

Christchurch to Dunedin

CORRIDOR MANAGEMENT PLAN



2018-2028



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Executive summary

The corridor starts at the intersection of SH73, Russley, Christchurch, passing through to Hornby where SH76 joins SH1 linking to the Port of Lyttelton. The corridor includes SH74A a local link between SH76 and SH74. SH1 continues south from Hornby along the east coast ending at St Andrew Street in central Dunedin. SH78 provides access to Timaru port. The corridor provides connections to other corridors linking to the central and western South Island communities and visitor destinations. The South Island main trunk rail line runs alongside SH1 from Hornby to Waitati on the northern edge of Dunedin where it follows the coast before cutting across the peninsula to the Port of Dunedin, and offers an alternative for freight movement.

The corridor is approximately 391 km long (3.4% of the state highway network). The total value of assets along the corridor is \$601M (2.6% of the total national asset value).

SH1 is a nationally significant corridor for moving people and goods critical to the social and economic needs of the country, region and communities along it. It is a national/ national high-volume route. The corridor consists of two large urban environments, one at each end and traverses rural areas and smaller towns approximately every 50km. The corridor is at the heart of the South Island economy linking people and goods to sea ports, airports and inland ports. It consists of two major urban centres at each end, Christchurch and Dunedin with rural section connecting smaller settlements between.

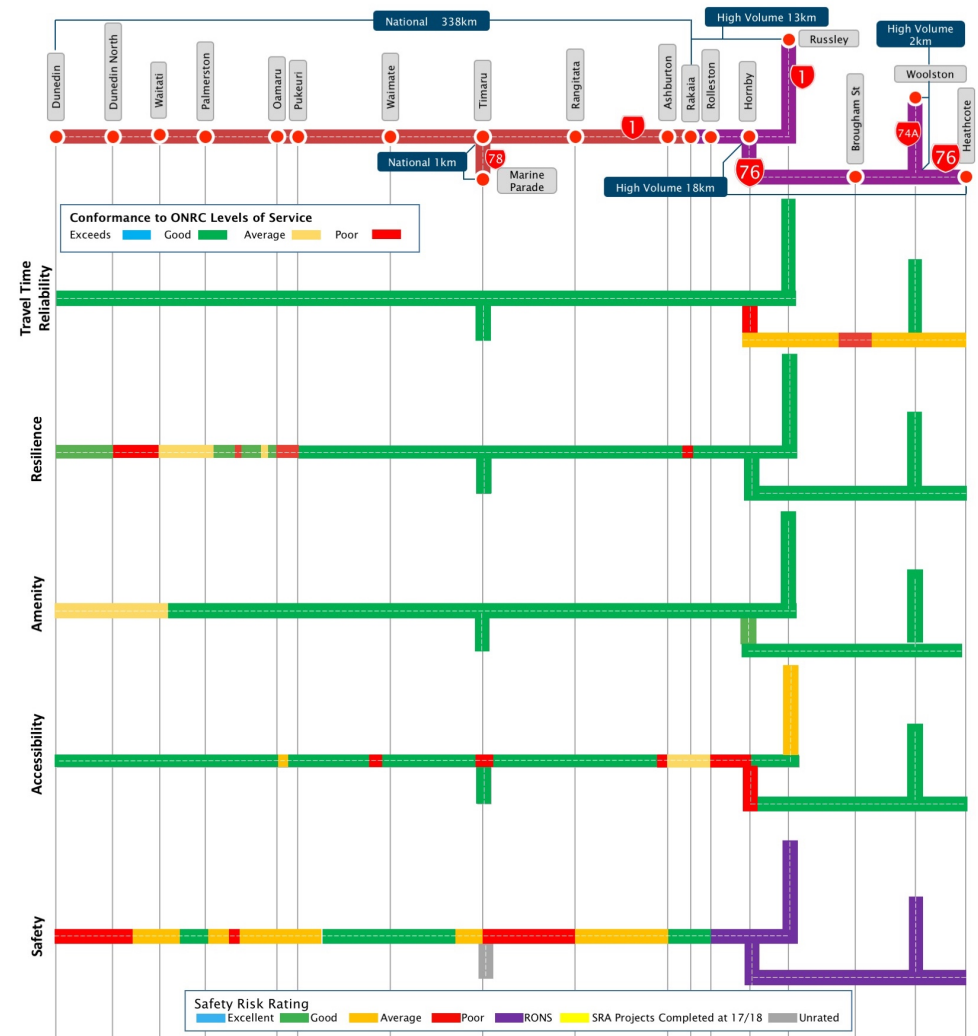
Significant population growth is not expected over the next 30 years along the corridor with the exception of Selwyn district which is projected to have between one and three percent growth by 2043. The population structure in Christchurch has changed as a consequence of the Christchurch earthquake in 2011. Significant investment in Christchurch to rebuild an integrated transport network with a greater focus on the south and west of the city is ongoing and will contribute to journey time reliability and efficiency, safety and access improvements across all users of the network. Traffic volumes may increase by 30% between 2011 and 2041.

The key areas of focus for the corridor south of Christchurch are journey time reliability and safety in the towns along the corridor and between them. In Christchurch urban area, intersection crashes are the primary type of unplanned event. Crashes south of Timaru are due to the geometric layout, narrow shoulders and roadside hazards. Outside of Christchurch the focus for investment improvements is to keep speeds at a more consistent level. They currently range from an average of less than 70kph through urban areas to over 90kph on rural sections. Investments that will provide consistent speeds as traffic volumes grow is the focus of business planning for the corridor between Selwyn and Dunedin.

Within the Christchurch reliability and efficiency have improved following the opening of the Christchurch Southern Motorway. Stage 2 is currently under construction. This will provide further reliability and efficiency benefits in the urban area.

The northern section of the corridor has good resilience, with unplanned events relating to crashes. Pressures arise north of Dunedin where coastal erosion has the potential to undermine the corridor. Alternate route options are generally long and on roads unsuitable to heavy vehicle this makes the maintenance of structures along the corridor essential to preserve access. Investment in resilience works is necessary north of Dunedin.

Figure 1 - Performance of the corridor against ONRC outcomes



Introduction

Purpose

What is the corridor management plan?

This Corridor Management Plan describes the customer service delivery story for the Christchurch to Dunedin corridor, as measured against the One Road Network Classification performance framework. It is intended to describe the investment story, i.e. why invest in this corridor, in a context everyone can understand whether the activities are delivered through investment in the State Highways maintenance, operations, renewals and improvements programmes.

The corridor management plan considers a combination of:

- The **pressures** on the system that are resulting in increased demand or a reduction in levels of service
- The **current state** of the system and how it is performing
- The **response** the Agency is investing in to deliver the customer levels of service along the corridor.

It is important to note that this is a first-generation Corridor Management Plan, therefore, we expect it to be improved as we learn from this approach. It sets a firm foundation to improve from in the next 2-3 years, utilising a common framework and consistent data sets across the 30 corridors.

Why is it needed?

The corridor plan provides a link between the long-term planning outlook, the 10-year medium term investment programme and the 3-year land transport programmes for the next funding round.

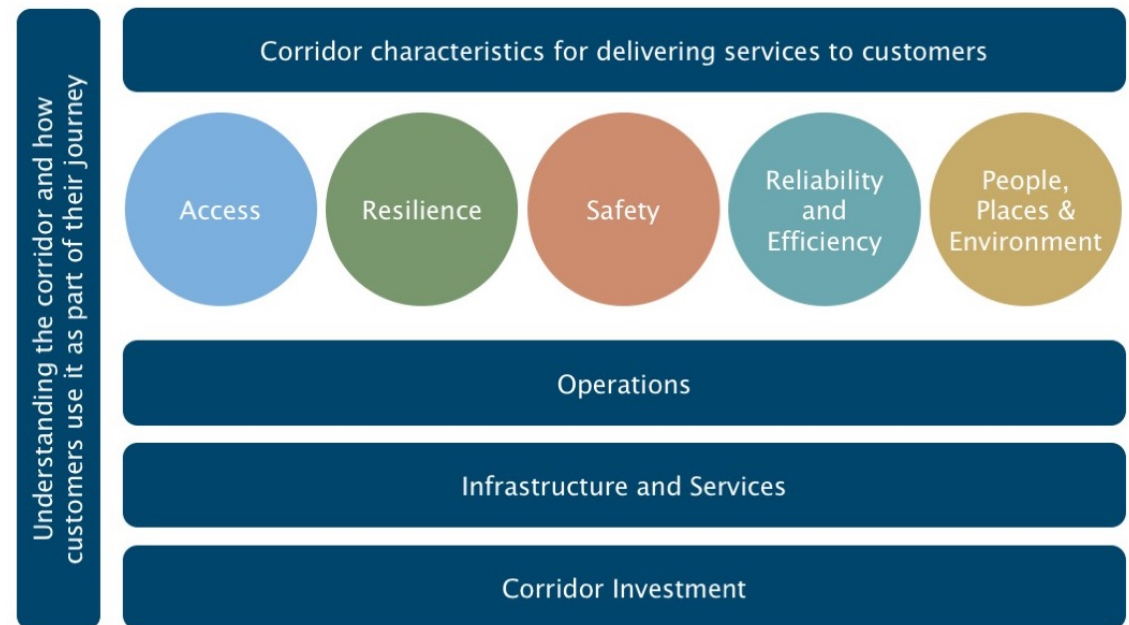
Traditionally, the approach to investing in maintenance and renewals is to consider each asset activity in isolation, i.e. pavement, structures, drainage, and in isolation of capital expenditure. The Corridor Management Plan approach considers all assets within the corridor and takes a holistic view of the customer levels of service they provide throughout the corridor. Planning is currently undertaken at the regional level, but typically significant journeys traverse more than one region. By considering the significant customer journeys and destinations, the corridor management plan is a vehicle to engage in regional and inter-regional conversations by focusing on the issues that are important and may extend beyond the state highways network.

How will we use it?

The Corridor Management Plan will provide the customer story and case for investment in maintenance, renewal and improvement on the corridor, based on targeting maintenance to achieve the appropriate customer levels of service within the context of providing value for money. The information presented in the corridor management plan helps to inform the business case for investment in State Highways for the subsequent triennial period.

In conjunction with the long-term view, the corridor management plan will provide for engagement with key stakeholders and partners to shape the future of the corridor. It responds to the needs of the users of the corridor to shape the future service levels.

Figure 2 - Corridor management plan framework



The corridor at a glance

Corridor overview

SH1 is a nationally significant corridor for moving people and goods critical to the social and economic needs of the country, region and communities along it. It is a national/ national high-volume route. The corridor consists of two large urban environments, one at each end and traverses rural areas and smaller towns approximately every 50km.

The corridor starts at the intersection of SH73, Russley, Christchurch, passing through to Hornby where SH76 joins SH1 linking to the Port of Lyttelton. The corridor includes SH74A a local link between SH76 and SH74. SH1 continues south from Hornby along the east coast ending at St Andrew Street in central Dunedin. SH78 provides access to Timaru port. The corridor provides connections to other corridors linking to the central and western South Island communities and visitor destinations.

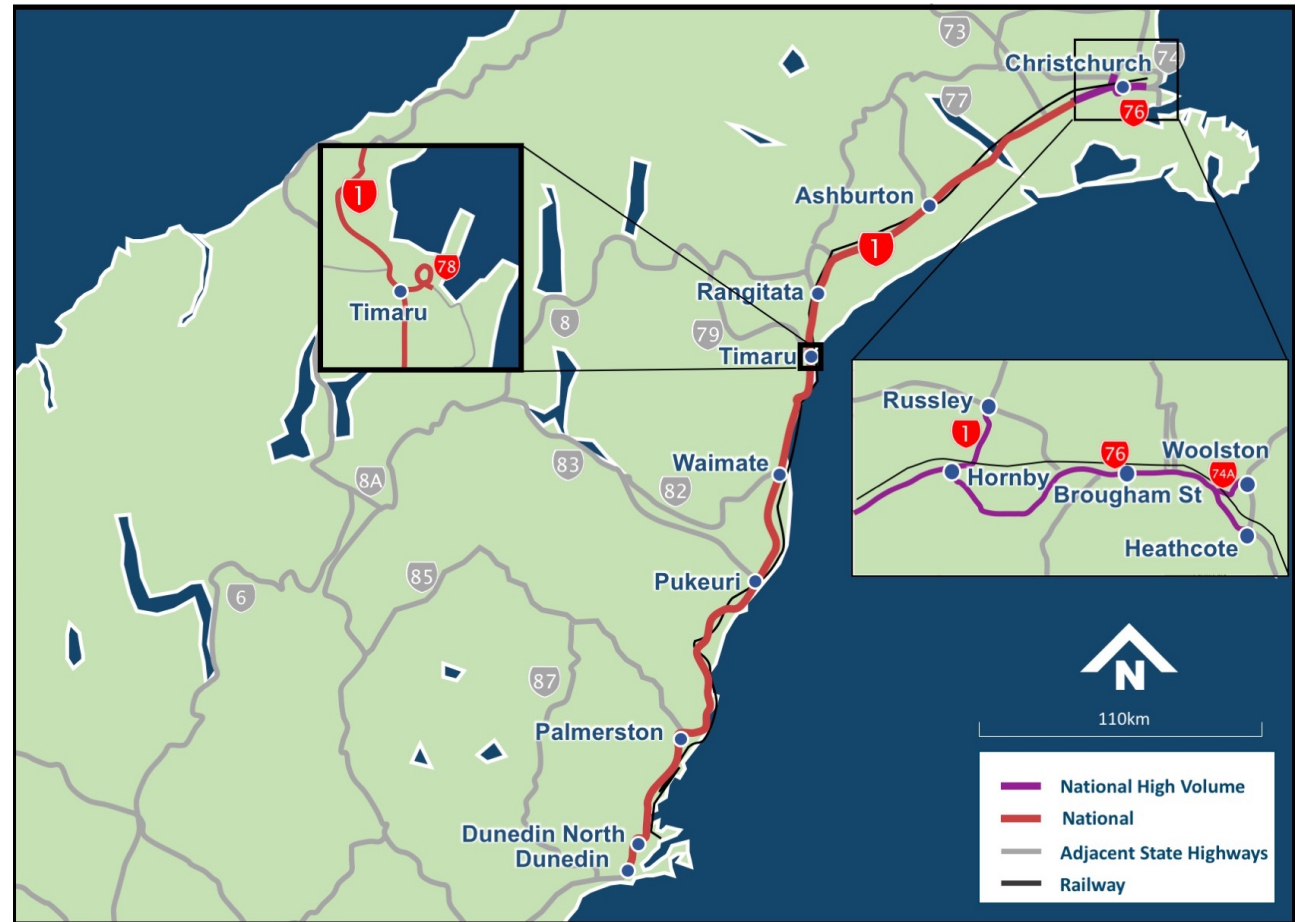
The South Island main trunk rail line runs alongside SH1 from Hornby to Waitati on the northern edge of Dunedin where it follows the coast before cutting across the peninsula to the Port of Dunedin. No visitor or commuter rail services are operated on the line.

The regional economy

The Canterbury region has a population of almost 575,000 people, representing 12.7% of the country's population. Unemployment is low at 3.2%. The region produces 13.1% of the national GDP. The key sectors are agriculture (dairy and sheep, beef cattle and grain farming) and manufacturing. It has particular strengths in machinery and equipment manufacturing and chemical, minerals and metal manufacturing. Construction employment has increased and international decreased since the earthquake of 2011.

The Otago region has a population of just over 210,000 representing 4.7% of the total NZ population. The economy is diverse with education and healthcare the main focus of Dunedin City's economy. There is growth in the high-tech and ICT sectors offset by a decline in manufacturing employment. Accommodation and food services, education and training activities employ 19% of the workforce.

Figure 3 – Corridor overview



Understanding our customers

Key customers

The key customers using the corridor are diverse, but use a limited range of transport modes. Different customers have different needs, expectations, and personal circumstances for using the transport system. Therefore, what customers value from the transport network needs to be understood in the context of who they are.

Daily commuter

Commuting by car is the dominant mode of transport in Canterbury and Otago. Otago has the second highest percentage of pedestrian and cycle commuting of all regions in the country. Public transport plays a key role in commuters' journeys in Christchurch.

Insights into daily commuter users:

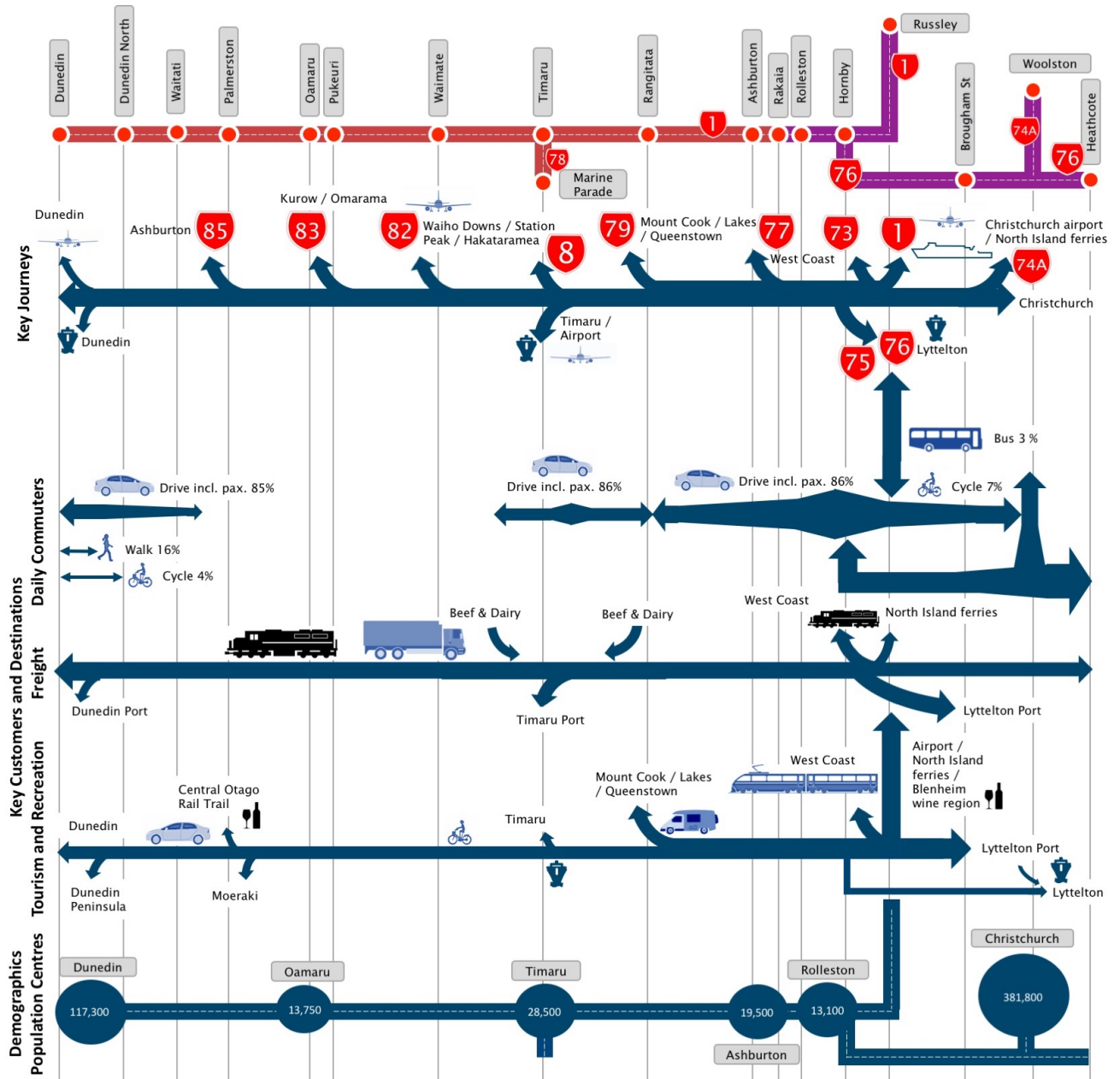
Road use: The primary longer distance commute is Selwyn to Christchurch. Three other important commutes are into Dunedin, into Timaru, and within Christchurch. There is strong interaction of pedestrians, cyclists and public transport services in urban areas along the corridor. Rolleston to Burnham flows are increasing as New Zealand Defence Force relocates personnel to Burnham.

Road knowledge: Good understanding of local area and conditions. Understand why and when changes in traffic flow will occur and plan their journeys accordingly.

Pain points: Hornby for all users. Brougham Street, Christchurch. No cycle facilities along the route (exception Ashburton bridge clip on). Public transport in Christchurch is unreliable. Christchurch Southern Motorway end merge into 2 lane opposing creates delays. Timaru through the four-lane section. Approach to Dunedin, slower moving vehicles exiting urban areas. Crossing state highway for pedestrians, cyclists and cars in all urban areas.

Daily commuters expect: Reliable journey times. Easy access to local facilities. Early information about delays on the corridor or weather conditions.

Figure 4 - Key customers, journeys, and destinations



Tourist and recreational users

There are four Regional Tourism Organisations (RTOs) along the corridor, Canterbury, Timaru, Waitaki and Dunedin. The Canterbury Tourism Partnership provides funding and governance support in leading tourism recovery following the earthquake.

Spending in Canterbury has seen a 5% increase in tourism spend from Jan 2016- to Jan 2017, this compares to Dunedin's 7% increase, 6% in Waitaki and 8% increase for South Canterbury. International spend is around 45% of total tourism spend in three RTO areas, with Canterbury international spend at 55% of total spend.

In December 2016, international guest nights rose in all RTO areas, although the length of stay reduced. Domestic guest nights fell between 5 and 25% in the RTO areas over the period December 2015 to December 2016.

Insights into tourist and recreational users are as follows:

Road use: Long distance journeys on the corridor and as part of longer trips the length of New Zealand. Seasonal peaks in winter and summer. Local seasonal trips to tourism destinations.

Road knowledge: International visitors have limited knowledge of the changing environment along the corridor. Not prepared for changing weather conditions during winter months. Absence of town entry signs at Timaru impacts ability of driver to alter behaviour on approach to the urban area. Locals have greater understanding of road conditions.

Pain points: Parking congestion at peak times around tourist destinations. Long weekends, school holidays and ski seasons. South of Timaru limited passing opportunities. Stopping opportunities south of Oamaru limited.

Tourist and recreational users expect: Signage to key tourist destinations including expected journey time, regular stopping places with range of facilities. Timely information on delays.



“weekend journey behaviour differs from weekday travel behaviour – we value ‘time’ differently on weekends”

Freight operator

The corridor is a key link for freight from and to international sea ports and inland ports. Between 150 and 4,100 heavy vehicles use parts of the route each day, representing between 5 and 22% of traffic flow. The corridor is paralleled by the South Island Main Trunk line which takes longer distance freight off the road network.

The Future Freight Scenarios study found that additional road upgrades will be required to access the Port of Otago, with other ports on the route having sufficient road capacity for future scenarios. Freight flows are generally outbound from Canterbury as it is the main distribution hub for the South Island. Freight growth¹ in Canterbury is estimated to increase from 35 million tonnes to 61 million tonnes by 2042 and for Otago from 10 million tonnes to 16 million tonnes over the same period.

The road freight constraints are typically around connections to international shipping schedules and domestic rail connections.

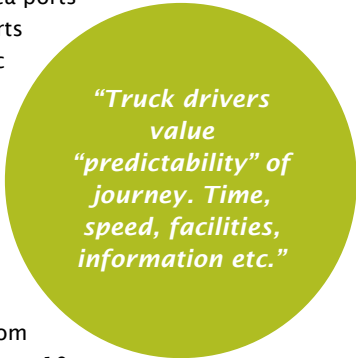
Insights into freight operators are as follows:

Road use: Access to ports and industrial / rural industrial and farming operations. Deliveries to central Otago are by truck to/from ports and rail. Highest HPMV uptake in the country. SH76 to SH1 is designated an over dimension route.

Road knowledge: Good level of knowledge. Prepared for seasonal variations in weather conditions. Aware of seasonal variations in traffic conditions.

Pain points: Rakaia Bridge speed restrictions for HPMV to 20 kph over 1.5 km length. Inclines north of Dunedin and changing speed limits through urban areas. Closures due to crashes as most alternate routes unable to take HPMV or heavy vehicles. Brougham Street interaction with other modes increases starting and stopping resulting in inefficiencies.

Freight operators expect: Reliable journey time that is consistent throughout the year, fuel and facilities for stopping / changing cabs, effluent discharge facilities conveniently located. Consistent speeds.



“Truck drivers value “predictability” of journey. Time, speed, facilities, information etc.”

¹ National Freight Demands Study Ministry of Transport. 2014 Executive Summary.

How we deliver services along the corridor

Transport partners

The land transport system comprises more than State Highways. To provide customers with a reliable and safe journey usually requires the use of two or more transport infrastructure provider's networks. The Transport Agency works with other network providers to provide a one network approach along the corridor shown in Figure 5.

Collaboration along the corridor

The Transport Agency is a partner in the Greater Christchurch Urban Development strategy along with Environment Canterbury, Waimakariri District Council, Selwyn District Council, Christchurch City Council and Ngai Tahu. The corridor is also part of the Safe Roads Alliance programme.

Street lights in urban Christchurch are operated and maintained under delegated authority by Christchurch City Council and in Dunedin by Dunedin City Council

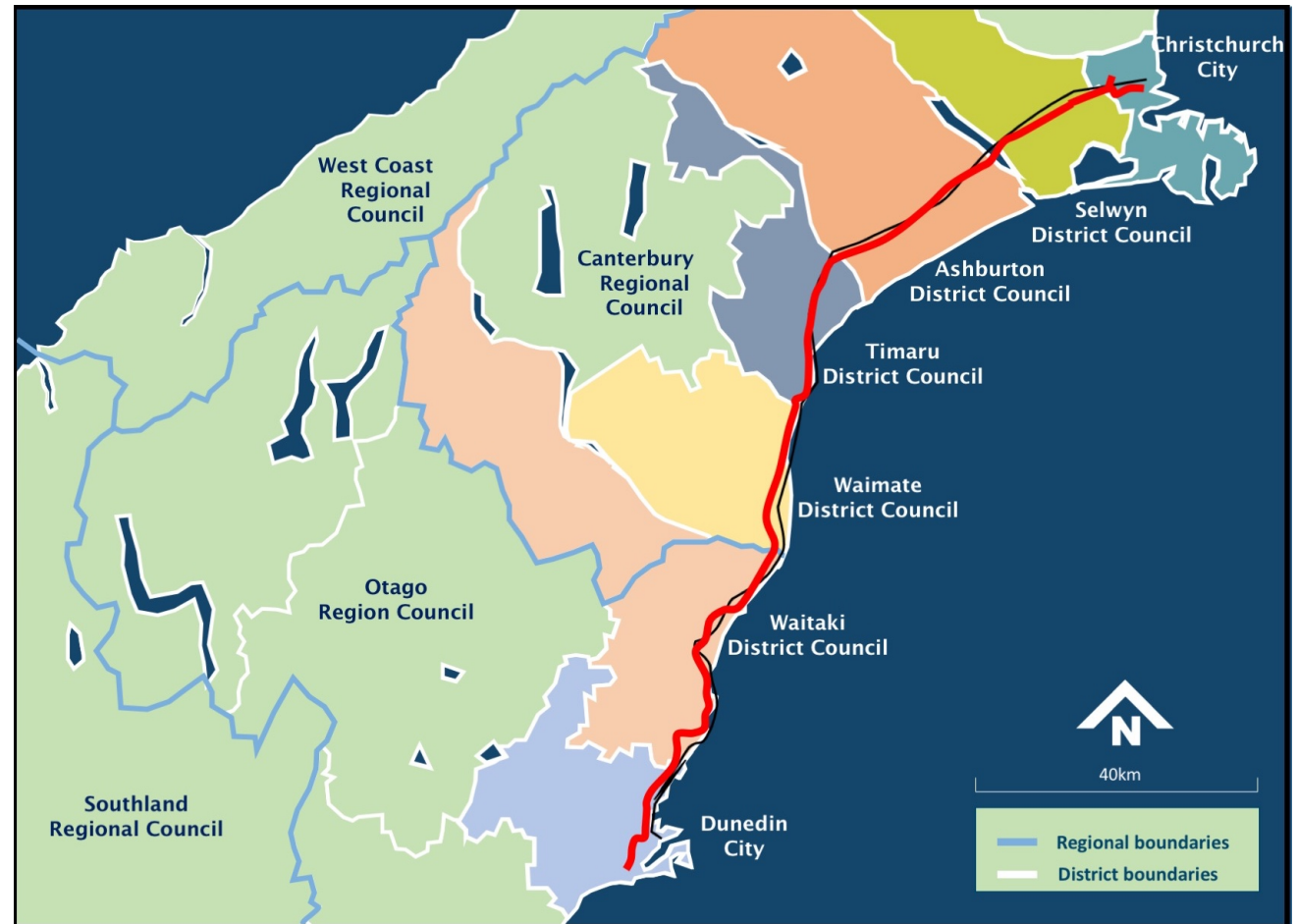
Other stakeholders include New Zealand Police, Iwi, AA, Road Transport Association, New Zealand Trucking Association, Christchurch & Wellington Transport Operation Centres, Ports of Christchurch, Timaru and Otago.

Special interest stakeholders include Spokes Canterbury, Fonterra, Synlait, Central Plains Water and Canterbury Development Corporation.

Christchurch Transport Operations Centre (CTOC)

Christchurch Transport Operations Centre (CTOC) was established in 2013 to better manage traffic and transport operations across the City. CTOC is a partnership between Christchurch City Council, ECan and the NZ Transport Agency, and was initiated to provide coordinated and reliable travel information following the Christchurch earthquakes. With the large amount of road works underway, CTOC can adjust traffic light phasing and coordinate temporary traffic management to reduce delays.

Figure 5 - Map of associated local authorities



Network Outcomes Contracts approach

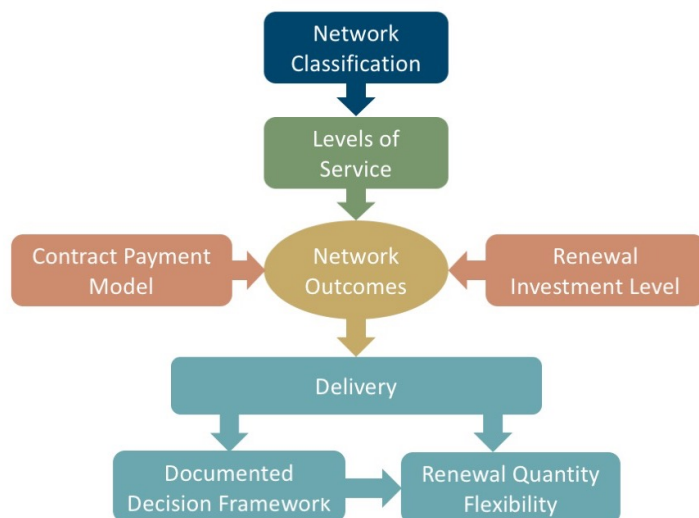
Network Outcome Contracts (NOC) are aimed at improving the effectiveness of service delivery for maintenance and operations of the state highway network. Elements of previous procurement methodologies (PSMC, Hybrid and Traditional models) have been integrated into the NOC contract model which delivers services through a primary supplier incorporating both professional services and physical works for all key maintenance activities.

To support this a central Governance and Management Group represents the interests of the Maintenance and Operations teams in the delivery of the NOCs. This group resolves issues, looks at opportunities for improvement, recommends changes to the national contract documentation, and ensures a consistent application, understanding and implementation of the NOC delivery model.

The core scope of work typically includes, but is not limited to maintenance, operations and renewals. The core scope of work typically excludes transport planning, ITS maintenance and management, capital works, emergency works reinstatement, Traffic Operation Centre activities, bridge and other structures management and repairs.

The contract process for the NOC's is shown below:

Figure 6 - NOC process



Collaborative delivery of services

North Canterbury Network Outcomes Contract

This contract is held by Downer and commenced on 1st May 2014. The contract is for a 5-year period with the option for extension for a further 2 years.

South Canterbury Network Outcomes Contract

This contract is held by Downer and commenced on 1st April 2014. The contract is for a 7-year period with the option for extension for a further 2 years.

This contract is supported by the following specialist maintenance contract:

- **Regional Bridge Management Contract**

This contract is held by Opus and commenced on 1 July 2014 and is awarded for a period of 5 years with a possible extension for a further 2 years.

Coastal Otago Network Outcomes Contract

This contract is held by Downer and commenced on 1 July 2015. The contract is for a 7-year period with the option for extension for a further 2 years.

This contract is supported by the following specialist maintenance contracts:

- **Regional Bridge Management Contract**

This contract is held by Opus and commenced on 1 July 2014 and is awarded for a period of 5 years. With a possible extension for a further 2 years.

Drivers for change

The Christchurch to Dunedin corridor caters for a variety of customers and the main driver for change is land use change within the Selwyn District, affecting the northern section of the corridor. The Greater Christchurch Transport Statement has established a framework for the transport network within Christchurch city and surrounding areas which is influencing investment in the transport network.

Changes in land use

Christchurch is a key hub supporting regional primary production, processing and export, through logistics, research and development, and manufacturing. The city's economy is closely linked to its relationship with the wider region, particularly the agricultural sector.

The Canterbury Earthquakes resulted in unprecedented change to the city with rapid population migration to smaller settlements within the Selwyn Districts, along with a decentralisation of commercial and retail activity.

Relocation of the population from the eastern suburbs to the south west area following the earthquake in 2011 has resulted in changes to transport patterns around the city. It has shifted previous points of localised congestion and travel time unpredictability while also changing the demands for public transport services which has resulted in higher levels of demand on the SH1 western corridor through Christchurch, the southernmost section of which, is covered in this CMP. Demand in the western corridor has increased as a result.

Movements between Christchurch and Ashburton have risen significantly since 2011, driven by increasing commuter flows and freight movements between Timaru, Christchurch and the inland port in Rolleston. Maintaining and managing efficient access to ports is a pressure for the corridor which will require new ways of working to maintain levels of service.

Greater Christchurch Transport Statement

The Greater Christchurch Transport Statement provides an overarching recovery framework for transport including an efficient and reliable road and rail freight network. Christchurch International Airport and Lyttelton Port are strategic infrastructure of national significance.

Christchurch serves a main freight distribution centre, a manufacturing centre and is home to a range of service sector companies. Approximately 236,000 people are employed within the area.

Key hubs in the area include Lyttelton Port, the emerging inland port in Rolleston and Christchurch International airport. The hubs have been supported by the development of the Christchurch Roads of National Significance programme. The city is forecast to continue to grow strongly over the next 10-30 years which is expected to drive growth in the demand for movement of both people and goods.

Increasing port activity

Rail moves significant volumes of bulk and containerised freight into Port Chalmers and between Timaru and Lyttelton. Rail is also playing an increasing role in moving containerised freight between Lyttelton Port and the inland ports at Woolston and Rolleston. Demand for road access to interface with rail services will place increasing pressure on the assets on this corridor.

Understanding customer levels of service on the corridor

Current levels of service performance

The One Network Road Classification (ONRC) is a framework that categorises roads throughout the country depending on what purpose they serve. Importantly it will also help New Zealand to plan, invest in, maintain, and operate the road network in a more strategic, consistent and affordable way throughout the country.

Over time all roads in a category should offer an increasingly consistent and fit for purpose customer level of service (CLOs) for road users. With the knowledge of current CLOs experienced by customers, we can better target investment to meet future intended service levels.

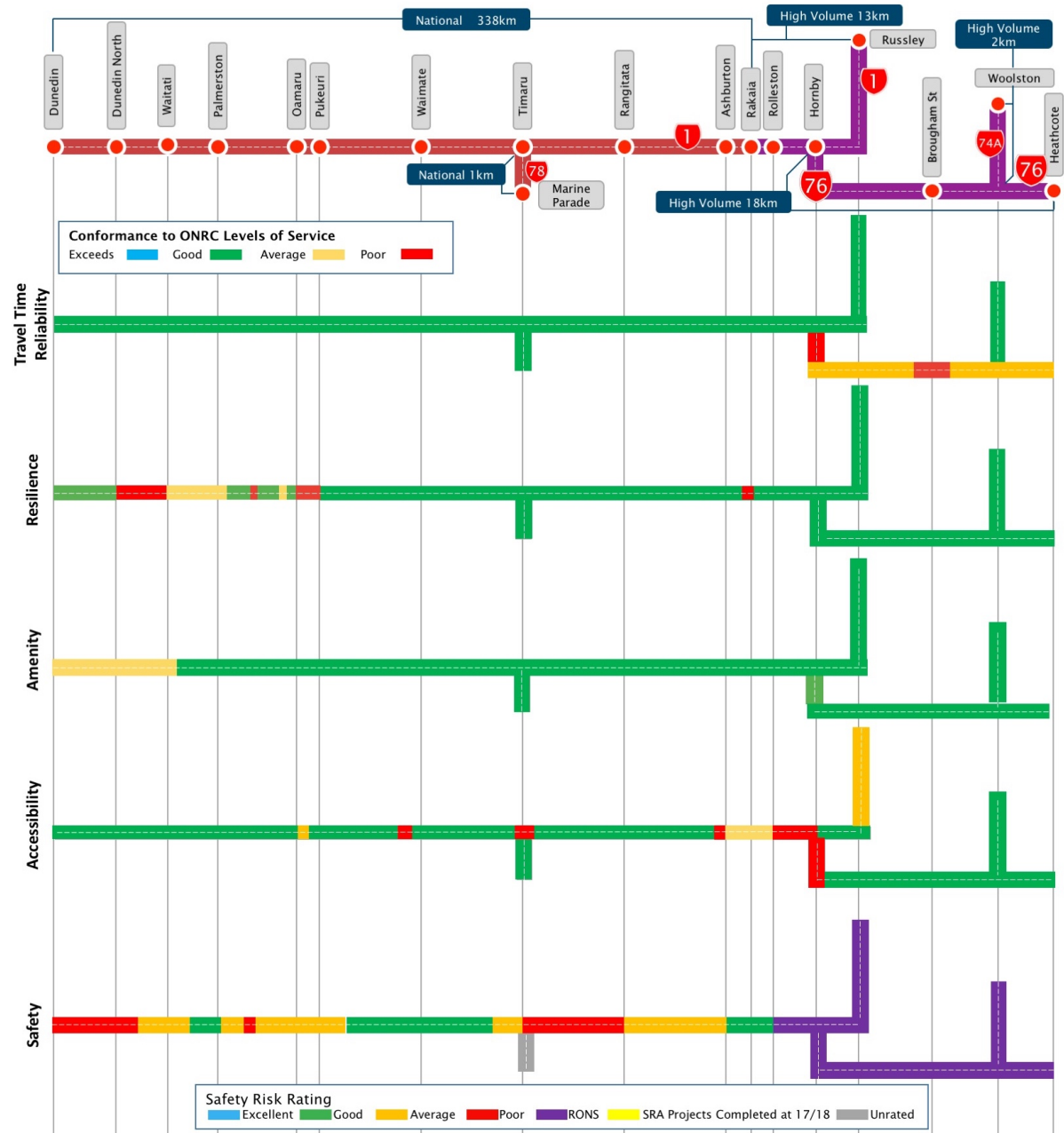
Overall, customers will be provided with the right level of road transport infrastructure where it is needed, determined by a robust, impartial, nationally consistent tool - the ONRC.

Road classification

The corridor is national high volume in the urban Christchurch area. From Rolleston south it has a national ONRC rating.

Overleaf provides additional context to explain the current levels of service along the corridor based on the road classification.

Figure 7 - Current ONRC levels of service performance







Summary of current performance

Figure 7 shows how the Christchurch to Dunedin corridor is performing against the ONRC Levels of Service, as they relate to each of the three current classifications.

Levels of service performance has been determined by workshop participants in the development of this corridor plan and is therefore not solely based upon consolidated evidence from the ONRC technical measures.

A simple four-point assessment has been utilised as follows:

	Exceeds	The level of service provided by the section of corridor for the activity under consideration exceeds what is required for a highway of that classification
	Good	The section of corridor generally meets the LOS requirements for the activity and ONRC
	Average	The section of corridor meets some but not all of the LOS requirements for the activity and ONRC classification
	Poor	The section of corridor generally fails the LOS requirements for the activity and ONRC classification, or there is a significant gap in the LOS for some aspects of the activity.

Travel time reliability

In the Christchurch, urban area high traffic volumes coupled with signalised intersections create delays, and journey times can be unpredictable. This is particularly noticeable on Brougham Street. South of Hornby travel times are reliable. Traffic flows on the corridor range between 2,500 and 25,700 vehicles per day.

Resilience

Resilience of the corridor is determined by the interaction of natural events and features along it. From Palmerston to Dunedin poor resilience is observed due to the topography of the corridor adjacent to the coast making it vulnerable to coastal erosion and through steep terrain. Bridges over major rivers along the corridor present resilience issues in the event of a failure. All bridges along SH1 carry major utility infrastructure.

Amenity

The amenity of the corridor is generally good, except for the section between Waitati and Dunedin that provides a lower standard of ride quality. There are a limited number of designated stopping places in the rural sections of the corridor particularly between Ashburton and Timaru.

Accessibility

There are accessibility pressures on SH1 from Russley to Hornby where high traffic volumes on the state highway and at local road intersections require limiting future access opportunities. High traffic volumes on SH1 from Hornby to Ashburton coupled with the corridor configuration lower accessibility for locals trying to access the corridor. Accessibility is also limited in Timaru and Oamaru.

Safety

Increasing traffic volumes along Brougham Street is a pressure due to the mix of heavy vehicles and cross movements at intersections with local traffic including pedestrians and cyclists.

The proximity of the railway throughout the corridor with the state highway creates safety issues for turning long vehicles. Typically, the stacking distance at level crossings is shorter than a heavy vehicle.

The star rating for some sections of SH1, a National Road is below the expected standard of 3-star KiwiRAP. This illustrates some deficiencies in the road features. The RoNS project on SH1 from Russley to Hornby and SH74 is being constructed to a 4-star KiwiRAP standard.

Out of context curves between Palmerston and North Dunedin contributes to a poor safety record for this section of the corridor.

There is a very high potential for preventing fatal and serious injuries between Rakaia to Rolleston through comprehensive high cost improvements being applied.

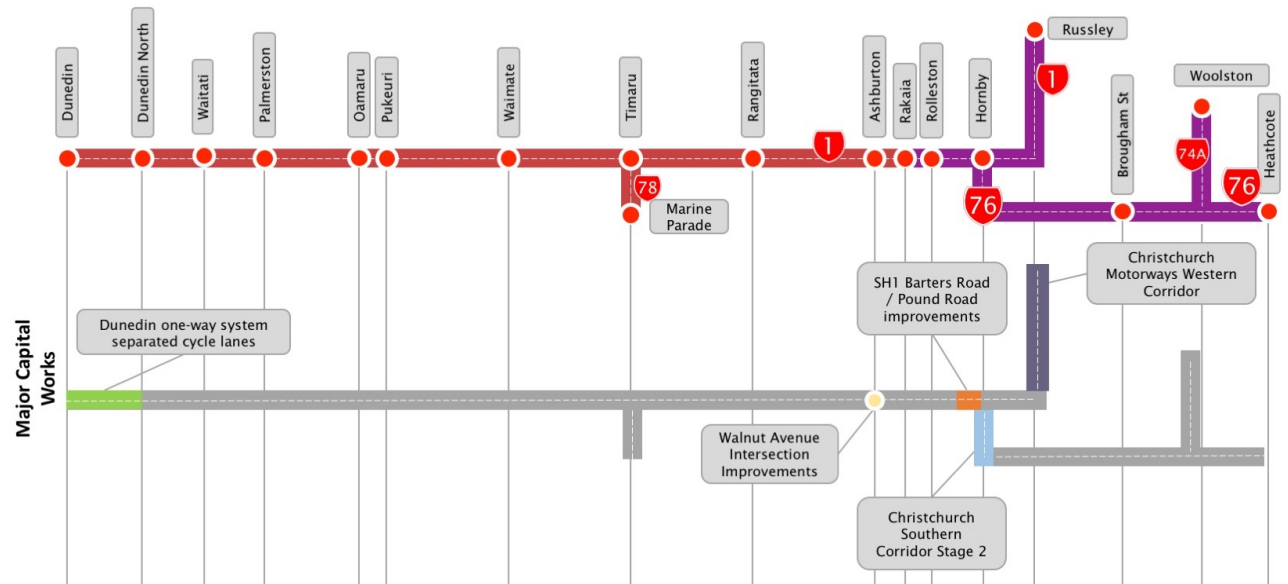
Improving the customer experience

In responding to Customer Levels of Service it is important to acknowledge that significant improvements to the corridor are planned or underway as part of the Roads of National Significance Programme and the NLTP.

When completed, the planned improvements on the corridor will result in enhanced journey time reliability and efficiency in Christchurch, improved resilience in the North Otago section as well as improved access for pedestrians and cycle users.

Planned improvements are discussed in greater detail later in this document.

Figure 8 – Significant corridor planned improvements



Access

Carriageway configuration

SH1 is 4-lane divided from Russley to Hornby where it narrows to 2-lanes. The RoNS Christchurch Southern Motorway Stage 2 is scheduled to be completed in 2020 and will link SH76 with SH1 providing a four-lane divided carriageway between SH1 and SH74A

SH76 is two-lane opposing or divided to the end of the corridor. SH74A is two-lane divided then two-lane opposing.

From Hornby to Timaru on SH1 the configuration is 2-lane with frequent passing opportunities with four short sections of 2-lane divided with some passing opportunities.

SH78 is the shortest state highway nationally connecting SH1 to Timaru port.

There are short sections of divided carriageway in Timaru and Oamaru. As SH1 heads south from Timaru it becomes a 2-lane carriageway with minimal passing opportunities through to Dunedin. Through Dunedin urban area the corridor is a 4-lane divided carriageway.

Speed limits

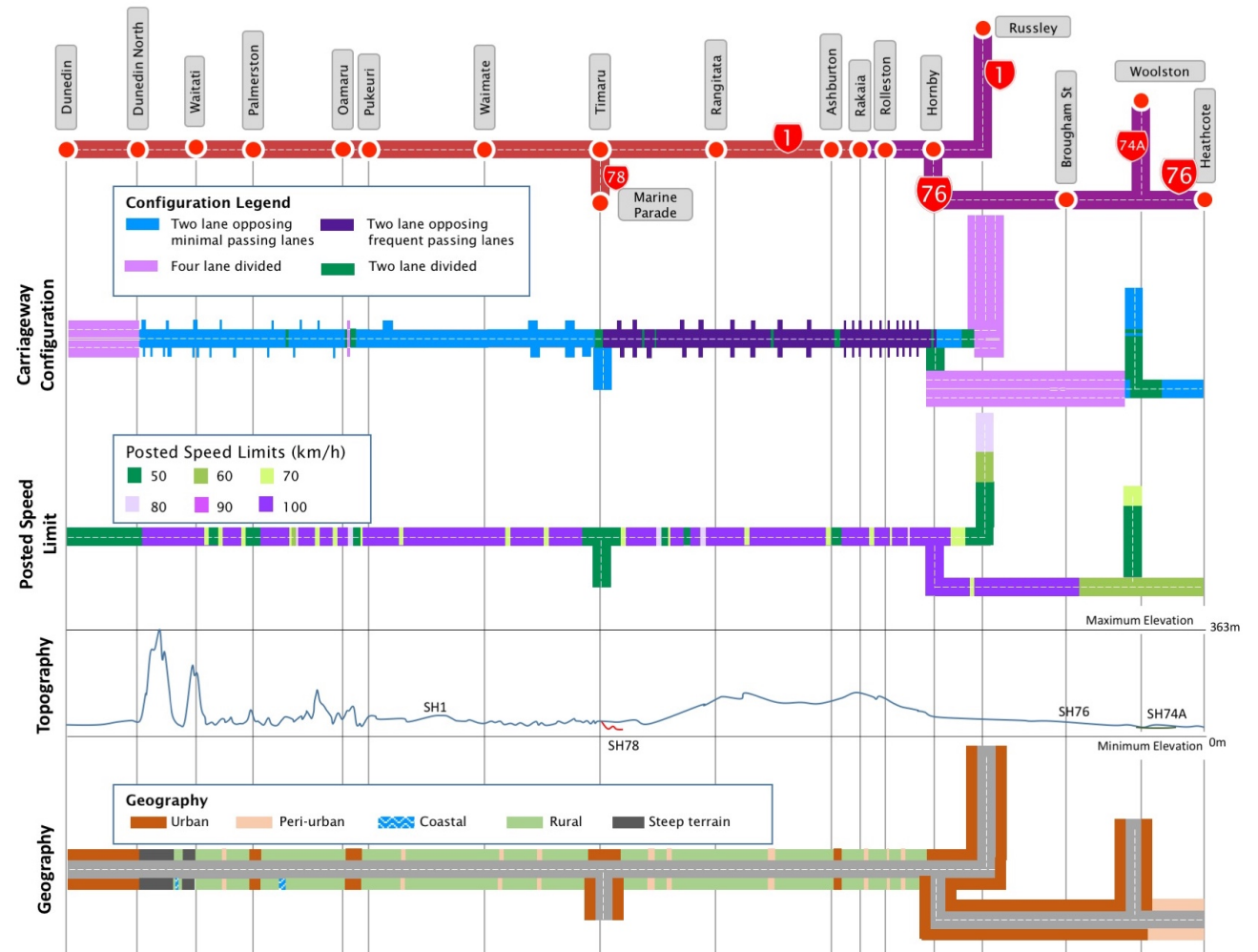
The corridor is 50 km/h through urban areas. On the approaches to most centres there is a speed limit reduction to 70 km/h from the rural speed of 100 km/h between centres.

Topography/geography

The corridor is flat at each end rising and falling rapidly on the approach to Dunedin over Kilmog (210m) and Leith Saddle (363m).

The corridor travels through urban areas at the north, central and southern end, with connecting rural sections of land between smaller urban areas. A short section of coastal road exists at Katiki.

Figure 9 - Corridor characteristics



Horizontal alignment

The infographic shows the location and extent of the out of context curves along the corridor. The height of the bar is an indication of the severity of the curve calculated as $\frac{1}{radius^2}$, meaning the taller the bar, the smaller the radius of the curve. Note: Unlike other infographics, the horizontal alignment infographics are drawn in proportion to the length along the corridor. As such they are not shown in context with the intermediate points which have been excluded.

The corridor contains a sparse distribution of larger radius curves with the northern end of the corridor being characterised by long straights between Christchurch to Oamaru. Clusters of out of context curves occur between Oamaru and Dunedin North. There are no sharper bends with a radius below 25m on the corridor.



Kerb realignment work to create a bus stop bay on the new cycle lanes along SH1 on Cumberland Street south outside the University near St David Street

Figure 10 - Horizontal alignment

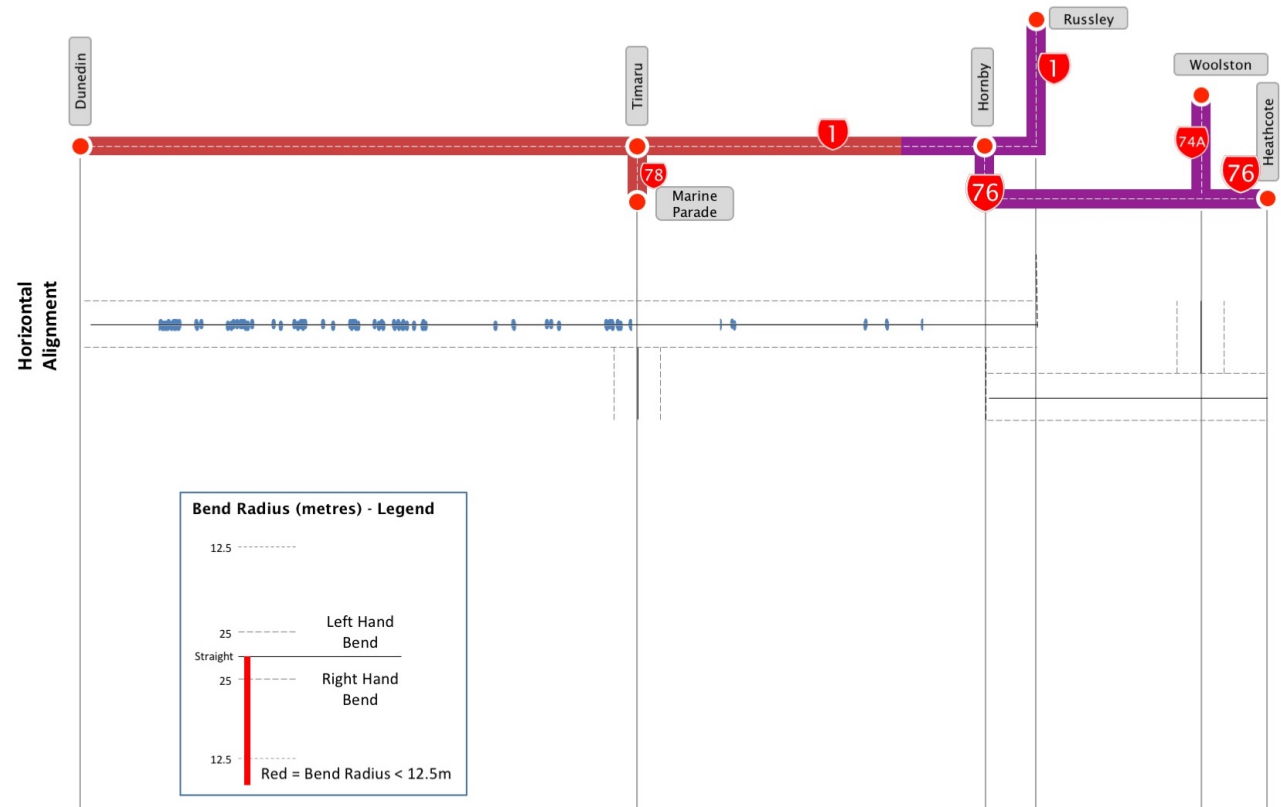


Figure 11 - Corridor capacity

Volumes

In urban areas traffic volumes are higher with inter-regional traffic combined with local trips. In Christchurch traffic volumes are up to 45,000 vehicles per day (vpd). Between Temuka to Timaru volumes are 12,000 vpd. From Pukeuri volumes fall to 4,500 and begin to increase to 7,000 entering Dunedin.

The capacity of the network copes well given the corridor configuration as shown in Figure 11. Traffic volumes per lane increase through urban areas of Timaru, Ashburton, Dunedin and Christchurch.

The high volume per lane for heavy vehicles through Hornby and on SH76 is a result of the current road configuration. These pressures are being addressed through the Christchurch Southern Motorway Stage 2.

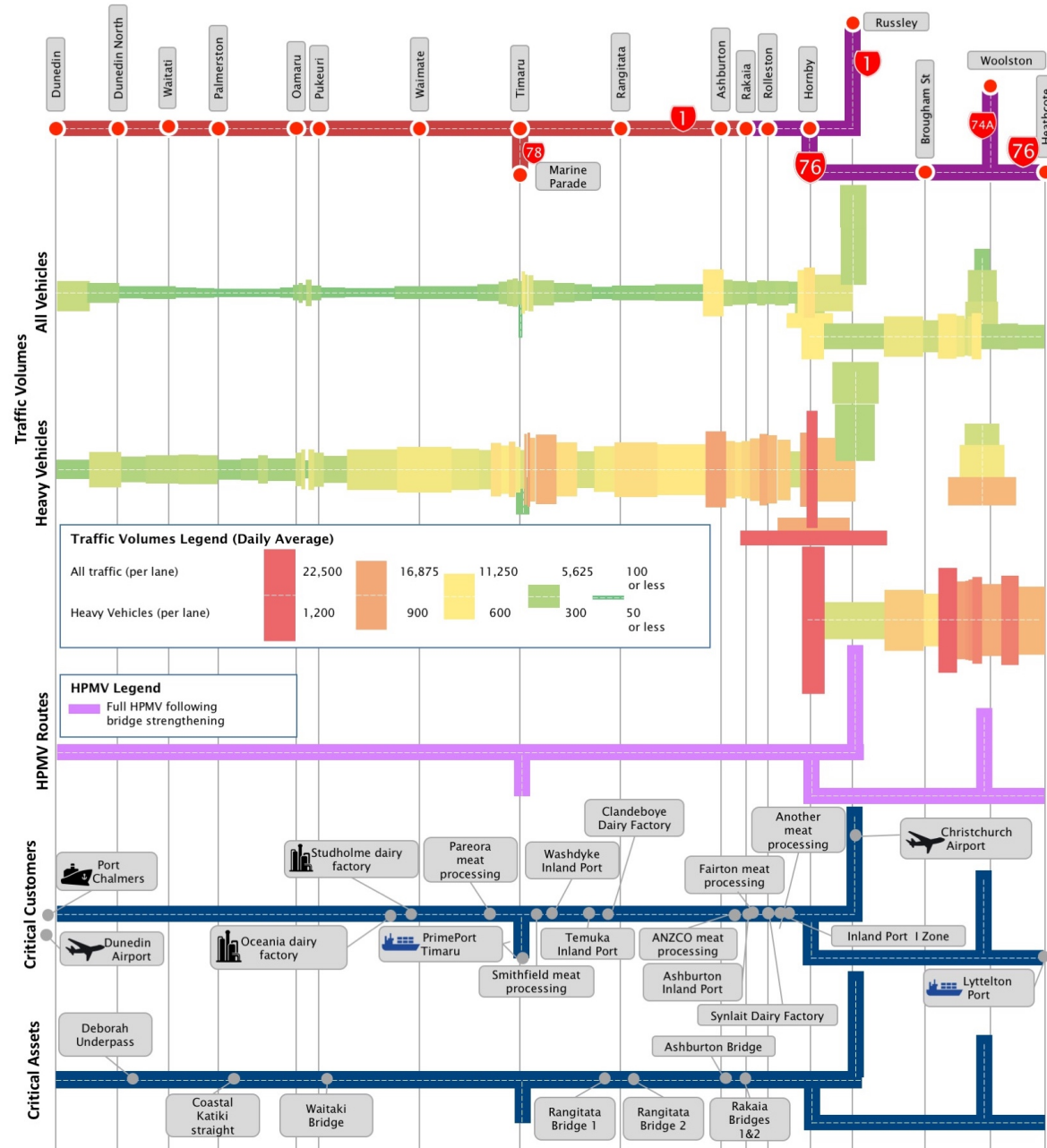
HPMV routes

The corridor is fully HPMV compliant. This requires speed reductions to 20 kph on the Rakaia bridge.

Critical customers and assets

The corridor has numerous critical customers who require 24/7 access including sea and inland ports, airports and meat and dairy processing factories. Rolleston contains two inland ports LPC’s Midland Port and the Port of Tauranga’s MetroPort, both are connected to the railway line.

There are seven critical assets along the corridor. The Rakaia, Ashburton, Rangitata, and Waitaki bridges are critical assets having limited alternative routes for heavy vehicles and carrying critical utility infrastructure. At the southern end the Katiki straight, south of Moeraki, is subject to coastal erosion with no suitable local road alternative for freight available. The rail overbridge at Deborah has a height restriction of 4.5 m, making it unsuitable for over-dimension and over-height vehicles.



Pressures

The pressures on the corridor that are resulting in increased demand or a reduction in levels of service for **Access** are the following:

- **Increasing freight movement:** Freight growth is forecast to increase by 47.7M tonnes between 2012 and 2042, a 68% increase. The increase in freight growth equates to an additional 4,667 truck trips per day, which will increase the concentration of heavy vehicles on the corridor and associated wear on the road assets. There is a strong interaction between PrimePort, in the centre of Timaru and the industrial area in Washdyke immediately to the north of the town and Temuka a short distance to the north. As a result, there is a significant volume of heavy vehicles turning movement requiring additional maintenance.
- **Different user requirements:** Through urban areas different mode users have differing expectations of the function of the corridor, i.e. balancing efficiency with local access across the carriageway. There is a perception that vehicles are delayed through urban areas, the programme business case found that vehicle users were travelling close to the speed limit. Maintaining travel speeds as traffic volumes increase or managing customer expectations will require a change in focus in the types of interventions used to deliver customer levels of service.
- **High number of access points:** The corridor has a high number of access points along its route. This is inconsistent with the functional expectations for a national corridor in the ONRC. Higher traffic volumes in future years will put pressure on consolidating access points.
- **Lack of pedestrian facilities:** The low number of crossing facilities in urban and rural areas results in poor access across the state highway for customers accessing necessary facilities in the community. For example, in Waitati the desire line for pedestrians to the shop is in the 100 km/h zone on an out of context corner with limited sight lines.
- **Land use changes:** In Christchurch future land use changes coupled with forecast freight growth will have major impacts on transport demands and patterns. This will result in further congestion and delay to journeys, particularly at signalised intersections if not planned into any new transport infrastructure now.
- **Intersection conflict:** Two major cycle routes cross SH1 and SH76 in Christchurch, Wheels to Wings and South Express. This section of the corridor carries high volumes of heavy vehicles from the Lyttelton port. Nine intersections along SH76 are nearing capacity.

Future considerations

The future considerations relating to corridor pressures, intervention triggers and appropriate levels of investment related to **Access** are as follows:

- **Implement the freight management plan:** Utilise the levers identified in the plan to manage the impact of growth in freight movements, to maintain customer levels of service.
- **Implement capital and maintenance programme:** Develop DBC's for the preferred options from the three PBC's along the corridor to deliver projects that address access, journey times and reliability pressures on the corridor, including installing new structures. This includes improvements at Ashburton and Tinwald and on SH76.
- **Demand management in urban areas:** Implementation of demand management measure can provide user choice of route in urban areas to improve the flow between through and cross movement, such as on through Timaru.
- **Review pedestrian crossing facilities:** Work alongside local stakeholders to develop an agreed strategy that improves utilisation of the local road network. On SH76 consolidate the number of local road crossing points.
- **Implement dynamic approach to traffic management:** To enable timely decisions on traffic management plans for network maintenance and capital improvement activities put in place dynamic processes that reduce the length of time required to achieve sign off of documentation. This will enable a responsive service to our customers and maintain access to the corridor in a timely manner to contractors.
- **Limit new access points:** As land use changes occur where possible remove access points or consolidate access points on to the corridor. This will necessitate better use of the local road network to access state highway intersections. This can reduce maintenance costs through fewer turning movements at many intersections to a smaller number of intersections.

Resilience

Vulnerabilities

The northern half of the corridor is more resilient with some flood incidents and a flood area warning at the eastern end of SH76 and a wind hazard warning from Rangitata to Timaru.

Between Waimate and Dunedin the corridor is highly vulnerable to unplanned incidents with hazard warning areas for snow, flooding, wind and rock fall. A major snow event will close the road once every five years. At the Katiki straight the sea is eroding the shore beside the corridor during storm events. Any large storm event could result in a washout of part of the carriageway.

Alternative routes and diversion lengths

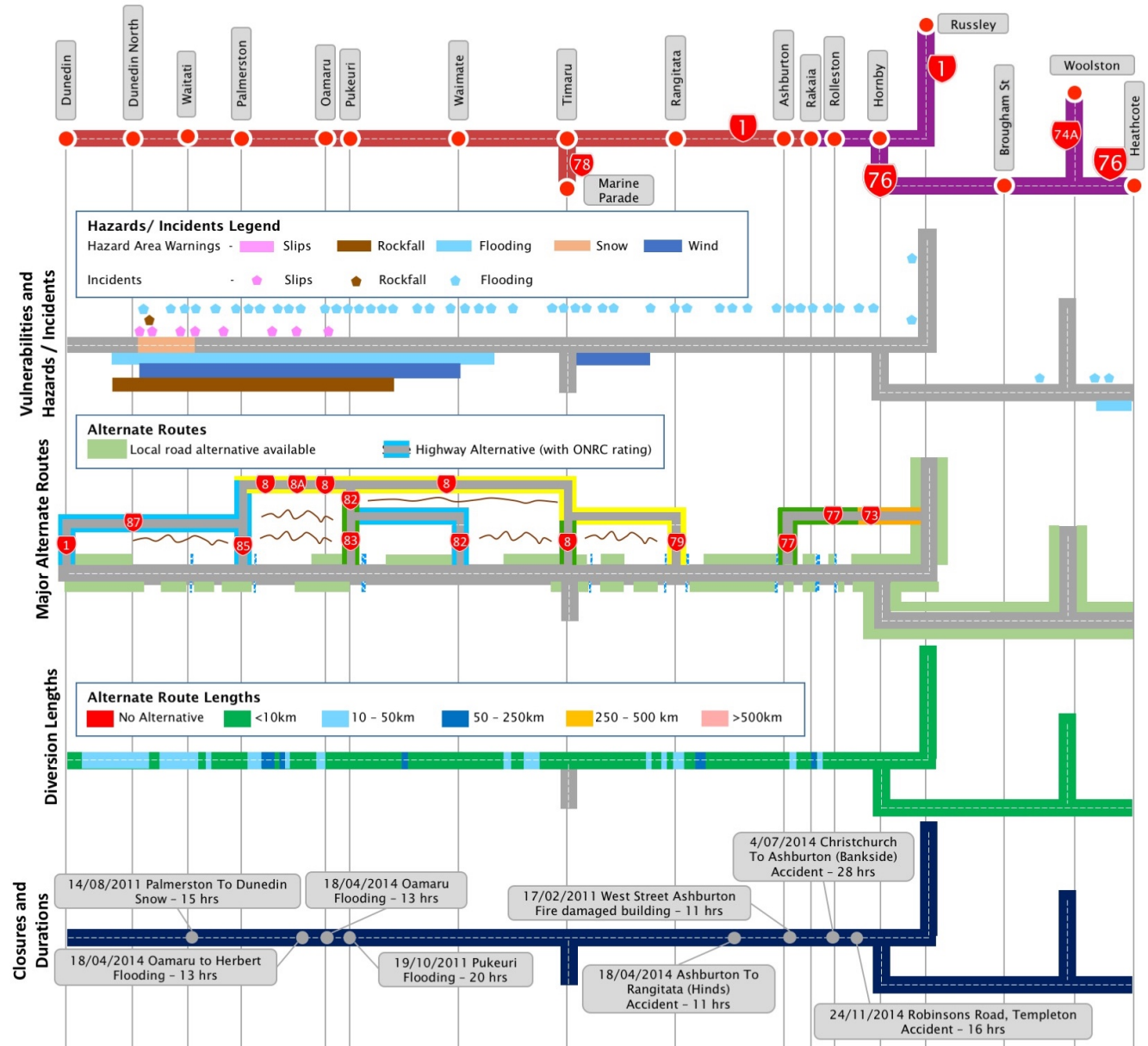
Alternative route options on this corridor exist although they are not all suitable for HPMVs or heavy vehicles which must wait on SH1 until the corridor reopens. When diversions are necessary for weather related events the alternative routes are affected by the same weather patterns, making them likely to be closed.

At structures on the route such as Waitaki, Rangitata, Ashburton, and Rakaia bridges, detours are 50-250 km in length. Any unplanned events between Herbert (such as at Katiki straight) and Palmerston have alternative detour routes over 250 km. Between Palmerston and Dunedin there are significant sections of the corridor where detours are up to 50 km.

Closures and duration

The major unplanned road closures and duration of interruption along the corridor in the last 5 years are shown in Figure 12. At the northern end the events are crashes and a building fire. At the southern end the significant unplanned events are weather. There were 35 road closures between 2011 and 2016 between Waitaki River and Dunedin, of shorter than 10 hr duration.

Figure 12 - Resilience



Pressures

The pressures on the corridor that are resulting in increased demand or a reduction in levels of service for **Resilience** are as follows:

- **Critical bridges:** The corridor crosses several structures which traverse rivers. These are important infrastructure assets due to the limited viable detours available in the event of failure or unplanned event. While high productivity motor vehicle (HPMV) access is available the Rakaia bridge, over 1km in length, must be travelled at 20kph. Structures on SH1 carry significant utilities including fibre. Essential services and communications would be lost if the structures failed.
- **Weather:** On the southern section snow and ice, high winds and flooding affect the resilience of the corridor. Between 2010 and 2015 from Waitaki to Dunedin there were 12 snow and ice closures which resulted in 105 hours of road closure. Eight flood events resulted in 88 hours of road closure. Where alternative routes are closed at the same time traffic must wait until the route is reopened to continue the journey.
- **Geology:** On the southern section, coastal erosion is undermining the corridor and adjacent railway. Events such as land slips and rock falls result in road closures. SH1 between Moeraki and Waitati is susceptible to liquefaction, lateral spreading, scour from storm surge and tsunami and increased exposure to coastal hazards from sea level rises.
- **Detour route planning:** Detour route knowledge is not widely known by customers in the event of closures. The first emergency response team on the ground makes decisions on the alternate route, and this can vary depending on the specific knowledge held by the response team for designated routes.

Future considerations

The future considerations relating to corridor pressures, intervention triggers and appropriate levels of investment related to **Resilience** are as follows:

- **Protect coastal areas from erosion:** Short term interventions to protect the corridor from erosion are underway.
- **Make improvements to the operations and response plans:** Review operation and response plans to unplanned events on the corridor. A shorter response time will enable closures to be minimised.
- **Improve communications:** From Oamaru to North Dunedin reduce communication black spots to enable early response in the event of crash. Provide advance warning of weather and road conditions along this stretch through VMS signs and other communication media.
- **Asset Improvement:** Consider maintaining structures on the corridor to a higher standard where diversion routes are not suitable, for example Rangitata bridge. This will maintain the customer level of service and improve it in the event of extreme natural events.



Deborah overbridge

Reliability and efficiency

Efficiency

The Efficiency Net data (2014) shows what the Level of Service that could be expected based on current carriageway conditions, gradients, merges, signals, speed limits and traffic volumes. It is theoretical and provides for comparison against what is observed in practice.

Lower levels of service (LOS) on SH76 around Wigram are due to signalised intersections in the AM and PM Peak. Inter peak levels of service deteriorate from SH74A to Tunnel Road.

SH1 from Russley to Hornby has a reducing Level of Service in all peaks, with inter peak LOS lower than the AM and PM peaks. Lower LOS around Barter's Road are currently being addressed through infrastructure investment. The corridor generally has a good LOS from Ashburton to North Dunedin. Dunedin has LOS A-C which is good, there are short sections generally on the approach to signals where the LOS is lower.

Variability

Variability in journey times along the corridor is low to very low overall. There are four short sections where variability is higher, Ashburton, Timaru, Oamaru and Palmerston.

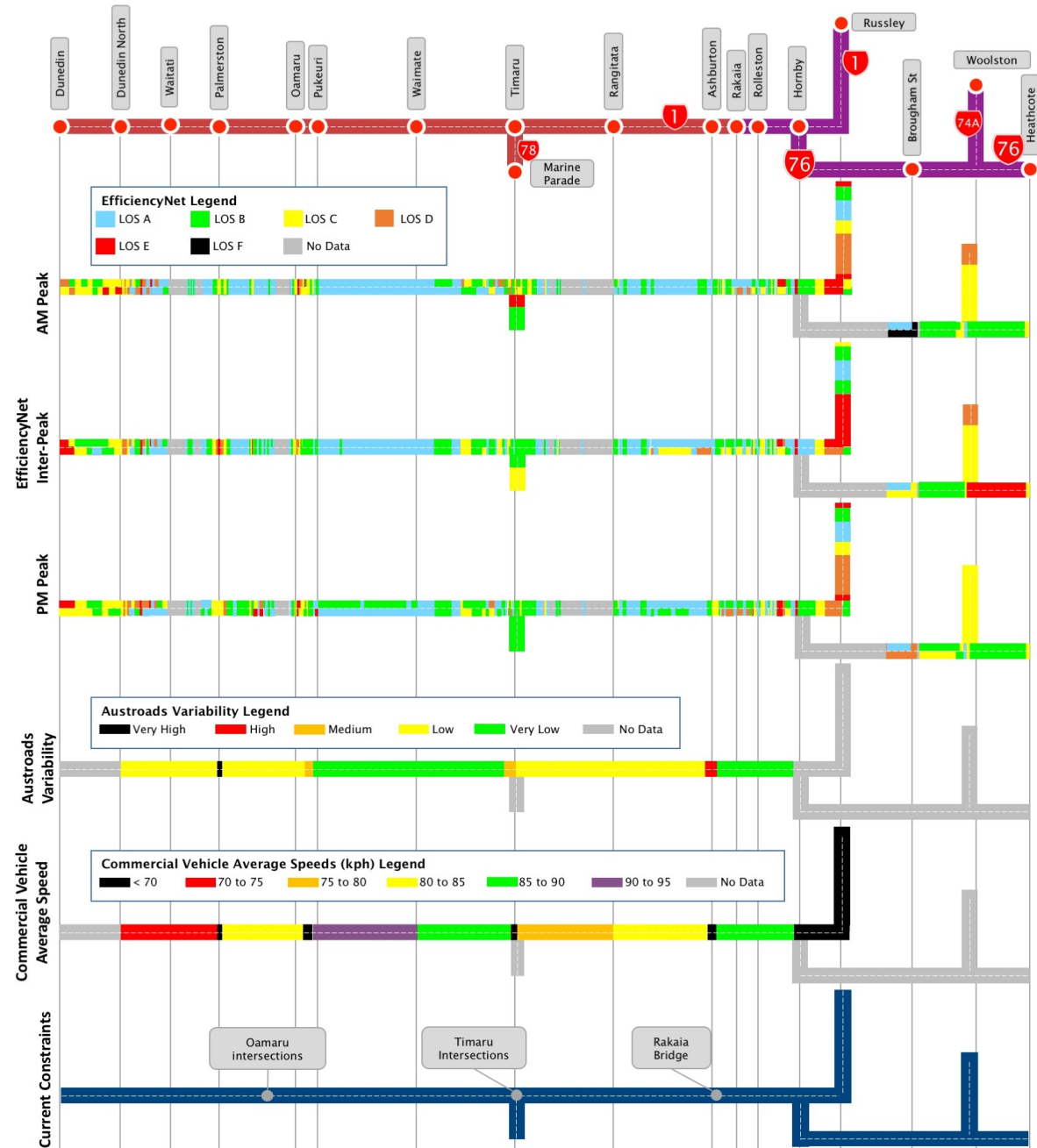
Commercial vehicle average speed

The urban areas have speeds below 70 km/h due to lower speed limits. Average speeds are not consistent between each centre, with variation of 10 – 20kph in adjacent sections.

Current constraints

The major current constraints on the network affecting journey reliability and efficiency are shown in Figure 13. Over dimension and overweight vehicles travelling over the Rakai Bridge slow or stop traffic. This can create delays of 10-15 minutes for north and southbound traffic.

Figure 13 - Reliability and efficiency



Pressures

The pressures on the corridor that are resulting in increased demand or a reduction in levels of service for **Reliability and Efficiency** are as following:

- **Out of context curves:** South of Timaru there are long sections of highway followed by out of context curves. The high traffic volumes and mix of vehicles which are required to decelerate on the approach to bends result in lower efficiency and increased maintenance requirements.
- **Traffic volumes combined with diverse range of vehicles:** This combination results in varying speeds along the corridor particularly on SH1 in the southern section. This impacts on travel time reliability. This is particularly noticeable on the exit from urban areas with larger vehicles taking longer to get up to higher speeds.
- **Industrial growth in urban areas:** Traffic growth has been static at 1% per annum increase from 2011 to 2015. During the same period, there was a 5% annual growth in heavy vehicles to / from PrimePort Timaru. The increase in heavy vehicles impacts on the maintenance requirements for the corridor.
- **High single occupancy vehicle use:** This pressure is created from land use patterns, infrastructure provision and the subsequent personal travel behaviour, this results in high single occupancy vehicle use and leads to unreliable travel times for all users as a consequence of high capacity use of the corridor.
- **Land use change and increasing traffic volumes:** in the urban Christchurch area, result in higher delays at intersections.
- **Rail Level Crossings:** Crossings both on the main corridor and off side roads result in delays for other drivers following long or heavy vehicles as they must stop or may overhang the carriageway if turning due to short stacking space.

Future considerations

The future considerations relating to corridor pressures, intervention triggers and appropriate levels of investment related to **Reliability and Efficiency** are as follows:

- **Improve east-west connections on SH76:** To maintain customer levels of service consolidation of local connectors, encouragement of use of alternative routes, consider including some right-turn bans for example, SH76 traffic to Colombo Street.
- **Improvements to rail freight:** Develop in partnership with stakeholders an integrated network to improve rail freight movement to support choice for freight movement. Integrating nodes at transport hubs to enable greater use of rail through new rail lines and rail line realignment. This will achieve minor to moderate benefits to travel time reliability. This has the potential to reduce long distance truck use on the road network which will reduce the impact on assets and increase their lifespan and additionally maintain customer levels of service.
- **Contribute to other stakeholder transport initiatives:** Support initiatives such as the Synlait workplace travel plan that encourages commuters to try alternative ways of travelling to work other than by single occupancy car. Provide technical advice or links to technical advice through websites for employers. These low-cost measures enable others to own the problem whilst maintaining customer levels of service for other corridor users.
- **Install grade separation of interchanges:** e.g. Rolleston will have local roads grade separated from the state highway corridor providing direct connection between residential and commercial /industrial zones without impacting on the reliability of through trips on the strategic network.
- **Implement demand management:** SH76 PBC identifies priority to public transport across Brougham Street to support mode shift to public transport. This will include public transport lanes on the approaches to traffic signals at Selwyn Street, Colombo Street and Ensors Road. The optimisation of signals at peak times to provide priority for buses through the intersections will also be included.

Safety

Collective risk

Collective risk varies substantially along the corridor. From Palmerston to Oamaru, SH1 has a medium collective risk rating. Dunedin to just south of Waitati is rated medium-high collective risk. The section between Rakaia and Hornby encompasses some high and medium-high risk section. Pukeuri to just south of Timaru is rated low, as is the section between Ashburton and Rakaia, and Christchurch to Tunnel Road. SH78 and the area immediately east of Hornby are unrated for collective risk.

Personal risk

The personal risk rating for most of the corridor is low, except for the segment between Dunedin to Dunedin North and a small section between Palmerston and Oamaru where it is medium-high. There are short sections of medium risk between Waitati and Oamaru and again between Rakaia and Hornby and medium low sections between Timaru and Hornby. SH78 from Timaru to Marine Parade is unrated for personal risk.

Star rating

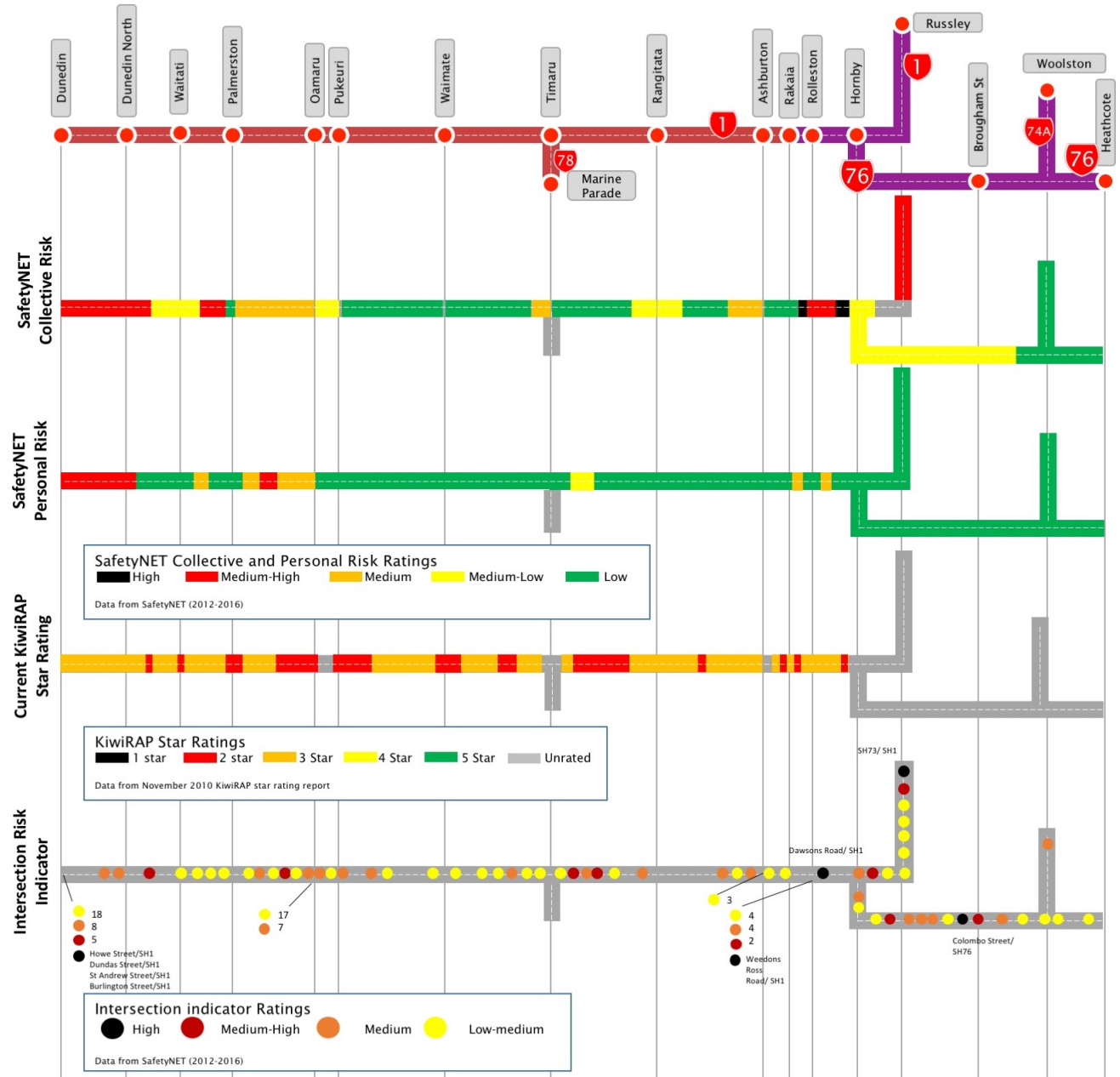
The KiwiRAP star rating for the corridor is 2-3 star with the urban sections within Christchurch, Timaru and Oamaru being unrated.

The lower 2-star ratings are located around out of context curves or where road side hazards or narrow carriageways exist. The star rating for some sections of SH1, a National Road is below the expected standard of 3-star equivalent or better.

Intersection risk indicators

There are 8 high risk intersections along the corridor. Four are in Dunedin Central in sections of the corridor rated medium-high for collective and personal risk. Two are between Rolleston and Hornby, an area of high collective risk and two are within the Christchurch urban area.

Figure 14 - Safety



Pressures

The pressures on the corridor that are resulting in increased demand or a reduction in levels of service for **Safety** are as follows:

- **Geometric layout:** The narrow shoulders and road side hazards creates an unforgiving road environment combined with driver mistakes contributing to deaths and serious injuries (DSI). The North Otago section of the corridor has above average DSI's resulting from road side hazards and narrow carriageway. In the northern sections, the main type of crash is head-on crashes or at intersections. The Ashburton to Timaru section has a high number of head on and intersection crashes. The carriageway configuration is 2 lane opposing with over taking opportunities.
- **Changing road environment:** The changing road environment, which maybe unknown by many users of the corridor, creates challenging driving conditions which can lead to unsafe practices including inappropriate overtaking manoeuvres. Coupled with the range of light and heavy vehicles, start / stop or slow / fast driving patterns emerge on the corridor.
- **Rail crossings:** On adjacent side roads, north of Rakaia stacking distances are not standardised and can result in some vehicles obstructing the carriageway or railway line. Further rail crossings on the SH1 corridor which are at grade require crossing at right angle for safety reasons, though this creates poor visibility and tight geometric approaches.
- **Cycle and pedestrian facilities.** Uncontrolled crossings and intersections are a hazard for cyclists and pedestrians crossing high volume roads.
- **Increasing traffic volumes** along Brougham Street is a pressure due to the mix of heavy vehicles and cross movements at intersections with local traffic including pedestrians and cyclists.

Future considerations

The future considerations relating to corridor pressures, intervention triggers and appropriate levels of investment related to **Safety** are as follows:

- **Improve passing opportunities:** Improving passing opportunities between Selwyn River and Ashburton will reduce driver frustration and improve safety outcomes and corridor efficiency and reliability outcomes. Between Oamaru and north of Palmerston there is a need to develop and implement a programme for the installation of slow vehicle lanes. This will enable safer passing opportunities for light vehicles and reduce driver frustration and risky overtaking manoeuvres.
- **Implement safety improvements:** Install centreline and carriageway widening between Temuka and Timaru to provide a more forgiving road environment. This will improve the safety rating and increase the customer level of service.

- **Land use changes:** Review and comment on any land use plan changes to identify impacts of new development and changes on current transport network. Consider whether the corridor should have limited access road status as traffic volumes increase. Develop plan of how the corridor access arrangement will be managed in the long term.
- **Speed limit review:** Implement urban engineering to reinforce the speed limit in urban areas. This will balance the competing needs of users through urban environments. Particularly address the transition from Christchurch Southern Motorway to Brougham Street.
- **Collaborate to develop travel plans and behaviour change programmes:** Working collaboratively with organisations that have large workforces or generate high vehicle movements to develop travel plans can improve safety and travel time reliability for the corridor. For example, Synlait dairy processing facility has a high workforce and generates high heavy vehicle movements. A workplace travel plan can include initiatives that support desired transport outcomes for both organisations.
- **Improve pedestrian infrastructure in urban environments.** These are to include improved footpaths, pedestrian crossings and behaviour change programmes to educate other users. This will improve safety in urban environments, including around schools on and adjacent to the state highway and in centres including Oamaru and Tinwald.
- **Implement cycle improvements consistently:** Provide additional signalised intersections to support safe cycle routes crossing SH76 and through smaller urban areas including Timaru to reduce the incidence of cycle accidents at intersections.
- **Improve information around high risk crash sites:** Increase signage on the approach to high risk crash sites, including curve warning signs and high-risk crash sites information signs. These enable drivers to make timely adjustments to their driving style and to traverse the route in a safer manner.
- **Implement education programmes:** –Working with stakeholders including the freight and tourism sector and NZ police develop programmes and initiatives to educate and upskill drivers. For example, the use of over dimension vehicles across bridges during peak hours or holiday periods should be avoided on this corridor to provide safe and reliable journey times

People, places and environment

Natural environment

The corridor has highly urbanised sections throughout its length interspersed with rural agricultural landscapes. From Christchurch to Pukeuri the terrain is level. The corridor has a large number of river catchments, with major river crossings frequent north of Timaru. In the south of the corridor the terrain is coastal, rolling and mountainous. There are numerous major reserve areas with half of the sites have ecological significance.

Noise, vibration and air quality

Through the larger urban areas noise and vibration require management during maintenance activities. These typically are the same locations as where air quality requires consideration.

Cultural landmarks, heritage and built environment

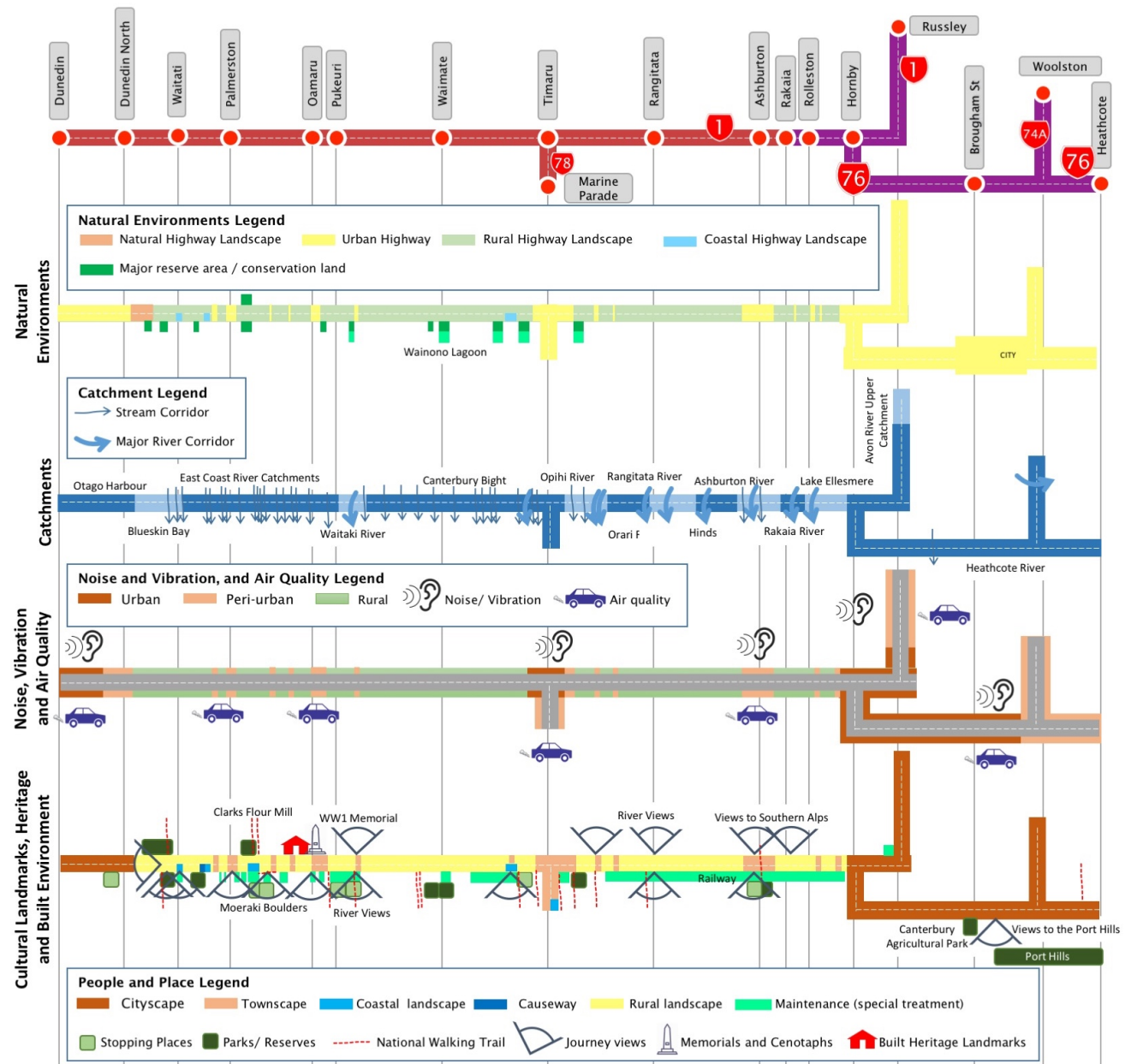
The northern end of the corridor has few cultural landmarks and heritage sites identified. The National Walking Trail has a single access point on SH76. The journey from Christchurch to Dunedin has increasing opportunities to view the Southern Alps. Some of these points have stopping places for customers to pull over and spend longer observing. Others viewing points have no stopping places close by. Oamaru has a number of built heritage landmarks and memorials for tourists to view.

The eastern side of the corridor and a single site in the urban Christchurch area have special maintenance requirements, these can range from working within a rail corridor to different methods for managing roadside vegetation.

There are limited facilities in urban areas for cyclists and pedestrians.

Bus services operate along SH1 Western Corridor and SH74 Christchurch servicing the airport, Hornby, Christchurch city, Westlake, Mt Pleasant, Hei Hei and Avonhead. Along SH1 southern corridor to Rolleston and Burnham a single service operates.

Figure 15 – People, places and environment



Pressures

The pressures on the corridor that are resulting in increased demand or a reduction in levels of service for **People, Places and Environment** are as follows:

- **Coastal erosion:** On the north Otago section of the highway is adjacent to the coast. There is uncertainty around how the coast will change in major weather events and how to manage the coastal road in the event of a major under slip.
- **Stopping places:** The facilities at stopping places vary along the corridor with the customer unsure what to expect until they are very close to the site. Uncertainty can result in indecisive driving which can create slower moving traffic and possibly increase safety risks for themselves and others.
- **Vandalism at stopping areas:** Facilities are removed and not replaced resulting in stopping places that have somewhere to park and a rubbish bin only.
- **Noise and Vibration:** In urban areas, the expectations for quieter and lower levels of vibration are necessary to improve or not worsen the level of service.
- **Air quality:** on SH1 western corridor, SH74, at Timaru and in Dunedin require monitoring and activities to improve or not worsen the current level of service.



The Western Corridor (SH1) provides access to Christchurch International Airport

Future considerations

The future considerations relating to corridor pressures, intervention triggers and appropriate levels of investment related to **People, Places and Environment** are as follows:

- **Review of stopping places:** Undertake a review of stopping places along the corridor and determine the appropriateness of the location and facilities currently provided and future asset provision. It is important to locate stopping places in areas where visitors want to stop to take photos, along with adequate signage so people know a stopping place (and photo opportunity) is up ahead.
- **Work with communities:** Through the business case process to develop safe provision of crossing facilities in urban areas. Work alongside each community to understand the local facilities that require easy access and where movements across the highway to access them occur. Influence local users to take local road alternative routes where possible.
- **Monitor, review and implement measures to maintain air quality:** At congested locations monitor and review air quality to meet current standards. Where local requests or concerns are raised work proactively with the community sharing data to educate and work collaboratively to jointly agree any work programmes required and timeframes for delivery.



The top piece of the gateway arches going into place: Installation of gateway arches at intersection of Russley Road and Memorial Avenue in Christchurch

Understanding the infrastructure assets

The following sections contain information about the condition and performance of the state highway assets within the corridor. This information is necessarily complex and therefore challenging to communicate simply. Every effort has been made to explain the base data inputs and what the information is describing in as simple terms as possible, however full comprehension does require some technical knowledge of the terms used.

Corridor asset base

The state highway system is a significant national asset, made up of 11,412 km of roads and associated assets. This corridor contributes approximately 391 km of road network which reflects 3.4% nationally. The total value of the assets along the corridor is \$601M (excluding ITS, and, heritage and green assets).

The corridor assets have been divided into eight groups as shown in Figure 16 which directly support the access, reliability and efficiency, safety, resilience and people, places and environment outcomes on the network.

Asset condition and performance summary

The infographic shows the summary score the entire corridor achieves for each of the eight measures used in this document to assess the condition and performance of the assets. These measures are assessed in more detail along the corridor in the following sections of the document.

Figure 16 – Corridor asset base

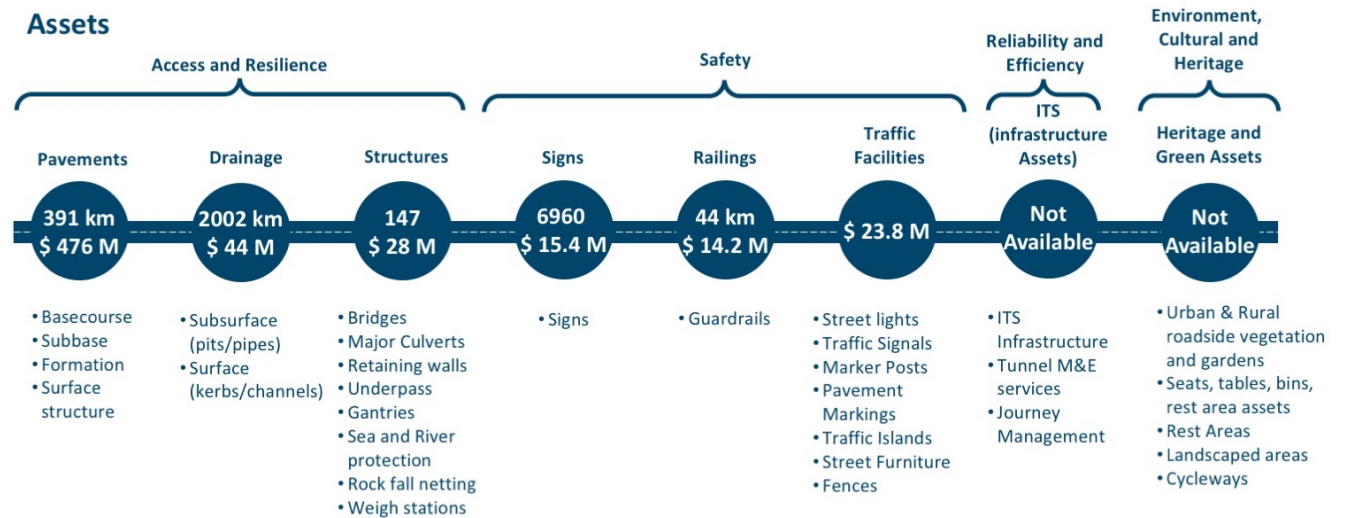


Figure 17 - Asset condition and performance



Asset condition and performance

Surface skid resistance

The infographic shows the proportion of the Route Section, as a percentage, that falls within the two levels of either threshold limit or investigation level. The change in Surface Skid Resistance infographic shows the change in the levels from the 2014 survey to the 2016 survey, as either an improvement or degradation.

The information is derived from inspection data that records a value every 10m in each direction. Each 10m length is rated as to whether it is within one of the bands: below threshold limit; within investigation limits; or above investigation limits. The proportion is then the number of 10m lengths in that section as a percentage of all 10m lengths in that section.

Sections SH1S/700 and SH1S/704 between Pine Hill and the intersection with SH88 have a high proportion of surface skid resistance below the threshold limit. SH78/0 to the Port of Timaru shows a high proportion of surface skid resistance within the investigation limits. Overall, the levels of surface skid resistance on the corridor have shown improvement over the last 3 years.

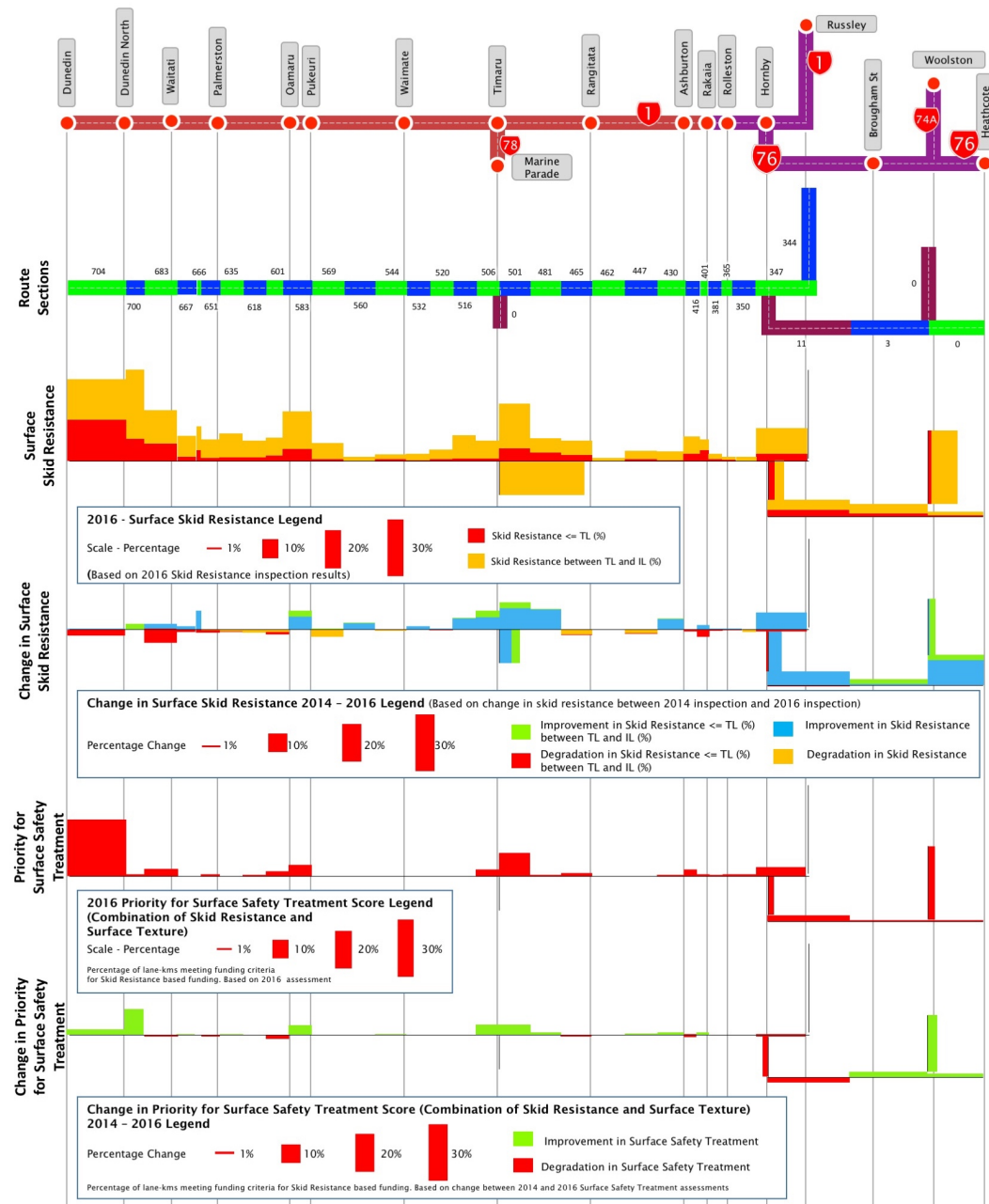
Priority for surface safety treatment

The infographics show the proportion of the Route Section that has a Priority for Surface Safety Treatment (Skid Assessment Length) that would qualify for funding, i.e. a score >140. The second infographic shows the change in these levels from the 2014 survey to the 2016 survey, as either an improvement or degradation.

Taken from inspection data that is normally recorded every 100m in each direction. Each 100m assessment length is rated and if it achieves a score over 140 it qualifies for funding. The proportion is then the length of route section that qualifies for funding as a percentage of the total length of that section.

A moderate percentage (1.79 %) of the corridor achieved Skid Assessment Length that qualifies for funding. This equates to 13.4 lane-km of the 750 total lane-km of the corridor. The sections with the highest priority for surface safety treatment qualifying for funding are SH1S/501 between Washdyke and Timaru, and, SH1S/704 within Dunedin urban area. Overall the priority for surface safety treatment scores have generally stayed static or slightly improved over the three years.

Figure 18 – Asset condition



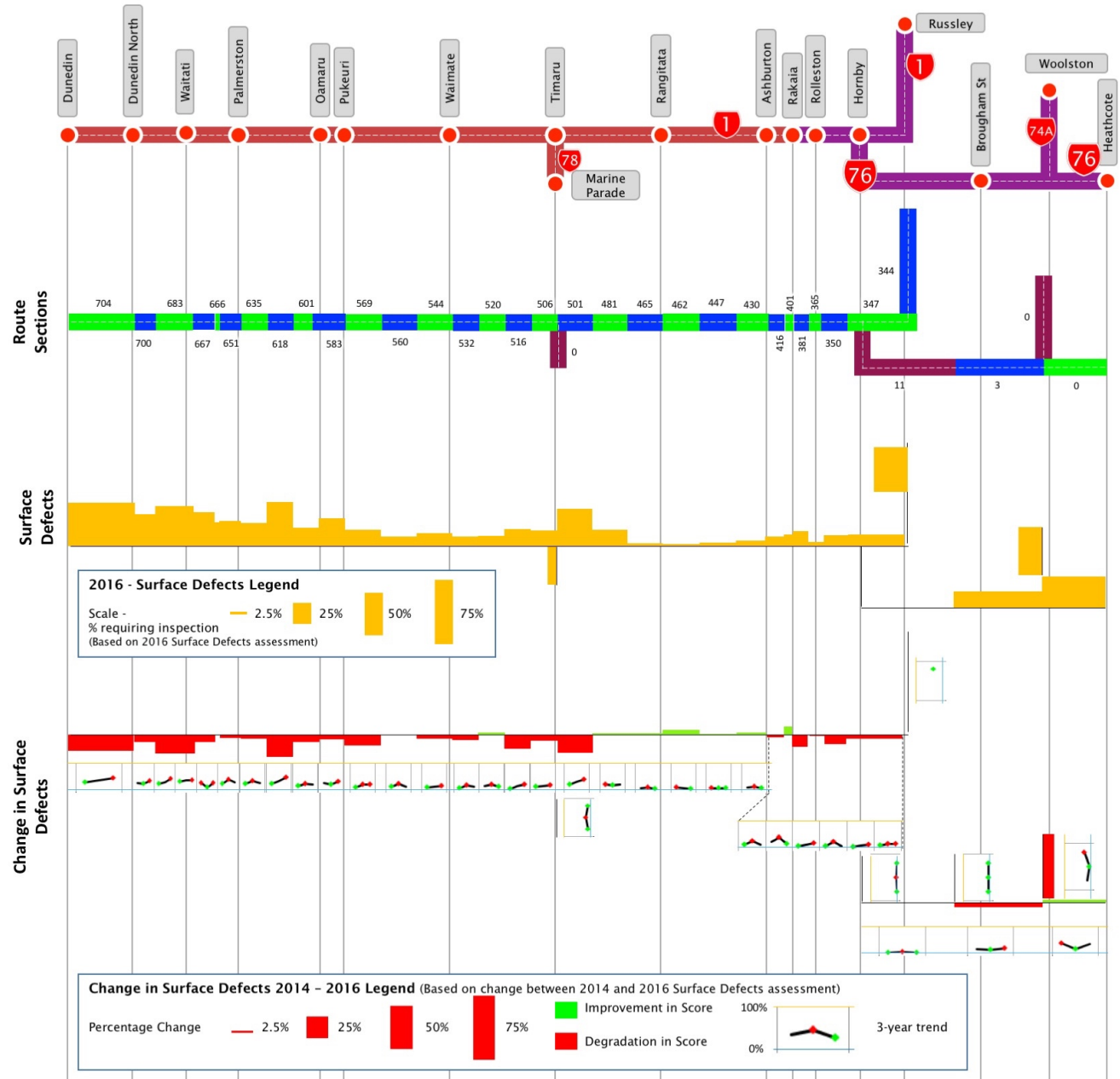
Surface defects

The infographics show the proportion of the Route Section that has a Surface Defects (100m Priority) score that would signal the need for further investigation, i.e. a score >20. The second infographic shows the change in these levels from the 2014 survey to the 2016 survey, as either an improvement or degradation, as well as the three-year trend.

The Surface Defects score is made up of a number of measures which all contribute to the overall score including: roughness, rutting, shoving, flushing, and design life. Any 100m section achieving a score over a total of 20 rates as flagged for inspection. The proportion is then the length of corridor that is flagged for inspection as a percentage of the total length of that section.

Overall, 20.3% of the corridor achieves a score above which inspection is required. Sections with significant lengths of surface requiring inspection include: SH1S/344 between Russley and Hornby, SH1S/501 between Washdyke and Timaru, SH1S/618 around Hampden, and sh1S/704 through North Dunedin. These sections also show a significant level of degradation in score over the last three years.

Figure 19 – Asset condition 2



Resurfacing

The infographics show the proportion of Route Sections planned for resurfacing in the 2016/17 and 2017/18 approved annual plans, confirmed through the RAPT tour, as an indication of the response to the surface condition described previously, and current surface condition.

The major resurfacing works are planned for sections SH1S/416 north of Ashburton, SH1S/447 between Hinds and Rangitata, and, SH1S/516 around Pareora.

Proportion of travel on smooth roads

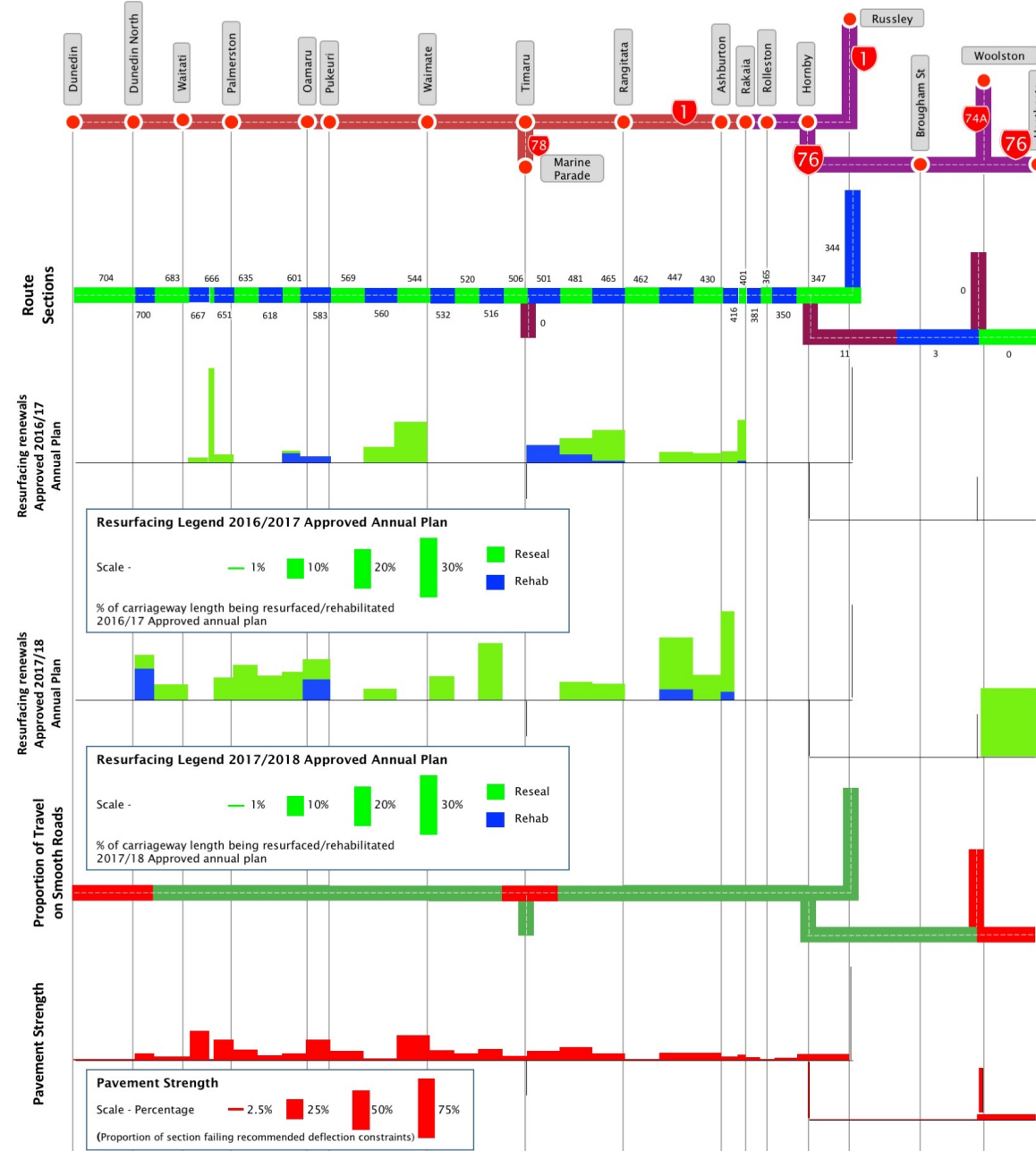
The infographic shows whether the route section passes the ONRC standard for Proportion of Travel on Smooth Roads (Smooth Travel Exposure). 97% is the ONRC target for proportion of travel on smooth roads. The infographic simply shows whether the route section achieves this level or not.

Pavement strength

Recommended deflection constraints for thin asphaltic surfaces is used as a measure of pavement strength. The infographic shows the proportion of the Route Section that fails to achieve the recommended deflection constraint for the classification of road, based on lane-km.

The sections of corridor with the highest proportion of pavement failing to meet the deflection constraints occur at SH1S/544 south of Waimate, and SH1S/651 and SH1S/667 between Palmerston and Waitati.

Figure 21 - Asset condition 4



Asset condition and performance pressures

The pressures on the corridor that are resulting in increased demand or a reduction in levels of service for **Asset Condition and Performance** are as follows:

- **Rakaia River Bridge:** condition deteriorating with any work requiring careful planning to manage disruption. The bridge is long and narrow requires closure when have to reseal. A local road diversion is long and not suited to all vehicles. The bridge has seismic load issues, is near the end of its life and is closely monitored with cameras and WIM.
- **Urban asphalts:** the asphalts in major urban areas deteriorate rapidly as they are subject to high loading and stresses, where there is HPMV freight and signalised intersections (stop start effects). The need for structural asphalt is driven by both better performance and overall efficiency. Southern asphalt programme not delivered 2016/17 and Asphalt in Oamaru is not achieving its expected life.
- **Surface performance:** limitations on haul distances for special treatment products (OGPA, UTA and SMA) mean that more is asked of standard surfacing, which can result in a cost-effective fit for purpose performance, but often reduced life. Increased roughness in southern parts of the corridor do not respond well to conventional approaches and require more costly interventions.
- **Tunnel Road to Brougham Street:** post the Christchurch earthquakes the higher water table has increased deterioration rate of Tunnel Road to Brougham street giving shorter lives, pavement weaker.
- **Oamaru to north of Waitaki river bridge:** a flood prone area where pavements are susceptible to water damage and seems to be worse with extra irrigation.
- **Killmog Hills:** north of Waitati to Palmerston – slip prone resulting in pavement damage and costlier to maintain during wet seasons.
- **Winter Weather:** winter conditions and maintenance practices required to keep roads safe and accessible can reduce overall condition, such as Dunedin Northern Motorway, where snow and ice accelerate surface deterioration driving reduced lives.
- **Maheno Area:** pavement is aging and difficult to maintain due to flooding effects. Highway raised above the spill area of the Kakanui-Dasher ranges catchment plains, but still influenced by the flooding that occurs. Also pavement issues with at grade rail crossing north of Maheno village.
- **Pine hill:** land slip and continuous movement drives lower condition performance- and greater maintenance cost.
- **Sign maintenance:** Both directional and destination signage is getting old with reduced visibility performance.

- **Railway:** a number of at grade rail crossings exist and cross the corridor alignment. There are roughness and condition concerns with them, such as in Oamaru and at Maheno.
- **Climate:** Variable rainfall is putting corridor performance at risk of with wetter weather following dry periods leading to varying rates of deterioration and accelerated deterioration during repeated long duration wet spells, where pavements continue to be intensely loaded.

Asset condition and performance future considerations

The future considerations relating to corridor pressures, intervention triggers and appropriate levels of investment related to **Asset Condition and Performance** are as follows:

- **Asphalt Programme:** current year programme was not achieved and forward programme sites require consideration both in terms of achievability and impact on community and traveller. Sites in Tinwald, Ashburton, and Oamaru due for significant lengths of resurfacing.
- **Corridor Width:** narrow sealed carriageway and shoulder widths are identified as a constraint to both current and improved performance of the southern corridor. They are below ONRC standards for the respective classifications and are unable to provide a basic level of service for pedestrians or cyclists. This was explicitly identified as a concern in urban areas such as Dunedin and Oamaru.
- **Urban Street Lighting:** LED streetlight retrofit is desirable in Dunedin, Oamaru, Hamden, and Palmerston, because current lighting levels are poor. However, they not able to be justified under the LED programme.
- **Legacy Guardrail:** there are multiple areas where old guardrail installations are low height and inconsistent with the current recommended standards. A guardrail retrofit programme needs to be considered.

Investing in the corridor

The **Customer Levels of Service** shapes our response to our investment in maintenance, renewals and improvements. The NZ Transport Agency must consider the impact we have on our customers, the environment, communities, iwi, and the NZ economy in everything we do.

Decisions must be evidence based, informed and transparent with investment targeted to the right treatment, in the right place, at the right time while considering a range of competing priorities for investment. This requires significant analysis of various alternatives and options and expertise in applying appropriate judgement in collaboration with our service delivery partners.

Right treatment, right place, right time

A range of factors have been considered to determine the best point at which to intervene with maintenance and/or renewal treatments and improvements along the corridor.

Intervention works will be programmed to ensure:

- The right treatment,
- At the right place, and,
- At the right time.

Interventions will:

- Be based on minimising whole of life, whole of system costs and be underpinned by facts derived from enhanced asset information and modelling
- Define the most appropriate approach to asset maintenance, inspection and renewal, supported by reliability, availability, maintainability and safety specifications
- Use a risk-based approach to determining intervention requirements to specified levels of reliability
- Use resilience requirements to a specified range of weather conditions, considering climate change
- Define how sustainable development requirements are to be addressed

Summary investment

The proposed investment in the corridor is as follows:

Table 1- Summary corridor investment (\$000)

Outcome	Expenditure Category	2018-2021	2021-2024	2024-2028
Access and Resilience	Maintenance and Operations	\$23,529	\$25,532	\$37,966
	Renewals	\$36,075	\$37,387	\$52,070
	Improvements	\$0	\$300	\$29,450
Reliability and Efficiency	Maintenance and Operations	\$12,087	\$13,087	\$19,651
	Renewals	\$2,069	\$1,610	\$2,491
	Improvements	\$54,447	\$1,646	\$0
Safety	Maintenance and Operations	\$18,708	\$20,059	\$29,909
	Renewals	\$3,450	\$4,981	\$6,246
	Improvements	\$67,404	\$2,130	\$0
People, places and Environment	Maintenance and Operations	\$4,559	\$4,894	\$7,097
	Renewals	\$394	\$386	\$579
	Improvements	\$0	\$0	\$0
Total		\$222,723	\$112,013	\$185,460

Figure 22 - Corridor investment

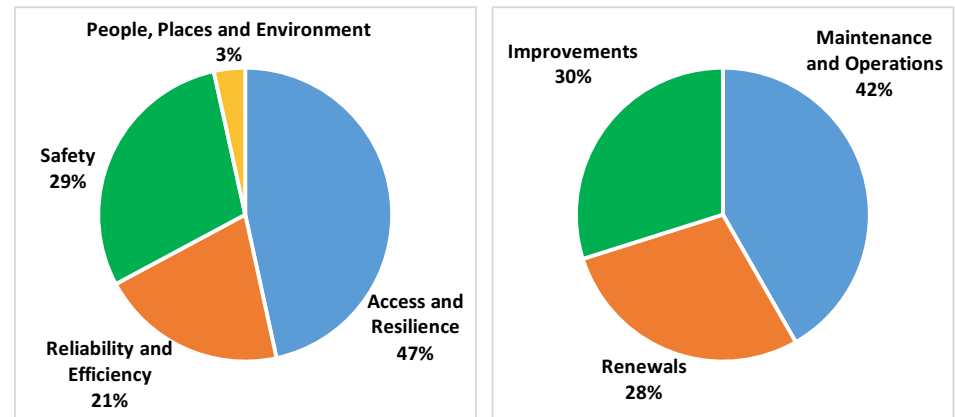


Table 2 - Summary investment by work category (\$000)

Outcome	Work Category	2018-2021	2021-2024	2024-2028
Access and Resilience	111 Sealed Pavement Maintenance	\$3,699	\$4,180	\$6,170
	112 Unsealed Roads	\$6	\$7	\$11
	113 Drainage Maintenance	\$1,825	\$2,006	\$3,095
	114 Structures Maintenance	\$3,927	\$4,168	\$6,243
	121 Environmental Maintenance	\$6,932	\$7,582	\$11,055
	122 Traffic Services Maintenance	\$160	\$248	\$367
	124 Cycle Path Maintenance	\$56	\$46	\$69
	151 Network & Asset Management	\$5,557	\$5,856	\$8,795
	161 Property	\$1,367	\$1,438	\$2,160
	211 Unsealed Road Metalling	\$19	\$21	\$31
	212 Sealed Road Resurfacing (excl. surface skid resistance)	\$22,117	\$22,015	\$28,668
	213 Drainage Renewals	\$1,419	\$1,531	\$2,162
	214 Pavement Rehabilitation	\$8,619	\$10,185	\$16,207
	215 Structures Component Replacements	\$3,697	\$3,392	\$4,638
222 Traffic Services Renewals	\$204	\$243	\$365	
321 - 341 Improvements	\$0	\$300	\$29,450	
Reliability and Efficiency	121 Environmental Maintenance	\$2,409	\$2,606	\$3,745
	123 Operational Traffic Management	\$7,458	\$8,199	\$12,523
	151 Network & Asset Management	\$1,970	\$2,021	\$2,990
	161 Property	\$251	\$261	\$392
	222 Traffic Services Renewals	\$2,069	\$1,610	\$2,491
	321 - 341 Improvements	\$54,447	\$1,646	\$0

Outcome	Work Category	2018-2021	2021-2024	2024-2028
Safety	111 Sealed Pavement Maintenance	\$4,038	\$4,494	\$6,641
	112 Unsealed Roads	\$5	\$6	\$9
	113 Drainage Maintenance	\$1,021	\$1,147	\$1,728
	114 Structures Maintenance	\$732	\$832	\$1,223
	121 Environmental Maintenance	\$848	\$969	\$1,456
	122 Traffic Services Maintenance	\$7,827	\$8,363	\$12,471
	124 Cycle Path Maintenance	\$39	\$28	\$42
	151 Network & Asset Management	\$3,613	\$3,590	\$5,392
	161 Property	\$585	\$630	\$946
	212 Surface Skid Resistance	\$1,674	\$1,895	\$2,845
	214 Pavement Rehabilitation	\$45	\$91	\$137
	215 Structures Component Replacements	\$659	\$730	\$1,097
	222 Traffic Services Renewals	\$1,072	\$2,265	\$2,167
	321 - 341 Improvements	\$67,404	\$2,130	\$0
People, places and Environment	111 Sealed Pavement Maintenance	\$386	\$356	\$534
	121 Environmental Maintenance	\$3,433	\$3,763	\$5,398
	151 Network & Asset Management	\$593	\$623	\$935
	161 Property	\$146	\$153	\$230
	221 Environmental Renewals	\$394	\$386	\$579
	321 - 341 Improvements	\$0	\$0	\$0
	Total	\$222,723	\$112,013	\$185,460

Investing in access and resilience

Operations and maintenance

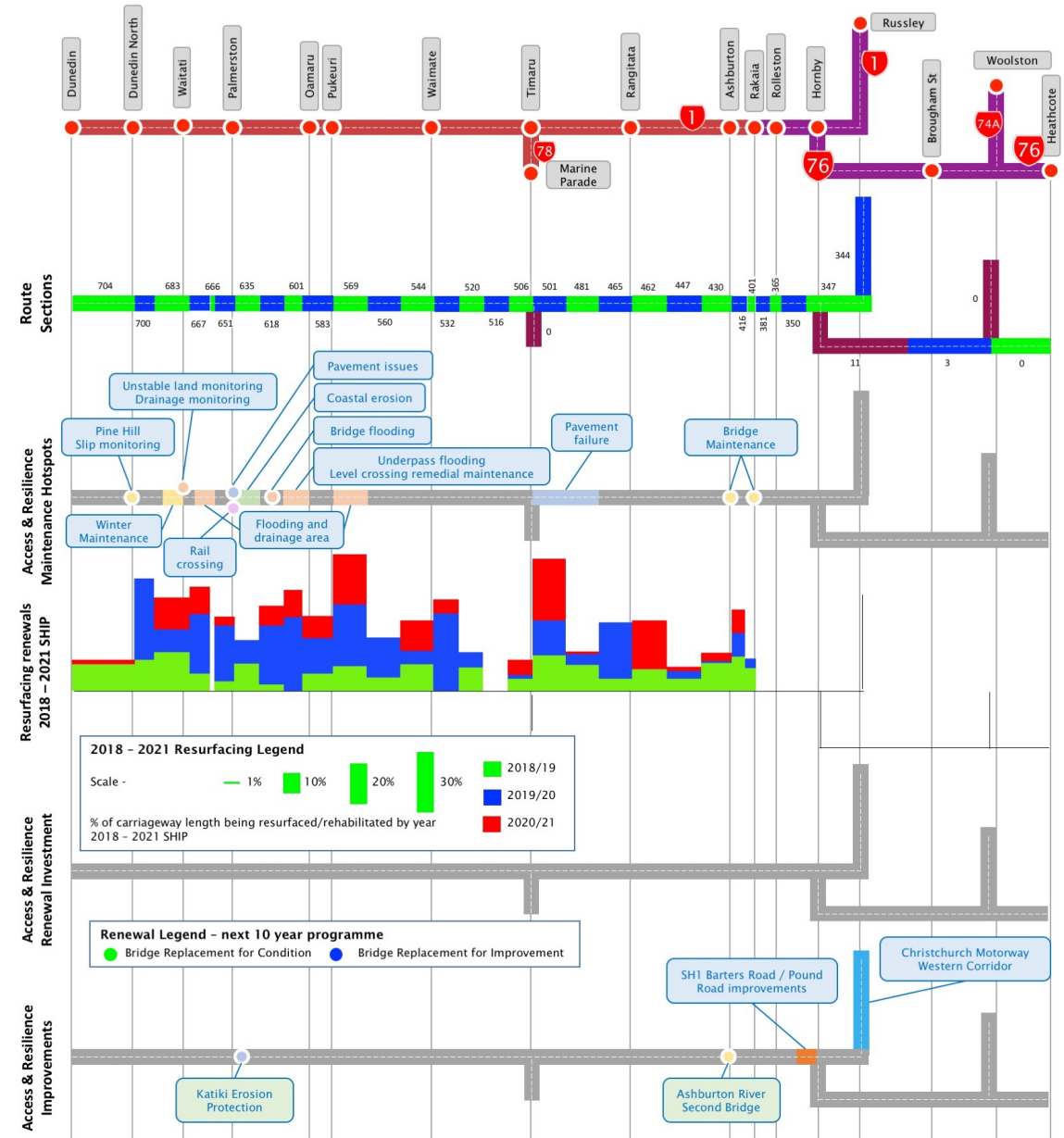
The main areas of investment to provide and preserve access and resilience are drainage maintenance, sealed road surfacing and structural component replacements and vegetation control. A key focus is to realign the base preservation quantities toward increased preventative maintenance and to slow pavement deterioration specially through improved drainage.

Maintenance hot spots

The following maintenance ‘hotspots’ require additional monitoring or cause an increased maintenance burden along the corridor:

- **Kilmog Hills:** slip prone and dearer to maintain during wet seasons. Drainage requires ongoing attention – has flumes and many off road drainage systems to maintain land stability. There are multiple slip stabilisation areas and a tree plantation system that maintains the road (agreement in place to manage).
- **Palmerston Hill:** Currently holding the surface as pavement rehabilitation is programmed for the pending 17/18 financial year.
- **Winter maintenance:** Dunedin North to Waitati, referred to as “northern motorway” has winter maintenance and access and resilience challenges requiring close attention, prove to both ice and snow.
- **Rakaia River Bridge:** requires ongoing maintenance and is susceptible to bridge strike.
- **Rakaia Overbridge:** prone to truck strike, and regular use by agricultural vehicles. It is on a bend over rail line with an out of context curve.
- **Pinehill slip:** just north of Dunedin, continuous movement and instability.
- **Flooding:** South Waikouaiti, Maheno River SH1S/601, Deborah underpass SH1/583, and North of Oamaru to Waitaki River (SH83) are areas of repeated flooding.
- **Big Kuri bridge SH1/618:** This bridge suffers from aggradation and flooding.
- **Waitaki River:** subject to scour and needs close river management with monitoring of the abutments and proactive vegetation control in the river.
- **Katiki (south of Moeraki):** SH1S/635 requires ongoing monitoring as prone to coastal erosion that affects both road and rail. A resilience project has been proposed to stop loss of the highway or provide an alternative route.

Figure 23 – Access and resilience investment



Renewals

Resurfacing

The infographic shows the proportion of route section by carriageway length planned for resurfacing within the period 2018/19 to 2020/21, the three-year span of the SHIP. This is also broken down in to the individual years to indicate the timing of expenditure over the three-year period.

Significant investment in resurfacing is planned for sections: SH1S/501 between Washdyke and Timaru, SH1S/569 between Glenavy and Pukeuri, SH1S/601 between Maheno and Herbert, and, sections SH1S/667, SH1S/683 and SH1S/700 between Waikouaiti and Pine Hill.

Structure renewal

The renewal investment infographic shows the planned bridge replacements along the corridor. No bridges are planned for replacement due to asset condition.

The Rakaia River Bridge is identified as vulnerable, has no renewal date as yet, but is continuously monitored both with cameras and weigh in motion equipment.



SH1 Barbers Road/Pound Road improvements

Improvements

Planned

The following projects are planned and underway. Details of the project progress can be found on the Transport Agency website at: <https://www.nzta.govt.nz/projects/>

SH1 – Barbers Road/Pound Road improvements

Description: The Barbers Road/Pound Road Upgrade will see a new road built through the Waterloo Business Park with traffic lights at key intersections, shared cycle and pedestrian lanes created and a new railway crossing installed. Storm and wastewater work will also be carried out over the 15-month project. The project is designed to cater for future growth in the area and will make it safer and easier for motorists to enter and exit Main South Road from Pound Road and improve links for cyclists and pedestrians.

Christchurch Motorway Western Corridor

Description: The Western Corridor (SH1) provides access to Christchurch International Airport for people and freight from throughout Canterbury and the South Island. The corridor runs between the Northern Motorway in Belfast and the Main South Road in Hornby.

Draft Regional Land Transport Programme considered for the SHIP

The following table shows the list of projects being considered through the Draft Regional Land Transport Programme through the SHIP, and cover the next 10 years.

Table 3- Draft regional programme considered for SHIP

Project	Funding Status	Description
Ashburton River Second Bridge		Construction of an additional bridge over the Ashburton River would reduce congestion along the existing bridge.
Katiki Erosion Protection		National highway is threatened by coastal erosion and located between the coast at the rail lane. No HCV detour available. Long term solution is required to improve resilience of the route.

Investing in reliability and efficiency

Operations and maintenance

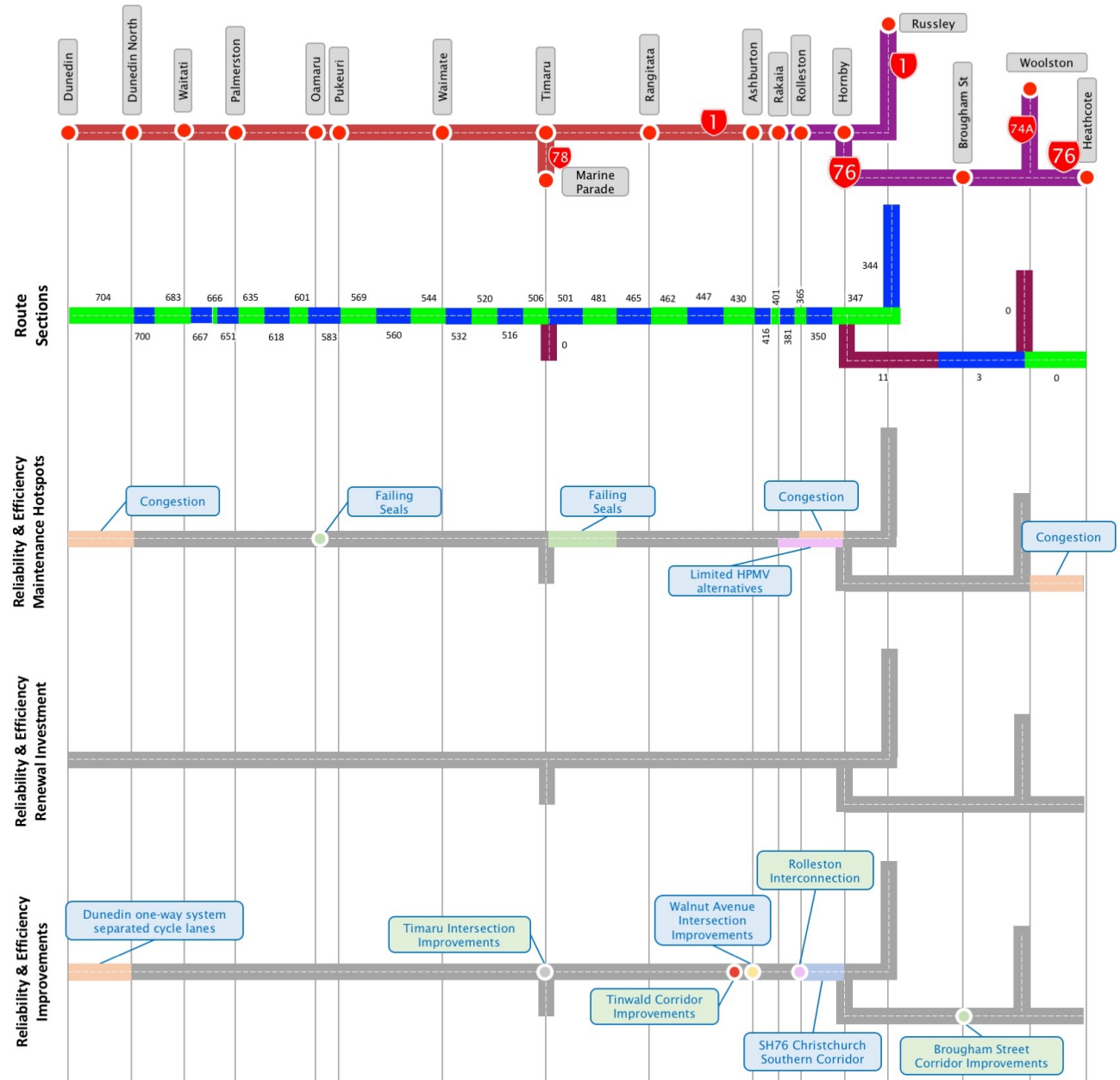
The main areas of investment to provide and preserve reliability and efficiency are environmental maintenance through keeping potential obstructions clear of the highway, wayfinding signage, and operational traffic management.

Maintenance hot spots

The following maintenance ‘hotspots’ require additional monitoring or cause an increased maintenance burden along the corridor:

- **HPMV:** detours for HPMV are limited between Christchurch and Rakaia River. They can be delayed excessively when there are serious and fatal crashes. This can put the drivers outside of their driving hours, adding still further to the disruption and delay. Similarly, further south there are no “easy” alternative routes for freight.
- **Dunedin urban:** congestion and traffic density is getting to the point where it is hard to cross the highway from local roads, compromising both efficiency and accessibility. In particular pedestrians and local road cross traffic around the Dunedin one-way pair.
- **Oamaru township:** roughness and failing seals that are not readily resolved particularly around the at grade rail crossing. Increasing delays from expansion of landuse at north end of township.
- **Pavement Failure:** On sections SH1S/481 and SH1S/501 capital project pavement failure that will require ongoing attention.
- **Rolleston:** delays and ongoing changes to traffic management due to Christchurch Southern Motorway 2, CSM2, capital project (Dog Bone interchange).

Figure 24 - Reliability and efficiency investment



Renewals

There are no reliability and efficiency related renewals planned for the corridor.

Improvements

Planned

The following projects are planned and underway. Details of the project progress can be found on the Transport Agency website at: <https://www.nzta.govt.nz/projects/>

SH76 – Christchurch Southern Corridor

Description: The Southern Corridor provides access to Lyttelton Port and the Christchurch CBD for people and freight from south of Christchurch. It includes the Southern Motorway from Barrington St to Halswell Junction Rd and the extension to re-join SH1 south of Waterholes Rd.

Walnut Avenue Intersection Improvements

Description: The intersection of State Highway 1 and Walnut Avenue in Ashburton will be upgraded by replacing the existing roundabout with traffic signals.

Dunedin one-way system separated cycle lanes

Description: Work is expected to start in July 2017 on this project to significantly improve cycle safety on the one-way system through north and central Dunedin, by providing cycle lanes that physically separate cyclists from traffic.



Draft Regional Land Transport Programme considered for the SHIP

The following table shows the list of projects being considered through the Draft Regional Land Transport Programme through the SHIP, and cover the next 10 years.

Table 4- Draft regional programme considered for SHIP

Project	Funding Status	Description
Brougham Street Corridor Improvements		Proposed improvements along SH76 Brougham Street corridor to address level of service gaps related to capacity issues, safety issues, intermodal connections, severance to local communities.
Rolleston interconnection (Flyover)		Flyover project to connect Rolleston Drive and Hoskyns Road.
Tinwald Corridor Improvements		Proposed corridor improvements to address travel time reliability, safety and capacity issues.
Timaru Intersection Improvements		Safety and capacity intersection treatments are proposed at various sites within the study area to ensure network performs optimally resulting from likely future development.

Renewals

There are no safety related renewals planned for the corridor.

Improvements

Planned

There are no currently planned safety related improvements underway on this corridor.

Draft Regional Land Transport Programme considered for the SHIP

The following table shows the list of projects being considered through the Draft Regional Land Transport Programme through the SHIP, and cover the next 10 years.

Table 5- Draft regional programme considered for SHIP

Project	Funding Status	Description
SH1 Main South/Aylesbury Intersection		Intersection upgrade to possibly large diameter rural roundabout and speed management.
Rangitata to Timaru Safety Improvements		Safe Road Alliance (SRA) Projects 18/19+ - SH1, Rangitata to Timaru Safety Improvement for Roads and Roadsides, (included in SH1 Chch to Dunedin Business Case.
Rakaia to Ashburton Safety Improvements		Safe Road Alliance (SRA) Projects 18/19+ - Road safety treatments for improvement of the KiwiRAP Star Rating on the SH1 corridor between the Selwyn River bridge and Ashburton - 44kms to achieve a safer roads and roadside environment.
SH1S: Timaru to Waitaki Safety Gap Analysis		Safety gap improvements identified for the SH1S.
North Oamaru Corridor Improvements		Possible re-allocation of road space with removal of cycle lanes and provision of quiet streets detours for cyclists. Intersection improvements.

Project	Funding Status	Description
Oamaru to Dunedin Safety Improvements		This is to achieve a safer roads and roadside environment for the SH1 corridor between Waitaki River (north of Oamaru) to Dunedin - 132kms. The indicative scope (from the PoE) includes treatments such as 'road widening; wide centreline (use of median barriers is unlikely outside of multi-lane situations); and high-performance edge-line and roadside barriers.
Pine Hill Rd / Great King St Intersection Improvements		Identified as one of the 200 high risk intersections in the country. Restricted visibility from priority controlled intersection located at base of a steep incline. Consideration of an improved at grade solution required. Part of the Safer Journeys - Roads & Roadsides business case.
Weigh Right Regional Construction		Improve weigh pits to improve overweight detection and to meet new vehicle and safety standards.
Speed Management Implementation		Transport planning activity to enable development of Regional Speed Management Plan in conjunction with partner Road Controlling Authorities
Minor Improvements 18/21		Activities will be targeted to low cost safety, optimisation and resilience activities which contribute to the Transport Agency's goals of either reduce the level of deaths and serious injuries, improve urban network capacity in our major centres or to reduce the resilience risk on our key routes through preventative maintenance activities.
Accelerated LED Renewals for SH Street Lighting		To replace all street lights with more cost-effective LEDs to save costs on power and maintenance.

Investing in people, places and environment

Operations and maintenance

The main areas of investment into people, places and environment are: surfacing to ensure a high proportion of travel on smooth roads, control of litter, provision of rest areas and stopping points, landscaped areas maintenance, and environmental compliance.

Extreme rainfall variability is putting corridor performance at risk with wetter weather following dry periods leading to varying rates of deterioration.

Maintenance hot spots

The following maintenance ‘hotspots’ require additional monitoring or cause an increased maintenance burden along the corridor:

- **Vibration and noise issues:** in urban environments such as at Christchurch end, Brougham Street to Tunnel Road, and Woolston area and south of Christchurch through Rolleston and Halswell as well as the northern approach to Dunedin. Increasingly also an issue through smaller townships, particularly when chip seals are used.
- **Winter maintenance:** health and safety of personnel working in the winter conditions and environmental considerations of how respond such as use of chemicals or materials that enter waterways.
- **Environmental:** Keeping Waitaki River within its banks, and flooding of plains along Maheno from snow melt.

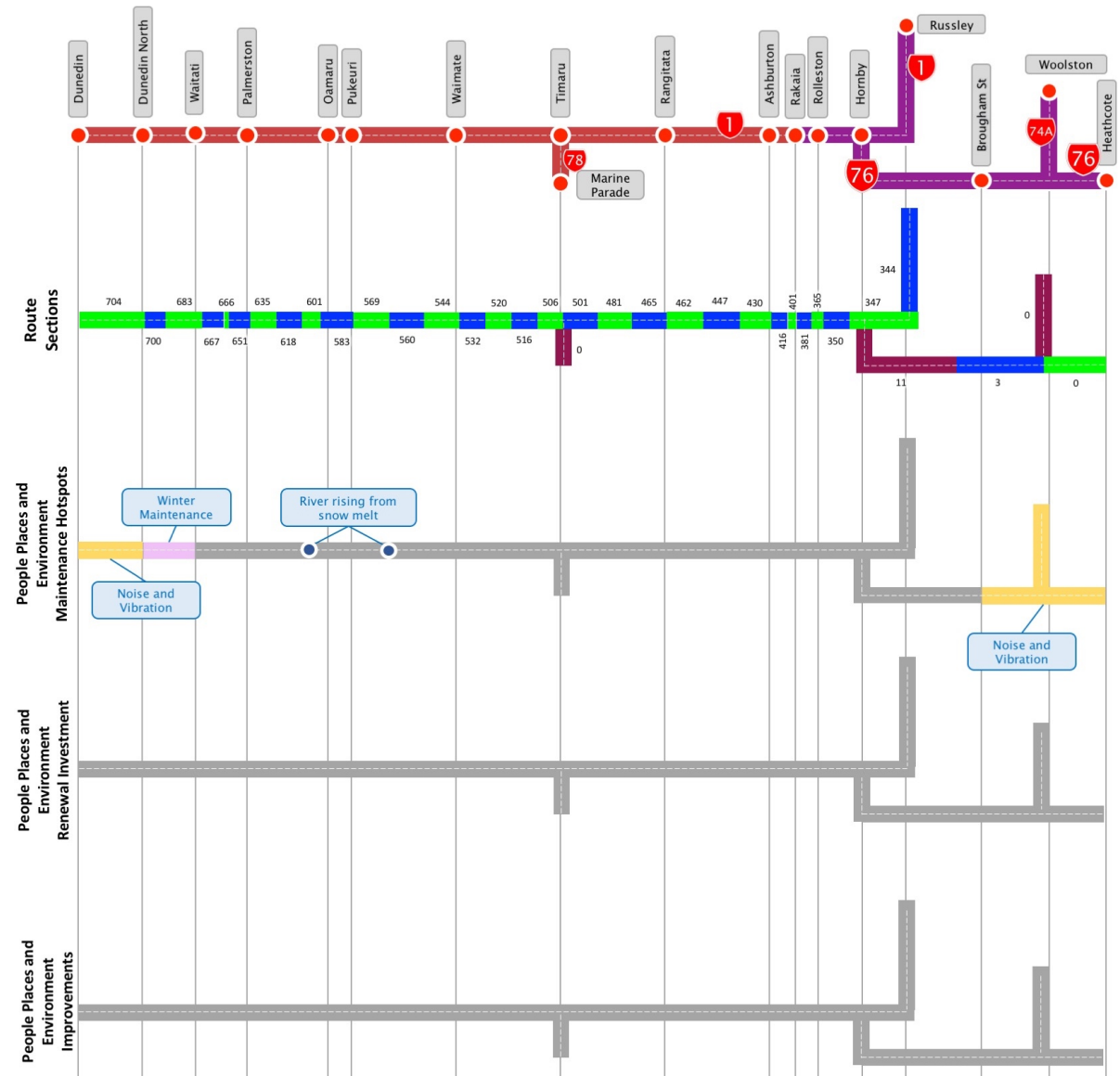
Renewals

There are no people, places and environment related renewals planned for the corridor.

Improvements

There are no people, places and environment related improvements planned for the corridor.

Figure 26 – People, places and environment investment



Investment pressures

Access and resilience

The following concerns excerpt pressure on the investment in **Access and resilience** on the corridor.

- **Rivers:** The corridor has many wide river crossings. These require long bridges and become pinch points for resilience, particularly when cyclic maintenance is required or when traffic must be detoured.
- **Flooding:** multiple areas along the corridor are prone to flooding, some of which could be improved through additional drainage investment.
- **Coastal erosion:** Coastal erosion and undercut of highway along Katiki straights, south of Moeraki.

Reliability and efficiency

The following concerns excerpt pressure on the investment in **Reliability and efficiency** on the corridor.

- **Asset growth:** asset growth is leading to increased maintenance costs.
- **Limited passing opportunities:** A lack of passing opportunities and the resulting platooning affect/driver frustration can cause slow speeds for customers caught behind a line of slower vehicles, particularly tourist/towing/unfamiliar drivers...when a heavy vehicle is using the route.
- **Variable Messaging Signage:** Would like to expand the number of VMS to improve information and advice about roads.
- **Dunedin Northern Motorway:** has no eyes on, consider installation of cameras for improved observation and response.
- **Oamaru township:** an integrated and co-ordinated response is required to issues through the township such as roughness, failing seals and at grade rail crossing.
- **Land use changes:** Land use changes and changed commuter patterns are impacting the northern Christchurch fringe with increased highway and local road traffic, particularly through the Rolleston, West Melton and Burnham areas. (CSM2 will provide some relief and is scheduled for opening in 2020)
- **Rolleston – West Melton/SH73** – the signals currently linking residential and local industrial area are not proposed to change with the development of the southern motorway, but this is having an increasing effect on both side road and main road flows that will need consideration. An overbridge has been suggested because there is pressure for freight to access the highway.

Safety

The following concerns excerpt pressure on the investment in **Safety** on the corridor:

- **Guardrail retrofit:** The corridor has outmoded guardrail designs present throughout, including under height rail and Texas twist terminals. There is a general pressure about meeting improved safety standards. Consider if there is a need for a retrofit programme or a strategic approach.
- **Safety at worksites:** As traffic volumes increase and AM/PM peaks extend in duration, it becomes increasingly difficult to safely deliver maintenance and renewal requiring consideration of alternative approaches to the planning and treatment choices.
- **Intersections:** interface between local roads and highway are a problem. Poor and absent intersection turn facilities and poor distribution and configuration, such as at Pine Hill Dunedin and West Melton, Rolleston and Burnham, south of Christchurch.
- **Incident response:** incident response and to lesser extent reinstatement of traffic management, signs and light poles -
- **Rail Crossings:** Level crossings on highway and on local roads close to highway (North of Oamaru) create an increased safety risk.
- **Winter Maintenance:** winter maintenance requirements are hard on road markings with increased wear and tear, requiring more frequent remark or lower level of service until remarking is possible (improved weather and temperatures). The cycle path through the Dunedin one-way pair is one such site.
- **Signs:** signs are aging and less effective, meaning that their value is easily lost, such as regulatory side road, wayfinding, destination and advisory road signage.

People, places and environment

The following concerns excerpt pressure on the investment in **People, places and environment** on the corridor.

- **Vibration & Noise:** Increasing noise sensitivity or less tolerance from residential land use, with greater expectation that concerns can and will be mitigated through use of earth bunds, noise attenuating fencing and low noise surfacings.
- **Coastal erosion:** uncertainty around how the coast will change in major weather events and how to manage the coastal road in the event of a major under slip. Consider developing strategic business case for this route.
- **Working environment:** more complex temporary traffic management required, greater sensitivity to noise, shorter working window based on seasonal variation, adjacent landuse and traffic density.
- **Litter:** The ONRC standards for litter are high and difficult to achieve economically along such a corridor.



Passing lanes at Dunsandel south of Christchurch, south of the Selwyn River



Russley Road - Harewood School visit May 2016: Copyright Neil Macbeth

Investment future considerations

Consideration of investment in the corridor in future should take account of the following:

- **Development of alternative routes:** The lack of good HCV alternative routes requires increased investment in mitigation to ensure the main corridor remains available. Investment in improving local road alternatives as well as ensuring resilient structures could have a positive impact on maintenance costs.
- **Asset Improvement:** Where diversion routes are poor or unsuitable consider maintaining or improving structures on the corridor to provide a higher standard e.g. Rangitata River bridge. This will maintain the customer level of service and improve it in the event of extreme natural events.
- **Intersections:** As the transport demand increases across the corridor a number of side road intersections will require upgrading to provide for the safe and efficient movement of customers and their goods. Particular areas for focus include those with freight growth between key sites such as PrimePort in Timaru to Washdyke and Temuka and from the outer Christchurch fringe growth area to Port of Lyttelton.
- **Brougham Street congestion:** There is congestion in commuter peak periods along Brougham Street and this is subject to improvement as per the detailed business case proposals.
- **Rakaia River Bridge:** condition deteriorating with any work requiring careful planning to manage disruption. The bridge is long and narrow requires closure when have to reseal. A local road diversion is long and not suited to all vehicles. The bridge has seismic load issues, is near the end of its life and is closely monitored with cameras and WIM.
- **Waitaki bridge:** A major upgrade is due and the project needs development.
- **Road widening and realignment:** Measures such as widening to reduce the impact of disruptive events, provide separation for cyclists and pedestrians and stacking area for freight vehicles.
- **Special treatment Surfacing:** limited in areas that special treatment surfacings can be applied because of distance from plant, such as Timaru at limit of cartage distance from Christchurch (UTA and SMA etc. other than stock standard as can get from mobile plant).
- **Asphalt:** the asphalt programme has not been delivered and the programme is likely to increase. There is pressure on resources and deliverability of the programme.
- **Fast response to incidents:** Being able to respond quickly and efficiently to incidents on the network is important to maintaining a reliable and efficient journey for customers. The ability to know when an incident has occurred and to advise road users of such incidences, is an area that could be enhanced to assist in dealing with disruptions as they arise. The use of permanent VMS signs at key locations along the corridor will enable delays and incidents to be communicated quicker allowing customers to make decisions about journeys.
- **Stopping places:** Consideration of combining stopping places (including rest areas and look outs) with places of interest, heritage sites, local business areas and main streets, and future electric vehicle charging infrastructure. Incentives such as food and beverage or Wi-Fi connections may assist in increasing use of these areas. Integrating stopping places for all customers that are safe and attractive while having a positive influence on the cost to maintain.

Appendix A – Information sources

Section	Infographic	Information Source	Date
Introduction	Corridor Overview Map	The Road Efficiency Group https://www.nzta.govt.nz/roads-and-rail/road-efficiency-group/onrc/	2013
Understanding our Customers			
Key Customers	Key journeys	Network Manager and Regional Staff	2016
	Daily commuters	Network Manager and Regional Staff	2016
	Freight	Network Manager and Regional Staff	2016
	Tourism and recreation	Network Manager and Regional Staff	2016
	Demographics and population centres	MBIE Regional Economic Activity Report Web Tool http://www.mbie.govt.nz/info-services/business/business-growth-agenda/regions	2015
Understanding Customer Levels of Service on the Corridor			
Customer Levels of Service	Corridor classifications	The Road Efficiency Group ONRC -right-road-right-value-right-time-combined-poster.pdf https://www.nzta.govt.nz/roads-and-rail/road-efficiency-group/onrc/	2015
Current Levels of Service Performance	Current ONRC Levels of Service Performance	Network Manager and Regional Staff	2016
Improving the Customer Experience	Significant planned improvements	Network Manager and Regional Staff NZTA Projects web page: https://www.nzta.govt.nz/projects/ NZTA Safe Roads web page: https://www.nzta.govt.nz/safety/our-vision-vision-of-a-safe-road-system/safe-roads/ Submitted Regional SHIP programmes	2017

Section	Infographic	Information Source	Date
Access	ONRC classification	The Road Efficiency Group https://www.nzta.govt.nz/roads-and-rail/road-efficiency-group/onrc/	2013
	Carriageway configuration	Network Manager and Regional Staff Corridor drive-over Highway information Sheets	2016
	Posted speed limit	NZTA – MapHub Speed Limits on NZ Road Network	2016
	Topography	Elevations derived from Google Earth™	2016
	Geography	Network Manager and Regional Staff Corridor drive-over	2016
	Traffic volumes – heavy vehicles	RAMM Carriageway Table – December Traffic Estimates	2015
	Traffic volumes – all vehicles	RAMM Carriageway Table – December Traffic Estimates	2015
	HPMV routes	NZTA – MapHub High Productivity Freight Network	2016
	Critical Customers	Network Manager and Regional Staff	2016
	Critical Assets	Network Manager and Regional Staff	2016
Resilience	Vulnerabilities	NZTA – MapHub Hazard Incidents and Area Warnings	2016
	Major Alternate Routes	Network Manager and Regional Staff Desktop analysis Corridor drive-over	2016
	Diversion Lengths	NZTA StateHighways.pptx Diversion Routes	Unknown
	Closures	NZTA 2011-2015_Treis_incidents_by_region.xlsx	2015
Reliability and efficiency	Efficiency	NZTA – MapHub EfficiencyNet	2016

Section	Infographic	Information Source	Date
	Variability	NZTA / Beca Dwg No. GIS-3391515-500-4 Network Performance - Attachments.pdf March 2012 eRUC Commercial Vehicle Data - State Highway Austroads Variability Assessment	2012
	Commercial Vehicle Average Speed	NZTA / Beca Dwg No. GIS-3391515-500-5 Network Performance - Attachments.pdf March 2012 eRUC Commercial Vehicle Data - State Highway Average Speeds	2012
	Current Constraints	Network Manager and Regional Staff Corridor drive-over	2016
Safety	KiwiRAP Collective Risk	https://nzta.abley.com/SafetyNET_2017 SafetyNET	2016
	KiwiRAP Personal Risk	https://nzta.abley.com/SafetyNET_2017/ SafetyNET	2016
	KiwiRAP Star Rating	http://www.kiwirap.org.nz From 2010 KiwiRAP star rating report.	2010
	Intersection Risk Indicator	https://nzta.abley.com/SafetyNET_2017/ SafetyNET	2016
	Gap Programme Rating	https://nzta.abley.com/SafetyNET_2017/ SafetyNET	2015
Environment Culture and Heritage	Natural Environment	NZTA - Environment and Urban Design Team	2016
	People and Place: Journeys	NZTA - Environment and Urban Design Team	2016
	People and Place: Landmarks and Heritage Places	NZTA - Environment and Urban Design Team	2016
	Noise and Vibration	NZTA - Environment and Urban Design Team	2016
	Drainage Catchments	NZTA - Environment and Urban Design Team	2016

Section	Infographic	Information Source	Date
Understanding the Infrastructure Assets			
Overview	Corridor Asset Base	NZTA_ 2017 Values by Corridor.xlsx compiled by Opus International Consultants from RAMM and other asset information sources	
	Asset Condition and Performance	Summarised from the data sets described below	
Asset condition and performance	Surface Skid Resistance	SCRIM data derived from RAMM by NZTA Data Quality and Access team	2016
	Surface Safety Treatment	SAL data derived from RAMM by NZTA Data Quality and Access team	2016
	Surface Defects	100m Priority data derived from RAMM by NZTA Data Quality and Access team	2016
	Surface Age	Surface Age data derived from RAMM by NZTA Data Quality and Access team	2016
	Service life of Prior Surface	Surface Age data derived from RAMM by NZTA Data Quality and Access team	2016
	Resurfacing	Resurface data derived from forward works programme	2016
	Proportion of Travel on Smooth Roads	STE data derived from RAMM by NZTA Data Quality and Access team	2016
	Pavement Strength	Deflection data derived from RAMM by NZTA Data Quality and Access team	2016
Investing in the Corridor			
Summary Investment	Summary Corridor Investment	2028-21 SHIP programme funding requests 2017/18 Annual Plans	2017
	Summary investment by work category	2028-21 SHIP programme funding requests 2017/18 Annual Plans	2017
Investing in access and resilience			
Investing in access and resilience	Maintenance Hot Spots	Network Manager and Regional Staff	2017
	Resurfacing 2018 - 2021	Resurface data derived from forward works programme	
	Renewal Investment	National Bridge Replacement Programme National bridge replacement programme 2017 LCMP data.xlsx	

Section	Infographic	Information Source	Date
	Improvements	Network Manager and Regional Staff NZTA Projects web page: https://www.nzta.govt.nz/projects/ Submitted Regional SHIP programmes	
Investing in reliability and efficiency	Maintenance Hot Spots	Network Manager and Regional Staff	2017
	Renewal Investment		
	Improvements	Network Manager and Regional Staff NZTA Projects web page: https://www.nzta.govt.nz/projects/ Submitted Regional SHIP programmes	
Investing in safety	Maintenance Hot Spots	Network Manager and Regional Staff	2017
	Renewal Investment		
	Improvements	Network Manager and Regional Staff NZTA Projects web page: https://www.nzta.govt.nz/projects/ NZTA Safe Roads web page: https://www.nzta.govt.nz/safety/our-vision-vision-of-a-safe-road-system/safe-roads/ Submitted Regional SHIP programmes	
Investing in people places and environment	Maintenance Hot Spots	Network Manager and Regional Staff	2017
	Renewal Investment		
	Improvements	Network Manager and Regional Staff NZTA Projects web page: https://www.nzta.govt.nz/projects/ Submitted Regional SHIP programmes	



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