Melbourne Metro Rail Project

MMR-AJM-PWAA-RP-NN-000815

Transport Impact Assessment

Melbourne Metro Rail Authority

20 April 2016

Revision: C1

Reference: CMS332569

Aurecon Jacobs Mott MacDonald
in association with Grimshaw

AJM
Joint Venture

Document control record

121 Exhibition Street

Melbourne VIC 3000

PO Box 23061 Docklands VIC 8012 Australia

A person using AJM JV documents or data accepts the risk of:

a) Using the documents or data in electronic form without requesting and checking them for accuracy against the original hard copy version.

b) Using the documents or data for any purpose not agreed to in writing by AJM JV.

Document control						
Report title		Transport Impact Assessment				
Document ID		MMR-AJM-PWAA-RP-NN-000815		**Contract No.**	CMS332569	
File path						
Client		Melbourne Metro Rail Authority		**Client contact**	Daniel Cullen	
Rev	**Date**	**Revision details/status**	**Prepared by**	**Author/s**	**Verifier**	**Approver**
C1	20/04/2016	Final issued for Exhibition	Peter Hunkin	Peter Hunkin & Katherine Mitchell	David Anderson	Lisa Ryan
Current revision		**C1**				

Approval			
Author signature		**Approver signature**	
Name	Peter Hunkin	**Name**	Lisa Ryan

Contents

Appendices

List of Figures

Glossary and Abbreviations

Term	Definition
AADT	Annual Average Daily Traffic
AJM-JV	Aurecon Jacobs Mott McDonald Joint Venture
ALBF	After Last Before First (an occupation between the last scheduled train on a given night and the first scheduled train the next morning)
CBD	Central Business District
CPLU	Cranbourne-Pakenham Line Upgrade
DART	Doncaster Area Rapid Transit
DDA	Disability Discrimination Act
DELWP	Department of Environment, Land, Water and Planning
DoS	Degree of saturation
FTZ	Free Tram Zone
HCMTs	High Capacity Metro Trains
km/h	Kilometres per hour
Melbourne Metro	Melbourne Metro Rail Project
MTPF Act	*Major Transport Project Facilitation Act 2009*
City Loop	Melbourne Underground Rail Loop
PBN	Principal Bicycle Network
PTV	Public Transport Victoria
SCATS®	Sydney Coordinated Adaptive Traffic System
SPPF	State Planning Policy Framework
SRO	State Revenue Office
VCCC	Victorian Comprehensive Cancer Centre
VHT	Total Travel Time
VITM	Victorian Integrated Transport Model
VKT	Vehicle Kilometres Travelled

Executive Summary

This report provides an assessment of the transport related aspects associated with the construction and operation of the Melbourne Metro Rail Project (Melbourne Metro). These include risks and impacts associated with transport operations. Other aspects including land use and planning, air quality and noise and vibration aspects are covered in other impact assessments that form part of the Environment Effects Statement, in particular:

- Technical Appendix D *Land Use and Planning*
- Technical Appendix E *Social and Community*
- Technical Appendix H *Air Quality*
- Technical Appendix I *Noise and Vibration*.

Transport Impact Assessment Context

Melbourne Metro Concept Design involves twin rail tunnels constructed under the Melbourne CBD and inner city area between Kensington and South Yarra with underground stations at Arden, Parkville, CBD North, CBD South and Domain. The area around each of the stations and tunnel portals are referred to as precincts. While the majority of the construction activity would be underground, there would be a large amount of activity at surface level to transport spoil materials away from the construction work sites and to transport construction materials and equipment to the sites. These transport activities would affect the transport network operations around each site to varying degrees. In addition the design of Melbourne Metro would result in some changes to various parts of the transport network around each precinct.

Methodology

The methodology for the transport impact assessment included:

- Desktop analysis of available data and site inspections to establish existing base conditions
- Modelling and associated analysis to estimate the transport operating conditions during the construction period and following completion of Melbourne Metro.

Information has been reviewed and updated to reflect current transport arrangements at each of the precincts for all transport modes including:

- Road traffic operations
- Public transport operations
- Pedestrian and bicycle operations.

The assessment has considered the operations of the transport networks in both the construction phase and the legacy state.

The construction phase assessment has considered the impacts of the construction traffic on the roads and other users around each of the work sites based on construction truck access route drawings developed for Melbourne Metro. In addition, the operation of the transport networks has been assessed with the disruptions associated with the construction approach around each work site using models that reflect conditions in year 2021.

Future transport conditions have been assessed against the base case conditions (principally against the future year base conditions that reflect the situation without Melbourne Metro) to determine the transport operational impacts of Melbourne Metro. For the purposes of this assessment, the future state has been assessed at the year 2031, around five years after the planned completion of Melbourne Metro in 2026. This assessment has been undertaken by comparing the future state without Melbourne Metro (known as the

2031 No Project Case) against the future state with Melbourne Metro (known as 2031 Melbourne Metro Legacy Project Case) with both benchmarked against the existing conditions base case.

Each of the modes has been assessed by taking into consideration the predicted growth in population and employment and the associated increase in travel demands in the vicinity of Melbourne Metro. The analysis has been tailored for each mode as the type of information available that is relevant to each mode and location is quite different and the assessment needs to reflect the project needs and the available data.

In summary, the approach comprised:

- The construction activity assessment has been undertaken by reference to the truck access route drawings and associated analysis. The assessment has reviewed the proposed access routes for construction activities and considered the scale of those movements in relation to the current levels of traffic on the key routes. Operational analysis has involved assessment of the operating conditions with the various network changes, such as road closures, that are required to facilitate Melbourne Metro construction. The construction assessment has included consideration of impacts on all modes
- The road transport (road operations and parking) assessment has been undertaken on the basis of project specific traffic modelling of the operation of the road network under each of the current and future year scenarios. The road transport assessment has been based on transport modelling and analysis to assess the operation of current and future conditions in key areas affected by Melbourne Metro. In addition, the changes to the road layouts and parking arrangements at each precinct have been assessed by consideration of the road functional layouts
- The public transport (trams and buses) assessment is based on assumptions agreed with Public Transport Victoria. The assessment has undertaken a comparison of the service frequency and capacity (where this information is available) following the completion of Melbourne Metro against current service levels
- The active transport assessment includes both pedestrian and bicycle aspects. The pedestrian analysis has been undertaken by reference to Melbourne Metro pedestrian modelling. Analysis has been undertaken to compare the 2031 pedestrian flows in each precinct with Melbourne Metro against the 2031 flows without Melbourne Metro. Any changes to the pedestrian facilities and the bicycle networks have been identified from the road functional layouts.

Risk Assessment

A risk assessment identified potential construction and operational hazards, impact pathways, consequences to values (transport operations) and likelihood of impacts. Risk to values was determined as the combination of consequence and likelihood. Where possible, mitigation measures were identified to reduce risks.

To inform the risk assessment, the existing conditions of each transport mode was established from available data and site inspections. The future conditions were then evaluated based on projections of future operations using transport modelling tools and associated analysis to estimate the operations both during construction and in the legacy state (i.e. when Melbourne Metro is completed and fully operational). Analysis was undertaken to evaluate the future year impacts with and without Melbourne Metro Concept Design.

Potential project hazards include construction activities impeding traffic flow and transport network operations and the legacy network changes reducing network connectivity or increasing congestion across the transport network.

The risk assessment concluded that mitigation measures could be implemented to reduce most risks to 'Negligible' or 'Low'. However the closures of roads in some precincts would potentially have a more significant on the transport network operations. The closure of Grattan Street in Parkville and the closure of Domain Road and the reduction of lanes in St Kilda Road during construction are both likely to adversely affect traffic operations. While transport management measures would encourage traffic to divert around the works areas, the limited options available mean that there is a medium risk of increased congestion and delays at both precincts.

Impact Assessment

A range of construction related impacts have been identified:

- Construction activity would generate truck movements at each station location (for spoil removal as well as materials and equipment delivery) that would add to the existing traffic activity, thereby affecting transport operations to some degree. While activity is planned to be mainly outside peak periods (and mainly during daytime in residential areas) there are likely to be occasional impacts on the network operations
- Construction activity would generate additional workers in the area that would add to the existing traffic, thereby affecting transport operations to some degree. Though the worker activity is expected to be mainly outside peak activity periods, there are likely to be occasional impacts on network operations, particularly at shift changeover times
- The closure of Childers Street to enable the construction of the western portal would impact on local traffic patterns particularly activity associated with the 50 Lloyd Street Business Estate as well as bicycle and pedestrian movements through the area
- The use of the Arden station site as a major construction and tunnel spoil removal site, as well as servicing other sites likely to impact local traffic operations for the duration of the works
- The closure of Grattan Street to enable the construction of the Parkville station is expected to impact local traffic patterns, bus and tram operations and bicycle and pedestrian operations for the duration of the closure
- The closure of Franklin Street is required to facilitate the construction of the CBD North station and the Concept Design includes the permanent closure of Franklin Street. The closure would impact local traffic patterns, tram operations and bicycle and pedestrian operations, particularly during the initial construction period.
- The closure of Domain Road and the reduction in St Kilda Road to one lane in each direction to enable the construction of the Domain station is likely to impact on traffic patterns, tram operations and bicycle and pedestrian operations for the duration of the closure
- The construction activity around the eastern portal site in South Yarra is likely to impact tram movements along Toorak Road as well as local traffic, bicycle and pedestrian operations for the duration of the works.

A range of 'legacy' operation (i.e. post construction) impacts have been identified that would need to be managed carefully, but with effective mitigation strategies can be expected to have minimal impact on the operations and safety of the transport network.

A range of Environmental Performance Requirements have been recommended that in all instances minimise impacts to transport operations, and on this basis, most project risks to transport operations are considered to be 'low'. There are several residual risks that carry a medium risk rating due to the potential for increased travel times and delays during the construction phase. In particular, there are medium risk ratings at Parkville station precinct due to the closure of Grattan Street and at Domain station precinct due to the closure of Domain Road and the reduction of capacity of St Kilda Road during construction.

Melbourne Metro would be expected to comply with the draft EES evaluation objective for transport connectivity elements if it achieves the recommended Environmental Performance Requirements.

The Melbourne Metro Concept Design is consistent with the draft EES evaluation objective for transport connectivity objective as it enables the metropolitan rail network to operate as a series of independent rail systems thereby delivering a significant increase in the frequency, reliability and availability of the rail network. In addition:

- Melbourne Metro provides effective connections between transport modes, notably improving rail to tram connectivity and the accessibility of rail patrons to key destinations in the CBD and inner city areas that were previously not as accessible by rail
- Melbourne Metro has been designed to manage the impacts of the construction of the project on the operations of transport modes in the vicinity of the project works given the need for major construction works sites
- Melbourne Metro has been designed to manage the legacy impacts of the project on the operations of transport modes in the vicinity of the project works restoring or improving the networks where required.

1 Introduction

This report provides an assessment of the transport network impacts on the Melbourne Metro Rail Project (Melbourne Metro). Related issues include:

- Technical Appendix D *Land Use and Planning*
- Technical Appendix E *Social and Community*
- Technical Appendix H *Air Quality*
- Technical Appendix I *Noise and Vibration.*

1.1 Project Description

Melbourne Metro comprises two nine-kilometre long rail tunnels from Kensington to South Yarra, travelling underneath Swanston Street in the CBD, as part of a new Sunbury to 'Cranbourne-Pakenham' line as shown in Figure 1-1 to form the new Sunshine-Dandenong Line The infrastructure to be constructed as part of Melbourne Metro broadly comprises:

- Two nine-kilometre rail tunnels from Kensington to South Yarra connecting the Sunbury and 'Cranbourne/ Pakenham' railway lines (with the tunnels to be used by electric trains)
- Rail tunnel portals (entrances) at Kensington and South Yarra
- New underground stations at Arden, Parkville, CBD North, CBD South and Domain with longer platforms to accommodate longer High Capacity Metro Trains (HCMTs). The stations at CBD North and CBD South would feature direct interchange with the existing Melbourne Central and Flinders Street Stations respectively
- Train / tram interchanges at Domain station.

Proposed construction methods would involve bored and mined tunnels, cut and cover construction of station boxes at Arden, Parkville and Domain stations and the tunnel portals, and cavern construction at CBD North and South. The project would require planning, environmental and land tenure related approvals to proceed.

1.2 Project Precincts

For assessment purposes, the Melbourne Metro boundary has been divided into precincts as outlined below. The precincts have been defined based on the location of project components and anticipated construction works, the potential impacts on local areas and the character of surrounding communities.

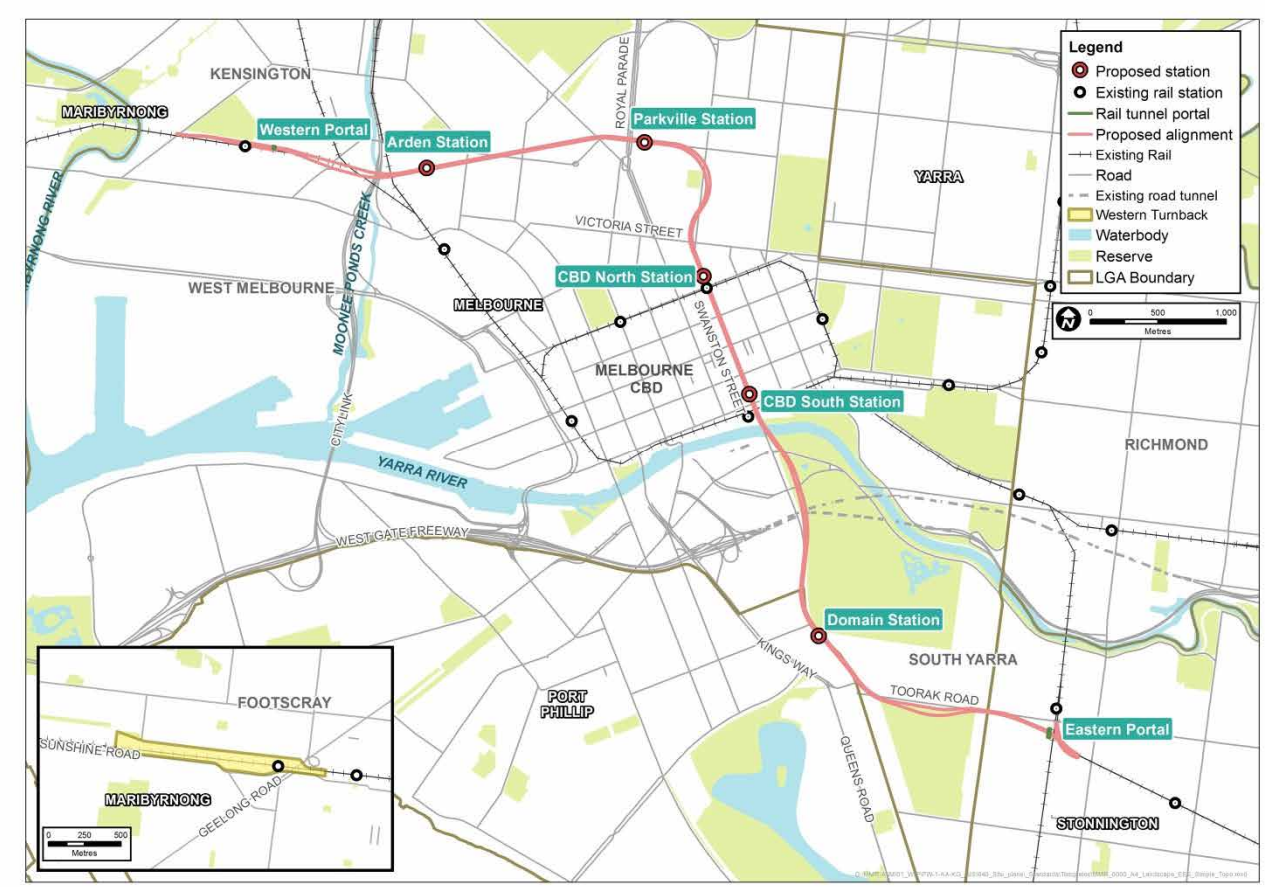

Figure 1-1 Map of the Melbourne Metro alignment and five underground stations

The precincts adopted for this assessment are:

- Precinct 1: Tunnels (outside other precincts)
- Precinct 2: Western portal (Kensington)
- Precinct 3: Arden station (including substations)
- Precinct 4: Parkville station
- Precinct 5: CBD North station
- Precinct 6: CBD South station
- Precinct 7: Domain station
- Precinct 8: Eastern portal (South Yarra)
- Precinct 9: Western turnback.

The precincts are shown in Figure 1-2.

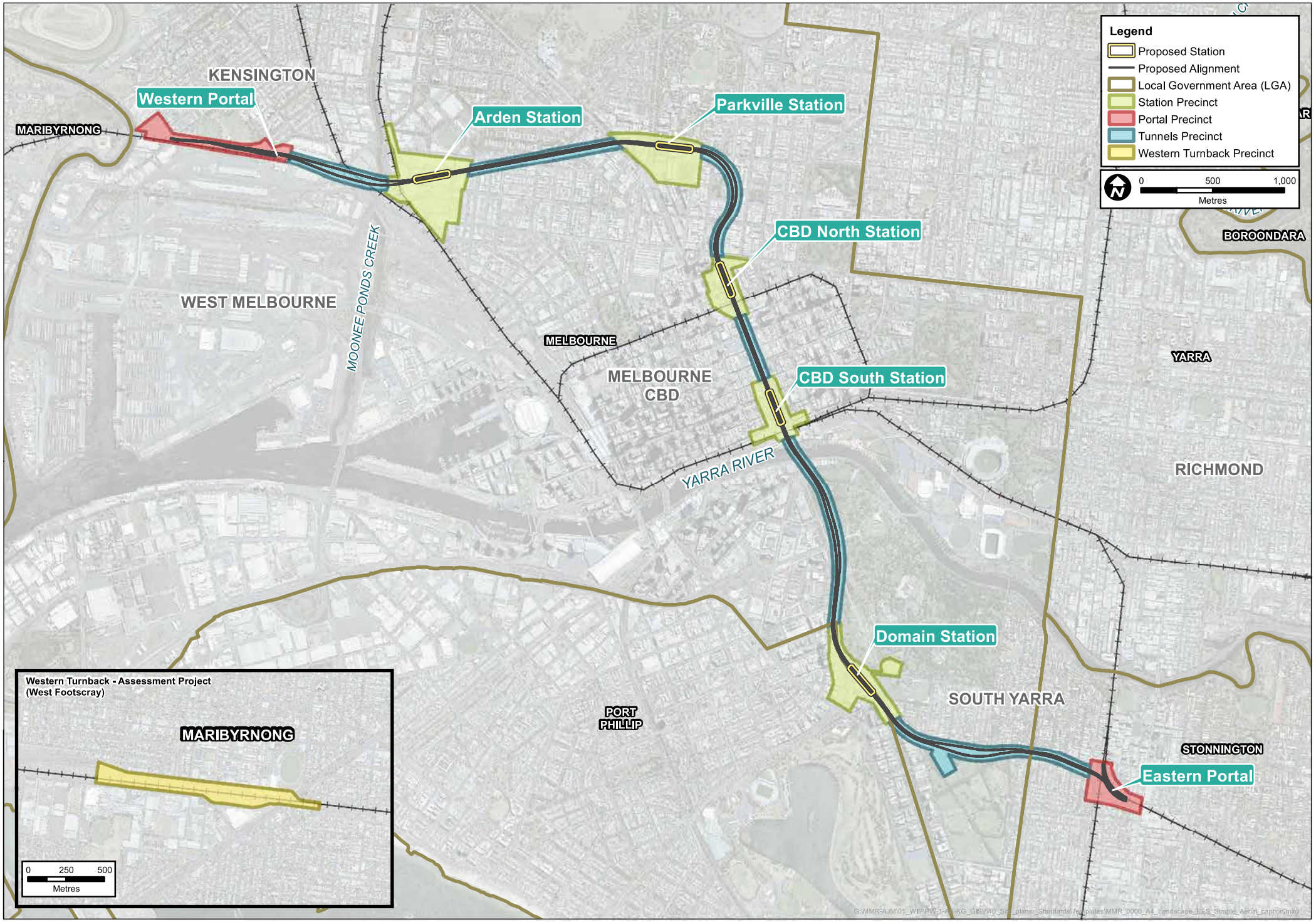

Figure 1-2 Melbourne Metro precincts

1.3 Purpose of this Report

The purpose of this report is to assess the transport impacts of Melbourne Metro in accordance with the EES Scoping Requirements.

To this end, this report assesses potential temporary and permanent impacts on all surface transport modes to allow decision makers to understand the potential risks and impacts of constructing and operating Melbourne Metro, recommends appropriate Environmental Performance Requirements to reduce adverse impacts, and proposes potential mitigation measures that would achieve the Environmental Performance Requirements.

1.4 Study Area

Melbourne Metro alignment has been divided into a number of different precincts corresponding to the stations and portals, as well as a consolidated tunnel precinct consisting of the lengths of tunnels that connect the various station and portal precincts. This transport impact assessment considers the implications of Melbourne Metro on the transport network within these precincts, as well as on a broader "area of influence" in the vicinity of Melbourne Metro.

1.5 Construction Approach

The construction methods and the programme are outlined below, and provide the basis for this assessment. Despite this, Melbourne Metro constructors are expected to have some flexibility to adopt alternative construction methods and practices, provided these still meet the recommended Environmental Performance Requirements.

The construction methods for the stations, tunnels and portals are summarised in Figure 1-3.

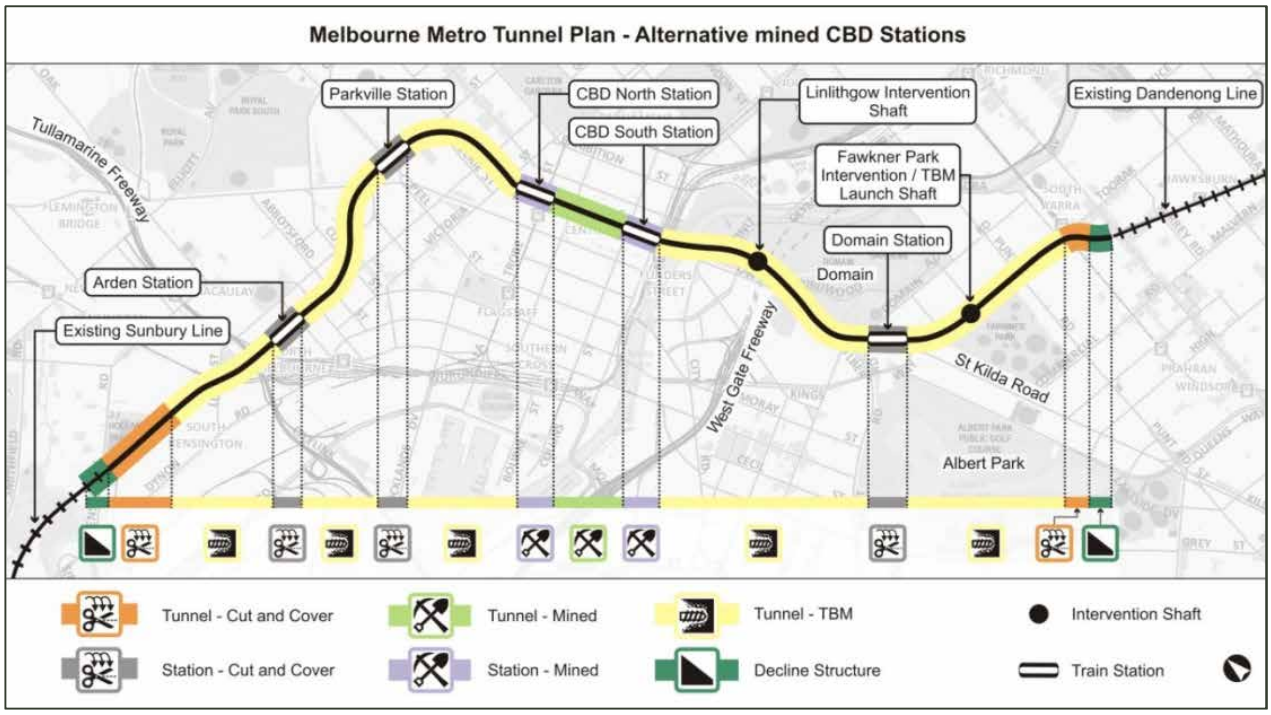

Figure 1-3 Melbourne Metro proposed construction methods

Tunnelling works would be undertaken 24-hours a day, 7-days a week. Some utility and tram line diversions may be carried out as separate 'Early Works' packages and completed prior to the commencement of major construction works.

A comprehensive description of the legacy Melbourne Metro and the construction methodologies is contained in Chapter 6 of the EES.

2 Scoping Requirements

2.1 EES Objectives

The following draft evaluation objectives are relevant to this transport impact assessment and identify the desired outcomes in the context of potential Melbourne Metro effects. The draft evaluation objectives provide a framework to guide an integrated assessment of environmental effects of the project, in accordance with the *Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978.*

Table 2-1 Transport Connectivity objective

Draft evaluation objective	Key Legislation
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	*Transport Integration Act 2010*

2.2 EES Scoping Requirements

The following extracts from the Scoping Requirements, issued by the Minister for Planning, are relevant to the Transport Connectivity objective.

Table 2-2 Transport Connectivity Scoping Requirements

Aspect	Response
Key Issues	• Need to manage permanent changes to the public transport, road, cycling and pedestrian transport system. • Need to manage disruptions and delays for residents, businesses and travellers during the construction of the project.
Priorities for characterising the existing environment	• Describe the elements of the transport system including public transport, road, cycling and pedestrian networks which might be affected by the project, in particular during the construction phase.
Design and mitigation measures	• Describe the design approach to integrating the project with the existing or modified transport network. • Describe the network changes proposed to maintain transport system function during the construction of the project, including the proposed nature and duration of diversions, route changes and changes in car parking availability and management. • Identify potential options and actions which could further mitigate adverse effects or optimise the transport system benefits of the project.
Assessment of likely effects	• Describe and as far as practicable quantify predicted travel time differences (relative to a 'no project' scenario) during and after the construction of the project.
Approach to manage performance	• Describe any monitoring or other program for managing disruption or delays relative to predicted effects and for identifying unexpected effects which may require remedial action.

3 Legislation, Policy and Guidelines

3.1 Overview of key documents

Table 3-1 summarises the relevant primary legislation that applies to the project as well as the implications, required approvals and interdependencies and information requirements associated with obtaining approvals. Further discussion of relevant legislation is contained in Appendix A.

Table 3-1 Primary legislation and associated information

Legislation/ policy	Key policies/ strategies	Implications for this project	Approvals required	Timing / Interdependencies
Commonwealth				
None of relevance				
State				
Environment Effects Act 1978	The *Environment Effects Act* 1978 provides for the assessment of actions that are capable of having a significant environmental effect.	As the Victorian Minister for Planning has declared the Project as 'public works' which are capable of having a significant impact on the environment under section 3 of the *Environment Effects Act 1978*, an EES is being prepared.	This Act triggers a substantial assessment process to be followed as per the applicable Ministerial direction.	The assessment under the *Environment Effects Act* 1978 would inform decision-making under other legislation.
Major Transport Projects Facilitation Act 2009	The purpose of the *Major Transport Projects Facilitation Act 2009* is "to facilitate the development of major transport projects".	Pursuant to the Premier's declaration (gazetted 4 September 2015), Melbourne Metro would utilise the *Major Transport Projects Facilitation Act 2009* suite of Project delivery powers. The Project was declared under s10(1)(b) of the Act, with the Minster for Public Transport declared the Project Minister under s14 of the same Act. A 'project authority' will be appointed under this Act in due course.	NA	Following approval of the proposed planning scheme amendment, the Project area would be declared to enable the project to use the delivery powers of the Act. The delivery powers under the Act broadly comprise: • Powers of the Project Authority • Road powers • Land acquisition Powers • Utility Powers.

Legislation/ policy	Key policies/ strategies	Implications for this project	Approvals required	Timing / Interdependencies
Planning and Environment Act 1987	The Act provides a planning framework which establishes planning schemes based as the principal way of setting out objectives, policies and controls for the use, development and protection of land within each municipality.	Melbourne Metro is subject to a range of planning controls and as such, approval is required under this Act.	It is proposed to amend the relevant planning schemes to include an incorporated document to regulate the construction of Melbourne Metro. Further detail is provided in Chapter 3 of the EES.	The timing of approvals is dependent on the approval mechanism used.
***Road Management Act 2004* (RM Act)**	The Act provides the statutory framework for VicRoads and local government to manage the Victorian road network and the coordination of road reserves for roadways, pathways, infrastructure and similar purposes.	The proponent may be required to submit an application for consent to carry out 'Works within Road Reserves' to VicRoads and the Councils for approval under this Act.	Potentially required to submit an application for consent to carry out 'Works within Road Reserves'	Early discussions should be held with VicRoads, Councils and CityLink regarding impacts to roads they manage.
Transport Integration Act 2010	Transport planning should 'provide for the effective integration of transport and land use and facilitate access to social and economic opportunities' (Section 11.1). The 'transport system and land use should be aligned, complementary and supportive and ensure that – (a) Transport decisions are made having regard to the current and future impact on land use; (b) Land use decisions are made having regard for the current and future development and operation of the transport system' (Section 11.3)	Transport planning decisions relating to Melbourne Metro must have regard to the current and future impact on land use.	NA	The DELWP, Councils and the Proponent are required to take account of this Act when making decisions or designing projects that impact on the transport system and land use.
Disability Discrimination Act 1992 (DDA)	Public transport should be more accessible for people with disabilities and should comply with the provisions of the Commonwealth Government's *Disability Discrimination Act 1992* and the Disability Standards for Accessible Public Transport.	Melbourne Metro should be developed in accordance with the current requirements of the DDA.	NA	The Proponent is required to take account of this Act when making decisions or designing transport projects.

Legislation/ policy	Key policies/ strategies	Implications for this project	Approvals required	Timing / Interdependencies
Local				
None of relevance				
Other documents of relevance				
None of relevance				
***Further information or relevant legislation can be found in Technical Appendix D* Land Use and Planning**				

3.2 State Legislation

3.2.1 Road Management Act 2004

The *Road Management Act 2004* provides the statutory framework for VicRoads and local government to manage the Victorian road network and the coordination of road reserves for roadways, pathways, infrastructure and similar purposes. The Minister for Roads and Road Safety is responsible for administering this Act.

Approval or 'consent' is typically required from the coordinating road authority to undertake works on, in, or under any road. A road includes the reserve from boundary line to boundary line. The project may require consent under clause 2 of schedule 2 for access to a controlled access road[1] and/or consent under clause 16 of schedule 7 for works on a road.

VicRoads manages the construction, maintenance and repair of motorway and arterial road infrastructure and the use and development of associated road reserves. Some of the major arterial roads in the vicinity of Melbourne Metro include:

- Dryburgh Street, North Melbourne
- Curzon Street, North Melbourne
- Flemington Road, North Melbourne / Parkville
- Royal Parade, Parkville
- Elizabeth Street, Carlton
- Victoria Street, Melbourne / Carlton
- St Kilda Road, Melbourne / Southbank / South Melbourne
- Alexandra Avenue, Melbourne
- Kings Way, Melbourne / South Melbourne
- Toorak Road, Melbourne / South Yarra
- Punt Road, Melbourne / South Yarra
- Sunshine Road, West Footscray
- Geelong Road, West Footscray.

Councils are responsible for the remaining roads within the project area, apart from CityLink which is a tollway managed by CityLink Melbourne Ltd.

Early discussions are underway with VicRoads and relevant Councils regarding impacts to roads they manage. The proponent would be required to submit an application for consent to carry out 'Works within Road Reserves' to VicRoads and the Councils for approval under this Act.

[1] VicRoads holds the power to restrict access to a road. This has the effect of improving traffic flow along controlled-access roads because places where traffic can enter and exit the roadway are restricted.

3.2.2 Transport Integration Act 2010

The *Transport Integration Act 2010* came into effect on 1 July 2010 and requires that all decisions affecting the transport system be made within the same integrated decision-making framework and objectives. The vision statement for transport in Victoria is outlined in Section 6 of the Act as aspiring to have '*an integrated and sustainable transport system that contributes to an inclusive, prosperous and environmentally responsible State'*.

The Act recognises that land use planning and transport planning are interdependent. Under the Act, strategic planning decisions must have regard to the impact of planning on the transport objectives of the State through the designation of planning authorities as 'interface bodies'. The assessment of projects must also consider a range of triple bottom line principles taking into account costs and benefits and value for money.

The *Transport Integration Act 2010* requires that the Department of Economic Development, Jobs, Transport and Resources undertake integrated transport planning to guide the development of the transport network in Victoria. The Department is developing a network development strategy, which would align with both a refresh of Plan Melbourne (anticipated to be finalised in mid-2016) and the Regional Statement, to provide integrated guidance on land use and transport planning for Victoria."

3.3 Other Strategic Documents

3.3.1 State and Local Government policy documents

There are a range of relevant State Government and Local Government policy documents that are relevant to Melbourne Metro. Short summaries of the relevant documents are included in Appendix A including:

State / regional planning policy documents

- Network Rail Development Plan
- Plan Melbourne (May 2014) and the Plan Melbourne Refresh that is currently underway
- VicRoads SmartRoads
- Inner Melbourne Action Plan.

City of Melbourne

- Transport Strategy 2012
- Bicycle Plan 2012-2016
- Walking Plan 2014-2017
- Road Safety Plan 2013-2017
- Motorcycle Plan 2015-2018
- Parking Plan 2008-2013.

City of Port Phillip

- Sustainable Transport Strategy (2014)
- Sustainable Transport Precinct Plans
- Bicycle Plan (2011)
- Walking Plan (2014)
- Parking Plan
- Public Transport Advocacy Statement (2009)
- St Kilda Road North Precinct Plan (2013)

Fisherman's Bend Strategic Framework Plan.

City of Stonnington

- Sustainable Transport Policy (2008)

- Cycling Strategy (2013-2018)
- Walking Policy (2011).

City of Maribyrnong

- Maribyrnong Integrated Transport Strategy (2012)
- Maribyrnong Bicycle Strategy (2014).

3.3.2 VicRoads SmartRoads Network Operating Plan

SmartRoads is an approach developed by VicRoads that manages competing interests for limited road space by giving priority use of the road to different transport modes at particular times of the day. All road users would continue to have access to all roads. However, certain routes would be managed to work better for cars while others would be managed for public transport, cyclists and pedestrians.

Decisions about the operation of the road network aim to support land use and transport planning and better consider the effects on the surrounding community, Victoria's key activity centres and the environment.

SmartRoads recognises the increasing importance of public transport, walking and cycling as transport modes. It uses a set of guiding principles to establish the priority use of roads by transport mode, time of day, and place of activity. This approach means that decisions about the road network operations actively support better integrated land use and transport planning.

Under SmartRoads, all road users continue to have access to all roads, but over time, changes are being made to how roads are operated to:

- Facilitate good pedestrian access into and within activity centres in periods of high demand
- Prioritise trams and buses on key public transport routes that link activity centres during peak periods
- Encourage cars to use alternative routes around activity centres to reduce the level of 'through' traffic
- Encourage bicycles through further development of the bicycle network
- Prioritise trucks on important transport routes that link freight hubs and encourage truck travel at times that reduce conflict with other transport modes.

These priority movements are assigned to arterial roads across the network forming the SmartRoads Network Operating Plans.[2]

The SmartRoads approach is relevant to the assessment of the potential impacts of Melbourne Metro across the existing transport network.

3.4 Relevant Planning Scheme Amendments

Technical Appendix D *Land Use and Planning* addresses the proposed planning scheme amendments and associated strategic planning studies and policies. Melbourne Metro affects the four planning schemes described below and as shown in the maps included in the EES Map Book:

- Melbourne Planning Scheme including the tunnels (Precinct 1) between the western portal and Punt Road in South Yarra, Precinct 2 (western portal), Precinct 3 (Arden station), Precinct 4 (Parkville station), Precinct 5 (CBD North station), Precinct 6 (CBD South station) and Precinct 7 (Domain station)
- Port Phillip Planning Scheme for the west side of St Kilda Road (south of Dorcas Street, South Melbourne), including part of Precinct 7 (Domain station) and the nearby tunnel alignment (Precinct 1)
- Stonnington Planning Scheme for the tunnels alignment east of Punt Road, South Yarra and Precinct 8 (eastern portal)
- Maribyrnong Planning Scheme for the western turnback at West Footscray (Precinct 9).

[2] http://www.maps.vic.gov.au/TransMaps/ui/DotmapUI.jsp

4 Methodology

4.1 Introduction

Achieving the transport connectivity objective in accordance with the *Transport Integration Act 2010* would have the following principal transport effects:

- Significantly increase rail capacity, both network wide and at station locations
- Permanent changes to the transport systems providing access to the new Melbourne Metro system
- Impacts during construction, particularly in the vicinity of Melbourne Metro construction work sites.

The methodology is designed to assess the impacts of these changes on the public transport, road, bicycle and pedestrian transport networks.

The local impacts of the changes to transport operations in each precinct are addressed in Section 8 for construction impacts and in section 9 for operational impacts. Modes assessed comprise:

- Road network impacts
- Public transport impacts (i.e. tram and bus)
- Active transport impacts (i.e. bicycle and pedestrians).

The impacts are assessed by:

- Establishing an understanding of the current transport system that may be impacted during construction and Melbourne Metro operations
- Confirming changes to existing conditions that are expected to be introduced prior to the construction and operation of Melbourne Metro
- Describing the design of Melbourne Metro and its impacts on the transport system during construction and operation
- Assessing the likely effects during the construction phase by comparison of the construction transport arrangements and the operation if Melbourne Metro was not being built (based on year 2021)
- Assessing the likely effects during Melbourne Metro operational phase (based on year 2031) by comparison of Melbourne Metro legacy case (i.e. with Melbourne Metro) and the No Project case (i.e. if Melbourne Metro was not built).

4.2 Assessment Approach

The EES scoping requirements outlined in Table 2-2 have been used in developing the methodology and approach to the impact assessment outlined in this transport impact assessment as shown in Table 4-1.

Table 4-1 Transport Impact Assessment approach to address the EES Scoping Requirements

Aspect	Response	Transport Impact Assessment approach
Key Issues	• Need to manage permanent changes to the public transport, road, cycling and pedestrian transport system. • Need to manage disruptions and delays for residents, businesses and travellers during the construction of the project.	The transport impact assessment should identify and assess potential impacts arising from permanent changes (referred to as Melbourne Metro Legacy outcomes) and the construction related disruptions and delays to residents, businesses and travellers. These issues are set out in the relevant sections for construction phase operations by precinct (Section 8) and operational phase operations by precinct (Section 9).

Aspect	Response	Transport Impact Assessment approach
Priorities for characterising the existing environment	• Describe the elements of the transport system including public transport, road, cycling and pedestrian networks which might be affected by the project, in particular during the construction phase.	The transport impact assessment should describe the elements of the current transport systems for each mode by precinct. A summary of key elements of the existing networks has been included as part of the construction impact assessment in Section 8 and more detailed information provided in Appendix B of this report.
Design and mitigation measures	• Describe the design approach to integrating the project with the existing or modified transport network. • Describe the network changes proposed to maintain transport system function during the construction of the project, including the proposed nature and duration of diversions, route changes and changes in car parking availability and management. • Identify potential options and actions which could further mitigate adverse effects or optimise the transport system benefits of the project.	The transport impact assessment should outline the components of the project of relevance to the transport network in each precinct in Section 7. Section 8 discusses the construction phase works and the function of the network including operational analysis at key precincts. It outlines the planned truck routes and other relevant matters associated with the construction works and sets out the expected changes to the transport system during the works (refer to Appendix C of this report). Where relevant the transport impact assessment outlines the mitigation works that have been identified to manage the disruption associated with the construction works and the changes to the transport network following the completion of Melbourne Metro.
Assessment of likely effects	• Describe and as far as practicable quantify predicted travel time differences (relative to a 'no project' scenario) during and after the construction of the project.	The transport impact assessment should include analysis of the operating conditions at key precincts including changes to travel times for both construction phase (section 8) and operational phase (Section 9). Further details are included in the Transport Modelling Summary Report (Appendix D of this report). Appendix E provides details of the road function layouts once Melbourne Metro is operational.
Approach to manage performance	• Describe any monitoring or other program for managing disruption or delays relative to predicted effects and for identifying unexpected effects which may require remedial action.	The transport impact assessment should set out the proposed approach to monitor and mitigate disruptions during the works. Appendix F identifies construction footpath closures and diversions. This is outlined in the relevant sections for construction phase by mode (Section 8) and operational phase by mode (Section 9).

4.3 Existing Conditions Desktop Assessment

In preparing this transport impact assessment , desktop assessments have been undertaken to collate data and establish base conditions at each site:

- Data has been sourced from government agencies where available
- Locations were identified where additional transport data was required
- Site inspections were undertaken to review and update existing conditions data to reflect the current arrangements at each site.

Any data sourced for the desktop assessments has been reviewed and verified on site or has been updated with current information from more recent surveys or analysis. The analysis has focussed on the precincts identified in Section 1 of this report.

Information has been reviewed and updated where necessary to reflect current transport arrangements at each of the precincts including:

- **Public Transport (rail, tram, bus)** – the configuration of the public transport network, volume of public transport users, service frequency, integration between services and modes, stop locations and facilities, disability access in accordance with the *Disability Discrimination Act 1992* (DDA). The latest available public transport data has been provided by Public Transport Victoria (PTV). Other details have been checked on site
- **Pedestrians** – the latest available surface level pedestrian data has been sourced from City of Melbourne for the CBD.3 Additional pedestrian surveys were undertaken for key intersections in the CBD and Parkville. Other details have been checked on site including provision of footpaths, crossing facilities, volume of pedestrians, desire lines, DDA (external to stations)
- **Traffic** – the road network configuration, traffic volumes, intersection controls, and road safety – the latest traffic data has been sourced from VicRoads and municipal councils and additional counts arranged where data was not available. Other details have been checked on site
- **Cycling** – bicycle data has been sourced from relevant Councils, VicRoads, Bicycle Network (where available) including details of the on and off street bicycle network, parking facilities, crossing facilities, gaps in the network, volume of cyclists. Other details have been checked on site
- **Parking and Access** – data has been sourced from relevant authorities detailing the on-street and off-street parking provision, type, taxi stands, loading zones, clearways. Other details have been checked on site
- **Land Use / Transport Integration** – the local attractions that generate transport usage including employment, education, medical and recreation (including special / major events) have been identified including current land use and planned and future development proposals.

4.4 Assessment of Future Conditions

4.4.1 Overview of Assessment Approach

The assessment has considered the operations of the transport networks in both the construction phase and the legacy state.

The construction phase assessment has considered the impacts of the construction traffic on the roads and other users around each of the work sites based on construction truck access route drawings developed for Melbourne Metro. In addition the operation of the transport networks has been assessed, allowing for the disruptions associated with the construction approach around the work sites, using models that reflect conditions in year 2021. The year 2021 has been adopted as it represents a mid-point during the construction period and base transport models (refer to VITM discussion below) are available at 5-year intervals including 2021.

Future transport conditions have been assessed against the base case conditions (both existing and future year base conditions that reflect the situation without Melbourne Metro) to determine the transport operational impacts of Melbourne Metro. For the purposes of this assessment, the future state has been assessed at the year 2031, around five years after the planned completion of Melbourne Metro in 2026. Transport models are available for 2031 and this is considered a suitable representation of operating conditions after Melbourne Metro is fully operational and any mode shift would have occurred such that the travel patterns would have settled to reflect long term travel arrangements.

This Melbourne Metro legacy state assessment has been undertaken by comparing the future state without Melbourne Metro (known as the 2031 No Project Case) against the future state with Melbourne Metro (known as 2031 Melbourne Metro Legacy Project Case). Each mode has been assessed as part of this

[3] http://www.pedestrian.melbourne.vic.gov.au/

analysis taking into consideration the growth in population and employment (based on the VITM transport models) and the associated increase in travel demands in the vicinity of Melbourne Metro.

For ease of reference, the construction phase and legacy state have been presented separately, with each mode 'group' (i.e. road transport, public transport and active transport) considered in each precinct, as follows:

- Construction phase assessment by precinct by mode (i.e. road transport, public transport and active transport) in Section 8
- Melbourne Metro legacy state assessment by precinct by mode (i.e. road transport, public transport and active transport) in Section 9.

The analysis has been tailored for each mode as the type of information available that is relevant to each mode and location is quite different and the assessment needs to be assessed based on the project needs and the available data.

A Transport Modelling Summary Report has been prepared outlining the modelling process and the outcomes of the analysis relevant to this impact assessment. A copy of that report is included in Appendix D of this report. An outline of the transport modelling tools used in the analysis is provided below.

4.4.2 Construction Phase Assessment

In summary, the approach to the construction phase assessment comprised:

- The construction activity assessment has included reference to the truck access route drawings, as shown in Appendix C. The assessment has reviewed the proposed access routes for construction activities and considered the scale of those movements in relation to the current levels of traffic on the key routes and discussed workforce and materials delivery issues
- The construction phase operational analysis has involved assessment of the operating conditions with the construction related network changes, such as road closures required to facilitate Melbourne Metro construction. The construction assessment has included consideration of the impacts on all modes.
- The road transport operations assessment has been undertaken on the basis of project specific traffic modelling of the operation of the road network under each of the current and future year scenarios (i.e. 2021) to assess the construction phase operating conditions in Melbourne Metro precincts
- The public transport assessment has undertaken a comparison of the service numbers, frequency and capacity during the construction phase against the current service levels. As limited data has been available to define the proposed public transport arrangements during the construction phase it has partly involved a qualitative assessment of the construction arrangements and sets out recommended Environmental Performance Requirements to guide the management of public transport services during the construction phase
- The active transport assessment includes both pedestrian and bicycle aspects and is largely based on a review of the proposed construction methodology in each precinct. As limited data has been available for this assessment it has primarily involved a qualitative assessment of the construction arrangements and sets out recommended Environmental Performance Requirements to guide the management of these vulnerable users during the construction phase.

4.4.3 Melbourne Metro Legacy State Assessment

In summary, the approach to the operational phase assessment comprised:

- Melbourne Metro legacy state assessment has been undertaken by reference to the proposed road functional layouts and the operational modelling of the road network under the future year scenario with and without the proposed changes associated with Melbourne Metro, as shown in Appendix D and E of this report

- Melbourne Metro legacy state operational analysis has involved assessment of the operating conditions with Melbourne Metro related network changes, compared to the network without those changes. The operations assessment has included consideration of the impacts on all modes
- The road transport operations assessment has been undertaken on the basis of project specific traffic modelling of the operation of the road network under each of the current and future year scenarios (i.e. 2031) to assess Melbourne Metro legacy state operating conditions in Melbourne Metro precincts (refer to Appendix D of this report)
- The public transport (trams and buses) assessment is based on assumptions agreed with Public Transport Victoria. The assessment has undertaken a comparison of the service numbers, frequency and capacity following the completion of Melbourne Metro against the current service levels (where this information is available)
- The active transport assessment includes both pedestrian and bicycle aspects. The pedestrian analysis has been undertaken by reference to Melbourne Metro pedestrian modelling. Analysis has been undertaken to compare the 2031 pedestrian flows in each precinct with Melbourne Metro against the 2031 flows without Melbourne Metro. The Transport Modelling Summary Report in Appendix D of this report also includes comparisons against existing pedestrian flows. Any changes to the pedestrian facilities are also identified from the road functional layouts in Appendix E of this report. Similarly, the assessment of the bicycle networks has involved a review of Melbourne Metro road functional layouts at each precinct.

4.4.4 Modelling Tools used in the Assessment

The transport modelling has used a number of technical modelling tools to analyse the operation of current and future conditions in key areas affected by Melbourne Metro. Different modelling tools have been applied at different precinct locations depending on the precinct complexity and the type of issues to be addressed. These include:

- **Victorian Integrated Transport Model (VITM)** is the State Government's strategic transport model. VITM has been used by Public Transport Victoria for the development of the broad patronage projections and the demands across the network for each forecast year including the base year 2011. VITM is also used to inform the more detailed precinct models to assess future year operations, being 2021 for construction analysis and 2031 for operational analysis (i.e. the analysis of traffic operations including travel times, queues and delays)
- **ClicSim** is a passenger simulation model of the Melbourne rail system originally developed to assess the capacity of the City Loop and Inner Core (CLIC) stations (i.e. the stations on the underground loop). The model simulates the passenger activity on trains moving through the rail network showing boardings, alightings, train loadings and travel times. It has been used for the development of pedestrian flows at each station entrance and to generate pedestrian flows around key inner city precincts
- **Aimsun** is a hybrid model that can model different areas as either a micro-simulation model (i.e. a small area modelling of vehicle movements and operations including queues and delays) or a mesoscopic model (i.e. larger local area model of operations including aspects of strategic models such as route choice that are not available in micro-simulation models) within the same model and has been used to assess the Parkville station precinct in greater detail due to the complexity of issues around that precinct
- **VISSIM** is a micro-simulation traffic model that models individual vehicles through a small/medium network (similar to the station precinct areas) and has been used to assess the Domain station precinct in greater detail due to the complexity of issues around that precinct
- **SIDRA** is a widely known traffic model used to assess the performance of individual intersections or small networks and has been used to model selected intersections in the CBD North and CBD South station precincts

4.4.5 Technical Modelling Standards and Guidelines

A range of standards and guidelines have been used in the development of the modelling tools outlined above including:

- London Underground Limited (2012), Station Planning Standards and Guidelines
- NZTA Transport Model Development Guidelines
- AUSTROADS Guide to Traffic Management Part 3: Traffic Studies and Analysis
- RMS Traffic Modelling Guidelines (2013)
- Transport for London (2010) Traffic Modelling Guidelines, TfL Traffic Manager and Network Performance Best Practice, Version 3.0, September 2010
- Austroads (2006) The Use and Application of Microsimulation Models
- Transport Modelling Guidelines - Volume 2: Strategic Modelling, Version 3, April 2012.

4.4.6 Transport Model Calibration and Validation

Calibration and validation is an important process to ensure base models reflect current network performance and operating conditions.

Calibration describes the process of placing verifiable data into a traffic model to replicate observed street conditions. All input data for calibration should be auditable, such as signal timings and on-street measurements (e.g. lane distance, cruise times, saturation flows). For Melbourne Metro, this information has been collected from a combination of on-street surveys, site observations and data from stakeholders, principally VicRoads and Public Transport Victoria. To synthesise the observed behaviour, it is usual for calibration to require adjustment of model parameters and this is the case for Melbourne Metro models. For this reason, the calibration process has been applied to each period being modelled.

Validation is the process of comparing model outputs against independently measured data not used during the calibration process. The purpose of validation is to verify that a model has been correctly calibrated and is therefore capable of producing valid predictions for proposed scenarios.

All transport modelling undertaken for Melbourne Metro has undergone a calibration and validation process, and has been independently reviewed to ensure that the models are fit for purpose to test future year scenarios.

4.4.7 Verification of Models

All transport and traffic models produced by AJM have been subject to verification independently of the team undertaking the modelling.

4.5 Peer Review

All models produced by AJM have been passed onto key stakeholders for comment and approval. VicRoads has undertaken reviews of the road based transport models, including the VISSIM, Aimsun and Sidra models. The ClicSim modelling has been reviewed by Public Transport Victoria and both VITM and ClicSim have been independently peer reviewed for Public Transport Victoria.

This assessment has been independently peer reviewed by Mr Shaun Smedley of Smedley Technical & Strategic. The peer reviewer reviewed and provided feedback on drafts of this report. The peer reviewer's methodology is set out in his report, but in general terms it included a review of the assumptions, methodology, assessment criteria and scope applied in this report. It also addressed whether there were any additional matters which should be considered as part of the impact assessment in order to address the EES Scoping Requirements that are relevant to transport impacts or management. The peer reviewer was also required to consider whether there are any gaps or matters where they disagreed with this assessment. The final peer review report is attached at Appendix G of this report, which sets out the peer

reviewer's conclusions in relation to a near final draft of this report, and raises three matters for further consideration:

- Precinct 4 - Parkville station – the peer reviewer recommended further analysis of the construction impacts of the Grattan Street closure on both road traffic operations and the route 401/402 bus. Further analysis is underway to identify road improvement options and to determine the optimal arrangements for the buses during the construction works. An Environmental Performance Requirement has been recommended to address this matter
- Precinct 5 - CBD South station – the peer reviewer has noted concerns about the short term closure of Flinders Street to enable the construction of the cut and cover pedestrian tunnel construction between Flinders Street Station and CBD South station. This assessment had concluded that the impacts on Flinders Street would be short term, periodic and partial closures of Flinders Street and as transport management plans would need to be prepared prior to the works this was an acceptable risk. An Environmental Performance Requirement has been recommended to address this matter
- Precinct 6 - Domain station – the peer reviewer has considered the analysis of the construction phase operations at Domain and has indicated support for the recommendations. The peer reviewer has also suggested that sensitivity tests be undertaken to test the impact on operations with assumptions of less traffic diversion. As noted in the assessment, further work is already underway to consider options to enhance the transport network and further reduce the impact of the Domain station works.

4.6 Assumptions

This report assesses the transport impacts of the Concept Design, including associated drawings and attachments.

The construction assessment has been assessed based on the truck access route drawings that form part of the Concept Design, and are included in Appendix C of this report.

The operational analysis for both the construction phase and the post-construction phase is based on the assumptions and processes for the traffic modelling and pedestrian analysis included in the Transport Modelling Summary Report, as outlined in Appendix D of this report.

4.7 Stakeholder Engagement

As part of this assessment, the following specific engagement with stakeholders was undertaken. Further details can be found in Technical Appendix C *Community and Stakeholder Feedback Summary Report*.

Table 4-2 Summary of stakeholder engagement

Activity	When	Matters discussed/ issues raised	Consultation outcomes
Traffic and transport working group meetings and modelling coordination meetings with stakeholders including: • VicRoads • Public Transport Victoria • DEDJTR • City of Melbourne • City of Port Phillip • City of Stonnington • Yarra Trams.	Transport modelling meetings are held weekly and Traffic and transport working group meetings are held every two weeks. Separate meetings have also been held with stakeholders during 2015 and 2016.	Periodic meetings with various stakeholders as part of the development of the surface transport options for each precinct.	Refinements of the road functional layouts to incorporate items of concern to key stakeholders.

Activity	When	Matters discussed/ issues raised	Consultation outcomes
We have not engaged with City of Maribyrnong as all the works at the western turnback are retained within the rail corridor.			
Technical Reference Group (TRG) meetings.	16 September 2015 3 February 2016 15 March 2016	A summary of the baseline data collected was presented in September 2015. An overview of the interim assessment of the transport impact assessment was presented in February 2016.	The key agencies on the TRG gained an improved understanding of the issues and interim outcomes of the transport impact assessment.
Community consultation sessions at South Yarra, Parkville, Kensington, Arden, Domain and the CBD.	Various dates in late 2015.	Various matters related to the proposed arrangements at each station and portal location.	Understanding of key transport related issues in each precinct and improved understanding by members of the public.

In addition to the specific agency and TRG engagement listed in the table above, general engagement and consultation with the community was also conducted as part of this assessment. Written feedback was obtained through feedback forms and the online engagement platform, and face-to-face consultation occurred at the drop-in sessions (refer to Technical Appendix C *Consultation and Stakeholder Engagement* for further information). Transport specialists attended the drop-in sessions at South Yarra, Parkville, Domain and the CBD, so that they could answer questions related to transport related issues.

Across the alignment, concerns and questions were raised about the impact constructions works would have on traffic and accessibility. Examples include concerns about increases in the volume of truck traffic through the CBD and on local roads (for example, on Childers Street in Kensington and Osborne Street in South Yarra) and queries regarding road closures and alternative access for vehicles, pedestrians and bikes (for example, queries about closures of Grattan Street or reducing the road capacity of St Kilda Road).

4.8 Limitations

The limitations associated with this assessment are as follows:

- The road transport operations assessment has been based on the modelling as outlined in the Transport Modelling Summary Report in Appendix D and the assumptions and processes outlined in that report. Modelling has focussed on Parkville station (Aimsun model), CBD North station (SIDRA models), CBD South station (SIDRA models) and Domain station (VISSIM model) precincts. Other precincts have not been modelled in detail as the traffic changes are considered to have minimal operational impacts
- No specific modelling of surface level public transport operations (i.e. bus and tram operations and their interaction with the rail network) has been undertaken, though there is some operational analysis available through the road network operational modelling. Tram and bus travel times are reported in the transport impact assessment. The analysis of tram and bus operations has therefore been based on assumptions agreed with Public Transport Victoria. The assessment has undertaken a comparison of the service levels, frequency and capacity (where this information is available)
- No specific modelling has been undertaken of special events. It is acknowledged that during events such as New Year's Eve, White Night, the Grand Prix, there would be other changes to the transport network and services to help facilitate the movement of people. These are annual events and are subject to separate event transport management plans. These would need to take into account changes to the transport network as a result of Melbourne Metro construction activity

- The post-construction pedestrian impact analysis has been undertaken based on pedestrian modelling. This analysis has focussed on the most critical precincts for pedestrians, namely Parkville station, CBD North station and CBD South station. Qualitative assessments have been undertaken for other precincts
- The bicycle analysis is based on a review of the bicycle facilities depicted on the road functional layouts for each precinct as shown in Appendix E of this report.

5 Regional Context

5.1 Introduction

This section provides a strategic overview of the rationale for Melbourne Metro, and is mostly based on the Business Case published in February 2016. It outlines the key drivers for Melbourne Metro and the strategic benefits that it delivers, by summarising:

- The current challenges of the Melbourne rail network. These challenges are related to patronage growth and the capacity, reliability and punctuality of the train system, and the need for good connectivity with other transport modes, particularly the tram network; and
- The benefits that would be delivered by Melbourne Metro against each of these challenges, largely based on the Public Transport Victoria (2016), '*Melbourne Metro Public Transport Demand Forecasts'*.

This information provides context for Melbourne Metro and explains how Melbourne Metro delivers against the draft evaluation objective in the EES Scoping Requirements, which is described in Section 2. Further information on the existing conditions at each precinct is included as part of the construction impact assessment in the Section 8.

5.2 Key Transport Drivers for Melbourne Metro

Melbourne Metro responds to the growth needs of Melbourne's most heavily congested passenger rail lines, and would provide capacity to better service metropolitan Melbourne's growth areas. Many of the rail lines that service the growth areas are already crowded, and further population growth would accentuate the crowding and diminish the quality of service that passengers experience.

Melbourne Metro would enable the opportunity for independent line operations on the Melbourne metropolitan rail network, often referred to as a 'metro' service. This would enable the services to be expanded with improved frequency, reliability and availability to all areas of Melbourne, particularly the growth areas. Independent rail lines would reduce the interaction of services, thereby reducing delays and enhancing the customer experience.

This improved level of service would typically result in an increase in rail patronage, by attracting more rail travel including as a result of a shift from other modes. The mode shift from car to rail would potentially improve road network operating conditions, thereby delivering benefits to all travellers.

There would also be complementary benefits to tram and bus services from the changes in operation and timetabling that support reduced road congestion across the network as well as other flow-on benefits. Less congestion typically improves the safety and operation of the road network, leading to a reduction in the personal and public cost of accidents.

5.3 Strategic Transport Benefits of Melbourne Metro

The broad strategic direction of the development of Melbourne Metro is being guided by a number of high level Project Objectives. Table 5-1 summarises how Melbourne Metro would meet these objectives.

Table 5-1 Meeting Melbourne Metro Project Objectives

Objective	Melbourne Metro Benefits
1. To meet customer needs by providing additional capacity on Melbourne's rail system that, as part of a program of investment, meets projected medium term demand and supports long-term patronage growth	On the first day of operation, Melbourne Metro would provide new services with the capacity to accommodate over 39,000 passengers in the morning and afternoon peak periods. Melbourne Metro would provide the platform for expanding capacity on the passenger rail network to move 150,000 passengers to and from Melbourne's CBD in the morning and afternoon peak periods. By removing the Sunbury and Cranbourne / Pakenham services from the City Loop and into the new Melbourne Metro tunnel, this would immediately increase service capacity on the lines affected by Melbourne Metro and provides the foundation to support long-term patronage growth.
2. To move towards a metro-style rail system which optimises the efficiency and reliability of operations and improves the customer experience	Melbourne Metro would enable the reconfiguration of the network to operate independent lines with independent rolling stock, stabling and maintenance facilities. This would improve the resilience, punctuality and reliability of the network by quarantining the flow-on impact of delays and cancellations. The independent lines would be supported by improved signalling and rolling stock to maximise service provision, leading to 'turn up and go' timetables and frequencies.
3. To deliver a project that supports the long-term plan and vision for the development and operation of Victoria's rail network	At present, due to constraints in the inner Melbourne rail network, further expansion into growth areas is not feasible. The capacity unlocked by Melbourne Metro would provide the foundation for longer-term expansion of the network, as envisaged in Public Transport Victoria's Network Development Plan – Metropolitan Rail.
4. To improve access and reduce congestion of the tram system within Central Melbourne and the road network in the north, west and south-east by diverting travel to the rail network	Melbourne Metro would relieve tram services on Elizabeth Street and the busy Swanston Street / St Kilda Road Corridor by encouraging tram travellers to shift to the rail network, and thereby relieve tram congestion and overcrowding. This allows Public Transport Victoria to re-organise the tram network to: • Facilitate new connections across and within the expanding CBD • Better serve emerging employment patterns • Improve operational performance, and • Reduce the level of tram-tram congestion on key corridors.
5. To improve accessibility to jobs, education and other social and economic opportunities and enable the growth and more effective use of land within Melbourne	Upon completion, Melbourne Metro would enable more job opportunities to be accessible to workers by enhancing capacity on the rail network and the provision of new stations at Parkville, Arden, Domain and in the CBD. Employers would also be able to access a greater pool of potential employees and in turn employees would be able to access a greater variety of jobs. This would improve 'job matching', a critical element in increasing labour productivity and Victoria's economic performance. By improving the accessibility of employment hubs such as Parkville and Domain, Melbourne Metro would support commercial and residential development in these areas. It would also support development of the Arden-Macaulay precinct as a major urban renewal site and employment destination on the fringe of the CBD.
6. To provide a value for money transport solution that delivers strong productivity, sustainability and liveability benefits	Melbourne Metro would provide a number of interrelated productivity, sustainability and liveability benefits to Melbourne and Victoria. Stronger productivity would be created through increased access to the Central Melbourne region, while improved sustainability would be delivered through increased public transport usage. Liveability would be enhanced by increased accessibility, reduced overcrowding on public transport, greater housing choice through the urban renewal opportunities Melbourne Metro would provide and improvements to the public realm, including the creation of new public spaces.
7. To contribute to a safe rail network that supports the health and wellbeing of users	Melbourne Metro would be designed and constructed in a way that supports the continuing safe operation of the passenger rail network. The design of Melbourne Metro would use Safety in Design (SiD) and Crime Prevention through Environmental Design (CPTED) principles that ensure the safety and wellbeing of the users of trains, trams, stations and interchanges. Melbourne Metro would also allow more people to live within the walking catchment of train stations, increasing opportunities for walking and cycling part of their journeys.

5.4 Existing Rail Network Configuration

The Melbourne metropolitan train network comprises a number of rail lines that are broadly assembled into five 'groups' serving distinct geographical areas:

- Trains operating through North Melbourne (incorporating the Craigieburn, Sunbury and Upfield lines in Melbourne's north and north-west)
- Cross-city group (incorporating the Werribee, Williamstown, Frankston and Sandringham lines in Melbourne's west and south-east)
- Dandenong group (incorporating the Pakenham and Cranbourne lines in Melbourne's south-east)
- Clifton Hill group (incorporating the South Morang and Hurstbridge lines in Melbourne's north and north-east)
- Burnley group (incorporating the Glen Waverley, Alamein, Belgrave and Lilydale lines in Melbourne's east).

Figure 5-1 shows the current arrangement of the metropolitan rail network across Melbourne.

The current network configuration includes a number of line convergences, where multiple lines need to converge onto single tracks to enter the underground City Loop. This means that the five groups cannot operate independent services.

The Dandenong group also faces significant capacity constraints. It is constrained by the nine level crossings between Caulfield and Dandenong and outdated signalling infrastructure and other rail systems along the corridor, which limits the number of trains that can be operated. The Cranbourne / Pakenham Line Upgrade (CPLU) project would address these constraints by removing the level crossings on this corridor and deploying 37 HCMT's. This is expected to boost capacity on the Cranbourne / Pakenham line each day by up to 42 per cent, providing the opportunity to carry an additional 11,000 customers in the AM peak. The CPLU would also boost capacity across the network by freeing up other parts of the existing rail network.[4]

Beyond these improvements, the deployment of extended HCMTs on the Dandenong group would provide sufficient capacity to meet growth in passenger demand to the middle of the century, without the need to build additional passenger rail tracks. However, the existing central area stations cannot currently accommodate extended HCMTs, and would require a major upgrade to do so.

In addition, there are capacity constraints on the Sandringham and Frankston lines. There are a number of reasons for this, in particular platform capacity limitations at Flinders Street Station. These limitations impact on train reliability, and are a significant constraint on increasing the number of train services on these lines.

[4] PTV, CPLU project website - http://ptv.vic.gov.au/projects/rail-projects/Works-to-transform-the-Cranbourne-Pakenham-corridor/

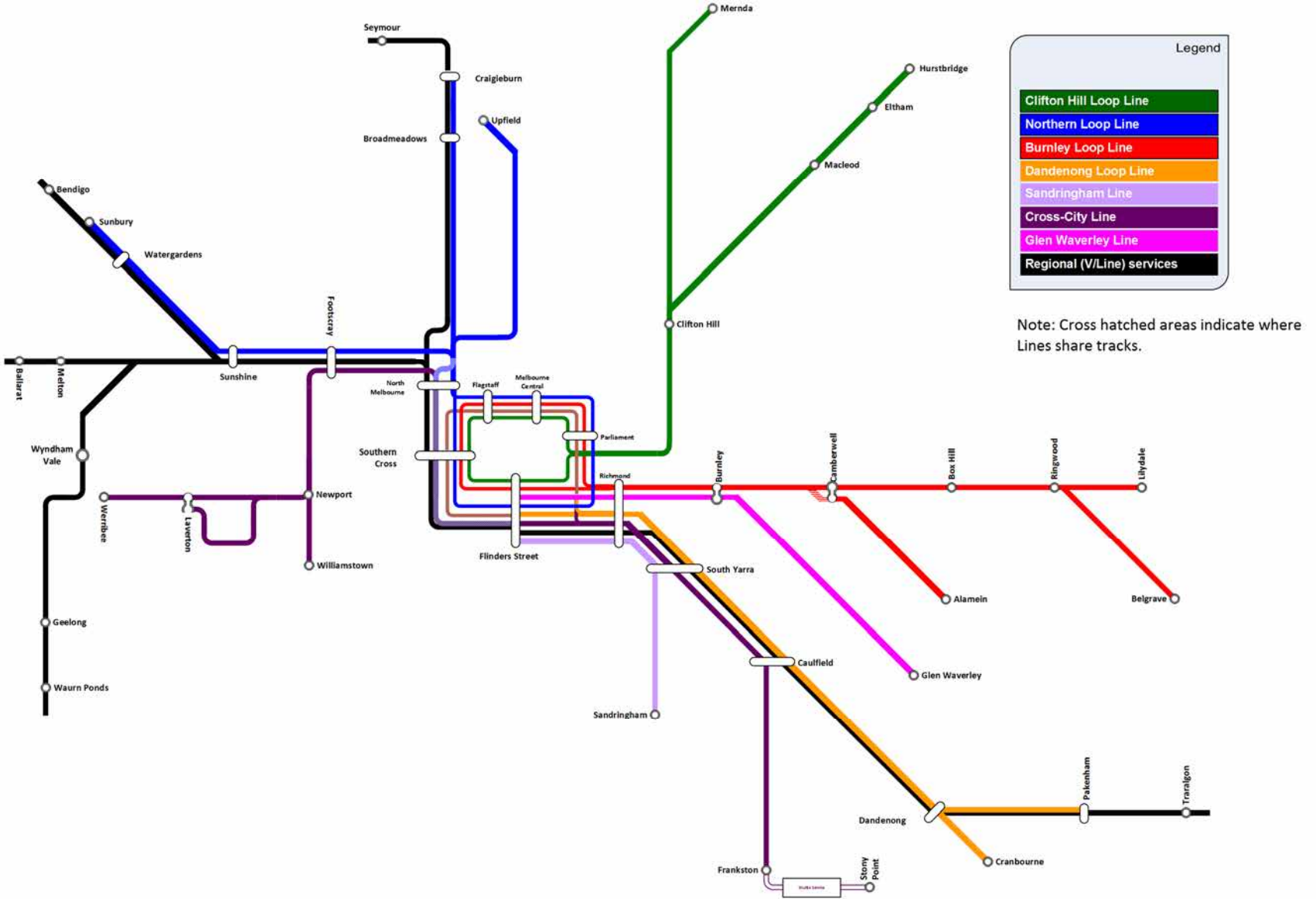

Figure 5-1 Melbourne's current rail network

(Source: Public Transport Victoria)

5.5 Public Transport Challenges

5.5.1 Rail Patronage

As illustrated in Figure 5-2, patronage on Melbourne's trains has experienced unprecedented growth over the past few decades. Rail patronage grew strongly from 89 million trips in FY1980-81 to 227.5 million trips in FY2014-15. The combination of population growth and employment growth in the CBD (which is more difficult to access by car, particularly during peak periods) has driven patronage to historical highs and Melbourne's rail network is reportedly carrying the highest number of passengers in its history.[5]

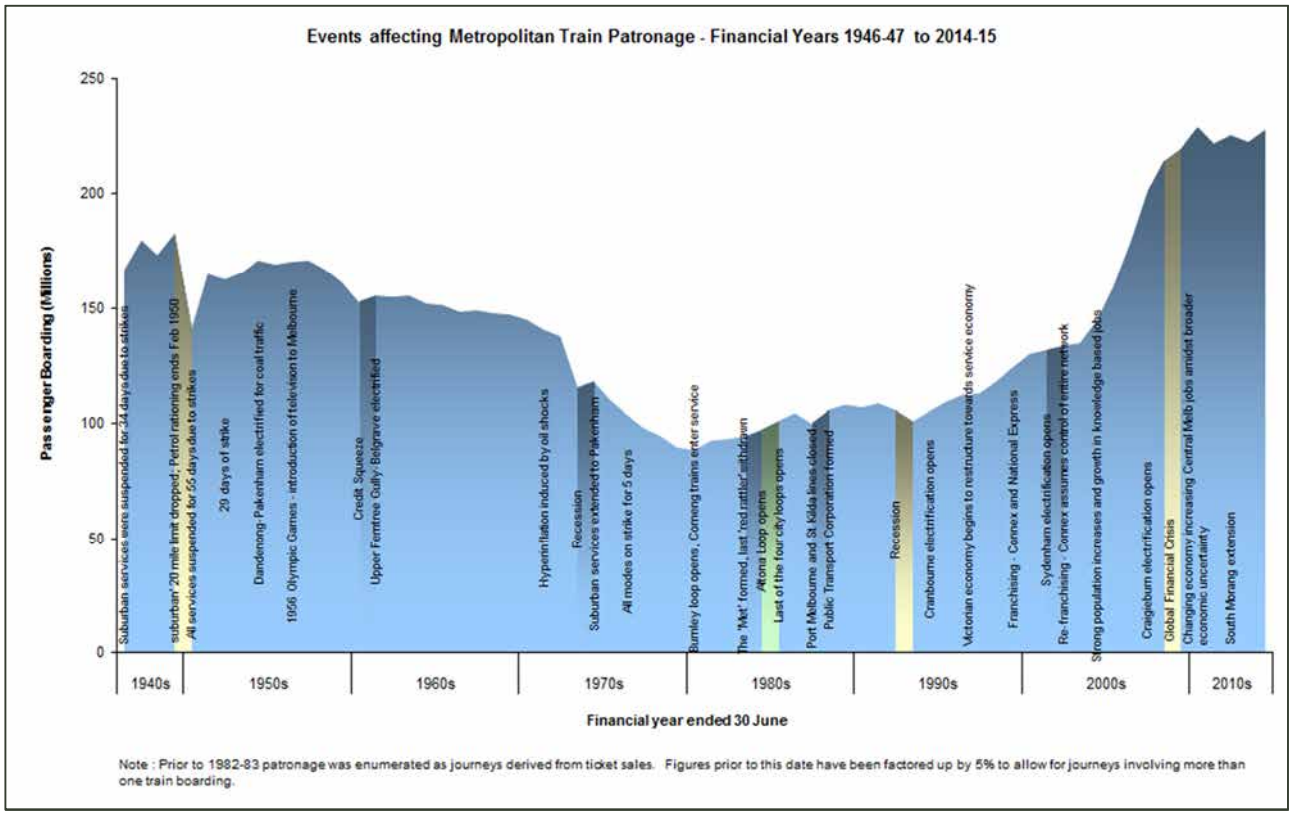

Figure 5-2 Events affecting Metropolitan train patronage 1946-47 to 2014-2015

(Source: Public Transport Victoria)

Even as overall patronage growth has fluctuated in recent years, there has been continuing patronage growth on trains coming into the city during the AM peak period (typically from 7am to 9am), when trains are busiest and capacity constraints are most strongly felt.

In particular, the rail lines servicing Melbourne's growth areas in the outer east, north and west have grown rapidly – more rapidly than those servicing other areas of Melbourne. Figure 5-3 shows that peak period growth from 2004 to 2014 (as measured at the Public Transport Victoria 'Total Load Cordon') on those lines servicing the growth areas ranges between 50 per cent and 120 per cent. Melbourne Metro and associated wider network enhancements would lead to improved operation on seven of the eight fastest growing rail corridors: the Frankston line, Sandringham line, Dandenong corridor (i.e. Cranbourne / Pakenham lines), Craigieburn line, Upfield line, Sunbury line and Newport corridor (i.e. Newport and Werribee lines).

[5] Public Transport Victoria (2016), Melbourne Metro Public Transport Demand Forecasts

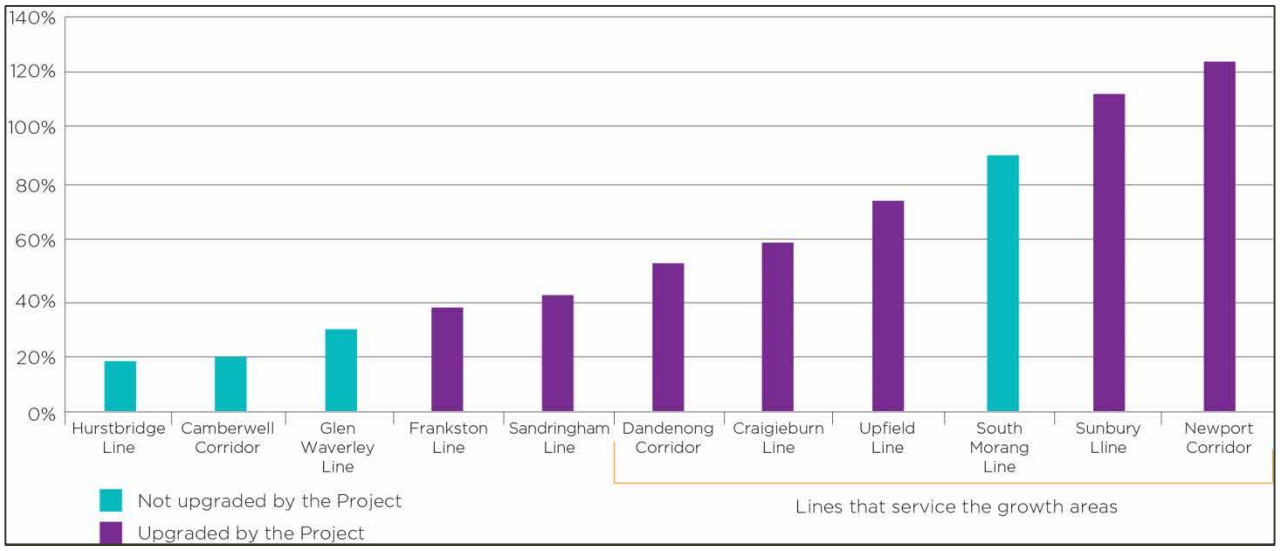

Figure 5-3: 2-hour AM Peak period growth 2004 to 2015 - metropolitan train corridors (Total Cordon Load)

(Source: Public Transport Victoria)

Public Transport Victoria projections that patronage would continue to increase over the next two decades, with average weekday boardings on metropolitan trains predicted to double from 750,000 in 2011 to 1.5 million in 2031.[6] It is apparent that Melbourne's population and resulting public transport demand is rapidly outstripping the capacity of the city's existing rail network, which was designed to serve a much smaller population.

5.5.2 Rail Punctuality is affected by Patronage Growth

As the network becomes more crowded, train service punctuality is affected. The ability of rail services to be provided within five minutes of the scheduled arrival and departure times starts to decline rapidly.[7] While many different factors affect service performance, the busiest lines on the network generally perform poorly in terms of punctuality. Some specific examples of recent punctuality performance include[8]:

- The worst performing lines in peak periods between January and March 2015 were Cranbourne (89.6 per cent of trains meeting punctuality targets), Lilydale (89.2 per cent), Belgrave (86.5 per cent) and Werribee (83.2 per cent) lines
- Only 91.2 per cent of metropolitan peak period trains through North Melbourne arrived within five minutes of schedule during the January to March 2015 period.

Without any further investment in rail network capacity and a predicted increase in patronage, reliability could be expected to decline further in the future.

Incidents that cause disruptions on one line also cause a considerable cascading effect throughout the network. The impact of these incidents is difficult to contain because the lines currently intersect and merge with each other. As a result, service disruptions on one line readily cascade across other lines. Service reliability is of fundamental importance to public transport customers, affecting both their propensity to choose public transport and the quality of their experience when they do.

[6] ibid
[7] ibid
[8] PTV (2015) *Public Transport Performance: January to March*

5.5.3 Rail Network Capacity Constraints Impact Service Quality

The nominal capacity of the rail network is determined by a mix of factors, including the design of the rail network, length of trains and stations, scheduled operating patterns and station dwell times and operational systems used to control the movements of trains. Currently, the network is limited by a number of these factors.

These rail network capacity limitations result in overcrowding on some lines and at major stations, and have a significant effect on the customer experience – both in terms of the quality of the customer journey where passengers board a crowded train, but also increasingly at peak times when customers are unable to board overcrowded trains at all. According to current projections,[9] by 2031 the patronage demand would exceed the capacity on the Craigieburn, Upfield, Melton, Werribee/Williamstown, Cranbourne / Pakenham lines, and increasingly lead to train and station overcrowding, deteriorating punctuality and unreliability.

Increased service frequency on the rail network increases the network capacity and reduces overcrowding as the passenger demand is spread over more trains. Similarly, the implementation of HCMTs provides an increase in the capacity of each service enhancing the customer experience.

5.5.4 CBD Stations are Overcrowded

CBD stations are already experiencing periodic crowding problems in peak periods, and this is expected to further intensify over time. Growing patronage means that central Melbourne stations would have to cater for more passengers boarding, alighting and transferring between rail services.

The consequence of not upgrading stations to match increases in rail patronage presents a number of issues:

- Increased dwell times which may reduce the number of trains that can operate along the entire corridor
- Increased unreliability
- Increased safety risk
- Poorer customer experience attributable to longer access and egress times
- Increased disruptions or incidents.

5.5.5 Existing Tram Network

Melbourne has the world's largest on-road tram network. The tram network is currently operated by Yarra Trams (under a franchise agreement) with 250 kilometres of double track, and 1,763 tram stops across the network. Yarra Trams operates 24 tram routes and the City Circle tourist tram. Around 80 per cent of Melbourne's tram network shares road space with other vehicles. The tram network accounts for approximately 36 per cent of all Melbourne's public transport use.[10] There are approximately 3.5 million passenger trips taken on the tram network every week, including more than 500,000 on weekends. The annual patronage for 2013-14 was 176.9 million boardings.[11]

There are nine classes of trams that operate on the network.[12] New generation low floor trams are being progressively rolled out onto selected routes across the network. These provide increased capacity, dynamic customer information, improved safety features and dedicated spaces for passengers with mobility aids or prams.

The connectivity between the tram network and the rail network is beneficial to both modes and optimises the public transport travel experience for passengers.

[9] Public Transport Victoria (2016), Melbourne Metro Public Transport Demand Forecasts
[10] VicRoads Traffic Monitor, 2012
[11] http://www.yarratrams.com.au/about-us/who-we-are/facts-figures/
[12] http://www.yarratrams.com.au/about-us/who-we-are/our-fleet/

The Night Network trial started on 1 January 2016 and provides all night public transport on weekends. This comprises all night trains and trams, late night buses, and a 2am coach service to key regional centres. Public Transport Victoria is leading the delivery of the one-year trial in partnership with Victoria Police. The trial network has been designed to provide over 70 percent of Melburnians with an all night tram, train or bus within one kilometre of their home, and includes: [13]

- Night Train: Hourly services in and out of the city on almost all metro train lines
- Night Tram: 30 minute service on six key tram routes throughout Melbourne
- Night Bus: 21 routes linking with trains from the city (replacing NightRider services)
- Night Coach: 2am services to Ballarat, Bendigo, Geelong and Traralgon.

5.6 Project Benefits

5.6.1 Reconfiguration of the Rail Network

As the first major upgrade of the Melbourne metropolitan rail network in 30 years, Melbourne Metro would deliver significant benefits to Melbourne and Victoria.

Figure 5-4 shows how the network would be configured after the implementation of Melbourne Metro. This reconfiguration would deliver the following network benefits:

- A new inner-city route, and capacity to accommodate services as part of the newly created Sunshine–Dandenong line
- Remove unnecessary route interactions between train services on different lines by reconfiguring the Melbourne metropolitan network and streamlining train operations
- Release substantial additional capacity on the existing inner city network by moving the Cranbourne / Pakenham and Sunbury lines from the existing city loop, thereby enabling new services on the Werribee/Williamstown, Laverton, Sandringham, Craigieburn, Broadmeadows/Essendon, Upfield/Gowrie, and Frankston lines
- Make it easier for customers to navigate the network by simplifying end-to-end service patterns.

5.6.2 Capacity Benefits

On the first day of operation, Melbourne Metro provides new and higher capacity services to expand the peak capacity of the network by over 39,000 passengers per peak period each morning and afternoon. Approximately 12,000 passengers of this peak period capacity is delivered on the new Sunshine-Dandenong rail corridor (i.e. the corridor created by connecting the Sunbury and Cranbourne / Pakenham lines).The remaining 27,000 passenger uplift would benefit lines that continue to operate on the existing rail network, through the additional capacity released by removing the Sunbury and Cranbourne / Pakenham lines from the City Loop.

Through unlocking capacity in the City Loop, Melbourne Metro would facilitate further capacity uplifts across the network, enabling more trains to travel to and from the CBD. The capacity uplift on the lines affected by Melbourne Metro is illustrated in Figure 5-5.

As discussed in Section 5.4 the Cranbourne / Pakenham Line Upgrade (CPLU) project is expected to boost capacity on the Cranbourne / Pakenham line each day by up to 42 per cent, providing the opportunity to carry an additional 11,000 customers in the AM peak.

[13] http://ptv.vic.gov.au/getting-around/night-network/night-network-overview/

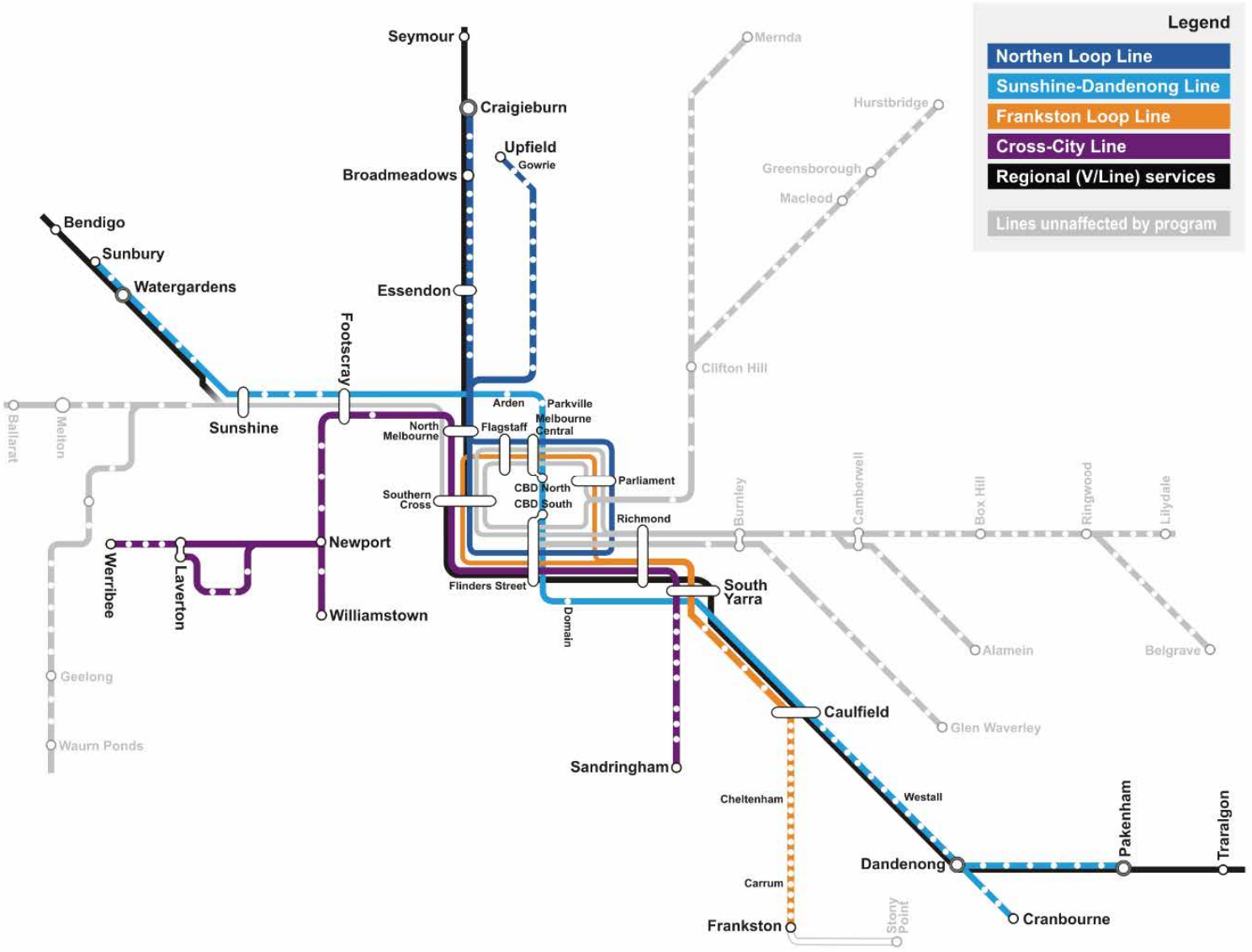

Figure 5-4 Melbourne rail network configuration in 2026 with Melbourne Metro

(Source: Public Transport Victoria)

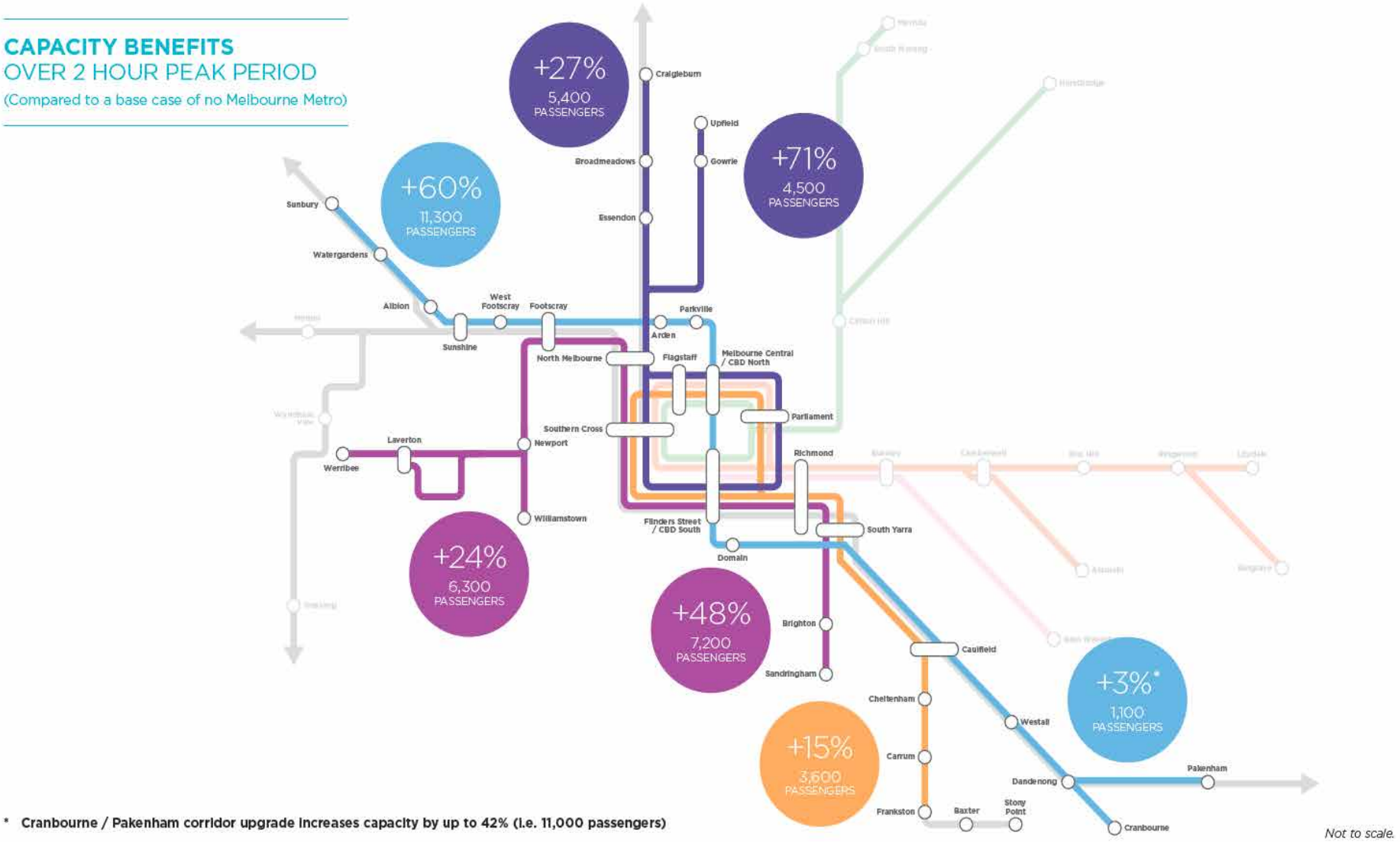

Figure 5-5 Capacity uplift delivered by Melbourne Metro (passengers in two-hour AM peak)

(Source: Public Transport Victoria)

5.6.3 Rail Service Punctuality Reliability

Melbourne Metro would create a new inner city route that would reduce reliance on coordinating and managing complex interactions between services that operate across multiple lines. By creating a new inner city line, and removing the need for planned interactions to work around congestion on other routes, Melbourne Metro would improve the resilience, punctuality and overall reliability of the network.

The following lines would experience improved reliability as a result of the new capacity, assets and simpler network operation delivered by Melbourne Metro:

- Werribee and Williamstown
- Sunbury
- Craigieburn and Upfield
- Frankston
- Sandringham.

5.6.4 Rail Crowding Relief

Capacity enhancements provided by Melbourne Metro would improve passenger journeys by improving crowding conditions and increasing the frequency of rail services. This would lead to shorter waiting times, especially on the Sunbury, Craigieburn, Upfield and Werribee lines.

The addition of new CBD stations would take crowding pressure off existing CBD stations.[14] The network changes introduced by Melbourne Metro would affect where people change between services. This is because Melbourne Metro would change which stations are served by particular lines, and where lines connect with each other. This is part of transition to a metro-style network of independent lines. In many cases, these altered interchange patterns would provide important relief to stations that are currently busy or congested.

By introducing two new CBD stations, Melbourne Metro would provide additional station capacity in the CBD. This would relieve existing, already busy stations, and help to support the growing number of trips using stations across the CBD.[15]

5.6.5 Road Network Relief

The benefits of Melbourne Metro are not limited to public transport passengers. When Melbourne Metro is built, some Victorians would realise that they can make their journey more easily by public transport than by car, thereby encouraging some car users to switch to public transport.[16]

The more people that switch from travelling in private cars to public transport, the more the roads would be freed-up to make:

- Travel easier for other vehicles
- Reduce travel times
- Travelling to further and/or different destinations more attractive to travellers who were put off from making journeys due to congestion (induced demand).

5.6.6 Tram Network Relief

Once operational, Melbourne Metro would perform some of the transport tasks currently undertaken by trams to St Kilda Road and Parkville. Melbourne Metro would also support the potential reconfiguration of the tram network as illustrated in Figure 5-6.

[14] Public Transport Victoria, Patronage Demand Forecast Report (2015)
[15] ibid
[16] ibid

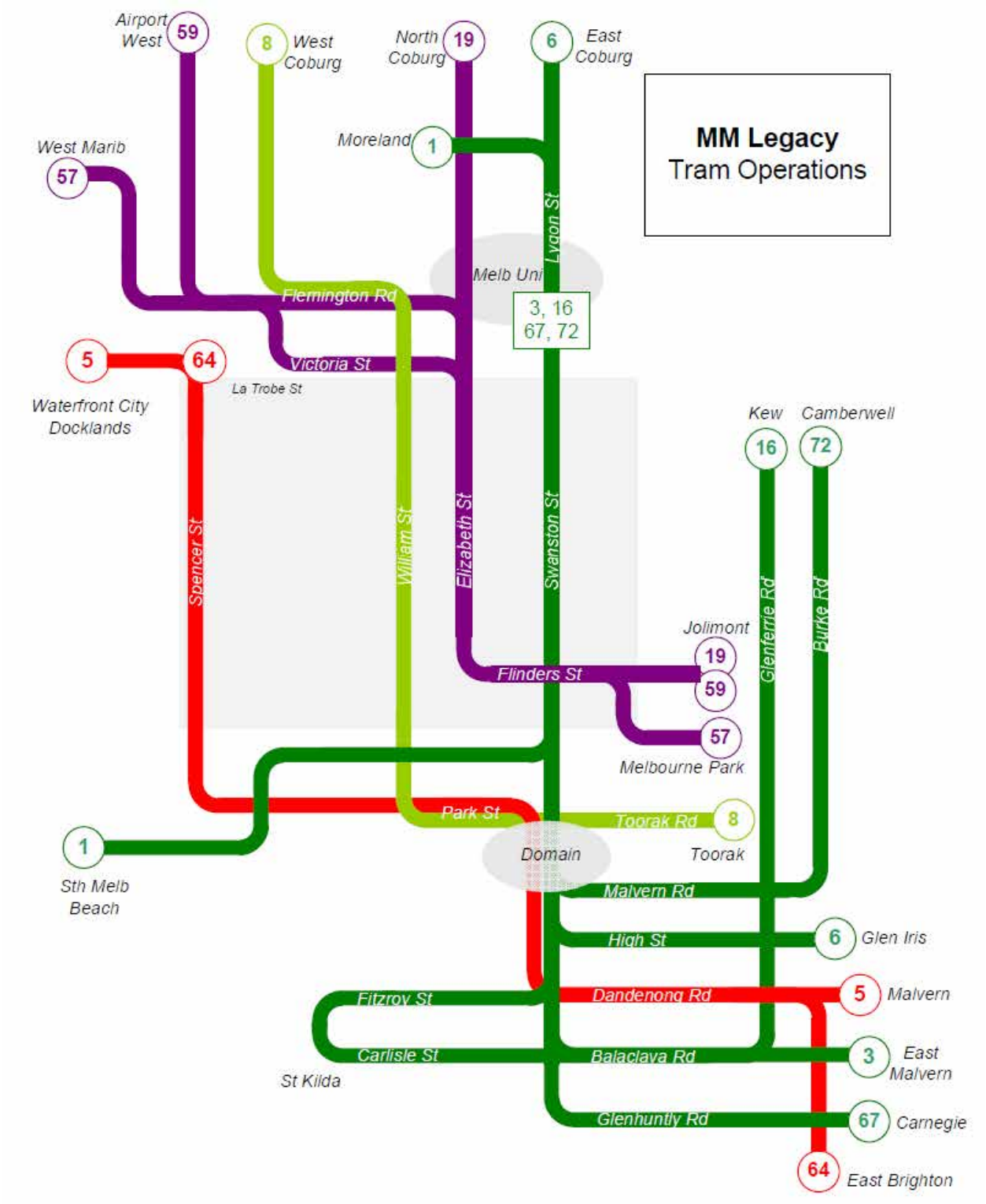

Figure 5-6 Indicative tram network following the construction of Melbourne Metro

(Source: Public Transport Victoria)

By diverting some of the existing Swanston Street routes to the west of the CBD and optimising the deployment of high capacity trams on the remaining Swanston Street routes, the network would be able to:

- Better serve emerging employment patterns
- Facilitate greater participation in culture and the arts

- Facilitate new connections across and within the expanding CBD
- Provide more accessible transport options
- Improve operational performance
- Reduce the level of tram-tram congestion.

The reconfigured tram network, along with the new CBD South and Domain stations, would improve access to the St Kilda Road professional services precinct and the Southbank entertainment and professional services precinct. The tram network would also benefit the rapidly growing number of residents moving into Southbank, including those living beyond walking distance of the CBD. Most notably, residents in the vicinity of Domain station and tram interchange would experience significant improvement in their ability to access, and travel to, various parts of the CBD.

6 Risk Assessment

6.1 Overview

A risk-based approach to assessing the environmental effects of Melbourne Metro is required by Section 3.1 of the Scoping Requirements for the EES. The Minister for Planning's EES guidelines describe the purpose of a risk-based assessment as being to ensure that 'suitable, intensive, best practice methods can be applied to accurately assess those matters that involve relatively high levels of significant adverse effects and to guide the design strategies to manage these risks. Simpler or less comprehensive methods of investigation may be applied to matters that can be shown to involve lower levels of risk.'

To satisfy the EES Scoping Requirements, an environmental risk assessment was undertaken in accordance with AS/NZS ISO 31000:2009. The environmental risk assessment process is summarised in this section in respect to transport issues, and described more fully in Appendix B *Environmental Risk Assessment Report* (of the EES).

Importantly, an environmental 'risk' is different from an environmental 'impact.' Risk is a function of the likelihood of an adverse event occurring and the consequence of the event. Impact relates to the outcome of an action in relation to values of a resource or sensitivity of a receptor. Benefits are considered in impact assessment, but not in risk assessment. Impact assessment must be informed by risk assessment so that the level of action to manage an impact relates to the likelihood of an adverse impact occurring.

The overall risk assessment process adopted was based on AS/NZS ISO 31000:2009, as illustrated in Figure 6-1.

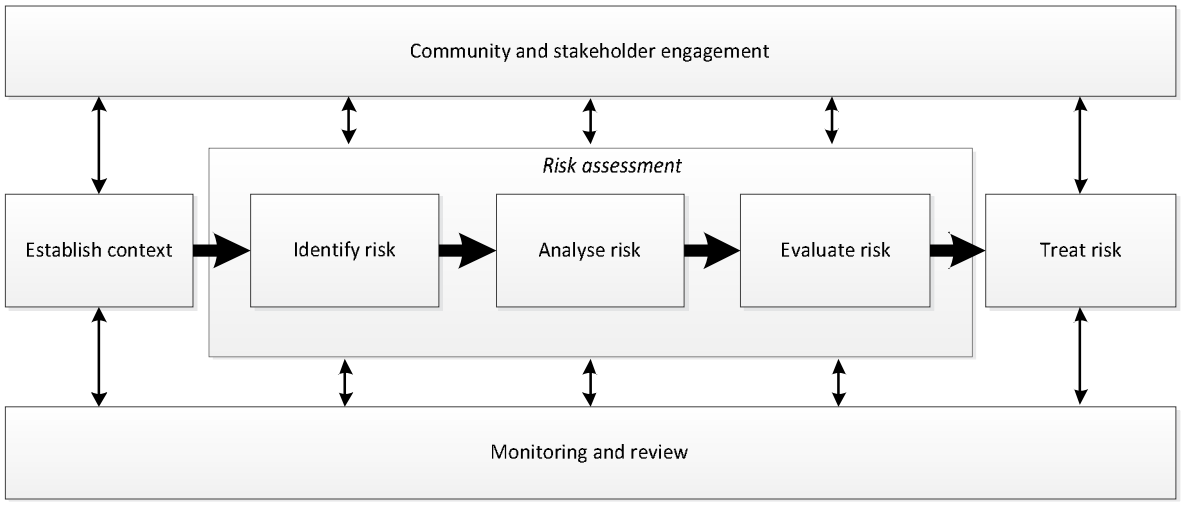

Figure 6-1 Overview of AS/NZS ISO 31000-2009 Risk Process

The following tasks were undertaken to determine the impact pathways and assess the risks:

- Setting of the context for the environmental risk assessment
- Development of consequence and likelihood frameworks and the risk assessment matrix
- Review of project description and identification of impact assessment pathways by specialists in each relevant discipline area. An impact assessment pathway is the activity or event by which a risk could potentially materialise
- Allocation of consequence and likelihood categories and determination of preliminary initial risks

- Workshops with specialist team members from different yet related discipline areas and focussing on very high, high and medium initial risks to ensure a consistent approach to risk assessment and to identify possible interactions between discipline areas. The authors of this transport impact assessment report participated in this workshop
- Follow-up liaison with specialist team members and consolidation of the risk register.

6.2 Context

The overall context for the risk assessment and a specific context for each specialist study is described in Appendix B *Environmental Risk Assessment Report* (of the EES). The context describes the setting for evaluation of risks arising from Melbourne Metro. The specific context for the transport impact assessment follows:

> *The Melbourne Metro alignment between Kensington and South Yarra is at the hub of the heavy rail and tramway systems of metropolitan Melbourne and within a dense urban area containing all categories of roads from freeways to laneways, an extensive on-road and off-road bicycle network and pedestrian paths. The railways, tramways and arterial roads within inner Melbourne are all congested during weekday morning and PM peak periods.*

The context is important, because it provides a basis for evaluating the likelihood and, in particular, the consequence of a risk.

6.3 Likelihood and Consequence

The likelihood rating criteria used in the risk assessment by all specialists is shown in Table 6-1.

Table 6-1 Likelihood rating criteria

Level	Description
Rare	The event is very unlikely to occur but may occur in exceptional circumstances.
Unlikely	The event may occur under unusual circumstances but is not expected.
Possible	The event may occur once within a 5 year timeframe.
Likely	The event is likely to occur several times within a 5 year timeframe.
Almost Certain	The event is almost certain to occur one or more times a year.

The consequence criteria framework used in the risk assessment follows. Each specialist has used this framework to develop criteria specifically for their assessment.

Table 6-2 Consequence framework

Level	Qualitative description of biophysical/ environmental consequence	Qualitative description of socio-economic consequence
Negligible	No detectable change in a local environmental setting.	No detectable impact on economic, cultural, recreational, aesthetic or social values.
Minor	Short term, reversible changes, within natural variability range, in a local environmental setting.	Short term, localised impact on economic, cultural, recreational, aesthetic or social values.
Moderate	Long term but limited changes to local environmental setting that are able to be managed.	Significant and/or long term change in quality of economic, cultural, recreational, aesthetic or social values in local setting. Limited impacts at regional level.

Level	Qualitative description of biophysical/ environmental consequence	Qualitative description of socio-economic consequence
Major	Long term, significant changes resulting in risks to human health and/or the environment beyond the local environmental setting.	Significant, long term change in quality of economic, cultural, recreational, aesthetic or social values at local, regional and State levels. Limited impacts at national level.
Severe	Irreversible, significant changes resulting in widespread risks to human health and/or the environment at a regional scale or broader.	Significant, permanent impact on regional economy and/or irreversible changes to cultural, recreational, aesthetic or social values at regional, State and national levels.

The consequence rating criteria used in the risk assessment specifically for the transport impact assessment is shown in Table 6-3.

Table 6-3 Consequence rating criteria

Level of Consequence	Consequence criteria
Negligible	No detectable change in a local transport operational setting.
Minor	Short term, reversible changes in a local transport operational setting.
Moderate	Long term but limited changes to transport operational setting that are able to be managed.
Major	Long term, significant changes resulting in risks to human health and/or the functioning of the transport network beyond the project area.
Severe	Irreversible, significant changes resulting in widespread risks to human health and/or the functioning of the transport network at a regional scale.

The risk assessment matrix used by all specialists to determine levels of risk from the likelihood and consequence ratings is shown below.

Table 6-4 Risk Matrix

		Consequence rating				
		Negligible	Minor	Moderate	Major	Severe
Likelihood rating	Rare	Very Low	Very Low	Low	Medium	Medium
	Unlikely	Very Low	Low	Low	Medium	High
	Possible	Low	Low	Medium	High	High
	Likely	Low	Medium	Medium	High	Very High
	Almost Certain	Low	Medium	High	Very High	Very High

Table 6-5 identifies the transport related risks associated with the project, based on a precinct basis. For further details refer to Environment Risk Assessment Report that includes the full Risk Register.

6.4 Risk Assessment

The relationship between the risk assessment and impact assessment process comprises a number of related steps.

The first step is to identify the *initial risk rating* for each *impact pathway*. The *impact pathways* for transport are listed in Table 6-5. Importantly, the *initial risk rating* describes the potential risk associated with Melbourne Metro if tailored, project-specific mitigation and Environmental Performance Requirements are not deployed. It does however assume that standard design and management measures are deployed – these are called the *Environmental Performance Requirements*. For transport risks, the Existing Environmental Performance Requirement was that the design of Melbourne Metro and traffic management plans would be used to manage transport impacts.

The *initial risk rating* identified transport risks as being either High, Medium, Low, or (in the case of legacy transport outcomes) Very Low. Construction risks were rated as either High or Medium, with the exception of Arden (Low) and western turnback (Very Low). Legacy risks were mostly rated as Low or Very Low, with the exception of local transport networks in the vicinity of Parkville, CBD North, CBD South, and Domain – these were rated as Medium.

The second step is to undertake the *impact assessment* by prioritising the High and Medium *initial risk ratings*, while also acknowledging and addressing the Low and Very Low risks as appropriate. Sections 8 (construction) and 9 (operational) of this transport impact assessment present the potential transport impacts associated with each of these risks, proposes project-specific Environmental Performance Requirements with the intent of reducing the *initial risk rating*, and suggests potential mitigation measures that would achieve the Environmental Performance Requirements.

The third and final step is to judge what effect achieving the Environmental Performance Requirements has on the *initial risk ratings*. Ideally, the deployment of mitigation measures to achieve the Environmental Performance Requirements should reduce the initial risk rating, though this would not always be possible. The post-mitigation risk rating, assuming the achievement of the Environmental Performance Requirements, is called the *residual risk rating*, Table 6-5 summarises the precinct-based transport risks associated with Melbourne Metro, and Section 11.2 explains how the Environmental Performance Requirements have reduced the risk ratings.

The recommended Environmental Performance Requirements are outlined in the following sections of the impact assessment and collated in Table 11-1 and Table 11-2. All Environmental Performance Requirements, including those presented in this transport impact assessment, are incorporated into the Environmental Management Framework for the project (Chapter 24).

For further details refer to Appendix B *Environmental Risk Assessment Report* (of the EES) which includes the full Risk Register, with existing Environmental Performance Requirements assigned to each risk. The final step in the assessment process is to evaluate whether the impacts and residual risks conform with the evaluation objective and assessment criteria in the EES Scoping Requirements. This is discussed in Section 12.

Table 6-5 Risk register for impact assessment

Impact Pathway			Initial Risk			Residual Risk			Risk No.
Category	Event	Precinct	Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
Construction									
Construction activities impeding traffic flow	Increased congestion and reduced connectivity for transport modes within the vicinity of the project area and across the broader transport network	1 - Tunnels 8 - Eastern portal	Moderate	Possible	Medium	Minor	Unlikely	Low	T001
Construction activities impeding traffic flow	Increased congestion and reduced connectivity for transport modes within the vicinity of the project area at the western portal and diverted traffic impacts on local residents	2 - Western portal	Moderate	Possible	Medium	Moderate	Possible	Medium	T002
Construction activities impeding traffic flow	Increased congestion and reduced connectivity for transport modes within the vicinity of the project area at Arden station	3 - Arden station	Minor	Possible	Low	Minor	Unlikely	Low	T003
Construction activities impeding traffic flow	Increased congestion and reduced connectivity for transport modes within the vicinity of Melbourne Metro	5 - CBD North Station 6 - CBD South Station	Major	Likely	High	Moderate	Likely	Medium	T004
Construction activities impeding traffic flow	Increased congestion and reduced connectivity for transport modes within the vicinity of Melbourne Metro as a result of road closures	4 - Parkville Station 7 - Domain Station	Major	Likely	High	Moderate	Likely	Medium	T005
Trucks removing tunnel spoil increase congestion levels in key parts of the network	Increased levels of heavy trucks on city streets across day and night would affect amenity and traffic operations - across all precincts where spoil is to be removed.	1 - Tunnels 3 - Arden station 7 - Domain station	Moderate	Possible	Medium	Moderate	Possible	Medium	T006

Impact Pathway			Initial Risk			Residual Risk			Risk No.
Category	Event	Precinct	Consequence	Likelihood	Risk	Consequence	Likelihood	Risk	
Trucks removing tunnel spoil increase congestion levels in key parts of the network	Increased levels of heavy trucks on local streets and associated road closures around South Yarra across day and night would affect amenity of local residents.	8 - Eastern portal	Moderate	Possible	Medium	Minor	Possible	Low	T007
Construction activities impeding traffic flow	Increased congestion and reduced connectivity for transport modes within the vicinity of the project area at the western turnback.	9 – western turnback	Minor	Unlikely	Low	Minor	Unlikely	Low	T008
Operation									
Legacy transport network outcomes reduce network connectivity or increase congestion	Increased congestion and reduced connectivity for transport modes within the vicinity of Melbourne Metro	2 - Western portal 3 - Arden Station	Minor	Possible	Low	Minor	Unlikely	Low	T009
Legacy transport network outcomes reduce network connectivity or increase congestion	Increased congestion and reduced connectivity for transport modes within the vicinity of Melbourne Metro and across the broader transport network	4 - Parkville station 5 - CBD North station 6 - CBD South station 7 - Domain station	Moderate	Possible	Medium	Minor	Possible	Low	T0010
Legacy transport network outcomes reduce network connectivity or increase congestion	Increased congestion and reduced connectivity for transport modes within the vicinity of the project area at eastern portal (South Yarra)	8 - Eastern Portal	Negligible	Unlikely	Very Low	Negligible	Unlikely	Very Low	T011

7 Project Components by Precinct

7.1 Project Precincts

Melbourne Metro has been structured into a number of distinct precincts to assist in the consideration of the project elements in the EES as discussed in Section 1. The following outline of the various precincts provides a summary of the project components, with a focus on elements related to this transport impact assessment. Figures in this section have been sourced from the EES Map Books – refer to the relevant maps for further details.

7.2 Precinct 1: Tunnels

7.2.1 Location and Construction Overview

As this transport impact assessment relates to the surface transport impact aspects of Melbourne Metro and the tunnel works are underground, there is limited consideration of the tunnels in this transport impact assessment. The removal of spoil from tunnel excavation is included in the review of truck movements at each precinct in Section 8. The only other aspect of the tunnels that is relevant to this assessment is the construction of the emergency access shafts and the locations for the TBM access.

The locations for emergency access shafts are to be at:

- Fawkner Park: see discussion in Section 7-2.2 and as shown in Figure 7-1; and
- Adjacent to Linlithgow Avenue: to be located in Queen Victoria Gardens (north of Linlithgow Avenue) as shown in Figure 7-2.

A permanent above ground structure would be constructed to provide access and house essential equipment. Parking and access for emergency services personnel is required adjacent to the emergency access shaft, as they need direct access from the public road network.

There are two TBM access and retrieval options considered in the transport impact assessment for the southern sections of the tunnel works:

- Domain only (refer to Figure 7-17); and
- Both Domain and Fawkner Park (refer to Figure 7-1 and Figure 7-17).

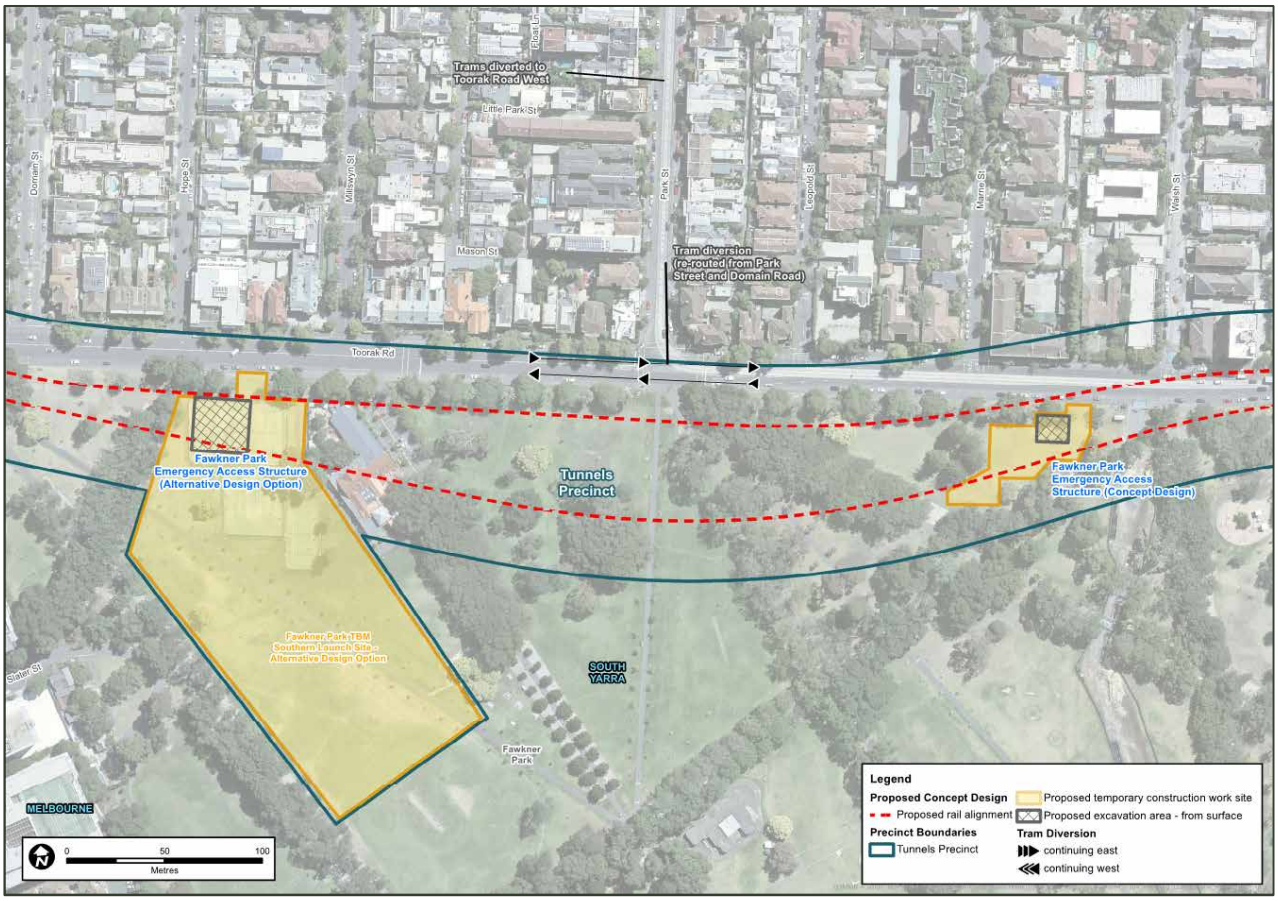

Figure 7-1 Fawkner Park construction work site

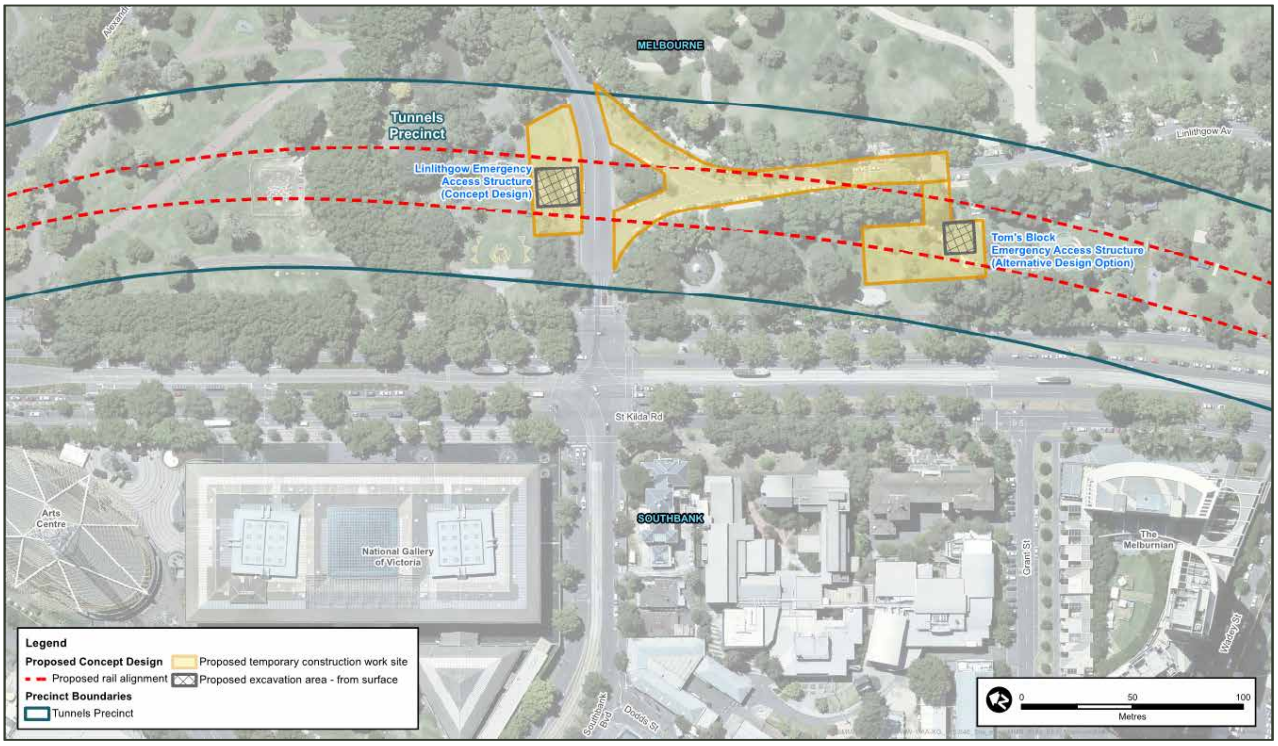

Figure 7-2 Linlithgow Avenue construction work site

7.2.2 Melbourne Metro Legacy Rail Network

Melbourne Metro legacy structures at Fawkner Park and Linlithgow Avenue are shown in Figure 7-3 and Figure 7-4 respectively. Two options are being considered for the emergency access shaft at each site, the Concept Design and the alternative design option.

Figure 7-3 Fawkner Park Melbourne Metro legacy emergency access structures

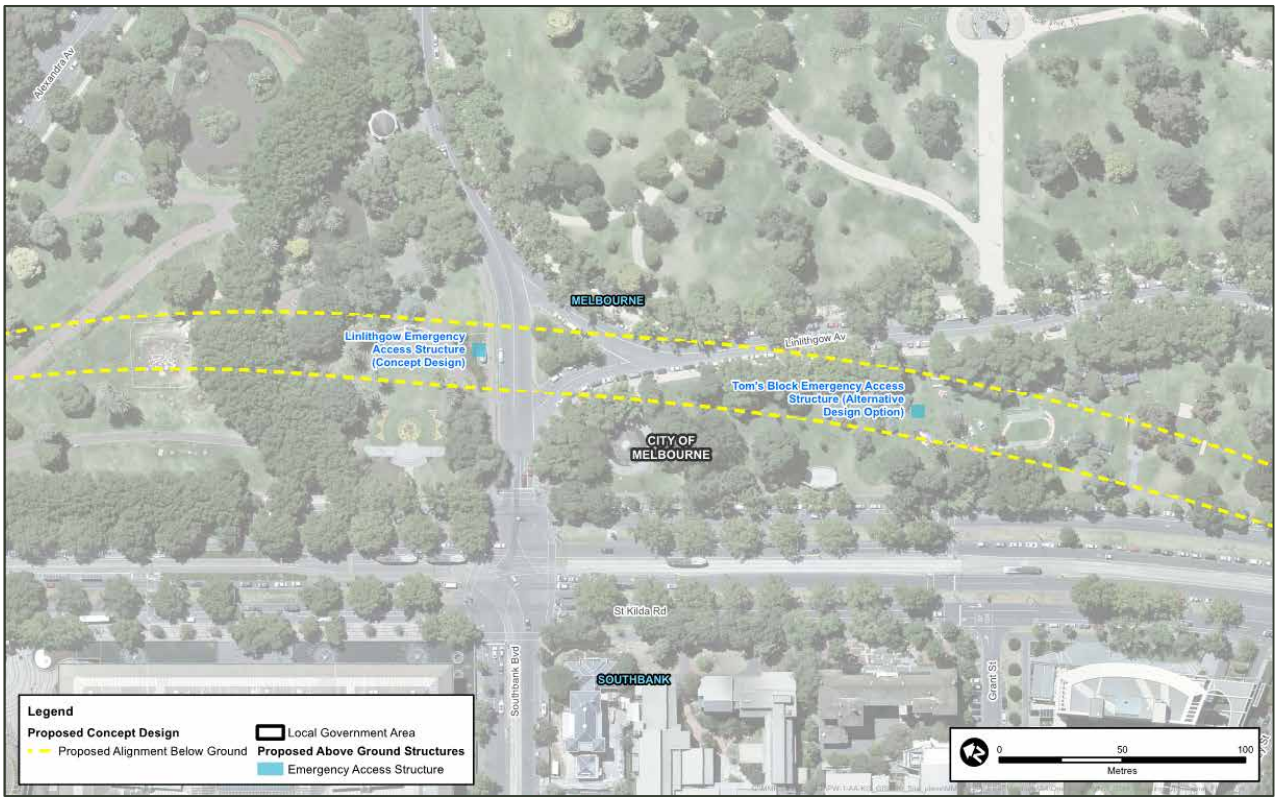

Figure 7-4 Linlithgow Avenue Melbourne Metro legacy emergency access structures

7.3 Precinct 2: Western Portal (Kensington)

7.3.1 Portal Design and Construction Outline

The existing Sunbury line tracks are to be realigned to form an at-grade junction with the Melbourne Metro tracks, allowing services along the existing Sunbury line tracks to enter the underground section while maintaining flexibility for trains to travel along the existing tracks to Southern Cross Station if needed (e.g. during a disruption to normal services). This configuration would allow final testing and commissioning of Melbourne Metro underground section to be completed while maintaining existing rail services.

Melbourne Metro tracks would connect to the existing rail network between the Maribyrnong River and adjacent to the South Kensington station, as shown in Figure 7-5, with a potential Alternative Design Option shown in Figure 7-6. The alternative design option moves the decline structure and tunnel portal further to the west and includes a potential substation site at the eastern end of the precinct. The western portal precinct is shown in brown and includes the approach to the tunnel and the tunnel works that connect to the tunnel precinct. Red shows the indicative rail alignment and the yellow hatch indicates the construction area, blue shows the decline structure, purple defines the tunnel cut and cover area and green is the TBM retrieval box. The alternative design option shows a blue shaded area that would be used for the alternative substation site.

A major construction work site is proposed to be located on Hobsons Road at the western end of the precinct, to support activities at the western portal. This site would be used for site offices and facilities, laydown areas and materials and equipment storage. The existing car parking areas along Childers Street would be occupied during construction to provide room for construction traffic. The eastern end of Childers Street would need to be closed to traffic during various construction stages to allow for the construction of the portal structure. During this period, access to the 50 Lloyd Street Business Estate would need to use Tennyson Street, Altona Street and Ormond Street for access to Childers Street west, Kensington Road and Dynon Road.

The alternative design option would change the acquisition requirements at the eastern end of Childers Street and would involve a slightly different arrangement for both the rail network and the legacy road and car parking arrangements along Childers Street.

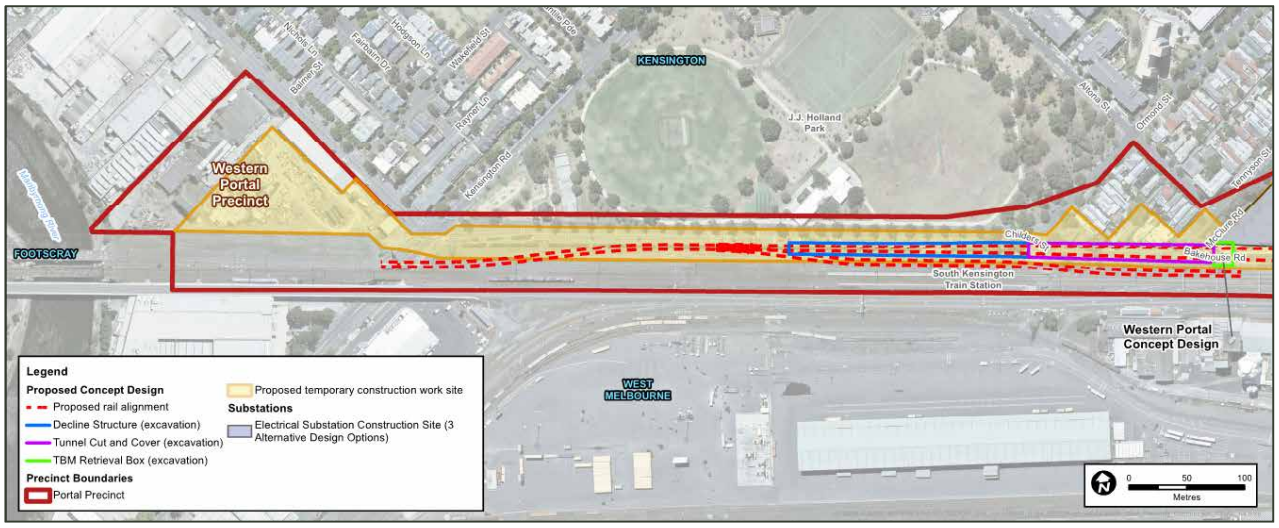

Figure 7-5 Western portal precinct construction work site – Concept Design

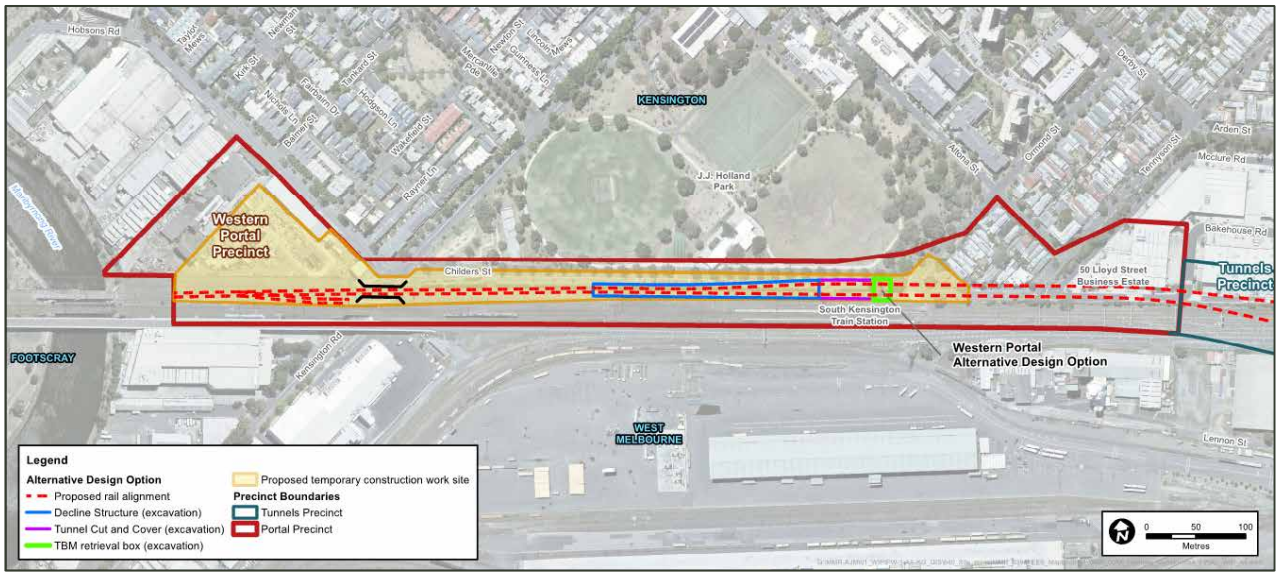

Figure 7-6 Western portal precinct construction work site outline – Alternative Design Option

7.3.2 Western Portal Melbourne Metro Legacy Rail Network

Melbourne Metro legacy rail network at the western portal is shown in Figure 7-7 and the alternative design option is shown in Figure 7-8.

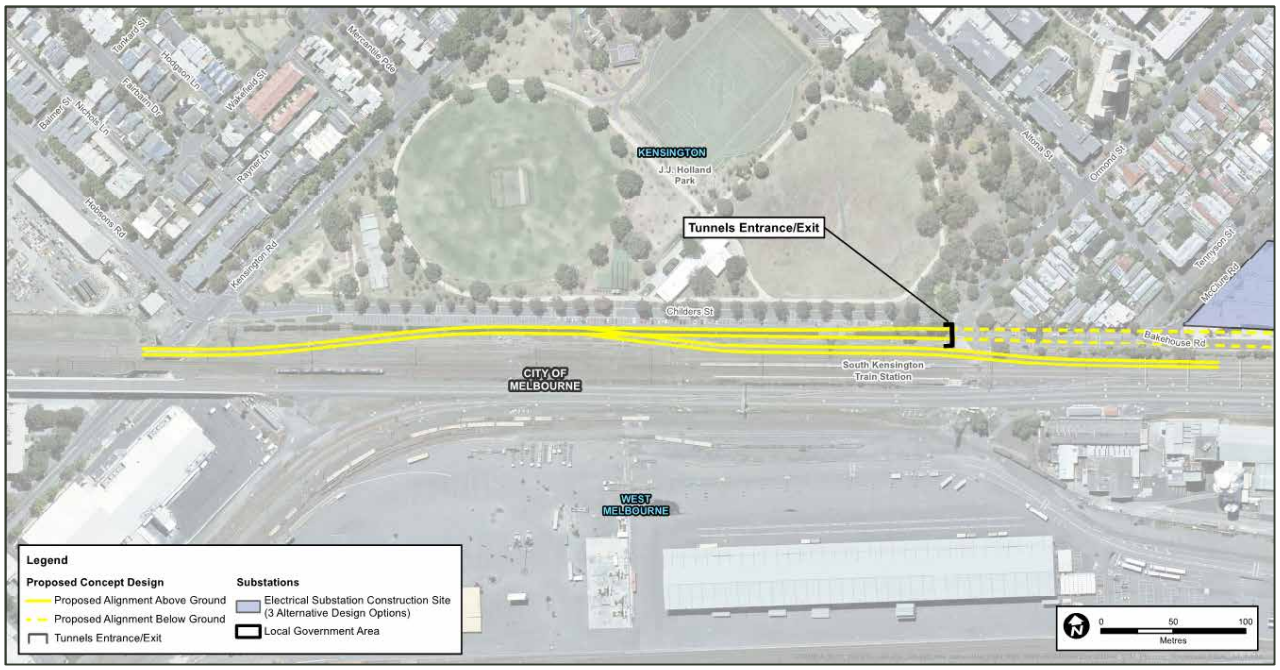

Figure 7-7 Western portal precinct Melbourne Metro legacy rail network – Concept Design

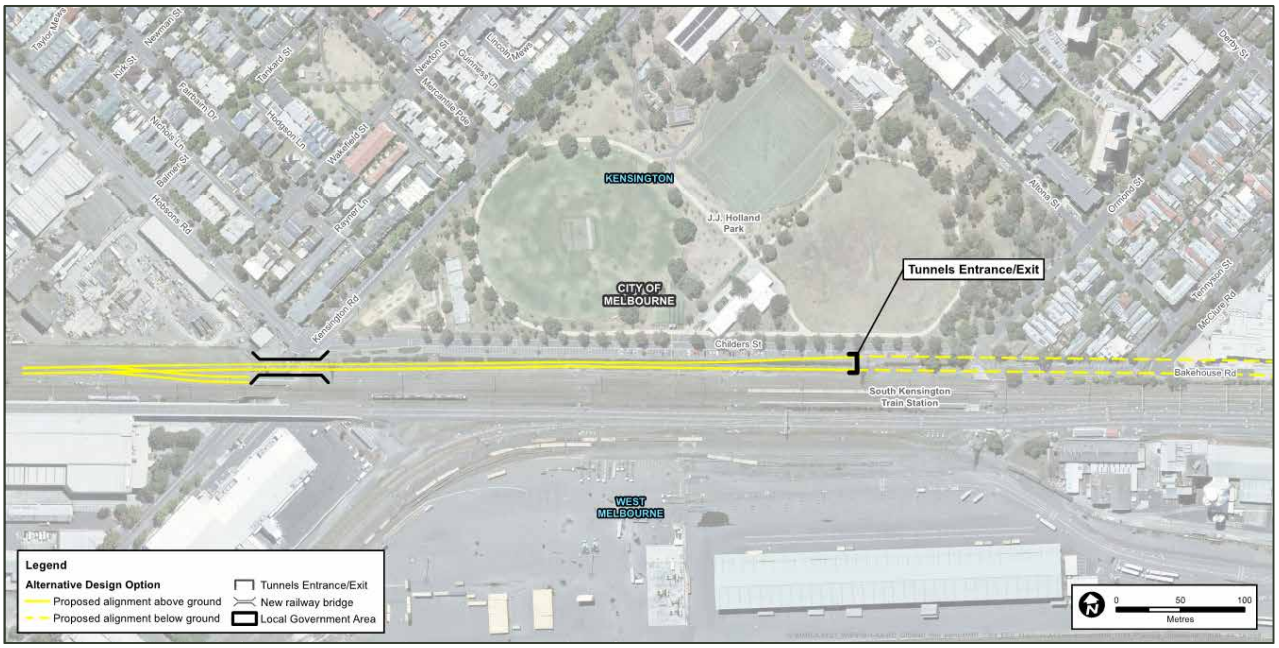

Figure 7-8 Western portal precinct Melbourne Metro legacy rail network – Alternative design option

7.4 Precinct 3: Arden Station

7.4.1 Station Location and Construction Outline

Arden station is located underground within the public owned (VicTrack) site as shown in Figure 7-9. The Arden station precinct is shown within the green line, while the indicative rail alignment is shown in red, and the yellow with black hatch indicates the proposed area for the station cut and cover. The yellow shaded area shows the proposed temporary construction work site.

The VicTrack land would be the major staging area for Melbourne Metro western section works, and include major storage areas and spoil extraction and handling facilities. The site would be required for the full construction period (approximately seven years), although some areas could be handed over for development in the latter stages of the construction program.

To support the construction of the east end of the station box, it is expected that parts of Laurens Street would need to be occupied for the duration of construction.

7.4.2 Arden Station Design

Melbourne Metro legacy arrangements at Arden station are shown in Figure 7-10. The proposed station box is shown in red and the pink shaded area shows the location of the station entrance structure. An emergency access structure is shown in light blue and the ventilation shaft in green.

The Arden station precinct has been identified as part of a major development site by the Metropolitan Planning Authority. Planning for this new precinct is underway, led by the Metropolitan Planning Authority in partnership with other government agencies.

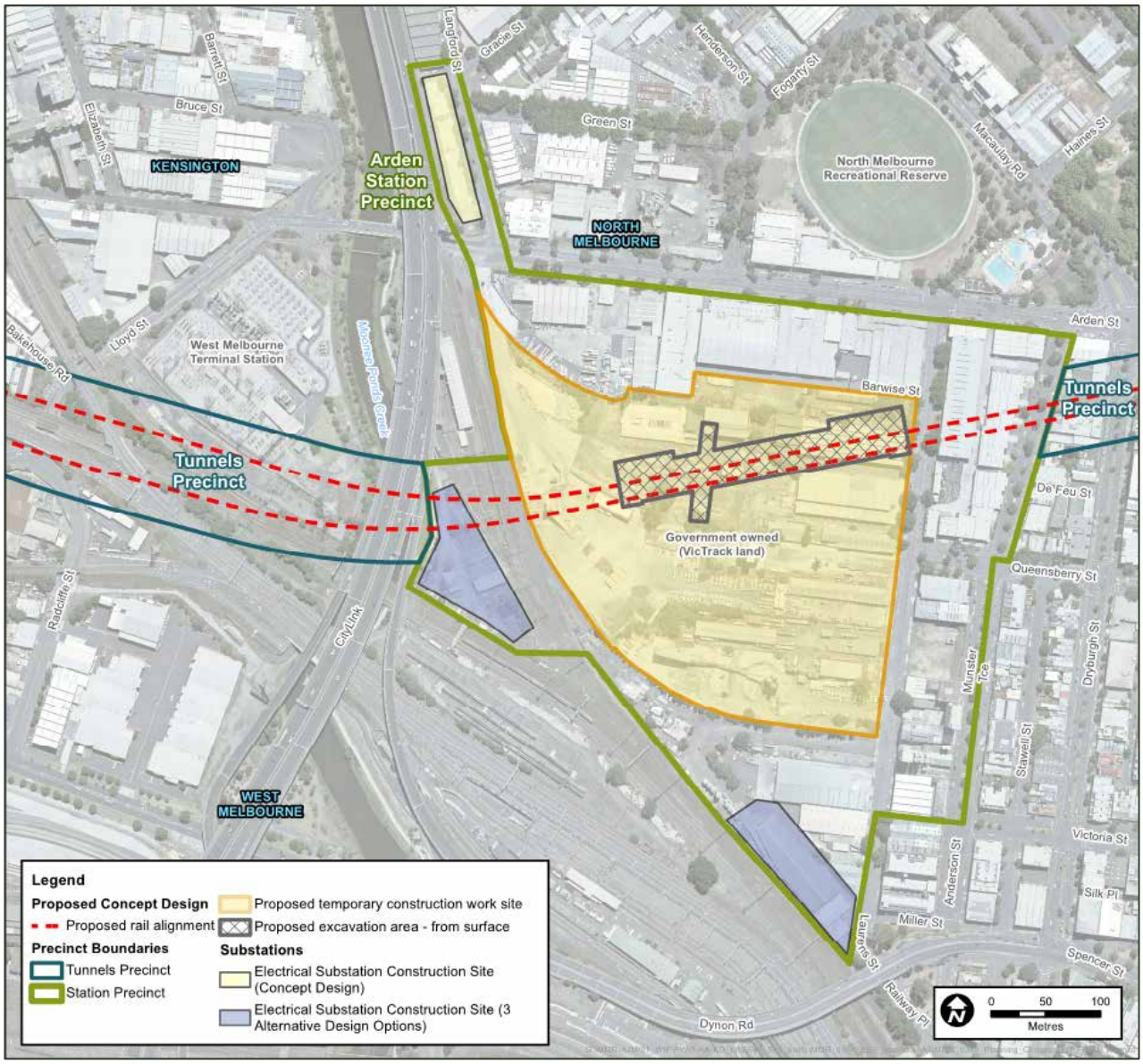

Figure 7-9 Arden station precinct construction work site outline

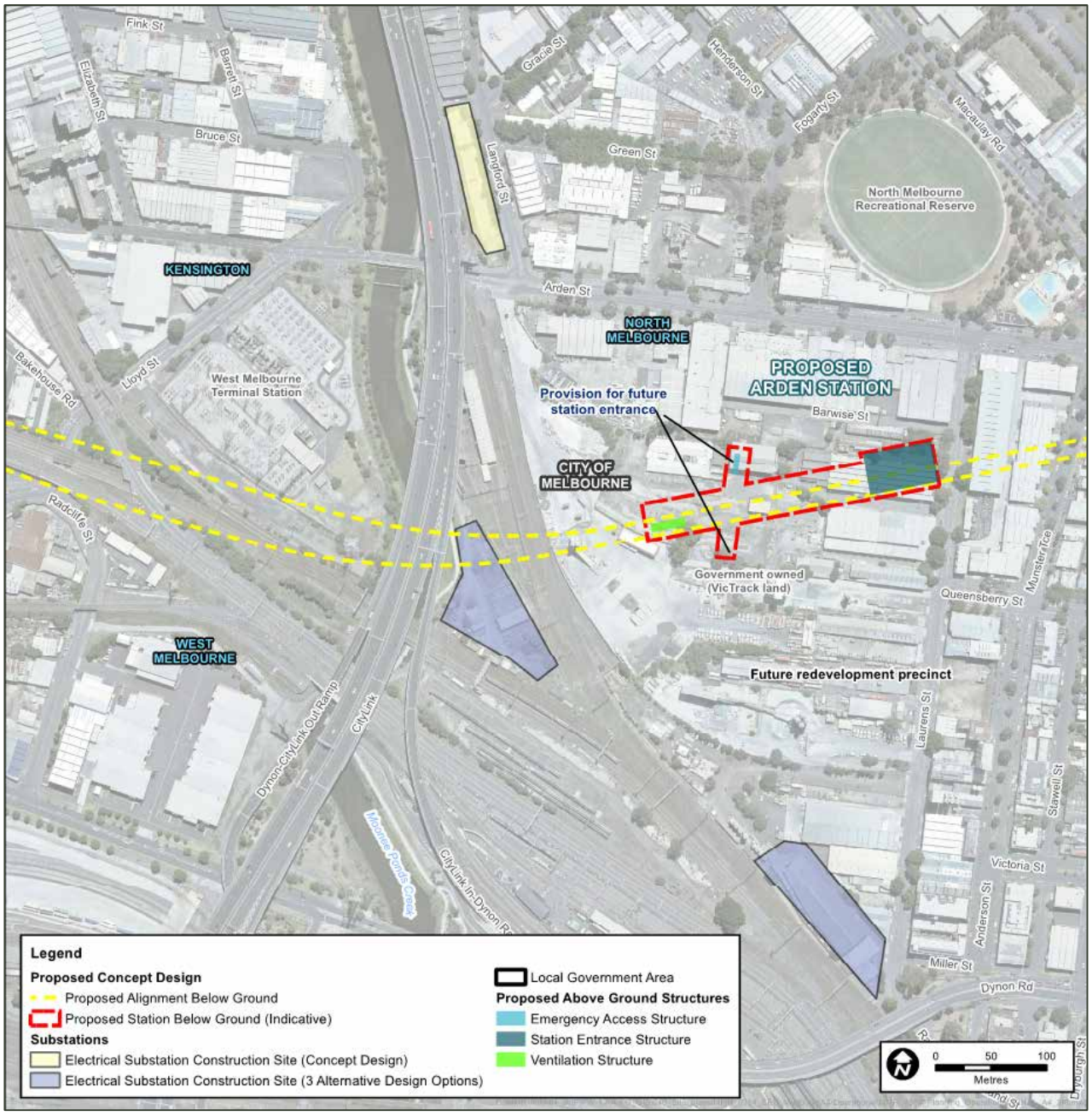

Figure 7-10 Arden station precinct legacy layout

7.5 Precinct 4: Parkville Station

7.5.1 Station Location and Construction Outline

Parkville station would be located under the Grattan Street road reserve, to the east of Royal Parade. The station footprint would occupy the full width of Grattan Street and extend from the intersection of Grattan Street and Royal Parade to the east of University Square as shown in Figure 7-11. The Parkville station precinct is shown within the green line, while the indicative rail alignment is shown in red and the yellow with black hatch indicates the proposed area for the station cut and cover. The yellow shaded area shows the proposed temporary construction work site areas.

The station would be constructed using a cut and cover method. The underground pedestrian connection across Royal Parade would be constructed using mined tunnel techniques.

Grattan Street would be closed to traffic between Royal Parade and Leicester Street for the duration of the works. The route 401, 402, 403, 505 buses and cyclists would be diverted around the works site, and vehicular access to surrounding businesses would be limited. Alternate options for these bus routes are currently being developed, and are considered at Section 8.7.4 of this report.

Pedestrian routes linking the precinct across Royal Parade and Grattan Street would be diverted and modified at various stages of the construction. However, pedestrian access would be maintained to the university and health facilities within the precinct throughout the construction works.

Access for emergency vehicles would be maintained at all times along Grattan Street, between Royal Parade and Flemington Road.

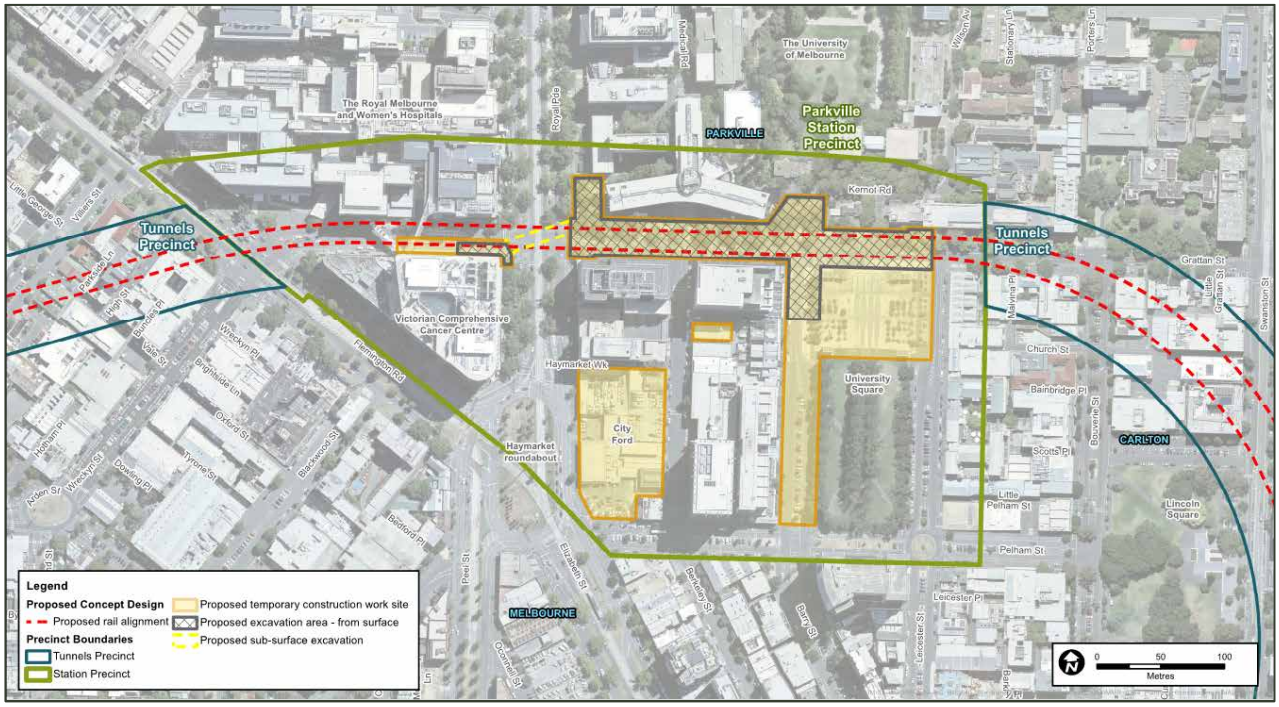

Figure 7-11 Parkville station precinct construction work site outline

7.5.2 Parkville Station Design

Melbourne Metro legacy arrangements at Parkville station are shown in Figure 7-12. The station box is shown in red, the pink shaded area shows the location of the station entrance structures (the darker one is a lift structure), and the location of ventilation shafts are shown in green.

The key features of the Parkville station design include:

- Entrances serving the health and education organisations, as well as a connection to the main north-south pedestrian route through the University of Melbourne campus
- DDA-compliant level access tram stops, with side platforms, to be constructed on Royal Parade
- Entrances providing access to the new tram stops on Royal Parade and adjacent to the proposed location of the future bus stops on Grattan Street
- Underground pedestrian connections beneath Royal Parade and Grattan Street.

After construction of Melbourne Metro has finished, the legacy arrangements would result in Grattan Street operating as a road traffic lane in each direction.

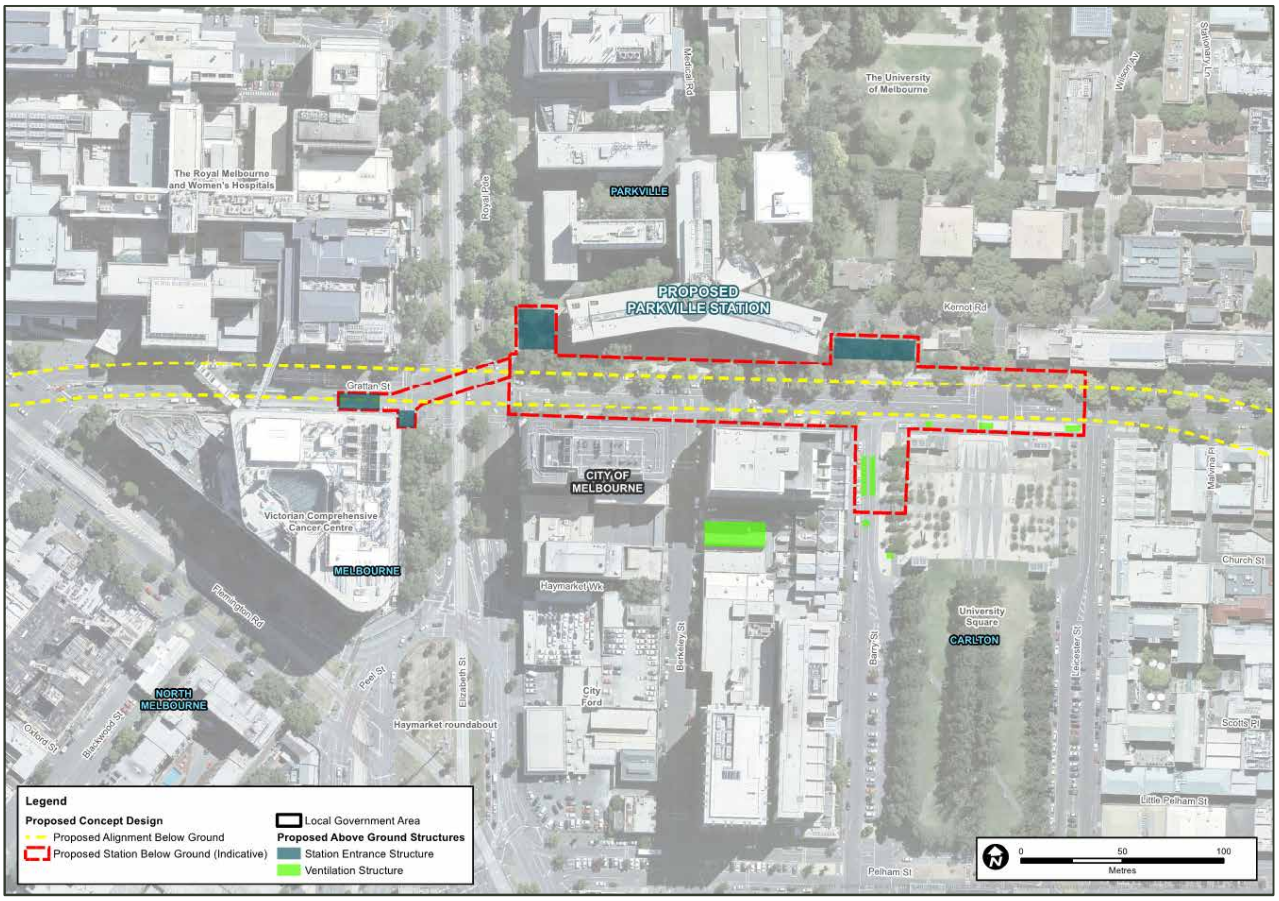

Figure 7-12 Parkville station precinct legacy layout

7.6 Precinct 5: CBD North Station

7.6.1 Station Location and Construction Outline

CBD North station is located directly beneath Swanston Street, between La Trobe Street to north of Franklin Street, as shown in Figure 7-13. The CBD North station precinct is shown within the green line, the indicative rail alignment is shown in red, and the yellow with black hatch indicates the proposed surface excavation areas that would be used to gain access to the mined station beneath Swanston Street. The yellow shaded area shows the proposed temporary construction work site areas.

The station is to be constructed under Swanston Street using the mined cavern construction method. Several areas adjacent to the station site are proposed to be used as construction work sites including closure of the section of Franklin Street to the east of Swanston Street. Access would be maintained along Franklin Street to the west of Swanston Street.

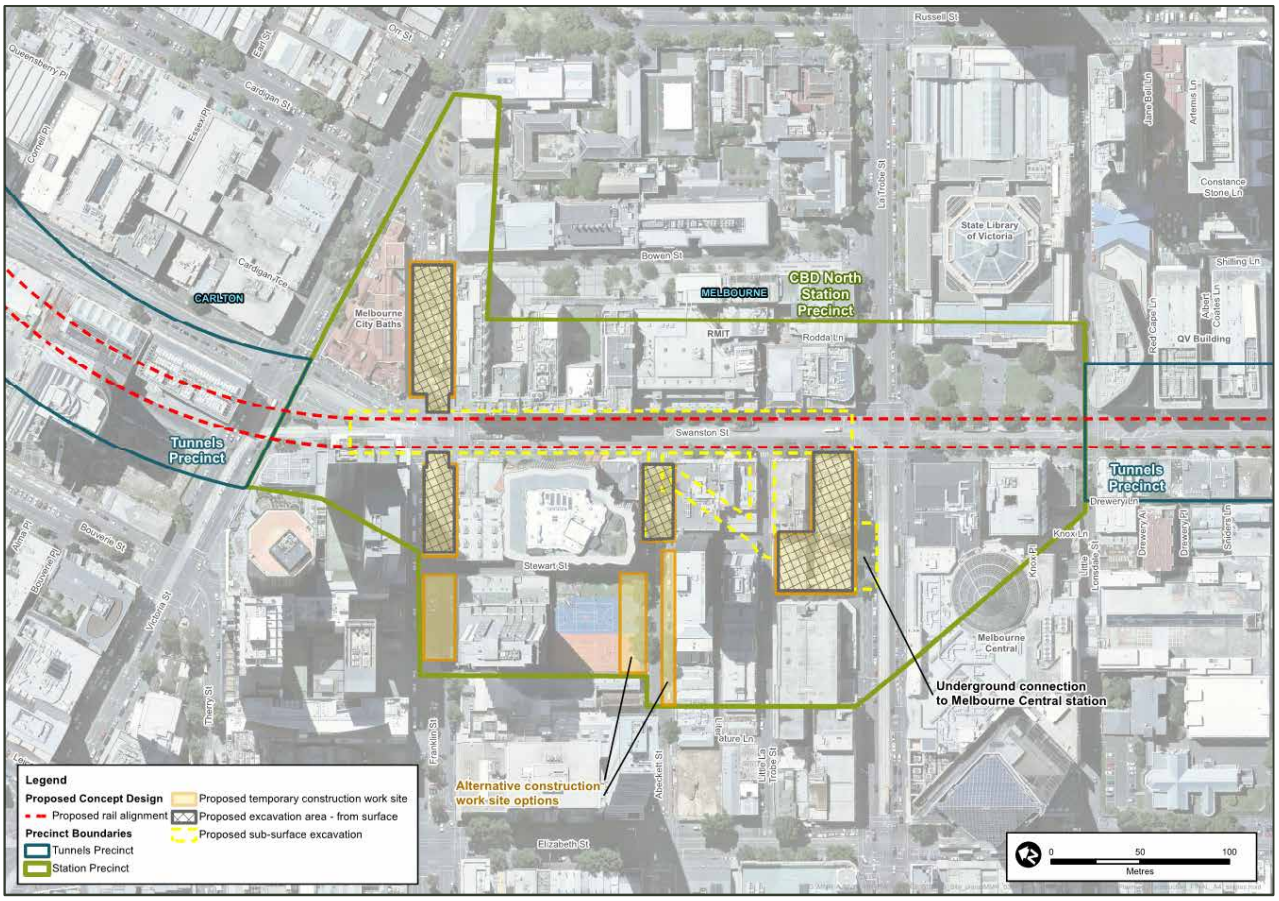

Figure 7-13 CBD North station precinct construction work site

7.6.2 CBD North Station Design

The key features of CBD North station design shown in Figure 7-14. The proposed station box is shown in red and the pink shaded area shows the location of the station entrance structure. Emergency access structures are shown in light blue and the ventilation shafts in green. Features include:

- A La Trobe Street entrance that would provide a direct underground pedestrian link to Melbourne Central Station under La Trobe Street, as well as surface connections to provide access to the existing tram lines along Swanston Street and La Trobe Street
- A northern entrance is to be located at Franklin Street to the east of Swanston Street.

After construction of Melbourne Metro has finished, the legacy arrangements show Franklin Street being permanently closed east of Swanston Street to accommodate a station entrance. There are ongoing discussions with City of Melbourne to develop a design that allows the partial opening of Franklin Street with Melbourne Metro. The transport impact assessment assesses the full closure of Franklin Street as a worst case scenario.

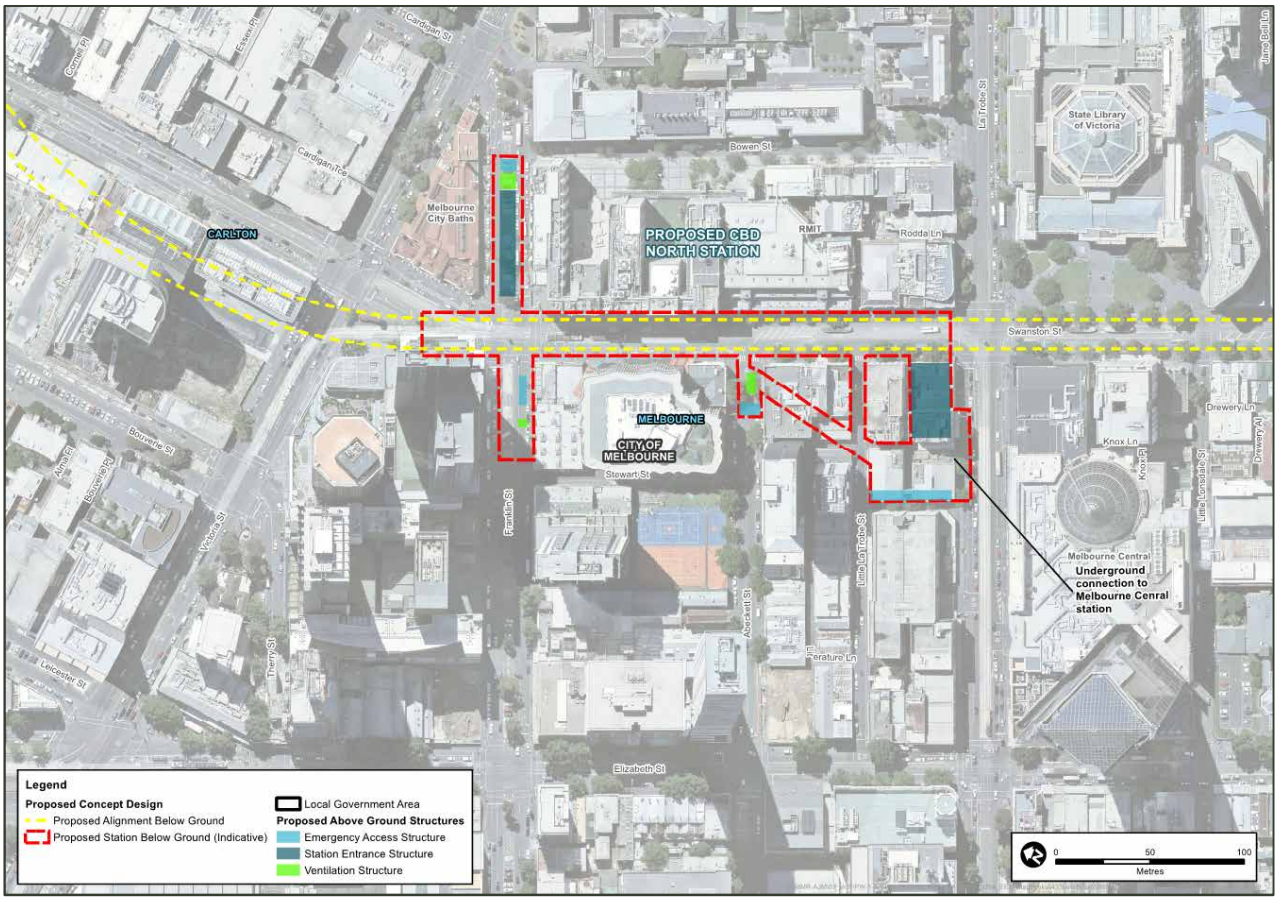

Figure 7-14 CBD North station precinct legacy layout

7.7 Precinct 6: CBD South Station

7.7.1 Station location and construction outline

CBD South station is located at the southern edge of the CBD, directly beneath Swanston Street running between, and partially under, Flinders Street and Collins Street as shown in Figure 7-15. The CBD South station precinct is shown within the green line, while the indicative rail alignment is shown in red and the yellow with black hatch indicates the proposed surface excavation areas that would be used to gain access to the mined station beneath Swanston Street. The yellow shaded areas indicate the proposed temporary construction work site areas.

The station is to be constructed under Swanston Street using the mined cavern construction method. A construction work site is proposed to be located at City Square, currently occupied by a public plaza, a café and a sub-surface car park. Another construction work site would be on Swanston Street near Flinders Street. The existing buildings on both sites would be demolished prior to construction commencing.

The underground pedestrian connection between CBD South station and Flinders Street Station would require a series of temporary closures of Flinders Street (potentially as early works), and would be undertaken using cut and cover techniques. The road closures and associated tram infrastructure works may affect the operation of Flinders Street between Elizabeth Street and Russell Street.

The Concept Design assumes that the underground pedestrian connection between CBD South station and Federation Square would be undertaken using mined tunnel techniques that would not require any closures of Flinders Street.

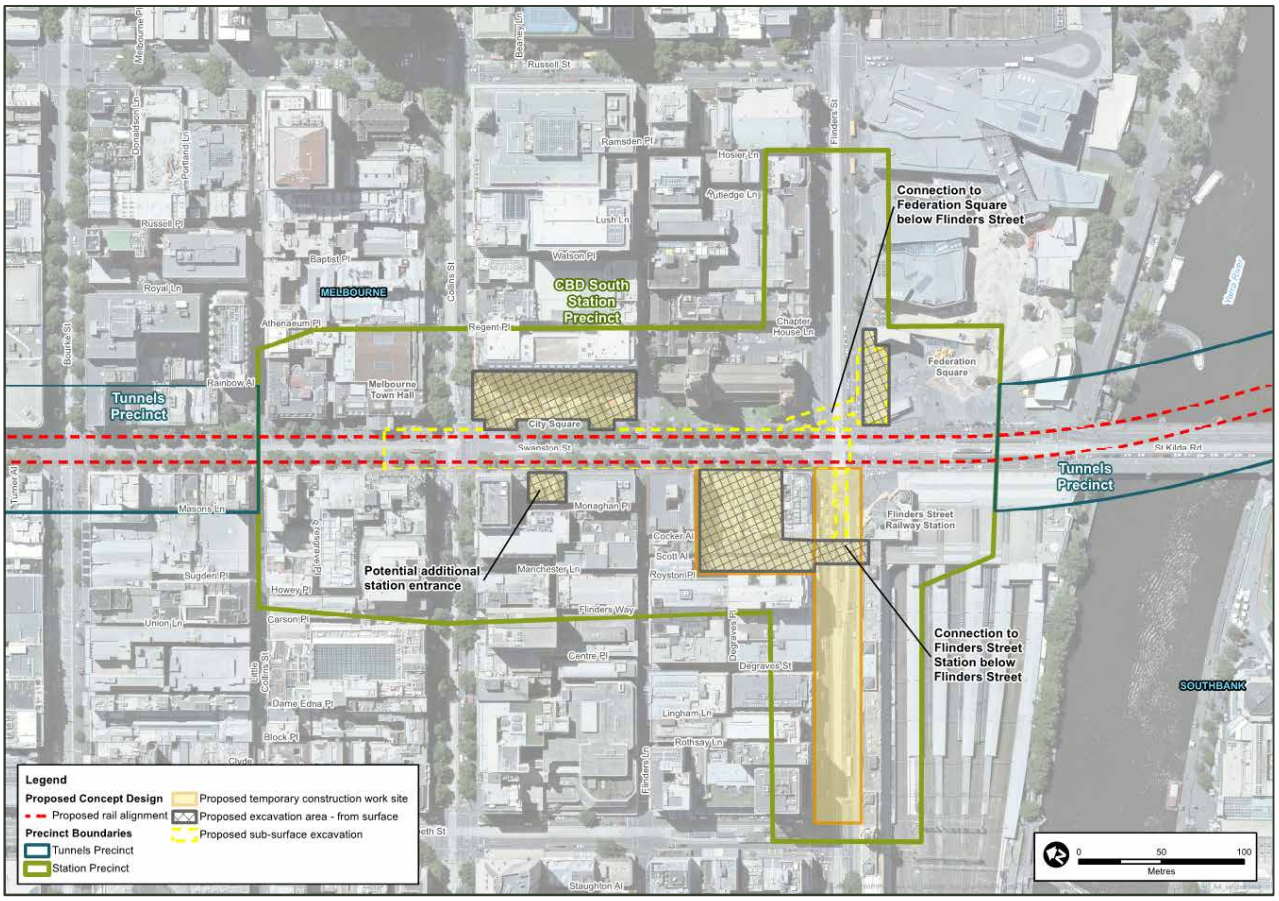

Figure 7-15 CBD South station precinct construction work site outline

7.7.2 CBD South Station Design

The key features of CBD South station design shown in Figure 7-16. The proposed station box is shown in red and the pink shaded area shows the location of the station entrance structures. Emergency access structures are shown in light blue and the ventilation shafts in green. Features include:

- A Collins Street entrance at the northern end of the City Square
- A Flinders Street entrance accessing both Flinders Street and Swanston Street with an underground connection directly into the main concourse at Flinders Street Station
- A Federation Square entrance via an underground connection to the north west corner of Federation Square
- Another potential entrance is under consideration at 165 - 173 Swanston Street. This option is limited as it would not be possible to install escalators as a result of limited footpath capacity adjacent to property.

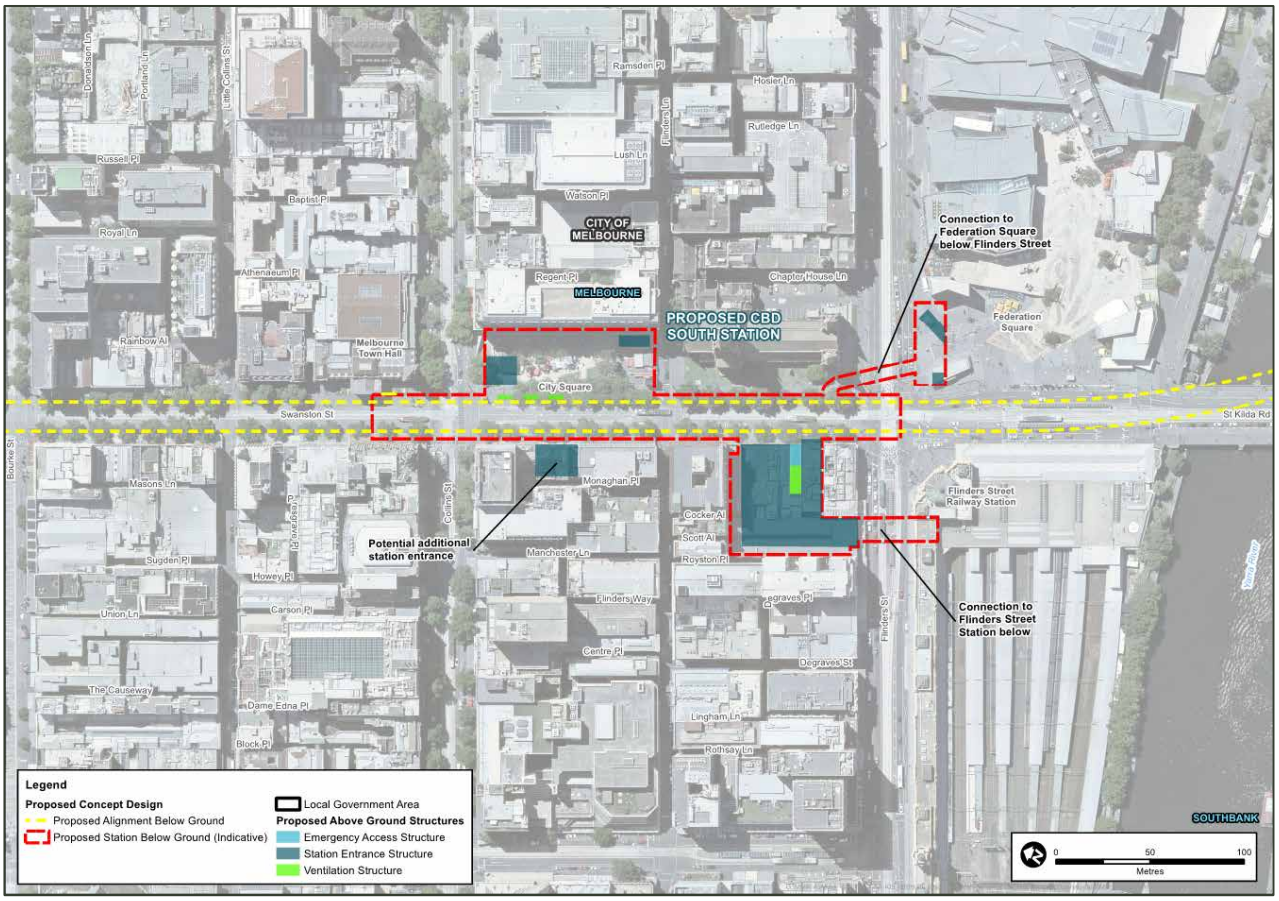

Figure 7-16 CBD South station precinct legacy layout

7.8 Precinct 7: Domain Station

7.8.1 Station Location and Construction Outline

Domain station is located under St Kilda Road, adjacent to Albert Road and Domain Road as shown in Figure 7-17. The Domain station precinct is shown within the green line, while the indicative rail alignment is shown in red and the yellow with black hatch indicates the proposed area for the station cut and cover. The yellow shaded area shows the proposed temporary construction work site.

The station is to be constructed using the cut and cover construction method. A large construction area would be required, involving areas on both sides of St Kilda Road, for site offices, amenities, equipment storage and materials laydown.

The construction of Domain station would require the closure of Domain Road. This would result in the number 8 tram being diverted along a new, route along Toorak Road, extending to the west from Park Street to connect to the existing tram network along St Kilda Road. The construction staging options around Domain station and associated works are likely to involve several stages that would involve reductions in the traffic carrying capacity of St Kilda Road (that would potentially impact all users), and potentially involve periodic short term closures of the tram services through the works site to realign the tram tracks to enable construction of the station box.

The proposed construction of the Domain station recognises the need to provide at least one tram track, one bike lane and at least one traffic lane along St Kilda Road in each direction throughout the entire construction period.

There are two TBM access and retrieval options considered in the transport impact assessment for the southern sections of the tunnel works:

- Domain only (refer to Figure 7-17); and
- Both Domain and Fawkner Park (refer to Figure 7-1 and Figure 7-17).

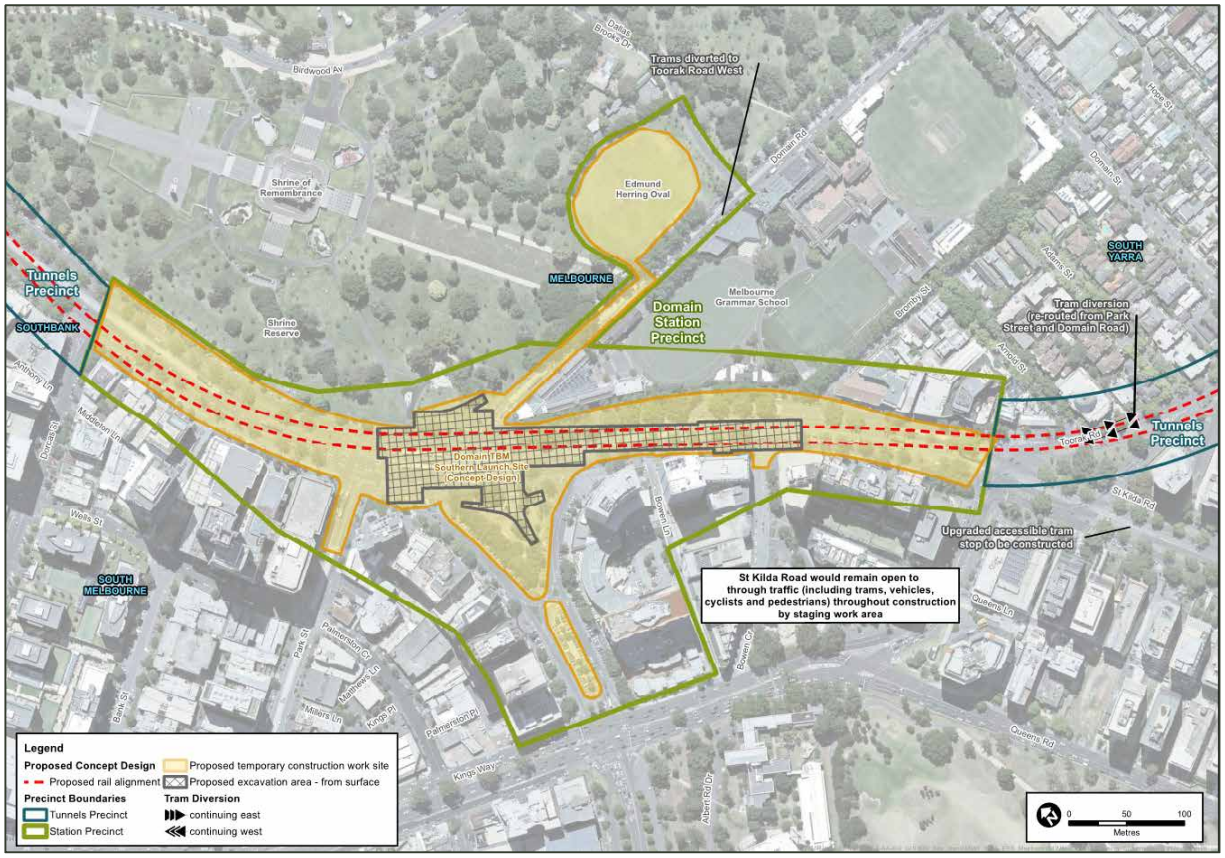

Figure 7-17 Domain station precinct construction work site outline

7.8.2 Domain Station Design

The key features of the Domain station design shown in Figure 7-18. Features include:

- Domain station would have four station entrances; one to the east into the Shrine parklands, two to the west into the triangular park located on the corner of Albert Road and St Kilda Road, and one entrance to the Domain tram interchange in the centre of St Kilda Road
- An underground (unpaid) connection to link both sides St Kilda Road
- The St Kilda Road functional layout shows two traffic lanes in each direction, and a parking lane which could be used as a Clearway during peak periods (refer to Appendix E of this report).

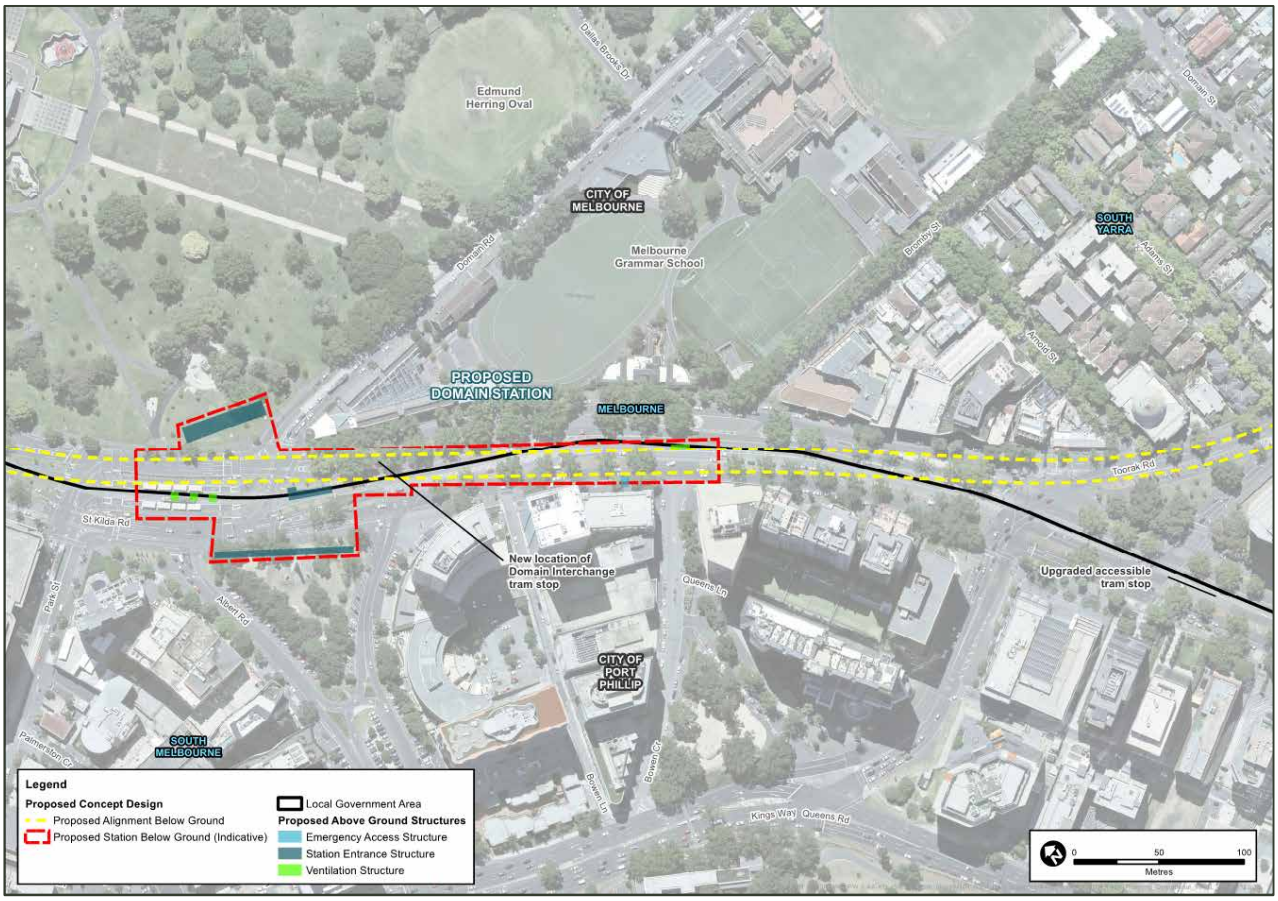

Figure 7-18 Domain station precinct legacy layout

7.9 Precinct 8: Eastern Portal (South Yarra)

7.9.1 Portal Location and Construction Outline

The eastern portal precinct connects the twin tunnels to the existing Dandenong rail corridor just west of Chapel Street as shown in Figure 7-19. The eastern portal precinct is shown in red and includes the approach to the tunnel and the tunnel works that connect to the tunnel precinct. The red dashed line shows the indicative rail alignment and the yellow hatch indicates the construction area, blue shows the decline structure, pink defines the tunnel cut and cover area, and green is the TBM retrieval box.

The Concept Design anticipates that William Street Bridge, the South Yarra Siding Reserve, Osborne Street and Lovers Walk would be affected by the construction works, and would require reinstatement or remediation works following construction.

The South Yarra Siding Reserve and Osborne Street Reserve would be occupied as part of the construction work site for the eastern portal construction. Construction access is constrained due to narrow streets and limited entry and exit points to the South Yarra Siding Reserve. The William Street bridge would not be available for local traffic for the duration of the eastern portal works.

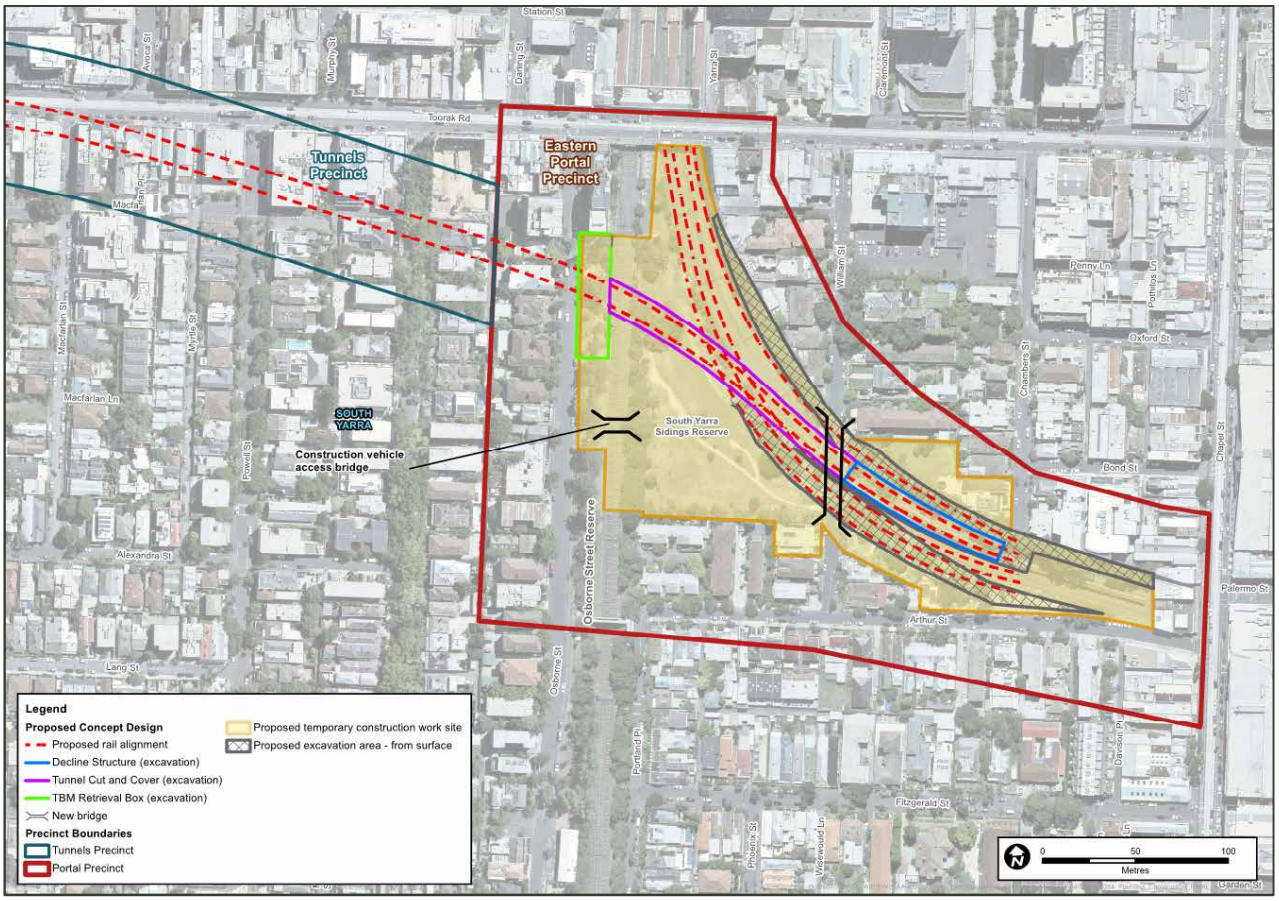

Figure 7-19 Eastern Portal precinct construction work site outline

7.9.2 Eastern Portal Melbourne Metro Legacy Rail Network

Melbourne Metro legacy rail network at the eastern portal is shown in Figure 7-20. It shows Melbourne Metro tracks emerging from the tunnel portal connecting to the existing tracks south of the South Yarra station, before the tracks pass under the Chapel Street bridge.

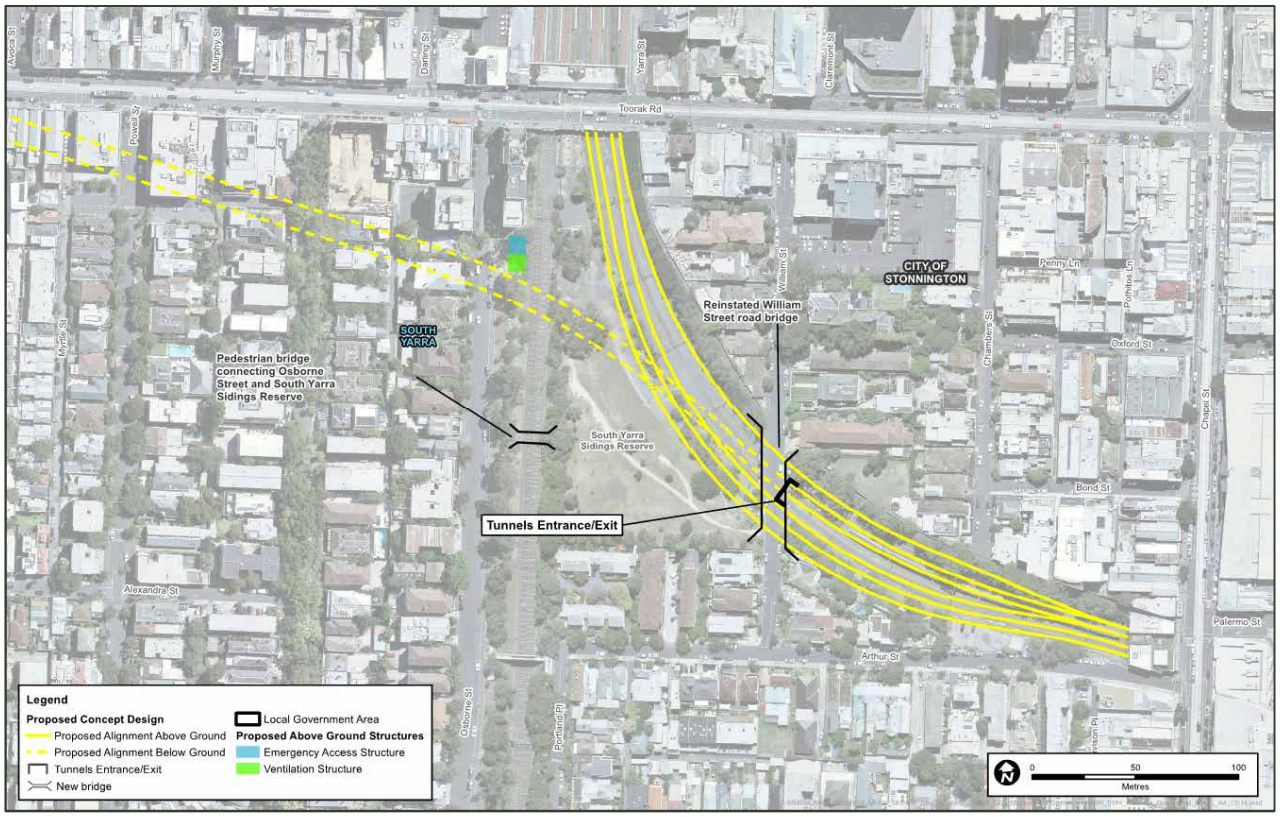

Figure 7-20 Eastern portal Melbourne Metro legacy rail network

7.10 Project Components - Precinct 9: Western Turnback

7.10.1 Western Turnback Location and Construction Outline

The initial operations of Melbourne Metro would have an imbalance in train numbers between the Sunbury and Cranbourne/Pakenham lines. This imbalance needs to be addressed by turning back some trains on the Sunbury line to run back towards the CBD to service the busy Cranbourne / Pakenham lines. The Concept Design includes a western turnback at West Footscray, with a third platform and track at West Footscray station, and associated modifications to the existing concourse.

The western turnback precinct comprises the area around the West Footscray station and the adjacent rail network shown in Figure 7-21.

7.10.2 Western Turnback Melbourne Metro Legacy Rail Network

Melbourne Metro legacy rail network at the western turnback is shown in Figure 7-22. It shows the changes to the existing tracks in the vicinity of the West Footscray station and the proposed new platform.

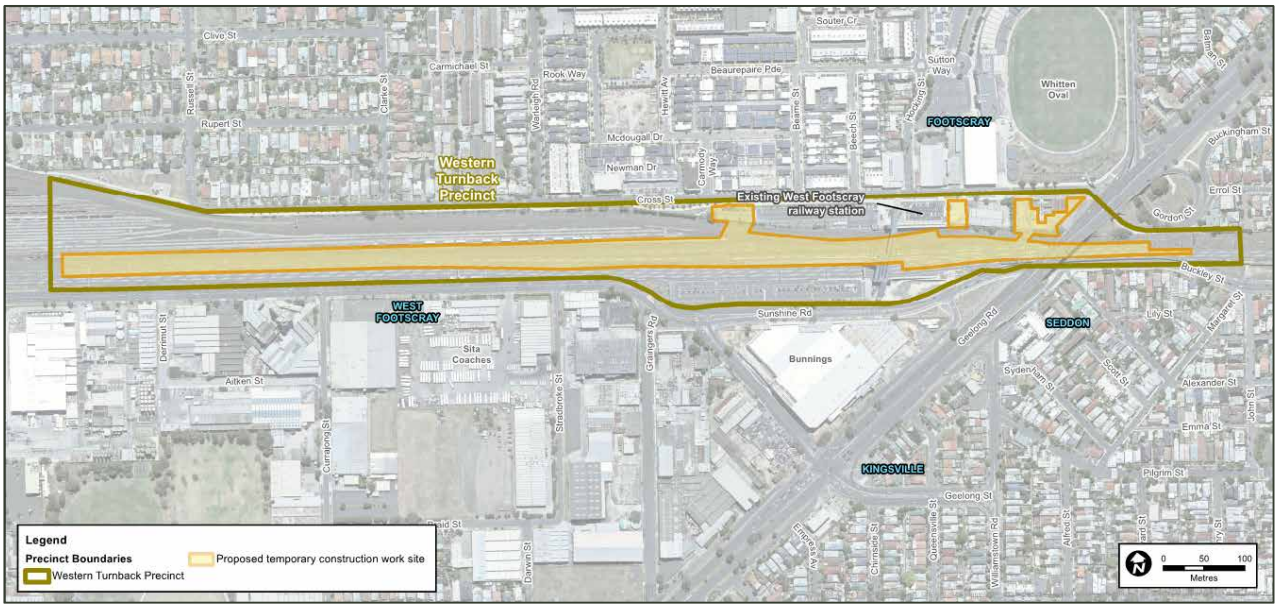

Figure 7-21 Western turnback precinct construction work site outline

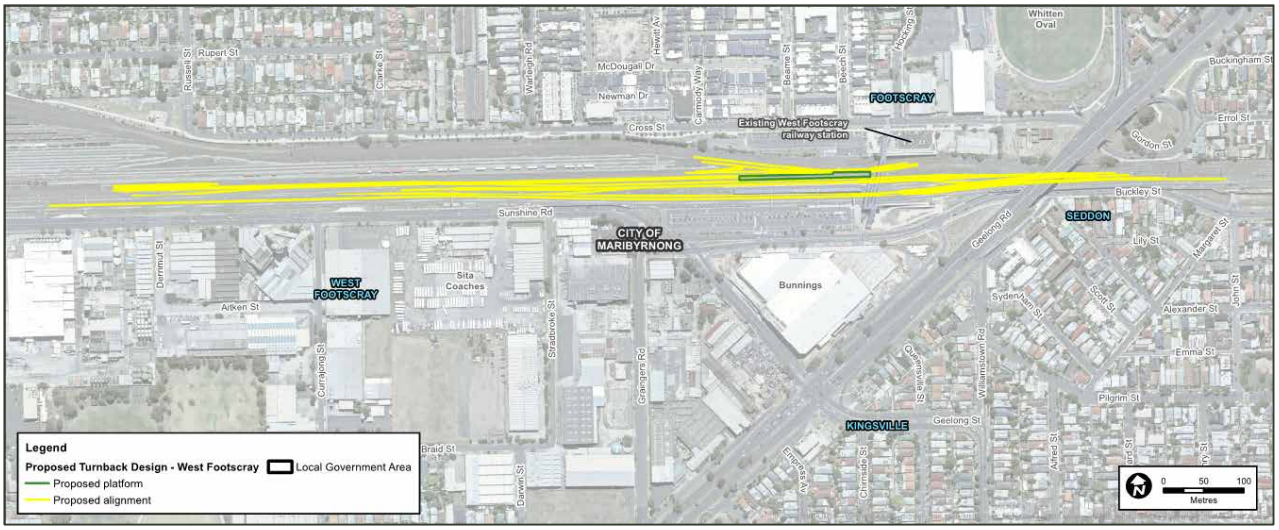

Figure 7-22 Western turnback Melbourne Metro legacy rail network

8 Construction Activity Assessment by Precinct

8.1 Draft Evaluation Objectives

The Scoping Requirements define the draft EES evaluation objectives and requirements. The Transport Connectivity Objective and associated requirements are relevant to this transport impact assessment and are shown in Table 2-1 and Table 2-2. The Scoping Requirements specify that the assessment of Melbourne Metro's impacts should consider specific requirements related to:

- Key issues
- Priorities for characterising the existing environment
- Design and mitigation measures
- Assessment of likely effects
- Approach to manage performance.

The EES Scoping Requirements relate to both construction of Melbourne Metro and its legacy outcomes. This section focuses on the construction-related impacts, and the subsequent sections assess the legacy or operational outcomes of the project against these EES Scoping Requirements.

An Existing Conditions report has been prepared detailing the existing conditions in each of the precincts. A copy of that report is included in Appendix B. An outline of the existing conditions is provided for each of the precincts in Section 8.

8.2 Overview of Proposed Construction Methodology

The key construction-related assumptions relevant to this report include:

- A large on-site workforce would be engaged during the construction period (refer to Table 8-1), and would require access to and from major work areas. As most of the major work sites are easily accessible by public transport, it is expected that parking provisions would not need to be significant, particularly in the CBD. On-site tool and equipment storage would reduce reliance on car travel. Where necessary, it is expected that the contractor would lease car parking space for employees. It is also expected that much of the workforce would travel outside of peak periods thereby reducing the impact on peak period traffic congestion. There is expected to be a minor impact on travel activity around the work sites, but the numbers of employees are relatively small in the context of these precincts, and a small proportion of the total workforce in these areas. Traffic generated by the construction workforce would be well within the daily fluctuations of traffic within and in the vicinity of these precincts. On this basis, and considering the daily fluctuations of traffic activity, the modelling presented below has not included the additional demands associated with the workforce travel activity. For sites outside the CBD, it is expected that some car parking provision would be arranged on-site for the workforce. This is a common approach adopted by contractors for major projects in the CBD and inner city areas
- Melbourne Metro is expected to generate a large amount of spoil that would need to be removed from construction areas by truck and transported elsewhere for disposal (see Section 20 Contaminated Land and Spoil Management)
- Vehicular access though each construction work site is to be maintained at all times for emergency vehicles
- Pedestrian and cycling connectivity would be maintained during construction wherever possible
- Access to businesses and residences at station construction locations would be maintained where possible but some access to some would be severely restricted

- 'Early works' tram diversion works would be undertaken to avoid having to divert tram services during construction wherever possible.

Managing the impacts of additional construction-related traffic on local streets (and on the road network more broadly) is a crucial component of Melbourne Metro's delivery. Detailed transport management plans would be implemented in each precinct to minimise the disruption to traffic caused by construction activities. These plans would include measures designed to:

- Manage traffic movements around works sites during the construction period
- Minimise truck movements during peak periods to avoid adverse impacts on peak period traffic
- Divert traffic to alternative routes and / or encourage motorists to use alternative routes
- Minimise truck movements at night time to reduce adverse impacts on residents.

These plans would also identify construction traffic routes to direct this traffic away from local streets and to the arterial road / freeway network as quickly as possible. Indicative construction traffic routes have been proposed for each precinct and are provided in Appendix C.

Construction hours

Construction of Melbourne Metro would require a number of construction work sites along the alignment corridor. The Concept Design includes construction work sites for major tunnelling and underground station works that correspond to the nominated station sites and other precincts described in this report.

Work that is undertaken on the above ground sections of Melbourne Metro would generally occur during standard construction hours of 7am – 6pm Monday to Friday, and 8am - 3pm on Saturdays. Above ground works on Sundays and Public Holidays may occur for the duration of Melbourne Metro construction, although it is expected this would generally be closely regulated and be communicated to relevant stakeholders in advance of commencement.

Underground tunnelling works would generally occur 24-hours a day, 7-days a week (includes TBM servicing and maintenance), along with above ground sites that support tunnelling and fit-out activities at stations. Spoil removal activities and tunnel supplies would generally be carried out 24-hours/day, 7-days/week at all sites. However, depending on road network conditions, disposal location availability and locational factors may be restricted to occur outside of peak traffic periods and special events. Removal activities include the transport of spoil to final disposal location. Various other works are expected to occur outside of standard hours at some times during the works.

Construction work site workforce

The Concept Design defines the peak construction workforce numbers as shown in Table 8-1. It should be noted that these represent an estimate of the workers on site and other personnel would be required to deliver Melbourne Metro that would not be part of the on-site workforce, such as support offices, manufacturing plants etc. Separate economic wide modelling has been completed that identifies that Melbourne Metro would create 3,900 jobs (net) across Victoria (including workforce numbers identified in Table 8-1) and approximately 4,700 (net) jobs nationally are expected to be supported at the peak of construction.

Table 8-1 Indicative construction workforce by precinct

Precinct	Indicative workforce
Western portal	84 workers
Arden station	421 workers
Parkville station	169 workers
CBD North station	151 workers
CBD South station	151 workers

Precinct	Indicative workforce
Domain station	289 workers
Eastern portal	93 workers
Fawkner Park	84 workers
Total	1,442 workers

Source: Advisian

As Melbourne Metro is proposing to operate many of the sites on a 24-hour, 7-day operation, there would be peak activity periods for arrival and departures around shift changeover times. There would typically be an overlap when both shifts are on site concurrently and the arrival and departure patterns would spread over a period of time. The management of these changeovers would need to be managed by the contractors to minimise the disruption to others living and working in the vicinity of the various work sites.

The employee travel to/from the work sites would be from all across the metropolitan area and would be on a mixture of travel modes. There would be a need for some employees to bring materials and equipment but most of that would be delivered and housed on site. Some would travel by car and potentially off-street car parking areas could be provided on site for some of the workforce at some locations, though it is expected that space would be at a premium at most sites and this would not be possible. Often contractors working on major projects would make arrangements for car parking nearby or would provide a shuttle bus service to off-site parking areas to manage parking demands. A proportion of worker travel would use the available public transport services to the work sites and some would travel by bicycle or walk.

Construction truck activity levels across the project

Trucks would comprise the majority of the construction traffic on the project. Construction truck volumes have been estimated for each site location based on the expected volumes of spoil to be removed, concrete to be poured and materials to be delivered. The other EES reports, and the construction truck route drawings in Appendix C, may refer to 'round' trips. A round trip comprises two truck movements, one travelling to the site and one travelling away from the site. For ease of assessment the transport impact assessment has converted these round trips so that they reflect the total truck movements, comprising trips to and from the work sites. The remainder of this section presents an assessment of the total truck movements.

As noted above, the construction of Melbourne Metro requires a number of construction work sites along the alignment corridor. Table 8-2 shows the number of truck movements estimated to be generated by each of the precincts if the TBM is launched from Domain only. They are reported by 6-month periods, over 48 months which is the peak construction period. There is project related traffic that leads into the start of the first 6 months and continues after the 48 month (for one to two years) but these traffic levels are significantly less than the 48 month period. For the purposes of the assessment we have selected the worst case time periods.

Table 8-3 shows the number of truck movements estimated to be generated by each of the precincts if the TBM is launched from Domain and Fawkner Park. They are reported by 6-month periods, over 48 months which is the peak construction period.

It shows that the peak activity levels are likely to occur in the period from 18 months to 24 months from the start of construction, with a peak of around 1,300 truck movements per day generated across the project.

Table 8-2 also shows that the most activity would be generated by the Arden station precinct, with an average of around 364 truck trips per day in that period. The CBD stations are the next busiest with around 210 average daily truck movements at the peak time. The impacts of construction vehicles are addressed throughout this Section by precinct.

The construction truck activity estimates include not only the spoil removal, but also the delivery of materials and equipment associated with the various construction activities (refer to Table 8-4). They do not include worker trips to/from the work sites.

It should be recognised that these are estimates developed by Advisian for the purpose of this assessment and are the best information available at the time of writing this report.

The tables below present estimates of the truck activity generated by each of the sites. However, all trucks need to be using the same road network to access the sites and to across the network to or from the respective destinations. As a result there is a need to consider the cumulative impacts of activity at multiple sites (e.g. Domain, Fawkner Park). Analysis of the cumulative impacts of the work sites is included in Section 10.

Table 8-2 Construction truck numbers distributed over time (for Southern TBM to be launched from Domain only)

Location	Timeframe (months)	Average Daily Truck Movements (total trips)	Months							
			1-6	6-12	13-18	19-24	25-30	31-36	37-42	43-48
Western portal	30	50	38	50	62	62	38	0	0	0
Arden station and Tunnels	48	260	156	260	312	364	312	260	208	208
Parkville station	48	100	60	100	120	140	120	100	80	80
CBD North station	48	150	90	150	180	210	180	150	120	120
CBD South station	48	150	90	150	180	210	180	150	120	120
Linlithgow Avenue Shaft	12	20	20	20	0	0	0	0	0	0
Domain station	48	100	60	100	120	140	120	100	80	80
Domain TBM Site and Tunnels	24	140	112	168	168	112	0	0	0	0
Fawkner Park Shaft	12	20	20	20	0	0	0	0	0	0
Eastern portal	30	50	38	50	62	62	38	0	0	0
	Totals	**1,040**	**684**	**1,068**	**1,204**	**1,300**	**988**	**760**	**608**	**608**

Source: Advisian

Numbers above do not include light vehicles for site workers.

Table 8-3: Construction truck numbers distributed over time (for Southern TBMs to be launched from Domain and Fawkner Park)

Location	Timeframe (months)	Average Daily Truck Movements (total trips)	Months							
			1-6	6-12	13-18	19-24	25-30	31-36	37-42	43-48
Western portal	30	50	38	50	62	62	38	0	0	0
Arden station and Tunnels	48	260	156	260	312	364	312	260	208	208
Parkville station	48	100	60	100	120	140	120	100	80	80
CBD North station	48	150	90	150	180	210	180	150	120	120
CBD South station	48	150	90	150	180	210	180	150	120	120
Linlithgow Avenue Shaft	12	20	20	20	0	0	0	0	0	0
Domain station	48	100	60	100	120	140	120	100	80	80
Domain TBM Site and Tunnels	24	70	56	84	84	56	0	0	0	0
Fawkner Park TBM Site and Tunnels	24	70	56	84	84	56	0	0	0	0
Fawkner Park Shaft	12	20	20	20	0	0	0	0	0	0
Eastern portal	30	50	38	50	62	62	38	0	0	0
	Totals	**1,040**	**684**	**1,068**	**1,204**	**1,300**	**988**	**760**	**608**	**608**

Source: Advisian

Numbers above do not include light vehicles for site workers.

The estimated split of construction trucks by type over the project duration is provided in Table 8-4. Note this split would vary by month dependent on the construction activities being performed.

Table 8-4: Estimated split of construction trucks by type - total project

Truck Type	% of Total Truck Numbers
Spoil Handling	33%
Concrete Delivery	20%
Materials & Equipment	47%

Source: Advisian

Figure 8-1 show the peak activity of construction trucks by 6 month periods during the construction program.

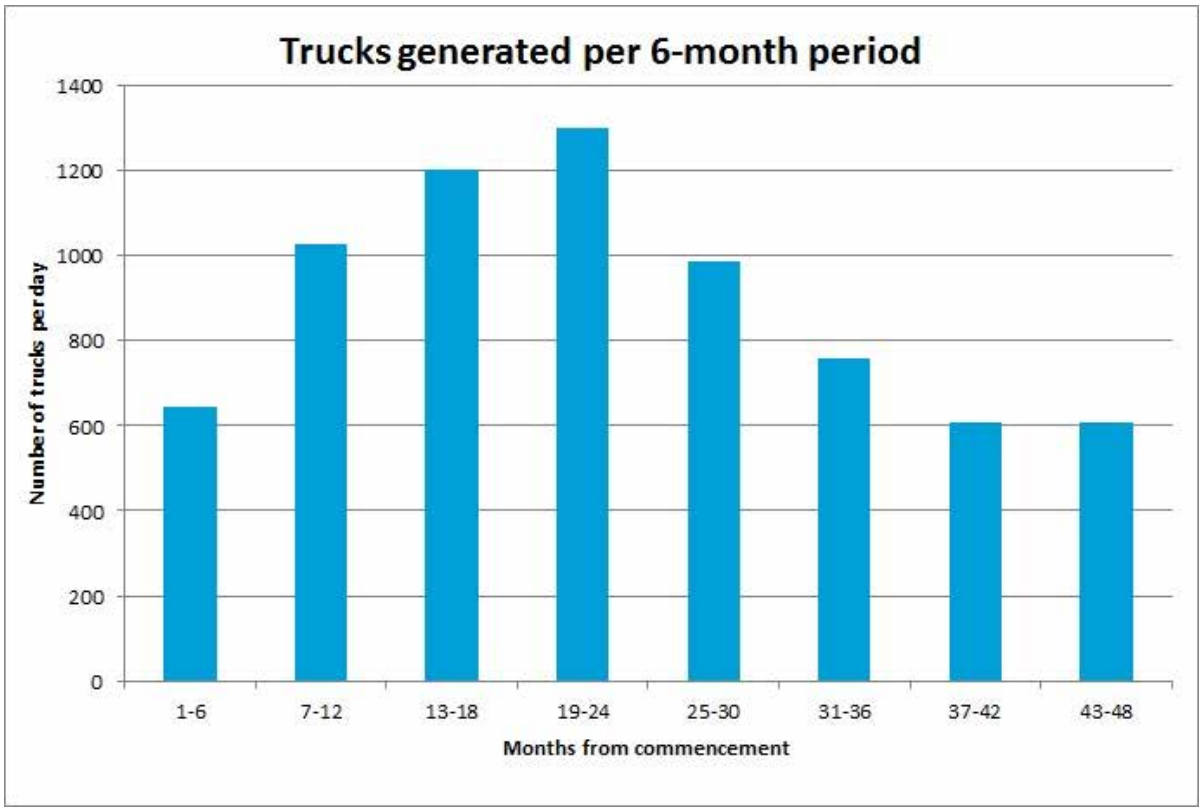

Figure 8-1 Peak activity for construction trucks by 6-month periods

Source: Advisian

The construction truck volumes predicted on Melbourne Metro are less concentrated than those typically predicted on a large-scale road tunnelling project. The reasons for this difference include:

- The project consists of multiple sites along the alignment with spoil removal, concrete and material delivery occurring at each of these locations, spreading the traffic load
- Spoil is removed at multiple locations along the alignment rather than each portal (i.e. both at TBM launch sites and each station box).
- The TBMs are not operating continuously without interruption. They pause excavation to pass through station boxes and also when they are retrieved from the end of their runs and relaunched to construct another tunnel run.
- Construction work at station locations would be interrupted when the TBMs pass through.
- There is a considerable proportion of spoil being removed through direct excavation at the stations and portals (70 per cent of the total volume vs 30 per cent from the tunnels).

8.3 Key Issues – Construction Traffic by Precinct

The key construction related issues and initial risk ratings associated with Melbourne Metro are outlined in Table 8-5 The initial risk ratings vary between precinct, primarily due to differences between the consequence of the identified risk happening.

These issues have been identified as key aspects of the identified risk categories that need to be considered in the transport impact assessment. Subsequent analysis of the construction approach and operations considers these issues in relation to the Concept Design including any planned mitigation measures and in the development of recommended Environmental Performance Requirements as outlined in the transport impact assessment.

Table 8-5 Key issues associated with Concept Design – Construction transport by precinct

Description	Issue	Risk Number
Precinct 1: Tunnels		
Emergency access shaft in Fawkner Park or Linlithgow Avenue and the TBM launch site at Fawkner Park	***Traffic*** management during the construction works, in particular increased heavy trucks on city streets associated with the TBM launch site and the emergency access shafts to maintain safety and network operations, and the potential for this to result in congestion and reduced connectivity. Traffic management plans need to identify and address site specific potential conflicts between truck movements to and from the work site and the other transport users, particularly vulnerable users like pedestrians and cyclists. ***Pedestrian and cycling*** facilities would need to be maintained through or around the works area to minimise disruption.	T001, T006
Precinct 2: Western portal		
Located adjacent to South Kensington station	***Traffic*** management arrangements during the construction works would need to be prepared to manage the truck activity associated with the 50 Lloyd Street Business Estate to minimise the impact of truck activity on affected residential properties. The closure of Childers Street and resulting loss of car parking could result in reduced connectivity for transport modes, and would need to be addressed as part of the traffic management plans. It would be desirable for as many replacement car parking spaces as practicable to be provided in the vicinity of the station / JJ Holland Park. There would also be occasional temporary weekend closures of Kensington Road to allow for construction work. Traffic management plans need to identify and address site specific potential conflicts between truck movements to and from the work site and the other transport users, particularly vulnerable users like pedestrians and cyclists. ***Public Transport*** measures would need to be introduced to provide replacement services as a result of some short occupations during construction of the (i.e. weekend and extended Saturday night occupations) affecting the Werribee lines through South Kensington station. ***Pedestrian and cycling*** facilities need to provide safe and effective movement of pedestrians and cyclists around the work site during the construction phase. Provision of a new shared path around the works site should minimise the impact of the works at this site on pedestrian and bicycle movements although this would need to be addressed as part of the traffic management plans.	T002
Precinct 3: Arden station		
Located on existing industrial land	***Traffic*** management during the construction works associated with the transport of spoil and materials to and from the Arden site. As this site would be a major construction work site, the activity levels are expected to be greater than at other sites and would require careful management of potential conflicts between construction vehicles and other transport users, particularly where vehicles cross footpaths and bicycle lanes.	T003, T006

Description	Issue	Risk Number
	The current activities on the site already generate truck traffic in the area so while this amount of construction traffic would cause some disruptions, the roads in the vicinity of the site have sufficient capacity to accommodate the additional traffic. Traffic management plans need to identify and address site specific potential conflicts between truck movements to and from the construction work site and the other transport users, particularly vulnerable users like pedestrians and cyclists. ***Public transport*** operations (service frequency and connectivity) would need to be maintained or measures introduced to provide replacement services. ***Pedestrian and cycling*** facilities need to provide safe and effective movement of pedestrians and cyclists around the construction work site during the construction phase.	
Precinct 4: Parkville station		
Located under Grattan Street, to the east of Royal Parade	***Traffic*** management during the construction works associated with the closure of Grattan Street to manage the traffic operation and safety impacts of associated diversions around the area. As this site is located in an area with high levels of pedestrian and cyclist activity associated with the hospitals and the university, it would require careful management of potential conflicts between construction vehicles and other transport users, particularly where vehicles cross footpaths and bicycle lanes. Traffic management plans need to identify and address site specific potential conflicts between truck movements to and from the construction work site and the other transport users, particularly vulnerable users like pedestrians and cyclists. ***Public transport*** operations (service frequency and connectivity) would need to be maintained or measures introduced to provide replacement services. Particular attention would need to be given to the management of tram related activities associated with construction works and the Grattan Street closure, and the appropriate diversion of heavily utilised bus services, in particular Route 401. ***Pedestrian and cycling*** facilities need to provide safe and effective movement of pedestrians and cyclists around the construction work site during the construction phase. Particular attention would need to be given to the management of pedestrian and cyclist movements around the Grattan Street closure.	T005
Precinct 5: CBD North station		
Located under Swanston Street, between Franklin and La Trobe Streets. Entrances on: • east side of Franklin Street • corner of Swanston Street and La Trobe Street • underground connection to	***Traffic*** management during the construction works to manage the traffic operation and safety impacts of traffic diversions around the area associated with: • the closure of Franklin Street east of Swanston Street • the closure of A'Beckett Street to allow construction traffic movements • increased construction traffic for the duration of CBD North construction works As this site is located in the CBD in an area with high levels of pedestrian and cyclist activity, it would require careful management of potential conflicts between construction vehicles and other transport	

Description	Issue	Risk Number
Melbourne Central Station	users, particularly where vehicles cross footpaths and bicycle lanes. Traffic management plans need to identify and address site specific potential conflicts between truck movements to and from the construction work site and the other transport users, particularly vulnerable users like pedestrians and cyclists. ***Public transport*** operations (service frequency and connectivity) would need to be maintained or measures introduced to provide replacement services. Particular attention would need to be given to the management of tram related activities associated with construction works and the Franklin Street closure. ***Pedestrian and cycling*** facilities need to provide safe and effective movement of pedestrians and cyclists around the construction work site during the construction phase. Particular attention would need to be given to the management of pedestrian and cyclist movements around the Franklin Street closure.	
Precinct 6: CBD South station		
Located under Swanston Street, between Collins and Flinders Streets with entrances from: • Collins Street at City Square • Flinders Street including the Port Phillip Arcade site • Flinders Street station via an underground connection • Federation Square via an underground connection	***Traffic*** management during the construction works and to manage the traffic operation and safety impacts of associated diversions around the area associated with the: • works at the Collins Street entrance at City Square • works at the Flinders Street entrance including the Port Phillip Arcade site • works related to the underground connection from Flinders Street station to CBD South station would result in the temporary closure of Flinders Street (2- 3 months) • works at the underground entrance connection to Federation Square As this site is located in the CBD in an area with high levels of pedestrian and cyclist activity, it would require careful management of potential conflicts between construction vehicles and other transport users, particularly where vehicles cross footpaths and bicycle lanes. Traffic management plans need to identify and address site specific potential conflicts between truck movements to and from the construction work site and the other transport users, particularly vulnerable users like pedestrians and cyclists. ***Public transport*** operations (service frequency and connectivity) would need to be maintained or measures introduced to provide replacement services. Particular attention would need to be given to the management of tram related activities associated with construction works in particular: • Works related to the underground connection from Flinders Street station to CBD South station would result in the temporary closure of Flinders Street (2- months) impacting trams and bus services. ***Pedestrian and cycling*** facilities need to provide safe and effective movement of pedestrians and cyclists around the construction work site during the construction phase	T004

Description	Issue	Risk Number
Precinct 7: Domain station		
Located under St Kilda Road, adjacent to Albert Road	***Traffic*** management during the construction works associated with the closure of Domain Road and the reduction in road capacity for traffic travelling through and around the Domain station works site along St Kilda Road, and to manage traffic operation and safety impacts of associated diversions around the area. As this site is located adjacent to St Kilda Road and the Domain parklands in an area where there are high levels of pedestrian and cyclist activity it would require careful management of potential conflicts between construction vehicles and other transport users, particularly where vehicles cross footpaths and bicycle lanes. Traffic management plans need to identify and address site specific potential conflicts between truck movements to and from the construction work site and the other transport users, particularly vulnerable users like pedestrians and cyclists. ***Public transport*** operations (service frequency and connectivity) would need to be maintained or measures introduced to provide replacement services. Particular attention would need to be given to the management of tram related activities associated with construction works and the Domain Road closure. The construction of Domain station would require the closure of Domain Road. This would result in the route 8 tram along Domain Road being re-routed via Toorak Road to connect with existing tram tracks along St Kilda Road. There would be a number of phases during construction to reroute trams along St Kilda Road. This would result in temporary occupations of the tram network and relocation of tram and bus stops. ***Pedestrian and cycling*** facilities need to provide safe and effective movement of pedestrians and cyclists around the construction work site during the construction phase. Particular attention would need to be given to the management of pedestrian and cyclist movements around the Domain Road closure and along St Kilda Road.	T005, T007
Precinct 8: Eastern portal		
The eastern portal works involve connection to the existing rail networks	***Traffic*** management arrangements would need to be developed to minimise truck activity during the construction works and minimise associated impacts on local residents and the operation of Toorak Road during peak periods. Traffic management plans need to identify and address site specific potential conflicts between truck movements to and from the construction work site and the other transport users, particularly vulnerable users like pedestrians and cyclists including the high level of pedestrian activity on Toorak Road associated with the South Yarra station. ***Public transport*** operations (service frequency and connectivity) would need to be maintained or measures introduced to provide replacement services as a result of numerous temporary occupations on the Frankston, Dandenong and Sandringham lines running through South Yarra station.	T001, T007

Description	Issue	Risk Number
	Truck movements to and from Toorak Road may need to be actively managed to avoid disruption to the tram services along Toorak Road. ***Pedestrian and cycling*** facilities need to provide safe and effective movement of pedestrians and cyclists around the construction work site during the construction phase.	
Precinct 9: Western turnback		
The western turnback would be at West Footscray with a third platform and track at Footscray station, with modifications to existing concourse	***Traffic*** management during the construction works associated with the western turnback. Traffic management plans need to identify and address site specific potential conflicts between truck movements to and from the construction work site and the other transport users, particularly vulnerable users like pedestrians and cyclists. ***Public transport*** operations (service frequency and connectivity) would need to be maintained or measures introduced to provide replacement services. ***Pedestrian and cycling*** facilities need to provide safe and effective movement of pedestrians and cyclists around the construction work site during the construction phase. Construction activity in a live rail environment would need to be sensitive to the existing rail users as well as surface level pedestrian movements	T008

The impact assessment that follows investigates these issues, and recommends Environmental Performance Measures that are aimed at reducing potential transport impacts, and their risk ratings. A discussion of how the Environmental Performance Requirements achieve a residual risk rating is included at Section 11.

8.4 Impact Assessment - Precinct 1: Tunnels

8.4.1 Existing Conditions

The existing conditions for this precinct are discussed in Section 8.10 Impact Assessment Precinct 7: Domain Station.

8.4.2 Proposed Construction Traffic Routes

The Concept Design includes construction vehicle routes for the emergency access shafts in Fawkner Park and the proposed works site at Linlithgow Avenue. There are also two TBM access and retrieval options considered in the transport impact assessment for the southern sections of the tunnel works:

- Both Domain and Fawkner Park
- Domain only.

Discussion related to construction within the Domain precinct can be found in Section 8.10.

These routes are shown in Figure 8-2 (Fawkner Park) and Figure 8-3 (Linlithgow Avenue). The truck access routes have been developed to provide the most direct route to the motorway network in order to minimise impacts on adjacent residents and sensitive areas.

For the Fawkner Park sites, there are three routes shown on Figure 8-2:

- Route 1 is via Kings Way, St Kilda Road, Toorak Road West (shown in red)
- Route 2 is one-way via Toorak Road West, Punt Road, Swan Street, Batman Avenue (shown in purple)
- Route 3 is to/from Arden site for delivery of materials etc. via Kings Way (shown in blue).

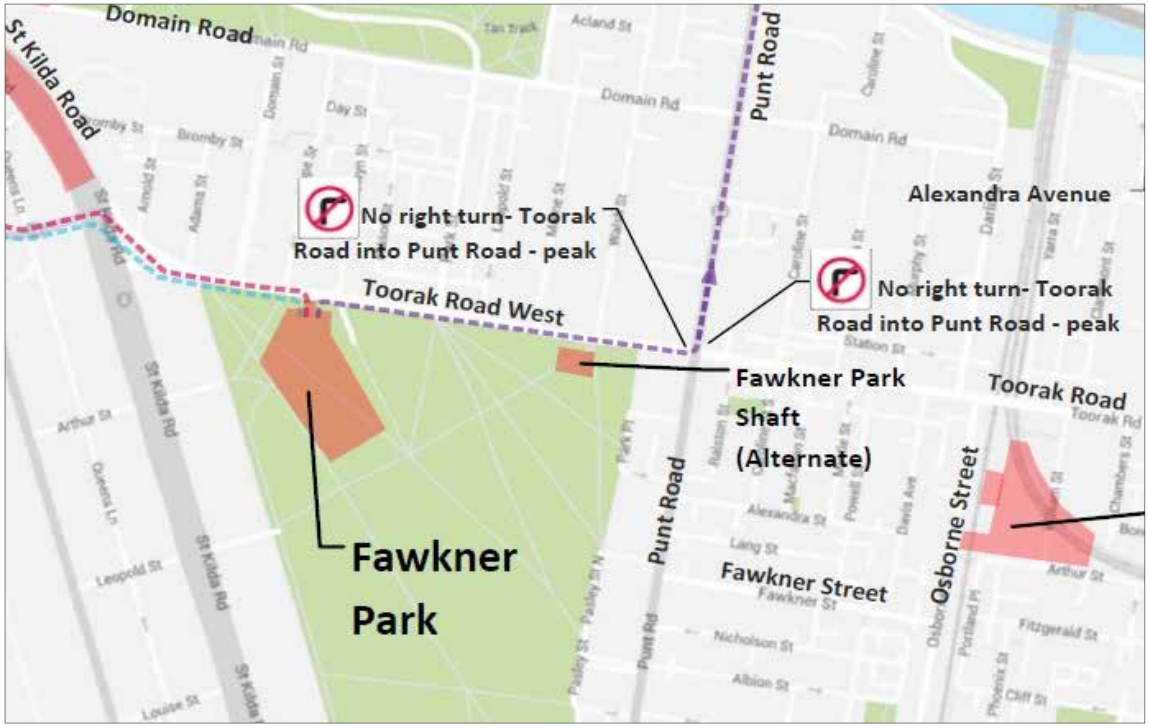

Figure 8-2 Fawkner Park construction vehicle access routes

For the Linlithgow Avenue site, there are four routes shown on Figure 8-3:

- Linlithgow Avenue shaft final access route to/from various site entrances (shown in green)
- Route 1 is via Power Street and City Road (shown in orange)
- Route 2 is to/from Monash Freeway via Batman Avenue, Swan Street, Alexandra Avenue (shown red)
- Route 3 is to/from Arden site for delivery of materials etc. via Kings Way (shown in blue).

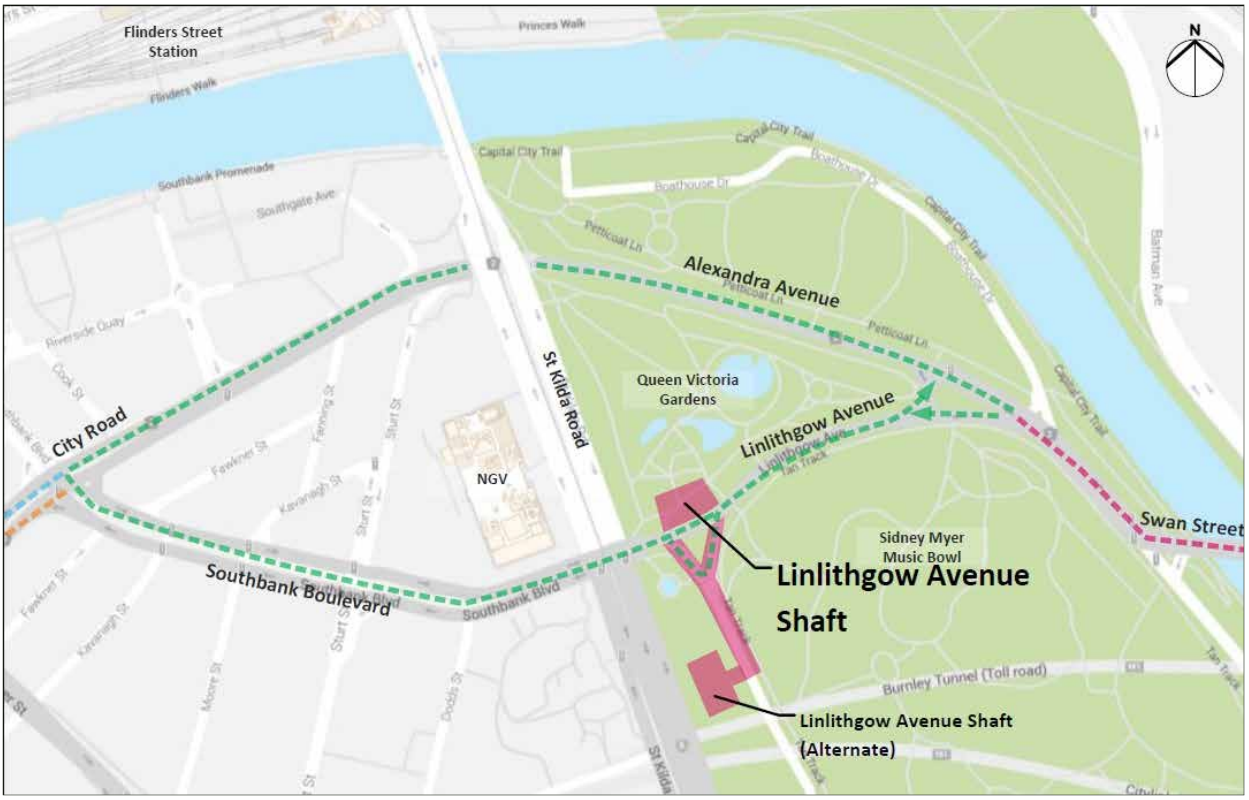

Figure 8-3 Linlithgow Avenue construction vehicle access routes

8.4.3 Road Transport Impact Assessment

Traffic disruptions

It is expected that there would be disruptions to local road traffic due to construction traffic activity associated with the Fawkner Park site, including:

- Access to major arterial roads for spoil and materials supply would require construction traffic on St Kilda Road, Punt Road, Toorak Road, Commercial Road and Domain Road in particular
- Truck movements are expected to involve standard hours of operation, however the site operation is expected to be 24-hours, 7-days per week

There are two Fawkner Park emergency access shaft sites that are being considered, and each would be expected to have similar levels of activity and impact. Access to/from both sites would be onto the same section of Toorak Road frontage to the park, where there are residential dwellings on the northern side of Toorak Road.

There are two Linlithgow Avenue emergency shaft sites that are being considered and these have more direct access to the motorway network, via Southbank Boulevard and Swan Street bridge, and one likely to have less impact on local residents and traffic operations.

Truck movements

The anticipated working hours at the Fawkner Park construction work site are 24-hour, 7-day operations for a period of up to 24 months. Based on the anticipated scale of spoil removal and materials delivery

activities, it is expected that there would be an average of around 90 truck movements per day over that period travelling to/from the Fawkner Park site. Peak activity is expected to be higher at around 104 truck movement per day (see Table 8-6).

Table 8-6 Fawkner Park - Estimated truck trip generation (total movements)

Fawkner Park - Estimated truck trip generation (total movements)	Emergency Access Shaft	TBM Site	TOTAL
Site working hours	24 hours, 7 days per week (upon placement of acoustic sheds)		
Timeframe (months)	12	24	36
Average daily truck trips	20	70	90
Peak average daily truck trips	20	84	104

Source: Advisian

The Linlithgow Avenue emergency access shaft site would have around 20 truck movements per day over an 18 month period as shown in Table 8-7.

Table 8-7 Linlithgow Avenue - Estimated truck trip generation (total movements)

Linlithgow Avenue - Estimated truck trip generation (total movements)	
Site working hours	24 hours, 7 days per week
Timeframe (months)	18
Average daily truck trips	20
Peak average daily truck trips	21

Source: Advisian

This level of truck volume added to the road network over a day is expected to have minimal impact on traffic operations as it is expected that much of the construction traffic would occur outside of peak hours when other demands on the network are considerably lower.

This analysis indicates that there would on average be a combined peak volume of around 125 truck movements per day at the Fawkner Park and Linlithgow Avenue sites. This is a relatively small number of vehicles compared to daily truck volumes on the key traffic routes Linlithgow Avenue, Power Street, City Road, Batman Avenue, Swan Street, Punt Road and Alexandra Avenue. All of these roads are currently carrying in excess of 10,000 vehicles per day.

Proposed construction traffic routes for these construction work sites aim to provide the most direct route to the motorway network for trucks and other construction traffic. However, the constructor would need to manage the travel routes and time of operation of truck movements to minimise operations during peak periods and night times to avoid adverse impacts on peak period traffic and the residential amenity in the Fawkner Park area.

Impacts from additional truck and construction traffic would be minimised through the implementation of a detailed traffic management plan that would divert traffic around the construction work sites and minimise truck movements through residential areas and during peak periods and at night time. With the implementation of these measures, there would still be some disruptions to the local road network from additional construction traffic.

Operational analysis

Traffic modelling has been undertaken to determine the likely impact of the proposed changes to the road network during construction, including the planned closures of Domain Road for the period of the construction of Domain station. Refer to the Domain station precinct analysis for details.

The analysis undertaken indicates that the Domain Road closure and associated traffic management arrangements (i.e. advisory signage etc.) would result in some diversion of traffic away from Domain Road and Fawkner Park, thereby resulting in a minor change to the traffic operations in these areas.

Truck movements at the Linlithgow Avenue site one expected to operate outside of peak periods. With small truck numbers to/from this site (less than one movement per hour across the day) and close proximity to two accesses to the motorway network, it is expected that this arrangement would have little impact on current activity in the area.

8.4.4 Public Transport Impact Assessment

No public transport services would need to be changed as a result of construction activities within the tunnel precinct at either site. Impacts of construction vehicles on the travel times and reliability of bus and tram services would be negligible given the very small proportion this represents of the total traffic volumes on the key roads within the vicinity of this precinct, As a result there are no recommended Environmental Performance Requirements for managing public transport operations.

The Fawkner Park site is adjacent to Toorak Road, where trams would be rerouted due to the closure of Domain Road (see Domain station precinct discussion in Section 8.10). This would change the travel patterns for people in the area that currently use the Domain Road tram.

8.4.5 Active Transport Impact Assessment

The establishment of construction work sites at Fawkner Park and Linlithgow Avenue would involve truck access to and from Toorak Road, mainly outside of peak periods. Traffic access arrangements to accommodate turns into and out of Fawkner Park would need to include measures to minimise truck conflicts with bicycles and pedestrians, and provide a safe site access with good sightlines for all road users.

Where the numbers of pedestrian and cyclists is high the contractor should consider active control at the site access to maintain safety of all persons.

In all cases, suitable measures should be implemented to direct pedestrian and bicycle movements safely and effectively around the works sites.

8.4.6 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Construction)

Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to:

- Management of any temporary or permanent full or partial closure of traffic lanes including (but not limited to):
  - Linlithgow Avenue, Melbourne
  - St Kilda Road, Domain Road, Albert Road at Domain
  - Toorak Road at Fawkner Park
- Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction

- Traffic management plan(s) must be developed recognising other projects operating concurrently, where relevant
- Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors
- Provision of suitable routes for vehicles to maintain connectivity for road users adjacent to the construction work sites
- In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites
- Special arrangements for delivery or removal of large loads.

Public Transport (Construction)

- Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria, including (but not limited to):
  - Tram operations on Toorak Road and the diversion of the Domain Road tram route
  - Tram routes on St Kilda Road
  - Disruption to other tram routes through Domain tram stop.

Active Transport (Construction)

- Develop and implement transport management measures in consultation with relevant authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) Toorak Road, St Kilda Road and Fawkner Park
- In consultation with the City of Melbourne provide suitable routes for, cyclists and pedestrians to maintain connectivity and safety for roads and shared paths to provide continued access, including (but not limited to) St Kilda Road, Toorak Road and Fawkner Park
- Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists.

Travel Demand Management

- In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.

8.4.7 Conclusion

There would on average be a combined peak volume of around 125 truck movements per day at the Fawkner Park and Linlithgow Avenue sites. This is a relatively small number of vehicles compared to daily truck volumes on the key traffic routes Linlithgow Avenue, Power Street, City Road, Batman Avenue, Swan Street, Punt Road and Alexandra Avenue.

The level of truck volume added to the road network on a daily basis during construction is expected to have minimal impact on traffic operations as it is expected that much of the construction traffic would occur outside of peak hours when other demands on the network are considerably lower.

There would be little, if any, impact of the works at either Fawkner Park or Linlithgow Avenue on public transport operations and safety. The Fawkner Park site is adjacent to Toorak Road where trams would be rerouted due to the closure of Domain Road.

Traffic access arrangements to accommodate turns into and out of Fawkner Park would need to include measures to minimise truck conflicts with bicycles and pedestrians, and provide a safe site access with good sightlines for all road users.

The impacts of additional truck and construction traffic as well as other temporary road closures and diversions would be minimised through the implementation of a detailed transport management plan. Travel demand management tools would be used to encourage people to change their travel behaviour which would assist in reducing these impacts.

The implementation of the Environmental Performance Requirements would result in minor residual risks to the transport network and operations during construction.

8.5 Impact Assessment Precinct 2: Western Portal

8.5.1 Existing Conditions

8.5.1.1 Precinct Context

The western portal is located adjacent to the existing South Kensington station and associated pedestrian underpass. The precinct contains housing, public open space, and an industrial estate to the north, whilst railway lines and a freight terminal are located to the south. JJ Holland Park is located to the north of the portal – a popular recreational facility used by local schools and sports clubs.

To the east of the western portal is a business park accessed from both Lloyd Street and Childers Street, with access controlled by gates and after-hours access from Childers Street requiring security access.

8.5.1.2 Road Network

Table 8-8 lists the SmartRoads categorisation of the road network near the portal precinct. CityLink is the only preferred traffic route within the western portal precinct. Dynon Road and Macaulay Road are designated traffic routes. Dynon Road, Lloyd Street and Epsom Road (north of Smithfield Road) are approved B-double and higher mass truck routes.

CityLink is a major tollway that functions as a bypass from the CBD and the West Gate Freeway to the Tullamarine Freeway and the M80 Ring Road near Essendon. It connects through to the Monash Freeway, which is tolled up to Toorak Road in Malvern. It passes over the western portal precinct and has off/on-ramps at Dynon Road and Racecourse Road, and a full interchange at Footscray Road.

Dynon Road is an arterial highway which provides a link into the CBD from Melbourne's western suburbs, providing an alternative to Footscray Road. It is a dual carriageway corridor where significant truck volumes are common as it is an important connection to the Port of Melbourne.

Table 8-8 Western portal precinct - SmartRoads road user priority classifications

SmartRoads Classification	Road Transport			Public Transport	Active Transport	
	Preferred Traffic Route	Traffic Route	Local Primary Access Route	Bus Priority Route	Bicycle Priority Route	Pedestrian Priority Area
Declared Roads						
City Link	✓	-	-	-	-	-
Dynon Road	-	✓	-	✓	✓*	-
Local Roads						
Macaulay Road	-	✓(east of Boundary Road)	✓	✓	✓*	✓(east of Kensington Rd)
Epsom Road	-	-	✓	-	✓**	-
Kensington Road	-	-	✓	✓	✓*	-
Lloyd Street	-	-	✓	-	- **	-

SmartRoads Classification	Road Transport			Public Transport	Active Transport	
	Preferred Traffic Route	Traffic Route	Local Primary Access Route	Bus Priority Route	Bicycle Priority Route	Pedestrian Priority Area
Arden Street	-	-	✓(east of Lloyd Street)	-	✓**	-
Childers Street	-	-	-	-	✓**	-
Hobsons Road	-	-	-	-	✓**	-
Tennyson Street	-	-	-	-	✓**	-
Ormond Street	-	-	-	-	-	-

* Principal Bicycle Network, ** Local Bicycle Network

Source: Transmaps, 2015 (http://www.maps.vic.gov.au/TransMaps/ui/DotmapUI.jsp)

There are a number of network constraints in the western portal precinct:

- Lloyd Street has three closely spaced railway bridges with the lowest clearance height of 3.1 m
- Kensington Road has a railway bridge with a height restriction of 4.7 m located to the south of Childers Street and Hobsons Road
- Macaulay Road from Epsom Road to Stubbs Street has a truck curfew from 7am – 7pm Monday to Friday and 7am – 1pm, Saturday.

8.5.1.3 Rail Network

The nearest station to the western portal location is South Kensington, which is an unstaffed station located on Childers Street.

The station is served by the Werribee and Williamstown lines. Other railway lines that pass through South Kensington, but do not stop, are the Sunbury line and the regional V/Line services for Melton/Ballarat, Bendigo and Geelong.

8.5.1.4 Tram Network

There is no tram route within the western portal precinct.

8.5.1.5 Bus Network

There are five bus services operating near the western portal:

- Routes 216 and 219 travel along Dynon Road to the south of the portal location
- Route 402 travels along Kensington Road to the west of JJ Holland Park and the portal location
- Route 404 travels along Epsom Road / Smithfield Road to the north of the portal location.

Dynon Road, Macaulay Road, and Kensington Road are all identified as designated SmartRoads bus priority routes. There are currently 18 bus services (peak direction) during the peak hour[17] operating in the vicinity of the western portal.

8.5.1.6 Pedestrian Environment

There is a good provision of pedestrian infrastructure in the vicinity of the western portal precinct. With the exception of Dynon Road, all roads connecting the site to the wider road network have footpaths on both sides of the carriageway providing a continuous network near and throughout the western portal precinct. During the AM peak period, there are typically 530 passenger entries / exits at South Kensington station

[17] Peak hour is typically the part of the day when the most public transport services operate.

(refer to Appendix D of this report).The key access modes to the station in the morning peak for boarding passengers are walk (80 per cent), car (16 per cent) and 2.5 per cent by bicycle[18].

8.5.1.7 Bicycle Environment

There are a number of on-road and off-road bicycle lanes in the vicinity of the western portal location including an off-road shared path on Childers Street between Kensington Road and Ormond Street and an on-road bicycle path east of Ormond Street. This bicycle path provides a strong connective role to well utilised bicycle paths on Arden Street, Queensberry Street, Wreckyn Street, Moonee Ponds Creek, Hobsons Road and Maribyrnong River.

8.5.2 Proposed Construction Traffic Routes

The objective of the proposed construction traffic routes is to access the arterial road/motorway network as soon as possible. There are arterial roads and motorways in close proximity to the construction work sites. Proposed traffic routes to and from construction work sites are shown on Figure 8-4 for the immediate area around the precinct – maps showing the broader area are included in Appendix C of this report.

The proposed western portal vehicle access options are:

- Route 1 – Dynon Road, Kensington Road, Childers Street (shown in blue)
- Route 2 – Footscray Road, Dynon Link Road, Dynon Road, Kensington Road, Childers Street (shown in purple)
- Route 3 – Footscray Road, Napier Street, Whitehall Street or Sims Street, Hopkins Street, Dynon Road, Kensington Road, Childers Street (shown in red)
- To and from other construction work sites – to/from Arden site (shown in light blue).

All of the proposed routes are VicRoads arterial roads (declared main roads) and Road Zone, Category 1 in the respective planning schemes apart from the following:

- Childers Street, Kensington
- Kensington Road, Kensington.

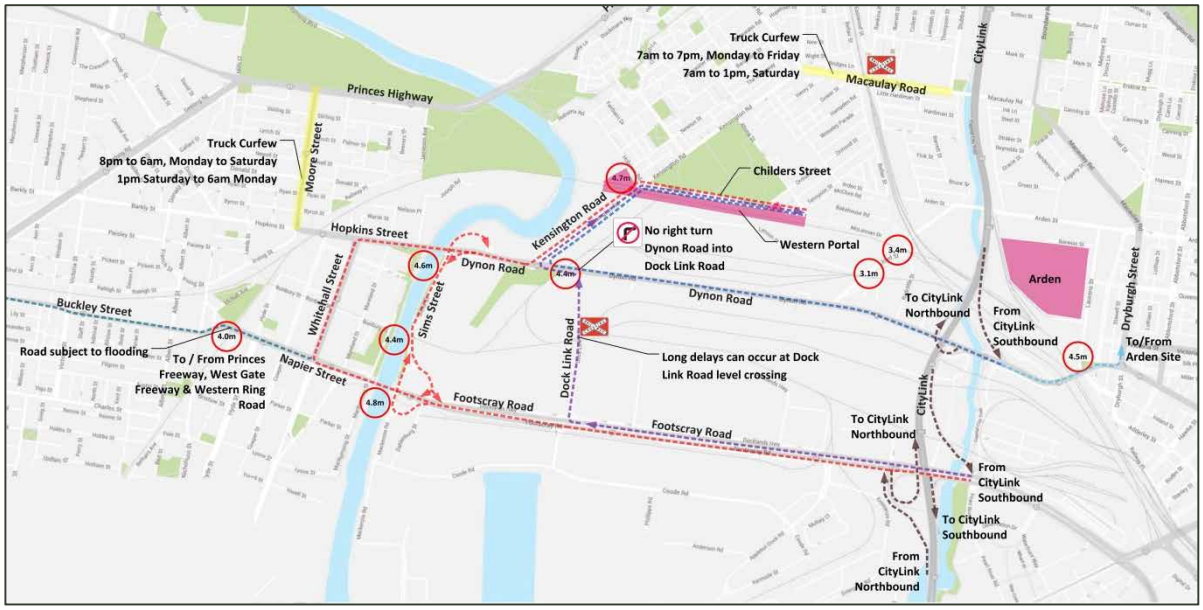

Figure 8-4 Western portal precinct construction vehicle access routes

[18] Public Transport Victoria, 'Train Station Patronage Fact Sheet', http://ptv.vic.gov.au/about-ptv/ptv-data-and-reports/research-and-statistics/,

8.5.3 Road Transport Impact Assessment

Traffic disruptions

Traffic disruptions in the western portal precinct would likely result in:

- Disruptions to Childers Street in various stages of construction, particularly at the eastern end where the road is expected to be required for the construction of the decline structure for the tunnel entry. This involves some property acquisition, temporary closure of Childers Street and temporary removal of the current closures of Ormond Street and Tennyson Street. Vehicles wishing to access the business park at the end of Childers Street would be encouraged to travel via Lloyd Street if possible. For over-height vehicles that cannot negotiate the low clearance bridges on Lloyd Street, access would be via Tennyson Street, Altona Street, Ormond Street and back to Childers Street
- There would be temporary weekend closures of Kensington Road (up to 3 weekends)
- Car parking spaces on Childers street to be temporarily occupied for construction traffic and equipment manoeuvring. Options are being investigated to provide replacement parking in the vicinity of the station to minimise impacts on rail patrons driving to the station and users of JJ Holland Park, but details are not available at the time of writing this report. It is expected that the contractor would be required to provide replacement car parking, for as many displaced car parking spaces as practicable, in the vicinity of the station during the construction phase
- Truck access and movement for construction works to be based on 24-hour operation.

Truck movements

Based on the expected spoil removal approach, plus materials delivery activities, it is expected that there would be an average of around 50 truck movements per day over 30 months travelling to/from the western portal site. Peak activity is expected to average around 20 per cent higher or around 60 truck movements per day. All access would be via Childers Street and Kensington Road to/from Dynon Road, each of which has adequate capacity to accommodate this small increase in trucks from the construction area.

Table 8-9 Western portal - Estimated truck trip generation (total movements)

Western portal - Estimated truck trip generation (total movements)	
Site working hours	24 hours, 7 days per week (upon placement of acoustic sheds)
Timeframe (months)	30
Average daily truck trips	50
Peak average daily truck trips	62

Source: Advisian

Operational analysis

The major impact of the works at the western portal site would be related to the closure of the eastern end of Childers Street to allow construction of the decline structure. Currently, over-height vehicles to/from the business park travel directly along Childers Street to Kensington Road. To travel around the works site, it would be necessary for vehicles to travel via Tennyson Street, Altona Street, Ormond Street and back to Childers Street as outlined above.

The anticipated timeframe for the construction of the decline structure and the reconstruction of Childers Street connection is around 12-18 months after which Childers Street would be able to be opened to traffic again. During this time there would be an increase in the volume of traffic travelling along these streets, potentially impacting on the amenity of residents that are currently living on these streets.

Traffic surveys were undertaken in December 2015 to determine the volume of trucks that may be affected by the closure and would need to reroute around the works site. The surveys indicated that there are around 1,500 vehicles per day along Childers Street, of which around 36 (or 2.4 per cent) are medium or

large trucks. These are the vehicles that would not be able to negotiate the low bridges on Lloyd Street and would need to continue along Childers Street (via the detour). The majority of these trucks travel in the daytime, thereby having minimal impact on residents at night.

Daily traffic volumes on many of the other key access routes are quite high. For example, around 9,500 vehicles per day use Kensington Road and around 33,500 vehicles per day use Dynon Road. Even if all trucks used Kensington Street for access to the western portal works site the 60 trucks would represent less than a 1 per cent per cent increase in daily volumes. As much of the truck traffic would travel outside peak periods, this volume of construction traffic would be unlikely to significantly affect overall traffic operations in the area.

The impacts of this additional traffic would be minimised through the adoption of a detailed traffic management plan. This would include minimising the impacts of truck activity on nearby residential properties during construction works associated with the 50 Lloyd Street Business Estate and by minimising construction truck movements during peak periods and at night time.

The existing car parking areas along Childers Street would be occupied during construction to provide room for construction traffic.

8.5.4 Public Transport Impact Assessment

The existing Sunbury line tracks are to be realigned to form an at-grade junction with the Melbourne Metro tracks, allowing services along the existing Sunbury line tracks to enter the underground section while maintaining flexibility for trains to travel along the existing tracks to Southern Cross Station if needed (e.g. during a disruption to normal services).

There would be some short occupations (Concept Design proposal) during construction of the (i.e. weekend and extended Saturday night occupations) affecting the Werribee lines through South Kensington station.

The volume of construction vehicles that would operate on Dynon Road and Kensington Road is a small fraction of the total amount of traffic on these roads. Consequently, the use of these roads by construction vehicles should not affect bus services that use these roads. Nevertheless, some limited delays to Bus Route 402 would occur at the site entrances on Kensington Road, as construction traffic enters/leaves the work sites.

The closure of Childers Street would remove areas of parking utilised by Kensington station users. Options are being investigated to provide replacement parking in the vicinity of the station to minimise impacts on rail patrons driving to the station.

Pedestrian access would also need to be maintained at South Kensington station during construction.

8.5.5 Active Transport Impact Assessment

During construction, the pedestrian footpath and the cycle lanes would be removed along Childers Street, although alternative routes would be provided through JJ Holland Park. Suitable measures should be implemented to direct pedestrian and bicycle movements safely and effectively around the works site. Pedestrian access would also need to be maintained at South Kensington station during construction. Providing these measures are well considered, there would be a minor level of impact on pedestrian and bicycle movements.

8.5.6 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Construction)

- Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to:

- Management of any temporary or permanent full or partial closure of traffic lanes including (but not limited to) Childers Street, Kensington and other local roads
- Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction
- Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant
- Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors
- Provision of suitable routes for vehicles to maintain connectivity for road users adjacent to JJ Holland Park and the South Kensington station construction work site
- Provision of alternative routes for trucks accessing the 50 Lloyd Street Business Estate
- Provision of alternate parking where possible to replace parking lost from Childers Street, during construction and preventing parking at undesignated locations on local roads
- Provision of car parking for construction workers where possible
- In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites
- Special arrangements for delivery or removal of large loads.

Public Transport (Construction)

- Develop and implement a plan for occupying railway land and tracks at the western portal that minimises the disruption to railway services during construction. Plan to be developed to the satisfaction of VicTrack and MTM
- Provide suitable routes for pedestrians to maintain connectivity, including DDA access for users of South Kensington station
- Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria
- Bus replacement services for disrupted rail customers.

Active Transport (Construction)

- Develop and implement transport management measures in consultation with relevant authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) JJ Holland Park and South Kensington station
- Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists
- In consultation with the City of Melbourne, provide suitable routes for cyclists and pedestrians throughout construction to maintain connectivity and safety for road and shared path users of JJ Holland Park and South Kensington station.

Travel Demand Management

- In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.

8.5.7 Conclusion

The impact of the construction works at the western portal site is mainly related to the closure of the eastern end of Childers Street to allow construction of the decline structure. Currently, over-height vehicles

to/from the business park travel directly along Childers Street to Kensington Road. Vehicles wishing to access the business park at the end of Childers Street would be encouraged to travel via Lloyd Street if possible. For over-height vehicles that cannot negotiate the low clearance bridges on Lloyd Street, access would be via Tennyson Street, Altona Street, Ormond Street and back to Childers Street. During this time there would be an increase in the volume of traffic travelling along these streets, potentially impacting on the amenity of residents living along these streets.

The implementation of traffic management measures and the Environmental Performance Requirements to manage traffic movements around the works site and operating the majority of truck movements outside of peak periods should deliver a safe and effective works site with limited disruption to traffic and local residents.

Car parking spaces on Childers Street would be temporarily occupied for construction traffic and equipment manoeuvring. Options are being investigated to provide replacement parking in the vicinity of the station to minimise impacts on rail patrons driving to the station and users of JJ Holland Park. It is expected that the contractor would be required to provide replacement car parking, for as many displaced car parking spaces as practicable, in the vicinity of the station during the construction phase.

There would be some short occupations to the rail network during construction (i.e. weekend and extended Saturday night occupations) affecting the Werribee lines through South Kensington station.

Provision of a new shared path around the works site should minimise the impact of the works at this site on pedestrian and bicycle movements.

The implementation of the Environmental Performance Requirements would result in medium residual risks to the transport network and operations during construction.

8.6 Impact Assessment Precinct 3: Arden Station

8.6.1 Existing Conditions

8.6.1.1 Precinct Context

The precinct is bounded by CityLink to the west, Arden Street to the north, Dryburgh Street to the east and Dynon Road to the south. The precinct is characterised by wide streets, low rise development and a mix of land uses, including light and heavy industrial as well as residential. While the area is currently utilised by these land uses, it is expected to be the site of extensive urban renewal over the next 20 years.

8.6.1.2 Road Network

Table 8-10 lists the SmartRoads categorisation of the road network in the Arden station precinct. Victoria Street and Queensberry Street are both designated tram routes in the Arden area with Dynon Road, Dryburgh Street and Arden Street bus priority routes. There are five bicycle priority routes in Arden and Victoria Street is a pedestrian priority route. CityLink is a tolled motorway connecting the Tullamarine and Calder Freeways with the West Gate Freeway, and is the only preferred traffic route in the area. Access to CityLink within the precinct is provided northbound from Dynon Road. Macaulay Road, Dynon Road, Dryburgh Street and Curzon Street/Harker Street are designated traffic routes. Curzon Street, Harker Street, Victoria Street and Dynon Road are approved B-double and higher mass truck routes in the vicinity of the precinct.

There are a number of network constraints in the vicinity of the Arden station precinct, including:

- Low level overhead tram wires on Queensberry Street and Abbotsford Street
- Low level rail bridge on Railway Place (southern end of Laurens Street) which has a height restriction of 4.6 m in height
- Gatehouse Street which is an extension of Curzon Street and Harker Street has a 24-hour truck curfew to all trucks greater than 4.5 tonnes.

Table 8-10 Arden station precinct - SmartRoads road user priority classifications

SmartRoads Classification	Road Transport			Public Transport		Active Transport	
	Preferred Traffic Route	Traffic Route	Local Primary Access Route	Bus Priority Route	Tram Priority Route	Bicycle Priority Route	Pedestrian Priority Area
Declared Roads							
City Link	✓	-	-	-	-	-	-
Dynon Road	-	✓	-	✓	-	✓*	-
Dryburgh Street	-	✓	-	✓	✓	✓*	-
Macaulay Road	-	✓	-	-	✓	✓*	-
Victoria Street	-	✓	-	-	-	✓*	-
Curzon Street	-	✓	-	-	-	✓*	-
Local Roads							
Arden Street	-	-	✓	✓ (east of Dryburgh)	✓	✓*	-
Laurens Street	-	-	-	-	-	-**	-
Abbotsford Street	-	-	-	-	✓	✓*	-
Queensberry Street	-	-	-	-	✓	✓*	✓ (east of Curzon)

* Principal Bicycle Network, ** Local Bicycle Network

Source: Transmaps, 2015 (http://www.maps.vic.gov.au/TransMaps/ui/DotmapUI.jsp)

8.6.1.3 Rail Network

Arden station is located near the North Melbourne rail junction, which is the convergence of multiple metropolitan and regional railway lines. These lines include the Upfield, Craigieburn, Sunbury, Werribee and Williamstown Metropolitan railway lines, as well as the regional V/Line for Melton/Ballarat, Bendigo, and Geelong and Seymour (on the Craigieburn line).

The nearest stations to Arden station are North Melbourne (to the south) and Macaulay (to the north-west). North Melbourne Station is a premium station, staffed from the first to last train. It has six platforms that serve the Craigieburn, Sunbury, Upfield, Werribee and Williamstown Lines. The main entrance to North Melbourne is at the south end of the platforms, at the intersection of Adderley Street and Railway Place. Macaulay is an unstaffed station with two platforms that serve the Upfield line. The entrance is off Macaulay Road.

North Melbourne is an important transfer station and recorded the fifth most transfers out of all the transfer stations in the network. During the AM peak there are approximately 2,600 passengers entering/ exiting North Melbourne Station. Fifty five percent of passengers using North Melbourne station are travelling for commuting purposes. A further 24 per cent travel for education purposes.[19]

There are currently 26 Metropolitan inbound services stopping at North Melbourne Station during the AM peak. All Upfield, Werribee, Williamstown, Craigieburn and Sunbury services stop at North Melbourne Station. In the inter-peak, there are 14 services (peak direction) stopping at North Melbourne station.

[19] Public Transport Victoria, 'Train Station Patronage Fact Sheet', http://ptv.vic.gov.au/about-ptv/ptv-data-and-reports/research-and-statistics/

8.6.1.4 Tram Network

Abbotsford Street, Queensberry Street, Victoria Street and Curzon Street are designated SmartRoads tram priority routes. Route 57 provides services near Arden station along Abbotsford Street and Victoria Street including stops at:

- Stop 13 – Curzon Street / Queensberry Street
- Stop 14 – Abbotsford Street / Queensberry Street
- Stop 15 – Abbotsford Street / Arden Street.

During the peak hour there are 10 services operating (peak direction) and 18 services during the 2-hour peak period.

8.6.1.5 Bus Network

Arden Street and Dryburgh Street are designated SmartRoads bus priority routes. There are three bus routes operating near Arden station.

- Route 401 is an express bus service between the hospital precinct, Melbourne University and North Melbourne Railway station. It travels along Dryburgh Street and Arden Street
- Route 402 and 403 run along Macaulay Road/ Canning Street to the north of Arden station.

Bus route 401 has seen a 147 per cent growth in average weekday trips since 2010-11 to almost 2.5 million passengers per annum, making it Melbourne's fourth busiest bus service. During the peak 2-hours, the 401 operates 30 services (peak direction). During the peak period route 402 operates 12 services during the 2-hour peak period (peak direction) and six services during the inter-peak period. Route 403 is a new route that runs from Footscray to the University of Melbourne in the off peak periods.

8.6.1.6 Pedestrian Environment

The immediate area around the Arden station precinct is mostly industrial. Most building frontages have little interface with the footpath and the industrial land use in the area does not generate much pedestrian traffic.

There are pedestrian footpaths along all streets in the vicinity of the Arden station precinct. Smaller roads as well as larger carriageways all have walkable footpaths. This is consistent with the age of the area in that it is a well-established suburb of Melbourne originally built as a walking, tram and horse-and-cart neighbourhood.

There are approximately 2,160 passengers entering / exiting North Melbourne station during the AM peak period, and nearly 2,000 in the PM peak. Transfers between platforms in the AM peak are around 5,000 passengers (refer to Appendix D of this report). At Macaulay station, there are approximately 200 passenger entries/exits during the AM and PM peak.

8.6.1.7 Bicycle Environment

The Arden station precinct has an established network of on-road bicycle lanes. The most developed bicycle infrastructure in the area is on the nearby Abbotsford Street, which has separated and chevron style bicycle lanes. Queensberry Street and the northern section of Macaulay Road have chevron style lanes but not separated lanes.

The Capital City Trail roughly follows the alignment of CityLink through the area, and is an important north-south CBD bicycle commuter route. The nearest access to the trail from the Arden station precinct is at Arden Street.

8.6.2 Proposed Construction Traffic Routes

The objective of the proposed construction traffic routes is to access the arterial road/motorway network as soon as possible. There are arterial roads and motorways in close proximity to the construction work sites. Proposed traffic routes to and from construction work sites are shown on Figure 8-5 for the immediate area

around the precinct – maps showing the broader area are included in Appendix C. There are a number of different routes proposed that would be used for travel to different destinations. This would also assist in reducing the scale of the impact on any particular route.

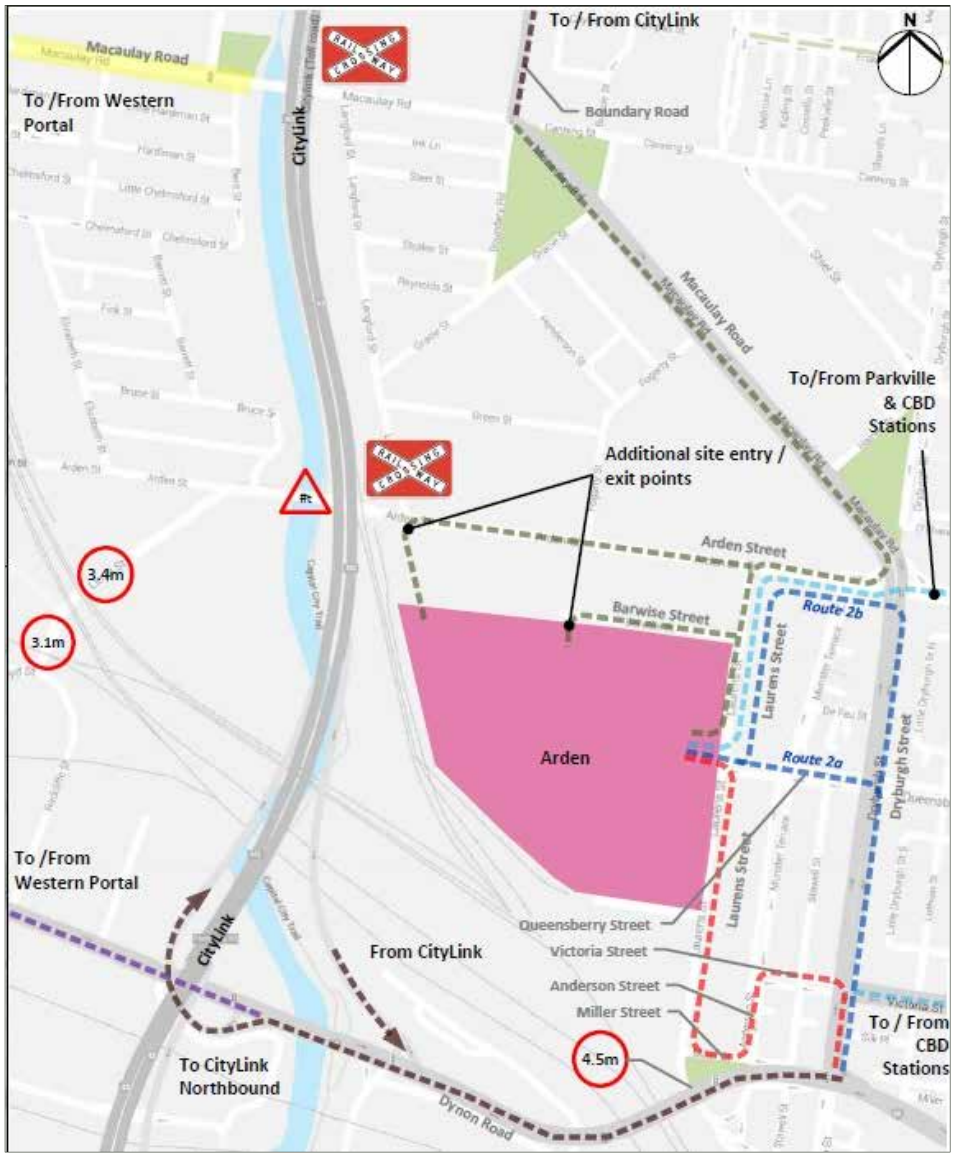

Figure 8-5 Arden station precinct construction vehicle access routes

The proposed vehicle access options for the construction of Arden station site are:

- Arden Vehicle Southern Route Options
  - Route 1 – Laurens Street, Miller Street, Anderson Street, Victoria Street, Dryburgh Street, Dynon Road (shown in red)
  - Route 2a – Queensberry Street, Dryburgh Street, Dynon Road (shown in dark blue)
  - Route 2b – Laurens Street, Arden Street, Dryburgh Street, Dynon Road (shown in dark blue)
- Arden Vehicle Northern Route Options:
  - Laurens Street, Barwise Street, Arden Street, Macaulay Road, Boundary Road (shown in olive green)
- Arden to Other work sites
  - Western portal via Dynon Road – Route 1, 2, 3a or 3b, Dynon Road, Kensington Road, Childers Street (shown in purple)

– To/from Parkville / CBD stations (shown in light blue)

There are a number of routes that include roads which are not VicRoads arterial roads (declared main roads) and Road Zone Category 1 in the respective planning schemes:

- Laurens Street, North Melbourne
- Arden Street, North Melbourne
- Barwise Street, North Melbourne
- Miller Street, North Melbourne
- Anderson Street, North Melbourne
- Victoria Street between King and Peel Streets, North Melbourne.

8.6.3 Road Transport Impact Assessment

Traffic disruptions

Traffic disruptions in the Arden station precinct would likely arise from:

- Truck access and movement to be based on 24-hour operation and site operation to be 7-days per week to support TBM operations and spoil removal
- Potential use of the site for 'truck call forward operations', where trucks are docked at the Arden construction work site until relevant CBD work sites are ready to receive them
- To support the construction of the east end of the station box, it is expected that parts of Laurens Street would need to be occupied for the duration of this phase of the construction.

The concentration of construction activities at Arden relieves pressure on some of these activities occurring at more sensitive and constrained sites i.e. less construction traffic and space requirements at those places.

Truck movements

Based on the expected spoil removal approach, plus materials delivery activities, it is expected that there would be an average of around 260 truck movements per day over 48 months travelling to/from the Arden station site. Spoil truck movements are an average across a period of time and would vary based on peak and non-peak periods. Peak activity is expected to be higher at around 360 truck movements per day.

Table 8-11 Arden station - Estimated truck trip generation (total movements)

Arden station - Estimated truck trip generation (total movements)	
Site working hours	24 hours, 7 days per week (upon placement of roof)
Timeframe (months)	48
Average daily truck trips	260
Peak average daily truck trips	364

Source: Advisian

The addition of up to around 360 truck trips per day spread across a number of traffic routes for access to the Arden site is expected to have minimal impact on traffic operations in the area. While this amount of construction traffic would cause some disruptions, the roads in the vicinity of the site have sufficient capacity to accommodate the additional traffic, particularly as it would be spread across a number of routes – minimising the impact on any particular street. The current activities on the site already generate truck traffic in the area so the net impact would be considerably less than the truck generation numbers indicate. The trucks would then move out of the local area onto the arterial and motorway network, with most of this activity occurring outside peak periods when these roads have adequate spare capacity to accommodate the additional traffic.

Operational analysis

No modelling has been undertaken for the Arden precinct, as the data or site observations indicate that base volumes are low and modelling is not required to support the assessment. The site already accommodates construction type industries and truck movements. As the Arden station precinct is planned to be one of the major construction activity sites for the construction of Melbourne Metro, it would necessarily generate more truck activity than other sites. Access route options to/from the site have been investigated and a number of options are proposed to minimise the reliance on any particular routes, and thereby minimise the impact on the residents living along those routes. Nevertheless, the activity at this site (for both spoil removal and other construction related activities generated by this site) would extend for a period of around four years with 24-hour, 7-day operations at around 260 truck movements (on average) per day.

8.6.4 Public Transport Impact Assessment

The construction activities at the Arden precinct would not result in any change to the timetabling or route of public transport services. The volume of construction vehicles that would operate on local roads is low and would not adversely affect the reliability of bus services. Consequently, no Environmental Performance Requirements are recommended for public transport impacts at Arden.

8.6.5 Active Transport Impact Assessment

Pedestrian and bicycle access may be affected along Laurens street during the construction period. Suitable measures should be implemented to direct pedestrian and bicycle movements safely and effectively around the works site, particularly along the frontages of the work sites where the existing footpaths and bicycle lanes may be affected by the works. Consideration should be given to provision of alternate parallel footpaths or shared paths around the site to maintain pedestrian and cyclist safety.

8.6.6 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Construction)

- Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to:
  - Management of any temporary or permanent full or partial closure of traffic lanes
  - Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction
  - Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant
  - Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors
  - Provision of suitable routes for vehicles to maintain connectivity for road users to adjacent to construction work sites
  - Provision of alternate parking where possible to replace parking lost from Laurens Street during construction and preventing parking at undesignated locations on local roads
  - Provision of car parking for construction workers where possible
  - In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites
  - Special arrangements for delivery or removal of large loads.

Public Transport (Construction)

- Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria.

Active Transport (Construction)

- Develop and implement transport management measures in consultation with relevant authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) Laurens Street
- Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists
- In consultation with the City of Melbourne, provide suitable routes for cyclists and pedestrians throughout construction to maintain connectivity and safety for road and shared path users.

Travel Demand Management

- In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.

8.6.7 Conclusion

As the Arden station precinct is planned to be one of the major sites for the construction of Melbourne Metro, more truck activity would be anticipated at this site than in other precincts. Activity at this site would extend over a period of around four years with 24-hour, 7-day operations and an average of approximately 260 truck trips each day for spoil removal and materials and equipment delivery. At peak times, this could increase to around 360 truck movements per day. This number of trucks only represents around a two per cent increase in daily volumes on the surrounding road network.

While this amount of construction traffic would cause some disruptions, the roads in the vicinity of the site have sufficient capacity to accommodate the additional traffic, particularly as it would be spread across a number of routes and outside peak times – minimising the impact on any particular street.

Implementing the recommended Environmental Performance Requirements for managing traffic would deliver a safe and effective work site with minimal disruption to traffic and local residents.

There is minimal impact of the works at this site on public transport operations and safety. As a result there are no recommended Environmental Performance Requirements for managing public transport operations in this precinct.

While there would be minimal impacts (alongside Moonee Ponds Creek) on pedestrian and bicycle movements and safety in this precinct, the recommended Environmental Performance Requirements include taking suitable measures to direct pedestrian and bicycle movements safely and effectively around the work sites and considering providing alternative footpaths or shared paths around the site to maintain pedestrian and cyclist safety.

The implementation of the recommended Environmental Performance Requirements would result in medium residual risks to the transport network and operations during construction.

8.7 Impact Assessment Precinct 4: Parkville Station

8.7.1 Existing Conditions

8.7.1.1 Precinct Context

The Parkville station precinct is located in an area that is dominated by health and education uses, including University of Melbourne, Royal Melbourne Hospital, Royal Women's Hospital, Royal Children's Hospital, the Peter Doherty Institute, the new Victorian Comprehensive Cancer Centre (VCCC) and other leading research and educational facilities. Many of these land uses feature high density development, while the residential area of Parkville to the north retains its strong heritage character and less intense development. Royal Parade and Flemington Road are major historic boulevards that define the city structure north of the CBD.

Melbourne Metro would provide rail access to the Parkville station precinct, supporting growing employment in the area and the precinct's continuing evolution as a leader in medical research, health care and education.

At the time of writing this report, the VCCC development is under construction on the triangular site bounded by Grattan Street, Flemington Road and Elizabeth Street. As a result of these redevelopment works the footpaths on the southern side of Grattan Street (west of Royal Parade) have been closed and there have been changes to the configuration of Grattan Street and parking arrangements on Royal Parade to the north of Grattan Street. There have also been temporary changes to the bicycle lanes on Elizabeth Street adjacent to the VCCC site. The VCCC would open in June 2016.

8.7.1.2 Road Network

Table 8-12 lists the SmartRoads categorisation of the road network in the vicinity of Parkville station. This report was prepared while the VCCC was still under construction on the triangle of land bordered by Royal Parade, Flemington Road and Grattan Street. Changes to transport conditions during later stages of construction, once the VCCC is operational, may be different to those outlined in this report. However, these changes are not expected to materially change the analysis and recommended Environmental Performance Requirements for this precinct.

The preferred traffic routes are College Crescent, Macarthur Road and Elliot Avenue. Royal Parade, Flemington Road and Peel Street are classified as traffic routes and approved B-double and higher mass truck routes. There are three designated traffic routes on the wider Parkville network. Royal Parade and Flemington Road are also designated traffic routes but not along their full length.

Table 8-12 Parkville station precinct - SmartRoads road user priority classifications

SmartRoads Classification	Traffic				Public Transport		Active Transport	
	Preferred Traffic Route	Traffic Route	Local Primary Access Route	Local Secondary Access Route	Bus Priority Route	Tram Priority Route	Priority Bicycle route	Priority Pedestrian Route
Declared Roads								
Royal Parade	-	✓	-	-	-	✓	✓*	✓
Flemington Road	-	✓	-	-	-	✓	✓*	✓
Peel Street	-	✓	-	-	-	✓	✓*	-
Elizabeth Street	-	✓	-	-	-	✓	✓*	✓
College Crescent	✓	-	✓	-	-	-	✓*	✓
Macarthur Road / Elliott Avenue	✓	-	-	-	-	-	-	-

SmartRoads Classification	Traffic				Public Transport		Active Transport	
	Preferred Traffic Route	Traffic Route	Local Primary Access Route	Local Secondary Access Route	Bus Priority Route	Tram Priority Route	Priority Bicycle route	Priority Pedestrian Route
Local Roads								
Grattan Street	-	✓	-	-	✓	-	✓*	✓
Queensberry Street	-	-	-	✓	-	-	✓*	✓
Swanston Street	-	-	✓	-	-	✓	✓*	✓
Wreckyn Street	-	-	✓	-	✓	-	✓**	-
Leicester Street	-	-	-	-	✓	-	-	✓
Bouverie Street	-	-	-	-	✓	-	- **	-
Pelham Street	-	-	-	-	✓	-	- **	-
Barry Street	-	-	-	-	✓	-	-	-
Berkeley Street	-	-	-	-	-	-	-	-

* Principal Bicycle Network, ** Local Bicycle Network

Source: Transmaps, 2015 (http://www.maps.vic.gov.au/TransMaps/ui/DotmapUI.jsp)

It should be noted that although Grattan Street is designated as a local road, it plays an important east-west connection to the immediate north of the CBD. There are a number of local roads in the Parkville area that have been subject to through traffic in the past (such as Gatehouse Street) and need to be carefully managed to protect them from the impacts of construction activity.

There are no major network constraints in the Parkville station precinct. The roads around the major trip generating centres, such as the hospitals and Melbourne University, are prioritised for public transport, pedestrians and cycling.

Historical traffic growth

A review of historical traffic data indicates that traffic volumes within the CBD, Parkville and Domain have remained static and in most cases has actually fallen over the last 10 years, as shown in Figure 8-6 and Figure 8-7. This is due to increased public transport capacity as well as key routes through and around these precincts being at or near capacity during peak periods. Given this evidence, it seems unlikely that there would be much traffic growth over the modelling analysis period. On this basis, unless outputs from VITM show significant growth which can be explained, the modelling approach has been to use actual traffic volumes from the latest available surveys.

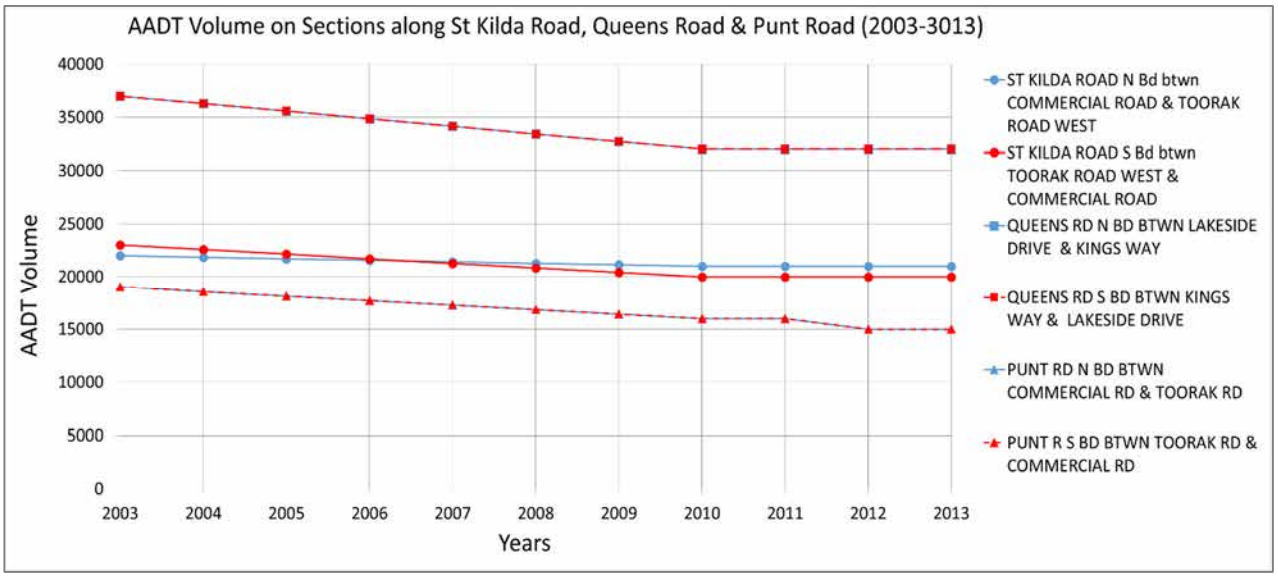

Figure 8-6 Domain Precinct Screen Line AADT Volume 2003-2013
Source: VicRoads

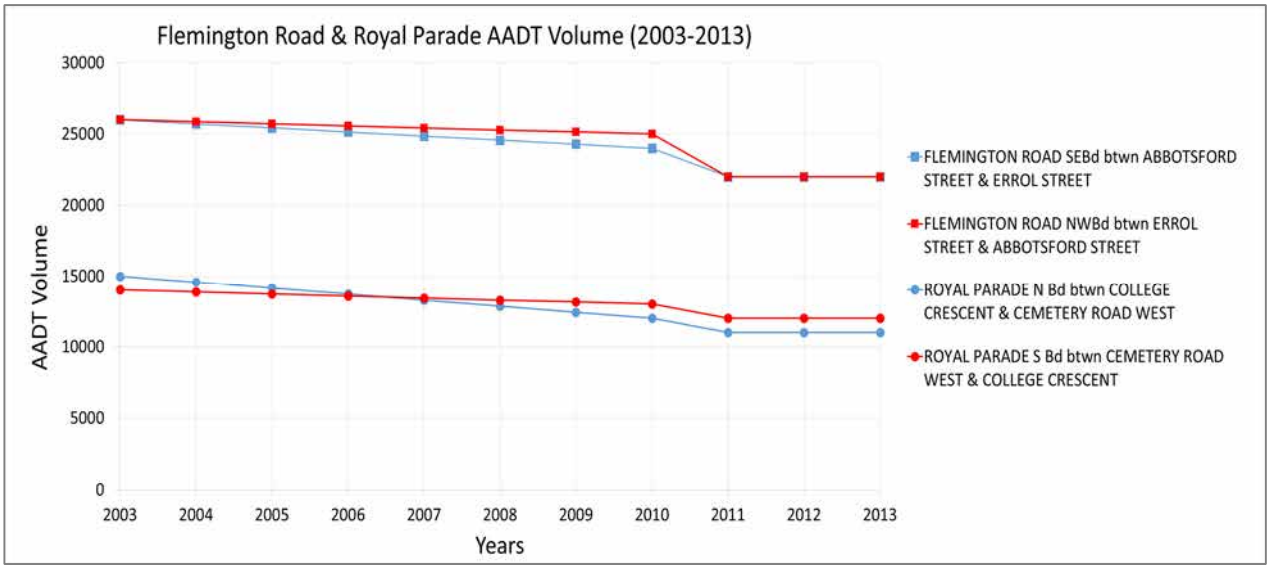

Figure 8-7 Flemington Road & Royal Parade AADT Volumes 2003-2013
Source: VicRoads

8.7.1.3 Rail Network

Railway stations are on the periphery of the Parkville station precinct and rely on tram and bus connections to access the major employment and education centres.

8.7.1.4 Tram Network

Royal Parade, Flemington Road, Peel Street, Elizabeth Street and Swanston Street are designated SmartRoads tram priority routes. Route 19 travels along Royal Parade past Melbourne University and Royal Melbourne Hospital. Route 55 travels along Flemington Road and into Royal Park, then travels north through Brunswick up to West Coburg. Route 59 transverses the Flemington Road corridor as well, passing through Moonee Ponds before heading west to Airport West.

All three routes operate in exclusive tram lanes, but travelling times can be compromised by cross-traffic at intersections where right turning traffic is permitted in tram lanes. For instance, the tram lanes from Elizabeth Street to Flemington Road on the Haymarket roundabout are occasionally blocked in the PM peak period by cars queuing back from Grattan Street to Peel Street.

In addition, there are nine tram routes operate on Swanston Street near the eastern edge of the precinct.

During the peak hour, Route 19 operates 14 services (peak direction) down Royal Parade. Route 19 has the fifth highest patronage out of all the tram routes in Melbourne. There are over 8,000 boardings and alightings per day at tram stops 10 and 11 on Royal Parade, outside Melbourne University and Royal Melbourne Hospital. [20]

Route 55 and Route 59 operate 15 and 14 services respectively during the peak hour along Flemington Road. Route 55 has an average of 80 passengers per service in the peak periods and is the twelfth busiest tram route in the Melbourne. A further 6,500 boardings and alightings occur on Flemington Road outside the Royal Melbourne Hospital per day.

8.7.1.5 Bus Network

There are four metropolitan bus routes that serve the Parkville station precinct, as well as a Night Network service at the weekend. Grattan Street and Wreckyn Street are designated SmartRoads bus priority routes. Part of Pelham Street, Bouverie Street and Leicester Street are designated SmartRoads bus priority routes to service Routes 401 and 402.

The Route 401 bus operates as a weekday limited stop shuttle service between North Melbourne Railway Station, the hospital precinct (Royal Melbourne Hospital, Grattan Street) and Melbourne University (Grattan Street) only. It is a prepaid service and the timetable alters with the university semester dates. It is a very high frequency service, with up to 15 buses per hour in the peak hour.

The Route 402 bus is a high frequency service (up to six buses per hour in the peak hour) that operates between Footscray and East Melbourne via North Melbourne, with four stops along Grattan Street. It connects with Footscray, Macaulay and Kensington stations allowing an option to transfer for access to Parkville.

The Route 505 bus operates daily between Moonee Ponds Interchange and Melbourne University via Parkville Gardens with stops throughout Parkville including Royal Park Station, Royal Parade, Melbourne Zoo, Melbourne University and Royal Melbourne Hospital.

The Route 546 bus between Heidelberg and Queen Victoria Market via Clifton Hill and Carlton with stops on Grattan Street (peak) and Royal Parade (off-peak) only operates on weekdays. It connects with stations along the Hurstbridge line including Heidelberg and Clifton Hill.

8.7.1.6 Pedestrian Environment

Most of the precinct is highly walkable with wide pavements, although dissected by major road corridors, particularly the north-south arterials. There are a number of SmartRoads pedestrian priority routes in Parkville, especially around the Melbourne University site including:

- Royal Parade
- Grattan Street
- Flemington Road
- Pelham Street
- Leicester Street
- Queensberry Street
- Haymarket Roundabout.

The area is dissected by major road corridors and in particular, the north-south arterial roads. Next to the major roads, pedestrian amenity levels can be poor due to high vehicular traffic volumes. There are few active street frontages along the major corridors.

[20] 2012-13 figures, Source: http://www.yarratrams.com.au/about-us/who-we-are/facts-figures/

There is a good provision of pedestrian infrastructure within the vicinity of the Parkville station precinct. All roads connecting the site to the wider road network have footpaths on both sides of the carriageway, providing a continuous network near and throughout the Parkville station precinct. Due to the construction of the VCCC, there are presently restricted pedestrian pathways along Grattan Street and Royal Parade near Royal Melbourne Hospital.

Pedestrian crossings on some of the more local roads are well provided for. The pedestrian crossing location on Grattan Street at University Square, in front of the Grattan Street entrance to Melbourne University, has two signalised crossing points and is a busy crossing location.

8.7.1.7 Bicycle Environment

Cycling is a significant and growing transport mode in and around Parkville. VicRoads permanent counts in 2013 recorded an average of 520 bicycle riders travelling southbound on Royal Parade.[21] To the north of Parkville are the local authorities of Moreland and the City of Yarra, which both have the highest mode shares for bicycle use in Melbourne. Significant numbers of bicycle commuters in these jurisdictions journey to work in Parkville or through the area to the CBD beyond.

There are a number of on and off bicycle routes through the Parkville precinct (refer to Appendix E). Grattan Street (east of Royal Parade) has an off road shared path. Royal Parade has on road lanes along the service road as well as a shared path between Park Street and Grattan Street on eastern side of Royal Parade. There are also on road bicycle lanes on Flemington road along the service road.

8.7.2 Proposed Construction Traffic Routes

The objective of the proposed construction traffic routes is to access the arterial road/motorway network as soon as possible. There are arterial roads and motorways in close proximity to the construction work sites. Proposed traffic routes to and from construction work sites are shown on Figure 8-8 for the immediate area around the precinct – maps showing the broader area are included in Appendix C.

21

https://www.vicroads.vic.gov.au/~/media/files/documents/traffic%20and%20road%20use/bicyclenetworkreportaug2013.ashx

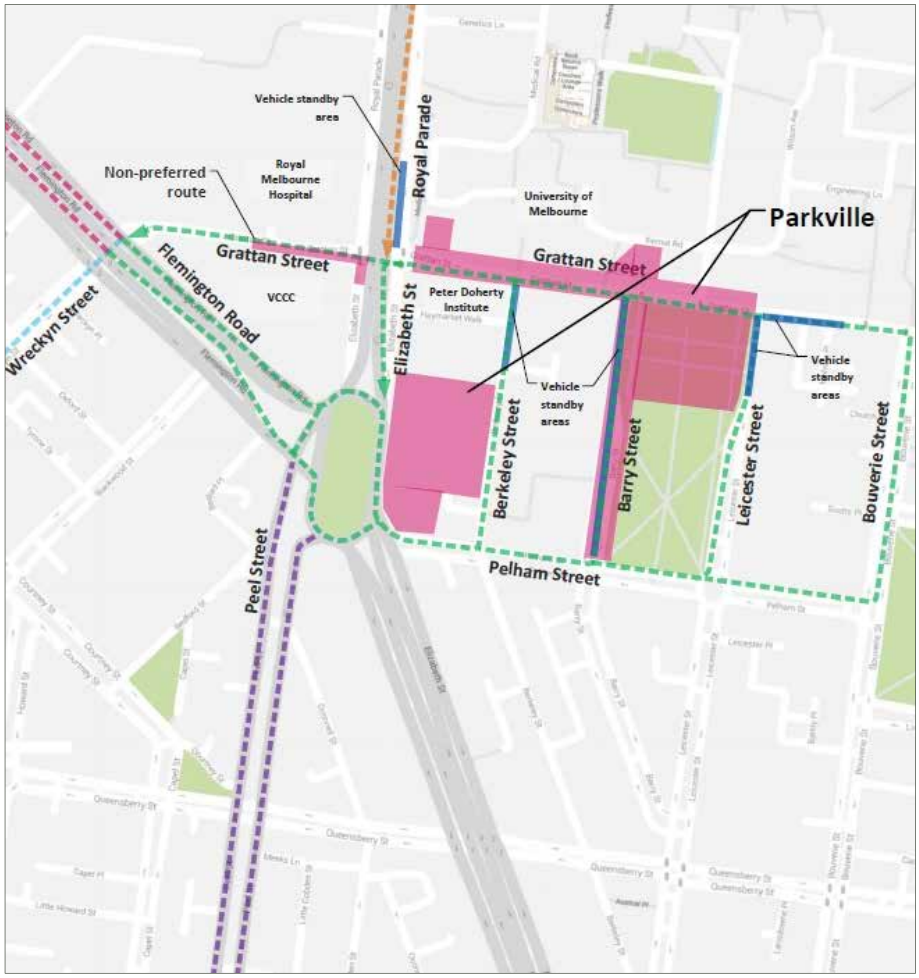

Figure 8-8 Parkville station precinct construction vehicle access routes

The proposed vehicle access options for the construction of Parkville station are:

- Route 1 – Flemington Road (shown in red)
- Route 2 – Footscray Road, Wurundjeri Way, Dudley Street, Peel Street (shown in purple)
- Route 3 – Flemington Road, Elliott Avenue, Macarthur Road, Royal Parade (shown in orange)
- To and from Arden – shown in blue.

The immediate local access movements are shown in green and are expected to require access from a number of the local streets as well as Flemington Road, Grattan Street west and the Haymarket roundabout. There are a number of different routes for local access movements as there are expected to be multiple access points to the station site on Grattan Street. This is likely to result in a smaller scale of impact on any particular street but would affect more properties. It is expected that there may need to be an access provided directly onto the Haymarket roundabout from the construction works site as Pelham Street does not currently provide access.

Access between the Parkville station precinct and the major construction work site at Arden would be via Wreckyn Street as shown in light blue.

Most of the proposed main access routes are VicRoads arterial roads (declared main roads) and Road Zone, Category 1 in the respective planning schemes apart from Grattan Street and Wreckyn Street that are local roads. The local access routes are shown in green and impacts on residents are proposed to be minimised by using multiple routes as shown. Pelham Street would be a key access route for most travel, though there is no access to the Haymarket roundabout from Pelham Street.

8.7.3 Road Transport Impact Assessment

Traffic disruptions

Traffic disruptions in the Parkville station precinct would likely result in:

- Closure of Grattan Street between Royal Parade and Leicester Street between Royal Parade to traffic other than construction vehicles would change peoples' travel patterns
- Bus routes through Grattan Street would need to be diverted around the Grattan Street closure
- Pedestrian and bicycle access should be maintained around the construction zones throughout the duration of works, though there may be times when access is restricted
- Increased truck movements around the area with 24-hour, 7-days per week activities (once station roof slab is in place)
- A need to plan for emergency vehicle access through the area, though they can typically use the tram tracks, where available, to bypass traffic queues
- There would be restrictions to on street loading, drop off and parking bays within or near the construction zone on Grattan Street, Berkeley Street, Barry Street, Leicester Street and Royal Parade during construction.

Truck movements

Based on the expected spoil removal approach, plus materials delivery activities, it is expected that there would be an average of around 100 truck movements per day over 48 months travelling to/from the Parkville station site. Truck movements are an average across a period of time and would vary based on peak and non-peak periods. Peak activity is expected to be higher at around 140 truck movements per day.

Table 8-13 Parkville station - Estimated truck trip generation (total movements)

Parkville station - Estimated truck trip generation (total movements)	
Site working hours	24 hours, 7 days per week (upon placement of roof)
Timeframe (months)	48
Average daily truck trips	100
Peak average daily truck trips	140

Source: Advisian

It is expected that this volume of trucks can be readily accommodated by the major access roads to the precinct. Most truck activity is expected to be outside of peak periods when roads have the capacity to accommodate the additional truck traffic without impacting on the operation of the access routes or the key intersections.

Daily traffic volumes on the key access routes are very high. For example, around 18,000 vehicles per day use Grattan Street and around 24,000 vehicles per day use Royal Parade/Elizabeth Street. If all trucks used Royal Parade for access to the Parkville station works site, the 140 trucks would only represent less than a 1 per cent increase in daily volumes. As much of the truck traffic would travel outside peak periods, this volume of construction traffic would be unlikely to significantly affect overall traffic operations in the area.

There are expected to be a number of separate accesses to the Grattan Street work site with separate accesses to each as shown in Figure 8-8. These include the intersection of Grattan Street and Royal Parade and a number of accesses to the south via Pelham Street. The contractor should be encouraged to access the site via the Grattan Street / Royal Parade intersection as much as possible

However there would be a need to access the site via a number of the roads between Grattan Street and Pelham Street to access the different site entries. While this means that more people would be affected by

the construction traffic, the volume of trucks passing each property is considerably less thereby reducing the scale of the impact. The western end of Pelham Street would carry the most construction traffic, as all (non-Grattan Street) routes would need to use Pelham Street.

The more critical issue at this location is the changes to traffic patterns associated with the temporary closure of Grattan Street as discussed below.

Operational analysis

Traffic modelling has been undertaken to determine the likely impact of the proposed changes to the road network during construction, including the planned closures of Grattan Street for the period of the construction of Parkville station.

It is noted that there would be several key stages of construction for Parkville station. Modelling has been undertaken for the main stage, described below, as this is expected to have the most major traffic impacts and be operating for the longest duration.

A number of traffic signal timing changes have been made in the traffic model for the construction phase of Melbourne Metro. This includes the implementation of dynamic SCATS signals at a number of intersections including Haymarket, Royal Parade/Grattan Street and Flemington Road / Grattan Street and therefore the green time splits would have differed based on demand. Refer to Appendix D for further information.

The construction of Parkville station would require the closure of Grattan Street, between Royal Parade and Leicester Street, for an extended period. Royal Parade/Elizabeth Street would also be restricted to two traffic lanes plus a tram lane and bicycle lane in each direction during the works.

As noted above, analysis of the historical growth of key roads around Parkville indicates virtually zero growth in daily traffic volumes over the last 10 years.

Based on the modelling analysis undertaken, it is expected that the Grattan Street closure and associated traffic management arrangements (i.e. advisory signage etc.) would assist to divert traffic away from the Parkville station precinct during the construction works, thereby minimising the impact on the traffic operations in at key intersections.

The analysis of the performance of the network during the construction period has been analysed based on the VITM outputs for the 2021 forecast year. The Parkville station precinct analysis has been undertaken using the Aimsun modelling software, with demands based on the VITM analysis. Table 8-14 and Table 8-5 summarise the changes in the volumes on key links within the Aimsun model network. These traffic volumes are model flows on key road links in the network. They represent the traffic volumes assigned to these links by the Aimsun model based on the expected demands in 2021. The model assigns (or allocates) traffic to the network and routes change depending on the delays and congestion in the model. Therefore the differences vary on each link, depending on the model assignment algorithms.

The results show some increases on roads in the vicinity of the Parkville construction work site in the AM peak period, notably Swanston Street where traffic that would have travelled along Grattan Street needs to travel north and south along Swanston Street to travel around the road closure. There are also increases along Queensberry Street and Royal Parade, but the impacts on other roads such as Gatehouse Street and Elliott Avenue and small in the AM peak.

In the PM peak, College Crescent, Gatehouse Street and Elliot Avenue are expected to carry a higher proportion of the diverted traffic.

Table 8-14 Network Volume AM Peak Summary - 2021 Construction Case compared to 2021 No Project Case

Network	2021 No Project Case	2021 Construction	Difference
Victoria Street, East of Peel Street, EB	860	910	50 (+6%)
Victoria Street, East of Peel Street, WB	710	720	10 (+1%)
Queensberry Street, East of Peel Street, EB	670	750	80 (+12%)
Queensberry Street, East of Peel Street, WB	490	630	140 (+29%)
Gatehouse Street, North of Flemington Road, NB	400	400	0 (0%)
Gatehouse Street, North of Flemington Road, SB	510	540	30 (+6%)
Swanston Street, North of Grattan Street, NB	170	490	320 (+188%)
Swanston Street, North of Grattan Street, SB	390	610	220 (+56%)
Elliott Avenue, East of Flemington Road, EB	1,180	1,240	60 (+5%)
Elliott Avenue, East of Flemington Road, WB	1,170	1,080	-90 (-8%)
College Crescent, between Princes Park Drive & Cemetery Road East, EB	1,890	1,800	-90 (-5%)
College Crescent, between Princes Park Drive & Cemetery Road East, WB	1,870	1,870	0 (0%)
Royal Parade, North of Grattan Street, NB	610	740	130 (+21%)
Royal Parade, North of Grattan Street, SB	1,080	970	-110 (-10%)
Grattan Street, East of Royal Parade, EB	660	240	-420 (-64%)
Grattan Street, East of Royal Parade, WB	470	40	-430 (-91%)

Source: AIMSUN model

Table 8-15 Network Volume PM Peak Summary - 2021 Construction Case compared to 2021 No Project Case

Network	2021 No Project Case	2021 Construction	Difference
Victoria Street, East of Peel Street, EB	930	1,000	70 (+8%)
Victoria Street, East of Peel Street, WB	1,000	1,040	40 (+4%)
Queensberry Street, East of Peel Street, EB	600	590	-10 (-2%)
Queensberry Street, East of Peel Street, WB	770	990	220 (+29%)
Gatehouse Street, North of Flemington Road, NB	460	580	120 (+26%)
Gatehouse Street, North of Flemington Road, SB	470	570	100 (+21%)
Swanston Street, North of Grattan Street, NB	550	870	320 (+58%)
Swanston Street, North of Grattan Street, SB	260	600	340 (+131%)
Elliott Avenue, East of Flemington Road, EB	900	1,010	110 (12%)
Elliott Avenue, East of Flemington Road, WB	1,300	1,270	-30 (-2%)
College Crescent, between Princes Park Drive & Cemetery Road East, EB	1,490	1,850	360 (+24%)
College Crescent, between Princes Park Drive & Cemetery Road East, WB	1,920	2,000	80 (+4%)
Royal Parade, North of Grattan Street, NB	1,130	1,240	110 (+10%)
Royal Parade, North of Grattan Street, SB	740	840	100 (+14%)
Grattan Street, East of Royal Parade, EB	700	240	-460 (+66%)
Grattan Street, East of Royal Parade, WB	670	40	-630 (-94%)

Source: AIMSUN model

With the closure of Grattan Street, traffic along Leicester Street and Swanston Street is expected to increase during the AM peak period. Swanston Street is generally a single lane each way and the rerouted traffic is expected to result in longer delays in the 2021 Construction Case. The modelling analysis indicates that there is increased congestion at the Elgin Street / Swanston Street Intersection and Cemetery Road East / College Crescent / Swanston Street Roundabout. This congestion may result in additional queueing along College Crescent towards Royal Parade. The Wreckyn Street right turn movement onto Flemington Road eastbound is expected to increase to compensate for the closure of Grattan Street.

In the PM peak period, there is a general increase in traffic along College Crescent, Swanston Street and Leicester Street. The closure of Grattan Street is expected to result in additional delay along College Crescent, Royal Parade, Peel Street and Flemington Road. The modelling analysis indicates that the Cemetery Road East / College Crescent / Swanston Street roundabout may be one of the key areas of congestion and delays, and is expected to result in additional delays on the surrounding roads.

Further analysis is underway to identify and test potential network enhancements to reduce the additional delays in the area.

Network Performance

Table 8-16 provides key outputs from the Aimsun model to compare network performance between the 2021 No Project Case and 2021 Construction Case model. All of the network performance model statistics for both peak periods indicate that the 2021 Construction Case would incur greater delays than the 2021 No Project Case.

Table 8-16 Network Parameters Summary – 2021 Construction Case compared to 2021 No Project Case

Peak	Parameters	2021 No Project Case	2021 Construction Case	Difference
AM Peak	Average Travel Time (min)	6:58	7:55	0:57 (+14%)
	Average Speed (km/h)	14.7	12.9	-1.8 (-12%)
	VKT (veh km)	32,900	31,100	-1,800 (-5%)
	VHT (hours)	2,200	2,400	200 (+9%)
	Total vehicles	19,300	18,200	-1,100 (-6%)
PM Peak	Average Travel Time (min)	6:58	8:04	1:06 (+15%)
	Average Speed (km/h)	14.5	12.8	-1.7 (-12%)
	VKT (veh km)	33,400	33,400	0 (0%)
	VHT (hours)	2,300	2,600	300 (+13%)
	Total vehicles	19,900	19,400	-500 (-3%)

Source: AIMSUN model

Intersection Analysis

The results have been analysed for the key signalised intersections within the precinct and show the results associated with individual approaches to each intersection. The results indicate that while many of the approaches change very little, there are some major differences between the 2021 Construction Case and the 2021 No Project Case model during the AM peak period as shown in Table 8-17.

The delay at the Haymarket roundabout north-west approach (Flemington Road) is predicted to increase due to the closure of Grattan Street, east of Royal Parade (increasing from around 70 seconds to 150 seconds per vehicle). The north approach of the roundabout is predicted to remain similar to the 2021 No Project Case. This is likely due to the congestion along around College Crescent restricting the traffic travelling southbound along Royal Parade. Vehicles on Wreckyn Street and Grattan Street are predicted to experience longer delays, though in the context of an overall journey the time differences are small.

Table 8-17 Intersection Performance - AM Peak 2021 Construction Case v 2021 No Project Case (average delay per vehicle)

Intersection	Approach	2021 No Project Case (sec)	2021 Construction (sec)	Difference (sec)
Haymarket Roundabout	Elizabeth Street (N)	50	60	10 (+20%)
	Elizabeth Street (SE)	60	80	20 (+33%)
	Peel Street (S)	40	60	20 (+50%)
	Flemington Road (NW)	70	150	80 (+114%)
Elizabeth Street / Grattan Street / Royal Parade	Royal Parade (N)	50	40	-10 (-20%)
	Grattan Street (E)	40	NA	NA
	Elizabeth Street (S)	30	20	-10 (-33%)
	Grattan Street (W)	50	70	20 (+40%)
Flemington Road / Grattan Street / Wreckyn Street	Grattan Street (E)	30	30	0 (0%)
	Flemington Road (SE)	30	30	0 (0%)
	Wreckyn Street (SW)	30	100	70 (+233%)
	Flemington Road (NW)	30	70	40 (+133%)

In the 2021 Construction Case PM peak period (shown in Table 8-18), the Haymarket roundabout is expected to experience more delay on all approaches in the PM peak period. Grattan Street west is also expected to experience longer delays while the remaining intersections are predicted to experience small changes in delay, some improving due to upstream congestion in the model.

Further optimisation of signal timings may reduce the level of these delays. However, as the roundabout is already operating near capacity, any change would have a major impact on the operation and associated delays.

Table 8-18 Intersection Performance - PM Peak 2021 Construction Case v 2015 Base Case (average delay per vehicle)

Intersection	Approach	2021 No Project Case (sec)	2021 Construction (sec)	Difference (sec)
Haymarket Roundabout	Elizabeth Street (N)	50	50	0 (0%)
	Elizabeth Street (SE)	70	130	60 (+86%)
	Peel Street (S)	60	120	60 (+100%)
	Flemington Road (NW)	60	110	50 (+83%)
Elizabeth Street / Grattan Street / Royal Parade	Royal Parade (N)	50	40	-10 (-20%)
	Grattan Street (E)	70	NA	NA
	Elizabeth Street (S)	30	30	0 (0%)
	Grattan Street (W)	40	110	70 (+175%)
Flemington Road / Grattan Street / Wreckyn Street	Grattan Street (E)	50	30	-20 (-40%)
	Flemington Road (SE)	40	40	0 (0%)
	Wreckyn Street (SW)	40	30	-10 (-25%)
	Flemington Road (NW)	30	30	0 (0%)

In the AM peak period, the closure of Grattan Street is predicted to cause the majority of the vehicles to reroute via Swanston Street and Queensberry Street. Swanston Street currently does not have the capacity to accommodate this increase in traffic, and thus would likely be a key congestion point. The congestion on Swanston Street may cause further congestion along College Crescent towards Royal Parade. With College Crescent already congested, the number of vehicles travelling along Royal Parade southbound is also expected to reduce, improving the performance of some of the intersections within the modelled area.

The modelling indicated that the AM peak period travel time along Flemington Road / Peel Street and Royal Parade / Elizabeth Street remained relatively similar, with a maximum increase in travel time of 20 seconds. Royal Parade southbound exhibited a decrease in travel time due to fewer vehicles along Royal Parade, attributed to congestion on College Crescent.

In the PM peak period, additional congestion is expected around the Haymarket roundabout. The congestion at Haymarket is expected to spread further south along Elizabeth Street and Peel Street northbound. Major delays are also predicted along College Crescent and Swanston Street because of a bottleneck in the general Swanston Street area.

Travel times

In order to understand the travel time implications of the partial closure of Grattan Street, some additional analysis was undertaken using the VITM model. VITM was used as it provides a broader network than the VISSIM models that are localised around the Parkville station precinct.

The following series of diagrams show the changes in predicted travel speeds from the VITM analysis:

- Figure 8-9 shows the Parkville station precinct travel speeds for the 2021 No Project AM peak period
- Figure 8-10 shows the Parkville station precinct travel speeds for the 2021 No Project PM peak period
- Figure 8-11 shows the Parkville station precinct travel speeds for the 2021 Construction Case for the AM peak period
- Figure 8-12 shows the Parkville station precinct travel speeds for the 2021 Construction Case for the PM peak period.

Travel speeds are a useful proxy for travel times when considering a broad area. The diagrams indicate that part of Grattan Street (east of Royal Parade) is closed in the 2021 Construction Case does not have any major impact on the speeds in the vicinity of the works. The speeds are reduced on east – west routes including Queensberry Street, Victoria Street and Cemetery Road during the AM peak periods.

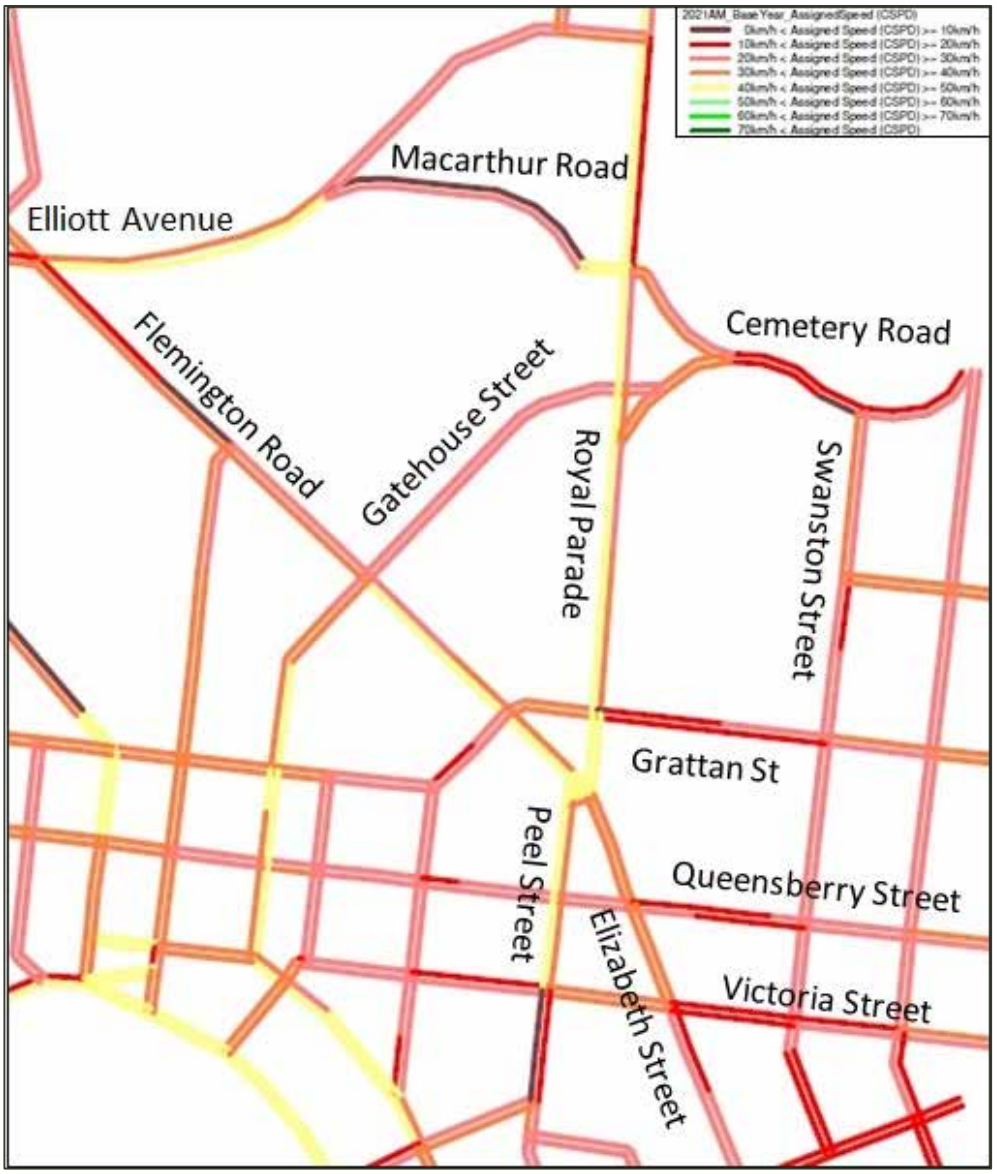

Figure 8-9 Parkville station precinct travel times – 2021 No Project AM Peak

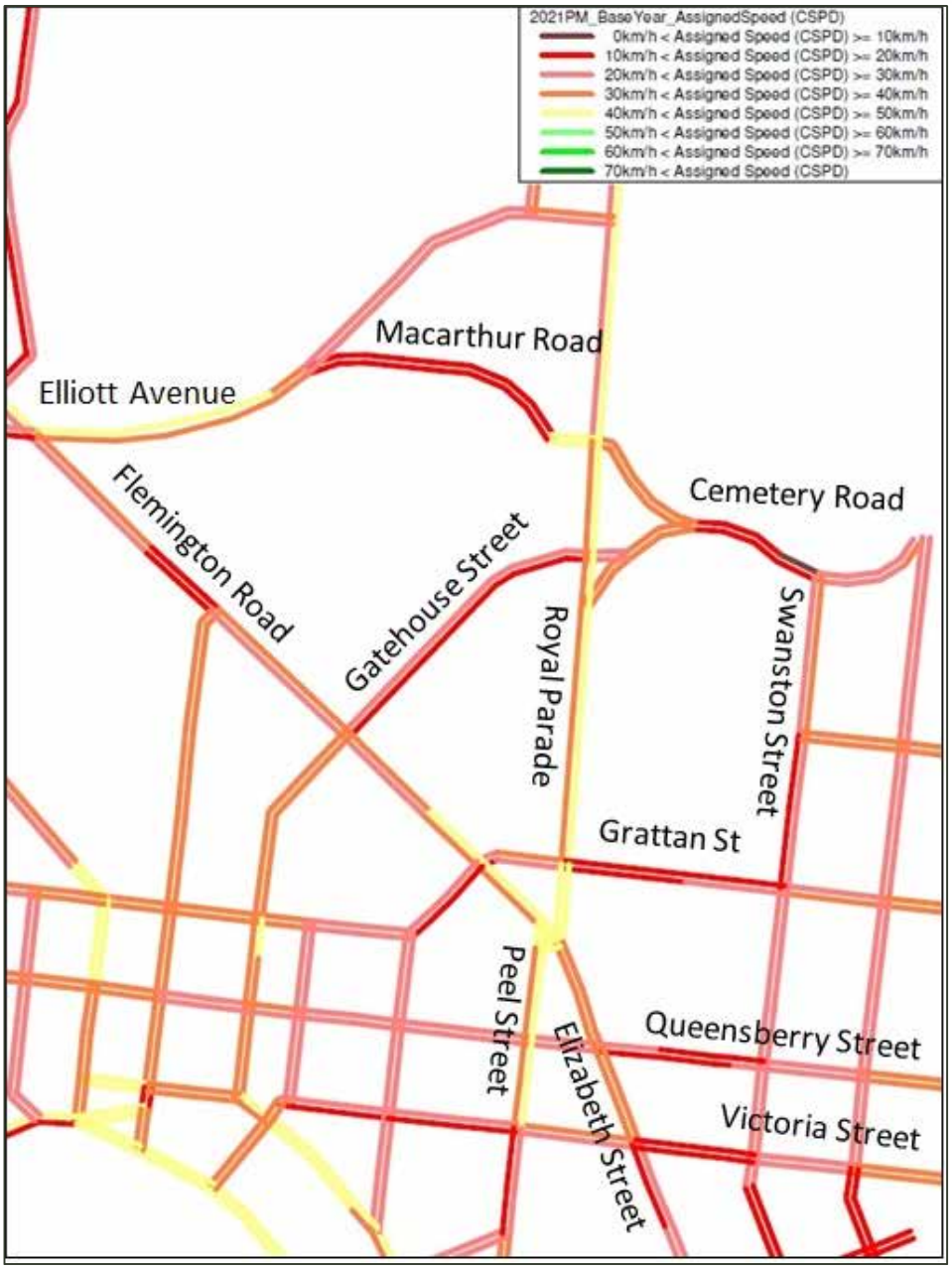

Figure 8-10 Parkville station precinct travel times – 2021 No Project PM Peak

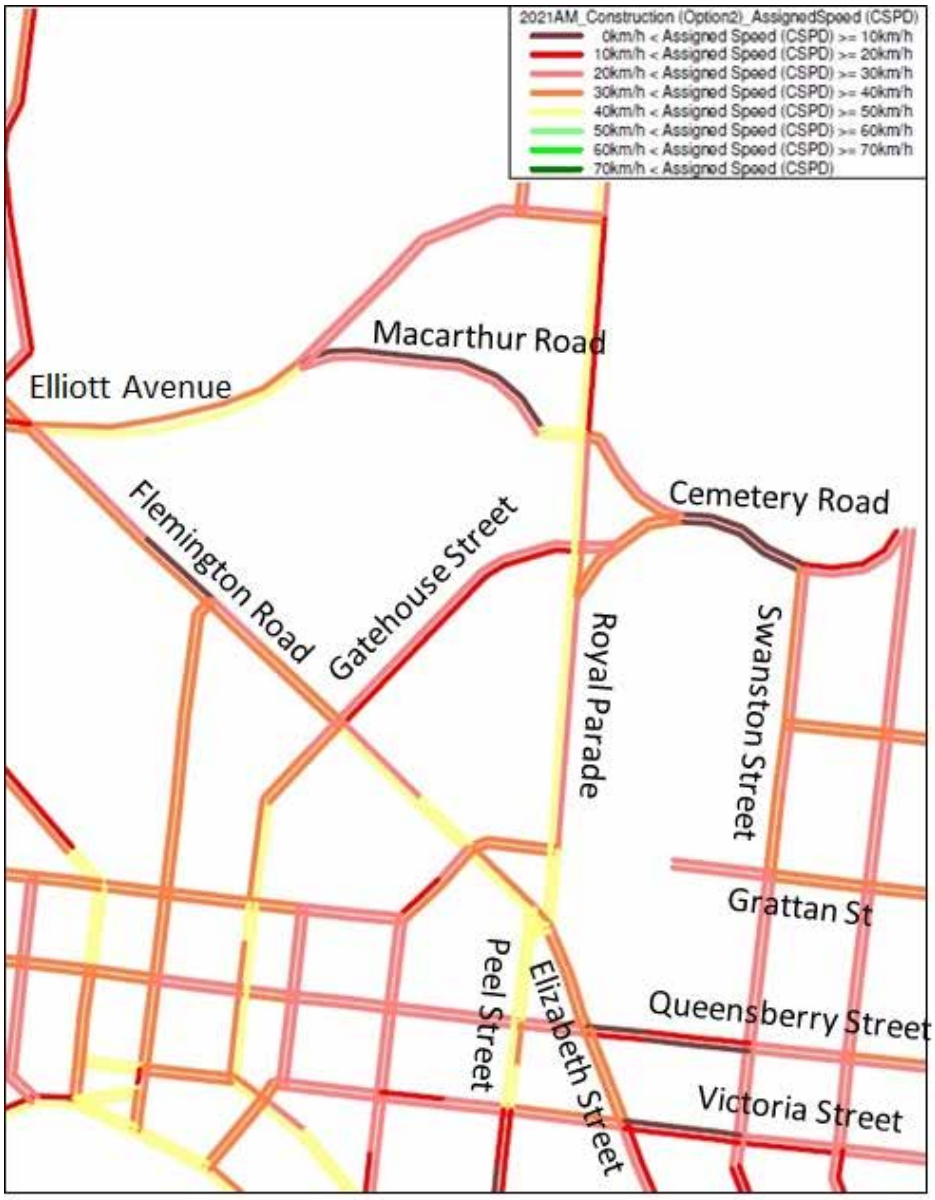

Figure 8-11 Parkville station precinct travel times – 2021 Construction Case AM Peak

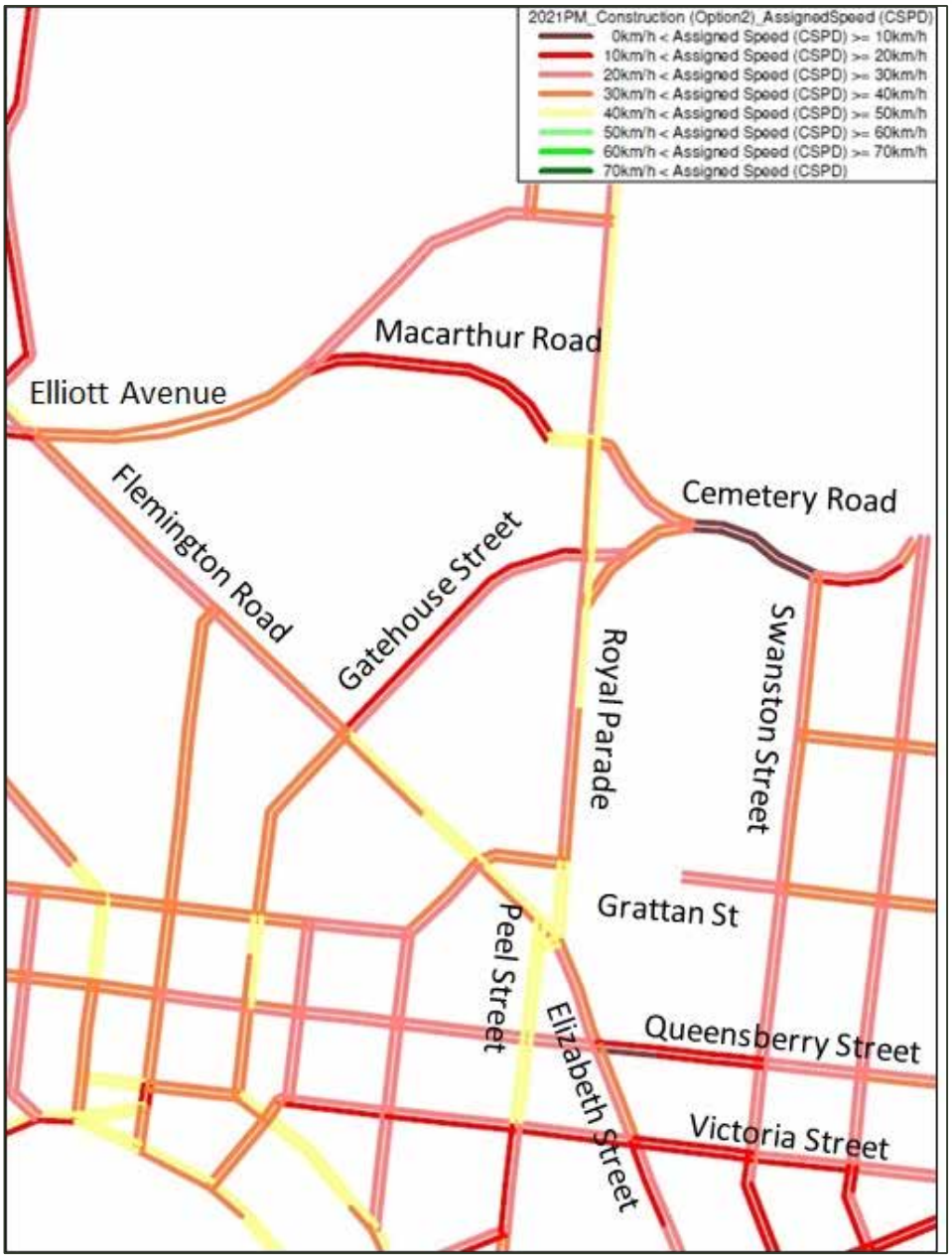

Figure 8-12 Parkville station precinct travel times – 2021 Construction Case PM Peak

The actual travel times along key routes through the Parkville area was also reviewed from the VITM models. The results indicated relatively small changes in travel times. Most routes demonstrated little change in travel as shown for Royal Parade / Elizabeth Street in Figure 8-13.

The graphs show direction of travel (northbound and southbound), for the AM and PM peaks. Each graph shows very little delays in the 2021 Construction Case. In the context of the overall travel journey and considering daily fluctuations in travel times, these are not considered to be a major impact.

It should be noted that the diversion outcomes from the VITM analysis mean that the impacts on the broader network are distributed widely, and none of the other routes show any significant change in travel times.

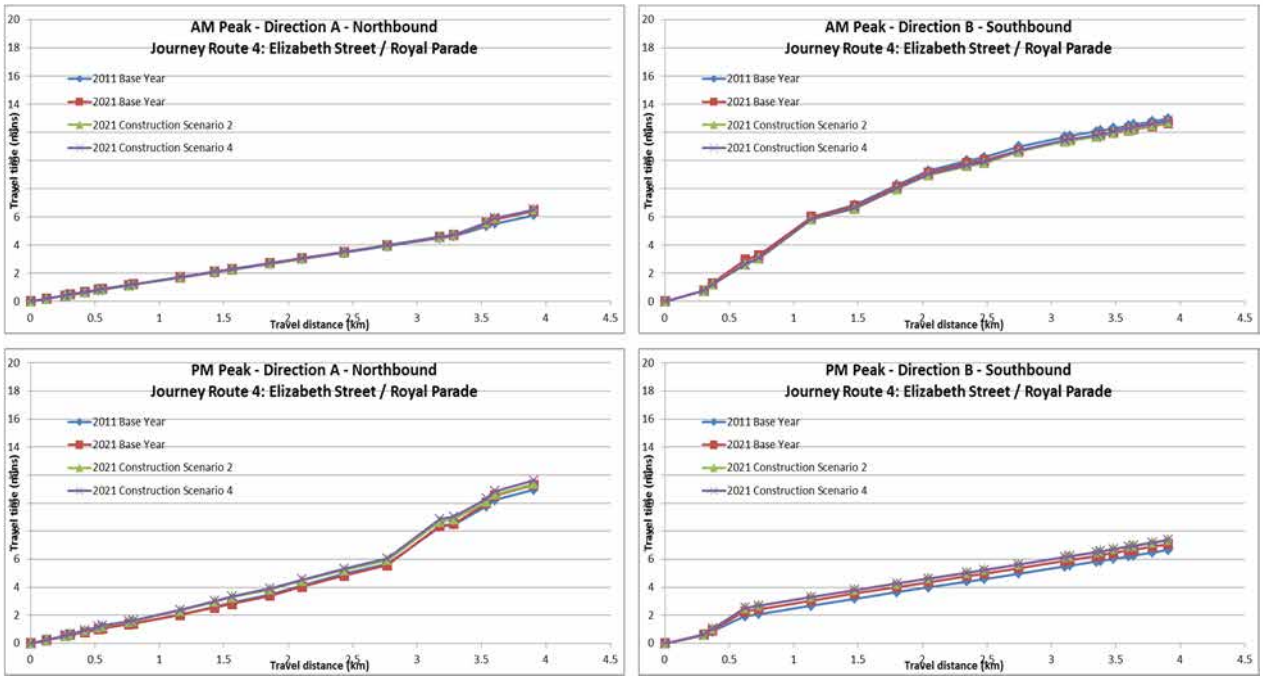

Figure 8-13 Parkville precinct construction vehicle access routes.

While the Grattan Street closure is expected to create some disruption to the local area with increased delays to traffic, Melbourne Metro is an important public transport project that would significantly improve the capacity and efficiency of the rail network across Melbourne. The traffic delay impacts would be largely on the designated SmartRoads public transport priority routes such as Royal Parade and Flemington Road, where public transport is prioritised over road use (tram ways are segregated), and the disruptions should therefore be considered in this context.

Further work is underway to consider possible improvements to optimise the operation of College Crescent as the modelling shows additional queuing and reduced travel speeds during the construction of Melbourne Metro.

Investigations are also underway in relation to the Haymarket roundabout to maximise the capability of the network to absorb changes in traffic flows including:

- Minor changes to lane configuration on the approach from Elizabeth Street north to the roundabout
- Reconfiguration of the roundabout to simplify operation and provide additional capacity between Elizabeth Street south and Flemington Road north
- Replace the roundabout with a signalised intersection.

Travel demand management tools are recommended to discourage traffic from travelling through the area, and should be publicised well in advance of the commencement of works and the closure of Grattan Street. Travel demand management tools would assist in mitigating these impacts, both within the Parkville station precinct area and across the wider network. Such measures would include:

- Identification of alternate routes around the works area
- Advance notice to motorists of the upcoming works and expected travel delays via media and roadside variable message signs
- Modifications to the traffic signal timings to prioritise preferred travel routes and optimise travel times.

8.7.4 Public Transport Impact Assessment

The works at Parkville include the closure of Grattan Street (between Royal Parade and Leicester Street) for the duration of the Parkville station construction period, and therefore has the potential to have a medium impact on public transport operations:

- The closure of Grattan Street east of Royal Parade would require rerouting of the 401, 402, 403 and 505 bus services around the works site, potentially affecting the level of service on these services. Route 401 and 402 are heavily patronised routes that offer a high level of access to the University of Melbourne. A number of potential alternative routes are under consideration, including Pelham Street and Queensberry Street and the Haymarket roundabout
- The construction of the new tram stop in Royal Parade and the associated roadworks would result in disruptions to tram services although this would be a short term occupation (approximately three weekends)
- Grattan Street (between Royal Parade and Leicester Street) would be closed during construction and, as a result, right turn movements from Royal Parade would not be in operation. This would result in reduced delays to trams on Royal Parade.

As a result of these altered routes and increased traffic congestion through the precinct, bus travel times are up to four minutes longer during peak periods especially Routes 401 and 402 which are high frequency, higher patronage services (refer to Table 8-19).

Table 8-19: Bus travel times – 2021 Construction Case

Route	AM Peak			PM Peak		
	2021 Base	2021 Construction	Difference (sec)	2021 Base	2021 Construction	Difference (sec)
401 - From University of Melbourne	05:40	08:28	168	06:15	10:35	260
401 - To University of Melbourne	05:43	10:08	265	05:37	07:44	127
402 - From University of Melbourne	05:49	08:41	172	07:30	12:19	289
402 - To University of Melbourne	06:30	11:01	271	07:02	08:31	129
505 - From University of Melbourne	04:44	08:02	198	05:49	10:10	261
505 - To University of Melbourne	06:25	06:07	-18	04:49	05:11	22
546	09:01	11:49	170	11:27	12:44	77

Source: Aimsun Model

Note: Route 403 not modelled as only started January 2016

Due to the closure of right turn movements from Royal Parade in Grattan Street, tram travel times improve during the AM peak on Route 19. Route 59 and the proposed route 8 (currently route 55) travel along Flemington Road and are not impacted by the construction works (refer to Table 8-20).

Table 8-20: Tram travel times – 2021 Construction Case

Route	AM Peak			PM Peak		
	2021 Base	2021 Construction	Difference (sec)	2021 Base	2021 Construction	Difference (sec)
19 - From CBD	10:41	09:05	-95	09:11	09:59	48
19 - To CBD	10:41	09:55	-46	09:48	10:17	29
Current 55 / Proposed 8 - From CBD	01:40	01:40	0	01:14	01:14	0
Current 55 / Proposed 8 - To CBD	01:12	01:12	0	01:29	01:29	0
57 - From CBD	01:43	01:43	0	01:14	01:14	0
57 - To CBD	01:20	01:20	0	01:19	01:19	0

Source: Aimsun Model

8.7.5 Active Transport Impact Assessment

Grattan Street provides a key east-west linking role for cyclists to destinations around Carlton. It provides an important connection for riders from the north, along with local riders travelling between the North Melbourne and Kensington area and Clifton Hill and Fitzroy North.

Due to Grattan Street's location in the Parkville education and health precinct, there are a significant number of work and Tertiary Education-related bike trips. Work trips account for 81 per cent, while tertiary students account for a further 18 per cent of trips along Grattan Street. Only a relatively small number of school-aged riders use this road for bike trips.

To understand the impact of closing Grattan Street, between Royal Parade and Leicester Street, during construction, strategic bicycle modelling has been undertaken using a Switch Route Model (SRM) developed by SGS (refer to Appendix D).

The proposed closure of Grattan Street is projected to have wide-ranging effects on the bicycle network. Cyclists on Sydney Road are likely to divert from Royal Parade, taking a route through Bowen Crescent, Rathdowne Street, increasing bicycle traffic on these roads. It is important to note that there is a preference for Rathdowne Street over Lygon Street, likely due to the limited bicycle infrastructure on Lygon Street. Tin Alley and Elgin Street, along with Pelham and Queensberry Streets, would be expected to take on greater east-west connecting role. Bicycle use along Bouverie Street also increases as it becomes an access road to enter the university from the south.

Further work is underway to consider possible improvements to the Haymarket roundabout maximise the capability of the network. This would need to consider changes to cycling behaviour with Grattan Street (east of Royal Parade) closed but also benefit riders currently using Royal Parade and Flemington Road. Improving access to Tin Alley (which runs through the Melbourne University campus) would also provide a reasonable alternative connection for riders, although it is noted that this is a private, one-way road.

Additional bicycle infrastructure is recommended along Lygon Street north of Elgin Street, as this would provide an alternative route closer than Rathdowne Street, and could provide for riders coming from Sydney Road. This could also potentially reduce the projected increase in cycle traffic at the Haymarket junction.

The proposed closure of Grattan Street and the short term closures of sections of Royal Parade would also impact on pedestrian movements through the area. Pedestrian routes linking the precinct across Royal

Parade and Grattan Street would be diverted and modified, however pedestrian access would be maintained to the university and health facilities adjacent to the construction and within the precinct throughout the construction works (refer to Appendix F). Due to the high pedestrian numbers, and potential conflict with trucks, special attention is required in the design of the Royal Parade / Grattan Street work site access.

8.7.6 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Construction)

- Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to:
  - Management of any temporary or permanent full or partial closure of traffic lanes including (but not limited to) Royal Parade, Grattan Street and Barry Street, Parkville
  - Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction
  - Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant
  - Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors
  - Provision of suitable routes for vehicles to maintain connectivity for road users to the medical and educational facilities adjacent to the Parkville construction work sites
  - Provision of alternate parking where possible to replace parking lost from Grattan Street during construction and preventing parking at undesignated locations on local roads
  - Provision of car parking for construction workers where possible
  - In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites
  - Special arrangements for delivery or removal of large loads.

Public Transport (Construction)

- Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria, including (but not limited to):
  - Options to divert the 401, 402, 403, 505 and 546 bus services
  - Periodic closures of Royal Parade tram route
- Bus replacement services for disrupted rail customers.

Active Transport (Construction)

- Develop and implement transport management measures in consultation with relevant authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) Grattan Street
- In consultation with the City of Melbourne, provide suitable routes for, cyclists and pedestrians to maintain connectivity and safety for roads and shared paths to provide continued access, including (but not limited to) Grattan Street
- Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists.

Travel Demand Management

- In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.

8.7.7 Conclusion

The construction of Parkville station would require the closure of Grattan Street between Royal Parade and Leicester Street for an extended period (Grattan Street currently carries around 18,000 vehicles per day). Royal Parade / Elizabeth Street would also be restricted to two traffic lanes, plus a tram lane and bicycle lane in each direction, during the works.

Traffic modelling indicates that the Grattan Street closure (and associated transport management measures) would encourage traffic to divert away from the Parkville station precinct during the construction works, thereby minimising the impact on traffic operations at key intersections. However, there would be major increases in traffic on roads in the area in the morning peak period, notably Swanston Street (near University of Melbourne) where traffic that would have travelled along Grattan Street would need to travel north and south along Swanston Street to move around the road closure.

There would be increased congestion at the Elgin Street \ Swanston Street intersection and Cemetery Road East \ College Crescent \ Swanston Street roundabout. This congestion may cause additional queueing along College Crescent towards Royal Parade. Delays would occur at the Haymarket roundabout north-west approach (Flemington Road). Vehicles on Wreckyn Street and Grattan Street would experience longer delays, although the time differences are small in the context of an overall journey.

Further work is underway to consider possible improvements to optimise the operation of College Crescent and the Haymarket roundabout during the construction of Parkville station

Spoil removal, along with materials and equipment delivery, in this precinct would generate an additional 100 truck trips each day over four years. Peak activity would be higher at around 140 truck movements per day. This volume of trucks would be readily accommodated by the major access roads to the precinct, with most truck activity expected to be outside peak periods when these roads have the capacity to accommodate the additional traffic without impacting on the operation of the access routes or key intersections.

While these disruptions would affect travel in the area for a period of time, they should be seen within the context of Melbourne Metro being an important public transport project that would significantly improve the capacity and efficiency of the rail network across Melbourne.

The impacts of additional truck and construction traffic as well as road closures and diversions would be minimised through the implementation of a detailed transport management plan. Travel demand management tools would be used to encourage people to change their travel behaviour which would assist in reducing these impacts.

The closure of Grattan Street east of Royal Parade would require rerouting of the 401, 402, 403 and 505 bus services around the works site, affecting the level of service and increasing travel time on these services.

There would be a medium impact of the works at this site on pedestrian and bicycle movements and safety. Measures would be implemented to direct pedestrian and bicycle movements safely and effectively around the works site, and to provide additional cycling infrastructure on alternative routes. Pedestrian access would be maintained to the university and health facilities adjacent to the construction work site and within the precinct throughout the construction phase.

The implementation of the recommended Environmental Performance Requirements would result in medium residual risks to the transport network and operations during construction.

8.8 Impact Assessment Precinct 5: CBD North Station

8.8.1 Existing Conditions

8.8.1.1 Precinct Context

CBD North station is located at the northern end of the Hoddle Grid that defines the Melbourne CBD. The area around CBD North station is characterised by a range of land uses including RMIT University, residential apartment towers, Melbourne Central Shopping Centre and Melbourne Central Station, the State Library and Melbourne City Baths. The area is highly developed and includes a diverse mix of modern and heritage buildings.

Swanston Street is the 'civic spine' of Melbourne and a high intensity tram corridor. Tram routes also run along La Trobe Street. The existing Melbourne Central railway station is located to the south of the precinct, built as part of the City Loop.

8.8.1.2 Road Network

Table 8-21 lists the SmartRoads categorisation of the road network in the vicinity of CBD North station. Victoria Street, Peel Street and Elizabeth Street to the north of CBD North station are classified as SmartRoads traffic routes. La Trobe Street and Swanston Street are classified as local primary access routes.

Table 8-21 CBD North station precinct - SmartRoads road user priority classifications

SmartRoads Classification	Traffic		Public Transport	Active Transport	
	Traffic Route	Local Primary Access Route	Tram Priority Route	Priority Bicycle Route	Priority Pedestrian Route
Declared Roads					
Victoria Street	✓	-	-	-	✓
Elizabeth Street (north of Victoria Street)	✓		✓	✓*	✓
Local Roads					
Swanston Street	-	-	✓	✓*	✓
La Trobe Street	-	✓	✓	✓*	✓
Elizabeth Street (south of Victoria Street)	-	✓	✓	✓**	✓
A'Beckett Street	-	-	-	-	-
Little La Trobe Street	-	-	-	-	-
Franklin Street	-	-	-	-	-
Stewart Street	-	-	-	-	-

* Principal Bicycle Network, ** Local Bicycle Network

Source: Transmaps, 2015 (http://www.maps.vic.gov.au/TransMaps/ui/DotmapUI.jsp)

There is a low bridge (4.3 m) on Dudley Street with a VicRoads warning that the Victoria Street and Elizabeth Street intersection has low tram wires. Other network constraints in the area include the various road closures, one way streets, and turn bans in the CBD.

The CBD 'Hoddle Grid' is characterised by nine east-west streets and nine north-south streets intersecting at right angles. This street layout results in a road network with closely spaced intersections carrying high volumes of pedestrian, bicycle, public transport and private vehicle movements. Many of the streets also provide access to laneways, further increasing the potential conflicts of transport movements in the CBD. This CBD Hoddle Grid street network layout requires careful management and often requires various regulatory measures such as one-way streets, turning bans at intersections and temporary road closures.

Historic traffic growth within the CBD

Within the CBD the intersections are closely spaced and signal-controlled to ensure maximum throughput through coordination of the traffic signals. Key routes through and around the CBD are at or near capacity during peak periods, and the signals often constrain flows such that they limit the traffic that reaches downstream intersections. As a result, various CBD intersections operate within their theoretical capacity limits. Regardless of this, many of the intersections in the CBD are close to capacity during peak periods. This is reflected in the analysis of historical data that indicates the traffic volumes entering the CBD have not increased over the last 10 – 15 years.

In order to assess the CBD growth, analysis has been undertaken based on a 'cordon screenline'[22] around the CBD to compare traffic entering and exiting the CBD during peak periods. The analysis was undertaken based on the VITM volumes for the 2011 Base Case and the 2031 No Project and 2031 Melbourne Metro Legacy Project Case models. The key finding was that the growth predicted by the various models (from 2011 to 2031) ranges from zero to five percent in the AM Peak and zero to seven percent in the PM peak. On an average annual growth rate, this level of growth is quite small and is actually within daily variations of traffic flow as indicated earlier.

On this basis, it was determined that the observed 2015 traffic volumes were appropriate for the 2021 No Project Case models. However, a sensitivity test was also modelled based on a 10 percent growth of traffic for all movements. Results from both the base models for 2031, and the sensitivity test, are provided in the Transport Modelling Summary Report in Appendix D for both the CBD North and CBD South precinct analyses. The assessment presented in this Section is based on the results of the zero growth case only, as it is considered to best reflect the expected traffic conditions in the vicinity of Melbourne Metro stations. Even with underlying growth up to one percent per annum, Melbourne Metro should provide a mode shift that should counter this level of growth, particularly in proximity to the stations.

Intersection analysis

The analysis of the CBD intersections was undertaken using the Sidra intersection modelling tool with the full details included in Appendix D. The three key intersections in the area (Swanston Street and La Trobe Street, Elizabeth Street / Victoria Street and Swanston Street / Victoria Street) have been considered in this assessment. The summary results of the existing conditions analysis for the AM and PM peak periods are shown in Table 8-22.

[22] A cordon screenline is a theoretical 'ring' around an area where the number of traffic movements into and out of the cordon is summed to enable the comparison of different scenarios. This captures all movements and balances out any localised discrepancies between alternate routes. In this case the cordon included all routes in and out of the CBD.

Table 8-22 CBD North station precinct - Intersection performance - Existing Conditions

Intersection	Approach	AM Peak			PM Peak		
		Degree of saturation	Max Queue (veh)	Ave delay (sec)	Degree of saturation	Max Queue (veh)	Ave delay (sec)
Swanston Street / La Trobe Street	Swanston Street (N)	0.31	10 (bike +vehicles)	21	0.32	8 (bike+ vehicles)	22
	La Trobe Street (E)	0.80	20	10	0.62	11	8
	Swanston Street (S)	0.25	3 (bike)	24	0.25	4 (bike)	23
	La Trobe Street (W)	0.63	11	8	0.79	20	10
	Overall	**0.80**	**20**	**12**	**0.79**	**20**	**12**
Elizabeth Street / Victoria Street	Elizabeth Street (N)	0.46	9	25	0.31	5	25
	Victoria Street (E)	0.76 (RT)	9	22	0.95	18	27
	Elizabeth Street (S)	0.33 (Tram)	2	29	0.60	9	37
	Victoria Street (W)	0.75	16	24	0.79	19	24
	Overall	**0.76**	**24**	**16**	**0.95**	**19**	**28**
Swanston Street / Victoria Street	Swanston Street (N)	0.28	4	29	0.19	2	24
	Victoria Street (E)	0.55	12	14	0.80	19	10
	Swanston Street (S)	0.22	2	25	0.32	4	22
	Victoria Street (W)	0.89	33	22	0.72	20	18
	Overall	**0.89**	**33**	**22**	**0.80**	**20**	**15**

Source: Sidra model outputs

The results indicate that generally these intersections are operating within their current capacity limitations, with queues and delays within reasonable levels. However, with the degree of saturation (DoS)[23] at some locations approaching or over 0.8, any increase in demands would result in a significant increase in delays and queues.

8.8.1.3 Rail Network

The existing Melbourne Central Station passenger entry, exit and transfer flows for the busiest two-hour periods in the AM and PM periods are shown in Appendix D. In 2012 there were just under 16,000 passenger entries/exits observed in the AM peak at Melbourne Central Station. Around 83 per cent of passengers walk to from Melbourne Central Station and a further 13 per cent use the tram.

[23] The degree of saturation of an intersection is a measure of how much demand it is experiencing compared to its total capacity. The degree of saturation (%) is a ratio of demand to capacity on each approach to the junction, with a value of 100%. Values over 85% are typically regarded as suffering from traffic congestion, with queues of vehicles beginning to form.

8.8.1.4 Tram Network

CBD North station is located on La Trobe Street on the edge of the Free Tram Zone,[24] near Swanston Street. Two tram routes operate on La Trobe Street. One of these tram routes is the City Circle free tourist tram, and the other is Route 30. Swanston Street is the busiest tram corridor in the Melbourne tram network. Both Swanston Street and La Trobe Street are designated SmartRoads tram priority routes.

Tram stops on Swanston Street near the CBD North station precinct are fully accessible stops, although only some tram routes use accessible low-floor trams. La Trobe Street trams are not currently fully accessible and no accessible tram stops are available on this street.

There are nine tram routes that operate on Swanston Street, and during the peak hour there are a total of 55 tram services operating on Swanston Street (peak direction). On Route 30, there are six services operating during the peak hour and 12 services during the 2-hour peak period (peak direction). On route 30 there are 722 daily boardings and alightings at the Swanston Street / La Trobe Street[25].

8.8.1.5 Bus Network

Four high frequency Doncaster Area Rapid Transit (DART) bus routes (905, 906, 907, 908) connect the Doncaster to Warrandyte area to the CBD where they operate along Lonsdale Street with a 6-10 minute frequency in peak periods on each route. In total, 44 DART buses are scheduled in the peak direction along Lonsdale Street during the two hour AM peak period.

Lonsdale Street also accommodates further Routes (200, 207, 250, 251, 302, 303, 304, 305, 309, 318, 350, 605). While these routes generally operate to a lower frequency than DART services, in aggregate there are 80 buses scheduled in the peak direction along Lonsdale Street in the two hour AM peak period.

8.8.1.6 Pedestrian Environment

CBD North is a busy pedestrian precinct with large numbers of pedestrian movements generated by the Melbourne Central Station and shopping centre, the RMIT campus, and the State Library. There are a number of SmartRoads pedestrian priority routes in CBD North including:

- La Trobe Street
- Swanston Street
- Lonsdale Street
- Elizabeth Street
- Victoria Street.

There is good pedestrian footpath provision in the CBD North station precinct, although some locations suffer from congestion at times. Footpaths are sufficiently wide on the major thoroughfares like Swanston Street and La Trobe Street, but street trading as well as street infrastructure (rubbish bins, traffic signal boxes, etc.) reduces the effective widths of footpaths in many areas.

Smaller streets typically have narrower footpath widths but usually less street infrastructure. Some streets like Little La Trobe Street have had upgrades in recent years to improve pedestrian amenity and footpath provision. But some streets like Little Lonsdale Street have limited space for future footpath extensions due to the adjacent built environment.

8.8.1.7 Bicycle environment

CBD North station is located in the heart of the CBD and is close to some of the city's most developed bicycle infrastructure. The major east-west and north-south roads provide segregated bicycle lanes along

[24] The Free Tram Zone (FTZ) was introduced to the Melbourne CBD and inner areas of Melbourne on 1 January 2015 – details can be found on the PTV website at http://ptv.vic.gov.au/tickets/zones/

[25] Tram Origin Destination Report, Public Transport Victoria, 2011.

La Trobe Street and Swanston Street and excellent bicycle connections to the north of CBD North station towards Parkville.

The area around CBD North station is one of Victoria's busiest in bicycle traffic during peak commuting hours, with 800 to 1000 cyclists travelling along Swanston Street north-south between 7am-9am, and around 600 to 800 cyclists travelling east-west along La Trobe Street.

8.8.2 Proposed Construction Traffic Routes

The objective of the proposed construction traffic routes is to access the arterial road/motorway network as soon as possible. There are arterial roads and motorways in close proximity to the construction work sites. Proposed traffic routes to and from CBD North station construction work site are shown on Figure 8-14 for the immediate area around the precinct – maps showing the broader area are included in Appendix C.

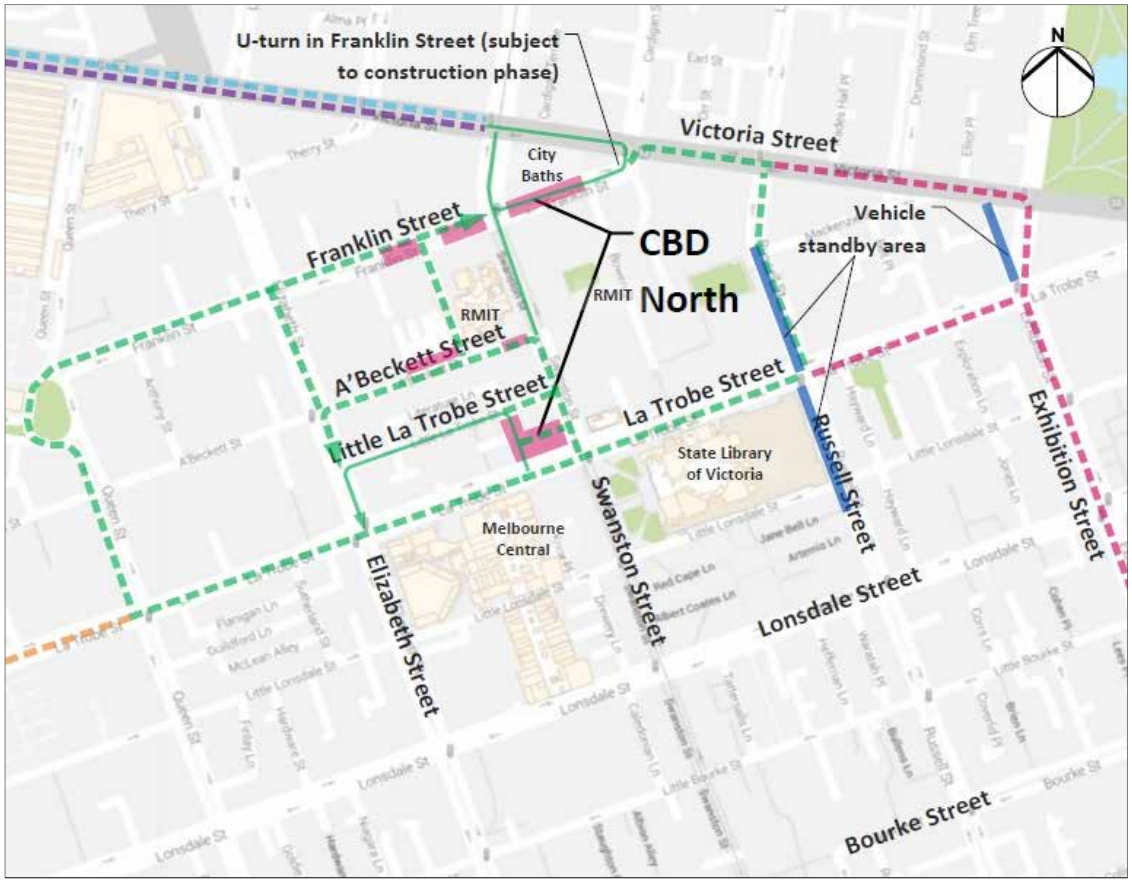

Figure 8-14 CBD North station precinct construction vehicle access routes

The proposed vehicle access options for the construction of CBD North station site are:

- Route 1: Footscray Road, Wurundjeri Way, Dudley Street, Peel Street, Victoria Street (shown in purple)
- Route 2: Footscray Road, Wurundjeri Way, Dudley Street, King Street, La Trobe Street (shown in orange)
- Route 3: Batman Avenue, Exhibition Street (shown in pink)

The immediate local access movements are shown in green and are expected to require access from vehicle standby areas in a number of the local streets as well, as La Trobe Street and Franklin Street. Access to/from the Arden construction work site would be via Victoria Street as shown in light blue.

There are a number of routes that include roads which are not VicRoads arterial roads (declared main roads) and Road Zone, Category 1 in the respective planning schemes apart from a number of the local access routes (green) including:

- Victoria Street between King and Peel Streets, North Melbourne
- Franklin Street
- A'Beckett Street
- Little La Trobe Street
- Russell Street.

8.8.3 Road Transport Impact Assessment

Traffic disruptions

Traffic disruptions in the CBD North station precinct would likely arise from:

- The closure of the eastern section of Franklin Street for a construction work site. This would result in traffic rerouting around the closure and may affect the operation of other CBD intersections
- A'Beckett Street would be closed to allow construction traffic movements but Stewart Street would be opened
- Local access is maintained and managed to businesses for deliveries including City Baths and RMIT
- Increased construction traffic for the duration of CBD North construction works
- Modified access for pedestrians alongside station entrance construction work sites
- Truck access and movements around the area to be based on 24-hour operation.

Truck movements

Based on the expected spoil removal approach, plus materials delivery activities, it is expected that there would be an average of around 150 truck movements per day over 48 months travelling to/from the CBD North station site. Spoil truck movements are an average across a period of time and would vary based on peak and non-peak periods. Peak activity is expected to be higher at around 210 truck movements per day.

Table 8-23 CBD North station - Estimated truck trip generation (total movements)

CBD North station - Estimated truck trip generation (total movements)	
Site working hours	24 hours, 7 days per week (upon placement of acoustic sheds)
Timeframe (months)	48
Average daily truck trips	150
Peak average daily truck trips	210

Daily traffic volumes on these key access routes are very high. For example, around 18,000 vehicles per day use La Trobe Street and around 27,000 vehicles per day use Victoria Street. So even if all trucks used La Trobe Street for access to the CBD North works site, the 210 trucks would only represent around 1 per cent increase in daily volumes. As much of the truck traffic would travel outside peak periods, this volume of construction traffic would be unlikely to significantly affect overall traffic operations in the area.

The proposed construction traffic routes developed for the precinct focus on moving truck and other construction traffic as quickly as possible to Footscray Road and Batman Avenue via arterial roads such as Victoria Street, Wurundjeri Way and Dudley Street.

The impacts of this additional traffic would be minimised further through the implementation of a detailed transport management plan that would include minimising truck movements during peak periods, managing truck arrivals and departures to avoid trucks queueing in CBD streets, and minimising truck movements past residential areas at night time.

Operational analysis

The proposed construction methodology for the CBD North station would retain Swanston Street through the CBD for the duration of the works. However, Franklin Street between Victoria Street and Swanston Street would need to be closed to allow for construction of the station. A number of traffic signal timing changes have also been made in the traffic model for the construction phase of Melbourne Metro. Refer to Appendix D for further information.

Franklin Street to the west of Swanston Street would be retained through Melbourne Metro construction with vehicle access to and from Swanston Street being maintained, though it would be reduced from two lanes in each direction to one lane in each direction.

The closure of the eastern section of Franklin Street, and reduction of the western section to one lane in each direction, would result in traffic diversions around the works site. Potential alternate routes have been considered, and a potential allocation of diverted traffic would move to the alternate routes as follows:

- Alternate Route 1 (60 per cent) - Local diversion around the closed section of Franklin Street – connecting back to Franklin Street west via Swanston Street and Victoria Street. This route can operate in both the eastbound and westbound direction - as the shortest diversion around the Franklin Street closure, it is expected to be used by most diverted traffic (shown in green)
- Alternate Route 2 (20 per cent) - La Trobe Street to bypass the works altogether. This route can operate in both the eastbound and westbound direction and connects to other accesses to the east and west (shown in light blue)
- Alternate Route 3 or broader rerouting beyond the local area (20 per cent) - Diversion of traffic along Victoria Street to Therry Street and Swanston Street – then connecting back to Franklin Street west or A'Beckett Street or La Trobe Street, but has limitations in the PM peak due to right turn bans at Victoria Street (shown in purple).

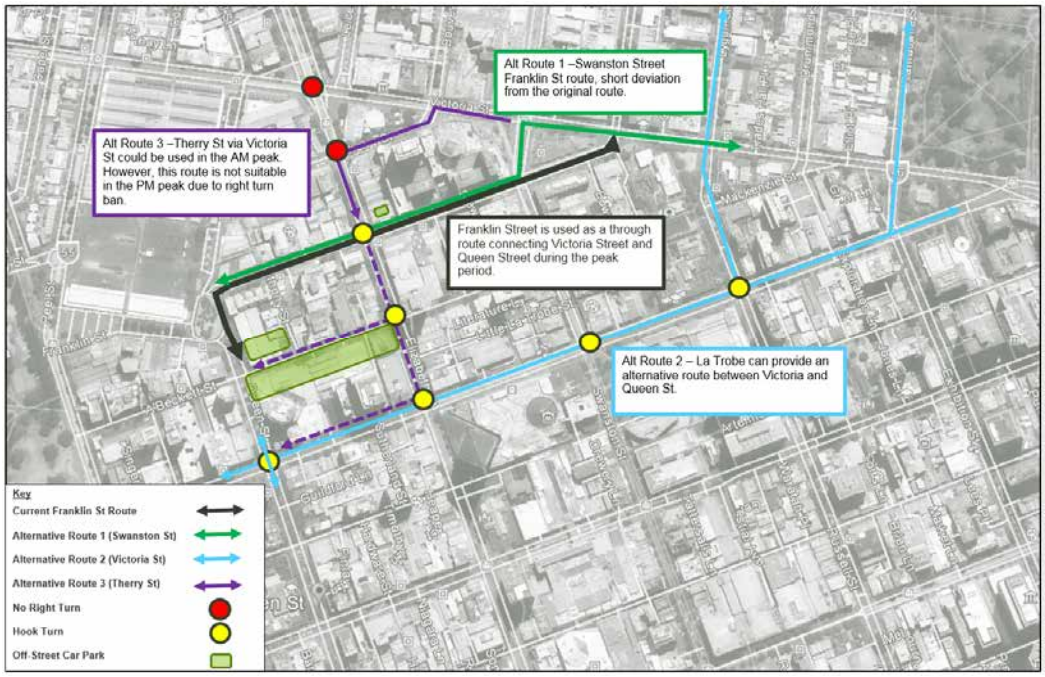

Figure 8-15 Franklin Street closure alternative routes

As the CBD traffic volumes have shown no growth over the last 10-15 years, it can be expected that the base demand volumes in the 2021 Construction Case would be the same as the 2015 existing conditions analysis outlined in Section 8.8.1. However the closure of Franklin Street would result in some traffic diverting around the works site. The resulting analysis is shown in Table 8-24.

Sidra modelling has been used to test the capacity of the main alternative route using Victoria and Swanston Streets. The results indicate that in the AM Peak, the Alternate Route 1 could accommodate up to 60 per cent of the diverted traffic. In the PM peak this route could accommodate up to 80 per cent of the diverted traffic. In both cases there would be heavy right turn movements turning into and out of Swanston Street in both directions that would benefit from minor adjustments to signal timings and phasing arrangements.

Alternate Route 2 via La Trobe Street could accommodate up to 20 per cent of the diverted traffic. At this level of diversion the intersection would be operating close to practical capacity, with the results indicating a DoS of 0.92 in the AM peak and 0.89 in the PM peak with long queues in both peaks.

On-street parking is currently allowed along La Trobe Street between 7:30am and 6:30pm. Introducing clearways during the AM and PM peak periods, together with additional turn bans at some intersections would provide additional capacity to service the increased demand associated with the 20 per cent diverted traffic.

Table 8-24 Intersection Performance – 2021 Construction Case (60% traffic via Swanston Street, 20% via La Trobe Street)

Intersection	Approach	AM Peak			PM Peak		
		Degree of saturation	Max Queue (veh)	Ave delay (sec)	Degree of saturation	Max Queue (veh)	Ave delay (sec)
Swanston Street / La Trobe Street	Swanston Street (N)	0.22	9 (bike)	20	0.21	5 (bike)	20
	La Trobe Street (E)	0.92	38	21	0.64	11	8
	Swanston Street (S)	0.24	2 (bike)	23	0.24	4 (bike)	22
	La Trobe Street (W)	0.67	12	8	0.89	32	17
	Overall	**0.92**	**38**	**17**	**0.89**	**32**	**15**
Elizabeth Street / Victoria Street	Elizabeth Street (N)	0.85	13	30	0.69	11	38
	Victoria Street (E)	Closed			Closed		
	Elizabeth Street (S)	0.20	3	34	0.45	10 (Bike)	37
	Victoria Street (W)	0.20	2	6	0.69	6	6
	Overall	**0.85**	**13**	**30**	**0.69**	**11**	**24**
Swanston Street / Victoria Street	Swanston Street (N)	0.89	12	37	0.81	7	55
	Victoria Street (E)	0.84	21	23	0.75	14	8
	Swanston Street (S)	1.01	9	50	0.75	12	30
	Victoria Street (W)	0.94	37	44	0.71	19	16
	Overall	1.01	37	34	**0.81**	**19**	**18**

Source: Sidra model outputs

8.8.4 Public Transport Impact Assessment

The relocation of services and ancillary works associated with the construction of CBD North station would result in disruptions to tram services on Swanston Street and La Trobe Street although this would be short term occupations (approximately three weekends).

The volume of construction vehicles that would operate on surrounding roads is a very small fraction of the total traffic volumes that utilise these roads. The generation of additional truck movements associated with the construction of CBD North would therefore not result in any change to the time-tabling or routes of public transport services.

Some limited delays would occur at the site entrances on Swanston Street, and on La Trobe Street, as construction traffic enters/leaves the work sites. This would be controlled to reduce the potential for conflict between public transport and construction vehicles turning into and out of the construction work site from these two streets.

8.8.5 Active Transport Impact Assessment

Pedestrian routes would be maintained on Franklin Street during the road closures although the closure is expected to affect bicycle movements. A'Beckett Street would be closed to pedestrians as sufficiently wide footpaths cannot be maintained. The footpath on the side south of Little La Trobe Street, behind the Swanston Street/La Trobe Street work site, would be closed.

Access to businesses and residences at station construction locations would be maintained where possible but for some access would be severely restricted. Due to the high pedestrian numbers, and potential conflict with trucks special consideration is required for the La Trobe Street/Swanston Street work site access. Refer to Appendix F for a map showing potential footpath diversions and closures. All existing cycle lanes remain open, including both Swanston Street and La Trobe Street.

8.8.6 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Construction)

- Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to:
  - Management of any temporary or permanent full or partial closure of traffic lanes including (but not limited to) Franklin Street, A'Beckett Street and Little La Trobe Street at CBD North
  - Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction
  - Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant
  - Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors
  - Provision of suitable routes for vehicles to maintain connectivity for road users adjacent to construction work sites
  - Provision of alternate parking where possible during construction and preventing parking at undesignated locations on local roads
  - Provision of car parking for construction workers where possible
- In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites
- Special arrangements for delivery or removal of large loads.

Public Transport (Construction)

- Provide suitable routes for pedestrians to maintain connectivity, including DDA access for users of Melbourne Central Station
- Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria, including (but not limited to) tram routes on La Trobe Street and Swanston Street.

Active Transport (Construction)

- Develop and implement transport management measures for cyclists and pedestrians to maintain connectivity for road and shared path users of Swanston Street and Franklin Street
- Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists
- In consultation with the City of Melbourne, provide suitable routes for cyclists and pedestrians throughout construction to maintain connectivity and safety for road and shared path users including (but not limited to) Franklin Street (including RMIT facilities) and Swanston Street.

Travel Demand Management

- In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with MMRA's Community and Stakeholder Engagement Plan.

8.8.7 Conclusion

The proposed construction methodology for CBD North station would not require the closure of Swanston Street. However, Franklin Street, between Victoria and Swanston Streets, would need to be closed to enable construction of the station. A'Beckett Street would also be closed to all but construction traffic but Stewart Street would be opened to traffic.

Franklin Street, to the west of Swanston Street, would be kept open throughout Melbourne Metro's construction phase, but would be reduced from two lanes in each direction to one lane in each direction.

Spoil removal, along with materials and equipment delivery, in this precinct would generate 150 truck trips each day over four years. During peak times of activity, this could increase to 210 truck movements per day. The proposed construction traffic routes developed for the precinct focus on moving truck and other construction traffic as quickly as possible to Footscray Road and Batman Avenue via arterial roads such as Victoria Street, Wurundjeri Way and Dudley Street.

Daily traffic volumes on these key access routes are very high and the 210 trucks would only represent a one per cent increase in daily volumes. As much of the truck traffic would travel outside peak periods, this volume of construction traffic would be unlikely to significantly affect overall traffic operations in the area.

The impacts of additional truck and construction traffic as well as road closures and diversions would be minimised through the implementation of a detailed transport management plan. Travel demand management tools would be used to encourage people to change their travel behaviour which would assist in reducing these impacts.

There would be minimal impacts to bus or tram services operating through the precinct during construction.

Pedestrian routes would be maintained on Franklin Street during the road closures although the closure is expected to affect bicycle movements. A'Beckett Street would be closed to pedestrians as sufficiently wide footpaths cannot be maintained. The footpath on the side south of Little La Trobe Street, behind the Swanston Street/La Trobe Street work site, would be closed.

Access to businesses and residences at station construction locations would be maintained where possible but for some access would be severely restricted. Due to the high pedestrian numbers, and potential conflict with trucks special consideration is required for the La Trobe Street/Swanston Street work site access.

The implementation of the recommended Environmental Performance Requirements would result in medium residual risks to the transport network and operations during construction.

8.9 Impact Assessment Precinct 6: CBD South Station

8.9.1 Existing Conditions

8.9.1.1 Precinct Context

This precinct is a highly urbanised and dense inner urban area, centred around the Swanston Street corridor between Collins Street and Flinders Street. The area is located at the southern edge of the Hoddle Grid and is the site of several Melbourne landmarks and visitor destinations, including Federation Square, St Paul's Cathedral, City Square, Melbourne Town Hall and Flinders Street Station. These landmarks are supported by laneways such as Degraves Street, Centre Place and Hosier Place, which are lined with bars, cafes, restaurants and retail outlets.

Public transport and walking are the most popular ways of accessing and moving through this area. Tram routes run along Swanston Street, Elizabeth Street, Flinders Street and Collins Street.

8.9.1.2 Road Network

Table 8-25 lists the SmartRoads categorisation of the road network in the vicinity of CBD South station. Like other parts of the CBD Hoddle Grid, the roads in the CBD South station precinct are principally pedestrian, bicycle, and public transport priority routes. The nearest traffic route is Alexandra Avenue to the south of the precinct.

Table 8-25 CBD South station precinct - SmartRoads road user priority classifications

SmartRoads Classification	Traffic		Public Transport	Active Transport	
	Local Primary Access Route	Local Secondary Access Route	Tram Priority Route	Priority Bicycle Route	Priority Pedestrian Route
Local Roads					
Swanston Street	-	-	✓	✓*	✓
Flinders Street	✓	-	✓	✓*	✓
Collins Street	-	✓	✓	✓*	✓
Elizabeth Street	-	✓	✓	✓*	✓
Flinders Lane	-	-	-	-	-
Little Collins Street	-	-	-	-	-

* Principal Bicycle Network, ** Local Bicycle Network

Source: Transmaps, 2015 (http://www.maps.vic.gov.au/TransMaps/ui/DotmapUI.jsp)

There are no preferred traffic routes within the CBD South station precinct.

There are a number of network constraints in the vicinity of the CBD South station precinct including:

- various road closures, one way streets, and turn bans
- Low-level tram wires - VicRoads26 notes that tram routes within the CBD have low level tram wires
- Low-level bridges - there are low-level bridges on Flinders Street to the west of Spencer Street with a height clearance of 4.0 m as well as low level bridges south of Flinders Street at Spencer Street (4.0 m), King Way (4.7 m), William Street (3.9 m) and Queensbridge Street (4.0 m).

The nearest arterial road is Alexandra Avenue, located to the south of the Yarra River. One of the key functions of this arterial road is to provide for traffic movements between South Melbourne, Port Melbourne and sections of the West Gate Freeway, and also to and from the CBD and inner eastern Melbourne suburbs. Another key function of this route is to provide an alternative route to the CityLink tunnels for placarded goods vehicles, as these vehicles are prohibited from using these tunnels.

Other arterial roads in the wider area include:

- King Street/Kingsway located at the western end of the CBD, which provides direct access to the West Gate Freeway
- Batman Avenue is a toll road that comprises part of the CityLink network, and connects to the south east of the CBD at the intersection with Flinders Street and Exhibition Street. This road link provides access to Alexandra Avenue as well as the wider freeway network.

Intersection analysis

As noted earlier, the analysis of the CBD intersections was undertaken using the Sidra intersection modelling tool with the full details included in Appendix D. The three key intersections in the precinct (Flinders Street / Swanston Street, Collins Street / Swanston Street and Flinders Street / Elizabeth Street) have been considered in this transport impact assessment. The summary results of the existing conditions analysis for the AM and PM peak periods are shown in Table 8-22.

Table 8-26 CBD South station precinct - Intersection performance - Existing Conditions

Intersection	Approach	AM Peak			PM Peak		
		Degree of saturation	Max Queue (veh)	Ave delay (sec)	Degree of saturation	Max Queue (veh)	Ave delay (sec)
Swanston Street / Flinders Street	Swanston Street (N)	0.22	8	28	0.34	13	20
	Flinders Street (E)	1.0	37	34	0.96	21	26
	Swanston Street (S)	1.0	25	45	0.90	13	26
	Flinders Street (W)	0.83	14	22	0.62	10	22
	Overall	**1.0**	**37**	**35**	**0.96**	**21**	**25**
Swanston Street / Collins Street	Swanston Street (N)	0.15	4 (Bike)	7	0.16	4 (Bike)	7
	Collins Street (E)	0.65	10	10	0.51	6	9
	Swanston Street (S)	0.27	7 (Bike)	10	0.16	4 (Bike)	9
	Collins Street (W)	0.63	8	9	0.76	14	11

[26] VicRoads, 2009, *Information Bulletin: Height Clearance on Roads*

Intersection	Approach	AM Peak			PM Peak		
		Degree of saturation	Max Queue (veh)	Ave delay (sec)	Degree of saturation	Max Queue (veh)	Ave delay (sec)
	Overall	**0.65**	**10**	**9**	**0.76**	**14**	**9**
Elizabeth Street / Flinders Street	Elizabeth Street (N)	0.82	5	51	0.61	6	42
	Flinders Street (E)	0.75	9	4	0.70	3	7
	Flinders Street (W)	0.64	10	14	0.68	12	18
	Overall	**0.82**	**10**	**12**	**0.70**	**12**	**14**

Source: Sidra model outputs

Site observations at Swanston Street / Flinders Street indicate that queue lengths along Swanston Street (St Kilda Road) are dictated by the 'upstream'[27] traffic signals. The modelling results indicate that this intersection is at capacity due to the impacts of the pedestrian operated signals on the south side of the intersection that provide the connection between Flinders Street Station and Federation Square. Similarly at the Elizabeth Street / Flinders Street intersection the pedestrian signal phasing controls the operation limiting the time allocation to the one-lane Elizabeth Street approach resulting in high DoS.

The results indicate that generally these intersections are operating within their current capacity limitations, with queues and delays within reasonable levels. However, with the DoS at some locations approaching or over 0.8, any increase in demands would result in a moderate increase in delays.

8.9.1.3 Rail Network

CBD South station is located near the existing Flinders Street Station, a key railway station in the metropolitan network that in 2011-12 was the busiest station by annual patronage (26 million).[28] Flinders Street Station is a key destination for many of the metropolitan rail network's railway lines. It is also located in a key part of the CBD and provides significant tram and walk connections to the wider area.

Public Transport Victoria data[29] derived from station surveys show the main journey purposes for Flinders Street Station rail trips are work/ business (54 per cent), personal business appointments (10 per cent) and education (18 per cent). Flinders Street Station has a high proportion of transfer passengers, meaning people arrive by train and then transfer to another train to leave the station. This means that there are less people that need to access the station from outside the station site. Surveys indicate that around 32 per cent of Flinders Street Station patrons are transfer passengers. Around 53 per cent arrive or depart by walking and around 14 per cent by tram.

The existing Flinders Street Station passenger entry, exit and transfer flows are shown for the busiest two-hour periods in the AM and PM in Appendix D. In 2012 there were approximately 32,000 passenger entries/ exits during the AM peak period and over 43,000 passenger entries and exits during the PM peak.

In the City, Flinders Street Station is the central hub for Night Trains. City Loop stations to close shortly after midnight and Southern Cross Station would close shortly after 1am. After 1am, all trains run direct to and from Flinders Street Station. Access to Flinders Street Station after 1am is only through the main

[27] The upstream traffic signals are those arrived at first, traffic can be considered to flow like a river moving from upstream to downstream

[28] PTV, 'Train Station Patronage Fact Sheet', http://ptv.vic.gov.au/about-ptv/ptv-data-and-reports/research-and-statistics/, Accessed 1 May 2015

[29] ibid

entrance on Swanston Street. Night Trains stop at all stations on the rest of the metropolitan rail network, except on the Stony Point and Flemington Racecourse lines where trains would not operate.

8.9.1.4 Tram Network

There are four tram corridors that operate near CBD South station. Swanston Street, Flinders Street, Elizabeth Street and Collins Street are designated SmartRoads tram priority routes, and all carry high tram frequencies.

There are nine tram routes that operate along Swanston Street and south along St Kilda Road, and these are in an exclusive tram corridor for the majority of the route. Swanston Street has the highest tram service frequency in Melbourne, with around 55 trams per hour in each direction or around one per minute.

There are four tram routes that operate on Collins Street, Routes 11, 12, 48 and 109. Trams operate in a segregated tram lane, generally with limited encroachment by traffic along the length of the street.

Tram routes 70 and 75 run in an east-west direction on Flinders Street. The free City Circle tram service (Route 35) also operates on Flinders Street. Tram routes 19, 57 and 59 run in a north-south direction on Elizabeth Street. Trams operate in a segregated tram lane along Elizabeth Street. Accessible platform stops are available on Elizabeth Street.

The CBD South station precinct has the highest volume of tram routes serving the area across the whole of Melbourne including[30]:

- Swanston Street – a total of 110 tram services (both directions combined) during the daily peak hour (5:00pm - 6:00pm), defined as the highest hour of tram activity across a weekday
- Collins Street – a total of 72 tram services (both directions combined) during the daily peak hour (8:00am-9:00pm)
- Flinders Street – a total of 29 tram services (both directions combined) during the daily peak hour (5:00pm-6:00pm)
- Elizabeth Street – a total of 69 tram services (both directions combined) during the daily peak hour (8:00am-9:00am).

8.9.1.5 Bus Network

There is one metropolitan bus route (Route 605) that runs near CBD South station that travels along Flinders Street on its journey from Gardenvale to the CBD via Kooyong Road.

8.9.1.6 Pedestrian Environment

There is a good provision of pedestrian infrastructure in the vicinity of CBD South station. Major pedestrian movements are observed around Flinders Street Station, Federation Square, City Square, and Swanston Street. There are a number of SmartRoads pedestrian priority routes within this precinct including:

- Flinders Street
- Swanston Street
- Collins Street
- Elizabeth Street.

The CBD South station precinct has a high number of closely spaced signalised intersections providing pedestrians multiple crossing opportunities. Throughout the CBD, the majority of traffic signals operate at 90 second cycles meaning that pedestrians have relatively short waiting times at signals.

In addition to footpaths along the main east-west and north-south streets, there are a number of laneways (some of which are traffic free) and malls making the CBD a highly accessible walking environment.

[30] PTV tram timetables (27 January 2016 – 31 December 2016), http://www.ptv.vic.gov.au/

In 2012 there was an average of 32,360 passenger entries/ exits in the AM peak period and over 43,500 passenger entries/exits in the PM peak at Flinders Street Station (refer to Appendix D). Flinders Street Station has a high proportion of passengers transferring between platforms with approximately 25,000 transfers during the AM peak period.

8.9.1.7 Bicycle Environment

Swanston Street is the key bicycle route through the CBD. Between Flinders Street and La Trobe Street access for delivery and maintenance vehicles is prohibited during the AM and PM commuter peaks and the lunch time peak periods. The removal of vehicles during these critical time periods provides cyclists better clearance from passing trams and provides more overtaking opportunities. There are also dedicated cycle lanes provided in the tram stop areas which require cyclists to stop and wait while stationary trams have their doors open.

Other key cycle routes into the city near the CBD South station include St Kilda Road, Batman Avenue, and the north and south sides of the Yarra River between Swan Street and Clarendon Street.

8.9.2 Proposed Construction Traffic Routes

The objective of the proposed construction traffic routes is to access the arterial road/motorway network as soon as possible. There are arterial roads and motorways in close proximity to the construction work sites. Proposed local area traffic routes to and from construction work sites are shown on Figure 8-16 for the immediate area around the precinct – maps showing the broader area are included in Appendix C.

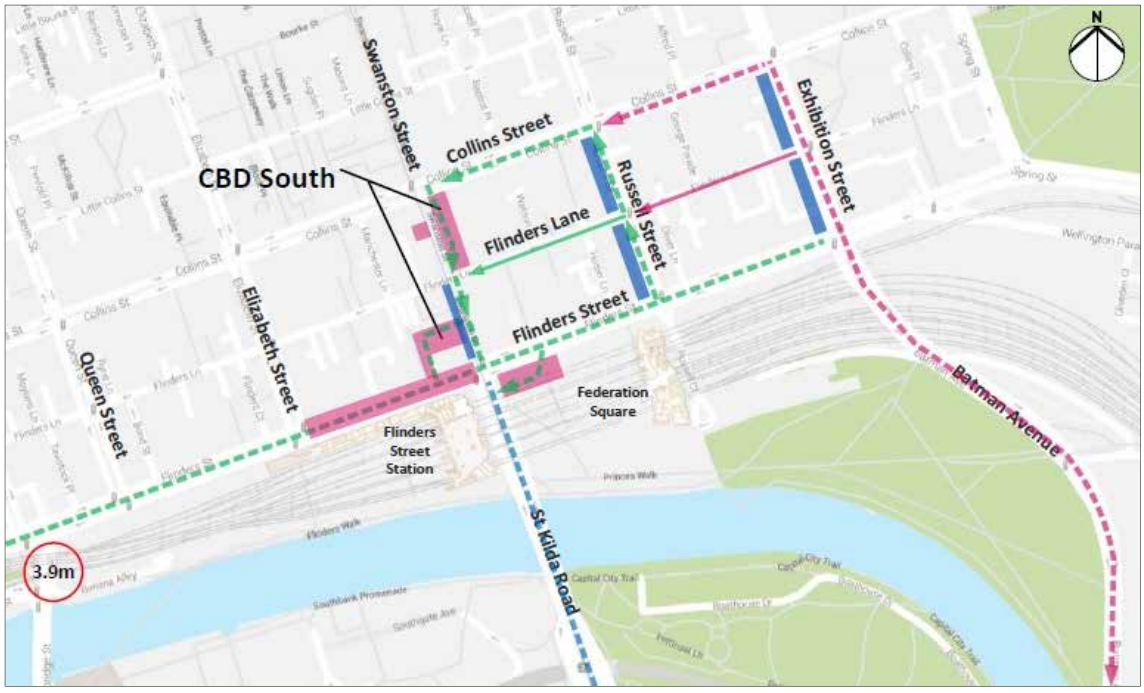

Figure 8-16 CBD South station precinct construction vehicle access routes

The proposed vehicle access options for the construction of CBD station are:

- Route 1 – Montague Street, Wurundjeri Way, Flinders Street west (not shown on diagram)
- Route 2 – Batman Avenue, Exhibition Street (shown in pink)
- Route 3 – Power Street, City Road, Southbank Boulevard, St Kilda Road (shown in blue).

The immediate local access movements are shown in green and are expected to require access from Collins Street, Flinders Street and Flinders Lane. Access to/from the Arden construction work site would be via Flinders Street west to King Street (refer to Appendix C). As noted earlier all roads in the precinct are local roads.

All of the proposed routes are VicRoads arterial roads (declared main roads) and Road Zone Category 1 in the respective planning schemes apart from Flinders Street and the local CBD access routes.

8.9.3 Road Transport Impact Assessment

Traffic disruptions

Traffic disruptions in the CBD South station precinct would likely result in:

- Increased construction traffic for the duration of CBD South construction works
- Altered access routes for pedestrians alongside the station entrance construction work sites
- Truck access and movements around the area to be based on 24-hour operation
- The construction of the connection between Flinders Street Station and CBD South station and Federation Square would require a short term closure of Flinders Street for approximately 4-6 weeks
- Road closures and resulting tram infrastructure reinstatement would affect movements along Flinders Street to Elizabeth Street and Russell Street, including trams and buses
- Additional ancillary works and relocation of services are also required at this location which would take approximately three weekends.

Truck movements

Based on the expected spoil removal approach, plus materials delivery activities, it is expected that there would be an average of around 150 truck movements per day over 48 months travelling to/from the CBD South station site. Spoil truck movements are an average across a period of time and would vary based on peak and non-peak periods. Peak activity is expected to be higher at around 210 truck movements per day.

Table 8-27 CBD South station - Estimated truck trip generation (total movements)

CBD South station - Estimated truck trip generation (total movements)	
Site working hours	24 hours, 7 days per week (upon placement of acoustic sheds)
Timeframe (months)	48
Average daily truck trips	150
Peak average daily truck trips	210

This additional truck traffic would distribute across a number of access routes, thereby minimising the impact on any particular route. The construction traffic would thus be a small fraction of total traffic volumes in the CBD road network.

Daily traffic volumes on these key access routes are already very high. For example, around 20,000 vehicles per day use Flinders Street and around 13,000 vehicles per day use Collins Street. So even if all trucks used Flinders Street for access to the CBD South station works site the 210 trucks would only represent around one per cent increase in daily volumes. As much of the truck traffic would travel outside peak periods, this volume of construction traffic would be unlikely to significantly affect overall traffic operations in the area.

Furthermore, much of the truck traffic would travel outside peak periods. It is therefore expected that this volume of construction traffic is unlikely to significantly affect overall traffic operations in the area, particularly with the likely diversion of traffic around the area as outlined.

The proposed construction traffic routes developed for the precinct focus on moving truck and other construction traffic as quickly as possible out of the CBD using arterial roads such as Montague Street, Batman Avenue (i.e. the tolled extension of Exhibition Street) and Wurundjeri Way. The impacts of this additional traffic would be managed further by minimising truck movements during peak periods and past residential areas at night time, and managing truck arrivals and departures to avoid trucks queueing in CBD streets.

Operational analysis

Construction of the CBD South station would be via mined shafts from work sites off the public road adjacent to Swanston Street, Collins Street and Flinders Street. While construction traffic would require access to and from these areas, vehicle numbers are expected to be low compared to existing traffic volumes and would principally occur outside of peak periods, and not materially affect the current operation of the road network. No traffic signal timing changes are proposed during the construction of Melbourne Metro.

As the CBD traffic volumes have shown no growth over the last 10-15 years, it could be expected that the 2021 volumes and signal operation would be the same as the existing conditions analysis presented in Table 8-26.

8.9.4 Public Transport Impact Assessment

The construction of the connection between Flinders Street Station and CBD South station and Federation Square would require a short term closure of Flinders Street for approximately 4-6 weeks. The Flinders Street Station underpass is expected to be constructed using cut and cover techniques while the Federation Square connection would be constructed using mined tunnelling techniques. Road closures and resulting tram infrastructure reinstatement would affect movements along Flinders Street to Elizabeth Street and Russell Street, including trams and buses. Additional ancillary works and relocation of services are required which would take approximately three weekends.

The volume of construction vehicles that would operate on surrounding roads is low. Some limited delays would occur at the site entrances on Swanston Street, Flinders Street and Collins Street, as construction traffic enters/leaves the work sites. This would be controlled.

Surface works at CBD South have the potential to have a major impact on public transport operations for short periods of time. Swanston Street is the busiest tram corridor in Melbourne and construction activities would need to be carefully managed to minimise any disruptions to tram services along Swanston Street. The construction of the underground access to the existing Flinders Street Station would require partial closures of Flinders Street that would need to be managed effectively to minimise impacts on the Flinders Street tram services and tram and train users. The closures should be undertaken at periods of low seasonal activity to minimise the disruption to tram services.

8.9.5 Active Transport Impact Assessment

The works at CBD South and Flinders Street have the potential to have a major impact on pedestrian and bicycle movements for short periods of time. Swanston Street, Collins Street and Flinders Street are very busy pedestrian corridors, and Swanston Street is one of the busiest bicycle corridors in Melbourne. Construction traffic management plans would need to carefully manage operations to minimise any disruptions to the networks within this precinct.

Access to businesses and residences at station construction locations would be maintained where possible but for some access would be severely restricted, especially at City Square (refer to Appendix F).

Due to the high pedestrian numbers, and potential conflict with trucks, special consideration is required of the Swanston Street and Flinders Street work site access points. Truck movements would need to be actively controlled wherever there is an interface with bicycles and pedestrians to maintain safety.

The Swanston Street corridor is a major bicycle access route into the CBD with the number of cyclists increasing each year. Swanston Street is also a major pedestrian thoroughfare and works would need to be planned to manage the interaction with these two groups. Truck movements would need to be controlled wherever there is an interface with bicycles and pedestrians to maintain safety. There is minimal impact of the works at this site on pedestrian and bicycle movements and safety. Suitable measures should be implemented to direct pedestrian and bicycle movements safely and effectively around the construction site.

8.9.6 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Construction)

- Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to:
  - Management of any temporary or permanent full or partial closure of traffic lanes including (but not limited to) Flinders Street and Flinders Lane at CBD South
  - Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction
  - Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant
  - Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors
  - Provision of suitable routes for vehicles to maintain connectivity for road users adjacent to the construction work sites
  - Provision of alternate parking where possible to replace parking lost during construction and preventing parking at undesignated locations on local roads
  - Provision of car parking for construction workers where possible
  - In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites
  - Special arrangements for delivery or removal of large loads.

Public Transport (Construction)

- Provide suitable routes for pedestrians to maintain connectivity, including DDA access for users of Flinders Street Station
- Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria, including (but not limited to) tram routes on Flinders Street and Swanston Street

Active Transport (Construction)

- Develop and implement transport management measures in consultation with relevant authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) Swanston Street and Flinders Street.
- Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists
- In consultation with the City of Melbourne, provide suitable routes for cyclists and pedestrians throughout construction to maintain connectivity and safety for road and shared path users.

Travel Demand Management

- In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.

8.9.7 Conclusion

Short-term partial closures of Flinders Street would be required to construct the underground connection linking Flinders Street Station to the new CBD South station. Spoil removal, along with materials and equipment delivery, in this precinct would generate an additional 150 truck trips each day over four years. This could rise during peak activity periods to around 210 truck movements per day and only represents one percent increase in daily traffic volumes.

The implementation of traffic management measures and recommended Environmental Performance Requirements to manage traffic movements around the works sites and operating the majority of truck movements outside of peak periods should deliver safe and effective works sites with limited disruption to traffic and local residents and businesses.

There would be a medium impact of the works at this site on tram and bus services with the temporary closure of Flinders Street. The closures should be undertaken at periods of low seasonal activity to minimise the disruption to tram services.

The CBD South station precinct is a busy pedestrian area, with a good provision of pedestrian infrastructure. The precinct has a high number of closely spaced signalised intersections that give pedestrians multiple crossing opportunities with relatively short waiting times. Pedestrian activity associated with Flinders Street Station is highest in the morning and evening peak periods. Swanston Street is the main bicycle route through the CBD, providing segregated bicycle lanes and connections to the south of the CBD along St Kilda Road and to the Capital City Trail along the Yarra River.

While there are high levels of walking and cycling in the area, there is expected to be minimal impact on pedestrians and cyclists during the construction of Melbourne Metro. The implementation of measures to direct pedestrian and bicycle movements safely and effectively around construction work sites, and active management of truck arrivals and departures, would avoid conflicts with cyclists, including those travelling along the busy Swanston Street route.

The implementation of the recommended Environmental Performance Requirements would result in medium residual risks to the transport network and operations during construction.

8.10 Impact Assessment Precinct 7: Domain Station

8.10.1 Existing Conditions

8.10.1.1 Precinct Context

This precinct is characterised by parks and gardens and the Shrine of Remembrance along the east side of St Kilda Road north of Domain Road, offices and residential apartments along the west side of St Kilda Road, and Melbourne Grammar School and commercial premises along the east side of St Kilda Road to the south of Domain Road.

8.10.1.2 Road Network

Table 8-28 lists the SmartRoads categorisation of the road network in the vicinity of Domain station. The main roads in the precinct are mixed priority routes with the exception of the preferred traffic corridors of Kings Way and Queens Road. St Kilda Road is a tram and bus priority and bicycle priority route as well as a traffic route.

Table 8-28 Domain station precinct - SmartRoads road user priority classifications

SmartRoads Classification	Traffic				Public Transport		Active Transport
	Preferred Traffic Route	Traffic Route	Local Primary Access Route	Local Secondary Access Route	Bus Priority Route	Tram Priority Route	Priority Bicycle route
Declared Roads							
St Kilda Road	-	✓	-	-	✓	✓	✓*
Kings Way	✓	-	-	-	-	-	-
Queens Road	✓	-	-	-	-	-	-
Toorak Road	-	✓	-	-	-	✓ (east of Park St)	✓*
Local Roads							
Domain Road	-	-	✓	-	-	✓	-
Domain Street	-	-	-	✓	-	-	-
Dorcas Street	-	-	-	-	-	-	✓*
Park Street	-	-	-	✓	-	✓	-
Albert Road	-	✓ (west of Kingsway)	-	-	-	-	✓*
Bowen Crescent and Bowen Lane	-	-	-	-	-	-	-
Linlithgow Avenue	-	-	✓	✓	-	-	✓*
Birdwood Avenue	-	-	-	✓	-	-	- **
Fawkner Park	-	-	-	-	-	-	- *

* Principal Bicycle Network, ** Local Bicycle Network

Source: Transmaps, 2015 (http://www.maps.vic.gov.au/TransMaps/ui/DotmapUI.jsp)

Toorak Road has multiple competing priorities including traffic, tram and bicycle. Around Domain interchange, bus priority declines for St Kilda Road but tram and bicycle priorities remain.

8.10.1.3 Network Performance

VISSIM micro simulation modelling has been used to assess performance of the local road network around Domain station.

Unlike Sidra, VISSIM provides statistics relating to the performance of the road network within the model, rather than individual intersection statistics. The key road network operating parameters around Domain station are shown in Table 8-29.

The AM and PM peak 2015 Base models have been calibrated and validated against traffic survey data collected in 2015, and therefore reflect the traffic conditions observed on site. This can be characterised as a network approaching capacity for a number of traffic movements, with some queuing and delay but overall is performing in a busy but reasonably manner typical of an inner city location.

Table 8-29 Domain station precinct - Network parameters summary - 2015

Peak	Parameters	2015 parameters
AM Peak	Average Travel Time (min)	3:23
	Average delay per vehicle (s)	80
	Average Speed (km/h)	20
	VHT – Total Travel Time	1,030
	VKT - Total Distance Travelled (km)	20,690
	Total Completed Trips	18,240
PM Peak	Average Travel Time (min)	3:33
	Average delay per vehicle (s)	90
	Average Speed (km/h)	20
	VHT – Total Travel Time	1,070
	VKT - Total Distance Travelled (km)	21,620
	Total Completed Trips	18,090

Source: VISSIM model

The results have been analysed for the signalised intersections within the precinct, and Table 8-30 and Table 8-31 show the results associated with individual approaches to the intersections for the AM peak and PM peak respectively.

Table 8-30 Domain station precinct - Intersection performance – 2015 (Existing Conditions) – AM Peak

Period	Intersection	Approach	Max Queue (m)	Average Delay (sec)
7:30-8:30AM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	100	20
		Domain Road	400	150
		St Kilda Road South	300	20
		Park Street	310	150
		Albert Road	70	80
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	130	40
		Toorak Road	210	80
		St Kilda Road South	230	30
		Kings Way	120	60
8:30-9:30AM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	60	20
		Domain Road	510	270
		St Kilda Road South	190	30
		Park Street	290	120
		Albert Road	90	120
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	170	40
		Toorak Road	210	80
		St Kilda Road South	230	50
		Kings Way	130	60

Table 8-31 Domain station precinct - Intersection performance – 2015 (Existing Conditions) – PM Peak

Period	Intersection	Approach	Max Queue (m)	Average Delay (sec)
4:30-5:30PM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	60	20
		Domain Road	180	100
		St Kilda Road South	190	30
		Park Street	390	290
		Albert Road	30	70
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	230	40
		Toorak Road	250	80
		St Kilda Road South	380	40
		Kings Way	170	60
5:30-6:30PM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	100	20
		Domain Road	90	80
		St Kilda Road South	190	20
		Park Street	320	120
		Albert Road	40	80
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	240	40
		Toorak Road	120	80
		St Kilda Road South	400	40
		Kings Way	130	60

Overall, the 2015 Base models reflect observations made on site and correlate well with turn counts and journey times surveyed on site. Traffic generally moves along St Kilda Road with delays primarily occurring at intersections and to vehicles on side roads, such as Park Street, Domain Road, Toorak Road and Kings Way entering or crossing St Kilda Road. This reflects the priority to tram and traffic movement along St Kilda Road.

8.10.1.4 Rail Network

The Domain station precinct does not have immediate access to the Metropolitan rail network. The nearest railway stations to the precinct are Flinders Street Station (1.8 km) and South Yarra Station (1.8 km). The Domain station precinct is serviced by buses and is a major tram junction in the Melbourne tram network.

8.10.1.5 Tram Network

Domain Tram Interchange is a major level access stop interchange located at the intersection of Park Street and St Kilda Road. The interchange was upgraded to full DDA compliance in 2013, although not all tram routes utilise low-floor trams along the St Kilda Road corridor. It features a series of island platforms for designated routes, weather shelters, and electronic displays to allow easy transfer between tram services. Domain functions as a key interchange point for many tram routes in the Melbourne tram network. Nine tram routes operate directly through Domain Interchange on St Kilda Road.

During the highest tram activity hour there are around 110 services (in both directions) that operate along St Kilda Road to various destinations to the south and east. Most of these tram services offer less than ten minute headways between trams during peak times. The Domain tram interchange has an average of over 13,500 daily boardings and alightings during a typical weekday.

8.10.1.6 Bus Network

There are limited bus services operating along the St Kilda Road corridor, reflecting the importance of trams as the principle public transport mode and the secondary role of buses. Bus route 216 runs accessible buses on weekends only, while routes 219 and 220 have fully accessible services every day of the week.

8.10.1.7 Pedestrian Environment

Footpath provision is generally excellent in the Domain station precinct. Footpath widths along St Kilda Road are generous and are typically even surfaced. A walking/bicycle shared zone exists on the northern side of St Kilda Road between Anzac Avenue and Domain Road. Other local roads in the precinct have wide footpaths with the exception of Bowen Crescent and Bowen Lane.

The St Kilda Road corridor is significant for through traffic modes including trams, bicycles and motor vehicles. Priority is generally given to these modes at crossing locations along St Kilda Road. The tram interchange provides a significant walking/tram interchange and is the site of several controlled pedestrian crossing points. Crossing points along Kings Way are generally low amenity, and due to the high motor vehicle traffic demand along this route, pedestrian crossing signal phase times are low.

The streetscape in the Domain station precinct provides a reasonably high level of accessibility compliance. Most crossing locations have aural signals as well as visual signalling. The provision of tactile paving is widespread, particularly around the redeveloped tram interchange.

8.10.1.8 Bicycle Environment

St Kilda Road is an important north-south bicycle route and is one of Victoria's busiest in bicycle traffic during peak commuting hours, with around 1,100 cyclists travelling north-south along St Kilda Road between 7am-9am weekdays. Albert Road and Park Street provide lesser used bicycle routes, but represent some of the only east west roads in the immediate area for bicycle traffic. Domain Road is an informal bicycle route between South Yarra and St Kilda Road and provides an alternative to Toorak Road.

St Kilda Road, Albert Road, Dorcas Street, Anzac Avenue, and Toorak Road are all classified as part of the Principal Bicycle Network.

The bicycle facilities and routes near Domain station are:

- On-road bicycle lanes on St Kilda Road (generally 1.5 m wide) and Albert Road to the east of Kingsway
- Off road shared paths on Albert Road to the west of Kings Way, on the footpath along St Kilda Road on the northern side between Anzac Avenue and Domain Road, and through Fawkner Park.
- Toorak Road and Birdwood Avenue are informal bicycle routes

8.10.2 Proposed Construction Traffic Routes

The objective of the proposed construction traffic routes is to access the arterial road/motorway network as soon as possible. There are arterial roads and motorways in close proximity to the construction work sites. Proposed traffic routes to and from construction work sites are shown on Figure 8-17 for the immediate area around the precinct – maps showing the broader area are included in Appendix C.

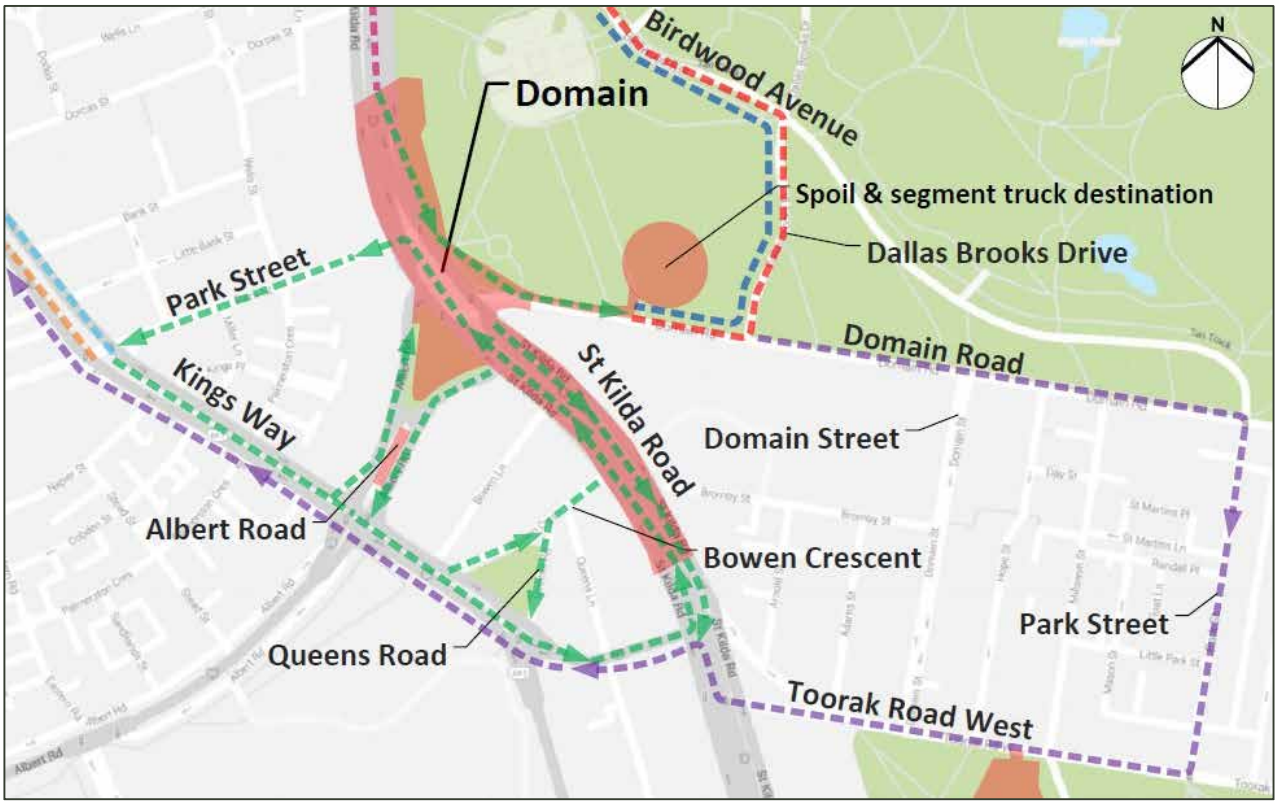

Figure 8-17 Domain station and TBM construction vehicle access routes

The proposed vehicle access options for the construction of Domain station and the TBM site are:

- Route 1 – Kingsway (shown in orange)
- Route 2 – Power Street, City Road, Southbank Boulevard, St Kilda Road (shown in red)
- Route 3 – Domain Road, Dallas Brooks Drive, Birdwood Avenue, Linlithgow Avenue, Southbank Boulevard, City Road, Power Street (outbound only) (shown in blue)
- Route 4 – Domain Road, Park Street, Toorak Road West, St Kilda Road, Kingsway (Outbound Only) (shown in purple)
- Route 5 – Domain Road, Dallas Brooks Drive, Birdwood Avenue, Linlithgow Avenue, Alexandra Avenue, Swan Street, Batman Avenue (Outbound Only) (also shown in red)

The immediate local access movements are shown in green and are expected to require access from Park Street, Albert Road, Bowen Crescent and St Kilda Road. Access to/from the Arden construction work site would be via Kingsway as shown in light blue then following the green routes to access the Domain site.

All of the proposed main access routes are VicRoads arterial roads (declared main roads) and Road Zone Category 1 in the respective planning schemes However there are a number of local roads proposed to be used for the local access and circulation movements around the precinct including Domain Road, Domain Street, Dallas Brooks Drive, Birdwood Avenue, Park Street (both), Albert Road, and Bowen Crescent.

8.10.3 Road Transport Impact Assessment

Traffic disruptions

Traffic disruptions in the Domain station precinct would likely arise from:

- Closure of Domain Road to trams and traffic other than construction vehicles would likely result in delays to traffic operations, tram operations and bicycle movements
- Periodic disruptions to tram services during the staged development of the Domain station as well as the temporary relocation of Domain tram interchange to be clear of the works area

- Staged road traffic diversions along St Kilda Road to accommodate station construction are likely to result in delays to traffic operations
- Pedestrian and bicycle access around the construction zones is likely to be affected throughout the duration of works
- Truck access and movements around the area to be based on 24-hour operation

Any access routes through sensitive areas would need to be carefully managed to minimise impacts on residents and users of the area. In particular, use of the route along Birdwood Avenue past the Shrine should be minimised during daytime hours when Birdwood Avenue is regularly used for bus drop-offs and pick-ups for school groups visiting the Shrine and at weekends when there is significant activity in the Domain gardens including the Shrine. Conversely using this route at night time when there is limited activity at the Shrine is a good option to minimise impacts on residents in the Domain area as it avoids travel past residential properties.

Truck movements

Based on the expected spoil removal approach, plus materials delivery activities, it is expected that there would be an average of around 170 truck movements per day over that period travelling to/from the Domain site (if the TBM is at Domain only). If the TBM launch site is at both Domain and Fawkner Park the expected truck movements would be less at an average of 105 truck movements per day over that period. Spoil truck movements are an average across a period of time and would vary based on peak and non-peak periods. Peak activity is expected to be higher at around 224 truck movements per day if the TBM site is only at Domain.

Table 8-32 Domain station - Estimated truck trip generation (total movements)

Domain station - Estimated truck trip generation (total movements)	Domain Station	Domain TBM (Domain only)	Domain TBM (Domain & Fawkner Park)
Site working hours	24 hours, 7 days per week (upon placement of acoustic sheds / roof)		
Timeframe (months)	48	24	24
Average daily truck trips	100	70	35
Peak average daily truck trips	140	84	42

This traffic would distribute across a number of access routes, thereby minimising the impact on any particular route. It is expected that truck movements would typically be outside the peak periods. As a result, this volume of construction traffic is unlikely to significantly affect overall traffic operations in the area, particularly with the likely diversion of traffic around the area as outlined below.

Daily traffic volumes on the proposed key access routes are very high. For example, around 30,000 vehicles per day use St Kilda Road and around 77,000 vehicles per day use Kings Way. So even if all trucks used St Kilda Road for access to the Domain works site the 224 trucks would only represent less than 1 per cent increase in daily volumes. As much of the truck traffic would travel outside peak periods, this volume of construction traffic would be unlikely to significantly affect overall traffic operations in the area.

These routes have been developed with the aim of minimising impacts on sensitive areas in the precinct. However, access would be required along Birdwood Avenue past the Shrine of Remembrance. Use of this route would be managed carefully to minimise impacts on users of the area, including minimising truck movements during daytime hours and at weekends when there is significant activity in the Domain Parklands and around the Shrine. Conversely, using this route at night time when there is limited activity at the Shrine would provide a good option to minimise impacts on residents in the Domain area as it avoids travel past residential properties.

Operational analysis

The construction of Domain station would require the closure of Domain Road. This would result in the route 8 tram being rerouted from Domain Road to Toorak Road in order to connect with existing tram tracks along St Kilda Road. This scenario has been modelled to assess construction impacts, with new segregated tram tracks and stops along Toorak Road west, which reduces to one running lane of traffic (plus parking) between Park Street and Domain Street.

A number of traffic signal timing changes have been made in the traffic model for the construction phase of Melbourne Metro. Refer to Appendix D for further information.

Rerouting of the route 8 tram requires a new phase at the St Kilda Road intersection to enable trams to turn into and out of Toorak Road west. To facilitate this, a third tram track is planned for southbound trams turning east into Toorak Road and stops are relocated in St Kilda Road, south of Toorak Road.

The construction methodology anticipates the need to reduce St Kilda Road to one lane of traffic in each direction during the construction phase. This would enable the works to be progressed faster, and minimise the duration of disruptions to traffic operations and tram operations. The proposed reduction to one lane is likely to result in some traffic using alternate routes to divert around the site. However, it is likely that there would still be increased congestion and associated delays, particularly during peak periods. The construction is likely to involve a number of phases to reroute traffic and trams around the station box to enable construction.

The expected program of works comprises the following stages:

- Domain Road closed to trams and traffic between St Kilda Road and Dallas Brooks Drive for five years.
- St Kilda Road to operate as two-lanes each way with trams for two weeks early 2017
- St Kilda Road to operate as one-lane each way with trams for approximately 18 months from Dec 2017 to June 2019 with numerous temporary changes to the tram, road, cyclist and pedestrian pathways
- St Kilda Road to operate as two-lanes each way with trams for approximately 18 months from June 2019 to Dec 2020 with numerous temporary changes to the tram, road, cyclist and pedestrian pathways

The temporary road layout for St Kilda Road would provide one tram lane, one traffic lane and a cycle lane in each direction between Kings Way and Park Street, with a temporary DDA-compliant tram stop to be provided opposite Albert Road.

While there are expected to be several stages of construction for Domain station as outlined above, modelling has been undertaken for the critical period when St Kilda Road would be reduced to one lane in each direction, as outlined above, as this is expected to have major traffic impacts and would be likely to be in place for a period of around 18 months.

Table 8-33 and Table 8-34 summarise the changes in the volumes on key links within the VISSIM model network. These traffic volumes are model flows on key road links in the network. They represent the traffic volumes assigned to these links by the VISSIM model based on the increases in the demands in 2031, as outlined above. The model assigns (or allocates) traffic to the network and routes change depending on the delays and congestion in the model. Therefore the differences vary on each link depending on the model assignment algorithms.

Table 8-33 VISSIM network volumes summary – 2021 Construction Case AM Peak period (2hr volumes)

Period	Road	Section	Direction	2015 Base	2021 No Project Case	2021 Construction
7:30-9:30AM	St Kilda Road	south of Dorcas Street	northbound	3,120	3,120	1,340
			southbound	1,530	1,860	1,090
	Park Street	east of Kings	eastbound	710	740	710

Period	Road	Section	Direction	2015 Base	2021 No Project Case	2021 Construction
		Way	westbound	790	790	560
	St Kilda Road	north of Toorak Road	northbound	4,100	4,130	2,190
			southbound	1,490	1,820	1,610
	Kings Way	west of Queens Lane	eastbound	1,500	1,400	1,410
			westbound	1,380	1,380	1,740
	Toorak Road	east of Park Street	eastbound	1,090	1,110	1,480
			westbound	1,750	1,760	1,390
	St Kilda Road	south of Arthur Street	northbound	4,520	4,520	3,210
			southbound	2,700	2,890	2,230

Table 8-34 VISSIM network volumes summary – 2021 Construction Case PM Peak period (2 hr volumes)

Period	Road	Section	Direction	2015 Base	2021 No Project Case	2021 Construction
4:30-6:30PM	St Kilda Road	south of Dorcas Street	northbound	2,110	2,260	900
			southbound	2,720	2,720	1,390
	Park Street	east of Kings Way	eastbound	890	890	670
			westbound	1,050	1,040	860
	St Kilda Road	north of Toorak Road	northbound	2,560	2,700	1,690
			southbound	2,940	2,960	2,060
	Kings Way	west of Queens Lane	eastbound	2,140	2,140	2,040
			westbound	1,610	1,610	1,390
	Toorak Road	east of Park Street	eastbound	2,080	2,070	1,670
			westbound	1,390	1,390	1,320
	St Kilda Road	south of Arthur Street	northbound	2,980	3,110	2,340
			southbound	3,720	3,720	3,010

The results indicate that there is a slight increase in vehicles along St Kilda Road travelling in both directions during the 2021 No Project Case for both peak periods, and the volumes are greatly reduced in the 2021 Construction Case.

The analysis of the 2021 Construction Case is based on the VITM analysis of the one-lane St Kilda Road proposal for the construction phase, but also assumes some additional diversion of traffic around the works area. If the expected diversion is less than assumed in the analysis, then the traffic congestion in the area may be greater than outlined below. It is therefore recommended that a package of transport management measures be deployed to encourage drivers to avoid the area during the construction period (i.e. travelling along diversion routes, travelling outside of peak activity times, or potentially changing travel modes).

The analysis assumes that during the construction period the diversion would result in a reduction of approximately 1,000 vehicles in the northbound direction along St Kilda Road (north of Toorak Road) and 400 vehicles southbound (south of Dorcas Street) during the AM peak hour. In the PM peak, reductions of approximately 700 vehicles in each direction are expected along St Kilda Road, south of Dorcas Street. Further details are included in Table 8-38.

Network Performance

Table 8-35 compares network parameters of the 2015 Base Case, 2021 No Project Case and 2021 Construction Case models.

Table 8-35 Network Parameters Summary - 2021 Construction Case

Period	Parameters	2015 Base	2021 No Project	Difference to 2015 Base	2021 Construction	Difference to 2021 No Project
AM Peak	Average Travel Time (h)	3:23	3:19	-0:04 (-2%)	3:39	-0:20 (+10%)
	Average delay per vehicle (sec)	80	80	0 (0%)	80	0 (0%)
	Average Speed (km/h)	20	20	0 (0%)	20	0 (0%)
	VHT – Total Travel Time	20,690	21,020	330 (+2%)	15,620	-5,400 (-26%)
	VKT - Total Distance Travelled (km)	1,030	1,010	-20 (-2%)	790	-220 (-22%)
	Total Completed Trips	18,240	18,190	-50 (0%)	13,030	-5,160 (-28%)
PM Peak	Average Travel Time (h)	3:33	3:29	-0:04 (-2%)	3:35	0:06 (+3%)
	Average delay per vehicle (sec)	90	90	0 (0%)	90	0 (0%)
	Average Speed (km/h)	20	20	0 (0%)	20	0 (0%)
	VHT – Total Travel Time	21,620	21,900	280 (+1%)	15,630	-6,270 (-29%)
	VKT - Total Distance Travelled (km)	1,070	1,060	-10 (-1%)	840	-220 (-21%)
	Total Completed Trips	18,090	18,200	110 (+1%)	14,010	-4,190 (-23%)

Table 8-35 indicates that the 2021 No Project Case operates at a similar level of service to that of the existing conditions models, though there is a slight decline in all network performance parameters in the construction scenario, even with the reduced number of trips, due to the reduced number of lanes along St Kilda Road.

Travel times increase in the 2021 Construction Case when compared to the 2021 No Project Case in all travel routes in both directions during both peaks principally as a result of the closure of Domain Road. The AM peak results indicate an increase of approximately 50 seconds in the peak direction, with less delay in the opposing direction. The PM peak results illustrate a slightly higher increase in travel times, with an approximate increase between 35 to 45 seconds in both routes, in both peak hours. These increases relate to traffic merging on the approaches to the one lane sections of St Kilda Road and reduced speed through the one lane section.

Intersection Analysis

Movement delays have been extracted from VISSIM using travel time sections for the key intersections of the precinct. Table 8-36 and Table 8-37 show expected average movement delays for the 2021 Construction Case compared to the 2015 Base models.

Table 8-36 Intersection Analysis – 2021 Construction Case – AM Peak - Average delays

Period	Intersection	Approach	2015 Base	2021 Construction	Difference
7:30-8:30AM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	20	30	10 (+50%)
		Domain Road	150	NA	NA
		St Kilda Road South	20	20	0 (0%)
		Park Street	150	100	-50 (-33%)
		Albert Road	80	120	40 (+50%)

Period	Intersection	Approach	2015 Base	2021 Construction	Difference
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	40	30	-10 (-25%)
		Toorak Road	80	90	10 (+13%)
		St Kilda Road South	30	40	10 (+33%)
		Kings Way	60	70	10 (+17%)
8:30-9:30AM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	20	30	10 (+50%)
		Domain Road	270	NA	NA
		St Kilda Road South	30	20	-10 (-33%)
		Park Street	120	110	-10 (-8%)
		Albert Road	120	110	-10 (-8%)
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	40	30	-10 (-25%)
		Toorak Road	80	80	0 (0%)
		St Kilda Road South	50	50	0 (0%)
		Kings Way	60	80	20 (+33%)

Table 8-37 Intersection Analysis – 2021 Construction Case – PM Peak - Average delays

Period	Intersection	Approach	2015 Base	2021 Construction	Difference
4:30-5:30PM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	20	20	0 (0%)
		Domain Road	100	NA	NA
		St Kilda Road South	30	30	0 (0%)
		Park Street	290	110	-180 (+180%)
		Albert Road	70	110	40 (+57%)
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	40	60	20 (+50%)
		Toorak Road	80	70	-10 (-13%)
		St Kilda Road South	40	40	0 (0%)
		Kings Way	60	70	10 (+17%)
5:30-6:30PM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	20	20	0 (0%)
		Domain Road	80	NA	NA
		St Kilda Road South	20	30	10 (+50%)
		Park Street	120	60	-60 (-50%)
		Albert Road	80	140	60 (+75%)
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	40	60	20 (+50%)
		Toorak Road	80	100	20 (+25%)
		St Kilda Road South	40	40	0 (0%)
		Kings Way	60	60	0 (0%)

The 2021 Construction Case indicates intersection approach delays are broadly similar to the 2015 Base Case in both the AM peak and the PM peak, though there are various differences associated with changes in travel patterns associated with the assumed diversion routes.

Travel times

In order to understand the travel time implications of the one-lane St Kilda Road construction phase traffic arrangements, some additional analysis was undertaken using the VITM model. VITM was used as it provides a broader network than the VISSIM models that are localised around the Domain station precinct.

The following series of diagrams show the changes in predicted travel speeds from the VITM analysis:

- Figure 8-18 shows the Domain station precinct travel speeds for the 2021 No Project AM peak period
- Figure 8-19 shows the Domain station precinct travel speeds for the 2021 No Project PM peak period

- Figure 8-20 shows the Domain station precinct travel speeds for the 2021 Construction Case one-lane proposal for the AM peak period
- Figure 8-21 shows the Domain station precinct travel speeds for the 2021 Construction Case one-lane proposal for the AM peak period

Travel speeds are a useful proxy for travel times when considering a broad area. The diagrams indicate that the one-lane configuration of St Kilda Road in the 2021 Construction Case does impact on the speeds in the vicinity of the works area due to the constraints imposed by the reduced capacity. The speeds are also reduced on other roads such as Kings Way and Toorak Road due to the resulting rerouting. However, the downstream speeds would be improved as there is less traffic and faster travel speeds past the area affected by the works.

Analysis indicates that a two-lane arrangement on St Kilda Road during the construction phase would reduce the level of impact on travel speeds and travel times through the area to some degree, but would still not deliver the same level of service currently experienced through the area.

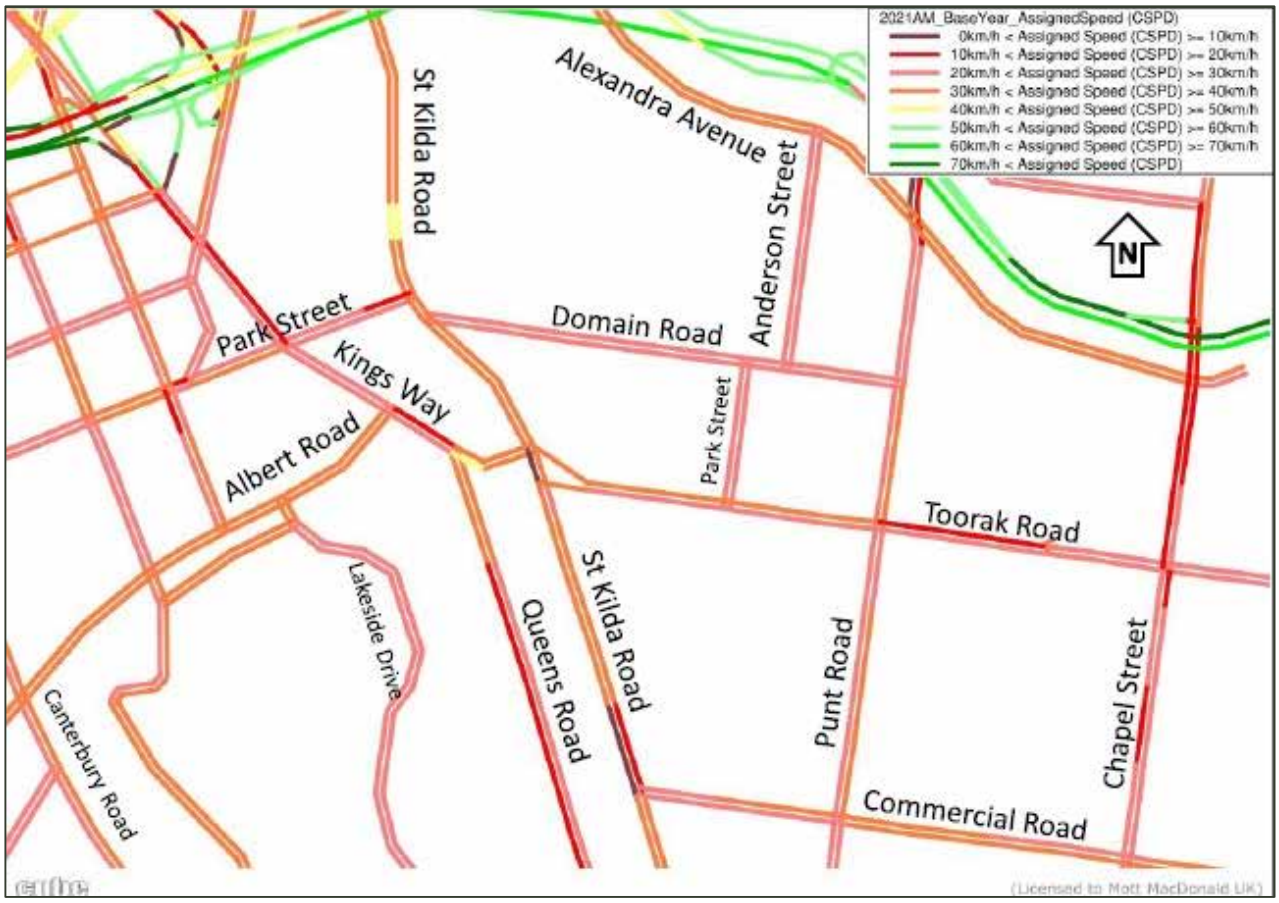

Figure 8-18 Domain station precinct travel times – 2021 No Project AM Peak

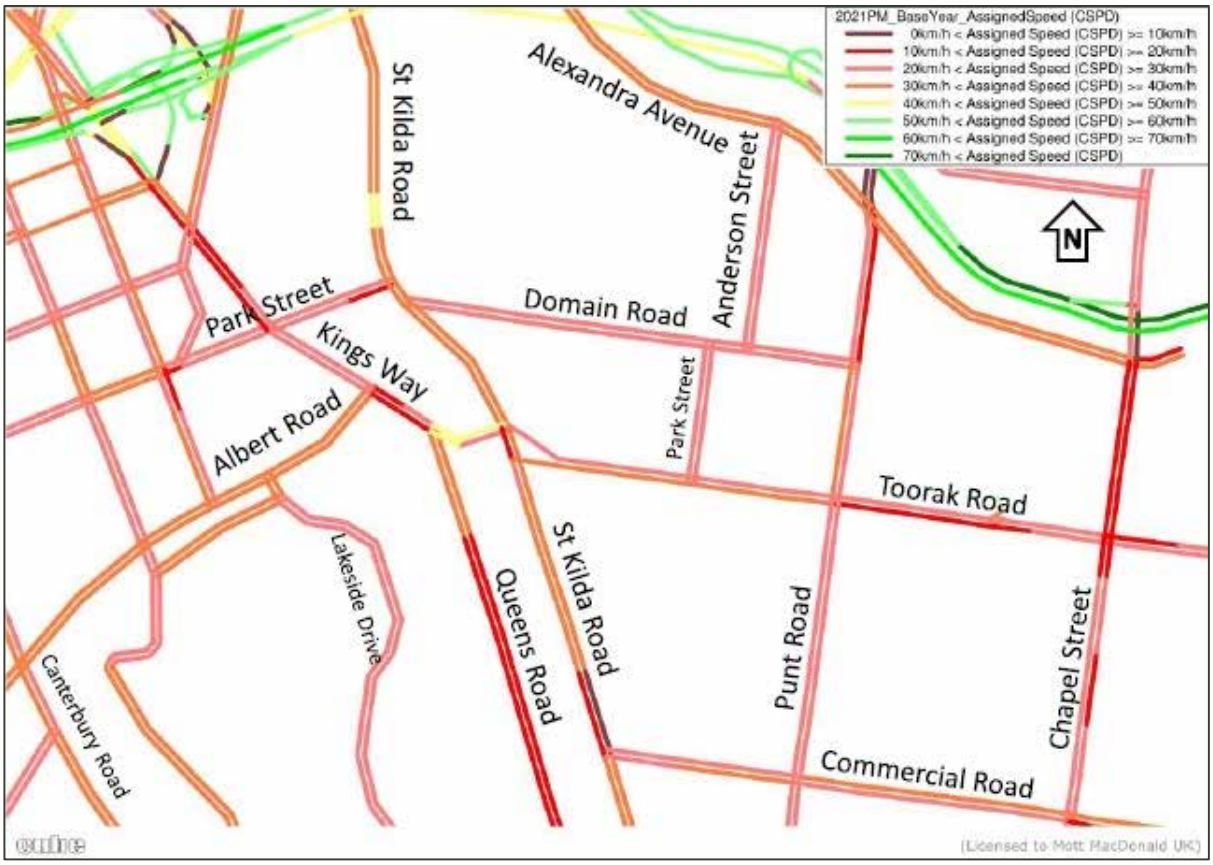

Figure 8-19 Domain station precinct travel times – 2021 No Project PM Peak

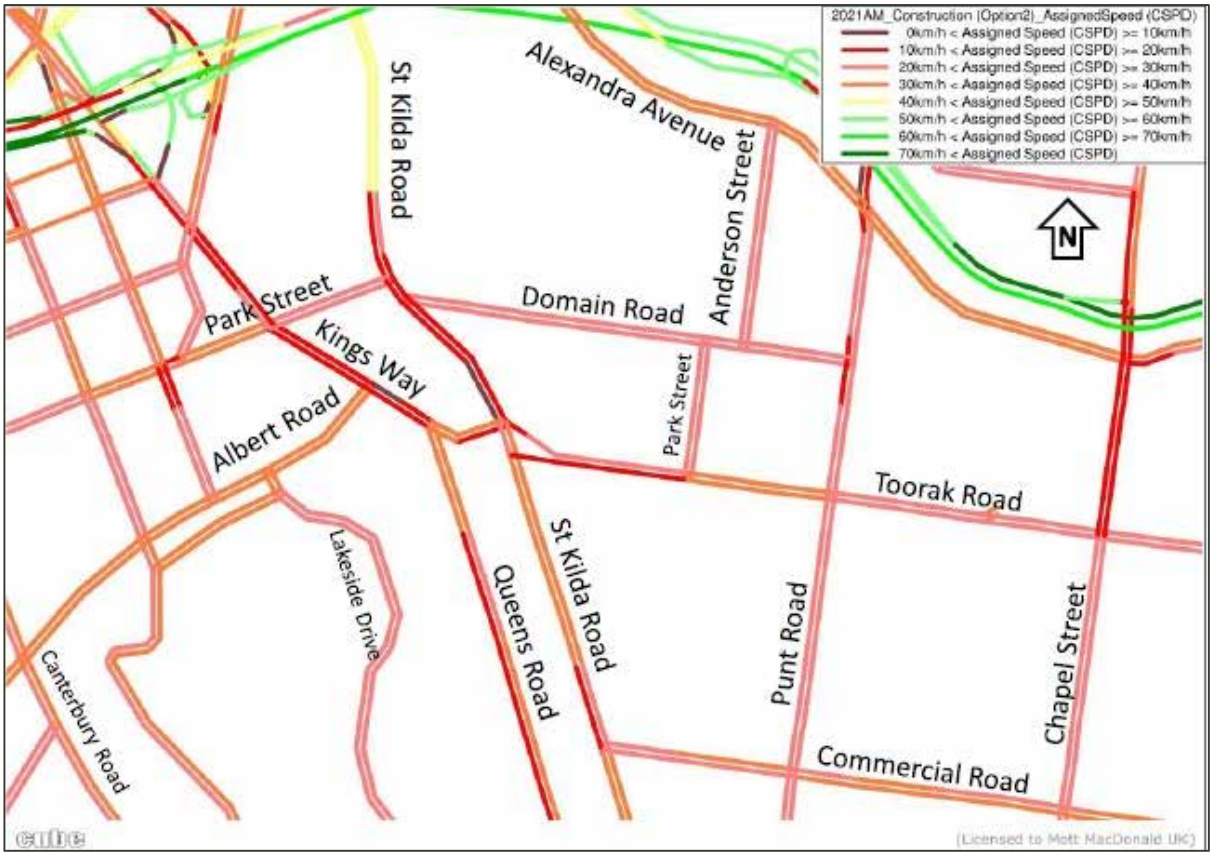

Figure 8-20 Domain station precinct travel times – 2021 Construction Case – One-lane – AM Peak

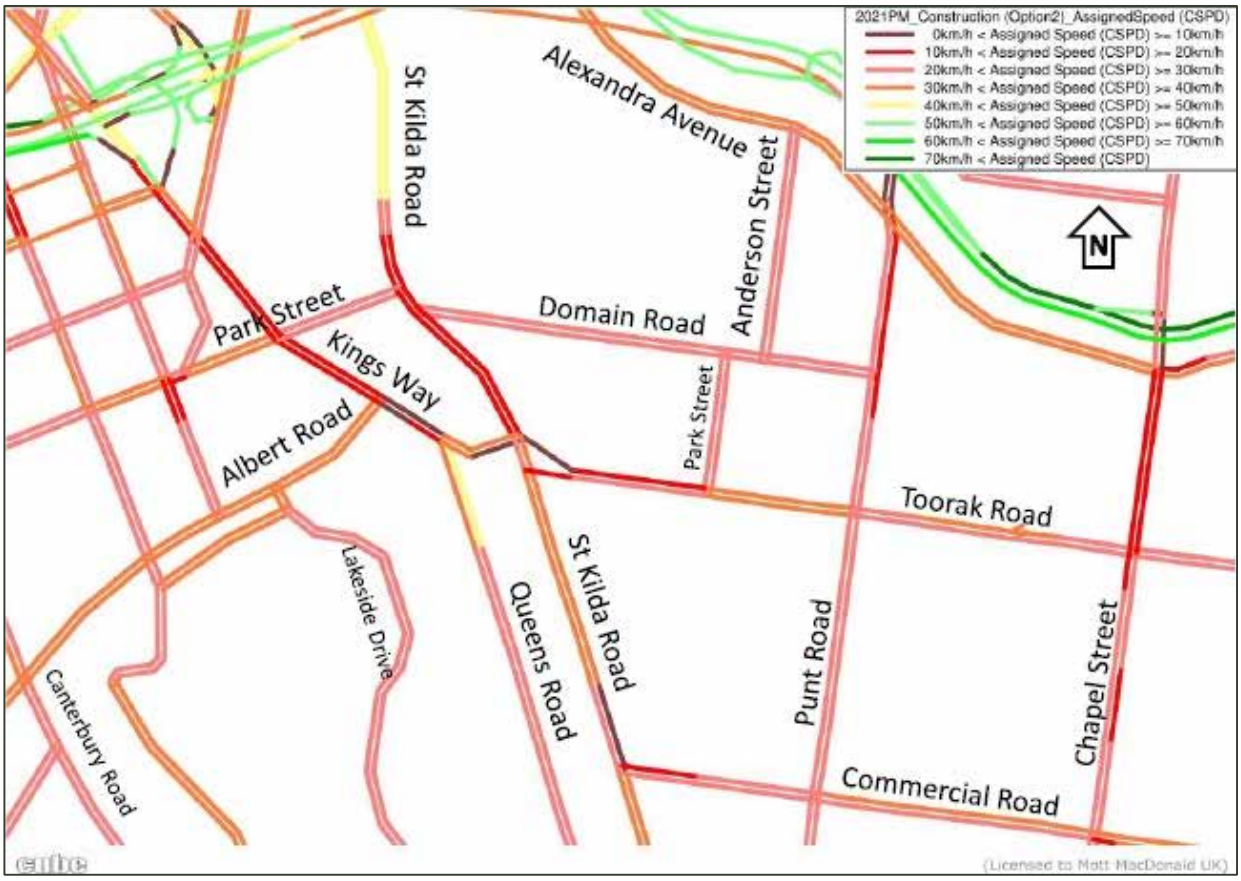

Figure 8-21 Domain station precinct travel times – 2021 Construction Case – One-lane – PM Peak

The actual travel times along key routes through the Domain area was also reviewed from the VITM models. The results indicated relatively small changes in travel times. Most routes demonstrated little change in travel times. However the St Kilda Road route showed delays through the Domain area as shown in Figure 8-22.

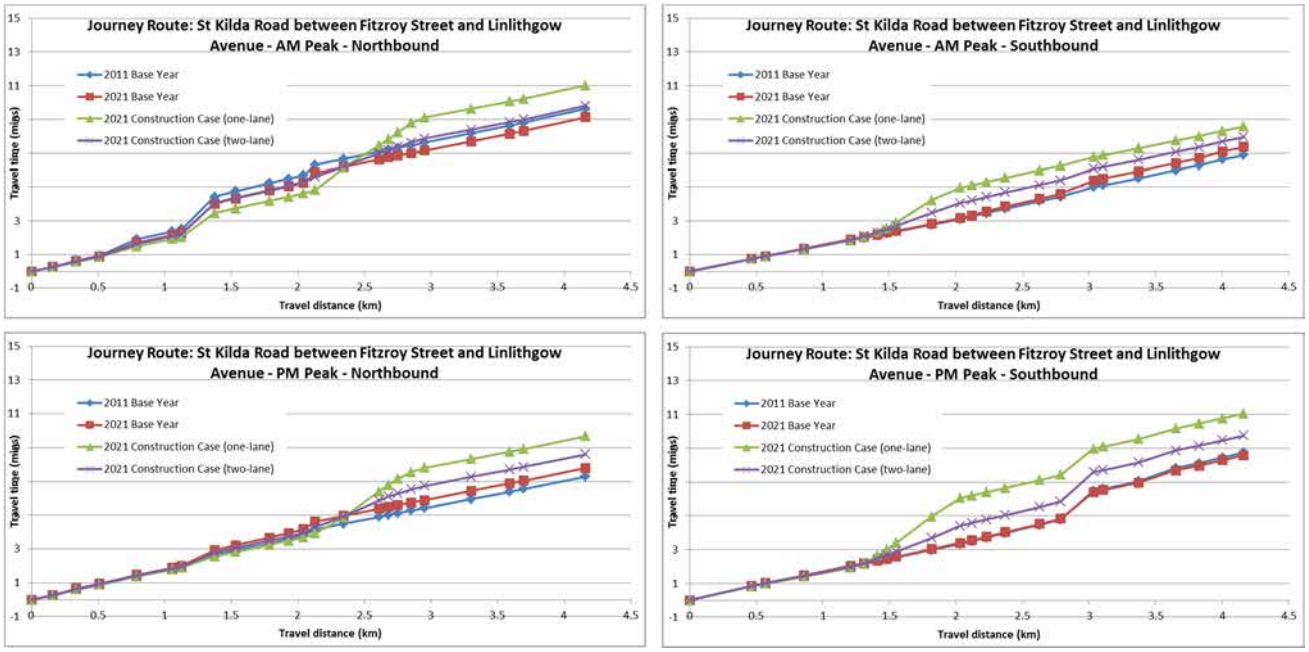

Figure 8-22 Domain precinct construction vehicle access routes

The graphs show direction of travel (northbound and southbound), for the AM and PM peaks. Each graph shows increased delays in 2021 Construction Case (one-lane), but also indicates that there would be increased delays in the 2021 Construction Case (two-lane) travel times. However, the increases in travel times along the corridor are quite small at up to around three minutes for the entire journey. In the context of the overall travel journey and considering daily fluctuations in travel times, these are not considered to be a major impact.

It should be noted that the diversion outcomes from the VITM analysis mean that the impacts on the broader network are distributed widely, and none of the other routes show any significant change in travel times. This analysis can also be considered to represent a 'worst case' scenario, as the analysis has not assumed any effects of travel demand management arrangements that would be an inherent part of such a proposed construction process.

A number of mitigation strategies are proposed to divert traffic away from the St Kilda Road corridor during construction. Such measures would include:

- Identification of alternate routes around the works area (i.e. Kings Way and Canterbury Road)
- Advance notice to motorists of the upcoming works and expected travel delays via media and roadside variable message signs
- Modifications to the traffic signal timings to prioritise preferred travel routes and optimise travel times around the area

Table 8-38 summarises the potential diversion outcomes from proposed mitigation measures.

Table 8-38 Potential diversion outcomes from transport management measures

Proposed mitigation	Forecast vehicles per hour
Kings Way corridor	150 – 250
Canterbury Road / Ferrars Road corridor	200 – 400
Other western routes (i.e. Beaconsfield Parade)	100 – 200
Peak spreading	200 – 300
Total	750 – 1,150
Additional potential	
Punt Road / Hoddle Street	100 – 150
TDM measures	100 – 200
Additional Total	200 - 350

Additional investigations are underway for Kings Way which has been identified as one of the potential diversion routes to understand where capacity can be increased. A number of options are currently being considered including:

- Additional CCTV and additional detection at a number of intersections.
- Reconfiguration of Queens Road/Kings Way including additional southbound left slip to improve capacity, reduce lost time and improve operation.
- Provision of median on Kings Way between Queens Road and St Kilda Road to reduce link disruption caused by Queens Lane traffic
- Improved lane signing and road marking for northbound traffic from Albert Road through to York Street
- Changes to service lane access on Albert Road and Kings Way to reduce blocking at Albert Road and Kings Way near Park Street

- Permanent right turn bans on Kings Way into Sturt Street, and from Sturt Street onto Kings Way with alternative turn provision.
- Rationalisation of Sturt Street/Coventry Street intersection to improve throughput and reduce conflict
- Changed lane markings and improved designation north of Sturt Street to provide two clear lanes to the West Gate Freeway and two to the CBD
- Intersection improvements at York Street and City Link intersections to reduce lost time and pedestrian crossing times
- New layout southbound on offslip to City Link to remove blocking of southbound Kings Way movements

8.10.4 Public Transport Impact Assessment

The works at Domain are expected to have a medium impact on public transport operations.

- The Swanston Street – St Kilda Road corridor is the busiest tram corridor in Melbourne and construction traffic management plans would need to have the objective of minimising disruptions to tram services along St Kilda Road
- The construction is likely to involve a number of phases to reroute traffic and trams around the station box to enable construction. Construction planning would need to carefully manage the changes to the St Kilda Road tram routes to minimise any tram shut-down periods and maintain tram service frequency and reliability. Construction activity would likely include the following short term occupations:
  - Relocation of services and ancillary works (3 weeks)
  - Reroute Park Street route via Toorak Road West (decommission Park Street and connect into St Kilda Road) (1 week)
  - Slew tram tracks St Kilda Road (1 week)
  - Construct centre section of station box (4 weeks)
  - Slew tram track alignment south to north on St Kilda Road (1 week)
  - Reinstate tram tracks to legacy alignment (1 week)
- The rerouting of the route 8 tram from Domain Road to Toorak Road westwards to St Kilda Road would adversely impact on some current tram users along the current route (in particular those north and east of the corner of Domain Road and Park Street), but would improve the service to those on Toorak Road.
- Rerouting of the route 8 tram also requires a new phase at the St Kilda Road intersection to enable tram to turn into and out of Toorak Road est. to facilitate this, a third track is planned for southbound trams running east into Toorak Road and stops are relocated in St Kilda road, south of Toorak Road.
- The operation of the traffic signals along St Kilda Road would need to be optimised to minimise the delays to tram services, particularly at the busy Toorak Road west intersection (refer to Appendix D for further information).

Tram travel times during the 2021 construction phase along within the modelled area along St Kilda Road are less than they would be during 2021 with no construction. This is due to a reduced number of tram stops along St Kilda Road during the construction phase.

Route 8 tram travel times increase with the modelled area due to new phasing at the Toorak Road / St Kilda Road signals allowing trams to run at this intersection.

Table 8-39: Tram travel times – 2021 Construction Case

Route	AM Peak			PM Peak		
	2021 Base	2021 Construction	Difference (sec)	2021 Base	2021 Construction	Difference (sec)
3, 5, 6, 16, 67, 64 72 (St Kilda Road Northbound)	5.08	4.19	-49	5.16	4.35	-41
3, 5, 6, 16, 67, 64 72 (St Kilda Road Southbound)	5.34	4.36	-58	5.35	5.23	-12
8 (Westbound)	4.47	5.47	60	4.27	5.37	70
8 (Eastbound)	4.40	5.50	60	4.17	6.11	114

Source: Vissim model

Bus travel times during the construction phase are similar to those of general traffic, and are generally less than one minute along St Kilda Road (through the modelled area). The longest delays are during the PM peak southbound on St Kilda Road (refer to Table 8-40).

Table 8-40: Bus travel times – 2021 Construction Case

Route	AM Peak			PM Peak		
	2021 Base	2021 Construction	Difference (sec)	2021 Base	2021 Construction	Difference (sec)
220, 216, 219 (St Kilda Road Northbound)	119	163	44	132	175	43
220, 216, 219 (St Kilda Road Southbound)	150	157	7	287	354	67

Source: Vissim model

The proposed reduction of St Kilda Road to one lane is likely to result in a high proportion of traffic using alternate routes to divert around the site. However, it is likely that there would still be a moderate amount of congestion and associated delays, particularly during peak periods. This would result in delays to bus services operating along this corridor.

8.10.5 Active Transport Impact Assessment

The construction of the Domain station and associated works are expected to require periods when bicycle paths would be restricted, and riders would need to exercise caution when travelling through the works area. This is likely to encourage diversion around the precinct, but those who continue would need to travel on lower standard facilities.

Pedestrian footpaths would be maintained on both sides of St Kilda Road and Domain Road throughout the construction period. Crossing points on St Kilda Road would be reduced, with a mid-block/works crossing restricted to a location in the vicinity of the temporary tram stop.

Suitable measures should be implemented to direct and protect pedestrian and bicycle movements safely and effectively around the works site and to maintain both pedestrian and bicycle routes through the works area. This could include a dedicated cycle lane, minimum 1.5 m wide should be provided in each direction along St Kilda Road.

8.10.6 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Construction)

- Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to:
  - Management of any temporary or permanent full or partial closure of traffic lanes including (but not limited to):
    - St Kilda Road, Domain Road, Albert Road at Domain
    - Toorak Road at Fawkner Park
- Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction
- Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant
- Provision for a minimum of one lane for traffic in each direction on St Kilda Road to be maintained throughout the construction within the Domain station precinct
- Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors
- Provision of suitable routes for vehicles to maintain connectivity for road users adjacent to the construction work sites
- Provision of alternate parking where possible to replace parking lost from Domain Road, St Kilda Road and Albert Road during construction and preventing parking at undesignated locations on local roads
- Provision of car parking for construction workers where possible
- Provision of suitable routes for, cyclists and pedestrians to maintain connectivity and safety for roads and shared paths that provide continued access, including (but not limited to) St Kilda Road, Albert Road, Domain Road, Toorak Road and Fawkner Park
- Provision of complementary improvements to Kings Way, Canterbury Road and other roads to accommodate additional traffic that may use these roads and to assist traffic flow in St Kilda Road for the duration of the works
- In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites.
- Special arrangements for delivery or removal of large loads.

Public Transport (Construction)

- Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria, including (but not limited to):
  - Tram operations on Toorak Road and the diversion of the Domain Road tram route
  - Tram routes on St Kilda Road
  - Disruption to other tram routes through Domain tram stop

Active Transport (Construction)

- Develop and implement transport management measures in consultation with relevant authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) St Kilda Road, Domain Road, Domain Parklands, Albert Road, Toorak Road and Fawkner Park.

- Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists
- In consultation with the relevant authorities provide suitable routes for cyclists and pedestrians throughout construction to maintain connectivity and safety for road and shared path users.

Travel Demand Management

- In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.

8.10.7 Conclusion

The Domain precinct would be one of the major construction activity sites as one of the TBM launch sites as well as construction activities related to the construction of Domain Station. Changes to the road network would include the relocation and removal of traffic islands, tram stops and car parking spaces along St Kilda Road, the use of temporary construction work sites on each side of St Kilda Road, the reduction of St Kilda Road to a single lane in each direction, the closure of Domain Road between St Kilda Road and Birdwood Avenue.

More truck activity would be anticipated at this site than in most other precincts. Activity at this site would extend for a period of around four years with 24-hour, 7-day operations and an average of approximately 100 truck trips each day for spoil removal and materials and equipment delivery related to the construction of Domain station. Peak activity is expected to be higher at around 140 truck movements per day.

In addition to this, the Domain (only) TBM launch site would generate an average of 70 vehicles each day over two years. If the option of both Domain and Fawkner Park sites is used for the TBM launch, associated truck trips would reduce to 35 truck trips per day as some trips would occur at Fawkner Park.

The proposed construction traffic routes have been developed with the aim of minimising impacts on sensitive areas in the precinct. However, access would be required along Birdwood Avenue past the Shrine of Remembrance. Use of this route would be managed carefully to minimise impacts on users of the area, including minimising truck movements during daytime hours and at weekends when there is significant activity in the Domain Parklands and around the Shrine. Conversely, using this route at night time when there is limited activity at the Shrine would provide a good option to minimise impacts on residents in the Domain area as it avoids travel past residential properties.

Traffic modelling indicates that transport management changes associated with the construction of Melbourne Metro would result in a medium impact in the operating conditions of the road network in and around the precinct. This analysis indicates negligible growth in total traffic volumes during construction, although some specific trips may record improvements or increases in travel times. For example, there may be a small increase in traffic volumes in the counter-peak direction (southbound) along St Kilda Road in the morning peak and a reduction in volumes in the peak direction (northbound).

While this would reduce existing capacity along St Kilda Road, it would likely result in a high proportion of traffic diverting to parallel routes. Traffic modelling shows that, during construction, there would be a decrease of approximately 1,000 vehicles in the northbound direction along St Kilda Road (north of Toorak Road) and 400 vehicles southbound along St Kilda Road (south of Dorcas Street) during the AM peak. In the PM peak, there would be reductions of approximately 700 vehicles in each direction along St Kilda Road, south of Dorcas Street.

To manage the impacts on traffic flows through the area, a transport demand management strategy would be implemented to advise the public of the potential increase in delays through the area and encourage people to choose alternate routes or to consider changing travel modes or their time of travel. A range of measures would be developed to manage travel demand and to facilitate the operation of alternative

routes. For instance, Kings Way would be a key alternative route around the works area and measures are currently being investigated with VicRoads to improve the flow of traffic along this key corridor. Other routes include Canterbury Road, Beaconsfield Parade and potentially Punt Road, given current proposals to improve the operation of Punt Road.

The construction of Domain station would also require the closure of Domain Road (between St Kilda Road and Dallas Brookes Drive) to trams and traffic for the period of construction of the station. The closure of Domain Road would require the tram to be rerouted to Toorak Road west.

There would also be other medium impacts on public transport operations along St Kilda Road with temporary shut downs affecting the frequency of trams services and relocation of tram and bus stops.

Construction activities would make specific provision for pedestrian and bicycle movements through the precinct. Measures would be implemented to direct pedestrian and bicycle movements safely and effectively around construction work sites and to maintain pedestrian and bicycle routes through the construction area. However, there would be periods when bicycle paths would be restricted and riders would need to exercise extra caution when travelling through the works area. This is likely to encourage some cyclists to divert around the precinct. Pedestrian footpaths would be maintained on both sides of St Kilda Road and Domain Road throughout the construction phase.

The implementation of the recommended Environmental Performance Requirements would result in medium residual risks to the transport network and operations during construction.

8.11 Impact Assessment Precinct 8: Eastern Portal

8.11.1 Existing Conditions

8.11.1.1 Precinct Context

This precinct is highly urbanised and comprises a diverse range of housing types, from low density detached housing to large scale residential apartment blocks. The area borders one of Melbourne's busiest retail and entertainment precincts, centred on Toorak Road and Chapel Street.

8.11.1.2 Road Network

Table 8-41 lists the SmartRoads categorisation of the road network in the vicinity of the eastern portal. It shows that the immediate area is principally a tram and pedestrian priority area. Punt Road to the west and Williams Road to the east are preferred traffic routes. Toorak Road, Punt Road and Commercial Road are all approved as B-double and higher mass truck routes.

Table 8-41 Eastern portal precinct - SmartRoads road user priority classifications

SmartRoads Classification	Traffic		Public Transport		Active Transport	
	Preferred Traffic Route	Traffic Route	Bus Priority Route	Tram Priority Route	Priority Bicycle Route	Priority Pedestrian Route
Declared Roads						
Punt Road	✓	-	✓	-	-	-
Toorak Road	-	✓	-	✓	✓*	✓
Commercial Road	-	✓	✓		✓*	✓
Local Roads						
Chapel Street	-	-		✓	✓*	✓
Osborne Street	-	-	-	-	-	-
William Street	-	-	-	-	-	-

* Principal Bicycle Network, ** Local Bicycle Network

Source: Transmaps, 2015 (http://www.maps.vic.gov.au/TransMaps/ui/DotmapUI.jsp)

The railway lines in the vicinity of the South Yarra station are in a deep cutting that has limited crossings for cars, bicycles and pedestrians. There are two existing bridges in the vicinity of the eastern portal that provide local access around the residential area to the south of Toorak Road:

- William Street bridge crosses the Cranbourne/Pakenham and Frankston rail lines as a bridge over the tracks. The location of the eastern portal is in close proximity to this bridge (no weight restriction)
- Argo Street pedestrian bridge crosses the Sandringham rail line as a bridge over the tracks (10 tonnes weight limit).

There are three arterial roads in the vicinity of the South Yarra precinct: Toorak Road, Punt Road and Commercial Road. Punt Road is defined as Arterial Highway, Toorak Road and Commercial Road are defined as Arterial (Other) Roads. The northern end of Chapel Street, north of Toorak Road, is also an Arterial (Other) road.

8.11.1.3 Rail network

South Yarra railway station is the location of the convergence of the Sandringham Railway Line with the Frankston Line and the Cranbourne/Pakenham Lines. This group of lines is often known as the 'Caulfield Group,' as the lines all run through Caulfield with the exception of the Sandringham Line.

In the AM peak inbound direction many services on the Dandenong corridor short-start and begin at Dandenong or Caulfield station. Some Frankston services in the PM peak terminate short at Carrum, Mordialloc, or Caulfield stations. Cranbourne and Pakenham trains have short terminations at Caulfield. These services are used to handle high demand and manage passenger seat allocation for shorter trips and longer trips.

South Yarra Station is the eleventh busiest station in the metropolitan network by number of annual boardings, and the sixth busiest transfer station in the Metropolitan network[31]. The principal journey purposes for South Yarra Station users are work related followed by education[32].

[31] PTV, 'Train Station Patronage Fact Sheet', http://ptv.vic.gov.au/about-ptv/ptv-data-and-reports/research-and-statistics/, Accessed 1 May 2015

8.11.1.4 Tram Network

The eastern portal precinct is well serviced by trams. All tram routes except Route 78 run through the CBD at some point during their journey. Route 78 is one of only a handful of tram routes in the Melbourne tram network that does not route via the CBD.

Accessible platform stops are not widely available on the immediate network. Route 78 does not currently have any fully accessible stops or compatible trams. The closest fully accessible stop for all other routes in the area is Domain Interchange on St Kilda Road.

Stops near the eastern portal location include:

- Route 8: Stop 30 – South Yarra station
- Route 72: Stop 31 – Chapel Street / Commercial Road
- Route 78: Stop 50 – Toorak Road / Chapel Street.

Route 8 (stop 30) has almost 2,000 daily boardings and alightings at South Yarra station. Route 72 (stop 31) and route 8 (stop 50) have 915 and 764 daily boardings and alightings respectively.

8.11.1.5 Bus Network

The majority of bus routes near the eastern portal run along Malvern Road to the south or Punt Road to the west of the portal location.

8.11.1.6 Pedestrian Environment

There is good provision of pedestrian infrastructure in the vicinity of the eastern portal precinct. The majority of the local roads connecting the site with the wider road network have footpaths on both sides of the carriageway which are in good condition. There are three SmartRoads pedestrian priority routes in the vicinity of the eastern portal:

- Toorak Road
- Chapel Street
- Commercial Street (east of Balmoral Street).

Toorak Road and Chapel Street are notable pedestrian environments connecting to the extensive commercial/retail/dining outlets on these streets. Street trading and dining areas have reduced footpath widths and cause congestion at peak times.

An off-street path (Lovers Walk) runs adjacent to the Frankston and Cranbourne-Pakenham rail lines from South Yarra Station to Toorak Station.

In 2012, there were nearly 3,000 passenger entries and around 3,500 passenger exits at South Yarra Station in the AM peak period. In addition, there were around 1,100 passengers transferring at South Yarra Station in 2012.

8.11.1.7 Bicycle Environment

The Principal Bicycle Network includes a number of the main roads in the eastern portal precinct, most notably Toorak Road and Chapel Street. Many of these routes are designated Principal Bicycle Network routes only, and do not have supporting cycling infrastructure. The City of Stonnington is the local authority that plans and manages the local cycle network, but it only has control over a few sections of the network.

The on-road bicycle route on Toorak Road operates as a clearway only bicycle route. Outside clearway times, this route is inactive and used as car parking. Chapel Street has had cycle lane improvements since 2013 as part of ongoing work to reduce the number of car/bicycle incidents.

[32] ibid

8.11.2 Proposed Construction Traffic Routes

The objective of the proposed construction traffic routes is to access the arterial road/motorway network as soon as possible. There are arterial roads and motorways in close proximity to the construction work sites. Proposed traffic routes to and from construction work sites are shown on Figure 8-23 for the immediate area around the precinct – maps showing the broader area are included in Appendix C.

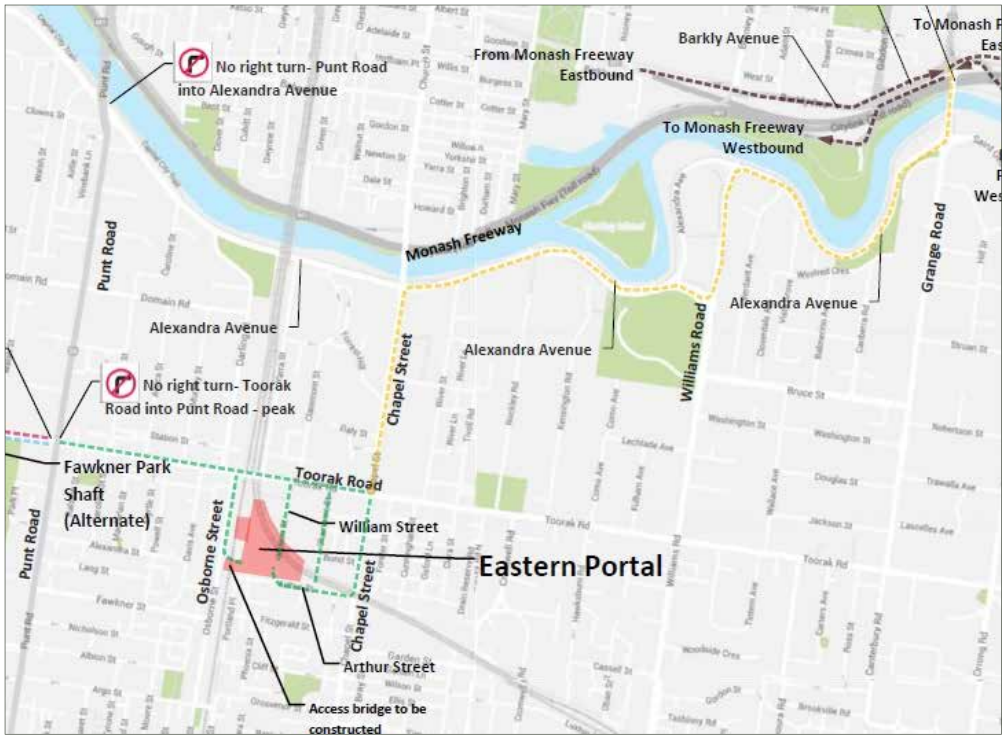

Figure 8-23 Eastern portal precinct construction vehicle access routes

The proposed vehicle access options for the construction of the eastern portal are:

- Route 1 – Kings Way, St Kilda Road, Toorak Road west (shown in pink)
- Route 2 – MacRobertson Bridge, Alexandra Avenue, Chapel Street, Toorak Road (shown in yellow)

The immediate local access movements are shown in green dash and are expected to require access from Punt Road, Chapel Street, Toorak Road, Commercial Road and some of the local streets around South Yarra as shown (i.e. William Street, Arthur Street, Osborne Street and Fawkner Street). Access to/from the Arden Street site would be via Toorak Road west and Kingsway and then following the same routes as the other precincts (refer to Appendix C).

All of the proposed routes are VicRoads arterial roads (declared main roads) and Road Zone Category 1 in the respective planning schemes apart from the local streets around South Yarra (i.e. William Street, Arthur Street, Osborne Street and Fawkner Street).

8.11.3 Road Transport Impact Assessment

Traffic disruptions

Traffic disruptions in the eastern portal precinct are likely to result in:

- Disruptions to local road traffic with construction traffic movements in occurring in residential streets, particularly Osborne Street
- Access to major arterial roads for spoil removal and materials supply involves use of Toorak Road
- Shaft construction adjacent to Osborne Street may temporarily affect vehicular access to residential properties
- TBM retrieval would require oversized and possibly overweight trucks to access the construction work site. This work is proposed to be undertaken during normal working hours. This is anticipated to take 4 to 6 weeks in total
- Truck access and movements would operate during standard working hours.

Truck movements

Based on the expected spoil removal approach, plus materials delivery activities, it is expected that there would be an average of 50 truck movements per day over 30 months travelling to/from the eastern portal site. Spoil truck movements are an average across a period of time and would vary based on peak and non-peak periods. Peak activity is expected to be higher at around 60 truck movements per day.

Table 8-42 Eastern portal - Estimated truck trip generation (total movements)

Eastern portal - Estimated truck trip generation (total movements)	
Site working hours	24 hours, 7 days per week
Timeframe (months)	30
Average daily truck trips	50
Peak average daily truck trips	62

The proposed construction traffic routes developed for the precinct focus on moving truck and other construction traffic to Toorak Road as quickly as possible to avoid disruptions to local residents. The expected level of construction traffic activity could be accommodated readily by Toorak Road outside of peak periods, with active traffic management required during peak periods to minimise delays to tram movements and traffic flow along Toorak Road.

Daily traffic volumes on Toorak Road, the key access route to this site, are quite high with around 18,000 vehicles per day currently travelling along Toorak Road. With the expectation that all trucks would use Toorak Road for access to the eastern portal construction works site the 60 trucks represents less than 1 per cent increase in daily volumes. As much of the truck traffic would travel outside peak periods, this volume of construction traffic would be unlikely to significantly affect overall traffic operations in the area.

Operational analysis

No modelling has been undertaken of the eastern portal construction activities, as the data or site observations indicate that base volumes are low and modelling is not required to support the assessment.

The construction work site is located in a residential area, which means the impact of truck movements and construction activity through the area should be minimised by restricting operations to daylight hours to minimise night-time impacts on residents. Operations should also be kept outside of peak periods to minimise any impacts on the operation of the arterial roads in the area, particularly Toorak Road that has a strong traffic carrying function in peak periods and is also a major tram route.

Given the relatively low numbers of trucks shown above, which would represent a small fraction of total traffic volumes on the construction routes, it is expected that this level of traffic can be managed effectively with minimal impact. There would be localised traffic and parking disruptions to local streets including,

Arthur Street, William Street, Osborne Street and Chambers Street with construction vehicles using these roads to access the construction work sites.

8.11.4 Public Transport Impact Assessment

The Concept Design would require extensive modification in and around South Yarra Siding Reserve. The following information expresses a potential construction methodology. There would be a number of occupations during construction which would impact the Frankston, Dandenong and Sandringham lines. Including:

- Frankston line – 2 weekend occupations, 4 day shutdown (Easter), 35 overnight occupations[33]
- Dandenong line – 2 weekend occupations, 12 day shutdown (Christmas), 16 overnight occupations
- Frankston and Dandenong lines combined – 5 weekend occupations. 16 day shutdown (Easter and Christmas), and 55 overnight occupations
- Sandringham line – 7 day shutdown, 10 overnight shutdowns.

There may be occasional disruption to tram movements a long Toorak Road due to truck movements but these are expected to be limited in frequency and duration. Otherwise, impacts of construction vehicles on the travel times and reliability of bus and tram services would be negligible given the very small proportion this represents of the total traffic volumes on the key roads within the vicinity of this precinct.

8.11.5 Active Transport Impact Assessment

An off-street path (Lovers Walk) runs adjacent to the Frankston / Cranbourne / Pakenham rail lines between South Yarra station and Chapel Street. This path and the William Street bridge would be removed for the duration of the construction works (refer to Appendix F). While alternative routes would be available, they are not as convenient or direct as these routes. In addition, changes to the operation of the streets in the precinct would potentially affect the safety and connectivity of pedestrian and bicycle movements through the area.

Measures would be implemented to direct pedestrian and bicycle movements safely and effectively around construction work sites.

8.11.6 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Construction)

- Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to:
  - Management of any temporary or permanent full or partial closure of traffic lanes including (but not limited to) Osborne Street and William Street in South Yarra
  - Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction
  - Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant
  - Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors

[33] After Last Before First (ALBF) – an occupation between the last scheduled train on a given night and the first scheduled train the next morning.

- Provision of suitable routes for vehicles to maintain connectivity for road users adjacent to the construction work sites
- Provision of alternate parking where possible to replace parking lost during construction and preventing parking at undesignated locations on local roads
- Provision of car parking for construction workers where possible
- In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites
- Special arrangements for delivery or removal of large loads.

Public Transport (Construction)

- Develop and implement a plan for occupying railway land and tracks at the eastern portal that minimises the disruption to railway services during construction. Plan to be developed to the satisfaction of VicTrack and MTM
- Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria. Implement replacement services for disrupted rail customers.

Active Transport (Construction)

- Develop and implement transport management measures in consultation with relevant road management authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to): Osborne Street, William Street and Chapel Street
- Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists
- In consultation with City of Stonnington, provide suitable routes for cyclists and pedestrians throughout construction to maintain connectivity and safety for road and shared path users.

Travel Demand Management

- In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with MMRA's Community and Stakeholder Engagement Plan.

8.11.7 Conclusion

Spoil removal, along with materials and equipment delivery, in this precinct would generate an average of 50 truck trips each day over 30 months, with peak activity periods likely to generate around 60 truck movements per day. TBM retrieval would also require very large trucks to access the construction work site.

The proposed construction traffic routes developed for the precinct focus on moving truck and other construction traffic to Toorak Road as quickly as possible to avoid disruptions to local residents. Toorak Road could readily accommodate the expected level of construction traffic activity outside of peak periods, with active traffic management required during these times to minimise delays to tram movements and traffic flow along Toorak Road.

There would be a number of occupations during construction which would impact the Frankston, Dandenong and Sandringham lines including weekend occupations, Easter and Christmas shutdowns and overnight shutdowns. There may also be occasional disruption to tram movements along Toorak Road due to truck movements but these would be limited in frequency and duration.

There is good provision of pedestrian infrastructure in the vicinity of the precinct. Toorak Road and Chapel Street are notable pedestrian environments connecting to the extensive commercial, retail and dining outlets on these streets.

An off-street path (Lovers Walk) runs adjacent to the Frankston / Cranbourne / Pakenham rail lines between South Yarra station and Chapel Street. This path and the William Street bridge would be removed for the duration of the construction works. While alternative routes would be available, they are not as convenient or direct as these routes. In addition, changes to the operation of the streets in the precinct would potentially affect the safety and connectivity of pedestrian and bicycle movements through the area.

The impacts of additional truck and construction traffic as well as road closures and diversions would be minimised through the implementation of a detailed transport management plan. Travel demand management tools would be used to encourage people to change their travel behaviour which would assist in reducing these impacts.

The implementation of the recommended Environmental Performance Requirements would result in low residual risks to the transport network and operations during construction.

8.12 Impact Assessment Precinct 9: Western Turnback

8.12.1 Existing Conditions

8.12.1.1 Road Network

Table 8-43 lists the SmartRoads categorisation of the road network in the vicinity of the western turnback.

Table 8-43 Western Turnback precinct – SmartRoads road user priority classifications

SmartRoads Classification	Road Transport Traffic Route	Public Transport Bus Priority Route	Active Transport Priority Bicycle Route
Declared Roads			
Geelong Road	✓	✓	✓
Sunshine Road	✓	-	-
Gordon Street	✓	-	-
Local Roads			
Cross Street	-	-	✓**
Errol Street	-	-	-

** Local Bicycle Network

Source: Transmaps, 2015 (http://www.maps.vic.gov.au/TransMaps/ui/DotmapUI.jsp)

8.12.1.2 Rail Network

The western turnback is located near the West Footscray Station. The Ballarat V/line service passes through the West Footscray station, but it does not stop at West Footscray. Metro services from Sunbury to the City operate a stopping service through West Footscray station.

8.12.1.3 Tram Network

There are no tram services in the vicinity of the turnback location at West Footscray.

8.12.1.4 Bus Network

There are three bus services that travel along Geelong Road to the east and one that travels along Sunshine Road to the south of the turnback location at the West Footscray station. Bus route 414 runs a fully accessible service. Bus routes 411 and 412 run accessible services on weekend buses only. There are no accessible services on route 472.

8.12.1.5 Pedestrian Environment

There are pedestrian crossing points at the following locations near the western turnback precinct:

- Signalised pedestrian crossing outside West Footscray station on Sunshine Road
- Zebra crossing outside West Footscray station on Cross Street
- Sunshine Road/Geelong Road signalised intersection.

There is provision of pedestrian infrastructure in the vicinity of the western turnback precinct. The majority of the local roads connecting the site with the wider road network have footpaths on both sides of the carriageway which are in good condition. Sunshine Road only has a footpath on the southern side of the road. Cross Street has a footpath on the northern side of the carriageway and shared path on the southern side of the carriageway.

8.12.1.6 Bicycle Environment

The Principal Bicycle Network includes a number of the main roads in the western turnback precinct, most notably Geelong Road and Cross Street around the West Footscray station. Many of these routes are designated Principal Bicycle Network routes only and do not have supporting cycling infrastructure.

There are on road cycle lanes on Cross Street and Sunshine Road at the West Footscray station. These cycle lanes are provided in both the eastbound and westbound directions on both roads. There is also a shared path on the southern side of Cross Street.

There is formal bicycle parking available on both the north and south sides of the West Footscray station. There are two parkiteer cages located at West Footscray station.

8.12.2 Road Transport Impact Assessment

The scale of works and the availability of land within the VicTrack property boundary to accommodate the works would result in very limited impact on the traffic operations in the local area. Truck activity is expected to be low and well within the capacity of the local road network.

8.12.3 Public Transport Impact Assessment

The works at the station would need to be aware of, and manage, interfaces with suburban rail services as well as freight trains passing through the station and the works area. Access for rail passengers would need to be managed as is typical when station upgrade works are occur. Car parking facilities would need to be maintained during the works or alternate arrangements made for replacement parking. Nevertheless, with good planning it is expected there would be limited impact on passenger rail services, and no impacts on bus or tram services,

8.12.4 Active Transport Impact Assessment

The works should have minimal impact on traffic operations, public transport, pedestrian or bicycle operations and safety. Access for rail passengers (including pedestrians and cyclists) would need to be managed.

8.12.5 Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Construction)

- Develop and implement a transport management plan(s) in consultation with the relevant authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to:
  - Management of any temporary or permanent full or partial closure of traffic lanes

- Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction
- Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant
- Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors
- Provision of suitable routes for vehicles to maintain connectivity for road users adjacent to the construction work sites
- Provision of alternate parking where possible to replace parking lost during construction and preventing parking at undesignated locations on local roads
- Provision of car parking for construction workers where possible
- In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites
- Special arrangements for delivery or removal of large loads.

Public Transport (Construction)

- Develop and implement a plan for occupying railway land and tracks at the western turnback that minimises the disruption to railway services during construction. Plan to be developed to the satisfaction of VicTrack and MTM
- Provide suitable routes for pedestrians to maintain connectivity, including DDA access for users of West Footscray station and around all construction work sites generally
- Bus replacement services for disrupted rail customers.

Active Transport (Construction)

- Develop and implement transport management measures in consultation with relevant road management authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) Cross Street
- Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists
- In consultation with relevant authority, provide suitable routes for cyclists and pedestrians throughout construction to maintain connectivity and safety for users of West Footscray station.

Travel Demand Management

- In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with MMRA's Community and Stakeholder Engagement Plan.

8.12.6 Conclusion

There is a low residual risk of the works at this site on traffic operations, public transport, pedestrian and bicycle movements and safety other than the works at West Footscray station.

8.13 Overall Conclusion - Construction Phase Impact Assessment

The construction phase work would affect users (i.e. traffic, public transport, pedestrians and cyclists) in each precinct at different levels. The key construction related issues associated with Melbourne Metro are outlined in Table 8-44.

Table 8-44 Key issues associated with Concept Design – Construction traffic by precinct

Description	Issue
Precinct 1: Tunnels	
Road transport	The implementation of traffic management measures to divert traffic around the works sites and operating the majority of truck movements outside of peak periods should deliver safe and effective works sites with minimal disruption to traffic operations in the area.
Public transport	There would be minimal impact of the works at these two sites on public transport operations and safety. As a result there are no recommended Environmental Performance Requirements for managing public transport operations. The Fawkner Park site is adjacent to Toorak Road where trams would be rerouted due to the closure of Domain Road. This would change the travel patterns for people in the area that currently use the Domain Road tram. Refer to the Domain station precinct analysis for further discussion.
Active transport	With suitable traffic management measures around these works sites there should be minimal impact of the works at these two sites on pedestrian and bicycle movements and safety.
Precinct 2: Western portal	
Road transport	The implementation of traffic management measures to manage traffic movements around the works site and operating the majority of truck movements outside of peak periods should deliver a safe and effective works site with minimal disruption to traffic and local residents.
Public transport	There would be minimal impact of the works at this site on public transport operations and safety. As a result there are no recommended Environmental Performance Requirements for managing public transport operations. Options are being investigated to provide replacement parking in the vicinity of the station to minimise impacts on rail patrons driving to the station. It is noted that some people may choose to travel to a different station during the works, thereby minimising the number of replacement carparks required. This should minimise the impacts of the works on rail travellers.
Active transport	There would be minimal impact of the works at this site on pedestrian and bicycle movements and safety.
Precinct 3: Arden station	
Road transport	The implementation of traffic management measures to manage traffic movements around the works site and operating the majority of truck movements outside of peak periods should deliver a safe and effective works site with minimal disruption to traffic and local residents.
Public transport	There is minimal impact of the works at this site on public transport operations and safety. As a result there are no recommended Environmental Performance Requirements for managing public transport operations in this precinct.
Active transport	Provision of alternate pedestrian and bicycle facilities around the works site would result in minimal impact on pedestrian and bicycle movements and safety.
Precinct 4: Parkville station	
Road transport	There is expected to be increased congestion around the Parkville station precinct during the construction period principally as a result of the closure of Grattan Street and the flow on impacts on the already congested roads in the area. The implementation of traffic management measures to direct traffic around the works site and operating the majority of truck movements outside of peak periods should deliver a safe and effective works site with minimal disruption to traffic and local residents though there would still be congestion in the area. Emergency vehicles can potentially be impacted by the additional congestion. However, they have the option of using the tram tracks.
Public transport	There would be a medium impact of the works at this site on public transport operations and safety with particular impacts on the heavily patronised bus routes along Grattan Street. The construction planning would need to manage the works to minimise the impacts on bus and tram travellers.

Description	Issue
Active transport	There would be a medium impact of the works at this site on pedestrian and bicycle movements and safety. The construction planning would need to manage the works to minimise the impacts on pedestrians and bicycles.
Precinct 5: CBD North station	
Road transport	The expected local diversion of traffic around the works area and the implementation of traffic management measures to manage traffic movements around the works sites and operating the majority of truck movements outside of peak periods should deliver safe and effective works sites with minimal disruption to traffic and local residents, education services and business.
Public transport	There would be a medium impact of the works at this site on public transport operations and safety. The construction planning would need to manage the works to minimise the impacts on tram travellers.
Active transport	There would be a medium impact of the works at this site on pedestrian and bicycle movements and safety. The construction planning would need to manage the works to minimise the impacts on pedestrians and bicycles.
Precinct 6: CBD South station	
Road transport	The implementation of traffic management measures to manage traffic movements around the works sites and operating the majority of truck movements outside of peak periods should deliver safe and effective works sites with minimal disruption to traffic and local residents and businesses.
Public transport	There would be a medium impact of the works at this site on public transport operations and safety. The construction planning would need to manage the works to minimise the impacts on tram travellers.
Active transport	Traffic management would need to actively control truck movements to and from the CBD South work site to maintain safety of pedestrians and cyclists travelling along this key access corridor to the CBD. Well managed traffic arrangements should result in minimal impact of the works at this site on pedestrian and bicycle movements and safety.
Precinct 7: Domain station	
Road transport	There is a risk of heavy congestion in the Domain station precinct during construction. The modelling analysis indicates that there may be extensive diversion away from the area through traffic management planning and motorists avoiding the anticipated congestion associated with the closure of Domain Road and the operation of St Kilda Road as one-lane in each direction for a period of 18 months. While the analysis indicates that operations would be similar to the existing level of service it is based on assumptions of considerable diversion. It is expected that queues and delays in this area would be significant for the duration of the construction works with potential impacts on safety of people in the area. The implementation of traffic management measures to manage traffic movements around the works site and operating the majority of truck movements outside of peak periods should assist but may there remains a risk to operations.
Public transport	There is likely to be a significant impact of the works at this site on public transport operations. The construction planning would need to manage the works to minimise the impacts on tram travellers.
Active transport	There is likely to be a significant impact of the works at this site on pedestrian and bicycle movements and safety that would require careful planning and management.
Precinct 8: Eastern portal	
Road transport	The implementation of traffic management measures to manage traffic movements around the works site and operating the majority of truck movements outside of peak periods should deliver a safe and effective works site with minimal disruption to traffic and local residents.
Public transport	There is expected to be minimal impact of the works at this site on public transport operations and safety.

Description	Issue
Active transport	There is likely to be a medium impact of the works at this site on pedestrian and bicycle movements and safety.
Precinct 9: Western turnback	
Road transport	There is minimal impact of the works at this site on traffic operations, public transport, pedestrian and bicycle movements and safety other than the works at West Footscray station.
Public transport	
Active transport	

9 Operational Phase Impact Assessment by Precinct

9.1 Draft Evaluation Objectives

The Scoping Requirements relevant to this transport impact assessment are shown in Table 2-1 and Table 2-2. The Scoping Requirements specifies that the assessment of the impacts of Melbourne Metro should consider specific requirements related to:

- Key issues
- Priorities for characterising the existing environment
- Design and mitigation measures
- Assessment of likely effects
- Approach to manage performance.

The Scoping Requirements relate to both construction of Melbourne Metro and legacy or operational outcomes. This section focusses on transport for the legacy outcomes of the project against the recommended Environmental Performance Requirements.

9.2 Key Issues - Legacy State

The key transport legacy state issues associated with Melbourne Metro by precinct and by mode are outlined in Table 9-1.

Table 9-1 Key transport operational issues associated with Melbourne Metro by precinct

Description	Issue
Precinct 1: Tunnels	
Road transport issues	There are no road transport related issues in this precinct that are relevant to the transport impact assessment.
Public transport issues	There are no public transport related issues in this precinct that are relevant to the transport impact assessment.
Active transport issues	There are no active transport related issues in this precinct that are relevant to the transport impact assessment.
Precinct 2: Western portal - Located adjacent to South Kensington station	
Road transport issues	Issues include the loss of car parking at the South Kensington station in the Concept Design and the reinstatement of closures at the southern end of Ormond Street and Tennyson Street that are to be removed as part of the construction works. Parking provision and footpath arrangements depend on the option adopted.
Public transport issues	There are no public transport related issues in this precinct that are relevant to the transport impact assessment.
Active transport issues	The proposed changes to the pedestrian network in the Concept Design include the provision of a 2.5 m wide shared use path along the northern side of Childers Street as part of the Childers Street reconstruction works following the construction of the western portal works, while the variation option retains the southern footpath.
Precinct 3: Arden station	
Road transport issues	There are no road transport related issues in this precinct that are relevant to the transport impact assessment.

Description	Issue
Public transport issues	Issues include the proximity to the North Melbourne railway station and the opportunity to develop a connection between the two stations to enhance connectivity between Melbourne Metro and the northern group (Upfield and Craigieburn lines).
Active transport issues	The proximity to the North Melbourne railway station provides opportunity to develop a pedestrian walkway connection between the two stations to enhance connectivity between Melbourne Metro and the northern group.
Precinct 4: Parkville station - Located under Grattan Street, to the east of Royal Parade	
Road transport issues	Issues include the operation of the road network following the changes to functional layouts of Grattan Street and Royal Parade.
Public transport issues	Issues include the planned location of the Parkville station to provide for the needs of the Melbourne University and hospital precinct users and the connectivity to the trams on Royal Parade and Swanston Street and buses on Grattan Street.
Active transport issues	The escalators proposed on the south western corner of Grattan Street and Royal Parade would provide direct access to the hospitals, though the majority of the hospital demand is located to the north of Grattan Street so a high proportion of the pedestrians using these escalators would need to cross Grattan Street.
Precinct 5: CBD North station - Located under Swanston Street, between Franklin and La Trobe Streets	
Road transport issues	Issues include the operation of the road network following the changes to road network, particularly the permanent closure of Franklin Street east of Swanston Street as well as changes to Franklin Street west of Swanston Street and A'Beckett Street to provide station accesses.
Public transport issues	Issues include the connectivity to the tram services on Swanston Street and La Trobe Street and the connectivity to the other rail lines through a direct connection to Melbourne Central Station.
Active transport issues	The capacity of this connection would need to be sufficient to accommodate the transfers between the two stations.
Precinct 6: CBD South station - Located under Swanston Street, between Collins and Flinders Streets	
Road transport issues	Issues include the operation of the road network around the area, though there are no proposed changes to the road network
Public transport issues	Issues include the need to provide good connectivity to the tram services on Swanston Street, Flinders Street and Collins Street and the connectivity to the other rail lines through a direct connection to Flinders Street Station. Provides good connectivity to the tram lines on the Swanston Street / St Kilda Road tram corridor and the major land uses in the area including Federation Square.
Active transport issues	Footpath capacity around the corner of Swanston Street and Collins Street would need to accommodate future demands. The pedestrian crossing capacity at this intersection would need to be increased to accommodate the increased pedestrian activity at this location Footpath capacity around the corner of Swanston Street and Flinders Street would need to accommodate future demands. The underground connection to Flinders Street Station should assist to reduce the crossing demands and reduce the congestion on the footpaths in this area. The capacity of the underground connection would need to be sufficient to accommodate the transfers between the two stations. The capacity of the Federation Square connection would need to be sufficient to accommodate the event demands
Precinct 7: Domain station - Located under St Kilda Road, adjacent to Albert Road	
Road transport issues	Issues include the operation of the road network following the changes to functional layouts of St Kilda Road and the associated changes to St Kilda Road traffic arrangements and the associated loss of car parking.
Public transport issues	Issues include the need to provide good connectivity to the tram lines along St Kilda Road including a direct connection to the new tram super stop in the centre of St Kilda Road.

Description	Issue
Active transport issues	The capacity of the connections between the tram superstop and Domain station and the standing capacity of the tram stop would need to accommodate the pedestrian demands.
Precinct 8: Eastern portal	
Road transport issues	There are no road transport related issues in this precinct that are relevant to the transport impact assessment.
Public transport issues	The implementation of Melbourne Metro would result in only the Frankston and Sandringham line services operating through South Yarra giving improved capacity and efficiency benefits.
Active transport issues	There are no active transport related issues in this precinct that are relevant to the transport impact assessment.
Precinct 9: Western Turnback	
Road transport issues	There are no road transport related issues in this precinct that are relevant to the transport impact assessment.
Public transport issues	The provision of an improved connection to Footscray Station should improve connectivity between rail services and enable Melbourne Metro to balance services and optimise network efficiency.
Active transport issues	Provision of a new platform at West Footscray station should improve connectivity between rail services but the concourse would need to be designed to accommodate increased demands.

9.3 Operational impact assessment – Wider network

9.3.1 Network Wide Impact Assessment – Road Network

There are no Melbourne Metro project related road improvement projects across the broader network relevant to this analysis other than those addressed in the precinct analysis presented later in this section. However, the works are likely to have impacts that extend beyond the precinct boundaries due to the nature of the works and the location of the precincts being within or near the CBD.

The VITM base modelling developed for Melbourne Metro in 2015 included a number of changes to the road network around station precincts as shown in Table 9-2.[34] The 2031 Melbourne Metro Legacy Project Case model includes the following changes to the 2031 No Project Case VITM model.

Table 9-2 Network assumptions included in the 2031 Melbourne Metro Legacy Project Case base model

Location	Network assumptions included in 2031 Melbourne Metro base model	Comments
Parkville station precinct	Grattan Street reduced to one lane in each direction between Flemington Road and Leicester Street. Royal Parade, southbound, no right turn into Grattan Street.	The location of the Royal Parade tram stop north of Grattan Street does not allow for a right turn lane.
CBD South station precinct	Flinders Street eastbound between Elizabeth Street and Swanston Street reduced to one lane in VITM as this was adopted as a worst case scenario when road functional layouts were being developed.	The VITM modelling was undertaken prior to the finalisation of the road functional layouts and so a worst case scenario was adopted at the time. Subsequently the road

[34] The VITM models used for the analysis of the Melbourne Metro were based on the Victorian government model managed by DEDJTR that was further developed by PTV to improve the model validation to public transport demands. The model changes listed in Table 9-2 reflect the assumptions adopted by PTV in the development of those base models provided to AJM-JV in June 2015. They reflect the assumptions at that time and may have changed in the development of the Melbourne Metro since that time

Location	Network assumptions included in 2031 Melbourne Metro base model	Comments
	The Sidra analysis has been undertaken in accordance with road functional layouts (i.e. no change to the existing configuration).	functional layouts determined that no changes were required at CBD South and so the Sidra analysis has assumed no change to the current configuration.
Domain station precinct	St Kilda Road reduced to two lanes in each direction between Domain Road and Kings Way.	As shown in the road functional layouts.

Figure 9-1 and Figure 9-2 show traffic volume difference outputs from the base model VITM analysis comparing the 2031 No Project Case and 2031 Melbourne Metro Legacy Project Case, based on the above assumptions. The figures show differences by link where those differences are either greater than 50 vehicles per hour or 10 per cent on the base volume. Increases are shown in red and decreases in blue.

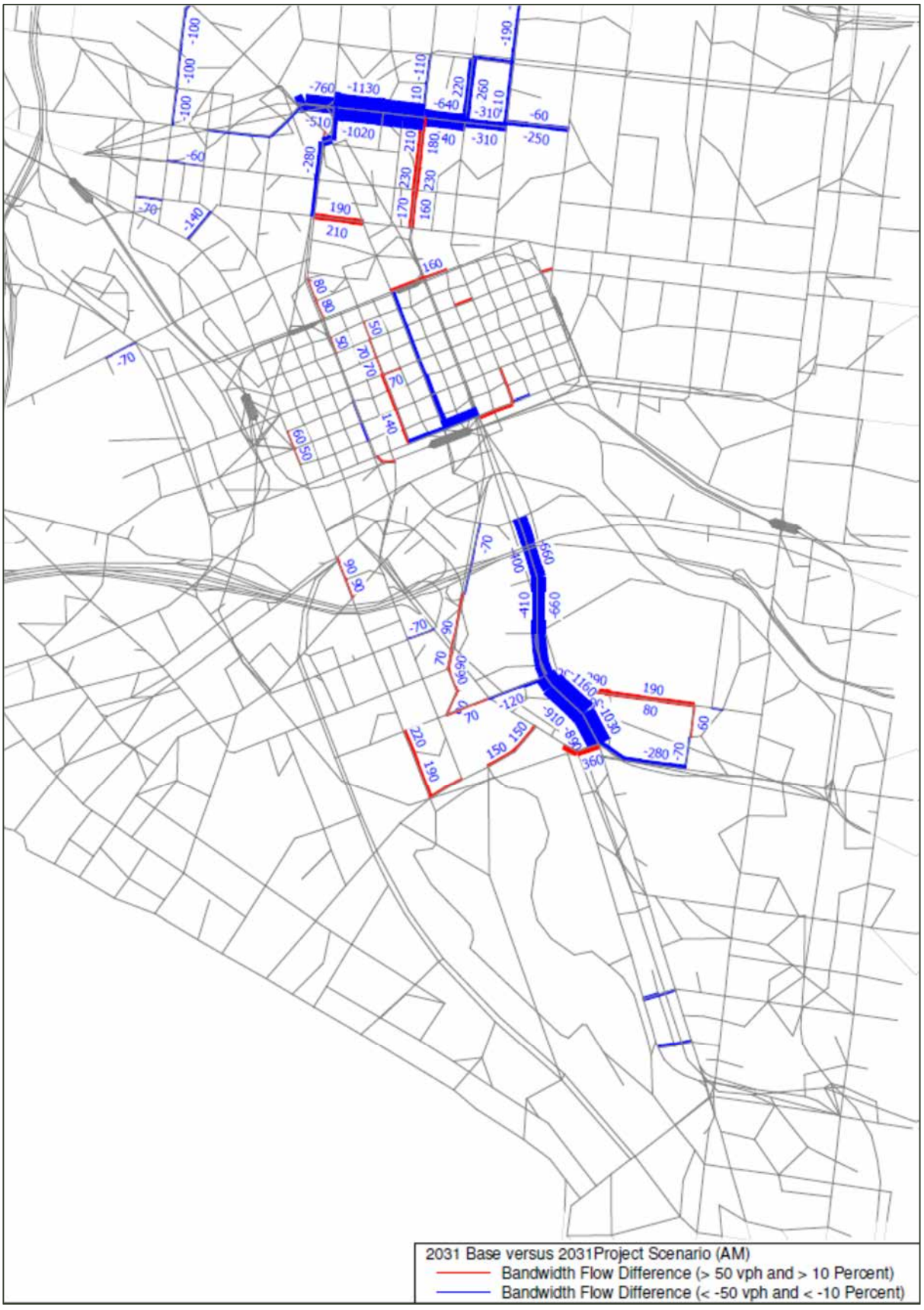

Figure 9-1 Traffic volume difference - 2031 No Project v 2031 Melbourne Metro Legacy - AM Peak (2 hours)

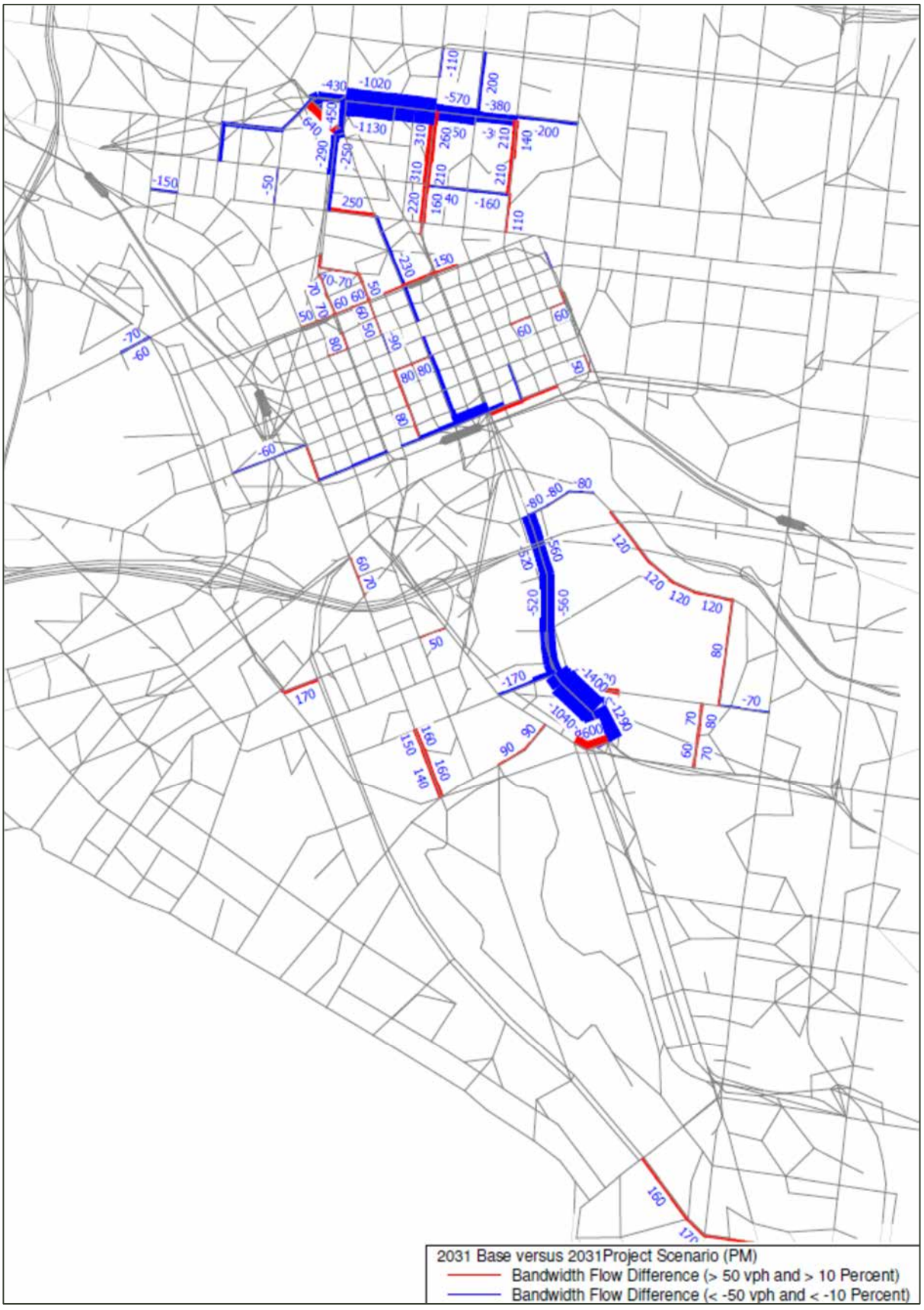

Figure 9-2 Traffic volume difference - 2031 No Project v 2031 Melbourne Metro Legacy – PM Peak (2 hours)

The figures indicate the following outcomes:

- There are some significant changes in traffic volumes in the vicinity of the Parkville station precinct and the Domain station precinct, while changes in other areas are relatively small
- Modelling of the Parkville station precinct indicates that the reduction in capacity of Grattan Street brought about by reducing this to a single lane each way would result in:
  - A significant reduction in the traffic volume along Grattan Street, between Flemington Road and Swanston Street
  - A general reduction in traffic along the east-west route through Grattan Street and Wreckyn Street
  - An increase in east-west traffic along Victoria Street
  - An increase in north-south traffic along Swanston Street and Rathdowne Street
  - No major increases on other roads in the area as the model tends to disperse traffic across the broader network
- There are no significant changes in traffic volumes at CBD North, though there are some small changes in traffic movements around the CBD. With a grid network and multiple access points the traffic movements around the CBD tend to distribute across the available access options. It should be noted that analysis of recent traffic data has indicated no growth in traffic demands over the past 10-15 years (refer to Section 8.8.1.2)
- As noted above, the VITM modelling was undertaken when options were being considered at CBD South that would have meant a reduction in the number of eastbound traffic lanes on Flinders Street at Swanston Street. This change had a flow on impact on VITM projections of traffic volumes, with small traffic reductions on Elizabeth Street and associated increases on William Street and King Street. The road functional layouts for the Concept Design show no change to the existing road and tram network at CBD South
- The Domain station precinct shows a significant decrease in traffic in both directions along St Kilda Road in both the AM and PM peak periods, but this does not translate to major increases on other roads in the area due to the dispersion of traffic across the broader network.

Other than these changes in the precincts, the VITM modelling analysis indicates that there is little change to the 2031 traffic flows across the broader road network. This partly relates to the mode shift that is inherent within the VITM base models, whereby some road based trips move to public transport modes as a result of the improvement in the rail network.

The VITM base models were run as a full four-step transport model involving trip generation, distribution, mode split and assignment. As a result, these models also include mode shift to public transport services that would result from the introduction of a major transport project such as Melbourne Metro. The mode shift would be particularly evident in the areas around the new stations at Arden, Parkville and Domain.

It would also impact on demands along the transport corridors that have enhanced public transport services as a result of both Melbourne Metro and the upgrades to the public transport services that are planned to be implemented prior to 2031. The additional capacity, availability and reliability expected to be delivered by Melbourne Metro should result in a greater use of the rail network and the demands on the road network would be reduced accordingly.

9.3.2 Network Wide Impact Assessment – Public Transport

9.3.2.1 Future Conditions – 2031 No Project Case

This transport impact assessment assumes the following changes to the public transport networks in the 2031 No Project Case from the existing networks:

- Cranbourne/Pakenham Line Upgrade project
- Mernda rail extension project

- Level crossings removal program
- Route 55 and 8 would merge to become route 8 (Moreland to Toorak).

There may also be some other changes to rail, tram and bus timetables, and changes to tram capacity on various routes as a result of the roll out of Class E trams across the network.

9.3.2.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

Rail network

The implementation of Melbourne Metro would lead to a major reconfiguration of the Melbourne metropolitan network that streamlines train operations by removing unnecessary route interactions between train services on different lines and creating simpler end-to-end service patterns that make it easier for customers to navigate the network. A number of changes to the rail network would have occurred by 2031 including a number of Level Crossing Removals, the Cranbourne–Pakenham Upgrade and the extension of the South Morang line to Mernda, (refer to Section 5 for further details).

Tram network

The inclusion of Melbourne Metro as part of the transport network would change the dynamic of public transport movements in the Melbourne CBD because passengers would be less reliant on the Swanston Street trunk tram corridor for access between Parkville and the CBD and Domain.

A set of upgrades to the tram network are proposed which would allow spare tram capacity arising from changed travel patterns to be redirected towards the Western CBD and provide direct connections from Melbourne Metro to the Inner-North-West tram routes, (refer to section 5). These projects include:

- A link to enable Routes 5 and 64 to connect the Domain station (and St Kilda Road) to Clarendon and Spencer Streets
- Northern CBD terminus facilities to enable the turn-back of Routes 5 and 64 operating via Spencer Street
- A connection to enable extension of Elizabeth Street services into Flinders Street
- Eastern terminus facilities to enable the turn-back of Routes 19, 57 and 59 at Jolimont and Melbourne Park (this connection needs to maintain the operability of Flinders, Elizabeth and Swanston Street services)
- Remove operational conflicts at the Collins/Spencer Street intersection and improve fleet efficiency
- E-class tram procurement – ongoing deployment of E-Class trams in line with the State rolling stock strategy and cascade of existing low floor trams on to other routes.

There would also be changes to tram timetables and tram capacity on different routes as a result of the ongoing roll out of E-Class trams across the network.

Bus network

The future bus network would expand the premium bus services to increase the number of direct, frequent and reliable bus services across the network. The premium network would be supported by traffic priority measures, real-time information and DDA compliant level access. To maintain integration between modes, Public Transport Victoria would review the bus network to realign routes (where appropriate) and coordinate services with the heavy rail network. The scope of the bus review is expected to consider:

- Improved coordination of the bus services
- Subtle route changes, as required, to provide connectivity to the revised heavy rail network including new Melbourne Metro stations.

Melbourne Metro would require a comprehensive review of the bus timetables (involving significant structural changes) for all existing lines on the Caulfield (Cranbourne, Frankston, Pakenham, Sandringham) and Northern (Craigieburn, Sunbury, Upfield, Werribee, Williamstown) groups.

9.3.3 Network Wide Impact Assessment – Active Transport

There are no proposed pedestrian or bicycle works across the broader network other than those addressed in the precinct analysis.

9.4 Operational Impact Assessment Precinct 1: Tunnels

9.4.1 Road Transport Impact Assessment

There are no road transport related issues in this precinct that are relevant to the transport impact assessment. Once the construction of Melbourne Metro is complete, the new infrastructure at Fawkner Park and Linlithgow Avenue would comprise the emergency access shafts that would have no impact on the road network.

9.4.2 Public Transport Impact Assessment

The proposed arrangements for the tram services along Toorak Road is to return the trams to the current alignment in Domain Road, so that they would not continue to use the Toorak Road west alignment proposed for use during the construction phase. Therefore there would be no change to the current public transport arrangements in the vicinity of these two sites.

9.4.3 Active Transport Impact Assessment

Similarly the pedestrian and bicycle facilities at Fawkner Park and Linlithgow Avenue would be returned to the current configuration and so Melbourne Metro would have no impact on the active transport network at these sites.

9.4.4 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Operational)

- Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required
- Optimise the design of the reinstated St Kilda Road and apply the road users hierarchy in consultation with the relevant road management authorities to:
  - Reduce delays and congestion
  - Maintain safe operations through the precinct
  - Determine the optimal parking provision in the area and replace any lost parking where possible.

Active Transport (Operational)

- Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council

9.4.5 Conclusion

The implementation of Melbourne Metro would have little, if any, impact on the transport networks in the Fawkner Park and Linlithgow Avenue sites. The existing transport networks would be restored to the current functionality and would provide suitable facilities for the ongoing needs of these two sites.

Overall, the achievement of the recommended Environmental Performance Requirements should ensure that any transport impacts are not detectable.

9.5 Operational Impact Assessment Precinct 2: Western Portal

9.5.1 Road Transport Impact Assessment

9.5.1.1 Future Conditions – 2031 No Project Case

At the time of this report, there are no committed changes to the existing road network in the vicinity of the western portal in a 2031 No Project Case scenario.

9.5.1.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

The proposed changes to the road network for Melbourne Metro are shown in the indicative road functional layout plan in Figure 9-3 and Figure 9-4 (more detailed road functional layouts are included in Appendix E).

Concept Design

The road functional layout for the concept design (refer to Figure 9-3) shows a change to the configuration of Childers Street primarily relating to the changes to the road layout, parking arrangements and the shared use path:

- Childers Street is proposed to be a two-way, two-lane road with speed control devices and a roundabout near Ormond Street to provide a turn-around opportunity for cars parked along the northern side of the road
- Childers Street is proposed to have parallel parking along the northern side of the road and a small number of right angle parking spaces at both the western end of Childers Street and between Tennyson Street and Ormond Street with a net reduction of around 56 parking spaces
  - 6 car parking spaces on Childers Street between Ormond Road and Tennyson Street
  - 50 car parking spaces on Childers Street between Ormond Street and Kensington Road
- The existing closures of Tennyson Street and Ormond Street are proposed to be reinstated once the construction works no longer require the eastern section of Childers Street
- There is proposed to be a shared use path along the northern side of Childers Street (within the park) between Kensington Road and Ormond Street and bicycle lanes on both sides of the road between Ormond Street and Tennyson Street
- Landscaping would be provided on the south side of Childers Street as part of the reinstatement works.

Alternative Design Option

The road functional layout for the option (refer to Figure 9-4) shows a change to the configuration of Childers Street relating to parking arrangements, footpath and the shared use path:

- Childers Street is proposed to be a two-way, two-lane road with speed control devices
- Childers Street is proposed to have 90º parking along the southern side of the road with a net reduction of around 34 parking spaces between Ormond Street and Kensington Road
- The existing closures of Tennyson Street and Ormond Street are proposed to be reinstated once the construction works no longer require the eastern section of Childers Street
- There is proposed to be a shared use path along the northern side of Childers Street (within the park) between Kensington Road and Ormond Street and bicycle lanes on both sides of the road between Ormond Street and Tennyson Street
- The existing shared use path on the south side of Childers Street is proposed to be converted to a footpath
- Landscaping would be provided on the south side of Childers Street as part of the reinstatement works.

These lost spaces are located on the road reserve, not on the VicTrack land, and the need for replacement spaces would need to be discussed further with the City of Melbourne. Observations indicate that the car parking is well utilised at the moment so this level of reduction would result in overflow parking in local streets.

Both of the road functional layout arrangements for the western portal precinct have been developed in accordance with current design standards and make suitable provision for all road users to move through the area. The option design allows for greater pedestrian movement along Childers Street with a separate footpath to the south of Childers Street as well as the shared path through JJ Holland Park. From a transport perspective this is the preferred option.

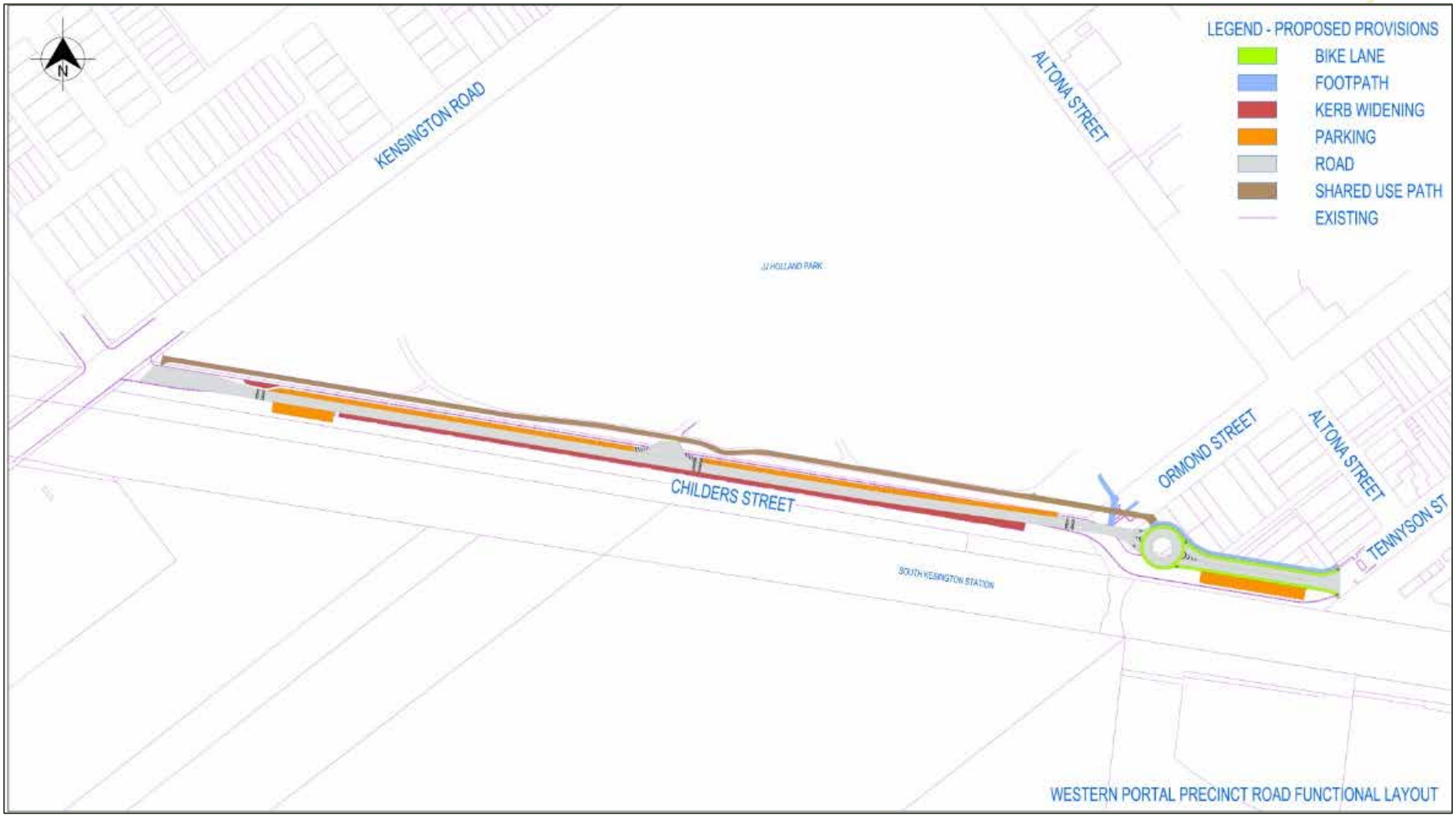

Figure 9-3 Western portal precinct road functional layout – Concept Design

Figure 9-4 Western portal precinct road functional layout - alternative design option

9.5.2 Public Transport Impact Assessment

9.5.2.1 Future Conditions – 2031 No Project Case

At the time of this report, there are no committed changes to the existing rail network in the vicinity of the western portal in a 2031 No Project Case. Similarly, the bus network in the 2031 No Project Case is expected to be the same as the existing bus network. There are no trams operating in the western portal precinct. There may be some changes to rail and bus timetables across the network.

9.5.2.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

The Cross City Line (Werribee/Williamston–Sandringham) would stop at South Kensington station. The delivery of Melbourne Metro would allow more services to operate through this line increasing the number of peak hour services. This would result in a benefit to passengers using South Kensington station.

There are no tram services operating in the western portal precinct. There may be some changes to bus timetables within the western portal precinct.

9.5.3 Active Transport Impact Assessment

9.5.3.1 Future Conditions – 2031 No Project Case

The pedestrian network in the 2031 No Project Case is expected to be the same as the existing network.

In the 2031 No Project Case, there would be an increase of approximately 370 passenger entries and exits (combined) in the AM Peak and over 600 passenger entries and exits in the PM Peak at South Kensington station compared to 2012, as shown in Table 9-3, driven by the projected increases in population and employment in the area. This would have a minor impact on the pedestrian network in the vicinity of the station given the low flows at present. There are pedestrian footpaths on both sides of Childers Street that would be able to accommodate this increase in pedestrian activity.

Table 9-3 South Kensington station - 2031 No Project Case passenger entries and exits

Scenario	AM Peak (7am – 9am)	PM (4:30-6:30pm)
	Total Entries and Exits	Total Entries and Exits
2012	530	310
2031 No Project	900	970
Difference 2031 No Project - 2012	+370 (+70%)	+660 (+213%)

Source: 2021 No Project Case ClicSim passenger modelling (Run B24)

The bicycle network in the 2031 No Project Case is assumed to be the same as the existing bicycle network and would experience natural growth that would be accommodated by the existing infrastructure.

9.5.3.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

Compared to 2031 No Project Case, there is projected to be an increase of approximately 100 passenger entries and exits combined at South Kensington station during the AM peak period with Melbourne Metro. In the PM peak period there would be an increase in passengers entries and exits combined (140 passengers) at South Kensington station (refer to Table 9-4).

Table 9-4 Kensington station - 2031 Melbourne Metro passenger entries and exits

Scenario	AM Peak (7am – 9am)	PM (4:30-6:30pm)
	Total Entries and Exits	Total Entries and Exits
2031 No Project	900	970
2031 Melbourne Metro	1000	1110
Difference 2031 Melbourne Metro – 2031 No Project	+100 (+11%)	+140 (+14%)

Source: **2031 Project Case ClicSim passenger modelling - B23 (PM) and B26 (AM)**

Concept Design

The proposed changes to the pedestrian network in the Concept Design include the provision of a 2.5 m wide shared use path along the northern side of Childers Street. This path would be constructed as part of the Childers Street reconstruction works, following the construction of the western portal. The path would connect to existing paths in the JJ Holland Park. In the Concept Design, there would no longer be a pedestrian path on the south side of Childers Street adjacent to the rail reserve from Kensington Road to South Kensington station. To the east of South Kensington station, a 2.0 m wide pedestrian path would be provided along Childers Street, connecting to Tennyson Street. The loss of footpath along the south side of Childers Street is expected to have a medium impact on pedestrians, who would need to use the shared path on the north side of Childers Street instead. A new pedestrian crossing would allow access from the shared use path (on the north side of Childers Street) to the existing South Kensington station pedestrian underpass. A new pedestrian plaza would be created in front of South Kensington station.

Although the growth in pedestrian numbers observed between 2031 No Project and 2031 Melbourne Metro is small, this is a further increase in the base growth in pedestrian movements between 2012 and 2031 No Project discussed above. In addition to this increased demand, the removal of the footpaths along the southern side of Childers Street, which currently provide access from the car park to South Kensington station, would affect the functionality of the footpath network. The footpath provision in the Concept Design comprises the existing shared use path along the northern side of Childers Street (which would involve sharing infrastructure with bicycle traffic), supplemented by modifications to the path near Kensington Road. On the basis of increased demand and the changes to the footpath network, Melbourne Metro is expected to have a medium impact on the pedestrian network in this location.

As noted above the proposed changes to the bicycle network in the Concept Design include the provision of a 2.5 m wide shared use path along the north side of Childers Street from Kensington Road to Ormond Street that would retain the current connections to the paths in the JJ Holland Park.

The eastern section of Childers Street from Ormond Street to Tennyson Street would include line-marked on-road bicycle lanes in each direction:

- Eastbound – a 1.8 m wide line-marked on-road bicycle lane
- Westbound – a 1.5 m wide line-marked on-road bicycle lane.

The completion of the Concept Design works would retain the functionality and connectivity of the bicycle network, so it is considered that Melbourne Metro would have a negligible impact on cyclists in this location.

Alternative Design Option

The alternative design option proposes the shared use path on the south side of Childers Street is converted to a footpath from the existing shared path use. There is proposed to be a shared use path along the northern side of Childers Street (within the park) between Kensington Road and Ormond Street and bicycle lanes on both sides of the road between Ormond Street and Tennyson Street.

9.5.4 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Operational)

- Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required
- Develop and implement a plan to reinstate car parking on Childers Street, Kensington in consultation with the relevant road management authorities that:
  - Minimises the permanent loss of parking where possible
  - Ensures re-instated car parking does not encroach on JJ Holland Park
  - Considers opportunities for replacement of any net loss of parking at nearby locations
  - Reduces the risk of overflow parking in local streets from South Kensington station and activities at JJ Holland Park
  - Replaces loading zones to service the needs of the existing businesses in the precinct where disrupted during construction.

Active Transport (Operational)

- Develop and implement a permanent shared use path along the northern side of Childers Street, Kensington in conjunction with the relevant road management authority and the land manager prior to the removal of the shared use path on the southern side
- Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council
- Provide wayfinding information to enhance connectivity for pedestrians and public transport users.

9.5.5 Conclusion

The road functional layout plan for the western portal precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient road and parking network through the Concept Design would result in the loss of 56 parking spaces. The recommended Environmental Performance Requirements would require further investigation to maximise the number of parking spaces provided to reduce overflow parking. There is minimal impact of the works at this site on public transport operations and safety.

The road functional layout plan for the western portal precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient bicycle and pedestrian network. There would be a medium impact to pedestrians due to the loss of footpath along the southern side of Childers Street and pedestrians would have to use the shared path on the north side of Childers Street. The new plaza would allow improved pedestrian movements and flows directly outside South Kensington station.

The alternative design option would result in the loss of 34 parking spaces. There is proposed to be a shared use path along the northern side of Childers Street (within the park) between Kensington Road and Ormond Street and bicycle lanes on both sides of the road between Ormond Street and Tennyson Street. The existing shared use path on the south side of Childers Street is proposed to be converted to a footpath.

The implementation of the recommended Environmental Performance Requirements would result in low residual risks to the transport network and operations with Melbourne Metro.

9.6 Operational Impact Assessment Precinct 3: Arden Station

9.6.1 Road Transport Impact Assessment

9.6.1.1 Future Conditions – 2031 No Project Case

At the time of this report, there are no committed changes to the road network in this precinct in a 2031 No Project Case scenario from the existing road network.

9.6.1.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

The new station at Arden would support the redevelopment plans for the Arden station precinct (located to the north of the existing North Melbourne station), by providing a direct and frequent public transport connection from the suburbs, to the hospital and universities precinct, and CBD. Planning for this new precinct is underway, led by the Metropolitan Planning Authority in partnership with other government agencies. The proposed changes to the road network are shown in the road functional layout drawing in Figure 9-5 (more detailed road functional layouts are included in Appendix E).

Figure 9-5 Arden station precinct road functional layout

The changes to the existing network are limited due to the ongoing planning of the Arden station precinct, but the road functional layout shows that the works in Laurens Street include some adjustments to the on-street parallel parking and on-street bicycle lanes in both directions and a mid-block signalised pedestrian crossing south of Barwise Street. There would be 20 additional right angle parking spaces provided along the south side of Barwise Street adjacent to Arden station. There are no changes proposed for Arden Street, which would retain the 4-lane undivided cross-section with parallel parking and on-street bicycle lanes on both sides.

The road functional layout plan for the Arden station precinct has been developed in accordance with current design standards and makes suitable provision for all road users to move through the area safely and efficiently.

There would be minimal change to the existing car parking supply and is expected to have a negligible impact on road traffic and parking in the Arden station precinct. It is noted that the proposed development of the precinct is likely to require further changes to the road network but that would be addressed as part of any future development proposal.

9.6.2 Public Transport Impact Assessment

9.6.2.1 Future Conditions – 2031 No Project Case

At the time of this report, there are no committed changes to the rail network in a 2031 No Project Case from the existing 2015 rail network. There are no proposed changes to tram routes or bus routes from the 2015 existing situation. There may be some changes to rail, tram and bus timetables across the network.

9.6.2.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

The new station at Arden would support the substantial redevelopment plans for the Arden station precinct (located to the north of the existing North Melbourne station), by providing a direct and frequent public transport connection from the suburbs, east to the hospital and universities precinct, and on to the CBD.

The Sunshine-Dandenong line would operate services from Sunbury through to Cranbourne and Pakenham via Arden station. At peak times, trains are expected to be schedules with an average 2½ minute separation. This is to facilitate coordination of connections with other modes operating on 10-minute base frequencies.

Initial land use projections for redevelopment at Arden have resulted in relatively low passenger volumes using the station. Passenger volumes are likely to increase substantially as development in the vicinity occurs.

The Northern Loop (Craigieburn and Upfield via City Loop) would benefit from the introduction of Melbourne Metro through the capacity released on the corridor as a result of the removal of the Sunbury services from the existing inner core route (Northern Underground Rail Loop). Additional services from Upfield and Craigieburn would operate on the former Sunbury/Watergardens service paths, providing inner city capacity to support growth in services on the Craigieburn and Upfield lines.

The delivery of Melbourne Metro and reconfiguration of the Frankston line to operate via the Caulfield Loop would enable the Cross-City line to be reconfigured to enable additional services to operate from Werribee, Williamstown, Brighton Beach and Laverton via Altona. Services from Werribee, Laverton and Williamstown would operate through to Sandringham and vice versa and would run through North Melbourne, Southern Cross, Flinders Street, Richmond and South Yarra.

Due to proximity of the proposed Arden station to North Melbourne station and the different geographic areas serviced by lines operating through these two stations, it is likely that some level of interchange between North Melbourne and Arden station would occur. The development of the Arden station and the precinct should consider the optimal ways to facilitate the expected passenger interchange.

It is expected that during both the 2031 Melbourne Metro Legacy Project Case AM and PM peak there would be a decrease in the number of passengers transferring between North Melbourne station and adjoining tram or bus services compared to 2012 (refer to Table 9-5). During the AM peak, 48 per cent of all transfer to and from North Melbourne Station are to/ from trams or buses. This increases to 66 per cent during the PM peak, (refer to Appendix D). With the opening of Parkville station, bus route 401 would have reduced frequency of services because people are benefitting from a direct link to Parkville.

Table 9-5: North Melbourne station - 2031 Melbourne Metro - Total transfers between rail and tram/bus

Station	AM Peak (7:00am – 9:00am)	PM Peak (4:30pm – 6:30pm)
2012	1,270	2,110
2031 Melbourne Metro	1,010	1,060
Difference 2012 – 2031 Melbourne Metro	-260 (-20%)	-1050 (-50%)

Source: 2031 Project Case ClicSim passenger modelling - B23 (PM) and B26 (AM)

Route 57 tram would operate from West Maribyrnong to Jolimont via Flinders Street. This alteration is as a result of the connection enabling the extension of Elizabeth Street services into Flinders Street and is part of Public Transport Victoria's wider tram network enhancements.

Overall there would be a massive improvement to public transport access in the area with a new heavy rail station at Arden This would increase the capacity of the public transport network and provide direct and frequent public transport connection from the suburbs, and along the new Melbourne Metro route to the hospitals and university precinct, and beyond to the CBD.

9.6.3 Active Transport Impact Assessment

9.6.3.1 Future Conditions – 2031 No Project Case

The pedestrian network in the 2031 No Project Case is assumed to be the same as the existing network. In the 2031 No Project Case there is predicted to be a large increase in AM peak passenger entries and exits at North Melbourne station. There is predicted to be over 5,400 additional passengers entering / exiting North Melbourne station during the AM peak period, and nearly 6,000 in the PM peak compared to 2012. Transfers between platforms in the PM peak are predicted to increase by just over 4,000 passengers as shown in Table 9-6.

This represents a very large increase in the number of pedestrians, which is expected to have a major impact on the pedestrian network around North Melbourne station. This growth results from the anticipated increases to future population, employment and land use changes as well as changes to train operations.

Table 9-6 North Melbourne station - 2031 No Project Case passenger entries, exits and transfers

Scenario	AM Peak (7:00am – 9:00am)		PM Peak (4:30 – 6:30pm)	
	Total Entries and Exits	Transfers between platforms	Total Entries and Exits	Transfers between platforms
2012	2,610	5,040	1,890	3,930
2031 No Project	8,030	6,970	7,820	8,040
Difference 2031 No Project - 2012	+5,420 (+208%)	+1,930 (+38%)	+5,930 (+314%)	+4,110 (+105%)

Source: 2021 No Project Case ClicSim passenger modelling (Run B24)

At Macaulay station in the 2031 No Project Case there is predicted to be a slight decrease in AM peak passenger entries and exits as shown in Table 9-7. During the PM peak there is expected to be an increase of about 80 people entering / exiting Macaulay station during the AM peak period. These changes are expected to have a negligible impact on the pedestrian network in the vicinity of the station.

Table 9-7 Macaulay station - 2031 No Project Case passenger entries and exits

Scenario	AM Peak (7:00am – 9:00am)	PM Peak (4:30 – 6:30pm)
	Total Entries and Exits	Total Entries and Exits
2012	230	200
2031 No Project	200	280
Difference 2031 No Project - 2012	-30 (-13%)	80 (+40%)

Source: 2021 No Project Case ClicSim passenger modelling (Run B24)

The bicycle network in the 2031 No Project Case would be the same as the existing bicycle network.

9.6.3.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

The new station at Arden would support the proposed redevelopment plans for the Arden precinct, by providing a direct and frequent public transport connection from the suburbs, and along the new Melbourne Metro route to the hospitals and university precinct, and beyond to the CBD.

The modelled station pedestrian entries and exits predicted for Arden station for the busiest two-hours in the AM and PM in 2031 are shown in Table 9-8. The current assumptions for the development around Arden station have resulted in relatively low passenger volumes initially using the station. These numbers are likely to increase if the redevelopment proceeds in the scale anticipated. As currently modelled, there is expected to be a negligible impact on the pedestrian flows around Arden station in 2031.

Table 9-8 Arden station - 2031 Melbourne Metro passenger entries and exits

Scenario	AM Peak (7:00am – 9:00am)	PM Peak (4:30 – 6:30pm)
	Total Entries and Exits	Total Entries and Exits
Melbourne Metro	880	800

Source: 2031 Project Case ClicSim passenger modelling (B23 (PM) and B26 (AM)

In the 2031 Melbourne Metro case North Melbourne station is expected to have a 59 per cent decrease in passenger entries / exits during the AM peak period and a 52 per cent decrease during the PM peak compared to the 2031 No Project Case. There would be a small increase in the number of passengers transferring between platforms at North Melbourne Station in the AM peak, and a slightly larger increase in transfers in the PM peak as shown in Table 9-9.

Table 9-9 North Melbourne station - 2031 Melbourne Metro passenger entries, exits and transfers

Scenario	AM Peak (7:00am – 9:00am)		PM Peak (4:30 – 6:30pm)	
	Total Entries and Exits	Transfers	Total Entries and Exits	Transfers
2031 No Project	8,030	6,970	7,820	8,040
2031 Melbourne Metro	3,290	7,490	3,720	9,600
Difference 2031 Melbourne Metro – 2031 No Project	-4,740 (-59%)	+520 (+7%)	-4,100 (-52%)	+1,560 (+19%)

Source: 2031 Project Case ClicSim passenger modelling (B23 (PM) and B26 (AM)

Compared to the activity in 2012, the 2031 Melbourne Metro case represents an increase of approximately 680 pedestrian entries / exits during the AM peak period, and approximately 1,800 entries / exits in the PM peak (further details are provided in Appendix D). This is a moderate growth in the number of pedestrians and is expected to have a medium impact on the pedestrian network around North Melbourne station. As noted in the 2031 No Project discussion, this growth is associated with the projected changes to future population, employment and land use, as well as changes to direction of services around the City Loop that is likely to influence passenger's travel journeys and transfer activity.

At Macaulay station in the 2031 Melbourne Metro case, it is predicted there would be a slight increase in AM and PM peak passenger entries and exits as shown in Table 9-10. This is expected to have a negligible impact on pedestrian activity in the vicinity of the station.

Table 9-10 Macaulay station - 2031 Melbourne Metro passenger entries and exits

Scenario	AM Peak (7:00am – 9:00am)	PM Peak (4:30 – 6:30pm)
	Total Entries and Exits	Total Entries and Exits
2031 No Project	200	280
2031 Melbourne Metro	230	310
Difference 2031 Melbourne Metro – 2031 No Project	+30 (+15%)	+30 (+11%)

Source: 2031 Project Case ClicSim passenger modelling (B23 (PM) and B26 (AM)

The bicycle network in the 2031 Melbourne Metro Legacy Project Case scenario includes the provision of on-road bicycle lanes in both directions on Laurens Street that would provide good network functionality for the bicycles in the area. It is also expected that Melbourne Metro would provide up to 50 new bicycle parking spaces at the Arden station, improving the opportunities for bicycles to park and ride from Arden station.

9.6.4 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Operational)

- Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required
- Develop and implement a plan to reinstate car parking on Laurens Street, North Melbourne in consultation with the relevant road management authorities that:
  - Minimises the permanent loss of parking where possible
  - Considers opportunities for replacement of any net loss of parking at nearby locations
  - Replaces loading zones to service the needs of the existing businesses in the precinct where disrupted during construction.

Public Transport (Operational)

- Review, with Public Transport Victoria, the bus services in the areas around Arden stations including a review of the route 401 bus frequency that would have reduced demand following implementation of Melbourne Metro.

Active Transport (Operational)

- Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council
- Provide wayfinding information to enhance connectivity for pedestrians and public transport users.

9.6.5 Conclusion

The road functional layout plan for the Arden station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient road and parking network, though there is some loss of on-street parking.

The new station at Arden would provide the opportunity for the Metropolitan Planning Authority to develop the area around Arden station as a major transport hub. To maintain an integrated multimodal transport system, the bus network would be reviewed to coordinate services with the revised rail network. This would include options that connect Melbourne Metro to the tram, bus, cycle and taxi routes that could be provided at Arden station. The redevelopment of the site should be designed to provide suitable traffic and parking arrangements for the proposed uses on the site, taking consideration of the availability of the Arden station.

The road functional layout plan for the Arden station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient bicycle and pedestrian network. The redevelopment of the site should provide suitable bicycle and pedestrian arrangements for the proposed uses on the site, taking consideration of the proximity of Arden station and North Melbourne station. There would be negligible impact to pedestrians at Macaulay station and minor impacts to the movements of pedestrians in the vicinity of North Melbourne station.

Overall there would be a significant improvement to public transport access in the area with a new heavy rail station at Arden. This would increase the capacity of the public transport network and provide a direct and frequent public transport connection from the suburbs, and along the new Melbourne Metro route.

The implementation of the recommended Environmental Performance Requirements would result in minor residual risks to the transport network and operations with Melbourne Metro.

9.7 Impact Assessment Precinct 4: Parkville Station

9.7.1 Road Transport Impact Assessment

9.7.1.1 Future Conditions – 2031 No Project Case

There are no committed changes to the road network in a 2031 No Project Case scenario from the existing road network in this precinct.

The future performance of the network has been analysed by the AJM modelling team. The Parkville station precinct analysis has been undertaken using the Aimsun modelling software with the model demands based on the VITM analysis. The following discussion is based on the modelling analysis that is included in the Transport Modelling Summary Report included in Appendix D.

VITM demand summary

The analysis of the historical growth on key roads around Parkville indicates zero or negative growth in the daily traffic volumes in the inner city areas over the last 10 years.

However, the VITM projections indicate some growth in the Parkville station precinct by 2031. Outputs from the VITM 2031 No Project model indicates a small percentage growth in total traffic going into and out of the Parkville station precinct (Aimsun) model area when compared to existing volumes (4.1 per cent total growth in AM and 5.9 per cent total growth in the PM peak periods). Some specific trips through the model (origin to destination) do show some growth and this information has been used to grow these specific trips within the 2031 Aimsun Base (No Project) model.

Aimsun network volumes

Table 9-11 and Table 9-12 summarise the changes in the volumes on key links within the Aimsun model network. The traffic volumes are model flows on key road links in the network and represent the traffic volumes assigned to these links by the Aimsun model, based on the increases in the demands in 2031 as outlined above. The model assigns (or allocates) traffic to the network and routes change depending on the delays and congestion in the model. Therefore the differences vary on each link depending on the model assignment algorithms.

The 2031 No Project models generally show small increases compared to the 2015 Base models that are consistent with the growth outlined above. However, some movements show reduced volumes as a result of network congestion effects.

Table 9-11 Network Volume AM Peak Summary - 2031 No Project Case compared to 2015 Base Case

Network	2015 Base	2031 No Project	Difference
Victoria Street, East of Peel Street, EB	840	890	50 (+6%)
Victoria Street, East of Peel Street, WB	670	680	10 (0%)
Queensberry Street, East of Peel Street, EB	640	690	50 (+8%)
Queensberry Street, East of Peel Street, WB	530	500	-30 (-6%)
Gatehouse Street, North of Flemington Road, NB	390	430	40 (+10%)
Gatehouse Street, North of Flemington Road, SB	490	490	0 (0%)
Swanston Street, North of Grattan Street, NB	200	190	-10 (-4%)
Swanston Street, North of Grattan Street, SB	440	350	-90 (-19%)
Elliott Avenue, East of Flemington Road, EB	1140	1200	60 (+5%)
Elliott Avenue, East of Flemington Road, WB	1100	1060	-40 (-4%)
College Crescent, Between Princes Park Drive & Cemetery Road E, EB	1900	1910	10 (0%)
College Crescent, Between Princes Park Drive & Cemetery Road E, WB	1720	1670	-50 (-3%)
Royal Parade, North of Grattan Street, NB	660	590	-70 (-11%)

Network	2015 Base	2031 No Project	Difference
Royal Parade, North of Grattan Street, SB	1110	1020	-90 (-8%)
Grattan Street, Between Swanston Street & Leicester Street, EB	760	790	+30 (4%)
Grattan Street, Between Swanston Street & Leicester Street, WB	930	880	-50 (5%)
Grattan Street, West of Royal Parade, EB	660	680	20 (+3%)
Grattan Street, West of Royal Parade, WB	570	540	-30 (-6%)

Table 9-12 Network Volume PM Peak Summary - 2031 No Project Case compared to 2015 Base Case

Network	2015 Base	2031 No Project	Difference
Victoria Street, East of Peel Street, EB	940	940	-0 (0%)
Victoria Street, East of Peel Street, WB	920	1110	190 (+20%)
Queensberry Street, East of Peel Street, EB	600	520	-80 (-12%)
Queensberry Street, East of Peel Street, WB	780	900	120 (+14%)
Gatehouse Street, North of Flemington Road, NB	430	450	20 (+6%)
Gatehouse Street, North of Flemington Road, SB	500	510	10 (+3%)
Swanston Street, North of Grattan Street, NB	560	520	-40 (-8%)
Swanston Street, North of Grattan Street, SB	250	330	80 (+33%)
Elliott Avenue, East of Flemington Road, EB	920	860	-60 (-6%)
Elliott Avenue, East of Flemington Road, WB	1320	1270	-50 (-3%)
College Crescent, Between Princes Park Drive & Cemetery Road E, EB	1440	1350	-90 (-6%)
College Crescent, Between Princes Park Drive & Cemetery Road E, WB	1950	1940	-10 (0%)
Royal Parade, North of Grattan Street, NB	1120	1050	-70 (--6%)
Royal Parade, North of Grattan Street, SB	780	640	-140(-17%)
Grattan Street, Between Swanston Street & Leicester Street, EB	900	820	80 (9%)
Grattan Street, Between Swanston Street & Leicester Street, WB	760	810	50 (7%)
Grattan Street, West of Royal Parade, EB	720	620	-100 (-15%)
Grattan Street, West of Royal Parade, WB	660	690	30 (+6%)

Network parameters

Table 9-13 provides key outputs from the Aimsun model to compare network parameters between the 2015 Base Case model and 2031 No Project model. With more trips in 2031 the total number of vehicles increased. In the morning period, the mean speed increased, causing VHT to decrease. The VKT also increased in 2031 as a result of the increased number of vehicles in the model. In the afternoon period the increase in vehicles reduced the average speed and this resulted in an increase in VHT. Overall this indicates a slight deterioration in network performance in 2031 No Project compared to the 2015 Base Case that is consistent with the increase in demand from the VITM modelling.

Table 9-13 Network Summary – 2031 No Project Case compared to 2015 Base Case

Peak	Parameters	2015 Base Case	2031 No Project Case (% change)
AM Peak	Average Travel Time (min)	7:23	7:04 (-6%)
	Average Speed (km/h)	13.9	14.7 (6%)
	VKT (veh km)	32,200	32,870 (2%)
	VHT (hours)	2,320	2,240 (-4%)
	Total vehicles	18,910	19,500 (3%)
PM Peak	Average Travel Time (min)	7:10	6:58 (-3%)
	Average Speed (km/h)	14.1	13.9 (-1%)
	VKT (veh km)	33,040	33,340 (1%)
	VHT (hours)	2,340	2,390 (2%)
	Total vehicles	19,560	20,240 (3%)

Source: Aimsun outputs

Travel time

Travel time data was extracted from the Aimsun model for two key routes in the Parkville station precinct:

- Along Peel Street/Flemington Road between Queensberry Street and Grattan Street
- Along Elizabeth Street/Royal Parade between Queensberry Street and Grattan Street.

The 2031 No Project Case travel times along the Peel Street/Flemington Road route remained relatively similar to the 2015 Base Case model with the exception of the southbound movement in the afternoon period.

The 2031 No Project travel times along the Royal Parade and Elizabeth Street are predicted to increase in the PM peak period. This is likely to relate to an increase in the demand for the right turn movement from Elizabeth Street[35] onto Grattan Street as well as the proposed introduction of longer trams on this route that would cause the right turn lane to overflow and adversely affect the through traffic movements.

The results have been analysed for the three key signalised intersections within the precinct and show the results associated with individual approaches to each intersection. The results indicate that for the three central intersections in the model, there is only a small difference from the 2031 No Project model during the AM peak period as shown in Table 9-14.

Table 9-14 Intersection Performance - AM Peak 2031 No Project v 2015 Base Case (average delay per vehicle)

Intersection	Approach	2015 Base (sec)	2031 No Project (sec)	Difference (sec)
Haymarket Roundabout	Elizabeth Street (N)	40	50	10 (+25%)
	Elizabeth Street (SE)	60	60	0 (0%)
	Peel Street (S)	60	50	-10 (-17%)
	Flemington Road (NW)	90	70	-20 (-22%)
Elizabeth Street / Grattan Street / Royal Parade	Royal Parade (N)	90	80	-10 (-11%)
	Grattan Street (E)	40	40	0 (0%)
	Elizabeth Street (S)	50	50	0 (0%)
	Grattan Street (W)	50	50	0 (0%)

[35] The section of road between the Haymarket roundabout and Grattan Street is known as Elizabeth Street and Royal Parade commences to the north of Grattan Street

Intersection	Approach	2015 Base (sec)	2031 No Project	Difference (sec)
Flemington Road / Grattan Street / Wreckyn Street	Grattan Street (E)	40	30	-10 (-25%)
	Flemington Road (SE)	40	30	-10 (-25%)
	Wreckyn Street (SW)	40	30	-10 (-25%)
	Flemington Road (NW)	40	30	-10 (-25%)

The afternoon period operations are shown in Table 9-15 and indicate that the Haymarket roundabout is likely to experience longer delays on all approaches, which are largely related to the congestion and the queuing at the Haymarket roundabout. Further optimisation of signal timings may reduce the level of these delays. However, as the roundabout is already operating near capacity any change would have a significant impact on the operation and associated delays. The impact of the congestion at the roundabout has flow-on impacts on the other intersections, some of which would improve (as upstream queues limit the flow of vehicles to downstream intersections) and some would deteriorate (due to downstream queues affecting upstream intersections).

Table 9-15 Intersection Performance - PM Peak 2031 No Project v 2015 Base Case (average delay per vehicle)

Intersection	Approach	2015 Base	2031 No Project	Difference
Haymarket Roundabout	Elizabeth Street (N)	60	70	10 (+17%)
	Elizabeth Street (SE)	100	160	60 (+60%)
	Peel Street (S)	130	150	20 (+15%)
	Flemington Road (NW)	110	160	50 (+45%)
Elizabeth Street / Grattan Street / Royal Parade	Royal Parade (N)	50	90	40 (+80%)
	Grattan Street (E)	80	100	20 (+25%)
	Elizabeth Street (S)	40	50	10 (+25%)
	Grattan Street (W)	50	40	-10 (-20%)
Flemington Road / Grattan Street / Wreckyn Street	Grattan Street (E)	50	130	80 (+160%)
	Flemington Road (SE)	40	40	0 (0%)
	Wreckyn Street (SW)	40	50	10 (+25%)
	Flemington Road (NW)	40	50	10 (+25%)

In summary, the AM peak period vehicles are expected to experience less delay than the afternoon period. Travel time in the morning period is expected to remain relatively similar to the 2015 Base Case model and within the bounds of accuracy of the transport models.[36] The PM peak period demonstrates more congestion around the Haymarket roundabout and as this is a key controlling intersection in the precinct, there is expected to be an overall increase in local travel times. When traffic conditions are approaching capacity of the network, a small change in demand can adversely affect the operation of the network. In the case of the Haymarket roundabout traffic conditions are already heavily congested on a daily basis and any change can be expected to add to the queues and delays as demonstrated above.

It is possible that refinement of the traffic signal settings at the roundabout signals may be able to better manage the operation and reduce the travel times indicated above. However as most approaches are congested there appears little opportunity for improvement in the 2031 No Project Case.

[36] While models are calibrated and validated to reflect traffic conditions they can only be a representation of the daily traffic conditions that vary from day-to-day by as much as 10% in some cases. The interpretation of model results needs to be considered in the context of the daily traffic fluctuations.

9.7.1.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

Parkville station is to be located under Grattan Street, to the east of the intersection with Royal Parade/Elizabeth Street. New side platform tram 'superstops' are to be provided on Royal Parade just to the north of Grattan Street. On-street bicycle lanes would be provided in both Grattan Street and Royal Parade/Elizabeth Street. These changes, along with new station entrances and associated station infrastructure, are expected to result in the following changes to the existing road layout as shown in Figure 9-6 (the detailed road functional layouts are included in Appendix E).

- Reduction in Royal Parade/Elizabeth Street traffic lanes to two through lanes in each direction in the vicinity of Grattan Street
- No right turn from Royal Parade (southbound) into Grattan Street
- Reduction to one through lane on Grattan Street (both directions) between Flemington Road and Leicester Street
- New side platform tram superstops in Royal Parade, immediately north of Grattan Street
- Modifications to existing parking arrangements along Grattan Street, Royal Parade and Elizabeth Street to suit the revised traffic arrangements and to suit the needs of the hospitals and the university
- Closure of Barry Street south of Grattan Street adjacent to University Square consistent with current City of Melbourne plans for the area.

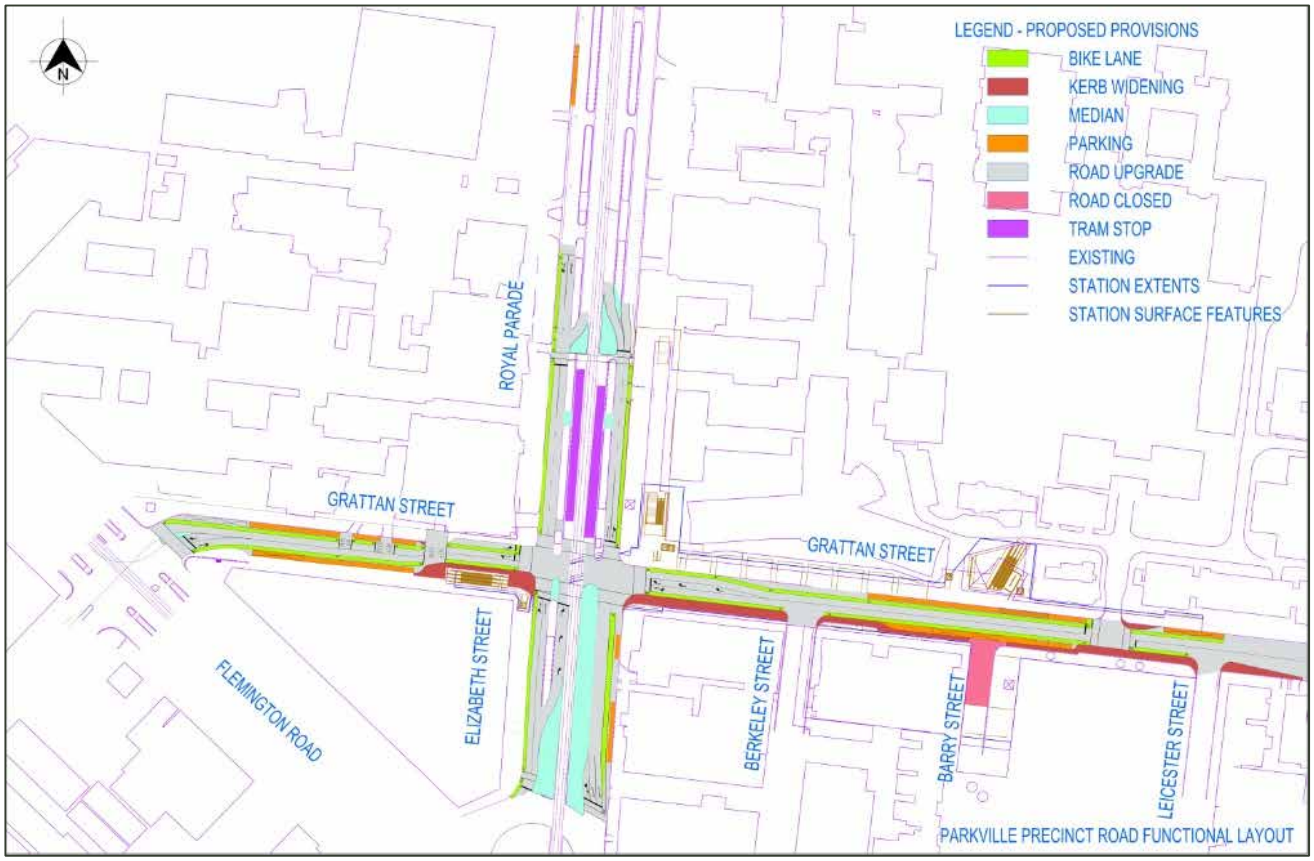

Figure 9-6 Parkville station precinct road functional layout

VITM Demand Summary

Outputs from the VITM 2031 Melbourne Metro Legacy Project Case model indicates a small percentage growth in total traffic going into and out of the Aimsun model area when compared to existing volumes (1.9 per cent growth in AM and 4.0 per cent growth in the PM peak). The growth is less than the growth in the 2031 No Project Case due to the mode shift associated with the provision of Melbourne Metro. Some specific trips through the model (origin to destination) do show growth and this information has been used to grow these specific trips within the Aimsun 2031 Melbourne Metro Legacy Project Case model.

Network Performance

A number of traffic signal timing changes have been made in the traffic model for 2031 Melbourne Metro legacy project case. Dynamic SCATS signals have been implemented at a number of intersections including Haymarket, Royal Parade/Grattan Street and Flemington / Grattan and therefore the green time splits would have differed based on demand. Refer to Appendix D for further information.

Table 9-16 provides key outputs from the Aimsun model to compare network performance between the 2031 No Project to the 2031 Melbourne Metro Legacy Project Case model. All general statistics decreased in the 2031 Melbourne Metro legacy project case model in the AM peak, mainly as a result of the mode shift and the model predicted changes in travel patterns around the area, whereas in the PM peak period there was little change.

In both the morning and PM peak scenarios, the total number of vehicles and mean speed decreased in the 2031 Melbourne Metro Legacy Project Case model. As a result, the total travel time experienced by all vehicles remained relatively similar to the 2031 No Project model, thus indicating that the 2031 Melbourne Metro Legacy Project Case model may experience a slight increase in the delay per vehicle.

Table 9-16 Network Performance Summary – 2031 Melbourne Metro Legacy Project Case

Peak	Parameters	2031 No Project Case	2031 Melbourne Metro Legacy Case (% change)
AM Peak	Average Travel Time (min)	6:54	6:58 (1%)
	Average Speed (km/h)	14.7	14.6 (-2%)
	VKT (veh km)	32,870	32,590 (-1%)
	VHT (hours)	2,240	2,230 (0%)
	Total vehicles	19,500	19,240 (-1%)
PM Peak	Average Travel Time (min)	6:58	7:12 (4%)
	Average Speed (km/h)	13.9	13.9 (0%)
	VKT (veh km)	33,340	33,120 (-1%)
	VHT (hours)	2,390	2,390 (0%)
	Total vehicles	20,240	19,980 (-1%)

Source: Aimsun outputs

The analysis indicated that the travel time along Flemington Road and Peel Street remained relatively similar to the 2031 No Project Case, with the exception of Flemington Road eastbound in the afternoon period. Travel times along Royal Parade and Elizabeth Street are predicted to decrease in the northbound direction and increase in the southbound direction. This is likely due to separating the right turn movement from Elizabeth Street onto Grattan Street and the tram movements which often cause the right turn pocket to over-spill. Based on the results, the new intersection configuration at the Royal Parade and Grattan Street intersection may marginally increase the southbound travel time along Royal Parade.

Aimsun Network Volumes

Table 9-17 and Table 9-18 summarise the changes in the volumes on key links within the Aimsun model network. As noted in the comments before Table 9-11 these traffic volumes are model flows on key road links in the network.

Overall, the results indicate a small decrease in traffic flows through the Aimsun modelled area in the AM peak and virtually no change in the PM peak totals.

Table 9-17 Comparison of Network Volumes - AM Peak 2031 Melbourne Metro Legacy Project Case v 2031 No Project

Network	2031 No Project	2031 Melbourne Metro	Difference (% change)
Victoria Street, East of Peel Street, EB	890	860	-30 (-3%)
Victoria Street, East of Peel Street, WB	680	730	50 (8%)
Queensberry Street, East of Peel Street, EB	690	650	-40 (-6%)
Queensberry Street, East of Peel Street, WB	500	490	-10 (-2%)
Gatehouse Street, North of Flemington Road, NB	430	350	-80 (-18%)
Gatehouse Street, North of Flemington Road, SB	490	590	100 (19%)
Swanston Street, North of Grattan Street, NB	190	220	30 (18%)
Swanston Street, North of Grattan Street, SB	350	400	50 (12%)
Elliott Avenue, East of Flemington Road, EB	1200	1160	-40 (-3%)
Elliott Avenue, East of Flemington Road, WB	1060	1170	110 (10%)
College Crescent, Between Princes Park Drive & Cemetery Road E, EB	1910	2000	90 (5%)
College Crescent, Between Princes Park Drive & Cemetery Road E, WB	1670	1950	280 (17%)
Royal Parade, North of Grattan Street, NB	590	780	190 (31%)
Royal Parade, North of Grattan Street, SB	1020	960	-60 (-6%)
Grattan Street, Between Swanston Street & Leicester Street, EB	790	520	-270 (34%)
Grattan Street, Between Swanston Street & Leicester Street, WB	880	580	-300 (34%)
Grattan Street, West of Royal Parade, EB	680	470	-210 (-31%)
Grattan Street, West of Royal Parade, WB	540	250	-290 (-53%)
Total	**890**	**860**	**-30 (-3%)**

Table 9-18 Comparison of Network Volumes - PM Peak 2031 Melbourne Metro Project Case v 2031 No Project

Network	2031 No Project	2031 Melbourne Metro	Difference (% change)
Victoria Street, East of Peel Street, EB	940	950	10 (1%)
Victoria Street, East of Peel Street, WB	1110	1150	40 (4%)
Queensberry Street, East of Peel Street, EB	520	510	-10 (-2%)
Queensberry Street, East of Peel Street, WB	900	850	-50 (-5%)
Gatehouse Street, North of Flemington Road, NB	450	400	-50 (-11%)
Gatehouse Street, North of Flemington Road, SB	510	490	-20 (-3%)
Swanston Street, North of Grattan Street, NB	520	620	100 (20%)
Swanston Street, North of Grattan Street, SB	330	310	-20 (-8%)
Elliott Avenue, East of Flemington Road, EB	860	920	60 (7%)
Elliott Avenue, East of Flemington Road, WB	1270	1310	40 (3%)
College Crescent, Between Princes Park Drive & Cemetery Road E,EB	1350	1450	100 (8%)
College Crescent, Between Princes Park Drive & Cemetery Road E,WB	1940	1990	50 (2%)
Royal Parade, North of Grattan Street, NB	1050	1120	70 (6%)
Royal Parade, North of Grattan Street, SB	640	730	90 (14%)

Network	2031 No Project	2031 Melbourne Metro	Difference (% change)
Grattan Street, Between Swanston Street & Leicester Street, EB	820	490	-330 (40%)
Grattan Street, Between Swanston Street & Leicester Street, WB	810	560	-250 (31%)
Grattan Street, West of Royal Parade, EB	620	410	-210 (-35%)
Grattan Street, West of Royal Parade, WB	690	460	-230 (-33%)
Total	**940**	**950**	**10 (1%)**

Intersection Analysis

During the AM peak period, the southbound movement along Royal Parade is more congested in the 2031 Melbourne Metro Legacy Project Case model as a result of Royal Parade being reduced from three lanes to two lanes at the Grattan Street intersection. Grattan Street eastbound between Flemington Road and Royal Parade occasionally operates at its maximum capacity as a result of the reduction to one lane in each direction. The eastbound queue on Grattan Street often spills back to Flemington Road thus preventing vehicles from Wreckyn Street to flow into Grattan Street.

Grattan Street westbound has fewer vehicles and thus the performance of the westbound movement to Wreckyn Street improves compared to the 2031 No Project Case. Overall, the model does not demonstrate much vehicle rerouting in the 2031 Melbourne Metro Legacy Project Case because there are less vehicles in comparison to the 2031 No Project model.

In the afternoon period, the southbound movement along Royal Parade is more congested in the 2031 Project Case in comparison to the 2031 No Project model. At the intersection of Royal Parade and Grattan Street, there are more vehicles queueing on Grattan Street westbound in the 2031 Melbourne Metro Legacy Project Case due to the lane reduction. The congested approach limits the traffic flow heading westbound and therefore, at the east approach of Flemington Road and Grattan Street performance improves due to the arrival of fewer vehicles on this approach. Overall, the model does not have a significant number of vehicles rerouting in the 2031 Melbourne Metro Legacy Project Case.

The results indicate an overall decrease in delay at the Haymarket roundabout during the morning and PM peak periods thereby improving the level of service at that location. However, that is the result of upstream congestion reducing the flow of traffic to the roundabout. With Grattan Street reduced to one lane, vehicles are expected to experience longer delays at the Elizabeth Street / Grattan Street / Royal Parade intersection.

Table 9-19 Intersection Performance - AM Peak 2031 Melbourne Metro Legacy Project Case (average delay per vehicle)

Intersection	Approach	2031 No Project	2031 Melbourne Metro	Difference
Haymarket Roundabout	Elizabeth Street (N)	50	50	0 (0%)
	Elizabeth Street (SE)	60	50	-10 (-17%)
	Peel Street (S)	50	60	10 (+20%)
	Flemington Road (NW)	70	70	0 (0%)
Elizabeth Street / Grattan Street / Royal Parade	Royal Parade (N)	80	100	20 (+25%)
	Grattan Street (E)	40	70	30 (+75%)
	Elizabeth Street (S)	50	30	-20 (-40%)
	Grattan Street (W)	50	90	40 (+80%)
Flemington Road / Grattan Street / Wreckyn Street	Grattan Street (E)	30	30	0 (0%)
	Flemington Road (SE)	30	30	0 (0%)
	Wreckyn Street (SW)	30	40	10 (+33%)

Intersection	Approach	2031 No Project	2031 Melbourne Metro	Difference
	Flemington Road (NW)	30	40	10 (+33%)

Table 9-20 Intersection Performance - PM Peak 2031 Melbourne Metro Legacy Project Case (average delay per vehicle)

Intersection	Approach	2031 No Project (sec)	2031 Melbourne Metro (sec)	Difference
Haymarket Roundabout	Elizabeth Street (N)	70	80	10 (+14%)
	Elizabeth Street (SE)	160	110	-50 (-31%)
	Peel Street (S)	150	120	-30 (-20%)
	Flemington Road (NW)	160	120	-40 (-25%)
Elizabeth Street / Grattan Street / Royal Parade	Royal Parade (N)	90	130	40 (+44%)
	Grattan Street (E)	100	70	-30 (-30%)
	Elizabeth Street (S)	50	30	-20 (-40%)
	Grattan Street (W)	40	120	80 (+200%)
Flemington Road / Grattan Street / Wreckyn Street	Grattan Street (E)	130	30	-100 (-77%)
	Flemington Road (SE)	40	40	0 (0%)
	Wreckyn Street (SW)	50	70	20 (+40%)
	Flemington Road (NW)	50	40	-10 (-20%)

The Haymarket roundabout has been the subject of many studies over the years with the introduction of traffic signals to control traffic providing a much safer arrangement than the no-signalised roundabout. A major redevelopment of the roundabout would be required to improve operations. Options that are currently being investigated include;

- Minor changes to lane configuration on the approach from Elizabeth Street north to the roundabout
- Reconfiguration of the roundabout to simplify operation and provide additional capacity between Elizabeth Street south and Flemington Road north
- Replace the roundabout with a signalised intersection.

The roundabout impacts on the modelled operations of upstream intersections, for instance the Elizabeth Street / Grattan Street / Royal Parade intersection is affected by the queues that form back from the roundabout. Enhancements to this intersection would do little to improve the operation without redevelopment of the roundabout.

The provision of a major railway station in the precinct should provide a substantial improvement in the public transport accessibility to the area, and should deliver a reduction in many of the local trips to the precinct. On this basis it is expected that the above analysis can be considered to represent a worst case situation.

Road Safety

The road functional layout plan for the Parkville station precinct has been developed in accordance with current design standards and makes suitable provision for all road users to move through the area safely and efficiently.

Car parking and access

The changes to access and parking shown in the proposed functional layout in Appendix E are expected to provide for the requirements of the Parkville station precinct and consistent with the function and use of these roads. Parking in Grattan Street west in front of the hospitals includes provision for the specific needs

of the hospitals including short term car parking and provision for disability spaces in accordance with DDA requirements. The Parkville station road functional layouts have been developed through a review of the car parking requirements associated with the hospitals and the university.

The functional layouts have also considered the need for bus lanes along Grattan Street and the layouts have resulted in a loss of around 25 on-street car parking spaces. However, many of these reductions are to accommodate the demands of the railway station and associated facilities such as train replacement bus stop facilities as well as some refinement of the parking arrangements around the hospital precinct.

The provision of a new high capacity railway station that provides connections across the broader metropolitan network would more than compensate for any small loss of on street parking in the precinct.

9.7.2 Public Transport Impact Assessment

9.7.2.1 Future Conditions – 2031 No Project Case

With no rail station within the Parkville precinct accessing the major employment and education centres in this area is by predominantly by tram and bus connections.

In the 2031 No project scenario there are predicted to be increased queues on College Crescent westbound. With more vehicles congested to the north of the Parkville precinct, Royal Parade southbound would be less congested and therefore travel times for route 505 can decrease (refer to Table 9-21). Travel times for route 546 do increase by about a minute in the AM peak and over two minutes in the PM peak as is it travels along College Crescent.

Table 9-21: Average bus travel times - 2031 No Project Case

Route	AM Peak			PM Peak		
	2015	2031 No Project	Difference (sec)	2015	2031 No Project	Difference (sec)
401 - From University of Melbourne	05:46	05:39	-6	06:16	06:16	0
401 - To University of Melbourne	05:56	05:49	-5	05:45	05:41	-4
402 - From University of Melbourne	06:05	06:07	2	07:01	07:20	19
402 - To University of Melbourne	06:31	06:54	23	06:34	06:25	9
505 - From University of Melbourne	05:31	04:24	-66	06:19	04:53	-86
505 - To University of Melbourne	05:23	05:17	-6	05:01	05:34	33
546	08:44	09:42	58	10:07	12:43	156

Source: Aimsun

Impacts on tram travel times through the modelled area have little change as all routes are segregated apart from the section of Elizabeth Street, north of the Haymarket roundabout. This results in some delays to route 19 as vehicles can turn right into Grattan Street (northbound).

Table 9-22: Average tram travel times - 2031 No Project Case

Route	AM Peak			PM Peak		
	2015	2031 No Project	Difference (sec)	2015	2031 No Project	Difference (sec)
19 - From CBD	10:50	11:06	16	09:48	08:54	54
19 - To CBD	11:09	11:27	18	09:55	10:08	13

Route	AM Peak			PM Peak		
	2015	2031 No Project	Difference (sec)	2015	2031 No Project	Difference (sec)
Current 55 / Proposed 8 - From CBD	08:26	08:38	12	08:34	08:44	10
Current 55 / Proposed 8 - To CBD	09:25	09:43	18	09:20	09:56	36
57 - From CBD	02:48	02:35	-13	03:52	04:05	13
57 - To CBD	03:35	03:35	0	02:20	02:25	5

Source: Aimsun

9.7.2.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

Rail Network

Parkville station would be located under the Grattan Street road reserve, to the east of Royal Parade. The station footprint would occupy the full width of Grattan Street and extend from the intersection of Grattan Street and Royal Parade to the east of University Square (refer to Section 7.5).

The new station at Parkville would service the University of Melbourne and the hospitals west of Royal Parade. The primary purpose of the station would be deliver a high capacity heavy rail service to the precinct as well as alleviate congestion on existing tram routes and the bus links from North Melbourne station and the CBD rail stations. It would have a positive impact to those working in, living in and visiting the Parkville precinct.

The Sunshine-Dandenong line would operate services from Sunbury through to Cranbourne and Pakenham via Parkville station. At peak times, trains are expected to be schedules with an average 2½ minute separation (refer to Arden Precinct rail network discussion).

Tram and Bus Network

The percentage of passengers entering / exiting Parkville station from tram or bus is expected to be approximately 18 per cent (refer to Table 9-23).

Table 9-23: Parkville station - 2031 Melbourne Metro - Total transfers between rail and tram/bus

Station	AM Peak (7:00am-9:00am)	PM (4:30pm - 6:30pm)
2031 Melbourne Metro	2,140	2,220
Percentage of Total station entries / exits	18%	17%

Source: 2031 Project Case ClicSim passenger modelling - B23 (PM) and B26 (AM)

Key features of Parkville station design include:

- DDA compliant level access tram stops, with side platforms, to be constructed on Royal Parade
- Entrances providing access to the new tram stops on Royal Parade and adjacent to the proposed location of the future bus stops on Grattan Street.

With the opening of Parkville station, bus route 401 would reduce the frequency of services because people are benefitting from a direct high frequency rail service to Parkville.

Travel times on tram route 19 would improve in 2031 with Melbourne Metro as right turns would not be allowed from Royal Parade (southbound) into Grattan Street (refer to Table 9-24).

Table 9-24: Average tram travel times - 2031 Melbourne Metro Legacy Project Case

Route	AM Peak			PM Peak		
	2031 No Project	2031 Project	Difference (sec)	2031 No Project	2031 Project	Difference (sec)
19 - From CBD	11:06	10:19	-47	08:54	08:44	10
19 - To CBD	11:27	09:44	-103	10:08	09:55	13
Current 55 / Proposed 8 - From CBD	08:38	08:48	10	08:44	08:39	5
Current 55 / Proposed 8 - To CBD	09:43	09:32	11	09:56	09:37	16
57 - From CBD	02:35	02:35	0	04:05	04:05	0
57 - To CBD	03:35	03:35	0	02:25	02:25	0

Source: Aimsun model

Due to the growth in traffic through the Parkville precinct by 2031, there would be longer travel times for buses travelling through this area (refer to Table 9-25). Grattan Street would also be reduced to one traffic lane in each direction. The decrease in travel time for bus route 505 is also attributed to congestion elsewhere in the network in the Project scenario. This results in fewer vehicles travelling on Royal Parade.

Table 9-25 : Average bus travel times - 2031 Melbourne Metro Legacy Project Case

Route	AM Peak			PM Peak		
	2031 No Project	2031 Project	Difference (sec)	2031 No Project	2031 Project	Difference (sec)
401 - From University of Melbourne	05:39	06:24	45	06:16	06:17	0.01
401 - To University of Melbourne	05:49	06:59	70	05:41	08:14	134
402 - From University of Melbourne	06:07	06:48	41	07:20	07:26	0.06
402 - To University of Melbourne	06:54	07:33	39	06:25	08:46	141
505 - From University of Melbourne	04:24	05:16	52	04:53	06:23	90
505 - To University of Melbourne	05:17	07:10	83	05:34	04:39	-55
546	09:42	12:15	153	12:43	14:01	78

Source: Aimsun model

Overall there would be a significant improvement to public transport access in the area with a new heavy rail station at Parkville. This would increase the capacity of the public transport network and provide direct and frequent public transport connection from the suburbs, and along the new Melbourne Metro route.

9.7.3 Active Transport Impact Assessment

9.7.3.1 Future Conditions – 2031 No Project Case

The VCCC would be open by 2031 and is therefore inherent within the 2031 No Project Case. The pathways that were closed during the construction phase around the site would be reopened (Grattan Street and Royal Parade) improving the dispersion of pedestrians around the area. The Parkville precinct has high pedestrian volumes during both peak and off peak periods to and between the large number of health, education and research facilities. The opening of the VCCC would increase the number of pedestrians within this precinct and alter pedestrian movements around the precinct.

The bicycle network in the 2031 No Project Case is expected to be the same as the existing bicycle network, though the VCCC would be complete so the temporary changes to the bicycle path on Elizabeth Street would be returned to existing arrangements.

9.7.3.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

Figure 9-7 shows the assumed walking catchment of Parkville station for both the AM and PM peak periods. The Parkville station precinct is located in an area that is dominated by health facilities to the west of Royal Parade and research and educational facilities uses to the east of Royal Parade. As indicated by the diagram, the volumes that are expected to be accessing the Parkville station would be distributed across all three of the station entrances and there is likely to be a reasonably balanced split across either side of Royal Parade. The walking catchment for this station is focused on trips to and from the major facilities in this precinct. Although the broader community would also be using the station, they are likely to be a smaller component of the overall demand.

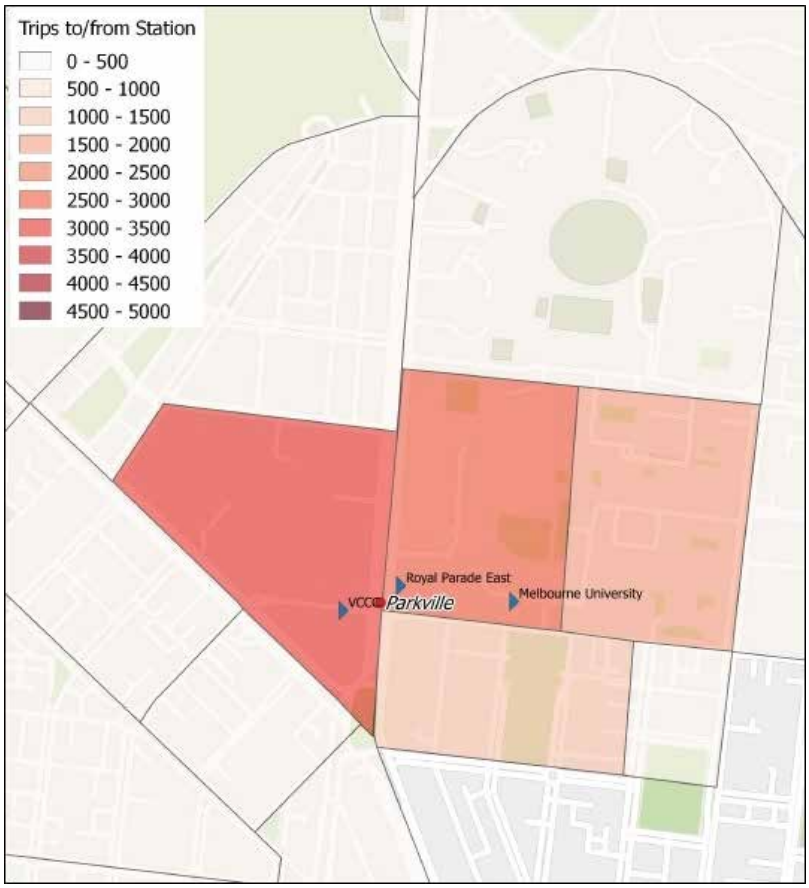

Figure 9-7 Walking catchment for Parkville station (peak periods) (Source: VITM)

The provision for pedestrians in the Parkville station precinct would be enhanced with the development of Melbourne Metro as shown in the functional layouts for Grattan Street and Royal Parade (refer to Appendix E of this report).

Parkville Station would have entrances serving the health and education facilities in the precinct as well as the main north-south pedestrian route through the University of Melbourne campus. Entrances are also well placed to serve the tram stops on Royal Parade and bus stops on Grattan Street. Pedestrian crossings on Grattan Street, Royal Parade and Elizabeth Street would be widened to 6.0 m and repositioned to provide for the expected increase in pedestrian flows. There would also be an unpaid pedestrian underpass beneath Royal Parade under the alignment of Grattan Street.

Modelled station pedestrian entries, exits and transfers for Parkville station for the busiest two-hours in the AM and in the PM peak periods are shown in Table 9-26. It is expected that when Parkville station opens

there would be approximately 12,000 passenger entries and exits during the 2-hour AM peak period and approximately 13,000 in the PM peak

The VCCC entrance on the corner of Grattan Street south / Royal Parade west is expected to be the busiest entrance with 42 per cent of entries and exits during the AM peak (and 39 per cent in the PM). The University of Melbourne entrance on Grattan Street east is expected to be the second busiest entrance with 35 per cent of all entries and exits during the AM peak (and 38 per cent in the PM).

Table 9-26 Parkville station - 2031 Melbourne Metro - Passenger entry and exits volumes

Station Entrance	Total Entries and Exits	
	AM Peak (7:00am – 9:00am)	PM Peak (4:30pm – 6:30pm)
VCCC	5,000 (42%)	5,020 (39%)
Melbourne University	4,140 (35%)	4,910 (38%)
Royal Parade East	2,700 (23%)	3,000 (23%)
TOTAL	**11,840 (100%)**	**12,930 (100%)**

Source: 2031 Project Case ClicSim passenger modelling - B23 (PM) and B26 (AM)

The provision of an underpass connection below the Royal Parade / Grattan Street intersection linking the Royal Parade entrance and the VCCC entrance and providing direct access to the station for the heavy demands of the major hospital sites would deliver a high level of pedestrian accessibility. To the south of the tram stop would be a 6.0 m wide surface level pedestrian crossings of Royal Parade (with direct access to the tram superstop) would further enhance pedestrian access and safety around the precinct. There is also a proposed pedestrian mid-block crossing at the north end of the central tram stop on Royal Parade by Gate 10 on Grattan Street (refer to Appendix E). These facilities provide substantial benefits to the pedestrian flows compared to the current arrangements.

The projected pedestrian demands in the area are quite high and high capacity facilities are required to service the demand. The Concept Design has been developed and designed to service these demands. Overall it is expected that Melbourne Metro would provide a positive benefit to pedestrians moving around the Parkville precinct.

The provision for bicycles in the Parkville station precinct would also be enhanced with the development of Melbourne Metro. The functional layouts for Grattan Street show provision for on-road bicycle lanes on both sides of the road for the entire length of Grattan Street, generally around 1.8 m in width.

The Royal Parade-Elizabeth Street corridor would also have on-road bicycle lanes, though widths vary depending on available space (around 1.5 m to 1.7 m width). There would be no on-street parking next to the bicycle lanes in the section to the south of University High School (both directions). North of University High School the road network (including bicycle lanes) would revert to the existing configuration.

It is also expected that Melbourne Metro would provide up to 50 new bicycle parking spaces at the new Parkville station improving the opportunities for bicycles to park and ride from Parkville.

9.7.4 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Operational)

- Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required
- Develop and implement a plan for the reinstatement of Grattan Street, Parkville in consultation with the relevant road management authorities that includes:

- Optimal replacement of car parking spaces along Grattan Street to service the needs of the hospitals and the university, including the retention or replacement of specific short-term and DDA compliant parking

- Optimal design of the road network around Grattan Street associated with the changed demands and network changes on Grattan Street and Royal Parade/Elizabeth Street.

Public Transport (Operational)

- Review, with Public Transport Victoria, the bus services in the areas around Parkville station including a review of the route 401 bus frequency that would have reduced demand following implementation of Melbourne Metro
- Optimise the design of Melbourne Metro stations to ensure integration with existing and planned future uses and so that they would provide connections between the new Parkville station and the new tram stop on Royal Parade.

Active Transport (Operational)

- Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council
- Provide wayfinding information to enhance connectivity for pedestrians and public transport users.

9.7.5 Conclusion

The road functional layout plan for the Parkville station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient road and parking network. However, the changes to the road network are expected to result in an increase in travel delays through the area, largely as a result of congestion at the busy Haymarket roundabout and the reduction in capacity at the Elizabeth Street / Grattan Street / Royal Parade intersection. Further mitigation measures should be considered to address the increased congestion impacts on Grattan Street and Royal Parade/Elizabeth Street.

Overall there would be a significant improvement to public transport access in the area with a new heavy rail station at Parkville. This would increase the capacity of the public transport network and provide direct and frequent public transport connection from the suburbs, and along the new Melbourne Metro route. The station provides opportunities for enhanced public transport to the university and hospitals with improved rail connections to the tram, bus, and cycle routes in the vicinity of the Parkville station.

The road functional layout plan for the Parkville station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient bicycle and pedestrian network. Pedestrian footpaths and crossings would be widened to accommodate the growth in pedestrian movements as a result of the new Parkville station. Separated bicycle lanes would be provided along Grattan Street which would significantly improve the pedestrian and cycling environments compared to the current shared path arrangement. Separated bicycle lanes would also be reinstated along Royal Parade following the construction of Parkville station.

The implementation of the recommended Environmental Performance Requirements would result in minor residual risks to the transport network and operations with Melbourne Metro.

9.8 Impact Assessment Precinct 5: CBD North Station

9.8.1 Road Transport Impact Assessment

9.8.1.1 Future Conditions – 2031 No Project Case

At the time of this report, there are no committed changes to the road network in a 2031 No Project Case scenario from the existing road network in the vicinity of the CBD North precinct.

As the CBD traffic volumes have shown no growth over the last 10-15 years, it is reasonable to expect that the 2031 volumes and signal operation would be the same as the existing conditions analysis presented in Table 8-22.

As a sensitivity test the same analysis has been undertaken for 110 per cent of the existing demands (i.e. an increase of 10 per cent over the current volumes) – refer to Appendix D for details. That analysis indicates that a 10 per cent growth would push these intersections close to capacity, with some approaches exceeding a DoS of 1.00 and associated increases in queue lengths and delays. Refinement of signal operations may improve the operation as other approaches are typically well within capacity limits.

9.8.1.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

CBD North station is to be located under Swanston Street, between Franklin Street and La Trobe Street. The station entrances would be in Franklin Street to the east of Swanston Street and adjacent to Swanston Street north of La Trobe Street. The station entrances and associated station infrastructure involve the following changes to the existing road layout as shown in Figure 9-8 (more detailed road functional layouts are included in Appendix E of this report):

- Closure of Franklin Street between Swanston Street and Bowen Street, including removal of parking
- Franklin Street connection to Victoria Street would remain as two-way access but would be only as far as Bowen Street and would retain only two parking spaces
- Two lanes eastbound and one lane westbound on Franklin Street west of Swanston Street with both eastbound lanes required to turn left
- Kerb extension (landscaping) on the south side of Franklin Street, west of Swanston Street, resulting in loss of parking and changes to A'Beckett Street to provide additional station accesses
- Minor adjustments to the existing parking arrangements along Swanston Street.

There are ongoing discussions with City of Melbourne to develop a design that allows the partial opening of Franklin Street with Melbourne Metro. The transport impact assessment assesses the full closure of Franklin Street as a worst case scenario.

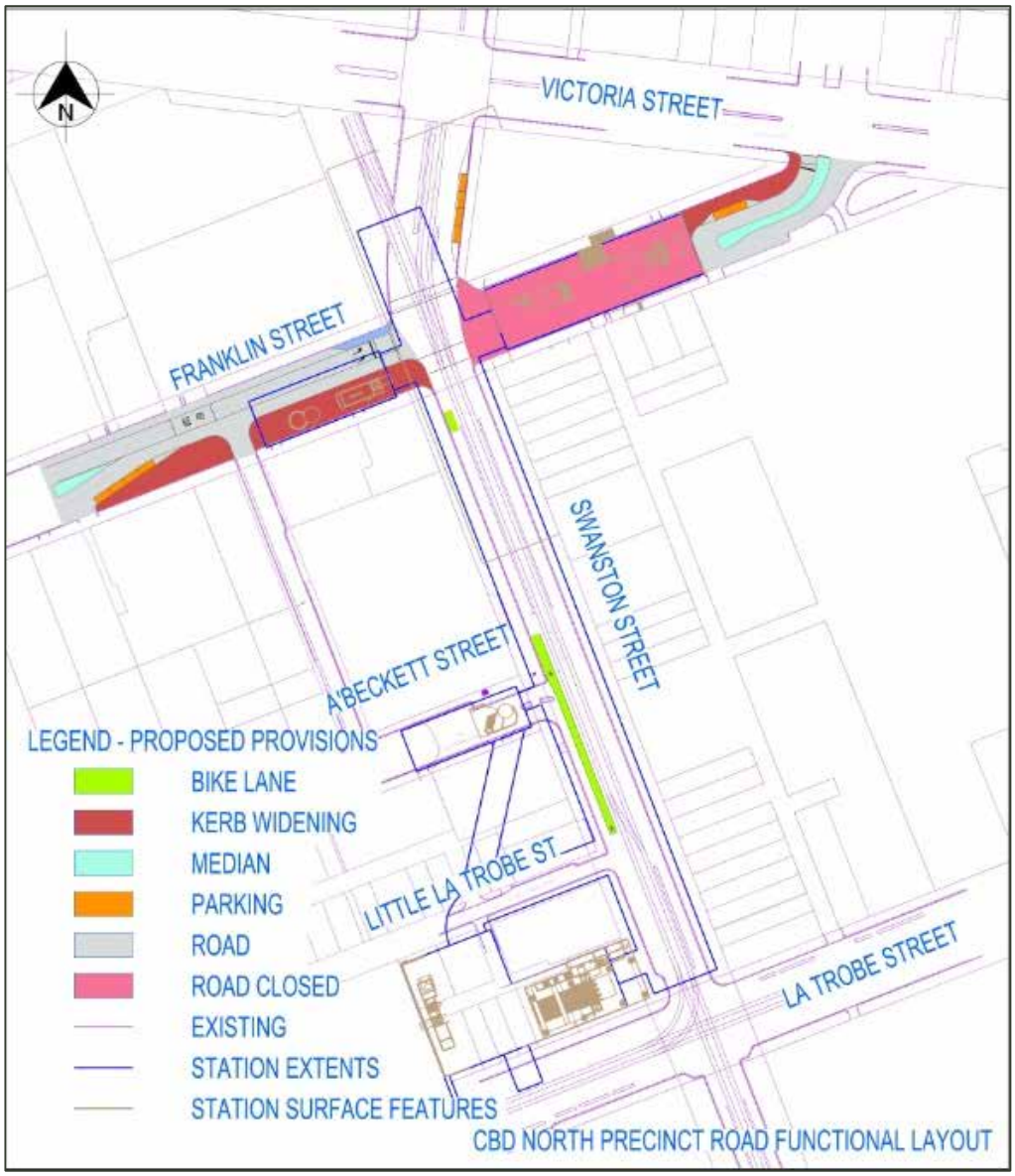

Figure 9-8 CBD North station precinct road functional layout

Applying a similar approach to the traffic growth as the 2031 No Project Case to the analysis of the 2031 Melbourne Metro Legacy Project Case with zero growth are shown in Table 9-27 and shows very similar results to the 2015 Base Case in Table 8-22. On this basis, it is expected that the operation would be effectively unchanged from the current operation of the intersections around the CBD North precinct. A number of traffic signal timing changes have been made in the traffic model for 2031 Melbourne Metro legacy project case. Refer to Appendix D for further information.

Table 9-27 Intersection Performance – 2031 Melbourne Metro Legacy Project Case

Intersection	Approach	AM Peak			PM Peak		
		Degree of saturation	Max Queue (veh)	Ave delay (sec)	Degree of saturation	Max Queue (veh)	Ave delay (sec)
Swanston Street / La Trobe Street	Swanston Street (N)	0.22	9 (bike)	20	0.16	5 (bike)	20
	La Trobe Street (E)	0.92	38	21	0.64	11	8
	Swanston Street (S)	0.18	2 (bike)	22	0.18	4 (bike)	22
	La Trobe Street (W)	0.67	12	8	0.89	32	15
	Overall	**0.92**	**38**	**17**	**0.89**	**32**	**15**
Elizabeth Street / Victoria Street	Elizabeth Street (N)	0.46	9	25	0.31	5	25
	Victoria Street (E)	0.76 (RT)	9	22	0.95	18	27
	Elizabeth Street (S)	0.33 (Tram)	2	29	0.60	9	37
	Victoria Street (W)	0.75	16	24	0.79	19	24
	Overall	**0.76**	**24**	**16**	**0.95**	**19**	**28**
Swanston Street / Franklin Street	Swanston Street (N)	0.92	13	36	0.49	8	30
	Franklin Street (E)	Closed					
	Swanston Street (S)	0.24	3	37	0.45	10 (Bike)	37
	Franklin Street (W)	0.16	1	6	0.48	5	3
	Overall	**0.92**	**13**	**31**	**0.49**	**10**	**22**
Swanston Street / Victoria Street	Swanston Street (N)	0.89	12	36	0.66	7	56
	Victoria Street (E)	0.84	21	23	0.72	12	8
	Swanston Street (S)	1.01	9	49	0.73	12	30
	Victoria Street (W)	0.94	37	41	0.69	19	16
	Overall	**1.01**	**37**	**34**	**0.73**	**19**	**18**

Source: Sidra model outputs

Road Safety

The road functional layout plan for the CBD North station precinct has been developed in accordance with current design standards and makes suitable provision for all road users to move through the area safely and efficiently.

Car parking and access

There are limited changes to the car parking arrangements around the CBD North station precinct. The changes are principally along Franklin Street associated with the station accesses and would result in a reduction of a number of on-street car parking spaces, particularly associated with the Franklin Street closure. In the context of the large number of car parking spaces in the area (on-street and off-street), it is expected that this reduction in spaces would have minimal impact.

The provision of a new high capacity railway station that provides connections across the broader metropolitan network would more than compensate for any small loss of parking in the precinct.

9.8.2 Public Transport Impact Assessment

9.8.2.1 Future Conditions – 2031 No Project Case

At the time of this report, there are no committed changes to the rail network in a 2031 No Project Case from the existing 2015 rail network.

There are no proposed changes to tram routes or bus routes from the 2015 existing situation. There may be some changes to rail, tram and bus timetables across the network.

9.8.2.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

CBD North station is located directly beneath Swanston Street, from La Trobe Street to north of Franklin Street with direct connections to the existing Melbourne Central Station to enable it to provide:

- Key interchange points for Melbourne Metro services onto other heavy rail lines
- Major expansion to Melbourne Central providing direct access to the northern extensions of the CBD, as well as eastern and central precincts.

To provide a seamless journey experience for passengers interchanging between the rail lines, the Concept Design provides for passengers to have a direct connection into the paid area at Melbourne Central Station in addition to routes (via ticket lines) into the surrounding precinct (refer detailed station plans in Map Book).

It is expected that during both the 2031 Melbourne Metro project case AM and PM peak there would be a 42 per cent and 32 per cent decrease respectively in the number of passengers transferring between Melbourne Central station and adjoining tram / bus services compared to 2012 (refer to Table 9-28). During the AM peak, 33 per cent of all passenger transfers to and from Melbourne Central station are to/ from trams and buses.

Table 9-28: Melbourne Central station - 2031 Melbourne Metro - Total transfers between rail and tram/bus

Station	AM Peak (7:00am – 9:00am)	PM Peak(4:30pm – 6:30pm)
2031 No Project	7,130	9,610
2031 Melbourne Metro	4150	6510
Difference 2031 No Project – 2031 Melbourne Metro	-2,980 (-42%)	-3,100 (-32%)

Source: 2031 Project Case ClicSim passenger modelling - B23 (PM) and B26 (AM)

The percentage of passengers entering / exiting CBD North station from tram or bus is expected to be approximately 21 per cent during the AM peak (refer to Table 9-29).

Table 9-29: CBD North station - 2031 Melbourne Metro - Total transfers between rail and tram/bus

Station	AM Peak (7:00am – 9:00am)	PM Peak (4:30pm – 6:30pm)
2031 Melbourne Metro	3,470	2,200
Percentage of Total station entries / exits	21%	14%

Source: 2031 Project Case ClicSim passenger modelling - B23 (PM) and B26 (AM)

The inclusion of Melbourne Metro as part of the transport network would change the dynamic of public transport movements in the Melbourne CBD because passengers would be less reliant on the Swanston Street trunk tram corridor for access between Parkville and the CBD and Domain (refer to Figure 5-6). There would be enhanced tram services operating along La Trobe Street.

Overall there would be a massive improvement to public transport access in the area with a new heavy rail station at CBD North. This would increase the capacity of the public transport network and provide direct and frequent public transport connection from the suburbs, and along the new Melbourne Metro route.

9.8.3 Active Transport Impact Assessment

9.8.3.1 Pedestrian Demand Growth

Figure 9-9 shows the existing 2015 and projected 2031 (No Project and Melbourne Metro Legacy) daily profiles of pedestrian trips around La Trobe Street and Swanston Street. The profile shows that pedestrian activity is highest during the lunchtime period (12:00pm–1:00pm) and remains high through to the PM commuter peak (5:00pm-6:00pm). In 2015 the peak number of pedestrian movements through the La Trobe Street / Swanston Street intersection is approximately 20,000 between 12:00pm-1:00pm.

The analysis shows that the overall profile is similar in each modelled scenario. The 2031 No Project Case and 2031 Melbourne Metro Legacy Project Case show similar levels of demand, with small increases in the 2031 Melbourne Metro Legacy Project Case in both the AM peak (7:00am – 09:00am) and PM peak (4:30pm – 6:30pm) periods associated with the opening of CBD North station.

However the major growth occurs between 2015 and 2031 even without the introduction of Melbourne Metro. This demand increase is reflective of the growth in activity across the CBD that would support Melbourne Metro, though Melbourne Metro is not actually the catalyst for that growth.

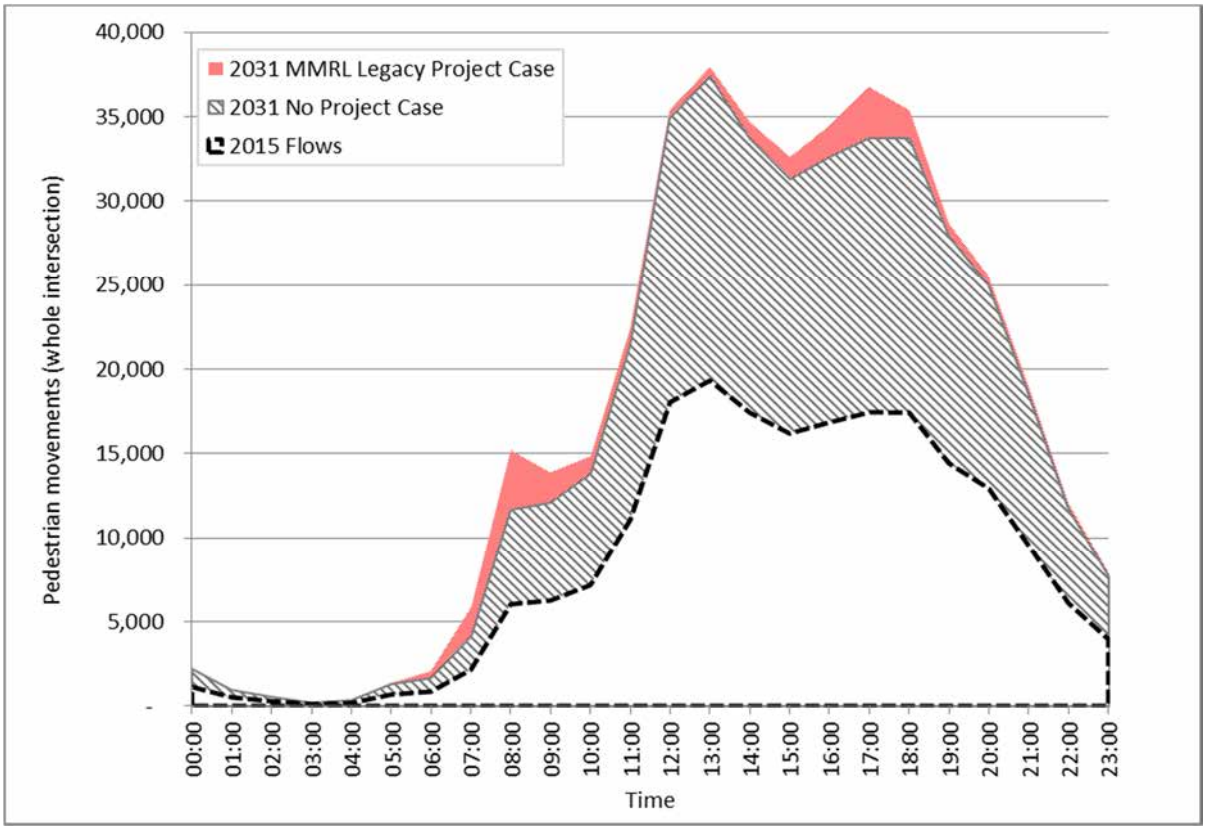

Figure 9-9 Pedestrian growth in CBD North precinct

9.8.3.2 Future Conditions – 2031 No Project Case

In the 2031 No Project Case, it is expected that there would be a large increase in AM and PM peak passenger entries and exits at Melbourne Central Station compared to 2012. There is an increase of approximately 11,000 additional passengers entering / exiting Melbourne Central station during the AM peak and over 18,000 more during the PM peak as shown in Table 9-30. There would be an increase of over almost 1,000 passengers transferring between platforms at Melbourne Central Station in the PM peak compared to 2012 (Table 9-6).

This is a large growth in the number of pedestrians that would have a major impact to the pedestrian network around Melbourne Central Station. This growth is largely as a result of changes to future population,

employment and land use changes, as well as changes to direction of services around the City Loop that are expected to influence passenger journey patterns.

Table 9-30 Melbourne Central Station - 2031 No Project - Passenger entries, exits and transfers

Scenario	AM Peak (7:00am – 9:00am)		PM Peak (4:30pm – 6:30pm)	
	Total Entries and Exits	Transfers	Total Entries and Exits	Transfers
2012	15,990	0*	21,530	0*
2031 No Project	26,940	390	39,660	1,060
Difference 2031 No Project - 2012	**+10,950 (+68%)**	**+390 (+100%)**	**+18,120 (+84%)**	**+1,060 (+100%)**

Source: 2021 No Project Case ClicSim passenger modelling (Run B24)

***Negligible number of transfers occurring at present**

In the 2031 No Project Case around two thirds of the Melbourne Central Station users access the station via the Swanston Street access as shown in Table 9-31. There are a greater number of entries and exits during the PM peak thought the proportions by access are similar.

Table 9-31 Melbourne Central Station - 2031 No Project - Passenger entry and exits volumes

Station Entrance	Total Entries and Exits	
	AM Peak (7:00am – 9:00am)	PM Peak (4:30pm – 6:30pm)
Swanston Street	17,450 (65%)	25,710 (+65%)
Elizabeth Street	9,490 (35%)	13,950 (+35%)
TOTAL	**26,940** (100%)	**39,660** (100%)

Source: 2021 No Project Case ClicSim passenger modelling

The bicycle network in the 2031 No Project Case would be the same as the existing bicycle network around the CBD North precinct.

9.8.3.3 Future Conditions – 2031 Melbourne Metro Legacy Project Case

The CBD North precinct includes both Melbourne Central Station and CBD North station and is characterised by a range of land uses including RMIT University, residential apartment towers, Melbourne Central shopping centre, Melbourne Central Station, the State Library and Melbourne City Baths.

The existing surface pedestrian network in the CBD North station precinct would remain largely unchanged as a result of Melbourne Metro other than the areas around Franklin Street. The key features of CBD North station design include:

- An entrance under La Trobe Street that would provide a new direct underground pedestrian link to Melbourne Central Station, as well as the existing surface connections across La Trobe Street and Swanston Street to provide access to the existing tram lines
- A northern entrance is to be located in the closed section of Franklin Street to the east of Swanston Street. The proposed closure of the eastern section of Franklin Street would provide a safer area for pedestrian access to the station access, by removing the need to cross operating roads.

It is understood that PTV is planning to upgrade the La Trobe Street tram stops adjacent to Swanston Street, but at the time of writing this report the details of those planned upgrades have not been finalised. Based on the construction of similar stops elsewhere in the CBD, the upgrade of the tram stops would significantly improve pedestrian safety in the area.

Figure 9-10 shows the walking catchment of CBD North station during the AM peak. The majority of pedestrian trips to and from CBD North station are between Franklin Street and La Trobe Street (north-south) and Elizabeth Street and Russell Street (east-west). There are also some trips to the RMIT campuses to the north of Victoria Street.

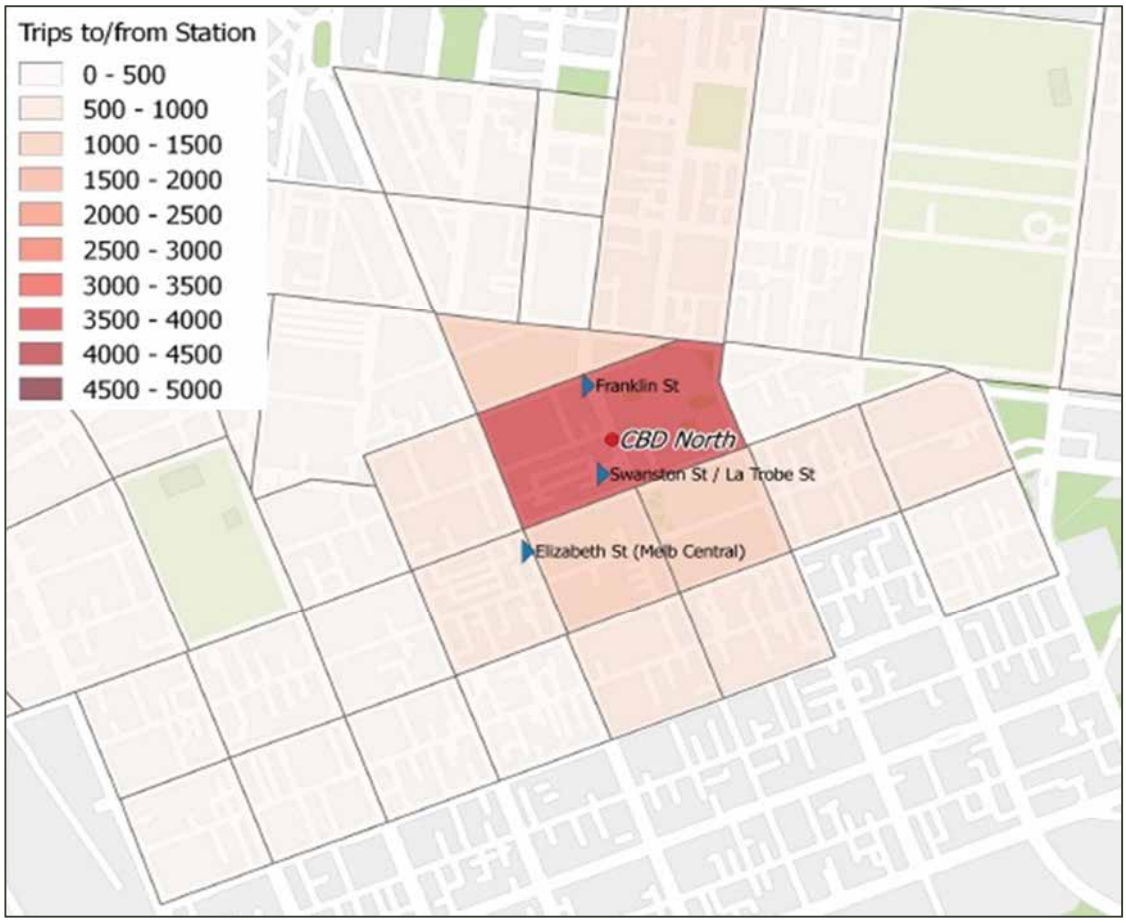

Figure 9-10 Walking catchment for CBD North station (AM peak) (Source: VITM)

The walking catchment of Melbourne Central Station is very concentrated around the station as shown in Figure 9-11. It should be noted that Melbourne Central Station has a wider walking catchment than CBD North. There are a greater number of trips to the south of the station along Swanston Street and to the west (across to Queen Street). There is also a broader spread of trips north of Victoria Street up to the Parkville precinct, though this is a relatively low number of trips.

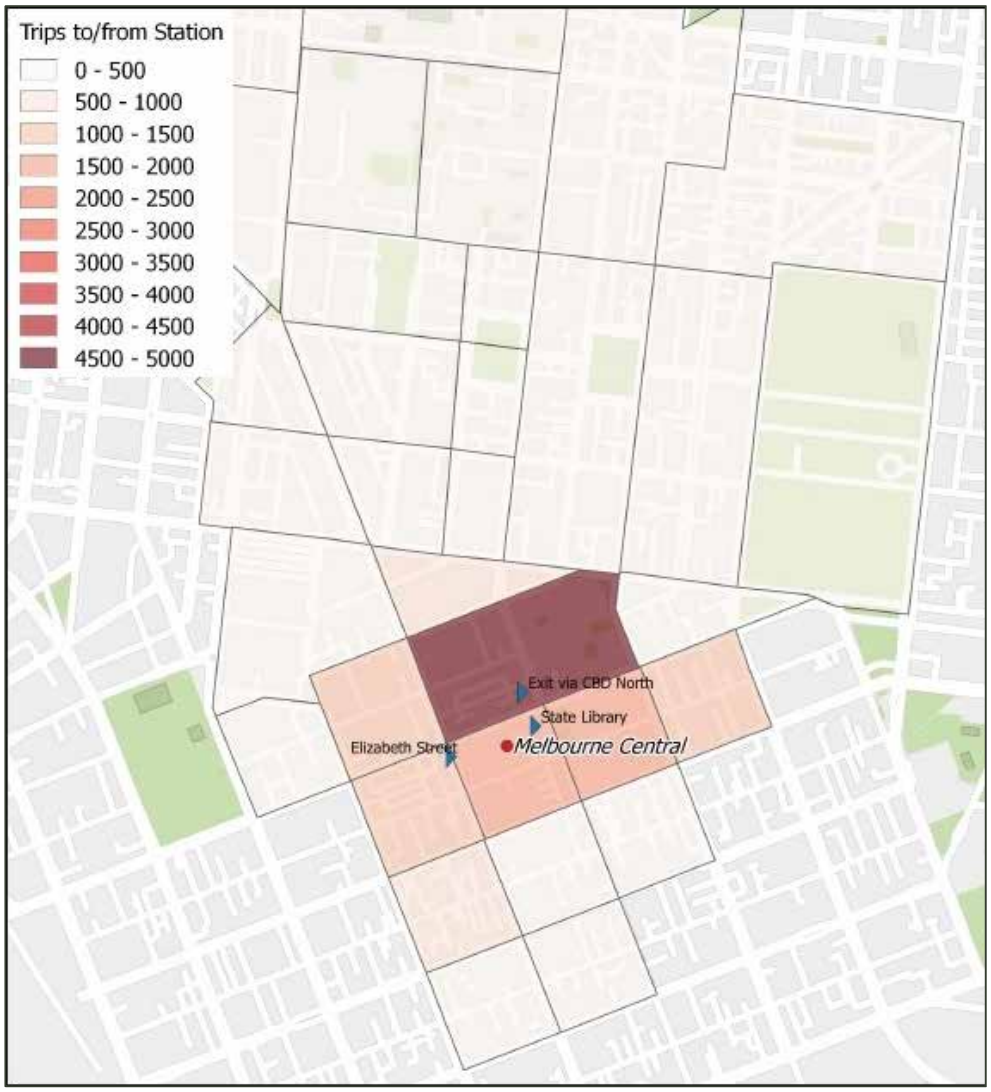

Figure 9-11 Walking catchment for Melbourne Central Station (peak periods) (Source: VITM)

The modelled 2031 Melbourne Metro case pedestrian entry, exit and transfer flows for Melbourne Central Station during the busiest two-hour periods in the AM and PM are shown in Table 9-32. Compared to the 2031 No Project Case, there would be a decrease of over 10,000 passenger entries / exits during the AM peak and a decrease of almost 12,000 entries / exits during the PM peak, as these trips shift to CBD North Station. Passenger transfers would increase as a result of people being able to transfer between Melbourne Central and CBD North stations (refer to Table 9-33).

Table 9-32 Melbourne Central Station – 2031 Melbourne Metro weekday passenger entries, exits and transfers

Scenario	AM Peak (7:00am – 9:00am)		PM (4:30pm – 6:30pm)	
	Total Entries and Exits	Transfers	Total Entries and Exits	Transfers
2031 No Project	26,940	390	39,650	1,060
2031 Melbourne Metro	16,880	7,180	27,710	9,400
Difference 2031 Melbourne Metro - 2031 No Project	-10,060 (-37%)	6,790 (+1840%)	-11940 (-30%)	8,340 (+890%)

Source: 2031 Project Case ClicSim passenger modelling (B23 (PM) and B26 (AM)

Table 9-33 CBD North station – 2031 No Project Case weekday passenger entries, exits and transfers

Scenario	AM Peak (7:00am – 9:00am)		PM (4:30pm – 6:30pm)	
	Total Entries and Exits	Transfers	Total Entries and Exits	Transfers
2031 Melbourne Metro	16,230	6,910	16,270	8,720

Source: 2031 Project Case ClicSim passenger modelling (B23 (PM) and B26 (AM)

There is expected to be a significant change in pedestrian movement patterns across the CBD North precinct following the opening of CBD North station. Entry / exit movements to Melbourne Central and CBD North stations are expected to be reasonably evenly split during the AM peak as shown in Table 9-34. This represents a reduction of approximately 64 per cent in the total number of people that would otherwise use the Swanston Street entrance / exit in the 2031 No Project Case.

Table 9-34 CBD North precinct stations - 2031 Melbourne Metro - Total weekday passenger entries and exits

Station Entrance	AM Peak (7:00am – 9:00am)	PM (4:30pm – 6:30pm)
	Total Entries and Exits	Total Entries and Exits
Melbourne Central		
Swanston Street	6,290 (22%)	10,290 (28%)
Elizabeth Street	7,800 (27%)	11,580 (32%)
CBD North		
La Trobe Street	7,840 (27%)	7,740 (21%)
Franklin Street	6,790 (24%)	6,850 (19%)

Source: 2031 Project Case ClicSim passenger modelling (B23 (PM) and B26 (AM)

During the PM peak, Melbourne Central Station would have a higher proportion of pedestrians entering / exiting with 60 per cent of all pedestrians using Swanston Street and Elizabeth Street entrances / exits. The overall reduction in the number of pedestrians using Melbourne Central entrances / exits would have a negligible impact on these busy sections of Swanston Street and Elizabeth Street. The increase in the number of pedestrians using La Trobe Street would be expected to have a medium impact at this location. The closure of Franklin Street would provide a safer area for pedestrian access to the station accesses so there is expected to be a negligible impact.

The bicycle network in the CBD North station precinct would remain largely unchanged as a result of Melbourne Metro works with the La Trobe Street and Swanston Street bicycle lanes retained in their current configuration.

Cycling activity in the CBD has demonstrated strong growth in recent years and is expected to continue to grow. The increase of cycling around the CBD North station (and Melbourne Central) access points would need to be carefully managed in the future to maintain safety of pedestrians and cyclists in this area.

It is expected that Melbourne Metro would provide up to 20 new bicycle parking spaces at the new CBD North station.

9.8.4 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Operational)

- Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required
- Develop and implement a plan for the future use of the Franklin Street road reserve in consultation with the relevant road management authorities that includes:
  - Optimising the design of the road network following the closure of Franklin Street between Swanston Street and Bowen Street
  - Monitoring the change in travel patterns around the area associated with the closure of Franklin Street
- Optimise the design of the reinstated St Kilda Road and apply the road users hierarchy in consultation with the relevant road management authorities to:
  - Reduce delays and congestion
  - Maintain safe operations through the precinct.

Public Transport (Operational)

- Review, with PTV, the bus services in the areas around CBD North station
- Optimise the design of Melbourne Metro stations to ensure integration with existing and planned future uses and so that they would provide connections for interchange between the new CBD North station and the existing tram and bus services along La Trobe Street and Swanston Street
- Review, with PTV and Yarra Trams, the bus and tram services in the area to optimise the functionality of the CBD North station and to reduce the reliance on the Swanston Street tram corridor.

Active Transport (Operational)

- Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council
- Provide wayfinding information to enhance connectivity for pedestrians and public transport users including (but not limited to) between Melbourne Central Station and the new CBD North station.

9.8.5 Conclusion

The road functional layout plan for the CBD North station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient road and parking network though there is some loss of car parking in the precinct. The traffic operations analysis shows that the key intersections would be operating at satisfactory levels in 2031 with Melbourne Metro.

Overall there would be a significant improvement to public transport access in the area with a new heavy rail station at CBD North. This would increase the capacity of the public transport network and provide direct and frequent public transport connection from the suburbs, and along the new Melbourne Metro route.

The station would also provide opportunities to enhance the coverage of the public transport network with enhanced rail connections to the tram, bus, cycle and taxi routes around the CBD North station.

The road functional layout plan for the CBD North station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient bicycle and pedestrian network.

There would be a medium impact to the pedestrians within the CBD North station precinct. The proposed closure of the eastern section of Franklin Street would provide a safer area for pedestrian access to the station accesses, by removing the need to cross operating roads. As a result of CBD North station there is expected to be less passengers entering and exiting Melbourne Central Station. This is likely to reduce the volume of pedestrians outside Melbourne Central Station on Swanston Street south of La Trobe Street.

There would be negligible impact to cyclists as the bicycle network along Swanston Street and La Trobe Street would be reinstated with separated bicycle lanes following construction of Melbourne Metro.

Cycling activity in the CBD has demonstrated strong growth in recent years and is expected to continue to grow. The increase of cycling around the CBD North station (and Melbourne Central) access points would need to be carefully managed in the future to maintain safety of pedestrians and cyclists in this area.

The implementation of the recommended Environmental Performance Requirements would result in minor residual risks to the transport network and operations with Melbourne Metro.

9.9 Impact Assessment Precinct 6: CBD South Station

9.9.1 Road Transport Impact Assessment

9.9.1.1 Future Conditions – 2031 No Project Case

At the time of this report, there are no committed changes to the road network in a 2031 No Project Case scenario from the existing 2015 road network.

As the CBD traffic volumes have shown no growth over the last 10-15 years, it is reasonable to expect that the 2031 volumes and signal operation would be the same as the existing conditions analysis presented above. The resulting analysis is shown in Table 8-26.

9.9.1.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

The CBD South station is to be located at the southern edge of the CBD directly beneath Swanston Street, between Collins Street and Flinders Street. The CBD South station entrances would be via:

- An entrance from Swanston Street north of Flinders Street
- An underground connection to Flinders Street station
- An underground connection to Federation Square
- An entrance from Collins Street at the northern end of the City Square.

The station entrances and associated station infrastructure are all outside the road reserve and would involve no changes to the existing road layout.

The proposed road functional layout plan is shown in Figure 9-12 (more detailed road functional layouts are included in Appendix E) showing no changes to the existing road network and no changes to car parking arrangements or safety management in the area.

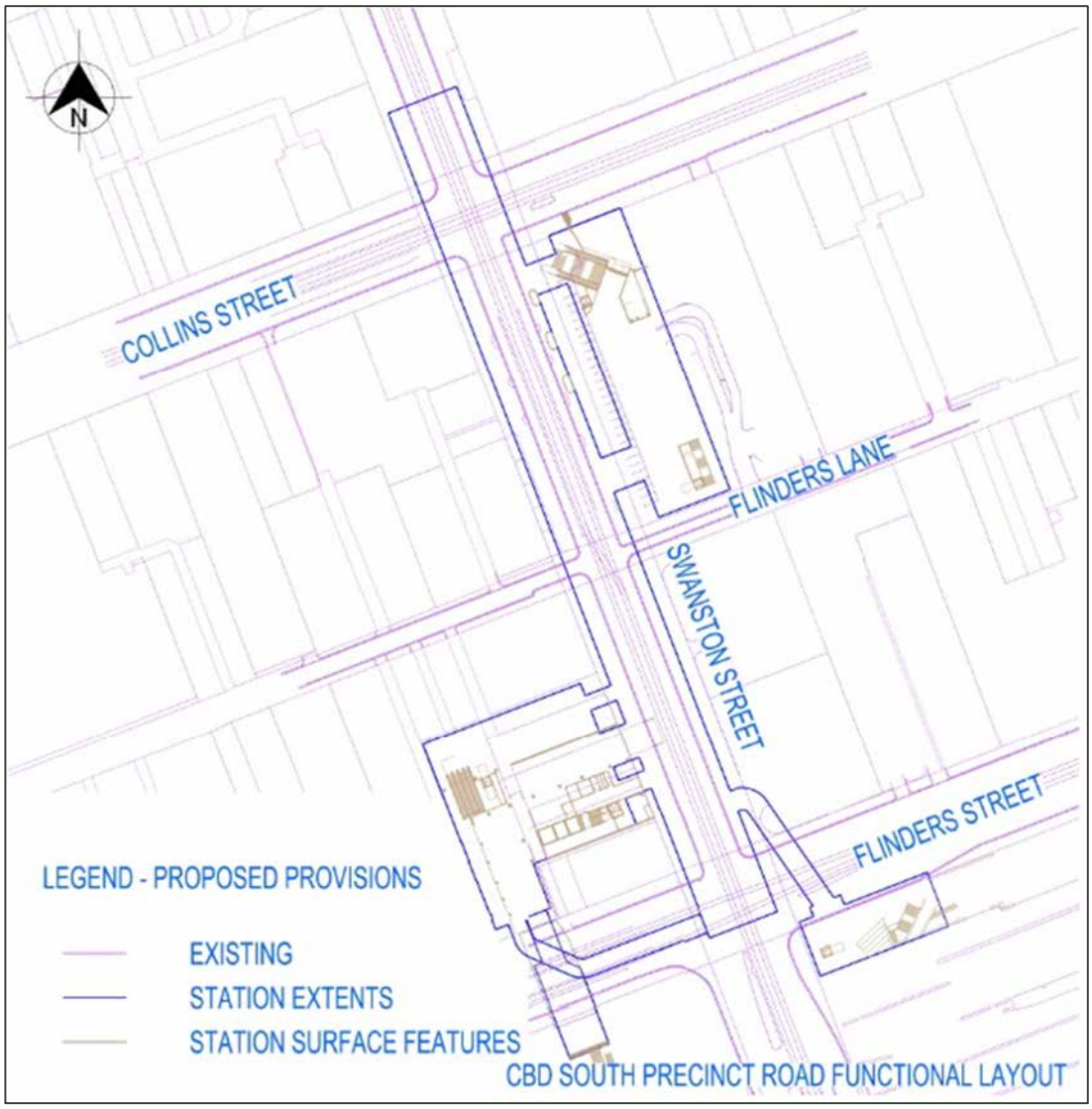

Figure 9-12 CBD South station precinct road functional layout

As the CBD traffic volumes have shown no growth over the last 10-15 years, it is reasonable to expect that the 2031 volumes would be effectively unchanged in 2031. As the 2031 Melbourne Metro Legacy Project Case retains the same road network the operation of the intersections would also be the same as the 2015 operation shown in Table 8-26. No traffic signal timing changes are proposed during the construction of Melbourne Metro.

9.9.2 Public Transport Impact Assessment

9.9.2.1 Future Conditions – 2031 No Project Case

At the time of this report, there are no committed changes to the rail network in a 2031 No Project Case from the existing 2015 rail network.

There are no proposed changes to tram routes or bus routes from the 2015 existing situation.

9.9.2.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

CBD South station is planned be constructed beneath Swanston Street with a direct connection to Federation Square and Flinders Street Station, extending the station reach along the north-south axis of Swanston Street. Like CBD North station, CBD South is expected to provide a dual role in servicing direct access the southern CBD and providing a critical interchange link to other heavy rail lines. A pedestrian link under Flinders Street would connect the new CBD South station directly into the main concourse at Flinders Street Station.

The addition of a new station in the CBD South precinct would be a positive impact as it would increase the capacity of public transport services and provide a key interchange points for Melbourne Metro services onto other heavy rail lines due to its connections with Flinders Street Station. Refer to the Network Wide Assessment for further information on future changes to the rail network.

It is expected that during both the 2031 Melbourne Metro project case AM peak there would be a 31 per cent increase in the number of passengers transferring between Flinders Street Station and adjoining tram / bus services compared to 2031 No Project Case, (refer to Table 9-35). During the PM peak there would be a 41 per cent decrease in the number of passengers transferring between Flinders Street Station and adjoining tram / bus services. This is due to changes in travel behaviour as a result of the new rail corridor.

Table 9-35: Flinders Street Station - 2031 Melbourne Metro - Total transfers between rail and tram/bus

Station	AM Peak (7:00am – 9:00am)	PM Peak (4:30pm – 6:30pm)
2031 No Project	13,060	34,500
2031 Melbourne Metro	17,060	20,390
Difference 2031 No Project – 2031 Melbourne Metro	4,000 (+31%)	-14,110 (-41%)

Source: 2031 Project Case ClicSim passenger modelling - B23 (PM) and B26 (AM)

It is expected that during the AM peak approximately 8000 passengers would transfer between CBD South station and trams / buses, (refer to Table 9-36).

Table 9-36: CBD South station - 2031 Melbourne Metro - Total transfers between rail and tram/bus

Station	AM Peak (7:00am – 9:00am)	PM Peak (4:30pm – 6:30pm)
2031 Melbourne Metro	8,020	7,090
Percentage of total station entries / exits	42%	34%

Source: 2031 Project Case ClicSim passenger modelling - B23 (PM) and B26 (AM)

The inclusion of Melbourne Metro as part of the transport network would change the dynamic of public transport movements in the Melbourne CBD because passengers would be less reliant on the Swanston Street trunk tram corridor for access between Parkville and the CBD and Domain.

There would be a minor impact on bus services within the CBD South station precinct though some services may be reviewed as part of Melbourne Metro.

Overall there would be a massive improvement to public transport access in the area with a new heavy rail station at CBD South. This would increase the capacity of the public transport network and provide direct and frequent public transport connection from the suburbs, and along the new Melbourne Metro route.

9.9.3 Active Transport Impact Assessment

9.9.3.1 Future Conditions – 2031 No Project Case

Figure 9-13 and Figure 9-14 show the daily profiles of pedestrian trips in the CBD South precinct around Flinders Street / Swanston Street and Collins Street / Swanston Street respectively. There are three clear peaks in pedestrian activity through the Flinders Street / Swanston Street intersection. This is related to the high volumes of pedestrians that need to access Flinders Street Station especially during the AM and PM peaks.

At Flinders Street / Swanston Street the lunchtime period has the highest volume of pedestrian movements between 12:00pm-2:00pm. It then decreases slightly before starting to increase again from 4:00pm-6:00pm. The City of Melbourne would experience significant increases in residential and employment populations which would result in more people walking in the municipality. By 2031, as shown in the 2031 No Project

Case, there is predicted to be significant growth in the number of pedestrians moving through this precinct with an expected increase in peak pedestrian movements during the lunchtime period to around 35,000 pedestrian movements and PM peak to around 32,000 pedestrian movements.

In the 2031 Melbourne Metro Legacy Project Case there would only be a small increase in pedestrian movements compared to 2031 No Project. The majority of these movements would occur during the AM peak period (8:00am-9:00am) and PM peak period (4:00pm-6:00pm).

At the Collins Street / Swanston Street intersection the lunchtime period (12:00pm-2:00pm) also has a significantly higher volume of pedestrian movements through the than the AM and PM peak periods. This area is lined with cafes, restaurants and retail outlets and is a very popular location at lunchtime.

In the 2031 No Project Case there is a significant growth in the number of pedestrians moving through this precinct with an expected increase in peak pedestrian movements during the lunchtime period to around 40,000 pedestrian movements. The PM peak pedestrian movements are expected to increase from approximately 15,000 to 20,000 movements.

In the 2031 Melbourne Metro Legacy Project Case there would only be a small increase in pedestrian movements compared to 2031 No Project Case across the day. While the opening of CBD South Station with entrances at City Square and Swanston Street is expected to result in an increase in pedestrian movements, the volumes are a small proportion of the flows in 2015 and in 2031 without Melbourne Metro.

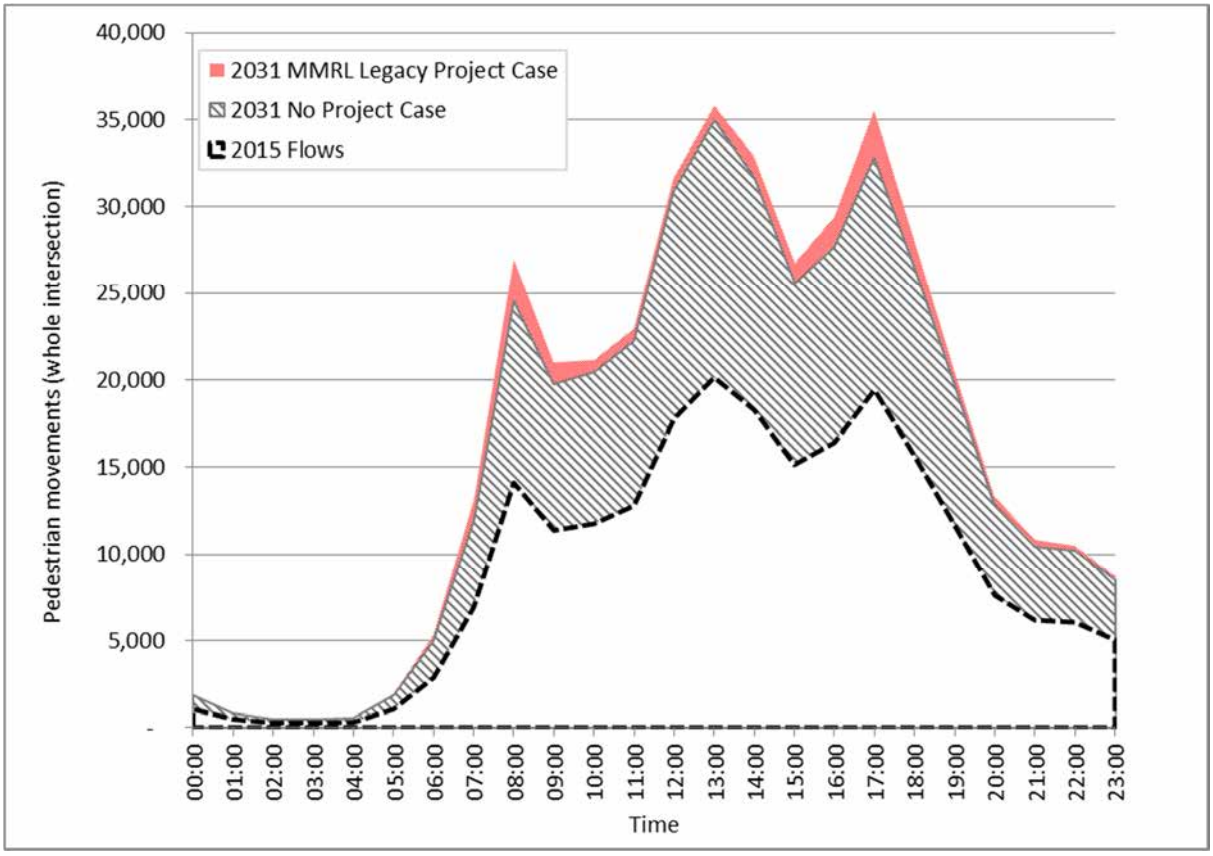

Figure 9-13 Pedestrian growth in CBD South precinct (Flinders Street / Swanston Street)

Source: City of Melbourne Pedestrian Counting System 2015, 2014 Myki data, ClicSim modelling, and AJM analysis

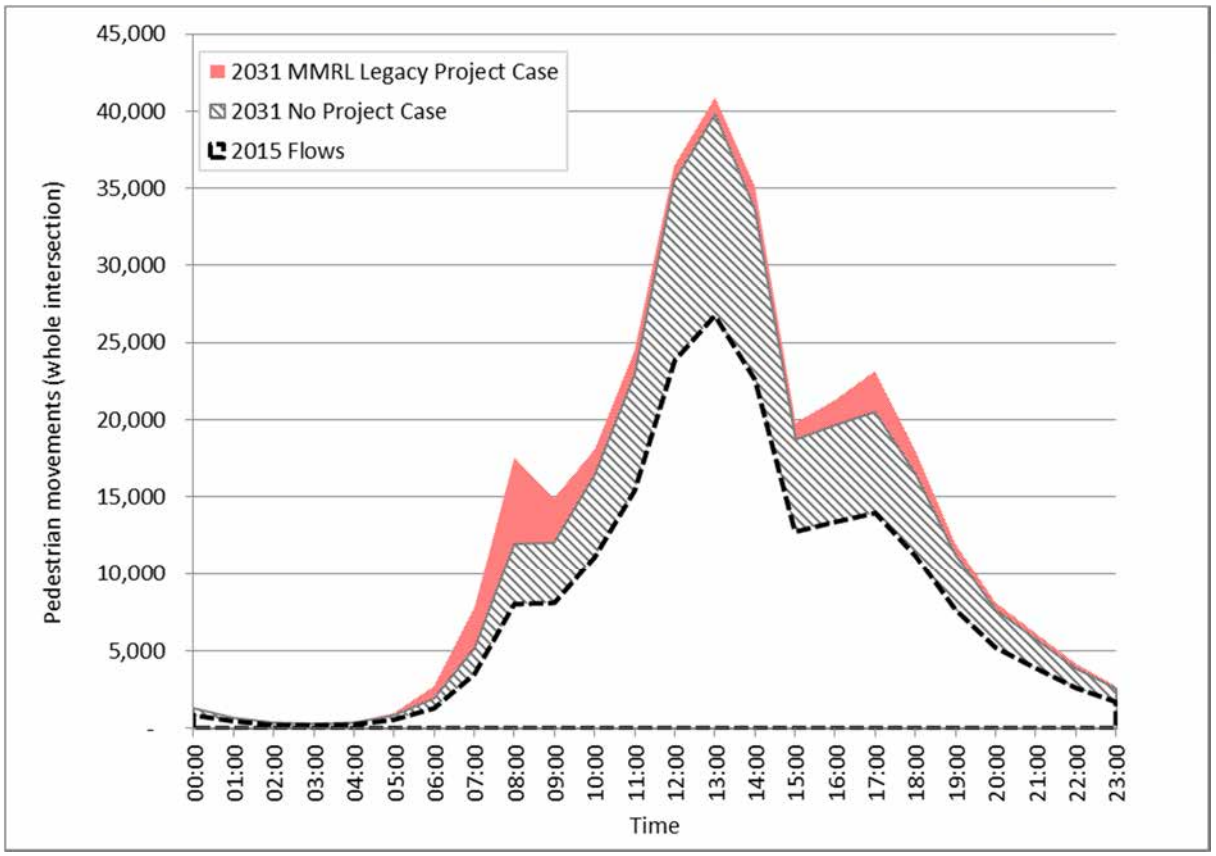

Figure 9-14 Pedestrian growth in CBD South precinct (Collins Street / Swanston Street)

Source: City of Melbourne Pedestrian Counting System 2015, 2014 Myki data, ClicSim modelling, and AJM analysis

The pedestrian network in the 2031 No Project Case is assumed to be the same as the existing 2015 pedestrian network.

The modelled future Flinders Street Station passenger entry, exit and transfer flows for the busiest two-hour periods in the AM and PM are shown in Table 9-37. In the 2031 No Project Case compared to 2012 it is predicted there would be an increase of almost 100 per cent in AM peak passenger entries/ exits at Flinders Street Station. There would be a decrease of over 15,000 passengers transferring between platforms at Flinders Street Station compared to 2012. There is a higher volume of passengers exiting Flinders Street Station in the PM peak compared to entries during the AM peak due to people visiting the city in the evening for recreational purposes.

Table 9-37 Flinders Street Station - 2031 No Project - Passenger entries, exits and transfers

Scenario	AM Peak (7:00am – 9:00am)		PM Peak (4:30pm – 6:30pm)	
	Total Entries and Exits	Transfers	Total Entries and Exits	Transfers
2012	32,360	24,820	43,570	19,490
2031 No Project	63,630	9,330	79,270	7,990
Difference 2031 No Project - 2012	+31,270 (+97%)	-15,490 (-62%)	+35,700 (+82%)	-11,500 (-59%)

Source: 2021 No Project Case ClicSim passenger modelling (Run B24)

Approximately 50 per cent of all station entries and exits during the AM peak would be via Elizabeth Street with a further 29 per cent using the Federation Square Crossing entrance / exit (refer to Table 9-38). During the PM peak the Elizabeth Street entrance / exit has the highest volume of pedestrian movements. Flinders Street and the Federation Square crossing have 24 per cent and 25 per cent of total movements

respectively. The Degraves Street entrance / exit is not expected to be widely used as a primary entrance or exit during the AM and PM peaks.

Table 9-38 Flinders Street station - 2031 No Project Case - passenger entry and exit movements

Station entry / exit	Total Entries and Exits	
	AM Peak (7:00am – 9:00am)	PM Peak (4:30pm – 6:30pm)
Flinders Street (Under the Clocks)	2,320 (5%)	19,120 (24%)
Federation Square crossing	14,740 (29%)	19,670 (25%)
Degraves Street	1,390 (3%)	1,770 (2%)
Elizabeth Street	25,640 (50%)	29,310 (37%)
Flinders Walk (Yarra River)	7,230 (14%)	8,900 (11%)
TOTAL	**51,320 (100%)**	**78,770 (100%)**

Source: 2021 No Project Case ClicSim passenger modelling (Run B24)

There is a large growth in the number of pedestrian entries and exits at Flinders Street Station between 2012 and the 2031 No Project Case. It is expected that this growth would have a major impact on the pedestrian network around the station, in particular at the Elizabeth Street and Federation Square crossing entrances / exits. This growth relates to changes in population, employment and land use, as well as changes to the direction of services around the City Loop that would influence passenger journeys and result in fewer passengers transferring at Flinders Street Station.

The bicycle network in the 2031 No Project Case would be the same as the 2015 bicycle network.

9.9.3.2 Future conditions – 2031 Melbourne Metro Legacy Project Case

CBD South station is located at the southern edge of the CBD directly beneath Swanston Street running between and partially under both Flinders Street and Collins Street. The key features of CBD South station design include:

- A pedestrian link under Flinders Street connecting from the new CBD South station directly into the main concourse at Flinders Street Station
- An entrance near the corner of Swanston Street and Flinders Street facing both Swanston Street and Flinders Street
- A pedestrian link under Flinders Street connecting from the new CBD South station directly to Federation Square
- An entrance from the City Square near the corner of Swanston Street and Collins Street.

Figure 9-15 shows the expected walking catchment of CBD South station during the AM and PM peak periods. The majority of pedestrian trips to and from CBD South station are between Flinders Street and Bourke Street and Queen Street and Exhibition Street. There is a greater spread of trips to the north and west of the station, broadly in line with the development in the CBD.

Figure 9-15 Walking catchment for CBD South station (peak periods) (Source: VITM)

Figure 9-16 shows the walking catchment of Flinders Street Station during the AM and PM peak periods. The majority of pedestrian trips to and from Flinders Street Station are to the west of Swanston Street and there is also a strong catchment to the south of the Yarra River around Southbank.

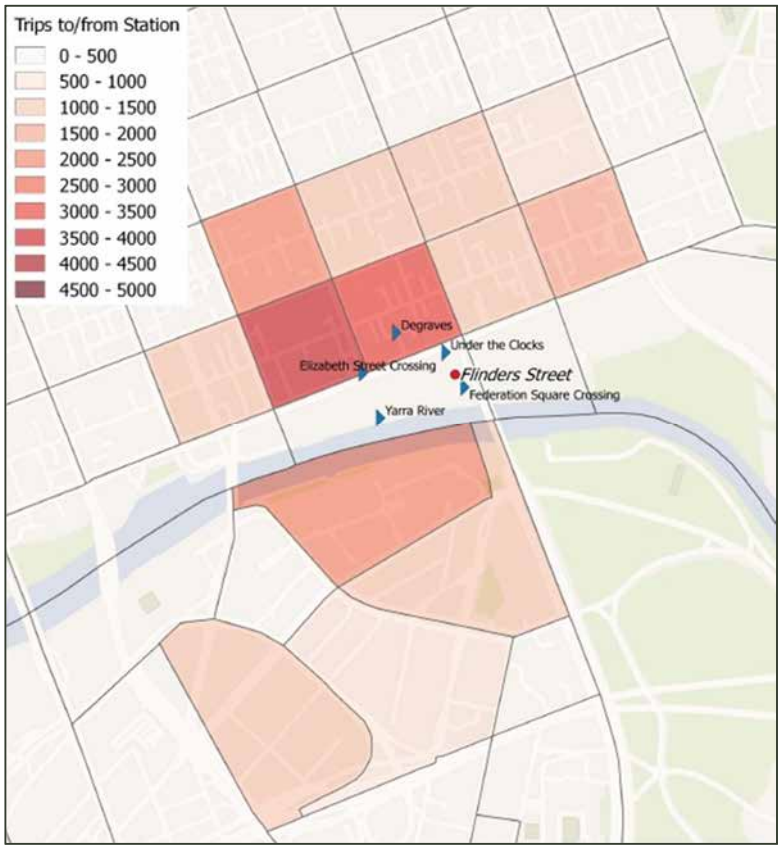

Figure 9-16 Walking catchment for Flinders Street Station (peak periods)

Source: City of Melbourne Pedestrian Counting System 2015, 2014 Myki data, ClicSim modelling, and AJM analysis

The modelled future Flinders Street Station pedestrian entries, exits, and transfers for the busiest two-hour periods in the AM and PM are shown in Table 9-39. It is expected that there would be a decrease of over 13,000 passengers entering / exiting Flinders Street Station during the AM peak period and a decrease of nearly 25,000 passengers in the PM peak period.

Compared to the 2031 No Project Case, there would also be a small increase in the number of passengers transferring between platforms at Flinders Street Station in the 2031 Melbourne Metro Legacy Project Case in the AM peak period.

Table 9-39 Flinders Street Station – 2031 Melbourne Metro passenger entries, exits and transfers

Scenario	AM Peak (7:00am – 9:00am)		PM Peak (4:30pm – 6:30pm)	
	Total Entries and Exits	Transfers	Total Entries and Exits	Transfers
2031 No Project	63,630	9,330	79,270	7,990
2031 Melbourne Metro	50,590	10,710	54,780	7,750
Difference 2031 Melbourne Metro - 2031 No Project	-13,040 (-20%)	1,380 (+15%)	-24,490 (-31%)	-240 (-3%)

Source: 2031 Project Case ClicSim passenger modelling (B23 (PM) and B26 (AM)

It is predicted that there would be over 19,000 passengers entering / exiting CBD South station during the AM peak in 2031 with Melbourne Metro. It is predicted that there would be approximately 5,000 passengers transferring between platforms at CBD South station in the AM peak (refer to Table 9-40).

Table 9-40 CBD South station – 2031 Melbourne Metro passenger entries, exits and transfers

Scenario	AM Peak (7:00am – 9:00am)		PM Peak (4:30pm – 6:30pm)	
	Total Entries and Exits	Transfers	Total Entries and Exits	Transfers
2031 Melbourne Metro	19,150	5,040	20,810	4,080

Source: 2031 Project Case ClicSim passenger modelling (B23 (PM) and B26 (AM)

In 2031 with Melbourne Metro, approximately 29 per cent of all station entries / exits during the AM peak (for CBD South and Flinders Street combined) would be via Elizabeth Street with a further 18 per cent using the Flinders Street entrance / exit (refer to Table 9-41). During the PM peak the Elizabeth Street entrance / exit has the highest volume of pedestrian movements. The Federation Square crossing and City Square entrance / exit would both have 15 per cent of total movements (refer to Appendix D). The Degraves Street entrance /exit would not be widely used during the AM and PM peaks.

Table 9-41 CBD South stations - 2031 Melbourne Metro - Passenger entry and exit movements

CBD South Stations	Total Entries and Exits	
	AM Peak (7:00am – 9:00am)	PM Peak (4:30pm – 6:30pm)
Flinders Street Station		
Flinders Street (Under the Clocks)	12,830 (+18%)	14,280 (+19%)
Federation Square crossing	9,150 (+13%)	11,160 (+15%)
Degraves Street	1,300 (+2%)	1,470 (+2%)
Elizabeth Street	20,370 (+29%)	20,360 (+27%)
Flinders Walk (Yarra River)	6,930 (+10%)	7,500 (+10%)

CBD South Stations	Total Entries and Exits	
	AM Peak (7:00am – 9:00am)	PM Peak (4:30pm – 6:30pm)
CBD South Station		
Federation Square	2,320 (+3%)	2,800 (+4%)
City Square	9,870 (+14%)	11,019 (+15%)
Swanston Street	6,960 (+10%)	6,990 (+9%)
TOTAL	69,730 (+100%)	75,580 (+100%)

Source: 2031 Project Case ClicSim passenger modelling (B23 (PM) and B26 (AM)

There is an increase of approximately 18,000 pedestrian entries / exits during the AM peak period for the 2031 Melbourne Metro case compared to 2012.

While this is spread across a number of access points this is expected to have a medium impact to the pedestrian network around Flinders Street Station. The growth is due to growth in future population, employment and land use as well as changes to direction of services around the City Loop that would influence passenger journeys. The underground pedestrian connections would significantly reduce the number of trips occurring at the surface level resulting in a reduction in the number of pedestrians at the existing pedestrian crossings.

The bicycle network in the CBD South station precinct would remain largely unchanged as a result of Melbourne Metro works with the Flinders Street, Collins Street, St Kilda Road and Swanston Street bicycle lanes retained in their current configuration.

Cycling activity in the CBD has demonstrated strong growth in recent years and is expected to continue to grow. The increase of cycling around the CBD South station access points (and particularly along the busy Swanston Street corridor) would need to be carefully managed in the future to maintain safety of pedestrians and cyclists in this area.

It is expected that Melbourne Metro would provide up to 20 new bicycle parking spaces at the new CBD South station.

9.9.4 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Operational)

- Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required
- Determine the optimal parking provision in the area and replace any lost parking where possible.

Public Transport (Operational)

- Review, with Public Transport Victoria, the bus services in the areas around CBD South station
- Optimise the design of Melbourne Metro stations to ensure integration with existing and planned future uses and so that they would provide connections for interchange between the new CBD South station and the existing tram services along Flinders Street and Swanston Street
- Review, with Public Transport Victoria and Yarra Trams, the bus and tram services in the area to optimise the functionality of the CBD South station and to reduce the reliance on the Swanston Street tram corridor.

Active Transport (Operational)

- Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council

- Provide wayfinding information to enhance connectivity for pedestrians and public transport users including (but not limited to) underground connection between Flinders Street Station and the new CBD South station.

9.9.5 Conclusion

The road functional layout plan for the CBD South station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient road and parking network. The traffic operations analysis indicates that traffic demands would be similar to current demands and that the key intersections would be operating at a similar level of service to the existing operations.

The implementation of Melbourne Metro would introduce a new station at CBD South with direct connections to Flinders Street Station and Federation Square and the City Square. The station would also provide opportunities to enhance the coverage of the public transport network with enhanced rail connections to the tram, bus, cycle and taxi routes around the CBD South station and reduce the reliance on the Swanston Street tram corridor.

The road functional layout plan for the CBD South station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient bicycle and pedestrian network.

It is expected that passengers utilising CBD South station would have direct connection to the paid area at Flinders Street Station, as well as high quality direct links (via ticket lines) to tram stops, walking links and public spaces in the surrounding precinct. Opportunities to provide accessible access points directly into the Swanston Street pedestrian precinct, Southbank, Federation Square/Birrarung Marr and St Kilda Road (aligned to major pedestrian desire lines) should be investigated to reduce both pedestrian congestion and conflicts between pedestrian and other traffic in the area.

With the construction of CBD South station pedestrian movement would be dispersed both above and underground with new underground pedestrian links to Flinders Street Station and Federation Square There is expected to be an increase in above ground pedestrian movements around the Swanston Street and Collins Street intersection associated with movements to and from the Collins Street tram stop.

There would be negligible impact to the bicycle network in the CBD South station precinct with all bicycle lanes retained in the current configuration and additional bicycle parking provided near CBD South station.

Cycling activity in the CBD has demonstrated strong growth in recent years and is expected to continue to grow. The increase of cycling around the CBD South station access points (and particularly along the busy Swanston Street corridor) would need to be carefully managed in the future to maintain safety of pedestrians and cyclists in this area.

The implementation of the Environmental Performance Requirements would result in minor residual risks to the transport network and operations with Melbourne Metro.

9.10 Impact Assessment Precinct 7: Domain Station

9.10.1 Road Transport Impact Assessment

9.10.1.1 Future Conditions – 2031 No Project Case

At the time of this report, there are no committed changes to the road network in a 2031 No Project Case scenario from the existing road network. However, City of Melbourne, the City of Port Phillip and VicRoads are considering and evaluating options for the restructuring of St Kilda Road.

The VITM models have been used to determine the level of growth in traffic volumes through the Domain station precinct between the 2011 and 2031 No Project networks. This analysis indicated negligible growth in total traffic volumes, though some specific movements through the area are expected to change. Generally,

increases are predicted to occur in the counter peak direction (i.e. southbound along St Kilda Road in the AM peak period and northbound in the PM peak period), with decreases in the peak direction.[37]

Table 9-42 and Table 9-43 summarise the changes in the volumes on key links within the VISSIM model network.

Table 9-42 VISSIM demand summary – 2031 No Project Case (2 hr volumes)

Road	Section	Direction	2015 Base	2031 No Project	Difference
St Kilda Road	south of Dorcas Street	northbound	3,120	3,070	-50 (-2%)
		southbound	1,530	2,050	520 (34%)
Park Street	east of Kings Way	eastbound	710	840	130 (18%)
		westbound	790	780	-20 (-3%)
St Kilda Road	north of Toorak Road	northbound	4,100	4,060	-40 (-1%)
		southbound	1,490	1,820	330 (22%)
Kings Way	west of Queens Lane	eastbound	1,500	1,700	200 (13%)
		westbound	1,380	1,370	-10 (-1%)
Toorak Road	east of Park Street	eastbound	1,090	1,360	270 (25%)
		westbound	1,750	1,610	-150 (-9%)
St Kilda Road	south of Arthur Street	northbound	4,520	4,520	0 (0%)
		southbound	2,700	2,860	160 (6%)

Table 9-43 VISSIM Demand Summary - PM Peak 2031 No Project Case (2 hr volumes)

Road	Section	Direction	2015 Base	2031 No Project	Difference
St Kilda Road	south of Dorcas Street	northbound	2,110	2,450	340 (16%)
		southbound	2,720	2,720	10 (0%)
Park Street	east of Kings Way	eastbound	890	890	0 (0%)
		westbound	1,050	1,040	-10 (-1%)
St Kilda Road	north of Toorak Road	northbound	2,560	2,860	300 (12%)
		southbound	2,940	2,940	0 (0%)
Kings Way	west of Queens Lane	eastbound	2,140	2,060	-80 (-4%)
		westbound	1,610	1,610	0 (0%)
Toorak Road	east of Park Street	eastbound	2,080	1,960	-110 (-5%)
		westbound	1,390	1,580	190 (14%)
St Kilda Road	south of Arthur Street	northbound	2,980	2,980	0 (0%)
		southbound	3,720	3,640	-80 (-2%)

Volumes in 2031 are generally comparable with 2015, with the maximum difference being approximately 260 vehicles per hour (520 vehicles per 2-hours in the table) along St Kilda Road (southbound), south of Dorcas Street during the AM Peak period in the 2031 No Project, while the PM results indicate an increase of approximately 170 vehicles per hour in the northbound movement at the same location.

Table 9-44 compares network performance of the 2015 Base Case and 2031 No Project models.

[37] Interrogation of the model with the government agencies indicates that this principally relates to changes in future year assumptions related to increases in the population living in the CBD and increases in parking costs in the CBD

Table 9-44 Network Parameters Summary - 2031 No Project Case

Peak	Parameters	2015 Base Case	2031 No Project Case	Difference
AM Peak	Average Travel Time (min)	3.23	3.33	0:10 (5%)
	Average delay per vehicle (sec)	80	90	10 (13%)
	Average Speed (km/h)	20	20	0 (0%)
	VHT – Total Travel Time (h)	1,030	1,100	70 (7%)
	VKT - Total Distance Travelled (km)	20,690	21,580	890 (4%)
	Total Completed Trips	18,240	18,630	390 (2%)
PM Peak	Average Travel Time (min)	3:33	3:28	-0:05 (-2%)
	Average delay per vehicle (sec)	90	90	0 (0%)
	Average Speed (km/h)	20	20	0 (0%)
	VHT – Total Travel Time (h)	1,070	1,060	-10 (-1%)
	VKT - Total Distance Travelled (km)	21,620	22,020	400 (2%)
	Total Completed Trips	18,090	18,270	180 (1%)

Source: VISSIM models

Table 9-44 indicates that there is a small difference in network performance between 2015 and 2031 in both peaks. There is a small decline in all network performance parameters in the AM Peak. The PM peak experiences a slight increase in overall network performance parameters due to the decrease in traffic movements turning right into Toorak Road from St Kilda Road. However this allows for more time to be allocated to other phases in the peak direction.

The 2031 No Project model indicates a longer travel time for both routes during the AM peak period, and a decline in travel time for both routes in the PM peak. However, the travel times changes are minor, with the maximum increase being 15 seconds during the AM Peak (7:30-8:30am), and maximum decrease being 11 seconds in the PM Peak (4:30-5:30pm).

Table 9-45 and Table 9-46 show the approach maximum queue and average delays in the AM and PM peaks respectively with the results compared to the 2015 Base Case.

Table 9-45 Intersection Analysis – 2031 No Project Case – AM Peak

Period	Intersection	Approach	Maximum Queue (m)			Average Delay (sec)		
			2015 Base	2031 No Project	Difference	2015 Base	2031 No Project	Difference
7:30-8:30AM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	100	110	10 (+10%)	20	30	10 (+50%)
		Domain Road	400	160	-240 (-60%)	150	100	-50 (-33%)
		St Kilda Road South	300	220	-80 (-27%)	20	20	0 (0%)
		Park Street	310	390	80 (+26%)	150	280	130 (+87%)

Period	Intersection	Approach	Maximum Queue (m)			Average Delay (sec)		
			2015 Base	2031 No Project	Difference	2015 Base	2031 No Project	Difference
		Albert Road	70	90	20 (+29%)	80	130	50 (+63%)
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	130	100	-30 (-23%)	40	40	0 (0%)
		Toorak Road	210	180	-30 (-14%)	80	80	0 (0%)
		St Kilda Road South	230	210	-20 (-9%)	30	30	0 (0%)
		Kings Way	120	110	-10 (-8%)	60	50	-10 (-17%)
8:30-9:30AM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	60	110	50 (+83%)	20	30	10 (+50%)
		Domain Road	510	220	-290 (-57%)	270	120	-150 (+-56%)
		St Kilda Road South	190	330	140 (+74%)	30	30	0 (0%)
		Park Street	290	390	100 (+34%)	120	300	180 (+150%)
		Albert Road	90	60	-30 (-33%)	120	100	-20 (-17%)
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	170	160	-10 (-6%)	40	40	0 (0%)
		Toorak Road	210	180	-30 (-14%)	80	80	0 (0%)
		St Kilda Road South	230	230	0 (0%)	50	50	0 (0%)
		Kings Way	130	120	-10 (-8%)	60	60	0 (0%)

Table 9-46 Intersection Analysis – 2031 No Project Case – PM Peak

Period	Intersection	Approach	Maximum Queue (m)			Average Delay (sec)		
			2015 Base	2031 No Project	Difference	2015 Base	2031 No Project	Difference
7:30-8:30AM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	60	40	-20 (-33%)	20	20	0 (0%)
		Domain Road	180	260	80 (+44%)	100	110	10 (+10%)
		St Kilda Road South	190	210	20 (+11%)	30	30	0 (0%)
		Park Street	390	410	20 (+5%)	290	230	-60 (-21%)
		Albert Road	30	30	0 (0%)	70	80	10 (+14%)
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	230	190	-40 (-17%)	40	40	0 (0%)
		Toorak Road	250	300	50 (+20%)	80	100	20 (+25%)
		St Kilda Road South	380	210	-170 (-45%)	40	30	-10 (-25%)
		Kings Way	170	160	-10 (-6%)	60	60	0 (0%)
8:30-9:30AM	St Kilda Road/ Park Street/	St Kilda Road North	100	40	-60 (-60%)	20	20	0 (0%)
		Domain Road	90	80	-10	80	70	-10

Period	Intersection	Approach	Maximum Queue (m)			Average Delay (sec)		
			2015 Base	2031 No Project	Difference	2015 Base	2031 No Project	Difference
	Domain Road/ Albert Road				(-11%)			(-13%)
		St Kilda Road South	190	210	20 (+11%)	20	30	10 (+50%)
		Park Street	320	200	-120 (-38%)	120	90	-30 (-25%)
		Albert Road	40	40	0 (0%)	80	60	-20 (-25%)
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	240	270	30 (+13%)	40	40	0 (0%)
		Toorak Road	120	230	110 (+92%)	80	90	10 (+13%)
		St Kilda Road South	400	130	-270 (-68%)	40	20	-20 (-50%)
		Kings Way	130	130	0 (0%)	60	60	0 (0%)

Comparison of the 2031 No Project Case and 2015 Base Case indicates similar movement delays on all approaches apart from Park Street and Albert Road in the AM peak that both experience increased movement delays and Domain Road, where movement delays reduce. This reflects the 2031 No Project VITM model projections that indicate increased trips along Park Street. Generally, the 2031 No Project Case has a similar level of performance as the 2015 Base Case. Where there are differences, these are generally small, and the network is expected to perform at a similar overall level of service.

As noted above, there are no committed changes to the road network, or the car parking arrangements in a 2031 No Project Case scenario from the existing road network. However, the City of Melbourne, the City of Port Phillip and VicRoads are considering and evaluating options for the restructuring of St Kilda Road, though the options are yet to be finalised. On this basis the arrangements are assumed to be the same as the existing arrangements, with no change to the current safety and operations in the precinct.

9.10.1.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

Domain station is to be located under St Kilda Road, between Domain Road and Bowen Crescent. The station arrangements include three station accesses near the corner of St Kilda Road, Domain Road and Albert Road. There would be one access located to the east and west of St Kilda Road and one from the new central tram superstop in the centre of St Kilda Road providing a direct interchange with tram services along St Kilda Road. The new station accesses and associated infrastructure are shown in Figure 9-17 (more detailed road functional layouts are included in Appendix E).

Figure 9-17 Domain station precinct road functional layout

Key changes to the existing road layout include:

- Closure of the southern arm of Albert Road at its intersection with St Kilda Road
- Removal of the existing tram interchange and associated pedestrian crossings at Domain
- Removal of the existing tram stops between Bowen Lane and Bowen Crescent, and the southbound tram stop just north of Kings Way
- Provision of new tram super stops on St Kilda Road adjacent to Domain station and just south of Toorak Road West
- Provision of new pedestrian crossings along St Kilda Road, aligned with the new station and tram stops
- Removal of existing outer separator traffic islands separating traffic lanes along St Kilda Road in the vicinity of Domain station
- Reconfiguration of traffic lanes along St Kilda Road between the intersections with Domain Road and Kings Way - two options are being considered, namely:
  - Reduction in traffic lanes to two through lanes and one bicycle lane in each direction
  - Retention to three through traffic lanes in peak periods (parking Clearway) and one bicycle lane in each direction.

The final lane configuration of St Kilda Road once Melbourne Metro has been constructed would be the result of consultation with VicRoads, MMRA, Councils and other stakeholders.

Outputs from the modelling of these two alternate lane configurations are described in the Transport Modelling Summary Report in Appendix D. The Transport Impact Assessment analysis has assumed the road functional layout on St Kilda Road as shown in Appendix E, and that the parking lanes would be treated as Clearways and available to provide a third lane in the peak direction in peak periods. Should the parking lanes be retained in peak periods, the operation of St Kilda Road would be less efficient with increased queues and delays. As the physical network allows for a three-lane operation, it is reasonable to expect that would be the arrangements in Melbourne Metro Legacy Project Case.

Table 9–47 and Table 9-48 summarise the changes in the volumes on key links within the VISSIM model network. These traffic volumes are model flows on key road links in the network. They represent the traffic volumes assigned to these links by the VISSIM model based on the increases in the demands in 2031 as outlined above. The model assigns (or allocates) traffic to the network and routes change depending on the delays and congestion in the model. Therefore the differences vary on each link depending on the model assignment algorithms. A number of traffic signal timing changes have been made in the traffic model for 2031 Melbourne Metro legacy project case. Refer to Appendix D for further information.

Table 9-47 VISSIM Network Volumes Summary – AM Peak 2031 Melbourne Metro Legacy Project

Period	Road	Section	Direction	2031 No Project	2031 Melbourne Metro	Difference from 2031 No Project
7:30-9:30AM	St Kilda Road	south of Dorcas Street	northbound	3,070	3,010	-60 (-2%)
			southbound	2,050	1,910	-140 (-7%)
	Park Street	east of Kings Way	eastbound	840	840	0 (0%)
			westbound	780	780	0 (0%)
	St Kilda Road	north of Toorak Road	northbound	4,060	4,050	-10 (0%)
			southbound	1,820	1,930	110 (+6%)
	Kings Way	west of Queens Lane	eastbound	1,700	1,700	0 (0%)
			westbound	1,370	1,530	160 (+12%)
	Toorak Road	east of Park Street	eastbound	1,360	1,350	-10 (-1%)
			westbound	1,610	1,570	-40 (-2%)

Period	Road	Section	Direction	2031 No Project	2031 Melbourne Metro	Difference from 2031 No Project
	St Kilda Road	south of Arthur Street	northbound	4,520	4,500	-20 (0%)
			southbound	2,860	2,770	-90 (-3%)

Table 9-48 VISSIM Network Volumes Summary – PM Peak 2031 Melbourne Metro Legacy Project

Period	Road	Section	Direction	2031 No Project	2031 Melbourne Metro	Difference from 2031 No Project
4:30-6:30PM	St Kilda Road	south of Dorcas Street	northbound	2,450	2,320	-130 (-5%)
			southbound	2,720	2,570	-150 (-6%)
	Park Street	east of Kings Way	eastbound	890	890	0 (0%)
			westbound	1,040	1,060	20 (+2%)
	St Kilda Road	north of Toorak Road	northbound	2,860	2,640	-220 (-8%)
			southbound	2,940	2,930	-10 (0%)
	Kings Way	west of Queens Lane	eastbound	2,060	2,060	0 (0%)
			westbound	1,610	1,550	-60 (-4%)
	Toorak Road	east of Park Street	eastbound	1,960	1,830	-130 (-7%)
			westbound	1,580	1,520	-60 (-4%)
	St Kilda Road	south of Arthur Street	northbound	2,980	2,940	-40 (-1%)
			southbound	3,640	3,620	-20 (-1%)

As the 2031 Melbourne Metro Legacy Project Case assumes 3-lanes would be provided each way on St Kilda Road in the peak periods (assuming Clearways in peak periods and parking in off peak periods) the traffic volumes are similar to the 2031 No Project Case, and differences generally within 'typical' daily fluctuations (volumes usually vary daily by around +/-10 per cent). In general the traffic volumes are less than the 2031 No Project Case indicating a mode shift towards public transport.

The network parameters for the 2031 Melbourne Metro Legacy Project Case in Table 9-49 show similar outcomes to the 2031 No Project Case. In the AM peak, though there is a small increase in travel time northbound along St Kilda Road. Southbound traffic along St Kilda Road is expected to experience a decrease in travel time.

In the PM peak, there is a decrease in travel times in comparison to the 2031 No Project Case. This is due to the increase in frequency of the phase accommodating the right turn movement at the intersection of St Kilda Road with Toorak Road and Kings Way that improves the efficiency of this key intersection.

Table 9-49 Network Parameters Summary - 2031 Melbourne Metro Legacy Project

Peak	Parameters	2031 No Project	2031 Melbourne Metro	Difference (value & %)
AM Peak	Average Travel Time (min)	3:33	3:41	0:08 (4%)
	Average delay per vehicle (sec)	90	90	0 (0%)
	Average Speed (km/h)	20	20	0 (0%)
	VHT – Total Travel Time	1,100	1,120	20 (2%)
	VKT - Total Distance Travelled (km)	21,580	21,330	-250 (-1%)
	Total Completed Trips	18,630	18,250	-380 (-2%)

Peak	Parameters	2031 No Project	2031 Melbourne Metro	Difference (value & %)
PM Peak	Average Travel Time (min)	3:28	3:21	-0:07 (-3%)
	Average delay per vehicle (sec)	90	80	-10 (-11%)
	Average Speed (km/h)	20	20	0 (0%)
	VHT – Total Travel Time	1,060	1,000	-60 (-6%)
	VKT - Total Distance Travelled (km)	22,020	21,260	-760 (-3%)
	Total Completed Trips	18,270	17,870	-400 (-2%)

The VISSIM model has been used to extract travel times and delays for the key intersections in the Domain station precinct.

Table 9-50 and Table 9-51 show the maximum queue, and average delay for each approach based on the assessment criteria outlined above. The results have been compared to the 2031 No Project model.

Table 9-50 Intersection Analysis – 2031 Melbourne Metro Legacy Project Case – AM Peak

Period	Intersection	Approach	Maximum Queue (m)			Average Delay (sec)		
			2031 No Project	2031 Melbourne Metro	Difference	2031 No Project	2031 Melbourne Metro	Difference
7:30-8:30AM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	110	80	-30 (-27%)	30	20	-10 (-33%)
		Domain Road	160	170	20 (+13%)	100	80	-20 (-20%)
		St Kilda Road South	220	120	-100 (-45%)	20	30	10 (+50%)
		Park Street	390	400	10 (+3%)	280	280	0 (0%)
		Albert Road	90	160	70 (+78%)	130	330	210 (+162%)
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	100	130	30 (+30%)	40	40	0 (0%)
		Toorak Road	180	200	20 (11%)	80	90	10 (+13%)
		St Kilda Road South	210	300	80 (+38%)	30	40	10 (+33%)
		Kings Way	110	120	10 (+9%)	50	60	10 (+20%)
8:30-9:30AM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	110	100	-10 (-9%)	30	20	-10 (-33%)
		Domain Road	220	130	-90 (-41%)	120	80	-50 (-42%)
		St Kilda Road South	330	190	-140 (-42%)	30	40	0 (0%)
		Park Street	390	390	0 (0%)	300	260	-40 (-13%)
		Albert Road	60	120	60 (+100%)	100	220	120 (+120%)

Period	Intersection	Approach	Maximum Queue (m)			Average Delay (sec)		
			2031 No Project	2031 Melbourne Metro	Difference	2031 No Project	2031 Melbourne Metro	Difference
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	160	140	-20 (-13%)	40	40	0 (0%)
		Toorak Road	180	350	170 (+94%)	80	130	50 (+63%)
		St Kilda Road South	230	510	280 (+122%)	50	70	20 (+40%)
		Kings Way	120	220	100 (+83%)	60	90	30 (+50%)

Source: VISSIM model

Table 9-51 Intersection Analysis – 2031 Melbourne Metro Legacy Project Case – PM Peak

Period	Intersection	Approach	Maximum Queue (m)			Average Delay (sec)		
			2031 No Project	2031 Melbourne Metro	Difference	2031 No Project	2031 Melbourne Metro	Difference
7:30-8:30AM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	40	80	40 (+100%)	20	20	-10 (-50%)
		Domain Road	260	100	-160 (-62%)	110	60	-50 (-45%)
		St Kilda Road South	210	300	100 (+48%)	30	40	20 (+67%)
		Park Street	410	300	-100 (-24%)	230	150	-70 (-30%)
		Albert Road	30	70	40 (+133%)	80	140	60 (+75%)
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	190	90	-100 (-53%)	40	30	-10 (-25%)
		Toorak Road	300	210	-90 (-30%)	100	90	-20 (-20%)
		St Kilda Road South	210	400	190 (+90%)	30	30	10 (+33%)
		Kings Way	160	130	-20 (-13%)	60	60	0 (0%)
8:30-9:30AM	St Kilda Road/ Park Street/ Domain Road/ Albert Road	St Kilda Road North	40	160	120 (+300%)	20	20	0 (0%)
		Domain Road	80	110	30 (+38)	70	70	-10 (-14%)
		St Kilda Road South	210	200	-10 (-5%)	30	30	0 (0%)
		Park Street	200	90	-100 (-50%)	90	80	-10 (-11%)
		Albert Road	40	50	10 (+25%)	60	130	60 (+100%)

Period	Intersection	Approach	Maximum Queue (m)			Average Delay (sec)		
			2031 No Project	2031 Melbourne Metro	Difference	2031 No Project	2031 Melbourne Metro	Difference
	St Kilda Road/ Toorak Road/ Kings Way	St Kilda Road North	270	170	-90 (-33%)	40	40	0 (0%)
		Toorak Road	230	330	100 (+43%)	90	120	30 (+33%)
		St Kilda Road South	130	210	80 (+62%)	20	30	10 (+50%)
		Kings Way	130	140	10 (+8%)	60	60	10 (+17%)

Source: VISSIM model

Results for 2031 Melbourne Metro Legacy Project Case generally indicate a similar result to the 2031 No Project Case, with the exception of an increase of approximately 150 m in the queue length along Toorak Road.

Road Safety

The road functional layout plan for the Domain station precinct has been developed in accordance with current design standards and makes suitable provision for all road users to move through the area safely and efficiently. The provision of two-lanes in each direction plus a full width parking lane that is able to be used as a Clearway in peak periods provides a suitable layout and future year operating conditions similar to the existing conditions. The improved clarity of the road network in the area should improve the safety and the traffic operations in the area.

Pedestrian operated signals would provide for safe controlled crossings of St Kilda Road, and the underground connections between either side of St Kilda Road and the tram stop would provide alternate opportunities for pedestrians to cross potentially reducing the volume of pedestrians crossing at surface level by a considerable number.

Car parking and access

The car parking arrangements around the Domain station precinct would be significantly affected by the proposed configuration of St Kilda Road and the other roads around the Domain station precinct. The proposed arrangements show a significant reduction in the number of car parking spaces (around 150 spaces lost in the area) due to the proposed reconfiguration of St Kilda Road, to provide for the new tram stop and interchange with the Domain station and associated works.

Though the number of spaces lost in the Domain station precinct is significant, the provision of a new high capacity railway station that provides connections across the broader metropolitan network together with a clearer road network is considered to adequately compensate for the loss of parking in the precinct.

9.10.2 Public Transport Impact Assessment

9.10.2.1 Future Conditions – 2031 No Project Case

Tram routes 55 and 8 are proposed to merge permanently in the 2031 scenario to become route 8 (West Coburg to Toorak) and travel along Park Street to St Kilda Road. There are no proposed changes to bus routes from the 2015 existing situation.

As the proposed route 8 was previously two separate routes it is not possible to directly compare tram travel times. The travel times for other routes travelling down St Kilda Road show relatively small increases in travel time (refer to Table 9-52).

Table 9-52: Tram travel times – 2031 No Project case

Route	AM Peak			PM Peak		
	2015	2031 No Project	Difference (sec)	2015	2031 No Project	Difference (sec)
3, 5, 6, 16, 64, 67, 72 (Northbound)	5.05	5.26	21	5.13	5.12	-1
3, 5, 6, 16, 64, 67, 72 (Southbound)	5.17	5.42	25	5.06	5.19	13
8 (Westbound)*	NA	5.42	NA	NA	4.19	NA
8 (Eastbound)*	NA	4.58	NA	NA	4.18	NA

Source: VISSIM model

***Previously routes 8 and 55**

Bus journey time changes follow those of general traffic and there is very little change to travel times through the modelled area (refer to Table 9-53).

Table 9-53: Bus travel times – 2031 No Project case

Route	AM Peak			PM Peak		
	2015	2031 No Project	Difference (sec)	2015	2031 No Project	Difference (sec)
220, 216, 219 (St Kilda Road Northbound)	121	128	7	129	118	-11
220, 216, 219 (St Kilda Road Southbound)	147	151	4	285	281	-4

Source: VISSIM model

9.10.2.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

The new station at Domain is expected to provide a major interchange with the tram network through provision of a new major superstop in St Kilda Road, as well as providing direct access to the St Kilda Road corridor (refer to Section 7). Provision of direct access to the tram interchange at street level would also enhance the pedestrian links between the trams and the surrounding area, enabling the station to provide the rail service to an expanded catchment extending from Southbank and South Yarra to Albert Park.

It is expected that during the AM and PM peak approximately 4,300 people would transfer between Domain station and trams / buses on St Kilda Road. Around 50 per cent of all entries / exits to Domain station would be transfers from tram or bus as shown in Table 9-54.

Table 9-54: Domain station - 2031 Melbourne Metro - Total transfers between rail and tram/bus

Station	AM Peak (7:00am – 9:00am)	PM Peak (4:30pm – 6:30pm)
2031 Melbourne Metro	4,350	4,370
Percentage of Total station entries / exits	52%	50%

Source: 2031 Project Case ClicSim passenger modelling - B23 (PM) and B26 (AM)

In 2031 (AM peak) with Melbourne Metro tram travel times generally reduce compared to the 2031 No project case as a result of the removal of a tram stop in St Kilda Road (refer to Table 9-55).

Travel times for route 8 increase during the PM peak due to the new signal phasing allowing trams to turn at St Kilda Road and Domain Street.

Table 9-55: Tram travel times – 2031 Melbourne Metro Legacy case

Route	AM Peak			PM Peak		
	2031 Base	2031 Melbourne Metro	Difference (sec)	2031 Base	2031 Melbourne Metro	Difference (sec)
3, 6, 16, 67, 72 (Northbound)	5.26	4.58	-28	5.12	4.14	-58
3, 6, 16, 67, 72 (Southbound)	5.42	5.12	-30	5.19	5.33	14
8 (Westbound)*	5.42	5.18	-24	4.19	5.20	61
8 (Eastbound)*	4.58	4.39	-19	4.18	4.24	6
5, 64 (Westbound)	6.26	5.35	-51	4.49	5.11	22
5, 64 (Southbound)	6.06	4.55	-71	5.26	6.00	34

Source: VISSIM model

***Previously routes 8 and 55**

The bus operations through the Domain precinct are expected to be similar to the traffic operations outlined above – in general terms there would be some impact on bus travel times along St Kilda Road but these would be similar to typical variations in daily travel time fluctuations.

Table 9-56: Bus travel times – 2031 Melbourne Metro Legacy case

Route	AM Peak			PM Peak		
	2031 Base	2031 Melbourne Metro	Difference (sec)	2031 Base	2031 Melbourne Metro	Difference (sec)
220, 216, 219 (St Kilda Road Northbound)	128	167	39	118	58	175
220, 216, 219 (St Kilda Road Southbound)	151	128	-23	281	30	311

Source: VISSIM model

Overall there would be a significant increase in significant improvement to public transport access in the area with a new heavy rail station at Domain This would increase the capacity of the public transport network and provide direct and frequent public transport connection from the suburbs, and along the new Melbourne Metro route to the hospitals and university precinct, and the CBD.

9.10.3 Active Transport Impact Assessment

9.10.3.1 Future Conditions – 2031 No Project Case

The pedestrian network in the 2031 No Project Case is assumed to be the same as the existing 2015 pedestrian network.

The bicycle network in the 2031 No Project Case is expected to be further developed from the existing bicycle network. The City of Melbourne is in discussions with VicRoads and the City of Port Phillip in relation to the future configuration of St Kilda Road – current proposals are being considered as part of the St Kilda Road Safety Corridor Project and the City of Port Phillip Strategic Bike Network Plan. These would be enhancing the connectivity and safety aspects of the current bicycle network.

9.10.3.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

The majority of the pedestrian network in the Domain station precinct would remain largely unchanged as a result of Melbourne Metro works. However, the station accesses in the Domain parklands, near Albert Road and in the central tram superstop, and the associated pedestrian crossings of St Kilda Road, would change pedestrian travel patterns around the precinct. The proposed new pedestrian crossings are 6.0 metres wide, providing high capacity access to the proposed central tram stop. There would also be an unpaid connection under St Kilda Road linking both sides.

Figure 9-18 shows the walking catchment of Domain station during the AM and PM peak periods. This precinct is dominated by parks and gardens and the Shrine of Remembrance along the east side of St Kilda Road (north of Domain Road). The majority of pedestrian trips to and from Domain station are to the offices and residential apartments along the west side of St Kilda Road. Trips to the east side of St Kilda Road (between Domain Road and Toorak Road) are to/from Melbourne Grammar School, commercial and residential premises.

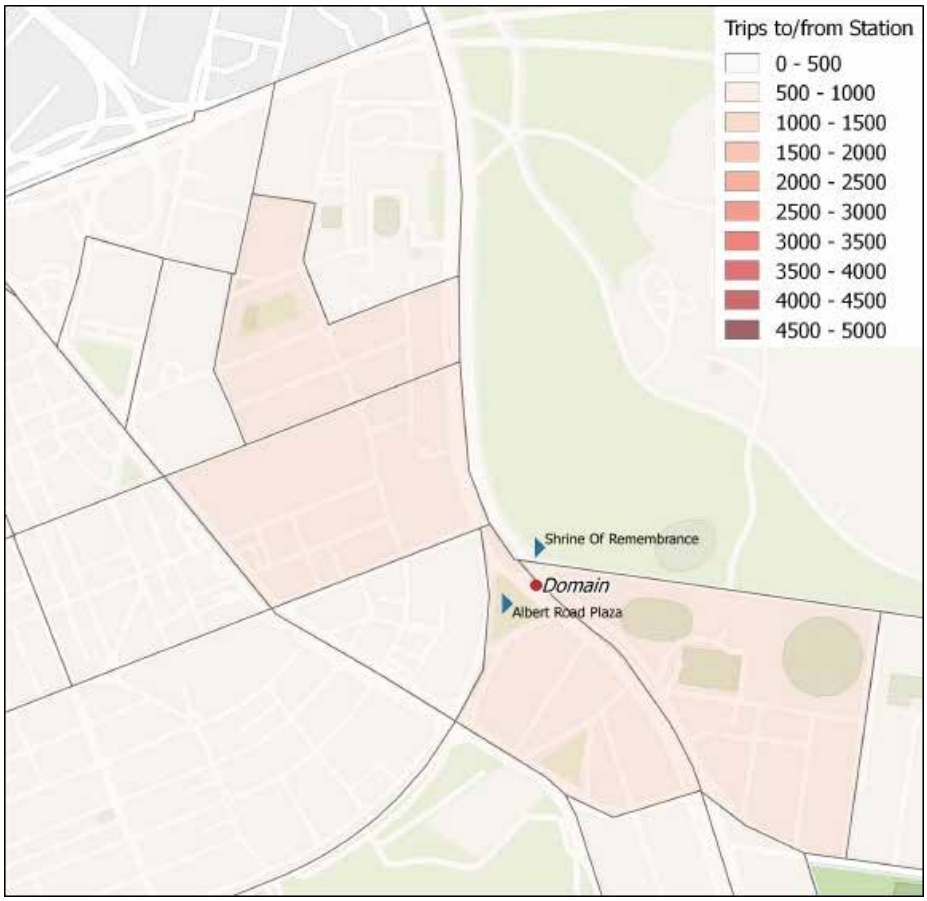

Figure 9-18 Walking catchment for Domain station (peak periods)

(Source: VITM)

The provision of an unpaid connection under St Kilda Road linking both sides of the road as well as 6.0 metre wide surface level pedestrian crossings is expected to be beneficial to the safe and efficient movement of pedestrians around Domain station.

Modelled station pedestrian entries, exits, and transfers for Domain station for the busiest two hours in the AM and in the PM are shown in Table 9-57. It is expected that when Domain station opens there would be over 8,000 passenger entries and exits in the AM peak period. Entries/ exits are slightly higher in the PM peak period.

Table 9-57 Domain station - 2031 Melbourne Metro - Passenger entry and exits volumes

Station Entrance	AM Peak (7:00am – 9:00am)		PM Peak (4:30pm – 6:30pm)	
	Total Entries and Exits		Total Entries and Exits	
Shrine Of Remembrance North	50	1%	50	1%
Shrine Of Remembrance South	640	8%	770	9%
Albert Road Plaza North	1850	22%	2,040	23%
Albert Road Plaza South	1,440	17%	1,550	18%
Tram Superstop	4,350	52%	4,370	50%
TOTAL	**8,330**	**100%**	**8,780**	**100%**

Source: 2031 Project Case ClicSim passenger modelling (B23 (PM) and B26 (AM)

Approximately 50 per cent of all station entries and exits during the AM and PM peak periods would be to / from the tram superstop in St Kilda Road, (refer to Appendix D). During a weekday peak period, the Shrine of Remembrance entrance is not expected to be widely used but would be more heavily used on weekends and for events. The remainder of pedestrians would use the entries / exits at Albert Road plaza that service the offices and residential towers on the east side of St Kilda Road.

The functional road layouts show proposed bicycle lanes along St Kilda Road and other roads in the precinct (refer to Appendix E). On-road bicycle lanes would be provided for the entire length of the Domain station precinct, mainly in the "Copenhagen lane" format (where the bicycle lane is on the left side of the parked car lane with a 1 m wide separator island) connecting to the existing on-road lanes further north and south on St Kilda Road. This configuration is expected to allow for potential future enhancements to the bicycle lanes further along St Kilda Road and provide a safe and effective bicycle lane for this heavily utilised bicycle corridor.

It is expected that Melbourne Metro would provide up to 50 new bicycle parking spaces at the new Domain station, improving the opportunities for bicycles to park and ride from Domain, though further engagement with authorities is ongoing to determine the optimal number of bicycle parking spaces that should be provided at Domain station.

9.10.4 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Operational)

- Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required
- Optimise the design of the reinstated St Kilda Road and apply the road users hierarchy in consultation with the relevant road management authorities to:
  - Reduce delays and congestion
  - Maintain safe operations through the precinct
- Determine the optimal parking provision in the area and replace any lost parking where possible.

Public Transport (Operational)

- Review, with Public Transport Victoria, the bus services in the areas around Domain station
- Optimise the design of Melbourne Metro stations to ensure integration with existing and planned future uses and so that they would provide connections between the new Domain station and the new island platform trams stop in the centre of St Kilda Road and connections to the tram services along Domain Road.

Active Transport (Operational)

- Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council
- Provide wayfinding information to enhance connectivity for pedestrians and public transport users.

9.10.5 Conclusion

The road functional layout plan for the Domain station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient road and parking network. The provision of two-lanes in each direction plus a full width parking lane that is able to be used as a Clearway in peak periods provides a suitable layout and future year operating conditions similar to the existing conditions.

The proposed three-lane configuration of St Kilda Road and the other changes to roads around the precinct would result in a reduction of around 150 car parking spaces in the area. While this is a significant number, the provision of a new high capacity railway station that provides connections across the broader metropolitan network would provide some compensation for the loss of parking in the precinct.

Melbourne Metro would deliver a new station at Domain that would expand the coverage of the train network to the St Kilda Road corridor. The station would have a direct connection to a new major tram interchange expanding the connectivity and coverage of the public transport network at Domain station and beyond.

The road functional layout plan for the Domain station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient bicycle and pedestrian network.

There would be minor impacts to the pedestrian network within the Domain station precinct. The reconstruction of St Kilda Road would enable improved connections across the busy St Kilda Road corridor. Improvements would include an underground connection across the full width of St Kilda Road with a direct connection to both the Domain station and the central tram superstop. This should reduce the above ground pedestrian movements across St Kilda Road giving safety and efficiency benefits.

The bicycle network in the precinct would be modified due to the major changes proposed to the road network. On-road bicycle lanes would be provided for the entire length of the Domain station precinct, connecting to existing on-road lanes further north and south on St Kilda Road. This configuration would allow for potential future enhancements to the bicycle lanes along St Kilda Road. Bicycle parking spaces would be provided at the new Domain station.

The implementation of the recommended Environmental Performance Requirements would result in minor residual risks to the transport network and operations with Melbourne Metro.

9.11 Impact Assessment Precinct 8: Eastern Portal

9.11.1 Road Transport Impact Assessment

9.11.1.1 Future Conditions – 2031 No Project Case

At the time of this report, there are no committed changes to the road network in this area in a 2031 No Project Case scenario from the existing road network.

9.11.1.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

As the construction works at the eastern portal would require the removal of the William Street bridge for the duration of the works, it would be necessary to reinstate the bridge at the completion of the works. This is the only work required for the functional road layout at the eastern portal. The functional design is shown in Figure 9-19 (more detailed road functional layouts are included in Appendix E).

Figure 9-19 Eastern portal precinct road functional layout

The road functional layout plan for the eastern portal precinct has been developed in accordance with current design standards and makes suitable provision for all road users to move through the area safely and efficiently.

As the existing road network would be returned to its current configuration and operation the car parking arrangements would remain as currently exist.

9.11.2 Public Transport Impact Assessment

9.11.2.1 Future Conditions – 2031 No Project Case

At the time of this report, there are no committed changes to the rail network in a 2031 No Project Case from the existing 2015 rail network. There are no proposed changes to tram routes or bus routes from the existing situation.

9.11.2.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

The implementation of Melbourne Metro would lead to a major reconfiguration of the Melbourne metropolitan network. The establishment of a new North-South corridor, joining the Dandenong corridor with the Sunshine corridor through Parkville and CBD would release tracks from South Yarra to the Caulfield Loop, which

would be used to segregate freight and V/Line movements through South Yarra and Richmond. The Frankston line and Sandringham lines would continue to run through South Yarra station.

The delivery of Melbourne Metro enables the Caulfield Underground Rail Loop to be dedicated for the Frankston services, providing additional capacity for growth on the Frankston line. The reconfiguration of Frankston line to operate via Caulfield Underground Rail Loop would enable the Cross-City line (Werribee/ Williamstown – Sandringham) to be re-configured. This would provide additional capacity on the Frankston and Sandringham lines via South Yarra.

It is expected that during both the 2031 Melbourne Metro project case AM and PM peak there would be a 44 per cent and 63 per cent decrease respectively in the number of passengers transferring between South Yarra Station and adjoining tram / bus services compared to 2012, (refer to Table 9-58). This is due to the removal of Cranbourne / Packenham services stopping at South Yarra station. Passengers who wish to connect to this line would need to either travel to Caulfield or Flinders Street / CBD South (dependent on their direction of travel).

Table 9-58: South Yarra station - 2031 Melbourne Metro - Total transfers between rail and tram/bus

Station	AM Peak (7:00am – 9:00am)	PM (4:30pm – 6:30pm)
2012	1,530	2,080
2031 Melbourne Metro	860	760
Difference 2012 – 2031 Melbourne Metro	-670 (-44%)	-1,320 (-63%)

Source: 2031 Project Case ClicSim passenger modelling - B23 (PM) and B26 (AM)

The tram legacy map shown in Section 5 shows the proposed route 8 tram travelling along Toorak Road from St Kilda Road. This option is still being considered by Public Transport Victoria but for this assessment we have assumed it would operate along Domain Road. There would be negligible impact to the tram network or bus services within the eastern portal precinct.

9.11.3 Active Transport Impact Assessment

9.11.3.1 Future Conditions – 2031 No Project Case

The pedestrian network in the 2031 No Project Case is assumed to be the same as the existing pedestrian network. In the 2031 No Project Case there is expected to be a 48 per cent and 70 per cent increase in AM peak passenger entries and exits respectively at South Yarra Station compared to 2012. In the PM peak there is expected to be an increase of over 1,600 passengers transferring at South Yarra Station compared to 2012.

This is a large growth in the number of pedestrians in the 2031 No Project Case that could be expected to have an adverse impact on the pedestrian network in and around South Yarra station. This growth is mainly related to the projections of growth in the future population, employment and land use changes as well as changes to direction of services around the City Loop that would influence passenger journeys.

Table 9-59 South Yarra station - 2031 No Project Case passenger entries, exits and transfers

Station Entrance	AM Peak (7:00am – 9:00am)		PM Peak (4:30pm – 6:30pm)	
	Total Entries and Exits	Transfer	Total Entries and Exits	Transfer
2012	6,300	950	5,200	300
2031 No Project	9,350	1,610	8,540	1,460
Difference 2031 No Project - 2012	+3,050 (+48%)	+660 (+70%)	+3,340 (+64%)	+1,160 (+387%)

Station Entrance	AM Peak (7:00am – 9:00am)		PM Peak (4:30pm – 6:30pm)	
	Total Entries and Exits	Transfer	Total Entries and Exits	Transfer

Source: 2021 No Project Case ClicSim passenger modelling (Run B24)

The bicycle network in the 2031 No Project Case is expected to be the same as the existing bicycle network.

9.11.3.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

All existing pedestrian network connectivity would be reinstated with the rebuilding of the William Street Bridge at the completion of the construction works at the eastern portal. Lovers Walk would also be reinstated in a quality manner to maintain its utility to the area.

In the 2031 Melbourne Metro case, there would be a 20 per cent and 13 per cent reduction in total passenger entries / exits during the AM and PM peak periods respectively at South Yarra Station compared to the 2031 No Project Case as shown in Table 9-60. There would also be a decrease of approximately 39 per cent and 72 per cent in the number of passengers transferring at South Yarra Station during the AM peak and PM peak respectively.

Table 9-60 South Yarra station - 2031 Melbourne Metro passenger entries, exits and transfers

Station Entrance	AM Peak (7:00am – 9:00am)		PM Peak (4:30pm – 6:30pm)	
	Total Entries and Exits	Transfer	Total Entries and Exits	Transfer
2031 No Project	9,350	1,610	8,540	1,460
2031 Melbourne Metro	7,480	990	7,450	410
Difference 2031 Melbourne Metro - 2031 No project	-1,870 (-20%)	-620 (-39%)	-1,090 (-13%)	-1,050 (-72%)

Source: 2031 Project Case ClicSim passenger modelling - B23 (PM) and B26 (AM)

In the 2031 Melbourne Metro Legacy Project Case, there is expected to be a 19 per cent (1,180) increase in pedestrian entry/ exits during the AM peak and 43 per cent (2,250) during the PM peak compared to the 2012 activity levels (details in Appendix D).

The predicted reduction in pedestrians using South Yarra station (compared to the 2031 No Project Case) is expected to have a beneficial impact on the pedestrian network around South Yarra station, increasing the available capacity, though it would still be much higher than current activity levels. This growth is principally a result of growth in population, employment and land use changes as well as changes to rail lines that stop of South Yarra station that would influence people's journey. Melbourne Metro does not stop at South Yarra so there is expected to be much less passenger throughput and much fewer transfers between pla at South Yarra station after the completion of Melbourne Metro.

There are no planned changes to the existing bicycle network in the vicinity of the eastern portal precinct.

9.11.4 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Operational)

- Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required
- Determine the optimal parking provision in the area and replace any lost parking where possible.

Active Transport (Operational)

- Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council.

9.11.5 Conclusion

The road functional layout plan for the eastern portal precinct would return the road network to its current configuration and operation and therefore provides a suitable road layout to service the needs of the area and deliver a safe and efficient road and parking network.

Once Melbourne Metro is operational, Frankston and Sandringham line services would only operate through South Yarra station. Cranbourne / Pakenham services would no longer go through South Yarra, but through the Melbourne Metro tunnels. This would release tracks from South Yarra to the Caulfield Loop, which would be used to segregate freight and V/Line movements through South Yarra and Richmond.

The Caulfield Underground Rail Loop would be dedicated for Frankston services, providing additional capacity for growth on this line. In turn, the reconfiguration of the Frankston Line to operate via Caulfield Underground Rail Loop would enable the Cross-City Line (Werribee / Williamstown – Sandringham) to be reconfigured. This would provide additional capacity on the Frankston and Sandringham Lines via South Yarra.

During both AM and PM peak periods in 2031, a 44 per cent and 63 per cent decrease respectively would be expected in the number of passengers transferring between South Yarra Station and adjoining tram / bus services, compared to 2012.

Once construction of the eastern portal is complete the road and pedestrian network around this site would be reinstated to the 2015 conditions.

The implementation of the recommended Environmental Performance Requirements would result in very low residual risks to the transport network and operations with Melbourne Metro.

9.12 Impact Assessment Precinct 9: Western Turnback

9.12.1 Road Transport Impact Assessment

At the time of this report, there are no committed changes to the road network in either the 2031 No Project Case scenario or the 2031 Melbourne Metro Legacy Project Case compared to the existing road network.

9.12.2 Public Transport Impact Assessment

At the time of this report, there are no committed changes to the public transport network in a 2031 No Project Case from the existing network.

Operations of the new Melbourne Metro line would include a facility to ‘turn back’ some trains early on the Sunbury line to run back towards the CBD to optimise the operation of Melbourne Metro corridor. The Concept Design includes the western turnback at West Footscray, with a third platform and track at West Footscray Station and modifications to the existing station concourse. The provision of the turnback provides improved functionality and enables greater capacity by improving service frequency along the Sunbury line and the Cranbourne/Pakenham line.

9.12.3 Active Transport Impact Assessment

9.12.3.1 Future Conditions – 2031 No Project Case

The pedestrian network in the 2031 No Project Case would be the same as the existing pedestrian network.

The bicycle network in the 2031 No Project Case would be the same as the existing bicycle network.

9.12.3.2 Future Conditions – 2031 Melbourne Metro Legacy Project Case

The pedestrian network in the 2031 Melbourne Metro Legacy Project Case would be the same as the existing 2015 pedestrian network other than the proposed changes to the West Footscray railway station and concourse. The bicycle network in the 2031 Melbourne Metro Legacy Project Case would be the same as the 2015 bicycle network.

The western turnback includes the construction of a third platform at West Footscray station and modifications to the existing station concourse that should be designed in accordance with relevant design standards to maintain safety and efficiency of pedestrians at the station. There would be negligible impact to pedestrians or cyclists in this precinct.

9.12.4 Environmental Performance Requirements

The recommended Environmental Performance Requirements for this precinct include:

Road Transport (Operational)

- Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required
- Determine the optimal parking provision in the area and replace any lost parking where possible.

Active Transport (Operational)

- Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council.

9.12.5 Conclusion

There is minimal impact of the works at this precinct on traffic operations and safety.

The implementation of Melbourne Metro would lead to a major reconfiguration of the Melbourne public transport network that streamlines train operations by removing unnecessary route interactions between train services on different lines and creates simpler end-to-end service patterns that make it easier for customers to navigate the network. It would fundamentally lift the capacity and reliability of the train network.

The western turnback includes the construction of a third platform at West Footscray station and modifications to the existing station concourse that should be designed in accordance with relevant design standards to maintain safety and efficiency of pedestrians at the station. There would be negligible impact to cyclists in this precinct.

The implementation of the recommended Environmental Performance Requirements would result in very low residual risks to the transport network and operations with Melbourne Metro.

9.13 Overall conclusions - Operational Phase Impact Assessment

The operational phase would affect users (i.e. traffic, public transport, pedestrians and cyclists) in each precinct at different levels. The key operational issues associated with Melbourne Metro are outlined in 9-1.

Table 9-61 Key issues associated with Concept Design – Legacy Melbourne Metro by precinct

Description	Issue
Precinct 1: Tunnels	
Road transport	There are no road transport related issues in this precinct that are relevant to the transport impact assessment.
Public transport	This transport impact assessment report does not address the public transport aspects of the tunnels as the analysis focuses on the public transport aspects at surface level.
Active transport	This transport impact assessment report does not address the active transport aspects of the tunnels specifically. The analysis addresses the access points to/from the tunnels at each of the station/portal precincts.
Precinct 2: Western portal	
Road transport	The proposed road functional layout plan for the western portal precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient road and parking network though there is a loss of around 56 car parking spaces along Childers Street in the Concept Design and 34 spaces in the alternative design option.

Description	Issue
Public transport	There is minimal impact of the works at this site on public transport operations and safety.
Active transport	The road functional layout plan for the western portal precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient bicycle and pedestrian network. There would be a medium impact to pedestrians due to the loss of footpath along the southern side of Childers Street and pedestrians would have to use the shared path on the north side of Childers Street.
Precinct 3: Arden station	
Road transport	The proposed road functional layout plan for the Arden station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient road and parking network though there is a loss of around car parking spaces in the vicinity of the station. The redevelopment of the site should provide suitable traffic and parking arrangements for the proposed uses on the site, taking consideration of the new station at Arden.
Public transport	Melbourne Metro would introduce a new station at Arden that would provide the opportunity for the Metropolitan Planning Authority to develop the area around the station as a major transport hub. To maintain an integrated multimodal transport system, the bus network would be reviewed to coordinate services with the revised rail network. This would include options that connect Melbourne Metro to the tram, bus, cycle and taxi routes that could be provided at Arden station.
Active transport	The road functional layout plan for the Arden station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient bicycle and pedestrian network. The redevelopment of the site should provide suitable bicycle and pedestrian arrangements for the proposed uses on the site, taking consideration of the proximity of Arden station and North Melbourne station.
Precinct 4: Parkville station	
Road transport	The proposed road functional layout plan for the Parkville station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient road and parking network for most of the day. However, the changes to the road network are expected to result in an increase in travel delays through the area largely as a result of the flow on impacts of the delays at the Haymarket roundabout and the reduction in capacity at the Elizabeth Street / Grattan Street / Royal Parade intersection. There is also expected to be a loss of a number of car parking spaces in the area.
Public transport	The implementation of Melbourne Metro would introduce a new station at Parkville that would expand the coverage of the train network. The station provides opportunities for enhanced public transport to the university and hospitals with improved rail connections to the tram, bus, cycle and taxi routes that in the vicinity of the Parkville station.
Active transport	The road functional layout plan for the Parkville station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient bicycle and pedestrian network. There would be medium impacts to the pedestrian and bicycle networks within the Parkville Precinct. Pedestrian footpaths and crossings would be widened to accommodate the growth in pedestrian movements as a result of the new Parkville station. Separated bicycle lanes would be provided along Grattan Street that would significantly improve the pedestrian and cycling environments compared to the current shared path arrangement. Separated bicycle lanes would also be reinstated along Royal Parade following the construction of Parkville station.
Precinct 5: CBD North station	
Road transport	The proposed road functional layout plan for the CBD North station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient road and parking network though there is a loss of a number of car parking spaces in the precinct. The traffic operations analysis shows that the key intersections would be operating at satisfactory levels based on the assumed rerouting of traffic around the proposed closure of Franklin Street east of Swanston Street. On this basis, the intersections around the CBD North station would operate at satisfactory levels.

Description	Issue
Public transport	The implementation of Melbourne Metro would introduce a new station at CBD North with direct connections to the existing Melbourne Central Station and the area at the northern end of the CBD. The station would also provide opportunities to enhance the coverage of the public transport network with enhanced rail connections to the tram, bus, cycle and taxi routes around the CBD North station.
Active transport	The road functional layout plan for the CBD North station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient bicycle and pedestrian network. There would be a medium impact to the pedestrians within the CBD North station precinct. The proposed closure of the eastern section of Franklin Street would provide a safer area for pedestrian access to the station accesses, by removing the need to cross operating roads. As a result of CBD North station there is expected to be less passengers entering and exiting Melbourne Central Station. This is likely to reduce the volume of pedestrians outside Melbourne Central Station on Swanston Street south of La Trobe Street. There would be negligible impact to cyclists as the bicycle network along Swanston Street and La Trobe Street would be reinstated with separated bicycle lanes following construction of Melbourne Metro.
Precinct 6: CBD South station	
Road transport	The proposed road functional layout plan for the CBD South station precinct involves no changes to the existing arrangements and provides a suitable road layout to service the needs of the area. The traffic operations analysis shows that the key intersections would be operating at similar levels to the existing operation.
Public transport	The implementation of Melbourne Metro would introduce a new station at CBD South with direct connections to Flinders Street Station and Federation Square and the City Square. The station would also provide opportunities to enhance the coverage of the public transport network with enhanced rail connections to the tram, bus, cycle and taxi routes around the CBD South station and reduce the reliance on the Swanston Street tram corridor.
Active transport	The road functional layout plan for the CBD South station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient bicycle and pedestrian network. There would be medium impacts to the pedestrian network within the CBD South station precinct. With the construction of CBD South station pedestrian movement would be dispersed both above and underground with new underground pedestrian links to Flinders Street Station and Federation Square. There is expected to be an increase in above ground pedestrian movements around the Swanston Street and Collins Street intersection associated with movements to and from the Collins Street tram stop. There would be negligible impact to the bicycle network in the CBD South station precinct with all bicycle lanes retained in the 2015 configuration and additional bicycle parking provided near CBD South station.
Precinct 7: Domain station	
Road transport	The proposed road functional layouts for the Domain station precinct indicate a considerable change to the existing road configuration as a result of the need to provide for the new tram interchange and the access to the new Domain station. This arrangement would result in some changes to the traffic patterns around the area, but the traffic operations analysis indicates that the overall operation would be broadly similar to the current operation. There would be a loss of a number of car parking spaces along St Kilda Road that would impact on car parking for the Domain parklands and for developments along St Kilda Road.
Public transport	The implementation of Melbourne Metro would introduce a new station at Domain that would expand the coverage of the train network to the St Kilda Road corridor. The station would have a direct connection to a new major tram interchange expanding the connectivity and coverage of the public transport network.at Domain station and beyond.

Description	Issue
Active transport	The road functional layout plan for the Domain station precinct provides a suitable road layout to service the needs of the area and should deliver a safe and efficient bicycle and pedestrian network. There would be medium impacts to the pedestrian network within the Domain station precinct. The reconstruction of St Kilda Road would enable improved connections across the busy St Kilda Road corridor. Improvements would include an underground connection across the full width of St Kilda Road with a direct connection to both the Domain station and the central tram superstop. This should reduce the above ground pedestrian movements across St Kilda Road giving safety and efficiency benefits. There would be an improvement to the bicycle network in the Domain station precinct with new segregated bicycle lanes to be provided along St Kilda Road that should improve safety and efficiency of the bicycle network through the area. Additional bicycle parking would also be provided near Domain station.
Precinct 8: Eastern portal	
Road transport	The proposed road functional layout plan for the eastern portal precinct would return the road network to its current configuration and operation and therefore provides a suitable road layout to service the needs of the area and deliver a safe and efficient road and parking network
Public transport	The implementation of that Melbourne Metro would result in only the Frankston and Sandringham line services operating through South Yarra station. The Cranbourne/Pakenham services would no longer go through South Yarra as they would operate through Melbourne Metro tunnels. This would release tracks from South Yarra to Caulfield, which would enable the segregation of freight and V/Line movements through South Yarra and Richmond.
Active transport	Once construction of the eastern portal is complete the road and pedestrian network around this site would be reinstated to the 2015 conditions. There would be negligible impact to pedestrians and cyclists in this precinct.
Precinct 9: Western Turnback	
Road transport	There is minimal impact of the works at this precinct on traffic operations and safety.
Public transport	Operations of the new Melbourne Metro line would include a requirement to 'turn back' some trains early on the Sunbury line to run back towards the CBD to optimise the operation of Melbourne Metro corridor. The Concept Design includes the western turnback at West Footscray, with a third platform and track at West Footscray Station and modifications to the existing station concourse. The provision of the turnback provides improved functionality and enables greater capacity by improving service frequency along the Sunbury line and the Cranbourne-Pakenham line.
Active transport	The western turnback includes the construction of a third platform at West Footscray station and modifications to the existing station concourse that should be designed in accordance with relevant design standards to maintain safety and efficiency of pedestrians at the station. There would be negligible impact to cyclists in this precinct.

10 Cumulative Impacts

10.1 Combined Impact of all Truck Activity

Melbourne Metro involves construction activity at a number of work sites across the inner city areas. The precinct by precinct analysis undertaken in Section 8 provides an indication of the likely level of truck activity in proximity to the precincts. However there is a cumulative effect of the trucks from multiple sites on the road network. While the access routes proposed for each precinct have been designed to access the sites in the most direct way from the arterial road and motorway network, multiple precincts are likely to be travelling on the same routes resulting in a compounding effect on the network operations.

In order to understand the scale of this issue geographical information systems (GIS) have been used to plot the cumulative travel routes for the trucks at all of the precincts. This can be compared to the current traffic volumes on the network to understand the scale of activity in comparison to the base traffic volumes.

Figure 10-1 shows the average daily traffic flows across the inner city areas of Melbourne, indicating that there are many roads with traffic flows in excess of 10,000 vehicles per day – sourced from VicRoads Traffic Monitor. This provides a useful base to compare the cumulative truck volumes as a proportion of the current truck activity and total traffic activity in the inner city areas. The following analysis considers the peak activity that is expected to occur in the period from 19-24 months after the start of the construction of Melbourne Metro, as indicated in Table 8-2.

Figure 10-2 and Figure 10-3 show the estimated cumulative Melbourne Metro truck activity as a proportion of the current truck volumes on the network and as a proportion of the total traffic volumes on the network respectively. Figure 10-2 demonstrates that the Melbourne Metro truck traffic represents a small proportion of the total truck activity with most locations showing less than 10 per cent increase in truck activity, though there are some areas around the precincts that show increases of around 30 per cent of current truck volumes. Figure 10-3 shows that the increase in truck activity represents a small proportion of the total traffic in the area, even in the areas close to the precincts with most areas showing less than three per cent increase in traffic, though around Arden the total traffic activity increases by around five per cent.

The diagrams indicate that the even the peak activity truck volumes associated with the construction of Melbourne Metro represent only a small increase in the total traffic volumes on the road network. Given the scale of the Melbourne Metro project and the benefits that it would deliver to Melbourne these predicted increases in truck traffic activity in the vicinity of the precincts are considered acceptable.

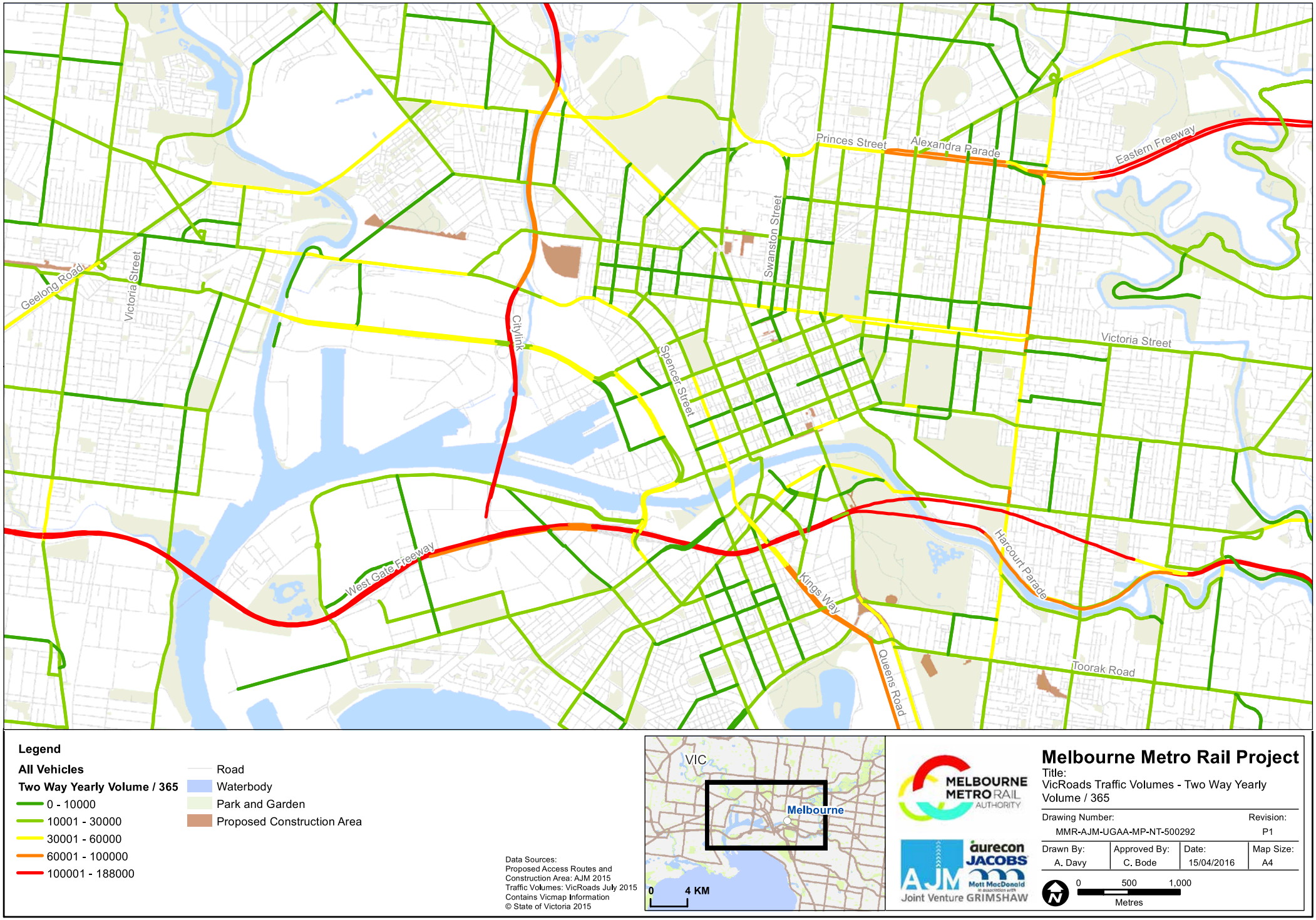

Figure 10-1 Existing traffic volumes on the inner city road network (Source: VicRoads)

G:\MMR-AJM\01_WIP\PW-1-AA-KG_GIS\640_Site_plans\MMR_0305_Traffic_Access_Routes\MMR_0305_A4_PerDayAvg_VicRoadsData.mxd

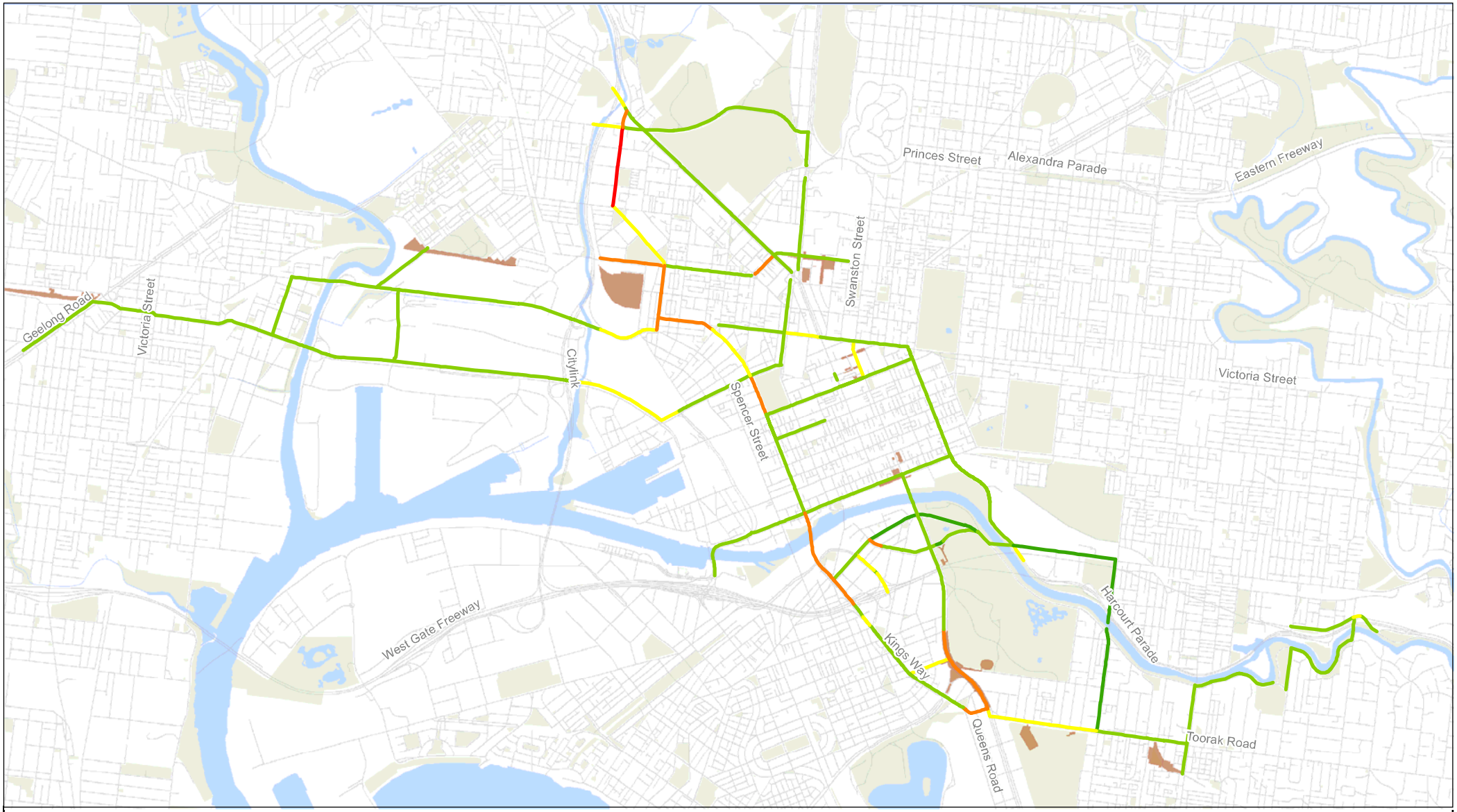

Figure 10-2 Percentage of estimated trucks added to the current network during construction – Truck volumes

MMR-AJM01_WIP\PW-1-AA-KG_GIS\640_Site_plans\MMR_0305_Traffic_Access_Routes\MMR_0305_A4_PercentIncrease_Trucks_16HourDay_19to24months.mxd

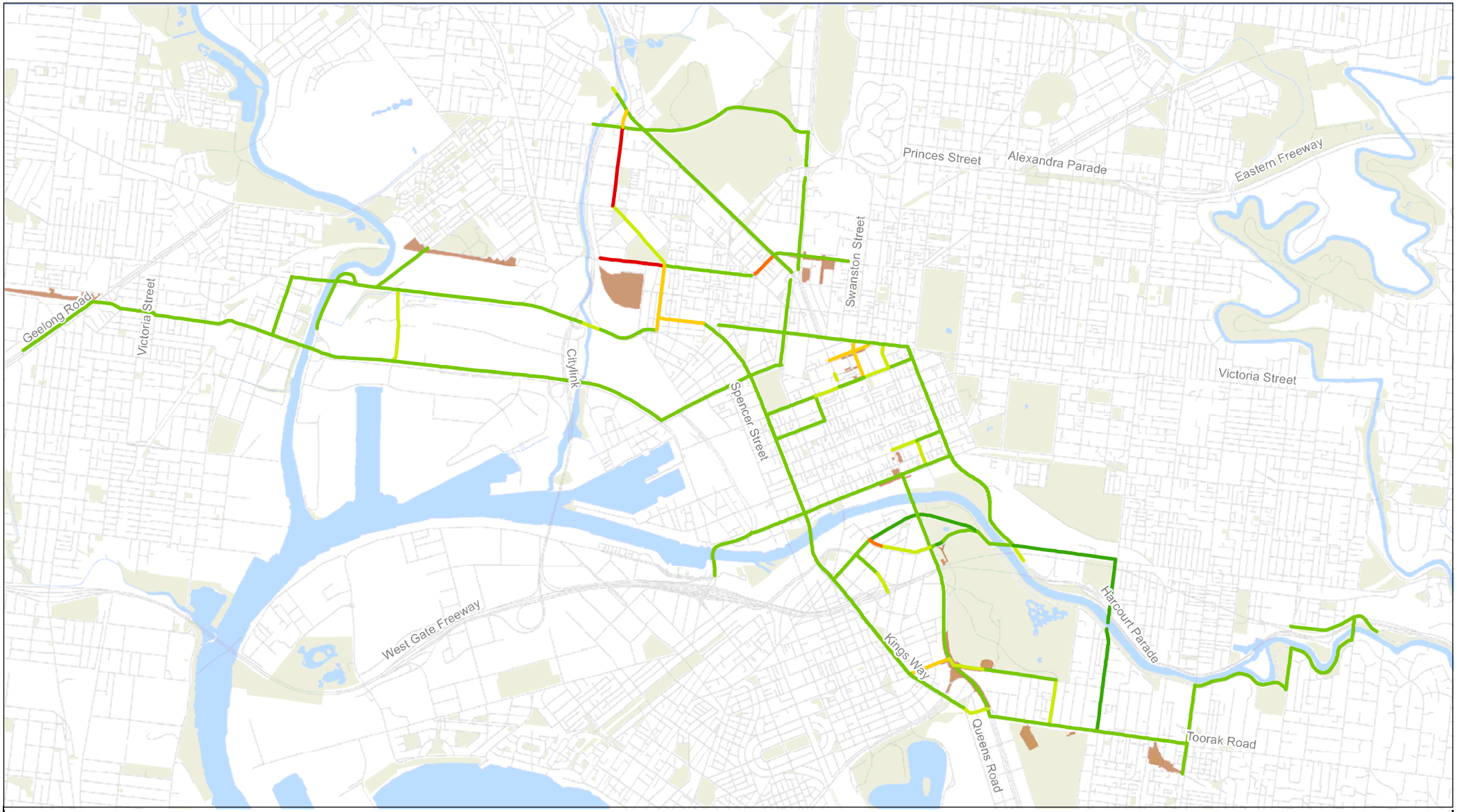

Figure 10-3 Percentage of estimated trucks added to the current network during construction – Total volumes

G:\MMR-AJM\01_WIP\PW-1-AA-KG_GIS\640_Site_plans\MMR_0305_Traffic_Access_Routes\MMR_0305_A4_PercentIncrease_16HourDay_19to24months.mxd

10.2 Concurrent Construction of Western Distributor and Melbourne Metro

The concurrent construction of two major transport infrastructure projects in the same area has the potential to compound the construction impacts of each project. Melbourne Metro is planned to commence construction in 2018 with completion scheduled around 2025.

The Victorian Government and Transurban are partnering to build the $5.5 billion Western Distributor Project, which includes the Monash Freeway Upgrade and access improvements for Webb Dock.

The Western Distributor is a major motorway project that would provide a new crossing of the Maribyrnong River and connections from the West Gate Freeway to the inner northern areas of inner Melbourne.

The Transurban website[38] indicates that the Western Distributor project (refer to Figure 10-4) includes:

- Widening of the West Gate Freeway from eight to twelve lanes and other improvements
- A new road and tunnel(s) under Yarraville connecting the West Gate Freeway with the Port of Melbourne, CityLink and the CBD
- A bridge over the Maribyrnong River joining an elevated road along Footscray Road
- A direct connection to the port from Hyde Street for trucks carrying hazardous goods
- Improved access to Swanson, Appleton and Webb Docks
- An eastern interchange connecting to CityLink, inner northern suburbs and the city
- Smart technology adding to the M1 managed motorway
- Improvements to traffic management on connecting roads
- Major new cycling and walking paths.

The concurrent construction of Melbourne Metro and Western Distributor would need to be managed to make sure that the common areas that are impacted by construction works are coordinated to minimise disruption to the travelling public. While the project would need to proceed through an EES process similar to the Melbourne Metro project, it is expected that the construction of the two projects would have some overlap so that there would be a period of concurrent construction.

The access arrangements at the city end of the Western Distributor project are yet to be determined and the current concept plans that have been released for consultation have limited detail on these arrangements. It is reasonable to expect that Western Distributor would connect into the areas to the north west of the Melbourne CBD, in areas that would potentially be affected by the construction activities around the western portal precinct and the Arden station precinct. As details are not yet available, it is not practical for the Melbourne Metro project to manage these potential cumulative impacts at this time.

It would be important to understand and manage the concurrent construction activities between Melbourne Metro and Western Distributor and plan for these as the details of the Western Distributor are further developed. Similarly there would be other development in and around various station precincts that would need to be carefully considered to manage the potential impacts on residents, businesses and other users in the area of the works.

[38] Source: http://westerndistributorproject.vic.gov.au/files/WD_acqua_overview_fact_sheet_14_April_2016.pdf

Figure 10-4 Western Distributor overview map

(Source: http://consult.transurban.com/western-distributor-join-the-conversation/forum_topics/concept-design-northern-tunnel-portal-and-bridge)

11 Proposed Environmental Performance Requirements

This section provides a summary of the recommended Environmental Performance Requirements identified as a result of this impact assessment. Table 11-1 provides the recommended Environmental Performance Requirements for the ***construction*** phase and Table 11-2 provides the recommended Environmental Performance Requirements for the ***operational*** phase on a precinct basis, linked to the EES evaluation objective.

11.1 Consolidated Summary

Table 11-1 Environmental Performance Requirements by Precinct – construction phase

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
Precinct 1: Tunnels			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	Road transport	• Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to: – Management of any temporary or permanent full or partial closure of traffic lanes including (but not limited to): ▪ Linlithgow Avenue, Melbourne ▪ St Kilda Road, Domain Road, Albert Road at Domain ▪ Toorak Road at Fawkner Park – Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction – Traffic management plan(s) must be developed recognising other projects operating concurrently, where relevant – Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors – Provision of suitable routes for vehicles to maintain connectivity for road users adjacent to the construction work sites – In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites – Special arrangements for delivery or removal of large loads.	• Prepare Transport Management Plan • Consult with relevant authorities • Consult with emergency services.

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
	Public transport	• Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria, including (but not limited to): – Tram operations on Toorak Road and the diversion of the Domain Road tram route – Tram routes on St Kilda Road – Disruption to other tram routes through Domain tram stop.	• Prepare Transport Management Plan • Prepare Rail Occupation Plan • Consult with relevant authorities.
	Active transport	• Develop and implement transport management measures in consultation with relevant authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) Toorak Road, St Kilda Road and Fawkner Park • In consultation with the City of Melbourne provide suitable routes for, cyclists and pedestrians to maintain connectivity and safety for roads and shared paths to provide continued access, including (but not limited to) St Kilda Road, Toorak Road and Fawkner Park • Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists.	• Prepare Transport Management Plan • Consult with relevant authorities.
	Travel Demand Management	• In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.	• Prepare Travel Demand Management Strategy and associated transport management measures • Consult with relevant authorities.
Precinct 2: Western portal (Kensington)			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of	Road transport	• Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to: – Management of any temporary or permanent full or partial closure of traffic lanes including (but not limited to) Childers Street, Kensington and other local	• Prepare Transport Management Plan • Consult with relevant authorities • Consult with emergency services.

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
the works on the broader transport network, both during and after the construction of the project.		roads – Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction – Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant – Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors – Provision of suitable routes for vehicles to maintain connectivity for road users adjacent to JJ Holland Park and the South Kensington station construction work site – Provision of alternative routes for trucks accessing the 50 Lloyd Street Business Estate, Kensington – Provision of alternate parking where possible to replace parking lost from Childers Street, during construction and preventing parking at undesignated locations on local roads – Provision of car parking for construction workers where possible – In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites – Special arrangements for delivery or removal of large loads.	
	Public transport	• Develop and implement a plan for occupying railway land and tracks at the western portal that minimises the disruption to railway services during construction. Plan to be developed to the satisfaction of VicTrack and MTM • Provide suitable routes for pedestrians to maintain connectivity, including DDA access for users of South Kensington station • Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria • Bus replacement services for disrupted rail customers.	• Prepare Transport Management Plan • Prepare Rail Occupation Plan • Consult with relevant authorities.

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
	Active transport	• Develop and implement transport management measures in consultation with relevant authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) JJ Holland Park and South Kensington station • Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists • In consultation with the City of Melbourne, provide suitable routes for cyclists and pedestrians throughout construction to maintain connectivity and safety for road and shared path users of JJ Holland Park and South Kensington station.	• Prepare Transport Management Plan • Consult with relevant authorities.
	Travel Demand Management	• In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.	• Prepare Travel Demand Management Strategy and associated transport management measures • Consult with relevant authorities.
Precinct 3: Arden station			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	Road transport	• Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to: – Management of any temporary or permanent full or partial closure of traffic lanes – Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction – Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant – Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors – Provision of suitable routes for vehicles to maintain connectivity for road users to adjacent to construction work sites	• Prepare Transport Management Plan • Consult with relevant authorities • Consult with emergency services.

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
		– Provision of alternate parking where possible to replace parking lost from Laurens Street during construction and preventing parking at undesignated locations on local roads – Provision of car parking for construction workers where possible – In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites – Special arrangements for delivery or removal of large loads.	
	Public Transport	• Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria.	• Prepare Transport Management Plan • Prepare Rail Occupation Plan • Consult with relevant authorities.
	Active Transport	• Develop and implement transport management measures in consultation with relevant authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) Laurens Street • Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists • In consultation with the City of Melbourne, provide suitable routes for cyclists and pedestrians throughout construction to maintain connectivity and safety for road and shared path users.	• Prepare Transport Management Plan • Consult with relevant authorities.
	Travel Demand Management	• In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.	• Prepare Travel Demand Management Strategy and associated transport management measures • Consult with relevant authorities.

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
Precinct 4: Parkville station			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	Road transport	• Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to: – Management of any temporary or permanent full or partial closure of traffic lanes including (but not limited to) Royal Parade, Grattan Street and Barry Street, Parkville – Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction – Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant – Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors – Provision of suitable routes for vehicles to maintain connectivity for road users to the medical and educational facilities adjacent to the Parkville construction work sites – Provision of alternate parking where possible to replace parking lost from Grattan Street during construction and preventing parking at undesignated locations on local roads – Provision of car parking for construction workers where possible – In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites – Special arrangements for delivery or removal of large loads.	• Prepare Transport Management Plan • Consult with relevant authorities • Consult with emergency services.

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
	Public transport	• Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria, including (but not limited to): – Options to divert the 401, 402, 403, 505 and 546 bus services – Periodic closures of Royal Parade tram route – Bus replacement services for disrupted rail customers.	• Prepare Transport Management Plan • Prepare Rail Occupation Plan • Consult with relevant authoritie.
	Active transport	• Develop and implement transport management measures in consultation with relevant authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) Grattan Street • In consultation with the City of Melbourne, provide suitable routes for, cyclists and pedestrians to maintain connectivity and safety for roads and shared paths to provide continued access, including (but not limited to) Grattan Street • Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists.	• Prepare Transport Management Plan • Consult with relevant authorities.
	Travel Demand Management	• In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.	• Prepare Travel Demand Management Strategy and associated transport management measures • Consult with relevant authorities.
Precinct 5: CBD North station			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the	Road transport	• Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to: – Management of any temporary or permanent full or partial closure of traffic lanes including (but not limited to) Franklin Street, A'Beckett Street and Little La Trobe Street at CBD North – Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour	• Prepare Transport Management Plan • Consult with relevant authorities • Consult with emergency services.

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
project.		change. Use this data as an input to the design of transport networks following construction – Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant – Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors – Provision of suitable routes for vehicles to maintain connectivity for road users adjacent to construction work sites – Provision of alternate parking where possible during construction and preventing parking at undesignated locations on local roads – Provision of car parking for construction workers where possible – In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites – Special arrangements for delivery or removal of large loads.	
	Public transport	• Provide suitable routes for pedestrians to maintain connectivity, including DDA access for users of Melbourne Central Station • Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria, including (but not limited to) Tram routes on La Trobe Street and Swanston Street.	• Prepare Transport Management Plan • Prepare Rail Occupation Plan • Consult with relevant authorities.
	Active transport	• Develop and implement transport management measures for cyclists and pedestrians to maintain connectivity for road and shared path users of Swanston Street and Franklin Street • Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists • In consultation with the City of Melbourne, provide suitable routes for cyclists and pedestrians throughout construction to maintain connectivity and safety for road and shared path users including (but not limited to) Franklin Street (including RMIT facilities) and Swanston Street.	• Prepare Transport Management Plan • Consult with relevant authorities.

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
	Travel Demand Management	• In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.	• Prepare Travel Demand Management Strategy and associated transport management measures • Consult with relevant authorities.
Precinct 6: CBD South station			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	Road transport	• Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to: – Management of any temporary or permanent full or partial closure of traffic lanes including (but not limited to) Flinders Street and Flinders Lane at CBD South – Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction – Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant – Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors – Provision of suitable routes for vehicles to maintain connectivity for road users adjacent to the construction work sites – Provision of alternate parking where possible to replace parking lost during construction and preventing parking at undesignated locations on local roads – Provision of car parking for construction workers where possible – In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites – Special arrangements for delivery or removal of large loads.	• Prepare Transport Management Plan • Consult with relevant authorities • Consult with emergency services.

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
	Public transport	– Provide suitable routes for pedestrians to maintain connectivity, including DDA access for users of Flinders Street Station – Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria, including (but not limited to) tram routes on Flinders Street and Swanston Street.	• Prepare Transport Management Plan • Prepare Rail Occupation Plan • Consult with relevant authorities.
	Active transport	• Develop and implement transport management measures in consultation with relevant authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) Swanston Street and Flinders Street. • Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists • In consultation with the City of Melbourne, provide suitable routes for cyclists and pedestrians throughout construction to maintain connectivity and safety for road and shared path users.	• Prepare Transport Management Plan • Consult with relevant authorities.
	Travel Demand Management	• In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.	• Prepare Travel Demand Management Strategy and associated transport management measures • Consult with relevant authorities.
Precinct 7: Domain station			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the	Road transport	• Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to: – Management of any temporary or permanent full or partial closure of traffic lanes including (but not limited to): ▪ St Kilda Road, Domain Road, Albert Road at Domain ▪ Toorak Road at Fawkner Park	• Prepare Transport Management Plan • Consult with relevant authorities • Consult with emergency services

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
project.		– Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction – Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant – Provision for a minimum of one lane for traffic in each direction on St Kilda Road to be maintained throughout the construction within the Domain station precinct – Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors – Provision of suitable routes for vehicles to maintain connectivity for road users adjacent to the construction work sites – Provision of alternate parking where possible to replace parking lost from Domain Road, St Kilda Road and Albert Road during construction and preventing parking at undesignated locations on local roads – Provision of car parking for construction workers where possible – Provision of suitable routes for, cyclists and pedestrians to maintain connectivity and safety for roads and shared paths that provide continued access, including (but not limited to) St Kilda Road, Albert Road, Domain Road, Toorak Road and Fawkner Park – Provision of complementary improvements to Kings Way, Canterbury Road and other roads to accommodate additional traffic that may use these roads and to assist traffic flow in St Kilda Road for the duration of the works – In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites – Special arrangements for delivery or removal of large loads.	

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
	Public transport	• Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria, including (but not limited to): – Tram operations on Toorak Road and the diversion of the Domain Road tram route – Tram routes on St Kilda Road – Disruption to other tram routes through Domain tram stop.	• Prepare Transport Management Plan • Prepare Rail Occupation Plan • Consult with relevant authorities.
	Active transport	• Develop and implement transport management measures in consultation with relevant authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) St Kilda Road, Domain Road, Domain Parklands, Albert Road, Toorak Road and Fawkner Park • Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists • In consultation with the relevant authorities provide suitable routes for cyclists and pedestrians throughout construction to maintain connectivity and safety for road and shared path users.	• Prepare Transport Management Plan • Consult with relevant authorities.
	Travel Demand Management	• In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.	• Prepare Travel Demand Management Strategy and associated transport management measures • Consult with relevant authorities.
Precinct 8: Eastern portal (South Yarra)			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of	Road transport	• Develop and implement a transport management plan(s) in consultation with the relevant road management authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to: – Management of any temporary or permanent full or partial closure of traffic lanes including (but not limited to) Osborne Street, William Street in South	• Prepare Transport Management Plan • Consult with relevant authorities • Consult with emergency services.

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
the works on the broader transport network, both during and after the construction of the project.		Yarra – Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction – Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant – Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors – Provision of suitable routes for vehicles to maintain connectivity for road users adjacent to the construction work sites – Provision of alternate parking where possible to replace parking lost during construction and preventing parking at undesignated locations on local roads – Provision of car parking for construction workers where possible – In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites – Special arrangements for delivery or removal of large loads.	
	Public transport	• Develop and implement a plan for occupying railway land and tracks at the eastern portal that minimises the disruption to railway services during construction. Plan to be developed to the satisfaction of VicTrack and MTM • Develop and implement measures to minimise disruption to the tram and bus networks resulting from the construction of Melbourne Metro in consultation with the relevant road management authorities and to the satisfaction of Public Transport Victoria. Implement replacement services for disrupted rail customers.	• Prepare Transport Management Plan • Prepare Rail Occupation Plan • Consult with relevant authorities.

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
	Active transport	• Develop and implement transport management measures in consultation with relevant road management authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) Osborne Street, William Street and Chapel Street • Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists • In consultation with City of Stonnington, provide suitable routes for cyclists and pedestrians throughout construction to maintain connectivity and safety for road and shared path users.	• Prepare Transport Management Plan • Consult with relevant authorities.
	Travel Demand Management	• In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.	• Prepare Travel Demand Management Strategy and associated transport management measures • Consult with relevant authorities.
Precinct 9: Western Turnback			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	Road transport	• Develop and implement a transport management plan(s) in consultation with the relevant authorities to minimise disruption to traffic, car parking, pedestrian and bicycle movements during construction, including but not limited to: – Management of any temporary or permanent full or partial closure of traffic lanes – Monitoring of travel behaviour changes caused by construction works, including pre-construction baseline data and periodic reporting on behaviour change. Use this data as an input to the design of transport networks following construction – Transport management plan(s) must be developed recognising other projects operating concurrently, where relevant – Potential routes for construction vehicles travelling to and from all Melbourne Metro construction work sites, recognising sensitive receptors – Provision of suitable routes for vehicles to maintain connectivity for road users adjacent to the construction work sites – Provision of alternate parking where possible to replace parking lost during	• Prepare Transport Management Plan • Consult with relevant authorities • Consult with emergency services.

Draft EES evaluation objective	Asset / value	Environmental Performance Requirements	Possible management measures
		construction and preventing parking at undesignated locations on local roads – Provision of car parking for construction workers where possible – In consultation with emergency services, develop suitable measures to ensure emergency service access is not inhibited as a result of Melbourne Metro construction work sites – Special arrangements for delivery or removal of large loads.	
	Public transport	• Develop and implement a plan for occupying railway land and tracks at the western turnback that minimises the disruption to railway services during construction. Plan to be developed to the satisfaction of VicTrack and MTM • Provide suitable routes for pedestrians to maintain connectivity, including DDA access for users of West Footscray station and around all construction work sites generally • Bus replacement services for disrupted rail customers.	• Prepare Transport Management Plan • Prepare Rail Occupation Plan • Consult with relevant authorities.
	Active transport	• Develop and implement transport management measures in consultation with relevant road management authorities for cyclists and pedestrians to maintain connectivity throughout construction for road and shared path users including (but not limited to) Cross Street • Implement active control at construction work site access points to maintain safety by avoiding potential conflicts between trucks, pedestrians and cyclists • In consultation with relevant authority, provide suitable routes for cyclists and pedestrians throughout construction to maintain connectivity and safety for users of West Footscray station.	• Prepare Transport Management Plan • Consult with relevant authorities.
	Travel Demand Management	• In advance of construction works, MMRA to develop and implement a travel demand management strategy and appropriate tools to promote specific transport behaviour changes in response to road, bicycle and pedestrian paths closures/modifications and to reduce traffic congestion around construction work sites, particularly where road closures and restrictions are proposed. The strategy must be consistent with the MMRA Community and Stakeholder Engagement Plan.	• Prepare Travel Demand Management Strategy and associated transport management measures • Consult with relevant authorities.

Table 11-2 Environmental Performance Requirements by Precinct – operational phase

Draft EES Evaluation Objective	Asset / Value	Environmental Performance Requirements	Possible management measures
Precinct 1: Tunnels			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	Road transport	• Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required • Optimise the design of the reinstated St Kilda Road and apply the road users hierarchy in consultation with the relevant road management authorities to: – Reduce delays and congestion – Maintain safe operations through the precinct • Determine the optimal parking provision in the area and replace any lost parking where possible.	• Prepare car parking management plan • Consult with relevant authorities • Design all works to relevant standards.
	Active transport	• Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council	• Consult with relevant authorities.
Precinct 2: Western portal (Kensington)			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	Road transport	• Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required • Develop and implement a plan to reinstate car parking on Childers Street, Kensington in consultation with the relevant road management authorities that: – Minimises the permanent loss of parking where possible – Ensures re-instated car parking does not encroach on JJ Holland Park – Considers opportunities for replacement of any net loss of parking at nearby locations – Reduces the risk of overflow parking in local streets from South Kensington station and activities at JJ Holland Park – Replaces loading zones to service the needs of the existing businesses in the precinct where disrupted during construction	• Prepare car parking management plan • Consult with relevant authorities • Design all works to relevant standards.

Draft EES Evaluation Objective	Asset / Value	Environmental Performance Requirements	Possible management measures
	Active transport	• Develop and implement a permanent shared use path along the northern side of Childers Street, Kensington in conjunction with the relevant road management authority and the land manager prior to the removal of the shared use path on the southern side • Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council • Provide wayfinding information to enhance connectivity for pedestrians and public transport users.	• Implement new shared path early • Consult with relevant authorities • Provide wayfinding information.
Precinct 3: Arden station			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	Road transport	• Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required • Develop and implement a plan to reinstate car parking on Laurens Street, North Melbourne in consultation with the relevant road management authorities that: – Minimises the permanent loss of parking where possible – Considers opportunities for replacement of any net loss of parking at nearby locations – Replaces loading zones to service the needs of the existing businesses in the precinct where disrupted during construction.	• Prepare car parking management plan • Consult with relevant authorities • Design all works to relevant standards.
	Public transport	• Review, with Public Transport Victoria, the bus services in the areas around Arden stations including a review of the route 401 bus frequency that will have reduced demand following implementation of Melbourne Metro.	• Review bus service plans • Design to optimise form and function of stations and interfaces with other public transport services • Consult with relevant authorities.
	Active transport	• Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council • Provide wayfinding information to enhance connectivity for pedestrians and public transport users.	• Consult with relevant authorities • Provide wayfinding information.

Draft EES Evaluation Objective	Asset / Value	Environmental Performance Requirements	Possible management measures
Precinct 4: Parkville station			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	Road transport	• Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required • Develop and implement a plan for the reinstatement of Grattan Street, Parkville in consultation with the relevant road management authorities that includes: – Optimal replacement of car parking spaces along Grattan Street to service the needs of the hospitals and the university, including the retention or replacement of specific short-term and DDA compliant parking – Optimal design of the road network around Grattan Street associated with the changed demands and network changes on Grattan Street and Royal Parade/Elizabeth Street.	• Prepare car parking management plan • Consult with relevant authorities • Design all works to relevant standards.
	Public transport	• Review, with Public Transport Victoria, the bus services in the areas around Parkville station including a review of the route 401 bus frequency that will have reduced demand following implementation of Melbourne Metro • Optimise the design of Melbourne Metro stations to ensure integration with existing and planned future uses and so that they will provide connections between the new Parkville station and the new tram stop on Royal Parade.	• Review bus service plans • Design to optimise form and function of stations and interfaces with other public transport services • Consult with relevant authorities.
	Active transport	• Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council • Provide wayfinding information to enhance connectivity for pedestrians and public transport users.	• Consult with relevant authorities • Provide wayfinding information.
Precinct 5: CBD North station			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the	Road transport	• Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required • Develop and implement a plan for the future use of the Franklin Street road reserve in consultation with the relevant road management authorities that includes: – Optimising the design of the road network following the closure of Franklin Street between Swanston Street and Bowen Street	• Prepare car parking management plan • Consult with relevant authorities • Design all works to relevant standards.

Draft EES Evaluation Objective	Asset / Value	Environmental Performance Requirements	Possible management measures
construction of the project.		– Monitoring the change in travel patterns around the area associated with the closure of Franklin Street • Optimise the design of the reinstated St Kilda Road and apply the road users hierarchy in consultation with the relevant road management authorities to: – Reduce delays and congestion – Maintain safe operations through the precinct.	
	Public transport	• Review, with Public Transport Victoria, the bus services in the areas around CBD North station • Optimise the design of Melbourne Metro stations to ensure integration with existing and planned future uses and so that they will provide connections for interchange between the new CBD North station and the existing tram and bus services along La Trobe Street and Swanston Street • Review, with Public Transport Victoria and Yarra Trams, the bus and tram services in the area to optimise the functionality of the CBD North station and to reduce the reliance on the Swanston Street tram corridor.	• Review bus service plans • Design to optimise form and function of stations and interfaces with other public transport services • Consult with relevant authorities.
	Active transport	• Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council • Provide wayfinding information to enhance connectivity for pedestrians and public transport users including (but not limited to) between Melbourne Central Station and the new CBD North station.	• Consult with relevant authorities • Provide wayfinding information.
Precinct 6: CBD South station			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while	Road transport	• Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required • Determine the optimal parking provision in the area and replace any lost parking where possible.	• Prepare car parking management plan • Consult with relevant authorities • Design all works to relevant standards.

Draft EES Evaluation Objective	Asset / Value	Environmental Performance Requirements	Possible management measures
adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	Public transport	• Review, with Public Transport Victoria, the bus services in the areas around CBD South station • Optimise the design of Melbourne Metro stations to ensure integration with existing and planned future uses and so that they will provide connections for interchange between the new CBD South station and the existing tram services along Flinders Street and Swanston Street • Review, with Public Transport Victoria and Yarra Trams, the bus and tram services in the area to optimise the functionality of the CBD South station and to reduce the reliance on the Swanston Street tram corridor.	• Review bus service plans • Design to optimise form and function of stations and interfaces with other public transport services • Consult with relevant authorities.
	Active transport	• Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council • Provide wayfinding information to enhance connectivity for pedestrians and public transport users including (but not limited to) underground connection between Flinders Street Station and the new CBD South station.	• Consult with relevant authorities • Provide wayfinding information.
Precinct 7: Domain station			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	Road transport	• Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required • Optimise the design of the reinstated St Kilda Road and apply the road users hierarchy in consultation with the relevant road management authorities to: – Reduce delays and congestion – Maintain safe operations through the precinct • Determine the optimal parking provision in the area and replace any lost parking where possible.	• Prepare car parking management plan • Consult with relevant authorities • Design all works to relevant standards.
	Public transport	• Review, with Public Transport Victoria, the bus services in the areas around Domain station • Optimise the design of Melbourne Metro stations to ensure integration with existing and planned future uses and so that they will provide connections between the new Domain station and the new island platform trams stop in the centre of St Kilda Road and connections to the tram services along Domain Road	• Review bus service plans • Design to optimise form and function of stations and interfaces with other public transport services • Consult with relevant authorities.

Draft EES Evaluation Objective	Asset / Value	Environmental Performance Requirements	Possible management measures
	Active transport	• Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council • Provide wayfinding information to enhance connectivity for pedestrians and public transport users.	• Consult with relevant authorities • Provide wayfinding information.
Precinct 8: Eastern portal (South Yarra)			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	Road transport	• Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required • Determine the optimal parking provision in the area and replace any lost parking where possible.	• Prepare car parking management plan for each precinct • Consult with relevant authorities • Design all works to relevant standards.
	Active transport	• Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council	• Consult with relevant authorities
Precinct 9: Western turnback			
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	Road transport	• Design all roadworks and shared path works to relevant design standards to maintain safety of movement in consultation with the relevant road management authorities as required • Determine the optimal parking provision in the area and replace any lost parking where possible.	• Prepare car parking management plan • Consult with relevant authorities • Design all works to relevant standards.
	Active transport	• Where practicable to do so, reinstate on-road bicycle lanes and bicycle parking provisions removed during construction in cooperation with the relevant road management authority and the local council	• Consult with relevant authorities.

12 Conclusion

12.1 Scope of the Transport Impact Assessment

This report documents the outcomes of an assessment of the risks and impacts to transport operations from activities associated with construction and operation of Melbourne Metro.

The focus for the assessment is the operations of the transport network, including traffic operations, public transport operations (i.e. trams and buses) and active transport operations (i.e. bicycles and pedestrians) associated with construction and operation of Melbourne Metro.

12.2 Relevant EES Objectives

The following draft EES evaluation objectives and assessment criteria (and indicators where relevant) are relevant to this assessment.

Table 12-1 Transport Connectivity objective

Draft Evaluation Objective	Key Legislation
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	*Transport Integration Act 2010*

Table 12-2 Transport connectivity assessment criteria

Draft EES Evaluation Objective	Transport Impact Assessment
Transport connectivity - To enable a significant increase in the capacity of the metropolitan rail network and provide multimodal connections, while adequately managing effects of the works on the broader transport network, both during and after the construction of the project.	• Manage permanent changes to the public transport, road, cycling and pedestrian transport system • Manage disruptions and delays for residents, businesses and travellers during the construction of the project • Identify the network changes proposed to maintain transport system function during the construction of the project, including the proposed nature and duration of diversions, route changes and changes in car parking availability and management • Identify potential options and actions which could further mitigate adverse effects or optimise the transport system benefits of the project • As far as practicable quantify predicted travel time differences (relative to a 'no project' scenario) during and after the construction of the project • Identify any monitoring or other program for managing disruption or delays relative to predicted effects and for identifying unexpected effects which may require remedial action.

Melbourne Metro Concept Design is consistent with the draft EES evaluation objective, as it enables the metropolitan rail network to operate as a series of independent rail systems thereby delivering a significant increase in the capacity of the rail network. In addition:

- Melbourne Metro provides effective connections between transport modes, notably improving rail to tram connectivity and the accessibility of rail patrons to key destinations in the CBD and inner city areas that were previously not readily accessible by rail

- Melbourne Metro has been designed to manage the impacts of the construction of the project on the operations of transport modes in the vicinity of the project works
- Melbourne Metro has been designed to manage the legacy impacts of the project on the operations of transport modes in the vicinity of the project works.

12.3 Transport Impact Assessment Summary

The Concept Design involves twin rail tunnels constructed under the Melbourne CBD and inner city area between Kensington and South Yarra with underground stations at Arden, Parkville, CBD North, CBD South and Domain. While the majority of the construction activity would be underground there would be a large amount of activity at surface level to transport spoil materials away from the construction work sites and to transport materials to the sites. These works would generate additional activity throughout the construction of the project that would affect operations around each site to varying degrees. In addition Melbourne Metro would change the transport network arrangements in the legacy state around each station location.

A range of construction related impacts have been identified:

- Construction activity would generate truck movements at each station location (for both spoil removal and materials delivery) that would add to the existing traffic activity, potentially affecting transport operations. While activity is planned to be mainly outside peak activity periods (and mainly during daytime in residential areas) there are likely to be some impacts on the network operations on occasions
- Construction activity would generate additional workers in the area that would add to the existing traffic activity, potentially affecting transport operations. While worker activity is expected to be mainly outside peak activity periods there are likely to be some impacts on the network operations on occasions
- The closure of Childers Street to enable the construction of the western portal would impact on local traffic patterns particularly activity generated by 50 Lloyd Street Business Estate
- The use of the Arden station site as a major construction work site would impact local traffic operations for the duration of the works
- The closure of Grattan Street to enable the construction of the Parkville station would impact local traffic patterns, bus and tram operations and bicycle and pedestrian operations for the duration of the closure
- The closure of Franklin Street to enable the construction of the CBD North station would impact local traffic patterns, tram operations and bicycle and pedestrian operations for the duration of the closure
- The closure of Domain Road and the reduction in St Kilda Road to one lane in each direction to enable the construction of the Domain station would have a significant impact on traffic patterns, tram operations and bicycle and pedestrian operations for the duration of the closure
- The changes to the local road network around the eastern portal site in South Yarra would impact local traffic patterns, bicycle and pedestrian operations for the duration of the works.

A range of 'legacy' operation (i.e. post construction) impacts have been identified that would need to be managed carefully, but with effective mitigation strategies would have minimal impacts on the operations and safety of the transport network.

A range of Environmental Performance Requirements have been recommended that in all instances minimise impacts to transport operations and on this basis most project risks to transport operations are considered to be 'low' or 'very low'. There are several residual risks that carry a medium risk rating due to the potential for increased travel times and delays during the construction phase. There are medium risk ratings at the Parkville station precinct due to the closure of Grattan Street and at the Domain station precinct due to the closure of Domain Road and the reduction of capacity of St Kilda Road during construction.

References

City of Maribyrnong (2012. Maribyrnong Integrated Transport Strategy

City of Maribyrnong (2014). Maribyrnong Bicycle Strategy

City of Melbourne (2008). *Parking Plan 2008-2013*

City of Melbourne (2012). *Bicycle Plan 2012-2016*

City of Melbourne (2012). *Transport Strategy – Planning for Future Growth*

City of Melbourne (2013). *Road Safety Plan 2013-2017*

City of Melbourne (2014). *Walking Plan 2014-2017*

City of Melbourne (2015). *Motorcycle Plan 2015-2018*

City of Port Phillip (2009). Public Transport Advocacy Statement

City of Port Phillip (2011). Bicycle Plan

City of Port Phillip (2012). Sustainable Transport Precinct Plans - Precinct 6 St Kilda Road

City of Port Phillip (2013). St Kilda Road North Precinct Plan

City of Port Phillip (2014). *Sustainable Transport Strategy*

City of Port Phillip (2014). Walking Plan

City of Port Phillip (2015). Fisherman's Bend Strategic Framework Plan

City of Port Phillip (2015). Parking Neighbourhood Scheme

City of Stonnington (2011). Walking Policy

City of Stonnington (2013). Stonnington Cycling Strategy 2013-2018

City of Stonnington (2013). Sustainable Transport Policy

Public Transport Victoria (14 May 2015). *Passenger Activity by Metropolitan Station 2008-09 to 2013-14*

Public Transport Victoria (2011). *Tram Origin Destination Report*.

Public Transport Victoria (2012). *Network Rail Development Plan*

Public Transport Victoria (2016). *Patronage Demand Forecast Report*

State Government of Victoria (2014). *Plan Melbourne – Metropolitan Planning Strategy*

VicRoads (2009). *Information Bulletin: Height Clearance on Roads*

VicRoads (2011) SmartRoads - Connecting Communities

VicRoads (September 2014). Traffic Monitor 2012 – 2013