MAJOR ROAD PROJECTS AUTHORITY

SEPTEMBER 2018

MORDIALLOC BYPASS

TRANSPORT IMPACT ASSESSMENT

Report Number: 2135645A-SE-26-TPL-REP-0005 Rev0

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Mordialloc Bypass
Transport Impact Assessment

Major Road Projects Authority

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ABBREVIATIONS

AADT	Annual Average Daily Traffic
ATC	Automated Traffic Count
BPR	Bicycle Priority Route
DDA	Disability Discrimination Act 1992
DEDJTR	Department of Economic Development, Jobs, Transport and Resources
DELWP	Department of Environment, Land, Water and Planning
DOS	Degree of Saturation
EES	Environment Effects Statement
EMF	Environmental Management Framework
EPR	Environmental Performance Requirement
GIS	Geographic Information System
IDM	Intersection Diagnostic Monitor
ITS	Intelligent Transport System
LOS	Level of Service
LXRA	Level Crossing Removal Authority
M&P	Movement and Place
MRPA	Major Road Projects Authority
NEIC	National Employment Innovation Cluster
OD	Origin - Destination
PBN	Principal Bicycle Network
PFN	Principal Freight Network
PTV	Public Transport Victoria
RCIS	VicRoads Road Crash Information System
SSA	Safe System Assessment
SCC	Strategic Cycling Corridor
SUP	Shared Use Path
TfV	Transport for Victoria
TIA	Transport Impact Assessment
VCR	Volume-Capacity Ratio
VITM	Victorian Integrated Transport Model
VMS	Variable Message Sign

EXECUTIVE SUMMARY

This Transport Impact Assessment report forms part of the Environment Effects Statements (EES) for the project. The report provides an assessment of transport impacts associated with the project and defines the Environmental Performance Requirements (EPRs) necessary to meet the EES objectives.

OVERVIEW

The Mordialloc Bypass (herein referred to as the bypass) corridor is located 26 kilometres south of the Melbourne Central Business District (CBD). The bypass will be configured as a freeway that extends northward from the Mornington Peninsula Freeway at Springvale Road to the Dingley Bypass. A shared use path, grade-separated interchanges and an upgrade of the existing Thames Promenade interchange will be constructed as part of the project.

The bypass will form part of Melbourne's southern movement corridor connecting the Mornington Peninsula, Southern and Bayside suburbs to the CBD and the Monash and Dandenong National Employment and Innovation Clusters.

The EES has been prepared in accordance with the scoping requirements provided by the Victorian State Government in the *EES Scoping Requirements for Mordialloc Bypass* (May 2018).

As per the Scoping Requirements, the transport evaluation objective of the Mordialloc Bypass is '*to provide for an effective connection between the Mornington Peninsula Freeway and the Dingley Bypass, to improve travel efficiency, road safety, and network capacity, as well as improve amenity and local transport networks in the Aspendale/Dingley area*'.

TRANSPORT IMPACT ASSESSMENT

The assessment covers the following aspects of the existing and potential impacts to the transport network through technical investigations:

- Access impacts induced by the proposed configuration of the project
- Network impacts considering forecast traffic demand, performance and safety
- The ability to support the intended road use proposed within the network
- Effectiveness in transport network integration considering public transport and shared use paths
- Construction impacts on safety and network operations.

The following three project scenarios have been assessed, in which the freeway project scenario is the preferred project configuration considering its alignment to the Scoping Requirements objectives:

- No project scenario (base case)
- Four-lane Arterial road (alternative project scenario)
- Four-lane Freeway (preferred project scenario).

METHODOLOGY

The methodology adopted for the transport impact assessment involved:

- Project scope identification and context study: develop initial EPRs, review of the initial design, legislation and policy.
- Existing conditions investigations: commission data collection, review of existing conditions and current operations.
- Technical investigations: undertake transport impact assessment on strategic modelling results to analyse forecast performance and review of project design against transport objective.

- Environmental Risk Assessment and Mitigation: identify environmental risks resulting from the project and proposed network changes, provide recommendations to reduce risks and define EPRs.
- Refining EPRs to form part of the Environmental Management Framework.

KEY FINDINGS

EXISTING CONDITIONS

An existing conditions study was carried out to provide an overview of current transport network conditions within the study area. A range of qualitative and quantitative information was used to characterise the provisions and performance of the existing road, public and active transport networks with the following key observations:

- The Mornington Peninsula Freeway, and the arterial roads within the study area, form part of the principal freight network which is expected to see growth in freight demand over the next 30 years.
- Key arterial routes experience heavy congestion, particularly during the AM peak travelling north and west, and during the PM peak travelling south and east.
- Substantially reduced operational speeds and highly variable travel times occur during peak periods, caused by a combination of high demand for competing traffic movements, inefficient network configuration and capacity constraints at key intersections.
- Crash statistics highlight that 59 per cent of injury crashes in the area surrounding the project are related to intersection crashes.
- Some roads have no pedestrian paths and connectivity is generally disjointed.
- The coverage and integration of existing bicycle facilities within the study is very limited.

NO PROJECT SCENARIO (BASE CASE)

Assessment of the 2031 no project scenario identified:

- An increase in vehicle trips throughout the local network is expected, brought about by population and employment growth, increasing volumes and congestion on arterial routes
- Likelihood of crashes is anticipated to increase due to the additional vehicle trips
- Journey times are anticipated to be less reliable than existing conditions
- Ineffective and disjointed bicycle network
- Disjointed road network continues to limit network capacity, meaning it is unlikely to fully support future economic growth opportunity
- The anticipated average travel speed along key north-south arterial roads reduce to 37 km/hr (compared to desirable speed of 80 km/h)
- Transport objective will not be met under the no project scenario.

ALTERNATIVE PROJECT SCENARIO (ARTERIAL)

Assessment of the 2031 alternative project scenario identified:

- The bypass will attract a significant number of vehicles (approximately 60,000 total vehicles per day including 9000 heavy vehicles) relieving pressure from parallel routes
- Due to the improved access provided by the new road connection, intersecting roads will experience an increase in traffic volumes
- The arterial road configuration will require the truncation of Old Dandenong Road and Woodlands Drive impacting on the surrounding local transport movements
- Travel times improved from the 2031 base case between the key origin/destination served by the Mordialloc Bypass (i.e. Dingley Bypass/Boundary Road to Mornington Peninsula Freeway/Thames Promenade) with likely reductions of 5.6 minutes (33 per cent) in the AM peak and 8.6 minutes (43 per cent) in the PM peak

- The anticipated average travel speed along the bypass corridor is between 59 to 67 km/hr (compared to desirable speed of 80 km/h)
- The alternative arterial road configuration is expected to reduce crash risks from the base case by reducing traffic volumes and providing physical separations between opposing traffic, but will have a significantly higher risk of intersection crashes compared to the preferred scenario
- The arterial road configuration of the Mordialloc Bypass will achieve the transport objectives but would be less effective compared to the preferred project scenario.

PREFERRED PROJECT SCENARIO (FREEWAY)

Assessment of the 2031 preferred project scenario identified:

- The freeway configuration of the Mordialloc Bypass will provide greater capacity than the alternative project scenario and attract a significant number of vehicles (over 75,000 total vehicles per day including 13,000 heavy vehicles) relieving pressure from parallel routes.
- Due to the improved access provided by the freeway, arterial roads connecting to the proposed interchanges will experience an increase in traffic volumes including Centre Dandenong Road, Lower Dandenong Road and Governor Road.
- Travel times improved from the 2031 base case between the key origin/destination served by the Mordialloc Bypass (i.e. Dingley Bypass/Boundary Road to Mornington Peninsula Freeway/Thames Promenade) with likely reductions of 7.7 minutes (46 per cent) in the AM peak and 10.6 minutes (52 per cent) in the PM peak.
- The freeway configuration provides travel time savings to a noticeably larger population (area) of potential beneficiaries (Monash National Employment Innovation Cluster) in comparison to the alternative project scenario.
- The freeway configuration is expected to reduce crash risks within the study area through a reduction in traffic volumes including heavy vehicles from the surrounding road network and grade separation of conflicting and opposing movements.
- Potential network disruption from increased construction traffic within the network is considered insignificant although disruption will be greater than the alternative scenario due to the additional temporary lane closures required.

PROJECT ALTERNATIVE COMPARISON (ARTERIAL AND FREEWAY)

The impact assessment indicates that the freeway configuration provides a number of benefits compared to the arterial configuration including:

- A higher level of travel efficiency and network capacity, evidenced by greater overall travel time improvements along key routes in the local and regional study area
- Provides greater access by retaining the existing road connection along Old Dandenong Road and introducing new north-facing entry and exit freeway ramps at Thames Promenade
- Better alignment with the Safe Systems principles resulting in a lower crash risk
- Ability to support the intended future road use including greater coverage of share use path to promote active transport travel
- Greater improvement to amenity and local transport networks, evidenced by the higher reductions in total traffic and heavy vehicle traffic volumes on roads with residential and other sensitive land uses.

1 INTRODUCTION

1.1 PROJECT RATIONALE

Melbourne's growth will need to be supported by increasing transport capacity to meet population and economic growth needs along the southern movement corridor. Addressing the configuration and capacity problems along the southern movement corridor will improve productivity, liveability, and economic development in the south-east as well as the wider metropolitan area.

The Mordialloc Bypass aims to meet the following objectives:

- enhancing the overall efficiency of the transport network
- reduce delays at existing intersections and provide a high level of service for all vehicles using the road network
- reduce reliance on local and low capacity arterial roads as key movement routes, boosting amenity in the middle south-eastern suburbs
- facilitating public transport improvements
- better access to economic and activity centres
- reduction in travel time variability and delays for commuters
- improved efficiency and consequently vehicle operating costs for freight and the logistics sector
- achieving value for money outcomes for the state, minimising the net cost of the project
- protecting, and where possible, enhancing natural and cultural resources throughout the development, delivery and operation of the project
- supporting sustainable communities and land development during the planning, delivery and operation of the project
- securing timely delivery of the project.

1.2 PROJECT DESCRIPTION

The Mordialloc Bypass project (the project) is the proposed construction of a new freeway connecting the Dingley Bypass with the Mornington Peninsula Freeway; and is predominately to be constructed within an existing road reservation. The project passes between the western boundary of Braeside Park and the eastern boundary of the Woodlands Estate (constructed) wetlands, traverses constructed wetlands at Waterways and approaches to within one kilometre of the Ramsar-listed Edithvale-Seaford Wetlands. The northern and southern ends of the project pass through or border the South East Green Wedge.

The project corridor is approximately 9.7 kilometres in length, comprising two, two-lane 7.5 kilometre long carriageways (with a path for walking and cycling) along the greenfield alignment, and 2.2 kilometres of roadworks required to integrate the project with the Mornington Peninsula Freeway. It is expected that each carriageway will provide for two 3.5-metre-wide lanes, with a 3.0-metre-wide outside shoulder and 1.0-metre-wide inside shoulder. The Mordialloc Bypass will also provide connections from the freeway onto the Dingley Bypass, Centre Dandenong Road, Lower Dandenong Road, Governor Road, Springvale Road and new north facing ramps at Thames Promenade. There will also be an overpass at Old Dandenong Road. Mordialloc Creek and the associated Waterways Wetlands will be spanned by twin 400-metre-long bridges.

The proposed alignment allows for a future upgrade of the project to a six-lane freeway standard road within the construction footprint.

The proposed alignment is generally located within the existing road reservation, most of which is already covered by Public Acquisition Overlay, and some of which is already in VicRoads' ownership.

The project area is shown in Figure 5.1. The proposed project consists of:

- Four-lane freeway with a standard cross-section (two lanes in each direction), divided by a centre median.
- 100 km/hr posted speed limit.
- Full diamond interchanges at Springvale Road, Governor Road and Lower Dandenong Road whereby Mordialloc Bypass is elevated over the arterial roadway with northbound and southbound entry and exit ramps providing access for all directions of travel.
- Half single point urban interchange at Centre Dandenong Road whereby Mordialloc Bypass is elevated over Centre Dandenong Road and southbound entry and northbound exit ramps provide accessibility to and from the south.
- Addition of northbound entry and southbound exit ramps at the existing Mornington Peninsula Freeway interchange at Thames Promenade. The existing interchange provides ramps to and from Mornington Peninsula Freeway to the south only. The proposed entry and exit ramps will create a full diamond interchange at Thames Promenade.
- An at-grade signalised T-intersection at Dingley Bypass.
- Elevation of the bypass over Old Dandenong Road and Bowen Parkway to maintain existing connectivity on these routes.
- Shared use path running north-south along the length of the Mordialloc Bypass and connecting existing paths along the north side of Dingley Bypass and the south side of Springvale Road adjacent to Chelsea Heights Hotel.
- Bus queue jump lanes provided in intersection configurations at the proposed Springvale Road and Centre Dandenong Road interchanges.

1.3 REPORT PURPOSE

This Transport Impact Assessment report assesses the impacts of the operation and construction of the Mordialloc Bypass on the transport network and forms part of the Environment Effects Statement (EES) for the project. In particular, the report addresses the scoping requirements for the EES outlined in Section 2 and documents a series of Environmental Performance Requirements (EPRs) in Section 9 necessary to meeting the study objectives.

2 SCOPING REQUIREMENTS

Scoping requirements for the project were released in May 2018. They define the environmental related matters that should be investigated and documented as part of the Environment Effects Statement (EES) in the context of Ministerial Guidelines for Assessment of Environmental Effects under the *Environment Effects Act 1978* (Ministerial Guidelines). Each of the technical studies informing the EES has a specific evaluation objective. The objective defined for transport efficiency, capacity and safety is:

To provide for an effective connection between the Mornington Peninsula Freeway and the Dingley Bypass, to improve travel efficiency, road safety, and network capacity, as well as improve amenity and local transport networks in the Aspendale/Dingley area.

The scoping requirements also include the following transport matters outlined in Table 2.1 for the EES to examine.

Table 2.1 Mordialloc Bypass scoping requirements

SCOPING REQUIREMENT		REPORT REFERENCE
Key issues	Changes to distribution and volumes of traffic (including heavy vehicles) on roads that might be affected by the project.	Forecast traffic data for base case (no project) conditions and project conditions (including both freeway and an alternative arterial road configuration of the Mordialloc Bypass is provided in Section 8.2. This transport modelling data provides the anticipated distribution and volume changes brought about by the project considering the cumulative impacts associated with surrounding projects, land use, employment and population change.
	Effective integration of the proposed project with local transport networks including public transport and shared bicycle pathways.	Provision of the proposed shared use path and bus facilities detailed in Section 8.3 reflects the integration of local public transport and active transport into the project
	Identify and compare modelled transport performance of the preferred project relative to identified alternatives (including the arterial road option and the “no project” option), in terms of travel times, capacity, traffic volumes, road safety and accessibility.	The project impact assessments outlined in Section 8 provide a comparison of the preferred freeway configuration and identified alternative scenarios including “no project” and an arterial road configuration project option. The comparisons were undertaken through technical investigations by evaluating the potential local and network impact. The assessment is informed by analysing forecast modelling performance outputs and proposed project configurations.

SCOPING REQUIREMENT		REPORT REFERENCE
Priorities for characterising the existing environment	Characterise traffic and road conditions (times, capacity, volumes, road safety) for the "no project" scenario.	An existing conditions assessment was undertaken to identify the existing performance and gaps within the current transport network; refer to Section 5 of the report. Overviews of the modelled base year and forecast transport network conditions are presented in Section 8.2.1 and Section 8.2.2. It outlines the anticipated performance of the transport network in 2031 without the project in place. By comparing the base year and future year performance, the modelling outputs present the anticipated changes within the network induced by population growth, land-use developments and surrounding projects.
	Characterise existing transport patterns —private vehicles, commercial/freight heavy vehicles, active and public transport— to identify influences on capacity, travel times, safety and accessibility. This should have regard to both existing and known planned future land uses within the area, in which transport patterns might be affected by the project.	
Design and mitigation measures	Provide potential design solutions that optimise linkages with the existing local road network to maintain or enhance network functionality (for commercial and private vehicles and active and public transport).	Mitigation measures have been identified in Section 6 the report and will be adopted by the project to reduce the likelihood of unacceptable impacts to travel time, road safety during both construction and operational phases of the project. Road safety is discussed in Section 8.4 of the report and associated risks identified in Section 6.
	Address potential risk areas for road safety and outline any specific measures to avoid, minimise and mitigate road safety issues.	
Assessment of likely effects	Assess the project's effects on traffic volumes, traffic composition and travel time outcomes, with allowance as appropriate for induced demand resulting from the project.	Forecast network project impact associated with safety, accessibility, traffic performance and transport integration that are expected during the stages of construction and post completion are outlined in Section 8 of the report.
	Assess the effects on network accessibility, safety and connectivity for commercial and private vehicles and active and public transport.	
	Assess the possible timing and implications of the project, including the construction phase, on transport network performance.	

SCOPING REQUIREMENT		REPORT REFERENCE
Approach to manage performance	Describe the performance of the preferred project option in meeting the proposed project's transport objectives, relative to alternatives.	Project impact assessments outlined in Section 8 provides a comparison of the preferred freeway configuration and identified alternative project scenarios including "no project" and the arterial road project option. The comparisons were undertaken through technical investigations by evaluating the potential local and network impact.
	Describe options for maintaining network connectivity for all users during project construction.	Recommendations on construction management impact are identified in Section 8.6 of this report to minimise the potential operational disruption and connectivity in the existing transport network. This includes the consideration of construction staging and contract specific interventions.
	Outline an operational monitoring regime to enable network performance to be measured relative to EES forecasts.	The project is required to provide measurements of corridor performance including travel time performance, traffic and freight volumes for the purpose of post completion project evaluation. Refer to Section 7.2 for details.

3 LEGISLATION AND POLICY

The development of the Mordialloc Bypass needs to have regard to the legislative, policy and strategic context within which the Department of Economic Development, Jobs, Transport and Resources (DEDJTR), Roads Corporation (VicRoads), Major Road Projects Authority (MRPA) and Public Transport Victoria (PTV) operate. The key legislative frameworks are the *Transport Integration Act 2010*, *Road Management Act 2004* and the *Planning and Environment Act 1987*.

3.1 STRATEGIC CONTEXT

3.1.1 PLAN MELBOURNE

Melbourne is facing unprecedented growth over the next 30 years with population projected to increase from 4.5 million to almost 8 million between 2017 and 2050. With population growth comes an increase in travel demand with more people accessing jobs, services and educational opportunities. Plan Melbourne outlines the strategic vision to ensure Melbourne continues to be sustainable, productive and liveable as its population increases over the next 30 years.

The following seven key outcomes were identified as part of Plan Melbourne:

1. Melbourne is a productive city that attracts investment, supports innovation and creates jobs
2. Melbourne provides housing choice in locations close to jobs and services
3. Melbourne has an integrated transport system that connects people to jobs and services and goods to market
4. Melbourne is a distinctive and liveable city with quality design and amenity
5. Melbourne is a city of inclusive, vibrant and healthy neighbourhoods
6. Melbourne is a sustainable and resilient city
7. Regional Victoria is productive, sustainable and supports jobs and economic growth.

An excerpt of Plan Melbourne is provided in Figure 3.1 identifying the following items proximate to the study area:

- Mornington Peninsula Freeway and Eastlink are both identified as State Significant road corridors
- Moorabbin Airport is identified as a transport gateway (major airport)
- Both Frankston and Dandenong are identified as Metropolitan Activity Centres
- Dandenong and Monash are identified as National Employment and Innovation Clusters (NEIC).

Further, Plan Melbourne identifies the local areas of Mordialloc, Mentone, Cheltenham, Chelsea, and Keysborough-Parkmore as Major Activity Centres.

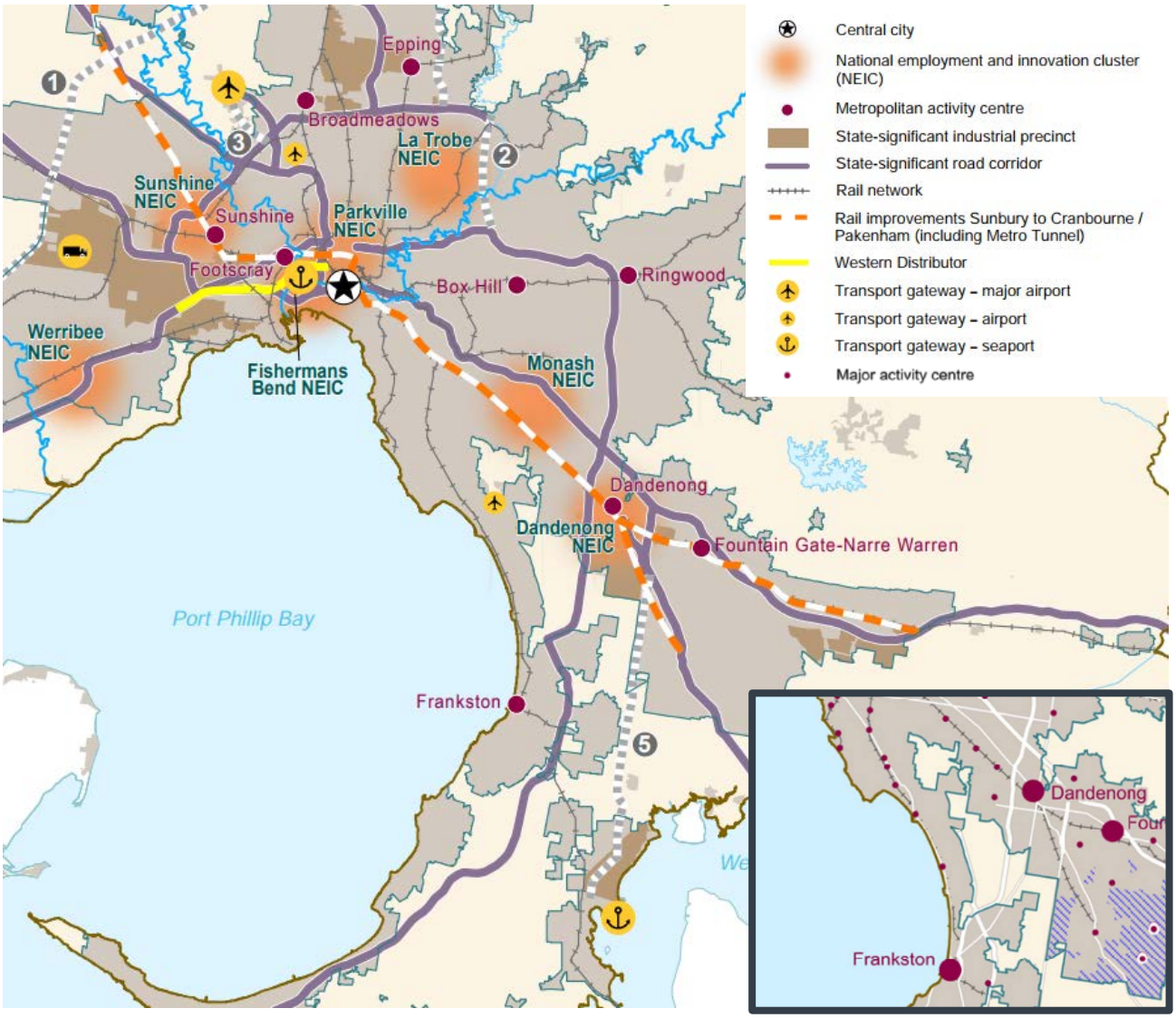


Figure 3.1 Plan Melbourne 2050 Plan (excerpts)

3.1.2 VICTORIAN INFRASTRUCTURE PLAN

The State Government's *Victorian Infrastructure Plan*, prepared in response to Infrastructure Victoria's *30 Year Infrastructure Plan*, was published in October 2017 and outlines the Government's intentions and priorities over the next five years and beyond. The plan recommends a program of upgrades to the arterial road network, focusing on congested roads in outer metropolitan areas over five to fifteen years.

The project has been identified by the Victorian State Government as a strategic response for addressing network inefficiencies and improving safety in the south-eastern suburbs under this program, with $375 million allocated from the 2017/18 and 2018/19 State budgets.

3.1.3 CITY OF KINGSTON CYCLING AND WALKING PLAN

The City of Kingston prepared a cycling and walking plan in August 2008 which outlines the strategic direction for developing the bicycle and pedestrian network from 2009 to 2013. The objectives for cycling and walking in Kingston include:

1 A quality network of cycling and walking routes which enhance access to local activity hubs
2 Integrated policy and practice that facilitates cycling and walking
3 Effective coordination and monitoring of Plan implementation

4 Provision of well-located end of trip facilities
5 Improved safety for bicycle riders and pedestrians
6 Improved maintenance and management of existing facilities
7 Effective encouragement and promotion of cycling and walking

The plan identified cross Municipal Access Routes including East-West Links / North-South Links and LGA boundary linkages as priority area for developing the local cycling and walking network.

3.1.4 MOORABBIN AIRPORT 2015 MASTER PLAN

The 2015 Master Plan sets out the strategic vision for Moorabbin Airport over the next 20 years, as a major Victorian transport gateway, as a centre of general aviation and flight training and as an existing and growing hub for employment, community life and economic activity in metropolitan Melbourne and Victoria.

The 2015 Master Plan envisages:

- On-Airport jobs growing from 3,300 to 8,500 over the next 20 years.
- Economic value increasing from $340 million to $825 million annually.
- $10 billion of economic activity over the 20-year period.
- Investment of $570 million in high quality facilities and infrastructure. Building on the Airport's national and international reputation for flight training and aviation excellence.

3.2 KEY LEGISLATION AND POLICIES

Key legislation and policies form the regulatory framework for traffic management in Victoria. The table below summarises the legislation and policy documents pertinent to transport planning and the Mordialloc Bypass requirements.

Table 3.1 Legislation and policy summary table

POLICY / PLAN	DESCRIPTION	RELATION TO MORDIALLOC BYPASS
Transport Integration Act 2010	The *Transport Integration Act 2010* establishes a legislated policy framework for the provision of an integrated and sustainable transport system in Victoria that contributes to an inclusive and environmentally responsible State. The Act establishes a set of six transport system objectives that contribute to meeting the above aspirations, they include: — Social and economic inclusion — Economic prosperity — Environmental sustainability — Integration of transport and land use — Efficiency, coordination and reliability — Safety, health and wellbeing. The Act outlines vision, key objectives, decision making principles for transport planning and requires agencies to consider the potential impact of land use planning proposals on transport.	Sets out the following seven decision-making principles to be considered for Mordialloc Bypass. — Integrated decision making — Triple bottom line assessment — Equity — Transport system user perspective — Precautionary principle — Stakeholder engagement and community participation — Transparency

POLICY / PLAN	DESCRIPTION	RELATION TO MORDIALLOC BYPASS
Road Management Act 2004	The *Road Management Act 2004* sets out the regulations and requirements of working within the road reserve and specifies the relevant road manager for arterial roads and local roads within Victoria. The purpose of this Act is to reform the law relating to road management in Victoria and to make related amendments to certain Acts. In outline this act: — Establishes a new statutory framework for the management of the road network which facilitates the coordination of the various uses of road reserves for roadways, pathways, infrastructure and similar purposes. — Sets out certain rights and duties of road users. — Establishes the general principles which apply to road management. — Provides for the role, functions and powers of a road authority. — Provides for the making of Codes of Practice to provide practical guidance in relation to road management. — Facilitates the making of road management plans as part of the management system to be implemented by a road authority in the performance of road management functions. — Enables the declaration and discontinuance of roads. — Provides a new process for the declaration and classification of roads and the re-allocation of management responsibility for roads. — Provides for a road authority to keep a register of public roads in respect of which the road authority is the coordinating road authority. — Provides for the construction, inspection, maintenance and repair of public roads. — Sets out the road management functions of road authorities. — Sets out the road management functions of infrastructure managers and works managers in providing infrastructure or conducting works. — Provides for issues relating to civil liability arising out of road management. — Provides for mechanisms to enforce and administer provisions of the Act.	Provides the statutory framework for VicRoads and local councils to manage the Mordialloc Bypass and is applicable throughout the whole of life cycle of the project including planning and development, constructions, operations and asset management. Code of practices are set out under the Road Management act to provide guidance for road authorities, works and infrastructure managers. The Act requires the project to obtain approval to connect to a freeway 'Mornington Peninsula Freeway' and requires MRPA to consult with municipal council under Schedule 2. VicRoads has delegated power and functions to the Major Road Projects Authority (MRPA) under the Road Management Act 2004 to enable the transition of major projects to MRPA and hand back of projects to VicRoads.

POLICY / PLAN	DESCRIPTION	RELATION TO MORDIALLOC BYPASS
	— Makes related amendments to the Transport Act 1983, the Road Safety Act 1986, the Local Government Act 1989 and certain other Acts. — Sets out powers, functions and responsibilities of road authorities.	
Planning and Environment Act 1987	Sets out objectives for land use planning, and in subordinate instruments, requirements to be considered in transport planning decision-making.	Sets out framework of land use planning requirements to be adopted for the planning of Mordialloc Bypass.
Victoria the Freight State – the Victorian Freight and Logistics Plan	Document which provides a vision and plan for ensuring that Victoria retains its status as Australia's freight and logistics capital, and for the freight and logistics sector to support other areas of the Victorian economy. A new freight strategy is to be developed. However, in the meantime, this document provides guidance on future directions.	Proposes Mordialloc Bypass as a potential future addition of a nationally significant link to the State's Principal Freight Network, linking Melbourne's key freight attractor. Mordialloc Bypass would represent a logical expansion of high productivity freight vehicle networks.
Towards zero – Victoria's Road Safety Strategy and Plan	*Towards Zero – Victoria's Road Safety Strategy and Plan* 2016-2020 is a plan to lower the number of lives lost on Victoria's roads to 200 or less by 2020, and reduce serious injuries by at least 15%. Key directions in Towards Zero that are relevant to Mordialloc Bypass are: — Safe System approach — Making local and busy places safer — Using our roads more safely	Safe system principles need to be applied at every stage of the planning, design, construction and operation of Mordialloc Bypass.
Cycling into the Future 2013/23	Strategy to position Victoria as Australia's most bicycle friendly State. A new cycling strategy is under development. *Cycling into the Future 2013–23* identifies six directions that will build our understanding of cycling and the types of trips Victorians make by bike, help us to increase these trips in the future and encourage more people to consider cycling: **1** Build evidence **2** Enhance governance and streamline processes **3** Reduce safety risks **4** Encourage cycling **5** Grow the cycling economy **6** Plan networks and prioritise investment	Responds to upgrades and new links identified in *Strategic Cycling Corridor.*

POLICY / PLAN	DESCRIPTION	RELATION TO MORDIALLOC BYPASS
Plan Melbourne	Plan Melbourne is a plan to manage the growth in the city and suburbs to the year 2050. It seeks to integrate long-term land use, infrastructure and transport planning, and, in doing so, meet the city's future environmental, population, housing and employment needs.	Plan Melbourne contains a large range of directions relating to population, employment and land use that need to be considered in the planning of Mordialloc Bypass.
Planning for the Monash Employment and Innovation Cluster (NEIC)	The proposed Monash Cluster draft framework plan provides a strategic vision to improve, promote and enhance: — The profile of the cluster — Public transport services and connections — Public realm and amenity — Commercial developments to support key employment areas.	Mordialloc Bypass has the potential to play a role in contributing to the success of Monash NEIC through improvements in accessibility to the area. Planning for Mordialloc Bypass will also need to take account of objectives for particular locations in the Monash NEIC, where it is planned to improve 'place' and accessibility to the employment cluster.
Victoria's 30-year infrastructure strategy (Infrastructure Victoria, 2016)	Strategy prepared by Victoria's independent infrastructure advisory agency. Contains recommendations to Parliament and Government.	Recommended construction of Mordialloc Bypass because it was assessed as: — Making a significant contribution to improving freight flows — Making a moderate contribution to accessing middle and outer suburban employment centres.

4 METHODOLOGY

The methodology adopted for this assessment enables potential transport impacts to be identified at both network and local level. Throughout the investigation and assessment of these potential impacts, mitigation measures have been considered where applicable.

Figure 4.1 illustrates the process adopted for the Transport Impact Assessment:

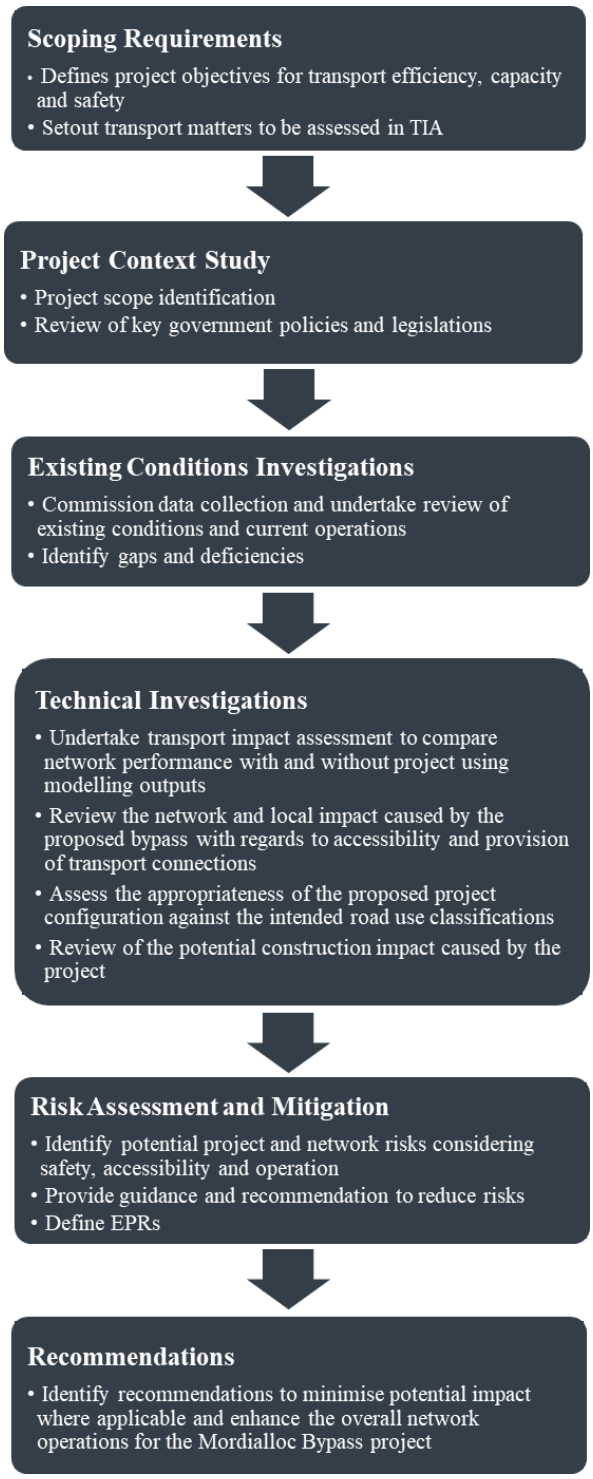


Figure 4.1 Transport impact assessment process

4.1 TECHNICAL INVESTIGATIONS

The Transport Impact Assessment discussed in this report has primarily been undertaken based on available existing transport data, technical information and transport modelling results. Site inspections and video recording of the site conditions have been undertaken and reviewed to form part of the assessment process.

4.1.1 TRANSPORT MODELLING

Strategic modelling has been undertaken to assess the anticipated network impacts and performance of the Mordialloc Bypass project. For this assessment, the Victorian Integrated Transport Model (VITM) was used to capture the potential network changes associated with future road and public transport projects and influence of land use growth over the coming years.

VITM is the State's primary strategic transport demand forecasting tool, owned and maintained by DEDJTR. As a traditional four-step model covering the whole of metropolitan Melbourne, VITM provides a platform for assessing the impacts of key transport projects on travel patterns and resulting demand for road and public transport travel both locally and across the broader network. Based on underlying projections for how land use, demographics and the transport network will change over time across Melbourne, VITM provides the ability to assess the impact of the transport projects to future time horizons. Adopting VITM for this project ensures the forecast impacts of the project on both private and heavy vehicle road traffic and public transport are captured and that the assessment aligns with the strategic planning vision of the Victorian State Government.

To enhance the credibility of the assessment, a series of validation checks were carried out specifically for the project. This included reviewing the validation of the original model, and comparing 2016 modelled and observed traffic volumes in the project area for individual count locations, screenlines and travel times.

VITM forecasts for 2031 were extracted for the purposes of this assessment, informing future demand and performance impacts with and without the proposed Mordialloc Bypass project discussed in Section 8.2. For further details, refer to the Mordialloc Bypass VITM Traffic Forecast Report in Appendix A.

4.1.2 PROPOSED MORDIALLOC DESIGN

For the purposes of evaluating the potential impact on accessibility including road and path connections, conceptual designs were sourced. The proposed layout was overlaid on high resolution aerial imagery to assist in identifying potential impact on the existing network. It is noted that the proposed design has been developed in accordance with Austroads standards and will be reviewed through the delivery stages of the project. Preliminary design layouts are attached in Appendix B.

4.2 RISK ASSESSMENT

As outlined in the Ministerial Guidelines for Assessment of Environmental Effects (2006) and the Scoping Requirements for the Mordialloc Bypass Project EES (2018), a risk-based approach was adopted for the EES studies to direct a greater level of effort at investigating matters that pose relatively higher risk of adverse environmental effects. The following definitions were adopted for the assessment:

- *Environmental impact:* is described as any change to the environment as a result of project activities.
- *Environmental risk:* As defined by the Ministerial Guidelines for Assessment of Environmental Effects Under the Environment Effects Act 1978 (DSE, 2006), *"Environmental risk reflects the potential for negative change, injury or loss with respect to environmental assets"*.

The purpose of the risk assessment was to provide a systematic approach to identifying and assessing the environmental risks, including heritage, cultural, social, health, safety and economic aspects as a result of the project. It articulates the likelihood of an incident with environmental effects occurring and the consequential impact to the environment.

The impact assessment and risk assessment processes were integrated throughout the development of the EES. The environmental risk assessment (ERA) process allowed the project team to identify as many environmental risks as a result of the project as possible and refine and target impact assessments accordingly. The impact assessments ensured the project team has a robust understanding of the nature and significance of impacts and the mitigation measures developed to minimise and control those impacts.

The risk and impact assessment processes were essential components of the project design process and in the formulation of construction and additional mitigation measures to minimise environmental impacts. These assessments also underpin the establishment of the Environmental Performance Requirements (EPRs), which set out the desired environmental outcomes for the project.

The below methodology was developed to assess the potential impacts of the Mordialloc Bypass on transport and sets out the process, methods and tools used to complete the impact and risk assessments.

The risk assessment is a critical part of the EES process as it guided the level and extent of impact assessment work required and facilitated a consistent approach to risk assessment across the various technical disciplines. The risk assessment process was based on the approach defined in *ISO 31000:2018 Risk Management – Principles and Guidelines*, which describes an environmental risk management process which is iterative and supported by ongoing communication and consultation with project stakeholders. The ERA process incorporated VicRoads key risk management requirements, specifically from the VicRoads Environmental Risk Management Guidelines (2012) and the VicRoads Environmental Sustainability Toolkit (2017).

4.2.1 SCOPE AND BOUNDARIES

The ERA assessed all project phases, namely: Initial Phase (the current approvals and concept design stage); Construction Phase; and Operations and maintenance Phase. The risk process evaluated environmental risks that would result from the development of the project based on the concept designs for the project, the draft construction methodology and the existing conditions of the study area, as well as the draft environmental impact assessment reports which were in development during the ERA.

4.2.2 RISK IDENTIFICATION

To effectively and comprehensively recognise all potential environmental risks that may result from the project, it was necessary to identify impact pathways for all project activities during all its project phases. An impact pathway is the cause and effect pathway or causal relationship that exists between a project activity and an asset, value or use of the environment

Environmental impact pathways were identified under two categories:

- Primary environmental impacts: The impacts to environmental values that are directly attributable to project activities within a cause and effect paradigm. Project activities cause environmental impacts (effects) on environmental values through an environmental impact pathway such as construction activities. The assessment of these impacts and their associated risks assumes that all standard mitigation measures are in place and working as intended.
- Cumulative impacts: The potential cumulative impacts to environmental values that may result from the implementation of the project. This allowed for the identification of:
  - Secondary environmental risks which may result from the implementation of a risk response in mitigating a primary environmental risk
  - On-site aggregate risks resulting from multiple on-site project activities on an environmental asset (risks were assessed in two ways, as a single project phase and as a whole project risk)
  - Off-site cumulative environmental risks which accounted for potential off-site cumulative impacts of the Mordialloc Bypass project in conjunction with surrounding off-site projects in the local area.

4.2.3 RISK ANALYSIS

With risks identified for each discipline, VicRoads and industry best practice and standard mitigation controls that are considered intrinsic to a project of this nature were identified, including requirements under relevant sections of the VicRoads Standard Specifications, EPA guidelines and Government environmental management policies.

4.2.4 RISK EVALUATION

The ERA process developed for the project is based on the risk analysis matrix used on recent and similar VicRoads projects, as presented in Table 4.1. It follows the standard industry semi-quantitative risk analysis methodology that utilises pre-defined consequence and likelihood criteria as the factors to arrive at a risk rating.

Table 4.1 Risk analysis matrix

			LIKELIHOOD				
CONSEQUENCE	**Risk Categories**		**Rare**	**Unlikely**	**Possible**	**Likely**	**Almost Certain**
			A	**B**	**C**	**D**	**E**
	Catastrophic	**5**	Medium	High	High	Extreme	Extreme
	Major	**4**	Medium	Medium	High	High	Extreme
	Moderate	**3**	Low	Medium	Medium	High	High
	Minor	**2**	Negligible	Low	Low	Medium	Medium
	Insignificant	**1**	Negligible	Negligible	Negligible	Low	Low

Based on the project objectives and context, a set of project-specific and appropriate likelihood and consequence criteria were developed in consultation with VicRoads, the TRG and technical specialists Table 4.2 and Table 4.3.

Table 4.2 Likelihood categories

LIKELIHOOD				
Less than once in 12 months OR 5% chance of occurrence during course of the project	Once to twice in 12 months OR 5 - 10% chance of occurrence during course of the project	3 to 4 times in 12 months OR 30% chance of occurrence during course of the project	5 to 6 times in 12 months OR 50% chance of occurrence during course of the project	More than 6 times in 12 months OR 100% chance of occurrence during course of the project
The event may occur only in exceptional circumstances	The event could occur but is not expected	The event could occur	The event will probably occur in most circumstances	The event is expected to occur in most circumstances
It has not happened in Victoria but has occurred on other road projects in Australia.	It has not happened in metropolitan Melbourne but has occurred on other road projects in Victoria	It has happened in metropolitan Melbourne	It has happened on a road project in metropolitan Melbourne in the last 5 years	It has happened on a road project of similar size and nature in metropolitan Melbourne within the last 2 years. OR It has happened multiple times on a road project in the region within the last 5 years.
Rare	Unlikely	Possible	Likely	Almost Certain
A	B	C	D	E

Table 4.3 Transport environmental risk assessment consequences descriptors

	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
Construction results in decline in road safety	No occurrence of road accidents during construction period	Occurrence of property damage only road accidents increase by less than 5% OR minor (first aid) injury to less than 5 individuals during construction period	Occurrence of property damage only road accidents increase by 5-10% OR major (hospitalisation/surgery) injury to between 5 and 10 individuals during construction period	Occurrence of property damage only road accidents increase by 10-20% OR major (hospitalisation/surgery) injury to more than 10 individuals during construction period	Occurrence of property damage only road accidents increase by greater than 20% OR increase in number of fatalities
Operations show decline in Road safety	No occurrence of road accidents during a 5-year period.	Occurrence of property damage only road accidents increase by less than 5% OR minor (first aid) injury to less than 5 individuals during a 5 year period	Occurrence of property damage only road accidents increase by 5-10% OR minor (first aid) injury to 5-10 individuals OR major (hospitalisation/surgery) injury to less than 5 individuals during construction period	Occurrence of property damage only road accidents increase by 10-20% OR minor injury to greater than 10 individuals OR major (hospitalisation/surgery) injury to more than 5 individuals during construction period	Occurrence of property damage only road accidents increase by greater than 20% or increase in number of fatalities over a 5 year period
Construction adversely impacts traffic conditions	Negligible adverse impact on traffic and transport conditions	Detectable adverse changes in traffic and transport condition (decrease in Level of Service) at one or two locations at any one point in time during the construction period	Detectable adverse change in traffic and transport conditions (decrease in Level of Service) at multiple locations	Traffic and transport congestion and delays exceed acceptable levels at multiple locations	Traffic and transport congestion and delays severely restrict the safe operation and efficiency of the transport network
Operation adversely impacts traffic conditions	Negligible adverse impact on traffic and transport conditions	Detectable adverse changes in traffic and transport condition (decrease in Level of Service) at one or two locations at any one point in time during the construction period	Detectable adverse change in traffic and transport conditions (decrease in Level of Service) at multiple locations	Traffic and transport congestion and delays exceed acceptable levels at multiple locations	Traffic and transport congestion and delays severely restrict the safe operation and efficiency of the transport network

	INSIGNIFICANT	MINOR	MODERATE	MAJOR	CATASTROPHIC
Construction impacts on traffic access	Negligible impact on access routes during construction/operation OR No changes to access routes	Less than 5 routes with access compromised OR Minor diversions required (up to 250m) and less than 5,000 vehicles per day affected	Greater than 5 and less than 10 routes with access compromised OR Diversions of up to 1,000m required; or between 5,000 and 20,000vpd affected	Greater than 10 and less than 30 routes with access compromised OR Diversions of more than 1,000m required; or more than 20,000vpd affected	Greater than 30 routes with access compromised OR Properties inaccessible for an extended period (greater than two weeks)
Operation impacts on traffic access	Negligible impact on access routes during construction/operation OR No changes to access routes	Less than 5 routes with access compromised OR Minor diversions required (up to 250m) and less than 5,000 vehicles per day affected	Greater than 5 and less than 10 routes with access compromised OR Diversions of up to 1,000m required; or between 5,000 and 20,000vpd affected	Greater than 10 and less than 30 routes with access compromised OR Diversions of more than 1,000m required; or more than 20,000vpd affected	Greater than 30 routes with access compromised OR Properties inaccessible for an extended period (greater than two weeks)
Cumulative Effects	Scope and Boundaries: As identified in the Transport Impact Assessment, the cumulative assessment informed the network impact of the Mordialloc Bypass project and other potential projects considering the strategic changes associated with demographics, employment and public transport services. The 2031 forecast demand and traffic pattern and travel time performance were compared to the alternative project scenarios including base case (no project) and arterial road configuration.				

For all risks rated medium, high or extreme in the initial risk rating, technical specialists were required to identify additional controls which could be implemented to further reduce risk and to perform the residual risk rating. Additional controls specify management measures over and above those considered as Standard Controls to ensure the residual risk has been effectively avoided or mitigated to as low as reasonably practicable.

Where risks could not be eliminated or sufficiently reduced (e.g. by engineering controls or re-design), these will typically be addressed by specific conditions in a site Environmental Management Plan (EMP), or be the subject of a separate management plan, including adaptive management plans based on ongoing studies or monitoring.

ENVIRONMENTAL PERFORMANCE REQUIREMENTS

Following the evaluation of risk and through consultation with MRPA, EPR's were developed to define, relevant and measurable performance based requirements that set the environmental outcomes, objectives or limits for the project to achieve. The mitigation measures identified during the risk assessment process were used to inform the EPRs and also specify the means by which the EPRs are to be satisfied. The EPRs to transport are outlined in Table 9.1.

5 EXISTING CONDITIONS

The existing conditions assessment was used to establish the study area and provide a base line assessment of the current environment.

5.1 STUDY AREA

5.1.1 REGIONAL STUDY AREA

The Mordialloc Bypass corridor is located 26 kilometres south of the Melbourne Central Business District (CBD) as shown in Figure 5.1. The Mordialloc Bypass will form part of Melbourne's southern movement corridor, a strategic transport corridor which connects the Mornington Peninsula, Southern and Bayside suburbs to the central city and to National Employment and Innovation Clusters in Monash and Dandenong.

Major traffic routes in Victoria typically extend out from the Melbourne CBD in a radial fashion. In the south-east, Nepean Highway, Princes Highway East and Monash Freeway distribute traffic between Melbourne CBD and the south-eastern suburbs. These routes are typically congested during commuter peak periods, resulting in delays and increased journey times.

The Mordialloc Bypass will provide a high standard freeway connection between the Mornington Peninsula Freeway and the recently constructed Dingley Bypass, providing an alternate route into, and out of, the Melbourne Inner Southeast. The alignment of the Mordialloc Bypass will also enable it to relieve pressure from the adjacent north-south aligned Boundary Road and Springvale Road.

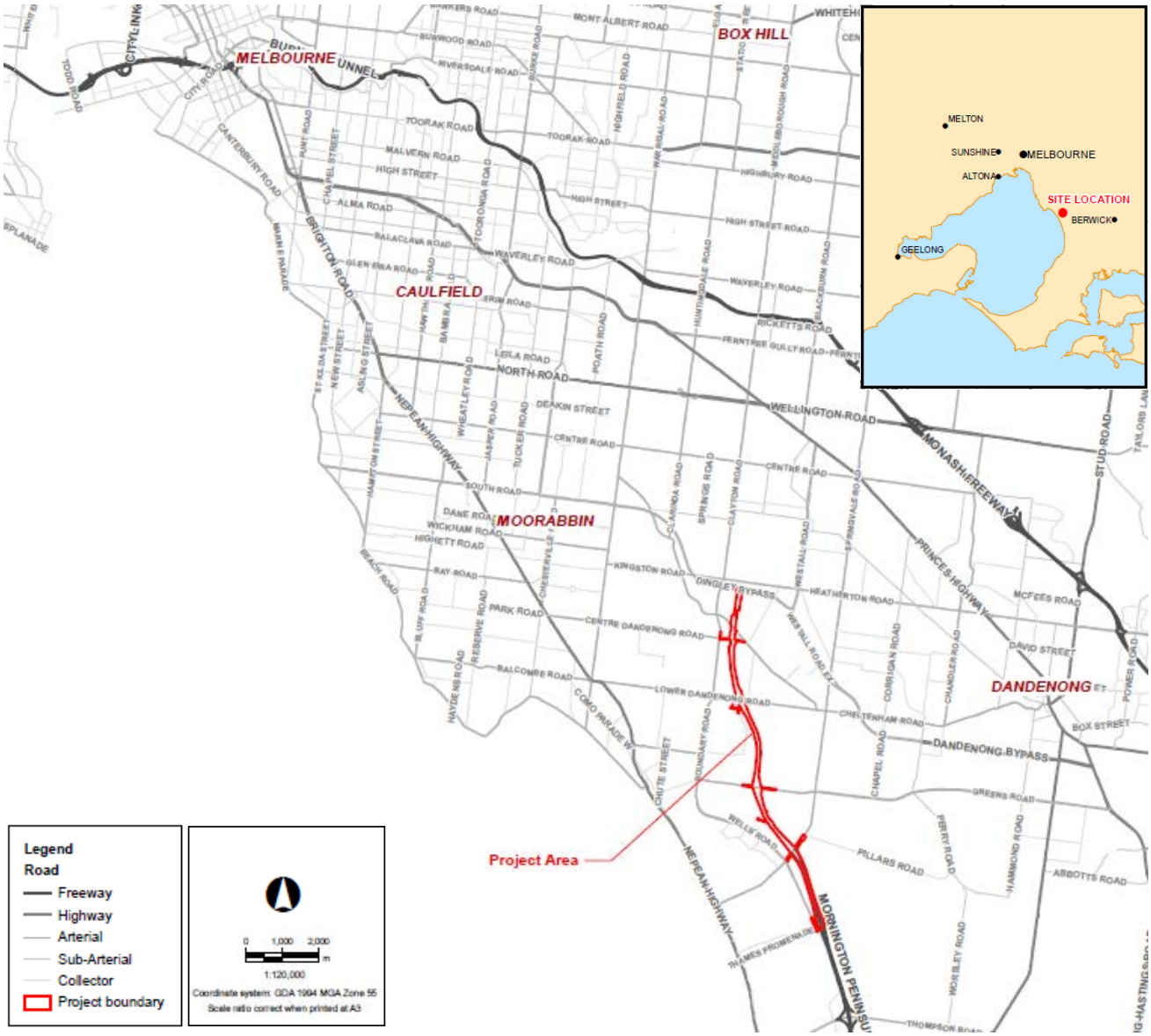


Figure 5.1 Regional study area

5.1.2 LOCAL STUDY AREA

The Mordialloc Bypass spans approximately 9 km between the Dingley Bypass and Dingley Village in the north, to Springvale Road / Mornington Peninsula Freeway and Aspendale Gardens in the south.

In consideration of the Mordialloc Bypass project, the local study area is generally bounded by Dingley Bypass, Springvale Road and Wells Road/Boundary Road.

The extent of the Mordialloc Bypass is shown in Figure 5.2 .

5.1.3 LAND USE

As shown in Figure 5.2, land use adjacent the project is generally a mix of residential, recreational, educational and commercial uses.

The bypass route traverses the suburbs of Aspendale Gardens, Waterways, Braeside and Dingley Village and is characterised by predominantly residential areas at its southern end, public open space in Braeside Park to the east, and industrial estates in Mordialloc and Braeside on its western side.

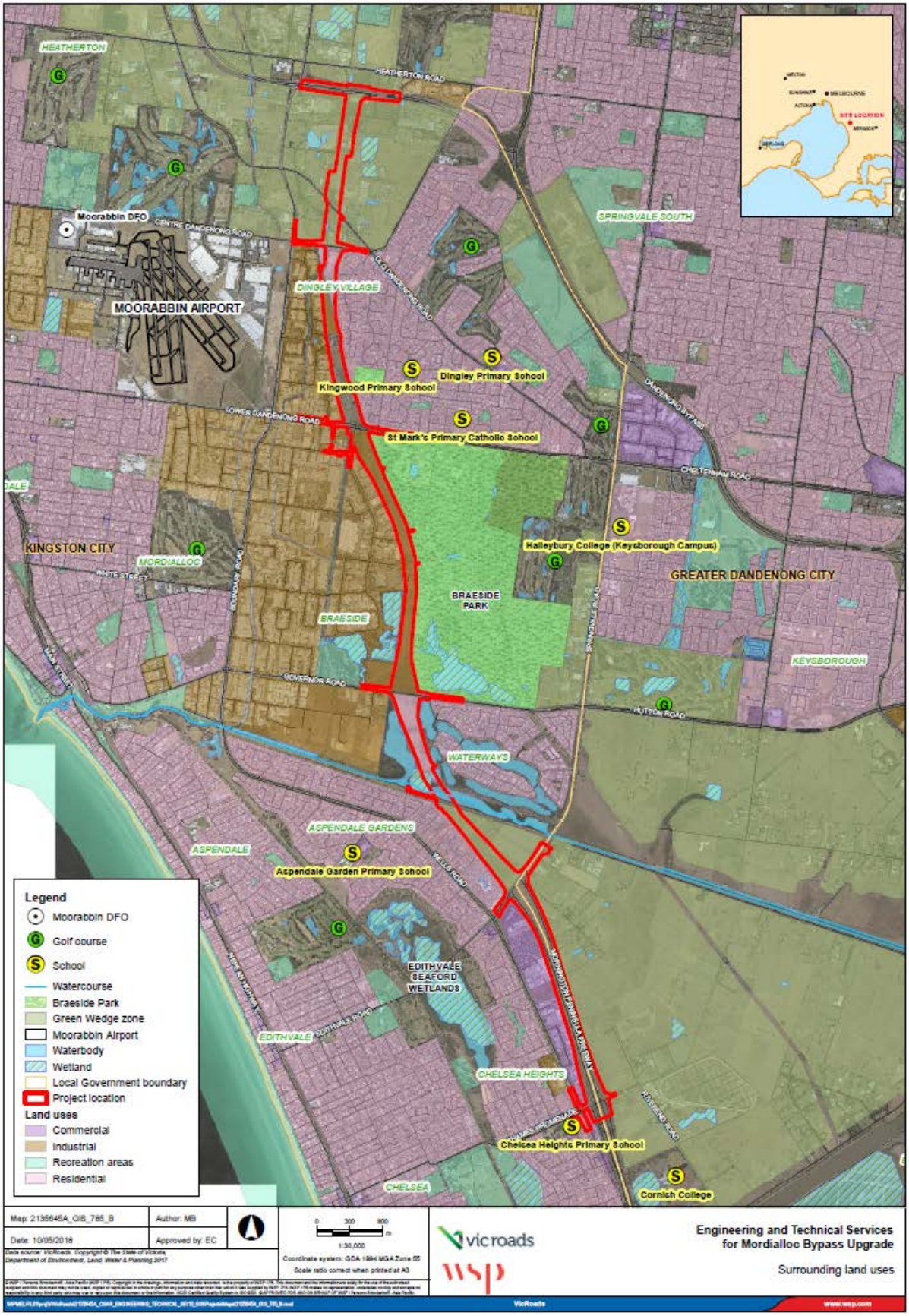
Several schools and educational facilities sit in close proximity to the project. Of note, Aspendale Gardens Primary School is located to the west of Wells Road; Haileybury College (Keysborough Campus) is located along Springvale Road; Cornish College is located in Bangholme, between River End Road and the Mornington Peninsula Freeway; Kingswood Primary School, St Marks Primary Catholic School and Dingley Primary School are all located in Dingley Village. Additionally, several Early Learning Centres and Kindergartens are also located in close proximity to the proposed route.

There are a number of open space areas within the local vicinity of the project. The bypass will pass over the Mordialloc Creek and waterways, and pass alongside Braeside Park. The Edithvale-Seaford Wetlands Environmental Area is also located east of the southern end of proposed bypass, along Edithvale Road.

Residential land use is characterised by a mixture of low and medium density dwellings.

The Woodlands industrial estate is located west of the proposed route, generally bounded by Governor Road and Lower Dandenong Road. The Redwood Gardens Industrial Estate is also located west of the Bypass route, bounded by Lower Dandenong Road, Centre Dandenong Road and Boundary Road.

Moorabbin Airport is located west of the proposed Bypass between Centre Dandenong Road and Lower Dandenong Road. DFO Moorabbin and Kingston Centre Plaza are immediately west of the airport, accessed from Centre Dandenong Road.



Source: VicRoads and Department of Environment, Land, Water & Planning

Figure 5.2 Surrounding land uses and local study area

5.1.4 DEMOGRAPHICS

Demographic information sourced from the Victorian Integrated Transport Model provides an overview of population and employment data within the south-east area, as summarised in Table 5.1.

Table 5.1 Land use demographics by LGA – VITM 2016

LOCAL GOVERNMENT AREA	POPULATION	EMPLOYMENT
Bayside	101,530	33,742
Casey	299,991	69,730
Frankston	137,743	53,150
Greater Dandenong	155,214	101,296
Kingston	156,399	88,797
Knox	157,375	72,770
Monash	187,889	123,554

5.1.5 OTHER TRANSPORT PROJECTS

As part of the ongoing development of the south-east, several transport network projects and improvements works have funding committed and are being undertaking surrounding the study area.

5.1.5.1 LEVEL CROSSING REMOVALS

Construction works to remove the existing railway level crossings at Clayton Road and Centre Road in Clayton are recently completed as part of the Caulfield to Dandenong Level Crossing Removal Project. The works, which are expected to be completed in 2018, see the Cranbourne/Pakenham railway line elevated over Clayton Road and Centre Road, and Clayton Railway Station reconstructed on the new elevated railway tracks. The project also removes level crossings at Chandler Road, Heatherton Road and Corrigan Road in Noble Park; Poath Road in Hughesdale; Murrumbeena Road in Murrumbeena; Koornang Road in Carnegie; and Grange Road in Caulfield East.

The existing Edithvale Road level crossing is proposed to be removed as part of the Southern Program of level crossing removals along the Frankston railway line. An Environment Effects Statement has recently been released for public consultation, with planning approvals scheduled for late 2018. Subject to planning approvals, the project would start construction in 2019. Other level crossings to be removed as part of the Southern Program include Charman Road in Cheltenham; Balcome Road in Mentone; Station Street in Bonbeach; Station Street, Eel Race Road and Mascot Road in Carrum; and Seaford Road in Seaford.

5.1.5.2 MONASH UPGRADE STAGE 1

The upgrade of the Monash Freeway (M1) was funded as part of the Western Distributor project and includes improvements to the Freeway between Chadstone and Pakenham. The following works have been completed as part of this project:

- Installation of Lane Use Management signs (LUMS) and upgrade of ramp signal between Warrigal Road and Eastlink
- Widening of the Freeway from eight to ten lanes between the Eastlink Interchange and the South Gippsland Freeway, and installation of LUMS
- Widening of the Freeway from four to six lanes between the South Gippsland Freeway and Clyde Road
- New and upgraded ramp signals from Clyde Road to Koo Wee Rup Road.

The completion of the project enables the M1 operate as a managed motorway from Werribee to Pakenham, a stretch of approximately 90 kilometres.

5.1.5.3 MONASH UPGRADE STAGE 2

The second stage of the Monash Freeway upgrade has recently been announced by the State Government and will add 36 kilometres of new lanes to the Monash Freeway aimed at easing congestion. It also includes an upgrade of the Old Princes Highway interchange at Beaconsfield and the extension of O'Shea Road in Berwick. The Monash Freeway is likely to be expanded from eight to ten lanes for most of the section between Warrigal Road and Eastlink, and from four to six lanes between Clyde Road and Cardinia Road to the east.

Smart on-road technology has also been proposed along Monash Freeway between the South Gippsland Freeway to the Old Princes Highway interchange, providing lane management capabilities and giving drivers live traffic information.

Detailed planning and design work is currently underway and construction is expected to commence before the end of 2018.

5.1.5.4 SUBURBAN ROADS UPGRADE

The Suburban Roads Upgrade will improve 22 priority roads across Melbourne's outer west, north and south-eastern suburbs. Funded through the Victorian Budget 2018/19, the $4 billion project will upgrade the roads to ease congestion, improving travel times and safety.

The Suburban Roads Upgrade will include duplication and upgrade works to south-eastern arterial roads including:

- Golf Links Road, from Peninsula Link to Baxter-Tooradin Road, and Grant Road, from Baxter-Tooradin Road to Frankston-Flinders Road, Langwarrin South
- Healesville – Koo Wee Rup Road, from Princes Freeway to Manks Road, Pakenham
- Hallam North Road, from Heatherton Road to James Cook Drive, Endeavour Hills
- Lathams Road, from Oliphant Way to Frankston-Dandenong Road, Carrum Downs
- Narre Warren – Cranbourne Road, from Thompsons Road to South Gippsland Highway, Cranbourne
- Pound Road West, new bridge over Cranbourne rail line to connect Pound Road West and Remington Drive, Dandenong South
- Thompsons Road, including signalised intersection upgrades at Dandenong-Frankston Road and Narre Warren – Cranbourne Road.

5.2 ROAD TRANSPORT

5.2.1 ROAD NETWORK

5.2.1.1 OVERVIEW

The Mordialloc Bypass primarily serves to connect the Mornington Peninsula Freeway in the south to the Dingley Bypass in the north. In doing so, the Bypass will cross east-west arterial and through traffic routes.

The road network within the local study area and further afield is a mixture of Declared roads, local roads and private roads.

5.2.1.2 DECLARED ROADS

The Declared roads, under the responsibility of VicRoads, within the local study area are summarised in Table 5.2.

Table 5.2 Declared roads within vicinity of the Bypass

NAME	DESCRIPTION
Dingley Bypass	The Dingley Bypass was completed and opened to the public in March 2016. The Dingley Bypass is an Arterial Highway aligned southeast to northwest from Westall Road in the east to Warrigal Road in the west, where it continues west as South Road. The Dingley Bypass typically provides for three lanes in each direction with auxiliary turning lanes at intersections, and operates with a posted speed limit of 80km/hr. Signalised, at-grade intersections are provided at the intersections of Dingley Bypass with Westall Road, Tootal Road, Boundary Road and Heatherton Road near the proposed Mordialloc Bypass.
Boundary Road	Boundary Road is an Arterial Road aligned north-south from Heatherton Road in the north to Governor Road in the south where it continues as Wells Road. South of Dingley Bypass, Boundary Road provides for two lanes in each direction to Centre Dandenong Road. South of Centre Dandenong Road, Boundary Road provides three lanes to Wells Road where it continues south as Wells Road (two traffic lanes). Along its length, Boundary Road operates with a posted speed limit of 80km/hr. At-grade signalised intersections are provided at the intersections of Boundary Road with Dingley Bypass, Old Dandenong Road, Centre Dandenong Road, Lower Dandenong Road and Malcolm Road. The intersection of Boundary Road with Governor Road is controlled by a metered roundabout.
Wells Road	Wells Road is an Arterial Road aligned northwest to southeast from Boundary Road to Springvale Road and continues south parallel to Mornington Peninsula Freeway to Patterson Lakes. Wells Road typically provides for two lanes in each direction with auxiliary turning lanes at intersections, and operates with a posted speed limit of 80km/hr. Wells Road provides for several unsignalised intersections with local roads, as well as signalised intersections at Narelle Drive, Nurten Parade and Springvale Road adjacent the Mordialloc Bypass corridor.
Old Dandenong Road	Old Dandenong Road is an Arterial Road which historically meandered in a northwest to southeast direction from Warrigal Road in the west to Centre Dandenong Road. Old Dandenong Road terminates at the Dingley Bypass at the northern end. Old Dandenong Road typically provides a single lane in each direction with auxiliary turn lanes at intersections, and operates with a posted speed limit of 60 and 70km/hr.
Governor Road	Governor Road is an Arterial Road aligned east-west between Boundary Road and Springvale Road. West of Boundary Road, Governor Road continues as a local road to Park Street. Governor Road typically provides a single lane in each direction with auxiliary turn lanes at intersections, and operates with a posted speed limit of 70km/hr.
Centre Dandenong Road	Centre Dandenong Road is an Arterial Road aligned east-west from Nepean Highway, Cheltenham to Tootal Road, Dingley Village. East of Tootal Road, Centre Dandenong Road continues southeast past Dingley Village Shopping Centre to Lower Dandenong Road. Centre Dandenong Road typically provides a single lane in each direction with auxiliary turn lanes at intersections, and operates with a posted speed limit of 70km/hr.

NAME	DESCRIPTION
Lower Dandenong Road	Lower Dandenong Road is an Arterial Highway aligned east-west from Nepean Highway to Centre Dandenong Road where it continues as Cheltenham Road. Lower Dandenong Road typically provides two lanes in each direction with auxiliary turn lanes at intersections, and operates with a posted speed limit of 80km/hr.
Westall Road	Westall Road is an Arterial Road aligned north south from Princes Highway in the north to Springvale Road in the south where it continues as the Dandenong Bypass. Westall Road typically provides three lanes in each direction with auxiliary turn lanes at intersections, and operates with a posted speed limit of 80km/hr.
Springvale Road	Springvale Road is an Arterial Highway aligned north-south from Wells Road, Aspendale in the south to Reynolds Road, Doncaster East in the north Springvale Road typically provides two lanes in each direction through the study area with auxiliary turn lanes at intersections, and operates with a posted speed limit of 80km/hr.
Mornington Peninsula Freeway	Mornington Peninsula Freeway extends south from Springvale Road, generally following the coastline, past Frankston through to Boneo Road in Boneo. Mornington Peninsula Freeway typically provides two lanes, and operates with a posted speed limit of 100km/hr.

5.2.1.3 LOCAL ROADS

The following key local roads under the control of City of Kingston also sit within close proximity of the project:

Tootal Road is a local road extending from the roundabout intersection of Centre Dandenong Road / Old Dandenong Road / Kingston Drive / Tootal Road to Heatherton Road in the northeast. Tootal Road provides a single traffic lane in each direction, and operates with a posted speed limit of 70 km/hr. Auxiliary turning lanes are provided at signalised intersections of Dingley Bypass / Tootal Road, and Heatherton Road / Tootal Road.

Tootal Road provides both direct and indirect access to residential dwelling along its length, as well as light commercial / industrial land uses.

Bowen Parkway is a local road which extends northeast from Wells Road, Aspendale Gardens to Waterside Drive, Waterways. Bowen Parkway provides a single traffic lane in each direction and operates at a posted speed limit of 50km/hr.

Bowen Parkway also provides the sole access to the Waterways Estate from the east (further access points Waterways are provided on Springvale Road and Governor Road). Indirect access to residential dwellings within the Waterways Estate is provided via Bowen Parkway.

Woodlands Drive is a local road aligned north-south between Lower Dandenong Road in the north to Malcolm Road in the south. Woodlands Drive provides a single traffic lane in each direction, and operates on a posted speed limit of 60 km/hr.

The intersection of Lower Dandenong Road and Woodlands Drive is signalised.

Woodlands Drive bisects the Woodland Industrial Estate and provides direct access to several industrial and commercial properties along its length, and is designed to facilitate to movement of large vehicles with a large carriageway width.

Howard Road is a local road aligned north-south between Centre Dandenong Road in the north and Lower Dandenong Road in the south. Howard Road provides a single traffic lane in each direction and operates at a posted speed limit of 60 km/hr.

The intersections of Howard Road with both Centre Dandenong Road and Lower Dandenong Road are controlled by traffic signals.

Howard Road provides both direct and indirect access to residential dwellings and well as access to Chadwick Reserve.

Tarnard Drive is a local road which extends east from Boundary Road. Tarnard Drive provides a single traffic lane in each direction, and provides direct and indirect access to industrial properties within the Woodlands Industrial Estate.

Bell Grove is a local road aligned north-south from Tarnard Drive to Lower Dandenong Road providing one lane in each direction along its length.

The intersection of Lower Dandenong Road and Bell Grove is unsignalised and the existing provision of a wide median on Lower Dandenong Road restricts this access to left-in / left-out.

Redwood Drive is a local road which extends east from Boundary Road, turning 90 degrees to continue south to Lower Dandenong Road. Redwood Drive provides access to industrial properties within the Redwood Gardens Industrial Estate.

The intersection of Lower Dandenong Road and Redwood Drive is a fully directional priority controlled intersection with a wide median to facilitate a staged right turn (out of Redwood Drive). A similar arrangement is provided for the intersection of Boundary Road / Redwood Drive, which is also fully directional and priority controlled.

Redwood Drive typically provides a single lane in each direction, with kerbside parallel parking.

Thames Promenade is a local road which extends from Station Street, Chelsea to Riverend Road, Bangholme. It has southerly access to the Mornington Peninsula Freeway (i.e. to and from Frankston) and services predominantly residential land uses west of the freeway and agricultural land east of the freeway. It provides a single traffic lane in each direction and generally operates at a posted speed limit of 60 km/hr, with the exception of a 40 km/hr school zone west of Wells Road. It is noted that the section of Thames Promenade between Wells Road and the Mornington Peninsula Freeway southbound entry ramp is declared as an arterial road.

5.2.1.4 KEY INTERSECTING ROADS

The proposed Mordialloc Bypass corridor is generally aligned north – south from Dingley Bypass in the north to Springvale Road in the south. As such, the Bypass will traverse a number of major east-west roads, where intersection treatments will need to be considered. A summary of the key east-west roads which the Bypass corridor traverses is provided in Table 5.3.

Table 5.3 Existing cross-section configurations along Mordialloc Bypass corridor

NAME	SPEED LIMIT	TRAFFIC CROSS-SECTION	BICYCLE PROVISION	PEDESTRIAN PROVISION	PUBLIC TRANSPORT PROVISION
Dingley Bypass	80 km/hr	3 lanes each direction	Shared off-road path on northern side		None
Old Dandenong Rd	70 km/hr	1 lane each direction	None	None	None
Centre Dandenong Rd	70 km/hr	1 lane each direction	Off road shared path on southern side		Bus Route 828
Lower Dandenong Rd	80km/hr	3 lanes each direction & auxiliary turning lanes at Woodlands Drive	Off road shared path on northern side		Bus Routes 811, 812
Governor Road	80 km/hr	1 lane each direction	None	None	Bus Route 709
Bowen Parkway	50 km/hr (default)	1 lane each direction	Off road shared path on southern side		None

NAME	SPEED LIMIT	TRAFFIC CROSS-SECTION	BICYCLE PROVISION	PEDESTRIAN PROVISION	PUBLIC TRANSPORT PROVISION
Springvale Road	80 km/hr	3 lanes northbound, 2 lanes southbound & auxiliary turning lanes	On road bike lane on northern side	None	Bus Route 902
Thames Promenade	60 km/hr	1 lane each direction	None	None	None

Additionally, Woodlands Drive is aligned in a north-south direction and runs parallel to the proposed Bypass corridor approximately to 145m the west of the proposed bypass. As Woodlands Drive intersects with Lower Dandenong Road its alignment falls within the scope of the proposed bypass.

5.2.2 INTERSECTION CONTROLS

Intersection control in the immediate vicinity of the Bypass corridor is a mixture of signalised interchanges, signals, roundabouts and unsignalised intersections.

The intersection controls in the local study area bounded by Dingley Bypass, Boundary Road, Wells Road, Springvale Road are identified in Figure 5.3.

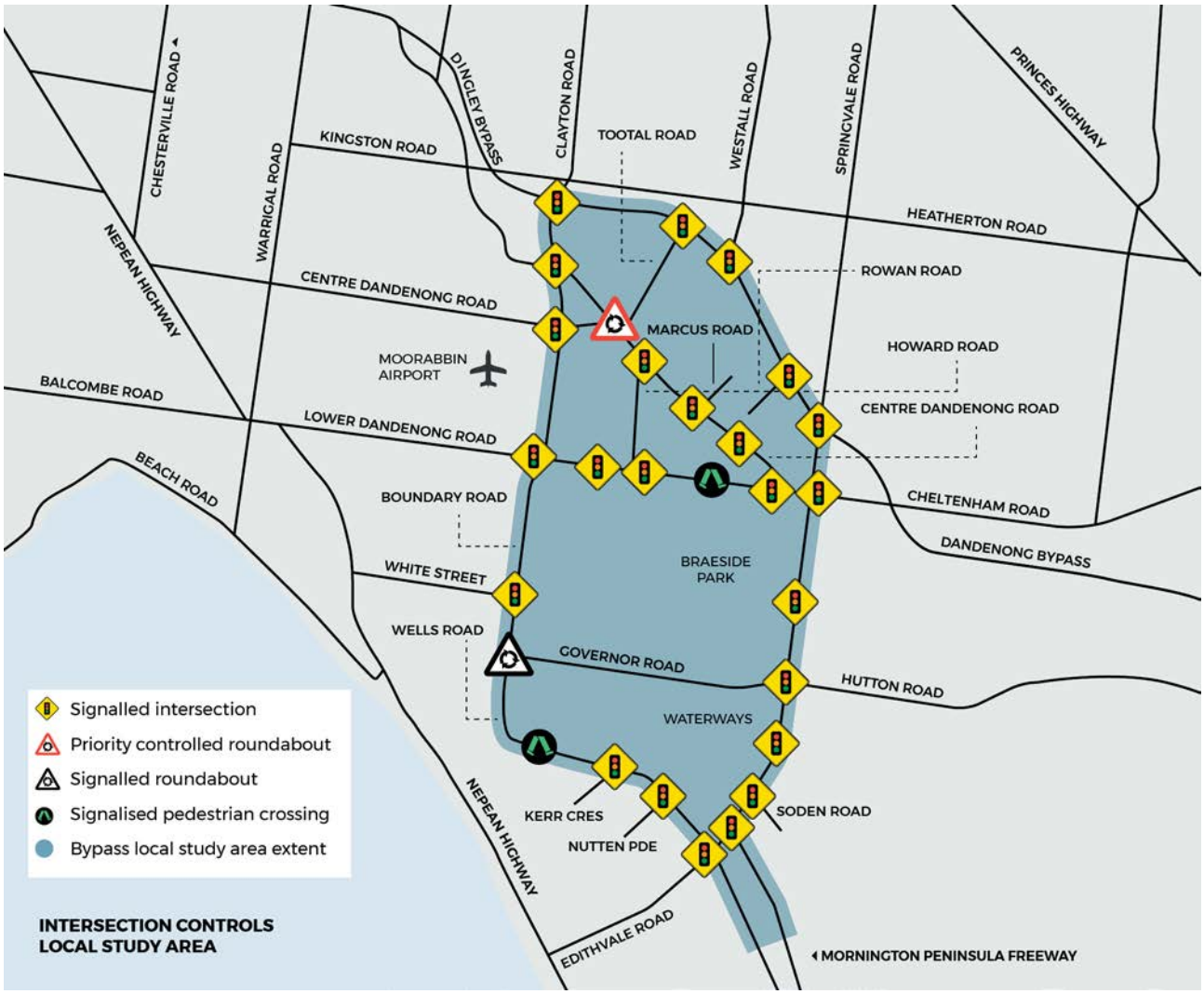


Figure 5.3 Intersection controls – local study area

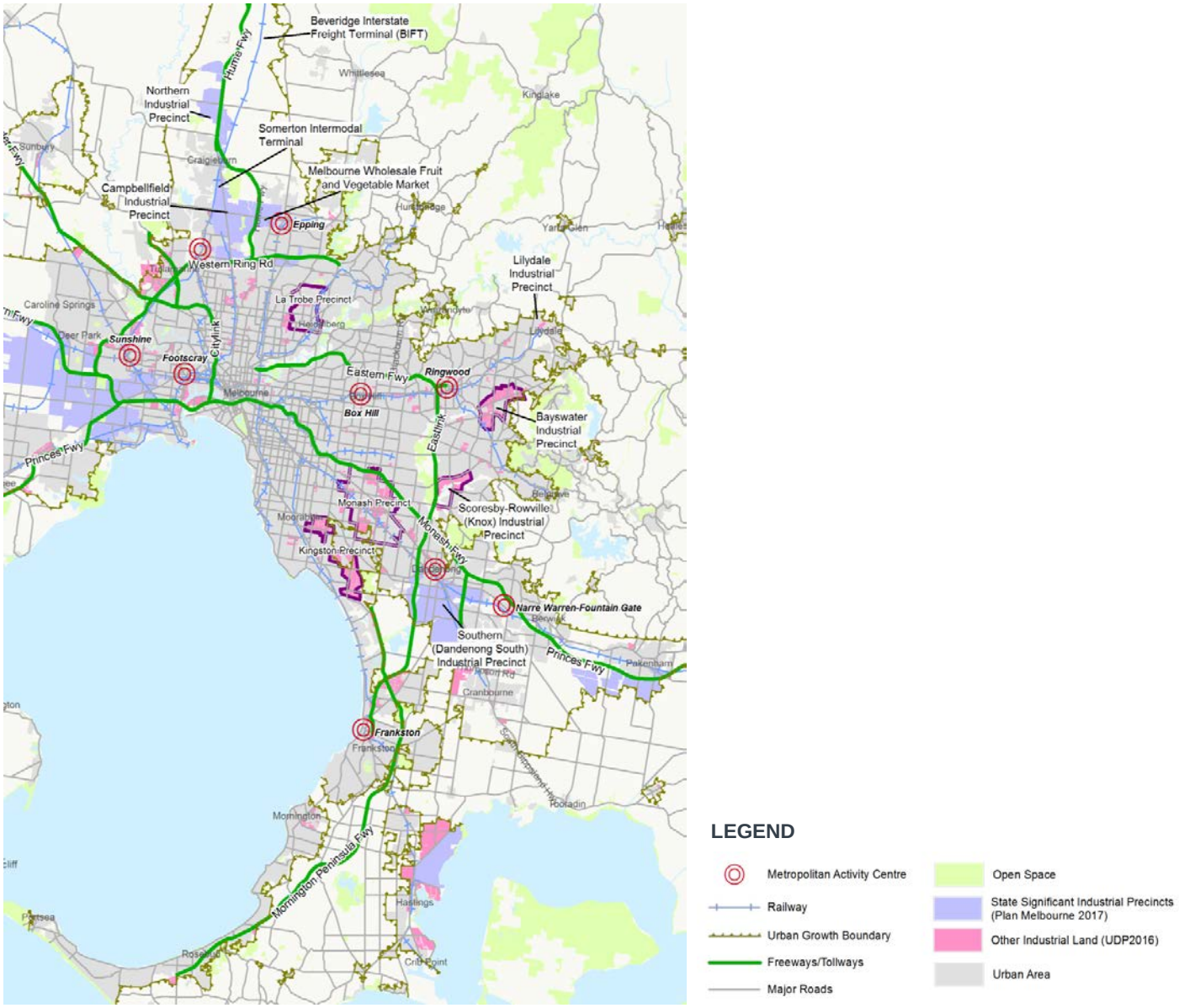
5.2.3 FREIGHT

5.2.3.1 REGIONAL CONTEXT

Mornington Peninsula Freeway and the arterial roads within the study area form part of the Principal Freight Network, distributing to and from local and inter-regional destinations. Mornington Peninsula Freeway is envisaged to be the southern freight corridor that facilitates the Metropolitan Melbourne and Regional Victoria freight demand over the next 30 years which is anticipated to grow at an average annual rate of 2.6% and 1.5% per annum respectively.

The Woodlands and Redwood Gardens Estates and surrounding industrial areas form part of the Kingston Industrial Precinct. Further to the north of the study area is the Monash National Employment and Innovation Cluster.

The key industrial areas in the context of Victoria are shown in Figure 5.4.

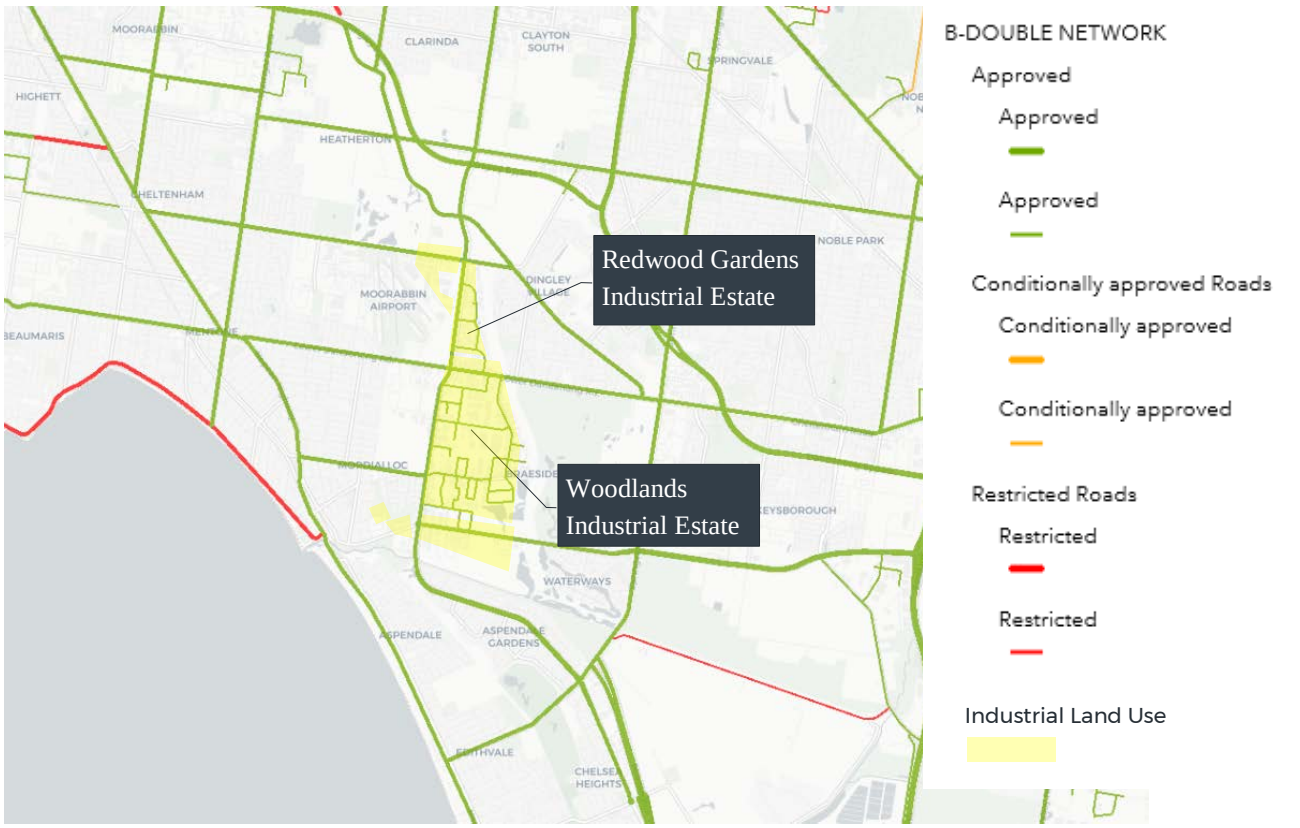


Source: Department of Economic Development, Jobs, Transport and Resources, Transport analysis and Assessment Branch, 28/03/2017

Figure 5.4 Key industrial areas Victoria

5.2.3.2 LOCAL FREIGHT MOVEMENT NETWORK

The VicRoads gazetted B-Double Network surrounding the site is shown in Figure 5.5, which identifies all arterial roads within the local area, as well as local roads within the Woodlands and Redwood Gardens industrial estates are approved for B-double vehicles. The freight route classification highlights the importance of freight connection throughout the study area. Table 5.4 presents the percentages of heavy vehicles based on average weekday daily traffic volumes for roads surrounding the project area.



Source: VicRoads

Figure 5.5 Gazetted b-double network

5.2.4 ROAD NETWORK PERFORMANCE

5.2.4.1 TRAFFIC VOLUMES

Traffic volume data was obtained at various locations in the study area. The tube count data provides continuous 24 hour counts of traffic passing through midblock locations that inform the traffic volume profile across the day and heavy vehicle proportion on key road links. The AM and PM peak period volumes as well as heavy vehicle percentages for each of the tube count locations are summarised in Table 5.4.

The survey traffic volumes show Mornington Peninsula Freeway, south of Springvale Road, catering for a high peak hour demand of traffic through the local area. Westall Road also accommodates a significant component of traffic flows west of Springvale Road (~5,000 veh/hour during both AM and PM peak), reducing along Dingley Bypass toward the city (~ 4,000 veh/hour during both AM and PM peak).

White Street carries a notable component of network traffic flows with approximately 2,000 veh/hour carried by a single traffic lane in each direction.

Table 5.4 Traffic volume and classification

ROAD	BETWEEN	TWO-WAY TRAFFIC DATA		
		DAILY HEAVY VEHICLES PROPORTION	AM PEAK VOLUME (ALL VEHICLES) 8AM-9AM	PM PEAK VOLUME (ALL VEHICLES) 5PM-6PM
Dingley Bypass	South of Heatherton Road	8.6%	4,000	3,800
	Boundary Rd and Tootal Road	9.1%	3,200	3,100
Springvale Road	South of Heatherton Road	3.1%	2,900	2,800
Centre Dandenong Rd	Boundary Rd and Federation Way	5.8%	2,400	2,400
	Boundary Rd and Tootal Road	7.4%	1,200	1,400
Old Dandenong Rd	South of Kingston Road	12.5%	700	600
	Boundary Rd and Tootal Road	6.7%	600	500
Lower Dandenong Rd	West of Centre Dandenong Road	9.8%	3,600	3,400
Boundary Road	North of White Street	6.5%	3,100	3,100
White Street	East of Chute Street	7.3%	2,200	1,900
Tarnard Dr	East of Downward Street	16.5%	100	100
Garden Boulevard	North of Redwood Dr	11.1%	200	100
Redwood Drive	East of Boundary Road	18.5%	100	100
Westall Road	Spring Road and Springvale Road	11.1%	5,000	5,200
Mornington Peninsula Freeway[1]	Springvale Road and Thames Promenade	5.0%	4,600	4,700
Wells Road[1]	North of Sanctuary Place	11.8%	3,500	3,200
Governor Road[1]	Boundary Road to Bate Dr	11.6%	2,100	1,900
Thames Promenade	East of Mornington Peninsula Freeway	6.2%	533	371

(1) March 2016 counts

Source: traffic counts 2016/2017

5.2.4.2 VEHICLE COMPOSITION

As noted in Table 5.4, local roads such as Tarnard Drive and Redwood Drive surrounding the Woodlands and Redwood Gardens industrial estates have a relatively higher proportion of vehicles compared to the arterial roads with surveys showing heavy vehicles proportions higher than 15 per cent.

A further breakdown of vehicle composition for key arterial roads in the study area has been reviewed based on the AM and PM peak hour traffic flow associated with a range of vehicle types as per Austroads classifications. The vehicle composition breakdown shows typical heavy vehicle composition between 2.5 and 12.1 per cent on the arterial roads, depending on the location and direction. Two-axle trucks (incl. buses) are the dominant heavy vehicle types within the study area with three and six-axle articulated trucks sharing a notable composition of the total number of heavy vehicles.

5.2.4.3 TRAFFIC PROFILE

The daily traffic profiles informed by traffic surveys are presented in Figure 5.6. The traffic profiles show typical suburban characteristics, with a pronounced AM peak period between 7am - 9am and PM peak between 4pm - 6pm.

Northbound and westbound movements are typically dominant in the AM peak period, with the reverse being southbound and eastbound movement dominate in the PM peak period. White Street is the main exception to this general trend which exhibits a constant profile throughout the day in both directions.

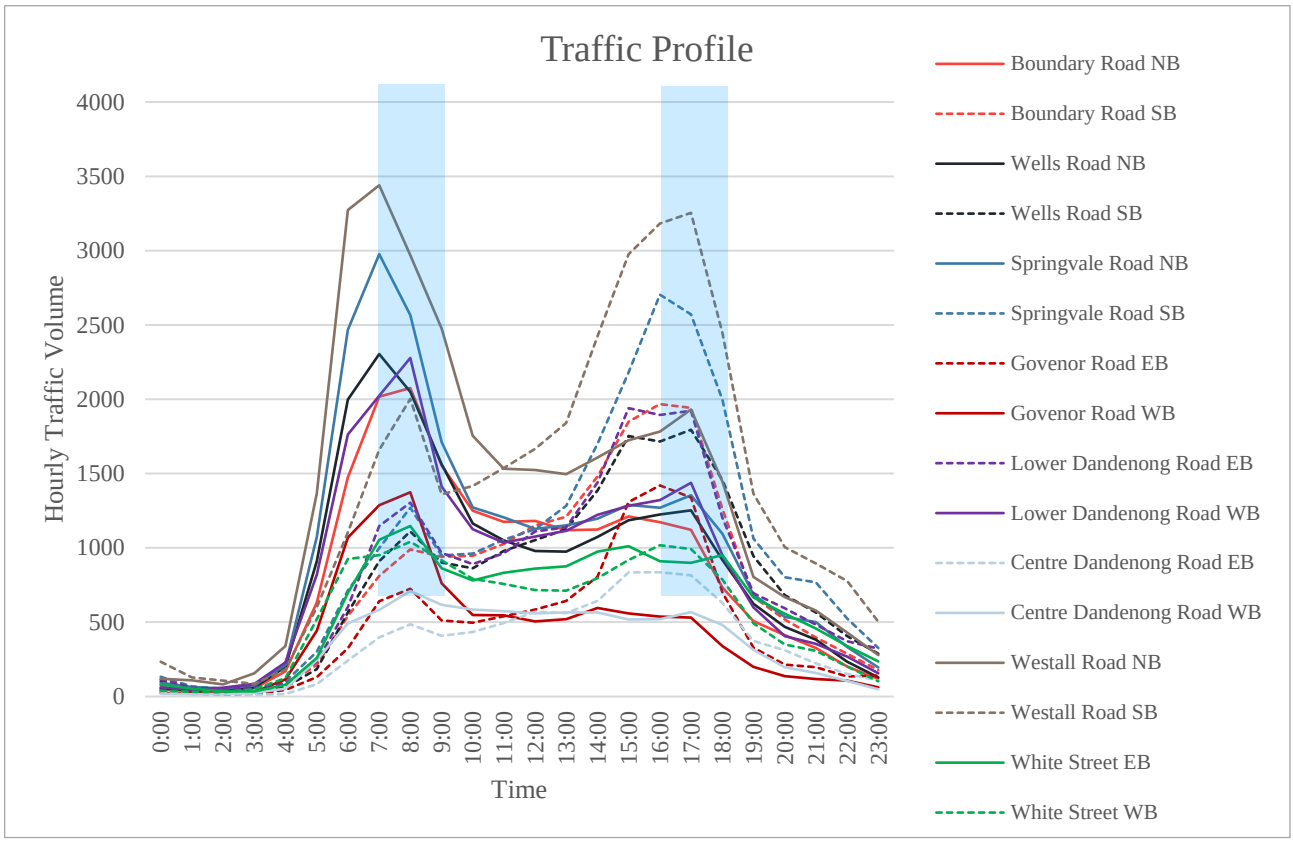


Figure 5.6 Traffic profile of surrounding roads

5.2.5 TRAVEL TIMES

5.2.5.1 ROUTE DELAY

Travel time surveys on various routes throughout the study area were undertaken in 2016 and 2017 to provide an understanding of key areas of congestion and variability in travel time during peak travel periods. Surveys were undertaken using the floating car survey methodology in which a number of survey vehicles, each fitted with GPS trackers, travelled designated routes repeatedly throughout the AM and PM peak periods, continuously recording travel time and location information. The routes surveyed are shown in Figure 5.7 with the results summarised in Table 5.5.

A high degree of variability in delay between typical conditions and congested conditions was prevalent through the area, with the average variability (the percentage difference between the fastest travel time and the slowest travel time) across all routes being 83% and ranging from 50% to 172%. In particular, the White Street - Governor Road – Greens Road corridor was shown to experience notable congestion impacts with the slowest travel time run for the corridor taking around twice as long as the fastest time in both peaks. Additionally, the eastbound journey along this route is on average 12 minutes longer depending on the time of day (average journey 21 minutes in the AM, 33 minutes in the PM).

The Springvale Road northbound route was shown to exhibit a very high degree of variability with the slowest trip (31min) equal to around three times fastest trip (11min).

ROUTE	FROM	TO
White Street / Governor Road	Nepean Highway	South Gippsland Highway
	South Gippsland Highway	Nepean Highway
Centre Dandenong Road	Lower Dandenong Road	Nepean Highway
	Nepean Highway	Lower Dandenong Road
Nepean Highway	McCleod Road	South Road
	South Road	McCleod Road
Mornington Peninsula Freeway / Boundary Road	Dingley Bypass	Thompson Road
	Thompson Road	Dingley Bypass
South Road to Dandenong Bypass	Nepean Highway	South Gippsland Highway
	South Gippsland Highway	Nepean Highway
Springvale Road	Nepean Highway	Heatherton Road
	Heatherton Road	Nepean Highway
Lower Dandenong Road	Lower Dandenong Road	Cheltenham
	Cheltenham	Lower Dandenong Road

Figure 5.7 Travel time survey coverage

Table 5.5 Travel times along key routes

ROUTE	FROM	TO	AVERAGE TRAVEL SPEED (KM/HR)		AVERAGE TRAVEL TIME (MIN)		FASTEST TIME (MIN)	SLOWEST TIME (MIN)	OBSERVED DELAY (MIN)	VARIABILITY
			AM	PM	AM	PM				
Lower Dandenong Road	Nepean Hwy	Bridge Rd	44	37	14:45	17:17	11:54	21:12	09:18	78%
	Bridge Rd	Nepean Hwy	31	35	20:23	18:32	15:09	26:23	11:14	74%
White Street / Governor Rd	Nepean Hwy	Sth Gippsland Hwy	41	26	20:49	32:40	17:30	37:59	20:29	**117%**
	Sth Gippsland Hwy	Nepean Hwy	35	32	24:21	26:25	20:18	40:04	19:46	**97%**
Centre Dandenong Rd	Nepean Hwy	Lower Dandenong Rd	38	33	13:14	15:07	10:46	19:16	08:30	79%
	Lower Dandenong Rd	Nepean Hwy	36	32	13:50	15:23	10:35	18:54	08:19	79%
Nepean Hwy	McCleod Rd	South Rd	44	44	24:34	24:52	19:31	29:14	09:43	50%
	South Rd	McCleod Rd	47	38	22:57	28:54	20:07	35:07	15:00	75%
Mornington Peninsula Fwy / Boundary Rd	Thompson Rd	Dingley Bypass	48	55	18:03	15:49	13:59	22:06	08:07	58%
	Dingley Bypass	Thompson Rd	57	43	15:14	20:07	13:40	26:46	13:06	**96%**
South Rd to Dandenong Bypass	Nepean Hwy	Sth Gippsland Hwy	48	43	25:43	28:53	22:15	34:30	12:15	55%
	Sth Gippsland Hwy	Nepean Hwy	42	45	28:59	27:37	22:33	36:13	13:40	61%
Springvale Road	Nepean Hwy	Heatherton Rd	36	39	16:23	15:08	11:57	20:51	08:54	74%
	Heatherton Rd	Nepean Hwy	38	29	15:44	20:37	11:18	30:45	19:27	**172%**

Source: 2016/2017 surveys

5.2.6 OPERATING SPEEDS

Reduced operating speeds are prevalent during the AM and PM commuter peak periods, in particular on approach to intersections. Heavily congested routes and slow points are typically mirrored across peak periods within the study area. For example, the northbound 'dog leg' movement from Mornington Peninsula Freeway to Wells Road via Springvale Road is slow moving during the morning commute, whereas the opposite, southbound movement from Wells Road to Mornington Peninsula Freeway is heavily congested during the PM commuter peak.

Link speed plots, as recorded by travel time surveys in 2016 and 2017 during the AM and PM commuter peak hours are illustrated and discussed in Source: Floating car surveys 2016/2017

Figure 5.8 and Figure 5.9.

- AM Peak Hour speed plots show low operating speeds across the network, with speeds between 0-19km/hr and 20-39km/hr common.
- Slow operating speeds are recorded on Wells Road northbound from the Wells Road / Governor Road roundabout intersection, extending back to Springvale Road. This congestion in turn impacts on the heavy 'dog leg' movement further south, from Mornington Peninsula Freeway northbound to Wells Road northbound.
- Congestion for northbound traffic on both Wells Road/Boundary road and Springvale Road is typical, worsening on approach to intersections, prevalent from Mornington Peninsula Freeway up to Dingley Bypass/Westall Road.
- Eastbound routes commonly operate at 0-19km/hr across the study area, with slower speeds more common toward Nepean Highway.

Source: Floating car surveys 2016/2017

Figure 5.8 AM commuter peak (8am-9am) link speed plots

- PM Peak Hour speed plots show low operating speeds across the network, with typical speeds between 0-19km/hr and 20-39km/hr.
- Slow operating speeds recorded surrounding the Wells Road / Governor Road roundabout intersection, extending north and east from the intersection.
- Heavy congestion southbound around the 'dog leg' movement from Wells Road southbound to Mornington Peninsula Freeway southbound.
- Congestion for southbound traffic on both Wells Road / Boundary Road and Springvale Road typical, worsening on approach to intersections, extending from Dingley Bypass / Westall Road to Mornington Peninsula Freeway.
- East-west routes slow in both directions across the study area.

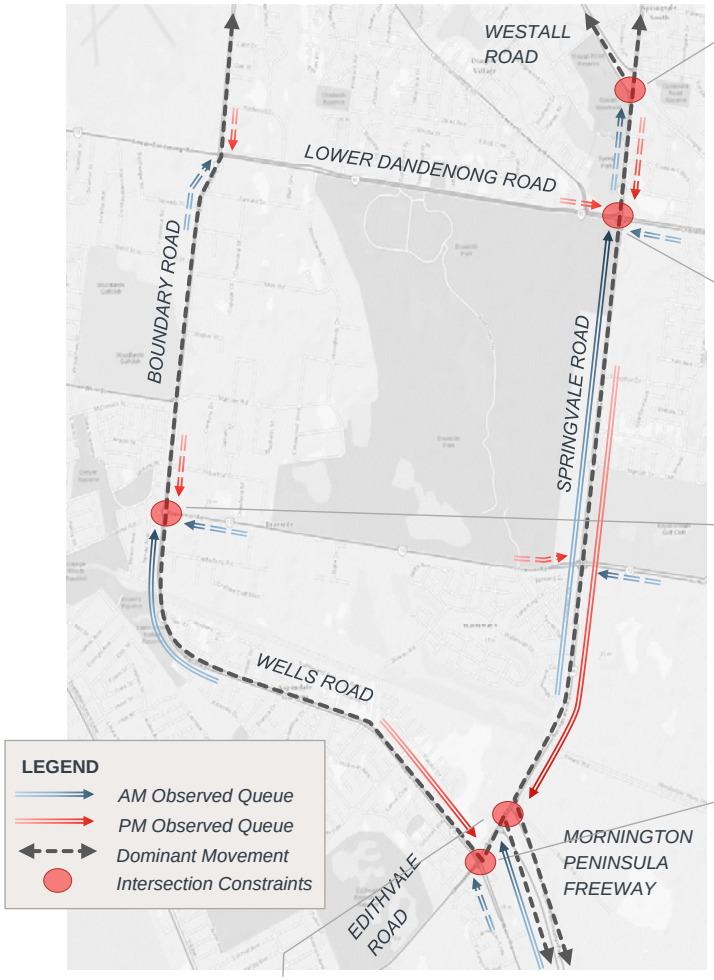
Source: Floating car surveys 2016/2017

Figure 5.9 PM commuter peak (5pm-6pm) link speed plots

5.2.7 KEY MOVEMENT CONSTRAINTS

The Mornington Peninsula Freeway is a state-significant corridor that provides the southern and bayside suburbs access into key employment clusters in the CBD, Monash and Dandenong. Its coverage extends from the Mornington Peninsula and terminates at Springvale Road in Aspendale Gardens. A significant proportion of freeway traffic is then distributed onto or attracted from two primary arterials, along Wells Road - Boundary Road and Springvale Road. From a wider network perspective, most vehicle trips channel through White Street and Lower Dandenong Road towards Nepean Highway; and Westall Road towards the Monash Freeway.

Origin-destination survey surveys were undertaken at the Springvale Road terminus of Mornington Peninsula Freeway on 22nd March 2017. The survey data indicates that 40 per cent of vehicle movements from the end of the Mornington Peninsula Freeway are distributed to Wells Road heading north along Boundary Road and 59 per cent along Springvale Road during the AM peak period between 7:30am to 8:30am, with the remaining portion of traffic distributed towards Edithvale Road and Wells Road south of Springvale Road. Across the PM peak period between 4:30pm and 5:30pm, a similar proportion of vehicle movements turn onto the Mornington Peninsula Freeway from Wells Road north of Springvale Road (36 per cent), Springvale Road (58 per cent) and with the remaining portion of traffic generated from Edithvale Road and Wells Road south of Springvale Road. The dominant network movements and key constraints are illustrated in Figure 5.10 below. The high demands along these north-south corridors put significant pressures on the major intersections that service the surrounding residential and industrial precincts and competing cross regional movements.



Westall Road / Dingley Arterial / Springvale Road Intersection Constraints

- Competing cross regional movements along Westall Road and Dingley Arterial
- Right turn bans have recently been implemented at Springvale Road approaches during peak periods to accommodate key vehicle movements

Lower Dandenong Road / Springvale Road Intersection Constraints

- Competing east-west movements along Lower Dandenong Road
- Northbound traffic queue extends beyond The Waterways Boulevard in the AM peak

Boundary Road / Governor Road Roundabout Constraints

- Traffic at the east approach along Governor Road is currently metered in the AM peak to minimise the impedance on the dominant northbound traffic movement
- Even with metering in place, northbound traffic queue can extend further than one kilometre

Wells Road / Edithvale Road /Springvale Road Intersection Constraints

- Inadequate right turn lane storage capacity at Edithvale Road and Wells Road approaches impacting on through movements during AM peak
- Insufficient lane capacity to facilitate PM peak movements from Wells Road to Mornington Peninsula Freeway
- Outbound traffic further impacted by downstream queueing conditions at MPF / Springvale Road
- Excessive outbound traffic queue along Wells Road extends from Springvale Road to and beyond Palm Grove Boulevard, at approximately 1.5 kilometre in length during PM peak.

Mornington Peninsula Freeway /Springvale Road Freeway Interchange / Terminal

- Citybound traffic queue extends from Springvale Road at approximately one kilometre due to inadequate left turn lane capacity and geometric delay induced by the terminal arrangement in the AM peak period
- Outbound congestion along Mornington Peninsula Freeway impacts on Springvale Road operation causes traffic to queue back beyond Governor Road

Figure 5.10 Key constraints overview

There are several deficiencies that currently exist along the key connecting roads associated with network configuration and intersection constraints that impact on the vehicle movements resulting in delays and crash risks.

5.2.8 DISJOINTED CONNECTION AND INEFFICIENT LOCAL NETWORK ARRANGEMENT

As illustrated in Figure 5.11, a significant proportion of vehicles travel between Mornington Peninsula Freeway and Wells Road throughout the AM and PM peak. Under current AM peak conditions, the high volume of traffic heading northbound is facilitated by a single left turn lane from the Mornington Peninsula Freeway terminal which yields to southbound traffic on Springvale Road. The single left turn provides insufficient capacity to channel the key network movements onto Springvale Road causing traffic to queue for approximately one kilometre along Mornington Peninsula Freeway, thus impacting on the adjacent right turn performance. Following the left turn, motorists then arrive at the Wells Road / Springvale Road intersection to complete a right turn onto Wells Road via a fully controlled (signalised) triple right turn arrangement. The short distance available along Springvale Road between Mornington Peninsula Freeway and Wells Road limits the storage available for the high right turn flow. To manage this demand with the storage available, the dominant right turn flow at Wells Road intersection is allocated a large portion of signal phase time impacting on movements at other approaches (approximately 40 seconds out of a cycle time of 130 seconds which equates to 30 per cent of the total signal cycle time – where typically right turn phases would be provided a lower proportion of cycle time compared to through phases).

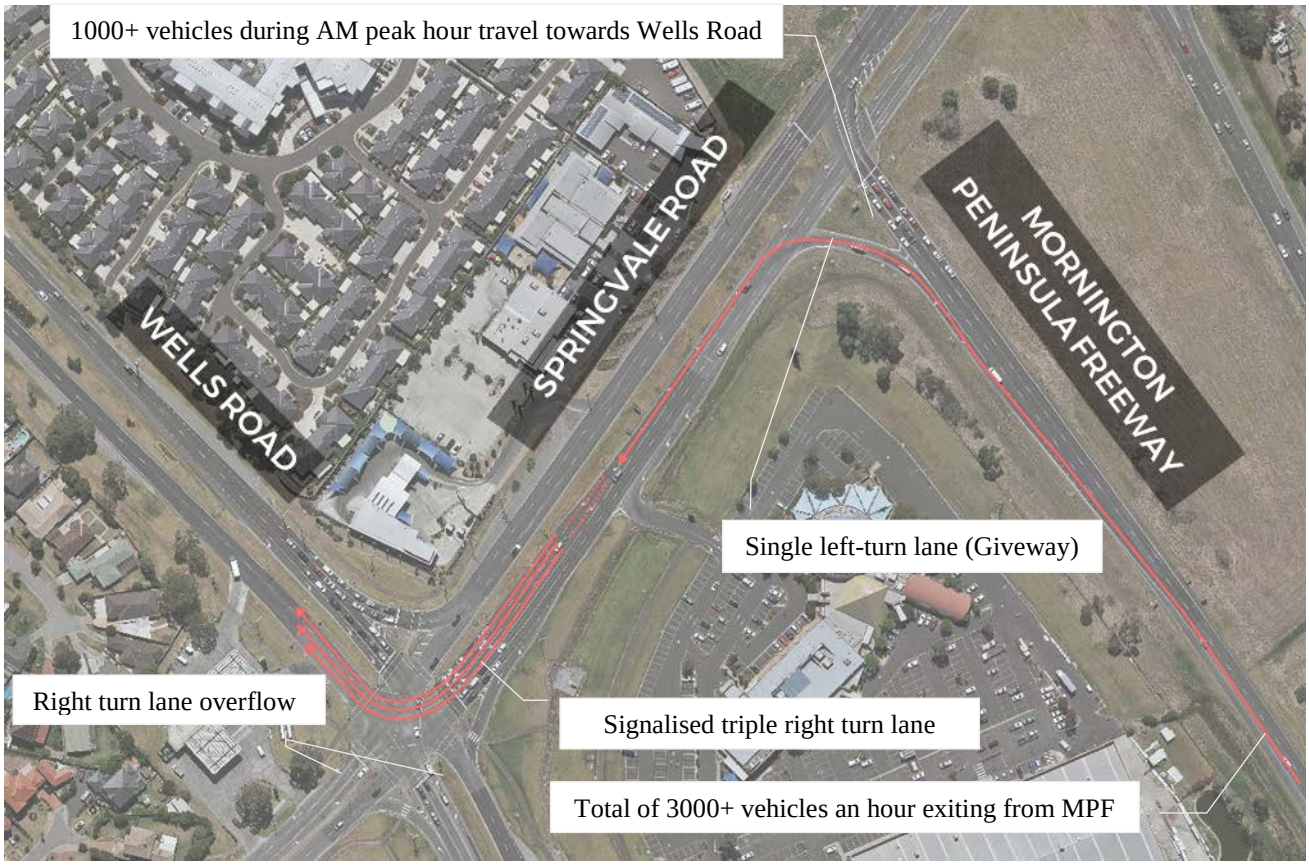


Figure 5.11 AM Peak local network structure

In the PM peak period, the opposing southbound flow travels via a signalised double left turn lane where one of the lanes is currently shared with the southbound through movement at the north approach of the Wells Road and Springvale Road intersection. Figure 5.12 and Figure 5.13 shows the current lane configuration on the approach. Because of this configuration and limited capacity, the left turn movement can be occasionally blocked by through vehicles due to the shared arrangement or vice versa. The limited capacity causes excessive traffic queues along Wells Road up to and beyond 1.5 kilometre past Palm Grove Boulevard with an observed average speed of approximately 20km/hr (standstill condition).

Figure 5.12 Lane use destination sign on Wells Road approaching Springvale Road

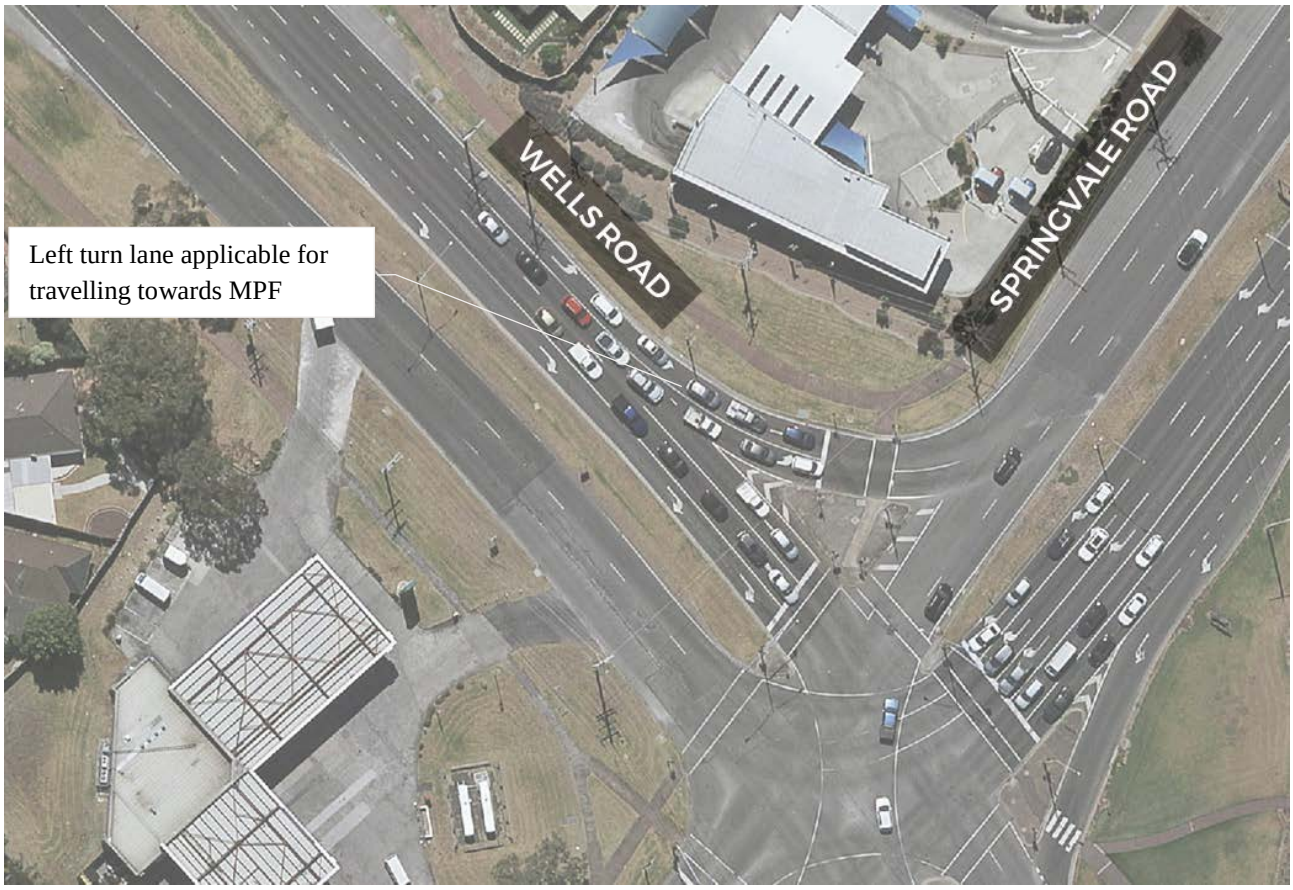


Figure 5.13 Lane configuration at Wells Road northern approach

Following this left turn movement, outbound traffic heading towards Mornington Peninsula Freeway is facilitated by an unconventional dedicated right turn lane and shared right and through lane arrangement at Mornington Peninsula Freeway and Springvale Road interchange, refer to Figure 5.14. The current arrangement could lead to driver confusion and induce the risk of rear end crashes with through traffic on the shared right and through lane often blocked by right turn traffic waiting to complete the turn onto the freeway. The congested conditions along Wells Road, and disjointed lane connection between the double right turn lane arrangement along Springvale Road and the double left turn at Wells Road northern approach, encourages motorists to disobey the intended lane use in an attempt to overtake vehicles utilising the designated traffic lane.

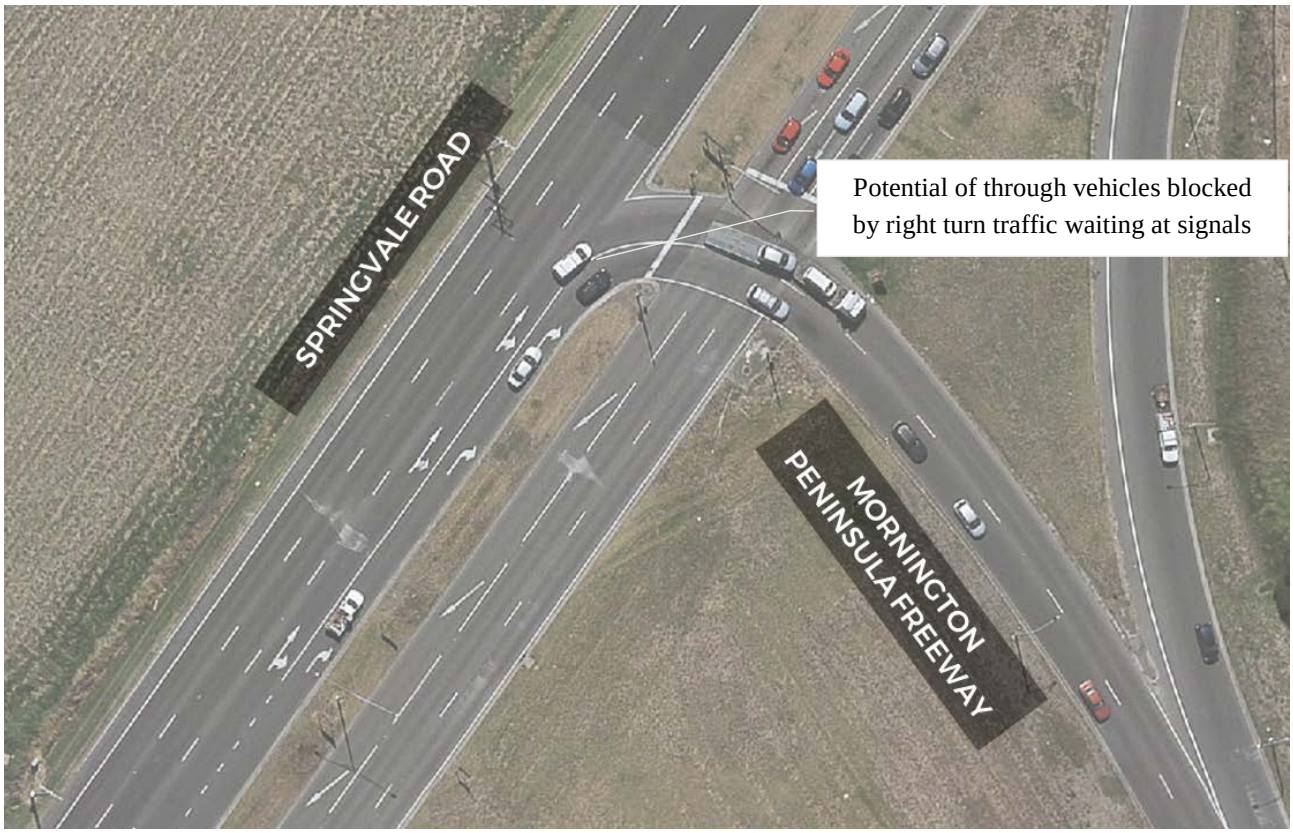


Figure 5.14 Springvale Road / Mornington Peninsula Freeway South-West Approach Configuration

The dominant 'dog leg' movements in the AM and PM peaks are relatively similar at approximately 1,000 vehicles per hour but are accommodated by vastly different and imbalanced road configurations in each direction. It should be noted that the nature of geometric delays associated with left and right turn manoeuvres further impact on the identified key network movements.

5.2.8.1 MORNINGTON PENINSULA FREEWAY

Site investigations were undertaken in March 2017 to understand the local operating conditions. These investigations revealed substantial congestion and queuing impacts arising from congestion on the Mornington Peninsula Freeway. There is a significantly higher utilisation of the left lane along Mornington Peninsula Freeway in the inbound direction near the Springvale Road terminal during the AM peak period. Queues extends to approximately 1km from Springvale Road intersection, refer to Figure 5.15.

Figure 5.15 AM Peak Hour: Observed imbalanced lane utilisation and queuing along Mornington Peninsula Freeway in the inbound direction

5.2.8.2 WELLS ROAD

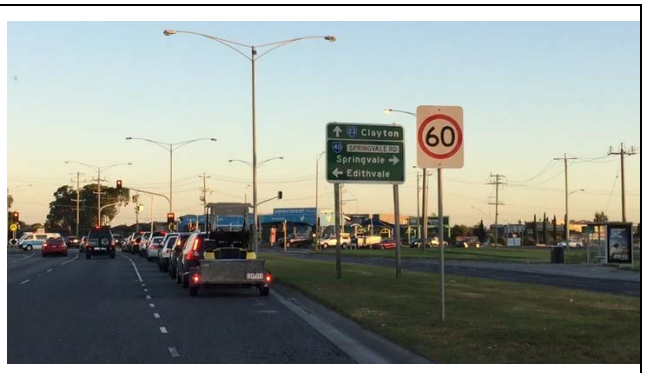
Wells Road was observed to be heavily congested during the AM and PM peaks, as well as intermittently during the inter-peak period (middle of the day). Increases in congestion during the peak periods leads to queuing at intersections, delay to travel time and reduced travel time reliability. This is evident in the speed plots presented in Section 0 which show Wells Road operating on average between 20-39 km/hr, indicating a high level of congestion along the route. Travel time data indicates a high level of travel time variability along Wells Road in the southbound direction between Winners Circle and Springvale Road.

Wells Road currently carries in the order of 41,000 vehicles per day under a four lane (two each way) carriageway configuration.

Site observations made in March 2017 are summarised in Figure 5.16.

In the PM peak period, high volume of left turn traffic was observed at the northwest approach of Wells Road and Springvale Road intersection. The shared through and left turn lane was observed to be highly utilised by the left turning movement as opposed to through movement in the AM peak period.

The southbound traffic queue along wells road extended from Springvale Road past Royal Palms Boulevard and Wells Road intersection. In some instances, the observed southbound traffic queue can extend well back towards the Governor Road roundabout.



Dedicated right turn lane overflow observed at the south approach of Wells Road / Springvale Road / Edithvale Road intersection. The same condition is reflected in the PM peak period.

Dedicated right turn lane overflow observed at the west approach of Wells Road / Springvale Road / Edithvale Road intersection.

Figure 5.16 Wells Road / Edithvale Road / Springvale Road Intersection Congestion Observations

5.2.9 ROAD SAFETY

5.2.9.1 CRASH STATISTICS

Crash Statistics were sourced from VicRoads Crash Stats database for the most recent 5-year period available (June 2012 to May 2017). The crash statistics study area is shown in Figure 5.17. During this period, a total of 339 crashes were recorded. Of these recorded accidents:

- One percent were fatal (3), 32 per cent resulted in serious injury (109) and the remaining 67 per cent were recorded as 'other injury' (227).
- The majority (77 per cent) of incidents involved collision with a vehicle (261). There were 21 recorded incidents of a pedestrian being struck (6 per cent).
- Forty-one percent (41 per cent) were recorded at a location other than an intersection (140), 28 per cent were recorded at a T intersection (94), 27 per cent were recorded at a cross intersection (93) and 4 per cent were recorded at multiple intersections (12).
- Most (54 per cent) accidents took place in an 80 km/hr speed zone (183), followed by 22 per cent of accidents taking place in a 60 km/hr speed zone.

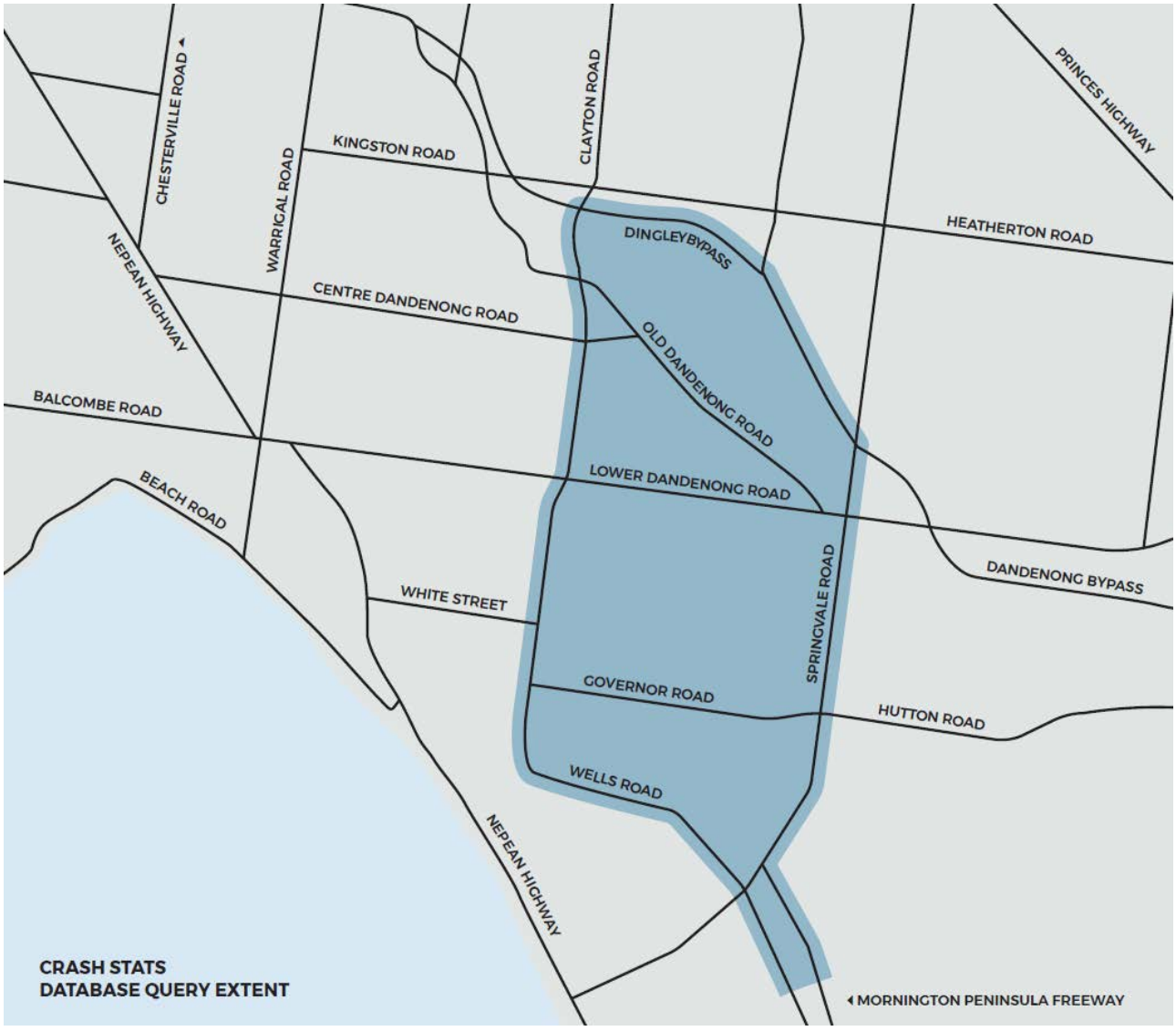


Figure 5.17 Crash Stats database query extent

The crash statistics for key roads within the local study area are summarised in Table 5.6. A significant number of crashes were recorded along Springvale Road and Wells Road / Boundary Road resulting in a total of 70 serious injuries and one fatality over the past five years.

Table 5.6 Crash statistics for selected road lengths

CRASH STATISTIC	SPRINGVALE ROAD	WELLS ROAD / BOUNDARY ROAD	GOVERNOR ROAD	LOWER DANDENONG ROAD
	(between Wells Road and Westall Road, including these intersections)	**(between Amaroo Drive N and Dingley Bypass, including these intersections)**	**(between Springvale Road and Boundary Road, excluding these intersections)**	**(between Springvale Road and Boundary Road, excluding these intersections)**
Total Crashes	97	112	13	28
Total Crashes / km / year	3.7	2.2	0.8	1.9
Intersection Crashes	69	80	3	13
Non-intersection (Midblock) Crashes	28	32	10	15
Fatal Crashes	1	0	0	0
Serious Injury Crashes	33	37	2	12
Other Injury Crashes	63	75	11	16
Total Crashes	97	112	13	28

Source: VicRoads crash stats data extract: June 2012 - May 2017

5.3 PUBLIC TRANSPORT

5.3.1 RAIL NETWORK

Both the Frankston rail line and Cranbourne/Pakenham rail lines operate in proximity to the proposed bypass route. The nearest railway station on the Frankston line is Edithvale Station, located approximately 2.5 kilometres from the southern end of the project. Springvale Station is the nearest railway station on the Cranbourne-Pakenham line, located approximately three kilometres from the northern end of the bypass.

The frequency of the rail services proximate to the site are summarised in Table 5.7.

Table 5.7 Rail services and frequency

LINE	NEAREST STATION	DIRECTION	NUMBER OF SERVICES[1]			
			AM PEAK	INTER PEAK	PM PEAK	OFF PEAK
Frankston	Edithvale	Northbound (to city)	17	43	11	31
		Southbound (from city)	11	44	12	41
Cranbourne/Pakenham	Springvale	Northbound (to city)	24	42	17	36
		Southbound (from city)	13	46	18	40

(1) AM Peak: 7am-9am, Interpeak – 9am-4pm, PM Peak:4pm-6pm, Off-peak: 6pm – 7am

Source: PTV Timetables November 2017

5.3.2 BUS NETWORK

The surrounding area is serviced by a bus network which traverses the study area and provides access to local destinations including Mordialloc railway station (route 705, 708) and Springvale railway station (route 811). The extent of bus services in the local study area is illustrated in Figure 5.18.

Source: PTV

Figure 5.18 Public Transport Map within and surrounding study area

In general, bus priority facilities are limited to:

- Queue jump lane treatments at intersections along Springvale Road including Governor Road, Lower Dandenong Road and Westall Road intersections.
- Dedicated bus lanes along Springvale Road upstream of these intersections and in the westbound direction along Lower Dandenong Road between Springvale Road and east of Lakeview Boulevard.

The frequency of the bus services proximate to the site is summarised in Table 5.8.

Table 5.8 Bus Routes and Frequency

ROUTE NUMBER	ROUTE DESCRIPTION	KEY BUS STOP LOCATIONS	NUMBER OF SERVICES[1]			
			AM PEAK	INTER PEAK	PM PEAK	OFF PEAK
Route 705	Mordialloc - Springvale via Braeside, Clayton South	Governor Road, Malcolm Drive	6	1	6	3
Route 708	Carrum - Hampton via Southland	Wells Road	12	30	9	15
Route 709	Mordialloc - Noble Park Station via Keysborough South	Governor Road	8	28	8	18
Route 811	Dandenong - Brighton via Heatherton Road	Lower Dandenong Road	4	14	4	10
Route 812	Dandenong - Brighton via Parkmore SC	Lower Dandenong Road	4	14	4	12
Route 828	Hampton - Berwick Station via Southland SC, Dandenong	Centre Dandenong Road	11	41	12	25
Route 902	Chelsea - Airport West (SMARTBUS Service)	Springvale Road	16	58	16	50

(1) AM Peak: 7am-9am, Interpeak – 9am-4pm, PM Peak:4pm-6pm, Off-peak: 6pm – 7am

Source: PTV Timetables November 2017

Bus services are heavily used throughout the study area, with data highlighting more than 8.5 million passengers serviced on an annual basis between 2014 and 2015, refer to Table 5.9. The existing bus services perform an important function in connecting commuters to railway stations and destinations that include recreation, retail, education and employment activities.

Table 5.9 Bus services within study area

ROUTE	ROUTE DESCRIPTION	ANNUAL PATRONAGE 2014 TO 2015	AVERAGE WEEKDAY 2014 TO 2015	AVERAGE SATURDAY 2014 TO 2015	AVERAGE SUNDAY 2014 TO 2015
705	Links Springvale and Mordialloc Stations, via Boundary Road (peak periods only)	47,207	181	-	-
708	Connects Aspendale Gardens with Mordialloc Station, via Wells Parade	698,722	2,346	944	715
709	Connects Waterways Estate to Mordialloc Station via Governor Road	38,939	131	-	-

ROUTE	ROUTE DESCRIPTION	ANNUAL PATRONAGE 2014 TO 2015	AVERAGE WEEKDAY 2014 TO 2015	AVERAGE SATURDAY 2014 TO 2015	AVERAGE SUNDAY 2014 TO 2015
811	Connects Dingley Village with Mentone and Springvale Stations via Lower Dandenong Road	582,415	1,744	1,384	1,063
812	Connects Dandenong to Brighton via Parkmore Shopping Centre Connects with Mentone Station via Lower Dandenong Road	345,377	1,225	273	222
824	Moorabbin to Keysborough via Clayton, Westall	821,402	2,835	994	571
828	Runs form Hampton to Berwick Station by way of Southland Shopping Centre, Dandenong, connecting Parkmore Shopping Centre with Cheltenham Station via Centre Dandenong Road	1,637,563	5,541	2,199	1,479
902	SmartBus from Chelsea Station via Springvale Road, providing access to major activity centres such as Glen Waverley and Doncaster.	4,374,574	14,054	7,615	5,972

Source: DEDJTR

Table 5.10 outlines the percentage of buses stopping with a late status which provides an indication of current bus network performance. Whilst the locality of the service deficiency is not discretely presented, the data suggests that the punctuality of bus arrivals could be enhanced for bus routes along Boundary Road, Lower Dandenong Road and Centre Dandenong Road. Of the six services where data was available, four experienced late stopping proportions of between 17 per cent and 29 per cent of all stoppings.

Table 5.10 Percentage of service stoppings with late status

ROUTE	ROUTE DESCRIPTION	% STOPPINGS WITH LATE STATUS
705	Links Springvale and Mordialloc Stations, via Boundary Road (peak periods only)	29%
709	Connects Waterways Estate to Mordialloc Station via Governor Road	4%
811	Connects Dingley Village with Mentone and Springvale Stations via Lower Dandenong Road	21%
812	Connects Dandenong to Brighton via Parkmore Shopping Centre Connects with Mentone Station via Lower Dandenong Road	21%
828	Runs form Hampton to Berwick Station by way of Southland Shopping Centre, Dandenong, connecting Parkmore Shopping Centre with Cheltenham Station via Centre Dandenong Road	17%
902	SmartBus from Chelsea Station via Springvale Road, providing access to major activity centres such as Glen Waverley and Doncaster.	2%

Source: PTV

5.3.3 FUTURE PUBLIC TRANSPORT

5.3.3.1 RAIL NETWORK

PTV's Network Development Plan – Metropolitan Rail report (December 2012) is a demand led strategic plan for the development of the rail network for the next 40 years. Over this time, it is envisaged that the Melbourne rail network will transition from its current operation where train lines often merge as they get closer to the city, to a metro style system with standalone rail lines running at high frequency.

Of note, the Metropolitan Rail Development Plan notes that the Cranbourne-Pakenham rail corridor will become the busiest rail corridor on the network by 2020.

Specific to the Frankston and Cranbourne-Pakenham Rail lines, the following network improvement works are envisaged by PTV's Networks Development Plan.

Table 5.11 Metropolitan Rail Development Plan

STAGE	FRANKSTON LINE	DANDENONG LINE
Stage 1 (Overcoming constraints now until 2016)	Construction of Southland Station (opened in late November 2017)	
Stage 2 Introduction of a metro style system: within 10 years	Creation of the Frankston loop line, operating as an independent stand-alone route.	Reconfiguration of line and frequency following opening of Melbourne Metro rail tunnel project
Stage 3 Extending the network: within 15 years	Electrification of line to Baxtera	Creation of the Sunshine – Dandenong line, a segregated line with improved capacity and reliability
Stage 4 Prepared for future growth within 20- years	Implementation of high capacity signalling	

(1) The Government has commenced work on the Baxter Extension business case, which is to be finalised by early 2019

Source: PTV December 2012

The Melbourne Metro project will deliver two nine-kilometre rail tunnels under the Melbourne CBD. As part of this project, high capacity signalling will be installed which is expected to allow an increase in the frequency of trains in the network. Early works for the Melbourne Metro project commenced in 2015, with works expected to be completed in 2026.

5.3.3.2 BUS NETWORK

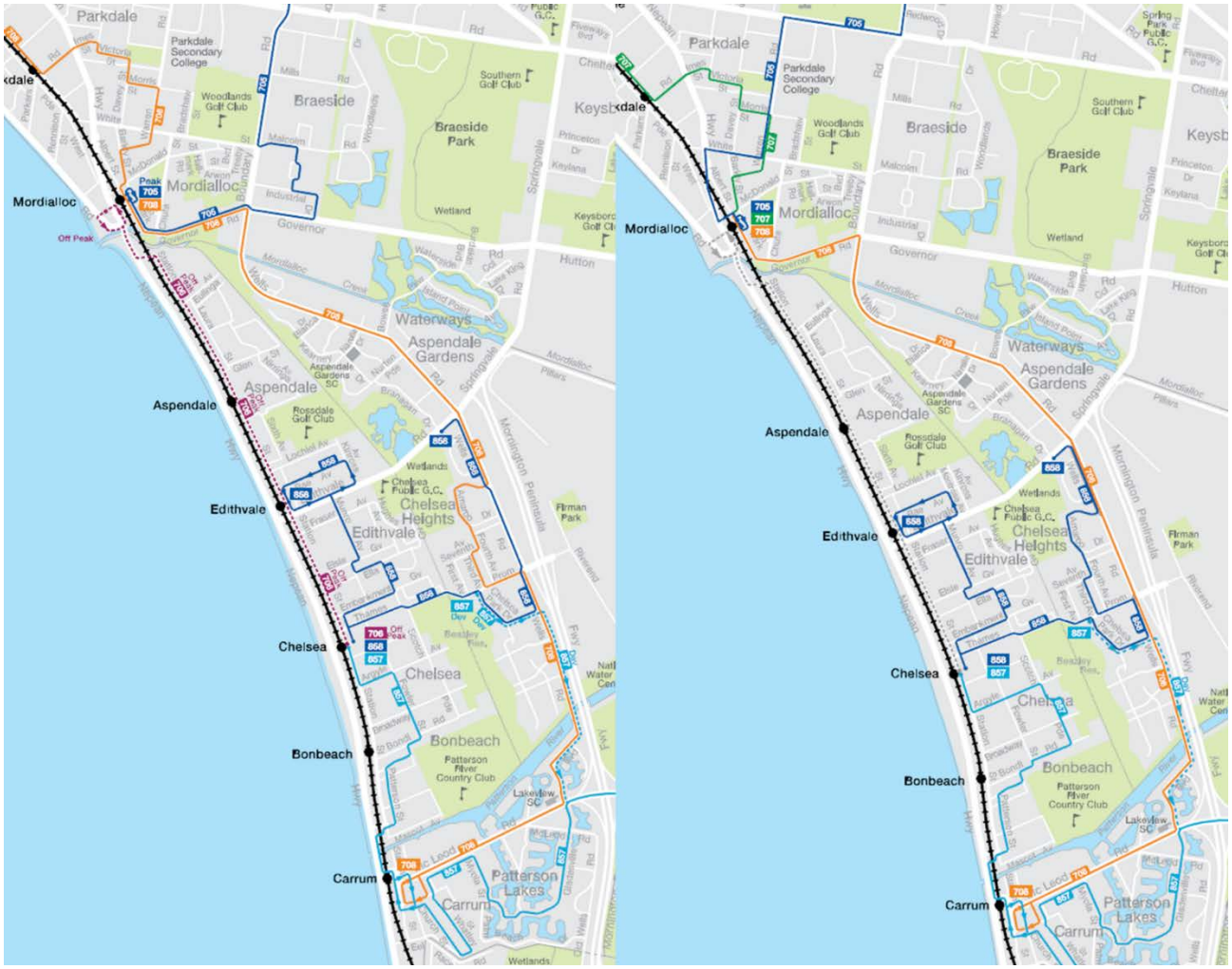
Transport for Victoria (TfV) is currently undertaking a review of bus routes in Mordialloc and surrounding areas, and is considering making changes to the network in order to improve the quality of bus services in the area. Table 5.12 summarises details of the proposed bus route changes, with Figure 5.19 presenting the existing and proposed bus route networks in the Mordialloc area.

TfV held consultation sessions for the proposed bus network changes in November 2017 and the results of these consultations are currently under evaluation.

Table 5.12 Changes to the bus route in Mordialloc and surrounding areas being considered by TfV

ROUTE	PROPOSED BUS ROUTE CHANGES
705	Rerouted between Centre Dandenong Road and Mordialloc Station to travel on Boundary Road, Lower Dandenong Road, Warren Road, White Street and Nepean Highway, terminating at Mordialloc Station.
706	Removal of Route 706 due to overlap with the Frankston train line (between Mordialloc and Chelsea).
857	Rerouted along Scotch Parade instead of Fowler Street.
858	Rerouting in Edithvale and Chelsea Heights
708	Route 708 will be divided into two shorter routes. The existing will continue to operate between Mordialloc and Carrum as previously. A new route will operate between Hampton and Mordialloc. Route 708 will no longer cover sections of Chelsea Heights, instead it will be covered by Route 858.
707	New Route 707 will travel between Hampton and Mordialloc Station, replacing Route 708 that currently travels this path.

Source: DEDJTR website



Source: DEDJTR/TfV

Figure 5.19 Mordialloc bus network (existing network on the left, proposed network on the right)

5.4 ACTIVE TRANSPORT

5.4.1 PEDESTRIAN ENVIRONMENT

5.4.1.1 FOOTPATH PROVISION

Pedestrian connectivity throughout the local study area is typically catered for by footpaths on both sides or one side of the road adjacent to residential, industrial and built-up areas.

Specific to the bypass corridor, there are some pedestrian crossings provided across the corridor:

- Dingley Bypass shared use path
- Centre Dandenong Road south side footpath
- Lower Dandenong Road north side footpath
- Informal paths between the Woodlands industrial area and the Howard Road Trail in Braeside Park, and between the Redwood Gardens Industrial Estate and Dingley Village residential areas
- Bowen Parkway south side footpath.

Whilst along the corridor, the only pedestrian facilities are unsealed trails between Lower Dandenong Road and Governor Road on the western edge of Braeside Park (Howard Road Trail, Wetlands Trail and Red Gum Trail).

Existing pedestrian connectivity in the north-south direction throughout the study area is generally limited to built-up sections of Springvale Road and Boundary Road – Wells Street only.

5.4.1.2 PEDESTRIAN CROSSINGS

Pedestrian crossing points of arterial roads are typically provided at signalised intersections on most approaches. Notable exceptions to this being the roundabout intersections at Boundary Road / Governor Road and Centre Dandenong Road / Old Dandenong Road / Tootal Road which do not provide pedestrian crossing facilities.

Two signalised pedestrian crossings are provided within the local study area, with one at Wells Road near Langslow Road and another on Lower Dandenong Road near Willow Glen Court.

5.4.2 BICYCLE ENVIRONMENT

5.4.2.1 BICYCLE NETWORK

The existing bicycle network within the study area is disjointed. There is generally good coverage in the east-west direction along Dingley Bypass-Westall Road, Centre Dandenong Road and Wells Road. However in there north-south direction there is sporadic provision of bicycle facilities on Springvale Road and Boundary Road only.

The Principal Bicycle Network (PBN), the strategic vision for the bicycle network, has extensive coverage through the local study area and is shown in Figure 5.20. All arterial roads are nominated on the PBN with the exception of Old Dandenong Road. It is noted that the PBN can include dedicated and shared bicycle facilities such as shared use paths and wide kerbside lanes. Of note, the Mordialloc Bypass corridor is nominated as part of the PBN, with connections further north to Heatherton Road.

Source: VicRoads SmartRoads

Figure 5.20 PBN – Local Study Area

5.4.2.2 BICYCLE UTILISATION

Intersection counts were undertaken at various times in 2016/2017 within the local study area and included counts of bicycle movements at intersections.

The average weekday peak bicycle movements recorded at key locations (mostly signalised intersections) are summarised in Table 5.13.

Table 5.13 Weekday average peak hour cyclists

LOCATION	AM PEAK (BICYCLES/HR)	PM PEAK (BICYCLES/HR)
Bowen Parkway (inc footpath)	18	18
Centre Dandenong Rd / Nepean Hwy signals	18	12
Lower Dandenong Rd / Howard Rd signals	9	8
Warrigal Rd / Centre Dandenong Rd signals	6	9
Lower Dandenong Rd / Redwood Drive signals	7	7
Lower Dandenong Rd / Woodlands Drive signals	6	6
Mornington Peninsula Fwy / Springvale Rd signals	6	5
Springvale Road / Lower Dandenong Rd signals	4	6
Boundary Road / Centre Dandenong Rd signals	5	4
Lower Dandenong Rd / Boundary Rd signals	4	2
Boundary Rd / Old Dandenong Rd signals	5	3
Springvale Rd / Wells Rd signals	3	3
Old Dandenong Rd / Centre Dandenong Rd signals	2	3
Boundary Rd / Clayton Rd signals	2	1
Warrigal Rd / Dingley Bypass signals	3	1
Boundary / Dingley Bypass signals	1	1

Source: Traffic surveys 2016/2017)

6 TRANSPORT RISK ASSESSMENT

6.1 KEY FINDINGS

Impacts to transport fall into a single category, impacts on road users.

The primary environmental risks identified for transport are provided in Table 6.1. The initial risk ratings presented below for both project and cumulative impacts consider standard inherent controls as listed in the Environmental Risk Assessment Report. The additional controls listed in the tables below are those recommended to further mitigate and minimise the primary environmental risks which were risk rated as medium or above. Primary environmental risks which were scored as low did not require additional controls to be applied.

Also included in the table below are any identified on-site project related cumulative risks, including: secondary risks (resulting from the implementation of a risk response in mitigating a primary environmental risk) and on-site aggregate cumulative risks (the aggregate / combined primary environmental risks resulting from diverse project activities having an impact on the same environmental asset.

Table 6.1 Transport environmental risk assessment register

RISK ID	IMPACT PATHWAY	PRIMARY ENVIRONMENTAL RISK DESCRIPTION	SECONDARY ENV. RISK	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	EPR	RESIDUAL RISK		
				CONSEQUENCE	LIKELIHOOD	RATING			CONSEQUENCE	LIKELIHOOD	RATING
R-T1	Construction stage impacts on road users	Construction works reduce capacity of the network and impacts travel time for general traffic, freight and public transport vehicles.	Social, Economic	Moderate	Possible	Medium	Setout works restrictions to minimise unnecessary disruptions where practical.	T2, S1	Moderate	Unlikely	Medium
R-T2	Construction stage impacts on road users	Construction works impact on the safety and operation of pedestrian and cycling movements.	Social	Moderate	Possible	Medium	Site investigation to consider the need for undertaking road safety audit during construction stages.	T2, T3, S1	Moderate	Unlikely	Medium
R-T3	Operation stage impacts on road users	Proposed bypass would likely induce significant changes on traffic patterns and demand within the existing road network causing disruption to the surrounding intersections.	Social	Minor	Possible	Low	Not required	T1, S1	Minor	Possible	Low
R-T4	Operation stage impacts on road users	Intersection and freeway designs do not adequately cater for traffic demand.		Minor	Unlikely	Low	Not required	T1	Minor	Unlikely	Low
R-T5	Operation stage impacts on road users	Wayfinding signage is unclear and road users do not take the most efficient route. i.e. route connections to Moorabbin Airport		Minor	Possible	Low	Not required	T1, T3	Minor	Possible	Low

RISK ID	IMPACT PATHWAY	PRIMARY ENVIRONMENTAL RISK DESCRIPTION	SECONDARY ENV. RISK	INITIAL RISK			ADDITIONAL MITIGATION / CONTROLS	EPR	RESIDUAL RISK		
				CONSEQUENCE	LIKELIHOOD	RATING			CONSEQUENCE	LIKELIHOOD	RATING
R-T6	Operation stage impacts on road users	Project increases the likelihood of crashes at shared use path crossing locations.		Moderate	Unlikely	Medium	Road Safety Audits and/or Safe System Assessment to be undertaken for the proposed design at shared use path crossing locations.	T1, T3, S1	Moderate	Rare	Low
R-T7	Operation stage impacts on road users	Project increases the likelihood of crashes within the network with the introduction of new intersections.		Moderate	Possible	Medium	Road Safety Audits and/or Safe System Assessment to be undertaken for the proposed design at new intersection locations	T1, T3, S1	Moderate	Unlikely	Medium
Cumulative Impacts - On-Site Aggregate											
R-T8	Aggregate Cumulative Effect	Changes in traffic conditions during construction and operation have negative impacts on road users.		Moderate	Possible	Medium	Setout works restrictions to further minimise unnecessary disruptions where practical. Road Safety Audits and/or Safe System Assessment to be undertaken for the proposed design to further reduce risk to road users.	T1, T2, T3, S1, PLU1	Moderate	Unlikely	Medium

The assessment of cumulative impacts was competed in two stages, namely the assessment of aggregate project impacts and the assessment of the cumulative impact of multiple off-site projects in addition to the Mordialloc Bypass project for transport. The cumulative environmental risks identified for transport is provided in Table 6.2.

Table 6.2 Transport cumulative effects environmental risk assessment

RISK ID	IMPACT PATHWAY	PROJECTS CONSIDERED	CUMULATIVE RISK DESCRIPTION	ADDITIONAL MITIGATION / CONTROLS	EPR	RESIDUAL RISK		
						CONSEQUENCE	LIKELIHOOD	RATING
R-T1	Construction stage impacts on road users	Edithvale Road level crossing removal	Construction traffic management may overlap with the Mordialloc Bypass construction causing additional delay to road users.	Not required	T2, S1	Moderate	Possible	Medium
R-T3	Operation stage impacts on road users	Westall Road extension, Monash Freeway Upgrade, Dandenong Bypass and Edithvale Road level crossing removal	Anticipated network performance may not be reflective if surrounding projects do not proceed and cause additional delay to road users.	Not required	T1, T3, S1	Minor	Likely	Medium
R-T4	Operation stage impacts on road users	Westall Road extension, Monash Freeway Upgrade, Dandenong Bypass and Edithvale Road level crossing removal	Anticipated network performance may not be reflective if surrounding projects do not proceed and cause additional delay to road users or under estimate the bypass utilisation.	Not required	T1, T3	Minor	Likely	Medium

7 PROJECT CONFIGURATION

7.1 FREEWAY

As shown in Figure 7.1 the proposed bypass is aligned north-south between the current terminus of the Mornington Peninsula Freeway and Dingley Bypass, predominately within an existing road reservation situated between Wells Road and Boundary Road and Springvale Road.

Refer to the preliminary design layouts in Appendix B for further details of the proposed bypass configurations.

Safety in design must be considered throughout the development process to ensure the proposed infrastructure would deliver the safety benefit as intended. Safe systems design principles have been considered in the design process in ensuring the proposed facility not only comply with the current design standards but is designed to be forgiving to minimise the likelihood of crashes.

Figure 7.1 Proposed freeway configuration

7.2 OPERATIONS AND ASSET MANAGEMENT

The proposed asset and transport management system infrastructure for the project is expected to follow existing practice. The asset management strategy should be consistent with Department of Treasury and Finance Asset Management Accountability Framework including but not limited to the following:

Operations – monitoring, recording, controlling of the asset in accordance with the transport network requirements. The proposed Mordialloc Bypass will require an appropriate freeway management system to enable these operational functions and enable network performance to be measured relative to EES forecasts. The proposed operating system and/or monitoring regime will be required to provide the measurements of corridor performance including but not limited to travel time performance, traffic and freight volumes to capture the transport network efficiency post project completion.

The existing Mornington Peninsula Freeway has limited Intelligent Transport System (ITS) infrastructure compared to other major freeways within Victoria such as the Monash Freeway and Western Ring Road. As such, the Mornington Peninsula Freeway does not currently have the capability of a managed freeway that would enhance the overall road user experience, including the provision of facilities that provide traveller information and the ability to enhance the safety, reliability and efficiency of the freeway operation. With the Mordialloc Bypass connecting to the Mornington Peninsula Freeway, the project must be developed so as to not preclude and support the future implementation of managed freeway facilities.

Asset Management – to ensure the proposed network infrastructure is compliant with standards at post completion and its condition and performance throughout the life cycle is fit for purpose. This process should involve routine inspection, refurbishment work and have necessary interventions and strategy to manage unplanned repair of asset. The project will be required to obtain approvals from all agencies and parties responsible for maintaining the assets in short, medium and long term.

7.3 PROJECT ALTERNATIVES

As specified in the Scoping Requirements, this report will also compare the relative impacts of project alternatives considered as part of the Mordialloc Bypass development process. The key project alternative is the 'arterial road' configuration option as opposed to the proposed 'freeway' configuration option identified above in Section 7.1.

Key differences between the proposed freeway configuration and the arterial road configuration are summarised in Table 7.1. It is noted that both configuration options follow the same alignment.

Table 7.1 Project alternatives summary

	PROPOSED FREEWAY CONFIG.	ALTERNATIVE ARTERIAL ROAD CONFIG.
Speed limit	100 km/hr	80 km/hr
Grade separated interchanges	Springvale Road, Governor Road, Lower Dandenong Road, Centre Dandenong Road (south facing ramps only), Thames Promenade (north facing ramps only)	Springvale Road
At-grade intersections	Dingley Bypass	Dingley Bypass, Centre Dandenong Road, Lower Dandenong Road, Governor Road
Old Dandenong Road treatment	Freeway overpass	Road truncation

8 IMPACT ASSESSMENT

The impact assessment is divided into four key parts which address the likely effects of the preferred and alternative options as required in the EES Scoping Requirements:

- access impact assessment, including network access and local access impacts resulting from the project
- alignment with future road use classifications, including integration with public transport and active transport networks
- network performance impact assessment, including changes to traffic volumes and travel times of the project (including project alternatives) against the base case
- construction traffic impacts, including consideration of construction vehicle numbers and haulage routes.

8.1 ACCESS IMPACT ASSESSMENT

The project is expected to alter the route selection behaviour as motorists are provided with an alternate north-south route between Mornington Peninsula Freeway and Dingley Bypass. To enable the construction of the proposed bypass, existing local road and active transport connections will be affected. Local and network access impacts are reported in this section to provide an overview of the expected changes as a result of the project.

In general, the discussion relates to the proposed freeway configuration. However, differences to access impacts between the freeway and arterial road configurations are highlighted where applicable.

8.1.1 NETWORK MOVEMENT AND ACCESS IMPACT

In general, at the arterial network level, the key east-west corridors that intersect the new roadway and their respective existing movements will be maintained.

Based on the proposed interchange and bypass terminal configuration, the applicable traffic movements are illustrated in Figure 8.1. At the proposed interchange/intersection locations (Dingley Bypass, Lower Dandenong Road, Governor Road and Springvale Road), all turning movements will be made available to and from the bypass.

It is anticipated that the existing inter-regional movements between Mornington Peninsula Freeway and north-south arterials including Wells Road, Boundary Road and Springvale Road (towards Westall Road) would likely be rerouted via the proposed Mordialloc Bypass. It is anticipated that local trips within the City of Kingston and journeys to Springvale Activity Centre will continue to be serviced by the existing north-south connecting routes post implementation of the bypass.

The differences between the freeway and arterial road option for the Mordialloc Bypass summarised in Table 8.1 and discussed in the following sections.

Table 8.1 Arterial network differences by configuration

	PROPOSED FREEWAY CONFIG.	ALTERNATIVE ARTERIAL ROAD CONFIG.
Centre Dandenong Road	Grade separated interchange with south facing ramps only	At-grade signalised cross intersection
Old Dandenong Road	Freeway overpass	Road truncation

Figure 8.1 Proposed access arrangement for traffic movement

8.1.1.1 CENTRE DANDENONG ROAD

For the preferred freeway configuration, the south-facing freeway interchange at Centre Dandenong Road would facilitate northbound freeway exit and southbound freeway entry movements enabling a seamless connection to and from the Mornington Peninsula Freeway.

In the absence of north-facing ramps, traffic from the north of project area and Dingley Bypass (e.g. Clayton and Springvale) heading towards activity centres along Centre Dandenong Road west of Boundary Road such as DFO shopping centre and Moorabbin Airport will likely be using the existing Boundary Road and Tootal Road connections. A review of the structure of the future road network and directness of travel associated with the aforementioned origins and destinations show that despite the new road link, the existing connections provide a more intuitive route. This has contributed to the exclusion of north-facing ramps in the preferred freeway configuration.

For the alternative arterial road configuration, full northbound and southbound access to the Mordialloc Bypass from Centre Dandenong Road is accommodated at the at-grade intersection. As noted above, despite the availability of a new route option, it is expected that trips between the north to Moorabbin Airport / DFO will continue to use existing routes due to the shorter travel distances as shown in Figure 8.2.

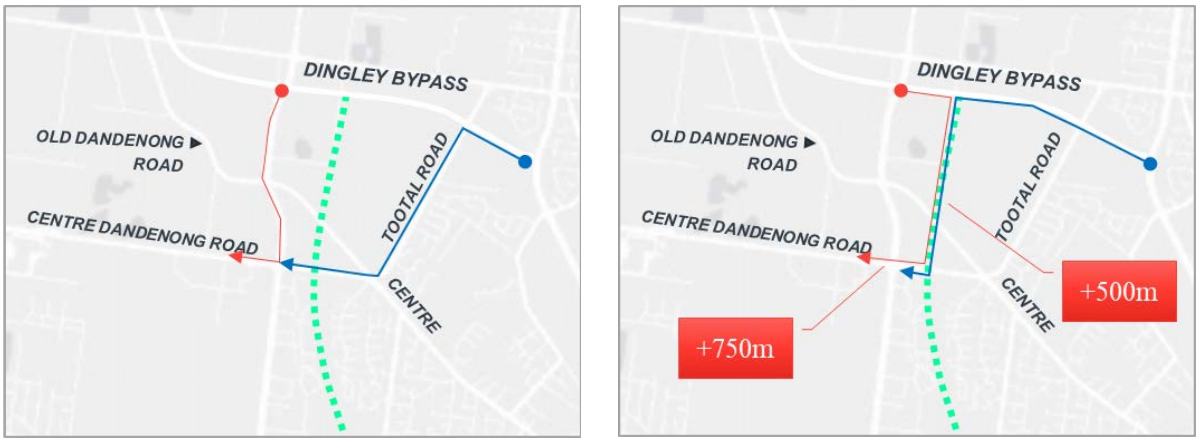


Figure 8.2 Route choice between Clayton / Springvale and Moorabbin Airport

8.1.1.2 OLD DANDENONG ROAD

For the preferred freeway configuration, there is no impact to Old Dandenong Road. A freeway overpass will be constructed for the Mordialloc Bypass with the existing Old Dandenong Road maintained at grade.

For the alternative arterial road configuration, Old Dandenong Road is proposed to be truncated and is expected to terminate on either side of the bypass with a cul-de-sac arrangement. Through traffic that currently operates along Old Dandenong Road between Boundary Road and Tootal Road is expected to travel via Centre Dandenong Road (refer to Figure 8.3). This is a marginal detour of approximately 300 metres for vehicles travelling between Boundary Road and Tootal Road.

Figure 8.3 Anticipated traffic movement associated with the proposed Old Dandenong Road configuration

8.1.2 LOCAL ACCESS IMPACT

Existing local road connections and site accesses are expected to be altered at a number locations along the route and these may differ slightly between the freeway and arterial road configurations. The local access impact arrangement between configurations is summarised in Table 8.2 and discussed further in the following sections.

Table 8.2 Local network differences by configuration

	PROPOSED FREEWAY CONFIG.	ALTERNATIVE ARTERIAL ROAD CONFIG.
Thames Promenade	New Mornington Peninsula Freeway north facing ramps	No change
Woodlands Drive	Truncated south of Lower Dandenong Road	Truncated south of Lower Dandenong Road
Redwood Drive	Access restrictions at Lower Dandenong Road	Access restrictions at Lower Dandenong Road
McDonald's Dingley site	Access restrictions at Centre Dandenong Road	Access restrictions at Centre Dandenong Road

8.1.2.1 THAMES PROMENADE

For the preferred freeway configuration, new north-facing ramps onto Mornington Peninsula Freeway at Thames Promenade will change traffic patterns in the local area network. Freeway access movements under the existing and proposed interchange arrangement are presented in Figure 8.4.

The new ramps will provide direct access to and from the Mordialloc Bypass for Chelsea Heights, Chelsea and Bonbeach residents and businesses. This will reduce traffic volumes on Wells Road (parallel to Mornington Peninsula Freeway) as traffic can join/exit the freeway further south. This will also free-up intersection capacity at Wells Road / Springvale Road, reducing the likelihood of queuing overflows.

For the alternative arterial road configuration, there is no impact to Thames Promenade as there are no network changes south of Springvale Road. Intersection capacity issues at Wells Road / Springvale Road are expected to persist.

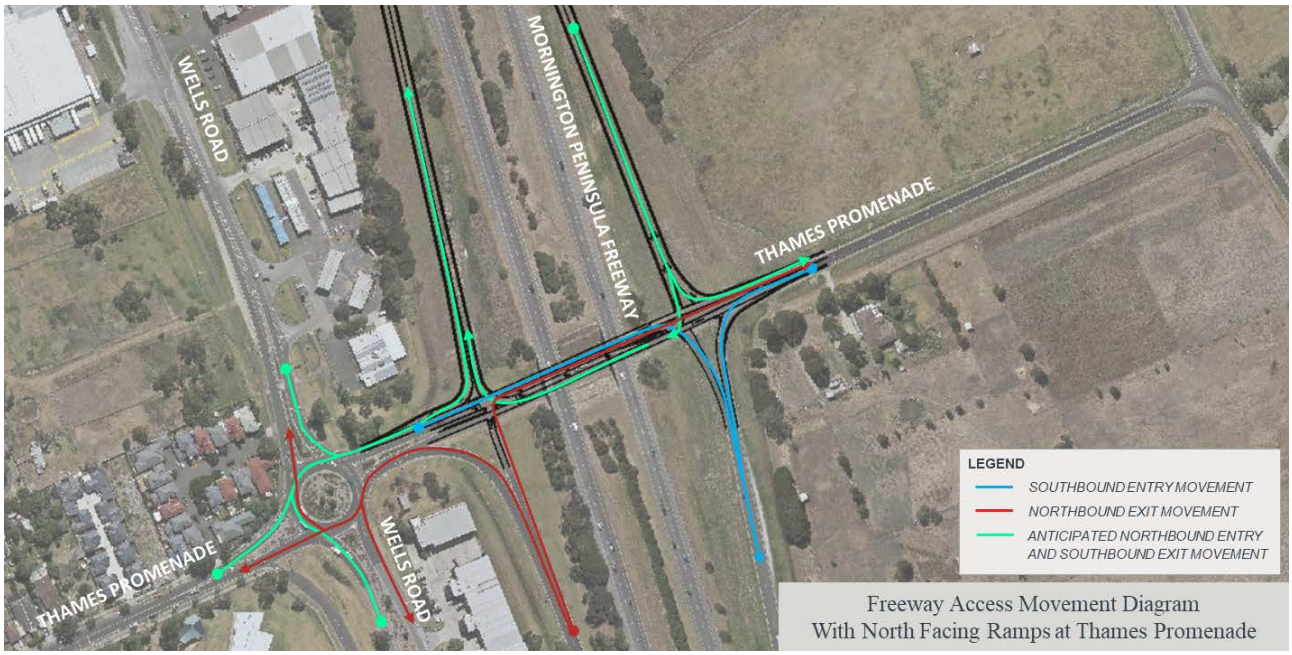


Figure 8.4 Thames Promenade freeway access movement diagram

8.1.2.2 WOODLANDS DRIVE

In terms of access, Woodlands Drive will be impacted in both the preferred freeway and alternative arterial road configurations due to the land requirements at the Mordialloc Bypass / Lower Dandenong Road interchange. The discussion below relates to both options.

Woodlands Drive is a Council-managed collector road providing access to the Woodlands industrial precinct. Woodlands Drive will be truncated south of Lower Dandenong Road with traffic diverted via a new road connection onto Tarnard Drive over the linear reserve/creek as shown in Figure 8.5. As a result of the traffic diversion from Woodlands Drive, the classification of Tarnard Drive and Bell Grove will need to be upgraded from local to collector road. This may also require widening of these road sections.

Access to Lower Dandenong Road will be provided at the existing T-intersection at Bell Grove / Lower Dandenong Road, which will be widened to include double right-turn lanes and upgraded to signal control to facilitate efficient movement of vehicles. The proposed intersection arrangement is expected to provide an adequate level of service for traffic accessing the Woodlands Industrial Estates.

The proposed connection between Tarnard Drive and Woodlands Drive will impact on existing parking on Tarnard Drive and at existing property car parks. Angle parking facilities along Woodlands Drive north of Tarnard Drive are proposed as a replacement.

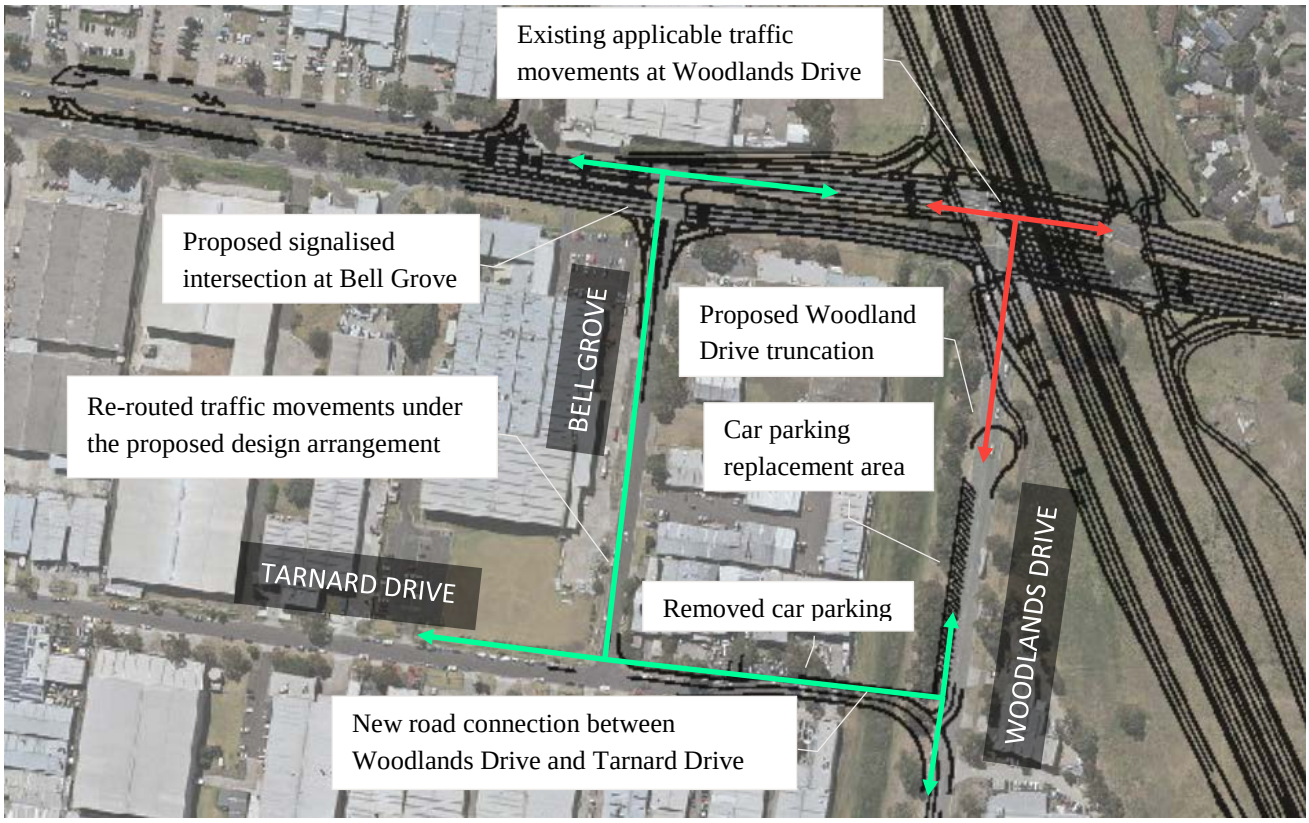


Figure 8.5 Proposed Woodlands Drive access arrangement

8.1.2.3 REDWOOD DRIVE

In terms of access, Redwood Drive will be impacted by the intersection modifications at Bell Grove / Lower Dandenong Road required for both the preferred freeway and alternative arterial road configurations. The discussion below relates to both options.

The existing access arrangement at Redwood Drive will be converted to a left-in left-out access to enhance the operational efficiency and minimise the potential conflicting movements at the proposed signalised T-intersection at Bell Grove / Lower Dandenong Road as shown in Figure 8.6.

Under the proposed arrangement, right turning traffic into Redwood Drive will be diverted to a new U-turn facility east of Boundary Road. In addition, a portion of right turn traffic is also expected to be re-routed to existing intersections along Boundary Road north of Lower Dandenong Road depending on the destination of travel, (see Figure 8.7). Right

turn traffic from Redwood Drive will be required to undertake a U-turn movement via the proposed signalised intersection at Bell Grove / Lower Dandenong Road.

A traffic survey was undertaken on the 24th May 2017 indicating right-turn traffic from Redwood Drive is less than or equal to five vehicles per hour during both AM and PM peak period on a typical weekday.

Figure 8.6 Proposed access arrangement at Redwood Drive

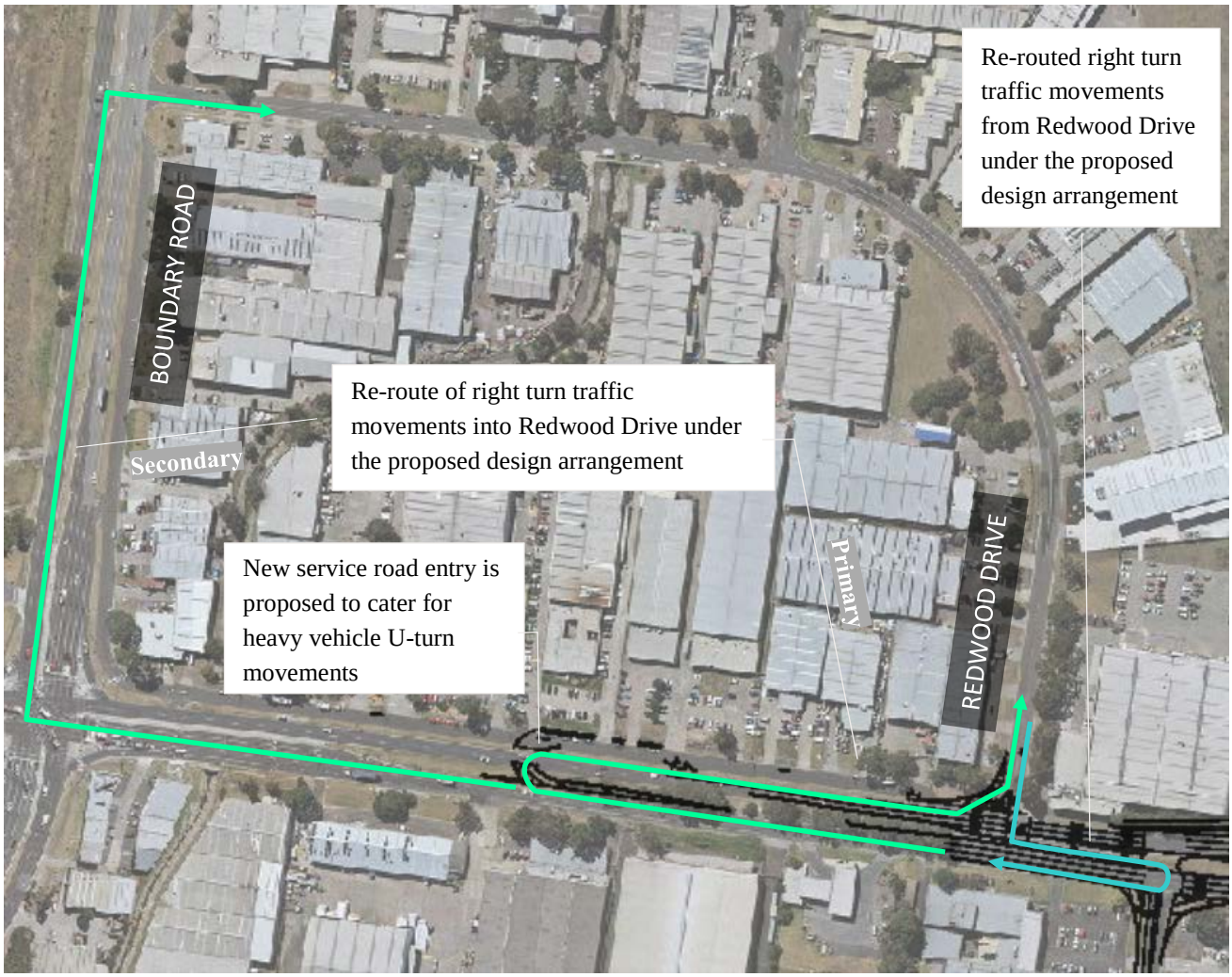


Figure 8.7 Re-routed right turn traffic movement at Redwood Drive

8.1.2.4 MCDONALD'S DINGLEY SITE ACCESS

The impact to the McDonald's Dingley access is identical for both the freeway and arterial road configurations. The discussion therefore refers only to the proposed freeway configuration.

As part of the safety initiative 'Pinch Point Projects', the existing McDonald's access along Centre Dandenong Road, east of Boundary Road, is proposed to be converted to a left-in left-out only access. Five collisions leading to minor and serious injuries have been recorded over the past five years. The recorded incidents are related to the conflict between right turn and through vehicle movements.

The project will support the arrangement proposed by Pinch Point Projects with the implementation of a divided four lane carriageway between Boundary Road and the proposed bypass. The concept design in Figure 8.8 shows a deceleration lane will be incorporated to provide a safer access for left turning traffic into the site.

An alternative access along Boundary Road south of Centre Dandenong Road is currently available for customers approaching from the west of the site.

Figure 8.8 Proposed access arrangement at McDonald's site on Centre Dandenong Road

8.1.3 PUBLIC TRANSPORT IMPACT

Provisions have been made in both the preferred freeway and alternative arterial road configuration designs to include treatments that enhance bus priority within the study area. Bus queue jump lanes are proposed at the following Mordialloc Bypass interchange/intersection approaches:

- Along Centre Dandenong Road, servicing Route 828 between Hampton and Berwick as shown in Figure 8.9; and
- Along Springvale Road, servicing SmartBus Route 902 between Chelsea and Airport West as shown in Figure 8.10.

These two roads carry the highest frequency and patronage bus routes within the study area. Most of the illustrated bus queue jump lanes enable buses to utilise the dedicated turn traffic lanes to bypass potential through traffic queue at the approaches, which will improve the reliability and performance of bus services.

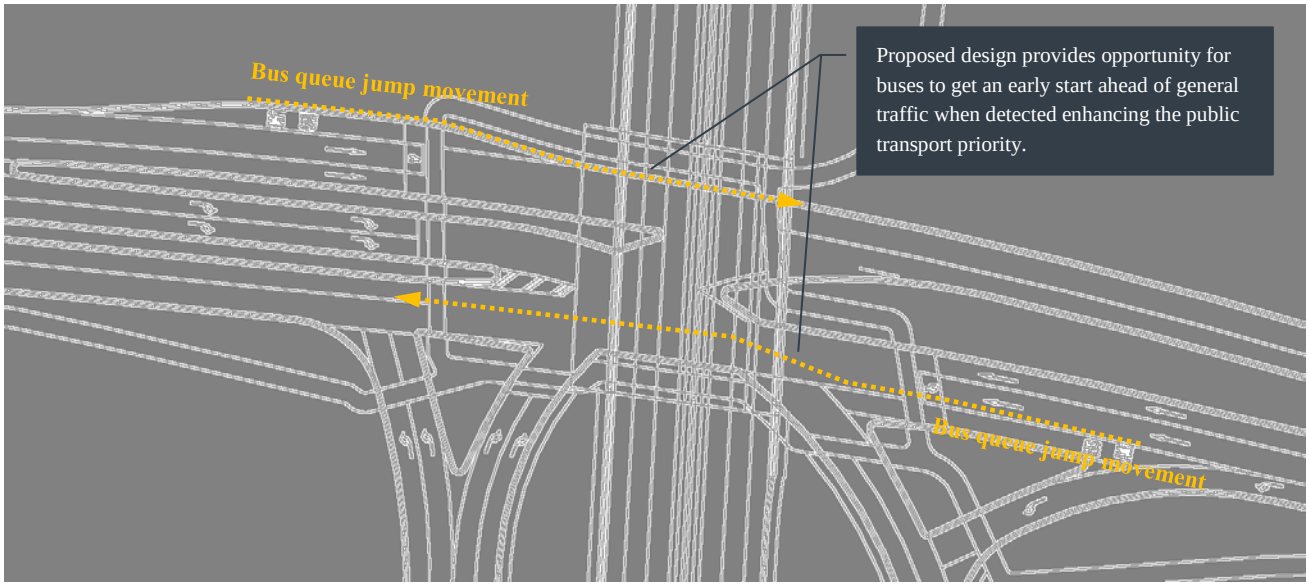
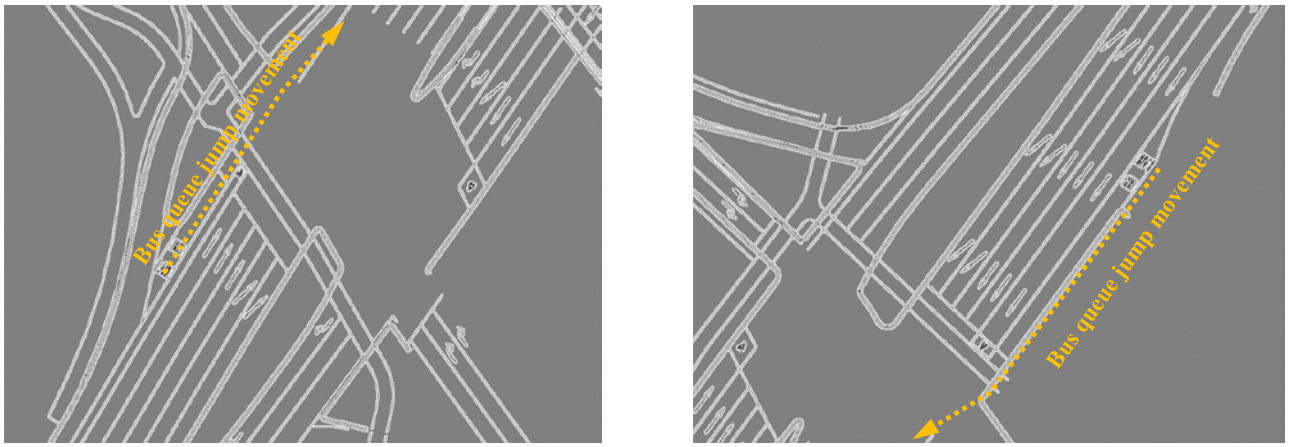


Figure 8.9 The proposed bus queue jump lane facilities at Centre Dandenong Road / Mordialloc Bypass freeway interchange



Source: VicRoads

Figure 8.10 The proposed bus queue jump lanes facilities at Springvale Road / Mordialloc Bypass / Mornington Peninsula interchange. Left: south-west approach, Right: north-east approach

8.1.4 PEDESTRIAN AND CYCLISTS ACCESS IMPACT

Under both the preferred freeway and alternative arterial road configurations, a shared use path with connections to existing pedestrian and cyclist facilities will be constructed along the length of the bypass between Springvale Road and Dingley Bypass. The discussion below relates to both options.

It should be noted that this component of the assessment focuses on the impact on existing connections and permeability across the bypass. Consideration of active transport network enhancement to support future road and path use intent are discussed in Section of the report.

A shared use path will significantly improve the amenity for pedestrians and cyclists in the area where dedicated facilities have been limited or non-existent. It will provide a continuous facility extending from Warrigal Road, Heatherton (via Dingley Bypass shared use path) to Springvale Road, Aspendale Gardens. In addition to this, it will enhance connections across the corridor with footpaths to be provided on both sides on all arterial roads at interchanges.

There are currently two informal crossing of the Mordialloc Bypass reserve between the Redwood Gardens Industrial Estate and Dingley Village, and between the Woodlands industrial area and Braeside Park. The link between Woodlands Industrial Estate and Braeside Park will be maintained with either an over or underpass of the Mordialloc Bypass. This has been incorporated into designs because the pedestrian desire lines are clear and have been formalised by footpaths on the western side and matching up with existing pedestrian trails in Braeside Park. The design plan is shown in Figure 8.11.

Figure 8.11 Proposed active transport path near Park Way

The informal link between Redwood Gardens industrial area and Dingley Village shown in Figure 8.12 is not proposed to be retained. This link has not been incorporated into the designs because it is not a formal link and currently connects an industrial property car park on the western side to the Chadwick Reserve and the rear of residential properties on the eastern side. Analysis of the current usage of the link has been undertaken using pedestrian and cyclist surveys between 6:00 am and 9:00 pm from 30 January 2018 to 4 February 2018:

- a maximum of 19 pedestrian movements was recorded on the weekdays
- a maximum of eight pedestrian movements was recorded on the weekend.

Very limited usage of this existing path is demonstrated from the surveys during the weekend period, with results indicating peak hour volume of only two pedestrian movements. Whilst the removal of this informal crossing will inconvenience some pedestrians, crossings are still possible approximately 800 metres to the north or south at Centre Dandenong Road and Lower Dandenong Road, respectively.

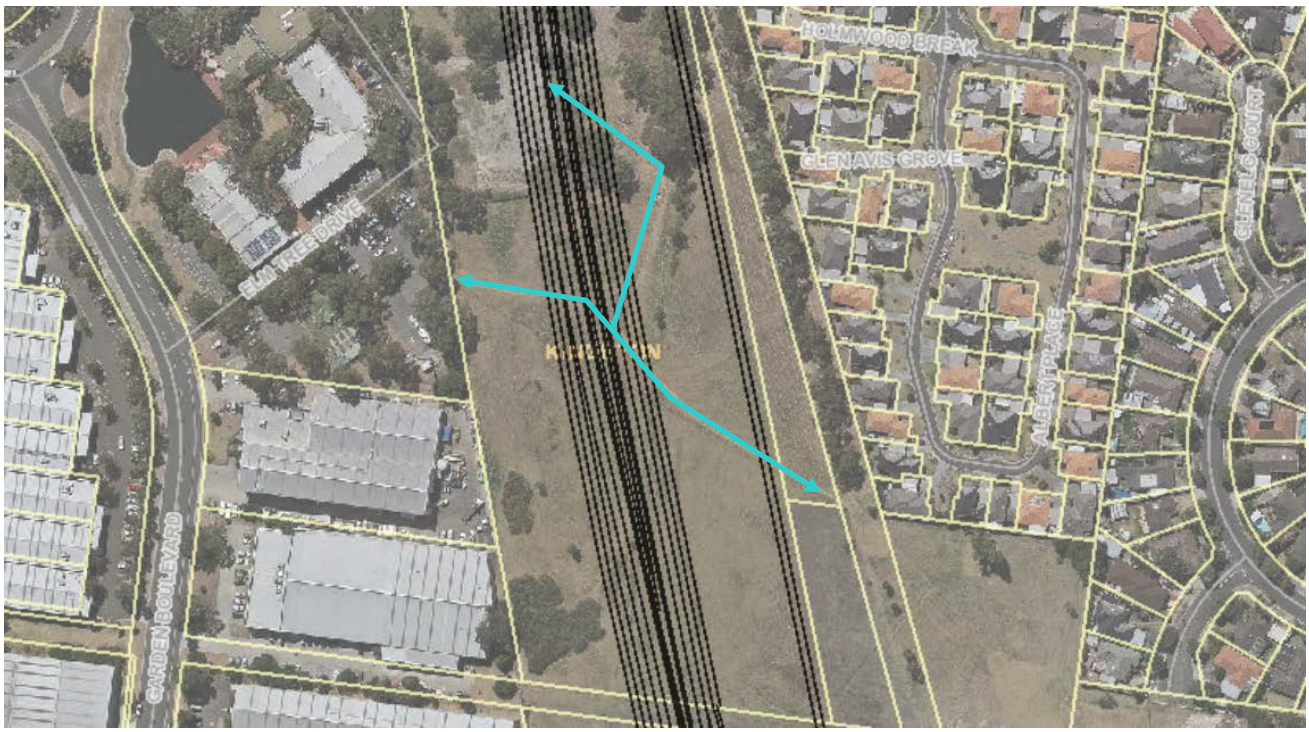


Figure 8.12 Existing active transport path near Elm Tree Drive

The project will also incorporate a new shared use path connection just east of Mangrove Court to support the future Mordialloc Creek Corridor planned by the Living Links. The proposed Mordialloc Creek Corridor has been identified as a new or improved links across the region to benefit the local community and environment. Connecting between the Dandenong Creek Corridor at Bangholme and Port Philip Bay at Mordialloc via the Mordialloc Creek. It also connects between a number of other Living Links corridors including the Eumemmering Creek, Living Links Nature Link, Patterson River, and Karkarook Park to Braeside Corridors. Proposed treatments at Bowen Parkway and Mordialloc Creek Corridor is illustrated in Figure 8.13.

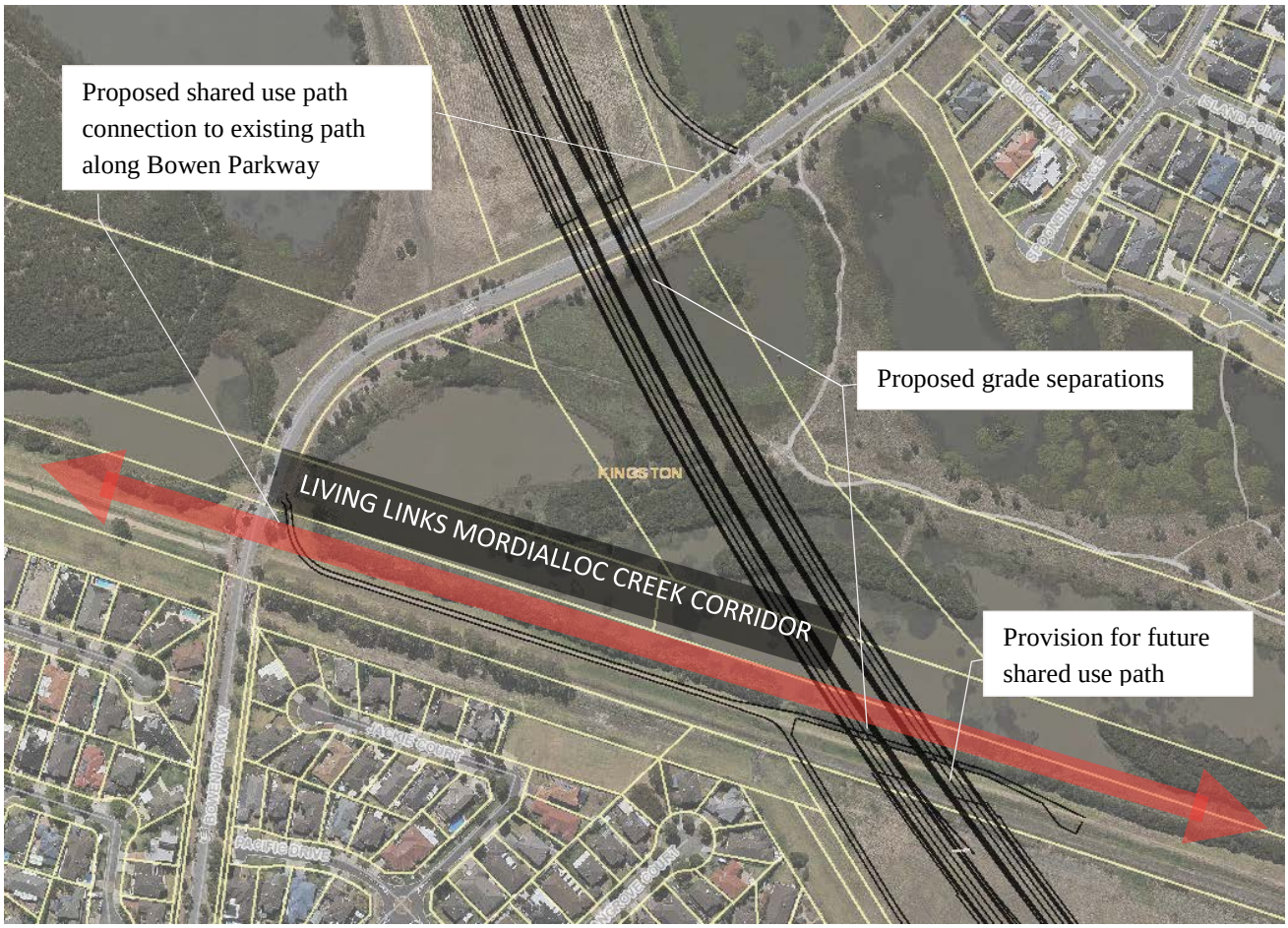


Figure 8.13 Proposed shared use path facility at Bowen Parkway and provision for future shared use path along the Living Links Mordialloc Creek Corridor

8.2 NETWORK PERFORMANCE IMPACT ASSESSMENT

The new road connection is anticipated to attract and facilitate traffic to and from surrounding residential, commercial and industrial precincts providing a more streamlined connection for the southern corridor movement.

The project alignment is located between Boundary Road and Springvale Road and is expected to relieve congestion on these parallel routes. Mordialloc Bypass is predicted to attract traffic from adjoining road links and network affecting a shift in traffic pattern and demand. The following sections outline the anticipated network performance impacts of the proposed bypass by comparing network conditions with and without the project, including project alternatives.

Network performance results were sourced from VITM modelling outputs as mentioned in Section 8.2 with emphasis on the shift in traffic demand, route travel time and link capacity performance. Traffic assessment has been based on 2031 forecast results to inform the potential network impact by the project. The findings and data presented in this section are consistent with the Mordialloc Bypass VITM Traffic Forecast Report in Appendix A.

8.2.1 2031 BASE CASE CONDITIONS (WITHOUT MORDIALLOC BYPASS)

This section provides an overview of the modelled base year and forecast network conditions without the Mordialloc Bypass in place. By comparing the base year and future year performance, the modelling output information presents the anticipated changes within the network brought about by population growth, land-use development and surrounding projects.

The future base case developed for this assessment is based on DEDJTR's Reference Case transport network. The Reference Case incorporates an assumed level of transport infrastructure investment as agreed across the transport portfolio. It includes a pipeline of medium term projects under development or already committed by Government such as Monash Freeway Upgrade Stage 2 and North East Link, and a range of other network upgrades which have not been committed, but can reasonably be expected to be required in the modelled horizon year.

8.2.1.1 FORECAST DEMAND AND TRAFFIC PATTERN

A series of modelling outputs have been extracted and processed from VITM to give an appreciation of the traffic demand changes throughout the network. Figure 8.14 shows a volume difference plot that provides a visual representation of the anticipated traffic volume changes surrounding the project area in 2031 compared to base year 2016.

The red bandwidth shown in the volume difference plot indicates the scale of the volume increase. An overall increase in traffic demand is anticipated in the network with the following roads showing the most significant volume increase surrounding the project area:

- Dingley Bypass – Dandenong Bypass
- Westall Road, north of Dingley Bypass
- Heatherton Road, east of Springvale
- Boundary Road, north of Lower Dandenong Road
- Mornington Peninsula Freeway, east of Springvale Road
- Springvale Road, north of Lower Dandenong Road.

In addition to the growth generated by population and land-use changes, the anticipated traffic growth is influenced by the inclusion of Dandenong Bypass and Westall Road Extension Projects.

The volume difference plot also shows minor decreases in traffic volumes on some links such as Heatherton Road, Edithvale Road and Old Dandenong Road. This could be attributable to adjacent land use changes over time or local road network capacity issues which influence route choices.

Two-way daily volume data extracted from VITM is presented in Table 8.3 showing the projected daily volume for key roads in the surrounding the project and the broader network. The data is consistent with the visual representation of the volume difference plot but provides an indication of the anticipated volume for the selected key road links.

The tabled volumes and volume difference plot both indicate that the overall traffic pattern within the existing network would likely be similar in 2031 with the exception of Dingley Bypass and Westall Road where increased demand is apparent. Based on the forecast information, an increase in turning movement demand to and from the cross roads along Dingley Bypass and Dandenong Bypass such as Boundary Road, Kingston Road, Westall Road and Springvale Road would be expected.

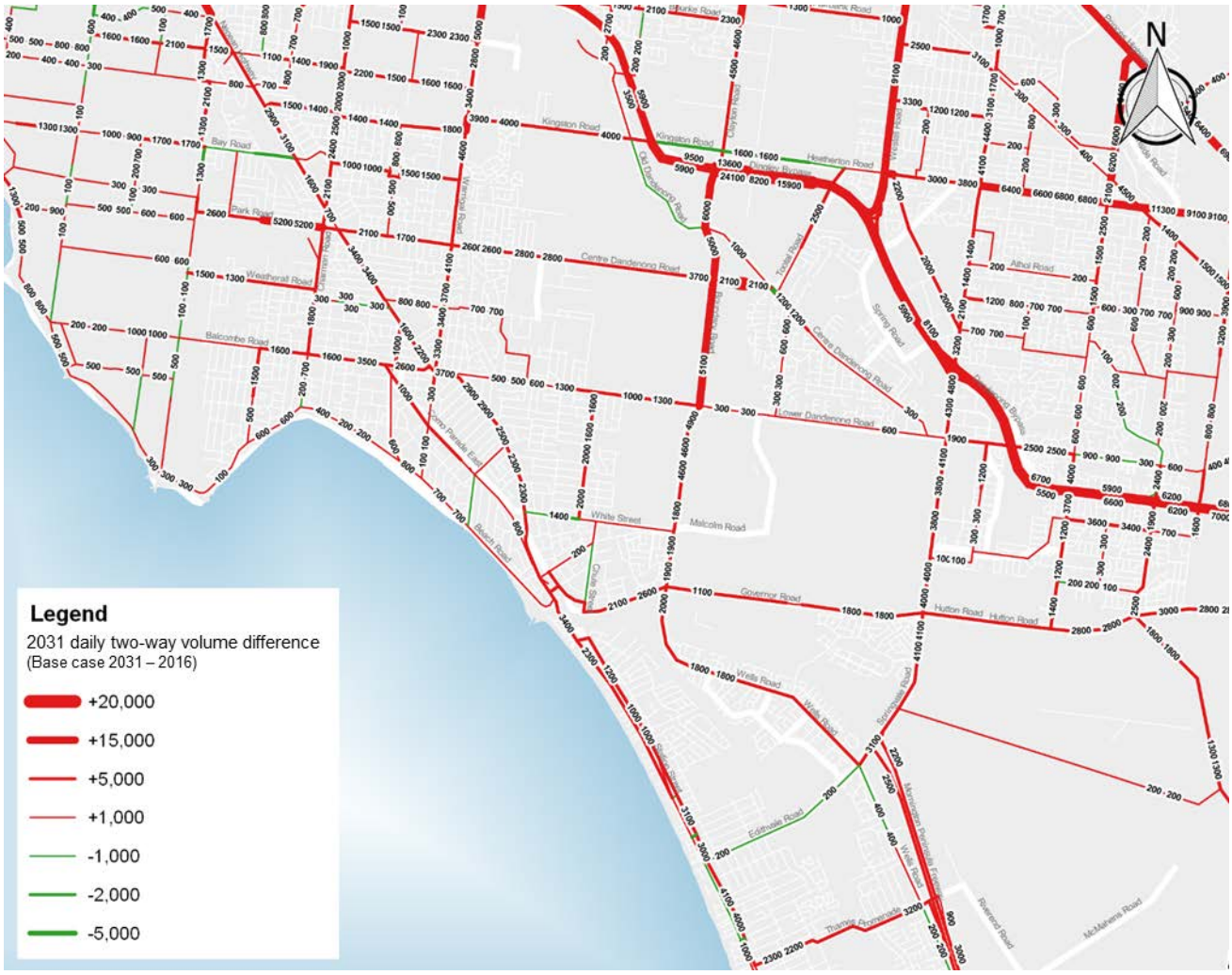


Figure 8.14 2031 Base Case – two-way daily volume (all vehicles) difference plot (2031 Base Case compared to 2016 Base Case)

Table 8.3 Base case forecast demand – two-way daily volume

ROAD	LOCATION	2016	2031	+/-
Mornington Peninsula Freeway	East of Springvale Road	45,900	50,700	4,800
Springvale Road	North of Mornington Peninsula Freeway	40,100	44,100	4,000
Springvale Road	South of Mornington Peninsula Freeway	38,200	40,100	1,900
Springvale Road	North of Westall Road	25,200	28,400	3,200
Wells Rd	West of Springvale Rd	33,100	34,900	1,800
Wells Rd	East of Springvale Rd	20,700	20,300	-400
Governor Road	Near Mordialloc Bypass	16,200	17,900	1,700
Lower Dandenong Road	Near Mordialloc Bypass	40,800	41,100	300
Boundary Road	South of Lower Dandenong Road	42,800	47,900	5,100
Boundary Road	South of Governor Road	42,700	44,700	2,000
Centre Dandenong Road	Near Mordialloc Bypass	15,000	17,300	2,300

ROAD	LOCATION	2016	2031	+/-
Old Dandenong Road	East of Boundary Road	3,400	4,500	1,100
Kingston Road	West of Dingley Bypass	18,500	22,700	4,200
Warrigal Road	North of Dingley Bypass	31,900	34,000	2,100
South Road	West of Warrigal Road	44,700	51,900	7,200
South Road	West of East Boundary Road	32,200	36,600	4,400
Westall Road	West of Springvale Road	44,300	58,000	13,700
Westall Road	North of Heatherton Road	47,800	56,400	8,600
Dingley Bypass	East of Boundary Road	37,600	52,800	15,200
Thames Promenade	West of Wells Road	11,600	14,800	3,200
Thompson Road	East of Mornington Peninsula Freeway	16,900	23,100	6,200
Thompson Road	West of Mornington Peninsula Freeway	18,600	19,800	1,200
Nepean Highway	North of White Street	40,900	43,300	2,400
Nepean Highway	North of Lower Dandenong Road	71,400	75,200	3,800

8.2.1.2 2031 SURROUNDING NETWORK PERFORMANCE

Volume-capacity ratio (VCR) plots have been produced to illustrate the projected level of service within the network in accordance with Austroads guidelines (refer to Table 8.4). The following VCR plots illustrate the network performance without the project in 2016 and 2031 for both AM and PM peak period, see Figure 8.15 and Figure 8.16.

Table 8.4 VCR and level of service relationship

VOLUME / CAPACITY RATIO	LEVEL OF SERVICE	COLOUR CODE	LEVEL OF SERVICE DESCRIPTION
< 0.28	A		Free-flow operations and motorists have high level of freedom to select desired speed and to manoeuvre within the traffic stream
0.28 – 0.44	B		Stable flow and motorists still have reasonable freedom to select desired speed and to manoeuvre within the traffic stream
0.45 – 0.64	C		Stable flow but most drivers are restricted to some extent in freedom to select desired speed and to manoeuvre within the traffic stream
0.65 – 0.84	D		Is close to the limit of stable flow and is approaching unstable flow. Motorists are restricted in their freedom to select desired speed and to manoeuvre within the traffic stream
0.85 – 0.99	E		At or approaching capacity. Flow is unstable with minor disturbances that may cause break-down in traffic stream.
>= 1	F		Unstable flow where flow break-down may occur

Source: Austroads

The modelling results suggest that road users are already experiencing congestion, with several sections of road approaching capacity in 2016. In 2031, increased congestion is evidenced by the increasing number of sections of road in the study area where VCR approaches and exceeds theoretical capacity (LOS E-F). The modelling suggests that with additional growth in demand and without the inclusion of the Mordialloc Bypass, several sections of road in the study

area will either approach or reach capacity by 2031, particularly in the PM peak, and that the existing roads may not be adequate to support the growing demand.

Figure 8.15 2016 Base Case Network Condition – AM (Left) and PM (Right) Volume-Capacity Ratio Plot

Figure 8.16 2031 Base Case Network Condition – AM (Left) and PM (Right) Volume-Capacity Ratio Plot

The key locations in the study area where road users are experiencing congestion in the peak periods are summarised in Table 8.5.VCR results indicate the road links surrounding the project area are currently approaching or at capacity, with the majority of roads deteriorating in performance by 2031. Significant congestion would likely be experienced along the following sections of roads, as results indicate the forecast performance to exceed theoretical capacity at level of service F in 2031.

- Springvale Road between Mornington Peninsula Freeway and Lower Dandenong Road
- Boundary Road between Governor Road and Springvale Road
- White Street between Nepean Highway and Boundary Road
- Governor Road, west of Boundary Road.

Table 8.5 Key locations where volumes approach or exceed capacity in 2016 and 2031

ROAD	PEAK PERIOD	PEAK DIR.	2016 BASE CASE		2031 BASE CASE	
			VCR*	LOS	VCR*	LOS
Springvale Road	AM	NB	0.7-1	D-E	0.8-1	D-E
Mornington Peninsula Freeway to Lower Dandenong Road	PM	SB	0.8-1	D-F	0.9-1	E-F
Boundary Road	AM	NB	0.8-1.1	D-F	0.8-1.2	D-F
Springvale Road to Governor Road	PM	SB	0.8-1.2	D-F	0.8-1.2	D-F
Governor Road	AM	WB	0.4-0.7	B-D	0.5-0.9	C-E
Boundary Road to Springvale Road	PM	EB	0.5-0.8	C-E	0.6-0.9	C-E
Lower Dandenong Road	AM	WB	0.6-0.9	C-E	0.9-0.9	E-E
Boundary Road to Springvale Road	PM	EB	0.6-0.9	C-E	0.9-0.9	E-E
Heatherton Road	AM	WB	0.6-0.9	C-E	0.7-0.9	D-E
West of Westall Road	PM	EB	0.6-0.9	C-E	0.7-1	D-E
White Street	AM	WB	0.9-1	E-F	0.8-1.1	D-F
Nepean Highway to Boundary Road	PM	EB	0.9-1	E-F	0.8-1.1	D-F
Tootal Road	AM	NB	0.4-0.9	B-E	0.4-0.8	B-D
South of Heatherton Road	PM	SB	0.4-0.7	B-D	0.4-0.8	C-D
Dingley Bypass	AM	WB	0.4-0.8	B-D	0.6-0.6	C-C
Warrigal Road to Westall Road	PM	EB	0.4-0.8	B-E	0.6-0.7	C-D
Nepean Highway	AM	NB	0.7-0.9	D-E	0.7-1	D-E
Centre Dandenong Road and White Street	PM	SB	0.8-0.9	D-E	0.8-1	D-E
Westall Road	AM	NB	0.3-0.9	A-E	0.2-1	A-E
Heatherton Road and Springvale Road	PM	SB	0.1-0.6	A-C	0.2-1	A-F
Centre Dandenong Road	AM	WB	0.5-0.8	C-D	0.6-0.9	C-E
Boundary Road and Warrigal Road	PM	EB	0.6-0.9	C-E	0.6-0.9	C-E
Mornington Peninsula Freeway	AM	NB	0.7-0.9	D-E	0.8-0.9	D-E
Thomson Road and Springvale Road	PM	SB	0.6-0.8	C-D	0.7-0.8	D-D

*Volume-capacity ratios (VCR) illustrated in the table have been rounded to the nearest one decimal place

8.2.2 2031 PROJECT CONDITIONS (WITH MORDIALLOC BYPASS)

A cumulative impact assessment has been undertaken to inform the network impact of the Mordialloc Bypass project and other potential projects considering the strategic changes associated with demographics, employment and public transport services. The content illustrated in this section is aimed at highlighting the anticipated transport network impacts of the project.

8.2.2.1 FORECAST DEMAND AND TRAFFIC PATTERN

Both project configurations (freeway and arterial road options) are expected to relieve congestion on the surrounding road network by enhancing traffic capacity in the north-south direction. Road links highlighted in green shown in Figure 8.17 provide an overview of the anticipated 2031 daily two-way volume reduction for the freeway configuration. Figure 8.18 that follows presents the changes in two-way heavy vehicle volumes.

The project provides an uninterrupted connection between Mornington Peninsula Freeway and Dingley Bypass and is likely to reduce a significant proportion of the existing "dog-leg" traffic movement between Boundary Road, Springvale Road and Mornington Peninsula Freeway. Importantly, the Mordialloc Bypass, in freeway configuration, will significantly reduce heavy vehicle volumes on residential streets such as White Street.

Servicing the nearby industrial, residential and commercial precincts, the proposed bypass will increase road usage along Dingley Bypass, Centre Dandenong Road, Lower Dandenong Road and Governor Road.

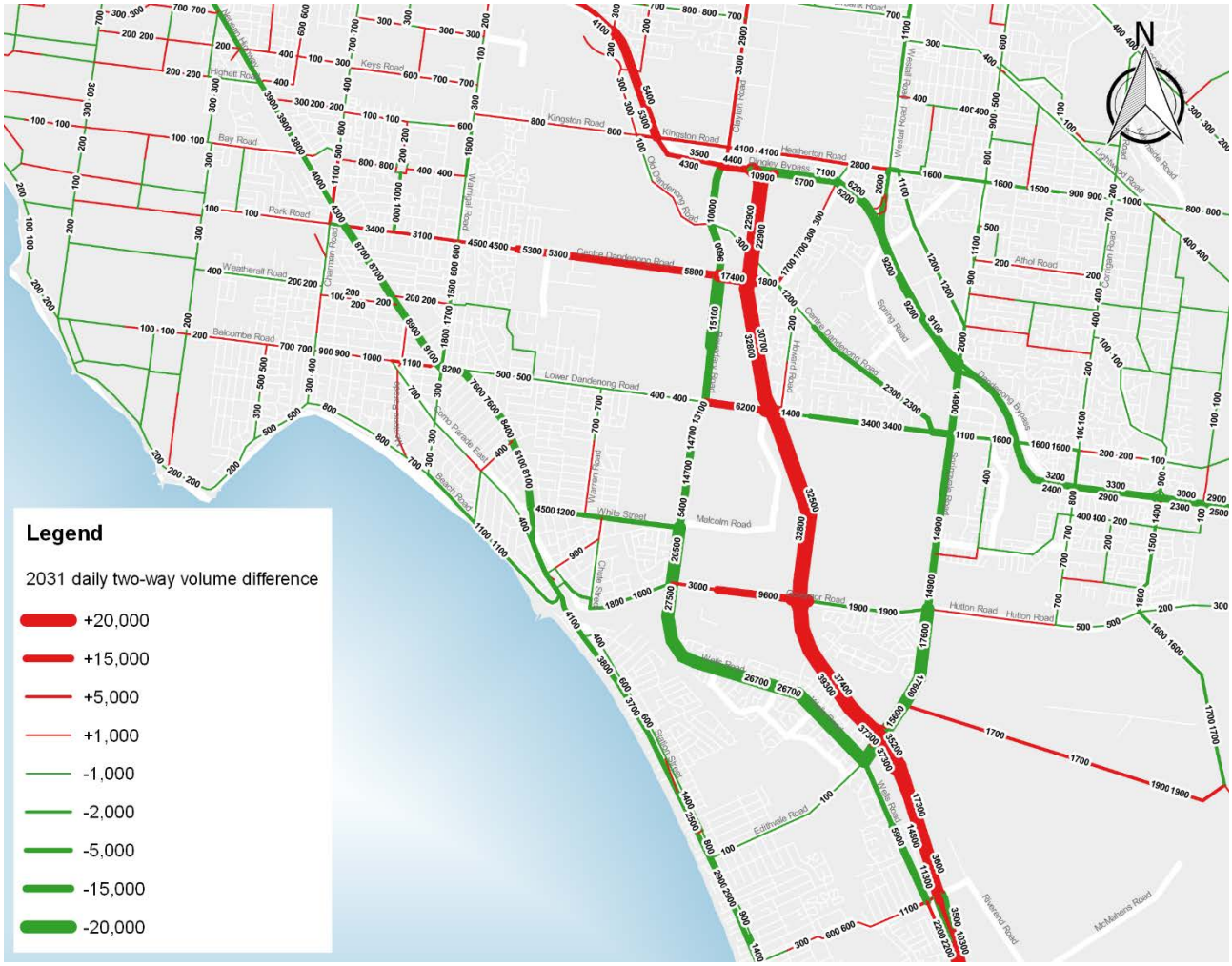


Figure 8.17 2031 two-way daily light vehicle volume difference plot (2031 freeway configuration minus 2031 Base Case)

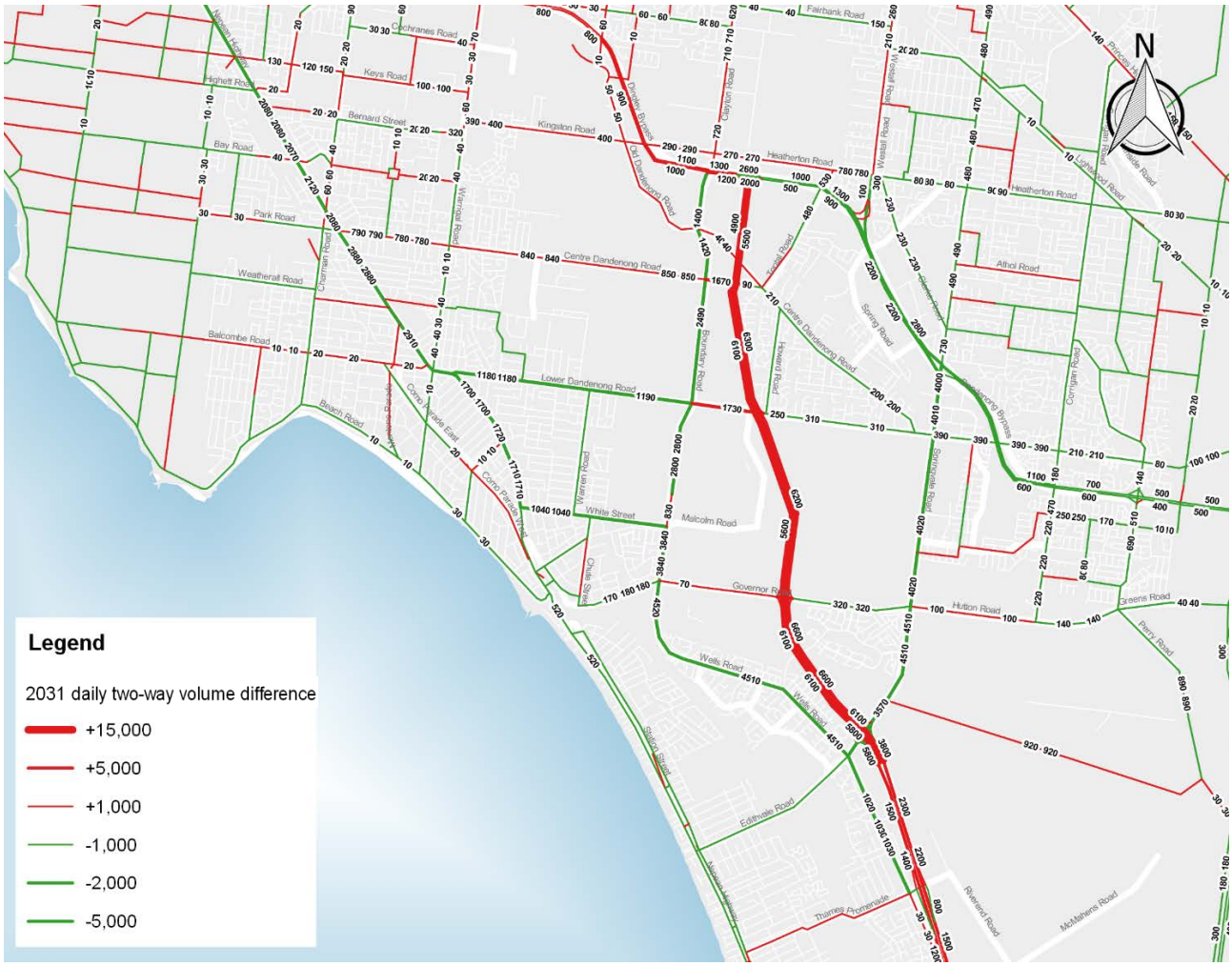


Figure 8.18 2031 two-way daily heavy vehicle volume difference plot (2031 freeway configuration minus 2031 Base Case)

Figure 8.19 and Figure 8.20 present the total traffic volume and heavy vehicle traffic volume differences between the freeway and arterial road configurations respectively. The higher capacity freeway configuration drives key differences in terms of traffic volume impacts to the surrounding road network. Primarily this includes a greater reduction in demands of up to 12,000 total daily vehicles along parallel routes such as Station Street / Nepean Highway, Wells Road / Boundary Road, Springvale Road and Dandenong Bypass. The arterial road configuration is also shown to be less effective in removing heavy vehicle traffic from roads with residential land uses such as Lower Dandenong Road and White Street.

The freeway configuration will attract higher demands along some intersecting arterial roads such as Centre Dandenong Road, Kingston Road/Heatherton Road and Hutton Road/Greens Road, compared to the arterial road configuration. However, these increases are at a smaller scale at up to 4,500 daily vehicles.

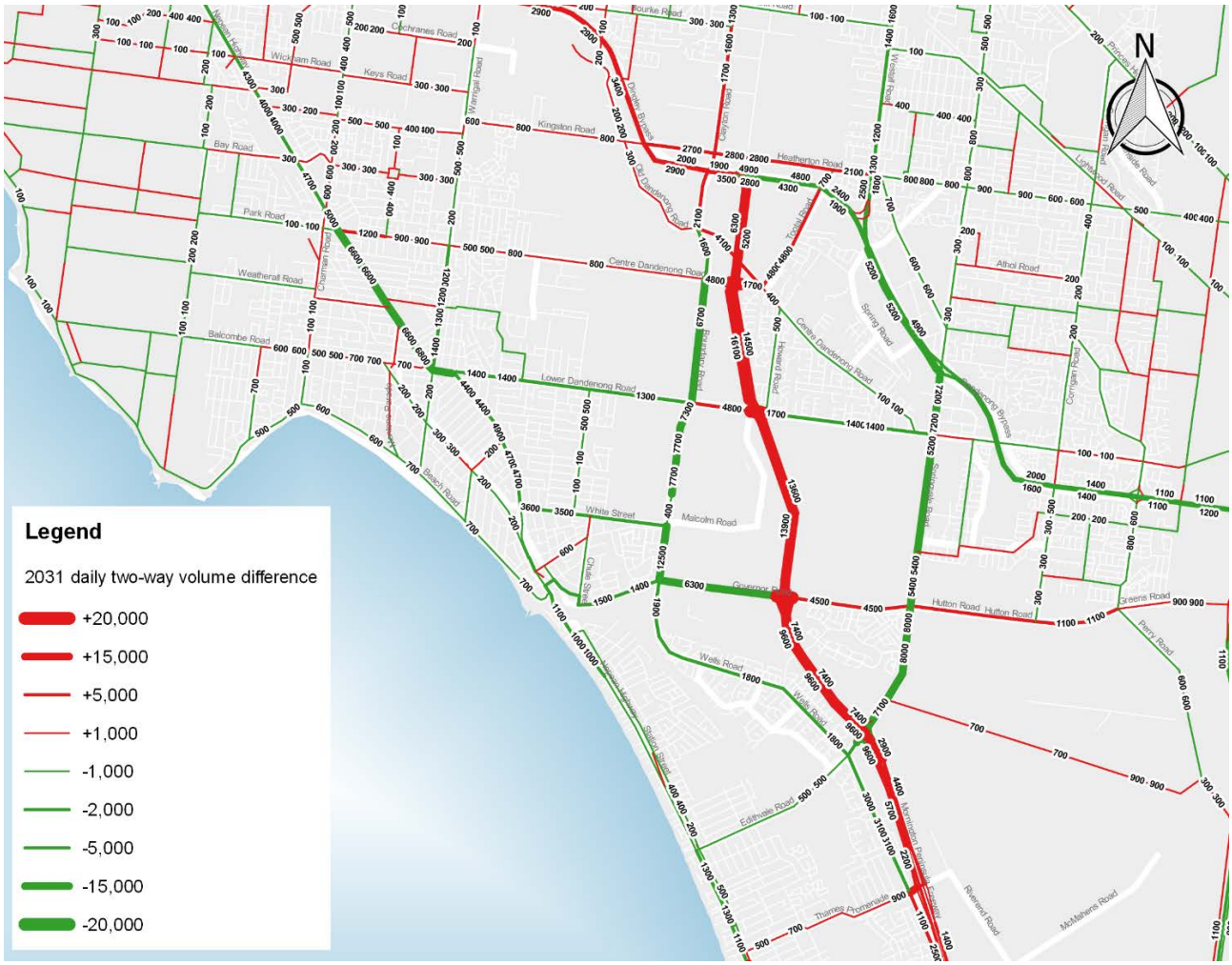


Figure 8.19 2031 two-way daily light vehicle volume difference plot (2031 freeway configuration minus 2031 arterial road configuration)

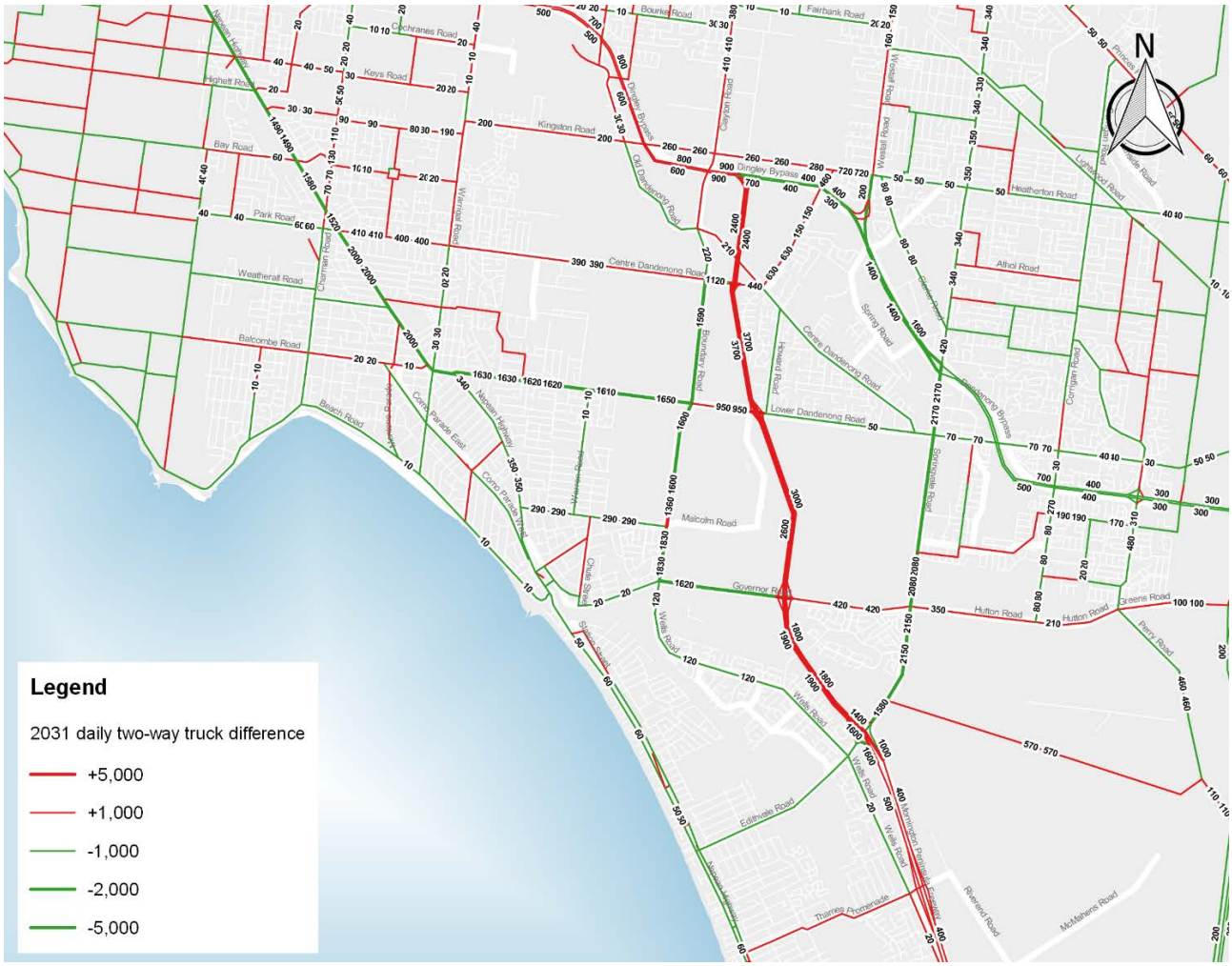


Figure 8.20 2031 two-way daily heavy vehicle volume difference plot (2031 freeway configuration minus 2031 arterial road configuration)

A detailed traffic volume comparison of the base case (without project) against the freeway and arterial road configurations in 2031 is presented in Table 8.6. It highlights the scale of volume changes on key roads within the study area, with results indicating a significant reduction in forecast demand along Westall Road, Boundary Road and Springvale Road.

Table 8.6 2031 base case and project forecast demand – daily two-way volume

ROAD	LOCATION	BASE CASE	ARTERIAL ROAD CONFIG. (%HV) [Δ BASE CASE]	FREEWAY CONFIG. (%HV) [Δ BASE CASE]
Mornington Peninsula Freeway	East of Springvale Road	50,700 (18%)	72,500 (17%) [+21,800]	82,800 (16%) [+32,100]
Springvale Road	North of Mornington Peninsula Freeway	44,100 (14%)	35,700 (11%) [-8,400]	28,500 (9%) [-15,600]
Springvale Road	South of Mornington Peninsula Freeway	40,100 (10%)	25,500 (2%) [-14,600]	22,500 (2%) [-17,600]

ROAD	LOCATION	BASE CASE	ARTERIAL ROAD CONFIG. (%HV) [Δ BASE CASE]	FREEWAY CONFIG. (%HV) [Δ BASE CASE]
Springvale Road	North of Westall Road	28,400 (8%)	27,100 (8%) [-1,300]	26,400 (6%) [-2,000]
Wells Rd	West of Springvale Rd	34,900 (13%)	10,100 (4%) [-24,800]	8,200 (2%) [-26,700]
Wells Rd	East of Springvale Rd	20,300 (7%)	18,500 (2%) [-1,800]	15,500 (3%) [-4,800]
Governor Road	West of Mordialloc Bypass	17,900 (14%)	33,500 (14%) [+15,600]	27,600 (12%) [+9,700]
Governor Road	East of Mordialloc Bypass	17,900 (14%)	11,600 (16%) [-6,300]	16,200 (14%) [-1,700]
Lower Dandenong Road	West of Mordialloc Bypass	41,100 (9%)	42,600 (10%) [+1,500]	47,300 (11%) [+6,200]
Lower Dandenong Road	East of Mordialloc Bypass	41,100 (9%)	42,000 (8%) [+900]	39,800 (8%) [-1,300]
Boundary Road	South of Lower Dandenong Road	47,900 (20%)	42,100 (21%) [-5,800]	34,800 (21%) [-13,100]
Boundary Road	South of Governor Road	44,700 (11%)	19,000 (2%) [-25,700]	17,100 (1%) [-27,600]
Centre Dandenong Road	West of Mordialloc Bypass	17,300 (13%)	39,500 (13%) [+22,200]	34,700 (11%) [+17,400]
Centre Dandenong Road	East of Mordialloc Bypass	17,300 (13%)	17,300 (9%) [0]	19,100 (12%) [+1,800]
Old Dandenong Road	East of Boundary Road	4,500 (4%)	<100* [-4,400]	4,100 (5%) [-400]
Kingston Road	West of Dingley Bypass	22,700 (17%)	23,100 (17%) [+400]	23,700 (18%) [+1,000]
Warrigal Road	North of Dingley Bypass	34,000 (10%)	34,400 (10%) [+400]	35,200 (9%) [+1,200]
South Road	West of Warrigal Road	51,900 (18%)	52,900 (19%) [+1,000]	57,000 (19%) [+5,100]
South Road	West of E Boundary Road	36,600 (15%)	37,400 (16%) [+800]	41,400 (18%) [+4,800]

ROAD	LOCATION	BASE CASE	ARTERIAL ROAD CONFIG. (%HV) [Δ BASE CASE]	FREEWAY CONFIG. (%HV) [Δ BASE CASE]
Westall Road	West of Springvale Road	58,000 (22%)	49,800 (22%) [-8,200]	39,700 (20%) [-18,300]
Westall Road	North of Heatherton Road	56,400 (15%)	56,900 (15%) [+500]	55,500 (15%) [-900]
Mordialloc Bypass	Springvale Road and Governor Road	-	59,700 (15%) [+59,700]	76,700 (17%) [+76,700]
Mordialloc Bypass	North of Governor Road	-	37,700 (16%) [+37,700]	65,300 (18%) [+65,300]
Mordialloc Bypass	North of Lower Dandenong Road	-	32,900 (15%) [+32,900]	63,500 (20%) [+63,500]
Dingley Bypass	East of Boundary Road	52,800 (20%)	55,800 (20%) [+3,000]	60,700 (21%) [+7,900]
Thames Promenade	West of Wells Road	14,800 (1%)	15,000 (1%) [+200]	15,900 (1%) [+1,100]
Thompson Road	East of Mornington Peninsula Freeway	23,100 (5%)	27,100 (6%) [+4,000]	28,500 (7%) [+5,400]
Thompson Road	West of Mornington Peninsula Freeway	19,800 (1%)	19,900 (1%) [+100]	19,900 (1%) [+100]
Nepean Highway	North of White Street	43,300 (11%)	40,000 (9%) [-3,300]	35,200 (9%) [-8,100]

* Estimated daily volume based on existing dwellings

In the case of the freeway configuration, the proposed Mordialloc Bypass will be a higher standard road with enhanced mobility compared to adjacent routes that currently service trips between Mornington Peninsula Freeway and key activity areas. As a result, the new piece of infrastructure would likely attract traffic from the surrounding project area along roads that will be connected to the proposed bypass including Dingley Bypass, Centre Dandenong Road, Lower Dandenong Road and Governor Road (where new interchanges are proposed). The increase of traffic is likely due to trips servicing the local area in City of Kingston that have been rediverted from Wells Road. The exception is traffic increases along the Dingley Bypass, which are likely to and from the wider network. Key volume changes driven by the project are listed below:

- a significant decrease in daily traffic volume, which equates to more than 70 percent to 75 percent, is anticipated along Wells Road, west of Springvale Road in the arterial road and freeway configurations, respectively
- a significant decrease in daily traffic volume of around 60 percent is anticipated along Boundary Road, south of Governor Road for both configurations
- a decrease in daily traffic volume along Springvale Road, north of Mornington Peninsula Freeway, of 15 percent and 35 percent for the arterial road and freeway configurations, respectively
- as a result of the proposed Old Dandenong Road truncation under the arterial road configuration, the anticipated daily volume is expected to be significantly reduced

- daily traffic volume is estimated to increase along Mornington Peninsula Freeway, east of Springvale Road, by more than 40 percent in the arterial road configuration and by more than 60 percent in the freeway configuration
- daily traffic volume is estimated to double along Centre Dandenong Road, west of Mordialloc Bypass. The impacts of the arterial road configuration are expected be even greater (228 percent) due to the full northbound and southbound access at Mordialloc Bypass
- daily traffic volume is estimated to increase along Governor Road, west of Mordialloc Bypass, by more than 50 percent in the freeway configuration and nearly 90 percent in the arterial road configuration.

The anticipated growth along Centre Dandenong Road is considered to be the most significant, largely due to the serviceability of the proposed bypass that unlocks the full potential of the proposed precincts development associated with the 2015 Moorabbin Airport Master Plan. Forecast results indicate that the project would enhance the equity of access by facilitating a higher quality wider network connection to the Moorabbin Airport whilst reducing pressure along Boundary Road which is currently, and will foreseeably be, an important route to support the 20-year Master Plan.

To accommodate the increased traffic volumes, both the freeway and arterial road configurations include the duplication of Centre Dandenong Road between Mordialloc Bypass and Boundary Road.

8.2.2.2 TRAVEL TIME PERFORMANCE

Travel time is one of the key performance metrics used to assess the impact of the project. Route travel time along existing roads and travel time performance servicing the Monash National Employment Innovative Cluster (NEIC) have been assessed to provide an appreciation of potential route performance and road user experience along the journey to work.

The travel time comparison plot illustrated in Figure 8.21 and Figure 8.22 for the freeway and arterial road configurations respectively, shows an overall network improvement in mobility and access for motorists wanting to travel to Monash NEIC during the AM peak period. In particular in areas that are located to the south of Springvale Road, at approximately 10 to 20 kilometres range from the Monash NEIC, a reduction of travel time greater than five percent can be attributed to the project. The freeway configuration is shown to have a greater benefit for a larger number of origin zones due to its ability to reduce demand on the surrounding arterial road network.

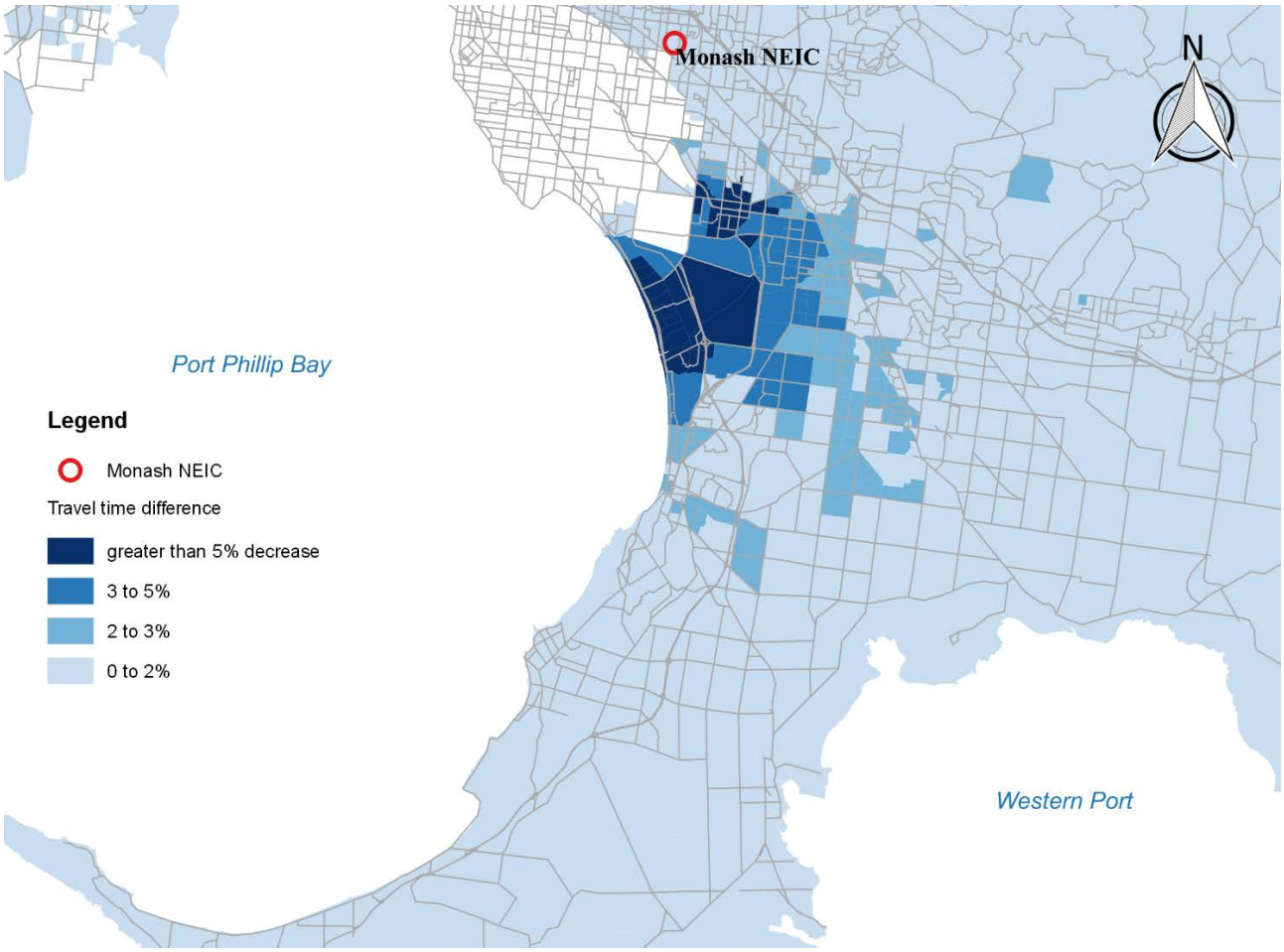


Figure 8.21 2031 AM peak average travel time difference plot (travel to Monash NEIC) – freeway configuration vs base case

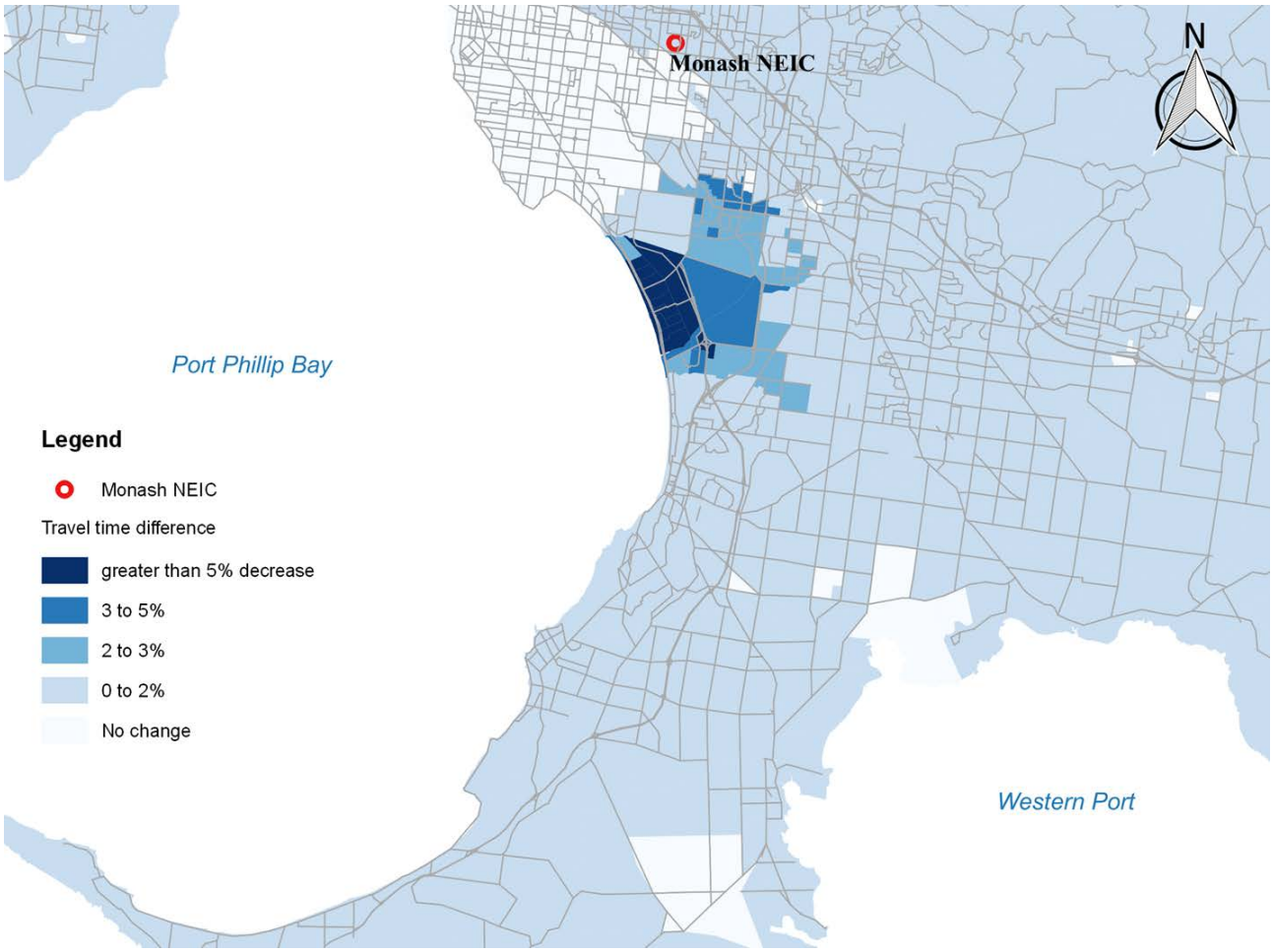


Figure 8.22 2031 AM peak average travel time difference plot (travel to Monash NEIC) – arterial road configuration vs base case

Performance impacts along the existing routes surrounding the project area is fundamentally important to inform the feasibility of the project. Route travel time results were extracted from VITM and are reported in Table 8.7 and Table 8.8 for the AM and PM peak.

The tabulated modelling results indicate the travel time differences of the base case and project scenario in 2031, with results presented in minutes. Travel time results are averaged throughout the AM and PM peak period to provide an overview of the anticipated route performance.

Table 8.7 2031 AM peak average travel time comparison in minutes

ROUTE		DIR.	BASE CASE	FREEWAY CONFIG.	+/-	ARTERIAL CONFIG.	+/-
1	Springvale Road between Mornington Peninsula Freeway and Dingley Bypass	NB	13.1	9.3	-3.8	10.0	-3.1
		SB	8.8	8.1	-0.7	8.3	-0.5
2	Boundary Road – Wells Road between Springvale Road and Dingley Bypass	NB	14.5	9.9	-4.6	10.2	-4.3
		SB	10.7	10.0	-0.7	10.1	-0.6
3	Wells Road – White Street between Springvale Road and Nepean Highway	NB	16.4	11.8	-4.6	12.4	-4.0
		SB	12.0	10.6	-1.4	11.1	-0.9
4	Wells Road – Lower Dandenong Road between Springvale Road and Nepean Highway	NB	19.5	15.9	-3.6	16.4	-3.1
		SB	15.1	14.3	-0.8	14.5	-0.6

ROUTE		DIR.	BASE CASE	FREEWAY CONFIG.	+/-	ARTERIAL CONFIG.	+/-
5	Lower Dandenong Road between Springvale Road and Boundary Road	EB	3.6	3.5	-0.1	3.9	0.3
		WB	5.0	4.8	-0.2	4.6	-0.4
6	Nepean Highway between White Street and Centre Dandenong Road	NB	7.9	6.9	-1.0	7.4	-0.5
		SB	5.5	5.3	-0.2	5.3	-0.2
7	Dingley Bypass between Warrigal Road and Boundary Road	EB	4.2	4.4	0.2	4.3	0.1
		WB	5.8	6.3	0.5	6.1	0.3
8	Springvale Road between Heatherton Road and Mornington Peninsula Freeway	NB	10.4	7.9	-2.5	8.3	-2.1
		SB	7.8	7.3	-0.5	7.4	-0.4
9	Mornington Peninsula Freeway between Thompson Road and Springvale Road	NB	5.9	8.5	2.6	7.6	1.7
		SB	5.2	5.3	0.1	5.3	0.1

*Travel times in the table have been rounded to the nearest decimal place.

Table 8.8 2031 PM peak average travel time comparison in minutes

ROUTE		DIR.	BASE CASE	FREEWAY CONFIG.	+/-	ARTERIAL CONFIG.	+/-
1	Springvale Road between Mornington Peninsula Freeway and Dingley Bypass	NB	9.1	8.3	-0.8	8.5	-0.6
		SB	16.4	9.4	-7.0	10.4	-6.0
2	Boundary Road – Wells Road between Springvale Road and Dingley Bypass	NB	10.4	9.7	-0.7	9.8	-0.6
		SB	17.7	10.3	-7.4	10.7	-7.0
3	Wells Road – White Street between Springvale Road and Nepean Highway	NB	12.8	10.9	-1.9	11.4	-1.4
		SB	19.4	12.7	-6.7	13.3	-6.1
4	Wells Road – Lower Dandenong Road between Springvale Road and Nepean Highway	NB	15.4	14.7	-0.7	15	-0.4
		SB	23.3	17.1	-6.2	17.8	-5.5
5	Lower Dandenong Road between Springvale Road and Boundary Road	EB	5.2	5.4	0.2	4.4	-0.8
		WB	3.7	3.8	0.1	3.7	0.0
6	Nepean Highway between White Street and Centre Dandenong Road	NB	5.9	5.5	-0.4	5.6	-0.3
		SB	8.8	8.0	-0.8	8.3	-0.5
7	Dingley Bypass between Warrigal Road and Boundary Road	EB	5.7	6.3	0.6	6.1	0.4
		WB	4.7	5.0	0.3	4.8	0.1
8	Springvale Road between Heatherton Road and Mornington Peninsula Freeway	NB	7.9	7.4	-0.5	7.5	-0.4
		SB	13.7	8.1	-5.6	8.7	-5.0
9	Mornington Peninsula Freeway between Thompson Road and Springvale Road	NB	4.8	5.0	0.2	4.9	0.1
		SB	5.4	9.0	3.6	8.3	2.9

*Travel times in the table have been rounded to the nearest decimal place.

Modelling results indicate an overall improvement in route travel times, which is particularly pronounced during the PM peak period. Travel time improvements are forecast to be greatest on Springvale Road, Boundary Road and Wells Road, with results showing:

- Average travel time along Springvale Road between Dingley Bypass and Mornington Peninsula Freeway is expected to decrease by approximately four and seven minutes in the peak direction during AM and PM peak respectively for the freeway configuration. The average travel time decreases would be marginally less at approximately three and six minutes during the AM and PM peak for the arterial road configuration.
- Average travel time along Boundary Road-Wells Road between Dingley Bypass and Mornington Peninsula Freeway is expected to decrease by approximately four and a half and seven minutes in the peak direction during AM and PM peak respectively for both configurations.
- Average travel time along Wells Road-White Street between Mornington Peninsula Freeway and Nepean Highway is expected to decrease by approximately seven minutes in the peak direction during PM peak period for the freeway configuration and six minutes for the arterial road configuration.

The new bypass connection is anticipated to bring about a minor increase in travel time along Mornington Peninsula Freeway and Dingley Bypass as a result of additional demand attracted by the project. The level of increase in travel time is expected to be outweighed by the improvement within the surrounding network as well as the continuous movement enabled by the new connection between Dingley Bypass and Mornington Peninsula Freeway.

8.2.2.3 ORIGIN-DESTINATION PERFORMANCE

In addition to changes in travel time performance along existing routes, Table 8.9 summarises average speed and travel time performance between the two key origins-destinations, Mornington Peninsula Freeway north of Thames Promenade and Dingley Bypass / Boundary Road intersection. As expected, the performance of the freeway configuration is substantially more favourable in terms of average speed and travel time savings due to the directness of travel and enhanced corridor condition.

Table 8.9 2031 origin-destination performance

ORIGIN-DESTINATION	PEAK	DIR.	2031 BASE CASE[1]		2031 FREEWAY[2]		2031 ARTERIAL[2]	
			AVE SPEED [KM/HR]	TRAVEL TIME [MIN]	AVE SPEED [KM/HR]	TRAVEL TIME [MIN]	AVE SPEED [KM/HR]	TRAVEL TIME [MIN]
Mornington Peninsula Freeway north of Thames Promenade to Dingley Bypass / Boundary Road intersection	AM	NB	42	16.9	73	9.2	59	11.3
	PM	NB	50	12.4	87	6.8	65	9.1
Dingley Bypass / Boundary Road intersection to Mornington Peninsula Freeway north of Thames Promenade	AM	SB	49	12.1	91	6.5	67	8.5
	PM	SB	37	20.2	72	9.6	60	11.6

(1) Performance extracted from the existing routes e.g. Mornington Peninsula Freeway, Wells Road, Boundary Road, Dingley Bypass and Springvale Road.

(2) Performance extracted from the proposed Mordialloc Bypass corridor, Mornington Peninsula Freeway and Dingley Bypass.

8.2.2.4 SURROUNDING NETWORK PERFORMANCE

IMPROVEMENTS

Potential improvements within the surrounding network introduced by the freeway configuration of the project are identified in the following VCR plots in Figure 8.23. These VCR plots illustrate the road links that would operate at or above capacity (LOS E and F) under the base case scenario but could be enhanced to operate at or better than LOS D by the project. From a capacity perspective, roads that would likely benefit from the project include:

- Springvale Road between Mornington Peninsula Freeway and Lower Dandenong Road
- Wells Road between Winners Circle and Springvale Road
- Governor Road between the bypass and Springvale Road
- Nepean Highway between Edithvale Road and Eulinga Avenue
- Boundary Road, south of Lower Dandenong Road
- Lower Dandenong Road, west of Boundary Road.

Figure 8.23 Road links that will be improved from LOS E or F to LOS D or better by the project (freeway configuration) – AM (Left) and PM (Right)

The differences between the arterial road and freeway configurations are observed to be relatively minor within the local study area (e.g. between Springvale Road and Dingley Bypass) in Figure 8.24. The key difference at the regional level is the lower level of benefit provided to Nepean Highway and the broader southern movement corridor. The arterial road is not able to cater to strategic north-west to south-east movements as readily as the freeway configuration as is therefore not able to free up the same quantum of capacity on parallel routes.

Figure 8.24 Road links that will be improved from LOS E or F to LOS D or better by the project (arterial configuration) – AM (Left) and PM (Right)

IMPACTS

Potential network constraints introduced by the freeway configuration of the project can be illustrated by comparing the VCR performance between the base case and project scenario. The VCR plots shown in Figure 8.25 have been formatted to explicitly identify the road links that are expected to underperform in 2031 (at or approaching capacity, LOS E-F) under the project scenario only and would perform at or better than LOS D in the base case scenario.

Figure 8.25 Road links that will be impacted by the project (freeway configuration) and are anticipated to operate at LOS E or F in 2031 – AM (Left) and PM (Right)

This assessment highlights a number of road links that would experience a higher level of congestion as a result of the project in the surrounding network. Impacts are primarily reflected in the southern and northern end of the project area along the following roads:

- Mornington Peninsula Freeway, east of Springvale Road
- Wells Road, north of Thames Promenade (AM peak only)
- Tootal Road, south of Dingley Bypass
- Westall Road, north of Heatherton Road
- Thames Promenade, west of Wells Road.

The proposed bypass may also increase congestion on the road links between Boundary Road and west of the bypass along Centre Dandenong Road and Lower Dandenong Road.

The arterial road configuration is similarly expected to attract a higher level of congestion to the same roads as the freeway configuration in comparison to the 2031 base case as shown in VCR plots in Figure 8.26. However, as the arterial road configuration provides less throughput than the freeway configuration, it attracts a lower volume of vehicles on roads providing access to the bypass which means they are less likely to be impacted by the project.

Notable differences between Figure 8.25 (arterial road) and Figure 8.26 (freeway) are Tootal Road and Lower Dandenong Road, between Boundary Road and the proposed bypass, remain within capacity.

Figure 8.26 Road links that will be impacted by the project (arterial road configuration) and are anticipated to operate at LOS E or F in 2031 – AM (Left) and PM (Right)

8.2.2.5 LEVEL OF SERVICE (VOLUME-CAPACITY RATIO)

Table 8.10 compares the level of service under the base case, freeway configuration and arterial road configuration scenarios for both AM and PM peaks. Consistent with the travel time performance results, the level of service is expected to be greatly enhanced along Boundary Road and Springvale Road by 2031 with the implementation of the Mordialloc Bypass.

Overall, the results indicate that the freeway configuration performs best within the road network, with significant improvements to Springvale Road and Wells Road / Boundary Road, the two parallel routes on either side of the proposed Mordialloc Bypass.

Under the project scenarios, the performance along Mornington Peninsula Freeway, Lower Dandenong Road and Centre Dandenong Road would be worse off compared to the base case condition. However, it is important to note that despite the increases in traffic volumes and VCR, additional travel times for these links less than the travel time savings on other links, indicating the overall benefit of the Mordialloc Bypass for the network.

Appendix C includes a visual presentation of Table 8.10 VCR map form for the three scenarios in both AM and PM peaks.

Table 8.10 VCR comparison table –2031 base case, 2031 freeway configuration and 2031 arterial road configuration

ROAD	PEAK PERIOD	PEAK DIR.	2031 BASE CASE		2031 FREEWAY		2031 ARTERIAL ROAD	
			VCR*	LOS	VCR*	LOS	VCR*	LOS
Springvale Road	AM	NB	0.8-1	D-E	0.4-0.6	B-C	0.5-0.7	C-D
Mornington Peninsula Freeway to Lower Dandenong Road	PM	SB	0.9-1	E-F	0.7-0.7	D-D	0.7-0.8	D-D
Wells Road / Boundary Road	AM	NB	0.8-1.2	D-F	0.4-0.6	B-C	0.5-0.7	C-D
Springvale Road to Governor Road	PM	SB	0.8-1.2	D-F	0.4-0.7	B-D	0.5-0.8	C-D
Governor Road	AM	WB	0.5-0.9	C-E	0.4-0.9	C-E	0.5-0.9	C-E
Boundary Road to Springvale Road	PM	EB	0.6-0.9	C-E	0.5-0.9	C-E	0.5-1	C-F

ROAD	PEAK PERIOD	PEAK DIR.	2031 BASE CASE		2031 FREEWAY		2031 ARTERIAL ROAD	
			VCR*	LOS	VCR*	LOS	VCR*	LOS
Lower Dandenong Road	AM	WB	0.9-0.9	E-E	0.7-1	D-E	0.8-0.9	D-E
Boundary Road to Springvale Road	PM	EB	0.9-0.9	E-E	0.7-1	D-F	0.9-1	E-F
Heatherton Road	AM	WB	0.7-0.9	D-E	0.7-0.9	D-E	0.7-0.9	D-E
West of Westall Road	PM	EB	0.7-1	D-E	0.8-0.9	D-E	0.8-0.9	D-E
White Street	AM	WB	0.8-1.1	D-F	0.7-1.1	D-F	0.7-1.1	D-F
Nepean Highway to Boundary Road	PM	EB	0.8-1.1	D-F	0.8-1.1	D-F	0.8-1.1	D-F
Tootal Road	AM	NB	0.4-0.8	B-D	0.3-0.9	A-E	0.3-0.7	B-D
South of Heatherton Road	PM	SB	0.4-0.8	C-D	0.5-0.9	C-E	0.4-0.8	B-D
Dingley Bypass	AM	WB	0.6-0.6	C-C	0.3-0.7	B-D	0.4-0.7	B-D
Warrigal Road to Westall Road	PM	EB	0.6-0.7	C-D	0.3-0.7	B-D	0.4-0.7	B-D
Nepean Highway	AM	NB	0.7-1	D-E	0.7-0.9	D-E	0.7-0.9	D-E
Centre Dandenong Road and White Street	PM	SB	0.8-1	D-E	0.8-1	D-E	0.8-1	D-E
Westall Road	AM	NB	0.2-1	A-E	0.2-0.9	A-E	0.2-0.9	A-E
Heatherton Road and Springvale Road	PM	SB	0.2-1	A-F	0.2-0.9	A-E	0.2-0.9	A-E
Centre Dandenong Road	AM	WB	0.6-0.9	C-E	0.7-1	D-E	0.6-0.9	D-E
Boundary Road and Warrigal Road	PM	EB	0.6-0.9	C-E	0.7-1	D-F	0.7-1	D-E
Mornington Peninsula Freeway	AM	NB	0.8-0.9	D-E	0.9-1	E-F	0.9-1	E-F
Thomson Road and Springvale Road	PM	SB	0.7-0.8	D-D	0.9-1	E-F	0.9-1	E-F

*Volume-capacity ratios (VCR) illustrated in the table have been rounded to the nearest tenth decimal place.

By 2031, motorists accessing the Mordialloc Bypass via the proposed interchange ramps may experience difficulty in merging onto the mainline due to a relatively high level of density of mainline flow. In addition to this effect, vehicles entering the mainline flow could induce flow breakdown along the freeway which may impact on the overall bypass operation and limit road user comfort in selecting desirable speed and perform lane change manoeuvre. The proposed design allows for future ramp metering and support the future implementation of a Managed Freeway system, which in turn would ultimately complement the project to enhance the safety and operation of the proposed freeway facility on the horizon. To maximise the effectiveness and realise the full potential of a Managed Freeway operation, it is recognised that a broader scheme would be required to incorporate treatments along the existing Mornington Peninsula Freeway.

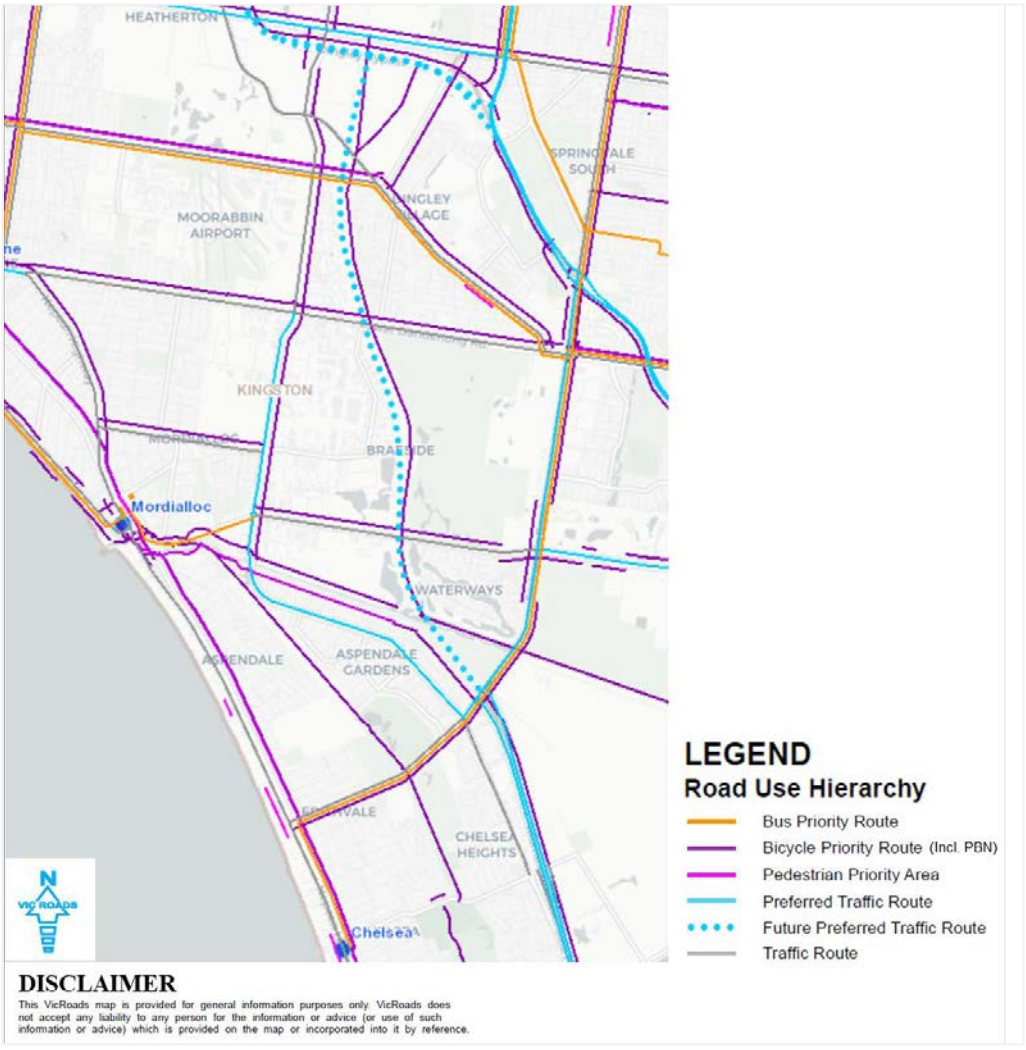
8.3 ALIGNMENT WITH FUTURE ROAD USE CLASSIFICATIONS

8.3.1 SMARTROADS

SmartRoads is a system employed by VicRoads to manage the competing interests of road space by nominating the priority of transport modes now and into the future. These priority movements are assigned to arterial roads across the network forming the SmartRoads Network Operating Plan. SmartRoads network operating plans have been developed through extensive consultation with local councils, government agencies and relevant stakeholders over several years.

The SmartRoads map presented in Figure 8.27 shows the location of the Mordialloc Bypass as a future preferred traffic route with a shared path alongside providing priority to cyclists and pedestrians forming part of the PBN. Bicycle priority routes area are also provided where major roads intersect the bypass connecting, providing local access to cyclists in the surrounding suburbs.

There is increasing interest in active transport moving forward and the south-eastern suburbs of Melbourne have several shared paths and on-road bicycle lanes encouraging active and facilitating local access.



Source: VicRoads

Figure 8.27 SmartRoads interactive map

The SmartRoads classification for the key roads within the local study area of the proposed bypass is summarised in Table 8.11.

Table 8.11 SmartRoads classifications

ROAD NAME (SECTION)	ACTIVE TRANSPORT		PUBLIC TRANSPORT	ROAD TRANSPORT	
	BICYCLE PRIORITY ROUTE / PBN	PEDESTRIAN PRIORITY ROUTE	BUS PRIORITY ROUTE	PREFERRED TRAFFIC ROUTE	TRAFFIC ROUTE
Dingley Bypass	✓			✓	
Boundary Road (Dingley Bypass to Lower Dandenong Road)	✓				✓
Boundary Road (Lower Dandenong Road to Wells Road)	✓			✓	
Wells Road (West of Springvale Road)				✓	
Old Dandenong Road					✓
Governor Road	✓				✓
Centre Dandenong Road (West of Old Dandenong Road)	✓		✓		✓
Centre Dandenong Road (East of Old Dandenong Road)			✓		✓
Centre Dandenong Road (Adjacent Dingley Village)		✓	✓		✓
Lower Dandenong Road (West of Centre Dandenong Road)	✓				✓
Westall Road	✓			✓	
Springvale Road	✓		✓	✓	
Mornington Peninsula Freeway	✓			✓	

Source: VicRoads

8.3.1.1 BUS PRIORITY

As shown in Table 8.11, Centre Dandenong Road and Springvale Road are defined in SmartRoads as bus priority routes. The 828 bus route services Centre Dandenong Road while the 902 SmartBus service runs along Springvale Road. Bus priority treatments at Centre Dandenong Road and Springvale Road interchanges with the Mordialloc Bypass are consistent with the designation of these roads.

8.3.1.2 ACTIVE TRANSPORT FACILITIES

The SmartRoads operating plan informs a high level of bicycle priority throughout the project area. A comparison of the proposed shared use path alignment and nominated SmartRoads bicycle priority routes and PBN shows a reasonable resemblance of the intended use, (refer to Figure 8.28).

The project seeks to provide connections to existing shared use paths and promote the use of off-road shared use paths as opposed to on-road bicycle facilities, offering a safer environment for cyclists. Segregation of active transport path and on-road traffic is particularly important along freight attracted routes such as Lower Dandenong Road and Governor Road.

At road crossing locations, pedestrian and cyclists will be required to deviate at proposed freeway interchanges and cross roads.

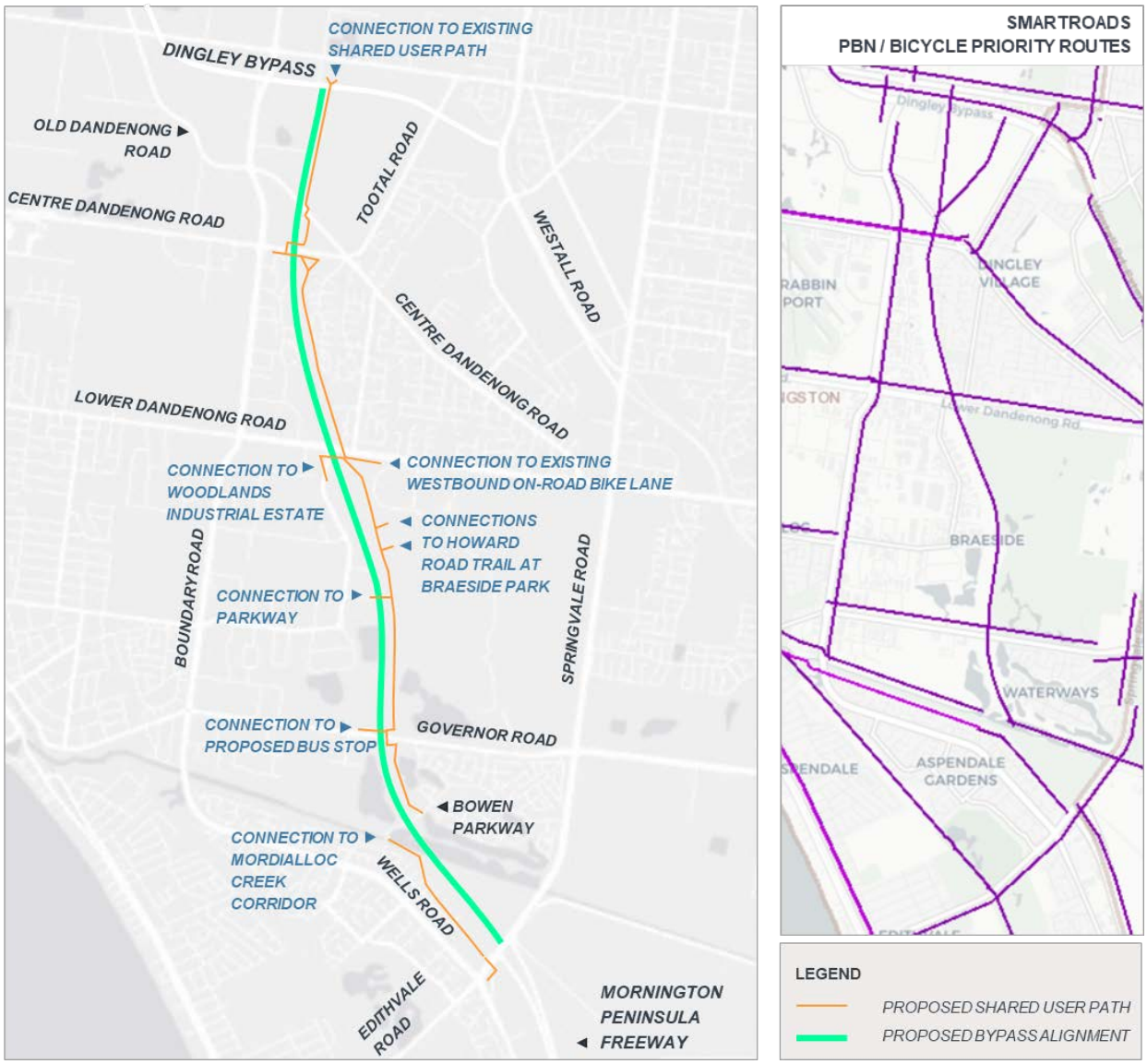


Figure 8.28 Proposed shared use path connections

8.3.2 MOVEMENT AND PLACE

Movement and Place (M&P) is a way of understanding the strategic role of a particular link within the transport network. The M&P approach recognises that transport links perform two functions; the movement of people and goods, and serving as a destination (place) in its own right. This way of thinking implies that while projects are planning for and developing the network, consideration should be given to the needs for movement and place-making simultaneously. The M&P framework was established by TFV to support integrated transport planning at various levels of project development.

In addition to SmartRoads detailed road use classifications, the M&P tool has been applied to inform the function of movement and place within the Mordialloc Bypass corridor. The classifications determined through this process have been sourced from VicRoads and are illustrated in Figure 8.29.

The main focus of the corridor adjacent to the Mordialloc Bypass reservation is concerned with Movement. All arterial roads in the local network are classified as 'M2', defined as "Significant movement of people and goods at moderate speed routes connecting across multiple municipalities or primary access to Regional level places". Mornington Peninsula Freeway is classified as 'M1' and is defined as "Mass movement of people & goods at high speeds on routes with a State or National level movement function or primary access to a State level place."

The only Place corridor identified near the project area is located in Dingley Village and has been classified as 'P4', defined as "Neighbourhood level - Low levels of activities, serving immediate neighbourhoods, such as milkbars and local shops".

The outcome of the assessment indicates that the proposed Mordialloc Bypass aligns well with the intended 'M2' classification for both general traffic and freight enhancing the mobility of the road link. Significant reduction in traffic on adjacent parallel routes and surrounding local roads enhances the liveability of the surrounding network thus aligning with the proposed place classification.

Source: VicRoads

Figure 8.29 Movement and place classifications

Table 8.12 outlines the alignment of each potential options associated with network's M&P classifications.

Table 8.12 Movement and place alignment

MOVEMENT AND PLACE INDICATIONS	NO PROJECT	ARTERIAL	FREEWAY
General traffic	Traffic conditions worsen	Moderate alignment with 'M2' classification	Best alignment with 'M2' classification and function
Freight	Freight movement delays worsen	Alternative route made available to Freight	Best alignment with 'M2' classification and function
Place	More freight & general traffic on local roads	Some reduction in traffic on roads that support the function of Place	Significant reduction in traffic on roads that support the function of Place
Options ranking	**3**	**2**	**1**

The outcome of the M&P assessment indicates that the freeway project option will provide the best fit to the intended M&P classifications by enhancing the movement of people and goods between municipalities and local amenity by reducing traffic on roads that support the function of Place.

8.4 ROAD SAFETY

Under Victoria's existing Safe System approach, effectively improving road safety requires a multi-faceted approach that targets the safety of the road environment, the vehicles in which people travel, and the behaviour of everyone on the road. Therefore, this project must provide a safe road environment for all types of road users - drivers, motorcyclists, cyclists, pedestrians and heavy vehicle drivers.

A Safe System assessment (SSA) was undertaken in reference to Austroads Research Report AP-R509-16, SSA Framework. The Safe System framework has been applied to indicate whether the project options will produce a Safe System outcome and the degree of a project's alignment with the Safe System objectives.

The following project options have been considered in the SSA:

- Arterial project option
- Freeway project option.

Figure 8.30 below illustrates the SSA outcomes by major crash type (with the lower score having better alignment with Safe System principles).

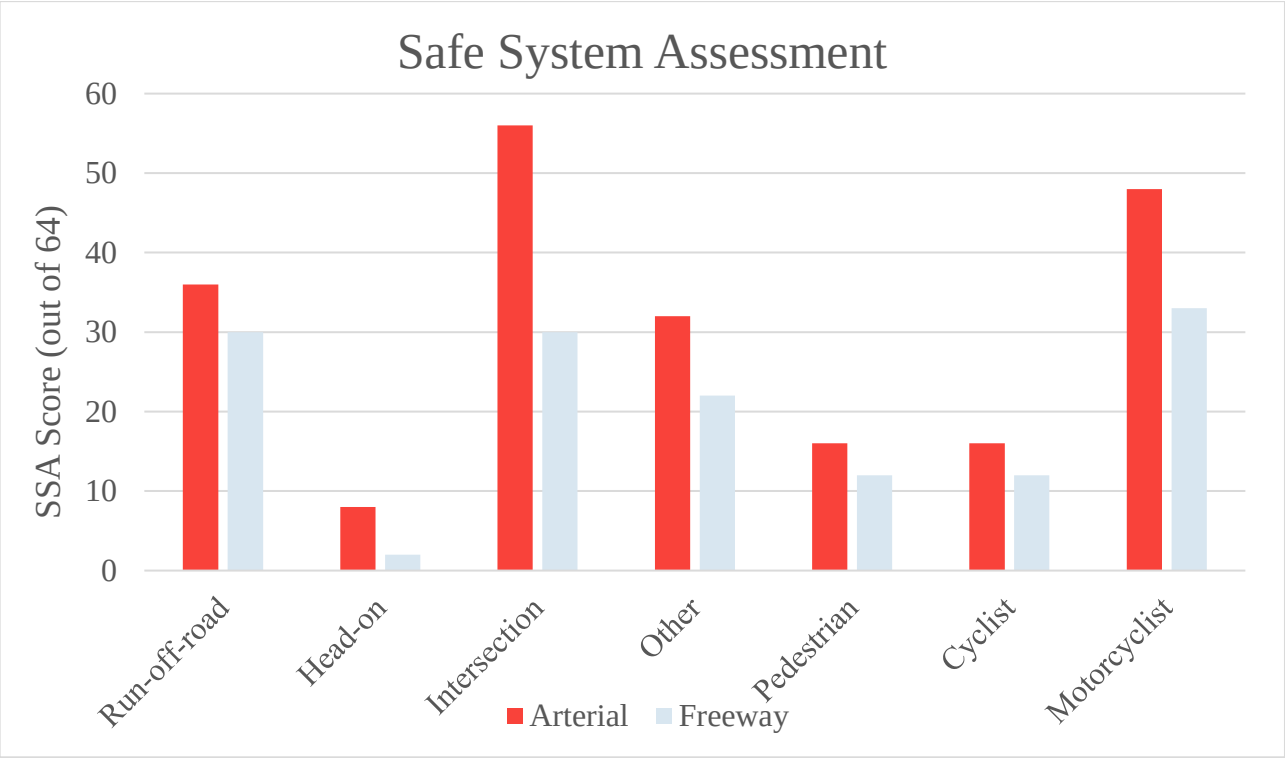


Figure 8.30 Safe system assessment risk score

Historic crash statistics information outlined in Section 8.4 highlighted 59 per cent of injury crashes surrounding the project area are related to intersection crashes. A higher proportion of intersection related crashes were identified along the following key north-south corridors with both equating to 71 per cent:

- Springvale Road between Wells Road and Westall Road
- Wells Road - Boundary Road between Dingley Bypass and Amaroo Drive.

Under the no project scenario, traffic is expected to increase in the future thus inducing potential of conflicting traffic movements along these existing routes. Increased delays within the network are likely to promote aggressive driving behaviours increasing the friction of vehicle movements and likelihood of crashes.

The freeway option provides a considerably safer road environment with a high standard of road infrastructure that consists of road safety barrier, enhanced cross-section and improved access controls that reduce the likelihood and severity of crashes. Removal of all at grade intersections significantly reduces the likelihood of run-off road, head-on, and intersection crashes; and reduces the number of high speed crossing points accessible to pedestrians and cyclists. Compared to the arterial project option, the proposed freeway configuration provides approximately 35 per cent reduction in the overall risk score considering all major crash type.

8.5 PROJECT COMPARISON SUMMARY

Section 8 details the assessment of impacts of the preferred freeway configuration of the Mordialloc Bypass against the alternative arterial road and ‘no project’ (base case) configurations.

Table 8.13 summarises the comparisons between the three project configurations in the context of the EES Scoping Requirements.

Table 8.13 Project option impact assessment summary

	BASE CASE	ARTERIAL ROAD	FREEWAY
Overall performance in meeting transport objective	Under the base case, the Mordialloc Bypass will not be constructed and there will be no direct connection between Mornington Peninsula Freeway and Dingley Bypass. Strategic modelling indicates that without an infrastructure solution there will be no improvement to travel efficiency, road safety or network capacity. Accordingly, there will be no improvements to local amenity or transport networks in the Aspendale/Dingley area. The base case will not meet the transport objective.	Under the alternative arterial road configuration, a four lane, 80 km/h road will be constructed between Mornington Peninsula Freeway and Dingley Bypass. Strategic modelling indicates that the new link will free-up network capacity along parallel routes and intersections, improving travel efficiency and road safety in the study area. In particular, this will benefit road users in Aspendale, Chelsea and Dingley, where traffic volumes along Wells Road and Springvale Road are reduced. The arterial road configuration of the Mordialloc Bypass will achieve the transport objectives.	Under the preferred freeway configuration, a high-speed, high-capacity link will be constructed between Mornington Peninsula Freeway and Dingley Bypass. Strategic modelling indicates that the new link will free-up a significant amount of network capacity along parallel routes and intersections thereby improving travel efficiency and road safety in the study area. In particular, this will benefit road users in Aspendale, Chelsea and Dingley, where traffic volumes along Wells Road and Springvale Road are most significantly reduced. The freeway configuration of the Mordialloc Bypass will achieve the transport objectives most effectively amongst all options.
Traffic volumes	The base case does not fundamentally change travel patterns within the study area. As a result, traffic volumes are generally expected to increase through population and employment growth. The exception is high capacity routes such as Dandenong Bypass, Dingley Bypass and Westall Road which will attract higher traffic volume increases due to their more strategic roles and connections to other projects included in the 2031 DEDJTR reference case.	The arterial configuration of the Mordialloc Bypass will attract a significant number of vehicles (approximately 60,000 total vehicles per day in which includes 9000 heavy vehicles) and relieve pressure from parallel routes such as Wells Road-Boundary Road, Springvale Road, Dandenong Bypass and Nepean Highway. Due to the improved access provided by the new road, intersecting roads experience an increase in traffic volumes including Centre Dandenong Road, Lower Dandenong Road and Governor Road. These roads provide access to the employment precincts in Braeside, Dingley and Moorabbin Airport.	The freeway configuration of the Mordialloc Bypass will attract a significant number of vehicles (over 75,000 total vehicles per day in which includes 13,000 heavy vehicles) and relieve pressure from parallel routes such as Wells Road-Boundary Road, Springvale Road, Dandenong Bypass and Nepean Highway. Due to the improved access provided by the freeway, arterial roads connecting to interchanges experience an increase in traffic volumes including Centre Dandenong Road, Lower Dandenong Road and Governor Road. These roads provide access to the employment precincts in Braeside, Dingley and Moorabbin Airport. The freeway configuration is more effective in attracting vehicles (including heavy vehicles) from existing arterial roads, particularly those with residential land uses such as Lower Dandenong Road and White Street.

	BASE CASE	ARTERIAL ROAD	FREEWAY
Travel times	The base case does not add any capacity to the network within the study area, which limits the ability to reduce congestion. As a result, amid traffic growth, travel times are expected to deteriorate.	The additional network capacity created by the new arterial reduces the demand and therefore congestion at intersections throughout the study area. Based on the strategic modelling, average travel time is anticipated to reduce by: — 3.1 minutes northbound in the AM peak and 6 minutes southbound in the PM peak along Springvale Road between Mornington Peninsula Freeway and Dingley Bypass — 4.3 minutes northbound in the AM peak and 7.1 minutes southbound in the PM peak along Boundary Road – Wells Road between Springvale Road and Dingley Bypass In addition, travel times between the key origin/destination served by the Mordialloc Bypass (i.e. Dingley Bypass/Boundary Road to Mornington Peninsula Freeway/Thames Promenade) are expected to be reduced by 5.6 minutes (33 per cent) in the AM peak and 8.6 minutes (43 per cent) in the PM peak compared to the base case in 2031 in the peak travel directions.	The additional network capacity created by the new freeway reduces the demand and therefore congestion at intersections throughout the study area. Based on the strategic modelling average travel time is anticipated to reduce by: — 3.8 minutes northbound in the AM peak and 7.1 minutes southbound in the PM peak along Springvale Road between Mornington Peninsula Freeway and Dingley Bypass — 4.6 minutes northbound in the AM peak and 7.4 minutes southbound in the PM peak along Boundary Road – Wells Road between Springvale road and Dingley Bypass In addition, travel times between the key origin/destination served by the Mordialloc Bypass (i.e. Dingley Bypass/Boundary Road to Mornington Peninsula Freeway/Thames Promenade) are expected to be reduced by 7.7 minutes (46 per cent) in the AM peak and 10.6 minutes (52 per cent) in the PM peak compared to the base case in 2031 in the peak travel directions. These travel time savings multiplied by the larger number of vehicles travelling through the corridor in comparison to the arterial road configuration result in a significant difference in benefits. Broader analysis of travel time to Monash NEIC indicate that the freeway configuration provides travel time savings to a noticeably larger population (area) of potential beneficiaries in comparison to the arterial road configuration.

	BASE CASE	ARTERIAL ROAD	FREEWAY
Network capacity	Strategic modelling indicates that without an infrastructure solution, there will be a general deterioration in Level of Service (volume-capacity ratio) on all road links between 2016 and 2031: — Springvale Road, Nepean Highway and Westall Road are expected to be operating at capacity. — Boundary Road-Wells Road and White Street are expected to be over capacity.	With the inclusion of a new road link in the network, there will be a significant improvement to overall network capacity: — Springvale Road, Boundary Road-Wells Road, Nepean Highway and Westall Road is expected to operate within capacity. — Lower Dandenong Road, Centre Dandenong Road, Governor Road and Mornington Peninsula Freeway will deteriorate slightly to operate at capacity. Despite traffic volume reductions, White Street will continue to operate over capacity in peak times.	With the inclusion of a new high capacity link in the network, there will be a significant improvement to overall network capacity: — Springvale Road, Boundary Road-Wells Road, Nepean Highway and Westall Road is expected to operate comfortably within capacity. — Lower Dandenong Road, Centre Dandenong Road and Mornington Peninsula Freeway will deteriorate slightly to operate at capacity. Despite traffic volume reductions, White Street will continue to operate over capacity in peak times.
Road safety	Without any significant modifications to infrastructure, road safety risks are not expected to change from 2016. The number of crashes may increase due to the increased number of vehicles travelling on the network. Increased delays as a result of congestion may promote aggressive driving behaviour which increases the likelihood of crashes.	The alternative arterial road configuration of the Mordialloc Bypass is expected to reduce crash risks within the study area through: — Reduction in traffic volumes including heavy vehicles on local and surrounding arterial roads. Separation of opposing through movements along the bypass corridor thereby reducing risk of head-on crashes.	The preferred freeway configuration of the Mordialloc Bypass is expected to reduce crash risks within the study area through: — Reduction in traffic volumes including heavy vehicles on local and surrounding arterial roads. — Grade separation of conflicting (cross impeding movement) and opposing through movements thereby reducing risk of rear-end crashes caused by stop-start traffic conditions and high severity crashes including head-on crashes
Accessibility	The base case does not change any existing access arrangements.	The alternative arterial road configuration of the Mordialloc Bypass allows for all movements on existing arterial roads except Old Dandenong Road, which will be truncated on either side of the Bypass corridor. This will result in a 300 metre detour along Centre Dandenong Road for vehicles travelling between Boundary Road and Tootal Road. Woodlands Drive and Redwood Drive, off Lower Dandenong Road will be impacted by the Mordialloc Bypass. Alternative arrangements have been incorporated into Mordialloc Bypass designs.	The preferred freeway configuration of the Mordialloc Bypass allows for all movements on existing arterial roads except for Centre Dandenong Road. In addition, it provides improved access for Chelsea and Bonbeach with north-facing ramps onto the Mornington Peninsula Freeway at Thames Promenade. Woodlands Drive and Redwood Drive, off Lower Dandenong Road will be impacted by the Mordialloc Bypass. Alternative arrangements have been incorporated into Mordialloc Bypass designs.

8.6 CONSTRUCTION TRAFFIC IMPACTS

This section outlines a high-level assessment of the potential construction traffic impact induced by the project. Traffic impacts that may be created from construction activities include:

- Use of road infrastructure by construction vehicles to access constructions site
- Temporary construction traffic management measures associated with road works during bypass construction

Traffic management plans, strategies and potential disruption investigations will need to be developed/undertaken to reduce the level of operational impacts and ensure that necessary safety interventions and traffic management measures are in place to satisfy requirements set out by all relevant governing agencies. Contract specifications for traffic management should be defined by the project to:

- Minimise the impact on traffic
- Provide a safe environment for the travelling public and construction personnel
- Cater for the needs of all traffic
- Communicate the purpose of the proposed traffic event
- Communicate the arrangements for and impacts of any event affecting traffic
- Provide guidance on work hours to avoid peak hour disruptions where appropriate

Fill construction material quantities that have been estimated through the road design process for the various sections of the proposed bypass are used to inform potential haulage volumes at surrounding roads. Results indicated that a relatively higher quantity will be transported through Governor Road.

The following types of construction vehicle could be expected to facilitate the bypass construction:

- Heavy vehicles, delivering construction materials and potential lifting/excavation machineries to/from sites
- Light vehicles, travelling to/from sites (moving people and goods)
- Oversize and special purpose vehicles, delivery precast or assembled components or machinery

The estimated haulage to transfer the load of earthworks is estimated in Table 8.14 based on the assumptions below. Results indicate that the additional peak hour construction vehicles would be insignificant and could be catered by the surrounding network.

The following assumptions are made:

- Three axles rigid truck with 3-4 axles dog trailer with general mass capacity limit (42.5 tonnes) set out by the National Heavy Vehicle Regulator
- 274 workdays per year (based on a six day week less rostered day offs and public holidays)
- Construction works would occur over two years
- Truck Movements over 12 hours per day (7am to 7pm)

Table 8.14 Estimated earthworks material quantities and haulage numbers

PROJECT AREA	DINGLEY BYPASS	CENTRE DANDENONG ROAD	LOWER DANDENONG ROAD	GOVERNOR ROAD	SPRINGVALE ROAD	THAMES PROMENADE
Total earthworks material to be transported (m3)	16000	228000	300000	362000	240000	1000
Construction vehicles per day	1	20	26	31	21	1
Construction vehicles per hour	1	2	3	3	2	1

Note: Figures have been rounded to the nearest thousand

Operational requirements will need to be established by the project to specify the applicable speed restrictions and road closure arrangement for roads that may have traffic management and controls implemented during the construction period. Under all circumstances and unless temporary replacement facilities are provided, public transport stops and operations should be maintained.

Arterial roads bounded by the following routes surrounding the project area are likely to be impacted by construction traffic associated with the project:

- Springvale Road between Edithvale Road and Westall Road
- Dingley Bypass between Boundary Road and Westall Road
- Boundary Road between Springvale Road and Dingley Bypass.

Traffic management controls including lane closures are anticipated at times at the following locations:

- Springvale Road at Mornington Peninsula Freeway
- Bowen Parkway between Westbridge Court and Gympie Lane
- Governor Road, east of Bate Drive
- Lower Dandenong Road between Boundary Road and Willow Glen Court
- Woodlands Drive near Lower Dandenong Road
- Tarnard Drive near Bell Grove
- Bell Grove between Tarnard Drive and Lower Dandenong Road
- Redwood Drive between Lower Dandenong Road and Garden Boulevard South
- Centre Dandenong Road between Boundary Road and Old Dandenong Road
- Old Dandenong Road between Centre Dandenong Road and Boundary Road
- Junction Road and Grange Road near the proposed Mordialloc Bypass alignment
- Dingley Bypass between Kingston Road and Westall Road
- Thames Promenade between Wells Road and Riverend Road.

Lane closures along Mornington Peninsula Freeway will likely be required to facilitate the construction of the on and off ramps. Contraflow traffic management is anticipated along Thames Promenade between Wells Road and Riverend Road to facilitate the construction of the freeway ramp terminals whilst maintaining the connection between Wells Road and Riverend Road. An alternative to this would be to divert traffic via Pillars Road and McMahens Road however the diversion route distance would be greater than 10 kilometres and induce excessive travel time for motorists within the area.

8.6.1 CONSTRUCTION STAGING

The interface with the Southern Programme Level Crossing Removal Project and in particular the Edithvale Road Level Crossing Removal will be essential to minimising the impacts of construction traffic and traffic management measures on the local road network. Whilst the timing and staging of construction of the Mordialloc Bypass project has not been confirmed, there is a likelihood of overlap between the two projects that may induce a cumulative effect on traffic operations. As Edithvale Road has been planned as a construction route for the Edithvale Level Crossing Removal Project, potential of cumulative impacts along Springvale Road, Wells Road and Mornington Peninsula Freeway could be induced should construction of the projects take place during the same period. It should be noted that Edithvale Road is not proposed to be utilised as a haulage route by the project.

The scope of the construction area associated with Mordialloc Bypass is predominantly within the road reservation which is currently a undeveloped area where construction impact on traffic movements would be minimal. A higher level of impact is expected at the proposed interchange and overpass locations as structural construction works takes place which may require partial or full road closure during the construction period. Road closures are expected to take place during non-peak periods to minimise potential disruption. Possible construction staging of the proposed grade separated infrastructure should be considered to avoid full road closures.

9 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

The EPRs outlined in Table 9.1 below set out the desired environmental outcomes, objectives or limits for the project. The EPRs are applicable to all project phases and provided certainty regarding the Project's environmental performance.

Table 9.1 Transport environmental performance requirements

EPR NUMBER	ENVIRONMENTAL PERFORMANCE REQUIREMENTS	PROJECT PHASE
T1	*Intersection and freeway design and performance* Intersections and freeway facilities that are affected and/or proposed by the project will be designed and constructed to provide safe vehicle movements to the satisfaction of the responsible road management authority. The design of intersections and the freeway must meet VicRoads' design standards with analysis undertaken to ensure the proposed configuration will achieve acceptable operational performance. Road Safety Audits and/or Safe System Assessment in accordance with Austroads guidelines will be undertaken to maximise the safety potential of the project.	All
T2	Transport Management Plan Prior to the commencement of works, TMP(s) must be developed and implemented to minimise disruption (to the extent practicable) to affected local land uses, traffic, on-road public transport, pedestrian and bicycle movements and existing public facilities during all stages of construction. The plan(s) will comply with relevant standards and must be developed in consultation with Kingston City Council, Greater Dandenong City Council, VicRoads and public transport providers and be informed and supported by an appropriate level of transport analysis. The plan(s) must include: — A program to monitor impacts of construction activities to all modes of active and passive transport. Where monitoring identifies adverse impacts, practicable mitigation measures must be developed and implemented. — Consideration of cumulative impacts of other major projects operating concurrently in the local area. — Identify the route options for construction vehicles (including haulage of spoil and other heavy materials to and from the construction site) travelling to and from the project construction site, recognising sensitive receptors, and minimising the use of local streets. — Development of suitable measures to ensure emergency service access is not inhibited as a result of project construction activities (in consultation with emergency services). — Provision for the minimisation of impacts on existing connectivity for pedestrians, cyclists, public transport and road vehicles as a result of construction, including the identification of alternative routes for pedestrians and cyclists and other measures to maintain connectivity and safety for pedestrians and cyclists. — Management of any temporary or partial closure of roads and traffic lanes, including provision for suitable routes for vehicles, cyclists and pedestrians, to maintain connectivity for road and footpath users.	Construction

EPR NUMBER	ENVIRONMENTAL PERFORMANCE REQUIREMENTS	PROJECT PHASE
	— Restrictions to the number of local roads to be used for construction-related transportation to minimise impacts on amenity, in consultation with the relevant road authorities, including at Edithvale Road (EPR B4). — Reinstatement of access to open space, community facilities, commercial premises and dwellings if disrupted, as soon as practicable, and to an equivalent standard. — Provision for safe access points to laydown areas and site compounds. — A communications strategy to advise affected users, potentially affected users, relevant stakeholders and the relevant road authorities of any changes to transport conditions in accordance with the Community and Stakeholder Engagement Management Plan (EPR S1). The plan must include specific measures for discrete components or stages of the works having the potential to impact on roads, shared use paths, bicycle paths, footpaths or public transport infrastructure.	
T3	*Vehicle and pedestrian access* Where vehicle, bicycle and pedestrian access are altered during construction, ensure that vehicle, bicycle and pedestrian access is replaced, in accordance with relevant road design standards, as soon as practicable.	Construction

10 CONCLUSIONS

10.1 SUMMARY OF EXISTING CONDITIONS

The existing conditions study provided an overview of existing transport network conditions within the study area surrounding the proposed Mordialloc Bypass project. A range of qualitative and quantitative information has been used to characterise the provisions and performance of the existing road, public and active transport networks.

The Mornington Peninsula Freeway, and the arterial roads within the study area, form part of the principal freight network which is expected to facilitate growth in freight demand over the next 30 years. This assessment identified that the existing transport network within the study area is incapable of serving the existing and strategic transport demand in a safe and efficient environment. It provides poor resilience to support the future employment and economic growth opportunities. In addition to the heavily congested road network, amenity is greatly reduced by the existing disconnected pedestrian and bicycle network which limits active travel opportunities particularly in the north-south direction.

10.2 IMPACT ASSESSMENT SUMMARY

10.2.1 EFFECTS OF TRAFFIC REDISTRIBUTION AND VOLUME CHANGES ON ROADS

Melbourne's southern movement corridor is primarily serviced by the Mornington Peninsula Freeway, Springvale Road and Wells Road – Boundary Road. It provides a connection between Mornington Peninsula and Bayside suburbs to key employment precincts including Monash NEIC, Moorabbin Airport and CBD. The disjointed network and capacity constraints within the existing network creates challenges to facilitate freight and logistics movements, thus limiting economic growth opportunities.

The project provides a direct, safer and more efficient road connection between the Mornington Peninsula Freeway and Dingley Bypass with access to key east-west arterial roads including Centre Dandenong Road, Lower Dandenong Road, Governor Road and Springvale Road. New interchanges along the bypass corridor will be constructed to service trips for the local areas in City of Kingston and the wider network movement.

The enhanced travel mobility and serviceability provided by the project, is expected to see the bypass attract significant volumes from adjacent routes and carry more than 75,000 total vehicles a day, including 13,000 heavy vehicle trips. Servicing the nearby industrial, residential and commercial precincts, the proposed bypass will redistribute traffic at the major signalised intersections along the Wells Road – Boundary Road (between Thames Promenade and Dingley Bypass) and Springvale Road corridor (between Mornington Peninsula Freeway and Westall Road) that connects with the bypass. Road links situated west of the bypass are anticipated to experience an increase in volume including Dingley Bypass, Centre Dandenong Road, Lower Dandenong Road and Governor Road. The project is expected to remove the constraints at the existing Mornington Peninsula Freeway terminal at Springvale Road and accommodate an increase in daily vehicle trips of more than 60 per cent compare to the "no project" scenario by 2031.

10.2.2 EFFECTIVENESS IN LOCAL TRANSPORT NETWORK INTEGRATION CONSIDERING PUBLIC TRANSPORT AND SHARED USE PATHS

The project must have regard to and support an effective integrated transport network that improves accessibility and transport efficiency for the intended land use and local communities. Assessment of the proposed design configuration and its effects on traffic redistribution concludes that the project closely aligns with the State's network operating plan and intended road use classifications. Freight, commuters and recreational users will benefit from the integrated transport system formed by the project through improved travel time, safety and network connections.

Bus priority treatments will be made available along existing bus routes to enable more efficient bus travel. More than eight kilometres of shared use path will be provided by the project to promote active transport travel in the north-south direction along the bypass corridor for pedestrians and cyclists. In addition, elevated road structures and new crossing facilities are proposed to maintain the permeability across the freeway and access to existing and future shared use path connections including Braeside Park and the Mordialloc Creek Corridor.

The project will include the duplication of Centre Dandenong Road between Boundary Road and the proposed Centre Dandenong Road interchange and provide a seamless road connection between Moorabbin Airport and Mornington Peninsula Freeway. The proposed bypass alignment and configurations will alter the access arrangements at Woodlands Drive, Redwood Drive and commercial access along Centre Dandenong Road. A new signalised intersection treatment at Bell Grove and Lower Dandenong Road intersection and U-turn facility west of Redwood Drive have been incorporated into the project to facilitate re-routed traffic movements.

10.2.3 RISK AND EPR

The risk assessment identified medium residual risks associated with construction disruption to the existing road network and travel time and the safety of pedestrian and cyclist operations. Additional controls were identified to manage these risks including developing a Transport Management Plan (EPR T2) to plan works appropriately to minimise disruptions and proposed investigations to consider the need for road safety audits during the construction stages (EPR T3).

For operation, residual risks are identified as low, primarily in relation to the improvements offered by the bypass in reducing traffic demand and changing existing patterns to reduce disruption at intersections, no additional control measures were identified for these risks, whilst EPR T1 relates to the improvements provided through the preferred Bypass design. Medium risks were identified for likelihood of crashes at shared use paths crossing locations during operations, however with additional controls through road safety audits and/or safe system assessment this can be reduced to a low rating. One operational residual risk remains at medium in relation to crash likelihood at new intersections. This again will be managed through road safety audits and safe system assessments (EPR T3) and the Bypass detailed design (EPA T1) however will remain a potential risk.

10.2.4 COMPARISON OF TRANSPORT PERFORMANCE OF THE PREFERRED PROJECT RELATIVE TO ALTERNATIVE PROJECT SCENARIOS (ARTERIAL AND "NO PROJECT")

The analysis indicates that the freeway configuration would provide the best fit in achieving the EES transport objective compared to the alternative project scenarios.

A higher level of travel efficiency and network capacity is expected to be achieved by the preferred project configuration. The continuous freeway connection will significantly reduce journey time for existing key north-south arterial roads and provide an alternative route that greatly enhances the directness and reliability of travel. Compared to the "no project" scenario, the project will reduce travel time by more than 45 and 50 per cent during both AM and PM peak periods respectively for trips between Dingley Bypass and Mornington Peninsula Freeway. The freeway configuration is shown to have a greater benefit for the overall transport network efficiency compared to the arterial road project configuration, largely due to its ability to reduce traffic from the surrounding network and increase mobility along the mainline. The project will also allow a larger catchment of origin zones in the south-east area to benefit from travel time savings for travel to the Monash NEIC compared to alternative project scenarios.

Crash risks are significantly reduced by the project which is largely attributed to the proposed grade separated interchanges and road safety barrier system. More than 70 per cent of crashes along Springvale Road and Wells Road – Boundary Road occurred at intersections over the past five years. Compared to the "no project" and arterial road configuration, the proposed interchange treatments would remove a large portion of conflicting movements at intersections, thus significantly reducing the likelihood of high severity intersection crashes. Compared to the arterial road configuration, the proposed freeway configuration minimises disruption for through-vehicles whereby traffic would not have to stop at signals along the bypass, which effectively reduces the likelihood of rear-end crashes. The continuous

median separation along the bypass will also be more effective compared to the alternative project scenarios in reducing the consequence and likelihood of run-off road and head-on crashes. Across all scenarios, the preferred project configuration aligns more closely with the Safe Systems principles, resulting in a lower crash risk.

In addition to the safety and quality of road travel, the project will improve urban amenity and the active transport network by providing an extensive and integrated shared use path facility and significantly reducing general and heavy vehicle traffic volumes on the surrounding road network. The project will reduce congestion on existing key arterials and local roads, enhancing the public realm and environment of residential areas and places of recreational significance.

11 LIMITATIONS

In preparing the report, WSP has relied upon data, surveys, analyses, designs, plans and other information provided by the other individuals and organisations, most of which are referred to in the report (the data). Except as otherwise stated in the report, WSP has not verified the accuracy or completeness of the data provided by third parties. WSP will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

APPENDIX A

VITM TRAFFIC FORECAST REPORT

MAJOR ROAD PROJECTS AUTHORITY

SEPTEMBER 2018

MORDIALLOC BYPASS

VITM TRAFFIC FORECASTING REPORT

REPORT NUMBER: 2135645A-SE-26-TPL-REP-0006 REV0

Question today
Imagine tomorrow
Create for the future

Mordialloc Bypass
VITM Traffic Forecasting Report

Major Road Projects Authority

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REV	DATE	DETAILS
0	18/09/2018	Final

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EXECUTIVE SUMMARY

The proposed Mordialloc Bypass will be a new road from Mornington Peninsula Freeway to the Dingley Bypass within Melbourne's southern movement corridor. Transport modelling was undertaken to understand future travel demands and provide inputs into the economic assessment for the Mordialloc Bypass Business Case.

Project modelling required for the traffic impact assessment and economic appraisal was completed using the Victorian Integrated Transport Model (VITM) for three future years (i.e. 2021, 2031 and 2051).

A series of validation checks helped ensure that the version of VITM received from Transport for Victoria (TfV) was suitable for assessing the proposed Mordialloc Bypass project. These included reviewing the original model's validation using data from 2011, and comparing with 2016-modelled and observed project area traffic volumes for individual count locations, screenlines and travel times. The model was found to be suitable for assessing the project, as it met all the measures specified in the VicRoads strategic modelling guidelines.

The existing VITM Reference Case was used as the basis for establishing the transport networks for the Base Cases (i.e. without the Bypass). Using the Base Case as a starting point, the Mordialloc Bypass project was modelled and can be described as:

- a four-lane freeway with divided median at 100km/hr. Full grade-separated interchanges at Springvale Road, Governor Road, and Lower Dandenong Road. Centre Dandenong Road interchange as a half-facing grade-separated interchange (south facing ramps only). At-grade signalised intersection at Dingley Bypass. North-facing ramps at Mornington Peninsula Freeway and Thames Promenade interchange.

FUTURE YEAR TRAFFIC CONDITIONS

The Base Case modelling results suggest a significant medium- to long-term (i.e. in 2031 and 2051) increase in traffic on the key roads in the study area, with large daily traffic increases expected on Mornington Peninsula Freeway, Springvale Road, Governor Road, Westall Road and South Road. This suggests that the Mordialloc Bypass will likely be beneficial in these periods. The 2031 traffic increase (from 2016 levels) is likely to increase AM and PM peak period congestion. Several roads in the area will either approach or exceed capacity, particularly Springvale Road, Boundary Road and Governor Road. The modelling results suggest the road network is unlikely to support expected travel demand growth.

PROJECT PERFORMANCE

The proposed Mordialloc Bypass project identified in the Business Case was modelled and compared to the base case in 2031. The modelling indicates that the project will relieve congestion by diverting traffic away from roads approaching or at capacity, and will improve travel times on key travel routes through and within the study area in 2031 AM and PM peak periods. According to the results, the Mordialloc Bypass will attract approximately 76,000 daily two-way vehicles, significantly reducing traffic volumes on Springvale Road and Wells Road/Governor Road. The bypass will reduce AM peak travel times northbound on Springvale Road and Boundary Road (routes 1 and 2) by about 4 minutes and 4.5 minutes respectively, and reduce travel times northbound on Wells Road (routes 3 and 4) by about 4.5 and 3.5 minutes. In the PM peak, the bypass will reduce travel times southbound on Springvale Road and Boundary Road (routes 1 and 2) by about 7 minutes and 7.5 minutes respectively, and on Wells Road (routes 3 and 4) by about 7 and 6 minutes.

1 INTRODUCTION

1.1 MODELLING PURPOSE

The Mordialloc Bypass Business Case required transport demand modelling to understand future travel demands and provide inputs into the project's economic assessment. Transport demand modelling completed in 2016 provided input into the original business case assessment. However, following recent updates to the future transport network assumptions for Melbourne, MRPA engaged WSP to refresh the transport demand modelling for the Mordialloc Bypass project.

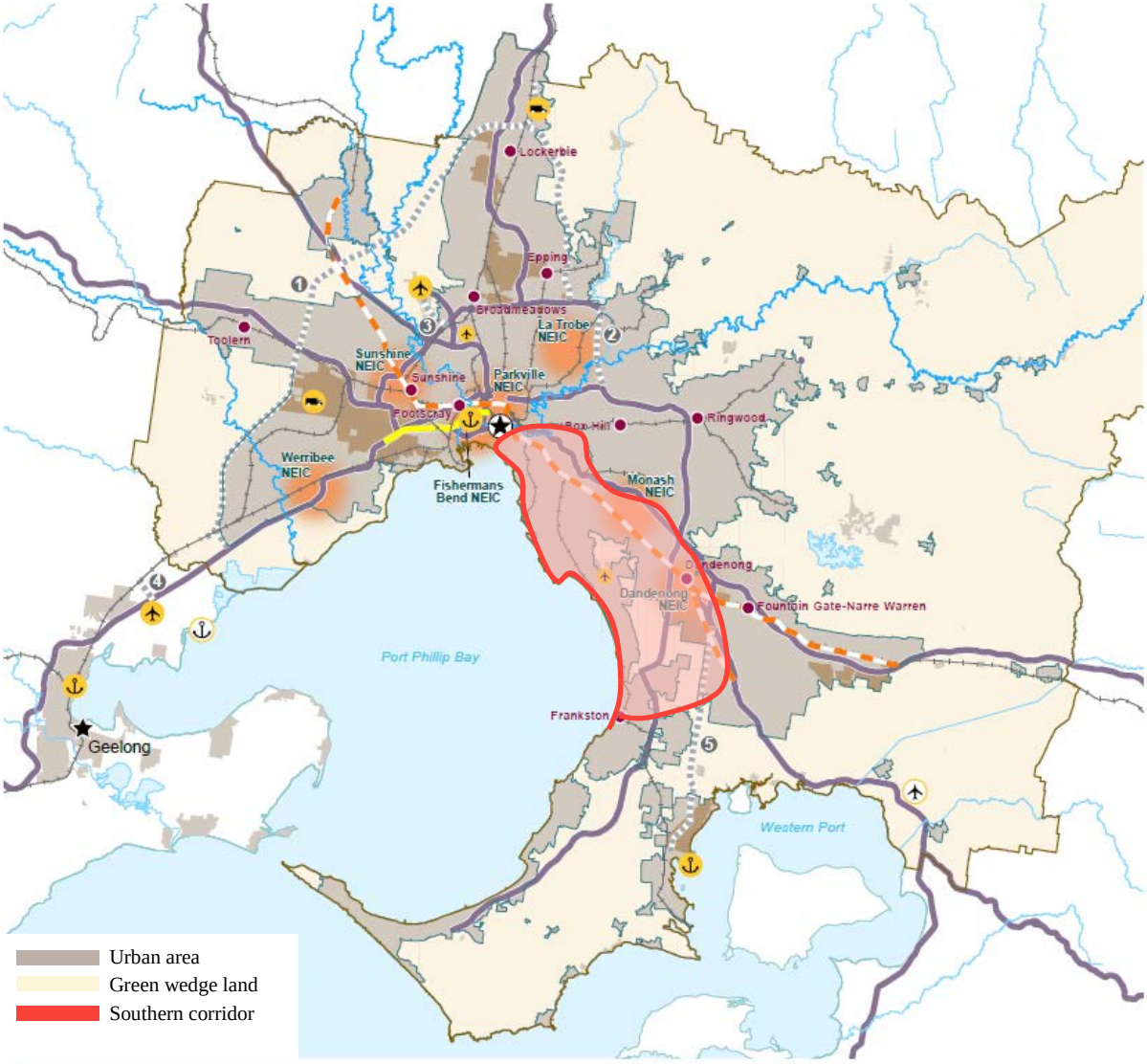
Project modelling required for the traffic impact assessment and economic appraisal was completed using the Victorian Integrated Transport Model (VITM) for three future years (i.e. 2021, 2031 and 2051).

1.2 BACKGROUND AND CONTEXT

Melbourne faces unparalleled growth challenges, particularly in the outer regions. Population is forecast to continue growing in the southern regions and in existing and emerging employment clusters. This growth is driving demand for travel in the southern movement corridor (refer to Figure 1.1). This is a significant economic corridor for Melbourne and Victoria that connects residents and businesses to local, national and international markets vital for economic development, employment and education. Increased travel demands will lead to more congestion on the road network and travel time delays for residents and businesses across Melbourne, reducing business productivity, and reducing residential areas' amenity and liveability.

The following three problems are identified in relation to transport connectivity within the southern movement corridor:

- poor configuration of the transport network restricts vehicle movements, creating costly delays and increasing crash risks
- travel demand from future land use growth will exceed network capacity and increase the severity of delays
- limited network connectivity constrains the development of employment and population centres in the South East corridor.



Source: Department of Environment, Land, Water and Planning (DELWP), 'Plan Melbourne 2017-2050' (2017)

Figure 1.1 Southern movement corridor

1.3 REPORT PURPOSE

This report forms part of the supporting documentation for the Mordialloc Bypass Business Case, and presents:

- an overview of the modelling undertaken
- key traffic validation results
- key modelling inputs
- base case and project case
- demand forecasting results.

2 MODELLING OVERVIEW

2.1 SUITABILITY OF VITM

The modelling for this project was completed using the Victorian Integrated Transport Model (VITM) owned by the Department of Economic Development, Jobs, Transport, and Resources (DEDJTR). It is a multimodal four-step strategic transport model that uses future population and employment projections to forecast the future impacts of changes to the Melbourne road and public transport networks. The model is a powerful strategic planning tool commonly used by Transport for Victoria (TfV) and VicRoads to help plan Victoria's road and public transport infrastructure, particularly to compare likely impacts of scenarios under different land use and/or transport network assumptions. VITM is therefore a suitable tool for this project, which requires transport modelling at the strategic level to inform assessment of different road network options.

It should be noted however, that any demand forecast is subject to uncertainties: some assumptions (e.g. land use, transport network) used to develop the forecasts may not be realised, and unanticipated events/circumstances may occur. No form of assurance can be given that the reported forecasts will be achieved, as the actual outcomes could vary.

2.2 MODELLING AND ASSESSMENT OF PROJECT CASE

An overview of the modelling undertaken for this project is outlined in Figure 2.1, together with how the modelling relates to the assessment of the project in the Full Business Case. In general, the project modelling for the Mordialloc Bypass used the latest available VITM provided by TfV. This version of the model had previously undergone an extensive validation process (*TfV VITM Model Validation Report, March 2016*), hence no further model enhancements were made for this project. Nevertheless, a series of checks and refinements were carried out in the project area to ensure the model was suitable for project testing, and conducted an extensive review of the road network to ensure it was accurately represented in the 2016 model. Land use in 2016 and all future years, as well as transport networks for the Base Cases in all future years, were also appropriately updated based on the latest reference cases.

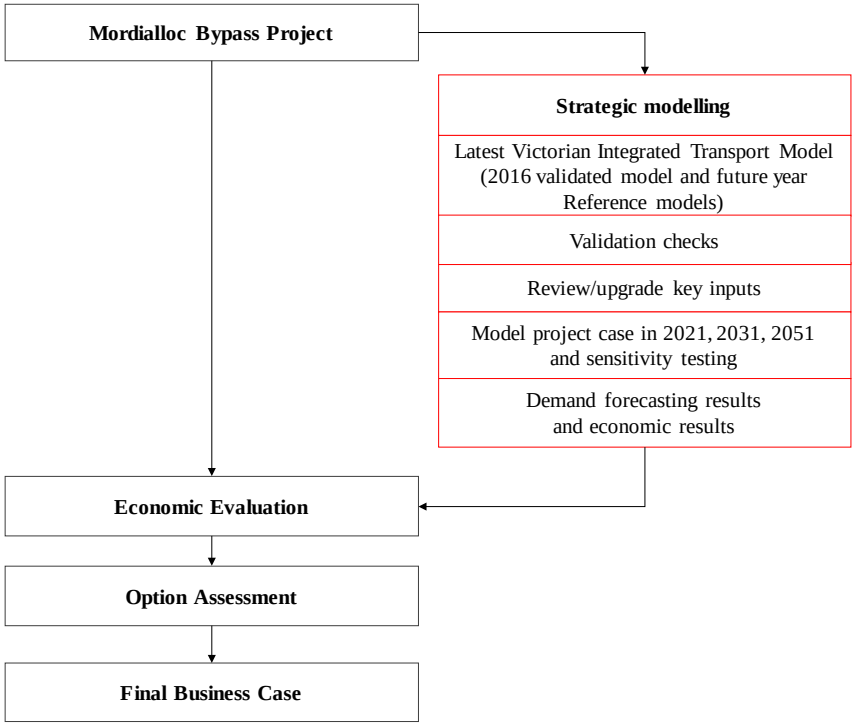


Figure 2.1 Modelling overview

2.3 MODELLING ASSUMPTIONS

A summary of the key modelling details is provided below:

- a summary of the 2016 model validation checks is provided in Section 3. Detailed model validation results of the 2016 model, and a review of the 2011 model validation can be found in Appendix A.
- the geographic area covered by the VITM is shown below in Figure 2.2
- the model zone system consists of 3,164 zones, 3,098 of which are internal zones
- a summary of the key land use assumptions for all modelled years is presented in Table 4.1 in Section 4.1
- the time periods modelled in the VITM include:
  - Weekday AM peak (AM): 7:00 am – 9:00 am
  - Weekday Inter peak (IP): 9:00 am – 3:00 pm
  - Weekday PM peak (PM): 3:00 pm – 6:00 pm
  - Weekday Off peak (OP): 6:00 pm – 7:00 am
  - Average weekday (Daily): 24-hour
- the vehicle types modelled are cars, light commercial vehicles (LCV) and heavy commercial vehicles (HCV).

Figure 2.2 Geographical area covered by VITM

3 MODEL VALIDATION RESULTS

To ensure that the VITM received from TfV was suitable for assessing the proposed Mordialloc Bypass project, a series of validation checks were undertaken. The validation of the original model provided was reviewed using data from 2011, and compared to the project area's 2016-modelled and observed traffic volumes for individual count locations, screenlines and travel times.

This chapter summarises the data used for the 2016 base model traffic validation and its key results. Full 2011 and 2016 model validation results can be found in Appendix A.

3.1 DATA USED FOR TRAFFIC VALIDATION

To provide suitable data for validating the VITM 2016 base year model, August 2016 traffic survey data was collected on key roads within the study area, and travel time data from the same period for four routes in both directions. Table 3.1 summarises the data collected.

Table 3.1 Transport data collection summary

DATA TYPE	SURVEY DATES	SURVEY TIMES
Mid-block survey	Wednesday, August 3, 2016	24 hours, classified
Intersection counts	Tuesday August 2 to Wednesday August 3, 2016	AM & PM Peak, classified
Freeway Data	August, 2016	24 hours, unclassified
SCATS data	August 1 to August 14, 2016	24 hours, unclassified
Travel time	Tuesday August 2 to Wednesday August 3, 2016	AM & PM peak

3.2 TRAFFIC VOLUME VALIDATION

3.2.1 INDIVIDUAL COUNT SITES

Modelled and observed volumes were compared over numerous sites in the project area (as shown in Figure 3.1), for all time periods and across an entire weekday. Overall, there is a good fit between modelled and observed data sets (refer to Figure 3.2, Figure 3.3 and Figure 3.4 for scatter plots of modelled and observed volumes across all count sites for the AM, PM and entire weekday respectively).

Figure 3.1 Traffic count locations

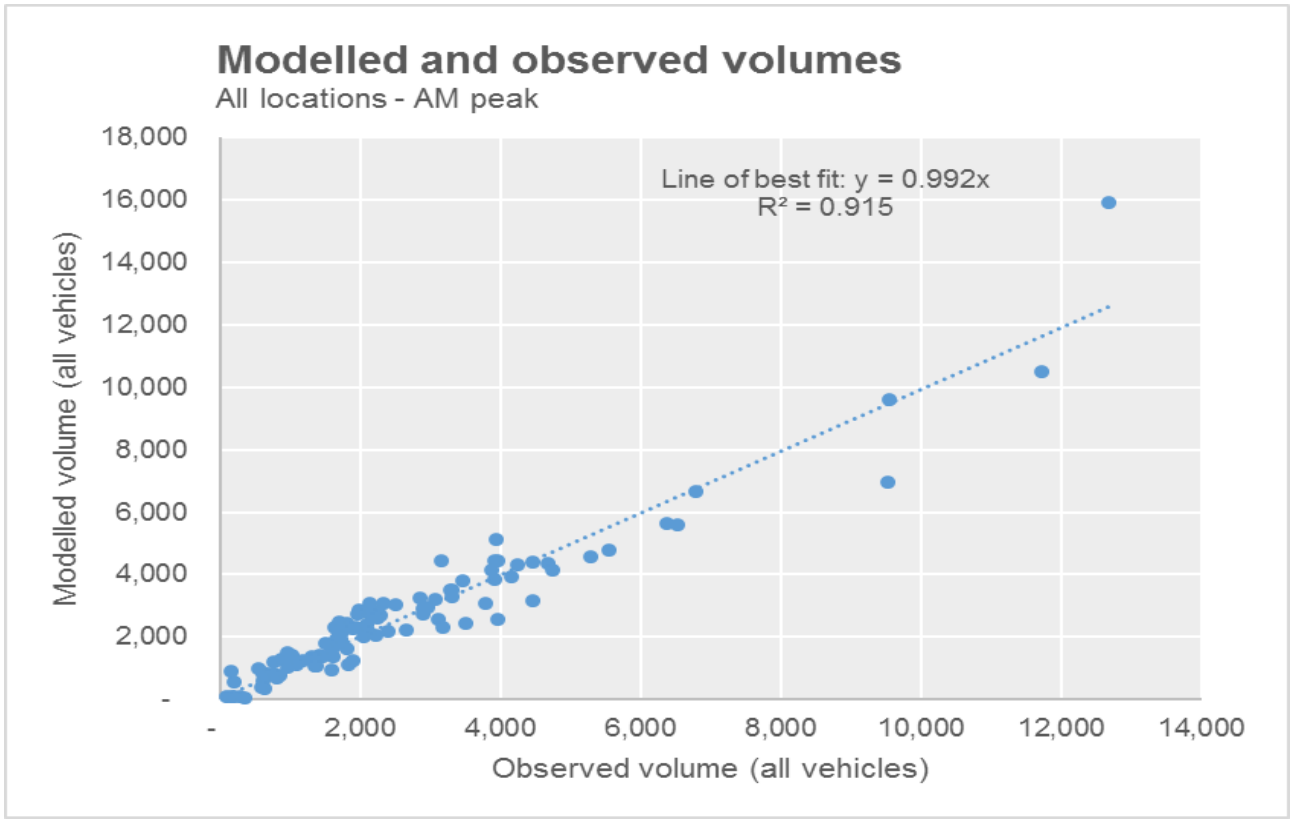


Figure 3.2 Comparison of 2016 modelled and observed two-hour link volumes (AM peak)

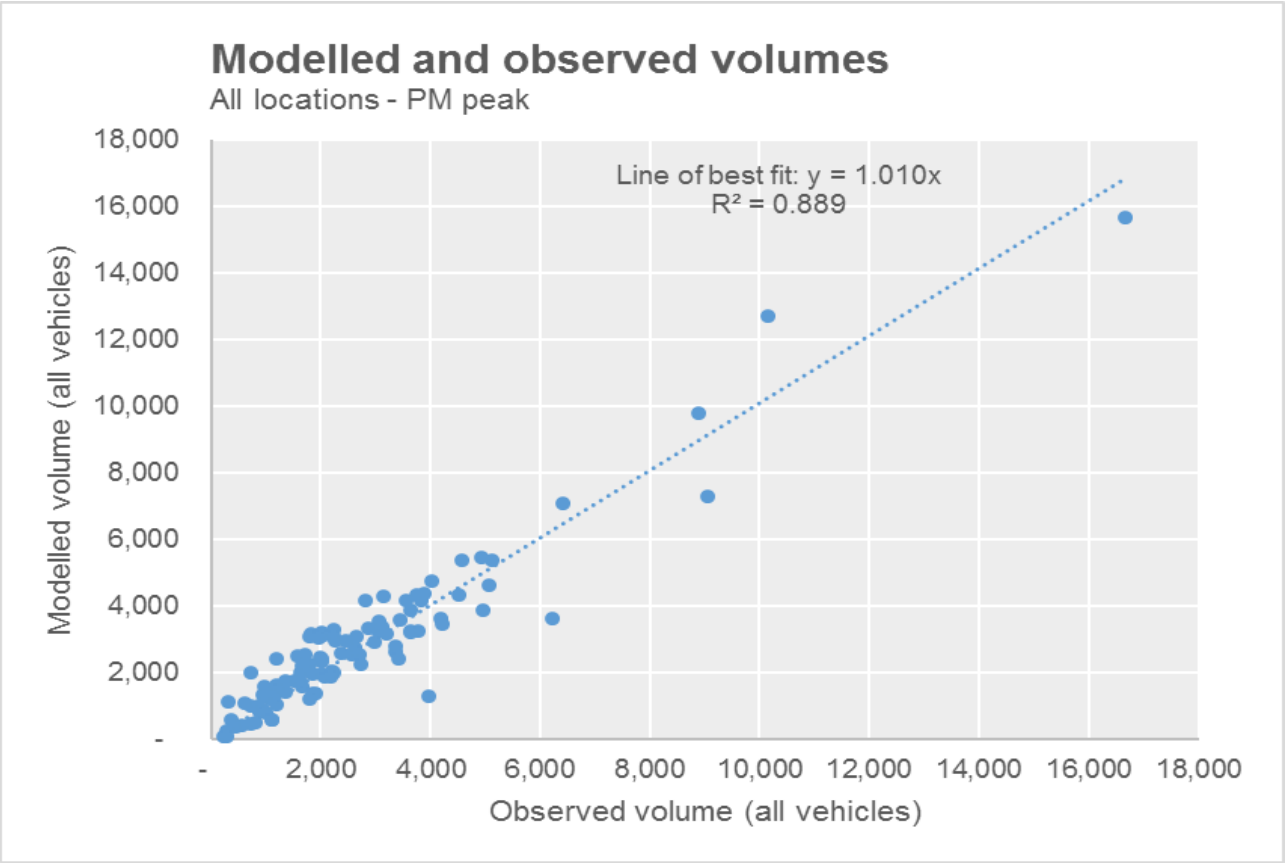


Figure 3.3 Comparison of 2016 modelled and observed two-hour link volumes (PM peak)

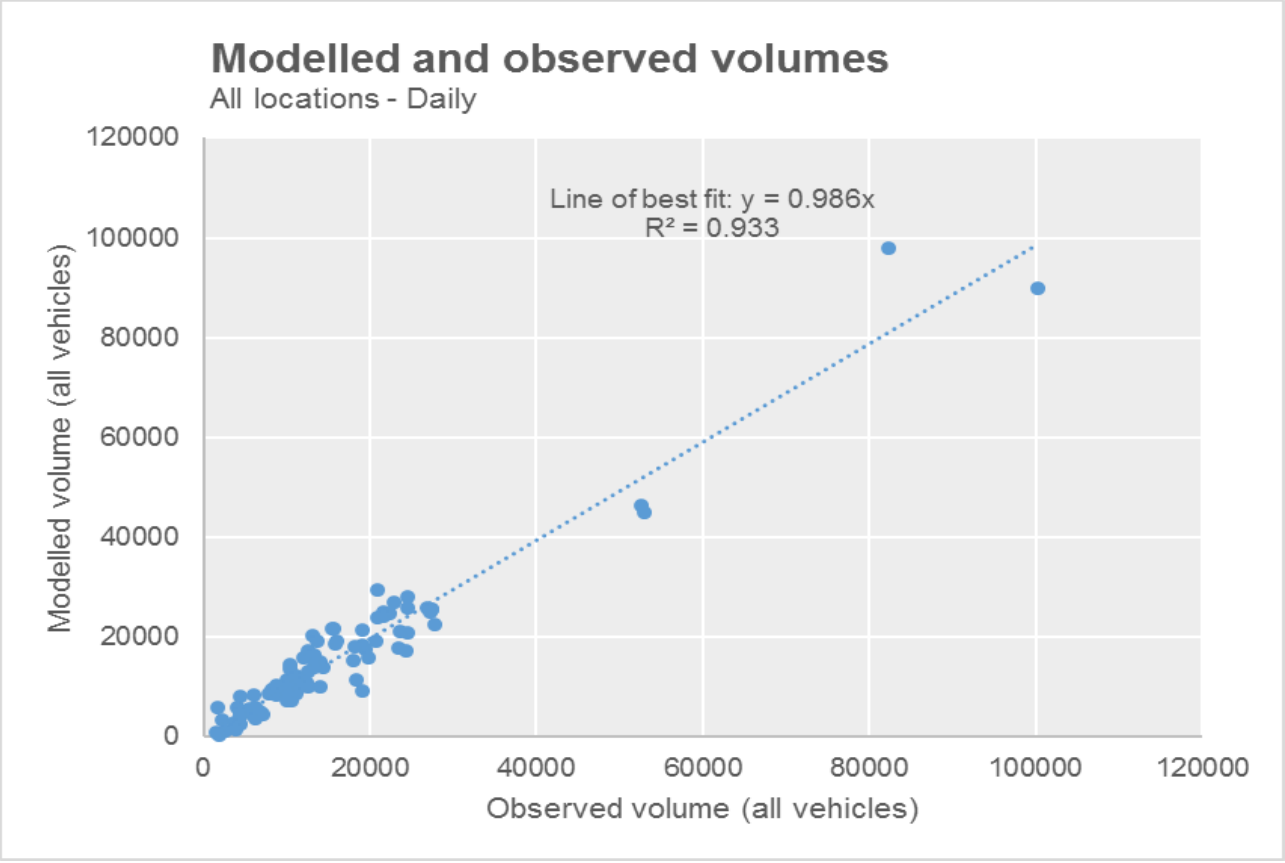


Figure 3.4 Comparison of 2016 modelled and observed 24-hour link volumes (weekday)

3.2.2 SCREENLINES

Five screenlines were established to intercept traffic on major roads and assess bulk traffic flows between different parts of the road network for the Mordialloc Bypass study area and its surrounding suburbs. All screenlines are shown in in Figure 3.5 below, with each screenline given a unique name for identification ease (i.e. *M-North, M-South, M-East, M-West and M-NW*).

The percentage differences between modelled and observed screenline flows for all time periods and across an entire weekday were plotted and compared to the thresholds recommended by the VicRoads strategic modelling guidelines. In general, a good fit at nearly all screenline locations was observed for the AM, PM and weekday (refer to Figure 3.6, Figure 3.7 and Figure 3.8) with only the M-NW (EB) screenline and M-West (EB) screenline in the PM peak period falling just outside VicRoads' threshold boundaries. This suggests that the model is performing well at the screenline level, generally satisfying the criteria in the both peaks and daily time periods.

Figure 3.5 Screenline names and locations

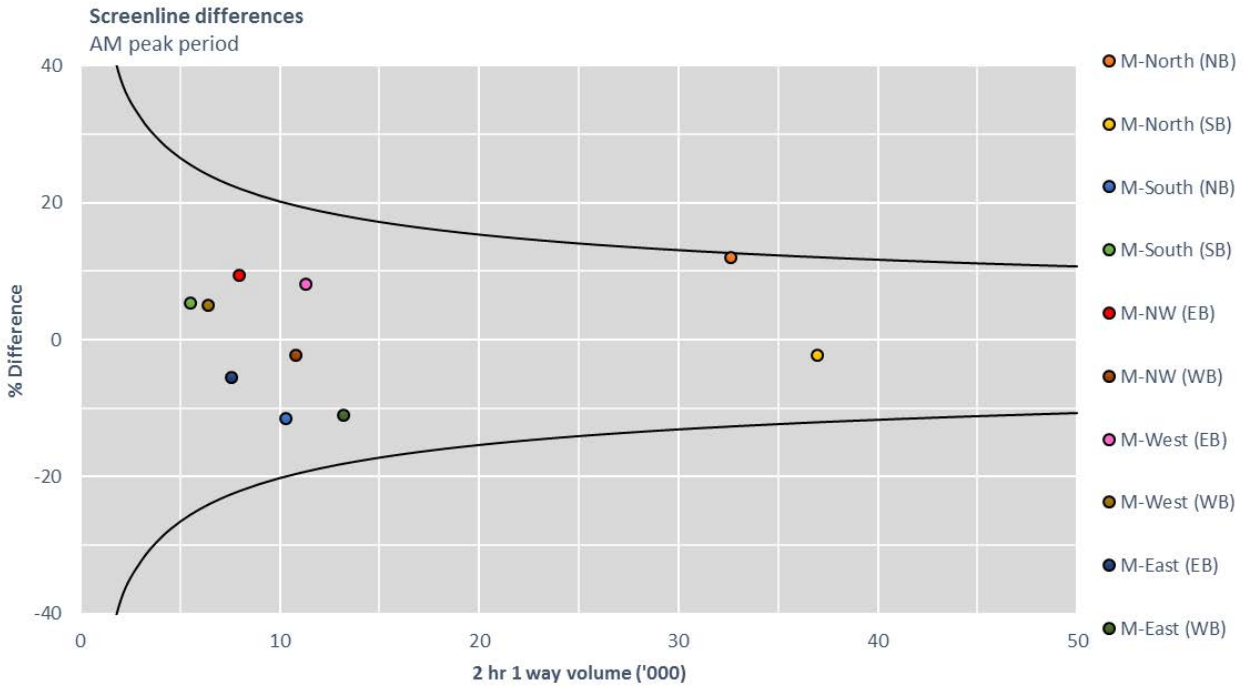


Figure 3.6 Differences in 2016 modelled and observed one-way two-hour screenline volumes (AM peak)

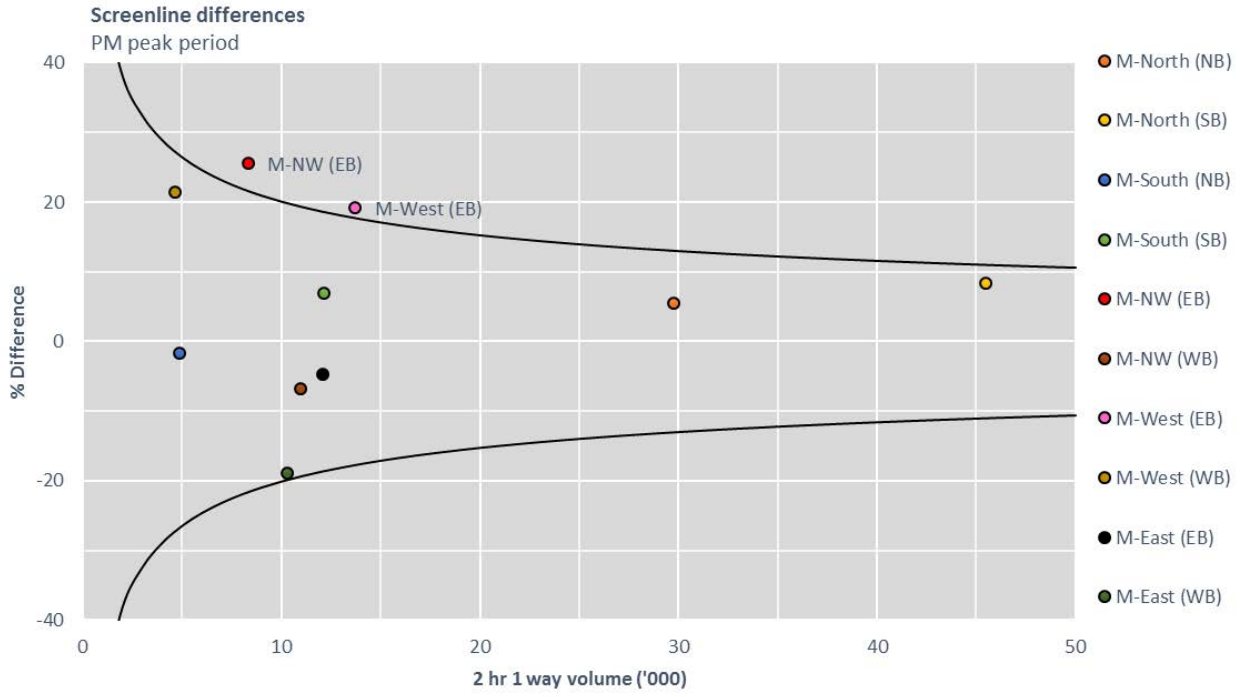


Figure 3.7 Differences in 2016 modelled and observed one-way two-hour screenline volumes (PM peak)

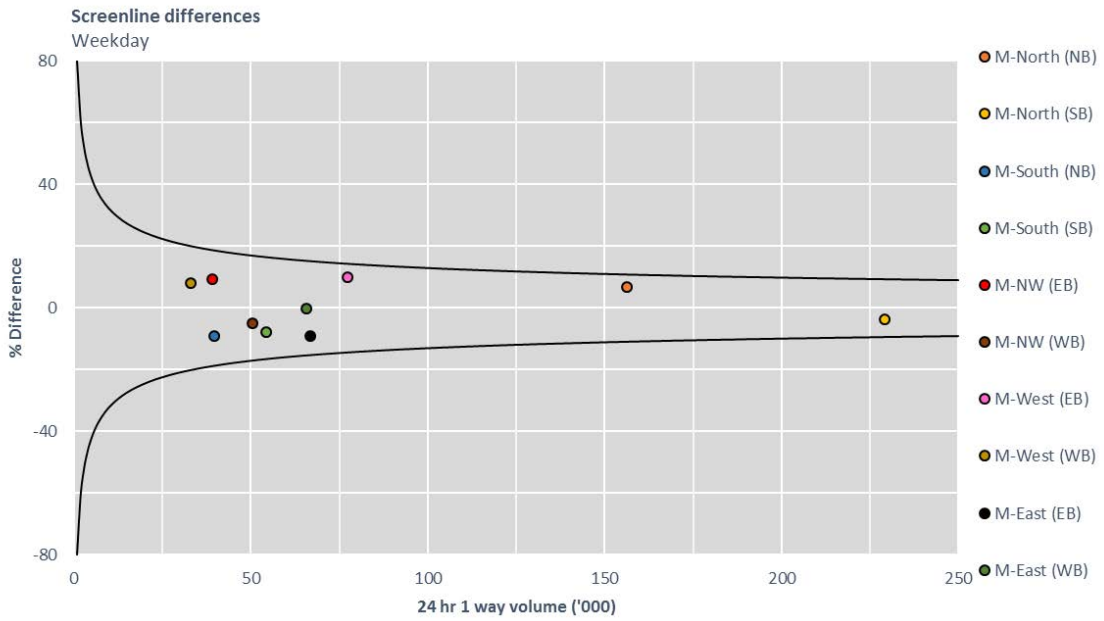


Figure 3.8 Differences in 2016 modelled and observed one-way 24-hour screenline volumes (weekday)

3.2.3 TRAVEL TIMES

A comparison of surveyed and modelled travel times along four travel time routes (shown in Figure 3.9) was undertaken. Table 3.2 shows the surveyed travel times for each route and direction. The surveyed travel time data consisted of runs over two days within the designated AM and PM peak periods. Hence, the observed data showed large variations between runs during the peaks. The surveyed minimum and maximum are included in the travel time validation below better indicate how well the modelled travel times compare with the surveyed data.

The results show that modelled travel times in the AM and PM peak periods generally compared well with the surveyed data for most routes (within 20% of surveyed average data). For all routes, the modelled travel times generally fall between the survey minimum and maximum travel times. Overall travel time validation results are considered acceptable for strategic modelling purposes.

Table 3.2 Comparison of total travel time on surveyed routes in AM and PM Peak (minutes)

ROUTE	PERIOD	DIRECTION	SURVEY MIN	SURVEY MEAN	SURVEY MAX	MODEL	DIFF	DIFF (%)
Nepean Highway between South Road and McLeod Road	AM	Southbound	20.1	23.0	27.2	24.1	1.1	4.8%
		Northbound	22.4	28.9	34.6	35.1	6.2	21.5%
	PM	Southbound	24.7	28.9	35.1	31.4	2.5	8.7%
		Northbound	27.4	29.0	33.5	31.3	2.3	7.9%
Boundary Road between Dingley Bypass and McLeod Road	AM	Southbound	13.7	15.2	17.9	15.7	0.5	3.3%
		Northbound	14.3	18.2	21.9	17.9	-0.3	-1.6%
	PM	Southbound	15.3	20.0	26.8	19.7	-0.3	-1.5%
		Northbound	14.0	15.8	18.2	15.0	-0.8	-5.1%

ROUTE	PERIOD	DIRECTION	SURVEY MIN	SURVEY MEAN	SURVEY MAX	MODEL	DIFF	DIFF (%)
South Road between Nepean Highway and Frankston Dandenong Road	AM	Eastbound	10.7	11.4	11.9	10.6	-0.8	-7.0%
		Westbound	10.7	11.4	13.1	10.9	-0.5	-4.4%
	PM	Eastbound	10.6	11.5	13.4	10.9	-0.6	-5.2%
		Westbound	10.6	11.8	13.9	10.6	-1.2	-10.2%
Springvale Road between Heatherton Road and Bridges Avenue	AM	Southbound	11.3	15.8	21.5	12.6	-3.2	-20.3%
		Northbound	12.0	16.4	20.9	14.1	-2.3	-14.0%
	PM	Southbound	14.4	20.7	30.8	16.3	-4.4	-21.3%
		Northbound	12.9	15.1	18.6	12.7	-2.4	-15.9%

Figure 3.9 Surveyed travel time routes

4 KEY INPUTS

4.1 LAND USE

SGS consultants developed the land use data for 2016 and future years 2021, 2031 and 2051 specifically for the project, and TfV provided the data as input into the modelling. The land use forecasts were developed at the VITM travel zone level covering Melbourne only. Table 4.1 shows each model year's forecast population and employment for metropolitan Melbourne. Spatial growth in population and employment between 2016 and 2051 are shown in Figure 4.1 and Figure 4.2 respectively. In general, significant population growth is forecast in Melbourne's outer regions; the Bayside region's population will continue to grow, but a much stronger growth is expected in the South East region.

Table 4.1 Population and employment projection summary

YEAR	POPULATION	EMPLOYMENT
2016	4,558,056	2,325,667
2021	5,007,948	2,567,010
2031	5,898,548	3,072,522
2051	7,737,817	4,145,841
Growth from 2016 to 2051	3,179,761	1,820,174

Source: DEDJTR VITM Land use and demographic inputs (28 April 2017)

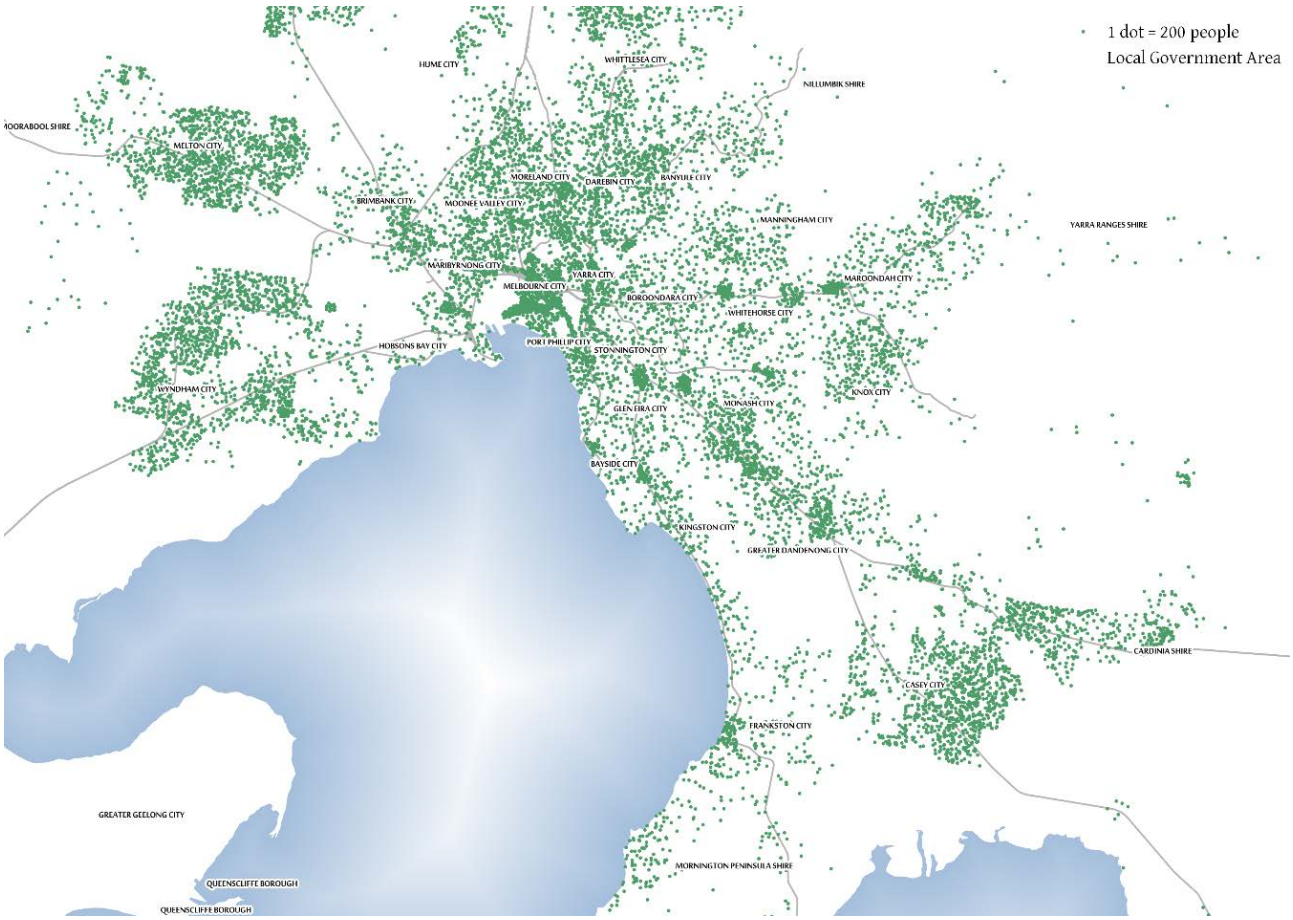


Figure 4.1 Change in population between 2016 and 2051

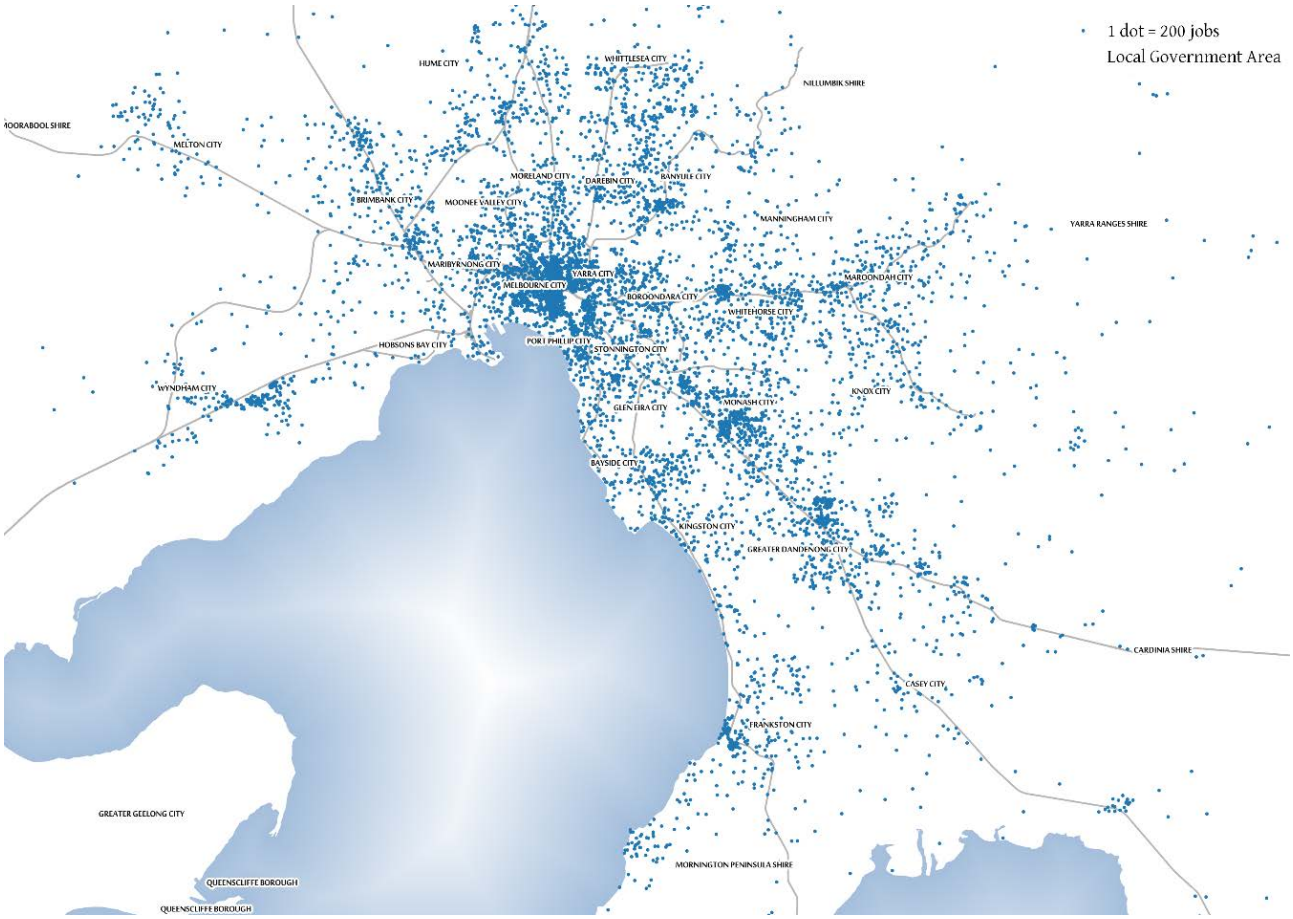


Figure 4.2 Change in employment between 2016 and 2051

Source: DEDJTR VITM Land use and demographic inputs (28 April 2017)

4.2 REFERENCE CASE

The TfV Reference Case contains a set of inputs considered to best represent future transport key factor outcomes (such as vehicle operating costs) influencing Victorians' travel behaviour. The transport networks are a key component of the Reference Case, intentionally created to provide consistency in transport demand modelling and assessment of major transport infrastructure projects.

The Reference Case transport networks include future road projects and public transport services to reflect the likely future road network capacity as well as public transport services and frequency.

Future road projects included in the latest Reference Case include:

- Monash Freeway Upgrade Stage 1 (by 2021)
- Monash Freeway Upgrade Stage 2 (by 2021)
- Dingley Bypass (by 2021)
- Mordialloc Bypass (by 2021)
- West Gate distributor (by 2021)
- Westall Road Extension (by 2031)
- North East Link (by 2031)
- Eastern Freeway widening (by 2031)
- Outer Metropolitan Ring Road (2051)
- Arterial road and local road upgrades in growth areas.

Future public transport projects included in the latest Reference Case include:

- Melbourne Metro rail tunnel (by 2031)
- Mernda Rail Extension (by 2021)
- Other tram and bus network enhancements around Melbourne.

5 BASE CASE AND PROJECT CASE

5.1 BASE CASE

The existing VITM Reference Case was used as the basis for establishing the 2021, 2031 and 2051 Base Cases (excluding the Mordialloc Bypass). It should be noted that the 2051 road and public transport networks were based on the 2046 VITM Reference Case networks, as no reference networks had been developed for 2051.

5.2 PROJECT CASE

Using the Base Case road network as a starting point, the Project Case for the Mordialloc Bypass was modelled. A detailed description of the project and how it differs from the Base Case is provided in Table 5.1 below, while the proposed Mordialloc Bypass alignment is shown in Figure 5.1.

Table 5.1 Summary of Project Case modelled in 2021, 2031 and 2051

SCENARIO	DESCRIPTION
Project Case – Four-lane freeway	
	— Four-lane freeway with two lanes with a divided centre median — 100km/hr posted speed — Full grade separated interchanges at Springvale Road, Governor Road, and Lower Dandenong Road — Half facing grade separated interchange at Centre Dandenong Road (south facing ramps only) — At-grade signalised intersection at Dingley Bypass — Freeway to go over Old Dandenong Road, without access — North facing ramps at Mornington Peninsula Freeway and Thames Promenade interchange

Figure 5.1 Proposed Mordialloc Bypass alignment

6 DEMAND FORECASTING RESULTS

6.1 BASE CASE PERFORMANCE

6.1.1 TRAFFIC VOLUMES

Table 6.1 presents a summary of Base Case two-way daily all-vehicle traffic volumes on key roads (see Figure 6.1). The results generally suggest that without further improvement to the road network, there will be significantly more traffic on most key roads in the study area, likely increasing congestion and travel time delays.

With regards to the daily traffic on specific roads, the following observations can be made:

- In 2021, a small increase in daily traffic is expected on most key roads, compared with 2016.
- However, in 2031 and 2051 there are substantial traffic increases, especially in areas adjacent to the planned Mordialloc Bypass (Springvale Road and Boundary Road), indicating the future benefit of the Mordialloc Bypass.

Table 6.1 Total two-way daily volumes (all vehicles) on key roads – 2016, 2021, 2031 and 2051 Base Cases

ROAD	LOCATION	2016	2021	2031	2051
Mornington Peninsula Freeway	East of Springvale Road	45,900	46,700	50,700	53,600
Springvale Road	North of Mornington Peninsula Freeway	40,100	41,600	44,100	47,100
Springvale Road	South of Mornington Peninsula Freeway	38,200	38,300	40,100	43,600
Wells Rd	West of Springvale Rd	33,100	33,100	34,900	36,200
Wells Rd	East of Springvale Rd	20,700	20,200	20,300	20,800
Governor Road	Near Mordialloc Bypass	16,200	15,900	17,900	21,200
Lower Dandenong Road	Near Mordialloc Bypass	40,800	40,200	41,100	42,300
Boundary Road	South of Lower Dandenong Road	42,800	43,700	47,900	53,500
Boundary Road	South of Governor Road	42,700	42,700	44,700	45,700
Centre Dandenong Road	Near Mordialloc Bypass	15,000	16,000	17,300	14,500
Old Dandenong Road	East of Boundary Road	3,400	3,800	4,500	4,200
Kingston Road	West of Dingley Bypass	18,500	20,600	22,700	29,700
Warrigal Road	North of Dingley Bypass	31,900	32,000	34,000	39,200
South Road	West of Warrigal Road	44,700	47,900	51,900	66,000
South Road	West of E Boundary Road	32,200	35,000	36,600	45,600
Westall Road	West of Springvale Road	44,300	52,300	58,000	79,200
Westall Road	North of Heatherton Road	47,800	49,600	56,400	64,100
Thames Promenade	West of Wells Road	11,600	14,200	14,700	16,100

Figure 6.1 Volume locations on key roads

6.1.2 VOLUME TO CAPACITY RATIO / LEVEL OF SERVICE

Figure 6.3 shows volume to capacity ratios (V/C) on key roads in the corridor in the 2016 and 2031 Base Case for the AM and PM peak (the colour bands correspond to Figure 6.2). The relationship between the V/C shown and Level of Service (LoS) for traffic flow is generally consistent with the classifications presented in Table 6.2.

The modelling results suggest that road users are already experiencing congestion; several sections of road were approaching theoretical capacity (i.e. LoS D to E) in 2016. In 2031, increased congestion is evidenced by the increasing number of sections of road in the study area where the V/C ratio either approaches theoretical capacity (i.e. V/C ratio greater than 0.8) or exceeds it (i.e. V/C ratio greater than 1). The modelling suggests that, with additional demand growth and no further road improvements, by 2031 several sections of road in the study area will be at capacity, particularly in the PM peak, and that the existing roads may not be adequate to support the growing demand. Table 6.3 summarises the key locations in the study area where road users are experiencing peak period congestion.

Table 6.2 V/C in relation to level of service

VOLUME/CAPACITY RATIO	LEVEL OF SERVICE
< 0.28	A
0.28 – 0.44	B
0.45 – 0.64	C
0.65 – 0.84	D
0.85 – 0.99	E
>= 1	F

Source: AustRoads Guide to Traffic Management Part 3: Traffic Studies and Analysis

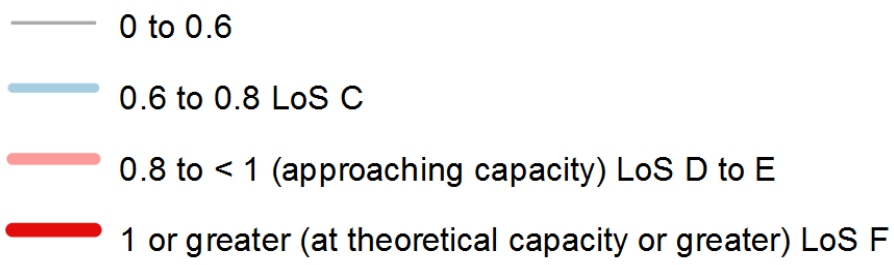


Figure 6.2 Legend for AM and PM peak V/C

Table 6.3 Key locations where volumes approach or exceed capacity in 2016 and 2031

ROAD	2016	2031
Springvale Road	**Approaching Capacity (LoS D to E):** Mornington Peninsula Freeway to Lower Dandenong Road, South of Heatherton Road	**Exceeding Capacity (LoS F):** Mornington Peninsula Freeway to Lower Dandenong Road (PM peak only) **Approaching Capacity (LoS D to E):** Governor Road to Lower Dandenong Road, South of Heatherton Road
Boundary Road	**Approaching Capacity (LoS D to E):** Mornington Peninsula Freeway to Governor Road	**Approaching Capacity (LoS D to E):** Mornington Peninsula Freeway to Governor Road, South of Lower Dandenong Road, Centre Dandenong Road to Heatherton Road
Governor Road	**Approaching Capacity (LoS D to E):** Boundary Road to Springvale Road, West of Boundary Road	**Exceeding Capacity (LoS F):** West of Boundary Road **Approaching Capacity (LoS D to E):** Boundary Road to Springvale Road
Lower Dandenong Road	**Approaching Capacity (LoS D to E):** Boundary Road to Springvale Road, West of Boundary Road, East of Springvale Road	**Approaching Capacity (LoS D to E):** Boundary Road to Springvale Road, West of Boundary Road, East of Springvale Road
Centre Dandenong Road		**Approaching Capacity (LoS D to E):** Boundary Road and Dingley Village

ROAD	2016	2031
Heatherton Road	**Approaching Capacity (LoS D to E):** West of Westall Road	**Approaching Capacity (LoS D to E):** West of Westall Road, East of Warrigal Road
Westall Road		**Approaching Capacity (LoS D to E):** North of Heatherton Road
Westall Road Extension	**Approaching Capacity (LoS D to E):** West of Springvale Road	**Approaching Capacity (LoS D to E):** West of Springvale Road
White Street	**Approaching Capacity (LoS D to E):** Nepean Highway to Boundary Road	**Approaching Capacity (LoS D to E):** Nepean Highway to Boundary Road
Tootal Road	**Approaching Capacity (LoS D to E):** South of Heatherton Road	**Approaching Capacity (LoS D to E):** South of Heatherton Road

Figure 6.3 2016 and 2031 Base Cases, AM and PM peak V/C

6.1.3 TRAVEL TIMES

Figure 6.4 illustrates the proposed bypass's likely impacts on the study area's key travel time routes (north-south and east-west). A summary of each route's 2016 and 2031 AM and PM peak car travel times is shown in Table 6.4. The modelling suggests congestion will increase in 2031, compared to 2016 when AM and PM peak period travel times increased significantly.

The following observations can be made from the modelling results:

- AM peak travel times northbound on Springvale Road between Mornington Peninsula Freeway and Dingley Bypass are forecast to increase by about 2 minutes. Northbound travel times on Wells Road/White Street between the Mornington Peninsula Freeway and Nepean Highway are expected to increase by around 2.5 minutes.
- PM peak travel times southbound on Boundary Road between Dingley Bypass and Mornington Peninsula Freeway are estimated to increase by nearly 3.5 minutes. Southbound travel times on Wells Road (routes 3 and 4) between Nepean Highway and Morning Peninsula Freeway are expected to increase by more than 3.5 minutes.

The results suggest that, with no further road improvements in the corridor in the medium to long term, road users will endure significant congestion and travel time delays during the peak periods.

Table 6.4 Change in AM and PM peak travel times in 2031 compared to 2016 Base

ROUTE		DIRECTION	(MINUTES) AM PEAK			(MINUTES) PM PEAK		
			2016	2031	CHANGE	2016	2031	CHANGE
1	Springvale Road between Mornington Peninsula Freeway and Dingley Bypass	Northbound	11.1	13.1	2.0	8.9	9.1	0.2
		Southbound	8.4	8.8	0.4	14.1	16.4	2.3
2	Boundary Road between Mornington Peninsula Freeway and Dingley Bypass	Northbound	12.7	14.5	1.8	10.2	10.4	0.2
		Southbound	10.6	10.8	0.2	14.5	17.8	3.3
3	Wells Road – White Street between Mornington Peninsula Freeway and Nepean Highway	Northbound	14.1	16.4	2.3	12	12.8	0.8
		Southbound	11.9	12	0.1	15.8	19.4	3.6
4	Wells Road – Lower Dandenong Road between Mornington Peninsula Freeway and Nepean Highway	Northbound	17.2	19.5	2.3	14.8	15.4	0.6
		Southbound	14.9	15.1	0.2	19.7	23.3	3.6
5	Lower Dandenong Road between Springvale Road and Boundary Road	Westbound	4.1	5	0.9	3.6	3.7	0.1
		Eastbound	3.4	3.6	0.2	4.7	5.2	0.5

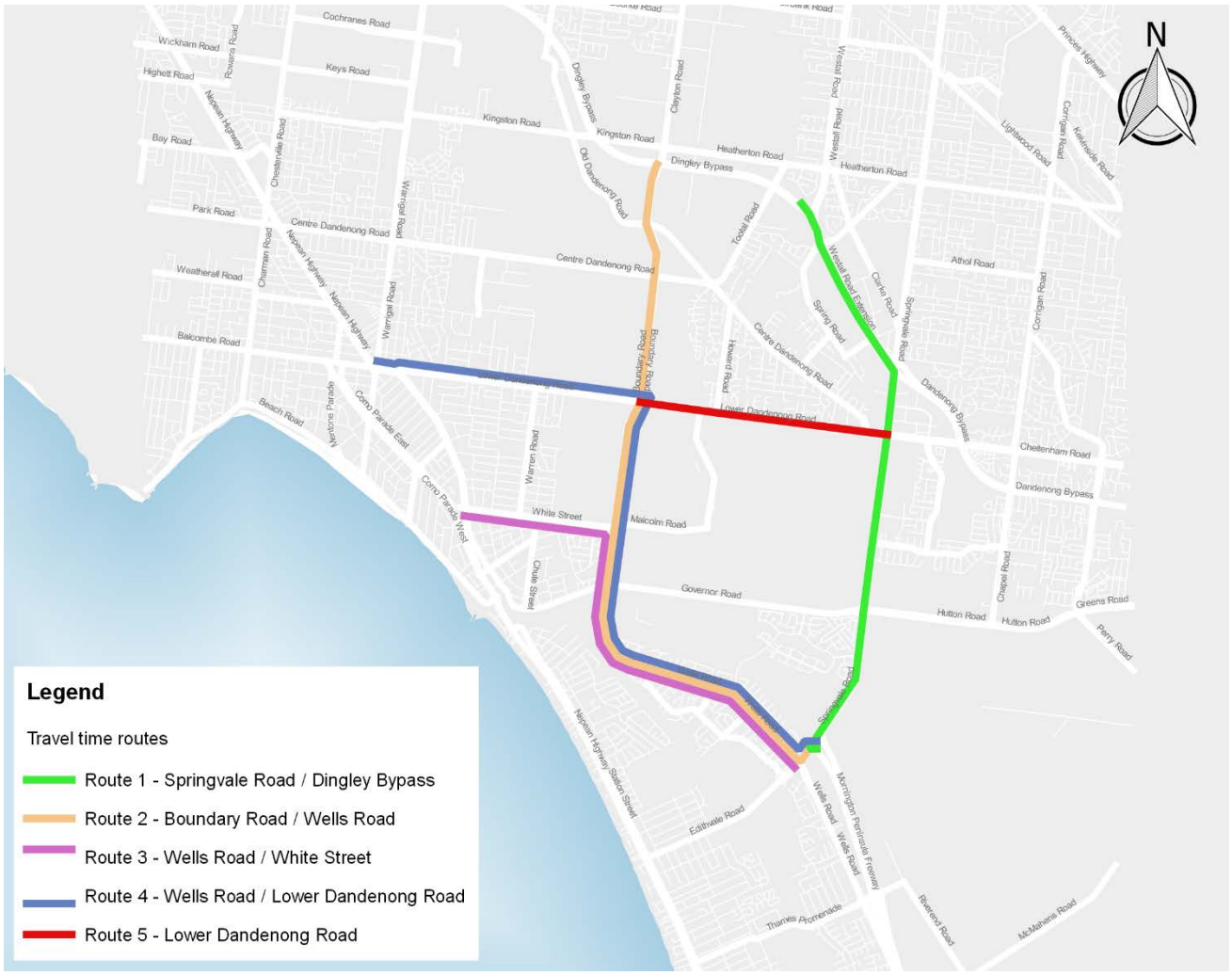


Figure 6.4 Travel time routes

6.2 PERFORMANCE OF PROJECT

6.2.1 TRAFFIC VOLUMES

Table 6.5 provides a summary of the daily two-way all-vehicle traffic volume in the 2031 Base Case, and the volume changes in the project for key roads in the study area. Traffic volume differences for each year modelled (i.e. 2021, 2031 and 2051) are attached in Appendix B. A network difference plot showing daily two-way volume differences in 2031 between the project case and the Base Case is shown in Figure 6.5.

When referring to the change in daily two-way traffic volumes in the project case compared to the Base Case, the following observations are made:

- Mordialloc Bypass between Springvale Road and Governor Road carries roughly 76,700 vehicles.
- Traffic on Mornington Peninsula Freeway east of Springvale Road is expected to increase by about 32,100 vehicles compared to the Base Case.
- Traffic volumes on north-south roads decrease significantly compared to the Base Case (i.e. 15,600 vehicles on Springvale Road north of Mornington Peninsula Freeway and 13,100 vehicles on Boundary Road south of Lower Dandenong Road), indicating that the finished project will divert large amounts of traffic from those roads to the Mordialloc Bypass.

- Traffic volumes on Boundary Road/Wells Road north of Mornington Peninsula Freeway are expected to decrease by around 27,000 vehicles compared to the Base Case.
- Increased traffic volume is expected west of Mordialloc Bypass on east-west roads (Governor Road, Lower Dandenong Road, Centre Dandenong Road and Dingley Bypass) compared with the Base Case – attributable to the increased demand for access to Mordialloc Bypass via these roads.
- A reduction of around 5,000 vehicles in traffic volume is expected on Wells Road between Springvale Road and Thames Promenade compared with the Base Case. The traffic on this road is being diverted away to the Mornington Peninsula Freeway via the north facing ramps in the project at the Thames Promenade interchange.

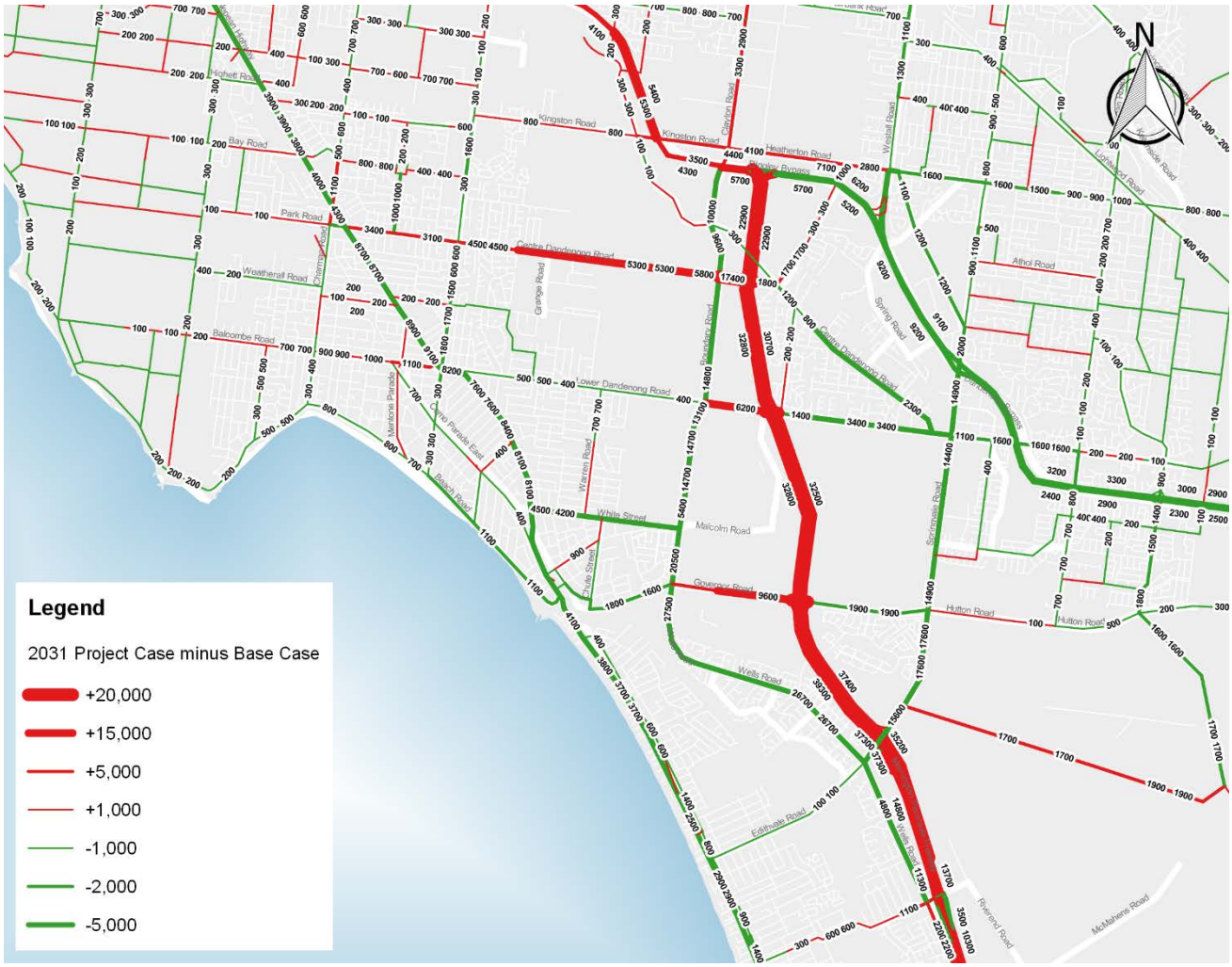


Figure 6.5 Change in daily two-way traffic volume (all vehicles) in Project Case compared to the Base Case in 2031

Table 6.5 Changes in daily volumes (both directions) on key roads in 2031 – Base Case vs Project Case

ROAD	LOCATION	BASE CASE	PROJECT CASE
Mornington Peninsula Freeway	East of Springvale Road	50,700	32,100
Springvale Road	North of Mornington Peninsula Freeway	44,100	-15,600
Springvale Road	South of Mornington Peninsula Freeway	40,100	-17,600
Wells Rd	West of Springvale Rd	34,900	-26,700
Wells Rd	East of Springvale Rd	20,300	-4,800
Governor Road	West of Mordialloc Bypass	17,900	9,700
Governor Road	East of Mordialloc Bypass	17,900	-1,700
Lower Dandenong Road	West of Mordialloc Bypass	41,100	6,200
Lower Dandenong Road	East of Mordialloc Bypass	41,100	-1,300
Boundary Road	South of Lower Dandenong Road	47,900	-13,100
Boundary Road	South of Governor Road	44,700	-27,600
Centre Dandenong Road	West of Mordialloc Bypass	17,300	17,400
Centre Dandenong Road	East of Mordialloc Bypass	17,300	1,800
Old Dandenong Road	East of Boundary Road	4,500	-400
Kingston Road	West of Dingley Bypass	22,700	1,000
Warrigal Road	North of Dingley Bypass	34,000	1,200
South Road	West of Warrigal Road	51,900	5,100
South Road	West of E Boundary Road	36,600	4,800
Westall Road	West of Springvale Road	58,000	-18,300
Westall Road	North of Heatherton Road	56,400	-900
Mordialloc Bypass	Springvale Road and Governor Road	-	76,700
Mordialloc Bypass	North of Governor Road	-	65,300
Mordialloc Bypass	North of Lower Dandenong Road	-	63,500
Thames Promenade	West of Wells Road	14,800	1,100

6.2.2 VOLUME TO CAPACITY RATIO/LEVEL OF SERVICE

Volume to capacity ratios (V/C) on key corridor roads in the 2031 Base Case are shown in Figure 6.6 and Figure 6.7 for the AM and PM peak. Those for the project are shown in Figure 6.8 and Figure 6.9. From these figures, the following key observations are made:

- In the project area, Wells Road and Boundary Road between Springvale Road and Heatherton Road which were previously approaching capacity (LoS D to E), now have capacity available (LoS C or higher) in both the 2016 and 2031 Base Case. This suggests that the proposed Mordialloc Bypass provides an alternative route to the existing north south routes in the corridor, therefore freeing up capacity on the existing roads.

- The section of Springvale Road between Mornington Peninsula Freeway and Governor Road is below capacity in the both the AM and PM peak. In the Base Case this road approached capacity (LoS D to E) in the AM peak northbound, and is at capacity (LoS F) in the PM peak southbound.
- The project relieves congestion on Nepean Highway (i.e. LoS D to E) near the Beach Road intersection; in the Base Case, the road is at capacity (LoS F) in the PM peak southbound

Figure 6.6 2031 Base Case AM peak V/C

Figure 6.7 2031 Base Case PM peak V/C

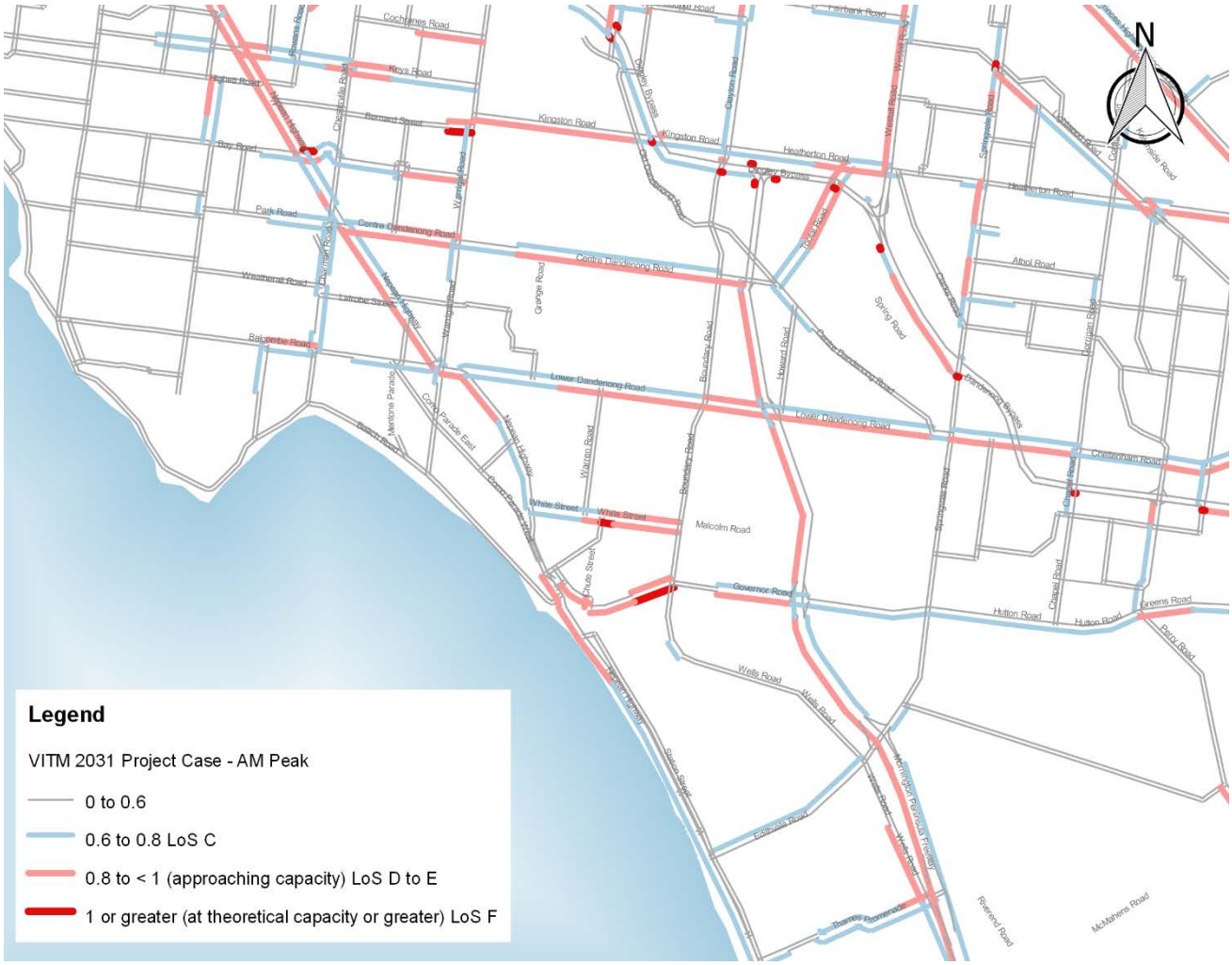


Figure 6.8 2031 Project Case – AM peak V/C

Figure 6.9 2031 Project Case – PM peak V/C

6.2.3 TRAVEL TIMES

One of the main objectives of the proposed bypass is to provide alternative transport for north-south movements through the study area. Table 6.6 and Table 6.7 show the 2031 changes in AM and PM peak car travel times for the project compared to the Base Case. A full summary of the AM and PM peak travel times for each route in each direction for the base case and the project in 2021, 2031 and 2051 is provided in Appendix B. When considering project performance in the AM and PM peaks, the following observations are made:

- The project reduces travel times on Springvale Road and Boundary Road (routes 1 and 2) by about 4 and 4.5 minutes in the AM peak.
- The project reduces travel times on Wells Road (routes 3 and 4) by about 4.5 and 3.5 minutes in the AM peak.
- The project reduces travel times on Springvale Road and Boundary Road (routes 1 and 2) by about 7 and 7.5 minutes in the PM peak.
- The project reduces travel times on Wells Road (routes 3 and 4) by about 7 and 6 minutes in the PM peak.

Based on these findings, the modelling suggests the project will reduce congestion in the study area and improve travel times on adjacent roads.

Table 6.6 Changes in AM peak travel times (minutes) in Project Case compared to Base Case in 2031

ROUTE		DIRECTION	BASE CASE	PROJECT CASE
1	**Springvale Road** between Mornington Peninsula Freeway and Dingley Bypass	Northbound	13.1	-3.8
2	**Boundary Road** between Mornington Peninsula Freeway and Dingley Bypass	Northbound	14.5	-4.6
3	**Wells Road – White Street** between Mornington Peninsula Freeway and Nepean Highway	Northbound	16.4	-4.6
4	**Wells Road – Lower Dandenong Road** between Mornington Peninsula Freeway and Nepean Highway	Northbound	19.6	-3.7
5	**Lower Dandenong Road** between Springvale Road and Boundary Road	Westbound	5.0	-0.1

Table 6.7 Changes in PM peak travel times (minutes) in Project Case compared to Base Case in 2031

ROUTE		DIRECTION	BASE CASE	PROJECT CASE
1	**Springvale Road** between Mornington Peninsula Freeway and Dingley Bypass	Southbound	16.4	-7.1
2	**Boundary Road** between Mornington Peninsula Freeway and Dingley Bypass	Southbound	17.8	-7.4
3	**Wells Road – White Street** between Mornington Peninsula Freeway and Nepean Highway	Southbound	19.4	-6.8
4	**Wells Road – Lower Dandenong Road** between Mornington Peninsula Freeway and Nepean Highway	Southbound	23.3	-6.2
5	**Lower Dandenong Road** between Springvale Road and Boundary Road	Eastbound	5.2	0.3

7 CONCLUSION

WSP undertook transport demand modelling for the proposed Mordialloc Bypass to assess:

- the future travel demands and traffic impacts in the study area
- the traffic impact of the Mordialloc Bypass Freeway project.

These assessments were conducted using the VITM, which was refined to improve the model performance between observed and modelled traffic flows in the base year (2016).

Modelling was undertaken for three future years (i.e. 2021, 2031 and 2051), where a base case and a project case were modelled for each year. The modelling outputs indicate that:

- The future traffic demand from land use growth in the study area is expected to significantly increase traffic volumes on key roads in the medium to long term (i.e. in 2031 and 2051). This growth is expected to cause increased congestion in the AM and PM peaks on roads such as Springvale Road, Boundary Road and Governor Road.
- Worsening AM and PM peak travel times were observed in 2031 when compared to 2016 model results on key routes in the study area, suggesting the area's road network may not be adequately supporting the growth in demand.
- The project, which provides additional capacity for north-south movements in the study area, was modelled and found to significantly reduce AM and PM peak congestion and travel time delays.
- The project is expected to carry roughly 76,700 daily two-way traffic volumes between Springvale Road and Governor Road.
- The project is expected to relieve congestion in the study area by diverting traffic away from existing roads. Daily two-way traffic volumes decrease by 27,000 on Boundary Road/Wells Road north of Mornington Peninsula Freeway, while traffic volumes on Springvale Road decrease by approximately 14,000.
- The project is expected to reduce daily two-way traffic volumes by 5,000 vehicles on Wells Road between Springvale Road and Thames Promenade. The traffic on this road is being diverted away to the Mornington Peninsula Freeway via the north facing ramps in the project at the Thames Promenade interchange.
- The project improves the AM peak V/C ratio on Springvale Road between Mornington Peninsula Freeway and Governor Road (i.e. LoS C). In the base case this road was approaching capacity (LoS D to E) in the AM peak and is at capacity (LoS F) in the PM peak.
- The project relieves congestion on routes through and in the study area, and reduces the AM peak period travel times in the northbound direction on Springvale Road and Boundary Road (routes 1 and 2) by about 4 and 4.5 minutes. The travel times on Wells Road (routes 3 and 4) reduce by about 4.5 and 3.5 minutes.
- In the PM peak, the project reduces travel times in the southbound direction on Springvale Road and Boundary Road (routes 1 and 2) by about 7 and 7.5 minutes. The travel times on Wells Road (routes 3 and 4) reduce by about 7 and 6 minutes.

APPENDIX A

VITM VALIDATION RESULTS

A1 REVIEW OF 2011 VALIDATION

This chapter summarises the outcomes of the original model validation using data collected in 2011 and documented in the *TfV VITM Model Validation Report (March 2016)*. The following sections describe the model's convergence and present a series of plots and tables to demonstrate the model's traffic and public transport validation on a network-wide basis.

A1.1 MODEL CONVERGENCE

When VITM is run, the model process is repeated over six loops. The results from each cycle are fed into the next loop, with the objective of achieving results convergence by the last loop. In addition to achieving convergence over these feedback loops, the model also seeks to achieve convergence in the traffic assignment, which is also an iterative process.

Achieving convergence of the overall feedback loops and traffic assignment is critical to obtaining stable results and assessing the impacts of future changes to the road and public transport networks. The following sections review the feedback and traffic assignment convergence reported in the 2011 model validation.

A1.1.1 FEEDBACK CONVERGENCE

The VicRoads model validation guidelines do not specify a specific stability threshold that must be obtained by the model's feedback loops. However, the guidelines do require the convergence to be checked and reported. Table A.1 summarises three convergence measures: (i) the percentage root mean squared (%RMSE) change between successive iterations; (ii) the mean GEH statistic; and (iii) the maximum GEH statistic[1].

Table A.1 Feedback loop convergence

LOOP	%RMSE	MEAN GEH	MAX GEH
1	–	–	–
2	17.7%	3.7	31.4
3	9.0%	1.6	26.1
4	7.9%	1.8	29.6
5	3.4%	0.64	13.5
6	2.9%	0.57	13.8

Source: TfV VITM Model Validation Report (March 2016)

Over the six feedback iterations, each of the measures indicates that the model is converging, as the differences between successive iterations become smaller[2].

A1.1.2 TRAFFIC ASSIGNMENT CONVERGENCE

The VicRoads guidelines specify several measures that may be used for demonstrating convergence of the traffic assignment. The two measures reported for the 2011 validation are the relative average absolute difference in link flows (RAAD) and the relative gap (RGAP) between successive iterations.

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1 The GEH statistic is defined in the VicRoads guidelines. It is an empirical formula that allows for greater variance on links with low flows and less variance on high-flow links. The mean and maximum are calculated over all links in the network.

2 There is a small increase in the maximum GEH in the last cycle, but this is not considered to be significant, as the other measures show improved stability for this cycle.

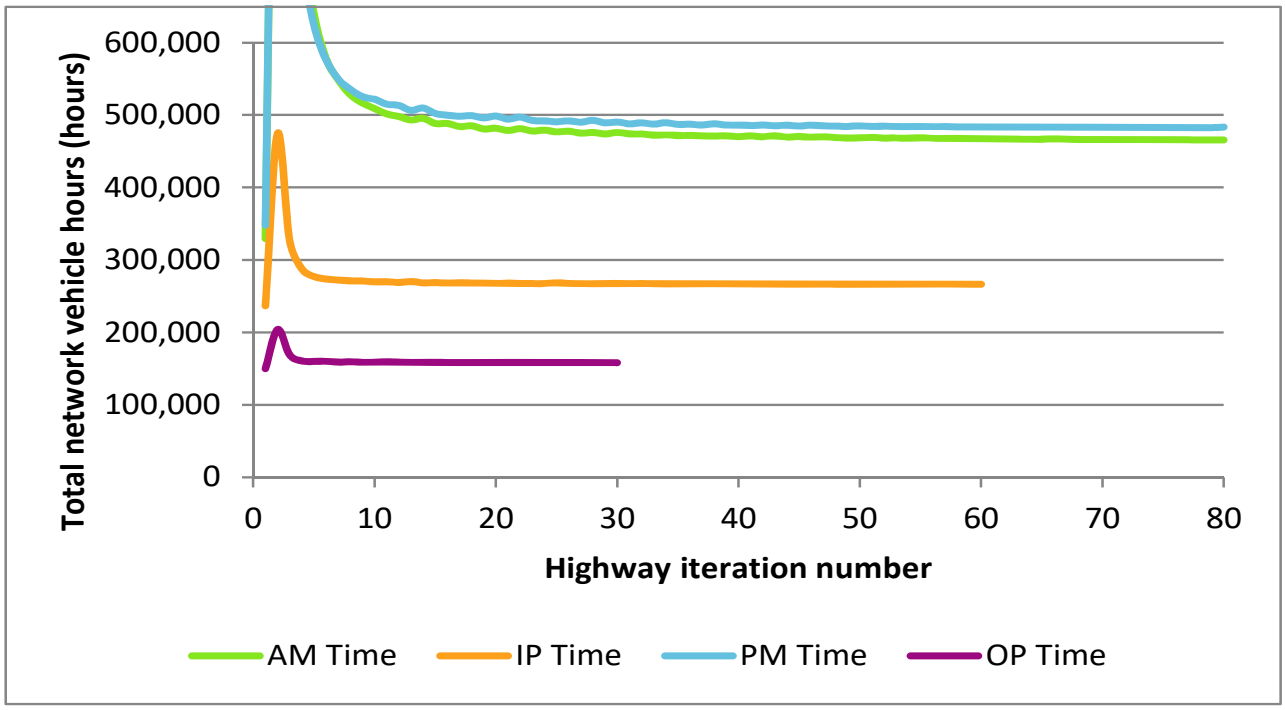
The guidelines require that sufficient traffic assignment iterations are performed so that the RAAD and RGAP measures are both less than 1%.

Table A.2 summarises the number of iterations undertaken in each time period's traffic assignment and the RAAD and RGAP results. These show that the traffic assignments converge within the required thresholds and there were enough iterations used for each time period. Figure A.1 demonstrates graphically that total vehicle hours converge after about eight iterations for the inter-peak and off-peak, and 50 iterations for the AM and PM peaks.

Table A.2 Traffic assignment convergence

PERIOD	CRITERIA	MODEL	PASS/FAIL
AM peak	Iterations RAAD < 1% RGAP < 1%	80 0.00% 0.11%	 Pass Pass
Inter-peak	Iterations RAAD < 1% RGAP < 1%	60 0.00% 0.08%	 Pass Pass
PM peak	Iterations RAAD < 1% RGAP < 1%	80 0.00% 0.18%	 Pass Pass
Off-peak	Iterations RAAD < 1% RGAP < 1%	30 0.10% 0.30%	 Pass Pass

Source: Model results from TfV VITM Model Validation Report (March 2016). Criteria from VicRoads (2012).



Source: TfV VITM Model Validation Report (March 2016)

Figure A.1 Convergence of total network vehicle hours travelled (VHT)

A1.2 TRAFFIC VALIDATION

The original TfV VITM validation report, reproduced in Figure A.2, carried out a high-level comparison of 2011 traffic volumes on screenlines across the metropolitan area.

The following equations specified in VicRoads' guidelines give the trumpet-shaped upper and lower limits, i.e.:

- Percentage difference = $\pm 50V^{-0.3953}$ for two-hour flows in the AM and PM peak time periods
- Percentage difference = $\pm 80.145V^{-0.3953}$ for daily flows

Where

V is the sum of one-way volumes across the screenline divided by 1000.

The graphs show that most screenline volumes fall within the required thresholds in the AM and PM peaks, indicating that the car matrices are of the correct magnitude. The daily plot shows underestimation of volumes on some screenlines, suggesting that total modelled car volumes across the day are slightly lower than expected.

Although screenline volumes for inter-peak and off-peak time periods were not reported in the original 2011 model validation, the original report notes that the discrepancy in daily screenline flows was largely due to having underestimated off-peak volumes.

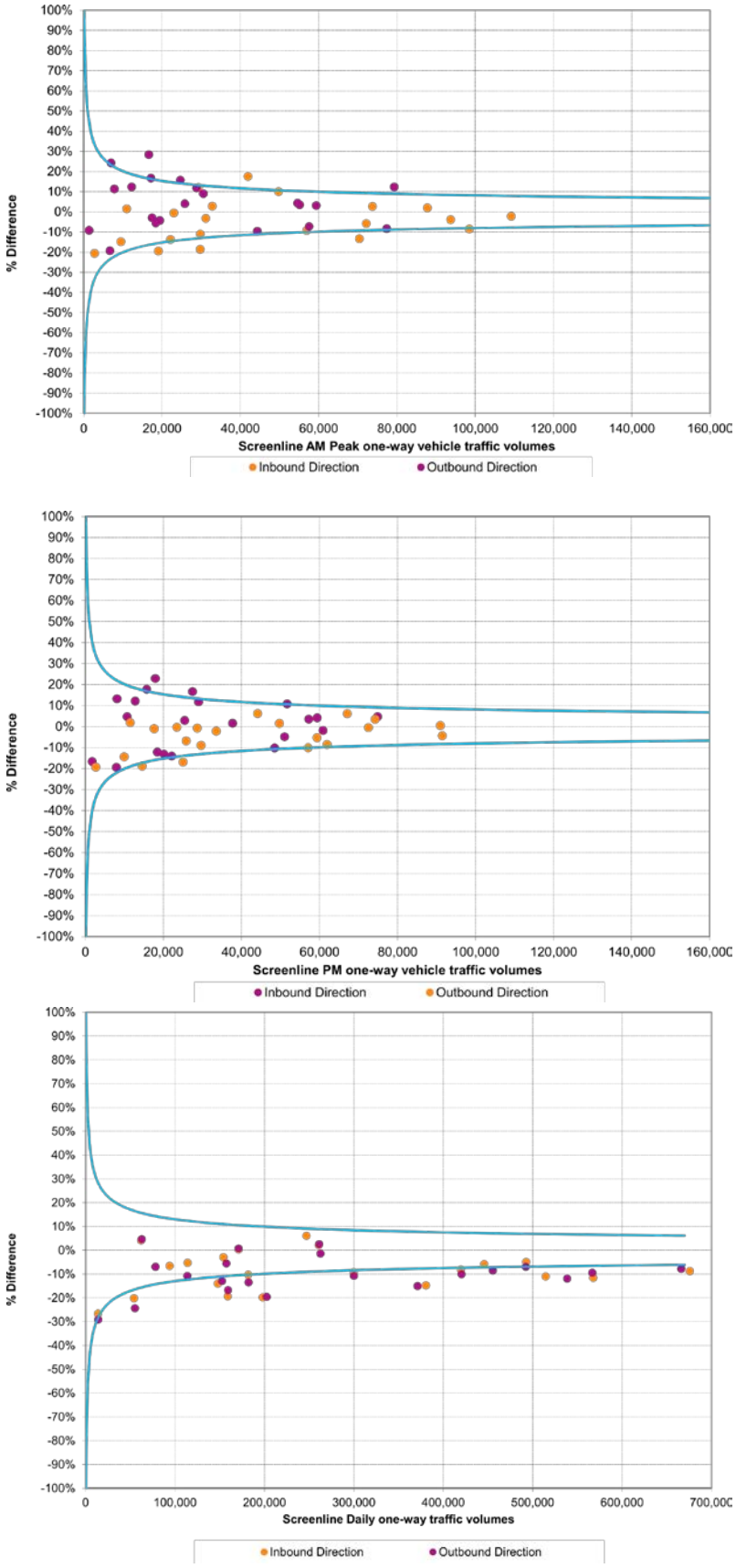
A1.2.1 PUBLIC TRANSPORT VALIDATION

Although the VicRoads guidelines do not specify requirements for public transport validation, this section provides a high-level comparison of observed and modelled public transport mode shares reported in the 2011 model validation. Table A.3 summarises the observed and modelled public transport shares for selected regions. Overall, modelled public transport mode shares are within 12 percent of observed shares, varying between 0 and 27 percent in selected local government areas (LGAs).

Table A.3 Comparison of weekday modelled and observed public transport (PT) mode shares

REGION	DIRECTION	OBSERVED PT SHARE	MODELLED PT SHARE
Melbourne CBD	To	33%	31%
Melbourne LGA	To	52%	56%
	From	34%	40%
Stonnington LGA	To	14%	12%
	From	16%	17%
Glen Eira LGA	To	6%	6%
	From	13%	12%
Maribyrnong LGA	To	7%	6%
	From	22%	16%
Port Phillip LGA	To	11%	14%
	From	22%	20%
Entire metropolitan area	N/A	10.9%	9.6%

Source: TfV VITM Model Validation Report (March 2016), Victorian Integrated Survey of Travel and Activity (VISTA 2007).



Source: TfV VITM Model Validation Report (March 2016)

Figure A.2 Modelled and observed screenline volume comparison for 2011 model (AM peak, PM peak, daily)

A2 2016 MODEL VALIDATION

This chapter reports the most recent validation of the model using traffic observations for the Mordialloc Bypass study area. The validation was carried out by running VITM with 2016 land-use and network inputs, and comparing the model's results with corresponding 2016 traffic observations.

Comparisons are reported for traffic volumes and for travel times and speeds, as specified in VicRoads' guidelines.

A2.1 TRAFFIC VOLUMES

A2.1.1 TRAFFIC COUNT LOCATIONS

Figure A.3 shows the locations where traffic counts were available for validating the model. The counts were mainly obtained from mid-block surveys, SCATS data and Freeway data from VicRoads' Freeway Management System.

Figure A.3 Traffic count locations

A2.1.2 ALL COUNT SITES

Modelled and observed volumes were compared over all the count sites shown in Figure A.3. The VicRoads guidelines specify two requirements for the fit of the modelled and observed data sets:

- the slope of the best-fit linear regression line should be between 0.9 and 1.1 (constrained to pass through the origin)
- the coefficient of determination (R^2) should be greater than or equal to 0.9.

Figure A.4 to Figure A.8 on the following pages show scatter plots of modelled and observed volumes across all count sites for the AM, inter-peak, PM, off-peak and weekday periods respectively. Overall, there is a good fit between modelled and observed data sets for scatter plots of modelled and observed volumes across all count sites for nearly all time periods.

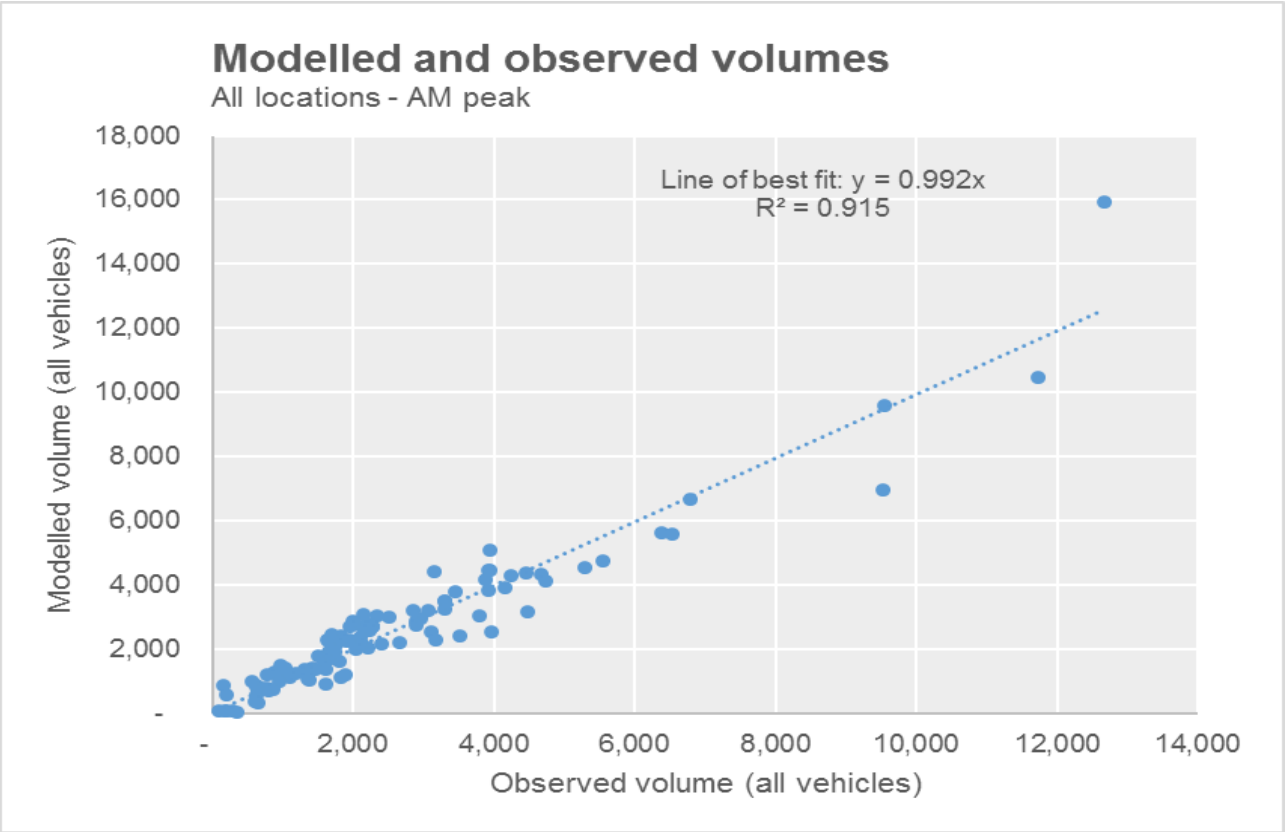


Figure A.4 Comparison of two-hour modelled and observed link volumes (AM peak)

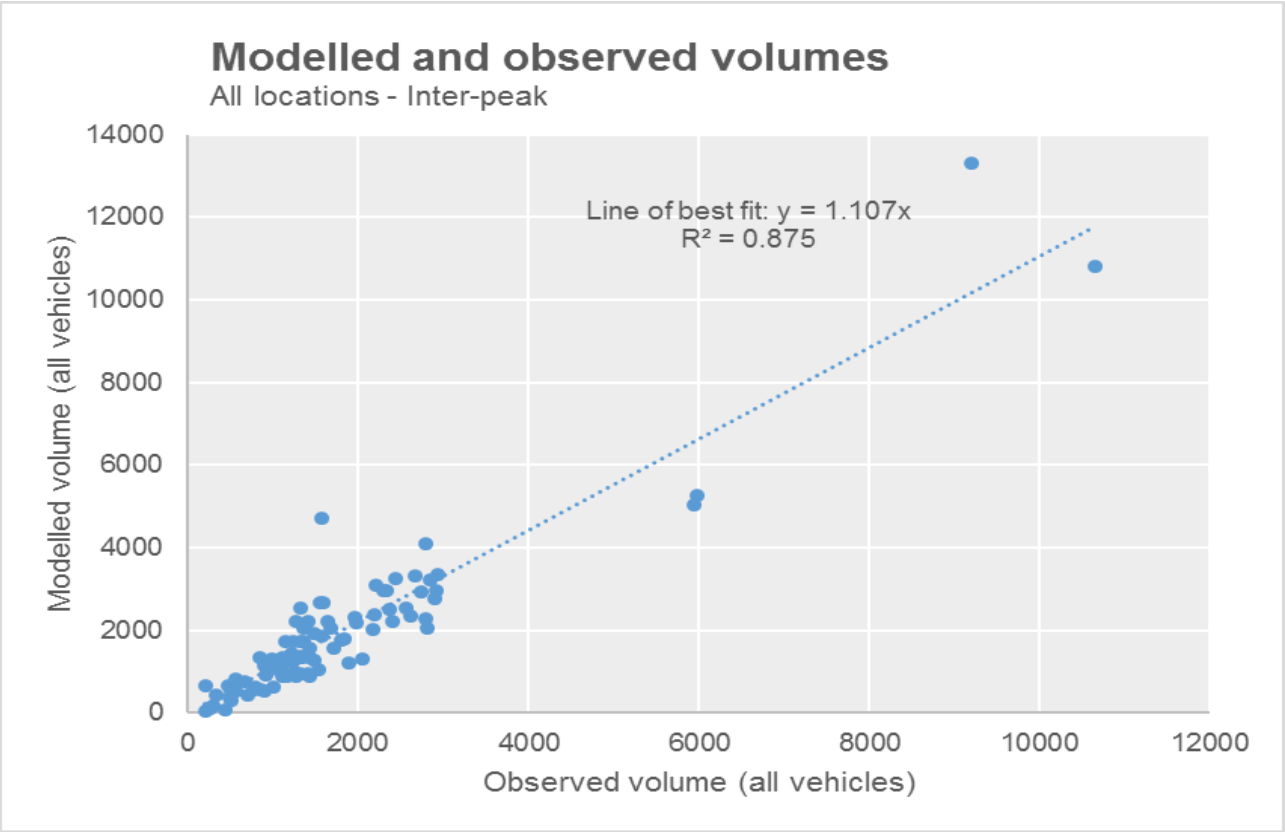


Figure A.5 Comparison of two-hour modelled and observed link volumes (Inter peak)

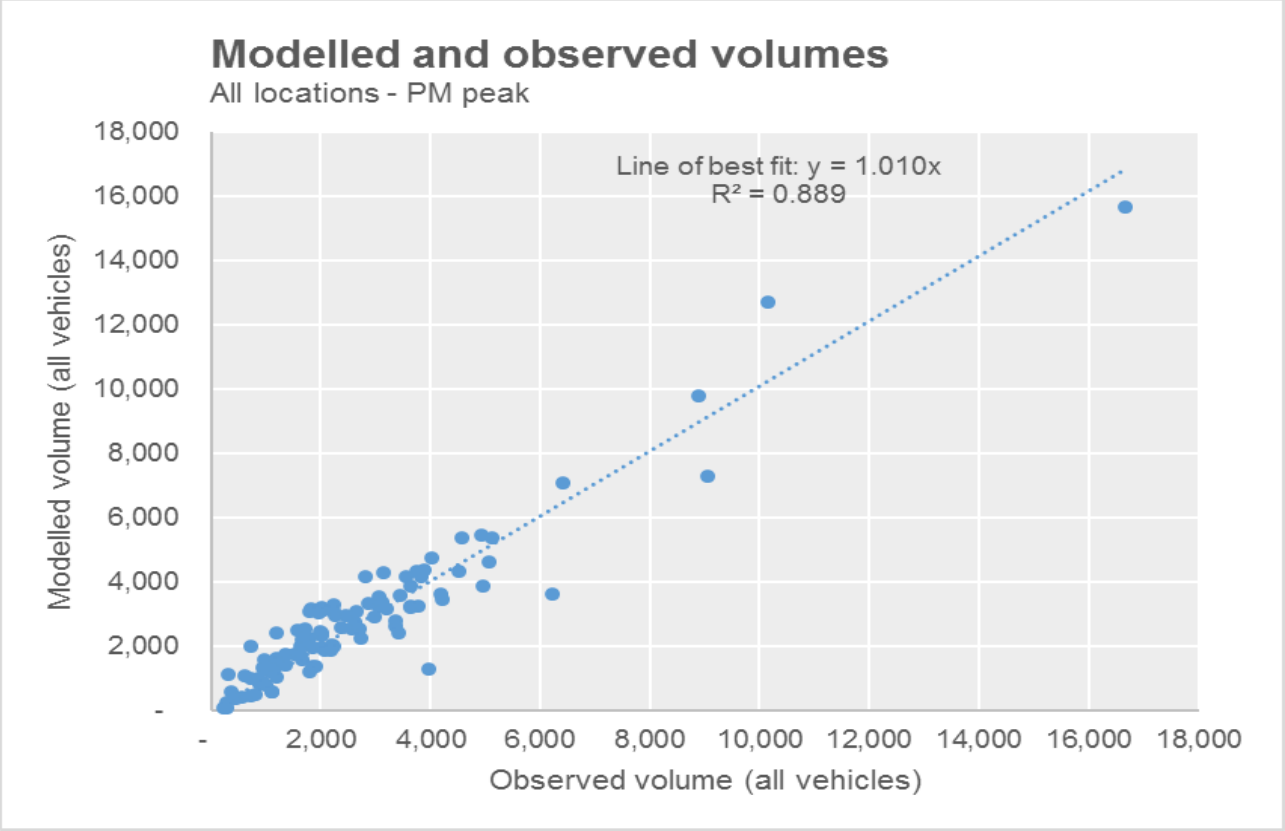


Figure A.6 Comparison of two-hour modelled and observed link volumes (PM peak)

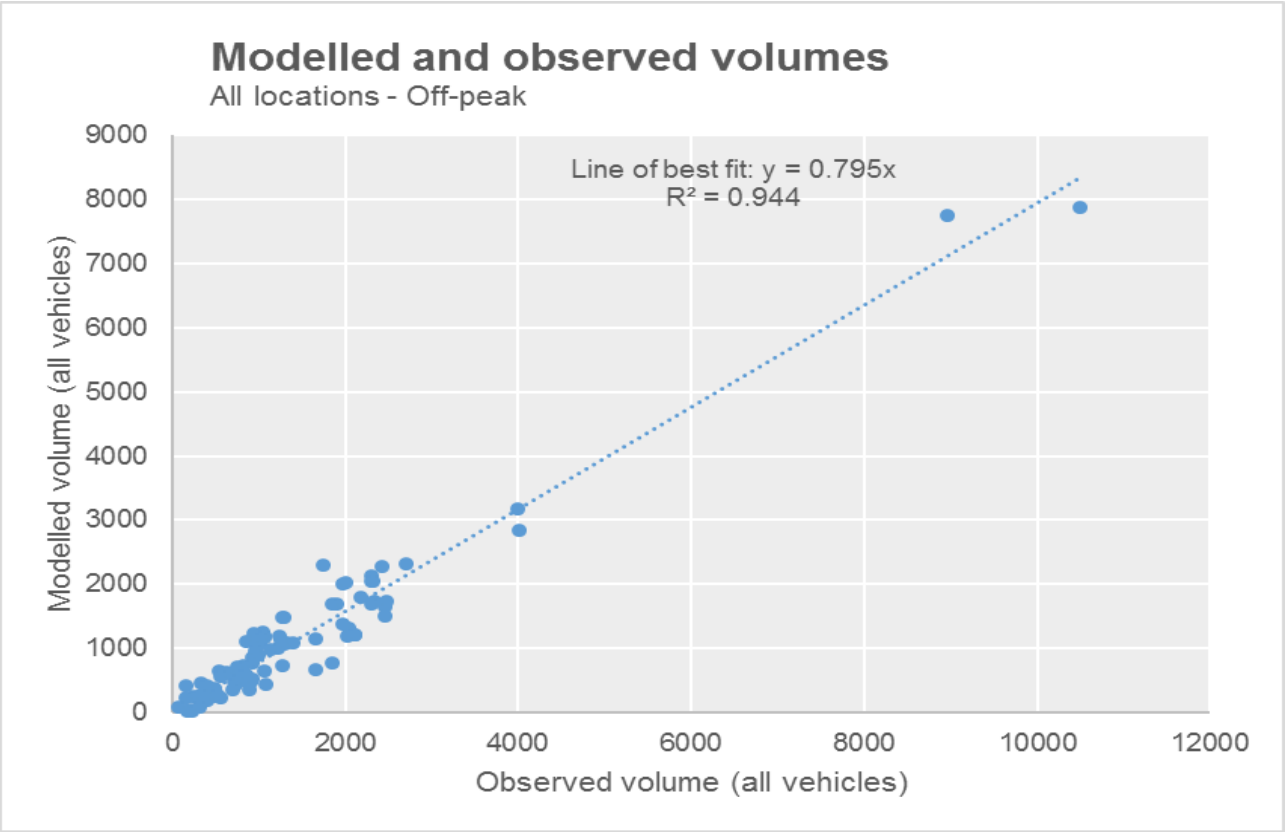


Figure A.7 Comparison of two-hour modelled and observed link volumes (Off peak)

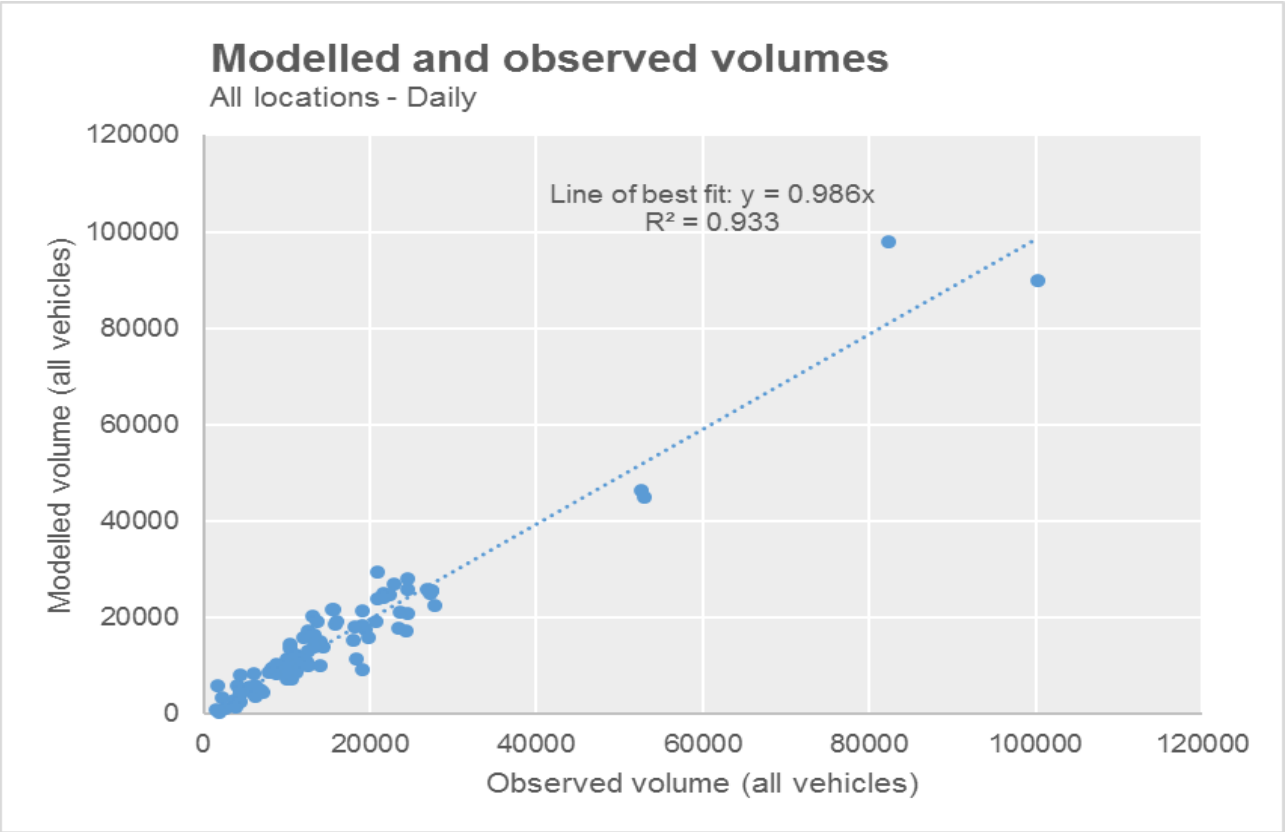


Figure A.8 Comparison of 24-hour modelled and observed link volumes (Weekday)

A2.1.3 SCREENLINES

Five screenlines were constructed for the Mordialloc Bypass study area (see Figure A.9). Each screenline intercepts traffic on the major roads crossing the line, providing a means of assessing bulk traffic flows between different parts of the road network.

The screenlines have been named *M-North, M-South, M-East, M-West and M-NW*, as shown in Figure A.9. These names are used in the following plots to uniquely identify each screenline.

The percentage differences between modelled and observed screenline flows for all time periods and across an entire weekday were plotted and compared to the thresholds recommended by the VicRoads strategic modelling guidelines. In general, a good fit at nearly all screenline locations was observed for most time periods. Refer to Figure A.10 to Figure A.14 for the percentage differences in modelled and observed screenline volumes in the AM peak, inter-peak, PM peak, off-peak and weekday periods respectively.

Figure A.9 Screenline locations

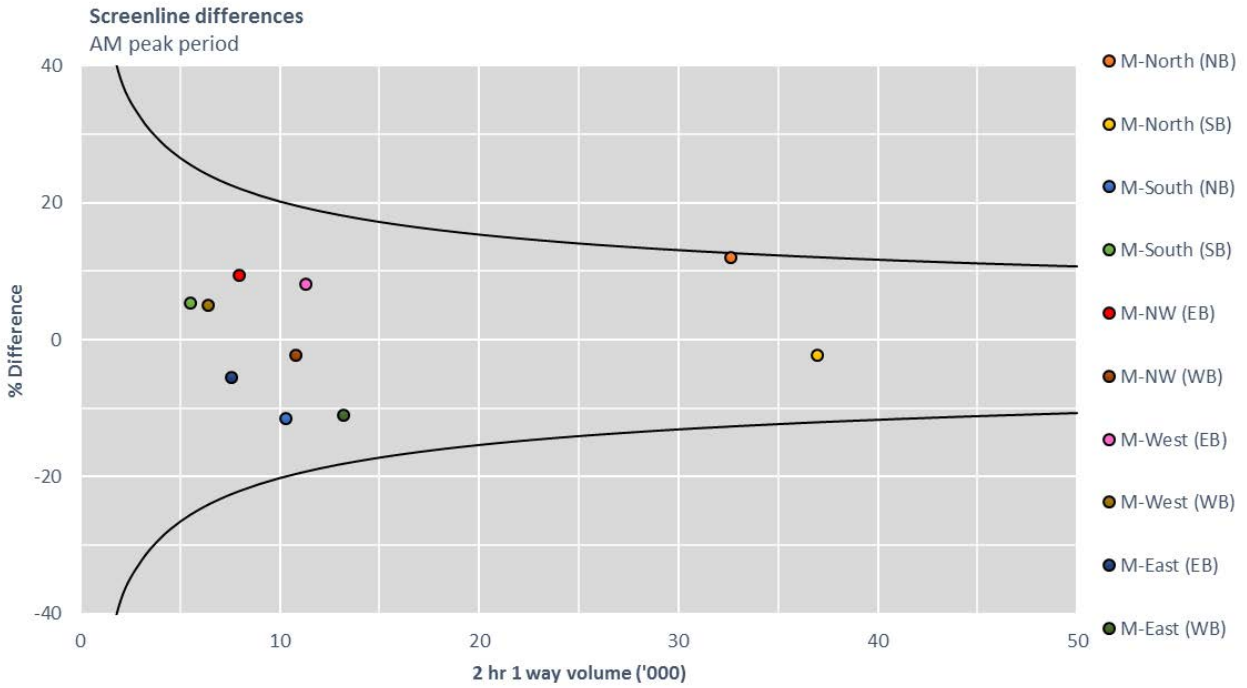


Figure A.10 Differences in modelled and observed one-way two-hour screenline volumes (AM peak)

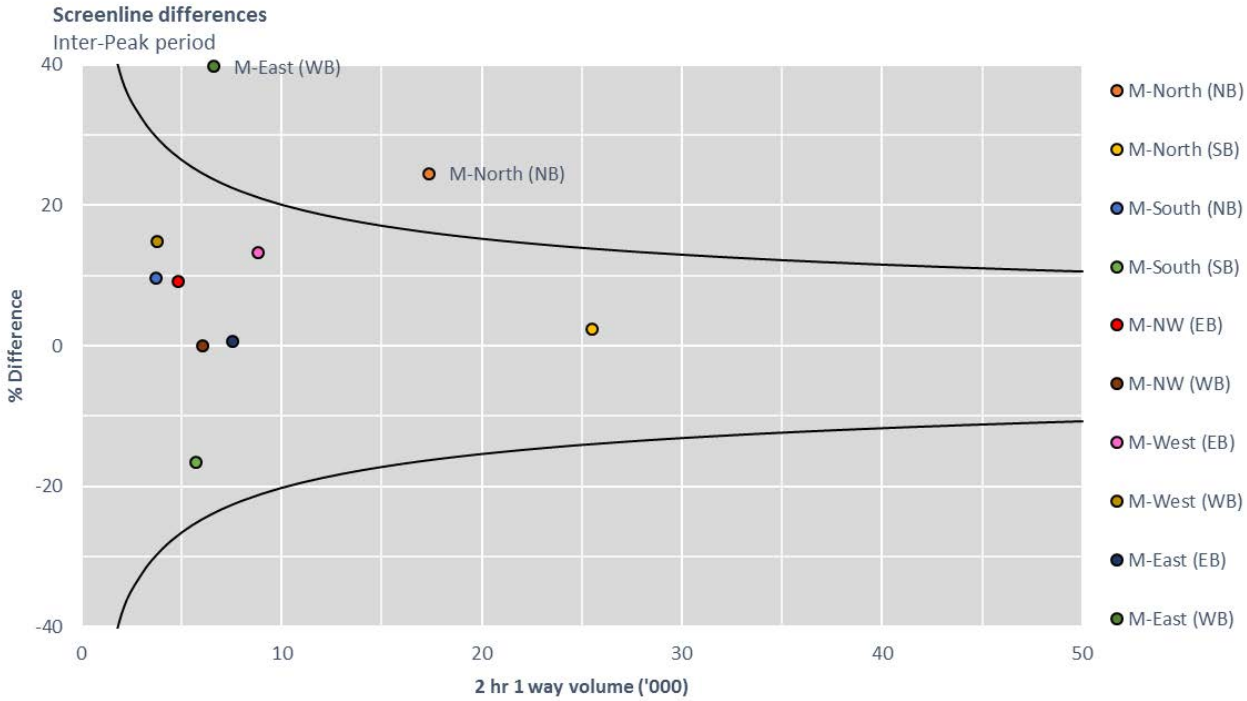


Figure A.11 Differences in modelled and observed one-way two-hour screenline volumes (Inter peak)

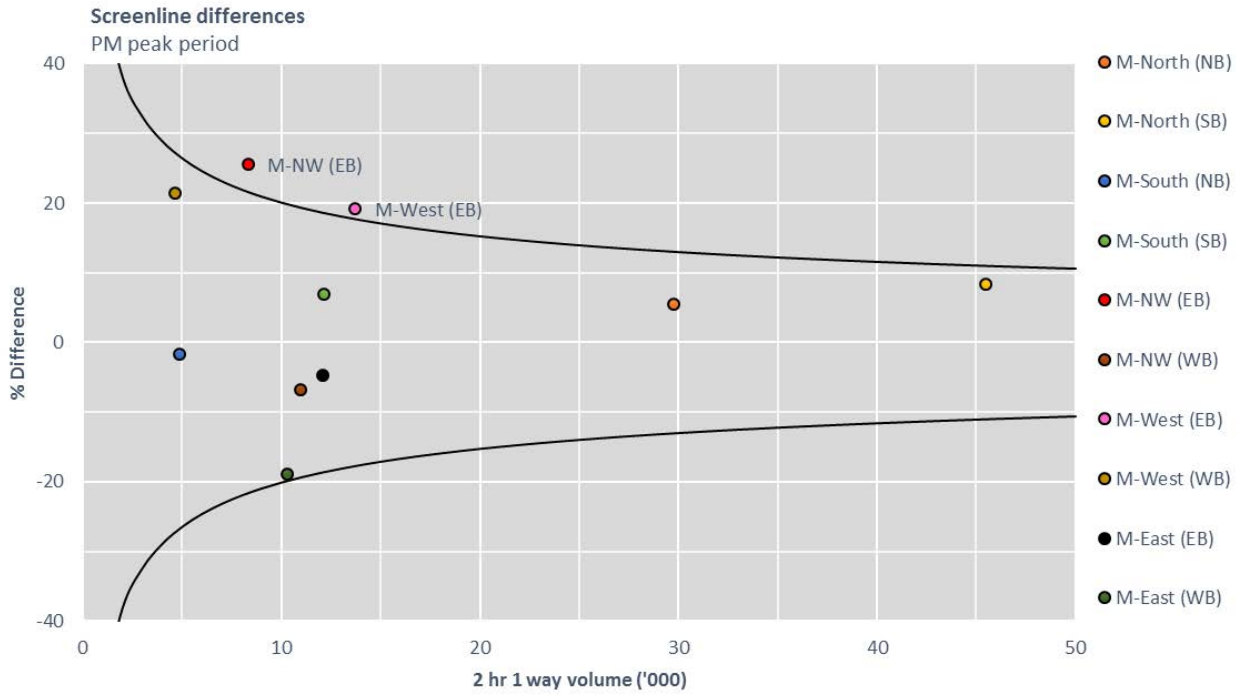


Figure A.12 Differences in modelled and observed one-way two-hour screenline volumes (PM peak)

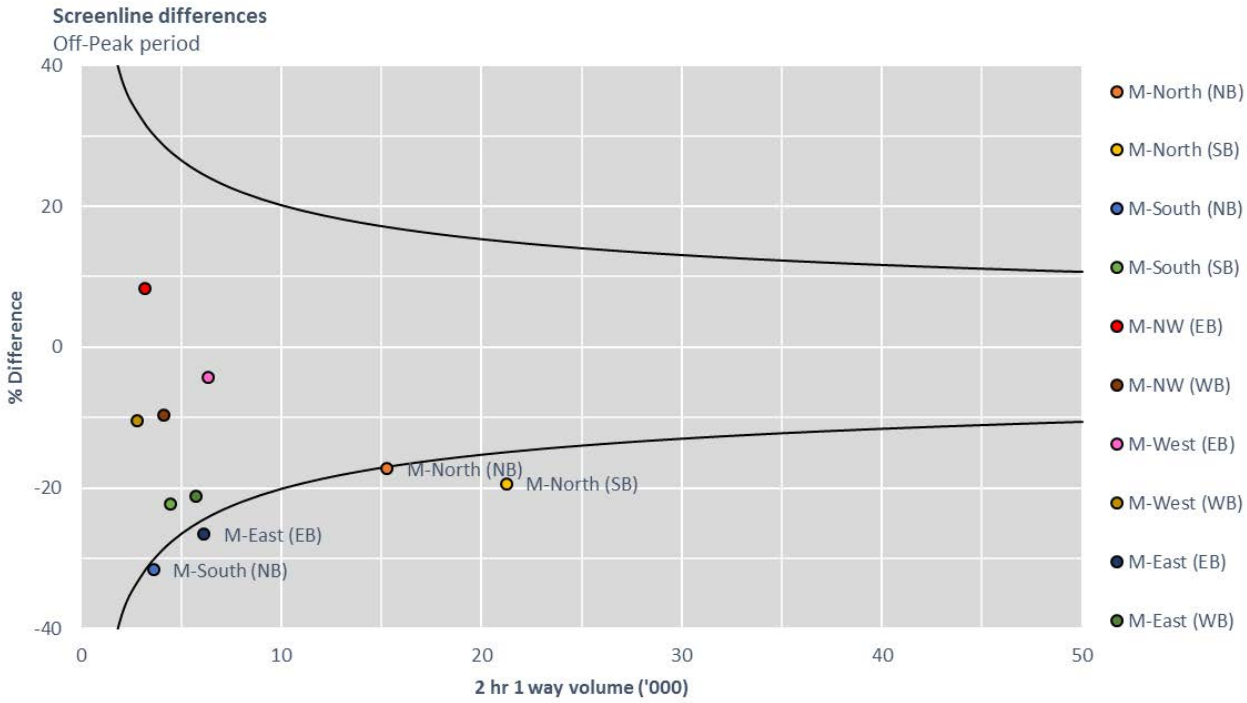


Figure A.13 Differences in modelled and observed one-way two-hour screenline volumes (Off peak)

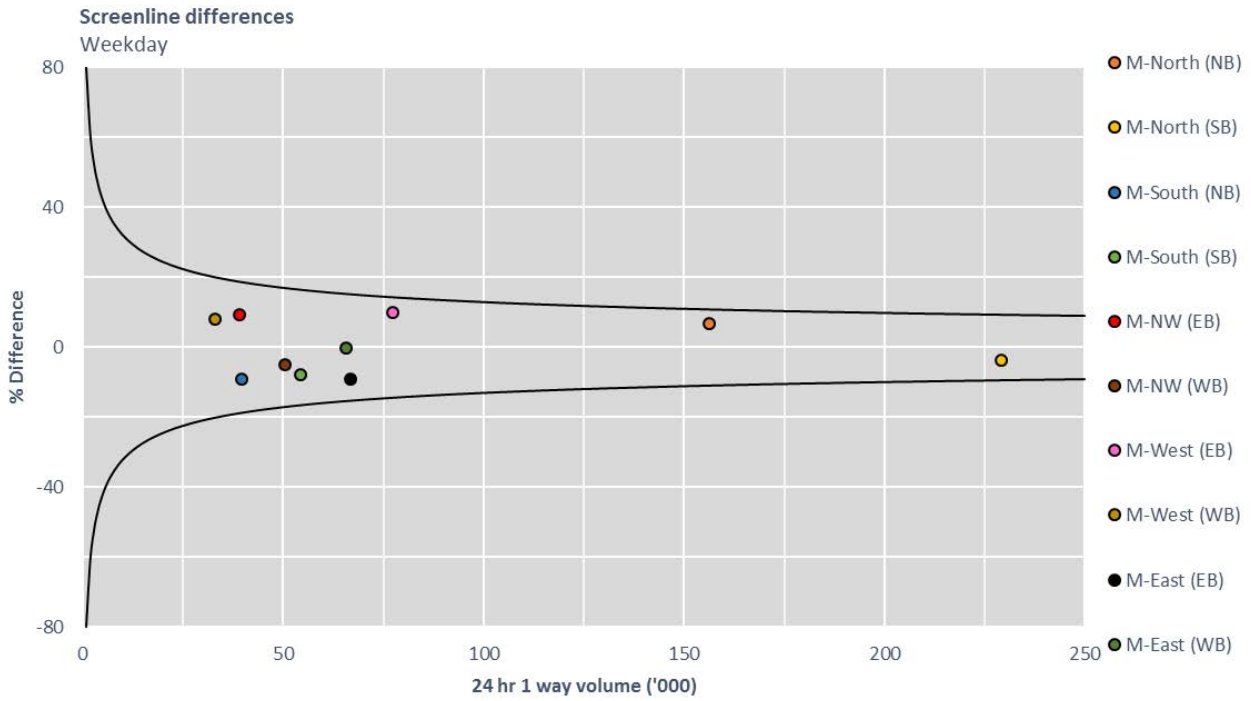


Figure A.14 Differences in modelled and observed one-way 24-hour screenline volumes (weekday)

A2.2 TRAVEL TIMES

A comparison of surveyed and modelled travel times along four travel time routes (shown in Figure A.15) was undertaken. Table A.4 shows the surveyed travel times for each route and direction. As the surveyed travel time data consisted of runs over two days within the designated AM and PM peak periods, the data was observed to show large variations between runs during the peaks. The surveyed minimum and maximum have been included in the travel time validation below to give a better indication of how well the modelled travel times compare with the surveyed data.

Table A.4 Comparison of total travel time on surveyed routes in AM and PM Peak (minutes)

ROUTE	PERIOD	DIRECTION	SURVEYED MIN.	SURVEYED MEAN	SURVEYED MAX.	MODEL TIME	DIFF-ERENCE	DIFF-ERENCE (%)
Nepean Highway between South Road and McLeod Road	AM	Southbound	17.0	23.0	33.7	24.1	1.1	5.0%
		Northbound	19.8	28.9	47.9	35.1	6.3	21.7%
	PM	Southbound	19.1	28.9	48.5	31.4	2.5	8.6%
		Northbound	20.3	29.0	42.0	31.3	2.3	7.9%
Boundary Road between Dingley Bypass and McLeod Road	AM	Southbound	11.6	15.2	21.5	15.7	0.5	3.5%
		Northbound	12.2	18.2	28.7	17.9	-0.3	-1.5%
	PM	Southbound	12.6	20.0	31.7	19.7	-0.2	-1.2%
		Northbound	11.5	15.8	22.0	15.0	-0.8	-5.1%

ROUTE	PERIOD	DIRECTION	SURVEYED MIN.	SURVEYED MEAN	SURVEYED MAX.	MODEL TIME	DIFF-ERENCE	DIFF-ERENCE (%)
South Road between Nepean Highway and Frankston Dandenong Road	AM	Eastbound	10.6	11.4	12.5	10.6	-0.8	-6.8%
		Westbound	10.4	11.4	13.6	10.9	-0.5	-4.0%
	PM	Eastbound	10.4	11.5	13.1	10.9	-0.6	-4.9%
		Westbound	10.4	11.8	13.9	10.6	-1.2	-10.1%
Springvale Road between Heatherton Road and Bridges Avenue	AM	Southbound	9.4	15.8	24.6	12.6	-3.2	-20.1%
		Northbound	10.7	16.4	25.2	14.1	-2.3	-14.1%
	PM	Southbound	11.6	20.7	36.7	16.3	-4.4	-21.1%
		Northbound	10.2	15.1	22.3	12.7	-2.4	-16.2%

Figure A.15 Surveyed travel time routes

APPENDIX B

DEMAND FORECAST RESULTS

B1 TRAFFIC VOLUMES

Table B.1 Total two-way daily volumes (all vehicles) on key roads – 2016 to 2051 Base Case

ROAD	LOCATION	2016	2021	2031	2051
Mornington Peninsula Freeway	East of Springvale Road	45,900	46,700	50,700	53,600
Springvale Road	North of Mornington Peninsula Freeway	40,100	41,600	44,100	47,100
Springvale Road	South of Mornington Peninsula Freeway	38,200	38,300	40,100	43,600
Wells Rd	West of Springvale Rd	33,100	33,100	34,900	36,200
Wells Rd	East of Springvale Rd	20,700	20,200	20,300	20,800
Governor Road	West of Mordialloc Bypass	16,200	15,900	17,900	21,200
Governor Road	East of Mordialloc Bypass	16,200	15,900	17,900	21,200
Lower Dandenong Road	West of Mordialloc Bypass	40,800	40,200	41,100	42,300
Lower Dandenong Road	East of Mordialloc Bypass	40,800	40,200	41,100	42,300
Boundary Road	South of Lower Dandenong Road	42,800	43,700	47,900	53,500
Boundary Road	South of Governor Road	42,700	42,700	44,700	45,700
Centre Dandenong Road	West of Mordialloc Bypass	15,000	16,000	17,300	14,500
Centre Dandenong Road	East of Mordialloc Bypass	15,000	16,000	17,300	14,500
Old Dandenong Road	East of Boundary Road	3,400	3,800	4,500	4,200
Tootal Road	South of Dingley Bypass	16,800	18,200	19,500	18,200
Kingston Road	West of Dingley Bypass	18,500	20,600	22,700	29,700
Warrigal Road	North of Dingley Bypass	31,900	32,000	34,000	39,200
South Road	West of Warrigal Road	44,700	47,900	51,900	66,000
South Road	West of E Boundary Road	32,200	35,000	36,600	45,600
Nepean Hwy	North of South Road	69,600	68,600	69,400	74,500
Nepean Hwy	North of Centre Dandenong Road	71,400	68,600	71,800	75,900
Nepean Hwy	North of White St	40,900	41,800	43,300	44,600
Westall Road	West of Springvale Road	44,300	52,300	58,000	79,200
Westall Road	North of Heatherton Road	47,800	49,600	56,400	64,100
White Street	West of Boundary Road	22,400	22,100	22,600	22,900
Thames Promenade	West of Wells Road	11,600	14,200	14,700	16,100

Table B.2 Total two-way two-hour AM Peak volumes (all vehicles) on key roads – 2016 to 2051 Base Case

ROAD	LOCATION	2016	2021	2031	2051
Mornington Peninsula Freeway	East of Springvale Road	7,943	8,121	8,356	8,882
Springvale Road	North of Mornington Peninsula Freeway	7,073	7,227	7,343	7,611
Springvale Road	South of Mornington Peninsula Freeway	6,178	6,087	6,261	7,064
Wells Rd	West of Springvale Rd	4,932	4,923	5,068	5,331
Wells Rd	East of Springvale Rd	3,103	2,982	2,951	2,951
Governor Road	West of Mordialloc Bypass	3,309	3,316	3,659	3,801
Governor Road	East of Mordialloc Bypass	3,309	3,316	3,659	3,801
Lower Dandenong Road	West of Mordialloc Bypass	5,739	5,685	5,725	6,018
Lower Dandenong Road	East of Mordialloc Bypass	5,739	5,685	5,725	6,018
Boundary Road	South of Lower Dandenong Road	6,930	7,100	7,629	8,283
Boundary Road	South of Governor Road	6,427	6,396	6,527	6,705
Centre Dandenong Road	West of Mordialloc Bypass	2,099	2,228	2,343	2,249
Centre Dandenong Road	East of Mordialloc Bypass	2,099	2,228	2,343	2,249
Old Dandenong Road	East of Boundary Road	633	723	867	809
Tootal Road	South of Dingley Bypass	2,259	2,387	2,438	2,528
Kingston Road	West of Dingley Bypass	2,953	3,166	3,334	4,182
Warrigal Road	North of Dingley Bypass	5,111	5,195	5,577	6,686
South Road	West of Warrigal Road	7,509	7,667	8,018	8,632
South Road	West of E Boundary Road	5,277	5,606	5,724	6,027
Nepean Hwy	North of South Road	9,806	9,505	9,442	9,389
Nepean Hwy	North of Centre Dandenong Road	10,419	9,822	10,242	10,978
Nepean Hwy	North of White St	5,986	5,932	6,109	6,354
Westall Road	West of Springvale Road	8,018	8,270	8,623	10,385
Westall Road	North of Heatherton Road	7,334	7,491	8,028	8,282
White Street	West of Boundary Road	2,881	2,894	2,978	3,077
Thames Promenade	West of Wells Road	1,640	1,850	1,905	2,024

Table B.3 Total two-way two-hour PM Peak volumes (all vehicles) on key roads – 2016 to 2051 Base Case

ROAD	LOCATION	2016	2021	2031	2051
Mornington Peninsula Freeway	East of Springvale Road	7,704	7,805	8,189	8,154
Springvale Road	North of Mornington Peninsula Freeway	6,388	6,705	6,861	7,044
Springvale Road	South of Mornington Peninsula Freeway	7,006	6,750	7,036	7,586
Wells Rd	West of Springvale Rd	5,514	5,367	5,609	5,837
Wells Rd	East of Springvale Rd	3,068	3,052	3,061	3,187
Governor Road	West of Mordialloc Bypass	3,567	3,357	3,681	3,794
Governor Road	East of Mordialloc Bypass	3,567	3,357	3,681	3,794
Lower Dandenong Road	West of Mordialloc Bypass	6,298	6,273	6,370	6,583
Lower Dandenong Road	East of Mordialloc Bypass	6,298	6,273	6,370	6,583
Boundary Road	South of Lower Dandenong Road	7,618	7,836	8,486	9,058
Boundary Road	South of Governor Road	7,279	7,125	7,385	7,538
Centre Dandenong Road	West of Mordialloc Bypass	2,208	2,501	2,659	2,731
Centre Dandenong Road	East of Mordialloc Bypass	2,208	2,501	2,659	2,731
Old Dandenong Road	East of Boundary Road	849	840	1,031	983
Tootal Road	South of Dingley Bypass	2,355	2,498	2,586	2,706
Kingston Road	West of Dingley Bypass	3,312	3,664	3,856	4,640
Warrigal Road	North of Dingley Bypass	5,291	5,503	5,921	7,019
South Road	West of Warrigal Road	8,169	8,482	8,671	9,388
South Road	West of E Boundary Road	5,754	6,148	6,341	6,684
Nepean Hwy	North of South Road	10,071	9,832	9,816	9,883
Nepean Hwy	North of Centre Dandenong Road	11,329	10,934	11,362	11,921
Nepean Hwy	North of White St	6,329	6,388	6,583	6,701
Westall Road	West of Springvale Road	6,474	8,817	9,221	10,914
Westall Road	North of Heatherton Road	7,564	7,911	8,518	9,133
White Street	West of Boundary Road	3,094	3,087	3,169	3,279
Thames Promenade	West of Wells Road	1,920	2,111	2,181	2,334

Table B.4 Change in AM Peak two-hour volumes (both directions) on key roads in Project Case from Base Case for 2021, 2031 and 2051

ROAD		2021		2031		2051	
NAME	SECTION	BASE CASE	PROJECT CASE	BASE CASE	PROJECT CASE	BASE CASE	PROJECT CASE
Mornington Peninsula Freeway	East of Springvale Road	8,100	3,400	8,400	3,400	8,900	7,000
Springvale Road	North of Mornington Peninsula Freeway	7,200	-2,700	7,300	-2,300	7,600	-1,300
Springvale Road	South of Mornington Peninsula Freeway	6,100	-2,600	6,300	-2,400	7,100	-1,000
Wells Rd	West of Springvale Rd	4,900	-3,500	5,100	-3,300	5,300	-1,900
Wells Rd	East of Springvale Rd	3,000	-200	3,000	-100	3,000	-500
Governor Road	West of Mordialloc Bypass	3,300	800	3,700	500	3,800	500
Governor Road	East of Mordialloc Bypass	3,300	-600	3,700	-600	3,800	-700
Lower Dandenong Road	West of Mordialloc Bypass	5,700	700	5,700	900	6,000	500
Lower Dandenong Road	East of Mordialloc Bypass	5,700	100	5,700	100	6,000	0
Boundary Road	South of Lower Dandenong Road	7,100	-2,300	7,600	-2,300	8,300	-2,100
Boundary Road	South of Governor Road	6,400	-3,800	6,500	-3,500	6,700	-2,400
Centre Dandenong Road	West of Mordialloc Bypass	2,200	2,700	2,300	3,000	2,200	3,000
Centre Dandenong Road	East of Mordialloc Bypass	2,200	400	2,300	400	2,200	600
Old Dandenong Road	East of Boundary Road	700	0	900	-100	800	200
Tootal Road	South of Dingley Bypass	2,400	200	2,400	200	2,500	100
Kingston Road	West of Dingley Bypass	3,200	100	3,300	200	4,200	0
Warrigal Road	North of Dingley Bypass	5,200	200	5,600	200	6,700	400
South Road	West of Warrigal Road	7,700	300	8,000	300	8,600	200

ROAD		2021		2031		2051	
NAME	SECTION	BASE CASE	PROJECT CASE	BASE CASE	PROJECT CASE	BASE CASE	PROJECT CASE
South Road	West of E Boundary Road	5,600	300	5,700	200	6,000	100
Nepean Hwy	North of South Road	9,500	100	9,400	100	9,400	100
Nepean Hwy	North of Centre Dandenong Road	9,800	-300	10,200	-200	11,000	-100
Nepean Hwy	North of White St	5,900	-800	6,100	-700	6,400	-600
Westall Road	West of Springvale Road	8,300	-2,000	8,600	-1,700	10,400	-1,000
Westall Road	North of Heatherton Road	7,500	-300	8,000	-200	8,300	300
White Street	West of Boundary Road	2,900	-300	3,000	-200	3,100	100
Mordialloc Bypass	Between Springvale Road and Governor Road	0	10,600	0	10,900	0	11,700
Mordialloc Bypass	Between Governor Road and Lower Dandenong Road	0	9,200	0	9,800	0	10,400
Mordialloc Bypass	Between Lower Dandenong Road and Centre Dandenong Road	0	8,600	0	9,300	0	9,900
Thames Promenade	West of Wells Road	1,900	100	1,900	200	2,000	100

Table B.5 Change in PM Peak two-hour volumes (both directions) on key roads in Project Case from Base Case for 2021, 2031 and 2051

ROAD		2021		2031		2051	
NAME	SECTION	BASE CASE	PROJECT CASE	BASE CASE	PROJECT CASE	BASE CASE	PROJECT CASE
Mornington Peninsula Freeway	East of Springvale Road	7,800	4,400	8,200	4,300	8,200	7,700
Springvale Road	North of Mornington Peninsula Freeway	6,700	-1,800	6,900	-1,300	7,000	-400
Springvale Road	South of Mornington Peninsula Freeway	6,800	-2,500	7,000	-2,300	7,600	-1,000
Wells Rd	West of Springvale Rd	5,400	-3,800	5,600	-3,500	5,800	-2,200
Wells Rd	East of Springvale Rd	3,100	-200	3,100	0	3,200	-300
Governor Road	West of Mordialloc Bypass	3,400	1,000	3,700	800	3,800	800
Governor Road	East of Mordialloc Bypass	3,400	-600	3,700	-400	3,800	-600
Lower Dandenong Road	West of Mordialloc Bypass	6,300	500	6,400	400	6,600	200
Lower Dandenong Road	East of Mordialloc Bypass	6,300	0	6,400	-100	6,600	100
Boundary Road	South of Lower Dandenong Road	7,800	-2,500	8,500	-2,600	9,100	-2,200
Boundary Road	South of Governor Road	7,100	-4,100	7,400	-4,000	7,500	-2,800
Centre Dandenong Road	West of Mordialloc Bypass	2,500	3,000	2,700	3,100	2,700	3,000
Centre Dandenong Road	East of Mordialloc Bypass	2,500	400	2,700	300	2,700	500
Old Dandenong Road	East of Boundary Road	800	0	1,000	0	1,000	100
Tootal Road	South of Dingley Bypass	2,500	200	2,600	100	2,700	100
Kingston Road	West of Dingley Bypass	3,700	200	3,900	100	4,600	200
Warrigal Road	North of Dingley Bypass	5,500	100	5,900	100	7,000	600
South Road	West of Warrigal Road	8,500	200	8,700	200	9,400	100

ROAD		2021		2031		2051	
NAME	SECTION	BASE CASE	PROJECT CASE	BASE CASE	PROJECT CASE	BASE CASE	PROJECT CASE
South Road	West of E Boundary Road	6,100	300	6,300	100	6,700	0
Nepean Hwy	North of South Road	9,800	100	9,800	100	9,900	0
Nepean Hwy	North of Centre Dandenong Road	10,900	-300	11,400	-200	11,900	-100
Nepean Hwy	North of White St	6,400	-800	6,600	-700	6,700	-600
Westall Road	West of Springvale Road	8,800	-2,100	9,200	-1,700	10,900	-1,000
Westall Road	North of Heatherton Road	7,900	-100	8,500	-100	9,100	200
White Street	West of Boundary Road	3,100	-200	3,200	-200	3,300	-100
Mordialloc Bypass	Between Springvale Road and Governor Road	0	11,300	0	11,500	0	12,300
Mordialloc Bypass	Between Governor Road and Lower Dandenong Road	0	9,700	0	10,300	0	10,900
Mordialloc Bypass	Between Lower Dandenong Road and Centre Dandenong Road	0	9,300	0	10,200	0	10,900
Thames Promenade	West of Wells Road	2,100	100	2,200	50	2,300	100

Table B.6 Change in Daily 24-hour volumes (both directions) on key roads in Project Case from Base Case for 2021, 2031 and 2051

ROAD		2021		2031		2051	
NAME	SECTION	BASE CASE	PROJECT CASE	BASE CASE	PROJECT CASE	BASE CASE	PROJECT CASE
Mornington Peninsula Freeway	East of Springvale Road	46,700	30,400	50,700	32,100	53,600	43,900
Springvale Road	North of Mornington Peninsula Freeway	41,600	-15,800	44,100	-15,600	47,100	-14,500
Springvale Road	South of Mornington Peninsula Freeway	38,300	-17,600	40,100	-17,600	43,600	-13,800
Wells Rd	West of Springvale Rd	33,100	-26,200	34,900	-26,700	36,200	-23,400
Wells Rd	East of Springvale Rd	20,200	-5,300	20,300	-4,800	20,800	-5,100
Governor Road	West of Mordialloc Bypass	15,900	9,200	17,900	9,700	21,200	10,000
Governor Road	East of Mordialloc Bypass	15,900	-2,100	17,900	-1,700	21,200	-3,700
Lower Dandenong Road	West of Mordialloc Bypass	40,200	4,800	41,100	6,200	42,300	7,400
Lower Dandenong Road	East of Mordialloc Bypass	40,200	-1,300	41,100	-1,300	42,300	-200
Boundary Road	South of Lower Dandenong Road	43,700	-12,100	47,900	-13,100	53,500	-12,300
Boundary Road	South of Governor Road	42,700	-26,800	44,700	-27,600	45,700	-24,800
Centre Dandenong Road	West of Mordialloc Bypass	16,000	15,400	17,300	17,400	14,500	20,000
Centre Dandenong Road	East of Mordialloc Bypass	16,000	1,900	17,300	1,800	14,500	4,800
Old Dandenong Road	East of Boundary Road	3,800	-400	4,500	-400	4,200	700
Tootal Road	South of Dingley Bypass	18,200	500	19,500	300	18,200	1,900
Kingston Road	West of Dingley Bypass	20,600	1,200	22,700	1,000	29,700	200
Warrigal Road	North of Dingley Bypass	32,000	1,600	34,000	1,200	39,200	3,200
South Road	West of Warrigal Road	47,900	6,100	51,900	5,100	66,000	3,100

ROAD		2021		2031		2051	
NAME	SECTION	BASE CASE	PROJECT CASE	BASE CASE	PROJECT CASE	BASE CASE	PROJECT CASE
South Road	West of E Boundary Road	35,000	5,700	36,600	4,800	45,600	2,500
Nepean Hwy	North of South Road	68,600	1,100	69,400	700	74,500	300
Nepean Hwy	North of Centre Dandenong Road	68,600	-5,100	71,800	-4,400	75,900	-4,200
Nepean Hwy	North of White St	41,800	-8,400	43,300	-8,100	44,600	-7,100
Westall Road	West of Springvale Road	52,300	-17,700	58,000	-18,300	79,200	-11,400
Westall Road	North of Heatherton Road	49,600	-1,400	56,400	-900	64,100	200
White Street	West of Boundary Road	22,100	-3,800	22,600	-3,300	22,900	-2,000
Mordialloc Bypass	Between Springvale Road and Governor Road	-	71,200	-	76,700	-	83,100
Mordialloc Bypass	Between Governor Road and Lower Dandenong Road	-	60,000	-	65,300	-	69,400
Mordialloc Bypass	Between Lower Dandenong Road and Centre Dandenong Road	-	56,800	-	63,500	-	68,200
Thames Promenade	West of Wells Road	14,200	950	14,700	1,200	16,100	1,200

B2 TRAVEL TIMES

Table B.7 AM peak travel times in 2021 (Minutes)

ROUTE		DIRECTION	BASE CASE	PROJECT CASE	DIFFERENCE (MINUTES)
1	Springvale Road between Mornington Peninsula Freeway and Dingley Bypass	Northbound	11.7	8.7	-2.9
		Southbound	8.5	8.1	-0.5
2	Boundary Road between Mornington Peninsula Freeway and Dingley Bypass	Northbound	12.9	9.8	-3.1
		Southbound	10.6	10	-0.6
3	Wells Road – White Street between Mornington Peninsula Freeway and Nepean Highway	Northbound	14.5	11.2	-3.3
		Southbound	11.8	10.4	-1.4
4	Wells Road – Lower Dandenong Road between Mornington Peninsula Freeway and Nepean Highway	Northbound	17.7	15	-2.7
		Southbound	15	14.2	-0.8
5	Lower Dandenong Road between Springvale Road and Boundary Road	Eastbound	3.5	3.4	-0.1
		Westbound	4.2	4.5	0.2

Table B.8 AM peak travel times in 2031 (Minutes)

ROUTE		DIRECTION	BASE CASE	PROJECT CASE	DIFFERENCE (MINUTES)
1	Springvale Road between Mornington Peninsula Freeway and Dingley Bypass	Northbound	13.1	9.3	-3.8
		Southbound	8.8	8.1	-0.6
2	Boundary Road between Mornington Peninsula Freeway and Dingley Bypass	Northbound	14.5	9.9	-4.6
		Southbound	10.8	10.0	-0.7
3	Wells Road – White Street between Mornington Peninsula Freeway and Nepean Highway	Northbound	16.4	11.8	-4.6
		Southbound	12	10.6	-1.5
4	Wells Road – Lower Dandenong Road between Mornington Peninsula Freeway and Nepean Highway	Northbound	19.5	15.9	-3.7
		Southbound	15.1	14.3	-0.8
5	Lower Dandenong Road between Springvale Road and Boundary Road	Eastbound	3.6	3.5	-0.2
		Westbound	5	4.8	-0.1

Table B.9 AM peak travel times in 2051 (Minutes)

ROUTE		DIRECTION	BASE CASE	PROJECT CASE	DIFFERENCE (MINUTES)
1	Springvale Road between Mornington Peninsula Freeway and Dingley Bypass	Northbound	18.8	12.4	-6.5
		Southbound	10.4	8.6	-1.8
2	Boundary Road between Mornington Peninsula Freeway and Dingley Bypass	Northbound	19.2	11.0	-8.1
		Southbound	11.8	10.2	-1.6
3	Wells Road – White Street between Mornington Peninsula Freeway and Nepean Highway	Northbound	21.7	16.0	-5.7
		Southbound	12.7	11.1	-1.6
4	Wells Road – Lower Dandenong Road between Mornington Peninsula Freeway and Nepean Highway	Northbound	25.1	19.5	-5.6
		Southbound	15.8	14.7	-1
5	Lower Dandenong Road between Springvale Road and Boundary Road	Eastbound	3.3	3.6	0.4
		Westbound	7.6	5.7	-1.8

Table B.10 PM peak travel times in 2021 (Minutes)

ROUTE		DIRECTION	BASE CASE	PROJECT CASE	DIFFERENCE (MINUTES)
1	Springvale Road between Mornington Peninsula Freeway and Dingley Bypass	Northbound	8.7	8.2	-0.5
		Southbound	13.7	8.7	-5.0
2	Boundary Road between Mornington Peninsula Freeway and Dingley Bypass	Northbound	10.1	9.7	-0.4
		Southbound	14.7	10.2	-4.5
3	Wells Road – White Street between Mornington Peninsula Freeway and Nepean Highway	Northbound	12.3	10.8	-1.5
		Southbound	16.3	11.7	-4.6
4	Wells Road – Lower Dandenong Road between Mornington Peninsula Freeway and Nepean Highway	Northbound	15	14.4	-0.6
		Southbound	19.9	15.9	-4
5	Lower Dandenong Road between Springvale Road and Boundary Road	Eastbound	4.5	4.9	0.4
		Westbound	3.7	3.7	0

Table B.11 PM peak travel times in 2031 (Minutes)

ROUTE		DIRECTION	BASE CASE	PROJECT CASE	DIFFERENCE (MINUTES)
1	Springvale Road between Mornington Peninsula Freeway and Dingley Bypass	Northbound	9.1	8.3	-0.8
		Southbound	16.4	9.3	-7.1
2	Boundary Road between Mornington Peninsula Freeway and Dingley Bypass	Northbound	10.4	9.7	-0.6
		Southbound	17.8	10.3	-7.4
3	Wells Road – White Street between Mornington Peninsula Freeway and Nepean Highway	Northbound	12.8	10.9	-1.9
		Southbound	19.4	12.7	-6.8
4	Wells Road – Lower Dandenong Road between Mornington Peninsula Freeway and Nepean Highway	Northbound	15.4	14.7	-0.7
		Southbound	23.3	17.1	-6.2
5	Lower Dandenong Road between Springvale Road and Boundary Road	Eastbound	5.2	5.4	0.3
		Westbound	3.7	3.8	0.1

Table B.12 PM peak travel times in 2051 (Minutes)

ROUTE		DIRECTION	BASE CASE	PROJECT CASE	DIFFERENCE (MINUTES)
1	Springvale Road between Mornington Peninsula Freeway and Dingley Bypass	Northbound	10.8	8.8	-2.0
		Southbound	21.4	12.9	-8.5
2	Boundary Road between Mornington Peninsula Freeway and Dingley Bypass	Northbound	11.2	9.8	-1.4
		Southbound	21.8	12.1	-9.7
3	Wells Road – White Street between Mornington Peninsula Freeway and Nepean Highway	Northbound	13.7	12.0	-1.7
		Southbound	24.3	17.4	-7.0
4	Wells Road – Lower Dandenong Road between Mornington Peninsula Freeway and Nepean Highway	Northbound	16.5	15.8	-0.7
		Southbound	28.4	21.4	-7
5	Lower Dandenong Road between Springvale Road and Boundary Road	Eastbound	8.6	6.9	-1.7
		Westbound	3.7	4	0.3

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APPENDIX B

PRELIMINARY DESIGN LAYOUTS

Legend

- Design layout
- Shared path
- Provision for future shared use path

Map: 2135645A_GIS_852_A	Author: AS		0 450 900 m 1:45,000 Coordinate system: GDA 1994 MGA Zone 55 Scale ratio correct when printed at A3
Date: 4/09/2018	Approved by: EC		

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MAJOR ROAD PROJECTS AUTHORITY

VICTORIA State Government

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Engineering and Technical Services for Mordialloc Freeway Upgrade

Figure 3 - Freeway option
Project Overview

Map: 2135645A_GIS_852_A	Author: AS		0 50 100 m 1:5,000 Coordinate system: GDA 1994 MGA Zone 55 Scale ratio correct when printed at A3
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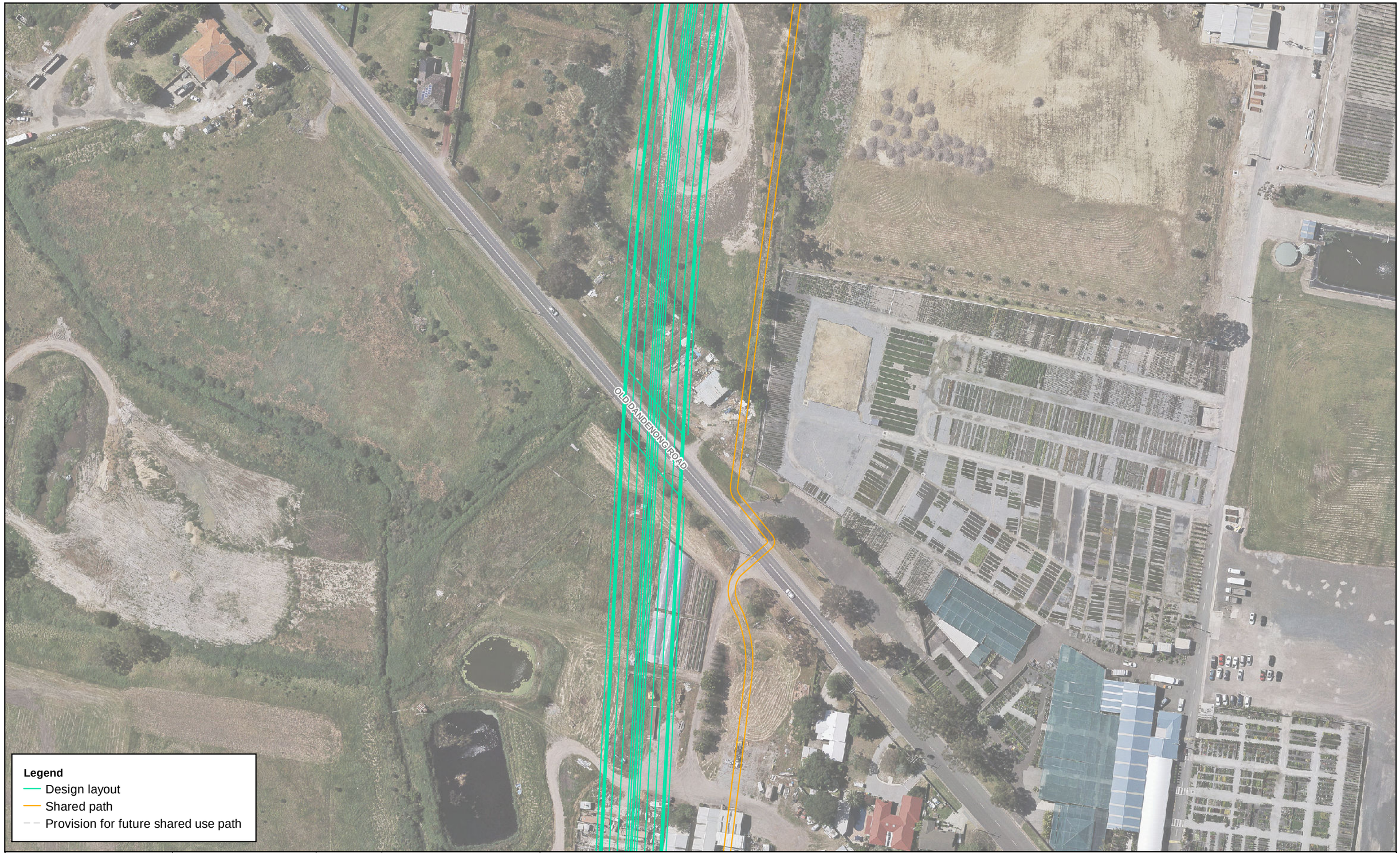
Figure 3 - Freeway option
Mordialloc Bypass / Dingley Bypass



Map: 2135645A_GIS_852_A	Author: AS		0 10 20 m 1:1,500 Coordinate system: GDA 1994 MGA Zone 55 Scale ratio correct when printed at A3
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Engineering and Technical Services for Mordialloc Freeway Upgrade

Figure 3 - Freeway option

Mordialloc Bypass / Old Dandenong Road

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Figure 3 - Freeway option

Mordialloc Bypass / Centre Dandenong Road

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0 50 100 m

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Engineering and Technical Services for Mordialloc Freeway Upgrade

Figure 3 - Freeway option

Mordialloc Bypass / Lower Dandenong Road

Map: 2135645A_GIS_852_A	Author: AS		0 50 100 m 1:5,000 Coordinate system: GDA 1994 MGA Zone 55 Scale ratio correct when printed at A3
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Engineering and Technical Services for Mordialloc Freeway Upgrade

Figure 3 - Freeway option
Mordialloc Bypass / Governor Road

Map: 2135645A_GIS_852_A	Author: AS	
Date: 4/09/2018	Approved by: EC	

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0 25 50 m

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MAJOR ROAD PROJECTS AUTHORITY

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Engineering and Technical Services for Mordialloc Freeway Upgrade

Figure 3 - Freeway option

Mordialloc Bypass / Bowen Parkway

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0 50 100 m

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Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

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Engineering and Technical Services for Mordialloc Freeway Upgrade

Figure 3 - Freeway option

Mordialloc Bypass / Springvale Road

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Date: 4/09/2018	Approved by: EC	

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0 50 100 m

1:5,000

Coordinate system: GDA 1994 MGA Zone 55

Scale ratio correct when printed at A3

MAJOR ROAD PROJECTS AUTHORITY

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Engineering and Technical Services for Mordialloc Freeway Upgrade

Figure 3 - Freeway option

Mordialloc Bypass / Thames Promenade

APPENDIX C

2031 VOLUME-CAPACITY RATIO PLOTS


N
Legend
VITM 2016 Base Case - AM peak
0 to 0.44
0.45 to 0.64
0.64 to < 0.84 (approaching capacity)
0.85 to 0.99 (above capacity)
1 or greater (at theoretical capacity or greater)


N
Legend
VITM 2016 Base Case - PM peak
0 to 0.44
0.45 to 0.64
0.64 to < 0.84 (approaching capacity)
0.85 to 0.99 (above capacity)
1 or greater (at theoretical capacity or greater)


N
Legend
VITM 2031 Base Case - AM Peak
0 to 0.44
0.45 to 0.64
0.64 to < 0.84 (approaching capacity)
0.85 to 0.99 (above capacity)
1 or greater (at theoretical capacity or greater)


N
Legend
VITM 2031 Base Case - PM peak
0 to 0.44
0.45 to 0.64
0.64 to < 0.84 (approaching capacity)
0.85 to 0.99 (above capacity)
1 or greater (at theoretical capacity or greater)


N
Legend
VITM 2031 Arterial Road Option - AM Peak
0 to 0.44
0.45 to 0.64
0.64 to < 0.84 (approaching capacity)
0.85 to 0.99 (above capacity)
1 or greater (at theoretical capacity or greater)


N
Legend
VITM 2031 Arterial Road Option - PM Peak
0 to 0.44
0.45 to 0.64
0.64 to < 0.84 (approaching capacity)
0.85 to 0.99 (above capacity)
1 or greater (at theoretical capacity or greater)


N
Legend
2031 Project VCR - AM Peak
0 to 0.44
0.45 to 0.64
0.64 to < 0.84 (approaching capacity)
0.85 to 0.99 (above capacity)
1 or greater (at theoretical capacity or greater)


N
Legend
2031 Project VCR - PM Peak
0 to 0.44
0.45 to 0.64
0.64 to < 0.84 (approaching capacity)
0.85 to 0.99 (above capacity)
1 or greater (at theoretical capacity or greater)

ABOUT US

WSP is one of the world's leading engineering professional services consulting firms. We are dedicated to our local communities and propelled by international brainpower. We are technical experts and strategic advisors including engineers, technicians, scientists, planners, surveyors, environmental specialists, as well as other design, program and construction management professionals. We design lasting Property & Buildings, Transportation & Infrastructure, Resources (including Mining and Industry), Water, Power and Environmental solutions, as well as provide project delivery and strategic consulting services. With 36,000 talented people in more than 500 offices across 40 countries, we engineer projects that will help societies grow for lifetimes to come.