

Southern Arterial & Primary Collection Cluster

CORRIDOR MANAGEMENT PLAN

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2018-2028



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Executive summary

The Southern Arterial and Primary Collectors corridor comprises, two clusters of highway. The **Southland Cluster** in the Southland/Otago region includes SH6 from Invercargill to Lumsden and west to east connections from Clifden to Dacre along SH98 and SH99, Ohai to Mataura along SH96, and Lumsden to Gore along SH94. SH90 runs northeast from McNab to Raes Junction and is mostly included in the Otago region. The **Otago Cluster** is made up of two discrete but connected highways - SH85 between Alexandra and Palmerston, and SH87 between Kyeburn and Mosgiel. The Main South Line (railway) links Bluff (sea port) and Invercargill to Dunedin/Christchurch, provides an alternative to road transport for freight movement.

The corridor is approximately 692km long (6.1% of the state highway network). The total value of assets along the corridor is \$642M (2.8% of the total national asset value).

The corridor is characterised by an expansive and productive rural landscape with small communities located throughout. Low traffic volumes are reflective of a largely remote area and small population base in both clusters. Winter conditions often provide a challenging driving environment throughout the corridor, especially with the **Otago Cluster** traversing relatively high altitudes.

The **Southland Cluster** of arterials and collector roads provides important connectivity with local roads for visitors, local communities and freight movement. SH99 forms part of the Southern Scenic Route, a popular tourist highway connecting Queenstown, Fiordland and Milford Sound to Dunedin via Riverton, Invercargill and The Catlins.

The **Otago Cluster** provides connectivity and links into Central Otago from larger population centres in Dunedin and Mosgiel. It also links freight movement from Coastal Otago.

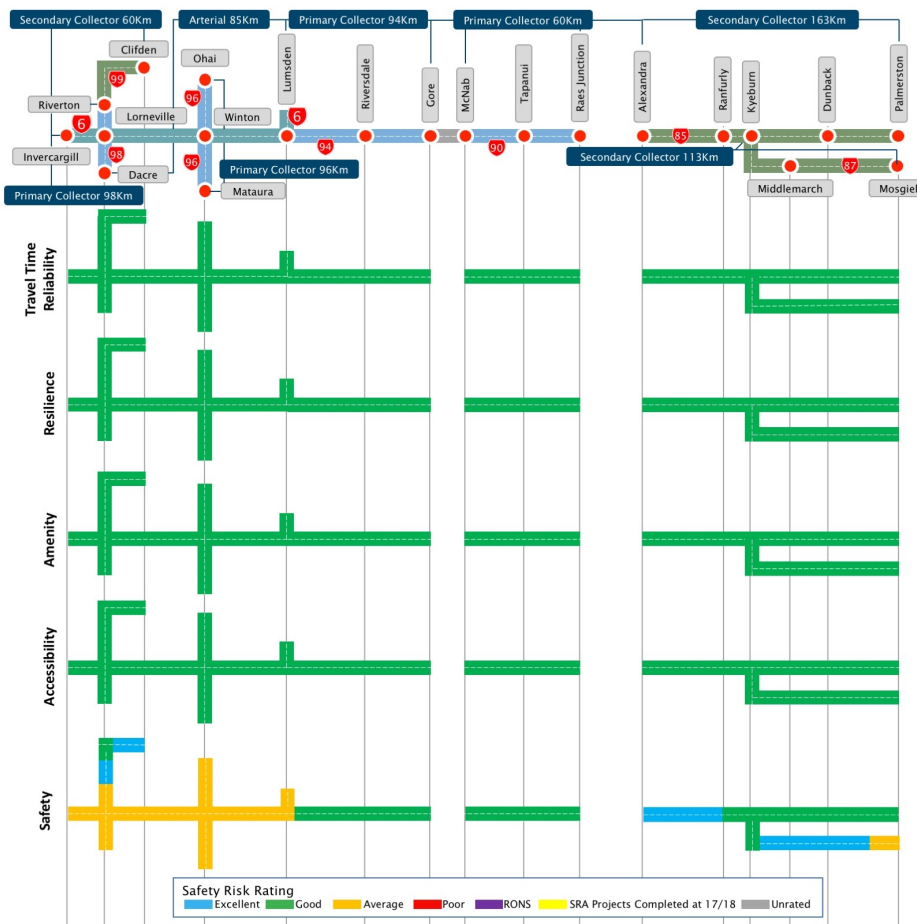
The main customers utilising this corridor are freight, rural communities, and tourists. The southern end of SH87 from Mosgiel to Dunedin has high commuter travel purpose as does the southern end of SH6 from Lorneville to Invercargill.

Invercargill and Mosgiel are the largest urban centres in the corridor. Economic development strategies have an overarching focus on bringing more people to this area. In the Otago Cluster, Mosgiel is experiencing rapid growth and the effects of this are noticeable on this section of corridor.

The primary sector is a key export earner for Southland and its regional economy relies heavily upon it. Freight movement from farm to factory must be undertaken as efficiently as possible with minimal disruption from the roading network. For the dairy industry, even a 20-minute delay for milk tankers impacts their bottom line. Efficient freight movement also helps attract new investors to the region.

Tourism growth is a significant opportunity for the Southland and Otago regions, which offer access to beautiful landscapes.

Figure 1 - Performance of the corridor against ONRC outcomes



Efficient freight movement, strong and connected communities, and positive tourist experiences contribute to the success of the regions' economy and the desire to visit, live, work and play there.

An extensive state highway and local road network already exists; therefore, investment needs to focus on how to make the most of what is available. To this extent, availability, reliability and safety are primary objectives of transport investment in this corridor.

Introduction

Purpose

What is the corridor management plan?

This Corridor Management Plan describes the customer service delivery story for the Southern Arterial & Primary Collector Cluster 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 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. 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

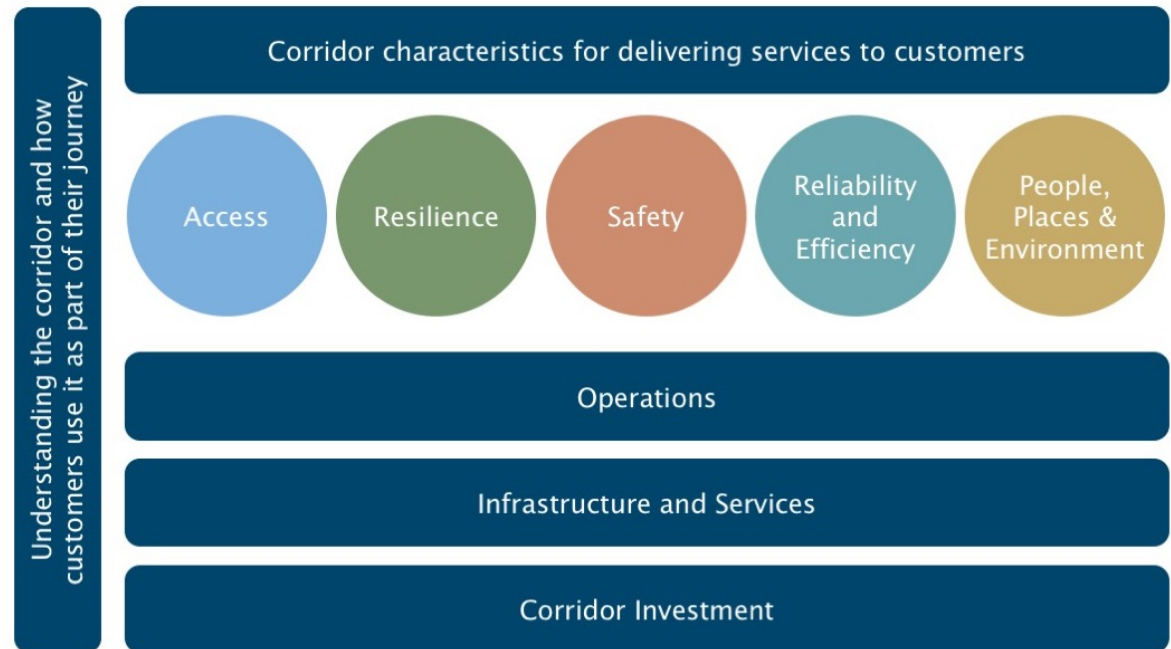
focusing on the issues that are important and which may extend beyond the state highways network.

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

The Southern Arterial and Primary Collector Corridor comprises:

Southland Cluster in the Southland/Otago region includes SH6 from Invercargill to Lumsden and west to east connections from Clifden to Dacre along SH98 and SH99, Ohai to Mataura along SH96, and Lumsden to Gore along SH94. SH90 runs northeast from McNab to Raes Junction and is mostly included in the Otago region.

Otago Cluster in the Otago region is made up of two discrete but connected highways - SH85 between Alexandra and Palmerston, and SH87 between Kyeburn and Mosgiel.

The Main South Line (railway) links Bluff (sea port) and Invercargill to Dunedin/Christchurch, providing an alternative to road travel for freight movement. A branch line connects Invercargill to Ohai and was previously used for transporting coal. The branch line is still operational, but has minimal use post the closure of the Ohai mine.

The corridor is characterised by an expansive and productive rural landscape with small communities located throughout. Low traffic volumes are reflective of a largely remote area and small population base in both clusters. Winter conditions often provide a challenging driving environment throughout the corridor, especially with the **Otago Cluster** traversing relatively high altitudes.

The **Southland Cluster** of arterials and collector roads provides important connectivity with local roads for visitors, local communities and freight movement. Invercargill is the main urban centre. With a length of over 10,000 km, the combined local road and state highway network within the Southland Cluster makes up nearly 11% of New Zealand’s entire roading system, but carries only 3% of New Zealand’s traffic. SH99 forms part of the Southern Scenic Route, a popular tourist highway connecting Queenstown, Fiordland and Milford Sound to Dunedin via Riverton, Invercargill and The Catlins.

The **Otago Cluster** provides connectivity and links into Central Otago from larger population centres in Dunedin and Mosgiel. It also links freight movement from Coastal Otago.

The regional economy

Southland has a population of 98,000 with 54,200 residents in Invercargill and is forecast to remain static until 20. South Port (at Bluff) and Port Chalmers (at Dunedin) support Southland’s export and import industries, \$4.4 billion in 2016, which is approximately 8.7% of New Zealand’s total export value, including timber, fisheries, dairy, and meat. Invercargill Airport provides a key domestic passenger connection.

Otago has a population of 219,200 with most residents living in Dunedin and Mosgiel. Over the last 10-years, population growth in the Queenstown Lakes district and Central Otago has been among the highest in New Zealand and this trend is predicted to continue. Otago contributes 4.3% to national GDP with tourism, agriculture, horticulture and viticulture.

Trends in land-use such as growth in dairy conversions and forestry for harvesting is expected to drive increased freight movement, increasing pressure on the road network. Tourism is also projected to increase, particularly self-drive tourism from international visitors, which has a strong dependence on the provision of quality road links and information.

Figure 3 – Corridor overview



Understanding our customers

Key customers

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. The key customers utilising the corridor are diverse, and can often have competing needs at similar times of the day.

Rural dwellers

The corridor services many small rural communities, which have a strong reliance on the transport network. The corridor often runs through the centre of these communities, which provides good accessibility, but also creates issues with safety, noise and vibration from heavy vehicles.

In the **Southland Cluster**, the network of local roads and state highway provides ease of access and good connectivity between towns and rural dwellings.

In the **Otago Cluster**, the isolation of rural dwellers during periods of heavy snow is an ongoing issue during winter months. Middlemarch on SH87 is often affected by snow and associated road closures.

Insights into rural dwellers:

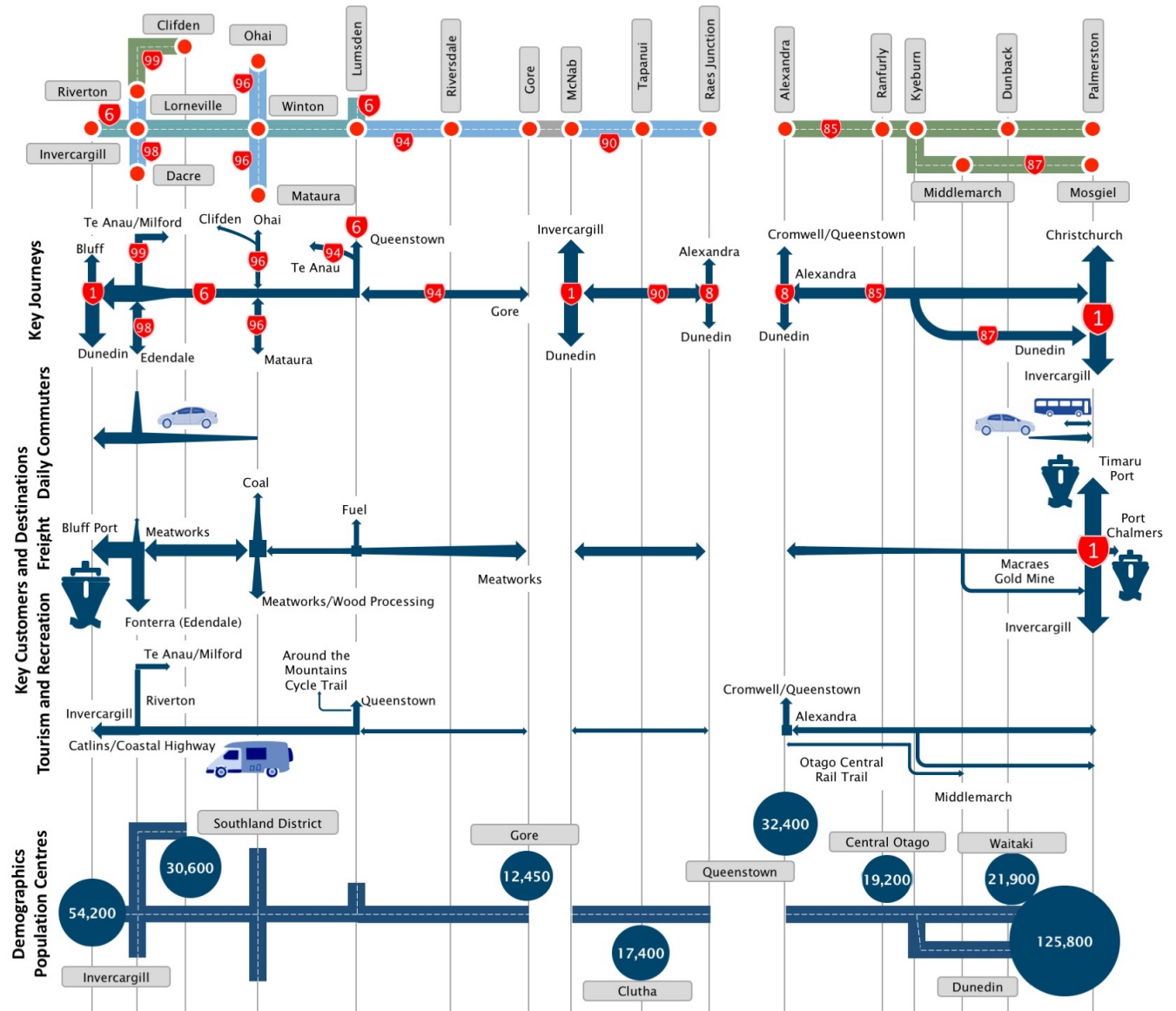
Road use: Private vehicles are the predominant mode of transport. Farm vehicles also access parts of the corridor.

Road knowledge: Rural dwellers are familiar with their route and will often use a combination of local roads and state highway to get to their destination in the quickest time possible.

Pain points: Isolation of communities in extreme weather events. Impact of traffic when it runs through the town centre.

Rural dwellers expect: Efficient and reliable journeys, ease of access to facilities that provide for their daily needs, and to be able to live in strong, proud and sustainable communities.

Figure 4 - Key customers, journeys, and destinations



Tourist and recreational users

The corridor provides access to key visitor destinations such as Milford Sound and Queenstown, and the opportunity to explore a range of popular tourist destinations including Stewart Island, the Catlins and the Otago Rail Trail.

The Southern Scenic Route is one of ten themed highways in New Zealand, promoted as a four-day self-drive journey between Queenstown and Dunedin, connecting natural and cultural attractions within the regions. A survey of the Southern Scenic Route in 2009 identified extremely high levels of satisfaction with the journey experience. Official cycle trails include the Otago Rail Trail and Around the Mountain Cycle Trail.

The regions are popular motorcycle routes due to vast areas of open road with low traffic volumes. The Taieri Gorge Railway provides a scenic rail journey from Dunedin to Middlemarch on SH87, an access point for the Otago Rail Trail.

Insights into tourist and recreational users are as follows:

Road use: There are many popular destinations and scenic points along the corridor, particularly SH99 and SH85 into Central Otago. Tourists are both domestic and international.

Road knowledge: Domestic visitors are more familiar with journey times. International visitors have less knowledge of the road, environmental conditions, likely journey times.

Pain points: Increasing number of self-drive tourists with expectations of higher levels of service. Consistent journey in terms of signage and road conditions. Black spots for mobile phone coverage. Road closures SH87/SH85 due to weather. Limited safe passing areas.

Tourist and recreational users expect: Ease of moving around, good directional signage to popular destinations including travel times, road availability and driving conditions, safe places to stop, readily available amenities when undertaking regional journeys, such as accommodation when journey plans are changed.

Freight operators

While the corridor supports comparatively low volumes of traffic, a high proportion of traffic is freight movement. On the **Southland Cluster**, most freight movement occurs within the regions, from farm to factory to port. Dairy, stock, forestry, coal are the key freight movements within the Southland region, with dairy the predominant freight movement in Otago. Fuel tankers service Central Otago via SH6/SH85.

Freight growth is expected to increase by 6.1 million tonnes per year across Southland by 2042, equivalent to an additional 205,000 truck trips, and by 7.8 million tonnes in Otago. Local roads are often used by heavy vehicles as they can provide more direct connections to origins and destinations than the network of state highways.

Insights into freight operators are as follows:

Road use: Increased frequency and weight of heavy vehicles to achieve efficient freight movement. Use of local roads where the state highway results in a longer or more arduous journey, or to avoid conflicting customer needs such as frequently stopping tourists.

Road knowledge: Knowledge of road conditions is particularly high given the geography, topography and extreme seasons. Confidence in managing difficult situations is high with many drivers willing to take calculated risks to keep business going.

Pain points: Road widths can be highly variable with narrow carriageways in some areas an issue for trucks. Winter road conditions impact on resilience and travel time predictability. Limited places for overtaking throughout the corridor. Sharing the road with other customers, namely tourists, who seek more from the corridor than just function.

Freight operators expect: Infrastructure that supports commercial activity. This includes alternative routes that cater for freight trucks safely with consistent width and visibility, passing opportunities and convenient places for trucks to stop and for drivers to rest. Information about road conditions that provides as much planning time as possible and enables considered decision-making and confidence that the advice is business-enabling.

Daily commuter

The corridor does not have a strong commuter function as it is predominately rural. The exceptions to this are Invercargill and Mosgiel. An urban bus network and various long-distance buses run between major Southland to other regions and a bus service operates between Mosgiel and Dunedin.

Insights into daily commuter users:

Road use: Use of private vehicles is the predominant mode of commuter transport with limited modes of alternative transport available.

Road knowledge: Local commuters are familiar with their route and there are viable alternatives to driving available in Invercargill and Mosgiel.

Pain points: Peak afternoon/evening traffic flows into Mosgiel from SH1. Efficiency and safety of the four-lane road layout on SH6 from Lorneville to Invercargill.

Daily commuters expect: Predictable journey times, consistent operating speeds, accurate and up to date information on traffic conditions, timely investment in transport infrastructure to ease congestion at peak times.

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, the use of two or more transport networks are required within Southland and Otago to ensure connectivity throughout vast areas of productive land which underpins their prosperity. As such, we will work with other network providers to provide a one network approach.

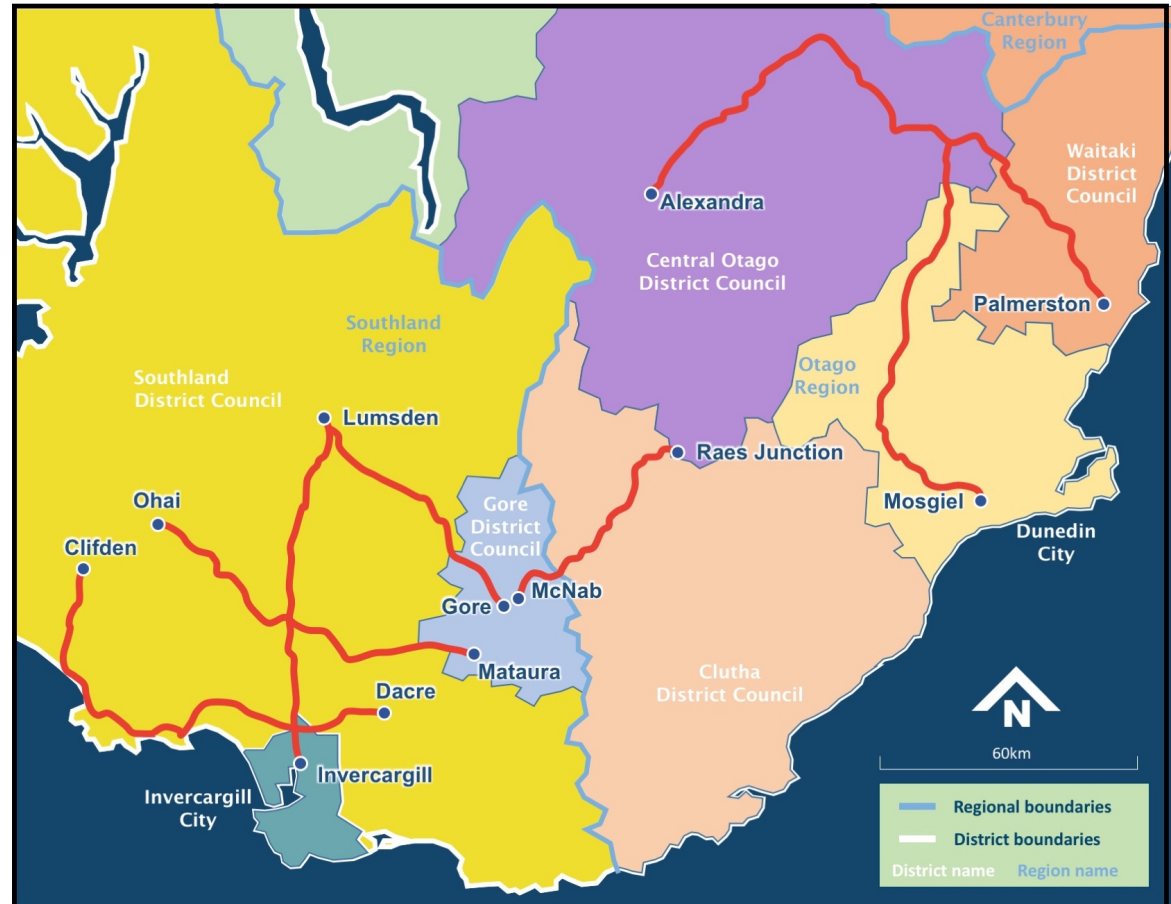
The NZ Transport Agency works closely with the local authorities and regional councils along the corridor shown in Figure 5.

Collaboration along the corridor

Currently the NZ Transport Agency is collaborating with the following organisations:

- Southland Regional Council on their Southland Regional Development Strategy action plan which highlights future transport actions to support the delivery of the regional growth strategy.
- Dunedin City Council and Otago Regional Council on 'Connecting Dunedin'. This project encompasses transport improvements for Dunedin city area, including the suburb of Mosgiel.
- Gore District Council on the Mataura Main Street beautification and speed management project.
- Invercargill City Council as they progress plans to upgrade SH1 through Invercargill as part of a major city centre scheme.

Figure 5 - Map of associated local authorities



Network Outcomes Contracts approach

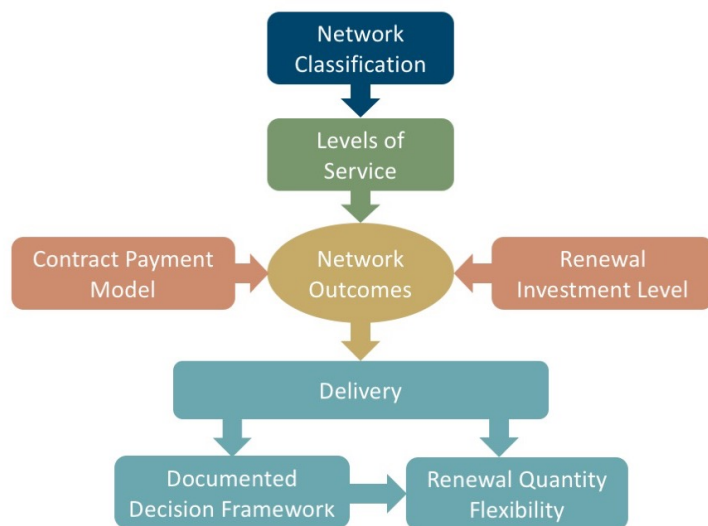
Network Outcome Contracts (NOC) are aimed at improving the effectiveness of service delivery for maintenance and operations of the state highway network. Elements of previous procurement methodologies (PSMC, Hybrid and Traditional models) have been integrated into the NOC contract model which delivers 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 is shown in Figure 6 below:

Figure 6 - NOC process



Collaborative delivery of services

The Southern Arterial and Primary Collector corridor crosses over three NOC areas.

Central Otago Network Outcomes Contract

The Central Otago NOC (PW O217/01) is undertaken by Fulton Hogan and commenced on 1 October 2016. This is a seven-year contract with the option of a further two years, based on performance. SH85 (Kyeburn to Alexandra) is included in the Central Otago NOC.

This contract is supported by the following specialist contracts:

- **Regional bridge and structures:** This contract covers both Otago and Southland regions. The work is undertaken by Opus International Consultants (PS O/207) and commenced on 1 July 2014 for a three-year period with potential for two single year extensions (3+1+1). Some routine structures maintenance sites are within the NOC contract with more specialised work put to the market annually as required.
- **Traffic monitoring:** Traffic count data in Otago and Southland is covered by a combined Otago and Southland region contract. The contract is undertaken by AgFirst Consultants (PS O/210) under a contract that commenced on 1 July 2014 for a 3-year period with potential for two single year extensions (3+1+1).
- **Delegations:** Urban area street cleaning and mud tank cleaning is delegated to Central Otago District Council.

Coastal Otago Network Outcomes Contract

The Coastal Otago NOC (PW O217/01) is undertaken by Downer NZ and commenced on 1 July 2016. This is a 7-year contract with the option, based on performance, of a further 2 years. SH85 (Palmerston to Kyeburn), SH87 and SH90 are included in the Coastal Otago NOC.

This contract is supported by the following specialist contracts:

- **Regional bridge and structures:** This contract covers both Otago and Southland regions. The work is undertaken by Opus International Consultants (PS O/207) and commenced on 1 July 2014 for a 3-year period with potential for two single year extensions (3+1+1).
- **Traffic monitoring:** Traffic count data in Otago and Southland is covered by a combined Otago and Southland Region contract. The contract is undertaken by AgFirst Consultants (PS O/210) under a contract that commenced on 1 July 2014 for a 3-year period with potential for two single year extensions (3+1+1).
- **Delegations:** Several activities are delegated to the local authorities. These include traffic light operation and maintenance (Dunedin City Council), urban area street cleaning and mud tank cleaning (Dunedin City Council, Waitaki District Council), street lighting power and maintenance (Dunedin City Council, Waitaki District Council), and noxious weed control (Dunedin City Council, Waitaki District Council)

Southland Network Outcomes Contract

The Southland NOC is undertaken by SouthRoads (PW S86/01) and commenced on 1 March 2016. This is a 7-year contract with the option, based on performance, of a further 2 years. SH6, SH94, SH96, SH98, and SH99 are included in the Southland NOC.

This contract is supported by the following specialist contracts:

- **Regional bridge and structures:** This contract covers both Otago and Southland regions. The work is undertaken by Opus International Consultants (PS O/207) and commenced on 1 July 2014 for a three-year period with potential for two single year extensions (3+1+1).
- **Traffic monitoring:** Traffic count data in Otago and Southland is covered by a combined Otago and Southland region contract. The work is undertaken by AgFirst Consultants (PS O/210) under a contract that commenced on 1 July 2014 for a three-year period with potential for two single year extensions (3+1+1).
- **Delegations:** Several activities are delegated to the local authorities. These include traffic light operation and maintenance (Invercargill City Council), urban area street cleaning and mud tank cleaning (Gore District Council, Invercargill City Council and Southland District Council), street lighting power and maintenance (Gore District Council, Invercargill City Council and Southland District Council), and noxious weed control (Gore District Council, Invercargill City Council and Southland District Council).



Visiting drivers may not be familiar with New Zealand's winding road alignments.

Drivers for change

The Southern Arterial and Primary Collector Corridor caters for variable levels and types of customers and this demand is expected to grow into the future.

Increasing tourism

Tourist routes are intended to create a discrete journey through New Zealand's countryside, connecting popular and tourist attractions that are often less well-known. Tourism is growing in New Zealand and the regions have an opportunity to promote the Southern Scenic Route even further.

The Southern Scenic Route is currently positioned as a one-way journey, typically from Queenstown to Dunedin. The placement of the corridor provides significant potential to create a tourist loop, utilising SH85, SH87 and parts of the adjoining corridors of Queenstown to Rangitata and Te Anau to Queenstown. Multiple benefits could be achieved from this approach in the long term including the following:

- Enhancing the tourist experience through promoting access to additional key destinations, scenic areas and amenities along the journey
- Supporting the Central Otago District Council proposal to establish SH85 and SH87 as a key tourist route and enabling this to occur in a coordinated manner
- Creating the opportunity to extend the route to include Arrowtown and help ease growth pressures on SH6/SH6A by diverting tourist traffic from Queenstown through Arthurs Point to Arrowtown and then connecting onto SH6 near Crown Range Road.

The success of this requires a seamless approach to the entire journey, regardless of ownership, so that customers have consistent levels of service along the way particularly in terms of journey information, safety and road conditions.

Regional economic development

The Southland Regional Development Strategy (SoRDS) Action Plan identifies three main challenges to enable social and economic growth for the region to 2025. These are to grow population, diversify the regional economy, and strengthen local business.

The SoRDS has a goal to increase the population in Southland by 10,000 people by 2025. The strategy outlines that the increase in population will build the capability of the professional and labour force and support economic development. Transport is identified as one of the enablers to this growth, by providing for rural transport, bulk haulage to the Port, increased tourist traffic, and supporting city/town redesign in Invercargill and Gore.

The majority of the corridor has the capacity to cope with increases in population, freight and tourism.

A summary assessment of each cluster is outlined in the table below.

Table 1: Drivers for change

	Driver for Change	Impact
Otago Cluster	Freight increase	<ul style="list-style-type: none"> • SH85/SH87 has capacity to cope with growth in most sectors including freight and tourism. • SH87 through Mosgiel pressures include safety and amenity in the town centre, and congestion and intersection limitations in south Mosgiel.
	Tourism increase	
Southland Cluster	Population growth in Mosgiel	<ul style="list-style-type: none"> • SH90/SH96 will require increased investment in pavement maintenance in the future to cope with growth in heavy vehicles. • The future closure of Nightcaps Mine will require a review of the SH96 status between Ohai and Wreys Bush. SH94/SH98 have capacity for future growth.
	Freight increase	
	Tourism increase	<ul style="list-style-type: none"> • The Southern Scenic Route along SH6 and SH99 has capacity for growth. The key journey however is not fully represented in this corridor and a broader response to tourism growth is required across the entire journey. • This includes implementation of Visiting Drivers Project safety initiatives, potential extension of the route, potential review of state highway status for sections currently designated to Local Authorities, and consistency of journey experience.

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 the purpose they serve. Importantly, it will help with the planning, investment, maintenance, and operation of the road network in a more strategic, consistent and affordable way throughout the country.

In time, all roads in a particular category should offer a consistent and fit for purpose customer level of service (CLoS) for road users. With knowledge of the 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.

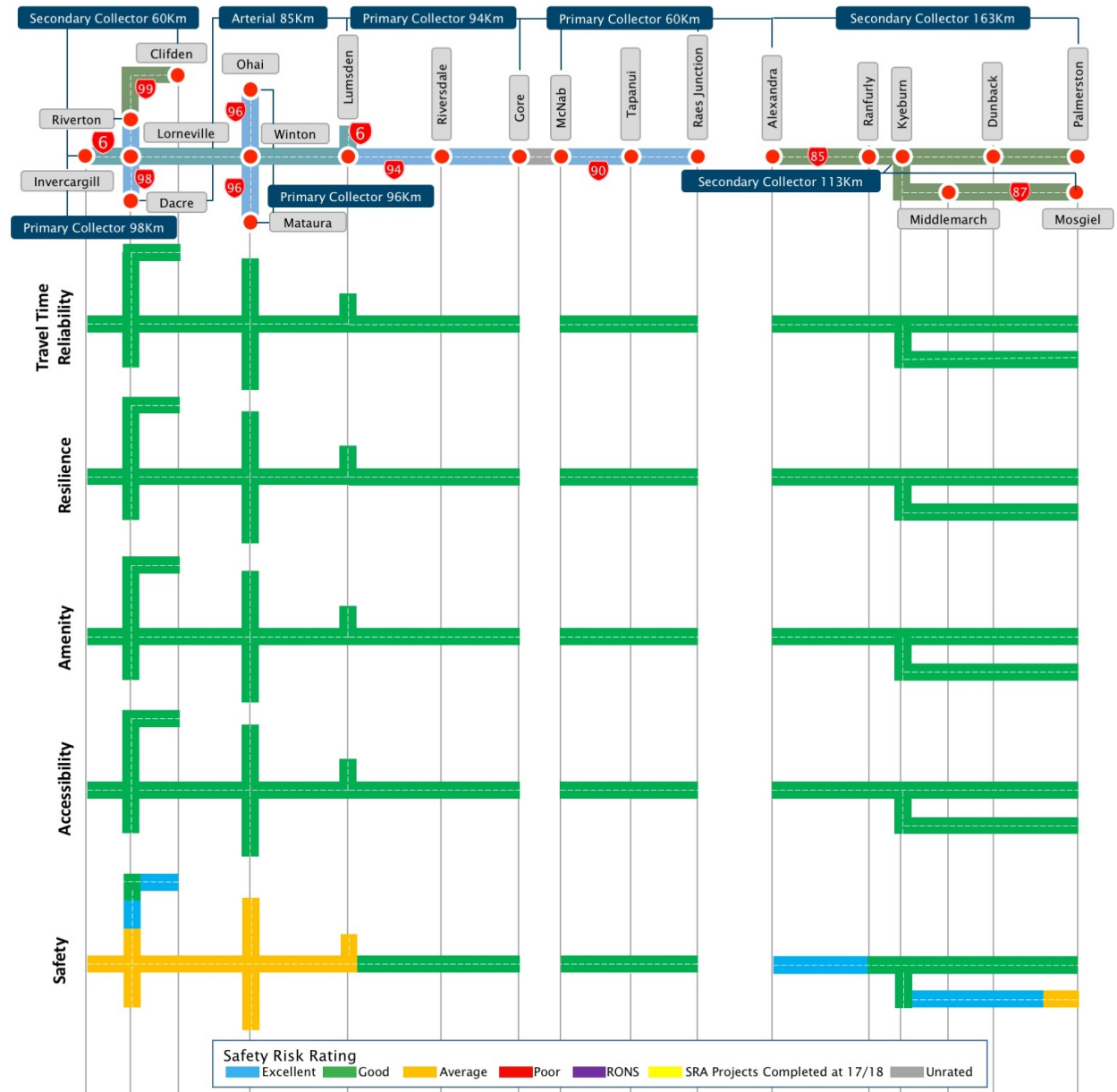
Road classification

SH6 from Invercargill to Lumsden is categorised as arterial, with the route providing a key connection to SH1 at Invercargill and SH6 travelling north to Queenstown.

SH90, SH94, SH96, SH98 and SH99 from Lorneville to Riverton are primary collectors. SH99 from Riverton to Clifden and SH85/SH87 are secondary collectors.

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 Southern Arterial & Primary Collector Cluster 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

Travel time reliability is generally high across the corridor with traffic flowing freely through most areas. However, increasing pressure is being put on the larger urban areas of Invercargill and Mosgiel, which can have variable reliability due to congestion at peak times. Good communication on road closures and weather conditions at key entry points is provided via permanent and mobile Variable Message Signs.

Resilience

Flooding of rivers and snow/ice often impact the operation of the corridor.

In the **Southland Cluster**, a connected network of local roads and state highways provide viable alternative routes in the event of a road closure.

In the **Otago Cluster**, SH85 and SH87 are viable routes towards the east coast. Both are alternative routes into Central Otago should SH8 be closed. There are not many local road alternatives on this route and the risk of isolation of the community is a concern during winter months.

Amenity

The road network generally complies with the ONRC Level of Service guidelines. Annual programmes of smoothing work and compliance with Operational Performance Measures under the NOC contract will be required to ensure this level of service is maintained.

Accessibility

The corridor has appropriate levels of accessibility in relation to its ONRC classification, providing an access and collection function to geographically dispersed regions. Mosgiel has the greatest pressure on accessibility, largely due to population growth. This growth and heavy vehicle use of SH87 creates safety and amenity issues through the town centre and increased congestion at the SH87 intersection with the Main South Line (railway) and local roads. The Mosgiel section of SH87 has considerably higher traffic volumes than those typical of a secondary collector road.

Safety

Most of the corridor has appropriate levels of safety in relation to its ONRC classification. Winter conditions, high winds and flooding create an environment that requires a proactive approach to minimising the risk of crashes. The mix of customers, particularly freight and tourism, can create a challenging environment for road users often resulting in frustration that can lead to poor decision-making and unsafe situations.

There are large sections of high personal risk along the corridor. There is a significant section of high personal risk between Kyeburn and Palmerston on SH85. Pressures on the corridor include a growing number of unfamiliar/visiting drivers as a result from a growth in tourism.

Improving the customer experience

There are no major improvements planned or underway on the corridor. The maintenance strategy generally achieves consistent customer levels of service across the corridor.

Access

Carriageway configuration

The carriageway configuration is a consistent two lanes throughout the corridor. Lorneville to Invercargill along SH6 has areas with four lanes in place to support commuter traffic, particularly at peak times. There are minimal passing lanes available, however, long stretches of road in some areas provide passing opportunities.

A one-lane bridge is located on SH87 between Middlemarch and Kyeburn. In the **Otago Cluster**, several 45 km/h bends require customers to significantly adjust their speed in these areas.

Speed limits

Most of the corridor is 100 km/h and is appropriate for the environment that the corridor runs through. Lorneville is a key intersection point of SH6, SH98 and SH99 and has an 80 km/h speed limit in place that extends south towards Invercargill.

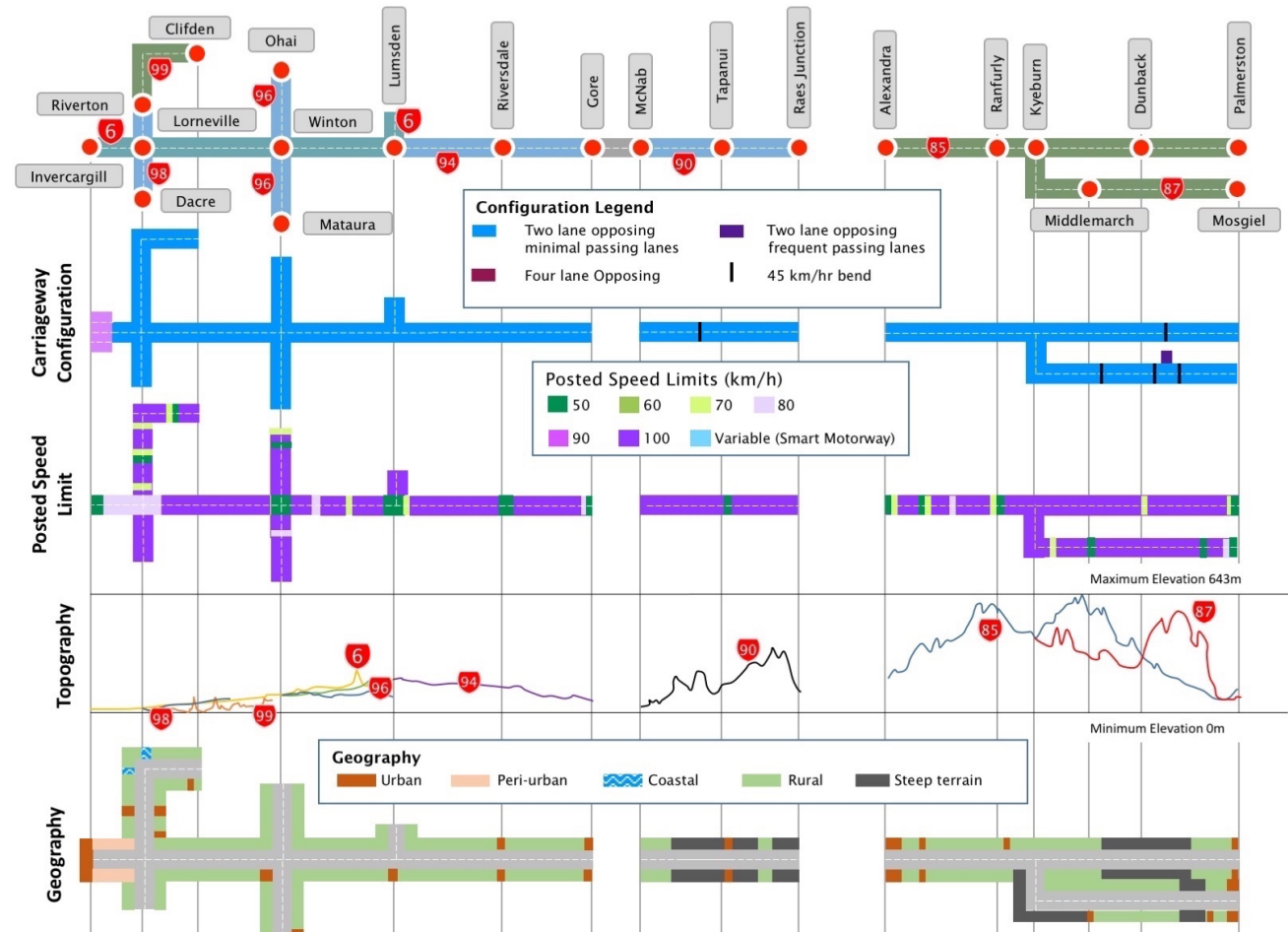
A range of reduced speed limits are in place within urban areas and rural communities located throughout the corridor.

Topography/geography

The **Southland Cluster** topography is dominated by flat to rolling rural landscapes with many rural communities dispersed throughout. The largest urban area is Invercargill. The cluster is characterised by coastal areas along SH99 offering scenic views and a gradual ascent to more alpine areas north of the corridor.

The **Otago Cluster** runs through rural landscapes and steep alpine terrain, creating a challenging environment during the winter months.

Figure 8 - Corridor characteristics

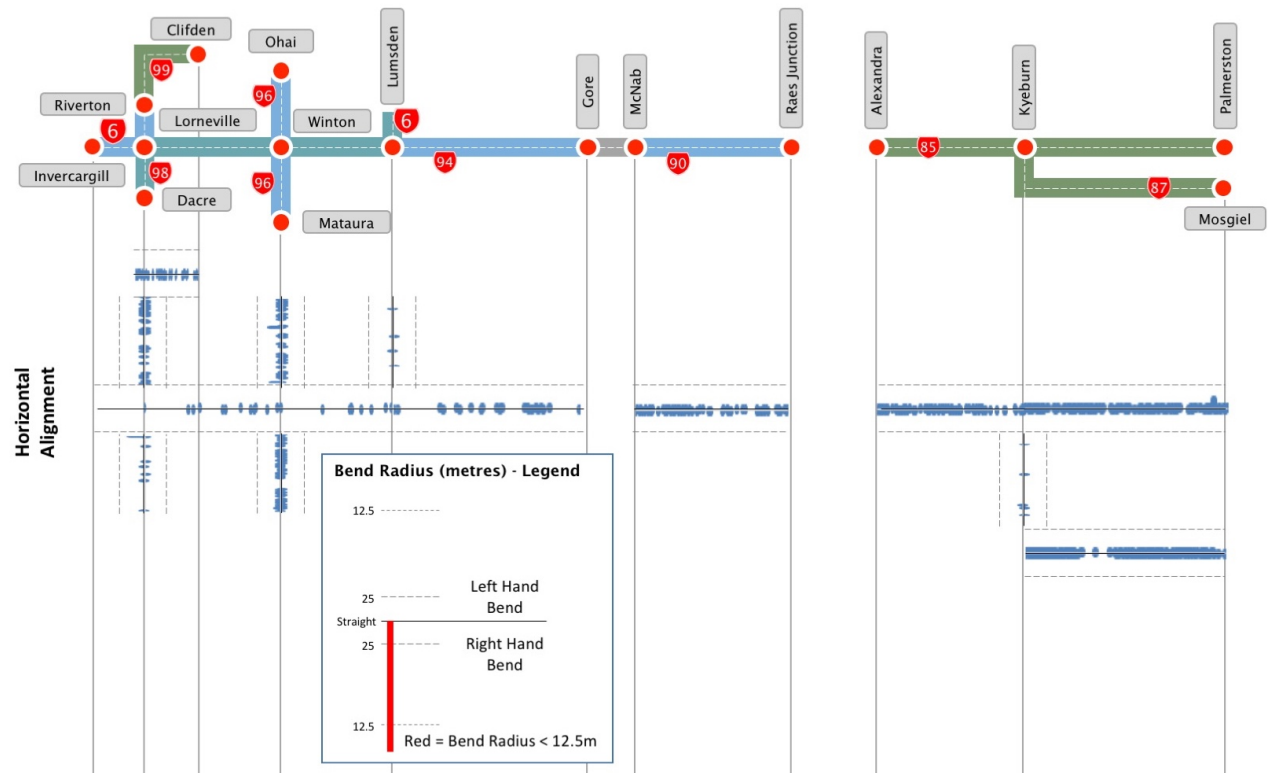


Horizontal alignment

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 regular occurrence of larger radius curves, with higher concentrations along SH85, SH87 and SH96. There are no sharp bends with a radius below 25m on the corridor.

Figure 9 - Horizontal alignment



Volumes

The **Southland Cluster** has comparatively low traffic volumes. Increased traffic volumes are only evident travelling into Invercargill. Heavy vehicle use reflects both the role of Invercargill as a service hub and the movement of freight. A large network of local roads connects communities and the state highway network, further dispersing traffic flows across a wider network and providing a range of alternative journey options.

The **Otago Cluster** has low traffic volumes, except for Mosgiel where there is a noticeable increase. The availability of other journey options from Dunedin into Central Otago places less reliance on SH85 and SH87. Heavy vehicle use is predominantly for the servicing of farms along this cluster. Local roads also play a role in dispersing traffic from the state highway, occasionally providing a faster journey to the destination. The Ida Valley Road between Omakau and Idaburn is regularly used for this purpose, as well as providing a scenic alternative to SH85.

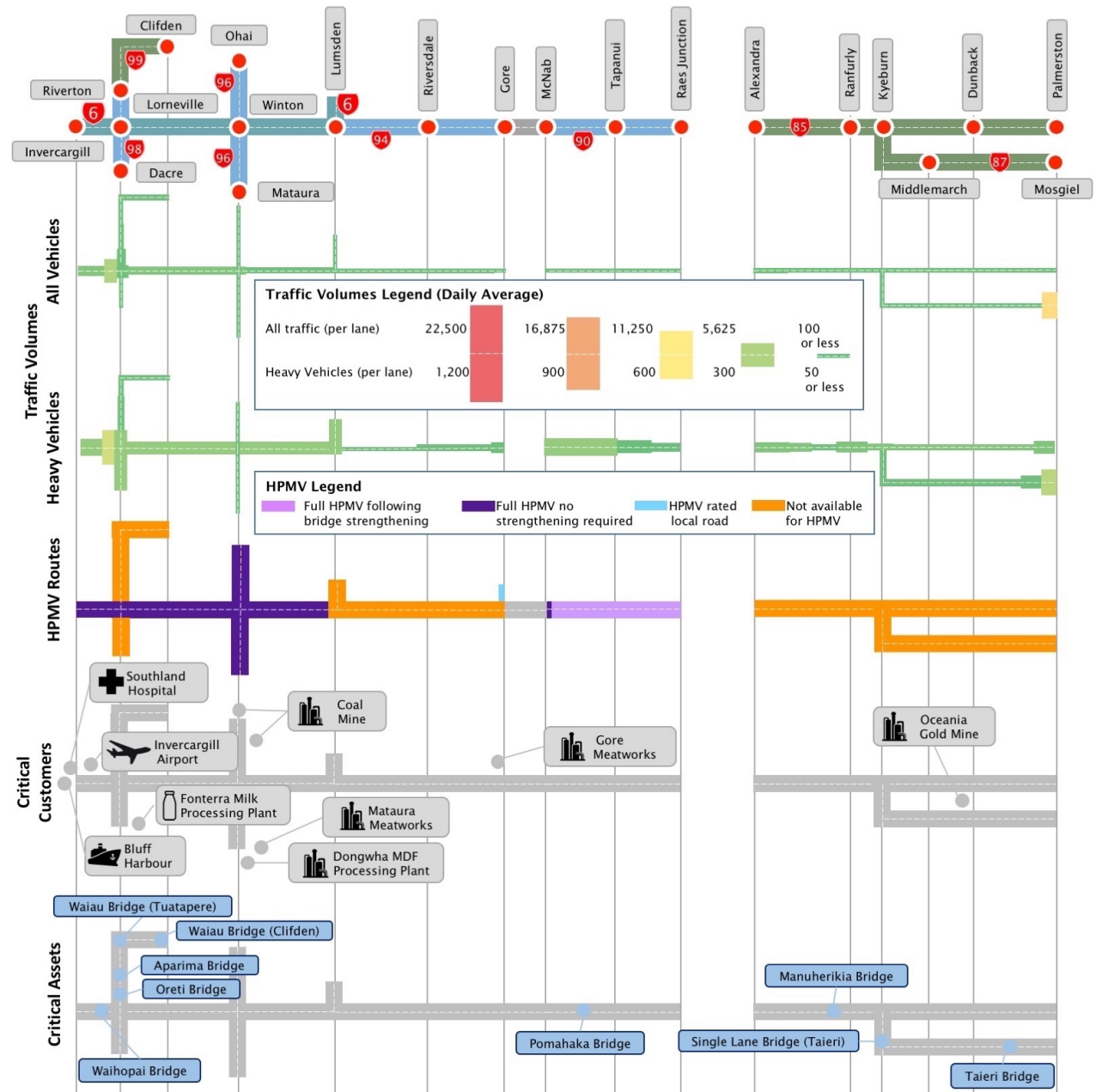
HPMV routes

Large sections of the corridor are not available for HPMVs and there is no anticipated demand for this in the future based on the current land use patterns and extent of freight activity occurring. Invercargill north along SH6 to Lumsden and SH96 from Ohai to Matura has full HPMV status reflecting the high levels of freight movement primarily for dairy, stock and coal.

Critical customers and assets

There are critical customers adjacent or close to the corridor, which rely on 24/7 access and are vulnerable to short-term interruptions. These include the transportation of perishable goods such as milk, and timely journeys for people travelling to Invercargill Hospital and Invercargill Airport. In both instances, delays of more than 30 minutes can result in failed journeys for customers. Critical bridge structures are located along sections of the corridor, particularly on SH99 between Lorneville and Clifden. These are often affected by coastal erosion and flooding, which impacts on the operation and condition of the state highway.

Figure 10 - Corridor capacity



Pressures

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

Southland Cluster:

- **Impact of heavy vehicles on the road surface:** Freight is the highest and most frequent user and is projected to continue to grow. Changes in landuse and new industries/closure of existing industries will change the travel pattern of heavy vehicles.
- **Movement of perishable goods:** Dairying is extremely vulnerable to short-term interruptions that impact productivity such as road maintenance and road closures. This creates pressure on the effective operation of the network.
- **Aparima River Bridge in Riverton:** This bridge is only capable of taking one heavy vehicle at a time, impacting on the efficient movement of heavy vehicles on SH99 through the Riverton area.
- **Increasing popularity of the Southern Scenic Route:** Visitor expectations of a consistent and reliable journey experience. This includes consistent signage, road condition information, cell phone coverage, rest areas, and amenities.

Otago Cluster:

- **Access to rural communities:** The cluster operates as a lifeline to the smaller communities located along SH85 and SH87. Communities can be significantly affected by road closures. Black spots in cell phone coverage also contribute to this pressure.
- **Growth in tourism:** The cluster is the primary access way of the Otago Central Rail Trail and Taieri Gorge Railway. It also offers access into unique and remote areas of Central Otago for tourists.
- **Mosgiel population growth:** Residential growth and heavy vehicle use through the town centre is contributing to congestion, safety, and amenity issues. The location of the Main South Line (railway) at a key intersection with SH87 and local roads creates congestion issues that can impact on the operation of SH1.
- **Land use:** Changes in land use which includes increasing dairying and potential mine closure which could impact requirements/demands on access.
- **Narrow shoulder width for cyclists:** Cyclists are an increasing user of the roads near Mosgiel/Outram and, due to narrow shoulder widths, have limited room for movement away from heavy vehicles or cars travelling at speed.

Future considerations

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

Southland Cluster:

- **Corridor management to increase asset life.** Consider smarter ways of responding to higher investment requirements without compromising the efficiency of use of the network by heavy vehicles. A recent example is Southland District Council placing speed restrictions on some bridges to prolong their useful lives.
- **Changing industry trends.** Mataura Valley Milk is developing a \$200 million dairy processing plant near McNab. This has the potential to redistribute heavy traffic across the region and create different pressure points on the network. The potential for future closure of coal production at Takitimu Coal Mine, near Nightcaps, will significantly reduce heavy vehicle use of this section of SH96. The state highway status and ONRC classification may no longer be appropriate and should be reviewed at the right time.

Otago Cluster:

- **Maintenance regimes:** The potential future closure of the OceanaGold Macraes Mine on Macraes Road will influence the maintenance strategy approach due to less loading on the road surface. Across the wider corridor, continuous improvement in the approach to winter maintenance requirements, including use of technology that enables smarter thinking when predicting and responding to weather events, should improve access and rationalise maintenance. Technology could include real-time monitoring of road temperature or permanent road de-icing sprayers on known high risk sections.
- **ONRC classification review:** There is ongoing growth in dairying and a growing importance of SH85 as an important freight link to processing factories located along SH1. A review of the ONRC classification of sections of the corridor to better align with use and function will enable investment to be better focussed in the future.
- **Review of the Southern Scenic Route.** Consider SH85 and SH87 becoming part of the Southern Scenic Route. This would create a 'loop' journey between Dunedin and Queenstown and will require a change to the way this journey is managed and marketed.

Resilience

Climate and topography have the greatest impact on resilience of the corridor.

Vulnerabilities

The corridor is susceptible to ice and floods that have varying degrees of impact on the network. There are several areas where there is no cell phone coverage.

In the **Southland Cluster**, the Makarewa River near SH99 and Pomahaka River on SH90 are prone to flooding, which often results in road closures. In the **Otago Cluster**, winter conditions are the predominant risk on SH85 and SH87, often isolating communities. Areas of SH85 and SH87 are susceptible to flooding, particularly near Palmerston and on the Taieri Plains.

Alternative routes and diversion lengths

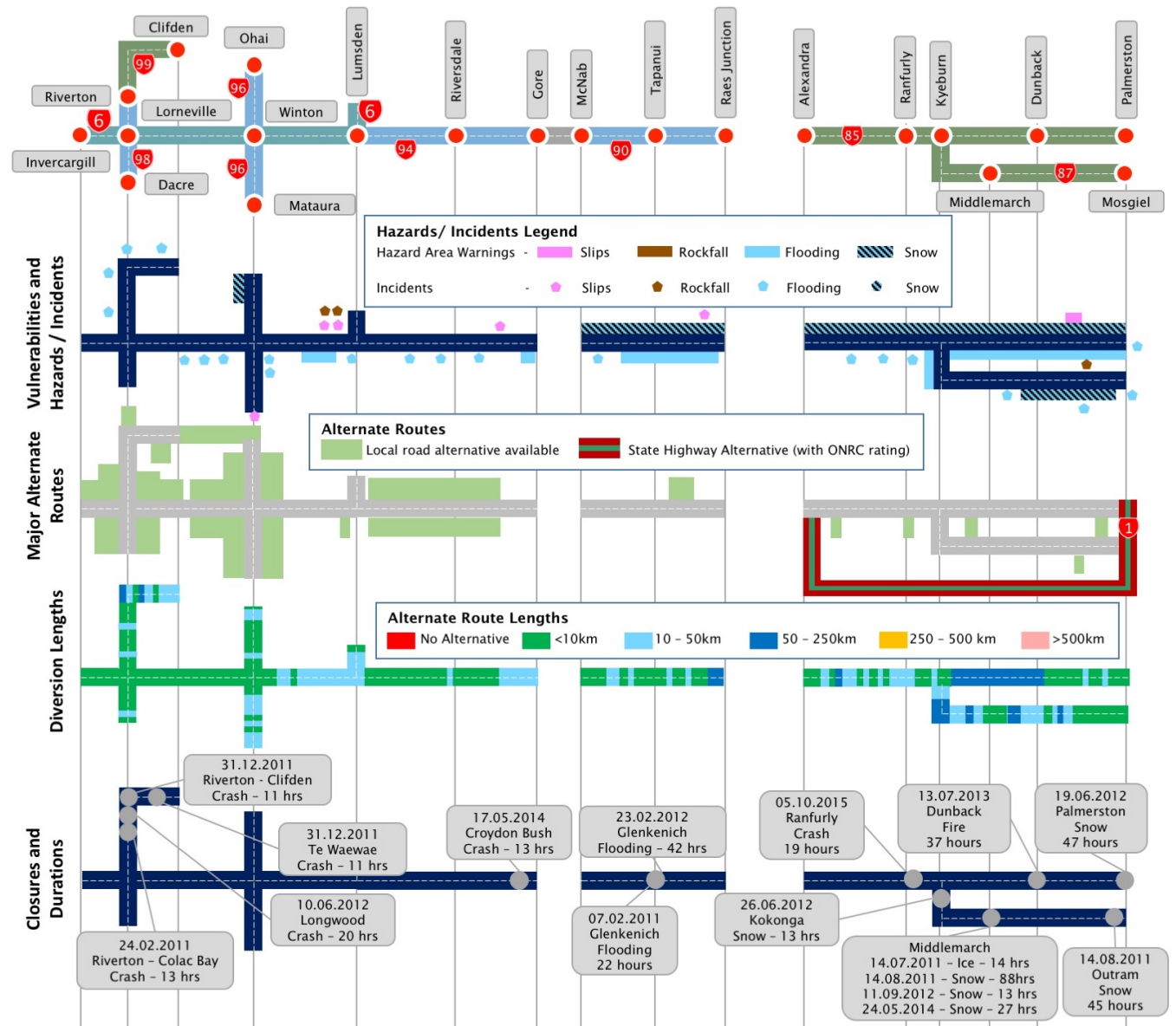
In the **Southland Cluster**, the extensive and interconnected network of state highway and local roads creates numerous alternative and viable options should road closures occur. Generally, the length of diversion routes is relatively short.

In the **Otago Cluster**, SH85 and SH87 are alternative routes for each other in the rare event that one is closed. Both are alternative routes to Central Otago if SH8 is closed, offering similar journey times. There are few local road alternatives. Permanent Variable Message Signs and gates are in place at key entranceways into SH85 and SH87.

Closures and duration

The major unplanned road closures and duration of interruption along the corridor in the last five years are shown in Figure 11. The common causes of road closures are flooding, snow/ice and vehicle crashes. Closures due to snow are a regular occurrence and can last for more than 24 hours in duration if significant.

Figure 11 - 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:

- **Access:** Accessibility of communities and their expectations of 24/7 access during extreme weather events. Planning for resilience of these communities is a vital part of the operation of the corridor to ensure communities continue to have access to their day to day requirements. Examples are Middlemarch and Ranfurly, which become isolated during road closures and periods of heavy snow.
- **Mobile phone coverage:** There is an increasing customer expectation of consistent and 24/7 access to mobile phone coverage across all journeys for information and for safety when incidents occur. Coverage black spots exist throughout the corridor, for example near Riversdale and Gore on SH94, and on the Southern Scenic Route. This also impacts emergency services response times and emergency maintenance response.
- **Changes in weather intensity:** Predictions indicate an increase in the intensity of weather events and the potential for an increased number of flooding events. This can impact on the state highway network in terms of road closures, and maintenance/investment requirements.

Future considerations

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

- **Higher quality asset:** With increasing adverse weather events, improved drainage and more robust pavements will improve corridor resilience. The area known as Deadhorse Pinch on SH85 and McCracken's View on SH99 have ongoing issues with slips that may require a pro-active solution rather than the current reactive maintenance approach.
- **Improved telecommunications:** Work with telecommunications providers to provide greater mobile phone coverage improving emergency services and maintenance response times. It would also allow 'push' notifications of real time road information to customers. The benefits of more informed customers are significant, particularly in terms of visitor safety and positive visitor experience. Identify priority areas such as the Southern Scenic Route.

Reliability and efficiency

Efficiency

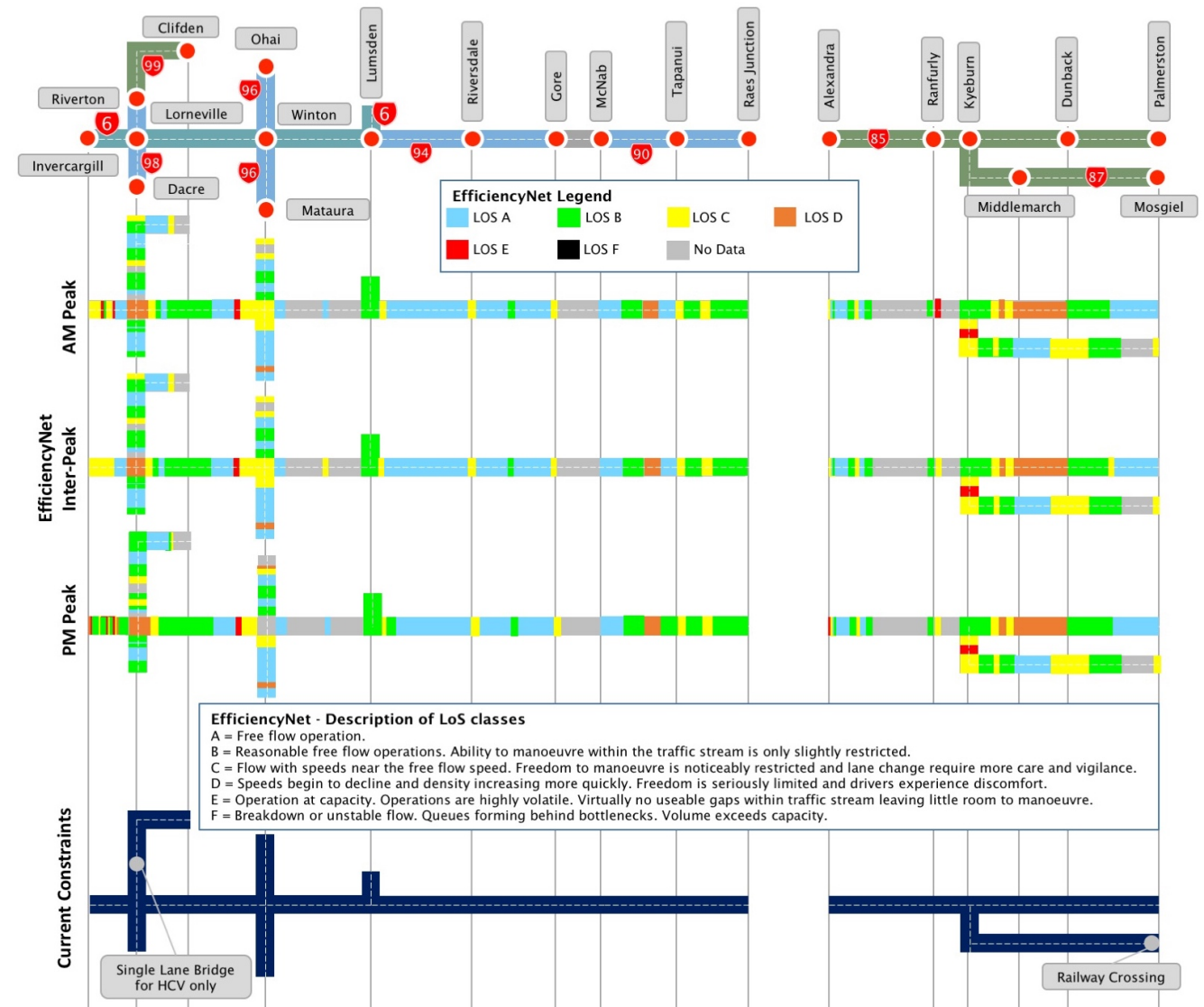
Most of the corridor performs well at all times. Level of service reductions occur mainly around urban areas and at specific points where topography and road conditions have the potential to impact on the efficiency of the journey.

Numerous areas along the corridor do not have efficiency data available to be able to determine how they operate.

Current constraints

The major current constraints on the network affecting journey reliability and efficiency are shown in Figure 12.

Figure 12- 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 follows:

Southland Cluster:

- **SH6 into Invercargill:** While growth is relatively static, issues with the efficiency of the current four lane section of SH6 between Lorneville and Invercargill are impacting this journey. The narrow width of the four-lane carriageway constrains the ability to cater to multi-modal forms of transport, such as cycling. Car parking on the side of the road also limits the efficient flow of traffic.

Otago Cluster:

- **Urban growth:** Mosgiel has undergone significant growth in the last ten years and this is projected to continue within the town centre and surrounding lifestyle blocks. SH87 runs through the town centre. A key challenge is managing traffic and freight demands in a way that enables improvement of the amenity and safety within the Mosgiel town centre, particularly for vulnerable users such as children and the elderly.
- **Commuter congestion:** A noticeable increase in commuter traffic travelling between Dunedin and Mosgiel has placed considerable pressure on the two major intersections and railway line that cross SH87 to the south of Mosgiel, with congestion often backing up to the SH1 Mosgiel off ramp.

Future considerations

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

Southland Cluster:

- **Improvements to SH6 near Invercargill:** Future options for the road layout of SH6 from Lorneville to Invercargill town centre need to take into consideration:
 - traffic volumes
 - key users
 - multi-modal transport options
 - impact of surrounding land use on the efficient operation of this section of the corridor
 - Invercargill City Council strategic direction such as cycling strategies, town centre revitalisation and economic development initiatives.
- **Safety and amenity in rural towns:** An important consideration for future maintenance strategies is the need to prioritise the amenity and safety of the many rural communities that the corridor traverses through. For example, ensuring that assets are maintained efficiently without risking asset condition too far as to create safety and noise issues.

Otago Cluster:

- **Review of SH87 functional priority:** Determine future options for freight and commuter movement along SH87 with a view to achieving a balance between providing for efficient freight and commuter movement and protecting the amenity and safety of the Mosgiel town centre

Safety

Collective risk

The level of collective risk is low across most of the corridor except between Invercargill and SH98/SH99 intersection where it has a medium-high collective risk rating. SH99 adjacent to Clifden and SH87 approaching Mosgiel also have medium-high collective risks.

Personal risk

High personal risk is predominantly seen on SH85 and SH87, particularly from Kyeburn to Palmerston and around Middlemarch to Mosgiel. SH6 to Lumsden and isolated segments on SH96 and SH99 are also rated high risk. SH95 overall is risk rated as low and medium except between Riversdale and Gore where a small section of the highway is medium-high.

Star rating

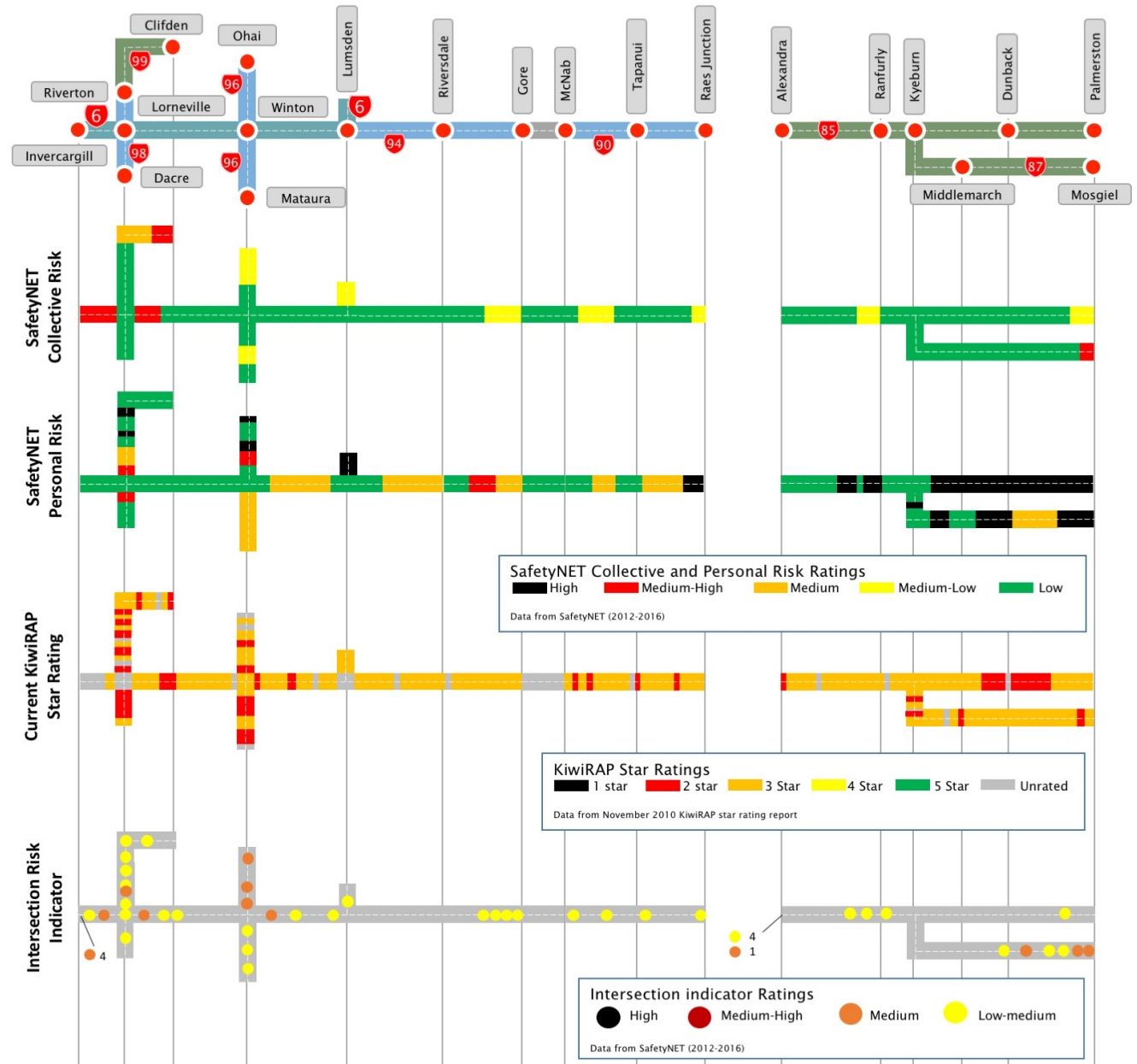
The KiwiRAP rating for SH94 is generally 3-star except for small sections of 2-star. SH98, SH99 and SH 96 have proportionally greater areas of 2-star rating compared to SH94 and only small section of 3-star rating.

For SH85 and SH87, these are predominantly 3-star rated corridors except around Dunback and some isolated sections near Alexandra, Middlemarch and Mosgiel where it is 2-star.

Intersection risk indicators

There are no high-risk intersections along the corridor. There are four medium risk intersections in Invercargill. Between Winton and Ohai there are three medium risk rural intersections. The corridor features low-medium rated rural and urban intersections across its entirety.

Figure 13 - 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:

- **Growth in tourism:** While there is capacity in the network to cater to this growth, driver behaviour issues are difficult to manage. This impacts on the safety of the network as road users are less familiar with New Zealand road conditions and road rules.
- **Crashes:** Ongoing death and serious injury crashes. Preventative actions need to be taken to minimise reoccurring crashes across the corridor, with safety being the key consideration over cost.
- **Sharing the road with other customers:** The mix of customers, particularly freight and tourism, can create a challenging environment for road users often resulting in frustration that can lead to poor decision-making and unsafe situations. For example, farm vehicles travelling at 40 km/hr and tourists unfamiliar with the road, wanting to take advantage of scenic opportunities along the way.

Future considerations

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

- **Tourism:** The corridor has capacity to cope with growth in tourism. However, the broader implications of growing tourism, particularly international self-drivers, utilising this network, and their associated expectations needs to be better understood and responded to.
- **Safety:** Changes to speed limits, lane delineation, rumble strips, and keep left arrows are low cost initiatives that can influence the safety of road users.



People, places and environment

Natural environment

The corridor is characterised by a rural landscape with areas of conservation land along the Southern Scenic Route on SH99 and the Blue Mountains on SH90. The coastline along the Southern Scenic Route provides stunning views of Foveaux Straight and Tewaewae Bay. Natural landscape features such as Raggedy Range, St Bathans Range and the Maniototo Valley are found within the **Otago Cluster**.

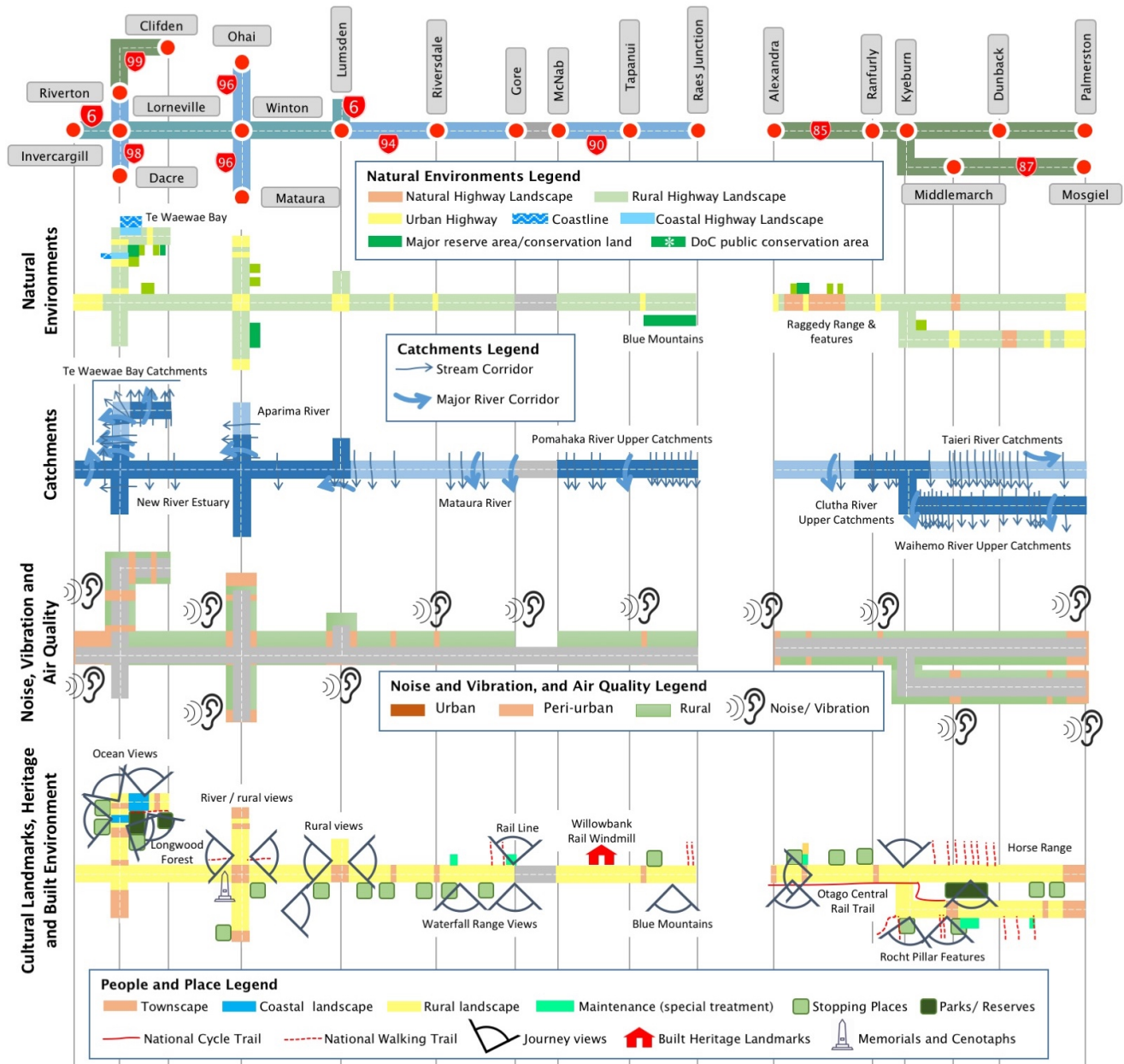
Noise, vibration and air quality

There have been complaints in some areas regarding noise and vibration particularly where the state highway runs through the middle of urban centres. This is managed through forward works renewal programme and maintenance strategies.

Cultural landmarks, heritage and built environment

There are numerous viewpoints along the corridor providing views to the ocean, waterfalls, forests and rural landscapes, particularly along the Southern Scenic Route. National walking trails and the Otago Rail Trail are key recreational features along SH85 and SH87. Stopping points and parks/reserves appear to be located where scenic viewing opportunities are available along some sections of the corridor. Towns along the corridor provide stopping points for access to amenities such as cafes and public toilets.

Figure 14 – 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:

- **Stock effluent disposal:** The seasonal change in location of stock over winter months from SH6 north and along SH90 to Central Otago, and along SH85 requires adequate access to stock effluent dump stations.
- **Management of trees adjacent to the corridor:** Farmers are planting trees close to the road (and areas of existing trees) that create shade. Wilding pines also establish. This can result in black ice on the corridor during winter months.
- **Increasing environmental standards:** Changing water quality standards has implications on stormwater runoff and management of soil contamination from roadside activities includes requirements for the removal of soil from sites to A grade landfills.
- **Increase in irrigation:** Newly irrigated areas often have drainage points onto the state highway, affecting the road pavement and risking water quality standards of surrounding water catchments.
- **Management of noise, vibration and air quality:** Many rural communities are undergoing a change from historically rural service centres to destinations and preferred places to live. Heavy vehicles on the state highway have a considerable impact on the ability to achieve this, particularly in terms of pedestrian connectivity, safety and amenity of the town centre. In Winton, Southland District Council are progressing plans to develop a heavy vehicle bypass off SH6 to improve the amenity and safety of the town centre. This has been a slow process with land purchase stalling any further progress. A heavy vehicle bypass has also been discussed for Mosgiel, but plans have not progressed further.
- **Tourist information:** The location, availability and consistency of approach to signage comes under pressure with greater use of the network by international and domestic drivers.

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:

- **Integrated land use planning:** Application of a 'place-based' approach to communities, where agencies work together to understand and respond to local community objectives and outcomes; particularly where the corridor has a significant impact on the attractiveness and function of town centres.
- **Stormwater management:** Improved management of stormwater to meet increased standards, particularly into water sensitive areas such as the water aquifer in Gore.
- **Development of the Southern Scenic Route:** There is potential for SH85 and SH87 to become part of the Southern Scenic Route to create a 'loop' journey between Dunedin and Queenstown. This will require a change to the way this journey is marketed and used, including the approach to future management of these sections of state highway to meet future customer requirements.
- **Vegetation management programmes:** Managing wilding pines and working with local farmers to manage tree planting near the corridor, particularly along SH85.
- **Bypasses:** Construction of a heavy vehicle bypass in Winton in response to requests from the community to minimise the impact on the connectivity, safety and amenity of their town centre.



Trees on SH94 encroaching on the highway have a detrimental effect on the pavement and pose a safety risk.

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 692 km of road network which reflects 6.1% nationally. The total value of the assets along the corridor is \$642M (excluding ITS, and, heritage and green assets).

The corridor assets have been divided into eight groups as shown in Figure 15 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 15 – Corridor asset base

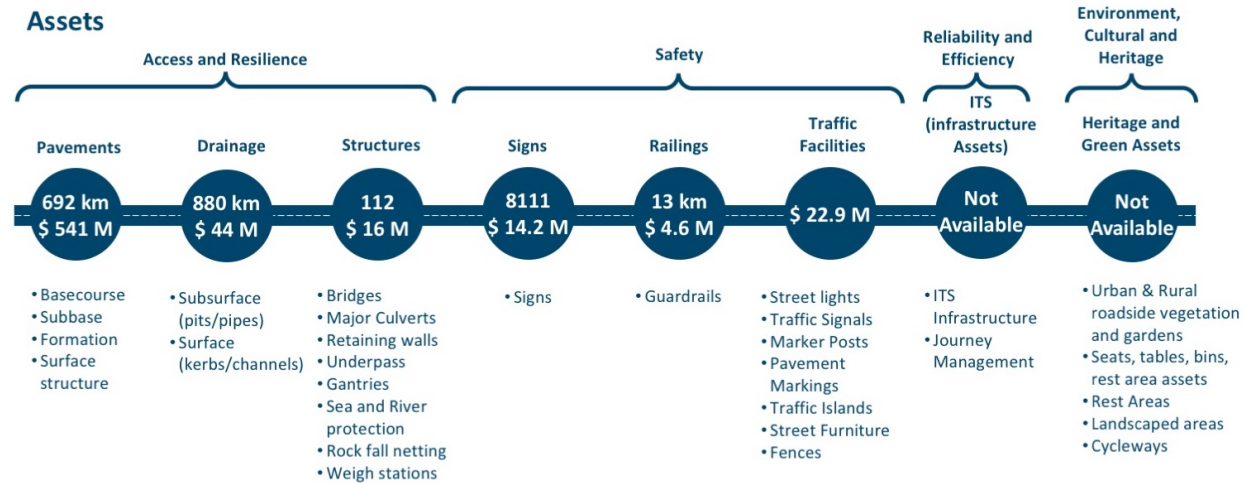


Figure 16 – Summary asset condition and performance



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 SH6/1168 between Lorneville and Invercargill, and, SH96/66 and SH96/84 between Heenans Corner and Ohai show a significant amount of surface skid resistance below the threshold limit, as well as within the investigation limits. These sections also show a significant degradation in surface skid resistance over the three-year period.

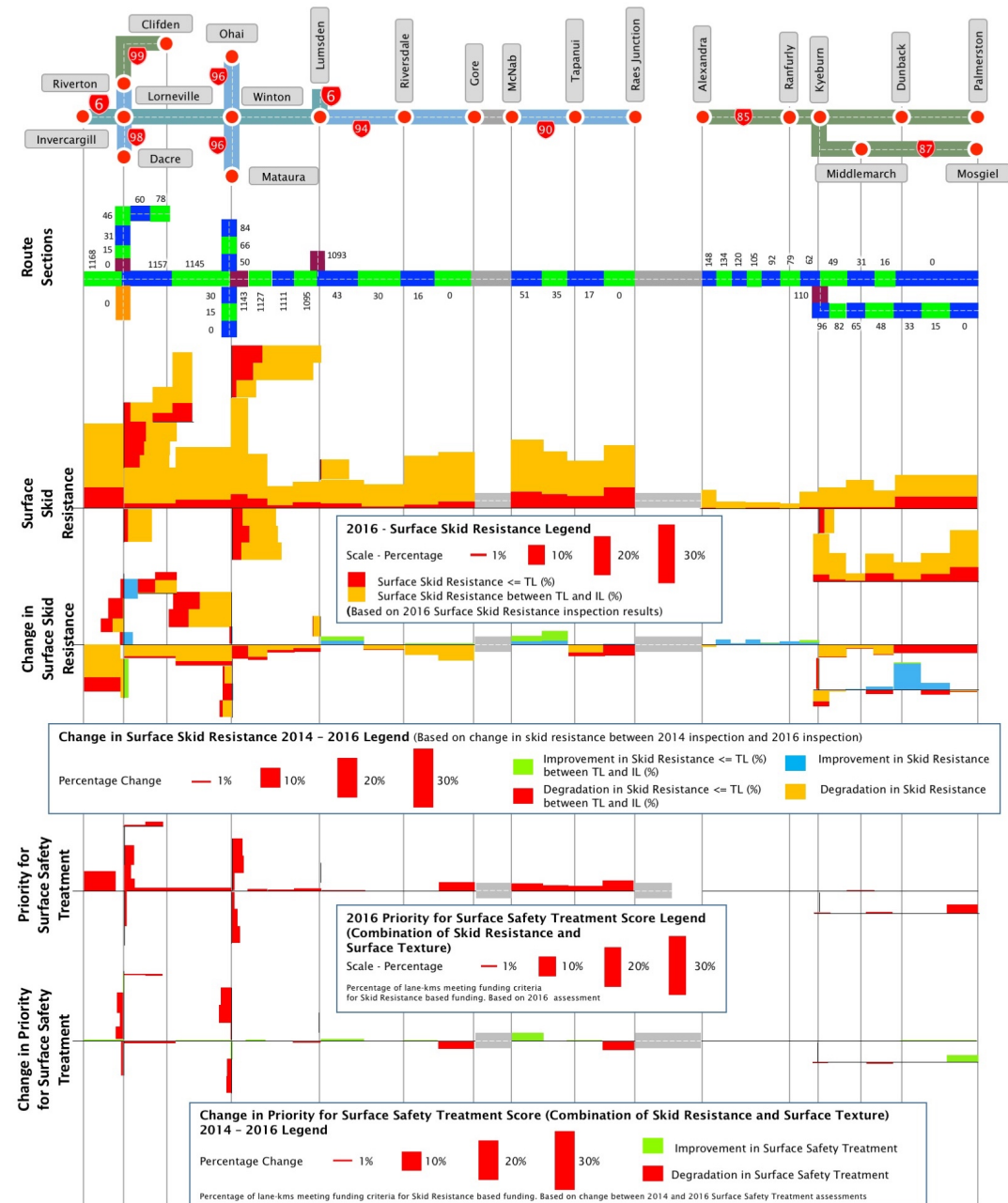
Priority for surface safety treatment

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 proportion (1.63 %) of the corridor achieved Skid Assessment Length that qualifies for funding. This equates to only 22.3 lane-km of the 1,368 total lane-km of the corridor. The sections with the highest priority for surface safety treatment qualifying for funding are: SH6/1168.

Figure 17 – Asset condition



between Lorneville and Invercargill, and, SH96/66 and SH96/84 between Heenans Corner and Ohai. These three sections also show the largest increase priority for surface safety treatment over the last 3 years.

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, 10.4% of the corridor achieves a score above which inspection is required. Sections with significant lengths of surface requiring inspection include: SH6/1168 between Lorneville and Invercargill, SH90/0 southwest from Raes Junction, and, SH96/66 and SH96/84 between Heenans Corner and Ohai. These sections also show a significant level of degradation in score over the last three years.

Figure 18 – Asset condition 2

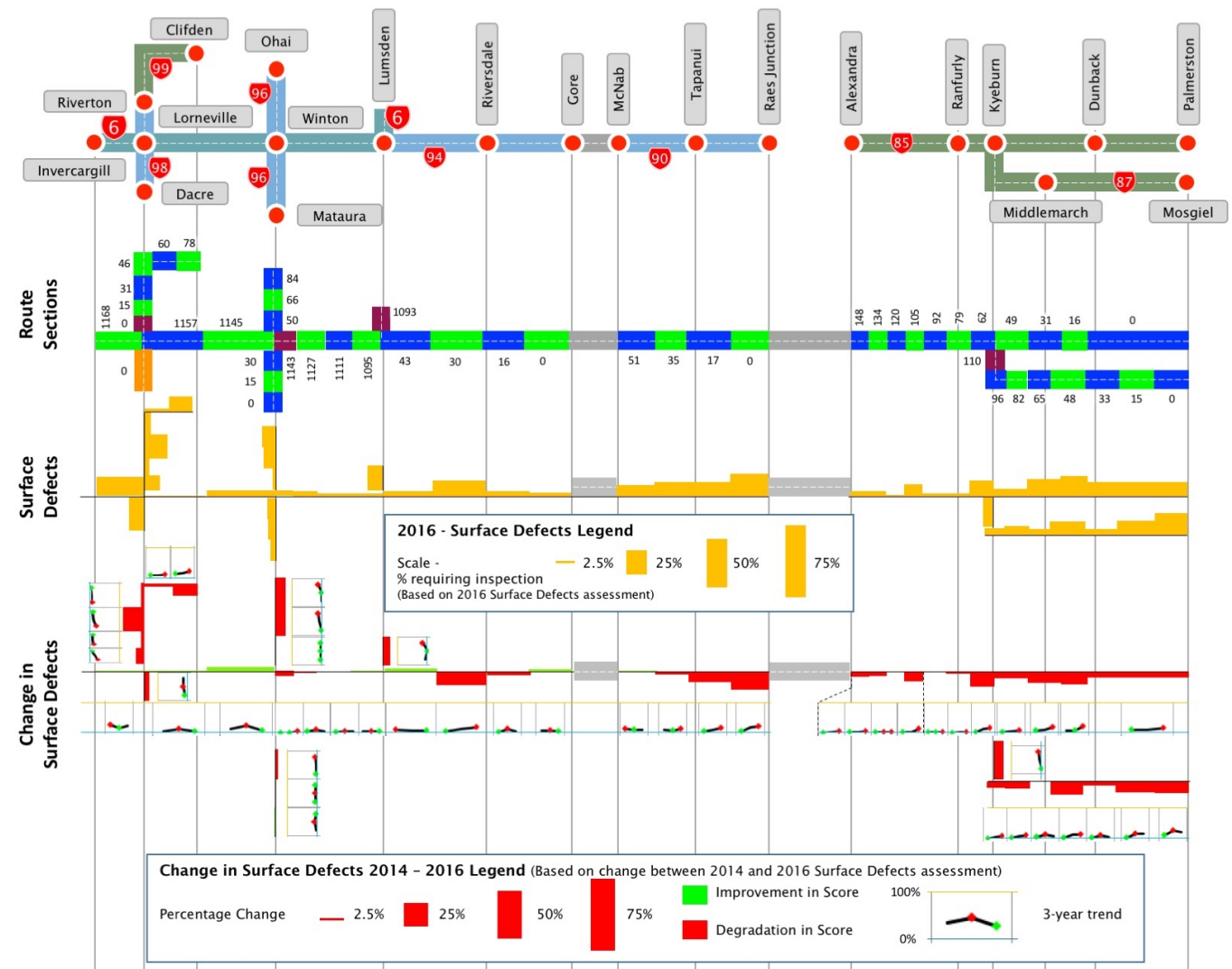


Figure 19 – Asset condition 3

Surface age

The infographic shows the weighted average age of road surface, and the proportions of surface age that fall within the three age bands.

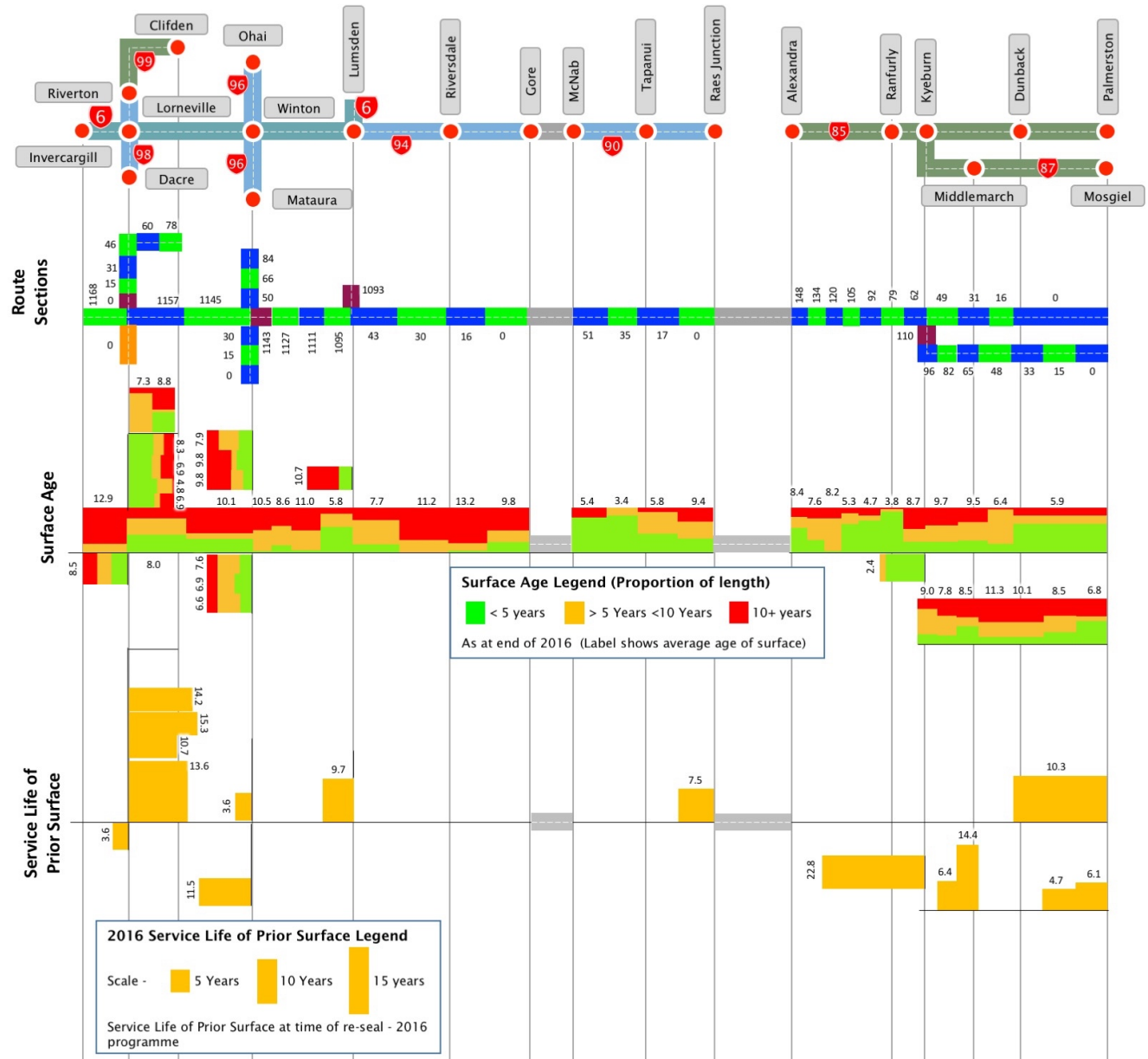
The base data is all the seal lengths and their age from RAMM. Then a weighted average is then calculated. Overall, all sections add up to 100%. The proportion is the length of corridor in a particular age band as a percentage of the total length of that section.

The sections of corridor with the oldest age profile are SH6/1111 between Dipton and Benmore, SH6/1143 through Winton, SH6/1168 between Lorneville and Invercargill, SH87/48 south of Middlemarch, and, SH94/16 and SH94/30 between Mandeville and Balfour.

Service life of prior surface

The infographic shows the weighted average age achieved for the sections of road surface that were resurfaced in the last financial year (2015-16). The infographic only shows sections where re-surfacing work was undertaken in the 2015/16 season. The value is derived from the weighted average age of the sections of seal that were overlaid by a new first coat seal. This is a standard ONRC measure.

Overall the re-surfaced sections achieved an average service life of 11.9 years, with sections SH87/65 north of Middlemarch, SH87/110 south of Kyeburn, and, and SH99/15 and SH99/31 between Waimatuku and Colac Bay achieving an average service life in excess of 14 years.



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 SH6/1111 and SH6/1127 between Dipton and Winton, SH6/1145 between Winton and Wilsons Crossing, and, SH87/15 between Outram and Clarks Junction.

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.

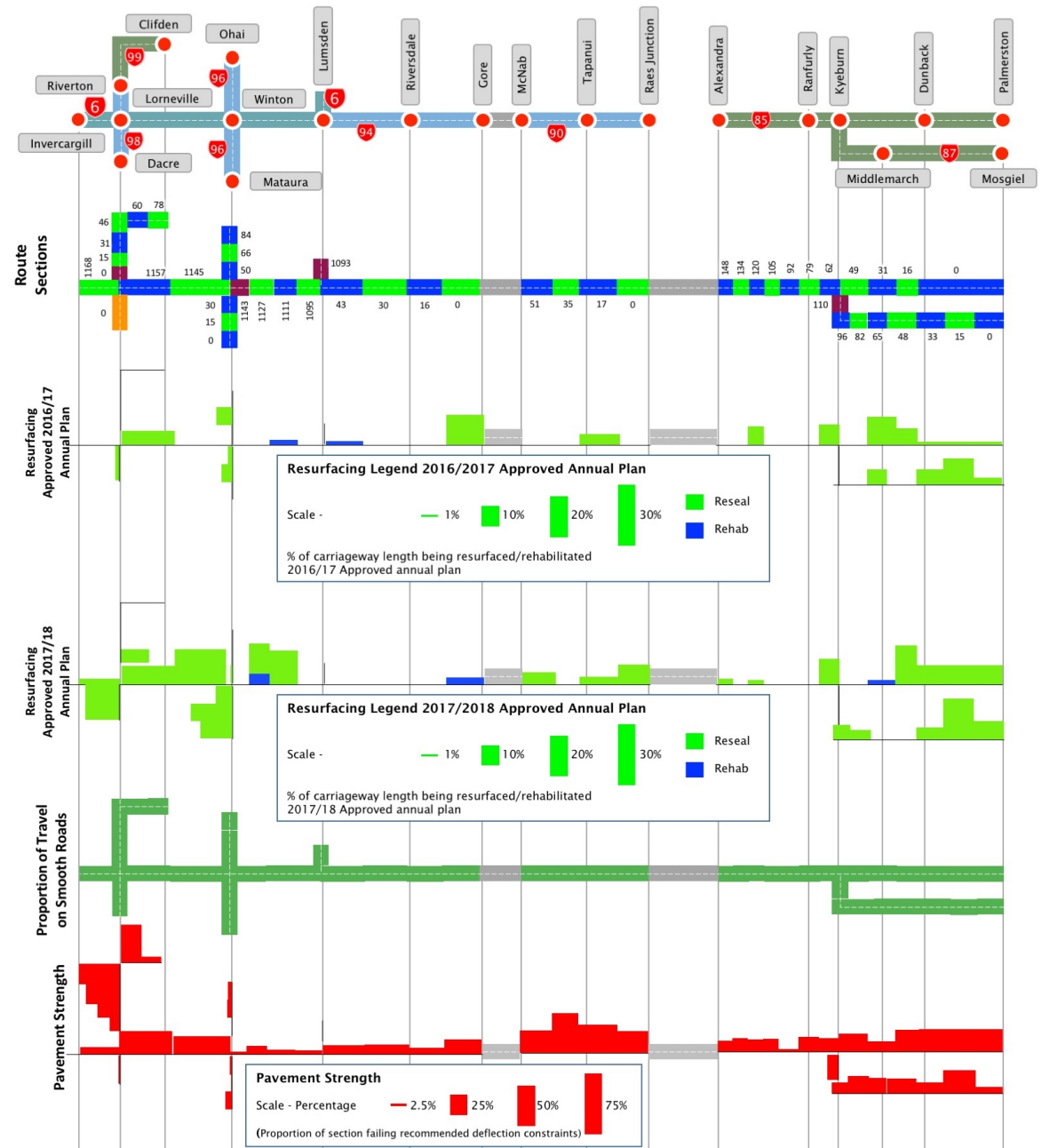
The corridor has no sections below the minimum standard for proportion of travel on smooth roads.

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 SH90/35 through Waikoikoi, and, SH99/46 and SH99/60 between Round Hill and Tuatapere.

Figure 20 – 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:

Otago Cluster

- **Old Pavement:** The pavements around Palmerston are old and not built to modern standards.
- **Ground movement:** Unstable ground movement is an issue at Dead horse pinch SH85/31, and Williamsons Hill SH85/105.
- **Pavement distress:** The pavement is distressed in section SH85/16. Costly rehabs are being avoided by undertaking interventions early.
- **SH87 Weak pavements:** There are weak pavements through Mosgiel which are old and thin, with weak subgrades.
- **String Winds:** Strong winds at SH87/48 and SH87/65 are having the effect of peeling seal off the road in exposed areas.

Southland Cluster

- **Aggregate Quality:** The poor quality of aggregate available locally means this has to be imported from outside the area.
- **Rapid deterioration:** On SH96 the decreasing side (heading east) is deteriorating at a faster rate than the opposing side of the highway.
- **McCracken's view slips SH99/60:** A major slip in this area will also certainly take the road with it, creating a significant resilience issue.

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:

Otago Cluster

- **New Diatomite mine:** A potential new diatomite mine near Middlemarch has the potential to create a high number of additional heavy vehicles (120 per day) along SH87.
- **Stock effluent:** With the significant adjacent land-use change to dairy, a new stock effluent site on SH85 between Ranfurly and Alexandra should be considered.

Southland Cluster

- **Riverton Bridge:** This structure is being closely monitored as it reaches its end of design life.
- **Waimeamea Bridge:** This structure is exposed to a marine environment and is also being closely monitored or deterioration.



The surface in each direction on SH96 is deteriorating at different rates

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 2- Summary corridor investment (\$000)

Outcome	Expenditure Category	2018-2021	2021-2024	2024-2028
Access and Resilience	Maintenance and Operations	\$7,908	\$8,175	\$12,821
	Renewals	\$9,003	\$14,119	\$21,789
	Improvements	\$0	\$0	\$0
Reliability and Efficiency	Maintenance and Operations	\$2,535	\$2,736	\$4,105
	Renewals	\$255	\$297	\$464
	Improvements	\$0	\$0	\$475
Safety	Maintenance and Operations	\$6,731	\$7,097	\$10,883
	Renewals	\$2,620	\$2,846	\$4,253
	Improvements	\$0	\$730	\$0
People, places and Environment	Maintenance and Operations	\$1,293	\$1,382	\$2,195
	Renewals	\$36	\$38	\$57
	Improvements	\$0	\$0	\$0
Total		\$30,381	\$37,421	\$57,042

Figure 21 - Corridor investment

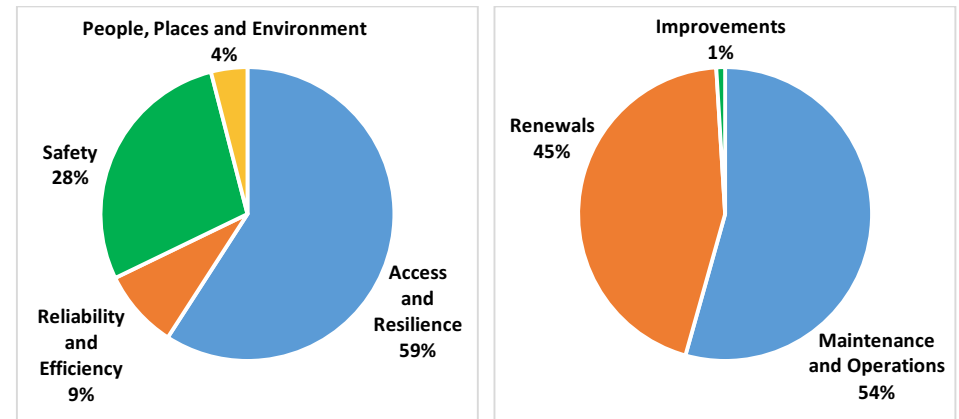


Table 3 - Summary investment by work category (\$000)

Outcome	Work Category	2018-2021	2021-2024	2024-2028
Access and Resilience	111 Sealed Pavement Maintenance	\$1,711	\$1,720	\$2,596
	112 Unsealed Roads	\$0	\$0	\$0
	113 Drainage Maintenance	\$616	\$436	\$939
	114 Structures Maintenance	\$969	\$1,134	\$1,942
	121 Environmental Maintenance	\$2,437	\$2,532	\$3,811
	122 Traffic Services Maintenance	\$58	\$85	\$127
	124 Cycle Path Maintenance	\$6	\$6	\$10
	151 Network & Asset Management	\$1,695	\$1,815	\$2,727
	161 Property	\$417	\$446	\$670
	211 Unsealed Road Metalling	\$6	\$6	\$10
	212 Sealed Road Resurfacing (excl. surface skid resistance)	\$5,676	\$10,506	\$13,196
	213 Drainage Renewals	\$191	\$202	\$279
	214 Pavement Rehabilitation	\$2,126	\$2,370	\$6,765
	215 Structures Component Replacements	\$788	\$795	\$1,195
	222 Traffic Services Renewals	\$216	\$239	\$345
321 - 341 Improvements	\$0	\$0	\$0	
Reliability and Efficiency	121 Environmental Maintenance	\$369	\$389	\$601
	123 Operational Traffic Management	\$1,557	\$1,703	\$2,555
	151 Network & Asset Management	\$533	\$562	\$828
	161 Property	\$76	\$81	\$122
	222 Traffic Services Renewals	\$255	\$297	\$464
	321 - 341 Improvements	\$0	\$0	\$475

Outcome	Work Category	2018-2021	2021-2024	2024-2028
Safety	111 Sealed Pavement Maintenance	\$2,212	\$2,223	\$3,352
	112 Unsealed Roads	\$0	\$0	\$0
	113 Drainage Maintenance	\$126	\$135	\$204
	114 Structures Maintenance	\$253	\$281	\$422
	121 Environmental Maintenance	\$255	\$292	\$439
	122 Traffic Services Maintenance	\$2,670	\$2,843	\$4,480
	124 Cycle Path Maintenance	\$0	\$0	\$0
	151 Network & Asset Management	\$1,037	\$1,128	\$1,693
	161 Property	\$179	\$195	\$293
	212 Surface Skid Resistance	\$2,156	\$2,321	\$3,486
	214 Pavement Rehabilitation	\$14	\$28	\$43
	215 Structures Component Replacements	\$142	\$162	\$243
	222 Traffic Services Renewals	\$308	\$335	\$481
	321 - 341 Improvements	\$0	\$730	\$0
	People, places and Environment	111 Sealed Pavement Maintenance	\$82	\$50
121 Environmental Maintenance		\$986	\$1,092	\$1,759
151 Network & Asset Management		\$181	\$193	\$290
161 Property		\$45	\$47	\$71
221 Environmental Renewals		\$36	\$38	\$57
321 - 341 Improvements		\$0	\$0	\$0
	Total	\$30,381	\$37,421	\$57,042

Investing in access and resilience

Operations and maintenance

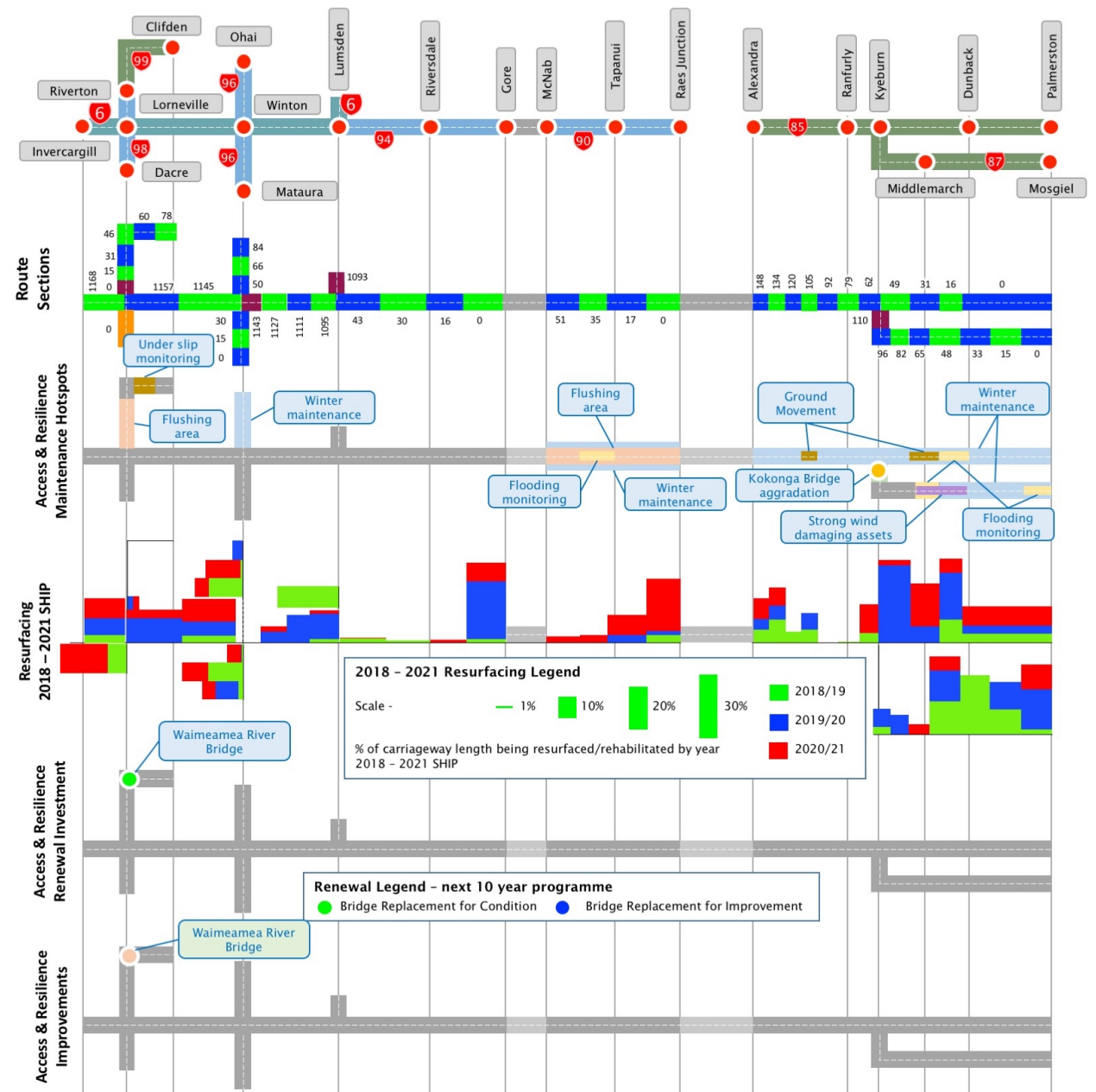
The main areas of investment to provide and preserve access and resilience are drainage maintenance, sealed road surfacing and structural component replacements and vegetation control. A key focus is to realign the base preservation quantities toward increased preventative maintenance and to slow pavement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

Maintenance hot spots

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

- **SH85/0:** During significant weather events the river floods the road
- **Dead horse pinch SH85/3, and Williamsons Hill SH85/105:** In these sections of highway unstable ground movement is causing issues.
- **Dairy conversion:** A change in land use to dairy has meant drainage maintenance has increased. This is particularly an issue on SH87 west of Middlemarch.
- **SH87/0:** Flooding is an issue on the flat terrain around Mosgiel during significant weather events.
- **SH87/48 and SH87/65:** Strong winds at are peeling the seal off the road in exposed areas of this section of highway.
- **Kokonga Bridge SH87/110:** This bridge is being affected by river aggradation.
- **SH90:** This highway is characterised by narrow shoulders and inadequate drainage. Winter maintenance is also required on this highway where trees and shelter belts provide shade
- **SH90/35:** Flood monitoring is undertaken of the Omahaka River.
- **SH90, SH99/0 to SH99/31:** These sections of the corridor are suffering from flushing issues.
- **McCracken’s view SH99/60:** Slips are an issue for this section of the corridor.

Figure 22 – 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: SH85/16 between Waynes and Morrisons, SH85/49 east of Kyeburn, SH87/0 between Mosgiel and Outram, SH87/48 south of Middlemarch, and, SH94/0 between Gore and Mandeville.

Structure renewal

The renewal investment infographic shows the planned bridge replacements along the corridor. One bridge is planned for replacement due to asset condition, at an estimated cost of \$0.4M.



Improvements

Planned

There are no currently planned access and resilience 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 4- Draft regional programme considered for SHIP

Project	Funding Status	Description
Waimeamea river bridge		Corrosion of one post tensioned cable in post tensioned beams has been identified. Forward management of bridge to extend life needs to be captured in AMP.

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:

- **Weather stations** are in place on SH85 at Chatto creek, and Wedderburn
- **VMS signage** is located at Palmerston, Mosgiel, Middlemarch, and Keyburn.

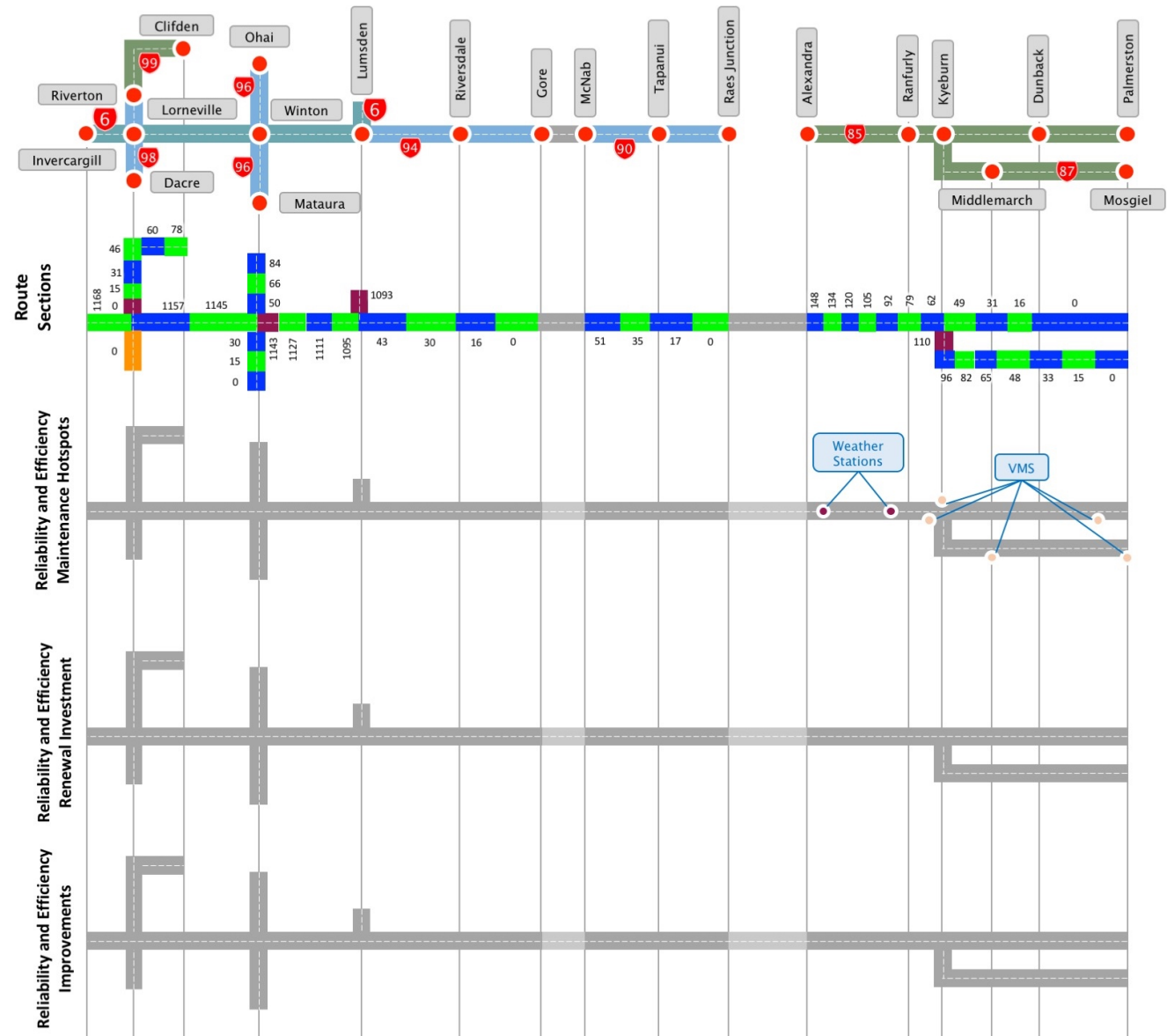
Renewals

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

Improvements

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

Figure 23 – Reliability and efficiency investment



Investing in safety

Operations and maintenance

Safer Journeys Goal 2016 to 2020 is to reduce the likelihood of crashes occurring and to minimise the consequences. The main areas of investment into ensuring safer journeys include: specialist pavement treatments, road marking including audio-tactile markings (ATP), signage, edge markers, safety barriers, speed limits, roadside vegetation control, and, street lighting.

Maintenance hot spots

No safety related maintenance 'hotspots' were identified along the corridor.

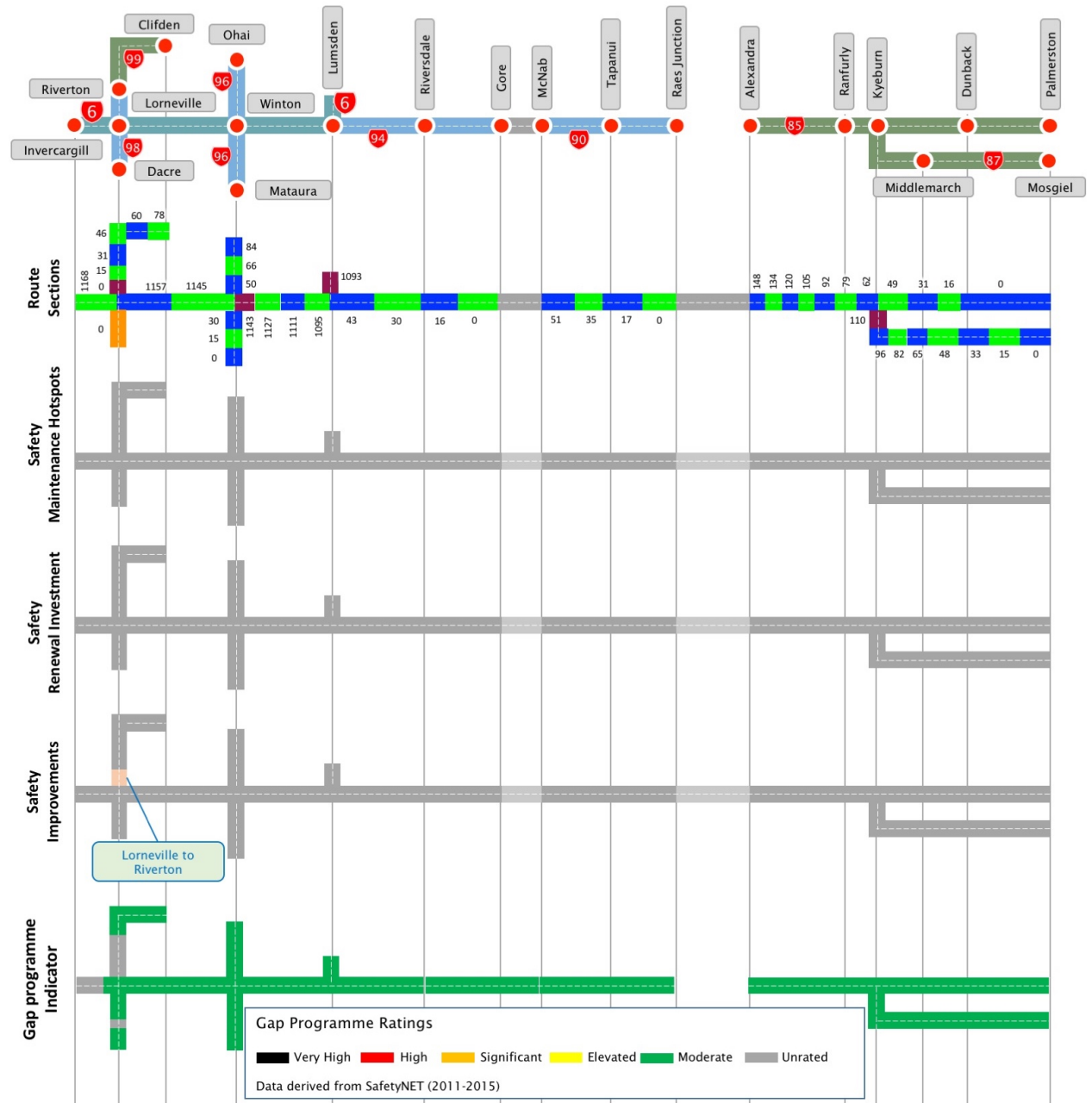
Gap programme indicators

The potential for reducing fatal and serious injuries across the corridor has been assessed under the Gap programme. The Gap programme looks at the collective risk rating, likely level of intervention and the potential reduction in death and serious injury that may be achieved to determine a possible treatment approach. For instance, a road segment rated 'Very High' could potentially achieve a 50-70% reduction in fatal and serious injuries with the application of high cost improvements. Alternatively, if the risk level is 'Elevated' a 10-20% reduction may be realised through targeted low cost, high coverage treatment improvements.

There is a moderate potential for reducing fatal and serious injuries along the entire corridor where targeted low cost high coverage improvements would be beneficial.

The unrated segments are either areas where potential crash savings are low or are being addressed under other existing programmes.

Figure 24 – Safety investment



Renewals

There are no safety related renewals planned for the corridor.



Severely corroded guardrail on SH99 requires replacement.

Improvements

Planned

There are no currently planned access and resilience 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
SH99 Lorneville to Riverton		Safety project from the Safety Gap Analysis exercise.

Investing in people, places and environment

Operations and maintenance

The main areas of investment into people, places and environment are: pavement rehabilitation 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.

Maintenance hot spots

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

- Historic Bridge:** A historic bridge structure at Dunback SH85/0:12.6, Bowker’s Bridge, is planned to be restored for amenity purposes. While no longer part of the highway, this structure will require ongoing maintenance to maintain its amenity value.

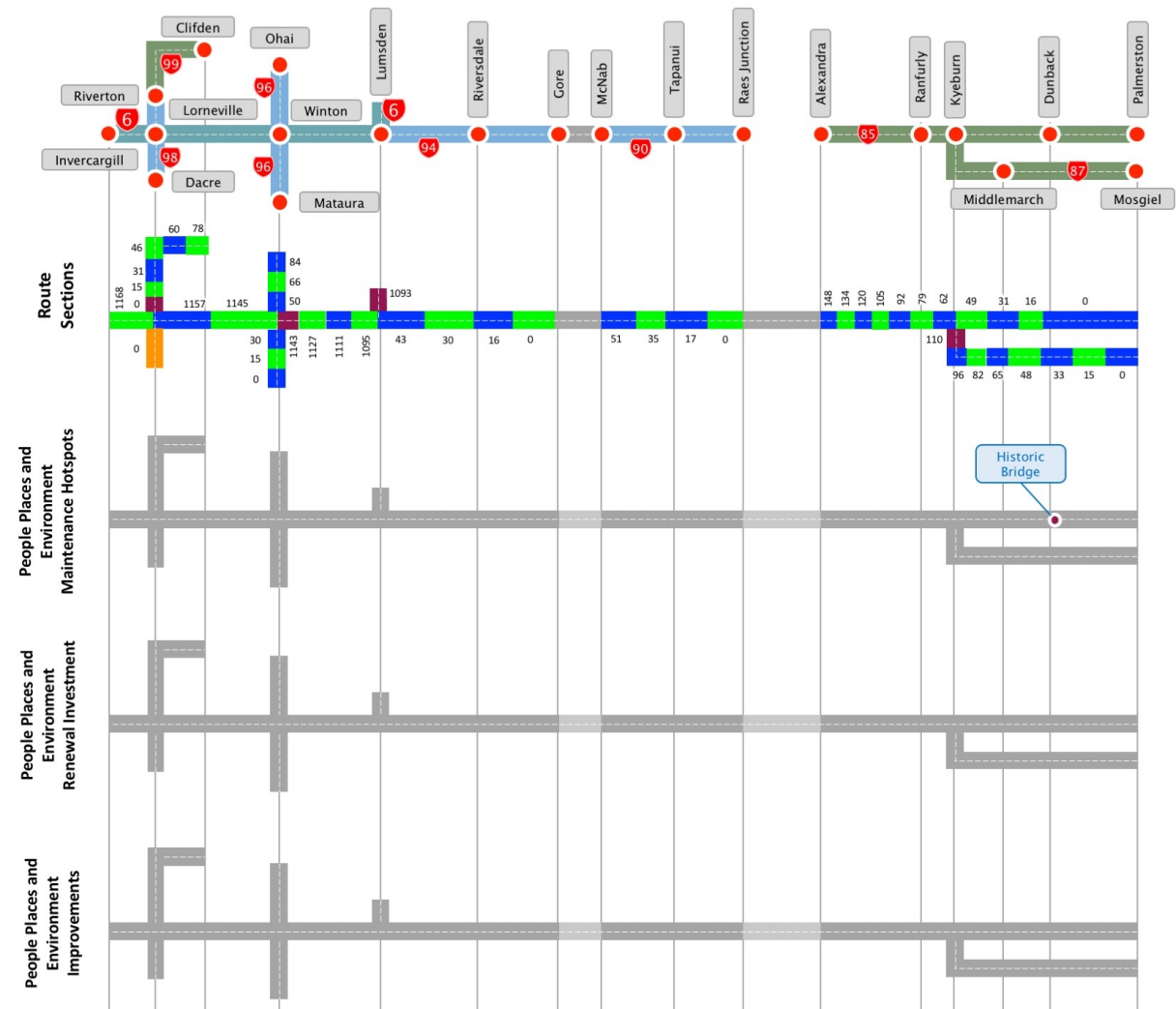
Renewals

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 25 – 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.

- **Impact of heavy vehicles on the road surface:** Freight is the highest and most frequent user and is projected to continue to grow. Changes in landuse and new industries/closure of existing industries will change the travel pattern of heavy vehicles, and the demand on the corridor.
- **Mosgiel population growth:** Residential growth and heavy vehicle use through the town centre is contributing to congestion, safety, and amenity issues. The location of the Main South Line (railway) at a key intersection with SH87 and local roads creates congestion issues that can impact on the operation of SH1. A key challenge is managing traffic and freight demands in a way that enables improvement of the amenity and safety within the Mosgiel town centre, particularly for vulnerable users such as children and the elderly.
- **Narrow shoulder width for cyclists:** Cyclists are an increasing user of the roads near Mosgiel/Outram and, due to narrow shoulder widths, have limited room for movement away from heavy vehicles or cars travelling at speed.
- **Aggregate Quality:** The poor quality of aggregate available locally means this has to be imported from outside the area.

Reliability and efficiency

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

- **Commuter congestion:** A noticeable increase in commuter traffic travelling between Dunedin and Mosgiel has placed considerable pressure on the two major intersections and railway line that cross SH87 to the south of Mosgiel, with congestion often backing up to the SH1 Mosgiel off ramp.

Safety

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

- **Additional asset maintenance burden:** There is potential for growth in safety related assets such as signage, long-life markings, and isolated intersection improvements along the corridor. The addition of these assets will increase the maintenance investment burden for the corridor.
- **Growth in tourism:** While there is capacity in the network to cater to this growth, driver behaviour issues are difficult to manage. This impacts on the safety of the network as road users are less familiar with New Zealand road conditions and road rules.

People, places and environment

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

- **Growth in tourism:** The corridor is the primary access way of the Otago Central Rail Trail and Taieri Gorge Railway. It also offers access into unique and remote areas of Central Otago for tourists. There is also increasing popularity in the Southern Scenic Route: Visitor expectations are of a consistent and reliable journey experience. This includes consistent signage, road condition information, cell phone coverage, rest areas, and amenities.
- **Management of trees adjacent to the corridor:** Farmers are planting trees close to the road (and areas of existing trees) that create shade. Wilding pines also establish. This can result in black ice on the corridor during winter months.
- **Increasing environmental standards:** Changing water quality standards has implications on stormwater runoff and management of soil contamination from roadside activities includes requirements for the removal of soil from sites to A grade landfills.

Investment future considerations

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

- **Corridor management to increase asset life.** Consider smarter ways of responding to higher investment requirements without compromising the efficiency of use of the network by heavy vehicles. A recent example is Southland District Council placing speed restrictions on some bridges to prolong their useful lives.
- **Changing industry trends.** There is ongoing growth in dairying and a growing importance of SH85 as an important freight link to processing factories located along SH1. A review of the ONRC classification of sections of the corridor to better align with use and function will enable investment to be better focussed in the future. Mataura Valley Milk is developing a \$200 million dairy processing plant near McNab. This has the potential to redistribute heavy traffic across the region and create different pressure points on the network. The potential for future closure of coal production at Takitimu Coal Mine, near Nightcaps, will significantly reduce heavy vehicle use of this section of SH96. A potential new diatomite mine near Middlemarch has the potential to create a high number of additional heavy vehicles (120 per day) along SH87.
- **Review of the Southern Scenic Route.** Consider SH85 and SH87 becoming part of the Southern Scenic Route. This would create a 'loop' journey between Dunedin and Queenstown and will require a change to the way this journey is managed and marketed.
- **Improved telecommunications:** Work with telecommunications providers to provide greater mobile phone coverage improving emergency services and maintenance response times. It would also allow 'push' notifications of real time road information to customers. The benefits of more informed customers are significant, particularly in terms of visitor safety and positive visitor experience. Identify priority areas such as the Southern Scenic Route.
- **Additional VMS signage:** In future, the corridor would benefit from more VMS signage on SH85 between Alexandra and Ranfurly.
- **Integrated land use planning:** Application of a 'place-based' approach to communities, where agencies work together to understand and respond to local community objectives and outcomes; particularly where the corridor has a significant impact on the attractiveness and function of town centres.
- **Tourism:** The corridor currently has capacity to cope with growth in tourism. However, the broader implications of growing tourism, particularly international self-drivers, utilising this network, and their associated expectations needs to be better understood and responded to.
- **Vegetation management programmes:** Managing wilding pines and working with local farmers to manage tree planting near the corridor, particularly along SH85.

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

Section	Infographic	Information Source	Date
	Closures	NZTA 2011-2015_Treis_incidents_by_region.xlsx	2015
Reliability and efficiency	Efficiency	NZTA - MapHub EfficiencyNet	2016
	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

Section	Infographic	Information Source	Date
	Noise and Vibration	NZTA - Environment and Urban Design Team	2016
	Drainage Catchments	NZTA - Environment and Urban Design Team	2016
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			
	Maintenance Hot Spots	Network Manager and Regional Staff	2017

Section	Infographic	Information Source	Date
Investing in access and resilience	Resurfacing 2018 - 2021	Resurface data derived from forward works programme	
	Renewal Investment	National Bridge Replacement Programme National bridge replacement programme 2017 LCMP data.xlsx	
	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		

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	



If you have any further queries, call our contact centre on 0800 699 000 or write to us:

NZ Transport Agency
Private Bag 6995
Wellington 6141

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