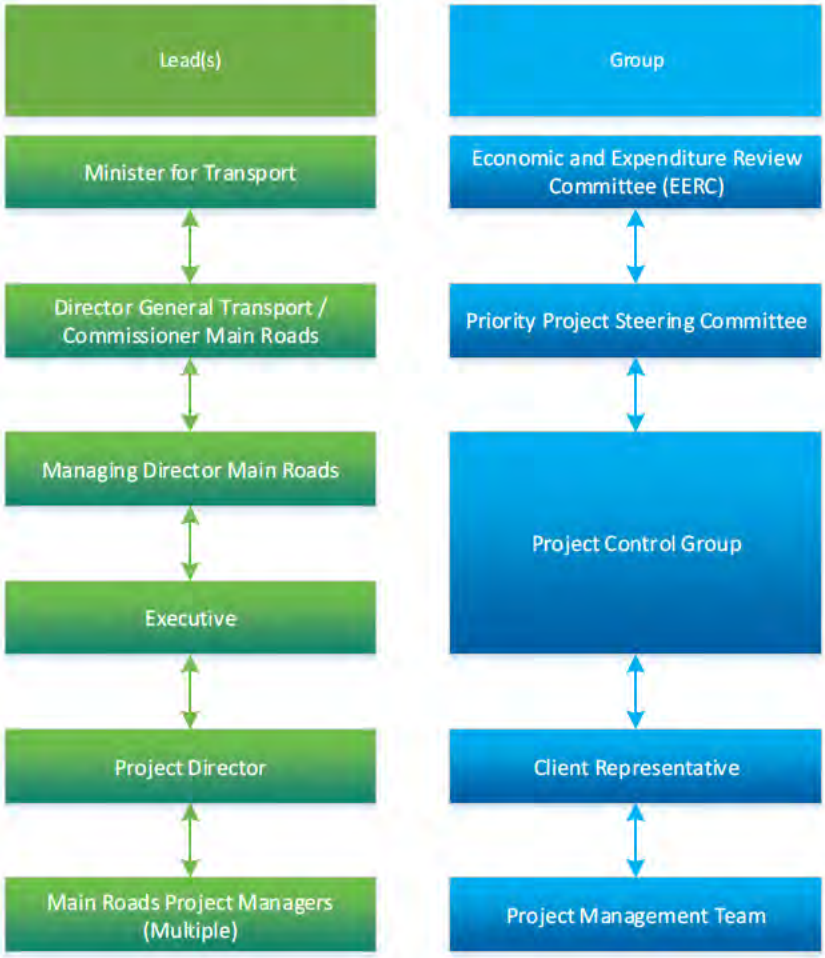
E.6 Public Recognition Signage Plan

A Public Recognition Signage Plan will be prepared in accordance with the applicable guidelines and will be forwarded to the Department of Infrastructure and Regional Development for approval.

E.7 Governance

E7.1 Governance Structure

The project governance structure moving forward into the delivery phase is designed to ensure that the appropriate decision making authority for the project is aligned with the contract model. The revised structure is shown below.



E7.2 Project Governance

A Priority Project Steering Committee is proposed to oversee the construction of the $2.3b package of road and rail projects announced in May 2017. The group comprises representatives from:

- Managing Directors office
- Strategy & Communications
- Infrastructure Delivery
- Planning & Technical Services
- Maintenance
- Finance
- Network Operations

A Project Control Group is proposed to underpin the Priority Project Steering Committee.

The role of the Project Control Group is to:

- Provide oversight of the delivery of the Project to the highest standards of project governance;
- Ensure the achievement of Project outcomes, objectives and functional requirements consistent with the Planning study;
- Provide executive leadership and support from the respective members in order to achieve the level of cooperation required for the successful completion of the Project;
- Ensure delivery of the Project is in accordance with the approved budget, timeframe, quality and safety standards;
- Endorse and make recommendations to Government on all relevant project matters including significant variations in scope, cost or time; and
- Provide strategic advice and direction to the project team via the Project Director.

To facilitate successful delivery of the project the specific project governance structure will be documented in the Project Management Plan. Below is a typical structure for Design & Construct projects.

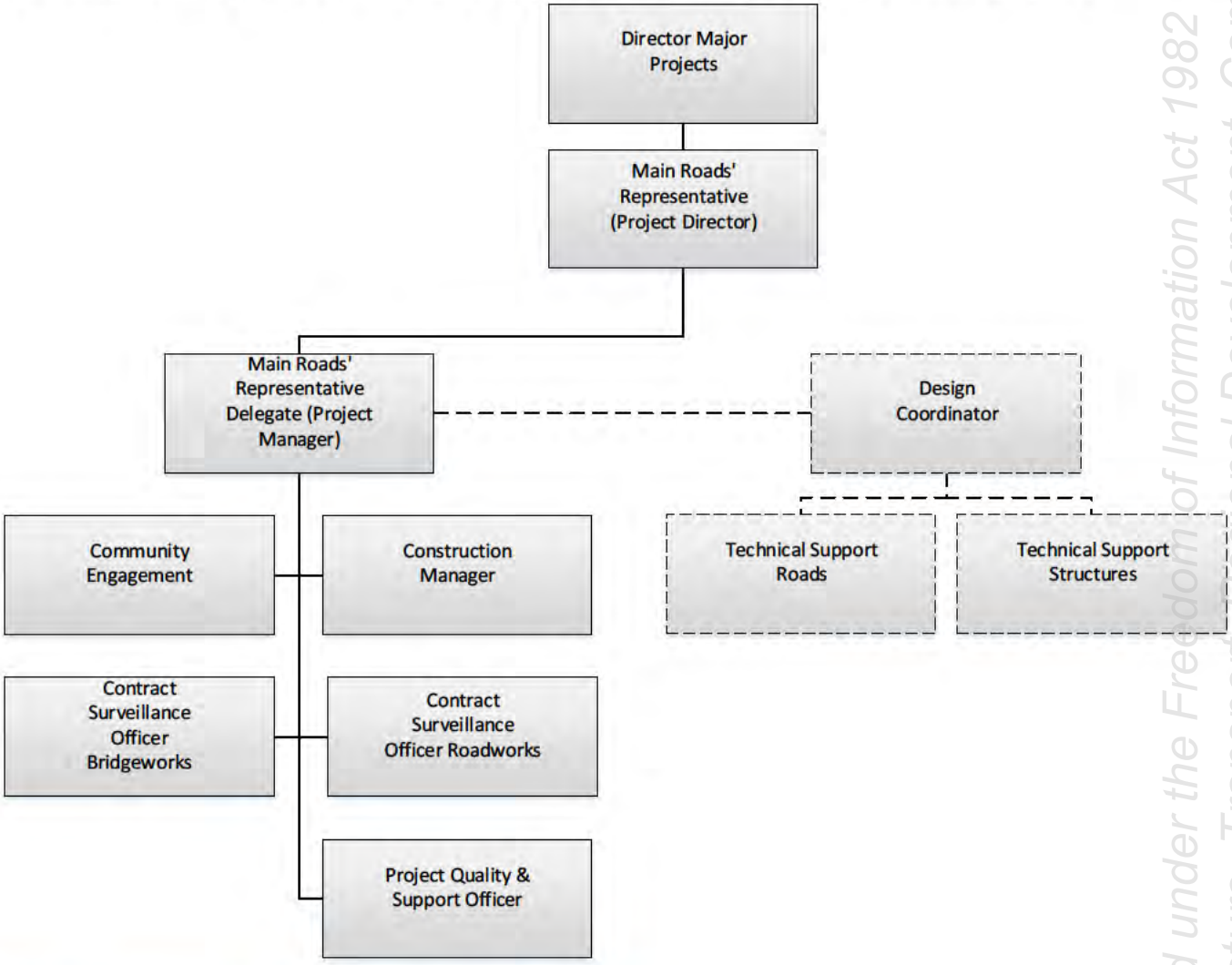


Figure 7 – Typical delivery structure for Design & Construct projects

F. COMPLIANCE (F1 TO F3)

The Australian Jobs Act 2013, Building Code 2013 and the Australian Government Building and Construction Occupational Health and Safety Accreditation Scheme apply to this project.

All requirements as set out in the Australian Jobs Act 2013, Building Code 2013 and the Australian Government Building and Construction Occupational Health and Safety Accreditation Scheme will be met. The Industry Participation Plan will be prepared and made available to the Department of Infrastructure and Regional Development if required.

G. SUPPORTING DATA

Data has been supplied through the proposal and in the appendices where required.

APPENDIX 1: PROJECT ESTIMATE

mainroads WESTERN AUSTRALIA

Metro Region

PROJECT ESTIMATE SUMMARY REPORT

Project Number: TBA

File Number: TBA

Delivery Phase
Detailed Estimate

Estimate No. 1
Revision No. 2

Estimate Date: 21/09/2017

Design & Construct

for

MITCHELL FREEWAY SOUTHBOUND
CEDRIC ST TO VINCENT ST

Template Trim Ref D17#58219

Template Rev 3 Jan 2017

Estimate No.: 1 - Revision No.: 2		Estimate Date:	21/09/2017
Delivery Phase - Detailed Estimate		Print Date:	11/12/2017
MITCHELL FREEWAY SOUTHBOUND			
CEDRIC ST TO VINCENT ST		Project Number:	TBA
Metro Region		File Number:	TBA

ESTIMATE CERTIFICATION (Greater than $10million)

Estimator:

s22(1)(a)(ii) Date: 6 November 2017

Name and Position Title

Certifier:

s22(1)(a)(ii) Date: 6 November 2017

Name and Position Title

Peer Reviewer / Parallel Estimator:

Date:

Name and Position Title

Recommended:

Date:

Project Manager/Project Director/Regional Manager

Endorsed:

Date:

Estimates Manager

Reviewed:

Date:

Manager Project Programming

Approved:

Date:

Executive Director

Estimate No.: 1 - Revision No.: 2		Estimate Date:	21/09/2017
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MITCHELL FREEWAY SOUTHBOUND			
CEDRIC ST TO VINCENT ST		Project Number:	TBA
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PROJECT SCOPE & DELIVERABLES

The proposed roadworks comprise the following components:

- Site Clearance ;
- Box out and removal of approaximately 26,000m3 of unsuitable material
- Construct additional running lane and re-construct emergency lane
- Preparation and sealing of all running lanes over length of widening
- Construct approximately 8Km of cast insitu concrete barrier
- Associated Signs, Line markings and Electrical works

Estimate No.: 1 - Revision No.: 2 — Estimate Date: 21/09/2017
Delivery Phase - Detailed Estimate — Print Date: 11/12/2017
MITCHELL FREEWAY SOUTHBOUND
CEDRIC ST TO VINCENT ST — Project Number: TBA
Metro Region — File Number: TBA

PROJECT COST ESTIMATE SUMMARY
(Probabilistic Risk Approach)

Description		Base Estimate ($)		P50		P90
Contactor's Costs						
Preliminaries		$ 2,916,355				
Traffic Management		$ 1,654,008				
Series 300 Earthworks		$ 2,013,969				
Series 400 Drainage		$ 209,882				
Series 500 Pavements		$ 10,411,661				
Series 600 Traffic Facilities		$ 3,317,527				
Series 700 Electrical & Lighting		$ 1,253,716				
Series 900 Miscellaneous		$ 2,390,274				
Provisional Sums - Service Relocations		$ 2,418,269				
Design		$ 1,567,762				
		$ -				
		$ -				
		$ -				
Subtotal (Construction Costs)		**$ 28,153,423**				
Add for Contractors Margin and Overheads		incl				
Subtotal (Construction Costs plus OH&P)		**$ 28,153,423**				
Client Management Estimated Costs						
Client Planning Design and Documentation		$ 295,200				
Client Contract Management	2.50%	$ 703,836				
Client Project Management	2.50%	$ 703,836				
Principal Controlled Insurances	1.50%	$ 422,301				
Site Investigation & Project Studies (inc geotech)		$ -				
Ethnographic Surveys & Clearances		$ -				
Land Costs		$ -				
Environmental Offsets (EXCLUDED)		$ -				
Other		$ -				
Subtotal (Owners Cost)		**$ 2,125,172**				
Base Estimate (Construction Costs + Owners Costs)		**$ 30,278,595**				
Contingency				**P50**		**P90**
Total Risk			11.17%	$ 3,382,119	18.60%	$ 5,631,819
Base Estimate + Contingency				**$ 33,660,715**		**$ 35,910,414**
Escalation						
Escalation to Contract Completion	5.03%			$ 1,691,753		$ 1,804,821
TOTAL OUTTURN COSTS (EXCL GST)				**$ 35,352,468**		**$ 37,715,235**
Sunk Costs		$ 286,146		$ 286,146		$ 286,146
TOTAL OUTTURN COSTS PLUS SUNK COSTS (EXCL GST)		**$AUD Millions**		**$35m**		**$38m**
PREDICTED CONTRACTORS TENDER SUM		**$32.77m**				

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File Number: TBA

TABLE 1

BENCHMARKING OF CONSTRUCTION COSTS INCLUDING PRELIMINARIES - REQUIRED FOR PROJECT COST BREAKDOWN REPORTING

Ref	Work Breakdown Area	Unit	Quantity	Rate	Total Cost (Incl Contractor's OH&P)	Description
1	Environmental Works				$0	**Cost** includes: Temporary and permanent environmental works including maintenance; Temporary and permanent noise barriers; Provision of fauna habitats; Property adjustment works.
2	Traffic Management and Temporary Works				$1,880,993	**Cost** includes: Temporary traffic management measures; Temporary bypasses or diversions; Temporary works (based on work method assumptions).
3	Public Utilities Adjustments				$0	**Cost** includes: Temporary or permanent diversion; Relocation or protection of public utilities; Relocation of major public utility infrastructure.
4	Bulk Earthworks	m^3	54,382	$42.12	$2,290,353	**Quantity** includes: Excavated material, including excavation in rock; Cut to fill; Cut & dispose etc; Fill imported from offsite. **Cost** includes all earthworks activities required for the formation of the required lines and levels of the new works.
5	Retaining Walls	m^2	5,120	$529.67	$2,711,931	Includes all types of retaining walls. **Quantity** - face area from the top of the wall foundation to the top of the wall. **Cost** includes detailed excavation (including spoil disposal) and backfill.
6	Drainage				$238,685	**Cost** includes: Kerbs & gutters; Excavation & backfill; Pollutant traps & treatment facilities; Removal and making safe redundent drainage.
7	Bridges	m^2		$0.00	$0	**Quantity** - deck area of bridge structure, between outer edges of bridge. **Cost** - all bridge construction activities including: Excavation; Foundations; Abutments; Barriers, handrails, walkways; Drainage; Surface finishing.
8	Tunnels	lane km	0.00	$0.00	$0	**Quantity** - length of tunnel by number of road lanes. **Cost** - all tunnel construction activities including: Mobilisation & demobilisation of tunnel equipment; Excavation & support; Linings; Drainage; Surface finishing; Ventilation; Control systems; All tunnel services.
8a	Underpasses	m				**Quantity** - length of underpass. **Cost** - all underpass construction activities.
9	Pavements	m^2	53,144	$222.80	$11,840,491	**Quantity** - total sub-base area including: Lanes; Margins; Lay-bys; Access roads; Shoulders. Does **NOT** include paths or kerbs & gutters. **Cost** includes: Working platforms; Bound/unbound sub-base; Base course; Wearing course; Milling existing and new wearing surfaces.
10	Finishing Works				$5,204,939	**Cost** includes: Line markings; Road barriers; Minor installations; Bus stops; Fencing; Footpaths/cycleways; Landscaping and maintenance; Rest areas (including amenities); Road lighting.
11	Traffic Signage, Signals and Controls				$0	**Cost** includes: Traffic signals & associated trenching, pits and power supply; Permanent traffic signage (static & electronic) including guide posts, grabrails, bollards; Intelligent Traffic Systems including information & monitoring systems.
12	Design (if by contractor)				$1,567,762	**Cost** - design activities completed by the contractor.
13	Supplementary Items				$2,418,269	This item should only be used for exceptional items that cannot be reasonably allocated to the above elements.
14	**Total Construction Costs**				**$28,153,423**	**Construction costs including Contractor's overheads and profit.**

Note: In Table 1, Preliminary costs are spread pro-rata across items 1 - 11 and 13 (all items excluding Design)

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Print Date: 11/12/2017

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File Number: TBA

TABLE 2

ADDITIONAL REQUIREMENTS FOR PROJECT COST BREAKDOWN REPORTING

Ref	Work Breakdown Area	Unit	Quantity	Description
A	Road Length	km	9.72	The total length of roadworks on the major carriageway.
B	Number of Road Lane Kilometres	km	30.42	The total length of road on the major carriageway by the number of lanes, inclusive of ramps
C	Number of Bridges	No	1	The number of bridge structures. **Excludes** underpasses and tunnels.
D	Number of Tunnels	No	0	The number of tunnel structures.
E	Tunnel Length	km	0	The total length of all tunnels structures.
F	Number of Underpasses	No	3	The number of underpass structures.
G	Underpath Length	m	0	The total length of all underpath structures.

TABLE 3

BENCHMARKING OF CONSTRUCTION COSTS INCLUDING PRELIMINARIES AND DESIGN

Ref	Description	Unit	Quantity	Rate	Total Cost (Incl Contractor's OH&P)	% of Construction Costs	Comments
PD1	Roadworks - New	lane km	30	$925,490.57	$28,153,423	100%	New roads (including reconstructed pavements) including ramps. The total length of road on the major carriageway multiplied by the number of lanes.
PD1a	Roadworks - Resurfacing	Lane km					Roads requiring resurfacing only. The total length of road on the major carriageway multiplied by the number of lanes, **includes ramps**
PD2	Structures - Bridges	m^2	0	#DIV/0!	$0	0%	Deck area of bridge structure is between the abutment expansion joint and the outer edges of the parapets. Approach slabs are not included as part of the deck area, however the costs are to be included with the bridge.
PD3	Structures - Tunnels	lane km	0.00	$0	$0	0%	Length of tunnel by number of road lanes.
PD4	Structures - Underpasses	m	0	#DIV/0!	$0	0%	The total length of all underpass structures.
PD5	Structures - Other		0	$0	$0	0%	
	Total Construction Costs				**$28,153,423**	**100%**	

Note: In Table 3, Preliminary and Design costs are spread pro-rata across items PD1 - PD5 (all items)

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ESTIMATE BASIS AND ASSUMPTIONS

This estimate is based on and makes the following assumptions:

- Refer to notes in attached estimate spreadsheet
-
-
-
-
-
-
-
-
-
-

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ESTIMATE EXCLUSIONS

This estimate excludes the cost of the following items:

- GST
- Any Land Fees
- Environmental costs

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LIST OF DRAWINGS AND DOCUMENTATION

Information provided via email dated 28/06/17

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CEDRIC ST TO VINCENT ST
Metro Region

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Print Date: 11/12/2017

Project Number: TBA
File Number: TBA

ESCALATION CALCULATION

Estimate Base Date (FY1)	21/09/2017
Financial Year (FY1)	2017/18
Financial Quarter	Sep
Base Date Quarter Index	100.81
Previous Financial Year (FY0)	2016/17
Average Index (FY0)	98.12
Uplift Factor	0.9733

Project Estimate Cost: $ 35,910,414.17

Financial Year	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	Subtotal
Construction Cost		$ -	$ 16,892,053.80	$ 11,261,369.20	$ -						$ 28,153,423.00
Owners Costs	$ -	$ -	$ 844,602.69	$ 1,280,569.74	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,125,172.43
MRWA Planning Design and Documentation		$ -	$ -	$ 295,200.00							
MRWA Contract Management		$ -	$ 422,301.35	$ 281,534.23	$ -						
MRWA Project Management		$ -	$ 422,301.35	$ 281,534.23							
Principal Controlled Insurances		$ -	$ -	$ 422,301.28	$ -						
Site Investigation & Project Studies											
Ethnographic Surveys & Clearances					$ -						
Land Costs		$ -		$ -							
Environmental Offsets											
Other											
P90 Contingency		$ -	$ 3,379,091.25	$ 2,252,727.50	$ -						$ 5,631,818.75
Project Estimate Cost	$ -	$ -	$ 21,115,747.74	$ 14,794,666.44	$ -	$ -	$ -	$ -	$ -	$ -	$ 35,910,414.17

Please Select Applicable Escalation Series: Design and Construct Urban

	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	Subtotal
Project Cost Estimate	$ -	$ -	$ 21,115,747.74	$ 14,794,666.44	$ -	$ -	$ -	$ -	$ -	$ -	$ 35,910,414.17
Uplift Factor	0.9733	0.9733	0.9733	0.9733	0.9733	0.9733	0.9733	0.9733	0.9733	0.9733	
Average Annual Escalation Index	98.12	102.43	104.63	107.66	110.87	114.37	117.68	120.79	123.97	127.25	
Annual Escalation Rate	0.00%	4.39%	2.15%	2.90%	2.98%	3.15%	2.90%	2.64%	2.64%	2.64%	
Cumulative Escalation Factor %	0%	4.39%	6.63%	9.72%	12.99%	16.55%	19.98%	23.10%	26.34%	29.68%	
Escalation $	$ -	$ -	$ 1,362,391.31	$ 1,399,643.14	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,762,034.45
P90 Total Outturn Cost (Cash flowed)	$ -	$ -	$ 21,915,286.01	$ 15,799,948.79	$ -	$ -	$ -	$ -	$ -	$ -	$ 37,715,234.80

Escalation %	5.03%

MAIN ROADS Western Australia
File Name:Mitchell Freeway Extension Estimate Report No PSP 2

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Estimate No.: 1 - Revision No.: 2	Estimate Date:	21/09/2017
Delivery Phase - Detailed Estimate	Print Date:	11/12/2017
MITCHELL FREEWAY SOUTHBOUND		
CEDRIC ST TO VINCENT ST	Project Number:	TBA
Metro Region	File Number:	TBA

COST ESTIMATE CALCULATIONS

See attached Estimate Submission Schedule

Estimate No.: 1 - Revision No.: 2
Delivery Phase - Detailed Estimate
MITCHELL FREEWAY SOUTHBOUND
CEDRIC ST TO VINCENT ST
Metro Region

Estimate Date: 21/09/2017
Print Date: 11/12/2017

Project Number: TBA
File Number: TBA

CHANGE SINCE PREVIOUS REVISION

Area/Item	MRWA Comment	Response
Approval	Estimators Signature to be added	Included in revised document
Scope	Expand on Scope of Works	Included in revised document
CES	Sunk costs to be included in correct section of report	Included in revised document

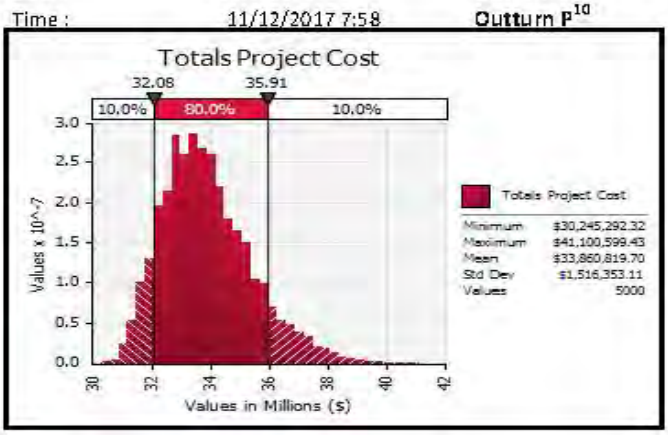
Estimate No.: 1 - Revision No.: 2
Delivery Phase - Detailed Estimate
MITCHELL FREEWAY SOUTHBOUND
CEDRIC ST TO VINCENT ST
Metro Region

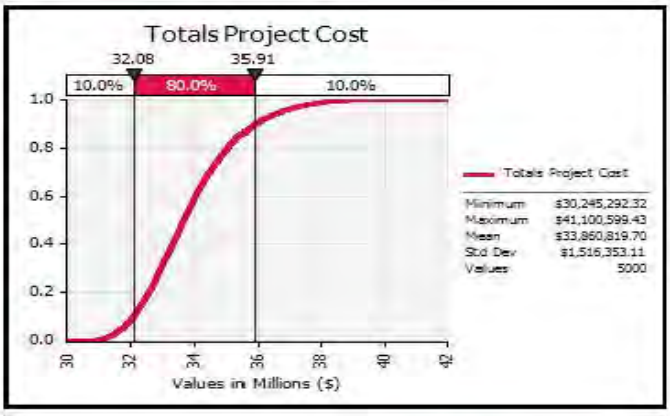
Estimate Date: 21/09/2017
Print Date: 11/12/2017
Project Number: TBA
File Number: TBA

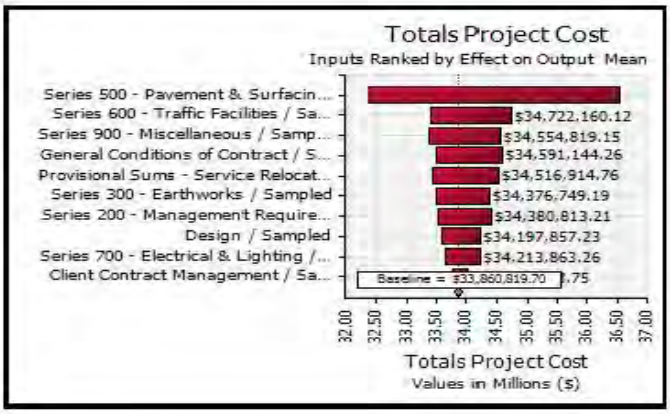
TOTAL OUTTURN COST RISK OUTPUT

Date : 11/12/2017
Time : 11/12/2017 7:58

Outturn P^{90} $35.91m
Outturn P^{50} $33.66m
Outturn P^{10} $32.08m







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File Name:Mitchell Freeway Extension Estimate Report No PSP 2

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APPENDIX 2: PROJECT COST BREAKDOWN

(5) Delivery Phase

The user of this sheet only has to populate the fields highlighted in colour. Green is for estimated costs/comments and blue is for actual costs, ie:
The remainder of the values on this sheet, which are locked to the user, will be automatically calculated based on the user's input.

Note that the cells with a dot pattern background are simply an indication as to which phase the cost for that element is most likely to occur in. If costs for that element occur in other phases just populate the appropriate cells.

Estimated costs or other user input (Text Box or Pulldown Menu or comments)
Actual costs - where applicable or available

SCRATCH PAD

Click button above to show scratch pad area

Table 1: BASE ESTIMATE TABLE: PROJECT COST BREAKDOWN (PCB) - ROAD PROJECT: Mitchell Freeway Widening - Cedric Street to Vincent Street

PCB Level 1	PCB Level 2	PCB Level 3	Elemental Breakdown Unit Cost	Elemental Breakdown Elemental Quantity	PCB Level 3	Breakdown of Property Acquisition elements according to Phases: Scoping	Development	Delivery	Breakdown of Construction elements according to Phases: Scoping	Development	Delivery	PCB Level 2	PCB Level 1
Client Management & Oversight													$2,125,172
	SCOPING											$0	
		Project Management-Scoping			$0								
		Design & Investigation-Scoping			$0								
	DEVELOPMENT											$0	
		Project Management-Development			$0								
		Design & Investigation-Development			$0								
	DELIVERY											$2,125,172	
		Project Management-Delivery			$1,407,671								
		Design & Investigation-Delivery			$295,200								
		Client supplied Insurances, Fees, Levies - Delivery			$422,301								
	PROPERTY ACQUISITION											$0	
		Purchase Price			$0								
		Transactional Cost & Other costs			$0								
		Business Compensation			$0								
		Environmental Offsets			$0								
Construction Cost													$28,153,423
	CONTRACTOR											$28,153,423	
		Environmental Works			$0						$0		
		Traffic Management and Temporary Works			$1,880,993						$1,880,993		
		Public Utilities Adjustments			$0						$0		
		Bulk Earthworks	$42.12	54382	$2,290,353						$2,290,353		
		Retaining Walls	$529.67	5120	$2,711,931						$2,711,931		
		Drainage			$238,685						$238,685		
		Bridges	$0.00		$0								
		Tunnels			$0								
		Pavements	$222.80	53144	$11,840,491						$11,840,491		
		Finishing Works			$5,204,939						$5,204,939		
		Traffic Signage, Signals and Controls			$0								
		Design (if by contractor)			$1,567,762						$1,567,762		
		Supplementary Items			$2,418,269						$2,418,269		
	CLIENT											$0	
		Client supplied Materials and Construction Services - Delivery			$0								
TOTALS					$30,278,595							$30,278,595	$30,278,595

Table 2: OVERALL PROJECT SUMMARY TABLE (incl sunk costs)

	P50	P90
BASE ESTIMATE	$30,278,595	$30,278,595
CONTINGENCY	$3,382,119	$5,631,819
PROJECT ESTIMATE	$33,660,714	$35,910,414
ESCALATION (incorporating uplift factor)	$1,692,565	$1,804,821
OUTTURN COST	$35,353,279	$37,715,235

Table 3: PROJECT COST (excl sunk costs)

	P50	P90
BASE ESTIMATE	$30,278,595	$30,278,595
CONTINGENCY	$3,382,119	$5,631,819
PROJECT ESTIMATE	$33,660,714	$35,910,414
ESCALATION (incorporating uplift factor)	$1,692,565	$1,804,821
OUTTURN COST	$35,353,279	$37,715,235

Table 4: FUNDING CONTRIBUTION

	P50	P90
AG Funding Sought	$28,282,623	$30,172,188
Jurisdiction Contribution	$7,070,656	$7,543,047
Total	$35,353,279	$37,715,235
Percentage funding Sought	80.00%	80.00%

Table 5: PROJECT CASHFLOW AND ESCALATION CALCULATION TABLE

	Total Scoping and Development Phase Expenditure	Scoping and Development Phase Expenditure		Project Cashflow 2016/17 onwards										TOTAL Project Costs
		Scoping Phase	Development Phase	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	YEAR 6	YEAR 7	YEAR 8	YEAR 9	YEAR 10	
				2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	
Base Estimate	$0					17,736,656.49	12,541,938.94							$30,278,595
P50 Project Estimate	$0	$0.00	$0.00			19,765,927.89	13,894,786.54							$33,660,714
P90 Project Estimate	$0	$0.00	$0.00			21,115,747.89	14,794,666.54							$35,910,414
Uplift Factor				0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	0.973	
Annual Escalation Rate %				0.00%	4.39%	2.15%	2.90%	2.98%	3.15%	2.90%	2.64%	2.64%	2.64%	
P50 Escalation ($)				0.00	0.00	1,275,300.72	1,314,510.39	0.00	0.00	0.00	0.00	0.00	0.00	$2,589,811
P50 Outturn Cost ($)	$0	$0.00	$0.00	0.00	0.00	20,514,355.84	14,838,922.98	0.00	0.00	0.00	0.00	0.00	0.00	$35,353,279
P90 Escalation ($)				0.00	0.00	1,362,391.31	1,399,643.15	0.00	0.00	0.00	0.00	0.00	0.00	$2,762,034
P90 Outturn Cost ($)	$0	$0.00	$0.00	0.00	0.00	21,915,286.16	15,799,948.90	0.00	0.00	0.00	0.00	0.00	0.00	$37,715,235

Please provide details of cost estimation approach used below if required (particularly where a mix of approaches were used):

Additional notes/clarification relating to any aspect of this cost estimate.

APPENDIX 3: RISK MATRIX AND ANALYSIS

Potential Risk	Causes	Resulting In	Likelihood	Conseq.	Risk Rating	Mitigation Strategy
			(L)	(C)	(LxC)	
Scope and budget uncertainty	Late decisions. Changing priorities. Pressure for other inclusions. PSP uncertainty.	Pre-qual and EOI impacts. Tender delays. Reputational damage.	Moderate (3)	Possible (3)	**Medium 9**	• Continue to liaise closely with other MRWA Directorates throughout scoping definition. • Complete the conceptual design for all potential scope inclusions. • Seek scope commitments from external agencies for final scope inclusions. • Undertake continued review of budget to ensure it is appropriate and communicate appropriately
Scope creep occurs after procurement commences.	Ongoing negotiation and cost variance.	Major cost increase result with funding shortfall. Value for money does not result.	Major (4)	Possible (3)	**High 12**	• Make provision in the EOI to include subsequent scope items. • Seek to define and commit to scope prior to going to RFP.
Principle Shared Path design adversely impacted.	Additional requirements result for widening of Mitchell Freeway ramps.	Design change and scope creep.	Minor (2)	Possible (3)	**Low 6**	• Review traffic analysis for Hutton Interchange project to assess the likely need for additional ramp capacity. • Assess possible additional ramp widening requirements and respond accordingly. • Resolve adjoining project locations and size prior to going to RFP. • Consider possible longer term provisions and design to consider future needs and impacts.
Information available to prospective tenderers is incomplete.	Unavailable or incomplete data cannot be sourced prior to EOI.	Subsequent claims. Responses are not fully informed. Pricing unknowns.	Moderate (3)	Unlikely (2)	**Low 6**	• Identify likely information gaps and needs • Ensure identified information gaps are filled prior to going to RFP. • Develop supporting strategies for information that cannot be provided in a timely way to minimise impacts for tender assessment and award.

						• Issue addenda where unavoidable to provide the best available information for costing purposes
Broader community and local residents are not aware of clearing of vegetation and other impacts	Scope uncertainty.	Stakeholder criticism and backlash. Reputational damage.	Minor (2)	Likely (4)	**Medium 8**	• Prepare and adopt comprehensive Stakeholder Management Plan. • Establish accurate and easily accessable web based information. • Advise directly affected residents of planned noise monitoring at noise logger installation points. • Advise affected Local Government Authorities of planned works. • Arrange for early community Newsletter distribution. • Establish communications protocols for adoption throughout the project life.
Construction impacts for road users	Rolling lane closures along the freeway. Widening required both sides of the freeway lanes.	Added congestion. Working hours impacted. Freeway capacity significantly diminished at times. High cost of traffic management.	Moderate (3)	Almost Certain (5)	**High 15**	• Identify organisation's best practice and requirements for lane closures and network operational matters for inclusion in the EOI and RFP. • Include Contractor competency and capability in the EOI assessment process. • Clearly define communications requirements for contractors throughout construction.

Consultation with Public Transport Authority (PTA) is protracted with unreasonable timeframes.	Opportunities arise for scope inclusions to benefit public transport. Rail safety standards change.	Scope expands. Costs escalate.	Moderate (3)	Likely (4)	**High 12**	• Continue frequent stakeholder engagement to understand concerns early. • Involve PTA in key design, safety in design and access decisions. • Ensure contractor has working in rail reserve accreditation. • Ensure contractor provides a Rail Safety Plan for approval by PTA and Office of Rail Safety prior to commencing works • Seek early advice from PTA on potentially affected rail infrastructure - communications, drainage, barriers and signalling, etc. and current policy requirements • Establish agreed requirements with PTA for the use of appropriate traffic management devices.
Industry capacity is lacking to deliver with concurrent works running	Market become flooded. Industry lacks the resources needed for a project of this scale. Cost estimating assumptions are flawed.	Cost escalates. Available workforce lacks competency and experience. Less competent team results in increased supervision and information requirement.	Moderate (3)	Possible (3)	**Medium 9**	• Include weighted criteria to reflect the need for highly skilled and experience workforce in a high traffic/operating passenger rail setting. • Conduct tenderer information session and highlight the critical need for a highly skilled team and explaining the construction context. • Confirm availability of the proposed construction team at the time of RFP with significant weighting.
Customer expectations are not met	Traffic throughput improves here with bottleneck shifted further south	Stakeholder criticism. Reputational damage.	Minor (2)	Possible (3)	**Low 6**	• Prepare and proactively adopt a Stakeholder Engagement Plan with dedicated resources by Main Roads and Contractor. • Include messaging of planned wider network improvements and initiatives. • Continue to review and evaluate traffic modelling with any changes to scope.

FRAMEWORK FOR CONTROL RATING AND ASSESSING THE LIKELIHOOD AND CONSEQUENCE OF IDENTIFIED RISKS

The ***likelihood*** of the risk event occurring is assessed using the table below.

LIKELIHOOD RATING	Level	Rating	Description	Frequency
	1	**Rare**	The event may occur only in exceptional circumstances	Less than once every 50 years*
	2	**Unlikely**	The event could occur at some time	Once every 10 – 50 years
	3	**Possible**	The event might occur at some time	Once every 1 – 10 years
	4	**Likely**	The event will probably occur in most circumstances	More than once per year
	5	**Almost Certain**	The event is expected to occur in most circumstances	More than once per month

* NB: Risks that are rated as likelihood category 'rare' may be expected to occur significantly less frequently than less than once every 50 years such as those relating to engineering principles and/or tolerances. Where this is the case it must be clearly indicated in the risk register, an appropriate treatment action plan undertaken accordingly, and additional quantitative risk analysis where required or appropriate.

The ***consequence*** of the risk event occurring is assessed using the table below.

Level	Rank	Health & Safety	Transport Services	Financial	Reputation & Trust (Political, Stakeholders & Community)	Business Operations	Environmental	Legal & Compliance
1	INSIGNIFICANT	No treatment required	• Service infrastructure receives minimal damage, minor rectification required. Service/s only temporarily unavailable or remain operational • Minor impact to customers e.g. minor drop in patronage or minor congestion	Greater of: • Less than $100,000; or • Deviation from project budget within ± 5%	• Isolated local community or individual's issue-based concerns. • Low profile media attention	• Some insignificant delays to business activities. • Up to 5% variation in KPI or objective	• Low impact to isolated area. • Simple or no treatment required. • No lasting effect or significance	• Guidance required for legal/ compliance issues managed through routine procedures. • Legal action unlikely.
2	MINOR	First aid treatment required	• One or a number of services are unavailable or operating with restrictions but can be resumed within acceptable timeframes. • Short term impact to customers e.g. short term drop in patronage or isolated congestion	Greater of: • $100,000 - $1M; or • Deviation from project budget between + 6-10%	• Local community impacts and concerns. • Occasional once off negative media attention. • Trust issues raised.	• Minor delays to business activities. • 5% to 10% variation in KPI or objective.	• Contained low impact. • Standard treatment. • Minor local short-term residual effect.	• Complex legal/ non-compliance issue to be addressed. • Legal action and /or public liability claim possible.
3	MODERATE	Medical treatment required or lost time injury	• One or a number of services, including critical services, are unavailable for an extended length of time. • Moderate impact to customers e.g. complaints and moderate drop in patronage or moderate lever of short-term congestion.	Greater of: • $1M - $10M; or • Deviation from project budget between + 10-20%	• Sectional community impacts and concerns publicly expressed. • Increased negative media attention. • Loss of confidence and trust by community and stakeholders in Agency processes and capability. • Ministerial concern.	• Some moderate delays to business activities. • 10% - 25% variation in KPI or objective. • One or more projects is significantly impaired.	• Uncontained impact, able to be rectified in short-medium term. • Significant medium term residual effect.	• Non-compliance/s with regulation and/ or probity infringements, which may result in some processes repeated. • Legal action probable
4	MAJOR	Single fatality or major injuries or severe permanent disablement	• A number of critical services are cancelled, with extensive rectification required before resumption of services. • Non-critical service infrastructure is not operational and cannot be rectified. • Substantial impact to customers e.g. major drop in patronage or major level of congestion.	Greater of: • $10M - $30M; or • Deviation from project budget between 20-30%	• Considerable and prolonged community impact and dissatisfaction publicly expressed. • Consistent negative media attention. • Criticism and loss of confidence/ trust by community and stakeholders in Agency processes and capability. • Ministerial intervention	• Major delays to activities • 25% to 50% variation in KPI or objective. • One or more critical programs or projects cannot be delivered.	• Extensive hazardous impact requiring long-term rectification. • Major medium-term residual effect.	• Major non-compliance with regulation which may result in termination of a process or imposed penalties. • Legal action taken against agency and/ or major public liability claim or potential class action
5	CATASTROPHIC	Multiple fatalities	• Critical service infrastructure is not operational and cannot be rectified. • Significant impact to customers e.g. sustained drop in patronage or sustained level of significant congestion	Greater of: • Greater than $30M; or • Deviation from project budget > 30%	• Significant adverse community impacts and condemnation. • Extreme negative media attention. • Consistent ongoing community loss of confidence and trust in Agency capabilities and intentions. • Government intervention	• Activities ceased. • More than 50% variation in KPI or objective. • Multiple critical programs or projects cannot be delivered.	• Uncontained hazardous impact requiring major long-term treatment and monitoring. • Major long-term residual effect.	• Major non-compliance with legislation and/ or regulation which may result in criminal charges and/ or loss of required accreditation. • Significant legal consequences/ class action against Agency.

The Risk Rating Table derived from the risk assessment is shown below

	CONSEQUENCE				
LIKELIHOOD	**Insignificant**	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost certain	**Low 5**	**High 10**	**High 15**	**Very High 20**	**Very High 25**
Likely	**Low 4**	**Medium 8**	**High 12**	**Very High 16**	**Very High 20**
Possible	**Low 3**	**Low 6**	**Medium 9**	**High 12**	**High 15**
Unlikely	**Low 2**	**Low 4**	**Low 6**	**Medium 8**	**High 10**
Rare	**Low 1**	**Low 2**	**Low 3**	**Low 4**	**Medium 7**

RISK ACCEPTANCE CRITERIA	Risk Rating Rating	Level of Risk	Management Oversight
	Low (1-6)	Risk is generally acceptable	Reviewed and accepted by Risk Owner
	Medium (7-9)	Risk is acceptable with adequate controls. Treatment action plan required if consequence is Catastrophic.	Reviewed and accepted by Risk Owner and Manager
	High (10-15)	Risk may be acceptable with adequate controls. Treatment action plan required to reduce risk level further where possible.	Reviewed and accepted by Risk Owner and Director/ Executive Director/ General Manager/ Manager
	Very High (16-25)	Risk is generally not acceptable. Treatment action plan required to reduce the risk.	Reviewed by Risk Owner, Director/ Executive Director/ General Manager/ Manager and Office of DG or Executive Committee

The framework for Control Rating is provided below

CONTROL RATING	Level	Description
	Adequate	The control design and operation meets the control objective. These controls are relevant, documented and apply appropriate good practice.
	Requires Improvement	Either the control design or operation is not fully meeting the control objective. These controls are relevant and documented however require improvement to their design or operation to meet the objective.
	Inadequate	Neither the control design nor operation is meeting the control objective. These controls may be relevant but improvements to the control design and operation are required to meet the control objective or implementation of alternative controls are required.