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MELBOURNE AIRPORT RAIL

Business Case

September 2022

Australian Government

VICTORIA'S BIG BUILD

VICTORIA State Government

Project Overview

Melbourne Airport Rail is a once-in-a-generation transformation of Victoria's transport network, connecting Melbourne Airport with a rail service for the first time. Melbourne Airport Rail will connect people from the airport to where they need to go — be that work, home or Victoria's major regional centres – and responds to the growth needs of Melbourne's airport precinct.

Melbourne Airport is a major commercial centre, supporting 20,600 full-time equivalent employees directly and 20,900 jobs working in airport-related businesses surrounding the precinct.[1] Activity at the airport is growing, with 52 per cent higher volumes of passengers passing through the airport in FY2019, at 37 million passengers, than a decade ago.

As a key conduit for economic activity, ground access to the airport precinct is critical. Melbourne Airport Rail (the Project) will improve transport connections by providing an alternative to road-based transport and a reliable public transport option that Victorians and visitors to the State can depend on in the future.

Melbourne Airport Rail will deliver:

- one-way capacity of 6,600 passengers per hour from the first day of operation
- a new railway station at Melbourne Airport
- 12 kilometres of new rail track from Melbourne Airport Station to Sunshine
- extension and modifications of rail systems to fully deliver the capacity and performance benefits.

Melbourne Airport Rail services will stop at Sunshine Station where metropolitan and regional passengers can interchange between Melbourne Airport Rail and other modes of transportation.

Sunshine is one of seven National Employment and Innovation Centres (NEICs) and a Metropolitan Activity Centre identified in *Plan Melbourne*. It is a key strategic centre for Melbourne's north west and has significant employment, education and health centres, including Victoria University, Western Health's Sunshine Hospital, St Albans Activity Centre and Sunshine Health Wellbeing and Education Precinct. Melbourne Airport Rail will connect into the heart of Melbourne's CBD via Sunshine and through the Metro Tunnel.

In peak periods, Melbourne Airport Rail will deliver a faster and more reliable journey between Melbourne Airport and the CBD (30 minutes), compared with the Melbourne City Express SkyBus, which is projected to take 40 minutes in 2031 and 66 minutes in 2056.

The new Melbourne Airport Rail will:

- deliver a faster and more reliable journey to Melbourne Airport via public transport in peak periods, with a travel time of 30 minutes between Melbourne Airport and the CBD
- significantly increase public transport patronage
- reduce vehicle volumes on the Tullamarine Freeway
- provide congestion relief and improved travel speeds across the road network.

The connection of Melbourne Airport Rail from the airport to Sunshine will also form a fundamental component of Suburban Rail Loop (SRL), specifically the West section.

Rail Projects Victoria (RPV) is working closely with other transport agencies including the Suburban Rail Loop Authority to ensure interfaces with other projects are carefully planned. Both Melbourne Airport Rail and SRL East (from Cheltenham to Box Hill) are currently expected to commence construction in 2022, with SRL North (from Box Hill to Melbourne Airport) to be delivered later. The economic appraisal for this Business Case was undertaken both with and without the SRL North

[1] Melbourne Airport, Melbourne Airport Master Plan (2018).

connection to Melbourne Airport in 2051, although subject to future government decisions SRL North could be delivered in the 2040s.

The economic appraisal presents the Benefit Cost Ratio (BCR), Net Present Value (NPV) and underlying economic benefits as a range between the P10 and P90 values. The incorporation of uncertainty in the economic appraisal reflects best practice and responds to broader recommendations in Victoria and Australia relevant to the appraisal of projects with long lead times.

Melbourne Airport Rail has a BCR of 1.8 – 2.1 using a 4 per cent discount rate and excluding the SRL North connection to Melbourne Airport in 2051 in the Base Case.

When the SRL North connection to Melbourne Airport in 2051 is included in the Base Case, the BCR is 1.1 – 1.3 using a 4 per cent discount rate.

The delivery of Melbourne Airport Rail will support up to 8,000 direct and indirect jobs during construction. These jobs will range from engineers and subject matter experts planning behind the scenes, to construction workers and local suppliers who will help to deliver the project on site.[2] This level of investment will increase the size of the economy and jobs market, creating 1,880 net additional jobs across Victoria at the peak of construction. The construction and operation of Melbourne Airport Rail is expected to increase Victoria's Gross State Product by $16.2 billion to $17.9 billion in present value terms (including and excluding the SRL North connection to Melbourne Airport in 2051 in the Base Case, respectively). Melbourne Airport Rail also provides for improvements to the network in the future, incorporating features such as longer platforms and an alignment that allows for a future intermediate station.

RPV will oversee delivery of Melbourne Airport Rail. Works will start in 2022, with major works expected to start in 2023, subject to relevant Victorian and Commonwealth planning, environmental and other government approvals. Melbourne Airport Rail is expected to commence operations in 2029. The government will work closely with the private sector to apply global knowledge and experience in the construction and delivery of the Project and in achieving optimal outcomes for Victoria in the short, medium and long terms.

This Business Case was developed in 2020, during which time the COVID-19 pandemic and the necessary measures implemented to slow its spread led to unprecedented economic challenges. While COVID-19 has impacted recent patronage demand, historical trends suggest air travel demand will likely progressively recover to long-term trends within five years. In addition, given that lead times for the Project will likely be longer than the recovery timeframe, the underlying problems that Melbourne Airport Rail aims to alleviate – such as growing pressures from population growth and improving access to economic hubs – are expected to remain relatively unchanged over the long term. Going forward, projects such as Melbourne Airport Rail can be a key tool in economic stimulus, initially by creating direct employment in its delivery in sectors such as construction, engineering and project management, and subsequently as a means of relieving road transport bottlenecks that constrain productivity growth.

Notwithstanding the above, additional sensitivity analysis was undertaken for this Business Case to understand the implications of COVID-19 on the Project, including delayed land use changes, the increase in working from home and subdued airport patronage demand. Further discussion of this sensitivity analysis is provided in Chapter 8 and Chapter 11.

[2] RPV analysis on behalf of the Department of Transport.

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Executive summary

Executive summary

The need for a rail link to Melbourne Airport

Access routes to Melbourne Airport are experiencing significant congestion, particularly on the Tullamarine Freeway – the airport's primary connection to Greater Melbourne and the CBD.

Over the last decade, passenger and air freight volumes at Melbourne Airport have grown substantially, underpinned by strong economic and population growth.

Within this context, there are two key problems that underpin the need for a rail link to Melbourne Airport.

- **Limited transport connections to Melbourne Airport constrain passenger access.**
  - Nearly half of current passenger trips to and from the airport are cross-city journeys from the inner, east or south-east suburbs. The significant distances covered to reach the airport mean most journeys are funnelled through Melbourne's arterial road network.
  - Accessibility to the airport is impacted by heavy congestion on these links and there are impractical public transport connections for the majority of the airport's user catchment. The reliability of the Melbourne City Express SkyBus, which is the airport's primary public transport connection to the CBD, is also impacted by congestion on the Tullamarine Freeway. Unlike most global airports of similar stature, Melbourne Airport has no direct rail connections to the CBD.
  - Impractical access to alternatives means that most (90 per cent) of airport users travel by private vehicle (including private car, taxi or ridesharing) to the airport. Sustained increases in airport patronage and freight demand will continue to adversely impact the reliability of all airport access routes.
- **Increasingly congested links to Melbourne Airport limit Victoria's economic prosperity.**
  - Growing patronage at the airport will generate more ground transport movement and add more cars to already-congested roads. The increasing concentration of key employment precincts in Melbourne's CBD and south-eastern suburbs is expected to concentrate significant travel demand on the Tullamarine and Monash freeway corridors.
  - Given the broad user base of Melbourne's arterials, network-wide congestion will have impacts beyond delaying airport passengers, including adding to supply chain costs, diminishing accessibility to social and economic opportunities across the city. Failure to address these issues will constrain Melbourne's economic potential and impact its reputation as an attractive place to live and invest.

Accessibility and connectivity to the airport are the hallmarks of a thriving global city. There is a clear need to build Melbourne Airport Rail as an alternative to road-based airport access to provide the connectivity, capacity and reliability needed to meet demand generated by the city's growing population and economy, and to reduce congestion on the city's road network.

While the COVID-19 pandemic has reduced airport patronage, historical trends suggest air travel demand will likely progressively recover to long-term trends within the next five years. In addition, given that lead times for Melbourne Airport Rail will likely be longer than the recovery timeframe, the underlying problems the Project aims to alleviate are expected to remain relatively unchanged over the long term.

The future without Melbourne Airport Rail

Without Melbourne Airport Rail, transport network performance in Melbourne will deteriorate significantly, impacting Victoria's economic prosperity.

- Trips to Melbourne Airport on existing modes will increase from 180,000 trips on an average weekday in 2021 to 370,000 trips a day by 2056.
- It is forecast the recently widened Tullamarine Freeway will reach capacity in 2036, with travel times expected to almost double by 2056.
- Average travel times from NEICs to Melbourne Airport in the AM peak will increase as set out in the table below.

NEIC	2021 Travel time (mins)	2056 Travel time (mins)
Sunshine	22	35
Werribee	36	45
Latrobe	30	53
Parkville	39	68
Monash	59	89

Strategic options investigated

After exploring numerous options over the last two decades, integrated heavy rail via Sunshine Station and connecting to the CBD via Sunbury tracks and the Metro Tunnel provides the best solution.

The *2018 Melbourne Airport Rail Link Strategic Appraisal* (2018 Strategic Appraisal), confirmed an integrated heavy rail connection as the preferred strategic response and the Sunshine Route as the preferred alignment, consistent with the findings of the *2002 Melbourne Airport Transit Link Study* and the *2012 Melbourne Airport Rail Link Study*.

This Business Case identifies and assesses three alignment options from Sunshine to the CBD, including:

- **The Metro Tunnel** – connecting to the CBD via the Sunbury tracks and Metro Tunnel.
- **Regional Rail Link** – connecting to the CBD via the existing Regional Rail Link track pair to Southern Cross Station.
- **Sunshine Tunnel** – connecting to the CBD via a new tunnel to Southern Cross Station.

A significant body of work identified the Metro Tunnel as the recommended Sunshine to CBD alignment option as it:

- provides superior travel choice, connectivity and accessibility of the options considered, due to the new Melbourne Airport Rail service being integrated within the existing rail network, via the Metro Tunnel's five new underground stations that are integrated with the existing transport network – the other two options connect only to Southern Cross Station

- connects directly to 30 stations without needing to change trains, with most other passengers only needing to change once
- supports the need to reduce high levels of road traffic congestion to Melbourne Airport, particularly from Melbourne's south-east due to a significant proportion of trips to and from the airport being cross-city journeys and the disparity between where people live and work adding to congestion on the south-eastern arterial road network
- has the shortest journey time to the central CBD, lowest number of interchanges and most inner-area locations, and most direct access to NEICs at Sunshine, Monash / Clayton, Dandenong and Parkville
- increases capacity between Sunshine and West Footscray, and increases capacity and provides a direct service to and from Melbourne Airport for passengers on Melbourne's busiest passenger rail corridor, the Dandenong corridor
- has the lowest environmental and heritage impacts and requires less land take than the other options
- provides greater opportunity for urban renewal due to its connection to various inner-city stations
- is the most cost effective option by using infrastructure and rolling stock[3] already being delivered as part of the Metro Tunnel Project and does not require significant additional works between Sunshine and the CBD, minimising capital and whole of life costs, disruptions and reducing the delivery timeframe
- has the highest Benefit Cost Ratio of all three options.

Defining Melbourne Airport Rail

Melbourne Airport Rail is a once-in-a-generation transformation of Victoria's transport network, connecting Melbourne Airport with a rail service for the first time.

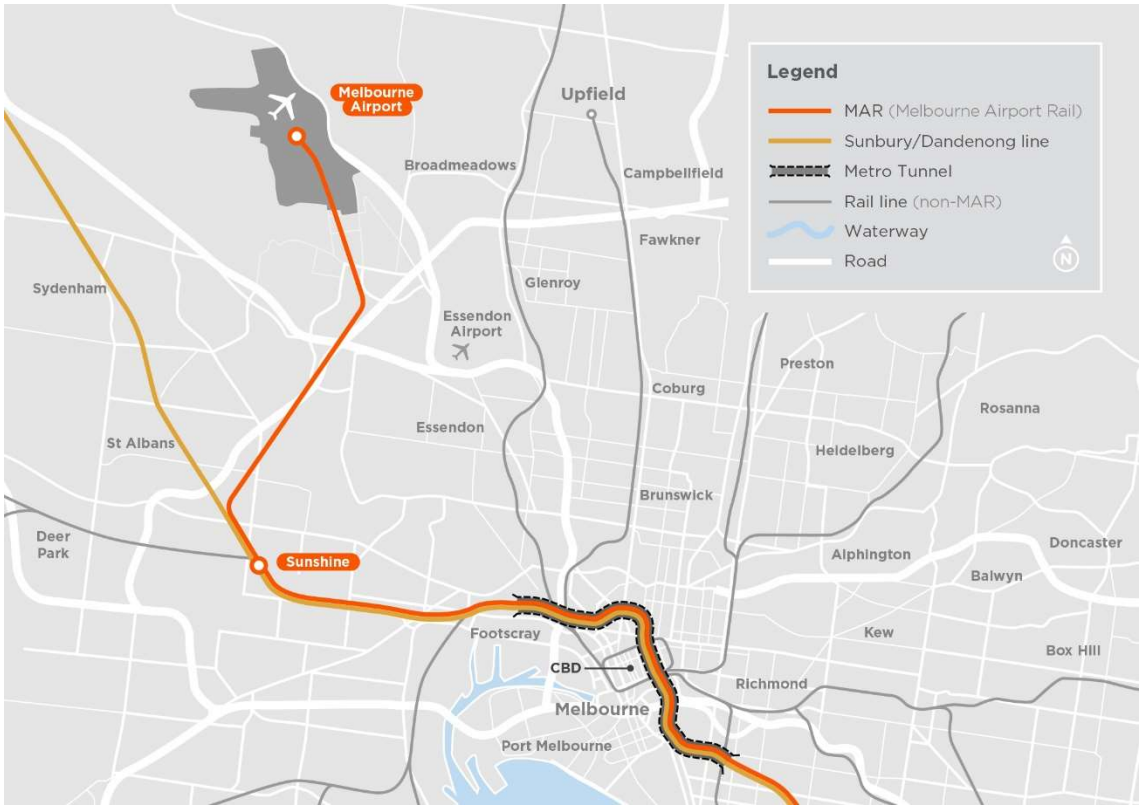
Melbourne Airport Rail responds to the growth needs of Melbourne's airport precinct and provides long-term capacity for connections to and from the airport for Victorians and visitors to the state. The rail services will run direct from the new Airport Station to the heart of Melbourne's CBD via Sunshine and through the Metro Tunnel and then continue along the Cranbourne / Pakenham Line.

The new Melbourne Airport Rail will:

- connect Melbourne's primary airport to the regional and metropolitan rail networks for the first time
- deliver a faster and more reliable journey to Melbourne Airport via public transport, with a travel time of approximately 30 minutes between Melbourne Airport the CBD
- significantly increase public transport patronage
- reduce vehicle volumes on the Tullamarine Freeway
- provide congestion relief and improved travel speeds across the broader road network
- improve productiveness and competitiveness for Victoria.

[3] Noting 5 additional High Capacity Metro Trains would be required.

Alignment of Melbourne Airport Rail



The key components of the Melbourne Airport Rail concept scope are:

- a new elevated railway station at Melbourne Airport[4]
- a track pair starting at the Airport Station and transitioning into an elevated viaduct at Mercer Drive that continues across Sharps Road and the Western Ring Road (M80) – the track continues on an embankment toward and through the Albion-Jacana freight corridor from Steele Creek, including a new bridge crossing over the Maribyrnong River, and a twin track flyover past Albion Station after which the track merges into the Sunbury line just before entering Sunshine Station
- futureproofing for an intermediate station (proposed at Keilor East)
- works at Sunshine Station to enable delivery of Melbourne Airport Rail
- an additional order of five High Capacity Metro Train (HCMT) 7-car sets
- protection and relocation of utility services, including ExxonMobil jet fuel pipeline and Ausnet high-voltage transmission lines
- freight reconfiguration from Airport West to Albion
- line-wide rail systems that are interoperable with those being incorporated into the Metro Tunnel.

[4] Further development of the Airport Station will be undertaken in consultation with Australia Pacific Airports (Melbourne) Pty Ltd (APAM), the current leaseholder and operator of Melbourne Airport.

Benefits of Melbourne Airport Rail

Melbourne Airport Rail will transform the airport precinct and improve connectivity to and from the precinct, supporting Melbourne and Victoria's economic prosperity and liveability.

The key benefits include:

- **Enhanced travel choice and outcomes for users travelling to and from Melbourne Airport** – The Project provides a foundation for enhanced accessibility and connectivity to and from Melbourne Airport with a faster and more reliable alternative to road-based travel, particularly in peak periods. This higher quality service will promote increased public transport usage and release capacity across the road network, particularly on the key access routes to the airport. The enhanced travel choice and outcomes for users of Melbourne Airport Rail include:
  - **Improved public transport connectivity for airport users** arising from:
    - **Delivering greater public transport capacity** – with turn-up-and-go services every 10 minutes, Melbourne Airport Rail will deliver a one-way capacity approximately fourteen times that of the current Melbourne City Express SkyBus service.
    - **Facilitating easier transfers across Victoria's rail network** – the alignment via Sunshine Station will provide direct access to the rest of the metropolitan rail network and enable users to transfer to the regional rail network via Sunshine. As a result, Melbourne Airport Rail will substantially increase the catchment of users who can practically access the airport by public transport.
    - **Enabling a one-seat journey for users along Melbourne's busiest rail corridor** – Melbourne Airport Rail will provide a one-seat journey to and from the airport for users along the Sunshine to Dandenong corridor, increasing trip reliability, reducing transfer time and the inconvenience associated with moving luggage.
  - **Reduced travel times to and from the airport by public transport** – in peak periods, Melbourne Airport Rail will deliver a faster journey between Melbourne Airport and the CBD (30 minutes), compared with Melbourne City Express SkyBus, where the journey time is projected to be 40 minutes in 2031 and 66 minutes in 2056.
  - **Increased public transport use** – Melbourne Airport Rail will incentivise a shift to public transport with enhanced connectivity and reduced travel times to Melbourne Airport through:
    - **Melbourne Airport Rail patronage** – Public transport patronage will increase significantly with Melbourne Airport Rail, with patronage growing from 20,000 to 51,000 between 2031 and 2056. Across the same period, the Melbourne City Express SkyBus patronage will grow from 19,000 to 28,000.
    - **Public transport trips to and from Melbourne Airport** – Melbourne Airport Rail will increase the number of airport trips made by public transport across all regions. A sizeable proportion of these public transport trips will occur during peak periods, taking cars off the road in the most congested period.
  - **Improving car journey times to and from the airport** – By 2056 the shift of users travelling to and from the airport on public transport instead of by car will be significant, with larger travel time savings for those travelling longer distances to access the airport, even after the impact of induced demand is incorporated.
- **Improved productivity and competitiveness for Victoria** – Beyond improved access to and from the airport, the mode shift to public transport due to Melbourne Airport Rail reduces congestion on key arterial roads across Melbourne. As Melbourne's arterial network is a key carrier of the city's freight task, the travel time savings will reduce input costs and help boost productivity for local exporters and businesses importing goods.

Melbourne Airport Rail forms a key component of Suburban Rail Loop

When developed, the connection of Melbourne Airport Rail from the airport to Sunshine will form part of the West section of Suburban Rail Loop (SRL).

The Victorian Government has separately committed to delivering SRL – an integrated program of rail and precinct development initiatives, with a 90-kilometre orbital rail line extending around Melbourne from Cheltenham to Werribee. SRL will intersect the city's major metropolitan rail lines, linking middle suburbs and connecting people to major job centres, health services and education institutions. When complete, SRL will provide an additional public transport connection to Melbourne Airport, facilitating direct access to the airport for a range of suburbs in Melbourne's north and east.

SRL has been considered in three sections. The section from Cheltenham to Box Hill is referred to as SRL East, the section from Box Hill to Melbourne Airport is referred to as SRL North, and the western section from Melbourne Airport to Werribee (formed partly by Melbourne Airport Rail) is referred to as SRL West.

The new Melbourne Airport station will also accommodate a future Suburban Rail Loop connection, to provide commuters with the fastest and most direct connections to the airport from all parts of Melbourne and Victoria. RPV is working closely with other transport agencies including the Suburban Rail Loop Authority to ensure links with other projects are carefully planned.

Melbourne Airport Rail forming a component of Suburban Rail Loop

Economic case for Melbourne Airport Rail

Melbourne Airport Rail has strong economic credentials, with a BCR ranging from 1.8 – 2.1 based on a 4 per cent discount rate and excluding the SRL North connection to Melbourne Airport in 2051 in the Base Case. The BCR ranges from 1.1 – 1.3 at a 4 per cent discount rate when the SRL North connection to Melbourne Airport in 2051 is included in the Base Case.

Both Melbourne Airport Rail and SRL East (from Cheltenham to Box Hill) are currently expected to commence construction in 2022, with SRL North (from Box Hill to Melbourne Airport) to be delivered later. In consideration of this, the economic appraisal has been undertaken both with and without the SRL North connection to Melbourne Airport in 2051 in the Base Case.

Although the economic appraisal in this Business Case was undertaken with the SRL North connection to Melbourne Airport in 2051, this could occur in the 2040s subject to future government decisions.

The economic appraisal presents the BCR, NPV and underlying economic benefits as a range between the P10 and P90 values. The incorporation of uncertainty within the economic appraisal reflects best practice and responds to broader recommendations in Victoria and Australia regarding the appraisal of projects with long lead times.

The economic analysis shows that Melbourne Airport Rail is economically viable with a NPV of $7.5 billion to $10.8 billion using a 4 per cent discount rate and excluding the SRL North connection to Melbourne Airport in 2051 in the Base Case.

	BCR (4 per cent discount rate)	NPV (4 per cent discount rate)
Excluding the SRL North connection to Melbourne Airport in 2051 in the Base Case		
Total economic benefits	1.8 - 2.1	$7.5bn - $10.8bn
Including the SRL North connection to Melbourne Airport in 2051 in the Base Case		
Total economic benefits	1.1 - 1.3	$0.9bn - $2.8bn

The delivery of Melbourne Airport Rail will support up to 8,000 direct and indirect jobs during construction. These jobs will range from engineers and subject matter experts planning behind the scenes, to construction workers and local suppliers who will help to deliver the project on site.[5] This level of investment will increase the size of the economy and jobs market, creating 1,880 net additional jobs across Victoria at the peak of construction. The construction and operation of Melbourne Airport Rail is expected to increase Victoria's Gross State Product by $16.2 billion to $17.9 billion in present value terms (including and excluding the SRL North connection to Melbourne Airport in 2051 in the Base Case, respectively).

Melbourne Airport Rail also provides for improvements to the network in future by incorporating features such as longer platforms and an alignment that allows for a future intermediate station, which is currently proposed at Keilor East. Melbourne Airport Rail will also form a fundamental component of the SRL, specifically the section between Broadmeadows and Werribee stations.

Cost to deliver Melbourne Airport Rail

The estimated cost of Melbourne Airport Rail in nominal terms is ***Redacted***

A summary of the estimated cost, on a real and nominal basis, is provided in the table below.

Redacted

Commercial-in-confidence

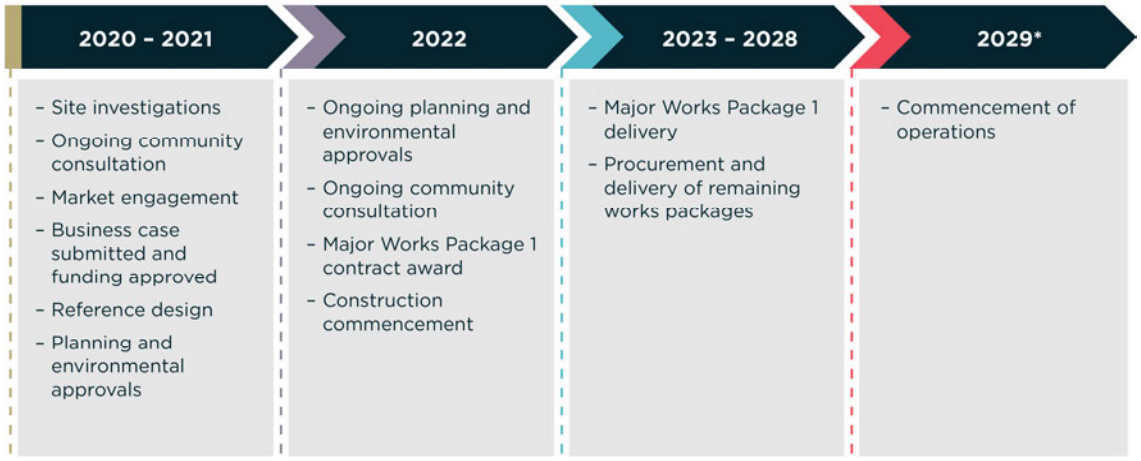
[5] RPV analysis on behalf of the Department of Transport.

Building Melbourne Airport Rail

Melbourne Airport Rail services will operate via the Metro Tunnel from 2029.

Subject to receiving all necessary approvals, construction is expected to start in 2022, with new rail services commencing in 2029.

Projects of the scale and complexity of Melbourne Airport Rail require long lead times to develop and construct, as shown in the diagram below. This makes it imperative to make this investment now.



** Dependent on planning and environmental approvals*

Delivery of Melbourne Airport Rail

The Melbourne Airport Rail packaging and procurement assessment was conducted in line with government guidelines and reflects the current scope of construction works to be undertaken in delivering Melbourne Airport Rail.

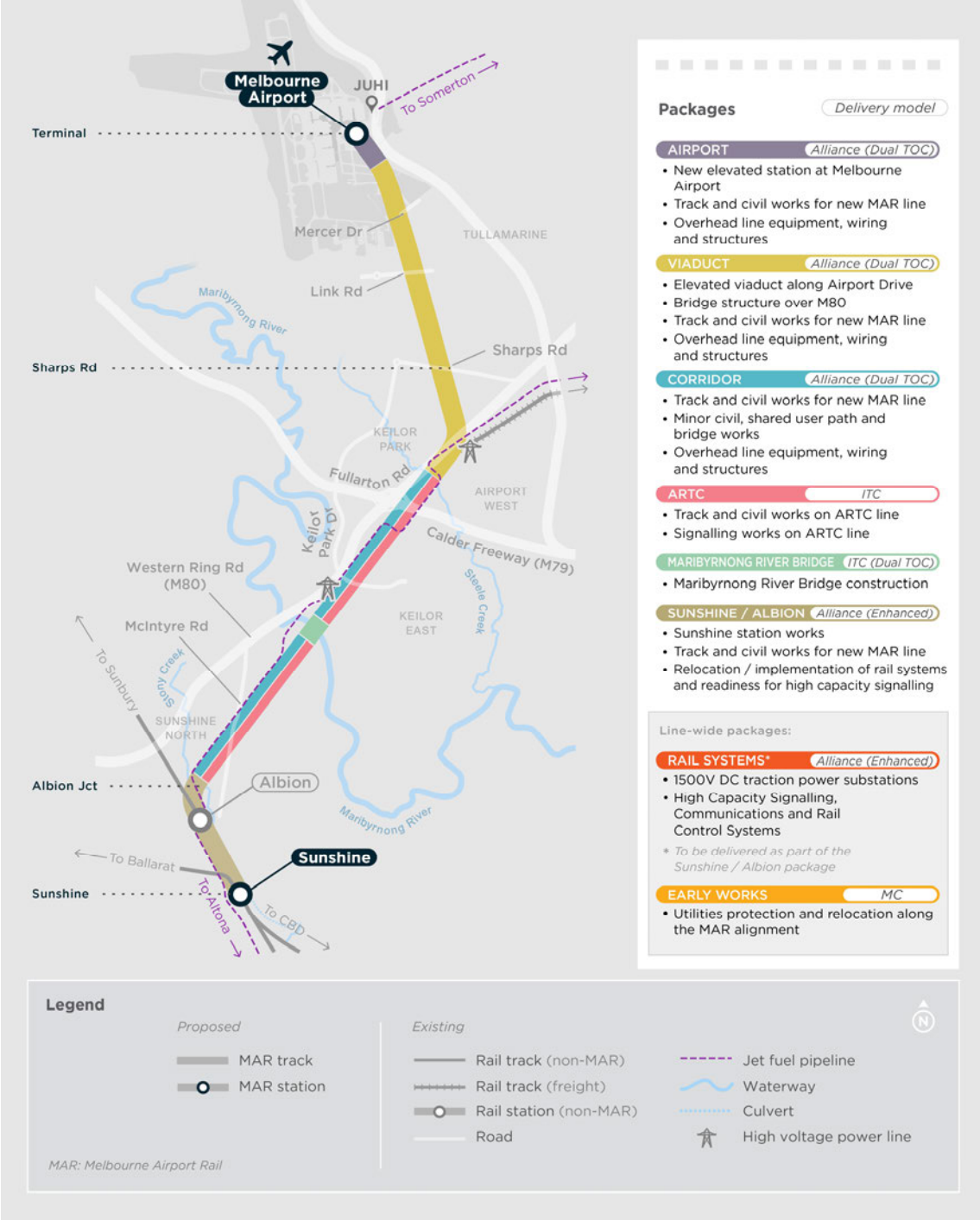
Delivery of Melbourne Airport Rail focuses on the following outcomes to drive value for money for the State:

- ensure market interest, appetite and capacity to optimise participation and competition
- deliver the Project within the time requirements
- ensure appropriate budget, capital and recurrent cost certainty to the State
- allocate risks to the party best placed to manage them
- incentivise contactor innovation where applicable
- retain control and flexibility to accommodate future changes.

Melbourne Airport Rail is being delivered as part of Victoria's Big Build and is one of the most significant investments in infrastructure in Victoria's history. Melbourne Airport Rail will eventually form part of SRL. It will also complement the longer-term pipeline of investment through the Western Rail Plan which will increase the capacity of the rail transport network to support the growing western region of Melbourne. The procurement of Melbourne Airport Rail will be undertaken in the context of this investment pipeline, and the State is continually evaluating infrastructure priorities and the most efficient way to procure and deliver these important projects, including considering innovative methods of procurement to provide value for money to the State and provide industry with a consistent and reliable pipeline of work to support the Big Build.

The packaging and procurement options assessment was conducted according to the Victorian Department of Treasury and Finance's (DTF) *High Value High Risk (HVHR) Investment Framework* and Infrastructure Australia guidelines. The outcome of this assessment is presented below.

Melbourne Airport Rail packaging and procurement solution



Due to the unique issues associated with delivering works on Melbourne Airport-leased land, the State will require a high degree of collaboration with APAM as the current leaseholder and operator of Melbourne Airport. Overarching governance and commercial arrangements for the development, delivery and operation of Melbourne Airport Rail will be agreed between the State (and Australian Government) and APAM and reflected in a Project Deed.

In addition to the above:

- the metropolitan rail franchisee will operate the Melbourne Airport Rail services as there are significant advantages to maintaining a single operator across the network

- the Melbourne Airport Rail services will use the HCMTs currently being delivered to operate the Sunbury to Dandenong corridor.

RPV has investigated opportunities for, and risks of, the Rail Systems package scope being delivered as part of the Sunshine / Albion package. This was recently tested with the market as part of the MAR procurement process and it has been determined that the Rail Systems package scope will be incorporated into the Sunshine / Albion package.

Opportunities provided by Melbourne Airport Rail

A comprehensive review of relevant value creation and capture opportunities was undertaken for this Business Case.

The opportunities under consideration for Melbourne Airport Rail are set out below.

Value creation and capture opportunities will be developed, monitored, assessed and managed over the life of the Project.

The approval pathways for Melbourne Airport Rail

While the primary planning, environment and heritage approvals potentially required for Melbourne Airport Rail are separated into two independent jurisdictions, an integrated approach will be adopted with the view to providing a seamless process for the Project to the extent practicable.

Preliminary investigations have identified a range of potential planning, environment and heritage impacts and indicated that primary approvals will be required for Commonwealth jurisdiction (Airport land) and State jurisdiction (the remainder of the project area).

These may include:

- development of a Major Development Plan under the *Airports Act 1996* (Cth)
- approval under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act), if the potential for significant impacts on matters of national environmental significance is identified
- application for a Planning Scheme Amendment (PSA) for the Hume, Brimbank, Moonee Valley and Maribyrnong planning schemes under the *Planning and Environment Act 1978* (Vic) to introduce a project-specific Incorporated Document to facilitate the Project
- preparation of a Cultural Heritage Management Plan (CHMP) for the Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation and a CHMP for Aboriginal Victoria
- referral under the EPBC Act, as a result of the presence of, and proximity of works to, Matters of National Environmental Significance
- land acquisition and project delivery powers under the *Major Transport Projects Facilitation Act 2009* (Vic)
- heritage permits or permit exemptions for impacts to any of the places or objects on the Victorian Heritage Register, or consents to damage any Victorian Heritage Inventory sites under the *Heritage Act 2017* (Vic)
- approval under the *Pipelines Act 2005* (Vic) for protection and potential relocation works on the existing fuel pipeline that connects to Melbourne Airport.

Management of Melbourne Airport Rail

The Department of Transport (DoT) is the Project Sponsor for Melbourne Airport Rail and will fulfil the organisation's legislative obligations to plan, coordinate, provide, operate and maintain a safe, punctual, reliable and clean public transport system consistent with the vision statement and the transport system objectives of the *Transport Integration Act 2010* (Vic).

RPV is delivering Melbourne Airport Rail and is responsible for development of the project reference design, site investigations, stakeholder engagement, planning approvals and procurement, through to construction delivery and project commissioning.

RPV is the Victorian Government body responsible for the planning and delivery of Melbourne Airport Rail, the Metro Tunnel Project, Regional Rail Revival program, Sunbury Line Upgrade and the Western Rail Plan. RPV is part of the Major Transport Infrastructure Authority (MTIA) which was established to oversee major transport infrastructure projects in Victoria The Australian Government is also a key stakeholder and decision-maker, as it is leasing the Airport land to APAM and is providing $5 billion in funding towards Melbourne Airport Rail. The Australian Government has been involved in developing Melbourne Airport Rail and will continue its involvement in the next phase, including as a member of the Melbourne Airport Rail Steering Committee. In early 2019, the Victorian and Australian governments collectively agreed the basis of funding for Melbourne Airport Rail and shared objectives to deliver the Business Case across both jurisdictions.

A strong governance framework is in place to manage and deliver Melbourne Airport Rail. The Major Transport Infrastructure Board (MTIB) will provide stewardship of Melbourne Airport Rail.

MTIB oversees major transport infrastructure projects to ensure delivery is in accordance with approved business cases and project scope and technical requirements. Additional arrangements are in place to manage the interfaces between Melbourne Airport Rail, Metro Tunnel, the Level Crossing Removal Project and HCMT procurement.

The successful execution and performance of Melbourne Airport Rail depends heavily on the effort and quality of project development and due diligence. An assessment of Melbourne Airport Rail against *DTF Project Development and Due Diligence (PDDD) Guidelines* was undertaken to confirm the required PDDD elements, such as site investigations, operational and system requirements, concept design reports, cost estimation and economic appraisal, have been integrated into the Project. The *DTF PDDD Guidelines* will continue to be followed throughout project delivery.

As part of the risk management process, a comprehensive project risk identification and assessment was conducted according to the DTF *HVHR Investment Framework* as well as Infrastructure Australia guidelines.

Risk mitigation / management strategies were identified for each identified risk and recorded in a project risk register. The risk register will be regularly monitored and updated as Melbourne Airport Rail proceeds through the approvals process, and during design, construction and implementation of the Project.

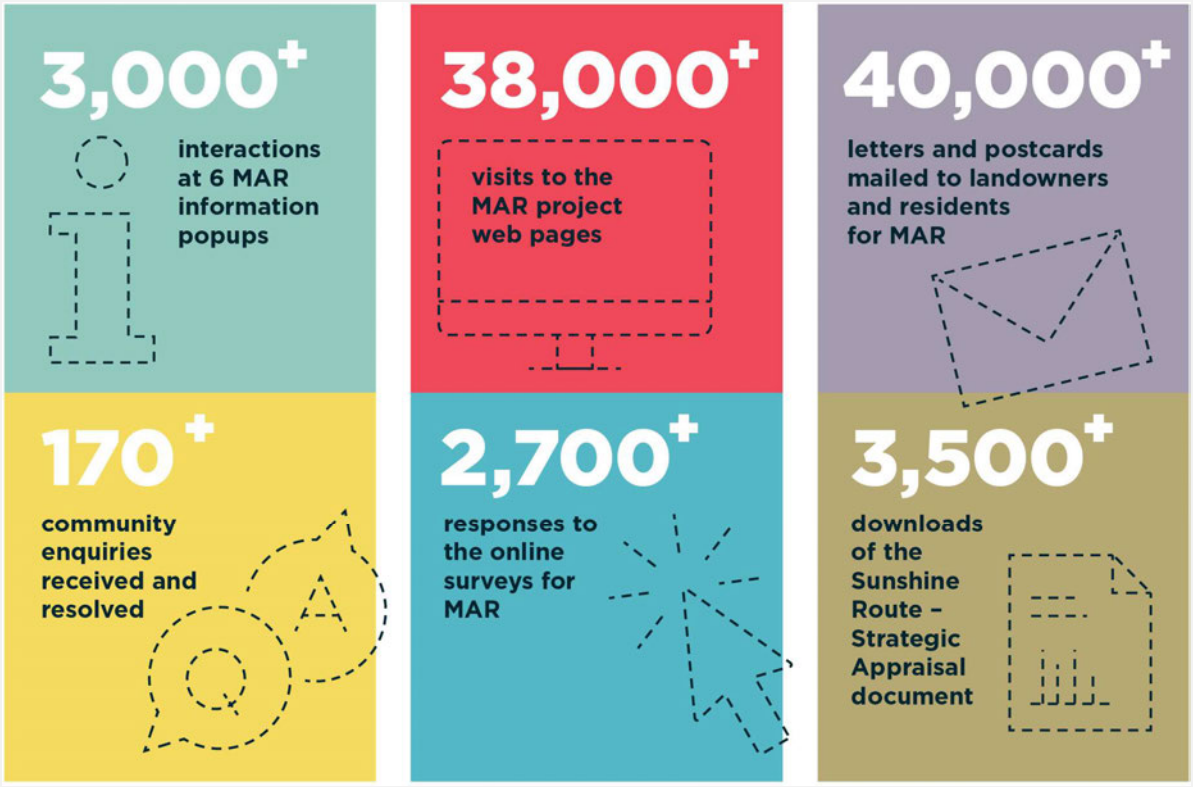
Following the Victorian Government's consideration of this Business Case, the next phase of Melbourne Airport Rail will include developing a detailed Risk Management Plan for risks retained by the State under the respective procurement models for each work package.

Stakeholder engagement

During delivery of Melbourne Airport Rail, there are several stakeholders who will be involved in, impacted by, or interested in the works. Melbourne Airport Rail spans a large geographic area through a variety of suburbs, indicating that a diverse range of communities will interact with the Project. The diversity of these communities is being considered when developing and undertaking engagement activities.

Through engagement conducted to date, stakeholders and the community have provided valuable feedback through their initial ideas and identified the elements of the Project of the most interest to them. This feedback has been used to inform this Business Case and will help support the design development and planning and approvals process.

A snapshot of the engagement to date is summarised below.



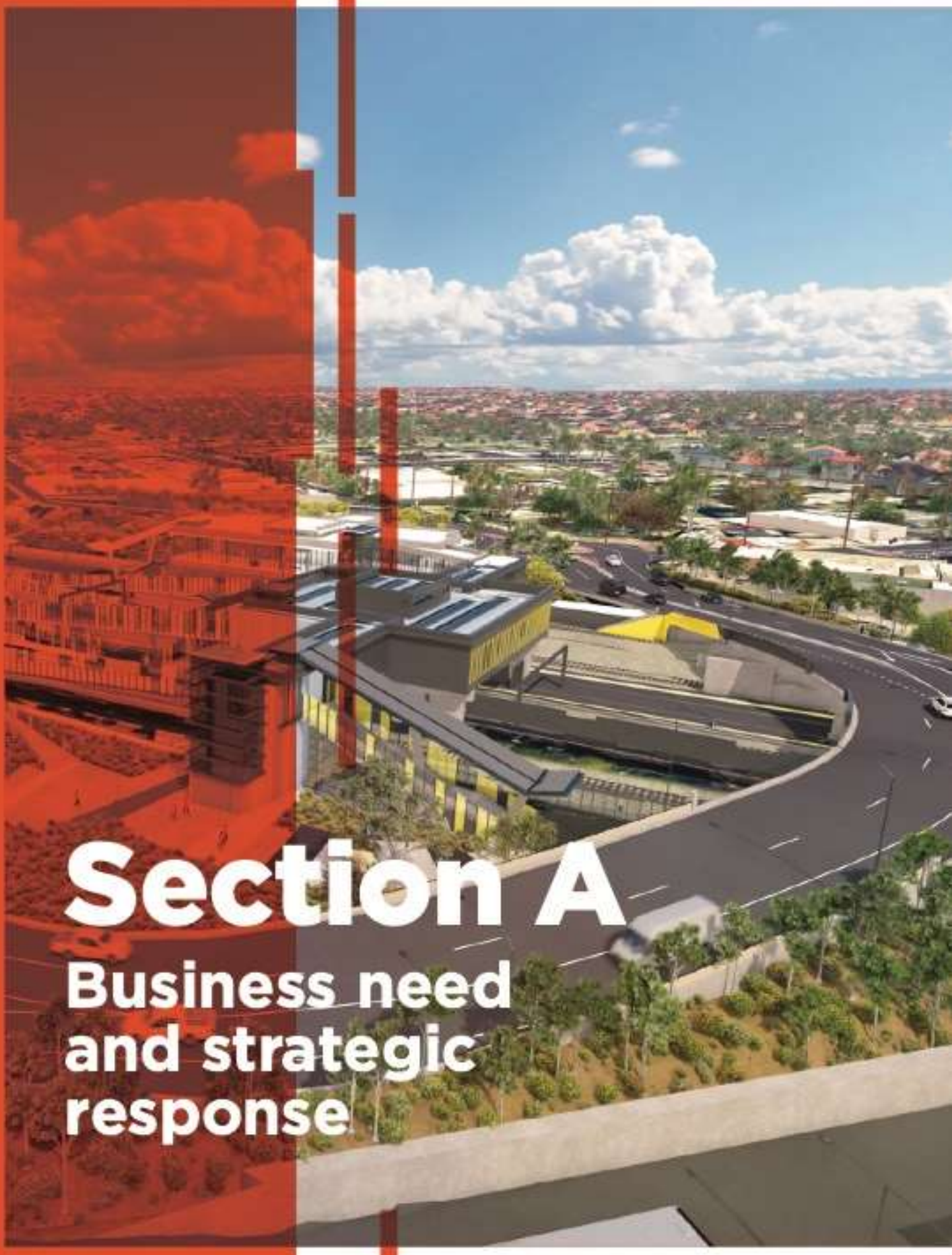
Recommendations of this Business Case

It is recommended the Victorian Government approves this Business Case and proceeds to full implementation of Melbourne Airport Rail.

This Business Case presents extensive analysis which demonstrates that Melbourne Airport Rail is the most appropriate solution to respond to the connectivity challenge to Melbourne Airport.

Melbourne Airport Rail:

- aligns with the strategic policy objectives of Australian, Victorian and local governments
- meets a pressing need to increase the capacity and reliability of access to and from Melbourne Airport
- represents the best option identified to deliver the objectives of rail investment
- delivers substantial social, environmental and economic benefits
- is economically viable and backed by a strong strategic case
- is deliverable within the cost and timeframes proposed
- is widely supported by stakeholders and the community.



Section A

Business need and strategic response

1 Introduction

1. Introduction

1.1 Project context

1.1.1 Melbourne Airport is critical economic infrastructure

Melbourne Airport is critical to the Victorian and national economies. It connects people from across Australia and the world to Victoria and plays a crucial role in opening local businesses to new trade and tourism markets. As Melbourne's population and economy has grown, so has activity at the airport. In FY2019, over 37 million passengers passed through the airport – 52 per cent more than a decade ago.

Melbourne Airport is also the most significant economic hub in Melbourne's north-west, directly employing over 20,600 people and supporting an additional 20,900 jobs in the business parks and employment centres surrounding the precinct.[6] In FY2016, it was estimated that activities within the airport precinct generated over $7 billion in direct economic activity for Victoria, and $20.7 billion in flow-on economic benefits to Australia.[7]

1.1.2 Ground access options to the airport are increasingly congested

Melbourne Airport's role in facilitating economic activity requires a high degree of landside accessibility. Ground access currently relies almost exclusively on road-based transport. While the roads surrounding the airport have served it well in the past, rapid urbanisation in Melbourne's north and west combined with sustained airside patronage growth in the last decade have increased demand on roads to the airport. As more people travel to, from and past the airport, its primary access routes have become increasingly congested.

The impacts of congestion are most acutely felt on the Tullamarine Freeway, particularly between the Calder Freeway merge, where nearly all airport traffic from across Melbourne is ultimately funnelled. The bottleneck can almost double travel times between the airport and the Central Business District (CBD) during peak times, and delay time-sensitive passengers en route to catching scheduled flights or connections elsewhere from the airport.[8] This erosion in travel time reliability to the airport impacts all users, including passengers travelling via private vehicle or public bus, as well as employees and commercial vehicles.

Congestion on airport access routes has broad implications. Access routes facilitate trips to the airport, connect people to jobs, education and social opportunities, and enable the movement of goods across the city to customers. Decline in the quality of airport access routes results in:

- increasing supply chain costs with goods spending more time in traffic, diminishing the competitiveness of Victorian businesses
- smaller labour and customer catchments for Melbourne's businesses and employment clusters, as accessibility to employment and other economic opportunities declines
- constraints on economic benefits that can be generated from emerging knowledge clusters, impacting Melbourne's reputation as an attractive place to live and invest.

Limited ground access options also means Melbourne Airport is out of step with airports of similar stature in Australia and overseas. Unlike most of the world's top 100 airports by patronage, Melbourne Airport (ranked 59th) is one of just 18 without a rail link to the CBD. Sydney, Brisbane and Perth (opening late 2022) airports all have a rail link to the CBD, providing a critical alternative to road-based transport.

[6] Melbourne Airport, *Melbourne Airport Master Plan,* (2018). Jobs quoted are full-time equivalent.
[7] Ibid.
[8] Victorian Integrated Transport Model (VITM) analysis undertaken by Rail Projects Victoria (RPV), (2020).

1.1.3 Melbourne's changing land use and transport needs will likely put further pressure on airport access roads

Pressures on ground access to Melbourne Airport routes will likely worsen over time. By 2048, the number of passenger movements at Melbourne Airport is expected to more than double to 87 million per annum and result in more cars on already-congested roads.[9] At the same time, continued population growth in Melbourne's outer north and west will place further pressure on the Tullamarine Freeway and impact the journeys of nearly all airport users.

Planning for the continued pressures on ground access to Melbourne Airport is important for airport users and the broader community. The anticipated growth of service and knowledge-based industries in Melbourne's CBD and in precincts such as Parkville and Monash will increase travel demand to these areas and impact travel times for nearly 40 per cent of airport users from Melbourne's inner and south-eastern suburbs.[10] Decline in the quality of major roads, particularly the Monash Freeway, has implications for the accessibility of the arterial's large user base from the east and south-eastern suburbs.

As land use constraints will eventually prevent future further widening of the Tullamarine Freeway, the continued reliance on private vehicles (including private cars, taxis and ridesharing) to reach the airport is not sustainable. Further, the SkyBus is the only form of public transport that directly connects the airport and CBD and it often experiences capacity issues and is impacted by congestion on the Tullamarine Freeway. This demonstrates a clear need for a step change in ground access infrastructure to adapt to growing transport demand between the airport, CBD and Victoria's economic clusters.

1.2 Background to Melbourne Airport Rail

1.2.1 Developmental context

The Victorian Government has completed various planning studies to explore options to improve accessibility to Melbourne Airport. Several of these studies have focused on providing a rail link between Melbourne Airport and central Melbourne.

In the last two decades, key assessments of potential route alignments have included:

- 2002 Melbourne Airport Transit Link Study
- 2012 Melbourne Airport Rail Link Study
- 2018 Melbourne Airport Rail Link Strategic Appraisal.

These studies recommended an integrated heavy rail solution with the Albion East route (most recently referred to as the Sunshine route) as the preferred alignment. The developmental background to these relevant studies considered in this Business Case is summarised below.

[9] VITM modelling undertaken by RPV, (2020).
[10] Ibid.

A history of investigations into rail links to Melbourne Airport [11]

This Business Case builds on various planning studies undertaken over previous decades, which have identified and assessed potential routes for a rail link between Melbourne Airport and the CBD. Each completed study has provided an updated assessment of the relative merits of an airport rail link, recognising the ongoing economic and social changes influencing Melbourne's travel demand, and the development of its transport network.

1960s – First Bill proposed to link airport to metropolitan rail network

Before Melbourne Airport opened in 1970, the Glenroy Tullamarine Railway Construction Bill was introduced during the Bolte Government in 1965. The Bill sought to enable land acquisition for a future rail connection between Glenroy and Tullamarine. This proposed rail line formed part of the planning for the future suburban rail network, as recommended by the then Railway Department to the Metropolitan Transport Committee (MTC). However, following the opening of the Tullamarine Freeway in 1968, and a period of parliamentary disagreements regarding the optimal route, cost and expected patronage, the Bill lapsed and plans for the rail link were not progressed. The *Metropolitan transportation study* commissioned by the MTC in 1969 did not refer to a rail link but proposed an express service using the Tullamarine Freeway.

1970s – The Aerotrain and changing priorities

Later in 1971, the Bolte Government authorised a feasibility study for a monorail system between the city and Melbourne Airport, termed the 'Aerotrain'. To be partly developed by the French Government, the feasibility study focused on the transport of air passengers to the airport with an extension to Sunbury also considered. However, greater community and ministerial calls to upgrade local bus and rail networks over investing in an airport monorail meant the project failed to gain traction and was abandoned by the Australian and French governments in 1975.

1980s – Setting the strategic foundation

The 1980s saw the publication of several documents that set out long-term strategic directions for transport access and infrastructure to the airport. This included Victoria's first economic strategy in 1984, *Victoria: The Next Step,* which supported the reservation of land for a rail link which would be justified by future demand. In cooperation with the Australian Government, the Victorian Government committed to augmenting landside access to Melbourne Airport to enable it to reach its economic potential.

Victoria: The Next Decade was subsequently released in 1987, followed by the *Melbourne Airport Surface Access Study* in 1988. Both papers outlined the need to take steps to establish a reserve between the Broadmeadows line and Melbourne Airport in metropolitan planning schemes.

1990s – Identifying suitable routes

In 1991, the Victorian Government released its *Infrastructure Investment Guidelines for Victoria.* The document highlighted five key projects to be developed in partnership with the private sector, including a Rapid Transit Link to the airport. However, following a change in government and a concomitant shift in priorities, the rail link was not progressed.

Plans for an airport rail link were renewed in 1996, through the release of the Victorian Government's *Transporting Melbourne* strategic framework. The report identified seven priority transport corridors, including the Melbourne Airport transport corridor. The Melbourne Airport transport corridor included a Victorian Government commitment to investigate service and route options, as well as the reservation of land for a future rail link.

In support of the *Transporting Melbourne* commitment, the Department of Infrastructure undertook an initial planning study in 1998 that sought to identify the most suitable route for reservation in planning schemes, and considered three alternative corridors – Broadmeadows, Essendon and Albion. This culminated in the *Melbourne Airport rail link* report, which concluded that the Broadmeadow corridor was the preferred alignment option to meet the public transport needs of the growing community and airport users.

Following the 1998 *Melbourne Airport rail link* recommendation, an amendment to the Hume Planning Scheme was sought to include a reserve for the Broadmeadows corridor. However, submissions for the amendment were reviewed by an independent Panel and Advisory Committee, who recommended postponing the amendment subject to investigation of alternative corridor options.

2000s – Feasibility studies and preliminary appraisals

Since 2000, there have been a number of significant studies into the feasibility of a rail link between Melbourne Airport and the CBD. These include the *Melbourne Airport Transit Link Study* (2002), *Melbourne Airport Rail Link Study* (2012) and *Melbourne Airport Rail Link Strategic Appraisal* (2018). These three studies are described in the next section.

[11] Department of Parliamentary Services, *Melbourne Airport rail link – Research paper*, (2017).

1.2.2 Relevant studies

1.2.2.1 2002 Melbourne Airport Transit Link Study[12]

The Victorian Government allocated $20 million in its FY2001 State Budget to the *Airport Transit Link Study* to assess the various corridor options between the city and Melbourne Airport. The study recommended further investigating the merits of the Albion corridor option. A Public Acquisition Overlay was subsequently put in place to reserve the Albion East route for a future rail link, securing a corridor between the existing Jacana rail route and Melbourne Airport.

However, following completion of the study in 2002, the Victorian Government announced it would not proceed with the rail link. Analysis of airport patronage suggested an airport rail link would not be commercially viable for at least a decade, primarily due to competition from road-based alternatives, which were considered more attractive for airport users.

1.2.2.2 2012 Melbourne Airport Rail Link Study[13]

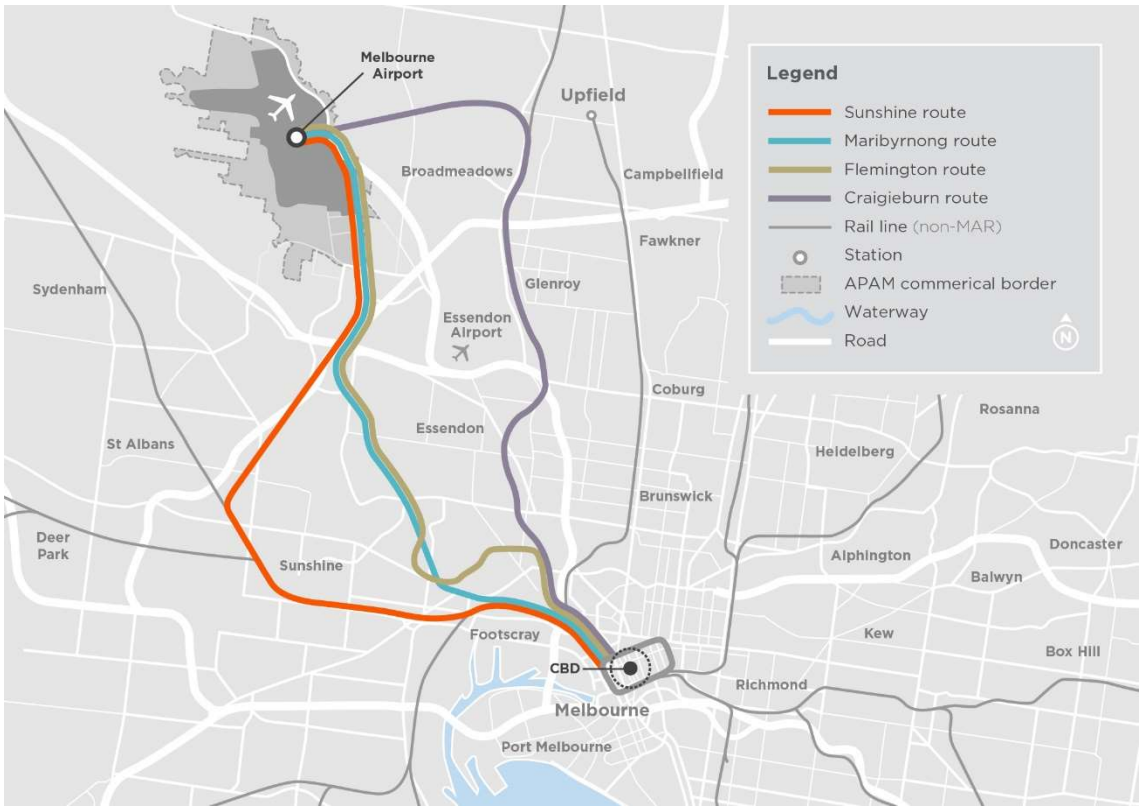
The Victorian Government allocated $6.5 million in its FY2012 State Budget for the *2012 Melbourne Airport Rail Link Study* to be undertaken by Public Transport Victoria (PTV). The study sought to investigate and identify options for a rail link between central Melbourne and Melbourne Airport, and reconsidered the investigations completed as part of the 2002 *Melbourne Airport Transit Link Study*, which identified the Albion East (via Sunshine) alignment as the preferred option. This was in response to projections of airport and public transport passenger growth, as well as subsequent developments in Victoria's rail system such as the Regional Rail Link (RRL) and the Metro Tunnel Project (MTP).

The Albion East alignment recommended as part of the 2002 *Melbourne Airport Transit Link Study* makes use of existing tracks on the Sunshine corridor. However, the 2012 PTV study identified that existing tracks would not facilitate patronage growth on the network and, given the timing of the 2002 study, it could not consider routing via the planned Metro Tunnel. As a result, and as part of the 2012 PTV study, the Albion East alignment retained the Albion East reserve and Sunshine rail corridor, but travelled through the Metro Tunnel to provide access to the CBD and the south-east.

This Albion East alignment (the Sunshine Route) became the base case that alternative route options were considered against. The PTV study reduced a range of corridor options to four options through detailed assessments that considered likely travel time, operational reliability, accessibility, capacity, connectivity, constructability, risk and cost. In addition to the Sunshine Route, the PTV study considered three alternative routes – the Maribyrnong Route, the Flemington Route and the Craigieburn Route. Figure 1-1 shows the Sunshine Route and the other three alignment options. In the rapid appraisal, the high cost and delivery risks associated with underground stations and tunnels made the Maribyrnong and Flemington options less viable compared with the Sunshine Route, while the Craigieburn link was forecast to have lower patronage than the base case. The PTV study concluded the Sunshine Route remained the preferred alignment for a rail connection to Melbourne Airport, consistent with the 2002 *Melbourne Airport Transit Link Study*.

[12] Department of Infrastructure, *2002 Melbourne Airport Transit Link Study*, (2002).
[13] Public Transport Victoria, *Melbourne Airport Rail Link Study,* (2012).

Figure 1-1: Route alignment options.[14]



1.2.2.3 2018 Melbourne Airport Rail Link Strategic Appraisal[15]

In 2018, the Victorian Department of Transport (DoT, then as Transport for Victoria) published the *Melbourne Airport Rail Link Strategic Appraisal.* The appraisal revisited the 2012 PTV study, specifically to ascertain whether:

- heavy rail remained the most appropriate long-term response for increasing capacity of the transport network connecting Victoria to Melbourne Airport
- the underlying assumptions remained reflective within the context of changes in the rate and distribution of population growth, especially considering the substantial population growth in outer metropolitan areas to the north and west of Melbourne Airport, as well as airport patronage growth
- the Sunshine Route remained the preferred option relative to the three alternatives identified in the 2012 PTV study, within the context of the rail system today and against the backdrop of changing rail patronage.

The DoT appraisal concluded that integrated heavy rail was the preferred mass transit link between Melbourne Airport and the CBD. It also noted that since the 2012 PTV study, while projections of airport passenger growth have remained consistent with current expectations, the number of passengers on Victoria's rail system has exceeded forecasts. The anticipated need for more passenger services along key growth corridors, and the broader network implications, was a consideration in the updated appraisal.

The appraisal also evaluated the four shortlisted heavy rail alignment options from the 2012 PTV study – the Sunshine, Maribyrnong, Craigieburn and Flemington routes. Consistent with the findings of the PTV study, the DoT appraisal recommended the Sunshine Route for a rail link between Melbourne Airport and the CBD. The key drivers for the Sunshine Route included the ability to deliver it sooner and at a significantly lower cost than other route options that offered a comparable level of

[14] Department of Transport, *Melbourne Airport Rail Link – Sunshine Route Strategic Appraisal*, (2018).
[15] Ibid.

benefit. The Sunshine Route also offers the potential for additional connections to regional Victoria and the broader metropolitan network.

1.2.3 Current government commitments

The Australian Government committed $30 million towards the planning of a rail link to Melbourne Airport and development of a business case in its FY2018 Budget.

In mid-2018, the Victorian and Australian governments each pledged $5 billion towards a rail link to Melbourne Airport, representing a 50-50 funding arrangement. The $5 billion commitment from the Australian Government comprised an allocation of up to $2.5 billion from the National Rail Program and up to $2.5 billion from the Infrastructure Investment Program.

In early 2019, the Victorian and Australian governments collectively agreed the basis of funding for Melbourne Airport Rail and shared objectives to deliver the Business Case across both jurisdictions.

1.3 Melbourne Airport Rail as part of other commitments

1.3.1 Suburban Rail Loop

The Victorian Government has separately committed to delivering Suburban Rail Loop (SRL) – an integrated program of rail and precinct development initiatives, with a 90-kilometre orbital rail line extending around Melbourne from Cheltenham to Werribee. SRL will intersect the city's major metropolitan rail lines, linking middle suburbs and connecting people to major job centres, health services and education institutions. Figure 1-2 shows how Melbourne Airport Rail (MAR, or the Project) integrates with SRL.

Figure 1-2: Melbourne Airport Rail and Suburban Rail Loop

SRL has been considered in three sections. The section from Cheltenham to Box Hill is referred to as SRL East. The section from Box Hill to Melbourne Airport is referred to as SRL North. The third section from Melbourne Airport to Werribee is SRL West is in the early stages of planning.

All projects underway in Melbourne's West, including MAR, Metro Tunnel, Geelong Fast Rail and other Western Rail Plan (WRP) initiatives will make provision for SRL West to allow for the earliest possible delivery of SRL to Werribee. A description of the WRP is provided in the next section.

The integration of MAR with SRL is expected to further improve the quality of public transport options to the airport for people from across Melbourne. Accessibility and travel times for passengers arriving at Melbourne Airport will improve and there will be more direct rail connections to metropolitan and regional Victorian destinations.

The considerable scale and complexity of SRL means that it will be completed in several stages over multiple decades. MAR will form the initial segment on the western side, while SRL East, which is

due to commence construction in 2022 and commence operations in 2035, will be the next segment delivered.

The Victorian Government has developed the SRL Business and Investment Case with a focus on SRL East and SRL North. The development of the SRL Business and Investment Case has been undertaken in parallel with this Business Case.

This Business Case focuses on MAR as a stand-alone component of SRL. Details relating to SRL are provided in the SRL Business and Investment Case. However, given the long-term nature of SRL North delivery, particularly the connection to the airport on the eastern side, the economic analysis in Chapter 9 of this Business Case is provided for two scenarios:

- In the first scenario, MAR is analysed as a stand-alone project to enable an assessment of its merits without the SRL North connection to the airport.
- In the second scenario, MAR is analysed with the SRL North connection to the airport completed by 2051.

1.3.2 Western Rail Plan

The Victorian Government has also committed to the Western Rail Plan (WRP). The WRP contemplates a range of investment initiatives that aim to improve the frequency and carrying capacity of services to growth areas in Melbourne's west and the travel times of rail services to the regional cities of Geelong and Ballarat.

The proposed initiatives considered within WRP include:

- works associated with enabling the operation of higher-capacity trains to the growth areas
- augmentation works to existing infrastructure to maximise available train paths
- significant expansion works at Sunshine Station, including the provision of a third regional platform
- the staged segregation of regional and metropolitan train paths to remove key bottlenecks and the extension of metropolitan electrified services
- new stations along the Ballarat / Melton and Geelong / Wyndham Vale corridors to serve population growth in Melbourne's west
- faster services to Geelong and Ballarat, facilitated by upgrade works on the Regional Rail Link and the Werribee lines and a progressive program of construction to provide additional service capacity on the western rail network.

Upgrades on the western rail network to enable higher-capacity rolling stock will involve works at Sunshine Station. These investments at Sunshine Station are considered an early priority within the WRP and along with the subsequent program of upgrades to the western rail network, will provide a 'stepping stone' to MAR and infrastructure upgrades under the complete WRP.

1.4 Objectives of Melbourne Airport Rail

The agreed objectives of the Australian and Victorian governments for MAR are to:

- address growth pressures in and around Melbourne, including population growth and increasing congestion
- increase public transport services, options and accessibility to and between Melbourne Airport and the CBD
- ensure financial and economic sustainability with consideration given to patronage and precinct development
- maximise service offerings to passengers with frequent and reliable services, and improved passenger amenity

- support Victoria's and Australia's economic growth by improving access to international and interstate markets
- integrate the Project into the urban and regional transport network to facilitate broader economic and social development goals for Victoria
- catalyse viable urban and economic development opportunities
- maximise other government policy outcomes with options for corridors including with respect to housing affordability, transport mode connections and access to employment.

1.5 Business Case development and purpose

1.5.1 Development of this Business Case

This Business Case acknowledges and builds on previous works and planning studies undertaken for a rail link to Melbourne Airport, summarised above in section 1.2.2. The Business Case does not therefore seek to re-prosecute the adoption of an integrated heavy rail solution or the alignment of MAR via Sunshine. However, the Business Case does seek to evaluate city access options between Sunshine Station and the CBD.

This Business Case is subject to Victoria's Department of Treasury and Finance (DTF) *High Value High Risk (HVHR) Investment Framework* assurance process for capital projects. The framework comprises a series of project assurance checks and processes to bring greater scrutiny and rigour in the development of complex investments. Assessment of risks by the Treasurer of Victoria and DTF at each stage of a project lifecycle is undertaken to improve program deliverability and the likelihood that projects achieve their stated benefits. The process of the HVHR Investment Framework is shown in Figure 1-3.

Figure 1-3: DTF HVHR Investment Framework process

This Business Case will also be subject to Infrastructure Australia's (IA) *Assessment Framework*, as required by the Australian Government before delivery funding can be released.

Uncertainties regarding COVID-19

This Business Case was developed in 2020 and since then, the COVID-19 pandemic and necessary measures implemented to slow its spread have led to unprecedented economic challenges. At the time of writing, these measures included:

- restrictions on domestic and international travel for Australian citizens
- all inbound travellers, except those from New Zealand, subject to mandatory 14-day quarantine
- 'last step' restrictions in Victoria which include caps on people densities indoors, and restrictions regarding social gatherings, religious gatherings, hospitality, community facilities and recreation, as well as ongoing limitations to on-site and office working.

By the end of 2021, most of these restrictions have been lifted in line with *Victoria's Roadmap: Delivering the National Plan*. In particular, international travel restrictions have been lifted primarily for fully vaccinated travellers. Remaining gathering, capacity and density limits in social, work, retail, hospitality and entertainment contexts as well as at major events were lifted at the end of November 2021.

Despite this relaxing of restrictions, the full length and severity of the economic contraction remains uncertain. The observed impacts of COVID-19 on the economy, the ensuing effects on work and travel patterns around Melbourne and the potential implications for MAR are discussed below.

The immediate economic fallout of COVID-19 has been significant, but there are signs of recovery

COVID-19 has dramatically impacted the livelihoods of Victorians. The most visible impacts during the lockdowns have included the shutdown of non-essential retail trade, the hospitality industry and arts and recreational venues. This has led to a large employment downturn and a substantial decline in economic activity. The lockdowns and closure of interstate and international borders have considerably reduced travel demand. The knock-on impacts of these closures are significant, as consumers stayed home and firms and households scaled back their expenditure in the face of economic uncertainty.

However, there are signs of economic recovery as the last restrictions are eased and Victoria's vaccination rate (of the population aged 12 and over) reaches 90 per cent by the end of 2021. The unemployment rate in Australia has declined to to 5.2 per cent as of October 2021, an improvement from a high of 6.9 per cent in October 2020..[16] This reflects some of the positive impact of eased restrictions on hard-hit sectors such as retail and hospitality. The labour force participation rate also recovered slightly to 64.7 per cent by October 2021 after falling to a low of 64.1 per cent in May 2020.

Ongoing constraints to work, study and visitor conditions will have a considerable impact on migration to Australia. The Commonwealth Treasury predicts that net overseas migration will fall from 194,000 in FY2019 to the lowest rate in more than a century, as travel restrictions prevent people coming to Australia and temporary migrants leaving the country. Overall, more people are expected to migrate out of Australia in FY2020 and FY2021, with net outflows of 97,000 and 77,000 respectively..[17] However, net overseas migration is expected to lift to pre-COVID-19 levels over the next four years..[18] International students are also expected to gradually return to Victoria in late 2021 and early 2022 under the International Student Arrivals Plan.

Overall, the globally synchronised slowdown is expected to dampen economic activity, rates of population growth and consumer spending in the short term, but there are signs of recovery as vaccination rates increase internationally. Domestically, stimulus packages and targeted support from governments have also helped to restore demand as restrictions are lifted and accelerate economic recovery. The Commonwealth Treasury projects GDP to grow 2.5 per cent in 2022, signalling a return to levels of growth observed pre-COVID-19, after a fall of 3.75 per cent in 2020..[19]

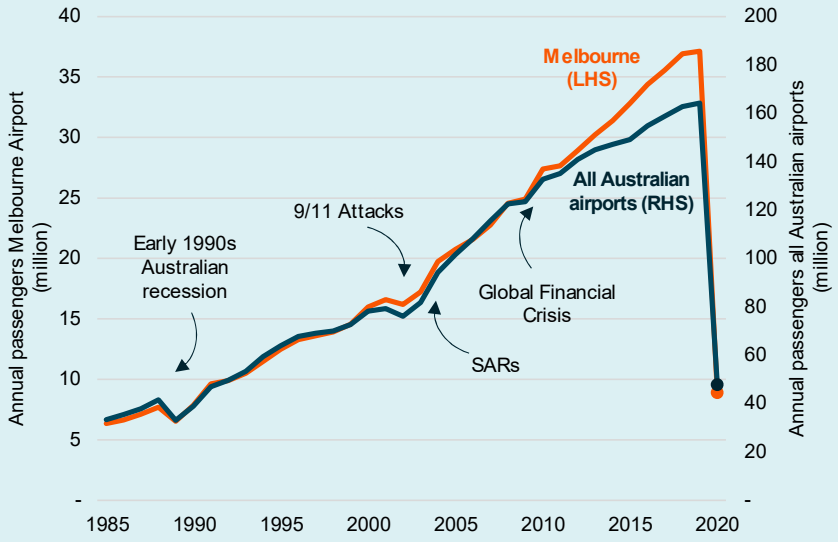
The scale of long-term impacts on the aviation industry remains uncertain

It remains to be seen to what extent current economic contraction will have longer-term implications for the aviation industry. Historically, air passenger traffic has generally bounced back relatively quickly from short-term upheavals, with typical returns to pre-shock trend levels occurring within four years..[20]

Global patterns indicating the resilience of the aviation industry are also reflected in airport traffic data from Melbourne Airport and Australian airport totals from 1985 to 2020 shown in Figure 1-4. The figure shows that air passenger traffic has continued to grow more or less in line with long-term trends after recovery from previous major shocks.

[16] Australian Bureau of Statistics, *Labour Force, Australia, October 2020,* (2020).
[17] Ibid.
[18] Ibid.
[19] Commonwealth of Australia , *Budget 2021-22: Budget Strategy and Outlook, Budget Paper 1 – May 2021,* (2021).
[20] International Air Transport Association (IATA), *Global Air Passenger Markets: Riding Out Periods of Turbulence*, (2015).

Figure 1-4: Air passenger traffic at Melbourne and all Australian airports, 1985 - 2020.[21]



However, each shock is different and the sharp decline in aviation activity from COVID-19 is significantly worse than those observed after the 9/11 attacks and the 2008 Global Financial Crisis. Overall traveller numbers at Melbourne Airport are currently down 27 per cent from 37 million in FY2019 to 27 million in FY2020..[22] This has declined to just over 6 million in FY2021..[23]

While the industry has historically been able to adapt its business model to new challenges and disruptions, it should not be assumed this will easily occur, as the regulatory environment and local market dynamics retain significant power on the industry's ability to weather shocks. Looking forward, the lifting of travel restrictions and federal support for the aviation and tourism industry is likely to restore some demand. However, a weakened global economic outlook and continued uncertainty will likely soften airport patronage for several years.

Possible changes to mobility patterns

How the crisis permanently impacts mobility patterns is uncertain. As people shifted to working from home or remote schooling during the lockdown, the share of active and private transport and shorter local trips has increased.

How, and if, this period fundamentally affects the frequency and way that people travel, and conduct business will only be realised in the years to come. It is possible that COVID-19 may lead to a changing of mindsets around remote working and grow the role technology can play in how we work. On the other hand, concerns around supply chain resiliency and minimising operational disruptions may catalyse a shift towards logistics networks with a larger local footprint.

There is also potential that as public transport is a less attractive option in the near-term, there may be a shift towards using private cars or certain 'micro mobility' modes such as scooters, bicycles and skateboards for more trips. As some cities across the world reopen following periods of lockdown, a rise in the popularity of active transport has been observed, but moderated as more cars return to roads. Beyond a decline in usage levels during the lockdown, it is also uncertain what will be the lasting impacts of the crisis on modes such as taxis, ridesharing and charter services.

Implications for MAR

While the length and magnitude of these headwinds is uncertain, many of these impacts will likely continue to be felt for some time. Despite many unknown variables, it is possible that airport patronage and road and public transport travel demand may be lower over the next few years. The combined impact of these factors is that congestion and expected patronage growth on MAR may be pushed out by a few years relative to business as usual scenarios.

However, given that lead times for MAR will likely be longer than the recovery timeframe, the underlying problems that MAR aims to alleviate – such as growing pressures from population growth, and improving access to economic hubs – are expected to remain relatively unchanged over the long term. Going forward, projects such as MAR can be a key tool in economic stimulus, initially by creating direct employment during its delivery in sectors such as construction, engineering and project management, and subsequently by relieving bottlenecks that constrain productivity growth.

Notwithstanding the above, additional sensitivity analysis was undertaken for this Business Case to understand the implications of COVID-19 on MAR, including delayed land use changes, the increase in working from home and subdued airport patronage demand. Further discussion of this sensitivity analysis is provided in Chapter 8 and Chapter 11.

1.5.2 Purpose of this Business Case

The following objectives establish the primary purpose for this Business Case:

- update the problem context from previous planning studies, and define the problems to be solved
- articulate the key benefits that are realised when the problems are solved
- assess alternative city access options between Sunshine Station and central Melbourne
- recommend a project solution based on an analysis of transport network, cost, risk, economic, environmental and social impacts
- provide guidance on the implementation and delivery of the recommended project solution.

[21] Bureau of Infrastructure, Transport and Regional Economics, *Airport Traffic Data 1985-86 to 2020-21.* (2020).
[22] Melbourne Airport, *Melbourne Airport passenger performance FY19/20.* (2020).
[23] Melbourne Airport, *Melbourne Airport passenger performance FY20/21*. (2021).

2 Problem definition

2. Problem definition

Chapter summary

- Melbourne is experiencing rapid demographic and economic change. In line with national trends, the fastest-growing sectors of the Victorian economy are service and knowledge-based industries. This is attracting more people to live in Greater Melbourne for its higher employment prospects, education and social opportunities.
- The spatial implications of these shifts are already being felt across Melbourne. Suburbs in Melbourne's outer north and west are experiencing among the fastest rates of population growth in Australia. At the same time, the intensification of employment in the CBD has contributed to significant population growth within inner-city areas.
- Activity at Melbourne Airport continues to grow. Underpinned by rising international visitor numbers, in FY2019 over 37 million passengers passed through the airport – 52 per cent more than a decade ago.[24] Before COVID-19, passenger trips at Melbourne Airport were forecast to increase 3.2 per cent annually over the next 30 years to reach 87 million trips per year by 2048.[25]
- The sustained growth in patronage and air freight has contributed to substantially higher demand on landside access. The combination of this growth and network-wide increases in vehicles on Melbourne's roads has contributed to deteriorating travel times and reliability on the key airport access routes. Given there are few ground transport options that do not use the Tullamarine Freeway, travel times and access reliability to the airport will worsen over time.
- Within this context, there are two key problems that underpin the need for a rail link to Melbourne Airport.
  - **Limited transport connections to Melbourne Airport constrain passenger access**
    - Nearly half of passenger trips to and from the airport are cross-city journeys from the inner, east or south-east suburbs. The significant distances covered to reach the airport mean most journeys are funnelled on Melbourne's arterial road network.
    - Accessibility to the airport is impacted by heavy congestion on these links and there are impractical public transport connections for the majority of the airport's user catchment. Unlike most global airports of similar stature, Melbourne Airport has no direct rail connection to the CBD.
    - Impractical access to alternatives means that most (90 per cent) of airport users travel by private vehicle (including private car, taxi or ridesharing) to the airport. Sustained increases in airport patronage and freight demand will continue to adversely impact the reliability of all airport access routes.
  - **Increasingly congested links to Melbourne Airport limit Victoria's economic prosperity**
    - Growing patronage at the airport will generate more ground transport movement and add more cars to already-congested roads. The increasing concentration of key employment precincts in Melbourne's CBD and south-eastern suburbs is expected to concentrate significant travel demand on the Tullamarine and Monash freeway corridors. Given the broad user base of Melbourne's arterials, network-wide congestion will have impacts beyond delaying airport passengers, including adding to supply chain costs, diminishing accessibility to social and economic opportunities across the city. Failure to address these issues will constrain Melbourne's economic potential and impact its reputation as an attractive place to live and invest.

[24] BITRE, *Airport Traffic Data 1985-86 to 2018-19,* (2019).
[25] Department of Economic Development, Jobs Transport and Resources, *Air Passenger Forecast Study,* (2018).

2.1 Problem context

The way people move around Melbourne is influenced by a range of interconnected economic and social trends. In line with changes occurring across Australia, the fastest-growing sectors of the Victorian economy are knowledge-based industries concentrated in Melbourne's CBD and around key education precincts. This is attracting more people to live in Greater Melbourne for its higher employment prospects, education opportunities and standards of liveability.

Melbourne Airport is a crucial piece of infrastructure facilitating this structural economic shift. Melbourne's growing importance as a national knowledge hub and driver of economic growth has brought more people and business activity to the city, increasing airport patronage. The rapid growth in the city's education and tourism sectors has also contributed to the increase in interstate and international visitors. This is adding to congestion on airport access routes, particularly on the Tullamarine Freeway.

As Melbourne's economy grows and urbanises, so does its population. The concentration of population growth in Melbourne's northern and western suburbs is placing additional pressure on access routes to Melbourne Airport. In particular, major freeways in Melbourne's north and west, including the Tullamarine Freeway, CityLink and Western Ring Road, are already near or at capacity during the AM peak, and often experience travel speeds well below the posted limit. Figure 2-1 shows the current major access routes to Melbourne airport without MAR.

Figure 2-1: Melbourne Airport context map with major access routes (without MAR)

Capacity issues on airport access routes have wide-ranging implications. Melbourne's arterial roads (including the freeway network) serve a broad user base. Arterial roads are critical links connecting people to jobs, education and social opportunities, and they facilitate the movement of goods across the city.

Despite investments to expand the capacity of airport access roads over the last decade, travel times will deteriorate as the city's population and economic stature continues to expand, combined with growing volumes of commuter and commercial traffic to and from the northern and western suburbs. This in turn constrains the city's economic potential and entrenches social disparities as congestion makes it harder for all to access jobs and other social opportunities across Melbourne.

2.1.1 Airport users generate substantial landside travel demand

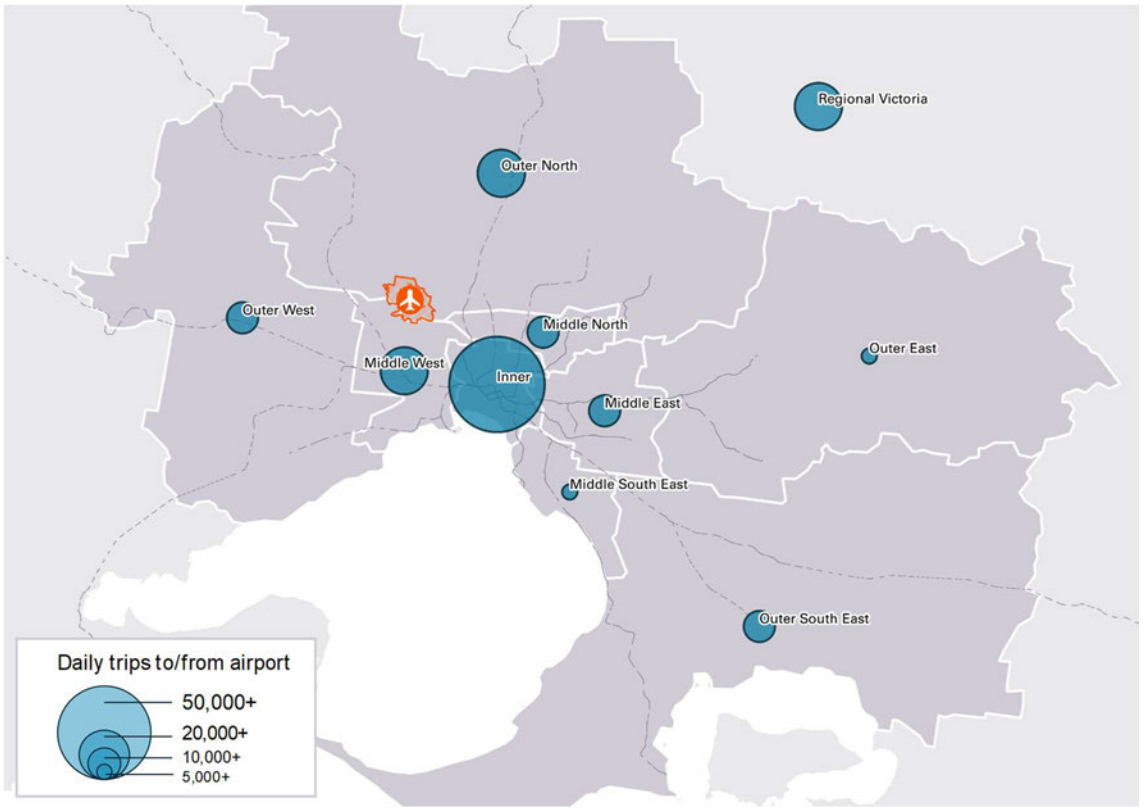
Landside trips to the Melbourne Airport precinct come from across Victoria and add considerable vehicle volumes to Melbourne's road network. Historically, the airport's Tullamarine location in Melbourne's outer north-west was chosen for its lack of surrounding land use constraints.[26] However, this now also means that almost half of all trips to and from the airport are cross-city journeys from inner, south-east and eastern Melbourne. These journeys are made almost entirely on Melbourne's arterial road network.

While the COVID-19 crisis has impacted recent patronage demand, historical trends suggest air travel demand will likely progressively recover to long-term trends within the next five years. By 2021, Melbourne Airport is forecast to generate over 180,000 trips on an average weekday.[27] Almost two-thirds of these trips will be made by airport passengers, with the remainder made by airport employees. Landside trips to the airport made by passengers are forecast to grow at an average rate of 3 per cent annually through to 2051.[28]

Almost 90 per cent of airport user trips are made to or from Greater Melbourne. Figure 2-2 shows the largest proportion of these airport trips are made between the CBD and inner suburbs (29 per cent), followed by the northern and western regions of Melbourne, which comprise a significant proportion of employee trips. Regional airport users contribute over 20,000 daily trips to and from the airport. A considerable proportion of this regional demand is from the cities of Geelong, Bendigo and Ballarat, which combined comprise over 40 per cent of regional trips to Melbourne Airport.[29]

[26] Arun Chandu, *The world's first purpose-built Airport City: Melbourne Airport, Tullamarine*, Planning Perspectives, 32:3, pp. 373-400, (2019).
[27] Department of Economic Development, Jobs Transport and Resources, *Air Passenger Forecast Study,* (2018).
[28] VITM modelling undertaken by RPV, (2020).
[29] Ibid.

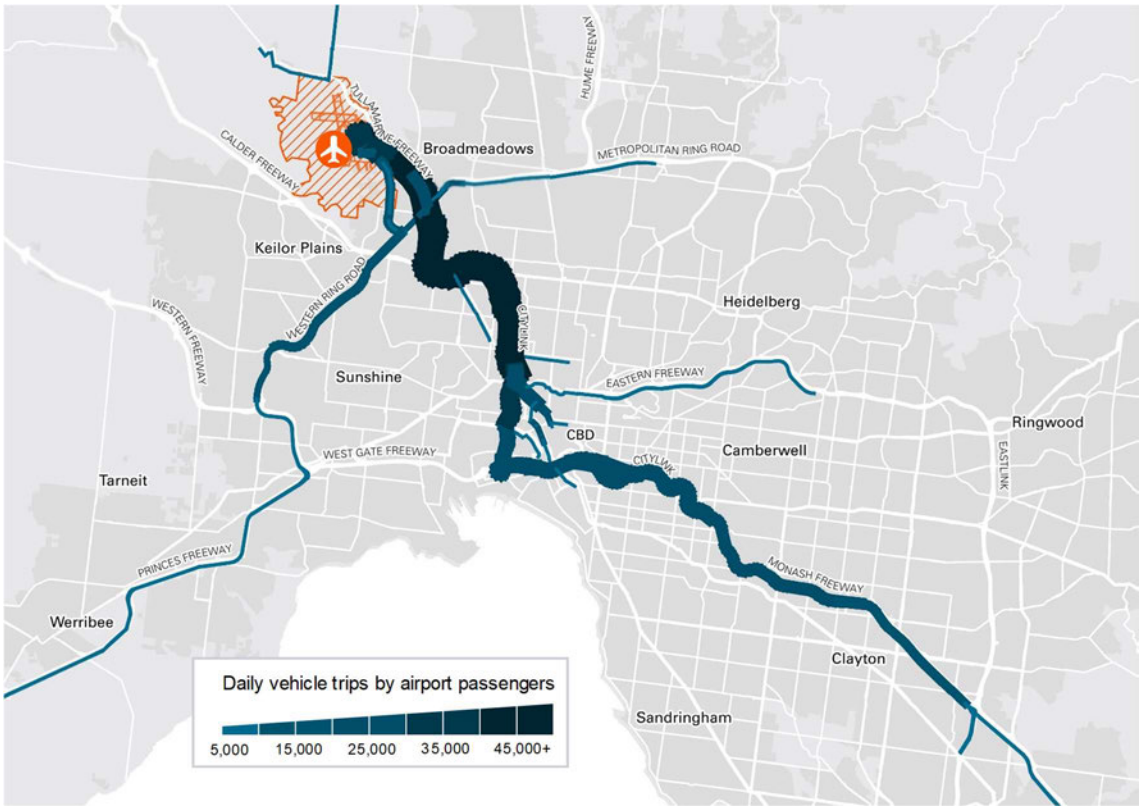
Figure 2-2: Melbourne Airport user catchment[30]



[30] VITM modelling undertaken by RPV, (2020). The inner, middle and outer boundary definitions are consistent with the definitions in Infrastructure Australia, *Outer Urban Public Transport – Improving accessibility in lower-density areas,* (2019). The definitions for West, North, East and South-East are broadly consistent with the VIFSA definitions for West, North, East and South respectively. The CBD is defined as the Melbourne SA2. Divisions for Western, Northern and Eastern Victoria broadly align with Victorian Legislative Council regions.

Figure 2-3 shows that most cross-city vehicle journeys to the airport are made on the Monash Freeway and CityLink, the major arterial roads traversing Melbourne's most populated areas. It also shows that most traffic converges at the Tullamarine Freeway, particularly as the freeway approaches the airport past the Western Ring Road. At the Melbourne Airport exit on the Tullamarine Freeway, airport passengers and employees comprise an estimated 84 per cent of total vehicle volumes.[31]

Figure 2-3: Traffic demand to/from Melbourne Airport (including employees, 2021 AM daily trips, without MAR)[32]



In conjunction with facilitating access to the airport, Melbourne's arterial roads are also the key carriers of the city's commuter and freight task. The pressures of these shared functions have been increasingly apparent in the last decade as a combination of factors including population growth, lengthening commutes and higher metropolitan freight demand have increased vehicle volumes on Melbourne's roads. Melbourne Airport passengers are competing for road space with growing numbers of vehicles across the network.

This impacts people accessing the airport via private vehicles as well as people using SkyBus and local bus services from across Melbourne. As the city grows and more people settle in Melbourne's outer northern and western suburbs, there will be greater demand on road networks from all users, including airport passengers, suburban commuters and commercial vehicles. This will reduce the efficiency of landside transport to and from the airport, and make getting to the airport more unpredictable, expensive and stressful.

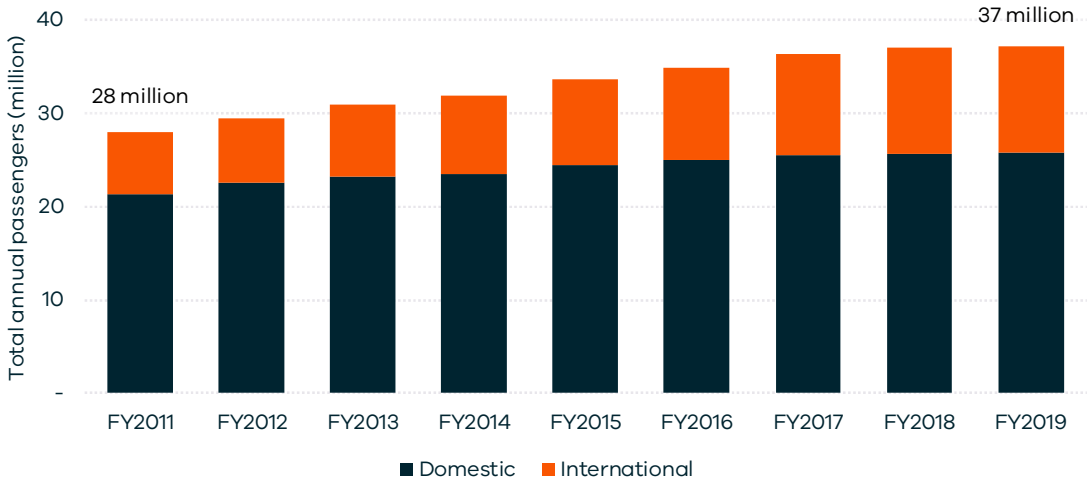
2.1.2 Growing air passenger and freight volumes

Over the last decade, passenger and air freight volumes at Melbourne Airport have grown substantially, underpinned by strong economic and population growth and reflecting the airport's significant role in facilitating economic activity in Victoria. However, the increased intensity of activity at the airport has led to more traffic on roads leading to and surrounding the precinct, further deteriorating travel times and reliability.

[31] VITM modelling undertaken by RPV, (2020). Accounts for both inbound and outbound daily vehicle trips.
[32] VITM modelling undertaken by RPV, (2020).

Figure 2-4 shows that over the decade to FY2019, total passenger movements at Melbourne Airport grew an average rate of 3.6 per cent from 28 million to 37 million.[33] This was primarily driven by a marked increase in international movements, which grew an average annual rate of 6.9 per cent. In the same period, the number of domestic and international flights at Melbourne Airport increased 21 per cent and 70 per cent respectively, reflecting sustained upward trends in local and overseas demand for travel.

Figure 2-4: Total annual passenger movements at Melbourne Airport (FY2011 to FY2019)[34]

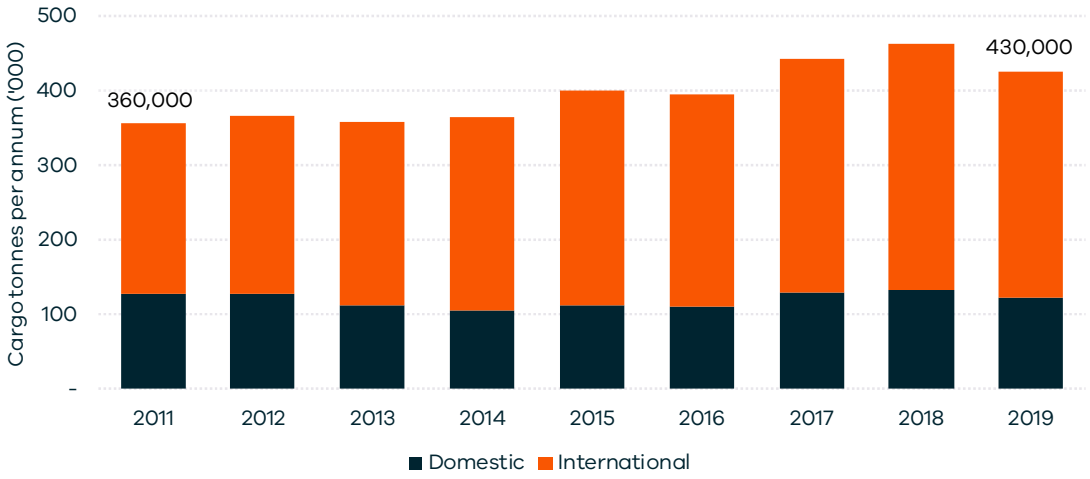


An increase in the city's air freight task has similarly contributed to congestion on key airport access routes. As a major hub for both domestic and international flights, the Melbourne Airport precinct is a vital node in national supply chains and handles approximately 29 per cent of Australia's total air cargo.[35] Despite comprising just 1 per cent of Victoria's overall freight task by volume, it accounts for 20 per cent of total value, and is an important contributor to the national economy. The adjacent Melbourne Airport Business Park located on the Tullamarine Freeway approach to the airport is home to the national hubs of logistics providers Toll and TNT and forms a sizeable import-export precinct of high-value freight.

Recent strong export demand for Australian produce and a growing e-commerce sector have been the core forces driving rapid growth in Melbourne Airport's freight task. Figure 2-5 shows that from 2011 to 2019, the total air freight task at Melbourne Airport grew an average 2.2 per cent per year, reaching 426,000 tonnes in 2019.

[33] Bureau of Infrastructure, Transport and Regional Economics (BITRE), *Airport Traffic Data 1985-86 to 2018-19*, (2019).
[34] Ibid.
[35] Ibid.

Figure 2-5: Annual air freight volumes at Melbourne Airport (2011 to 2019)[36]



While the COVID-19 pandemic has slowed this growth, it will likely recover and continue in the long term. Over the next 30 years, annual passengers at Melbourne Airport are expected to double from 37 million to nearly 87 million (an annual average growth rate of 3.2 per cent), comparable to the current patronage levels of major global airports such as Paris' Charles De Gaulle Airport and Hong Kong's International Airport.[37]

Air freight volumes at Melbourne Airport are also expected to double in the same period to 900,000 tonnes per annum.[38] Similarly, gradual return of domestic and international visitors to Victoria will be another driver of growth in passenger movements. Beyond the immediate impacts of the COVID-19 pandemic, tourism numbers are expected to trend positively over the long-term in line with domestic and global recovery patterns.[39]

Airside, Melbourne Airport plans to service the growth in passenger and freight volumes through terminal and runway expansions, and upgrades to the airport's freight handling capabilities. This growth will exacerbate congestion on airport access routes and reduce the potential benefits of future airport infrastructure upgrades. This growth in airport passenger movements will continue to negatively impact the efficiency of non-airport journeys made on the Monash and Eastern freeways and Western Ring Road.

2.1.3 Growing distances between population and employment

Melbourne's overall transport task has also grown substantially as the number of people living and working within its expanding boundaries increases. Sustained population growth means more cars on already-congested roads, deteriorating travel time reliability for airport passengers.

At the same time, the distances between where people live and work are increasing. More jobs are clustering in the CBD and around existing health and education precincts in inner and south-eastern Melbourne, away from suburbs with the fastest residential growth in the north and west. This is directing more commuter traffic onto cross-city arterial roads and increasing the congestion experienced by airport users on key access routes to the airport. The first stage of SRL to connect the largest employment clusters in the south-east will further expand the significance of these suburban precincts, and lead to higher private and public transport demand along the route.

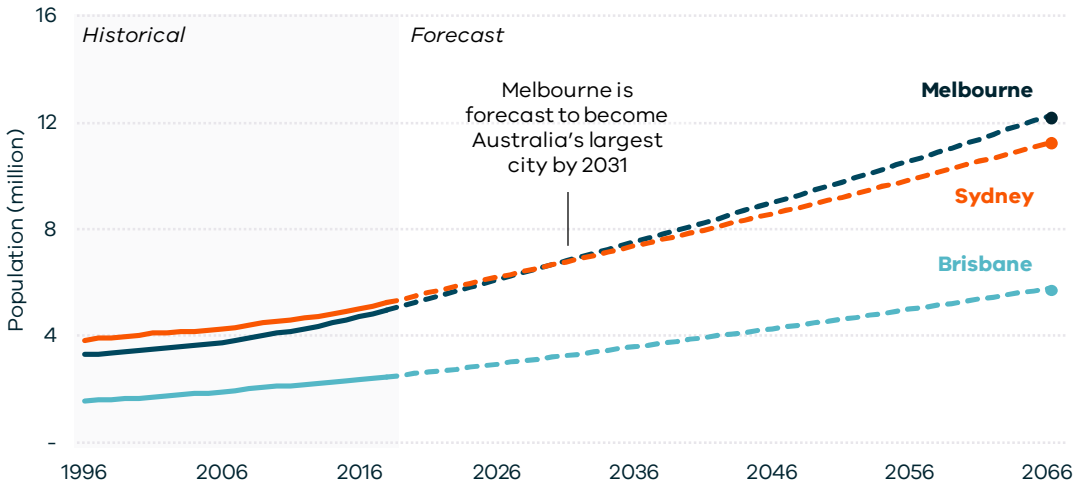
2.1.3.1 Population growth has been fast but unevenly distributed

Melbourne's population has been rapidly growing for the last two decades in response to strong economic performance and the city's reputation for a high standard of liveability. Since 2002,

[36] Bureau of Infrastructure, Transport and Regional Economics, *Australian Domestic Aviation Activity Annual publications – Statistical reports*, (2010-2018).
[37] Department of Economic Development, Jobs Transport and Resources, *Air Passenger Forecast Study,* (2018).
[38] Melbourne Airport, *Melbourne Airport Master Plan*, (2018).
[39] Tourism Research Australia, *Moving Forward: The Role of Domestic Travel in Australia's Tourism Recovery*, (2020).

Melbourne's population has consistently grown faster than Sydney, at an average annual rate of 2.1 per cent (compared with Sydney's 1.5 per cent). Figure 2-6 shows that Melbourne's population is forecast to reach 7 million by 2031, surpassing Sydney. While COVID-19 has added uncertainties in population forecasts, Melbourne's population growth is expected to continue to outpace other Australian cities.

Figure 2-6: Historical and forecast population growth, Melbourne, Sydney, Brisbane[40]

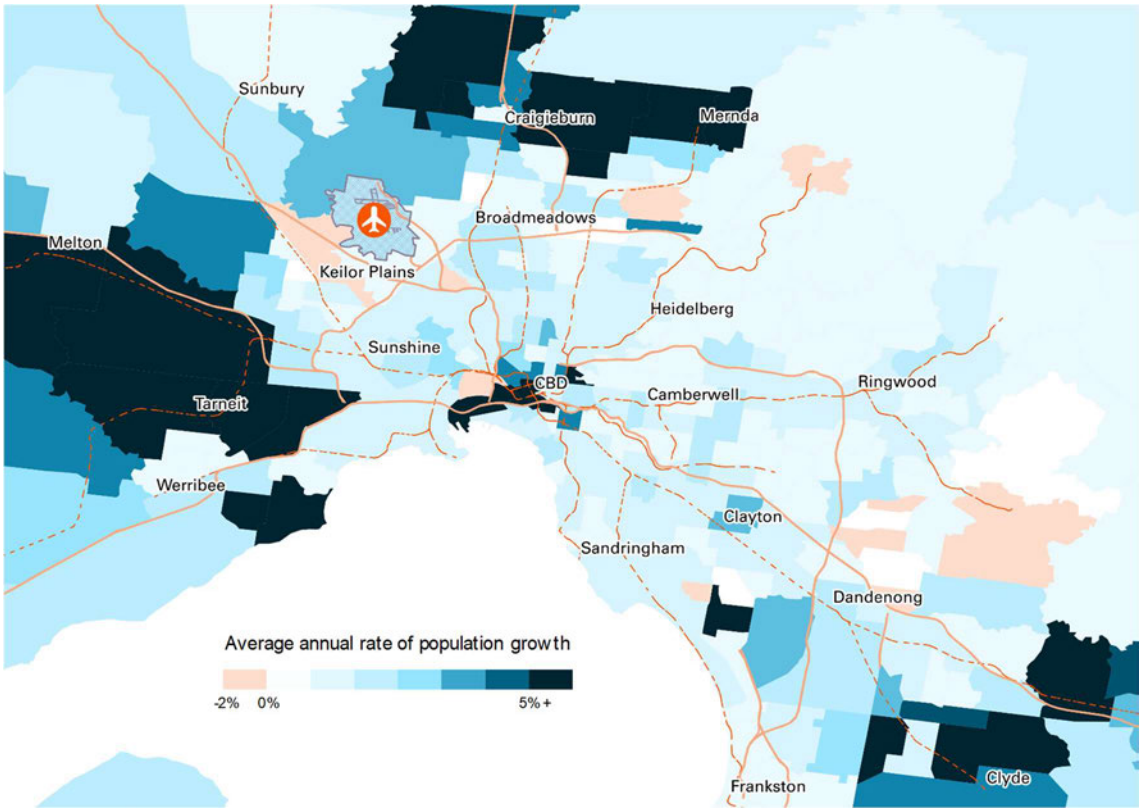


However, the recent distribution of population growth across Melbourne has been uneven, with the most significant gains concentrated in Melbourne's CBD. From 2011 to 2018, the City of Melbourne's population grew an average annual rate of 7.8 per cent, or by 69 per cent in total over eight years. Inner city areas such as the CBD, Docklands and Southbank are among the fastest growing in Melbourne, with each growing at least 10 per cent annually from 2011 to 2018.

Figure 2-7 shows that in the same period, the city's outer west, north and south-eastern suburbs have also experienced population growth at rates much faster than the rest of Greater Melbourne, partly due to the release and development of relatively affordable housing and land. Areas such as Tarneit, Rockbank and Epping have been the fastest-growing areas in the north and west. From 2011 to 2018, the populations of the City of Wyndham and City of Whittlesea grew at an average annual rate of 6.3 per cent and 4.9 per cent respectively, making them among the fastest-growing local government areas in Australia.[41]

[40] Australian Bureau of Statistics, *ABS.Stat Population Projections, Australia, 2017-2066*, (2019).
[41] Australian Bureau of Statistics, *Regional Population Growth, Australia, 2011-12, 2017-18, cat. No 3218.0*, (2019).

Figure 2-7: Annual population growth rate (2011 to 2018)[42]

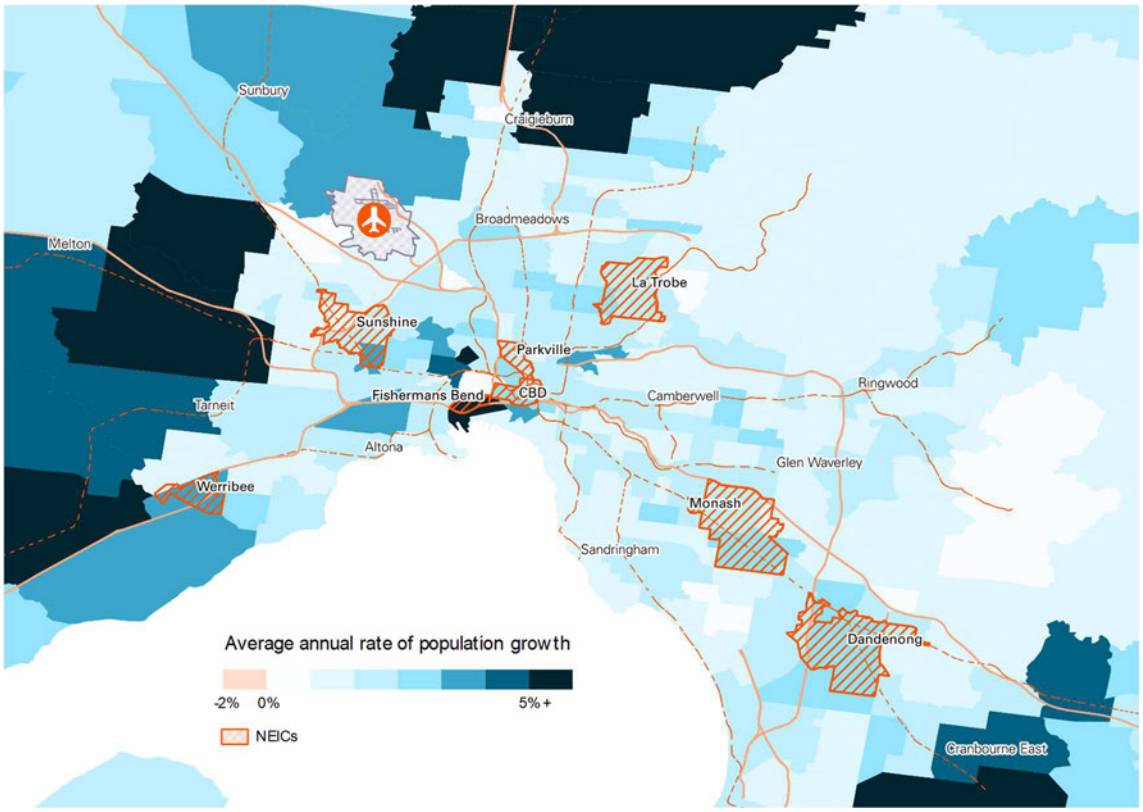


2.1.3.2 Population growth will continue to be highest in outer growth areas away from economic precincts

Despite recent impacts from the COVID-19 pandemic, the continuation of planning initiatives and land zoning means the fastest rates of residential expansion are expected to remain in Melbourne's growth areas to at least 2036, turning them into the city's major population centres. Figure 2-8 shows that significant growth in population is expected in Melbourne's north and west, particularly in areas adjacent to Melbourne Airport.

[42] Australian Bureau of Statistics, *Estimated Residential Population, 'Australia, Statistical Area Level 2'*, (2001) and *Regional Population Growth, 'Australia, Statistical Area Level 2', cat. No 3218.0*, (2019). Growth rate reported is the compound annual growth rate between 2011 and 2018.

Figure 2-8: Forecast annual population growth rate (2021 to 2036)[43]



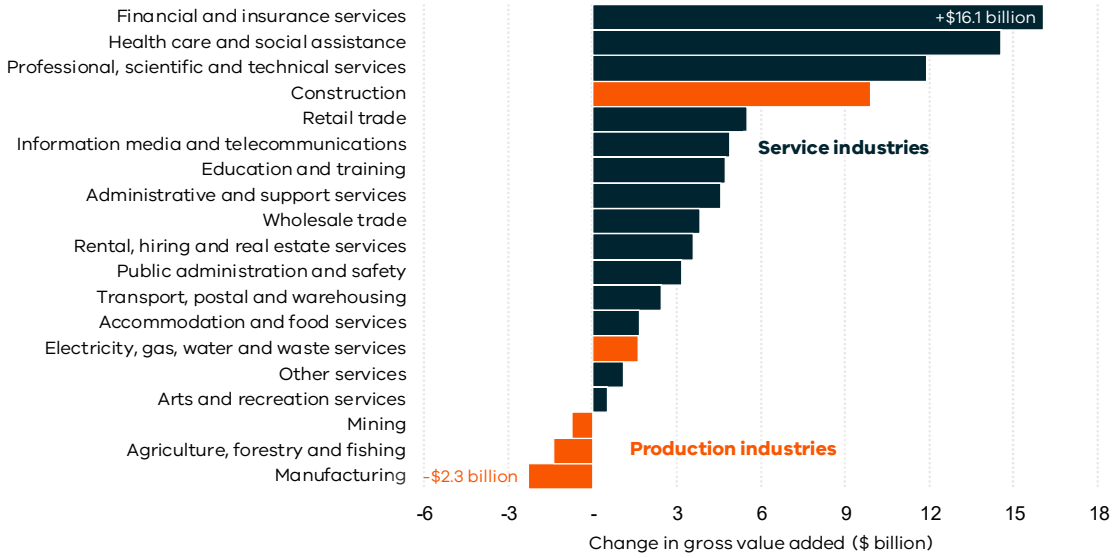
This figure also highlights the seven National Employment and Innovation Clusters (NEICs) which represent key current and future employment precincts as defined by the Victorian Government's metropolitan planning strategy *Plan Melbourne 2017 – 2050*. These precincts are primarily concentrated in inner and south-eastern Melbourne.

More broadly, the gradual urbanisation of the Victorian economy is changing the concentration of jobs across Melbourne, with tertiary sectors such as financial, healthcare and professional services growing substantially over the last decade. The growth in Melbourne's central and inner suburbs reflects a structural shift towards an economy underpinned by knowledge-based industries, which are increasingly concentrated in the CBD and key NEICs, to capture the benefits from a diverse pool of clients and a broader catchment of skilled labour. While most of those knowledge-based jobs have been relocated to the home during the COVID-19 pandemic, it is likely they will continue to comprise a greater share of the Victorian economy, and remain mostly concentrated in NEICs where businesses can accrue the benefits of agglomeration and collaboration.

Figure 2-9 highlights the substantial growth in service industries across Victoria over the last 10 years, which are typically more knowledge intensive than production industries. The figure also shows that in contrast, Victoria's manufacturing base historically located in Melbourne's west and outer south-east has contracted, with gross value added declining by $2.2 billion over the last 10 years. It is also likely that COVID-19 may result in additional changes to Victoria's industry structure. Although the short-term impacts of the crisis on industries such as arts, recreation and hospitality, imports and exports and logistics are apparent, the permanence of these impacts on business activities remains uncertain.

[43] Department of Environment, Land, Water and Planning, *Victoria in Future 2019,* (2019). Growth rate reported is the compound annual growth rate from 2021 to 2036.

Figure 2-9: Change in gross value added to Victoria, FY2008 to FY2018 ($ billion, chain volume measures)[44]



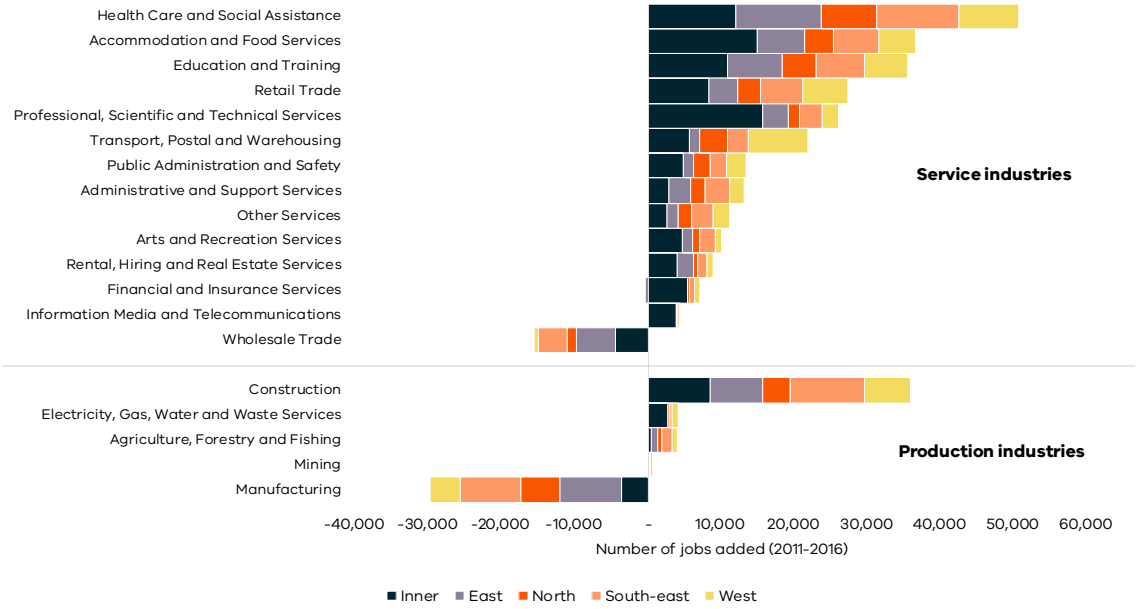
Despite recent events, the spatial implications of Victoria's structural economic shift are clearly apparent and have already been felt strongly across Melbourne. The intensification of knowledge-based industries is expected to continue in the CBD, which has long been Melbourne's commercial core. In the last two decades, Melbourne's inner-city areas have rapidly developed, reflecting the increasing economic importance of the CBD. In April 2014, Melbourne's CBD had 4.3 million square meters of office floorspace and this grew 300,000 square metres to 2019, an increase of 7 per cent over five years.[45] This has extended the footprint of the commercial core to areas such as Docklands and Southbank, and catalysed a population boom in these areas and inner-city suburbs such as Richmond, Footscray and Brunswick.

This growth of professional services jobs in the CBD has been mirrored by Victoria's education sector, which is being driven by increasing student enrolments and the leveraging of strong industry linkages to scientific and technical research sectors. Enrolments at universities in Victoria grew 20 per cent from 2014 to 2018, while the tertiary education sector has contributed nearly $5 billion in gross value to the Victorian economy over the last decade.[46]

Across Greater Melbourne, job growth from 2011 to 2016 was significantly higher for service industries compared with production industries. Figure 2-10 shows that over one-third of new jobs added during these years were in inner Melbourne. These jobs were primarily service-based jobs, particularly in health care, hospitality, education and retail trade. This reflects Melbourne's growing population, especially in the inner suburbs, which has corresponded to higher demand for consumer goods and social services.

[44] Australian Bureau of Statistics, *Australian National Accounts: National Income, Expenditure and Product, cat. No. 5206.0 Table 2. Expenditure on Gross Domestic Product (GDP), Chain volume measures*, (2019). Industry definitions for production and service industries are based on ABS classifications.
[45] Knight Frank, *Melbourne CBD Office – Market Overview papers*, (April 2014 and March 2019).
[46] Department of Education, *Skills and Employment, Enrolments time series - Full Year Data*, (2019) and Australian Bureau of Statistics, *Australian National Accounts: National Income, Expenditure and Product*, cat. No. 5206.0 Table 2. Expenditure on Gross Domestic Product (GDP), Chain volume measures, (2019).

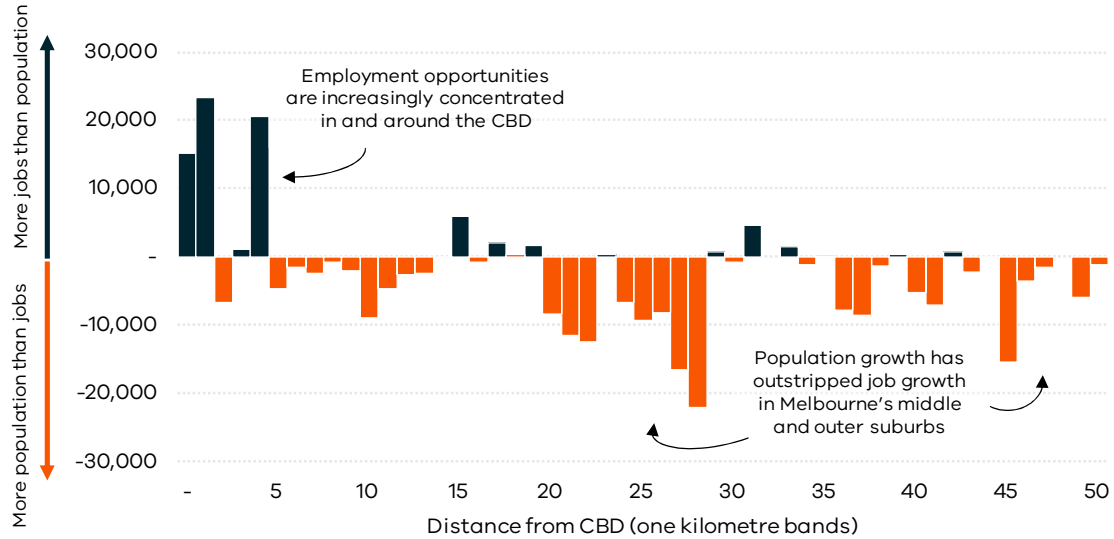
Figure 2-10: Change in employment in Melbourne by industry (2011 to 2016)



Similarly, knowledge-based industries such as professional, scientific and technical services and financial and insurance services were among Melbourne's growing sectors and highly concentrated around the CBD. With the exception of the construction industry, employment growth was minimal in most production industries. Notably, the decline in the manufacturing industry represents an economic shift away from suburban production jobs.

The increased clustering of employment opportunities across Melbourne is highlighted in Figure 2-11, which illustrates that from 2011 to 2016, the growth in employment opportunities in the CBD outstripped population growth. This has not been mirrored in Melbourne's outer-ring suburbs, which have experienced significant population growth with no corresponding increase in employment opportunities.

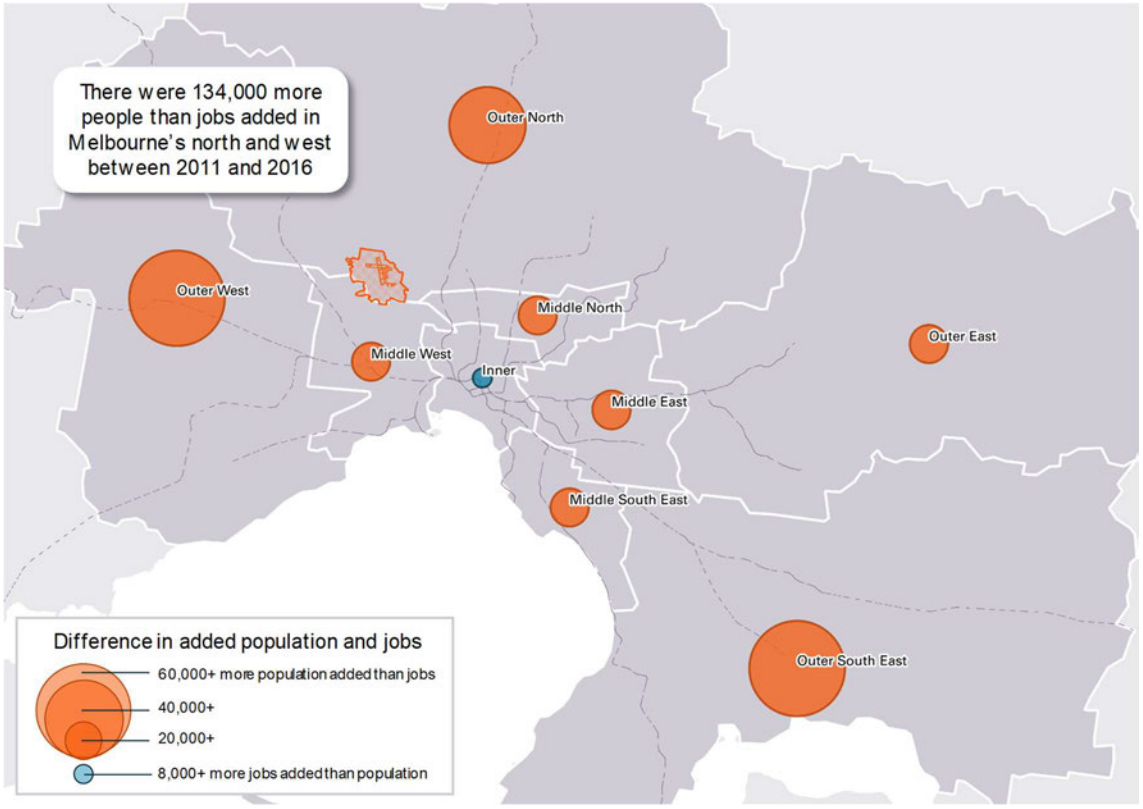
Figure 2-11: Change in employment less change in population, by distance from CBD (2011 to 2016)[47]



[47] Australian Bureau of Statistics, *Greater Melbourne, Place of Work, Place of Residence*, (2011 and 2016 Census).

This disparity between where people live and work is shown geographically in Figure 2-12, which highlights that the most pronounced mismatches between population change and employment change from 2011 to 2016 are in Melbourne's outer west, north and south-east. Despite the airport being a major employer in Melbourne's north, there are still 66,000 more people than jobs, meaning a sizeable number of people still need to travel to other areas for work.

Figure 2-12: Change in employment less change in population by region (2011 to 2016)[48]



This divergence in where people live and work is expected to remain in the long-term, as Victoria's economy continues to be more heavily weighted by sectors that exhibit high rates of job clustering. While growth in the professional services and education sectors has recently been dampened by the COVID-19 pandemic, the Victorian Government recognises these industries remain important to economic prosperity and is continuing to prioritise them as part of its long-term *Priority industries and sectors* initiative.

This uneven distribution of population and employment growth means there will be an increase in overall trips from these areas as residents seek to access employment, educational and social opportunities. It is likely a considerable proportion of employment trips from these outer north and west areas will be toward and from the CBD and key south-eastern NEICs in the morning and evening peaks. As a result, the continued legacy of Melbourne's historical expansion to the east poses challenges for residents of the city's newer outer-western and northern suburbs.

In addition, the lower level of public transport provision in Melbourne's outer north and west means these trips will more likely be undertaken by private vehicle on key arterial roads, such as the Tullamarine Freeway and Western Ring Road. Given these arterial roads are also primary facilitators of travel to Melbourne Airport, the rise in commuter and commercial vehicle trips from the north and west during peak periods reflects a growing population accessing jobs that are not close to home. This will worsen congestion and travel time variability for airport users and residents in these growth areas.

[48] Australian Bureau of Statistics, *Victoria, (SA2), Place of Work, Place of Residence*, (2016 Census).

2.2 Problem statement

2.2.1 Investment Management Standard

This Business Case follows the DTF Investment Management Standard (IMS) and demonstrates a clear rationale for an investment to be pursued. The IMS is underpinned by a 'line of enquiry' that considers several key components relating to investment decision-making. The line of enquiry includes identifying the problem the Project aims to address, the benefits that need to be delivered and the expected outcomes, as well as the preferred and recommended response and the economic benefits of the Project, Figure 2-13 sets out the chapter of this Business Plan where each IMS line of enquiry is considered.

Figure 2-13: IMS line of enquiry

The problem context outlined above demonstrates an opportunity to provide access options independent of Melbourne's freeway network to reduce the wide-ranging impacts of congestion on key access routes to and from Melbourne Airport. As Victoria's population to the north and west of Melbourne grows, along with air travel through Melbourne Airport, these routes will become increasingly congested and unreliable.

This underlying context informed the development of the Investment Logic Map (ILM), which in turn guides the analysis in this chapter.

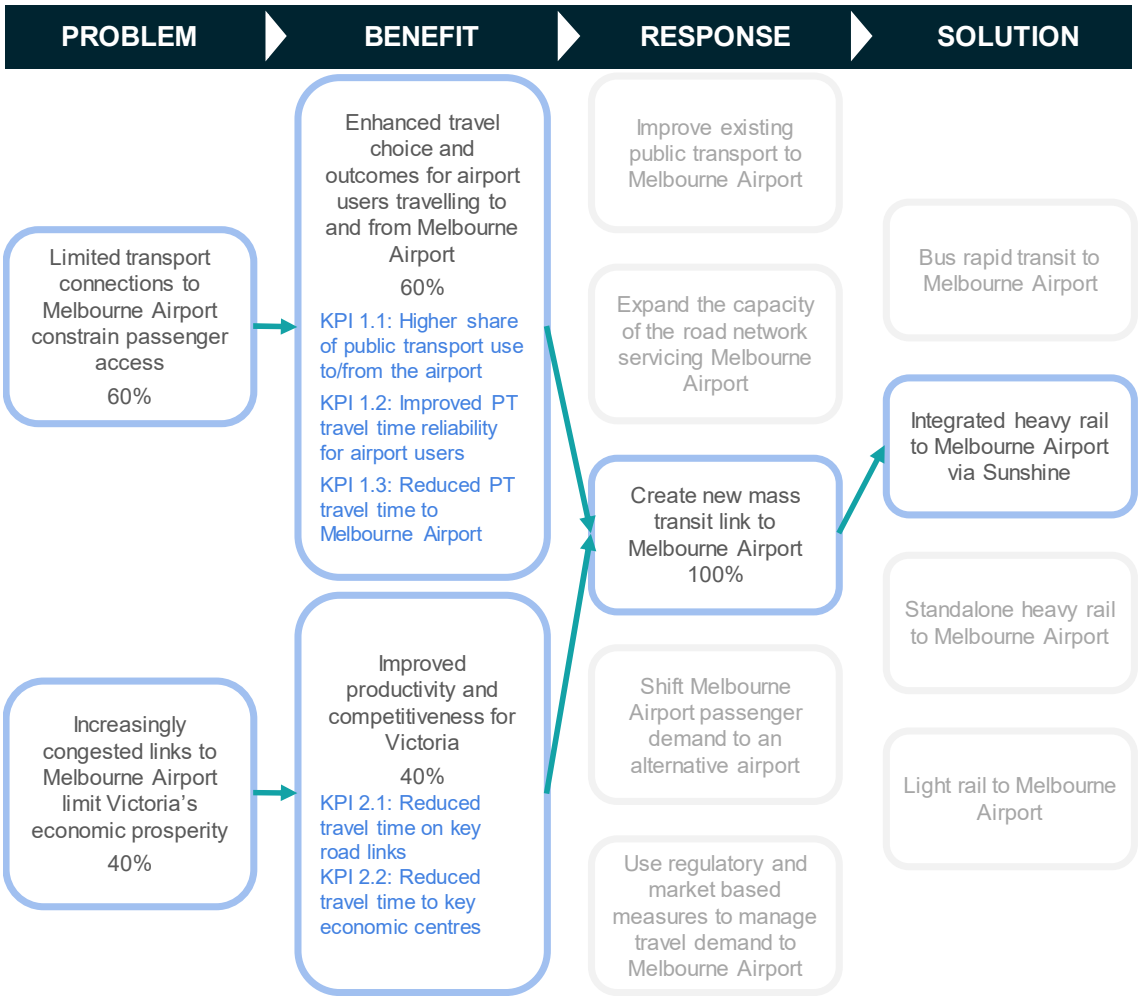
2.2.2 Investment Logic Map

The ILM outlines the problems that will be addressed and expected benefits that will be realised through their resolution. Figure 2-14 sets out the problem, benefit, response and solution process of the ILM.

The ILM forms the basis of this Business Case which will:

- examine the identified problems in detail, including available evidence to support the cause and effect of the issues identified
- assess the magnitude of the potential benefits available to government and the community from addressing the identified problems
- explore and compare investment options to address the identified problems
- identify a recommended investment option and proposed arrangements for implementation and delivery.

Figure 2-14: Investment Logic Map



The responses and solutions in the ILM were identified and assessed as part of the *2018 Melbourne Airport Rail Link Strategic Appraisal.* The appraisal identified a **new mass transit link** as the preferred response option and an **integrated heavy rail link** as the preferred mass transit solution, as highlighted in Figure 2-14. The *Melbourne Airport Rail Link Strategic Appraisal* also evaluated the preferred heavy rail route, concluding that the **Sunshine Route** was the preferred alignment for MAR. For details on the strategic response assessment, see Chapter 4.

The next section provides an updated assessment of the problem evidence and reiterates the need for a rail link to Melbourne Airport.

2.3 Definition and evidence of the problem

Table 2-1 summarises the two main problems of the overarching challenge, and further defines their seven sub-problems. The supporting evidence for and impact of these sub-problems is discussed in the following sections.

Table 2-1: Problem summary

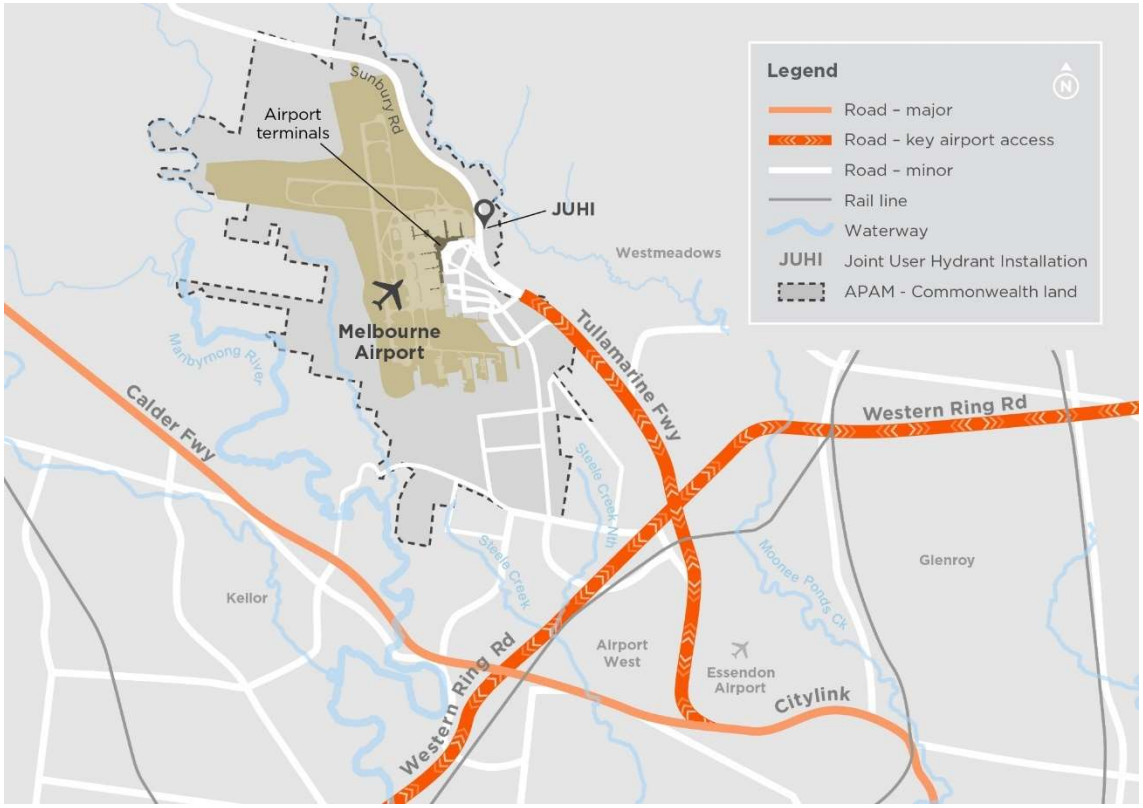
Problem	Sub-problems
Problem 1 Limited transport connections to Melbourne Airport constrain passenger access	1. There are few practical public transport options for the majority of airport users 2. Travel to Melbourne Airport is heavily reliant on private vehicles 3. Growing airport patronage and population are exacerbating congestion on airport access routes 4. Travel times to the airport can vary significantly during peak hours
Problem 2 Increasingly congested links to Melbourne Airport limit Victoria's economic prosperity	5. Growing congestion impacts supply chain efficiency for air freight 6. Congestion reduces accessibility to employment opportunities for people in Melbourne's north and west 7. Poor quality access to employment hubs limits Victoria's economic potential

2.3.1 Problem 1: Limited transport connections to Melbourne Airport constrain passenger access

Ground transport to Melbourne Airport relies almost exclusively on road-based transport, which is funnelled through a limited number of access points shown in Figure 2-15, including:

- **Tullamarine Freeway (M2), including CityLink** – providing access for the majority of airport users from the CBD and inner northern suburbs, as well as connection to the Monash Freeway and south-eastern suburbs.
- **Airport Drive and Melrose Drive** – providing access from the Western Ring Road (M80) and Calder Freeway (M79), and commercial and residential areas immediately south of the airport.
- **Sunbury Road** – providing access from Bulla, Sunbury and other areas north-west of the airport.

Figure 2-15: Melbourne Airport and surrounding access roads



Despite being only 22 kilometres from Melbourne's CBD, 86 per cent of people travelling to Melbourne Airport use private vehicles (50 per cent in private cars and 36 per cent in taxis/ridesharing). The impracticality of public buses for many users, limited connections to Melbourne's outer suburbs and poor travel time reliability in peak times all contribute to low public transport mode share to the airport.

The SkyBus from Southern Cross Station is the primary public transport connection from the CBD and is used by an estimated 11 per cent of airport passengers. Another 3 per cent of passengers use private regional or suburban buses. Other than the SkyBus, there are limited options for public transport connections between Melbourne Airport and the CBD or other locations across Melbourne and Victoria.

The majority of the airport's user base do not have the option of a 'one-seat journey', with nearly all public transport routes to the airport requiring at least one transfer, often between different transport modes. Consequently, access to Melbourne Airport is primarily depends on a limited number of major arterial roads.

This means that nearly all airport users from across the city are channelled onto a limited number of access roads, leading to bottlenecks on the approach to the airport during peak times. This perpetuates the decline in quality for road-based private and public transport, impacting access for all airport users, including employees and commercial users.

2.3.2 Evidence and impacts of Problem 1

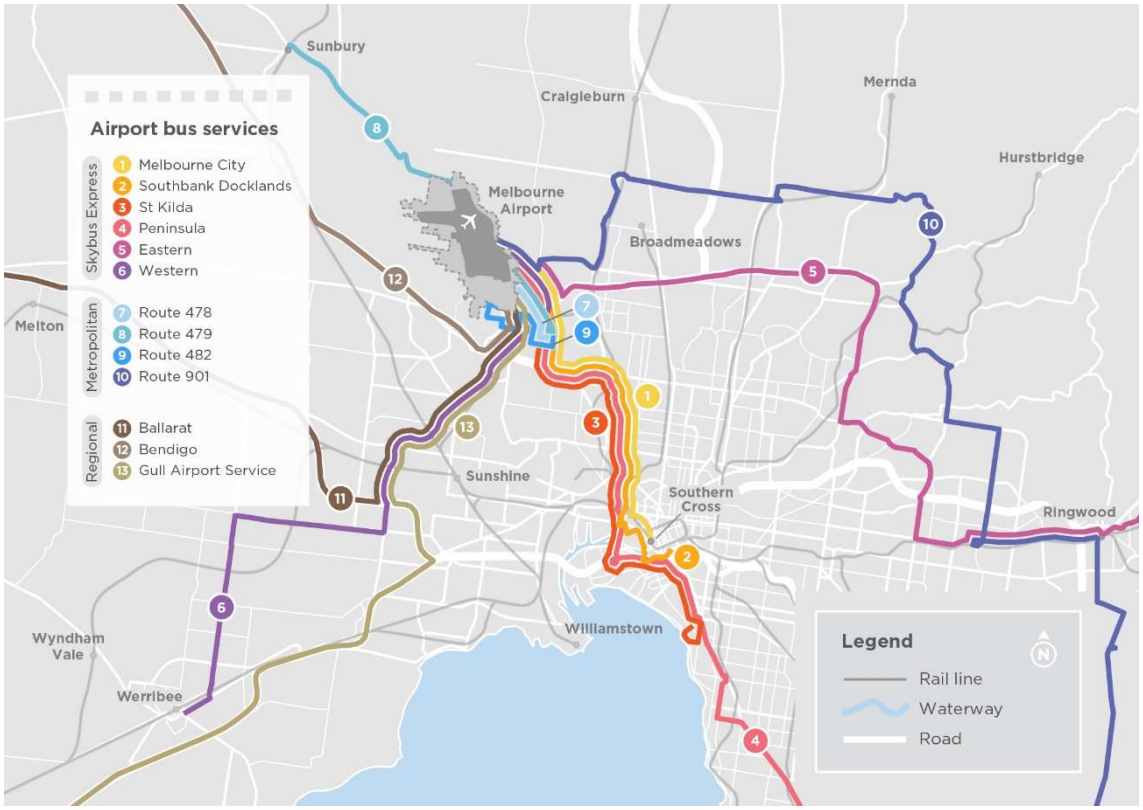
2.3.2.1 There are few practical public transport options for the majority of airport users

Public transport to Melbourne Airport is often impractical and so has limited mode share. SkyBus is Melbourne Airport's existing primary public transport offering, with the Melbourne City Express route operating 24/7 at frequencies of eight minutes during the day to and from Southern Cross Station. According to SkyBus, travel times between Southern Cross Station and the airport are typically between 22 and 35 minutes, but passengers are alerted to allow extra travel time during

peak periods.[49] The SkyBus is also the busiest bus route in Melbourne and often experiences crowding during the morning peak period.[50]

In addition to the Melbourne City Express, SkyBus provides connectivity across Melbourne via an additional five services that operate to Southbank, St Kilda, Frankston and Melbourne's western and eastern suburbs as shown in Figure 2-16.

Figure 2-16: Bus routes to Melbourne Airport



The figure also shows other metropolitan bus routes serving the airport. These are primarily local (not express) and operate at low frequencies, as set out in Table 2-2. This is an unattractive option for airport passengers, particularly business travellers, who typically place a higher value on travel time than regular commuters given the potential time and financial costs of missing a flight. These services target key airport employee catchments and are not designed to be a primary method of transporting passengers to the airport.

[49] The pre-COVID-19 timetable for the Melbourne City Express service (26 February 2020) noted an average trip time of 22 minutes between Southern Cross Station and Melbourne Airport and an estimated journey time of 35 minutes between Southern Cross Station and Terminal 1. SkyBus recommends allowing additional journey time during peak periods.

[50] Infrastructure Australia, *Urban Transport Crowding and Congestion*, (2019).

Table 2-2: Public transport options to Melbourne Airport

	Route to airport	Hours of operation	Peak frequency	Adult fare from origin (one-way)[51]	Estimated travel time from origin to airport[52]
SkyBus					
Melbourne City Express	Express from Southern Cross Station	24 hours	9 – 10 minutes	$19.75 (however family, group and employee discounts are available)	22 – 35 minutes
Southbank Docklands Express	Beginning at Crown Complex, stopping at the Convention Centre, then express to Melbourne Airport from Waterfront City	5:30 am – 9:00 pm	30 minutes	$19.75	40 – 80 minutes
St Kilda Express	Follows The Esplanade from Barkly Street, then express to Melbourne Airport from Fitzroy Street	5:30 am – 8:00 pm	30 minutes	$20.50	60 – 75 minutes
Peninsula Express	Beginning in Rosebud, stopping at major nodes on Mornington Peninsula and Bayside, including Dromana, Frankston, Southland, Brighton and express to Melbourne Airport from Elsternwick Station	5:00 am – 12:00 am	60 minutes	$26.50 – $56.00 (depending on origin)	3 hours 10 minutes
Eastern Express	Beginning at Croydon Station, then stopping at Ringwood, Blackburn, Box Hill, Doncaster Shopping Centre, then express to Melbourne Airport from Watsonia	4:30 am – 7:00 pm	90 minutes	$15.00	1 hour 30 minutes
Western Express	Beginning at Werribee RSL, then stopping at Pacific Werribee and Tarneit Station before express to Melbourne Airport	5:00 am – 9:00 pm	30 minutes	$22.50	1 hour 15 minutes
Metropolitan buses					
478	Beginning at Airport West Shopping Centre, then following Melrose Drive to Melbourne Airport	6:00 am – 7:30 pm	60 minutes	$4.50	15 minutes
479	Beginning at Airport West Shopping Centre, then following Melrose Drive to Melbourne Airport (terminates at Sunbury)	5:30 am – 7:30 pm	60 minutes	$4.50	17 minutes from Airport West 27 minutes from Sunbury
482	Beginning at Airport West Shopping Centre, then to	5:30 am – 6:00 pm	60 minutes	$4.50	25 minutes

[51] Fares for metropolitan buses are 2-hour adult Myki fare.
[52] These are estimated road travel times. Actual travel times can vary significantly depending on road traffic conditions.

	Route to airport	Hours of operation	Peak frequency	Adult fare from origin (one-way)[51]	Estimated travel time from origin to airport[52]
	Melbourne Airport via Keilor Park				
901	Beginning in Frankston, then north to Dandenong and Ringwood, Blackburn, Lower Plenty, Roxburgh Park, Broadmeadows to terminate at Melbourne Airport	4:30 am – 1:00 am	15 minutes	$3.00 (zone 2 only)	4 hours
Key regional services					
Ballarat Airport Shuttle Bus	Direct from Ballarat to Melbourne Airport, with an option of additional stops at Ballan, Bacchus Marsh and / or Melton based on demand	3:30 am to 10:20 pm	50 minutes	$37.00	1 hour 30 minutes
Bendigo Airport Service	Direct from Bendigo to Melbourne Airport, with an option of additional stops at Kangaroo Flat, Castlemaine, Chewton, Malmsbury, Kyneton and / or Woodend based on demand	4:00 am to 8:35 pm	120 minutes	$49.00	2 hours 15 minutes
Gull Airport Service (Geelong)	Beginning in Geelong, then stopping at Geelong station and Corio Village before express to Melbourne Airport	3:45 am to 11:55 pm	60 minutes	$35.00	1 hour 30 minutes

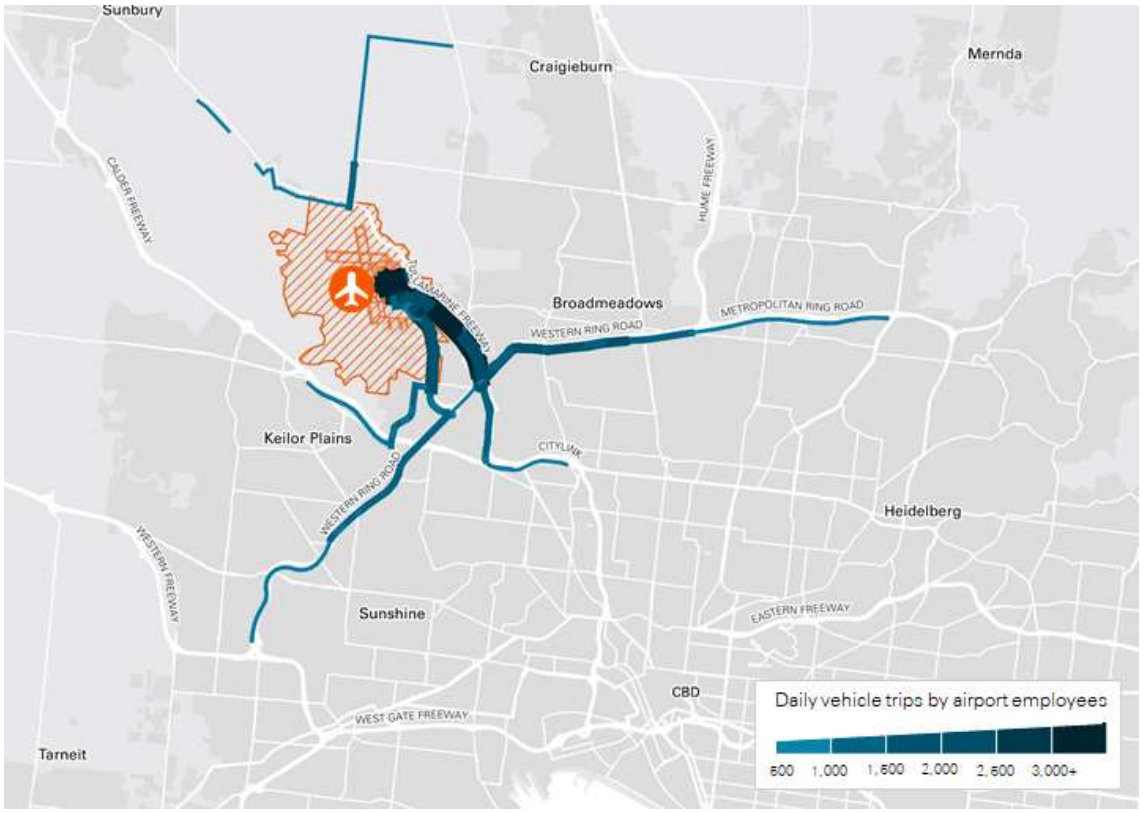
Rail connections to the vicinity of the airport are suboptimal and impractical for most users. The nearest railway station is Broadmeadows on the Craigieburn line, which is eight kilometres away by road and connected to the airport by the orbital 901 bus. Travelling to the airport from the CBD using this rail / bus combination takes approximately 65 minutes, excluding transfer wait times at Broadmeadows Station, which is primarily a commuter station not designed for interchange with luggage. Watergardens Station on the Sunbury line is 15 kilometres away by road but does not have a direct bus connection to the airport.

The limited diversity in access options also impacts the airport's employees, who comprise a substantial proportion (30 per cent) of total transport demand to the airport.[53] The available metropolitan bus routes traverse the airport's primary labour catchment, but their hours of operation are limited and they are infrequent and indirect. Figure 2-17 shows that 80 per cent of airport employees use a private car to get to work, with the largest flows being on the Western and Metropolitan Ring Roads.

In comparison, only 22 per cent of Victorians who work in the CBD, Docklands or Southbank use private cars to get to work.[54] This high reliance on private cars and taxis as the primary mode of ground transport to the airport will continue to place pressure on surrounding roads. Considerable landside travel demand from employee vehicles also limits the accessibility of the airport for all users and demonstrates the need for an alternative mode of transport.

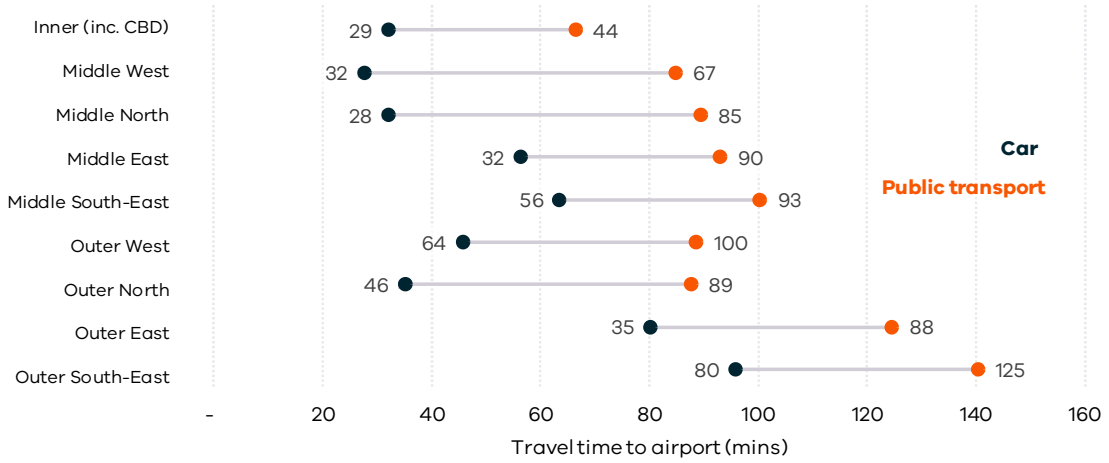
[53] Melbourne Airport, *Melbourne Airport Master Plan*, (2018).
[54] Australian Bureau of Statistics, *Victoria, (SA2), Mode of Travel to Work*, (2016).

Figure 2-17: Daily traffic demand of airport employees (2021 daily trips)[55]



For those who live outside inner-city Melbourne, public transport connections to the airport are often indirect and time consuming, particularly compared with private transport. Figure 2-18 shows travel times to the airport are consistently higher by public transport than by car for all users across Melbourne.

Figure 2-18: Comparison of travel time to Melbourne Airport by car and public transport (2021 AM peak)[56]

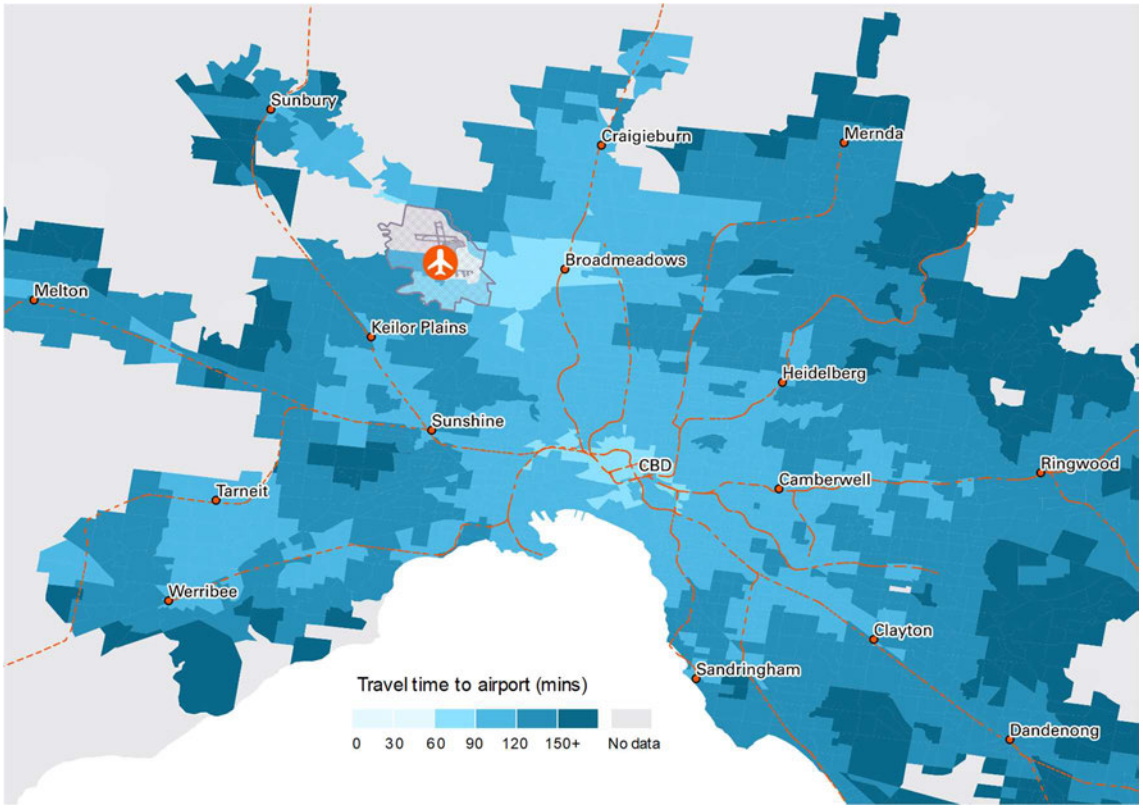


While airport users come from all over the city, the level of public transport provision is not even for all passengers. In particular, Figure 2-19 demonstrates that access to the airport by public transport

[55] VITM modelling undertaken by RPV, (2020).
[56] VITM modelling undertaken by RPV, (2020). Average travel times for each travel zone are population weighted and aggregated up to produce an average travel time for each region.

is most feasible from Melbourne's central suburbs. Notably, despite being closer to the airport, travel times by public transport are longer from Melbourne's inner north and west than from the CBD.

Figure 2-19: Peak travel time to Melbourne Airport by public transport (2021 AM peak)[57]



Of the world's top 100 airports by patronage, Melbourne Airport (ranked 59th) is one of just 18 which is not currently serviced by a direct rail connection.[58] By 2048, approximately 87 million passengers are expected to pass through Melbourne Airport every year. This is higher than current patronage at some of the world's busiest airports as shown in Table 2-3. To adequately accommodate higher passenger volumes, enhanced levels of ground transport provision are needed to efficiently move people to where they need to be.

Table 2-3: Comparison of accessibility and public transport access options from the world's major airports[59]

Airport	Annual passengers (2018)	Primary ground transport access options to CBD
Melbourne	**36.7 million**	**2 freeways (Tullamarine and M80)**
Sydney (Kingsford Smith Airport)	44.4 million	1 freeway, 1 rail line
Tokyo (Narita Airport)	42.6 million	1 freeway, 3 rail lines
New York City (John. F. Kennedy Airport)	57.8 million	2 freeways, 2 rail lines
London (Heathrow Airport)	80.1 million	2 freeways, 2 rail lines

Limited availability and choice of public transport options to the airport reduces the ability of passengers to move away from private vehicles, which have been and will be further impacted by

[57] VITM modelling undertaken by RPV, (2020).
[58] Graham Currie, *Melbourne Airport Rail Link – Status, Rational and Options* (2019).
[59] Department of Transport, *Melbourne Airport Rail Link – Sunshine Route Strategic Appraisal*, (2018).

heavy congestion on surrounding airport roads. The implications of not investing in additional transport options for airport users include:

- continued reliance on private vehicles, including those of 'meeters and greeters' as the primary form of transport, which adds significant congestion on roads around the airport
- deteriorating reliability of all road-based public transport options as Melbourne's population grows and becomes more urbanised, which further entrenches reliance on private vehicles
- inability of the airport to meet the needs of passengers, who require time and cost-efficient connections to the CBD and NEICs across Melbourne.

2.3.2.2 Travel to Melbourne Airport is heavily reliant on private vehicles

Private vehicles are the dominant mode of ground access to Melbourne Airport. It is estimated that just under 50 per cent of users access the airport by private car (using the car parks or being picked up / dropped off). Another 36 per cent of users travel to the airport by taxis (including ridesharing). The remaining 14 per cent represents the public transport mode share.[60]

Despite relatively high associated costs which can include taxi fares, car parking and tolls (if travelling via CityLink), travel via private vehicle is still seen as the more efficient and attractive option for most airport users. Figure 2-20 shows AM peak travel times to Melbourne Airport by car. In comparison to Figure 2-19, it can be seen that even in peak periods, travel times by private vehicle during the AM peak can be significantly faster than public transport. This is particularly true for those travelling from Melbourne's outer suburbs.

Figure 2-20: Peak travel time to Melbourne Airport by private vehicle (2021 AM peak)[61]

The predominant share of private vehicle usage to access the airport demonstrates its ability over existing public transport options to provide more efficient connections to the CBD and broader Melbourne. The airport is relatively well-connected to major arterial roads that traverse its key catchments, including the Western and Metropolitan Ring Roads and Monash Freeway via CityLink. This has naturally sustained the advantage of private vehicles as the key mode which provides a

[60] Melbourne Airport, *Melbourne Airport Master Plan* (2018).
[61] VITM modelling undertaken by RPV, (2020).

one-seat journey. Over time, this reliance has been reinforced by the widening of the Tullamarine Freeway, expansions to the airport car park and the proliferation of competitive ride-sharing options.

The high reliance on private vehicles for ground transport is unsustainable in the long-term. Against network-wide increases in travel demand, airport users will likely suffer from further congestion as the airport's passenger and freight tasks grow. Given a lack of alternative access options, the consequences of not investing in additional transport choices include:

- more delays and congestion on key airport feeder routes, particularly on the Tullamarine Freeway
- declining travel time reliability on major arterial roads across Melbourne, impacting all user types, including suburban commuters, commercial vehicles and airport users
- increases in associated economic costs generated by longer time spent in congestion and efficiency losses from growing contingent time allowances
- declining amenity for residents in Melbourne's growing north-western suburbs, whose local roads are impacted by growing volumes of airport-related traffic.

2.3.2.3 Growing airport patronage and population are exacerbating congestion on airport access routes

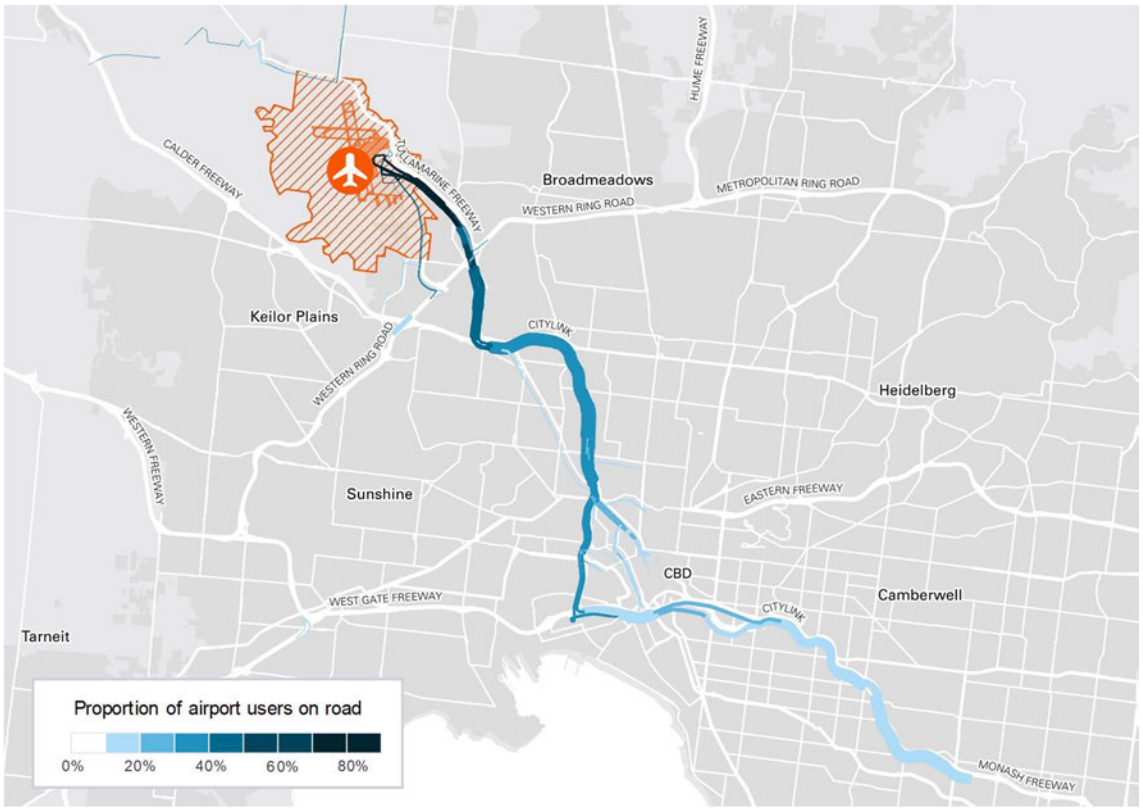
Increasing patronage growth will further diminish the quality of ground access to the airport. Figure 2-3 above shows that airport passengers already generate substantial travel demand on Melbourne's arterial roads. The Tullamarine Freeway is the main access route to the airport and is used by 66 per cent of all entering vehicles and 70 per cent of all exiting vehicles.[62] Airport-related traffic is estimated to contribute to approximately 80 per cent of total traffic volumes on the Tullamarine Freeway between Melbourne Drive and Sunbury Road.[63]

On a typical weekday in 2016, the road links to and from Melbourne Airport experienced demand for a total of 118,300 trips, comprising 71,200 passenger trips, 31,800 employee trips and 15,300 commercial trips (those associated with freight and logistics). On a busy day, this can fluctuate to close to 130,000 trips.[64] This sizeable contribution in vehicle volumes from airport users impacts the performance of Melbourne's freeways.

Figure 2-21 shows that airport users can comprise up to 80 per cent of total vehicle volumes on the Tullamarine Freeway near the airport, and up to 50 per cent on the CityLink section past the Bolte Bridge. In the future, growing patronage volumes will impact travel times on this critical CBD connection. As nearly all airport traffic converges on the Tullamarine Freeway, the resultant delays will impact all airport users coming from across Melbourne.

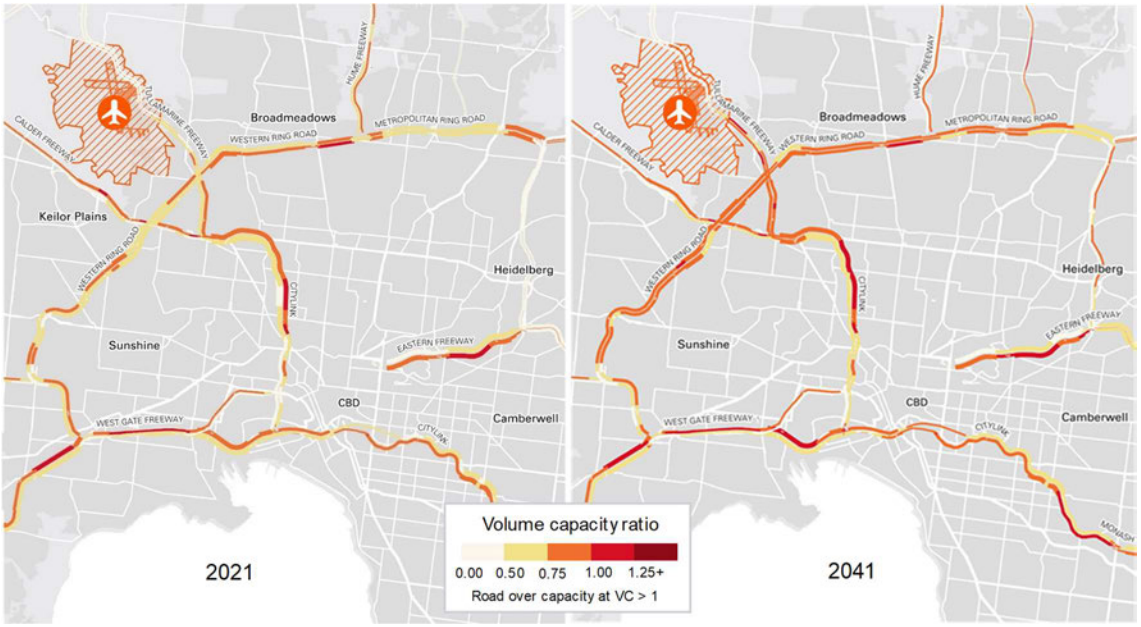
[62] Melbourne Airport, *Melbourne Airport Master Plan*, (2018).
[63] VicRoads Open Data, *Traffic Volume*, (2019) and Melbourne Airport vehicle counts from Melbourne Airport Master Plan, (2018).
[64] Melbourne Airport, Melbourne Airport Master Plan, (2018). Note that these figures reflect external trips, and exclude internal trips undertaken by aviation support vehicles, emergency services, taxis (when circulating from pick-up and drop-off) and rental vehicles.

Figure 2-21: Proportion of airport users on Melbourne's road network (2021 AM peak)



This contributes to heavy congestion in the peak periods that causes delays and diminishes travel time reliability. Figure 2-22 shows that by 2021, congested conditions in the morning peak period are predicted to be most acute on the CityLink-Tullamarine, Monash and West Gate Freeways. Even taking into account the relief provided by projects such as North East Link, the West Gate Tunnel and the Sunbury Road upgrade, increased travel demand to the airport and population growth in Melbourne's north and west will likely considerably worsen capacity issues on these roads by 2041.

Figure 2-22: Forecast Melbourne weekday traffic volume / capacity ratio (2021 and 2041 AM peak)[65]



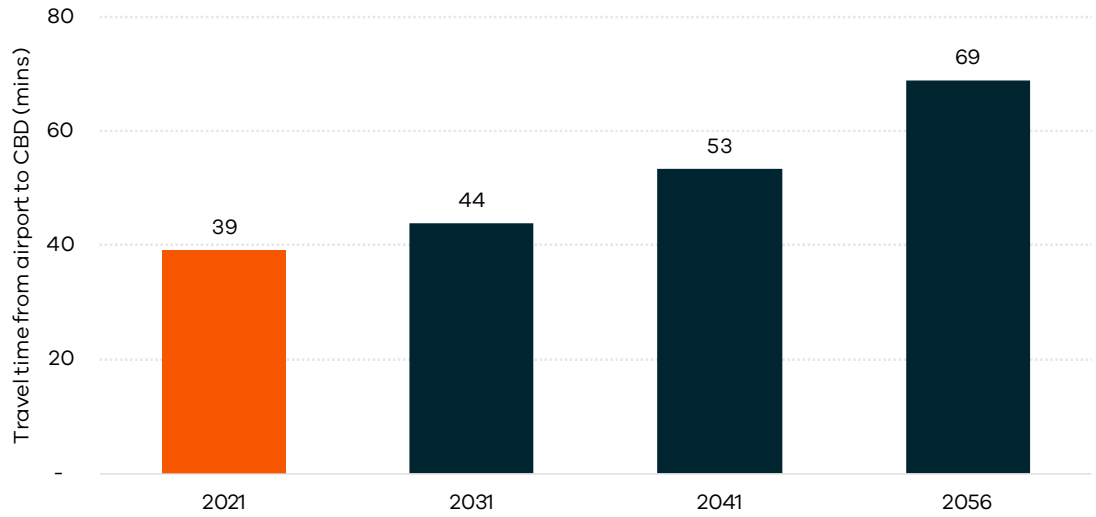
[65] VITM modelling undertaken by RPV, (2020).

Congestion on these access routes delays passengers getting to the airport, who are typically time-sensitive given the potential time and financial costs of missing a flight. Poor reliability of the route also means passengers have to increase the amount of 'buffer' time to factor into travelling to the airport, which adds to the general cost of travel.

This congestion is despite significant investments to augment road-based capacity and airport accessibility in Melbourne. In 2019, the final stage of the CityLink Tulla Widening project was completed to add an extra lane on the Tullamarine Freeway in each direction between the Bolte Bridge and Melbourne Airport. Other recent upgrades to improve airport accessibility include an expansion to the SkyBus terminal at Southern Cross Station, also completed in 2019.

While the CityLink Tulla Widening project has reduced travel times, forecast long-term growth in traffic demand set out in Figure 2-23 suggests the Tullamarine Freeway will reach capacity in 2036, with travel times expected to almost double by 2056. This demonstrates that continual expansion of the Tullamarine Freeway is not a sustainable long-term solution, given constraints on available land and conflicts with adjacent land use.

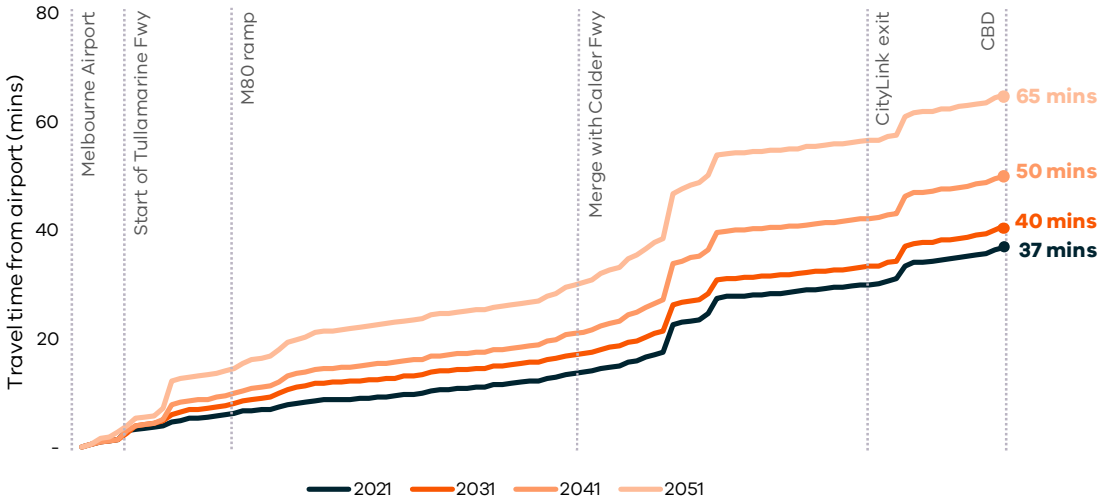
Figure 2-23: Melbourne Airport to CBD journey times (AM peak)[66]



Over the next 20 years, both Melbourne's population and Melbourne Airport passenger volumes are expected to double, further worsening congestion on major access routes, intensifying bottlenecks and extending journey times for all users. Figure 2-24 shows the merging of the Tullamarine Freeway with users from other arterials, particularly from the Calder Freeway and CityLink, is set to create key pinch points which will progressively contribute to deteriorating travel times for airport users. By 2051, it is expected that travel times during the morning peak from the airport to the CBD will worsen by 27 minutes from current journeys in 2021.

[66] VITM modelling undertaken by RPV, (2020).

Figure 2-24: Forecast performance of the Tullamarine Freeway inbound from Melbourne Airport (AM peak)[67]

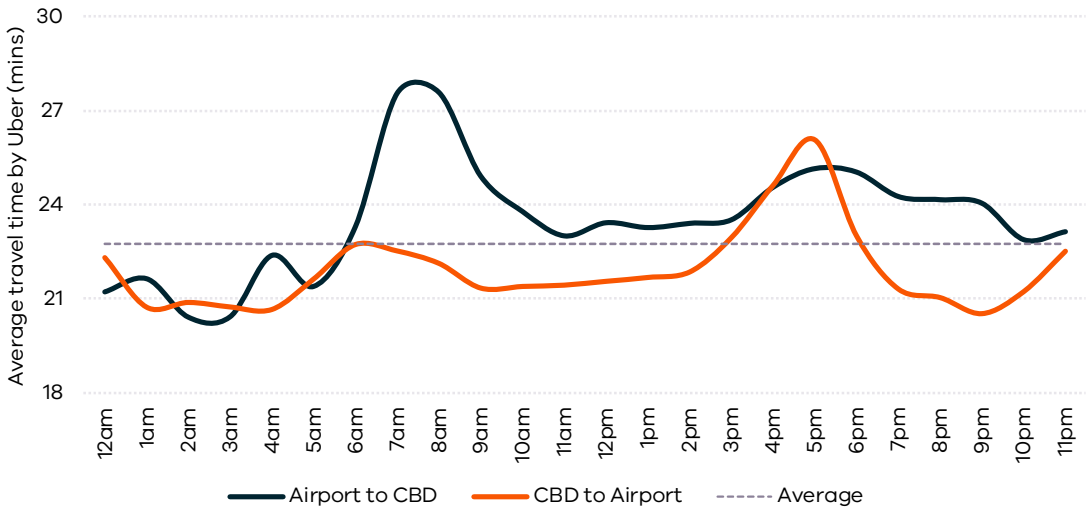


To alleviate these pressures, alternatives to the Tullamarine Freeway are needed to improve passenger connectivity and the overall efficiency of movement across Melbourne for all users. Without intervention, the impacts of growing vehicle volumes on airport passengers will add delays to the journeys of all airport users, with significant implications on the cost of travel and doing business. The broader productivity impacts of congestion on key arterials to the airport are explored further in Problem 2 (section 2.3.3).

2.3.2.4 Travel times to the airport can vary significantly during peak hours

Spikes in traffic volumes during peak hours can greatly erode travel times and the reliability of access to the airport. Figure 2-25 shows there is significant variation between the average travel time and peak hour travel times between the airport and CBD in both directions. During the morning peak, average travel times to the airport can be up to 28 minutes from the CBD, nearly 10 minutes longer than free-flow conditions.

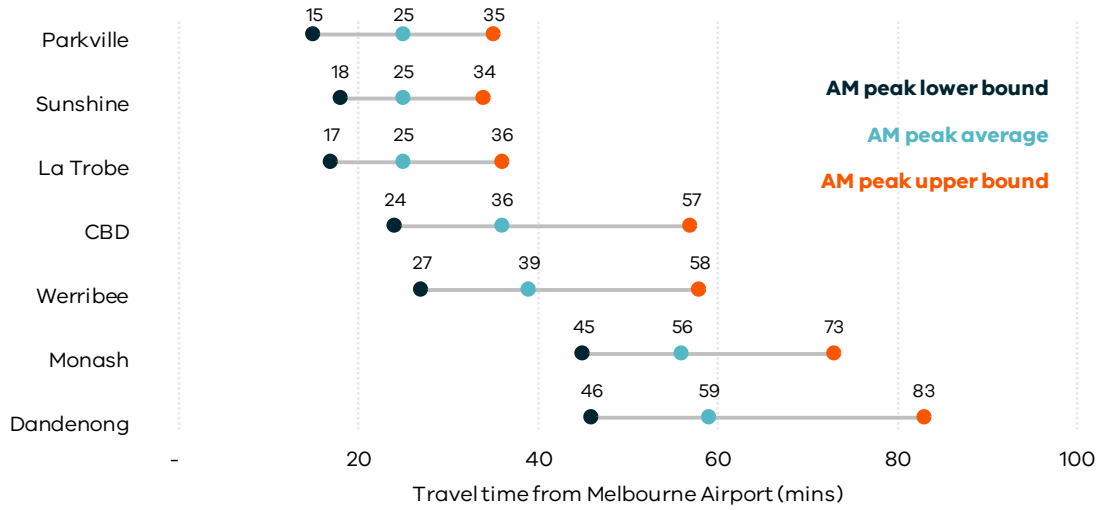
Figure 2-25: Weekday road journey time variability and daily average travel time (June – September 2019)[68]



[67] VITM modelling undertaken by RPV, (2020).
[68] Uber Movements, Travel data from June – September 2019.

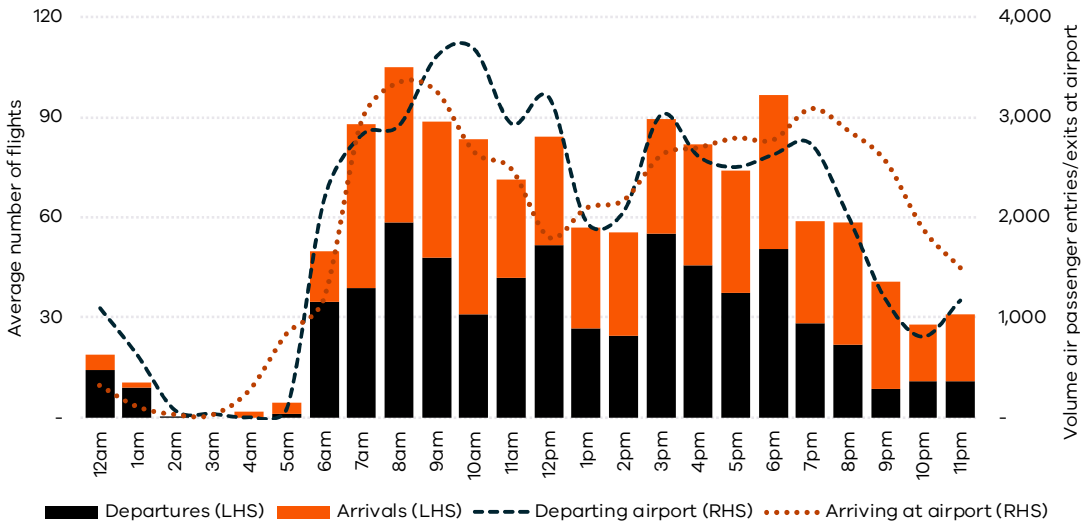
Similarly, Figure 2-26 shows this variability in travel times can be significant across most areas in Melbourne, and this variability grows the further the origin is from the CBD.

Figure 2-26: Variability in travel time from Melbourne Airport to NEICs (2019 AM peak)[69]



This has material consequences for many airport passengers, given the peak periods are those with the highest numbers of scheduled departures, as shown in Figure 2-27. The peak periods also coincide with the start / end of some airport employee shifts and more broadly when Melbourne Airport Business Park employees would be travelling on the roads.

Figure 2-27: Distribution of flights and passenger entry / exit at Melbourne Airport over an average weekday[70]



This demonstrates that a large proportion of airport passengers are forced to travel during peak periods of congestion, or else mitigate the risk of meeting peak-hour traffic by leaving early to allow additional 'buffer' time. For those travelling by taxi or using ridesharing services, additional congestion can add significant cost penalties, in addition to time delays.

[69] Uber Movements, Travel data from 30 June to 30 September 2019, Weekday AM peak. The upper bound indicates that, on average, 97.5 per cent of trips by Uber between Melbourne Airport and the NEIC are completed within this period of time. The lower bound indicates 2.5 per cent of trips were completed faster than the stated period of time. This is calculated using two standard deviations and assuming uniform distribution and the empirical rule.

[70] Flight data obtained from Melbourne Airport, over a period of 5 weekdays from 28 January to 3 February 2020. Passenger departure and arrival volumes from Melbourne Airport provided from RPV, with daily average volumes derived from observed passenger trips across FY2016-17. Weekday volumes exclude public and school holidays.

This variability on the Tullamarine Freeway also impacts public buses and coach services, primarily the SkyBus service, which lacks an express lane. While SkyBus operators may have the ability to improve the frequency and capacity of their services, the quality of the service will remain dependent on the performance of the road network. Without additional airport access options independent of road conditions, existing access points will become increasingly congested, further reducing journey reliability and forcing travellers to add a longer buffer. Increasing congestion will also have substantial negative environmental implications.

2.3.3 Problem 2: Increasingly congested links to Melbourne Airport limit Victoria's economic prosperity

As discussed in section 2.1, Melbourne's arterial roads have diverse roles. They connect people to employment, education and social opportunities, and facilitate the movement of goods across Melbourne and to domestic and overseas markets. As the city continues to undergo economic and population growth in the long term, delays from rising congestion will generate significant knock-on impacts, effectively constraining productivity. Congestion is estimated to cost the Victorian economy $1.3 billion per annum in 2018 and is expected to rise to $10.2 billion per annum by 2030.[71]

The recent growth in airport activity, population density and non-aviation related development in Melbourne's north and west is adding more cars on airport access routes. As nearly all airport traffic from across the city converges at the Tullamarine Freeway, added congestion on this link and surrounding feeder routes extends travel times to and from the airport for all users. Delays on the Tullamarine Freeway connection to the CBD impacts all road users, including leisure and business travellers, and has implications for Melbourne's reputation as an attractive place to visit and invest.

The productivity and economic potential of knowledge-based industries is underpinned by accessibility to a broad catchment of labour, clients and industry connections. These jobs are increasingly located in the CBD and along the diagonal formed by the Tullamarine and Monash freeways, extending from the airport to Dandenong. Growing vehicle volumes on these routes will impact all landside movements to the airport and inflate the cost of doing business for many sectors.

Network-wide congestion limits accessibility not only for airport passengers, but also makes it harder for Victorians to get to jobs, education and social opportunities across Melbourne. Failure to address this congestion will result in:

- increasing supply chain costs, which will diminish Victoria's competitiveness and attractiveness to do business compared with other global cities
- declining accessibility to employment and education opportunities, which will be particularly acute in the outer-west and outer-north suburbs, which are already among Melbourne's most disadvantaged areas
- smaller labour catchments for Melbourne's businesses and employment clusters, constraining productivity benefits from economic agglomeration, and increasing the risk of skills shortages
- poor accessibility to Melbourne Airport, as well as between key activity and employment centres, which will hamper the ability of these areas to reach their economic potential.

2.3.4 Evidence and impacts of Problem 2

2.3.4.1 Growing congestion impacts supply chain efficiency for air freight

Congestion has significant implications for the movement of goods to and from the airport, and its distribution across the city. Air freight is usually high value and often time sensitive, and commonly includes fresh foods as well as consumer items ordered online. This freight is generally flown between Australia and overseas and domestic markets as customers place a premium on reliable and timely delivery. While air freight in Victoria comprises around 1 per cent of the nation's freight

[71] Transport for Victoria, *Delivering the Goods - Victorian Freight Plan*, (2018). LHS = Left hand side axis, RHS = right hand side axis.

task by volume, it is estimated to contribute 20 per cent by value.[72] In FY2018, an estimated $18 billion worth of air freight was handled at Melbourne Airport.[73]

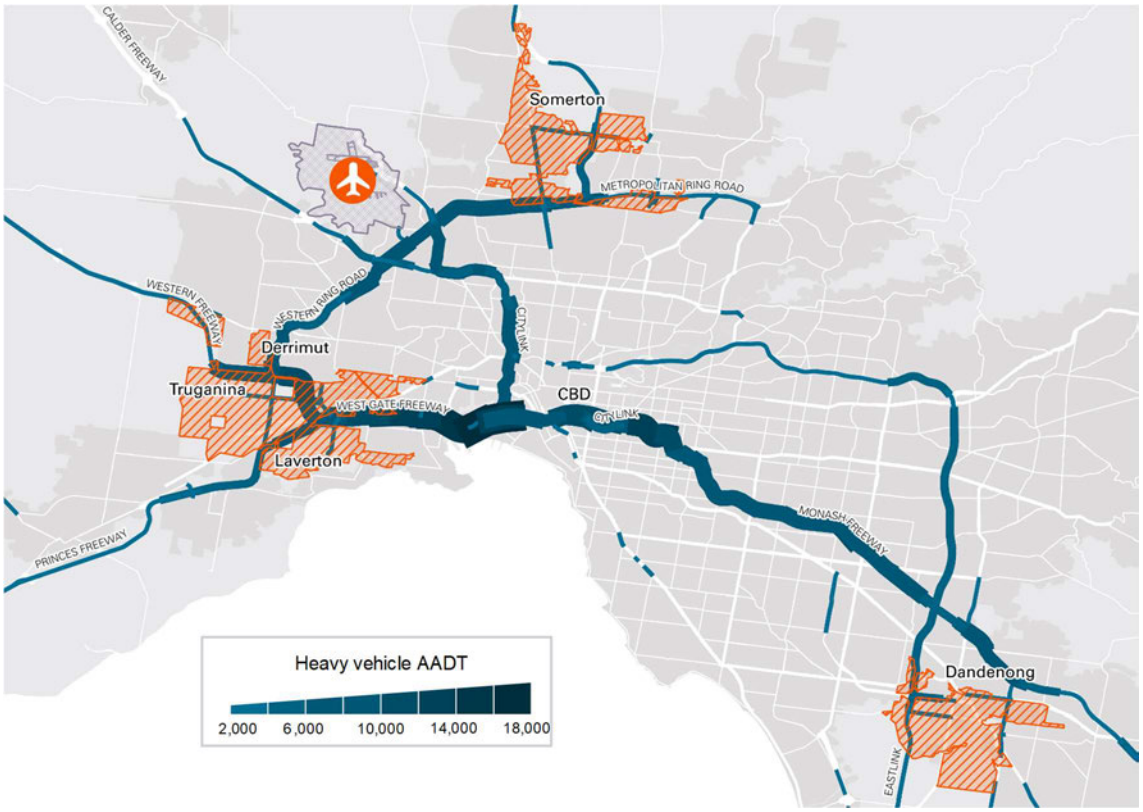
Melbourne Airport and the surrounding industrial precinct has a significant role in the receipt and movement of Australian air cargo and is a vital node in supply chains in the south-eastern part of the country, including Victoria, southern New South Wales, Tasmania and eastern South Australia. Australian air freight largely operates through a 'hub and spoke' model, with major city airports acting as an intermediary for secondary locations. Melbourne Airport's high frequency and availability of services to domestic and international locations means it can attract high baseline levels of demand, and drive economies of scale for local businesses. Melbourne and Sydney airports are typically the first point of entry or exit for international freight, with Melbourne Airport transporting over 30 per cent of Australia's total air cargo.[74] Given that at least 80 per cent of air freight travels in the cargo holds of passenger planes, the increase in passenger flights at Melbourne Airport is the key facilitator of the rise in air freight coming in and out of Melbourne.

The performance of roads around the airport is important in ensuring the efficient transport of freight between distribution centres to and from the airport. General freight (such as consumer goods and online purchases) usually travel from the airport to local distribution centres in Ardeer or Sunshine, using congested roads such as the Western Ring Road, before being trucked to their final destination. While the airport's proximity to major freeways enables ready access to customer bases and interstate networks, it also means the movement of air freight can be slowed down by private vehicle traffic.

Figure 2-28 shows that heavy vehicle volumes are heavily concentrated on routes which link the airport to Melbourne's major distribution centre precincts. These include the Western Ring Road, which links the airport to distribution centres in Derrimut and Truganina in the west, and the core Tullamarine-Monash Freeway corridor which links to the Dandenong industrial precinct in the south-east. Recent modelling suggests the opening of the North East Link will provide an option for users to make cross-city trips without travelling via the CBD. However, the concentration of major freight precincts and nodes in Melbourne's west and inner-west means the displacement of commercial vehicles from the Monash-Tullamarine Freeway corridor will unlikely be significant.

[72] Department of Transport, *Ports and Freight*, (2019). Available at: https://transport.vic.gov.au/ports-and-freight
[73] Infrastructure Partnerships Australia, *International Airfreight Indicator*, (2019).
[74] Melbourne Airport, *Melbourne Airport Master Plan*, (2018).

Figure 2-28: Heavy vehicle annual average daily traffic (AADT) in Melbourne, and location of state-significant industrial precincts (2019)[75]



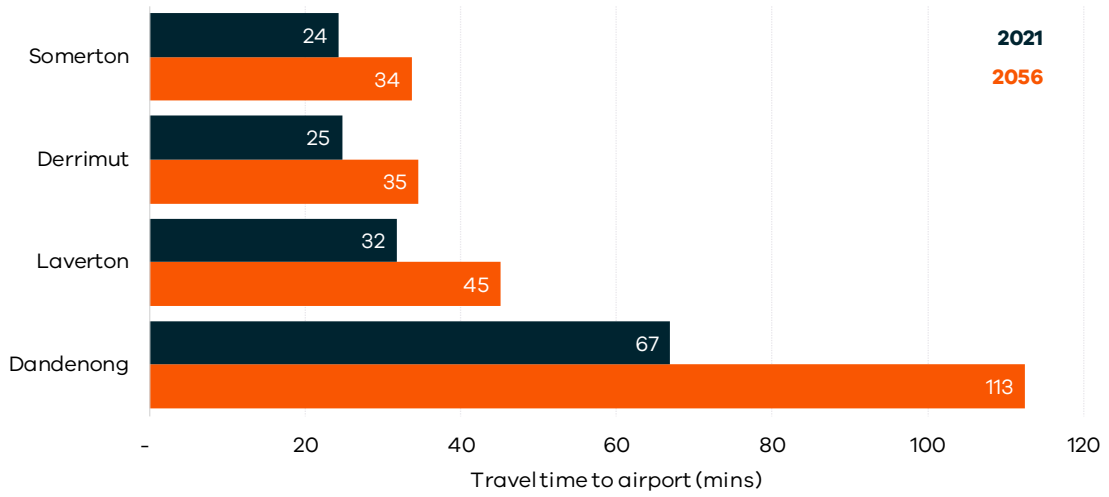
Looking forward, strong export demand for fresh and processed Australian food products to Asia and the Middle East combined with a growing e-commerce sector are set to lift the amount of air freight through Melbourne Airport. By 2038, it is predicted that Melbourne Airport's air freight task will double to 900,000 tonnes. This will result in a significant rise in commercial vehicle traffic on routes surrounding the airport, which already accounts for 13 per cent of total airport traffic.[76]

Melbourne's position as a centre of economic activity means Melbourne Airport plays a critical role in the movement of freight to and from Victoria. The rise of e-commerce and growing consumer expectations around rapid and on-time delivery means the performance of roads to the airport is vital in ensuring Victorian businesses are able to fully capitalise on their market potential. With most of the city's new residents settling in greenfield developments in outer-suburban areas, there is a strong need to supplement existing transport infrastructure to alleviate congestion and minimise the impacts of urban encroachment on established supply chains.

Over time, it is anticipated that congestion will lengthen travel times from key industrial precincts to the airport and have material impacts on the efficiency on air freight supply chains. Figure 2-29 shows that by 2051, travel times are forecast to be significantly longer from key state-significant industrial precincts (SSIPs), particularly Derrimut and Dandenong.

[75] VicRoads Open Data, *Traffic Volume*, (2019).
[76] Ibid.

Figure 2-29: Forecast travel time from key industrial precincts to Melbourne Airport (PM peak)[77]



Increasing levels of congestion on Melbourne's roads means goods will spend more time delayed in traffic than previously. Around Melbourne, certain cargo with narrow turnarounds between supply chain stages, or time-critical air freight such as dairy or e-commerce products, cannot avoid travelling in peak times and are likely to be severely affected by congestion in the future. The broader impacts of congestion can include:

- missed connections between integrated global supply chains, which can lead to cascading delays and operational impacts across subsequent supply chain stages and linkages
- increase to supply chain costs, as delays to freight reaching distribution centres can attract penalties or additional warehousing costs when trucks miss timeslots into customer loading docks or scheduled planes, as more resources are needed to manage unexpected volumes
- overall increases in the cost of doing business, as labour costs for truck drivers sitting in traffic rises, or goods are lost from spoilage
- diminished value of goods delivered, and reduction in competitive advantages between Victorian producers with interstate or overseas vendors.

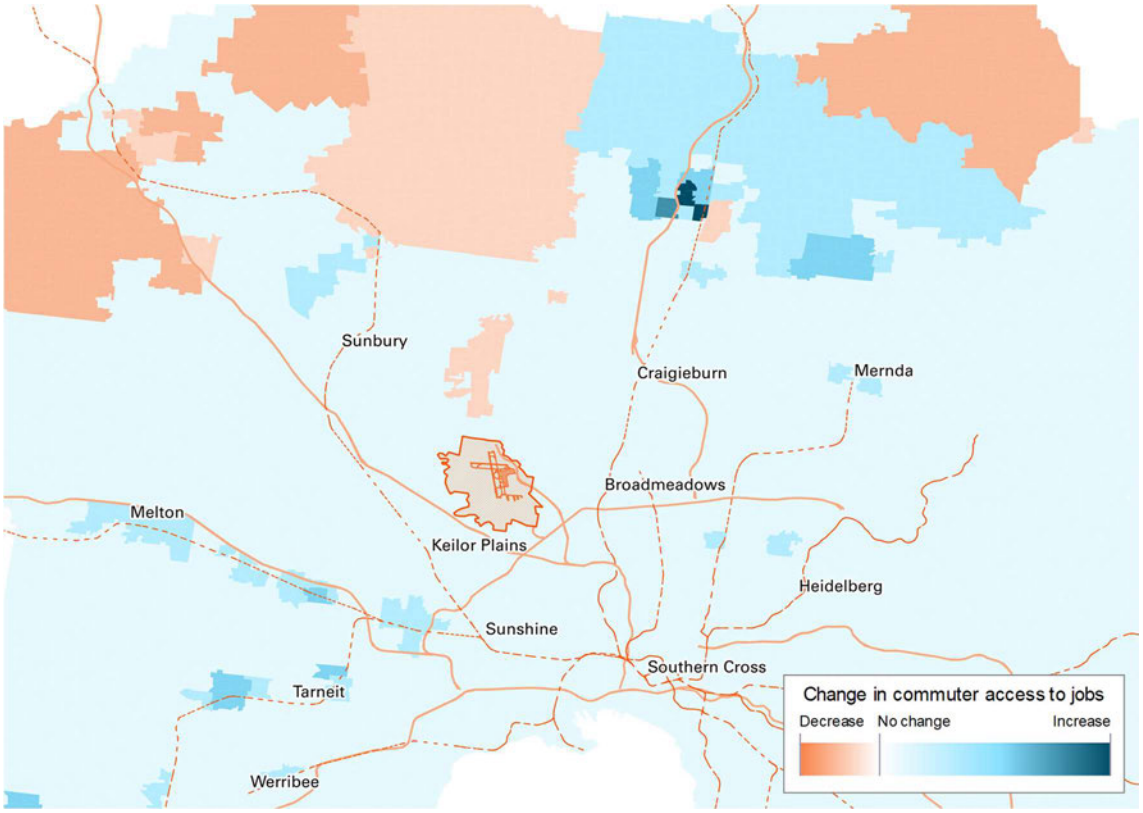
2.3.4.2 Congestion reduces accessibility to employment opportunities for people in Melbourne's north and west

Accessibility is a critical issue that impacts people's ability to reach a broader range of employment and educational opportunities not available in their area of residence. As noted in section 2.1.3, the high level of population growth in Melbourne's north and west, away from key employment precincts in the CBD and south-east, means that residents in these areas are increasingly required to travel across the city to access employment opportunities. Rising volumes of airport-related traffic will worsen congestion on key arterial roads which also service these cross-city journeys, such as the Tullamarine Freeway, Metropolitan and Western Ring Roads, and diminish accessibility for all users.

Poor accessibility also limits the attractiveness of an area for commercial development. This drives businesses to locate in more established suburbs that are well serviced by the transport network. This constrains the availability of jobs locally (in outer suburbs) and perpetuates social and economic disadvantage. Figure 2-30 shows that as Melbourne's jobs increasingly cluster around particular precincts, disparities in accessibility to jobs in the outer north and north-west will be more pronounced by 2046 compared with more established inner and eastern suburbs unless cross-city connectivity is improved.

[77] VITM modelling undertaken by RPV, (2020). Travel times taken from centroids of state-significant industrial precincts. PM peak times shown to reflect typical movement of air freight from warehouse to airport in the afternoon to catch international flights in the evening or early morning.

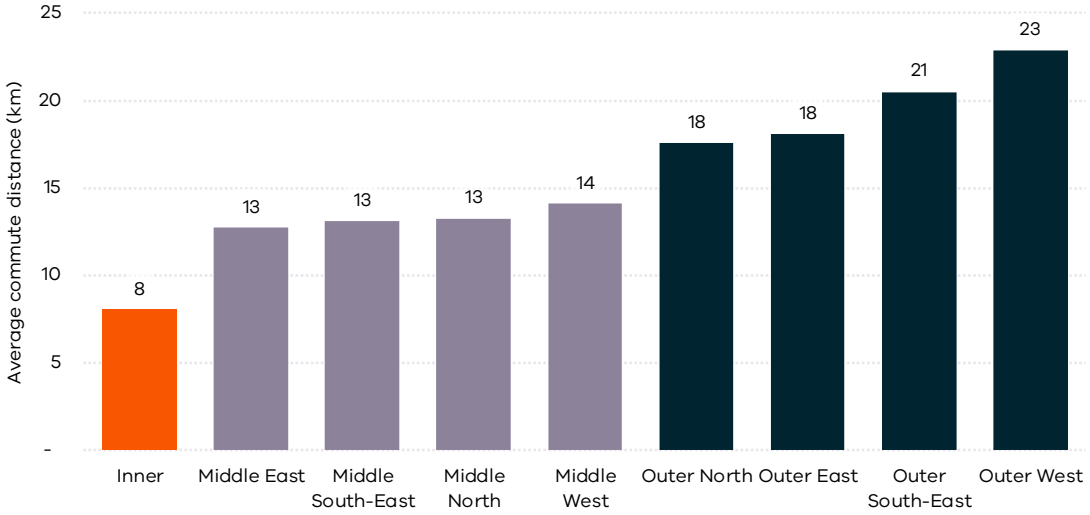
Figure 2-30: Change in employment accessibility (2031 to 2046)[78]



The divergence between areas of fastest population and employment growth will lengthen average commutes, with effects exacerbated by growing congestion. Figure 2-31 shows that commuters in Melbourne's outer west and outer south-east already travel the longest distances to work, with average commutes more than 4.5 kilometres more than the rest of Melbourne. At least 44 per cent of residents in Melbourne's outer west and 41 per cent of residents in Melbourne's outer south-east have commutes longer than 20 kilometres, compared with just 7 per cent in Melbourne's inner suburbs and 17 per cent in Melbourne's middle ring suburbs.[79] This means for residents in Melbourne's outer suburbs, there are more sources of congestion which can lengthen their commuting times.

[78] LUTI modelling undertaken by RPV.
[79] Australian Bureau of Statistics, *Victoria, (SA2), Distance to Work*, (2016).

Figure 2-31: Average distance to work (2016)[80]



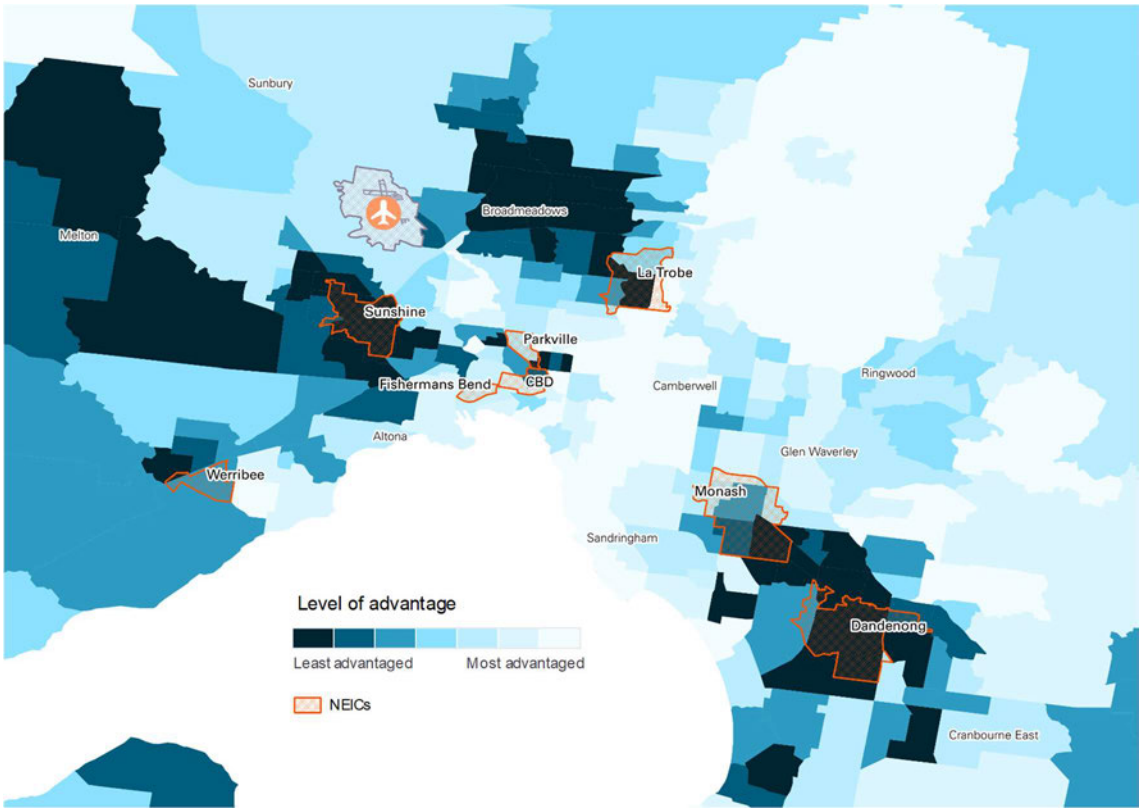
Even considering the recent changes to commuting during the COVID-19 pandemic, the growing importance of the city as a major centre of commercial activity further underscores the need to improve the number and quality of connections between the airport and CBD. Securing public transport connectivity between Melbourne's suburbs, particularly by improving the efficiency of cross-city commuting, will improve the liveability of Melburnians and also generate positive knock-on benefits for the city's visitor economy.

Access to quality transport infrastructure plays a vital role in supporting local and regional economies by linking residents with employment, education, health and other recreational opportunities that may not exist near where they live. Figure 2-32 shows many residents in Melbourne's outer west, northern and south-eastern suburbs typically experience lower socio-economic advantage, considering measures such as employment status, educational attainment and income.

While there are many contributing factors, there is a strong correlation between areas within the least advantaged quintile and areas with longer journey times to work. It follows that enhancing accessibility to key employment precincts (including Melbourne Airport, which is the key employment hub in the north-west) by reducing commute times would assist in alleviating these disparities.

[80] Australian Bureau of Statistics, 2016 Census, 'Victoria, (SA2), 'Distance to Work', (2016).

Figure 2-32: Index of relative socio-economic advantage (2016)[81]



Suboptimal public transport provision in Melbourne's north-west further compounds these issues. On the key Geelong and Ballarat V/Line corridors which service growing populations in Melton, Wyndham Vale and Tarneit, the number of passengers on V/Line services grew 157 per cent and 74 per cent respectively from 2008 to 2018.[82] This growth has resulted in demand approaching or exceeding the capacity of the current network, leading to crowding and a decline in service quality, especially during peak hours. Commuters have diminished incentive to shift to public transport and are instead forced to use private vehicles on already congested roads, many shared with airport-related traffic.

2.3.4.3 Poor quality access to employment and education hubs limits Victoria's economic potential

The shift towards an economy increasingly comprising knowledge-based and services sectors has significant implications for transport demand. Knowledge-based industries grow from gains in productivity benefits and economies of scale through the development of human capital. This is driven by increasing opportunities for knowledge-sharing, facilitated by locating close to similar businesses and primary client bases.

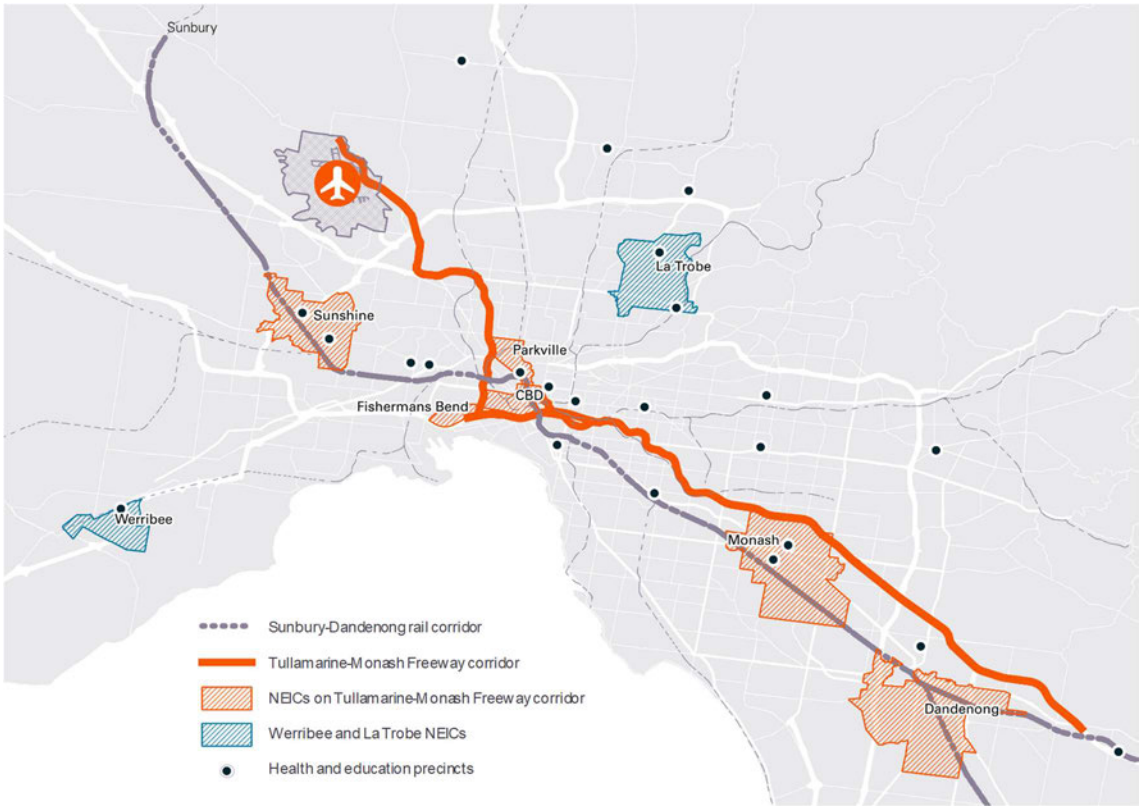
This means that Melbourne's jobs will increasingly grow from industry hubs to form NEICs. The largest of these industry hubs will be concentrated around the CBD and in Melbourne's south-east around established university precincts. Over the next 30 years, the coalescing of jobs in NEICs will create centres of financial, technical, health and education services, critically underpinning Victoria's economic prosperity. Ensuring quality connections to these NEICs will be critical to realising Victoria's full economic potential.

As discussed in section 2.3.3, Melbourne Airport plays a key role in facilitating the growth of national knowledge services and within a global context by supporting the movement of interstate and international visitors. While Figure 2-33 shows that direct freeway links provide strong connections between the airport and most NEICs, the quality of this access will be impacted by the increasing levels of congestion across the city's road network. Failure to address this road network congestion

[81] Australian Bureau of Statistics, *Socio-economic indexes for areas (SEIFA) cat. No. 2033.0.55.001*, (2016).
[82] V/Line, *Annual Report 2017– 2018*, (2018).

will constrain the size of labour and client catchments, and the ability of businesses to share knowledge which underpins their growth. This will progressively deteriorate the attractiveness of Melbourne as a knowledge hub and limit Victoria's economic potential.

Figure 2-33: Location of NEICs across Melbourne and concentration of economic activity[83]

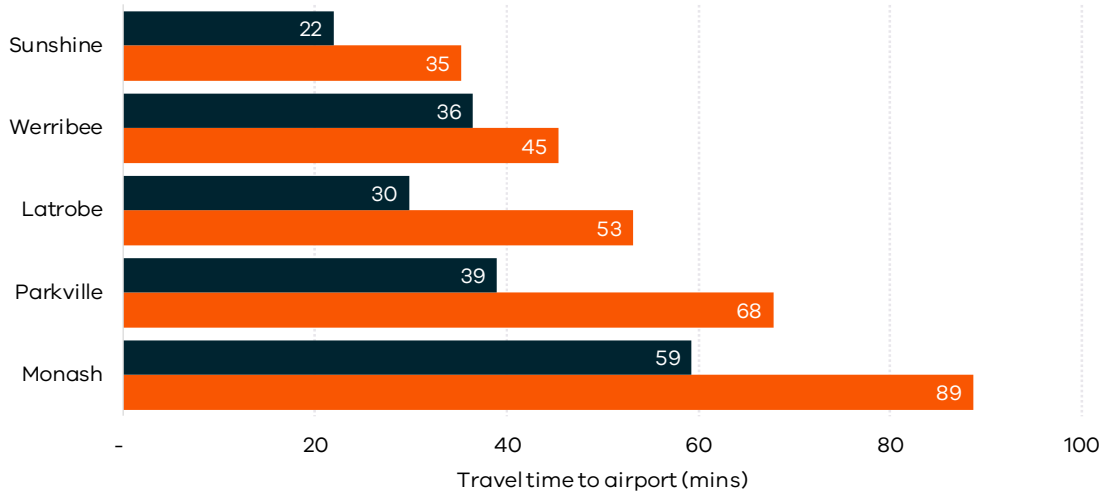


The continued divergence in where people live and work will place pressure on major roads facilitating cross-city travel, especially from the growth areas in the north and west to the key employment and education hubs in the CBD and south-east. While the clustering of knowledge-based industries will enable opportunities for essential knowledge sharing, it will increasingly focus travel demand on the Tullamarine and Monash freeways and the Western Ring Road, which are also key airport access routes.

Substantial pressure will also be placed on the Sunbury-Dandenong rail corridors set to be linked by the Metro Tunnel scheduled for completion in 2025, making public transport a less attractive alternative. Increasing volumes of vehicles on airport access roads will further deteriorate travel times and reliability for commuters, commercial vehicles and airport users. In particular, there are significant impacts to labour market participation if travel to work becomes prohibitively difficult. Commuters may opt for lower value work closer to home or leave the labour force. Figure 2-34 shows that travel times between the airport and key NEICs are forecast to increase substantially over the next 30 years.

[83] Image adapted from Department of Environment, Land, Water and Planning, *Plan Melbourne 2017-2050*, (2016).

Figure 2-34: Forecast travel time from NEICs to Melbourne Airport (AM peak)[84]



The alignment of economic activity on this corridor will significantly transform Melbourne, but will also increase travel demand on routes linking key living, learning and work precincts. Given approximately one-quarter of people accessing the airport use the Monash Freeway and 85 per cent use the Tullamarine Freeway, this will have substantial implications for travel times to the airport.[85]

Difficult access to employment opportunities can have considerable impacts to labour market participation, as commuters may opt for lower value work closer to home or leave the labour force. For these reasons, improved access solutions to employment clusters in Melbourne's west, including Sunshine and Werribee, are important to relieve pressure on cross-city arterials.

It is therefore critical there are alternative access options to the airport to minimise delays for airport passengers and increase the quality of connections to socio-economic opportunities for all road users. Given that airport access routes serve a broad range of commuter and commercial users, improving travel times and reliability on these routes can have wide-ranging benefits that enhance Victorian liveability, productivity and economic competitiveness.

[84] VITM modelling undertaken by RPV, (2020).
[85] VITM modelling undertaken by RPV, (2020). Accounts for both inbound and outbound daily vehicle trips.

2.4 Timing considerations

The need for alternative access options to existing routes to Melbourne Airport will only increase over time. Assuming continuation of current growth in airport patronage and trip demand along the corridor, it is expected the Tullamarine Freeway will reach capacity by 2036.

Further, indicative plans by Melbourne Airport (as stated by its owner and operator, Australia Pacific Airports (Melbourne) Pty Ltd (APAM)) to construct a fourth runway and additional freight handling facilities beyond 2038 will likely increase landside travel demand to the airport.[86] The declining performance of key access roads will impact the potential benefits received from planned upgrades at the airport as well as from infrastructure improvements across Melbourne's road network.

Uncertainties around the problem – COVID-19

Several external factors may introduce further uncertainties around the scale of economic and demographic shifts in Melbourne. At the time of writing, the COVID-19 pandemic continues to pose a range of risks to global and Victorian economic conditions, and the full length and severity of these impacts are still unknown. COVID-19 has already led to a change in how some industries work, with a large uptake in people working remotely due to government restrictions, more local trips and a shift from public to active and private transport. However, it is uncertain how much these immediate impacts will permanently change travel patterns.

While the strength of these headwinds is uncertain, the majority of these impacts will likely continue to be felt for some time. Despite many unknown variables, it is possible that COVID-19 will lower population growth rates, airport patronage and travel demand, at least over the next few years. The combined impact of these factors is that patronage growth (and therefore the expected benefits of MAR) may be delayed by a few years compared with a business as usual scenario. Sensitivity tests which explore the potential implications of lower population, economic and airport patronage growth on MAR are discussed in Chapter 11 and in Appendix 9: Economic appraisal.

While the rate of rail patronage growth is uncertain, the underlying objectives of MAR such as reducing road congestion and improving poor accessibility to economic hubs are expected to remain relatively unchanged over the long term. Going forward, the Victorian Government's readiness for investment in major infrastructure projects such as MAR will be a stimulus to support economic recovery efforts following the COVID-19 pandemic.

[86] Melbourne Airport, *Melbourne Airport Master Plan* (2018). The Melbourne Airport Master Plan communicates plans for a fourth runway within its Long Term Development Concept Plan.

3 Case for change

3. Case for change

Chapter summary

- A rail link from Melbourne Airport will substantially address the problems identified in Chapter 2 and generate a range of economic and social benefits for the community.
- Identified sources of community benefits that MAR will generate include:
  - **Enhanced travel choice and outcomes for airport users travelling to and from Melbourne Airport**
    - Improving the availability and quality of public transport to the airport is projected to reduce road congestion and improve travel time reliability for all airport users. Predictability of ground access is particularly valuable for airport users given the time and financial costs of missing a flight.
    - Reducing road congestion, particularly on the Tullamarine Freeway and key arterials in Melbourne's growing northern and western suburbs, which serve airport users and an increasing number of commuters.
  - **Improved productivity and competitiveness for Victoria**
    - Shifting a proportion of airport-related traffic from these arterials will contribute to network-wide improvements in congestion and material efficiency benefits for commuters and supply chains.
    - Improving connectivity between Melbourne Airport and the CBD as well as to key employment centres across Melbourne will ease business activities for visitors and strengthen Victoria's emerging knowledge economy.
- As required by Victoria's Department of Treasury and Finance's Investment Management Strategy (IMS), evidence of these benefits will be quantified through a Benefits Management Plan (BMP). The key performance indicators (KPIs) used to measure this uplift include the ability of MAR to prompt mode shift and reduce travel times to the airport and economic centres across Melbourne.
- The delivery of a rail link to Melbourne Airport has been a priority on the policy agenda at state and federal levels, as underlined by the $10 billion joint commitment from the Victorian and Australian governments. An initiative to increase public transport capacity to the airport has been on Infrastructure Australia's Priority Infrastructure List since 2016, and the issues MAR aims to alleviate are directly aligned with the objectives of *Plan Melbourne 2017 – 2050* and Infrastructure Victoria's *30-Year Infrastructure Strategy (2016).*

3.1 Introduction

Connecting Melbourne Airport to the metropolitan rail network has the potential to generate benefits including:

- enhanced travel choice and outcomes for airport users travelling to and from Melbourne Airport
- improved productivity and competitiveness for Victoria.

These benefits align with policies and objectives of the Victorian and Australian governments.

A BMP has been developed, in accordance with DTF guidelines, which sets out the overall approach to managing the benefits. The BMP sets out the range of benefits that MAR has the potential to deliver to address the problems identified in Chapter 2.

3.2 Benefits to be delivered

An integrated heavy rail link between Melbourne Airport and the broader metropolitan and regional rail network through Sunshine has the potential to deliver a range of benefits to Victoria and Australia more broadly. Addressing the two key problems discussed in section 2.3 will deliver the following.

3.2.1.1 Benefit 1: Enhanced travel choice and outcomes for airport users travelling to and from Melbourne Airport

- Improve choice of travel options and convenience of access to Melbourne Airport by directly connecting the airport to the metropolitan and regional rail network at Sunshine.
- Reduce travel times to and from Melbourne Airport in peak periods with a high-frequency fixed link unimpeded by road congestion.
- Reduce road congestion on key airport access routes such as the Tullamarine Freeway by shifting some inbound and outbound airport traffic to alternative routes and modes.
- Improve the reliability of travel times to Melbourne Airport. Consistency in travel times is particularly important for travellers departing from Melbourne due to the high cost associated with missing a flight, particularly for business travel. This will benefit business and non-business airport users in Melbourne's growing north and western suburbs.

3.2.1.2 Benefit 2: Improved productivity and competitiveness for Victoria

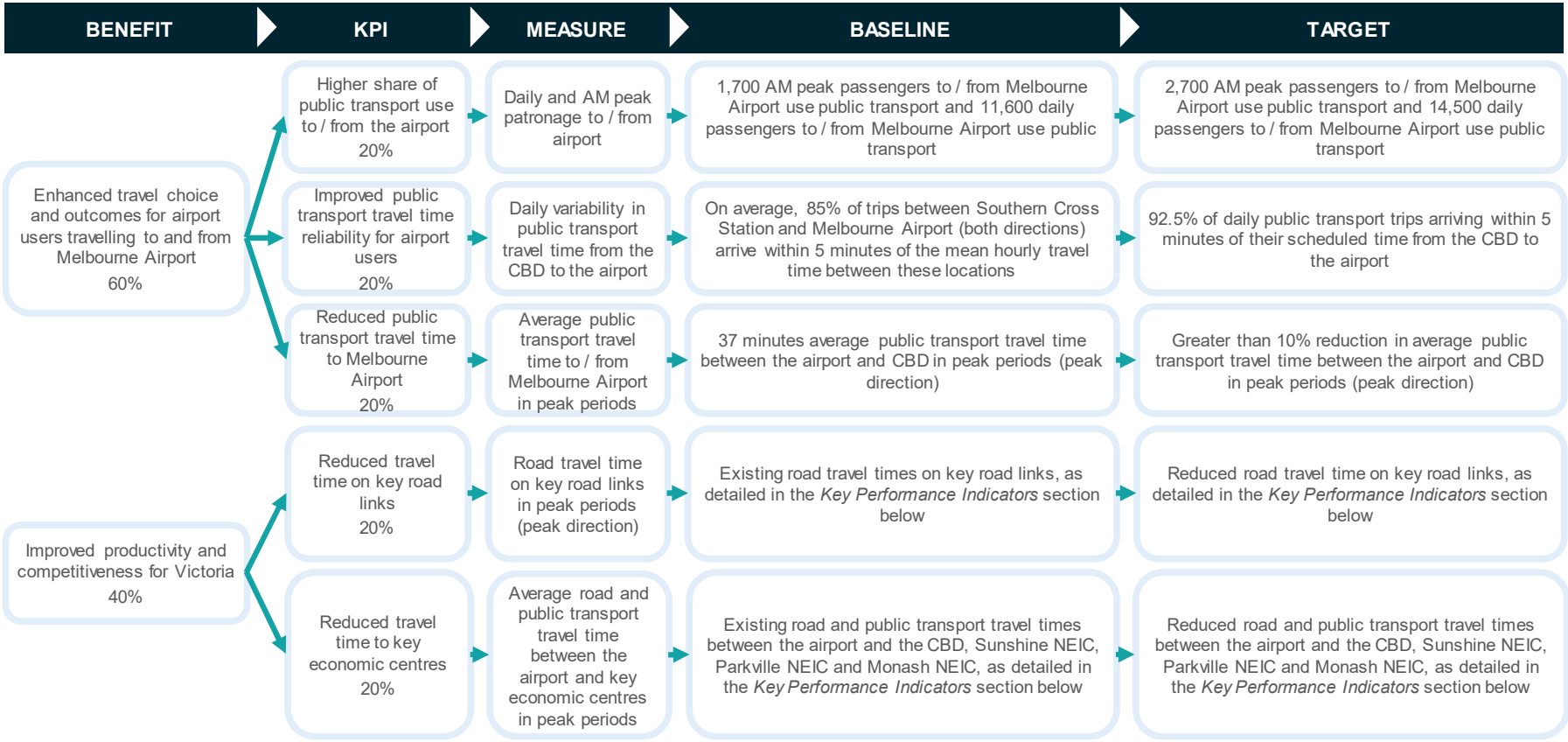
- Improve connectivity to and from Melbourne Airport and Melbourne CBD as well as existing employment hubs and other emerging economic centres such as Sunshine. An increase in accessibility, particularly to the CBD, will strengthen and expand Victoria's knowledge economy and drive growth in labour productivity, and enhance the contribution of nationally-significant employment clusters to Victoria and Australia.
- Improve travel time reliability on road links surrounding the airport with a shift away from road vehicles. This will allow businesses to reduce contingencies related to travel time variability, reducing input costs and minimising impediments to productivity growth.
- Reduce congestion on key arterial roads by promoting mode shift. This will reduce congestion impacts on supply chain efficiency, improve business access to markets outside Victoria and contribute to improved national freight efficiency.
- Attract further commercial and residential development near Melbourne Airport with greater public transport network coverage and capability, leading to greater availability of local jobs and stimulating economic activity in the area. Combined with improved accessibility to the airport, this will provide employees, particularly in Melbourne's west, with access to more diverse employment opportunities and employers with a more diverse workforce.

3.2.2 Evidence of benefit delivery – Benefit Management Plan

A BMP is required under the DTF IMS to identify, track and measure benefits delivered by a project or program and ensure the problems identified continue to be alleviated. Figure 3-1 sets out the overall approach of the BMP to benefits management. It specifies the KPIs, measures, baselines and target that will be used to determine whether the specified benefits have been delivered in accordance with expectations. The BMP will be managed by DoT.

The BMP also forms the basis of the *Investment and Benefits Realisation Plan* developed by Rail Projects Victoria (RPV), which defines the operational requirements of MAR. The benefits and KPIs from the BMP are the primary input used to test and develop detailed output specifications for MAR across future configuration states (2031 through to 2051). These output specifications provide a statement of requirements the future operation of MAR will need to meet for benefits to be realised.

Figure 3-1: MAR Benefits Management Plan



3.2.3 Key Performance Indicators

Table 3-1 sets out the detail of each KPI, including benefits, target dates and responsible departments.

3.2.3.1 Benefit 1: Enhanced travel choice and outcomes for airport users travelling to and from Melbourne Airport

- *KPI 1.1: Higher share of public transport use to / from the airport* – measures the change in daily and AM peak patronage of public transport trips to / from Melbourne Airport.
- *KPI 1.2: Improved public transport travel time reliability for airport users* – measures the percentage of daily public transport trips within five minutes of the scheduled / reported time from the CBD to Melbourne Airport.
- *KPI 1.3: Reduced public transport travel time to Melbourne Airport* – measures the change in average public transport travel time between Melbourne Airport and CBD in peak periods (peak direction).

3.2.3.2 Benefit 2: Improved productivity and competitiveness for Victoria

- *KPI 2.1: Reduced travel time on key road links* – measures the change in road travel time in peak periods (peak direction) for key road links.
- *KPI 2.2: Reduced travel time to key economic centres* – measures the change in average road and public transport travel time from Melbourne Airport to key economic centres including the CBD and key NEICs (including Sunshine, Parkville and Monash) in peak periods.

Table 3-1: MAR KPIs and measures

KPIs	Existing baseline measures	Target measures[87]	Target dates	Department responsible	Data source from
Enhanced travel choice and outcomes for airport users travelling to and from Melbourne Airport					
KPI 1.1: Higher share of public transport use to / from Melbourne Airport	1,700 AM peak passengers to / from Melbourne Airport use public transport and 11,600 daily passengers to / from Melbourne Airport use public transport.	2,700 AM peak passengers to / from Melbourne Airport use public transport and 14,500 daily passengers to / from Melbourne Airport use public transport.	1 year post-opening	DoT	DoT
KPI 1.2: Improved public transport travel time reliability for airport users	On average, 85 per cent of trips between Southern Cross Station and Melbourne Airport (both directions) arrive within 5 minutes of the mean hourly travel time between these locations.[88] Baseline measure to be reported again one year before opening.	92.5 per cent of daily public transport trips arriving within 5 minutes of their scheduled time from the CBD to Melbourne Airport.	1 year post-opening	DoT	DoT
KPI 1.3: Reduced public transport travel time to Melbourne Airport	37 minutes average public transport travel time between Melbourne Airport and CBD in peak periods (peak direction). Baseline measure to be reported again one year before opening.	Greater than 10 per cent reduction in average public transport travel time between Melbourne Airport and CBD in peak periods (peak direction).	1 year post-opening	DoT	DoT
Improved productivity and competitiveness for Victoria					
KPI 2.1: Reduced travel time on key road links	Average road travel time in peak periods (both directions) in 2021: • Tullamarine Fwy between Melbourne Airport and Burnley Tunnel (29 minutes) • Westgate Fwy between M80 and West Gate Tunnel (19 minutes) • Princes Fwy between Dandenong and Burnley Tunnel (32 minutes) • Western Ring Road from Hume Fwy to Tullamarine Fwy (9 minutes)	Average road travel time in peak periods (both directions) in 2031: • Tullamarine Fwy between Melbourne Airport and Burnley Tunnel (29 minutes) • Westgate Fwy between M80 and Westgate Tunnel (19 minutes) • Princes Fwy between Dandenong and Burnley Tunnel (34 minutes) • Western Ring Road from Hume Fwy to Tullamarine Fwy (9 minutes)	1 year post-opening	DoT	Observed traffic data (e.g. VicRoads, Google API)

[87] The measures for KPI 1.1 reflect SkyBus patronage (existing baseline) and MAR patronage (target). The target measures for KPI 2.1 and KPI 2.2 are direct outputs from the VITM modelling as the passenger volume ramp-up profile cannot be directly applied to changes in travel times.
[88] Uber Movements, Travel data from October – December 2019. Analysis based on hourly mean and hourly standard deviation travel time information between zones containing Southern Cross Station and Melbourne Airport, and assumes a normal distribution.

KPIs	Existing baseline measures	Target measures[87]	Target dates	Department responsible	Data source from
	• Western Ring Road from Calder Fwy to Tullamarine Fwy (3 minutes) Average road travel time in peak periods (both directions) in 2031: • Tullamarine Fwy between Melbourne Airport and Burnley Tunnel (30 minutes) • Westgate Fwy between M80 and Westgate Tunnel (19 minutes) • Princes Fwy between Dandenong and Burnley Tunnel (35 minutes) • Western Ring Road from Hume Fwy to Tullamarine Fwy (9 minutes) • Western Ring Road from Calder Fwy to Tullamarine Fwy (3 minutes) Baseline measure to be reported again one year before opening.	• Western Ring Road from Calder Fwy to Tullamarine Fwy (3 minutes) Baseline measure to be reported again one year before opening. Note that significant change in average road travel times not expected on day one given impact of project grows over time.			
KPI 2.2: Reduced travel time to key economic centres	1. Average road travel time in 2021 (peak periods) between Melbourne Airport and: • CBD (44 minutes) • Sunshine NEIC (21 minutes) • Parkville NEIC (39 minutes) • Monash NEIC (59 minutes) Average road travel time in 2031 (peak periods) between Melbourne Airport and: • CBD (49 minutes) • Sunshine NEIC (25 minutes) • Parkville NEIC (44 minutes) • Monash NEIC (64 minutes) Baseline measure to be reported again one year before opening.	1. Average road travel time with MAR (peak periods) between Melbourne Airport and: • CBD (48 minutes) • Sunshine NEIC (25 minutes) • Parkville NEIC (43 minutes) • Monash NEIC (63 minutes)	1 year post-opening	DoT	1. Observed traffic data (e.g. VicRoads, Google API)
	2. Average public transport travel time in 2021 (peak periods) between Melbourne Airport and: • CBD (59 minutes)	2. Average public transport travel time (peak periods) between Melbourne Airport and: • CBD (47 minutes)			2. DoT

KPIs	Existing baseline measures	Target measures[87]	Target dates	Department responsible	Data source from
	• Sunshine NEIC (72 minutes) • Parkville NEIC (61 minutes) • Monash NEIC (108 minutes) Average public transport travel time in 2031 (peak periods) between Melbourne Airport and: • CBD (57 minutes) • Sunshine NEIC (76 minutes) • Parkville NEIC (63 minutes) • Monash NEIC (113 minutes) Baseline measure to be reported again 1 year before opening.	• Sunshine NEIC (26 minutes) • Parkville NEIC (44 minutes) • Monash NEIC (95 minutes)			

3.3 Importance of benefits to government

The Victorian and Australian governments have developed key policy initiatives, strategic directions and investment priorities that consider the short, medium, and long-term infrastructure needs of the state and country. A rail connection between Melbourne Airport and the CBD via Sunshine will assist the governments in delivering on these key policies.

Table 3-2 summarises Victorian and Australian government policies relevant to MAR and demonstrates how they align with the problems set out in Chapter 2, as well as the benefits discussed above.

Table 3-2: Victorian and Australian government policy alignment with MAR problems and benefits

Key policies and themes	Relationship with problems and benefits
Victorian Government	
Plan Melbourne 2017-2050	
Plan Melbourne is the Victorian Government's key metropolitan planning strategy guiding the city's growth to 2050. It seeks to integrate long-term land use, infrastructure and transport planning to meet the population, housing and employment needs of the future. The Addendum to *Plan Melbourne* (released in 2019) included an additional focus on transport infrastructure supporting the initiatives of the strategy.	*Plan Melbourne* establishes Melbourne Airport as a transport gateway of State significance for passenger and freight movements. The strategy highlights the importance of supporting future employment and economic development opportunities at the airport. The strategy also anticipates the fastest population and employment growth will be in Melbourne's western and northern suburbs, and underscores the need to bolster the city's transport system to facilitate rising trip demand. *Plan Melbourne* also emphasises Melbourne's potential to position itself as one of the world's foremost new knowledge economies by supporting significant employment, health and education precincts, including Sunshine.
Victoria's 30-Year Infrastructure Strategy (2016)	
Victoria's first ever 30-year infrastructure strategy was delivered by Infrastructure Victoria in 2016 and is currently being updated for final release in 2021. The strategy is a state-wide, evidence-based plan that covers all types of infrastructure and was developed with all Victorians in mind. The strategy sets out a pipeline of initiatives – 137 recommendations – to be delivered over the next 30 years to help create the best possible future for all Victorians.	The Infrastructure Strategy recommends the construction of a rail link between Melbourne Airport and central Melbourne to provide a higher capacity and higher quality service for interstate and international visitors to travel from Melbourne Airport to the central city. The strategy notes the rail line should preferably be linked to the south-east of Melbourne. The Infrastructure Strategy also recognises the importance of Melbourne Airport as an economic and employment centre critical to Victoria's economy over the long term, recommending planning works to start immediately and for it to be operating within 15-30 years.
Victorian Infrastructure Plan (2017)	
The Victorian Infrastructure Plan is the state's first long-term, state-wide infrastructure plan delivering the economic, social and environmental outcomes critical to Victoria's future. The Victorian Infrastructure Plan specifically sets out the state's infrastructure priorities for the next five years. The plan responds to Infrastructure Victoria's 30-year Infrastructure Strategy.	The Infrastructure Plan recognises the importance of building integrated transport infrastructure for the future to address changing demographics and population growth in Victoria. In line with this, the plan supports Infrastructure Victoria's recommendation for the Melbourne Airport rail link.
Victorian Freight Plan (2018)	
The Victorian Freight Plan sets out the short, medium and long-term priorities to support the state and national freight and logistics system. It considers initiatives over the next five years to improve the movement of goods to local, interstate	The Freight Plan discusses the dependency of Victoria's freight and logistics sector on the state's road and rail networks. The Freight Plan highlights as a

Key policies and themes	Relationship with problems and benefits
and overseas markets, as well as providing longer-term direction for the freight network to respond to the growth in freight volumes and rapid change in the broader environment.	priority the need to reduce congestion on supply chain costs and communities.
Priority Precincts (2019)	
The Victorian Government's Priority Precincts portfolio in the Department of Jobs, Precincts and Regions is focused on maximising the key strengths of existing activity precincts in Melbourne, and grow their potential to attract and create jobs in Melbourne. This will involve investing in urban renewal initiatives and engaging with industry to generate economic opportunities. Priority precincts include Fishermans Bend, Parkville, Arden, Richmond to Docklands, Sunshine and Footscray.	The Victorian Government views MAR as an enabler of development in Sunshine. MAR will enhance the capacity of travel between the CBD and the precinct, and also be a key piece of infrastructure facilitating improved access to the Victoria University campuses, Sunshine Hospital and other opportunities created under its designated NEIC status. Enhanced accessibility to the area will help support employment growth in Sunshine and Melbourne's west.
Transport Integration Act 2010	
The Victorian *Transport Integration Act 2010* requires that all decisions affecting the state's transport system are made within the same integrated, decision-making framework to support the same objectives. The Act's six transport system objectives are: • social and economic inclusion • economic prosperity • environmental sustainability • integration of transport and land use • efficiency, coordination and reliability • safety and health and wellbeing.	The Transport Integration Act informs the vision for an integrated and sustainable transport system that contributes to an inclusive, prosperous and environmentally responsible state. Delivering the benefits highlighted above will contribute to: • social and economic inclusion through improved public transport accessibility and associated connectivity to jobs and services • greater accessibility to and connectivity between key economic centres and improved freight efficiency leading to economic prosperity • encouraging mode shift to public transport and in turn promoting environmental sustainability • provision of a more efficient and reliable public transport service.
Australian Government	
Infrastructure Australia – Australian Infrastructure Plan (2016)	
The Australian Infrastructure Plan was developed primarily in response to the problems identified in the Australian Infrastructure Audit (2015). The Infrastructure Plan sets out the infrastructure challenges and opportunities Australia faces over the next 15 years and the solutions required to drive productivity growth, maintain and enhance our standard of living, and ensure our cities and regions remain world class.	The Infrastructure Plan discusses the importance of removing impediments to productivity growth facilitating the movement of people and goods to domestic and international markets quickly, safely and at least cost through Australia's international gateways. The Infrastructure Plan also highlights growing demand for air travel and underscores the importance of high-frequency rail links between major airports and city centres to facilitate the efficient movement of people between Australia's major cities.
Infrastructure Australia Priority Infrastructure List (2019)	
The Infrastructure Priority List is a prioritised list of nationally significant investments and is updated annually. It provides decision-makers with advice and guidance on specific infrastructure investments that will underpin Australia's continued prosperity.	Melbourne Airport to CBD public transport capacity is included as a priority initiative of the Infrastructure Priority List. The list recognises the congestion in both directions on the Tullamarine Freeway and highlights how Melbourne's population growth, combined with expected growth in passenger numbers, will exacerbate these congestion issues.
Infrastructure Investment Program	
The Australian Government is investing $100 billion over 10 years from 2019-20 in transport infrastructure across Australia. The Infrastructure	The Infrastructure Investment Program is a crucial part of the Australian Government's transport strategy, and includes a focus on alleviating congestion and addressing the national freight challenge.

Key policies and themes	Relationship with problems and benefits
Investment Program comprises a significant component of this investment.	The Australian Government has funded $2.5 billion towards a Melbourne Airport Rail link under the Infrastructure Investment Program. A key initiative of the Infrastructure Investment Program is the National Rail Program (see below).
National Rail Program	
As part of the 2017-18 Federal Budget, the Australian Government established the $10 billion National Rail Program, a major, long-term commitment to invest in passenger rail networks in our big cities, and between our cities and their surrounding regional centres.	The National Rail Program promotes the benefits of providing a higher reliability and higher frequency public transport service to Melbourne Airport. It points to major global airports in discussing a shift from bus to rail connectivity when passenger movements reach a critical scale. The program also emphasises the importance of a rail connection to Melbourne Airport in alleviating congestion on the Tullamarine Freeway. The Australian Government has funded $2.5 billion towards a Melbourne Airport Rail link under the National Rail Program.
Smart Cities Plan (2016)	
The Australian Government committed to the Smart Cities Plan in 2016. The plan sets out the government's vision for productive and liveable cities that encourage innovation, support growth and create jobs. The plan represents a framework for cities policy at the federal level—and is a framework that guides action across various portfolios to deliver better outcomes for Australian cities, the people who live in them and all Australians.	The Smart Cities Plan highlights the importance of cities in driving productivity growth and human capital. The plan notes that as people and businesses have an incentive to locate in areas with the greatest job opportunities, employment centres will play a growing role in driving economic activity within cities. This highlights the need to improve accessibility to these hubs and capitalise on the interaction between the economy and built environment. At the same time, the Smart Cities Plan acknowledges that congestion and poor access to jobs and services can impact the quality of life for people in cities. By linking Melbourne Airport to the CBD and broader rail network, MAR will improve accessibility to employment centres for people in the western and northern suburbs, and provide greater potential for businesses to capitalise on larger employment and customer catchments.

4 Strategic response

4. Strategic response

Chapter summary

- This chapter summarises work completed in the 2018 *Melbourne Airport Rail Link Strategic Appraisal* (2018 Strategic Appraisal), which identified among a range of strategic interventions that **a new mass transit** option to Melbourne Airport would best serve current network capacity and accessibility issues to the airport.
- A comparative multi-criteria analysis was used to qualitatively appraise the merits of the following mass transit options to connect the CBD to the airport:
  - **bus rapid transit**, involving dedicated lanes for high-frequency buses.
  - **light rail**, a tram system with dedicated right-of-way.
  - **standalone heavy rail**, which runs independently of the existing network but allows for interchange opportunities.
  - **integrated heavy rail**, which is integrated within the existing network and leverages existing infrastructure.
- Taking into account deliverability and likely social, economic and fiscal impacts, an **integrated heavy rail** option was identified as the preferred response.
- Several other studies have previously been completed by the Victorian Government which explore possible rail connections. The 2018 Strategic Appraisal, which re-evaluates previous studies, concluded the best route for an airport rail connection is via Sunshine Station.
- This Business Case does not re-evaluate the merits of integrated heavy rail nor the Sunshine connection.

4.1 Introduction

The 2018 Strategic Appraisal confirmed an integrated heavy rail connection as the preferred strategic response and the Sunshine Route as the preferred alignment. This is consistent with the findings of the 2002 *Melbourne Airport Transit Link Study* and the 2012 *Melbourne Airport Rail Link Study* as detailed in section 1.2.

In early 2019, the Victorian and Australian governments collectively agreed the basis of funding for Melbourne Airport Rail and the shared objectives to deliver the Business Case across both jurisdictions, providing rail access to Melbourne Airport via the Sunshine Route.

Given the above, this chapter does not re-prosecute the adoption of a new mass transit strategic intervention, a heavy rail solution nor the alignment of MAR via Sunshine. Instead, the chapter summarises the strategic interventions and strategic response options considered as part of the 2018 Strategic Appraisal.

4.2 Identifying strategic interventions and options

The 2018 Strategic Appraisal identified the strategic interventions available to address the problems identified. Following the approach outlined by DTF, the strategic interventions considered a focus on:

- **managing demand** – interventions intended to reduce or redistribute travel demand on the transport network servicing the airport
- **improving productivity** – interventions intended to optimise performance of existing assets and services that support Melbourne Airport
- **increasing supply** – interventions intended to increase the capacity of existing transport connections or introduce new connections to meet increased airport travel demand.

Ten strategic interventions across each of the three categories were identified. These are summarised in Table 4-1 and range from doing nothing to providing new road access to Melbourne Airport.

Table 4-1: Strategic interventions[89]

Intervention category	Strategic intervention
Business as usual / Do nothing	1. Do nothing
Manage demand	2. Limit Melbourne Airport growth
	3. Alternative international airport
Improve productivity	4. Improve performance of existing public and active transport services
	5. Facilitate urban and economic development in the north-west
	6. Optimise use of landside airport access capacity
	7. Optimise use of road network
Increase supply	8. Enhance public transport accessibility in the north-west
	9. Mass transit link to Melbourne Airport
	10. New road access to Melbourne Airport

[89] Department of Transport, *Melbourne Airport Rail Link – Sunshine Route Strategic Appraisal*, (2018).

Based on the strategic interventions, six strategic options were identified and are described in Table 4-2.

Table 4-2: Strategic options[90]

Option	Strategic intervention	Description
Option 1	Business as usual	Assumes no significant change to the current situation—that is, continues to rely on current avenues to access Melbourne Airport (as well as committed projects including North East Link and West Gate Tunnel) and maintains the current public transport mode split to Melbourne Airport.
Option 2	Existing public transport focus	Focuses on improving existing public transport linking Melbourne Airport to greater Melbourne and regional Victoria.
Option 3	Airport mass transit focus	Focuses on the creation of a public transport corridor that is capable of transporting high volumes of passengers between Melbourne Airport and central Melbourne.
Option 4	Road based focus	Focuses on augmenting the capacity of the existing road network providing access to Melbourne Airport through further investment including widening, duplication and intersection grade separations.
Option 5	Alternative airport focus	Focuses on reducing travel demand to Melbourne Airport by shifting a portion of airport passenger demand to an alternative airport.
Option 6	Pricing / productivity focus	Focuses on managing travel demand and transport network reliability through regulatory and market-based measures, including access restrictions, tolling landside access points or road pricing structures.

4.3 Assessing strategic options

As part of the 2018 Strategic Appraisal, a comparative multi-criteria assessment for each strategic option was undertaken based on their likely benefits, cost, delivery time and social / environmental impact. Based on the qualitative appraisal, the **airport mass transit focus** was progressed as the preferred strategic option.

As described in the 2018 Strategic Appraisal, the mass transit option was preferred based on its ability to:

- improve travel time and travel time reliability for airport users
- contribute to Melbourne Airport's accessibility for middle and outer metropolitan and regional residents via connections to the existing public transport network
- encourage mode shift to public transport and so reduce demand on existing road links, resulting in travel time savings and travel time reliability improvements for road trips to and from the airport.

The focus on airport mass transit was also viewed as less of a risk than pricing and productivity measures which could have substantial adverse social impacts. Similarly, measures that focused on improving the existing public transport network were seen as a risk due to their inability to significantly improve the overall capacity of the network or contribute to mode shift away from road.

4.4 Identifying and assessing response options

The 2018 Strategic Appraisal noted that a new mass transit option could take multiple forms. The appraisal considered the following strategic response options:

- **bus rapid transit** – dedicated corridors, carriageways or lanes that enable buses to run with greater reliability and frequency
- **light rail** – dedicated right of way or corridor for operation of a tram system

[90] Ibid.

- **stand-alone heavy rail** – a heavy rail solution that runs independently of the existing network but that can interchange with the existing network; stand-alone heavy rail typically incorporates different technology including rolling stock, signalling and traction power, with efficient end-to-end terminals facilitating express stopping patterns
- **integrated heavy rail** – a heavy rail solution that looks to leverage existing infrastructure and expands the coverage of airport connections via integration with other metropolitan and regional rail lines.

A comparative, multi-criteria assessment for each mass transit option was undertaken based on their likely benefits, cost, delivery time and social / environmental impact. Based on the qualitative appraisal, the **integrated heavy rail** was progressed as the preferred mass transit option. The integrated heavy rail option was preferred based on its ability to:

- integrate with the wider public transport network relative to the standalone heavy rail solution
- provide faster travel times and superior travel time reliability relative to bus and light rail solutions
- convey more passengers across less services
- leverage existing rail corridors and assets, which contributes to counter-balancing the higher delivery costs of heavy rail over bus and light rail solutions.

4.5 Integrated heavy rail route options

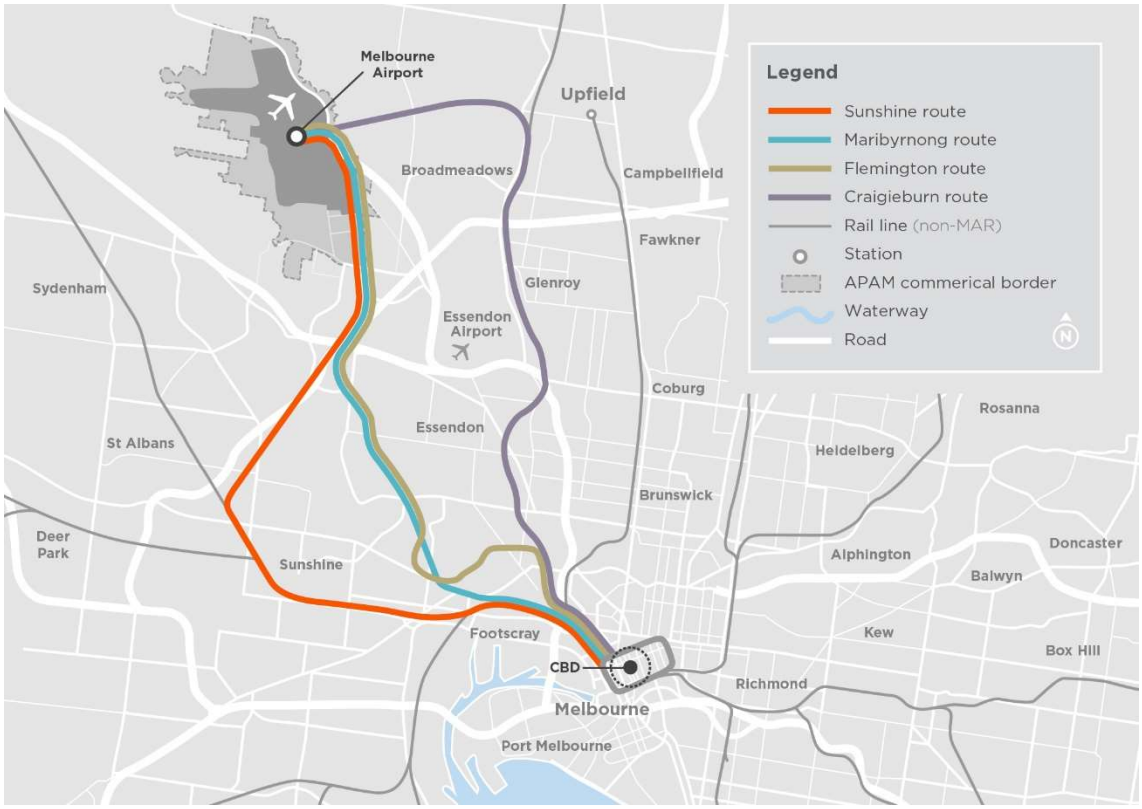
A significant body of work has been undertaken over several years to consider potential route options that could address Melbourne Airport's current and future public transport capacity needs. As previously discussed in section 1.2.2, the key studies undertaken include:

- 2002 Melbourne Airport Transit Link Study
- 2012 Melbourne Airport Rail Link Study (PTV study)
- 2018 Melbourne Airport Rail Link Strategic Appraisal (2018 Strategic Appraisal).

The 2012 *Melbourne Airport Rail Link Study* (PTV study) aimed to investigate and identify options for a rail link between central Melbourne and Melbourne Airport. The PTV study re-considered the investigations completed as part of the 2002 *Melbourne Airport Transit Link Study*, which identified a rail link via Sunshine as the preferred option. This was in response to projections of airport passenger growth and subsequent developments in Victoria's rail system, such as the RRL and MTP.

The PTV study reduced the possible route options to four through increasingly detailed assessments that considered likely travel time, operational reliability, accessibility, capacity, connectivity, constructability, risk, and cost. In addition to the Sunshine Route, the PTV study considered three other route options – the Maribyrnong Route, the Flemington Route and the Craigieburn Route. The route options are shown in Figure 4-1.

Figure 4-1: Route options[91]



- The PTV study concluded the Sunshine Route remained the best alignment for a rail connection to Melbourne Airport, consistent with the 2002 *Melbourne Airport Transit Link Study*. While all four short-listed options were deemed to provide high quality access between the CBD and Melbourne Airport, the three alternative alignment options were found not to provide significantly greater benefits overall when compared with the Sunshine Route. The primary reasons for this conclusion include that in the rapid appraisal, the high cost and delivery risks associated with underground stations and tunnels made the Maribyrnong and Flemington options less viable compared with the Sunshine Route.
- While the travel time to / from Melbourne Airport is fastest under the Maribyrnong and Flemington options, the appraisal noted that when the travel time circulating the City Loop is considered, the benefits of these two options are reduced and are effectively comparable to the Sunshine Route.
- Patronage on the Craigieburn Route was forecast to be lower than the Sunshine Route.
- The Sunshine Route provides the highest level of connectivity across all options considered due to the connections it provides at Sunshine and through the direct link to the CBD and beyond.

The 2018 Strategic Appraisal revisited these four route options in light of the substantial population growth in outer metropolitan areas to the north and west of Melbourne Airport. The strategic appraisal framework provided each route with a benefit and deliverability score, taking into consideration the likely benefits, cost, delivery time and social / environmental impact of each route option.

The assessment of the four route options against the benefit and deliverability KPIs was a comparative assessment so that the best-performing option was scored a five and the other route options were given a relative proportion of this score. Table 4-3 summarises the comparative assessment, which shows the Sunshine alignment option performed best overall on the stated criteria.

[91] Department of Transport, *Melbourne Airport Rail Link – Sunshine Route Strategic Appraisal*, (2018).

Table 4-3: Strategic assessment of heavy rail route options[92]

Criteria	Weight	Route option			
		Sunshine	Maribyrnong	Flemington	Craigieburn
Benefits					
More efficient journeys to the airport	*10%*	**5.0**	**4.8**	**4.6**	**4.5**
Public transport use by airport travellers	*20%*	**4.7**	**5.0**	**4.8**	**4.4**
Travel time reliability on key links servicing the airport	*30%*	**4.8**	**5.0**	**4.7**	**4.4**
Travel time to key economic centres	*20%*	**5.0**	**4.8**	**4.4**	**3.7**
Redevelopment opportunities and accessibility along the corridor	*20%*	**2.5**	**4.2**	**5.0**	**0.9**
Deliverability					
Potential social and environmental impact	*20%*	**5.0**	**4.5**	**3.0**	**3.5**
Constructability and delivery timing	*20%*	**5.0** *(7-9 yrs)*	**1.6** *(10-12 yrs)*	**2.9** *(8-10 yrs)*	**4.8** *(7-9 yrs)*
Indicative order of magnitude capital cost (risk adjusted)	*60%*	**3.6** *($8-$13bn)*	**1.7** *($20-$25bn)*	**2.1** *($15-$20bn)*	**5.0** *($5-$10bn)*
Combined relative benefit and deliverability score and ranking					
Overall score		**4.3**	**3.5**	**3.6**	**4.1**
Overall ranking		**1**	**4**	**3**	**2**

4.6 Preferred strategic response

Based on the route alignment assessment, the **Sunshine Route** shown in Figure 4-2 is the preferred strategic response, achieving the highest ranking of the four options. While all four options performed well against the assessment criteria, using existing rail corridors means the Sunshine Route can be delivered sooner and at a significantly lower cost than other route options that offered a comparable level of benefit.

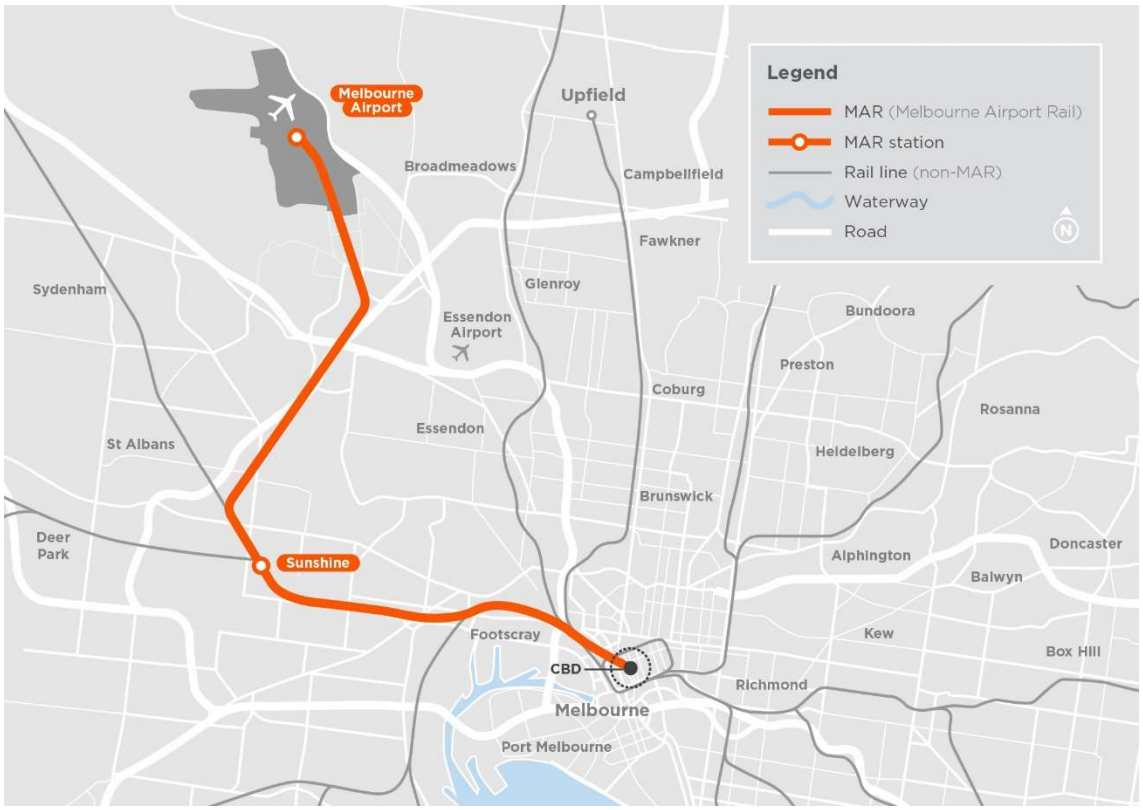
In particular, the Sunshine Route offers the potential for superior connectivity to regional Victoria and the broader metropolitan network, particularly when compared with the Craigieburn Route (the next ranked option) which has longer travel times and inferior airport accessibility.

The 2018 Strategic Appraisal noted the Sunshine Route:

- offers superior connections to more areas of Melbourne through its integration with the Metro Tunnel – while travel times to central Melbourne are longer via the Sunshine Route than the Maribyrnong and Flemington routes, travel times to other employment clusters and middle and outer metropolitan suburbs were better as airport services can more efficiently connect to Melbourne's south-east and a higher number of other lines
- offers superior connections to regional Victoria through interchange at Sunshine – passengers from Warrnambool, Geelong, Ararat, Maryborough, Ballarat, Swan Hill, Echuca and Bendigo will all realise minimum significant time savings when accessing Melbourne Airport via public transport and no longer need to travel all the way into the CBD
- could be delivered earlier and at a significantly lower cost than other route options that offered a comparable level of benefit – using existing rail corridors for the majority of the route means the Sunshine Route is 1.5 to 2 times cheaper than the Flemington and Maribyrnong routes.

[92] Department of Transport, *Melbourne Airport Rail Link – Sunshine Route Strategic Appraisal*, (2018).

Figure 4-2: Preferred strategic response – Sunshine Route



This Business Case does not seek to re-prosecute the adoption of an integrated heavy rail solution nor the alignment of MAR via Sunshine. However, the DoT appraisal noted that city access options were still to be explored and so an options analysis was undertaken to evaluate Sunshine to CBD options to inform this Business Case. The options analysis is set out in Chapter 5.

5 Sunshine to CBD alignment options

5. Sunshine to CBD alignment options

Chapter summary

- Chapter 4 outlined the preferred strategic response for MAR, which is a heavy rail connection to Melbourne Airport via Sunshine. This chapter explores the options available for connecting MAR to the CBD via Sunshine Station (Sunshine to CBD alignment options).
- Three Sunshine to CBD alignment options have been identified and assessed:
  - **Option 1: Metro Tunnel** – connecting to the CBD via Sunbury tracks and the Metro Tunnel.
  - **Option 2: Regional Rail Link (RRL)** – connecting to the CBD via the existing RRL track pair to Southern Cross Station.
  - **Option 3: Sunshine Tunnel** – connecting to the CBD via a new tunnel to Southern Cross Station.
- The options were assessed against a set of evaluation criteria influenced by the transport system objectives in the *Transport Integration Act 2010* (Vic).
- The analysis and comparison of the options identified the Metro Tunnel as the recommended Sunshine to CBD alignment option as it:
  - Provides superior travel choice, connectivity and accessibility of the options considered, due to the new MAR service being integrated within the existing rail network, via the Metro Tunnel's five new underground stations that are integrated with the existing transport network, while the other two options connect only to Southern Cross Station
  - connects directly to 30 stations without needing to change trains, with most other passengers only needing to change once
  - supports the need to reduce high levels of road traffic congestion to Melbourne Airport, particularly from Melbourne's south-east due to a significant proportion of trips to and from the airport being cross-city journeys and the disparity between where people live and work adding to congestion on the south-eastern arterial road network, as highlighted in Chapter 2
  - has the shortest journey time to the central CBD, lowest number of interchanges and most inner-area locations, and most direct access to NEICs at Sunshine, Monash / Clayton, Dandenong and Parkville
  - increases capacity between Sunshine and West Footscray, and increases capacity and provides a direct service to and from Melbourne Airport for passengers on Melbourne's busiest passenger rail corridor, the Dandenong corridor
  - has the lowest environmental and heritage impacts and requires less land take than the other options
  - provides greater opportunity for urban renewal due to its connection to various inner-city stations
  - is the most cost effective option by using infrastructure and rolling stock[93] already being delivered as part of the Metro Tunnel Project and does not require significant additional works between Sunshine and the CBD, minimising capital and whole of life costs, disruptions and reducing the delivery timeframe
  - has the highest Benefit Cost Ratio of all three options.

[93] Noting 5 additional HCMTs would be required.

5.1 Introduction

This chapter summarises the Sunshine to CBD alignment options analysis undertaken to determine the preferred solution for connecting MAR to the CBD via Sunshine.

5.1.1 Network context

A range of factors relating to the broader rail network are relevant for this Sunshine to CBD alignment options analysis, including:

- The western rail network is substantially constrained due to the convergence of regional and suburban services, which limits the potential frequency and speed of services.
- The limited availability of train paths into Southern Cross Station means that delays on one line can create knock-on effects to the punctuality and reliability of services on other lines. Southern Cross Station itself is also approaching full capacity and would require major expansion to manage any substantial increase in the volume of services and passengers.
- There are overcrowding and service reliability issues on existing Geelong / Wyndham Vale and Ballarat / Melton services, which share the RRL corridor into Southern Cross Station.
- Once the Metro Tunnel opens in 2025, Melbourne's western rail network will be connected directly to the Dandenong corridor (Cranbourne / Pakenham lines), with five new underground stations at Parkville, Arden, State Library, Town Hall and Anzac as well as interchanges with Melbourne Central and Flinders Street stations.
- The Victorian Government has also committed to the planning and development of the WRP to improve the frequency and carrying capacity of services to growth areas in Melbourne's west and the travel times of rail services to the regional cities of Geelong and Ballarat. The delivery of MAR will interface heavily with the works required at Sunshine Station under the WRP, as shown in Figure 5-1. See section 1.3 for detail on the WRP.

Figure 5-1: Western rail network context

5.1.2 Key assumptions

The Sunshine to CBD alignment options analysis considers only primary viable options for connecting Melbourne Airport to the CBD via Sunshine. DoT has considered a range of alternative solutions that include a mix of elevated structures and shorter sections of tunnel, but preliminary investigations have proven these are not appropriate for further examination as they are not technically or operationally feasible.

The works between Albion and Melbourne Airport are assumed to be the same under each option for the purpose of this analysis.

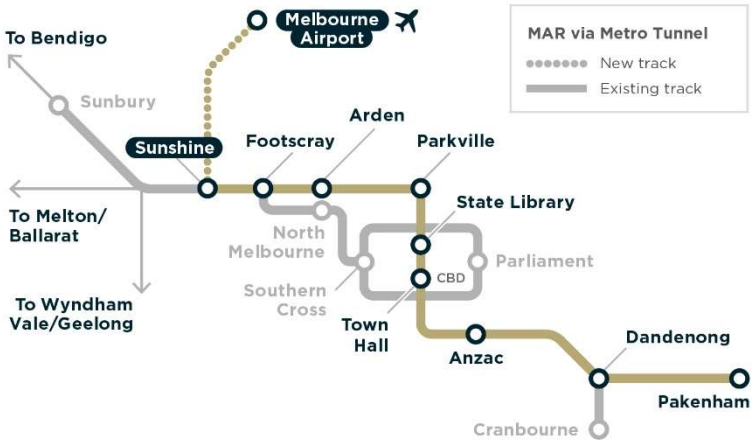
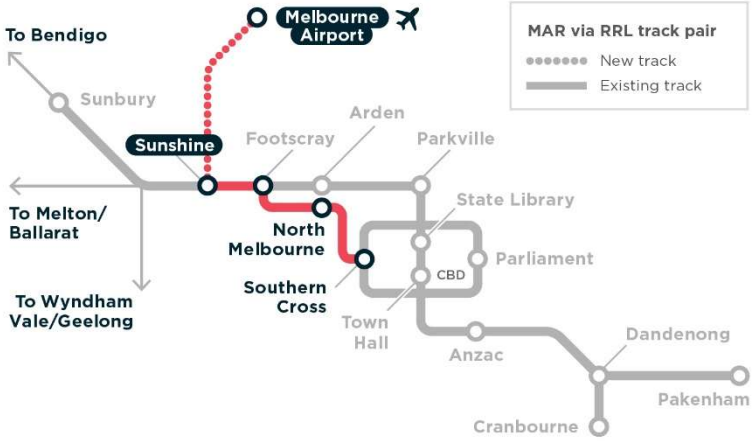
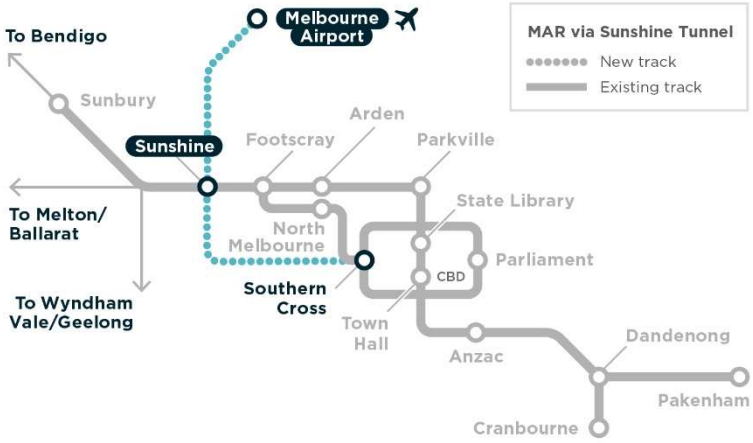
Further detailed technical project options are considered separately in Chapter 6 and as part of reference design development for the selected Sunshine to CBD alignment option.

5.2 Summary of Sunshine to CBD alignment options

5.2.1 Overview

Three potential Sunshine to CBD alignment options were developed and considered for this analysis. The alignment and description of each is summarised in Table 5-1.

Table 5-1: Summary of identified Sunshine to CBD alignment options

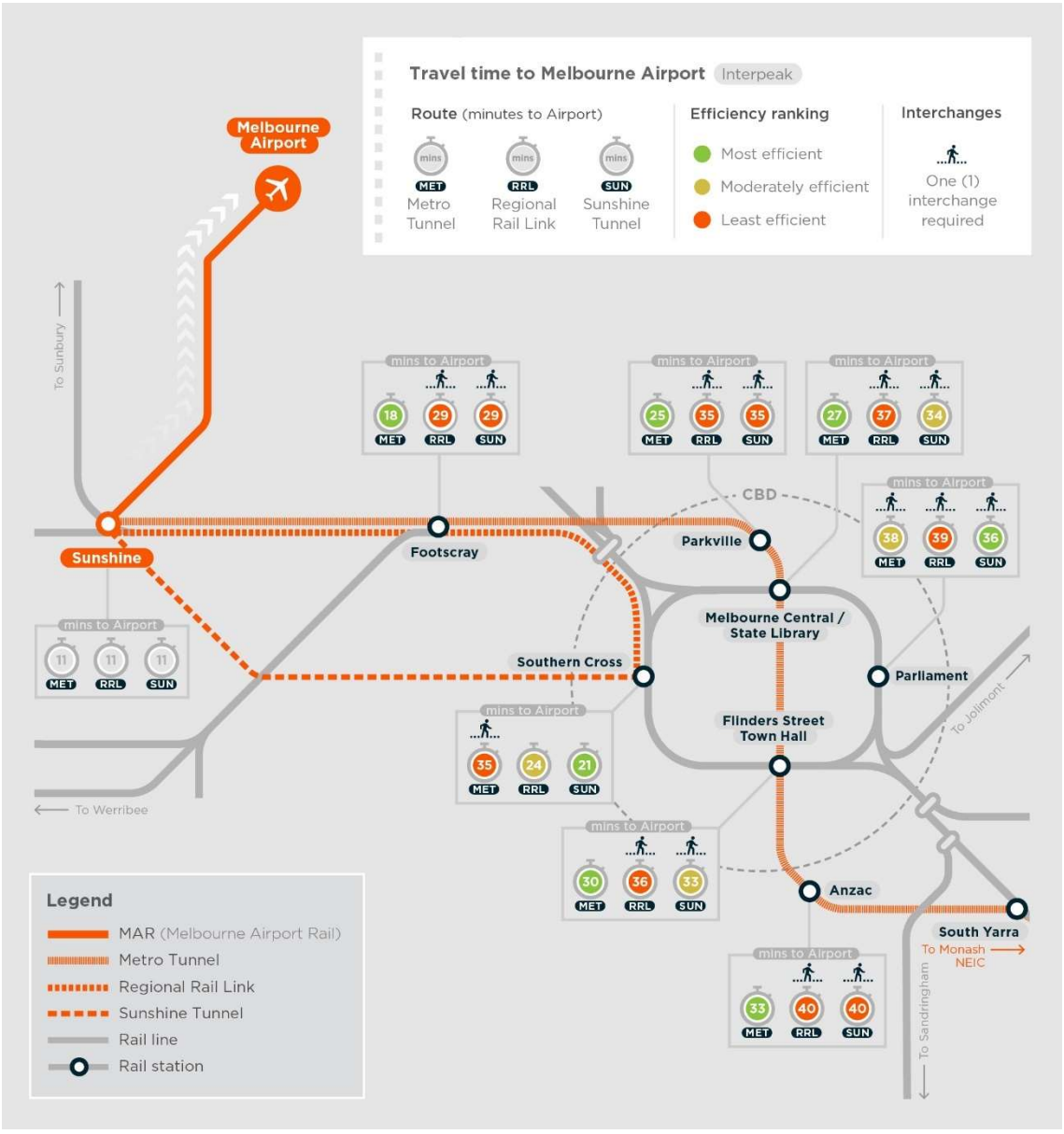
Option	Description
Option 1: Metro Tunnel	
	The MAR service would connect to the CBD via Sunbury tracks and the Metro Tunnel.
Option 2: Regional Rail Link (RRL)	
	The MAR service would connect to the CBD via the existing RRL track pair to Southern Cross Station.
Option 3: Sunshine Tunnel	
	The MAR service would connect to the CBD via a new tunnel from the vicinity of Sunshine to Southern Cross Station.

The analysis in this chapter is based on the original concept design for Option 2 and Option 3 as completed at September 2019, with costs reviewed and updated in October 2020. Drawings and figures are indicative and used to support a comparative assessment of the Sunshine to CBD alignment options.

5.2.2 Key features of each option

This section summarises a range of features of each option to demonstrate key points of differentiation. Figure 5-2 compares the estimated travel times between Melbourne Airport from a number of key inner-city locations for each option during the interpeak period.[94] For journey times to other stations on the network, see Appendix 1: Sunshine to CBD alignment options analysis. Table 5-2 identifies other key services features, while Table 5-3 summarises key delivery and scope features.

Figure 5-2: Comparison of estimated travel times of each option to Melbourne Airport from key inner-city locations (interpeak)



[94] Based on the proposed service plan at the time of this Business Case.

Table 5-2: Comparison of key service features

Service features	Option 1: Metro Tunnel	Option 2: RRL	Option 3: Sunshine Tunnel
MAR services enabled	• 6 trains per hour (tph) through service	• 3tph shuttle to Sunshine, 3tph through service to Southern Cross Station (peak)[95] • 6tph through service (non-peak)	• 6tph through service[96]
Direct link to stations	• Sunshine and Footscray • Metro Tunnel inner-city stations (Arden, Parkville, State Library, Town Hall and Anzac) • All stations between Caulfield and Dandenong • All stations to Pakenham and Clyde	• Sunshine • Southern Cross Station	• Sunshine • Southern Cross Station
Demand	• Patronage is broadly comparable to the other options • Direct services save journey time for passengers not alighting at Southern Cross Station	• Patronage is broadly comparable to the other options • Patronage negatively impacted by need to transfer at Sunshine during peak periods	• Patronage is broadly comparable to the other options • Fastest journey time to Southern Cross Station offset by passengers needing to transfer at Southern Cross Station (unless a passenger alights at Southern Cross Station)

The assumed service specifications of each option are provided in Appendix 1: Sunshine to CBD alignment options analysis.

Table 5-3: Comparison of key delivery / scope features

Scope features	Option 1: Metro Tunnel	Option 2: RRL	Option 3: Sunshine Tunnel
Major civil works (between Albion and the CBD)	• Track work between Albion and Sunshine stations to connect MAR track pair to Metro Tunnel / Sunbury track pair	• Track work between Albion and Sunshine stations to connect MAR track pair to RRL track pair • Electrification of RRL track pair and associated works between Sunshine and Southern Cross stations	• Track work between Albion and Sunshine stations to connect MAR track pair to new platforms • 8.2 km of new tunnel to Southern Cross Station from near Tottenham plus significant portal works
Sunshine works	• Modifications at Sunshine to connect MAR into the existing Metro Tunnel / Sunbury line platforms	• Rebuilt Sunshine Station including new platforms	• Rebuilt Sunshine Station including new platforms

[95] To enable MAR to operate in peak periods on the existing RRL tracks without negatively impacting existing service levels, RRL capacity would need to increase from 18tph to 21tph.
[96] This option provides capacity for up to 18tph, meaning there would be 12 spare train paths per hour. However, to use this spare capacity, significant additional investment would be required which is not included in the cost estimate for this option.

Scope features	Option 1: Metro Tunnel	Option 2: RRL	Option 3: Sunshine Tunnel
Extent of brownfield works	• Approximately 3km of brownfield construction on the Sunbury line (between Albion and Sunshine)	• Approximately 3 km of brownfield construction on the Sunbury line (between Albion and Sunshine) • Approximately 8 km of brownfield work between Sunshine and Southern Cross stations for electrification and signalling	• Approximately 6 km of brownfield construction on the Sunbury line (between Albion and Tottenham) • Major brownfield works to the stabling, maintenance and platforms at Southern Cross Station
Land take	• Some land take required at Sunshine (less than other options)	• Significant land take required at Albion and Sunshine • Minor land take at South Kensington	• Significant land take required at Albion and Sunshine • Land take at Southern Cross Station and intermediate ventilation shaft locations • Strata land take for full Sunshine Tunnel alignment
Estimated capital cost[97]	• Most cost effective option	• Requires 1.5 times the costs of Option 1	• Requires 2.5 times[98] the costs of Option 1

5.3 Methodology and approach

A detailed comparative analysis of the options was conducted against the following evaluation criteria, which are influenced by the transport system objectives in the *Transport Integration Act 2010* (Vic) (Transport Integration Act) as follows:

- ability to improve customer journey experience
- ability to improve transport system outcomes
- environmental and heritage impacts
- property and community impacts
- land take
- schedule and constructability
- cost implications.

In assessing the options, regard was given to the vision and objectives of the Transport Integration Act, and to MAR's project objectives and requirements as well as relevant technical reports, stakeholder views and relevant policies and legislative requirements.

Demand modelling was undertaken using the Victorian Integrated Transport Model (VITM) to support the evaluation of customer experience and transport system outcomes. The modelling compared each of the Sunshine to CBD alignment options (where the Melbourne City Express SkyBus service from Southern Cross Station ceases to operate during MAR operating hours) against a Base Case (where the Melbourne City Express SkyBus service continues to operate as the primary public transport service between the CBD and Melbourne Airport). All non-CBD SkyBus services operate in the Base Case and Project Case for each alignment option. Future years modelled were 2026, 2031, 2036, 2041, 2051 and 2056.

[97] The costs for Option 2 and Option 3 are based on the original concept design as at September 2019, with costs reviewed and updated in October 2020. These costs should therefore be treated as indicative only for the purposes of this assessment.
[98] Sunshine Tunnel costs do not include all enabling works to fully utilise the capacity of the Sunshine Tunnel option.

The Sunshine to CBD alignment options were assessed against each criterion and given scores based on a qualitative assessment summary of pros and cons to reach a final rating based on the details summarised in Table 5-4. Following this assessment, preliminary economic analysis was undertaken on the three options to validate the preferred option. This analysis was undertaken to understand the economic benefits of the three options, relative to a Base Case under which SkyBus continues to operate with no additional public transport options introduced.

Table 5-4: Assessment ratings

Ratings					
Superior benefit	✓✓✓	**Minimal benefit / disbenefit**	**-**	**Moderate disbenefit**	**×**
Significant benefit	✓✓			**Significant disbenefit**	**××**
Moderate benefit	✓			**Superior disbenefit**	**×××**

The findings of the options analysis are summarised below. More detail about how the options were assessed and scored is provided in Appendix 1: Sunshine to CBD alignment options analysis.

5.4 Summary of options analysis

The key findings and outcomes of the options analysis for each evaluation criterion are summarised below.

5.4.1 Ability to improve customer journey experience

This criterion focuses on each option's ability to improve the MAR customer experience, considering factors such as journey time, crowding, number of interchanges required and accessibility to key locations.

Key findings relating to this criterion are:

- **Frequency** – All three options enable a 10-minute service frequency for MAR, although under the RRL option this frequency is only achievable during interpeak periods (during peak, only half of the services would continue to Southern Cross Station). The Sunshine Tunnel option provides spare capacity for 12tph but these train paths would likely be used for non-MAR services and at a significant additional cost.
- **Demand** – Patronage for MAR under each option is comparable.
- **Interchanges** – All three options enable MAR services to stop at Sunshine Station, providing interchange to both the metropolitan and regional rail networks, however when considered at a whole of rail network level the Metro Tunnel option requires fewer interchanges than the RRL and Sunshine Tunnel options, which require passengers to interchange unless their destination is Southern Cross Station. Under the RRL option, services terminating at Sunshine Station during the peak require passengers to change trains to reach the CBD.
- **Journey time** – The Sunshine Tunnel option has the shortest journey time to the CBD (Southern Cross Station only). The Metro Tunnel option has the shortest journey time to the central CBD and more inner-area locations, including Parkville, Melbourne Central / State Library, and Flinders Street / Town Hall.
- **Dedicated / integrated fleet** – The Metro Tunnel and RRL options assume the MAR rolling stock will service both airport and metropolitan passengers, which may contribute to some crowding in the peak. The Sunshine Tunnel option enables the use of dedicated MAR rolling stock fleet which could be customised for airport passengers, albeit at a significant additional cost. However, depending on the service plan, airport services under the Sunshine Tunnel option may also service some metropolitan passengers. The Metro Tunnel option, being integrated into the broader network provides benefits of not requiring a new class of rollingstock, as it would utilise HCMT trains which are already being procured by the State.
- **Connectivity to CBD and NEICs** – The RRL and Sunshine Tunnel options offer limited choice for passengers between Sunshine and the CBD, and in the CBD itself, as they enable interchange at Sunshine or direct access to Southern Cross Station only. They also do not

provide any material accessibility improvements to Melbourne's south-east. In contrast, the Metro Tunnel option provides direct connection to the CBD enabling interchange to all other lines, connection to other key destinations such as the St Kilda Road precinct, and the NEICs at Sunshine, Parkville, Monash / Clayton and Dandenong. It also provides a direct service to and from Melbourne Airport for passengers on the Clyde / Pakenham line, Melbourne's busiest passenger rail line.

Assessment outcome		
Option 1: Metro Tunnel	**Option 2: RRL**	**Option 3: Sunshine Tunnel**
✓✓✓	-	✓✓

Option 1: Metro Tunnel performs best in relation to this criterion as it provides greater travel choice and accessibility than the other options that connect only to Southern Cross Station. This is due to the new MAR service being integrated within the existing rail network, including via Metro Tunnel's five new underground stations and their integration with the existing transport network, in particular Melbourne's south-east. The Metro Tunnel option provides a direct service to and from Melbourne Airport for passengers on Melbourne's busiest passenger rail corridor, the Dandenong corridor (Clyde / Pakenham lines). When considered on a whole of rail network level, this option also has the lowest number of interchanges, shortest journey time to the central CBD and most inner-area locations and most direct access to a range of NEICs.[99]

Although the Sunshine Tunnel has the potential to deliver more spare capacity than the Metro Tunnel option (up to spare capacity of 12tph), the additional train paths would likely be used for non-MAR services and require significant investment to be realised. This option is therefore unlikely to materially improve MAR passenger outcomes, and the dedicated MAR rolling stock results in unutilised patronage capacity where capacity outweighs demand for MAR services. However, depending on the service plan the Sunshine Tunnel option may also service some metropolitan passengers.

The RRL option scores lower than the Metro Tunnel and Sunshine Tunnel options as it provides less capacity through to Southern Cross Station during the peak period. RRL provides limited direct access to stations other than Southern Cross Station and has inconsistent service pattern during peak periods.

5.4.2 Ability to improve transport system outcomes

This criterion focuses on the option's impact on the broader transport system, including reliability and capacity as well as ability to accommodate future patronage growth.

Key findings relating to this criterion are:

- **Demand** – Patronage for non-MAR services is comparable under each option.
- **Reliability impact on other services** – The RRL option will likely affect journey time reliability for MAR, Geelong, Ballarat, Bendigo, Wyndham Vale and Melton services due to the high utilisation of tracks between Sunshine and the CBD. The Sunshine Tunnel option would slightly reduce travel times for metropolitan and regional services using the tunnel, although this can only be enabled through significant additional investment (such as electrifications and new trains for Geelong / Wyndham Vale) which is not considered as part of this assessment.
- **Capacity uplift for other passengers** – The Metro Tunnel option provides a holistic network benefit via more services between Sunshine and Footscray (in all periods) and more services on the Dandenong corridor (in non-peak periods). It also leaves spare train paths in the Metro Tunnel (5-6 per hour) to enable future additional services for the western growth corridor. The 12 spare train paths per hour available in the Sunshine Tunnel option could also enable future additional services for the western growth corridor or regional lines, but this requires significant further investment not included in the cost for this option.
- **Impact on other services (current and future)** – The Metro Tunnel option does not impact operation of the existing regional and metropolitan services between Sunshine and the CBD and retains spare capacity in the Metro Tunnel for improved services to the west after completion of MAR. The RRL option has a limit of 3tph to Southern Cross Station during peak periods, and the Sunshine Tunnel option requires significant further investment to utilise the residual non-MAR capacity.

[99] Noting journey times are dependent on the station location used to access MAR, and vary across metropolitan rail corridors where an interchange is required.

- **Interoperability** – The Metro Tunnel option's integration with the existing rail network, including use of existing rolling stock (HCMTs) provides interoperability benefits for MAR services. For the RRL and the Sunshine Tunnel options, there are unresolved issues associated with passenger flows and platform use at Southern Cross Station.

Assessment outcome		
Option 1: Metro Tunnel	**Option 2: RRL**	**Option 3: Sunshine Tunnel**
✓✓✓	-	✓✓

Option 1: Metro Tunnel performs the best in relation to transport system outcomes as it provides an integrated solution with the existing rail network and increases capacity between Sunshine and West Footscray and on the Dandenong corridor. The integrated nature of this option also retains spare capacity in the Metro Tunnel for additional services to the west after completion of MAR, provides interoperability benefits for operation of MAR services, including use of existing rolling stock[100] (HCMTs) and avoids interoperability issues at Southern Cross Station.

The RRL option creates a number of challenges at Southern Cross Station and operationally on the already congested RRL corridor. It is therefore expected to adversely affect journey time reliability for several metropolitan and regional services.

The Sunshine Tunnel option also has interoperability issues at Southern Cross Station and involves a significant investment which does not, in itself address key network constraints (see section 5.1.1). Although it provides opportunity for significant service capacity uplift for non-MAR services, this cannot be realised without further significant investment.

5.4.3 Environmental and heritage impacts

This criterion assesses each option's potential environmental and heritage impacts, based on construction footprint and methodology and energy consumption as understood at the time of writing this Business Case.

Key findings relating to this criterion are:

- **Construction footprint** – The Metro Tunnel option has a considerably smaller construction footprint than the other options as it leverages an existing asset on the network and minimum works required at Sunshine Station to connect MAR into the existing Metro Tunnel / Sunbury line platforms. This reduces potential noise, dust and vibration impacts often experienced during delivery. The RRL and Sunshine options have a considerably larger construction footprint to the Metro Tunnel option and would require significant works from Sunshine through to Southern Cross Station.
- **Construction methodology** – The Sunshine Tunnel option involves the greatest volume of removal of waste due to significant excavation works, and the area is subject to complex land and groundwater issues (including potential PFAS contamination).
- **Energy consumption** – The Metro Tunnel and RRL options are less energy intensive compared with the Sunshine Tunnel option, which is the most energy-intensive option during construction (due to the use of tunnelling equipment) and operations (due to the tunnel ventilation system requirements). A disadvantage of the Metro Tunnel option is that it does not provide an opportunity to explore other, less energy-intensive traction power systems (such as 25kV AC) due to the requirement for compatibility with the Metro Tunnel's 1500V DC system.

Assessment outcome		
Option 1: Metro Tunnel	**Option 2: RRL**	**Option 3: Sunshine Tunnel**
✓✓	✓	✖✖

Option 1: Metro Tunnel is assessed as performing best in relation to this criterion as it will likely have lower environmental and heritage impacts than the other two options. It has a considerably smaller construction footprint by utilising existing transport infrastructure including the Metro Tunnel and is less energy intensive overall, whereas the other options require significant works at Sunshine and Southern Cross stations.

[100] Noting 5 additional HCMTs would be required.

Assessment outcome
The Sunshine Tunnel option has the most significant environmental impacts during construction and operations due to the footprint, nature and extent of the works. The RRL option also has significant impacts, specifically in relation to construction footprint but these are less pronounced than the Sunshine Tunnel option as it avoids tunnelling works.

5.4.4 Property and community impacts

This criterion assesses the positive or negative impacts of each option on property and the community. This includes disruption during construction, ability to promote land use changes and urban renewal, as well as the extent of property acquisition required.

Key findings relating to this criterion are:

- **Disruption** – Disruption during construction is minimised under the Metro Tunnel option, as it avoids the need for significant additional development between Sunshine and the CBD. In contrast, the RRL and Sunshine Tunnel options will cause significant disruption as part of the redevelopment of Sunshine Station and modifications required at Southern Cross Station, and further disruption along the existing RRL corridor for the RRL option.
- **Urban renewal** – Redevelopment of Sunshine Station as part of the RRL and Sunshine Tunnel options would provide opportunities for urban renewal and enhanced public realm including through better integration with the Sunshine activity centre. It is noted that future development of Sunshine Station is not precluded under the Metro Tunnel option. The Metro Tunnel option also provides direct connectivity between the Airport and key employment clusters around the inner-city stations at Parkville, the CBD and Anzac which may promote positive land use changes. Further, the Metro Tunnel option provides greater opportunity for inner-city urban renewal due to its connection to various inner-city stations.
- **Property acquisition** – The acquisition of private land required at Sunshine is lowest under the Metro Tunnel option (see section 5.4.5), reducing the impact to local residents and businesses.

Assessment outcome		
Option 1: Metro Tunnel	**Option 2: RRL**	**Option 3: Sunshine Tunnel**
✓✓	-	-
Option 1: Metro Tunnel performs best in relation to this criterion as its property and community impacts are comparatively better than the other options. It is the least disruptive and provides greater opportunity for inner-city urban renewal due to its connection to various inner-city stations. Although the RRL and Sunshine Tunnel options may enhance urban renewal and public realm through the redevelopment of Sunshine Station, they will also cause significant disruption during construction.		

5.4.5 Land take

This criterion assesses the extent of land take required under each option. Project costs (see section 5.4.7) are increased with more land take, due to payments to landowners and other land interest holders, as well as the likelihood for residential relocation and business relocation, disruption or destruction.

Key findings relating to this criterion are:

- The Metro Tunnel option has the lowest land take of all options, requiring minimal land take at Sunshine. It also avoids land take at Matthews Hill Reserve where sensitive *Environmental Protection and Biodiversity Conservation Act* (Cth) (EPBC)-listed native grasslands and threatened species are located.
- The RRL option requires some land take at South Kensington and significantly more land take at Sunshine and Albion than the Metro Tunnel option.
- The Sunshine Tunnel option requires the highest land take of all three options, including at Sunshine and Albion as well as Southern Cross Station and intermediate ventilation shaft

locations. Further, acquisition of strata would be required along the full Sunshine Tunnel alignment.

Assessment outcome		
Option 1: Metro Tunnel	**Option 2: RRL**	**Option 3: Sunshine Tunnel**
✓	-	✖

Option 1: Metro Tunnel performs best in relation to this criterion as it requires the lowest land take.

The RRL and Sunshine Tunnel options have higher land take requirements than the Metro Tunnel option, including at Sunshine and Albion, as well as at South Kensington and Southern Cross Station respectively.

5.4.6 Schedule and constructability

This criterion focuses on each option's deliverability, complexity and risk as well as the impact on the project schedule.

Key findings relating to this criterion are:

- **Complexity and risk** – The Metro Tunnel option uses committed infrastructure being delivered by the MTP, reducing complexity and risk associated with the Sunshine Tunnel option. The Sunshine Tunnel option has a lower impact on surface infrastructure than the RRL option but involves 8.2 kilometres of deep tunnelling and portal structures, which requires complex equipment and significant excavation. Although the civil works required under the RRL option are less complex, they still involve the relocation and redevelopment of South Kensington Station, complex grade separations and potential track reconfigurations.
- **Interfaces** – The Metro Tunnel option is dependent on the MTP being completed and in operation, and involves interfaces with the MTP work packages (Tunnels and Stations, Rail Infrastructure Alliance (RIA), and Rail Systems Alliance (RSA)) and the HCMT Project. There are technical interface and commercial issues related to the RRL and Sunshine Tunnel options associated with increasing patronage and delivering major capital works at Southern Cross Station.
- **Technical constraints** – The Metro Tunnel option uses committed rolling stock being delivered as part of MTP (noting approximately five additional HCMT sets will be required to meet the service plan) and spare train paths in the MTP. There are numerous traction power challenges associated with the RRL option due to existing DC electrification systems and structures, extensive routing of utilities and generally spatially constrained rail corridor. The Sunshine Tunnel option requires significant investment in Southern Cross Station to cope with additional services and patronage. The RRL option also requires investment at Southern Cross Station, albeit to a lesser extent compared with the Sunshine Tunnel option.
- **Schedule** – The Metro Tunnel option enables the shortest delivery timeframe, while the Sunshine Tunnel option has the longest delivery timeframe. The Metro Tunnel and RRL options both also provide a potential opportunity for earlier MAR completion.

Assessment outcome		
Option 1: Metro Tunnel	**Option 2: RRL**	**Option 3: Sunshine Tunnel**
✓✓	✓	✖✖

Option 1: Metro Tunnel was assessed as performing best in relation to this criterion due to its integration with the existing rail network and use of infrastructure already being delivered as part of the MTP. Further, the Metro Tunnel option does not require significant additional works between Sunshine and the CBD to deliver MAR.

The RRL and Sunshine Tunnel options involve higher levels of disruption due to complex station reconfiguration works, grade separations, electrification works and / or deep tunnelling. The Sunshine Tunnel option also has a much longer delivery timeframe and interface issues at Southern Cross Station.

5.4.7 Cost implications[101]

This criterion assesses the cost implications of each option, considering overall capital costs as well as operating and maintenance costs.

Key findings relating to this criterion are:

- The Metro Tunnel option utilises committed infrastructure and rolling stock being delivered as part of MTP, minimising the overall capital and operational and maintenance costs of additional infrastructure required for MAR compared with the RRL and Sunshine Tunnel options. Noting approximately five additional HCMT sets will be required to meet the service plan. It is therefore the most cost effective option.
- The RRL option makes use of existing infrastructure, so is the second most cost effective option with an estimated cost 1.5 times more than the Metro Tunnel option. This is due to the additional works required at Sunshine and between Sunshine and Southern Cross stations (that is, electrification) and so greater capital and operational and maintenance costs.
- The Sunshine Tunnel option is the most expensive option, with an estimated cost 2.5 times more than the Metro Tunnel option. This is primarily because of the additional cost associated with 8.2 kilometres of new tunnelling and the required works at Sunshine and Southern Cross stations. In addition to the estimated cost, significant investment would also be required to use the service capacity of the new tunnel. For example, to enable the spare train paths to be used for regional services, electrification would be required on the outer rail corridors as well as new or replacement rolling stock. The Sunshine Tunnel option would also involve significant ongoing maintenance requirements associated with tunnel operations, tunnel ventilation and other systems, creating significant whole of life costs for this option.

Assessment outcome		
Option 1: Metro Tunnel	**Option 2: RRL**	**Option 3: Sunshine Tunnel[102]**
✓✓	✓	✖✖✖
Option 1: Metro Tunnel performs best in relation to this criterion because it is the most cost effective option, integrating with the existing rail network and using existing infrastructure and rolling stock already being delivered as part of the MTP (noting five additional HCMTs would be required). The RRL and Sunshine Tunnel options are significantly more expensive, estimated to require 1.5 times and 2.5 times more capital costs respectively than the Metro Tunnel option. Further, the Sunshine Tunnel option requires significant whole of life costs due to the dedicated tunnel solution.		

5.4.8 Preliminary economic analysis

Preliminary economic analysis was undertaken to understand the economic benefits of the three Sunshine to CBD alignment options, relative to a 'Base Case' under which the SkyBus (from Southern Cross Station) continues to operate. The preliminary analysis focused solely on conventional economic benefits, including user benefits (public transport users and road users), societal benefits (externality effects) and infrastructure residual value. The analysis incorporated a preliminary set of costs developed by RPV for the purpose of the Sunshine to CBD alignment options analysis.[103]

Key findings of the analysis are:

- All options benefit public transport users and road users by enhancing connectivity to the airport and improving overall travel times.
- Public transport user benefits account for the highest proportion of total discounted conventional benefits, comprising between approximately half of benefits across the capital options.

[101] The costs for Option 2 and Option 3 are based on the original concept design as at September 2019, with costs reviewed and updated in October 2020. These costs should therefore be treated as indicative only for the purposes of this assessment.
[102] Sunshine Tunnel costs do not include all enabling works to fully utilise the capacity of the Sunshine Tunnel option.
[103] Ibid.

- The primary beneficiary of public transport user benefits are air passengers, comprising more than 95 per cent of these benefits across the capital options.
- Road user benefits are driven by a network-wide reduction in road congestion as airport passengers shift from road to MAR.
- The proportion of road user benefits is higher for the Metro Tunnel option compared with the other options. This is driven by a shift to public transport from road users in the south-east, who previously made cross city road-based airport trips on heavily congested parts of the road network.
- The Metro Tunnel option has the lowest cost and yields the highest conventional benefits. This results in the highest BCR across the options of 1.1 using a 4 per cent discount rate as set out in Table 5-5.
- The Sunshine Tunnel option yields the second highest conventional benefits, but the significantly higher cost results in the lowest BCR of 0.5 using a 4 per cent discount rate.

Table 5-5: Preliminary economic analysis results (4 per cent discount rate)[104]

Economic performance measures	Option 1: Metro Tunnel	Option 2: RRL	Option 3: Sunshine Tunnel
Benefit Cost Ratio	**1.1**	**0.6**	**0.5**

5.5 Recommended Sunshine to CBD alignment option

5.5.1 Summary of findings

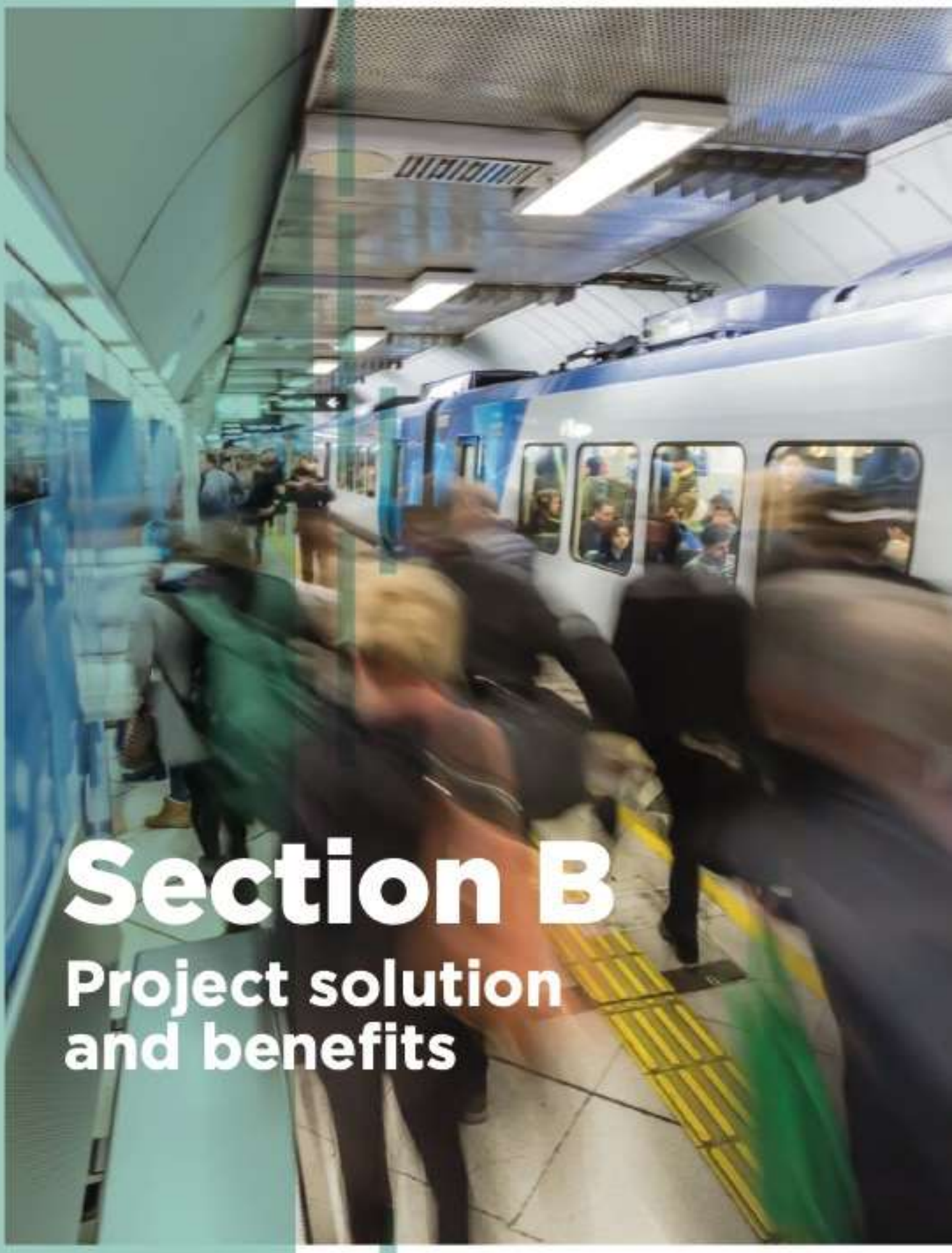
Based on the analysis above, **Option 1: Metro Tunnel is the recommended Sunshine to CBD alignment option** because it:

- provides superior travel choice, connectivity and accessibility of the options considered, due to the new MAR service being integrated within the existing rail network, via the Metro Tunnel's five new underground stations that are integrated with the existing transport network – the other two options connect only to Southern Cross Station
- connects directly to 30 stations without needing to change trains, with most other passengers only needing to change once
- supports the need to reduce high levels of road traffic congestion to Melbourne Airport, particularly from Melbourne's south-east due to a significant proportion of trips to and from the airport being cross-city journeys and the disparity between where people live and work adding to congestion on the south-eastern arterial road network, as highlighted in Chapter 2
- has the shortest journey time to the central CBD, lowest number of interchanges and most inner-area locations and most direct access to NEICs at Sunshine, Monash / Clayton, Dandenong and Parkville
- increases capacity between Sunshine and West Footscray, and increases capacity and provides a direct service to and from Melbourne Airport for passengers on Melbourne's busiest passenger rail corridor, the Dandenong corridor
- has the lowest environmental and heritage impacts and requires less land take than the other options
- provides greater opportunity for urban renewal due to its connection to various inner-city stations

[104] The preliminary economic analysis for the Metro Tunnel option as part of the capital options analysis in Table 5-5 is lower than the detailed economic appraisal for the Metro Tunnel option in Chapter 9. This is primarily due to the nature of the preliminary analysis being to assess the relative benefits of different options. The detailed economic appraisal of the preferred option (refer Chapter 9) incorporated a range of refinements to the demand and economic modelling as well as the scheme considered. Additional benefits such as option and non-use value and wider economic benefits were also incorporated.

- is the most cost-effective option by using infrastructure and rolling stock[105] already being delivered as part of the MTP and does not require significant additional works between Sunshine and the CBD, minimising capital and whole of life costs, disruptions and reducing the delivery timeframe
- has the highest Benefit Cost Ratio of all three options.

[105] Noting 5 additional HCMTs would be required.



Section B

Project solution and benefits

6 Project solution

6. Project solution

Chapter summary

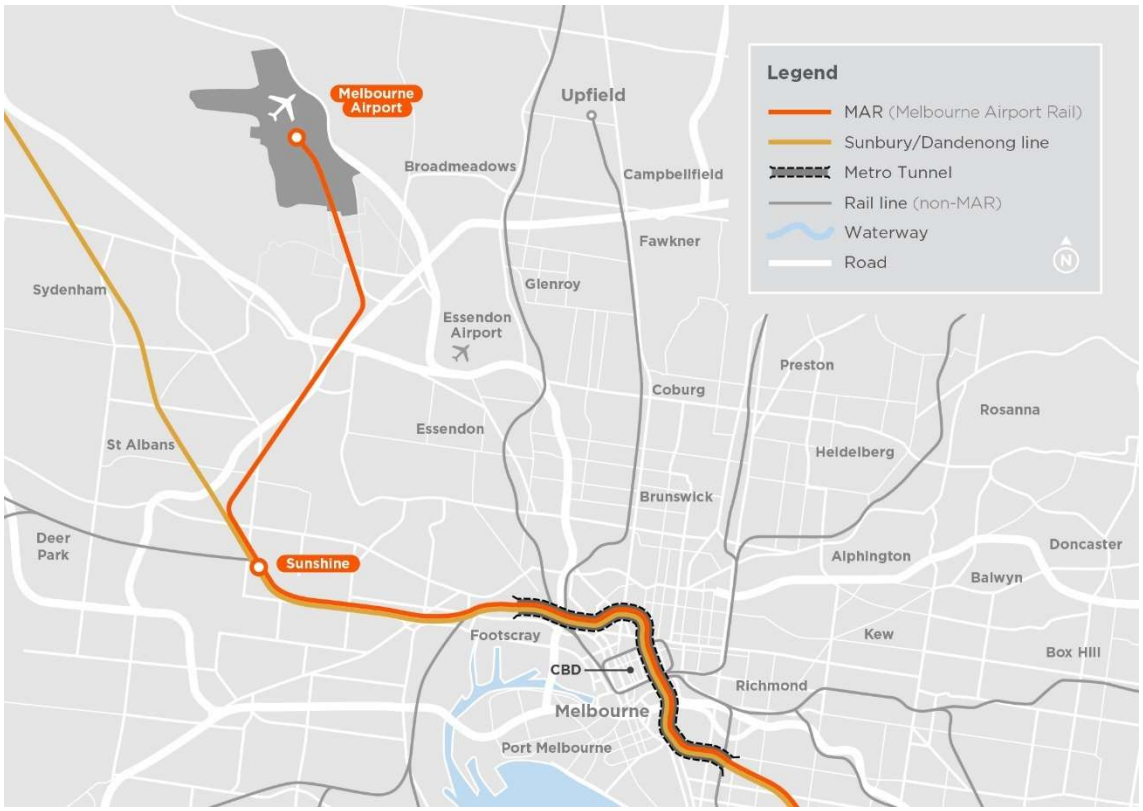
- The Metro Tunnel is identified in Chapter 5 as the preferred alignment option for the Sunshine to Central Business District (CBD) portion of Melbourne Airport Rail (MAR).
- This chapter provides an overview of the technical scope of MAR, including the key decisions and project options that were assessed to identify the recommended project solution between Sunshine and Melbourne Airport.
- The key decisions are focused on significant scope and alignment issues, including material differences in vertical alignments.
- Project options were assessed against the same set of evaluation criteria used for the Sunshine to CBD alignment options analysis outlined in Chapter 5.
- The project solution includes:
  - an elevated station at Melbourne Airport in a location consistent with the *Melbourne Airport Master Plan* (noting an elevated station reduces construction complexity, allows the Project to be delivered earlier, has less construction impact on airport operations and the environment, and is significantly more cost effective)
  - a track pair starting at the Airport Station and transitioning into an elevated viaduct at Mercer Drive that continues across Sharps Road and over the Western Ring Road (M80) – the track continues on an embankment toward and through the Albion-Jacana freight corridor from Steele Creek, including a new bridge crossing over the Maribyrnong River, and a double track flyover past Albion Station after which the track merges into the Sunbury line just before entering Sunshine Station
  - future proofing for an intermediate station (proposed at Keilor East)
  - works at Sunshine Station to enable delivery of MAR
  - line wide rolling stock, traction power and train control and signalling solutions that are interoperable with those being incorporated into the Metro Tunnel.
- The proposed solutions resulting from the key decisions outlined in this chapter will be refined during the development of a reference design to be used for procurement.
- MAR will deliver outstanding urban design and architectural outcomes for rail customers, local communities and all Victorians through urban design and creative strategies that will articulate the design intent and ensure it contributes to community identity, a sense of place and improved safety and amenity.

6.1 Overview

The scope of MAR incorporates a new station at Melbourne Airport in Tullamarine and creates a rail alignment through existing road reserves and industrial areas towards the Albion-Jacana rail freight corridor, where the Project delivers an additional, dedicated set of tracks for approximately 6.9 kilometres within the freight corridor from the M80 crossing at Steele Creek to the St Albans Road bridge, then onwards past Albion Station. Between Albion and Sunshine stations, the Project connects the MAR tracks into the Sunbury line. This enables Melbourne Airport services to travel to the CBD via the Metro Tunnel and onwards to Pakenham and Cranbourne.

Figure 6-1 shows MAR in the context of Melbourne's broader transport network. This chapter focuses primarily on the major technical scope decisions between Melbourne Airport and Sunshine.

Figure 6-1: MAR in the transport network context



6.2 Approach to options analysis

Rail Projects Victoria (RPV) and its advisors have developed a solution for the Project. A wide range of scope decisions have been made as part of this process to arrive at a recommended project solution. However, the key decisions set out in this Business Case focus on significant scope and alignment issues only, including material differences in vertical alignments.

Matters related to construction methodology or more detailed design issues (such as station entrances, refinement of alignments, or the potential range of engineering requirements) will be considered as part of the finalisation of the reference design developed for procurement and are not discussed in this Business Case. Additionally, the proposed solutions resulting from the key decisions outlined in this chapter will be refined further during the development of the reference design for use during procurement.

The following sections of this chapter summarise the key decisions and options assessed, the evaluation criteria used, and the high-level findings of the options analysis. Detailed assessment tables for each of the key decisions are provided in Appendix 2: Project options analysis.

6.2.1 Study areas and key decisions

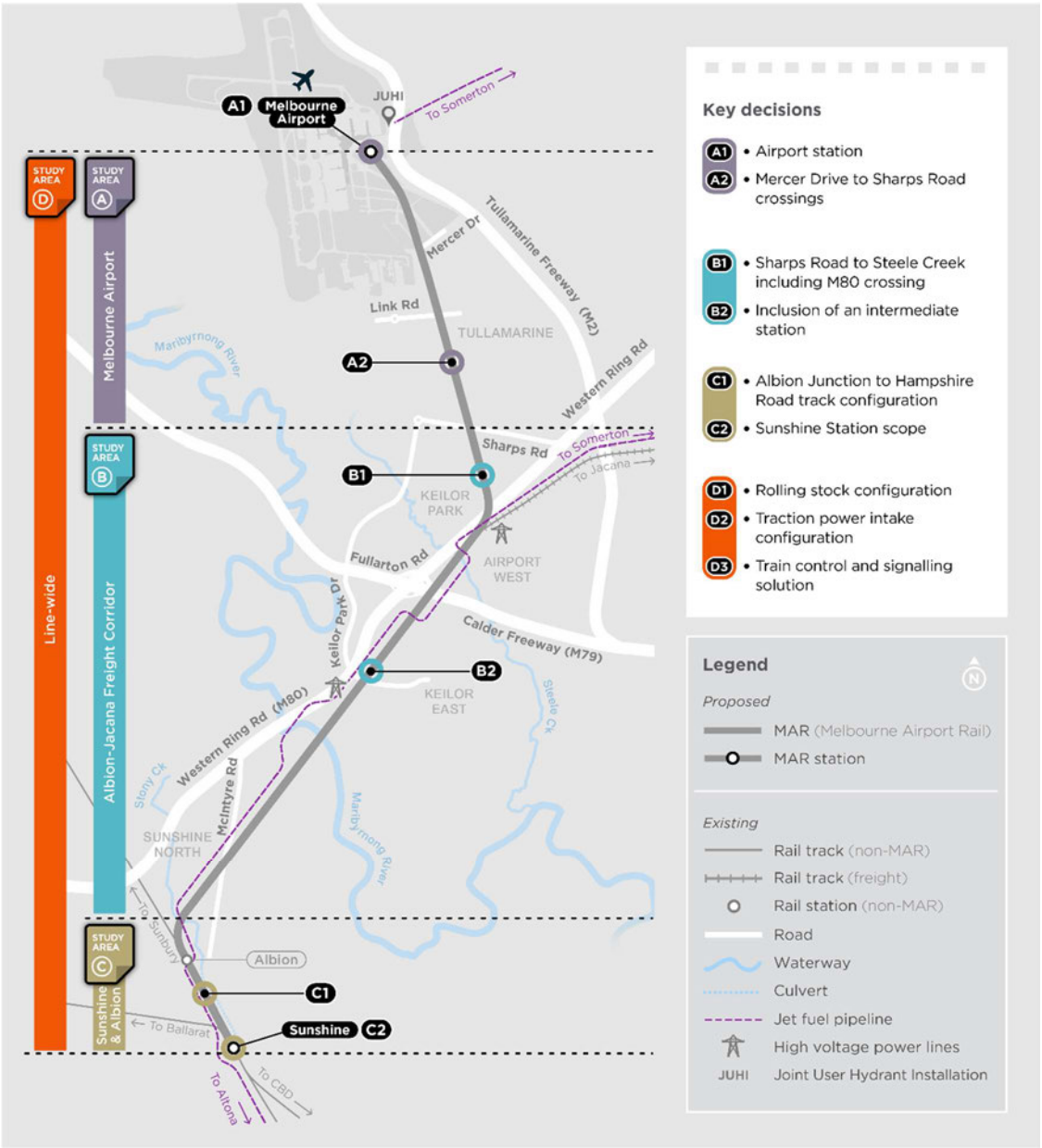
Given the scale and complexity of MAR, options analyses were undertaken across four key study areas between Sunshine and Melbourne Airport, noting the alignment from Sunshine to the CBD is discussed earlier in Chapter 5.

The four key study areas are:

- Study area A – Melbourne Airport (Commonwealth land boundary)
- Study area B – Albion-Jacana freight corridor
- Study area C – Sunshine and Albion
- Study area D – Line-wide.

These study areas were determined based on the key characteristics of each area, which present natural boundaries for the purposes of undertaking the options analysis. The four study areas and the key technical scope decisions considered are shown in Figure 6-2.

Figure 6-2: Key decisions considered under each study area



6.2.2 Key decisions options

For each key decision, multiple options were developed and assessed. Where more than three options were analysed, this chapter provides the analysis for the three most viable options. Table 6-1 outlines the key decisions and options that were analysed.

Table 6-1: Summary of key scope decisions and options

Study area	Key decision	Options assessed
Study area A: Melbourne Airport	**Decision A1: Airport Station**	• Shallow underground station • Elevated station
	Decision A2: Mercer Drive to Sharps Road crossings	• Shallow underground • At-grade • Elevated viaduct
Study area B: Albion-Jacana freight corridor	**Decision B1: Sharps Road to Steele Creek including M80 crossing**	• Deep underground • Shallow underground with low level embankment • Elevated viaduct
	Decision B2: Inclusion of an intermediate station at Keilor East	• Include an intermediate station • Do not include an intermediate station • Future proof for an intermediate station
Study area C: Sunshine and Albion	**Decision C1: Albion Junction to Hampshire Road track configuration**	• Double track flyover • Single track flyover
	Decision C2: Sunshine Station scope	• Works for MAR • Works for MAR plus additional scope from future projects
Study area D: Line-wide	**Decision D1: Rolling stock configuration**	• 7-car High Capacity Metro Trains (HCMT-7), future proofing for 10-car HCMTs
	Decision D2: Traction power intake configuration	• Single 66 kilovolt intake • Multiple intakes
	Decision D3: Train control and signalling solution	• Conventional train control and signalling • High Capacity Signalling (HCS)

6.2.3 Evaluation criteria

While these key decisions were assessed against the same evaluation criteria used in Chapter 5, for the purposes of this chapter they are consolidated into four criteria, as outlined in Table 6-2. The full evaluation criteria are used in the detailed assessment included in Appendix 2: Project options analysis.

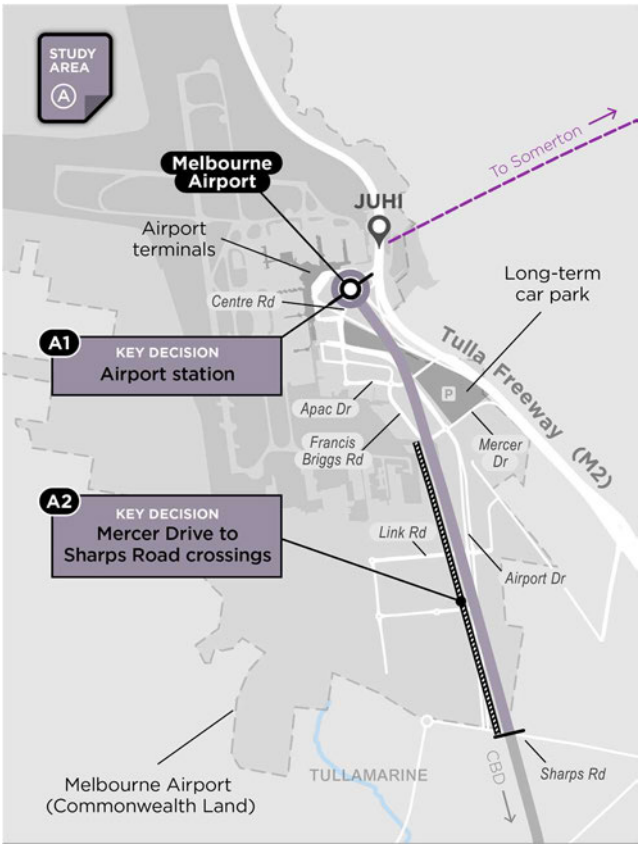
Table 6-2: Evaluation criteria used in options analysis

Project options evaluation criteria (Chapter 6)	Project options evaluation criteria (Appendix 2)
1. Customer experience and transport system outcomes	1. Achievement of project requirements
	2. Ability to improve customer journey experience
	3. Ability to improve transport system outcomes
2. Environmental, heritage, property and community impacts	4. Environmental and heritage impacts
	5. Property and community impacts
	6. Land take
3. Deliverability	7. Schedule and constructability
4. Cost implications	8. Cost implications

6.3 Study area A: Melbourne Airport

Study area A – Melbourne Airport is shown in Figure 6-3. Melbourne Airport is owned and operated by APAM. It is situated on land owned by the Australian Government leased to Australia Pacific Airports (Melbourne) Pty Ltd (APAM) under a 50-year lease with an option to extend for a further 49 years. In this study area, the boundary of the Commonwealth land starts where the MAR alignment intercepts Sharps Road.

Figure 6-3: Study Area A – Melbourne Airport



The Melbourne Airport site is approximately 2,663 hectares in area and contains two runways and four terminals. APAM plans to deliver two additional runways, upgrade and expand terminals, and expand the internal road network in the coming decades to respond to a forecast increase in air travel demand.

There is significant non-aviation commercial development surrounding the airport, making it one of Victoria's key employment and activity centres. Works on Melbourne Airport land as part of MAR will be implemented within the parameters of the *Melbourne Airport Master Plan*, capital works projects and precinct guidelines, as well as the *Airports Act 1996* (Cth) and relevant approvals for major project development on Commonwealth land. RPV will need to work closely with APAM for all aspects of MAR on Melbourne Airport land (Airport land).

This study area incorporates the Airport Station as well as the new alignment created through Airport land towards the Albion-Jacana rail freight corridor. North of Mercer Drive, the alignment runs through a land-side airport operating environment, while south of Mercer Drive, it runs through a largely greenfield environment interfacing with a live road environment. The area includes significant utility services infrastructure.

The MAR works in this area will include interfaces at a number of intersecting roads, including Centre Road, APAC Drive, Mercer Drive, Airport Drive, Link Road, Sharps Road and Tullamarine Park Road as well as the airport's long-term car park. Construction in this study area will have significant interfaces with several key stakeholders including APAM, the Australian Government and utility service providers.

It is intended the SRL will provide orbital rail connectivity from Cheltenham to Werribee. The Airport Station will be a significant interchange station for SRL and the station delivered by MAR will provide for an efficient interchange in the future.

The key decision that has most materially informed the scope for works in study area A are:

- Decision A1: Airport Station
- Decision A2: Mercer Drive to Sharps Road crossings.

6.3.1 Decision A1: Airport Station

The Project has examined the optimal vertical alignment for the Airport Station. A number of possible permutations have been identified that explore different vertical alignments, locations and platform

layouts for the new station. An overview of the two most viable options is provided in Table 6-3 with the analysis undertaken summarised in Table 6-4.

Both options are proposed to be built in the same general location, which is illustrated in Figure 6-4.

Figure 6-4: Location of Airport Station (both options considered)

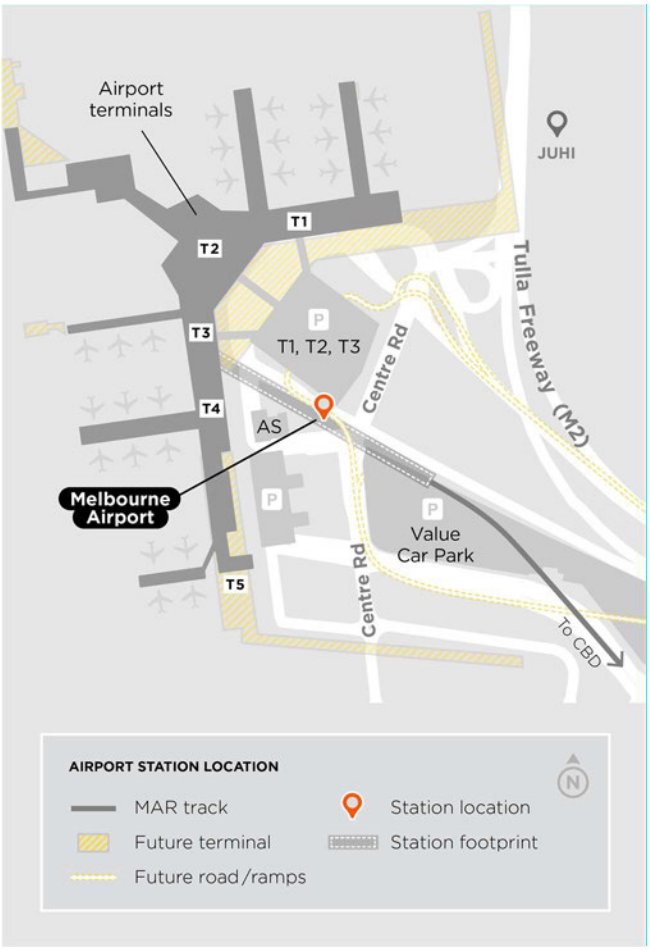
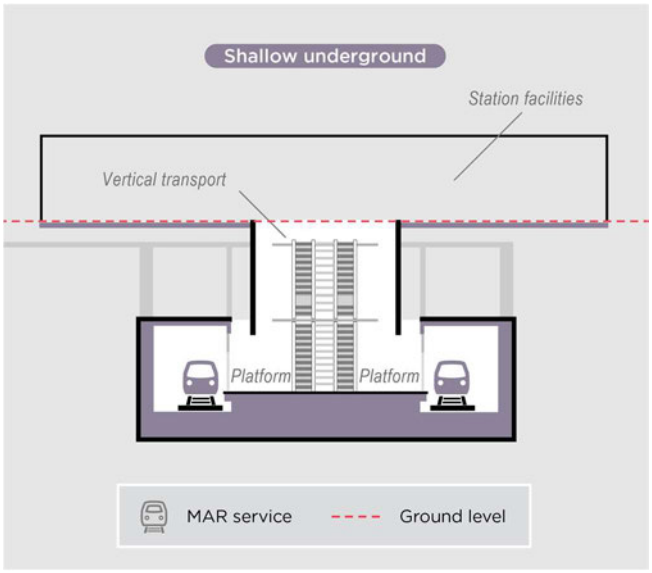
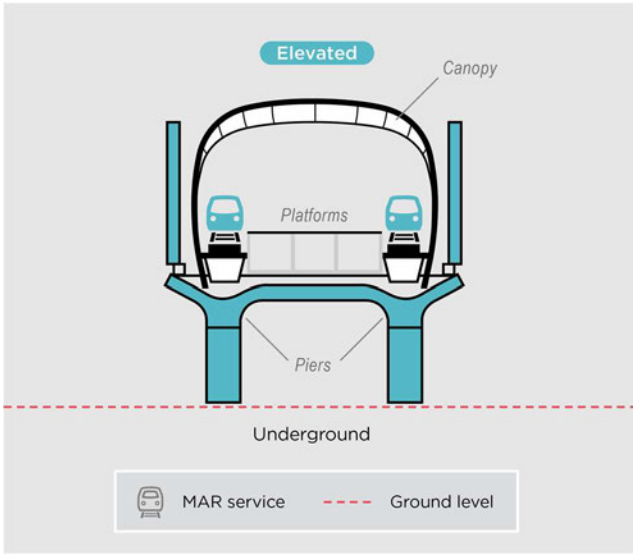


Table 6-3: Options for Airport Station

Option	Description	Indicative design
Shallow underground station	• Island platforms • Cut and cover with reinstated ground plane • Vertical transport connects platforms to ground level and to departures level	
Elevated station	• Above ground level with island platform • Vertical transport connects platforms ground level and to a link bridge which connects through to departures level	

The assessment of Decision A1 against the evaluation criteria is provided in Table 6-4 below.

Table 6-4: Assessment of Decision A1 against evaluation criteria

Evaluation criteria	Assessment
Customer experience and transport system outcomes	The two options are comparable in terms of their ability to achieve the project requirements. The underground option provides clear lines of sight to the station and shorter walking times for arriving passengers, while the elevated option provides clear lines of sight to the terminals and shorter walking times for departing passengers. Both options provide a direct connection to T4 and a connection to T1, 2 and 3. They also have a common vertical transport node, with escalators and large lifts to connect passengers between arrivals, departures and the platform. The location and rail alignment of both options is consistent with *Melbourne Airport Master Plan*. Both options also provide an opportunity to create a world-class station that conveys a 'gateway' to Melbourne, with the elevated option benefiting from enhanced natural light and vistas while the underground option provides more flexibility to create gateway moments.

Evaluation criteria	Assessment
	In terms of passenger safety, the elevated option may increase the perceived level of public safety as there is greater visibility and passive surveillance, which promotes better behaviour. In terms of passenger comfort, the underground option is likely to provide a more comfortable experience due to the active ventilation to the platforms and concourse. A distinct benefit of the elevated solution is that it provides more options for connecting to a future SRL station. This option also provides a generally consistent vertical rail alignment through the Airport precinct, whereas the underground option will require a portal to transition from the rail viaduct south of the station to the open trench station. The underground option has slightly higher ongoing maintenance requirements (e.g. due to ventilation and fire and life safety systems), including periodic testing. Neither option triggers a change to, or impact on, taxis, rideshare or buses. Overall, the elevated option performs better than the underground option when considering all customer experience and transport system outcomes.
Environmental, heritage, property and community impacts	The elevated station results in fewer embodied emissions from materials, construction and operation than the underground station. There is also less potential for the elevated option to cause significant disruption to the airport precinct during construction. For example, the use of pre-cast concrete is expected to have lower noise, dust and vibration impacts when compared to the underground option, which involves excavating through rock. The footprint required for temporary land acquisition is generally comparable between the two options, but the duration of the acquisition is significantly longer under the underground option (21 months longer than the elevated solution). A disadvantage of the underground option compared to the elevated option is that it reduces the existing road capacity of the airport precinct. Neither option will result in an impact to heritage. Overall, the elevated option is the superior option when considering all environmental, property and community impacts.
Deliverability	The estimated construction duration of the elevated option is significantly shorter than the underground option (by approximately 21 months). The underground option is more complex to deliver as it has a greater impact on existing buildings (e.g. Tri-Gen Facility), involves rock excavation, and requires the relocation of approximately 134 more utilities and services than the elevated option.
Cost implications	The capital cost of the underground option is estimated to be approximately double the cost of the elevated option. Both options are generally comparable with respect to operational cost impacts, although the elevated option is marginally less expensive.
Assessment outcome	
The **elevated station option** is preferred as it outperforms underground station option across each evaluation criteria. Further development of the Airport Station will be undertaken in consultation with APAM.	

6.3.2 Decision A2: Mercer Drive to Sharps Road crossings

MAR will deliver new rail track from the Melbourne Airport area to the Albion-Jacana freight corridor. The track will need to be installed across a number of roads and intersections including Mercer Drive, Airport Drive and Link Road. The three most viable options for the vertical alignment are included in this options analysis and described in Table 6-5.

In the diagrams in Table 6-5, the vertical alignment shown at the approach to Sharps Road and Mercer Drive are indicative only. The vertical alignment in these areas may be inclining, declining or continuing at level, depending on the vertical alignment of the next section of rail track. Additionally, as the reference design for use in procurement is in development, transition between vertical alignments may occur at a different location altogether, or at multiple locations.

The assessment of Decision A1 against the evaluation criteria is provided in Table 6-6.

Table 6-5: Options for Mercer Drive to Sharps Road crossings

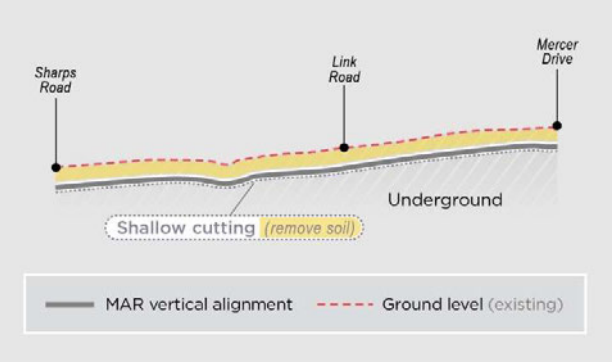
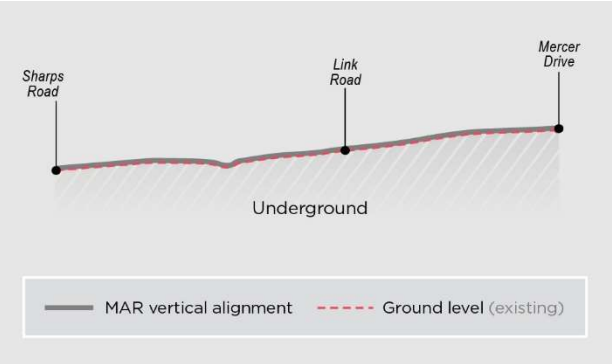
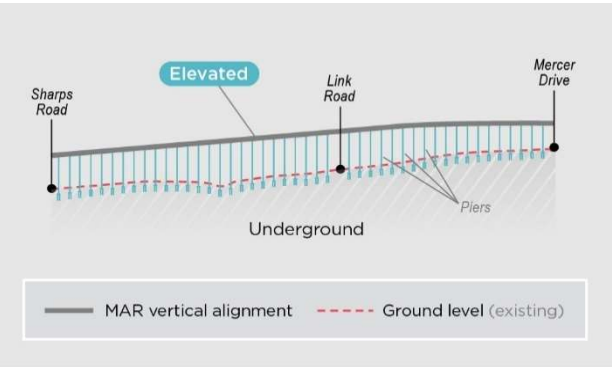
Option	Description	Indicative design
Shallow underground	• Shallow underground alignment • Grade separations at Mercer Drive, Link Road and Sharps Road • Option for open trench, or cut and cover with reinstated ground plane	
At-grade	• At grade in median strip of Airport Drive which was specifically reserved • Requires modifications to local road network to support existing traffic movements	
Elevated viaduct	• An elevated structure over Mercer Drive, Link Road and Sharps Road	

Table 6-6: Assessment of Decision A2 against evaluation criteria

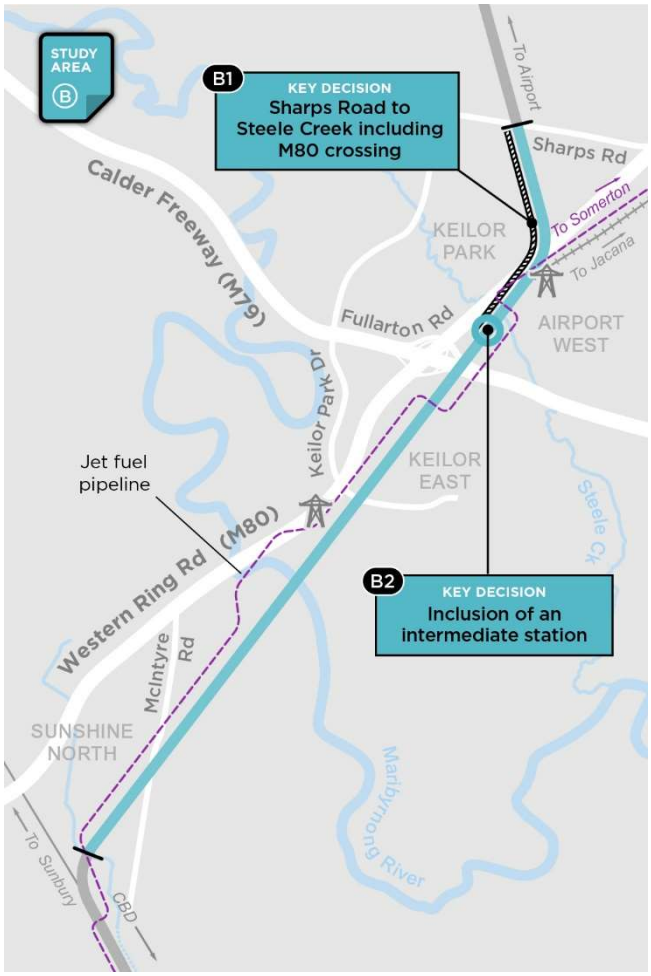
Evaluation criteria	Assessment
Customer experience and transport system outcomes	Each option may present marginal differences in travel time, which will mildly affect the passenger experience. The time difference will depend on the resulting interface at Sharps Road and Mercer Drive. The elevated viaduct option will result in a generally consistent vertical rail alignment through the Airport precinct, as it connects with the elevated Airport Station. The shallow underground and elevated options constrain access for maintenance and emergency egress. Additionally, the shallow underground option will require ventilation and fire and life safety systems, which have ongoing maintenance requirements, including periodic testing. The at-grade option provides the best accessibility for maintenance and emergency egress, but will require a rail-over-road grade separation at Link Road to maintain existing traffic movements.

Evaluation criteria	Assessment
Environmental, heritage, property and community impacts	The elevated option provides the greatest likelihood of visual and noise impacts during operations, followed by the at-grade solution, with the shallow underground solution having the lowest likelihood. The shallow underground option has the greatest potential for embedded and direct greenhouse gas emissions from a combination of the extent and volume of concrete, excavation works, and operation of ventilation systems. The at-grade option will likely generate the least greenhouse gas emissions due to the limited excavation works and concrete volumes compared with the other two options. The at-grade option has the greatest risk of impacting the surface environment, which may include vegetation, heritage and surface water flows, followed by the shallow underground option. The elevated option provides the lowest risk of impacting the surface environment. The at-grade option impacts traffic within the airport precinct.
Deliverability	The shallow underground option will take the longest to construct due to the excavation of soil and groundwater, and the installation and testing of fire and life safety systems. The at-grade and elevated solutions can be delivered more efficiently. While the at-grade solution involves the simplest construction methodology, it also requires associated works such as utility relocations and grade separations that result in the construction timeframe being comparable to that of the elevated option.
Cost implications	The at-grade and elevated options are estimated to cost about the same, while the shallow underground option is estimated to cost twice as much.
Assessment outcome	
The **option for an elevated viaduct along Airport Drive between Mercer Drive and Sharps Road** is preferred. It provides the most program-efficient options, is one of the lowest cost options, and has a lower risk associated with environmental, heritage, property and community impacts.	

6.4 Study area B: Albion-Jacana freight corridor

Study area B – Albion-Jacana freight corridor is shown in Figure 6-5. MAR will deliver infrastructure for the new MAR rail line from Sharps Road to the Albion-Jacana freight corridor, incorporating the M80 crossing and the freight corridor up until the junction with Albion Station. The Albion-Jacana freight corridor is owned by VicTrack and currently leased and operated by the Australian Rail Track Corporation (ARTC).

Figure 6-5: Study area B – Albion-Jacana freight corridor



MAR will deliver new rail track along the existing Development Plan Overlay and Public Acquisition Overlay reserved for rail infrastructure. The tracks will cross Steele Creek and Steele Creek North before passing through the predominantly residential and light industrial suburbs of Keilor East and Sunshine North. It will also cross the Maribyrnong River, which has a deep and asymmetrical valley floor and is a known area of cultural heritage, historic heritage and ecological sensitivity. The Albion-Jacana freight corridor crosses the Maribyrnong River over a rail bridge listed on the Victorian Heritage Register (VHR).

Study area B includes the following key interfaces:

- the existing Joint User Hydrant Installation fuel pipeline operated by ExxonMobil
- the ARTC mainline freight track, as well as passing loops and sidings
- Viva Energy's proposed Melbourne Jet Pipeline Project
- various road overbridges, shared user paths and pedestrian crossings
- significant existing utilities, including 500 kilovolt (kV) and 220kV overhead transmission lines
- the existing heritage-listed ARTC embankment adjacent to the M80 intercept point.

The following two key decisions materially inform the scope of MAR in this Study area B:

- **Decision B1** – Sharps Road to Steele Creek including M80 crossing
- **Decision B2** – inclusion of an intermediate station.

6.4.1 Decision B1: Sharps Road to Steele Creek including M80 crossing

MAR will install new rail track from Sharps Road to Steele Creek, including across the M80. The three main options for the vertical alignment of this track considered are outlined in Table 6-7.

The assessment of Decision B1 against the evaluation criteria is provided in Table 6-8.

Table 6-7: Options for Sharps Road to Steele Creek including M80 crossing

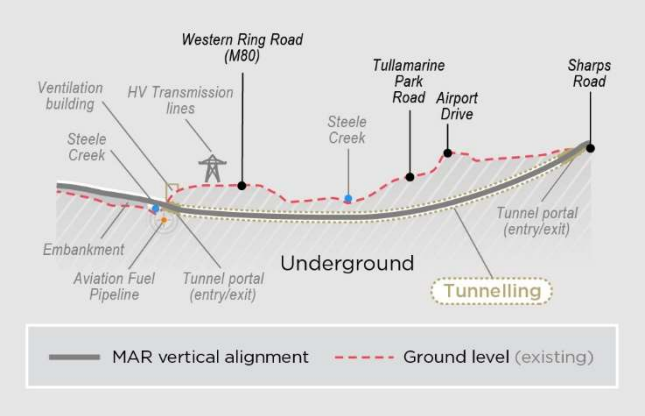
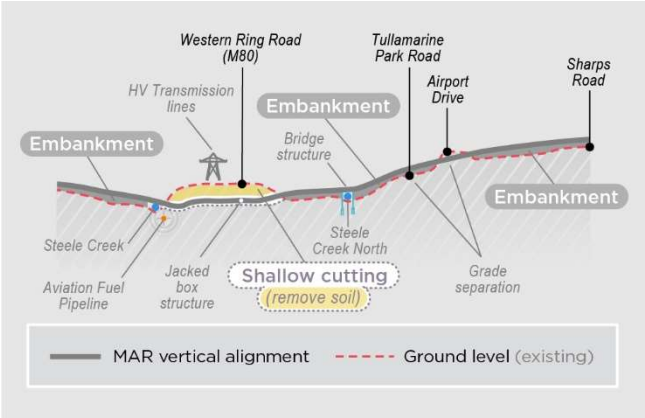
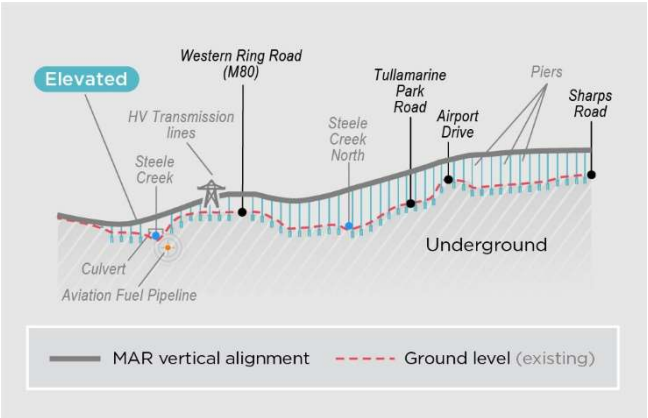
Option	Description	Indicative design
Deep underground	• An approximately 2.3 km-long twin bored tunnel from Steele Creek (after crossing M80) to Sharps Road • Tunnel portals at both Steele Creek (after crossing M80) and at Sharps Road • A ventilation and services structure at each portal, located on top of the cut and cover decline structure	
Shallow underground (with low level embankment)	• A shallow jacked box structure under the M80 • Open cut trench north of the M80 that then transitions into a low-level embankment with short bridge elements over Steele Creek North and road grade separations along Airport Drive	
Elevated viaduct	• An approximately 2.5 km elevated viaduct structure starting south of Steele Creek and crossing over the M80 towards Sharps Road (elevated structure continues from elevated structure in Melbourne Airport study area)	

Table 6-8: Assessment of Decision B1 against evaluation criteria

Evaluation criteria	Assessment
Customer experience and transport system outcomes	Each option may present marginal differences in travel time which will mildly affect the passenger experience. The time difference will be dependent on the resulting interface at Sharps Road. All options constrain access for maintenance and emergency egress. The underground options will require ventilation and fire and life safety systems which have ongoing maintenance requirements, including periodic testing. Overall, there is no significant or critical difference between the options for this evaluation criteria.

Evaluation criteria	Assessment
Environmental, heritage, property and community impacts	The shallow underground option will likely have significant impacts to the surface level including substantial impacts to groundwater, overland water flow and vegetation as construction would involve major ground excavation through Steele Creek and across the M80, Tullamarine Park Drive and Airport Drive. Where the option impacts overland water flows, additional drainage infrastructure may be introduced to respond to the change conditions. The option will impact the community and the transport network during construction across the M80 as this will require lane closures for long durations as construction progresses from one side of the carriageway to the other, together with an extensive network of temporary road diversions. This option will likely severely impact the long-term community amenity of Steele Creek. The deep underground option will likely have major impacts on the surface level including substantial impacts to groundwater, overland water flow, and vegetation resulting from the requirement for tunnel portals at Steele Creek and Sharps Road. Where the option impacts overland water flows, additional drainage infrastructure may be introduced to respond to the changed conditions. This option is anticipated to avoid disruptions to the road network but reduce the community amenity of Steele Creek. This option also has the greatest potential for embedded and direct greenhouse gas emissions from a combination of the extent and volume of concrete, excavation works, and operation of ventilation systems. The elevated option carries the greatest risk of visual impact, however, it limits the risk of impacts to the surface level waterways and vegetation as excavation works will be localised to bridge footings and construction access paths. It is expected that impacts to vegetation from construction will be remediated after the work is complete and that there is no permanent impact to overland water flows. Additionally, the structure provides opportunities to rehabilitate the land and waterways underneath it. Construction activities for this option are expected to be managed through partial lane closures and a single overnight road closure. This option will likely have a minor impact on the community amenity of Steele Creek. As outlined above, all options include a degree of ground excavation. The soil removed will be classified, managed and removed off-site in accordance with environmental requirements. There may be opportunity to re-use non-contaminated soil on another part of the Project. The elevated option provides the optimal outcome against this evaluation criteria.
Deliverability	The deep underground option has the longest delivery timeframe as it involves the most complex and specialised construction methodology. The elevated option additionally requires the relocation and elevation of electrical transmission infrastructure in the vicinity. Despite those factors, the elevated option still results in the shortest construction duration while the shallow underground option will take approximately 30 per cent longer and the deep underground option will take approximately 70 per cent longer than the elevated option.
Cost implications	The elevated and shallow underground options are estimated to cost about the same, while the deep underground option is estimated to cost almost 1.5 times as much.
Assessment outcome	
The **elevated option** is the preferred option for MAR to deliver new rail track between Sharps Road to Steele Creek including crossing the M80 as it is quicker and less expensive to deliver and is expected to have the least environmental impact. The elevated structure links in with Decision A1 to deliver an elevated structure from Sharps Road towards the airport. Each of these decisions have been determined holistically, and individually, to assess the merits of the respective options.	

6.4.2 Decision B2: Inclusion of an intermediate station at Keilor East

This decision has examined the potential inclusion of an intermediate station between Sunshine and Melbourne Airport as part of the MAR scope. For the purposes of this Business Case and to enable an informed decision by government, an initial assessment on where the intermediate station could be located recommended Keilor East as a potential preferred option as it:

- has the highest forecast patronage demand range relative to other locations

- enables the best local urban development outcomes, servicing a significant existing population with poor public transport connectivity
- has a limited impact on ARTC operations
- is the least expensive option considered and is the location preferred by local councils and the community.

The other locations considered included Sunshine North, the Melbourne Airport Business Park and Keilor Park Drive.

Following the recommended location for an intermediate station, this Business Case assesses the relative merits of including a station between Sunshine and Melbourne Airport (currently proposed at Keilor East for the purposes of assessment) as part of the Day 1 scope for MAR. Three options were assessed and are summarised in Table 6-9.

The assessment of Decision B2 against the evaluation criteria is provided in Table 6-10.

Table 6-9: Options for inclusion of intermediate station at Keilor East

Option	Description
Intermediate station	MAR includes scope for a new intermediate station.
No intermediate station	MAR does not include scope for a new intermediate station.
Future proof for an intermediate station	MAR's scope will future proof for an intermediate station at a future date. This involves positioning the track alignment so there is space for a future station. The cost difference to position the track alignment in this position rather than the optimal position is not material in the context of the cost to deliver MAR.

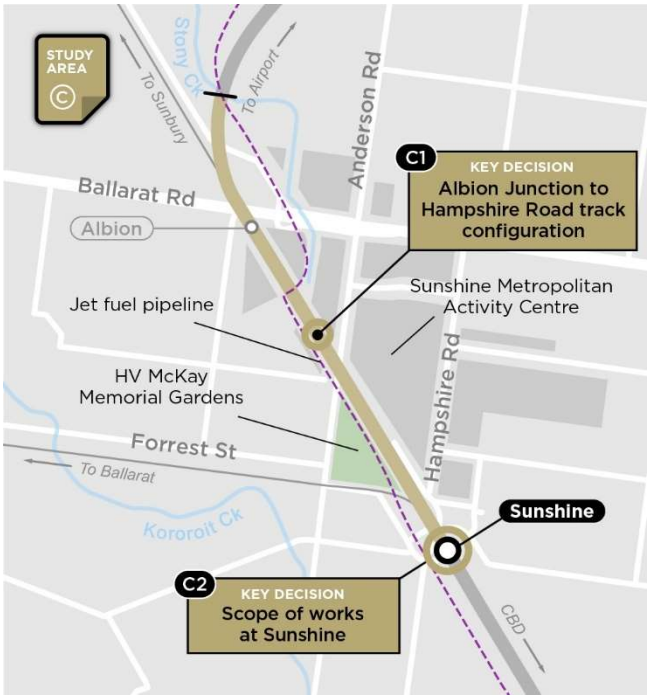
Table 6-10: Assessment of Decision B2 against the evaluation criteria

Evaluation Criteria	Assessment
Customer experience and transport system outcomes	Providing an intermediate station as part of MAR will provide the greatest experience to passengers embarking and disembarking from a new Keilor East Station, although patronage modelling demonstrated the station would experience low initial usage with the majority of customers already being existing public transport customers (that is, these passengers would not be removed from the roads). The intermediate station will provide some relief to adjacent train lines, although this relief is minor (approximately 3,000 transferred trips per day in 2051). Providing an intermediate station will also increase the journey time by 2 minutes for all MAR passengers embarking and disembarking from all other stations, which diminishes the experience for these passengers who will represent a greater proportion of journeys on MAR. In turn, this increase in journey time could decrease the use of MAR by airport customers. Future proofing for an intermediate station while delivering MAR enables the government to more efficiently build an intermediate station later, should it choose to do so. Although the projected usage of the station is relatively low to 2051, there may be network benefits the government wishes to obtain in the future, including improvements to network resilience. It is important to note the current proposed location of the station is considered to be the preferred location for building an intermediate station in the future from an overall rail network benefits perspective.

Evaluation Criteria	Assessment
Environmental, heritage, property and community impacts	Including an intermediate station in MAR's scope has the greatest positive community impact as residents currently have limited public transport options. It also enables urban design development outcomes through the creation and improvement of community spaces and urban regeneration. These positive outcomes are partially offset by the disruption associated with private and public land impact, and the risk of impacts on noise and amenity to sensitive receptors near the rail corridor, including residential and aged care facilities. Conversely, not including an intermediate station in MAR's scope avoids these disruptions but continues the current state of public transport in the area and removes related urban design opportunities. Future proofing for an intermediate station while delivering MAR will delay both the positive outcomes and the disruptions that come with the delivery of an intermediate station. It is important to note the community will experience some disruption from the delivery of MAR for all options as new rail track and infrastructure will need to be delivered in the area.
Deliverability	The inclusion of an intermediate station in MAR's scope requires the longest delivery timeframe. While not including an intermediate station presents the shortest delivery timeframe, it is important to note that if the government decides to proceed with building a station in the area in the future (and MAR has precluded a future station), the infrastructure in the area will require substantial reconfiguration. Future proofing for an intermediate station when delivering MAR reduces the scale of reconfiguration required if the station is delivered at a future date.
Cost implications	In the short-term, including an intermediate station in MAR's scope is the highest cost option, followed by future proofing for an intermediate station which is estimated as less than 15 per cent of that cost. Not including either of these in MAR's scope is the cheapest option as it does not incur any cost. The cost difference between future proofing for and not including an intermediate station is not material. The future proofing works are not made redundant if the intermediate station is built in the future. However, in the long-term, if the government decides to build a station as proposed at Keilor East, then the total cost of delivering the station would be less if MAR does not preclude a future intermediate station. This is due to the reduction in reconfiguration required as noted in the above assessment against deliverability.
Assessment outcome	
The preferred option is to **future proof for an intermediate station** at Keilor East as the customer experience and transport system outcomes do not yet provide justification for the additional cost to deliver, although this may change in future. However, an intermediate station in this proposed location has been sufficiently considered to enable a priced option for inclusion in the Project.	

6.5 Study area C: Sunshine and Albion

Figure 6-6: Study area C – Sunshine and Albion



Study area C – Sunshine and Albion is shown in Figure 6-6. Study area C is located in the City of Brimbank, approximately 14 kilometres west of the Melbourne CBD. It encompasses the existing Sunshine and Albion stations and the interconnecting rail corridor. MAR services are not proposed to service Albion Station however all services will stop at Sunshine Station. Metropolitan and regional passengers can interchange between MAR and other transportation at Sunshine Station.

Sunshine is one of seven National Employment and Innovation Centres and a Metropolitan Activity Centre identified in the government's metropolitan planning strategy *Plan Melbourne*. It is a key strategic centre for Melbourne's north west and contains significant employment, education and health centres, including Victoria University, Western Health's Sunshine Hospital, St Albans Activity Centre and Sunshine Health Wellbeing and Education Precinct.

The area around Sunshine is characterised by underused land and there are significant opportunities for future urban renewal and development. The land adjacent to the rail corridor in Sunshine and Albion is predominantly low-density residential or mixed use, including large commercial and industrial sites. Road access over the tracks is provided by the Hampshire Road bridge, which connects the east and west sides of Sunshine. There is also connectivity provided by the Ballarat Road bridge north of Albion Station and the Anderson Road bridge south of Albion Station.

The existing rail corridor between Albion and Sunshine contains up to five tracks at any one point, accommodating regional and metropolitan passenger services as well as freight services. This means any construction works within and around the corridor are being delivered in a highly complex and constrained brownfield environment.

There is expected to be a range of projects delivered in the coming decades that will require works within the Sunshine-Albion precinct. This includes investments to achieve the objectives of the Victorian Government's Western Rail Plan (WRP). Where possible, any works delivered as part of MAR in this study area will be designed to either actively or passively future proof or at least not preclude future works, such as those included in the WRP, where this can be achieved at no or minimal additional cost.

There will need to be some changes to freight operations associated with the scope at Sunshine, independent of the decisions outlined below. This includes the removal of the dual ladder crossover on the up side of Sunshine, removing the connection from the Regional Rail Link (RRL) tracks to the Independent Goods line to simplify and reduce the risk associated with the HCS extension for MAR. These crossovers will need to be removed to achieve the future network configuration state relating to the WRP although it is noted this change and other aspects of the MAR scope result in some constraints to the corridor with respect to the available paths for broad gauge freight which will need to be accommodated operationally

To enable MAR operations, the Project scope must include as a minimum works at Sunshine Station relating to the slewing of tracks to provide a dedicated track for MAR from Sunshine Station to Melbourne Airport, works to deliver the dedicated track for MAR from Sunshine Station to Albion

Junction, upgrades to existing traction power substations, and station works to facilitate the interchange between MAR services and other services in the vicinity.

6.5.1 Decision C1: Albion Junction to Hampshire Road track configuration

MAR will install rail track from Albion Junction to Hampshire Road. This area is a heavily constrained brownfield environment where two main configuration options for the track have been considered, as outlined in Table 6-11 and shown in Figure 6-7. The assessment of Decision C1 against the evaluation criteria is provided in Table 6-12.

Table 6-11: Options for Albion Junction to Hampshire Road track configuration

Option	Description
Double track flyover	• A double track flyover structure to deliver MAR services that retains the current position of Albion Station and existing road bridges
Single track flyover	• A single track flyover structure with the remaining track at-grade, resulting in re-build of Albion Station, St Albans Bridge and Ballarat Rd Bridge

Figure 6-7: Options for Albion Junction to Hampshire Road track configuration

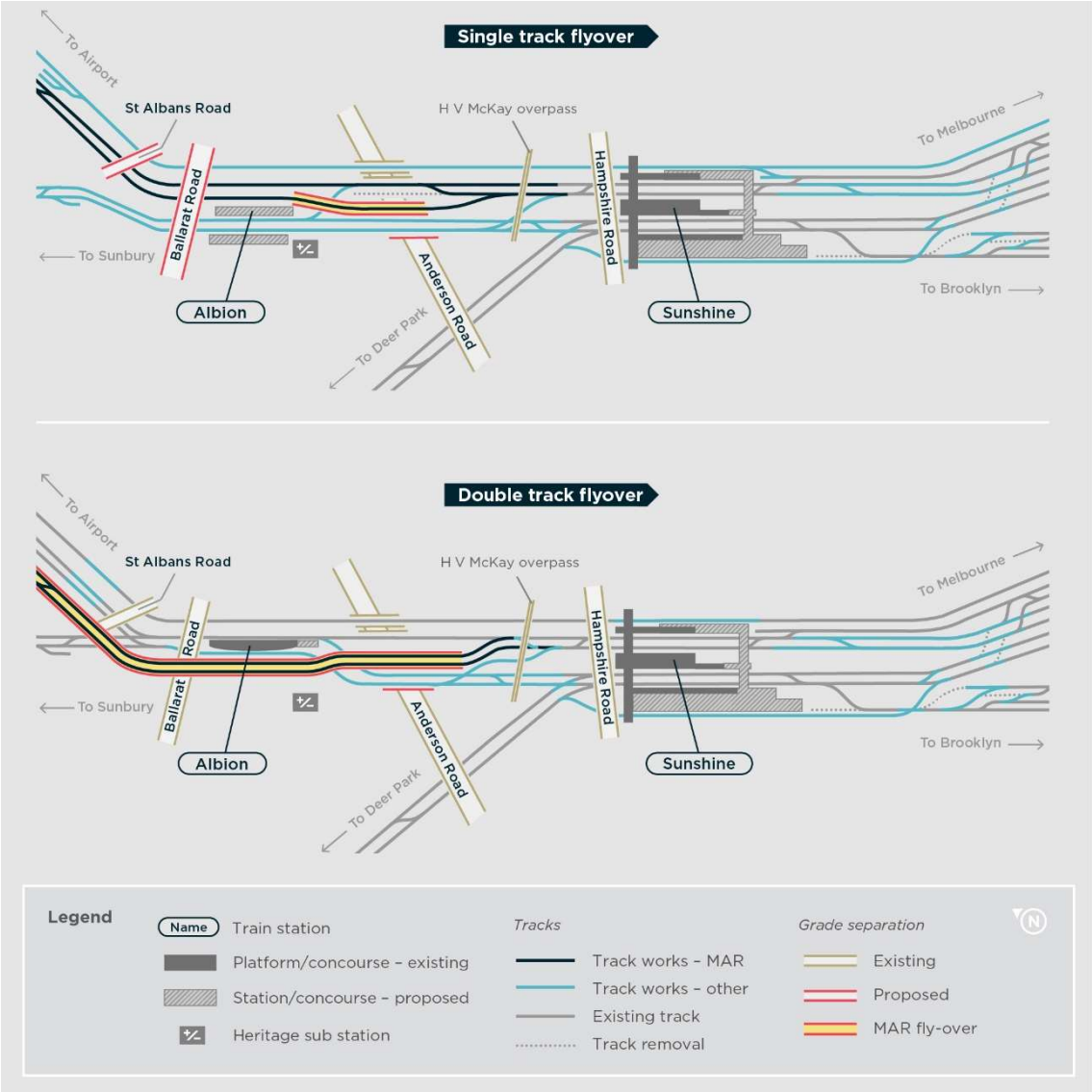


Table 6-12: Assessment of Decision C1 against evaluation criteria

Evaluation criteria	Assessment
Customer experience and transport system outcomes	Both the single and double track flyover options provide regional and inter-modal connectivity at Sunshine Station, enabling access to the city metropolitan network via the Metro Tunnel and regional lines to the west. However, the double track flyover provides more reliable operations for both MAR and Bendigo services by separating the MAR line on an elevated viaduct through the Albion area. For both options, future station upgrades at Albion Station are possible. While the double track flyover provides opportunities to implement upgrades at Albion Station, the option does not require the rebuild and relocation of Albion Station which can occur in future investment sequences. With the single track flyover solution requiring the rebuild of Albion Station the customer experience will be improved for those passengers taking other metropolitan services to and from this station. The rebuild of the station will include improving the station's current access to be *Disability Discrimination Act 1992 (Cth)* compliant and the removal of the underpass provides a positive safety outcome. The single track flyover is a less desirable option for regional Bendigo trains for the following reasons: • the length of a Bendigo service train would be limited to 6 car VLocity sets, but not viable for N-class 6 carriage sets • the travel time is increased comparatively though the Albion area as the speed through a diamond is lower than through a set of turnouts (40kph and 65kph respective speed restrictions) The single track flyover provides more resilient operations when interruptions occur on the network and future proofs for more MAR services. With respect to freight service plans, the single track flyover requires converting the existing single standard gauge line into a dual gauge bi-directional line through the Albion area, placing the existing broad gauge freight services onto the ARTC standard gauge track using up future ARTC capacity. The double track flyover option retains the current freight connections through Albion, which reduces scope, cost and risk of ARTC interface works. In addition, it does not constrain the dual gauging of the existing ARTC standard gauge line in a future investment. (At the time of the Business Case, this specific investment is not currently being considered).
Environmental, heritage, property and community impacts	The double track flyover solution will produce more greenhouse gas emissions in construction of the additional rail bridge due to the increased amount of concrete required and power during operations (increased vertical grades of 2 tracks rather than 1), however this is partially offset by the double track flyover requiring less maintenance than the single track flyover as it results in the use of more slab track than ballasted track. In addition, by not requiring the rebuild of Albion Station, Ballarat Road Bridge and St Albans Road Bridge, the double track flyover option better utilises the significant carbon already expended in the original construction of these assets, which are at varying stages of their asset lifecycle. The double track flyover structure is likely to impact the sightline to the John Darling and Son Flour Mill and the Albion Substation from the railway aspect, both of which are on the VHR, but this option provides an increased urban realm integration potential at grade level. The single track flyover option, also has an increased potential impact to the Albion Substation as the Sunbury and Bendigo services (15 per hour peak) have a smaller track offset to the building than the MAR double track flyover (6 trains per hour). At Albion, the double track flyover structure is likely to have visual impacts on the local communities, however provides opportunity for an urban design response using the iconic piece of railway infrastructure to identify Sunshine-Albion as a landmark gateway on the journey into Melbourne. This supports Brimbank Council's vision for Sunshine to be a destination and an important transit hub for local or regional connections to passengers and the community, and is akin to the structural features on CityLink at Flemington and at the tunnel portals at EastLink that have become features in Victoria's transport network.

Evaluation criteria	Assessment
Deliverability	The double track flyover option is subject to confirmation that an EES is not required. It is more likely that a Planning and Design Approval with an advisory committee will be required, enabling approvals in a shortened timeframe. Overall, the double track flyover option enables the earliest delivery of the MAR works as it eliminates significant and complex changes to the freight tracks, ensuring the delivery of the long-awaited airport service in a shorter period of time and a significantly reduced railway disruption during construction through the Sunshine Albion area for the metropolitan, freight and regional services. The single track flyover option involves significant complex brownfields delivery risks relating to assumptions made in the construction methodology for the ARTC dual gauge track, which are unquantifiable at this stage and difficult to control.
Cost implications	The double track flyover option costs 15 per cent less to implement than the single track flyover option.
Assessment outcome	
The **double track flyover option** is the preferred option as it delivers superior operational outcomes and less complexity and risk during construction, delivering the MAR project outcomes in a shorter time and at a lower cost. Additionally, the double track flyover provides an opportunity to deliver a feature gateway feature at Sunshine-Albion for passengers on the journey into Melbourne.	

6.5.2 Decision C2: Sunshine Station scope

The Sunshine precinct is expected to undergo significant development over the coming decades. This development is anticipated to include enhancements and changes to the transport network in the vicinity, including at Sunshine Station, as envisaged in the WRP and which will be subject to separate business cases and funding decisions.

The scope of works at Sunshine Station responds to the implementation of MAR and associated impacts through the delivery of:

- a new pedestrian overpass at the opposite end of the station to the existing concourse to accommodate passenger interchange
- works to existing station facilities to enable delivery of MAR
- upgrades to active transport facilities within the Sunshine Station precinct
- construction of additional car parking at Sunshine Station western car park.

The scope of works also responds to an opportunity to improve the resilience of regional train services through earlier delivery of scope from the WRP. The WRP scope that could be delivered in parallel to MAR to efficiently capture this opportunity includes delivery of Platform 5 on the opposite side of the existing Platform 4 (built to accommodate future longer regional trains). This scope is likely to include the relocation of the nearby fuel pipeline to accommodate an extension of the existing concourse over the new Platform 5. Timing for delivery of the WRP scope remains subject to approvals and other considerations.

There is a further opportunity to deliver additional scope at Sunshine Station required for WRP and other investments, as part of MAR in anticipation of the delivery of proposed future rail projects in the area, to decrease the overall disruption, cost and magnitude of those future projects. The additional scope includes the delivery of three additional platforms, a new concourse, retaining walls, and additional upgrades to the station and the station surrounds. Delivering the three additional platforms and the new concourse removes the need to deliver the pedestrian overpass and the delivery of Platform 5 on the opposite side of existing Platform 4. While this additional scope's primary objective is to facilitate future projects, some additional benefits for the transport network and the community would also be generated upon completion of those works.

To assess the merit of this opportunity, the option to deliver the standard or additional MAR scope was assessed against the evaluation criteria. The options are described in Table 6-13 and shown in Figure 6-8.

The assessment of Decision C2 against the evaluation criteria is provided in Table 6-14.

Table 6-13: Options for scope of works at Sunshine

Option	Description
Standard scope	• Works for MAR: – A new pedestrian overpass at the opposite end of the station to the existing concourse to accommodate passenger interchange – Works to existing station facilities to enable delivery of MAR – Upgrades to active transport facilities within the Sunshine Station precinct – Construction of additional car parking at Sunshine Station western car park • Opportunity to improve resilience of regional train services through earlier delivery of scope from WRP: – New Platform 5 on the opposite side of the existing Platform 4 including extension of existing concourse and relocation of fuel pipeline
Additional scope	• Redevelopment of Sunshine Station, including new concourse and track reconfiguration • Three new regional platforms built and commissioned, enabling future service uplift at Sunshine Station • Active transport improvements around Sunshine Station • A new bus interchange • Replacement of east-west Hampshire Road overpass • Likely relocation of the nearby fuel pipeline

Figure 6-8: Options for Sunshine Station scope

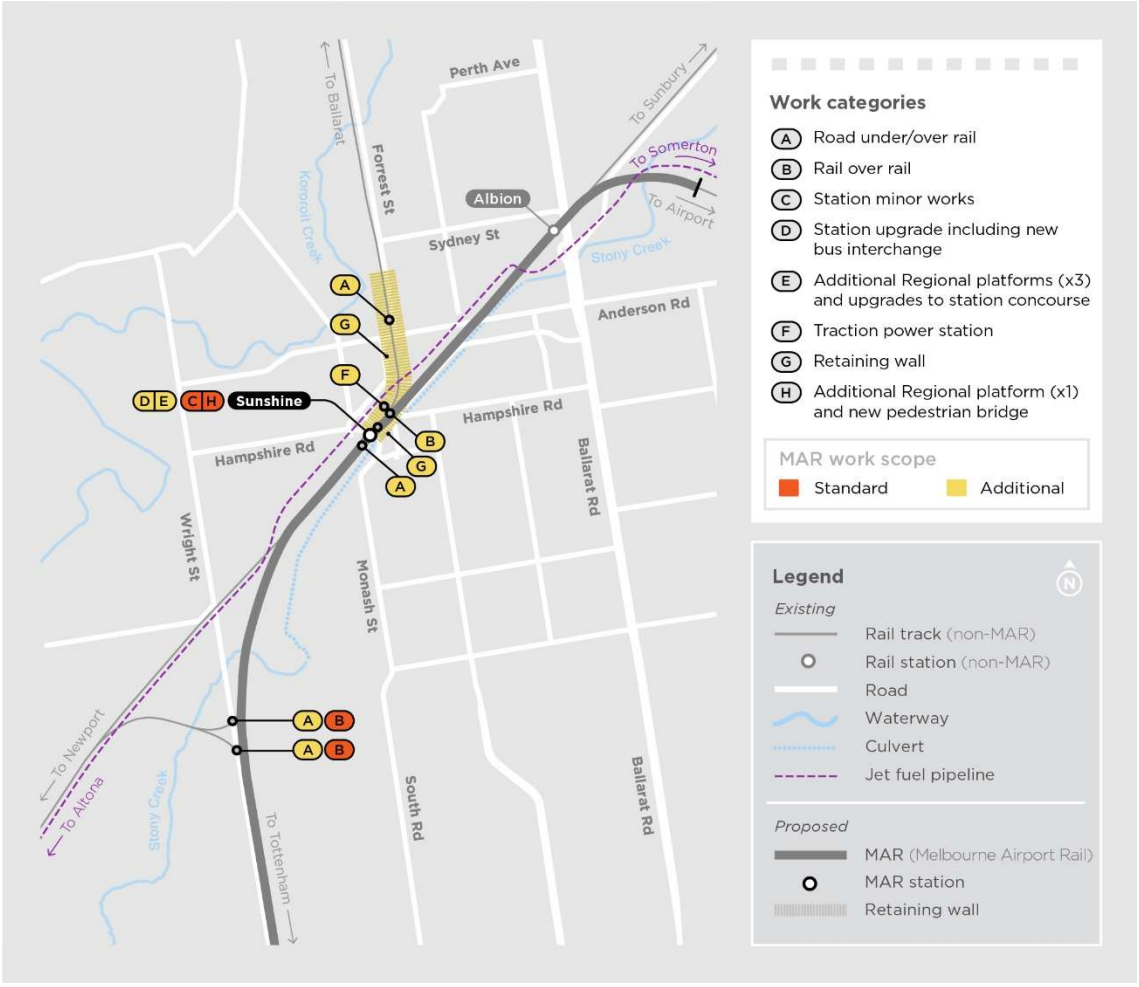


Table 6-14: Assessment of Decision C2 against evaluation criteria

Evaluation criteria	Assessment
Customer experience and transport system outcomes	The upgrades to the station and surrounds included in the additional scope will provide passengers with a better departure, arrival and interchange experience by improving pedestrian flows and connections to other transport services and modes. There is a risk associated with delivering these works early under MAR, being that the resulting infrastructure may constrain the solutions for the works planned in the WRP, which are not fully developed at this stage. There is also a risk that, as a result of future design development for the WRP, these works if delivered under, MAR become redundant.
Environmental, heritage, property and community impacts	The upgrades to Sunshine Station and surrounds included in the additional scope will have positive impacts on the community by increasing the amenity of the station and surrounding area and blending it into the greater Sunshine precinct. Delivering the additional scope early will increase the potential negative impacts of MAR on the environment, heritage and the community including additional disruptions and noise, increased concrete volumes and energy use contributing to embedded greenhouse gas emissions, and additional works in the vicinity of the HV McKay Memorial Gardens, which is heritage listed. It will also require commercial, residential, and community land acquisition that may otherwise not be required until additional projects described in the WRP are funded. However, if the additional scope is delivered by future projects rather than MAR, the potential negative impacts on the environment, heritage and the community discussed above will only be deferred, not avoided. Additionally, the effort to manage the risk of these impacts is likely to be higher overall as some of the mitigations and controls to be implemented for MAR may need to be applied again in the future for subsequent projects. It is noted there is a potential to reduce the overall disruption to the community during construction by delivering the additional scope in occupations already required for MAR. This may decrease the number, or the length of, future occupations for works for future WRP projects. Additionally, this will reduce the risk of disruption to MAR services in the future.
Deliverability	Delivering the additional scope will significantly extend the delivery timeframe for MAR in this geographical area and potentially for the whole project primarily due to the works relating to the concourse, Hampshire Road overpass, intermodal connections and track works.
Cost implications	Delivering the additional scope will significantly increase the cost the scope at Sunshine Station, i.e. by 190 per cent. This significant additional cost in the short-term is for scope that does not contribute to the targeted benefits of MAR, and instead contributes to the benefits targeted by future projects such as WRP, which have not yet been economically assessed. Additionally, delivering the additional scope may incur additional future costs for re-work if the work completed earlier under MAR does not align with the future projects' scopes once they are further developed. Delivering the standard scope will result in minor redundant works if WRP works occur in the future.
Assessment outcome	
The **standard scope** is the preferred option as it is significantly less disruptive, can be delivered in a shorter timeframe, and appropriately allocates relevant project costs to MAR, excluding costs associated with future projects such as those delivered as part of WRP, that have not yet been fully assessed or secured funding. It does not preclude any future investment and preserves flexibility for future projects in the area.	

6.6 Study area D: Line-wide

As highlighted in Chapter 5, the MAR alignment will connect into the Sunbury line between Albion and Sunshine stations, enabling Melbourne Airport services to travel into the CBD via the Metro Tunnel. As a result, line-wide scope items such as rolling stock, train control and signalling and traction power, must be interoperable with those being incorporated into the Metro Tunnel and are dependent on the delivery of:

- HCMTs by the HCMT Project
- HCS system implementation and deployment
- infrastructure upgrades including traction power necessary to support the HCMT and volume of train services.

6.6.1 Decision D1: Rolling stock configuration

Integration with the Metro Tunnel requires MAR to operate HCMTs to achieve compatibility with the Metro Tunnel network, platform screen doors and stabling facilities. Consistent with the Metro Tunnel, MAR will enable Day 1 operation of the HCMT-7 designed to minimise boarding and alighting times.

Five additional HCMTs are required to accommodate the Day 1 service plan for MAR (in addition to those HCMTs already on order by the government). The technical requirements and specifications will be consistent with the existing HCMT Project. Consistent with the Metro Tunnel, the Airport Station will be designed to accommodate the operation of 10-car HCMTs in the future.

6.6.2 Decision D2: Traction power intake configuration

Given the critical interface between MAR and the Metro Tunnel, the new MAR track pair will be electrified to 1500V DC to ensure compatibility with the HCMT rolling stock. Initial traction power modelling and a substation location assessment indicates that six (four new and two existing) 1500V DC substations will be required to support the new traction power system. The new substations will be indicatively located at McIntyre Siding, Fullarton, Airport Drive and Melbourne Airport. The High Voltage (HV) supply to these substations has two options for configuration as described in Table 6-15.

The assessment of Decision D2 against the evaluation criteria is provided in Table 6-16.

Table 6-15: Options for the traction power intake configuration

Option	Description
Single 66 kV intake	• A single, metered 66kV supply is taken from the electricity service provider and 22kV is then privately distributed to the substations • MAR will deliver: – a 66kV to 22kV feeder station – four new 22kV substations – a 22kV distribution ring to provide 22kV to each of the four substations.
Multiple intakes	• Each substation is a separate, individually metered, supply (either 66kV or 22kV – to be confirmed) from the electricity service provider. • The Project will deliver: – four new substations (either 66kV or 22kV).

Table 6-16: Assessment of Decision D2 against evaluation criteria

Evaluation criteria	Assessment
Customer experience and transport system outcomes	There is no anticipated difference between the options with regard to customer experience. The option for a single 66 kV intake with private distribution of 22kV to the four substations provides the Department of Transport (DoT) with the ability to use the single intake to support other railway power loads (e.g. at train stations) without additional supply connection requests to the electricity service provider, providing more flexibility for future power needs of the transport network.

Evaluation criteria	Assessment
Environmental, heritage, property and community impacts	The option for a single 66 kV intake with private distribution of 22kV to the four substations results in additional infrastructure being delivered within the rail corridor, which will minimally increase the potential environmental and community impacts with respect to noise, disruption, excavation and embedded greenhouse gas emissions associated with concrete use. However, this is not expected to be significant.
Deliverability	The option for a single 66 kV intake with private distribution of 22kV to the four substations results in additional infrastructure being delivered, which may increase the delivery timeframes for this package of works. There are some complications relating to distributing the 22kV along the railway including provision of appropriate bending radius in cable containments, appropriately sized pits, separation from other services and the weight associated with pulling the cable through conduit. However, the likelihood the required supply from the electricity service provider is available is higher for the single 66kV intake option. The multiple intakes option may require extensive upgrades to the electricity service provider's network to supply the capacity at each substation location.
Cost implications	The option for a single 66 kV intake with private distribution of 22kV to the four substations results in additional infrastructure being delivered, increasing the capital cost of the works. However, there will be a significant saving in operational expenditure due to reduced tariffs that will offset this increase.
Assessment outcome	
The **single 66kV intake** option is the preferred option as it provides additional flexibility for future transport power needs of the transport network, is more likely to be available from the electricity service provider without upgrades to their infrastructure and reduces the energy tariffs applicable for the energy use.	

6.6.3 Decision D3: Train control and signalling solution

This decision assessed the train control and signalling solution to implement for MAR and was influenced by the interface with the Metro Tunnel. This is because of the need to interface with the Sunbury line track pair and the HCMT fleet, as well as the need to have the solution ready for Day 1 operations of MAR. Two main train control and signalling options were analysed and are outlined in Table 6-17. The assessment of Decision D3 against the evaluation criteria is provided in Table 6-18.

Table 6-17: Options for train control and signalling solution for Day 1 of MAR operations

Option	Description
Conventional train control and signalling	• Signalling solution for Day 1 of MAR operations uses conventional train control and signalling from Sunshine Station to the Airport Station for the new MAR infrastructure • Assumes conventional train control and signalling remains in place from West Footscray Station to Sunshine Station • Assumes HCS will be deployed from West Footscray to Melbourne Airport, and West Footscray to Watergardens in the future
High-Capacity Signalling (HCS)	• Signalling solution for Day 1 of MAR operations uses HCS from Sunshine Station to the Airport Station for the new MAR infrastructure

Table 6-18: Assessment of Decision D3 against evaluation criteria

Evaluation criteria	Assessment
Customer experience and transport system outcomes	The HCS option enables the MAR service to meet the required run times between Airport Station and Sunshine Station. The conventional signalling option results in less flexibility to meet the required run times, which results in a more severe impact to run times in degraded mode scenarios. HCS for the MAR infrastructure provides higher system availability and more reliable services particularly when combined with HCS extending from West Footscray to Ginifer due to the complex interactions of Bendigo passenger services, Sunbury and Watergardens services, and Melbourne Airport services merging movements at Sunshine.

Evaluation criteria	Assessment
Environmental, heritage, property and community impacts	There is no anticipated difference between the options with regard to environmental, heritage, property and community impacts, with both options expected to have minor or insignificant impacts.
Deliverability	The conventional train control and signalling option has a high degree of delivery certainty as the technology and industry capability to deliver, operate and maintain the technology is mature. The HCS option is highly dependent on the completion of the MTP and the deployment of HCS between West Footscray and Ginifer stations, and so introduces additional project schedule risk.
Cost implications	The conventional train control and signalling option will cost less in the short-term, but more in the long-term when HCS is extended to support future WRP service plans. The HCS option will cost less in the long term as it avoids the cost of designing and delivering the conventional train control and signalling system beyond what is needed for interim stage works at Sunshine. Additionally, the cost to implement HCS is minimised as the majority of the HCMT fleet will already be fitted with on-board HCS equipment which is a significant contributor to the total cost of implementation.
Assessment outcome	
HCS is identified as the preferred option for the Day 1 train control and signalling solution for MAR as it achieves the MAR journey time objectives and is the most cost-effective solution.	

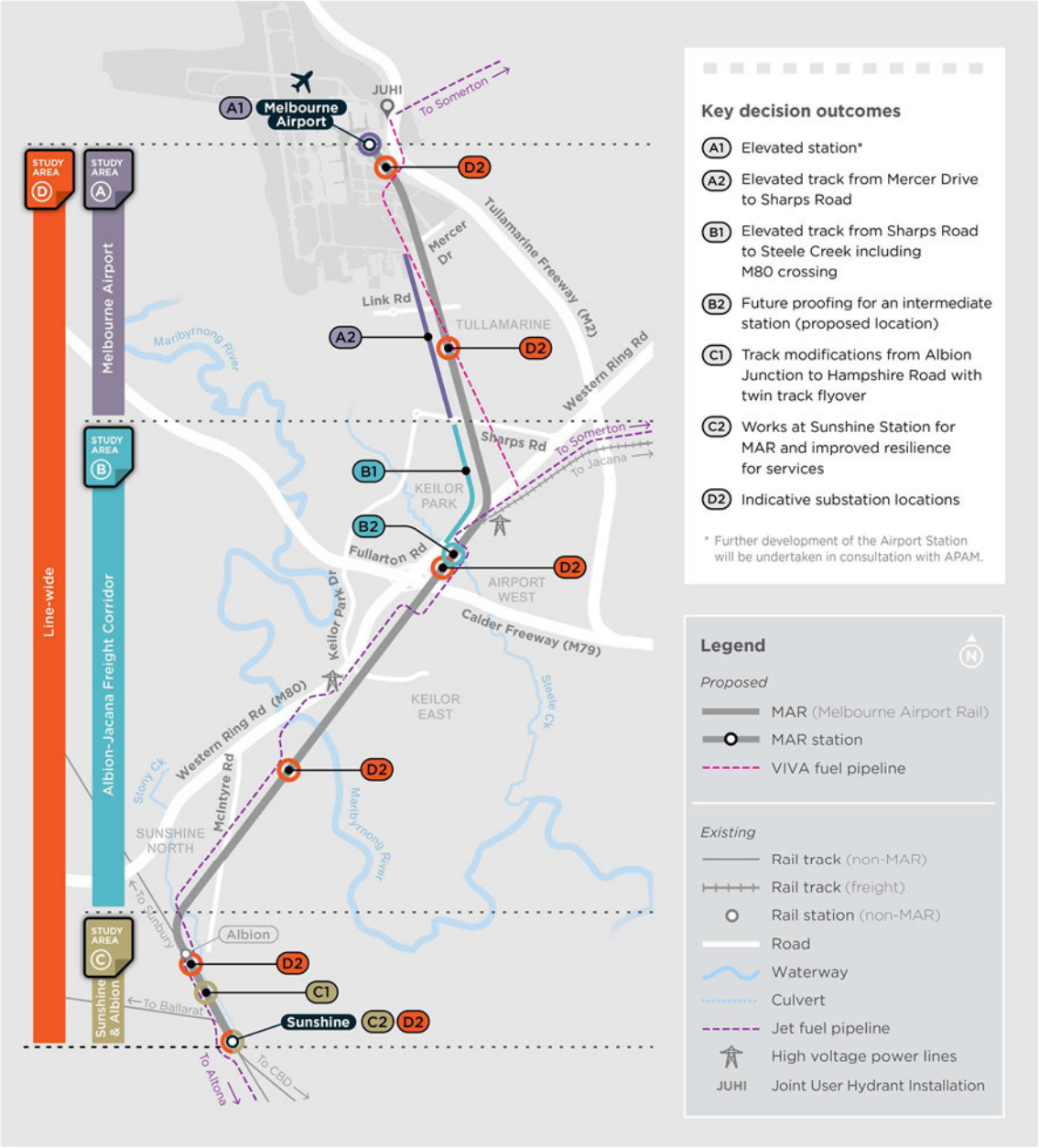
6.7 Summary of recommended project solution

After assessing options for the key decisions represented across the four study areas, the scope of the recommended project solution for MAR includes:

- an elevated station at Melbourne Airport
- a track pair starting at the Airport Station and transitioning into an elevated viaduct at Mercer Drive that continues across Sharps Road and over the Western Ring Road (M80) – the track continues on an embankment toward and through the Albion-Jacana freight corridor from Steele Creek, including a new bridge crossing over the Maribyrnong River, and a double track flyover past Albion Station after which the track merges into the Sunbury line just before entering Sunshine Station
- future proofing for an intermediate station (proposed at Keilor East)
- works at Sunshine Station to enable delivery of MAR
- potential enhancements in and around Albion Station where opportunities are available
- line wide rolling stock, traction power and train control and signalling solutions that are interoperable with those being incorporated into the Metro Tunnel.

Figure 6-9 summarises the scope of MAR, identifying the key options recommended for each decision. The detailed assessments of the options that support this chapter are set out in Appendix 2: Project options analysis.

Figure 6-9: Scope of MAR with key decision outcomes



6.8 Interfacing and interdependent projects

A number of projects have interdependencies or interfaces with MAR.

- Interdependent projects are those where the benefits and timing of either the project and/or MAR are dependent on the delivery of the other.
- Projects that interface with MAR, while not driving benefits, require coordination and agreement between the projects to manage the interface which may be geographical, system, stakeholder and/or construction related.

Interdependent and interfacing projects are described in the following sections and summarised in Appendix 3: MAR Investment Context on a Page.

6.8.1 Interdependent projects

The following projects are interdependent with MAR:

- Metro Tunnel Project – MTP is delivering a 9-kilometre twin tunnel, five underground stations, HCS and related rail infrastructure on the Sunshine to Dandenong corridor including infrastructure on the wider Metropolitan Rail Network. This will create a new Sunshine-Dandenong Corridor and discrete metro services that integrates the Sunbury, Pakenham and Cranbourne line services. MAR will connect in with the Sunshine-Dandenong Corridor at a location on the upside of Albion Station. MAR must have compatible signalling, rolling stock, traction power and operational parameters to the Sunshine-Dandenong Corridor. The realisation of the full benefits of MAR is dependent on the full delivery and operation of the Metro Tunnel.
- Dandenong Corridor Readiness Works – This is currently unfunded. These works are critically interdependent with the MTP. The realisation of the full benefits of MAR is dependent on the full delivery and operation of the Metro Tunnel, which is in turn dependent on Dandenong Corridor Readiness Works.
- HCMT Project – The current HCMT Project is progressively delivering HCMT-7s to operate initially on the Dandenong, Cranbourne and Pakenham services via the Caulfield Loop and upon the opening of the Metro Tunnel, Sunbury services will be included. As MAR will integrate with the Sunshine-Dandenong Corridor, it is expected that a homogenous fleet of HCMT will run on the corridor including MAR. MAR is dependent on the HCMT Project delivering 65 HCMT-7s for Day 1 services for the Metro Tunnel. MAR requires an additional five HCMT-7s to meet the proposed service timetable.
- Western Rail Plan – WRP aims to progressively increase capacity and service performance on the Wyndham Vale and Melton lines, as well as improve run times, capacity and performance on the Geelong and Ballarat lines to support growing demand and policy intent. It is expected that before Day 1 of MAR operations, longer trains will run through Sunshine Station and so regional platforms at Sunshine Station will be extended before Day 1 of MAR operations as part of WRP.

6.8.2 Interfacing projects

The following projects interface with MAR:

- Suburban Rail Loop – SRL is an orbital rail line providing passenger connections to most existing suburban rail line services and MAR between Melbourne Airport and Sunshine forms a key part of this. It is currently intended that MAR and SRL passengers that intend to pass through rather than terminate at Melbourne Airport will interchange at Melbourne Airport Station.
- Geelong Fast Rail – Geelong Fast Rail aims to progressively improve travel times between Geelong and the CBD. Geelong services currently move through the Sunshine corridor and stop at Sunshine Station.
- Inland Rail Project – The Victorian Government is in discussion with the Australian Government and ARTC to finalise the scope of the Victorian portion of the Inland Rail Project. However, the following network assumptions underpin the MAR project:
  - no double-stacked trains will travel on the Albion-Jacana alignment south of Somerton
  - Tottenham will not be used as an intermodal terminal.

  If the above conditions were not met, it would result in significant additional MAR scope and project timelines and potentially affect freight and passenger service performance.
- Melbourne Airport Elevated Road Projects – APAM will be building a network of elevated roads to improve traffic flow into and around Melbourne Airport. This work will be delivered in four stages which are outlined in the *Melbourne Airport Master Plan*. MAR will coordinate with APAM to ensure alignment of interfaces as the projects progress.
- Cross-City Line Upgrade – The Cross-City Line Upgrade Project is one of the ‘Wider Network Enhancement’ projects in the MTP business case that proposes to connect the existing Sandringham, Werribee, Williamstown and Laverton Lines upon the opening of the Metro Tunnel,

allowing an uplift in service frequencies on these lines. This will impact interchange behaviour with MAR services at Footscray Station.

- Melbourne Airport Intermediate Station – DoT is planning an intermediate station along the MAR corridor at Keilor East, and MAR will future proof for this station as outlined in section 6.4.2.

6.9 Design intent statement

MAR represents a landmark opportunity to deliver a positive legacy for Victoria. The way the Project is designed and integrated with the surrounding context will have lasting outcomes for local communities and contribute to Victoria's reputation as a great place to live, visit and do business.

MAR will deliver significant urban design and architectural outcomes for rail customers, local communities and all Victorians. New infrastructure and public realm delivered as part of MAR will support active transport and leave a positive legacy of people-focused outcomes. MAR will traverse a range of natural and urban settings. An urban design strategy will be developed to provide guidance on how MAR should respond to these unique locations, while creating an identity that makes MAR recognisable and memorable as a global connection.

Five key directions have been established to underpin the urban design and creative strategies for MAR:

- great journeys
- connect communities
- unique places
- living histories
- celebrate Victoria.

6.10 Scalability

RPV has assessed the scalability of the recommended solution to confirm whether it is possible for the Victorian Government to support MAR at a lower cost. The assessment considered five scalability options, which were determined to either not be viable, or not result in a material decrease in the MAR cost. The results are shown in Table 6-19.

Table 6-19: Assessment of MAR against typical scalability options

Scalability option	Assessment
Modular, prioritised solutions	It is not possible to deliver a new service to Melbourne Airport from the CBD in modules. Modules defined by geography would not allow the service to travel the full length. Modules defined by infrastructure types (e.g. structural, electrical, and civil) would not allow the train to run safely on the existing metropolitan train network.
Piloting	It is possible to pilot a new service to Melbourne Airport from the CBD with an integrated heavy rail solution, via the Metro Tunnel. However, to do this, MAR would be required to deliver all infrastructure between Sunshine and Melbourne Airport and updates to train control systems to allow a train to safely run. This would result in the delivery of the full project and would not lower the cost, and the benefits would be greatly reduced.
Targeting specific cohorts and then expanding the service more broadly	Similar to piloting, it is possible to target specific cohorts and then expand the service more broadly. However, to do this MAR would be required to deliver all infrastructure between Sunshine and Melbourne Airport and updates to train control systems to allow a train to safely run. This would result in the delivery of the full project and would not lower the cost, and the benefits would be greatly reduced.

Scalability option	Assessment
Adjusting frequency, quantity, or level of service provision	The frequency and journey time of MAR services could be reduced, however the cost would not materially decrease, and the benefits would be greatly reduced through the following: • decreased passenger experience outcomes • reduced patronage on MAR.
Phasing options	It is not possible to deliver a new service to Melbourne Airport from the CBD in phases. Phases defined by geography would not allow the service to travel the full length. Phases defined by infrastructure types (e.g. structural, electrical, and civil) would not allow the train to run safely on the existing metropolitan train network.

7
Value creation and capture

7. Value creation and capture

Chapter summary

- RPV and the DoT are committed to creating and capturing additional value above and beyond what would ordinarily be achieved by MAR by applying the Victorian Government's *Value Creation and Capture Framework* (VCC Framework).
- Through research and stakeholder consultation, RPV has identified and validated value creation and capture (VCC) opportunities and has developed them into VCC mechanisms for MAR.
- During procurement, RPV will request market respondents to propose additional VCC mechanisms.
- VCC mechanisms will be implemented in accordance with the Project's existing governance and delivery framework.
- The following Value Creation mechanisms have been developed for MAR at the time of the Business Case:
  - digital engineering
  - urban design strategy
  - creative strategy
  - procurement conditions
  - sustainability strategy
  - MAR Project Hub
  - partnership with tertiary education
  - active transport networks
  - digital maps.
- The following Value Capture mechanisms have been developed for MAR at the time of the Business Case:
  - advertising opportunities
  - VicTrack infrastructure
  - farebox revenue
  - partnerships with airlines.

7.1 Context

The Victorian Government's VCC Framework puts value creation and equitable value capture at the centre of how government departments and agencies think about public projects. The VCC Framework aims to improve productivity, increase access to jobs and employment, enhance public amenity and unlock commercial activities. It also supports a wide range of policy outcomes such as industry and skills development, affordable housing, the provision of open space and community facilities, and energy efficiency.

In accordance with the VCC Framework, MAR is a high value construction project with potential for significant VCC opportunities. RPV is committed to delivering outcomes in accordance with the VCC Framework and is progressing the development and inclusion of VCC mechanisms into MAR to create additional public value above and beyond what would ordinarily be achieved by the Project.

7.2 Approach

The VCC Framework requires compliance with five stages shown in Figure 7-1 to identify and progress VCC opportunities throughout the life of the Project and delivery of the following outputs.

- Statement of Intent – an outline of the Victorian Government's policy objectives for the Project, including broader objectives relevant to VCC.
- Strategic VCC Plan – an outline of VCC opportunities proposed to be pursued, including an analysis of associated benefits and costs.
- Detailed VCC Plan – a VCC plan prepared for the full Business Case.

Figure 7-1: VCC stages

As part of developing this Business Case, the stages for identification and analysis in the VCC stages have been further broken down into the four-stage approach described in Table 7-1. This project approach to VCC was reviewed and approved by the Department of Premier and Cabinet (DPC) with the VCC Statement of Intent.

Table 7-1: Project approach to VCC

Stage	Aim	Required activities	Output
Stage 1 Identify	To identify potential **VCC opportunities** through stakeholder consultation.	• Initial research • Initial stakeholder consultations • Whole of Government workshop • Compile list of proposed VCC opportunities	Proposed VCC Opportunities
Stage 2 State Intent	To develop the **VCC objectives and outcomes** for the Project.	• Develop VCC objectives and outcomes from the list of proposed VCC opportunities • Confirm alignment of proposed VCC opportunities with government policies • Prepare Statement of Intent	Statement of Intent
Stage 3 Develop	To develop **VCC mechanisms** that align to the VCC objectives and outcomes.	• Conduct preliminary qualitative validation of proposed VCC opportunities • Refer relevant opportunities to DPC or other departments/agencies as appropriate • Develop VCC mechanisms from the list of validated VCC opportunities • Document at a high-level the costs, benefits, risks of each VCC mechanism • Prepare Strategic VCC Plan	Strategic VCC Plan
Stage 4 Plan	To further develop and detail the VCC mechanisms and **plan for implementation.**	• Document the detailed costs, benefits, beneficiaries, risks, issues, mitigation and implementation requirements of each VCC mechanism • Collate the analysis conducted throughout the VCC process for the Project • Prepare Detailed VCC Plan	Detailed VCC Plan

RPV has engaged with a range of Victorian Government departments and agencies throughout the VCC process. This engagement included individual consultations and a VCC workshop held by RPV and DPC, which facilitated the collation of 225 VCC opportunities in Stage 1. The broader consultation process for VCC opportunities has focused primarily on value creation opportunities, however some value capture opportunities have been identified and progressed.

These opportunities have been validated against DPC's VCC Guidelines for selecting appropriate VCC mechanisms, which provides clarification that opportunities should be assessed by the department using the VCC Framework only where the opportunity:

- has a time imperative to be completed concurrently to MAR
- is achievable as a result of the development and delivery of the MAR scope
- warrants further investigation
- remains viable following material MAR scope changes.

Some of the opportunities that have not been further assessed as part of MAR, based on the above criteria, have been referred to DPC where appropriate (see section 7.6) for discussion and potential development with other government departments.

Over-Site Development (OSD) has not been further assessed as part of MAR. RPV completed an analysis of the estimated costs and expected benefits of OSD at the Airport Station, between Sunshine Station and the Airport Station, at Sunshine Station and at Albion Station with the following conclusions:

- Airport Station – OSD at Airport Station is under the jurisdiction of APAM and is not currently considered in the existing Melbourne Airport Master Plan. In addition, the outcome of the multi-criteria options analysis for the vertical alignment of the Airport Station concluded that an elevated station is preferred (see section 6.3.1), which further reduces the viability of OSD.
- Between Sunshine and Airport Stations – OSD along the rail corridor between these stations was not considered viable due to the value of land adjoining the rail corridor in these areas
- Sunshine Station – OSD at Sunshine Station was not considered viable in the context of cost, complexity and risk associated with development, the presence of more economical

redevelopment and urban renewal opportunities in the vicinity and the need to retain flexibility for future significant work at and around Sunshine Station associated with the WRP. The MAR works do not preclude OSD being considered and delivered as part of this future work.

- Albion Station – OSD at Albion Station was not considered viable because of the value of land surrounding the station, ample development opportunities at the adjoining Albion Triangle site and heritage constraints relating to the Darling Flour Mill.

The remaining VCC opportunities have been further shortlisted based on value demonstrated, and then translated into a number of VCC mechanisms that seek to group common VCC opportunities and implement them. A significant proportion of the VCC mechanisms have been introduced into the MAR scope through either the application of the VCC process, or concurrently through the application of the RPV Project Management Framework and Investment Management Lifecycle. These mechanisms are summarised in section 7.3.

7.3 Value creation

7.3.1 Digital engineering

Digital engineering is a convergence of technologies such as Building Information Modelling (BIM), Geographic Information Systems (GIS) and other related systems for driving better businesses, projects and asset management outcomes.

RPV has developed a *Digital Engineering Data Package Completion Guideline* (DE Guideline) that will be used on MAR. Work is being undertaken to determine the scope of digital engineering on MAR. It is anticipated that it will include the use of BIM, GIS and tagged data relating to asset classes at different levels.

Asking delivery partners to use digital engineering to develop and deliver MAR may improve communication between all stakeholders from the ability to visualise what is to be built, improve budgeting and cost-estimating capabilities, reduce the number of corrections made on site by improving collision-detection during design, increase the reliability of expected field conditions, reduce costs by using more prefabricated materials, reuse of information on subsequent projects, and improved handover of asset information to the asset owner, maintainer and operator for the maintenance and operations phase of the asset for improved asset management and operational outcomes.

7.3.2 Urban Design Strategy

As outlined in the design intent statement in section 6.9, an Urban Design Strategy has been developed for MAR to inform the architectural design and line-wide identity of the stations and the MAR rail corridor. The Urban Design Strategy will be translated into project scope and technical requirements (PS&TRs) for each of the relevant work packages. Implementation of the Urban Design Strategy will support the delivery of high-quality and context-sensitive design outcomes that will improve local amenity, enhance the function and identity of activity centres along the rail corridor and ensure a positive passenger experience.

7.3.3 Creative Strategy

Complementary to the Urban Design Strategy, the Creative Strategy sets out the vision and requirements for creative outcomes to support the design vision and directions of MAR. The Creative Strategy identifies key temporary and legacy creative opportunities and intervention sites along the alignment, including at Melbourne Airport. Implementation of the Creative Strategy will deliver high quality creative outcomes that will improve the identity and amenity of the local environment, enhance the passenger experience, and improve engagement between MAR and local communities.

7.3.4 Procurement conditions

RPV will include conditions in the procurement of work packages to achieve policy objectives such as industry and skills development, preferential procurement (such as for recycled materials or businesses applying sustainable practices) or employment outcomes (such as for disadvantaged employees or traditional owner groups), open space, community facilities, resilience of infrastructure to climate change, or management of worker well-being, among others. Alignment of procurement activities under MAR to the Victorian Social Procurement Framework will support the delivery of multiple social and sustainable outcomes that benefit all Victorians. A key target for social procurement will be to use Victorian based Aboriginal and/or Torres Strait Islander-owned enterprises.

7.3.5 Sustainability Strategy

RPV is developing a Sustainability Design Strategy for MAR to inform the contractual requirements. This will inform the design and construction activities undertaken during delivery.

The benefits targeted by the Sustainability Strategy include:

- reduced greenhouse gas emissions over the asset's lifecycle
- reduced energy consumption
- reduced waste being disposed of in landfills
- maximised use of recycled and reused materials
- improved management of water resources
- enhanced health, wellbeing and quality of life of staff, commuters and adjoining communities
- support the Project to achieve a positive and enduring legacy
- build resilience to the projected impacts of climate change.

7.3.6 MAR Project Hub

RPV has explored the viability, impact and benefits associated with a MAR Project Hub to:

- provide information to the community and answer their questions or concerns in person
- employ and train local community members to staff the office
- provide space to display local artwork and showcase community opportunities
- act as a starting point and briefing zone to commence tours for schools, students and stakeholders
- provide an events space to celebrate MAR milestones and hold major MAR briefings.

Options are being investigated as to where the MAR Project Hub is to be located. This opportunity may facilitate economic stimulus and diversification of the workforce.

7.3.7 Partnership with tertiary education

After consultation with stakeholder groups, RPV has identified and assessed the viability, impact and benefits associated with establishing a partnership with tertiary education providers. This partnership would:

- increase participation in Science, Technology, Engineering, Art, and Mathematics education and research
- support innovation in the fields of transport and aeronautics
- support an increase in manufacturing in Australia
- increase the use of technology to improve project delivery.

This opportunity could include sponsorship or partnering with rail infrastructure managers, rail operators, constructors and design firms.

It is noted the under MTP's Tunnels and Stations package, the Cross Yarra Partnership and Holmesglen Technical and Further Education (TAFE) have established Metro Hub as a jobs and training centre for the work package. Additionally, the MTP has built the Victorian Tunnelling Centre at Holmesglen Institute's Chadstone campus to train and skill local workers in underground construction and tunnelling. RPV has also already built relationships with the Royal Melbourne Institute of Technology and the University of Melbourne, and the Level Crossing Removal Project has established a number or training and support programs that include relationships with tertiary education.

Under MAR, it is anticipated that any future partnership with tertiary education providers would either build on the existing relationships RPV has with tertiary education providers, or with institutions that are in proximity to the area impacted by the Project (for example, Victoria University).

Establishment of a partnership between MAR and tertiary education for rail skills centres and innovation may support economic outcomes through diversification of workforce, improving skills training, increasing the skilled workforce and increasing student enrolments in tertiary education.

7.3.8 Active transport networks

MAR provides a major opportunity to connect existing built sections of the strategic cycling network to improve connectivity along and across the rail alignment for improved community and customer access.

Delivery of new and upgraded active transport connections along the rail corridor and stations will enhance community access to public transport, employment, recreation, green spaces, goods and services, and potentially reduce the use of motor vehicles.

7.3.9 Digital maps

MAR may see digital screens installed for displaying network maps instead of static maps at stations. This would be aligned with a DoT strategy for a whole-of-network rollout of digital maps. The target benefit of this initiative is to decrease operational expenditure to update maps each time the rail network is augmented.

7.4 Value capture

7.4.1 Advertising opportunities

MAR will passively deliver space for advertising opportunities at stations such as floor, ceiling, wall, staircases, and columns. Additionally, MAR may actively deliver digital billboard infrastructure at stations. Provision for advertising opportunities at stations will generate revenue, and may contribute to increasing employment opportunities and economic stimulus. The revenue generated from advertising will help to offset the cost of operating the network (as per current franchise arrangements).

7.4.2 VicTrack infrastructure

MAR will deliver new VicTrack telecommunications infrastructure along the rail corridor. VicTrack will manage on-selling telecommunications services over the fibre or selling cores as dark fibre to capture value for the State. Provision of VicTrack infrastructure will contribute to the overall economic outcomes of the VicTrack telecommunications networks to generate revenue through selling telecommunications services and provide cost effective telecommunications services to State entities. The revenue is used to offset other VicTrack activities such as the remediation of contaminated land.

7.4.3 Farebox revenue

The economic analysis included in this Business Case assumes the ticket price for journeys to Melbourne Airport will include a premium over and above ticket prices of the metropolitan and regional transport system. For instance, travel to or from the city costs a single 2-hour full fare Zone 1 and Zone 2 ticket plus a premium for boarding or alighting at Melbourne Airport. The premium fare will generate revenue that could be used to offset the operational cost of MAR. The actual fare premium for MAR will be subject to a separate analysis and determined at a later point in time by the Victorian Government.

7.4.4 Partnerships with airlines

A partnership with airlines will be explored where the airline contributes to the capital or operational expense of MAR to receive in kind services.

Funding from airline partnerships could be used to offset the operational cost of MAR, and they may increase the patronage of MAR.

7.5 Innovation from the market

RPV will ask market respondents shortlisted for work packages to identify and propose opportunities to deliver additional value on, or capture value from MAR. This request will be made with accompanying principles and guidelines for appropriate VCC opportunities.

RPV will also explore asking market respondents to propose interventions relating to specific VCC mechanisms such as the Urban Design Strategy, Sustainability Strategy and Creative Strategy.

Where appropriate, shortlisted respondents will also be asked to propose their solution for meeting local content, sustainability and recycling targets that RPV are currently working to develop, under the procurement conditions mechanism.

7.6 Governance

The VCC mechanisms will be implemented in accordance with the existing project governance framework (see Chapter 16 for more detail) and as described in Appendix 4: Detailed VCC Plan. However, separate planning and environmental approvals may be required for some VCC mechanisms that have not been included in the planning and environmental approvals for MAR.

8 Benefits of MAR

8. Benefits of MAR

Chapter summary

- MAR will catalyse a range of impacts on Melbourne's public transport and road networks, delivering on the two key benefits outlined in the Investment Logic Map (ILM):
  - **Enhanced travel choice and outcomes for users travelling to and from Melbourne Airport** – The Project provides a foundation for enhanced accessibility and connectivity to and from Melbourne Airport with a faster and more reliable alternative to road-based travel, particularly in peak periods. This higher quality service will promote increased public transport usage and release capacity across the road network, particularly on the key access routes to the airport. The enhanced travel choice and outcomes for users of MAR include:
    - **Improved public transport connectivity for airport users** arising from:
      - **Delivering greater public transport capacity** – with turn-up-and-go services every 10 minutes, MAR will deliver a one-way capacity approximately fourteen times that of the current Melbourne City Express SkyBus service.
      - **Facilitating easier transfers across Victoria's rail network** – the alignment via Sunshine Station will provide direct access to both the metropolitan and regional rail networks. As a result, MAR will substantially increase the catchment of users who can practically access the airport by public transport.
      - **Enabling a one-seat journey for users along Melbourne's busiest rail corridor** – MAR will provide a one-seat journey to and from the airport for users along the Sunshine to Dandenong corridor, increasing trip reliability, reducing transfer time and the inconvenience associated with moving luggage.
    - **Reduced travel times to and from the airport by public transport** – in peak periods, MAR will deliver a faster journey between Melbourne Airport and the CBD (30 minutes), compared with Melbourne City Express SkyBus, where the journey time is projected to be 40 minutes in 2031 and 66 minutes in 2056.
    - **Increased public transport use** – MAR will incentivise a shift to public transport with enhanced connectivity and reduced travel times to Melbourne Airport through:
      - **MAR patronage** – Public transport patronage increases significantly under MAR, with patronage growing from 20,000 to 51,000 between 2031 and 2056. Across the same period, the Melbourne City Express SkyBus patronage will grow from 19,000 to 28,000.
      - **Public transport trips to and from Melbourne Airport** – MAR will increase the number of airport trips made by public transport across all regions. A sizeable proportion of these public transport trips will occur during peak periods, taking cars off the road in the most congested period.
    - **Improving car journey times to and from the airport** – By 2056 the shift of users travelling to and from the airport on public transport instead of by car will be significant, with larger travel time savings for those travelling longer distances to access the airport, even after the impact of induced demand is incorporated.
  - **Improved productivity and competitiveness for Victoria** – Beyond improved access to and from the airport, the mode shift to public transport due to MAR reduces congestion on key arterial roads across Melbourne. As Melbourne's arterial network is a key carrier of the city's freight task, the travel time savings will reduce input costs and help boost productivity for local exporters and businesses importing goods.
- The demand impact of COVID-19 was assessed through a sensitivity scenario which considered lower population and employment growth, an increase in working from home and a short-term reduction in air travel. Under this scenario, daily MAR patronage decreased 5 to 6 per cent compared with the Project Case.

8.1 Introduction

The delivery of MAR will catalyse direct and indirect impacts on Melbourne's rail and road network. The analysis in this chapter explores the benefits of connecting Melbourne Airport to the metropolitan and regional rail networks. As stated in the ILM, the two key benefits from addressing the problems identified in Chapter 2 are:

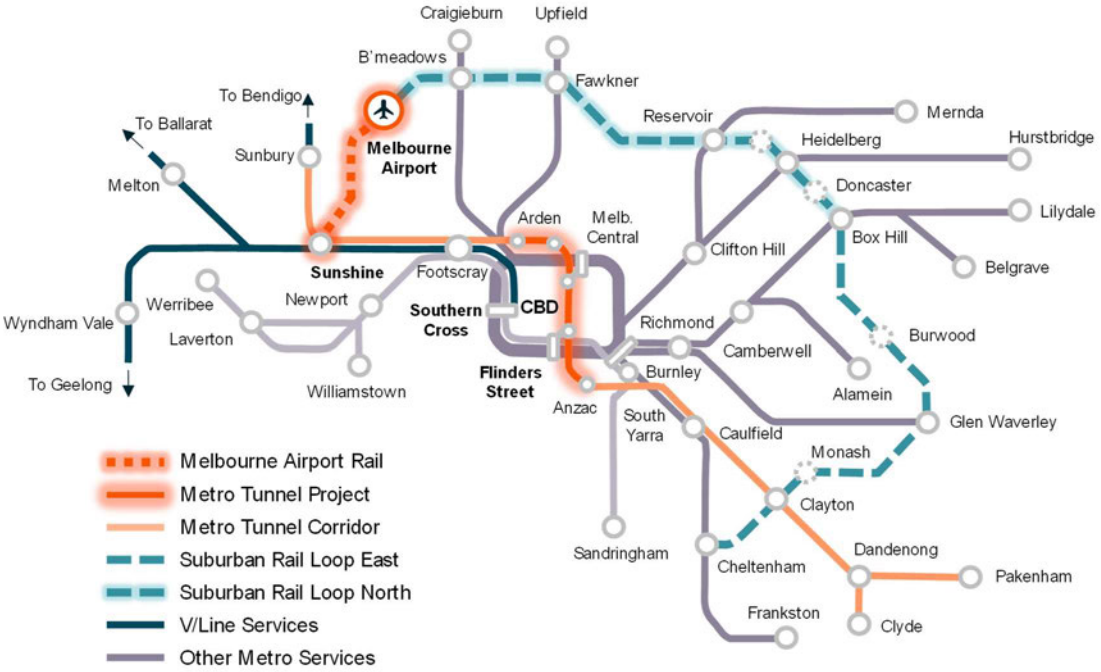
- Benefit 1 – Enhanced travel choice and outcomes for airport users travelling to and from Melbourne Airport.
- Benefit 2 – Improved productivity and competitiveness for Victoria.

The analysis in this chapter presents the benefits of MAR excluding the SRL North connection to Melbourne Airport in 2051. The analysis presented reflects the AM peak period due to the significant benefits accrued in peak periods. The detailed transport network impacts underpinning the analysis, including the impact of the SRL North connection to Melbourne Airport, are provided in Appendix 5: Demand modelling.

8.2 Service uplift delivered by MAR

A rail link to Melbourne Airport will provide access from the airport to the rest of the metropolitan rail network as shown in Figure 8-1. A rail link creates multiple entry and exit points for airport services within the Melbourne CBD via the five new stations in the Metro Tunnel, and through indirect links to the City Loop via Melbourne Central and Flinders Street stations (accessed via underground walkway from State Library and Town Hall stations). MAR will also provide direct access to the south-east along the Metro Tunnel corridor to Pakenham and Cranbourne/Clyde and enables transfers to the regional Bendigo, Ballarat and Geelong lines at Sunshine.[106]

Figure 8-1: MAR within the broader rail network



The service uplift from MAR includes:

- Direct 6tph service from Melbourne Airport to the south-east of Melbourne via Sunshine and the CBD. This will reduce travel times for air passengers along this corridor and enable a one-seat

[106] For the purposes of this analysis, the Metro Tunnel corridor is defined as the corridor from Sunbury to Pakenham / Clyde. Services on this corridor will operate through the Metro Tunnel once operational. MAR services will operate on the Metro Tunnel corridor between Sunshine and Pakenham / Clyde.

journey to / from the airport (compared with the Melbourne City Express SkyBus service) as well as increase capacity from Sunshine following the extension of West Footscray short-starters.

- Travel time of approximately 27 to 30 minutes between Melbourne Airport and the CBD during non-peak and peak periods, respectively.[107]
- Provision of HCMT-7 rolling stock, delivering public transport capacity of 6,600 people per hour (one-way) from the CBD to Melbourne Airport during the AM peak.

8.3 Benefit 1: Enhanced travel choice and outcomes for airport users travelling to and from Melbourne Airport

8.3.1 Improved public transport connectivity for airport users

MAR provides an alternative choice to road transport for accessing Melbourne Airport. MAR delivers improved public transport connectivity to the airport by increasing public transport capacity, facilitating easier transfers and providing a one-seat journey for airport users in the south-east of Melbourne and along the Metro Tunnel corridor. These factors contribute to increased public transport use and substantial mode shift from road to public transport.

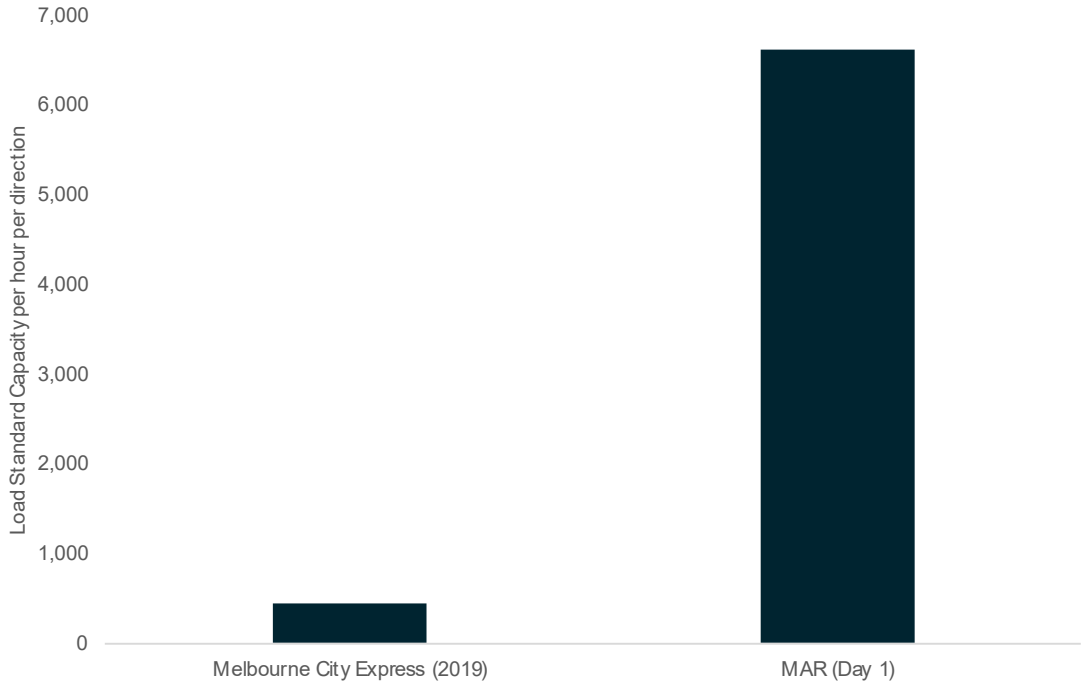
8.3.1.1 Delivering greater public transport capacity

The delivery of heavy rail to Melbourne Airport significantly improves existing public transport capacity to the airport. The Melbourne City Express SkyBus service has a capacity of 75 passengers and currently runs every 9 to 10 minutes, providing a one-way capacity of 450 passengers per hour.

MAR will operate with the HCMT-7 on Day 1 of operations, with a capacity of 1,100 passengers. With a service every 10 minutes, MAR will deliver a one-way capacity of 6,600 passengers per hour, significantly increasing the capacity available compared to the current Melbourne City Express SkyBus service, as shown in Figure 8-2.[108]

[107] Based on operational modelling undertaken by RPV.
[108] It is possible that the Melbourne City Express SkyBus capacity may be expanded to cater to increased demand over the next decade. However, this will be limited by infrastructure constraints at Melbourne Airport / Southern Cross Station and the maximum capacity of buses.

Figure 8-2: Capacity uplift delivered by MAR to Melbourne Airport[109]



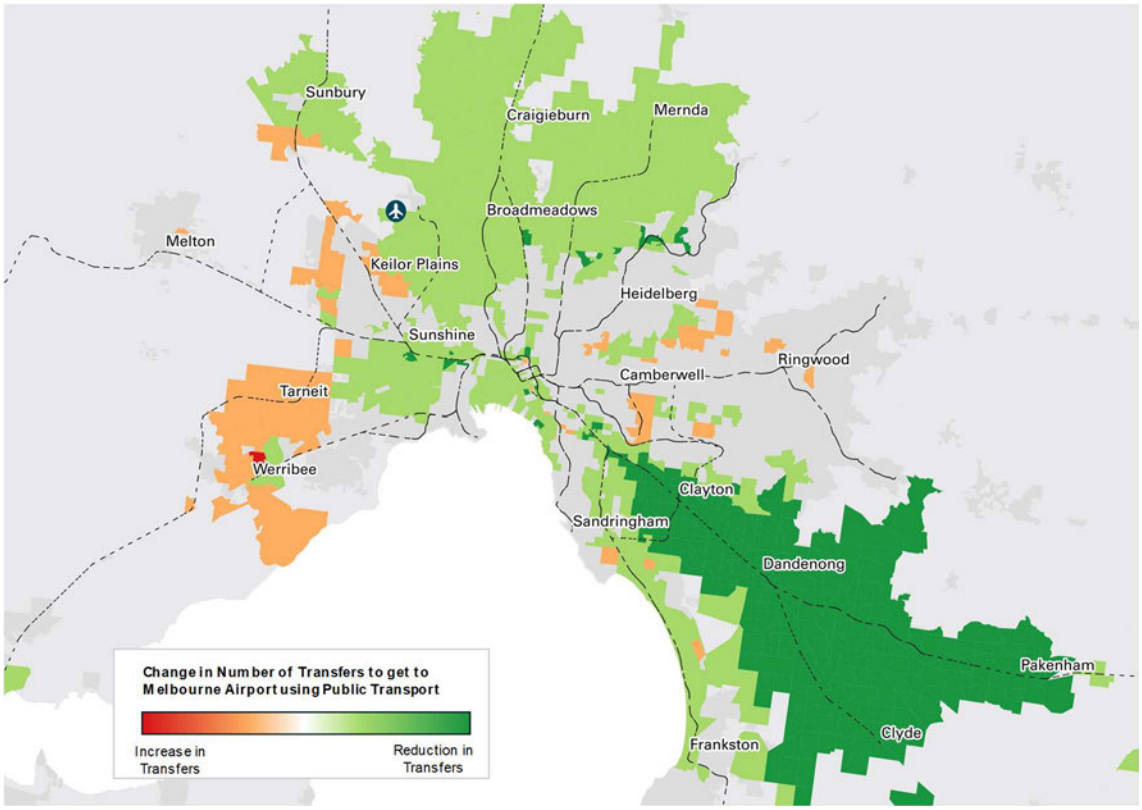
8.3.1.2 Facilitating easier transfers across Victoria's rail network

A rail link to Melbourne Airport enables airport users to connect to the rest of the rail network. The transfer point at Sunshine will provide direct access to the rest of the metropolitan rail network or to transfer to the regional rail network. This creates multiple entry and exit points for airport services within the CBD via the five new stations in the Metro Tunnel, and through indirect links to the City Loop via Melbourne Central and Flinders Street stations.

Routing airport services via Sunshine enables transfers to the regional Bendigo, Ballarat and Geelong lines. This means that MAR will substantially increase the catchment of users who can access the airport by public transport. This is highlighted in Figure 8-3 below, which shows a reduction in the number of minimum transfers required to reach the airport via public transport from across the State.

[109] VITM modelling undertaken by RPV (2020).

Figure 8-3: Change in number of minimum transfers required to reach Melbourne Airport by public transport with MAR (2031)[110]



8.3.1.3 Enabling a one-seat journey for users along Melbourne's busiest rail corridor

Almost 90 per cent of airport user trips are made to or from Greater Melbourne. Almost half of all trips to and from the airport are cross-city journeys from inner, south-east and eastern Melbourne and are made almost entirely on Melbourne's arterial road network.

Airport users located along the north-west/south-east diagonal currently need to interchange at least once to utilise the Melbourne City Express SkyBus service, with the majority of journeys originating in the south-east requiring two to three transfers. Only those located in proximity of Southern Cross Station currently have the option of a one-seat journey to Melbourne Airport via public transport.

MAR will provide a one-seat journey to the airport for users along the Metro Tunnel corridor (between Sunshine and Pakenham/Clyde), increasing trip reliability, reducing transfer time and the inconvenience associated with moving luggage. For airport users, the option of a one-seat journey and avoidance of interchanges/transfers is particularly significant due to the time-sensitive nature of these trips (there is a large cost associated with a missed flight). Figure 8-3 shows the greatest reduction in transfers will be for people along the Metro Tunnel corridor between Sunshine and Pakenham/Clyde, where most will be able to travel to Melbourne Airport without transferring. As population growth is primary concentrated along this corridor, MAR will provide an increasing impact in terms of one-seat trips over time.

8.3.2 Reduced travel times to the airport by public transport

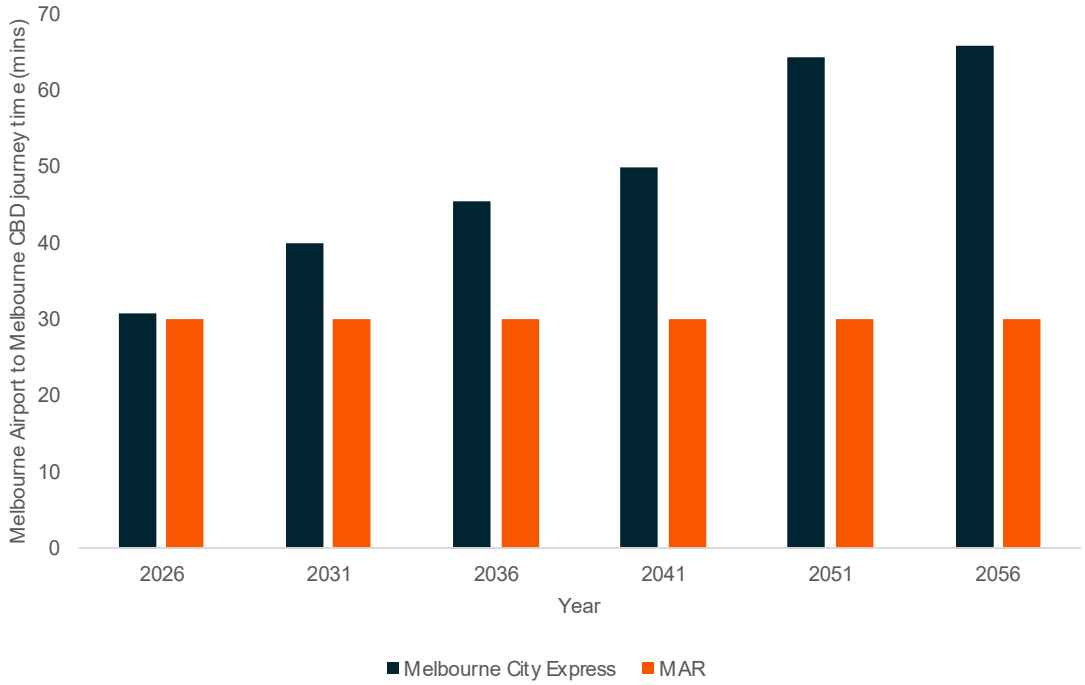
Chapter 2 outlines the impact of population and airport patronage growth on landside access to Melbourne Airport. Annual passenger movements are forecast to increase at a rate of 3.2 per cent annually to reach 87 million trips per year in 2048, the majority of which use the Tullamarine Freeway – Citylink corridor. The Melbourne City Express SkyBus service is the primary public transport

[110] VITM modelling undertaken by RPV (2020).

connection to the airport in the Base Case. Road congestion impacts this service and without investment, travel times and access reliability will deteriorate considerably during peak periods over time for the service as well as private vehicles. Travel times via the Tullamarine Freeway from Melbourne Airport to the CBD are forecast to more than double from 2026 (30 minutes) to 2056 (66 minutes). This is driven by projected growth in population and airport demand.

MAR will provide an alternative mode of accessing the airport via public transport, independent of road congestion. In peak periods, MAR delivers a faster journey between Melbourne Airport and the CBD (30 minutes), compared to the Melbourne City Express SkyBus service, where the journey time is 40 minutes in 2031 and 66 minutes in 2056, as shown in Figure 8-4.

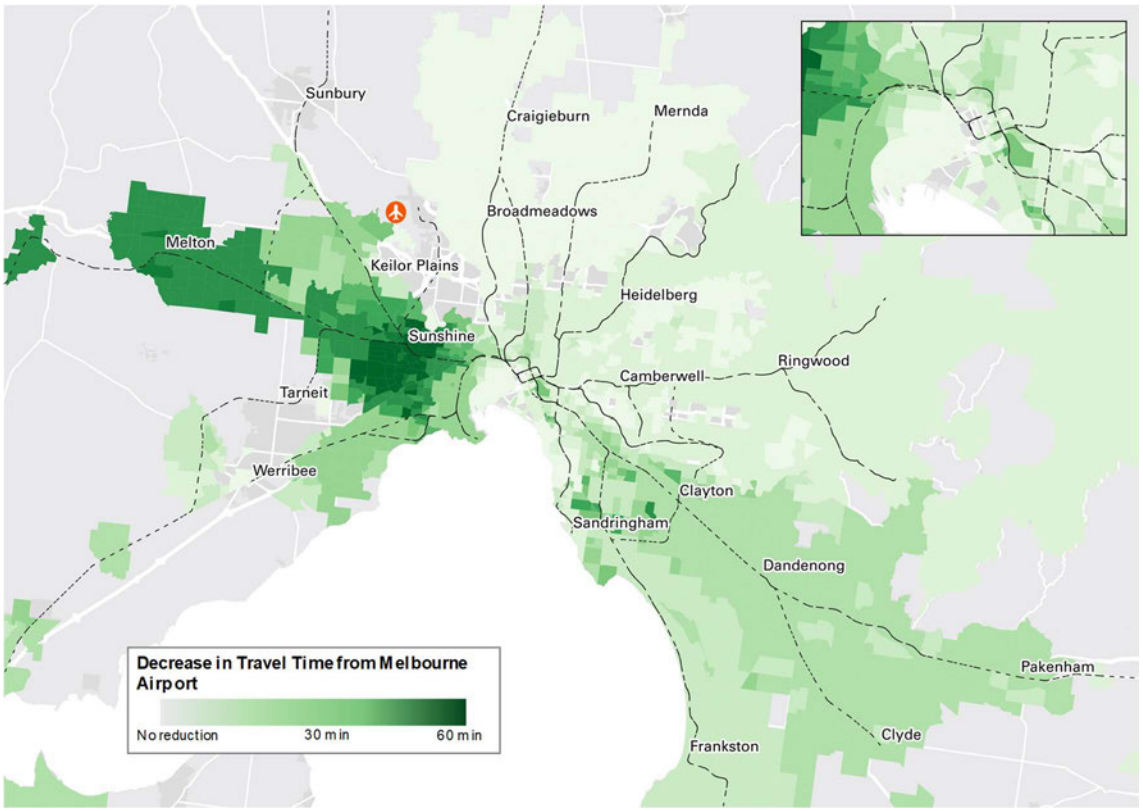
Figure 8-4: Travel times via public transport from Melbourne Airport to CBD (AM peak)[111]



Public transport travel time savings from MAR are initially most pronounced for travellers in Melbourne's west. Previous public transport options for people in Melbourne's west were highly impractical relative to travelling to the airport by car, as shown in Figure 8-5. Connecting the airport to the rail network via Sunshine substantially increases the attractiveness of using public transport for people living in Melbourne's west. Travel time savings are initially less pronounced for airport trips which require crossing the CBD. This is because MAR provides only a slightly faster journey between the CBD and Melbourne Airport compared with the Melbourne City Express SkyBus service in 2031.

[111] For the Melbourne City Express SkyBus service, travel times reflect the journey between Melbourne Airport terminal and Southern Cross Station terminal in the AM peak period. For the MAR service, travel times reflect the journey between Melbourne Airport Station and State Library Station in the AM peak period. The travel times reflect journey time only and do not account for initial wait time, transfers, walk times or other aspects of the trip.

Figure 8-5: Change in travel time for public transport trips from Melbourne Airport (AM Peak, 2031)[112]



By 2056, deteriorating travel times on the Tullamarine Freeway for private vehicles and the Melbourne City Express SkyBus service mean users from a large swath of Melbourne's east, south-east and west can expect substantial travel time savings to/from the airport via public transport, as shown in Figure 8-6. People living along the Metro Tunnel corridor between Sunshine and Pakenham/Clyde, will significantly benefit with access to a one-seat journey to Melbourne Airport that is faster than the Melbourne City Express SkyBus service in the Base Case.

[112] VITM modelling undertaken by RPV (2020).

Figure 8-6: Change in travel time for public transport trips from Melbourne Airport (AM peak, 2056)[113]

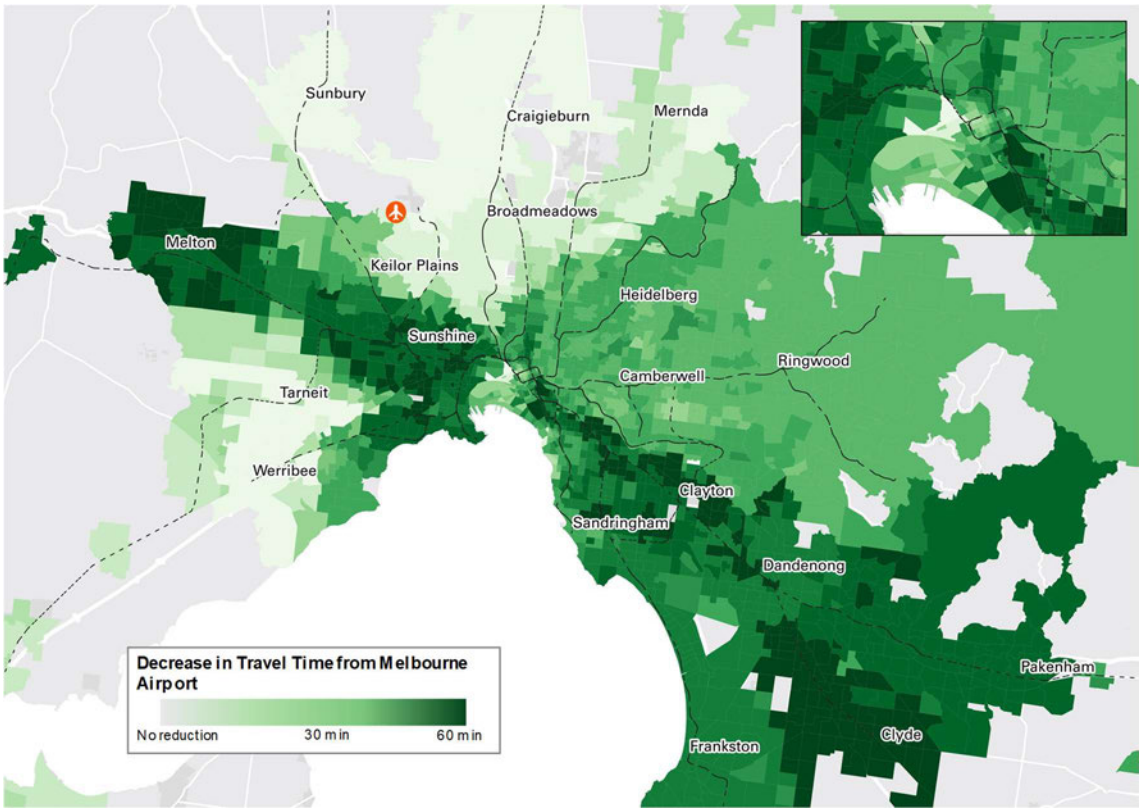


Table 8-1 outlines the door-to-door travel time savings MAR will deliver to various stations across the network. In this context, door-to-door travel times reflect all components of the journey, including station access time, initial wait time, time spent on the service, transfer time (if needed) and walking from the airport to the Airport station.

The analysis in the table shows that in 2031, people travelling from Melbourne Airport to Sunshine experience significant travel time savings with the door-to-door travel time decreasing more than half. In 2056, door-to-door travel time savings are further increased due to growing congestion on the road network. Benefits are greatest for airport users in the CBD and south-east corridor. Both these locations are substantially impacted by the growing congestion on the Tullamarine Freeway which leads to the greater travel time savings experienced for MAR journeys.

[113] VITM modelling undertaken by RPV (2020).

Table 8-1: Comparison of forecast travel time by public transport from Melbourne Airport, AM peak[114]

Suburb/ locality	2021 Base Case No MAR	2031			2056		
		No MAR	MAR	Travel time savings with MAR	No MAR	MAR	Travel time savings with MAR
Sunshine *North-west Melbourne*	80 mins	82 mins	33 mins	**49 mins**	88 mins	33 mins	**54 mins**
Flinders Street *Melbourne CBD*	59 mins	60 mins	49 mins	**11 mins**	87 mins	47 mins	**40 mins**
Cheltenham *South-east Melbourne*	96 mins	98 mins	80 mins	**18 mins**	132 mins	87 mins	**45 mins**
Clayton *South-east Melbourne*	95 mins	102 mins	80 mins	**22 mins**	130 mins	80 mins	**50 mins**
Dandenong *South-east Melbourne*	117 mins	122 mins	100 mins	**22 mins**	167 mins	108 mins	**59 mins**
Wyndham Vale *West Melbourne*	80 mins	88 mins	69 mins	**19 mins**	93 mins	72 mins	**21 mins**
Travel times detailed above are door to door travel time from Melbourne Airport to a sample of suburbs/localities. Door to door travel times include time spent walking to the station, waiting for a service, time taken to transfer if needed and walking from the airport station to the airport.							

8.3.2.1 Reduced public transport travel times from Melbourne Airport to regional Victoria

Given MAR travels via Sunshine, Melbourne CBD, Clayton and Dandenong it not only integrates with the metropolitan rail network, but also with the regional rail network.

Table 8-2 outlines the door-to-door travel time savings MAR will deliver to key regional cities in Victoria. The analysis in the table shows that passengers travelling from Melbourne Airport to Ballarat and Geelong will experience significant travel time savings as they are now able to transfer from MAR at Sunshine rather than travelling to Southern Cross Station as a result of using the Melbourne City Express SkyBus service.

Regional passengers from Traralgon also see significant travel time benefits in 2056, driven by growing congestion on the Tullamarine Freeway and easier transfers on to MAR.

Table 8-2: Comparison of forecast travel time by public transport from Melbourne Airport, AM peak[115]

Regional city	2021 Base Case No MAR	2031			2056		
		No MAR	MAR	Travel time savings with MAR	No MAR	MAR	Travel time savings with MAR
Geelong *Barwon*	106 mins	120 mins	96 mins	**23 mins**	121 mins	102 mins	**19 mins**

[114] VITM modelling undertaken by RPV (2020).
[115] VITM modelling undertaken by RPV (2020).

Regional city	2021 Base Case No MAR	2031			2056		
		No MAR	MAR	Travel time savings with MAR	No MAR	MAR	Travel time savings with MAR
Ballarat *Central Highlands*	173 mins	175 mins	126 mins	**49 mins**	179 mins	126 mins	**53 mins**
Bendigo *Loddon*	163 mins	146 mins	136 mins	**9 mins**	148 mins	136 mins	**12 mins**
Shepparton *Goulburn*	No data	214 mins	212 mins	**2 mins**	229 mins	223 mins	**6 mins**
Traralgon *Gippsland*	201 mins	201 mins	191 mins	**10 mins**	232 mins	191 mins	**41 mins**
Travel times detailed above are door to door travel time from Melbourne Airport to a sample of suburbs/localities. Door to door travel times include time spent walking to the station, waiting for a service, time taken to transfer if needed and walking from the airport station to the airport.							

8.3.3 Increased public transport use

MAR will incentivise a shift to public transport with enhanced public transport connectivity and reliable and reduced travel times to Melbourne Airport.

8.3.3.1 MAR patronage

Figure 8-7 illustrates the trend in public transport patronage (in the Base Case and Project Case) and the mode shift to MAR evident by the growing gap between the Melbourne City Express SkyBus and MAR patronage. Public transport patronage increases significantly under MAR, with patronage growing from 20,000 to 51,000 from 2031 to 2056. Across the same period, Melbourne City Express SkyBus patronage grows from 19,000 to 28,000 under the Base Case.

Airport precinct employees, who primarily live in the northern and western regions of Melbourne, have the option to use MAR or continue to travel to work via private vehicle – taking advantage of the road network improvements following implementation of MAR (see section 8.3.4).

Figure 8-7: Increase in public transport patronage to the airport following delivery of MAR[116]

8.3.3.2 Public transport trips to Melbourne Airport

MAR increases the overall number of public transport trips to and from Melbourne Airport. In 2031, as a result of MAR, the public transport mode share increases by 2 per cent. By 2056 the increase in mode share due to MAR is approximately 5 per cent, resulting in an overall public transport mode share of 18.4 per cent to the airport.

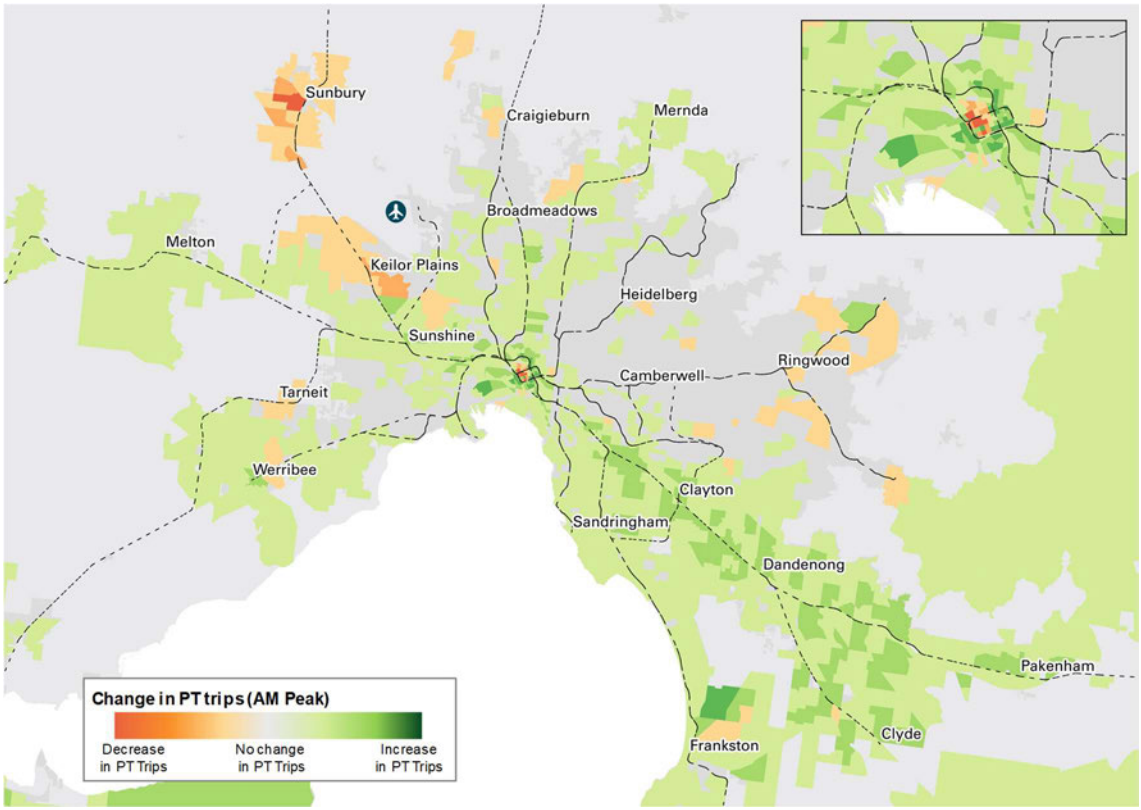
A sizeable proportion of these public transport trips occur during the peak periods, taking cars off the road in the most congested period.

Figure 8-8 shows that in 2031, patronage of services along the Metro Tunnel corridor will significantly increase with MAR improving accessibility to and from the airport. MAR provides these airport users a zero-transfer trip to the airport and an airport connection from the CBD that is faster than Melbourne City Express SkyBus service in peak periods. A decrease in public transport trips will occur in and around Sunbury and Keilor Plains as people living in these areas benefit from improved road conditions in and around the airport.

A large proportion of these public transport trips occur during peak periods which will remove cars from key arterials in the south-east. More broadly, this shift from private vehicles to public transport will generate amenity and environmental benefits across Melbourne.

[116] VITM modelling undertaken by RPV (2020).

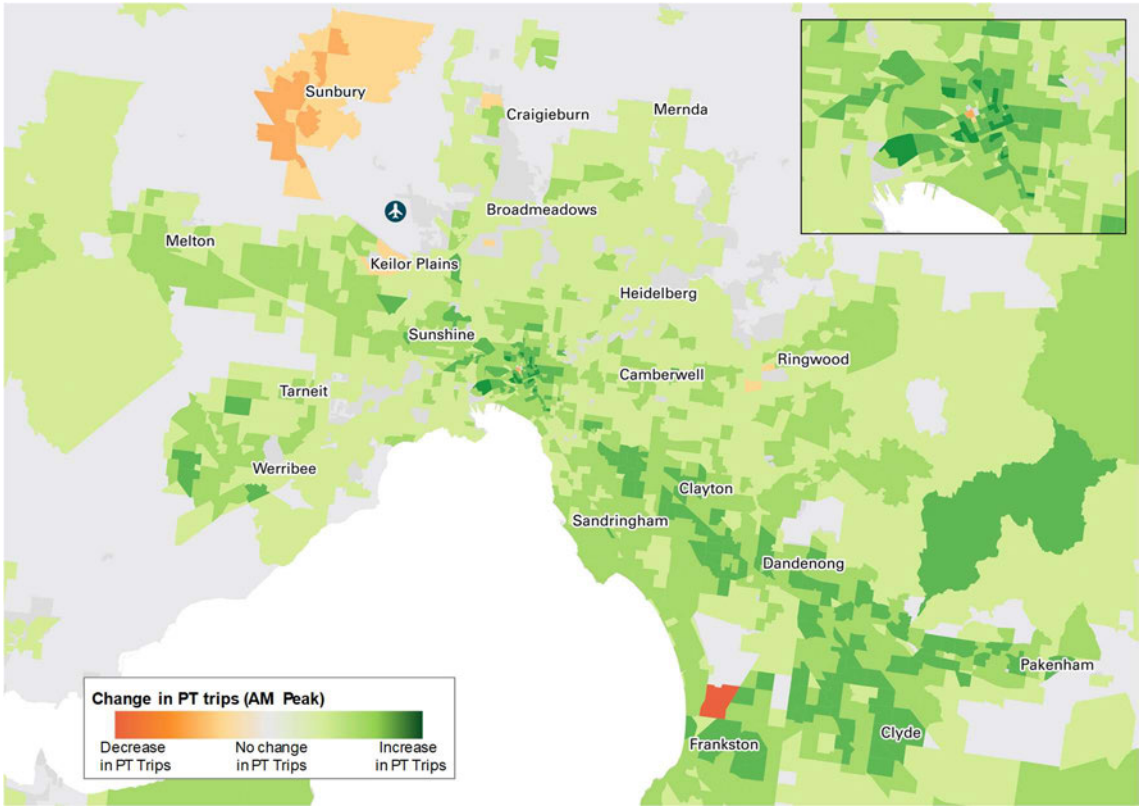
Figure 8-8: Change in public transport trips to and from Melbourne Airport (AM peak, 2031)[117]



In 2056, the number of public transport trips in the AM peak along the Metro Tunnel corridor (between Sunshine and Pakenham/Clyde) increases significantly. There is also a notable increase in trips west of Melbourne, particularly along the Melton corridor and near Werribee. This increase in trips is driven by users switching to MAR as a result of a faster overall journey compared with existing public transport options or by road, as shown in Figure 8-9.

[117] VITM modelling undertaken by RPV (2020).

Figure 8-9: Change in public transport trips to and from Melbourne Airport (AM peak, 2056)[118]



8.3.4 Improving car journey times to the airport

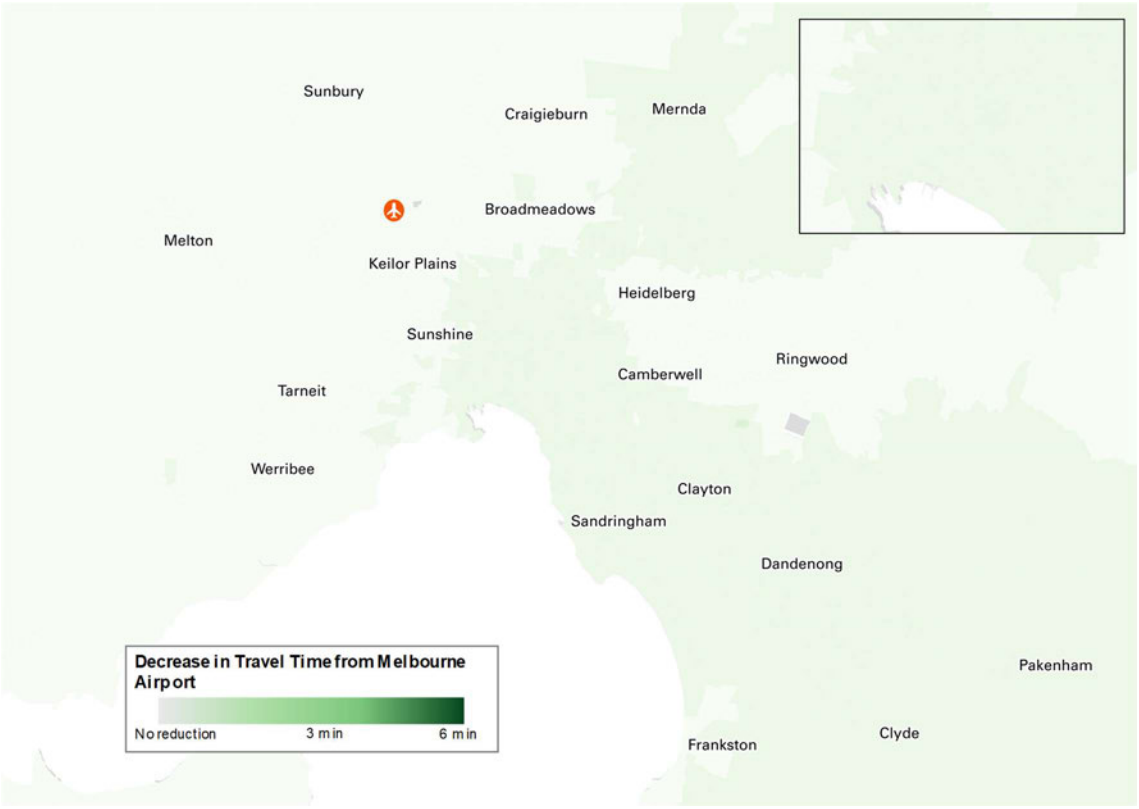
Diverting airport users from road to public transport will substantially reduce the volume of vehicles on the Tullamarine Freeway, of which airport users comprise approximately 84 per cent of total vehicle volumes. Given the performance of the Tullamarine Freeway is a key determinant of travel times to the airport by road, reducing vehicle volumes will increase travel speeds and reduce road travel times to the airport.

In 2031, the magnitude of mode shift is not significant and so the improvement in road conditions for people travelling to the Melbourne Airport is limited, as shown in Figure 8-10.

However, by 2056 this mode shift is significant and results in larger travel time savings for those travelling longer distances to access the airport, even after the impact of induced demand is incorporated, shown in Figure 8-11. People travelling longer distances benefit from the cumulative impact of congestion relief and improved travel speeds across the network as MAR sees more people switch to public transport.

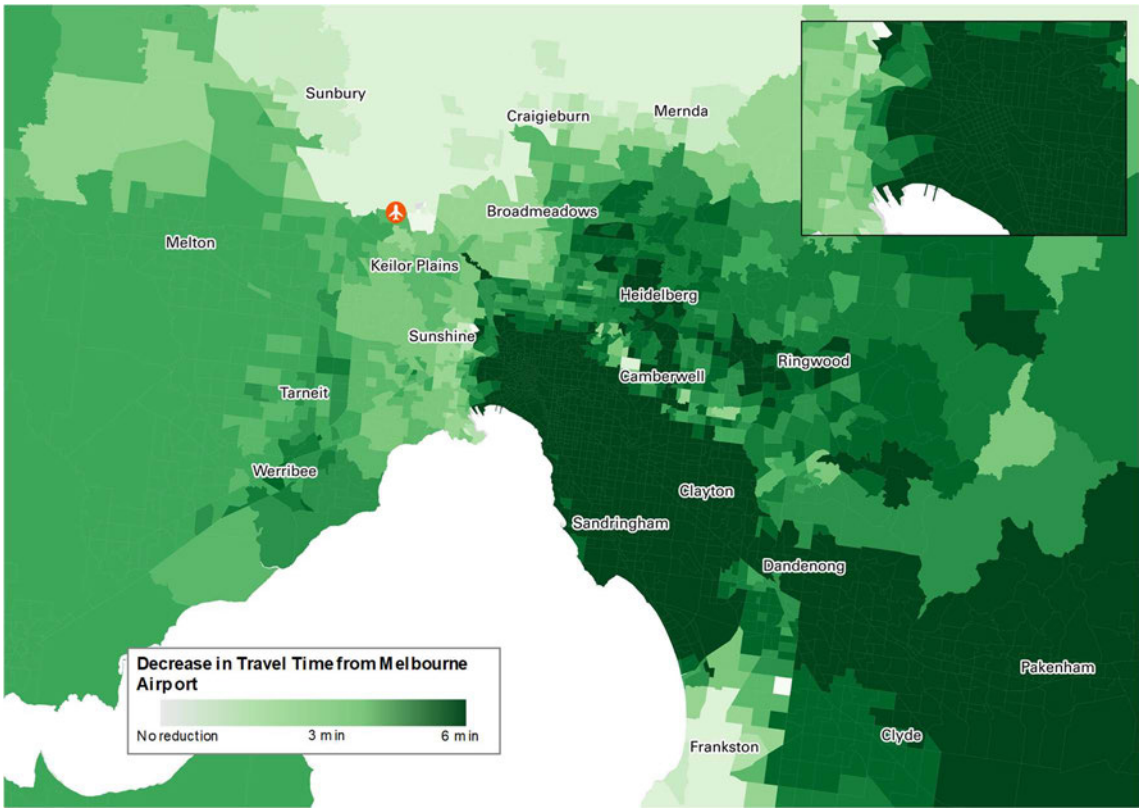
[118] VITM modelling undertaken by RPV (2020).

Figure 8-10: Change in car journey times from Melbourne Airport following delivery of MAR (AM peak, 2031)[119]



[119] VITM modelling undertaken by RPV (2020).

Figure 8-11: Change in car journey from Melbourne Airport times following delivery of MAR (AM peak, 2056)[120]



8.4 Benefit 2: Improved productivity and competitiveness for Victoria

With the majority of trips to Melbourne Airport made by private vehicles from across Greater Melbourne, airport users contribute to road congestion on Melbourne's arterial roads. The arterial road network serves a broad user base and comprises critical links connecting people to jobs, education and social opportunities. It also facilitates the movement of goods across the city from sites of production to their final customers. MAR will reduce congestion by taking cars off major arterial roads as airport users switch to public transport and will therefore provide benefits across the road network as a whole, particularly in later years. This will contribute to improved productivity and competitiveness for Victoria by reducing travel costs.

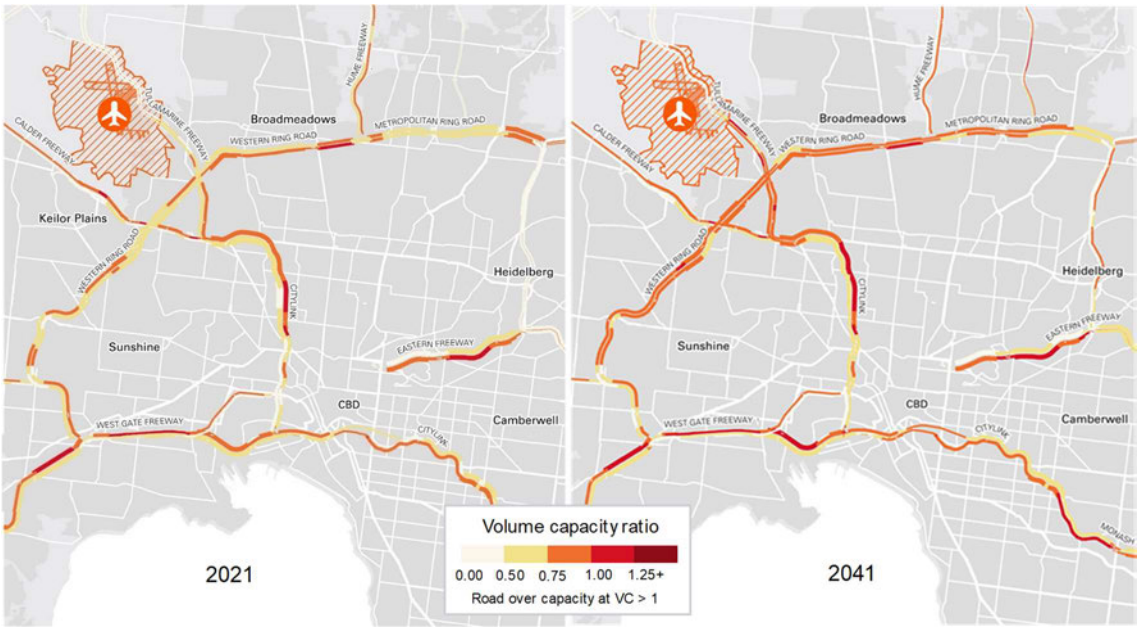
8.4.1 Providing relief across the Melbourne road network

8.4.1.1 Road congestion in the Base Case public transport network

As detailed in Chapter 2, population growth and increased airport patronage will contribute to growing vehicle volumes on the Tullamarine Freeway – CityLink corridor. In the absence of MAR, substantial congestion will develop over the next 20 years on this key access route to Melbourne Airport, in addition to other airport access routes such as the Monash Freeway and M80, as shown in Figure 8-12.

[120] VITM modelling undertaken by RPV (2020).

Figure 8-12: Forecast Melbourne weekday traffic volume / capacity ratio (2021 and 2041 AM peak)[121]



8.4.1.2 Reduced travel time on key road links

Beyond improved access to and from the airport, the shift to public transport with MAR will reduce congestion on key arterial roads across Melbourne. By removing airport users from the road network, MAR will reduce road congestion by shifting inbound and outbound airport traffic to alternative routes and modes. This results in higher road network speeds and improved travel time for airport users and other road network users (non-business and business trips).

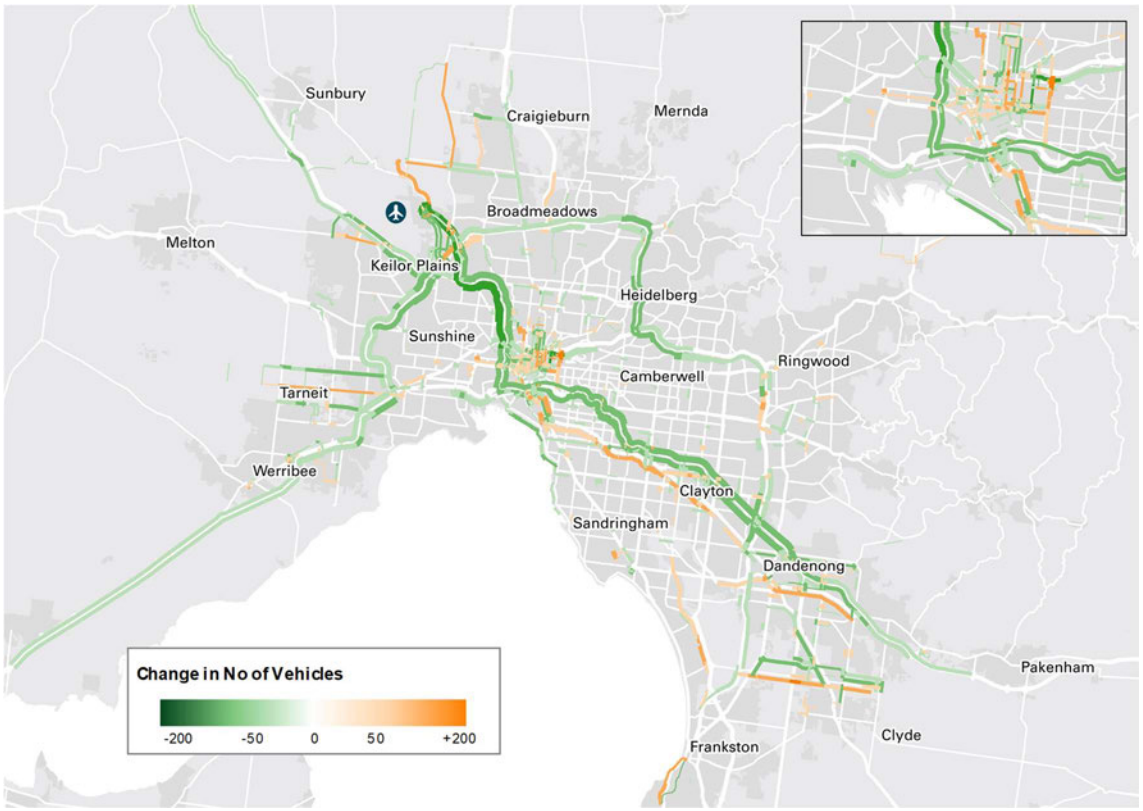
Melbourne's arterial roads are key carriers of the city's freight task, with travel time one of the largest cost inputs into the transportation of goods. Any intervention which produces travel time savings will reduce input costs and help boost productivity for local exporters and businesses importing goods.

In 2031, the areas with the greatest reduction in vehicle numbers reflect the areas with the greatest public transport accessibility improvements from MAR. These areas include the south-east road corridor (CityLink / Monash Freeway) and the Melbourne CBD-airport corridor (CityLink / Tullamarine Freeway). There are also reduced vehicle numbers on the south-west corridor (Princess Freeway / M80) and the north-east corridor (Metropolitan Ring Road), as highlighted in Figure 8-13. This will benefit road network users with reduced travel times and reduced transport-related costs. This will contribute to improved productivity for business-to-business and freight trips on the road network.

The number of vehicles on the road network that MAR will remove increases further by 2056 as people shift to public transport, as shown in Figure 8-14. The number of cars travelling along the Monash Freeway, CityLink, Tullamarine Freeway, EastLink, North East Link, M80 and the Outer Metropolitan Ring Road (OMR) will significantly reduce.

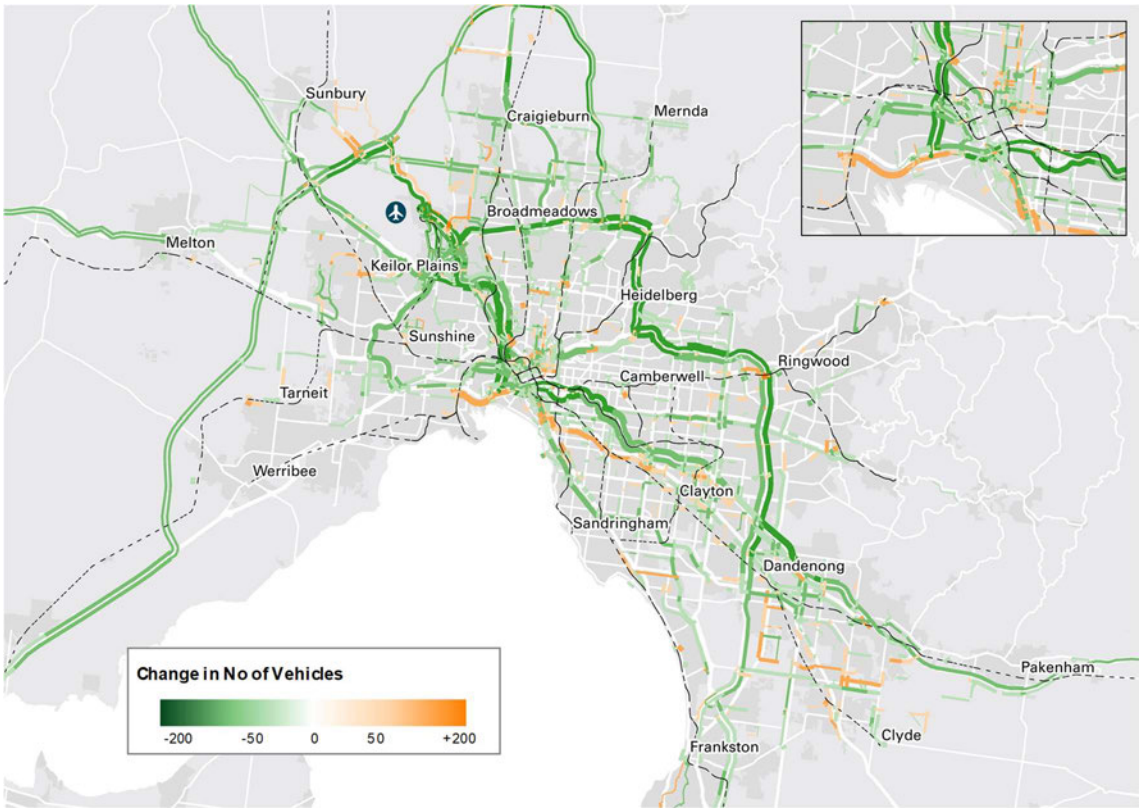
[121] VITM modelling undertaken by RPV (2020).

Figure 8-13: Change in number of vehicles following delivery of MAR (AM peak, 2031)[122]



[122] VITM modelling undertaken by RPV (2020).

Figure 8-14: Change in number of vehicles following delivery of MAR (AM peak, 2056)[123]



8.5 Impact of COVID-19

At the timing of writing this Business Case, the COVID-19 pandemic continues to pose risks to global and Victorian economic conditions, and the full length and severity of these impacts are still unknown. COVID-19 has already changed how some industries work, with a large uptake in people working remotely due to government restrictions, more local trips and a shift from public to active and private transport. It is uncertain how much these immediate impacts will mean a permanent change to travel patterns.

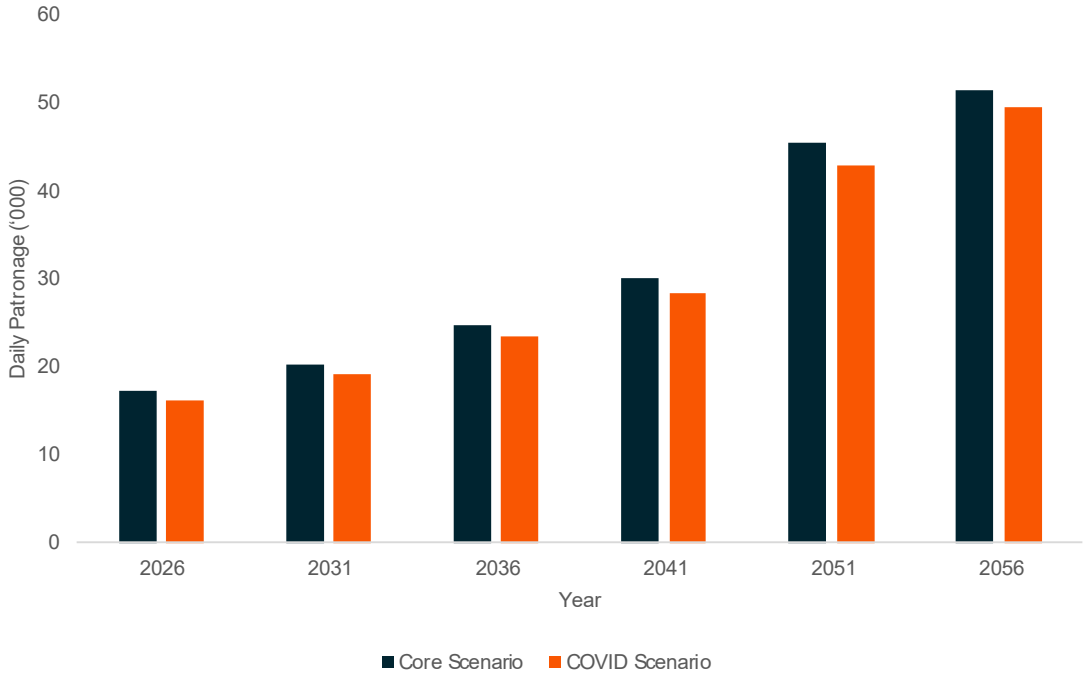
While the length and severity of the COVID-19 pandemic remains uncertain, it is likely the majority of these impacts will continue to be felt during the first months or years of recovery. Despite many unknown variables, it is possible that COVID-19 reduce population growth, airport patronage and travel demand, at least over the next few years. To understand the potential demand and patronage impacts of COVID-19 on MAR, a sensitivity test was undertaken with the following revised modelling assumptions[124]:

- Based on DELWP analysis, population and employment are expected to be delayed by two years in early model years, increasing to delay of four years by 2056. For example, the growth originally forecast for 2020 is expected to be realised by 2022, while 2052 growth levels are expected to be realised by 2056.
- Based on DoT and DJPR analysis, 29 per cent of Victorian jobs are suited for remote work and those employed in these jobs will work from home for two to three days a week
- Air passenger numbers will reduce in the short term, with travel returning to 2019 levels by 2023 for domestic and short haul travel, and by 2024 for all travel. By 2031, travel forecasts will revert to pre-COVID levels.

[123] VITM modelling undertaken by RPV (2020).
[124] Department of Transport (2020). *COVID-19 impacts on demand forecasts – sensitivity and scenario testing project analysis.*

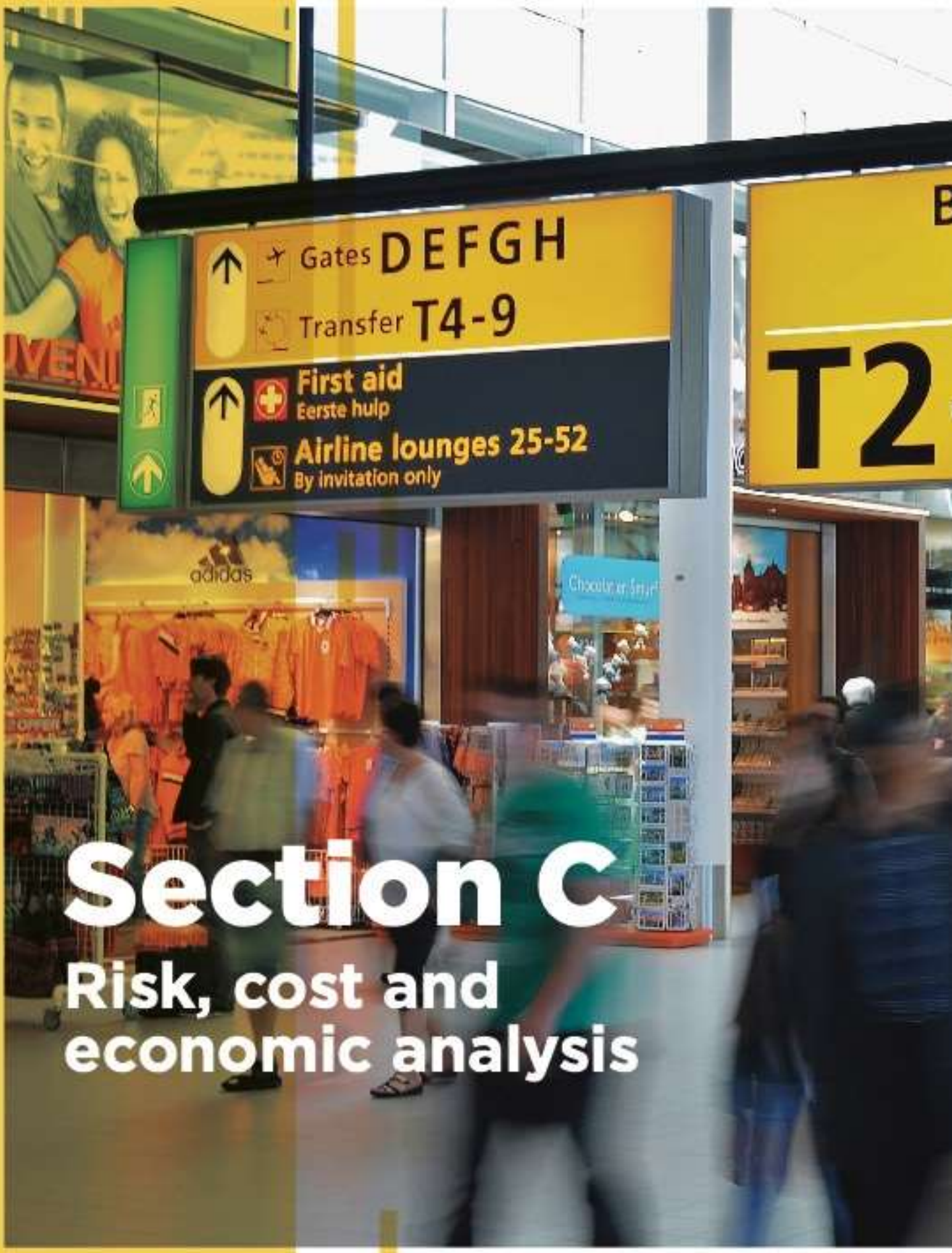
The demand impact of the COVID-19 sensitivity is shown below in Figure 8-15, with daily MAR patronage forecast to decrease by 5 to 6 per cent in the modelled years compared with the core Project Case. The economic impact of this sensitivity scenario is reported in Chapter 9.

Figure 8-15: Impact of COVID-19 on daily MAR patronage[125]



More information on the sensitivity and scenario testing undertaken for MAR is provided in Appendix 5: Demand modelling.

[125] VITM modelling undertaken by RPV (2020).



Section C

Risk, cost and economic analysis

9 Project risk assessment

9. Project risk assessment

Chapter summary

- A comprehensive risk assessment process was undertaken in accordance with Department of Treasury and Finance (DTF) *High Value High Risk* (HVHR) Guidelines, Infrastructure Australia (IA) Guidelines and *AS ISO 31000:2018 Risk Management – Principles and Guidelines* to prepare this Business Case. This process included a series of workshops with key project team members, stakeholders and advisors.
- A detailed risk register for Melbourne Airport Rail (MAR or the Project) that identifies and quantifies risks across a number of risk categories was developed to cover the full scope included in this Business Case.
- A separate Operations and Maintenance risk register was developed to account for specific risks that related to the operations phase of MAR.
- The top five categories of quantified risks by value are:
  - uncertainty and variability in the cost estimates, as a result of variability in the estimation inputs, including pricing, quantities and unit rates
  - design development before contract award leading to a change in scope and additional costs
  - cost impact of delays to delivery of MAR as identified by the Schedule Risk Assessment (SRA)
  - scope growth as a result of engagement with key stakeholders
  - Australian Rail Track Corporation (ARTC) maintenance, operational and safety requirements regarding the introduction of MAR tracks in the Albion-Jacana corridor results in additional ARTC broad gauge track upgrade/renewal scope.
- Risks will continue to be monitored, assessed and managed through the Project Lifecycle in accordance with the Rail Projects Victoria (RPV) *Risk, Issues and Opportunity Management Plan*.

9.1 Risk assessment process

A comprehensive risk assessment process was conducted according to DTF HVHR Guidelines[126], IA Guidelines and *AS ISO 31000:2018 Risk Management – Principles and Guidelines* to develop this Business Case. Figure 9-1 shows the key inputs, stages and result of the risk assessment process.

Figure 9-1: Risk assessment

9.2 Methodology

The risk assessment process was completed in four key steps, described below. RPV manages risks in accordance with *AS ISO 31000:2018 Risk Management – Principles and Guidelines* and the steps below focus on the risk quantification elements of this guide.

Step 1: Development of the risk register

A risk register has been developed by the project team taking into consideration risks identified during project development and risks associated with other comparable rail infrastructure projects.

The risk register includes inherent and contingent risks:

- **Inherent risks** – are a result of uncertainties in the cost estimate due to potential for changes to factors such as unit prices for project inputs (labour, materials, and equipment), choice of materials, the quantities of inputs required and design development. The inherent risk ranges were provided by the cost estimator for each scope item.
- **Contingent risks** – captures potential unforeseen events that may impact the Project. Examples include unforeseen circumstances such as weather impacts, industrial issues, safety, planning approval conditions, stakeholder related scope growth and geotechnical investigations. The contingent risks were identified and quantified through the risk workshop process described below.

The detailed risk register is provided in Appendix 6: Risk Register.

Step 2: Risk workshops

Risk workshops were undertaken as part of the risk assessment process to identify and quantify risk. These workshops involved key RPV project team members and advisors (including technical, commercial and cost estimating specialists) and DTF. This group was responsible for updating, reviewing and validating the risk register and determining the inputs into the risk quantification estimates / calculations.

[126] Department of Treasury and Finance, *Investment Lifecycle and High Value High Risk Guidelines*.

Risk identification

The risk identification process involved:

- introducing and providing an overview of the purpose of the risk register in the context of the Business Case
- identifying risks associated with the work under consideration
- identifying interdependent, interfacing and emerging risks
- agreeing on appropriate definitions for each risk
- identifying potential mitigation strategies.

Risk analysis

Risk analysis was conducted following the risk identification step and involved:

- agreeing on drivers (that is, indicative cost line or delay) to be applied to each quantifiable risk
- agreeing the preliminary qualitative risk ratings using the risk likelihood and the risk impact categories as guided by the RPV risk register matrix (see Appendix 6: Risk Register).

Following completion of the risk workshops, the workshop facilitator(s) and key project team members undertook further consolidation, review and refinement of the risk registers.

Step 3: Risk quantification

Contingent risk quantification

Cost risk quantifications were based on logic developed by the RPV project team and costed by the cost estimators.

The contingent risks considered to have a financial impact were quantified using a three-point estimate (best, most likely and worst-case) to quantify the financial impact of each risk. This, along with the probability of the risk occurring, calculates the potential impact of the risk in each of the three defined states.

In most instances, these states were derived through consultation with the cost estimators and based on specific units and rates, consistent with the cost estimate that would be expected if the risk were to materialise. Where specific units and rates were not available, a percentage allowance was applied to the cost driver (direct construction costs) that was impacted by the risk.

Inherent risk quantification

Inherent risk modelling was undertaken to capture the uncertainty and variability in the capital cost estimation inputs, including pricing, quantities and unit rates provided by the cost estimators or the RPV project team.

Design development risk quantification

Design development risk modelling was undertaken to consider potential scope increases due to design development between concept design and contract award. The RPV project team quantified potential changes in the direct cost estimate based on the three-point estimate approach.

Delay risk quantification

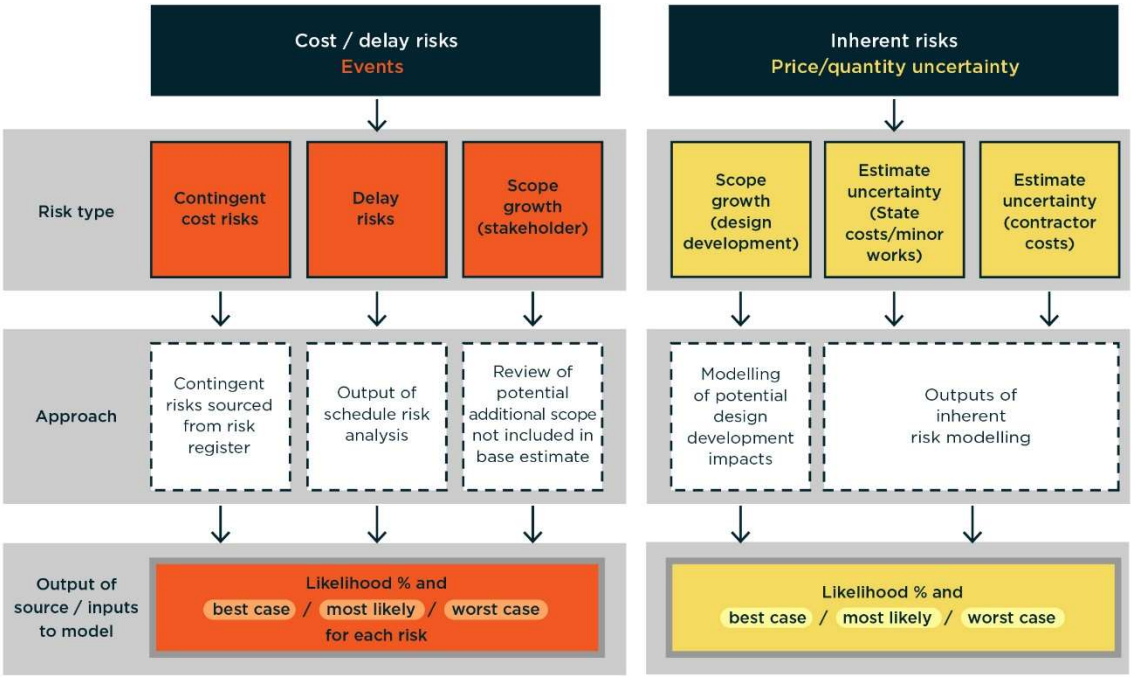
An SRA was performed on the MAR project schedule to develop a robust estimate of the program's contigent time allowance. The cost impact of the contingent time allowances was assessed by the project team and included in the contignent risk allowance for MAR.

Correlation

Correlation between risks was derived by identifying key correlated cost / schedule risks and the sign of their correlation (i.e. positive or negative). The proposed correlation factors were then included in a correlation matrix.

The elements of the risk quantifiation are summarised in Figure 9-2.

Figure 9-2: Risk quantification approach



The expected value of each risk was then modelled based on the probability of the risk occurring and the sum of the products of the quantified cost and their probabilities in each of the three defined states. A Monte Carlo analysis was then used to calculate the P50 and P90 values.

Step 4: Review and refinement

As the scope of work for MAR was further developed and refined, further sessions were held with key project team members, stakeholders and specialist advisors to review and refine the risk register and risk allocations.

9.3 Key project characteristics influencing risk

A number of defining features significantly influence the overall risk characteristics of MAR. Table 9-1 sets out these key characteristics.

Table 9-1: Project risk characteristics

Characteristic	Description
Large project area	• The proposed MAR alignment covers a large project area impacting several communities and crossing State and Commonwealth land, which elevates risks around environmental approvals and community / stakeholder concerns with MAR
Large-scale mega project	• The large-scale nature of MAR increases the magnitude of construction risk and introduces risk associated with market capacity
Interface and interdependencies with future and current investments	• Interfaces and interdependencies between MAR and existing and future planned capital works initiatives on Melbourne's transport network adds complexity
Melbourne Airport on Commonwealth land	• The proposed station and other works at Melbourne Airport are on privately operated Commonwealth land with significant interfaces with existing infrastructure, requiring co-ordination with and assistance from Melbourne Airport's owner and operator, Australia Pacific Airports (Melbourne) Pty Ltd (APAM)

Characteristic	Description
Sunshine / Albion stations brownfield development	• The Sunshine and Albion station development areas are brownfield sites in a live rail environment, with works planned to stations, platforms, tracks, wayside structures / systems and works near the jet fuel pipeline presenting significant construction and operational risks

9.4 Key assumptions

The risk assessment process relied to a large extent on a forward-looking approach that focuses on risks with a relatively high probability of occurring and those that would have a material impact if they were to occur.

Identifying and quantifying the risks is largely shaped by the collective experience of the project team, stakeholders and advisors on similar large-scale transport construction and operations projects. Due to the nature of risk, not all circumstances that may influence MAR's outcomes can be estimated at this stage.

As part of the risk assessment process, a number of unquantifiable risks were identified (see section 9.7). A risk is classified as unquantifiable when its cost impact cannot be estimated. An allowance for the unquantifiable risks was not included in the risk adjusted cost forecasts, but because these risks can be significant, they will be closely managed and monitored during the development of MAR.

9.5 Risk register

Table 9-2 summarises by category the highest value risks and opportunities identified through the risk assessment process and the risk mitigation strategy to respond to them. The detailed risk register is provided in Appendix 6: Risk Register.

Table 9-2: High value risks and opportunities

Risk / opportunity	Description	Mitigation strategies
Cost and revenue estimation risk	Uncertainty and variability in the capital cost and operating cost estimates (excluding risk), as a result of variability in the estimation inputs including pricing, quantities and unit rates.	• Cost estimates have been developed by the RPV cost advisors. • Cost estimates have undergone an extensive review and refinement process including peer review and benchmarking
	Contractor escalation rates differ to the Major Transport Infrastructure Authority (MTIA) forecasted rates used in modelling.	• Develop the project scope and technical requirements (PS&TR) to a sufficient level to ensure contractors will not bid inflated risk amounts due to uncertainty • Ensure strong project controls and reporting in the form of well-defined program, budget and schedule
	Inaccuracies in forecasting passenger numbers and the underlying assumptions regarding future macro-economic factors that support the long-term demand forecasts are inaccurate impacting overall revenue of MAR.	• Demand forecasts relied upon for this Business Case are from the Victorian Integrated Transport Model (VITM). Assumptions in the airport module in VITM have been updated by RPV's technical advisors • Demand forecasts have undergone an extensive review and refinement process, including peer review
Planning and statutory approvals	Planning and environmental approvals process is delayed resulting in delay to start of works.	• A detailed planning and environmental approvals program has been developed and is being tracked against other work streams to ensure that RPV complies with and obtain approvals from both State and

Risk / opportunity	Description	Mitigation strategies
		Commonwealth stakeholders in a timely manner
	The Major Development Plan (MDP) for MAR works on Commonwealth land cannot be obtained in time for planned approval pathway.	• Undertake baseline site investigations • Develop approvals strategy including pathways and program to achieve approvals in adequate time – de-couple State and Commonwealth approvals • Engage with regulators and key stakeholders to maintain support for approval process
	Planning and environmental legislation changes during the development and delivery of MAR requiring further research, consultation and assessment before moving forward resulting in delays.	• Develop approvals strategy that includes measures to address potential changes to legislation • Engage with Environment Protection Authority (EPA) Victoria on new regulations and guidelines as part of the new *Environment Protection Act 2018* (Vic) amendment act that takes effect 1 July 2021 • Engage with Heritage Victoria, Department of Environment, Land, Water and Planning (DELWP), local councils and the Department of Agriculture, Water and the Environment (DAWE) to maintain knowledge of potential changes to heritage listings and planning schemes
Interface	Packaging / staging strategy results in interface issues between various contractors, inefficient delivery of MAR, increased claims, disputes and delay.	• Strategic Procurement Plan to be developed • Identify and detail key procurement, design, delivery and completion interfaces between packages and document in package contracts • Develop performance incentives to align packages on a whole of project basis for interface management • Establish a centralised overarching governance structure to provide robust oversight and stewardship of the Project
	Contracts associated with the delivery of MAR impacts delivery of existing contracts (e.g. Metro Tunnel Project (MTP), Level Crossing Removal Project (LXRP), High Capacity Metro Trains (HCMT) project), resulting in additional costs (to be compensated), re-sequencing or delays to completion of those projects.	• Implement RPV Interface Management Guidelines including interface control agreements • Staging of procurement timelines and delivery requirements cognisant of other Victorian rail projects timelines • A MAR Steering Committee and Major Projects Steering Committee (see section 16.1.4) will be established which will monitor related projects / strategic planning activities to ensure key interfaces are managed • Any major interface risks to be escalated to the MAR Steering Committee or Major Projects Steering Committee for resolution
Land and property	Access to public and private land required for permanent or temporary infrastructure for MAR is delayed / results in additional costs.	• Early identification of preferred corridor and station locations reflected in Planning Scheme Amendment (PSA) documentation • Early and ongoing communication process with councils to ensure RPV is alerted to

Risk / opportunity	Description	Mitigation strategies
		any proposals for development along the alignment
Design and engineering	Design development scope growth results in delay and additional costs.	• Ensure there is sound accountability for scope definition – papers for key decisions to be signed off by appropriate governance committees • Each stage of the MAR Program to be scoped at an early stage, with the involvement of relevant stakeholders as required
	Integration work does not deliver coordinated interface and integration outcomes resulting in package delays, additional scope of work, re-allocation of scope, scope gaps, delay to operations.	• Optimise packaging and procurement outcome to minimise complex interfaces and integration across MAR packages • Produce an Interface and Integration Framework regarding integration functions and approach for MAR • Define key internal and external interfaces in program, technical and commercial documentation • PS&TR clearly defines accountability for integration within packages and where it is required across packages
Construction	Lack of support from stakeholders during construction results in delay and additional costs.	• Extensive program of engagement through development, procurement and delivery • Development of commercial models to balance risk and incentivise support from key stakeholders (i.e. APAM and ExxonMobil)
	Extent of contaminated spoil management required and costs to remediate in accordance with Victorian and Australian government requirements underestimated.	• Investigations to understand the extent of contamination across the MAR site to reduce tenderer risk • Soil contamination review and develop spoil management strategy • Identify authorised disposal sites – for groundwater and spoil
Stakeholder	Timing and sequencing of Victorian and Australian governments' approval processes for scope items results in delay to MAR.	• Establish a MAR Steering Committee with representatives from both the Victorian and Australian governments to meet on a regular basis to resolve any matters
	Delay in agreement with owners of key strategic assets impacted by the works of MAR (e.g. agreement with the owners of jet fuel pipeline and on the protection and/or relocation of jet fuel line resulting in delay to main works).	• Early identification of key strategic assets impacted by MAR • Early engagement and communication with asset owners and investigation of impact on the critical path for MAR • Development of interface agreement and regular communication on key project issues
	Community opposition as a result of land acquisition and impact on property / business owners.	• Detailed property acquisition strategy developed including communications strategy • Ongoing communication with the council(s), community and other stakeholders
Procurement / commercial / legal	The contracting strategy is not optimal and the interfaces between the work packages are not managed effectively.	• Implementation of procurement options analyses, in conjunction with carrying out market sounding with the industry

Risk / opportunity	Description	Mitigation strategies
		• Develop appropriate interface risk management mechanisms and incentives in the contracts to encourage and manage interface between work packages
	Scope of MAR does not deliver the defined operational outcomes.	• The Project requirements have been developed with all appropriate stakeholders, in parallel with the development of both concept and reference design • Operational assumptions have been developed by the Department of Transport (DoT), in collaboration with RPV's transport planning team, supported by expert rail operations advisors Rail Operations Planning Advisory Services (ROPA)
Market capacity	Insufficient market capacity to meet MAR's requirements for design, manufacturing and construction resulting in increased cost and/or inefficient delivery and delay.	• Robust packaging and procurement strategy analysis including seeking feedback from the market on the proposed Project timeline • Investigate performance of current projects in delivery • Ongoing dialogue between RPV, other delivery agencies and other Victorian and national project owners to monitor performance of current projects in delivery
COVID-19	COVID-19 related delays to announcements and approvals resulting in delay to procurement and construction activities	• Briefings to the Minister of Transport Infrastructure on any consequences of delays of the MAR Program as a result of COVID-19

9.6 Risk quantification summary

Table 9-3 shows the breakdown in risks categories for MAR. The table illustrates that inherent risks, delay risks, scope related risks and design development risks are the largest risk category by quantified impact.

Table 9-3: Breakdown of risk categories (%, Nominal P90)

Nominal P90 risk adjustment	% of quantified risk
Commercial and legal	6.4%
Construction	2.7%
Delay risk	23.3%
Design development	13.3%
Design and engineering	4.7%
Environmental and cultural heritage	0.6%
Inherent risk	20.8%
Interface	8.2%
Project management / land management	1.6%
Scope	16.9%
Stakeholder	1.5%
Total mean risk adjustment	**100.0%**

The results of the probabilistic risk modelling process are included in the financial analysis and funding sections of Chapter 10.

9.7 Unquantifiable risks

A risk is classified as unquantifiable when its cost impact cannot be estimated. An allowance for these risks was not included in the risk adjusted cost forecasts and assumed funding costs for this Business Case.

A number of unquantifiable risks were identified during the risk assessment process. Included within the unquantifiable risks are assumptions that have been made by the Project team in relation to certain major scope items. To the extent these assumptions prove to be incorrect the overall costs of the Project may significantly increase. The monitoring of these key Project assumptions will be managed through the RPV risk management process.

Table 9-4 outlines the key unquantifiable risks and project assumptions identified and the risk mitigation strategies developed to respond to these risks. The detailed risk register is provided in Appendix 6: Risk Register. The risk register includes other unquantifiable risks including details of other items assumed to be out of scope for MAR.

Table 9-4: Unquantifiable risks

Risk	Description	Mitigation strategies
Unquantifiable risk		
Stakeholders and community	Commercial negotiations with APAM are ongoing, impacts of any potential commercial arrangement between APAM and the State have not yet been agreed.	• Initiating proactive and early engagement with APAM and establishing a governance framework for MAR • Development of interface agreement and regular communication on key MAR issues
	Impacts to the community or stakeholders during construction resulting in community resistance and/or pressure for change in scope.	• Ensure robust communication and engagement strategy focusing on upfront, honest and timely communication and engagement • Proactive community and stakeholder engagement with relevant consultation to seek feedback into project designs and decision making • Conducting of noise and/or vibration modelling before and during the delivery of MAR
Interface	Unclear interface and provisions to enable future projects requiring additional changes to design resulting in increased costs and delay to the Project.	• Engage with stakeholder from the Network Development Reference Group to understand plans for future projects • Develop interface risk register to understand and manage inter-project interfaces
Unquantifiable Project assumption risks		
Construction	Requirements to replace Hampshire Road bridge.	• Operational assumptions have been developed by DoT, in collaboration with RPV's transport planning team, supported by expert rail operations advisors • Undertake operational dynamic modelling to determine feasibility of proposed Sunshine Station track configuration • Engage with major stakeholders (i.e. Accredited Rail Operator (ARO) and fuel pipeline owners) to develop a manageable solution
Scope	Existing Sunshine Station does not provide the required amenity for passengers transferring to MAR services	• Desktop analysis of customer types, luggage, movements, interfaces • Understand customer experience

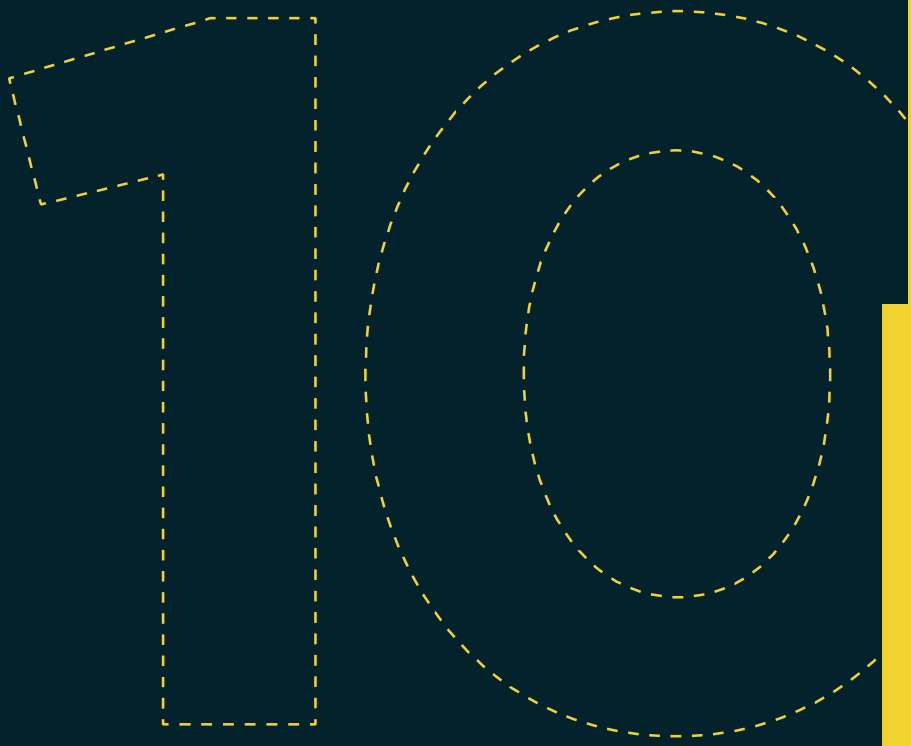
Risk	Description	Mitigation strategies
	and alternative solution is required for Sunshine.	• Seek agreement and sign-off of requirements with key stakeholders

9.8 Risk management

RPV has an established risk and opportunity management framework that is directly applicable to MAR and includes:

- Risks, Issues and Opportunities Management Plan
- Risk and Opportunity Management Procedure
- Risk Allocation Management Procedure
- Issues Management Procedure.

The RPV risk management framework complies with *AS ISO 31000:2018 Risk Management* (the Standard). In accordance with the RPV risk management framework, a risk register is developed and maintained for all projects and for RPV functional areas. Further details of RPV's approach to risk management is included in section 16.5 of this Business Case.



10 Project budget

10. Project budget

Chapter summary

- This chapter provides an overview of the approach to developing the financial estimates, including key inputs and assumptions, and the results of the financial modelling.
- The analysis was undertaken on a risk-adjusted basis at the P50 and P90 confidence levels, which means that estimates were adjusted to allow for the variability in forecast project costs to 50 per cent and 90 per cent certainty levels.
- The total risk adjusted capital cost of MAR is summarised below:

Redacted

Commercial-in-confidence

- The capital costs above include the development and delivery costs for additional rolling stock, development costs incurred to date, and the delivery of Platform 5 at Sunshine Station from the Western Rail Plan (WRP) as described in section 6.5.2.

Redacted

Commercial-in-confidence

- For the purposes of the demand modelling and economic analysis in this Business Case it is assumed the SkyBus service from Southern Cross Station to Melbourne Airport does not operate during the hours MAR is operating. Furthermore, the incremental revenue included in this Business Case is calculated based on farebox revenue generated by MAR excluding Myki less farebox revenue lost by not running SkyBus services.

Redacted

Commercial-in-confidence

- Opportunities to reduce costs and enhance revenues will continue to be identified as the Project progresses.

10.1 Overview

10.1.1 Summary of project costs

This chapter provides an overview of the methodology used to develop the financial estimates, the key inputs / assumptions used to prepare the financial analysis and the results from the financial modelling of MAR.

The real financial results of the design and construction costs detailed in this Business Case are in 1 January 2020 dollars. Nominal financial results were developed by escalating real financial results to year of expenditure dollars using appropriate indexation rates.

The analysis in this chapter differs from the economic analysis in Chapter 11. It does not include estimates of external costs and benefits. See section 11.4 for further details on what is included in the economic assessment.

Table 10-1 summarises the risk adjusted capital costs in real and nominal terms for MAR. Additional project budget tables not shown in this chapter are provided in Appendix 7: Capital cost estimate report.

Table 10-1: Summary of capital costs

Redacted

Commercial-in-confidence

The estimate for the total risk adjusted capital costs for MAR in nominal terms ranges between ***Redacted*** with a 50 per cent and 90 per cent respective probability that actual MAR costs will not exceed these estimates (a P50 and P90 cost respectively).

MAR is forecast to require five additional HCMT-7 trains. The costs for these trains will be incurred as part of a modification to the HCMT Public Private Partnership (PPP) contract and are subject to negotiation with Evolution Rail.

In addition, the total funding request for MAR includes delivery of Platform 5 at Sunshine Station from the WRP as described in section 6.5.2. Capital costs, land acquisition, operations and maintenance and asset renewals costs in this chapter are presented inclusive of this element of the WRP scope.

Table 10-2 summarises MAR cash flows for the 50-year evaluation period following expected project close out date in real and nominal terms. Cash flows during this operations phase refer to the incremental costs and revenues associated with maintaining and operating the infrastructure created by the investment. The demand modelling and economic analysis of this Business Case assumes the Southern Cross to Melbourne Airport SkyBus service will not operate during the hours MAR is operating. The cost associated with not running these services is included as an incremental cost saving for MAR for the purpose of the economic analysis.

The ‘Low’ revenue figure is based on the low incremental revenue forecast for MAR and the ‘High’ revenue figure is based on the high incremental revenue forecast. The incremental revenue included in this Business Case is calculated based on farebox revenue generated by MAR excluding Myki less farebox revenue lost by not running SkyBus services.

Table 10-2: Summary of cash flows during the operations phase of MAR

Redacted

Commercial-in-confidence

10.1.2 Financial analysis methodology

The analysis outlined in this chapter is based on a set of assumptions outlined below. To the extent that assumptions change, the results of the analysis may vary. There will usually be differences between forecast and actual results because events and circumstances frequently do not occur as expected.

10.1.2.1 Financial model development

A detailed financial model was developed to support the financial assessment of MAR. The financial model presents the total financial picture of MAR by bringing together all costs and revenues associated with the project delivery for which this Business Case seeks an investment decision.

The financial model was structured to support the analysis of:

- risk adjusted whole-of-life costs of MAR on a real, nominal and present value basis
- timing of risk adjusted project cashflows.

The financial model was developed according to best practice modelling principles and was internally reviewed and tested.

10.1.2.2 Key inputs and assumptions

Financial modelling was undertaken using inputs and assumptions prepared by advisors with reference to comparable rail projects and/or provided by RPV, MTIA and DoT. Table 10-3 sets out the inputs, assumptions and the relevant sources used in the financial model.

Table 10-3: Financial modelling inputs and assumptions

Input / Assumption	Description	Source
Timing	Delivery – Airport: 2022 – 2029	RPV Project Team
	Operations: 50 years from end of project delivery	

Input / Assumption	Description	Source
Escalation	*Redacted* *Commercial-in-confidence*	
Discount rate (capital costs)	1.84% p.a. - 10-year TCV bond rate as reported at 30 September 2021	Treasury Corporation of Victoria
NPV Date	1 July 2021	RPV project team
Evaluation period	Development phase plus the operations phase (50 years of operations)	RPV project team
Capital costs – infrastructure	Concept Design Cost Estimate as set out in Appendix 7: Capital cost estimate report	Turner & Townsend
Land acquisition costs	Concept Design Cost Estimate as set out in Appendix 7: Capital cost estimate report	Turner & Townsend
Operating and maintenance costs – infrastructure	Concept Design Operations and Maintenance Cost Estimate as set out in Appendix 8: Operational cost estimate report	Firecone
Asset renewal costs	Concept Design Operations and Maintenance Cost Estimate as set out in Appendix 8: Operational cost estimate report	Firecone
Operating and maintenance costs – rolling stock	Concept Design Operations and Maintenance Cost Estimate as set out in Appendix 8: Operational cost estimate report	Firecone
SkyBus cost savings	Concept Design Operations and Maintenance Cost Estimate as set out in Appendix 8: Operational cost estimate report	Firecone
Incremental demand	Net impact of change in demand for passengers travelling on MAR less passengers no longer travelling on SkyBus	VITM

10.2 Detailed capital costing

10.2.1 Development of capital costs

The capital cost estimates consider the development of all aspects of the infrastructure, rolling stock, stations and facilities and land required. The overall scope of works that comprise the cost estimate includes the following key components:

- **Track and Civil** – includes all track and civil works required for the Project including formation and earthworks, utilities and services relocation or protection, trackwork, combined service routes, fencing, noise walls, jet fuel line protection and relocation, track drainage, urban design and other civil works.

- **Structures** – a track pair starting at the Airport Station and transitioning into an elevated viaduct at the Value Car Park that continues across Sharps Road and over the Western Ring Road (M80). The track continues on an embankment toward and through the Albion-Jacana freight corridor from Steele Creek, including a new bridge crossing over the Maribyrnong River, and track through Albion Station. Other structures include Link Road Bridge, Mercer Drive Bridge, modification to existing road overbridges and new shared user paths.
- **Stations** – a new elevated station at Melbourne Airport with additional works at Albion Station and Sunshine Station to enable the delivery of MAR and future proofing provisions for an intermediate station at Keilor East.
- **Signalling and traction power** – line-wide traction power, Communication Based Train Control (CBTC) signalling, train control and rolling stock solutions that are consistent and/or compatible with those being incorporated into the Metro Tunnel including systems scope on the Sunbury Line to integrated MAR and Metro Tunnel services.
- **Additional scope** – Modifications to existing franchisee control centres, digital train radio systems requirements and fibre optic management.
- **Occupations –** costs associated with track occupations, safe working requirements and traffic management.
- **Contractor management (including design)** – costs associated with site-based preliminaries, project management and contractor design.
- **Rolling stock** – estimated costs incurred by DoT and Evolution Rail to procure and manufacture an additional five HCMTs and maintain the additional trains until MAR Day 1.
- **RPV owner's costs** – costs incurred by RPV to develop MAR including planning and construction oversight.
- **Minor works** – allowances for additional costs incurred by the Project including stakeholder costs, wayfinding signage costs, rail authority costs, insurances, non-successful bid fee(s), operational readiness costs and key result area performance costs.
- **Land acquisition costs** – costs incurred by RPV for the acquisition of land required for the construction of MAR.

Capital cost estimates have undergone an extensive review and refinement process to determine if the results are within the expected range when compared against other benchmark projects and first principles rates for labour, plant and materials. Costs relating to land include all land to be acquired for temporary and permanent purposes, for the construction, development and operation of each package. The project team developed land and property estimates plus allowances for professional expenses, replacement property costs and other allowable items.

As there is inherent uncertainty around actual capital costs, risk adjustments were developed using the risk quantification process outlined in Chapter 9 and applied to the capital cost estimates to present risk adjusted cost estimates and the P50 and P90 confidence levels. More details are provided in Chapter 9.

10.2.2 Capital costs detail

Table 10-4 provides a breakdown of the risk adjusted capital costs in real, nominal and present value terms for each of the major project works elements with further details provided in Appendix 7: Capital cost estimate report.

Table 10-4: Summary of capital costs

Redacted

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This Business Case does not assume an intermediate station is required between Sunshine and Melbourne Airport.

Figure 10-1 illustrates annual nominal P90 risk adjusted capital costs (exclusive of rolling stock and costs incurred before 1 July 2021).

Figure 10-1: Monthly risk adjusted capital costs (P90)

Redacted

Commercial-in-confidence

Figure 10-2: Cumulative monthly risk adjusted capital costs (P90)

Redacted

Commercial-in-confidence

10.3 Owner's costs

RPV owner's costs were developed using a first principles estimation methodology and reflect the proposed organisational structure and suite of advisors the development of the reference design, procurement and support during the delivery phase of MAR. The overall scope of works that comprise the owner's cost estimate includes the following key components:

- **Resources** – staffing costs for RPV to develop MAR including planning and construction oversight costs.
- **Advisors** – advisor costs to support MAR including costs for technical advice and investigations, project management services, commercial and legal services, cost estimators, constructability advisors and various independent reviewer requirements.

- **Project overheads** – overhead costs to the State to support the development of MAR including Major Transport Infrastructure Authority (MTIA) costs, accommodation costs, allowances for project management in the defects period and project close down activities and other RPV indirect costs (i.e. technology costs).
- **Costs to date** – costs incurred to date to develop MAR to the end of FY21.
- **Risk allowance** – the risk estimate includes the forecast time delay impact from the SRA performed on the MAR project schedule plus the uncertainty and variability in the owner's cost estimate, as a result of variability in the estimation inputs; these variabilities include pricing, quantities and unit rates.

Table 10-5 outlines the total risk adjusted owner's costs for MAR in nominal terms ranges from ***Redacted*** with a 50 per cent and 90 per cent respective probability that actual owner's costs will not exceed these estimates.

Table 10-5: Summary of owner's costs

Redacted

Commercial-in-confidence

10.3.1 Staffing impacts

MAR will generate a range of new ongoing employment opportunities, particularly during the construction phase. Although the works will predominantly be delivered by private sector contractors, Victorian Government personnel will play key roles in managing the delivery of MAR on behalf of the State.

Existing and new staff will take on roles created to support the delivery of MAR. Victorian Public Servant (VPS) personnel involvement will be across a number of government agencies.

Table 10-6 provides an estimate of the new and existing full-time equivalent VPS and non-VPS staff requirements for MAR.

Table 10-6: Summary of VPS staffing impacts

Description	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29
New full-time equivalent (FTE)								
New VPS staff	129.6	89.1	22.5	-	-	-	-	-
Existing FTE								
Existing VPS staff	-	58.8	-	-	-	-	-	-
Total FTE	**129.6**	**147.9**	**22.5**	**-**	**-**	**-**	**-**	**-**

Assumptions adopted to determine the VPS staffing impacts are as follows:

- FY21 includes the cumulative number of Full Time Employees (FTEs) at 30 June 2021
- Future years includes incremental FTEs required for the Project
- FTEs associated with the graduate program (and other employment programs) and MTIA are excluded.

10.4 Whole-of-life costs

Cashflows during the operations phase refer to the incremental costs and revenues associated with maintaining and operating the infrastructure created by MAR over the 50-year evaluation period.

Risk adjustments were developed using the risk quantification process outlined in Chapter 9 and applied to the operational cost estimates to present a risk adjusted whole-of-life cost estimates.

10.4.1 Operating and maintenance costs

Cash flows during the operations phase refer to the incremental costs associated with operation and maintenance of the infrastructure that MAR delivers. These include:

- driver labour, including costs for driver training, management, and the driver resources to operate MAR
- driver non-labour costs, including uniforms, medicals and other relevant allowances
- station staff labour costs, including costs for training, management and the resources required to deliver staffing for MAR in line with current operational practices relating to barrier staff and station hosts
- station staff non-labour costs, including uniforms, medicals and other relevant allowances
- Authorised Officers and Protective Service Officers labour and non-labour costs, including training management, resources required to deliver revenue enforcement, security coverage, uniforms, medicals and other allowances
- infrastructure maintenance costs relating to the number of incremental route kilometres for the rail line, new Melbourne Airport Station infrastructure (i.e. vertical transport, fire, life and safety systems) and modifications to the existing Sunshine Station
- rolling stock maintenance costs for cleaning, examinations, overhauls, and unplanned maintenance incurred by the HCMTs
- operations control centre labour and non-labour costs associated with the additional incremental FTE requirement as the level of complexity increases with MAR
- operational, control and management systems labour and non-labour costs associated with the additional incremental FTE requirement as the level of complexity increases with MAR
- energy costs associated with the incremental traction energy consumption of the HCMTs
- maintenance costs for installation of additional ticketing equipment
- costs associated with the operator's mobilisation and delivery support.

The cost estimator has developed preliminary operating and maintenance cost estimates by reference to comparable rail infrastructure projects, Metro Trains Melbourne (MTM) operating and maintenance costs benchmarks and the proposed service plan at the time of this Business Case. These estimates were adjusted using the risk quantification process outlined in Chapter 9.

The operations and maintenance costs are summarised in Table 10-7 for the proposed final scope included in this Business Case.

Table 10-7: Summary of operating and maintenance costs

Redacted

Commercial-in-confidence

10.4.2 Asset renewals

Asset renewals are the costs associated with capital maintenance (major maintenance, refurbishment or replacement) of MAR infrastructure over the 50-year operating period modelled. Asset renewal costs include:

- infrastructure renewals costs associated with any MAR related infrastructure when the design life of the asset has expired
- rolling stock renewals including whole of train replacement once trains have exceeded their useful design lives.

The cost estimator has developed the asset renewal cost estimates using asset useful lives and industry data. These estimates were adjusted using the risk quantification process outlined in Chapter 9.

Table 10-8 summarises the risk adjusted incremental investment asset renewal costs.

Table 10-8: Summary of risk adjusted asset renewal costs

Redacted

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Table 10-3 illustrates the profile of the risk adjusted asset renewal costs of MAR over the 50-year operating period.

Figure 10-3: Risk adjusted asset renewal costs (Nominal)

Redacted

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10.4.3 Revenue

The revenues associated with MAR represents incremental farebox revenue (net of lost SkyBus revenue) generated by MAR from passengers travelling to and from Melbourne Airport inclusive of the premium charged to passengers boarding or alighting at the airport and exclusive of the Myki fare.

Demand was forecast considering two fare structures to align with the assumptions adopted in the economic analysis. The two fare structures in the economic analysis were calculated using real 2016 dollars and included:

- Base case fare structure of ***Redacted***
- Alternative fare structure of ***Redacted***

The actual fare premium for MAR will be subject to a separate analysis and determined at a later point in time by the Victorian Government. Real revenue is based on an escalated fare to reflect 1 January 2020 dollars.

Underpinning both fare structures was an assumption regarding the demand ramp-up period. A ramp-up period reflects the fact that typically for new transport projects the impact of demand for the services is rarely instantaneous. This Business Case considers research undertaken in the

Australian Transport Assessment and Planning Guidelines[127] to determine the appropriate demand ramp-up period for MAR. Two core scenarios were considered:

- **Conservative estimate** – demand in accordance with a major corridor change; that is travel between Melbourne Airport and the Central Business District (CBD) via a new premium rail service and alternative route compared with SkyBus.
- **Optimistic estimate** – Demand will ramp up in accordance with a route/connectivity change that is a realigned travel route between Melbourne Airport and the CBD.

The demand ramp-up periods are shown in Table 10-9. The project team elected to adopt the midpoint of these two assumptions.

Table 10-9: Demand ramp-up factors

Demand ramp up	Q1	Q2	Q3	Q4	Year 2	Year 3
Major corridor change	21%	34%	43%	49%	65%	73%
Route/connectivity change	85%	91%	93%	95%	97%	99%
MAR Ramp-Up	**53%**	**63%**	**68%**	**72%**	**81%**	**86%**

Table 10-10 outlines the combined risk adjusted revenues for MAR.

Table 10-10: Summary of risk adjusted nominal revenues

Redacted

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The forecast incremental farebox revenues in Table 10-10 above were modelled based on demand outputs from RPV's Technical Advisor airport module in the VITM (discussed further in Chapter 11). The VITM is owned and managed by the Victorian Government with key inputs provided by RPV, DoT and its advisors to inform the demand model runs.

The forecast farebox revenues in this Business Case were prepared for the express purpose of use in this Business Case and for transport planning decisions and are not intended for any other purpose.

A range of uncertainties are associated with the demand modelling outputs and the inputs and assumptions listed above that could cause actual MAR demand to differ materially from the forecasts. Some key generic and MAR-specific uncertainties are summarised in Table 10-11.

Table 10-11: Key uncertainties with demand forecasts

Generic uncertainties	MAR-specific uncertainties
• Future government decisions around investment in interdependent infrastructure projects, including major/minor road and rail projects and supporting infrastructure such as the completion date for the Suburban Rail Loop or available car parks at train stations and at Melbourne Airport • Changing economic conditions that could impact demographic and land use forecasts, including	• Domestic and international travel demand which will be impacted by changing economic conditions and travel patterns • Future decisions made by Melbourne Airport to expand capacity (e.g. an extra runway) and flight volumes

[127] https://www.atap.gov.au/sites/default/files/M1_Public_transport.pdf

Generic uncertainties	MAR-specific uncertainties
birth rates, death rates, overseas and interstate migration and employment projections by location • Future public transport service plans, including service frequencies, capacities and stopping patterns • Changing future travel patterns across Melbourne due a range of potential unknown variables such as uptake of autonomous vehicles or adjustments from the COVID-19 pandemic	• Future decisions made by Avalon Airport to expand/reduce capacity and flight volumes • Freight forecasts which will be impacted by changed domestic and international industry structures and economic conditions • The impact that luggage on MAR may have on train capacity and dwell times • Air passenger travel preferences – Sydney Airport travel preference data was used to inform the demand modelling as it represented the best available data across Australia at the time of writing. The collection of similar data for Melbourne Airport passengers was not possible due to COVID-19 related interruptions to travel during 2020.

10.4.4 SkyBus cost savings

The demand modelling and economic analysis of this Business Case assumes the Southern Cross to Melbourne Airport SkyBus service will not operate during the hours MAR is operating. The final decision on the operation of the Southern Cross to Melbourne Airport SkyBus service after MAR commences operations has not yet been made and will be subject to a future government decision. As part of the economic analysis the cost associated with not running these SkyBus services is included as an incremental cost saving for MAR.

These cost savings include:

- bus driver resources required to operate SkyBus as well as an allowance for customer service assistants at stations
- staff uniforms, medicals, and other relevant allowances as well as costs for diesel energy consumption, based on consumption benchmarking
- periodic maintenance costs benchmarked against comparable coach third party contracts, with periodic replacements comprising the whole of bus replacement, assuming a 25-year design life
- as the journey time for the SkyBus changes over time due to rising congestion, additional buses are required to maintain the specified headway, with additional coaches assumed to be purchased in batches of five.

Table 10-2 summarises the risk adjusted cost savings associated with SkyBus.

Table 10-12: Summary of risk adjusted SkyBus cost savings

Redacted

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10.5 Budget impacts

Table 10-13 summarises the budget impacts for the capital components of the Project. The Total Estimate Investment (TEI) includes all MAR costs up until 2029 and includes development costs that were previously funded.

Table 10-13: Capital budget impacts

Redacted

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Table 10-13 includes an estimate of the total cost of the additional HCMTs to be purchased for the Project, the State balance sheet impact is subject to detailed accounting analysis of the current HCMT PPP Liability and is dependent on negotiation with Evolution Rail.

No additional output funding is being sought before FY29, see section 10.4 for incremental increase in total operating and maintenance and renewals costs for MAR. Separate funding submissions will be submitted for the incremental increase in total operating and maintenance and renewals costs for MAR.

11 Economic appraisal

11. Economic appraisal

Chapter summary

- This chapter summarises the results of the economic appraisal undertaken for MAR.
- The analysis was undertaken in accordance with the relevant guidelines, including the Infrastructure Australia (IA) Assessment Framework, DTF Economic Evaluation for Business Cases Technical Guidelines, DoT guidelines, latest revision of the Australian Transport Assessment and Planning (ATAP) Guidelines and Austroads Guide to Project Evaluation.
- Both Melbourne Airport Rail and SRL East (from Cheltenham to Box Hill) are currently expected to commence construction in 2022, with SRL North (from Box Hill to Melbourne Airport) to be delivered later. In consideration of this, the economic appraisal in this chapter was undertaken with and without the SRL North connection to Melbourne Airport in 2051 in the Base Case. Although the economic appraisal was undertaken with the SRL North connection to Melbourne Airport in 2051, this could occur in the 2040s subject to future government decisions.
- The Benefit Cost Ratio (BCR), Net Present Value (NPV) and underlying economic benefits set out in this appraisal are shown as a range between the P10 and P90 values. The incorporation of uncertainty in the economic appraisal reflects best practice and responds to broader recommendations within Victoria and Australia on the appraisal of projects with long lead times.
- Table 11-1 summarises the economic analysis results for MAR excluding the SRL North connection to Melbourne Airport in 2051 in the Base Case as well as for MAR including the SRL North connection to Melbourne Airport in 2051 in the Base Case. The results are presented at a 4 per cent discount rate.

Table 11-1: Summary of economic evaluation results for MAR (4 per cent discount rate)

	BCR	NPV
Excluding the SRL North connection to Melbourne Airport in 2051 in the Base Case		
Total economic benefits	1.8 - 2.1	$7.5bn - $10.8bn
Including the SRL North connection to Melbourne Airport in 2051 in the Base Case		
Total economic benefits	1.1 - 1.3	$0.9bn - $2.8bn

- MAR will support up to 8,000 direct and indirect jobs during construction. These jobs will range from engineers and subject matter experts planning behind the scenes, to construction workers and local suppliers who will help to deliver the project on site.[128] This level of investment will increase the size of the economy and job market, creating 1,880 net additional jobs across Victoria at the peak of MAR's construction. Across Australia, approximately 2,100 net additional jobs are expected to be generated at the peak of construction.
- In present value terms, the construction and operation of MAR excluding the SRL North connection in the Base Case is expected to increase Victoria's Gross State Product (GSP) approximately $17.9 billion at a 4 per cent discount rate. For MAR including the SRL North connection in the Base Case, the Project is expected to increase GSP by $16.2 billion at a 4 per cent discount rate.
- The Victorian economy as measured by change in GSP is expected to be better off by 5.9 and 5.0 times the cost of investment (after allowing for borrowing costs) for MAR excluding the SRL North connection in the Base Case and MAR including the SRL North connection in the Base Case respectively. Similarly, the Australian economy as measured by change in Gross Domestic Product (GDP) will be better off by 2.9 and 2.4 times the cost of investment for MAR excluding the SRL North connection in the Base Case and MAR including the SRL North connection in the Base Case respectively.

[128] RPV analysis on behalf of DoT.

- Given the inherent uncertainties associated with the long-term projections underpinning the MAR economic appraisal, a range of future scenarios via alternative Base Case and/or Project Case combinations were also considered.

11.1 Overview

This chapter summarises the results of the economic appraisal undertaken for MAR.

The analysis was undertaken in accordance with the relevant guidelines, including the IA Assessment Framework, DTF Economic Evaluation for Business Cases Technical Guidelines, DoT guidelines, latest revision of the ATAP Guidelines and Austroads Guide to Project Evaluation. The appraisal also incorporates agreed assumptions and inputs from a range of stakeholders, including DoT, RPV and DTF.

Both Melbourne Airport Rail and SRL East (from Cheltenham to Box Hill) are currently expected to commence construction in 2022, with SRL North (from Box Hill to Melbourne Airport) to be delivered later. In consideration of this, the economic appraisal was undertaken:

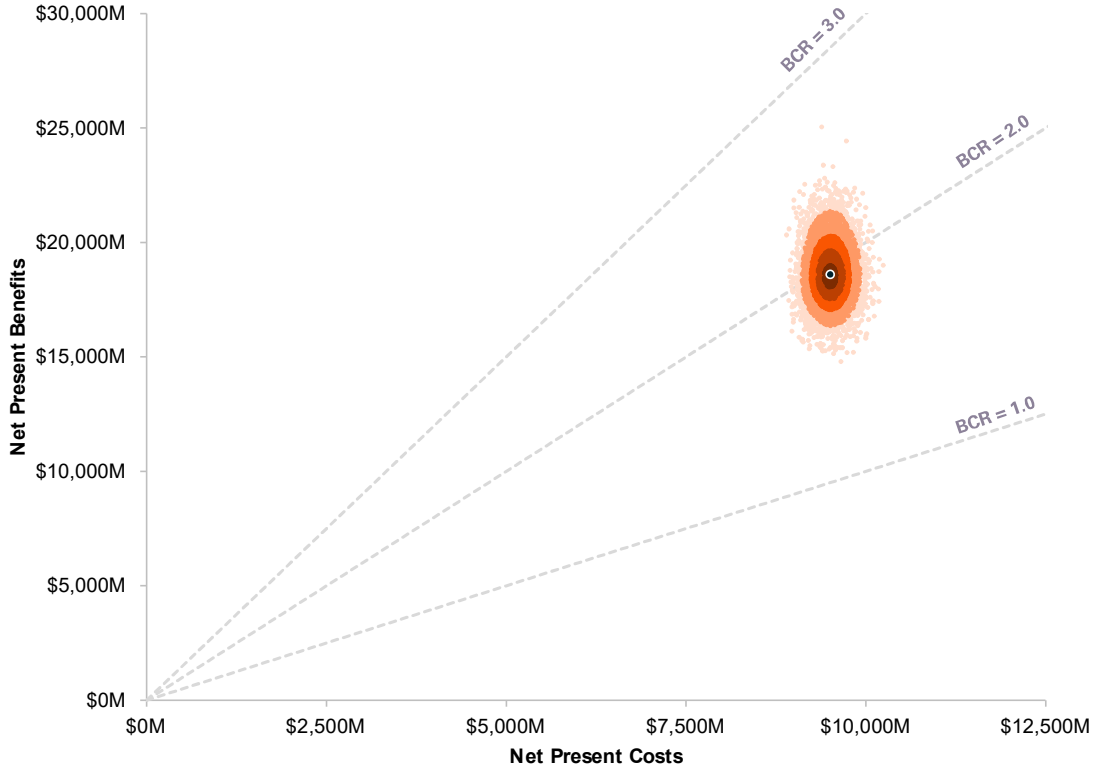
- excluding the SRL North connection to Melbourne Airport in 2051 in the Base Case (MAR excluding the SRL North connection)
- including the SRL North connection to Melbourne Airport in 2051 in the Base Case (MAR including the SRL North connection).

Although the economic appraisal was undertaken with the SRL North connection to Melbourne Airport in 2051, this could occur in the 2040s subject to future government decisions.

The BCR, NPV and underlying economic benefits set out in this appraisal are shown as a range between the P10 and P90 values. The incorporation of uncertainty within the economic appraisal reflects best practice and responds to broader recommendations within Victoria and Australia on the appraisal of projects with long lead times.[129]

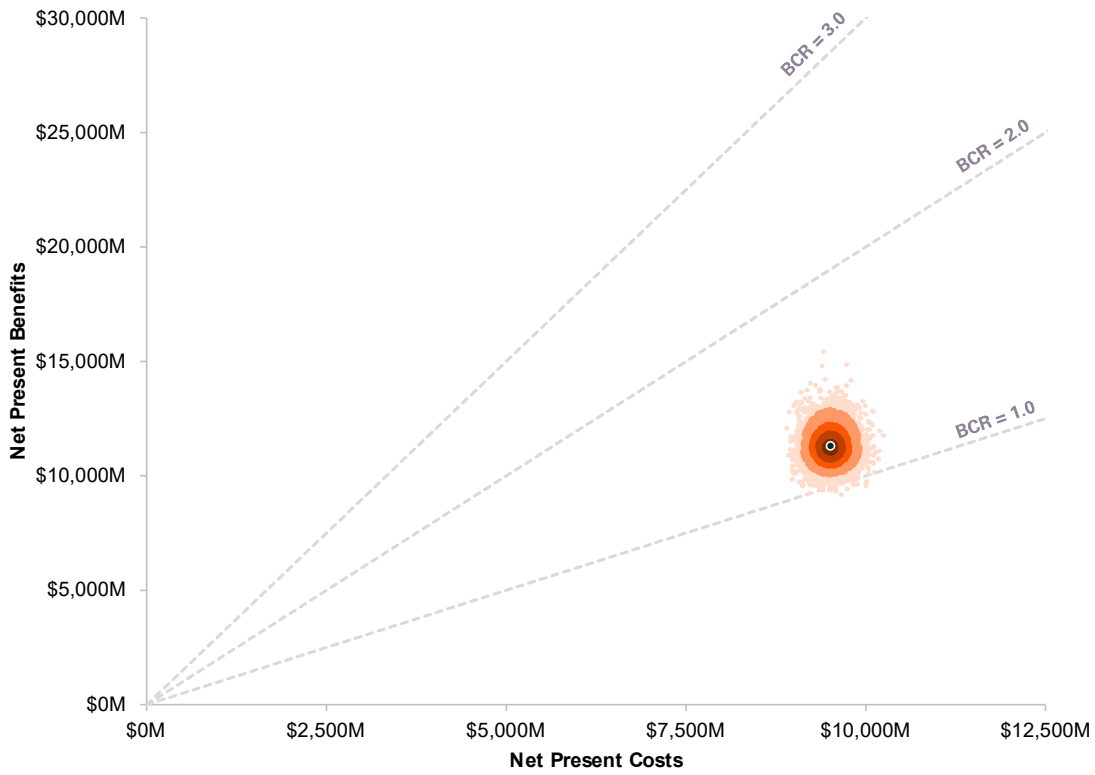
Figure 11-1 and Figure 11-2 summarise the probabilistic economic analysis results for MAR excluding the SRL North connection and MAR including the SRL North connection respectively at a discount rate of 4 per cent.

Figure 11-1: Economic evaluation result considering a 4 per cent discount rate (MAR excluding the SRL North connection in the Base Case)



[129] Victorian Auditor-General's Office (2019, pg.11). *Melbourne Metro Tunnel Project - Phase 1: Early Works.*

Figure 11-2: Economic evaluation result considering a 4 per cent discount rate (MAR including the SRL North connection in the Base Case)



VITM was used to assess the network-wide impacts of MAR. VITM is the Victorian Government's four-step strategic transport model used to assess major transport policies and projects. The economic results set out in this chapter are calculated using outputs of VITM.

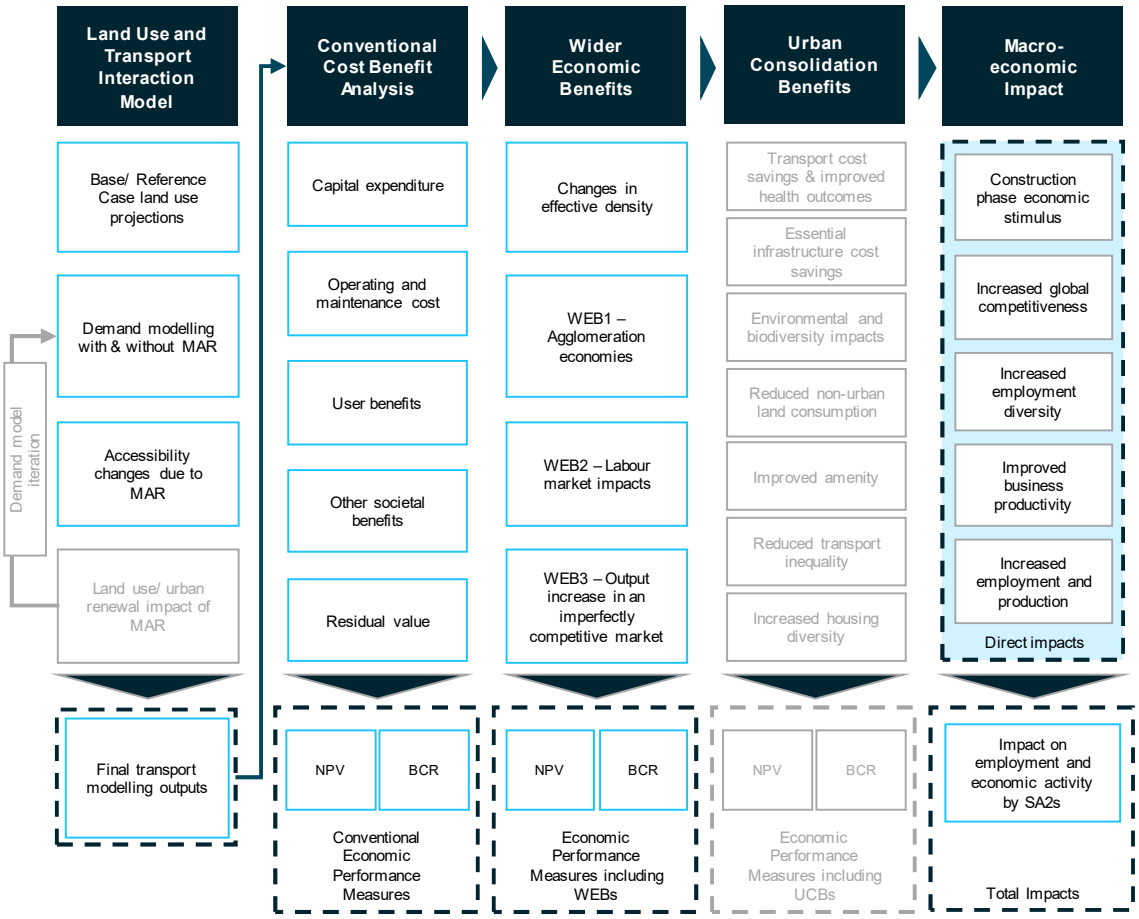
The land use impact of MAR was modelled using CityPlan – an advanced dynamic disequilibrium land use transport interaction (LUTI) model that covers Greater Melbourne, Geelong, Ballarat and Bendigo. Due to the nature of the Project, the land use impacts of MAR, as assessed within the CityPlan model, are not substantive. As a result, the land use change generated by MAR was not considered within the economic appraisal.

11.2 Economic appraisal methodology

The economic appraisal framework considers a full spectrum of impacts attributable to MAR, combining demand analysis, economic benefits assessment and economic costs estimation to assess the social, economic and environmental impacts of the Project.

The economic appraisal framework is summarised in Figure 11-3.

Figure 11-3: Economic appraisal framework



The figure sets out the benefits considered in the economic appraisal framework:

- **Conventional economic benefits** – including travel time savings, improved road travel time reliability, reduced crowding, externalities and option and non-use value; these benefits were quantified using cost-benefit analysis (CBA), drawing on relevant Victorian and Australian economic evaluation guidelines.
- **Wider economic benefits (WEBs)** – including agglomeration, labour market deepening through increased labour supply and output increase in an imperfectly competitive market, which result from improved accessibility and connectivity.
- **Macro-economic impacts** – such as increased global competitiveness, labour productivity, economic output and employment, which have been quantified using computable general equilibrium (CGE) modelling.

Urban consolidation benefits (UCBs) arise due to a more consolidated land use form, and resulting changes to the socio-economic fabric creating a more socially equitable and inclusive community. The land use impacts of MAR, as assessed within the CityPlan model, are not substantive so neither the land use impact nor the UCBs were incorporated into the economic appraisal of MAR.

11.3 Scenarios assessed

This economic evaluation assesses and compares the incremental costs and benefits of the Project Case relative to the Base Case. The Base Case for the economic analysis is derived from DoT's Reference Case.

11.3.1 Reference Case

The Reference Case developed by DoT includes the following agreed set of assumptions relating to Victoria:

- land use projections for population and employment growth
- future transport network projects, including arterial road upgrades, rail service upgrades, motorway improvements, tram and bus upgrades and service level augmentations to supply a reasonable capacity to support future demand associated with the Reference Case land use.

Inclusion of transport projects in the Reference Case does not imply any commitment from the Victorian Government or DoT to undertake these projects. It merely indicates that DoT has determined that it is reasonable to represent the project, or a similar investment, in the future network for the purposes of modelling demand in the transport system.

In 2051, the DoT Reference Case incorporates the SRL North connection to Melbourne Airport, providing an additional means of accessing Melbourne Airport via public transport. As discussed in section 11.1, the economic analysis was undertaken with as well as without the SRL North connection to Melbourne Airport in 2051 in the Base Case.

11.3.2 Base Case

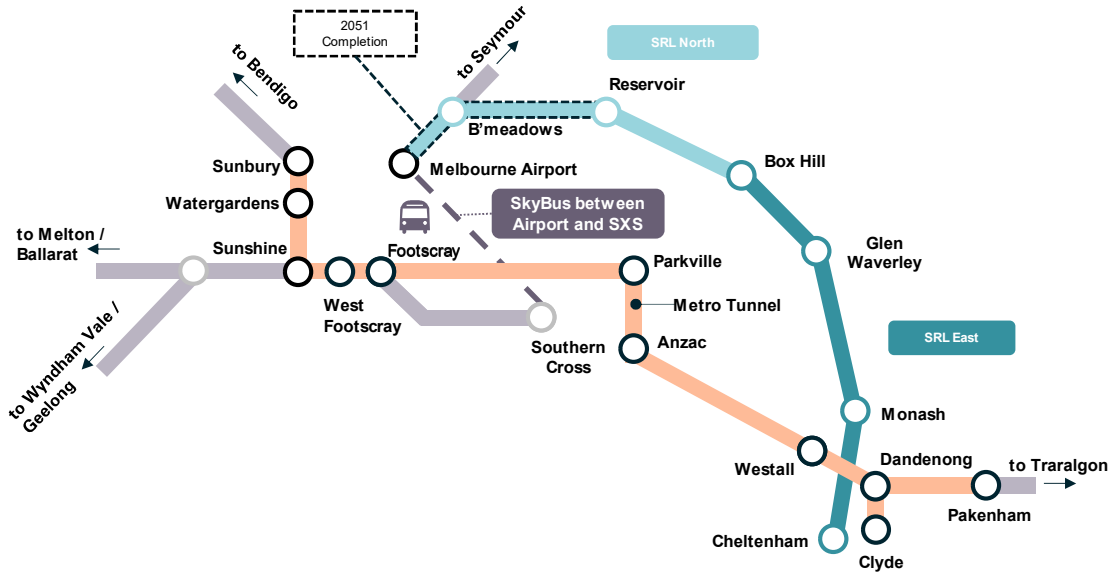
The Base Case is the reference point for the economic analysis and considers future transport network assumptions and land use projections consistent with the DoT Reference Case, but excludes MAR. The Base Case for this appraisal therefore:

- reflects the scenario without costs or benefits associated with MAR
- includes land use assumptions as per the Reference Case, but without the MAR investment.

Under the Base Case, the Melbourne City Express SkyBus service is the primary public transport connection between the CBD and Melbourne Airport.

The Base Case network configuration is provided in Figure 11-4 with the MTP corridor also highlighted.

Figure 11-4: Base Case network configuration

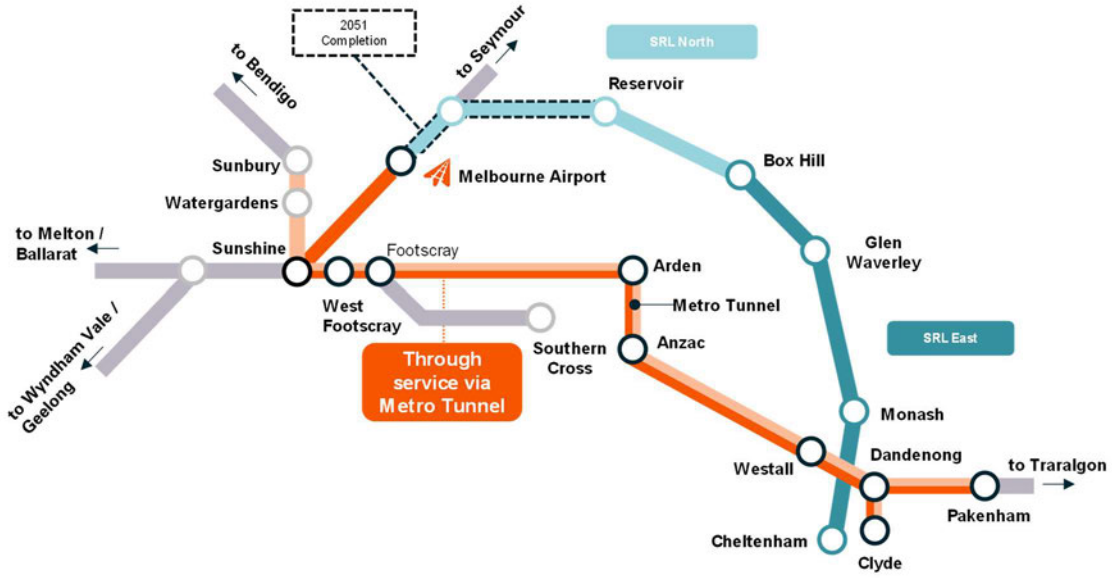


11.3.3 Project Case

The Project Case considers the Base Case described in section 11.3.2, plus the changes to the transport network required to deliver the proposed service plan for MAR. This involves the extension of short starters at Sunshine and West Footscray to Melbourne Airport via a new track between Sunshine and the airport. In the Project Case, the Melbourne City Express SkyBus does not operate during MAR hours of operation.

The network configuration associated with the Project Case is shown in Figure 11-5. This figure also highlights that infrastructure associated with MAR forms an integral part of SRL by providing a link to the western network between Broadmeadows and Sunshine.

Figure 11-5: Project Case network configuration



As noted previously, the economic analysis was undertaken with as well as without the SRL North connection to Melbourne Airport in 2051.

11.4 Key inputs and assumptions

Key inputs and assumptions used in the economic appraisal include:

- **Capital costs** – All non-recurrent capital costs that are expected to be incurred to deliver MAR. The capital cost estimates were developed in real (2020 dollar) prices. More details are provided in Appendix 7: Capital cost estimate report.
- **Operating and maintenance costs** – All necessary recurrent costs to operate, maintain and renew the MAR asset and rolling stock over the evaluation period. It also considers the operational and maintenance cost savings associated with the cessation of the Melbourne City Express SkyBus service in the Project Case. The operating, maintenance and renewal costs were estimated in real (2020 dollar) prices. More details are provided in Appendix 8: Operational cost estimate report.
- **Demand forecasts** – Outputs from VITM for the Base Case and the Project Case for the model years 2026, 2031, 2036, 2041, 2051 and 2056. For each of the model years, outputs are provided for four time periods across an average weekday from which benefits (including travel time savings, vehicle operating cost savings, crash cost savings and environmental externality savings) are calculated.
- **Unit rates** – For each of the benefits calculated from the modelling outputs, primarily derived from ATAP guidelines.
- **Applicable evaluation parameters** – Key input parameters are summarised in Table 11-2.

Table 11-2: Key input parameters

Parameter	Value	Supporting information
Discount rate, real	4 per cent (real)	The economic assessment was undertaken using a discount rate of 4 per cent. See section 11.4.1 for details
Costs	The economic cost distribution used within the probabilistic analysis has been derived from the financial cost distribution	The financial costs set out in Chapter 10 (and detailed in Appendix 7: Capital cost estimate report and Appendix 8: Operational cost estimate report) were adjusted to yield the real economic costs as described in Appendix 9: Economic appraisal This real economic cost distribution is included within the probabilistic analysis
Evaluation period	50 years	From the first year of operation of the Project Case, 50 years is used in line with the ATAP T2 guideline for rail infrastructure As per IA and DTF guidance, the residual value of assets is included in the last year of evaluation to incorporate the benefits that will continue to be delivered by the main asset
Base year for discounting	2022	To align with the first year of major capital expenditure as per the ATAP T2 guideline
Price base	2020 (Q1)	To align with the price base used for capital costs as outlined in Chapter 10
Capital spend period	***Redacted*** ***Commercial-in-confidence***	To align with the capital spend period outlined in Chapter 10
Operational commencement		As per the P90 completion date in line with the construction schedule. See Chapter 15 for details
Fare structure (airport access)		***Redacted*** ***Commercial-in-confidence*** The actual fare premium for MAR will be subject to a separate analysis and determined at a later point in time by the Victorian Government

Parameter	Value	Supporting information
Public transport expansion factors	Peak to annual: 241.2 Off peak to annual: 354.5	Based on travel patterns informed by Myki data for work days, public / school holidays and weekends For the economic appraisal, a probability distribution for public transport expansion factors has been considered around this central value. More details are provided in Appendix 9: Economic appraisal
Road expansion factors	Daily to annual: 330	This is consistent with the economic appraisal of major road transport infrastructure projects such as North East Link[130]
Value of travel time savings	Value of travel time (in 2020 dollar terms): • business to business trips: $55.32 • other trips: $17.05	In line with the ATAP PV2 guideline and indexed as described below For the economic appraisal, a probability distribution for the airport user value of travel time has been considered. More details are provided in Appendix 9: Economic appraisal
Indexation	Value of Travel Time (VOT) has been indexed at 1.5 per cent per year for work related travel For non-work related travel, VOT has been indexed at 0.75 per cent (calculated as the estimated real long-term average growth in real income in Victoria multiplied by an elasticity of 0.5)	Analysis of Average Weekly Earnings (AWE) and Consumer Price Index (CPI) data from the Australian Bureau of Statistics (ABS) for Victoria This is consistent with the 2015 Intergenerational Report[131] which recommends the value of time being indexed using long-term average growth in real income
Demand modelling years	2026, 2031, 2036, 2041, 2051 and 2056	As agreed with DoT
Interpolation and extrapolation	Benefits have been linearly interpolated between modelled years using the annual average growth rates of the modelled economic benefit between model years The modelled benefit between 2051 and 2056 has been used to determine the magnitude of benefits beyond the final demand modelling year (until the end of the economic appraisal period)	More details are provided in Appendix 9: Economic appraisal

11.4.1 Economic discount rate

For some time, there has been growing local and global support for fit-for-purpose discount rates for multi-generational projects. For example, research from the Grattan Institute noted that longer-term

[130] Ernst & Young (2018). *Appendix Q1 Economic Appraisal* [PDF File]. Retrieved from: https://northeastlink.vic.gov.au/__data/assets/pdf_file/0003/417954/NEL-Business-Case-Appendix-Q1.pdf
[131] Commonwealth of Australia (2015). *2015 Intergenerational Report - Australia in 2055*

projects should require lower discount rates that vary to reflect the current risk-free rate and the sensitivity of the project's expected returns to the economy.[132]

In recent years, fit-for-purpose discount rates have been applied on a number of major infrastructure project appraisals, such as:

- In the UK, London's Crossrail project[133], High Speed Rail 1[134] and High Speed Rail 2[135] – these projects were assessed over a 60 year period utilising a discount rate of 3.5 per cent for the first 30 years and 3 per cent thereafter to reflect the impacts on future generations
- Grand Paris Express, a large scale automated metropolitan orbital transport and urban regeneration project under construction in Paris and greater Ile-de-France – this was assessed using a discount rate of 4 per cent to demonstrate the rate of return required for public projects in France[136]
- Inland Rail, an expansive multigenerational rail infrastructure initiative – the Australian Government and Australian Rail Track Corporation applied and reported against a discount rate of 4 per cent as part of the project's economic appraisal.[137]

Using a discount rate for multi-generational projects – such as MAR – in line with standard investment guidance results in latter year benefits (and equally costs) being discounted to near zero. For example, the equivalent of $1 (real) in undiscounted economic benefits in 2029 (the first full year of operation) would be valued at 62 cents in present value terms and in 2053 (halfway through the appraisal period), would be valued at just 12 cents in present value terms if a discount rate of 7 per cent (real) was applied.

Accordingly, the economic assessment of MAR has considered a discount rate of 4 per cent (real) that:

- better reflects the intended outcomes of the multi-generational MAR investment
- is more in-line with the low risk-free rate over the last decade and longer, as well as the current global economic environment
- is consistent with global and local practice for appraising long term, large scale infrastructure investments.

11.5 Transport and land use modelling

VITM was the primary model used to inform the transport demand forecasts and subsequent economic appraisal for MAR and is described in Table 11-3. More detail about model application and development is provided in Appendix 5: Demand modelling.

Table 11-3: VITM description

Model type	Model	Role	Benefits calculated
Transport demand model	VITM	A primary, four-step model which forecasts travel demand by road and public transport from a given set of demographic, road network and public transport service plan inputs	Outputs for the majority of benefits were sourced from VITM, including conventional benefits and WEBs

[132] Terrill, M. and Batrouney, H. (2018). *Unfreezing discount rates: transport infrastructure for tomorrow* [PDF File]. Retrieved from: https://grattan.edu.au/wp-content/uploads/2018/02/900-unfreezing-discount-rates.pdf
[133] Transport for London (2010). *Crossrail business case – Summary report* [PDF File]. Retrieved from: https://2577f60fe192df40d16a-ab656259048fb93837ecc0ecbcf0c557.ssl.cf3.rackcdn.com/assets/library/document/c/original/crossrailbusinesscasefinal300710.pdf
[134] London & Continental Railways (2019). *Economic Impact of High Speed 1* [PDF File]. Retrieved from: https://volterra.co.uk/wp-content/uploads/2013/02/Economic-Impact-of-High-Speed-1.pdf
[135] UK Department for Transport (2020). *High Speed 2 Phase One – Full Business Case* [PDF File]. Retrieved from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/879445/full-business-case-hs2-phase-one.pdf
[136] International Transport Forum (2018). *Strategic Investment Packages – Case-Specific Policy Analysis* [PDF File]. Retrieved from: https://www.itf-oecd.org/sites/default/files/docs/strategic-investment-packages.pdf
[137] Australian Rail Track Corporation (2015). *Inland Rail Programme Business Case* [PDF File]. Retrieved from: https://1worpv3xudfc4dl40l1hi7fz-wpengine.netdna-ssl.com/wp-content/uploads/2020/07/business-case-2015.pdf

The transport impacts of MAR are discussed in detail in Chapter 8 and Appendix 5: Demand modelling.

The land use impacts of MAR were also assessed using CityPlan, a 4th Generation Land Use and Transport Interaction Model (when combined with VITM) that helps assess the changes in land use facilitated by transport accessibility changes. Due to the nature of the Project, the land use impacts of MAR, as assessed within the CityPlan model, are not substantive. CityPlan outputs were not therefore incorporated back into VITM and a 'fixed' land use was considered appropriate for appraising MAR. A detailed explanation of land use impact estimation for MAR is provided in Appendix 5: Demand modelling.

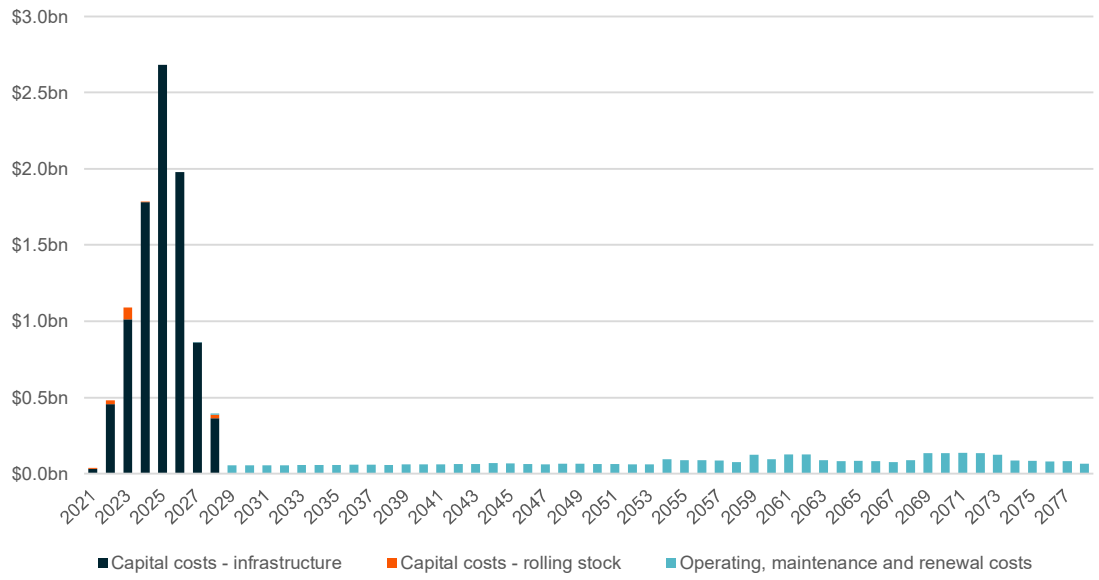
11.6 Costs

The economic appraisal requires that only economic costs are included in the analysis. Economic costs include incremental changes relative to the Base Case required to deliver the benefits of the project and consider:

- **Capital costs** – All capital expenditure incurred during planning, construction, delivery and commissioning of the infrastructure and rolling stock. The capital costs include an inherent and contingent risk allowance and consider real escalation.
- **Recurrent costs** – All necessary incremental costs to the Base Case relating to operating, maintenance and periodical renewal to support the operation of infrastructure, rolling stock, rail track and stations over the 50-year appraisal period. Cost savings arising from the Melbourne City Express SkyBus service not operating during the hours when MAR is operating were also considered.

Figure 11-6 outlines the cost profile for MAR over the economic appraisal period.

Figure 11-6: Cost profile for MAR (P50, real, undiscounted, $2020)



Source: Appendix 7: Capital cost estimate report and Appendix 8: Operational cost estimate report

11.7 Benefits

The economic benefits quantified in the economic appraisal can be categorised into conventional benefits and WEBs.

11.7.1 Conventional economic benefits

Conventional economic benefits primarily include transport-related benefits quantified in accordance with ATAP, DoT and DTF guidelines where appropriate. Conventional economic benefits fall into three main categories:

- **User benefits (public transport and road users)** – Benefits to public transport and remaining road users as a result of the Project Case. User benefits include, for example, reduced crowding and waiting times on public transport, or travel time savings and vehicle operating cost savings for commercial vehicles resulting from people switching from car to public transport. The majority of benefits are calculated using the consumer surplus approach. Certain benefits are not perceived by users but result in a change in consumption of resources. Resource cost corrections therefore need to be applied.[138]
- **Other societal benefits** – Benefits accruing to Victorians as a whole from changes to travel behaviour following the introduction of the Project Case. For example, this includes reduced crashes, greenhouse gas emissions and improved health (due to increased walking) resulting from people switching from car to public transport. Other societal benefits also include the value Victorians place on having an airport rail link, including benefits associated with option and non-use value.[139]
- **Infrastructure residual value** – The infrastructure constructed for the Project Case will have an economic life beyond the end of the evaluation period. The residual value is an estimate of the economic benefit of the infrastructure from the end of the evaluation period to the end of the economic life of the asset.

11.7.2 Wider Economic Benefits (WEBs)

The conventional CBA is based on the assumption of perfect competition and lack of market imperfections. The presence of additional market imperfections (beyond those externalities typically identified in a conventional CBA) means that not all the impacts of changes in the marginal costs of travel are assessed in a conventional CBA. In addition, the cost of travel does not equate to the marginal social cost of transport supply. This divergence between price and marginal social cost gives rise to potential for additional impacts (benefits or costs) that are not captured in the conventional CBA.

These impacts, which have been traditionally excluded from ‘conventional’ CBA, are now commonly referred to as WEBs. Over the last decade, WEBs have entered the project evaluation framework for significant transport projects.

Three categories of WEBs arising from MAR were assessed:

- agglomeration economies – change in effective density and clustering effects
- labour market deepening – move to more productive jobs and increased labour supply
- increased output due to imperfectly competitive markets.

11.8 Economic analysis considering uncertainty

The economic analysis undertaken for major transport infrastructure business cases is typically reflected through the reporting of a single ‘headline’ BCR. However, due to the range of intrinsic uncertainties associated with cost planning, transport modelling and a range of other assumptions (including long-term projections of land use and the future transport network configuration), the presentation of a single economic result fails to adequately capture the possibility of a range of possible scenarios and economic outcomes.

[138] Farebox resource cost corrections include the network-wide change in public transport fare revenue as a result of the Project. This is considered within the benefits delivered by the Project.
[139] An option value is the willingness to pay to preserve the option of using a transport service for trips not yet anticipated or currently undertaken by other modes, over and above the expected value of any such future use. Non-use values are the values that are placed on the continued existence of a service, regardless of any possibility of future use.

The impact of changes in key inputs and assumptions was tested through an uncertainty analysis, comprising both probabilistic analysis and scenario testing.

11.8.1 Probabilistic analysis

Monte Carlo simulation was undertaken to analyse the impact of key uncertainties on the NPV and BCR. The need for this approach is driven by uncertainties associated with key inputs, assumptions and the nature of air passenger travel. To account for this, an input distribution was considered for the following economic parameters:

- air passenger value of time
- public transport expansion factors
- willingness to pay for option and non-use.

The uncertainty in WEBs was also considered as part of the probabilistic analysis. Furthermore, costs are reported in ranges for this appraisal, taking into consideration the risk-adjusted cost distribution derived from the financial analysis outlined in Chapter 10. In particular, for capital costs, this captures the upside risk and so provides a more robust estimate of the NPV and BCR. More details on the input distributions considered are provided in Appendix 9: Economic appraisal.

11.8.2 Scenario tests and economic sensitivities

Given the inherent uncertainties associated with the long-term projections underpinning the MAR economic appraisal, it is appropriate to consider the economic outcomes of a range of future scenarios via alternative Base Case and/or Project Case combinations. The following were considered as part of the scenario testing:

- COVID-19 sensitivity which considers the following assumptions[140]:
  - based on analysis undertaken by the Department of Environment, Land, Water and Planning (DELWP), population and employment are expected to be delayed by two years in early model years, increasing to a delay of four years by 2056 (for example, the growth originally forecast for 2020 is now expected to be realised by 2022, while 2052 growth levels are expected to be realised by 2056)
  - based on analysis undertaken by DoT and the Department of Jobs, Precincts and Regions (DJPR), 29 per cent of Victorian jobs are suited for remote work and those employed in these jobs are assumed to work from home for two to three days a week
  - air passenger numbers fall in the short term – with travel returning to 2019 levels by 2023 for domestic and short haul travel, and by 2024 for all travel – but by 2031, air travel forecasts are assumed to revert to pre-COVID levels.
- alternative fare structure of ***Redacted*** [141]
- including an intermediate station at Keilor East, which reflects the priced option discussed in Chapter 6
- different alternative specific constant (ASC) in VITM airport module to test different user response assumptions to MAR – this test provides a 10 minute preference to rail as a mode choice for air passengers[142]
- prevalence of autonomous vehicles (AVs)[143]:
  - in a high automation, high private use (PAV) scenario which considers 35 per cent conventionally driven vehicles (CDVs) and 65 per cent privately owned AVs

[140] Department of Transport (2020). *COVID-19 impacts on demand forecasts – sensitivity and scenario testing project analysis.* Air passenger assumptions are based on IATA and Qantas announcements and were agreed with DoT/RPV.
[141] This equates to an $ * fare (in 2016 dollar terms) for trips made from Zone 1 and Zone 2.
[142] The ASCs in the Airport Module account for the unobserved attributes not captured by the time and cost incurred by a user which impact air passenger mode choice. The use of alternative ASCs aims to test the variability of the unobserved user attributes on modelled results (e.g. sensitivity of mode share).
[143] Note that all CDVs and AVs in these scenarios are electric vehicles.

  - in a high automation, high shared use (SAV) scenario which considers 21 per cent CDVs, 39 per cent privately owned AVs and 40 per cent shared, on-demand AVs.
- transport network pricing (TNP) options based on time of day, mode of transport and location – specifically, the TNP scenario tested considers an alternative pricing strategy for both road and public transport travel:
  - road pricing: $0.165/km
  - public transport (peak): $1.70 flag fall and $0.09/km
  - public transport (off-peak): $1.50 flag fall and $0.07/km.

More details on the modelled scenarios and the associated demand findings are provided in Appendix 5: Demand modelling.

A number of additional economic sensitivities were also considered which include:

- no growth in benefits beyond the final model year
- a 20 per cent decrease in public transport benefits
- a 20 per cent increase in public transport benefits
- a 20 per cent decrease in road benefits
- a 20 per cent increase in road benefits.

The economic evaluation results for these scenario tests and economic sensitivities are summarised in section 11.9.3.

11.9 Economic evaluation results

The following economic performance measures were calculated to determine the economic viability of MAR:

- the NPV, which gives an indication of the magnitude of net benefit to society, and where positive NPVs indicate the investment is desirable to society as a whole
- the BCR, which is a measure of value for money for public expenditure, and is of principal value when a government is considering spending scarce funds.

11.9.1 Core results

- The economic evaluation results for MAR, considering a 4 per cent discount rate, are summarised in ranges from 1.8 (P10) to 2.1 (P90) for MAR excluding the SRL North connection in the Base Case
- ranges from 1.1 (P10) to 1.3 (P90) for MAR including the SRL North connection in the Base Case.

Table 11-4.

Under a holistic assessment including conventional benefits and WEBs, the BCR:

- ranges from 1.8 (P10) to 2.1 (P90) for MAR excluding the SRL North connection in the Base Case
- ranges from 1.1 (P10) to 1.3 (P90) for MAR including the SRL North connection in the Base Case.

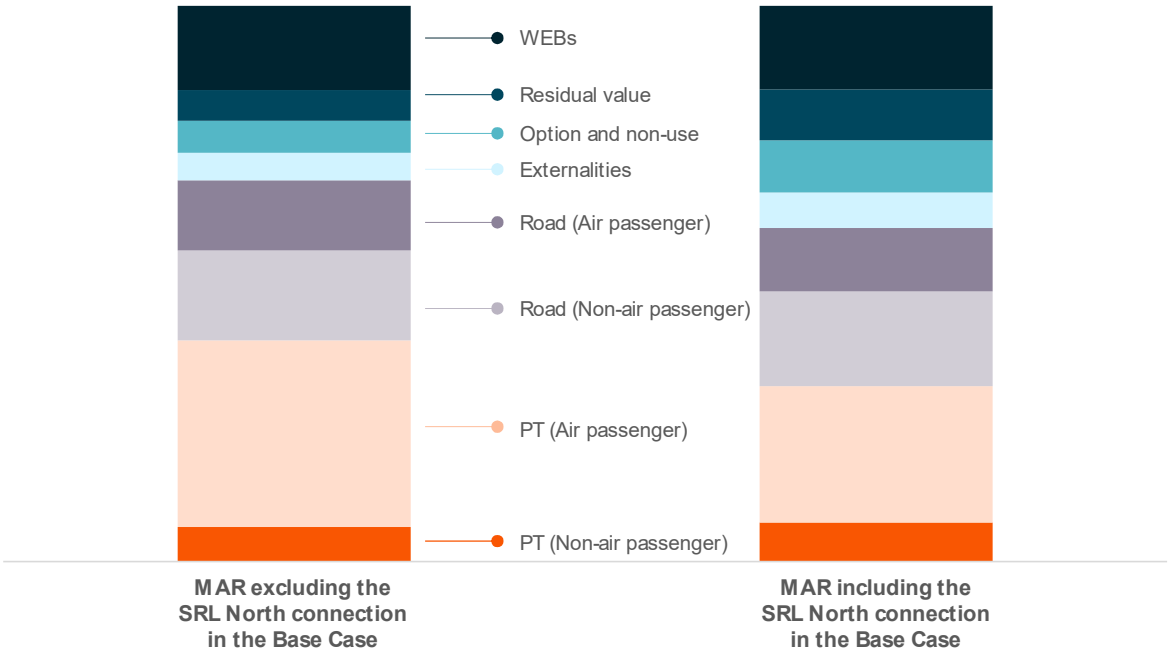
Table 11-4: Economic evaluation results for MAR (4 per cent discount rate)[144]

Category	MAR excluding the SRL North connection in the Base Case (P10 to P90)	MAR including the SRL North connection in the Base Case (P10 to P90)
Costs		
Capital costs	$8.1bn - $8.5bn	$8.1bn - $8.5bn
Operating, maintenance & renewal costs[1]	$1.1bn - $1.3bn	$1.1bn - $1.3bn
Total costs	**$9.2bn - $9.8bn**	**$9.2bn - $9.8bn**
Benefits		
Conventional economic benefits	$14.3bn - $17.4bn	$8.8bn - $10.5bn
Wider economic benefits	$2.4bn - $3.2bn	$1.5bn - $1.9bn
Total economic benefits	**$17.1bn - $20.3bn**	**$10.4bn - $12.3bn**
Economic performance measures		
Net Present Value	$7.5bn - $10.8bn	$0.9bn - $2.8bn
Benefit Cost Ratio	**1.8 - 2.1**	**1.1 - 1.3**

[1] *Operating, maintenance and renewal costs include savings from the cessation of the Southern Cross to Melbourne Airport SkyBus service*

The approximate composition of benefits is shown in Figure 11-7.

Figure 11-7: Benefit composition (4 per cent discount rate)



[144] Note that the probabilistic ranges set out in this table are not necessarily additive. This is because the underlying input distributions to the probabilistic analysis vary for each line item. More detail on the underlying input distributions is provided in Appendix 9: Economic appraisal.

The largest component of benefits are public transport user benefits, accounting for approximately 40 per cent and 32 per cent of total benefits for MAR excluding the SRL North connection and for MAR including the SRL North connection respectively. The primary beneficiary of public transport benefits are air passengers, who comprise approximately 84 per cent of public transport benefits for MAR excluding the SRL North connection and approximately 78 per cent of public transport benefits for MAR including the SRL North connection.

Road user benefits arising from decongestion comprise the second largest component of the benefit stream, accounting for approximately 29 per cent of total benefits for MAR excluding the SRL North connection and approximately 28 per cent of total benefits for MAR including the SRL North connection. The primary beneficiary of road user benefits are non-air passengers, who comprise approximately 56 per cent of road user benefits for MAR excluding the SRL North connection and approximately 60 per cent of road user benefits for MAR including the SRL North connection.

Other conventional benefit streams, including externalities, option and non-use value and the residual value of assets, account for approximately 16 per cent and 25 per cent of total benefits for MAR excluding the SRL North connection and for MAR including the SRL North connection respectively.

WEBs make up 15 per cent of total benefits for MAR excluding the SRL North connection and for MAR including the SRL North connection.

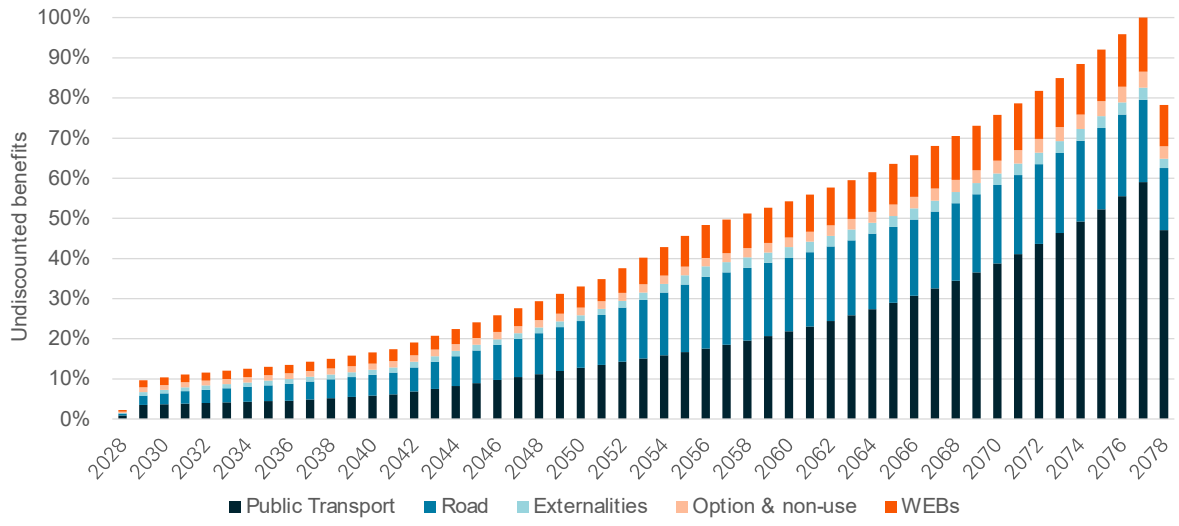
A detailed breakdown of the economic results is provided in Appendix 9: Economic appraisal.

11.9.2 Benefit profile over time

Conventional benefits account for the majority of benefits attributable to MAR. This is driven by public transport and road user benefits, with the former becoming the primary source of economic benefits in later years.

Figure 11-8 shows the profile of undiscounted economic benefits (conventional benefits as well as WEBs) for MAR excluding the SRL North connection over the 50-year evaluation period.

Figure 11-8: Undiscounted expected benefit profile (MAR excluding the SRL North connection in the Base Case)[145]



11.9.3 Scenario tests and economic sensitivities

To assess the impact of changes in key inputs and assumptions, a number of alternative future scenarios were modelled in VITM and a number of economic sensitivities were considered as

[145] The benefits observed in 2028 and 2078 are less than that observed in adjacent years. This is because the appraisal period considered is from late 2028 to late 2078 and the economics therefore captures a portion of the full calendar year of benefits in these two years.

highlighted in section 11.8.2. The economic evaluation results for these are summarised in Table 11-5. Note that the following analysis considers conventional benefits only and excludes the SRL North connection to Melbourne Airport in 2051.

Table 11-5: Economic results for MAR scenario tests and economic sensitivities, excluding the SRL North connection to Melbourne Airport in 2051 in the Base Case (4 per cent discount rate)

Scenario	Economic benefits	Total costs	Net present value	Benefit cost ratio
Core	$17.1bn - $20.3bn	$9.2bn - $9.8bn	$7.5bn - $10.8bn	**1.8 - 2.1**
Core (excluding WEBs)	$14.3bn - $17.4bn	$9.2bn - $9.8bn	$4.8bn - $7.9bn	**1.5 - 1.8**
Scenario tests (excluding WEBs)				
COVID-19	$12.9bn - $15.8bn	$9.2bn - $9.8bn	$3.3bn - $6.3bn	**1.3 - 1.7**
Alternative fare structure	$15.2bn - $18.5bn	$9.2bn - $9.8bn	$5.6bn - $9.0bn	**1.6 - 2.0**
Keilor East	$14.8bn - $17.8bn	$9.4bn - $10.0bn	$5.0bn - $8.1bn	**1.5 - 1.8**
Modified ASCs	$16.5bn - $20.1bn	$9.2bn - $9.8bn	$6.9bn - $10.5bn	**1.7 - 2.1**
PAV	$10.6bn - $13.0bn	$9.2bn - $9.8bn	$1.1bn - $3.5bn	**1.1 - 1.4**
SAV	$9.1bn - $11.1bn	$9.2bn - $9.8bn	-$0.5bn - $1.6bn	**1.0 - 1.2**
TNP	$13.9bn - $17.1bn	$9.2bn - $9.8bn	$4.3bn - $7.6bn	**1.5 - 1.8**
Economic sensitivities (excluding WEBs)				
No growth in benefits post 2056	$12.7bn - $15.3bn	$9.2bn - $9.8bn	$3.1bn - $5.8bn	**1.3 - 1.6**
- 20% PT benefits	$13.0bn - $15.7bn	$9.2bn - $9.8bn	$3.5bn - $6.2bn	**1.4 - 1.7**
+ 20% PT benefits	$15.6bn - $19.1bn	$9.2bn - $9.8bn	$6.1bn - $9.6bn	**1.6 - 2.0**
- 20% road benefits	$13.3bn - $16.3bn	$9.2bn - $9.8bn	$3.8bn - $6.7bn	**1.4 - 1.7**
+ 20% road benefits	$15.3bn - $18.6bn	$9.2bn - $9.8bn	$5.8bn - $9.0bn	**1.6 - 2.0**

The economic evaluation results are discussed below, noting that demand related impacts are addressed in detail in section 7 of Appendix 5: Demand modelling:

- The modelled impacts of COVID-19 act to reduce benefits relative to the Core scenario. This is primarily driven by the delayed land use growth and increased working from home rates considered as part of this test, which reduce road network congestion and result in road-based access to Melbourne Airport remaining a viable alternative for a longer duration within the appraisal period.
- The alternative fare structure yields higher benefits than the Core scenario due to the increased patronage the lower fare attracts relative to the Core scenario.
- The inclusion of Keilor East Station results in a small increase to the economic benefits delivered by MAR. However, this is offset by the additional cost associated with the provision of the intermediate station, which means the BCR is unchanged relative to the Core scenario.
- The modified ASCs test yields materially higher benefits than the Core scenario. This scenario provides a 10 minute preference to rail as a mode choice for air passengers, and highlights the upside potential if airport users view rail preferentially to other modes as a means to access the airport (over and above the generalised cost considered when making a mode choice within VITM, such as the reliability of a rail service compared with road-based travel).
- The AV sensitivities result in a considerable reduction in economic benefits relative to the Core scenario. This is largely driven by the ability of AVs to use the road network more efficiently through platooning, which generates a 20 – 25 per cent increase in road network capacity without any corresponding infrastructure enhancements. In turn, this results in a measurable improvement in the performance of the road network, leading to reduced congestion in the Base Case and Project Case, and a concomitant reduction in the attractiveness of public transport.

Together, these factors yield an overall drop in MAR patronage, driving down public transport user and road user benefits.

- The impact on economic benefits for the SAV scenario is more pronounced than the PAV scenario. This is driven by two factors:
  - the SAV scenario has a larger share of total AVs relative to the PAV scenario, resulting in a larger increase in road network capacity
  - the inclusion of shared, on-demand AVs as part of the SAV scenario provides an alternative cost-effective means of access to Melbourne Airport.
- The TNP scenario results in a slight reduction in economic benefits relative to the Core scenario, primarily driven by lower road user benefits. As highlighted in section 11.8.2, the road pricing considered as part of this test applies a per km fare to road travel. This lowers highway demand relative to the Core scenario improving the Base Case and Project Case road networks, which in turn, reduces the incremental benefit delivered by MAR.

11.10 Economy-wide impacts

11.10.1 Economic output and employment impacts

MAR represents a significant investment that will have a material impact on the capital stock of Victoria as well as overall employment. MAR will enable employment and economic growth opportunities at a regional, state and national level. It is therefore relevant to assess the Project's total economic contribution to obtain an understanding of how MAR will affect the broader economy.

The economy-wide impact of MAR was assessed using KPMG-SD, a regional CGE model of the Australian economy. This approach assesses the total impact of MAR on the labour market, including flow-on effects and other key markets. As such, the analysis estimates the economy-wide impacts of the proposed infrastructure investment and the operational phase at the state and national levels. Further detail about the CGE modelling approach, inputs and assumptions is provided in Appendix 9: Economic appraisal.

The economy-wide impact on employment, Gross Regional Product (GRP)[146], GSP and GDP is summarised in Table 11-6.

Table 11-6: Economy wide impact (4 per cent discount rate)

		Construction period	Operational period	Total
MAR excluding the SRL North connection in the Base Case				
Gross Regional / State / Domestic Product (present value)	Greater Melbourne	$2.5bn	$14.5bn	$17.1bn
	Victoria	$2.7bn	$15.2bn	$17.9bn
	Australia	$2.5bn	$13.2bn	$15.7bn
Jobs number in peak year	Victoria	1,880	1,210	n/a
	Australia	2,100	470	n/a
MAR including the SRL North connection in the Base Case				
Gross Regional / State / Domestic Product (present value)	Greater Melbourne	$2.5bn	$12.9bn	$15.4bn
	Victoria	$2.7bn	$13.6bn	$16.2bn
	Australia	$2.5bn	$11.7bn	$14.1bn
Jobs number in peak year	Victoria	1,880	980	n/a
	Australia	2,100	380	n/a

[146] Gross Regional Product denotes Greater Melbourne.

On an annual basis, the largest economic impacts of MAR on employment occur during its construction. These are positive as investment ramps up, generating an increase in real wages and aggregate employment. At the peak of construction, real GSP for Victoria and real GDP for Australia are up $0.6 billion from the baseline.

The delivery of MAR will support up to 8,000 direct and indirect jobs during construction. These jobs will range from engineers and subject matter experts planning behind the scenes, to construction workers and local suppliers who will help to deliver the project on site.[147] This level of investment will increase the size of the economy and job market, creating 1,880 net additional jobs across Victoria at the peak of construction. Across Australia, 2,100 net additional jobs are created at the peak of construction. During the operational period, employment in Victoria peaks at 1,210 net additional jobs for MAR excluding the SRL North connection and 980 net additional jobs for MAR including the SRL North connection.

Over the evaluation period, the analysis demonstrates that in present value terms, Victorian GSP is $17.9 billion higher for MAR excluding the SRL North connection and $16.2 billion higher for MAR including the SRL North connection .

For Australia as a whole, the corresponding impacts are slightly lower, reflecting the relocation of some jobs to Greater Melbourne in response to the relatively higher levels of productivity resulting from MAR. Productivity benefits of MAR are reflected in higher average real wage rates at the state and national levels. By the end of the operational phase, increases in wages are a much more important source of benefits than are increases in employment, especially at the national scale.

11.10.2 Economic return on investment

An alternative approach to assessing the economic contribution of the investment is to assess the return on investment against the funding cost of the investment. Two separate KPIs have been developed at both the state and national level to assess the value of investing in MAR to bolster and catalyse growth in the Victorian and Australian economy. This is particularly relevant given the current economic uncertainty:

- **KPI 1** – compares the total cost (capital expenditure and benchmark borrowing cost) against the real increase in GSP / GDP
- **KPI 2** – compares the financing cost (benchmark borrowing cost) against the marginal increase in tax receipts (as a result of increases to GSP / GDP).

The KPIs are summarised in Table 11-7.

Table 11-7: CGE KPIs[148]

	MAR excluding the SRL North connection in the Base Case	MAR including the SRL North connection in the Base Case
KPI 1		
Victoria (Δ GSP / State total cost)	5.9	5.0
Australia (Δ GDP / State + Australian total cost)	2.9	2.4
KPI 2		
Victoria (Δ State tax receipts / State interest)	0.8	0.7
Australia (Δ State + Australian tax receipts / State + Australian interest)	1.9	1.6

The KPI 1 results in Table 11-7 highlight the economic return on investment compared with the funding cost. This analysis shows that the Victorian economy will be better off by 5.9 and 5.0 times

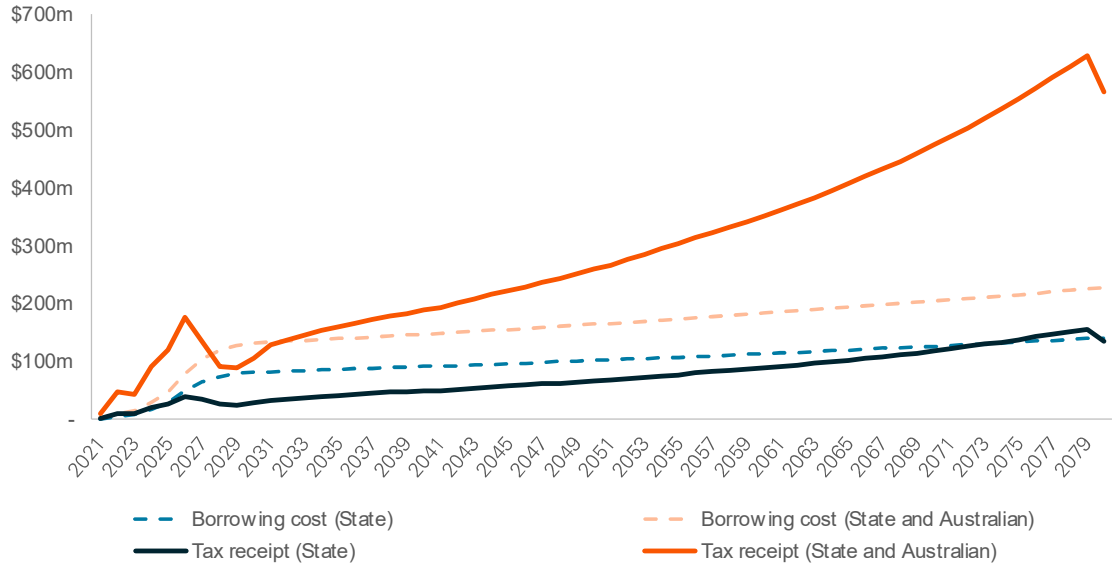
[147] RPV analysis on behalf of DoT.
[148] The analysis assumes that 100 per cent of the investment cost is borrowed and is split evenly between the Victorian and Australian governments. Interest payments are based on the 10-year TCV bond rate and 30-year Commonwealth bond rate for the Victorian and Australian governments respectively. The KPIs have been calculated using total cost (capital expenditure and benchmark borrowing cost) and the real increase in GSP / GDP.

the cost of investment (after allowing for borrowing costs) for MAR excluding the SRL North connection and for MAR including the SRL North connection respectively. Similarly, the national economy will be better off by 2.9 and 2.4 times the cost of investment for MAR excluding the SRL North connection and for MAR including the SRL North connection respectively.

This increase in economic activity will boost Victorian and Australian government tax receipts. The KPI 2 results in Table 11-7 show the increase in tax receipts is sufficient to cover the combined Australian and Victorian government borrowing costs, with a minor shortfall when only considering the Victorian Government borrowing costs.

The relationship between borrowing costs and tax receipts over time for the Victorian and Australian governments is highlighted in Figure 11-9 for MAR excluding the SRL North connection.

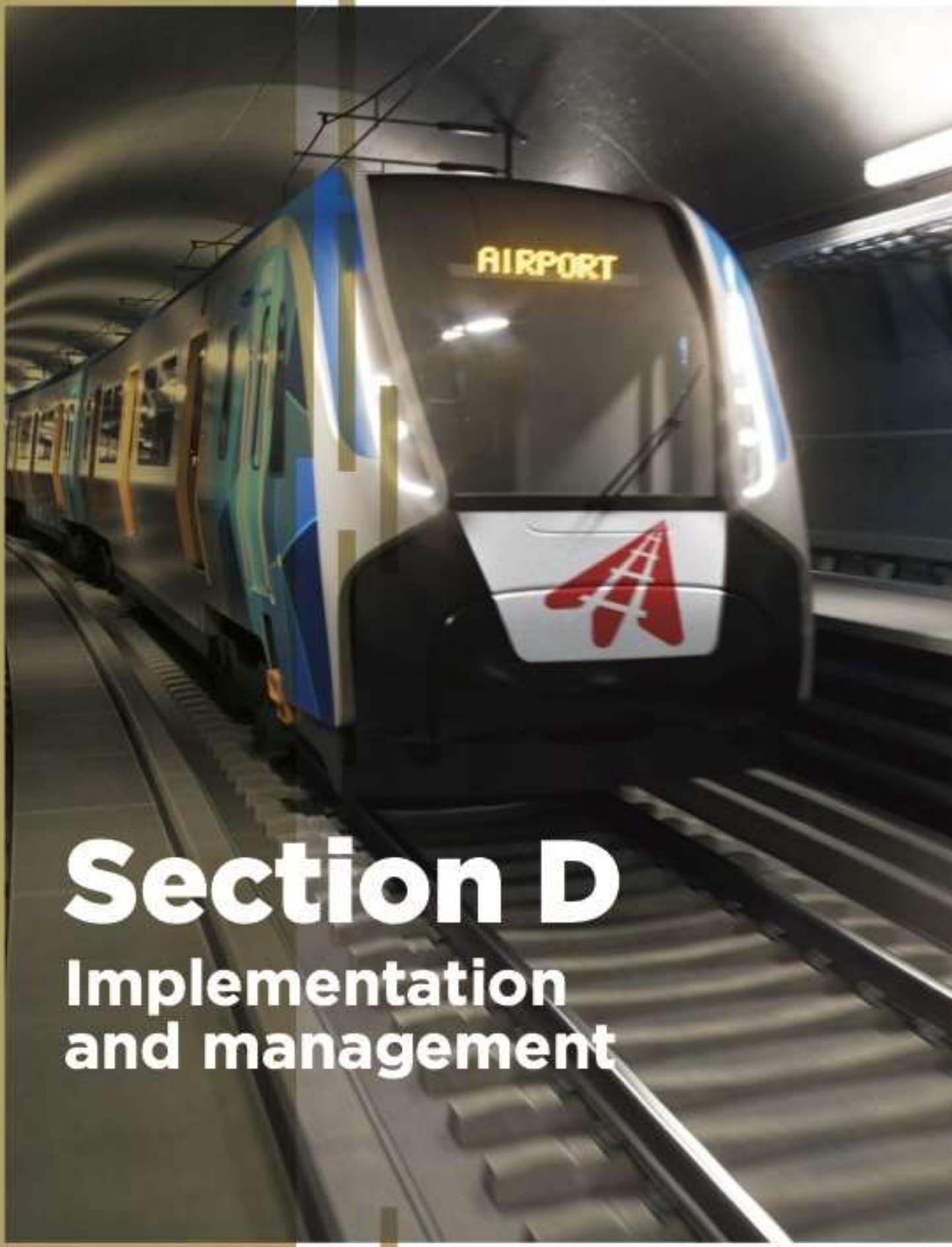
Figure 11-9: Borrowing costs against tax receipts (MAR excluding the SRL North connection in the Base Case)



11.11 Qualitative impacts excluded from economic assessment

A range of other economic effects were identified but not quantified for the economic appraisal. These include:

- improved reliability of travel to the airport associated with rail transport
- some of the temporary disruption effects of construction
- reduced roadway costs as a result of reducing vehicle volumes
- potential for improved social inclusion and equality by improving transport accessibility and connectivity
- improved amenity at Sunshine Station following works including vertical transport enhancements, upgrades to active transport facilities and construction of additional car parking.



Section D

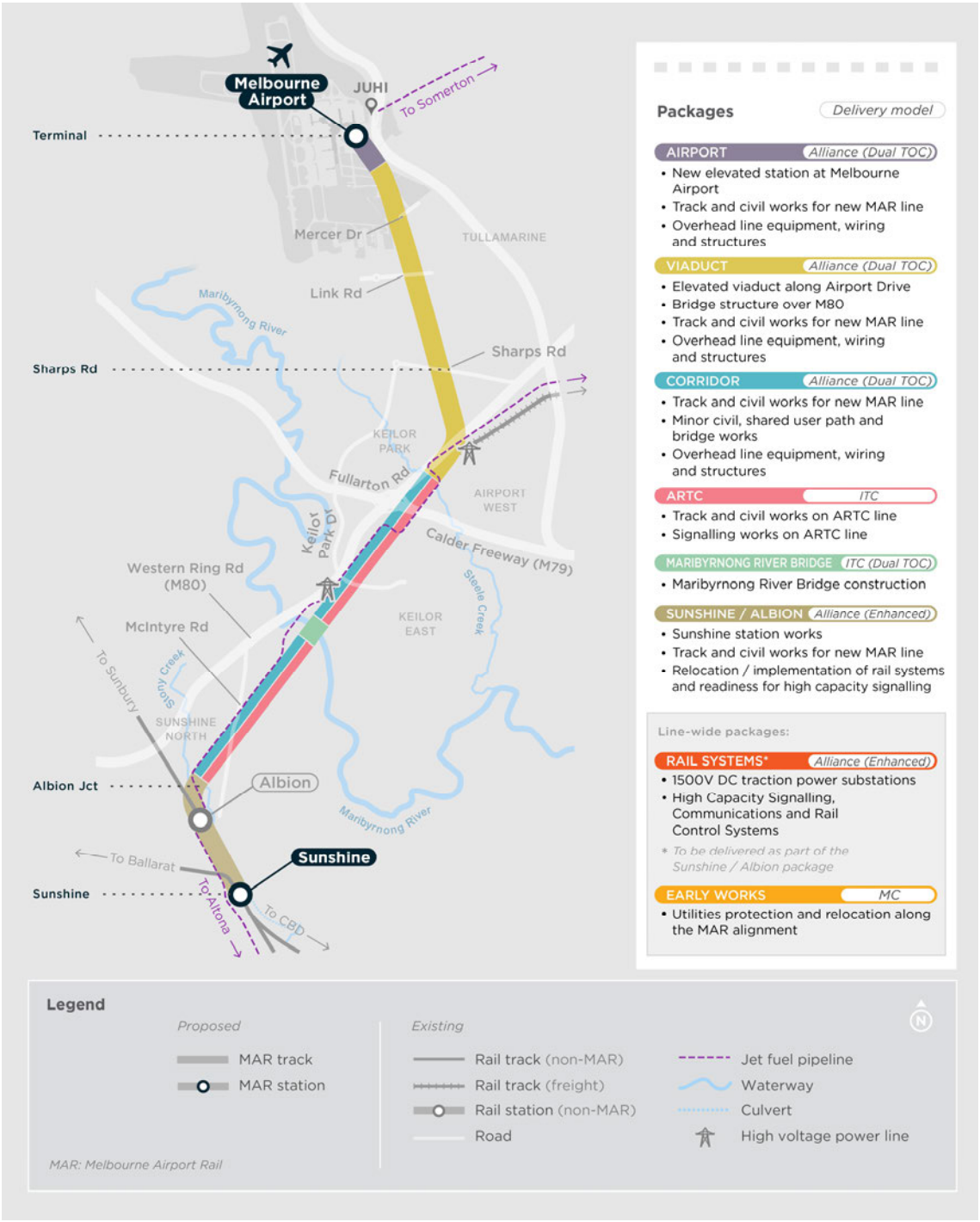
Implementation and management

12 Commercial and procurement

12. Commercial and procurement

Chapter summary

- The evaluation methodology used to assess packaging and procurement options is consistent with relevant Department of Treasury and Finance (DTF) and Infrastructure Australia (IA) guidelines, as well as approaches adopted on comparable projects.
- The recommended packaging and procurement solution for Melbourne Airport Rail (MAR or the Project) is summarised in the figure below, although the final position is subject to further technical work on the design solution, discussion with key stakeholders and market engagement feedback.



- The metropolitan rail franchisee will operate the MAR services.
- High Capacity Metro Trains (HCMT) will be used to operate the MAR services and will be procured separately to the Project on a network-wide basis.[149]

[149] Work undertaken by the Department of Transport (DoT) to date has identified that 5 additional HCMTs are required to accommodate the Day 1 service plan for MAR (in addition to those HCMTs already on order by the State).

12.1 Overview of market conditions and risks

12.1.1 Market conditions

A key consideration in evaluating packaging and procurement strategies is the impact of current and future Australian projects on market conditions. There are currently 165 major road and rail transport projects being delivered across Victoria involving around A$80 billion in capital expenditure[150], including projects like Suburban Rail Loop and North East Link.

A large number of major transport projects are also being planned and delivered elsewhere across Australia, such as Sydney Metro (NSW), NorthConnex (NSW), WestConnex (NSW), Western Harbour Tunnel & Beaches Link (NSW), Western Sydney Airport (NSW), North-South Rail Link (NSW), Cross River Rail (Qld), Inland Rail Project (Vic, NSW, Qld), Forrestfield Airport Link (WA) and Metronet (WA). The wide-spread and ongoing government commitment to major projects is translating into a 'new normal' level of public sector investment in infrastructure projects.

More broadly, market dynamics are shifting as the current wave of projects move into delivery and delivery risks begin to materialise. Market capacity has already evolved to be a significant issue in recent years, with Victoria competing with interstate and international projects for contractors and resources.

12.1.2 Commercial and procurement risk assessment

A key consideration in the selection of a packaging and procurement strategy is its ability to promote efficient and effective management of project risks. Risks should be allocated to the party most capable of managing and/or pricing the risk.

An outline of key package-specific risks and how the proposed delivery model for each works package will mitigate these risks is provided in section 12.6.

12.2 Background

12.2.1 Operations and rolling stock

As set out in earlier chapters, MAR will connect Melbourne Airport to the CBD via a rail line from a new Airport Station through Sunshine via the Metro Tunnel.

The development of potential packaging and procurement options was undertaken in the context of the following key decisions by RPV in respect to operations and rolling stock:

- the metropolitan rail franchisee will operate the MAR services
- HCMTs will be used to operate the MAR services and will be procured separately to the Project on a network-wide basis.[151]

12.2.2 Procurement objectives

To support the delivery of the MAR Project Objectives, the following procurement objectives were developed with a focus on achieving commercial and delivery-related outcomes that will help drive value for money for the State:

- optimise market participation and competition
- deliver MAR within the State's time requirements
- provide appropriate budget, capital and recurrent cost certainty to the State

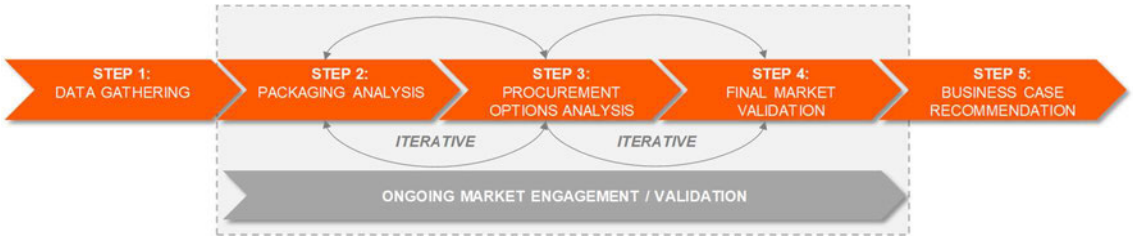
[150] Major Transport Infrastructure Authority, *Victoria's Big Build*, (2020). Available at: https://bigbuild.vic.gov.au/projects
[151] Work undertaken by DoT to date has identified that 5 additional HCMTs are required to accommodate the Day 1 service plan for MAR (in addition to those HCMTs already on order by the State).

- allocate risks to the party best placed to manage and price them
- incentivise contactor innovation where applicable
- enable the State to retain appropriate control and flexibility to accommodate future changes.

12.3 Evaluation methodology

The evaluation methodology adopted is consistent with DTF and IA guidelines for identifying and assessing packaging and procurement options. Figure 12-1 shows the five-step methodology.

Figure 12-1: Process for developing packaging and procurement recommendation



This chapter summarises RPV's analysis and key conclusions under each of the five steps. More detail is provided in Appendix 10: Packaging and procurement strategy.

12.4 Step 1: Data gathering

12.4.1 Overview

As part of this initial phase of development, RPV gathered and considered key data relevant to the packaging and procurement assessment, including:

- desktop reviews of various other airport rail links and other precedent projects from Australia and overseas
- Project objectives
- base assumptions
- detailed scope elements
- unique project characteristics
- key project risks and interfaces
- scale of works
- market capacity, capability, trends and preferences
- performance of other projects
- informal market sounding feedback
- indicative cost of works.

12.4.2 Procurement workshops

A series of packaging and procurement workshops were held with technical, legal and commercial teams to inform the development of the recommended packaging and procurement strategy.

12.4.3 Market engagement process

RPV is conducting a multi-phase market engagement process to understand the extent of interest in MAR, the market's views and preference, potential issues, risks and opportunities. This process builds on the initial Registration of Interest (ROI) process undertaken in late 2018, which resulted in over 100 industry participants registering their interest in the Project. The most recent aspects of the process have involved three key stages:

- **Stage 1: Written questionnaire** (December 2020 – January 2021) – As part of this stage, an Information Brief was issued to all ROI respondents providing background on the Project and reference packaging and procurement strategy, and seeking written responses to a series of questions regarding the Project. Responses were received from 27 participants.
- **Stage 2: Initial market soundings** (February 2021) – Following receipt of written submissions in Stage 1, one-on-one meetings were conducted with 14 participants, focused on local and international construction companies of various sizes.
- **Stage 3: Further market soundings** (September 2021) – RPV undertook further market soundings with the same constructor group that participated in Stage 2, with one additional participant. The purpose of Stage 3 was to provide an update on the packaging and procurement strategy, confirm market interest and appetite in each MAR package, and obtain feedback from participants on a range of specific commercial and delivery issues.

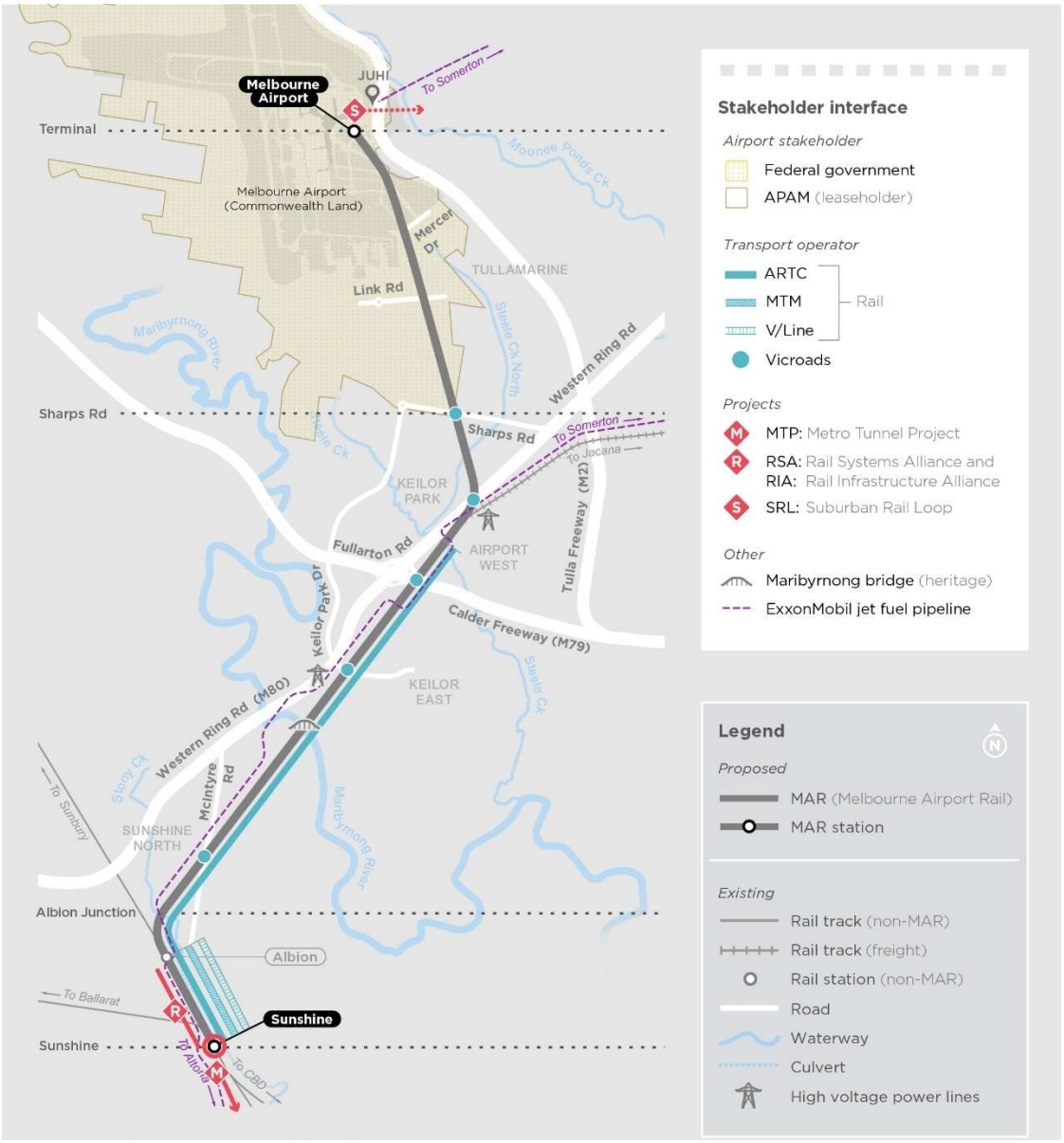
Refer section 12.7 for a summary of the key findings from the market engagement process to date.

12.4.4 Key scope interfaces and interdependencies

Based on the scope set out and as highlighted in Chapter 6, a range of interfaces exist with land owners, transport operators and other projects currently being delivered on the network that have been considered as part of the development of the packaging and procurement strategy for MAR.

Figure 12-2 depicts a number of the key scope interfaces and a range of interfacing and interdependent projects are also detailed in section 6.8.

Figure 12-2: Key scope interfaces (land owners, transport operators and other rail projects)



12.5 Step 2: Packaging analysis

12.5.1 Packaging approach

To establish the most appropriate procurement strategy for MAR, it is necessary to determine if works should be delivered as a single, integrated package or split into a number of smaller packages.

After consideration of the Project's characteristics, inputs from technical advisors and analysis of approaches adopted or proposed to be adopted on comparable projects, the packaging considerations outlined in Table 12-1 were developed to support the development, assessment and comparison of packaging options. These drivers helped identify and inform the key differentiating factors between potential packaging options as part of this assessment.

Table 12-1: Packaging considerations

Packaging considerations	Description
Geography	• Does the approach maximise efficiencies / synergies by bundling / separating works by geography?
Technical requirements / discipline	• Does the approach maximise efficiencies / synergies by bundling / separating works by discipline / technical requirements (i.e. like with like according to contractor capability)? • Does the approach minimise complicated technical interfaces?
Program	• Does the approach minimise risk of program overruns? • Does the approach support the ability to deliver the Project in line with the State's sequencing and time constraints and minimising the risk of program overrun?
Risk profile	• Can works be grouped / separated by risk profile?
Cost efficiency	• Does bundling the works provide for a more efficient use of resources and minimise the risk of cost overrun?
Market capacity, appetite and capability	• Does the market have capacity, appetite and capability to deliver the works (with reference to size, scale and complexity)? • Does the approach encourage an appropriate number of bidders?
Interfaces	• Does the approach minimise and / or create natural and manageable, points of interface with other packages (and/or existing network / ongoing projects)? • Does the approach minimise stakeholder interfaces / approval processes (e.g. Accredited Rail Transport Operator (ARTO) access / approvals)?
Disruption	• Does the approach minimise disruption in relation to other packages, projects and/or the existing transport network?
Innovation	• Does the packaging approach support / enable innovation in design, construction and/or whole-of-life focus?

The approach used to develop and evaluate packaging options comprised three key steps:

- consideration of an extensive list of potential packaging options on factors such as geography and technical discipline
- identification of a shortlist of potential packaging options by undertaking a qualitative analysis to determine the most realistic, practical options, which considered factors such as the potential benefits of delivering elements with specific characteristics separately, the ability of the packaging option to assist in achieving Project objectives and reduce interface risks

- assessed shortlisted packaging options against the packaging considerations to determine the most suitable option.

12.5.2 Recommended packaging solution

A summary of the recommended packaging solution is summarised in Figure 12-3. The rationale for the proposed approach is summarised in Table 12-2.

Figure 12-3: Packaging solution

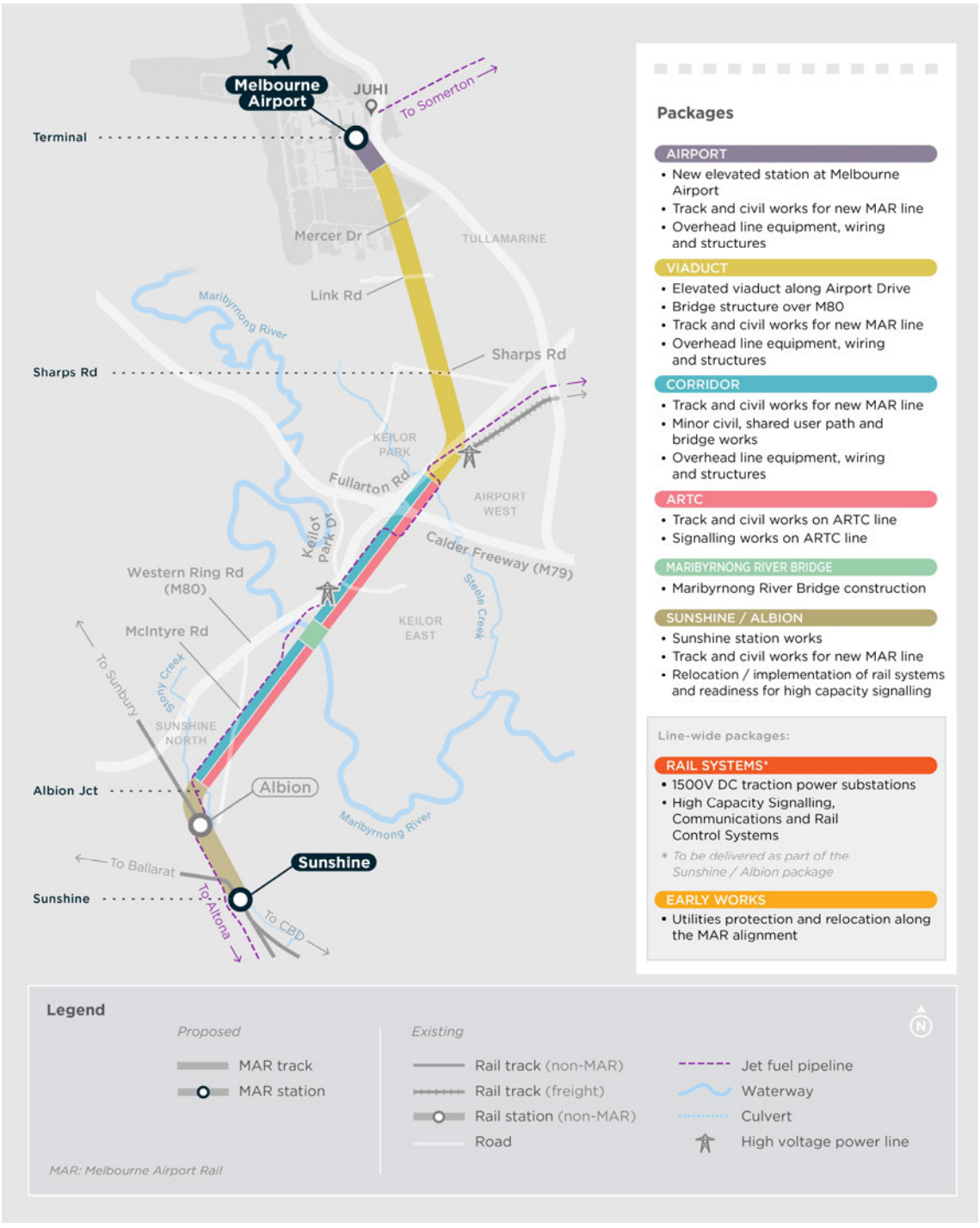


Table 12-2: Packaging assessment

Packaging approach	Analysis / Rationale
Airport package	• **Interface** – The works in this area are relatively high risk due to the number of physical and operational interfaces with the existing airport infrastructure (including a number of access roads and APAM capital works projects as well as the terminals itself) and a complex and heavily congested operational airport environment for delivery of the works. Separating these works from the remaining works on Airport-leased land 'ring-fences' the direct, technically complex interface with the Melbourne Airport terminals and elevated road program within a single, smaller value package of works (and as a result, mitigates some interface and program risk from the remaining works on Airport-leased land). • **Risk profile and program** – The complexity of constructing the Airport Station, and in particular how these works interface with the airport terminals and Australia Pacific Airports (Melbourne) Pty Ltd's (APAM) elevated road network (which remains under development) has been identified as a key project risk, with the potential to cause significant delays if not completed according to program timelines. An Airport package enables the critical, complex works associated with the station to be managed by a single contractor and isolated from the remaining works on Airport-leased land (mitigating risk to the overall program in the event of delays to the agreement of the Airport Station design with Melbourne Airport). • **Market capacity, appetite and capability** – Bundling the technical disciplines required for the works on Airport-leased land should maximise market interest by creating a package of a more manageable size from a contractor perspective that is largely focussed on specialist skillsets required for the Airport Station.
Viaduct package	• **Risk profile** – Delineating between the Viaduct works and the Airport package scope 'ring-fences' the critical, complex works associated with constructing adjacent to the Airport terminals and APAM's elevated road network and potentially means the viaduct package has a more manageable risk profile for contractors. • **Technical discipline** – The technical requirements for delivering the viaduct is different when compared to other works along the alignment (i.e. this package focuses largely on delivery of elevated infrastructure in a greenfield rail environment, whereas other packages are delivering infrastructure in complex operating environments with significant interfaces). Bundling this major civil structure into one package will allow the viaduct contractor to focus on the specific technical discipline required. • **Market capacity, appetite and capability** – This package provides the opportunity to attract contractors (including international contractors) with a specialist structures skillset and experience. The package also maximises the length of the same structural form up to the Airport package interface, which maximises economies of scale.
Corridor package	• **Market capacity, appetite and capability** – Bundling the technical disciplines required for the works along this section of the alignment (i.e. track and civil works, road bridge works) maximises the potential number of bidders for this package of works, given the largely common civil nature of the works which many contractors are capable of completing. • **Program** – Bundling works in this section of the corridor by geography offers the State and contractor the ability to better coordinate occupations and create the potential for program savings. Further, scheduling occupations is complex along this section of the alignment due to the limited opportunities for access in and alongside the Albion-Jacana freight corridor, and would be best managed by a single point of contact. • **Interface** – This package enables the isolation of specific works with stakeholders along this section of the alignment, specifically interfaces with the Australian Rail Track Corporation (ARTC) (operator of the Albion-Jacana freight corridor) and VicRoads. It is noted that the interface with ARTC will need careful management and coordination, as its operational rail presence in the corridor makes for a more difficult and constrained delivery environment and this presence extends beyond the boundary of this package (into the Sunshine/Albion package).
ARTC package	• **Program** – The majority of participants in the MAR market engagement process confirmed that utility works, general site preparatory and investigatory works, should be delivered as early works. Delivering the ARTC works as a separate package allows early delivery of key scope items (including utilities relocation and other important preparatory works such as the freight track slew) which will de-risk the Sunshine /

Packaging approach	Analysis / Rationale
	Albion works, Corridor works, Maribyrnong River Bridge works and overall MAR Program. • **Risk profile** – The ARTC package has a distinct risk profile when compared to other works in the geographical area, given the works are being delivered on predominantly ARTC assets within an operational freight environment. An ARTC package enables these works to be managed by a single contractor and distinct from the remaining works associated with the Albion-Jacana freight corridor. • **Market capacity, appetite and capability** – Separating the ARTC scope from the remaining packages allows for a smaller, discrete package of works and maximises the opportunity for smaller contractors to participate in the Project.
Maribyrnong River Bridge package	• **Program** – Delivering the Maribyrnong River Bridge as a separate package allows early delivery of the Maribyrnong River Bridge to de-risk the overall MAR Program. • **Risk profile** – The Maribyrnong River Bridge package has a distinct risk profile when compared to other works in the geographical area, given the heritage overlay of the existing Maribyrnong River Bridge and construction occurring over a waterway. A Maribyrnong River Bridge package enables any resulting heritage requirements associated with the works (including conditions of a heritage permit) to be managed by a single contractor and isolated from the remaining works in the Albion-Jacana freight corridor. • **Market capacity, appetite and capability** – The largely common civil nature of the works and the size of the package should maximise the potential number of bidders for this package of works and provide smaller contractors with an opportunity to participate in the Project.
Sunshine / Albion package	• **Interfaces** – Given the multiple rail operators in this area (including Metro Trains Melbourne (MTM), V/Line and ARTC), in addition to multiple project to project interfaces (including the Rail Systems Alliance (RSA) and Rail Infrastructure Alliance (RIA) from the Metro Tunnel Project (MTP)) access and approvals would be best managed by a single point of contact. One delivery entity should be responsible for the operational interfaces in this busy, live, brownfield rail environment that has a number of interstate, regional and metropolitan passenger services as well as freight services passing through on a daily basis. • **Program** – The delivery timeframe and staging of works will be largely interdependent and interface with the rest of the works in the geographic area. Bundling this package geographically will minimise the risk of program delays. • **Disruption** – Due to the complexity required for staging the works in this section of the alignment at a critical junction on the network, disruption to the existing rail and road networks will be a primary consideration that will need to be managed efficiently to avoid additional costs and program delays. This can be more effectively managed if there is one delivery entity responsible for safety and disruption management, the scheduling of occupations and shut downs. • **Geography** – Geographical synergies can be leveraged to minimise cost, delays and disruption given the heavy brownfield, operational rail environment in the Albion and Sunshine sections of the alignment. Vertically packaging these works on a geographical basis will enable an efficient outcome despite the complexities associated with delivering works in this area.
Rail Systems package[152]	• **Technical discipline and risk profile** – Rail systems are complex and will have significant interfaces with the new HCMT rolling stock, existing signalling infrastructure, rail operations and the broader network. Separating these works from other works packages facilitates efficient and effective management of systems related risks. • **Interface** – While the systems package will have overarching interfaces with each of the main works packages referred to above, bundling the systems by technical discipline will be a more manageable interface than bundling systems by geography. • **Market capacity, appetite and capability** – Procuring the rail systems separately from other works packages enables specialist systems technologies and requirements (such as High Capacity Signalling (HCS)) to be isolated to a single package and procured on a value for money basis.

[152] Rail Systems package scope to be delivered as part of the Sunshine / Albion package.

Packaging approach	Analysis / Rationale
Early Works Package	• **Program** – By undertaking these works in advance of the main works packages, it is possible to reduce the overall MAR Program and support the delivery of the Project in line with the State's sequencing and time constraints. • **Risk profile and interface** – Delivery of utilities protection and relocation, particularly those that are complex and have long lead times, ahead of the main works reduces the number of direct interfaces with Utility Service Providers (USPs) and other third party asset owners/operators during delivery of the main works. Quarantining works associated with USPs from the rest of the main works enables these works to be managed more effectively and allow the main works to be 'de-risked' and delivered at a lower cost. • **Technical discipline** – Bundling this package by technical discipline will maximise efficiencies / synergies associated with utility services and USP interfaces.

12.6 Step 3: Procurement options analysis

12.6.1 Procurement assessment approach

Consistent with the DTF *Procurement Strategy Guidelines*, Step 3 builds on the recommended packaging approach to consider suitable delivery models for the MAR scope by undertaking analysis of procurement options for delivery for each package of works.

Having regard for the factors outlined in Step 1 and considering approaches adopted on comparable projects, the following evaluation criteria were developed to support the value for money assessment of delivery models for the identified works packages.

Table 12-3: Procurement options assessment evaluation criteria

Evaluation criterion	Description	Relative Priority
Market interest and appetite	The extent to which the delivery model assists in maximising market interest amongst the appropriate market participants with the relevant skills, expertise and capacity.	High
Time	The extent to which the delivery model is able to deliver the Project within the State's time constraints and provides time certainty.	High
Price and budget certainty	The extent to which the delivery model supports cost certainty and competitive pricing for capital costs.	High
Risk management	The extent to which the delivery model allocates risk (including technical, approvals, interface) to the party best placed to manage it.	High
Flexibility and control	The extent to which the delivery model enables the State to retain flexibility to change specifications, access, occupations and provide operational flexibility over time.	Moderate
Innovation and incentive	The extent to which the delivery model incentivises the contractor to innovate to meet the required performance outputs and other requirements.	Moderate
Stakeholder management	The extent to which each procurement option assists the Victorian Government in managing stakeholders through the delivery of the Project.	Moderate

These criteria have not been numerically weighted, although some provide inherently greater differentiation between alternative procurement models than others and so an indicative 'priority' (such as high / moderate / low rating) has been attached to each criterion as set out above. The 'Relative Priority' listed relates to a whole-of-project focus, although the weightings may vary between packages to reflect the key drivers for the relevant package.

The ratings described in Table 12-4 were used to assess the suitability and value for money proposition of each shortlisted procurement model against the evaluation criteria.

Table 12-4: Procurement options assessment evaluation framework

Scoring	Description
✓✓✓	Procurement option is extremely effective in satisfying the requirements of the criterion
✓✓	Procurement option is effective in satisfying the requirements of the criterion
✓	Procurement option satisfies or partially satisfies the requirements of the criterion
✖	Procurement option is ineffective in satisfying the requirements of the criterion
n/a	Not applicable

12.6.2 Procurement options identified

Procurement models across Australia have evolved over the past decade, primarily driven by the increasingly constrained construction market and evolving market appetite for risk. This has seen the rigid definition and labels of traditional procurement models become more fluid with elements of collaboration and fixed price co-existing in any given procurement model.

Based on RPV's preliminary consideration of the issues and relevant package risks, fixed price / lump sum Design and Construct (D&C) and Alliance delivery models are seen as the opposing ends in a spectrum of viable procurement models for the seven main works packages under consideration (Sunshine / Albion package, Corridor package, ARTC package, Maribyrnong River Bridge package, Viaduct package, Airport package and Rail Systems package), as shown in Figure 12-4. Note that the recommended delivery model(s) for the Airport and Viaduct packages have been informed by the unique issues associated with delivering works on Melbourne Airport-leased land (see section 12.6.12).

Figure 12-4: Collaborative contracting spectrum

A number of procurement models were considered but not formally assessed for each package. More details are provided in Appendix 10: Packaging and procurement strategy. Ultimately, RPV assessed two delivery model options in detail for each of the Sunshine / Albion package, Corridor package, ARTC package, Maribyrnong River Bridge package, Viaduct package, Airport package and Rail Systems package, which are summarised in Table 12-5.

Table 12-5: Delivery models assessed

Procurement option	Description
Alliance	An alliance comprising the State as owner, the franchisee and other non-owner participants (NOPs) – for example, Contractor NOP, Designer NOP and

Procurement option	Description
	potentially a Rail Systems NOP, if required. Key elements of a traditional alliance include: • participation in performance-based remuneration arrangements, under which NOPs and the project owner share the financial benefits or disbenefits of project performance through a painshare / gainshare regime • open book transaction process, with full transparency in relation to reimbursable costs • no blame, no disputes clause, which limits the liability of each party for mistakes, breach or negligence (except in very limited circumstances) • contractual commitments to co-operate and act in 'good faith' • governance arrangements that facilitate collective problem-solving and project-based decision-making.
Design & Construct (D&C)	A fixed-price, fixed-time contract for the delivery of the works (potentially with provisional sum items if required).

12.6.3 Sunshine / Albion package

Table 12-6 summarises the procurement options assessment for the Sunshine / Albion package against each evaluation criterion. More details are provided in Appendix 10: Packaging and procurement strategy.

Table 12-6: Procurement options assessment summary – Sunshine / Albion package

Package / Evaluation criterion	Relative Priority	Alliance	D&C	Recommended model
Market interest and appetite	High	✓✓✓	✓	**Alliance**
Time	High	✓✓	✓✓	
Price and budget certainty	High	✓✓	✓	
Risk management	High	✓✓✓	✓	
Flexibility and control	Moderate	✓✓✓	✓	
Innovation and incentive	Moderate	✓✓✓	✓	
Stakeholder management	Moderate	✓✓✓	✓✓	

An Alliance approach was assessed as the recommended procurement model for the Sunshine / Albion package, as it performs stronger than a D&C against all of the evaluation criteria. This reflects, amongst other things, the level of construction complexity associated with the Sunshine / Albion works and brownfield, operational rail environment through Sunshine into the Albion-Jacana corridor, which involves numerous ARTOs operating through Sunshine Station and multiple interfaces with other projects currently in delivery.

Table 12-7 summarises the key risks specific to the Sunshine / Albion package and how the recommended Alliance would mitigate these risks.

Table 12-7: Mitigation of key Sunshine / Albion package risks

Key risks	Mitigation under delivery model
• Stakeholder interface with ARTOs (e.g. MTM, V/Line and ARTC) is less effective and efficient than expected, resulting in delay. • Complex staging requirements of works in operational road and rail environments is more difficult than anticipated, leading to program delays.	• An alliance model is expected to provide the best commercial framework through which these risks can be managed, with the State, the contractor(s) and the ARTOs commercially aligned and therefore all working together to identify, mitigate and manage these risks. • Complex works to be delivered in a live operational environment results in a risk profile that would be better managed collaboratively between relevant parties to minimise delays and manage these risks effectively, with the contractor incentivised via painshare / gainshare regime.

12.6.4 Corridor package

Table 12-8 summarises the procurement options assessment for the Corridor package against each evaluation criterion. More details are provided in Appendix 10: Packaging and procurement strategy.

Table 12-8: Procurement options assessment summary – Corridor package

Package / Evaluation criterion	Relative priority	Alliance	D&C	Recommended model
Market interest and appetite	High	✓✓✓	✓✓	**Alliance**
Time	Moderate	✓✓	✓✓	
Price and budget certainty	High	✓✓	✓✓	
Risk management	High	✓✓✓	✓✓	
Flexibility and control	Moderate	✓✓✓	✓✓	
Innovation and incentive	Moderate	✓✓	✓	
Stakeholder management	Moderate	✓✓	✓✓	

An Alliance approach has been assessed as the recommended procurement model for the Corridor package as, on balance, it performs equal to or stronger than a D&C in relation to each of the evaluation criteria. This reflects, amongst other things, the highly brownfield nature of the Corridor package and construction, staging and interface complexity and the need to work closely with ARTOs such as ARTC.

Table 12-9 summarises the key risks specific to the Corridor package and how the recommended Alliance model would mitigate these risks.

Table 12-9: Mitigation of key Corridor package risks

Key risks	Mitigation under delivery model
• Stakeholder interface with ARTOs (e.g. ARTC) and VicRoads is less effective and efficient than expected, resulting in delay.	• An alliance model is expected to provide the best commercial framework through which these risks can be managed, with the State, the contractor(s)

Key risks	Mitigation under delivery model
• Restrictive site access arrangements due to freight timetabling, leading to an impact on the occupations schedule and thereby program delays.	and the Franchisee commercially aligned and therefore all working together to identify, mitigate and manage these risks.

12.6.5 ARTC package

Table 12-10 summarises the procurement options assessment for the ARTC package against each evaluation criterion.

Table 12-10: Procurement options assessment summary – ARTC package

Package / Evaluation criterion	Relative priority	Alliance	D&C	Recommended model
Market interest and appetite	High	✓✓✓	✓✓	**Incentivised Target Cost (ITC)**
Time	High	✓✓	✓✓	
Price and budget certainty	High	✓✓	✓✓	
Risk management	High	✓✓	✓✓	
Flexibility and control	Moderate	✓✓✓	✓✓	
Innovation and incentive	Moderate	✓✓	✓	
Stakeholder management	Moderate	✓✓	✓✓	

As outlined in section 12.6.2, fixed price / lump sum D&C and Alliance delivery models are seen as the opposing ends in a spectrum of viable procurement models. Therefore, while the procurement options assessment conducted above was based on these two delivery models, the assessment highlighted this package may be best suited to a procurement model that has both elements of collaboration and greater risk transfer to the contractor. As a result, an Incentivised Target Cost (ITC) approach (which sits on the collaborative contracting spectrum) was assessed as the recommended procurement model for the ARTC package.

RPV has also assessed options for the ITC contracting structure and determined that ARTC is the most appropriate entity to enter into the agreement as counterparty and manage the works on behalf of the State. This is due to the following key factors:

- ARTC, as ARTO of the Albion-Jacana corridor, is best placed to manage the constrained delivery environment and difficult operational interface for delivery of these works (which will require careful management and coordination).
- A key benefit of the ARTC package is that certain key ARTC works can be completed early, which de-risks the Sunshine / Albion, Corridor and Maribyrnong River Bridge packages. As the package involves planning and delivery of works on ARTC-controlled assets, having ARTC directly manage procurement and delivery of the works simplifies the process and allows for faster mobilisation.
- ARTC's direct involvement and control over the works will help to reduce rail accreditation and safety interface risks along the corridor, as well as minimise disruption to ARTC's business generally.

- ARTC has significant experience in procuring and managing capital works on its assets, with an established project delivery arm to its business.

Table 12-11 summarises the key risks specific to the ARTC package and how the recommended ITC model would mitigate these risks.

Table 12-11: Mitigation of key ARTC package risks

Key risks	Mitigation under delivery model
• Operational and safety interface risks due to the live freight network • Risk that the works fail to meet ARTC's rail safety accreditation standards	• The ITC model promotes a collaborative approach between ARTC and the contractor, with the target cost providing a more flexible and transparent mechanism for managing unforeseen events during delivery • Under an ITC, an independent certifier may be engaged to certify that the works have been completed in accordance with the specification

12.6.6 Maribyrnong River Bridge package

Table 12-12 summarises the procurement options assessment for the Maribyrnong River Bridge package against each evaluation criterion.

Table 12-12: Procurement options assessment summary – Maribyrnong River Bridge package

Package / Evaluation criterion	Relative priority	Alliance	D&C	Recommended model
Market interest and appetite	High	✓✓✓	✓✓✓	**Incentivised Target Cost (ITC)**
Time	Moderate	✓✓	✓✓	
Price and budget certainty	High	✓✓	✓✓	
Risk management	High	✓✓	✓✓	
Flexibility and control	Moderate	✓✓✓	✓✓	
Innovation and incentive	Moderate	✓✓	✓	
Stakeholder management	Moderate	✓✓✓	✓✓	

As with the ARTC package discussed in section 12.6.5, the procurement options assessment for the Maribyrnong River Bridge package suggests that this package may be best suited to a procurement model which has both elements of collaboration and greater risk transfer to the contractor. As a result, an ITC model was assessed as the recommended procurement model for the Maribyrnong River Bridge package.

Table 12-13 summarises the key risks specific to the Maribyrnong River Bridge package and how the recommended ITC model would mitigate these risks.

Table 12-13: Mitigation of key Maribyrnong River Bridge package risks

Key risks	Mitigation under delivery model
• Requirements of Heritage Victoria are more onerous or time consuming than expected, leading to program delays. • Adverse ecological impacts arise as a result of the location of the works which may lead to changes in requirements during the design and construction of the works.	• The collaborative and flexible aspects of the ITC model should allow for innovation in the design solution of the new Maribyrnong River Bridge while remaining cognisant of the site's complexities, due to the topography, ecology, heritage and cultural heritage.

12.6.7 Viaduct package

The procurement options assessment for the Viaduct packages and Airport Station outlined in the following subsections have been informed by the unique characteristics associated with works carried out on Airport-leased land, which are outlined in section 12.6.12. The State will require a high degree of collaboration with APAM as the current leaseholder of the Airport-leased land and operator of Melbourne Airport. As a result, the recommended model(s) for these packages will be subject to agreement with APAM.

Table 12-14 summarises the procurement options assessment for the Viaduct package against each evaluation criterion.

Table 12-14: Procurement options assessment summary – Viaduct package

Package / Evaluation criterion	Relative priority	Alliance	D&C	Recommended model
Market interest and appetite	High	✓✓✓	✓	**Alliance**
Time	High	✓✓	✓✓	
Price and budget certainty	High	✓✓	✓✓	
Risk management	High	✓✓✓	✓✓	
Flexibility and control	Moderate	✓✓✓	✓✓	
Innovation and incentive	Moderate	✓✓	✓	
Stakeholder management	Moderate	✓✓✓	✓✓	

An Alliance approach was assessed as the recommended procurement model for the Viaduct package as, on balance, it performs equal to or stronger than a D&C in relation to each of the evaluation criteria. This reflects the nuances associated with the Viaduct package straddling Airport and State land. Construction, staging and interface complexity will be associated with the operational road environment on the State land portion of the package, in addition to the need to work closely with APAM in relation to the Airport land portion of the package.

Table 12-15 summarises the key risks specific to the Viaduct package and how the recommended Alliance would mitigate these risks.

Table 12-15: Mitigation of key Viaduct package risks

Key risks	Mitigation under delivery model
• Stakeholder interface with APAM is less effective and efficient than expected, resulting in delay. • Restrictive site access arrangements and complex staging requirements due to operational airport and road environment lead to program delays.	• An alliance model is expected to provide the best commercial framework through which these risks can be managed, with the State, the contractor(s) and Franchisee commercially aligned and therefore all working together to identify, mitigate and manage these risks.

12.6.8 Airport package

Table 12-16 summarises the procurement options assessment for the Airport package against each evaluation criterion.

Table 12-16: Procurement options assessment summary – Airport package

Package / Evaluation criterion	Relative priority	Alliance	D&C	Recommended model
Market interest and appetite	High	✓✓✓	✓	**Alliance**
Time	High	✓✓	✓✓	
Price and budget certainty	High	✓✓	✓✓	
Risk management	High	✓✓✓	✓✓	
Flexibility and control	Moderate	✓✓✓	✓✓	
Innovation and incentive	Moderate	✓✓	✓	
Stakeholder management	Moderate	✓✓✓	✓✓	

An Alliance approach was assessed as the recommended procurement model for the Airport package as, on balance, it performs equal to or stronger than a D&C in relation to each of the evaluation criteria. This reflects the live brownfield operational environment of the Airport package which will present construction, staging and interface complexity and the need to work closely with APAM.

Table 12-17 summarises the key risks specific to the Airport package and how the recommended Alliance would mitigate these risks.

Table 12-17: Mitigation of key Airport package risks

Key risks	Mitigation under delivery model
• Stakeholder interface with APAM is less effective and efficient than expected, resulting in delay of this critical path scope element. • Restrictive site access arrangements and complex staging requirements due to operational airport environment lead to program delays of this critical path scope element.	• An alliance model is expected to provide the best commercial framework through which these risks can be managed, with the State, the contractor(s) and Franchisee commercially aligned and therefore all working together to identify, mitigate and manage these risks.

12.6.9 Rail Systems package

Table 12-6 summarises the procurement options assessment for the Rail Systems package against each evaluation criterion. More details are provided in Appendix 10: Packaging and procurement strategy.

Table 12-18: Procurement options assessment summary – Rail Systems package

Package / Evaluation criterion	Relative priority	Alliance	D&C	Recommended model
Market interest and appetite	High	✓✓✓	✓	**Alliance**
Time	High	✓✓	✓	
Price and budget certainty	High	✓✓	✓	
Risk management	High	✓✓✓	✓	
Flexibility and control	High	✓✓✓	✓	
Innovation and incentive	Moderate	✓✓✓	✓	
Stakeholder management	Moderate	✓✓✓	✓✓	

An Alliance approach was assessed as the recommended procurement model for the Rail Systems package, as it performs stronger than a D&C against all of the evaluation criteria. This reflects, among other things, the technical complexity of the rail systems scope and its interface with the other packages and other rail network projects. The procurement model must facilitate the early and sustained identification, mitigation and management of these risks, on a collaborative basis, with the State, contractors, ARTOs, systems providers and other key stakeholders.

RPV has investigated opportunities for, and risks of, the Rail Systems package scope being delivered as part of the Sunshine / Albion package. This was recently tested with the market as part of the MAR procurement process and it has been determined that the Rail Systems package scope will be incorporated into the Sunshine / Albion package.

Table 12-19 summarises the key risks specific to the Rail Systems package and how the recommended Alliance would mitigate these risks.

Table 12-19: Mitigation of key Rail Systems package risks

Key risks	Mitigation under delivery model
• Risk of delay due to complex staging of works and interfaces with multiple packages (and projects, including MTP) and varying operational rail, road and airport environments. • Risks associated with integration of new systems into the Victorian network, including delays and technical interface issues.	• An alliance model is expected to provide the best commercial framework through which these risks can be managed, with the State, the contractor(s) and ARTOs commercially aligned and therefore all working together to identify, mitigate and manage these risks.

12.6.10 Early Works package

RPV has identified discrete scope items (primarily related to utility relocations) that would benefit MAR overall through separate procurement and delivery before, or in parallel to, the main works. These scope items will be delivered under a Managing Contractor (MC) arrangement, with the MC managing the interface with the relevant Utility Service Providers.

12.6.11 Early Works (other scope items)

RPV is exploring other opportunities for early works (not within the scope of the MC package above) to be delivered as part of the Project. For example, relocation of AusNet HV Towers could be delivered by Ausnet via a direct agreement between the State and AusNet.

12.6.12 Context for works on Airport-leased land

12.6.12.1 Airport context

The most appropriate delivery model(s) and framework for the works to be delivered on Airport-leased land (that is, the Airport and Viaduct packages, the latter of which straddles Airport and State land) were informed by the unique characteristics applicable to the scope of works, including:

- **APAM** – Melbourne Airport is owned and operated by APAM. The State will need to reach an agreement with APAM in relation to the design, approvals, delivery and operations phases of the Project, which involves constructing the Airport Station and associated infrastructure on Airport-leased land.
- **Land tenure and leasing arrangements** – Melbourne Airport is situated on land owned by the Australian Government, which is leased to APAM under a 50-year lease (with an option to extend for a further 49 years). Over 4 kilometres of the MAR alignment will be located within the APAM leasehold. The boundary of the Airport-leased land starts where the MAR alignment intercepts Sharps Road. For the delivery of works on Airport-leased land, the State will need to agree a range of tenure and access agreements with APAM over the alignment from Sharps Road to the airport terminals.
- **Major Development Plan (and other approvals)** – MAR Works on Melbourne Airport-leased land will need to be implemented within the parameters of the existing Melbourne Airport Master Plan, capital works projects and precinct guidelines, as well as the *Airports Act 1996* (Cth) and relevant approvals for major project development on Commonwealth land. This will require a range of approvals from APAM and the Australian Government, as well as the Airport Building Controller.
- **Melbourne Airport Internal Road Network Plan** – Under the current Airport Master Plan, expansion of the on-airport road network is proposed including the construction of an elevated entry to a newly reconfigured T123 by 2023. The proposed elevated road is geographically proximate to the proposed location of the Airport Station and may impact construction methodologies. As a result, discussion and agreement with APAM is required to identify the most appropriate design for both the elevated road solution and the Airport Station.
- **Live airport environment** – Melbourne Airport is an operational airport environment, which attracts additional requirements that will need to be contemplated as part of the Airport Station design and delivery (such as security, safety, fire and police requirements).

Both the Airport package and the Viaduct package are subject to these unique characteristics. The Airport package relates to works located solely on Airport-leased land for delivery in a heavily congested Airport-leased landside environment. The Viaduct package scope requires the delivery of largely elevated infrastructure on State and Commonwealth land (the viaduct extends beyond the Sharps Road boundary into State land (until Terror Street) for approximately 2 kilometres).

The proposed alliance delivery model(s) and framework for the Airport and Viaduct packages will need to deal appropriately with each of the elements above to ensure a successful outcome. As a result, the State will require a high degree of collaboration with APAM as the current leaseholder of the Airport-leased land and operator of Melbourne Airport.

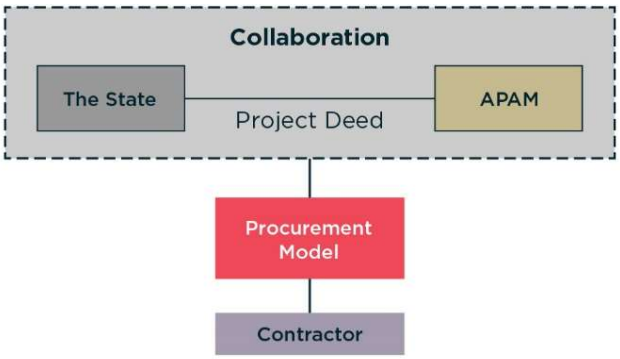
12.6.12.2 Project Deed

Due to the unique characteristics applicable to the works to be delivered on land currently leased to APAM by the Australian Government, the proposed alliance delivery model(s) is only one part of the Project's procurement strategy. In addition to the delivery of the physical scope of works on Airport-leased land, overarching governance and commercial arrangements for delivery and operation of MAR will need to be agreed between the State (and Australian Government) and APAM. These

arrangements will be reflected in a Project Deed, the terms of which are intended to be negotiated with APAM.

A summary of these procurement and delivery arrangements is illustrated in Figure 12-5.

Figure 12-5: Airport works – procurement and delivery framework



The terms of the Project Deed will be required to contemplate the following topics (not exhaustive):

- input and approval over the design, and design standards, for works delivered on Airport-leased land
- input and approval over construction methodology (including traffic management, site access, site conditions, hours of operation) for works delivered on Airport-leased land
- land tenure arrangements on Airport-leased land
- procurement process for works on Airport-leased land
- governance, including arrangements to address scope change, disputes, delays.

12.6.13 Packaging and procurement solution

Table 12-20 summarises the recommended packaging and procurement solution as developed in Step 2 and Step 3.

Table 12-20: Packaging and procurement solution

Works package	Description	Procurement model
Airport Package	**Airport station works** • New elevated station at Melbourne Airport **Civil and track works** • New track pair for MAR services • Civil works for traction power substation and rail systems **Overhead wiring (OHW)** • Overhead line equipment (OHLE), wiring and structures	Alliance
Viaduct Package	**Viaduct works** • Bridge structure across Western Ring Road (M80) • Elevated viaduct along Airport Drive **Civil and track works** • New track pair for MAR services • Civil works for traction power substation and rail systems	Alliance

Works package	Description	Procurement model
	OHW • OHLE, wiring and structures	
Corridor Package	**Bridge and SUP works** • Road bridge modifications **Civil and track works** • New track pair for MAR services • Shared user paths and bridge works • Civil works for traction power substations **OHW** • OHLE, wiring and structures	Alliance
ARTC Package	**Civil and track works** • ARTC track slew to accommodate the MAR • Civil works and relocation of existing ARTC CSR • Utilities identification, protection, replacement and relocation **Systems** • Signalling and rail control system works on the ARTC line • Relocation/decommissioning of ARTC signalling assets **Other transport mode infrastructure and urban design** • Reinstatement and repair of road infrastructure • Adjustments and reinstatement of existing public areas	ITC
Maribyrnong River Bridge Package	**Bridge works** • New Maribyrnong River Bridge construction	ITC
Sunshine / Albion Package	**Station works** • Modifications to existing Sunshine and station • Conventional signalling works to facilitate staging works required **Civil and track works** • New track pair for MAR services • Rail bridges • Double track flyover **OHW and structures** • OHLE, wiring and structures • Upgrade of existing traction power substations	Alliance
Rail Systems Package[153]	**Train Control and Signalling** • Rail systems design (including CBTC) • Equipment / cable supply, install and testing	Alliance

[153] Scope to be delivered as part of Sunshine / Albion package.

Works package	Description	Procurement model
	• System level testing and commissioning **Traction Power** • New DC and Intake Substations • 22kv reticulation **Communications** • Fibre Optic network • Train Radio Systems	
Early Works Package	Utilities protection and relocation along the MAR alignment	Managing Contractor

In addition to the above, it is also noted that:

- the metropolitan rail franchisee will operate the MAR services
- HCMTs will be used to operate the MAR services and will be procured separately to the Project on a network-wide basis.[154]

12.7 Step 4: Market validation

As outlined in section 12.4.3, multiple stages of market engagement have been undertaken by RPV, comprising both written questionnaires and one-on-one market sounding interviews. A number of packaging and procurement options were validated with the market in accordance with DTF Guidelines, including key elements of the packaging and procurement solution outlined above.

Key themes from the market sounding processes relevant to establishing the overarching procurement strategy may include but are not limited to:

- market appetite and capacity
- packaging and procurement, including risk allocation and viability of early works
- interface, integration and commissioning
- procurement process and timelines.

The packaging and procurement solution was revisited following this market validation exercise to confirm that the proposed delivery strategy for the Project ensures an optimal result for Victorians as well as ensuring value for money is obtained for the State.

At a high level, notable key messages from the market engagement process were as follows:

- Most participants were **generally supportive of the base case packaging strategy** and noted support for the Maribyrnong River Bridge as its own package.
- Most participants **confirmed that utility works, general site preparatory and investigatory works, should be delivered as early works**, specifically mentioning that the utilities and services at Melbourne Airport should be done early.
- Participants generally agreed with the proposed strategy that the **Sunshine / Albion package and Systems package** should be **alliances**.
- Participants also generally recommended that the **Corridor and Airport packages** should also be delivered as **alliances**.
- Some participants noted that the **Viaduct package** should also be an **alliance or collaborative contract however** others suggested that the Viaduct **could be delivered under a more traditional delivery model**.

[154] Work undertaken by the Department of Transport (DoT) to date has identified that 5 additional HCMTs are required to accommodate the Day 1 service plan for MAR (in addition to those HCMTs already on order by the State).

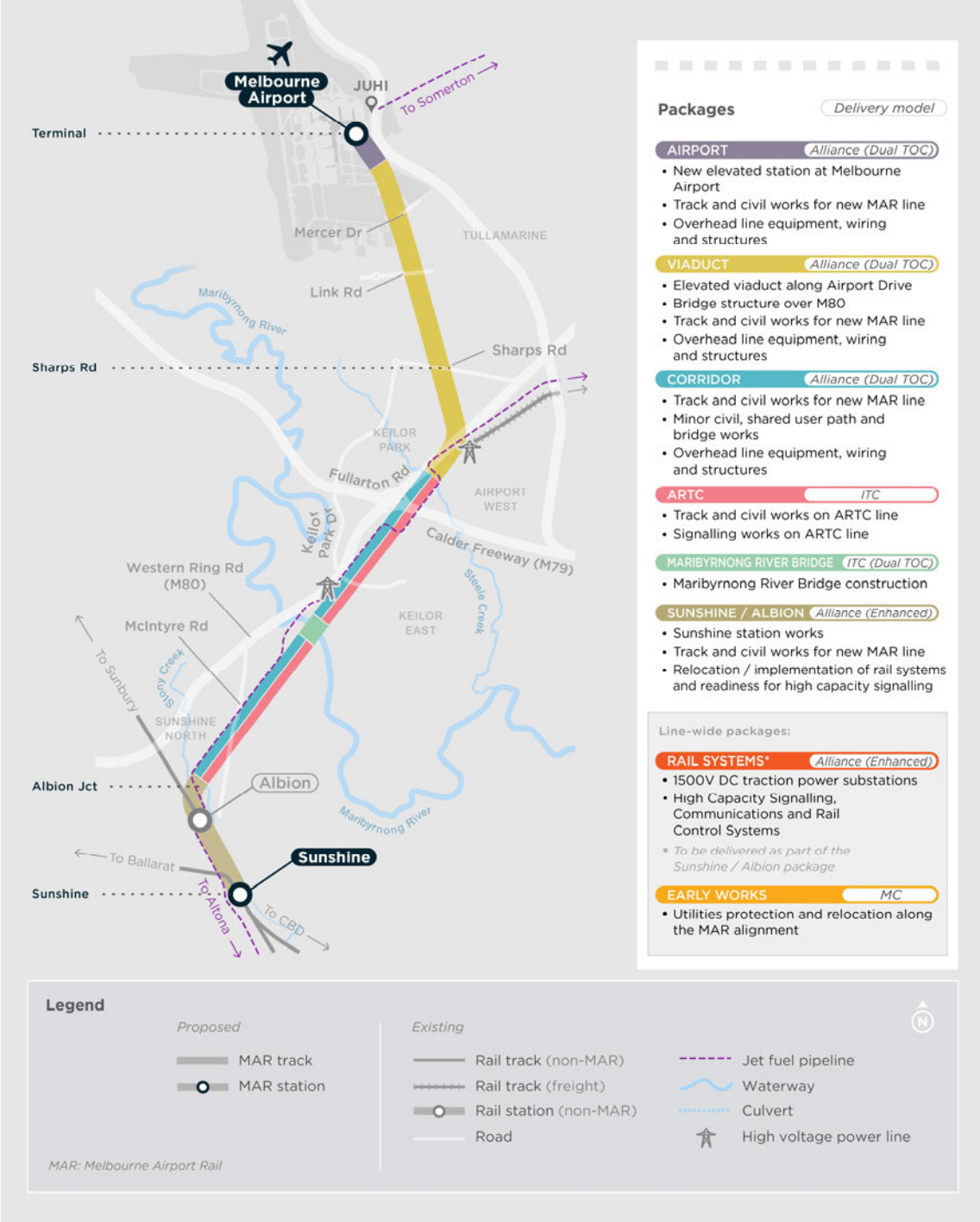
- A number of participants identified the **Maribyrnong River Bridge** as a simpler scope element for MAR that may be suited to **a greater level of risk transfer to the contractor.**
- All participants generally **supported collaborative contracting and a shared approach to risk**. Key risks related to interfaces, utilities, geotechnical and contamination risks were repeatedly referenced as risks that needed to be shared or retained by the State.
- The market indicated that the **preferred contractor should be engaged in a one-on-one collaborative process quicker**, so that more value and certainty can be unlocked and risks effectively identified, quantified and mitigated.
- Engaging in **deep collaboration** during procurement processes, utilising **collaborative procurement models**, leveraging existing **benchmarking data** and getting the **right team** on the job early were suggested as the **best ways to achieve value for money**.

12.8 Step 5: Business Case recommendation

MAR is being delivered as part of Victoria's Big Build and is one of the most significant investments in infrastructure in Victoria's history. MAR will eventually form part of SRL. It will also complement the longer-term pipeline of investment through the Western Rail Plan which will increase the capacity of the rail transport network to support the growing western region of Melbourne. The procurement of MAR will be undertaken in the context of this investment pipeline, and the State is continually evaluating infrastructure priorities and the most efficient way to procure and deliver these important projects, including considering innovative methods of procurement to provide value for money to the state and provide industry with a consistent and reliable pipeline of work to support the Big Build.

The recommended packaging and procurement solution for MAR is summarised in Figure 12-6, noting that the final position is subject to further technical work on the design solution, discussion with key stakeholders and market engagement feedback.

Figure 12-6: Packaging and procurement solution



13 Planning, environment and heritage approvals

13. Planning, environment and heritage approvals

Chapter summary

- The primary planning, environment and heritage approvals potentially required for MAR are separated into those required for land under Commonwealth jurisdiction (Airport land) and land under State jurisdiction (the remainder of the Project area).
- While the approvals processes for these two jurisdictions are independent, an integrated approach will be adopted with the view to providing a seamless approvals process for MAR to the extent practicable.
- Preliminary investigations have identified a range of potential planning, environment and heritage impacts and indicated that primary approvals will be required for Commonwealth and State land. Further work is required to confirm the approval pathway.
- RPV will continue to engage closely with the Department of Environment, Land, Water and Planning (DELWP), APAM and other agencies as necessary to avoid, mitigate and manage the potential impacts associated with the delivery of MAR.

13.1 Planning, environment and heritage considerations

Preliminary analysis was undertaken to identify key planning, environment and heritage approvals potentially required for MAR. These are separated into those required for land within:

- **Commonwealth jurisdiction (Airport land)** – Project works between Sharps Road, Tullamarine and Melbourne Airport Integrated Terminal Precinct are on Commonwealth-owned land, which is leased to APAM (also referred to as Airport land). Commonwealth legislation applies to planning and environmental approvals for these Project works.
- **State jurisdiction (the remainder of the Project area)** – Includes all other land relevant to the Project, including land south of Sharps Road, Tullamarine and east of the M80, including public and privately-owned land. Victorian (State) legislation and certain Commonwealth legislation applies to Project works on State land.

Although the approvals processes for these two jurisdictions are separate, the application processes can be run concurrently. An integrated approach will be adopted with the view to provide a seamless approvals process for the Project, to the extent practicable.

13.1.1 Commonwealth approvals

For works occurring on Airport land within Commonwealth jurisdiction, the development of a Major Development Plan (MDP) is required under the *Airports Act 1996* (Cth), including advice of the Minister for the Environment under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act).

RPV, with extensive input from APAM, will develop the MDP. Under its environmental policy, APAM aims to achieve best practice in the management of cultural heritage. Although the *Aboriginal Heritage Act 2006* (Vic) is not applicable to Commonwealth land, APAM typically elects to undertake a voluntary Cultural Heritage Management Plan (CHMP) for proposed developments that may impact upon cultural heritage values. These voluntary CHMPs adhere to the requirements of State legislation and have been approved by Wurundjeri Land and Compensation Cultural Heritage Council Aboriginal Corporation (Wurundjeri) for past airport projects.

All development on Airport land must be consistent with the objectives and principles of the 2018 Melbourne Airport Master Plan (Master Plan). As the existing Master Plan contemplates a rail link to the airport, no variation or amendment to the Master Plan is required at this stage.

The State will require APAM to lodge the MDP and will require tenure over the Airport land to facilitate construction and operation of MAR. This will require agreement from APAM and the Australian Government as to the nature and duration of any tenure arrangements.

13.1.2 State approvals

For all works on land within the State jurisdiction, the following may be required:

- Application for a planning scheme amendment (PSA) for the Hume, Brimbank, Moonee Valley, Hobsons Bay and Maribyrnong planning schemes under the *Planning and Environment Act 1987* (Vic) to introduce a project-specific Incorporated Document to facilitate the Project.
- Preparation of a CHMP for land administered by the Wurundjeri Woi Wurrung Cultural Heritage Aboriginal Corporation and a CHMP for land administered by Aboriginal Victoria.
- Referral under the *Environment Effects Act 1978* (Vic) (EE Act), pending the outcome of various impact assessments.
- Major transport project declaration and project area designation with consequent referral under the EPBC Act will likely be required due to the presence of and proximity of works to matters of national environmental significance (MNES), although further work is required to confirm whether MAR will likely be a controlled action requiring approval under the EPBC Act.

- Project delivery powers under the *Major Transport Projects Facilitation Act 2009* (Vic) including land acquisition, works on roadways and utilities agreements.
- Heritage permits or permit exemptions for impacts to any of the places or objects on the Victorian Heritage Register (VHR), or consents to damage any Victorian Heritage Inventory (VHI) sites under the *Heritage Act 2017* (Vic).
- Approval under the *Pipelines Act 2005* (Vic) (PL Act) for potential relocation works on the existing jet fuel pipeline which connects through to Melbourne Airport.

13.1.3 Primary and secondary approvals

Overall approval for the Project is contingent upon primary approvals under State and Commonwealth legislation, which enable construction.

The likely primary approval requirements for MAR are outlined in Table 13-1.

Table 13-1: Primary approval requirements

Act	Commonwealth	State
***Airports Act 1996* (Cth)**	Requires the approval of a MDP by the Commonwealth Minister for Infrastructure, Transport and Regional Development.	-
***EPBC Act 1999* (Cth)**	To be confirmed once Melbourne Airport MNES information (to confirm presence or absence) and project impacts are known. The MDP is required to be referred to the Minister for the Environment under the EPBC Act before approval.	Likely to require referral under EPBC Act due to potential presence of vulnerable and endangered species – impact to be confirmed.
***Environmental Effects Act 1978* (Vic)**	-	Referral unlikely based on the findings from the preliminary EE Act self-assessment.
***Planning and Environment Act 1978* (Vic)**	-	PSA via section 20(4) is recommended, subject to further consideration of impact assessments and informal notice and consultation. This would streamline the approvals process and allow the Minister for Planning to prepare, adopt and approve the PSA with an exemption from formal notice and review requirements. An Environmental Management Framework (EMF) is the preferred tool to manage impacts on the environment during construction.
***Aboriginal Heritage Act 2006* (Vic)**	Likely voluntary CHMP.	Mandatory CHMPs required.
***Pipelines Act 2005* (Vic)**	-	Likely to require approval for either a 'minor alteration' to an authorised route under section 66 or a 'significant alteration' to an authorised route under section 68 of the PL Act. Protection works are unlikely to require primary approval under the PL Act but will likely require consent of the pipeline operator and secondary consents.
***Major Transport Projects Facilitation Act 2009* (Vic)**	-	MAR could be declared under the Major Transport Projects Facilitation Act *2009* (excluding Parts 3 and 8) with

Act	Commonwealth	State
		designation of a project area to enliven various project delivery powers.
Heritage Act 2017 **(Vic)**	-	Permits/consents required for VHR/VHI sites to be impacted. Possible amendment to HV McKay Memorial Gardens and Maribyrnong Rail Bridge (Albion Viaduct) VHR listings.

For State land, overall approval of the Project is not contingent upon secondary approvals. Secondary approvals, permits, or consents can be sought after the primary approvals are obtained before the relevant aspect of construction starts, and are typically the responsibility of the project / package delivery partner.

For the Commonwealth land, secondary approval is required before construction can start, in accordance with the *Airports (Building Control) Regulations 1996* and are also typically the responsibility of the project / package delivery partner.

Based on the scope of MAR, it is likely that a number of secondary approvals will be required under State and Commonwealth legislation.

13.2 Planning, environment and heritage risk summary

Key risks related to planning, environment and heritage for MAR are summarised in Table 13-2.

Table 13-2: Planning, environment and heritage risks

Area	Potential risks
MDP	• The MDP may impact the approvals program timeframes. In particular, any environmental matters under the MDP would need approval from the Commonwealth Department of Agriculture, Water and the Environment. • Unknown conditions may be imposed onto an MDP approval, which may further impact the construction program.
Environment Effects Statement (EES)	• There is a risk the Victorian Minister for Planning will decide that an EES is required for MAR. This would mean the assessment of the proposed PSA would likely occur within the scope of the EES. Assessment of any required EPBC Act approvals may be conducted within the EES pursuant to the existing bilateral agreement. An EES process would impact the approvals program timeframes. Typically, development and approval of CHMPs would occur in parallel with the EES.
EPBC – controlled action	• The presence of, and potential impact to, matters of national environmental significant (MNES) will need to be confirmed. The approach will be to avoid the potential of significant impact on MNES where possible, seeking to avoid a controlled action through refinement of design outcomes and construction management requirements. A controlled action decision following the EPBC Act referral would have an impact on the approvals program timeframes, depending on the level of assessment required.
PSA	• There is a risk the PSA may not be approved by the Victorian Minister for Planning pursuant to section 20(4) of the *Planning and Environment Act 1987* (Vic) and instead require some form of public hearing process (for example, Independent Advisory Committee), which would impact the approvals program timeframes. • There is a risk the PSA may not be approved by the Victorian Minister for Planning due to potential impacts arising from ecology, noise, amenity, visual impacts, contaminated land, surface water, property acquisition, historic heritage and Aboriginal cultural heritage.
VHR	• Anomalies have been identified within the VHR listings for the Maribyrnong Rail Bridge (Albion Viaduct) and the HV McKay Memorial Gardens, which have the potential to impact approval processes and will require amending.

Area	Potential risks
PL Act	• There is a risk that relocation works for the jet fuel pipeline will require approval for a 'significant alteration' to an authorised route under section 68 of the PL Act. The significant alteration process can take up to two years and would impact the approvals program timeframes.

As noted in this chapter, RPV has developed an integrated approach to the Commonwealth and State approvals processes to enable a concurrent and seamless approach to planning, environment and heritage approvals required for MAR.

Further work is required to confirm the approval pathway for all primary approvals on Commonwealth and State land. RPV will continue to work closely with DELWP and other agencies as necessary to avoid, mitigate and manage the above risks in the delivery of MAR. Detailed mitigation strategies will be developed as the Project progresses.

14 Stakeholder engagement and communications

14. Stakeholder engagement and communications

Chapter summary

- Stakeholder engagement and community consultation for MAR began in 2018, following the public commitment by the Victorian and Australian governments to the Project. Since then, RPV has engaged with local councils, utility providers, community and interest groups, local residents, industry stakeholders, government departments and agencies to raise awareness and gain meaningful feedback to inform key planning and development activities.
- Engagement conducted to date has established that stakeholders understand MAR offers a wide range of benefits, such as improved access and journeys to Melbourne Airport, positive environmental outcomes and economic opportunities.
- There are some stakeholder concerns that will need to be considered and managed appropriately as MAR progresses. These include disruption to residents and businesses during construction, operational changes to public transport and roads, and land and property impacts.
- A phased approach to communications and stakeholder engagement has been developed, which provides public participation opportunities at key points and proactively identifies and manages risks and opportunities. This approach builds on the work done to date and involves the following phases:
  - **Planning and development (2019 to 2021)** – information gathering, raising awareness and early engagement (underway).
  - **Design development, approvals and procurement (2020 to 2022)** – seeking formal feedback and acceptance of the reference design with key stakeholders (underway).
  - **Delivery (2022 onwards)** – ongoing stakeholder and community engagement and formal feedback and acceptance of the design with the appointed contractors.

14.1 Introduction

Since 2018, RPV has engaged with local councils, utility providers, community and interest groups, local residents, industry stakeholders, government departments and agencies as part of the planning and development of MAR. This has been supported by activities such as social research, newsletters, postcards, virtual community information sessions, pop-up events, letters to landowners adjacent to the rail corridor and online surveys (noting during this time there were limitations associated with engagement, in particular face-to-face activities in line with COVID-19 restrictions).

This chapter summarises the stakeholder engagement and communications approach for MAR.

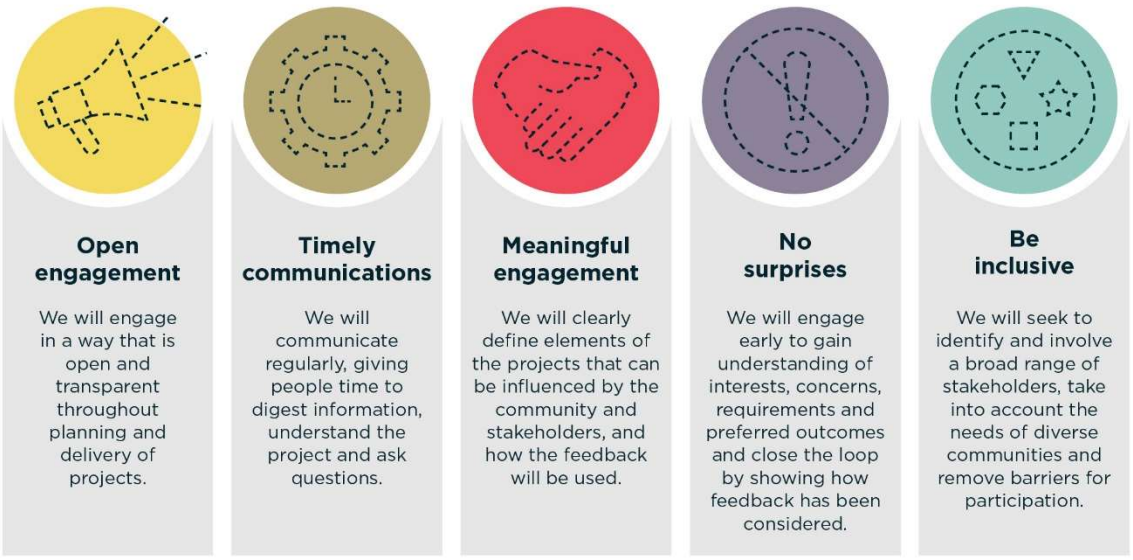
14.2 Objectives and principles

A targeted, strategic approach will be applied to communications and stakeholder engagement to meaningfully engage the public at key points during Project planning, development and delivery. The objectives of stakeholder engagement are to:

- actively involve community and stakeholders in the planning and delivery of MAR to improve Project outcomes
- gather community and stakeholder feedback at appropriate times for them to meaningfully influence the Project
- encourage participation and provide opportunities for stakeholders and community members to be involved in the Project
- increase awareness and understanding of the need for MAR, its benefits, potential effects and proposed mitigation measures
- provide communications materials that are timely, clear and accessible.

Guiding principles that underpin the approach to communications and stakeholder engagement for MAR are outlined in Figure 14-1.

Figure 14-1: Stakeholder engagement principles

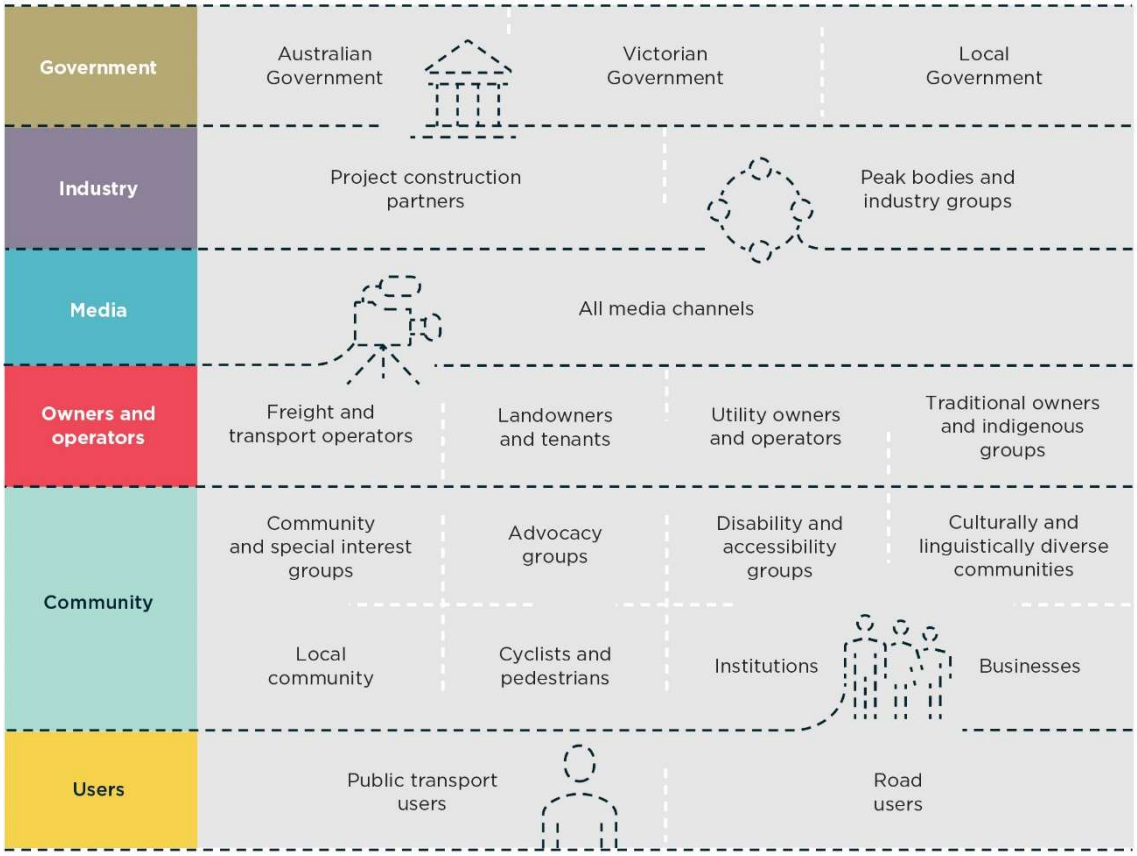


14.3 Stakeholder identification and engagement

During delivery of MAR, a number of stakeholders will be involved in, impacted by, or interested in the works. MAR spans a large geographic area through a variety of suburbs, indicating that a diverse range of communities will interact with the Project. The diversity of these communities is considered

when developing and undertaking engagement activities. Ongoing stakeholder engagement will target the stakeholder groups listed in Figure 14-2.

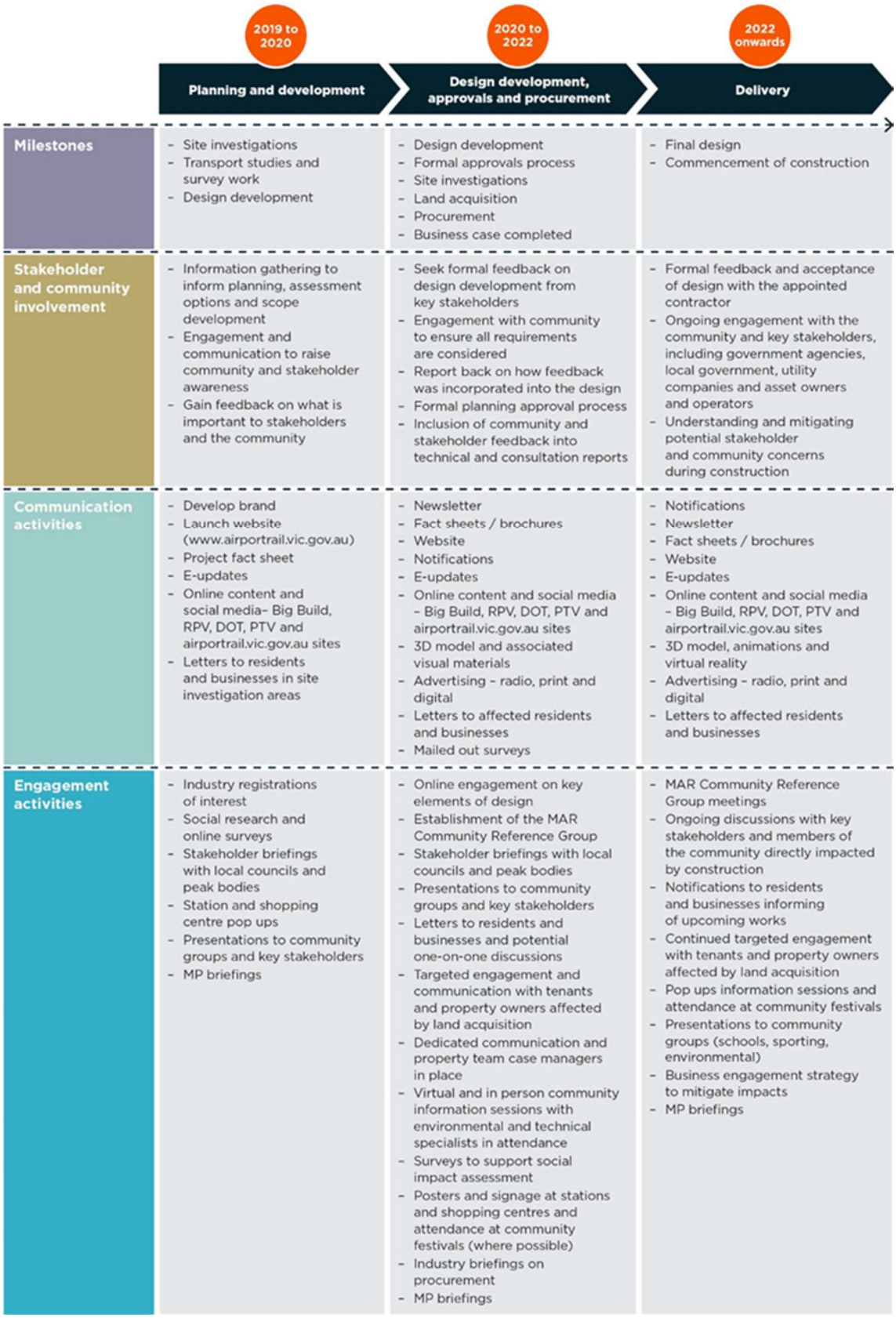
Figure 14-2: High-level identification of key stakeholders



A phased engagement approach is being adopted to support project milestones and deliverables. It is building on the engagement undertaken to date, which has focused on raising awareness and understanding of the Project and its benefits.

Figure 14-3 summarises the communication and engagement approach and activities planned for MAR, aligning with the key Project phases. The figure shows communication activities that have been, and will continue to be, undertaken on the Project. These activities are instrumental in ensuring interested parties have access to appropriate information and that feedback is received and taken into consideration by RPV.

Figure 14-3: Overview of phased stakeholder engagement approach



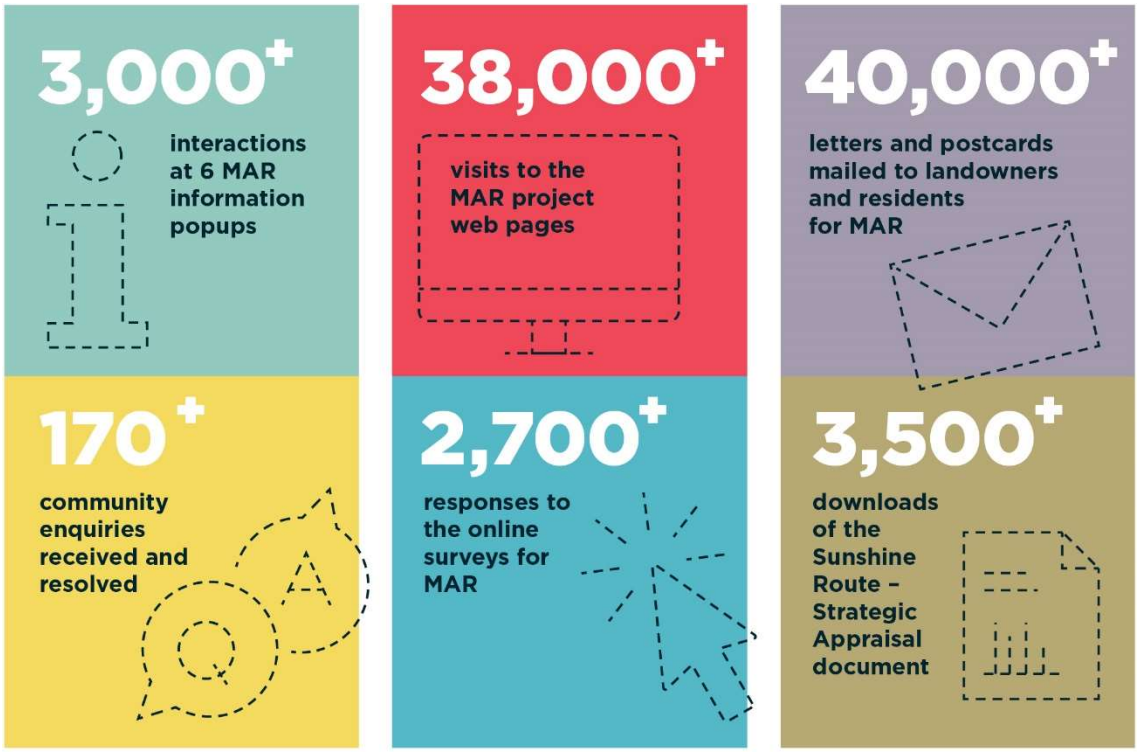
14.4 Key stakeholder feedback

Understanding the interests, concerns, requirements and preferred outcomes of key stakeholders enables RPV to develop solutions to the issues and challenges that will be faced in delivering the Project.

Engagement conducted to date has seen stakeholders and the community provide valuable feedback about their initial ideas and has identified the elements of MAR of most interest to them. This feedback informed this Business Case and will help support the design development and planning and approvals process.

A snapshot of the engagement as at the time of writing this Business Case is provided in Figure 14-4.

Figure 14-4: Engagement by numbers



To date stakeholders and the wider community have identified a range of Project benefits including:

- improved journeys to Melbourne Airport
- economic development and urban renewal
- increased local employment
- improved access to Melbourne Airport for regional passengers and people with special needs such as people with a disability or young children
- improved safety
- improved environmental outcomes.

Many aspects of these benefits are recognised in the overarching benefits identified for MAR and are summarised in Chapter 3. Stakeholders and local communities have also nominated their areas of interests, key questions and concerns. This information and the future engagement channels that RPV intend to use are summarised in Table 14-1.

Table 14-1: Stakeholder feedback and engagement summary

Stakeholder	Areas of interest	Future engagement channels
Local councils	• Visual and landscaping outcomes • Impacts to public transport and shared user paths • Maintaining access for local communities • Potential impacts on local businesses • Potential property acquisition and temporary use of land during construction • Interest in the local environment and heritage • Impacts on council assets	• Involvement in the Melbourne Airport Rail Community Reference Group • Regular meetings • Workshops and presentations • Regular e-news updates
Local residents and community groups	• Construction impacts including noise and vibration, dust, traffic and night works • Impacts to public transport • Impacts on cultural and historic heritage, loss of trees and ongoing impacts on waterways • Visual and landscaping outcomes • Potential property acquisition and temporary use of land during construction	• Involvement in the Melbourne Airport Rail Community Reference Group • Regular e-news updates • Online materials and engagement tools • Face-to-face information sessions and pop-ups • Virtual community engagement sessions • Notifications for site investigations and works
Businesses	• Construction impacts including noise and vibration, dust, traffic and night works • Changes to access • Potential property acquisition and temporary use of land during construction	• Regular e-news updates • Online materials • Meetings with impacted businesses • Engage with business and retail representative groups • Notifications for site investigations and works
Utility providers and transport operators	• Maintaining access to their assets • Construction impacts • Permanent changes to assets • Changes to asset maintenance	• Regular meetings • Establish working groups (if needed)

RPV will continue to build on the work done to date and conduct stakeholder and community engagement throughout the development, procurement and delivery of MAR. Chapter 13 outlines statutory and approvals engagement, including the approach to cultural heritage considerations for MAR.

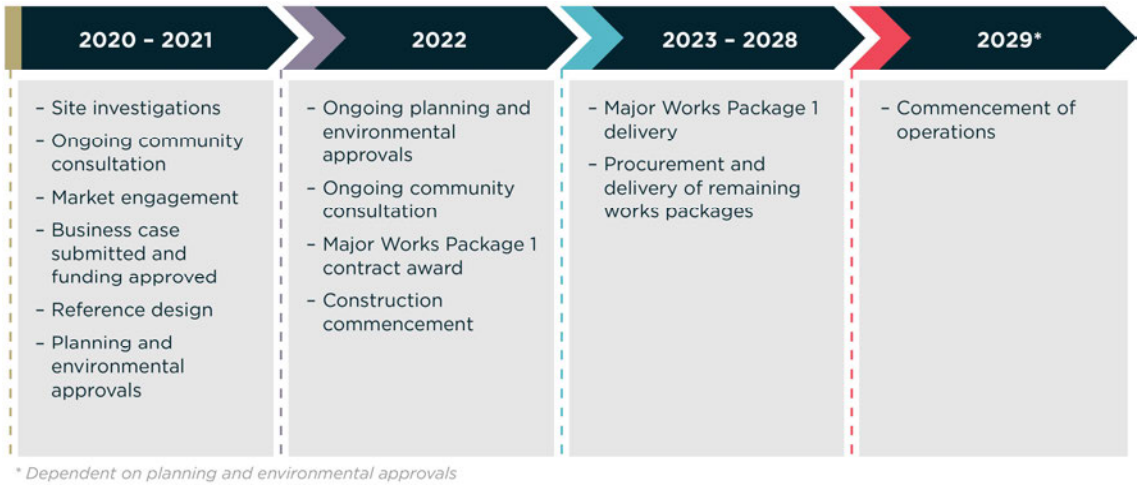
15 Implementation

15. Implementation

Chapter summary

- This chapter outlines a range of activities being undertaken to ensure successful implementation of MAR. These include development of a project schedule, completion of project development and due diligence activities, and analysis of lessons learnt and insights from a range of previous similar projects.

- A project schedule has been established that outlines all activities required to develop, procure and deliver MAR (see summary below), noting it is subject to further due diligence and refinement. The schedule outlines timeframes for planning approvals, land acquisition, procurement and delivery as well as critical path milestones and decision points.



- A range of critical path milestones for MAR have been identified that are fundamental to the Project's success. These include planning and environmental approvals, property acquisition and site preparation.
- A Schedule Risk Assessment (SRA) was undertaken to estimate the contingency allowances associated with the overall project completion dates and to estimate key milestones. Based on the SRA, the P90 project completion date is ***Redacted*** [155]
- The successful execution and performance of MAR depends heavily on the effort and quality of project development and due diligence. An assessment of MAR against DTF *Project Development and Due Diligence Guidelines* (PDDD Guidelines) was undertaken to confirm the required Project Development and Due Diligence (PDDD) elements (such as site investigations, operational and system requirements, concept design reports, cost estimation and economic appraisal) have been integrated into the Project.
- MAR has also been assessed against the Victorian Government's Public Interest Test, including consideration of broader public aspects. It was concluded the project solution protects the public interest.
- As well as completing the required PDDD activities and Public Interest Test, a wide range of national and international precedent projects were considered for MAR, including internal learnings, insights and experience from projects such as the MTP, which have faced similar challenges and opportunities. Analysing the lessons learnt and best practice approaches from these projects and embedding them in the development and delivery of MAR will help deliver better outcomes.

[155] Reference to quarters in this chapter are based on calendar years.

15.1 Project schedule

15.1.1 Project schedule

Table 15-1 provides an outline of the project schedule for MAR main works, including procurement steps and statutory approvals necessary to progress the Project. Note the project schedule is subject to further due diligence and refinement, including finalisation of the packaging and procurement strategy (see section 12.8).

Table 15-1: Key milestones

Redacted

Commercial-in-confidence

15.1.2 Critical path activities and key milestones

Starting construction in 2022 lays the foundation for critical path milestones and activity sequences for development and delivery. The following are the primary critical path milestones for MAR, which are fundamental to the Project's success:

- State and Commonwealth planning and environmental assessment and statutory approvals
- land acquisition for the Sunshine/Albion package after PSA approval
- site preparation
- commencement of major works under the Sunshine/Albion package

- Maribyrnong River Bridge package procurement and bridge construction
- engagement with APAM and development of the MDP to facilitate commencement of construction at Melbourne Airport
- design, installation and commissioning of rail systems (Rail Systems package)
- Franchisee end to end trial train operations.

A number of other activity sequences are close to the critical path and require careful management, including:

- completion of design sufficient to undertake potential early works
- power energisation on the MAR Spur
- ARTC track slew
- Airport package final commissioning on permanent power after Rail Systems package handover
- procurement of potential early works
- completion of reference design and Sunshine/Albion package tender documentation.

Further information on the procurement process and statutory approvals process are included in Chapter 12 and Chapter 13, respectively.

Public announcement of key project timelines will be undertaken as outlined in Chapter 14.

15.1.3 Project schedule risk assessment

RPV has commissioned an SRA of the MAR schedule to estimate the contingency allowances associated with the overall project completion dates and to estimate the key milestones summarised in Table 15-1 above.

RPV has undertaken a probabilistic program risk assessment of the MAR schedule using a program risk model that takes into account the impact on durations of the risk identified. This approach provides a robust estimate for the Project schedule's contingent time allowance, which gives a significant level of confidence in the overall Project duration and corresponding end dates for each package. The independently performed SRA provides an additional layer of assurance behind these findings.

The outcomes of the risk assessment also help to identify the activities with the greatest potential to influence MAR's duration and end date.

Based on the SRA performed, the P90 project completion date is ***Redacted*** which represents a 90 per cent likelihood MAR will be completed on or before this date.

The SRA performed on the RPV program identified the works at Melbourne Airport as a critical path for the Project, inclusive of risk. The deterministic date for the program is ***Redacted*** , and the risk adjusted close-out date for project completion at P10, P50, and P90 confidence levels are:

Redacted

Commercial-in-confidence

Key risks with the greatest influence on the critical path of MAR are:

- timing of utility relocation at Melbourne Airport
- duration uncertainty of key activities for Airport Station construction works and fit-out
- final testing and commissioning activities, including system integration
- complexities associated with the MDP process and the extended duration of this activity in the program.

15.2 Project development and due diligence

A strong indication of successful execution and performance of a project is an appropriate project development and due diligence undertaking. The Office of Projects Victoria (OPV) PDDD Guidelines encompass, at a high-level, the activities and deliverables undertaken at various stages of a project lifecycle.

As DoT's agency responsible for the planning and delivery of major rail projects, RPV has a well-established Investment Management Lifecycle (IML) process that identifies the key deliverables and activities required to complete a project from conception to close out. The IML aligns broadly with the PDDD Guidelines but is specifically tailored to rail projects.

RPV's IML uses slightly different nomenclature than the PDDD Guidelines, as the IML uses common terminology used in the Victorian rail industry. RPV is in the process of integrating the PDDD elements into the existing RPV Project Management Framework (PMF) and IML. Until this undertaking is complete, the project team will complete the PDDD and RPV IML assurance processes in parallel.

Additionally, the PDDD elements align with the areas of investigation and examples of evidence that were required to make available for the DTF Gate 2 (Business case) review.

The PDDD elements map, depicted in Table 15-2 includes:

- PDDD elements and the aligned IML activities and deliverables where applicable
- demonstration of the alignment of PDDD elements and the requirements of Gate 2
- the PDDD checklist in the PDDD Guidelines, which:
  - identifies the PDDD elements
  - provides a short description of the completion of each element for the Project as applicable across Gate 1 (Concept and feasibility) and Gate 2
  - provides an overview of RPV's plan to complete each element as applicable for Gate 3 (Readiness for market)
  - references the final evidence the Project will have for each of the elements.

The deliverables and activities completed to date for MAR are of suitable quality, breadth and depth for the current stage of the Project and have enabled clarity around constructability, interfaces (project, packaging and operational), budget and implementation.

Table 15-2: PDDD elements map

PDDD Element	Description of application on MAR
Project scope and design	
Client requirement documents	RPV completed a detailed analysis to inform the development of this business case which was endorsed by DOT as the client
Operational requirements	RPV completed a detailed analysis to inform the development of this business case. Operational requirements will be further developed to inform the procurement process
Functional requirements	RPV will complete a high-level analysis to inform the procurement process
System requirements	RPV completed a detailed analysis to inform the development of this business case. System requirements will be further developed to inform the procurement process
Development brief	RPV will developed a high-level strategy to inform the procurement process
Project charter	The *2018 Melbourne Airport Rail Link Strategic Appraisal* (2018 Strategic Appraisal) has informed the development of this business case
Principal project requirements	RPV will finalise and endorse principal project requirements for inclusion in delivery contracts
Standards and specifications	RPV will include a standards baseline and specification in the tender documentation for each works package

PDDD Element	Description of application on MAR
Concept design and design reports	RPV has finalised and accepted concept design and design reports which informed the development of the business case
Digital engineering and information requirements	RPV has completed a high-level analysis which will be further developed to inform the procurement process
Urban design framework	RPV will developed a high-level strategy to inform the procurement process
Scope development plan	RPV developed and executed a plan to develop the project scope to inform the stages of the development phase of the project
Reference design	RPV is developing a reference design to inform the procurement process
Site layout	RPV has completed a high-level analysis which will be further developed to inform the procurement process
Feasibility, planning and approvals	
Economic appraisals	RPV completed a detailed analysis to inform the development of this business case
Client and operator agreement	RPV has nominated the MAR project to V/Line, Metro Trains Melbourne (MTM) and Australian Rail Track Corporation (ARTC) under existing arrangements for managing projects. RPV will continue to engage with each of the operators throughout the delivery of the project
Investment logic map	RPV completed a detailed analysis to inform the development of this business case
Benefits logic map	RPV completed a detailed analysis to inform the development of this business case
Demand modelling	RPV completed a detailed analysis to inform the development of this business case
Approvals processes plan	RPV has developed and continues to refine a plan for approvals processes
Planning approval strategy	RPV has developed and continues to refine a strategy for planning approvals
Land acquisition requirements	RPV has completed a high-level analysis which will be further developed to inform the procurement process
Land availability study	RPV has completed a high-level analysis which will be further developed to inform the procurement process
Legal and Legislative Framework	RPV has completed a high-level framework which will be used to inform the procurement process
Approvals documentation	RPV keep records of all approval documentation
Project initiative summary	RPV completed a detailed analysis to inform the development of this business case
Project option assessment report	RPV completed a detailed analysis to inform the development of this business case
Project Management	
Constraints, risks and opportunities register	RPV maintains a register of constraints, opportunities and risks throughout the project lifecycle
Cost estimation	RPV completed a detailed analysis to inform the development of this business case. Cost estimates will be further developed to inform the procurement process
Project schedule	RPV completed a detailed analysis to inform the development of this business case. Project schedules will be further developed to inform the procurement process
Project assurance plan	RPV has developed a high-level plan which will be further developed to inform the procurement process

PDDD Element	Description of application on MAR
Governance plan	RPV has developed a high-level plan which is being refined for the delivery phase of the project
Interfaces and interdependencies	RPV has completed a high-level analysis to inform this business case which will be further developed to inform the procurement process
Resource management plan	RPV has developed a high-level plan which is being refined for the delivery phase of the project
Stakeholder matrix	RPV completed a detailed analysis to inform the development of this business case and forward planning
Asset handover plan	RPV is developing a high-level plan to inform the procurement process
Commissioning plan	RPV is developing a high-level plan to inform the procurement process
Interface and integration plan	RPV is developing a high-level plan to inform the procurement process
Benefits realisation management	DoT and RPV will develop a high-level plan to inform the procurement process
Investigations	
Air quality assessment	The Project scope is not currently expected to affect air quality
Asset audit	RPV have completed a high-level audit and will undertake further auditing to inform the procurement process
Constructability assessment	RPV has completed a high-level assessment which will be further developed to inform the procurement process
Contamination and spoil management assessment	RPV has completed a high-level assessment which will be further developed to inform the procurement process
Cultural heritage assessment	RPV has completed a high-level assessment which will be further developed to inform the procurement process
Disruption identification	RPV has completed a high-level assessment which will be further developed to inform the procurement process
Ecological assessment	RPV has completed a high-level assessment which will be further developed to inform the procurement process
Ecological audits	RPV have completed a high-level audit and will undertake further auditing to inform the procurement process
Existing conditions assessment	RPV has completed a high-level assessment which will be further developed to inform the procurement process
Existing conditions plan	RPV has developed a plan based on a high-level assessment which will be further developed to inform the procurement process
Geotechnical assessment	RPV has completed a high-level assessment which will be further developed to inform the procurement process
Hydrological, hydrogeological and hydraulic conditions	RPV has completed a high-level assessment which will be further developed to inform the procurement process
Land survey	RPV has developed a preliminary list of required spot surveys at tight design areas which will be undertaken to inform the procurement process
Land use assessment	RPV has completed a high-level assessment which will be further developed to inform the procurement process
Landscape and visual assessment	RPV has completed a high-level assessment which will be further developed to inform the procurement process
Major utility locations and diversion strategies	RPV has developed and continues to refine strategies for interfacing utilities.

PDDD Element	Description of application on MAR
Noise and vibration assessment	RPV has completed a high-level assessment which will be further developed to inform the procurement process
Water quality assessment	RPV will assess all data, investigations, calculations, and assumption to inform the procurement process
Procurement and delivery	
EOI/RFT management plan	RPV has developed a draft reference packaging and procurement solution and planned for EOI and RFT stages of the procurement process
Tender documents	RPV will finalise all tender documentation
Tender evaluation plan	RPV will develop a plan for evaluating each tender
Construction strategy	RPV has developed and continues to refine strategies for construction
Traffic management and logistics	RPV has considered traffic management and logistics in the development of the program and business case. RPV will further consider traffic management and logistics during the procurement process
Handover of design drawings and reports	RPV will provide design drawings and reports to DoT at Gate 5. RPV will include conditions and requirements in delivery contracts relating to the handover of design drawings and reports from delivery partners
Management Plans	
Project management plan	RPV has developed a high-level plan for managing the project through development phase which is now being reviewed and updated for delivery phase
Design management plan	RPV has developed a plan for managing design through development phase. RPV will require package contractors to develop plans for managing deign within their scope of work
Procurement management plan	RPV has developed a draft reference packaging and procurement solution and planned for the procurement process
Change management plan	RPV will include conditions and requirements in the delivery contracts for each work package relating to change management
Community and stakeholder engagement plan	RPV has developed a plan for managing community and stakeholder engagement through development phase. RPV will require package contractors to develop plans for managing community and stakeholder engagement within their scope of work
Construction environmental management plan	RPV will include conditions and requirements in the delivery contracts for each work package relating to environmental management during delivery
Construction management plan	RPV will include conditions and requirements in the delivery contracts for each work package relating to construction management
Cost management plan	RPV has developed a high-level plan to manage the cost throughout the delivery of the MAR Project
Fire and life safety plan	RPV will develop a high-level plan and include conditions and requirements in the delivery contracts for each work package to deliver a detailed plan relating to fire and life safety
Information management plan	RPV has developed a high-level plan and will include conditions and requirements in the delivery contracts for each work package relating to information management during delivery
Quality assurance management plan	RPV has developed a high-level plan and will include conditions and requirements in the delivery contracts for each work package relating to quality assurance management during delivery
Risk and opportunity management plan	RPV has developed a high-level plan and will include conditions and requirements in the delivery contracts for each work package relating to risk and opportunity management during delivery

PDDD Element	Description of application on MAR
Decanting management plan	RPV will develop a plan prior to Gate 4

15.3 Public interest test

An assessment was made as part of this Business Case of the extent that MAR is in the public interest. The analysis was undertaken in accordance with Partnerships Victoria guidance on how to evaluate whether a project is in the public interest.

MAR has been assessed against the evaluation criteria to determine whether suitable measures can be established to adequately protect the interests of the community and to ensure that no group is unreasonably disadvantaged by, or denied access to, MAR.

The key findings are:

- MAR is effective in achieving government objectives and delivering benefits as it is aligned with a range of Victorian and Australian government policies and objectives. In particular, and as outlined in the Chapter 3, MAR aligns with objectives around building integrated transport infrastructure to reduce congestion, improve accessibility and support Victoria as a key economic and employment centre.
- To ensure there is accountability and transparency throughout development, procurement and delivery of MAR, the community will be informed about the obligations of the government and private sector partners, which include compliance with relevant legislation and having an independent probity advisor and auditor. Key stakeholders and the community will also be engaged throughout planning, development and delivery of MAR, including throughout the approvals processes. Chapter 14 provides more detail on the stakeholder engagement and communication process for MAR.
- To ensure that no group is unreasonably disadvantaged or denied access to MAR, the Project will meet all special needs and rights of the community through adequate design, construction, maintenance and farebox premium on-top of the applicable Myki fare[156] for passengers boarding or alighting at Melbourne Airport. This includes complying with all relevant legislation, standards and codes such as the *Disability Act 2006* (Vic) and the Disability Standards for Accessible Public Transport.
- MAR will provide assurance that community health and safety will be secured throughout all stages of the Project. This will be achieved through the requirement that MAR is designed, built and maintained to meet relevant occupational health, safety, physical security, emergency risk management, data protection and ICT security requirements in full. In addition, MAR will ensure the protection of rights to privacy through adherence to a set of 'Privacy Principles'.
- Finally, during delivery of MAR, adequate safeguards will be implemented to ensure access for the public and the continued supply of service.

The assessment against the public interest test criteria concluded that, on balance, the public interest is being protected by MAR. Appendix 11 contains the detailed outcomes of the public interest test.

15.4 Lessons learnt and project insights

RPV is a mature delivery organisation and leverages extensive internal lessons learnt from its experience on projects such as the MTP and Regional Rail Revival (RRR) program. As part of the Major Transport Infrastructure Authority (MTIA), it also draws on key insights from MTIA projects such as the Level Crossing Removal Project (LXRP), Westgate Tunnel and North East Link.

In addition, the planning and delivery of MAR will draw on a wide range of national and international precedent projects that have faced similar challenges and opportunities. Analysing the lessons learnt

[156] The actual fare structure for MAR has not yet been determined. It is subject to a separate analysis and will be determined at a later point in time.

and best practice approaches from these projects and embedding them in MAR will help to deliver better project outcomes.

An internal analysis was undertaken of projects of a similar nature, employ similar features, and/or share similar risks to MAR. Table 15-3 summarises some key lessons from domestic and international infrastructure mega-projects, including:

- Metro Tunnel Project (Australia)
- Regional Rail Link (Australia)
- Level Crossing Removal Project (Australia)
- Westgate Tunnel Project (Australia)
- North East Link Project (Australia)
- Crossrail (UK)
- High Speed Rail 2 (UK).

Table 15-3: Summary of lessons learnt and project insights from precedent projects

Lessons learnt	Application to MAR
Commercial and procurement	
Undertaking wider and early market engagement helps gain an understanding of market capability and capacity, generate market interest including incentivising international participants and identify potential risks and opportunities	In progressing the packaging and procurement strategy, RPV will engage early with market participants to seek input into the proposed approach. RPV is undertaking a three-stage market engagement process including: • a briefing to all participants who registered through the Registration of Interest (ROI) in September 2018 • project-wide market sounding involving one-on-one meetings with selected participants • package-specific market sounding involving further one-on-one meetings with a selection of identified participants. A core focus of the first stage of RPV's market engagement strategy was to create awareness of the Project and the opportunities it offers local and international participants. It included proactive contact with key international market players to make them aware of the opportunity. While a selection of key international contractors have already been identified as interested parties through the MAR ROI process, the following actions may be undertaken if international interest and awareness needs to be further developed: • direct notification to Australian (or Asia/Regional) heads of operations outlining the Project or specific projects, the opportunity for the respective company and relevant details on the briefing including where to register their attendance • select advertising of the Project and the opportunities it offers in relevant international publications • using MTIA's or other existing relationships and contacts as a platform for information sharing and marketing (as needed). If required, further promotion of the Project to international participants may occur during the second and third stage of market engagement. This level of early engagement with the market enables RPV to test its proposed approach and incorporate expertise into its development and finalisation of the MAR packaging and procurement strategy at multiple stages of the project lifecycle.
Engaging the right resources with strong commercial and technical skillsets on both client and contract side	RPV (formerly the Melbourne Metro Rail Authority (MMRA)) was established in 2015 to oversee the construction of the MTP. Since its inception, RPV has developed, procured and commenced delivery on a large number of Victorian rail projects including the MTP, RRR program and Sunbury Line Upgrade in addition to MAR. Over this time, RPV has and continues to employ staff and external advisors with expert experience and skillsets in all areas required to deliver rail infrastructure projects, including commercial and technical disciplines. The MAR Project Management Plan (PMP) includes a plan for resource management to ensure MAR has sufficient resources with correct skills and experience for the Project to be successfully completed. The goals of resource management are to: • determine the best way to resource MAR • acquire and mobilise the necessary resources

Lessons learnt	Application to MAR
	• control resources throughout the Project lifecycle • demobilise resources at Project close-out. In respect of contractor resources, RPV includes comparative evaluation criteria through procurement, (both Expressions of Interest and Request for Proposal phases) for evaluation of contractors proposed teams to deliver the Project, including, but not limited to, whether the team: • comprises appropriately skilled and experienced personnel, specifically key personnel identified in management and executive positions • is suitably structured across the project lifecycle, including relative to the risks of delivery stages • is available and committed for the duration of the Project. Procurement of MAR will include the above comparative evaluation of proposed delivery teams to ensure the successful contractors have strong project teams with requisite experience.
Duration of the procurement timeframe between announcement of the preferred proponent and contract award	RPV has undertaken extensive development of the MAR procurement program, including review of precedent RPV procurement processes. During the procurement phase of MAR, RPV will ensure the duration of the period between announcement of the preferred proponent and contract award is sufficient to enable clear alignment of inter-package and intra-package interfaces and the contractual mechanism for interface management.
Contractor incentivisation to drive the right behaviours during project delivery	The current recommended procurement models for the MAR packages include alliance and collaborative contracting models. The commercial framework of an alliance includes an incentive regime with mechanisms to drive financial and non-financial performance and behaviours during delivery. Financial performance is measured via the contractor's performance against the Target Outturn Cost (TOC), and non-financial performance is measured via the contractor's performance against Key Performance Indicators (KPIs). The collaborative contract model is proposed to be a delivery model that will fall along the collaborative contracting spectrum and draws upon elements of fixed time, fixed price contracts and collaborative contracts. The risk allocation and level of collaboration, including contractor incentivisation will be tailored to address the specific risks of the package for which it is used, taking into account market feedback. Following the market engagement process, RPV will further develop the proposed approach.
Project scope	
A high degree of site investigations and detailed design can result in timely tender processes, appropriate pricing of risk, a well-defined scope of works and help minimise scope variations	At the time of this Business Case, RPV is developing the reference design for the Project. A range of technical activities are being undertaken to confirm key scope decisions, ensuring RPV is conducting the necessary work for an in-depth understanding of the project requirements. Some of activities completed to date include: • site investigations • multi-criteria scope options analysis • constructability analysis • value engineering • identification of key constraints and project requirements. • Through the progression of MAR, RPV will continue to conduct technical activities to ensure it remains an informed client.
Balance of performance-based requirements in the PS&TR	In developing the Project Scope and Technical Requirements (PS&TR) for each MAR package, RPV will assess the balance between performance-based measures and prescriptive requirements. The recommended contract model will also determine the level of design refinement and innovation requested from the market, and therefore how prescriptive the PS&TR is able to be.
Reducing the number of interfaces between packages and minimising complexity	In developing the packaging and procurement strategy, RPV considered how to minimise the number of interfaces and reduce the complexity of interface management. The analysis undertaken considered the technical activities already completed to ensure that there are appropriate and manageable interfaces.

Lessons learnt	Application to MAR
	Further work will be undertaken as part of detailed pre-procurement planning activities, ongoing market interactions and stakeholder engagement for MAR to determine the precise scope delineation between work packages, including developing strategies to mitigate interface risks.
Engineering, design and network planning	
There is a trade-off between design certainty and seeking innovation from the market	RPV will ensure to encourage and seek innovation from the market during procurement. When developing the procurement requirements for each respective package, RPV will consider how much weight should be given to design innovation. Further, RPV will ensure the reference design for each package has sufficient detail to enable innovation while providing enough technical information for the market to accurately respond to all requirements in the procurement documentation. In the delivery phase, RPV will manage the level of innovation / variations to the contractor's design to mitigate the risk of program delays and consequential impacts across other MAR packages and the network.
A long-term strategy of the network which outlines the program of works to be completed / developed and the extent of future proofing required	During the development phase of MAR, RPV has undertaken extensive due diligence and technical work to understand how MAR impacts the wider rail network, including identifying projects with key interdependencies. For the Business Case, RPV has developed a summary document that highlights the precursor, concurrent and future projects which are interdependent or interfacing with MAR. This document (provided at Appendix 3: MAR Investment context on a page) highlights the projects on the network which do, may or could have an impact on MAR. Further work is being conducted to ensure the project requirements for all other projects that impact or are impacted by MAR have been considered in the development phase. In addition, in the development phase RPV has considered future proofing in its three-stage design, such as whether an intermediate station at Keilor East should be included, not included or to future proof for, or future proofing Sunshine Station to enable MAR and the delivery of proposed future projects. See Chapter 6 for further detail on the options assessment undertaken.
Systems integration	
Sufficient development timeframes for systems packages	RPV has undertaken extensive development of the MAR procurement program, including review of precedent RPV procurement processes. The current program is for the Systems package to be procured early in the procurement program (2021), to enable systems requirements and interfaces to be included in the PS&TR of the civils packages, or at least communicated early in the civils contractors' detail design development processes. See section 15.1 for the Project schedule. RPV will seek feedback from the market during the market engagement process before finalising the procurement program.
Systems perspective for the whole project	RPV's operating structure is based on best practice for large, complex projects, with clearly defined roles and responsibilities in the MAR technical team, including for all systems scope and delivery requirements through the Project lifecycle. Further, the operational requirements of the Systems package are being developed in detail through the three-part reference design process, with the recommended signalling solution influenced by the interface with the MTP. This is due to an interface with the Sunbury line track pair and the HCMT fleet, but also to have the solution ready for Day 1 operations of MAR.
Demand, economics and benefits management	
Clear disclosure and transparency around demand forecasting model assumptions and likely error and uncertainty bands should be provided	In developing and drafting this Business Case, DoT and RPV have ensured there are clear definitions and disclosures around the assumptions applied, the context of the modelling forecasts and the different demand and economic scenarios tested. In conjunction with DoT, RPV and its advisors have developed detailed assumptions and context for the economic appraisal of MAR. The key inputs and assumptions to the economic modelling include: • preliminary cost estimates • economic evaluation parameters and inputs. See Chapter 9 for further detail on the key inputs and assumptions included in the MAR economic appraisal.

Lessons learnt	Application to MAR
Projects should align with best practice guidance on benefits management, which includes establishing objective baseline measures and targets with progressive monitoring and evaluation throughout the project to facilitate benefits realisation	A preliminary Benefits Management Plan (BMP) was developed, in accordance with the DTF Guidelines, which sets out the overall approach to managing the range of potential benefits achieved through delivery of MAR. The BMP also forms the basis of the Investment and Benefits Realisation Plan. The benefits and KPIs from the BMP are the primary input used to develop detailed output specifications for MAR across a number of future configuration states (2031 through to 2051). These output specifications provide a statement of requirements that the future operation of MAR will need to meet for benefits to be realised. Detailed operating plans that drive delivery of these benefits will continue to be refined as the technical solution is finalised. Further, the KPIs in the BMP are measured at a target date after completion of the Project to ensure the benefits outlined in the BMP and Business Case are monitored and achieved.
A network plan that outlines the current program of works and operational requirements	The economic appraisal methodology incorporates the current program of works on the rail network and the operational requirements (where available) for each project. The framework adopted for the economic appraisal quantitatively and qualitatively assessed: • land use projections for population and employment growth • future transport network projects, including arterial road upgrades, rail service upgrades, motorway improvements, tram and bus upgrades • MAR with and without the SRL North connection to Melbourne Airport in 2051. See Chapter 9 for further detail on the key inputs and assumptions included in the MAR economic appraisal.
Stakeholder engagement and communications	
Early, open and transparent communication and stakeholder engagement	Stakeholder engagement and community consultation for MAR began in 2018. Since then, a number of stakeholders in relation to MAR have been engaged including: • local councils • community groups • local residents • business owners and utility operators. The engagement conducted to date has established that stakeholders understand the Project offers a wide range of potential benefits, such as improved access and journeys to Melbourne Airport, positive environmental outcomes and economic opportunities. While an extensive amount of early engagement with a range of stakeholders has already occurred, DoT and RPV are currently progressing engagement with Australian Government and APAM and other key stakeholders.
Strategic understanding early in the development phase, including issues and implications for the relevant stakeholder	RPV has ensured that key team members have a strong strategic understanding of the Project before engaging with stakeholders on its scope and details. Stakeholder identification and analysis is a core part of developing an engagement approach. MAR has multiple stakeholders all with varying needs and requirements, therefore tailored engagement approaches will be developed so that effective engagement is undertaken throughout the life of the Project. See Chapter 14 for further detail on the stakeholder engagement and communications strategy.
Upfront management of stakeholder expectations	A wide range of communication and engagement tools and channels will support the different phases of engagement. Using a variety of tools and channels will allow communications and engagement to be tailored based on audience and approach. Tools and channels help ensure information and updates about the Project are disseminated regularly and feedback from the community and stakeholders is received and addressed promptly. See Chapter 14 for further detail on the stakeholder engagement and communications strategy.
Implementation	
Clearly defined roles, responsibilities, accountability /	In the development phase, RPV has developed a governance framework that is structured to enable transparent decision making, clearly defined accountability, roles and responsibilities, and stakeholder interests to be adequately accounted for in

Lessons learnt	Application to MAR
ownership and governance structures in place when managing packages	development and delivery. The RPV operating structure is based on best practice for large, complex projects, programs and portfolios that operate across the complete project lifecycle. In addition, RPV has further developed the IML Framework that identifies the key deliverables for each project phase. The deliverables are grouped in project management functional areas and separated into tasks, which are set out in the Project Management Framework. In order to complete these deliverables, RPV has established an appropriate team structure reflective of the Project's packaging structure and includes a blended work force of RPV employees and consultants.
Integrated program driven by the Client, with clear definition of interfaces between packages	RPV is developing an integrated program for delivery of MAR. During procurement and alignment with the preferred contractors, RPV will work with each contractor to incorporate its proposed program. Further, through its detailed due diligence and project development, RPV has a clear definition and understanding of inter-package interfaces, including allowances with the Project cost estimate to effectively manage interfaces through delivery.
Periodic assurance should occur throughout the project to ensure that the timelines of the programme of works is feasible	RPV has established an internal project governance structure so that decisions are made in a clear and logical way by people and forums with the required authority levels. At key points of the IML, reviews are undertaken by various stakeholders including RPV, DoT and DTF. Exit from each project phase into the next is subject to approval from the relevant assurance body but may also require governance approval. Once the Project moves into delivery, each package contractor is required to adhere to specified assurance stage gates, including the Franchisee's (MTM) stage gate process. In the Alliance contracts, the MTM stage gates are also subject to KPIs, with performance risk and reward values attributed to the outcome. The contractor is therefore financially incentivised to meet its minimum assurance expectations throughout delivery.

The consideration of insights and lessons learnt from other projects will be an ongoing process. RPV will continue to review and draw on lessons learnt from those projects and additional projects as relevant as MAR proceeds into procurement, delivery and operations.

16 Management

16. Management

Chapter summary

- The successful implementation of MAR will require effective project management, change management and risk management, supported by clear governance arrangements and a robust benefits realisation framework.
- The governance framework for MAR is structured to enable transparent decision-making, clearly defined accountability, roles and responsibilities, and stakeholder interests to be adequately accounted for in project development and delivery.
- RPV is the Victorian Government body overseeing the delivery of MAR. This includes planning and development of the Project reference design, site investigations, stakeholder engagement, planning approvals and procurement, through to construction delivery and project commissioning.
- As the Project Sponsor for MAR, DoT will fulfil the organisation's legislative obligations to plan, coordinate, provide, operate and maintain a safe, punctual, reliable and clean public transport system consistent with the vision statement and the transport system objectives of the *Transport Integration Act 2010 (Vic*).
- RPV will apply its existing PMF to manage project delivery, and leverage existing change management procedures with the Rail Transport Operators (RTOs) and Rail Infrastructure Managers (RIMs) to manage the capability uplift to areas including staff, training and facilities that results from the delivered infrastructure.
- RPV is applying the PDDD Guidelines to the Project as appropriate, with recognition of the broad alignment to the RPV IML, which describes the activities and deliverables expected at each phase of a major rail project to support successful delivery of the Project.
- As the Project transitions through procurement and into the delivery phase, a Change Management Strategy will be developed to define the organisational change management procedures required to successfully integrate MAR into the existing network and effectively deliver the Project benefits.
- A risk management framework will continue to apply to MAR, which includes maintaining a MAR risk register. The risk register will be regularly monitored and updated as MAR proceeds through the approvals process, and during design, construction and implementation of the Project.

16.1 Governance framework

16.1.1 Key governance principles

The governance arrangements for MAR have been established using the foundation principles for public sector governance and project governance as they relate to:

- developing and delivering each project using best practices across relevant disciplines
- clearly separating infrastructure planning and project approval from project delivery
- making project delivery clearly accountable to government
- providing robust oversight and stewardship of the Project.

16.1.2 Overarching strategy

Project governance sets the basis for project success by enabling transparent decision-making, clearly defining roles and responsibilities, and ensuring that stakeholder interests are adequately accounted for in the development and delivery of MAR.

DoT is the Project Sponsor for MAR. DoT is accountable for fulfilling the organisation's legislative obligations to plan, coordinate, provide, operate and maintain a safe, punctual, reliable and clean public transport system consistent with the vision statement and the transport system objectives of the *Transport Integration Act 2010* (Vic).

RPV will work closely with DoT through its project development and delivery authority (MTIA) in relation to MAR. DoT and RPV use an integrated approach throughout the project lifecycle, which involves:

- RPV supporting DoT in planning and development of the Project solution, with DoT retaining accountability for scope decisions, benefits realisation and the final Business Case
- DoT supporting RPV in procurement and delivery of the Project scope.

The Australian Government is also a key stakeholder and decision-maker, as it is leasing the Airport land to APAM and is providing $5 billion in funding for MAR. It has been involved in the development of MAR and will continue to be involved in the next phase, including as a member of the MAR Steering Committee.

Success will rely on close cooperation between DoT, RPV and the Australian Government to plan and implement the proposed Project scope. The proposed governance framework separates responsibility for day-to-day management activities from the primary decision-making bodies.

The governance structure for the development and procurement and delivery phases of MAR are described in further detail in section 16.1.3.

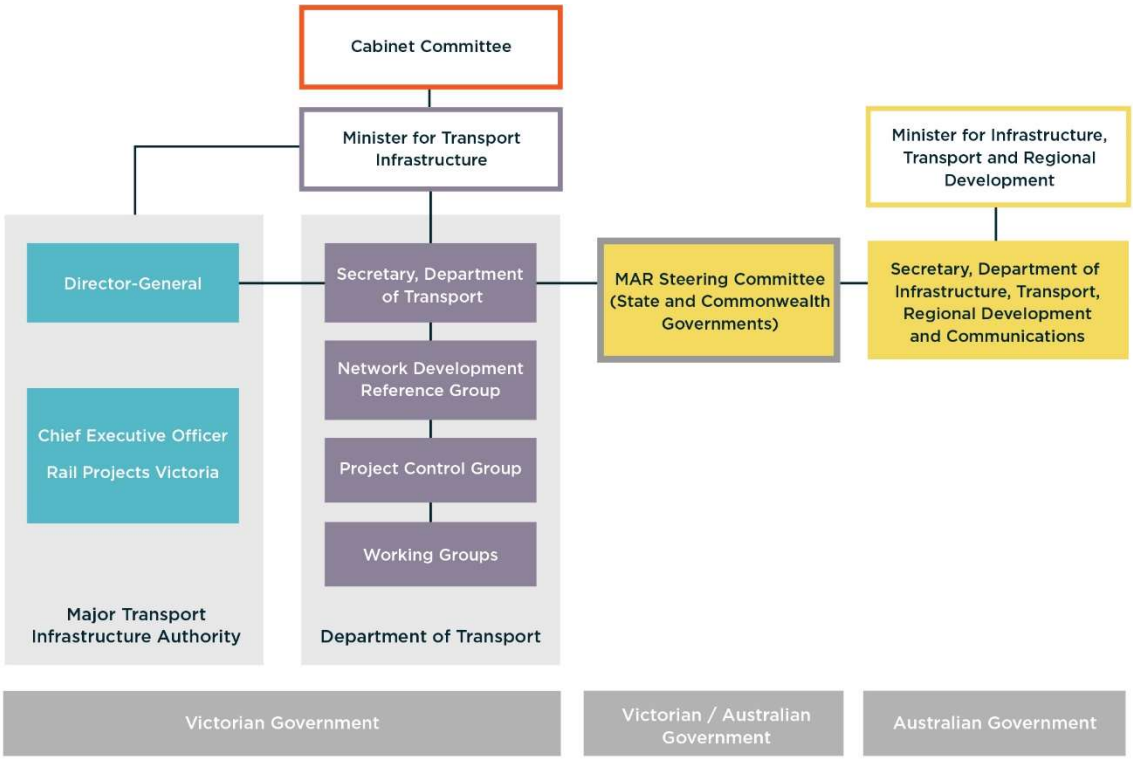
16.1.3 Governance structure

The governance structure for the MAR development phase is shown in Figure 16-1. The governance structure for the procurement and delivery phase is shown in Figure 16-2.

During the procurement and delivery phase, governance will be focused on driving performance against key delivery metrics including project benefits, risk, program and cost to deliver the scope approved by the Victorian Government.

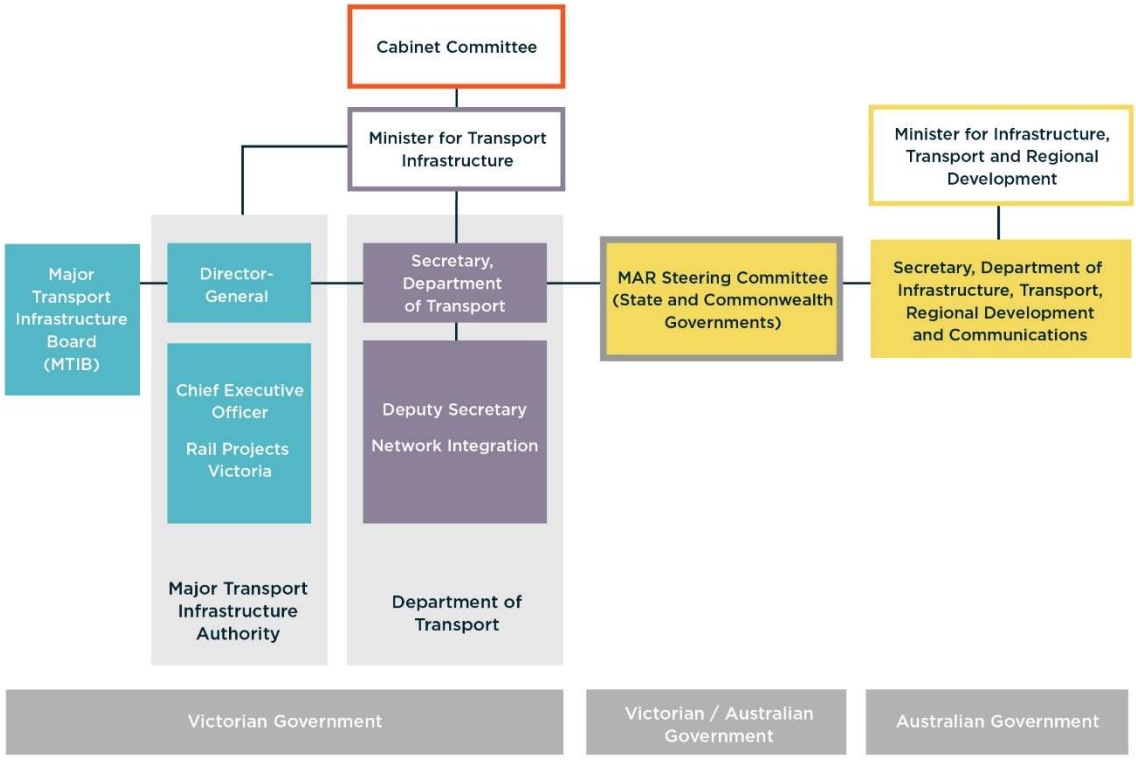
The roles and responsibilities of key governance groups are outlined in section 16.1.4.

Figure 16-1: MAR governance structure – development phase



The governance groups outlined in Figure 16-2 will be supported by various working groups and reference groups (for example, to verify network development and configuration) that provide specialist advice and peer review, as well as dedicated project teams formed specifically to deliver MAR. Further, during delivery, the governance structure of each procurement model recommended in Chapter 12 will enable RPV to work collaboratively with the delivery partners and key stakeholders, retain project oversight and make best for project decisions.

Figure 16-2: MAR governance structure – procurement and delivery phase



16.1.4 Key governance groups

Table 16-1 summarises the roles and responsibilities of the key governance groups for MAR.

Table 16-1: Key governance groups

Group	Roles and responsibilities
Project Control Group	The Project Control Group (PCG) is the key governance body during the development phase, responsible for approving the project scope and Business Case. The PCG includes senior members of DoT, RPV, DTF and Department of Premier and Cabinet (DPC) with key roles in developing the Project, and technical experts as required. The composition of the PCG was designed to achieve close coordination within DoT and between DoT and other agencies.
MAR Steering Committee	A joint MAR Steering Committee with members from the Victorian and Australian governments was established in March 2019. The Steering Committee's role is to oversee the Project, including the development of this Business Case and procurement activities, with oversight by Ministers from the Victorian and Australian governments. The Steering Committee includes representatives from the Department of Infrastructure, Transport, Regional Development and Communications (DITRDC), DoT, RPV, DTF and the Infrastructure and Project Financing Agency (IPFA). Its key responsibilities include: • agreeing the scope, timing, procurement strategy and budgets for the Business Case • providing input into, and agreeing, the deliverables, key milestones and work program associated with the Business Case • guiding working groups, project teams and consultants to achieve required outcomes • reviewing and monitoring project progress and resolving issues or outstanding project matters.

Group	Roles and responsibilities
Infrastructure Coordination Committee	The Infrastructure Coordination Committee (ICC), chaired by the Secretary to DPC, and includes representatives from DTF, DoT, DELWP, the Department of Jobs, Precincts and Regions (DJPR) and MTIA. The ICC provides an opportunity to discuss and inform Heads of Departments of project-related matters to be considered by the Government for decision.
Network Development Reference Group	The Network Development Reference Group (NDRG) is chaired by the DoT Executive Director, Project Integration and includes representatives from DoT, RPV, LXRP, V/Line, MTM and VicTrack. The objectives of the NDRG are to: • provide Major Transport Project authorities with input and guidance to the development of scope, costs, program and risk registers • provide progressive input on key assumptions, high level technical and scope requirements as well as operational outcomes to build toward future Network Configuration States. Major scope decisions in the development phase, and change management through the delivery phase will consult the NDRG. The scope of the NDRG will: • provide a forum for the key scoping and operational outcome assumptions to be proposed as a basis for the Project's inputs to the scope, design, project development and / or business cases that are best for network outcomes and the State • provide guidance on key strategic decisions to avoid any unnecessary and redundant design and scoping work by the Project and its advisors • ensure that key stakeholders are progressively informed and involved to expedite acceptance of the project scope and operational outcomes • ensure that key risks and issues are captured and progressively managed • collaboratively develop DoT's key requirements to allow the Project requirements to be produced, enabling the development phase to progress in parallel with the Project requirements development • enable, support and drive a timely decision-making process • act strategically, taking into consideration the broader aspects of scope, budget, delivery strategy whole of life cost, operational outcomes, reliability as well as public and customer factors • report to the Secretary, DoT • keep other collaborative forums informed of proceedings as necessary. The NDRG will not make final decisions on scope, operational outcomes and requirements. These are made by DoT as Network Planner and Project Sponsor (Client) and will be endorsed by the: • Major Projects Steering Committee (MPSC) • Secretary, DoT.
Major Projects Steering Committee	The MPSC is the key forum for making decisions about the Project before it is recommended to the Victorian Government for funding and delivery. The MPSC is chaired by the Head, DoT, and includes representation from DoT portfolio agencies, as well as DPC and DTF. The purpose of the MPSC is to ensure that projects are developed in accordance with the strategic directions defined by DoT. MPSC has oversight of the Project during development, in particular the development and finalisation of the Business Case. During delivery, if required, consideration of major change events in relation to the project scope required to deliver project benefits and / or additional budget requirement will be escalated through MPSC. The MPSC will receive high-level progress briefings and reports throughout delivery of the Project.
Major Transport Infrastructure Board (during delivery)	The key governance group during delivery is the Major Transport Infrastructure Board (MTIB). The purpose of MTIB is to ensure that project delivery accords with the approved Business Case and technical requirements, is cost effective, promotes sustainability, enhances community amenity and is consistent with broader transport policy objective.

Group	Roles and responsibilities
	Further, MTIB is the key governance group for major transport projects across the network. As such, will work to ensure that effective governance of major construction activities and projects that are critical and complementary to MAR are coordinated throughout delivery of the Project, such as the HCMT Project.

16.2 Project management strategy

16.2.1 Overview

DoT is ultimately accountable for MAR and ensuring the benefits of the Project are delivered. RPV supports DoT by managing the development and delivery of MAR. This includes planning and development of the reference design, site investigations, stakeholder engagement, planning approvals and procurement, through to construction delivery and commissioning. RPV has significant experience in managing large, complex rail infrastructure projects such as the MTP and RRR program.

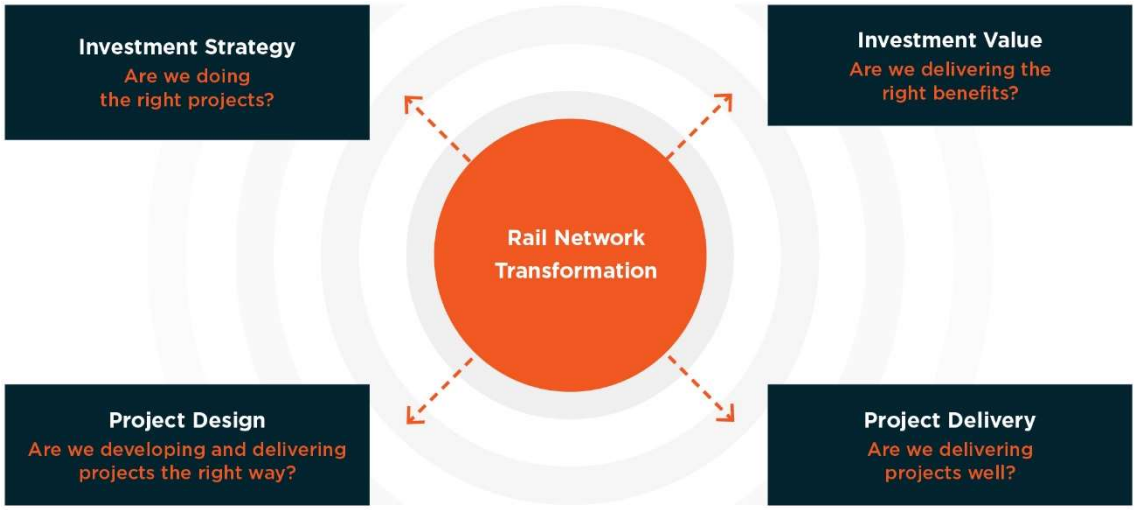
The RPV operating structure is based on best practice for large, complex projects, programs and portfolios that operate across the complete project lifecycle. The operating structure is scalable, responsive, efficient and sustainable to meet the growing portfolio of rail projects in Victoria. This structure allows for:

- an informed development and delivery group aligned to DoT strategy and planning
- a scalable team of specialists and resources necessary to successfully develop and deliver complex rail projects
- total systems integration capability of high risk and technically complex rail projects
- safe and resilient railways to be delivered into operational service
- best international practices in design, operation and maintenance of railways.

RPV has a *Development and Delivery Strategy* that provides an overview to the operating frameworks and core processes that provide a roadmap for how RPV operates, delivers value and matures as an organisation, including the RPV PMF.

The PMF responds to the key governance and assurance challenges highlighted in Figure 16-3 and is related to the roles and responsibilities of projects under DoT.

Figure 16-3: RPV Project Management Framework



The key areas of the PMF include:

- development and delivery management (as per the IML discussed in section 15.2)
- project governance and assurance
- project reporting and performance.

16.2.2 Development and delivery management

The RPV IML aligns to the DTF Investment Lifecycle Gateway review process and is specifically targeted at RPV deliverables and activities, but also considers those of other agencies, required to deliver a project. It guides the sequence of development stages, activities undertaken, deliverables produced and assurance reviews.

The IML identifies the key deliverables for each Project phase. The deliverables are grouped in project management functional areas and separated into tasks which are presented in Roadmaps in the PMF. In order to complete these deliverables, RPV has established an appropriate team structure which supports the project packaging structure and includes a blended work force of RPV employees and consultants. This enables the RPV project team to ramp up and down quickly, as well as engage specialist external skills to assist with project development and delivery management as required.

As per section 15.2, the new PDDD Guidelines have additionally been applied to MAR.

16.2.3 Project governance and assurance

RPV has established an internal project governance structure that ensures decisions are made in a clear and logical way by people and forums with the required authority levels. This structure is aligned to the DTF Investment Lifecycle Gateway process. At various stages during project development and delivery formal external (outside of RPV) approval or decisions are required. RPV determines the relevant approval body by assessing several factors including project value, complexity, statutory powers, delegations and various decisions made early in the planning and development stages of the project. As MAR is jointly funded by the Victorian and Australian governments, additional formal approval and decisions have been included as required.

At key points of the IML, reviews are undertaken by various stakeholders including RPV, DoT and DTF. As MAR is jointly funded by the Australian Government, it is considered a key stakeholder in this respect with project assurance undertaken by Infrastructure Australia, an independent statutory body that provides advice to the Australian Government under the *Infrastructure Australia Act 2008* (Cth). Exit from each project phase into the next is subject to approval from the relevant assurance body but may also require governance approval.

During planning and development stages, assurance reviews assess project work to ensure investment viability, value for money, deliverability and ensure delivery risk is mitigated and reduced.

During delivery, reviews provide assurance the delivery partners are meeting requirements and that, the system is safe, integrates and ready for revenue service. Table 16-2 details the key assurance processes and reviews.

Table 16-2: Summary of key assurance processes and reviews

Entity	Stage gate reviews
DoT	DoT undertakes five reviews from development of the Project requirements through to acceptance into revenue service. Ensuring that project objectives are delivered, while ensuring significant change to the network configuration baseline are managed in a disciplines and systematic way to control risks.
DTF	DTF undertakes six Gate reviews at key decision points in the project lifecycle. The process involves using an independent external reviewer team to provide timely and confidential advice about progress and likelihood of delivery success.

Entity	Stage gate reviews
RPV	RPV undertakes eight reviews from concept design to acceptance into revenue service. Conducted to provide progressive assessment and risk evaluation against various requirements including technical and safety, appropriate to the project phase.
Infrastructure Australia	Infrastructure Australia undertakes a five-stage review from problem identification and prioritisation to post-project completion. The review process provides a structured and objective approach to making infrastructure decisions and facilitates evidence based development of infrastructure projects.

16.2.4 Project reporting and performance

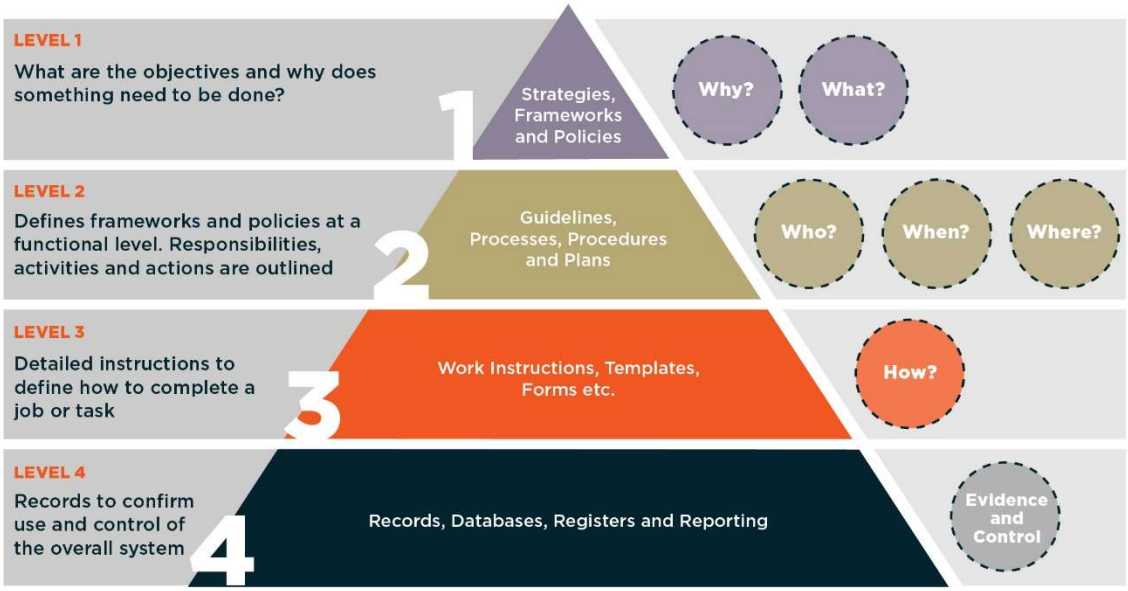
RPV aims to implement best practice reporting and performance systems to support and complement its existing governance and reporting structures. An overview of these systems is outlined below:

- **RPV Performance Management System** – aims to manage and improve performance at several different organisational levels, using a structured reporting hierarchy and a consistent set of reports and dashboards.
- **Data and Analytics System** – provides a 'single source of truth' and transforms source system data into information that is communicated simply, visually and drives actionable insights.

16.2.5 Project management plan

The PMF requires a level of documentation to support its execution, operation and maintenance. Figure 16-4 sets out the document hierarchy.

Figure 16-4: PMF documentation hierarchy



The application of the PMF for each RPV project is documented in a PMP. PMPs are live documents that are updated when projects move from one stage to the next. The MAR PMP is currently in draft format and includes the key processes and management systems for activities up to DTF Gate 3 review (Readiness for market). At the DTF Gate 4 review (Tender decision), the PMP will be updated to reflect RPV readiness for the tender decision, award and delivery phases of each package. Beyond DTF Gate 4 review, the successful delivery partners for each work package will submit a PMP for their respective works. In readiness for this point, the MAR PMP will be updated to outline RPV's delivery oversight responsibilities.

The MAR PMP includes reference to the wider guidelines, processes, procedures and plans, as well as providing an overview of key milestones. As per the PMP, the MAR project team has developed a MAR internal program, which is used to manage and track all internal RPV activities and deliverables to ensure they are delivered on time. The program includes the activity dependencies and is updated fortnightly by the MAR planning team in collaboration with the different functional leads and subject matter experts. When reviewing the program fortnightly, the MAR team analyse all dependencies and associated constraints to ensure the program is achievable.

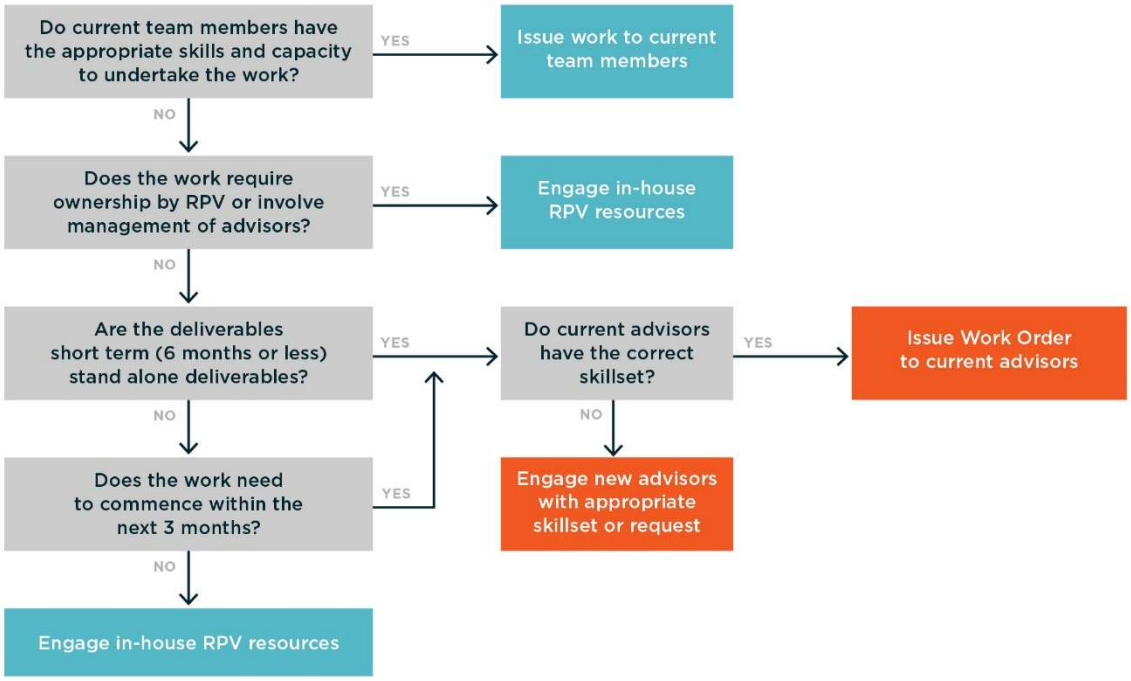
16.2.6 Resource management strategy

Each project role with resource management responsibilities (identified and listed in the MAR PMP), will undertake a six-monthly resource estimating process as shown in Figure 16-5.

Figure 16-5: Resource estimating process

After identifying new resource requirements, the responsible person determines if in-house (RPV employee) or external (third party) resources should be engaged, this typically follows a best for project principal. The decision tree in Figure 16-6 should be followed to assist in determining what type of resource should be engaged.

Figure 16-6: MAR resource selection decision tree



References to in-house RPV resources could include resources transitioning of other projects managed by RPV, such as the MTP or RRR program.

16.3 Change management

16.3.1 Scope

The scope of change to organisations and processes required to manage MAR and effectively deliver the benefits is significant. Key areas of change include:

- **Services** – major timetable and service changes resulting from the introduction of the MAR service to operate through the MTP corridor to Sunshine Station and to arrange for connecting services from other modes to provide passengers with a multi-modal journey to Melbourne Airport.
- **Fleet** – rolling stock management changes to facilitate the movement and maintenance of additional rolling stock required for the MAR service.
- **Staff** – increases in drivers, maintainers, controllers, and operators to drive, maintain, control and operate new rolling stock, signals, and associated infrastructure for the MAR service, including, any changes to industrial relations.
- **Equipment and facilities** – additional workstations, equipment, and space required in operational centres such as Metrol and the Sunshine Satellite Signal Control centre for the increase in controllers and operators. Additional equipment and facilities for the increase in drivers and maintainers, including training facilities.
- **Training** – additional and new training for the new services, new / additional rolling stock and new equipment.
- **Passenger interface** – changes to passenger information on the public transport network maps, services and stops. Introduction of new policies and rules regarding baggage. Consideration on increase in capacity on related customer platforms such as call centres, help desks, websites and mobile phone applications. In addition, changes to wayfinding at Melbourne Airport and key interchange stations.
- **Processes** – update of operational and maintenance processes and procedures for new fleet, services, training, equipment, and facilities.
- **Systems** – update of systems for new stations, rolling stock, journey times, rail lines, equipment and people.

16.3.2 Change Management Strategy – MAR operator

As the MAR operator, currently MTM, will experience the most changes from the Project. The proposed change management strategy for MTM is outlined below.

It is important to note the Franchise Agreement between DoT and MTM is for a 7-year period, ending in November 2024, with an option to extend to November 2027. Therefore, it is not confirmed that MTM will be the operator for the metropolitan train network, including MAR, by the time MAR is operational.

16.3.2.1 Preliminary operating requirements

The Franchise Agreement between DoT and MTM is of a modular structure. The Projects Module includes obligations on MTM to contribute to the development of the Project requirements by providing to DoT the following preliminary operating requirements:

- the operational needs required to fulfil the Project Objectives
- the maintenance needs required to fulfil the Project Objectives

- any operational constraints that relate to safety or the effective operation of the existing network to be captured in operational procedures or manuals.

The Project has captured MTM's preliminary operating requirements in the Project requirements, which is managed under configuration control to ensure requirements cannot be removed without the required procedures and approvals. Additionally, preliminary operating requirements will be included in a Project Operating Plan, also to be kept under configuration control. The Project Operating Plan is informed by rail operations modelling to test the viability and reliability of the service levels and operating requirements.

16.3.2.2 Final operating requirements

Similar to the above, MTM has obligations to contribute to the development of the System Requirement Specification (SRS) for the Project by attending workshops and providing to DoT the following final operating requirements:

- the safety requirements developed from a comprehensive 'Preliminary Hazard Analysis'
- the operational requirements that define the interaction of operations and maintenance in the final system
- the human factors requirements
- the asset management, maintenance and training requirements derived from MTM's organisational strategies
- definition and description of the different states and modes of the system
- a list of published and approved standards covering operations, maintenance and assets
- any other functional, technical, performance or rolling stock requirements of standards that MTM (acting as a prudent, efficient and experienced railway operator and infrastructure manager) considers relevant.

The Project will capture MTM's final operating requirements in a number of Technical Requirements Documents kept under configuration control to ensure requirements cannot be removed without the required procedures and approvals. These requirements will then be included in the PS&TRs for the appropriate work packages.

16.3.2.3 Implementation and Final Impact Statement

To support a DoT funding submission for operational costs, MTM will submit a Preliminary Impact Statement and a Final Impact Statement. These documents will include the operational, maintenance and staffing impacts of MAR on MTM's business.

16.3.3 Change Management Strategy – Others

MAR will also impact other organisations such as:

- the operator of Southern Cross Station for wayfinding signage and passenger information
- Melbourne Airport and key interchanges for wayfinding signage and passenger information
- ARTC for relocation of tracks and equipment
- V/Line for relocation of tracks and equipment, update of passenger information
- DoT for update to journey planner applications, website, brochures, and update to ticketing systems and network maps, as well as processing changes to the Franchise Agreement resulting from the operation of MAR.

Management of changes from the Project will occur according to each organisation's procedures. MAR will incorporate each organisation's requirements in the Project requirements, SRS, PS&TRs and the Project Operating Plan as relevant.

Further, change management activities in relation to stakeholders including public transport users, the broader community and council consultation will be undertaken in accordance with the

stakeholder engagement and communications strategy as discussed in Chapter 14. The communications and engagement strategy also captures key changes for adjacent residents and businesses during and after construction, such as impacts on local roads, access, and shared user paths.

16.4 Performance measures and benefits realisation

As noted in Chapter 3, a preliminary BMP was developed for this Business Case. The BMP describes the benefits that will result from addressing the two key problems identified in Chapter 2 and outlines the KPIs and measures that will be used to track if the benefits of MAR are delivered.

The BMP also forms the basis of the Investment and Benefits Realisation Plan. The benefits and KPIs from the BMP are the primary input used to develop detailed output specifications for MAR across a number of future configuration states (2031 through to 2051). These output specifications provide a statement of requirements the future operation of MAR will need to meet for benefits to be realised.

Detailed operating plans that drive delivery of these benefits will continue to be refined as the technical solution is finalised.

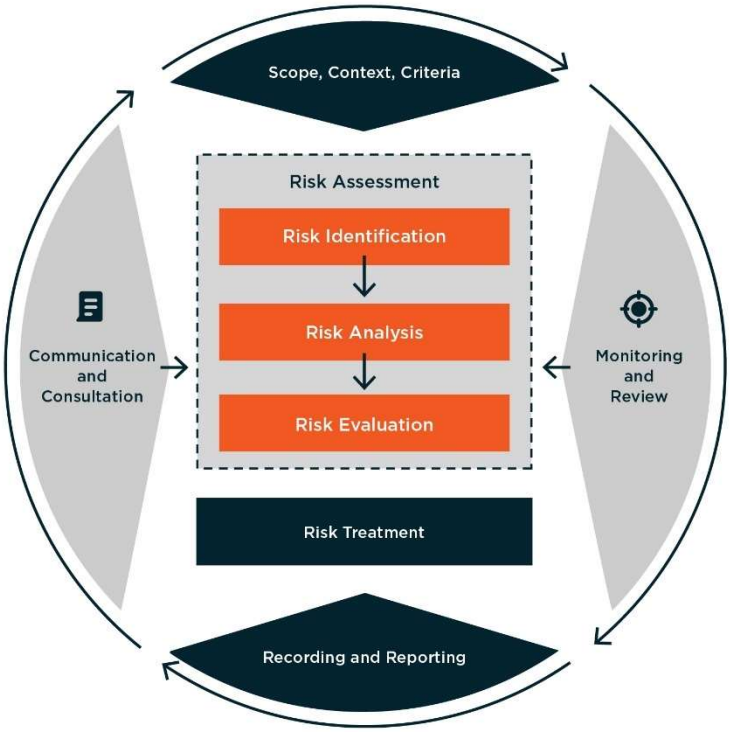
16.5 Risk management in RPV

RPV has an established risk and opportunity management framework that is directly applicable to MAR and includes:

- Risks, Issues and Opportunities Management Plan
- Risk and Opportunity Management Procedure
- Risk Allocation Management Procedure
- Issues Management Procedure.

The RPV risk management framework complies with *AS ISO 31000:2018 Risk Management* (the Standard) and is illustrated in Figure 16-7. In accordance with the RPV risk management framework, a risk register is developed and maintained for all projects and for RPV functional areas. The risk register for MAR will be a live document (database) that continues to be updated and refined throughout the life of the Project.

Figure 16-7: Risk assessment and management process



16.5.1 Risk management framework

Key features of the RPV risk management framework are:

- ownership and treatment actions are assigned to all risk treatments in the risk register (particularly for those risks that require urgent and immediate action)
- likelihood and consequence are assigned to the identified risks (current risks and post mitigated) to prioritise and manage those key risks with a higher rating
- an open or closed status is assigned to each risk – each risk is listed as closed (but not deleted) when completely mitigated by some form of treatment or where they are no longer applicable at a Project milestone
- all risks and opportunities across the organisation are regularly reviewed by their respective owners to ensure ongoing progress of the management of risks and to ensure updated information is included in monthly reporting.

16.5.2 Delivery and reporting

The key elements of the risk management framework address the requirements of the Standard as illustrated in Figure 16-7 above.

These elements will continue to be systematically applied throughout the life of MAR as follows:

- **Risk management planning** – continuous awareness of risks and evolving the risk planning approach as MAR progresses.
- **Risk identification** – determining what, when, where and how the risks occur.
- **Risk analysis** – evaluating and estimating possible impacts.
- **Risk evaluation** – prioritising risks and reviewing the effectiveness of existing controls / mitigation actions.
- **Risk treatment** – implementing identified mitigation actions.

- **Communication and consultation** – involving stakeholders in the risk management process.
- **Monitoring, review and reporting** – providing visibility of risks and measuring effectiveness of treatments.

Probabilistic analysis will be conducted progressively through the development and procurement of MAR. During delivery, a review of forecast risk and contingency allocation will be conducted monthly, based on the updated likelihood and risk allowance, assigned to specific risks and reviewed with the project team.

DoT requires RPV to report and attest annually on risk and opportunity management compliance with the *Victorian Government Risk Management Framework*. Additional regular reporting will include:

- RPV reporting monthly to MTIB
- RPV reporting quarterly to the MTIA Program Audit, Risk and Integrity Committee.

16.6 Readiness and next steps

The key steps required to transition to the next phase for MAR are:

- further appointment of staff and resources as necessary to manage the Project in its various packages
- further work to confirm the complete funding requirements for MAR
- ongoing community and stakeholder engagement
- technical investigations, including further survey and geotechnical work, environmental assessments, utilities investigation and relocation / protection strategies
- progression of reference designs capturing substantial value engineering tasks
- further rail operations modelling (as required)
- obtaining approvals for MAR relating to planning, environment and heritage (as relevant to State and Commonwealth land)
- land acquisition
- development of procurement and contractual documentation to release to market
- procurement of the key MAR work packages.

The specific activities to undertake and documents to prepare in the next stage of MAR are identified in the PDDD elements map in section 15.2.

16.7 Exit strategy

Should priorities change prior to contract award, the Victorian Government reserves the right to exit the Project at any time, noting a range of project development and reference design costs will have been incurred. However, these outputs/assets can be retained for future use.

Should priorities change after commencement of the delivery phase, an exit from the Project would incur significantly higher costs depending on how far progressed the contractors are at the time of exit.

In any case where the Victorian Government chooses to exit the Project, it risks reputational damage by not meeting public commitments.

Glossary

Glossary

Term	Definition
ABS	Australian Bureau of Statistics
AC	Alternating Current
Airport Land	Commonwealth-owned land at Melbourne Airport
AM peak	AM peak (for the purposes of economic and transport modelling) is between 7am and 9am
APAM	Australia Pacific Airports (Melbourne) Pty Ltd, being the owner and operator of Melbourne Airport
ARTC	Australian Rail Track Corporation
Asset Renewal Costs	Asset renewals are the costs associated with capital maintenance (major maintenance, refurbishment or replacement) of the project infrastructure over the operating period
ARO	Accredited Rail Operator
ATAP	Australian Transport Assessment and Planning
A/V	Audio Visual
BCR	Benefit Cost Ratio
Benefits	As defined in Chapter 3 and 8
BIM	Building Information Modelling
BMP	Benefits Management Plan
Buffer time	Extra time individuals take to mitigate meeting peak hour traffic
CBA	Cost Benefit Analysis
CBD	Central Business District of Melbourne which is bordered by Spencer Street to the west, La Trobe Street to the north, Spring Street to the east and Flinders Street to the south
CBTC	Communication Based Train Control
CHMPs	Cultural Heritage Management Plans
CityLink	A network of tollways in Melbourne that links the CBD, Port of Melbourne and Melbourne Airport in Tullamarine
Cth	Commonwealth
CYP	Cross Yarra Partnership
Day 1	The first day of operations for Melbourne Airport Rail
D&C	Design and Construct
DC	Direct Current
DDA	*Disability Discrimination Act 1992* (Cth)
DDO	Design and Development Overlay
DE Guideline	Digital Engineering Data Package Completion Guideline
DELWP	Department of Environment, Land, Water and Planning
DoT	Department of Transport
DPC	Department of Premier and Cabinet
DTF	Department of Treasury and Finance
DITRDC	Department of Infrastructure, Transport, Regional Development and Communications
EE Act	*Environmental Effects Act 1978* (Vic)

Term	Definition
EES	Environmental Effects Statement
EIRR	Economic Internal Rate of Return
EMF	Environmental Management Framework
EOI	Expression of Interest
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
Frequency	Must enable a service frequency of no less than 6 HCMT-7s per hour in each direction.
FTE	Full-time Equivalent
FY	Financial year
GIS	Geographic Information Systems
HCMT	High Capacity Metro Train
HCMT-7	High Capacity Metro Train with 7 car design
HCS	High Capacity Signalling
Hub and spoke model	Operating model where flights from typically smaller destinations are routed through a hub airport usually within a major city. This enables airlines to consolidate traffic flows and benefit from economies of scale.
HVHR	High Value High Risk
IA	Infrastructure Australia
ICC	Infrastructure Coordination Committee
ILM	Investment Logic Map
IML	Investment Management Lifecycle
IMS	Investment Management Standard
Interpeak	Interpeak (for the purposes of economic and transport modelling) is between 9am and 3pm
Infrastructure Investment Program	A Commonwealth Government investment of over $100 billion over 10 years for transport infrastructure across Australia
IP	Intellectual Property
IPFA	Infrastructure and Project Financing Agency
IPL	Infrastructure Priority List
Integrated heavy rail link	A rail solution that leverages existing infrastructure and expands the coverage of airport connections via integration with other metropolitan and regional rail lines
ITC	Incentivised Target Cost
JUHI	Joint User Hydrant Installation
km	Kilometres
KPI	Key Performance Indicator
kV	Kilovolts
LGA	Local Government Area
LXRP	Level Crossing Removal Project
m	metres
m^2	Metres squared

Term	Definition
M80	Western Ring Road, a major freeway connecting Victoria's northern and western suburbs to other urban and rural freeways
Master Plan	Melbourne Airport Master Plan (2018)
MAR	Melbourne Airport Rail
MDP	Major Development Plan
MLP	Market Led Proposal
mm	Millimetre
MNES	Matters of national environmental significance
Monash Freeway	A major freeway in Melbourne linking the CBD to the south-eastern suburbs and beyond to the Gippsland region
MPSC	Major Projects Steering Committee
MTIA	Major Transport Infrastructure Authority
MTIB	Major Transport Infrastructure Board
MTM	Metro Trains Melbourne
MTP	Metro Tunnel Project will connect Melbourne's western tail network directly to the Dandenong corridor with five new underground stations (Parkville, North Melbourne, State Library, Town Hall and ANZAC) which is set to be complete in 2025
National Rail Program	A major long term commitment by the Commonwealth Government to invest in passenger rail networks across Australia
NEIC	National Employment and Innovation Cluster
NDRG	Network Development Reference Group
New mass transit link	Focuses on the creation of a public transport corridor that is capable of transporting high volumes of passengers between Melbourne Airport and central Melbourne
NOPs	Non-Owner Participants
NPV	Net Present Value
O&M	Operations and maintenance
OHLE	Overhead Line Equipment
OHW	Overhead Wiring
OMR	Outer Metropolitan Ring
OPV	Office of Projects Victoria
PCG	Projects Control Group
PDA	Planning and Design Approval
PDDD	Project Development and Due Diligence
Peak period	The busiest periods on the transport network. For the purposes of economic and transport modelling, AM peak is experienced between 7am and 9am and PM peak between 3pm and 6pm
Plan Melbourne	The Victorian's Government metropolitan planning strategy for the city's growth to 2050
PL Act	*Pipelines Act 2005* (Vic)
PMF	Project Management Framework
PM peak	PM peak (for the purposes of economic and transport modelling) is between 3pm and 6pm
PRINP	Passenger Rail Infrastructure Noise Policy
Problems	As defined in Chapter 2

Term	Definition
PSA	Planning Scheme Amendment
PS&TRs	Project Scope and Technical Requirements
PT	Public Transport
PTV	Public Transport Victoria
Punctuality	Refers to improved reliability of travel times. Where there is significant variability in journey times, transport users may be required to allow more time for the journey to reduce the probability of arriving late at their destination. If variability in travel time is reduced, then transport users benefit from being able to reduce this extra time allowance
Recommended project solution	As defined in Chapter 6
Reference case	The Department of Transport reference case as defined in Chapter 9
Reliability	Refers to the resilience of the transport network and its ability to respond to and recover from out of course incidents and delays. It includes the reduced likelihood of delays from one part of the network cascading to the rest
RFT	Request for Tender
RIA	Rail Infrastructure Alliance
RMIT	Royal Melbourne Institute of Technology
ROPAS	Rail Operations Planning Advisory Services
RPV	Rail Projects Victoria
RRL	Regional Rail Link
RRR	Regional Rail Revival
RSA	Rail Systems Alliance
RTO	Rail Transport Operator
SEIFA	Socio-economic indexes for areas
SkyBus	The primary public transport airport bus service operating six services throughout Melbourne from Melbourne Tullamarine Airport to Melbourne City, Southbank, St Kilda, Frankston and Bayside suburbs, and Melbourne western and eastern suburbs
SRA	Schedule Risk Assessment
SRL	The Suburban Rail Loop project, which will connect Melbourne's middle suburbs via a new underground rail link and connect all major railway lines from the Frankston line to the Werribee line via Melbourne Airport. The project is to be delivered in stages, but is intended to terminate at Airport Station
SRLA	Suburban Rail Loop Authority
SRS	System Requirement Specification
SSIPs	State-significant industrial precincts
SUP	Shared Users Paths
TOC	Target Outturn Cost
tph	Trains per hour
Tullamarine Freeway	A major freeway connecting Melbourne Airport in Tullamarine to the Melbourne CBD
UCB	Urban Consolidation Benefits
USP	Utility Service Provider
V	Voltage
VAGO	Victorian Auditor-General's Office

Term	Definition
VCC	Value Creation and Capture
VDAS	Victorian Digital Asset Strategy
VHI	Victorian Heritage Inventory
VHR	Victorian Heritage Register
VITM	Victorian Integrated Transport Model
VOC	Vehicle operating cost
VOT	Value of Travel Time
VPS	Victorian Public Service
VTC	Victorian Tunnelling Centre
WEBs	Wider Economic Benefits
WRP	Western Rail Plan