



Western Ring Route – Waterview Connection



Assessment of Transport Effects



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Quality Assurance Statement

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Executive Summary

In 2009 the NZ Transport Agency (NZTA) confirmed its intention that the 'Waterview Connection Project' (the Project) would be lodged with the Environmental Protection Authority as a Proposal of National Significance. The Project includes works previously investigated and developed as two separate projects: being the SH16 Causeway Project and the SH20 Waterview Connection. The key elements of the Project are:

- Completing the Western Ring Route (which extends from Manukau to Albany via Waitakere);
- Improving resilience of the SH16 causeway between the Great North Road and Rosebank Interchanges to correct historic subsidence and "future proof" it against sea level rise;
- Providing increased capacity on the SH16 corridor (between the St Lukes and Te Atatu Interchanges);
- Providing a new section of SH20 (through a combination of surface and tunnelled road) between the Great North Road and Maioro Street Interchanges; and
- Providing a pedestrian / cycle way throughout the surface road elements of the Waterview Connection Project corridor.

A description of the Project including description of the provision for walking, cycling, passenger transport and the roading layout is provided in **Section 2** and a more comprehensive description of all aspects of the Project is provided in Part A Chapter 4 of the AEE.

Scope of Assessment

Beca Infrastructure Ltd (Beca) has been commissioned by NZTA to undertake a Transport Assessment to assess the potential effects of the works to be undertaken for the Project, which will inform the Assessment of Environmental Effects for the Project. The preparation of this Transport Assessment has taken into consideration the guidance set out in the Auckland Regional Transport Authority (ARTA) and NZTA documents for the preparation of Integrated Transport Assessments. The key matters in relation to the assessment of the Project are considered to be the defined objectives for the Project (as set out in the AEE), together with other regional and local policies, strategies, plans relevant to the transport context of this report. The traffic modelling and the Transport Assessment for the Project has been subject to an independent peer review, the outcomes of which are reflected in this report.

This report concentrates on the assessments of effects, with the technical information relating to the traffic modelling that has been undertaken being the subject of a separate report (Technical Report G.25: *Traffic Modelling Report*).

The existing and future transport environment has been considered both within the Project area and across the wider region, where appropriate. This enables both the positive and any adverse effects of the Project to be assessed in the context of this transport environment.

The potential operational effects and the associated mitigation of the Project are discussed in detail including consideration of all transport modes, as well as the potential effects on property access and parking.

Wider Network Traffic Effects

The assessment of the wider State highway effects has indicated that the completion of the SH20 section of the Project will result in a shift of traffic from the SH1 corridor to the SH20 corridor. Moreover, the assessment of the sector to sector travel indicates that the Project would provide for access to and between centres of future economic development across the region. The assessments also indicate that benefits will arise in separating through and local traffic function which will improve the efficiency of the transport network.

Reductions in daily Heavy Commercial Vehicle (HCV) traffic flows and the HCV vehicle kilometres travelled on arterial and local roads are predicted with the Project in place, in line with the overall reduction in total traffic using these roads. It is considered that this would be primarily associated with the opportunity for HCVs to use SH20 or SH16 as strategic freight routes. This is demonstrated in the predicted percentage increase in the daily vehicle kilometres travelled by HCVs on motorways in both the Project area and across the Auckland region with an associated reduction in percentage of HCVs travelling on local arterial roads.

The identified reductions in traffic flows and travel times on Great North Road resulting from the project should also allow the opportunity for alternative modes of transport to share the use of this corridor, as part of Regional Arterial Road Plan projects. The predicted traffic flow reductions should also complement the Carrington Road / Mt Albert Road corridor plan identified in the Regional Arterial Road Plan. In both cases, this would assist in providing for a range of transport opportunities for connections between centres along these corridors.

The effects of the Project on the transport network are also considered to provide opportunities for delivery of local transport plans and strategies, such as the Auckland City Council (ACC) Liveable Arterials Plan, the ACC Future Planning Framework and the identified future walking and cycling networks in the ACC and Waitakere City Council (WCC) areas, as discussed above.

Traffic Effects on SH16 and SH20 Corridors

The Project will provide significant improvements in the lane capacity along SH16 in both the eastbound and westbound directions. However, there is also predicted to be significant increase in traffic flows in the future, in the peak eastbound and westbound directions in the morning and evening peak periods respectively. Between 2006 and 2026, ten years after the opening of the Project, traffic flows on SH16 eastbound are anticipated to increase by around 25%. In the westbound direction, during the evening peak period, traffic flows in 2016 and 2026 with the Project are predicted to increase by approximately 20–25% and 35% respectively compared with 2006.

During the morning period, eastbound travel times on SH16 are anticipated to improve with the completion of the Project in 2016 compared with 2006, although the operational model observations indicate that queuing would still be anticipated from east of St Lukes Interchange toward the Great North Road Interchange. By 2026, ten years after opening, eastbound travel times are predicted to increase compared to 2016 with the Project, but are anticipated to be improved compared with the 2006 baseline.

In 2016 with the Project, westbound queuing on SH16 in the evening peak period, is observed to extend back from the approach to the Te Atatu westbound off ramp to west of the Great North Road Interchange westbound on ramps. The travel times along SH16 westbound during the evening peak period are similar to the travel times predicted in 2006, as the additional capacity in the westbound direction, has provided for future traffic demand. Ten years after opening, additional queuing and increases in travel times are predicted during the evening peak period from Te Atatu Interchange back to the Great North Road Interchange and along the SH20–SH16 westbound on ramp. It is therefore recommended that a tunnel management plan or strategy is considered to manage the northbound traffic flows on SH20 through the tunnel during any affected period.

Other than the predicted effects associated with the SH16 westbound queuing during the evening peak period in 2026, SH20 is generally observed to operate satisfactorily in both the northbound and southbound directions. Some slow moving traffic and platooning is observed to occur on the southbound exit to the tunnel, but this is not observed to result in queuing back into the tunnel.

The project will accommodate extra traffic due to the additional capacity being proposed, however some queuing is expected around the interchanges due to constraints on the feeder roads. Whilst it is considered this may be reduced with further optimisation and coordination of adjacent and surrounding intersections, plans (operational or infrastructure) should be developed by local authorities to ensure the benefits of the project can be realised. By way of example, as identified in the Regional Arterial Road Plan, Waitakere City Council (WCC) could consider corridor improvements along Te Atatu Road to complement the improvements to the Te Atatu Interchange, particularly for High Occupancy Vehicles (HOV) and buses.

In summary, the SH16 and SH20 corridors assessed in the operational models are expected to accommodate up to 25% and 35% more morning and evening peak hour traffic in 2026 with the Project respectively, compared with the 2006 baseline, such that the overall performance is broadly similar to 2006. During the morning peak in 2026, the performance is observed to be improved in the eastbound peak direction, whilst in the westbound direction during the evening peak the performance of the SH16 corridor is not materially different, when compared with the 2006 baseline.

Cycling and Walking

This assessment has identified that the Project will directly complement future pedestrian and cycling connections at both a regional and local level, as identified in the relevant ARTA, Auckland City Council (ACC) and Waitakere City Council (WCC) plans and strategies. In the case of a number of arterial routes across the Project area, it is considered that the Project would also assist in enabling opportunities for delivery of these plans and strategies, based on the predicted changes in traffic flows on these arterial roads.

The proposed extension to the SH20 pedestrian / cycle way aligns well with and progresses the intended future strategic and regional routes identified by ACC in its 20 year cycle network plan. The proposed route also complements other identified future cycling routes on north–south and east–west corridors within the ACC area, which will enhance connections between surrounding communities. The proposed enhancements and new facilities along the Northwestern pedestrian / cycle way are considered to provide a more convenient, direct and reliable experience for either commuting or recreational cyclists and improve connections to the future cycling network in Waitakere.

In relation to the proposals for both the Northwestern pedestrian / cycle way and the SH20 pedestrian / cycle way, a number of further enhancements to the proposals have been identified through the assessment of

effects, which include measures related to any closure of the Northwestern pedestrian / cycle way and additional extensions or facilities associated with the proposed shared pedestrian / cycle paths.

Passenger Transport

The Project proposals will almost double the existing bus shoulder provision along the section of SH16 between Te Atatu Road Interchange and Great North Road Interchange. The more continuous provision of bus shoulders along SH16 is anticipated to provide significant direct benefits to the operation of peak direction buses, particularly when combined with future bus shoulder provision further to the west on SH16. The Project is also expected to contribute to enabling future opportunities for improvements to passenger transport provision, particularly bus services, on arterial roads primarily with regard to the future Quality Transit Network (QTN).

The proposed improvements at the Te Atatu Interchange include bus priority measures for buses using the east facing ramps. The Project outcomes can be further complemented by any future improvements to the Te Atatu Road corridor, which has been identified as part of the QTN in the Auckland Regional Arterial Road Plan.

Provision has been included within the Waterview Connection Project to allow for the future expansion of the Rapid Transit Network (RTN) by ARTA and associated stakeholders, as a separate project, by maintaining and facilitating a corridor for the future Avondale – Southdown Rail Line.

Transport Effects During Construction

The report also identifies the anticipated effects on the pedestrian, cycle, passenger transport and road networks during the Project construction. To mitigate these effects a Construction Environmental Management Plan (CEMP) has been prepared for the Project. The CEMP will be provided to each Contractor prior to works commencing. The CEMP will assist in the process of the delivery of identified mitigation measures, and ensure that the Contractor(s) meet both the designation resource consent conditions and the NZTA requirements.

Summary

In summary, it is considered that the Waterview Connection Project will provide transport infrastructure that will support the Auckland Regional Growth Strategy by achieving objectives of the Auckland Regional Land Transport Strategy (RLTS) 2010. The RLTS identifies continued investment to complete the agreed strategic roading system, including giving greater attention to improving the efficiency of the network of arterial roads, and emphasis for improvements to passenger transport, walking and cycling. The specific road network capacity improvements sought in the RLTS 2010 includes completion of the WRR.

The Project is considered to provide opportunities to enable the Auckland Passenger Transport Network Plan (PTNP) and the Regional Arterial Road Plan and the Auckland Regional Freight Strategy, in terms of both strategic rail and road freight networks. In particular, the proposed bus shoulders on SH16 will significantly improve peak period bus journey times on this identified QTN route within the PTNP.

It is considered that the Project will improve the capacity of the SH16 corridor, provide an alternative to SH1 along the completed SH20 corridor and provide for access to and between centres of future economic

development across the region. This will significantly improve the accessibility and connectivity of the motorway system across the majority of the day and generally provide benefits to the wider local arterial road network. During the weekday peak periods, the associated increases in traffic on the corridor and the associated constraints on feeder roads the overall performance on SH16 is expected to be marginally better than the 2006 baseline, while accommodating substantially more traffic.

It is recommended that particular consideration is given to preparation of a tunnel management plan or strategy to manage northbound traffic on SH20 through the tunnel by 2026, to progressing the prioritised corridor improvements along Te Atatu Road identified in the Regional Arterial Road Plan in parallel with this Project, and to preparation of management plans for accommodating the possibility of increased queuing at some locations.

It is considered that the Transport Assessment demonstrates that the proposed Waterview Connection Project and the identified mitigation measures will be consistent with the following objectives for the Project:

- To contribute to the region's critical transport infrastructure and its land use and transport strategies by connecting SH16 and SH20 and completing the WRR and by improving the capacity of SH16;
- To improve accessibility for individuals and businesses and support regional economic growth and productivity by improving access to and between centres of future economic development;
- To improve resilience and reliability of the State highway network by providing an alternative to the existing SH1 corridor through Auckland that links the northern, western and southern parts of Auckland;
- To support mobility and modal choices within the wider Auckland Region by providing opportunities for improved public transport, cycling and walking, and protecting opportunities for future passenger transport development (e.g. rail); and
- To improve the connectivity and efficiency of the transport network by separating through traffic from local traffic within the wider SH20 corridor.

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Glossary

Term	Definition
ACC	Auckland City Council
AEE	Assessment of Environmental Effects
ARC	Auckland Regional Council
ARGS	Auckland Regional Growth Strategy 1999
ARPS	Auckland Regional Policy Statement
ART3	Auckland Regional Transport model – Version 3
ARTA	Auckland Regional Transport Authority
ATP	Auckland Transport Plan
C Emphasis	Community Emphasis
CBD	Central Business District
CEMP	Construction Environmental Management Plan
CMA	Coastal Marine Area
CoPTTM	Code of Practice for Temporary Traffic Management
CWF	ACC Draft Walking and Cycling Framework 2007
DM	Do Minimum
F Emphasis	Freight Emphasis
GV Emphasis	General Vehicle Emphasis
HCV	Heavy Commercial Vehicle
HOV	High Occupancy Vehicle
LCN	Local Connector Network
LTCCP	Long-Term Council Community Plan
NIMT	North Island Main Truck
NZTA	NZ Transport Agency
OPT	Option
PT Emphasis	Passenger Transport Emphasis

PTNP	Auckland Passenger Transport Plan 2006 - 2016
QTN	Quality Transit Network
RLTS	Auckland Regional Land Transport Strategy 2010
RoNS	Roads of National Significance
RTN	Rapid Transit Network
SSTMP	Site Specific Traffic Management Plan
TLA	Territorial Local Authority
WCC	Waitakere City Council
WRR	Western Ring Route

1. Introduction

1.1 Background

The NZ Transport Agency (NZTA) is working on projects to complete the “*Western Ring Route*”, a strategic alternative route to State Highway 1 (SH1). The Western Ring Route (WRR) forms one of the Roads of National Significance (RONS) identified by the Government: a 48km motorway providing a regional connection across Auckland and connecting the south (Manukau), west (Waitakere) and north (North Shore). A key component of the WRR is the Waterview Connection Project, which will complete the State Highway 20 (SH20) link to State Highway 16 (SH16). **Figure 1-1** illustrates the location of the Waterview Connection Project in the context of the wider WRR.



Figure 1-1: Indicative Location of Waterview Connection Project and WRR

In 2009 the NZTA confirmed its intention that the 'Waterview Connection Project' would be lodged with the Environmental Protection Authority as a Proposal of National Significance. The Project includes works previously investigated and developed as two separate projects: being the SH16 Causeway Project and the SH20 Waterview Connection. The key elements of the Waterview Connection Project are:

- Completing the Western Ring Route (which extends from Manukau to Albany via Waitakere);
- Improving resilience of the SH16 causeway between the Great North Road and Rosebank Interchanges to correct historic subsidence and "future proof" it against sea level rise;
- Providing increased capacity on the SH16 corridor (between the St Lukes and Te Atatu Interchanges);
- Providing a new section of SH20 (through a combination of surface and tunnelled road) between the Great North Road and Maioro Street Interchanges; and
- Providing a pedestrian / cycle way throughout the surface road elements of the Waterview Connection Project corridor.

Beca Infrastructure Ltd (Beca) has been commissioned by NZTA to undertake a Transport Assessment to assess the potential effects of the works to be undertaken for the SH20 Waterview Connection Project (the Project). This will inform the Assessment of Environmental Effects (AEE) for the Project.

Sinclair Knight and Mertz Ltd. (SKM) has been commissioned to undertake an independent peer review of the traffic modelling and the Transport Assessment for the Waterview Connection Project. A continual process of liaison has occurred with the peer reviewers to agree the scope and methodology of the traffic modelling and this Transport Assessment.

1.2 Report Structure

The preparation of this Transport Assessment has taken into consideration the guidance set out in the Auckland Regional Transport Authority (ARTA) document "Integrated Transport Assessment Guidelines & Supplementary Documents" (October 2007) and Appendix 5C of the NZTA Planning Policy Manual.

For the purpose of reporting, the length of this Project has been divided into sectors of "common environment" or community interest. The location of these Sectors can be seen in **Figure 1–2**. A brief description of each Sector with the main facilities provided is defined in **Section 2**. The transport proposals and effects have been assessed in these sectors where appropriate, although in some cases the effects across several sectors have been considered, as this can be more readily reported in this way.

Western Ring Route: Waterview Connection (SH16-20) - Sector Diagram

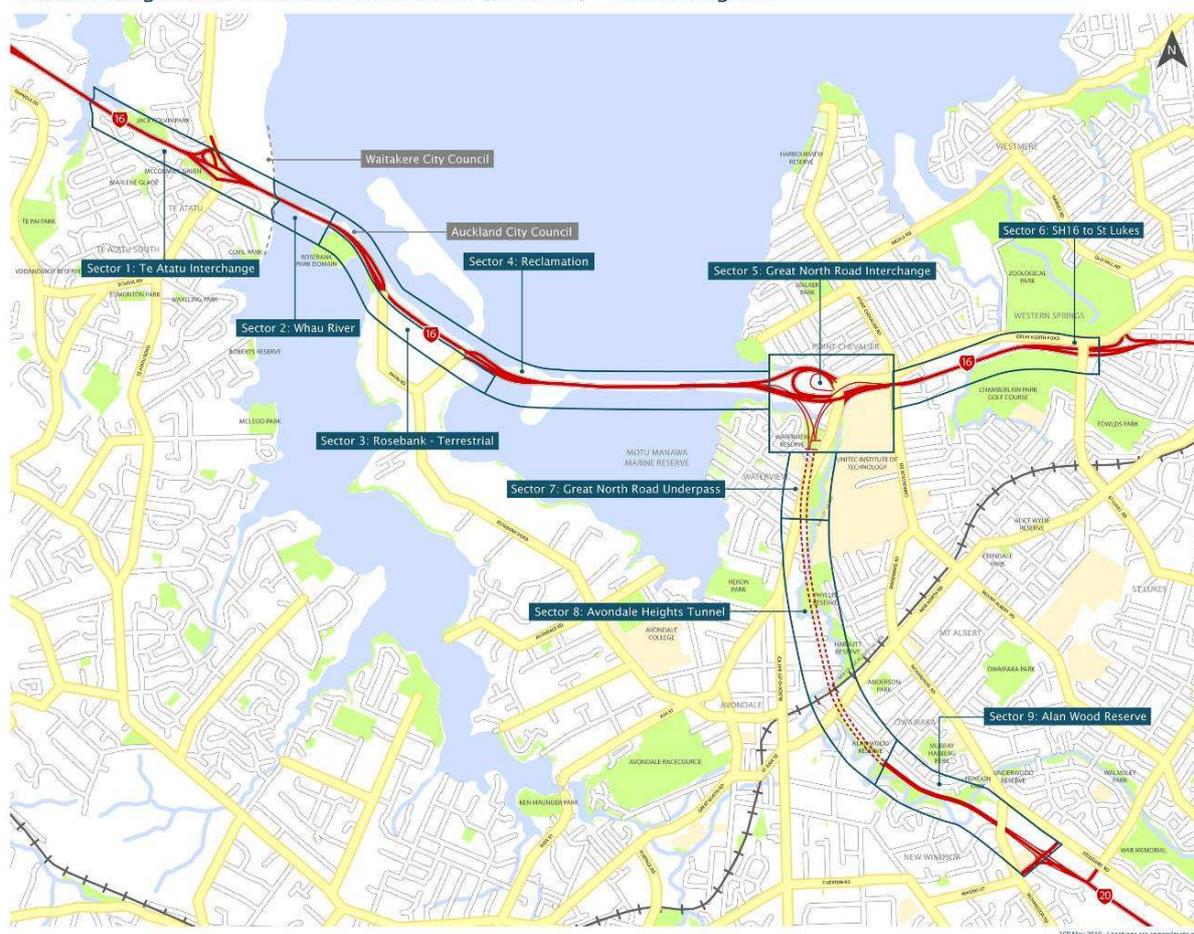


Figure 1-2: Western Ring Route: Waterview Connection (SH16-20) – Sector Diagram

On this basis, the Transport Assessment is structured as follows:

- **Section 2** – Description of the Project including description of the provision for walking, cycling, passenger transport and the roading layout;
- **Section 3** – Discussion of the methodology and assessment matters relating to the Project with regard to walking, cycling, passenger transport and roading;
- **Section 4** – Discussion of the existing transport conditions and the future anticipated transport projects, which may be affected or have effects on the Waterview Connection Project;
- **Section 5** – Assessment of the potential operational effects of the completed Project;
- **Section 6** – Assessment of the predicted effects during the construction of this Project; and
- **Section 7** – A summary and the conclusions of the Transport Assessment, including measures proposed to avoid, remedy and mitigate adverse effects identified.

1.3 Other Reports

There are a number of technical reports, also prepared by Beca, which support, inform and supplement this Transport Assessment. These reports will be provided separately to this Transport Assessment, as part of the AEE, and are as follows:

- Technical Report G16: *Assessment of Temporary Traffic Effects*, July 2010;
- Technical Report G.25: *Traffic Modelling Report*, July 2010; and
- Technical Report G.26: *Operational Traffic Model Validation Report*, July 2010.

2. Description of Project

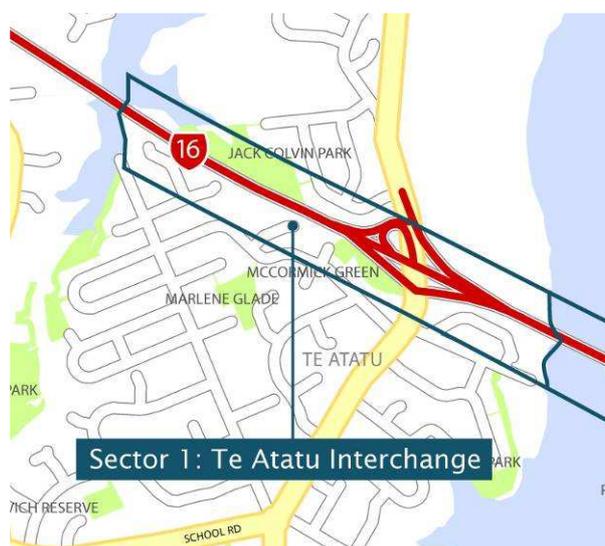
The Waterview Connection Project is the key project to complete the WRR, providing for works on both State Highway 16 (SH16) and State Highway 20 (SH20). It will establish a high-quality motorway link that will deliver the WRR; one of the Roads of National Significance (RoNS). A brief description of each sector is provided below followed by a description of the key transport elements of the Project in the remainder of this section. A full description of the Project, relating to the operation, is provided in Part A Chapter 4 of the AEE.

2.1 Overview

Sector 1 – Te Atatu Interchange

Sector 1 includes significant improvements to the Te Atatu Interchange. These include enlargement and re-configuring of off and on ramps to accommodate additional lanes and to provide for bus shoulder and priority for buses and other High Occupancy Vehicles (HOVs).

Modifications to the configuration of the interchange including provision to accommodate vehicle stacking resulting from ramp signalling and improved facilities for pedestrian and cycles traversing the interchange and moving through the interchange on the pedestrian / cycle way.



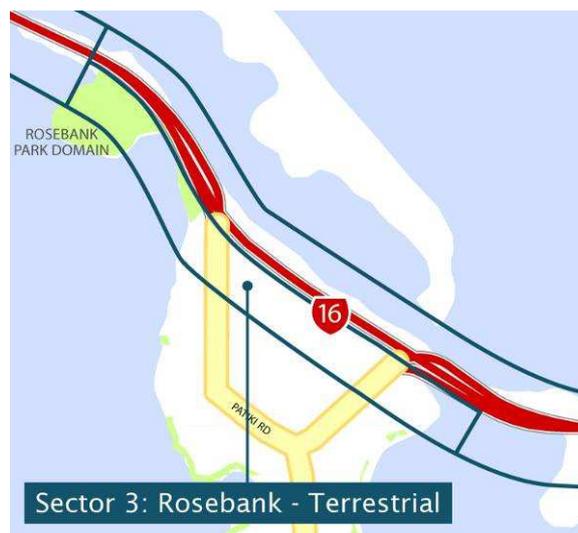
Sector 2 – Whau River

Sector 2 includes increasing the capacity (by widening) of the existing Whau River Bridge, to accommodate additional lanes including bus shoulders in both directions. A separate dedicated cycle/pedestrian bridge is to also be constructed alongside the Whau River Bridge.



Sector 3 – Rosebank – Terrestrial

Sector 3 of the Project involves the re-configuration of the existing Rosebank on and off ramps to improve traffic merging. The outside lane westbound will be “dropped” at the Rosebank exit ramp (i.e. a dedicated lane off the motorway on to the ramp). Between the Rosebank Interchange and the Te Atatu Interchange additional lanes will be added to provide four lanes east and westbound. A bus shoulder will also be provided in both directions. A new bridge will be provided over the Patiki On-ramp Westbound.



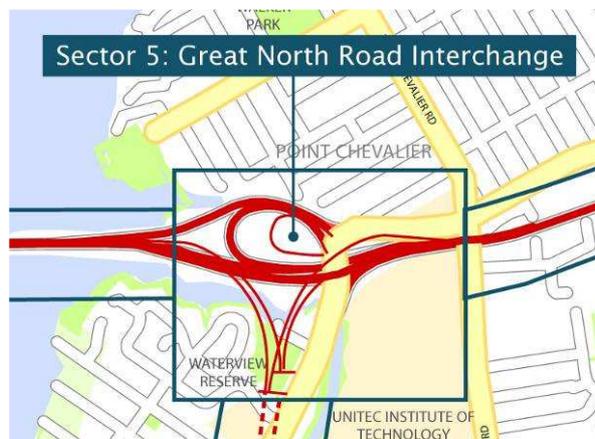
Sector 4 – Reclamation

Sector 4 involves the provision of two additional westbound lanes from the Great North Road Interchange to the Rosebank Road Interchange to create a total of five westbound lanes plus a dedicated bus shoulder. An additional lane will be added from the Rosebank Interchange to the Great North Road Interchange to create total of four eastbound lanes in this sector. Along the Causeway the bridges over the inlet to the Motu Manawa Marine Reserve will be widened. With the additional lane over the Causeway, the pedestrian / cycle way will be moved further to the south and widened, with a new structure provided alongside the Causeway Bridges.



Sector 5 – Great North Road Interchange

Sector 5 of the Project extends from the Waterview Park area, and includes the ramps and alignment associated with the connection of SH20 to SH16 (the Great North Road Interchange). The existing will be configured to provide continuous connection through the interchange with the addition and reconfiguration of the ramps.



Sector 6 – SH16 to St Lukes

Sector 6 of the Project includes an additional lane in each direction on SH16, between the Great North Road Interchange and St Lukes Interchange.



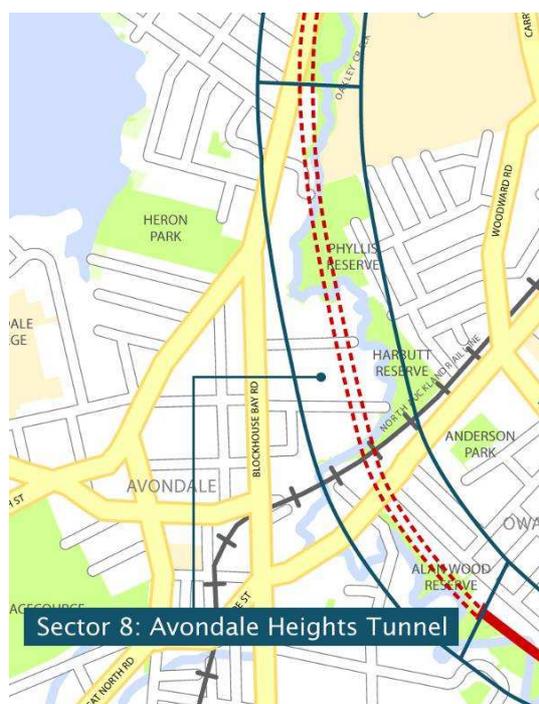
Sector 7 – Great North Road Underpass

Sector 7 comprises the 'cut and cover' section of tunnel and runs from the northern portal at (Waterview Park), crossing beneath Great North Road in a southerly direction to connect with the deep tunnel (Sector 8) in the vicinity of Waterview Downs.



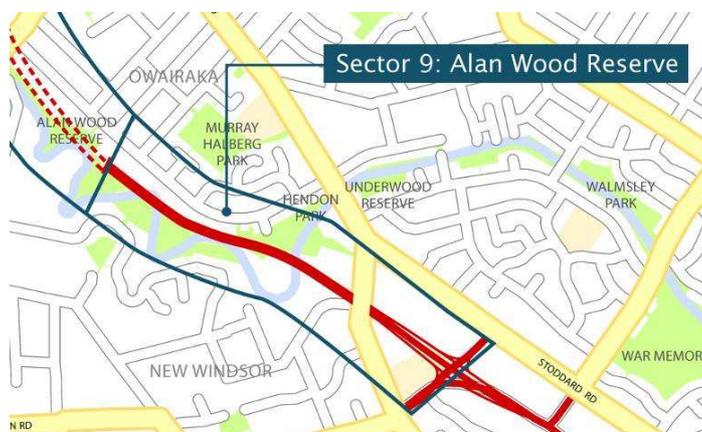
Sector 8 – Avondale Heights Tunnel

The motorway continues from the cut and cover tunnel in Sector 7 into two deep tunnels, in a southerly direction through to Alan Wood Reserve, passing beneath Avondale Heights/Springleigh, the North Auckland Rail Line and New North Road. The tunnels will emerge at grade approximately halfway along the length of Alan Wood Reserve.



Sector 9 – Alan Wood Reserve

In Sector 9 the driven tunnels emerge into Alan Wood Reserve at the southern portals. The two carriageways will continue through Alan Wood Reserve, under the proposed Richardson Road Bridge and continue to join up with the existing SH20 motorway section at the Mauro Street Intersection.



2.2 Pedestrian and Cycle Proposals

The Waterview Connection Project includes a number of new proposals for pedestrians and cyclists and a number of the current facilities will be upgraded as part of this Project. The proposed pedestrian / cycle way facilities are identified on the scheme plans in **Part F** of the **Application Document, Drawing Set F.2**. The sections below describe the design philosophy for the pedestrian / cycle way and the Project proposal in each sector.

2.2.1 Design Philosophy

The design philosophy for the pedestrian / cycle way (both the Northwestern Pedestrian / cycle way and SH20 Pedestrian / cycle way) is based around the project objectives, identified in **Section 3.2.1**, as well as the provision of opportunities for connections with the surrounding communities and design guidelines for the facilities.

In this regard, the following objectives for the Project are relevant to the design of the pedestrian / cycle way:

- To improve accessibility for individuals and businesses and support regional economic growth and productivity by improving access to and between centres of future economic development; and
- To support mobility and modal choices within the wider Auckland Region by providing opportunities for improved cycling and walking.

As discussed in **Section 3.2** and **Section 4.1**, the existing and future cycling plans identified by Auckland City Council (ACC) and Waitakere City Council (WCC) have been reviewed to determine how the proposed pedestrian / cycle way can enhance the connectivity provided by these identified existing and future connections, such that cycling connections can be improved for both local connections between communities and longer distance leisure or commuting trips between areas.

In relation to design guidelines, a review of current design guidelines for pedestrian and cycling provision has been undertaken using the following documents. It is noted that the New Zealand Supplement supersedes Austroads Part 14 and provides guidance specifically for New Zealand conditions:

- Austroads Online: Guide to Road Design, Part 6A: Pedestrian and Cyclist Paths (2009) (Austroads Publication No. AGRD06A/09); and
- New Zealand Supplement to the Austroads Guide to Traffic Engineering Practice Part 14: Bicycles (Document Number: SP/M/025).

The “minimum” and “recommended” design guidance for dedicated cycling facilities and shared walking/ cycling facilities is summarised in **Table 2–1** below.

Table 2-1: Summary of Pedestrian / cycle way Design Guidelines

	Off-Road Cycling / Shared Path	On-Road Cycling	
		Without Parking	With Parking
Width – Minimum ¹	2.0m	1.2m	1.6m ²
Width – Recommended	2.5 – 3.0m	1.5m	1.8m
Gradient –Recommended	<1:20 to 1:33	–	–
Gradient – Maximum ³	1:14 with level areas every 9m	–	–

1. Minimum width is for low demand areas, where conditions are constrained or for a short section of cycle or shared path.
2. 1.6m is the absolute minimum and should only be used when the 85th percentile speed is ≤40km/h. This would also be in low demand areas, where conditions are constrained or for short section of the cycle path.
3. Any gradients 1:33 or greater, up to the maximum gradient, require regular level areas for users.

2.2.2 Sector 1 – Te Atatu Interchange

Pedestrian and cycle proposals within the Te Atatu Interchange sector include a number of additional signalised crossing points on the northern side of the Interchange. The pedestrian crossings have been located to align with current informal crossing points and to fit with Interchange signals. These crossings include the following, which are shown in more detail on the **Figure 2-1**:

- A crossing at the eastbound off-ramp (both right and left turn);
- A crossing at the eastbound loop on-ramp for traffic coming from Te Atatu Road south of the interchange;
- A crossing over Te Atatu Road from the western side between the right and left turn of the eastbound off-ramp to the median island and then across to the island between the through lanes and the ramp signals priority lane; and
- An additional crossing over the ramp signals priority lane for the Peninsula eastbound on-ramp.

The existing subway that runs underneath the existing eastbound off-ramp and loop on-ramp that takes pedestrians from Te Atatu Bridge to Te Atatu Road near Titoki Street (and vice versa) is to be removed and replaced with an improved subway facility. The new alignment of the subway is shown on **Figure 2-1**.

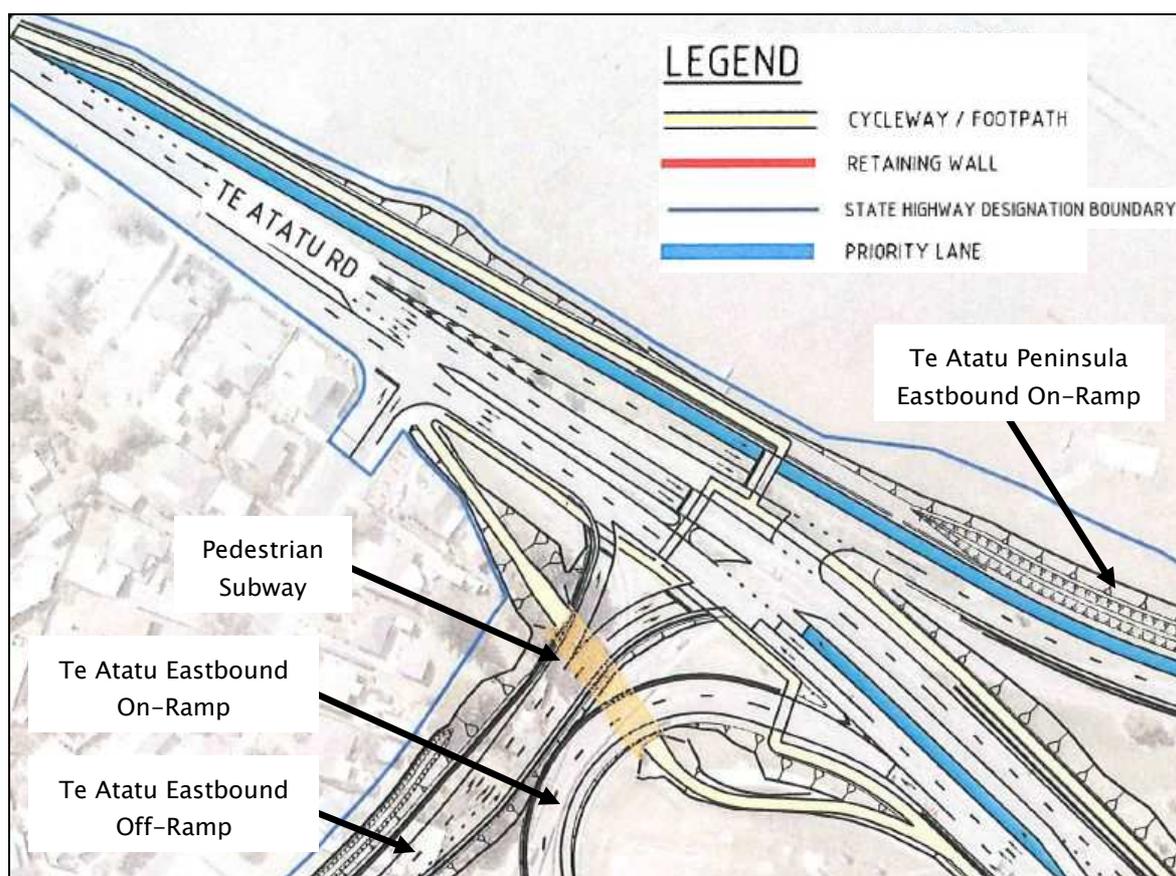


Figure 2-1: Proposed Shared Pedestrian / Cycle Facilities - North of Te Atatu Interchange

A 3m dedicated pedestrian / cycle way/pedestrian facility will be provided alongside the westbound carriageway towards Te Atatu Road where an improved at-grade crossing will be provided to connect to the existing pedestrian / cycle way/pedestrian facility in McCormick Green. This existing pedestrian / cycle way will be extended alongside the westbound carriageway at the bottom of McCormick Road and continue through to Henderson Creek and beyond.

An upgrade of the existing cycle/pedestrian facility through McCormick Green will be undertaken as part of the overall improvements.

2.2.3 Sector 2 - Whau River

This section forms part of the Northwestern Pedestrian / cycle way. Through this sector a new dedicated pedestrian/pedestrian / cycle way bridge is proposed to be located approximately 8m south of the new widened westbound bridge. The pedestrian / cycle way will be approximately 3m wide along the bridge and through this section.

2.2.4 Sector 3 – Rosebank – Terrestrial

The existing pedestrian / cycle way alongside the westbound carriageway will be upgraded to a generally 3m pedestrian / cycle way/footpath (2m between Rosebank Interchange and Patiki Road to avoid land take and building impacts from the edge of industrial land). The pedestrian / cycle way/footpath will link underneath the existing westbound off-ramp at Rosebank Interchange and continue between the industrial land and the westbound carriageway (as it currently does).

A new link is then provided onto Patiki Road for those wishing to exit here to connect with the local roading network. Alternatively those wishing to continue alongside SH16 pass underneath the eastbound off-ramp at Patiki and over the westbound on-ramp along a new pedestrian / cycle bridge.

2.2.5 Sector 4 – Reclamation

The existing pedestrian / cycle way along the westbound carriageway will be upgraded to a consistent 3m width in this sector and a new 3m pedestrian / cycle way bridge will be constructed to replace the existing crossing over the Motu Manawa Marine Reserve inlet channel.

2.2.6 Sector 5 – Great North Road Interchange

The pedestrian / cycle way in this sector is adjacent to the westbound SH16 carriageway and follows the edge of the Coastal Marine Area (CMA). The existing pedestrian / cycle way bridge across Great North Road will be retained and the alignment reconfigured to avoid piers on Ramps 2, 3 and 4 and linking to the existing bridge over Great North Road.

2.2.7 Sector 6 – SH16 to St Lukes

No additional walking and cycling facilities are to be provided within this sector. The Northwestern Pedestrian / cycle way will continue in its current location, alongside the westbound carriageway to Carrington Road. From here, it will use the existing crossing over Carrington Road and continue along Sutherland Road to the dedicated cycle path between the motorway and Chamberlain Park Golf Course. The pedestrian / cycle way will continue using the crossing facilities at the St Lukes Interchange and continue along the current pedestrian / cycle way beyond the extent of this Project.

2.2.8 Sector 7 – Great North Road Underpass

SH20 will be formed in a 'cut and cover' tunnel crossing under Great North Road approximately between Oakley Avenue and Herdman Street. The existing shared path along the eastern side of Great North Road through Sector 7 provides a good quality facility for both pedestrians and cyclists. The provision accords with the Austroads guidance relating to the provision of shared paths in that the recommended width is achieved along the length of path through this sector. The Project will include reinstating existing facilities, including the existing off-line pedestrian/cycle route.

2.2.9 Sector 8 – Avondale Heights Tunnel

Through Sector 8, the proposed SH20 motorway consists of two deep tunnels for vehicular traffic and no provision is made for cycle or pedestrian facilities in this road reserve (tunnel).

Cycling routes between the Pt Chevalier node area (Great North Road Sector 6) and the Alan Wood Reserve (Sector 9) therefore involve surface routes via New North Road/ Blockhouse Bay Road / Great North Road to the west or via New North Road/ Woodward Road/ Carrington Road to the east as identified by ACC in its 20 year cycle plan.

2.2.10 Sector 9 – Alan Wood Reserve

In order to provide connectivity between the residential areas to the north and the south of the new motorway, a pedestrian/cycle bridge will be provided. The pedestrian/cycle bridge will play an important role in both accessing and activating the open space and in contributing to a better-used environment will also contribute to safety and the perception of safety. The new bridge connection at Hendon Park will connect to the Walmsley/Underwood pedestrian / cycle way and provide access for the Owairaka community to the sportsfields now located at 25 Valonia Street.

Pedestrian connections to the local street network are provided at regular intervals, and all major intersections have wide street frontages, being a minimum of 20m wide. Connections to the surrounding streets are made to Richardson Road, Valonia Street, Methuen Road and Hendon Avenue.

From the Hendon Park area described above the Pedestrian / cycle way will proceed northwest and marry into the existing Pedestrian / cycle way adjacent the Avondale Motor Park (46 Bollard Ave).

In the other direction (southeast) the Pedestrian / cycle way proceeds through the Alan Wood Reserve and under the proposed Richardson Road bridge to connect to the Maioro Street Pedestrian / cycle way. At this stage, it is expected to be elevated above the carriageway on a retaining structure under the Richardson Road bridge. From this point the pedestrian / cycle way follows the alignment at the grade of the motorway until the Maioro Street northbound on-ramp, where it follows the on-ramp up to the Maioro Street Interchange. Once at this interchange, the pedestrian / cycle way will connect with links through the interchange to the Southern Isthmus Pedestrian / cycle way or onto the local roads.

2.3 Passenger Transport Proposals

The Project proposals include a number of different bus priority measures, which are discussed in the following sections. The extent of bus priority, including the proposals for additional bus shoulders along SH16, is shown on the scheme plans in **Part F** of the **Application Document, Drawing Set F.2**.

A key element of these proposals is the additional provision of bus shoulders on SH16. **Table 2-2** below provides information on the proposed length of bus shoulder provision on SH16 between Henderson Creek and St Lukes Interchange with the completion of the Project, based on the motorway chainage (in metres) defined for the Project. These bus shoulder provisions are shown on the scheme plan in **Part F** of the **Application Document, Drawing Set F.2**.

Table 2-2: Summary of Proposed Bus Shoulder Provision along SH16

Direction	Start Chainage (metres)	End Chainage (metres)	Length (metres)
Westbound	850	2,200	1,350
	2,850	3,300	450
	3,800	5,350	1,550
	5,450	6,500	1,050
	Total		4,400
Eastbound	5,500	6,500	1,000
	4,350	5,200	850
	2,750	4,050	1,300
	850	2,150	1,300
	Total		4,450
Total Eastbound and Westbound			8,850

2.3.1 Sector 1 – Te Atatu Interchange

At the western end of the Project, once the westbound on-ramp has merged at the Te Atatu Interchange with the motorway mainline, a bus shoulder lane begins in the westbound direction. At the same point, the eastbound bus shoulder lane merges with the mainline before the eastbound off-ramp diverges.

The Te Atatu Peninsula eastbound on-ramp has provision for passenger transport in the form of a Priority Lane. This lane allows vehicles such as buses, taxis, trucks and cars with two or more people to by-pass the ramp signals in the Priority Lane. This Priority Lane has feeders on the local roads which allow Priority Lane traffic to gain advantage on single occupancy vehicles by entering the on-ramp and ultimately the motorway

via these lanes. The bus shoulder lane in the eastbound direction starts at the end of the Priority Lane on the Te Atatu Peninsula eastbound on-ramp and continues into the future sectors.

A bus shoulder is provided in the westbound direction, which carries on from the Whau River crossing. This bus shoulder is planned to continue up the Te Atatu westbound off-ramp to the intersection with Te Atatu Road. At this intersection, there is a bus shoulder lane on the left hand side of the off-ramp, which allows the buses to merge into the Te Atatu Road traffic without having to change lanes to arrive at a bus stop on Te Atatu Road, which is close to the intersection.

There is also proposed to be a new bus shoulder on the westbound carriageway to the west of the Interchange following the end of end of the westbound on ramp merge. The existing bus shoulder along the eastbound carriageway to the west of the Interchange, which terminates in advance of the eastbound off-ramp through the Interchange, will be retained. These bus shoulders will connect with similar provision further to the west of Henderson Creek, which is being considered within other projects.

2.3.2 Sector 2 – Whau River

Bus shoulder lanes continue from the Te Atatu Interchange along both sides of the carriageway over the Whau River.

2.3.3 Sector 3 – Rosebank – Terrestrial

A dedicated bus shoulder will generally be located on both the eastbound and westbound carriageway within Sector 3 except on the approaches to the Rosebank Road on and off ramps and Patiki Road on and off ramps.

A bus shoulder lane in the eastbound direction continues from the Whau River and merges back into the main carriageway prior to the Rosebank Road off-ramp. Once the off-ramp passes over the motorway, the bus lane resumes and continues along the causeway.

The westbound bus shoulder lane begins after the diverge of the Rosebank Road off-ramp and continues along the carriageway under the Rosebank Road on-ramp flyover. The bus shoulder lane merges back with the motorway mainline prior to a 'pinch point' of the motorway designation, due to the proximity of adjacent industrial land to the motorway. Where the Patiki Road on-ramp joins the motorway, the bus shoulder lane begins on the on-ramp and continues as the on-ramp joins the mainline. The westbound bus shoulder lane continues along the motorway into the Whau River Sector (Sector 2).

2.3.4 Sector 4 – Reclamation

Bus shoulder lanes will be provided along both sides of the carriageway through this sector. The eastbound bus shoulder lane begins after the merge of the Rosebank Road eastbound on-ramp and continues along the length of the causeway. The bus shoulder lanes merge with the general traffic lanes prior to the Great North Road Off-ramp and the location of the bridge over the inlet.

The westbound shoulder is a continuation of the bus shoulder lane after the Great North Road / SH20 Interchange along the length of the causeway. The buses will merge back into the main carriageways prior to the diverge with Rosebank Road Off-ramp.

2.3.5 Sector 5 – Great North Road Interchange

Through the interchange there are no proposals to provide bus shoulders or other priority measures due to the number of merges and diverges.

2.3.6 Sector 6 – SH16 to St Lukes

In the eastbound direction the merges of the on-ramp from Great North Road, followed by the motorway to motorway link from SH20 northbound, limits the opportunity for a bus shoulder lane. The SH16 mainline passes under Carrington Road, an eastbound bus shoulder lane is provided through to just before the eastbound off ramp diverge at the Western Springs.

In the westbound direction, the St Lukes on-ramp merges with the mainline of SH16. Not far downstream, the motorway to motorway connection to SH20 diverges from SH16 closely followed by the Great North Road off-ramp. Consequently, there are no bus shoulder lanes provided in the westbound direction.

2.3.7 Sector 7 – Great North Road Underpass / Sector 8 – Avondale Heights Tunnel / Sector 9 – Alan Wood Reserve

There are no bus shoulders or other priority measures proposed through these three sectors as they are not warranted under the current bus service designs. The existing rail corridor designation is maintained by the Project, with all structures crossing the allowing for the designation. However, any development of the rail network will not be undertaken within this Project.

2.4 Roading Proposals

The Waterview Connection Project is proposed to construct a 6-lane motorway along SH20, and widen the existing SH16 to provide additional lanes. SH20 will include north facing ramps at the Maoro Street Interchange (the south facing ramps and bridge are assumed to have been constructed before 2016). The motorway will extend north, both at grade and within a tunnel, joining to SH16 at the Great North Road Interchange with east and west facing ramps. SH16 will be widened to provide additional lanes in each direction from St Lukes Interchange through to west of the Te Atatu Road Interchange. Further detail of the roading proposals in each of the sectors is described below.

2.4.1 Sector 1 – Te Atatu Interchange

The western end of Sector 1 begins at the mainline with three lanes in each direction with bus shoulder lanes west of Te Atatu Interchange, which connects with projects subject to separate assessment to the west of Henderson Creek. The Te Atatu South loop on-ramp joins the motorway as a lane gain with the Peninsula On-ramp merging into a fourth lane. In the westbound direction, there are four lanes on the approach to the interchange with a lane drop and a diverge of the lane reducing the mainline lanes to three. All of the ramps, excluding the loop on-ramp eastbound, have bus shoulder lane provision. The existing eastbound and westbound off-ramps will be extended at the Te Atatu Interchange.

2.4.2 Sector 2 – Whau River

The bridge over the Whau River will be widened in both eastbound and westbound directions. This will allow for an extra lane in each direction, resulting in four lanes in each direction.

2.4.3 Sector 3 – Rosebank – Terrestrial and Sector 4 – Reclamation

Through these two sectors the causeway will be widened to allow for an additional lane in each direction. From the Whau River Crossing to the Rosebank Road Interchange, both directions will have four lanes of traffic. The eastbound carriageway will continue to have four lanes over the causeway to the Great North Road Interchange. In the westbound direction, there will be five lanes of traffic with a lane drop at the Rosebank Road westbound off-ramp.

2.4.4 Sector 5 – Great North Road Interchange

The mainline carriageway of SH16 through the Great North Road Interchange will consist of three lanes in each direction. This interchange will allow for all movements with the existing on-ramps in both directions and the off-ramp in the eastbound direction remaining mainly in their current configuration.

However, the diverge of the eastbound off-ramp will be modified, as it will form the exit from the mainline for both the SH16 eastbound off-ramp and the SH16 motorway to SH20 motorway connection to the south. The off-ramp will consist of a lane drop and a diverge from the mainline, with the eastbound off-ramp to Great North Road again diverging from the left while a two lane flyover continues over SH16 and into the cut and cover tunnel on SH20.

In the westbound direction the Great North Road off-ramp will be a lane drop from SH16. The SH20 southbound motorway to motorway connection exit, diverges from the nearside lane approximately 100m after the Great North Road exit, and will also provide a through lane for westbound traffic on SH16. The off-ramp at Great North Road diverge for the right turning traffic with the main movement as a lane gain on Great North Road southbound. The SH20 motorway to motorway link is a one lane link which merges with the two lane link from SH16 westbound to form three lanes in the southbound direction.

In the northbound direction on SH20, three lanes diverge into a two lane westbound connection and two lanes diverge to a one lane at the merge with SH16 in the eastbound direction. The Great North Road westbound on-ramp to SH16 will remain in the same location with the SH20 northbound link merging with the mainline after the on-ramp merge. The two lane motorway to motorway connection in the northbound direction on SH20 will form two additional lanes with SH16 westbound. The motorway to motorway connection from SH20 northbound to SH16 eastbound will initially be two lanes merging to one before the merge with SH16 eastbound under the Carrington Road Bridge.

2.4.5 Sector 6 – SH16 to St Lukes

The proposed layout for this sector is an additional lane in each direction resulting in an eight lane carriageway.

2.4.6 Sector 7 – Great North Road Underpass and Sector 8 – Avondale Heights Tunnel

As described above, SH20 will be formed in a 'cut and cover' tunnel crossing under Great North Road approximately between Oakley Avenue and Herdman Street. Two tunnels will be cut, one in each direction, with three lanes in each tunnel. These 'cut and cover' tunnels will continue to the start of the 'deep' tunnels within Oakley Creek Esplanade. SH20 will continue underground under Phyllis Reserve and under New North Road.

2.4.7 Sector 9 – Alan Wood Reserve

The deep tunnels continue into Alan Wood Reserve where the southern portal is located. From here, the two carriageways will rise to ground level and be adjacent to each other. Three lanes will be provided in each direction within this sector with a lane drop to two lanes at the Maioro Street Interchange north facing ramps.

SH20 will continue under Richardson Road with Richardson Road forming a bridge over the top. The Richardson Road Bridge will allow for two lanes of traffic, the potential for parking and a shared pedestrian and cycle path separated by landscaping from the main carriageway, as well as the potential future rail designation corridor. Realignment of Valonia Street is required to provide for the SH20 connection under Richardson Road.

Once the motorway passes under Richardson Road, it will continue to join up with the motorway section under the proposed Maioro Street Half Diamond. The north facing ramps will be built to create a full diamond interchange at Maioro Street and complete the Waterview Connection Project and the WRR.

2.5 Property Access Proposals

The proposed property accesses affected during the construction and after completion of the Waterview Connection are detailed in this section.

Due to the nature of this Project, there are a number of sectors which will not have any property access issues (e.g. tunnelling and existing motorway).

The following sectors have no issues with property access and parking during operation or construction:

- Sector 2 – Whau River;
- Sector 4 – Reclamation;
- Sector 6 – SH16 to St Lukes; and
- Section 8 – Avondale Heights Tunnel.

The following paragraphs describe the current proposals for alternative arrangements for property access proposed for the Waterview Connection Project. Where there could be effects on property access or parking during the operational and construction phases, this is discussed further in **Sections 5** and **6** of this report.

2.5.1 Sector 1 – Te Atatu Interchange

With the widening works at Te Atatu Interchange, land take would be required for the realignment of both the westbound and eastbound off-ramps. As Te Atatu Road will be widened on the southern approach to the interchange, land take will be required on the west side of Te Atatu Road. As a result, the access for the property numbers 356, 356A and 358 on Te Atatu Road will be removed. To maintain access to these residential properties, one dwelling will require removal (94 Royal Road) to provide new access off Royal Road. This is indicatively shown on **Figure 2-2**.

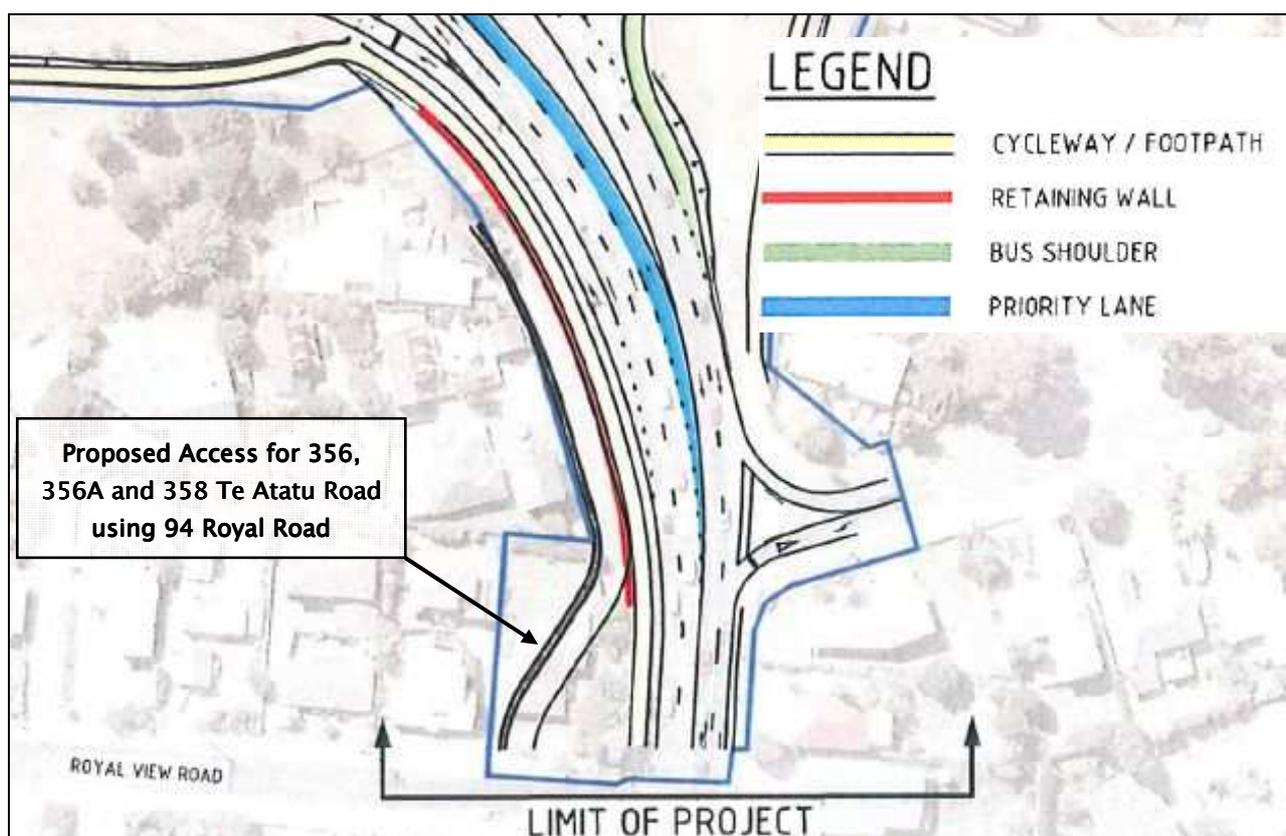


Figure 2-2: Proposed Property Access for Properties on Te Atatu Road

2.5.2 Sector 3 – Rosebank – Terrestrial

A new two-way two lane access road will be constructed from Patiki Road to the Rosebank Park Domain (Go Kart) adjacent to the western carriageway. The existing service road at the end of the access road will be maintained and upgraded to access the other end of the race track.

2.5.3 Sector 5 – Great North Road Interchange

Land take is required for a number of properties around this area for the construction of the Great North Road / Great North Road Interchange. All properties north of Herdman Street on the west side of Great North Road are within the footprint of the Interchange designation, as are all properties on Cowley Street. These properties will not require access during construction or operation.

2.5.4 Sector 7 – Great North Road Underpass

The operational effects associated with access in this sector are considered in **Section 5**, as they relate to Great North Road and the residential streets to the east in the Waterview area. Access and parking for properties on

Great North Road and the residential streets to the east (Herdman Street, Oakley Avenue and Alford Street) would be affected by construction, as will be discussed further in **Section 6**. There is no on-street parking on Great North Road or adjacent residential streets.

2.5.5 Sector 9 – Alan Wood Reserve

Within this sector, there are a number of properties which are required for the realignment of Valonia Street and construction of SH20 through Richardson Road, which will no longer need to be provided with access. Access and parking for the remaining properties along Richardson Road and Valonia Street may be affected by construction activities and the completion of the Project, as will be considered in **Sections 5 and 6**.

3. Methodology & Assessment Matters

Based on the ARTA and NZTA guidance (see **Section 1.2**), the Transport Assessment considers the following matters, which are more specifically relevant to assessing the Waterview Connection Project:

- How the Project meets general and specific transport planning and policy objectives, including the specific Project objectives;
- The opportunities provided by the Project in contributing to the development of the future transport network; and
- The effects of both the operation and construction of the Project on the existing and future transport network, together with the nature and scale of any changes to the transport network required to mitigate these effects.

SKM has been involved in reviewing all stages of the traffic modelling process from the Traffic Model Scoping Report (May 2009) through to the Technical Report G.26: *Operational Traffic Model Validation Report* (July 2010). SKM has been provided with the Transport Assessment for review and comment to inform the assessment in this report.

3.1 Methodology

3.1.1 Traffic Modelling and Traffic Assessment

A key element of the assessment of the transport effects is the development of the traffic modelling methodology. The WRR project follows the hierarchical modelling structure used successfully on other major projects across the Auckland region since the early 1990's. This involves the following three components:

- A strategic **Demand** model that relates land use (such as population and employment), to travel patterns at a strategic, region-wide level;
- A **Project Assignment** model, which is similar to the demand model, but has a more refined network in the Project area. This model loads the vehicle trip patterns predicted by the demand model onto the road network to test various options and investigate the traffic effects at a more detailed level; and
- An **Operational** model, which uses micro-simulation to look at motorway operations, as well as the intersections and connections in even greater detail.

It is the project assignment and operational models which are the subject of the Technical Report G.25: *Traffic Modelling Report* (July 2010) and the project assignment model which provides the traffic volumes for the Transport Assessment. Details of the assumptions used in the strategic demand model are also included in the Technical Report G.25: *Traffic Modelling Report* (July 2010). The hierarchy of models is required as it is not practical to develop a system in a single model to cover both the strategic demand issues across the whole region and the detailed local operational effects. This hierarchical system has been used successfully on most major projects in the Auckland region (and elsewhere) and is a common modelling approach.

The strategic demand model (the 'ART3' model) is a 4-step multi-modal model based on extensive data collected in 2006. It has a base year of 2006 which was developed using Census and travel data, and a full model validation exercise was undertaken. Separate models exist for the morning (AM) and evening (PM) commuter peak and weekday inter-peak periods. The ART3 model is operated by the ARC and is implemented in the EMME software, which is a well-used and proven platform for this kind of analysis. This model is updated every five years, based on the census data, and validated for five year periods. As such, the opening of the Project is expected to coincide with the predicted strategic demand model in 2016.

It is therefore the ART3 model that predicts the overall regional traffic patterns, based on the inputs and forecasts of population and employment growth, together with the assumed level of road and public transport infrastructure. This model also predicts how trip making will change in response to a major project, such as the WRR, and the Water Connection Project.

The project assignment model is similar to the assignment module in the ART3 model, but represents the road network in the immediate study area in significantly greater detail. It is only an 'assignment' model in that it takes the traffic demands from the ART3 model and 'assigns' them to the road network. Land use data is not used directly in this part of the model, and it only includes vehicle traffic (not passenger transport trips).

The project assignment model, developed in EMME, covers the same wider area as the ART3 model, namely the greater Auckland Region. However, it covers the area around the Waterview Connection Project and the WRR in greater detail than the ART3 model. As with the ART3 model, the project assignment model is validated to a 2006 base year, as detailed in the Project Assignment Traffic Model Validation Report (February 2010).

Operational models are used to assess localised issues in more detail than is possible in the project assignment model. The operational model is a simulation model developed in the S-Paramics software covering SH20 between the Maoro Street Interchange and SH16, as well as the length of SH16 between the Newton Road interchange and the Westgate Interchange.

The operational model obtains travel demands, in the form of origin-destination trip tables, from the project assignment model. These trip tables are then loaded as flow rates into the simulation models, along with assumed flow profiles to represent the build-up and dissipation of peak traffic flows. Details of the methodology used to determine the baseline and future year traffic flows used in the operational model are discussed further in the Technical Report G.25: *Traffic Modelling Report* (July 2010).

Again, the simulation (operational) model has been calibrated and validated to a 2006 base year, details of which are included in the Technical Report G.26: *Operational Traffic Model Validation Report* (July 2010), as discussed further in that report and the Technical Report G.25: *Traffic Modelling Report* (July 2010).

Within the Transport Assessment, the project assignment model has been used to assess the wider daily and peak period network effects with the operational model being used to assess detailed operational matters within the study area during the AM and PM peak periods.

3.1.2 Other Transport Considerations

The Transport Assessment will also consider the potential effects of the Project on other modes of transport, including pedestrians, cyclists and passenger transport, together with the assessment of the potential effects on property access and parking on the existing roads in the vicinity of the Project, as appropriate, relating to both construction and operation of the Project.

The assessment of effects in relation to pedestrians, cyclists and passenger transport will consider the existing and future provision, identified at both a regional and local level (outlined in **Section 4**) for these modes of travel within the area of influence of the Project. This will identify the potential for this Project, where appropriate, to assist in delivering opportunities for travel by these transport modes within this regional and local context. The effects of the Project within this environment will also be considered and potential mitigation identified, where necessary.

3.1.3 Other Transport Reports

As discussed in **Section 1.3**, there are a number of technical reports, also prepared by Beca, which support and inform this Transport Assessment. These reports will be provided separately to the Transport Assessment, as part of the AEE.

3.2 Assessment Matters

3.2.1 Project Objectives

The objectives and action directions for the Waterview Connection Project are:

1. To contribute to the region's critical transport infrastructure and its land use and transport strategies:
 - by connecting SH16 and SH20 and completing the WRR; and
 - by improving the capacity and resilience of SH16.
2. To improve accessibility for individuals and businesses and support regional economic growth and productivity:
 - by improving access to and between centres of future economic development.

3. To improve resilience and reliability of the State highway network:
 - by providing an alternative to the existing SH1 corridor through Auckland that links the northern, western and southern parts of Auckland; and
 - by securing the SH16 causeway against inundation.
4. To support mobility and modal choices within the wider Auckland Region:
 - by providing opportunities for improved public transport, cycling and walking; and
 - by protecting opportunities for future passenger transport development (e.g. rail).
5. To improve the connectivity and efficiency of the transport network:
 - by separating through traffic from local traffic within the wider SH20 corridor.

3.2.2 Regional Policy Context

This report has been prepared to inform the AEE, and in particular assessment matters have been identified on the proposed designations required for the Project.

Other key regional documents from a transport planning perspective relating to the Project are outlined below.

Auckland Regional Growth Strategy 1999

The Auckland Regional Growth Strategy (ARGS) sets out to achieve the region's growth through sustainable management for the next 50 years. ARGS seeks intensive mixed-use growth on major passenger transport routes. The intention is to provide growth where it can be accommodated by a variety of travel modes. The ARGS also seeks to provide development in a way that reduces the need to travel. It states that the Regional Land Transport Strategy is a key instrument in the implementation of the ARGS.

The Strategy sets out that in the central and west part of the Auckland region, growth should be focused on two broad corridors; the western rapid transit corridor and motorway, and intensification along the full length of roading corridors, where appropriate. The west intensification would be focused within the development corridor of the existing western rapid transit corridor and would include a smaller town centre at Te Atatu Peninsula. In the central area, intensification would be focused along major transport corridors, both road and rapid transit, radiating out from the central city area. Mt Albert and Avondale local centres have been identified as areas within the Growth Concept where growth will make the best use of the rapid transit opportunities. Alternatively, where intensification along roading corridors occur (like Great North Road), the ARGS identifies that allowance should be made for passenger transport that can make multiple stops.

The immediate sector-based work stated in the ARGS for the sector taskforce is for ACC, WCC and the ARC to, *"...complete planning for a rapid transit system, integrated with intensive land-use activities, along the western*

transit corridor....” This project is expected to be implemented through relevant District Plans, Long Term Financial Strategies, and the Regional Passenger Transport Action Plan.

Auckland Regional Policy Statement

The Auckland Regional Policy Statement (ARPS) sets growth management principles for the Auckland region. The ARPS requires that land use and transport planning be integrated to help reduce the need for private vehicle travel and significantly increase the mode of travel by passenger transport, walking and cycling. It notes that District Plans need to be consistent with the ARPS, and include design criteria that ensure road layouts provide for passenger transport, walking and cycling environment. This report assesses the provision of all modes of travel as indicated in this policy statement.

The ARPS aims to provide a more sustainable transport system, in which trip numbers and lengths are minimised, and the use of energy and space-efficient modes of transport, such as public transport, cycling and walking, are viable and encouraged. The development of such a system in the Auckland Region would work towards minimising adverse environmental effects, meeting accessibility needs and improving safety.

Regional Land Transport Strategy – 2010

The Regional Land Transport Strategy (RLTS) provides policies to develop standards and guidelines on how the strategic and regional networks should be managed through to 2040. The RLTS incorporates various supporting documents which include Auckland Transport Plan, Auckland Land Transport Programme, Sustainable Transport Plan, Passenger Transport Network Plan, as well as the Regional Freight Strategy.

The objectives of the Plan include supporting the Auckland Regional Growth Strategy (ARGS) through providing focus on measures such as reducing reliance on private vehicles and providing transport alternatives. The Strategy identifies that continued investment is needed to complete the agreed strategic roading system, including giving greater attention to improving the efficiency of the network of arterial roads, but that there is a strong need for significantly greater investment in public transport (both infrastructure and services), walking, cycling, and behaviour change measures in order to counter long term under investment in these modes.

The RLTS 2010 recognises the completion of the WRR and the Waterview Connection as key elements of the strategic land transport network (Map 4 of the RLTS). The Objectives and Policies of the RLTS include provision for new capacity in the network to accommodate growth (including passenger transport, freight and road capacity). In particular, Policy Category 6 seeks to *“selectively increase the capacity of the road network where alternative management options are not sufficient to address growth in travel demand”*. Within this, Policy 6.2 identifies the specific road network capacity improvements sought in the RLTS and includes the Western Ring Route. The RLTS states that:

“The Western Ring Route ... provides a strong connection between the North Shore, West Auckland and South Auckland and also provides an alternative north – south route through the region from a little south of Albany to Manukau City Centre. ... Completion of the Western Ring Route is scheduled for completion within the first 10 years of this strategy.”

Auckland Transport Plan 2009

The Auckland Transport Plan (ATP) is a long-term multi-modal integrated implementation plan and provides the overall framework to integrate multiple programmes. The Sustainable Transport Plan, Passenger Transport Network Plan and Regional Arterial Road Plan are all key inputs into the ATP. Other agency plans such as Long Term Council Community Plans, NZTA State Highway Forecast and ONTRACK's 10-year Rail Network Development Plan are also key components of the ATP. The ATP provides for the preparation of annual programmes and is used for prioritising projects and packages within the Auckland Land Transport Programme.

Auckland Passenger Transport Network Plan 2006–2016

The Auckland Passenger Transport Network 2006–2016 (PTNP) identifies the both the 10-year plan for the development of the passenger transport network in the Auckland region, as well as the longer term plan for the Auckland Passenger Transport Network.

Fundamental to the PTNP is the development of a rapid transit network, a quality transit network and an integrated network for the Auckland region. The specific elements of the PTNP relating to the Project are discussed further in **Section 4.2.2**.

Auckland Regional Arterial Road Plan 2009

The Auckland Regional Arterial Road Plan identifies the importance of the existing and future road network operating at an optimal level, together with the role of regional arterial roads within Auckland's wider transport network. The Plan identifies the parts of the regional arterial network that have the highest priority for the future. A guideline for the development of corridor management plans are set out in the Plan and it also provides indicative costs of upgrading the network and funding issues. Monitoring requirements, key performance indicators and a future review processes have also been identified in the Plan.

The Plan provides a table summarising the role and future strategic direction for sections of regional arterial network, including proposed short-term actions. Within the Project area, Great North Road, Maoro Street, Carrington Road and Mt Albert Road have a defined role and strategic direction. The key role and the strategic direction for the roads within the Project area are identified in **Table 3–1** below.

Table 3-1: Role and Strategic Direction of Regional Arterial Roads

Route	Key Role	Strategic Direction	Short-term Actions
Great North Road (Auckland TLA boundary to Point Chevalier)	Major bus route forming part of the QTN. Passes through Avondale town centre. Heavy traffic flows along Waterview Straight.	Route influenced by proposed SH20 Waterview extension. Need to develop bus priority. Integration with SH16 interchange management.	Integrate planning of bus priority measures on Great North Road with SH20 extension through Waterview.
Maioro Street (as part of Wolverton Street – Tiverton Road – Maioro Street)	East-west route with increased role following SH20 Mt Roskill extension, including link between Maioro Street and Sandringham Rd.	Increased traffic function. Increased passenger transport role over time.	Complete implementation of route upgrading.
Carrington Road and Mt Albert Road (as part of Carrington Road – Mt Albert Road – Mt Smart Road – Mays Road – Church Street)	Cross-city route. Part of QTN west of Selwyn St, Onehunga. Links growth centres and north-south corridors. Accesses major employment areas, Unitec and Mt Smart Stadium. Part of regional cycle network.	Traffic flows to reduce west of Queenstown Rd as SH20 is extended westwards. Use opportunity to increase passenger transport emphasis and integrate with intensification of town centres.	Prepare plans indicating how route will be managed in phase with the westward extension of SH20 and supporting town centre development objectives

This Plan also advocates prioritisation of a number of corridors to provide improved access to SH16. The prioritisation of these corridors has been through a process to demonstrate the high functionality within each of the categories and a high deficiency in providing that function. These include:

- Te Atatu Road: Edmonton Road to SH16 Interchange; and
- Great North Road: Blockhouse Bay Road to SH16 Interchange.

The above routes within the Project have been suggested for further investigation through the development of corridor management plans by local authorities. These routes are not included in the Waterview Connection Project and are anticipated to be included in the future under direction of the local authority.

Auckland Regional Freight Strategy 2006

The Strategy incorporates policies, key objectives and then proposes actions and priorities for achieving an efficient freight system. This aims to relieve traffic congestion and encourage freight movements by rail and sea. The strategy proposes developing local area freight management plans that would promote long-term environmental sustainability.

Figure 1 of the 2006 Strategy identified an indicative 'Proposed Strategic Route' from the termination of SH20 toward SH16. Within the 2010 RLTS, Map 2 identifies the following corridors as part of the Strategic Freight Network:

- Strategic Freight Network Roads
 - Future Strategic Route (Primary) indicatively along the proposed SH20 alignment to SH16; and
 - Primary Arterial Route (Current) along Great North Road to the SH16 Interchange.
- Strategic Freight Network Rail
 - Secondary Strategic Route (Current) using the North Auckland Rail Line; and
 - Secondary Strategic Route (Future) indicatively along the Avondale – Southdown Rail Line designation.

3.2.3 Local Context

Auckland City Council Liveable Arterials Plan

The Liveable Arterials Plan has been developed by ACC to provide a plan of the management strategy of the roading network for the next 25 years. It separates the roads within ACC into four segments:

- General Vehicle Emphasis (GV);
- Community Emphasis (C);
- Passenger Transport Emphasis (PT); and
- Freight Emphasis (F).

These segments relate to the functional role of the arterial which is trying to be achieved. In some cases there has been more than one 'emphasis' for the arterial, as the road serves more than one function. As such, the Plan indicates that where one emphasis has been defined for an arterial, this does not exclude others from being applied.

Within the Liveable Arterials Plan, the following also applies (where possible) on those arterials identified in the Plan:

- Permanent bus lanes are only used for arterials with a “PT Emphasis,” but all other bus priority (including peak period clearway bus lanes) is still envisaged on other arterials. It is also possible that routes on ARTA’s QTN will use arterials with non-PT Emphasis.
- Provision for dedicated cycling lanes is envisaged, where appropriate, on arterials.
- While the “GV Emphasis” is oriented most towards the movement of large commuter volumes, arterials with another emphasis are also anticipated to share this function.
- All centres have been given the “C Emphasis” in recognition of their critical community roles. This also applies to all smaller centres and local centres on arterials.

The following describes each ‘emphasis’ and provides an indicative “aspirational” cross sections showing how the different outcomes could be achieved given the same road reserves. An overall plan of the identified ‘emphasis’ for different roads across ACC (as extracted from Page 19 of the Liveable Arterials Plan) is included in **Appendix A**.

General Vehicle Emphasis

The main function of the role of these roads, as defined within the Liveable Arterials Plan, is to maintain the through movement of vehicles.

The arterials within this category will concentrate on providing settings which manage property access and other conflicts. As such, on-street parking may be removed or managed (such as by peak hour clearways) to facilitate additional travel lanes. Generally, there will be two or more travel lanes each direction, but sometimes one in mid-block conditions. **Figure 3-1** below is a typical cross section for roads defined with a GV Emphasis.

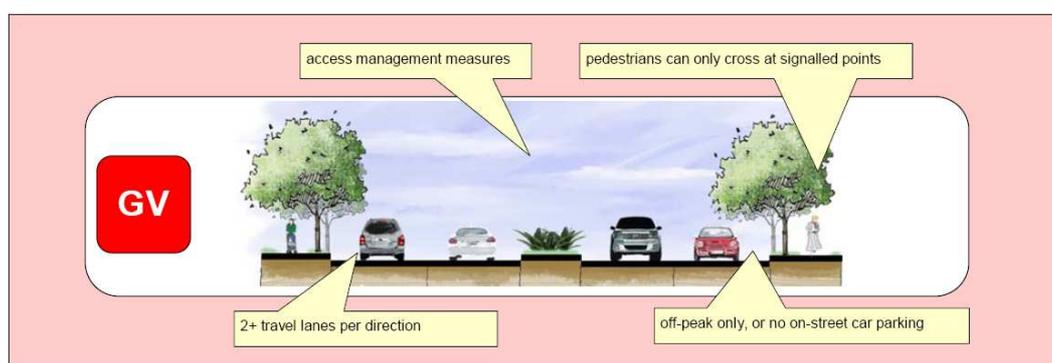


Figure 3-1: General Vehicle Emphasis as defined within the Liveable Arterials Plan

The roads within the Project area defined as having a GV Emphasis are:

- New North Road (west of Richardson Road / Woodward Road to east of Blockhouse Bay Road) – For this section of New North Road the Plan identifies a GV Emphasis with four lanes of traffic and a median strip, either a flush or kerbed median. Signalised pedestrian crossings will be included, where appropriate, to facilitate movements and enhanced landscaping along with route with street trees.
- Richardson Road (south of Stoddard Road) – A GV Emphasis with two lanes of traffic and a flush median. This is also anticipated to provide enhanced landscaping and street trees.
- Richardson Road (north of Stoddard Road) – Has a GV Emphasis with two lanes of traffic and a flush median. This is also anticipated to provide enhanced landscaping and street trees.
- Blockhouse Bay Road (south of Great North Road) – This road is expected to have a GV Emphasis with two lanes plus a flush median. It is anticipated to be enhanced by landscaping, street trees and providing adequate pedestrian crossing opportunities.

Community Emphasis

This Emphasis is envisaged where maintaining the local condition and amenity of ‘place’ is the primary role of the arterial, particularly in town and local centres, and around schools.

These will typically involve speed managed environments, often with lowered design speeds of 40kmh or less. Travel lanes will be minimised (generally one but sometimes two in each direction) to facilitate lateral crossing opportunities and edge amenity (through avoidance of traffic intensity). This is intended to help support local pedestrian use and community interaction. **Figure 3-2** below provides an aspirational cross section of the C Emphasis.

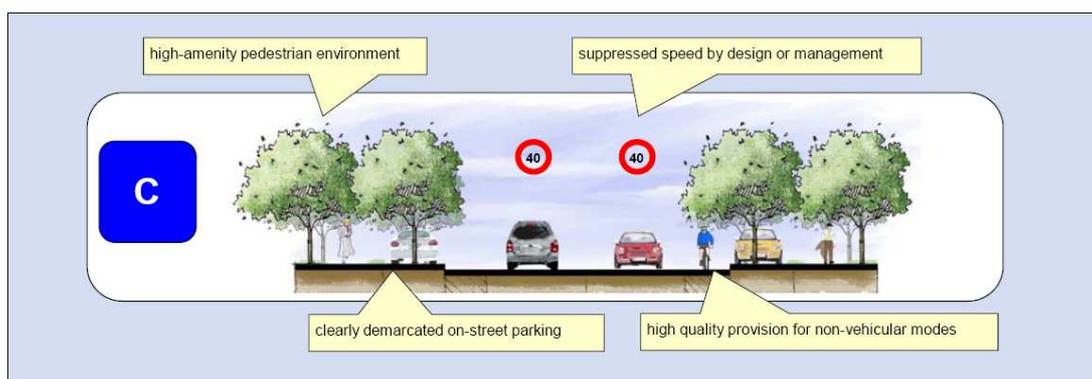


Figure 3-2: Community Emphasis as defined within the Liveable Arterials Plan

The roads within the Project area defined as having a C Emphasis are:

- Stoddard Road (between Maoro Street and Sandringham Road) – This road is expected to have a C Emphasis and as such will have two lanes of traffic (as currently existing), a flush median, on-street parking and cycle lanes. Enhanced pedestrian opportunities will provide additional crossing points and street trees will signal a change in environment. Vehicle speed will be managed through the area by a combination of design and lower speed limits.
- New North Road (between Richardson Road and Mt Albert Road) – This is expected to be four lanes of traffic (as currently existing) with on-street parking. Cycle lanes are a possible options where and enhanced pedestrian crossing opportunities through Mt Albert Centre. Where feasible, street trees will be added to provide a community focused environment.
- Woodward Road – Has been indicated with a C Emphasis, but no specific information has been identified.
- Carrington Road – This is expected to have a two emphasis with the C Emphasis at the centres as noted below.

Passenger Transport Emphasis

Where maintaining the effective and efficient movement of commuters by passenger transport is the primary role of the arterial, a PT Emphasis has been identified.

These streets will involve permanent bus lanes – preferably reconfigured from existing bus lanes in operation– so that they will traverse the middle of the street (subject to design and local compatibility of pedestrian access and bus stops/stations). Making the bus system more obvious, efficient, and effective will be an important part of helping to improve the use of buses. **Figure 3–3** below provides an indicative cross section of a road with a PT Emphasis.

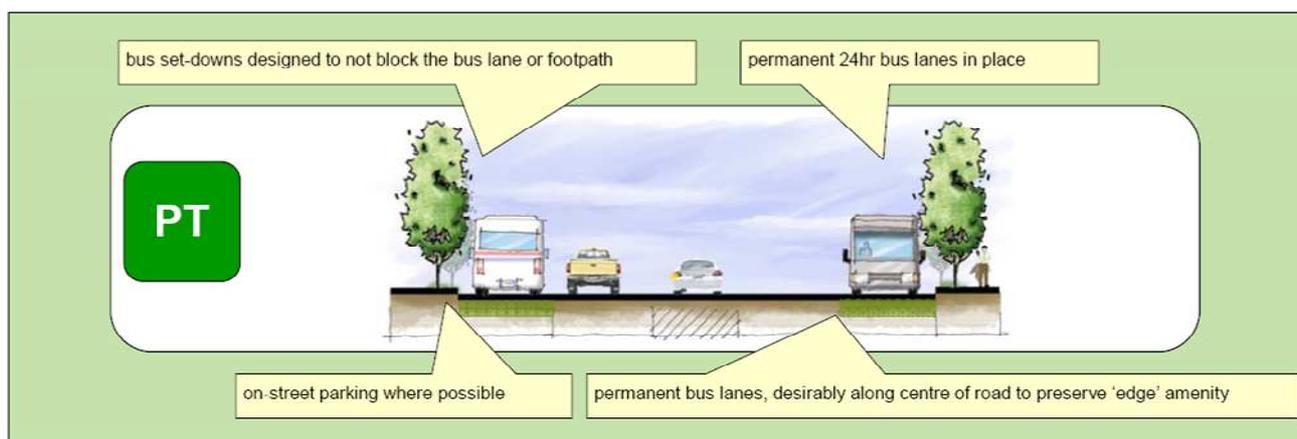


Figure 3–3: Passenger Transport within the Liveable Arterials Plan

The roads within the Waterview Connection area which are defined as having a Passenger Transport Emphasis are:

- Great North Road west of Carrington Road to Blockhouse Bay Road intersection.
- Carrington Road (north of Woodward Road) – this road has two emphases; along the length a passenger transport emphasis is predominate, with a community emphasis at the centres. This aspirational design for Carrington Road involves two lanes of traffic with cycle lanes and permanent bus lanes at appropriate locations. Flush medians may occur in some locations along with increase street amenities and street tree planting.

Freight Emphasis

A Freight Emphasis has been identified, where maintaining the viability of the Isthmus and CBD, as a place to conveniently move goods and services is the primary role of the arterial. On these arterials, the movement of freight is of greatest importance. These streets relate strongly to the State Highway network, which acts as the primary freight movement route. They also relate strongly to the Port, airport and movement into the neighbouring Waitakere and Manukau Districts.

The key qualities and characteristics for roads with freight emphasis are to have a number of features included in the design to facilitate freight movement. This includes wide pedestrian footpaths of at least 1.8m with buffer zones separating traffic from footpath and off-road cycle lanes, as well as typically two travel lanes in each direction with wider lanes and painted flush medians to accommodate turning and queuing of large vehicles. A typical cross section is shown in **Figure 3-4** below which incorporates the key qualities and characteristics.

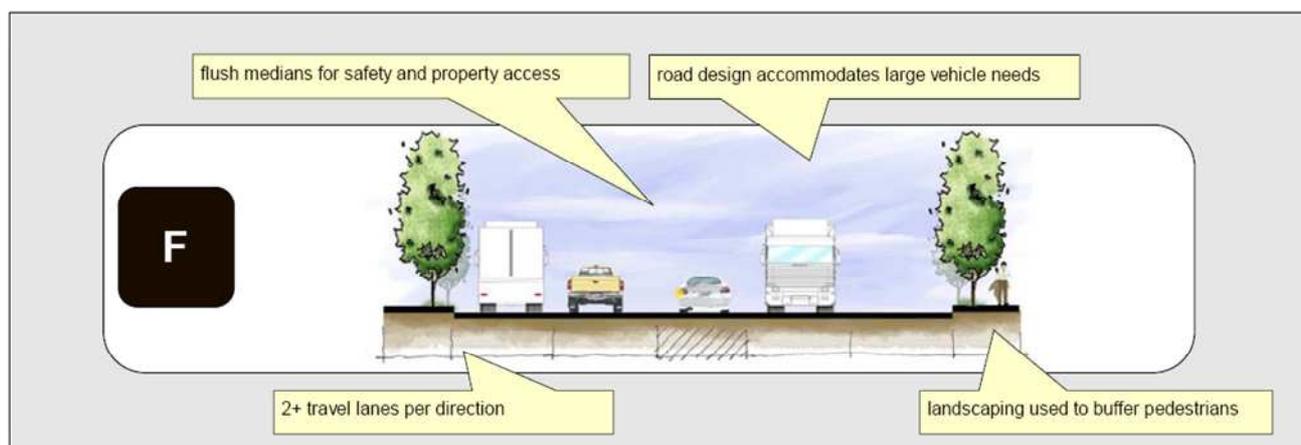


Figure 3-4: Freight Emphasis as defined within the Liveable Arterials Plan

The only road within the Project area, which is defined as having a F Emphasis is Maioro Street. A specific design for cross section of this road has not been identified within the Liveable Arterials Plan, but is likely to incorporate the general features described above.

Auckland City Future Planning Framework 2009

ACC has developed a Future Planning Framework, which is a city-wide overview and has been developed to support the overarching vision for ACC. It provides a 10-year plan for monitoring and prioritising of key projects in each area in the next 10 to 20 years, with the key outcome expected by 2030. There are plans for different parts of ACC identified in the Future Planning Framework, which includes the following in the Project area;

- Avondale / Blockhouse Bay,
- Mt Eden / Mt Albert,
- Western Bays, and
- Mt Roskill / Hillsborough.

Within the plans for each of the areas, aspirational features have been identified. These include public transport interchanges, future rail stations and general alignment, improved pedestrian and/or cycle facilities, key routes for passenger transport, the major transport network and improved connectivity. Within the Project area, the following key features have been identified:

- Improved pedestrian and or cycle environments through the Great North Road Interchange to Pt Chevalier, alongside Great North Road, through the Oakley Creek Reserve, Phyllis Reserve, Harbutt Reserve, along New North Road and Woodward Road, as well as through Alan Wood Reserve and Hendon Park.
- Key passenger transport routes have been identified along SH16, Great North Road, Blockhouse Bay Road, New North Road, Richardson Road, Maioro Street, Stoddard Road (between Maioro Street and Sandringham Road) and Sandringham Road.
- The Waterview Connection has been identified as a major change to the transport network and the approximate alignment is shown in the Future Planning Framework document.

Auckland City Growth Management Strategy

The Auckland region is growing rapidly and Auckland City must comply with the Auckland Regional Council Growth Strategy to manage that growth and the change it brings, while still preserving what Aucklanders value.

Auckland City Council has set itself a broad strategic direction, which includes planning for urban intensification and growth. A strategic plan was developed in 2002 and includes the following:

- Manage the growth of Auckland to coordinate areas of growth with improvements to infrastructure, public transport and amenities.
- Enhance the quality of the built environment with forward-looking urban design.

The key principle is that quality of life, sense of community and choice of lifestyles can be improved by having vibrant town centres within the city, which are easy to get around by foot. This kind of development is known as "smart growth" or "transit-oriented development", and its crux is that growth and land use are linked to transport.

Concentrating people and activities around transport (preferably within a five or ten minute walk) provides enough population density to support improved passenger transport and local services such as shops. Increased services within walking distance, in turn reduces the need for car travel.

As part of the Strategy, Auckland City identified 'areas of change' which are appropriate for this kind of development. These areas of change are generally around centres with good passenger transport routes – bus and/or rail.

The SH20 Waterview project is on the fringe, or passes through the following areas of change:

- Avondale, identified in the strategy as a priority 1 Area of Change
- Pt Chevalier, identified in the strategy as a priority 1 Area of Change
- Stoddard, identified in the strategy as a priority 4 Area of Change.

Auckland City Council Draft Cycling and Walking Framework 2007

The ACC Draft Cycling and Walking Framework (CWF) identifies how the Council will plan, improve and enhance pedestrian and cycling initiatives and facilities throughout ACC for the next 10 years. It sets a long term vision and provides direction of how this will be achieved. This framework takes into account the Long Term Council Community Plan (LTCCP) and works to achieve these plans.

There are five objectives of this document based around increasing the number of people walking and cycling by provided convenient, attractive, direct and safe walking and cycling routes. Indicators and targets have been set to measure the success in each of the five objectives. The indicators and measures include an increase in cyclists and pedestrians, better facilities for cyclists and pedestrians, together with walking and cycling initiatives.

Waitakere City Council Growth Management Strategy 2009

The Growth Management Strategy for Waitakere provides a framework to address the growth within the WCC area over the next 50 years. The document is based on the Auckland Regional Growth Strategy, which looks at the Auckland Region as a whole. Within this Strategy, transport has been identified as a key growth issue.

The Te Atatu Peninsula area is an area of predicted growth and, as such, a "concept plan" has been developed to manage this growth and the associated infrastructure. In particular, the Te Atatu Peninsula area has been identified as a 'Town Centre' growth node. The Strategy identifies that, as any growth within the area directly affects the capacity of the Te Atatu Road Interchange, it is important to understand the impact of this growth

within the wider context due to all access to the Te Atatu Peninsula area being through at the Te Atatu Interchange.

Waitakere City Transport Strategy 2006–2016

WCC prepared a Transport Strategy in 2006 to provide strategic direction for the vision for transport within Waitakere. This vision is to provide *“a sustainable multi-modal transport system that is integrated with lane use and contributes to Waitakere as an eco city”*.

The key features of the 10-year programme are passenger transport improvements, bus priority measures on state highway and key arterial roads, pedestrian / cycle ways and footpath improvements and the initiation of travel demand measures to reduce congestion. The shift from single occupancy vehicles to alternative modes, such as passenger transport and walking and cycling is identified as the key to achieving this Strategy.

The Strategy is aligned with the LTCCP prepared by WCC and is reviewed on a regular basis. The objectives and desired outcomes of the Transport Strategy are contained within the document and how these objectives were derived. Within the document the roles of the transport modes and transport corridors within WCC are defined. This includes key routes such as SH16, access to SH20, and other corridors which feed SH16.

Waitakere City Council Walking and Cycling Strategy 2005

WCC Walking and Cycling Strategy has been developed to promote the health and fitness benefits of walking and cycling and reduce the negative impacts of motor vehicles by increasing walking and cycling for commuters, for leisure and for short trips.

The Council has set six objectives and associated targets to measure these objectives, which range from reducing pedestrian and cyclist injury to increasing satisfaction with provisions for pedestrian and cyclist, and completing walking and cycling provisions by 2015. An indicative implementation plan is included within the Walking and Cycling Strategy. This plan includes projects to meet each objective and which years the projects are expected to be carried out.

Avondale – Southdown Rail Line

The Avondale – Southdown Rail Line is a corridor to provide a south-western rail link through the suburbs of Onehunga and Mount Roskill, to connect to the North Auckland Rail line between the Avondale and Mt Albert Stations. This connection would provide a western loop to the North Island Main Trunk (NIMT) line within the Auckland region. The corridor is provided for by designation ‘G08-05 – Railway Purposes Avondale Southdown Line’ in the Auckland City District Plan.

Historically (in initial plans for the corridor), the design was principally to accommodate a freight service with a number of level crossings, including crossings at New North Road (where the line would connect to the North Auckland Rail Line) and at Richardson Road. However, the original design also included provision for stations along the corridor, including within the Alan Wood Reserve area.

There remains a commitment for development of the Avondale to Southdown Rail Line. Most recently, this commitment is demonstrated in the 2009 Auckland Transport Plan which makes the following references to the future Avondale to Southdown Rail Line:

“Future development of the passenger transport network, primarily the Rapid Transit Network, is expected to be given effect via ... Rapid transit connections between Avondale and Southdown, the Auckland CBD and the Auckland Airport, and Manukau City Centre and Auckland Airport”

The intentions for freight are similar to the intentions within the Auckland Regional Freight Strategy (2006). As such, it is important that future opportunities for the corridor, as both a double track rail line and as an electrified service, are recognised and not precluded.

Timing for the construction of this rail line has not yet been determined.

4. Transport Context

4.1 Pedestrian and Cycle Facilities

4.1.1 Existing Pedestrian and Cycle Facilities

This section discusses the current pedestrian and cycle facilities provided within the area surrounding the Waterview Connection Project. An overview of the existing facilities across the Project area is provided, followed by more detailed consideration of the facilities in each Project sector. **Appendix B** includes the existing environment movement map illustrating the existing cycle routes and infrastructure within WCC and ACC areas, as identified on the ARTA website.

Both ACC and WCC have current walking and cycling maps which provide detail of the type of facility and the location of the pathways. These routes show the locations of the walkways and cycle paths and define the type of facility currently installed. While some of the cycle routes highlighted on the maps do not have dedicated facilities, they have been recommended for other reasons. The first reason is that a road may be a relatively quiet road with lower traffic volumes and therefore be more conducive to cycle on or walk alongside. The other reason is that, although they may potentially be a busy road, there is considered sufficient space at the kerbside for cyclist to be present with sufficient space for vehicles to pass.

Cyclists and pedestrians are prohibited within the motorway environment, due to the safety issue of mixing the more vulnerable types of transport with vehicular traffic travelling at the speed limit of up to 100km/hr along SH16 (west of Newton Road ramps) and SH20 (south of the SH20 termination at Mt Roskill). To facilitate cyclist movements, the existing Northwestern Pedestrian / cycle way and Southern Isthmus Pedestrian / cycle way (south of Maiero Street) run parallel to the state highway, but are separated from the general traffic lanes.

Sector 1 - Te Atatu Interchange

There are several existing pedestrian and cycle facilities at Te Atatu Interchange.

The shared pedestrian/cycle way (which forms part of the “Northwestern Pedestrian / cycle way” along SH16) on the east side of the bridge starts at the westbound off-ramp, where there are pram crossings across the signalised left turn to a kerbed island. Signalised crossings allow for movement across the right turning lanes of the off-ramp and also across Te Atatu Road, providing connections to the shared pedestrian and cycle paths through McCormick Green and along the eastern side of the bridge respectively. To the south along Te Atatu Road footpaths are provided on both sides of the road.

After passing through McCormick Green, the Northwestern Pedestrian / cycle way runs through some local ‘quiet road’ routes (Royal View Road and Flanshaw Road) to connect with off-road routes along Henderson

Creek at the western extent of Sector 1. There are a number of walking paths within the area to the west of the Interchange, including Henderson Creek Walkway under the SH16 overbridge, which is currently identified from improvements by WCC as part of the Twin Streams project.

The westbound on-ramp also has a signalised crossing to facilitate movements through the Interchange along the western side of the bridge. Shared pedestrian / pedestrian / cycle ways are provided on both sides of the bridge over SH16, with approximate widths of 3m and 5m on the east and west sides of the bridge respectively.

To the north of the bridge, footpaths are currently provided on the western side of Te Atatu Road and a pedestrian subway currently provides segregated access for pedestrians under the eastbound off ramp and loop on ramp on the north western side of the Interchange, which avoids conflict with vehicles using these ramps. However, the subway is currently not well located on a direct desire line for pedestrians travelling along the western side of Te Atatu Road through the Interchange and pedestrians have therefore been observed crossing the ramps at-grade, where there is currently no dedicated pedestrian crossing provision. On the eastern side of Te Atatu Road, a shared pedestrian / cycle path currently runs north of the Interchange alongside Te Atatu Road providing access between the Te Atatu Peninsula and the Northwestern pedestrian / cycle way.

Sector 2 - Whau River / Sector 3 - Rosebank - Terrestrial / Sector 4 - Reclamation

Through these sections the Northwestern Pedestrian / cycle way runs alongside the SH16 westbound carriageway. At some points the motorway and pedestrian / cycle way are in close proximity, only separated by a wire link fence.

Over the Whau River, the pedestrian / cycle way narrows to approximately 1m wide, due to the physical constraints of the bridge. For a short section west of Patiki westbound on-ramp, the pedestrian / cycle way becomes an on-road facility along Patiki Road, where access is also provided for the Rosebank Park Domain, before the pedestrian / cycle way takes the bridge over the westbound on-ramp.

Sector 5 - Great North Road Interchange / Sector 6 - SH16 to St Lukes Interchange / Sector 7 - Great North Road Underpass / Sector 8 - Avondale Heights Tunnel / Sector 9 - Alan Wood Reserve

These sectors have been combined together to discuss the strategic walking and cycling routes currently in place around the proposed SH20 sectors of the Project. As, for a number of reasons, there are no walking and cycling facilities able to be provided for a number of reasons within the tunnel, focus has been put on a review of the walking and cycling facilities in the surrounding area. Within this area, there are generally footpaths provided along all roads on at least one side, if not both. Where additional walking and cycle facilities in the area are provided they are described below.

Great North Road Interchange has the continuation of Northwestern Pedestrian / cycle way running over Great North Road on a shared walking and cycle bridge, which continues along the northern side of the Unitec Campus. At Carrington Road, there are shared walking and cycling paths from the pedestrian / cycle way along both sides of the road to the intersection with Pt Chevalier Road / Great North Road. The Northwestern

Pedestrian / cycle way continues along local roads until it is provided as a dedicated pedestrian / cycle way between SH16 and the Chamberlain Park Golf Club and through to the St Lukes Road Interchange.

A shared pedestrian/cycle way runs along approximately two thirds of the length of Great North Road on the section between the Great North Road Interchange and the intersection with Blockhouse Bay Road. The provision of an off-road facility along this road is considered to be important, due to the volume of traffic currently using Great North Road.

There are currently on-road cycle lanes along both sides of the length of Carrington Road and Mt Albert Road to the intersection with Sandringham Road. These cycle lanes provide a direct link to the Unitec campus on a north-south alignment between Sandringham and Pt Chevalier, generally parallel to the proposed SH20 alignment, but further to the west. Linking Carrington Road with New North Road, Woodward Road and Richardson Road have been identified, as part of the ARTA cycle network, as roads with wide kerbside lanes for cyclists. From Woodward Road, Springleigh Avenue is a quieter road which links cyclists with the existing shared pedestrian/cycle way through Phyllis Street Reserve.

There are also pedestrian walkways through Oakley Creek Esplanade, Alan Wood Reserve and Hendon Park. Oakley Creek Esplanade can be accessed from Great North Road through a number of locations and stairs into the park and alongside the creek. Alan Wood Reserve and Hendon Park have an entry from New North Road and a number of accesses along Hendon Avenue. At the end of the walkway through Hendon Park, a shared pedestrian/cycle way continues through Underwood Park and Walmsley Park.

Blockhouse Bay Road (south of New North Road) is currently recommended as route for cyclists on a road with wide kerbside lanes along the full length. Tiverton Road, Maioro Street, New Windsor Road (south of Tiverton Road) and Richardson Road (south of Stoddard Road) are similarly identified as potential routes on roads with wide kerbside lanes.

In the vicinity of the existing SH20 termination at Maioro Street, a segregated shared pedestrian/cycle way is currently provided along the southern side of SH20 (the Southern Isthmus Pedestrian / cycle way). Shared pedestrian/cycle ways are also provided between Maioro Street and Stoddard Road both via the SH20 roundabout termination and a bridge over SH20 between Sandringham Road Extension and Ernie Pinches Street.

4.1.2 Future Pedestrian and Cycle Facilities

WCC has future links on Te Atatu Road, to the north and south of the Te Atatu Interchange. These are expected to be in the form of on-road facilities.

ACC has produced a 20 year cycle network plan which identifies various new dedicated cycle paths (regional links) and on-street facilities (strategic links), where roads with wide kerbside lanes can be used. An extract from the 20 year cycle network plan for the Project area can be seen in **Figure 4-1** below.

The strategic links shown on the plan include a route along Stoddard Road, through Hendon Park (where it links with another strategic route from Underwood Park), through the Alan Wood Reserve across New North

Road and through the Harbutt and Phyllis Reserves to link with the Oakley Creek Route, which links to the existing off-road facility along the eastern side of Great North Road.

Other regional links (on-road facilities) shown on the plan are identified along a number of the arterial roads in the vicinity of the Project, including:

- Great North Road;
- New North Road (Blockhouse Bay Road to the Auckland CBD);
- Blockhouse Bay Road;
- Woodward Road;
- Richardson Road; and
- Stoddard Road.



Figure 4-1: ACC 20 Year Cycle Network Plan

For the roads where future on-road cycle lanes have been identified in the Plan, **Table 4-1** below provides a comparison with the intended emphasis for these roads in the Council’s Liveable Arterials Plan and Future Planning Framework document, which were discussed in **Section 3.2.3**.

As can be seen from **Table 4-1**, the future provision of on-road cycle facilities on New North Road, Blockhouse Bay Road and Richardson Road as part of the 20 year plan is in contrast to the general vehicle emphasis along these roads in the Liveable Arterials Plan. Although, it is noted that the Liveable Arterials Plan indicates that, whilst a route may have a general vehicle emphasis, improvements to pedestrian, cycle and passenger transport provision are not excluded.

The intentions identified by the Council in the Future Planning Framework document are largely consistent with the provision on-road cycle facilities on these roads as part of the 20 year cycle network plan, given the identified improvements to cycle or passenger transport facilities along these roads.

Table 4-1: Comparison of 20 Year Cycle Plan, Liveable Arterials Plan and Future Planning Framework

	ACC 20 Year Cycle Network Plan	ACC Liveable Arterials Plan 2006	ACC Future Planning Framework 2008
Great North Road (Blockhouse Bay Road to Carrington Road)	On-road cycling with wide kerbside lanes	Passenger Transport Emphasis	Improved pedestrian, cycle and passenger transport facilities
New North Road (Blockhouse Bay Road to Richardson Road)	On-road cycling with wide kerbside lanes	General Vehicle Emphasis	Improved pedestrian, cycle and passenger transport facilities
Blockhouse Bay Road (Great North Road to New North Road)	On-road cycling with wide kerbside lanes	General Vehicle Emphasis	Improved passenger transport facilities
Richardson Road	On-road cycling with wide kerbside lanes	General Vehicle Emphasis	Improved passenger transport facilities
Stoddard Road	On-road cycling with wide kerbside lanes	Community Emphasis (South of Maioro Street)	Improved passenger transport facilities
Woodward Road	On-road cycling with wide kerbside lanes	Community Emphasis	Improved pedestrian and cycle facilities

It is also noted that the proposed works associated with the completion of the Maioro Street Half Diamond project (which is currently being progressed as a separate project by NZTA) will extend and improve existing pedestrian / cycle facilities around the SH20 termination at the proposed half diamond interchange. This

includes extension of the existing shared pedestrian/cycle way from the existing bridge over SH20 to the southern side of the proposed interchange with signalised crossings then providing access to the northern side of the interchange.

The Waitakere Walking and Cycling Strategy 2005, discussed in **Section 3.2.3**, identifies provision of a city-wide network of routes will facilitate all walking and cycling trips whether long or short. It identifies that currently the majority of such trips are conducted close to home but long distance facilities are required by serious cyclists, walkers, runners and commuters. In this regard the Strategy identifies the completion of the walk / cycle network map included on page 14 of the Strategy by 2015. This includes two main types of route:

- Type One routes – Dedicated off-road facilities for their entire length, which will include rail corridor and state highway routes, and envisaged as forming the backbone of the network; and
- Type Two routes – Providing both “safe-collector” routes for Type One routes and routes to key locations (schools, town centres etc), the facilities of which will be determined on a case-by-case basis.

The cycle network map on page 14 of the Strategy identifies locations for these routes below, which are also illustrated on the existing environment movement map in **Appendix B**:

- Type One – Alongside the length of SH16 through Sector 1 of the Project, as well as long the alignment of the existing cycle routes through McCormick Green and along the ‘quiet road’ routes (Royal View Road and Flanshaw Road) to Henderson Creek; and
- Both to the north and south of Te Atatu Interchange along Te Atatu Road. To the north of the Interchange, a Type Two route is identified through the Harbourview Oranahina Reserve, which in combination with the Te Atatu Road route is identified as providing a loop around the Te Atatu Peninsula.

4.2 Passenger Transport Facilities

4.2.1 Existing Passenger Transport Facilities

There are many bus services operating on routes within the Project study area and in Sector 8 the North Auckland Rail Line also runs broadly parallel to New North Road. The following paragraphs outline a summary of the roads on which buses operate within each of the Project sectors and the frequency of busses on these roads, which includes bus services operating along SH16 and the existing bus shoulder provision. All regular bus services are including, included buses which services schools on a scheduled basis. The existing Local Transit Network (LCN), Quality Transit Network (QTN) and Rapid Transit Networks (RTN) are shown on the existing environment movement map in **Appendix B**.

Sector 1 – Te Atatu Interchange

The existing passenger transport routes through the Te Atatu Interchange are shown on **Figure 4-2**. **Table 4-2** details the number of buses which pass through the intersection on Te Atatu Road (by time of day / day of week), onto the motorway at the Interchange and those routes continuing through the Interchange along the motorway.



Figure 4-2: Existing Bus Routes in Sector 1

Table 4-2: Bus Services and Frequency in Sector 1

	Direction	Entrance Ramp in Sector	Exit Ramp in Sector	Weekday AM Peak 7am – 9am	Weekday PM Peak 4pm – 6pm	Weekday Daily Total	Saturday Daily Total
Route 1	Eastbound	Already on Motorway	Stay on Motorway	12	0	16	0
	Westbound	Already on Motorway	Stay on Motorway	1	12	18	0
Route 2	Eastbound	Te Atatu On-ramp	Stay on Motorway	33	13	99	60
	Westbound	Stay on Motorway	Te Atatu Off-ramp	10	32	102	56
Route 3	Northbound	Te Atatu Road	Te Atatu Road	0	1	9	9
	Southbound	Te Atatu Road	Te Atatu Road	0	1	10	9

Sector 2 – Whau River / Sector 3 – Rosebank – Terrestrial / Sector 4 – Reclamation

These sectors include the Whau River crossing, the ramps at Rosebank Road and Patiki Road and the Causeway. **Figure 4-3** and **Table 4-3** show the routes of the services through this sector and the frequency of buses. These sectors have been combined as bus services in these sectors run along SH16.



Figure 4-3: Existing Bus Routes in Sectors 2, 3 and 4

Table 4-3: Bus Services and Frequency in Sectors 2, 3 and 4

	Direction	Entrance Ramp in Sector	Exit Ramp in Sector	Weekday AM Peak 7am – 9am	Weekday PM Peak 4pm – 6pm	Weekday Daily Total	Saturday Daily Total
Route 4	Eastbound	Patiki Off-ramp	Rosebank Rd On-ramp	6	5	33	30
	Westbound	Rosebank Rd Off-ramp	Patiki On-ramp	3	14	45	24
Route 5	Eastbound	Already on Motorway	Stay on Motorway	39	8	82	30
	Westbound	Already on Motorway	Stay on Motorway	8	30	75	32

Bus shoulders are currently provided intermittently along the length of SH16 in both the eastbound and westbound directions between the Te Atatu Interchange and the Great North Road Interchange. **Table 4-4** summarises the existing bus shoulder provision along this section of SH16, by motorway chainage (in metres), as defined by the Project and which is also indicatively illustrated below on **Figure 4-4**.

Table 4-4: Summary of Existing Bus Shoulder Provision along SH16

Direction	Start Chainage (metres)	End Chainage (metres)	Length (metres)
Westbound	850	2,300	1,450
	Total		1,450
Eastbound	6,500	5,800	700
	4,150	2,950	1,200
	2,250	1,000	1,250
	Total		3,150
Total Eastbound and Westbound			4,600



Figure 4-4: Indicative Existing Bus Shoulder Provision along SH16

Sector 5 – Great North Road Interchange

Around the Great North Road Interchange there are three bus service routes. Services operate along SH16 providing routes between West Auckland and the Auckland CBD. Another route is along Great North Road through the Interchange. In addition, there are some buses operate between Great North Road and SH16 through the Interchange, as can be seen in **Figure 4-5**. The number and frequencies of these buses can be seen in **Table 4-5**.

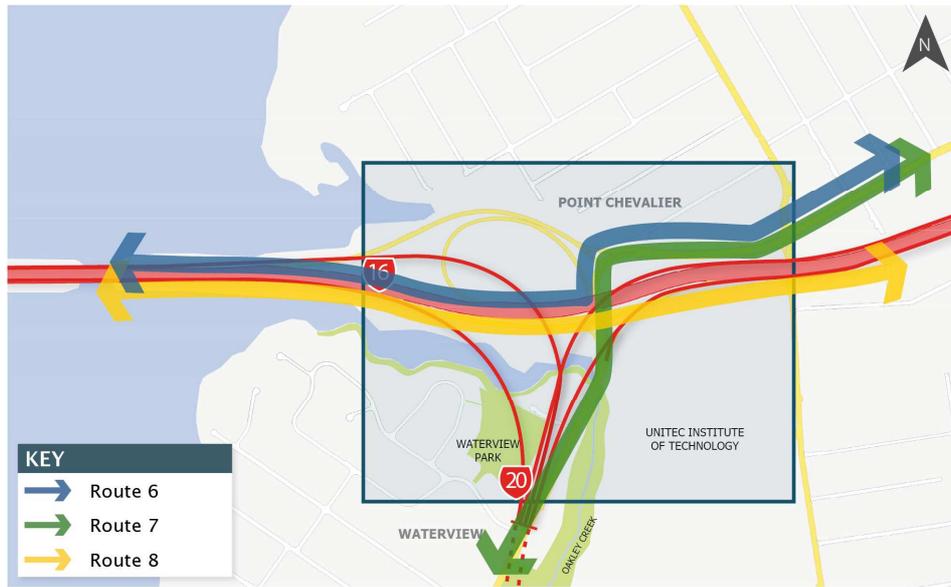


Figure 4-5: Existing Bus Routes in Sector 5

Table 4-5: Bus Services and Frequency in Sector 5

	Direction	Entrance Ramp in Sector	Exit Ramp in Sector	Weekday AM Peak 7am - 9am	Weekday PM Peak 4pm - 6pm	Weekday Daily Total	Saturday Daily Total
Route 6	Eastbound	Great North Road On-ramp	Stay on Motorway	37	13	105	60
	Westbound	Already on Motorway	Great North Rd Off-ramp	11	34	107	56
Route 7	Eastbound	Already on Great North Road	Stay on Great North Road	31	24	194	129
	Westbound	Already on Great North Road	Stay on Great North Road	15	34	145	90
Route 8	Eastbound	Already on Motorway	Stay on Motorway	8	0	10	0
	Westbound	Already on Motorway	Stay on Motorway	0	10	13	0

Sector 6 - SH16 to St Lukes

The bus services in this sector are the same as those services operating through Sector 5 with the services operating along either Great North Road or SH16 between or through the Great North Road Interchange and the Auckland CBD. These are shown in **Figure 4-6** and the route numbers and frequencies of these buses are provided in **Table 4-6**.



Figure 4-6: Existing Bus Routes in Sector 6

Table 4-6: Bus Services and Frequency in Sector 6

	Direction	Entrance in Sector	Exit in Sector	Weekday AM Peak 7am – 9am	Weekday PM Peak 4pm – 6pm	Weekday Daily Total	Saturday Daily Total
Route 9	Eastbound	Already on Motorway	Stay on Motorway	8	0	10	0
	Westbound	Already on Motorway	Stay on Motorway	0	10	13	0
Route 10	Eastbound	Already on Great North Road	Stay on Great North Road	81	46	362	225
	Westbound	Already on Great North Road	Stay on Great North Road	37	84	322	182

Sector 7 – Great North Road Underpass

Through this sector the main existing bus services of interest are those operating along Great North Road. **Figure 4-7** shows the existing bus service routes through the sector. **Table 4-7** details the number of buses for each of the routes which use Great North Road and the frequency of buses during a weekday morning (AM) and evening (PM) peak and the daily total for a weekday and Saturday.

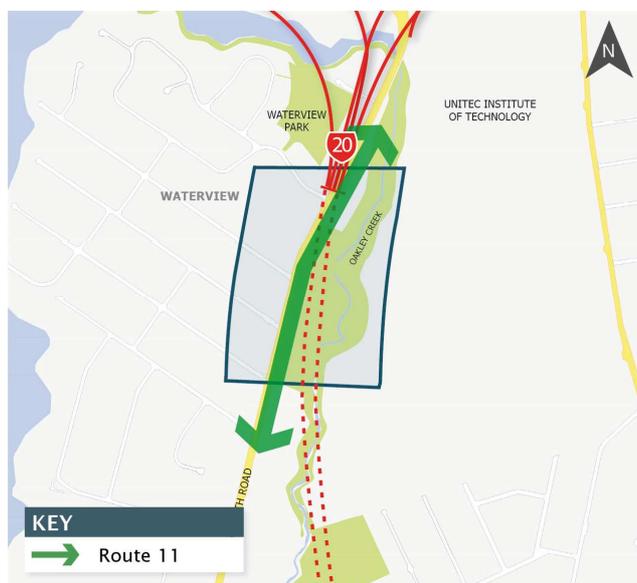


Figure 4-7: Existing Bus Routes in Sector 7

Table 4-7: Bus Services and Frequency in Sector 7

	Direction	Entrance in Sector	Exit in Sector	Weekday AM Peak 7am – 9am	Weekday PM Peak 4pm – 6pm	Weekday Daily Total	Saturday Daily Total
Route 11	Northbound	Great North Road	Great North Road	29	22	124	94
	Southbound	Great North Road	Great North Road	12	28	116	76

Sector 8 – Avondale Heights Tunnel

There are no bus services through this sector, as it is currently reserve. There are other bus services on the local roads surrounding the reserve, which may be affected by the construction or the operation of the Project. This includes bus services operating along New North Road, as set out on **Figure 4-8** and in **Table 4-8**.



Figure 4-8: Existing Bus Routes in Sector 8

Table 4-8: Bus Services and Frequency in Sector 8

	Direction	Entrance in Sector	Exit in Sector	Weekday AM Peak 7am – 9am	Weekday PM Peak 4pm – 6pm	Weekday Daily Total	Saturday Daily Total
Route 12	Eastbound	Blockhouse Bay Road	Hendon Avenue	23	13	105	57
	Westbound	Hendon Avenue	Blockhouse Bay Road	11	13	105	52

The North Auckland Rail Line operates between the Avondale and Mt Albert railway stations through Sector 8. The proposed tunnel will pass underneath the North Auckland Rail Line.

Sector 9 – Alan Wood Reserve

The alignment of the Project within this sector runs through reserve and hence does not have a direct effect on passenger transport services when operational. However, there are bus services which are likely to be affected by the construction of the Project. These service routes and buses run along Richardson Road and Hendon Avenue and are detailed below in **Figure 4-9** and **Table 4-9**.

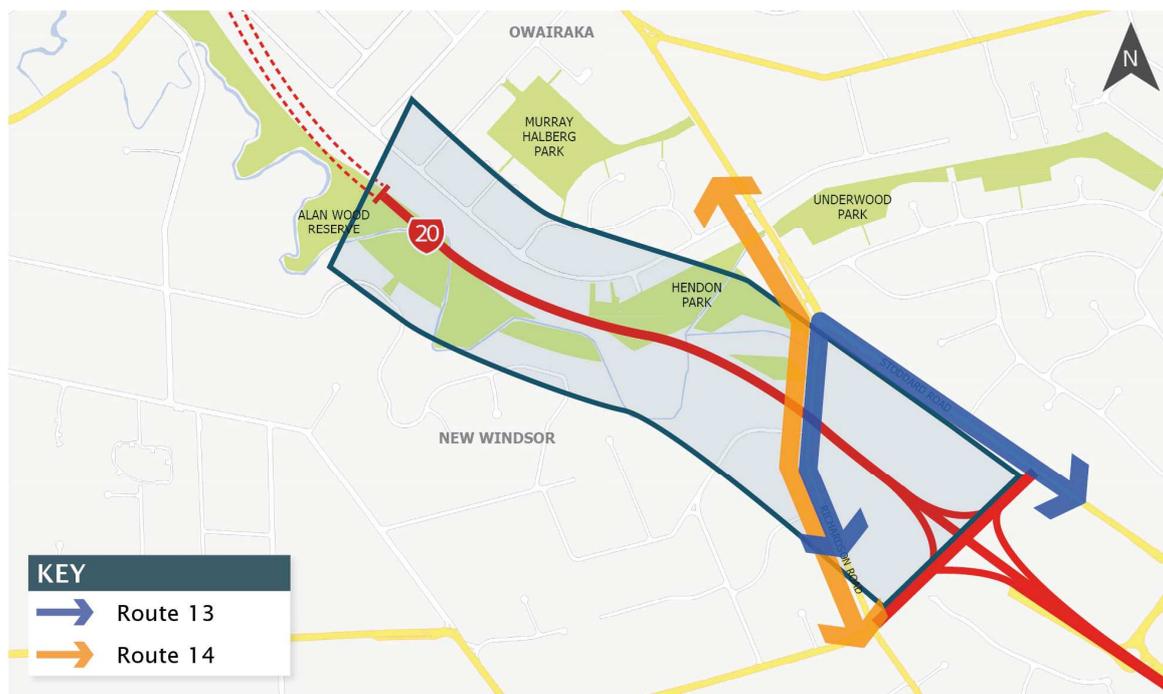


Figure 4-9: Existing Bus Routes in Sector 9

Table 4-9: Bus Services and Frequency in Sector 9

	Direction	Entrance in Sector	Exit in Sector	Weekday AM Peak 7am – 9am	Weekday PM Peak 4pm – 6pm	Weekday Daily Total	Saturday Daily Total
Route 13	Eastbound	Maioro Street	Stoddard Road	14	6	43	27
	Westbound	Stoddard Road	Maioro Street	4	10	47	28
Route 14	Eastbound	Maioro Street	Owairaka Road	10	6	45	28
	Westbound	Owairaka Road	Maioro Street	5	7	44	27

4.2.2 Future Passenger Transport Facilities

The proposed and planned provision of the RTN and QTN in the Auckland region by 2016 is illustrated on figure 1.2 in the PTNP and shown on the extract in **Figure 4-10** below. In relation to the Project area, the proposed / planned passenger transport infrastructure includes the following improvements:

- Improvements, such as bus priorities and increase in services, along the QTN from Westgate and Henderson to the Auckland CBD, which includes routes along SH16, Te Atatu Road and via New Lynn along Great North Road;
- Improvements, such as bus priorities and increase in services, along the QTN from New Lynn to the Auckland CBD, which includes routes along Great North Road;
- Improvements to the LCN through bus priorities and increased service frequency to provide better access to the RTN and QTN, which includes access to the following planned / proposed RTN and QTN within the Project area:
 - RTN along the North Auckland Rail Line between New Lynn and the Auckland CBD;
 - QTN along SH16 between Henderson Creek and St Lukes Interchange;
 - QTN along Mt Albert Road and Carrington Road (Dominion Road to Great North Road); and
 - QTN along Great North Road (New Lynn to Auckland CBD).
- Provide a new ferry terminal and services at Te Atatu, if supported by investigations.



Figure 4-10: Proposed / Planned RTN and QTN by 2016 (source: ARTA – Auckland Passenger Transport Network Plan 2006)

In relation to the operation of the QTN, including route along SH16, Great North Road, Mt Albert Road and Carrington Road, the PTNP has set minimum service guidelines for the to be achieved by 2016. These guidelines involve:

- Providing coverage of median to high density area not serviced by the RTN;
- Facilitate high speed and reliable access across the region;
- Increase of the frequency of the services to:
 - 10 mins during peak periods (15 mins for new services).
 - 20 mins during interpeak periods (30 mins for new services).
 - 60 mins during evenings, Saturday and Sunday (60 mins for new services); and
- Service periods between 5:30am-12:30am for all services on weekdays, between 7am and 12.00pm Saturdays and between 8:00am and 10pm on Sundays.

The PTNP has guidelines for improved facilities at QTN stops, which would include routes along Great North Road. These have been split into major and minor stops in terms of the need for the upgrade of the facilities. **Table 4-10** shows what facilities are going to be upgraded for the QTN stops. However, the major and minor stops of the QTN network have not been defined.

Table 4-10: Facilities to be upgraded as part of the Auckland Passenger Transport Network Plan (2006-2016)

Type of Facility	Facility	QTN Major Stop	QTN Minor Stop
Comfort and Convenience Facilities	Shelter	✓	✓
	Seating	✓	✓
	Ticket Machine	✓	
	Pay telephone	✓	
	Commercial operations / vending machines	✓	
	Bicycle Storage facilities	✓	
Information	Station / Stop number	✓	✓
	Station / Stop name	✓	
	Direction of travel	✓	✓
	Site specific route numbers and destination	✓	✓
	Stop specific route diagram	✓	✓
	Area route map	✓	
	Site specific fare information and zone map	✓	✓
	General fare information and zone map	✓	✓
	Stop specific timetable	✓	✓
	General timetable	✓	
	Real-time Information	✓	✓
Safety and Security	Lighting	✓	✓
	Video surveillance	✓	
	Emergency help point	✓	
	Tactile surface indicators	✓	✓

The longer term extension to the RTN identified in the PTNP is illustrated on **Figure 4-11**, which is an extract from figure 1.1 of the PTNP. This is indicatively identified to include the future Avondale – Southdown Rail Line corridor. This would provide a south-western rail link through the suburbs of Onehunga and Mount Roskill, to connect to the North Auckland Rail Line between the Avondale and Mt Albert Stations. As discussed in **Section 3.2.3**, the corridor is provided for by a designation in the Auckland City District Plan.



Figure 4-11: Longer-Term Extensions of the RTN (source: ARTA – Auckland Passenger Transport Network Plan 2006)

Passenger transport services will increase their frequency along the QTN routes according to the minimum service guidelines described above. There are key service review levels, which can trigger a review of the capacity or the frequency of services. For the QTN, the maximum loading trigger levels are:

- During peak period – in a 15 minutes interval the services provided are 85% of total capacity per route, or during a 30 minute period the services are at 70% of their total capacity (where total capacity = seated + standing availability).
- During interpeak periods (weekends and evening) if in a 60 minute period the services are at 60% or more of their total capacity. However, there may be some trips during this period which exceed these levels.

For a service to decrease in frequency or capacity, a minimum patronage trigger level must be reached. For the QTN these are:

- During the peak period the patronage is less than 50% of the seated capacity at the maximum load point. This is to be averaged by the number of trips operated during any 20 minute period
- During other periods, patronage is less than 30% of the seated capacity at the maximum load point. This is to be averaged by the number of trips operated during any 20 minute period

4.3 Rooding Network, Property Access & Parking

4.3.1 Existing Local Rooding Network, Property Access and Parking

The following sections review the existing rooding environment within the Project area. An overview of the State Highway network considerations is provided and then the rooding environment within each of the Project sectors is considered.

State Highway

SH16 and SH20 are defined as a “Strategic Route” within the Auckland City District Plan. The Plan identifies that *“strategic routes form part of the network of strategic national importance”* and that the main function of these roads is to *“carry the major traffic movements between the principal sectors of the region”*, predominantly through traffic. As such, access on to the motorway is restricted to the interchanges and therefore functions such as property access and parking are prohibited along the entire length of SH16 and SH20.

Sector 1 – Te Atatu Interchange

SH16 through Te Atatu Interchange currently has two lanes of traffic in each direction. The existing layout of the Te Atatu Interchange is illustrated on **Figure 4–12** and **Figure 4–13**.

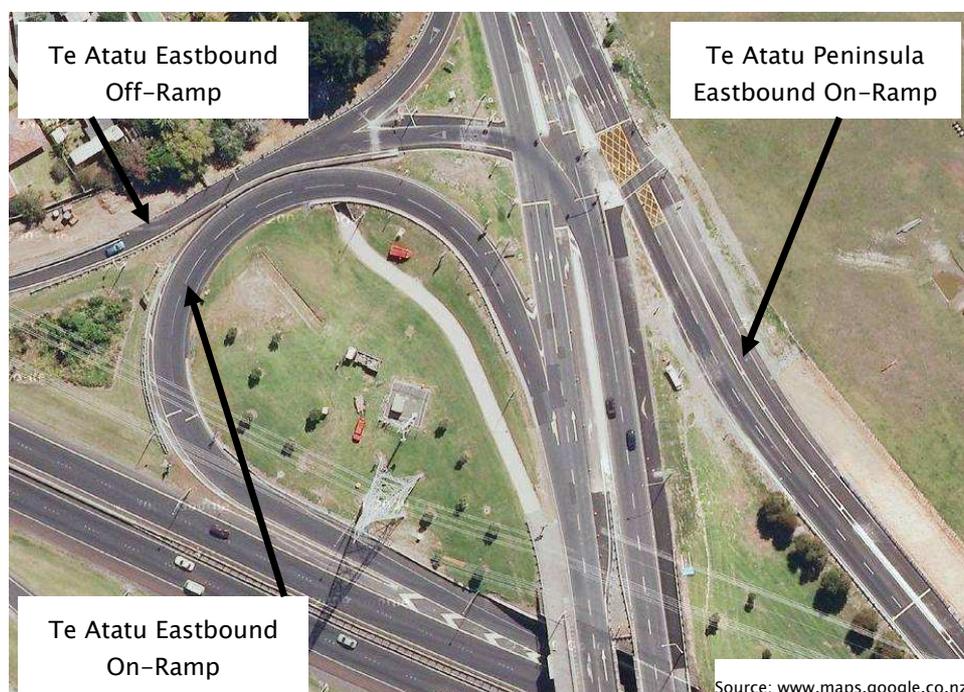


Figure 4–12: Existing Eastbound Ramps Arrangements at Te Atatu Interchange

The eastbound off-ramp diverges from the mainline to terminate at signals on Te Atatu Road. The eastbound loop on-ramp is for traffic travelling north on Te Atatu Road to travel toward Auckland City. The Peninsula on-ramp is for traffic coming from Te Atatu Peninsula to travel eastbound. There is a priority lane on the Peninsula on-ramp, which high occupancy vehicles (HOV's), including trucks, buses and motorbikes can use on should they meet the requirements for use. This can be accessed by both northbound and southbound vehicles on Te Atatu Road to travel east toward Auckland City.

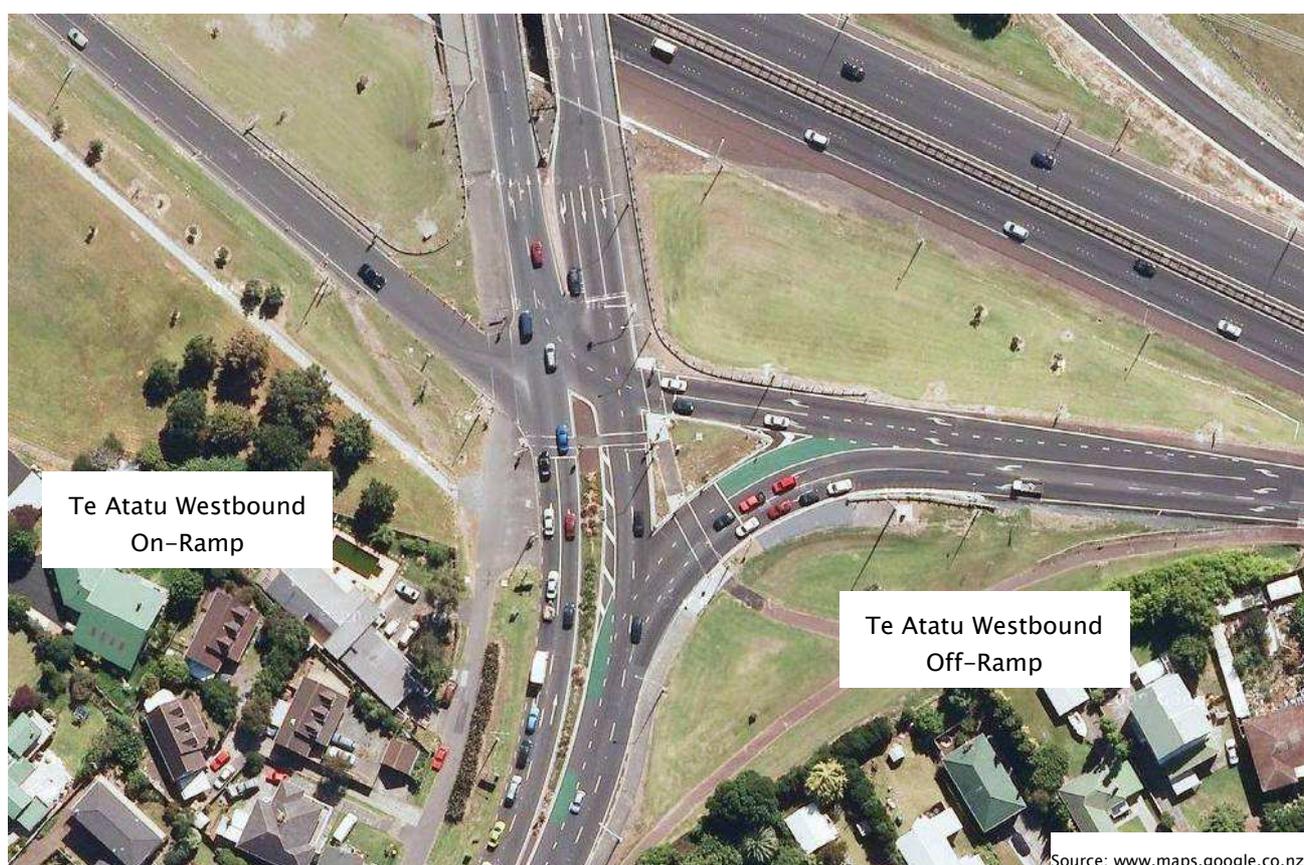


Figure 4-13: Existing Westbound Ramps Arrangements at Te Atatu Interchange

Te Atatu Interchange currently has three on-ramps and two off-ramps. The westbound on-ramp has two lanes of storage prior to the ramp signals, which then merge after the limit line and merges with the mainline. The westbound off-ramp has a lane drop and a diverge lane off from the mainline, which turns into two right turn lanes and three left turn lanes at the intersection with Te Atatu Road, one of which is a bus lane. This short section of bus lane at the signals is accessed from the right hand turn lane, which allows buses to move into a short bus lane on Te Atatu Road before merging with the main traffic on Te Atatu Road. Buses are given a priority signal within the traffic phase to allow for priority over general traffic.

Sector 2 – Whau River

Currently there are three lanes in each direction on the motorway mainline over the Whau River.

Sector 3 – Rosebank – Terrestrial / Sector 4 – Reclamation

Within these Project sectors, there are west facing ramps at Patiki Road and east facing ramps at Rosebank Road. The off-ramps at both of these interchanges are lane diverges from the mainline, with the on-ramps at both interchanges merging with the motorway mainline. The existing ramp arrangements at Patiki Road and Rosebank Road are illustrated on **Figure 4-14**.

The eastbound on-ramp at Rosebank and eastbound off-ramp at Patiki are flyovers over the mainline at their respective interchanges. Through these sectors there are three lanes in each direction between Great North Road Interchange and Rosebank Interchange ramps.

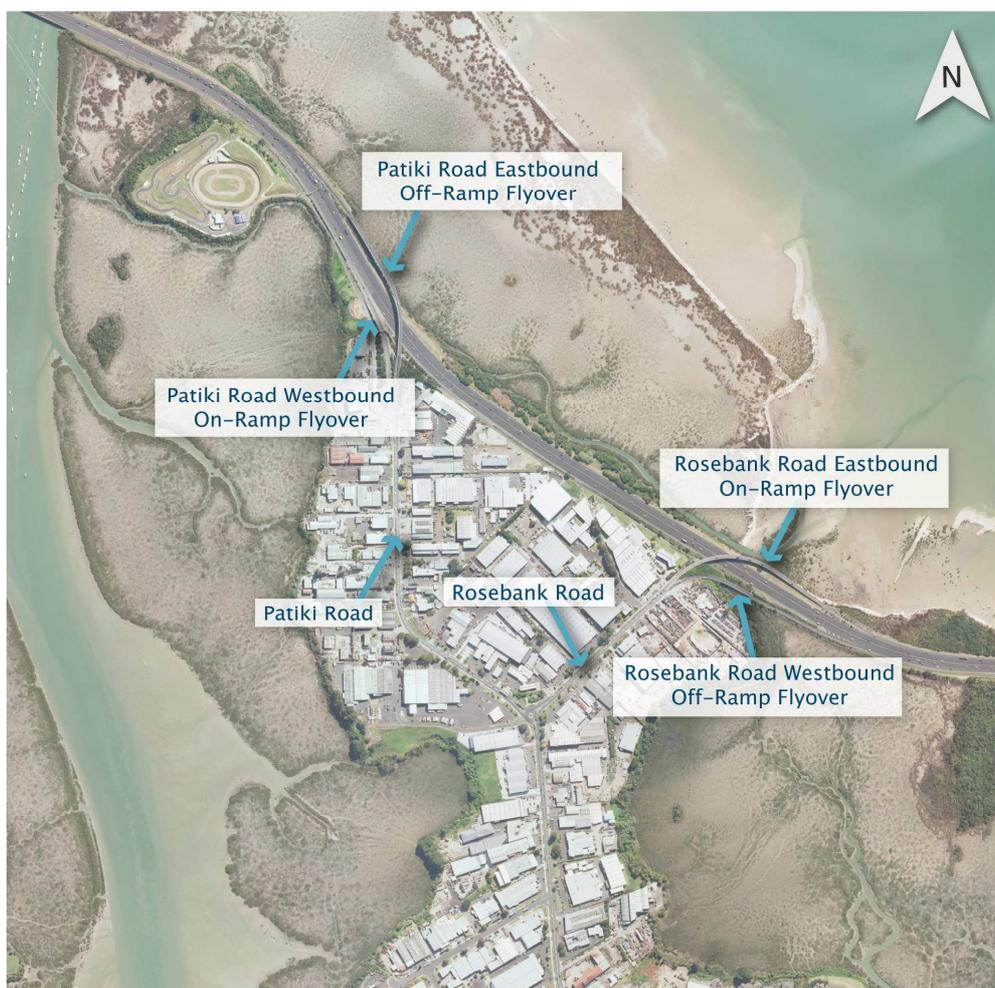


Figure 4-14: Existing Ramp Arrangements at Patiki Road and Rosebank Road

Sector 5 – Great North Road Interchange

At Great North Road Interchange there are three lanes in each direction along SH16. The existing ramp arrangements at the Great North Road Interchange are illustrated on Figure 4–15.

The westbound ramps and the eastbound off-ramp allow for both right turning and left turning movements onto the on-ramp or off the ramps at their intersections with Great North Road. The eastbound on-ramp is a loop on-ramp and only has provision for traffic travelling northbound on Great North Road to enter the ramp. Both the eastbound and westbound on-ramps have ramp signals and a priority lane to allow truck, buses, motorbike, taxis and cars with two people or more to by-pass the ramp signals.



Figure 4–15: Existing Ramp Arrangements at Great North Road Interchange

After the two off-ramps diverge from the main carriageway, separate approaches are provided to Great North Road for vehicles either travelling north or south on Great North Road. The intersection of the eastbound and westbound off ramps with Great North Road for right turn movements at Great North Road are signal controlled. The westbound off-ramp has a single slip lane into its own lane on Great North Road and the left turn of the eastbound off ramp is has a “Give Way” control with the nearside lane continuing into a dedicated lane and the offside left turn lane merging with northbound traffic on Great North Road.

Sector 6 – SH16 to St Lukes

Currently there are three lanes in each direction between the Great North Road and St Lukes Interchanges. At the termination of the westbound off ramp at St Lukes, the right turning traffic is controlled by traffic signals and the left turn traffic has a free left turn to a lane gain southbound on St Lukes Road. The westbound on-ramp has ramp signals operating, when required, and merges with the motorway mainline. The eastbound ramps are provided to the east of St Lukes Road at the Western Springs Interchange off Great North Road and are outside of the Project area.

Sector 7 – Great North Road Underpass

Great North Road is defined as a strategic route within the Auckland City District Plan. As discussed in the Plan *“strategic routes form part of the network of strategic national importance”*. However, Great North Road is not a motorway and the District Plan identifies that, as such, it is considered to have the same characteristics and form as a regional arterial road. The main function of regional arterial roads being to *“carry major traffic movements between the principal sectors of the region not catered for by strategic routes”*. On street parking is restricted along the length of Great North Road defined as a strategic route, between the SH16 / Great North Road Interchange and the Blockhouse Bay Road intersection. Along this section of Great North Road, four lanes are provided and the speed limit is 50km/hr.

The surrounding environment to the west of Great North Road and around the Blockhouse Bay Road intersection is predominantly residential properties. A BP Service Station is also location on the eastern side of Great North Road. As such, direct property access is provided along this section of Great North Road and this is facilitated by the hatched median along this section.

Between the SH16 Interchange and Blockhouse Bay Road there are a number of intersections which provide access into the adjacent Waterview residential area. **Table 4-11** indicates the roads which intersect with Great North Road between SH16 and Blockhouse Bay Road, the type of control for each intersection and the type of road as defined within the District Plan.

Table 4-11: Roads Intersecting Great North Road, and Intersection Control

Road	Intersection Control	Type of Road
Cowley Street	Priority “Give Way” Controlled	Local Road
Herdman Street	Signalised Intersection	Local Road
Oakley Avenue	Priority “Give Way” Controlled	Local Road
Alford Street	Signalised Intersection	Local Road
Alverston Street	Priority “Stop” Controlled	Local Road
Fir Street	Priority “Give Way” Controlled	Local Road
Waterview Downs	Priority “Give Way” Controlled	Local Road (Private Road)
Fairlands Avenue	Priority “Give Way” Controlled	Local Road
Blockhouse Bay Road	Signalised Intersection	District Arterial Road

South of the Blockhouse Bay intersection, Great North Road is still identified as a strategic route and four lanes are provided, but with no hatched median. Four lanes, separated by a kerbed median, are also provided to the north of the Great North Road Interchange to the Carrington Road intersection with this section being identified in the District Plan as a regional arterial road. To the east of the Carrington Road intersection, Great North Road is identified as a district arterial road in the District Plan and two lanes are provided in each direction with a hatched median.

Sector 8 – Avondale Heights Tunnel

Within this sector, the main roads of relevance are considered to be Blockhouse Bay Road, Carrington Road and New North Road.

Blockhouse Bay Road is indicated as a district arterial road within the District Plan, generally identified as having daily traffic flows in the range of 5,000 to 25,000 vehicles. This forms part of the secondary road network, with the primary function to *“cater for traffic movement between the major areas of the City”*. Blockhouse Bay Road is a wide two lane road with on-street marked parking permitted along the majority of the length. The speed limit is 50km/hr and the surrounding land is residential with direct property access.

Carrington Road is identified as a regional arterial road in the District Plan, which is identified as having the function to *“carry major traffic movements between the principal sectors of the region not catered for by strategic routes”*. Regional arterials are identified in the District Plan, as having daily traffic flows up to and in excess of 40,000 vehicles. Carrington Road is generally a two lane road with a speed limit of 50 km/hr. Between New North Road and Woodward Road there is no median provided, but a hatched median is generally provided north of Woodward Road to Great North Road.

Parking is restricted along most of the length of Carrington Road and bus stops are generally located such that they do not obstruct the movement of general traffic along the road. The land use surrounding Carrington Road is predominantly residential and direct property access is provided off Carrington Road. To the north of Woodward Road, the Unitec campus is located to the west of Carrington Road and several vehicle accesses are provided along this section.

New North Road is also defined as a regional arterial road in the District Plan. New North Road has a speed limit of 50km/hr and is a four lane road with a flush median. The majority of the land use along New North Road is residential and direct driveway access is provided for all properties with frontages on to the road. On-street parking is permitted during off-peak times, with clearway restrictions operating in the northbound direction during the AM peak and in the southbound direction in the PM peak.

Sector 9 – Alan Wood Reserve

The existing roads within this sector which are considered particularly relevant to the Project are Richardson Road, Hendon Avenue and Valonia Street. The speed limit along all of these roads is 50km/hr and parking on both sides is permitted in most locations.

Richardson Road is defined in the District Plan as a district arterial road and forms part of the secondary road network. Richardson Road is generally a two lane road surrounded by residential areas, with on-road parking permitted along the road between New North Road and Stoddard Road. Properties which have frontages onto Richardson Road generally have driveway access off Richardson Road. The carriageway is relatively wide for a two lane road and has the centre line marked, but no median. Bus stops regularly provided along Richardson Road and bus stops are generally located such that they do not obstruct the movement of general traffic along the road. There is no parking permitted within the Richardson Road / Stoddard Road intersection area in the northbound direction, however there are recessed parallel bays on the southern side for parking for the retail shops and on the Stoddard Road approach.

To the north of Alan Wood Reserve, Hendon Avenue provides access to the residential properties and several pedestrian links to the reserve are provided off Hendon Avenue. Hendon Avenue is identified as a collector road within the District Plan. The main function of these roads is to *“collect and distribute traffic to and from the arterial network, and also act as local main roads, supplementing roads within the primary network”* with typical daily traffic flows identified in the Plan as being in the range of 3,000 to 10,000 vehicles. Hendon Avenue is a two lane, two directional road lined with trees and with a 50km/hr speed limit.

Parking is generally permitted on the western side of the road, as indicated by marked parking bays. On the eastern side parking is permitted in parking bays to the north of Stewart Road and is generally restricted to the south of this point, although in some locations recessed parking bays are provided on the eastern side south of Stewart Road. There are footpaths on both sides on the road and refuge islands are provided within the parking bays at defined pedestrian crossing points. The intersections with Richardson Road and New North Road are controlled by traffic signals, with the other roads under controls as indicated in **Table 4-12**.

Table 4-12: Roads Intersecting with Hendon Avenue and Intersection Control

Road	Intersection Control	Type of Road
New North Road	Signalised Intersection	Strategic Route/Regional Arterial Road
Harlston Road	Priority “Give Way” Controlled	Local Road
Stewart Road	Priority “Give Way” Controlled	Local Road
Range View Road	Priority “Give Way” Controlled	Local Road
Olympus Street	Priority “Give Way” Controlled	Local Road
Hargest Terrace (northern end)	Priority “Stop” Controlled	Local Road
Barrymore Road	Priority “Give Way” Controlled	Local Road
Hargest Terrace (southern end)	Priority “Give Way” Controlled	Local Road
Richardson Road	Signalised Intersection	District Arterial Road

Valonia Street intersects Richardson Road south of the Richardson Road / Stoddard Road intersection. Valonia Street is defined as a local road in the District Plan and, as such, its main function is to *“provide direct access to abutting properties”*. The Auckland City District Plan indicates that daily traffic flows on local roads are generally less 1,000 vehicles, but in some circumstances up to 5,000 vehicles, depending on the roads form

and function. Access onto Richardson Road is controlled by a “Give Way” priority intersection. The existing layout of Valonia Street and the intersection with Richardson Road is illustrated on **Figure 4-16**.



Figure 4-16: Existing Layout of Valonia Street and Richardson Road

Valonia Street provides access to all adjacent properties, which are residential, and is a two lane /two-way street with on-street parking. The road also has traffic calming measures in the form of speed bumps at regular intervals, further emphasising the local road environment.

4.3.2 Future Roothing Network

There are several local and strategic roading / transport projects, which are either in the process of being completed, will be constructed or have been planned for completion within the future year periods being considered in this assessment of the potential effects, namely:

- 2016 – the anticipated opening year of the Waterview Connection project; and
- 2026 – 10 years after the anticipated Project opening year.

These assumptions relating to these projects have been detailed in the Technical Report G.25: *Traffic Modelling Report* (July 2010) and have been agreed with SKM, as part of the modelling methodology for the project assignment model. Although the project assignment model uses broadly the same network assumptions as the ART3 model, it also assumes some additional local 'small scale' projects.

Within the future year models for 2016 and 2026, the project assignment model assumes the same projects will be complete either with the 'do minimum' scenario or the 'option' scenario (Waterview Connection Project model), with the difference being the inclusion of the completed Waterview Connection Project within the option model. The assumptions used in the project assignment model regarding the projects to be completed by 2016 and 2026 are detailed in **Appendix C**.

As discussed in **Section 3.2**, the future local roading network will also be influenced by the intended development of the local transport networks by both ACC and WCCs, particularly as identified in the ACC Liveable Arterial Plan, the ACC Future Planning Framework and the WCC Transport Strategy. These documents together with the regional policy and transport planning documents will be taken into consideration when identifying the predicted future opportunities and effects associated with the Project proposals.

4.4 Traffic Flows and Travel Times

4.4.1 Existing and Future Traffic Flows

As described in **Section 3.1.1**, the traffic modelling methodology utilises two types of model in assessing the potential traffic effects of the Waterview Connection Project; the project assignment (EMME) models and the operational (S-Paramics) models. As discussed previously, the operational model obtains travel demands, in the form of origin-destination trip tables, from the project assignment model. These trip tables are then loaded as flow rates into the simulation models, along with assumed flow profiles to represent the build-up and dissipation of peak traffic flows.

Both models have been calibrated and validated to a 2006 base year, details of which are included in the Project Assignment Traffic Model Validation Report (February 2010) and Technical Report G.26: *Operational Traffic Model Validation Report* (July 2010), and discussed in more detail in the Technical Report G.25 *Traffic Modelling Report* (July 2010).

The project assignment model has been used to assess the wider network effects with the operational model being used to assess the local road within the study area for peak period effects. Details of the methodology used to determine the baseline and future year traffic flows used in the operational model are discussed further in the Technical Report G.25 *Traffic Modelling Report* (July 2010)

The following section provides a summary of the modelled traffic flows across the Project and wider areas, as obtained from the project assignment models, which are further detailed in the Technical Report G.25 *Traffic Modelling Report* (July 2010). This provides a comparison of the baseline 2006 traffic flows with the forecast

'do minimum' traffic flows (i.e. without the Project) in 2016 and 2026. This is considered in two parts, Sectors 1 to 6 of the Project along SH16 and then selected wider arterial roads associated with the Project as a whole.

The daily two directional traffic flows for 2006 and the 2016 and 2026 forecast future years are shown in **Table 4-13** and a percentage change has been shown to compare the traffic growth from 2006 to the future year, based on the 'do minimum' (DM) models.

Table 4-13: Comparison of 2006 with 2016 and 2026 Daily Traffic Flows on SH16 (Vehicles per Day)

Location	2006	2016 DM	2006-2016 DM % Change	2026 DM	2006-2026 DM % Change
Newton Road to St Lukes Road	126,900	135,100	6.5%	137,900	8.7%
St Lukes to Great North Road	116,700	113,700	-2.6%	117,000	0.3%
Great North Road to Rosebank	104,000	105,300	1.3%	115,500	11.1%
Rosebank to Patiki	88,400	89,000	0.7%	97,600	10.4%
Patiki to Te Atatu Road	105,400	106,200	0.8%	116,500	10.5%
Te Atatu Road to Lincoln Road	76,600	82,600	7.8%	91,300	19.2%
Lincoln Road to Royal Road	61,100	75,500	23.6%	86,200	41.1%
Royal Road to Westgate	42,800	54,600	27.6%	69,000	61.2%

The following can be observed from **Table 4-13**:

- The predicted increase in flows on all sections of SH16 to the east of Te Atatu Road (apart from the small decrease from St Lukes to Great North Road) is not significant between 2006 and 2016, as no SH16 capacity improvements are assumed on this section;
- To the west of Te Atatu Road, the predicted daily traffic flows increases (particularly west of Lincoln Road) are predicted to be significant (around 23 to 27%). This is due to the completion of the major projects on SH18, which are due for completion between 2006 and 2016, namely Upper Harbour Bridge Duplication and the Greenhithe and Hobsonville Duplications, as well as the SH16 Brigham Creek Extension. In addition, there is planned to be development in the area, such as the Massey North development at the end of SH16;
- In 2026, daily traffic flows on SH16 are anticipated to increase by no more than around 10 to 11% (compared to 2006) on the sections to the east of Te Atatu Road. This is because the eastern end of SH16 at, or approaching, capacity in 2006 and there is limited capacity for future increases in traffic flows, as discussed above; and
- Once again, on the western sections (particularly west of Lincoln Road) increases in daily traffic of up to around 60% are predicted by 2026, when compared with 2006. As discussed above, this is due to the

completion of the major projects on SH18, such as Upper Harbour Bridge Duplication, and Greenhithe and Hobsonville Duplications, as well as the SH16 Brigham Creek extension.

The wider network effects of the growth in traffic over 10 or 20 years between 2006 and 2016 or 2026 respectively are shown in **Table 4-14**. This allows the comparison of the impacts on arterial roads over the 10 years from the base model and provides the “do minimum” scenario upon which to assess the impact of the Project during operation once completed. **Table 4-14** shows the changes in daily flow on selected arterial routes.

Table 4-14: Comparison of 2006 with 2016 and 2026 Daily Traffic Flows on Selected Routes (Vehicles per Day)

Location	2006	2016 DM	2006-2016 DM % Change	2026 DM	2006-2026 DM % Change
Manukau Road (south of Greenlane)	31,400	30,900	-1.6%	30,900	-1.6%
Gillies Avenue	16,200	17,900	10.5%	20,100	24.1%
Mt Eden Road	22,300	22,100	-0.9%	21,700	-2.7%
New North Road	29,800	28,600	-4.0%	28,200	-5.4%
Dominion Road	16,900	21,600	27.8%	21,600	27.8%
Sandringham Road	14,700	15,600	6.1%	15,400	4.8%
Tiverton/Wolverton	17,800	27,300	53.4%	28,400	59.6%
Mt Albert Road	18,600	16,600	-10.8%	16,400	-11.8%
Carrington Road	28,100	30,800	9.6%	32,400	15.3%
Great North Road (west of New Lynn)	37,000	35,800	-3.2%	37,800	2.2%
Great North Road (north of Blockhouse Bay Road)	48,200	46,700	-3.1%	46,300	-3.9%
Rosebank Road	25,000	25,700	2.8%	27,200	8.8%
Blockhouse Bay Road	13,600	15,100	11.0%	15,200	11.8%
St Lukes Road	30,600	34,400	12.4%	34,600	13.1%
Te Atatu Road	42,800	43,300	1.2%	44,100	3.0%
Lincoln Road	44,800	44,400	-0.9%	48,800	8.9%

The following can be observed from **Table 4-14**:

- Traffic flows are set to change between 2006 and 2016. In 2009, the SH20 Mt Roskill extension between Hillsborough Road and Maoro Street was completed and opened. This resulted in a change in travel patterns in the area and has led to a reduction in flows on roads such as Mt Albert Road. It has also led to an increase in flows on certain roads such as Gillies Avenue, Dominion Road and Sandringham Road, as a result of more vehicles using these roads to access the completed SH20 Mt Roskill extension; and
- There is an increase in traffic observed on the Tiverton/Wolverton Corridor as a result of the completion of the widening project in this corridor between 2006 and 2016.

4.4.2 Existing and Future Travel Times

The project assignment model has been used to derive travel times between a number of origins and destinations. As the origin-destination savings do not directly indicate the changes in speeds on specific routes, only the average of all routes has been used. These travel times for the 'do minimum' scenarios will later be used to consider the effects of the Project in **Section 5.3**.

In terms of travel times along specified routes, the predicted travel time was calculated for the 2016 'Do Minimum' scenario for the following routes shown in **Figure 4-17** below. These travel times in the "Do Minimum" scenarios in 2016 provide a basis for comparison with the travel times which result from the completion of the Waterview Connection Project.

- SH16 (Royal Road to St Lukes);
- Rosebank Road (Rosebank Road/Patiki Road roundabout to Blockhouse Bay Road);
- Tiverton/Wolverton;
- Great North Road/New North Road (Clark Street to St Lukes Road);
- Great North Road;
- Carrington Road;
- Dominion Road;
- Te Atatu Road (Great North Road to SH16); and
- Lincoln Road (Swanson Road to SH16).



Figure 4-17: Travel Time Routes

The AM and PM peak period travel times are shown in **Table 4-15** below, together with the predicted change in travel times between the 2016 and 2026 ‘do minimum’ scenarios, from which the following can be observed:

- Between 2016 and 2026, a number of routes experience an increase in travel times as may be expected due to the growth in traffic volumes in this ten year period;
- The largest increase in travel times is seen on SH16 in the peak directions, which correspond with the increases in traffic volumes on the motorway as seen in **Table 4-13**;
- The local and arterial roads show smaller increases in travel times, this may be due to these roads already being congested in 2016, and therefore the increase in travel times as a result of an increase in traffic is not seen; and
- Two roads in the PM peak can be observed to experience a decrease in travel time between 2016 and 2026, however, this is negligible (less than 2%).

Table 4-15: 2016 DM and 2026 DM Total Travel Times along Selected Routes

Route	Direction	Length (km)	Travel Times (minutes)					
			2016 DM AM	2026 DM AM	Change	2016 DM PM	2026 DM PM	Change
SH16 (Royal Road to St Lukes)	E/B	11.5	9.4	12.1	2.7 (28%)	7.2	7.2	0.0 (0%)
	W/B	11.0	6.9	6.9	0.0 (0%)	14.2	16.5	2.3 (16%)
Rosebank Road	E/B	4.1	7.1	7.3	0.2 (3%)	9.1	9.3	0.2 (2%)
	W/B	4.1	10.1	10.3	0.3 (3%)	7.8	8.2	0.5 (6%)
Tiverton/ Wolverton	E/B	3.5	8.5	8.5	0.1 (1%)	6.2	6.2	0.0 (0%)
	W/B	3.5	6.1	6.1	0.0 (0%)	6.9	6.9	0.1 (1%)
Great North Road/ New North Road	N/B	6.1	13.7	13.9	0.2 (1%)	13.4	13.4	0.0 (0%)
	S/B	6.1	12.8	12.9	0.0 (0%)	14.0	13.8	-0.2 (-2%)
Great North Road	N/B	3.4	5.7	5.7	0.0 (0%)	5.7	5.7	0.0 (1%)
	S/B	3.4	5.9	5.9	0.0 (0%)	6.4	6.8	0.3 (5%)
Carrington Road	N/B	5.0	7.6	7.8	0.2 (3%)	7.4	7.6	0.2 (3%)
	S/B	5.0	8.3	8.3	0.0 (0%)	7.1	7.2	0.0 (0%)
Dominion Road	N/B	4.4	9.0	9.0	0.0 (0%)	8.6	8.6	0.0 (0%)
	S/B	4.4	8.0	8.0	0.0 (0%)	9.0	8.9	-0.1 (-1%)
Te Atatu Road	N/B	3.3	6.3	6.6	0.3 (4%)	6.5	6.6	0.1 (1%)
	S/B	3.3	5.5	5.5	0.0 (0%)	6.4	6.4	0.0 (1%)
Lincoln Road	N/B	2.9	7.3	7.7	0.4 (5%)	7.2	7.8	0.6 (8%)
	S/B	2.9	5.8	5.9	0.1 (1%)	6.1	6.3	0.2 (3%)

5. Operational Assessment

Based on the ARTA and NZTA guidelines (**Section 1.2**), this Transport Assessment will consider the following matters, which are relevant to assessing the operational effects of the Waterview Connection Project:

- How the Project meets general and specific transport planning and policy objectives, including the specific Project objectives;
- The opportunities provided by the Project in contributing to the development of the future transport network; and
- The effects of the operation of the Project on the existing and future transport network, together with the nature and scale of any changes to the transport network required to mitigate these effects.

The assessment of the operational effects of the Project has been undertaken primarily around the potential effects and opportunities associated with the Project in the currently anticipated year of opening in 2016, following completion of construction. Given that construction will be completed in stages and may be commissioned later than 2016, the assessment also considers the 2026 future year, ten years after the anticipated opening, in relation to the longer term effects on the road network operation. The year 2016 coincide with a future year of the strategic demand model (the 'ART3' model) providing future anticipated land use and growth, as well as the anticipated year of opening as described in **Section 3.1.1**.

This section details the assessment of the potential operational transport effects of the Project, considering the following potential effects and any necessary measures to mitigate the identified effects:

- Pedestrian and Cycle Assessment;
- Passenger Transport Assessment;
- Traffic Assessment, including:
 - Wider State highway effects;
 - Project and local area assessments;
 - Operational traffic model assessments; and
 - Property access and parking assessment.

5.1 Pedestrian and Cycle Assessment

As discussed in **Section 3.2**, the identified objectives for the Project relevant to the design and provision of walking and cycling facilities as part of the Project are:

- To improve accessibility for individuals and businesses and support regional economic growth and productivity by improving access to and between centres of future economic development; and
- To support mobility and modal choices within the wider Auckland Region by providing opportunities for improved cycling and walking.

The assessment of the effects of the Project in relation to existing and future pedestrian and cycle facilities has generally been considered in relation to these objectives, together with the regional and local policy and plans for future pedestrian and cycle infrastructure. This has been undertaken from both an overall perspective of the proposed routes and in relation to the improvements and opportunities within each Project sector. The assessment also considers the predicted traffic effects of the completed Project in relation to the potential changes in traffic flows on surrounding roads that may enable opportunities for ACC and WCC to develop their identified future pedestrian and cycling networks.

5.1.1 Regional and District-Wide Assessment

Section 3.2 and **Section 4.1** reviewed the existing and future cycling plans identified by ACC. With regard to the existing and future cycling network, the alignment of the proposed SH20 Pedestrian / cycle way in relation to these identified future routes is indicatively illustrated on **Figure 5-1**.

As can be seen from **Figure 5-1**, the proposed SH20 Pedestrian / cycle way aligns well with intended future strategic and regional routes identified by ACC by way of providing Pedestrian / cycle way from the proposed Maiero Street interchange to the Alan Wood Reserve area in the vicinity of Hendon Park. As such, the alignment of the route continues to complement the identified future routes on other north-south and east-west corridors within the ACC area.

Overall the proposed facilities along both the SH20 Pedestrian / cycle way route can be provided in accordance with the Austroads recommended design guidelines for shared pedestrian/cycle paths, as discussed in **Section 2.2**. Further detail of the assessment of the design of the route and the local connections is provided in **Section 5.1.3**.

The extent of s within the WCC area is limited to the Northwestern Pedestrian / cycle way as described below. As such this had not been included in **Figure 5-1**.

The proposed improvements to the Northwestern Pedestrian / cycle way will enhance access between the pedestrian / cycle way and the surrounding future pedestrian and cycle networks identified by ACC and WCC. With the enhanced provision of a consistent 3m wide pedestrian / cycle way between Te Atatu Road and Great North Road Interchanges, coupled with the improved separation of the route from the SH16, segregation from conflict with vehicle movements and the raising of the causeway, it is considered the Northwestern Pedestrian

/ cycle way would provide a more convenient, comfortable and more reliable experience for either commuting or recreational cyclists.

The further extension of the Northwestern Pedestrian / cycle way to the west of the Te Atatu Road Interchange will provide a more direct connection between the Interchange and the existing routes along and around Henderson Creek, as is discussed further below. This would be consistent with the future provision of 'Type 1' routes alongside SH16 (within the state highway corridor) between Te Atatu Road and Henderson Creek as identified in the Waitakere Walking and Cycling Strategy.



Figure 5-1: Indicative SH20 Pedestrian / cycle way Alignment and ACC 20-Year Plan

5.1.2 Enabling Future Opportunities

As will be discussed in **Section 5.3**, the Project is predicted to result in lower future daily traffic flows on several roads across the wider Project area (particularly within the ACC area), when compared with the predicted 2016 future daily traffic flows in the 'do minimum' scenario. This includes a mix of 'strategic route', regional arterial and district arterial roads, as identified by the Auckland City District Plan.

The roads of particular interest to the Project, where lower future daily traffic flows are predicted with the Project than in the 2016 'do minimum' scenario, are as follows:

- Mt Albert Road / Carrington Road;
- Great North Road (North of Blockhouse Bay Road); and
- Blockhouse Bay Road.

In relation to each of these roads, the opportunities provided by the reduction in traffic volumes, compared to the 2016 'do minimum' scenario, in relation to delivery of future walking and cycling facilities by ACC and WCC are discussed below. Other selected roads are also considered, where daily traffic flows reductions are identified in 2016 with the Project.

Mt Albert Road / Carrington Road

In combination, Carrington Road and Mt Albert Road provide an important east-west arterial corridor between Pt Chevalier and Royal Oak. Between Pt Chevalier and Mt Roskill the corridor is identified as being an existing route for cyclists with dedicated cycle lane facilities provided along the Mt Albert Road/Carrington Road between Sandringham Road Extension and Great North Road.

Both Carrington Road and Mt Albert Road are identified for future improvements to the pedestrian and cycling environment within the ACC Future Planning Framework, the Liveable Arterials Plan and the 20 year cycle network plan. This includes provision of both on-road and off-road cycle facilities along this corridor, which would provide for both regional and strategic links as part of the future cycle network. With the Community emphasis identified in the Liveable Arterials Plan at centres along Mt Albert Road and along the full length of Carrington Road (including connection toward Pt Chevalier), improvements to the pedestrian environment are also indicated.

In 2016, with the Waterview Connection Project complete, daily traffic flows on Mt Albert Road are expected to reduce by 14% compared with the 'do minimum' in the same year, as discussed further in **Section 5.3**. Traffic on Carrington Road is predicted to reduce by approximately 25%. On both roads the traffic is also predicted to be lower than the recorded 2006 daily traffic volumes. It is considered that these identified reductions in daily traffic flows along both Mt Albert Road and Carrington Road provide the opportunity for the identified future improvements and enhancements to the walking and/or cycling facilities along the Mt Albert Road / Carrington Road corridor, as identified in the Liveable Arterials Plan, the Future Planning Framework and the 20 year Cycle Network Plan.

Great North Road

As identified in **Table 4-1**, the ACC 20 year cycle network plan, Liveable Arterials Plan and the Future Planning Framework document identify a mix of potential future pedestrian/cycle and passenger transport improvements along the Great North Road corridor, north of the Blockhouse Bay Road intersection.

The 20 year cycle plan anticipates a regional link along this corridor with on-road facilities in the form of wide kerbside lanes. Meanwhile the Liveable Arterials Plan and the Future Planning Framework both identify various passenger transport improvements along this corridor with the future provision of bus lanes and bus priority measures, where possible. It is noted that the aspirations within the Liveable Arterials document were based on the assumption that the completion of the SH20 Waterview Connection would result in a substantial reduction in traffic along this section of Great North Road.

The predicted daily traffic flows on Great North Road (**Section 5.3**) following the completion of the Project anticipated a reduction of approximately 4,000 vehicles per day in 2016, compared with the 'do minimum' scenario, and is also anticipated to be a reduction when compared with current (2006) daily traffic flows. This equates to reductions of approximately 9% and 12% in daily traffic volumes compared with the 2016 'do minimum' and 2006 scenarios, but the predicted quantum of daily traffic is expected to remain at around 42,000 to 43,000 vehicles per day.

Whilst these anticipated reductions in traffic flows would improve the pedestrian and cycle environment along Great North Road, and potentially provide opportunities for the enhancements to pedestrian and cycle facilities as envisioned in the above Plans and documents, it is not anticipated that these would be the 'substantial' reductions identified in the Liveable Arterials Plan. More specific consideration of the ways in which the Project proposals provide these opportunities is considered in **Section 5.1.3**.

Blockhouse Bay Road

Table 4-1 identified contrasting future aspirations for Blockhouse Bay Road. Within the 20 year cycle network plan regional cycle links, as on-road kerbside lanes, was identified. However, within the Liveable Arterials Plan a Private Vehicle emphasis is identified. It is recognised that the Plan does not preclude the opportunity for pedestrian / cycle improvements by identifying this emphasis, and specifically mentions improvements to crossing provision for pedestrians. The Future Planning Framework also identifies improvements to the pedestrian and/or cycle environment on Blockhouse Bay Road.

In 2016, a reduction in daily traffic flows on Blockhouse Bay Road of 32% is expected with the completion of the Project, compared to the 2016 'do minimum' scenario, which would also represent a reduction against 2006 daily traffic flows (**Section 5.3**). It is considered that this predicted reduction in daily traffic flows on Blockhouse Bay Road would enable these future plans of ACC for pedestrian and cycle improvements, which would assist in providing for future improvements to the wider connectivity of the cycle network in the ACC area, as identified on the 20 year cycle network plan.

Other Selected Roads

In addition to the roads discussed above, there are a number of other roads where there are identified future pedestrian and cycle improvements as part of the 20 year cycle network plan, the Liveable Arterials Plan or the Future Planning Framework. These have been compared with the predicted changes in 2016 daily traffic flows on arterial roads identified in **Section 5.3**. In this regard, it is noted that with the Project, it is anticipated that reductions in daily traffic flows on the following roads (15% or more) would potentially provide opportunities for future pedestrian and improvements in line with the aspirations of the above documents:

- Sandringham Road (20 year cycle network plan / Future Planning Framework);
- St Lukes Road (20 year cycle network plan / Future Planning Framework);
- Gillies Avenue (Future Planning Framework); and
- Dominion Road (20 year cycle network plan / Liveable Arterials Plan).

5.1.3 Assessment of Sectors

Sector 1 – Te Atatu Interchange

As discussed in **Section 2.2.2**, the proposals for pedestrian and cycle facilities will provide significant improvements for pedestrian and cycle connections through the interchange along Te Atatu Road and connection to the Northwestern Pedestrian / cycle way, which will be extended to the west along the southern side of SH16. In particular, pedestrian and cycle connections will be improved on the northern side of the interchange through the proposals for new pedestrian/cycle crossings between the eastern and western sides of Te Atatu Road.

In addition, the proposals include the improvements and extension of the existing subway beneath the eastbound on ramp and off ramp. The subway is not currently well located to provide good connections for pedestrians and cyclists on north-south desire lines and it has been observed that this results some people choosing to cross the on/off ramps at-grade, where there are currently no signal controlled crossing facilities.

The realignment and extension of the subway (**Figure 2-1**) will enable pedestrians and cyclists to directly access the subway on the southern side of the Titoki Street / Te Atatu Road intersection and continue through uninterrupted under the on/off ramps to the new shared path provided along the western side of the SH16 overbridge. It is recognised that some pedestrians and cyclists may prefer not to use the subway, due to perceived safety and security associated with the lack of natural surveillance. The design of an upgraded facility can address this in part. In this regard, the provision of the enhanced subway facility is to be supported by the provision of at-grade signal controlled crossing on the eastbound on and off ramps, which align with the current informal crossing points.

The Project proposals include the provision of a new shared pedestrian and cycle path along the southern side of SH16, extending the existing Northwestern Pedestrian / cycle way corridor through to Henderson Creek and

beyond as part of separate projects. In conjunction, the existing shared path through McCormick Green will be improved. These improvements and new facilities will assist WCC in delivering key routes identified within their Walking and Cycling Strategy and improve connections for pedestrians and cyclists travelling along Te Atatu Road between Te Atatu Peninsula and Te Atatu South on future routes identified by WCC. The delivery of improved connections between Te Atatu Road Interchange and Henderson Creek will also improve opportunities for people to access recreational routes along Henderson Creek, which are anticipated to be improved by WCC, as part of the Twin Stream Project.

Sector 2 – Whau River to Sector 4 – Reclamation

The improvements to the Northwestern Pedestrian / cycle way along the southern side of SH16 between Te Atatu Road Interchange and Great North Road Interchange will enhance connectivity and the quality of the route for both commuting and recreational cyclists. The raising of the pedestrian / cycle way along certain sections, together with the increased separation from the mainline carriageway will provide a significantly improved environment for cyclists with views across the Waitemata Harbour.

Along this length of the pedestrian / cycle way, there is good inter-visibility between cyclists and vehicles using SH16, particularly during daylight hours (when most cyclists would be anticipated to utilise the Northwestern Pedestrian / cycle way) providing good passive surveillance of the pedestrian / cycle way, which offers cyclists a better perception of safety and security.

Within Sector 3 – Rosebank (Terrestrial), the pedestrian / cycle way will generally continue to be provided as a 3m wide facility. Between Rosebank Park Domain and the Patiki Road westbound onramp the pedestrian / cycle way will be improved by segregation from the existing access road to the Domain, which is also to be upgraded. This will mean that cyclists will no longer be required to share the access road with vehicles and will have use of a more dedicated and well connected facility.

These improvements will continue across Patiki Road, where a new pedestrian / cycle way bridge will be provided over the westbound on ramp from Patiki Road to SH16. In addition, cyclist connections to Patiki Road will also be enhanced through the provision of a new connection from the Northwestern Pedestrian / cycle way along the eastern side of Patiki Road. These structures and links will be provided in accordance with relevant design standards and guidance.

It has been identified that along the proposed Northwestern Pedestrian / cycle way between the Patiki Road and Rosebank Road ramps, a short section of the pedestrian / cycle way can only be provided with a width of 2m, to avoid the adjacent industrial land. The reduced width of the shared pedestrian / cycle way would still comply with the minimum width for shared paths identified in the Austroads guidelines (see **Table 2-1**), particularly given the pedestrian / cycle way is completely segregated from vehicles and pedestrian movements along the pedestrian / cycle way would be minimal. The guidelines recognise that the minimum width is acceptable in circumstances, where there are constraints over a short section.

The pedestrian / cycle way will continue as currently provided underneath the existing Rosebank Road on and off ramps, but with the improved width to generally 3m and then continue with the enhanced facilities toward Great North Road Interchange. This includes a new dedicated pedestrian / cycle way bridge over the Waterview Estuary Inlet.

Sector 5 – Great North Road Interchange

Approaching the interchange, the pedestrian / cycle way will travel along a 'boardwalk' alongside Oakley Creek prior to reaching the existing pedestrian / cycle way facilities and pedestrian / cycle way bridge over Great North Road (to the south of the interchange). Along a short section, the pedestrian / cycle way along the boardwalk will pass over the water to provide sufficient headroom under northbound motorway to motorway connection (Ramp 2).

The pedestrian / cycle way alongside Oakley Creek will also provide pedestrian connections, via a bridge, to extensions and improvements to the walkable coastal esplanade on the southern side of the Creek. This will also provide improved recreational connections for residents in the Waterview area to the CMA and in particular the historic Star Mill site and surrounding archaeological area.

On the approach to the existing pedestrian / cycle way bridge over Great North Road, the alignment of the existing pedestrian / cycle way will need to be slightly reconfigured to pass underneath the southbound motorway to motorway connection (Ramp 1). However, the existing bridge will be retained, as it is considered to provide a satisfactory connection, as part of the existing Northwestern Pedestrian / cycle way.

The existing pedestrian and cycle connections between Waterview and Pt Chevalier have been reviewed in relation to the quality and the connectivity between these areas for these modes of travel. Two options are currently provided to enable pedestrians and cyclists to travel between the Waterview area and the Great North Road / Carrington Road intersection, as illustrated on **Figure 5-2**.



Figure 5–2: Cycle and Pedestrian Routes between Waterview and Pt Chevalier

The review of the existing Route 1, parts of which also form part of the Northwestern Pedestrian / cycle way continuing to the east toward Carrington Road and onto St Lukes Interchange, is summarised as:

- Overall the route provides a relatively direct at-grade path between Waterview and Pt. Chevalier. The route is well lit by streetlights and being adjacent to the road provides a good level of passive surveillance by vehicles improving personal security for pedestrians and cyclists.
- The section of path under the SH16 overbridge is narrower than the recommended width of 2.5m in the Austroads design guidance (but greater than the minimum width of 2m) and only occurs for a short section. This is therefore considered acceptable.
- Several smaller areas of the path on Route 1 require maintenance attention by ACC, as the path has not been fully re-instated after minor works have been carried out.

The review of Route 2 is summarised as:

- This off-road facility provides a greater continuity for cyclists and pedestrians, as travel is not delayed by at-grade signalised crossings around the Great North Road Interchange.
- It generally provides a better environment for cyclists in terms of safety as they are separated from the conflicts of vehicular traffic. However, whilst the path is lit, the perception of safety may be reduced due

to the nature of the route through the Unitec Campus, where there is little activity and passive surveillance at night time.

In overall terms, it is considered that in combination these two routes already provide a good quality of walking and cycling connections between the Waterview residential area and the Pt Chevalier area, which would not need improvement, as part of this Project. The routes provide the opportunity for pedestrians and cyclists to utilise a route segregated from direct conflict and associated delays with vehicular traffic (Route 2) or a route with better passive surveillance and personal security (Route 1).

In reviewing these routes it was identified that the Herdman Street intersection provides a signalised crossing facility that can be utilised by pedestrians and cyclists from the Waterview area to safely cross Great North Road to join the existing shared pedestrian / cycle path along the eastern side of Great North Road. This signalised intersection will be the northern most access point to the Waterview suburb.

Sector 6 – SH16 to St Lukes Interchange

It is not proposed to provide any additional walking or cycling infrastructure within Sector 6.

As outlined above, from the Great North Road Interchange, the existing Northwestern Pedestrian / cycle way continues along the southern side of SH16 on the edge of the Unitec campus to Carrington Road. The existing crossing on Carrington Road could continue to be used and cyclists can then continue to use Sutherland Road and the dedicated shared path along the northern side of Chamberlain Park Golf Course to St Lukes Road and beyond. These existing facilities are already considered to be a good provision and quality of route for cyclists.

As discussed in **Section 5.1.2**, with the Project there is anticipated to be lower 2016 future daily traffic flows on several roads, when compared to the 2016 'do minimum' scenario (without the Project). This included lower daily flows on both Carrington Road (approximately 25% lower) and St Lukes Road (approximately 19% lower). It is considered that the Project may enable opportunities for ACC to deliver improvements to pedestrian and cycle facilities on these roads in conjunction with the anticipated lower daily traffic flows, given that the predicted flows were also lower than the current (2006) daily traffic flows presented in **Section 4.4**.

Sector 7 – Great North Road Underpass

As detailed in **Section 4.1**, the existing shared path along the eastern side of Great North Road through Sector 7 provides a good quality facility for both pedestrians and cyclists. The provision accords with the Austroads guidance relating to the provision of shared paths in that the recommended width is achieved along the length of path through this sector.

As will be discussed in **Section 6**, the closure of Herdman Street at Great North Road will be required during stages of the construction of the underpass at Great North Road. The permanent closure of the Herdman Street / Great North Road signalised intersection following completion of the Project has also been considered within the operational traffic assessment in **Section 5.3**. It is considered that in overall terms, it is preferable to retain the existing signalised intersection, given its current function in providing access to the Waterview area (particularly the school), together with the existing controlled pedestrian crossing at the intersection

which has been observed to be well used, particularly by school children. This is also a point where cyclist from the Waterview suburb can safely cross Great North Road and join the shared pedestrian / cycle path along the eastern side of Great North Road.

Sector 8 – Avondale Heights Tunnel

Through Sector 8, the proposed SH20 motorway consists of two deep tunnels for vehicular traffic and no provision is made for cycle or pedestrian facilities in this road reserve.

Cycling routes between the Pt Chevalier node area (Great North Road Sector 6) and the Alan Wood Reserve (Sector 9) therefore involve surface routes via New North Road/ Blockhouse Bay Road / Great North Road to the west or via New North Road/ Woodward Road/ Carrington Road to the east. These two routes follow the general north–south alignment as identified by ACC in its 20 year cycle plan. These options would be Council lead project as part of the 20 year plan, with support from NZTA.

New North Road – Blockhouse Bay Road – Great North Road

From Alan Wood Reserve this route travels westbound along New North Road to Blockhouse Bay Road, through the intersection of New North Road / Blockhouse Bay Road and along Blockhouse Bay Road north to the Great North Road / Blockhouse Bay Road intersection. At this point, it would likely follow the Great North Road shared pedestrian and cycle pathway, on the eastern side of Great North Road, to the Northwestern Pedestrian / cycle way and Point Chevalier node.

Blockhouse Bay Road is identified within the ACC Liveable Arterials document as a private vehicle route. There are no specific walking or cycling facilities along this route, however, the provision for adequate crossing opportunities is identified.

Blockhouse Bay Road and New North Road are all identified within the ACC Proposed Cycle Network (20 Year Plan) as forming part of the “Regional Links,” anticipated as on–road facilities in the form of wide kerb side lanes.

Within the Land Transport Safety Authority’s (LTSA’s) “Cycle Network and Route Planning Guide,” figure 6.1 provides guidance as to the preferred type of cycle facility which is based on the traffic speed and daily traffic volumes of the roads requiring facilities. From the project assignment traffic model used for the future assessment of the Waterview Connection Project, the volumes in 2016 with and without the Project are shown in **Table 5–1**.

Table 5–1: Daily Traffic Volumes along New North Road – Blockhouse Bay Road (Two–Way Vehicles)

Road	2006	2016 without Project	2016 with Project
New North Road	29,800	28,600	29,600
Blockhouse Bay Road	13,600	15,100	10,300

When the speed limit of the road is 50km/hr, such as New North Road and Blockhouse Bay Road, off-road cycle paths are preferred for any road that has over approximately 9,000 vehicles per day (one-way flows) or two-way flows of 18,000 vehicles. For roads with one-way daily flows between 5,000 and 9,000 vehicles, or two-way flows of 10,000 – 18,000 vehicles, cycle lanes are preferred.

Based on this information, it would be likely that off-road cycle facilities be provided on New North Road. However, on-road cycle lanes would be possible on Blockhouse Bay Road with the completion of the Waterview Connection Project, as the traffic volumes are predicted to reduce by approximately 32% compared to without the project.

Blockhouse Bay Road could have on-road cycle lanes. As there are parking bays along most of Blockhouse Bay Road, a total road width of approximately 13.8m is required for a 3m traffic lane, a recommended 1.8m on-road cycle lane and a 2.1m parking bay in each direction. The average mid-block width of Blockhouse Bay Road is approximately 12m. Therefore, a combination of the removal / narrowing of parking bays or widening of the road width would be necessary to achieve on-road cycle lanes. With widening of the road, footpaths of 1.2m to 1.5m should be maintained to cater for pedestrians. Currently footpath widths vary between approximately 2.0m to 2.5m along Blockhouse Bay Road and there is generally a grass verge between the footpath and the road carriageway, which may allow road widening to be provided and the 1.2m to 1.5m footpath widths retained. This would need to be subject to further design and consultation. Where flush medians or right turn bays develop, different treatment options would be required to provide a continuous on-road cycle lane.

New North Road currently (2006) carries approximately 29,000 daily vehicles along an important east-west corridor between Avondale/New Lynn and the Auckland CBD and is defined as a regional arterial road in the District Plan. As identified in **Section 5.3**, the 2016 future daily traffic flows (both with and without the Project) along New North Road between Blockhouse Bay Road and Carrington Road are identified as remaining broadly similar to current (2006) daily traffic flows. In this regard, it is noted that the ACC Liveable Arterials Plan identifies that this section of New North Road is anticipated to have a General Vehicle emphasis, primarily associated with maintaining the through movement of vehicles, although it is recognised that this does not preclude future walking and cycling improvements. This section of New North Road is currently provided with four traffic lanes (two lanes in each direction) with weekday peak hour 'clearways', which is consistent with the nature of roads with a General Vehicle emphasis.

On New North Road, to provide the preferred shared cycle path, a total carriageway width of at least 20m would be required. This includes a 2.5m shared pedestrian and cycle facility on each side of the road along with a lane configuration of four lanes plus a flush median (minimum width of 3m each).

With regards to Great North Road, the shared pedestrian and cycle pathway ends (approximately opposite Fir Street) at the driveway on 1510 Great North Road. From this point, only a footpath is currently provided along the eastern side of Great North Road. Along this footpath between 1510 Great North Road and the Blockhouse Bay intersection, there are a number of trees in planting boxes (see **Figure 5-3**), which restrict the width of the footpath to approximately 1.2m, as well as lighting columns and two bus stops reducing the footpath width at some points. Between Waterview Downs and Blockhouse Bay intersection, regular driveway access to

properties cross the footpath. Where there are no planting boxes, the footpath is generally 2.0 to 2.4m wide along this section.



Figure 5-3: Existing Footpath on Eastern Side of Great North Road

Between Waterview Downs and the Blockhouse Bay intersection, it is therefore considered that there is currently insufficient footpath width for a shared path due to the combination of existing tree planting boxes street furniture obstructions. However, with the removal of trees and planting boxes, a width of approximately 2.0 to 2.4m could generally be provided along this section to enable provision of a shared facility.

The provision of a 2.4m wide shared path would only be marginally less than the recommended width in the Austroads design guidelines and the general provision would still be in excess of the minimum width of 2.0m identified in the same guidelines. Whilst a new shared path would regularly cross property driveways along this section, the low volume of vehicle movements associated with each of these accesses should not have significant safety effects on cyclists. However, it is recommended that signage be installed to raise cyclists' awareness of driveway traffic along this section.

By comparison, a shared path along the equivalent section on the western side of Great North Road would only be able to achieve a similar level of shared path provision for cyclists. The footpath on the western side is generally 2.0 to 2.5m (similarly affected by localised narrowing associated with bus stops and street furniture) and there are also regular property driveways and two intersections at Fairlands Avenue and Fir Street. Moreover, provision of a facility along the western side would require cyclists to cross Great North Road at the Blockhouse Bay intersection and then return to the eastern side to access the existing shared path, reducing the continuity of the route with the existing provision along the eastern side.

The predicted future traffic volumes (see Section 5.3) indicate that the existing road carriageway and central median will need to be retained along Great North Road. As such, road carriageway narrowing to increase the width of this shared facility on the eastern side of Great North Road is not likely to be possible. The current and predicted future daily traffic volumes on Great North Road are not considered to be conducive to the provision of on-road cycle lanes, given the existing road carriageway width. Once again, the provision of on-road cycle provision, particularly for northbound cyclists, would reduce the continuity with the existing shared path.

It is therefore concluded that an extension to the existing shared path between 1510 Great North Road and the Blockhouse Bay intersection, enabled by the footpath works discussed above, is the most appropriate solution for the Cycle route.

New North Road – Woodward Road – Carrington Road

From Alan Wood Reserve this route travels eastbound along New North Road to the intersection of Woodward Road / Richardson Road. The pedestrian / cycle way would then continue along Woodward Road through the intersection of Woodward Road / Carrington Road and onto Carrington Road. Carrington Road currently has sections of on-road cycle lanes leading to the Northwestern Pedestrian / cycle way, south of the SH16 (Northwestern motorway) bridge.

New North Road and Woodward Road are identified within the ACC Proposed Cycle Network (20 Year Plan) as forming part of the “Regional Links”. On both roads, on-road facilities are anticipated in the form of wide kerb side lanes. Carrington Road is defined as part of the “Strategic Link” network and is provided as a separate off-road facility.

The Future Planning Framework indicates improved pedestrian and / or cycle environments along this section of New North Road and along Woodward Road.

As discussed previously, Land Transport Safety Authority’s (LTSA’s) “Cycle Network and Route Planning Guide,” figure 6.1 provides guidance as to the type of cycle facility which is preferred, according to the traffic speeds and volumes of the roads requiring facilities. Using the Waterview Connection project assignment models, the volumes in 2016 with and without the Project are shown in **Table 5–2**.

Table 5–2: Daily Traffic Volumes along Route 3 (Vehicles per day)

Road	2006	2016 without Project	2016 with Project
New North Road	29,800	28,600	29,600
Woodward Road	12,700	16,100	13,500
Carrington Road	28,100	30,800	23,000

Applying the previous thresholds, on-road cycle lanes could be possible on Woodward Road as the two-way daily flow (13,500 vehicles) would fall within the preferred limit (less than 18,000 two-way vehicles) for when on-road cycle lanes should be considered. On-road parking may need to be restricted, on one or both sides of the road, to allow for a marked on-road cycle lanes, along Woodward Road.

Carrington Road has predicted two-way traffic flows of 23,000 vehicles with the Project in 2016, which are higher than is preferred for cycle lanes. It is considered that cycle lanes can be accommodated on Carrington Road and would be preferred in this situation and give access for the Unitec Campus.

New North Road has predicted two-way traffic flows of approximately 28,000 – 30,000 vehicles, which is approximately 65% greater than the two-way flows preferred for on-road lanes and therefore off-road cycle paths would be preferred. As such, options to utilise the footpath and provide shared facilities would need to be considered. This route is similar to Great North Road in the context of having a number of accesses provided to properties along this 700m section of New North Road, the width of the footpath and the need to negotiate the Hendon Avenue intersection.

Clear signage in both directions would be required, as northbound and southbound cyclist would be required to cycle on different paths. This route requires cyclists to cross busy roads on a number of occasions at intersection.

Sector 9 – Alan Wood Reserve

The SH20 Pedestrian / cycle way is continued from the proposed Maioro Street interchange to the Alan Wood Reserve area in the vicinity of Hendon Park in conjunction with the proposed bridges which will improve both north-south and east-west connectivity in relation to the future walking and cycling routes defined by ACC and in relation to access between surrounding communities.

The pedestrian / cycle way will provide a new dedicated north-south connection between Richardson Road and New North Road, which is in line with the future strategic route identified in the ACC 20-year cycle plan. As with the other parts of the pedestrian / cycle way a 3m wide shared path will be provided, which is consistent with the Austroads design guidelines, as are the proposed bridges.

The proposed bridge at Hendon Park will provide both access to the reserve areas and also new connections between Mt Albert, Owairaka and New Windsor through the different connections to the surrounding existing street network Richardson Road, Valonia Street, Methuen Road, Bollard Avenue, New North Road and Hendon Avenue (where there are several access points). This supports the Project objective to improve access between centres and provide opportunities for pedestrian and cycle travel in this area. The proposed pedestrian / cycle way and the provision of the Hendon Park bridge will provide a link to Richardson Road, just south of the Hendon Avenue intersection. This will enable connections for pedestrians and cyclists between the existing Walmsley Park/Underwood Park pedestrian / cycle way, which provides further connections to Mt Roskill.

As discussed previously, the further connections to the south under Richardson Road and to the Maioro Street Interchange will continue to be provided in accordance with the relevant Austroads guidance. The connection with the future facilities at the Maioro Street Interchange will complete connections with the Southern Isthmus Pedestrian / cycle way and other local connections. Crossing facilities for cyclists at the interchange will connect with those provided as part of the Maioro Street Half Diamond project.

5.1.4 Assessment & Mitigation Summary

It is considered that the Project will complement future pedestrian and cycling connections identified at both a regional and local level, as identified in the relevant ARTA, ACC and WCC plans and strategies. In the case of a number of arterial routes across the Project area, it is considered that the Project could assist in enabling opportunities for delivery of these plans and strategies, based on the predicted changes in traffic flows on these arterial roads. In particular this includes identified future routes along Mt Albert Road / Carrington Road, Great North Road (North of Blockhouse Bay Road) and Blockhouse Bay Road, as well as a number of other arterial routes with the wider area.

The proposed SH20 Pedestrian / cycle way aligns well with intended future strategic and regional routes identified by ACC in its 20 year cycle network plan. The proposed route also complements other identified future cycling routes on north-south and east-west corridors within the ACC area, which will enhance connections between surrounding communities. In particular, connections between New Windsor, Owairaka and Mt Albert will be improved by the Hendon Park bridge as well as the associated connections with the surrounding street network within the Alan Wood and Hendon Reserves. The proposed enhancements and new facilities along the Northwestern Pedestrian / cycle way are considered to provide a more convenient, comfortable and reliable experience for either commuting or recreational cyclists and also improve connections to the identified future cycling network in Waitakere.

The proposed facilities on both the SH20 Pedestrian / cycle way and Northwestern Pedestrian / cycle way can generally be provided in accordance with the Austroads recommended design guidelines for shared pedestrian/cycle paths. Although some short sections of the proposed pedestrian / cycle ways would be less the recommended shared path width, the proposed provision would still provide facilities in accordance with the guidelines.

In relation to the proposals for both the Northwestern Pedestrian / cycle way and the SH20 Pedestrian / cycle way, a number of further enhancements to the proposals have been identified through the assessment of effects. These are summarised as follows:

- The proposed raising of the causeway will in overall terms provide improved reliability along the Northwestern Pedestrian / cycle way. To the west of the Great North Road Interchange, the pedestrian / cycle way will be realigned to travel adjacent to the westbound on-ramp.
- The extension of the pedestrian / cycle way from the southern portal of the deep tunnel would be a Council lead project, with support from NZTA, to complement the proposed 20 year cycle network plan, following investigations from ACC.

As such, it is considered that the proposals for the enhancements and extensions to the existing Northwestern Pedestrian / cycle way, coupled with the new and improved facilities provided for with the SH20 Pedestrian / cycle way, will align with the objectives of the Project:

- To improve accessibility for individuals and businesses and support regional economic growth and productivity by improving access to and between centres of future economic development; and
- To support mobility and modal choices within the wider Auckland Region by providing opportunities for improved cycling and walking.

5.2 Passenger Transport Assessment

Section 3.2 identified the objectives for the Project. The objectives of the Project considered most relevant to the assessment of the passenger transport effects and opportunities are:

- To improve accessibility for individuals and businesses and support regional economic growth and productivity by improving access to and between centres of future economic growth;
- To support mobility and modal choices by providing opportunities for improved public transport and by protecting opportunities for passenger transport development (e.g. rail); and
- To improve the connectivity and efficiency of the transport network by separating through traffic from local traffic.

The assessment of the effects of the Project in relation to existing and future passenger transport network has been considered in relation to these objectives, together with the regional and local policy and plans for future infrastructure. In this regard, the assessment of passenger transport considers both the direct and indirect effects associated with the Project proposals, including:

- Bus priority measures, including bus shoulders on SH16 and bus priority at Te Atatu Interchange, and effects on existing bus infrastructure;
- Protection of future rail opportunities, particularly the Avondale – Southdown Rail Line corridor; and
- The ways in which the Project may enable other future passenger transport opportunities.

5.2.1 Bus Priority Measures and Existing Infrastructure

Sectors 1 to 4 – SH16 West of Great North Road Interchange

As described in **Section 2.3**, the bus priority measures proposed as part of the Project in these sectors are the bus priority improvements at the Te Atatu Interchange and the bus shoulders along SH16 between Henderson

Creek and Great North Road Interchange. Further to the west, beyond Henderson Creek, the proposed bus shoulders will connect with bus shoulders to be provided as part of separate projects.

At the Te Atatu Interchange, the priority lane on the eastbound on ramp from Te Atatu Peninsula, as well as the right turn priority lane for northbound vehicles (including buses), will be retained. Additional bus priority measures are provided through the continuation of the westbound bus shoulder on SH16 along the eastbound off ramp at Te Atatu Interchange to the signalised intersection for left turn lanes at Te Atatu Road. This will improve the existing provision on this off ramp, enabling buses to bypass and queuing on the off ramp and have priority at the Te Atatu Road intersection. No bus stops on Te Atatu Road would need to be relocated following completion of the Project.

It is also noted that around 30 to 40 buses currently use the Patiki Road eastbound on ramp on weekday, with around 20 to 30 buses on Saturdays. These buses then exit the motorway at Te Atatu Road Interchange westbound off ramp. Consequently, in combination with the proposed facilities at Te Atatu Road Interchange, the proposed bus shoulder provision will provide a continuous bus priority lane from Patiki Road to Te Atatu Road for these services. As illustrated on **Figure 4-4**, there is currently no bus shoulder provision along this westbound section of SH16.

The overall change in bus shoulder provision along the length of SH16 between Henderson Creek and Great North Road Interchange is summarised in **Table 5-3**, which is derived from the previously reported existing and proposed bus shoulder provision in **Table 4-4** and **Table 2-2** respectively.

As can be seen from **Table 5-3**, the Project proposals will almost double the existing bus shoulder provision along this section of SH16. The most significant improvement in the provision of the bus shoulder provision will be for westbound buses, particularly from west of the Rosebank Road off ramp to the Te Atatu Road Interchange. For eastbound buses, a continuous bus shoulder provision will be enabled from the Te Atatu Road eastbound on ramp to just before the Patiki Road eastbound off ramp.

**Table 5-3: Summary of Proposed Change in SH16 Bus Shoulders
(Henderson Creek to Great North Road Interchange)**

Direction	Existing (metres)	Proposed (metres)	Change (metres)
Westbound	1,450	4,400	+2,950
Eastbound	3,150	4,450	+1,300
Total Eastbound and Westbound	4,600	8,850	+4,250

In general, the location of the start and end of the bus shoulder provision has been designed such that buses will either merge or diverge from the nearside mainline lanes at least 60m in advance of either an off ramp or an on ramp, which is consistent with the design of the existing bus shoulder provision on SH16 and the design

specification for bus shoulders. Moreover, as bus drivers and other vehicles are already familiar with the operation of bus shoulder on SH16, it is considered that the additional bus shoulder provision should not result in any significant operational issues.

As discussed above, at Te Atatu Road Interchange, the westbound bus shoulder continues along the eastbound off ramp to Te Atatu Road. There are some westbound 'express/flyer' bus services which continue along the SH16 mainline through the interchange toward Henderson Creek. These buses would therefore be required to exit the bus shoulder in advance of the Te Atatu Road Interchange to continue along the SH16 mainline. There are currently around 12 weekday evening peak period buses along this route, with only around 18 buses throughout the day on weekdays. With the provision of training for bus drivers and appropriate signage on the westbound approach to the Te Atatu Interchange, it is considered that these manoeuvres could be undertaken without significant effects on the operation of buses or mainline traffic.

The more continuous provision of bus shoulders along SH16 is anticipated to provide significant benefits to the operation of peak direction (weekday AM peak – eastbound, weekday PM peak – westbound) buses along SH16, particularly when combined with bus shoulder provision further to the west on SH16. This is enhanced by the priority lane provision at Te Atatu Road Interchange, which will allow buses to enter and exit the motorway more smoothly and to avoid delays associated with travel within general traffic. The provision of these measures complements the identified future development of the QTN corridor along Te Atatu Road to SH16, as well as along SH16.

The proposed bus priority provision in these sectors is therefore considered to meet the objectives for the Project with regard to improve accessibility for individuals and businesses and support regional economic growth and productivity by improving access to and between centres of future economic growth, as well as to support mobility and modal share choices by providing opportunities for improved public transport.

Sectors 5 to 9 – SH20 and SH16 East of Great North Road Interchange

As discussed in **Section 2.3**, there is limited opportunity for the provision of bus priority measures or dedicated passenger transport facilities as part of the Project within Sectors 5 and 6 due to the associated merging and diverging of ramps and mainline carriageway in these sections. There are no dedicated passenger facilities through Sectors 7 to 9 as it is currently not anticipated that there is a requirement for these facilities, specifically bus shoulders, on this section of SH20.

Consequently, within these sectors, it is anticipated that bus shoulder provision would only be possible along the eastbound section of SH16 from east of the Carrington Road overbridge to the diverge at the Western Springs off ramp. This would be anticipated to have some benefits for eastbound buses in the peak direction during the AM peak period.

Following completion of the Project, the existing bus stops on Great North Road could be reinstated along with the other transport infrastructure along this road. At Richardson Road, the existing northbound and southbound bus stops (see **Figure 4-16**) are in the same location as the proposed Richardson Road Overbridge and, as such, the location of both the stops following the completion of the Project would need to be a matter for further discussion with ARTA.

5.2.2 Protecting Future Rail Opportunities

Provision has been included within the Waterview Connection Project to allow for the future expansion of the RTN by ARTA and associated stakeholders (**Figure 4-11**), as a separate project, by maintaining a corridor for the future Avondale – Southdown Rail Line as identified by designation ‘G08-05 – Railway Purposes Avondale Southdown Line’ in the Auckland City District Plan.

The approach taken to the provision is in a manner consistent with the earlier extension of SH20 in the Mt Roskill Extension with a future rail line of 20m in width, which allows for double-tracking, electrification and maintenance access. In designing structures over the SH20 alignment (such as the Richardson Road bridge) specification has included the opportunity for this same provision in the future along the Avondale – Southdown Rail Line.

Provision has been made in the Project design to accommodate a future rail line corridor, generally assumed to be on the northeastern side of the motorway alignment between the Maoro Street Interchange and the southern portal in the Alan Wood Reserve. At the southern portal, the design allows for the rail line to cross over the tunnel and then connect to the North Auckland Rail Line, as per the design in the existing rail designation. It is noted that the alignment provided for by the Project would require a modification to the existing rail designation, as discussed in more detail in the AEE for the Project. However, from a transport perspective, it has been demonstrated that a corridor designation can still be provided for the Avondale – Southdown Rail Line, such that it could form part of the future RTN network identified in the PTNP.

Moreover, the designation provided by the Project to accommodate the future Avondale – Southdown Rail Line, enables the rail line to be part of the future strategic network for rail freight, as identified in the Regional Land Transport Strategy 2010 (see **Section 3.2.2**). It is understood that the focus of the future Avondale – Southdown Rail Line as either a passenger or freight route (or both) is still to be determined.

On the basis of the above, it is considered that the Project will allow for and not preclude the identified future expansion of the RTN and be consistent with the objective to support mobility and modal choice by protecting opportunities for passenger transport development (e.g. rail).

5.2.3 Enabling Other Future Passenger Transport Opportunities

In order to consider the effects of the Project in relation to enabling future opportunities for improvements to passenger transport provision on arterial roads, particularly bus services, consideration has been given primarily to the effects of the Project in relation to the future QTN, as identified in the Passenger Transport Network Plan (PTNP), which includes Great North Road, the Mt Albert Road / Carrington Road corridor and Te Atatu Road within the Project study area.

The existing frequency of bus services along these roads and the future frequency of buses by 2016, as anticipated by the PTNP minimum service guidelines (**Section 4.2.2**) have been compared. **Table 5-4** shows the current number of buses along each of these QTN routes over the two-hour peak periods, as identified from **Section 4.2.1**, together with the resulting approximate average frequency of buses in the peak periods.

Table 5-4: Current Buses on QTN Routes

	Current Bus Numbers (2 Hour Peak Period)		Approximate Current Frequency of Buses	
	AM Peak	PM Peak	AM Peak	PM Peak
Te Atatu Road	13	19	1 per 9mins	1 per 6 mins
Great North Road	41	50	1 per 3 mins	1 per 2 mins
Carrington Road / Mt Albert Road	22	23	1 per 5 mins	1 per 5 mins

The minimum service guidelines for the weekday peak periods, identified by the PTNP, are for a 10 minute frequency of buses along these QTN routes by 2016. As can be seen from **Table 5-4**, the existing buses operating on these routes are already providing an average frequency which meets the minimum service guidelines identified in the PTNP for QTN routes.

As such, it is considered that the frequency of peak period buses on these QTN routes is meeting the aspirations of the PTNP and would continue to do so in 2016 provided similar service levels were maintained on these roads over this period. Consequently, in reviewing the effects on these QTN routes, consideration has been given to the predicted changes in peak period travel times in 2016 with the Project, when compared with the 'do minimum' scenario. The predicted travel times on these routes, as identified in the project assignment model (**Section 5.3**) are discussed further below. It is noted that this relates to travel times based on all traffic and makes no allowance for existing or future bus priority measures.

Along Great North Road, the travel times are predicted to decrease in both northbound and southbound directions in both peak periods with the Project. The southbound travel time is predicted to decrease by 5% in the AM peak and 10% in the PM peak. This is consistent with the predicted reductions in peak period traffic along Great North Road.

The Carrington Road / Mt Albert Road corridor is expected to have decreases in travel times in both directions during both peak periods. Decreases of 8% and 16% are predicted in the AM peak period for northbound and southbound traffic respectively. During the PM peak, decreases of 7% in the northbound direction and 3% in the southbound direction are identified.

For both these routes, it is therefore anticipated that with the predicted improvements in travel times on these corridors, coupled with the anticipated traffic flow reductions, greater reliability of QTN services along these routes may be able to be achieved following the completion of the Project. This would be consistent with the Project objective to provide opportunities for improved passenger transport to support mobility and modal choices in the Auckland region.

It is noted that in 2016 with the Project, travel times on Te Atatu Road in both directions are predicted to increase with the Project in the AM peak period, whilst during the PM peak period only southbound travel times are predicted to increase. In this regard, it is again noted that this is based on all traffic, without accounting specifically for future bus priority measures along in this road. As discussed in **Section 5.2.1**, the proposed

improvements at the Te Atatu Interchange include bus priority measures for buses using the east facing ramps. The Project proposals are also complemented by the future improvements to the Te Atatu Road corridor under the Regional Arterial Road Plan (see **Section 5.3.2**), which is anticipated to involve improvements for buses and high occupancy vehicles.

In addition to the anticipated effects on the QTN routes described above, there are other roads within the wider Project area where reductions in traffic flows (**Section 5.3**) with the Project could provide potential improvements to passenger transport services. This could assist in the future development of the LCN and the connectivity of LCN routes with the above QTN routes, which is discussed in **Section 4.2.2** as an objective of the PTNP. With these roads also being identified corridors for passenger transport improvements within the Auckland Liveable Arterials Plan and Future Planning Framework. In summary, those roads where lower traffic flows are predicted with the Project in 2016 are:

- Sandringham Road and Mt Eden Road, which are identified in the Liveable Arterials Plan with Community emphasis, as well as a secondary Passenger Transport emphasis; and
- Dominion Road, which is identified with a Passenger Transport emphasis in the Liveable Arterial Plan.

5.2.4 Assessment & Mitigation Summary

The Project proposals will almost double the existing bus shoulder provision along the section of SH16 between Te Atatu Road Interchange and Great North Road Interchange. The most significant improvement in the provision of the bus shoulder provision will be for westbound buses, particularly from west of the Rosebank Road off ramp to the Te Atatu Road Interchange. The more continuous provision of bus shoulders along SH16 is anticipated to provide significant benefits to the operation of peak direction (weekday AM peak – eastbound, weekday PM peak – westbound) buses along SH16, particularly when combined with bus shoulder provision further to the west on SH16, as part of separate projects.

Provision has been included within the Waterview Connection Project to allow for the future expansion of the RTN by ONTRACK/ARTA and associated stakeholders, as a separate project, by maintaining a corridor for the future Avondale – Southdown Rail Line. The approach taken will allow for double-tracking, electrification and maintenance access.

The Project is considered to enable future opportunities for improvements to passenger transport provision, particularly bus services, on arterial roads primarily with regard to the future QTN including Great North Road and the Mt Albert Road / Carrington Road corridor. On both QTN routes, with the predicted improvements in travel times and traffic flow reductions with the Project, greater reliability of QTN services along these routes may be able to be achieved following the completion of the Project. Anticipated reductions on other arterial roads could also benefit LCN services on these roads.

Travel times on Te Atatu Road in both directions are predicted to increase with the Project, although it is noted that this is based on all traffic (not buses) without accounting specifically for future bus priority measures along this road. However, the proposed improvements at the Te Atatu Interchange include bus priority

measures for buses using the east facing ramps. The Project proposals will be complemented by future improvements to the Te Atatu Road corridor.

It is therefore considered that the Project proposals will align with the relevant objectives of the Project:

- To improve accessibility for individuals and businesses and support regional economic growth and productivity by improving access to and between centres of future economic growth;
- To support mobility and modal choices by providing opportunities for improved public transport and by protecting opportunities for passenger transport development (e.g. rail); and
- To improve the connectivity and efficiency of the transport network by separating through traffic from local traffic.

5.3 Traffic Assessment

Section 3.2 identified the objectives for the Project. It is considered that the majority of these objectives are relevant to the consideration of the traffic effects of the Project and any potential transport opportunities enabled by the completion of the Project.

The assessment of the effects of the Project in relation to the existing and future road network has been considered in relation to these objectives, together with the regional and local policy and plans for future infrastructure. In this regard, the effects and opportunities in relation to other modes of transport have been discussed above and the effects on the road network associated with the Project proposals discussed below therefore include:

- Wider State highway effects, based on the project assignment model;
- Project and local area assessments, based on the project assignment model;
- Operational traffic assessment, based on the operational model; and
- Property access and parking assessment.

The assessment of the traffic effects of the Project is based on the project assignment and operational models. A more comprehensive description of the modelling methodology, process and the outputs is provided in the Technical Report G.25: *Traffic Modelling Report* (July 2010). The operational model is used to assess localised issues in more detail, during the AM and PM peak periods, than is possible in the project assignment model.

In relation to the reporting of effects identified by the traffic modelling, it is noted that this considers both the 2016 and 2026 future years. The assessments report both the effects of completion of the Project, the Option (OPT), and without the Project, the 'do minimum' (DM), in the future years.

It is noted that for ease of reporting, the assessment of the traffic effects (particularly within **Sections 5.3.1 to 5.3.3**) is based around different geographical areas of the strategic and local road network, rather than around the Project sectors.

5.3.1 Wider State Highway Effects

A summary of the predicted changes in daily traffic between the ‘do minimum’ and Option in 2016 and 2026 on selected key state highway links around Auckland is provided in **Table 5-5**. For comparison purposes, the current (2006) daily traffic flows are also reported.

The following can be determined from **Table 5-5**:

- Between 2006 and the 2016 DM, there is a growth on the key State Highway Links. The large increase in growth between 2006 and the 2016 DM on the SH18 Upper Harbour Bridge is due to the completion of the SH18 improvement projects (Greenhithe, Hobsonville and Upper Harbour Bridge) in the intervening years;
- Between the 2016 DM and the 2026 DM, 1% growth is forecast on Auckland Harbour Bridge and SH1, with 17% growth being forecast for SH18;
- In 2026, the increase in flow on SH18 Upper Harbour Bridge is around 1,000 vehicles per day with the project in place, whereas on SH16 (Royal to Westgate) is around 6,000 vehicles per day. This suggests that the Project is not increasing trips to/from the North Shore much compared with growth on SH16;
- With the Project in place in both 2016 and 2026, a decrease (albeit small) in flows on SH1 is forecast. This is a result of vehicles choosing to use the completed SH20 and WRR rather than SH1, but is also likely to be affected by other traffic taking-up some of the spare capacity provided (as discussed below); and
- With the Project in place, there is an increase (6% to 7%) in flow expected on SH20 Manukau Harbour Crossing. This is because the combination of the widening on SH16 and the completion of SH20 with the Waterview Connection means that the WRR is complete, which provides an alternative to SH1 to get to the North and West and attracts traffic from the local road network, as will be discussed further below. The increase in flow on SH20 Mt Roskill is 71% in 2016 and 92% in 2026.

Table 5-5: Daily Flows on Key State Highway Links

Location	Scenario						
	2006	2016 DM	2016 OPT	Change	2026 DM	2026 OPT	Change
SH1 Auckland Harbour Bridge	184,100	191,600	191,800	200 (0%)	193,400	194,000	600 (0%)
SH18 Upper Harbour Bridge	26,500	57,100	58,000	900 (2%)	66,800	68,000	1,200 (2%)
SH20 Mt Roskill	-	49,400	84,300	34,900	51,400	98,800	47,400

Location	Scenario						
	2006	2016 DM	2016 OPT	Change	2026 DM	2026 OPT	Change
Extension				(71%)			(92%)
SH20 Manukau Harbour Crossing	-	126,100	133,100	7,000 (6%)	133,100	141,800	8,700 (7%)
SH1 Greenlane East to Market Road	180,500	186,600	183,400	-3,200 (-2%)	188,900	184,400	-4,500 (-2%)
SH1 CMJ (south of SH16)	159,600	194,000	182,100	-11,900 (-6%)	201,300	186,100	-15,200 (-8%)

As discussed in the Traffic Modelling Report, it is noted that the differences in flows may not necessarily be due to rerouting alone, but also due to distribution and mode shift effects as a result of changes in the ART3 model between the do-minimum and the Option runs. In this regard, it is noted that the only difference between the two scenarios is the introduction of the Project.

The predicted routing of traffic for longer distance peak direction trips, north to south in the AM peak and south to north in the PM peak, travelling between a location on SH1 (south of the SH1/SH20 Interchange) and a location on SH16 (west of Great North Road Interchange) has been reviewed in the project assignment model. With the completion of the Waterview Connection Project there is predicted to be a shift in the pattern of these longer distance peak direction trips from the SH1 corridor to the SH20 corridor. This indicates that the completion of the connection from the existing SH20 termination to SH16, as part of the Project, will provide an alternative to the existing SH1 that links the northern, western and southern parts of Auckland in line with the objectives of the Project.

As discussed above, and indicated in **Table 5-5**, this does not result in significant reductions in daily traffic on SH1, as it is predicted that some of the resulting spare capacity on SH1 with the completion of the Project would be taken up by otherwise constrained traffic flows. In particular, the project assignment model analysis indicates there is a net reduction in daily flow through the Central Motorway Junction with the Project in 2026 (all traffic passing through the central junction including traffic using SH16 links), although the reduction of traffic diverting to the Project is replaced on this part of the network with more local traffic, who take advantage of the reduced congestion.

Further analysis was undertaken to understand where traffic using the Project comes from across the wider network. The origins and destinations of vehicles using the SH20 section of the Project at a daily level were assessed in terms of sector-sector movements, as detailed further in the Traffic Modelling Report. This indicated that:

- 11% to/from the North Shore;
- 30% to/from Manukau and the south (including the airport);

- 9% to/from Auckland CBD;
- 20% to/from Waitakere; and
- 30% Auckland City including the project assignment model study area, but excluding the CBD.

While the immediate study area would receive significant benefits from reduced traffic flows on local roads, less than 9% of traffic using the Project would be associated with the immediate study area itself (the Avondale sector). In particular, this suggests that the SH20 section of the Project would be providing more of a function for through traffic, rather than local traffic, which would be anticipated to use the local road network. This would be consistent with the Project objective to improve the connectivity and efficiency of the transport network by separating through traffic from local traffic in the wider SH20 corridor.

The Traffic Modelling Report has also reviewed the changes in average travel time during the AM and PM peak periods between selected origin and destinations, when the Project is in place compared to the 'do minimum' in the 2026 future year. These origin/destination pairs were Westlake, Auckland CBD, Penrose, Manukau, Airport, Westgate, Henderson, New Lynn, Avondale College, Rosebank and Lynfield. It is noted within the Traffic Modelling Report that the reporting of these changes is for the average two-hour modelled periods and may differ from travel times in the 'height' of the peak.

The key findings identified that AM peak travel times between most origin/destination pairs decreased with the completion of the Project. The largest decreases in travel time in this period were identified from Westgate to the south, and destinations along the WRR, such as Henderson and Avondale. There were also decreases in travel time for trips from the airport and Manukau – especially to Rosebank, Westgate and Westlake. People travelling from Westlake to and from the airport were also identified as experiencing a reduction in travel time. During the PM peak period, a similar pattern of changes were observed, although it was noted that decreases in travel times were actually greater than during the AM peak period.

A number of increases in travel time were observed in both peak periods. However, this was identified as being due to increases in delay on other parts of SH16 or SH20 (outside of the Project), rather than delays on SH16 and SH20 within the Waterview Connection Project itself. Moreover, it was noted that these increases are relatively minor, especially when compared to the larger travel time savings on most other journeys. In summary, when weighted by the traffic flow volumes between the origin/destination pairs, the net result is a significant overall reduction in average travel time during both the AM and PM peak periods between these origin–destination pairs. Furthermore, when these travel times in 2026 with the Project are compared with the 2006 AM and PM models, reductions in travel times between these origins–destinations are also observed with similar patterns to the comparison above.

In relation to the above, it is considered that the objectives of the Project to improve the resilience and reliability of the State Highway network by providing an alternative to the existing SH1 corridor through Auckland that links the northern, western and southern parts of Auckland can be demonstrated by the project assignment model. Moreover, the assessment of the sector–sector travel indicates that the Project would provide for access to and between centres of future economic development across the region, which it is considered should improve accessibility between these areas for individuals and businesses to support

economic growth. The assessments also indicates that there would be benefits in separating through and local traffic to improve the efficiency and function of these parts the transport network.

5.3.2 Project and Local Area Assessment

SH20 Traffic Flows

At the opening of the Project in 2016, SH20 between Maoro Street Interchange and Great North Road Interchange is predicted to attract 70,000 vehicles per day (vpd). By 2026, 10 years after opening, this is anticipated to rise to 83,000 vpd.

Table 5-6 details the predicted daily users of the SH20 mainline and the ramps with SH16 at the Great North Road Interchange in 2016 and 2026. **Table 5-7** shows the equivalent users in the two-hour peak periods.

Table 5-6: Daily Users of SH20 Waterview Connection

Location	Direction	2016	2026
SH20 Waterview Connection mainline	N/B	36,000	41,700
	S/B	33,900	40,600
East Facing Ramps at SH16	To city	19,100	21,800
	From SH16	16,300	19,300
West Facing Ramps at SH16	To West	18,900	19,900
	From SH16	17,600	21,300

Table 5-7: Peak Period (2 hour) Users of SH20 Waterview Connection

Location	Dir	2016		2026	
		AM	PM	AM	PM
SH20 Waterview Connection mainline	N/B	4,700	5,800	5,000	6,900
	S/B	5,500	3,800	6,500	4,100
East Facing Ramps	To city	2,700	2,500	2,800	3,000
	From SH16	1,800	1,800	2,200	2,000
West Facing Ramps	To West	2,000	3,300	2,200	3,800

	From SH16	3,600	2,000	4,400	2,200
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The predicted 2026 daily and two-hour peak period traffic flows on the SH20 mainline in either direction (northbound or southbound) are around 40,000 and 6,500–7,000 vehicles. It is anticipated that this can be adequately accommodated by the proposed three lane provision in each direction, both on the at-grade and tunnel sections. In basic terms, with an assumed lane capacity of 2,100 vehicles per hour, it is anticipated that the daily and two-hour peak period capacity of a typical three lane motorway carriageway would be around 150,000 and 12,600 vehicles respectively. Whilst these capacities would be reduced under certain conditions, such as the operating conditions in the tunnel or inclined grades, the predicted 2026 traffic volumes would still be anticipated to be adequately accommodated.

With regard to the SH16/SH20 motorway to motorway ramps, the predicted 2026 daily and two-hour peak period traffic flows are around 22,000 and 4,500 respectively (AM peak direction from SH16 to SH20). With the exception of the westbound off ramp SH16 to SH20 (which is a single lane), the three other motorway to motorway ramps are proposed to be provided with two lanes. Consequently, even considering ramps grades, it is anticipated that the ramps would adequately accommodate the predicted 2026 traffic flows.

Further operational assessment of SH20, the Maioro Street Interchange and the Great North Road Interchange ramps in both 2016 and 2026 with the Project is provided within **Section 5.3.3**

Effects on SH16

The predicted effects of the Project in relation to the changes in daily traffic flows on SH16 in both the 2016 and 2026 future years, when compared with the ‘do minimum’ scenarios, are summarised in **Table 5-8** below.

As was discussed in **Section 4.4**, compared with current (2006) traffic flows, increases in daily traffic flows on all sections of SH16 (apart from between St Lukes and Great North Road) are identified between 2006 and 2016 with the Project, and again between 2016 and 2026. On the eastern section (to the east of Te Atatu Interchange) this growth was negligible, but growth on the western sections of SH16 was substantial, up to between 20% and 60% on different sections.

The following can be observed from **Table 5-8**:

- As expected, a further increase in flow can be observed when SH16 is widened in 2016 (up to 22% between St Lukes and Great North Road Interchanges). In 2016, the more notable increases (over 10%) are seen in the sections of SH16 to the east of Lincoln Road on SH16, as the sections further to the west have not assumed to be widened by this time;
- In 2026, there are larger percentage increases in traffic (compared with the ‘do minimum’ scenario) along the whole length of SH16 as the whole motorway is widened, thereby providing capacity for more traffic (up to 20% more than the 2026 ‘do minimum’ in the sections between Te Atatu and Lincoln Road Interchanges); and

- In 2026, with the completion of the other sections of the WRR to the west of Henderson Creek to the Westgate Interchange (outside the scope of this Project), further increases in the volume of traffic on SH16 are identified, which is considered to be an effect of more traffic being attracted to SH16, as a result of the completion of the WRR.

Table 5–8: Daily Traffic Flows on SH16 (2 directional)

Location	Scenario						
	2006	2016 DM	2016 OPT	Change	2026 DM	2026 OPT	Change
Newton Road to St Lukes Road	126,900	135,100	148,400	13,300 (10%)	137,900	156,000	18,100 (13%)
St Lukes to Great North Road	116,700	113,700	138,800	25,100 (22%)	117,000	147,700	30,700 (26%)
Great North Road to Rosebank	104,000	105,300	120,200	14,900 (14%)	115,500	133,000	17,500 (15%)
Rosebank to Patiki	88,400	89,000	101,500	12,500 (14%)	97,600	113,200	15,600 (16%)
Patiki to Te Atatu Toad	105,400	106,200	118,600	12,400 (12%)	116,500	132,200	15,700 (13%)
Te Atatu Road to Lincoln Road	76,600	82,600	93,500	10,900 (13%)	91,300	109,700	18,400 (20%)
Lincoln Road to Royal Road	61,100	75,500	77,400	1,900 (3%)	86,200	96,100	9,900 (11%)
Royal Road to Westgate	42,800	54,600	55,900	1,300 (2%)	69,000	75,300	6,300 (9%)

Table 5–9 and **Table 5–10** illustrate the predicted changes in directional traffic flows on SH16 with the Project, compared with the 'do minimum' scenarios in 2016 and 2026, during the AM and PM two hour peak periods respectively.

From the information provided in **Table 5–9** and **Table 5–10**, it can be seen that:

- Similarly to the daily traffic flows, there is an increase in traffic observed on SH16 in the 10 year period between 2006 and the 2016 DM, with a further increases in the ten years to the 2026 DM;
- The widening of SH16 and the addition of the SH20 connection, as part of the Waterview Connection Project, further increases the flows on the motorway;

- It is apparent that SH16 has peak period tidal flows, that is eastbound (city bound) in the AM peak and westbound in the PM peak, but this tidality reduces over time with higher growth in the non-peak direction; and
- In both the AM and PM peaks, the non-peak direction experiences a small increase in flow with the Project.

Table 5-9: AM Peak flows on SH16 (2 hour)

Location	Dir	Scenario						
		2006	2016 DM	2016 OPT	Change	2026 DM	2026 OPT	Change
Newton to St Lukes	E/B	11,600	12,000	11,900	-100 (-1%)	11,900	11,900	0 (0%)
	W/B	5,200	6,400	7,000	600 (9%)	6,700	7,600	900 (13%)
St Lukes Road to Great North Road	E/B	10,500	10,100	12,900	2,800 (28%)	10,100	13,000	2,900 (29%)
	W/B	5,300	5,300	6,500	1,200 (23%)	5,600	7,000	1,400 (25%)
Great North Road to Rosebank	E/B	10,200	10,200	12,500	2,300 (23%)	10,500	13,000	2,500 (24%)
	W/B	5,100	5,600	6,400	800 (14%)	6,200	6,900	700 (11%)
Rosebank To Patiki	E/B	9,200	9,100	11,200	2,100 (23%)	9,300	11,900	2,600 (28%)
	W/B	3,800	4,000	4,600	600 (15%)	4,500	5,100	600 (13%)
Patiki to Te Atatu	E/B	10,900	10,900	12,900	2,000 (18%)	11,100	13,800	2,700 (24%)
	W/B	4,500	4,600	5,200	600 (13%)	5,200	5,800	600 (12%)
Te Atatu Road to Lincoln Road	E/B	6,500	6,900	8,600	1,700 (25%)	6,800	9,900	3,100 (46%)
	W/B	3,600	4,000	4,800	800 (20%)	4,500	5,700	1,200 (27%)
Lincoln Road to Royal Road	E/B	6,000	6,400	6,600	200 (3%)	6,900	8,600	1,700 (25%)
	W/B	2,600	4,100	4,300	200 (5%)	4,700	5,300	600 (13%)
Royal Road to Westgate	E/B	3,400	3,700	4,100	400 (11%)	4,900	6,100	1,200 (24%)
	W/B	2,000	3,600	3,600	0 (0%)	4,200	4,600	400 (10%)

Table 5-10: PM Peak flows on SH16 (2-hour)

Location	Dir	Scenario						
		2006	2016 DM	2016 OPT	Change	2026 DM	2026 OPT	Change
Newton to St Lukes	E/B	6,400	7,400	8,300	900 (12%)	7,700	9,100	1,400 (18%)
	W/B	11,300	13,600	14,000	400 (3%)	13,400	13,900	500 (4%)
St Lukes Road to Great North Road	E/B	6,100	5,800	7,500	1,700 (29%)	6,100	8,300	2,200 (36%)
	W/B	10,800	11,100	13,100	2,000 (18%)	11,100	13,200	2,100 (19%)
Great North Road to Rosebank	E/B	6,100	6,200	6,800	600 (10%)	6,800	7,500	700 (10%)
	W/B	9,500	9,200	12,100	2,900 (32%)	9,400	12,800	3,400 (36%)
Rosebank To Patiki	E/B	4,600	4,600	5,200	600 (13%)	5,100	5,800	700 (10%)
	W/B	8,800	8,400	11,100	2,700 (32%)	8,500	11,800	3,300 (39%)
Patiki to Te Atatu	E/B	5,300	5,200	5,900	700 (13%)	5,800	6,500	700 (14%)
	W/B	10,500	10,300	13,000	2,700 (26%)	10,500	13,800	3,300 (39%)
Te Atatu Road to Lincoln Road	E/B	4,500	5,500	6,200	700 (13%)	6,100	7,000	900 (15%)
	W/B	7,600	7,400	9,300	1,900 (26%)	7,300	10,400	3,100 (42%)
Lincoln Road to Royal Road	E/B	3,600	5,200	5,200	0 (0%)	5,900	6,100	200 (3%)
	W/B	6,700	7,100	7,500	400 (6%)	7,200	9,000	1,800 (25%)
Royal Road to Westgate	E/B	2,700	4,200	4,100	-100 (-2%)	5,000	5,300	300 (6%)
	W/B	4,600	5,100	5,400	300 (6%)	5,600	6,700	1,100 (20%)

The highest predicted two-hour peak period traffic flows on SH16 in the peak direction are generally along the sections between the St Lukes and Te Atatu Road Interchanges. Along these sections, the peak direction flows are predicted to be around 13,000 to 14,000 vehicles across the two-hour peak period in 2026. With completion of the Project, at least eight lanes (four lanes in each direction) will be provided along these sections of SH16 between interchanges, which it is considered should accommodate the anticipated traffic flows along the mainline sections.

In relation to travel times on SH16 along the route, previously identified in **Figure 4-17**, **Table 5-11** illustrates the predicted travel times in 2026 with the Project (Option) compared with the 2026 'do minimum' scenario during the AM and PM peak periods.

Table 5-11: 2026 Total Travel Times along SH16

Route	Dir	Length (km)	Travel Times (minutes)					
			DM AM	OPT AM	Change	DM PM	OPT PM	Change
SH16 (Royal Road to St Lukes)	E/B	11.5	12.1	9.3	-2.8 (-23%)	7.3	7.2	-0.1 (-1%)
	W/B	11.0	6.9	6.9	0 (0%)	16.5	8.3	-8.2 (-50%)

As can be seen in **Table 5-11**, the peak direction travel times along SH16 are much improved with the Project. Eastbound in the AM peak is predicted to be 23% (3 minutes) faster, with the PM peak direction predicted as being over 8 minutes (50%) faster.

However, it is recognised that the capacity and travel times of the motorway will also be affected by other factors, including the interactions around interchanges, which is not necessarily captured by the project assignment model, and further assessment of the operation of SH16 is provided by the operational model assessments described in **Section 5.3.3**, which provides a more comprehensive review of the operation of SH16 and the predicted travel times.

Effects on Arterial Routes

The wider effects within the Project area, in terms of changes in daily and peak period traffic flows on the local arterial road network has also been provided. **Table 5-12** shows the predicted changes in daily flows on selected arterial routes within the ACC and WCC local road networks.

There is predicted to be a reduction in daily traffic flows on the majority of roads identified in **Table 5-12** with the Project in both 2016 and 2026, when compared with the 'do minimum' scenarios. Indeed, with the exception of the Tiverton/Wolverton route, on routes where a reduction in daily traffic flows is predicted with the Project, the 2026 Option scenario traffic flows are actually lower than the current (2006) flows. Overall, the average reduction in daily traffic flows across the routes included in **Table 5-12** is more than 12% in 2016 and 14% in 2026, when the Project is provided.

In the case of the Tiverton/Wolverton route, it has previously been identified that the significant traffic growth by 2016 in the 'do minimum' scenario is associated with the corridor improvements that will occur as part of a separate project.

The equivalent changes in AM and PM peak period traffic flows on the same arterial routes are shown in **Table 5-13**. These also show similar patterns to the reduction in daily traffic flows, with substantial reductions in the two-hour traffic flows on some roads, up to 20 to 30% in some cases.

Table 5-12: Predicted Daily Flows on Arterial Routes

Location	Scenarios						
	2006	2016 DM	2016 OPT	Change	2026 DM	2026 OPT	Change
Manukau Road (south of Greenlane)	31,400	30,900	28,900	-2,000 (-6%)	30,900	28,500	-2,400 (-8%)
Gillies Avenue	16,200	17,900	12,100	-5,800 (-32%)	20,100	10,700	-9,400 (-47%)
Mt Eden Road	22,300	22,100	19,900	-2,200 (-10%)	21,700	19,000	-2,700 (-12%)
New North Road	29,800	28,600	29,600	1,000 (3%)	28,200	29,200	1,000 (4%)
Dominion Road	16,900	21,600	16,900	-4,700 (-22%)	21,600	16,800	-4,800 (-22%)
Sandringham Road	14,700	15,600	13,200	-2,400 (-15%)	15,400	12,900	-2,500 (-16%)
Tiverton/Wolverton	17,800	27,300	23,700	-3,600 (-13%)	28,400	24,300	-4,100 (-14%)
Mt Albert Road	18,600	16,600	14,300	-2,300 (-14%)	16,400	13,000	-3,400 (-21%)
Carrington Road	28,100	30,800	23,000	-7,800 (-25%)	32,400	23,000	-9,400 (-29%)
Great North Road (West of New Lynn)	37,000	35,800	33,100	-2,700 (-8%)	37,800	34,700	-3,100 (-8%)
Great North Road (north of Blockhouse Bay Road)	48,200	46,700	42,700	-4,000 (-9%)	46,300	42,200	-4,100 (-9%)
Rosebank Road	25,000	25,700	25,800	100 (0%)	27,200	27,400	200 (1%)
Blockhouse Bay Road	13,600	15,100	10,300	-4,800 (-32%)	15,200	10,300	-4,900 (-32%)
St Lukes Road	30,600	34,400	27,700	-6,700 (-19%)	34,600	26,500	-8,100 (-23%)
Te Atatu Road	42,800	43,300	46,200	2,900 (7%)	44,100	48,400	4,300 (10%)
Lincoln Road	44,800	44,400	44,200	-200 (0%)	48,800	49,900	1,100 (2%)

Table 5-13: Peak Flows on Selected Arterial Routes in 2026 (Two-way, 2 hours)

Location	2026 AM			2026 PM		
	DM	OPT	Change	DM	OPT	Change
Manukau Road	4,600	4,100	-500 (-11%)	4,100	3,900	-200 (-5%)
Gillies Avenue	2,500	1,600	-900 (-36%)	2,800	1,400	-1,400 (-50%)
Mt Eden Road	3,100	2,500	-600 (-19%)	3,500	3,100	-400 (-11%)
New North Road	4,500	4,600	100 (2%)	4,100	4,000	-100 (-2%)
Dominion Road	3,000	2,200	-800 (-27%)	3,500	2,500	-1,000 (-29%)
Sandringham Road	2,400	1,800	-600 (-25%)	1,900	2,100	200 (11%)
Tiverton/Wolverton	3,800	3,300	-500 (-13%)	5,400	4,600	-800 (-15%)
Mt Albert Road	2,800	2,300	-500 (-18%)	2,300	1,700	-600 (-26%)
Carrington Road	4,400	3,400	-1,000 (-23%)	4,700	3,400	-1,300 (-28%)
Great North Road (West of New Lynn)	5,700	5,400	-300 (-5%)	6,200	5,200	-1,000 (-16%)
Great North Road (north of Blockhouse Bay Road)	6,900	6,400	-500 (-7%)	7,800	7,800	0 (0%)
Rosebank Road	3,800	3,900	100 (3%)	3,600	3,700	100 (3%)
Blockhouse Bay Road	2,000	1,400	-600 (-30%)	2,200	1,700	-500 (-23%)
St Lukes Road	4,900	3,600	-1,300 (-27%)	5,200	4,000	-1,200 (-23%)
Te Atatu Road	5,700	6,500	800 (14%)	6,800	7,500	700 (10%)
Lincoln Road	5,800	6,100	300 (5%)	7,300	7,900	600 (8%)

Table 5-12 and **Table 5-13** show increases in both daily and two-hour peak period traffic flows on other routes, particularly on Te Atatu Road, Rosebank Road and Lincoln Road, which is anticipated to be a result of vehicles accessing SH16. In the case of both Rosebank Road and Lincoln Road, the predicted changes with the Project (compared to the 2026 'do minimum') are less than 10% during the peak periods, which is no more than may be anticipated by typical daily fluctuations in peak period flows, and negligible (less than 2%) across the day.

Te Atatu Road is a four-lane arterial road, but much of the current congestion on this road is currently observed to occur around the SH16 interchange. The Project will provide significant improvements to the capacity for both through traffic on Te Atatu Road and traffic accessing SH16 at the interchange, which it is anticipated would enable the interchange to be better able to accommodate the predicted increases in daily and peak period traffic on Te Atatu Road of approximately 7-10% in the 2016 and 10-14% in the 2026.

Moreover, it is noted that WCC are investigating improvements to the Te Atatu Road corridor (under a separate project) and as discussed in **Section 3.2.2**, the Te Atatu Road corridor (Edmonton Road to the SH16 Interchange) is also identified as a prioritised corridor within the Regional Arterial Road Plan. The identified improvements for the corridor particularly involve improvements for buses and high occupancy vehicles, which will be enhanced by the priority/bus lanes provided at the interchange identified as part of this Project.

Table 5-14: 2026 Total Travel Times along Selected Routes

Route	Dir	Length (km)	Travel Times (minutes)					
			DM AM	OPT AM	Change	DM PM	OPT PM	Change
Rosebank Road	E/B	4.1	7.3	8.4	1.1 (15%)	9.3	9.0	-0.3 (-3%)
	W/B	4.1	10.3	9.6	-0.7 (-7%)	8.2	8.8	0.6 (7%)
Tiverton/Wolverton	E/B	3.5	8.5	7.4	-1.1 (-13%)	6.2	6.1	-0.1 (-2%)
	W/B	3.5	6.1	6.2	0.1 (2%)	6.9	6.1	-0.8 (-12%)
Great North Road/New North Road	N/B	6.1	13.9	13.2	-0.7 (-5%)	13.5	12.3	-1.2 (-9%)
	S/B	6.1	12.9	12.1	-0.8 (-6%)	13.8	12.3	-1.5 (-11%)
Great North Road	N/B	3.4	5.7	5.6	-0.1 (-2%)	5.7	5.5	-0.2 (-4%)
	S/B	3.4	5.9	5.6	-0.3 (-5%)	6.8	6.1	-0.7 (-10%)
Carrington Road	N/B	5.0	7.8	7.2	-0.6 (-8%)	7.6	7.1	-0.5 (-7%)
	S/B	5.0	8.3	7.0	-1.3 (-16%)	7.2	7.0	-0.2 (-3%)
Dominion Road	N/B	4.4	9.0	8.2	-0.8 (-9%)	8.6	8.3	-0.3 (-3%)
	S/B	4.4	8.0	7.8	-0.2 (-3%)	8.9	8.5	-0.4 (-4%)
Te Atatu Road	N/B	3.3	6.6	7.4	0.8 (12%)	6.6	6.5	-0.1 (-2%)
	S/B	3.3	5.5	6.1	0.6 (11%)	6.4	7.7	1.3 (20%)
Lincoln Road	N/B	2.9	7.7	8.0	0.3 (4%)	7.8	6.5	-1.3 (-17%)
	S/B	2.9	5.9	5.8	-0.1 (-2%)	6.3	7.7	1.4 (22%)

Details of the total travel times along arterial routes for the AM and PM peaks in the 2026 ‘do minimum’ and Option scenarios are provided in **Table 5-14** above. These routes were previously identified on **Figure 4-17**. **Table 5-14** shows that travel times along these arterial routes have similar patterns to the predicted daily and two-hour peak period traffic flows in terms of reductions compared with the ‘do minimum’ scenario. In particular, the following is noted:

- Travel times along the Tiverton/Wolverton corridor are up to 13% faster with the Project. This is considered to be due to traffic diverting from this corridor to the Project, when it is in place;
- Travel times along Great North Road are up to 10% faster in the southbound direction with the Project, due to predicted reductions in traffic on Great North Road and on the roads accessing Great North Road;

- Carrington Road travel times are up to 16% faster (AM peak southbound) with the Project, due to the reductions in traffic flow, which should improve opportunities for access to the Unitec campus for all modes of transport;
- Dominion Road has improved travel times by up to 9%, when the Project is in place; and
- Travel times along Te Atatu and Lincoln Road are increased in the peak direction by around 12–22% due to extra traffic accessing SH16. However, more people and freight will be moving through these corridors within this period.

As has been discussed in **Sections 5.1** and **5.2**, lower daily and peak period traffic volumes on the majority of these arterial routes compared to both the 2026 'do minimum' scenario, and 2006 in the case of the daily traffic flows, provides opportunities for the future provision of pedestrian, cycle and passenger transport facilities along these corridors.

Te Atatu Road (Edmonton Road to SH16) and Great North Road (Blockhouse Bay Road to SH16) are identified in the Regional Arterial Road Plan, as prioritised corridors for which corridor management plans are to be developed. As discussed above, the Project improvements to the Te Atatu Interchange should complement any Te Atatu Road corridor project. The identified reductions in daily and peak period traffic flows and travel times on Great North Road should also assist in the development of the corridor management plan for this route, as part of a separate project.

It is considered that the reductions in traffic flows and improved travel times on both Great North Road (Auckland TLA boundary to Pt Chevalier) and Carrington Road / Mt Albert Road corridor will complement the role, future strategic direction and short-term action of these routes, as identified in the Regional Arterial Road Plan (see **Table 3-1**). This would assist in providing for a range of transport opportunities for connections between centres along these two routes.

By providing for the transport opportunities on arterial roads, discussed above, the Project would be supporting mobility and modal choices across the Auckland region in line with the Project objectives. Moreover, the reductions in traffic flows would be anticipated to provide benefits in relation to the operation of these local road corridors, which would benefit local traffic and improve the connectivity and efficiency of the local transport network.

Heavy Commercial Vehicles

The delivery of the SH20 Waterview Connection between Maioro Street Interchange and SH16 will also complete an identified part of the strategic freight road network. An indicative connection along the SH20 alignment is identified as a Strategic Route (Primary) within the Regional Land Transport Strategy. It is considered that by providing for strategic freight movements with the completion of the SH20 Waterview Connection improves access between centres of future economic development for businesses and supports economic growth in line with the objectives of the Project.

As discussed in the Traffic Modelling Report, an indicative assessment has been undertaken to assess the potential effect of the routes taken by Heavy Commercial Vehicles (HCVs) with the completion of the Project,

compared to the 'do minimum' scenario. The assessment showed that when the Project is in place, reductions in HCVs are observed on many arterial roads in the project assignment model study area. In particular, reductions were noted on Great North Road, Blockhouse Bay Road, Carrington Road, Mt Albert Road, Sandringham Road, Dominion Road, Manukau Road and Rosebank Road, which were consistent with the daily flows for all traffic, as reported previously.

There is a small increase in daily HCV traffic flows predicted on Te Atatu Road and New North Road, although this was consistent with the increase in total daily traffic flows on these links.

It is considered that this would be primarily associated with the opportunity for HCVs to use SH20 or SH16 as strategic freight routes, with the establishment of the SH20 connection to SH16 and improved capacity on SH16 respectively. This is also demonstrated in the Traffic Modelling Report by an overall increase in the daily vehicle kilometres travelled by HCVs on motorways in both the study area and across the Auckland region, whilst daily HCV vehicle kilometres travelled reduced on arterial and local roads.

In relation to Great North Road, this is identified in the Regional Land Transport Strategy 2010 (RLTS) as a current primary arterial freight route. The combination of the overall traffic flow reductions previously identified on this road, together with the anticipated reduction in strategic HCV movements, could facilitate its intended function in the RLTS 2010 as an arterial freight route as well as providing opportunities for provision of other transport functions in line with the Liveable Arterials Plan and Future Planning Framework document.

5.3.3 Operational Traffic Model Assessment

The operational model is a simulation model developed in the S-Paramics software covering SH20 between the Maioro Street Interchange and SH16, as well as the length of SH16 between the Newton Road interchange and the Westgate Interchange. Details of the development of the operational model has already been discussed and further detail is provided in the Technical Report G.25 *Traffic Modelling Report* (July 2010) and the Technical Report G.26 *Operational Traffic Model Validation Report* (July 2010).

The operational models for the AM and PM peak periods have been used to assess localised issues in more detail than is possible in the project assignment model, specifically within the operational model study area.

Whilst the AM and PM operational models can provide more detailed assessment, it is noted that they are still only a 'simulation' of the potential operation of the road network during these peak periods. The aim of 'simulation' modelling is therefore to identify any potentially significant issues associated with the road network operation in a generic set of network operating conditions for the different assessment scenarios in order that design modification or any further mitigation can be identified. Whilst the models give consideration to the influence of factors, such as driver behaviour and other operational and design factors, there will inevitably be fluctuations in the day-to-day operation of the road network, as well as across different times of year, depending on the specific road operating conditions at that time. In this regard, manual capacity calculations have been undertaken to assess the effects of the design specification for the roads and to support the operational model assumptions, where necessary.

It is noted that the geographic extent of operational model can make it more difficult to assess and optimise and coordinate each intersection across the full scope of the model network. Consequently, whilst some optimisation of signalised intersections has generally been incorporated in the future year operational models, further improvements in network performance may be able to be achieved at certain locations with further refinement to the optimisation and coordination of adjacent intersections. In addition, the modelling of ramp signals at motorway on ramps has been replicated using a slow vehicle speed over a short section of the on ramp. Whilst this can replicate the effects of the ramp signals it does not adjust to traffic demand on the on ramp and therefore cannot fully replicate the complex operation of the ramp signal systems. These points have been discussed in relation to a number of locations, as identified in the following paragraphs.

A summary of the findings of the operational traffic modelling for the peak periods is provided below (Figure 5-4), including details of predicted average travel times on identified routes (two-hour period), as well as a description of the observations of the road network operation within the models, which cover the full four-hour peak period of the models.

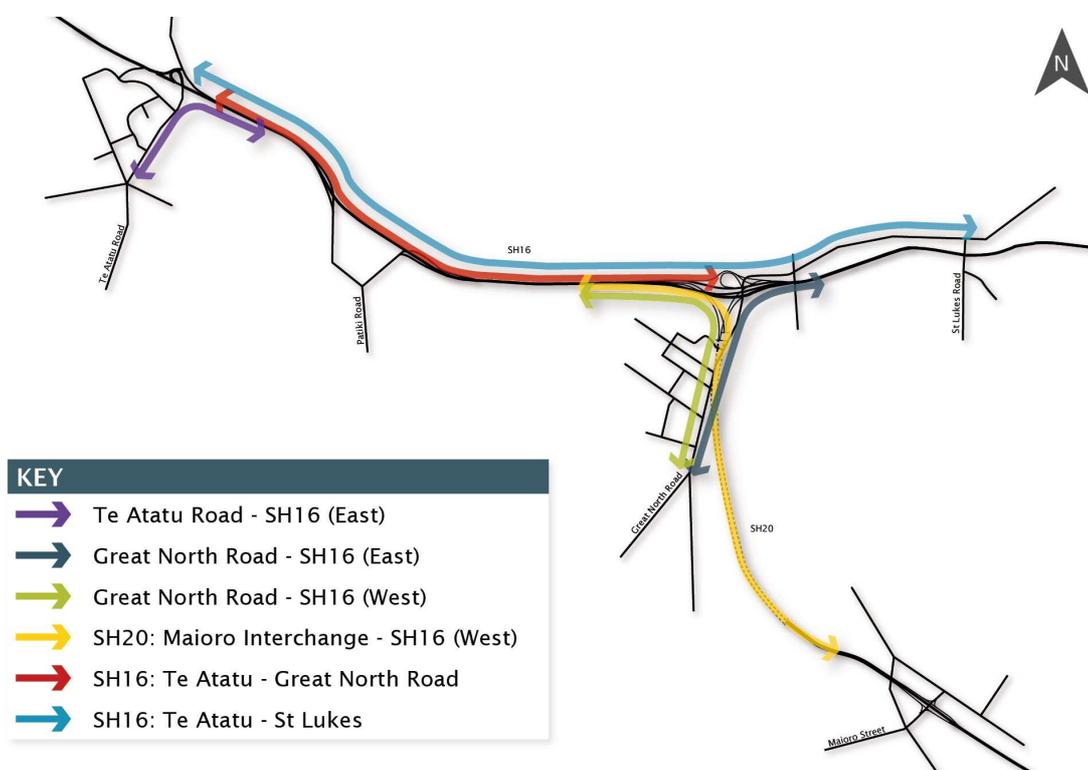


Figure 5-4: Operational Model Travel Time Routes

The travel times discussed in this section are from an average of five simulation 'runs' of the model. As it may be considered that this is not enough runs to produce statistically correct or 'stable' results, further analysis of this data has been undertaken with the Technical Report G.25 *Traffic Modelling Report* (July 2010). That analysis demonstrates how the average, minimum and maximum travel times vary between the model runs and confirms that the travel times presented in this section, together with the reporting of the model observations, is robust enough for the reporting that has been undertaken.

The assessments consider both the 2016 and 2026 future year operating conditions with the Project (the 'Option' scenarios), as well as the baseline 2006 conditions. Comparison of the wider operation of the network without the Project (the 'do minimum' scenarios) in the future years has been provided earlier in **Section 5.3**.

In relation to the average travel times, the routes extracted from the operational model, shown on **Figure 5-4** include routes along SH16 and SH20, as well as locations, where connections are provided between State highways, or between the State highway and arterial road network.

AM Peak Period Models

Table 5-15 provides a summary of the predicted average travel times (minutes), comparing the 2006 operational model outputs with the predicted 2016 OPT and 2026 OPT future year operation for the AM peak period.

Table 5-15: Summary of Average Travel Times – AM Peak Period

Route	Direction	2006	2016 OPT – With Project		2026 OPT – With Project	
		Average Travel Time (mins)	Average Travel Time (mins)	Change 2006 to 2016 OPT (mins)	Average Travel Time (mins)	Change 2016 OPT to 2026 OPT (mins)
Te Atatu Rd – SH16 (East)	N/B	6.7	7.0	0.3	6.8	-0.2
	S/B	2.5	3.5	1.0	4.5	1.0
Great North Rd – SH16 (East)	N/B	11.9	7.1	-4.8	8.5	1.4
	S/B	2.9	2.9	0.0	2.8	-0.1
Great North Rd – SH16 (West)	N/B	7.1	4.4	-2.7	5.2	0.8
	S/B	5.3	4.6	-0.7	4.4	-0.2
SH20: Maioro Interchange – SH16 (West)	N/B	n/a	4.8	n/a	5.2	0.4
	S/B	n/a	4.4	n/a	4.8	0.4
SH16: Te Atatu – Great North Road	E/B	6.8	4.0	-2.8	4.8	0.8
	W/B	3.5	3.7	0.2	3.7	0.0
SH16: Te Atatu – St Lukes	E/B	11.8	6.1	-5.7	7.1	1.0
	W/B	5.3	5.6	0.3	5.6	0.0

The main points from **Table 5-15** are identified as:

- Northbound traffic on Te Atatu Road to SH16 eastbound is on average identified as experiencing a broadly similar travel time to the 2006 baseline in both the 2016 and 2026 OPT scenarios. However, vehicles travelling in the opposite (southbound) direction from SH16 to Te Atatu Road are anticipated to experience increased delays. This is considered to be primarily due to increased delay on Te Atatu Road, where traffic flows are predicted to increase, due to the extra capacity provided on SH16, as identified in **Table 5-12** and **Table 5-13**.
- On Great North Road, northbound traffic heading to either SH16 (East) or SH16 (West) is on average anticipated to experience improvement in travel time with the Project in both 2016 OPT and 2026 OPT scenarios, compared with the 2006 baseline. This is anticipated to be related to the predicted reductions in traffic flow on Great North Road and extra capacity provided on SH16, discussed in **Section 5.3.2**. In the equivalent southbound direction, there are only marginal changes in the travel times anticipated.

- Along SH20 between Maioro Street Interchange and SH16 (West), only marginal changes in the northbound and southbound travel times occur between the 2016 OPT and 2026 OPT scenarios. The average travel time along this route of approximately 5 minutes, equates to an average vehicle speed of approximately 70kph on this route.
- On SH16, there is anticipated to be noticeable improvements in the eastbound peak direction travel time in the 2016 OPT scenario, when compared with the 2006 baseline. Between the 2016 OPT and 2026 OPT scenarios, there is anticipated to be an increase in the eastbound travel times on SH16, although travel times are still anticipated to be improved when compared with the 2006 baseline. In this regard, eastbound travel times equate to average vehicle speeds of around 40kph, 70kph and 65 kph in the 2006, 2016 OPT and 2026 OPT scenarios respectively. It is noted that this should be considered in the context of the increases of approximately 25% (2,000–2,500 vehicles in the two hour peak, see **Table 5-9**) in eastbound traffic on SH16 between St Lukes and Te Atatu Interchanges. In the westbound direction, travel times are predicted to remain broadly similar in each scenario with average vehicle speeds equating to approximately 80–90kph.

The key observations in relation to the operational model during the AM peak period in the 2016 OPT and the 2026 OPT scenarios are provided below. Each set of observations is referenced to **Figure 5-5** and **Figure 5-6** in relation to the 2016 OPT and 2026 OPT observations respectively. The observations from the 2016 OPT scenario, in the AM peak period model, are as follows:

1. On the northbound approach from Te Atatu South, the observed queuing extends to the south of the Edmonton Road roundabout over a period between approximately 0700 and 0900. It is considered that this queuing occurs, in part, as a result of the observed vehicle weaving in the model related to the lane changing approaching the intersection. In comparison to the model observations, it is considered that in reality drivers are actually likely to make more informed decisions at an earlier stage and as a consequence there would be improved lane utilisation. Given the increases in traffic flow predicted on this section of Te Atatu Road, combined with these observations and no capacity improvements along the corridor south of the interchange, it is considered that a broadly similar build up and dissipation of queuing across the peak period along Te Atatu Road to the 2006 baseline would be observed.

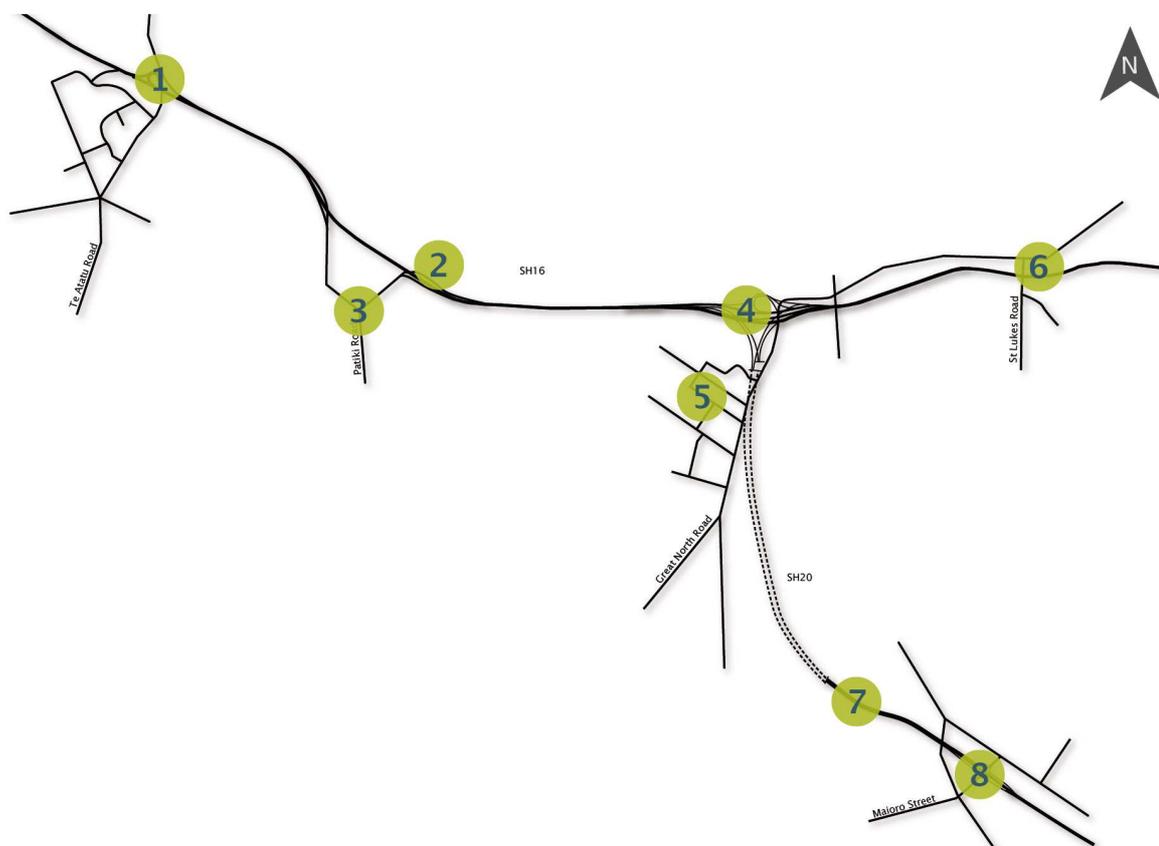


Figure 5-5: 2016 OPT AM Peak Period Observations

On the southbound approach from Te Atatu Peninsula, queuing is observed to extend back along Te Atatu Road beyond the Gloria Avenue roundabout for a period from around 0800 through to the end of the peak period. This is considered to be related to the operation of the signals at the eastbound on ramp for southbound traffic and the priority lane for northbound traffic, as well as the coordination with the ramp signals on this eastbound on ramp. Due to the method of modelling the ramp signals in the operational model, it is not possible to optimise the operation of the ramp signal on the eastbound on ramp to the vehicle demand or coordinate its operation with the adjacent signals associated with the northbound priority lane. Whilst refinements to the optimisation and coordination of these signals could reduce the observed queuing, management plans for accommodating this possibility should be developed.

2. Eastbound on SH16, the model observations indicate weaving of vehicles and a slight reduction in vehicle speeds, which initially occur over a short section just east of the Rosebank eastbound on ramp around 0800 due to lane changing /selection approaching the Great North Road Interchange. However, this is observed to dissipate by around 0900 and traffic is observed to operate satisfactorily through to the end of the peak period.

3. In general, the on ramps and off ramps at Patiki and Rosebank are observed to operate well during the AM peak period. However, it is noted that the model observations indicate queues occurring back from the Patiki Road / Rosebank Road roundabout onto the Rosebank Road westbound off ramp, as well as onto the SH16 westbound mainline for a period of around 90 minutes from 0800. Separate assessments using the SIDRA detailed intersection analysis package are described in the Traffic Modelling Report (May 2010), which indicate that the queuing on the Rosebank Road approach would not extend to the Rosebank westbound off ramp. As such, the extent of queuing observed in the operational model is not anticipated to occur.
4. At the Great North Road Interchange, both the eastbound on ramps to SH16 from SH20 and Great North Road are generally observed to operate satisfactorily. The eastbound on ramp from Great North Road is observed to extend back around the on ramp for a short period before 0900. It is considered that refinement of the operation of the ramp signals could reduce the observed queuing at this on ramp.
5. Observations of the queuing and vehicles speeds on Great North Road indicate that the overall operation for northbound vehicles would be improved compared with observed operations in 2006, with a reduction in the duration of queuing and improvements in vehicle speeds and travel times.
6. To the east of the St Lukes / Western Springs Interchange weaving is predicted to occur as eastbound vehicles lane change approaching Newton Road and the SH1 Interchange, which causes slow moving queue of traffic back along SH16 to the west of the St Lukes Interchange. This is observed to occur over a period of around 90 minutes across the peak period. However, toward the end of the peak period, this weaving and slow moving traffic has dissipated, similarly to the 2006 scenario.

It is also noted that the model observations indicate queuing on the Western Springs eastbound off ramp extending back onto the eastbound mainline on SH16 for a period of around 30 minutes at the height of the AM peak period, due to the demand for the right turn onto Great North Road at the end of the ramp. On St Lukes Road approaching the Great North Road intersection, queuing is predicted to build from around 0800 through to 0930, but dissipates by the end of the peak period. Whilst further optimisation and coordination of the traffic signals on St Lukes Road and Great North Road may reduce the observed queues back to the SH16 eastbound mainline and on St Lukes Road, management plans for accommodating this possibility should be reviewed/developed and implemented before the Project is commissioned.

7. SH20 is observed to operate satisfactorily throughout the AM peak period around the Great North Road Interchange and through the tunnel, as indicated by the travel times along the route presented above. On the southbound approach to Maioro Street Interchange, reduced vehicle speeds are observed for HCVs and other larger vehicles exiting the tunnel as the gradient increases. These vehicles are generally observed to move to the nearside lane and as a result the observations do not indicate that queuing occurs back through the tunnel.
8. At the Maioro Street Interchange, the ramps are observed to operate satisfactorily throughout the peak periods and the SH20 mainline operates satisfactorily through the interchange. It is observed that there high traffic flows from Maioro Street (West) and Richardson Road (South) proceeding across the interchange bridge to turn south onto the southbound on ramp. Whilst refinement to the optimisation and

coordination of the Maoro Street / Richardson Road signals may reduce the observed queuing and the adverse effects on the operation of the interchange, management plans for accommodating this possibility should be reviewed/developed and implemented before the Project is commissioned.

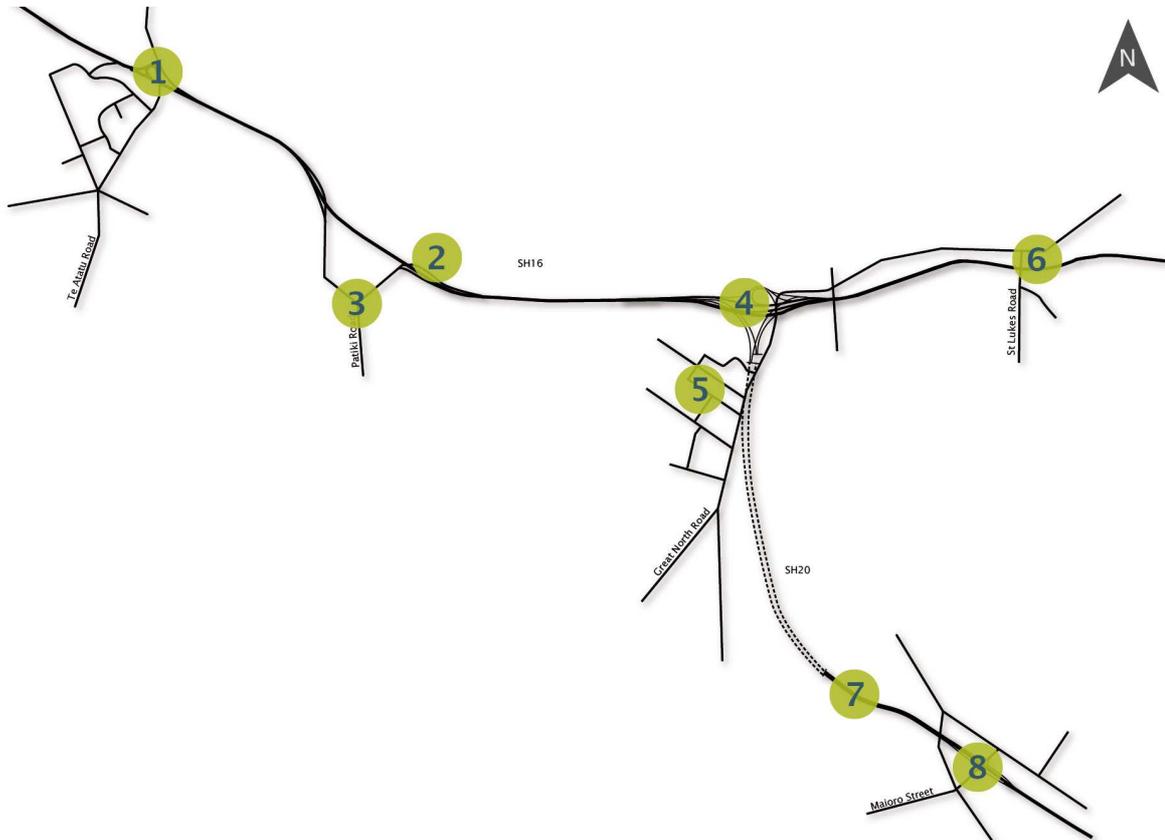


Figure 5-6: 2026 OPT AM Peak Period Observations

The observations from the 2026 OPT scenario, in the AM peak period model, are as follows:

1. The observations on Te Atatu Road approaching the interchange are similar to those in the 2016 OPT scenario, although due to variations in traffic flow demands and the optimisation/coordination of the signals different patterns are observed.

On the southbound approach from Te Atatu Peninsula, queuing is observed to extend back along Te Atatu Road beyond the Gloria Avenue roundabout for a period of between 45 and 60 minutes during the height of the AM peak period. The reasons for this are considered to be similar to those discussed previously and relate to the operation of the signals at the eastbound priority lane on ramp as well as the coordination with the ramp signals on this on ramp.

On the northbound approach from Te Atatu South, the observed queuing extends to the south of the Edmonton Road roundabout over a period between approximately 0700 and 0930. It is again considered that this queuing occurs, in part, as a result of the observed lane changing approaching the intersection. Nevertheless, the observed queuing in 2026 is broadly similar to the observed build up and dissipation of queues along Te Atatu Road in 2006, even accounting for the predicted increases in traffic flows, due to improved operation provided by the Interchange improvements.

2. Similarly to the 2016 OPT scenario, eastbound vehicles on SH16 are observed to weave and there is a reduction in vehicle speeds, which initially occur over a short section just east of the Rosebank eastbound on ramp around 0800. This is observed to be related to vehicles changing lanes in advance of the off ramps at the Great North Road Interchange, but occurs well in advance of these off ramps. Between 0800 and 0900, this weaving continues to occur over a similar length but moves further west to around the Rosebank eastbound on ramp. In reality, it is anticipated that this weaving of eastbound vehicles would occur over a longer section between the Rosebank on ramp and Great North Road off ramp.
3. In general, as in the 2016 OPT scenario, the on ramps and off ramps at Patiki and Rosebank are observed to operate well during the AM peak period. However, the model observations indicate queues occurring back from the Patiki Road / Rosebank Road roundabout onto the Rosebank Road westbound off ramp, as well as onto the SH16 westbound mainline for a period of around 30–45 minutes. As discussed in the Traffic Modelling Report (May 2010), detailed SIDRA analyses indicate that the extent of queuing observed in the operational model is not anticipated to occur.
4. At Great North Road Interchange, the queue on the eastbound on ramp from Great North Road is observed to extend back around the on ramp for a period of around 30 minutes at the height of peak period. At the SH20 eastbound on ramp, queues are observed to extend back to around the crest of the ramp at times during the height of the peak period.
5. Observations of the queuing and vehicles speeds on Great North Road indicate that the overall operation for northbound vehicles would be similar to the observed operations in 2006, with some reduction in the duration of queuing and improvements in vehicle speeds and travel times.
6. As in the 2016 OPT scenario, to the east of the St Lukes / Western Springs Interchange, weaving is predicted to occur as eastbound vehicles change lanes approaching Newton Road and the SH1 Interchange. In the 2026 OPT scenario this is observed to result in a slow moving queue of traffic back along SH16 to the west of the St Lukes Interchange, which occurs over a period of around 90 minutes across the peak period. However, toward the end of the peak period, this weaving and slow moving traffic has dissipated. This demonstrates a similar build up and dissipation of observed queuing on eastbound traffic on SH16 to the observations of the 2006 baseline scenario.

It is also noted that the model observations indicate queuing on the Western Springs eastbound off ramp extending back onto the eastbound mainline on SH16 for a period of around 60 minutes at the height of the AM peak period, due to the demand for the right turn onto Great North Road at the end of the ramp. On the westbound off ramp at St Lukes Interchange, queuing is predicted back to the mainline for a short period in the AM peak, due to the demand for right turns from the off ramp onto St Lukes Road. In both cases, whilst further optimisation and coordination of the traffic signals on St Lukes Road and Great North

Road at and between these off ramps may reduce the observed queues back to the SH16 mainline, management plans for accommodating this possibility should be reviewed/developed and implemented before the Project is commissioned.

7. SH20 is observed to operate satisfactorily throughout the AM peak period around the Great North Road Interchange and through the tunnel, as indicated by the travel times along the route presented above. As in the 2016 OPT scenario, on the southbound approach to Maioro Street Interchange reduced vehicle speeds are observed for HCVs and other larger vehicles exiting the tunnel as the gradient increases, but observations do not indicate that queuing occurs back through the tunnel.
8. Similar observations to the 2016 OPT scenario occur at the Maioro Street Interchange, but the extent of the queuing on Maioro Street and Richardson Road is observed to increase. The ramps are generally observed to operate satisfactorily throughout the peak periods and the SH20 mainline operates satisfactorily through the interchange. It is observed that high traffic volumes from Maioro Street (West) and Richardson Road (South) proceeding across the interchange bridge to turn south onto the southbound on ramp. It is considered that the method used for the ramp signal operation in the model does not allow the ramp signal to be optimised to the variations in traffic demand during the peak period. As such, queuing back across the overbridge is observed to affect the northbound off ramp operation, resulting in queuing on the northbound off ramp back to the SH20 northbound mainline for around 30 minutes. Whilst refinement to the optimisation and coordination of the Maioro Street / Richardson Road signals, the interchange signals and at the southbound on ramp, the observed queuing may be reduced, management plans for accommodating this possibility should be reviewed/developed and implemented before the Project is commissioned.

PM Peak Period Models

Table 5-16 provides a summary of the predicted average travel times (minutes), comparing the 2006 operational model outputs with the predicted 2016 OPT and 2026 OPT future year operation for the PM peak period.

Table 5-16: Summary of Average Travel Times – PM Peak Period

Route	Direction	2006	2016 OPT – With Project		2026 OPT – With Project	
		Average Travel Time (mins)	Average Travel Time (mins)	Change 2006 to 2016 OPT (mins)	Average Travel Time (mins)	Change 2016 OPT to 2026 OPT (mins)
Te Atatu Rd – SH16 (East)	N/B	3.5	10.3	6.8	9.4	-0.9
	S/B	3.3	4.6	1.3	4.5	-0.1
Great North Rd – SH16 (East)	N/B	4.9	4.4	-0.5	4.4	0.0
	S/B	3.4	4.2	0.8	4.1	-0.1
Great North Rd – SH16 (West)	N/B	4.1	3.6	-0.5	4.5	0.9
	S/B	5.0	4.2	-0.8	4.2	0.0
SH20: Maioro Interchange – SH16 (West)	N/B	n/a	4.1	n/a	5.6	1.5
	S/B	n/a	4.2	n/a	4.3	0.1
SH16: Te Atatu – Great North Road	E/B	3.5	3.4	-0.1	3.4	0.0
	W/B	7.7	6.2	-1.5	8.0	1.8
SH16: Te Atatu – St Lukes	E/B	5.3	5.1	-0.2	5.1	0.0
	W/B	10.2	9.1	-1.1	10.9	1.8

The main points from **Table 5-16** are identified as:

- Northbound traffic on Te Atatu Road to SH16 eastbound is on average identified as experiencing an increase in travel time between the 2006 baseline and both the 2016 OPT and 2026 OPT scenarios. Increases in travel time for southbound vehicles on Te Atatu Road are also predicted with the Project in both the 2106 OPT and 2026 OPT scenarios. This is considered to be due to the observed poor operation of this road corridor, in combination with the predicted increases in traffic flows associated with the Project identified in **Table 5-12** and **Table 5-13**. It is also expected that significant growth in the non-peak direction (i.e. from the west) associated with growth to the west, add conflicting movements at the interchange.
- On Great North Road, travel times northbound and southbound, to and from the SH16 eastbound on or off ramp respectively are predicted to improve in the future years with the Project. There is also predicted to be improved travel times northbound on Great North Road to SH16 westbound in the 2016 OPT scenario.

However, in the other scenarios, travel times to and from the SH16 westbound carriageway are affected by the observed queuing on SH16 westbound, as discussed below.

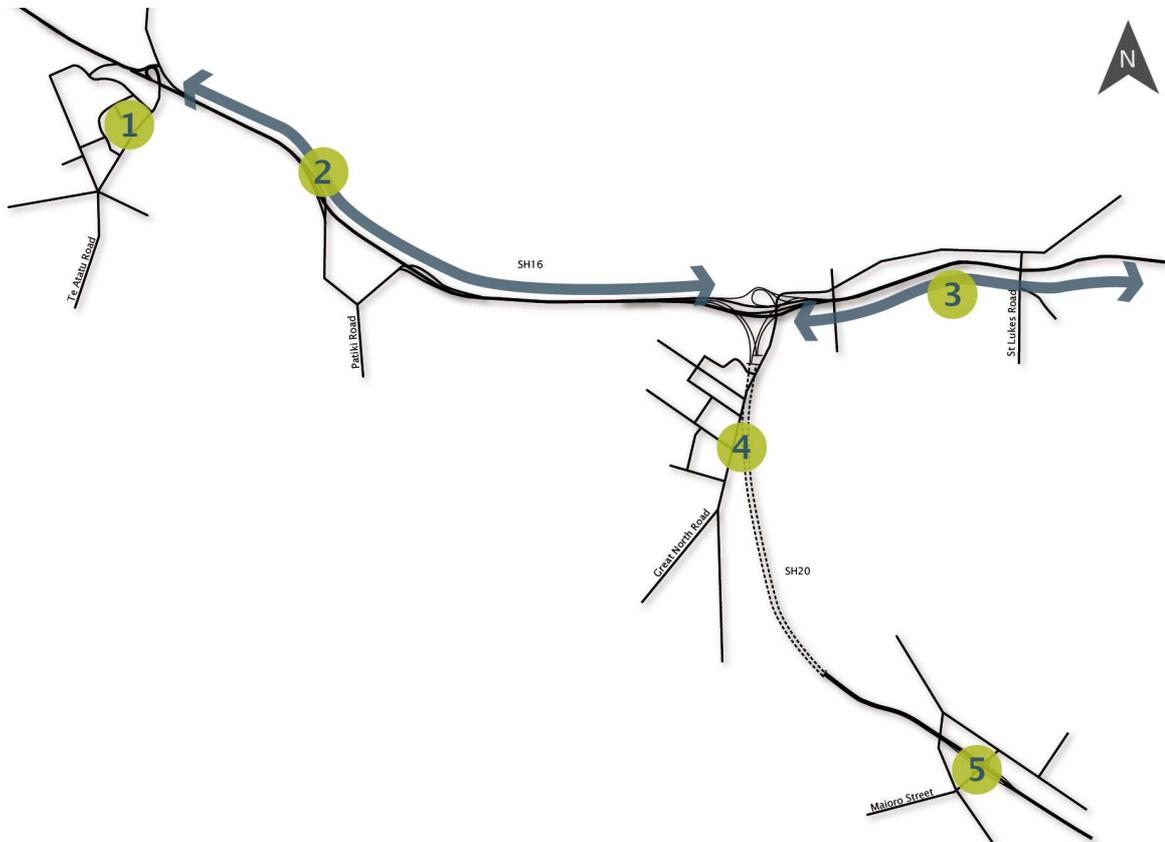


Figure 5-7: 2016 OPT PM Peak Period Observations

- Along SH20 between Maioro Street Interchange and SH16 (West), only a marginal increase in the southbound travel time occurs between the 2016 OPT and 2026 OPT scenarios, with average vehicle speeds remaining 75 to 80kph. However, in the northbound direction, an increase in travel time between the 2016 OPT and 2026 OPT scenarios is predicted, which is consistent with the observations below relating to the increases in queuing on SH16 westbound back to the SH20 on ramp. The increase in travel time equates to a reduction in the average vehicle speed from around 80 to 55kph along this travel time route.
- In the westbound (peak direction) on SH16 in the PM peak period, there is predicted to be slight improvements in travels times between the 2006 baseline and the 2016 OPT scenarios, even with westbound traffic flows increasing by approximately 20-25% (or around 2,000-2,500 vehicles). Between the 2006 baseline and 2026 OPT scenario, travel times are predicted to increase by less than 10% on SH16 westbound with the equivalent vehicle speeds remaining around 40-45kph over these routes. It is again

noted that whilst additional capacity is provided westbound with the Project, traffic flows between these scenarios are also predicted to increase by around 35% (see **Table 5-10**).

- In the eastbound direction, travel times are predicted to remain broadly similar in each scenario with average vehicle speeds equating to approximately 80–90kph. However, it is noted that compared to the 2006 baseline, the 2016 OPT and 2026 OPT scenarios are predicted to result in increases in 2 hour traffic flows of 10–15% and 20–25% respectively (see **Table 5-10**).

The key observations in relation to the operational model during the PM peak period in the 2016 OPT and the 2026 OPT scenarios are provided below. Each set of observations is referenced to **Figure 5-7** and Error! Reference source not found. in relation to the 2016 OPT and 2026 OPT observations respectively.

The observations from the 2016 OPT scenario, in the PM peak period model, are as follows:

1. During the PM peak period, queues are observed to build on the Te Atatu Road northbound approach to the interchange. Queues are observed to extend south past the Edmonton Road roundabout for around two hours through the peak period until around 1830, when queuing begins to dissipate. As in the AM peak period, observations indicate that poor lane utilisation and weaving in the model, as vehicles arrive at the interchange, contributes to this situation. It is noted that the observations do not indicate any significant issues with the operation of the interchange intersections or ramps and there is no significant southbound queuing on Te Atatu Road (from Te Atatu Peninsula).
2. Around 1630 weaving and platooning of vehicles is observed to occur on a short section of SH16 westbound between Te Atatu Interchange and the Patiki westbound on ramp. As the peak period progresses, the queue grows in length, such that by around 1800 to 1830 it extends back to around the Great North Road Interchange westbound on ramps. By the end of the model period, the queue reduces, but is still observed to occur from the approach to the Te Atatu Interchange back to east of the Rosebank westbound off ramp.

It is noted that the queue is not observed to extend back onto either the SH20 or Great North Road westbound on ramps at any stage in the peak period. It is also observed that the ramps at Great North Road continue to operate satisfactorily throughout the peak period.

3. To the east of the Great North Road Interchange, weaving and queuing begins to occur around St Lukes / Western Springs Interchange around 1500. It is observed that the weaving occurs as vehicles move between lanes on this section from St Lukes approaching the Great North Road Interchange. As with the queuing to the west of Great North Road Interchange, this builds during the peak period, such that by around 1730 there is observed to be queuing on the SH16 mainline from the westbound off ramps at Great North Road through to the east of the St Lukes / Western Springs Interchange. This queuing begins to dissipate by the end of the peak period and at no stage is observed to have significant adverse effects on the operation of the St Lukes / Western Springs Interchange and ramps.

Through the peak period, queues are observed to build on St Lukes Road northbound from the St Lukes Road / Great North Road intersection through the peak period. As was discussed with the AM peak observations, whilst further refinements to the optimisation and coordination of signals in this part of the

St Lukes Road / Great North Road corridor may reduce the observed queues, management plans for accommodating this possibility should be developed.

4. In general, traffic on both Great North Road and SH20 is observed to operate satisfactorily throughout the peak period. As in the AM peak period observations there is some platooning of slow moving traffic exiting the tunnel in the southbound direction. However, this is not observed to result in queuing back into the tunnel.
5. The Maioro Street Interchange is generally predicted to operate satisfactorily during the PM peak period in the 2016 OPT scenario, with no significant queuing observed on either the SH20 mainline through the interchange or the ramps. However, as the peak period progresses, queues build on the Stoddard Road / Sandringham Road and the Richardson Road (North and South) approaches. By the end of the peak period there is observed to be quite long queues on these approaches. However, it is noted that the operation of the signals through the interchange intersections have generally been coordinated for the State highway off ramps and through movements between the interchange and Maioro Street. Whilst further refinement to the phasing, optimisation and coordination at the intersections around the Maioro Street interchange, the queuing on the surrounding arterial roads could be reduced, without compromising the operational performance of the State highway ramps, management plans for accommodating this possibility should be reviewed/developed and implemented before the Project is commissioned.

In general, the pattern of the observations from the 2026 OPT scenario (**Figure 5–8**) is similar in character to the observations in the 2016 OPT scenario. However, as discussed below, there are differences due to changes in peak period traffic demand:

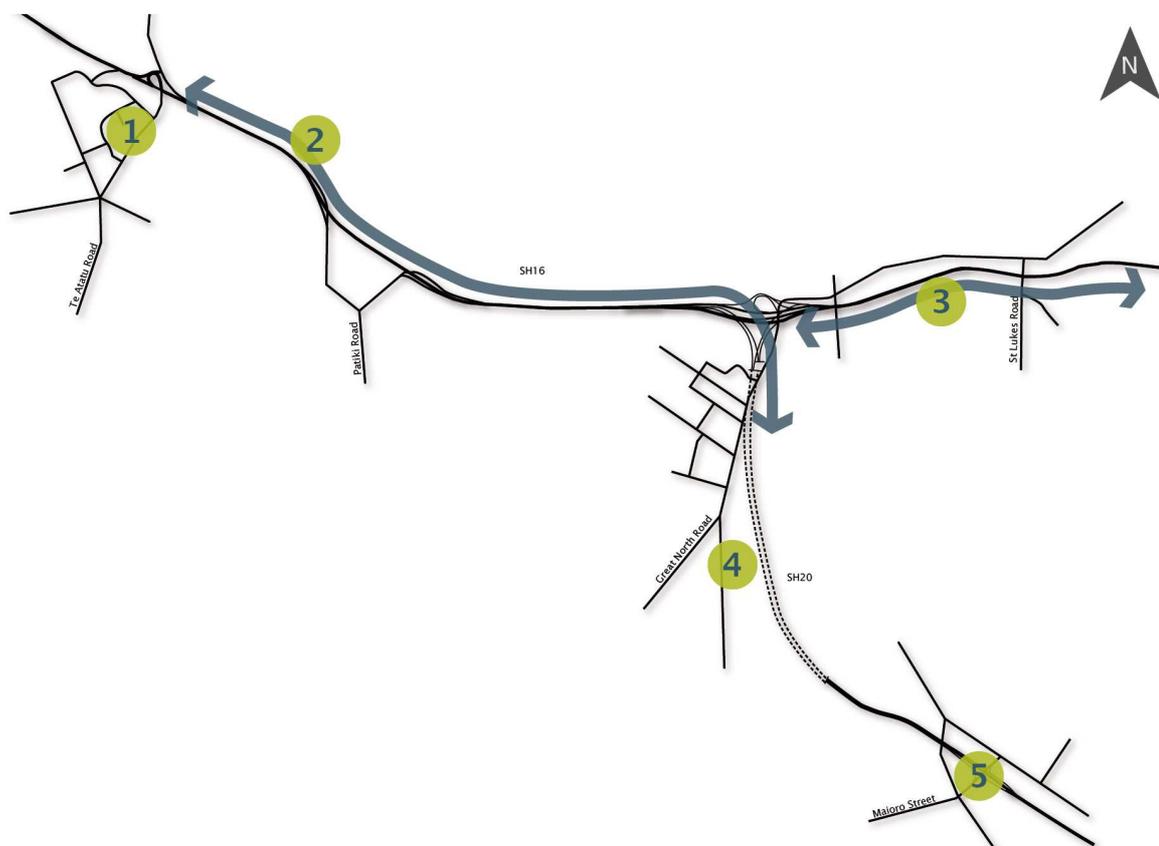


Figure 5-8: 2026 PM Peak Period Observations

1. Similar northbound queuing patterns are observed along Te Atatu Road toward the Te Atatu Interchange in the 2026 OPT to the 2016 OPT scenario, although the extent of queuing is not as significant. From around 1530, the northbound queue on Te Atatu Road builds and extends past the Edmonton Road roundabout. By around 1700, the queue has dissipated and there is observed to be only shorter sections of platooning and slow moving traffic on Te Atatu Road, such that by around 1800 there is minimal queuing northbound. It is also noted that the observations of queuing on the northbound approach to the Interchange are not dissimilar to the observations from the 2006 baseline scenarios.

By comparison, whilst not observed in the 2016 OPT scenario, there is also predicted to be some queuing on the southbound approach to the interchange (from Te Atatu Peninsula) later in the peak period, which occasionally extends back to around Gloria Avenue. It is considered that the observed changes in the queuing patterns at the Te Atatu Interchange are probably associated with changes in the signal optimisation between the 2016 and 2026 OPT scenarios. In the 2026 OPT scenario queuing on the northbound approach is reduced with resulting increases in queuing on the southbound approach, which is observed to be affected by the optimisation and coordination of the signals on the eastbound priority

lane on ramp. During the peak period, both the on and off ramps at Te Atatu Interchange are observed to operate satisfactorily, with short queues occasionally forming on the eastbound off ramp for right turn vehicles.

2. In the 2026 OPT scenario, weaving and platooning of vehicles is again observed to occur on a short section between the Te Atatu Interchange and Patiki westbound on ramp near the start of the peak period. This builds during the peak period to a greater extent than observed in the 2016 OPT scenario, such that by around 1730 queues extend back onto the SH20 westbound on ramp at the Great North Road Interchange. As the peak period continues, the queuing is observed to extend further back along SH20 northbound into the Great North Road Underpass and around 1830 there is observed to be very slow moving traffic northbound through northern section of the tunnel. This is observed to continue, with the queue and slow moving remaining at a similar extent, until the end of the peak period. This has already been identified as affecting the travel times along SH20 to SH16 westbound in the PM peak.

A tunnel management plan or strategy should be considered to manage the northbound traffic flow on SH20 into and through the tunnel, in order that longer stationary queues did not occur further south through the tunnel.

3. To the east of the Great North Road Interchange, similar patterns are observed in the 2026 OPT scenario to the 2016 OPT scenario, with weaving and platooning of westbound vehicles observed between the Great North Road Interchange and the St Lukes / Western Springs Interchange around 1500–1530, which begins to extend back to the east through the St Lukes / Western Springs Interchange as the peak period continues, but is observed to dissipate toward the end of the peak period. These observations are similar to the build up and dissipation of queues observed in the 2006 baseline scenario. As shown in **Table 5-16**, there is predicted to be an increase in the travel times westbound on SH16 in the 2026 OPT scenario, however, this in the context of increases in the 2 hour traffic flows on SH16 westbound of approximately 35% compared with the 2006 baseline or 2026 DM scenarios.

It is also observed in the 2026 OPT scenario, that with the increases in traffic demands on St Lukes Road and Great North Road (westbound), queuing occurs south along St Lukes Road for northbound traffic, east along Great North Road for westbound traffic approaching the Western Springs Interchange intersection and also on the westbound off ramp at St Lukes. Whilst further refinement of the coordination and optimisation of signals through this corridor may reduce these observed queues, management plans for accommodating this possibility should be reviewed/developed and implemented before the Project is commissioned.

4. Other than the queuing observed back from SH16 westbound along SH20 northbound, both SH20 and Great North Road are observed to operate satisfactorily. As was discussed previously, the predicted queuing back along SH16 westbound affects SH20 northbound through the tunnel and this was reflected in the travel times shown in **Table 5-16**.
5. In the 2026 OPT scenario, the predicted traffic flows on the arterial roads around the Maioro Street Interchange are lower than in the 2016 OPT scenario, due to wider changes in travel patterns identified in the project assignment model. In this regard, whilst queuing is observed on the Richardson Road and

Stoddard Road approaches, as well as on the northbound off ramp, this is not observed to be significant and is much less than the observed queuing in the 2016 OPT scenario.

5.3.4 Property Access and Parking Assessment

As discussed in **Section 2.5**, there are a number of sectors which will not have any property access or parking issues, as they are currently motorways or are within the SH20 tunnel sections of the Project. In addition, in a number of cases, land take as a result of the Project will mean that access to properties is no longer required. In this regard, it is considered that there are no property access or parking effects associated with Sector 2 (Whau River), Sector 4 (Reclamation), Sector 6 (SH16 to St Lukes) and Section 8 (Avondale Heights Tunnel) following the completion of the Project.

The following sections provide an assessment of the potential effects resulting from the operation of the Project within each of the other Project sectors. The potential access and parking effects of the Project within the wider Project area are also considered.

Sector 1 – Te Atatu Interchange

With the widening of the southern approach to the Te Atatu Interchange access for property numbers 356, 356A and 358 on Te Atatu Road will be removed. However, alternative provision for access to these three properties is proposed by a new accessway via the property at 94 Royal Road.

The proposed accessway should be provided in accordance with the requirements of the WCC Code of Practice for City Infrastructure & Land Development: Engineering Standards Manual (Section 3: Transportation) and the Parking and Driveway Guideline. As illustrated previously on **Figure 2-2**, the proposed location for the accessway off Royal View Road will be in approximately the same location as the existing driveway for 94 Royal Road. It is considered that the location of the access and the vehicle movements associated with the three properties using this accessway would have negligible effects on the operation of the Royal View Road/Te Atatu Road intersection. Moreover, it is considered that the provision of vehicle access to these properties off Royal View Road, rather than the existing access directly off Te Atatu Road in the vicinity of the SH16 Interchange, provides a more appropriate arrangement.

The existing Royal View Road and Bridge Avenue intersections off Te Atatu Road to the south of the interchange, as well as the existing Titoki Street intersection to the north of the interchange, would be not be affected by the widening on the approach of the interchange. Due to the current parking restrictions in place in the vicinity of the Te Atatu Road Interchange, there is considered to be no effect on parking associated with the widening on the approach to the interchange.

Sector 3 – Rosebank – Terrestrial

The widening works along the southern side of the Patiki Road westbound on ramp, coupled with the provision of a new separate pedestrian / cycle way along this section, have effects on the existing access road to the Rosebank Park Domain. Consequently, a new two lane access road will be constructed from Patiki Road to the Rosebank Park Domain adjacent to the Northwestern Pedestrian / cycle way to the south of the SH16

westbound carriageway. This provides an improved vehicle access to the Rosebank Park Domain, whilst retaining the existing access arrangements for this road off Patiki Road.

Sector 5 – Great North Road Interchange

The land take associated with the completion of the new motorway to motorway connections in Sector 5 results in all properties on Cowley Street as well as along the western side of Great North Road between Cowley Street and Herdman Street being removed. In addition, the properties along the western side of Great South Road between Herdman Street and Oakley Avenue (Sector 7) will also be removed, as will several properties on the eastern end of Herdman Street approaching Great North Road. A complete description of these properties is provided in the AEE. As such, driveway access to all these properties either of Great North Road, Cowley Street or Herdman Street would no longer be required with the completion of the Project.

Within Sector 5, i.e. on Great North Road to the north of Herdman Street, this would remove any turning movements between Great North Road and Cowley Street or the residential properties on the western side of Great North Road. This would have a beneficial effect of removing the existing conflicts, which may result from these turning movements. The removal of direct property access along the western side of Great North Road, north of Herdman Street, would also be beneficial in the suggested new shared pedestrian/cycle way along this side of Great North Road to the existing pedestrian/cycle way bridge, as identified in **Section 5.1**. As there is currently no parking along this section of Great North Road, there would be no effects on parking associated with this part of the Project.

Whilst Cowley Street will be closed following the completion of the Project, alternative access to facilities retained within the Waterview Reserve could instead be provided via Herdman Street, which it is recommended would remain open following the completion of the Project (see below).

Sector 7 – Great North Road Underpass

As will be discussed in **Section 6**, access to Herdman Street, Oakley Avenue and Alford Street will be affected during the construction works for the Great North Underpass, as will access to the existing BP service station on the eastern side of Great North Road and some properties on the western side south of Oakley Avenue. However, following completion of the Project access to these streets, properties and the BP service station will be reinstated along with the existing facilities (footpaths, bus stops, street lighting etc) on this section of Great North Road. Again, there is no parking on Great North Road in this area, which will be affected by the Project following completion.

It has been anecdotally noted during site visits that the existing signalised pedestrian crossing at the Herdman Street intersection is reasonably well utilised, particularly around the school arrival and departure periods. It is also considered that the signalised crossing provides a useful controlled crossing point for pedestrians between the Waterview area and the shared path along the eastern side of Great North Road. Provision for pedestrians and cyclists during construction along Great North Road, with the closure of Herdman Street are considered in the Technical Report G.16: *Assessment of Temporary Traffic Effects* (July 2010).

A new accessway is proposed off Great North Road, just north of Oakley Avenue, providing access to the vent building at the northern portal of the tunnel. The anticipated traffic using this accessway would be negligible,

particularly when it is considered that along this side of Great North Road approximately 20 existing private driveways will be removed with the completion of the Project.

Sector 9 – Alan Wood Reserve

Within this sector, there are a number of properties which are required for the realignment of Valonia Street and construction of SH20 under the proposed Richardson Road overbridge, which will no longer need to be provided with access. Access to the remaining properties along the adjacent sections of Richardson Road and Valonia Street will continue to be provided following completion of the Project, as will the existing facilities (such as footpaths, lighting etc) on both these roads.

The realignment of Valonia Street will allow a new Valonia Street / Richardson Road intersection to be provided, slightly to the south of the existing intersection, which would maintain access off Richardson Road in the same intersection form as is currently provided. The realignment of the intersection would result in the loss of some on-street parking on the eastern and western sides of Richardson Road in the vicinity of the existing intersection.

Following the realignment, the existing parking arrangements on Valonia Street could be maintained and with a reduction of some nine currently occupied properties along this section of Valonia Street, it is anticipated that any on-street parking demands on Valonia Street would be reduced. Consequently, in combination, it is considered that the effects of the Project in this area on the existing on-street parking would be negligible.

Wider Project Area Effects

In relation to the potential wider effects of the Project on property access and parking, as was discussed in **Section 5.3.2**, the Project is anticipated to result in lower daily and peak period traffic flows on several other arterial roads in 2016. This would not only be in comparison with the predicted 2016 'do minimum' scenario, but in some cases in comparison to 2006 daily traffic flows.

On these arterial roads, where there is property access and parking, the predicted traffic flow reductions could provide benefits to the ease of access or the operation of on-street parking. However, it is noted that this may be affected by other future transport projects (identified through the RARP, PTNP, Liveable Arterials Plan or Future Planning Framework), which may be enabled by the predicted traffic flow reductions in the future.

5.3.5 Assessment and Mitigation Summary

Wider State Highway Effects

It is considered that the objectives of the Project to improve the resilience and reliability of the State Highway network by providing an alternative to the existing SH1 corridor through Auckland that links the northern, western and southern parts of Auckland is demonstrated by the project assignment model.

Moreover, the assessment of the sector-sector travel indicates that, compared to 2026 "without the Project" and 2006, the Project would provide for access to and between centres of future economic development across

the region, which should improve accessibility between these areas for individuals and businesses to support economic growth.

The assessments also indicates that there would be benefits in separating through and local traffic to improve the efficiency of the purpose and function of these respective parts the transport network. As the Waterview Connection is one of the seven RONS, the focus of moving people and freight between and within centres more safety and efficiently aims meets the Project intentions.

Project and Local Area Assessment

The predicted daily and peak period traffic flows on the SH16 and SH20 motorway and ramp indicates that the lane provision should be sufficient to accommodate the predicted flows in 2026 with the Project. However, it is recognised that the capacity and travel times of the motorway will also be affected by other factors, including the interactions around interchanges, which is not necessarily captured by the project assignment model, and further assessment of the operation of SH16 is provided by the operational model assessments.

There is predicted to be a reduction in daily traffic flows and travel times on the majority of arterial roads identified in the Project study area with the Project in both 2016 and 2026, when compared with the 'do minimum' scenarios. Indeed, with the exception of the Tiverton/Wolverton route, on routes where a reduction in daily traffic flows is predicted with the Project, the 2026 Option scenario traffic flows are actually identified as being lower than the current (2006) flows.

Te Atatu Road (Edmonton Road to SH16) and Great North Road (Blockhouse Bay Road to SH16) are identified in the Regional Arterial Road Plan as prioritised corridors for which corridor management plans are to be developed. The Project improvements to the Te Atatu Interchange should complement any Te Atatu Road corridor project and the identified reductions in traffic flows and travel times on Great North Road should also assist in the development of the corridor management plan for this route, as part of a separate project.

Moreover it is considered that the reductions in traffic flows and improved travel times on both the Great North Road and Carrington Road / Mt Albert Road corridors will complement the role, future strategic direction and short-term action of these routes, identified in the Regional Arterial Road Plan as being possible with the completion of the SH20 section of the Waterview Connection Project. This would assist in providing for a range of transport opportunities for connections between centres along these two routes.

Reductions in daily HCV traffic flows and the HCV vehicle kilometres travelled on arterial and local roads are predicted with the Project, in line with the overall reduction in total traffic using these roads. It is considered that this would be primarily associated with the opportunity for HCVs to use SH20 or SH16 as strategic freight routes. This is demonstrated in the Traffic Modelling Report by an overall increase in the daily vehicle kilometres travelled by HCVs on motorways in both the study area and across the Auckland region.

By providing for the transport opportunities on arterial roads, through the predicted reductions in overall traffic flows, HCV traffic and travel times, the Project is considered to support mobility and modal choices across the Auckland region in line with the Project objectives. Moreover, the reductions in traffic flows would be anticipated to provide benefits in relation to the operation of these local road corridors, which would benefit local traffic and improve the connectivity and efficiency of the local transport network.

Operational Traffic Assessment

The main findings of the operational model assessments relating to the predicted effects of the Project in the 2016 and 2026 future years are as follows:

- Te Atatu Road – Whilst the operational performance of the Te Atatu Interchange may be improved through further refinement of the coordination and operation of the Interchange signals, particularly at the eastbound priority lane on ramp, management plans for accommodating the possibility of the observed queues should be developed. It is also noted that there are anticipated to be increases in traffic flows on Te Atatu Road in both peak periods and future years, with the implementation of the Project, when compared with the future year ‘do minimum’ scenario. Whilst it is considered optimisation and coordination of adjacent and surrounding intersections could result in some improvements, Waitakere City Council (WCC) may need to consider corridor improvements along Te Atatu Road (operational or infrastructure) particularly for High Occupancy Vehicles (HOV) and buses to ensure the benefits of the Project can be realised.
- SH16 Eastbound – In the 2016 OPT scenario, the observed queues do not affect travel times, which when compared with the 2016 do minimum scenario are actually anticipated to improve in the eastbound (peak direction) in the AM peak period.

However, in the 2026 OPT scenario, the observed queuing is predicted to result in increased eastbound travel times compared with the 2006 baseline scenario. Nevertheless, this should be considered in the context that, whilst increased motorway capacity has been provided along the SH16 corridor, traffic flows during the 2 hour AM peak period are anticipated to increase by around 25% (or 2,000–2,500 vehicles) compared with the 2006 baseline.

- SH16 Westbound – A improvement in travel times is predicted westbound during the PM peak in the 2016 OPT compared to the 2016 do minimum scenario. Increased lane capacity is provided westbound with the Project, compared to the 2006 baseline and 2016 DM scenarios such that these slight improvements are predicted even with increases of approximately 20–25% (or 2,000–2,500 vehicles) in westbound traffic flows with the Project between these scenarios.

With the 2026 OPT scenario, queuing is observed to extend south along the northbound carriageway on SH20 to the Great North Road Underpass, resulting in very slow moving traffic in the northern end of the tunnel through to the end of the PM peak period. Consequently, it is considered that with these observed effects, a tunnel management plan or strategy would need to be initiated to manage the northbound traffic flows on SH20 through the tunnel during this period.

On SH16 westbound, the predicted travel times increase by approximately 30–35%, when compared with the 2006 baseline scenario. However, even with the westbound lane capacity improvements with the Project, this is again noted to be against an associated increase in traffic flows on this section of SH16 of around 35% between the 2006 and 2026 Opt scenarios over the 2 hour peak period.

- SH20 – SH20 is generally observed to operate satisfactorily in both the northbound and southbound directions in all scenarios. In each scenario, on the southbound approach to Maioro Street Interchange,

exiting the tunnel as the gradient increases, HCVs and other larger vehicles are generally observed to move to the nearside lane and as a result the observations do not indicate that queuing occurs back through the tunnel.

- Rosebank Westbound Off Ramp – Detailed SIDRA analyses have indicated that queuing should not occur, with queues from the roundabout not extending back to the Rosebank westbound off ramp in either the 2016 OPT or 2026 OPT scenario.

St Lukes and Maioro Street Interchanges – In the case of the in the 2016 OPT and 2026 OPT scenarios during both peak periods, the predicted future traffic flows on the surrounding arterial roads result in longer queues through the peak periods, particularly in the 2016 OPT scenario during the PM peak period. In each case, whilst further refinement to the optimisation and coordination at the intersections may reduce the observed queuing on the surrounding arterial roads, without compromising the operational performance of the State highway, management plans for accommodating this possibility should be developed.

In summary, the SH16 and SH20 corridors assessed in the operational models are expected to accommodate up to 25% and 35% more AM and PM peak hour traffic in 2026 with the Project respectively, compared with the 2006 baseline, such that the overall performance is broadly similar. During the AM peak in 2026, the performance is observed to be improved in the eastbound peak direction, whilst in the westbound direction during the PM peak the performance of the SH16 corridor is slightly worse, when compared with the 2006 baseline.

Property Access and Parking Assessment

It is considered that the effects of the Project in relation to property access and parking can be satisfactorily managed by the proposals, such that there would be no more than minor adverse effects resulting from the operation of the Project. A number of measures are proposed to mitigate the predicted effects on property access, which include:

- Sector 1 – Alternative access to three properties on Te Atatu Road via a new accessway at 94 Royal Road to be provided in accordance with relevant WCC requirements;
- Sector 3 – A new two lane access road between Patiki Road and the Rosebank Park Domain provided in accordance with relevant ACC requirements; and
- Sector 9 – Realignment of Valonia Street in accordance with relevant ACC requirements. The realignment of the intersection would result in the loss of some on-street parking on the eastern and western sides of Richardson Road. It is anticipated that any on-street parking demands on Valonia Street would be reduced and effects of the Project in this area on the existing on-street parking would be negligible.

In relation to the potential wider effects of the Project on property access and parking, the Project is anticipated to result in lower daily and peak period traffic flows on several arterial roads in 2016. Where there is property access and parking, the predicted traffic flow reductions could provide benefits to the ease of access or the operation of on-street parking. However, these benefits may be affected by other future

transport projects (identified through the RARP, PTNP, Liveable Arterials Plan or Future Planning Framework), which may be enabled by the predicted traffic flow reductions in the future.

5.4 Summary of Transport Effects and Mitigation Measures

5.4.1 Pedestrian and Cycle

It is considered that the Project will complement future pedestrian and cycling connections identified at both a regional and local level, as identified in the relevant ARTA, ACC and WCC plans and strategies. In the case of a number of arterial routes across the Project area, it is considered that the Project could assist in enabling opportunities for delivery of these plans and strategies, based on the predicted changes in traffic flows on these arterial roads.

The proposed SH20 Pedestrian / cycle way aligns well with intended future strategic and regional routes identified by ACC in its 20 year cycle network plan. The proposed route also complements other identified future cycling routes on north-south and east-west corridors within the ACC area, which will enhance connections between surrounding communities. The proposed enhancements and new facilities along the Northwestern Pedestrian / cycle way are considered to provide a more convenient, comfortable and reliable experience for either commuting or recreational cyclists and improve connections to the future cycling network in Waitakere.

The proposed facilities on both the SH20 Pedestrian / cycle way and Northwestern Pedestrian / cycle way can generally be provided in accordance with the Austroads recommended design guidelines for shared pedestrian/cycle paths. Although some short sections of the proposed pedestrian / cycle ways would be less the recommended shared path width, the proposed provision would still provide facilities in accordance with the guidelines.

In relation to the proposals for both the Northwestern Pedestrian / cycle way and the SH20 Pedestrian / cycle way, a number of further enhancements to cycling amenity have been identified through the assessment of effects, primarily due to the reductions in traffic volumes on several roads that the Project will bring about. In that regard ACC will be better placed to implement their strategies.

With regard to the above, it is considered that the proposals for the enhancements and extensions to the existing Northwestern Pedestrian / cycle way, coupled with the new and improved facilities provided for with the SH20 Pedestrian / cycle way, will align with the objectives of the Project:

- To improve accessibility for individuals and businesses and support regional economic growth and productivity by improving access to and between centres of future economic development; and
- To support mobility and modal choices within the wider Auckland Region by providing opportunities for improved cycling and walking.

5.4.2 Passenger Transport

The Project proposals will almost double the existing bus shoulder provision along the section of SH16 between Te Atatu Road Interchange and Great North Road Interchange. The more continuous provision of bus shoulders along SH16 is anticipated to provide significant benefits to the operation of peak direction buses, particularly when combined with bus shoulder provision further to the west on SH16.

Provision has been included within the Waterview Connection Project to allow for the future expansion of the RTN by ARTA and associated stakeholders, as a separate project, by facilitating a corridor for the future Avondale – Southdown Rail Line. The approach taken will allow for double-tracking, electrification and maintenance access. In designing structures over the SH20 alignment, specification has included the opportunity for this same provision in the future along the Avondale – Southdown Rail Line.

The Project is considered to enable future opportunities for improvements to passenger transport provision, particularly bus services, on arterial roads primarily with regard to the future QTN including Great North Road and the Mt Albert Road / Carrington Road corridor. On both QTN routes, with the predicted improvements in travel times and traffic flow reductions with the Project, greater reliability of QTN services along these routes may be able to be achieved following the completion of the Project.

Travel times on Te Atatu Road in both directions are predicted to increase with the Project, although it is noted that this is based on all traffic (not buses) without accounting specifically for future bus priority measures along in this road. The proposed improvements at the Te Atatu Interchange include bus priority measures for buses using the east facing ramps and the Project proposals will be complemented by future improvements to the Te Atatu Road corridor.

It is therefore considered that the Project proposals will align with the relevant objectives of the Project:

- To improve resilience and reliability of the State highway network by providing an alternative to the existing SH1 corridor through Auckland that links northern, western and southern parts of Auckland;
- To improve the connectivity and efficiency of the transport network by separating through traffic from local traffic;
- To contribute to the region's critical transport infrastructure and its land use and transport strategies by improving the capacity of SH16 through to 2026; and
- To improve the accessibility for individuals and businesses and support regional economic growth and productivity by improving access to and between centres of future economic growth.

5.4.3 Traffic

Wider State Highway Effects, Project and Local Area Assessment

The assessment of the wider State highway effects has indicated that the completion of the SH20 section of the Project will result in a shift of traffic travelling between SH1 and SH16 from the SH1 corridor to the SH20 corridor. Moreover, the assessment of the sector–sector travel indicates that compared to 2026 without the Project and 2006, the Project would provide for improved access to and between centres of future economic development across the region. The assessments also indicate that there would be benefits of Project in separating through and local traffic to improve the efficiency of the purpose and function of these respective parts the transport network.

The predicted daily and peak period traffic flows on the SH16 and SH20 motorway and ramp indicates that the lane provision should be sufficient to accommodate the predicted flows in 2026 with the Project. However, it is recognised that the capacity and travel times of the motorway will also be affected by other factors, including the interactions around interchanges, which is not necessarily captured by the project assignment model, and further assessment of the operation of SH16 is provided by the operational model assessments.

There is predicted to be a reduction in daily traffic flows and travel times on the majority of arterial roads identified in the Project study area with the Project in both 2016 and 2026, when compared with the ‘do minimum’ scenarios. Indeed, with the exception of the Tiverton/Wolverton route, on routes where a reduction in daily traffic flows is predicted with the Project, the 2026 Option scenario traffic flows are actually identified as being lower than the current (2006) flows.

The Project improvements to the Te Atatu Interchange should complement the prioritised Te Atatu Road corridor project identified in the Regional Arterial Road Plan. The identified reductions in traffic flows and travel times on Great North Road should also assist in the development of the prioritised corridor management plan, as part of the Regional Arterial Road Plan project. The predicted traffic flow reductions should also complement Carrington Road / Mt Albert Road corridor plan identified in the Regional Arterial Road Plan. This would assist in providing for a range of transport opportunities for connections between centres along these corridors.

Reductions in daily HCV traffic flows and the HCV vehicle kilometres travelled on arterial and local roads are predicted with the Project, in line with the overall reduction in total traffic using these roads. It is considered that this would be primarily associated with the opportunity for HCVs to use SH20 or SH16 as strategic freight routes. This is demonstrated in the Traffic Modelling Report by an overall increase in the daily vehicle kilometres travelled by HCVs on motorways in both the study area and across the Auckland region.

It is therefore considered that the Project proposals will align with the relevant objectives of the Project:

- To improve resilience and reliability of the State highway network by providing an alternative to the existing SH1 corridor through Auckland that links the northern, western and southern parts of Auckland;
- To improve accessibility for individuals and businesses and support regional economic growth and productivity by improving access to and between centres of future economic development;

- To contribute to the region's critical transport infrastructure and its land use and transport strategies by improving the capacity of SH16; and
- To improve the connectivity and efficiency of the transport network by separating through traffic from local traffic within the wider SH20 corridor.

Operational Traffic Assessment

On SH16 eastbound (peak direction) during the AM period, travel times are anticipated to improve with the completion of the Project in 2016, although the operational model observations indicate that queuing would still be anticipated from east of St Lukes Interchange toward the Great North Road Interchange. In 2026, ten years after opening, eastbound travel times are predicted to increase compared with the 2006 baseline, but a similar pattern of queuing across the peak period is observed. Nevertheless, this is in the context that, whilst increased motorway capacity has been provided along the SH16 eastbound corridor, traffic flows during the 2 hour AM peak period are anticipated to increase by around 25% or 2,000–2,500 vehicles compared to 2006.

Westbound on SH16 in the PM peak period, queuing is observed to extend back to just west of the Great North Road Interchange westbound on ramps from the approach to the Te Atatu westbound off ramp. However, slight improvements in travel times are predicted to be achieved westbound in 2016 with the Project compared to 2006. The increased lane capacity provided westbound with the Project counteracting the predicted increases of approximately 20–25% or 2,000–2,500 vehicles in westbound traffic flows, compared to both 2006 and 2016 without the Project.

Ten years after opening, greater levels of queuing and increases in travel times are predicted during the PM peak period from Te Atatu Interchange back to the Great North Road Interchange (similar to current conditions) and along the SH20–SH16 westbound on ramp, resulting in very slow moving vehicles in the northern end of the tunnel. It is therefore recommended that a tunnel management plan or strategy is considered to manage the northbound traffic flows on SH20 through the tunnel during any affected period. This is predicted to result in SH16 westbound travel times increasing by approximately 30–35% compared with 2006, although this is in comparison with increases in traffic flows of around 35% between 2006 and 2026 with the Project on this section of SH16.

Other than the predicted effects associated with the SH16 westbound queuing during the PM peak period in 2026, SH20 is generally observed to operate satisfactorily in both the northbound and southbound directions. Some slow moving traffic and platooning is observed to occur on the southbound exit to the tunnel, but this does not result in queuing back into the tunnel.

Whilst operational performance of the Te Atatu Interchange may be improved through further refinement of the coordination and operation of the interchange signals, particularly at the eastbound priority lane on ramp, management plans for accommodating this possibility should be developed. It is considered that with the opportunity for the corridor improvements along Te Atatu Road to complement the improvements to the interchange, particularly for HOV's and buses, the prioritised corridor improvements identified in the Regional Arterial Road Plan should be progressed in parallel with this Project.

Both the St Lukes and Maoro Street Interchanges and ramps are generally observed to operate without significant effects in each of the operational scenarios. In both cases, traffic flows on the surrounding arterial roads are generally anticipated to be lower with the Project than without the Project. However, some long queues are expected around the interchanges during the height of the peaks. Whilst this may be reduced with further refinement to the optimisation and coordination at the surrounding intersections, without compromising the operational performance of the interchanges or the State highway, management plans for accommodating this possibility should be developed.

In summary, the SH16 and SH20 corridors assessed in the operational models are expected to accommodate up to 25% and 35% more AM and PM peak hour traffic in 2026 with the Project respectively, compared with the 2006 baseline, such that the overall performance is broadly similar. During the AM peak in 2026, the performance is observed to be improved in the eastbound peak direction, whilst in the westbound direction during the PM peak the performance of the SH16 corridor is slightly worse, when compared with the 2006 baseline.

Property Access and Parking Assessment

It is considered that the effects of the Project in relation to property access and parking can be satisfactorily managed by the proposals, such that there would be no more than minor adverse effects resulting from the operation of the Project. A number of measures are proposed to mitigate the predicted effects on property access, which include:

- Sector 1 – Alternative access to three properties on Te Atatu Road via a new accessway at 94 Royal Road to be provided in accordance with relevant WCC requirements;
- Sector 3 – A new two lane access road between Patiki Road and the Rosebank Park Domain provided in accordance with relevant ACC requirements; and
- Sector 9 – Realignment of Valonia Street in accordance with relevant ACC requirements. The realignment of the intersection would result in the loss of some on-street parking on the eastern and western sides of Richardson Road. It is anticipated that any on-street parking demands on Valonia Street would be reduced and effects of the Project in this area on the existing on-street parking would be negligible.

In relation to the potential wider effects of the Project on property access and parking, the Project is anticipated to result in lower daily and peak period traffic flows on several arterial roads in 2016. Where there is property access and parking, the predicted traffic flow reductions could provide benefits to the ease of access or the operation of on-street parking. However, these benefits may be affected by other future transport projects (identified through the RARP, PTNP, Liveable Arterials Plan or Future Planning Framework), which may be enabled by the predicted traffic flow reductions in the future.

6. Construction Assessment

6.1 Background and Assessment Approach

This section of the Transport Assessment considers the potential effects arising in relation to the construction of the Project. A full description of the proposed works for the construction of the Project is provided in Part A Chapter 5 of the AEE.

As discussed in **Section 1.3**, there are a number of technical reports prepared by Beca, which support, inform and supplement this Transport Assessment, which includes the Technical Report G.16: *Assessment of Temporary Traffic Effects* (July 2010). This assessment report provides a more detailed assessment of the potential traffic management methodologies and techniques that may be implemented by the contractor (or contractors) to manage the operation of the transport network in the vicinity of the proposed works and around the currently identified construction yards, including access to these yards.

This report does not therefore discuss the potential management methodologies or techniques in detail, but instead identifies where there are anticipated to be construction effects on the pedestrian, cycle, passenger transport and road networks. Any necessary measures to avoid, remedy or mitigate these effects have been generally identified, where appropriate, such that a suitable package of measures can be taken forward to manage the environmental effects of the construction activities.

Given the current stage of the Project, the methodologies and management techniques associated with the construction works will undergo further development. In particular, once the RMA approvals have been obtained and the Project has been awarded and a contractor (s) is in place, the methodology will be further refined and developed.

Section 6.1.1 below outlines the anticipated 'sections' of construction work (by Project sector) and the overall anticipated work programme. In order to assess the potential effects of the construction upon the transport network and identify where any necessary mitigation should be provided, the assessment provided in this section of the report is based on the same 'sections' of construction works.

In addition to assessing the effects of the physical construction works and yard areas, within this report and the Technical Report G.16: *Assessment of Temporary Traffic Effects* (July 2010), the potential wider effects of the anticipated daily construction traffic on the road network have been considered and are discussed within this section of the report.

6.1.1 Duration of Construction

The Project is currently anticipated to take between five to seven years to complete and will be able to be undertaken on a number of fronts or work faces, such that many elements of the Project will be undertaken concurrently.

It is anticipated that the construction of the Project will be undertaken in the following main sections of work, which have been defined by the Project sectors:

1. Te Atatu Interchange (Sector 1)
2. Causeway and Whau Bridges (Sector 2, 3 and 4)
3. Great North Road Interchange (Sector 5)
4. SH16 Great North Road to St Lukes (Sector 6)
5. Tunnel (Sector 7 and 8)
6. SH20 from tunnel to Maioro Interchange (Sector 9).

Figure 6-1 shows the approximate timing of the proposed works and how the different work fronts may progress over and within the five to seven year timeframe. It is reiterated that while there are some dependencies between these work fronts, the specific staging and phasing of the work will be dependent on procurement, the availability of contractors and availability of other resources (such as land and materials and construction equipment).

Sections of Works		Year					
Sector Name	No.	1	2	3	4	5	6
Te Atatu Interchange	1	█	█	█	█	█	
Causeway and Whau Bridges	2,3,4	█	█	█	█	█	█
Great North Road Interchange	5				█	█	█
SH16 Great North Road to St Lukes	6			█	█		
Tunnel	7,8	█	█	█	█	█	█
SH20 from Tunnel to Maioro Interchange	9	█	█	█	█	█	█

Figure 6-1: Approximate Construction Works Programme

6.1.2 Night Time Works

Underground tunnel construction (Sector 8) will be carried out 24 hours a day as the noise and lighting effects of these activities are shielded by the ground. The developing construction methodology has already indicated that in order to minimise disruption to traffic, some other works will also be undertaken at night. At this stage, the major activities include, but are not limited to:

- Te Atatu Interchange Bridge Deck replacement (Sector 1);
- Te Atatu Interchange on/off ramps (localised sections only, where offline works need to tie in with the existing Te Atatu Road) (Sector 1);
- Subway at Te Atatu eastbound on and off ramp (Sector 1);
- Patiki Cycle Bridge – removal of existing cycle bridge & positioning of Truss Bridge (Sector 3);
- Erection of structures at the Great North Road Interchange (Sector 5);
- Aspects of the widening works on SH16 between Great North Road Interchange and St Lukes (Sector 6);
- Works associated with the Great North Road underpass (Sector 7);
- Richardson Road bridge tie in (Sector 9); and
- General Traffic Management set up throughout the life of the contract (all Sectors).

6.1.3 Construction Yards

There are 12 construction yards proposed along the route of the Waterview Connection Project, which are described in more detail in Part A Chapter 5 of the AEE. The methodologies and assessment of the construction vehicle access arrangements to these yards are discussed in more detail in the Technical Report G.16: *Assessment of Temporary Traffic Effects* (July 2010). In certain areas, the potential effects and any necessary mitigation measures associated with access to these yards has been discussed herein.

In general, the construction yards will operate during daytime from 6:00 to 19:00, Monday to Saturday, and on Sunday to allow receipt of materials and plant for the upcoming week work. However, as night time works are required on occasions across all of the sectors, there is likely to be requirements for access to some or all of the yards at night. The construction yards for the driven tunnel will be active 24 hours a day, however the night time works within these yards will be limited as the majority of work will be undertaken underground. It is understood that the construction yards would have adequate on-site parking arrangements for construction vehicles and workers or alternative measures for the transfer of workers to the yards, such that any potential effects of parking on surrounding roads are minimised.

6.2 Assessment of Construction Sections

Within each of the identified construction sections, the potential effects of the construction works (outlined in Part A Chapter 5 of the AEE) on the existing walking/cycling, passenger transport and roading network have been identified for different construction work activities, and any necessary measures to manage the effects then identified in relation to these activities.

6.2.1 Te Atatu Interchange (Sector 1)

The overall programme of construction works in Sector 1 is currently anticipated to take around 42 months to complete and predominantly comprises the interchange improvements and the works on the SH16 mainline carriageway. The construction works within Sector 1 include:

SH16 Motorway Works

The works on SH16 include the widening works and vertical alignment works around the Te Atatu Interchange. In order to reduce the effects of these works, traffic management measures would be put in place to ensure that the existing number of SH16 mainline lanes would remain operational throughout the works programme, other than at the specified stage discussed below. Speed restrictions would be in place through the works areas due to the narrower lanes and shoulders and thus the effects of the construction on existing SH16 traffic, including buses. Narrower lanes and lower speed limits will generally result in lower speeds through or past works areas. Vehicle headways will generally increase and these effects will result in a reduction of capacity. The term “generally” has been used because it is recognised that effects will be different for different periods of the day and different for the stages of the construction, and the various traffic management plans being implemented. Overall it is considered that the various construction traffic management plans will be tailored to minimise or mitigate the effects for the various periods of the day and stages of construction.

At some stages, work would be required over the motorway, including demolition and replacement of Te Atatu Bridge beams. To satisfactorily manage the effects of these works on the SH16 motorway, it has been identified that these works would be undertaken during a temporary and localised night time closure, with mainline traffic diverted via the Interchange ramps. With the lower volumes of night time traffic on SH16, it is considered that this would provide a suitable management measure with no more than minor effects.

Te Atatu Interchange Improvement Works

During the works at the Te Atatu Road Interchange, both on Te Atatu Road and on the ramps, traffic management measures would be put in place to maintain the existing number of lanes on Te Atatu Road and on the ramps during the construction works. There will be delays associated with the works being undertaken, including speed restrictions, to maintain the existing number of lanes and thus effects on existing interchange traffic, including buses. It is recognised that effects will be different for different periods of the day and different for the stages of the construction, and the various traffic management plans being implemented. Overall it is considered that the various construction traffic management plans will be tailored to minimise or mitigate the effects for the various periods of the day and stages of construction.

It is noted that the works associated with the 'tie in' of the new on/off ramps to Te Atatu Road and the pedestrian/cycle subway at the eastbound on/off ramps would not be possible as off-line works and would therefore be anticipated to have greater effects on traffic operation at the interchange, if undertaken during the daytime. As such, to mitigate the effects of these works, it has been identified that these would be undertaken as night time works, when it is considered effects could be mitigated, such that they would be no more than minor.

The works at the interchange would also have effects on pedestrians and cyclists using the existing facilities on Te Atatu Road. In particular, the construction works associated with the completion of the new pedestrian/cycle subway would occur on a similar alignment to the existing subway, which is anticipated to be closed during certain stages of the works. In this regard, it is considered that an adequate at-grade pedestrian and cycle path and associated crossing provision should be maintained on at least one side of the Te Atatu Bridge during the works and, as far as possible, connections with the existing surrounding footpath and cycle facilities maintained throughout the works.

It is considered that the identified construction works on Te Atatu Road would not have significant effects on existing property access or parking in Sector 1. In relation to on-street parking, there is currently no parking permitted in the vicinity of the interchange on Te Atatu Road. The traffic management measures established during the works would need to maintain the existing intersections arrangements at Bridge Avenue, Royal View Road and Titoki Street. As discussed in **Section 2.5**, the access to three existing properties (356, 356A and 358 Te Atatu Road) to the west of Te Atatu Road will be replaced by a new accessway off Royal View Road. To maintain continual access to these properties, the proposed accessway to these three properties would need to be constructed in advance of any construction works resulting in the closure of the existing accessway.

North Western Pedestrian / cycle way Works

The construction works in Sector 1 will also include enhancements of the existing Northwestern Pedestrian / cycle way. It is considered that access along the pedestrian / cycle way can be maintained throughout construction with negligible effects on existing users.

6.2.2 Causeway and Whau Bridges (Sector 2, 3 and 4)

The works within Sectors 2, 3 and 4 relate to the following:

- Widening of the existing motorway, including bridges, to provide additional traffic lanes and bus shoulders;
- Construction of the new pedestrian/cycle bridges at the Whau River crossing, Patiki Road westbound on ramp and the Causeway; and
- Construction of the new access road to Rosebank Park Domain.

Overall, it is anticipated that the works within these three sectors would take around 66 months to complete, with works in Sectors 2, 3 and 4 taking approximately 28, 24 and 54 months respectively, as concurrent works activities in each sector.

SH16 Motorway Works

The widening works on these parts of SH16 will be undertaken with the implementation of traffic management measures to ensure that the existing number of SH16 mainline lanes (3 lanes in each direction) would remain operational throughout the works programme, which it is considered would minimise the effects on general traffic. Whilst speed restrictions would be in place through the works areas, due to the narrower lanes and shoulders, maintaining the existing lane provision through the works should reduce the effects of the construction on existing SH16 traffic.

It is noted that during some stages of the works, the existing bus shoulders would not be available. Existing bus shoulders are expected to be utilised for construction during Stage 1 and anticipated to be reinstated in the eastbound direction during Stage 3 and in the westbound direction in Stage 4. As such, during the removal of the bus shoulder provision (particularly eastbound in the AM peak period) is anticipated to result in delays to bus services during these periods of the construction works, where there travel times would be similar to the general traffic travel time changes detailed in Section 6.1.3 of Technical Report G.16: *Assessment of Temporary Traffic Effects* (July 2010). Although, in the longer term with the completion of the Project, there will be much improved bus facilities on SH16. In this regard, ongoing communication will be required with ARTA, bus service operators and the general public to keep them informed of the effects of the construction works on bus services using SH16.

North Western Pedestrian / cycle way Works

The construction of the new pedestrian/cycle bridge at the Whau River crossing can be undertaken off-line. During the construction of the new bridge the existing pedestrian / cycle way provision would be retained and user then diverted to the new bridge following completion. As such, there are anticipated to be negligible effects on existing pedestrian / cycle way users.

Before the new pedestrian/cycle bridge can be constructed at Patiki Road, the existing bridge needs to be demolished. As a result, there would be no pedestrian/cycle connection across Patiki Road for the existing Northwestern Pedestrian / cycle way. Prior to the new bridge being completed, alternative arrangements would be provided for pedestrians and cyclists to cross the Patiki Road westbound on ramp. This would require a diversion of existing users from the existing pedestrian / cycle way to the east of the on ramp and provision of controlled crossing facilities at Patiki Road to allow users to cross and then return to the existing pedestrian / cycle way to the west. It is anticipated that these temporary diversion arrangements would be required for a period of approximately seven months until the new bridge is installed. Provided appropriate crossing facilities are provided on Patiki Road and the diversion route is clearly signposted, it is considered that the effects on pedestrian / cycle way users would be no more than minor over this relatively short period.

The new Northwestern Pedestrian / cycle way bridge over the Causeway will be constructed off-line, in the same manner as the Whau River pedestrian / cycle way bridge. Consequently, there are anticipated to be negligible effects on existing bridge users, who would be diverted to the new bridge once completed.

Access for users along other parts of the existing Northwestern Pedestrian / cycle way through these sectors would be retained throughout the construction period. It is possible that some very short duration and localised closures may be necessary due to the other construction works, but these could be undertaken at night time and would have negligible effects on the very limited number of users in this period.

Rosebank Park Domain Access Road Works

The construction of the new access road to the Rosebank Park Domain will be undertaken off-line to the existing access road alignment and prior to the proposed SH16 widening works. As such, uninterrupted access will be provided to the Domain and there would be no effect on the access road users associated with these works.

6.2.3 Great North Road Interchange (Sector 5)

Within Sector 5, the main construction activities relate to the four new motorway to motorway ramps and associated works for the SH20 tunnel portal, which are anticipated to take approximately 24 months to complete.

The majority of the works in this sector can be undertaken off-line and would therefore be anticipated to have no significant direct impacts on the existing motorway, Great North Road Interchange ramps or surrounding arterial roads, such as Great North Road.

The staging of the works, coupled with the traffic management measures that would be put in place, would generally allow the existing number of lanes on the motorway, ramps and surrounding arterials to be retained throughout the works, other than during the night time works, as discussed below. Whilst speed restrictions would be in place through the works areas, due to the narrower lanes and shoulders, maintaining the existing lane provision through the works should reduce the effects of the construction on existing traffic, including bus services. Overall it is considered that the various construction traffic management plans will be tailored to minimise or mitigate the effects for the various periods of the day and stages of construction.

At some stages of the construction, works will be required in the median or over the live motorway carriageway or ramps, which will require lane or full closures on the sections. Undertaking these works during the daytime would result in greater effects than being undertaken at night, hence these closures would be undertaken at night time in order to minimise the effects on road users. As necessary, during these night time closures, diversions will need to be provided.

Due to the land take required in Sector 5 for the completion of the Project along Great North Road, Cowley Street and to the north of Herdman Street, the works within these areas would not have effects on property access or parking on the sections of these roads in Sector 5.

With the off-line nature of the works, it is considered that there would be less than minor effects on the existing pedestrian and cycle facilities along the Northwestern Pedestrian / cycle way and Great North Road during the construction works.

It is noted that the construction works would result in the realignment of the existing western ramp of the Great North Road pedestrian / cycle way bridge. In this regard, it is considered that the new realigned ramp to the bridge should either be provided before the existing ramp is closed or appropriate well signposted alternative routes provided for pedestrians and cyclists until the new ramp is completed. For people travelling north and east toward the Great North Road / Carrington Road intersection, a temporary diversion route could be provided using the existing at-grade crossing facilities and shared path at the interchange. Pedestrians and cyclists travelling south on Great North Road, could be directed to use the existing signalised crossing at the Herdman Street intersection or it may be possible to provide a temporary crossing of the existing westbound off ramp from SH16 to Great North Road, should the construction works in this area facilitate this. In any event, it is considered that the effects on pedestrians and cyclists resulting from these temporary diversions would be less than minor, given the anticipated short duration of the works to provide the new western ramp for the pedestrian / cycle way bridge.

6.2.4 SH16 Great North Road to St Lukes (Sector 6)

The construction works within Sector 6 are anticipated to take approximately 12 months to complete and mainly involve the mainline motorway widening and the associated connections with the new motorway to motorway ramps.

The effects of the works would be reduced by providing traffic management measures to ensure that the existing number of SH16 mainline lanes would remain operational throughout the works programme with only lane and shoulder narrowing. Speed restrictions would be in place through the works areas due to the narrower lanes and shoulders and thus the effects of the construction on existing SH16 traffic, including buses. Narrower lanes and lower speed limits will generally result in lower speeds through or past works areas. Vehicle headways will generally increase and these effects will result in a reduction of capacity. The term “generally” has been used because it is recognised that effects will be different for different periods of the day and different for the stages of the construction, and the various traffic management plans being implemented. Overall it is considered that the various construction traffic management plans will be tailored to minimise or mitigate the effects for the various periods of the day and stages of construction.

At some stages of the widening works in Sector 6, works may be required in or over live traffic lanes, which could not be undertaken during the daytime, because of the resulting adverse traffic effects. As such, these works would be undertaken with night time lane closures. With the lower volumes of night time traffic on SH16, it is considered that this would provide a suitable management measure and result no more than minor effects on mainline motorway traffic.

6.2.5 Tunnel (Sector 7 and 8)

The main construction works in Sectors 7 and 8 relate to the completion of the Great North Road Underpass and northern portal building, the tunnelling works, as well as providing access to the associated construction yards. The programmes for the works within these sectors are 24 months for the Great North Road Underpass (Sector 7) and 48 months for the tunnelling (Sector 8), which with some works running concurrently have a combined duration of approximately 57 months.

Tunnelling Works

By their sub-surface nature, the tunnelling works would not have any direct effects on the surrounding transport network. However, the construction vehicles associated with these works and access to and from the yards associated with the tunnelling activities will result in effects on the existing transport networks.

As discussed previously, the methodologies and assessment of construction vehicle access arrangements to these yards within Sectors 7 and 8 is considered in the Technical Report G.16: *Assessment of Temporary Traffic Effects* (July 2010), whilst the wider operational effects of construction traffic are considered in **Section 6.3** of this report.

Great North Road Underpass Works

The construction of the Great North Road Underpass will have an effect various transport modes using Great North Road. Overall it is considered that various construction traffic management plans will be tailored to minimise or mitigate the effects for the various periods of the day and stages of construction.

The construction works associated with the Underpass at Great North Road comprises three parts; north of the Underpass (north of Great North Road), the Underpass and south of the Underpass. It is envisaged that the construction of the Great North Road Underpass will be conducted over two phases with the realignments of Great North Road, requiring associated lane and shoulder narrowing. Initially, Great North Road will be realigned to the north to begin construction of the Underpass, followed by a shift to the south to facilitate work on the southern extent of the Underpass and the northern portal and vent building.

The construction works associated with the northern vent building will be undertaken off-line from Great North Road and would not therefore have a direct effect on existing transport facilities on Great North Road.

The existing number of lanes (four lanes) on Great North Road will remain operational with the temporary realignments required during both the first and second phase of the works. This should enable the adverse effects on existing traffic using Great North Road to be reduced. This would include reducing effects on buses, which with the retention of the four traffic lanes, would not need to be diverted as a result of the construction works on Great North Road.

However, the traffic management measures provided, such as the narrow lanes, speed restrictions and construction yard access will reduce the operational capacity of Great North Road during the works period. In this regard, given the existing operation of the Great North Road corridor, which is identified as a 'strategic' regional arterial road and QTN bus route, it is considered that construction vehicle movements associated with access to the construction yards off Great North Road are, where possible, restricted during the weekday AM and PM peak periods.

Whilst it is anticipated that most works on Great North Road can be undertaken whilst maintaining the existing four traffic lanes, it will be necessary for some works to be undertaken with lane closures. Due to the potential adverse effects associated with these lane closures on Great North Road, these works would need to be undertaken as night time works.

It will be necessary to provide alternative arrangements for pedestrians and cyclists who use the existing shared path on the eastern side of Great North Road, as it is anticipated that this facility could not continue to be provided during these construction works. Due to the works area, these arrangements are anticipated to require pedestrians and cyclists to use an alternative facility along the western side of Great North Road. As part of the traffic management measures, appropriate crossings of Great North Road will need to be established to provide access to the path on the western side. These diversions from the existing shared path will need to be supported by appropriate signage. As discussed in **Section 2.2**, following the completion of the works on Great North Road, the existing shared path on the eastern side will be fully reinstated and enhanced.

The implementation of the traffic management measures for the construction works associated with the Great North Road Underpass will result in either the temporary removal or relocation of two existing northbound and one southbound bus stop along Great North Road. As part of the further development of the traffic management measures, further discussions would be required with ARTA and bus service operators relating to the temporary removal and relocation of these bus stops at the various stages of the works. The bus stops would be fully reinstated following completion of the construction works on Great North Road.

As there is currently no parking permitted on Great North Road, this would not be affected by the proposed works. However, access to several existing properties on Great North Road and to the adjacent residential streets to the west of Great North Road would be affected by the works. Although, as discussed in **Section 2.5**, following completion of the construction works, access to these properties and residential streets would be reinstated.

Properties along the western side of Great North Road to the north of Oakley Avenue form part of the land take associated with the Project and would therefore not be affected by the proposed works. However, several properties along the western side of Great North Road (south of Oakley Avenue) will be affected by the works and the traffic management measures will need to consider alternative access arrangements for these properties. Alternative traffic controls are anticipated to be required for the existing BP service station on the eastern side of Great North Road. On the western side of Great North Road, alternative traffic controls will be required at the Herdman Street, Oakley Avenue and Alford Street intersections at various stages during the works and it is possible that at some stages these intersections will be closed temporarily. In each of these cases, this may require temporary signed diversion to be provided via other residential streets of Great North Road. With regard to traffic management measures at Oakley Avenue and Herdman Street, it is noted that these road provides access to the Waterview Primary School and will need particular consideration with regard to potential conflicts with construction traffic accessing the yards in the vicinity of Herdman Street.

The development of the traffic management measures for the provision of access to these properties, the residential streets and the school during the construction works, together with access to the construction yards off Great North Road, are considered further within the Technical Report G.16: *Assessment of Temporary Traffic Effects* (July 2010).

As outlined above, measures will be developed to minimise the effects of Great North Road Underpass construction works on pedestrians, cyclists, buses, general traffic as well as access to adjacent properties and residential streets. In general it is considered that the various construction traffic management plans will be tailored to minimise or mitigate the effects for the various periods of the day and stages of construction.

6.2.6 SH20 from tunnel to Maioro Interchange (Sector 9)

The main construction works in Sector 9 relate to the construction of the southern tunnel portal and vent building, the at-grade motorway alignment to the Maioro Street Interchange, the Richardson Road Bridge, as well as providing access to the associated construction yards in this sector. The programme for the works within Sector 9 is approximately 15 months, as several parts of the works run concurrently. These works are anticipated to be undertaken at the outset of the overall construction programme and will assist in providing construction vehicle access to the construction yards in Hendon Park and the Alan Wood Reserve.

In addition, the works in Sector 9 will include the construction of the SH20 Pedestrian / cycle way, which will require construction of the Hendon Park pedestrian / cycle way bridge, as well as the pedestrian / cycle way through the Alan Wood Reserve and to the Maioro Street Interchange.

Southern Portal and SH20 Motorway Works

Other than the works at the Richardson Road, the construction works associated with the southern portal (including the vent building) and at-grade motorway to the Maioro Street Interchange will generally be off-line from existing transport networks and not have any direct effects on these networks.

However, the construction vehicles associated with these works and access to and from the yards associated with the construction activities in Sector 9 will result in effects on the existing transport networks. The methodologies and assessment of construction vehicle access arrangements to these yards within Sector 9 is considered in the Technical Report G.16: *Assessment of Temporary Traffic Effects* (July 2010), whilst the wider operational effects of construction traffic are considered in **Section 6.3** of this report.

Construction vehicle access will generally be provided from Richardson Road to the Sector 9 yards in the early stages of the works. However, once the Richardson Road Bridge is completed, it will be possible for construction vehicles to access the yards using an access road through the Maioro Street Interchange connecting with temporary 'site entry only' and 'site exit only' ramps off SH20.

It is also noted that site access is proposed to yards within the Alan Wood Reserve off Hendon Avenue. Hendon Avenue has direct residential property access and also provides access to a number of other residential streets, as described in **Section 4.3.1**. The road is a two lane, two directional road lined with trees, with a 50km/hr speed limit and parking is generally permitted on the road. To reduce the effects on Hendon Avenue and its residents, it is suggested that Hendon Avenue is not used as a 'main' access and that further consideration be given to minimising direct construction vehicle access off Hendon Avenue through the further refinement and development of the traffic management measures.

The construction of the southern portal and SH20 motorway through the Alan Wood Reserve and Hendon Park will have effects on the existing users of the reserves and limit public access to these reserves for a time. However, it is considered that appropriate construction management measures can be implemented to manage the effects on existing users, and the completion of the Project will ultimately establish improved connections between the surrounding residential communities with the improved pedestrian and cycle connections.

Richardson Road Bridge Works

Work on the Richardson Road bridge will be undertaken in two phases of realignments with associated lane and shoulder narrowing. In the first phase, Richardson Road will be realigned to the west to allow completion of the new bridge, following which Richardson Road will be realigned to the new bridge for completion of the works.

The existing number of lanes on Richardson Road will remain operational throughout works, which will minimise the effects on traffic using Richardson Road. This includes existing bus services, which with the retention of the existing two lanes, would not need to be diverted. The narrowing of lanes and associated speed limit reductions with the traffic management measures will result in additional delays for traffic on Richardson Road during the twelve month period of the works. Narrower lanes and lower speed limits will generally result in lower speeds through or past works areas with a reduction of capacity. The term “generally” has been used because it is recognised that effects will be different for different periods of the day and different for the stages of the construction, and the various traffic management plans being implemented. Overall it is considered that the various construction traffic management plans will be tailored to minimise or mitigate the effects for the various periods of the day and stages of construction on Richardson Road.

At certain stages of the works lane closures will be required on Richardson Road. Given the potential adverse effects of these lane closures, it is considered that these works would need to be undertaken at night time to minimise the effects, such that they would be no more than minor.

Pedestrian and cycle access across along Richardson Road should be maintained throughout the works, as part of the traffic management measures, otherwise long diversions would be required for pedestrians and cyclists currently using Richardson Road.

The existing northbound and southbound bus stops on Richardson Road (see **Figure 4-16**), just north of Valonia Street will need to be temporarily relocated during the construction works. It is anticipated that northbound bus stop could be relocated to the south and the southbound bus stop relocated to the north. As part of the further development of the traffic management measures, further discussions would be required with ARTA and bus service operators relating to the relocation of these bus stops at the various stages of the works. The bus stops would be fully reinstated following completion of the construction works on Richardson Road.

The Richardson Road Bridge works also have effects on the existing on-street parking and access to Valonia Street, which will be realigned as part of the Project works. It is considered that effects of the reduction in parking on Richardson Road and Valonia Street during construction will be less than minor. It is likely that access to Valonia Street off Richardson Road could be maintained during the works. However, should this not be possible at any stage, alternative diversion routes could be provided as part of the traffic management measures, which would have less than minor effects on access to Valonia Street.

On the basis of the above, it is considered that with the development of appropriate traffic management measures, the Richardson Road Bridge works could generally be undertaken with no more than minor effects on the adjacent transport network, other than in some relatively short periods.

SH20 Pedestrian / cycle way Works

The construction of the SH20 Pedestrian / cycle way through the Alan Wood Reserve and Hendon Park, including the Hendon Park pedestrian / cycle way bridge, and on toward the Maiero Street Interchange along the SH20 motorway alignment will be off-line from existing transport facilities. As discussed in relation to the SH20 motorway works, the work within the reserves and park will have effects on the existing users and limit public access for a short time. However, it is considered that appropriate construction management measures can be implemented to manage the effects on existing users and the completion of the works will establish improved connections between surrounding residential communities. As such, the works are considered to have negligible effects on the surrounding transport network.

6.3 Wider Traffic Effects

Due to the location of the construction works and the associated construction yards, construction vehicle access to these yards can largely be undertaken using the existing State highway network. A summary of the potential vehicle routing associated with access to these yards is described in the following section. The wider effects on the road network of the currently anticipated construction traffic generated by the works associated is also considered.

6.3.1 Construction Vehicle Routing

As discussed in **Section 6.1.3**, there are 12 construction yards proposed along the route of the Waterview Connection Project. The following section considers the potential routing. Specific origins/destinations and routing of construction vehicles accessing these construction yards are not known at this stage and would not be identified until appointment of a contractor (s).

Within all sectors, construction traffic, particularly HCVs, should be able to use State highways (SH16, SH20, SH18 and SH1) for the majority of their routes to gain access to the construction yards and works areas. Where the local road network will be used this is discussed below. The Technical Report G.16: *Assessment of Temporary Traffic Effects* (July 2010) provides a more detailed assessment of the potential traffic management methodologies and techniques that may be implemented by the contractor (or contractors) to manage access to the construction yards.

It is acknowledged that construction workers are more likely to utilise the arterial road network, but it is considered that a proportion of these workers could in any event be anticipated to be travelling on these parts of the road network as part of general economic activities and construction works across the region.

As discussed previously, all construction yards are anticipated to operate during the daytime from 6:00 to 19:00 (Monday to Saturday) and on Sunday (for receipt of materials and plant), as well as throughout the night time at some yards or at certain times at night at other yards. It is anticipated that access for HCVs and changes in shifts for workers would be managed to avoid the road network peak periods on these arterial roads, where possible, reducing the effects on these arterial roads. However, in certain circumstances, access

for both HCVs and construction workers during the peak periods will be unavoidable and will have adverse effects on these arterial roads.

Sector 1 – Te Atatu Interchange to Sector 6 – SH16 to St Lukes

Construction vehicle access to the construction yards associated with Sector 1 to 6 could generally be achieved using the State highway network, particularly SH16, SH1 and SH18.

The construction yards located at Te Atatu Interchange (Harbourview–Orangihina Park), Patiki Road, Waterview Park and Meola Creek will require access off the local road network. However, vehicle access to each of these yards can be achieved using regional or district arterial roads (Te Atatu Road, Patiki Road and Great North Road), which would be considered satisfactory for construction vehicles, including HCVs.

It is noted that the Overdimension Vehicle Route Maps published by the NZTA identify that the State highway and the sections of Great North Road and Patiki Road providing access to the construction yards at Patiki Road, Waterview Park and Meola Creek are suitable for overdimension vehicles.

Sector 7 – Great North Road Underpass to Sector 9 – Alan Wood Reserve

Within Sectors 7, 8 and 9, construction vehicle access to the construction yards associated with these sectors would primarily be achieved using routes via the State highway network, SH16 via the Great North Road Interchange and SH20 via the future half diamond interchange at Maoro Street.

To access the construction yards at Oakley Creek Reserve, as well as within the Alan Wood Reserve and Hendon Park, construction vehicles would need to use the local road network from either of the above State highways. Construction vehicle use of Great North Road has been discussed above. It is considered that the various construction traffic management plans will be tailored to minimise or mitigate the effects for the various periods of the day and stages of construction.

Construction vehicles using SH20 to access yards in the Alan Wood Reserve and Hendon Park have currently been identified to use access off Richardson Road or Hendon Avenue in the early stages of the construction works, but following the completion of the Richardson Road they could access these yards directly off SH20, as described in **Section 6.2.6**. Richardson Road is identified as a district arterial road and is considered satisfactory for construction vehicles, including HCVs. Whilst not identified on the NZTA Overdimension Vehicle Route Maps, Richardson Road is identified on ACC's Overdimension Route map.

As discussed in **Section 6.2.6**, access to construction yards in the Alan Wood Reserve access is currently identified off Hendon Avenue. However, given the nature and character of Hendon Avenue, it is suggested that Hendon Avenue is not used as a 'main' access for these construction yards and that further consideration be given to minimising direct construction vehicle access off Hendon Avenue through the further refinement and development of the traffic management measures.

6.3.2 Construction Traffic Effects

As discussed previously, given the current stage of the Project, details relating to the number and routing (origin/destination) of construction vehicles associated with the various stages of the construction cannot be specifically defined. This information would not be available until a contractor (s) has been appointed.

However, indicative estimates of the potential daily construction traffic (including HCVs and workers) on the strategic (State highway) and the arterial road network have been derived, based on the currently anticipated works across the Project. Based on the currently anticipated works programme, this has considered the daily construction worker and HCV movements at each of the construction yards or works areas at the various stages of construction (month by month).

Whilst more intensive periods of daily construction vehicle movements would occur in individual parts of the Project at certain stages, this approach is considered to provide an overall approximation of the 'peak' period of daily vehicle movements for concurrent works across the Project. The estimated daily construction vehicle movements in this 'peak' period is summarised in **Table 6-1**.

**Table 6-1: Estimated Daily Construction Vehicle Movements across Project in 'Peak' Period
(Two-Way Vehicle Movements)**

Car & Light Vehicle Movements	HCV Movements	Total Vehicle Movements
3,770	3,420	7,190

In order to assess the potential effects of these daily construction traffic predictions during the 'peak' period for concurrent construction works across the Project, the predicted daily traffic flows in 2014 across the road network within the wider Project area have been identified from the project assignment traffic model. These 2014 daily traffic volumes represent a road network during the current construction programme period. The predicted daily traffic flows across this area, have been derived on the basis of the two cordons, shown on **Figure 6-2** and **Figure 6-3** for the State highway and arterial road networks, being around the northern and southern parts of the wider Project area respectively.

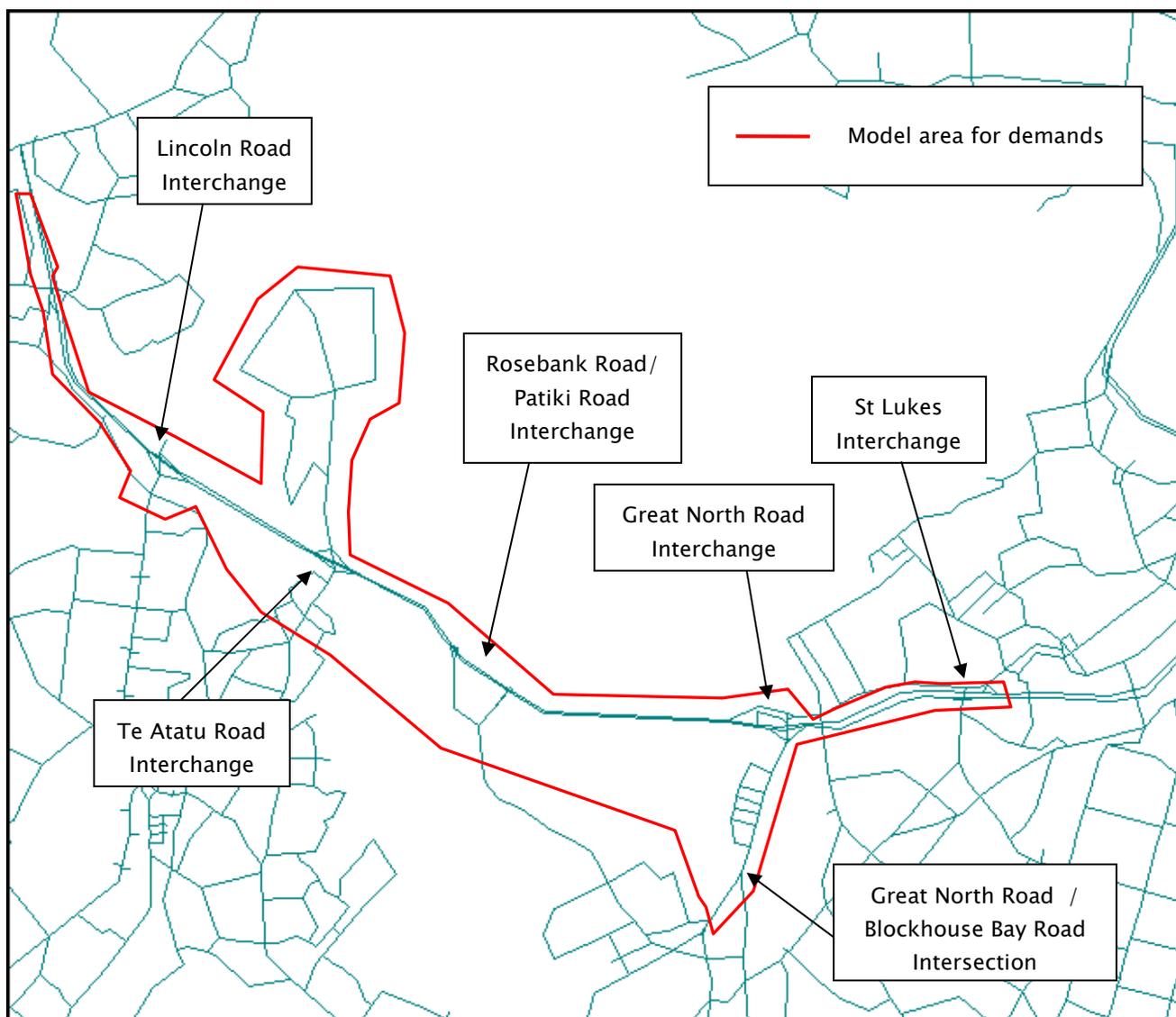


Figure 6-2: 2014 Project Assignment Traffic Model - Northern Daily Traffic Cordon

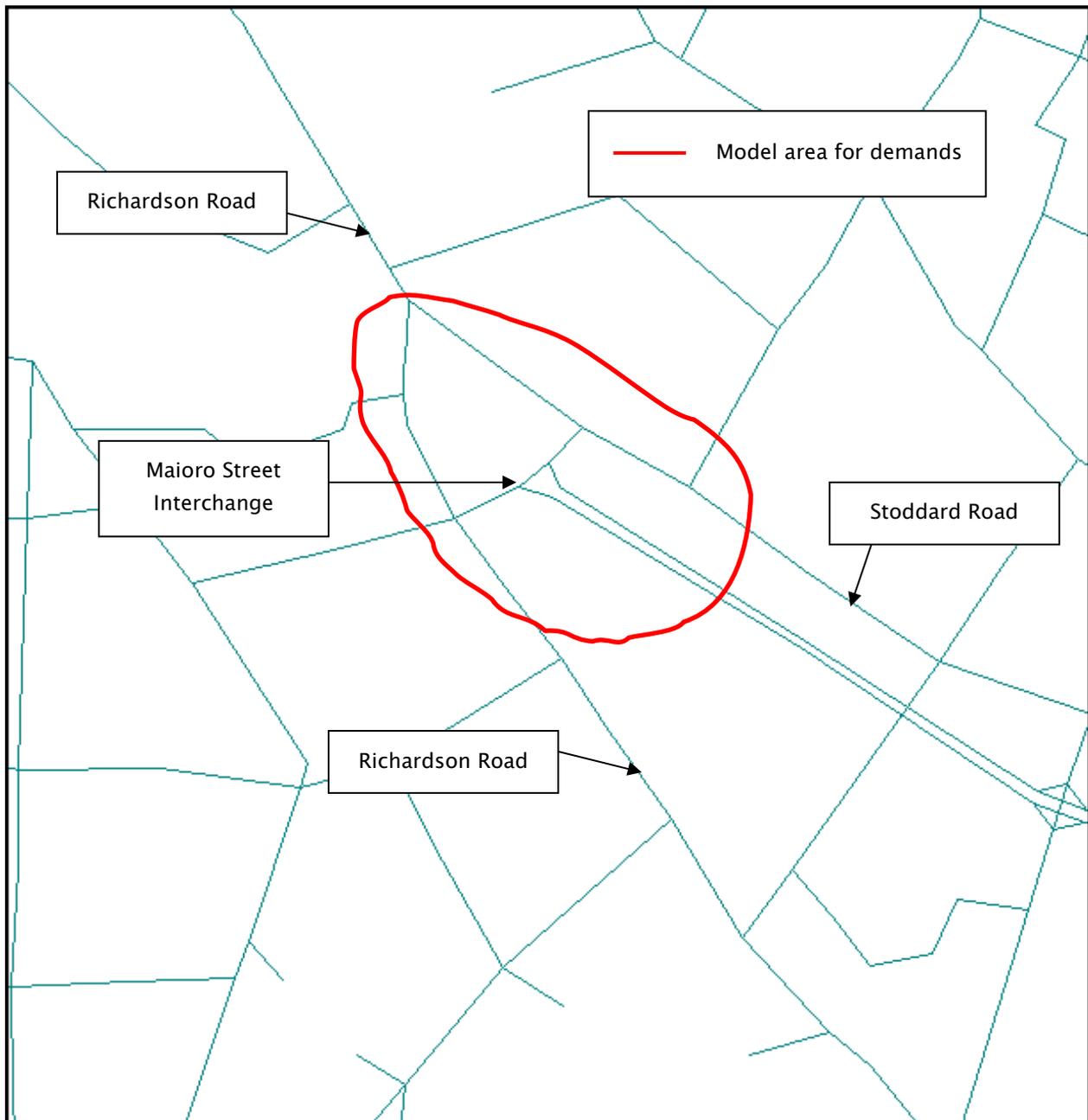


Figure 6-3: 2014 Project Assignment Traffic Model – Southern Daily Traffic Cordon

Table 6-2 provides a summary of the 2014 future daily traffic predictions associated with the defined cordon areas, with both cordons combined. This has been provided in a matrix of four types of traffic flows within and through the two cordon areas; internal-internal (within cordon area), internal-external (exiting cordon area), external-internal (entering cordon area), and external-external (passing through cordon area). It is considered that using only the external-external movements from this matrix would provide a reasonable approximation for traffic flows using the State highway or arterial road network to travel through these two

cordon areas between external points, i.e. for the road networks on which the construction vehicle movements are anticipated to occur.

Table 6–2: 2014 Model – Daily Traffic Flow Matrix for Cordon Areas

	External	Internal	Total
External	319,710	33,311	353,021
Internal	33,229	6,670	39,899
Total	352,938	39,981	392,919

As can be seen from **Table 6–2**, around 320,000 external–external daily traffic movements are predicted to occur through the two cordon areas in the 2014 future year. By comparison, the daily construction traffic of approximately 7,200 vehicle movements associated with the concurrent construction works across the Project in a ‘peak’ period would represent an increase of approximately 2–3% in daily traffic flows.

Whilst construction vehicle movements are predicted to result in a relatively minor increase in daily traffic flows across these cordon areas around the Project, as has been discussed in **Section 6.2**, various construction traffic management plans will need to be tailored to minimise or mitigate the effects for the various periods of the day and stages of construction with regards to the provision of construction vehicle access to the identified construction yards.

6.4 Summary of Effects and Mitigation Measures

This section has identified the anticipated effects on the pedestrian, cycle, passenger transport and road networks of the Project construction. On this basis, any necessary measures to avoid, remedy or mitigate these effects have been generally identified, where appropriate, such that a suitable package of measures can be taken forward to manage the environmental effects of the construction activities.

The Technical Report G.16: *Assessment of Temporary Traffic Effects* provides a more detailed assessment of the potential traffic management methodologies and techniques that may be implemented by the contractor (or contractors) to manage the operation of the transport network in the vicinity of the proposed works and around the currently identified construction yards, including access to these yards. Construction yard access will be designed and managed to minimise the effect on the road network.

Given the current stage of the Project, the methodologies and management techniques associated with the construction works will undergo further development. Moreover, once the Project has been awarded and a contractor (s) is in place, the methodology will be further refined and developed. The traffic management measures will be undertaken in accordance with the Code of Practice for Temporary Traffic Management (CoPTTM). Site-Specific Traffic Management Plans (SSTMP) will also be required for some construction works, such as night time works. The further refinement and development of the methodologies will require liaison and approvals of the measures by the relevant road controlling authorities.

In general, where construction works are undertaken on the State highway, motorway ramps and arterial roads, the existing number of traffic lanes on these roads would be retained during the construction works to reduce the effects of the works on general traffic and buses. As discussed previously, narrower lanes and lower speed limits will generally result in lower speeds through or past works areas. Vehicle headways will generally increase and these effects will result in a reduction of capacity. The term “generally” has been used because it is recognised that effects will be different for different periods of the day and different for the stages of the construction, and the various traffic management plans being implemented. Overall it is considered that the various construction traffic management plans will be tailored to minimise or mitigate the effects for the various periods of the day and stages of construction.

In combination with the removal of the bus shoulders on SH16 until the later stages of construction, this will affect on the operation of buses along SH16, particularly eastbound in the AM peak period. Ongoing communication will be required with ARTA, bus service operators and the general public to keep them informed of the effects of the construction works on bus services using SH16. However, in the longer term with the completion of the Project, there will be much improved bus facilities on SH16.

Similarly, the effects of the traffic management measures on Great North Road and Richardson Road is anticipated to result in the temporary relocation/removal of bus stops and delays to bus services, which will also require communication with ARTA and bus service operators.

In certain areas, lanes closures will be required and construction works will need to be undertaken at night time to mitigate the effects of the works. It is considered that in these cases, night time works with signed diversion routes would generally have no more than minor effects on the transport network.

It is considered that the works associated with the completion of the Northwestern Pedestrian / cycle way and SH20 Pedestrian / cycle way can be completed with no more than minor effects on the transport network. However, in certain areas around Patiki Road and Great North Road, particular measures have been identified to mitigate the effects so that they could be considered to be no more than minor. These will be detailed as part of the Construction Traffic Management plan.

As discussed above, it is recognised that the traffic management measures associated with the construction of the Project will have some adverse effects on the operation and facilities on the surrounding transport network. However, given the location of the works within an urban and State highway environment, this would be anticipated and, where possible, works have been taken off-line to reduce the potential effects.

In relation to the wider effects of the construction works, it is considered that vehicle routing to the construction yards and works areas can generally occur using State highways and arterial routes, which would be satisfactory for use by construction vehicles including HCVs. However, as discussed above, it is considered that further consideration be given to minimising direct construction vehicle access off Hendon Avenue through the further refinement and development of the traffic management measures.

Construction vehicle movements are predicted to result in a relatively minor increase in daily traffic flows across these cordon areas around the Project construction yards. Various construction traffic management plans will need to be tailored to minimise or mitigate the effects for the various periods of the day and stages

of construction with regards to the provision of construction vehicle access to the identified construction yards.

To assist in the process of the delivery of identified mitigation measures, and ensure that the Contractor (s) meet both the designation and resource consent requirements and the NZTA requirements, a Construction Environmental Management Plan (CEMP) has been prepared for the Project to manage the identified effects. This incorporates the assessments provided in this report and the Technical Report G.16: *Assessment of Temporary Traffic Effects* in order that the identified effects can be fully understood and appropriately managed.

The CEMP sets out the specific measures required to be put in place by the contractor(s) to manage actual and potential environmental effects during construction, based on the outcome of the AEE, the anticipated designation and consent requirements, and the NZTA's minimum environmental standards. The CEMP will be provided to each Contractor prior to works commencing. The Contractor will then be required to complete the CEMP (in accordance with any relevant conditions) for each specific package of work and submit to NZTA and the consenting authority for approval.

7. Summary and Conclusion

7.1 Report Summary

7.1.1 Background

In 2009 the NZTA confirmed its intention that the 'Waterview Connection Project' (the Project) would be lodged with the Environmental Protection Authority as a Proposal of National Significance. The Project includes works previously investigated and developed as two separate projects: being the SH16 Causeway Project and the SH20 Waterview Connection. The key elements of the Project are:

- Completing the Western Ring Route (which extends from Manukau to Albany via Waitakere);
- Improving resilience of the SH16 causeway between the Great North Road and Rosebank Interchanges to correct historic subsidence and "future proof" it against sea level rise;
- Providing increased capacity on the SH16 corridor (between the St Lukes and Te Atatu Interchanges);
- Providing a new section of SH20 (through a combination of surface and tunnelled road) between the Great North Road and Maioro Street Interchanges; and
- Providing a pedestrian / cycle way throughout the surface road elements of the Waterview Connection Project corridor.

A description of the Project including description of the provision for walking, cycling, passenger transport and the roading layout is provided in **Section 2** and a more comprehensive description of all aspects of the Project is provided in Part A Chapter 4 of the AEE.

Beca has been commissioned by NZTA to undertake a Transport Assessment to assess the potential effects of the works to be undertaken for the Project, which will inform the AEE for the Project. SKM has been commissioned to undertake an independent peer review of the traffic modelling and the Transport Assessment for the Project.

There are a number of technical reports, also prepared by Beca, which support, inform and supplement this Transport Assessment. These reports will be provided separately to this Transport Assessment, as part of the AEE, and are outlined in **Section 1.3**.

7.1.2 Methodology and Assessment Matters

The methodology for the Transport Assessment and the main assessment matters for consideration have been set out in **Section 3**. The preparation of this Transport Assessment has taken into consideration the guidance set out in the ARTA and NZTA documents for the preparation of Integrated Transport Assessments.

The key matters in relation to the assessment of the Project are considered to be the defined objectives for the Project (as set in the AEE), together with other regional and local policies, strategies, plans relevant to the transport context of this report. In particular, through the assessment process, this included consideration of the potential for the Project to assist in enabling other future regional and local transport opportunities, in line with the Project objectives.

Section 4 provides a detailed description of the transport environment within the Project study area. The existing and future transport environment has been considered both in this study area and across the wider region, where appropriate. This enables both the positive and any adverse effects of the Project to be assessed in the context of this transport environment.

7.1.3 Operational Assessment

The potential operational effects and the associated mitigation of the Project have been discussed in detail in **Section 5** including consideration of all transport modes, as well as the potential effects on property access and parking. The main findings of these assessments are summarised below.

Cycling and Walking

This report has identified that the Project will directly complement future pedestrian and cycling connections at both a regional and local level, as identified in the relevant ARTA, Auckland City Council (ACC) and Waitakere City Council (WCC) plans and strategies. In the case of a number of arterial routes across the Project area, it is considered that the Project would also assist in enabling opportunities for delivery of these plans and strategies, based on the predicted changes in traffic flows on these arterial roads.

The proposed SH20 Pedestrian / cycle way aligns well with intended future strategic and regional routes identified by ACC in its 20 year cycle network plan. The proposed route also complements other identified future cycling routes on north-south and east-west corridors within the ACC area, which will enhance connections between surrounding communities. The proposed enhancements and new facilities along the Northwestern Pedestrian / cycle way are considered to provide a more convenient, comfortable and reliable experience for either commuting or recreational cyclists and improve connections to the future cycling network in Waitakere.

The proposed facilities on both the SH20 Pedestrian / cycle way and Northwestern Pedestrian / cycle way can generally be provided in accordance with the Austroads recommended design guidelines for shared pedestrian/cycle paths. Although some short sections of the proposed pedestrian / cycle ways would be less than the recommended shared path width, the proposed provision would still provide facilities in accordance with the guidelines.

In relation to the proposals for both the Northwestern Pedestrian / cycle way and the SH20 Pedestrian / cycle way, a number of opportunities for further enhancements to the proposals have been identified through the assessment of effects.

Passenger Transport

The Project proposals will almost double the existing bus shoulder provision along the section of SH16 between Te Atatu Road Interchange and Great North Road Interchange. The more continuous provision of bus shoulders along SH16 is anticipated to provide significant benefits to the operation of peak direction buses, particularly when combined with bus shoulder provision further to the west on SH16. The Project is also expected to contribute to enabling future opportunities for improvements to passenger transport provision, particularly bus services, on arterial roads primarily with regard to the future Quality Transit Network (QTN).

Provision has been included within the Waterview Connection Project to allow for the future expansion of the RTN by ARTA and associated stakeholders, as a separate project, by facilitating a corridor for the future Avondale – Southdown Rail Line. In designing structures over the SH20 alignment, specification has included the opportunity for the future Avondale – Southdown Rail Line.

The Project is considered to enable future opportunities for improvements to passenger transport provision, particularly bus services, on arterial roads primarily with regard to the future QTN including Great North Road and the Mt Albert Road / Carrington Road corridor. On both QTN routes, with the predicted improvements in travel times and traffic flow reductions with the Project, greater reliability of QTN services along these routes may be able to be achieved following the completion of the Project.

Travel times on Te Atatu Road in both directions are predicted to increase with the Project, although it is noted that this is based on all traffic (not buses) without accounting specifically for future bus priority measures along in this road. The proposed improvements at the Te Atatu Interchange include bus priority measures for buses using the east facing ramps and the Project proposals will be complemented by future improvements to the prioritised Te Atatu Road corridor, as part of the Auckland Regional Arterial Road Plan.

Traffic

The assessment of the wider State highway effects has indicated that the completion of the SH20 section of the Project will result in a shift of traffic from the SH1 corridor to the SH20 corridor. Moreover, the assessment of the sector–sector travel indicates that the Project would provide for access to and between centres of future economic development across the region. The assessments also indicate that there would be benefits of the Project in separating through and local traffic to improve the efficiency and local function of these respective parts of the transport network.

The Project will provide significant improvements in the lane capacity along SH16 in both the eastbound and westbound directions. This is also predicted to result in significant increase in traffic flows in the peak eastbound and westbound directions in the AM and PM peak periods respectively. Between 2006 and 2026, ten years after the opening of the Project, traffic flows on SH16 eastbound are anticipated to increase by around 25%. In the westbound direction, during the evening peak period, traffic flows in 2016 and 2026 with the Project are predicted to increase by approximately 20–25% and 35% respectively compared with 2006.

During the morning period, eastbound travel times on SH16 are anticipated to improve with the completion of the Project in 2016 compared with 2006, although the operational model observations indicate that queuing would still be anticipated from east of St Lukes Interchange toward the Great North Road Interchange. By 2026, ten years after opening, eastbound travel times are predicted to increase compared to 2016 with the Project, but are still anticipated to be improved compared with the 2006 baseline.

Westbound on SH16 in the evening peak period, queuing is observed to extend back from the approach to the Te Atatu westbound off ramp to west of the Great North Road Interchange westbound on ramps in 2016 with the Project with similar travel times predicted as in 2006. Ten years after opening, greater queuing and increases in travel times are predicted during the PM peak period from Te Atatu Interchange back to the Great North Road Interchange and along the SH20–SH16 westbound on ramp. It is therefore recommended that a tunnel management plan or strategy is considered to manage the northbound traffic flows on SH20 through the tunnel during any affected period.

Other than the predicted effects associated with the SH16 westbound queuing during the PM peak period in 2026, SH20 is generally observed to operate satisfactorily in both the northbound and southbound directions. Some slow moving traffic and platooning is observed to occur on the southbound exit to the tunnel, but this is not observed to result in queuing back into the tunnel.

It is considered that with the opportunity for the corridor improvements planned by WCC along Te Atatu Road to complement the improvements to the interchange, particularly for High Occupancy Vehicles (HOV) and buses, the prioritised corridor improvements identified in the Regional Arterial Road Plan should be progressed in parallel with this Project.

The identified reductions in traffic flows and travel times on Great North Road should also assist in the development of the prioritised corridor management plan, as part of Regional Arterial Road Plan projects. The predicted traffic flow reductions should also complement the Carrington Road / Mt Albert Road corridor plan identified in the Regional Arterial Road Plan. In both cases, this would assist in providing for a range of transport opportunities for connections between centres along these corridors.

Because of the extra traffic accommodated by the Project and constraints on the feeder roads, some queuing is expected around the interchanges. Whilst it is considered this may be reduced with further refinement to the optimisation and coordination at the surrounding intersections, without compromising the operational performance of the interchanges or the State highway, management plans for accommodating this possibility should be developed. In relation to St Lukes Interchange, it is noted that NZTA is already progressing a separate study to consider improvements to this Interchange.

Reductions in daily Heavy Commercial Vehicle (HCV) traffic flows and the HCV vehicle kilometres travelled on arterial and local roads are predicted with the Project, in line with the overall reduction in total traffic using these roads. It is considered that this would be primarily associated with the opportunity for HCVs to use SH20 or SH16 as strategic freight routes. This is demonstrated in the predicted percentage increase in the daily vehicle kilometres travelled by HCVs on motorways in both the study area and across the Auckland region with an associated reduction in percentage of HCVs travelling on local arterial roads.

In summary, the SH16 and SH20 corridors assessed in the operational models are expected to accommodate up to 25% and 35% more AM and PM peak hour traffic in 2026 with the Project respectively, compared with the 2006 baseline, such that the overall performance is broadly similar. During the morning peak in 2026, the performance is observed to be improved in the eastbound peak direction, whilst in the westbound direction during the evening peak the performance of the SH16 corridor is not materially different, when compared with the 2006 baseline.

7.1.4 Construction Assessment

Section 6 identified the anticipated effects on the pedestrian, cycle, passenger transport and road networks of the Project construction. If not appropriately managed the traffic associated with the construction of the Project would have some potentially adverse effects on the operation and facilities on the surrounding transport network. In this regard the Construction Environmental Management Plan (CEMP) has been prepared for the Project to mitigate these effects, which will be provided to each Contractor prior to works commencing. The CEMP will assist in the process of the delivery of identified mitigation measures, and ensure that the Contractor(s) meet both the designation resource consent requirements and the NZTA requirements.

In general, where construction works are undertaken on the State highway, motorway ramps and arterial roads the existing number of traffic lanes on these roads would be retained during the construction works to reduce the effects of the works on general traffic and buses. The implementation of the traffic management measures including narrower lanes/shoulders and reduced speed limits is anticipated. Narrower lanes and lower speed limits will generally result in lower speeds through or past works areas. Vehicle headways will generally increase and these effects will result in a reduction of capacity. The term “generally” has been used because it is recognised that effects will be different for different periods of the day and different for the stages of the construction, and the various traffic management plans being implemented. Overall it is considered that the various construction traffic management plans will be tailored to minimise or mitigate the effects for the various periods of the day and stages of construction.

In combination with the removal of the bus shoulders on SH16 until the later stages of construction, this will have adverse effects on the operation of buses along SH16, particularly eastbound in the AM peak period. Ongoing communication will be required with ARTA, bus service operators and the general public to keep them informed of the effects of the construction works on bus services using SH16. However, in the longer term with the completion of the Project, there will be much improved bus facilities on SH16.

Similarly, the effects of the traffic management measures on Great North Road and Richardson Road is anticipated to result in the temporary relocation/removal of bus stops and delays to bus services, which will also require communication with ARTA and bus service operators.

The realignment of the Valonia Street / Richardson Road intersection would result in the loss of some on-street parking on the eastern and western sides of Richardson Road in the vicinity of the existing intersection. Consequently, in combination, it is considered that the effects of the Project in this area on the existing on-street parking would be negligible.

In certain areas, lanes closures will be required and construction works will need to be undertaken at night time to mitigate the effects of the works. It is considered that in these cases, night time works with signed diversion routes would generally have no more than minor effects on the transport network.

It is considered that the works associated with the upgrade of the Northwestern Pedestrian / cycle way and SH20 Pedestrian / cycle way can be completed with no more than minor effects on the transport network. However, in certain areas of Patiki Road and Great North Road, particular measures have been identified to mitigate the effects, such that they could be considered to be no more than minor. These will be detailed as part of the Construction Traffic Management plan.

It is recognised that the traffic management measures associated with the construction of the Project would have some effects on the operation and facilities on the surrounding transport network. However, given the location of the works within an urban and State highway environment this would be anticipated and it is considered that the various construction traffic management plans will be tailored to minimise or mitigate the effects for the various periods of the day and stages of construction..

In relation to the wider effects of the construction works, it is considered that vehicle routing to the construction yards and works areas can generally occur using State highways and arterial routes, which would be satisfactory for use by construction vehicles including HCVs. However, it is considered that further consideration be given to minimising direct construction vehicle access off Hendon Avenue through the further refinement and development of the traffic management measures.

Given the current stage of the Project, the methodologies and management techniques associated with the construction works will undergo further development. Moreover, once the Project has been awarded and a contractor (s) is in place, the methodology will be further refined and developed.

To assist in the process of the delivery of identified mitigation measures, and ensure that the Contractor (s) meet both the resource consent requirements and the NZTA requirements, a CEMP has been prepared for the Project. The CEMP will be provided to each Contractor prior to works commencing. The Contractor will then be required to complete the CEMP (in accordance with any relevant conditions) for each specific package of work and submit to NZTA and the consenting authority for approval.

7.2 Conclusions

It is considered that the Waterview Connection Project will provide significant transport infrastructure that will support the Auckland Regional Growth Strategy by achieving objectives of the Auckland Regional Land Transport Strategy (RLTS) 2010. The RLTS identifies continued investment to complete the agreed strategic roading system, including giving greater attention to improving the efficiency of the network of arterial roads, and emphasis for improvements to passenger transport, walking and cycling. The specific road network capacity improvements sought in the RLTS 2010 includes completion of the WRR.

The Project is considered to provide opportunities to enable the Auckland Passenger Transport Network Plan and the Regional Arterial Road Plan and the Auckland Regional Freight Strategy, in terms of both strategic rail

and road freight networks. In particular, the proposed bus shoulders on SH16 will significantly improve peak period bus journey times on this identified QTN route within the PTNP.

The effects of the Project on the transport network are also considered to provide opportunities for delivery of local transport plans and strategies, such as the ACC Liveable Arterials Plan, the ACC Future Planning Framework and the identified future walking and cycling networks in the ACC and WCC areas. The proposed connections and enhancements associated with the Northwestern and the SH20 Pedestrian / cycle ways are considered to improve pedestrian and cycle accessibility between communities.

It is considered that the Project will improve the capacity of the SH16 corridor, provide an alternative to SH1 along the completed SH20 corridor and provide for access to and between centres of future economic development across the region. This will significantly improve the accessibility and connectivity of the motorway system across the majority of the day and generally provide benefits to the wider local arterial road network. During the weekday peak periods, given the associated increases in traffic on the corridor and the associated constraints on feeder roads, the overall performance on SH16 is expected to be only marginally better than the 2006 baseline, albeit accommodating substantially more traffic.

It is recommended that particular consideration is given to preparation of a tunnel management plan or strategy to manage northbound traffic on SH20 through the tunnel by 2026, to progressing the prioritised corridor improvements along Te Atatu Road identified in the Regional Arterial Road Plan in parallel with this Project and to preparation of management plans for accommodating the possibility of increased queuing at some locations. In relation to St Lukes Interchange, it is noted that NZTA is already progressing a separate study to consider improvements to this Interchange.

The traffic management measures associated with the construction of the Project will have some adverse effects on the operation and facilities on the surrounding transport network. In this regard the CEMP has been prepared for the Project to minimise or mitigate these effects, which will be provided to each Contractor prior to works commencing. The CEMP will assist in the process of the delivery of identified mitigation measures, and ensure that the Contractor (s) meet both the designation resource consent requirements and the NZTA requirements.

On this basis, it is considered that the Transport Assessment demonstrates that the proposed Waterview Connection Project and the identified mitigation measures will be consistent with the following objectives for the Project:

- To contribute to the region's critical transport infrastructure and its land use and transport strategies by connecting SH16 and SH20 and completing the WRR and by improving the capacity of SH16;
- To improve accessibility for individuals and businesses and support regional economic growth and productivity by improving access to and between centres of future economic development;
- To improve resilience and reliability of the State highway network by providing an alternative to the existing SH1 corridor through Auckland that links the northern, western and southern parts of Auckland;

- To support mobility and modal choices within the wider Auckland Region by providing opportunities for improved public transport, cycling and walking, and protecting opportunities for future passenger transport development (e.g. rail); and
- To improve the connectivity and efficiency of the transport network by separating through traffic from local traffic within the wider SH20 corridor.

APPENDIX A – EXTRACT FROM AUCKLAND CITY
LIVEABLE ARTERIALS PLAN

APPENDIX B – EXISTING ENVIRONMENT MOVEMENT MAPS

APPENDIX C – PROJECT ASSIGNMENT MODEL
'DO MINIMUM' NETWORK ASSUMPTIONS