Port Chalmers to Bluff

CORRIDOR MANAGEMENT PLAN

1 86 88 93

2018-2028

NZ TRANSPORT AGENCY
WAKA KOTAHI

New Zealand Government

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Executive summary

The Port Chalmers to Bluff Corridor runs the full length of SH88 from Port Chalmers to its intersection with SH1 at Castle Street in Dunedin, it then continues south along SH1 to Bluff. The corridor also includes SH86, from its intersection with SH1 at Allanton, to Dunedin Airport, and SH93 in its entirety between its intersections with SH1 at Clinton and Mataura. Part of the Main South Line rail track runs alongside SH1 from Dunedin to Invercargill crossing at various points of the corridor. A freight only branch of the line also operates from Dunedin to Port Chalmers alongside SH88. SH86 is the primary route providing a vital link to Dunedin International Airport

The corridor is approximately 330 km long (2.9% of the state highway network). The total value of assets along the corridor is $461M (2.0% of the total national asset value).

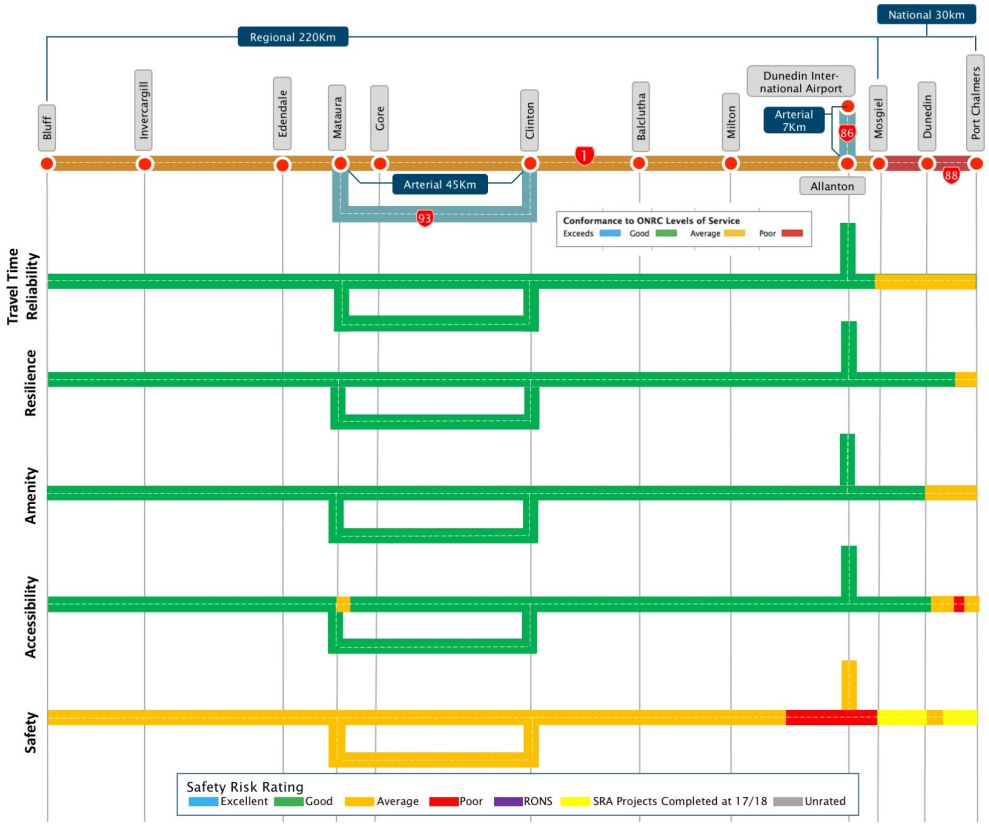
The corridor facilitates many uses associated with its function as a regional connector. Primarily, it connects regional businesses and critical customers along its length. It is the main economic enabler for the region supporting commuter travel to Dunedin in the north and Invercargill in the South. It is also a freight route supporting logging, milk, meat processing, fuel and stock movements along its length, connecting critical customers to Ports and markets via Port Otago. The corridor also has an important function as a tourist route, forming part of the Southern Scenic Route linking Queenstown, the Catlins, Te Anau Invercargill, Bluff and Dunedin.

Southland Regional Development strategy identifies transport as one of the enablers to economic growth in the region. Its highlights the need to provide for rural transport, bulk haulage to South Port as well as meeting the increased demand of tourist traffic. There are also transport pressures to support town and city redesign in Invercargill and Gore.

As part of the Southern Scenic Route, the corridor enables access to key tourism and recreation destinations attracting both domestic and international tourists. The plan also includes improvements to signage across roads to better cater for international tourists as well as embarking on sealing local roads that access key tourist areas such as the Catlins. Cruise ships dock at Port Chalmers and passengers rely on the corridor to access Dunedin and the greater Otago region for day trip excursions.

Given the significance of the corridor to Otago and Southland economic growth and prosperity, the corridor needs to be reliable, resilient and safe. Growth in freight around Port Otago is expected to continue, together with an increase in cruise ships at Port Otago is increasing demands on the SH88 and growth in suburbs such as Mosgiel are also increasing traffic volumes and journey times during peak hour around Dunedin.

Figure 1 - Performance of the corridor against ONRC outcomes



The section of the corridor with the highest classification, SH88 between Dunedin and Port Chalmers, is failing to meet expected levels of service in a number of areas, as well as demonstrating poor asset condition for a number of performance measures. This coupled with the expected growth in heavy vehicle traffic and its importance to the regional economy in terms of freight and tourism, means significant future investment on SH88 is warranted.

Introduction

Purpose

What is the corridor management plan?

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

The corridor management plan considers a combination of:

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

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

Why is it needed?

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

Traditionally, the approach to investing in maintenance and renewals is to consider each asset activity in isolation, i.e. pavement, structures, drainage, and in isolation of capital expenditure. The Corridor Management Plan approach considers all assets within the corridor and takes a holistic view of the customer levels of service they provide throughout the corridor.

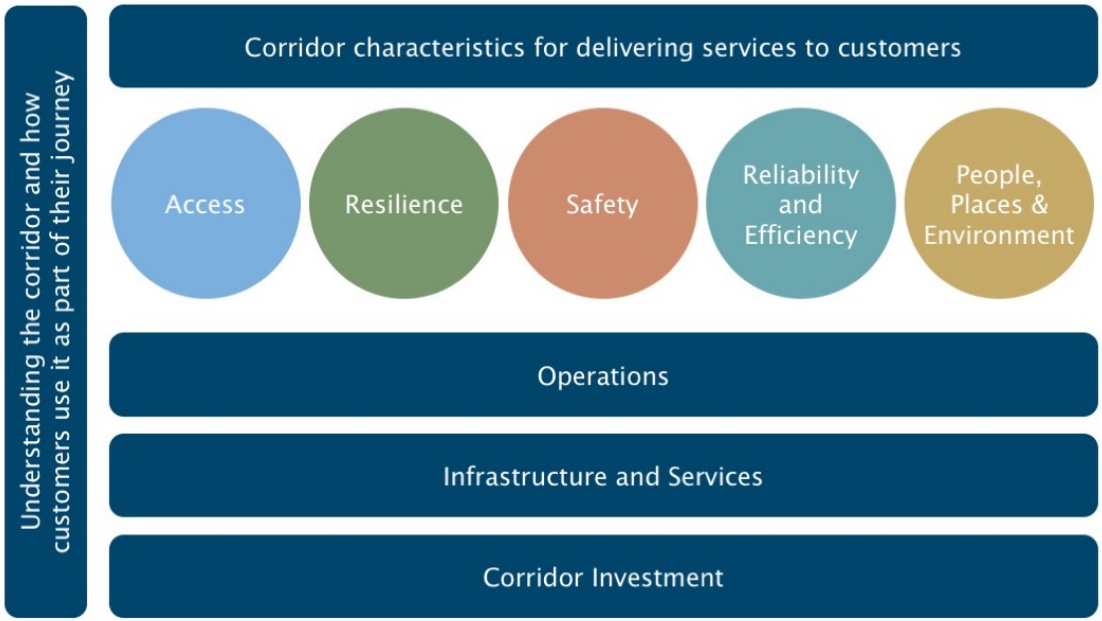
Planning is currently undertaken at the regional level, but typically significant journeys traverse more than one region. By considering the significant customer journeys and destinations, the corridor management plan is a vehicle to engage in regional and inter-regional conversations by focusing on the issues that are important and may extend beyond the state highways network.

How will we use it?

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

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

Figure 2 - Corridor management plan framework



The corridor at a glance

Corridor overview

The Port Chalmers to Bluff Corridor runs the full length of SH88 from Port Chalmers to its intersection with SH1 at Castle Street in Dunedin, then it continues south along SH1 to Bluff. The corridor also includes SH86, from its intersection with SH1 at Allanton, to Dunedin Airport and SH93 in its entirety between its intersections with SH1 at Clinton and Mataura. Part of the Main South Line rail track runs alongside SH1 from Dunedin to Invercargill crossing at various points of the corridor. A freight only branch of the line also operates from Dunedin to Port Chalmers alongside SH88. SH86 is the primary route providing a vital link to Dunedin International Airport

The corridor facilitates many uses associated with its function as a regional connector. Primarily, it connects regional businesses and critical customers along its length. It is the main economic enabler for the region supporting commuter travel to Dunedin in the north and Invercargill in the South. It is also a freight route supporting logging, milk, meat processing, fuel and stock movements along its length, connecting critical customers to Ports and markets via Port Otago. The corridor also has an important function as a tourist route, forming part of the Southern Scenic Route linking Queenstown, the Catlins, Te Anau Invercargill, Bluff and Dunedin.

The regional economy

The Southland and Otago regions together have a population of just under 320,000, making up 6.8% of NZ's total population. Education and healthcare are key employment generators for the Dunedin City economy, accounting for 26.4 % of all employment. As a region, Otago District has a strong focus on tourism with 10% of employment in the accommodation and food industry. Southland has a major focus on manufacturing and export. Invercargill City employs 18% of its employed population in manufacturing consisting mainly of meat processing and non-ferrous metal manufacture. Farming is also a major focus in southland region including dairy, sheep, beef and cattle farming.

As NZ's second largest region by land area, over half of Southland is on conservation estate. These conservation lands support the tourism industry and are the main source of the region's freshwater. Tourism and growth in dairy and farming activity are key economic drivers for the Region. Road transport connections between urban hubs and access to export locations are vital to continued economic growth across the corridor regions. The Southland Regional Development Strategy (SoRDS) action plan cites transport as an enabler to achieving their goals; raising increase in tourism and heavy traffic on the roads as key concerns regarding the ability of the network to accommodate planned growth. The action plan also promotes the Southern Scenic Route which aligns with the SoRDS Tourism Strategy.

The Cruise ship industry in Otago received around 139,000 unique passenger visits in 2015/16 according to Cruise New Zealand and Market Economics 2016. This figure is predicted to grow by 19% in the 2016-17 year, with an increase of 23% in voyage calls in Otago. The Cruise Dunedin Action Plan 2015-2018 outlines several actions to improve the cruise experience for passengers and a performance indicator to maintain the disembarkation rate of an average of 90% of passengers per ship. The SH88 is the gateway to facilitating onward travel of cruise ship passengers to Dunedin and the wider Otago Region. It is therefore a vital link in maintaining this important economic activity for the Region.

Figure 3 – Corridor overview

Understanding our customers

Key customers

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

Daily commuter

Commuter use on the route is centralised around main population hubs; Dunedin and Invercargill. Public transport services adequate for the population are available in Dunedin however, public transport services are limited in Invercargill. Active modes of transport contribute to a reasonable number of commuter trips in Dunedin. Business/commercial travel is prominent between urban areas and communities along the corridor. Business traffic around Invercargill does result from regular use of the City as a conference hub.

Insights into daily commuter users:

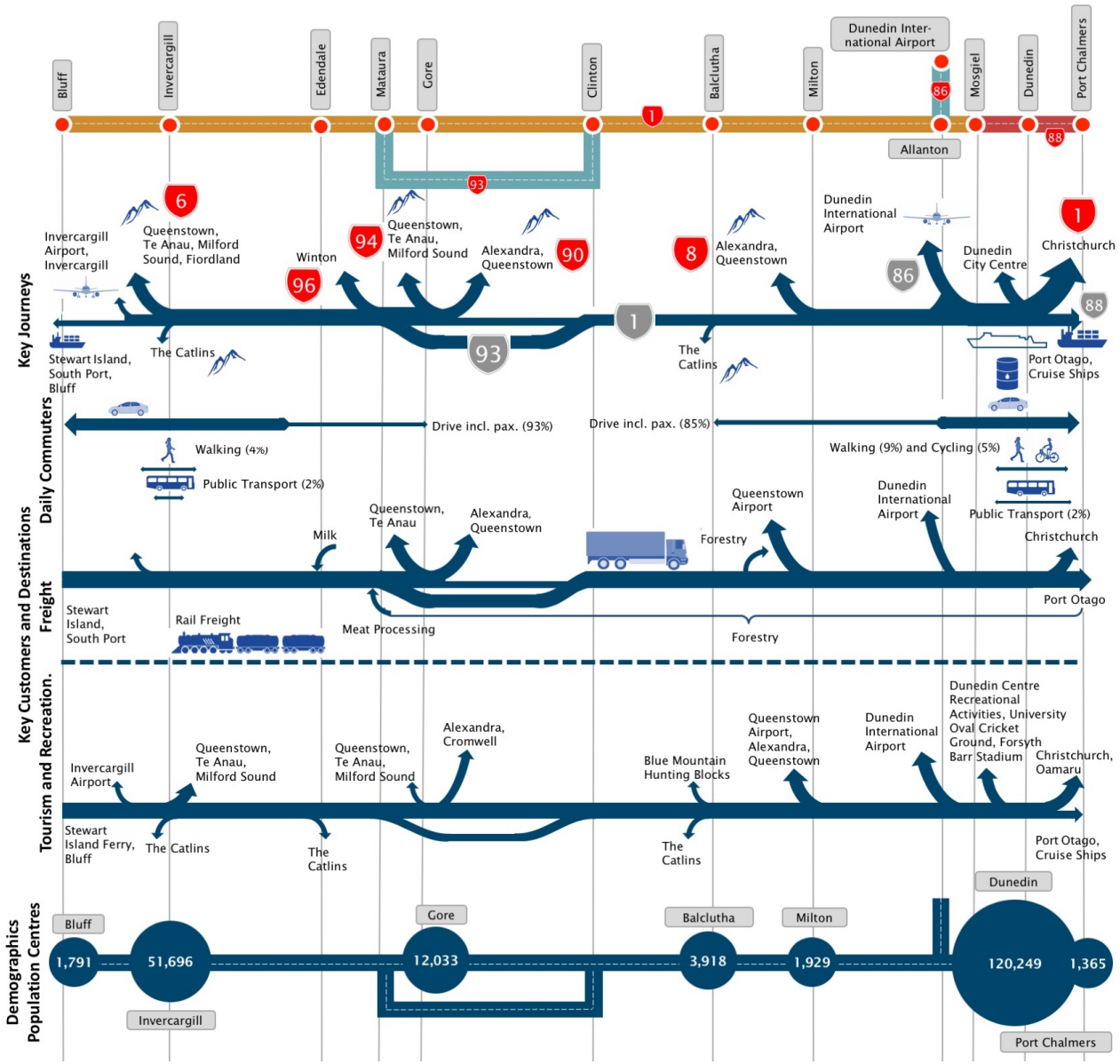
Road use: Use of private vehicles is predominant since alternative transport modes are limited. In Dunedin and Invercargill, active modes of transport have greater mode share than public transport.

Road knowledge: Commuters are familiar with their route and viable alternatives to avoid congestion when required. Journey times are relatively predictable considering time of day and day of week. Motorists around Dunedin need to adjust driving whilst navigating from a one-way road system to a multi lane separated motorway.

Pain points: Peak hour congestion and queuing traffic occurs at common locations (Barnes Drive, Abbotsford Interchange) around Dunedin particularly for access to Mosgiel. Restricted carriageway width to accommodate cycle lanes through Dunedin City. Higher pedestrian conflict at peak times in some localised areas (Gore).

Daily Commuters expect: Predictable journeys at peak times, accurate and up to date information about traffic, weather, road conditions and hazards. Improved facilities for cyclists and pedestrians to promote safe interaction with vehicles.

Figure 4 - Key customers, journeys, and destinations



Tourist and recreational users

Otago is a tourist destination for domestic and international tourists alike, with numerous attractions ranging from scenic reserves and wine trails to adventure activities. The corridor forms part of the Southern Scenic Route, enabling access to key tourism and recreation destinations attracting both domestic and international tourists. Cruise ships dock at Port Chalmers and passengers rely on the corridor to access Dunedin, Queenstown and other day trip locations. These trips may be by bus, rental car or self-drive campers. These customers operate to tight schedules, reliable access and journey times to the Port is imperative.

Southland has a strategy to increase its stance as a tourist destination and this includes promotion of the Southern Scenic Route to strengthen tourism around Invercargill and Southland. This is likely to increase the use of the corridor by visiting drivers that are likely to be unfamiliar with the route and driving conditions.

International sporting events held by University Oval Cricket Ground and Forsyth Barr Stadium in Dunedin attract significant number of both domestic and regional/national visitors. Domestic visitors may travel from Balclutha or Timaru by road.

Insights into tourist and recreational users are as follows:

Road use: Recreational users during weekends to/from communities and urban centres along the route. International visitors, may drive the full route or parts of the route as part of bus tours or a holiday destination schedule in self-drive cars or campers. May drive late into the night.

Road knowledge: High level of road knowledge demonstrated by domestic recreational users. International visitors have not experienced the roads and conditions and are focused on the landscape, are likely to underestimate travel times and distances, with no knowledge of stopping places on the journey. Traffic volumes around key recreational areas increase slightly during holiday seasons and Public Holiday periods.

Pain points: The influx of visitors to international events in Dunedin puts additional pressure on the corridor within Dunedin and can result in congestion and poor travel time reliability. Cruise ship passengers are particularly affected by unplanned delays on the network which may prevent them from returning to the ship on time (Port Otago is often the first or last port of call in NZ). Visiting drivers may find a lack of road user safety guidance on challenging sections of the corridor.

Tourist and recreational users expect: Ease of getting around the country, including using complementary travel modes, good directional signage to destinations, distances, places to stop for refreshments and toilet breaks when undertaking regional journeys. Reliable journey times to and from the airport and port to make additional travel commitments.

Freight operator

Primary industries drive much of the area's economic growth, so good access for freight services linking farms and forests, suppliers, processors and export gateways is critical. The corridor links a major port, Port Otago at Port Chalmers, exporting containerised produce from Otago to a lesser extent the South Island. The corridor also connects South Port in Bluff, the southern most commercial port in New Zealand. These are both vital lifelines for the economic wellbeing of the Otago and Southland regions. The corridor is the most direct HPMV rated route from Dunedin to Invercargill.

The corridor is supported by the Main South railway line which runs adjacent to the corridor. Primary industries, particularly dairy will transport milk using freight trucks and rail which relieves pressure from the road corridor.

Insights into freight operators are as follows:

Road use: Comfortably undertake the various return trips along the corridor including loading/unloading and rest breaks within a shift. Schedule and time critical, inter-regional journeys and constant road use.

Road knowledge: Knowledge of road conditions is extremely high, verging on technical, confidence of managing difficult conditions is high.

Pain points: Left turning movements are challenging for freight vehicles from SH88 to SH1 in Dunedin due to the geometry and urban constraints. Vehicles larger than 13m are restricted from making the right turn movement in Mataura from SH93 to SH1 due to proximity of the rail crossing to the intersection. Due to the one-way traffic configuration in Dunedin, there is a lack of direct access to fuel stops for northbound heavy vehicles, two fuel stops are located for southbound traffic.

Freight operators expect: Infrastructure that supports commercial activity—alternative routes that cater for freight trucks safely and reliably with consistent width and visibility, convenient places for trucks to stop and drivers to rest, and slow vehicle lanes for other vehicles that want to pass safely.

Information about road conditions that provides as much planning time as possible and enables considered decision-making and confidence that the advice is enabling business.

How we deliver services along the corridor

Transport partners

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

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

Collaboration along the corridor

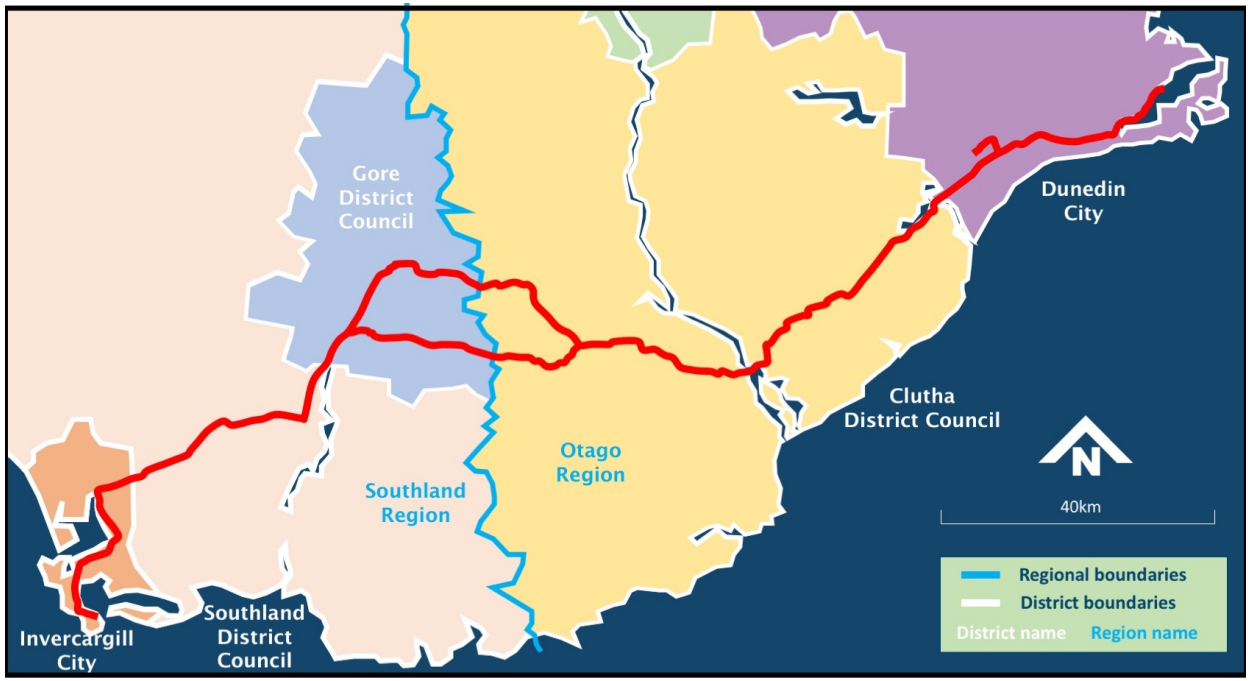
Currently the NZ Transport Agency is collaborating with Southland Regional Council on their SoRDS action plan which has highlighted future transport actions to support the delivery of their regional growth strategy.

It is also working collaboratively on 'Connecting Dunedin' with Dunedin City Council and Otago Regional council. The project which encompasses transport improvements for Dunedin city area.

Other collaboration projects include the Mataura Main Street beautification and speed management project which on which the NZ Transport Agency is working with Gore District Council.

Collaboration with Invercargill City Council as plans to upgrade SH1 through Invercargill City as part of a major city centre scheme, which involves reducing sections of SH1 from a four-lane to two-lane median separated carriageway enhancing safety for pedestrians, particularly where schools are adjacent the corridor in Invercargill. A strategic cycle link is also planned with the additional road space in Invercargill.

Figure 5 - Map of associated local authorities



Network Outcomes Contracts approach

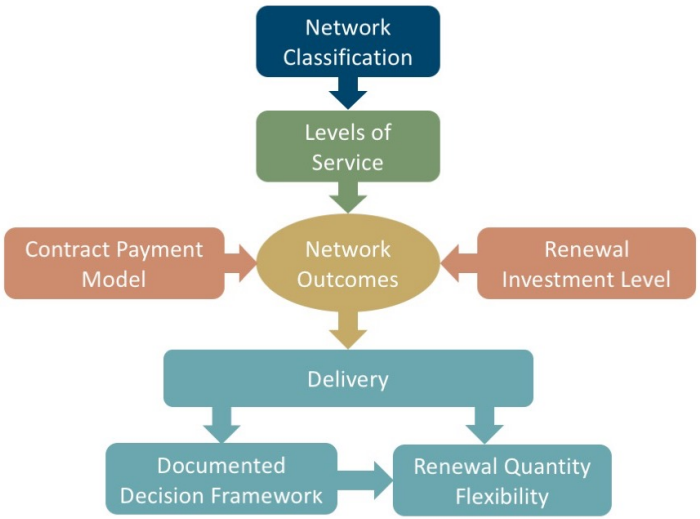
Network Outcome Contracts (NOC) are aimed at improving the effectiveness of service delivery for maintenance and operations of the state highway network. Elements of previous procurement methodologies (PSMC, Hybrid and Traditional models) have been integrated into the NOC contract model which delivers 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 contact documentation, and ensures a consistent application, understanding and implementation of the NOCs delivery model.

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

The contract process for the NOC's is shown in Figure 6 below

Figure 6 - NOC Process



Collaborative delivery of services

The Port Chalmers to Bluff corridor passes through two NOC areas as outlined below. Traffic signal maintenance in Invercargill is delegated to Invercargill City Council and in Dunedin, traffic signals are delegated to Dunedin City Council. ITS systems on the corridor are monitored by WTOC.

Coastal Otago Network Outcomes Contract

The Coastal Otago NOC is undertaken by Highway Highlanders supported by SouthRoads, Downer, MWH, McDonough and Buxton Consulting. The contract commenced on 1 July 2016 for a 7-year period with the possibility of a 2-year extension. It covers routine maintenance and operations of 773 kilometres of the state highway network.

- **Traffic monitoring sites** -Undertaken by AGFirst and commenced on 1 July 2014 for a period of 5 years until 30 June 2019.
- **Regional bridge and structures:** Undertaken by Opus International Consultants (Professional services contract O/207) which was awarded on 1 July 2014 for a period of 5 years until 30 June 2019.

Southland Network Outcomes Contract

The Southland NOC is operated by Highways South led by SouthRoads, supported by Downer NZ Ltd and MWH Limited. The contract commenced on 1 March 2016 for a period of 7 years with a possible 2-year extension based on performance and covers 674 kilometres of the state highway network.

The above contracts are supported by the following specialist maintenance contracts:

- **Traffic monitoring sites** -The traffic monitoring contract collecting traffic data is undertaken by AGFirst and commenced in May 2014.
- **Regional bridge and structures:** Undertaken by Opus International Consultants (Professional services contract O/207) which was awarded on 1 July 2014 for a period of 5 years until 30 June 2019.

Drivers for change

The Port Chalmers to Bluff corridor caters for variable levels and types of customers and this demand is expected to growth into the future. The drivers for change associated with the corridor are briefly described below.

Southland regional economic development area

The Southland Regional Development Strategy (SoRDS) Action Plan has identified three main challenges to enable social and economic growth for the region to 2025, these are to:

- Grow population
- Diversify the Regional Economy
- Strengthen Local Business.

The SoRDS has a goal to increase the population in the Southland region 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 has been identified as one of the enablers to this growth by providing for rural transport, bulk haulage to Southland Port, to meet the increase in demand of tourist traffic, and support town and city redesign in Invercargill and Gore. The plan also includes improvements to signage across roads to better cater for international tourists as well as embarking on sealing local roads that access key tourist areas such as the Catlins.

Understanding customer levels of service on the corridor

Current levels of service performance

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

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

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

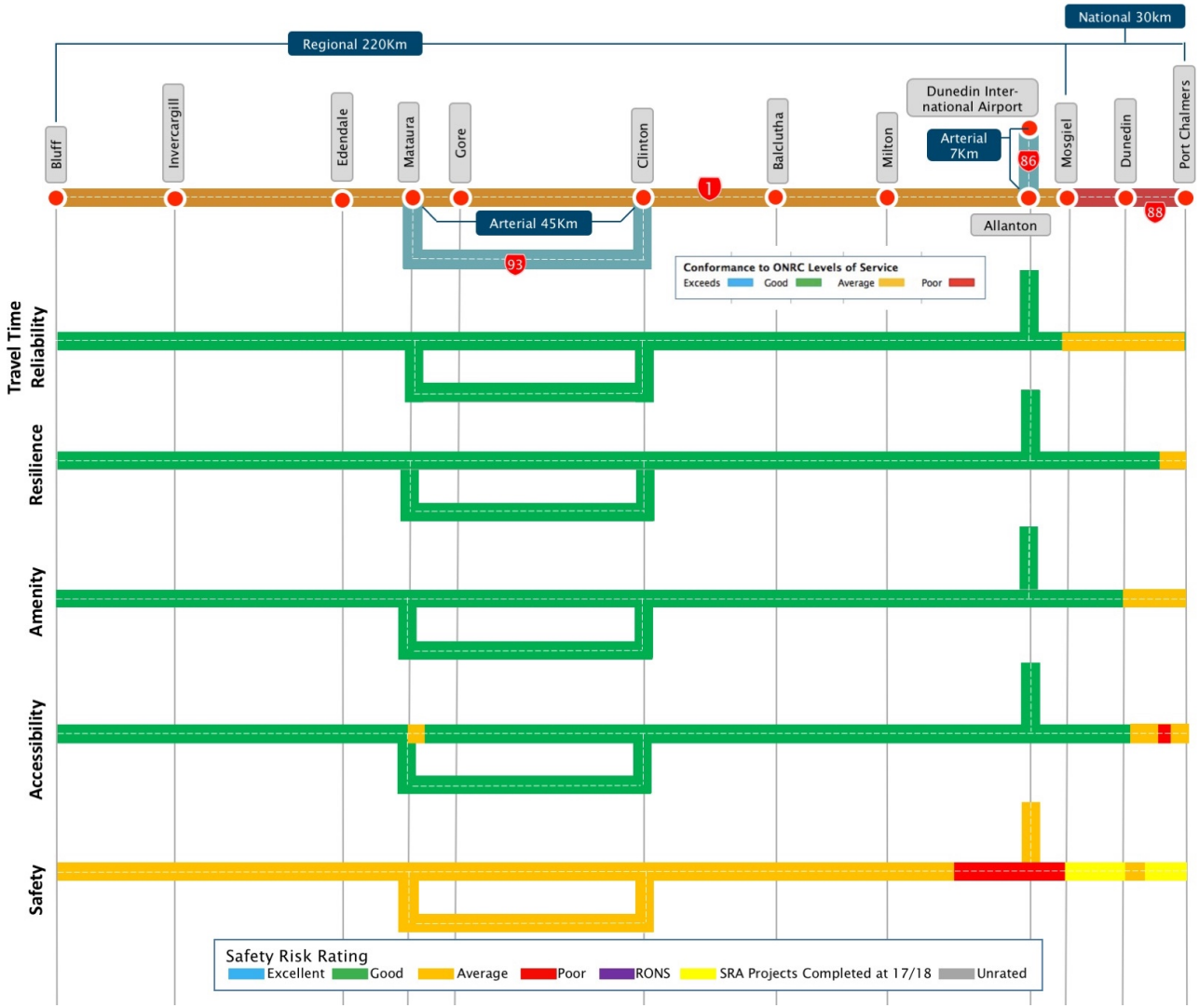
Road classification

SH88 from Port Chalmers to Castle Street in Dunedin is classified as National High Volume recognising the major link it provides to Port Otago. SH1 is also National High Volume between the SH88 Castle Street and the SH87 intersections at Mosgiel. SH1 then continues as a Regional corridor though to its conclusion in Bluff.

SH86 and SH93 are both classified as Arterial over their full extents.

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 Port Chalmers to Bluff 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 good along rural sections of SH1, SH86 and SH93 and in urban sections of the corridor in Balclutha, Gore and Invercargill. Travel times within Dunedin and towards Port Chalmers are particularly sensitive to unplanned disruptions. Reliability of SH88 has become and will continue to be increasingly important to accommodate the needs of cruise ship passengers to/from Port Chalmers, unexpected delays affecting journeys of cruise ship passengers that may operate on a tight schedule has a significant negative impact on the corridor performance.

Resilience

Port Chalmers to Dunedin has an average resilience LoS as this section of corridor is prone to flooding and slip incidents that could close the corridor for significant periods of time and diversion routes suitable for heavy vehicles are limited in some areas. The route has a very high proportion of critical customers along its length. SH88 has a lower resilience risk due to a lack of alternative routes in some areas, as well as no alternative routes for HPMV traffic.

There are incidences of unplanned events on SH88 due to poor resilience of the underground utilities located in the road reserve.

Amenity

The corridor has a good standard of amenity with the only average performing section being from Port Chalmers to south of Dunedin due to the poor condition of the road surface and constrictive nature of the road for some users. The aesthetics of the adjacent road environment reflect the character of the area and are appropriate for the mix of customers on the route. Investment in cycle lanes on SH1 and SH88 in Dunedin will enhance provision for active users. Elsewhere, the facilities are reflective of the current use on the route. Stopping points on the route will be reviewed under the Visiting Drivers strategy which supports the promotion of the Southern Scenic Route.

Accessibility

There are several accessibility issues for heavy vehicles and over dimension vehicles along the route, predominantly the left turn movement from SH88 to SH1 in Dunedin and the right turn from SH93 to SH1 in Mataura (vehicles >13m). There are sub-standard vehicle accesses adjacent to SH88 around Port Chalmers which present difficulties. Fredrick Street is not full HPMV compliant and HPMV approaching from the north use St. Andrews Street. Height restrictions and the narrow road width at Sawyers Bay overbridge limit use of the corridor by over dimension and over height vehicles. There is no suitable HPMV diversion route for SH88 and alternative routes suitable for heavy vehicles and coaches is limited.

Safety

SH88 ranks poor for safety due to inconsistent alignment and failure to meet KiwiRAP targets required for its classification as a Regional Route. The remainder of the corridor varies between good and average depending on the KiwiRAP risk rating and safety targets. SH1 from Dunedin to Milton has a medium-high collective risk and primarily alternates between 2 and 3-star ratings. Safe Roads Alliance projects are planned to decrease collective risk. SH1 between Milton and Gore has a medium-low collective and medium personal risk. SH93 has a medium-high personal risk resulting from a lack of road safety features and narrow roads.

Vulnerable users are not well catered for within urban areas, with cycle schemes through Dunedin, Port Chalmers and Invercargill planned to address this. High proportions of heavy vehicles on the route at the southern end increase user risk on this corridor. Increased use of the route by visiting drivers without supporting investment in safety, such as safe speeds, safety barrier and better road user safety information, is likely to have a negative impact on the LoS in this area.

Pressures on the corridor include narrow road geometry, increased conflict with cyclists and heavy vehicles and the proximity of the railway line to the road corridor.

Improving the customer experience

In responding to Customer Levels of Service it is important to acknowledge that significant improvements to the corridor are planned or underway as part of the Safe Roads Alliance including: SH88 Port Chalmers to Dunedin, SH1 Dunedin to Fairfield and Mosgiel to Balclutha. Additional capital works planned include the Dunedin to Port Chalmers Walking and Cycling Path Project, Elles Road intersection upgrade and SH1Edendale Bypass.

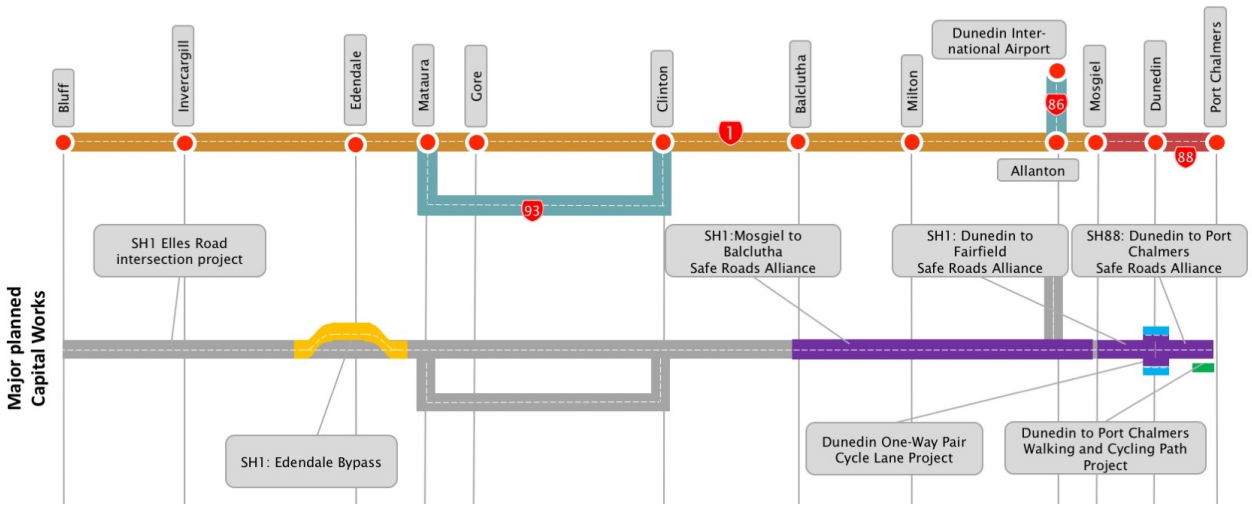
When completed, the planned improvements on the corridor will result in significant improvements to the performance of the corridor against the ONRC outcomes. Safe Roads Alliance projects will target improvements to the current KiwiRAP star rating on SH88 and SH1 with the aim of reducing the number of fatal and serious injury crashes on the corridor.

The Edendale Bypass will realign SH1 around Edendale township and Fonterra Milk processing plant. Project benefits include reducing travel times between Gore and Invercargill, consistent travel speeds, improved safety and increased safe passing opportunities, this will also improve safety around Edendale School.

A shared walking and cycling path will provide an alternative safer route along SH88 for pedestrians and cyclists travelling between Dunedin and Port Chalmers. The provision of these facilities will move pedestrians and cyclists away from live traffic and reduce the need to cross the state highway.

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

Figure 8 – Significant corridor planned improvements



SH88 Dunedin to Port Chalmers walking & cycling path project

Access

Carriageway configuration

The corridor transitions through a variety of carriageway configurations within the urban area of Dunedin. SH1 has a 4-lane one-way configuration in central Dunedin with Castle Street facilitating southbound traffic flow and Cumberland Street facilitating northbound flow. These two 'parts' of SH1 through Dunedin are separated by commercial buildings. There is also a section of motorway between Dunedin and Mosgiel.

The remainder of the corridor has sections of frequent passing lanes between Allanton and Clinton and less passing opportunities south of Clinton to Bluff. SH88 and SH93 have a two-lane opposing configuration with minimal passing lanes throughout their entire lengths.

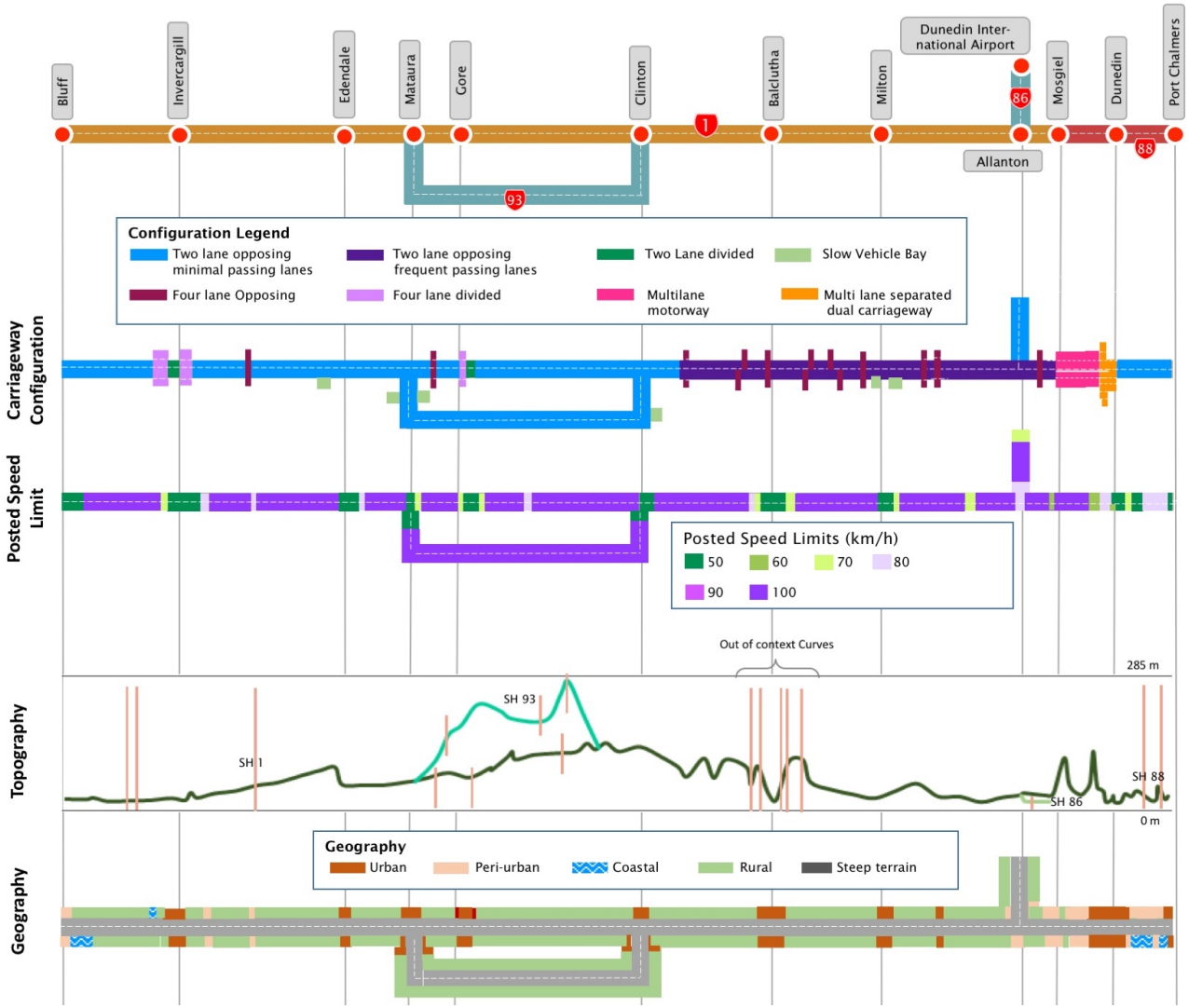
Speed limits

Between Port Chalmers and Mosgiel, the corridor has posted speed limits ranging from 50km/h to 80km/h appropriate for the urban area. The remainder of the corridor is generally 100km/h with appropriate speed limits applying within towns and communities.

Topography/geography

Out of urban areas, the corridor traverses through rural rolling hill country. SH93 has some steep climbs/descents. There are out of context curves at several points along the route. At Balclutha, sections of short sharp climbs, out of context curves and steep descents slow heavy vehicle traffic. On approach to Dunedin from the south, there are several steep hills to navigate. The corridor around Milton is low lying and prone to flooding.

Figure 9 - Corridor characteristics



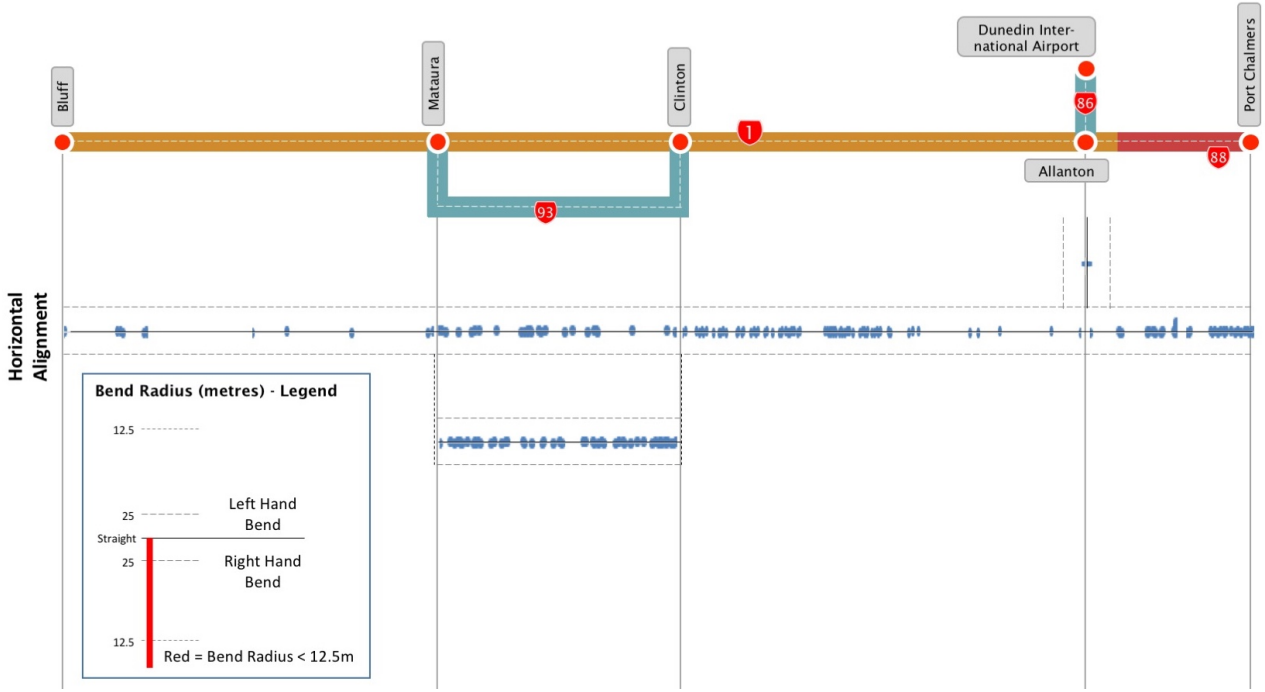
Horizontal alignment

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

The corridor contains a regular occurrence of larger radius curves on SH88 between Dunedin and Port Chalmers, along the length of SH93, and on SH1S between Milton and Gore. There are no tight bends with a radius below 25m on the corridor.

Cyclists on shared path

Figure 10 – Horizontal alignment



Volumes

The corridor supports significant volumes of traffic through Mosgiel and Dunedin which lessens towards Port Chalmers. SH88 has a high concentration of heavy vehicle traffic to Port Otago, and SH93 typically has relatively low traffic volumes.

Heavy vehicle volumes are particularly high from Port Chalmers to Balclutha and from Gore to Invercargill, reflecting the number of critical freight customers in these areas including the container terminal in Port Chalmers, forestry, a meat processing plant, Fonterra milk processing plants and silver fern farms. Vehicles travelling south on the corridor will choose the SH93 link over SH1 since the travel time and distance is less than using SH1.

HPMV routes

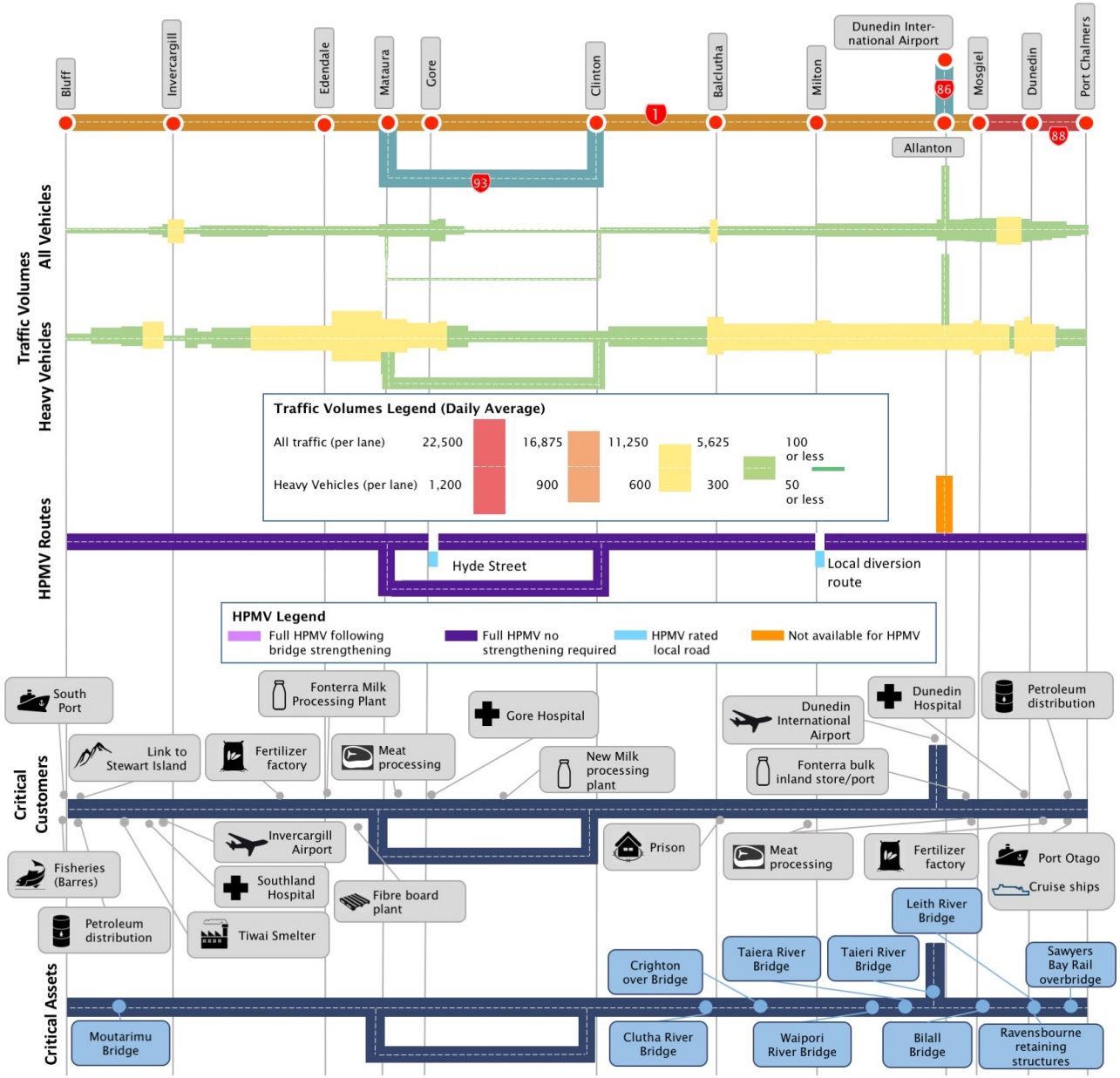
SH1, SH93 and SH88 are fully HPMV rated except for two areas within Balclutha and Mataura where Council Bylaws restrict use of SH1 by HPMV vehicles through the urban area. At these points, local HPMV rated roads allow vehicles to reconnect with SH1 following the restricted area. SH86 is not available for HPMV. Sawyers Bay overbridge restricts SH88 for over dimension vehicles.

Critical customers and assets

Many critical customers adjacent/ close to the route rely on the corridor being open 24/7. They are vulnerable to having short term interruptions which may impact productivity/ service. This includes Fonterra milk processing, several Hospitals, meat processors and cruise ship tourists adhering to tight timetables as Port Chalmers is often either the first of last port of call in NZ.

Critical assets along the route which need an enhanced maintenance focus to ensure they do not fail or significantly interrupt services along the corridor include several key bridges and retaining structures at Ravensbourne. Bridges are not only a critical asset from a transport network perspective, but also provide carriage to other critical utilities infrastructure along the corridor which large parts of the community depend on. Trimble Bridge is an 'indicator bridge', this structure will be inspected following seismic activity as a guide to impacts on other structures in the vicinity.

Figure 11 - Corridor capacity



Pressures

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

- **Right turn restriction at Mataura:** Vehicles over 13 meters in length are prevented from the right turn movement from SH93 to SH1 in Mataura since the proximity of the rail line to the intersection means vehicles over 13m length may overhang the rail track whilst waiting to make a right turn. Although the number of vehicles affected by this is low, affected heavy vehicles are required to divert through Gore or make a U-turn on the SH1 where possible (though this movement is difficult and undesirable).
- **SH88 alignment:** SH88 from Ravensbourne to Port Chalmers is narrow, windy and lacks adequate shoulders over a significant portion of its length for a national route. This results in lower traffic speeds and greater risk to vulnerable road users such as cyclists and pedestrians.
- **Restricted height and cross section at Sawyers Bay overbridge:** Some over dimension heavy vehicles cannot navigate Sawyers Bay overbridge on SH88 due to its restricted height and cross section.
- **Urban residential growth in areas such as Mosgiel around Dunedin:** Continuing residential urban growth is likely to increase commuter traffic using SH1 and the off ramps accessing Mosgiel and surrounding areas. Queuing traffic is regularly experienced around Abbotsford Interchange, due to the volume of traffic navigating the intersection linking the SH network to the local road traffic particularly at PM peak. Further growth is likely to exacerbate congestion and queuing at these constraint points leading to greater delays during peak periods.
- **A new $200 million milk processing plant will be built just north of Gore on SH1:** The new facility is expected to create 60 new jobs generating both additional private vehicle and heavy vehicle traffic movements. The additional traffic volumes generated by this development will further increase pressure on the corridor where heavy vehicles volumes are already a high proportion of traffic movements.
- **Reduce speed limits:** There is likely to be continued ongoing pressure from local communities to reduce speed limits through urban areas.

Future considerations

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

- **Improving unofficial/sub-standard slow vehicle bays:** Sections of the corridor have unofficial heavy vehicle bays in wide shoulders to allow following vehicles an opportunity to overtake. Passing opportunities on the route may require review as part of an overall passing lane strategy south of Balclutha to construct additional passing lanes.
- **Speed management:** Application of the Safe and Appropriate Speeds framework across the route will assist in ensuring speed limits are appropriate and defendable across the corridor.
- **Future development:** Monitoring and controlling of development likely to further increase heavy vehicle traffic on SH1 to ensure that access to the state highway network is fit for purpose and to ensure that the asset can continue to accommodate increased heavy vehicle movements without compromising LoS.
- **Collaboration with KiwiRail:** Realign the rail siding at the SH93/SH1 intersection in Mataura to accommodate vehicles over 13m length.

Resilience

The corridor is the key route between Dunedin and Invercargill, the biggest urban centres in Otago and Southland respectively. The corridor has a significant resilience profile providing a lifeline to numerous critical customers connected by the corridor. Whilst the risk profile is high, there are several alternative routes (local and state highway) to keep people moving, good management procedures mean the corridor is rarely closed for prolonged periods.

Vulnerabilities

A large portion corridor is susceptible to flooding, with flood area warnings between Port Chalmers to Dunedin and Mosgiel to Balclutha. Slip incidents occur between Port Chalmers and Dunedin and from Milton to Balclutha. The corridor is prone to ice and occasionally snow between Milton and Balclutha. High winds, resulting in heavy vehicle rollovers occur north of Balclutha. Since it is particularly sensitive to disruption, event management procedures are now in place on SH88 to manage issues and cruise ship passengers in the event of a closure. This includes bus alternatives and rail use.

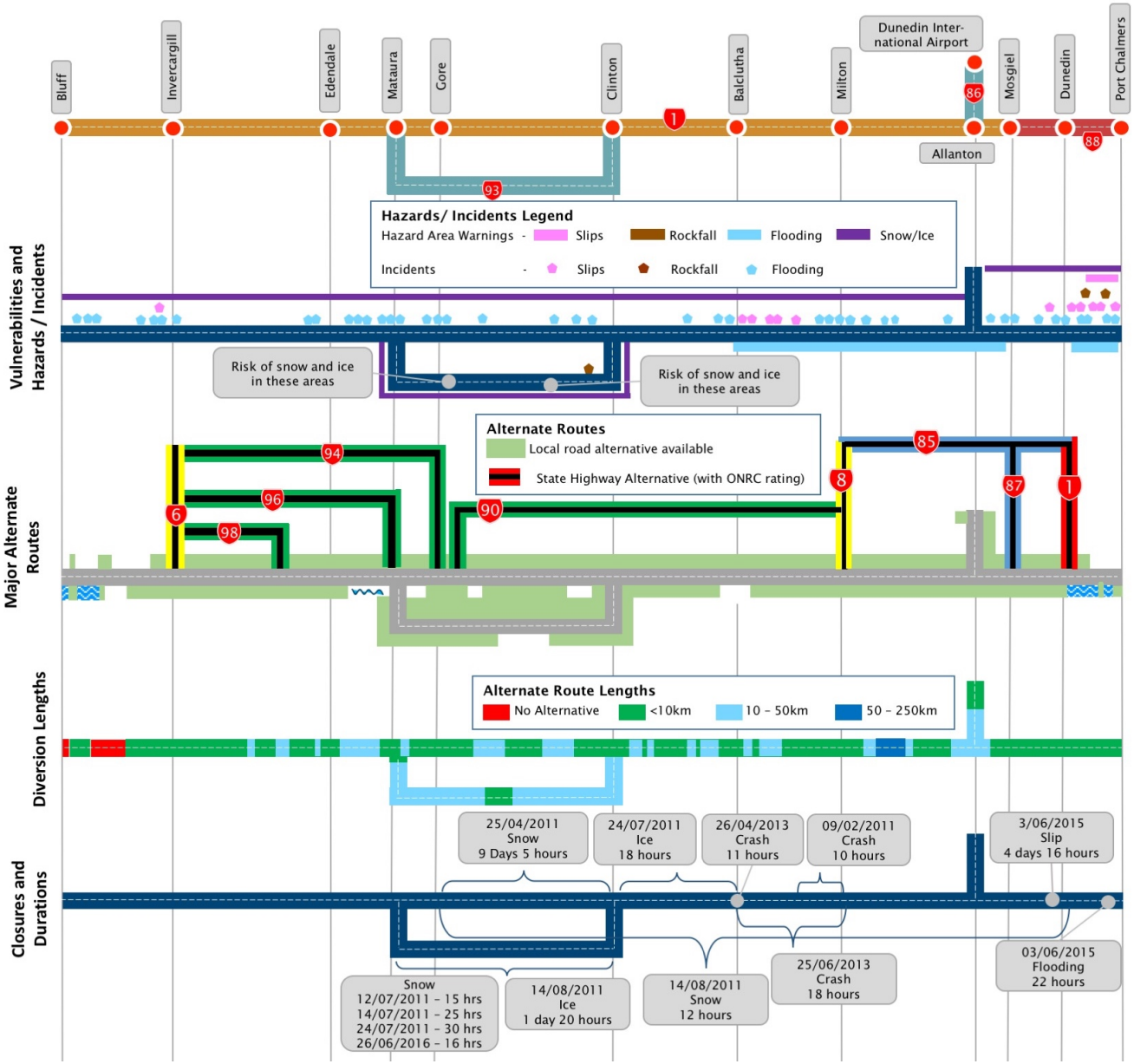
Alternative routes and diversion lengths

Most of the corridor is well catered for in terms of alternative routes. There are localised areas where diversion routes may be longer for heavy vehicles, although these areas are more constrained by the environment. SH1 and SH93 between Clinton and Mataura serve as alternate routes for each other if either section is closed. No alternative routes are available near Bluff as SH1 reaches its termination. SH88 has no alternative route for HPMV, and some local routes are unsuitable for coach (cruise passengers) and heavy vehicles.

Closures and duration

The major unplanned road closures and duration of interruption along the corridor in the last 5 years are shown in Figure 12.

Figure 12 – Resilience



Pressures

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

- **Snow and ice during winter resulting in road closures:** The Otago and Southland regions are prone to heavy snow fall leading to road closures that can last more than a day.
- **Flooding resulting in road closures:** Low lying coastal margins near Port Chalmers, Dunedin and Bluff can be influenced by the effects of surface water run-off during heavy rainfall and tidal conditions. SH1 approaching Bluff is worst affected as there are no alternative routes.
- **Lack of alternate routes for heavy vehicles on SH88:** As an important freight route to and from Port Chalmers, it is crucial that viable alternate routes are available for HPMV and heavy vehicles. As the anticipated growth in freight volumes is seen, this will increase pressure to provide suitable alternate routes.

Future considerations

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

- **Improved advanced and real-time information services:** Natural events such as flooding, snow and ice can close the road for extended periods of time. Technology services can provide advance or real-time information on road closures and conditions so that customers can make appropriate adjustments to their journey. This could also be supported by Variable Messaging Systems (VMS).
- **Critical customer engagement:** The number and diversity of critical customers on the corridor is particularly high. Understanding the individual needs of critical customers and their expectations who depend on the corridor will become more vital when making decisions on the management of the corridor. Liaison with critical customers does occur when maintenance works are undertaken or when works may affect a customer, however further investment and collaboration to better define individual customer needs and expectations in a formal manner would improve LoS.
- **Develop travel/ contingency plans for events:** Looking at prioritisation of event management based on ONRC classifications will be important to manage expectations and Levels of Service appropriately. This should link the engagement with customers together with the appropriate LoS for each route to identify contingency plans across the corridor during events. This will develop on the event plans prepared for cruise ship passengers on SH88.
- **Response to incidents:** The ability to respond quickly to snow and ice incidents is important, ensuring adequate investment in winter maintenance procedures and monitoring of snow, ice and road conditions. There is a need to innovate and make use of best practice for winter maintenance activities and procedures to ensure that the response is appropriate to cater for the types of vehicles using the route also considering the times of operation of critical customers serviced by the corridor which may be out with typical daytime use.

Reliability and efficiency

Efficiency

The corridor performs well for efficiency, particularly south of Dunedin. There are sections in Dunedin where the corridor displays a reduced level of service during the AM and PM peaks, although this is expected for the urban environment.

Variability

The data available is not consistent with anecdotal network knowledge which suggests that variability along much of the corridor is low, with the exception of a localised area in Dunedin from the motorway to Anzac Avenue which does experience variability due to congestion. Generally, the corridor performs well for variability although some sections through Gore may be affected by the HPMV diversion and the presence of several pedestrian crossings. Local knowledge suggests that typically variability through Gore is consistent with the rest of the corridor.

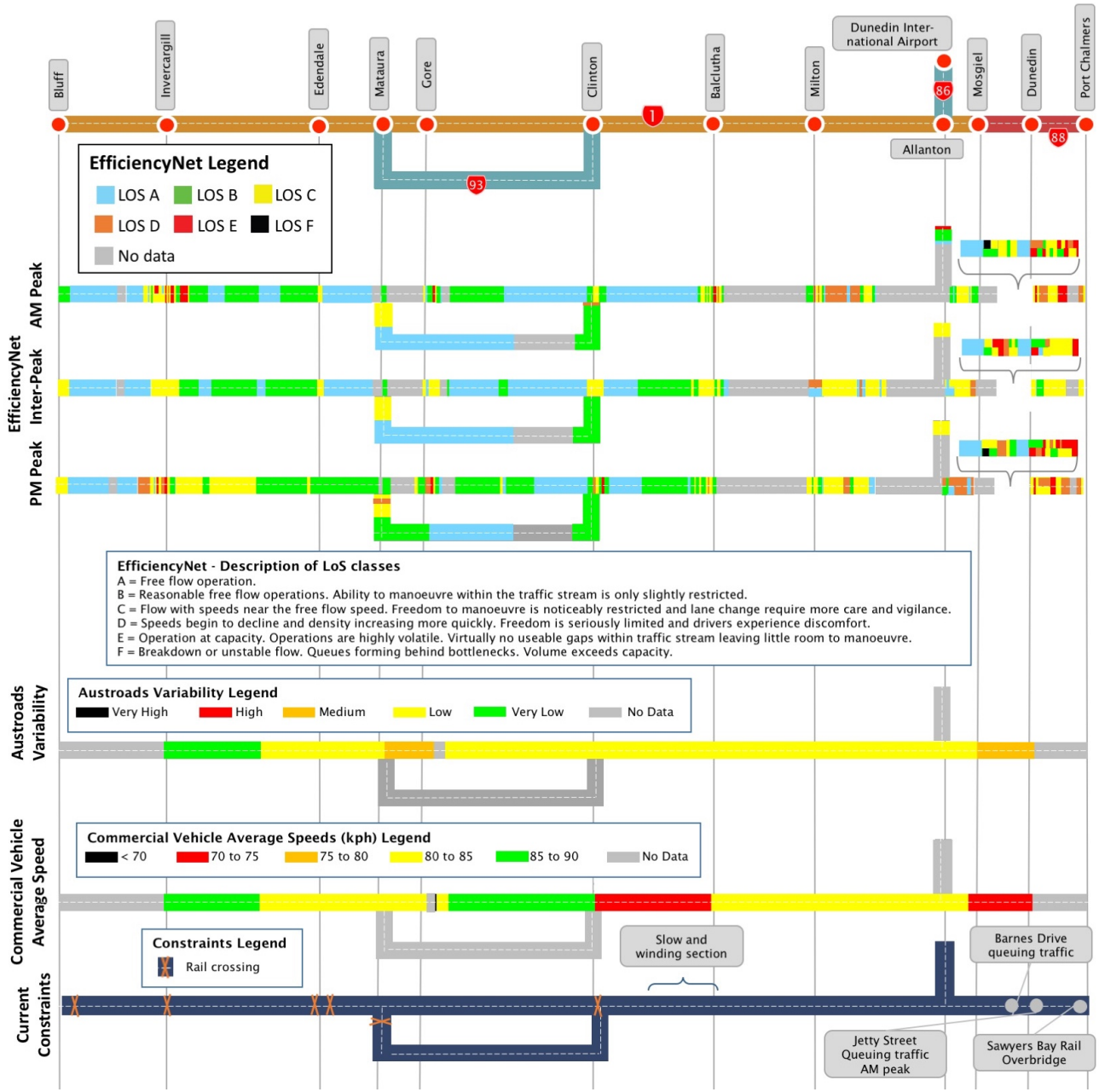
Commercial vehicle average speed

Average speeds for commercial vehicles vary along the corridor and there are some sections with no available data. Lower average speeds occur between Dunedin and Mosgiel due to congestion and the hilly topography (Caversham Hill and Saddle Hill). Between Balclutha and Clinton, the hilly topography also reduces average speeds.

Current constraints

The major current constraints on the network effecting journey reliability and efficiency are shown in Figure 13.

Figure 13 - Reliability and efficiency



Pressures

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

- **Incomplete/inaccurate data:** The variability data does not provide an accurate picture of the customer journey on parts of the network, particularly SH1 around Gore, parts of SH88 and SH93.
- **Low average speeds:** During the AM and PM peaks in Dunedin and Invercargill, vehicles experience inconsistent and occasionally reduced levels of service. Freight vehicles also experience low average speeds between Dunedin and Mosgiel, and Balclutha and Clinton due to topography.
- **Queuing traffic:** There are several areas on the outskirts of Dunedin City where traffic queues on off-ramps leading back to the SH1. This is an issue during peak times particularly around Mosgiel where queuing traffic is regularly observed at Abbotsford Interchange and Westland Street.
- **Timing of maintenance works:** Due to the sensitivities of managing cruise ship passengers departing and arriving, SH88 requires careful management of road restrictions and planned and unplanned events/incidents (utilities and road related) to minimise disruption to cruise ship passengers.
- **Slow moving farm vehicles:** On rural sections of corridor south of SH86, slow moving farm vehicles traverse the corridor at around 40km/hr in a 100km/hr zone. Wide tyres can take up the entire lane and overhang into the second lane. This creates safety and queueing issues for all motorists. The agricultural industry is likely to continue to grow along the corridor therefore the impacts of increased use of areas of the corridor for year-round general agricultural use may need to be monitored to assess the relative impact on customer LoS.
- **Alignment and topography impact heavy vehicle journey times:** On SH1 between Balclutha and Clinton, the hilly and windy environment prevents heavy vehicle traffic from maintaining optimum speeds. SH93 has steep climbs and narrow roads that larger vehicles can find challenging to navigate, resulting in reduced speeds and increased journey times.

Future considerations

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

- **Investment in accurate and complete datasets:** The corridor should be monitored so that variability of travel time and speed can be measured as heavy vehicle volumes increase. Since SH93 is also a key link for freight volumes travelling south, data on this section would also be of use, as well as the critical link via SH88 to Port Otago. This information will be particularly important for freight, commercial vehicles and business trips requiring consistent, reliable travel times so that LoS can be measured and maintained.
- **Efficient incident response:** Responding quickly to incidents on the network is important to maintaining reliable and efficient journeys for customers and current LoS. A robust monitoring regime is in place supported by WTOC through Dunedin, however additional investment in technology and innovations to respond to incidents more efficiently and communicate accurate information to customers more effectively would be of benefit to maintain LoS around Dunedin and Port Chalmers as traffic volumes increase in these areas.
- **ITS:** Use of ITS to manage traffic flows is increasing in popularity and given the importance of the corridor through Port Chalmers to Dunedin, further investment to improve levels of service and manage congestion through SMART management systems could be considered.
- **Heavy vehicle Invercargill bypass:** High level preliminary discussions are taking place between the NZ Transport Agency and Invercargill City Council regarding a heavy vehicle Invercargill bypass. This will remove heavy vehicle traffic from residential areas of Invercargill providing a more direct route on local roads to Bluff. This would assist in improving journey times for heavy vehicles travelling to South Port.
- **SH93 right turn, Mataura:** Trucks over 13m are restricted from turning right from SH93 to SH1 due to the proximity of the rail line to the intersection. This movement restriction, although only impacting a small proportion of heavy vehicles, does impact travel time reliability and journey times LoS for those affected. Collaboration with KiwiRail and investment will be required to realign the siding adjacent to the intersection. This is something that this currently being considered.

Safety

Collective risk

The level of collective risk varies from low to medium along SH1 from Bluff to Milton. The section of the corridor between Milton and Port Chalmers is mostly rated medium with segments of medium high risk.

Personal risk

Personal risk is low to medium for most of SH1, expect for some sections near Bluff, Clinton and between Milton and Allanton, where the rating is medium high. Much of SH93 is rated either as high or medium high with a small segment having a low personal risk.

Star rating

The star rating for most of SH1 varies between 2 and 3 star KiwiRAP with the urban areas unrated. A substantial section of the corridor between Mosgiel and Dunedin along the Southern Motorway is rated as 4 star.

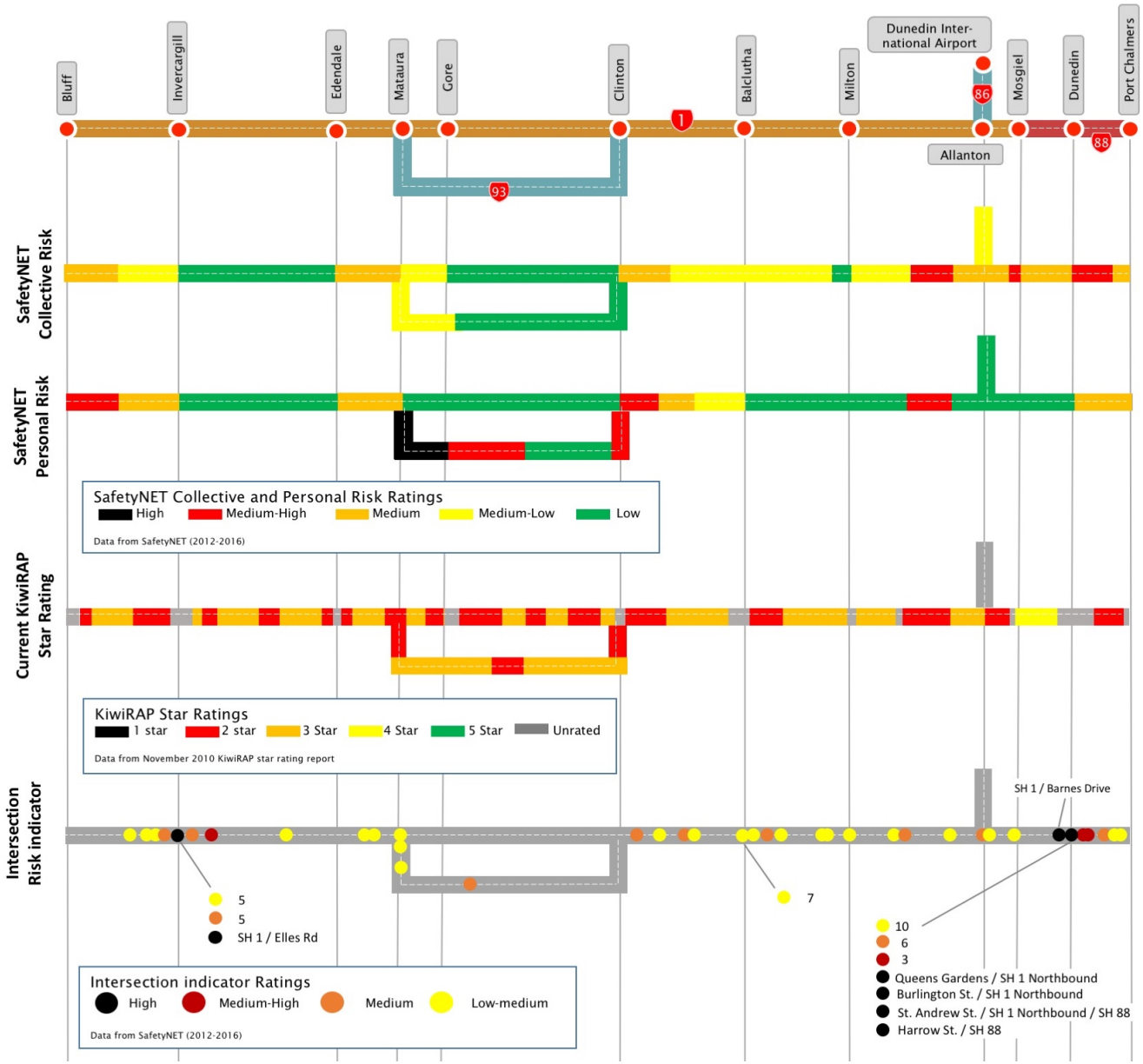
Most of the corridor is classified as Regional, with the exception of SH88 and SH93 which are Arterial and SH88 which is a National High-Volume Road. The desired customer level of service (CLoS) for regional and national high-volume roads are a star rating of three and four respectively, which is not met along several sections of the corridor, particularly along SH88.

Intersection risk indicators

There is one high risk intersection in Invercargill on SH1 and five in and around Dunedin on SH88.

There are also six medium-high intersections with one between Invercargill and Edendale, three in Dunedin and two on the approach to Port Chalmers.

Figure 14 - Safety



Pressures

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

- **Focus on increasing safety:** There are areas with high risk which are below the target star rating and there is no planned investment to address the risk profile i.e. SH93.
- **Increased use of corridor by visiting drivers:** Planned promotion of the corridor as the Southern Scenic Route in Southland together with general growth in tourism in the area may have a negative effect on the safety of the corridor with more unfamiliar drivers using the corridor
- **Interaction of rail with corridor:** Rail crossings and tracks alongside the corridor with little segregation is a safety risk. Loss of control on SH88 has led to vehicles entering the rail corridor. Several rail crossings on the corridor increase risk of rail /vehicle interaction.
- **Lack of safety features on SH93:** The SH93 corridor achieves a 2-star rating where it intersects with SH1 in Clinton and Edendale. The corridor has multiple cliffs and drop offs, lacks adequate safety barriers, has sections with narrow road width and out of context curves and has poor road user advice for navigating the challenging topography.
- **Sub-standard passing lanes:** There are passing lanes at Stoney Creek that do not meet current standards which increases risk to road users. Investment is needed to bring these up to current standard.
- **Narrow road geometry:** Several areas of the corridor suffer from narrow road geometry (SH88, SH93 and parts of SH1) affecting the star rating. Constrained geometry limits the available solutions and increases investment required to remedy risk areas.
- **Intersection safety:** Increasing industrial development around Invercargill, Bluff and along SH88 (particularly associated with the Port Container Store) is placing pressure on the safety of the corridor particularly at intersections and where truck and trailer movements are anticipated, where narrow road widths impact heavy vehicle turning movements.
- **Increasing trend in cycle crashes:** As a result of high traffic volumes, high proportion of heavy vehicle traffic, narrow road widths and lack of facilities catering for active road users around SH88 and SH1 in Dunedin, contribute to an increasing trend in cycle crashes. New segregated facilities planned on SH88 are located on the opposite side of the SH88 to residential areas creates a severance issue for cycle and pedestrian users of this facility. There is also a similar trend developing in Invercargill which may extend to other urban areas of the route where there is a lack of appropriate active user facilities.

Future considerations

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

- **Safety investment on SH93:** Investment targeting the out of context curve location and areas with limited road widths and lack of safety barrier will contribute to improve the safety LoS.
- **Investment in SH88:** Widening of the corridor and provision of safety barrier and accesses appropriate for heavy vehicle use will require a significant future investment for this route. Predicted traffic volume increases to the Port, may require consideration of the appropriateness of local roads as alternative heavy vehicle routes, which may require some investment and collaboration. Topography constraints around SH88 may prevent significant upgrades to the route from occurring.
- **Review passing lanes:** Upgrading passing lanes to meet current standard at Stoney Creek will assist in maintaining the LoS. A review of the overall passing lane provision for consistency on the corridor in line with the Passing Lane Strategy will also be of benefit.
- **Improve safety for visiting drivers:** Enhancing road user safety information for visiting drivers on SH93 and areas of the SH1 with challenging topography and lower star rating. Investment in safety barriers to assist in reducing crash severity where there are steep drops adjacent to the carriageway and out of context curves.
- **Elles Road intersection:** Proactive methods to reduce risk at Elles Road intersection have been put in place to prevent injury occurring until capital works are completed to upgrade the area, however as development continues, specifically adding to the heavy vehicle volumes, the suitability of Elles Road intersection in the short and long term will require monitoring. Controls and requirements for access standards will need consideration for future developments such as at the new milk processing facility near Gore. Targeted safety programme for high risk intersections along the corridor to ensure consistency of treatments.
- **Improve facilities for cycle/pedestrian road users:** Measures are being put in place in Dunedin to improve facilities for these types of users although further investment and innovation to reduce the risk to vulnerable road users will be necessary in other urban centres (Port Chalmers and Invercargill to Bluff) as these modes become more popular.
- **Severance at Ravensbourne:** Pedestrians and cyclists need to cross SH88 to access the segregated facility. Consideration of a formal crossing point at Ravensbourne on SH88 to access the separated active user facility may be required. Monitoring of the new facility will determine the level of severance created and the demand for any crossing point.

People, places and environment

Natural environment

Much of the corridor consists of rural highway landscape with Otago Harbour and Bluff Harbour located at the northern and southern ends respectively.

Multiple stream and river catchments traverse the corridor. Heavy rain and high tides can cause water from the Bluff Harbour to flood the road. Lake Waihola also provides a popular stopping place with a view along the corridor. Edendale, Mataura and Gore are sensitive receiving environments due to the Edendale aquifer which supplies ground water to the town and industries reliant on the natural resource in the area. There are areas of the route between Bluff and Gore and around Waihola where restrictions are placed on soil removal due to concern of contamination from road water run-off.

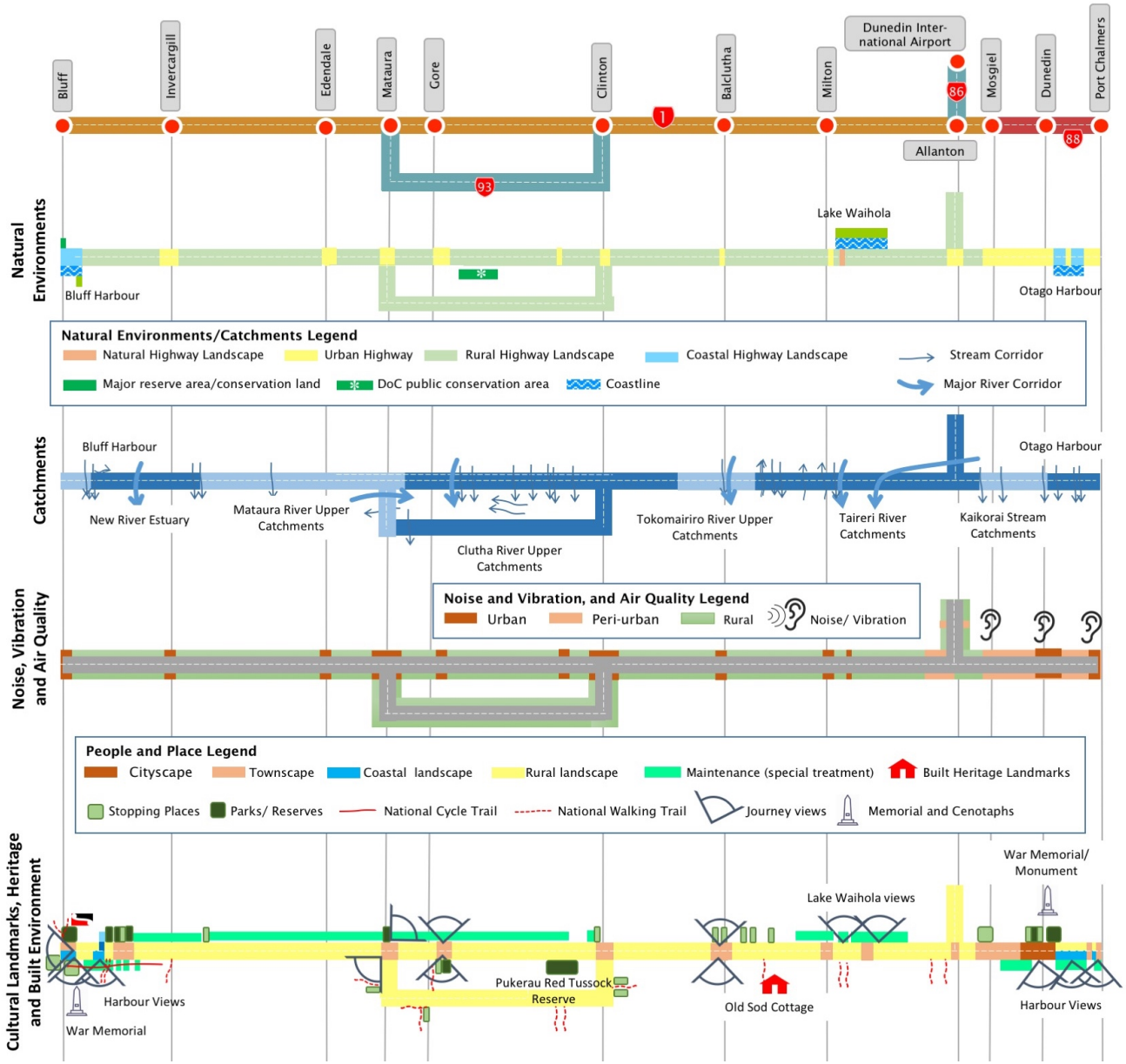
Noise, vibration and air quality

Urban areas of Port Chalmers, Dunedin and Mosgiel are subject to noise issues, mainly from engine braking and vibrations (from uneven utility covers and surface irregularities). Poor road reinstatements and patch repairs together with heavy traffic volumes on SH88 through Port Chalmers create noise issues for communities. A noise restriction is in place on the Southern Motorway at Fairfield.

Cultural landmarks, heritage and built environment

The corridor provides views towards the Otago and Bluff harbours and Lake Waihola. There are multiple popular stopping places along SH1 and SH93 with parks/reserves in the Dunedin and Invercargill urban areas. The Pukerau Red Tussock Reserve, Old Sod Cottage and War Memorials are also key landmarks accessible from SH1. There are several memorials in central Dunedin. These are places of significant interest attracting crowds on Anzac Day.

Figure 15 – People, places and environment



Pressures

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

Natural environment

- **Special maintenance restrictions and environmental management:** High standards of environmental management in relation to stormwater, erosion and sediment control and the reduced use of herbicides for plant pest management may be required for works near coastal areas and within flood plains. Activities in these areas may be restricted to certain times of the year, impacting maintenance programmes. Special maintenance restrictions such as no soil take away zones between Bluff and Invercargill.
- **Resource consenting requirements:** Maintenance around Gore, Mataura and Edendale requires resource consent to manage stormwater quality due to the sensitive Edendale aquifer. Ongoing maintenance is required to swale stormwater management systems in these areas which treat water and protect the natural ground water system around Edendale and Mataura. Milton is also located within a flood plain. These requirements may increase demand for budget to undertake maintenance works.
- **Heritage trees:** Trees adjacent to the corridor within Dunedin constrain alterations to the current road configuration in this area.

Noise, vibration and air quality

- **Noise management and vibration around Port Chalmers:** Maintenance schemes have looked to address rocking gully covers and surface irregularities, increasing traffic volumes and high percentage of heavy vehicles will increase pressure to maintain LoS.
- **Kinmont:** (near Mosgiel) is a noise sensitive area, with specific requirements regarding surfacing material used in this area.

Cultural landmarks, heritage and built environment

- **Urban stopping places:** Urban centres on the corridor function as stopping places, with local trade benefiting from the connections with highway customers. Increased pressure to support communities with appropriate town entry treatments, streetscape and signage to local services and facilities. Where new highway realignment bypass existing settlements (Edendale) there will be pressures to engage with local trade stakeholders.
- **Rural stopping places:** Ensure that rural stopping places are adequate to accommodate any increased tourist traffic and that signage is adequate to points of interest and attractions.

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:

- **Combining stopping places:** (including rest areas and look outs) with places of interest, heritage sites, local business areas and main streets, and future electric vehicle charging infrastructure. Utilising these places to tell local stories and enhance the attractiveness and amenity of journeys.
- **Review adequacy of stopping places:** A review of stopping places along the corridor in line with the Visiting Drivers strategy, ensuring stopping places for all customers that are safe and attractive will be necessary to support local plans to promote the Southern Scenic Route.
- **Wayfinding and signage for active users:** The investment in Cycle and pedestrian improvements on SH88 and SH1 through Dunedin is an opportunity to improve cycle wayfinding and signage around cycle/pedestrian and vehicle interaction points.
- **Consenting:** Working with regulatory agencies to streamline consenting processes and approve disposal sites. This is an area where future investment may be required to maintain LoS. Collaboration with the agencies applying restrictions will be important to assist their understanding of the impact if future restrictions. Already parts of the SH1 corridor around Waihola and between Gore and Bluff are affected by restrictions. Working with regulatory agencies to get global consents for maintenance activities around sensitive areas (Edendale Aquifer and Milton).
- **Access to fuel stops:** The SH1 southbound one-way section through Dunedin has two service stations for southbound traffic, improved direct access to facilities for northbound traffic would assist in catering for the needs to northbound heavy vehicle traffic in particular.
- **Collaboration with utility providers:** Infrastructure located within the SH88 road reserve will assist in enhancing response times to defective apparatus and equipment and in understanding the impact their infrastructure may have on surface irregularities and apparatus which leads noise issues through Port Chalmers.

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 330 km of road network which reflects 2.9% nationally. The total value of the assets along the corridor is $461M.

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

Asset condition and performance summary

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

Figure 16 – Corridor asset base

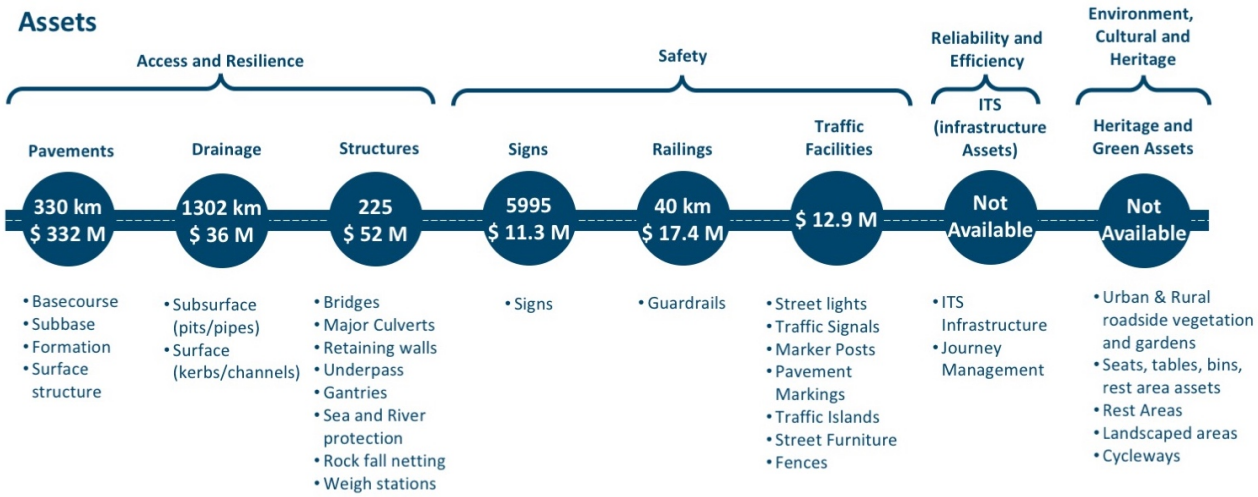


Figure 17 - Summary asset condition and performance

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 SH1S/786 south of Balclutha, SH1S/854 north of Gore, and the entire length of SH88 between Dunedin and Port Chalmers show a significant level of surface skid resistance below the threshold limit. Much of the corridor also shows a significant level of surface skid resistance within the investigation limits. Overall, surface skid resistance on the corridor shows degradation over the three-year period.

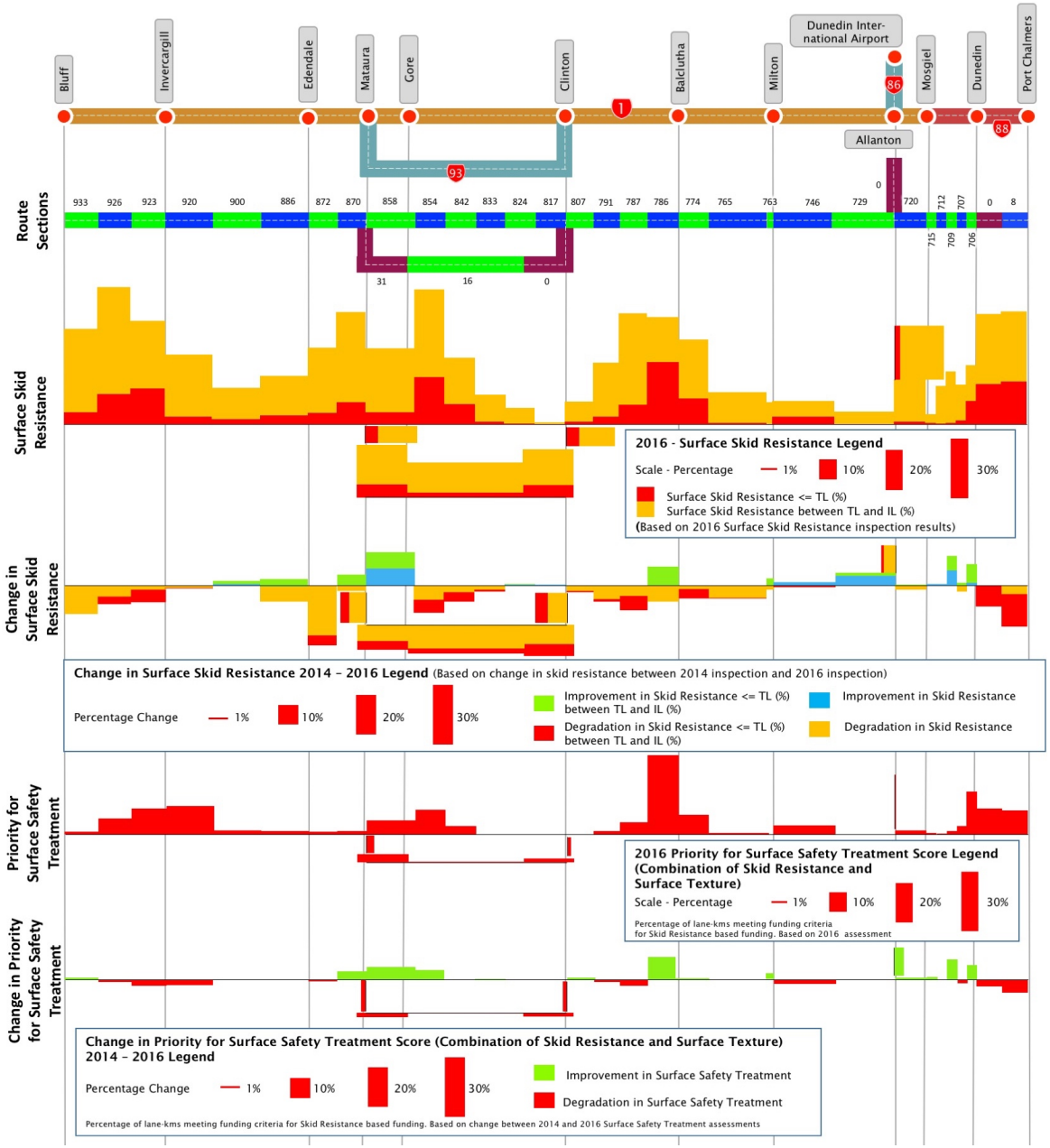
Priority for surface safety treatment

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 relatively high percentage (3.38 %) of the corridor achieved Skid Assessment Length that qualifies for funding. This equates to only 21.6 lane-km of the 639 total lane-km of the corridor. Sections with the highest priority for surface safety treatment qualifying for funding are, SH1S/786 south of Balclutha, SH1S/706 in Dunedin, and, the entire length of SH88 between Dunedin and Port Chalmers.

Figure 18 – Asset condition



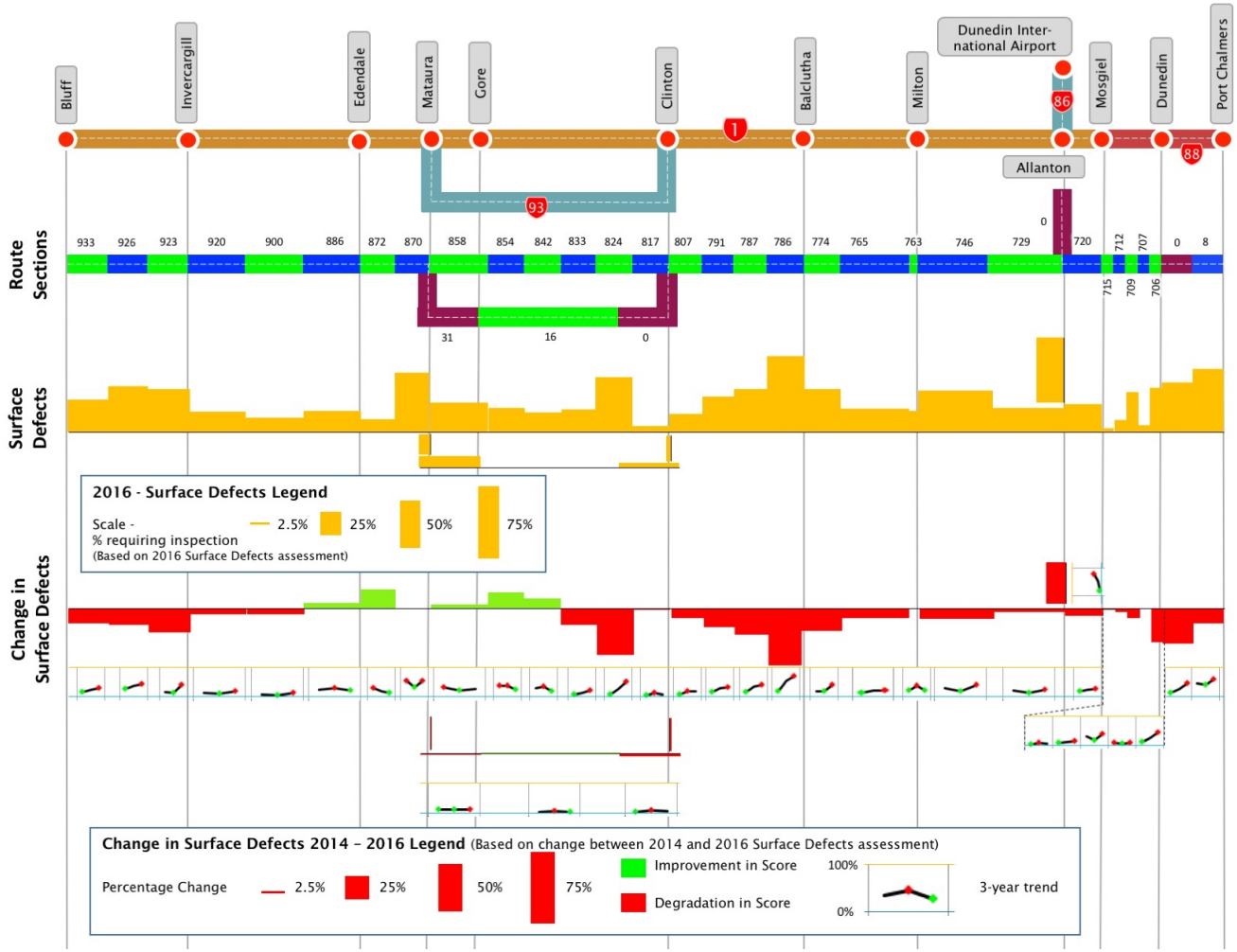
Surface defects

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

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

Overall, 26.1% of the corridor achieves a score above which inspection is required. Sections with significant lengths of surface requiring inspection include: SH1S/786 south of Balclutha, SH1S/854 north of Gore, SH1S/824 southeast of Waipahi, and, the entire length of SH88 between Dunedin and Port Chalmers. These sections also show a significant level of degradation in score over the last three years.

Figure 19 – Asset condition 2



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.

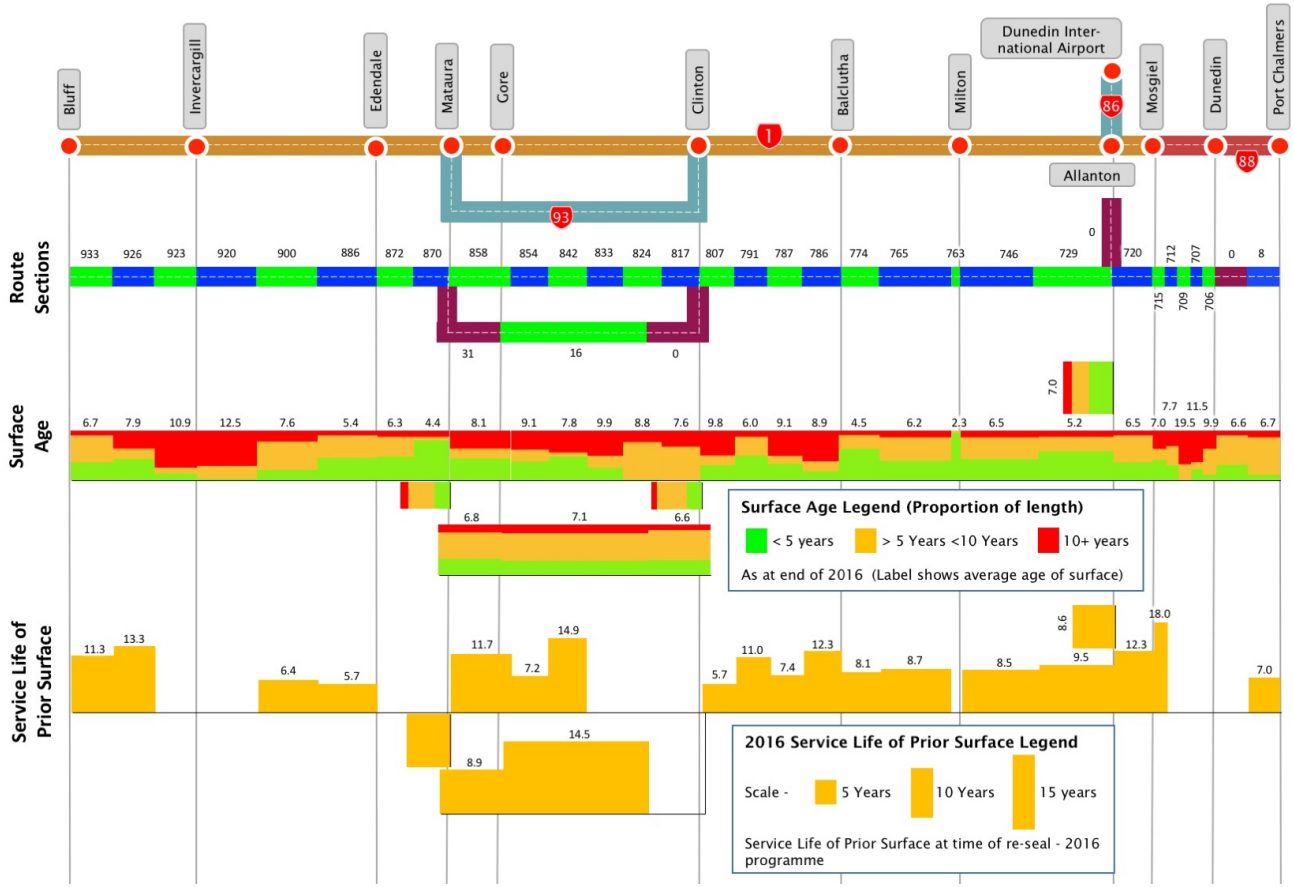
The sections of corridor with the oldest age profile are SH1S/707 and SH1S/709 in Dunedin, and, SH1S/920 and SH1S/923 through urban Invercargill.

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 10.4 years, with sections SH1S/715 north of Mosgiel, SH1S/842 between Pukerau and McNab, and, SH93/16 east of Ferndale achieving an average service life in excess of 14 years.

Figure 20 – Asset condition 3



Resurfacing

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

The major resurfacing works are planned for sections SH1S/706 in Dunedin, SH1S/787 in Balclutha, SH1S/842 between Pukerau and McNab, SH1S/926 between Invercargill and Woodend, and, SH93/16 east of Ferndale.

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 show whether the route section achieves this level or not.

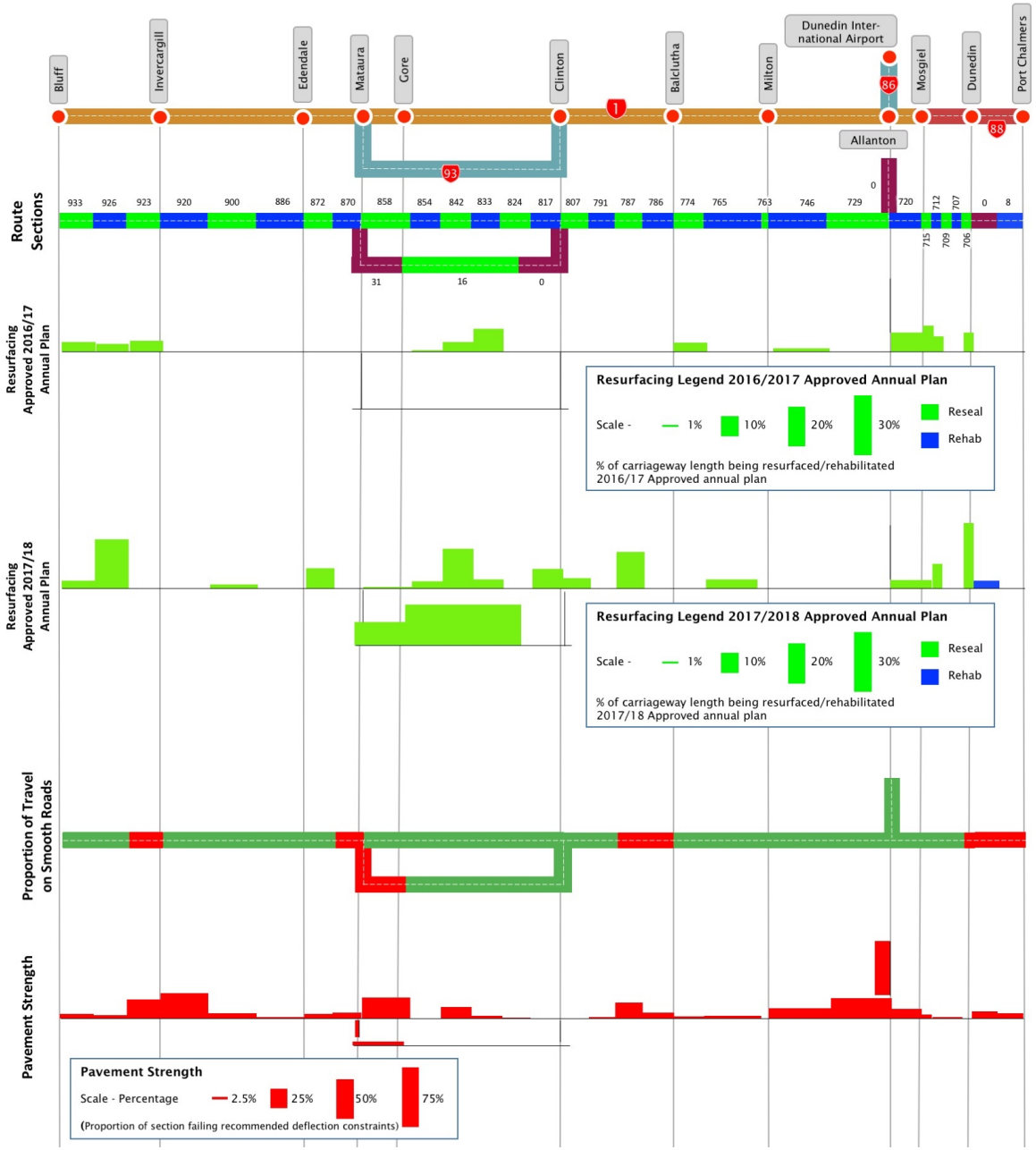
Sections where the corridor fails to meet the minimum standard for proportion of travel on smooth roads include: All of SH88 between Port Chalmers and Dunedin, SH1S/786 south of Balclutha, SH1S/870 and SH93/31 around Mataura, and SH1S/923 south of Invercargill.

Pavement strength

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

The sections of corridor with the highest proportion of pavement failing to meet the deflection constraints occur at SH1S/858 between Gore and Mataura, and, SH1S/920 and SH1S/923 through Invercargill.

Figure 21 – Asset condition 4



Asset condition and performance pressures

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

- **Bluff Road:** This section traverses swampy ground, has poor pavement, and poor performing aggregate has been used in the past.
- **Port Chalmers:** This area has a high maintenance demand because of soft silt sub-grades. This combined with a high number of heavy vehicles leads to more frequent re-seals.
- **Aggregate imported:** Higher demand surface skid resistance sites have required imported aggregate from Central Otago.
- **Sawyers bay underpass SH88**: Flooding occurs at the low point with effective drainage being difficult.
- **Allanton to Milton, Balclutha to Clinton, Invercargill to Bluff:** Poor performing subgrades, moisture sensitive pavements, poor drainage, and pavement failure on passing lanes. Addressing drainage should minimise the effects.

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:

- **Port Chalmers to Dunedin SH88:** Crib walls and retaining structures are getting old, have had little maintenance historically, and may be subject to failure. More safety works planned in this section with additional barriers and high performing markings.
- **Allanton to Milton, Balclutha to Clinton, Invercargill to Bluff:** Addressing the drainage in these sections should minimise the effects on pavements.
- **Southern Motorway**: An additional 14km of barrier may increase the maintenance burden.

SH88 Roseneath to Maia slips July 2017

Investing in the corridor

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

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

Right treatment, right place, right time

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

Intervention works will be programmed to ensure:

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

Interventions will:

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

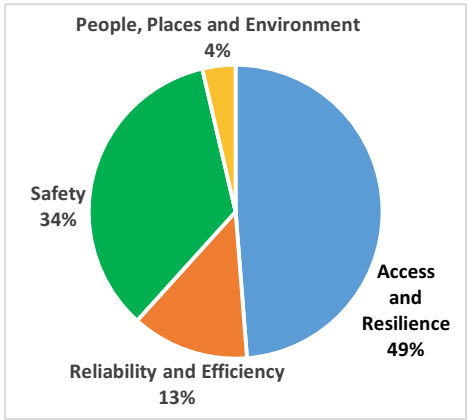
Summary investment

The proposed investment in the corridor is as follows:

Table 1- Summary corridor investment ($000)

Outcome	Expenditure Category	2018-2021	2021-2024	2024-2028
Access and Resilience	Maintenance and Operations	$13,504	$14,352	$22,239
	Renewals	$17,192	$21,245	$31,689
	Improvements	$0	$0	$0
Reliability and Efficiency	Maintenance and Operations	$4,688	$5,075	$7,594
	Renewals	$505	$519	$869
	Improvements	$10,710	$1,940	$0
Safety	Maintenance and Operations	$10,226	$10,940	$16,724
	Renewals	$2,140	$2,470	$3,652
	Improvements	$39,270	$0	$0
People, places and Environment	Maintenance and Operations	$2,435	$2,518	$3,833
	Renewals	$58	$63	$94
	Improvements	$0	$0	$0
	Total	**$100,727**	**$59,122**	**$86,695**

Figure 22 – Corridor investment



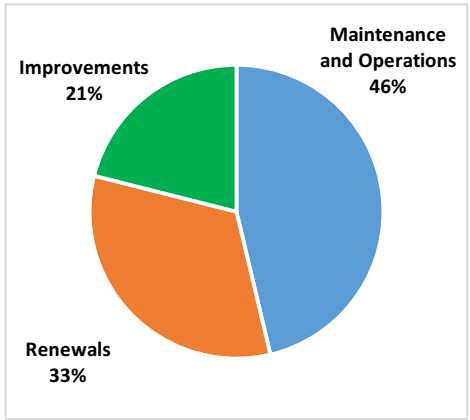


Table 2 - Summary investment by work category ($000)

Outcome	Work Category		2018-2021	2021-2024	2024-2028
Access and Resilience	111	Sealed Pavement Maintenance	$2,573	$2,723	$4,220
	112	Unsealed Roads	$0	$0	$0
	113	Drainage Maintenance	$1,187	$1,094	$1,959
	114	Structures Maintenance	$1,531	$1,748	$2,865
	121	Environmental Maintenance	$4,648	$4,928	$7,402
	122	Traffic Services Maintenance	$49	$93	$139
	124	Cycle Path Maintenance	$10	$11	$17
	151	Network & Asset Management	$2,814	$3,014	$4,526
	161	Property	$692	$740	$1,112
	211	Unsealed Road Metalling	$10	$11	$16
	212	Sealed Road Resurfacing (excl. surface skid resistance)	$10,112	$13,751	$18,513
	213	Drainage Renewals	$752	$778	$994
	214	Pavement Rehabilitation	$4,229	$4,798	$9,312
	215	Structures Component Replacements	$1,860	$1,649	$2,476
	222	Traffic Services Renewals	$229	$258	$377
	321 - 341	Improvements	$0	$0	$0
Reliability and Efficiency	121	Environmental Maintenance	$585	$625	$952
	123	Operational Traffic Management	$3,026	$3,313	$4,969
	151	Network & Asset Management	$950	$1,002	$1,472
	161	Property	$127	$134	$202
	222	Traffic Services Renewals	$505	$519	$869
	321 - 341	Improvements	$10,710	$1,940	$0
Safety	111	Sealed Pavement Maintenance	$3,035	$3,179	$4,905
	112	Unsealed Roads	$0	$0	$0
	113	Drainage Maintenance	$290	$308	$454
	114	Structures Maintenance	$331	$373	$560
	121	Environmental Maintenance	$389	$449	$675
	122	Traffic Services Maintenance	$4,303	$4,582	$7,052
	124	Cycle Path Maintenance	$0	$0	$0
	151	Network & Asset Management	$1,582	$1,725	$2,591
	161	Property	$296	$324	$487
	212	Surface Skid Resistance	$1,373	$1,521	$2,284
	214	Pavement Rehabilitation	$23	$47	$71
	215	Structures Component Replacements	$242	$275	$414
	222	Traffic Services Renewals	$501	$627	$884
	321 - 341	Improvements	$39,270	$0	$0
People, places and Environment	111	Sealed Pavement Maintenance	$220	$136	$205
	121	Environmental Maintenance	$1,841	$1,982	$3,028
	151	Network & Asset Management	$300	$320	$481
	161	Property	$74	$79	$118
	221	Environmental Renewals	$58	$63	$94
	321 - 341	Improvements	$0	$0	$0
		Total	**$100,727**	**$59,122**	**$86,695**

To be confirmed through RLTP process

Investing in access and resilience

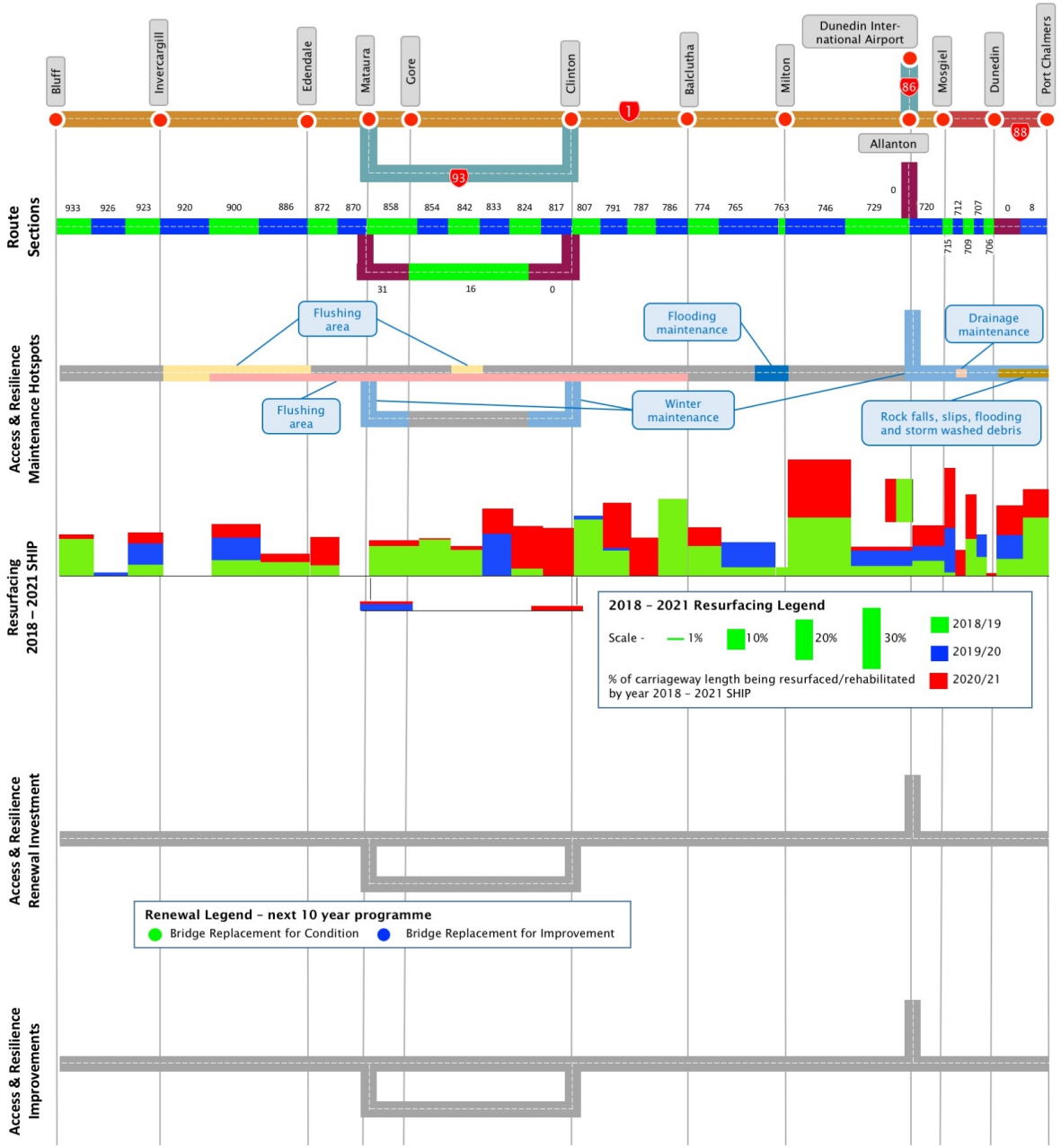
Operations and maintenance

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

- **SH88/8 St Leonards to Port Chalmers:** Rockfalls and slips along this section require continued maintenance
- **SH88 Port Chalmers to Dunedin:** Ponding, surface water, and storm washed debris are all issues with this low lying coastal length of highway.
- **Southern Motorway SH1S/712:** The drainage in this section of corridor is prone to blockages.
- **Winter Maintenance:** During colder months, winter maintenance is required on sections: SH88, SH93/0 and 93/31.
- **Dunedin Airport Access SH86:** This length of highway is a high priority for winter maintenance to keep access to airport open.
- **Flushing issues:** There are issues of pavement flushing on sections: SH1S/886 to 920 Edendale to Invercargill, and, SH1S/842 Pukerau.
- **SH1S Balclutha to Invercargill East:** Old pavements and multiple seal layers combine to cause ongoing issues requiring pavement maintenance.

Figure 23 – Access and resilience investment



Renewals

Resurfacing

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

Significant investment in resurfacing is planned for sections: SH1S/746 between Waihola and Milton, and, SH88/0 and SH88/8 between Dunedin and Port Chalmers.

Improvements

There are no access and resilience related improvements planned for this corridor.

Investing in reliability and efficiency

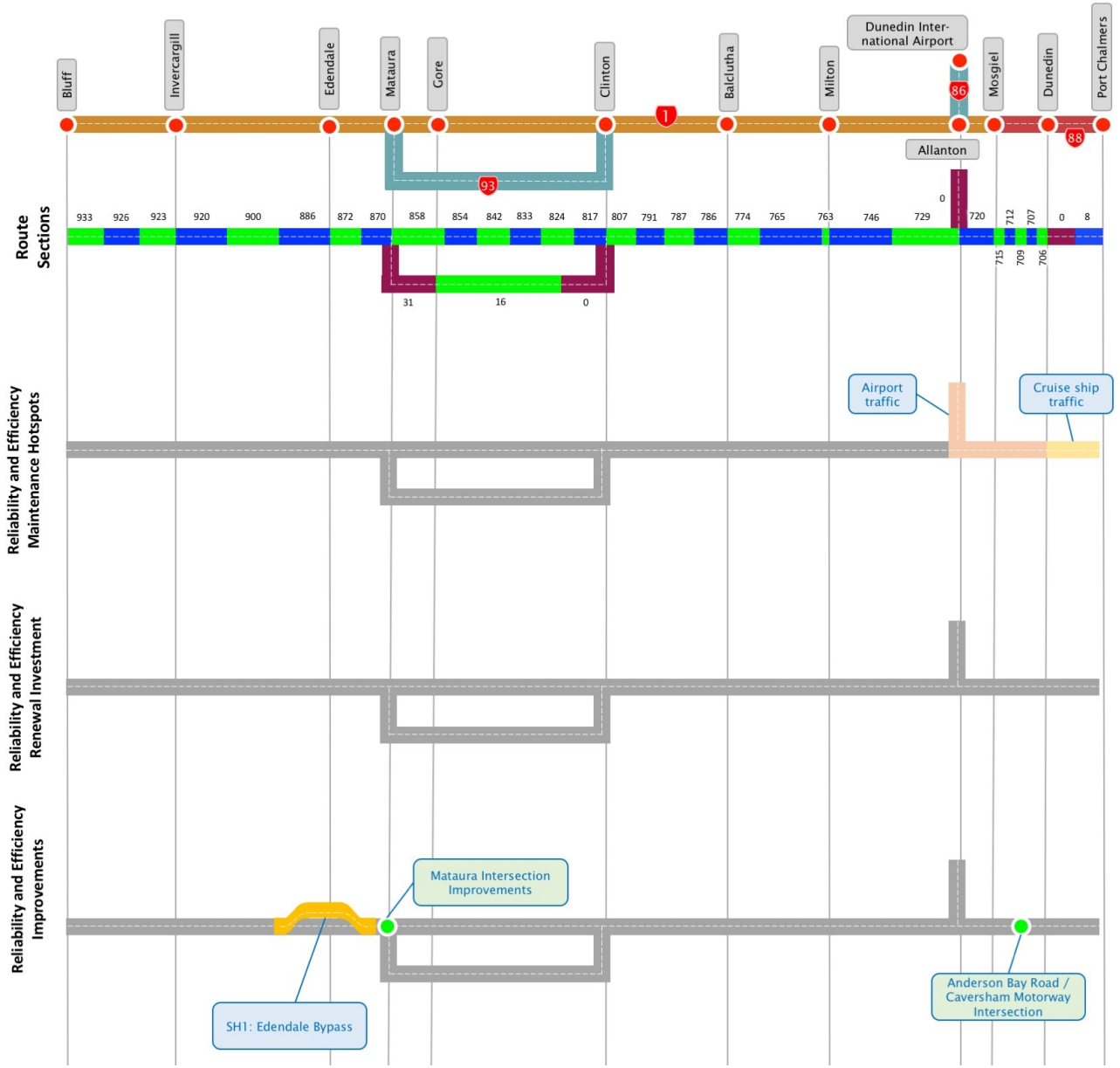
Operations and maintenance

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

- **SH88:** Traffic control is required for maintenance due to narrow carriageway. In the summer period, there is also a need to be mindful of the cruise ship schedule for Port Chalmers.
- **SH1S and SH86 Dunedin to Airport:** There is a need to be mindful of the airline schedule when scheduling maintenance along these sections of the corridor.

Figure 24 – Reliability and efficiency investment



Renewals

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

Cyclists on SH 88 shared path. Courtesy of Antony Hamel

Improvements

Planned

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

SH1 – Edendale Bypass

Description: To realign State Highway 1 (SH1) around Edendale township to reduce travel times between Gore and Invercargill, and improve safety from the increasing number of heavy vehicles using this road.

Draft Regional Programme considered for SHIP

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

Table 3- Draft regional programme considered for SHIP

Project	Funding Status	Description
Andersons Bay Road/Caversham Motorway Intersection		Improvements to Andersons Bay Road/Caversham Motorway intersection as part of the DCC Eastern Freight Bypass to improve efficiency for freight (including access to Port Otago).
Mataura Intersection Improvements		The main trunk rail line runs parallel with SH1 at the intersection of SH1 and SH93. Trucks from SH93 are unable to pull up to the limit line to confirm it is safe to turn left into SH1 without straddling rail line. The Alliance Plant has been reconfigured and all stock now enters from SH1 and this will increase the right turn movements from SH93. The Alliance plant car park is also being relocated, which will put additional demand on this intersection. The intersection needs to be reconfigured to cater for the additional demand.
St Andrew St Anzac Ave Intersection		Revise layout of existing signal controlled intersection to improve operational efficiency, especially for port-bound freight. Intersection complicated by adjacent rail line.

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

- **SH1S/720 to SH1S/774 Mosgiel to Balclutha:** The increase in safety assets in this section is creating an increased maintenance investment burden, with an increase in the responses to barrier strikes.

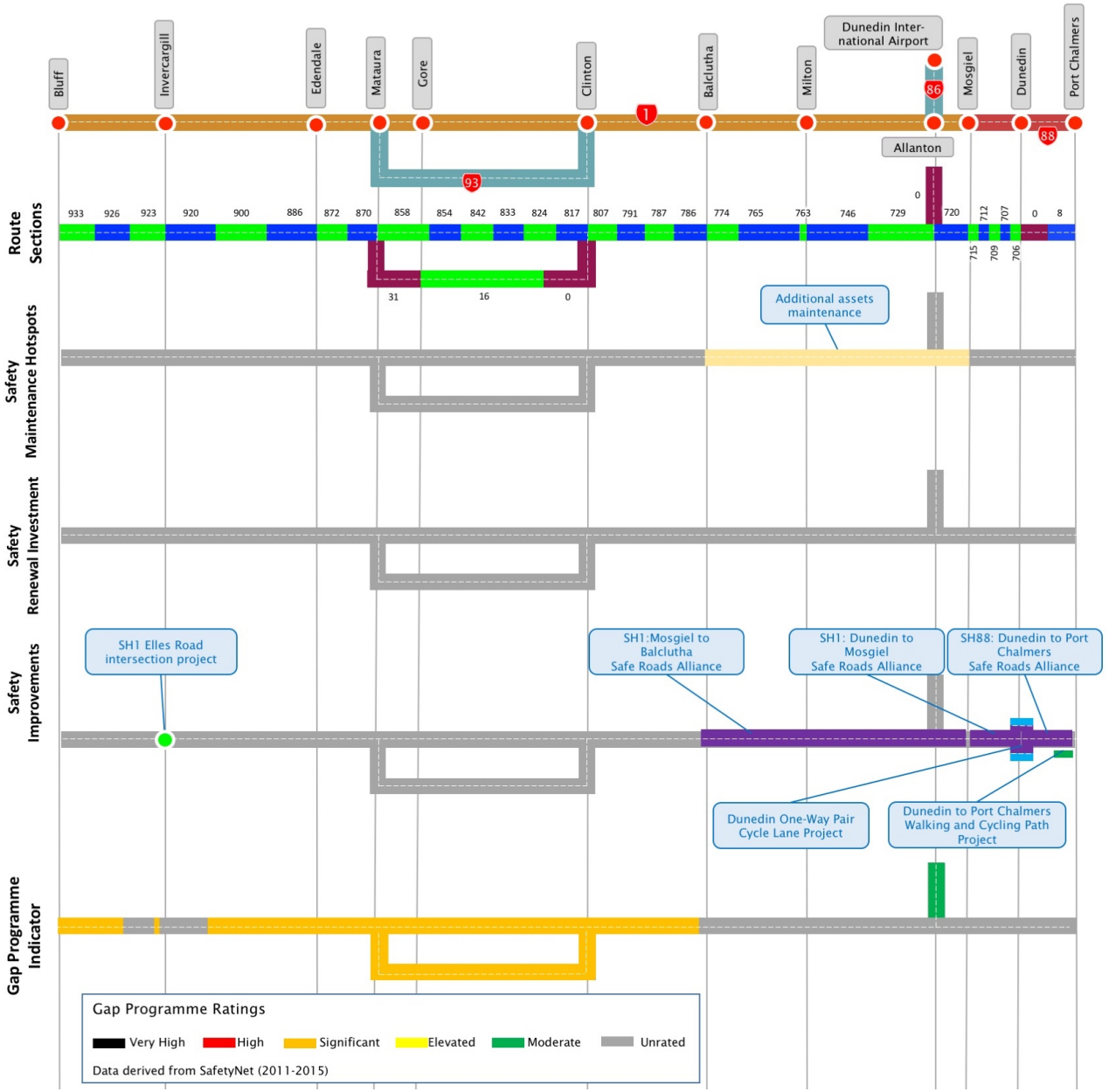
Gap programme indicators

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.

SH1 and SH93 has an elevated potential for reducing fatal and serious injuries and would benefit from targeted low cost high coverage improvements. SH86 from Allanton to Dunedin International Airport has a moderate potential and would also benefit from targeted, low improvements.

For the unrated segments of the corridor, the potential crash savings are low or are being addressed under other existing programmes.

Figure 25 – Safety investment



Renewals

There are no safety related renewals planned for the corridor.

Improvements

Planned

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

SH1 – Mosgiel to Balclutha (Safe Roads Alliance)

Description: This project will improve road and roadside safety on State Highway 1 between Dunedin and Mosgiel. Improved safety features will include additional side barriers, a wider centre line or median barrier at the Mosgiel end, and high-performance road markings along the whole route.

SH1 – Dunedin to Mosgiel (Safe Roads Alliance)

Description: This project will improve road and roadside safety on State Highway 1 between Dunedin and Mosgiel. Improved safety features will include additional side barriers, a wider centre line or median barrier at the Mosgiel end, and high-performance road markings along the whole route.

SH88 – Dunedin to Port Chalmers

Description: This is to implement various options of safety improvement along the 7 km SH88 road corridor through combination of improved delineation (e.g. ATP markings); wire rope barrier, and w-section guardrail barrier. Nominally focus in areas of 80km/h speed limit between Ravensbourne and Port Chalmers, and to protect from loss of control impact from entry into harbour, onto rail lines, into/over steep embankments. This project is combined with the last stage of the Dunedin to Port Chalmers shared pedestrian and cycle path from St Leonards to Port Chalmers. This part of the project is to provide a safe alternative to walking and cycling on the highway.

SH1 – Dunedin to Port Chalmers Walking and Cycling Path Project

Description: Providing a safe alternative route for pedestrians and cyclists to State Highway 88 (SH88) between Dunedin and Port Chalmers, is the main reason for building this shared path along the western edge of the Otago Harbour.

Elles Road Roundabout

Description: Intersection is listed in the Top 200 High Risk Intersections and located on the main freight route to the Port at Bluff. The intersection is located on an out of context curve and the intersection has a number of deficiencies including the short acceleration lane from Elles Road onto SH1 to the south. Development of a transport hub and industrial intensification on Lake Street have changed the traffic volumes and turning movements at the intersection at Lake Street which is located 350m from the SH1/Elles Road intersection

Draft Regional Programme considered for SHIP

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

Table 4- Draft regional programme considered for SHIP

Project	Funding Status	Description
Weigh Right Regional Construction		Improve weigh pits to improve overweight detection and to meet new vehicle and safety standards.
Speed Management Implementation		Transport planning activity to enable development of Regional Speed Management Plan in conjunction with partner Road Controlling Authorities
Minor Improvements 18/21		Activities will be targeted to low cost safety, optimisation and resilience activities which contribute to the Transport Agency's goals of either reduce the level of deaths and serious injuries, improve urban network capacity in our major centres or to reduce the resilience risk on our key routes through preventative maintenance activities.
Accelerated LED Renewals for SH Street Lighting		To replace all street lights with more cost-effective LEDs to save costs on power and maintenance.

Investing in people, places and environment

Operations and maintenance

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

- **SH1S/707 and 709 Southern Motorway:** Vegetation maintenance in the narrow centre median is problematic, requiring traffic control while being undertaken. Litter is also a concern along this section of highway.
- **SH1S/712 Green Island:** Noise monitoring is undertaken of a special seal site.
- **SH1S/720:** Rubbish dumping over boundary fences is causing drains to block, the result being this is sending drainage overflows across adjacent properties.

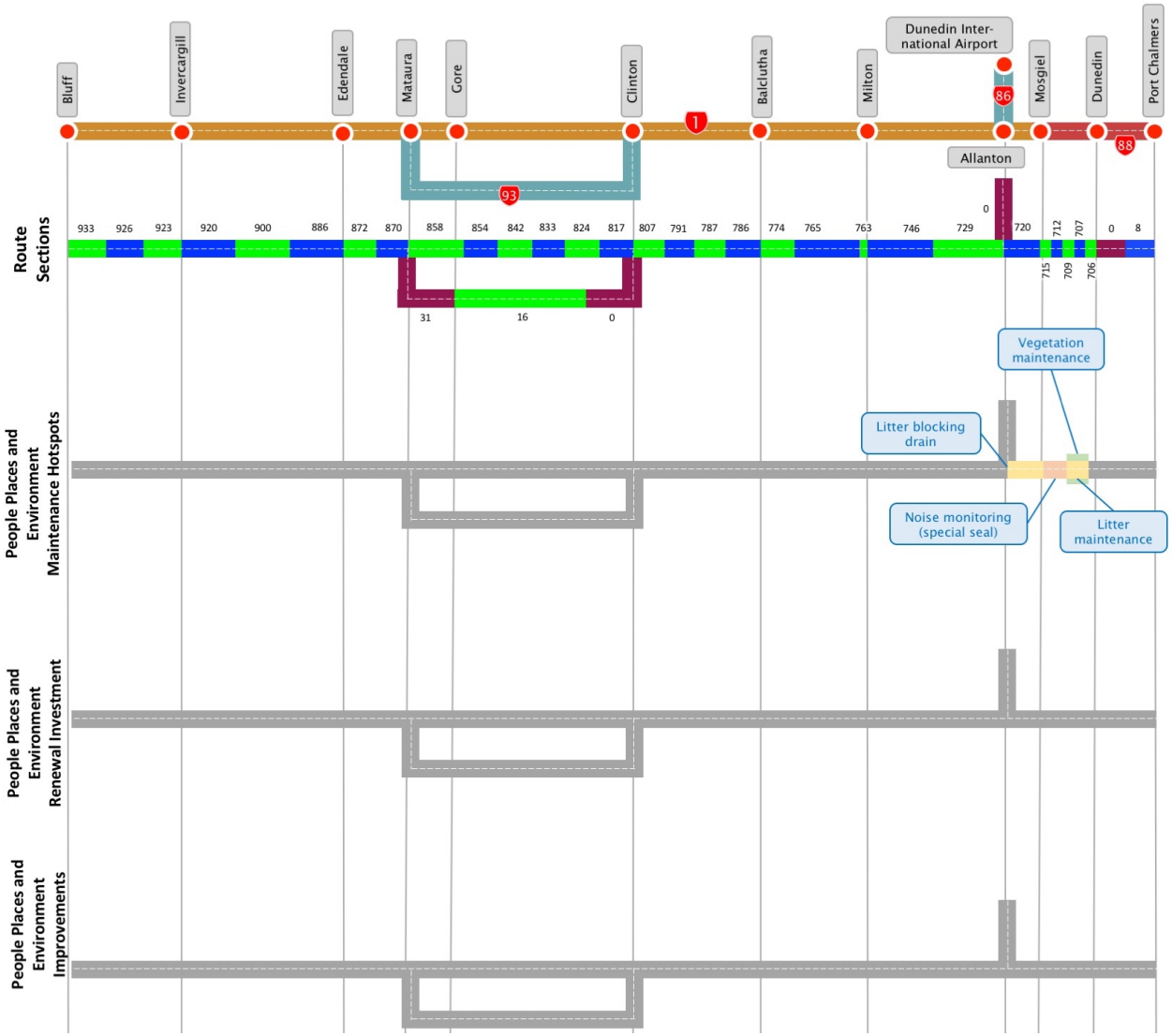
Renewals

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

Improvements

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

Figure 26 – People, places and environment investment



Investment pressures

Access and resilience

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

- **Port Chalmers:** This area has a high maintenance demand because of soft silt sub-grades. This combined with a high number of heavy vehicles leads to more frequent re-seals.
- **Aggregate imported:** Higher demand surface skid resistance sites have required imported aggregate from Central Otago.
- **Dunedin Airport Access:** Maintaining accessibility to Dunedin airport, through planning around the flight schedule, prompt response to incidents, and effective winter maintenance.
- **Flooding resulting in road closures:** Low lying coastal margins near Port Chalmers, Dunedin and Bluff can be influenced by the effects of surface water run-off during heavy rainfall and tidal conditions.
- **Snow and ice during winter resulting in road closures:** The Otago and Southland regions are prone to heavy snow fall leading to road closures that can last more than a day.

Reliability and efficiency

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

- **Timing of maintenance works:** Due to the sensitivities of managing cruise ship passengers departing and arriving, SH88 requires careful management of road restrictions and planned and unplanned events/incidents (utilities and road related) to minimise disruption to cruise ship passengers.
- **Efficient incident response:** Responding quickly to incidents on the network is important to maintaining reliable and efficient journeys for customers and current LoS. A robust monitoring regime is in place supported by WTOC through Dunedin.

Safety

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

- **Port Chalmers to Dunedin SH88:** Crib walls and retaining structures are getting old, have had little maintenance historically, and may be subject to failure.
- **Intersection safety:** Increasing industrial development around Invercargill, Bluff and along SH88 (particularly associated with the Port Container Store) is placing pressure on the safety of the corridor particularly at intersections and where truck and trailer movements are anticipated, where narrow road widths impact heavy vehicle turning movements.
- **Increasing trend in cycle crashes:** As a result of high traffic volumes, high proportion of heavy vehicle traffic, narrow road widths and lack of facilities catering for active road users around SH88 and SH1 in Dunedin, contribute to an increasing trend in cycle crashes.

People, places and environment

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

- **Special maintenance restrictions and environmental management:** High standards of environmental management in relation to stormwater, erosion and sediment control and the reduced use of herbicides for plant pest management may be required for works near coastal areas and within flood plains. Activities in these areas may be restricted to certain times of the year, impacting maintenance programmes.
- **Resource consenting requirements:** Maintenance around Gore, Mataura and Edendale requires resource consent to manage stormwater quality due to the sensitive Edendale aquifer.

Investment future considerations

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

- **Urban residential growth in areas such as Mosgiel around Dunedin:** Continuing residential urban growth is likely to increase commuter traffic using SH1 and the off ramps accessing Mosgiel and surrounding areas. Queuing traffic is regularly experienced around Abbotsford Interchange, due to the volume of traffic navigating the intersection linking the SH network to the local road traffic particularly at PM peak. Further growth is likely to exacerbate congestion and queuing at these constraint points leading to greater delays during peak periods.
- **A new $200 million milk processing plant will be built just north of Gore on SH1:** The new facility is expected to create 60 new jobs generating both additional private vehicle and heavy vehicle traffic movements. The additional traffic volumes generated by this development will further increase pressure on the corridor where heavy vehicles volumes are already a high proportion of traffic movements.
- **Efficient incident response:** Additional investment in technology and innovations to respond to incidents more efficiently and communicate accurate information to customers more effectively would be of benefit to maintain Levels of Service around Dunedin and Port Chalmers as traffic volumes increase in these areas.
- **Critical customer engagement:** The number and diversity of critical customers on the corridor is particularly high. Understanding the individual needs of critical customers and their expectations who depend on the corridor will become more vital when making decisions on the management of the corridor.
- **Reduce speed limits:** There is likely to be continued ongoing pressure from local communities to reduce speed limits through urban areas.
- **ITS:** Use of ITS to manage traffic flows is increasing in popularity and given the importance of the corridor through Port Chalmers to Dunedin, further investment to improve levels of service and manage congestion through SMART management systems could be considered.
- **Safety investment on SH93:** Investment targeting the out of context curve location and areas with limited road widths and lack of safety barrier will contribute to improve the safety LoS.
- **Investment in SH88:** Widening of the corridor and provision of safety barrier and accesses appropriate for heavy vehicle use will require a significant future investment for this route.
- **Improve safety for visiting drivers:** Enhancing road user safety information for visiting drivers on SH93 and areas of the SH1 with challenging topography and lower star rating. Investment in safety barriers to assist in reducing crash severity where there are steep drops adjacent to the carriageway and out of context curves.
- **Combining stopping places:** (including rest areas and look outs) with places of interest, heritage sites, local business areas and main streets, and future electric vehicle charging infrastructure. Utilising these places to tell local stories and enhance the attractiveness and amenity of journeys.

Appendix A – Information sources

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

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

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

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

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

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

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This publication is also available on NZ Transport Agency's website at www.nzta.govt.nz

NZ TRANSPORT AGENCY
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