Peka Peka to North Ōtaki Expressway
Integrated Transport Assessment

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Integrated Transport Assessment

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Contents

Executive Summary ..... **v**

1 Introduction **9**
1.1 Roads of National Significance 9
1.2 Project Definition and Objectives 10
1.3 Background and Previous Studies 11

2 Transportation Context **15**
2.1 Current Land-Use Patterns 15
2.2 Transport Infrastructure 17
2.3 Transport Services 17
2.4 Travel to Work 18
2.5 Shopping in Ōtaki 20
2.6 Future Land Use & Growth 20
2.7 Do Minimum Transport Network 22
2.8 Current & Future Traffic Flows 22
2.9 Current and Future Pedestrian and Cyclist Travel Demand 31
2.10 Road Safety 34

3 Modelling Approach **39**
3.1 Modelling Methodology 39
3.2 Assumptions 40

4 Existing and Future Traffic Demand **45**
4.1 Existing Motor Vehicle Trip Origins and Destinations 45
4.2 Existing and Future Traffic Flow 45
4.3 Summary of Existing and Future Traffic Demand 49

5 Project Description **51**
5.1 Expressway Alignment 51
5.2 NIMT 51
5.3 State highway 1 at Mary Crest 51
5.4 Form and Spacing of Expressway Interchanges 53

6 Forecast Traffic Reassignment and Travel Time Effects **55**
6.1 Traffic Flow Forecasts 55
6.2 State Highway Performance 61
6.3 Peka Peka Interchange 65
6.4 Travel Time Forecasts 67
6.5 Northbound Expressway Merge: North of Ōtaki 70
6.6 Summary of Forecast Traffic Reassignment and Travel Time Effects 71

7 Expressway and Local Road Traffic Connectivity **73**

7.1 Local Road and Interchange Performance 73
7.2 Route Security 81
7.3 Summary of Expressway and Local Road Traffic Connectivity 81

8 Effect on Passenger Transport Users 83
8.1 Mode Choice Effects 83

9 Effect on Pedestrians, Cyclists and Equestrians 85
9.1 Effect on North-South Journeys along the Existing SH1 86
9.2 Across the Transport Corridor 89
9.3 Amenity in Ōtaki Retail/Railway Precinct Area 92
9.4 Summary of Pedestrian, Cyclist and Equestrian Effects 93

10 Road Safety Effects 95
10.1 Level Crossings 95
10.2 Summary of Road Safety Effects 96

11 Property Access Effects 97
11.1 Distance and Travel Time 97
11.2 Emergency Services Access 98
11.3 Summary of Project Access Effects 98

12 Transport Effects during Construction 99
12.2 Assumed Construction Method 99
12.3 Site Access 101
12.4 Worker Arrivals and Departures - Light Vehicles 101
12.5 Movement of Construction Materials - Heavy Commercial Vehicles 102
12.6 Traffic Effect of additional HCVs 105
12.7 Safety Effect of additional HCVs 106
12.8 Bridge Construction Staging as Road Safety Mitigation 109
12.9 Temporary Speed Restriction on SH1 Traffic as Mitigation 112
12.10 Temporary Warning Signs as Mitigation 112
12.11 Over-dimension Loads 113
12.12 Rahui Road Rail Bridge 114
12.13 Effect of Construction Activity on PT and Non-Motorised Road Users 114
12.14 Summary and Proposed Mitigation 115

13 Summary & Recommendations 117
13.1 Summary of Effects 117
13.2 Objectives 118
13.3 Possible Mitigation 120

Appendices

Appendix A – Ōtaki Traffic and Transportation Report
Appendix B – SH1 Crash History for Project Area (1st of January 2007 and 31st December 2011)
Appendix C – Kāpiti Traffic Model (KTM) 2.1 – Base and Forecast Models (including Peer Review)
Appendix D – Do Minimum Sidra Intersection Model Outputs
Appendix E – Peak Hour Traffic Flow Diagrams
Appendix F – Travel Time Variability Calculations
Appendix G – Option Sidra Intersection Model Outputs

Executive Summary

The Peka Peka to North Ōtaki Expressway ("Expressway" or "Project") is one of eight sections of the Wellington Northern Corridor which forms one of the Government's Roads of National Significance (RoNS). RoNS are part of the Government's strategy to unlock economic growth potential. Investment in the RoNS is expected to significantly improve access within and through New Zealand's largest cities and improve critical parts of our national freight and tourism routes. The Wellington Northern Corridor RoNS will improve journey times between Levin and Wellington Airport. The Project sets out to:

- enhance inter-regional and national economic growth and productivity;
- enhance efficiency and journey time reliability between and through Kāpiti District;
- enhance safety of travel on SH1;
- appropriately balance the competing functional requirements of inter-regional and local traffic movements; and
- facilitate others to provide modal choice opportunities.

Vehicle kilometres travelled in Wellington Region have shown consistent growth over the last 30-40 years. The Wellington Regional Land Transport Strategy 2010-40 (RLTS) notes that vehicle kilometres travelled has levelled off in the last 5 years and that this is primarily due to fuel price increases and the economic recession.

As noted in the RLTS, across the region, growth of 26 percent in the vehicle-kilometres travelled over the next 30 years is expected. As has been the case over the last 30 years, the number of heavy commercial vehicle (HCV) trips on SH1 is expected to grow faster than light vehicles.

Currently SH1 passes directly through the Ōtaki Railway Retail area. Delays caused by pedestrians crossing, motorists manoeuvring into on-street car parks or side roads slow traffic and make travel times unreliable. The current traffic flows in this location are inappropriate for the retail function of the street. SH1 also bisects the Te Horo community. Very few pedestrians or cyclists have been observed, with the exception of the Ōtaki urban area. The delays and perceived danger associated with crossing rural sections of the existing SH1 deters people from walking or cycling in the area.

This assessment shows that around Ōtaki traffic congestion is already observed at the start and end of weekends and, particularly around public holiday weekends. The high traffic flows on the existing SH1 make it difficult and unsafe for all road users including pedestrians, cyclists, equestrians and motorists to join or cross the SH1. This is highlighted by the high proportion (40%) of crashes in the last five years that occurred at SH1 intersections or private access points within the Project area. In the Project area, the southern part of SH1 currently has a three star KiwiRap rating while the northern portion of the Project area currently has a two star KiwiRap rating (where a five star rating is the best).

The Expressway provides an alternative route for inter-regional or inter-district traffic and enables the existing SH1 to function as a local arterial. It also allows inter-regional and inter-district traffic to avoid passing through populated areas. Traffic flows on the rural sections of the existing SH1 are forecast to reduce by 80% as a result of the Project. Reductions of more than 50% are forecast for the existing SH1 in the Ōtaki Railway Retail area. By having the existing SH1 and the Expressway there are alternative routes in case of natural hazards or road traffic accidents. The reduction in traffic on the existing SH1 will make crossing SH1 easier and improve access and connectivity within the Project area.

The Project will improve the connection between the existing SH1 and local side roads. Significant delays for motorists, pedestrians or cyclists travelling from side-roads such as School Road or Ōtaki Gorge Road are experienced at present and are forecast to deteriorate in future if nothing is done. The future delays are forecast to be of a magnitude that would encourage motorists to change their route (if possible), the time of travel or to take increased risks when joining the existing SH1. The Project significantly reduces the traffic flow on the existing SH1, making it easier and safer to join or cross it. This increases accessibility and is consistent with the principles of appropriate road hierarchy. This is a positive effect of the Project for local residents who will continue to use the existing SH1 once the Expressway is constructed.

The Project will reduce travel times for people travelling past Ōtaki by almost two minutes which corresponds to a 10 percent reduction in travel times through the Project area. This will improve the reliability and efficiency of inter-regional freight movements as well as improving access for other motorists to Wellington. Travel times for rail passengers and freight will also be reduced as a result of the improved rail re-alignment past the Otaki Railway Retail area.

The additional traffic associated with construction of the Expressway will affect the safe operation of the at-grade intersections between the existing SH1 with Ōtaki Gorge Road, Old Hautere Road and School Road. There are several ways to avoid or mitigate the safety problems associated with construction traffic. The successful contractor will need to determine, in collaboration with the road controlling authorities, which to progress.

The Project will have a significantly positive effect on road safety and result in an approximate 60 percent reduction in annual crash costs within the Project area. The cumulative travel time savings for all users of the Expressway will benefit the national, regional and local economy. The Project also results in the creation of an appropriate arterial road (existing SH1) for the local community as well as avoiding the possibility of crashes between motor vehicles and rail by providing grade separated local road connections across the NIMT at five of the eight existing level crossings.

With the adoption and implementation of the measures for mitigating transport effects during construction, it is considered that construction will have no more than minor effect upon the safe and efficient operation of the road network.

The objectives for the Project, as relevant to this transport assessment, are listed below with a summary of how the Project will contribute to meeting them. Sitting above these are a set of Wellington Northern Corridor RoNS-wide RMA objectives. Table 2 in Part A of the AEE shows how the Project objectives (below) relate to the RoNS-wide objectives. Part A also presents KiwiRail objectives for this project which are related to rail safety, efficiency and accessibility.

Enhance efficiency and journey time reliability from, to and through the Kāpiti District, Wellington's Central Business District, key industrial and employment centres, the port, airport and hospital (by developing and constructing a cost-optimised new State highway to expressway standards between Peka Peka and north of Otaki).

The Project will:

- reduce travel times through the Project area by approximately two minutes at peak hours on an average weekday;
- reduce the travel time unreliability associated with travel on weekends and holiday weekends; and
- provide a second highway route, built to a higher standard, thereby increasing resilience to natural hazards and providing a choice of routes in cases of a serious road traffic accident.

Enhance safety of travel on SH1 (by developing and constructing a cost-optimised new State highway to expressway standards between Peka Peka and north of Otaki).

The Project will:

- minimise or eliminate the number of severe or fatal head on crashes (currently 14% of crashes over the past 5 years); and
- significantly reduce the number and severity of crashes overall (including the existing SH1). The construction of the Expressway is expected to reduce the annual crash cost by 60 percent.

Appropriately balance the competing functional performance requirements of inter-regional and local traffic movements, and to facilitate others to provide modal choice opportunities, to enable local facilities and amenities in the Kāpiti Coast District to be efficiently accessed (by developing and constructing a cost-optimised new State highway to expressway standards between Peka Peka and north of Otaki).

The Project will:

- reserve the use of the existing SH1 for use by people making local trips within the Project area and within Kāpiti District;
- significantly reduce the traffic flow on the existing SH1, making it more conducive to non-motorised travel;
- moderately ease connectivity across the national transport corridor (NIMT and Expressway);
- significantly ease connectivity across the existing SH1; and
- make it significantly easier to access side roads and parking areas and cross the road in the existing SH1 in Ōtaki Railway Retail area.

Avoid, remedy or mitigate the immediate and long-term adverse social, cultural, land use and other environmental effects of the Project on the Kāpiti Coast District and its communities by, so far as reasonably practicable, through route and alignment selection, expressway design and conditions (by developing and constructing a cost-optimised new State highway to expressway standards between Peka Peka and north of Otaki).

The Project will:

- limit development pressures at Te Horo in accordance with KCDC and the Greater Ōtaki Community's land use aspirations (refer to the Ōtaki Vision);
- make access to the Ōtaki Retail Area during peak periods, including public holidays easier for visitors and residents by reducing the volume of traffic on existing SH1;
- safeguard the future ability to extend rail double tracking through the Project area; and
- avoid the possibility of crashes between motorvehicles and rail by providing grade separated local road connections instead of level crossings.

Be integrated into the form of Kāpiti Coast District by taking into account current and planned future land use and development in route and alignment selection, expressway design and conditions.

The Project will:

- support and highlight Ōtaki's function as one of Kāpiti District's three main centres and the functional centre of the Greater Ōtaki area;
- limit development pressures at Te Horo; in accordance with KCDC and the Greater Ōtaki Community's land use aspirations (refer to the Ōtaki Vision); and
- reduce severance by improving connectivity and accessibility of cross corridor and local movements across the existing SH1.

Efficiently serve Ōtaki and its future development by providing appropriate vehicle access and signage to and from the new expressway.

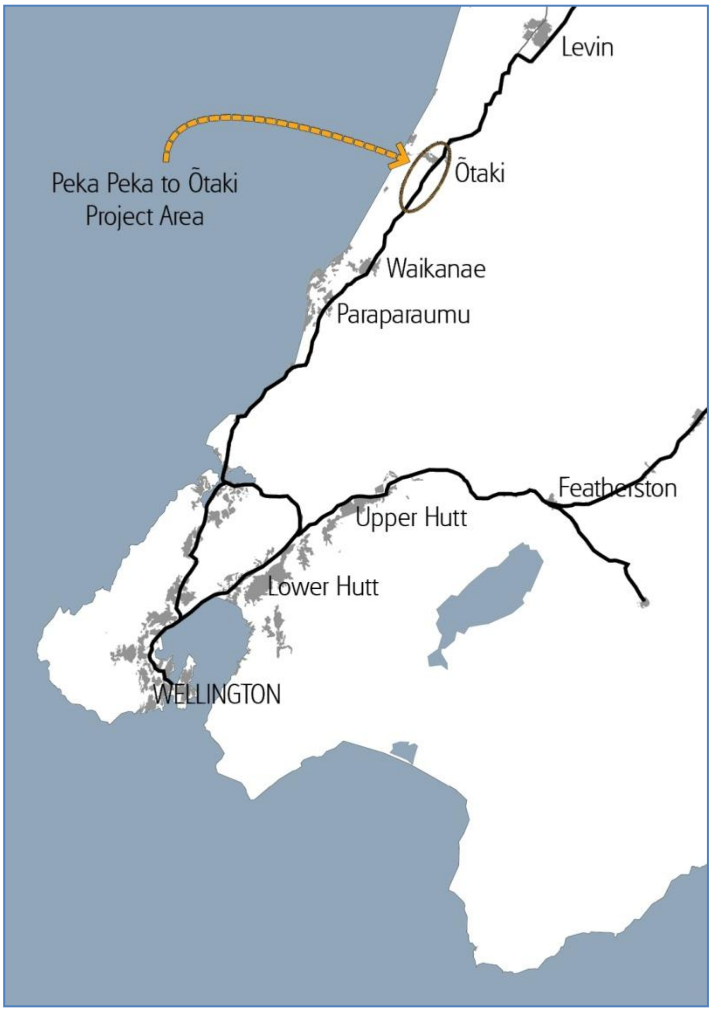
The Project will:

- through the half-interchanges at north and south Ōtaki, provide fast and efficient motor-vehicle access to and from Ōtaki without increasing travel distance; and
- provide Expressway users with advanced warning (i.e. advanced directional signing) on the approaches to Ōtaki.

1 Introduction

The Project area is located in Kāpiti Coast District; approximately 65 km north of Wellington (see Figure 1-1). The Project area stretches for 13km from Peka Peka Road in the south to Taylor's Road in the north. The Project area comprises a mix of land uses including rural, residential, industrial, commercial and horticultural. The area outside Ōtaki township is predominantly rural, with the Ōtaki economy relying largely on the farming communities.

Figure 1-1 - Scheme Location Plan



1.1 Roads of National Significance

State highway 1 (SH1) between Levin and Wellington Airport is one of seven Roads of National Significance (RoNS) which have been given top priority by the Government. The identification and development of the seven RoNS, including the Wellington Northern Corridor, is part of the Government's strategy to unlock economic growth potential. Investment in the RoNS is expected to significantly improve access within and through New Zealand's largest cities and improve critical parts of our national freight and tourism routes.

Key impacts the Government expects to achieve through investment in New Zealand's transport system in the next three years are:

- improvements in the provision of infrastructure and services that enhance transport efficiency and lower the cost of transportation through:
  - improvements in journey-time reliability;
  - easing of severe congestion;
  - more efficient freight supply chains;
  - better use of existing transport capacity;
- better access to markets, employment and areas that contribute to economic growth;
- a secure and resilient transport network; and
- reductions in deaths and serious injuries as a result of road crashes.

The Project is close to the northern end of the Wellington Northern Corridor road of national significance. The local area, regional functions to the north and New Zealand nationally have much to gain from the potential benefits the Project provides.

SH1 through the Kāpiti District is the major route in and out of Wellington and the lower North Island, linking the centres of Palmerston North, Wanganui and Levin with Wellington. The importance of an efficient highway corridor through this district has been highlighted in previous studies. Both the MacKays to Peka Peka and Peka Peka to Ōtaki sections of SH1 are in the first phase of projects within the Wellington Northern RoNS.

1.2 Project Definition and Objectives

The Expressway is just one segment of the proposed roading improvements along the Wellington Northern Corridor RoNS which will contribute to providing improved roading efficiency and encourage regional and national economic development.

The scope of the Project includes investigation of a new four lane Expressway between Taylors Road (north of Ōtaki) through to a connection with the proposed MacKays to Peka Peka Expressway (M2PP) in the south, (the Peka Peka interchange forms part of the M2PP Project scope). This is inclusive of changes to the Taylors Road intersection. The Project includes investigation of all associated elements including, local road connections, interface with the existing SH1 (new local arterial), railway realignment and associated environmental, urban and landscape design considerations.

The overall Project objective can be summarised as follows:

> *"To provide a modern 4-lane Expressway that will support economic development by providing a strategic arterial route to improve trip reliability and efficiency through the Wellington region, whilst providing legible connections to Ōtaki township, and providing for community connections across the corridor. The Expressway is to be integrated with the Ōtaki Vision and opportunities to enhance urban and landscape outcomes are to be explored."*

The objectives for the Project, as relevant to this transport assessment, are:

- To:
  - enhance inter-regional and national economic growth and productivity;

- enhance efficiency and journey time reliability from, to and through the Kāpiti District, Wellington's central business district, key industrial and employment centres, the port, airport and hospital;

- enhance safety of travel on SH1; and

- appropriately balance the competing functional performance requirements of inter-regional and local traffic movements, and to facilitate others to provide modal choice opportunities, to enable local facilities and amenities in the Kāpiti Coast District to be efficiently accessed;

by developing and constructing a cost-optimized new State highway to expressway standards between Peka Peka and north of Ōtaki.

- To manage the immediate and long-term social, cultural, land use and other environmental effects of the Project on the Kāpiti Coast District and its communities by, so far as reasonably practicable, avoiding, remedying or mitigating any adverse effects through route and alignment selection, Expressway design and conditions.
- To integrate the Expressway into the form of Kāpiti Coast District by taking into account current and planned future land use and development in route and alignment selection, Expressway design and conditions.
- To work with NZ Railways Corporation Ltd (KiwiRail) to achieve an integrated design for both the new Expressway and a realigned main trunk railway.; and
- To efficiently serve Ōtaki and its future development by providing appropriate vehicle access and signage to and from the Expressway.

KiwiRail's objectives for the Project are:

- to establish and maintain safe and efficient rail passenger transport services within the region by providing rail infrastructure and services;
- economic development and provide for the development of safe public transport services;
- allow for stations which are easily accessible and serve the needs for existing and future communities; and
- to achieve a connected and integrated transport network.

1.3 Background and Previous Studies

1.3.1 Previous Investigations

Past studies have shaped and informed the current work on this Project. These past studies are described below. Some deal with the need for transportation improvements and some also deal with the assessment of alternatives. There was further consideration of alternatives during the scheme assessment addendum completed by Opus in 2012.

Strategy and Scheme Assessment Reports by Meritec (1998 - 2003)

In 1998, Transit NZ (now the NZ Transport Agency) commissioned Meritec to determine the most appropriate route and development options for SH1 between Himitangi and Waikanae. The Strategic Study report was presented in September 2000 and recommended a four lane highway in the existing transport corridor between Levin and

Waikanae. The study also recommended that the proposed strategy was publicised and presented to the Kāpiti Coast District Council, Horowhenua District Council, community boards and other interested parties before confirmation of the strategy.

In 2002, as part of the same contract, Meritec completed a Scheme Assessment Report (SAR) for the section between North Ōtaki and Peka Peka Road. The report was presented as two parts comprising the Ōtaki Bypass and Te Horo Expressway. Six route options and combinations of sub-options were presented.

In 2003, following consultation and further investigation into an alternative route for the Ōtaki Bypass (Te Waka Road route), the Transit NZ Board adopted an Eastern alignment for both parts of the Project. The Board chose not to designate the route at that time due to funding constraints.

Western Corridor Study by Maunsell Ltd (2005)

In 2005 Transit, together with the GWRC, commissioned the Western Corridor Study (Maunsell Ltd), the purpose of which was to investigate the principal options for all transport modes in the Region's western transport corridor (Ngauranga to Ōtaki). The study confirmed the need to develop a four-lane alignment for SH1 from MacKays Crossing to north of Ōtaki as part of a series of multi-modal transportation improvements along this corridor.

Kāpiti SH1 Strategic Study by Opus International (2008-2009)

Between July 2008 and August 2009, under the direction of the NZTA Wellington Regional Team, Opus revisited the alignment adopted by the Transit NZ Board in 2003 as part of a Strategic Study of the Kāpiti Coast.

Modifications were made to remove the proposed interchange at Te Horo to limit growth pressures and to alter the on/off ramps around Ōtaki. Public engagement for this section was combined with the consultation on options for the MacKays to Peka Peka section and, in December 2009, the NZTA Board reaffirmed the Eastern alignment for the Te Horo Expressway and an Eastern Bypass of Ōtaki.

Peka Peka to Ōtaki Expressway: Preferred Option Approval (2011)

At the NZTA board meeting held on 1 December 2011, the Board approved the preferred option as outlined in the Scheme Assessment Report Addendum (SARA). This is consistent with the alignment supported by the board in 2003 and 2009.

1.3.2 Associated Projects

MacKays to Peka Peka Expressway

The proposed MacKays to Peka Peka (M2PP) Expressway Project connects into the southern end of the Expressway. The M2PP Project includes construction of the Peka Peka interchange and local connection to Hadfield Road.

The M2PP Project is another of the identified RoNS projects in the Wellington Northern Corridor. The M2PP Project will create a 13.5km four lane Expressway through Paraparaumu and Waikanae, along with associated interchanges and a new four lane bridge over the Waikanae River. It has been envisioned that the construction of the M2PP and the Project may overlap one another.

The connection between the two proposed projects is particularly important as the Peka Peka interchange in the M2PP Project will service northbound vehicles wanting to enter the Expressway and southbound vehicles wanting to exit the Expressway. The interchange will also provide a link with the proposed local road servicing properties severed by the Expressway on the western side of the alignment.

The interface between the two projects has been taken to the north of Peka Peka interchange ramps (on the basis of north facing ramps at this location).

North Ōtaki to Levin

A series of safety improvements are proposed along the existing State highways 1 and 57 to improve safety and efficiency. Although a large range of route options were considered, these generally fell into two categories; an Expressway to the east or west of Levin, or to improve the existing road. Initial work has identified that the best option is to target improvements on existing State highways (SH1 between Taylor's Road and the Manawatu River Bridge and SH57 between the intersection of SH1 and Potts Road) because this offers better value for money than building a new Expressway away from the existing road. The NZTA are yet to finish investigating options to improve the existing State highway, but features may include additional passing lanes and improvements to intersections along the route.

KiwiRail Upgrades

KiwiRail has recently undertaken over $550million worth of improvements to its network within the Wellington Region. A significant amount of money has been spent on double tracking and electrification of the North Island Main Trunk (NIMT) railway from MacKay's crossing to Waikanae. KiwiRail has also improved the stations at various stops along the line to accommodate new rolling stock.

KiwiRail have recently upgraded the NIMT alignment north of Ōtaki, including the construction of a new bridge over the Waitohu Stream. Any new design for the railway north of Ōtaki will match into this altered alignment.

As part of a strategy to reduce journey times between Wellington and the north KiwiRail are also actively investigating existing speed/rail curvature deficiencies along the corridor with an aim to remove constraints. Key speed constraints exist immediately north of Ōtaki Railway Station, at the Ōtaki River bridge (north and south of river) and to the south in the vicinity of Mary Crest.

Forest Lakes Safety Improvements

The Forest Lakes Safety Improvements are located at the northern extent of the Project encompassing SH1 between Pukehou Rail Bridge and the Waitohu Stream Bridge. The Project is still at feasibility/investigation stage but it is likely to incorporate a wire rope median barrier, widening of the highway and intersection improvements at Taylor's Road and Forrest Lakes Road. A high level RoNS corridor study from Taylors Road to Pukehou Rail Bridge has been completed. It identified a preferred expressway corridor for further investigation along the existing State highway corridor and concluded that the Forest Lakes Safety Improvements can be implemented prior to the construction of the Peka Peka to North Ōtaki Expressway in 2017. Further work may be considered as part of the North Ōtaki to Levin Project.

SH1 Revocation

The Project includes investigation of the necessary direct mitigation and tie-in works for the Expressway. A new section of local arterial is also to be provided south of Mary Crest where the Expressway will sit on top of the existing SH1.

The Project does not include identifying what further works may be required as part of the existing SH1 handover to KCDC. A separate investigation will provide input into the existing SH1 revocation process and will encompass further consideration of a proposed off-road walking, cycling and equestrian path along the local arterial corridor. An understanding of the extent of works, or the process to be entered into (between NZTA and KCDC) is expected prior to entering the Environmental Protection Agency (EPA)/Board of Inquiry (BOI) process. The NZTA and KCDC are in the process of developing a memorandum of understanding in relation to the revocation process.

Following revocation, the existing SH1 is likely to become a local arterial. Current controls limiting access to the existing SH1 effectively prevent / limit development along its length. This corresponds with existing KCDC land-use plans which would focus new development in Ōtaki and limit development elsewhere, in rural parts of the Project area. Much of the Project area is zoned as rural in the District Plan. While this may limit intense development adjacent to the existing SH1 when it becomes a local arterial, landowners may seek plan changes when non-conforming developments are proposed.

It is expected that in future if subdivision is proposed, land nearest to expressway interchanges will, given the greater motorised access, be most appealing for any developers.

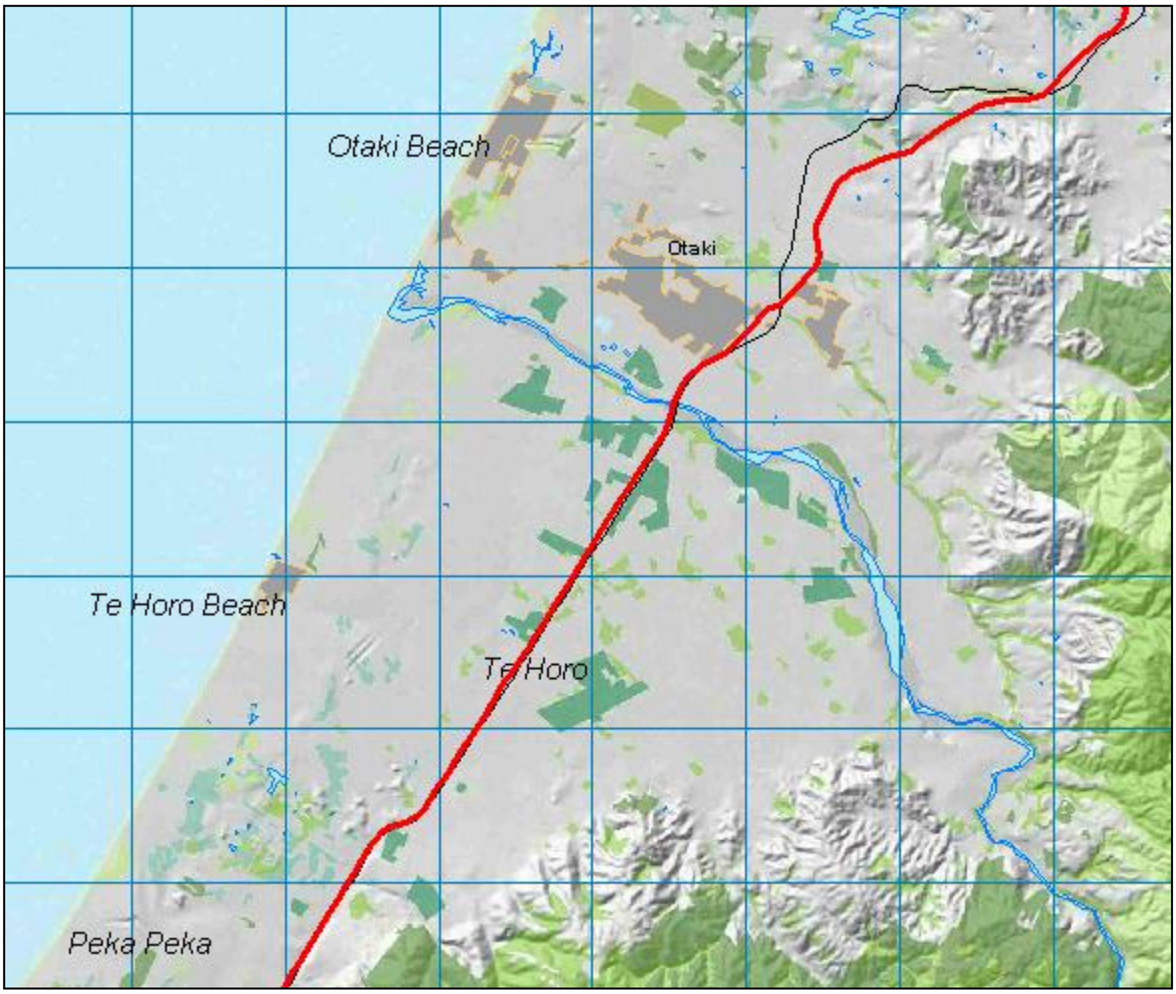
Others

On-going investigations into road improvements through the Ōtaki Town Centre have also been undertaken. These investigations have centred on ways to improve traffic flow through the town centre, and have looked at treatments such as parking restrictions and signalised pedestrian crossings. The proposed improvements are documented in the Ōtaki Traffic and Transportation Report which is included in Appendix A.

2 Transportation Context

Figure 2-1 shows the area of Kāpiti Coast District through which the Expressway will pass. The existing SH1 is shown in red, while the NIMT Railway is shown in black. The area shown is the focus of this assessment, although any effects expected further afield are also reported. The area includes two main townships: Te Horo, with a small community of approximately 640 people, and Ōtaki, a larger town of approximately 5,600. Ōtaki is the northernmost urban centre of the Kāpiti Coast and Wellington Region.

Figure 2-1 - Area of Interest



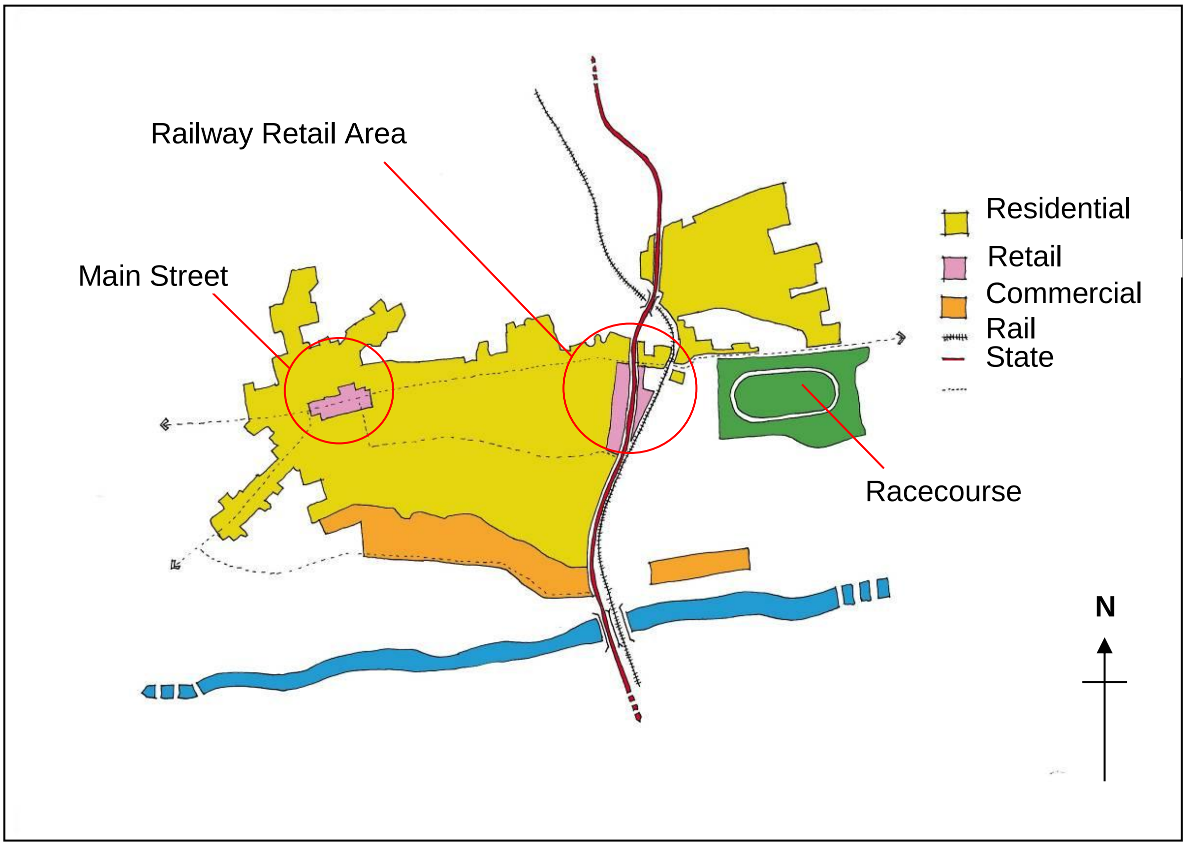
2.1 Current Land-Use Patterns

The Project area comprises a mix of land uses including rural, residential, industrial, commercial and horticultural. Ōtaki Township is the local service centre and is the focus for activity from the surrounding, predominantly rural area.

In Ōtaki, much of the retail development is linear and follows the SH1 corridor so that large numbers of commercial properties abut or are in close proximity to the State highway. Ōtaki Main Street is located approximately 1km to the north-west of SH1/Main Highway and is equidistant from SH1 and Ōtaki Beach. Commercial / light industrial development (such as the Winstone's aggregate plant) is located on either side of SH1 along the northern bank of the Ōtaki River.

The majority of residential development is located to the west of SH1, and east of the Ōtaki Main Street town centre. There is also a smaller residential area, disconnected from the main urban area which is east of SH1 and north of the racecourse (refer to Figure 2-2).

Figure 2-2 - Ōtaki Land-use



The local library and civic buildings are located close to Ōtaki Main Street. One of the two Ōtaki supermarkets is located on Main Street close to other grocery shops, clothes shops, a Post Shop, an Automated Teller Machine (ATM) and hotels. Seven of the education facilities within the Project area are located in Ōtaki Township.

The Ōtaki Railway Retail Area is located on either side of SH1 close to the Ōtaki Railway Station. This area, as its name suggests, provides shopping opportunities as well as cafés, public toilets and one of Kāpiti Coast District Council's (KCDC) tourist information points. Two petrol stations and a Supermarket are located in this area adjacent to the State highway.

South of Main Street and the Railway Retail Area, alongside Riverbank Road there is a cluster of industrial / commercial facilities such as waste processing depots, light industry depots and warehousing.

The area surrounding Ōtaki township is predominantly rural, with the Ōtaki economy relying largely on the farming communities. Farming activities are predominantly horticultural. Te Horo is small rural community with some businesses and a primary school.

2.2 Transport Infrastructure

Figure 2-1 shows SH1 and the railway, as well as the main settlements in this part of Kāpiti Coast District. SH1 and the North Island Main Trunk Line (NIMT) are part of the national transport network. They pass north-south through the Kāpiti Coast District approximately midway between the coast to the west and the hills to the east. Other than these strategic connections there is limited opportunity for north-south travel within the district.

The existing SH1 and NIMT rail bridges across the Ōtaki River provide the only transport connections across the river between the north and the south of the Project area. Another upstream crossing, the Waiohanga Road Bridge, is provided from Ōtaki Gorge Road on the southern side of the river. This provides property access but no connections to the wider transport network north of the Ōtaki River.

The lack of local roads providing north-south connectivity and the reliance on one primary river crossing means that SH1 effectively functions as a local road for travel within the district as well serving regional and national strategic traffic, including freight. These conflicting trip purposes reduce the efficiency of SH1. The lack of an alternative routes also has implications on the region's resilience should there be an incident resulting in the closure of SH1. For example currently, the closure of the existing SH1 Otaki river crossing would sever connections to Wellington except via alternative routes through the Wairarapa.

Local roads in this part of Kāpiti District branch out from the east and the west sides of SH1. Except at the Ōtaki Roundabout intersection with Mill Road and Rahui Road, the existing SH1 has priority over traffic (including cyclists) joining from side roads. Land-based travel between the east and west of the district involves crossing both SH1 and the NIMT at-grade. Road bridges across the NIMT railway are provided at Ōtaki Gorge Road and for SH1 immediately north of Ōtaki Railway Retail Area. At other locations railway level crossings are provided. Although at-grade connections across the strategic transport corridor are provided, SH1 and the adjacent NIMT railway create physical and perceived severance between the east and west sides of the district. Section 4.2 describes the delays associated with crossing SH1.

Formal provision for non-motorised road users is most evident within Ōtaki where pedestrian footways within the road corridor. Pedestrian build-outs and central refuges are provided within the Ōtaki Railway Retail Area to make it easier and safer to cross the existing SH1

Outside Ōtaki, in the rural, less populated parts of the Project area, there is less demand and therefore provision for non-motorised road users. Cycle lanes are provided in each direction along Mill Road between Ōtaki Town and the Ōtaki Railway Retail Area. A footway is provided on the southern side of School Road in Te Horo.

2.3 Transport Services

There are currently two public transport routes serving the Ōtaki area. Bus route 290 runs between Ōtaki Beach and Waikanae Railway Station via Mill Road and the Ōtaki Railway Retail Area. The service allows passengers to transfer to/from regular rail services at Waikanae Railway Station. Frequent commuter rail services to/from Wellington do not extend further north than Waikanae.

Bus route 290 provides five services a day in each direction. Two of the southbound services extend to Paraparaumu. Two of the northbound services start in Paraparaumu, allowing residents of Ōtaki to access Coastlands shopping centre. There are also a number of longer-distance bus services to other centres in the North Island that stop at Ōtaki. There are also school buses which serve the following schools:

- Ōtaki College;
- Ōtaki School;
- St Peter Chanel School;
- Te Horo School;
- Te Kura-a-iwi o Whakatupuranga Rua Mano;
- TKKM o Te Rito; and
- Waitohu School.

Ōtaki Railway station is located to the east of Railway Retail area, behind the shops that front the existing SH1. Currently the station is served by the Capital Connection that operates a commuter service with limited stops between Palmerston North and Wellington in the morning with a return service in the evening.

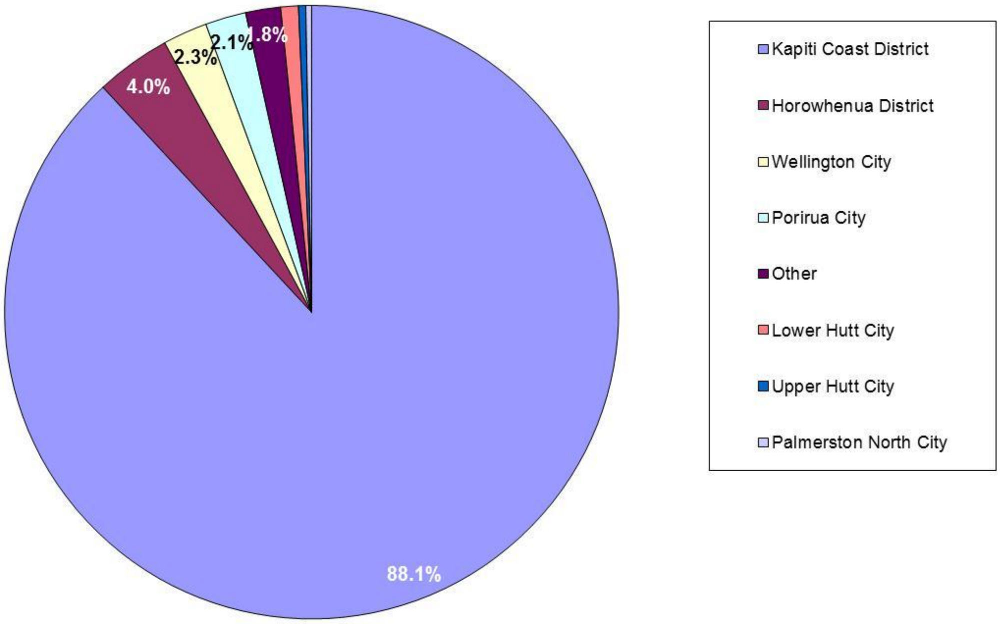
Although there is an aspiration from some sectors of the community to extend the rail electrification, double tracking or commuter services from Wellington as far as Ōtaki, there are currently no committed plans. Despite this, the Project has been designed so as to allow any future extension of rail double tracking. If commuter services were extended to Ōtaki, it is likely that there would be a small decrease in traffic using the Expressway to travel to access Waikanae Railway Station. If this were to happen there would be a corresponding decrease in commuter parking in Waikanae. The peak hour traffic flow reductions would be small relative to the total traffic flows at this time.

2.4 Travel to Work

The most recent census was in 2006[1]. On census day 2006, respondents indicated that just fewer than 12,000 people were employed in Kāpiti District. As summarised in Figure 2-3 the data shows that at that time, 88.1% of those employed in Kāpiti also lived within the district. 4% of those employed in Kāpiti (just under 500) were usually resident in Horowhenua District, immediately north of Ōtaki and Kāpiti District.

[1] The 2011 census has been postponed until 2013 due to the Christchurch Earthquake in February 2011

Figure 2-3 - Place of Residence for Kāpiti Coast Workforce on Census Day 2006



On the day of the 2006 census 20,448 of the Kāpiti Coast usually resident population were employed. Almost half (49%) were employed outside the district. This means that in 2006 there were more journeys to work leaving Kāpiti district (9,960 trips), than there were trips into the district (1,416 trips).

Around half of the trips to workplaces outside the district were to locations south of Kāpiti. The number of Kāpiti residents employed in Districts south of Kāpiti is shown Table 2-1.

Table 2-1 - Place of Work on Census Day 2006

Usual Residence	Population Employed	Place of Work on Census Day 2006				
		Kāpiti Coast	Porirua City	Wellington City	Upper Hutt City	Hutt City
Kāpiti Coast District	20,448	10,488	882	3,768	174	756
Horowhenua District	12,957	471	45	225	9	45
Palmerston North City	39,150	36	21	138	21	30

So on census day 2006, of the Kāpiti Coast resident population in employment:

- 51% (10,488) worked within the District with the two largest urban centres, south of the Project area; and
- 27% (5,580) worked in locations south of Kāpiti District including Wellington City;

Very few people living to the north of the Project area in Horowhenua District or Palmerston North City work within the Kāpiti Coast District.

This analysis shows that there is a need for an efficient and reliable connection from the Kāpiti Coast District to the south and there needs to be an efficient and reliable network enabling residents to travel to places of work within the Kāpiti Coast District.

2.5 Shopping in Ōtaki

In March 2011, Opus Central Laboratories undertook interviews with 500 pedestrians intercepted in Ōtaki Main Street or the Railway Retail Area[2]. Of the total sample, 69 percent were surveyed in the Railway Retail Area.

Figure 2-4 summarises where the people who were surveyed, travelled from. Most (89%) had travelled by car, either as a driver or a passenger. Just over half of those surveyed had travelled from outside the Ōtaki area. 57% had travelled for less than 30 minutes. The survey found that 62% of those surveyed had travelled to Ōtaki for a specific purpose, rather than stopping en-route to another destination. Shopping was the most often cited reason for being in Ōtaki. 48% of respondents indicated that it was their main reason for being in Ōtaki.

Figure 2-4: Origins of Surveyed Shoppers in Ōtaki

Origin	Percentage
Ōtaki area	47%
Kāpiti, but excluding Ōtaki area	17%
Wellington City/ Lower Hutt/ Upper Hutt/ Porirua	12%
Ohau / Manukau / Waikawa	2%
Levin	7%
Palmerston North	5%
Other North Island	10%

The majority of the surveyed shoppers had specifically travelled to Ōtaki to go shopping. The study found that “overall, only 11% of those surveyed would no longer stop in Ōtaki after the Project is constructed.

2.6 Future Land Use & Growth

The Ōtaki Vision was published by KCDC in 2007 following extensive community engagement. There is clear consensus within the community that upgrading the Ōtaki Railway Retail Area, Main Street, the (riverside) industrial area and Ōtaki Beach are important for the area. There was also substantial support for initiatives to address the traffic and parking problems on SH1 through Ōtaki.

[2] Ōtaki Customer Survey: Pedestrian Intercept Surveys, Opus Central Laboratories, March 2011.

The Ōtaki Vision would see Main Street continue to provide local services and act as an historic / tourist attraction. The community would like to see local retail activity here grow. It is envisaged that the Railway Retail Area will serve a sub-regional function, providing specialist shops with adequate parking facilities. These activities are consistent with the existing zoning within the KCDC District Plan.

The commercial / industrial area along the northern side of the Ōtaki River has recently been the subject of a KCDC Plan Change. The area surrounding Riverbank Road is now a designated mixed-use growth area with a focus on 'clean tech' industries. This is one of four significant planned developments within the Kāpiti District, all of which have gone through the statutory District Plan Change processes. The three other developments are in the southern part of the district as listed below:

- Paraparaumu Town Centre - a mix of residential, retail and mixed use;
- Paraparaumu Airport - predominantly a mix of retail, office and warehousing / distribution; and
- Waikanae North - two, mainly residential developments at Ngarara and Waikanae North.

Table 2-2 shows the number of vehicle trips forecast for each of these developments. These are derived from trip rates agreed during the Plan Change processes. The data presented assumes 100% uptake of land at each site and 100% of all forecast trip generation.

Table 2-2 - Vehicle Trips Associated with Planned Development in Kāpiti District[3]

Development	Inbound	Outbound	Total Trips
Paraparaumu Town Centre	12,000	11,900	23,900
Paraparaumu Airport	11,700	11,600	23,300
Waikanae North	8,300	8,800	17,000
Ōtaki (Riverbanks)	1,700	1,700	3,400
Total	**33,700**	**33,900**	**67,600**

For comparison, in the base year model there are approximately 120,000 daily trips to / from and within all of Kāpiti, so these developments alone would represent a 50% increase in traffic. It is assumed for the purposes of this assessment that these developments are complete and occupied from 2031.

The area surrounding Ōtaki is predominantly of rural character and is zoned as such in the KCDC District Plan. In the Ōtaki Vision document, the community seeks increased horticultural and agricultural productivity from this land, rather than an increase in dwellings or lifestyle developments.

[3] Reproduction of Table 5.6, Technical Report 34 - Traffic Modelling Report, MacKays to Peka Peka Expressway, NZTA.

2.7 Do Minimum Transport Network

Development of other Wellington RoNS results in increased capacity on wider network which can influence people's travel decision and result in changes to demands within the Project area. Therefore when assessing the effects of the Expressway, the Project team needs to compare the Expressway Scenario to a scenario with the same assumptions but with no Expressway. The scenario used for the comparison is known as the "Do Minimum" since it represents what would happen on the network in the future if the Project was not constructed. Table 2-3 shows which projects are assumed to be completed on the wider network in 2021, 2031 and 2041 in the Do Minimum scenario. A check (✓) indicates where a project is complete while an "X" indicates that the project has not been constructed.

Table 2-3: RoNS Projects in the Do Minimum

RoNS Traffic Scheme	2021	2031	2041
Otaki to north of Levin	×	✓	✓
Peka Peka to Ōtaki (PP2O)	×	×	×
MacKays to Peka Peka (M2PP)	✓	✓	✓
Linden to MacKays (Transmission Gully)	×	✓	✓
Ngauranga to Aotea Quay (NtAQ)	✓	✓	✓
Terrace Tunnel Duplication	×	✓	✓
Basin Reserve	✓	✓	✓
Airport to Mt Victoria Tunnel	×	✓	✓
Other	**2021**	**2031**	**2041**
Petone to Grenada Link Road	×	✓	✓

The inclusion of the RoNS projects in the do minimum removes pinch points on the wider network which will result in more traffic being able to reach the Project area.

2.8 Current & Future Traffic Flows

2.8.1 Historic Traffic Volumes

In this and later sections of this report, two measures of traffic flow are presented:

- Annual Average Daily Traffic (AADT) flow which is the mean of daily traffic flows throughout the year; and
- Average Daily Traffic (ADT) flow which is the mean daily flow for a period of time shorter than a year (e.g. for one month).

As shown in Figure 2-5, daily traffic volumes on SH1 have increased over the past 35 years. There have been some years where the volume has decreased, but the general trend is growth in traffic.

The analysis in this section is based on data from NZTA's continuous TMS count site located at Ohau, approximately 15km north of Ōtaki on SH1. The Ohau count site has been used, as it is the nearest continuous count site to enable robust analysis of seasonal and holiday trends.

Analysis has shown that the trends apparent at Ohau are representative of those observed at the count site North of Waitohu Valley Road, at the northern extent of the Ōtaki Township[4].

The following sections contain a more detailed analysis of trends associated with weekdays, weekends, holidays and traffic composition. This analysis is based on data collected at the Ohau site from 1 January 2009 to 30 June 2012

Figure 2-5: SH1 Annual Average Daily Traffic (AADT) 1975 to 2011

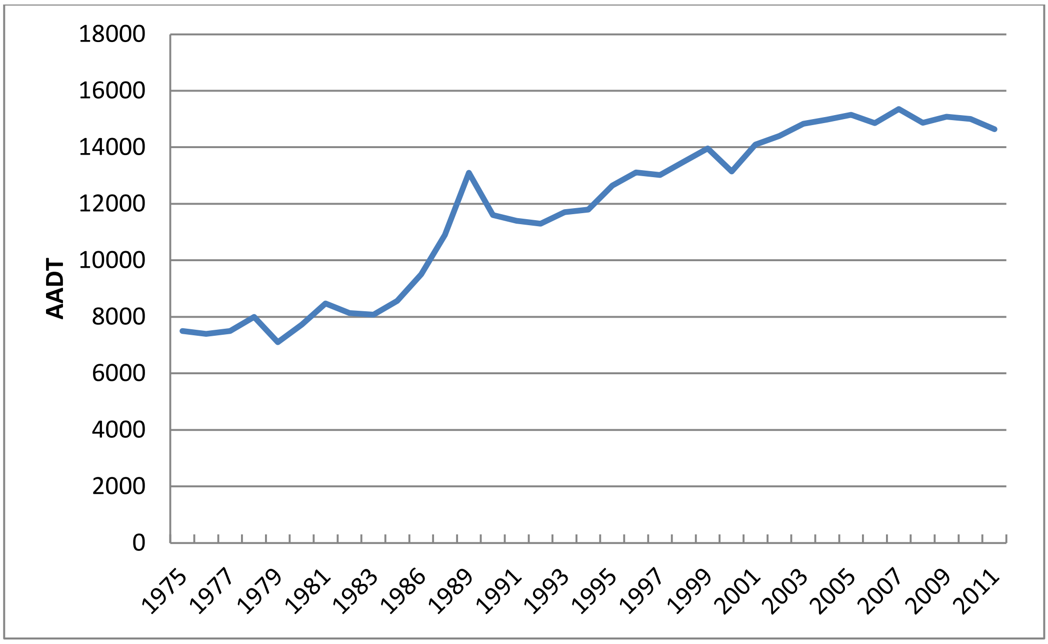


Figure 2-6 shows a small reduction in average ADT for weekends and weekdays between 2009 and 2012. The Wellington Regional Land Transport Strategy (RLTS) 2010-40 has noted that historically the regional vehicle kilometres travelled has grown, but this has levelled off since 2005 primarily due to fuel price increases and the economic recession. However, in the medium growth scenario[5] a 26 percent growth in the vehicle kilometres travelled in the region is forecast over the next 30 years as shown in Figure 2-7.

[4] The average daily traffic (ADT) flows for each month recorded at Ohau are between 5 and 10 percent greater than the average daily traffic flow recorded at the site North of Waitohu Valley Road, in Otaki.

[5] The RLTS uses low, medium and high growth scenarios when developing forecasts for the future. These scenarios relate to the potential growth in population and employment in the region.

Figure 2-6: Variation in Average ADT by Year (Total Vehicles)

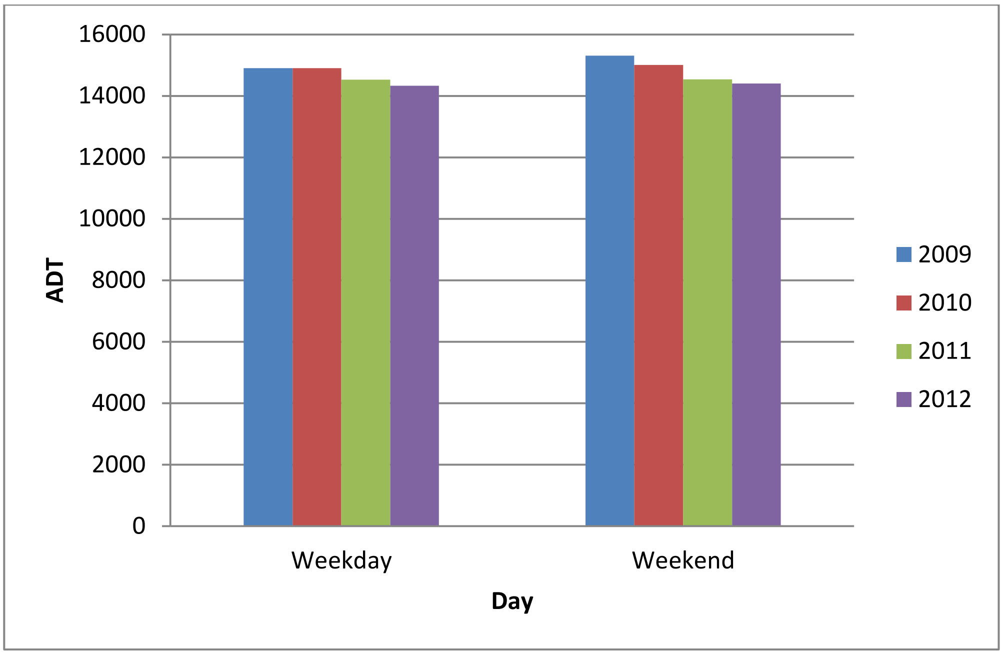
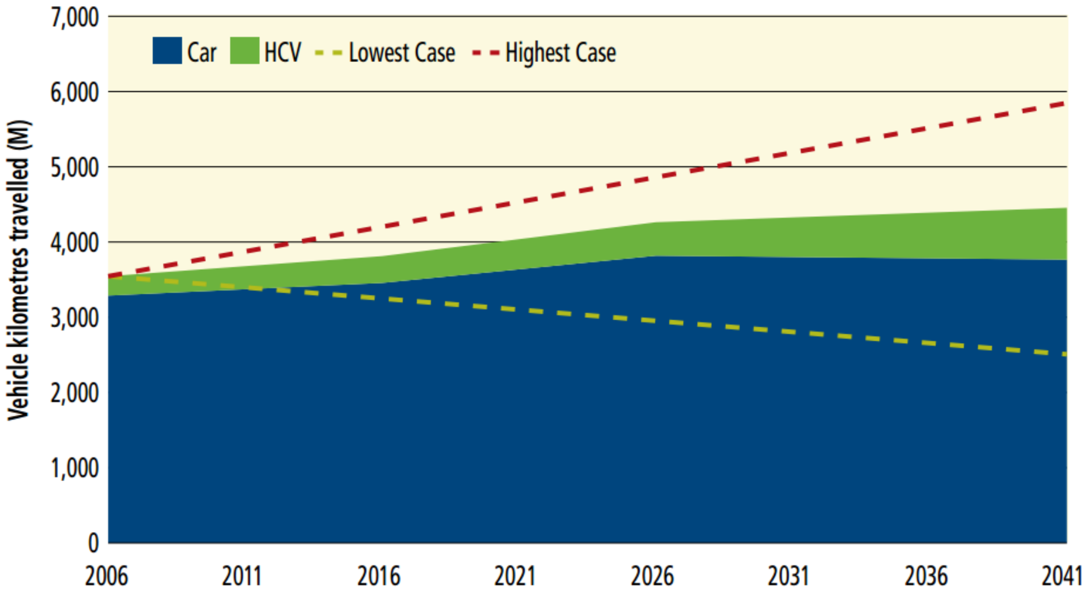


Figure 2-7: Forecast Growth in Wellington Region's Vehicle Kilometres Travelled[6]

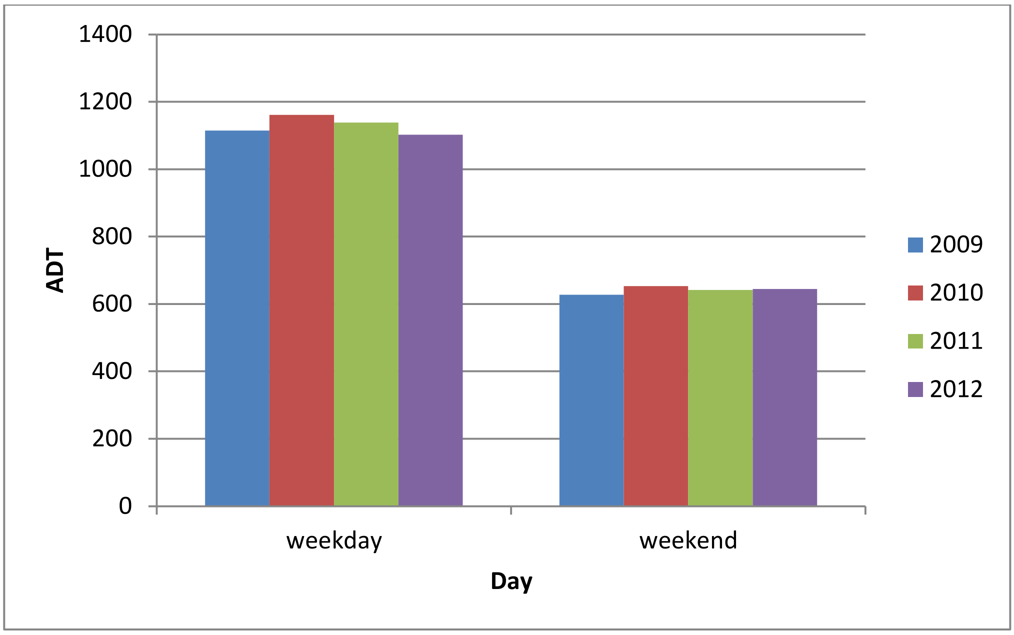


2.8.2 Traffic Composition

Figure 2-8, below summarises the heavy commercial vehicle (HCV) ADT between 2009 and 2012 for weekdays and weekends. This graph shows a slight decline in the number of weekday HCVs. There are also significantly fewer HCVs on the weekend compared to the weekdays.

[6] Source: Figure 7 in Wellington Regional Land Transport Strategy 2010-2040

Figure 2-8: Variation in HCV ADT by Year



The hourly number of HCVs for each direction is shown in Figure 2-9 and Figure 2-10. Data for Tuesday to Friday are grouped and presented together on the graph since there was essentially no variation between the data for those days.

During the week, northbound HCV volumes start increasing around 5am before peaking at about 8am and remaining constant throughout the day. Southbound HCV volumes are much higher in the very early morning, with the increase in HCVs starting at about 2am. Between 2am and 6am there are far more HCVs travelling southbound compared to northbound. Many of these trips are likely to continue to the south island. Overall, most HCVs are travelling during the day with many travelling during peak periods. Opportunities to reduce journey times and improve reliability will be of benefit to HCVs.

Although most HCVs pass through the Project area, the main commercial origin / destination for HCVs within the Project area is the Riverbank Road industrial area and the aggregate works on the southern side of Ōtaki. There are also a small number of HCV movements to and from rural parts of the Project area. Industrial freight is also moved through the Project area by rail.

Figure 2-9: Hourly Northbound HCV Volume

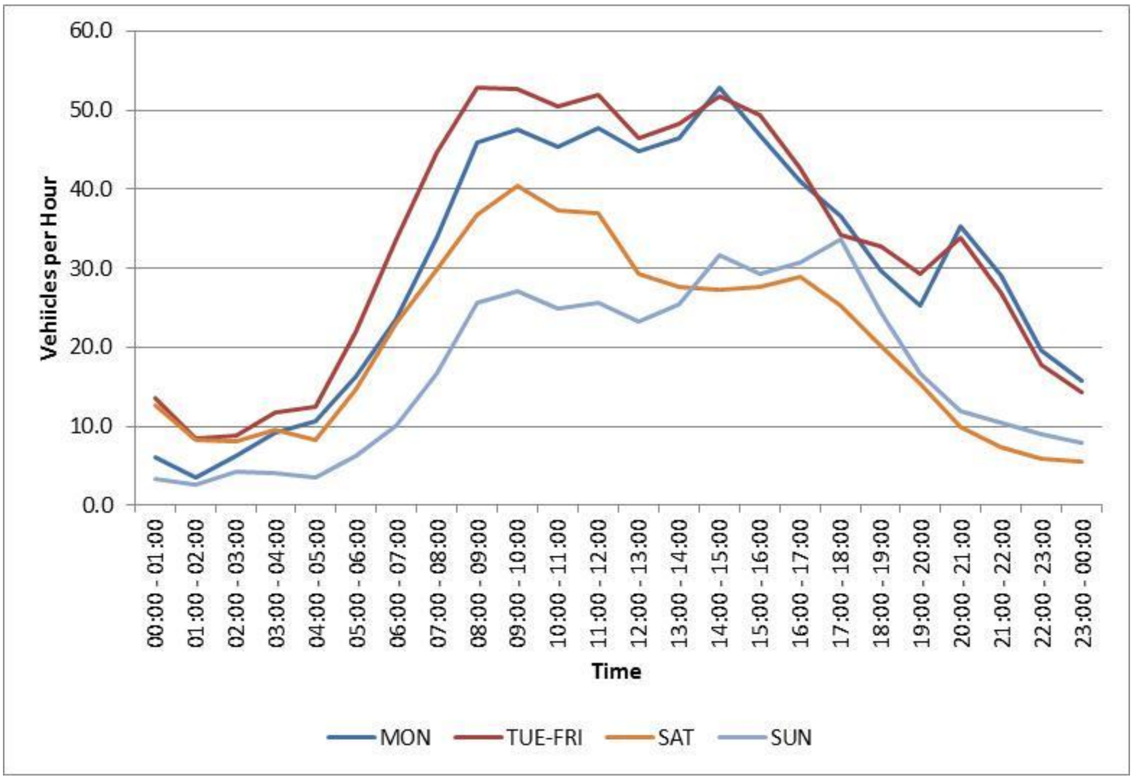
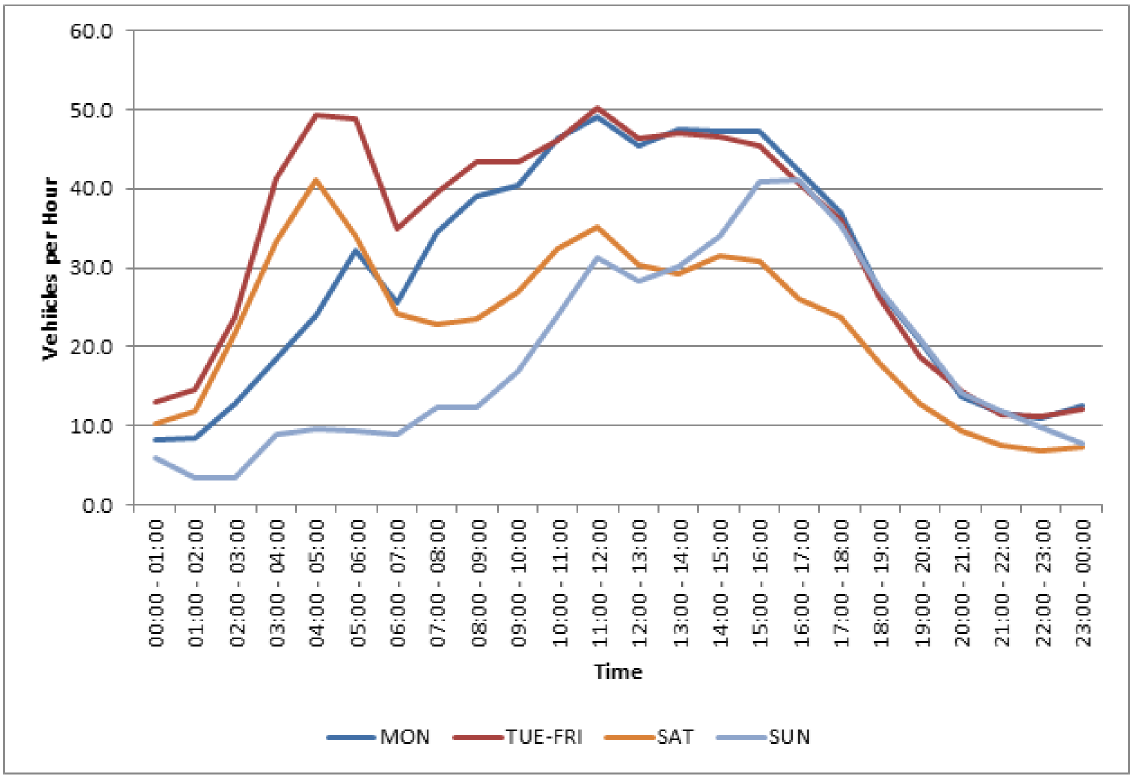


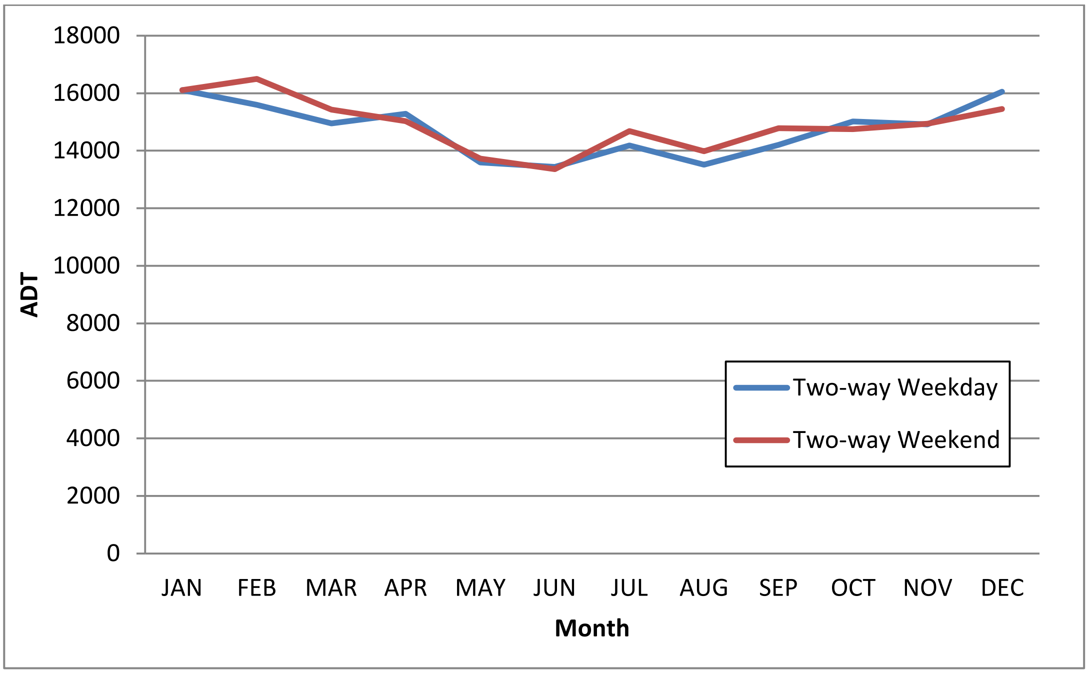
Figure 2-10: Hourly Southbound HCV Volume



2.8.3 Seasonal Variation

Figure 2-11 shows the variation in the average ADT throughout the year. Generally traffic flows are highest in the summer and lower in the winter. The seasonal variation could be linked to holidays which primarily occur in the summer months. The maximum variation between months is about 20 percent of the average.

Figure 2-11: Monthly ADT

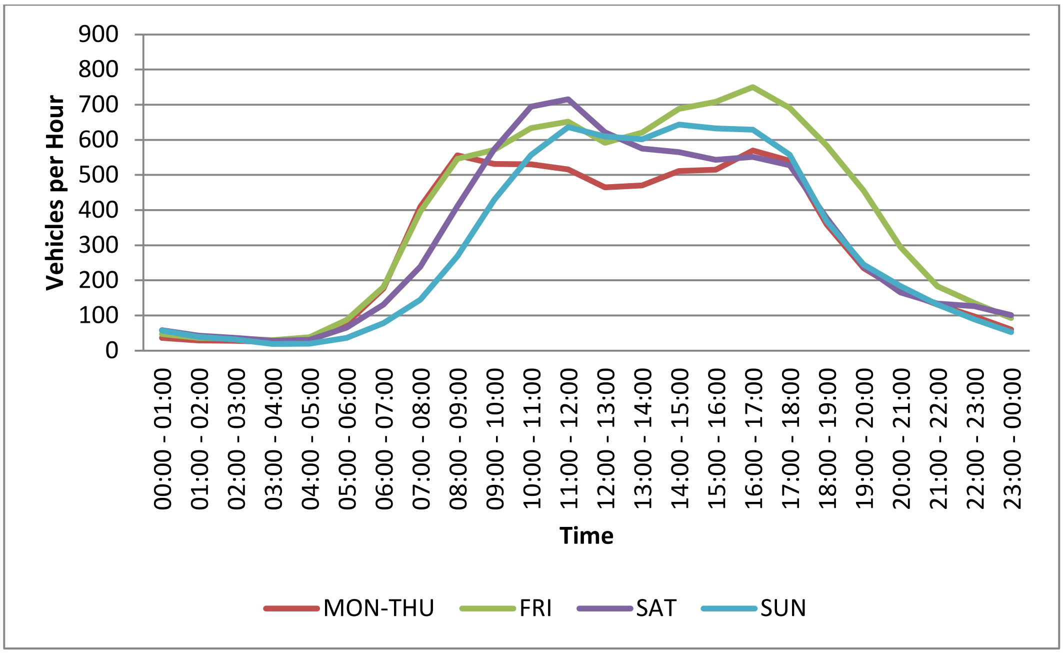


2.8.4 Daily Variation

Figure 2-12 and Figure 2-13 shows the hourly traffic volumes for Monday to Thursday, Friday, Saturday and Sunday for the northbound and southbound directions respectively.

The northbound traffic profile is essentially flat during the week on Monday to Thursday with consistent flows throughout the day. There is a peak on Friday evenings with traffic heading out of Wellington for the weekend. On Saturdays there is a peak mid-morning but then the flow tapers off. Sunday has a flat flow profile throughout the day but the volumes are higher than on weekdays (Monday to Thursday). Traffic which is travelling through the Project area will benefit from an efficient, direct route.

Figure 2-12: Hourly Northbound Traffic Volume



In the morning, southbound traffic volumes are lower than northbound. Peaks in the evening occur on Sundays, Fridays and during the week with the largest peaks occurring on Sundays. The Saturday daytime traffic profile is flat. The magnitude and length of the peaks on weekend are significant when compared to the weekdays.

Figure 2-13: Hourly Southbound Traffic Volume

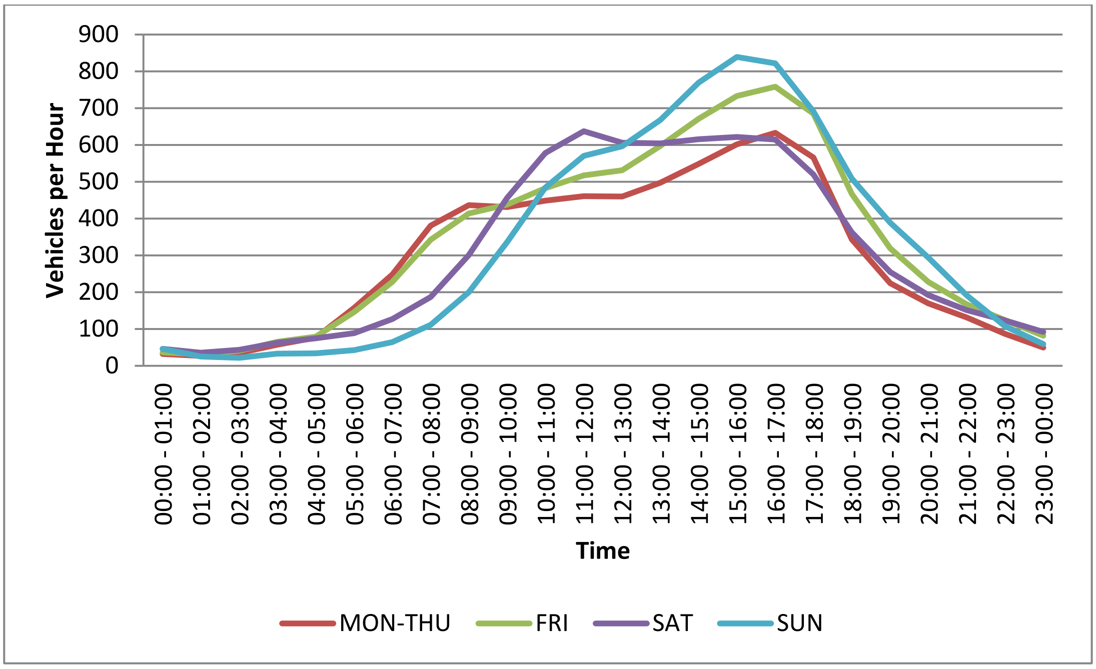


Table 2-4 summarises the 25th percentile, average and 75th percentile AADT for each direction on weekdays and weekends. The difference between the 25th and 75th percentile values show that traffic volumes can be expected to be plus or minus about 10 per cent.

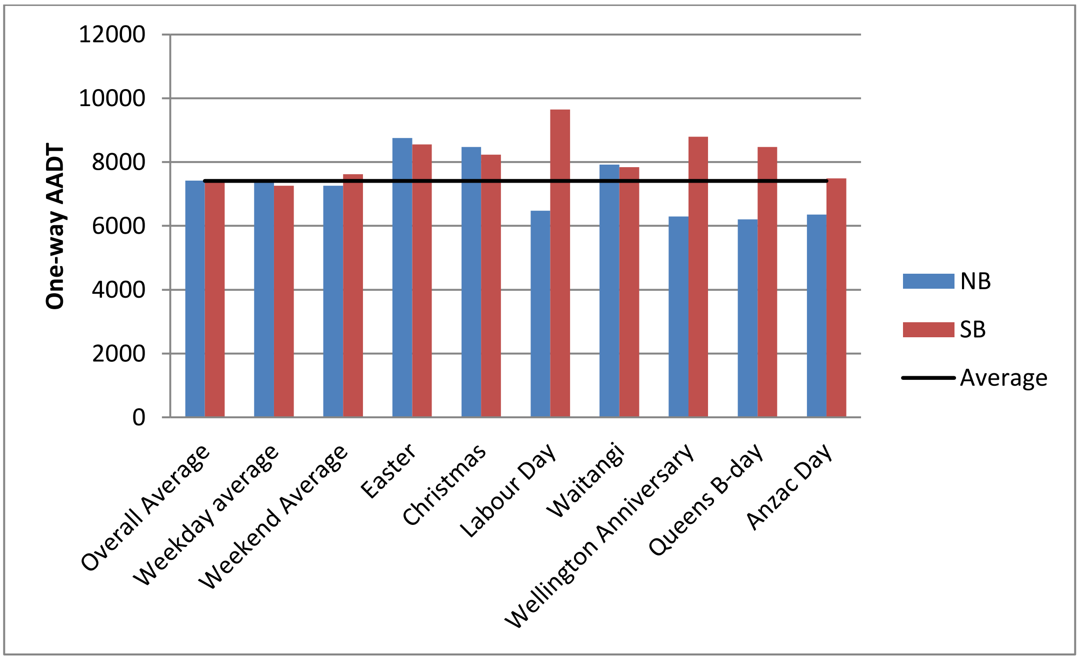
Table 2-4: Variability in AADTs

Day	Dir.	25th Percentile	Average	75th Percentile	Difference 25th and 75th Percentile
Weekday	NB	6663	7455	8024	1361
	SB	6650	7261	7728	1078
Weekend	NB	6696	7256	7715	1020
	SB	7002	7616	8123	1121

2.8.5 Holiday Traffic

Figure 2-14 compares holiday[7] traffic volumes to the average for both northbound and southbound. In the past, the highest traffic volumes occur southbound on Labour Day. Northbound holiday traffic volumes are often lower than the average; however, traffic from Wellington which is going away for a long weekend often travel the weekday before the holiday. For example, some motorists leave on the Friday evening before Labour weekend.

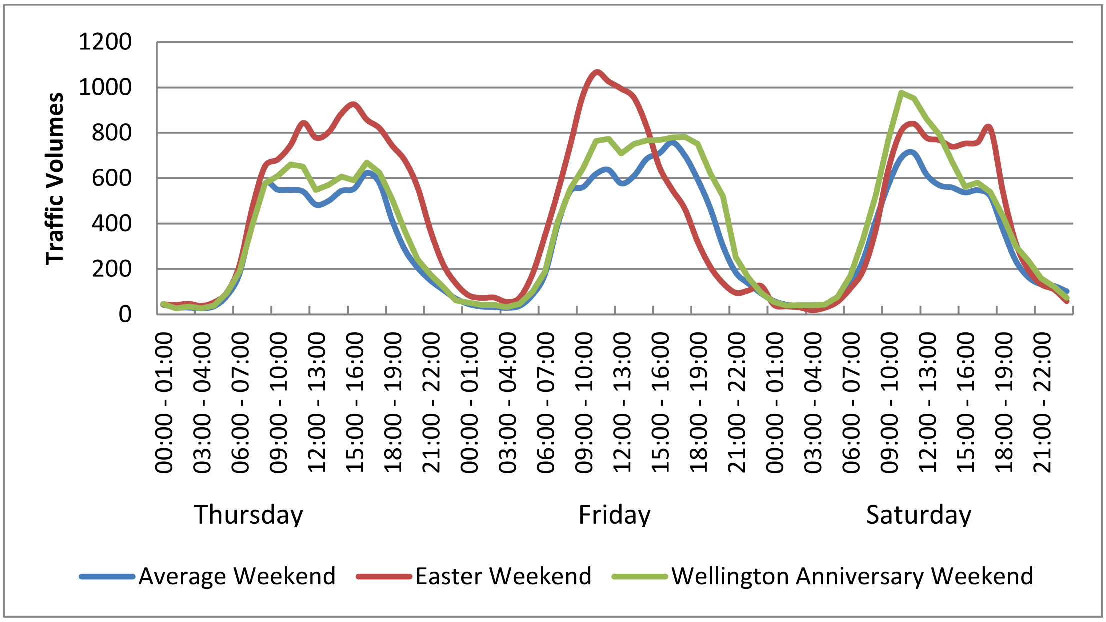
Figure 2-14: Holiday ADTs



The hourly northbound traffic volume on an average Thursday, Friday and Saturday has been plotted on a graph along with the traffic volumes for the Thursday, Friday and Saturday of Wellington Anniversary and Easter long weekends as shown in Figure 2-15. It shows that the northbound volumes throughout the Thursday, Friday and Saturday of on the Easter weekend are higher than a typical weekend suggesting that some motorists choose to extend their long weekend by travelling on the Thursday while others wait until Saturday. On Good Friday there is a large peak in traffic in the morning and early afternoon.

[7] Christmas represents the average traffic volume for Christmas Day, Boxing Day, New Year's Day and the Day after New Year's Day. Easter represents the average traffic volume for Good Friday, Easter Monday and the Saturday and Sunday in between.

Figure 2-15: Average Northbound Traffic Volumes Thursday to Saturday, 2009-12



On Wellington Anniversary weekend the statutory holiday occurs on the Monday. Traffic volumes on the Thursday before the long weekend are similar to a typical weekend. On the Friday the maximum hourly volume is comparable to a typical Friday, but on the long weekend Friday the higher volume of traffic occurs throughout the morning and afternoon rather than just being concentrated in the PM peak like a typical Friday. The highest northbound traffic volume peak during Wellington Anniversary weekend occurs on Saturday morning, while Saturday afternoon volumes are comparable to a typical Saturday.

The above figure shows that people tend to travel throughout the day on the preceding weekday before the holiday weekend. On the first day of the holiday weekend (i.e. the Saturday for Wellington Anniversary weekend and the Friday for Easter weekend) there is a peak in traffic volumes. This peak is larger and occurs over a longer time period than peaks in traffic that typically occur on weekends.

2.8.6 Traffic within Ōtaki

Various data including traffic volumes, queue lengths, travel time, parking occupancy and number of parking manoeuvres, and pedestrian crossing demand within Ōtaki has been collected between 2007 and 2009. This data has been summarised and analysed in the Ōtaki Traffic and Transportation Report[8] and is summarised below.

Surveys completed on the Friday and Monday of the 2008 Labour weekend found only minor variations in the average travel speed between Friday and Monday for traffic in both directions with the exception of southbound traffic on Monday where significant delays and queuing were experienced. This coincides with the expected peak caused by people from the Wellington region returning home after being away for the long weekend. A similar

[8] Ōtaki Traffic and Transportation Report, prepared by Opus International Ltd. for NZTA, November 2009.

delay was not experienced on Friday in the northbound directions, but this could be due to a wider spread of when people travel.

The data shows a drop in vehicle speed to the south of the Mill Road roundabout in Ōtaki when compared to vehicle speeds to the north of the roundabout. This reduction in speed appears to be caused by congestion as a result of parking movements and pedestrian activity within Ōtaki.

A detailed analysis of the traffic performance and various factors which can influence it was undertaken for Labour weekend 2009. Analysis of data collected between noon and 5:30pm on Monday 26 October 2009 showed that the southbound queue is not directly related to the traffic volume. The traffic volume steadily increased between noon and 5:30pm, yet the queue had died away by 5pm. 5pm is when most shops close and there is significant reductions in the number of pedestrians crossing SH1.

There appears to be a correlation between queue length and pedestrian crossing demand and number of turning movements at Arthur Street. The start of the queue forming corresponds to the highest pedestrian crossing demand and turning demand at Arthur Street. Once a queue forms, a bottleneck is created and the queue tends to grow.

The collected data did not show a discernible relationship between the parking manoeuvres and queue length. However, based on on-site observations, the parking movements cause some delay to the through traffic on SH1. Opportunities which reduce the volume of traffic travelling on the existing SH1 through Ōtaki will reduce the delays experienced by motorists at peak periods and will improve amenity for pedestrians.

2.9 Current and Future Pedestrian and Cyclist Travel Demand

Journey to Work data collected during the 2006 census shows that 3.3% of Kāpiti Coast District's normally resident population in employment walked or jogged to work, and 1.3% bicycled. This corresponds to 690 people walking and 273 people bicycling out of a total 20,500 employed residents across the whole of Kāpiti Coast District.

The New Zealand Household Travel Survey 2010 shows that school-aged children and young adults (5-24) and older road users (>65) are the most likely to travel on foot or by bicycle. Table 2-5 shows the mode share for journeys to school over the period 2007-2011 for the whole of New Zealand, including the major urban areas.

Approximately 1,300 students attend primary or secondary schools within the Project area. Given the mode share presented in Table 2-5 it is therefore likely that around 400 students walk or cycle to school in the Project area.

Table 2-5 - % Home to School Journeys 2007 - 2011

Travel Mode (s)	Ages 5-12	Ages 13-17
Walk (Only)	22%	27%
Passenger	58%	33%
Passenger + Walk	1%	1%
Bicycle	3%	4%
Public Transport	7%	6%
Walk / PT	6%	18%
Car Passenger/ PT	2%	2%
Driver	0%	6%
Other	0%	3%
Total	100%	100%

The New Zealand Household Travel Survey also provides information on average cycling and walking trip lengths. This is summarised in Table 2-6, while Table 2-7 summarises the trip length for some of the potential trips within the Project area.

Table 2-6 - New Zealand Average Walking and Cycling Trip Lengths

<table>
<tr><th></th><th>Walking[9]</th><th>Cycling[10]</th></tr>
<tr><td>Adults (18+)</td><td>0.76 km</td><td>5.2 km</td></tr>
<tr><td>Adolescents (13-17)</td><td rowspan="2">0.65 km</td><td>2.1 km</td></tr>
<tr><td>Children (5-12)</td><td>1.7 km</td></tr>
</table>

Table 2-7 - Length of Potential Walking and Cycling Trips within the Project Area

Potential Journey	Distance
Te Horo to Ōtaki Gorge Road	3.7 km
Te Horo to Ōtaki Railway Retail Precinct	5.4 km
Ōtaki Gorge Road to Ōtaki Railway Retail Precinct	1.7 km
Riverbank Road to Ōtaki Railway Retail Precinct	1.2 km
Te Horo Primary School to SH1	1.2 km

These tables show that distances within the Project area are generally longer than the average walking and cycling trip length for children and adolescents and the average walking trip length for adults. This means that it is unlikely that potential journeys for utility trips to be completed by walking. Based on distance alone it is feasible for adults to complete some trips via bicycle.

[9] Based on median walking trip time and 1.5m/s walking speed. http://www.transport.govt.nz/research/Documents/Walking_2011.pdf

[10] Source: http://www.transport.govt.nz/research/Documents/Cycling-for-transport-Oct-2011.pdf

2.9.1 Count Data

The number of pedestrians and cyclists observed in the vicinity of the intersections with the existing SH1 were counted on Wednesday 21 July 2010 or Thursday 22 July 2010. The number of pedestrians counted, listed from north to south, is shown in Table 2-8. The blank cells in the table mean no pedestrians were observed at that location during that particular peak. No cyclists were observed and this could be influenced by poor weather conditions during the surveys. The number of pedestrians and cyclists might be higher in the summer when the weather is better and it is brighter in the mornings and evenings.

Table 2-8: Number of Pedestrians Counted

Location	AM (7-9am)	IP (11am-1pm)	PM (4-6pm)
Taylors Road & SH1			
Waitohu Valley Road & SH1	4	1	1
Te Manuao Road & SH1	6		
County Road & SH1	41	9	23
Mill Road/Rahui Road & SH1	1	3	2
Arthur Street & SH1	14	133	61
Waerenga Road & SH1	4	28	22
Riverbank Road & SH1	1	3	2
Ōtaki Gorge Road & SH1			
Addington Road & SH1			
Old Hautere Road & SH1			1
Te Waka Road & SH1			
Te Horo Beach Road & SH1			
School Road & SH1		2	3
Te Hapua Road & SH1			
Te Kowhai Road & SH1			

A total of 365 pedestrians were observed within the Project area. 97 percent of these pedestrians were within the 50km/h speed zone of Ōtaki (from south of Waerenga Road to north of Waitohu Valley Road). The remaining 3 percent of pedestrians were observed at School Road (Te Horo) and Old Hautere Road.

The low number of pedestrians and cyclists observed outside Ōtaki is unsurprising given:

- The speed of traffic using the existing SH1;
- The distances between origins and destinations compared to the average currently travelled by New Zealanders; and
- The absence of formal pedestrian and cyclist facilities outside Ōtaki.

2.9.2 Future Pedestrian and Cyclist Demand

Travel demand is primarily influenced by the level of activity in an area and by the proximity of different activities to each other. The preceding section has shown that in the rural parts of the Project area the distances between potential origins and destinations may already discourage many people from travelling on foot or by bike. Environmental factors such as motorised traffic speeds and separation from traffic also influence levels of walking and cycling.

Outside Ōtaki, no significant growth in population is encouraged or expected as per the Greater Ōtaki Vision. This means that unless the travelling environment is changed and more of the existing population begins using non-motorised forms of travel the numbers of pedestrians and cyclists will not change.

Within urban Ōtaki, the riverfront development will increase the numbers of people travelling to and from the southern part of Ōtaki. Some of these trips will be made on foot or by bicycle.

The above analysis has shown that current pedestrian and cyclist demand is low, especially within the rural sections of the Project area. This is most likely related to the large distances between potential destinations, lack of facilities and traffic volumes and speeds on existing SH1. The poor pedestrian and cyclist environment may be suppressing demand.

2.10 Road Safety

The KiwiRap rating tool is an assessment program to assess risk and identify safety shortcomings on New Zealand's state highways. There are two components to KiwiRap: the star rating and risk mapping.

The star rating is an assessment of the level of 'built-in' safety provided on State highways through engineering features such as lane and shoulder widths or safety barriers. 1-star is the least safe roads while 5-star roads are the safest roads.

Figure 2-16 shows that the southern part of the Project area has a 3-star rating, while the northern portion has a 2-star rating. Since the star rating tool is only designed for roads with speed limits of 80km/h or greater, the section of SH1 through Ōtaki has not been rated. Typically, 3-star roads are undivided and have deficiencies in some road features such as alignment and roadsides and/or poorly designed intersections at regular intervals. 2-star roads are also typically undivided and have major deficiencies such as insufficient overtaking provision, narrow lanes and/or poorly designed intersections at regular intervals. Opportunities to enhance the physical characteristics and increase the star rating of the road network will increase the 'built-in' safety provided within the Project area.

Risk mapping uses historical traffic and crash data to determine the relative level of risk on the State highway network. KiwiRap looks at two different measures of risk: collective risk (or crash density) and personal risk. Collective risk is a measure of the total number of fatal and serious injury crashes per kilometre over a section of road, while personal risk is a measure of the danger to each individual using the State highway being assessed. Unlike collective risk, personal risk takes into account the traffic volumes on each section of State highway. The risk ratings are based on fatal and serious injury crashes for the five-year period 2002-2006[11].

Based on KiwiRap the section of SH1 from Paraparaumu to Levin[12] has a collective risk rating of high (corresponding to 0.19 or more average annual fatal and serious injury crashes per km). The collective risk (0.33 annual average fatal and serious crashes per 100M vehicle-kilometres) which takes traffic volumes into account is well above the threshold for high collective risk. The Project area has a personal risk rating of medium (corresponding to 5 to 6.9 average annual fatal and serious injury crashes per 100 million vehicle-km) as shown in Figure 2-17 and Table 2-9.

Figure 2-16: KiwiRap Star Rating

[11] An update of the risk ratings to use more recent data is currently in progress, but it has not been released yet.
[12] The Paraparaumu to Levin section is inclusive of the Project area and therefore these ratings apply to Peka Peka to Ōtaki.

Figure 2-17: KiwiRap Risk Mapping

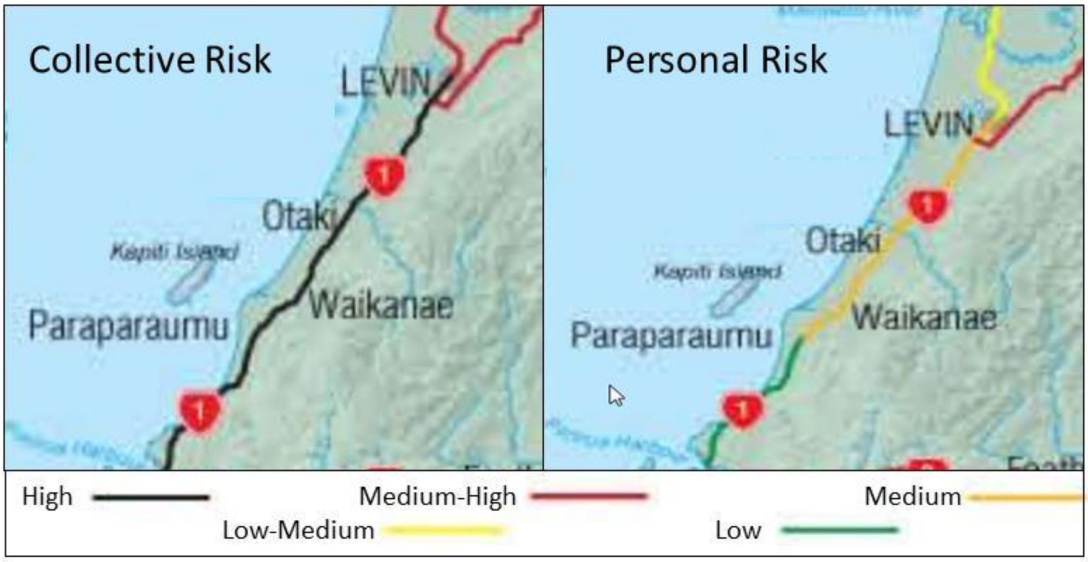


Table 2-9: KiwiRap Risk Mapping

Segment	Serious Crashes 2002-06	Fatal Crashes 2002-06	Collective Risk (annual average fatal and serious crashes per km)	Collective Risk Band	Personal Risk (annual average total fatal and serious crashes per 100 million veh*km)	Personal Risk Band
Paraparaumu to Levin	44	15	0.33	High	5.2	Medium

The high collective risk rating and medium personal risk rating shows that there are a high number of crashes currently occurring on the existing SH1 within the Project area. Opportunities to reduce the crash risk will have a positive effect on the Project area.

2.10.1 Crash History

The road safety analysis is based on data from NZTA's Crash Analysis System (CAS) for the five year period between 1st of January 2007 and 31st December 2011. Table 2-10, below summarises the crash history by year along SH1 in the Project area.

Table 2-10: Crash History by Year

Year	Fatal	Serious	Minor	Non-Injury	Total
2007	0	3	6	13	**22**
2008	0	4	4	27	**35**
2009	2	2	8	25	**37**
2010	0	2	12	29	**43**
2011	0	1	6	20	**27**
Total	**2**	**12**	**36**	**114**	**164**

One of the fatal crashes was the result of a cyclist being hit. Alcohol was most likely a factor in this crash. The second fatal crash in 2009 was a head on crash on a straight section of road. It occurred during bright and dry conditions. Provision of an Expressway with a median barrier would reduce the risk of these crashes.

The crashes in the Project area were grouped based on speed environment:

- The 50 km/h section of Ōtaki Township (1.6 km);
- The 70 km/h section of Ōtaki Township (0.8 km); and
- The 100 km/h section south of Ōtaki Township to Peka Peka[13] (9.3 km) and north of Ōtaki Township to north of Taylors Road (1.5 km).

Table 2-11, below, summarises the five year crash history for each speed environment. There have been over 3 times more crashes per kilometre in the 50 km/h speed zone (Ōtaki Township) than the 70km/h or 100 km/h zones. However, these crashes are generally lower severity, as expected with the lower speeds. The crashes within Ōtaki Township are primarily rear end/obstruction.

In the 100 km/h speed zone 30 percent of the crashes occurred at intersections and another 10 percent occurred at driveways. 14 percent of the 100 km/h crashes were head-on.

Table 2-11: Crash History by Severity and Speed Environment.

Section	Fatal		Serious		Minor		Non-Injury		Total	
	# Crashes	Crashes /km /year	# Crashes	Crashes /km /year	# Crashes	Crashes /km /year	# Crashes	Crashes /km /year	# Crashes	Crashes /km /year
100km/h	2	0.04	9	0.17	24	0.44	51	0.94	86	1.59
70km/h	0	0	2	0.5	2	0.5	6	1.5	10	2.5
50km/h	0	0	1	0.13	10	1.25	57	7.13	68	8.5
Sub total	2	0.03	12	0.18	36	0.55	114	1.73	164	2.48

KiwiRAP considers any road with 0.11 to 0.189 serious or fatal crashes per kilometre per year medium-high risk and roads with greater than 0.19 serious or fatal crashes per kilometre high risk. These risk ratings have been developed based on links that are long enough to ensure statistical reliability (at least 20 fatal or serious crashes over five years) and with speed limits of 80km/h or greater. Therefore, these rating bands are not directly applicable to the data in Table 2-11, but can be used to get a sense of how the road is performing. Both the 100km/h and 70km/h hour sections have crash rates greater than 0.19 which puts them in the high risk category, while the 50km/h section would be in the medium-high risk category.

There have been a total of four crashes involving pedestrians and three crashes involving cyclists. Three of the pedestrian crashes occurred within the 50km/h speed zone of Ōtaki. On two occasions, the crashes were the result of the pedestrians (11 year old skateboarder and a 71 year old) crossing heedless of traffic, while the third pedestrian crash in Ōtaki was

[13] The 1km long 80km/h speed zone through Te Horo has been included as part of the 100km/h speed environment for this analysis.

caused by the driver failing to give way to the pedestrian at a pedestrian crossing. The fourth pedestrian crash occurred in the 70km/h zone as a result of driver fatigue.

Two of the three cyclist crashes involved alcohol; in the first crash a motorist was intoxicated and hit a cyclist on SH1 near School Road resulting in a fatality, while in the second crash the cyclist was intoxicated and lost control, resulting in minor injury. The third cyclist crash occurred at the Mill Road roundabout in Ōtaki and involved a motorist failing to give way to an 11 year old cyclist, resulting in minor injury.

Further information on the crash history is contained in Appendix B

3 Modelling Approach

The modelling approach taken for the assessment of environmental effects incorporates the use of a multi-modal strategic transport model as well as a Project specific traffic model, in accordance with the approach taken for the assessment of other major projects in the Wellington region. Intersections have also been individually modelled for concept design purposes. The models used are a:

- multi-modal strategic model: Wellington Transport Strategy Model (WTSM), 2011; and
- project specific model: Kāpiti Traffic Model (KTM 2.1).

3.1 Modelling Methodology

A SATURN traffic model been used to assist in the assessment of the traffic demands and journey times associated with the do minimum and Expressway scenarios for the 2011 base year, and 2021 and 2031 forecast years. Specifically, an updated version of the Kāpiti Traffic Model (KTM) has been used. The updated model is called KTM2.1. This is an updated version of the model which was used to assess the traffic effects of the MacKays to Peka Peka (M2PP) Expressway proposal. The traffic modelling was undertaken by the M2PP team. This was intended as a way to encourage consistency between the two assessments.

KTM2.1 encompasses the geographic area within which any effects associated with the Project are expected to arise. The geographic extent of the model is shown in Figure 3-1. The KTM2.1 model has been peer reviewed and is considered fit for purpose for this evaluation (Refer to Appendix C). It complies with the validation criteria contained in the New Zealand Economic Evaluation Manual (EEM).

The trip matrices used in KTM2.1 are derived from the updated 2011 WTSM model. The WTSM model covers the whole Wellington Region and is a high level strategic model. It is a four stage multi-modal model, meaning it represents passenger transport trips in addition to private vehicles and HCVs. The model is run using a software package called EMME. It was originally developed in 2001 and underwent an update in 2008 in which the model was validated to 2006 conditions using Census data and observed travel data. In 2011, another update was commissioned and completed in 2012 by Opus. This update differed from the previous one in that there was no Census data available as the 2011 Census was postponed due to the Christchurch earthquakes. The 2011 update thus relied heavily on surveyed travel data and estimated land use. For further information refer to the WTSM Calibration and Validation report. The modelled areas covered by WTSM and KTM2.1 are shown in Figure 3-1.

WTSM includes forecast growth scenarios for 2021, 2031 and 2041 at low, medium and high growth rates. The 2021 and 2031 medium growth scenarios have been used to produce forecast demand matrices for the KTM2.1 model for both car and HCV trips. However as WTSM has a coarse zone makeup in the Kāpiti area it is unlikely to be reflecting trips to and from specific developments in the region such as the Riverbank developments in Ōtaki. This has led to the need to make specific adjustments to the KTM2.1 model as was the case for the traffic assessment of the M2PP expressway. These specific adjustments are outlined in the KTM2.1 forecasting summary of impacts memorandum which is included in Appendix C.

In addition to modelling the network in SATURN, key intersections have been modelled using SIDRA (a software package used for intersection capacity, level of service and performance analysis) as it is better suited than SATURN for operational assessments of individual intersections. The SIDRA models have been built on the traffic volumes extracted from SATURN. Since the SIDRA models are for concept design of new intersections they are not calibrated and use default SIDRA settings. The following intersections were modelled individually in SIDRA:

- School Road and existing SH1;
- Te Horo Beach Road and existing SH1;
- Old Hautere Road and existing SH1;
- Old Hautere Road and Ōtaki Gorge Road;
- Ōtaki Gorge southbound on ramp and Ōtaki Gorge Road over bridge;
- Existing SH1 and Ōtaki Gorge Road over bridge;
- Ōtaki Gorge northbound off ramp and Ōtaki Gorge Road over bridge;
- Ōtaki Gorge Road and existing SH1;
- Riverbank Road and existing SH1;
- Rahui Road, Mill Road and existing SH1; and
- North Ōtaki northbound on ramp and existing SH1.

Further details on the layouts and performance of these intersections are provided in Section 6.

3.2 Assumptions

3.2.1 WTSM Assumptions

The land use matrices used for this assessment have used what is known as the composite growth scenario, which includes medium growth from the WTSM model and the inclusion of the Riverbank Road development and those trips associated with additional development in Paraparaumu town centre, Waikanae North and the Kāpiti Coast Airport development. This will ensure the design has sufficient capacity to accommodate the forecast demand as development occurs.

It has been identified that the growth forecast in WTSM does not make specific allowance for the planned developments and subsequent trips identified in Table 2-2. In the base year model, the trips associated with the three main development areas would represent more than a 50% increase in traffic. WTSM forecasts 20% growth in vehicular trips between 2011 and 2031. Simply adding development traffic with WTSM growth would result in an almost

80% increase by 2031. Work undertaken in the development of the model highlighted that simply summing the trips associated with the WTSM medium growth and the trips associated with developments would "double count" and therefore overestimate future demand.

The composite growth approach assumes that overall, growth will be consistent with WTSM and makes account of the locations and intensity of development associated with the three specific developments. The resulting growth in vehicular trips is 33%, 32% and 35% in the AM, inter and PM peaks respectively. More information regarding this methodology is presented in Technical Report 34 – Traffic Modelling Report, prepared by the Kāpiti Alliance and a supplementary note included in Appendix C to this report.

Other assumptions are consistent with those identified in Section 2.7. The MacKays to Peka Peka Expressway is included in the 2021 matrices as is Ngauranga to Aotea Quay and the Basin Reserve. The 2031 and 2041 matrices also include Transmission Gully, Terrace Tunnel Duplication, Airport to Mount Victoria Tunnel improvements and the Petone to Grenada link road.

3.2.2 KTM2.1 Assumptions

When developing a traffic model and using it to test the effects of future changes there are two key inputs:

- assumptions about land use changes and population growth which influence the number of trips on the road network and where they are travelling to or from (known as the trip matrices), and
- assumptions about what changes will occur on the network i.e. which roads will be built.

It is possible to use the WTSM to forecast changes in trip origins and destinations resulting from development or new infrastructure. For this Project a variable trip matrix approach was adopted. One matrix represented the trip origins and destinations without the Expressway and another option matrix with the Expressway. Comparison of the two WTSM origin-destination matrices (motor vehicle trips) for the do minimum scenario and Expressway scenario found that the difference in the number of trips between each origin-destination pair were so small as to be negligible. Although in this situation a fixed matrix approach would have been appropriate, it was decided to use variable trip matrices in order to promote a consistent approach between the M2PP and PP2O traffic assessments.

When assessing the effects of changes to the road network generally two network models are needed for each forecast year. These are called the do minimum scenario and option scenario. In this case the option scenario is known as the Expressway scenario since it contains the Expressway.

For these two scenarios consistent land use and population growth assumptions have been used. In terms of networks the difference between the scenarios is that the Expressway is not included in the do minimum scenario but included in the Expressway scenario. This enables the effects of the Expressway on traffic patterns to be evaluated.

The assumptions used for the KTM2.1 network modelling are consistent with the changes to the network discussed in section 2.7, above. The MacKays to Peka Peka Expressway is included in the Do Minimum KTM2.1 model for 2021 and 2031. The Expressway, as described in Section 2 above is included in all the option models.

The influence of the other Wellington RoNS on the traffic demands are included in the trip matrices since the matrices are derived from WTSM, which covers a larger geographic area. Table 2-3 summarises which RoNS schemes have been included in the trip matrices for each horizon year.

The matrices from WTSM[14] have been used with the adjustments for development described in the preceding section. In addition a sensitivity test was completed using the high growth matrices[15] . All modelling completed to date has focused on weekdays. The following weekday periods were modelled, calibrated and validated:

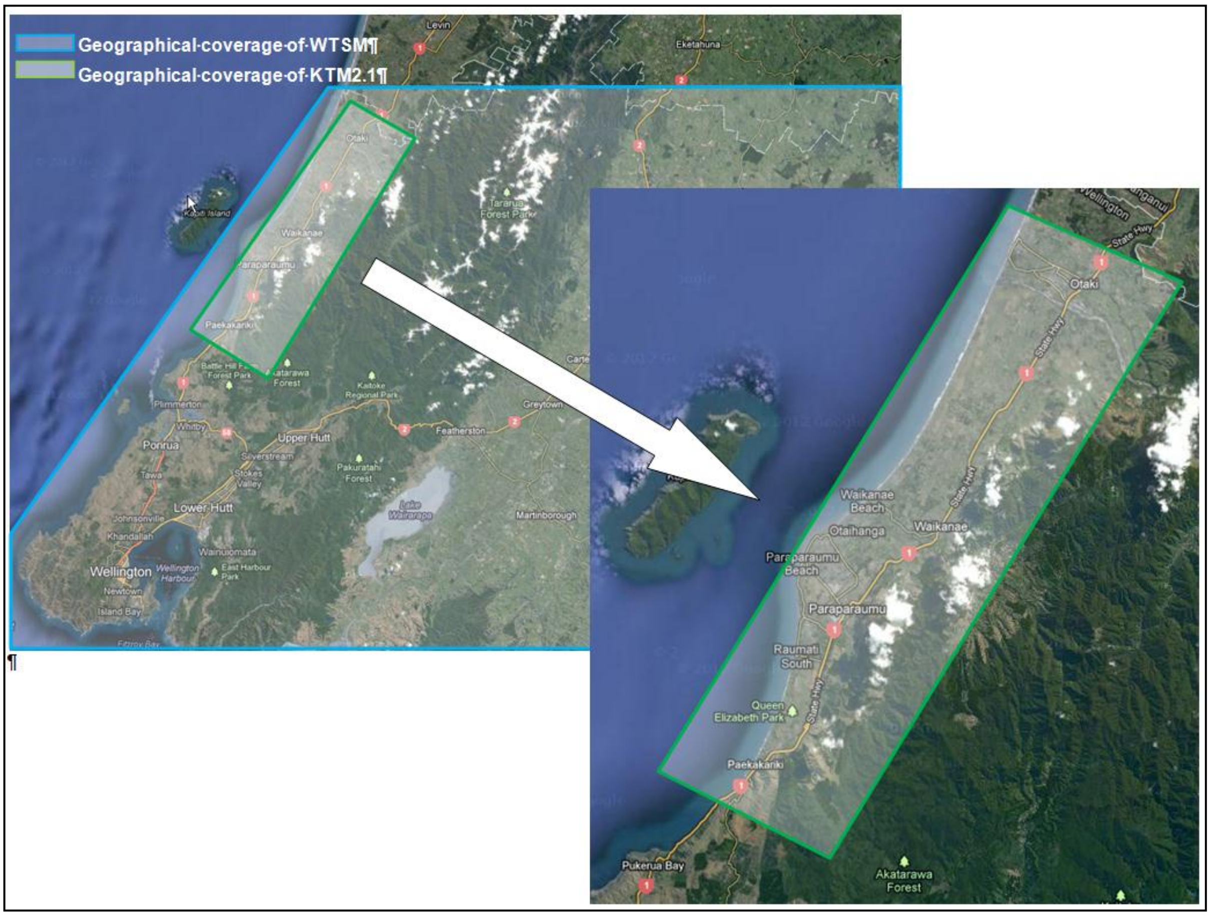
- AM peak – 8am to 9am;
- Inter-peak – 1hr average of 9am to 4pm; and
- PM peak – 5pm to 6pm.

In addition, one hour preceding both the AM and PM peaks was modelled (but not calibrated) this was to ensure that any queues that might start before the peak hours are accurately represented. Peak flow factors were determined for both the pre-peaks and each of the calibrated peak hours. Except the hour preceding the AM peak these were 90% or more which means that the flows are relatively flat. For the purposes of this assessment it was therefore assumed that the traffic flows over the modelled peak hours are consistent.

There is also recognition of significant demands occurring on holidays and weekends. Given that there is limited route choice within the Project area tests to demonstrate the effect of the Project on weekends have been undertaken using SIDRA intersection models with demands factored to represent holiday weekend conditions.

[14] The WTSM model contains three different sets of trip matrices representing low, medium and high population growth. This modelling has used the medium growth trip matrices from WTSM.
[15] For further information on the different growth scenarios used to develop the WTSM matrices see Tech Note 29: Demographic Inputs to WTSM prepared for GWRC.

Figure 3-1: Geographic Coverage of WTSM and KTM2.1



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4 Existing and Future Traffic Demand

4.1 Existing Motor Vehicle Trip Origins and Destinations

Between 14,000 and 18,000 to motor vehicle trips are simulated in each of the periods modelled in the Kāpiti Traffic Model (KTM2.1) for 2031. This translates to approximately 208,000 vehicle trips per day simulated in the area of the model. As shown in Figure 3-1 the KTM 2.1 model covers all of Kāpiti, not just the Project area. By 2031, approximately 34,000 vehicle-trips to or from Kāpiti District each day are forecast. Most, if not all of these trips would use some part of the Kāpiti Expressway:

- 10,000 trips per day between SH1 north of the model area (north of Taylors Road) and Kāpiti District.
- 24,000 trips per day between SH1 south of the model area (at Paekakariki) and Kāpiti District.

By 2031, about 4,000 trips per day are forecast between SH1 north of the model area and SH1 south of the model area all the way through Kāpiti District. All these trips would be made using the Expressway. It is also expected that there will be around 6,000 vehicle-trips per day between Ōtaki (Main Street and Retail Area) and southern parts of the district (in and around Waikanae or Paraparaumu), many of which would use the expressway. Therefore, about 90% of vehicle-trips made using the Kapiti Expressway would have a beginning or an end in Kāpiti District.

Excluding internal trips within the Ōtaki urban area, by 2031, around 13,600 vehicle-trips each day are forecast to have either an origin or destination in the Ōtaki Retail Area or Main Street. In comparison, 4,900 are forecast to begin or end in Te Horo and the rural part of the Project area.

There are approximately 1100 vehicle-trips between Te Horo and SH1 south of the model area and 3900 vehicle-trips between Ōtaki and SH1 south of the model area.

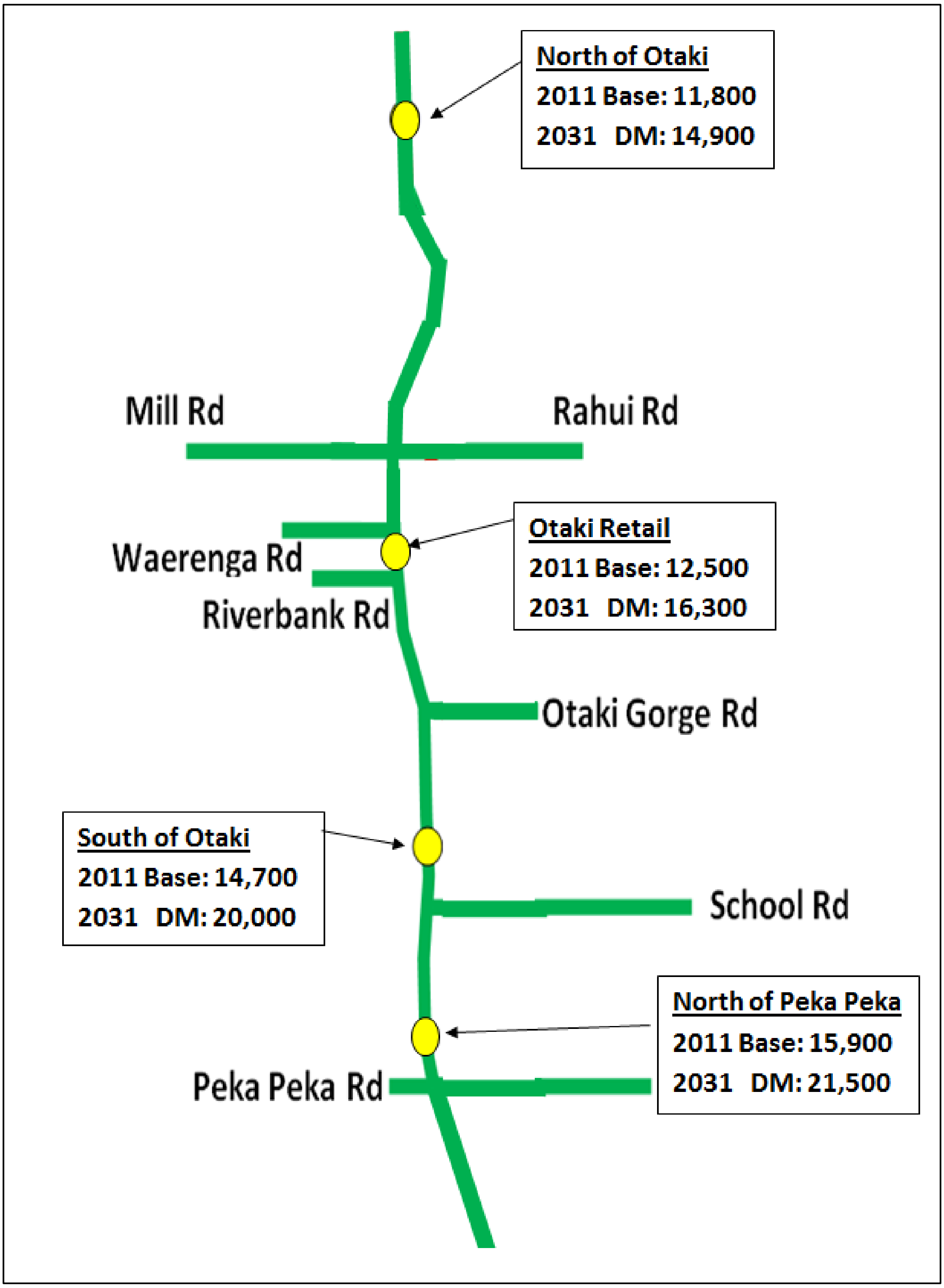
There are approximately 2100 vehicle-trips between Waikanae and SH1N and 4300 vehicle-trips between Ōtaki and SH1N.

4.2 Existing and Future Traffic Flow

Figure 4-1, below, summarises the two-way AADT for 2011 base and 2031 do minimum on SH1. Traffic volumes are lowest at the northern end of the Project area and increase as you head south along SH1. By 2031, traffic volumes on SH1 are expected to increase between 3000 and 5600 vehicles per day. This corresponds to a growth rate of 1.3 to 1.8 percent per year.

Key intersections along SH1 have been modelled for the 2031 do minimum scenario (as described in Section 2.7) using SIDRA. This represents how the intersections would perform in 2031 if the Expressway is not built. The results of this modelling are discussed below and model outputs are contained in Appendix D.

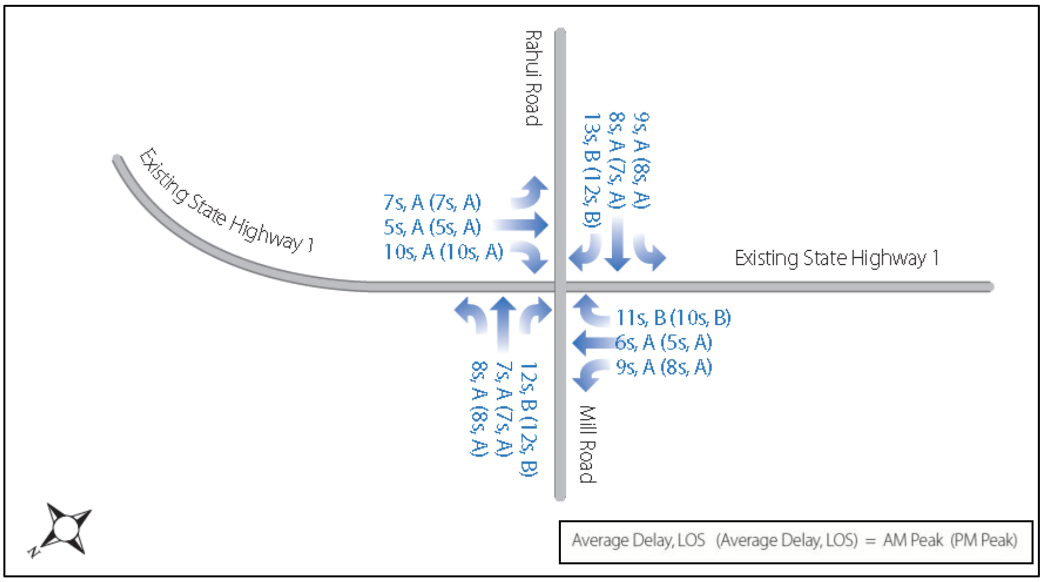
Figure 4-1: Existing and Future Traffic Volumes on SH1 (Two-way AADT)



4.2.1 Ōtaki Roundabout

Figure 4-2 shows that the roundabout in Ōtaki at Rahui Road and SH1 performs well in 2031 during typical AM and PM peak periods, based on traffic volumes from the KTM 2.1 SATURN model for the do minimum scenario.

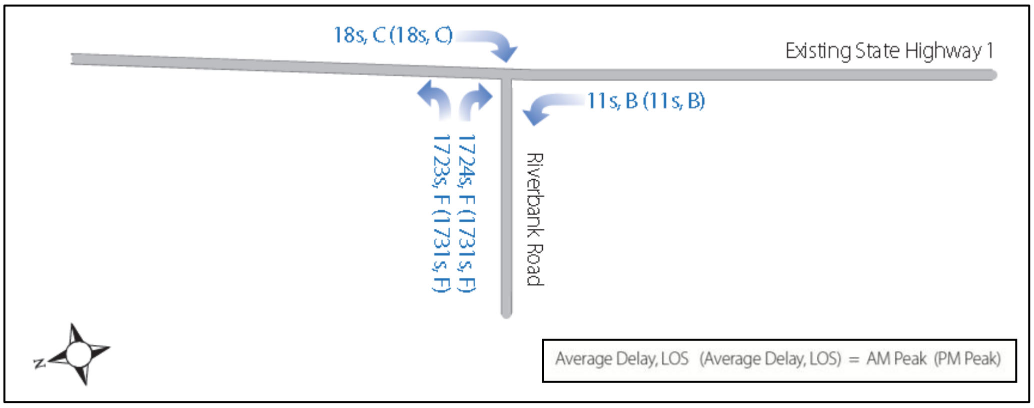
Figure 4-2: Ōtaki Roundabout Performance 2031 Do Minimum



4.2.1 Riverbank Road

To be conservative and allow for the fact that not all motorists will use the seagull arrangement to complete their right turn from Riverbank Road, it was modelled as a traditional T-intersection. As summarised in Figure 4-3, the model shows that traffic exiting Riverbank Road will experience delays of over 1700 seconds in 2031 do minimum scenario based the T-intersection layout. In reality, motorists will not wait this long at this intersection. Instead the motorists would use an alternative route such as Waeranga Road or Mill Road.

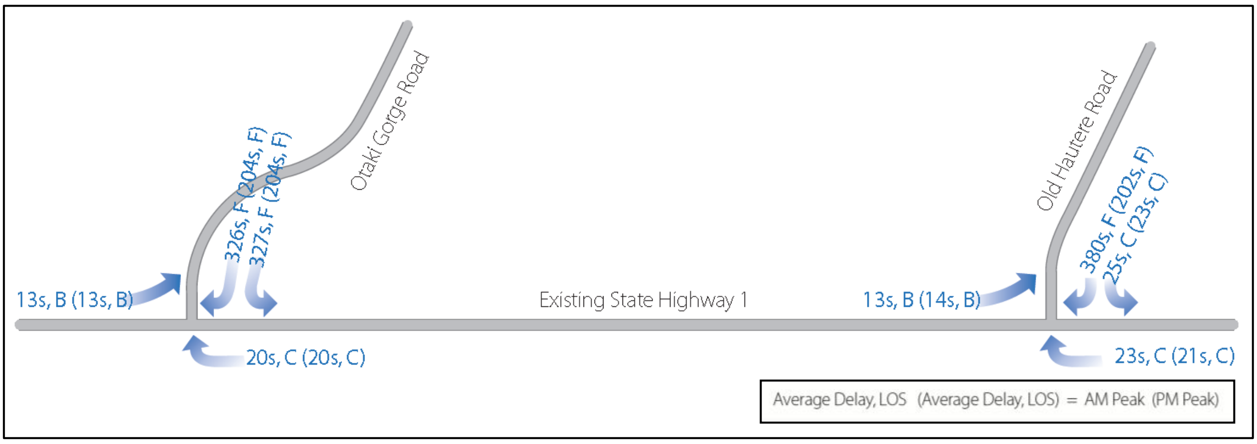
Figure 4-3: Riverbank Road Performance 2031 Do Minimum



4.2.2 Ōtaki Gorge Road

In the AM peak traffic exiting Ōtaki Gorge Road and Old Hautere Road experience average delays of over 3 minutes in 2031 do minimum scenario. The average delay increases to over 5 minutes in the PM peak as shown on Figure 4-4, below.

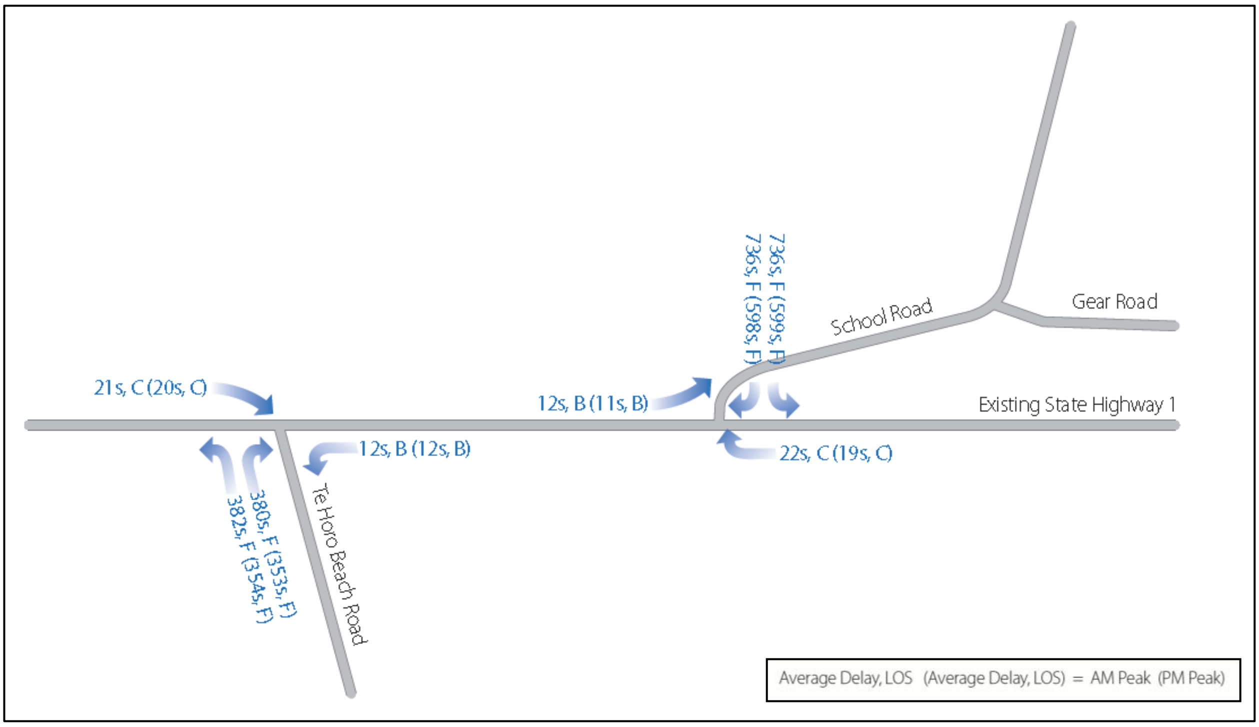
Figure 4-4: Ōtaki Gorge Performance 2031 Do Minimum



4.2.3 Te Horo

At Te Horo, traffic exiting the side roads also experience lengthy delays in the 2031 do minimum scenario. At Te Horo Beach Road, motorists wait on average 6 minutes or more to turn to SH1, as shown in Figure 4-5. Traffic exiting School Road is forecast to experience delays of 10 minutes in the PM peak.

Figure 4-5: Te Horo Performance 2031 Do Minimum



The above analysis shows that, by 2031, motorists will experience long delays and have difficulty accessing SH1. The delays experienced by motorists means that drivers may take risks when completing these manoeuvres. The crash history discussed in Section 2.10 showed that many crashes already occur at intersections and driveways. As traffic volumes on SH1 increase and the delay experienced by motorists also increases, the number of intersection and driveway related crashes can be also expected to increase.

4.3 Summary of Existing and Future Traffic Demand

Between 2011 and 2031 traffic volumes are forecast to grow between 1.3 and 1.8 percent per year. In 2031 approximately 34,000 vehicle trips per day would use at least part of the Expressway for part of their journey.

In 2031, if the Expressway is not constructed motorists trying to turn onto existing SH1 from the side roads would experience extensive delays. The delays would be of a magnitude which could result in motorists changing their trip making patterns or taking increased risks when turning. During typical traffic conditions, the roundabout in Otaki at the Mill Road / Rahui Road / SH1 intersection would operate well with a level of service of A or B.

5 Project Description

5.1 Expressway Alignment

The Wellington Northern Corridor Roads of National Significance (RoNS) runs from Wellington International Airport to Levin and completing it will assist regional and national economic growth. The Project is one of eight sections of the Wellington Northern Corridor which has been identified by the Government as a RoNS. The location of the Project in the overall scheme of this corridor is illustrated in Figure 5-1 below.

The Kāpiti Expressway comprises three sections of the Wellington Northern Corridor - namely MacKays to Peka Peka, Peka Peka to Ōtaki and Ōtaki to Levin. The NZTA proposes in this application to designate land and obtain the resource consents to construct, operate and maintain the Peka Peka to Ōtaki section of the Kāpiti Expressway. The Project extends from Te Kowhai Road in the south to Taylors Road just north of Ōtaki, an approximate distance of 13km.

The Expressway will provide two lanes of traffic in each direction. Connections to existing local roads, new local roads and access points over the Expressway to maintain safe connectivity between the western and eastern sides of the Expressway are also proposed as part of the Project. There is an additional crossing of the Ōtaki River proposed as part of the Project, along with crossings of other watercourses throughout the Project length. Scheme Plans are provided as part of the Assessment of Environmental Effects.

On completion, it is proposed that the Expressway become State highway 1 (SH1) and that the existing SH1 between Peka Peka and Ōtaki will become a local road, allowing for the separation of local and through traffic. The power to declare roads to be State highways or revoke status resides with the Chief Executive of the Ministry of Transport, not with the NZTA.

5.2 NIMT

KiwiRail proposes to designate land in the Kāpiti Coast District Plan for the construction, operation and maintenance of a re-aligned section of the NIMT through Ōtaki. The realignment of the NIMT is to facilitate the Expressway, however at the same time the realignment yields benefits for the safety of the NIMT.

5.3 State highway 1 at Mary Crest

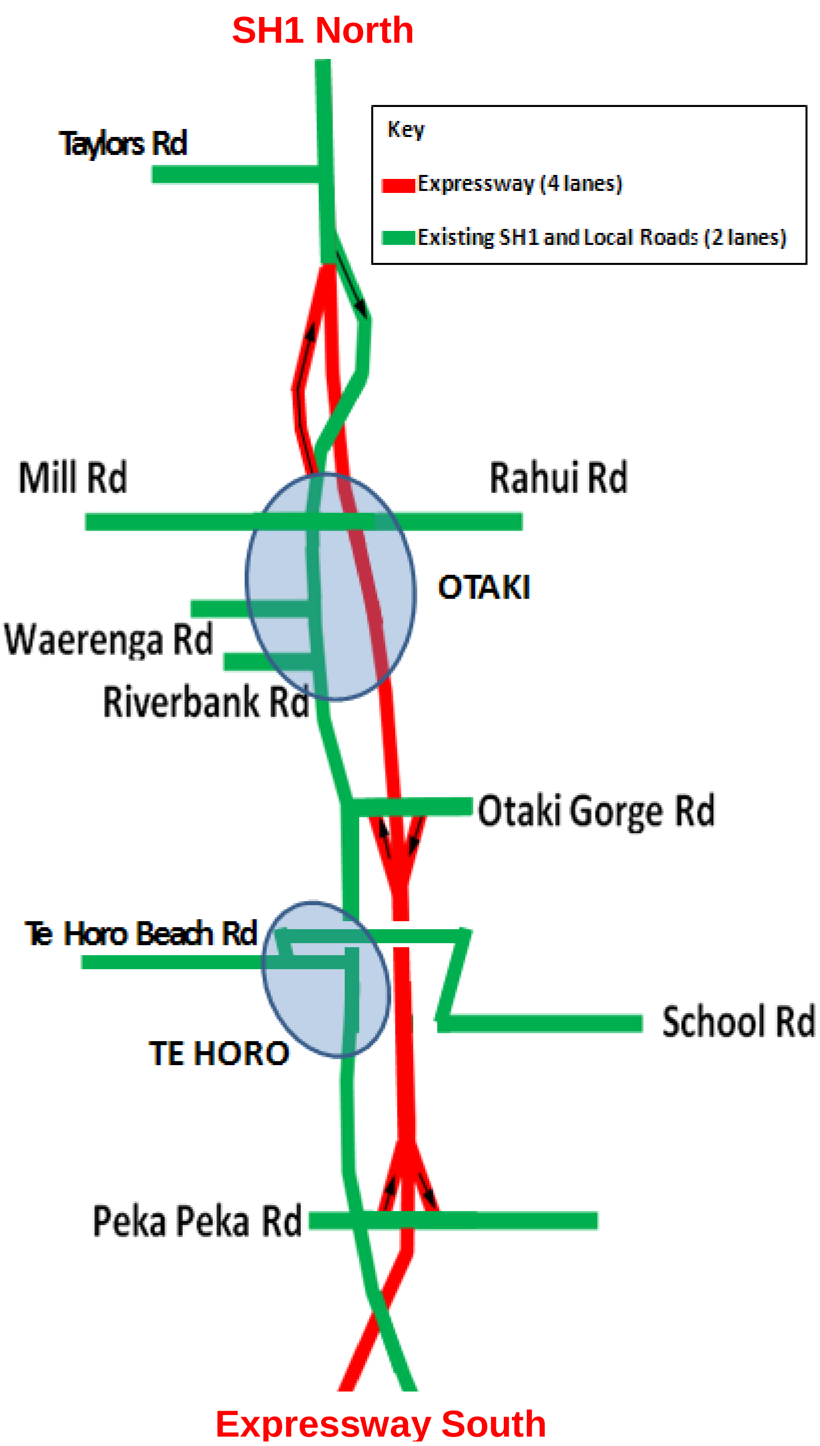
As part of the Project, a section of the existing SH1 at Mary Crest is required to the relocated. In effect, a new section of SH1 will be built in the western side of the Expressway, connecting to the existing SH1 south of the Project area. The existing SH1 will be either removed or has the Expressway built on top of it.

Figure 5-1: Location of Peka Peka to Ōtaki section of the Kāpiti Expressway

5.4 Form and Spacing of Expressway Interchanges

The Project is shown schematically in Figure 5-2, below.

Figure 5-2: Schematic of the Expressway and Interchanges



6 Forecast Traffic Reassignment and Travel Time Effects

Traffic flow re-routing (reassignment) resulting from the introduction of the Expressway was forecast using the Kāpiti Traffic Model (KTM2.1). This chapter presents the changes in traffic routing (assignment) expected as a result of the Project. It also explains the effect on journey times for travel by motor vehicle.

It is possible to use the WTSM to forecast changes in trip origins and destinations resulting from development or new infrastructure. Comparison of the WTSM origin-destination matrices (motor vehicle trips) for the do minimum scenario and Expressway scenario found that there was little difference between them. Variable trip matrices have still been used regardless of this finding.

The matrix of trip origins and destinations has also not been adjusted to reflect changes in the behaviour of users of the Otaki Railway Retail area. The Opus Central Laboratories intercept survey[16] found that all but 10.9% of those that had stopped at (and were surveyed in) Ōtaki would continue to do so. This means that in the model the number of trips on the Expressway past Ōtaki is likely to be slightly over-estimated and the number through Ōtaki under-estimated. This inaccuracy would have a negligible effect on the traffic flow forecasts.

6.1 Traffic Flow Forecasts

Chapter 2.8 showed that in 2011, the weekday traffic flow profile is relatively flat with similar northbound flows each hour between 08:00 and 18:00, particularly on Mondays to Thursdays. In the southbound direction the profile is flat during most of the day but there is a small peak in the late afternoon/ early evening. There is some variation in the magnitude of the traffic volumes between the AM, inter-peak and PM peak periods, but the general trends are consistent between the different periods. Traffic trends presented in this chapter, are therefore based on annual average daily traffic flow, which is representative of the conditions across the year.

On the following pages are a series of schematic diagrams presenting traffic forecasts for the do minimum scenario and Project scenario by 2031. Traffic conditions were forecast and assessed for 2021, 2031 and 2041. For clarity, only figures for 2031 are presented here since they trends for 2021, 2031 and 2041 were similar. The figures show:

- Figure 6-1: a comparison of AADT flows for the do minimum and Project;
- Figure 6-2: a comparison of AADT flows for light and heavy vehicles for the Project;
- Figure 6-3: a comparison of Project AADT flows for the option with two sensitivity tests.

Peak hour traffic volumes are summarised in Appendix E.

[16] Ōtaki Customer Survey: Pedestrian Intercept Surveys, Opus Central Laboratories, March 2011.

6.1.1 AADT Flows

Figure 6-1 summarises the AADT flows on the existing SH1 and Expressway for the 2011 base scenario, the 2031 do minimum scenario and the 2031 medium growth scenario. The flows are the sum of flow in each direction.

Comparing the 2011 base with the 2031 do minimum shows the forecast growth of traffic on the existing SH1 at the following locations:

- 26% increase in AADT on SH1 North of Ōtaki;
- 30% increase in AADT on SH1 in Ōtaki Railway Retail Area; and
- 36% increase in AADT on SH1 in Te Horo.

The Project provides a superior route for motorists that do not have trip origins or destinations in Te Horo or rural parts of the Project area, with shorter and safer trips with more reliable travel times. The introduction of the Expressway is therefore forecast to reduce the numbers of vehicles on the existing SH1. Motorists leaving or passing through the Project area instead use the Expressway.

Forecast for 2031 (see Figure 6-1) show that the Expressway carries about 9,500 vehicles AADT past the Ōtaki Railway Retail Area. The Expressway carries about 17,100 vehicles past Te Horo. The reason more traffic is forecast to use the existing SH1 in the Ōtaki Railway Retail area than in Te Horo is that there are more vehicle trips that start or end in the Ōtaki.

6.1.2 HCV Traffic

Currently the daily proportion of HCVs on SH1 at Ohau (north of the Project area) is 8%. There is a strong correlation between economic activity and vehicle-kilometres travelled by HCVs[17]. Since 1989 HCV traffic in New Zealand has doubled[18]. The number of HCVs using this part of SH1 is forecast to grow more quickly than the number of light vehicles. This means that by 2031, HCVs will make up a higher proportion of the daily traffic flow than at present.

Table 6-1 allows a comparison between the numbers of HCVs on the existing SH1 in 2011 against the number forecast for the 2031 do minimum. It shows that HCV proportions are forecast to increase from between 12% and 14% in 2011 to between 17% and 22% in 2031. This suggests that daily HCV flows will double again in the coming 20 year period. The 2031 do minimum and option forecasts are also shown in Figure 6-1.

The Project allows HCV drivers making inter-regional or inter-district trips to use the Expressway rather than the existing SH1. Comparison against a do minimum scenario demonstrates that overall, the Project relieves the existing SH1 of HCV traffic. The reduction is most noticeable in Te Horo where the Project results in lower HCV flows using the existing SH1 in 2031, than were experienced in 2011. In 2011 the two-way HCV AADT passing Te Horo on the existing SH1 is 2,200. In 2031 there are 4,700 HCV forecast to

[17] Prediction of New Zeeland's Freight Growth by 2020, Transport Engineering Research New Zealand Limited, March 2006.
[18] Wellington Regional Land Transport Strategy 2010-40, Greater Wellington Regional Council, Sept 2010.

pass Te Horo per day with 3,900 of these HCVs using the Expressway and 800 using the existing SH1. This means despite a total increase of 2,500 HCVs per day, there are 1,400 fewer HCVs on existing SH1.

On the existing SH1 south of the Ōtaki Railway Retail area, HCV flows in 2031 are forecast to be similar to 2011 levels as HCVs drivers leave the Expressway to access destinations in Ōtaki or the Riverside Development.

Figure 6-1: 2011 Base, 2031 Do Minimum and Option AADTs

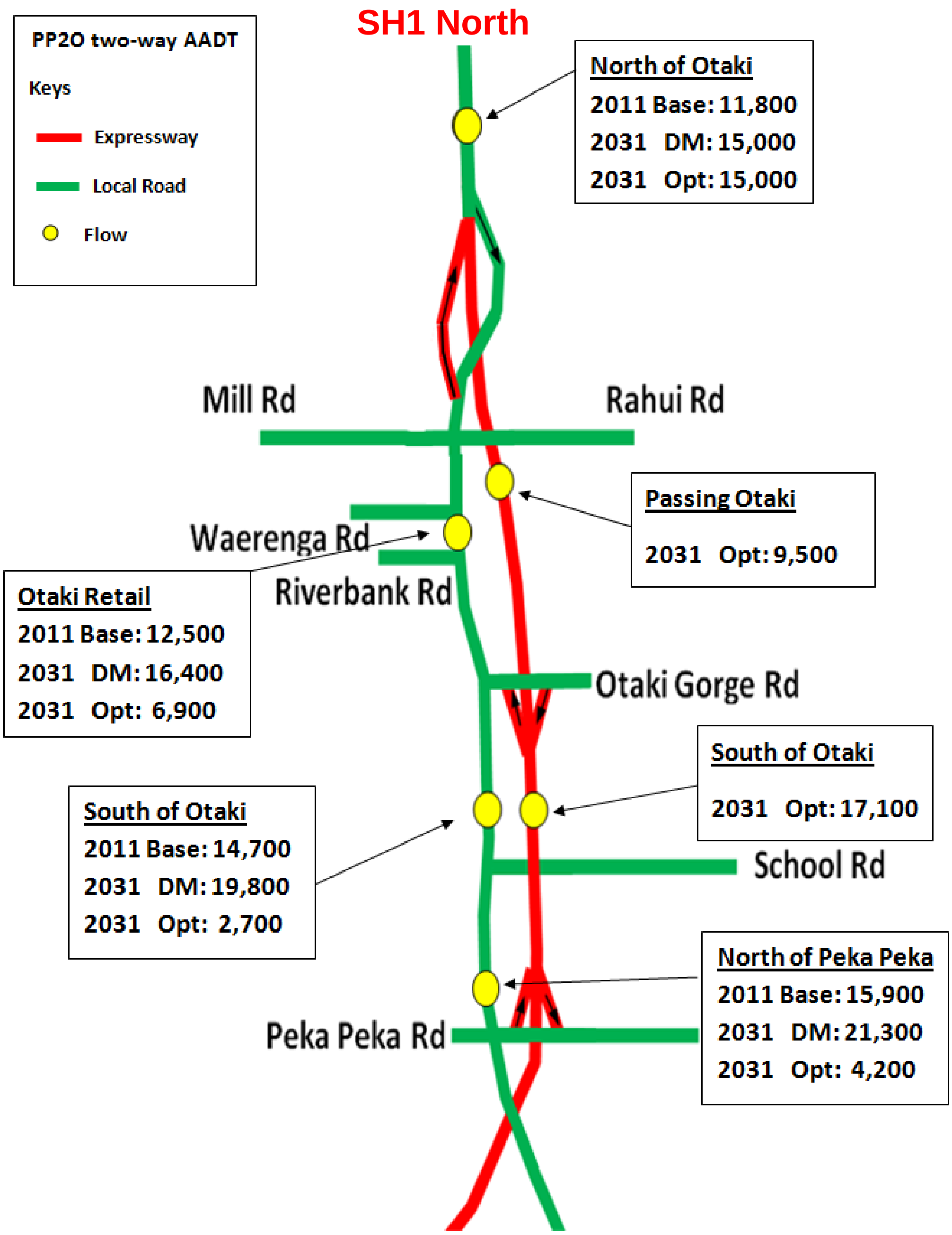
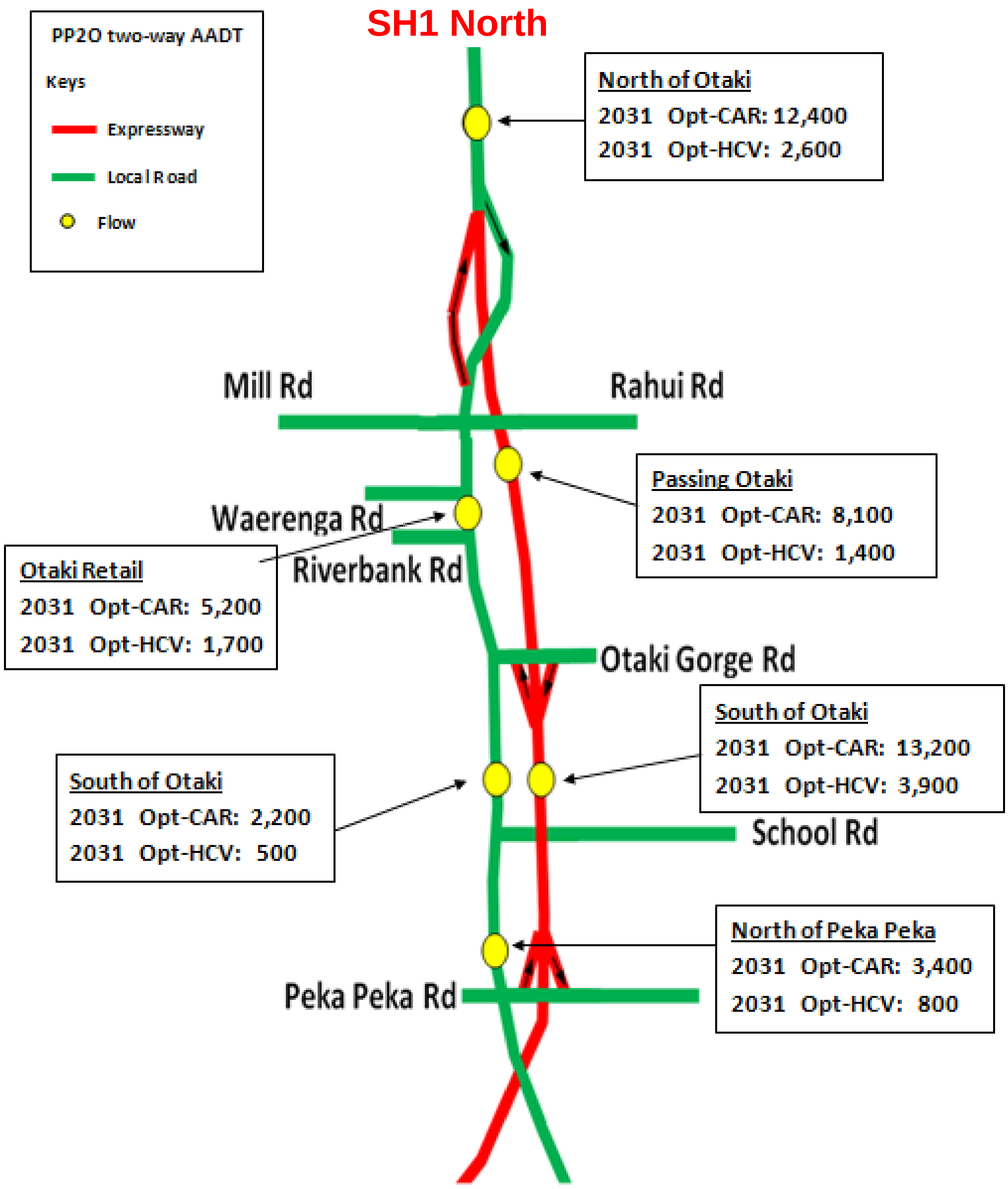


Table 6-1 - Forecast Traffic Flows on the Existing SH1

		2011 Base			2031 Do Minimum			2031 Option		
		NB	SB	**Tot.**	NB	SB	**Tot.**	NB	SB	**Tot.**
North of Ōtaki	Total Vehs.	6100	5700	**11800**	7700	7200	**14900**	7700	7200	**14900**
	HCVs	800 13%	700 12%	**1500**	1400 18%	1200 17%	**2600**	1400 18%	1200 17%	**2600**
Railway Retail Area	Total Vehs.	6300	6200	**12500**	8300	8000	**16300**	3300	3600	**6900**
	HCVs	900 14%	800 13%	**1700**	1700 20%	1400 18%	**3100**	900 28%	900 25%	**1800**
Te Horo	Total Vehs.	7500	7200	**14700**	10300	9700	**20000**	1200	1500	**2700**
	HCVs	1100 14%	1000 14%	**2100**	2300 22%	2100 22%	**4400**	200 20%	300 17%	**500**

Figure 6-2: 2031 Option Light and Heavy Vehicle AADTs



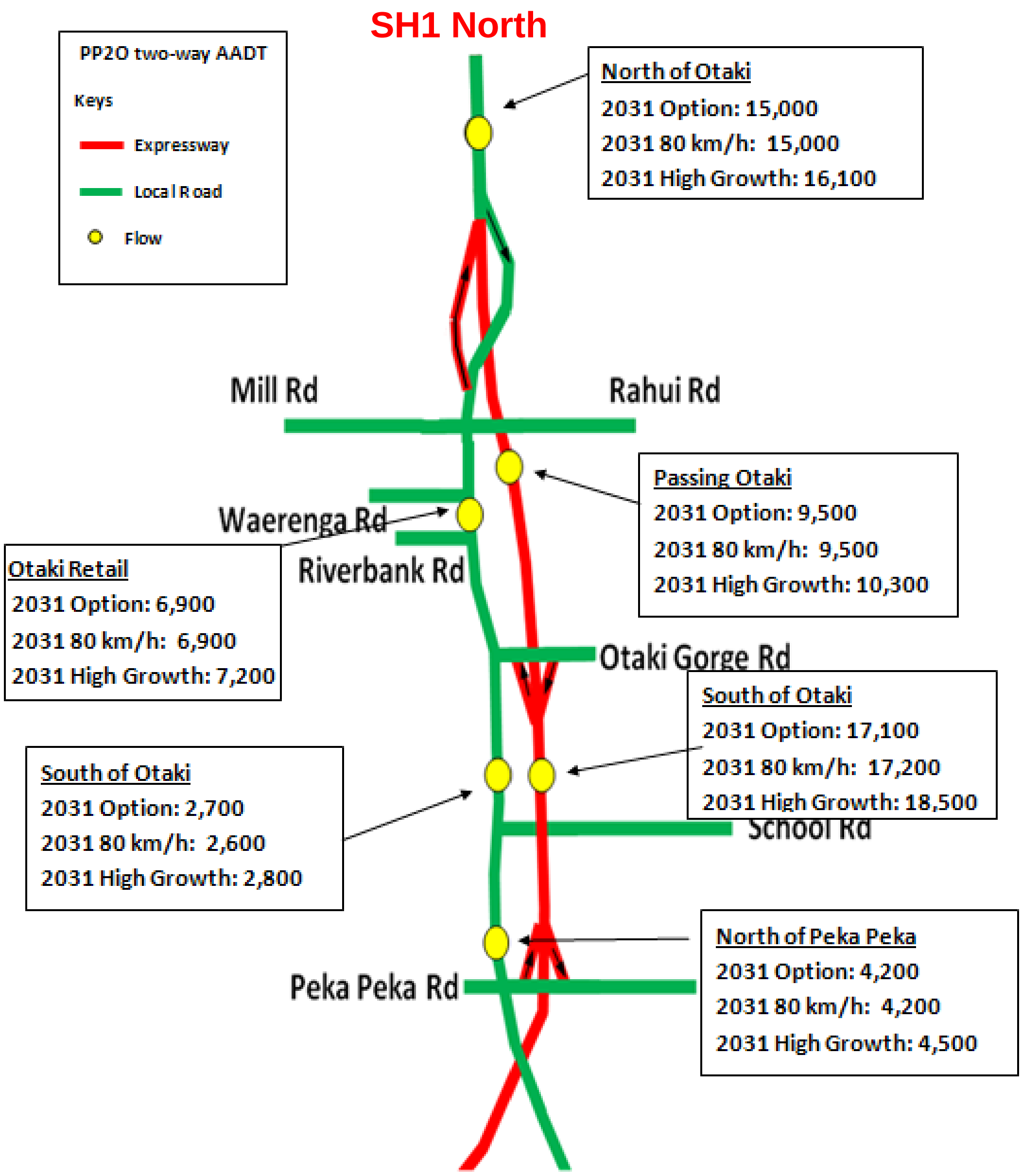
6.1.3 Traffic Flow Sensitivity Tests

Two sensitivity tests were completed to understand:

- the traffic routing effect of reducing the rural speed limit on the existing SH1 from 100km/h to 80km/h; and
- the sensitivity of the traffic flows to the high growth scenario.

Reducing the speed of traffic on the existing SH1 from 100km/h to 80km/h is not planned as part of this Project. However, by constructing the Expressway there is the opportunity for the speed on the existing SH1 to be reduced in the future. A sensitivity test was completed to understand the potential effects should this occur. The 2031 AADT flows forecast for each of these scenarios are shown in Figure 6-3. The 2031 Option AADT flows are repeated for completeness and ease of comparison.

Figure 6-3: 2031 Sensitivity Test AADTs



When the Expressway is operational, the existing SH1 will be reclassified as a local arterial. Kāpiti Coast District Council (KCDC) would like the existing SH1 to provide increased priority and amenity for pedestrians, cyclists and equestrian users of this local arterial when it becomes a local road. KCDC and the NZTA will agree the form and condition of the existing SH1 expected at handover as part of the State highway revocation process. Until agreement on the physical changes is reached it has been assumed that no changes are made to the existing SH1. This represents a worst-case in terms of the assessment of benefits.

A sensitivity test has been completed to determine the traffic routing effect of reducing the speed restriction on rural sections of the existing SH1 from 100kmph to 80kmph. This is intended to represent the macro effect of any localised traffic calming measures which may be agreed in future. Figure 6-3 shows that reducing the speed limit to 80kmph would cause very little change in the traffic patterns. About 100 additional vehicles per day to switch to the Expressway from the existing SH1. The trips affected would all have one trip end further south than Waikanae and an origin or destination in the rural part of the Project area surrounding Te Horo. The effects of this change are therefore most likely to be experienced by people that live or work in the rural part of the Project area.

Figure 6-3 also shows the AADT flows associated with a high growth scenario. It shows that the Expressway is forecast to accommodate most of the growth. In 2031, traffic flows on the Expressway for the high growth scenario are forecast to be between 800 and 1400 vehicles per day higher than for the medium growth scenario. The flows on the existing SH1 are however only about 100 to 300 vehicles per day higher. The high growth forecasts for the 2031 forecast year are similar in magnitude to the 2041 medium growth forecasts.

6.1.4 Induced Traffic

Induced traffic can be considered in a number of ways. Induced traffic can be considered to be a measure of changes in the way people choose to travel (e.g. shift between motorised private travel and public transport), or it can be changes in the trip origins and destinations or additional trips to be introduced as a result of the Project. Comparison of the Do Minimum and Option matrices shows about a 1% difference in trip ends and mode share. This indicates that the trips people make and the way people travel will be largely unchanged as a result of the Project.

6.1.5 Peak Shifting and Compression

Peak shifting is when the time peak traffic flows occur changes. It is likely that the travel time reductions associated with the Project would encourage commuter motorists to start their journeys later in the morning, particularly for journeys to Wellington. Return journeys may also pass through the Project area sooner than is currently the case. Overall, the effect on the daily traffic flow profile is expected to be minimal (see Figure 2-12 and Figure 2-13), given the rural nature of much of the route and the limited difference between peak hour and inter-peak traffic flows.

Peak compression is when the peak traffic flows occur during a shorter duration. This could occur as a result of the Project. Some motorists with origins or destinations within the Project area are likely to time their journeys so that they are immediately prior to or after the peak traffic flows on SH1, thus making it easier for them to turn to and from the existing SH1. The traffic reduction on the existing SH1 resulting from the Project would mean that these motorists would no longer find this to be necessary.

As discussed in sections 2.8.5 and 6.5, there may also be some initial compression some compression of peak holiday traffic flows.

6.2 State Highway Performance

The Highway Capacity Manual (HCM) provides guidance for assessing the level of service (LOS) of highway links. The LOS experienced by motorists using rural highways is affected by the capacity of the road, the traffic flows on the road and ratio of flow (volume) to capacity. As the traffic flow approaches the capacity of the road, the LOS deteriorates. As traffic flow increases, motorists using the road experience slower vehicle speeds. When the road capacity is reached, flow breakdown occurs and queuing forms. The LOS definitions used for this assessment are presented in Table 6-2.

Table 6-2 - HCM Link LOS Definitions

Volume / Capacity %	LOS	Description
< 25%	A	Free flow operations. Vehicles are almost completely unimpeded in their ability to manoeuvre within the traffic stream.
< 40%	B	Reasonably free flow operations. The ability to manoeuvre within the traffic stream is only slightly restricted.
< 60%	C	Flow with speeds near the free flow speed of the freeway. The ability to manoeuvre within the traffic stream is noticeably restricted.
< 80%	D	Speeds begin to decline with increasing flows. Ability to manoeuvre within the traffic stream is seriously limited.
< 100%	E	Operation is at capacity. Operations are highly volatile with little room to manoeuvre within the traffic stream.
> 100%	F	Flow breakdown or unstable flow.

The analysis focused on three locations on the existing SH1:

- south of Riverbank Road;
- Te Horo; and
- north of Peka Peka Road.

At each location the LOS was assessed for the following three scenarios:

- 2011 base;
- 2031 do minimum; and
- 2031 option.

Table 6-3 shows the LOS service forecasts for the three locations in each scenario. The forecasts year assessments assume the medium growth scenario. The volume to capacity ratios (V/C) were extracted from the Kāpiti Traffic Model (KTM2.1) and are therefore based on Passenger Car Units (PCUs)[19]. Table 6-4 shows the same information for the 2031 high growth scenario.

Table 6-3 - LOS for Existing SH1, AM Peak Hour, Medium Growth

Location	Dir.	2011 Base		2031 Do Min (Medium)		2031 Option (Medium)	
		V/C	LOS	V/C	LOS	V/C	LOS
South of Riverbank Road	NB	36%	B	50%	C	21%	A
	SB	34%	B	51%	C	21%	A
Te Horo	NB	36%	B	51%	C	5%	A
	SB	37%	B	53%	C	6%	A
North of Peka Peka Road	NB	38%	B	55%	C	10%	A
	SB	42%	C	61%	D	8%	A

[19] Light vehicles (cars) equal one passenger car unit, while HCVs equal two passenger car units.

Table 6-4 shows that the existing rural sections of SH1 currently perform at LOS B or C.

Table 6-4 - LOS for Existing SH1, AM Peak Hour, High Growth

Location	Dir.	2011 Base		2031 Do Min (High)		2031 Option (High)	
		V/C	LOS	V/C	LOS	V/C	LOS
South of Riverbank Road	NB	36%	B	53%	C	30%	B
	SB	34%	B	55%	C	30%	B
Te Horo	NB	36%	B	54%	C	7%	A
	SB	37%	B	57%	C	6%	A
North of Peka Peka Road	NB	38%	B	58%	C	11%	A
	SB	42%	C	66%	D	15%	A

Both tables show that, in the 2031 do minimum the volume to capacity ratios increase and there is a corresponding degradation in the LOS to mostly C.

The volume to capacity ratios forecast for the do minimum high growth scenario are only slightly higher than for the medium growth. This is because much of the growth in the district is expected further to the south around Waikanae and Paraparaumu. Section 6.1.3 (Traffic Flow Sensitivity Tests) showed that the increased traffic flows in this part of the district will largely be accommodated by the Expressway.

The tables also show that the reduction in traffic on the existing SH1 resulting from the Project will result in LOS A for both the 2031 medium and high growth scenarios. Both the medium and high growth scenarios include trips associated with the riverbank road development area. In addition, the high growth scenario includes additional trips to and from Ōtaki. Most of these vehicle trips will be accommodated by the Expressway. Therefore the relief provided to the existing SH1 between River Bank Road and the South Ōtaki interchange is not as pronounced in the high growth scenario. This section of the existing SH1 is expected to perform with LOS B.

LOS A is forecast for each section of the Expressway in both the 2031 medium and high growth scenarios.

The above methodology and analysis has not been applied to the urban section of SH1 through Ōtaki since in urban locations the LOS experienced by motorists is more influenced by the performance of intersections and side friction than by the degree of saturation of the road links. Therefore, the existing SH1 through the Ōtaki Railway Retail area was not assessed using the HCM criteria for link LOS.

The modelling has shown that with the reduction in traffic volumes on the existing SH1 in Ōtaki travel times through the urban section of Ōtaki will be reduced by a couple of seconds. In future this section of the existing SH1 in Ōtaki will function to provide access to this retail area rather than prioritising through traffic.

Section 7 presents the LOS experienced by traffic on the side roads accessing SH1.

6.2.1 Level of Service on Holiday Weekends

The LOS assessment described above is based on an average weekday during an average month of the year. The effect of additional traffic observed on holiday periods is known to cause congestion and delays on the Kāpiti Coast. Section 2.8 shows how daily traffic flows on holiday weekends compare to average daily traffic. Closer analysis of the traffic count data[20] from the past three years shows on holiday weekends northbound hourly flows are up to 146% of the average peak hourly flow. Southbound flows are 140% of the average peak hourly flow for that direction. However, northbound flows are often throttled by congestion and bottlenecks further south which regulates traffic demands and conditions within the Project area.

Table 6-5 shows the levels of service forecast for the rural sections of the existing SH1 at the holiday peak hour. As discussed above, the levels of service for the urban section of SH1 through Ōtaki has not been forecast since the HCM criteria for link LOS is not an appropriate measure of performance in urban area.

Comparing Table 6-5 with Table 6-3 allows the effect of the additional holiday traffic on the performance of the road.

Table 6-5 - LOS for Existing SH1, AM Peak Hour, Medium Growth + Holiday Traffic

Location	Dir.	2011 Base		2031 Do Min (Medium + Holiday)		2031 Option (Medium + Holiday)	
		V/C	LOS	V/C	LOS	V/C	LOS
South of Riverbank Road	NB	52%	C	73%	D	30%	B
	SB	48%	C	72%	D	30%	B
Te Horo	NB	52%	C	74%	D	7%	A
	SB	51%	C	75%	D	8%	A
North of Peka Peka	NB	56%	C	80%	D	14%	A
	SB	58%	C	85%	E	11%	A

This comparison shows that the 2011 holiday peak hour flows on rural parts of the existing SH1 are forecast to perform at LOS C, which is slightly worse the AM peak hour for either the medium or high growth scenarios (LOS B). By 2031, the rural roads are approaching capacity and operating at LOS D. As previously the Project provides substantial relief to the existing SH1 which will continue to perform at LOS A or B.

Any holiday traffic travelling through the Project area is expected to use the Expressway. The Expressway is forecast to operate at LOS A at peak hours on an average day. As discussed in Section 6.5 with the construction of the RoNS on the wider network, there is the potential for holiday traffic profiles to change. However, there is still limited capacity north of the Project area as SH1 remains a two lane highway. As is currently the case, people will adjust when they travel to minimise the congestion they experience to the north

[20] Data from NZTA's TMS Count Site located at Ohau.

of the Project. Therefore this will have the effect of minimising the potential for extreme peaks in holiday traffic flows.

6.3 Peka Peka Interchange

Construction of the Expressway changes accessibility for some motorists. The do minimum scenario for this assessment assumes that the MacKays to Peka Peka Expressway and all other sections of the RoNS, south of Kāpiti, are operational before the Project is constructed. An interim interchange, with a northbound on-ramp and southbound off-ramp, will provide for the merge and diverge between the Expressway and the existing (old) SH1 south of Peka Peka Road.

Until the Peka Peka to Ōtaki Expressway is constructed, the Kāpiti Expressway will merge into the existing SH1 immediately north of Peka Peka Road. Figure 6-4 schematically shows the Peka Peka Interchange for the do minimum (with the MacKays to Peka Peka section) and following construction of the Project.

Figure 6-4 highlights the differences between the do minimum and Project. Initially, in the Do Minimum, all motorists travelling to or from locations north of Peka Peka will use the existing SH1. At Peka Peka Road, motorists travelling towards the south from Te Horo, Ōtaki or locations north of Kāpiti may choose to join the Expressway or join the existing (old) SH1 alignment south of Peka Peka Road.

When the Expressway is constructed, a parallel local arterial will provide access to Te Horo and rural parts of the district. Motorists travelling towards the south from Ōtaki may choose to use the Expressway or the parallel local arterial. For these road users there is no difference from the do minimum scenario.

The Peka Peka interchange does not include a southbound on-ramp or a northbound off-ramp. This means that when the Project is constructed motorists travelling between the MacKays to Peka Peka section of the Expressway and Te Horo or rural parts of the Project area will have to travel via the Te Moana Road or Ōtaki South Interchanges. In the do minimum scenario[21] they would have been able to use the MacKays to Peka Peka section of the Expressway and then access existing SH1 at Peka Peka without detour. The effect of the Project is therefore to increase the travel distance and time for motorists travelling between Te Horo (or other nearby locations) and the MacKays to Peka Peka section of the Expressway.

[21] The do minimum scenario has the MacKays to Peka Peka Expressway constructed, but the Project is not constructed (i.e. the Peka Paka to north of Ōtaki Expressway is not built).

Figure 6-4: Peka Peka Interim Interchange Layout: Do Minimum and Project

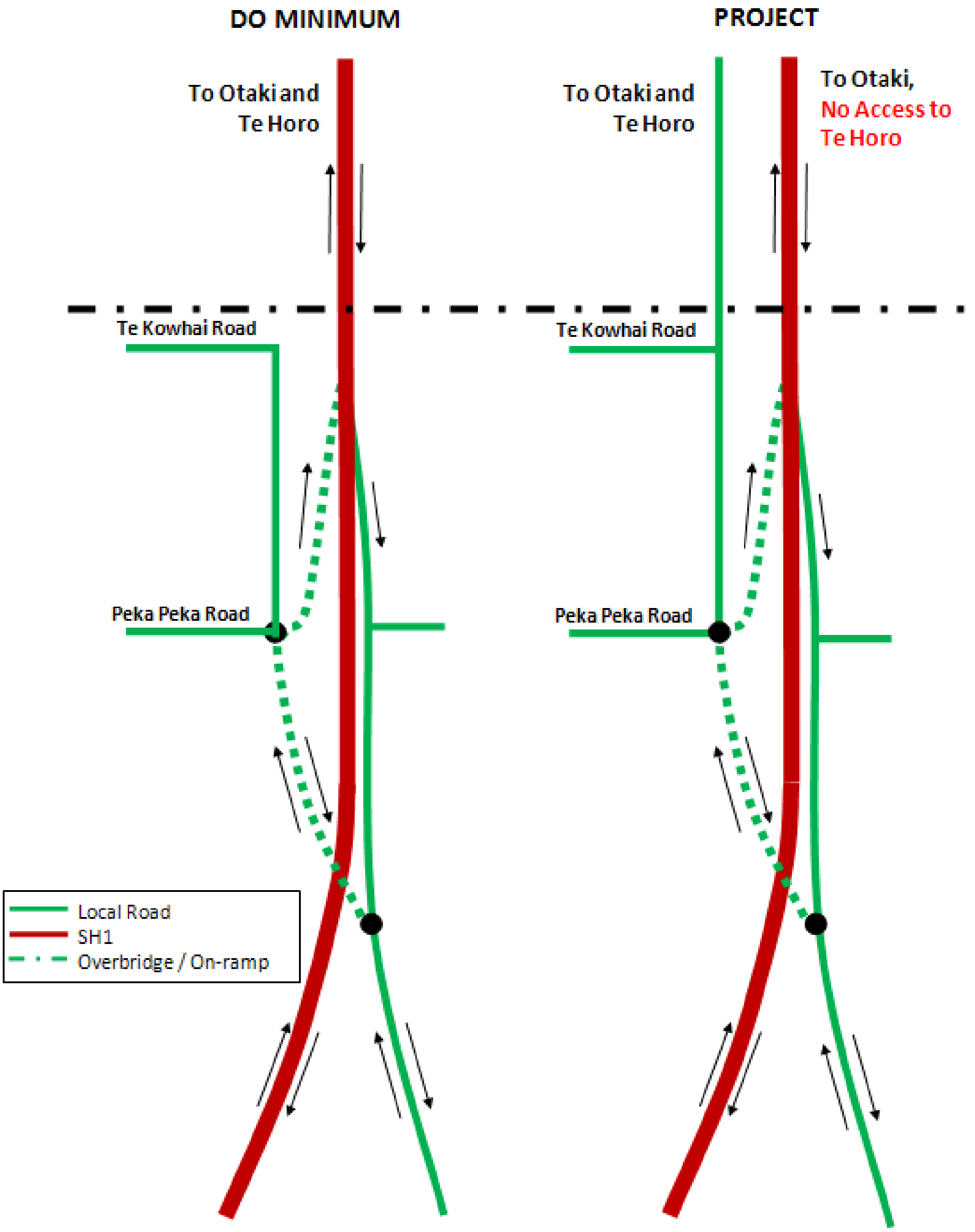
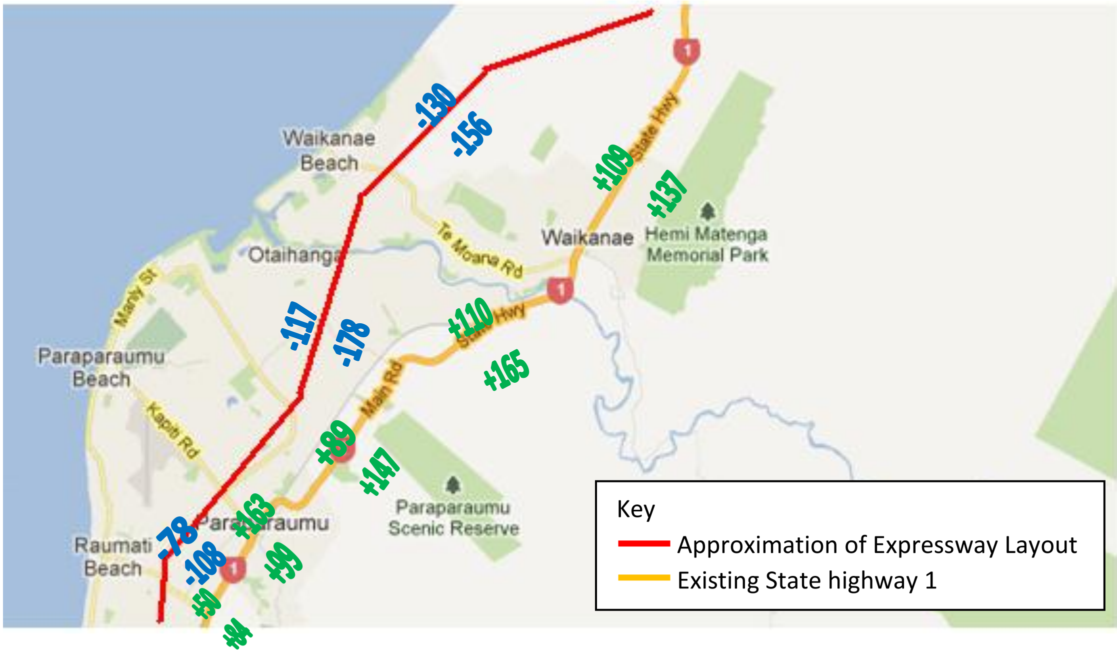


Figure 6-5 shows how the Project affects traffic flows, south of Peka Peka Road. It is a difference plot for the 2031 AM peak hour. Green lines show where traffic flows are forecast to increase as a result of the Project. Blue lines show where traffic flows are forecast to decrease.

In the 2031 do minimum scenario 27,000 AADT are forecast on the Expressway south of Peka Peka Road. Approximately 14,000 AADT are forecast on the existing (old) SH1 between Waikanae and Paraparaumu. Construction of the Project causes 3,500 AADT to shift from the Expressway to the existing (old) SH1 south of Peka Peka Road. These are people who need to access Te Horo or other locations in the vicinity.

Figure 6-5 - KTM2.1 Difference Plot: Option minus Do Minimum: AM Peak Hour 2031



6.4 Travel Time Forecasts

Journey times for seven key origin and destination pairs have been extracted from the model. These origin and destination pairs are:

(a) SH1 south (MacKays Crossing) and SH1 north of Ōtaki; both north and southbound;

(b) SH1 south and retail area near Arthur Street, Ōtaki; both north and southbound;

(c) SH1 north of Ōtaki and retail area near Arthur Street, Ōtaki; both north and southbound;

(d) SH1 south (MacKays Crossing) and Te Horo at School Road; both north and southbound;

(e) Te Horo at School Road and Paraparaumu Town Centre; both north and southbound;

(f) Te Horo at School Road and Waikanae near Elizabeth Street; both north and southbound; and

(g) Te Horo at School Road and Arthur Street in Ōtaki; both north and southbound.

The forecast travel times for these journeys in the PM peak hour for the 2011 base, 2031 do minimum and Project are shown in Table 6-6. Section 4.1 presented an overview of the numbers of trips between different sectors of the District.

From the 2011 base to 2031 Do Minimum the travel times for some journeys are reduced. This is due to the MacKays to Peka Peka section of expressway not being constructed in 2011, but included in the 2031 do minimum.

Table 6-6: 2031 PM Peak Travel Time Comparison

Travel Time Route		Northbound				Southbound			
		2011 Base	2031 Do Min	2031 Expressway	*Difference: Project - Do Min*	2011 Base	2031 Do Min	2031 Expressway	Difference: Project - Do Min
(a) Between SH1 at MacKays Crossing and SH1 north of Ōtaki	Time (m:s)	26:27	20:32	18:44	*-01:48*	23:17	20:25	18:41	*-01:44*
	Dist (km)	31.2	30.7	31.1	*0.4*	31.2	31.0	31.1	*0.1*
(b) Between SH1 at MacKays Crossing and Arthur St in Ōtaki Retail	Time (m:s)	24:20	18:24	18:19	*-00:05*	21:11	18:19	18:22	*00:03*
	Dist (km)	29.0	28.6	29.0	*0.4*	29.0	28.8	29.1	*0.2*
(c) Between SH1 north of Ōtaki and Arthur St in Ōtaki Retail	Time (m:s)	02:06	02:08	02:03	*-00:05*	02:06	02:06	02:03	*-00:03*
	Dist (km)	2.1	2.1	2.4	*0.3*	2.1	2.1	2.4	*0.3*
(d) Between Te Horo at School Road and SH1 at MacKays Crossing	Time (m:s)	20:18	14:27	18:23	*03:56*	17:07	14:13	17:28	*03:15*
	Dist (km)	23.5	23.5	23.9	*0.4*	23.5	23.5	23.8	*0.3*
(e) Between Te Horo at School Road and Paraparaumu Town Centre	Time (m:s)	14:05	13:32	12:52	*-00:40*	13:01	13:37	13:18	*-00:19*
	Dist (km)	17.0	17.2	17.3	*0.1*	16.99	17.14	17.32	*0.2*
(f) Te Horo at School Road and Waikanae at Elizabeth Street	Time (m:s)	06:42	07:25	07:01	-00:24	06:53	07:25	07:19	-00:06
	Dist (km)	9.9	10.2	10.2	0.0	9.9	10.2	10.2	0.0
(g) Te Horo at School Road and Arthur Street in Ōtaki	Time (m:s)	04:03	03:58	04:07	+00:09	04:04	04:06	04:05	-00:01
	Dist (km)	5.5	5.5	5.5	0	5.5	5.5	5.5	0

Overall, motorists driving through the Project area are expected to experience shorter travel times with the Expressway constructed compared to the do minimum. Table 6-6 shows that travel time savings of up to 1 minute and 48 seconds are forecast in 2031 when comparing the Expressway to the do minimum. This is for travelling along the whole length of the Expressway. However, these time savings are primarily as a result of bypassing Ōtaki. Trips travelling from Te Horo to north of Ōtaki would experience a similar time savings since they also bypass Ōtaki.

For trips which use the Expressway (from either the north or south) and are travelling to Ōtaki only experience a decrease of 5 seconds in travel time. This is due to the travel time on the rural sections of the Expressway being very similar to the existing SH1.

Table 6-6 shows that some journeys between Te Horo and Paraparaumu will take longer after the Expressway is constructed when compared to the do minimum for the same year. This is due to the change in access to the Expressway described in 6.3.

In the do minimum, motorists making these journeys have easy access to the MacKays to Peka Peka Expressway. When the Peka Peka to Ōtaki section is complete the fastest route to the Expressway is via the South Ōtaki Interchange (north of Te Horo). For most journeys, it will be quicker to drive south using the existing SH1 where in the do minimum these had been made using the MacKays to Peka Peka Expressway.

Comparison of the 2011 base travel times with the 2031 Expressway travel times shows that for journeys between Te Horo and SH1 south (at MacKays Crossing):

- in the northbound direction, motorists' journeys are between 1 minute 5 seconds and 1 minute 13 seconds faster in 2031 than they were in 2011; and
- in the southbound direction, motorists' journeys are 17 to 21 seconds longer in 2031 than they were in 2011.

The most common journeys to and from Te Horo are to and from Waikanae and Ōtaki. Travel times for these journeys are relatively unchanged.

6.4.2 Travel Time Reliability

As discussed in earlier sections motorists currently experience variable travel times when travelling through the Project area, particularly on weekends and holidays. This variability is generally caused by delays which occur as a motorists travel through the Ōtaki Railway Retail area. With the Expressway constructed, motorists will be able to bypass this area. Motorists who choose to stop in Ōtaki will also experience improved performance of the existing SH1 due to the reduction in traffic. These improvements in journey time reliability will also benefit HCVs. The Ōtaki bypass also means HCVs do not need to accelerate or decelerate for intersections or when travelling through the Ōtaki urban area which will improve their operating efficiency.

There is the potential for some journey time variability to occur on holiday weekends as a result of constraints north of the Project area. Specifically, in the north of the Project area where the Expressway ends, SH1 becomes a single lane in each direction. If the peak traffic demands exceeds the capacity of the single lane delays could occur.

Table 6-7 and Table 6-8 below show the forecast travel time statistics for the Do Minimum and Option scenarios respectively under 2031 forecasts. It should be noted that the route used to derive these statistics is between Peka Peka Road and Taylors Road so represent a long route. The percentage variability is influenced by the length of the route selected.

Table 6-7: 2031 Weekday Forecast Do Minimum Travel Time Variability

2031 DM Model	Northbound			Southbound		
	AM	IP	PM	AM	IP	PM
Average (s)	564	561	572	581	568	568
Standard Deviation (s)	20	17	26	25	15	15
Variability	3%	3%	4%	4%	3%	3%

Table 6-8: 2031 Weekday Forecast Expressway Travel Time Variability

2031 OPT Model	Northbound			Southbound		
	AM	IP	PM	AM	IP	PM
Average (s)	464	464	464	464	464	464
Standard Deviation (s)	0	0	0	0	0	0
Variability	0%	0%	0%	0%	0%	0%

Travel time variability has also been considered for public holidays as can be seen in Table 6-9. This table shows a much greater level of variability than is experienced on typical weekdays. This data was observed for a shorter route between Waerenga Road and South Manakau Road. The standard deviation and variability are not directly comparable to those presented in preceding tables because the travel times were recorded for different lengths.

Table 6-9: 2008 Public Holiday Observed Travel Time Statistics

2008 Labour Day Observed	NB	SB
Number of Observation	12	12
Average (s)	333.2	997.5
Standard Deviation (s)	33	552
Variability	10%	55%

An outline of the methodology and full set of findings for the above results is included in Appendix F.

6.5 Northbound Expressway Merge: North of Ōtaki

The two northbound lanes bypassing Ōtaki will merge down to one lane and then this lane will merge with the one lane on-ramp coming north out of Ōtaki. In effect there are two merges; both are the equivalent of a single lane on-ramp merging into a single lane.

NAASRA[22] was used to calculate the performance of the merge. HCM was also reviewed but was not considered appropriate given the number of lanes. NAASRA predicts that when the traffic volumes in the merge are 1250 vehicles per hour or less the merge is expected to perform with a LOS of C or better. When the traffic volumes in the merge are between 1250 and 1475 vehicles per hour, the merge performs at LOS D and at traffic volumes greater than 1475 vehicles per hour the merge performs at LOS E/F which corresponds to flow breakdown.

[22] National Association of Australia State Road Authorities GTEP Roadway Capacity 1988.

Based on the historic traffic count data[23] there were no occasions where the hourly northbound traffic volume north of Ōtaki exceeded 1250 vehicles per hour suggesting this merge has sufficient capacity to meet current demand, including holiday weekends. With the construction of the other RoNS to the south, downstream capacity restrictions are removed which means it is conceivable that peak flows on holidays could be greater or concentrated in a smaller time period. If this occurs, traffic demands could be higher which might result in congestion at the merge. However, it is difficult to predict whether this will actually occur since driver behaviour on holiday weekends is influenced by many factors such as weather. North of the Project area where SH1 merges back to a single northbound lane there will continue to be a constraint. Therefore the traffic profile is likely to remain similar to current holiday weekends.

In the vicinity of the merge the traffic model indicates that traffic volumes in 2031 will be 126 percent of the 2011 volume. Applying this growth rate to the historic count data, it is possible to get an indication of possible traffic demands in 2031 on holiday weekends or other peak periods. On this basis, with the historic traffic count data grown to 2031 levels there are 8 days over the 3.5 years of historic traffic data where the demands could exceed 1250 vehicles per hour, this corresponds to two to three days per year where a LOS of D can be expected to occur for the merge. These peaks can be expected to occur around Wellington Anniversary weekend, Easter or Christmas. At all other times the LOS can be expected to be C or better and there are no occasions where a LOS E or F is predicted.

This analysis is based on the assumption that the current travel patterns and traffic profiles do not change in the future and there is just general growth. In reality with all the RoNS constructed, holiday travel patterns may change. However, it is very difficult to predict how the travel patterns will change as discussed in Section 2.8.5.

6.6 Summary of Forecast Traffic Reassignment and Travel Time Effects

In 2031 with the construction of the Expressway the volume of traffic using the existing SH1 is significantly reduced. For example on existing SH1 through Te Horo the volume of traffic in 2031 is forecast to drop from nearly 20,000 vehicles per day in the do minimum scenario to nearly 3,000 vehicles per day with the Expressway. The volume of traffic passing through Ōtaki with the Expressway is higher (around 7,000 vehicles per day) but this is still a significant reduction compared to the do minimum flow which is forecast to be 16,400 vehicles per day. These reductions in the traffic volume result in improvement in the link LOS on the existing SH1. The Expressway will also operate with a link LOS of A.

The Expressway is forecast to result in a 2 minute travel time saving for motorists travelling through the Project area. This is largely due to the bypass of Ōtaki. Journey time reliability will also improve since motorists will not be subject to delays within Ōtaki as currently occurs on weekends and holidays.

North of Ōtaki the merge is generally expected to perform well with a LOS of C or better. It should also perform well on holiday weekends. However, if there are significant changes to holiday travel patterns as a result of the elimination of other downstream constraints due to

[23] Using data from NZTA continuous TMS count site located at Ohau with data from 1 January 2009 to 30 June 2012.

the wider RoNS package delays could be experienced. As is currently the case, motorists will most likely adapt to this by adjusting their travel patterns.

7 Expressway and Local Road Traffic Connectivity

7.1 Local Road and Interchange Performance

The performance of the local roads and interchanges been assessed using SIDRA. Analysis focused on the AM and PM peak 2031 medium growth do minimum and option scenarios. The average delays presented here incorporate both the intersection delay (time waiting for a gap in traffic) and geometric delay (time associated with completing turning the manoeuvres). Therefore some movements which have right-of-way still have a delay associated with them.

At some of the existing intersections, SH1 is widened which means it is possible for motorists turning right from a side road to complete their manoeuvre in two stages like at a seagull[24] type intersection. In SIDRA, where these intersections occur, each stage has been modelled with the assumption being that every motorist making the right turn does so by way of staged crossing. The comparative assumption, where no cars make any staged crossings, has also been modelled with the associated results showing much more severe delays i.e. they have been modelled as a traditional T intersection.

In reality, not all motorists will make the staged crossing, therefore the intersections will perform somewhere in between the two models. Given the extremity of the no staged crossing results, and the absence of observed data on the proportion of motorists making each type of manoeuvre, the results of the staged crossing assessment is presented in this report. This is a best case scenario that presents the minimum delays likely to be experienced. The side road approaches to SH1 have generally been modelled as a single full lane with a short turning bay. This corresponds with the way the intersections are used.

For the analysis of the local road and interchange performance the Project area has been divided into three general areas: Ōtaki, Ōtaki Gorge, and Te Horo. The results and performance for each area is discussed in the following sections and model outputs are contained in Appendix G. Finally the local road and interchange performance assessment concludes with some sensitivity tests examining the impact of higher than typical traffic flows such as those which may be experienced on holiday weekends.

Intersection level of service (see Table 7-1) is defined in the HCM as a function of delay.

Table 7-1: LOS Criteria for Intersections

LOS	Delay (Roundabouts)	Delay (Stop and Give-way)
A	Less than 10s	Less than 10s
B	10s to 20s	10s to 15s
C	20s to 35s	15s to 25s
D	35s to 50s	25s to 35s
E	50s to 70s	35s to 50s
F	Greater than 70s	Greater than 50s

[24] Seagull is a type of intersection layout for a T-junction with the through traffic having the right of way. Extra space is provided between the opposite directions of traffic on the through road which enables motorists turning right from a minor side road to complete the movement in two stages. This reduces the delay for motorists on the minor road since they only need to find a gap in one direction of traffic at a time.

Gap acceptance criteria has generally followed the defaults as set out in the SIDRA manual which are based on the *AUSTROADS Guide to Road Design* manual and as shown in Table 7-2. Generally the SIDRA default values have been used with the exception of:

- a right turn movements from minor roads have used the minimum values.
- a right turn staged crossings has used 5.5 and 3.5 seconds for critical gap and follow up headway respectively for the first stage. The second stage has used 4.5 seconds for critical gap acceptance and 2.7 second for the follow up headway

Table 7-2: Gap Acceptance Values

Type of Movement	**AUSTROADS Guide AGRD04A-10 (2010)**		**Default or recommended values and ranges for use in SIDRA INTERSECTION**	
	Critical Gap (seconds)	**Follow-up Headway (seconds)**	**Critical Gap (seconds)**	**Follow-up Headway (seconds)**
Left Turn (1)	5	2-3	(3 – 6)	(2.0 – 3.5)
1-lane opposing			4.5	2.5
2-lane (or more) opposing			5	3
Through movement crossing one-way road				
2-lane one-way	4	2	4.5 (4 – 5)	2.5 (2 – 3)
3-lane one-way	6	3	5.5 (5 – 6)	3.0 (2.5 – 3.5)
4-lane one-way	8	4	6.0 (5 – 8)	3.5 (3 – 4)
Through movement crossing two-way road				
2-lane two-way	5	3	5.0 (4.5 – 5.5)	3.0 (2.5 – 3.5)
4-lane two-way	8	5	6.5 (5 – 8)	3.5 (3 – 5)
6-lane two-way	8	5	7.5 (7 – 8)	4.5 (4 – 5)
Right Turn from Major Road (2)				
Across 1 lane	4	2	4.0 (3.5 - 4.5)	2.0 (2 - 3)
Across 2 lanes	5	3	4.5 (4 - 5)	2.5 (2 - 3)
Across 3 lanes	6	4	5.5 (5 - 6)	3.5 (3 - 4)
Right Turn from Minor Road (3)				
One-way	3	3	Use Left turn values above	
2-lane two-way	5	3	5.5 (5 - 6)	3.5 (3 - 4)
4-lane two-way	8	5	7.0 (6 - 8)	4.0 (3 - 5)
6-lane two-way	8	5	8.0 (7 - 9)	5.0 (4 - 6)
Merge from acceleration lane	3	2	3.0 (2.5 - 3.5)	2.0 (1.5 - 2.5)

Notes (1) to (3) below are not included in the AUSTROADS Guide.

(1) This is considered to apply to Left-Turn movements from the Minor Road, as well as Slip-Lane Left-Turn movements from minor road

(2) This case is relevant to two-way Major Road conditions with one direction of the Major Road opposing (1-lane, 2-lane or 3-lane).

(3) The conditions specified (one-way, 2-lane two-way, 4-lane two-way, 6-lane two-way) are relevant to the opposing movement lanes on the Major Road.

7.1.1 Ōtaki

Figure 7-1 and Figure 7-2 summarises the Ōtaki Roundabout performance for the do minimum and Expressway scenarios, respectively. Figure 7-2 also shows the performance of the northbound on ramp north of Ōtaki. The Rahui Road, Mill Road, and SH1 roundabout performs well in both the do minimum and Expressway scenarios with each movement having an average delay of 13 seconds or less which corresponds to LOS of A or B. The intersection of the existing SH1 and the new northbound on-ramp also performs well with a LOS of A for all movements in both the AM and PM peak periods.

Figure 7-1: Ōtaki Roundabout Performance 2031 Do Minimum

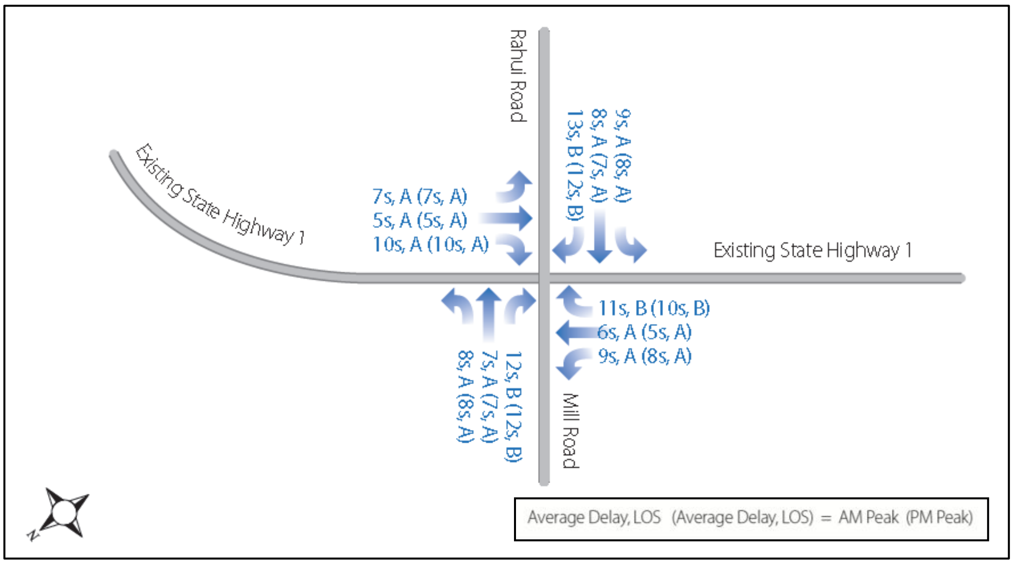
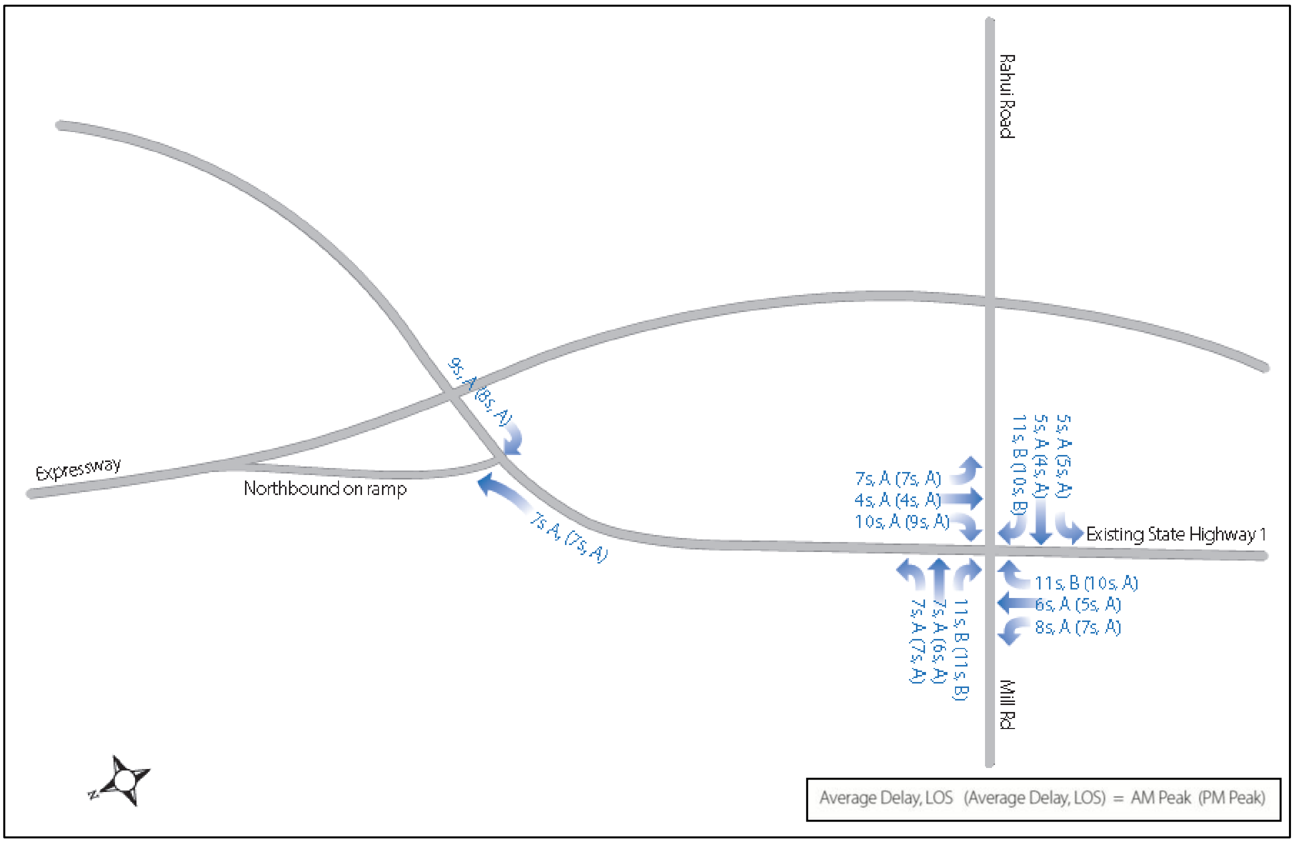


Figure 7-2: Ōtaki Roundabout and Northbound Ramp Performance 2031 Expressway



In 2031 traffic turning out of Riverbank Road experiences extensive delays without the Expressway as shown in Figure 7-3. With the Expressway constructed the volume of traffic on the existing SH1 is significantly reduced which results in a considerable improvement for traffic exiting Riverbank Road as shown in Figure 7-4.

Figure 7-3: Riverbank Road Performance 2031 Do Minimum

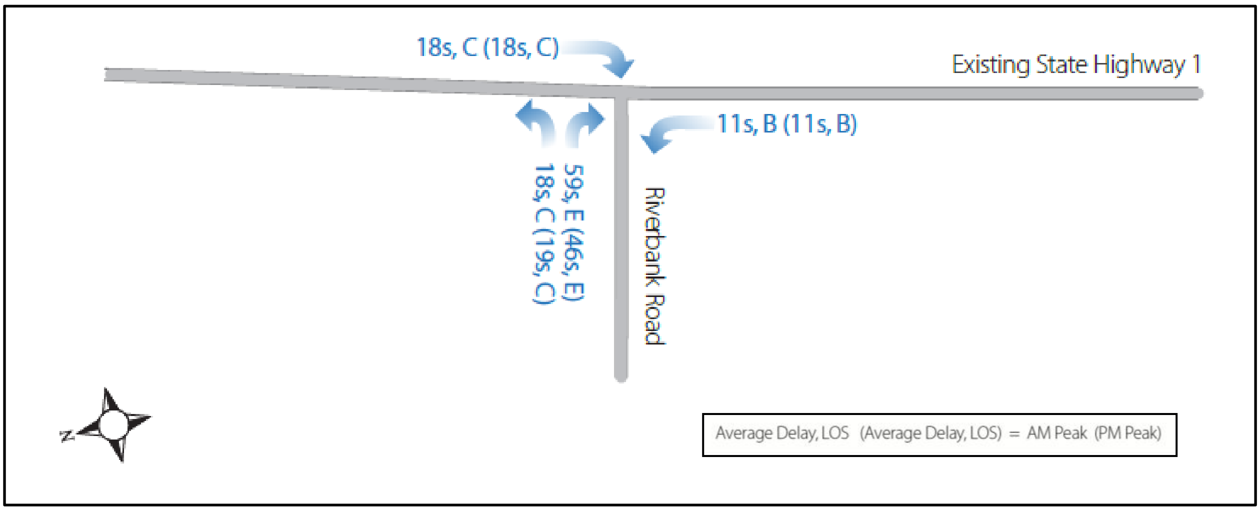
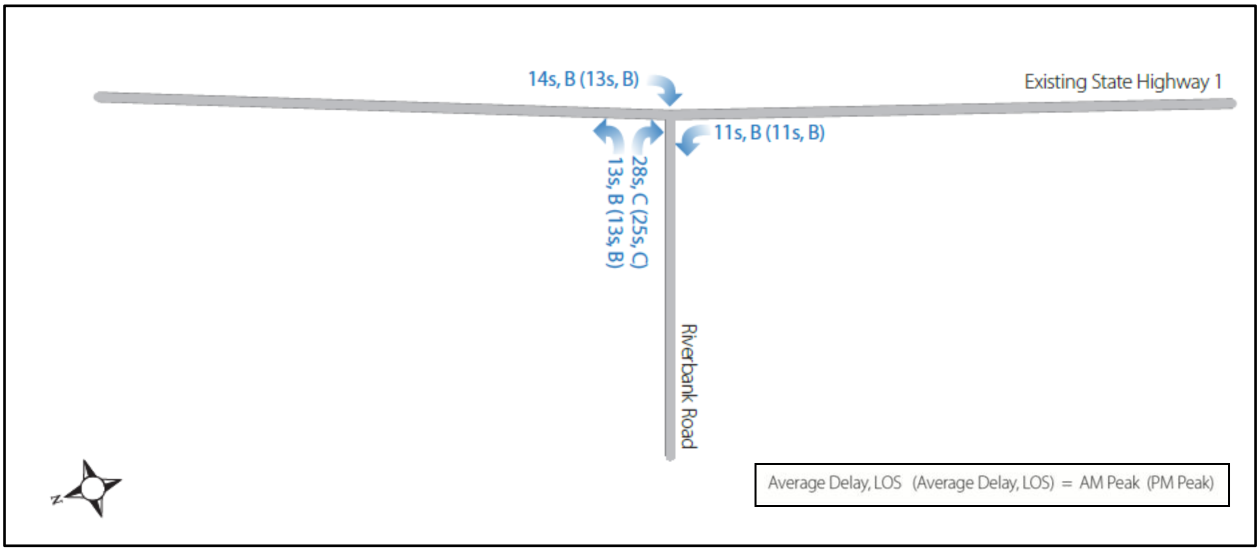


Figure 7-4: Riverbank Road Performance 2031 with Expressway



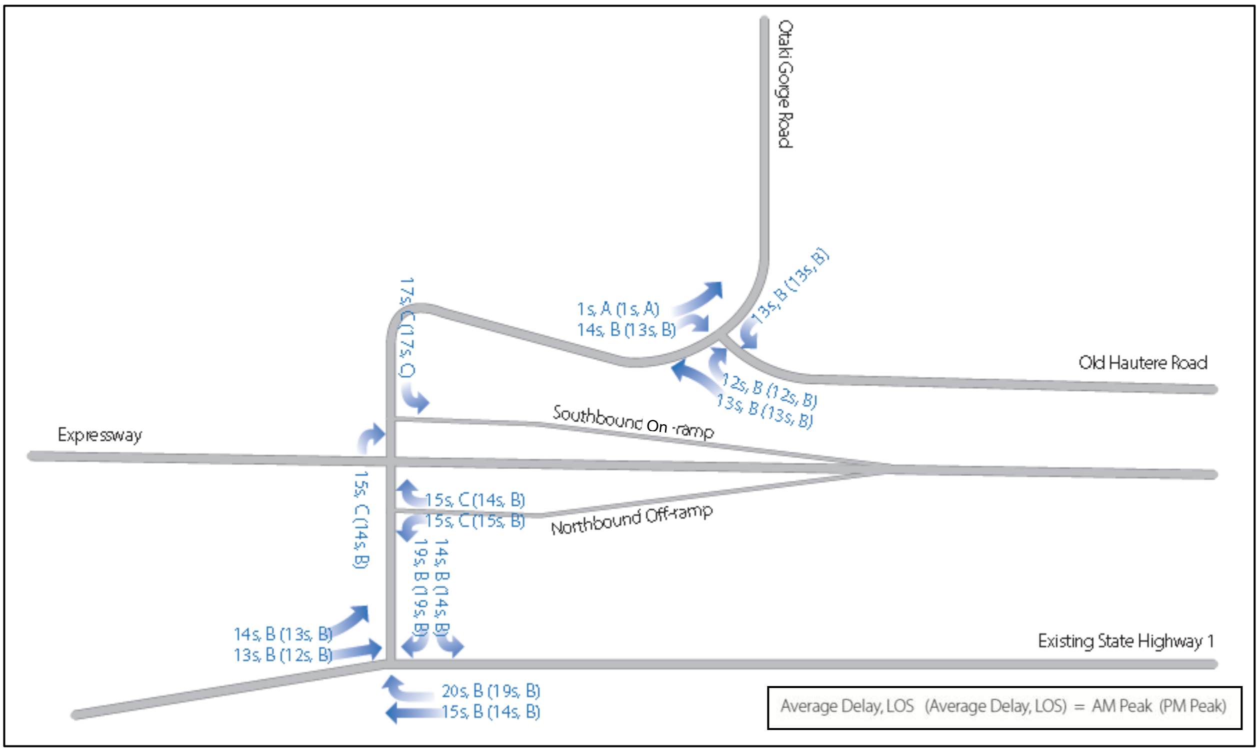
7.1.2 Ōtaki Gorge

Figure 7-5 summarises the do minimum performance of Ōtaki Gorge Road and Old Hautere Road. Traffic exiting either of these roads in 2031 experiences extensive delays while waiting for a gap in the through traffic on SH1. With the Expressway built, as shown in Figure 7-6, the road network layout in the vicinity is completely different. North facing ramps to the Expressway are provided along with a bridge across the Expressway for local traffic. In the Expressway scenario all intersections operate well with average delays of 20 seconds or less. As shown on the figure, traffic from Ōtaki Gorge Road and Old Hautere

Road can access the existing SH1 and the Expressway with significantly less delay than in the do minimum.

Figure 7-5: Ōtaki Gorge Performance 2031 Do Minimum

Figure 7-6: Ōtaki Gorge Performance 2031 with Expressway



For the intersection of Ōtaki Gorge Road and the southbound on-ramp, the above intersection performance analysis was based on a layout with right turn bay from Ōtaki Gorge Road to the on-ramp in addition to an eastbound through lane from existing SH1 to Ōtaki Gorge Road. A sensitivity test with a shared through and right turn bay was also completed. This sensitivity test found that this change resulted in less than 1 second change in the delay for motorists since the volume of through traffic is so low.

7.1.3 Te Horo

Similar to the other locations, traffic will experience long delays when accessing SH1 from School Road or Te Horo Beach Road in the do minimum scenario, as shown on Figure 7-7. The construction of the Expressway results in significantly less traffic on the existing SH1 which means there is less delay for motorists turning to or from the existing SH1, as shown on Figure 7-8.

Figure 7-7: Te Horo Performance 2031 Do Minimum

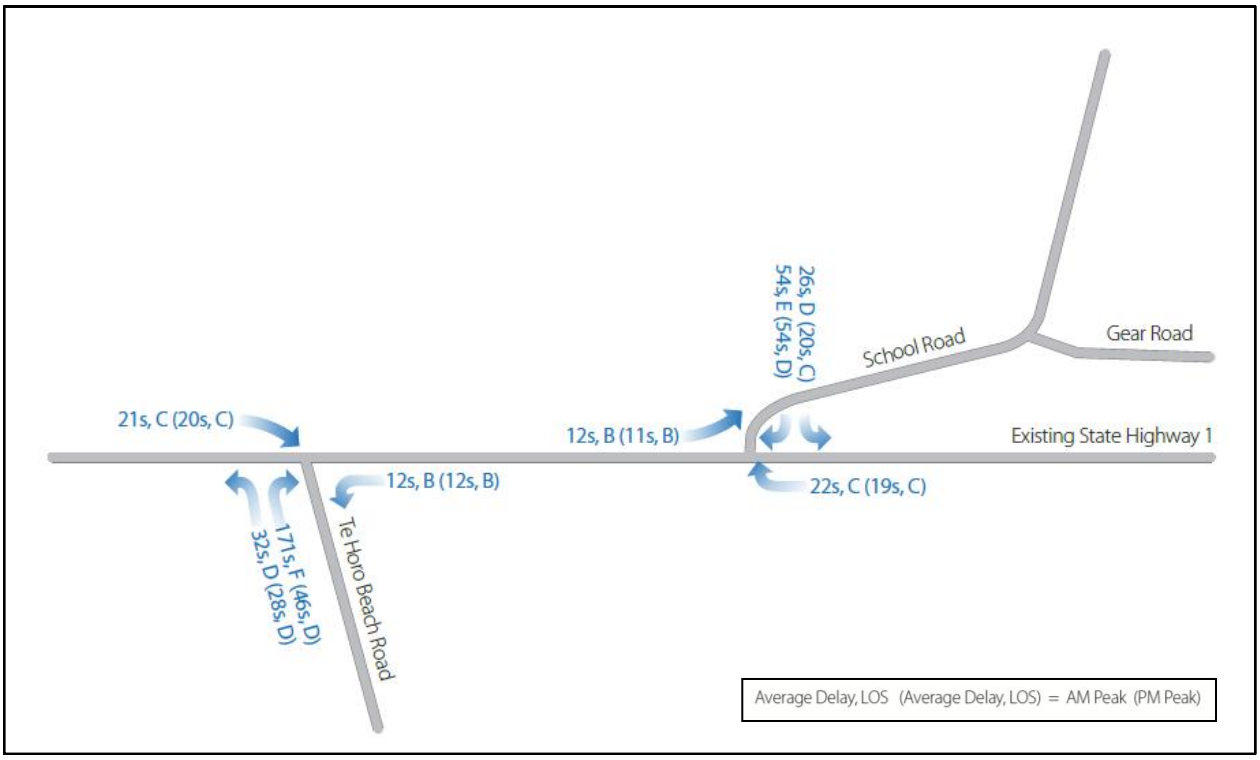
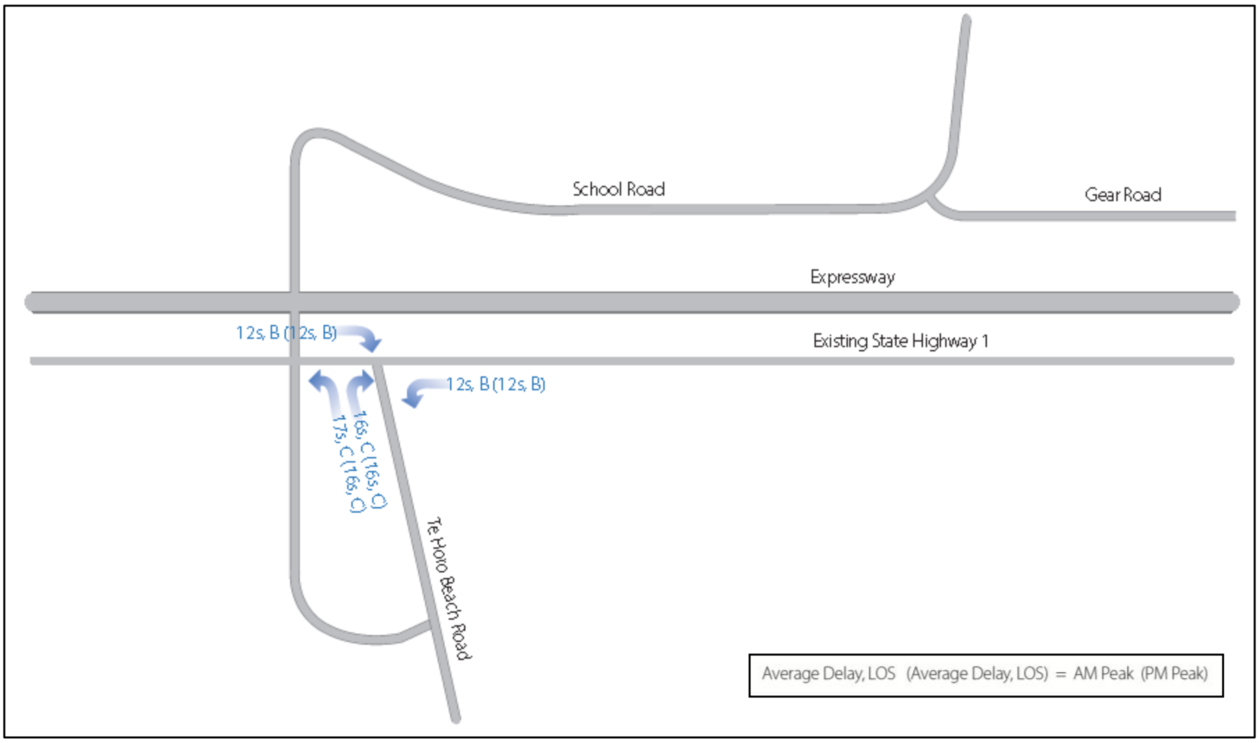


Figure 7-8: Te Horo Performance 2031 with Expressway



7.1.4 Peak Traffic Flow Sensitivity Tests

The above analysis has focused on the 2031 medium growth scenarios. Sensitivity tests were completed to consider the capacity of key intersections and ramps to cope with peak demands such as those potentially experienced on holiday weekends. The following four intersections were analysed since they are most likely to experience peak holiday traffic:

- Ōtaki Gorge Road and Expressway Southbound On-ramp;
- Ōtaki Gorge Road and Expressway Northbound Off-ramp;
- Ōtaki Gorge Road and existing SH1 roundabout; and
- Existing SH1, Mill Road and Rahui Road roundabout.

At each of these intersections traffic volumes were grown (for all movements) until the performance of at least one movement degraded to LOS D. The percentage increase in total intersection demand flow to cause this drop in performance was then calculated and is summarised in Figure 7-9, below. The percentage increase has been calculated using total intersection demand flow for 2031 Expressway medium growth as the base.

Analysis of the historic traffic volumes has shown that the maximum hourly traffic volume recorded on holidays does not typically exceed 140 to 150 percent of the average hourly maximum traffic flow on a weekday. This test shows that the intersections can handle over one and half times the normal AM or PM peak traffic flows before intersection performance starts to significantly degrade in the scenario with the Expressway constructed.

On holiday weekends many motorists are travelling through the Project area and will remain on the Expressway for their whole journey and therefore not utilise any of the intersections.

Even if there are some changes to holiday travel patterns in the future, the intersections and ramps have adequate capacity for holiday traffic peaks since many holiday motorists will not use the intersections and ramps.

Figure 7-9: Peak Traffic Flow Sensitivity Test

Intersection	Period	Total Intersection Demand Flow (Veh/h)		
		2031 Medium Growth	Peak Flow	Percent Increase
Ōtaki Gorge Rd and southbound on-ramp	AM	437	734	168%
	PM	354	849	240%
Ōtaki Gorge Rd and northbound off-ramp	AM	740	1376	186%
	PM	684	1300	190%
Ōtaki Gorge Rd and Existing SH1 roundabout	AM	922	2176	236%
	PM	940	2049	218%
Existing SH1/ Mill Rd/ Rahui Rd roundabout	AM	918	2031	221%
	PM	829	2240	270%

7.2 Route Security

Currently SH1 is the only arterial route into Wellington from the west coast of the North Island. At times motorists using SH1 experience traffic congestion. The route is also vulnerable to catastrophes. The Expressway is designed to a higher standard that the existing SH1. This means that it is less susceptible to natural disasters (e.g. flooding) and can be repaired more easily than the existing SH1 following a severe earthquake[25].

As well as the risk of natural hazards (e.g. earthquakes and flooding) there have been several instances within the last few years where SH1 has been partially or completely closed due to road traffic accidents. The lack of an alternative route means that this route into Wellington has poor route security.

With the construction of the Expressway there are two north-south routes within the Project area. Should there be an incident which results in the closure of either the existing SH1 or the Expressway there is an alternative route to maintain the movement of people and goods and provide access for emergency services. The Project provides the benefit of there being a second, higher standard, road crossing of the Ōtaki River. This is a significant improvement to the resilience of the road network.

7.3 Summary of Expressway and Local Road Traffic Connectivity

With the construction of the Expressway the volume of traffic on existing SH1 is significantly reduced which results in the intersections of the local roads and existing SH1 performing much better. In locations where the Expressway severs the link between a local road and existing SH1 an underpass is provided to maintain the connection. All of the Expressway on and off ramps also perform well with a good level of service.

[25] Refer to hydrology and geotechnical specialist assessments respectively.

Sensitivity tests regarding the effects of peak holiday traffic have also been completed and show that with the Expressway constructed all intersections will have a good level of service.

The provision of the Expressway in addition to the existing SH1 means there is an alternative, higher standard route should there be an incident on either corridor. This improves the resilience to the transportation network.

8 Effect on Passenger Transport Users

Generally, the Expressway has minimal effect on passenger transport users.

The bus route can continue to use the existing SH1 or switch to using the Expressway. By using existing SH1 it is possible to pick up passengers at intermediate points between Ōtaki and Waikanae as is currently done.

The Ōtaki Railway Station will be shifted slightly but this will not affect access to the station or its operation. The design of the Expressway allows for double tracking of the railway should there be a desire to do this in the future.

The realignment of the railway tracks will eliminate the existing railway speed / curvature deficiencies immediately north of Ōtaki Railway Station. The Project does not address the deficiencies at the Ōtaki River bridge or in the vicinity of Mary Crest. However, the Project does not preclude KiwiRail from upgrading these sections in the future, if desired.

Residents who currently park and ride from Ōtaki or Waikanae station will be able to access the stations easier, as a result of the increased roading capacity associated with the Project.

The roads currently used by school bus services are shown in Figure 8-1. The Expressway will have minimal effect on these routes, as most of the existing local road to State highway connections will be maintained. The connection at Old Hautere Road will be closed off and redirected to Ōtaki Gorge Road with the expressway in place, meaning a slightly longer travel length and travel time for school bus routes which currently use this connection. The overall effect will be minimal.

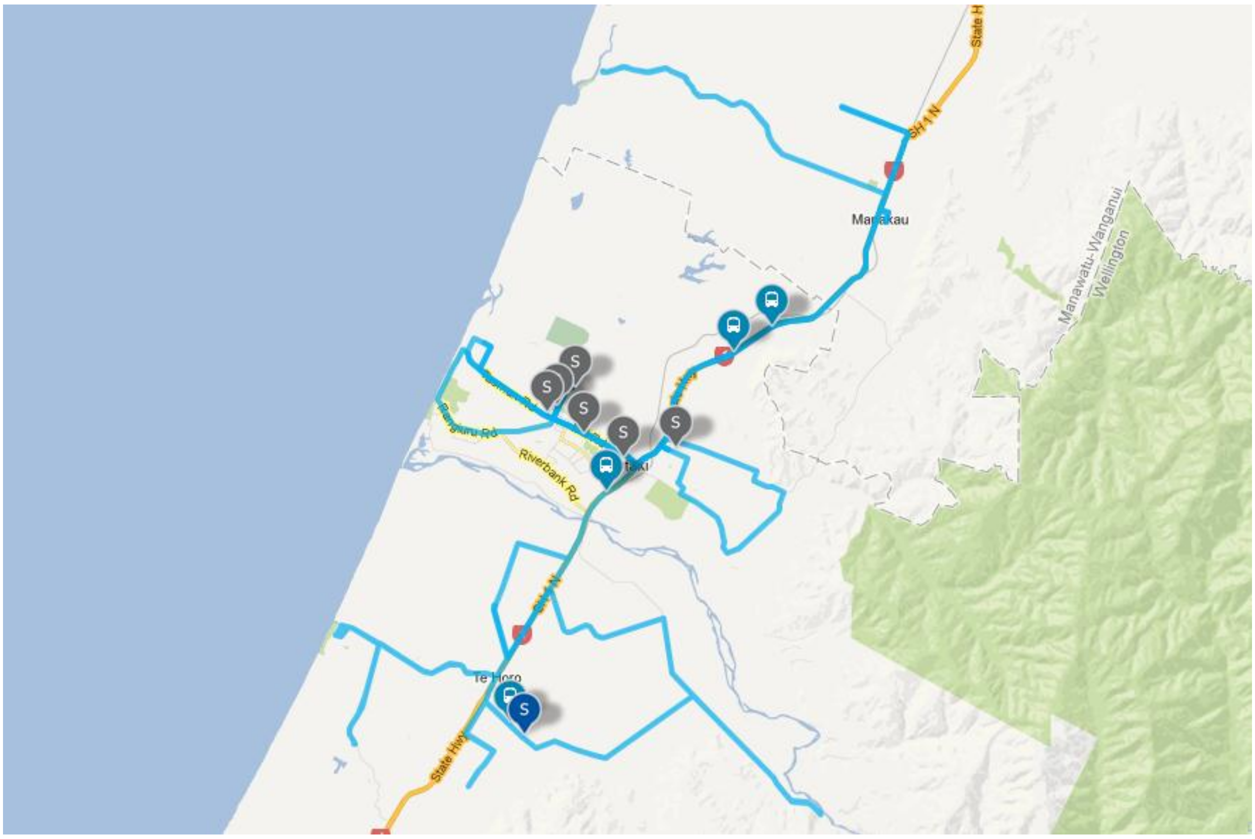
If the Capital Connection train service from Palmerston North is cancelled in the future there would be a slight increase in vehicles driving through the Project area. This potential increase in traffic is insignificant relative to the current traffic volumes on SH1.

8.1 Mode Choice Effects

The Wellington Regional Transport Strategy Model (WTSM) is able to forecast how changes to land use, transport infrastructure or services will affect the forms of motorised transport that are used. It can be used to forecast the numbers of trips made by car, bus or train and to estimate the future proportion s of trips by each mode.

On its own, the effects of the Expressway on mode choice would not be perceptible. This is because of the currently limited provision of passenger transport services and the low numbers of users. The mode choice effects of this Project have therefore not been tested individually.

Figure 8-1: School bus routes



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9 Effect on Pedestrians, Cyclists and Equestrians

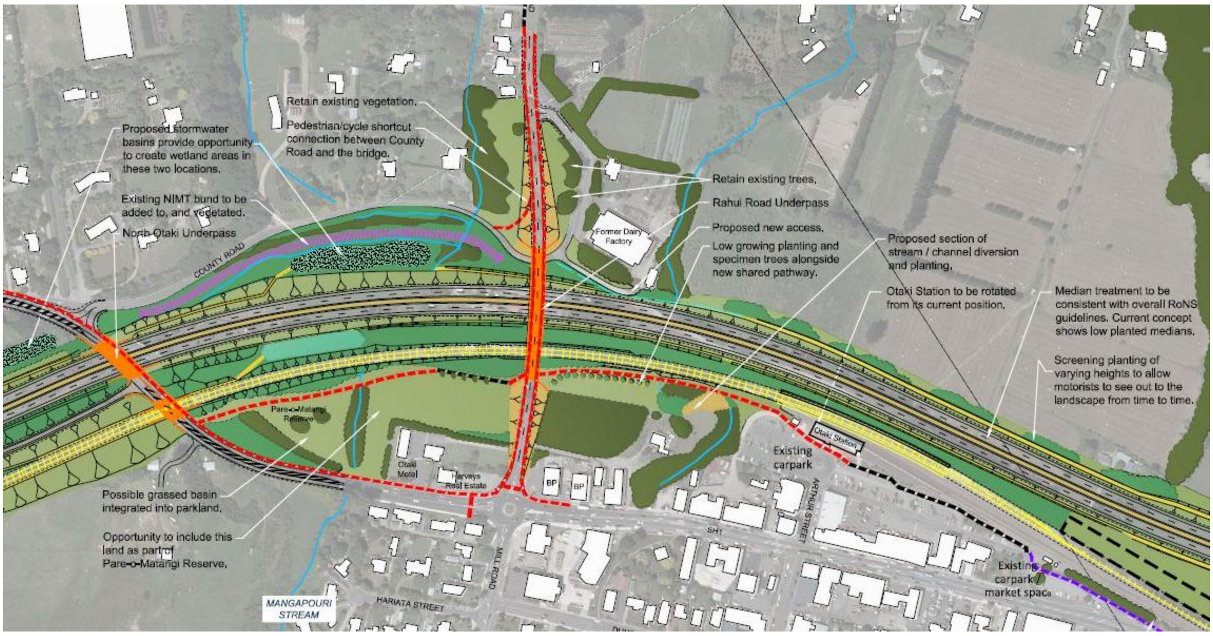
The Expressway has a number of effects related to walking and cycling. As discussed above, very few people currently cycle or walk within the Project area, except within Ōtaki. This could be related to the distances between potential destinations and the current environment. The existing SH1 is a high volume, high speed road with no dedicated facilities for pedestrians or cyclists.

Pedestrians, cyclists and equestrians will not be encouraged to travel on the Expressway, although legally they will be permitted to do so. Opportunities for pedestrians and cyclists access the other side of the Expressway will be provided at locations where local roads cross the Expressway. These links are provided north of Ōtaki, Rahui Road, Ōtaki Gorge Road and at Te Horo. Each of the new connections across the Expressway and NIMT railway provide 3m wide paths adjacent to the new road link as follows:

- Bridge Nos. 2 & 3: North Ōtaki bridge - on southern side;
- Bridge No. 4: Rahui Road - on both sides;
- Bridges Nos. 6 & 7: South Ōtaki bridge - on northern side; and
- Bridge No. 8: Te Horo - on southern side.

The construction of new link connecting with Old Hautere, Gear and School Roads includes the provision of a minimum 2.5m wide sealed foot way on one side. New pedestrian links are not proposed on existing roads, except in Ōtaki where a path will be provided alongside the existing SH1 between Rahui Road and County Road. New off-road pedestrian links are proposed in Ōtaki providing improved access to the Pare-O-Matangi Reserve and Ōtaki Railway Station. These links are shown in Figure 9-1 where red lines show the proposed new links.

Figure 9-1 -Proposed Shared Paths at Ōtaki Railway Retail Precinct



This chapter addresses the expected effect of the Project on existing pedestrian and cyclist trips. It also considers the extent to which the Project will influence the future demand for walking and cycling. In summary, the Project will affect:

- the safety and amenity of walking and cycling trips along the existing SH1; and
- the accessibility between the east and west sides of the north-south transport corridor (i.e. Expressway and NIMT Railway).

For the purposes of this assessment, adjacent traffic flow and vehicle speeds will be used as a proxy for amenity. Pedestrians are more sensitive than cyclists to small changes in trip length. Accessibility / connectivity effects for both road users are assessed in terms changes to:

- the directness of the route (trip length);
- changes in gradient; and
- changes in delay / travel time.

9.1 Effect on North-South Journeys along the Existing SH1

No formal facilities are currently provided for pedestrians, cyclists or equestrians travelling north-south along the existing SH1. Non-motorised road users may travel in the sealed road shoulders which are between 1.5m and 3m wide. Pedestrians and equestrians may travel on the grass verge where this is possible and convenient. Neither of these would be appropriate or safe locations for young or old people to be. Existing traffic flows also make these locations unappealing places to walk or cycle.

The Project will significantly reduce the traffic flow on the existing SH1 south of Ōtaki Gorge Road. This will:

- reduce the exposure of pedestrians, cyclists and equestrians to motorised traffic reducing the risk they are involved in a crashes;
- create gaps in the traffic noise, reducing the sense of a car dominated environment; and
- make it easier to cross the existing SH1 and have an impact on pedestrian's perception of severance.

Table 9-1 shows the forecast change in two-way traffic flows on the existing SH1 associated with the Project.

Table 9-1 - Forecast Change in Hourly Traffic Flows AM Peak Hour

		2011 Base	2021 Do Minimum	2021 Expressway	2021 Change
Te Horo	Total (Veh.)	1262	1,606	317	-1,289 (-80%)
	HCV (Veh.)	151	257	41	-216 (-84%)
Ōtaki, North of Riverbank Road	Total (Veh.)	997	1,172	503	-669 (-57%)
	HCV (Veh.)	130	176	101	-75 (-42%)

Construction of the Project will mean that a pedestrian or cyclist travelling alongside SH1 through Te Horo in 2021 would see 5 vehicles each minute rather than 26 per minute during the AM and PM peaks. This is fewer vehicles than one would expect to see on Mill Road today.

9.1.1 Bicycle Level of Service (BLOS)

This section presents the effect of the traffic reductions on the existing SH1 on users of that road. The Highways Capacity Manual[26] suggests a method for assessing the level of service experienced by cyclists using rural highways. It is not applicable for urban situations or off-road facilities. The assessment method uses as inputs:

- outside lane width (m);
- shoulder width (m);
- number of lanes;
- presence of roadside parking (% length);
- pavement standard (1 to 5);
- hourly traffic flow; and
- HCV %.

The cross section of the existing SH1 was measured from aerial photographs at multiple locations between Peka Peka and Ōtaki Gorge Road. It was found that:

- outside lane widths varied between 2.8m and 3.7m; and
- shoulder widths varied between 1.4m and 4m.

Along the route the hourly traffic flows for the 2021 Do Minimum varied between 750 and 950 vehicles per hour in each direction. HCV proportions ranged between 10% and 18%.

The resulting BLOS for the 2021 Do Minimum were predominantly D and E[27]. The results for this assessment appeared to be most affected by the shoulder widths. Only north of Old Hautere Road, where shoulders of 2.4m wide or more are provided, was BLOS assessed to be C. For the majority of rural section between Old Hautere and Peka Peka Road, BLOS were D and E.

The BLOS is very sensitive to localised conditions and are therefore heavily affected by the choice of test point. Table 9-2 shows a 2031 Do Minimum base case and the sensitivity of that scenario the base assumptions. Bold numbers represent input parameters that have been adjusted from the base case.

Table 9-3 shows the BLOS for the 2031 Do Minimum compared against the 2031 Option. It shows that the traffic reduction on the existing SH1 changes the BLOS from D/E to B. It shows that further traffic reductions lift the BLOS to A.

[26] Chapter 15, Highway Capacity Manual (2010).
[27] BLOS uses the same ranking system as vehicular LOS with BLOS A representing the best conditions and BLOS F representing the worst conditions

Table 9-2 - BLOS for Existing SH1: 2031 Do Minimum

Input Parameters	2031 Do Minimum					
	Base Case	Wide Lane	Wide Shoulder	Narrow Shoulder	Lower Flow	Higher HCV%
[Wol] Outside Lane Width (m)	3.3	***3.7***	3.3	3.3	3.3	3.3
[Ws] Shoulder Width (m)	2.5	2.5	***4***	1.4	2.5	2.5
[V] Hourly Directional Volume (veh/hr)	900	900	900	900	***750***	900
Peak 15min Count	225	225	225	225	187.5	225
[HV] % HGV	14	14	14	14	14	***18***
[Sp] Posted Speed Limit (km/hr)	100	100	100	100	100	100
[P] Pavement Rating (1-5)	3	3	3	3	3	3
Bicycle Level of Service (BLOS)	D	C	A	E	D	E

Table 9-3 - BLOS for Existing SH1: 2031 Option

Input Parameters	2031 Do Minimum (Base Case)	2031 Option			
		Base Case	Lower Flow	Higher HCV%	Lower Speeds
[Wol] Outside Lane Width (m)	3.3	3.3	3.3	3.3	3.3
[Ws] Shoulder Width (m)	2.5	2.5	2.5	2.5	2.5
[V] Hourly Directional Volume (veh/hr)	900	200	***100***	200	200
Peak 15min Count	225	50	25	50	50
[HV] % HGV	14	9	9	***12***	9
[Sp] Posted Speed Limit (km/hr)	100	100	100	100	80
[P] Pavement Rating (1-5)	3	3	3	3	3
Bicycle Level of Service (BLOS)	D	B	A	B	B

9.2 Across the Transport Corridor

The existing SH1 and NIMT railway create an impediment to movement between the east and west sides of the transport corridor. The factors contributing to this severance are the:

(a) physical barrier formed by the NIMT railway;

(b) time needed to wait for adequate gap in traffic flow to cross the existing SH1;

(c) the distance people would walk or cycle to cross the existing SH1;

(d) risk of involvement in a road traffic accident; and

(e) the perception of danger.

This section considers (a) to (d) above. The UK Design Manual for Roads and Bridges (DMRB) provides guidelines for assessing severance both in terms of relief from existing and the degree of new severance. That guideline considers severance in terms of:

- changes in traffic flow which affect the ease of crossing the road; and
- the diversion distance.

The Project provides connections across the NIMT railway and traffic flows on the existing SH1 and Expressway. At some locations it also introduces additional deviation and increased travel distances for some journeys. The severance assessment therefore uses the DMRB guidance as a basis with some interpretation.

Table 9-4 shows summarises the severance indicators for four routes across the transport corridor. Figure 9-2 and Figure 9-3 show graphically the routes assessed. Red routes are currently provided; green routes will be provided as part of the Project instead of the red routes.

Figure 9-2 - Connections across the Expressway in Te Horo

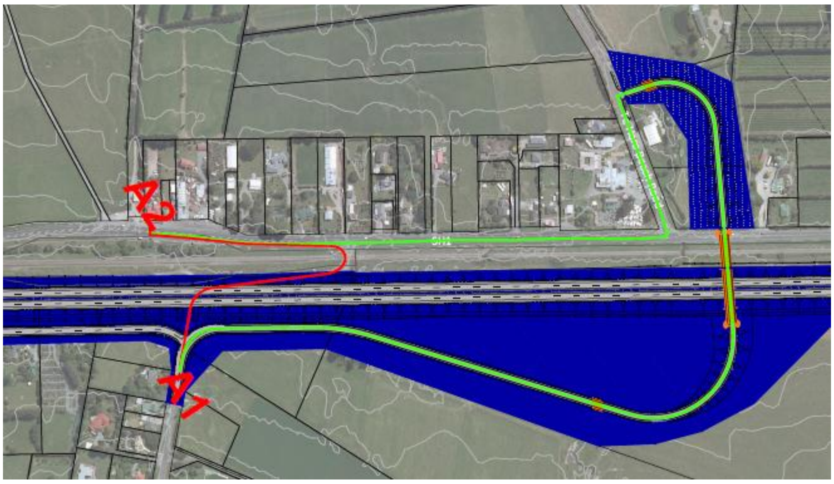


Figure 9-3 - Connections across the Expressway South Ōtaki

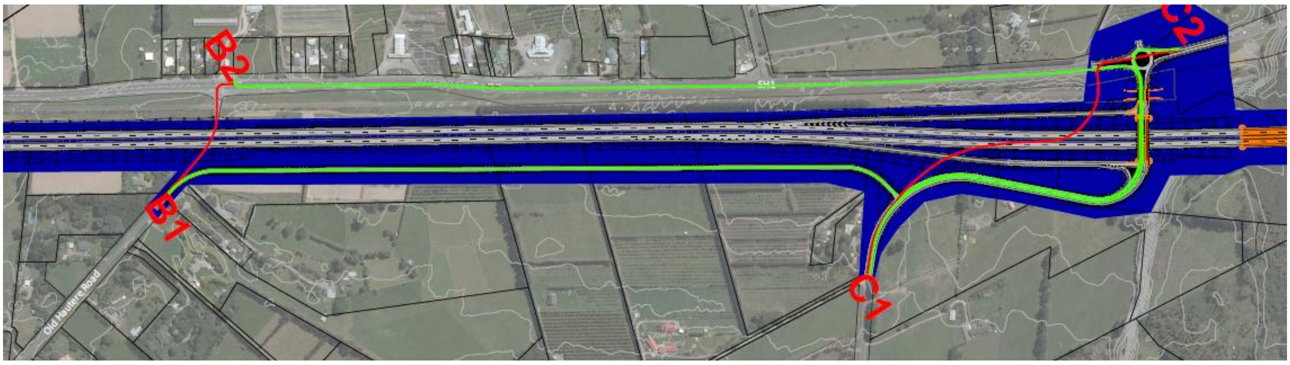


Table 9-4 - Summary of Severance Assessment

Route	Scenario	Route Length (m)	Level Difference (m)	Max Gradient	Existing SH1		
					Forecast AADT 2031	Peak Hour Flow 2031	Average Crossing Delay (Secs per person)
School Road [A-A]	2031 Do Minimum	295	2.5	1.4%	21,119	1,737	300
	2031 Option	2,066 (+1,771)	13.0	5.3%	3,966 (-17,153)	165 (-1,572)	8 (-292)
Old Hautere Road [B-B]	2031 Do Minimum	201	1.0	2.4%	19,842	1,658	192
	2031 Option	2,987 (+2,786)	7.3	1.7%	7,932 (-11,910)	655 (-1,003)	16 (-176)
Ōtaki Gorge Road [C-C]	2031 Do Minimum	609	4.5	5.2%	19,320	1,635	175
	2031 Option	711 (+102)	5.8	1.7%	7,932 (-11,388)	655 (-980)	16 (-159)
Rahui Road	2031 Do Minimum	407	1.5	1.0%	16,680	1,433	300
	2031 Option	386 (-21)	9.7	6.5%	7,932 (-8,748)	655 (-778)	24 (-276)
The Ōtaki "Ramp"	2031 Do Minimum	434	13.5	4.3%	16,680	1,433	300
	2031 Option	437 (+3)	13.9	7.8%	7,932 (-8,748)	655 (-778)	24 (-276)

It should be noted that, during surveys undertaken in July 2010, very few pedestrians or cyclists were observed. More non-motorised users may be observed in summer and it is likely that the environment on existing SH1 deters some from walking or cycling. In Table 9-4:

- the change in length is heavily influenced by the routes selected. For example the length of walking trips from Old Hautere Road to Ōtaki would barely change in length, however journeys to or from locations to the south of Old Hautere Road would increase by almost 3km (35 minutes);
- the level difference is the difference between the lowest point on the route and the highest point along the route;
- change in traffic flows from the do minimum is shown in brackets;
- crossing delays are capped to 300 seconds. Pedestrians expecting to experience delays would either defer there trip to a time with lower traffic flows or risk crossing in smaller traffic gaps; and
- all of the maximum gradients are within the tolerances that are acceptable for cyclists or disabled pedestrians.

For the do minimum scenario, the severance caused by traffic volumes on the existing SH1 is severe. This means people are deterred from making trips which require crossing SH1. In the rural parts of the Project area, traffic flow on the existing SH1 is reduced by between 60% and 80% once the Expressway is constructed. At each of the test locations the ability for pedestrians to cross the existing SH1 at-grade is greatly improved due to the substantial reduction in traffic flow. There will however be less need at these locations to cross the existing SH1 when the Expressway is operational.

Closer to the Ōtaki Railway Retail area, forecast 2031 traffic flows are approximately 50% lower. This again leads to substantial reduction in delays (4.5 minutes) and / or safety improvements for pedestrians crossing the road as a result of the Expressway.

AustRoads provides a guideline on the maximum uphill gradient which is acceptable to cyclists. For a 10% gradient a maximum length of 10m is desirable and a maximum length of 20m is acceptable. The maximum acceptable value for a mean gradient for wheelchair users is 5% with an ultimate maximum gradient of 8% for up to 9m[28].

Table 9-5 summarises the assessment of pedestrian severance. The table shows that overall there is a reduction in severance for pedestrians crossing the transport corridor. Cyclists and equestrians are likely to perceive relief from severance (i.e. reduced traffic flows) in much the same way as pedestrians in terms of gaps in the traffic. Grade separation may, in fact be more important to equestrians because of the effect of traffic noise on fretful horses. They are however, less sensitive to increases in trip length. The assessment of journeys to and from School and Old Hautere Roads would therefore be more positive overall for these users.

[28] NZTA Pedestrian Planning and Design Guide, Table 14.7.

Table 9-5 - Pedestrian Severance Assessment

Route	Comments	Relief from Existing Severance	New Severance	Result
School Road	• grade separated crossing of the transport corridor • additional 1.7km for some trips	Substantial Positive	Severe Negative	Neutral
Old Hautere Road	• grade separated crossing of the transport corridor via South Ōtaki Interchange • minimal increase in length for trips to/from Ōtaki	Substantial Positive	Slight Negative[29]	Moderate Positive
Ōtaki Gorge Road	• 60% reduction in traffic flows on existing SH1 • negligible change in trip length	Substantial Positive	Negligible	Substantial Positive
Rahui Road	• 50% reduction in traffic flows on existing SH1 • negligible change in trip length	Moderate Positive [30]	Negligible	Moderate Positive
The Ōtaki "Ramp"	• 50% reduction in traffic flows on existing SH1 • negligible change in trip length	Moderate Positive [31]	Negligible	Moderate Positive

9.3 Amenity in Ōtaki Retail/Railway Precinct Area

As was outlined in Section 6 and illustrated in Figure 6-1, the Expressway will greatly reduce the traffic flow through the Ōtaki Railway Retail area. This will have a positive effect for the retail area. New Zealand Standard 4404:2010 (Land Development and Subdivision Infrastructure) advises the traffic volumes appropriate for different types of road. It suggests that a road providing for urban retail activity should have an AADT volume of less than 8000 vpd.

The 2011 base model predicts an AADT of 12,500 vpd and the 2031 Do Minimum model an AADT of 16,400 vpd which, in terms of NZS 4404:2010, is more in line with a minor arterial road. Minor arterial roads are not typically pedestrian friendly.

With the Expressway in place, AADT volumes through the Ōtaki Railway Retail precinct in 2031 are predicted to reduce to 6,900 vpd, which is in less than the flows suggested in NZS 4404:2010 for a road providing for urban retail activity.

[29] Assumes most trips are to/from Ōtaki.
[30] Assumes built-up areas are less sensitive to traffic reduction.
[31] Assumes built-up areas are less sensitive to traffic reduction.

9.4 Summary of Pedestrian, Cyclist and Equestrian Effects

This chapter has shown that the Project will have a moderate to significantly positive effect on non-motorised user trips. The current environment and traffic flows mean that some non-motorised road users are likely to be deterred from travelling along or across the existing SH1. This is reflected by the small numbers of pedestrians in the rural parts of the Project area. Non-motorised users of the road experience delays, a poor level of service and exposure to high volumes of fast moving traffic. By reducing the traffic flow on the existing SH1 and providing grade separated links across the Expressway, the Project will:

- improve the experience for pedestrians, cyclists and equestrians using the existing SH1;
- make it easier to cross the existing SH1, reduce the delays for non-motorised users, encouraging more trips on foot, by bike or on horseback; and
- reduce the need to use unsuitably small gaps in the traffic flow and reducing the risk of crashes.

The additional walking distance between School Road and the western side of Te Horo is consistent with the preferences expressed in the 2010 community engagement. It is unlikely that many pedestrians would find direct routes across the Expressway and NIMT railway appealing. The perceived danger would deter most people. Despite this low risk, the severity of any pedestrian crashes on the Expressway is likely to be severe or fatal. It is therefore recommended that the detailed design of the bund separating Gear Road and the Expressway considers ways to limit the desire to cross the Expressway at grade. Potential urban design and landscaping approaches could include limiting the visual connection across the Expressway or planting that deters pedestrian access to the Expressway.

10 Road Safety Effects

The crash history and road safety rating for the existing SH1 are presented in section 2.10. The current alignment has a 2-3 star rating, where roads with a 5 star rating are considered the safest. The poor safety rating reflects the lack of built in safety features and design characteristics currently provided. The existing SH1 is undivided and does not have roadside features that meet current road safety best practice. This means that when road traffic accidents occur the design of the road is unforgiving.

Section 2.10 showed that 14 percent of crashes which occurred in the 100 km/h were head-on. Head on crashes are typically severe or fatal, especially in a 100 km/h area. These crashes can be prevented by the provision of a divided highway, separated with a median barrier. The Project will virtually eliminate head-on crashes for users of the Expressway. Although it will still be possible for head-on crashes to occur on existing SH1 after the Expressway is constructed, the risk will be significantly reduced by the substantial traffic reductions and reduced need for overtaking.

Section 4.2 showed that motorists turning to or from the existing SH1 experience delays as they wait for a suitably large gap in the traffic flow. In future these delays will increase. For some motorists it is possible to choose an alternative route or to travel at times that avoid the highest traffic flows on SH1. More and more, motorists will take risks when turning to or from the existing SH1. This is borne out by the crash history where in the 100 km/h speed zones, 30 percent of the crashes occurred at intersections and 10 percent at driveways.

The provision of the Expressway and the resulting reduction in traffic flows on the existing SH1 mean motorists will not need to wait for gaps in which to turn. There will be less motivation for motorists to take risks. It is therefore expected that the number of crashes at intersections on the existing SH1 will be significantly reduced to almost negligible levels.

The provision of grade separated interchanges north and south of Ōtaki Railway retail area means that motorists joining or leaving the expressway will not need to turn across high volumes of fast moving traffic. Whilst nose-to-tail crashes can occur at grade separated interchanges, these tend to be lower severity crashes. The Expressway design has been subject to a road safety audit, in which the design team and the safety auditors have sought to gain agreement on the safety of the Project.

Due to the reduction in traffic on the existing SH1 the crash costs for existing SH1 are expected to reduce by 75 percent. However, there is a risk of some, generally low severity, crashes occurring on the Expressway or the new intersections associated with the on and off ramps. Therefore, the construction of the Expressway is expected to result in an overall 60 percent savings per year[32] in crash costs compared to the existing situation.

10.1 Level Crossings

The Project also means that five of the eight existing rail level crossings within the Project area will be closed. They are:

[32] This is based crash models and forecasting completed as part of the SARA.

- School Road, grade separation provided;
- Property access opposite Te Waka Road, alternative access provided;
- Stevens property access, alternative access provided;
- Old Hauture Road, alternative access provided; and
- Rahui Road, grade separation provided.

Three existing level crossings will be retained. They are Sampson property access, Mary Crest and the Winstone's crossing. As at present, the Winstone's crossing will only be used for oversized loads.

All of the level crossings on public roads will be closed as part of the Project. The remaining level crossings are private access and therefore carry lower traffic flows. The changes will therefore significantly reduce the risk of crashes occurring between trains and road traffic, pedestrians or cyclists.

10.2 Summary of Road Safety Effects

The construction of the Expressway will result in a significant improvement in road safety by providing a high quality, well designed Expressway which meets current design standards, including median separation. The reduction in traffic on the existing SH1 will make access to local roads and properties much easier and safer. Also, a number of at-grade railway crossings are eliminated. Overall, the Expressway is forecast to result in a 60 percent reduction in crash costs within the Project area.

11 Property Access Effects

11.1 Distance and Travel Time

After the Expressway is constructed, there will be no physical change to many residents' access to the existing SH1, although access will be easier and safer. However, there are some locations where residents' access to the existing SH1 will be severed by the Expressway. In these situations alternative access arrangements have been developed. As discussed below, this might result in an increase in travel distance for some journeys. However, the traffic volumes on the existing SH1 in the future will be much lower which will make this manoeuvre safer and easier. Any new access roads will be built to KCDC standards and incorporate any speed management measures considered necessary.

From Gear Road to School Road access is provided by a new local road parallel to the Expressway. There is minimal change in travel distance for motorists heading north from the affected properties. For journeys to or from the south motorists must travel to the over bridge at Te Horo Beach Road before doubling back on themselves. This increases the travel distance by approximately 1.5 km for the roughly 200 motorists who would complete this manoeuvre in the AM or PM peak hour. As discussed in Section 7.1.3 the delay associated with making the right turn from School road in 2031 Do Minimum is extensive. Despite the increase in distance associated with using Te Horo Beach Road once the Expressway is constructed the total journey time will be reduced since the delay associated with making a left turn from Te Horo Beach Road is much shorter.

Between Ōtaki Gorge Road and Old Hautere Road access is provided by new local road parallel to the Expressway. Again, there is minimal change in the travel distance for motorists heading north from the affected properties. For motorists wanting to head south from Old Hautere Road the journey length is increased by about 2.5 km. Approximately 30 motorists are affected in the AM and PM peak hours. However, since south facing ramps are provided at Ōtaki Gorge motorists have the option of using the Expressway for their southbound journey.

To provide access to some properties on the eastern side of the Expressway between Te Horo and Old Hauture Road a new road is planned. This will provide access to properties which otherwise become landlocked and enables some other properties to be subdivided since the new road would provide access. This change affects about 5 existing properties but only one or two existing homes.

From Mary Crest to a point opposite Te Hapua Road the existing SH1 will remain and function as a local access road for properties east of the Expressway. Access to this road will be via an underpass beneath the Expressway at Mary Crest. For journeys to or from the north there will be minimal effect on journey length. However, a motorist wishing to travel south from the property located at 564 SH1 (opposite Te Hapua Road) would need to travel an additional 2.8 km. A new local arterial will be built on the western side of the Expressway to tie in with the roading network to the south of the Project area. The new section of local arterial will provide access to the properties on the western side of the Expressway and will not result in an increase in journey length for these residents.

For residents that may continue to directly access the existing SH1, there will be no change to their journey distance. The reduction in traffic on existing SH1 will result in improvements to their safety and the ease of turning to and from SH1.

11.2 Emergency Services Access

The impact of the Expressway on emergency services access is dependent upon the specific location from which they are responding. For access to properties within the Project area the effects are generally similar to those noted above. Special access, for emergency services only, from the Expressway to Gear Road in Te Horo is planned. This will enable emergency vehicles travelling in either direction to access Ōtaki.

Since only half interchanges are provided to the Expressway, the distance emergency services must travel to respond to an incident could be very lengthy. Currently there is a special access link between the northbound and southbound direction of the Expressway provided at Te Horo. For example, this link will enable emergency services from Ōtaki to respond to an incident in the northbound direction near Te Horo by accessing the Expressway at Ōtaki Gorge Road, heading southbound on the Expressway and then using the emergency services link to access the northbound direction. Otherwise the emergency responders would have to travel all the way to Peka Peka to access the Expressway in the northbound direction. More of these links will be provided within the Project area to ensure emergency services can efficiently respond to any incidents on the Expressway and are discussed more in the section on mitigation required for the Project.

11.3 Summary of Project Access Effects

Construction of the Expressway will result in some motorists having to travel slightly further to access SH1 for some journeys. However, the reduction in traffic on the Expressway means that this manoeuvre is much easier and safer and can be completed with much less delay when compared to the Do Minimum scenario. Emergency services access will also be affected. The provision of special emergency services only access across the Expressway will ensure they are able to respond to emergencies efficiently.

12 Transport Effects during Construction

This section identifies the possible transport effects resulting from construction activities. Given the stage of Project development, there is uncertainty regarding the construction timing and methodology. Given the uncertainty, the approach has been to generally assume the worst case scenario with regards to the number of vehicles. The aim of this assessment has been to identify the possible effects, where they might occur, to scope their significance and to identify possible measures to avoid or manage the possible effects. This information should inform the development of the construction methodology and a construction management plan.

This section of the transport assessment has referenced the Assessment of Construction Effects Report. The types of construction activity that could affect transport activities are:

(a) arrival and departure of construction workers in light vehicles or buses;

(b) delivery of plant or materials using heavy commercial vehicles movements;

(c) movement of overweight and / or over dimension loads; and

(d) construction activities close to a live highway.

The Project will predominantly be constructed off-line and without the need for temporary road closures and traffic diversions.

12.2 Assumed Construction Method

This is a linear construction project. The initial construction methodology assumes that the Expressway will be divided into four sections which will be built consecutively. It is likely that many of the transport movements associated with construction will be within the site along the line of the new road, thus avoiding public roads. Each construction site will also have access from public roads.

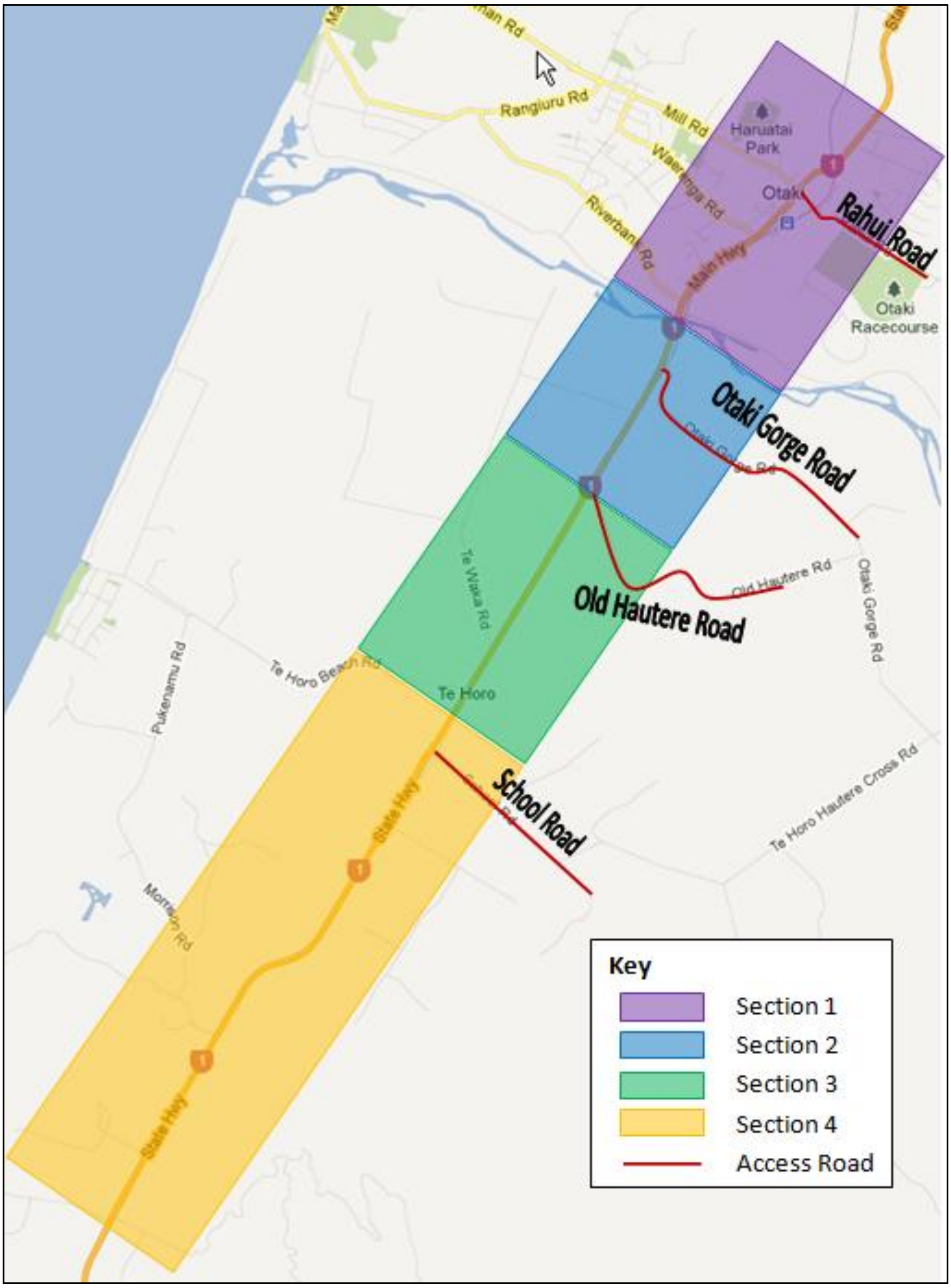
Figure 12-1 provides and an indication of the length of each section and the potential access points. Much of the Project is located on the eastern side of the NIMT railway, where the existing SH1 is on the western side. Unless new or temporary rail crossings are permitted, access to each site is naturally limited to locations where there is an existing level crossing or bridge across the NIMT railway.

For the purposes of this assessment, the main assumptions are that:

- construction activity is 6 days a week;
- construction occurs across an 8 hour day (this may vary slightly across the year);
- construction workers arrive at site in the hour starting 07:00;
- construction workers leave site in the hour starting 16:00;
- all trucks importing pavement material or water will leave the site empty; and
- all trucks exporting earthworks material will arrive at the site empty.

In order to optimise the efficiency of construction and to minimise costs, the contractor awarded this work will programme works to avoid moving empty trucks. It is also likely they will seek to extend working hours and the working week. The above assumptions therefore represent a worst case scenario for the assessment of transport effects.

Figure 12-1 - Construction Sections



12.3 Site Access

In addition to access along internal haul routes, each construction section may be accessed from the public road network. The following routes are assumed between:

- SH1 and Section 1 via Rahui Road;
- SH1 and Section 2 via Ōtaki Gorge Road;
- SH1 and Section 3 via Old Hautere Road; and
- SH1 and Section 4 via School Road.

12.4 Worker Arrivals and Departures - Light Vehicles

Additional trips will be generated by construction staff travelling to and from the site. It is estimated that there will be approximately 200 workers on site each day based on the Assessment of Construction Effects. At worst, each worker will travel to site in their own vehicle, creating 200 vehicle trips to site in the morning and 200 from site in the evening. In reality, some workers will share and some may travel using buses specifically for transporting workers. An assessment of intersection performance was undertaken for 2021 flows using SIDRA. It was assumed that:

- the workers are evenly distributed between the four work sections (i.e. there will be 50 workers in each section);
- in the morning peak hour 80% of workers will drive to site, 20% will drive from site; and
- trips will be equally distributed between the north and the south.

Table 12-1 shows the assumed vehicle movements at each intersection. The movements shown are small compared to the flow on the existing SH1. The increased flow, is however high when considered as a proportion of the existing turning movements at this intersections which, when surveyed in 2010 were in the order of 50 per hour.

Table 12-1 - Assumed Construction Worker Traffic Movements: AM Peak Hour

	To / From South		To / From South	
	Right-in	**Left-out**	**Left-in**	**Right-out**
Section 1 - SH1 / Rahui Road	20	5	20	5
Section 2 - SH1 / Ōtaki Gorge Road	20	5	20	5
Section 3 - SH1 / Old Hautere Road	20	5	20	5
Section 4 - SH1 / School Road	20	5	20	5

The analysis showed that the effect of the additional light vehicles on the operation of the intersections was negligible. Table 12-2 presents the levels of service for movements to and from the existing SH1 in the morning and evening.

Motorists wishing to turn right across one or both directions at existing at-grade intersections on SH1, experience significant delays while they wait for a suitable gap. The level of service for turning motorists in 2021 is summarised in Table 12-2.

Table 12-2 - Levels of Service for Turning Movements to / from existing SH1 in 2021

	2021 AM Peak		2021 PM Peak	
	Left-in	**Right-in**	**Left-out**	**Right-out**
Section 1 - SH1 / Rahui Road	A	B	A	B
Section 2 - SH1 / Ōtaki Gorge Road	B	C	F	F
Section 3 - SH1 / Old Hautere Road	B	E	C	F
Section 4 - SH1 / School Road	B	C	F	F

The assessment showed that the additional worker vehicles did not noticeably increase delays for motorists travelling from these side roads. The delays are already experienced by motorists making these movements.

Table 12-2 shows that motorists turning at the roundabout intersection between Rahui and Road SH1 would experience LOS A or B and delays of 7 - 13 seconds. The other intersections are priority controlled, each providing a turning bay for right turns from SH1.

In the morning, when it assumed that most workers will be driving to the site, northbound motorists making the right turn across southbound traffic will experience acceptable delays (LOS B or C) except at Old Hautere Road (LOS E) where delays of about 34 seconds are expected.

The most significant delays are forecast for motorists turning right out of these side roads in the evening peak hour where delays of more than 3.5 minutes per vehicle are forecast. The queues of motorists waiting to turn right onto the northbound direction for SH1 will also create delays for those wishing to turn left. Mitigation to address these effects will be required. Construction mitigation is discussed in Section12.5, below.

12.5 Movement of Construction Materials - Heavy Commercial Vehicles

Heavy Commercial Vehicles (HCVs) will be used to move materials and large loads such as bridge beams. The majority of truck and trailer movements will be associated with:

- earthworks (cut and fill);
- import of materials for pavement construction; and
- water cartage for dust management.

The number of movements was derived as part of the preliminary construction methodology based on the estimated quantities. As a starting point it was assumed that truck and trailer units would be used to transport earthworks and pavement materials. Other assumptions are listed above in section 12.2.

12.5.1 Earthworks

The majority of the daily HCV movements generated by the Project are associated with the movement of earthworks. The earthworks quantities and the numbers of truck and trailer units are presented in Table 12-3. The earthworks volumes and total number of loads via truck and trailer for each section is based upon the Assessment of Construction Effects.

Positive numbers refer to exports (i.e. movements out from site). Negative numbers indicate imports (movements in to site). Exports from construction sections 1 and 2 will be moved by road to section 4.

Table 12-3 - Earthworks Quantities and Estimated Truck and Trailer Movements

	Section 1	**Section 2**	**Section 3**	**Section 4**	**Net Total**
No. Weeks	*15*	*61*	*18*	*47*	*n/a*
Surplus Cut in Section (m3)	58,500	246,000	-64,000	-283,500	-43,000
Total Truck & Trailers Out via haul road (One-way)		3,200	-3,200		
Total Truck & Trailers Out via SH1 (One-way)	3,000	9,000		-16,300	-16,300
Hourly Movements (1 truck + trailer) Out Via SH1 (One-way)	**4**	**3**		**-7**[33]	**n/a**

Table 12-3 shows that there is an excess of cut in sections 1 and 2. In summary,

- cut material from section 1 will be transported to section 4 via SH1;
- cut material from section 2 will be moved to section 3 via an internal haul route and to section 4 via SH1, thus minimising the need for HCVs to turn to or from Old Hautere Road; and
- additional fill, beyond the surplus material generated by sections 1 & 2 will be needed for section 4.

The number of movements presented in Table 12-3 is based on the assumption that trucks with trailers are used. If the contractor uses only trucks the number of movements would be doubled.

Without optimisation, there would be corresponding un-laden trips each hour as empty delivery vehicles return to the construction section to pick up more fill. All the earthworks trips to section 4 are from sections 1 and 2.

12.5.2 Pavement Materials

The source of the pavement construction materials is yet to be determined. For the purposes of this assessment it has been assumed that pavement material will be transported from south of the Project area.

[33] Imports from zones 1, 2 and beyond the Project area.

Table 12-4 - Pavement Quantities and Estimated Truck and Trailer Movements

	Section 1 - Rahui	Section 2 - Gorge	Section 3 - Hautere	Section 4 - School	Total
No. Weeks	50	30	49	55	n/a
Imported Pavement Material (m3)	33,000	20,000	32,500	37,000	122,500
Total Truck & Trailers In via SH1 (One-way)	2,000	1,200	2,000	2,200	7,400
Hourly Movements In Via SH1 (One-way)	**1**	**1**	**1**	**1**	**4**

The estimates provided in Table 12.4 above are the expected amount of material required. To account for the conditions potentially not being as anticipated an upper bound amount of pavement material has also been determined. Even if the greater amount of material is required the hourly movements via SH1 would remain 1 for each of the four sections.

There would be a corresponding un-laden outward trip each hour as delivery vehicles leave the site.

12.5.3 Water

The source of water for the Project is proposed to be from within the site[34]. It has been assumed that water carts will make 50 deliveries of water to each construction section every day. This corresponds to six deliveries per hour with six, empty outward trips.

12.5.4 Summary

Most of the pavement materials will be needed following completion of earthworks. These materials will need to be imported. Until there is more certainty regarding the construction programme, it has been assumed that the movement of cut and fill, pavement materials and water will occur at the same time. This presents a worst case scenario. Table 12-5 summarises the hourly numbers of HCV movements at each access. Note that earthworks movements from sections 1 and 2 and to section 4.

Table 12-5 - Summary of Hourly HCV Movements

	Section 1 - Rahui	Section 2 - Gorge	Section 3 - Hautere	Section 4 - School
Hourly Movements Out	11	10	7	13
Hourly Movements In	11	10	7	13

By 2021 it is forecast that SH1 will be carrying just under 1500 vehicles per hour in the morning peak period through its intersection with Ōtaki Gorge Road. Approximately 16% or around 240 are forecast to be HCVs. This volume of HCVs means that on average,

[34] Potential water source locations are deep water bores located south of Mary Crest, in the vicinity of the proposed Te Horo Overbridge near Mangaone Stream, north of the Otaki River, and south of the Waitohu Stream. Water may also be sourced from the M2PP project bores for construction at the south end of this Project.

someone standing at the side of the road would be passed by two northbound and two southbound trucks every minute. Construction of the Project will add 26 HCVs per hour at this location, which would increase the HCV proportion to 18%. Someone standing at the side of the road would not notice this increase in the number of HCVs.

12.6 Traffic Effect of additional HCVs

The 2021 performance of the four intersections which will be used for site access as identified in Section 12.3 has been analysed using SIDRA. The performance for the 2021 Do Minimum scenario has been compared to a scenario where the construction traffic is added. The results for the most poorly performing approach to each intersection are presented in Table 12-6 below.

Table 12-6 shows that at each location the right turn from the side road onto SH1 is the worst performing movement. Except at the Mill Road / Rahui Road / SH1 roundabout, the right turn out is expected to perform with LOS F at each location regardless of the construction traffic. The additional HCV traffic is expected to increase delays for these movements by more than 5 minutes at Ōtaki Gorge Road and Old Hautere Road in the PM Peak hour. This represents a worst case scenario. Opportunities to optimise the construction methodology and reduce the number of vehicles would result a smaller increase in delays.

Delays of magnitude shown in Table 12-6 would increase the construction cost, and potentially the construction period if they are not avoided or managed. They may also increase the risk of crashes at these intersections. Section 12.7 explains the safety implications of the existing intersection layouts. Sections 12.8 and 12.9 present an assessment of some of the options for minimising delays for construction traffic and the hazard associated with turning traffic. Potential mitigation is discussed in Section 13.3.

Table 12-6 - Intersection Performance with Additional HCV Trips

		2021 Do Minimum			2021 with HCV Traffic			Change Delay (Mins)
		v/c	Delay Mins	LOS	v/c	Delay Mins	LOS	
Section 1 - Right Turn from Rahui Road to SH1	AM	14%	0.2	B	16%	0.2	B	
	PM	32%	0.2	B	11%	0.2	B	
Section 2 - Right Turn from Ōtaki Gorge Road to SH1	AM	49%	2.3	F	97%	5.9	F	+3.6
	PM	42%	2.7	F	100%	7.8	F	+5.2
Section 3 - Right Turn from Old Hautere Road to SH1	AM	67%	4.0	F	100%	7.4	F	+3.4
	PM	44%	2.9	F	93%	8.4	F	+5.5
Section 4 - Right Turn from School Road to SH1	AM	125%	7.8	F	144%	7.8	F	
	PM	134%	4.1	F	156%	6.5	F	+2.3

12.7 Safety Effect of additional HCVs

The safety of additional HCV traffic has also been considered in terms of the ability for drivers to turn safety across high speed traffic flows on existing SH1 and the effect of queuing HCVs. Right turn bays are provided for each of the right turns from the existing SH1 to the side roads. Average queue lengths for right turns with construction traffic are forecast to be easily accommodated. It is however recommended that temporary signs warning of the construction access are erected for the duration each is in use.

This assessment has also identified the available queuing space between the existing SH1 and level crossings of the NIMT railway. The available queuing space is listed in Table 12-7 and shown in Figure 12-2. Truck and trailer units can measure up to 20m long (Land Transport NZ, RTS 18: New Zealand on-road tracking curves for heavy motor vehicles, August 2007). Where the length of the truck and trailer unit (20m) exceeds the available queuing space a truck driver waiting for a gap in SH1 traffic would end up having his trailer unit blocking the railway tracks. If there is a queue of more than one unit, the additional units can safely wait on the other side of the railway tracks.

Table 12-7 - Queue Storage Space

	Right Turn Bay from SH1	Separation of SH1 and NIMT Railway
Section 2 - Ōtaki Gorge Road	32m	Bridge
Section 3 - Old Hautere Road	30m	17m
Section 4 - School Road	54m	10m

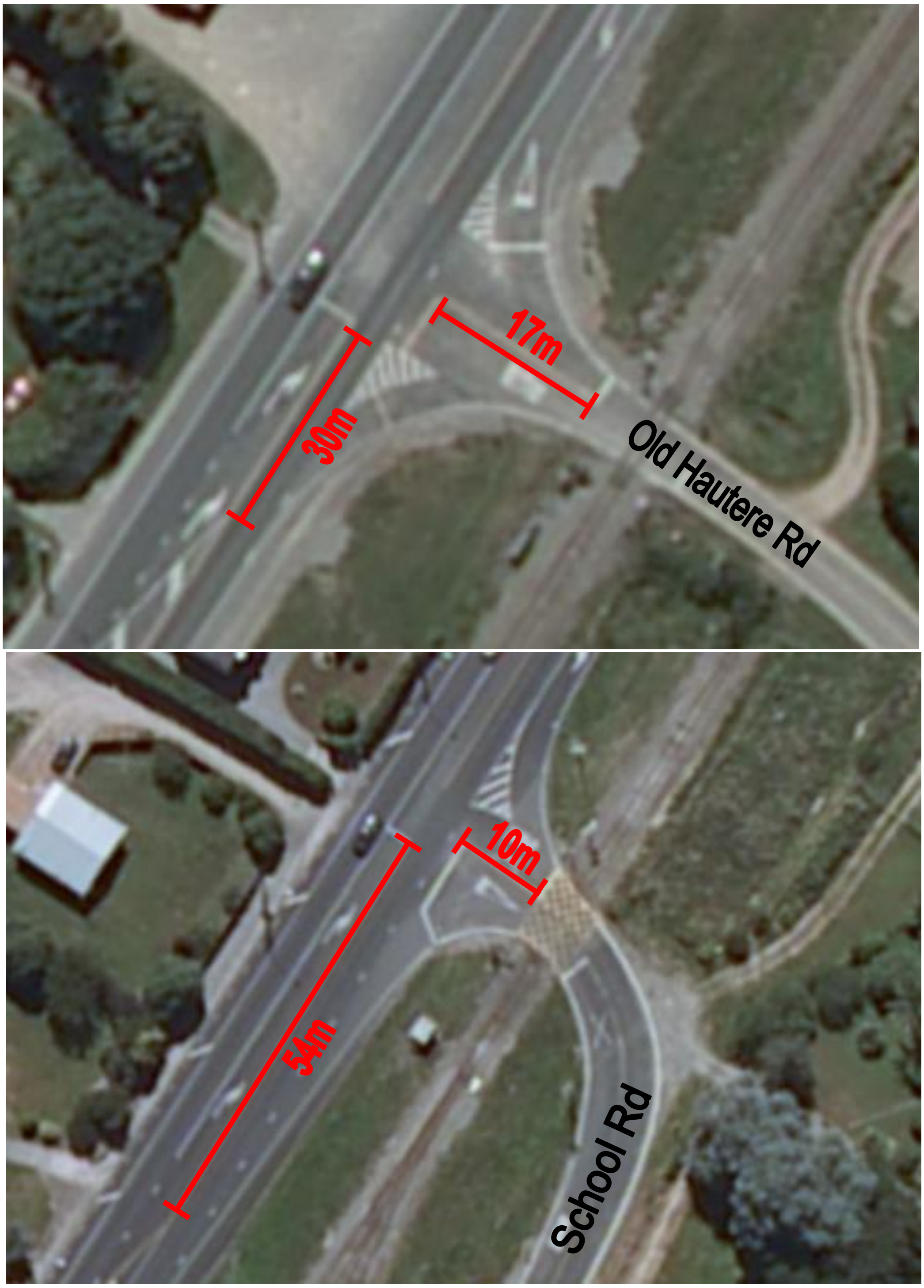
The provision of localised seal widening for left turns into or from these side roads enables these turns to be safely accommodated without blocking back. The existing layouts at the Old Hautere and School Road intersections do not however safely accommodate a truck and trailer unit turning right into or right from these side roads. There is a risk either that:

- units stopped at the SH1 give way line will block back across the level crossing; or
- units stopped to check for approaching trains will partially block existing SH1.

Old Hautere Road is the most likely access for construction Section 3. Fill will be imported to Section 3 from Section 2, via an internal haul route. Most of the trips through this access will therefore be associated with the movement of water using vehicles less than 17m long. Approximately one delivery of pavement materials (plus empty return trip) is expected via this access each hour for 18 weeks. The risk of blocking back can be avoided by safety briefings for truck drivers and temporary adjustment of the stop and give way lines. The contractor may also choose to use trucks without trailers for delivery through this access.

With only 10m distance between the SH1 give way line and the NIMT stop line, the School Road / SH1 intersection is more constrained. This access would be used for more than a year. It is also the intersection that is nearest to the local population and it is used to access Te Horo Primary School.

Figure 12-2 - Queue Storage Space: Old Hautere Road (Section 3) and School Road (Section 4)



A left turn bay is already provided for turns into school road. A left turn slip lane could easily be provided for traffic exiting School Road. However most of the movements to this access are expected to be associated with the delivery of excess cut from Sections 1 and 2, north of Te Horo.

Options for minimising the risk of truck and trailers blocking back include:

(a) temporarily re-locate the School Road level crossing further to the south where the required storage space can be provided;

(b) limit the movement of truck and trailer units to left in a left out only from this intersection - this would allow for deliveries from the north with trucks using the Peka Peka interchange (4km to the south) to turn back towards the north;

(c) using trucks without trailers - this would double the numbers of HCV movements at the intersection; or

(d) staging of bridge construction to minimise traffic effects (see section 12.8, below).

Each of the above would avoid the risk of blocking back and would therefore minimise the associated safety hazard. The contractor is likely to use cost and programme to identify the most suitable options. Of the three, (c) is likely to be least expensive but would double the hourly number of HCV movements at the intersection and increase the delay for side road traffic turning onto SH1. Option (d) may also be cost effective but could affect the efficiency of SH1 operations during construction. This is assessed in the following section.

12.8 Bridge Construction Staging as Road Safety Mitigation

There are two locations where early construction of local road overpasses would avoid the safety hazard associated with heavy vehicles turning right across high volume traffic flows on the existing SH1.

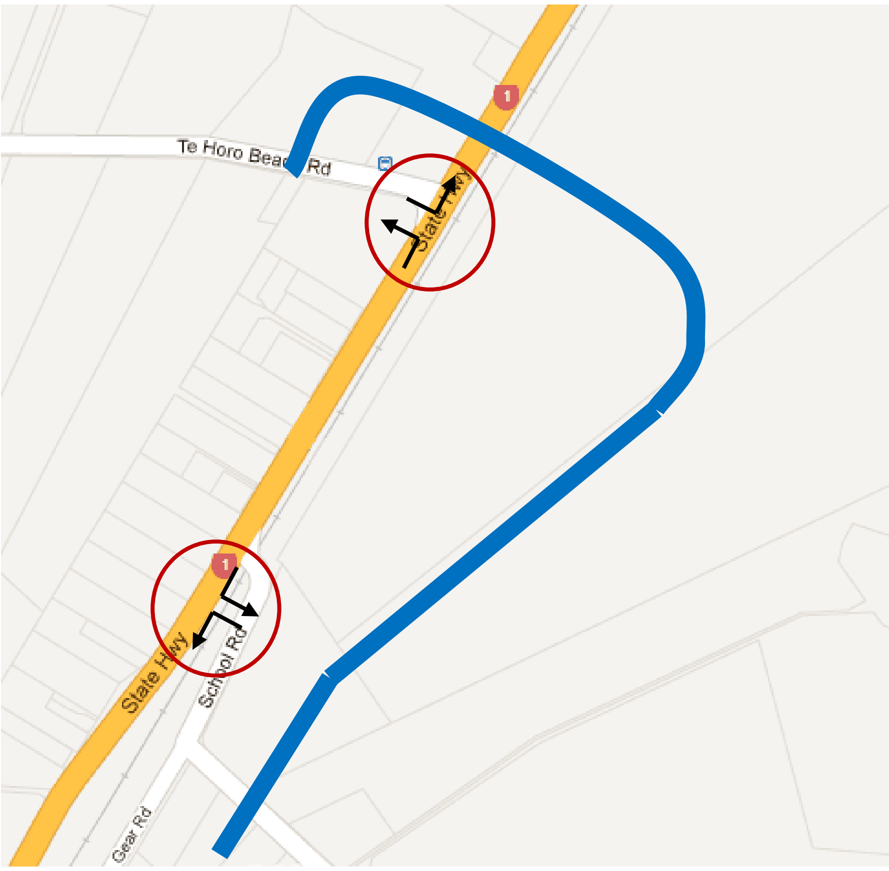
12.8.1 Te Horo Overpass

At Te Horo, the Project includes the provision of a local road connection between School Road and Te Horo Beach Road. The connection will pass over the NIMT Railway, the existing SH1 and the Expressway. If the bridge were constructed before work on section 4 is started, the overpass could be used for access to site. Features of this mitigation measure (shown in Figure 12-3) include:

- building the overpass and road connecting School Road to Te Horo Beach Road in the initial phase of construction (indicated by the blue line);
- maintaining the existing School Road connection to the existing SH1. This will be removed before the Expressway is opened; and
- restricting movements at the intersection of SH1 with School Road and Te Horo Beach Road to left-in / left-out.

The ban on right turns could be applied only to construction traffic via a construction traffic management plan. If applied to all traffic, the ban could be self-enforced by the provision of a concrete central median barrier through Te Horo. The permitted movements are shown in Figure 12-3. Removing all right turns at these intersections would provide immediate safety benefits in Te Horo.

Figure 12-3 - Use of Te Horo Overpass during Expressway Construction



Instead of turning right from School Road, motorists travelling from the site towards the north would travel across the existing SH1 via the overpass, turn left onto Te Horo Beach Road and then left again on the existing SH1. To drive to the site from the north, motorists may continue to turn left onto School Road, across the existing SH1.

Motorists travelling to the site from the south, rather than turning right into School Road would turn left into Te Horo Branch Road, and then turn right onto the new overpass to School Road.

12.8.2 Ōtaki Gorge Road Overpass

The formation of the south Ōtaki Interchange will replace the bridge over the NIMT railway. Ōtaki Gorge Road will connect with the existing SH1 at a new roundabout. This is shown in Figure 12-4. When the Expressway is open, the predominant movement at the roundabout will be between the existing Ōtaki river bridge and the overpass. Until the Expressway is opened, the predominant movement will be along the existing SH1.

The Ōtaki Gorge Road bridge over rail means that there are no constraints associated with level crossing. Early formation of the overpass and roundabout would reduce the likelihood of crashes associated with right turning HCVs and make it easier for construction traffic to access the site from SH1. The roundabout would however introduce delays for motorists travelling on the existing SH1 until the Expressway is opened. The connection between Ōtaki Gorge Road and the existing SH1 would need to be removed as soon as the new link across the NIMT railway is provided.

Figure 12-4 - Use of Ōtaki South Interchange during Expressway Construction

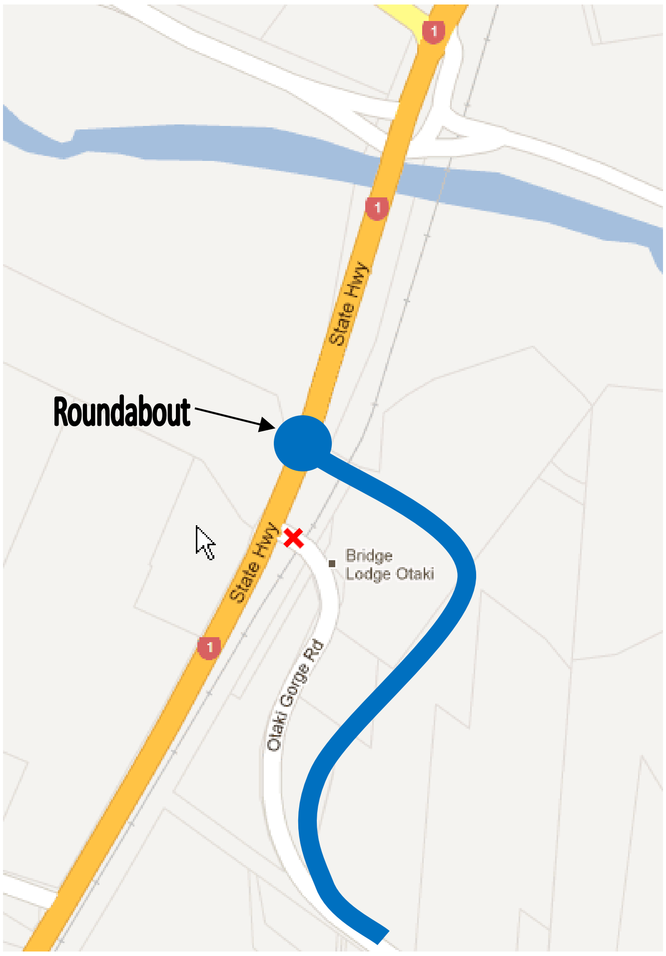


Table 12-8 shows a comparison of the performance for the existing layout against a roundabout. The flows incorporate the additional traffic associated with construction activity. The implementation of the roundabout early in construction will reduce delays for construction traffic by about 5 minutes, but will introduce delays for motorists using the existing SH1. LOS A is maintained for motorists travelling on the existing SH1 who would on average experience an additional four seconds delay.

Table 12-8 - Ōtaki Gorge Road: Comparison of Existing layout with Roundabout

Road		Vehicles AM Peak (HCVs)	Existing layout		Roundabout	
			Ave delay (sec)	LOS	Ave delay (sec)	LOS
SH1 Northbound	*T*	633 (129)	0.0	A	3.9	A
	R	25 (5)	22.7	C	9.4	A
Ōtaki Gorge Road	*L*	10 (5)	311.0	F	12.5	B
	R	19 (2)	308.8	F	16.4	B
SH1 Southbound	*T*	669 (126)	0.0	A	4.0	A
	L	25 (3)	13.5	B	4.9	A

The flows on the existing SH1 are substantially higher than those to or from the side road. At first glance, the total hourly delays for SH1 traffic would appear prohibitive. The tolerance of this delay will depend on the amount of time that the roundabout will be in place, before the Expressway is opened. It should also be compared against the delays associated with other options for providing access to the construction site.

12.9 Temporary Speed Restriction on SH1 Traffic as Mitigation

Reduced speed limits on the approaches to side roads would reduce the risk and severity of crashes at these SH1 intersections. This would reduce the risk of crashes now, even without the additional HCV movements associated with project construction. This would however increase in travel time for motorists using the existing SH1. Table 12-9 shows the additional travel time associated with temporary speed restrictions.

Table 12-9 - Additional Travel Time associated with Temporary Speed Restrictions

Existing Speed Environment	Temporary Speed Restriction	Length of restriction	Additional Travel Time
100 kmph	70 kmph	350m	5.4 Seconds
80 kmph	50 kmph	270m	7.3 Seconds

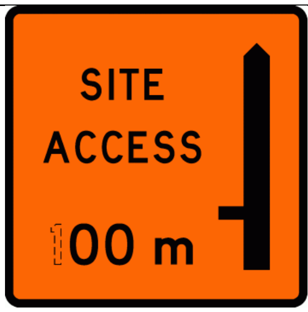
Given the volume of traffic using the existing SH1 and the expected duration of construction activity, temporary speed limits on SH1 are undesirable. Alternative mitigation such as the use of the Te Horo overpass during construction the early completion of the South Ōtaki Interchange and new roundabout intersection may therefore be preferable.

12.10 Temporary Warning Signs as Mitigation

Temporary warning signs should be used at every location where construction traffic is moving to or from the existing SH1. The location of the signs should be specified in the construction management plan. Figure 12-5 shows an example of the types of signs that should be used.

Figure 12-5 - Temporary Signs: Site Access (Not to Scale)

TW-29L



TW-28L

TW2.7B

12.11 Over-dimension Loads

The Project may require the movement of a small number of over-dimensioned loads. For example, concrete bridge beams may be fabricated elsewhere and transported to site. The bridge beams are likely to be longer than most HCVs usually permitted to use public roads. The Land Transport Rule: Vehicle Dimensions and Mass 2002 governs how and when over dimensioned loads may be moved.

Such loads are not permitted to be moved on this part of SH1 during the following times:

- at times when there are unusually heavy traffic flows;
- public holidays or after 1600 hours on the day proceeding a public holiday; and
- Saturday and Sunday, 1000 hours to 1300 hours and 1600 hours to 1900 hours.

The movement of any dimensioned loads will be undertaken in accordance with these limitations.

Where the roading environment is unconstrained, vehicles carrying over dimensioned loads may travel at speeds of up to 90km/h. The size of the over-dimension transporters means that it is difficult to safely overtake them when they are moving, even along straight road sections. Their movement therefore has the potential to disrupt the efficient operation of the roading network.

The LTNZ Vehicle Dimension and Mass Rule 2002 specifies measures that must be taken to mitigate the possible affects moving over-sized and over-dimensioned loads. In relation to transport efficiency the rule requires that over-dimension motor vehicles *"are operated with due consideration for other road users and where it is safe to do so, other road users must be allowed to pass the vehicle at the earliest opportunity"*[35]. For safety reasons, haulage contractors prefer to pull-over on straight sections of road since these are the safest location for other motorists to pass. The frequent passing lanes on SH1 also provide opportunities for other road users to pass.

Transporters will need to travel at slower speeds where adverse (horizontal or vertical) road alignments need to be negotiated. It will therefore be necessary to introduce measures to protect the safety of road users and minimise disruption to traffic. Heavy haulage contractors will be responsible for ensuring turbine components are moved in accordance with the LTNZ Vehicle Dimension and Mass Rule 2002.

A key measure to mitigate potential affects will be the provision of pilot vehicles giving advance warning of the over-dimensioned loads. Pilot vehicles and transporters will be highlighted with warning markings in accordance with the specifications of the LTNZ rule (including flags, retro-reflective / hi-visibility panels and 'oversize' signs). All measures to slow, stop or re-direct traffic using State highways during the movement of over-weight / over-dimension vehicles will conform to requirements of:

- "Code of Practice for Traffic Control at Bridges being Crossed by Over-weight Vehicles" (Land Transport); and

[35] LTNZ Vehicle Dimensions and Mass 2002, Cl 6.6(7)

- "Vehicle Dimension and Mass Rule 2002" (Land Transport).

If additional measures are required to minimise the safety risks, for example where over-dimensioned loads turn to or from the existing SH1, temporary traffic management plans will be prepared and submitted to road controlling authorities for comment and approval before the loads are moved. If required, the TMPs would document:

- measures required to direct, stop or slow general traffic;
- locations where queued traffic may pass or divert around over-dimensioned loads; and
- timetable for moving loads that accords with the Land Transport Rule.

12.12 Rahui Road Rail Bridge

All of the new bridges may be constructed off-line. Construction of the new Rahui Road bridge over the Expressway and realigned NIMT railway will occur very close to the existing alignment of Rahui Road. It has been assumed that Rahui Rd will operate with one lane only while this work is completed. Opposing traffic flows would need to be controlled with temporary traffic signals lights. The operation of these signals has been assessed on the following basis:

- Rahui road will be narrowed to one lane for 100m;
- vehicle speeds will be limited to 30km/hr past the construction site; and
- 2021 medium growth do minimum with additional HCV movements.

Using these parameters the "all red" time between phases set to 15 seconds. This ensures that all vehicles are able to exit before opposing traffic is given a green signal. Delays of 25-30 seconds are forecast as a result of the one-way working. This corresponds with a level of service C which is acceptable.

12.13 Effect of Construction Activity on PT and Non-Motorised Road Users

Construction traffic will be travelling on local roads to access the site. Surveys completed in July 2010 (see section 2.9.1) recorded very few pedestrians or cyclists. The survey was undertaken during winter and so some more pedestrians and cyclists may be observed in summer. Except at School Road, the roads used to access site do not provide footways. It will therefore be important that HCV drivers and other construction workers are briefed to look out for pedestrians and to drive appropriately as they pass them. This will be particularly important in summer.

The locations where particular care will be needed are:

(a) Rahui Road, Ōtaki;

(b) off-road link between Rahui Road and Ōtaki Railway Station (Arthur Street);

(c) County Road, Ōtaki; and

(d) School Road in Te Horo.

Higher numbers of pedestrians were counted at these locations during surveys. The location of these roads also increases the likelihood that school children will be walking or cycling in the area.

Otaki College, Otaki School and Te Horo School all have school buses. However, the construction is not anticipated to have an effect on the operation of the school buses.

The early construction of the Rahui Road Bridge and the Te Horo overpass would see the provision of a dedicated footway providing separation between pedestrians and construction traffic.

It is not expected that any pedestrian or cyclists routes will be severed for longer than a few hours at a time during construction. Where this is the only option to allow construction to progress, temporary diversions will be put in place. Pedestrians, cyclists and others should be diverted along a safe route past the area in which truck and trailer units will be operating using temporary directional signs where appropriate (see Figure 12-6 for examples). It is recommended that consideration is given to equestrians when the construction management plan is developed.

Figure 12-6 - Temporary Signs Pedestrians & Cyclists (Not to Scale)

	
TW-32P (L)	**TW-32.1C (L)**

A temporary platform with shelters will be provided in in the vicinity of the Ōtaki Railway Station will be provided while the station is being relocated.

12.14 Summary and Proposed Mitigation

This chapter has shown that the increase in light and heavy vehicles associated with construction is small relative to the flows on the existing SH1 and would be barely noticed by motorists travelling through Kāpiti District.

The additional traffic will affect the operation of the at-grade intersections between the existing SH1 with Ōtaki Gorge Road, Old Hautere Road and School Road. The additional HCV traffic will result in significantly increased average delay, particularly for turns from the side roads onto the existing SH1. The intersection turning delay will affect construction traffic using these site access as well as motorists travelling to and from properties to the east of the transport corridor. The increased delay and the associated safety hazard is the main issue that needs to be addressed in the construction traffic management plan.

The current separation between the existing SH1 and the NIMT railway at Old Hautere Road and School Road does not allow truck and trailer units to wait to cross the railway or join the existing SH1. Minor changes to the road layout Old Hautere Road will avoid this issue. More substantial measures are needed at School Road.

There are several approaches for mitigating the intersection efficiency and road safety effects at School Road during construction, including:

(a) limit truck and trailer units to left in a left out only (substantially increase the length of the haul routes);

(b) use trucks without trailers (doubling the number of HCV movements at the intersections);

(c) temporary warning signs on the SH1 approaches to intersections;

(d) temporary speed restrictions on the SH1 approaches to intersections; and

(e) staging of bridge construction to minimise traffic effects (see section 12.8, above).

Overall, it is considered that the potential adverse transport-related effects of constructing the Project can be avoided or mitigated to an acceptable level if the recommendations proposed in this report are adopted. (a) and (b) would reduce the efficiency of construction operations, may increase the duration of construction and may therefore not be appropriate. Option (c) and (d) will not address the delays experienced by motorists accessing SH1 from the local roads. Therefore (e) is recommended to avoid or mitigate the traffic effects associated with construction. Implementation of (c) and (d) in combination of € should be considered when preparing the construction traffic management plan. Recommendations are summarised below:

- develop a construction traffic management plan for all construction activities including the movement of over-dimension components (e.g. bridge spans);
- to minimise journey distances and reduce transport costs, every effort will be made to source bulk materials from locations / settlements within Kāpiti or adjoining districts;
- transportation of over-dimension components shall be undertaken in accordance with the appropriate operational approvals (see section 12.11), prepared by the applicant to the satisfaction of the Road Controlling Authorities (i.e. the NZTA);
- maximise the use of internal haul routes (e.g. move earthworks within the site rather than via public roads);
- self-contained drive through wheel wash will be considered for each site access;
- brief workers and bulk goods suppliers of the poor crash record of at grade intersections on the existing SH1 before their first visit to the site;
- advance warning signs for SH1 approaches to site access roads used for construction site access;
- consider temporary speed restrictions on the SH1 approaches to Ōtaki Gorge Road, Old Hautere Road and School Road;
- stage the construction of the bridge to minimise traffic effects (see Section 12.8, above);
- introduce temporary traffic signal control during the construction of the Rahui Road bridge;
- introduce measures to ensure the safety of non-motorised road users of side roads, particularly at School Road and Rahui Road; and
- In order to minimise the risk to child pedestrians using the School Road site access will be warned of school bus arrival and departure times SH1 and instructed to take additional care when using the route.

With the adoption and implementation of these recommendations, it is considered that construction will have no more than minor effect upon the safe and efficient operation of the road network.

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13 Summary & Recommendations

SH1 is the main route into Wellington, New Zealand's capital city. The Project is part of a major programme of works to improve access between different parts of the region and to regional facilities such as Wellington Regional Hospital, Wellington Port and Airport. The RoNS also seeks to stimulate economic activity and growth. The Project seeks to improve the movement of goods and people as well as access to services. The overall RoNs will improve journey times between Levin and Wellington Airport.

Currently SH1 is the only arterial route into Wellington from the west coast of the North Island. At times motorists using SH1 experience traffic congestion. The route is also vulnerable to catastrophes. As well as the risk of natural hazards (e.g. earthquakes and flooding); there have been several instances within the last few years where SH1 has been partially or completely closed due to road traffic accidents. The lack of an alternative route means that this route into Wellington has poor route security. The provision of an Expressway built to a higher standard than the existing SH1 will improve the resilience of the transport network.

Motorists using this section of the Wellington RoNS between Peka Peka and North Ōtaki already experience congestion at the start and end of each weekend and particularly around public holiday periods. The delays caused by the lower speed limits, pedestrian activity and parking manoeuvres add up to 10 minutes[36] to the journey time for motorists that travel through without stopping.

The function of SH1 as a national arterial route conflicts with the access and adjacent land use in this part of Ōtaki. The traffic volumes passing through this area are almost twice as high as desirable for a street designed for shopping and working. This makes is difficult for pedestrians to cross the road and increases the risk of crashes. It also makes it difficult for traffic to turn across the SH1 traffic flows to side roads and access parking areas. This in turn causes delay and unreliability for through traffic on SH1.

The additional travel times and unreliability already experienced is has an impact on the movement of freight. Over the last 30 years the growth in road based freight has been twice that of the growth in private travel. This growth is forecast to continue in coming years. Providing a route which improves travel time reliability, decreases acceleration and deceleration through Ōtaki will reduce vehicle operating costs and increase the efficiency of HCVs.

The remainder of this chapter describes the overall effect of the Project and the extent to which it achieves the transport objectives presented in section 1.2.

13.1 Summary of Effects

The Project will result in a significant improvement in road safety both for users of the Expressway and also for people who travel on the existing SH1 on foot, by bicycle, on horseback or using motorised transport. Over the last five years 40% of crashes within the Project area were associated with motorists turning to or from SH1 and 14% were head-on

[36] As measured by during travel time surveys completed over Labour Weekend in 2008.

crashes. The number of these crashes will be significantly reduced, if not eliminated as a result of the Project. The annual crash costs for the Project area are anticipated to be reduced by about 60 percent with the construction of the Expressway. The provision of grade separated rail crossings at five of the eight existing level crossings as part of the Project will also avoid the risk of crashes between motorists and the railway.

The Project will improve the connection between the existing SH1 and local side roads. Significant delays for motorists, pedestrians or cyclists travelling from side-roads such as School Road or Ōtaki Gorge Road are experienced at present and are forecast to deteriorate in future if nothing is done. The future delays are forecast to be of a magnitude that would encourage motorists to change their route (if possible), the time of travel or to take risks when joining the existing SH1. The Project significantly reduces the traffic flow on the existing SH1. For example, at Te Horo in 2031 in the AM and PM peaks the volume of traffic on SH1 reduces from 1,700 vehicles per hour with no Expressway (do minimum scenario) to 300 vehicles per hour with the Expressway. This reduction makes it much easier and safer to join or cross the existing SH1. This increases accessibility and is consistent with the principles of an appropriate road hierarchy.

On an average weekday in 2031, the Project will reduce travel times for people travelling past Ōtaki by almost two minutes. Already the existing SH1 becomes congested at weekends and at busy holiday periods. The Project will improve the reliability and efficiency of inter-regional freight movements as well as improving regional connectivity for other motorists. Improvements to the railway alignment immediately north of Otaki will reduce travel time for passengers or freight transported by rail.

There will be additional HCV and light vehicle traffic during construction and measures are necessary to ensure the safe operation of the existing SH1 during this period. This report has identified several possible ways to minimise the effect of the construction traffic including:

- advanced warning of turning traffic;
- temporary speed limits;
- controls on the routing of construction traffic; and
- to avoid negative effects, early construction of over bridges associated with the Project.

The successful contractor will need to develop these ideas, agree them with the road controlling authority and document them in a construction traffic management plan.

13.2 Objectives

The objectives for the Peka Peka to Ōtaki Project are listed in section 1.2. Sitting above these are a set of Wellington Northern Corridor RoNS-wide RMA objectives. Table 2 in Part A of the AEE shows how the Project objectives (below) relate to the RoNS-wide objectives. Part A also presents KiwiRail objectives for this project which are related to rail safety, efficiency and accessibility. This section documents the transport effects relevant to the objectives.

Enhance efficiency and journey time reliability from, to and through the Kāpiti District, Wellington's Central Business District, key industrial and employment centres, the port, airport and hospital (by developing and constructing a cost-optimised new State highway to expressway standards between Peka Peka and north of Otaki).

The Project will:

- reduce travel times through the Project area by approximately two minutes at peak hours on an average weekday;
- reduce the travel time unreliability associated with travel on weekends and holiday weekends; and
- provide a second highway route, built to a higher standard, thereby increasing resilience to natural hazards and providing a choice of routes in cases of a serious road traffic accident.

Enhance safety of travel on SH1 (by developing and constructing a cost-optimised new State highway to expressway standards between Peka Peka and north of Otaki).

The Project will:

- minimise or eliminate the number of severe or fatal head on crashes (currently 14% of crashes over the past 5 years); and
- significantly reduce the number and severity of crashes overall (including the existing SH1). The construction of the Expressway is expected to reduce the annual crash cost by 60 percent.

Appropriately balance the competing functional performance requirements of inter-regional and local traffic movements, and to facilitate others to provide modal choice opportunities, to enable local facilities and amenities in the Kāpiti Coast District to be efficiently accessed (by developing and constructing a cost-optimised new State highway to expressway standards between Peka Peka and north of Otaki).

The Project will:

- reserve the use of the existing SH1 for use by people making local trips within the Project area and within Kāpiti District;
- significantly reduce the traffic flow on the existing SH1, making it more conducive to non-motorised travel;
- moderately ease connectivity across the national transport corridor (NIMT and Expressway);
- significantly ease connectivity across the existing SH1; and
- make it significantly easier to access side roads and parking areas and cross the road in the existing SH1 in Ōtaki Railway Retail area.

Avoid, remedy or mitigate the immediate and long-term adverse social, cultural, land use and other environmental effects of the Project on the Kāpiti Coast District and its communities by, so far as reasonably practicable, through route and alignment selection, expressway design and conditions (by developing and constructing a cost-optimised new State highway to expressway standards between Peka Peka and north of Otaki).

The Project will:

- limit development pressures at Te Horo in accordance with KCDC and the Greater Ōtaki Community's land use aspirations (refer to the Ōtaki Vision);
- make access to the Ōtaki Retail Area during peak periods, including public holidays easier for visitors and residents by reducing the volume of traffic on existing SH1;
- safeguard the future ability to extend rail double tracking through the Project area; and
- avoid the possibility of crashes between motorvehicles and rail by providing grade separated local road connections instead of level crossings.

Be integrated into the form of Kāpiti Coast District by taking into account current and planned future land use and development in route and alignment selection, expressway design and conditions.

The Project will:

- support and highlight Ōtaki's function as one of Kāpiti District's three main centres and the functional centre of the Greater Ōtaki area;
- limit development pressures at Te Horo; in accordance with KCDC and the Greater Ōtaki Community's land use aspirations (refer to the Ōtaki Vision); and
- reduce severance by improving connectivity and accessibility of cross corridor and local movements across the existing SH1.

Efficiently serve Ōtaki and its future development by providing appropriate vehicle access and signage to and from the new expressway.

The Project will:

- through the half-interchanges at north and south Ōtaki, provide fast and efficient motor-vehicle access to and from Ōtaki without increasing travel distance; and
- provide Expressway users with advanced warning (i.e. advanced directional signing) on the approaches to Ōtaki.

13.3 Possible Mitigation

The Project, by its nature, avoids the significant road safety effects that are forecast in future if no changes to the road hierarchy are introduced. This will benefit not only people travelling through the Project area, but also people that make trips to and from the Project area.

It is recommended that particular care is taken in the urban design and landscaping at Gear Road and School Road in Te Horo. This is necessary to minimise, the already small, risk that pedestrians attempt to cross the Expressway and NIMT railway at-grade.

The transport effects of construction activities will also need to be mitigated. The successful contractor will need to work with the road controlling authorities to develop the most appropriate mitigations measures. It is recommended that:

- a construction traffic management plan is developed for all construction activities including the movement of over-dimension components (e.g. bridge spans);
- minimise journey distances and reduce transport costs, every effort will be made to source bulk materials from locations / settlements within Kāpiti or adjoining districts;
- transportation of over-dimension components shall be undertaken in accordance with the appropriate operational approvals (see section 12.11), prepared by the applicant to the satisfaction of the Road Controlling Authorities (i.e. the NZTA);
- maximise the use of internal haul routes (e.g. move earthworks within the site rather than via public roads);
- self-contained drive through wheel wash will be considered for each site access;
- brief workers and bulk goods suppliers of the poor crash record of at grade intersections on the existing SH1 before their first visit to the site;
- advance warning signs for SH1 approaches to site access roads used for construction site access;
- consider temporary speed restrictions, during construction activity, on the SH1 approaches to Ōtaki Gorge Road, Old Hautere Road and School Road;
- consider use of temporary traffic signal control on Rahui Road during the construction of the Rahui Road bridge;
- introduce measures to ensure the safety of non-motorised road users of side roads, particularly at School Road and Rahui Road; and
- in order to minimise the risk to child pedestrian, during the use of School Road as a site access, HCV drivers will be warned of school bus arrival and departure times and instructed to take additional care when using the route.