Appendix K
Transport Assessment
Project case report

February 2018

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Executive summary

This transport assessment is an appendix to the North East Link Business Case. It provides an assessment of the changes in transport conditions in 2036 across the north east of Melbourne as a result of the North East Link project (the project). Comparisons within this report are made between the 2036 project and no project scenarios.

Overview

North East Link is a proposed 11 km fully managed motorway between the Eastern Freeway in Bulleen and the M80 in Greensborough, completing the missing link in Melbourne's orbital network. The link will form part of a continuous ring road around Melbourne, passing through Altona in the west, Greensborough in the north, Ringwood in the east, and Frankston in the south-east.

The project includes an upgrade of the Eastern Freeway to a managed motorway with additional lanes between Springvale Road and Chandler Highway as well as an upgrade of the M80 between Plenty Road and the Greensborough Bypass.

The Doncaster Busway will be constructed along the Eastern Freeway as part of the North East Link project. This will be a dedicated bus-only carriageway, mostly within the existing shoulders on the northern side of the Eastern Freeway, between Hoddle Street and Doncaster Road to allow buses to travel along the Eastern Freeway separated from general traffic.

Key findings

The assessment has found that North East Link will assist in reducing congestion on roads across the north-east of Melbourne. It provides a new crossing under the Yarra River, bypassing up to 18 sets of traffic signals between the Eastern Freeway and the M80, reducing travel times by up to 30 minutes in the peak periods. This improved journey assists in removing heavy vehicles from residential roads, with decreases of up to 75 percent on residential roads such as Rosanna Road.

The transport assessment has found the following:

- North East Link will reduce the travel time for a journey from the Eastern Freeway (Doncaster Road) to the M80 (Plenty Road) by up to 30 minutes when using the project. For vehicles that prefer to continue using the arterial road network, traffic volume reductions on these roads will mean journeys will also be up to 15 minutes faster.
- North East Link will operate as an orbital link, with the majority of vehicles forecast to travel to and from the eastern sections of the Eastern Freeway.
- The alignment of North East Link maximises access to business, households and freight with improved connectivity to centres such as La Trobe, Greensborough, Box Hill and Doncaster.
- North East Link will not result in a significant mode shift from public transport to private vehicles. Daily public transport trips are predicted to decrease by less than one percent due to the introduction of the project.
- Daily traffic volumes are predicted to decrease across the majority of roads within the north-east with reductions of up 11,000 vehicles per day on Rosanna Road, 14,000 vehicles per day on Fitzsimons Lane, 32,000 vehicles per day on Greensborough Road and 9,000 vehicles a day on Banksia Street.

- The Eastern Freeway will be upgraded to address existing performance issues as well as accommodating traffic accessing North East Link. The upgrades will include the conversion to a fully managed motorway with ramp signals and overhead lane management and additional lanes between Hoddle Street and Springvale Road. Traffic flow will be optimised by separating traffic into an express carriageway and North East Link bound carriageway via a collector-distributor and mainline carriageway arrangement between Burke Road and Tram Road. The Doncaster Busway will be constructed along the Eastern Freeway, providing a dedicated bus-only carriageway between Doncaster Road and Hoddle Street.
- Travel times for general traffic along the Eastern Freeway are predicted to improve by up to 40 percent between Springvale Road and Hoddle Street, while bus travel times are predicted to improve by up to 30 percent between Doncaster Road and Hoddle Street.
- There will be 15,000 fewer trucks each day on arterial roads in the north east, with a reduction of 200,000 kilometres travelled by trucks on residential roads within the north east.
- Over-height and placarded vehicles will be able to utilise North East Link between the M80 and Lower Plenty Road taking these trucks away from schools and residential communities. South of Lower Plenty Road, these vehicles will continue to use Rosanna Road and Bulleen Road. However, these vehicles typically represent less than one percent of total vehicles travelling within the north-east.
- Key walking and cycling improvements include the completion of a north-south path parallel to the North East Link alignment between the M80 and the Eastern Freeway and construction of the North East Bicycle Corridor – a new shared use path along the Eastern Freeway from Chandler Highway to Merri Creek.

1 Introduction

North East Link is a proposed new road link between the Eastern Freeway and the M80 Ring Road (M80) in Melbourne's north eastern suburbs. The purpose of this report is to assist the development of the business case and to document the future transport conditions of Melbourne's north east in a 'with project' scenario. This report assesses the expected performance of the transport network in 2036 if the North East Link project was completed.

1.1 Study area

This report focuses on two geographical areas:

- The wider metropolitan Melbourne
- The local area (henceforth referred to as the study area).

Metropolitan Melbourne

The metropolitan Melbourne area comprises the road network within the Melbourne Statistical Division (MSD), presented in Figure 1. Infrastructure projects of Metropolitan scale such as the North East Link project have the potential to impact the broader transport network, and will generally influence network-wide statistics such as vehicle kilometres travelled (VKT) and average vehicle speeds.

Local area

The study area focuses on Melbourne's north eastern suburbs, spanning from the Merri Creek in the west, to Melbourne's outer fringes in the north and east. The study area is presented in Figure 2. This extent covers a wide area between the Eastern Freeway in the south and the M80 in the north.

While the metropolitan Melbourne assessment focuses on whole-of-network statistics, the local area assessment explores issues related to the arterial and freeway road network, public transport routes and walking and cycling in the area.

Figure 1 Melbourne Statistical Division

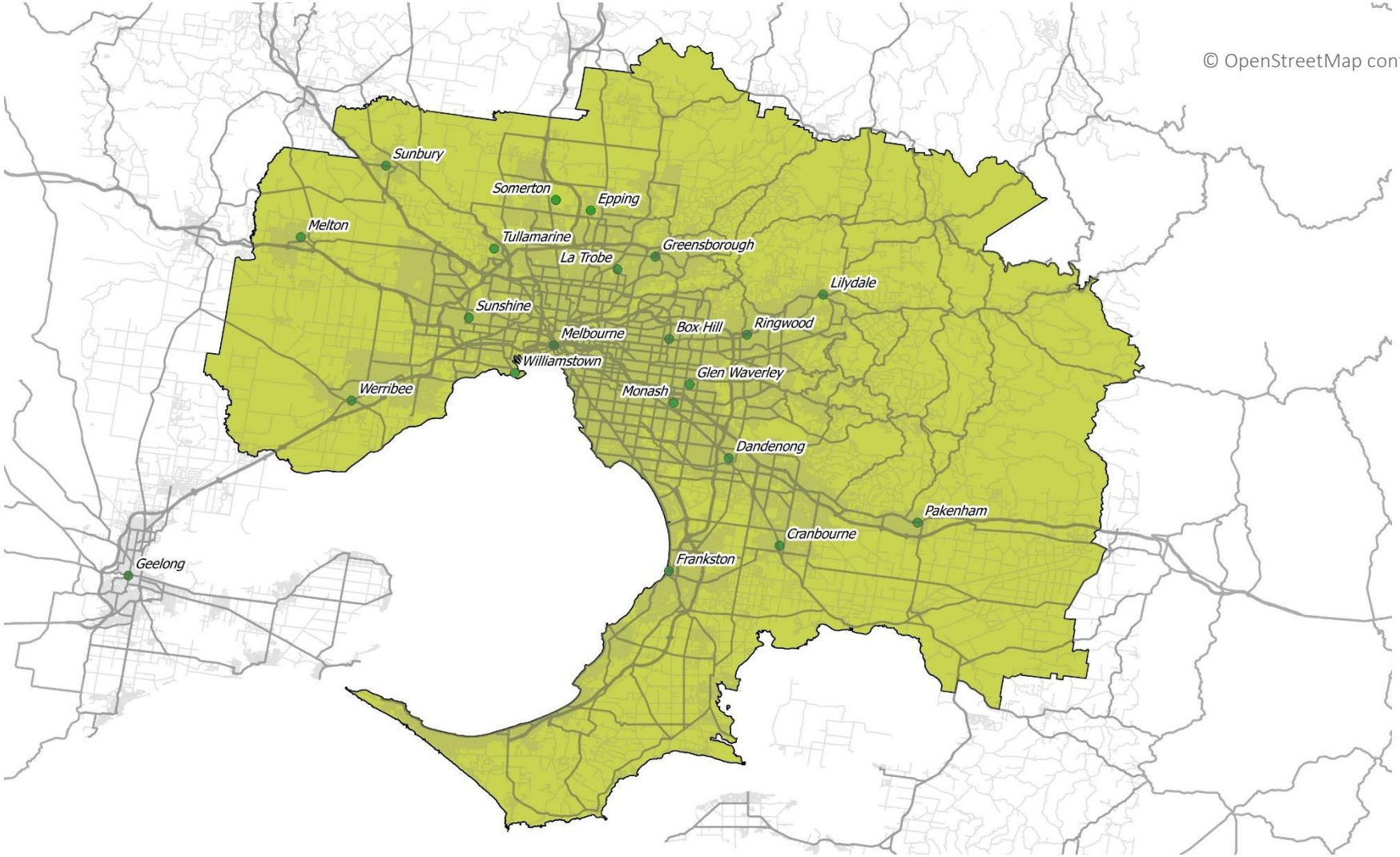
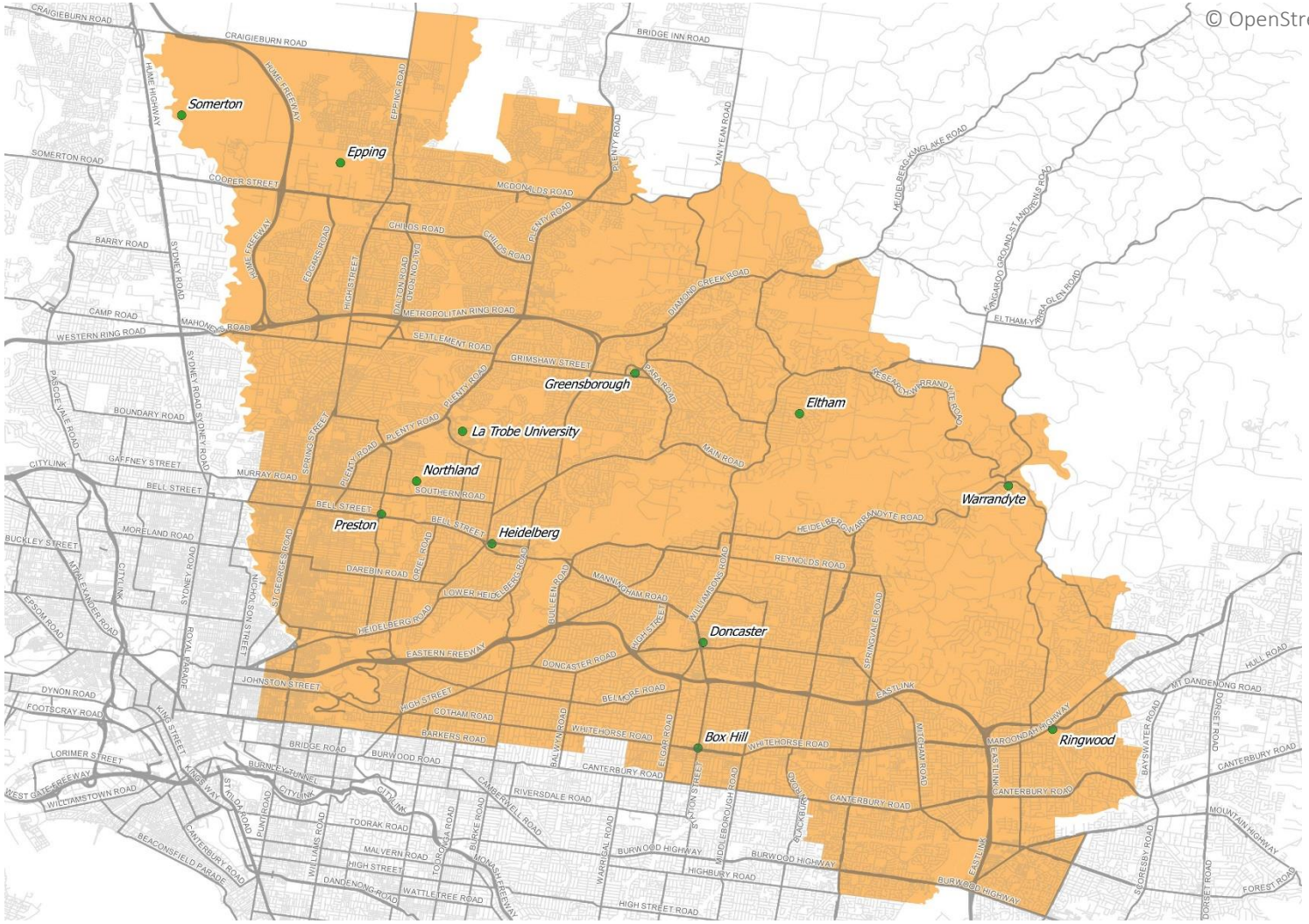


Figure 2 Study Area



1.2 Structure of this report

This report is structured as follows:

- Chapter 2 summarises the North East Link project scope
- Chapter 3 explains how North East Link completes Melbourne's orbital freeway network
- Chapter 4 explains the potential for North East Link to reduce congestion on the arterial road network in Melbourne's north east
- Chapter 5 analyses the ability to for North East Link to take trucks off residential arterial roads
- Chapter 6 analyses the travel time benefits of using North East Link as well as the benefits to the rest of the road network, and the improved accessibility to jobs and services in the north east
- Chapter 7 explains how North East Link improves network redundancy and provides route choice for various trips across metropolitan Melbourne
- Chapter 8 summarises the benefits of managed motorway technology on the new and upgraded sections of freeway
- Chapter 9 summarises the proposed Doncaster Busway on the Eastern Freeway
- Chapter 10 summarises the potential for North East Link to provide upgraded walking and cycling facilities across the north east of Melbourne.

Note that this report assesses the recommended alignment and the proposed scope of North East Link. For a summary of the options assessment and a comparison against other potential alignments, refer to Appendix D of the North East Link business case.

2 North East Link

2.1 Project Overview

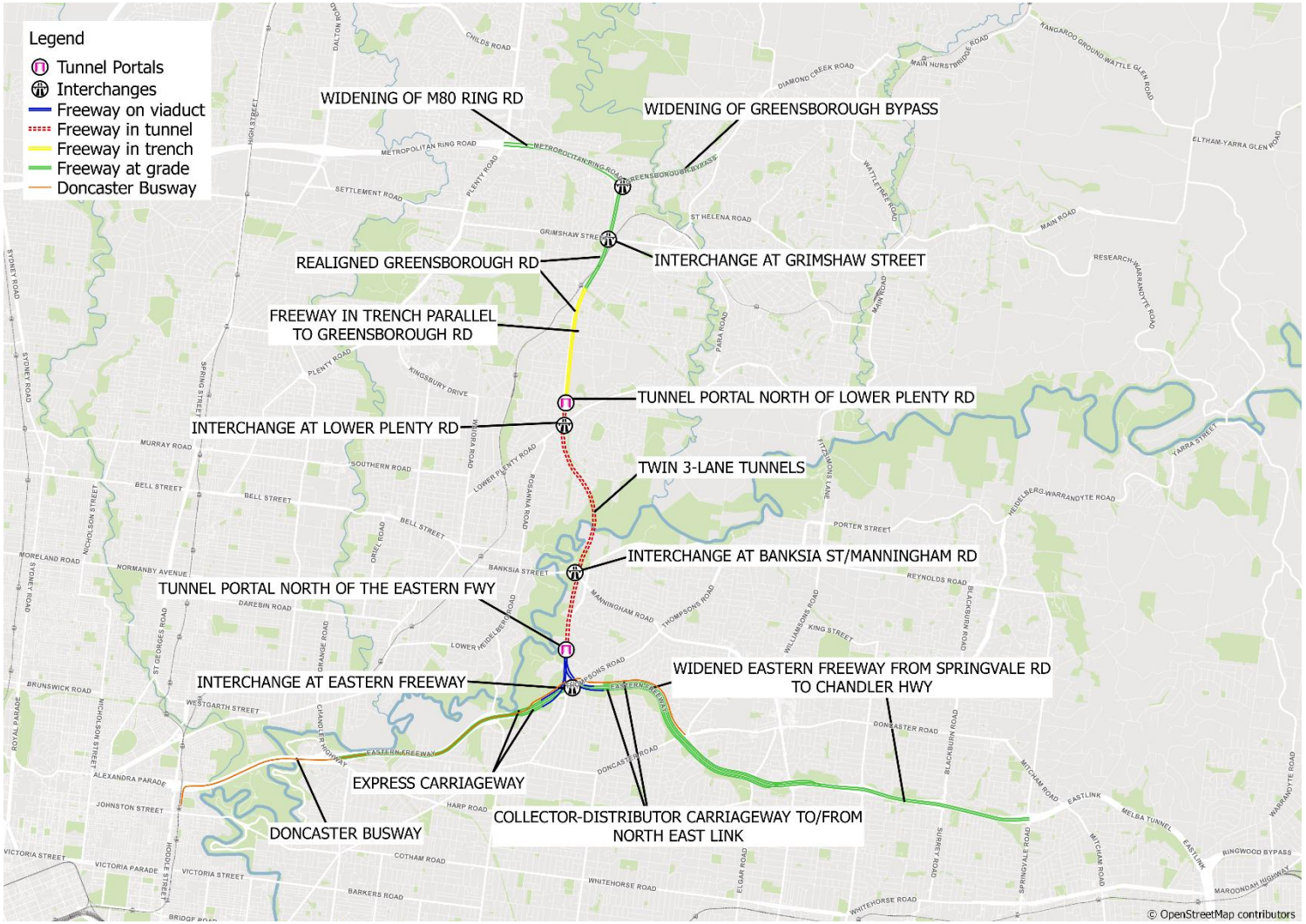
North East Link is a proposed 11 km fully managed motorway between the Eastern Freeway in Bulleen and the M80 in Watsonia, completing the missing link in Melbourne's orbital network. The link will form part of a continuous ring road around Melbourne, passing through Altona in the west, Greensborough in the north, Ringwood in the east, and Frankston in the south-east.

Broadly, the North East Link project involves:

- A new freeway between the Eastern Freeway and M80 with interchanges at the Eastern Freeway (at Bulleen Road), Manningham Road, Lower Plenty Road, Grimshaw Street and the M80 (at Greensborough Bypass)
- An upgrade of the Eastern Freeway to a managed motorway with additional lanes between Springvale Road and Chandler Highway
- An upgrade of the M80 between Plenty Road and the Greensborough Bypass
- A new Doncaster Busway system consisting of dedicated bus lanes and bus priority treatments on the Eastern Freeway
- An improved walking and cycling network across the north east.

A summary of the road alignment and other core works that will be constructed as part of the project are presented in Figure 3.

Figure 3 North East Link alignment and core additional works

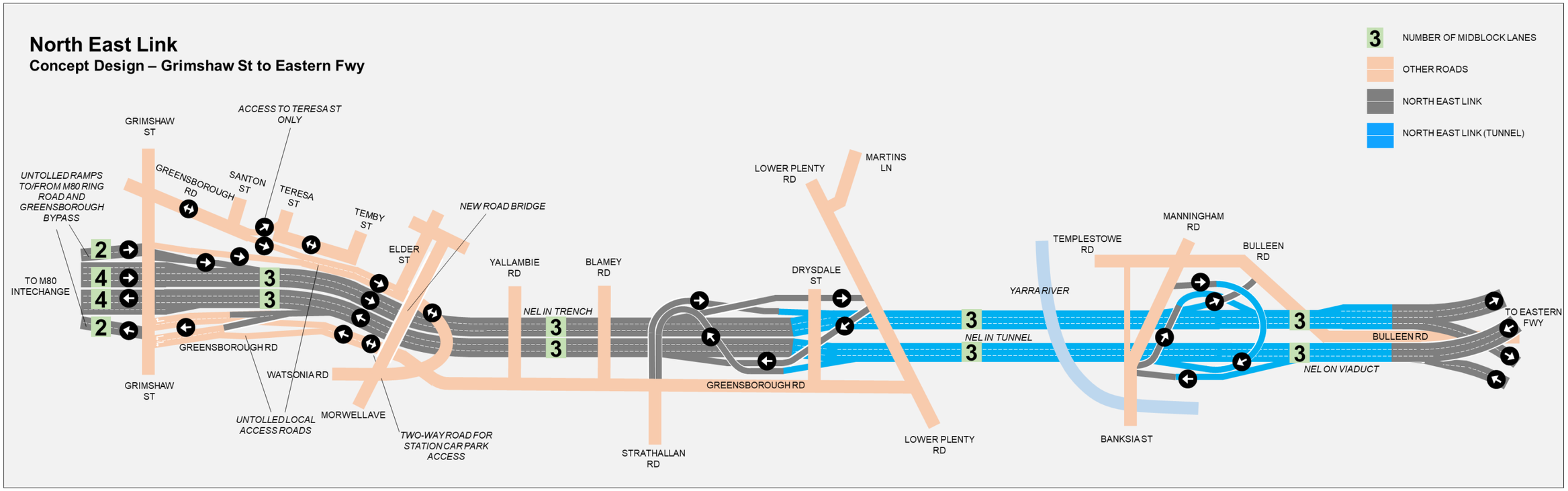


2.2 New link between the M3 and M80

The new freeway link between the M3 (Eastern Freeway) and the M80 is presented in Figure 4 overleaf. A summary of the proposed scope is as follows:

- Ramps connecting North East Link to the Eastern Freeway allowing travel east and west on the Eastern Freeway
- Twin 3 lane tunnels with a southern tunnel portal north of the Eastern Freeway next to Bulleen Road, running north-south under the Yarra River, and a northern tunnel portal north of Lower Plenty Road
- A grade separated interchange at Manningham Road
- A grade separated interchange at Lower Plenty Road
- A lowered freeway in a trench parallel to Greensborough Road
- Realignment of Greensborough Road either side of North East Link near Watsonia Station to allow for non-tolled existing movements and local access
- A grade separated interchange at Grimshaw Street
- A grade separated connection to the M80 allowing travel east on the Greensborough Bypass and west on the M80
- Grade separation of Drysdale Street, Yallambie Road, Blamey Road, Elder Street and Kempston Street either over or under North East Link.

Figure 4 North East Link between the Eastern Freeway and M80

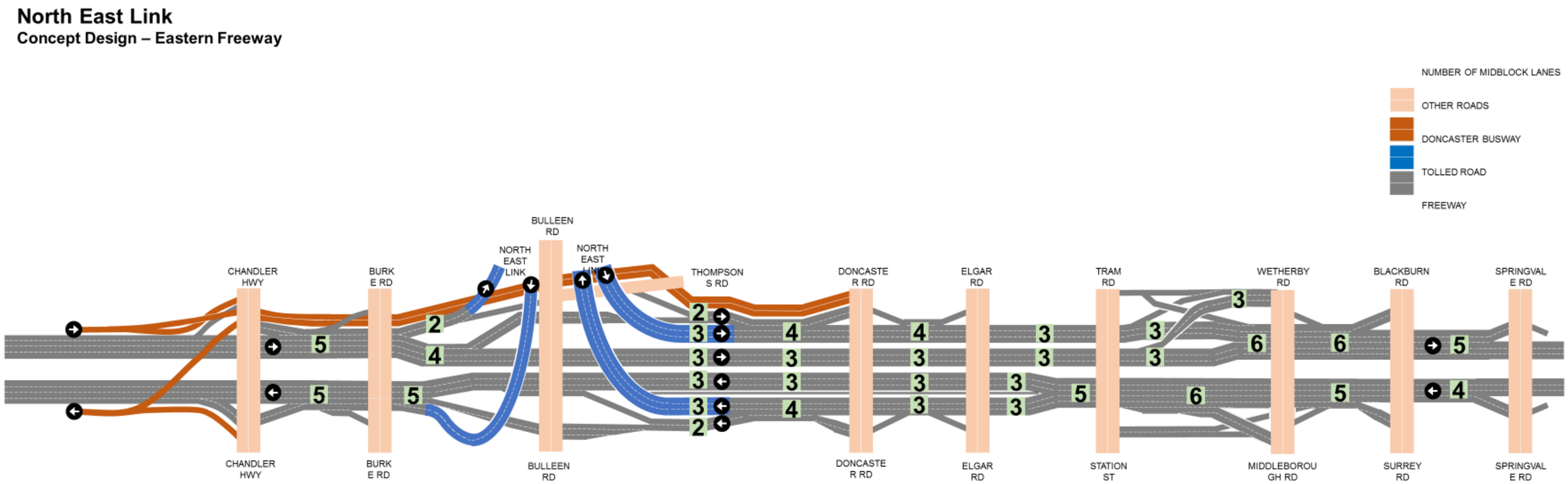


2.3 Eastern Freeway and the Doncaster Busway

North East Link will include the upgrade and modernisation of 15 kilometres of the Eastern Freeway between Springvale Road and Chandler Highway. The upgraded freeway is presented in Figure 5 and is as follows:

- Modernisation of the freeway to a fully managed motorway including ramp metering, lane use management signs (LUMS), incident detection, variable message signs (VMS) and improved closed-circuit television (CCTV) coverage
- Additional lanes will be provided between Springvale Road and Chandler Highway including separation of traffic into an express carriageway and North East Link bound carriageway via a collector-distributor and mainline carriageway arrangement between Burke Road and Tram Road
- A new Doncaster Busway system – a dedicated bus-only carriageway mostly within the freeway shoulder between Hoddle Street and Doncaster Road to allow buses to travel along the Eastern Freeway separated from general traffic
- Ramp connections between the Eastern Freeway and North East Link over Bulleen Road
- Upgrading of the structures along Eastern Freeway to cater for heavy vehicles.

Figure 5 Eastern Freeway upgrade

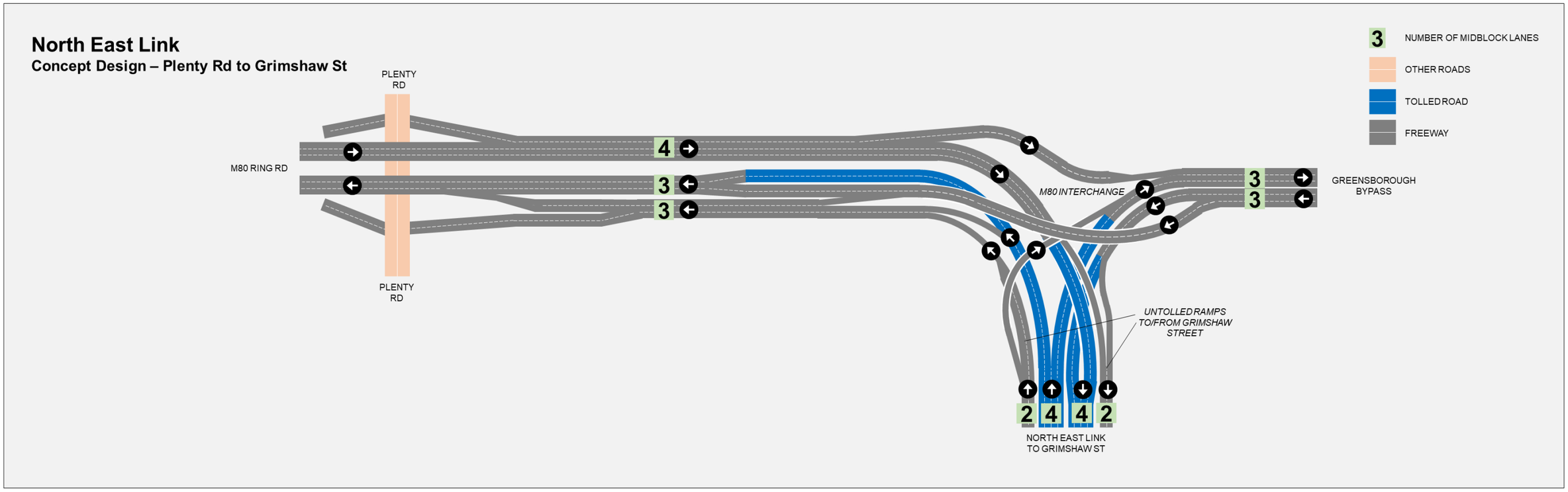


2.4 M80 and Greensborough Bypass upgrade

North East Link will require the upgrade of the Greensborough Bypass and M80 interchange and the widening of the M80. The upgraded freeway is presented in Figure 6 and is as follows:

- An upgrade of the Greensborough Bypass between Grimshaw Street and the M80 including Ramp connections either side of North East Link between Grimshaw Street and the M80 to maintain existing non-tolled access;
- An upgrade of the M80 Interchange to a fully grade separate freeway standard interchange;
- Additional capacity on the M80 between the M80 Interchange and Plenty Road; and
- Additional capacity on the Greensborough Bypass between the M80 Interchange and the Diamond Creek Road roundabout.

Figure 6 M80 and interchange upgrade



2.5 Walking and cycling

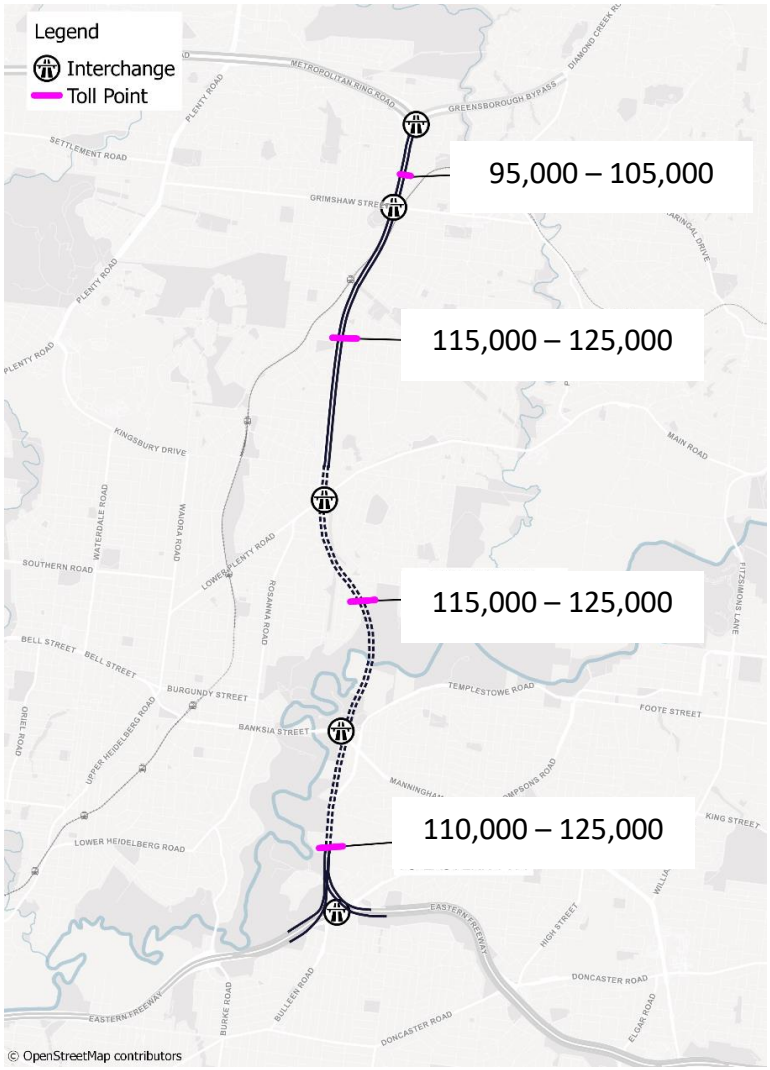
North East Link also provides the opportunity to provide new walking and cycling connections throughout the north east, improving accessibility to activity centres in line with Plan Melbourne's 20-minute neighbourhood concept and completes missing links in the Strategic Cycling Corridor network.

Key walking and cycling improvements are the completion of a north-south path parallel to the North East Link alignment between the M80 and the Eastern Freeway and construction of the North East Bicycle Corridor – a new shared use path along the Eastern Freeway from Chandler Highway to Merri Creek.

2.6 Traffic on North East Link

North East Link is estimated to carry up to 125,000 vehicles per day by 2036 (10 years after opening) as presented in Figure 7. Traffic is split roughly 60 percent southbound and 40 percent northbound during the AM peak, and reversed in the PM peak, and evenly split during the inter-peak and off-peak periods. Traffic volumes are discussed further in Section 3.

Figure 7 Traffic volumes on North East Link (2036 weekday volumes)



Of the traffic travelling southbound on North East Link from the M80, 45 to 55 percent of this traffic is expected to travel the full corridor towards the Eastern Freeway. The majority of this traffic is then expected to continue east on Eastern Freeway.

2.7 Tolling

North East Link will be a tolled road, with a toll structure designed to encourage and optimise use during all times of the day, including periods of lower demand. For more details refer to Appendix M1 – Strategic Tolling Report.

The tolling strategy for the project has not been fully developed as yet. However, it is likely that it will be of a similar level to the CityLink and EastLink toll prices. It is proposed to apply a 20 percent discount outside the morning and evening peak periods to optimise use during the middle of the day and at night. A flagfall toll will form part of the tolling structure to encourage shorter trips to use the arterial road network which is better suited for these trip patterns.

Arterial road alternatives to the tolled route will also be retained along the length of the corridor as North East Link will complement, not replace existing roads; trips between the Eastern Freeway and M80 will still be able to be completed via the arterial road network. For example, trips between Grimshaw Street and the M80 can use a non-tolled carriageway, and trips between Lower Plenty Road and Grimshaw Street can still be completed by the parallel Greensborough Road.

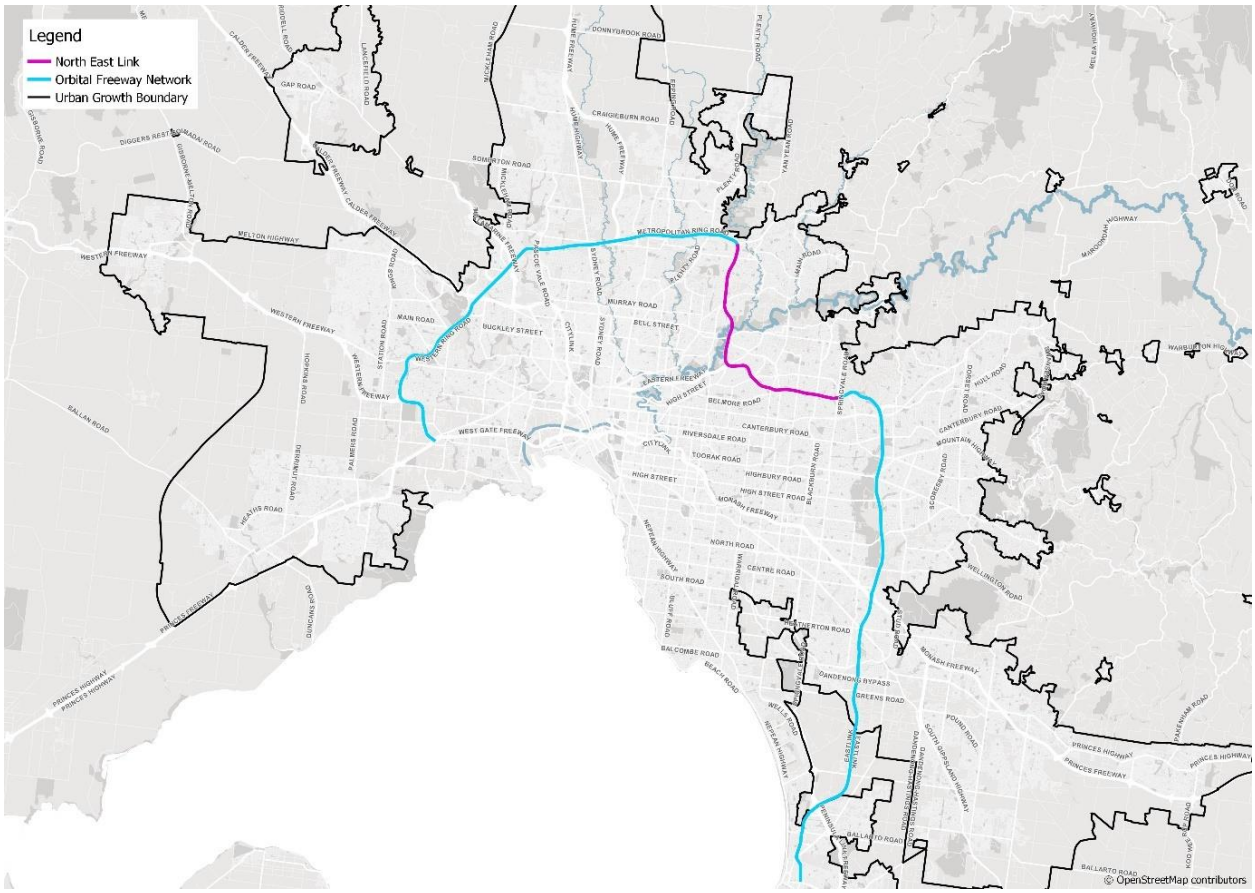
3 An orbital link to complement the existing network

3.1 Completing the orbital network

North East Link completes the missing link in Melbourne's orbital freeway network, as presented in Figure 8. The road, along with the upgraded Eastern Freeway will connect EastLink to the M80, creating a continuous freeway standard orbital road around Melbourne between Frankston in the south and Altona in the west via Ringwood, Greensborough and Tullamarine.

This missing link completes nearly 30 years of investment in the orbital network, allowing the full benefits of these earlier investments to be realised. This means the existing orbital network will be better utilised as orbital journeys are diverted away from the radial freeway network and the arterial road network and onto these orbital links. For example, a trip between Frankston and Tullamarine may be completed via EastLink, the Eastern Freeway, North East Link and the M80, whereas previously this trip would almost certainly have been via the M1 and Tullamarine Freeway.

Figure 8 Melbourne's completed orbital network

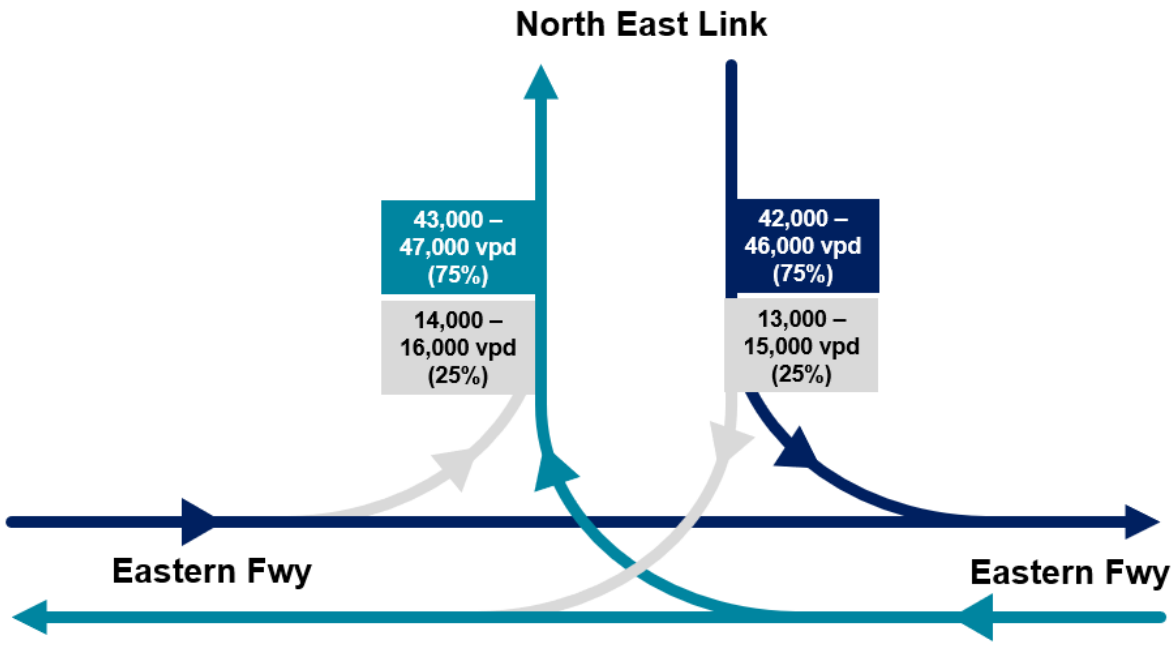


3.2 An orbital road, not a radial city access road

North East Link will be an orbital link in the wider road network, not a radial freeway moving vehicles between the north east and the CBD. The vast majority of vehicles on North East Link are expected to travel to and from the eastern sections of the Eastern Freeway as presented in Figure 9. Approximately three quarters of vehicles on North East Link will travel to or from the eastern end of the Eastern Freeway (towards Ringwood and EastLink).

This does not mean that the remaining 25 percent of trips that are from the western end of the Eastern Freeway are necessarily all accessing the inner city. A high proportion of these trips from the west of North East Link are also orbital trips originating from areas such as Kew or Balwyn, accessing North East Link from Chandler Highway.

Figure 9 Traffic volume splits at the Eastern Freeway – North East Link interchange



Ramps between North East Link and the eastern section of the Eastern Freeway will be a free-flow connection, while ramps to and from the city end of the Eastern Freeway will be controlled by ramp signals. This further reinforces the priority given to the orbital route between North East Link and the south-east.

3.3 Maximising access to population and employment centres

North East Link's alignment and interchanges place it within close proximity to a number of major population and employment centres. The road (including the widened Eastern Freeway) provides improved accessibility to Box Hill, Doncaster, Greensborough and the La Trobe National Employment and Innovation Cluster, as presented in Figure 10. The route maximises access for businesses, households and freight, with efficient connections to the arterial road network.

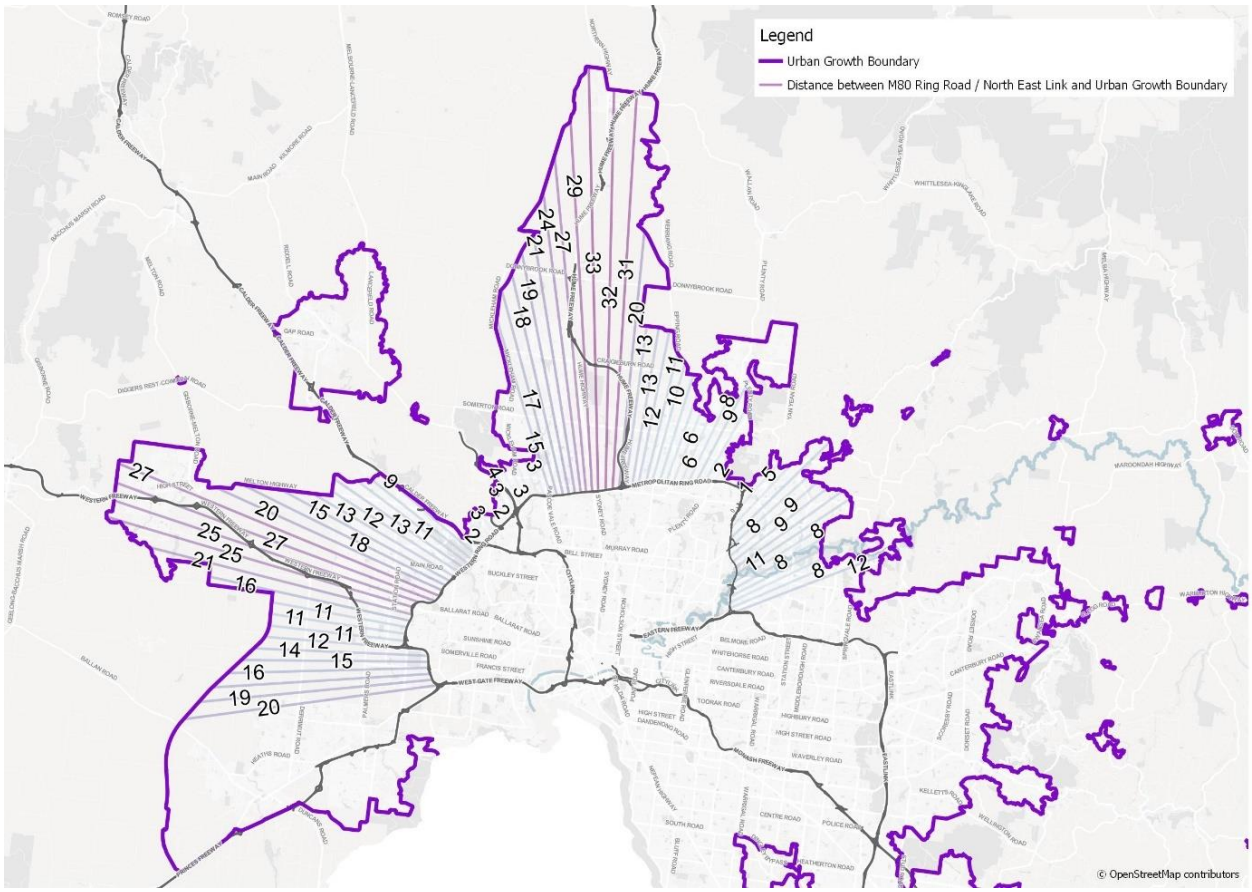
Figure 10 North East Link access routes to activity centres

Much like the rest of the M80, North East Link will be located within the urban growth boundary. While the completed orbital network as a whole will not form a symmetrical ring around Melbourne, this is reflective of the fact that Melbourne's boundaries are also unsymmetrical.

The Urban Growth Boundary is more constrained in the north east of Melbourne, unlike the west, north and south eastern suburbs, as presented in Figure 11. North East Link will be approximately 10 kilometres away from the UGB, whereas the M80 is typically 20 kilometres (and up to 30 kilometres) away from the UGB in the west and north.

A road any further east would place North East Link outside the UGB, putting undesirable development pressure on low density areas and regions outside the UGB.

Figure 11 Distance between orbital roads and the Urban Growth Boundary



3.4 Unlocking underutilised existing assets

North East Link will unlock the unused potential of the Eastern Freeway which is currently underutilised by freight, maximising freight efficiency throughout the region. As the Eastern Freeway currently ends at Hoddle Street, many trucks exit the freeway earlier (further east) or avoid the road altogether and travel along alternative routes such as the M1 corridor.

North East Link connects the Eastern Freeway to the wider freeway network of the M80 and Hume Freeway, creating a continuous freeway standard road for freight. This will increase trucks by approximately 45 percent between Springvale Road and Bulleen Road, drawing trucks away from the arterial road network. This will increase truck volumes on the Eastern Freeway to a comparable level with the rest of Melbourne's freeway network.

Additionally, the widening works on the Eastern Freeway will allow for the existing bottlenecks constraining capacity to be addressed. Issues such as the lack of midblock capacity in certain sections and congestion due to merging of traffic at on-ramps will be addressed; these bottlenecks are currently constraining the freeway from operating at its full potential. This is discussed further in Section 4.5.

4 Reducing congestion in the north east

North East Link will transform Melbourne's transport network, with benefits across the network as far away as Dandenong in the south-east and Epping in the north. The new roadway will redistribute traffic away from other congested freeways and arterial roads.

This chapter explores how North East Link can relieve congestion across the road network, especially at the major road network constraints – the Yarra River, along the Eastern Freeway and across the north-south arterial roads in the north east such as Rosanna Road, Greensborough Road and Fitzsimons Lane.

4.1 Network statistics

North East Link will improve the daily commute for motorists in Melbourne, who are expected to see faster and more reliable commute times. This is reflected in the average network statistics for the MSD, as presented in Table 1.

Table 1 MSD network statistics – 2036 project case vs 2036 'no project' scenario

Metric	Time period	MSD	North East
Road Vehicle Trips (Car + LCV + HCV)	Daily	12,489,000 (<+1%)	2,291,000 (<+1%)
	AM Peak (7am - 9am)	1,882,000 (<+1%)	340,000 (<+1%)
	PM Peak (4pm - 6pm)	2,026,000 (<+1%)	375,000 (<+1%)
Vehicle Kilometres Travelled (km)	Daily	174,290,000 (<+1%)	29,768,000 (+6%)
	AM Peak (7am - 9am)	26,672,000 (<+1%)	4,485,000 (+7%)
	PM Peak (4pm - 6pm)	28,511,000 (<+1%)	4,765,000 (+7%)
Vehicle Hours Travelled (hrs)	Daily	4,267,000 (<-1%)	808,000 (<+1%)
	AM Peak (7am - 9am)	878,000 (<-1%)	168,000 (<-1%)
	PM Peak (4pm - 6pm)	891,000 (<-1%)	167,000 (<-1%)
Average Speed (km/h)	Daily	41 (+1%)	37 (+6%)
	AM Peak (7am - 9am)	30 (+1%)	27 (+7%)
	PM Peak (4pm - 6pm)	32 (+1%)	28 (+8%)
Public Transport trips	Daily	3,105,000(<-1%)	387,000 (<-1%)

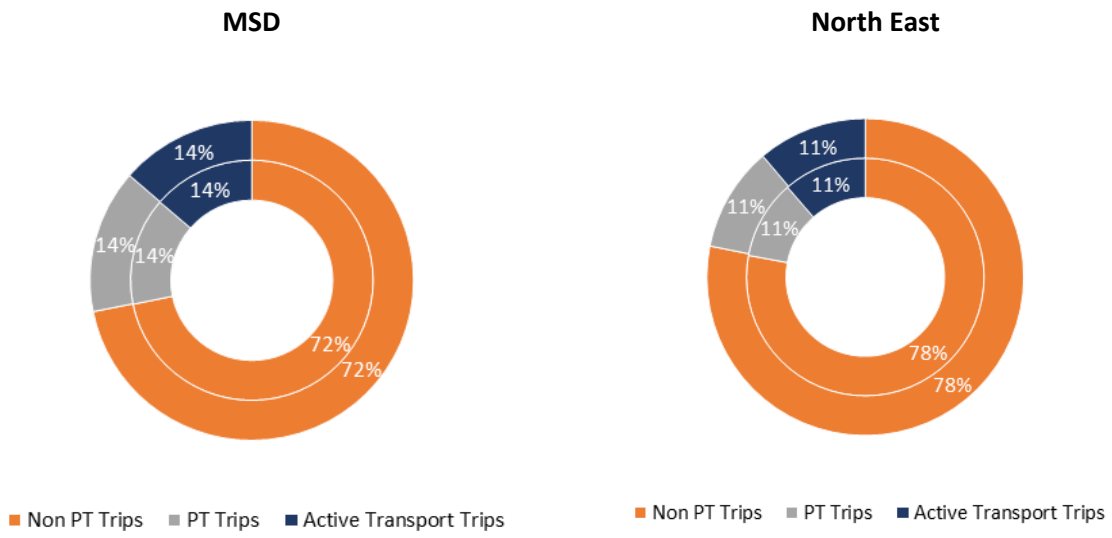
Average speeds across the MSD are expected to slightly improve with an increase of approximately one percent.

The changes in average vehicle speeds in the north east are expected to be much greater than the Melbourne-wide average due to the magnified localised benefits on the roads surrounding North East Link. Average speeds will increase by six percent across the day, and up to eight percent during the morning and evening peak periods.

As vehicles divert away from the arterial road network onto North East Link, travel times and vehicle speeds across the north east will improve, off-setting the forecast congestion due to population growth in the north. This improvement in average vehicle speeds relates to a total saving of almost 18,000 vehicle hours a day in the north east, which means that drivers will be spending less time stuck in traffic leaving more time for productive uses.

There is no indication that the project will cause any significant shift in trips away from public transport to private car travel. Total road vehicle trips in both the MSD and north east areas remain constant between the project case and 'no project' scenarios, as do the number of public transport trips. This is also demonstrated in Figure 12, where the mode share for public transport is expected to remain constant at 14 percent for the MSD and 11 percent for the north east.

Figure 12 MSD mode share 2036 project case vs 2036 'no project' scenario



4.2 The Yarra River screenline

From day one of opening, North East Link will provide congestion relief at the five north-south bridge crossings of the Yarra River – Chandler Highway, Burke Road, Manningham Road, Fitzsimons Lane and in Warrandyte.

North East Link will provide an additional six lanes of freeway standard capacity across the river (three in each direction). This means an additional 10,200 vehicles an hour can cross the Yarra River during peak hour, a significant increase in capacity. As a result, it is expected that there will be an increase of approximately 25 percent in vehicles crossing the Yarra River screenline each day; this represents repressed demand that previously could not travel due to the lack of capacity on the network or that used alternative routes such as the M80 and Tullamarine Freeway. By 2036, North East Link will carry 32 percent of all vehicles travelling across the Yarra River in the north east each day.

While more people will travel across the Yarra River, pressure will be taken off the arterial road river crossings. Medium to long distance trips are likely to divert away from the arterial road network and instead travel on North East Link. As presented in Table 2, all five arterial road bridges will see significant decrease in traffic, most notably at Manningham Road/Banksia Street and Fitzsimons Lane.

The reduction in traffic on these bridges will provide congestion relief at these bottlenecks, freeing up space on the road network for localised trips.

Even the Warrandyte river crossing will see a large reduction (approximately 20 percent), as through traffic is removed, including those that were previously avoiding Fitzsimons Lane. Reductions along other routes allow some of the traffic through Warrandyte to divert back to more suitable routes or use North East Link.

Table 2 Yarra River screenline assessment – 2036 project case scenario

River Crossing	Number of lanes (two way)	Daily traffic volume with North East Link (percentage reduction)	Percentage share of screenline volume
Chandler Highway1	6	59,000–76,000 (-5%)	18%
Burke Road	4	31,000–41,000 (-15%)	9.5%
Manningham Road/Banksia Street	6	64,000–82,000 (-10%)	19.5%
Fitzsimons Lane	4	51,000–66,000 (-20%)	16%
Kangaroo Ground-Warrandyte Road	3	17,000–21,000 (-20%)	5%
North East Link	6	115,000–125,000	32%
Total	-	**337,000–411,000**	**100%**

4.2.1 North East Link capacity across the Yarra River

The busiest section of North East Link will be the tunnel section between the Eastern Freeway and Lower Plenty Road across the Yarra River which is expected to carry up to 125,000 vehicles a day in 2036. As the tunnels will be designed to operate as three lanes in each direction at all times, this volume will be well under the estimated daily capacity of 140,000 vehicles a day. A typical freeway would be able to carry up to 20,000 vehicles per lane per day (120,000 vehicles per day across six lanes). This is often based on roads that have a very high peak directional bias, and run very high in the peak periods when compared to the rest of the day.

Through the traffic analysis provided in Appendix C1, it is evident that high traffic volumes in the north east are maintained throughout the day. It is expected that the North East Link tunnels will mirror this trend and run with high volumes maintained throughout the day. This is further encouraged through the tolling structure which provides incentives to use the link in the non-peak periods through reduced toll rates. This will make use of the spare capacity within the tunnels outside of the peak periods. Further, there's expected to be a reasonable directional balance during the peak periods as many trips are going both north and south during each of the peaks.

Unlike other tunnels in Melbourne, the North East Link tunnels have been designed to avoid steep grades which reduces vehicle speeds and the capacity of the tunnels. The tunnels will also not have the operational constraints which plague the CityLink tunnels, where some traffic lanes are often closed during the peak periods which further impacts their capacity.

Recent advice from VicRoads indicates that with a freeway management system (FMS) in operation (including ramp metering and lane use management signs), a single traffic lane can carry up to 26,000 vehicles per day.

Based on the above, it has been assumed that the North East Link tunnels could carry approximately 23,000 vehicles per lane per day, or 140,000 vehicles per day across the six lanes.

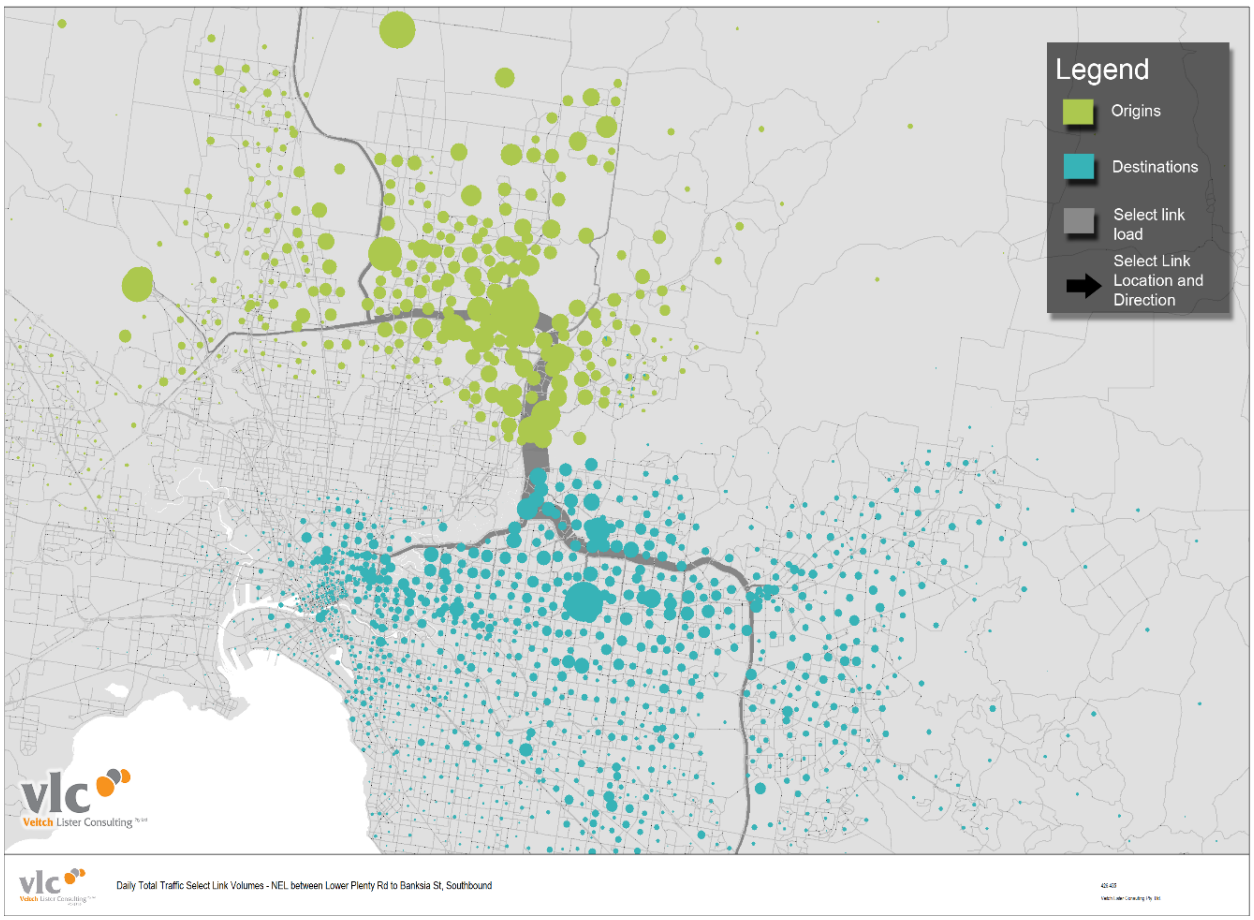
If we further consider the likely benefits to throughput capacity that may be achieved by the improvements in vehicle technology and autonomous vehicles, then assuming 23,000 vpd per lane beyond 2036 could be considered conservative.

4.3 Removing through trips from the local network

As discussed previously, North East Link has the ability to remove medium and long distance trips from the arterial road network. Long range trips are essentially "through" trips, in that they are trips that have no actual destination within the north east, such as travelling between Box Hill and South Morang or between Dandenong and interstate. Medium length trips are those that have one end of the trip within the north east such as travel between Watsonia and Ringwood. People travelling these medium length trips can use part of North East Link to more easily access their north east destinations.

By removing the medium to long distance trips from the north east arterial network, additional capacity for shorter distance or "local" trips are made available. It also allows the use of the road network to better align with the VicRoads Movement and Place hierarchy; moving through trips to roads with a high "movement" value (such as freeways) and utilising residential arterial roads (especially those that pass through activity centres) that have a higher "place" function for local access purposes. These medium to long distance trips can be seen in Figure 13, which presents the origins and destinations of vehicles travelling through the North East Link tunnels (southbound). Origins of trips in the north are along the M80 corridor, and further north of the M80, with destinations mainly south of the Eastern Freeway. The destinations south of the Yarra River are widely dispersed throughout the eastern and south-eastern suburbs; North East Link is not just used by traffic along the EastLink corridor, but from locations such as Box Hill, Kew, Blackburn and Balwyn.

Figure 13 Daily origins and destinations all southbound vehicles using North East Link



4.4 Taking traffic off arterial roads

Melbourne's north east currently and in the future will continue to experience significant road congestion without North East Link. Congestion increases travel times, reduces the reliability of trips and impacts on accessibility for the local community.

Reducing congestion on the arterial road network will result in faster and more reliable journeys, improving accessibility to jobs, services, education and recreation for local residents living in the north east. It will also improve amenity through a reduction in traffic noise, improvements in air quality and improvements in road safety, while assisting in improving the operation of public transport on these roads.

The reductions in traffic on the arterial road network is presented in Figure 14, with key roads summarised in Table 3. These roads shown in Table 3 have been identified by the community and stakeholders as having known issues regarding amenity and traffic congestion. The forecast daily traffic volumes with North East Link is presented in Figure 15.

The biggest reductions are expected on the parallel routes of Rosanna Road (reduction of up to 11,000 vehicles per day) and Greensborough Road (reduction of up to 32,000 vehicles per day near Lower Plenty Road), with significant reductions also on Waiora Road and Banksia Street.

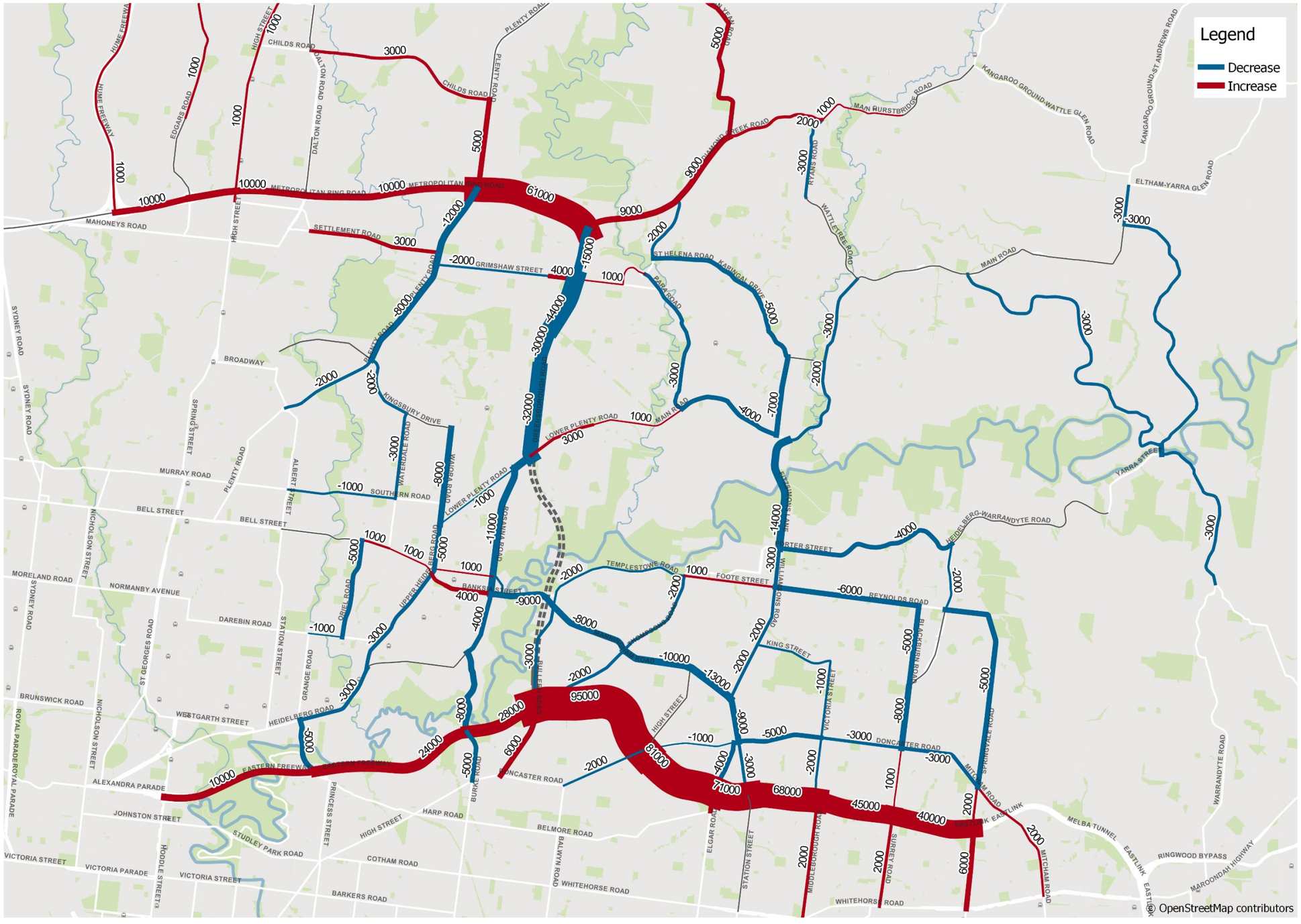
However, it is not just roads adjacent to North East Link that benefit. Long distance "through" trips are expected to divert away from roads far removed from the project such as Plenty Road, Burke Road, Fitzsimons Lane and Springvale Road.

These traffic reductions improve access to locations such as the La Trobe National Employment and Innovation Cluster; while North East Link does not provide direct freeway access to this area, the traffic reductions on road such as Waiora Road (-8,000 vehicles per day), Upper Heidelberg Road (-3,000 vehicles per day), Waterdale Road (-3,000 vehicles per day) and Kingsbury Drive (-2,000 vehicles per day) due to North East Link enables faster and less congested access via the arterial road network.

Table 3 Change in traffic volumes on key arterial roads

Road	Daily traffic volume with North East Link	Change in daily traffic volumes
Banksia St (At Yarra River)	64,000–82,000	-7,000 to -9,000 (-10%)
Bulleen Rd (North of Eastern Fwy)	42,000–54,000	-2,000 to -3,000 (-5%)
Burke Rd (North of Eastern Fwy)	31,000–41,000	-6,000 to -8,000 (-15%)
Chandler Hwy (At Yarra River)	59,000–76,000	-4,000 to -5,000 (-5%)
Fitzsimons Ln (At Yarra River)	51,000–66,000	-11,000 to -14,000 (-20%)
Greensborough Road (between Blamey Road and Yallambie Road)	28,000–37,000	-22,000 to -32,000 (-50%)
Greensborough Bypass (between M80 and Diamond Creek Rd)	65,000–84,000	7,000 to 9,000 (15%)
Grimshaw St (West of Watsonia Rd)	24,000–32,000	-1,000 to -2,000 (-5%)
Kangaroo Ground-Warrandyte Rd (At Yarra River)	17,000–21,000	-3,000 to -5,000 (-20%)
Lower Plenty Rd (Between Greensborough Rd and Rosanna Rd)	54,000–69,000	-11,000 to -14,000 (-20%)
Lower Plenty Rd (West of Rosanna Rd)	18,000–23,000	-500 to -1,000 (-5%)
Main Road (between Para Rd and Bolton St)	25,000–33,000	-3,000 to -4,000 (-10%)
Manningham Road (between Bulleen Rd and Thompsons Rd)	28,000–36,000	-7,000 to -8,000 (-20%)
Para Road (between Rattray Rd and Main Rd)	16,000–21,000	-2,000 to -3,000 (-15%)
Plenty Road (North of Kingsbury Dr)	57,000–74,000	-7,000 to -8,000 (-10%)
Reynolds Road (between Blackburn Rd and Williamsons Rd)	29,000–37,000	-5,000 to -6,000 (-15%)
Rosanna Rd (South of Lower Plenty Rd)	32,000–42,000	-9,000 to -11,000 (-20%)
Springvale Rd (North of Mitcham Rd)	19,000–24,000	-4,000 to -5,000 (-20%)
Upper Heidelberg Road (between Banksia St and Studley Rd)	16,000–21,000	-2,000 to -3,000 (-15%)
Wairoa Road (Between Southern Rd And Dougharty Rd)	20,000–27,000	-7,000 to -8,000 (-25%)

Figure 14 Daily change in traffic volumes in the north east (2036)



Note: Changes in traffic volumes on EastLink are not provided due to commercial arrangements between the State and ConnectEast.

Figure 15 Daily traffic volumes in 2036 with North East Link

4.5 Fixing the Eastern Freeway

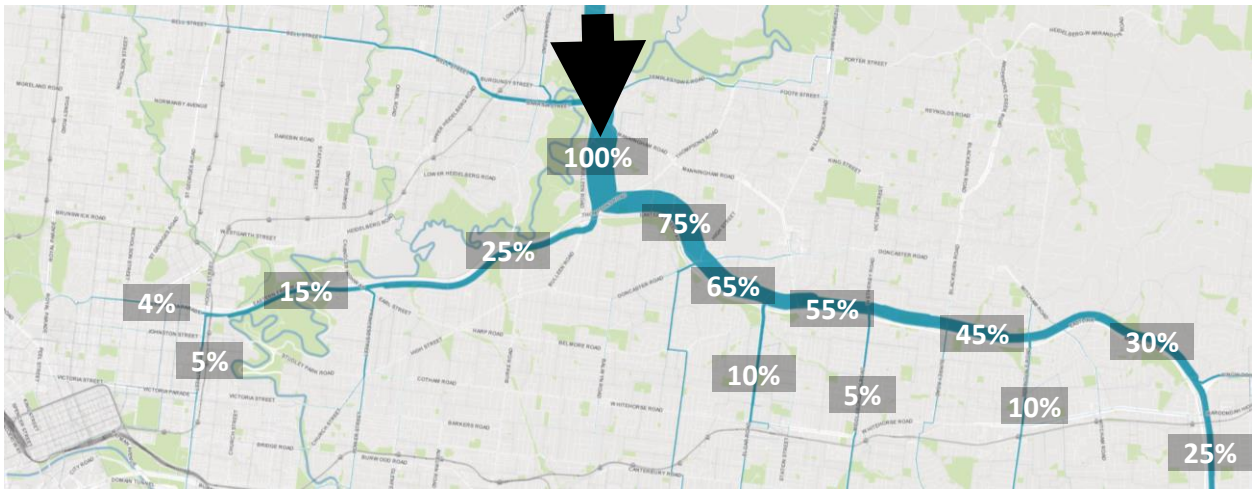
As North East Link connects into the existing Eastern Freeway at Bulleen Road, demand for travel along the Eastern Freeway is expected to significantly increase (mainly east of Bulleen Road). To cater for this increased demand, the project will reconfigure and upgrade the Eastern Freeway by significantly increasing the traffic carrying capacity and improving traffic flow.

North East Link traffic distribution

As discussed previously, the majority of traffic from North East Link travels to and from the eastern end of the Eastern Freeway. Approximately 75 percent of vehicles travelling southbound on North East Link head east when joining the Eastern Freeway as presented in Figure 16.

Approximately 30 percent of North East Link traffic also travels through the EastLink tunnels; this means that 45 percent of traffic on North East Link either enter or exit the Eastern Freeway between Doncaster Road and Springvale Road. Only five percent of traffic on North East Link is destined for Hoddle Street.

Figure 16 Distribution of southbound North East Link traffic using the Eastern Freeway (2036)



Additional lane capacity

The proposed number of lanes at each midblock section of the Eastern Freeway is presented in Table 4 and is sufficient to accommodate the expected 2036 peak hour traffic flows on the freeway. Crucially, the existing six-lane sections of freeway (three lanes in each direction) between Station Street and Bulleen Road will be doubled to between 12 and 14 lanes to remove one of the biggest bottlenecks along the corridor. Capacity is increased by up to 130 percent per hour, with traffic only expected to increase by up to 75 percent in this section of freeway (during the AM peak). While this may seem excessive, the configuration is required to solve the existing congestion issues at a number of bottlenecks (particularly the existing three lane sections of road).

Table 4 Number of lanes on the Eastern Freeway

Midblock section	Existing number of lanes (two-way)	Proposed number of lanes (two-way)	Increase in capacity[1]	Change in AM peak hour volumes (2036)
Springvale Road to Blackburn Road	6 (7 during PM peak)	9[2]	45%	5-10%
Blackburn Road to Middleborough Road	8	11	35%	5-10%
Middleborough Road to Station Street	8	12	50%	20-25%
Station Street to Elgar Road	6	12	100%	55-60%
Elgar Road to Doncaster Road	6	14	115%	55-60%
Doncaster Road to Bulleen Road	6	14	130%	70-75%
Bulleen Road to Burke Road	8	10	25%	25-30%
Burke Road to Chandler Highway	8	10	25%	20-25%
Chandler Highway to Hoddle Street	10	10	-	5-10%

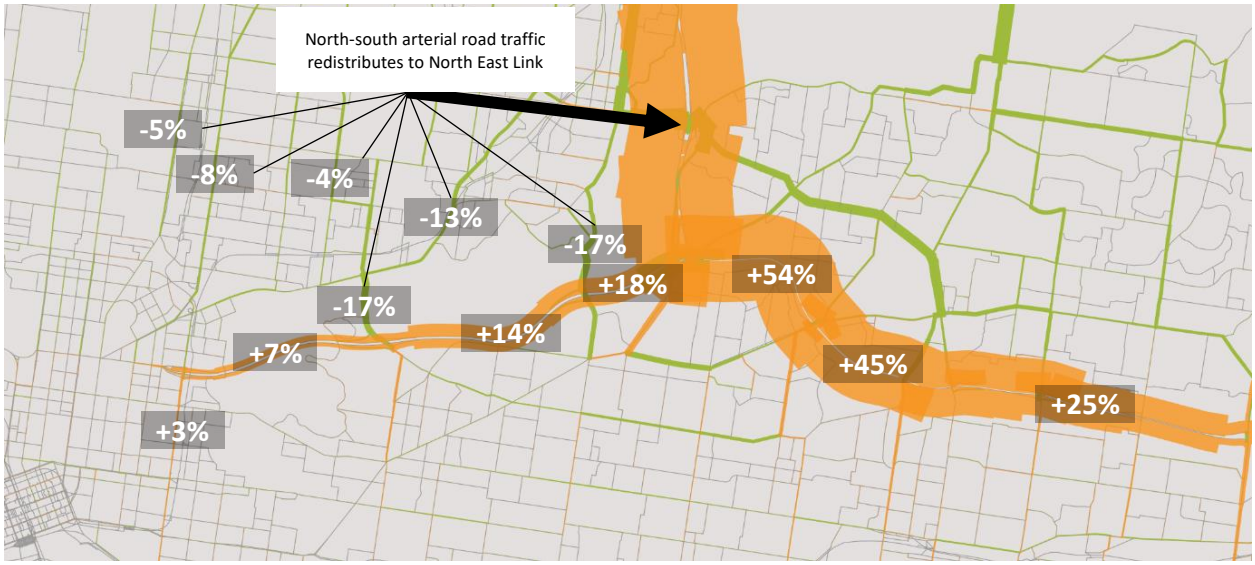
1 Capacities based on VicRoads Motorway Capacity Guide (2017)

2 Additional lane (5 lanes) provided in eastbound direction compared to westbound direction (4 lanes) to better separate traffic exiting at Springvale Road from traffic travelling towards EastLink

City end of the Eastern Freeway

While traffic volumes at the western end of the Eastern Freeway (Hoddle Street to Chandler Highway) are forecast to increase with North East Link, this is largely due to traffic redistributing from other arterial roads, such as Heidelberg Road and St Georges Road. Part of this redistribution is to take advantage of the improved traffic conditions as a result of North East Link and also due to the upgrade of the Eastern Freeway to a managed motorway (ramp metering and lane management etc), improving traffic flow during peak periods. This traffic redistribution is presented in Figure 17.

Figure 17 Traffic redistribution at the city end of the Eastern Freeway



This increased traffic volume does not reflect demand created from North East Link; without the managed motorway upgrades traffic will only increase at the western end by up to four percent across the day (as opposed to seven percent with the managed motorway upgrades). This means roughly 30 percent of the traffic volume increases can be attributed to the managed motorway upgrades, not new demand for travel on North East Link itself.

Further from the end of the Eastern Freeway, there is no net increase in traffic volumes within the CBD with the addition of the North East Link.

Separating orbital and radial movements

The Project will also provide express lanes to allow unimpeded radial travel between the eastern suburbs and the western end of the Eastern Freeway. Traffic will be split into a main "expressway" carriage in the centre of the freeway and collector-distributor carriageways on the outside between Station Street and Burke Road, which gives those on radial trips an express run unimpeded by merging from traffic entering the freeway and diverging traffic leaving the freeway. The express carriageways are coloured purple in Figure 18.

Note that traffic travelling to and from the Hoddle Street end of the freeway can still use the outer carriageways to access Bulleen Road, Doncaster Road and Elgar Road.

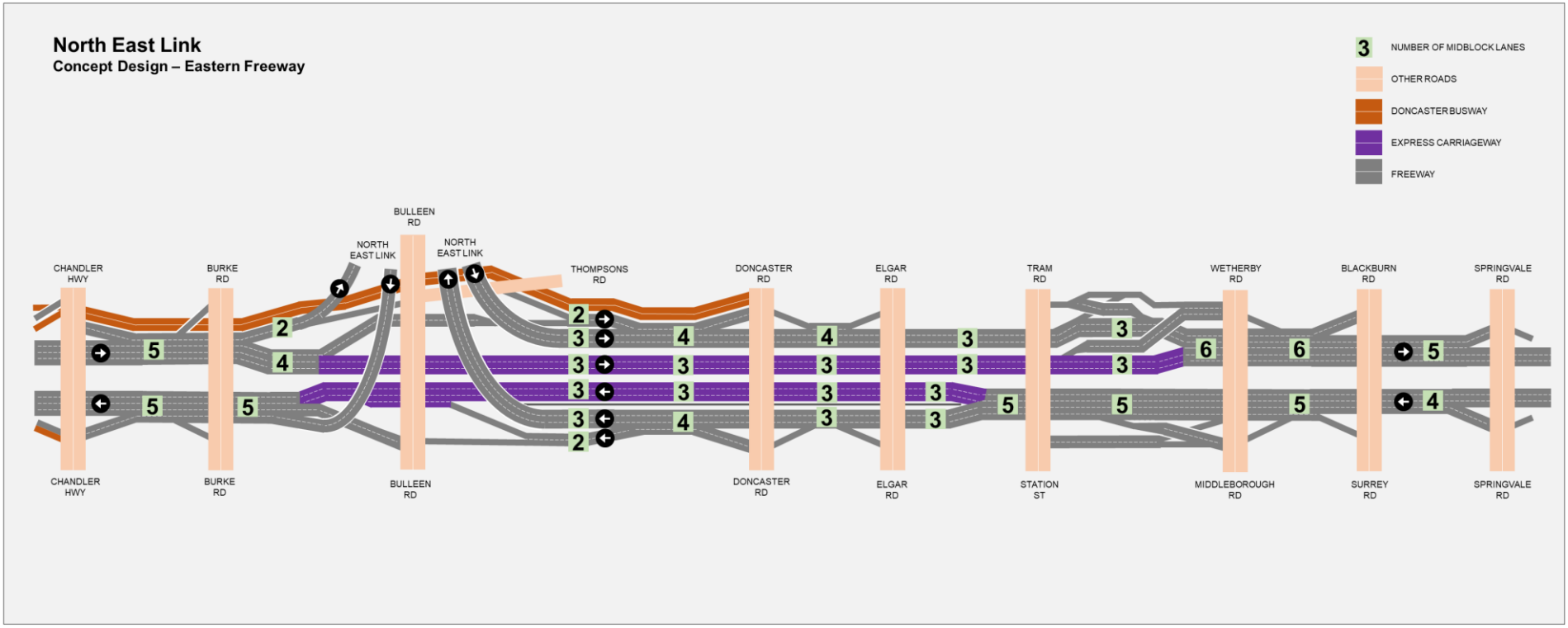
The Doncaster Busway

Buses are also an important component of the Eastern Freeway corridor, and the upgrade to the freeway will also improve bus travel times and reliability. The proposed upgrade includes the full separation of DART services (to Doncaster Road) by building the Doncaster Busway - a separated bus only carriageway which runs in the existing shoulders on both sides of the freeway from Hoddle Street and on the north side between Chandler Highway and Doncaster Road. These bus lanes improve travel time reliability and bypass any congestion on the freeway and ramps. This is discussed further in Section 9.

Boosting capacity through managed motorways

Proposed works also include the upgrade of the freeway to a fully managed motorway including electronic lane use management signs and ramp metering of all on-ramps to the freeway which will improve traffic flow and boost lane capacities. This is discussed further in Section 8. The upgrade of the on and off-ramps will also include additional lanes on the ramps and additional storage on both on and off-ramps to prevent flow breakdown and traffic from queuing on the freeway lanes or extending back onto the arterial roads.

Figure 18 Eastern Freeway express carriageways



Fixing congestion at on-ramps

Along with ramp metering of on-ramps, additional lanes on on-ramps will help improve traffic flow at merge points. These changes are presented in Table 5. Ramp capacity is either maintained or increased at most locations along the Eastern Freeway. The exception to this is at Bulleen Road and Tram Road, as demand is reduced through the new freeway configuration.

The existing congestion points at the Springvale Road inbound on-ramp and the Thompsons Road outbound on-ramp will see capacity improvements of 100 percent and 50 percent respectively.

Additionally, the upgrade of the Springvale Road inbound on-ramp will improve traffic flow in the EastLink tunnels. Tunnel traffic will no longer need to significantly slow down to allow vehicles from Springvale Road to enter the Eastern Freeway, which reduces the likelihood of a shockwave of congestion travelling back into the EastLink tunnel.

Table 5 Changes to freeway on-ramps

On-ramp	Existing capacity (vehicles per hour)	Proposed capacity (vehicles per hour)	Change in capacity
Inbound			
Springvale Rd inbound ramp	1,200	2,400	+100%
Blackburn Rd inbound ramp	1,800	1,800	-
Middleborough Rd inbound ramp	1,200	1,800	+50%
Elgar Rd inbound ramp	1,200	1,200	-
Doncaster Rd inbound ramp	1,200	2,400	+100%
Bulleen Rd inbound ramp	2,400	1,200	-50%[1]
Burke Rd inbound ramp	1,200	1,200	-
Chandler Highway inbound ramp	2,400	2,400	-
Outbound			
Chandler Highway outbound ramp	1,200	2,400	+100%
Thompsons Road outbound ramp	1,200	1,800	+50%
Doncaster Road outbound ramp	1,200	1,800	+50%
Tram Road outbound ramp	1,800	1,200	-50%[2]
Middleborough Road outbound ramp	1,200	1,200	-

Table notes:

1 Ramps from North East Link reduces demand for the Bulleen Road inbound on-ramp

2 Trips between Tram Road and Middleborough Road provided through a separate carriageway reducing demand for the Tram Road outbound on-ramp

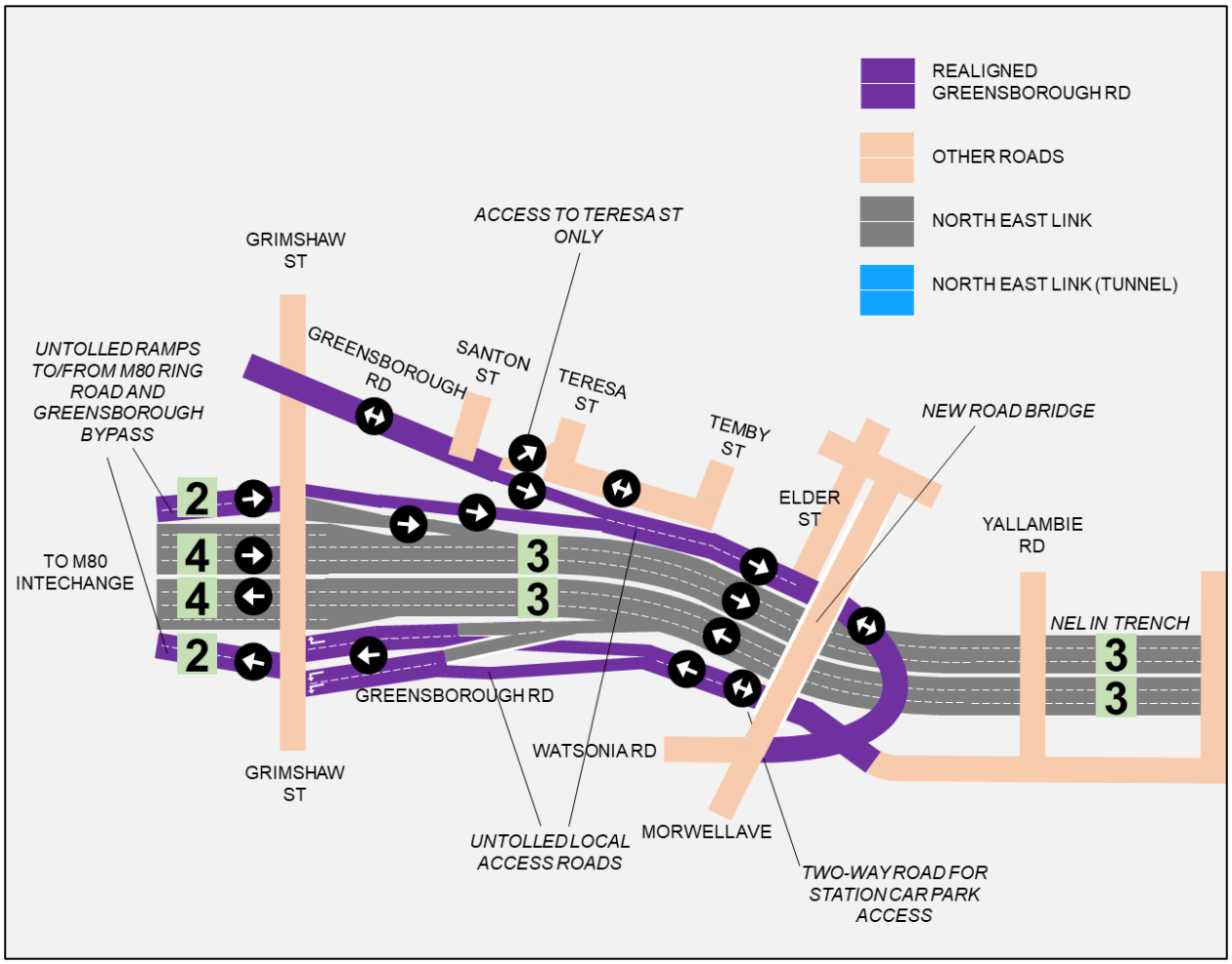
4.6 Maintaining local access

North East Link will provide a non-tolled access route between Grimshaw Street and Watsonia Road by realigning the local road network to provide for those who do not want to use the tolled carriageways. While North East Link will replace the existing Greensborough Bypass, a new access road will be constructed between North East Link and Watsonia Station to provide for local access, as presented in Figure 19.

Northbound travel will be via a road on the western side of North East Link, while southbound travel will be via Greensborough Road on the eastern side of North East Link, these two roads combine at the Watsonia Road – Greensborough Road intersection.

Additional non-tolled carriageways will be provided between Grimshaw Street and the M80 Interchange and Greensborough Bypass which allows for non-tolled travel along the entire North East Link corridor.

Figure 19 Realignment of Greensborough Road



*Design at Greensborough Road being reviewed in light of community feedback.

5 Removing trucks from residential roads

North East Link will remove trucks from residential arterial roads, with a high-quality freeway standard road providing travel time savings and reliability to the freight industry. It will also improve travel time reliability, bypassing up to 18 sets of traffic lights and congestion on the arterial road network which can be highly variable throughout the day.

This chapter explores how North East Link completes the freight network, the expected change in truck volumes across the network and improvements in freight efficiency and accessibility.

5.1 Completion of the freight network

General freight

North East Link will complete the missing link in the orbital freeway network between the Eastern Freeway and M80. This means trucks will no longer have to snake through the arterial road network or detour through the inner city via the M1 corridor to travel between the south-eastern and northern suburbs. Trucks will be able to travel between the north and southeast via EastLink, an upgraded Eastern Freeway, the new North East Link and an upgraded M80.

HPFVs

As North East Link will be designed to SM1600 standard (able to carry truck up to 160 tonnes), the road will be able to cater for the increasingly larger and heavier truck fleets that operate on Melbourne's road network. Additionally, by upgrading the Eastern Freeway to 75 percent of SM1600 standard, freight and logistics operators will be able to move goods more efficiently, all across Melbourne via the orbital freeway network. Upgrading the Eastern Freeway will mean that the majority of the metropolitan freeway network will be at least 75% of SM1600 standard (following upgrades to the M80 and the West Gate Freeway).

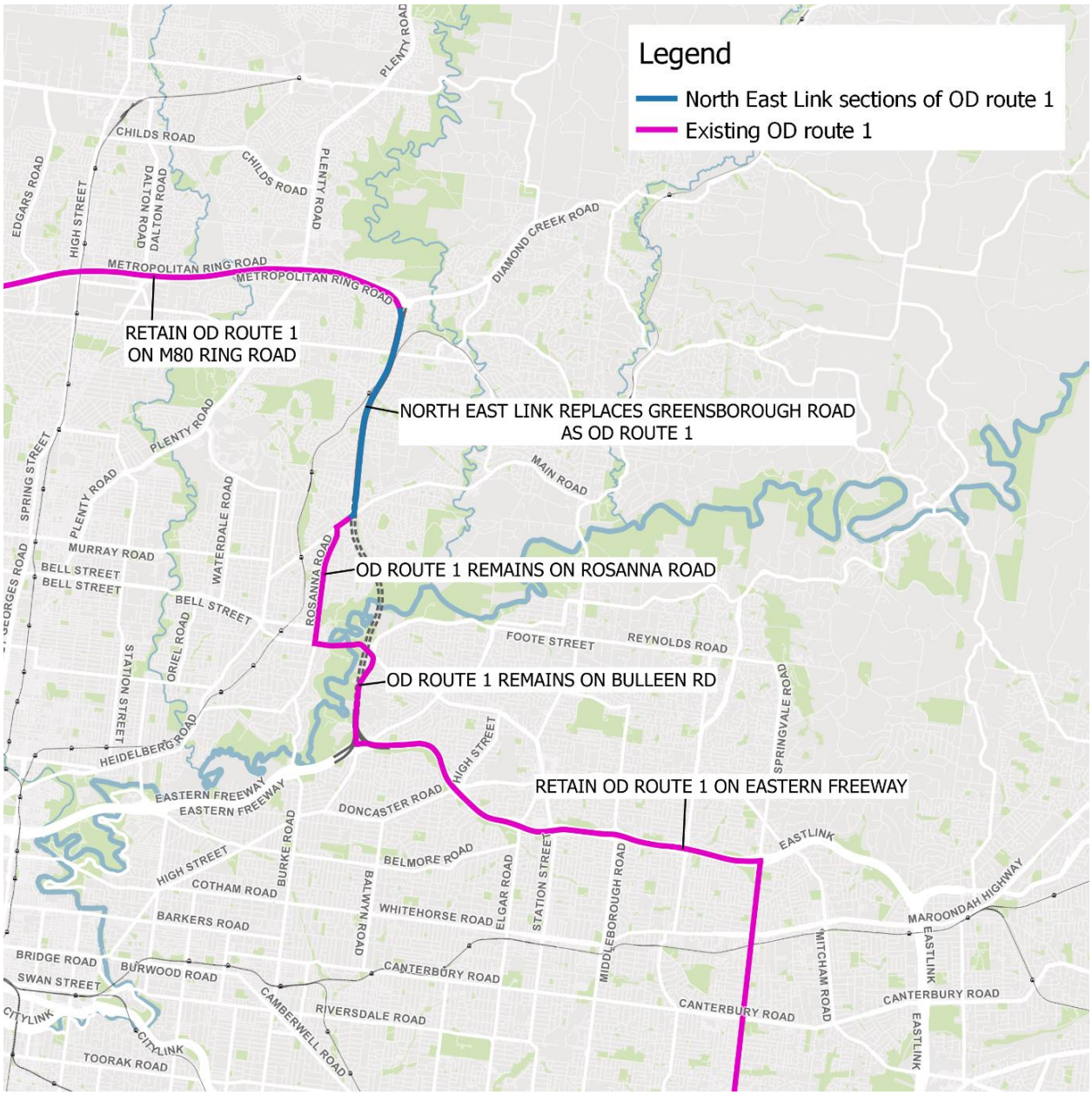
Over-dimensional vehicles and placarded load vehicles

Over-dimensional vehicles and vehicles carrying placarded loads will be accommodated on sections of the North East Link, however these vehicles will be limited to the above ground and open sections due to the limited vertical clearance in the tunnel section and the prohibition of dangerous goods travelling through tunnels.

These vehicles are still likely to use Bulleen Road and Rosanna Road before re-joining North East Link to continue on their journey. Note that truck classification surveys conducted have shown that relatively few trucks (less than 2 percent) are expected to have to detour around the tunnels. The tolling structure will be developed that over-dimensional or placarded vehicles that exit North East Link to travel around the tunnels will not have to pay an additional flag fall when they re-join the network.

North East Link will replace arterial sections of the over-dimensional route 1 where these vehicles can use the new link. This will result in reducing the number of these vehicles from Greensborough Road. The proposed new OD route 1 is presented in Figure 20.

Figure 20 Proposed OD route



5.2 Truck volumes and origins and destinations

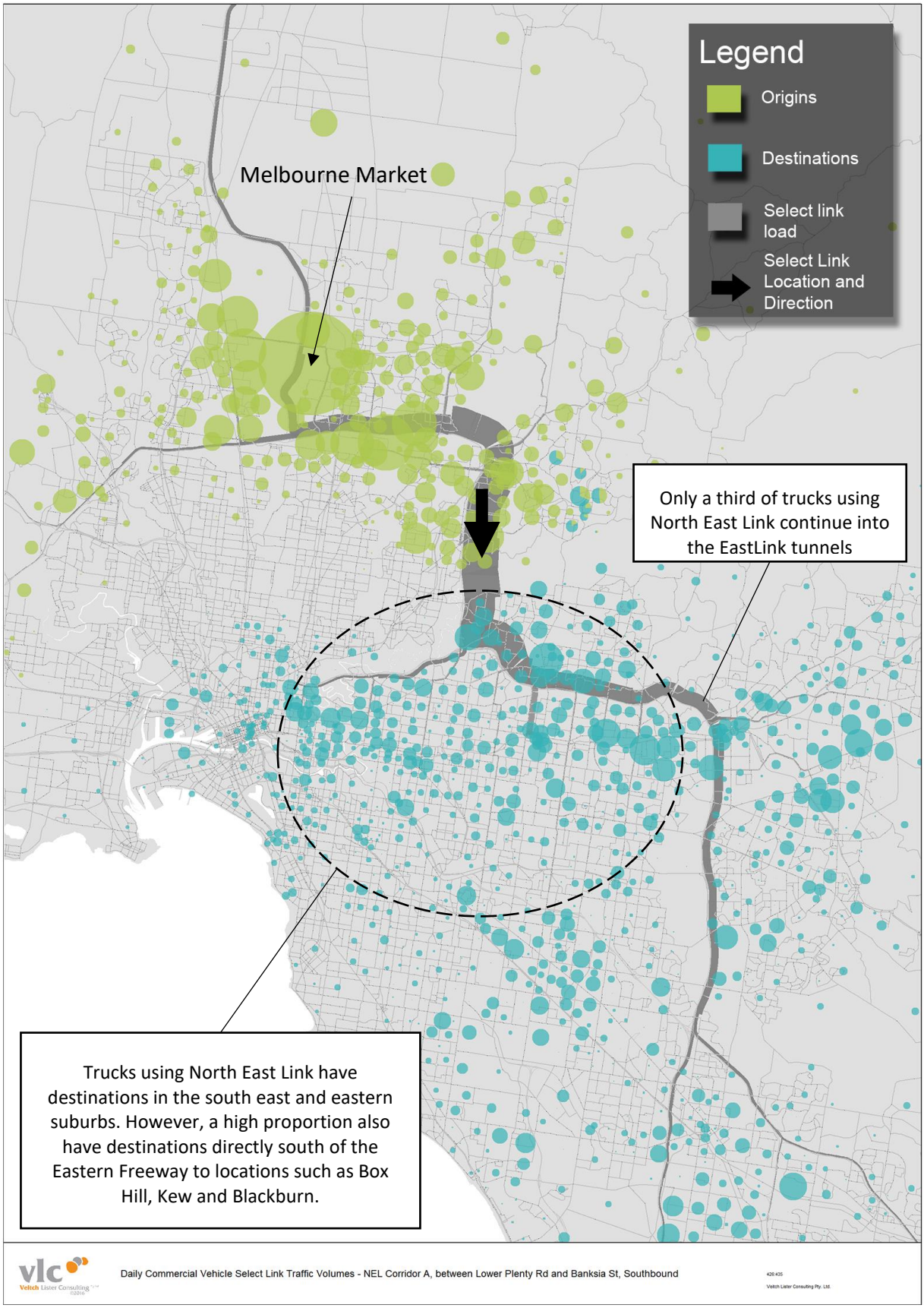
North East Link is expected to carry 18,000 to 23,000 trucks each day. This comprises of approximately 30 percent light commercial vehicles and 70 percent heavy commercial vehicles.

The origins and destinations of trucks travelling southbound in the tunnel across the day is presented in Figure 21. The bulk of the trucks travelling through the tunnel originate from the industrial areas around Thomastown and Somerton, with one of the largest truck generators being the Melbourne Market in Epping. Destinations in the south are widely dispersed across the eastern and south-eastern suburbs. These trends are similar (although reversed) for the northbound direction.

While many people assume that the majority of freight on North East Link travels to or from the south-eastern suburbs (from the industrial precincts such as Dandenong South), this freight is only forecast to comprise a small proportion of all trucks on the new road. As shown by the grey line in Figure 21, only a third of trucks in the North East Link tunnels are expected to continue to the EastLink tunnels to access destinations such as Ringwood, or Dandenong.

More prevalent destinations (as can be seen from the levels of saturation of green circles) are locations immediately south of the Eastern Freeway such as Box Hill, Blackburn, Nunawading, Balwyn, and Burwood. This highlights the importance of retail stores, supermarkets and other non-industrial truck generators within the larger freight supply chain and logistics network.

Figure 21 Origin/Destinations of trucks using the tunnel



5.3 Redistribution of freight trips from arterial roads

The construction of North East Link will result in a redistribution of freight trips from arterial roads onto the freeway network as the new route will bypass up to 18 sets of traffic lights when travelling from the Eastern Freeway to the M80. The redistribution of freight from the arterial road network onto the freeway network means there will be 15,000 fewer trucks a day on the arterial road network, or approximately 200,000 less kilometres travelled on arterial roads within the north east a day, a reduction of 17 percent.

Trucks will redistribute to North East Link due to the travel time and reliability benefits. Travel time improvements are reflected in direct cost savings and efficiency gains for the transport industry. This is achieved through reduced driver costs, fuel and maintenance costs, and increased vehicle utilisation (completing more trips in the same amount of time). Improvements in travel time reliability provides more certainty for operators, enabling more appropriate logistics management and the scheduling of loads. These improvements can lead to freight fleet rationalisation as more efficient trips can result in less vehicles being required to deliver their good within the same timeframe.

The forecast change in truck volumes are provided in Table 6 and in Figure 22, with forecast daily volumes presented in Figure 23.

Figure 22 Change in daily truck volumes – 2036 with North East Link

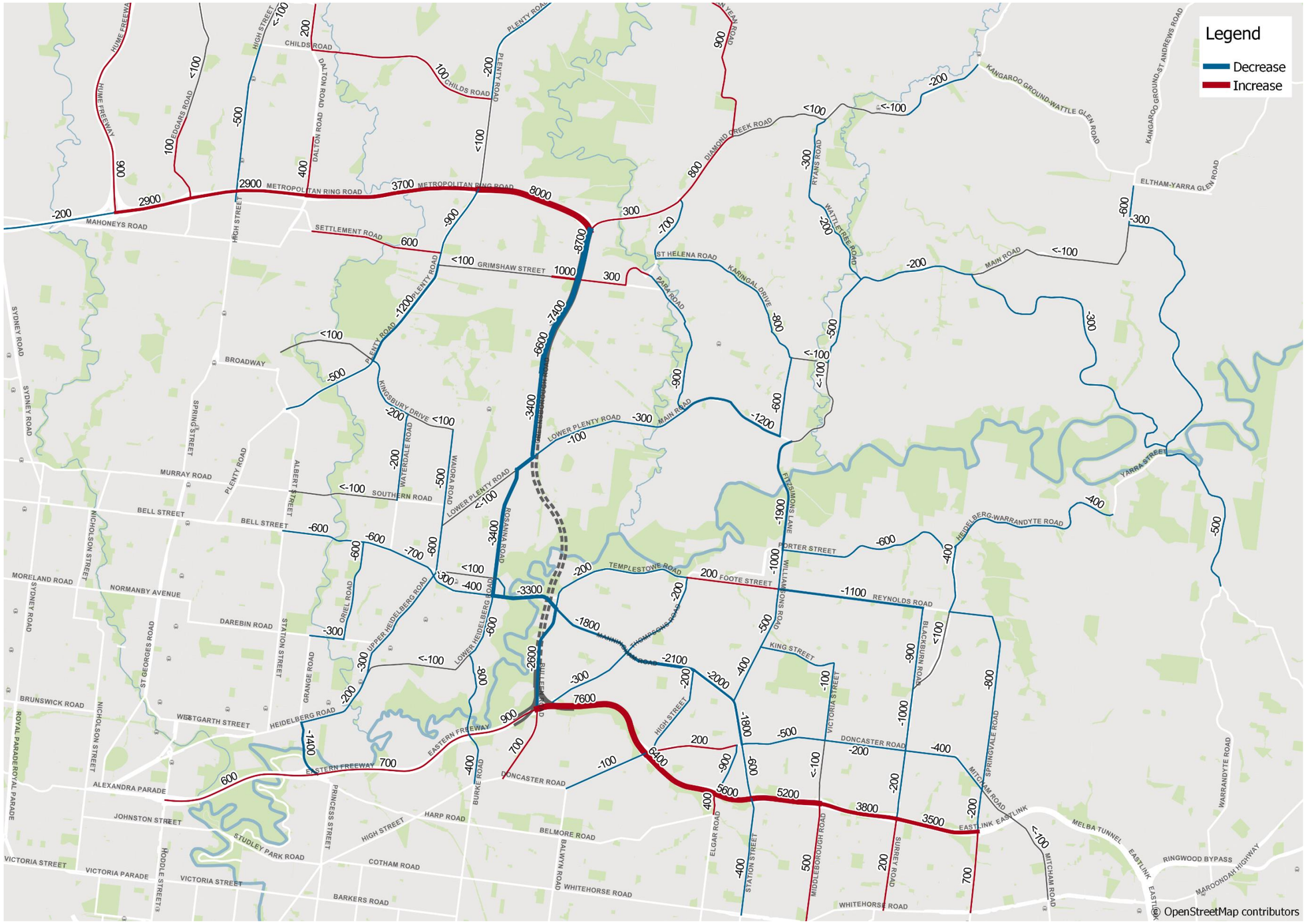


Figure 23 Daily truck volumes in 2036 with North East Link

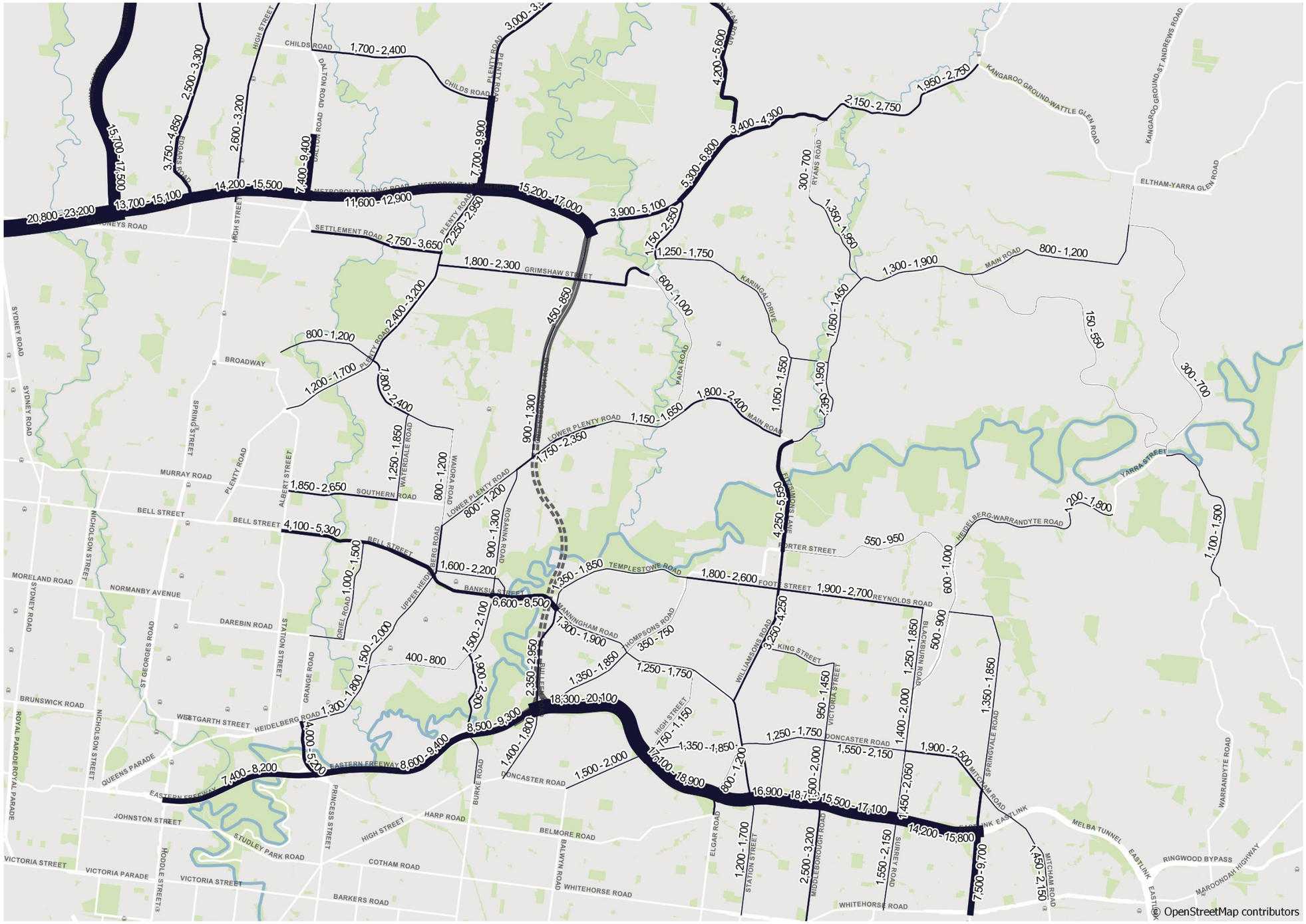


Table 6 Forecast change in truck volumes 2036

Location	Daily truck volume (with North East Link)	Change in daily truck volumes
Banksia St (At Yarra River)	6,600–8,500	-2,300 to -3,300 (-30%)
Bulleen Rd (North of Eastern Fwy)	2,350–2,950	-1,600 to -2,600 (-50%)
Burke Rd (North of Eastern Fwy)	1,900–2,500	-100 to -800 (-30%)
Chandler Hwy (At Yarra River)	4,000–5,200	-400 to -1,400 (-25%)
Fitzsimons Ln (At Yarra River)	4,250–5,550	-900 to -1,900 (-25%)
Greensborough Road (between Lower Plenty Road and Yallambie Road)	900–1,300	-2,000 to -3,400 (-75%)
Greensborough Bypass (between M80 and Diamond Creek Rd)	3,900–5,100	100 to 300 (5%)
Grimshaw St (West of Watsonia Rd)	1,800–2,300	0 (0%)
Kangaroo Ground-Warrandyte Rd (At Yarra River)	800–1,200	-100 to -700 (-40%)
Lower Plenty Rd (Between Greensborough Rd and Rosanna Rd)	1,700–2,300	-2,000 to -3,100 (-60%)
Lower Plenty Rd (West of Rosanna Rd)	800–1,200	0 (0%)
Main Road (between Para Rd and Bolton St)	1,800–2,400	-200 to -1,200 (-35%)
Manningham Road (between Bulleen Rd and Thompsons Rd)	1,300–1,900	-800 to -1,800 (-50%)
Para Road (between Rattray Rd and Main Rd)	600–1,000	-100 to -900 (-55%)
Plenty Road (North of Kingsbury Dr)	2,400–3,200	-200 to -1,200 (-30%)
Reynolds Road (between Blackburn Rd and Williamsons Rd)	1,900–2,700	-100 to -1,100 (-30%)
Rosanna Rd (South of Lower Plenty Rd)	900–1,300	-2,000 to -3,400 (-75%)
Springvale Rd (North of Mitcham Rd)	1,350–1,850	-100 to -800 (-35%)
Upper Heidelberg Road (between Banksia St and Studley Rd)	1,500–2,000	-100 to -300 (-15%)
Wairoa Road (Between Southern Rd And Dougharty Rd)	800–1,200	-100 to -500 (-35%)

Truck volumes are forecast to decrease at a number of locations throughout the north east including key roads such as Rosanna Road, Fitzsimons Lane and Banksia Street. The largest decreases (as a percentage) are along Rosanna Road (reduction of 75 percent), Bullen Road (reduction of 50 percent) and Lower Plenty Road (reduction of 60 percent), which are all currently heavily utilised by trucks when travelling between the Eastern Freeway and the M80.

A large reduction is also predicted on Fitzsimons Lane (25 percent) as North East Link will remove a number of trucks travelling through the area that do not have a local destination. The strategic modelling that has been undertaken for the project has not assumed any additional truck curfews within the north east at this stage. The existing night-time curfews that VicRoads have implemented have been assumed to still be in place when North East Link is opened. Further work and discussions with the community and key stakeholders will be undertaken following the completion of the business case in this area.

Note that even if new truck bans or curfews were implemented, it will not be possible to remove all trucks from roads within the study area. Trucks with a local destination are legally permitted to travel past a truck ban or curfew sign if they have no other way to access their destination. There will also be trucks that cannot enter the tunnel as they may be over-height or placarded vehicles. These vehicles will need to continue to use arterial roads to travel to/from their destinations.

5.4 Rosanna Road

North East Link will reduce truck volumes on residential roads such as Rosanna Road. A summary of the predicted change in truck volumes along Rosanna Road is presented in Table 7.

Table 7 Forecast changes in truck volumes on Rosanna Road

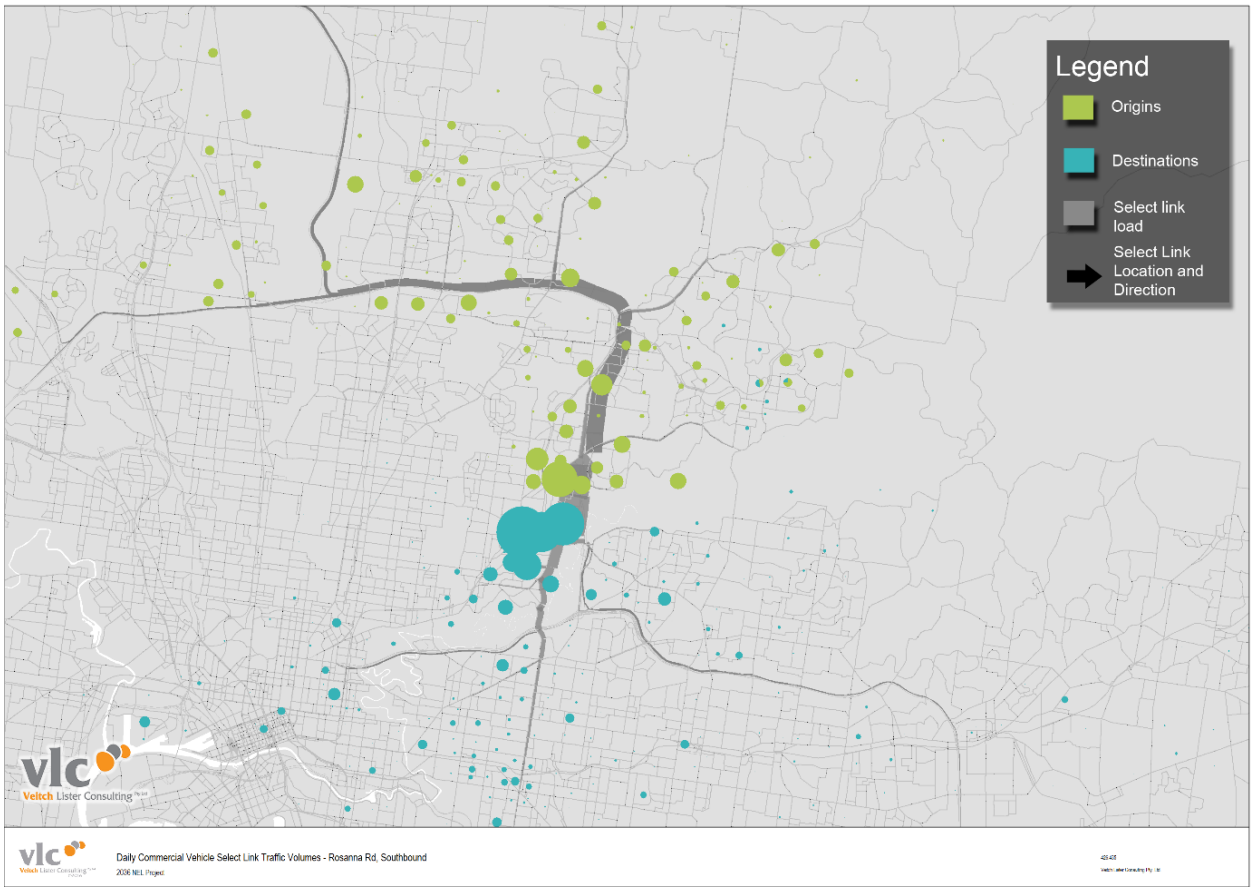
	2017	2036 'no project' scenario	2036 with project
Truck volumes	2,800–3,600	3,800–5,000	900–1,300
Percentage commercial vehicles in all traffic	7%	9%	3%

With the introduction of North East Link, truck volumes are predicted to reduce by approximately 75 percent to 900 to 1,300 trucks a day. 65 percent of the remaining forecast trucks are light commercial vehicles which are two-axle trucks and not a typical semi-trailer that most associate when referring to a truck. It is likely that even with a truck ban (banning vehicles over 4.5 tonnes), many of these trucks will still be allowed to travel on the road.

The proportion of trucks travelling along Rosanna Road will decrease from the nine percent to five percent once North East Link is opened. This will assist in improving traffic conditions and safety along Rosanna Road through less truck-car interaction. The reduction of heavy vehicles will also provide opportunities to change traffic signal phasing along the corridor improving connectivity across Rosanna Road for pedestrians and cyclists.

The trucks remaining on Rosanna Road after the opening of North East Link predominantly service the local area as presented in Figure 24. Trucks travelling southbound on Rosanna Road are travelling from origins south of the M80. The bulk of these vehicles are accessing destinations within Heidelberg (deliveries to shopping centres etc), showing that these vehicles are making local trips that may not be suited to the use of the freeway network.

Figure 24 Origin/Destinations of trucks using Rosanna Road in 2036 (with North East Link open)



5.5 Freight efficiency and accessibility

North East Link provides the opportunity for increased efficiency between the north and the eastern or south-eastern suburbs. Operators travelling between these locations will have an alternative to the congested M1 and inner-city corridor, with the potential for significant travel time savings by using North East Link. Trucks travelling from interstate or from the northern freight terminals can decide on a time and efficiency basis whether the orbital (North East Link) or central city routes (CityLink / Monash Freeway) provide the best option for their transport task.

While North East Link provides greater connectivity between the north and south east, it also provides greater access to destinations adjacent to the corridor that require freight access. This includes centres such as Somerton, Epping, Ringwood, Heidelberg, Box Hill, Doncaster, La Trobe and Greensborough. North East Link enables freight vehicles accessing these locations to now travel for the majority of their trip on a freeway standard road, improving vehicle efficiency while removing trucks from local and arterial roads.

North East Link will also improve travel time reliability, bypassing up to 18 sets of traffic lights and congestion on the arterial road network which can be highly variable throughout the day. The improvement in travel time reliability provides an opportunity for an improvement in fleet operations and scheduling. This could mean that a distributor may require less trucks through a reduction in lost time due to vehicles being stuck in congestion. It will also enable additional trips to be completed within the same timeframes. When these elements are applied across a broad fleet of trucks they can provide significant savings.

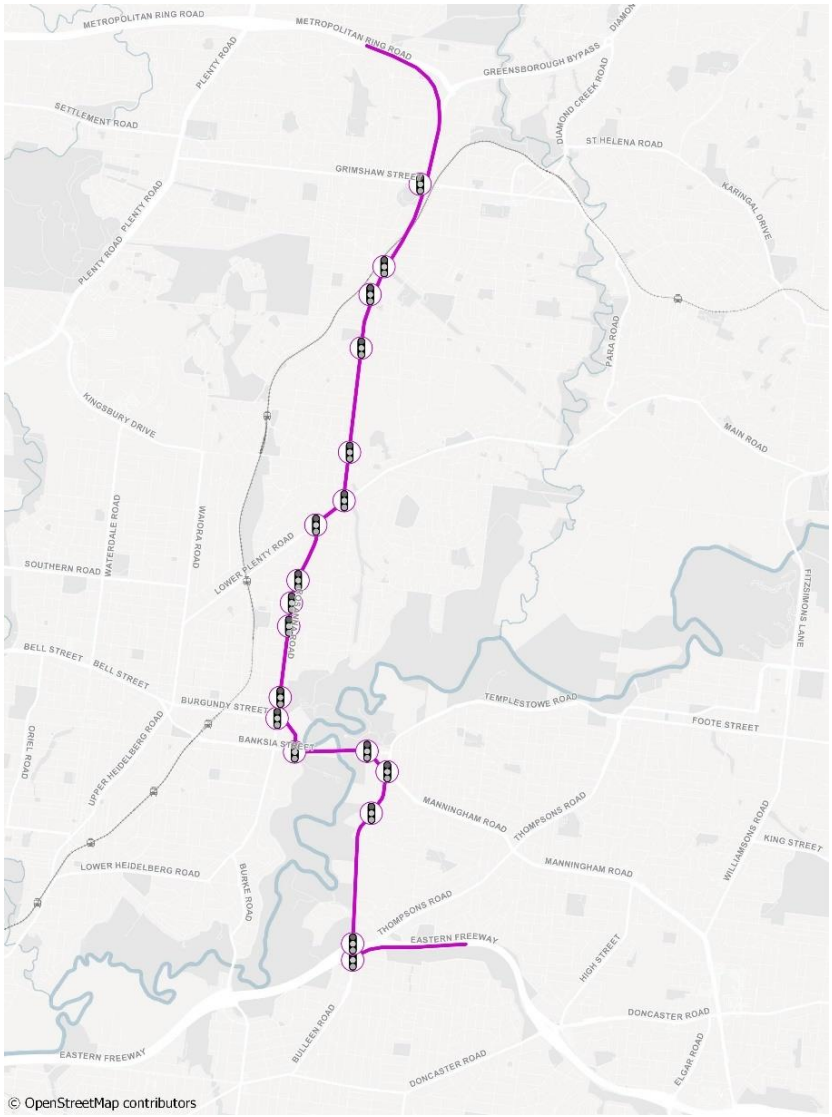
6 Improving travel times and accessibility to jobs and services

By diverting traffic away from congested arterial roads, North East Link will significantly reduce travel times and improve accessibility to jobs, services, education and recreation. This chapter explores how users of North East Link will benefit from improved travel times and how others road users on the wider network will indirectly benefit.

6.1 Travel time benefits

North East Link provides a freeway standard connection between the Eastern Freeway and M80 which will bypass 18 sets of traffic lights compared to the current arterial route, as presented in Figure 25.

Figure 25 Existing route between the Eastern Freeway and M80



By 2036 in a 'no project' scenario, this route between the M80 (at Plenty Road) and the Eastern Freeway (at Doncaster Road) will take between 50 to 55 minutes on average (southbound during the AM peak, and northbound during the PM peak). With North East Link, this same trip (and travelling via North East Link) can be reduced to approximately 20 minutes. This saves up to 30 minutes on average in one direction, meaning trips can be completed up to 65 percent faster with North East Link.

Additionally, the diversion of traffic away from the Bulleen Road – Rosanna Road – Greensborough Road route means that travel times on the arterial roads will also improve for those not willing to pay to use North East Link. Travel times along the existing arterial road corridor (in a scenario with North East Link) will improve by up to 30 percent in the peak periods.

A summary of the travel time benefits between the Eastern Freeway and M80 is presented in Table 8.

Table 8 Eastern Freeway (Doncaster Rd) to M80 (Plenty Rd) average travel times (route F)

Route	2036 'no project' scenario	2036 with North East Link	Percentage change
AM peak - southbound			
Arterial road network	54 min	40 min	-25%
North East Link	-	22 min	-60%
PM peak – northbound			
Arterial road network	52 min	37 min	-30%
North East Link	-	19 min	-65%

The Eastern Freeway upgrade will also see significant travel time reductions due to the reconfiguration and additional capacity. Journey times will be up to 40 percent faster on average following the upgrade. This means that average vehicle speeds increase from 35 kilometres per hour to 50 kilometres an hour in the AM peak, with speeds in some heavily congested areas (such as Bulleen Road to Doncaster Road) increasing from 30 kilometres per hour to 70 kilometres per hour.

Table 9 Eastern Freeway (Springvale Road to Hoddle Street) average travel times (route E)

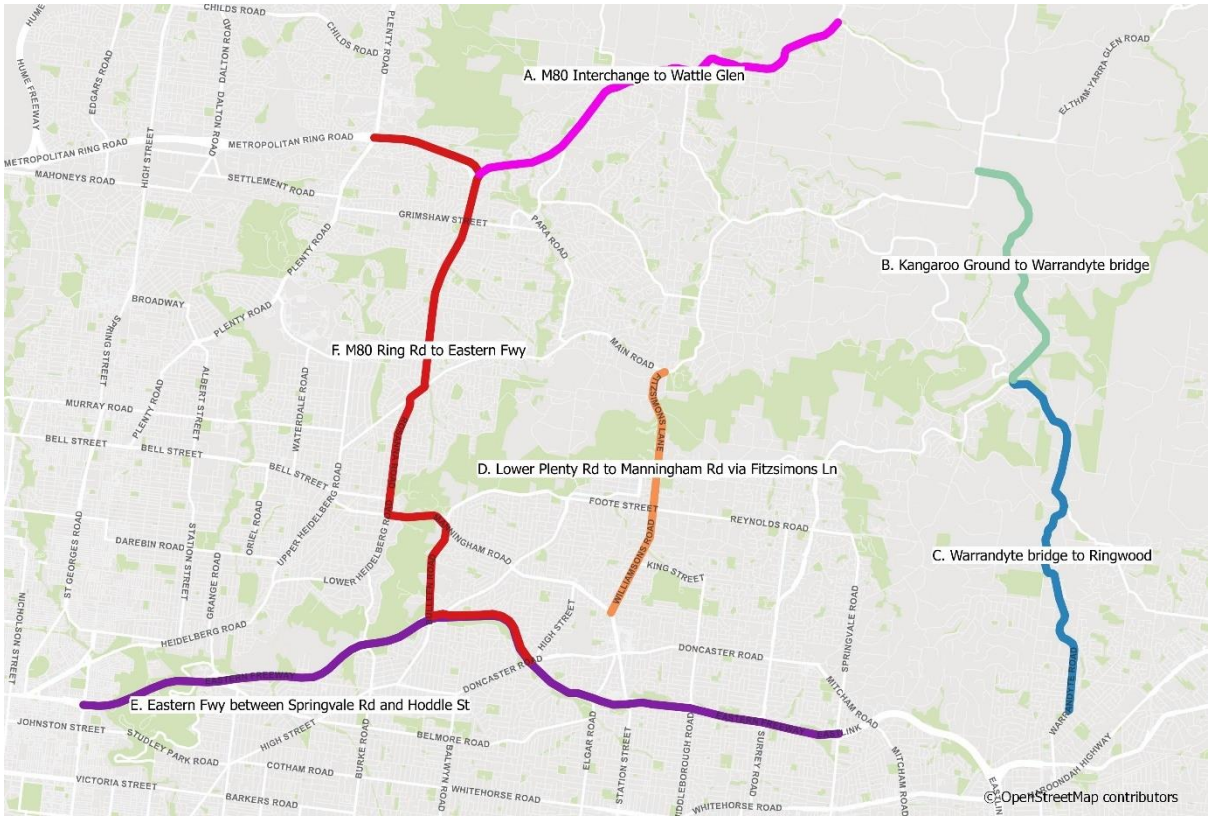
Route	2036 'no project' scenario	2036 with North East Link	Percentage change
AM peak – westbound	31 min	22 min	-30%
PM peak – eastbound	28 min	17 min	-40%

As discussed previously in Section 3, North East Link will draw traffic away from the arterial road network, freeing up the road for more localised uses. This means people travelling on other roads removed from the project will still see travel time reductions. Those travelling along Fitzsimons Lane and through Warrandyte will experience faster journeys of up to 30 percent, as presented in Table 10. The routes are presented in Figure 26, with routes E and F provided above.

Table 10 Other arterial road travel time changes

Route	2036 with project scenario travel times					
	AM peak (7-9am)			PM peak (4-6pm)		
	Direction	2036 average travel time (mins)	% change	Direction	2036 average travel time (mins)	% change
A – Wattle Glen to M80 Interchange	WB	22	+1%	EB	20	+5%
B – Kangaroo Ground to Warrandyte Bridge	SB	8	-25%	NB	6	-25%
C – Warrandyte Bridge to Ringwood	SB	12	-5%	NB	15	-5%
D – Main Road to Manningham Road	SB	9	-30%	NB	18	-25%

Figure 26 Travel time routes



6.2 Travel times between key destinations

Overall, the traffic reductions on the road network means that access to the key activity centres and major activity centres in the north east will be significantly improved. The travel time routes assessed are presented in Figure 27 with the changes between the 2036 'no project' scenario and project case (with North East Link) presented in Table 11.

Figure 27 Travel time locations assessed

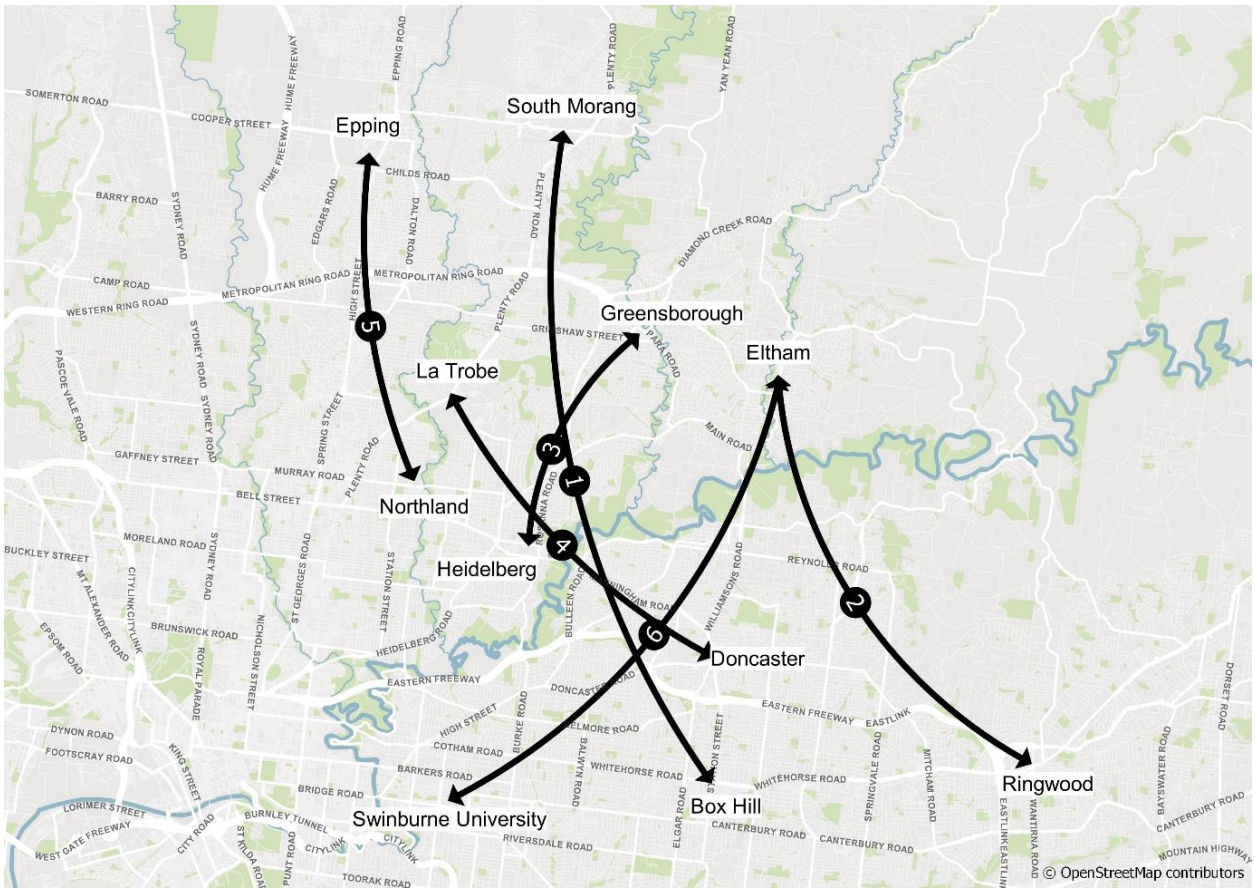


Table 11 Change in travel times between key locations in the AM peak

Origin	Destination	Change in travel times between 2036 project case and 2036 'no project' scenario
South Morang	Box Hill	-20% to -25%
Eltham	Ringwood	-10% to -15%
Greensborough	Heidelberg	-25% to -30%
Doncaster	La Trobe	-10% to -15%
Epping	Northland	-1% to -5%
Eltham	Swinburne University	-10% to -15%

The largest reductions in travel times are between South Morang and Box Hill and between Greensborough and Heidelberg, with a reduction of 20 percent and 25 percent respectively in the AM peak. This is primarily due these activity centre's proximity to North East Link. However, other arterial routes also see significant reductions in travel times, such as Eltham to Ringwood (15 percent reduction) Doncaster to La Trobe (10 percent reduction) and Eltham to Swinburne University (10 percent reduction). These reductions in travel times are due to a general reduction in traffic volumes on the arterial road network as vehicles redistribute to the upgraded Eastern Freeway and North East Link to travel to their destinations.

This means trips that do not use North East Link will still benefit from improved travel times and reduced levels of congestion.

Additionally, trips to the Melbourne Airport are expected to improve. For example trips between Doncaster and Melbourne Airport will improve by up to 30 percent, as presented in Table 12. Coupled with improved travel time reliability and network redundancy benefits (discussed in Section 7), North East Link will allow for a quicker and more hassle-free commute to the airport.

Table 12 Change in travel times to Melbourne Airport

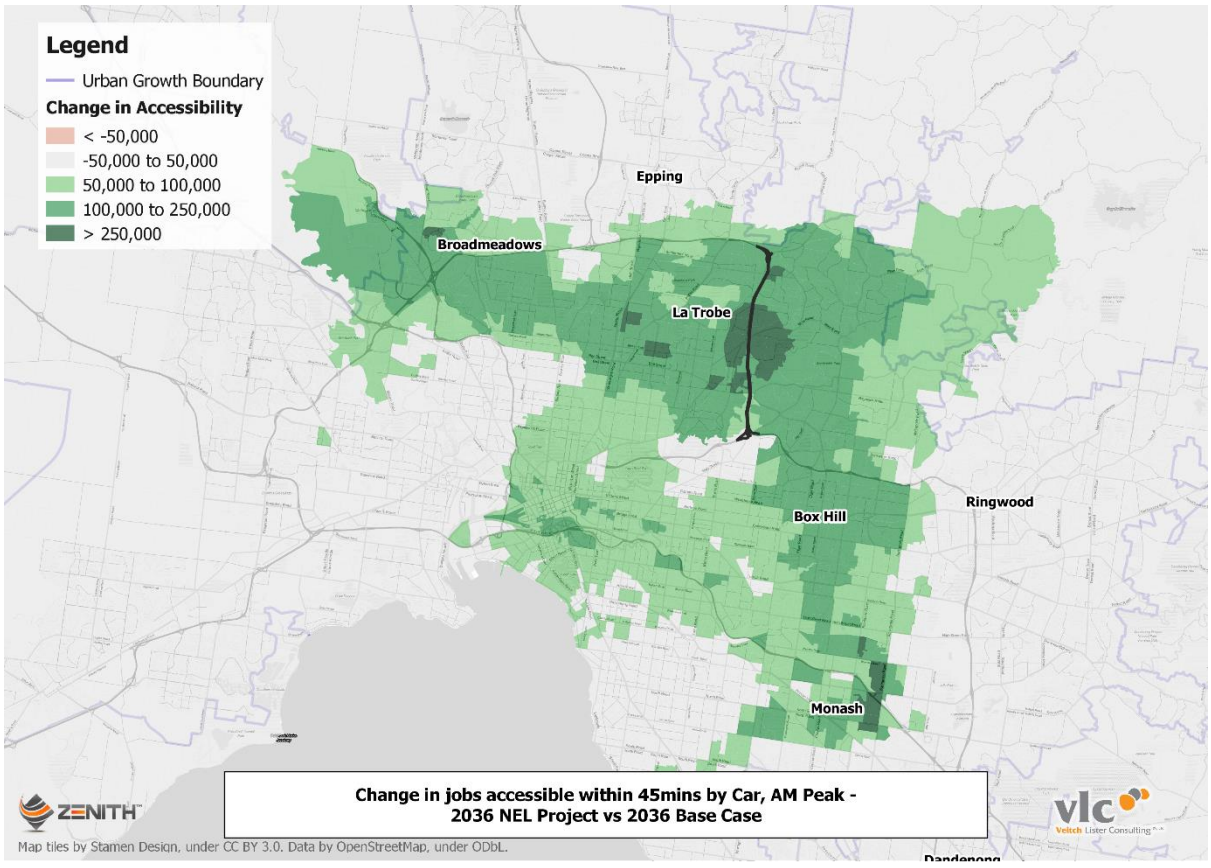
Route	Percentage change
Doncaster to Melbourne Airport	-25% to -30%

6.3 Accessibility to jobs and services

Providing a new freeway link and removing traffic from arterial roads on one hand allows current trips to be completed faster, however it also enables people to travel further in the same amount of time. North East Link opens up the region, making it more accessible to a larger workforce pool. Additionally, people living in the north east are able to access a greater number of jobs and services that were previously out of reach.

The additional number of jobs that are available to people within a 45-minute car ride during the AM peak period is presented in Figure 28. Hundreds of thousands of jobs will be now be available within a 45-minute journey that could have previously taken an hour or more to complete. This offers people in the north east a greater choice of employment opportunities, and businesses a larger labour market in which they can access.

Figure 28 Increased accessibility to jobs during the AM peak



7 Improving network redundancy and route choice

Drivers from the south-east do not currently have alternative freeway routes for cross-city travel. They can travel along the M1 corridor through the central city which then provides access to the Tullamarine Freeway. However, this route is often congested with highly variable travel times. An alternative route is via EastLink, the Eastern Freeway and the arterial road network to access the M80. However, similar to the M1 corridor, this route can be congested, particularly along Rosanna Road and Greensborough Road.

North East Link will provide a new alternative route, where drivers can bypass congestion while remaining on the freeway network to access their destination. This chapter explores how North East Link improves the redundancy across the freeway network while also improving route choice and reduces the reliance on the M1 corridor.

7.1 Improved redundancy

In periods of disruption on the network, increased and more efficient travel options will be available for motorists to reach their destinations. North East Link will provide a new link between the Eastern Freeway and M80, enabling motorists to bypass issues that may occur along the M1 corridor. The West Gate Bridge has approximately 750 vehicle breakdowns a year, providing an indication of how often incidents occur along this key corridor.

Travel from the interchange of Eastlink and the Monash Freeway to the M80 and Hume Highway interchange will be 8 km shorter via the EastLink/Eastern Freeway and North East Link route than via the Monash Freeway, West Gate Freeway, Tullamarine Freeway and the M80. This will create a viable alternative to the M1 corridor with a shorter travel time for some road users.

In addition, any avoidance of the M1 corridor particularly during peak hours will provide relief to this corridor, allowing it to operate more efficiently due to reduction in traffic volumes. The M1 route and the North East Link route are presented in Figure 29.

Without North East Link, motorists would be required to use the arterial road network to bypass congestion on the M1 corridor. These arterial roads do not have the adequate capacity to accommodate the diversion from the freeway network, particularly during the peak periods, resulting in additional congestion on the arterial network and highly variable travel times.

Figure 29 Alternate freeway route

North East Link provides motorists with the ability to make a choice as to which route they use to get to their destination. Real time information can be provided to drivers using variable message boards, advising of traffic conditions or incidents on the network ahead. This would enable a driver to make an informed choice and select a suitable route which can bypass congestion and improve their travel time.

The upgrade to the Eastern Freeway includes the separation of the express and collector-distributor carriageways by solid safety barriers, providing additional network redundancy. A disruption caused by a substantial incident on the Eastern Freeway between Tram Road and Burke Road will be predominately contained to the carriageway it occurred in, reducing the overall disruption to the network and allowing the unaffected carriageway to keep flowing. This separation of carriageways will enable traffic flow to be maintained, where previously it may have closed the whole carriageway.

7.2 Improving road safety

The construction of the project is forecast reduce the number of crashes on the road network. To forecast the 2036 no project number of crashes, the default urban crash rates have been applied. These rates have been extracted from the VicRoads report "Accident Analysis by Road Profile Study, Operational Report", January 1996, Table 3.1 (updated by T Boyd, 2010).

The North East Link Project will upgrade the Eastern Freeway to a fully managed motorway. This will manage traffic flow with ramp metering and overhead lane control. The improvement in traffic control will result in less congestion and congestion related crashes.

VicRoads has undertaken a study of the M1 freeway to assess the change in crash rates due to the introduction of the managed motorway. The VicRoads "Managed Motorway Framework", March 2017, provides details on the reduction on the crash rate along the freeway due to the managed motorway. The analysis showed that the crash rates decreased by approximately 30 percent with the introduction of the managed motorway, while the crash rates on other freeways remained consistent. As such, a 30 percent reduction in crash rate on the freeway has been applied for the 2036 project scenario.

North East Link will result in a redistribution of traffic from the arterial road network onto the freeway network, removing through trips from residential roads. The project will provide an additional 50km of freeway lanes through the widening of the Eastern Freeway as well as the construction of the new link. These additional lanes as well as the redistribution of traffic onto the freeway results in a large increase in the amount of vehicle kilometres travelled (VKT) on the freeway network.

While the amount of traffic travelling on the freeway network will increase due to North East Link, the improvements in road safety due to the managed motorways will result in a reduction in the number of crashes forecast to occur. This, combined with the reductions in crashes on the arterial roads due to the redistribution away from them, results in an overall reduction of 89 crashes per year when North East Link is opened.

This assessment does not take into consideration the further road safety benefits on the collector-distributor lane arrangements as there is insufficient data available to determine a suitable crash rate. However, it is likely that there will be further reductions in crashes due to the separation of movements.

A summary of the forecast number of crashes is provided in Table 13.

Table 13 Forecast number of crashes 2036

Road type	2036 no project		2036 project		Change in forecast crashes
	Daily VKT	Forecast crashes	Daily VKT	Forecast crashes	
Freeways	6,420,000	157	9,010,000	152	-5
Non-freeway	21,650,000	2,031	20,759,000	1,947	-84
Total		**2,188**		**2,099**	**-89**

7.3 Repurposing the M1 for radial trips

North East Link will redistribute some trips away from the M1 corridor, due to a shorter orbital route via EastLink and the Eastern Freeway and the ability to bypass the centre of Melbourne with its associated congestion. This will free up some capacity on the M1 corridor, improving traffic conditions and providing the spare capacity for other trips.

8 Extending Melbourne's Managed Motorway Network

Managed motorways are critical to the successful operation of the freeway network. They enable the monitoring of traffic conditions, provision of real time information and the management of traffic flow.

This chapter explores the benefits of a managed motorway and what will be provided as part of North East Link.

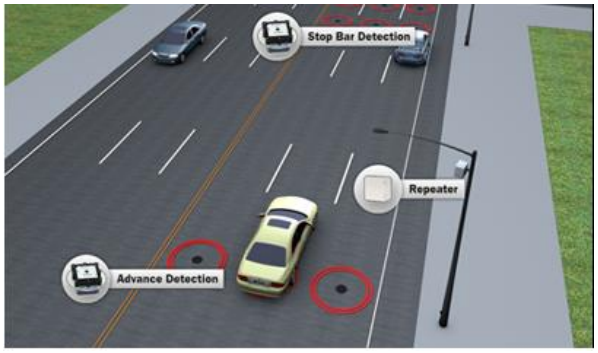
8.1 What is a managed motorway

Melbourne's freeway network is gradually being upgraded from simple asphalt with line-marking to a fully managed motorway – installing a range of technologies to improve the operation, reliability and end user experience on the freeway network.

The managed motorway concept is made up of a number of discreet technologies including Lane Use Management Signs (LUMS), ramp metering, Variable Message Signs (VMS), Closed Circuit Television (CCTV) cameras and in-pavement detection studs, together with a strategic operational concept that manages traffic performance along the whole corridor rather than focusing on single entry ramps. Examples of the roadside infrastructure are provided in Table 14.

This infrastructure allows the collection of data and active monitoring of traffic performance, enabling quick and effective responses to incidents or traffic congestion to be implemented.

Table 14 Examples of managed motorway infrastructure

LUMS	Allows variable speed limits depending on traffic conditions and closure of traffic lanes during incidents	
Ramp metering	Manages traffic flow entering the motorway to optimise traffic flow and minimise the likelihood of congestion	
Variable message signs	Provide a range of information to motorists including advice on delays, detours, travel times and traffic conditions	
Closed circuit television	For monitoring of traffic and road users, lane use management and incidents	
Pavement detection studs	Can detect volume of vehicles and the speed they are travelling at. Can also detect queues and congestion	

Source: VicRoads Management Motorways Framework, March 2017

8.2 Benefits of a managed motorway

In an assessment of the impact of managed motorway improvements on the M1 corridor, VicRoads[1] noted a 19 percent increase in vehicle speeds in the AM peak and a 28 percent increase in speeds during the PM peak. There was also a 16 percent increase in freeway capacity which is equivalent to adding approximately 0.7 new lanes of capacity in each direction on the road.

This improvement in lane capacity and vehicle speeds has occurred primarily through the implementation of ramp metering. Ramp metering controls the rate that vehicles can enter the motorway which optimises mainline traffic flow and minimises the likelihood of congestion along the motorway. However, to enable effective operation of ramp metering, other systems are required to be installed along the corridor to monitor traffic performance.

Managed motorways also assist in quickly identifying abnormal traffic congestion due to incidents or flow breakdown. This is done through the in-pavement detectors which can identify flow breakdown and alert operators.

Analysis undertaken by the Queensland Department of Transport and Main Roads[1] in Brisbane found that the duration of impacts of an incident are roughly five times the duration of the incident itself. A managed motorway system on some roads has reduced the average detection time of queuing and flow breakdown on one freeway in the study from 32.2 minutes to 4.3 minutes. This improved detection rate enables road mangers to respond to flow breakdown, reducing the duration of the incident and therefore minimising the impacts to the broader road network.

8.3 Proposed scope

North East Link will be a fully managed motorway which will include ramp metering at all entry ramps. The city facing ramps connecting North East Link and the Eastern Freeway will also be metered. LUMS, VMS and CCTV will also be installed along North East Link corridor.

The Eastern Freeway from Springvale Road to Hoddle Street and the M80 from Plenty Road to Greensborough Bypass (currently being upgraded by VicRoads) will be upgraded to a managed motorway. This will include ramp metering, LMS, VMS and CCTV along both corridors.

8.4 Melbourne's managed motorway network

Since 2006, VicRoads has been implementing a managed motorway system across Melbourne to optimise traffic flow across the freeway network. With the possible exception of EastLink, the full inner urban freeway network will be a managed motorway once North East Link is completed (including the completion of the West Gate Tunnel project, M80 Upgrade and Monash Freeway upgrade). This would result in one of the largest managed motorway networks in the world.

[1] VicRoads, Managed Motorways Framework, March 2017.

9 Doncaster Busway – High-frequency DART services

The North East Link project includes upgrading the Doncaster Area Rapid Transport (DART) bus routes by providing new dedicated bus lanes along the Eastern Freeway. The Doncaster Busway will include designated bus lanes from Doncaster Road to Hoddle Street, creating an uninterrupted path for SmartBus services travelling between the eastern suburbs and the city.

Currently, the DART services utilise the left-hand shoulder on the Eastern Freeway which can be shared with taxis. During high levels of congestion during peak periods, DART services are unable to travel at free flow speeds due to on and off-ramp congestion, and travel times between Doncaster Road and Hoddle Street are heavily impacted. This results in a longer commute for passengers seeking a fast connection between eastern suburbs and the city, with travel times that vary significantly over the day.

By separating the carriageway, the Doncaster Busway will enable the bypassing of AM and PM peak congestion on the Eastern Freeway mainline, entry and exit ramps, and be unaffected by delays on the Eastern Freeway as interaction between buses and other vehicles will be limited. Bus travel times across the Eastern Freeway will become more consistent and reliable.

A higher frequency of services can be implemented due to faster and more reliable trips between Doncaster Road and Hoddle Street, servicing more passengers and reducing queues at the Doncaster Park & Ride.

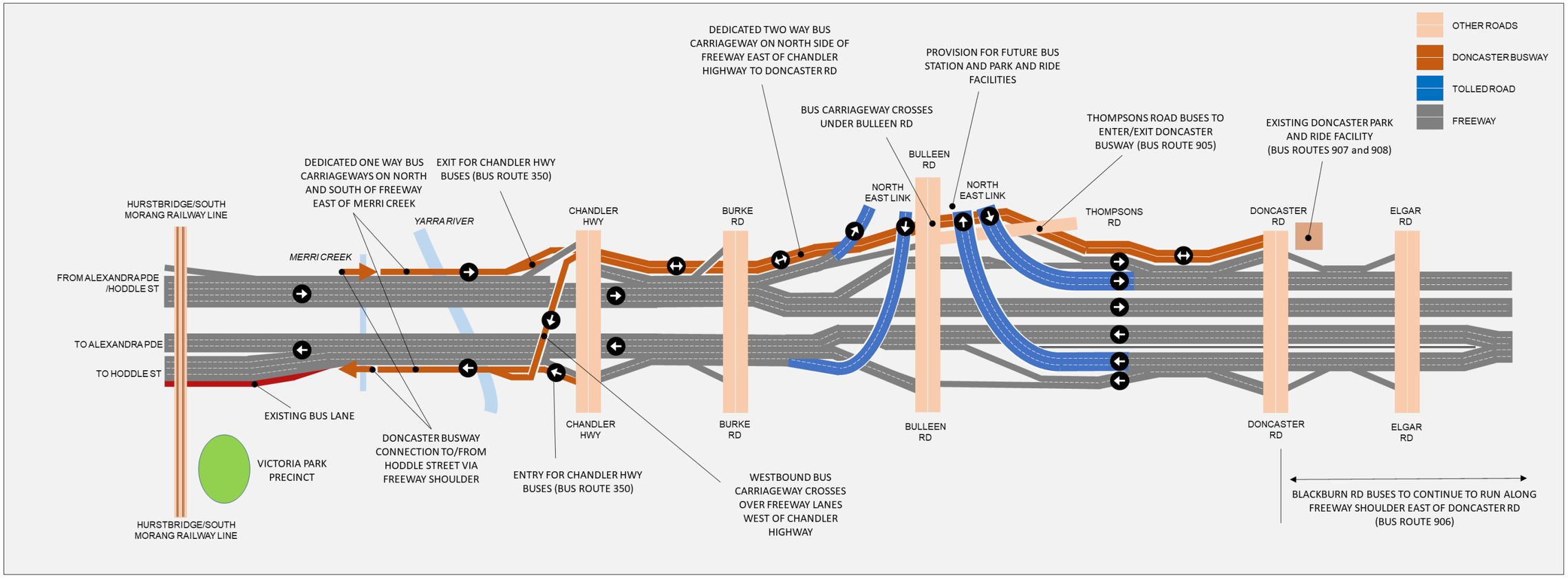
9.1 Scope

The Doncaster Busway will be two dedicated bus only lanes between Doncaster Park & Ride and Hoddle Street. It will be situated in the existing shoulders of the Eastern Freeway between Hoddle Street and Doncaster Road, as presented in Figure 30. Having the bus carriageway on the north side of the freeway will assist in separating the Doncaster Busway from the proposed North East Link exit and entry ramps, while streamlining access to the bus stops on Thompsons Road and Doncaster Road.

The Doncaster Busway also includes:

- An at-grade intersection of the Doncaster Busway at the Doncaster Road / Doncaster Park and Ride intersection
- The ability for buses to directly access the arterial road network at Doncaster Road and Bulleen Road / Thompsons Road
- Allowance for a future park and ride facility at the Bulleen Road / Thompsons Road interchange to enable it to be easily constructed at some point in the future
- Provision of space for potential bus stops at Chandler Highway, Burke Road and Bulleen Road / Thompsons Road.

Figure 30 Doncaster Busway



9.2 Patronage and travel times

With the implementation of the Doncaster Busway along the Eastern Freeway, daily patronage is predicted to increase on all four DART services. The 907 and 908 service patronage is estimated to grow by up to 10 percent, as presented in Table 15. The DART bus services are some of the most heavily utilised bus services in Melbourne, with a 10 percent increase resulting in a significant volume of additional boardings each day. This assessment has been undertaken for the full route of the bus services presented in Table 15.

With the provision for future bus stops on Burke Road, Bulleen Road and Chandler Highway, the Doncaster Busway lays the foundation for bus patronage to significantly increase in the future.

Table 15 Forecasted bus patronage increase

Route	Increase in patronage between 2036 Base and Project
905	<5%
906	5%
907	10%
908	10%

Travel times on the Doncaster Busway along the Eastern Freeway between Doncaster Road and Hoddle Street is predicted to be 30 percent faster in 2036 when compared to the non-upgraded Eastern Freeway without the Doncaster Busway. This is achieved through the full separation of bus services from general traffic which results in the bypassing of entry/exit ramps, any delays or incidents on the Eastern Freeway and an overall increase in bus operating speeds.

The travel time reduction on the freeway sections of the DART bus routes are presented in Table 16.

Table 16 DART bus routes change in inbound travel times

Route	Eastern Freeway segment
905	-30 to -35 %
906	-25 to -30 %
907	-30 to -35 %
908	-30 to -35 %

9.3 Other bus services

Travel times for a range of other bus services across the north east are forecast to improve due to a reduction in traffic volumes on arterial roads. As North East Link removes traffic from roads used by bus services in the north east, bus travel times and service reliability will improve, as presented in Table 17.

Table 17 Changes in volumes on bus routes

Road	Daily change in traffic volumes	Bus routes
Grimshaw Street	-1,000 to -2,000 (-5%)	566, 902
Plenty Road	-7,000 to -8,000 (-10%)	382, 566
Greensborough Road	-22,000 to -32,000 (-50%)	513
Rosanna Road	-9,000 to -11,000 (-20%)	513
Lower Heidelberg Road	-3,000 to -4,000 (-10%)	546, 584
Burke Road	-6,000 to -8,000 (-15%)	548
Chandler Highway	-4,000 to -5,000 (-5%)	350, 609
Heidelberg Road	-2,000 to -3,000 (-10%)	546
Thompsons Road	-1,000 to -2,000 (-15%)	200, 305
Banksia Street	-7,000 to -9,000 (-10%)	903
Fitzsimons Lane	-11,000 to -14,000 (-20%)	293, 901, 902

10 Walking and cycling in the north east

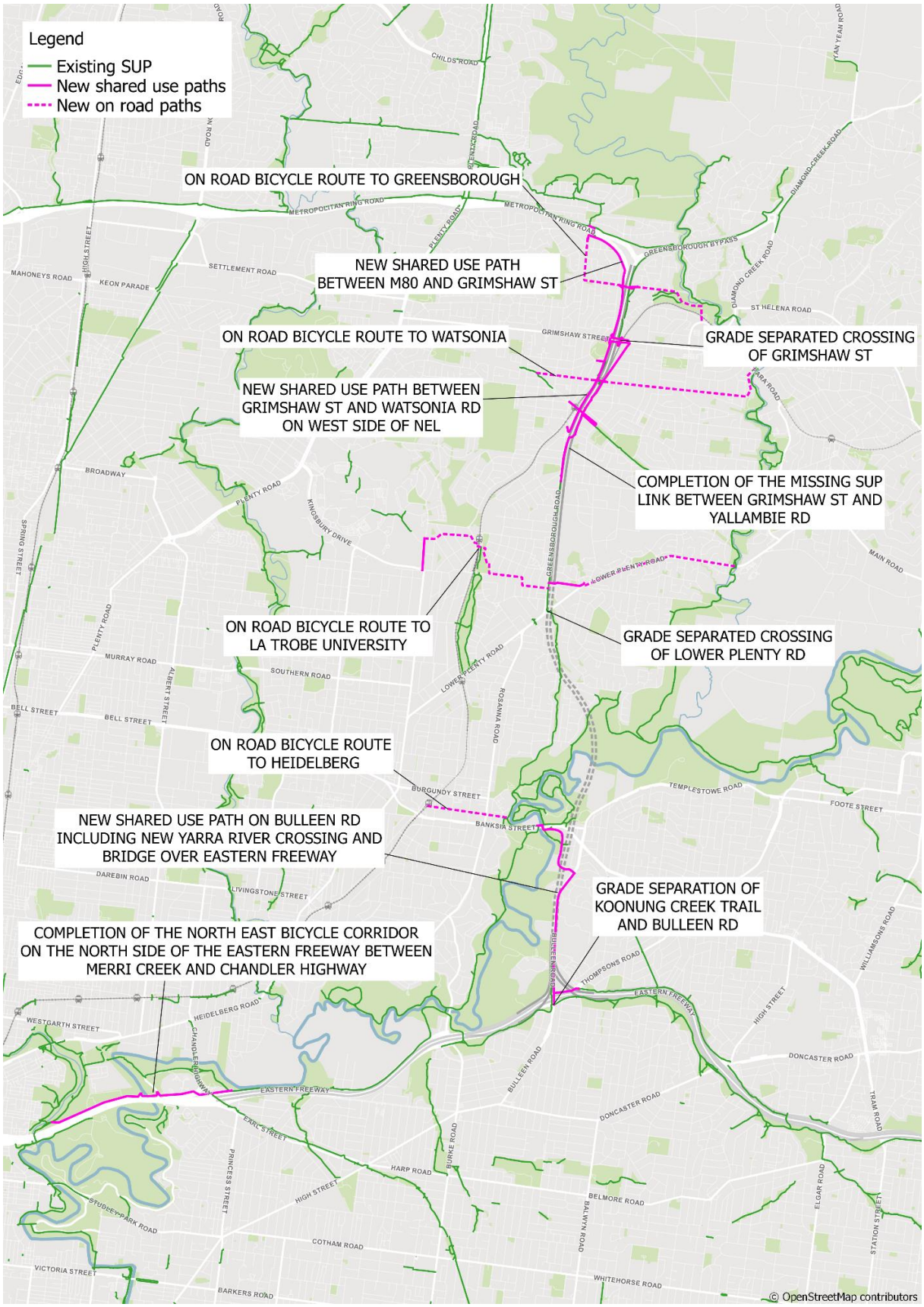
North East Link passes a number of key destinations such as activity centres, schools and recreation facilities. This presents the opportunity to provide high quality walking and cycling infrastructure along the project corridor to improve accessibility to these locations. This chapter covers the proposed walking and cycling scope for the project, and how the project will improve walking and cycling within the north east.

10.1 Walking and cycling infrastructure

North East Link enables the completion of a key missing link in the Strategic Cycling Corridor network – the completion of the Greensborough Road path between Yallambie Road and Grimshaw Street. This will enable cycling entirely off-road between the M80 and the wider walking and cycling network via the Eastern Freeway. This path will form part of a continuous ring road trail around Melbourne; over 100 kilometres of off-road cycling following the orbital freeway network via Altona, Tullamarine, Greensborough, Ringwood, Dandenong and Carrum.

The proposed walking and cycling infrastructure to be provided is presented in Figure 31.

Figure 31 North East Link walking and cycling base scope



10.2 The North East Bicycle Corridor – a new commuter cycling route to the city

The upgrade of the Eastern Freeway presents the opportunity to improve walking and cycling links into the inner-city areas. The North East Bicycle Corridor is a proposed new shared use path between Merri Creek and Chandler Highway on the north side of the Eastern Freeway, as presented in Figure 32. This link will provide a more direct route to the currently circuitous Main Yarra Trail or Yarra Boulevard.

Combined with the shared use path upgrades along Chandler Highway and Grange Road, this new route will also provide an alternative to the Heidelberg Road on-road route or the narrow Yarra River crossing at Fairfield.

At the eastern end, the path will connect to the Main Yarra Trail near Chandler Highway, continuing under Chandler Highway parallel to the Eastern Freeway. The path will then cross over the outbound off-ramp on a new bridge structure, before crossing Yarra Boulevard and Yarra Bend Road at grade, including a new bridge structure over the Yarra River.

The path connects back to the Main Yarra Trail at the bridge crossing of Merri Creek (near Roseneath Street). Additional works further along the Main Yarra Trail at Gipps Street (to be delivered by Parks Victoria) will further enhance this route between the eastern suburbs and the inner-city.

Further work and consultation will also be undertaken to assess extending this path further west over Merri Creek towards Hoddle Street and Alexandra Parade.

10.3 Completing the Greensborough Road path

A shared use path will be constructed parallel to the above ground sections of North East Link, completing the missing link in the Greensborough Road trail, a priority project identified in the Northern Regional Trails Strategy. The shared use paths along this corridor are presented in Figures 33 to 35 and include:

- A new shared use path on the southern side of the M80 and western side of North East Link between Macorna Street and Grimshaw Street. This will link to the existing bridge over the M80 at Macorna Street, the Yando Street underpass and will be grade separated over Kempston Street
- A new shared use path on the western side of North East Link between Grimshaw Street and Watsonia Road
- A new shared use path on the eastern side of North East Link between Grimshaw Street and Watsonia Road
- A new shared use path between Greensborough Road and North East Link between Watsonia Road and the existing path near Yallambie Road
- A new east-west shared use path in the reserve north of Drysdale Street between Greensborough Road and Lower Plenty Road, removing cyclists from the Lower Plenty Road interchange.

Figure 32 Proposed North East Bicycle Corridor alignment

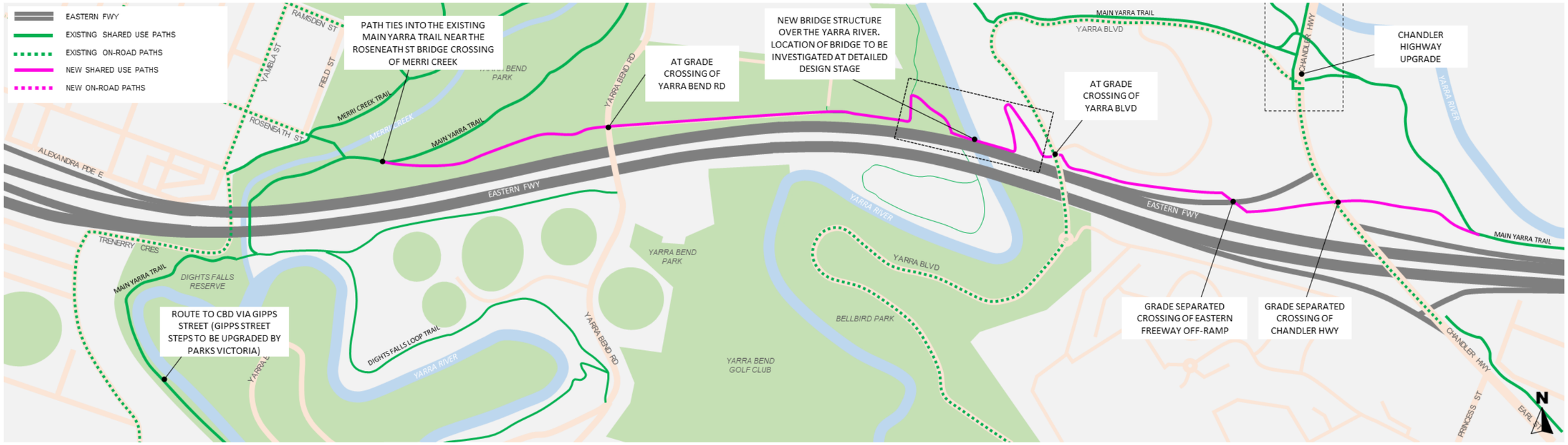


Figure 33 M80 Interchange proposed walking and cycling paths

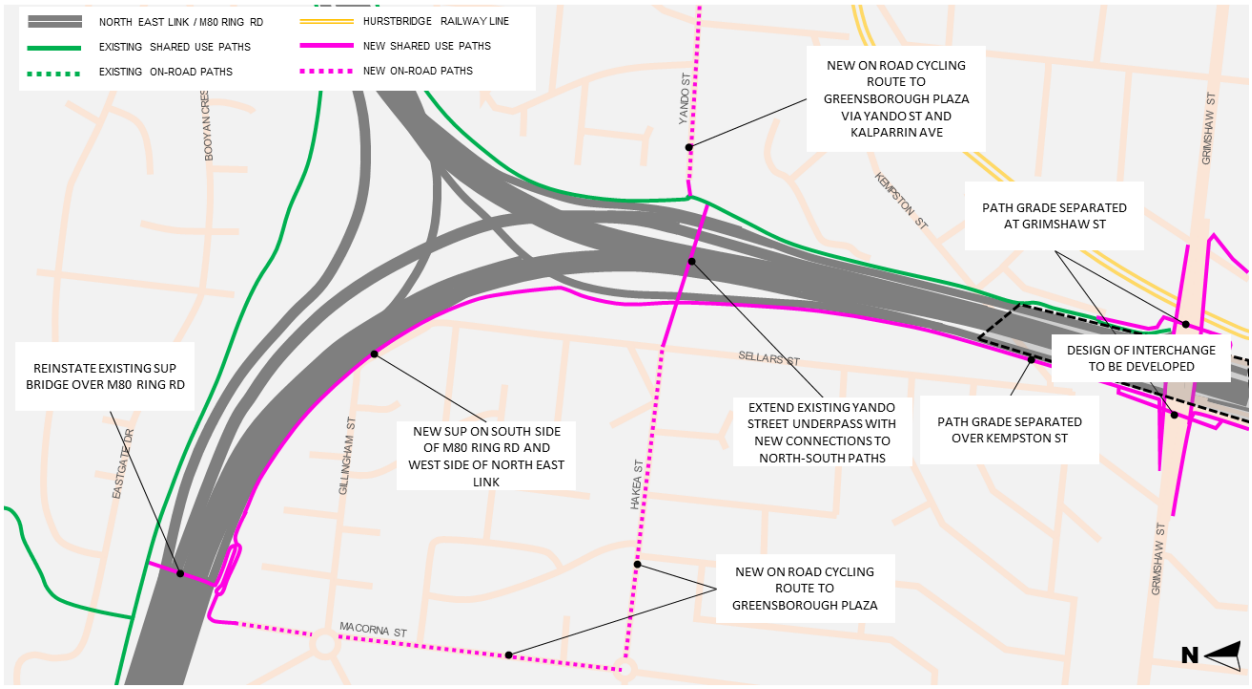


Figure 34 Greensborough Rd (north) walking and cycling scope

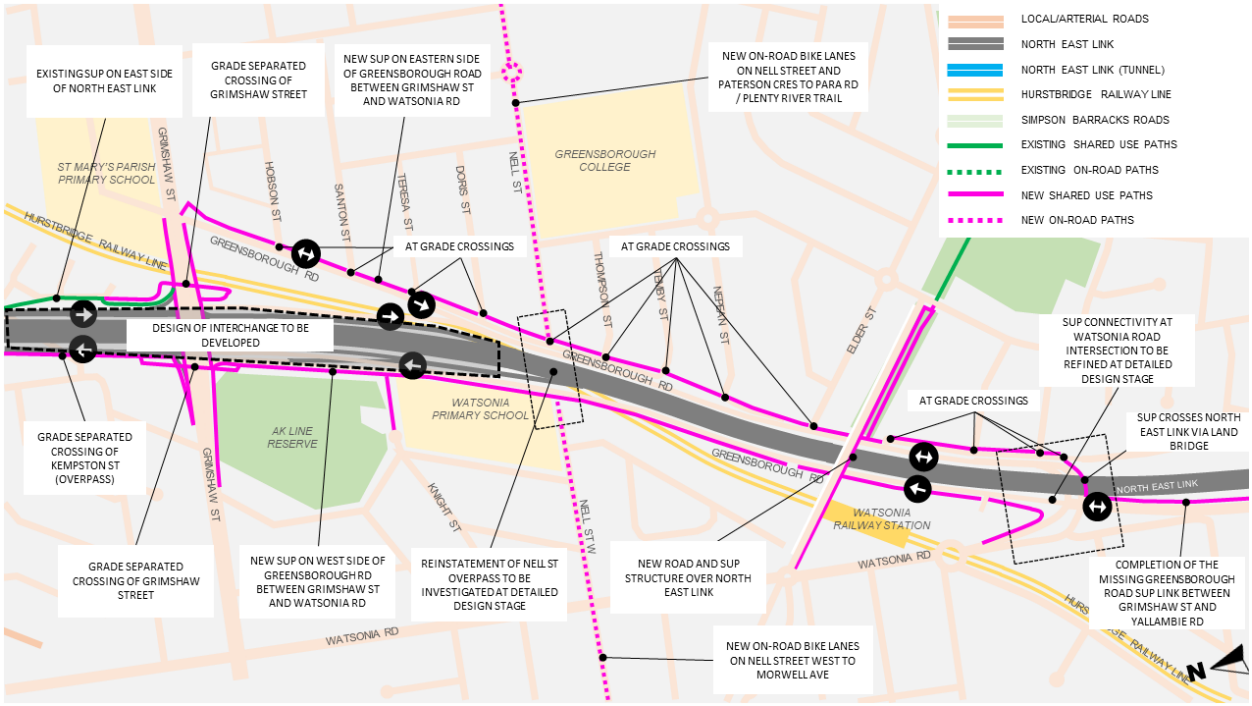
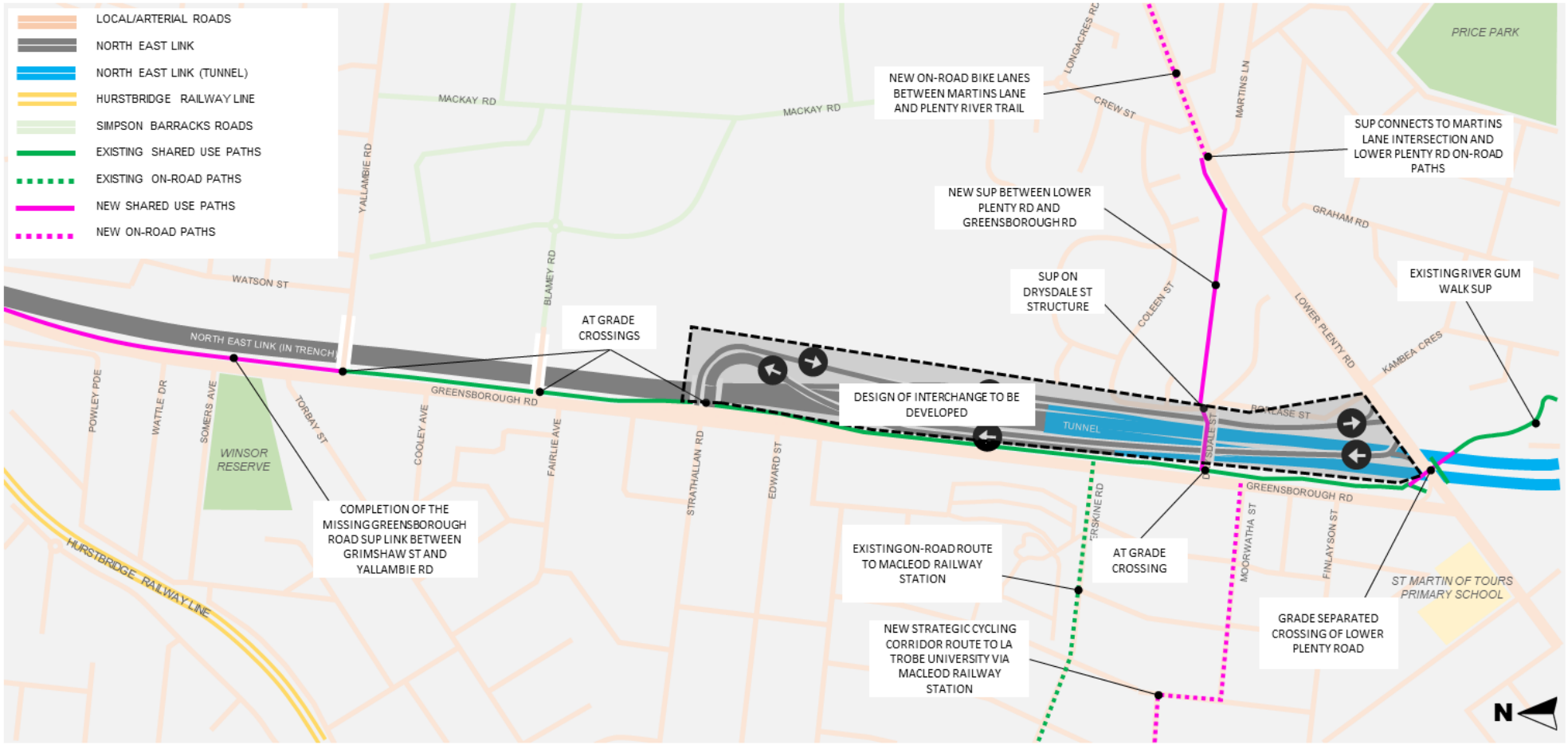


Figure 35 Greensborough Road (south) walking and cycling scope

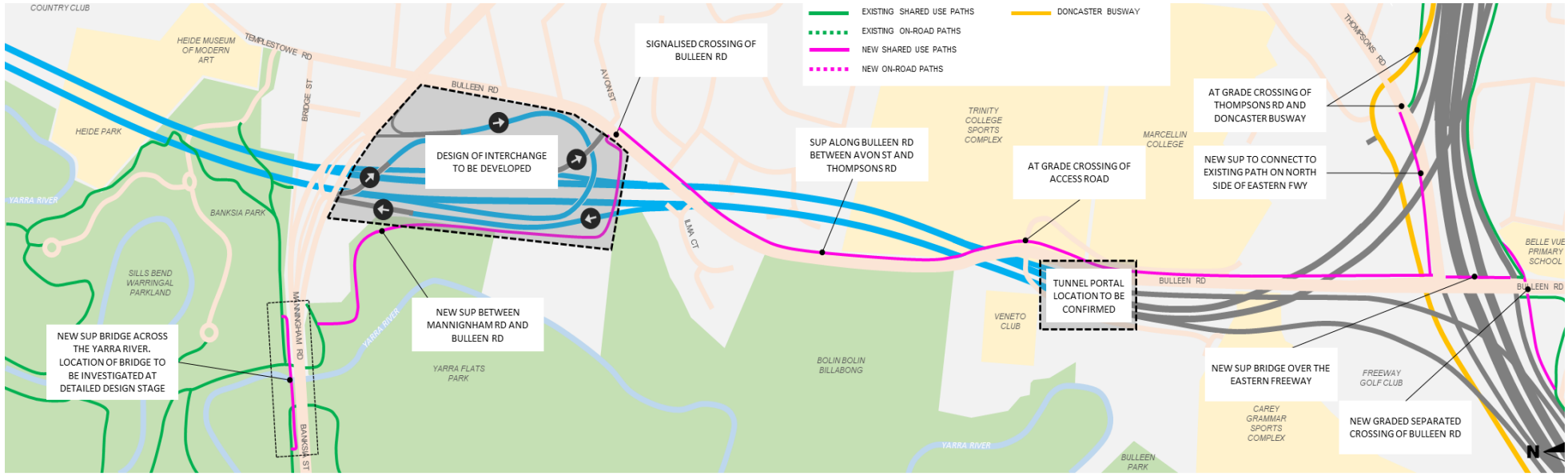


10.4 Improving access to schools and sporting facilities on Bulleen Road

A shared use path connection starting from Banksia Street and running parallel to Bulleen Road to the Eastern Freeway will provide new connectivity to the schools and sporting fields on Bulleen Road from both the south and the north. This path is presented in Figure 36 and includes:

- A new shared use path bridge across the Yarra River near Heidelberg. This crossing is a priority trail identified in the Northern Regional Trails Strategy and improves accessibility to Heidelberg from the east
- A new shared use path at the Manningham Road interchange. This path crosses Bulleen Road at grade at the North East Link off-ramp intersection with Bulleen Road
- A new shared use path along Bulleen Road between the North East Link off-ramp and Thompsons Road. The path is currently planned for the eastern side of Bulleen Road, however the final alignment of the path will be subject to further discussions with the local community
- A new shared use path along Thompsons Road between Bulleen Road and the Thompsons Road outbound on-ramp
- A new shared use path structure on the eastern side of the Bulleen Road interchange at the Eastern Freeway. This will enable safer and easier crossing of the freeway, linking the new Bulleen Road path with the residential areas south of the freeway. This will be a significant upgrade from the current narrow and sub-standard footpath at the freeway.

Figure 36 Bulleen Road shared use path



10.5 Realising the Strategic Cycling Corridor network

Opportunities are limited to provide off-road connections in an east-west direction in the area. Instead, on-road cycling routes will be planned in the vicinity of North East Link, in line with the Strategic Cycling Corridor network. These routes will improve accessibility to activity centres such as Watsonia, Greensborough and the La Trobe NEIC.

These routes are identified as dashed lines in Figure 31.

10.6 Separating cars from pedestrians and cyclists

The shared use paths in the vicinity of North East Link will include grade separation of arterial road crossings where practical. These include:

- Grade separated crossings on both sides of North East Link under Grimshaw Street
- A grade separated crossing of Lower Plenty Road connecting the River Gum Walk shared use path with the Greensborough Road path
- A grade separated crossing of the Koonung Creek Trail under Bulleen Road. Note that the feasibility of this underpass is subject to further detailed design and consultation with stakeholders.

10.7 Avoiding severance across the freeway

Freeways are often thought of severing communities, as it often becomes a barrier to movement from either side. However, North East Link will not reduce east-west connectivity for pedestrians and cyclists across the Greensborough Road corridor. In some places connectivity is improved such as a new shared use path structure which is proposed over North East Link and Greensborough Road near Elder Street (location 10). This will improve connectivity from the east not only into Watsonia Station but across the Rail corridor also to provide for improved access from the eastern side of Greensborough Bypass to the Watsonia shops.

Additionally, the signalisation of the Drysdale Street – Greensborough Road intersection provides a new crossing point for cyclists and pedestrians across Greensborough Road. New pedestrian and cyclist crossing points of the surface sections of North East Link are roughly available at 400 to 500 metre intervals.

Much of the new road will be either in trench or lower than the ground level between Lower Plenty Road and Grimshaw Street. This means that walking and cycling connections can be provided at grade. The crossings at Drysdale Street, Blamey Road, Yallambie Road and Watsonia Road will all be via land bridges over the freeway in trench, with additional land bridges between Yallambie Road and Watsonia Road, provide further community integration across the North East Link.

The east-west walking and cycling crossing across North East Link (and Greensborough Road) are presented in Figure 37.

Figure 37 Walking and cycling crossings of North East Link