PART 2 RESPONDING TO THE SCOPING REQUIREMENTS

7 Effects on Transport Capacity and Connectivity

7.1 Overview

7.1.1 Introduction

This chapter discusses the potential environmental effects on transport capacity and connectivity during the design, construction, operation and maintenance phases of the Project consistent with the Environment Effects Statement (EES) Scoping Requirements and the relevant Evaluation Objective.

This chapter has been informed by the following specialist technical assessment, peer review report and risk report that form part of the EES:

- Technical Report A – *Transport Impact Assessment* (Arcadis/WSP 2020)
- Peer Review N – *Transport Peer Review* (Dr Craig McPherson 2019)
- Attachment III *Environmental Risk Report.*

The project area (described in Chapter 5 *Project Description*) encompasses the section of Yan Yean Road between Kurrak Road and Bridge Inn Road, located in the local government areas of the City of Whittlesea and Nillumbik Shire Council. Currently, the road is heavily congested during the commuter peak periods resulting in congestion and slow travel speeds. Additionally, there is currently a lack of sufficient space or infrastructure for active transport, with no walking and cycling paths and limited and disconnected footpaths along the road.

Extensive land development within the Whittlesea Growth Corridor is well underway and has resulted in a significant increase in traffic throughout the local region; in particular, increases are expected to continue for traffic along key north-south routes, including Yan Yean Road. The ongoing expansion of the suburbs in the area has significantly increased demands for transport, creating a disparity between the rate of residential development and the provision of adequate road infrastructure.

Yan Yean Road has reached, and in some periods is exceeding, its traffic volume capacity. In addition, there has been an increase in the number of crashes (recorded between 2006 and 2018) and the types of crashes (the majority of which are rear end crashes commonly associated with congestion) along this section of the road, including a fatal head on collision at Jorgensen Avenue in 2014. The intersection at Jorgensen Avenue qualified for upgrade funding under the Federal Black Spot Program in 2015-2016. The forecast population growth in the local area suggests the existing congestion will become worse if not addressed, highlighting the need for the Project.

Direct access to adjacent land use is generally uncontrolled and the majority of intersections are controlled with 'give way' or 'stop' signs. Lack of appropriate infrastructure to support active and public transport also represents a safety risk for road users, pedestrians and cyclists and creates disconnection for locals, especially vulnerable users such as the elderly or children.

One of the most effective avenues in reducing vehicle crashes is by improving safety at intersections, primarily by installing control measures such as traffic lights and roundabouts. Safety barriers also provide greater safety for road users. As part of the Project, all key intersections would be upgraded with control measures, right-turns would only occur at key intersections along the alignment and continuous safety barriers would be installed in the centre median and on either side of the road resulting in safer conditions for road users.

Implementing transport infrastructure projects in constrained transport corridors often results in a level of disruption to access and mobility during the construction phase. During the Project's construction, there would be some impacts to traffic and movement in the local area. To address potential adverse impacts during construction, appropriate mitigation measures have been developed.

The key to avoiding and minimising potential impacts is consistent and ongoing consultation with affected stakeholders, allowing the community to plan ahead and be notified of upcoming disruptions (refer to EPR S2) and the development of a Traffic Management Plan well in advance of works (refer to EPR TP2). Staging of construction works would be key to minimising potential impacts to the community.

This would allow the majority of the works to be completed offline while maintaining traffic flow on the existing carriageway. Local property access would be maintained during construction, either at existing access points or alternative access would be provided.

During operation, the Project is expected to provide benefits and opportunities including improving safety and access along the project corridor for road users and pedestrians, as well as improving the efficiency for public transport (buses) and the amenity of walking and cycling in the area. Access to key activity and employment centres would also be improved for residents of the communities adjacent to Yan Yean Road, including the Whittlesea growth area, through improved traffic flow and a reduction in travel times.

7.1.2 EES Scoping Requirements

On 14 October 2018, the Minister for Planning determined under the *Environment Effects Act 1978*, that an Environment Effects Statement (EES) would be required for the Project to assess the potential environmental effects of the Project.

The Scoping Requirements, including draft Evaluation Objectives, for the EES were issued by the Minister for Planning in June 2019. The Minister's decision to require an EES for the Project was largely due to the potential significant effects on biodiversity, social and cultural values as a result of the Project's proposed clearance of a very large number of trees and habitat, including potential cumulative effects on the habitat of the Swift Parrot.

The Minister also required the EES to examine the following key matters:

- Projected traffic growth volumes and related uncertainties for Yan Yean Road and related roads in the network
- Design alternatives and refinements and their associated impacts, particularly how they avoid and minimise native tree loss with proposed locations of tree and vegetation removal, no go zones and offset requirements and a demonstration that avoid and minimise principles have been applied
- Consideration of carriageways, medians, shared pathways, footpaths, intersections and other treatments to minimise the loss of preferred foraging trees for the critically endangered Swift Parrot (*Lathamus discolor)* and avoidance of high retention trees of ecological and cultural value.

The relevant EES scoping requirements set out by the Minister for Planning give particular attention to the assessment of specific environmental effects related to transport capacity and connectivity, biodiversity (refer to Chapter 8 *Effects on Biodiversity*) and social and cultural values (refer to Chapter 9 *Effects on Social and Cultural Values*). The Evaluation Objective and key issues for transport capacity and connectivity as identified in the EES scoping requirements is provided in the extract below.

Effects on transport capacity and connectivity

Evaluation Objective – To provide for an effective corridor through the northern outer suburbs of Melbourne, to improve travel efficiency, road safety, and capacity.

Key issues:

- Contribution to an integrated and sustainable transport system, including active transport
- Transport connectivity and capacity across the northern outer suburbs of Melbourne, including network resilience and redundancy
- Effects of any redistribution of traffic and implications for residents, residential areas and businesses during construction and operation
- Connectivity of pedestrian and cycling networks across the northern outer suburbs of Melbourne and opportunities for future linkages
- Reliability of predictions of future travel behaviour and transport demand over time.

7.2 Methodology

This section summarises the methodology used to assess the Project's impacts in relation to transport capacity and connectivity. As outlined above, a specialist technical assessment was completed to inform the development of this chapter. Technical Report A – *Transport Impact Assessment* presents the potential integrated transport network effects associated with construction and operation of the Project.

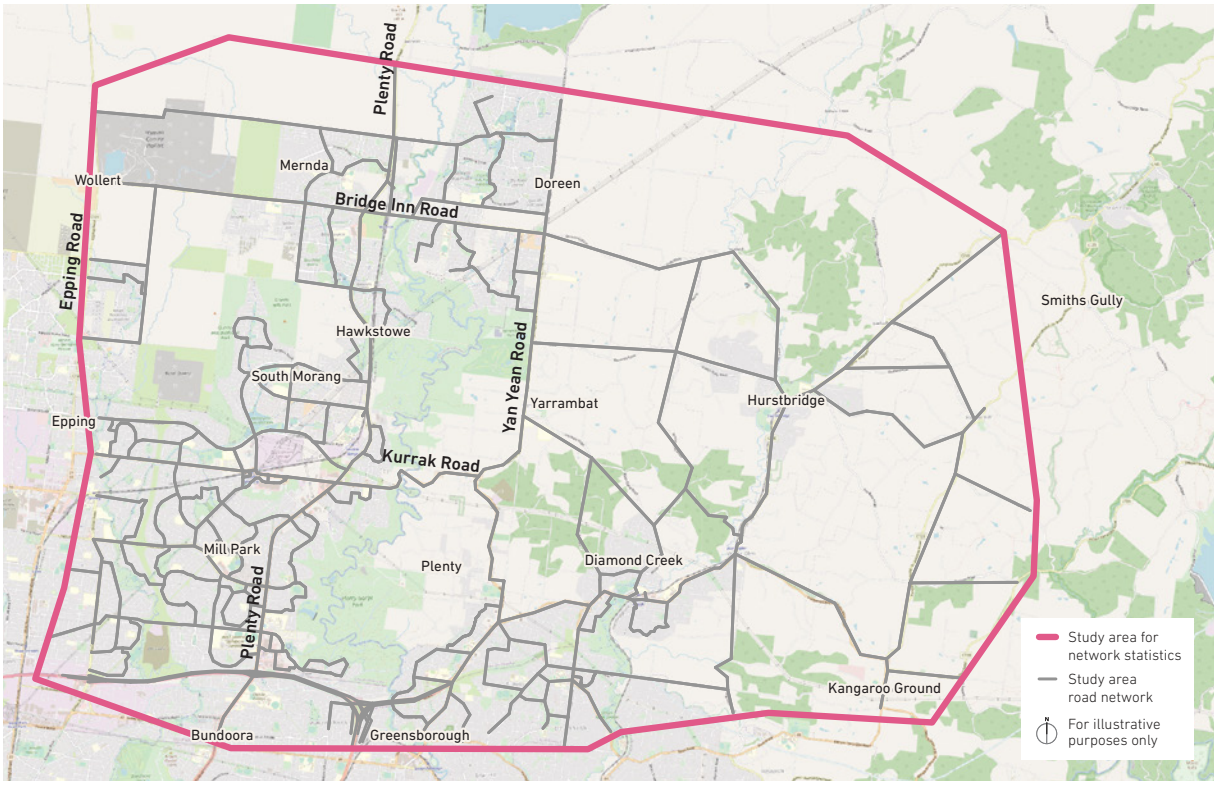
The same project area was used for each specialist technical assessment, as described in Chapter 5 *Project Description* and shown in Figure 5.1. A study area was also developed to model average travel speeds within the road network, as shown in Figure 7.1.

The approach adopted for the transport impact assessment included:

- Undertaking desktop assessments to source and collate existing data and identify locations where additional transport data collection was required
- Reviewing and updating information about existing transport conditions and conducting site inspections to confirm these conditions for all transport modes: road, rail, bus and active transport (cycling and walking)
- Assessing anticipated traffic and transport conditions in 2031 with and without the Project, using transport models to determine the operational impacts of the Project and with no Project
- Undertaking sensitivity testing to understand how changes in the forecast traffic numbers would impact the modelled road performance and intersection 'stress testing' to ascertain how changes in traffic volumes would impact intersection performance
- An assessment against the Movement and Place Framework (Department of Transport, February 2019)
- A Safe System Assessment to measure the extent of which the Project aligns with Victoria's Safe Systems design principles and a road safety audit
- A high-level assessment of potential construction impacts due to the Project
- Identifying key risks generated during construction, operation and maintenance phases of the Project
- Identifying mitigation measures for the Project to inform the Environmental Performance Requirements (EPRs)
- Review of the modelling assumptions and methodology by an independent peer reviewer.

This approach is explained in more detail below.

Figure 7.1 Road network study area used to model average travel speeds



7.2.1 Baseline and background data

An assessment of the existing conditions of the project area and its surrounds was undertaken to understand the characteristics, condition and performance of the existing road network and the active and public transport network. This important step formed the baseline for the risk and impact assessments.

Data sources

Data sources used in the transport impact assessment included:

- Traffic surveys undertaken in 2017 including midblock traffic counts, intersection turning movement counts and travel time surveys
- Data sourced from VicRoads[1] and local Councils including crash statistics and historical traffic counts from VicRoads
- Public transport data provided by Public Transport Victoria
- Data on road functionality, Movement and Place classifications and the Principal Bicycle Network provided by VicRoads
- Site inspections to observe transport network conditions to confirm data collected from the various sources.

1 *VicRoads and Public Transport Victoria became part of Department of Transport in 2019 but are referred to separately in this EES when the information supplied came from that specific agency.*

Desktop review

Desktop reviews were undertaken using various web-based resources and publicly available data such as previous investigations, aerial images, demographic data, historical records and existing information about the Project. The following tasks were undertaken:

- Review of key legislation, relevant policies, strategies and plans for transport in the vicinity of the Project. A full assessment of the Project against the relevant legislation, policies and guidelines is provided in Attachment II *Legislation and Policy*
- Review of both the broader and local road network context for the Project
- Review of existing public transport and active travel facilities and services in the vicinity of the Project
- Review of the existing environment including relevant roads and intersections to determine existing road condition, safety history and capacity in the context of current and proposed future use
- Review of the road-based transport system elements (including private and commercial access to properties and cycling and pedestrian networks) that might be affected by the Project during its construction and operational phases.

Site visits and traffic surveys

The following data was collected for a seven-day period in May 2017 at various locations along Yan Yean Road:

- Traffic volume data, including vehicle counts, speeds and vehicle classifications
- Intersection turning movement counts (video, manual)
- Travel time surveys (floating car with video).

Site observations were also made from video footage collected during surveys and site visits undertaken between 2017 and 2019, completed during peak morning and afternoon periods.

7.2.2 Transport modelling

Transport demand models provide an analytical framework to understand and assess the performance of the transport system under existing and future scenarios. The models identify factors such as changes in traffic volumes, speeds, travel times and delays at intersections. Two modelling tools have been used to test and understand current and anticipated traffic conditions:

- The State Government's strategic transport demand forecasting tool, the Victorian Integrated Transport Model (VITM), was used to assess the impacts of integrated transport and land-use strategies
- The operational modelling tool, SIDRA INTERSECTION (V.8) endorsed by Austroads, was used to model intersection performance at individual intersections.

Strategic modelling outputs from VITM are used in the transport impact assessment (refer to Technical Report A) to assess the impacts of the Project by comparing 'no Project' and 'with Project' conditions at a 'network' level (that is, including key arterial roads). Outputs from VITM have informed the development of intersection turning demand forecasts for detailed intersection performance analysis along the Project corridor using SIDRA. VITM also captures the cumulative travel demand effects of proposed nearby projects on the Yan Yean Road upgrade corridor and vice versa.

The modelling incorporates road and public transport networks across Melbourne, giving it the capability to capture forecast changes in travel demand and operating conditions across these modes. The modelling also included sensitivity tests to understand the influence of inherent uncertainties regarding how land use and the transport network may change into the future and determine how sensitive the findings are to changes in key assumptions.

7.2.3 Peer review

An independent peer review of the strategic traffic forecasting and key assumptions was carried out to investigate the assumptions and methodologies used in the transport modelling and to assess the reasonableness of the final forecasts. The peer review was carried out in two stages as:

- Peer review of intersection turn forecasting methodology used in traffic analysis to inform initial intersection configurations for the Project
- Peer review of network wide impacts of the Project in response to the EES scoping requirements.

The report of the independent peer review can be found in two locations in this EES: as Appendix B of Technical Report A – *Transport Impact Assessment* and Peer Review N – *Transport Peer Review*.

7.2.4 Risk assessment

As required by the EES Scoping Requirements, a risk-based approach was adopted to understand the key risks and those impact pathways with the potential to lead to significant impacts on the environment and / or on local communities. The risk assessment included assessing impact pathways identified as relevant to the Project and investigating additional design options to minimise environmental impact.

Chapter 4 *Environment Effect Statement Assessment Framework* and Attachment III *Environmental Risk Report* provide more details about the risk assessment methodology.

7.2.5 Impact assessment

Impact assessments were completed to determine the potential impacts on transport capacity and connectivity during the construction, operational and maintenance phases of the Project. As part of the assessments, potential positive impacts (benefits) associated with the Project were also identified.

Specialists applied their own methods (defined by relevant legislation, policies, standards and guidelines and their professional judgement and experience) to assess the magnitude of the key impacts, taking into consideration management and mitigation measures where appropriate, which informed the development of EPRs. As a result, the approach to impact assessment was specific to each of the specialist aspects. Key legislation and policies that guided the impact assessments are detailed in Attachment II *Legislation and Policy*.

The results of the transport modelling (refer to Section 7.9.2) were used to prepare the operational impact assessment focusing on the results of the 'with Project' modelling outputs compared to the 'no Project' outputs. The comparison of the two project scenarios enabled an assessment of the impacts on traffic and transport during the operational phase of the Project.

The impact assessment also reviewed the design, access and road safety implications of the Project and conducted an analysis of the Project against relevant criteria such as the Movement and Place Framework.

As a result of the impact assessment, project-specific EPRs – such as the preparation of a detailed transport management plan – have been recommended to address and mitigate these identified impacts.

7.2.6 Consultation

Consultation has been ongoing throughout the development of the Project and has continued during the preparation of this EES. This has included community engagement and consultation to gain an understanding of concerns related to transport connectivity and traffic issues raised by local residents, businesses and other interested parties, as well as with Councils and relevant government agencies to identify the key issues and policy priorities of State and local government.

Three key stages of engagement with communities and stakeholders have been completed to inform development of this EES:

- Stage 1 – Initial design of the Project
- Stage 2 – EES preparation
- Stage 3 – Design options and landscape values

Consultation also occurred with a Technical Reference Group and key stakeholders such as the local Yan Yean MP and local Nillumbik and Whittlesea Councillors.

Key design changes that are relevant to transport capacity and connectivity and were developed in response to the stakeholder and community engagement undertaken include:

- Installing a roundabout at Youngs Road to support U-turn for larger vehicles based on feedback from businesses in Ashley Road and community groups in Yarrambat Park
- Installing traffic lights at the Jorgensen Avenue intersection based on concerns regarding traffic flor and potential rat running in the area
- Installing a wider shoulder between Laurie Street and Bannons Lane to support safer access for residents along this section of Yan Yean Road.

Chapter 6 *Communications and Engagement* provides further information regarding the consultation process and key issues and feedback that has been provided. The feedback received has informed the transport impact assessment, including feedback on existing and likely land use change, land acquisition, access and the identification of Project construction and operational impacts and appropriate mitigation measures.

7.3 Existing conditions

A review of the transport network and traffic conditions identifies Yan Yean Road between Kurrak Road and Bridge Inn Road (the project area and key project components are described in Chapter 5 *Project Description* and are shown in Figure 5.2) as a road that:

- Is experiencing a growth in crashes over recent years with a prevalence of rear end collisions due to congestion
- Is presently operating beyond its designed capacity and struggling to accommodate existing traffic volumes, leading to congested and unreliable traffic conditions
- Lacks appropriate infrastructure to support active and public transport, thus presenting a safety risk for road users, pedestrians and cyclists, and constraining social connectedness for locals.

Chapter 2 *Project Rationale* provides the basis for developing the Project based on the existing conditions described in the following sections.

7.3.1 Transport network

An assessment of the existing transport network was undertaken to understand the regional context of Yan Yean Road including connections with other roads (including arterial roads, local council controlled roads, local streets and accesses into private properties and other land uses) and community centres, existing public transport services and the availability of active transport options including footpath and cycling options.

Road network

Yan Yean Road is an arterial road that provides connectivity between the growing areas of Doreen and Plenty, through the township of Yarrambat, with the established areas of Diamond Creek and Greensborough. It also connects these areas via the key east-west arterials of Bridge Inn Road to Mernda, Kurrak Road to South Morang and Diamond Creek Road to Diamond Creek and Greensborough. These routes provide connectivity to the rest of the North Growth Area, the Metropolitan Ring Road, the future North East Link and the Hume Freeway.

Yan Yean Road is currently an undivided two-lane road through hilly terrain, consisting of sections with steep vertical grades and poor lines of sight. The cross section is rural in nature with unsealed shoulders, adjacent open table drains and trees close to the road's edge. Direct access to adjacent land use is generally uncontrolled and a majority of intersections are priority controlled via 'give way' or 'stop' controls.

The operating speed of the road network is generally slower in the morning peak period than the afternoon peak period. The average speeds along Epping Road, Yan Yean Road and Bridge Inn Road are very slow – ranging between 15 to 30 kilometres per hour in the dominant direction of travel during peak times. All these roads are the same configuration of two lane and two-way roads. However, Plenty Road, which has had recent upgrades on some sections and includes controlled intersections and sections of two lanes and four lanes, operates much better with network speeds of around 40 kilometres per hour during the morning and afternoon peak periods in both directions of travel.

Public transport network

The Mernda railway line runs parallel to Yan Yean Road and is located approximately three kilometres west of the project area. The recently constructed stations of Mernda, Hawkstowe and Middle Gorge provide the nearest point of access to the rail network from Yan Yean Road. The Hurstbridge railway line runs approximately five kilometres east of the project area. Wattle Glen and Hurstbridge station are the closest stations on the Hurstbridge line to the project area.

Two bus routes use Yan Yean Road: route 381 Mernda Station to Diamond Creek Station and route 385 Greensborough to Mernda North. Both routes leave Yan Yean Road at Jorgensen Avenue and return at Orchard Road to run along local streets. Several bus stops are located along the project area road alignment. During the morning and evening peak periods, buses run along the project area approximately every 15 to 20 minutes.

Active transport network

Lack of appropriate infrastructure to support active users has most likely led to low levels of walking and cycling in the project area. This represents a safety risk for road users, pedestrians and cyclists and constrains social connectedness for locals, especially vulnerable active users such as the elderly or children. Pedestrian crossing points along the alignment are limited to two locations: Orchard Road and the Yan Yean Road and Ironbark Road intersection.

Footpaths along this section of Yan Yean Road are currently present on approximately 25 percent of the alignment and generally only on one side. Sections are typically disconnected, meaning footpath use by pedestrians and / or cyclists is limited by footpath availability. Several additional informal paths are used by pedestrians, cyclists and horse riders.

The northern section of the project area between Jorgensen Avenue and Bridge Inn Road is part of the Principal Bicycle Network (a network of bicycle routes that provide access to major destinations in the Melbourne metropolitan area), providing connectivity north to Arthurs Creek and Yan Yean Reservoir and connecting to the east-west bicycle route along Bridge Inn Road with access to Mernda Station. There are no formal cycling facilities provided either on or adjacent to Yan Yean Road. The narrow width of Yan Yean Road, as well as its highly trafficked nature, is considered likely to discourage on-road cycling. Very few cyclists were observed on Yan Yean Road in traffic surveys and site observations.

7.3.2 Traffic conditions

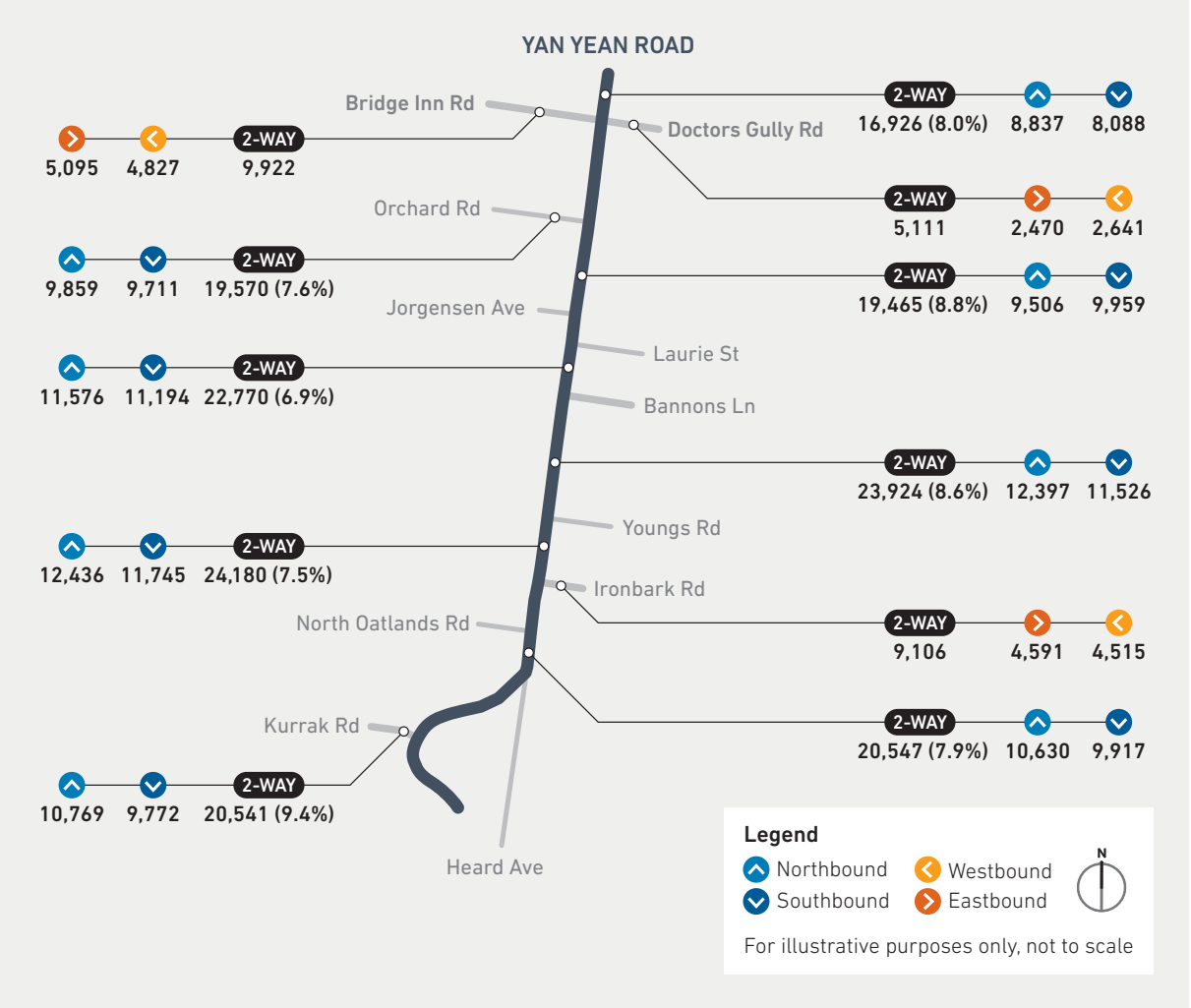
An assessment of the existing traffic conditions was completed to understand how many, and what type of, vehicles currently use Yan Yean Road and how travelling on the road by vehicle is experienced. Further information on how and when the assessment was undertaken can be found in Technical Report A – *Transport Impact Assessment*. This section summarises the key findings of the transport impact assessment.

Yan Yean Road typically carries between 20,000 to 24,000 vehicles per day from Monday through to Friday. Traffic volumes are generally lower on the northern end of Yan Yean Road, steadily increasing further south as traffic from the growing residential areas in the north combines with the traffic from the existing residential areas.

The busiest section of Yan Yean Road is located between Ironbark Road and Youngs Road, with over 24,000 vehicles recorded per weekday. On this section, approximately 7.5 percent of all traffic recorded are heavy vehicles.

Figure 7.2 summarises the daily traffic volumes and heavy vehicle proportions along the Project corridor by direction.

Figure 7.2 Average weekday traffic volumes including heavy vehicle percentages in brackets



During the morning peak period (6.00 am to 9.00 am), southbound travel along Yan Yean Road is dominant when people are heading out to go to work and school. At the observed peak hour, approximately 1,200 vehicles were recorded between 6.00 am and 7.00 am. The key bottleneck for southbound travel in the morning peak period occurs at Ironbark Road where the average vehicle speed drops to approximately 25 kilometres per hour (Figure 7.3). The end of the slow-moving queue observed at this location between 8.00 am and 9.00 am is regularly over one kilometre away at Golf Links Drive and occasionally as far back as Bannons Lane (over 1.5 kilometres away).

During the afternoon peak period (3.00 pm to 7.00 pm), northbound travel along Yan Yean Road is dominant when people are returning from work and school. Between 5.00 pm and 6.00 pm (the observed peak hour), approximately 1,350 vehicles were recorded on Yan Yean Road. The key bottleneck for northbound travel occurs at Bridge Inn Road (Figure 7.4), with observed queues extending back as far as Orchard Road over 900 metres away. Minor delays were also observed at Ironbark Road. Investigations by Nillumbik Shire Council have found that road users avoid bottlenecks at these locations by 'rat running' through local streets.

The average travel time in the project area during the morning peak period in the dominant southbound direction is approximately 10 minutes at an average speed of 35 kilometres per hour. During these trips, motorists experience relatively high delays on this portion of Yan Yean Road (of approximately 4.5 minutes). It is similar for northbound travel in the afternoon peak period.

Variation of the journey time was also assessed to understand the difference between the slowest and fastest journey, which indicates the reliability of traveling by vehicle on the road. This section of Yan Yean Road experiences poor journey reliability, with journey time variation of over 7.5 minutes in the peak travel directions.

The traffic conditions assessment found that Yan Yean Road is currently at, or close to, capacity during the peak periods in the dominant directions of travel.

Yan Yean Road has reduced capacity to respond to disruptive events that may occur on road networks on a daily basis and affect traffic flow. As the existing road is one lane in each direction, it profoundly impairs the ability of the transportation network to guarantee basic mobility services as well as management of emergency situations.

As traffic conditions are forecast to deteriorate substantially in the future, there is a strong likelihood that motorists would consider 'rat-running' through the residential area to the south-west of the Bridge Inn Road intersection to avoid some of the arterial road congestion, with potential safety and amenity impacts in these residential areas.

The traffic conditions assessment found that Yan Yean Road is currently at, or close to, capacity during the peak periods in the dominant directions of travel.

Figure 7.3 Existing network average operating speed during the morning peak period (8.00 am to 9.00 am)

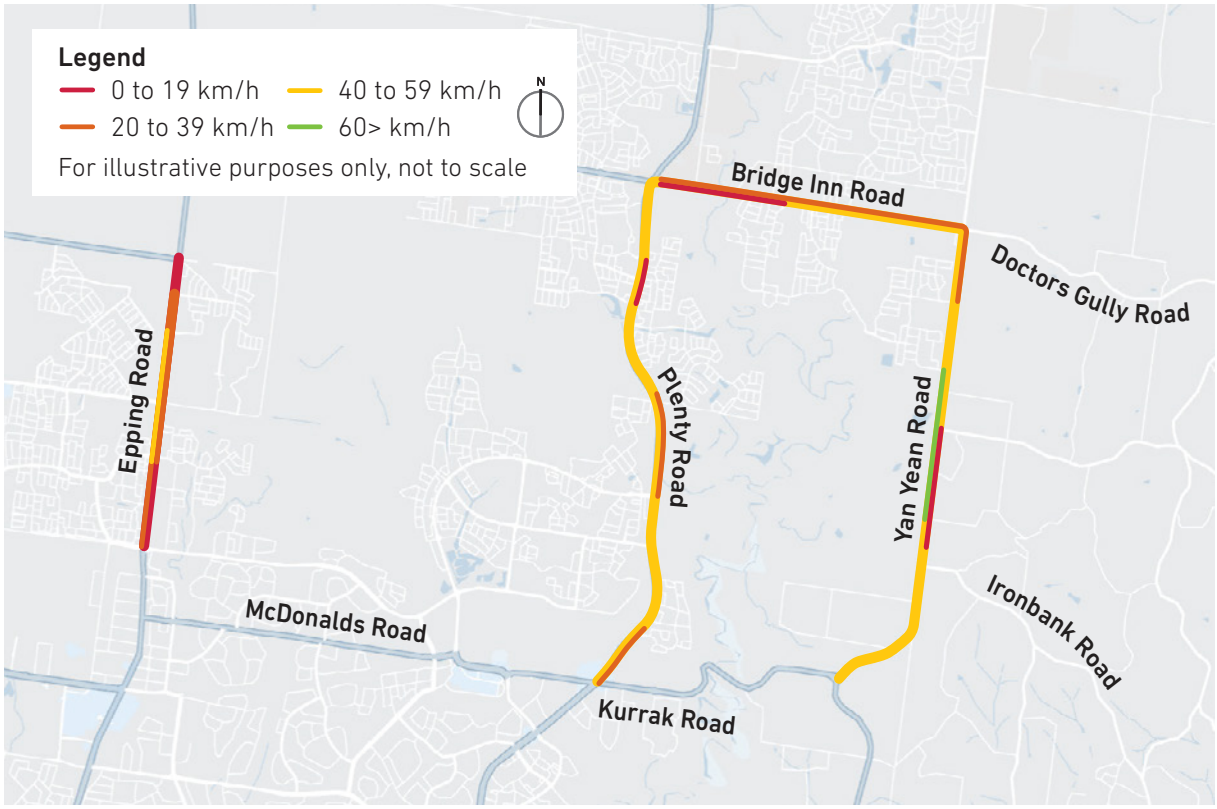
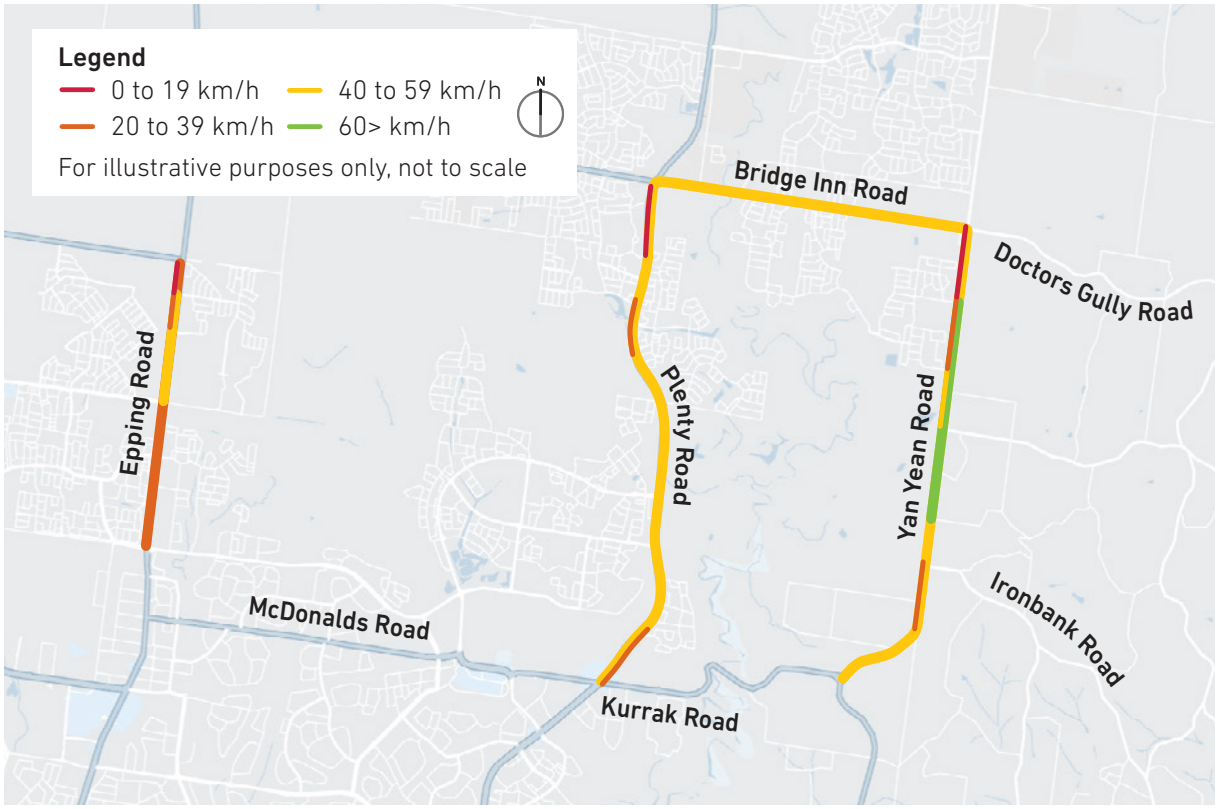


Figure 7.4 Existing network average operating speed during the afternoon peak period (5.00 pm to 6.00 pm)



Analysis of crash statistics from Vic Roads data between 2006 and 2018 found there was an upwards trend in both the number and severity of crashes over this period. Analysis of annual crashes indicates there is an approximate 50 percent increase in the number of crashes per year since 2006. Further analysis of crash statistics between 2014 and 2018 found:

- The majority of crashes (63 percent) occurred at intersections
- The roundabout at the intersection of Yan Yean Road and Kurrak Road was the site of most recorded crashes (five crashes) followed by the roundabout at Bridge Inn Road (four crashes). (It should be noted that the intersection at Kurrak Road was upgraded in 2019 as part of Yan Yean Road Upgrade Stage 1)
- Rear end crashes were the most dominant crash type accounting for 42 percent of all crashes. Rear end crashes are generally considered more prevalent in congested traffic.

In 2015-2016, after a fatal head on collision in 2014, the intersection at Yan Yean Road and Jorgensen Road qualified for upgrade funding under the federal Black Spot Program. The intersection upgrade forms part of this Project.

Intersection performance is based on the average delay per vehicle (in seconds of delay per vehicle) and is summarised using a Level of Service (LoS) criteria (as defined by Austroads 2017). LoS categories range from LoS A, representing excellent conditions with minimal delays, to LoS F, representing oversaturated conditions where the road is over capacity. The following findings were made in the transport impact assessment with regards to existing intersection performance in a 'no Project' scenario:

- Intersections are forecast to operate very poorly in the AM and PM peaks during the 2031 'no Project' scenario, with key intersections (Bridge Inn Road, Orchard Road and Ironbark Road) operating at LoS F
- All priority controlled intersections (those with give way controls) within the project area are expected to perform very poorly (LoS E to LoS F), with road users egressing these residential areas expected to encounter difficulty in finding suitable gaps in traffic along Yan Yean Road.

7.4 Risk assessment

A risk assessment was undertaken in relation to the existing conditions discussed in Section 7.10. For more information on the risk assessment process, refer to Chapter 4 *Environment Effects Statement Assessment Framework* and Attachment III *Environmental Risk Report*. Key risks are defined as those having an initial rating of 'significant' and above and are shown in Table 7.1 below. These risks require management throughout the Project and would be addressed through the EPRs listed in Section 7.14 and the Environmental Management Framework described in Chapter 12.

A discussion of the impact pathways and the likely effectiveness of the proposed EPRs to minimise potential impacts is provided in Section 7.12.

Table 7.1 Key risks

Risk #	Aspect	Impact pathway	Project Phase	Initial rating	EPR #	Residual rating
37, 56	Transport – Road users	Construction activities impede the efficient movement of road traffic including general traffic, emergency services, public transport (i.e. buses).	Earthworks, civils and structures	Significant	EPR T2	Medium

7.5 Impact assessment

This section describes the potential beneficial and adverse impacts on transport capacity and connectivity during the construction, operation and maintenance phases of the Project and appropriate mitigation measures to avoid or otherwise minimise adverse impacts.

The optimisation of the Project design is key to improving the safety, transport capacity and connectivity (including walking and cycling paths) of Yan Yean Road. The design of the Project involves the careful consideration of:

- The interaction of users (road and active users)
- The different modes of travel (vehicles, buses, bicycles, walking)
- The roadway itself (including footpaths and walking and cycling paths).

Improving how these three factors interact provides an optimal road for all users. An optimal road is one that achieves a balance between safety, mobility, reliability, accessibility and amenity.

Key decisions in the development of the Project design have been assessed for this EES, including those features that have an effect on the overall environmental impact of a road. The Project design:

- Chapter 3 *Project Development* describes how the design of the Project has been developed since the need for the Project was identified to the design that is now presented in this EES
- Chapter 5 *Project Description* details the design, construction and operation of the Project Road.

The proposed EPRs aim to address and mitigate the identified risks and adverse impacts of different phases of the Project (see Section 7.14).

The impact assessment identified that the potential impacts could be temporary or permanent, with temporary impacts occurring for a limited time and normally during construction activities or when maintenance is required, and permanent impacts including permanent changes to the road corridor.

7.5.1 Construction

Implementing transport infrastructure projects in constrained transport corridors often results in a level of disruption to access and mobility during construction. Work during the construction phase of the Project has the potential to impact traffic operations and road safety, as demonstrated by the significant risk rating assigned to the impact of construction activities on road users (refer to Section 7.11). Aspects of construction that have been identified as having the greatest potential to result in adverse impacts include construction traffic and temporary closures of the road, pedestrian crossings, footpaths and informal paths.

While the effective implementation of mitigation measures would assist in providing for the efficient and safe operation of the transport network during construction, unavoidable temporary closures and the volume of construction traffic necessary to construct the Project mean there would be residual impacts felt by transport users (both road and active transport). These impacts are mostly associated with changes to existing access arrangements, detours and delays to traffic flow.

These issues would be primarily addressed through the adoption of a Traffic Management Plan (refer to EPR TP2) and the staging of the construction process. The development of measures to further minimise impacts during disruptive activities for the Project would be undertaken in consultation with the appropriate road management authorities: Nillumbik Shire Council and the City of Whittlesea. The construction program for the Project is still being developed; however, a typical construction program for a project of a similar scale would be expected to be about 30 months' duration. Construction of the Project is due to be completed by 2025.

Construction traffic

The types of trips associated with demolition and construction activities include heavy vehicles bringing machinery to site, mobile plant travelling to site, trips made by associated trades, delivery of materials and removal of excavated spoil and debris.

Construction works would generate additional truck movements, increasing traffic activity in areas surrounding the construction work sites – potentially disrupting local traffic and having amenity impacts on nearby residents and businesses. The presence of an onsite construction workforce would likely add to existing traffic activity and parking demand, potentially affecting the operation of the broader transport network on occasions.

The total number of vehicle movements to the construction compounds would depend on:

- How the delivery of materials and plant to site is managed (such as choice of haulage routes)
- Location of laydown areas.

Haulage routes and construction laydown areas have not been formally defined for the Project. Haulage routes would be influenced by the timing of other road projects in the area, and the haulage destination. In terms of laydown areas, the project area has allowed for a site on the western side of Yan Yean Road in close proximity to the Yarrambat Horse and Pony Club, which is currently being used as laydown area by Yarra Valley Water.

The project area also includes a land parcel owned by the Department of Transport at 423-437 Yan Yean Road Yarrambat at the southern extent of the Project. Following the engagement of a contractor, one or more sites that are suitable for this purpose will be identified on the basis of least environmental impact (refer to Figure 5.2 in Chapter 5 *Project Description*).

Amenity impacts (such as noise from construction traffic) are discussed in detail in Chapter 11 *Effects on Physical Environment* and the relevant technical reports listed in Section 11.1 of Chapter 11.

Temporary road and footpath closures

There would be some impacts on the transport network's operations at certain times due to temporary road closures, which would affect road and active transport users. As construction would be staged over the length of the Project construction period, the reduced road capacity would not be along the entire road alignment.

To facilitate operation of the road during construction activities, one lane in each direction would need to be maintained for a majority of the time. However, temporary closure of the road may be required at off-peak times (for example, overnight or on a weekend), particularly when constructing complicated intersections. During off-peak times, congestion would still be expected; however, the level of impact to the local community and general traffic would be lessened due to traffic volumes being lower at these times.

Closures of pedestrian crossings and footpaths (where available) may also be required during the construction period. This has the potential to increase travel distances, resulting in longer journey times for pedestrians. Pedestrian crossing and footpath closures also have the potential to impact safety if alternate facilities cannot be provided to the same standard or if the closures encourage pedestrians to adopt risky behaviour.

The road reserve along Yan Yean Road could be used for temporary construction and laydown areas, temporary site offices, relocation and construction of minor utility installations and traffic diversions. Presence of laydown areas in the road reserve would mean that local access to some properties along Yan Yean Road would need to be altered and carefully managed in consultation with affected property owners, occupiers and users.

Mitigation measures

Two primary mitigation measures to address the identified construction impacts have been identified:

- Construction staging
- Traffic Management Plan.

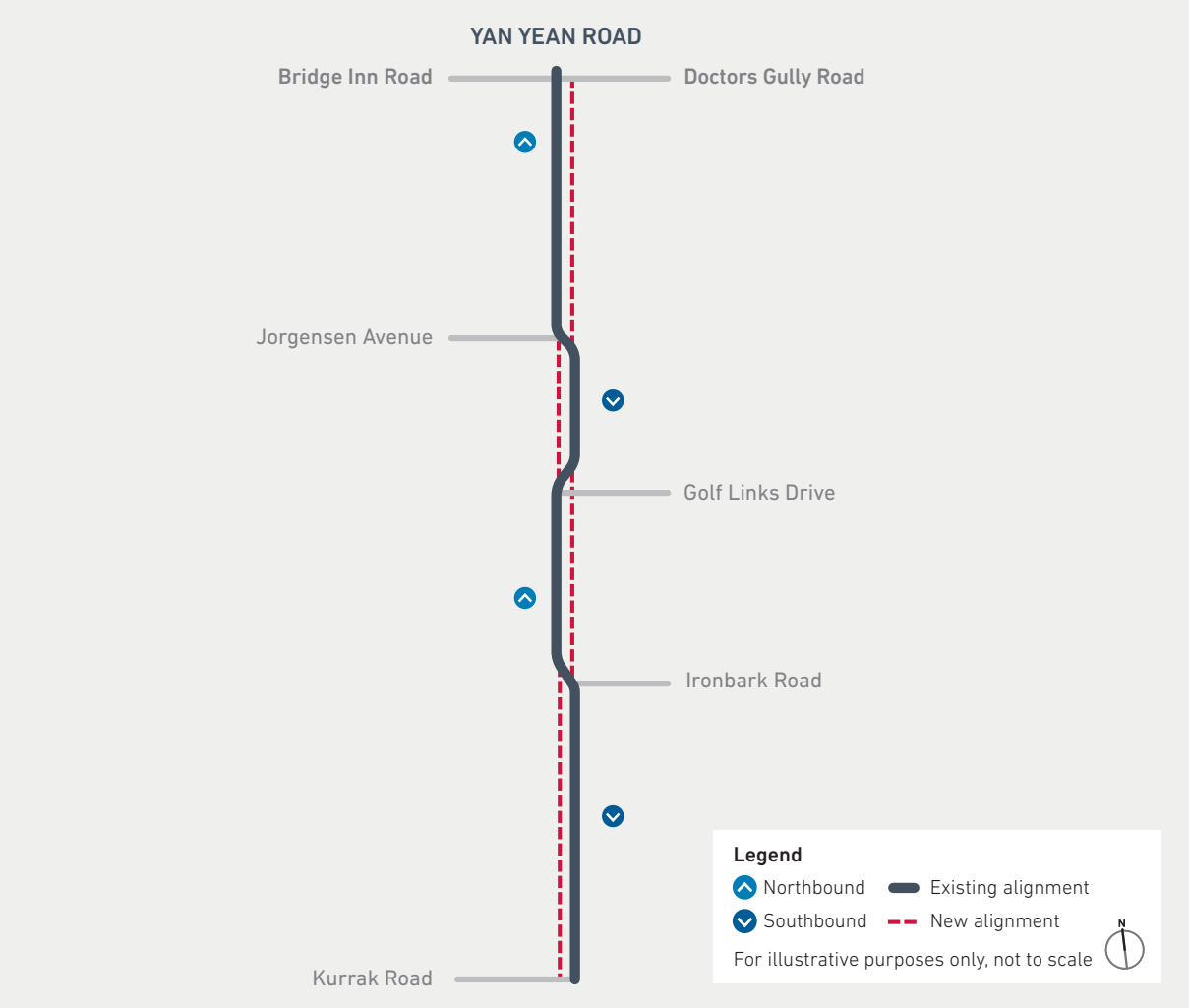
The following sections provide further detail on these measures.

Construction staging

Works would be staged to maintain traffic flow along Yan Yean Road for the majority of the construction program to minimise temporary road and footpath closures and subsequent disruption to the community while providing a safe roadside work environment (refer to EPR TP2). This would be achieved by:

- Constructing as much of the new carriageway as possible offline, while maintaining traffic flow on the existing carriageway (as shown in Figure 7.5)
- Switching all traffic to the second carriageway, while establishing temporary intersection controls as required, to allow for the upgrade of the old carriageway
- Prioritising upgrading intersections, which may be driven by additional staging requirements, to maintain all critical movements during construction.

Figure 7.5 Existing and proposed alignment



Traffic Management Plan

While staging would relieve impacts to traffic flow within the project area, it would result in secondary impacts including:

- Temporary closures (off-peak times) for constructing complicated intersections
- Loss of local direct access at certain key times.

These secondary impacts would be managed through the development and implementation of a Traffic Management Plan (refer to EPR TP2). The Traffic Management Plan would be prepared in consultation with appropriate road management authorities, Shire of Nillumbik and the City of Whittlesea prior to construction.

The main types of measures that would be incorporated into the Traffic Management Plan include:

- A program to minimise and monitor impacts of construction activities to all modes of road and active transport. Where monitoring identifies adverse impacts, practicable mitigation measures would be developed and implemented
- Coordination with and consideration of cumulative impacts of other major infrastructure concurrently under construction in the local area, including the Northern Suburban Roads Upgrade (most specifically Bridge Inn Road Upgrade) and North East Link
- A program to minimise impacts on existing connectivity for public transport and road vehicles during construction
- Implementation of safe construction practices in accordance with WorkSafe and road authority requirements
- Development of suitable measures to maintain access requirements for emergency services at all times, developed through consultation with relevant emergency services
- Route options for construction vehicles (including haulage of spoil and other heavy materials) travelling to and from the Project construction site, recognising sensitive receptors and minimising the use of local streets
- Temporary traffic lights at intersections identified as detour routes (where traffic lights do not currently exist) and/or upgrades to detour routes where required
- Management of any road closures, including provision of diversion routes for vehicles, cyclists and pedestrians to maintain connectivity
- Timing temporary closures, oversized load deliveries and pedestrian disruptions to minimise impacts (for example, at times when traffic volumes are lower, avoiding the weekday peak period or weekends)
- Details of proposed speed zones and provision of construction-related parking, noting that the location of these would depend on the final proposed construction methodology
- A program to maintain and enhance, where practicable, pedestrian (informal and formal routes), cyclist, recreational and other community connectivity during construction by providing, for example:
  - Advance notification of works to encourage cyclists and pedestrians to seek alternate routes
  - Traffic signal modifications to provide additional pedestrian crossing time
  - Provision of temporary pedestrian crossings in close proximity to the existing crossings
  - The development and implementation of signed detour or diversion routes for pedestrians and cyclists, with alternative routes identified that consider use by younger pedestrians and cyclists, including access to schools
  - Scheduling disruptive construction activities outside times where large volumes of pedestrians are expected (such as the weekday peak period or during summer)
  - Informal crossing points for horse riders through consultation with the Pony Club
  - Strategies to maintain key kangaroo crossing points
  - Ongoing consultation with key community groups to notify of impacts
- Provision for safe access points to laydown areas and site compounds
- Provision of convenient and safe access across Yan Yean Road at all bus stops
- Provision for onsite signage for affected properties that provide a service to the local or regional community
- Reinstatement of vehicle, pedestrian and property accesses, if disrupted, as soon as practicable, and to an equivalent standard
- Safe passage for vulnerable road users (young pedestrians and cyclists) to access schools.

A Communications and Stakeholder Engagement Plan (refer to EPR S2) would be developed for the Project. During construction, this plan would include a strategy to communicate traffic management arrangements for the Project, including extensive use of Variable Message Signs and local alerts, and advising affected users, potentially affected users, relevant stakeholders and emergency services, as well as the relevant road authorities of any changes to transport conditions. Advance notice of upcoming disruptions would allow the community to plan ahead.

Key educational and community facilities, including community groups within the Yarrambat Park Precinct and businesses along the alignment and in abutting local streets, would be consulted and informed of temporary road closures and / or disruptions resulting in altered access ahead of proposed works.

More broadly, the combination and timing of road closures during construction could potentially result in a wider redistribution of traffic across the road network. Coordination of detour routes, closure times, signage and communications with other construction projects in the wider road network (such as the Northern Suburban Roads Upgrade and North East Link) would be required through consultation with the Department of Transport, Nillumbik Shire Council and the City of Whittlesea (refer to EPR TP2). In practice, many current users of these roads would adjust their travel patterns by using other transport modes or changing the time of their journeys.

Mitigation measures to address potential amenity impacts (dust and noise generated during construction) are discussed in Chapter 11 *Effects on Physical Environment* and the relevant technical reports listed in Section 11.1 of Chapter 11.

7.5.2 Operation and maintenance

This section considers the benefits and opportunities provided by the road once it is operational, as well as the potential impacts associated with maintenance activities. The design of the Project is a critical element in the successful outcome for road and active transport users. The identified benefits and impacts would affect both road and active transport users and are summarised under the following pathways:

- Safety – which relates to changes in risks to road users and active transport users
- Traffic flow – which relates to changes in traffic volumes and travel speeds and how the road responds to stress during temporary lane closures
- Travel times – which relates to changes in potential travel times road users may experience, including the consistency of travel times and the ability of a road to provide a desired travel time
- Access – which relates to the changes of physical features on the road that would impact on the ease of access to properties and places of interest along the alignment, as well as to key activity centres in surrounding suburbs.

To understand the changes in traffic flow, travel times and access, traffic forecasting was undertaken for a 'no Project' scenario (without Yan Yean Road Upgrade – Stage 2) and 'with Project' scenario (with Yan Yean Road Upgrade – Stage 2) in the future year 2031. The traffic forecasting model takes into account the cumulative travel demand effects of proposed nearby projects (such as the Northern Suburban Roads Upgrade and North East Link) on the Project and the impacts of the Project on other nearby projects. In addition, SIDRA modelling was undertaken to understand intersection delays, based on corridor operational speed and intersection performance.

Overall the Project is expected to bring about the following improvements in transport capacity and connectivity during operation:

- Enhanced safety with the introduction of separate carriageways and controlled intersections
- A forecast increase in operating speed of 20 to 30 kilometres during peak periods
- More efficient intersection performance at all intersections compared to existing performance, with the intersection at Bridge Inn Road operating at a LoS D and all other intersections operating a LoS C (or better) (Transport Impact Assessment, Arcadis / WSP, 2020).

Safety

The Project includes road safety improvements to reduce risk to road and active transport users. All users would benefit from the provision of new street lighting at all intersections, road signage and landscaping. The following section discuss the safety improvements for road users and active users.

Road users

During the design development phase of the Project, Safe System Assessments and road safety audits were carried out to enhance the road safety outcomes of the design. Safe System Assessments are a tool that measures the extent to which a road project aligns with Victoria's Safe Systems design principles, which are based on the development of a road system that is forgiving of driver error and seeks to eliminate fatalities and serious injuries. A road safety audit is a review of the design and site conditions to identify potential road safety issues and opportunities to improve road safety through the design process.

Intersection performance targets were adopted to help guide and inform the Project, representing a reasonable level of operation while ensuring a small amount of spare capacity for growth after 2031. The proposed intersection treatments perform significantly more efficiently than the 'no Project' scenario, with Bridge Inn Road operating within the acceptable range at LoS D and all other intersections operating at LoS C (or better). Intersections are forecast to meet accepted performance targets. Intersection control treatments (such as roundabout or traffic signals) were selected on the basis of outcomes of the performance assessment and to address safety, spatial and operational concerns.

The key design elements of the Project expected to improve safety include:

- Upgrade of a roadway from a single carriageway to a divided carriageway. Divided carriageway roads have a substantially improved road safety record compared to single carriageway road in terms of:
  - Reduction in fatal crashes and injury crashes
  - Added resilience and the ability to absorb and react to adverse events in case of closure to one lane, guaranteeing basic mobility services as well as management of emergency situations
  - Discouraging rat running through the local network
- Upgrade from priority-controlled intersections (give way intersections) to more controlled forms (traffic signals, roundabouts), improving safety for turning movements and, in particular, right turning movements
- Restricting local access to left in / left out movements only, by diverting traffic to U-turning facilities at traffic signals or roundabouts
- Isolating road users from hazards through construction of continuous safety barriers. Kerbside safety barriers protect road users from roadside hazards such as trees and minimise the severity of run-off-road crashes. Median safety barriers reduce the potential for head-on crashes and minimise the severity of crashes if they do occur.

Active users

The following measures would be incorporated to improve safety outcomes for active transport users:

- Provision of a walking and cycling path on the western side and a footpath on the eastern side of Yan Yean Road would improve safety for pedestrians and cyclists, especially for vulnerable users (school aged children and the elderly)
- Bus stops are either indented midblock or would use part of the left turn deceleration lane at intersections, making them safer for both active and public transport users
- Continuous safety barriers would run along the Project's length and are proposed in the median and behind outer kerbs along the mid-block sections of the carriageways, making it safer for road and active transport users
- There is currently only one safe crossing point at the Ironbark Road intersection. The Project would provide safe crossing points at each of the six traffic signals located between North Oatlands Road and Bridge Inn Road. This would provide a safer crossing opportunity for pedestrians and cyclists, reducing the potential for informal and uncontrolled crossing of the road.

Traffic flow

The Project would result in improved traffic flow by improving the handling of higher traffic volumes and increasing travel speeds for users of Yan Yean Road and the surrounding road network.

Changes in traffic volume

Future traffic operations will be affected by the rate of land development, which sees significant growth in traffic volumes forecast for the year 2031 along key north-south routes through the City of Whittlesea, with the soon to be upgraded sections of Epping Road and Plenty Road seeing significant increases in traffic demand. Continued traffic growth is forecast on Yan Yean Road between Kurrak Road and Bridge Inn Road.

Analysis of the origins and destinations of vehicle trips shows that Yan Yean Road is forecast to be used predominately by residents within the surrounding suburbs of Doreen, Mernda and South Morang. The Project corridor provides residents with access to the Metropolitan Ring Road, the future North East Link and employment opportunities at Greensborough, Bundoora and the La Trobe National Employment and Innovation Cluster (NEIC). The Project corridor is also used for access to and from Ironbark Road for its connectivity to Ryans Road, Wattletree Road and the Diamond Creek and Eltham activity centres.

Figure 7.6 shows the impact of the projected growth in the local area on traffic volumes on Yan Yean Road and the surrounding transport network without the Project. As this figure indicates, it is likely that existing congestion levels will be exacerbated and capacity reached for longer periods of the day, meaning that without the Project there is less capacity to accommodate the growth seen on adjacent north-south routes like Plenty Road and Epping Road.

Furthermore, the limited capacity available on Yan Yean Road results in traffic being forced down Plenty Road (which will have been upgraded in the modelled year of 2031) and more rural roads in the Shire of Nillumbik such as Doctors Gully Road, Hurstbridge-Arthurs Creek Road and Heidelberg Kinglake Road.

Figure 7.6 Modelled daily traffic volumes between 2016 and 2031 without the Project

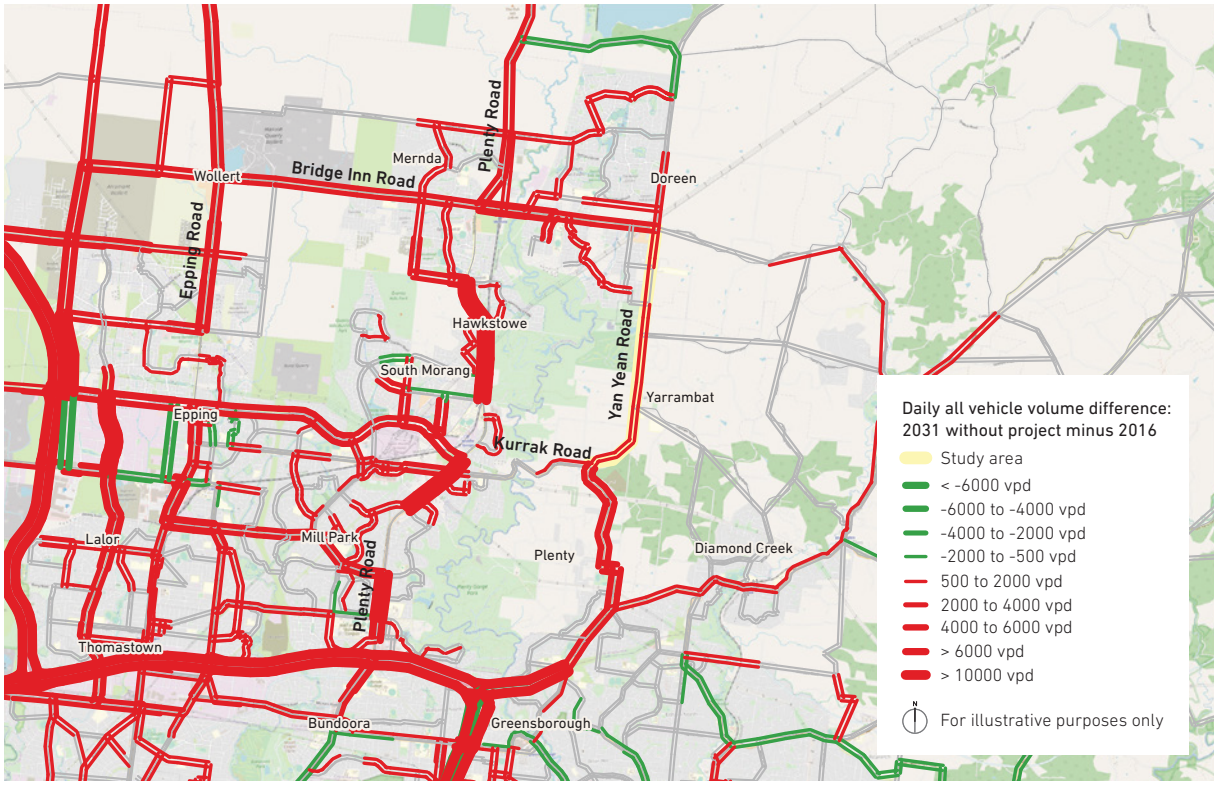
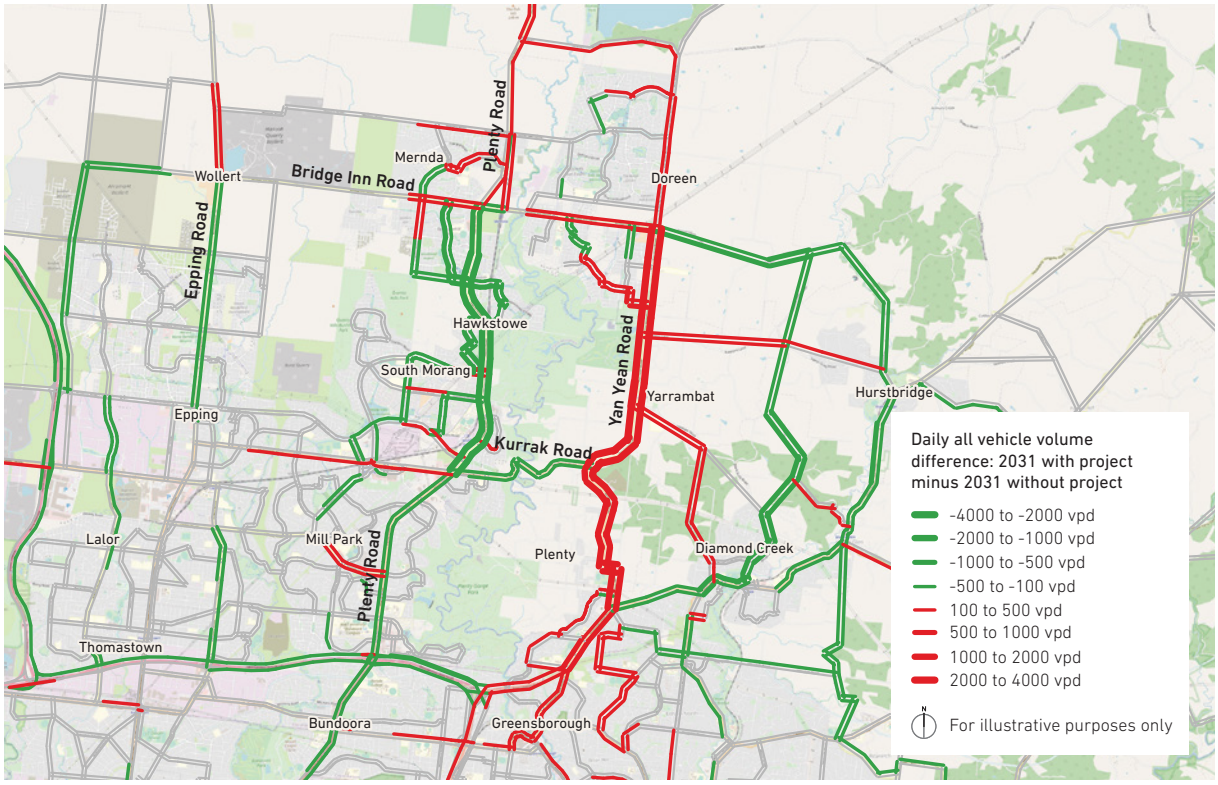


Figure 7.7 shows the modelled daily traffic volumes for the 'no Project' scenario compared to the 'with Project' scenario. The comparison shows that the Project is expected to result in a reduction in traffic along alternate north-south routes. Significant reductions in traffic are also seen beyond the Project corridor along Plenty Road to the west and Doctors Gully Road, Heidelberg-Kinglake Road and Broad Gully Road to the east of the Project as the closest north-south alternatives to Yan Yean Road.

Traffic detouring via Plenty Road and roads to the east for north-south travel in the 'no Project' case, would use Yan Yean Road due to improved capacity and travel speeds, resulting in an increase in traffic volumes along Yan Yean Road with the Project in place. This is further demonstrated in Figure 7.10, Figure 7.11 and Table 7.2.

Figure 7.7 Traffic volumes in 2031 with the Project compared to 2031 with no Project



The duplication of Yan Yean Road will also reduce congestion as a result of increased capacity. The design caters for current traffic volumes and the rapid anticipated growth in the area. SIDRA modelling undertaken for the Project indicates during both peak hour periods, intersection performance is more efficient than without thein a 'no Project' scenario with Bridge Inn Road operating at a LoS D (an improvement from LoS F) and all other intersections operating at a LoS C or better. This modelling takes into consideration the increase in traffic volumes anticipated with the Project in place.

A further comparison of a 2051 scenario was undertaken to understand the likely impact of longer-term population and employment growth (beyond 2031) on traffic volumes. The comparison showed that significant growth in land use adjacent to Yan Yean Road is not expected between 2031 and 2051; as such, the 2031 forecast year can be considered an appropriate forecasting horizon for the Project.

Changes in travel speeds

Network travel speeds for the road network surrounding the Project have been modelled to provide an understanding of the forecast level of congestion expected by the year 2031. The model was developed to include alternative key routes (such as Plenty Road, Epping Road, Bridge Inn Road and Kurrak Road) in proximity to the Project. This is considered important because it demonstrates the ability of the Project to influence traffic movement and speed beyond its alignment.

Figure 7.8 shows the modelled change in travel speed on the arterial road network without the Project in place for the morning peak. Figure 7.9 reflects the travel speed change for the afternoon/evening peak.

Changes in travel speeds are typically influenced by changes in traffic volumes (roads that experience a reduction in traffic show an improvement in travel speeds, while roads with an increase in traffic show a decrease in travel speed). A deterioration in travel speeds is notable along the Project corridor in both directions in the 'no Project' scenario, even with improved capacity on alternative north-south routes.

Figure 7.8 AM peak – Modelled (VITM) change in travel speed between 2016 and 2031 without the Project

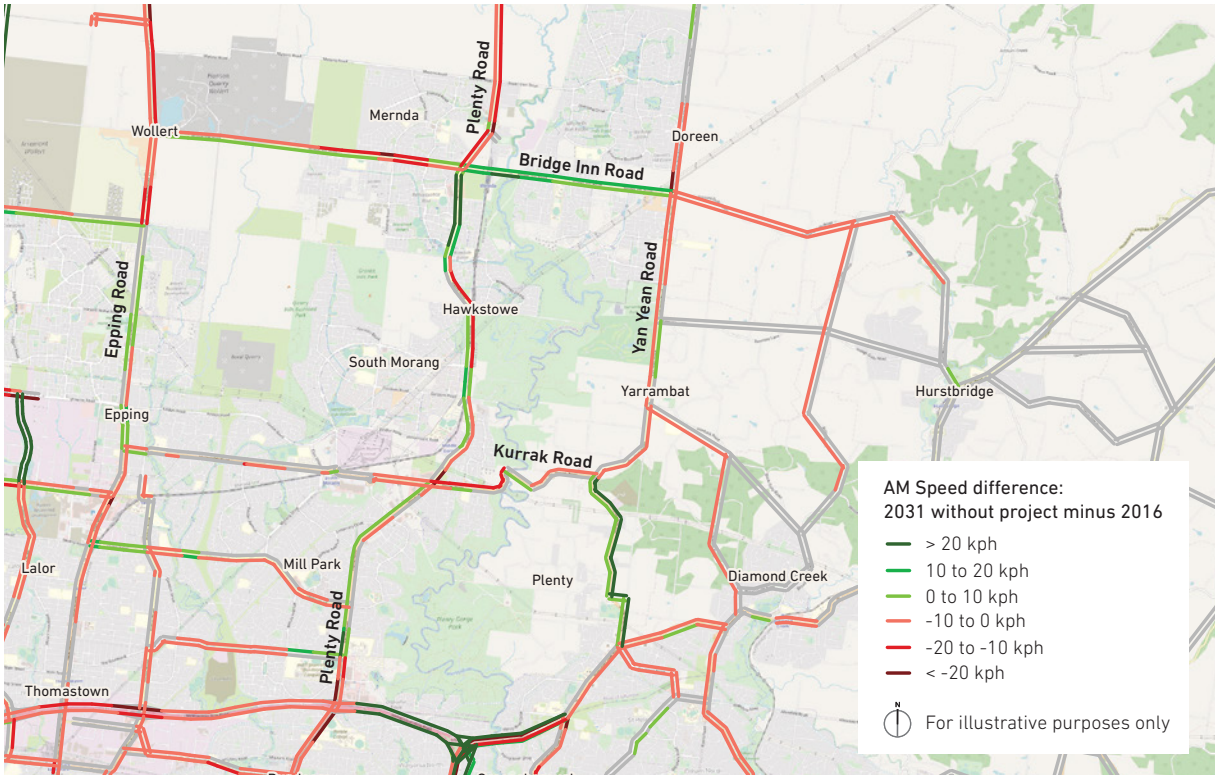


Figure 7.9 PM peak – Modelled (VITM) change in travel speed between 2016 and 2031 without the Project

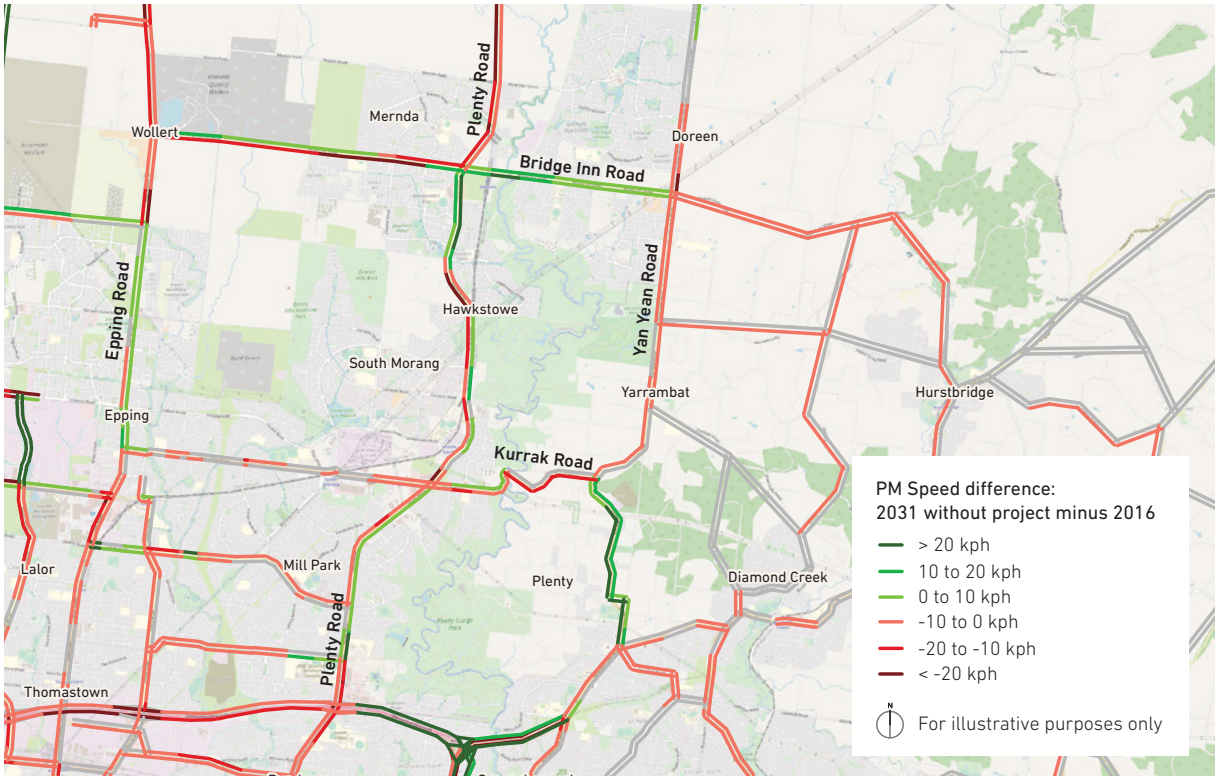
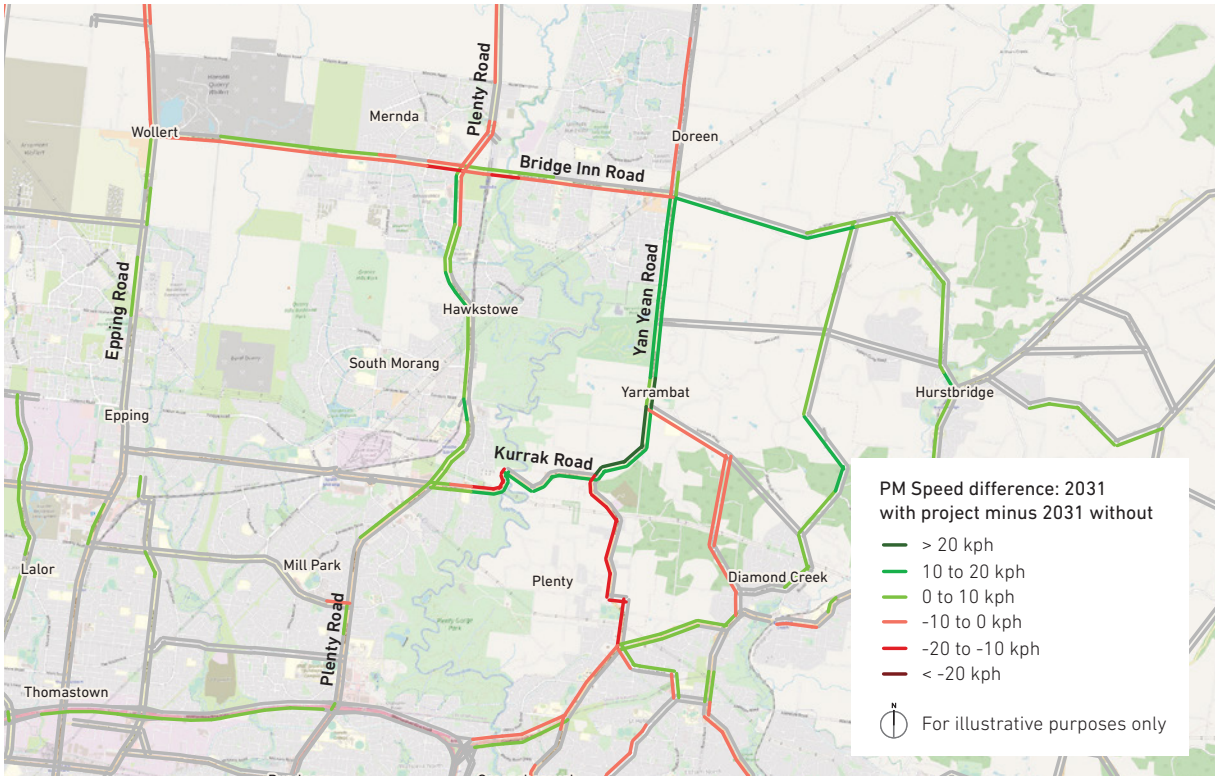


Figure 7.10 and Figure 7.11 illustrate the forecast improvements in travel speeds that are observed on Yan Yean Road and beyond the Project corridor with the Project in place for the morning and afternoon peaks. Average travel speeds for vehicle trips across the local road network are forecast to improve by around two kilometres per hour or six percent in the morning peak and three kilometres per hour or over 10 percent in the afternoon/evening peak.

➔ The Project brings travel speed improvements along key routes through the local network, particularly where traffic volumes are reduced, along with some more moderate reduction in travel speeds where traffic has selected new travel routes to take advantage of the travel time improvements along Yan Yean Road (refer to Technical Report A – *Transport Impact Assessment*).

Figure 7.10 AM Peak – Forecast change in travel speed 2031 with Project compared to 2031 without the Project

Figure 7.11 PM Peak – Forecast change in travel speed 2031 with Project compared to 2031 without the Project



In the 'with Project' scenario, the upgrade provides improved travel speeds despite an increase in traffic, as illustrated in Figure 7.10 (for the morning peak) and Figure 7.11 (for the afternoon peak). Operational modelling along the Project corridor for the year 2031 shows an improvement in the average operating speed in the dominant direction of travel during peak times (both morning and afternoon peaks) of between 20 and 30 kilometres per hour. This is equivalent to an improvement of between 50 percent and 60 percent in travel speeds compared to the no Project forecasts (refer to Technical Report A – *Transport Impact Assessment*).

The average operating speeds during the morning and evening peak periods without the Project (in 2017 and in 2031) and with the Project in 2031 are shown in Table 7.2 below. Traffic performance is expected to deteriorate without the Project, with average travel speeds likely to drop to around 20 kilometres per hour in the dominant direction of travel during peak times. With the Project in place, average travel speeds are forecast to be 10 to 15 kilometres per hour faster in the dominant direction of travel during peak times (in the morning and afternoon peak periods).

Table 7.2 Average operating speeds ('No Project' and 'With Project', AM and PM peak hour)

	AM Average speed			PM Average speed		
Direction	**2017 Survey**	**2031 'No Project'**	**2031 'With Project'**	**2017 Survey**	**2031 'No Project'**	**2031 'With Project**
Northbound	50 km/h	41 km/h	47 km/h	34 km/h	21 km/h	48 km/h
Southbound	30 km/h	18 km/h	43 km/h	52 km/h	26 km/h	49 km/h
Corridor*	-	14 km/h	42 km/h	-	14 km/h	45 km/h

** Corridor estimate based on SIDRA 'network' results, and considers delays on side road*

Network resilience

To understand the resilience and redundancy in the local road network with the Project in place, several scenarios were modelled (in VITM) to simulate an incident (such as a vehicle crash or maintenance works that require lane closure) occurring in the dominant direction of travel during peak times on either Plenty Road or Yan Yean Road.

The results of the modelling indicated that with the Project in place the level of impact on the network due to lane closure on Yan Yean Road is smaller, with some traffic still able to use the single lane available along Yan Yean Road. The number of diversions to other road networks to avoid the incident site is forecast as lower than without the Project in place, substantially limiting the extent of delays and disruptions brought about by the incident. Accordingly, the network can be said to be more resilient to incidents of this nature with the Project in place.

Modelling to simulate an incident occurring on Plenty Road indicates that with the Project the additional capacity available on Yan Yean Road allows traffic to be diverted away from Plenty Road to Yan Yean Road. The network is considered to be more resilient with the Project in place to an incident occurring along Plenty Road that requires a lane closure.

Changes in travel times

Travel time is a measure of the length of time a segment, facility or route can be traversed in a given time period. It is most often reported for a given direction during the peak period and takes into account congestion during peak periods.

Forecast travel times along a series of key arterial routes throughout the local network that are expected to be impacted were compared for the 2031 'with Project' and 'no Project' scenarios. The results show that:

- Travel times along Yan Yean Road are most significantly improved with the Project in place, particularly in the peak southbound direction in the morning peak (forecast travel time saving of approximately 20 minutes when compared to no Project) and northbound direction in the afternoon / evening peak (forecast travel time saving of approximately 14 minutes when compared to no Project), which are forecast to be heavily congested in 2031 without the Project in place. Yan Yean Road sees a moderate improvement of a few minutes in the non-peak travel directions
- Travel times along adjacent routes in Plenty Road and Epping Road are also expected to see improvement with the Project in place, particularly in the peak travel direction
- Small travel time improvements are forecast along Kurrak Road and Bridge Inn Road, as traffic seeks to access Yan Yean Road for north-south travel rather than Plenty Road.

Changes in access

The Project would result in improvements in accessibility to places of interest along the alignment for active transport users and to key activity centres. There would also be other accessibility impacts through an increase in travel distance and time incurred by local traffic, and by limiting (but not removing any) direct property access and local road access to left in and left out traffic movements only; however, these changes would be required to deliver the safety benefits of the Project outlined above and to comply with the access management principles for an arterial road.

Access to key activity centres

Forecast travel time improvements for the year 2031 show that accessibility to each of the key activity centres (Melbourne CBD, LaTrobe National Employment and Innovation Cluster, Greensborough and Eltham) would be improved with the Project in place. The Project corridor would also continue to be used for access to and from Ironbark Road, taking advantage of its connectivity to Ryans Road, Wattletree Road and the Diamond Creek and Eltham activity centres.

Furthermore, public transport would benefit from the increased capacity of Yan Yean Road, providing efficient connections with key activity centres. Under the 'no Project' scenario, there are no upgrades proposed for bus travel and therefore the performance of bus travel is expected to deteriorate as bus travel times are likely to increase significantly. This is particularly the case during the peak periods and in the peak direction travel, with journey times becoming more variable. This is likely to adversely impact bus operations, including timetabling, service frequency and performance objectives.

Bus stop locations have been identified in the design (refer to Attachment VI *Map Book*), with the intent to ease and further improve accessibility. The precise location and form of bus stops, along with bus shelter requirements, would be finalised during detailed design in consultation with Public Transport Victoria (PTV), MRPV and other key stakeholders.

Access along the alignment

The Project removes the high number of uncontrolled right turn opportunities along the corridor through provision of a continuous median safety barrier. Consistent with arterial road access management policies, access movements are redirected to intersections as a safer alternative, lowering the risk of crashes. However, this would result in some users driving a longer distance to safely perform a U-turn to head in the direction of their travel, increasing the length of some local trips.

The provision of U-turn facilities is key for safe access to adjacent land and local roads. Signalised intersections provide opportunities for passenger cars to perform safe U-turns, while roundabouts are more suitable for rigid and articulated vehicles (such as semi-trailers and horse floats).

Pedestrian and cycle network

The provision of a new 5.5 kilometre separated shared walking and cycling path on the west side on Yan Yean Road, a footpath on the east side and safe crossing points via new signalised intersections would improve accessibility to places of interest for active transport modes. Currently, access points for active transport users are limited, sporadic and generally of a poor quality.

These new paths and crossing points would improve access to bus stops along the alignment and to places of interest such as Yarrambat Primary School, the Plenty Valley Christian College, Yarrambat Park and Yarrambat Horse and Pony Club, Werther Park, Plenty Gorge Park Reserve and Doreen Recreation Reserve, which is consistent with State and local policy objectives.

In particular, the walking and cycling path at Werther Park and at some locations adjacent to Yarrambat Park has been designed to minimise tree loss and link up with the existing path network. South of Werther Park, the walking and cycling path provides direct access to Yarrambat Park and the Plenty Gorge Park Reserve to the west.

Social access concerns

This section considers possible concerns and perceptions of local residents with regards to the following proposed changes:

- Permanent change of access to some properties
- Change in local access to adjacent businesses, residential properties and key locations, which includes the impact on horse floats and trailers leaving and entering Yarrambat Park
- B-double truck and larger vehicles U-turn points
- Traffic flow due to the number of intersections along the road.

There would be permanent changes to access for some properties, as discussed in Chapter 10 *Effects on Land Uses, Businesses and Social Assets,* due to land acquisition that includes linear portions of property driveways directly fronting onto Yan Yean Road. Re-establishment of affected driveways onto Yan Yean Road or an adjacent road would be provided and U-turn facilities or service roads would ensure no resultant loss in access and a limited increase in difficulty of access.

Changes in the current access arrangements as a result of safety improvements (such as the removal of right turn access due to centre median safety barriers) would result in some users driving a longer distance to safely U-turn to head in the direction of their travel and increasing the length of some local trips. In some instances, this has potential to alter travel behaviours, with some users perceiving greater convenience in continuing to travel straight ahead to access facilities and services rather than turning around at a U-turn point to access facilities or services that may be closer. The greatest distance between U-turn facilities for a car along Yan Yean Road would be 980 metres, meaning no car would need to travel further than one kilometre to access a U-turn opportunity.

It would be slightly further, up to 1.5 kilometres, between U-turn opportunities for large vehicles (as they require more space to perform a U-turn ,which is only available at certain locations along the alignment). For instance, for heavy and/or large vehicles (such as horse floats) travelling southbound on Yan Yean Road to access Yarrambat Park a U-turn would need to be performed 1.5 kilometres past the entrance to Yarrambat Park at Youngs Road.

Restricting U-turn movements at controlled intersections would result in overall safer access movements on Yan Yean Road. Installing midblock U-turn facilities or U-turn facilities for large vehicles at controlled intersections were considered to increase the amount of U-turn opportunities; however, the greater spatial requirements were not considered to achieve a positive balance of impacts and benefits when taking into account the additional land acquisition and environmental impacts.

There is a concern that intersections would become congested with drivers making right-hand turns filling up the turn lane and spilling out into through traffic and that this would impede the movement of road users. Drivers turning right have to wait for oncoming traffic. Drivers behind the queue of turning vehicles have to wait for it to clear before going through the intersection. In busy areas, for example around shopping centre developments or businesses, this can create long backups and driver frustration.

The operational modelling tool for intersections showed that during both 2031 peak hour periods, all intersections in the project area perform significantly more efficiently than the 'no Project' scenario, with Bridge Inn Road operating within the acceptable range and all other intersections meeting performance targets.

Maintenance

Comprehensive maintenance is essential to preserve the infrastructure (road, shared walking and cycling paths) in its originally constructed condition, protect adjacent resources and user safety, and provide efficient, convenient travel along the route.

Maintenance of the infrastructure would be undertaken by the Department of Transport or local Councils where agreed, in accordance with existing requirements (refer to EPR EMF5).

Maintenance works must be carried out in ways that aim to ensure the safety of road workers, road users and active transport users, as well as minimising delays and inconvenience to traffic.

Mitigation measures

Overall the Project would deliver significantly more transport benefits to the local community for both road and active transport users than adverse impacts. While the Project design provides the greatest opportunity to mitigate impacts on transport and traffic, additional measures would include:

- Preparation of a detailed and targeted Communications and Stakeholder Engagement plan (refer to EPR S2) that details a strategy to build awareness of the Project among residents and local communities, including its drivers and objectives, and beneficial outcomes for the community. The plan would provide a single point of contact for the affected local community and an avenue to provide feedback on both the construction and consultation approaches
- Ongoing and continuous consultation with the relevant stakeholders such as Councils, road authorities, landowners / occupiers and businesses during all key stages of the Project, including the initial period of the operational phase (refer to EPR S2)
- Where required, maintaining the visibility of uses (such as businesses) by appropriate measures such as signage on site that is visible to passing traffic (refer to EPR S2)
- Liaison with emergency services, including Yarrambat CFA, to provide notification well in advance of any planned disruptions during the operation phase and provide a nominated point of contact should any concerns arise (refer EPR S2)
- Maintaining 24-hour access for all emergency services (refer EPR S2)
- Retaining horse riding access wherever possible so that local communities have access to safe and convenient active modes of transport, particularly between residential areas and service centres such as the Yarrambat township and major recreational hubs such as Yarrambat Public Golf Course and Yarrambat Park (refer to EPR TP1)
- Liaison with Public Transport Victoria and local bus companies to minimise impacts to timetables and existing routes and bus stops, and investigate opportunities to enhance existing infrastructure (refer to EPR S2)
- Carrying out a traffic analysis during detailed design development to demonstrate design performance under forecast demands (refer to EPR TP1)
- Undertaking appropriate mitigation measures to address potential amenity impacts, as detailed in Chapter 11 *Effects on Physical Environment*
- Undertaking appropriate mitigation measures to address social impacts resulting from permanent change of access to some properties, as discussed in Chapter 10 *Effects on Land Uses, Businesses and Social Assets.*

There are further opportunities to improve the Project in the next stages of the detailed design process, which includes design of road furniture such as bus stops and walkways (refer to EPR TP1).

7.6 Consistency with transport and urban plans

This section outlines how the Project aligns with key transport and urban plans.

7.6.1 Movement and Place Framework

Victoria's Movement and Place Framework is an approach to designing roads and streets that considers them as more than just movement corridors to get people from A to B. The framework seeks to ensure that projects are planned and developed to balance the needs of both transport users and place users, recognising the tension between these two uses and their competing interests for limited road space. The framework considers network-wide, strategic outcomes alongside local aspirations, and aims to identify priority uses, performance measures and potential options for different road and street types.

A high level Movement and Place assessment concluded that the Project 'strongly addresses' the following key issues:

- Traffic congestion along Yan Yean Road results in delays to all road users including general traffic, buses and freight
- Poor road safety outcomes
- Lack of cycling infrastructure along Yan Yean Road does not support the use of active transport along the corridor.

The assessment did note that the Project reduces access to residential land users through the implementation of left in and left out turning controls. On balance, this was assessed to align with access requirements as regular U-turn facilities would be provided.

7.6.2 Victorian Cycling Strategy

The Victorian Cycling Strategy 2018-2028 was developed by the State government to provide a framework for increasing the number, frequency and diversity of Victorians cycling for transport. It has two overarching goals:

- Investing in a safer, lower-stress, better-connected network, prioritising strategic cycling corridors
- Making cycling a more inclusive experience.

The Project proposes a new walking and cycling path on the west side of Yan Yean Road, which is expected to promote active transport through the corridor for commuting and recreational activities and provide safer access for younger users travelling to school.

Yan Yean Road, between Bridge Inn Road and Jorgensen Avenue, is part of the Principal Bicycle Network. It provides connectivity north to Arthurs Creek and Yan Yean Reservoir and connects to the east-west running Principal Bicycle Network along Bridge Inn Road with access to Mernda Station. The proposed walking and cycling path would fill in the existing gap in the Principal Bicycle Network.

7.6.3 Plan Melbourne

Plan Melbourne 2017-2050 is the metropolitan planning strategy to manage Melbourne's growth and development through integrating long-term land use, infrastructure and transport planning. A key outcome of Plan Melbourne is that "*Melbourne has an integrated transport system that connects people to jobs and services and goods to market*".

Of particular relevance to the Project, Plan Melbourne seeks improvements to arterial road connections and improved efficiency of the motorway network, as well as better transport infrastructure in newer suburbs.

The Project provides improved connectivity for cyclists and pedestrians with a new walking and cycling path in addition to the capacity improvement it provides for road traffic. The Project directly serves the rapidly expanding suburbs of Doreen, Plenty and Yarrambat, as well as the wider City of Whittlesea, which is one of the fastest growing municipalities in Melbourne.

For details on the response of the Project to applicable legislation and additional transport and urban plans, refer to Chapter 2 *Project Rationale*, Chapter 10 *Effects on Land Uses, Businesses and Social Assets* and Attachment II *Legislation and Policy*.

7.7 Environmental Performance Requirements

This EES includes an Environmental Management Framework (refer to Chapter 12 *Environmental Management Framework*) which provides a transparent and integrated framework for managing environmental risk for the Project. It contains Environmental Performance Requirements (EPRs), which set the environmental outcomes that must be achieved during the design, construction and operation of the Project.

Initial EPRs for the Project were prepared to inform the environmental risk assessment. This performance-based approach defines the legislative requirements, standards, limits and processes that the Project must meet, while still providing flexibility to accommodate minor modifications during the detailed design process – provided the outcomes specified in the EPRs are achieved.

These initial EPRs were based on standard requirements and measures that are typically incorporated into construction contracts for road projects. In developing the EPRs, the following hierarchy of control was used to identify potential mitigation and management measures:

- Avoidance through design refinements
- Minimisation through timing of the activities
- Mitigation or management through physical/engineering controls
- Mitigation or management through operational controls
- Induction, training and awareness
- Monitoring and measurement
- Adaptive management and contingency protocols.

EPRs relevant to transport capacity and connectivity have been grouped by Evaluation Objective and are shown in Table 7.3.

Table 7.3 Environmental Performance Requirements

Performance objective	Applicable legislation	Impact pathway	EPR number	Environmental Performance Requirement	Project phase
Effects on transport capacity and connectivity – To provide for an effective corridor through the northern outer suburbs of Melbourne, to improve travel efficiency, road safety, and capacity					
Transport (active users and road users) To provide for an effective corridor through the northern outer suburbs of Melbourne, to improve travel efficiency, road safety, and capacity	*Transport Integration Act 2010* *Road Management Act 2004* *Planning and Environment Act 1987*	Design layout and inefficient operation of the road impedes the movement of active users, including pedestrians, cyclists and horse riders	TP1	**Optimise design for active and road users** Optimise the design in consultation with appropriate road management authorities, Shire of Nillumbik and City of Whittlesea to: • Minimise adverse impact on travel times for all transport modes, including walking and cycling • Maintain, and where practicable, enhance the traffic movements at intersections within the project area • Design the road, walking and cycling elements and other recreation activities to meet relevant road and transport authority requirements • Where existing traffic movements are altered by the Project, ensure that alternative movements are incorporated into the design • Maintain, and where practicable, enhance pedestrian movements, horse rider access, bicycle connectivity, and walking and cycling paths, including access to public open space and reserves.	Design and operation

Performance objective	Applicable legislation	Impact pathway	EPR number	Environmental Performance Requirement	Project phase
Continued: As above	**Continued:** As above	Construction activities impede the efficient movement of active users, including pedestrians, cyclists and horse riders.	TP2	**Traffic Management Plan** The Project should be constructed in stages to minimise impact on road users and prior to commencement of relevant works, a Traffic Management Plan (TMP) must be developed and implemented to minimise disruption during construction in accordance with AS1742.3-2009 and in consultation with relevant authorities including Department of Transport, Shire of Nillumbik and City of Whittlesea. The TMP will clearly outline measures to: • Minimise road closures, access restrictions and disruption to all road users, public transport users and active users, including pedestrians, cyclists and horse riders • Minimise impacts on local streets such as from 'rat running' during construction closures • Provide for safe construction practices in accordance with road authority requirements • Provide alternative routes for affected road users, public transport users and active users where practicable • Maintain property accesses during construction where practicable or provide alternative access • Potential routes for construction haulage and construction vehicles travelling to and from the project, recognising sensitive receptors and avoiding the use of local streets where practicable • Maintain community safety through appropriate measures such as providing convenient and safe access across Yan Yean Road at all bus stops, activity nodes and places of community significance • Suitable measures, developed in consultation with emergency services, to ensure emergency service access is not inhibited as a result of project construction activities • Ensure affected community is notified in advance (in accordance with EPR S2) of changed traffic conditions.	Construction

Performance objective	Applicable legislation	Impact pathway	EPR number	Environmental Performance Requirement	Project phase
Environmental Management Framework To provide a transparent framework with clear accountabilities for managing and monitoring the environmental effects associated with the Project	Not applicable	Relevant for all impact pathways across the Project.	EMF5	**Operation and maintenance** Any potential impacts during operation and maintenance will be managed in accordance with the Department of Transport's environmental management system and standards for managing declared roads in Victoria.	Operation and maintenance

Performance objective	Applicable legislation	Impact pathway	EPR number	Environmental Performance Requirement	Project phase
Social To avoid where possible, and otherwise minimise adverse effects on social and cultural values, and maximise the enhancement of these values where opportunities exist	*Planning and Environment Act 1987* *Land Acquisition and Compensation Act 1986*	Potential impacts on social and cultural values such as community, educational, religious or recreational facilities due to changes to access or amenity	S2	**Implement a Communications and Stakeholder Engagement Plan** Prior to construction, develop and implement a Communications and Stakeholder Engagement Plan to engage and consult the community and affected stakeholders and discuss progress of construction activities. The Communications and Stakeholder Engagement Plan must include measures to: • Identify a process for identifying community issues and the recording, management and resolution of complaints from affected stakeholders including business owners, community service providers, education providers, public and active transport key user groups and residents, consistent with Australian Standard AS/NZS 10002:2014 Guidelines for Complaint Management in Organisations • Communicate and engage with the community and potentially affected stakeholders in relation to: – Construction activities including temporary works and impacts that may affect the community, businesses or individual stakeholders (e.g. dust, noise, vibration and light) and relevant mitigation – Changes to transport conditions and relevant mitigation (e.g. road closures, detours) • Ensure that communities are notified of construction and changes well in advance of works commencing as approved by MRPV • Ensure that the consultation program includes provision for onsite signage of affected properties that provide a service to the local or regional community • Continue consultation with people affected by the relocation of memorials • Outline the timing of works that will affect particular local areas, to be updated to reflect current and anticipated conditions • Communicate incidents and emergencies, including notification methods and timeframes in the event of a major incident or overrun • Ensure the workforce has appropriate community awareness and sensitivity • Implement innovative communications tools and methods to enhance the Project's ability to effectively communicate and engage with the community and stakeholders including best available technology in addition to conventional means • Make provision for a 24-hour phone number to be available to the community to report concerns.	Design and construction

7.8 Conclusion

This chapter summarised the findings of the technical assessments that have been undertaken to determine the Project's impacts on the transport capacity and connectivity.

Yan Yean Road is presently operating beyond its carrying capacity and there has been an increase in the number of crashes (recorded between 2006 and 2018) and rear end crashes which are commonly associated with congestion The ongoing expansion of the suburbs in the area has significantly increased demands for transport, creating a disparity between the rate of residential development and the provision of adequate road infrastructure. Traffic forecasting suggests the existing congestion will become significantly worse if not addressed, highlighting the need for the Project within the context of these changes.

Added to these safety and capacity issues of the road corridor, Yan Yean Road lacks appropriate infrastructure to support active and public transport, which has led to low levels of walking, cycling and public transport use. Overall, this represents a safety risk for road users, pedestrians, cyclists and horse-riders and creates constrained social connectedness for locals, especially vulnerable road users such as the elderly or children.

The outcome of the technical assessment indicated that the impacts rated as significant for the Project are likely to result from temporary closures and increased traffic during the construction phase, which has the potential to impact on access to businesses and properties as well as public land adjacent to Yan Yean Road.

The operation of the Project would result in improvements in transport capacity and connectivity. This is due to the safety, efficiency and greater connectivity benefits generated by the Project. The impact assessment found that the Project is consistent with Evaluation Objective 4.1 *To provide for an effective corridor through the northern outer suburbs of Melbourne, to improve travel efficiency, road safety, and capacity* as it provides the following benefits and opportunities not only within the project area but also to key arterial roads in the wider network:

- Upgrading intersections, controlling turning movements and minimising conflict points within the project area, which would improve safety of the intersections
- Improving and controlling the number of access points to properties within the project area by reducing conflict points and improving sight and stopping distances
- Providing additional capacity to cater for additional traffic across the local network, which would significantly improve speeds and travel times on Yan Yean Road, and bring speed improvements on other key north-south routes in the network study area. Once the Project is constructed, improvement in average operating speed in the dominant direction of travel during peak times of between 20 and 30 kilometres per hour are forecast along Yan Yean Road for 2031
- Improving amenity and safety for active transport modes through provision of a new 5.5 kilometre walking and cycling path, encouraging active travel through the corridor
- Enhancing accessibility to key activity and employment centres including Melbourne CBD, La Trobe National Employment and Innovation Cluster and Greensborough and Eltham activity centres for residents of the growing communities adjacent to Yan Yean Road
- Building additional resilience into the local road network by limiting the scale of traffic impacts occurring if capacity reduction occurs on Yan Yean Road and Plenty Road due to roadworks, breakdowns or other incidents.

The recommended Environmental Performance Requirements developed for the Project would minimise impacts during construction through the development and implementation of a detailed Traffic Management Plan, which would minimise access restrictions and disruption to all road and active transport users.

The plan would include measures such as providing detour routes for affected users, maintaining property accesses, adhering to safe construction practices, developing plans for haulage routes for construction equipment and materials and where possible, scheduling these movements to occur at times that minimise impacts on other road users. Works would also be staged to maintain traffic flow along Yan Yean Road for the majority of the construction program.

Therefore, the Project is considered to respond the EES Scoping Requirements relevant to the effects on transport capacity and connectivity by:

- Identifying the potential adverse environmental effects in all key aspects using a risk-based approach
- Proposing a comprehensive environmental management approach including appropriate performance measures to avoid, otherwise minimise and mitigate adverse environmental impacts.

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