

Akaroa to Kumara

CORRIDOR MANAGEMENT PLAN



2018-2028

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Executive summary

The Kumara Junction to Akaroa corridor comprises SH73 from Kumara Junction on the West Coast of the South Island to the SH73/SH76 intersection in Christchurch, and SH75 continuing southeast to Akaroa on Banks Peninsula. The CMP also includes SH77 from Darfield to Ashburton, via Methven, to the west of Christchurch. The Midland Rail Line provides an alternative for tourist and freight transport between Christchurch and Greymouth.

The corridor is approximately 398 km long (3.5% of the state highway network). The total value of assets along the corridor is \$486M (2.1% of the total national asset value).

The SH73 corridor is the major transport route linking Christchurch/Canterbury Region and the West Coast Region, keeping Arthur’s Pass and Porters Pass open are crucial to maintain the connection between Canterbury and the West Coast.

Resilience is the primary concern for State Highway (SH) 73, SH75 and SH77, with alternatives limited on SH73 and SH75 in the event of a closure, particularly through the Southern Alps and Banks Peninsula. A road closure in the event of a crash, flooding, slips, rockfalls, and snow/ice can limit the economic sustainability of business, particularly on the West Coast. The corridor also provides a vital link during periods of lengthy closures on neighbouring corridors, particularly important during the 2016 Kaikoura earthquake that closed SH1.

Customers using this corridor are generally regular users, with a good understanding of the road conditions and its limits.

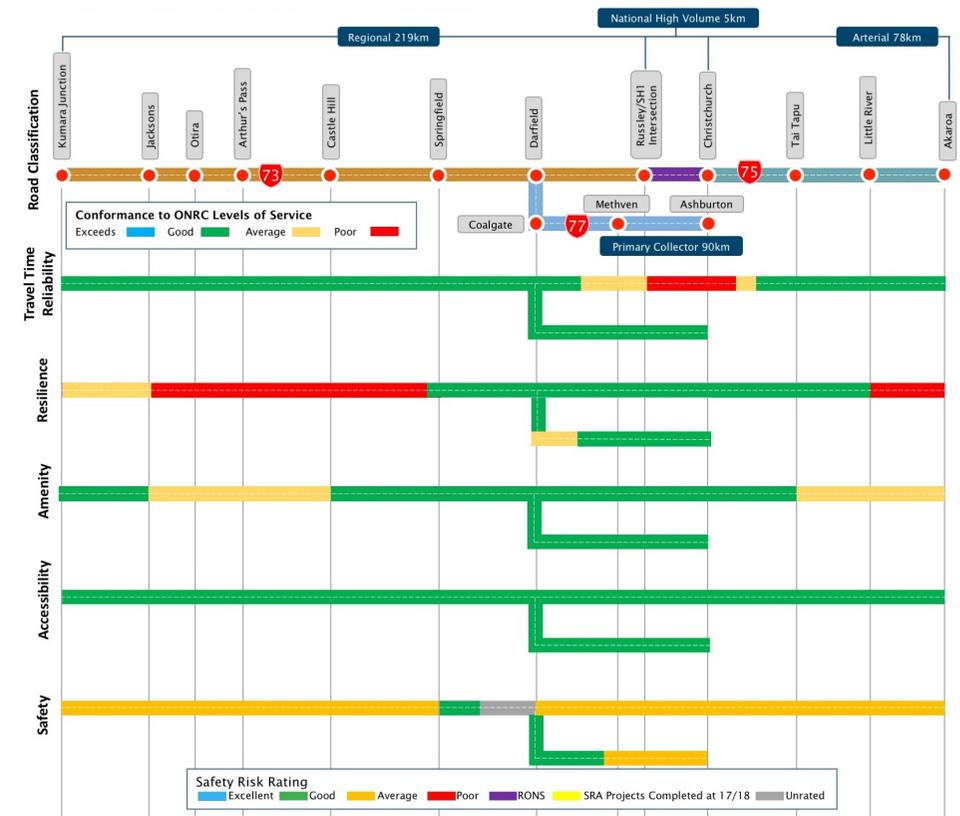
Current concerns are mainly focused on the frequency of rockfalls and slips, seasonal tourist and recreational demand, and general driver behaviour including risk taking.

The Canterbury and West Coast Region’s tourist industry is heavily reliant on the resilience of the corridor, with ski fields, walking trails, campgrounds and other tourist destinations in both the Southern Alps and Banks Peninsula being susceptible to closures. Tourism and recreation is a benefit and a risk for the corridor, bringing revenue to the local region, but also additional traffic, with potential delay for freight and locals, and greater infrastructure requirements.

Resilience is the core requirement for the corridor and their users. Management of weather events and general incidents is paramount, but this corridor has areas of low resilience and high vulnerability to service disruption. Capital works have focused on safety and reliability improvements on SH73 in Arthur’s Pass, removing dangerous ‘out of context’ curves and dips/hollows from the state highway. Further investment and on-going maintenance is required to ensure the corridor is resilient in future.

Seismic risk is a cause of more concern with recent events in the South Island. An event of a similar scale would bring greater economic hardship to large areas of Canterbury and the West Coast.

Figure 1 - Performance of the corridor against ONRC outcomes



The future scenario for this corridor will require ongoing maintenance but potentially minimal further investment to realise its full potential. The SH73 corridor has a relatively large section that is not available for HPMV, however bringing some sections and potentially the full corridor up to HPMV standard, will open opportunities for business expansion and investment. This will provide greater employment opportunities for the West Coast and local areas along the corridor, along with additional inward investment. However, the increased demand will result in greater pressure for corridor improvements, including additional passing opportunities through areas of conflict, particularly through the Selwyn District, to help minimise driver frustration and further improve general road safety.

Introduction

Purpose

What is the corridor management plan?

This Corridor Management Plan describes the customer service delivery story for the Kumara Junction to Akaroa 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.

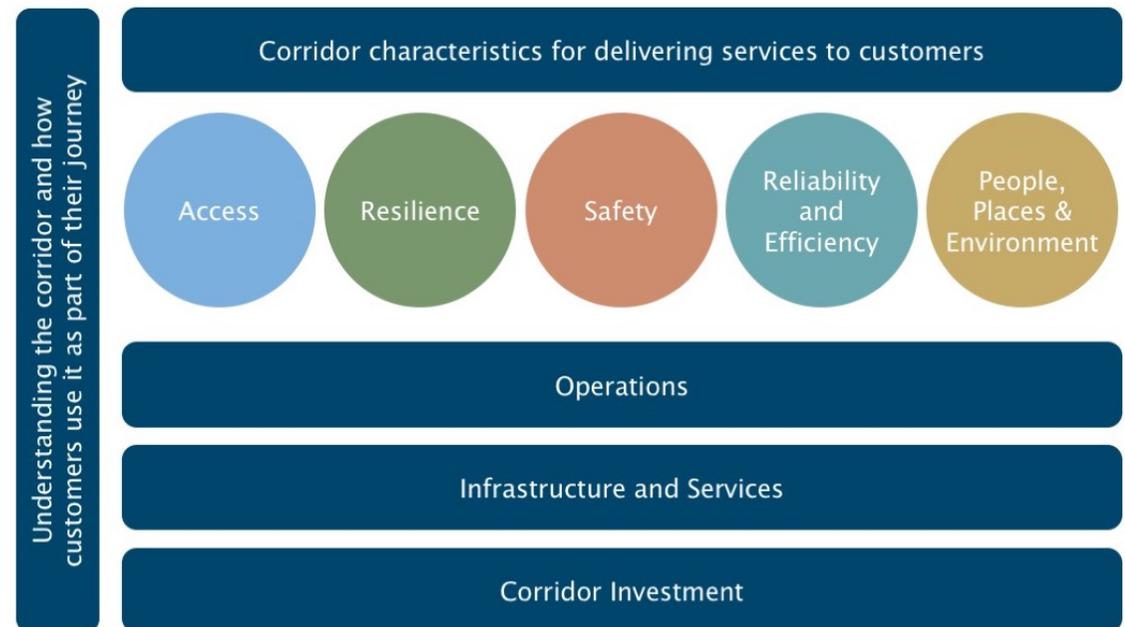
Planning is currently undertaken at the regional level, but typically significant journeys traverse more than one region. By considering the significant customer journeys and destinations, the corridor management plan is a vehicle to engage in regional and inter-regional conversations by focusing on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

How will we use it?

The CMP 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 LOS within the context of providing value for money. The information presented in the CMP helps to inform the business case for investment in state highways for the subsequent triennial period.

In conjunction with the long-term view, the CMP 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 Kumara Junction to Akaroa corridor comprises SH73 from Kumara Junction on the West Coast of the South Island to the SH73/SH76 intersection in Christchurch, and SH75 continuing southeast to Akaroa on the Banks Peninsula.

The CMP also includes SH77 from Darfield to Ashburton, via Methven, to the west of Christchurch.

The SH73 corridor is the major transport route linking Christchurch/Canterbury Region and the West Coast Region, keeping Arthur's Pass and Porters Pass open are crucial to maintain the connection between Canterbury and the West Coast.

The regional economy

The West Coast Region has 33,000 residents (almost 1% of New Zealand's population), and accounts for around 1% of national employment and 1% of NZ GDP. The Canterbury Region has 600,000 residents (13% of New Zealand's population) and accounts for 14% of national employment and 17% of NZ GDP.

The West Coast Region has high employment in accommodation and food services, healthcare and social assistance, retail trade, manufacturing, and construction, accounting for over 50% of paid employment. The unemployment rate in the region is around 5%. Forestry, fishing, mining, electricity, gas, water and waste services, agriculture, and manufacturing underpin the West Coast Region's economy, accounting for 16%, 14% and 9% of regional GDP respectively.

The Canterbury Region has a high representation of employment in manufacturing, healthcare and social assistance, retail trade, construction, and education and training, accounting for over 50% of paid employment. The unemployment rate in the region is around 4%, compared with 7% for all of New Zealand. Manufacturing, professional, scientific, technical, administrative, and support services, and agriculture underpin the region's economy, accounting for 13%, 8% and 7% of regional GDP respectively. Lyttelton Port, Christchurch International Airport, tertiary education providers, Crown Research Institutes and health services are other important parts of the region's economy.

The Selwyn District has experienced significant population growth in recent years, with population and business relocation to the south and west of Christchurch following the 2010/2011 Canterbury earthquakes. Statistics New Zealand project that substantial growth in these areas will continue.

Figure 3 - Corridor overview



Understanding our customers

Key customers

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

Daily user

Insights into daily users:

Road use: The majority of users in the Canterbury and West Coast Regions are commuters who travel by private vehicle to the urban centres of Greymouth and Christchurch. There is bus provision in Christchurch and expanding cycle infrastructure, but transport mode choices beyond Christchurch are limited. There is very little commuter demand on SH77 or the Akaroa end of SH75. A rail line runs parallel to a significant proportion of the SH73 corridor from Jacksons to Darfield, however this is used for freight and tourism.

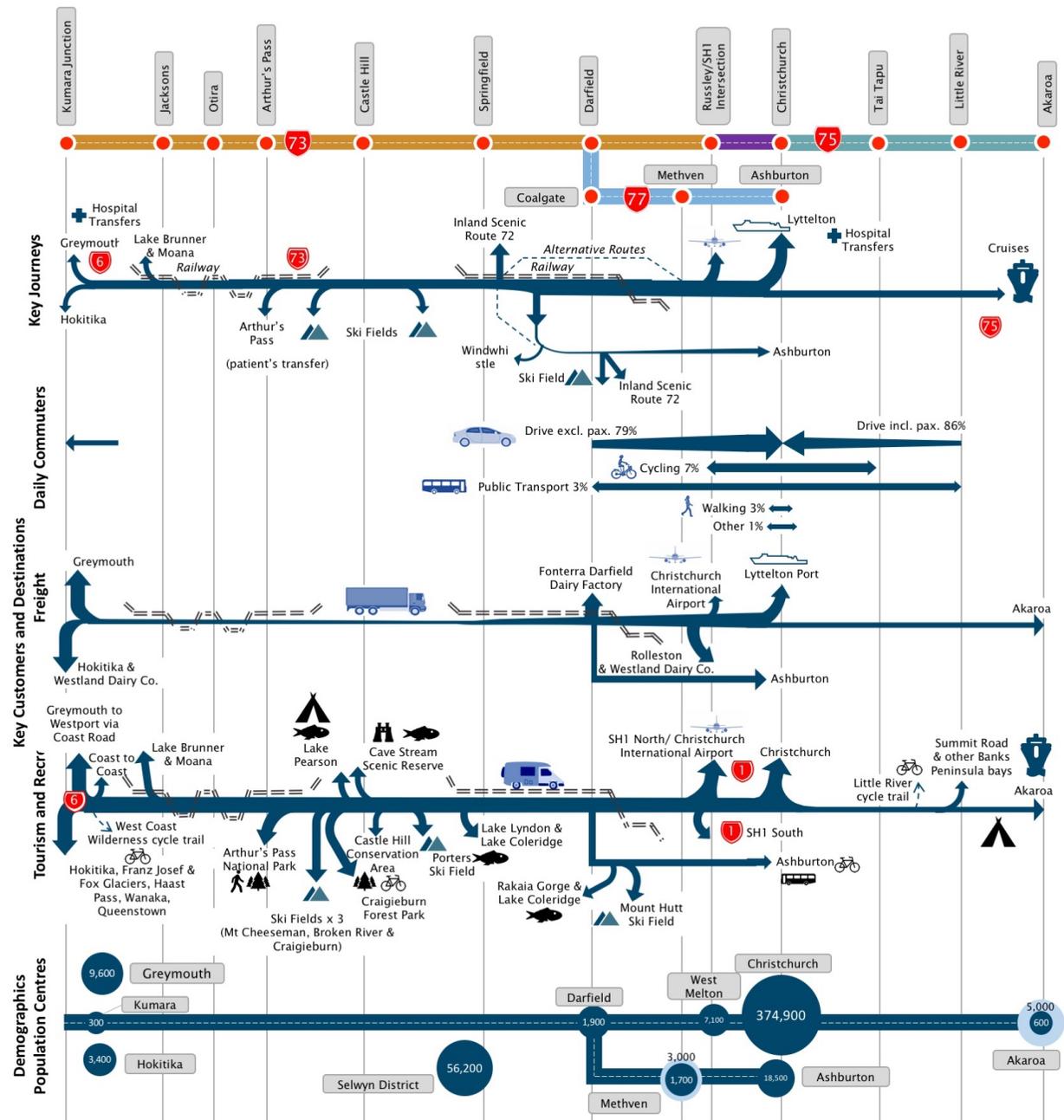
Commuters on the Christchurch section of the corridor face some delays during peak periods. There is sufficient capacity in Christchurch and the remaining corridor at all other times. The AM/PM peak periods in and approaching Christchurch on SH73 and SH75 are significant.

Road knowledge: Most users of the corridor are familiar with the road, and viable alternatives to avoid delay. Journey times are relatively predictable considering time of day and day of the week, with some sections of congestion at intersections.

Pain points: Delay and travel time reliability on the approaches to SH76 Brougham Street are congested during peak periods. Few slow/passing vehicle lanes along the SH73 corridor in the Selwyn District. Significant AM/PM peak congestion in and approaching Christchurch on SH73 from Darfield and West Melton, and SH75 from Tai Tapu.

Daily commuters expect: Predictable journeys at peak periods, accurate and up-to-date information about traffic (peak and off-peak), weather, road conditions and hazards. Demand is growing to provide greater mode choice, improve journey reliability, and opportunities to avoid delays.

Figure 4 - Key customers, journeys, and destinations



Tourist and recreational users

Tourism contributed over \$2 billion to Canterbury's economy in the year ending October 2016, with 2.7 million guest nights in the year ending September 2016. The corridor provides the only state highway access to connect tourists and recreational users to Mt Hutt and Porters Ski Fields, the Rakaia Gorge, Arthur's Pass National Park, Cave Stream Scenic Reserve, and Akaroa. Key attractions here include skiing, camping, fishing, biking, walking, and the natural beauty of these areas.

The SH73 corridor is a key tourist route link connecting Christchurch with the West Coast of the South Island for other key tourist attractions, including Franz Josef and Fox Glaciers. It also provides a key connection from the west of Christchurch to Christchurch International Airport, supporting an increasing number of international visitors. Journey time reliability is particularly important for customers and staff connecting to flights and airport services.

SH73 and SH77 is often used as an alternative to SH1 during peak holiday congestion for drivers travelling to/from Wanaka and Queenstown.

Insights into Tourist and Recreational Users are as follows:

Road use: Journeys from Christchurch to the West Coast (via SH73) and Akaroa (via SH77) are promoted as part of the tourist experience. Many of the tourists drive long distances to make organised activities and timelines with the journeys to Akaroa promoted as a day trip. Local recreational users typically travel on weekends and during holiday periods. SH75 is a well-known motorcycle route.

Road knowledge: Many self-driving international visitors are unfamiliar with New Zealand roads and conditions, with the vehicles used often slower on the corridor topography, causing delays. Travel times can be underestimated, leading to potentially unsafe behaviour, further exacerbated by limited/no knowledge of the corridor. Road knowledge amongst local recreational users is high. Local recreational users travel at quieter times are aware of the terrain and its challenges, however take greater risks.

Pain points: Weekend travel and holiday periods are busy. Seasonal population increases are experienced in Akaroa and Methven (Mt Hutt Ski Field). Arthur's Pass experiences slow and unfamiliar drivers frequently on the network, blocking and restricting other users. Few passing/slow vehicle lanes result in delays and lead to driver frustration and risk-taking behaviour.

Tourist and recreational users expect: There is an expectation that all journeys will be straightforward with consistent surface conditions. Motorcyclists have time/speed expectations. Good directional signage, real-time information, distances to urban centres and stopping places are expected.

"Speeds of 120km/h and over were the norm on SH75 and dangerous driving was far too common"

Freight operators

Freight movements tend to be from the West Coast Region towards Christchurch and the Rolleston inland ports (on SH1 south of Christchurch). Inter-island freight has been using the SH73 route more recently due to the closure of SH1 following the Kaikoura earthquake, which put greater pressure on SH7. The majority of freight currently uses SH7, however there have been a number of closures on this route due to crashes, which has forced traffic on to SH73. This has increased pressure on business operations and the corridor.

Insights into freight operators are as follows:

Road use: Freight comprises primarily long haul sized vehicles (trucks and trailers). A consistent and reliable freight route between Nelson to the north and Christchurch is of particular importance with the recent earthquakes in the region. Recent landslides, crashes and closures have highlighted the fragility of the network and the reliance on a few routes. A stock effluent station is located in Springfield. Discussion is underway on a new stock effluent station at Jacksons.

Road knowledge: Knowledge of road conditions is good, with regular use and understanding of varying conditions.

Pain points: Road conditions can be particularly disruptive, with a number of single-lane bridges and winding geometry, including the Kowai Bridge near Springfield and the Wainihinihi Bridge to the west of the corridor. Alternative heavy transport routes are limited, with significant distances of deviation up to 300km, adding delays to delivery times and cost for business. The only viable alternative route is to the north on SH7 which is a >200km diversion. Few passing/slow vehicle opportunities cause safety issues and driver frustration. SH73 has many 'out of context' curves (and straights in the Southern Alps).

Freight operators expect: Infrastructure that improves travel times and reliability of service delivery. This includes alternative routes that can safely cater for long-haul sized vehicles, along with good road facilities and safety, as well as information about road conditions to allow forward planning and confidence of service delivery. The corridor is also expected to provide effluent centres for livestock. One is available at Springfield, however more are required.

"Perhaps we need to be thinking about how we spend that money to build resilience into the network, so if adverse events do happen we minimise them."

How we deliver services along the corridor

Transport partners

The land transport system comprises more than state highways. Providing customers with a reliable and safe journey usually requires the use of two or more transport infrastructure provider’s networks. As such, the Agency works with other network providers to deliver a one network approach.

On the Kumara Junction to Akaroa corridor, the Agency works closely with the territorial local authorities (TLAs) and regional councils, shown in Figure 5.

Collaboration along the corridor

Other transport partners include Christchurch City Council (CCC), Ngai Tahu, Department of Conservation (DoC), Lyttelton Port, Port of Greymouth, Tourism New Zealand, New Zealand Trucking Association, Road Transport Association New Zealand (RTANZ), New Zealand Automobile Association (AA), Christchurch & Canterbury Tourism, Tourism West Coast, Spokes Canterbury, KiwiRail, Safer Road Alliance, Accident Compensation Corporation (ACC), Westland Milk Products, Met Service (weather forecasting), National Variable Message Signs (VMS), and New Zealand Police.

Christchurch Traffic Operations Centre

Christchurch Traffic Operations Centre (CTOC) and Wellington Traffic Operations Centre (WTOC) manage ITS, Signals and Traffic Counting for Canterbury and West Coast regions.

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

Figure 5 - Map of associated local authorities



Network Outcomes Contracts approach

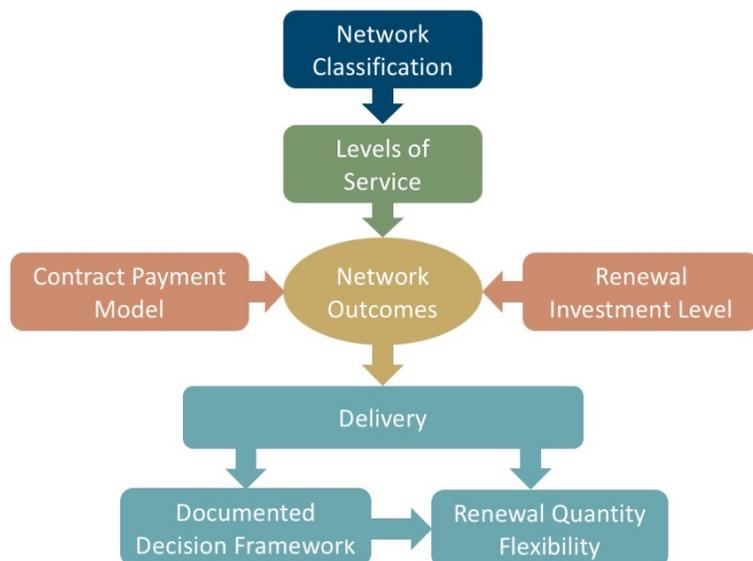
Network Outcome Contracts (NOC) are aimed at improving the effectiveness of service delivery for maintenance and operations of the state highway network. Elements of previous procurement methodologies (PSMC, Hybrid and Traditional models) have been integrated into the NOC contract model which delivers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

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

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

The contract process for the NOC is shown below:

Figure 6 - NOC process



Collaborative delivery of services

The Kumara Junction to Akaroa corridor crosses over two contract areas, as shown below. The boundary of the West Coast contract areas covers Kumara Junction to Jacksons and the North Canterbury covers the contract for the regional boundary near Arthur's Pass to the end of the corridor at Akaroa.

West Coast Network Outcomes Contract

The West Coast NOC contract is undertaken by Fulton Hogan Limited. The contract commenced on 1 September 2015 for a period of 7+1+1.

North Canterbury Network Outcomes Contract

The North Canterbury NOC contract is undertaken by Downer New Zealand Limited. The contract will commence on 1 May 2017 for a period of 5+1+1.

South Canterbury Network Outcomes Contract

The South Canterbury NOC is undertaken by Downer New Zealand Limited. The contract commenced on 1 April 2014 for a period of 7+1+1.

Regional bridge consultant

Opus International Consultants Limited provides for all the above regions.

Drivers for change

The Kumara Junction to Akaroa corridor's main driver for change is the continued growth of all traffic types including local, freight and tourism. There is capacity for growth along large sections of the corridor with focused improvements on bottlenecks, 'out of context' curves and straights, overtaking and passing lanes, and intersection capacity upgrades.

Christchurch City Growth

Since the Canterbury earthquakes, residential and commercial development has moved out of the city centre, with many of the surrounding rural areas experiencing significant residential growth. Population distribution is increasing commuting distances and traffic volumes on the corridor, which is in turn increasing congestion and pressure on existing road infrastructure, particularly at peak times at intersections. With changes in land use zoning to accommodate increasing residential development, this pressure is expected to increase.

Significant population growth in the Selwyn District has increased traffic volumes on SH73 and SH75 in Christchurch. Residential development in the Russley area is increasing demands on the corridor, and the local road network. Annual traffic volumes are increasing by 3.9% on SH73 West Coast Road near Russley, and 2.4% at SH73 Curletts Road¹.

Significant AM and PM peak periods on SH73 and SH75, in and approaching Christchurch are affected customer Levels of Service at these times. Ongoing development of SH1 near Christchurch International Airport will increase road capacity, moving greater volumes of traffic to the SH73 corridor.

Regional growth and development

Canterbury

The Canterbury Regional Land Transport Plan (RLTP) 2016 has seven work programmes which indicate regional priorities. A regional population shift away from Christchurch to areas such as Darfield and the north of Christchurch is increasing, and demand has spread as business has relocated from the City to peripheral areas post-earthquakes. As redevelopment in the CBD continues, business is likely to return, increasing trips to the CBD and pressure on SH73.

West Coast

The Tai Poutini West Coast Growth Study 2016 aims to develop and enhance tourism, investing in new cycle trails. Local population is expected to remain stagnant, with tourism growth and accompanying pressure on corridor infrastructure and communications. There is a local focus on Stewardship Land investment, improved UFB/RBI and mobile networks.

Key journeys

Key journeys within the corridor have having a significant influence on current pressures. Particularly, those sections of the corridor part of the SH1 alternative route network.

Kumara Junction to Springfield

Resilience is a key issue for the SH73 corridor through Arthur's Pass and Castle Hill as it is a vital link for supplies and industry between the West Coast and Canterbury. It is also acting as the back-up route for SH7 for South Island freight distribution via Rolleston and Christchurch until SH1 reopens. West Coast communities rely on SH73 to be available not only for basic supplies, but also for industry. Arthur's Pass is a popular and growing tourist destination for domestic and international visitors during all seasons.

Darfield to Christchurch

Increasing residential development in Darfield is placing pressure on the corridor, and this is expected to continue. Darfield is also a key destination for regional businesses, with the Darfield Fonterra Dairy Factory, a timber processing plant, concrete plant and brickworks, all of which require freight to supply and distribute resources and products.

Christchurch to Akaroa

Increasing numbers of tourist day trip coaches taking cruise ship passengers between Akaroa and Christchurch is expected to continue to grow. Driver safety and resiliency issues through the winding topography of Banks Peninsula hill climb, along with land stability, snow/ice issues, can add to the pressure on tourists and drivers unfamiliar with the corridor. The SH75 corridor to Tai Tapu has peak hour congestion which is tempered by rat-running and detours to other nearby corridors.

Ashburton to Darfield

SH77 is the 'Inland Scenic Route' between Ashburton and Darfield with growing freight movements servicing the Darfield Fonterra Dairy Factory. Greater numbers of recreational users travel the corridor at the weekends and in peak season to/from urban centres to access the Mt Hutt Ski Field. The corridor is also part of an alternative inland route to SH1 via route 72.

¹ AADT 2014 data

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 CLOS for road users. With the knowledge of current CLOS experienced by customers, we can better target investment to meet future intended service levels.

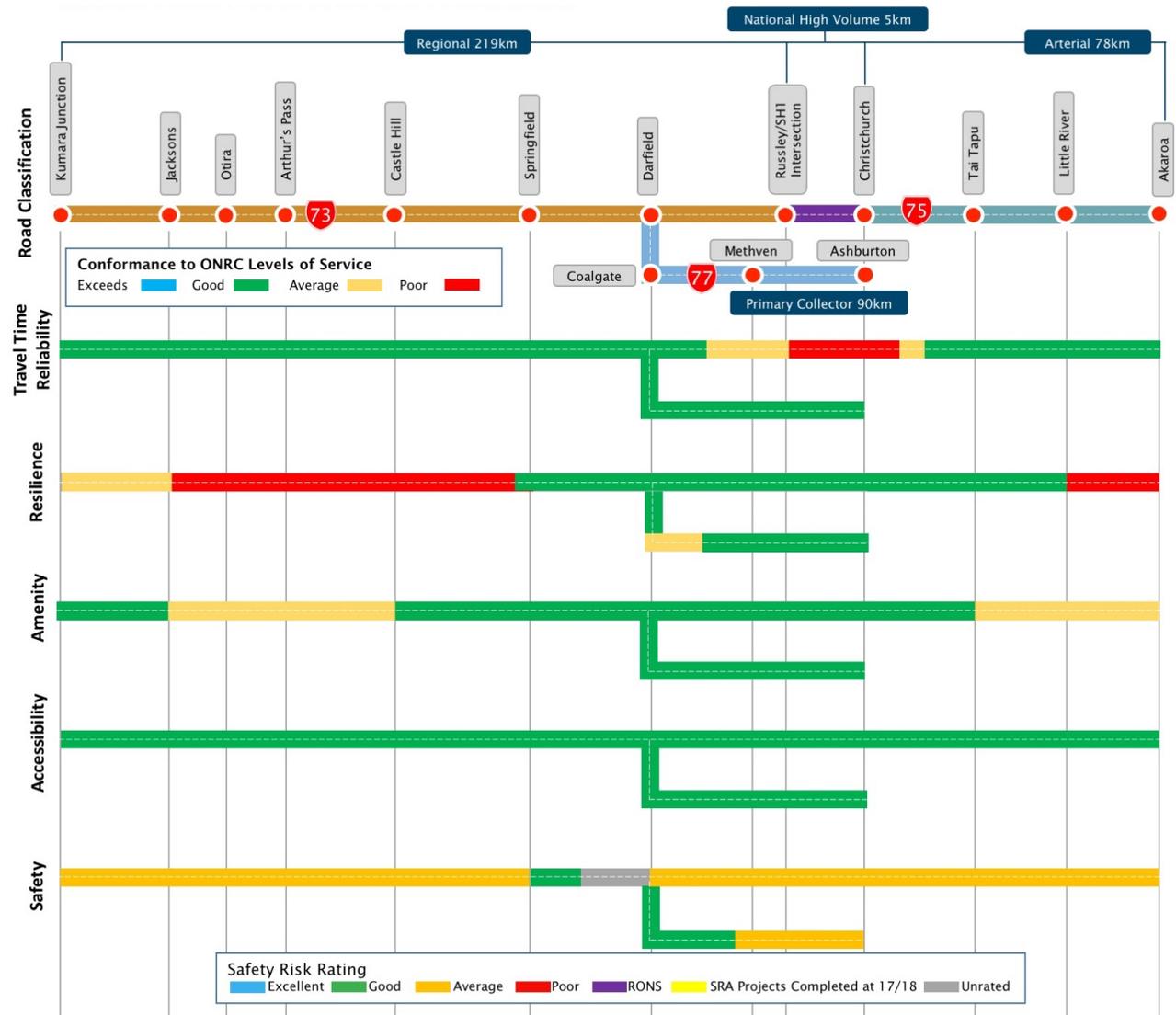
Overall, customers will be provided with the right level of road transport infrastructure where it is needed, determined by a robust, impartial, nationally consistent tool - the ONRC.

Road classification

The SH73 corridor from Kumara Junction to Russley is classified as Regional, while the urban section of the corridor from Russley to the SH73/SH76 intersection in Christchurch is classified as National High Volume. SH75 from Christchurch to Akaroa is classified as Arterial. SH77 from Darfield to Ashburton via Methven is classified as a Primary Collector.

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 Kumara Junction to Akaroa SH73/SH75 corridor and SH77 Darfield to Ashburton corridor is performing against the ONRC LOS, as they relate to each of the four 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

The vast majority of the corridor is relatively free-flowing and could be viewed as exceeding expectations in some places. The more congested sections on approach to Christchurch (SH73 and SH75) is where LOS deteriorates due to higher vehicle volumes, significantly more intersections and signalised intersections, which is likely to continue to have an effect on LOS when compared to the corridor through the regions.

Resilience

The section of corridor through the Southern Alps (SH73) has a high level of risk. There are limited viable alternative routes should critical assets, such as bridges in the Otira Gorge and over the Waimakariri River fail, or a major blockage occur along this section due to flooding, slips, rockfalls and snow/ice. The only alternative route across the Southern Alps is via SH7 to the north in the event of road closures, which is a significant detour. There are no alternative routes available for SH75 to Akaroa.

Amenity

The general amenity of the corridor is good with good access to shops, cafes and rest areas in the peri-urban and urban areas. The road condition through the Southern Alps between Jacksons and Castle Hill requires regular maintenance with surface cracking and reduced grip through corners. Travel quality is generally good through the corridor due to the efficient and rapid response to disruption and damage.

Accessibility

The Southern Alps and Banks Peninsula sections can be cut off by a variety of events, including rockfalls, slips and crashes. With limited alternatives, these sections have poor accessibility, however it is, as would be expected in keeping with the neighbouring geography and connected conurbations. The urban section of SH73 in Christchurch has good connections and direct access to the corridor. The remaining area on the Canterbury Plains have good ONRC LOS.

Safety

The majority of the corridor is KiwiRAP 3-star rated. The section between Kumara Junction and Castle Hill on SH73 has a number of 2-star rated areas due to roadside hazards, narrow sections, winding roads and frequency of crashes. 'Out of context' curves are a common hazard through the Southern Alps, Banks Peninsula, and sections of SH77. The Southern Alps also contains 'out of context' straights due to the regularity of the curves. SH77 has a narrow carriageway between 6m-7m from Mount Hutt to Ashburton adding risk.

There are several sections along the corridor with a high collective and personal risk rating. There is now star rating for urban Christchurch. Between Rolleston and Christchurch there are numerous high-risk intersections.

Safety improvements to the corridor have been identified as road realignments in hot spots and reduction of 'out of context' curves. Better provision for HPMVs along the corridor will improve road safety along the corridor.

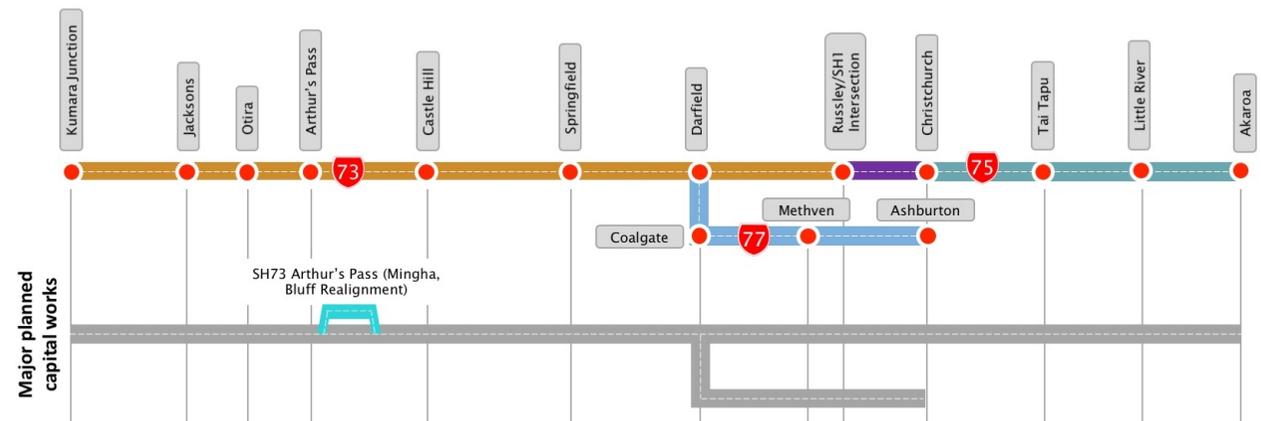
Improving the customer experience

In responding to customer LOS, it is important to acknowledge that there are several significant improvements planned or underway as part of the Roads of National Significance (RoNS) programme, including the Christchurch RoNS programme. These roads are not part of the corridor but may have an impact once the works are completed, due to increased volumes of traffic both in the short and long term. The RoNS encompass three corridors connecting with SH1, which have been broken into three smaller projects called the Christchurch Northern Arterial, Western Belfast Bypass and Southern Motorway Stage 2.

There is currently works being completed on SH73 near Arthur's Pass, known as the Mingha Bluff Realignment. When completed, the planned improvements within Arthur's Pass National Park between Mingha Bluff and Rough Creek will improve safety and reliability while minimising environmental impacts on Arthur's Pass National Park. Construction started in May 2015.

Other sections of SH73 have been substantially upgraded in previous years, including Otira Viaduct and Candy's Bend improvements. This has led to a steady increase in traffic using the state highway as the route has become safer and more reliable. Planned improvements are discussed in greater detail later in this document.

Figure 8 – Significant corridor planned improvements



Camper van on SH73 Arthurs pass

Access

Carriageway configuration

The majority of the corridor is two lane opposing with minimal passing lanes. SH77 is two lane opposing throughout. Between Russley and Christchurch on SH73, the corridor is three and four-lane divided, with two lanes eastbound to Christchurch. Once past the SH73/SH76 intersection, the SH75 corridor is two-lane divided through the Christchurch suburb of Halswell.

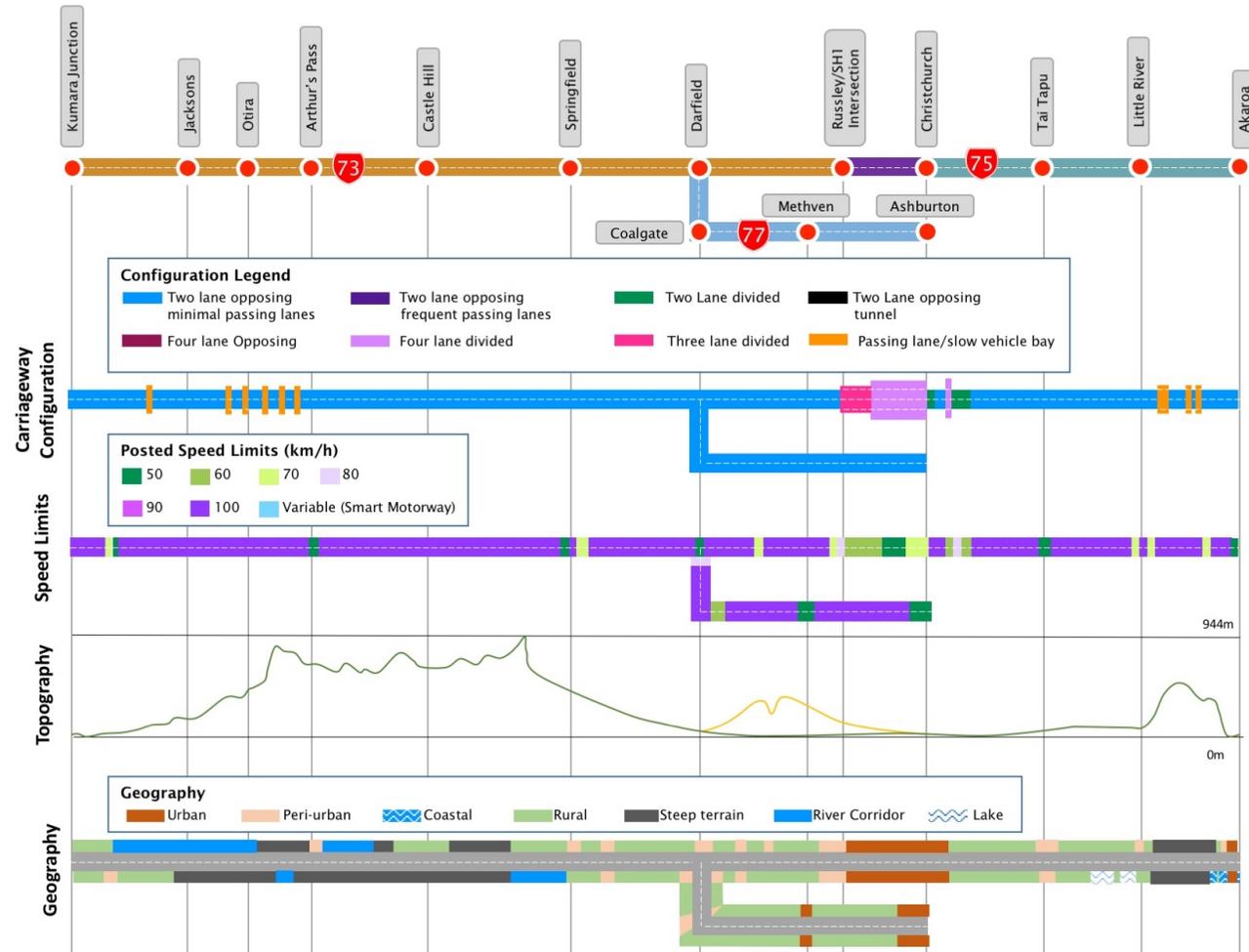
Speed limits

The majority of the SH73 corridor is 100km/h with small sections of lower speed limit through peri-urban and rural townships, including Kumara, Arthurs Pass, Springfield, Sheffield, Darfield and Kirwee. The remaining section between Russley and Christchurch varies, between 50km/h and 70km/h. SH75 and SH77 are 100km/h, other than areas such as Tai Tapu and Little River, and through the Hill Climb in Banks Peninsula, where the speed drops to between 50km/h and 70km/h.

Topography/geography

The topography of the route is varied with steep gradients through the Southern Alps and Banks Peninsula. There is a gradual gradient from the West Coast up to Oтира and very steep gradient to the east of Oтира. There are large sections of relatively flat road through the Southern Alps, with the occasional 'out of context' curve to the highest point of the corridor at 944m, followed by a gradual gradient to the east through to Springfield and Darfield. Sections of the corridor between Darfield through to Tai Tapu and Little River are relatively flat. SH77 is a gradual rise to the edge of the Southern Alps from both Ashburton and Darfield.

Figure 9 - Corridor characteristics



Horizontal alignment

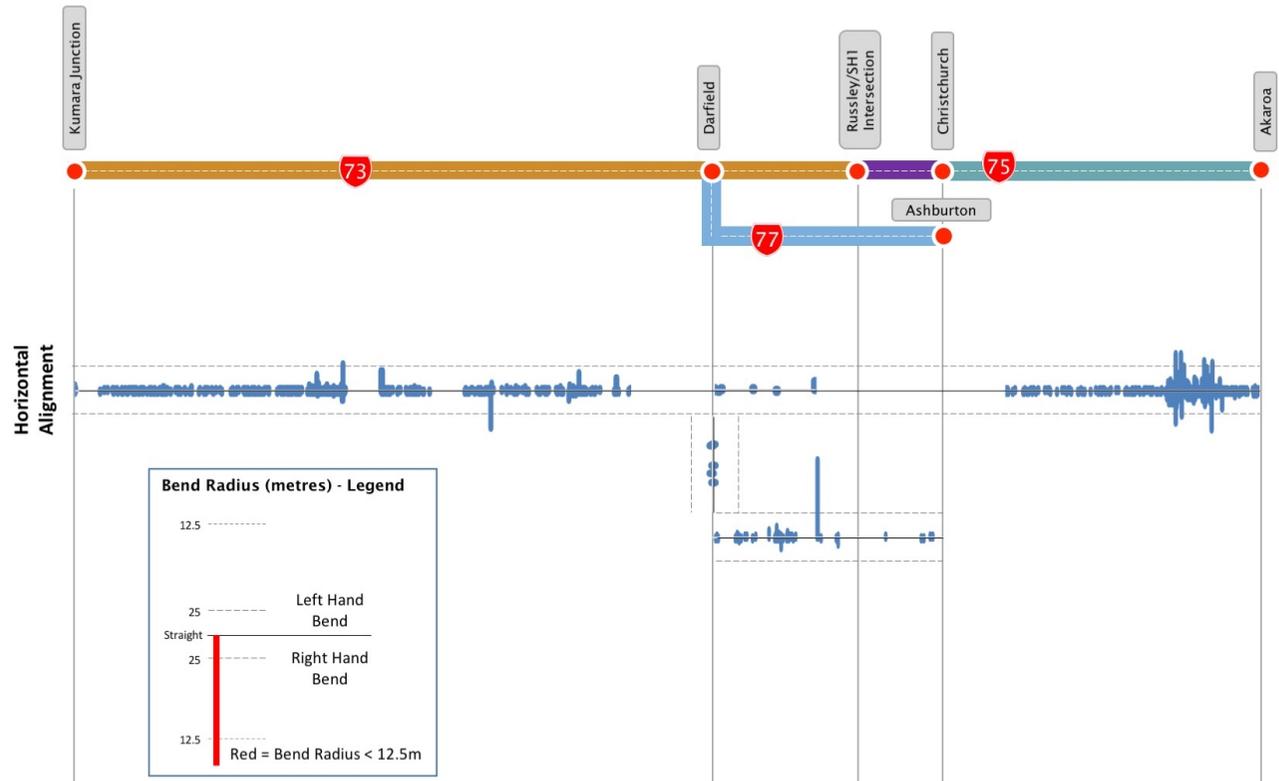
The infographic shows the location and extent of the out of context curves along the corridor. The height of the bar is an indication of the severity of the curve calculated as $\frac{1}{radius^2}$, meaning the taller the bar, the smaller the radius of the curve. Note: Unlike other infographics, the 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 over Banks Peninsula, and the Southern Alps, with the urban Christchurch and Canterbury Plains sections being relatively free from out of context curves. Sharper bends with a radius below 25m occur extensively on Banks Peninsula, between Duvauchelle and Puaha. at the Brynderwyn Hills and at the Parkhurst Road intersection in Helensville. The sharp bend on SH77 is a signposted crossroads with a 90-degree turn required to continue on the State Highway.



SH73 Otira

Figure 10 - Horizontal alignment



Volumes

Traffic volumes are around 2,000 vehicles per day (vpd) for the majority of the corridor. Christchurch, between Darfield and Tai Tapu, has the highest concentrations of traffic, with the greatest volumes centred on Yaldhurst Road (SH73) to the west of Christchurch at 22,000 vpd, and similar volumes on Halswell Road south of Christchurch (SH75). On SH75, heading in to Christchurch, there is less capacity and queues are generally longer, however drivers take alternative routes via SH76 or Sparks Road to avoid these queues. Volumes are relatively high between Darfield and Russley from 5,000 vpd up to 13,000 vpd on SH73 and Tai Tapu to Halswell from 4,000 up to 11,000 vpd.

Freight volumes and heavy vehicle traffic has increased substantially in recent years, particularly on SH77 between Ashburton and Darfield. There has been a noticeable increase of dairy tanker movements in the region.

HPMV routes

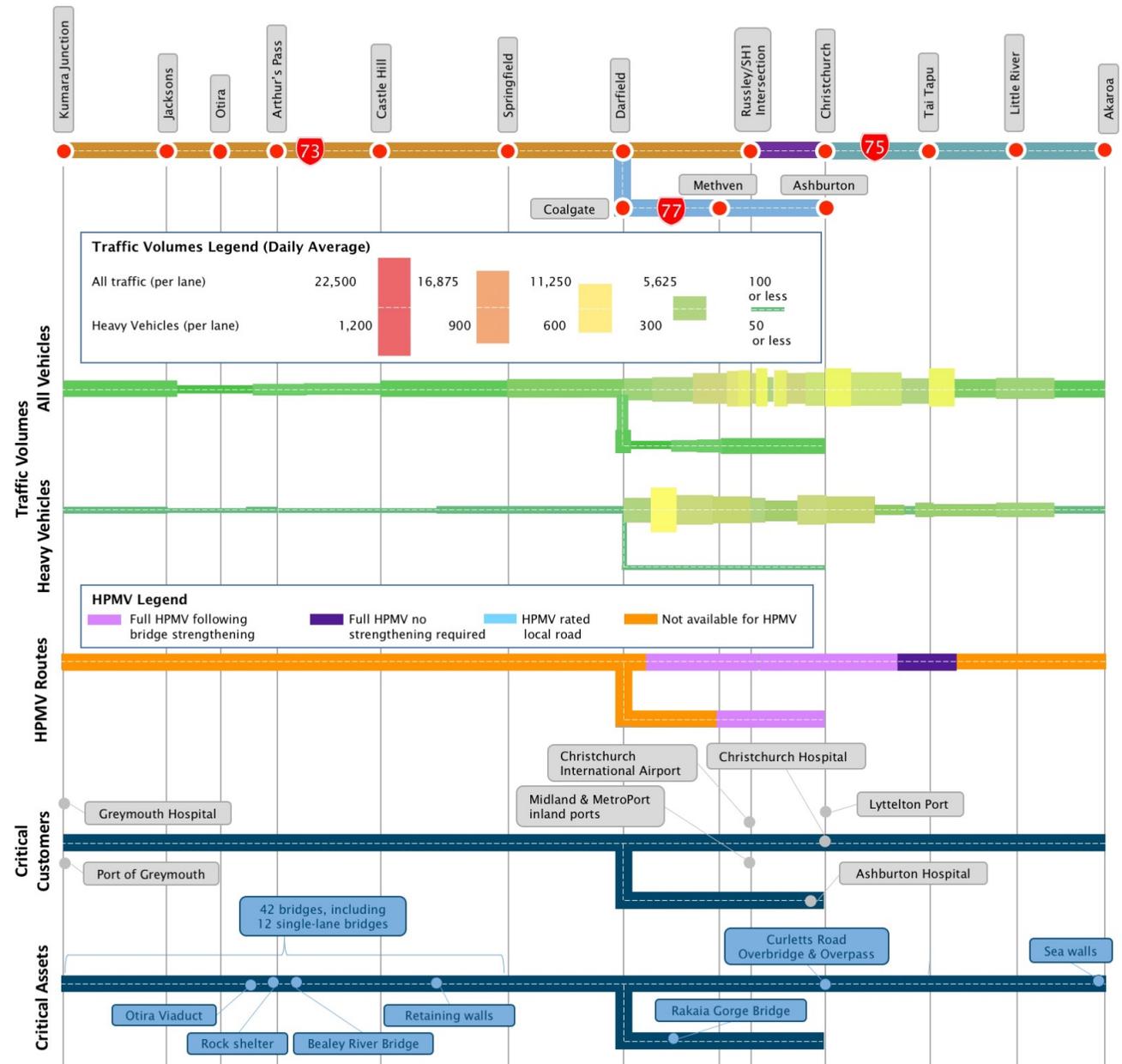
Large sections of each state highway are not suitable as HPMV routes, particularly between Kumara Junction and Darfield on SH73, Methven and Darfield on SH77, and Tai Tapu and Akaroa on SH77. The section between Russley and Christchurch would be full HPMV following bridge strengthening. Only a small section of the corridor is full HPMV capable, with the remaining sections of the corridor currently not available.

Over-dimension access can impact journey times and the movements of goods to local communities and products to Lyttelton Port, particularly in the Southern Alps and between Tai Tapu and Akaroa.

Critical customers and assets

There are a number of critical customers adjacent to or near to the corridor which rely on the corridor to be fully operational, and are vulnerable to interruptions, impacting productivity. These include Christchurch, Hillmorton and Ashburton Hospitals, and collections from dairy farms for the Fonterra milk powder factory in Darfield. Tourists and recreational visitors are critical customers for businesses in Arthurs Pass and the economy of the West Coast region.

Figure 11 - Corridor capacity



Pressures

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

- **Physical constraints:** Over dimension access, impacting journey times particularly between Kumara Junction and Darfield, and Darfield to Methven. At present, this is constrained by topography (steep and winding). This can impact the movement of fresh produce to market.
- **Limited alternative routes** – the only viable alternative route between Kumara Junction and Christchurch is SH7 to the north, however this detour would be undesirable for any service wishing to take an alternative route, due to the extra distance. There are no alternative routes available for SH75 to Akaroa.
- **Conflict points** – carriageway and intersection configurations can create choke points which impact journey times. The three-lane divided sections of the corridor, such as SH73 Yaldhurst Road in Christchurch can cause problems and delays, resulting in considerable congestion and queuing on both the local and state highway network.
- **Tourism demand** – pressure on the corridor and neighbouring infrastructure, including road side parking, use of stopping places, roads and bridges, is increasing and is affected by tourist traffic through increased use. Traffic brings delays to freight and other key services, particularly on the winding sections (Southern Alps and Banks Peninsula), and reduced travel times through lower speeds, lower familiarity and confidence levels.
- **Community services** – access to the corridor is vital for communities to supply and access local services including education, healthcare, police and fire support, fuel and day to day supplies.
- **Emergencies** - the steep and winding topography of the Southern Alps and Banks Peninsula can cause driver pressure and potential for error. It can also increase the time for emergency services to attend and clear the site when crashes and other weather induced events occur.
- **Population redistribution** - there has been a significant shift of urban growth from Christchurch to the regions since the Canterbury earthquakes. The more rural areas are experiencing significant growth, with some recent growth closer to the City. This general residential growth and resulting greater distances travelled is placing greater demands on existing infrastructure and congested areas.

Future considerations

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

- **Development of a higher quality asset** – demand for maintaining or developing a higher quality asset with greater resilience, longer life, and lower maintenance requirements is likely to grow. With the expansion of the population into the regions and growth over time, ensuring the existing capacity is sufficient and maintenance requirements are minimised, to reduce traffic delays, particularly during the peak hours is key.
- **HPMV and Freight investment** – Investment in the provision of HPMV between Kumara Junction and Darfield, and Darfield and Methven will help allow for the movement of greater quantities and ensure improved quality of goods in the Selwyn and Ashburton Districts. The SH77 Rakaia Gorge Bridge was opened up to 50max vehicles following installation of kerb to ensure vehicles track on the centre of the bridge.
- **Tourism demand** – an increase of tourists to the region is expected, putting greater pressure on existing infrastructure, conflicts with freight operators and delays to key services. Further investment in slow vehicle and passing lanes, replacement of single lane bridges and alternative routes will improve operations and experience of all users.
- **Communications** – the alternative route distance and time to traverse detour routes requires appropriate traffic management consideration for the task duration. At times, it may be quicker to wait for the works to be completed than to drive the detour. Investment in new and improved warning measures including Real Time Information will improve journey planning and a potential reduction of vehicle kilometres travelled.
- **Technology impacts** – consideration of vehicle automation may reduce/remove some of the current issues and constraints. Other new technology may take vehicles off the road or increase vehicle use of the corridor at different times, including night travel.
- **Intersection improvements** – several intersections along SH73 from Darfield to Russley are experiencing difficulties with current levels of growth. Pound Road roundabout in particular, west of Russley Road is becoming heavily congested during peak periods and requires investment to prevent a congestion bottleneck on the network.

Resilience

The corridor is currently one of only two alternative routes to the north from Christchurch. The Kaikoura earthquake closing SH1, along with recent heavy rainfall has highlighted the vulnerabilities of the network, critical parts of the corridor and its high-risk profile.

Vulnerabilities

The corridor is susceptible to flooding on the western end of the corridor with high levels of rainfall and resulting slips and rockfalls within the Southern Alps, between Jacksons and towards Springfield, west of Sheffield. Slips are the main concern through Banks Peninsula and flooding along SH77. Rock-falls are common and high winds through the Southern Alps can cause some vehicles to blow over or off the road.

Alternative routes and diversion lengths

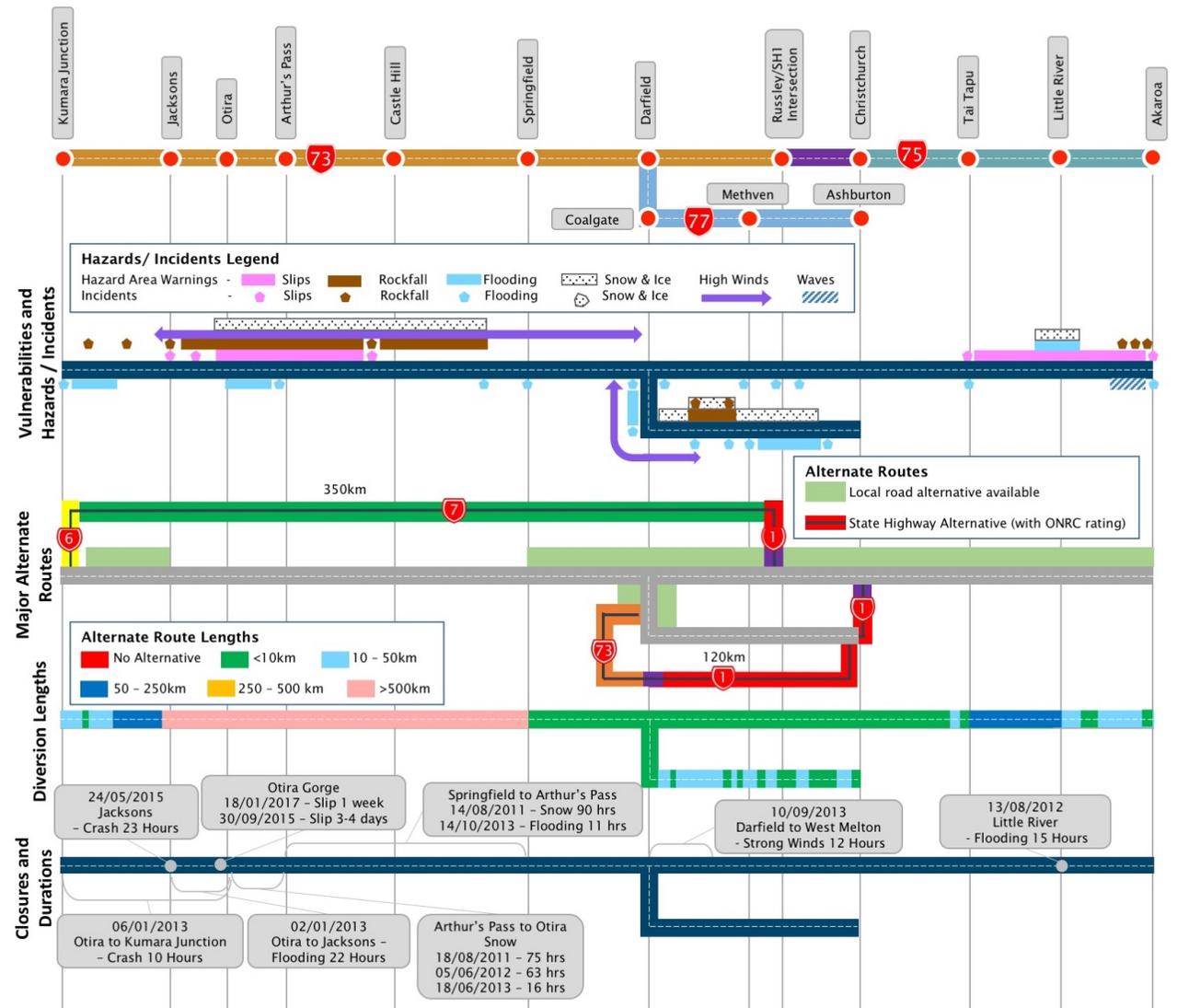
The only realistic diversion route crossing from the West Coast to the east coast is SH7. SH73 is a crucial link should other closures occur on SH7. The diversion length is long and adds to the already significant diversion to connect Nelson to Christchurch. The natural obstructions of the Southern Alps and Banks Peninsula mean some sections have no viable alternative routes other than a 300km diversion. There are only alternative local roads between Darfield and Ashburton and the only additional crossing of the Rakaia River (southwest of Christchurch) is via SH1. There are no alternative routes available for SH75 to Akaroa.

Closures and duration

Major unplanned road closures and duration of interruption along the corridor in the last five years of data are shown in Figure 12

Over the previous five years data, there have been 14 major unplanned road closures greater than ten hours, the longest being one week due to a slip in the Oтира Gorge on SH73. Slips are a regular issue through the Southern Alps, with small volumes being up to 50m³. The workshop participants highlighted that there is at least one event per year exceeding 10,000m³ of slip material.

Figure 12 – Resilience



Pressures

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

- **Weather induced events** - flooding, slips, high winds and snow/ice, particularly in the Southern Alps and Banks Peninsula, may bring more temporary restrictions and/or closures. In the NOC, a slip greater than 50m³ is classified as a serious slip, requiring additional funding. SH73 in the Southern Alps is faced with at least one slip exceeding 10,000m³ each year.
- **Topography** - the steep and winding topography of the corridor, particularly in sections of the Southern Alps and Banks Peninsula, can increase the regularity of a closure and the time it takes to clear slips and rockfalls.
- **Limited alternative routes** - along a large proportion of the corridor between Kumara Junction and Springfield the only viable alternative route is SH7 to the north, however this detour can be 300km depending on origin and destination. There are no alternative routes available for SH75 to Akaroa.
- **Business and community services** - tourist centres through the Southern Alps and along a large proportion of the West Coast region rely on the corridor being available to supply and access local services including education, healthcare, police and fire support, fuel and day-to-day supplies. They also rely on the corridor for tourists to access the area, for a business to remain viable. Basic supplies are also vital for areas including Akaroa to serve both the residents and cruise ships.
- **Freight distribution** - dependence on the corridor and its critical assets, including the Otira Gorge Viaduct, Bealey Bridge and Kowai Bridge, for the movement of goods. These include forestry and timber products, and access to critical services, including Christchurch International Airport, Christchurch Hospital and Lyttelton Port.
- **General access** - there are several levels of access restriction during winter months in the Southern Alps and the Hilltop in Banks Peninsula, requiring enforcement. The four levels for the Southern Alps are; open; closed to towing; closed to towing and chained; closed. The Hilltop in Banks Peninsula on SH75 is either open or closed. These restrictions are manned; however, the enforcement team have no powers to stop drivers.
- **Seismic risk** - the corridor crosses the Alpine Fault Line which has become a more recent concern, which will likely cause damage to the corridor and neighbouring detour roads in the future, blocking access for key supplies.

Future considerations

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

- **Weather induced events and Emergency response** - more frequent and more significant flooding, slips rockfalls, tree fall and snow/ice events. There are several solutions including rockfall protection netting in vulnerable areas, investment in drainage maintenance in areas susceptible to flooding, higher levels of monitoring of the neighbouring environment to help prepare for events, and faster intervention maintenance and early warning systems.
- **Improved communications and monitoring** - ITS system investment will be able to provide more real-time information for the corridor including maintenance, freight haulage drivers, tourists and the general public. Improving communication networks to provide a choice for users prior to each journey. Mobile coverage is poor through the Southern Alps and south of Tai Tapu. Investment in improved communications will help provide real-time information and/or staged investment in readiness of first responder personnel. New equipment may be more feasible, focusing on the most vulnerable areas at the most critical times.
- **Improvements to rail infrastructure and services** - there is an existing freight rail line through to Arthur's Pass. Maintaining and improving the rail corridor access will provide alternatives for freight movement, possible passenger movement to Christchurch and tourism improvements.
- **HCV/HPMV upgrade** - There is an untapped potential for the region, by upgrading the corridor to full HPMV capability, opening opportunities at Lyttelton Port and the Port of Greymouth, with increased national and international trade and an alternative to Timaru, improving South Island Resilience.
- **Regional economic potential** - improved transport links raises the potential for inward investment for currently underperforming areas in New Zealand. There are limited primary industry opportunities on the West Coast, therefore tourism is a key economic contributor to the region. Any investment ensuring the region maintains and improves access is vital.

Reliability and efficiency

Efficiency

The majority of the corridor performs very well, with large sections at a LOS A and B. Some sections around the urban centres and rural townships, 'out of context' curves, 'out of context' straights and single-lane bridges have an impact throughout the day, particularly around Otira and towards Akaroa through Banks Peninsula. The efficiency around Christchurch is generally acceptable in the inter-peak with a reduced LOS in the peak periods.

Traffic congestion builds at intersections in the AM/PM peak west of Russley on SH73 and south of Christchurch on SH75. As highlighted previously, rat running to other roads on the network minimises congestion between Christchurch and Tai Tapu.

The data gaps shown in grey were discussed during the workshops as part of the CMP development, and the consensus was that these sections were reasonably free-flow at all times, with a LOS A, as shown on the neighbouring sections of corridor.

Variability

Overall, where data is available, the corridor performs well. Medium and low levels between Jacksons and Springfield are below what would be expected for this area due to the challenging terrain, geometry and frequent closures. Based on discussions at the workshops held as part of the CMP development, it was expected that between Darfield and Russley would be yellow (low), Russley to Tai Tapu would be orange (medium), and Tai Tapu to Akaroa would be yellow.

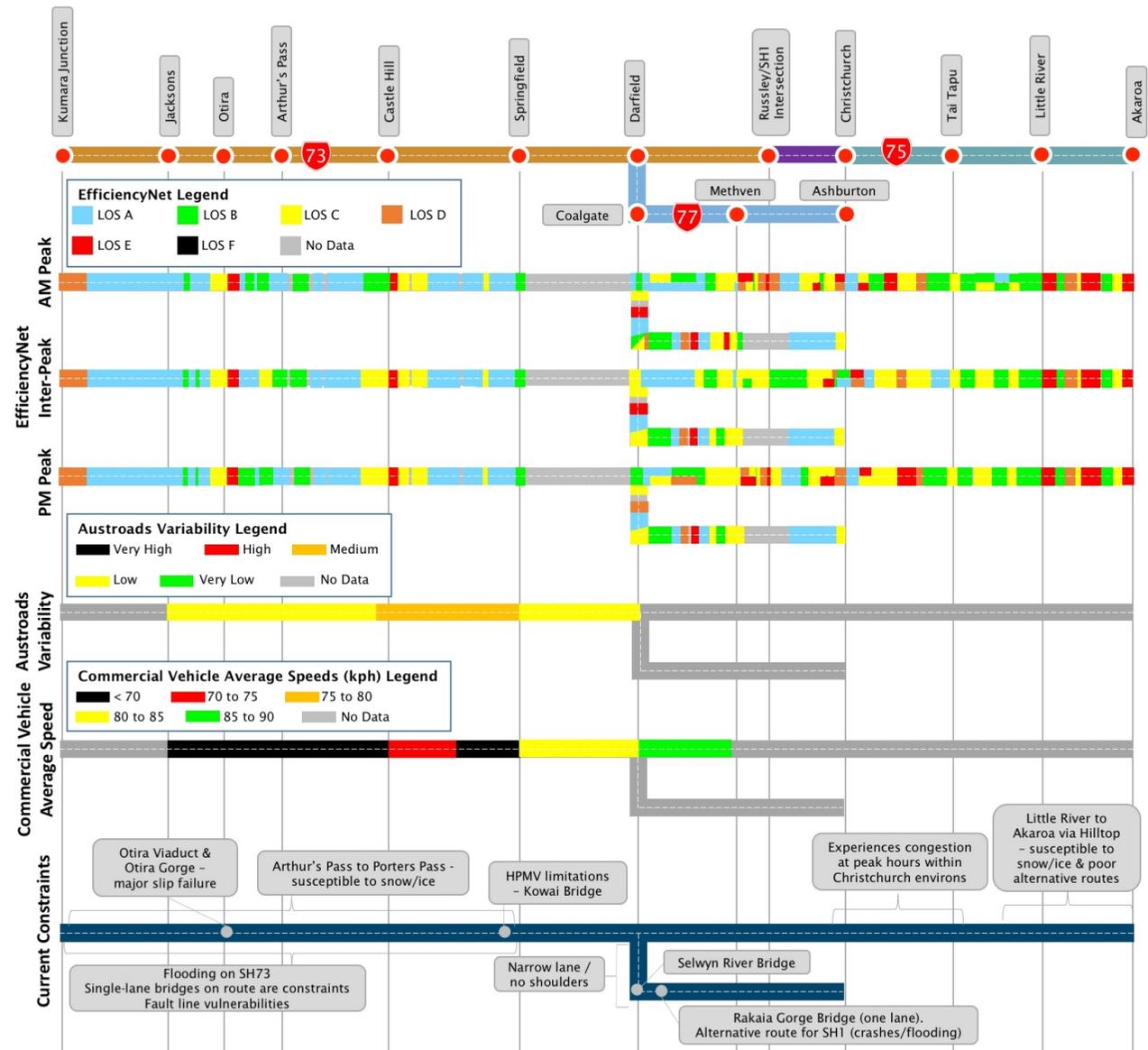
Commercial vehicle average speed

Average speeds for commercial vehicles are at the lower end of the scale. However, this is as would be expected with the terrain and infrastructure being negotiated.

Current constraints

The major current constraints on the network affecting 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 LOS for **Reliability and Efficiency** are as following:

- **Road capacity** - the four-lane divided section of the corridor in Christchurch (SH73 - Yaldhurst Road and Curletts Road), and the two-lane divided section between Little River and Akaroa, are at or near capacity during peak periods and are delivering poor LOS at these times. SH73 through Christchurch and the SH76 interchange experiences conflict between cyclists and other general traffic due to confined space and congestion. Morning peak periods in Christchurch are reliant on the rate at which the City can absorb the arriving traffic.
- **Speed restrictions** - townships generally require an appropriate reduction in travel speed to suit the surrounding environment and users. This speed change results in travel time delay, but increases general safety for pedestrians and drives in the centres.
- **Business performance** - commercial vehicle and business effectiveness, efficiency and operating costs increase rapidly with low average speeds, such as occurs between Jacksons and Springfield. Excessive business disruption can lead to relocation and economic loss to a community.
- **Weather induced events** - flooding, slips, rockfalls, and snow/ice, particularly in the Southern Alps and Banks Peninsula, will bring more temporary restrictions and/or closures affecting the reliability and efficiency of the corridor.
- **Restricted passing opportunities** - few passing/slow vehicle lanes, there are currently none in the Selwyn District, cause driver frustration, greater risk taking, potential safety issues and travel time delays.
- **Event Management** – events including Cup and Show Week at Canterbury Agricultural Park, Coast to Coast in Greymouth and the West Coast, and Le Race at Riccarton Racecourse have temporary impacts on the corridor, attracting large numbers of people and vehicles to each area, causing congestion, parking on road sides on narrow sections of the corridor and disruption to through traffic.

Future considerations

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

- **Incident response management** - being able to respond quickly and efficiently to incidents on the network is important to maintain reliable and efficient journeys for customers. This requires a higher level of investment in communications, response equipment, staff numbers and training to improve response times.
- **ITS management** - use of ITS to manage flow is increasing. Reliance on real-time information dissemination to customers will become even more important as traffic volumes continue to grow. The supporting infrastructure will need to be maintained and grow with public acceptance of services. This will increase expectations in areas of higher volumes of traffic (Christchurch) and areas more prone to closure (Arthurs Pass).
- **Resource availability** - competition for resources to maintain and improve the corridor may require earlier commitment to, or longer-term supply agreements. Ensure where possible, contracts accounting for a long-term strategy with sufficient time to allocate appropriate resources. Increasing budgets or accepting a lower quality product to fit the given budget, and greater coordination with the market may be required.
- **Maintenance access** - limited access opportunities for maintenance works along with the topography of sections of the corridor (Southern Alps and Banks Peninsula) dictate that more robust treatments are required to ensure a continuity of service.
- **Maintenance burden** - as capital works and safety improvements come on stream, there is a risk of additional maintenance burden to ensure that they remain fully effective.
- **Capital Investment** - There is expected to be ongoing growth in tourism. The corridor provides for growth to the west and south of Christchurch, however connections to the City and key destinations are already reaching capacity at peak times. Consideration and investment in passing lanes, Park and Ride facilities, encouraging use of existing infrastructure more efficiently including buses and rail, and capacity improvements, are all required to ensure future corridor reliability and efficiency.

Safety

Collective risk

The SH73 corridor from Kumara Junction to Darfield has a low or medium-low collective risk rating for most sections except for small segments around Arthur's Pass, Castle Hill and between Kumara Junction and Jacksons. A medium-high and high-risk rating is seen on the approach to Russley/SH1 intersection and on the section between Christchurch and Tai Tapu. The corridor between Tai Tapu to Akaroa is mostly rated medium-low to medium. SH77 generally has a low collective risk rating from Darfield to Ashburton.

Personal risk

Personal risk along the SH73 corridor between Kumara Junction and Springfield ranges from low and medium-low on the flat to medium high and high in the Southern Alps and key approaches such as Oтира, Arthur's Pass and Castle Hill (Porter's Pass). SH75 has a medium-high to high personal risk for most sections of the corridor between Tai Tapu and Akaroa. The remaining sections of the corridor generally performs well for personal risk with a low risk rating except for a high section on SH77.

Star rating

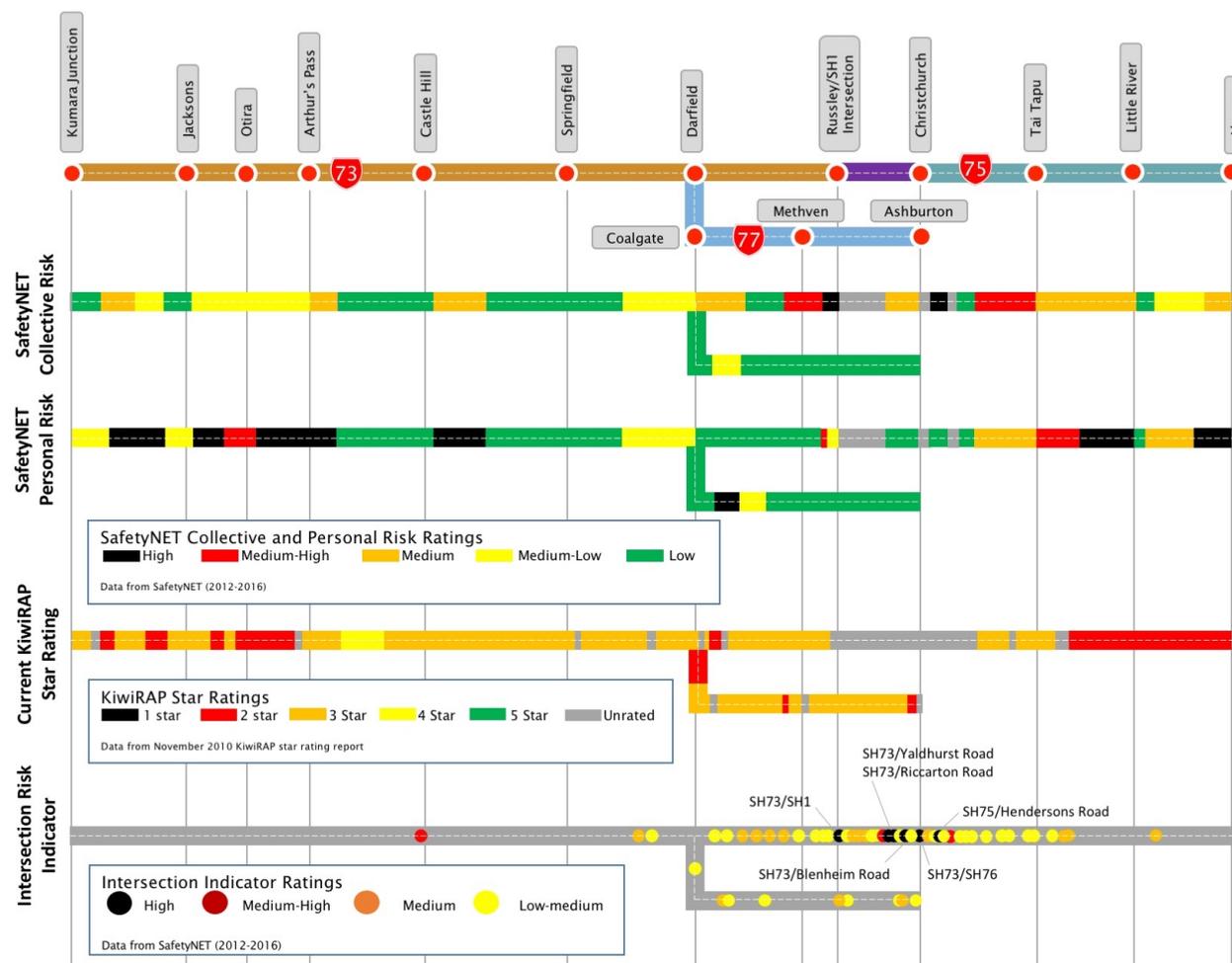
The corridor is predominantly 3 star rated except for Tai Tapu to Akaroa, Oтира to Arthur's Pass and Darfield to Colgate where it is 2 star, along with some other isolated sections.

No rating is provided for the urban area in Christchurch.

Intersection risk indicators

Five high risk intersections have been identified between the Russley/SH1 intersection and Christchurch. This includes the SH73 intersections with SH1, Yaldhurst Road, Riccarton Road, Blenheim Road and SH76. The SH75 intersection with Henderson's Road also has a high-risk rating.

Figure 14 - Safety



Pressures

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

- **Geometry** – the Southern Alps and Banks Peninsula is a general safety concern where the geometry of the road is winding and steep. The section of greater safety concern is between Tai Tapu and Akaroa, and Otira to Arthurs Pass, which have long straights followed by winding sections and ‘out of context’ curves (and ‘out of context’ straights in the Southern Alps);
- **Lack of safety based assets** – limited use of ‘safe systems’ design features including wire rope barriers, improved visibility and turning lanes at intersections and forward visibility on the corridor;
- **Driver fatigue** – as the corridor is a key freight route and key for tourists and recreational users, drivers typically drive the entire length of SH73 from Kumara Junction to Darfield and beyond, putting them at risk of fatigue. Sometimes the corridor is part of a longer journey beyond the corridor, e.g. Greymouth to Rolleston or Lyttelton Port, Christchurch to Franz Josef / Fox Glaciers;
- **Level crossings** – there are three rail level crossings in the vicinity of Otira on SH73 where the road and rail corridors cross. Train frequency is relatively low with up to 4 freight train trips and 2 TransAlpine trips per day. The freight train lengths can be substantial causing additional delays for drivers;
- **Motorcycle users** - SH75 is a popular route for groups of motorcyclists, as well as the SH73 / SH7 loop. There is a high concentration of motorcycle crashes between Tai Tapu and Akaroa on SH75 where additional investment for a safe journeys route has been committed by ACC, to improve road surfaces, reduce dips and the geometric alignment of the road where possible. There is growing pressure on the extended corridor to accommodate motorcyclists that travel at high speed and take risks on corners and areas of restricted visibility;
- **Narrow lanes/shoulders** – sections of the corridor, particularly on the West Coast section, between Ashburton and Mount Hutt and Banks Peninsula have narrow lanes and no hard shoulder. These sections of road are often through winding and challenging road alignments resulting in run off the road crashes;

Future considerations

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

- **Safety improvements** - improvement to high risk areas may include road realignment in crash hot spots, including reduced ‘out of context’ curves between Kumara Junction and Otira on SH73 and Tai Tapu and Little River on SH75. Other improvements may include Variable Message Signs (VMS) before high risk areas to warn motorists on approach to intersections, such as Kirwee (Courtenay Road) and West Melton (Weedons Ross Road). Extending and adding new passing lanes/slow vehicle lanes, particularly on the sections of the corridor between Springfield and Russley, and Tai Tapu and Akaroa, where driver frustration is higher will help minimise unsafe passing manoeuvres. Other safety improvements could include minor widening along narrow sections of corridor along with more significant investment including wire rope barriers, road and bridge widening;
- **Improved experience strategy** – providing stopping areas for drivers requires consideration, including encouragement of refreshment businesses where possible for a more positive user experience along the corridor and reduced driver fatigue. Encourage and work with councils and other agencies to provide well sign-posted and accessible stopping areas in existing settlements, and when events are on in Kumara, the West Coast and Christchurch;
- **Level crossing removal** – a high level of investment would be required to separate the rail and road corridors. As traffic volumes increase, congestion from closed level crossings will exacerbate delays elsewhere on the corridor. However, the traffic volume increase in the next three years is unlikely to be sufficient to warrant investment;
- **HPMV upgrade** – upgrading the corridor infrastructure to accommodate HPMV’s will provide added benefits to other users, including road straightening, gradient reductions and passing lanes, improving general road safety.

People, places and environment

Natural environment

The key natural environment features are the Southern Alps and Banks Peninsula sections of the corridor, providing exceptional alpine and harbour views. Arthur's Pass is a DoC conservation area with ecological significance. Habitats vary from thick forest to tussock grassland, with the West Coast section between Kumara Junction and Jacksons being heavily forested along the Taramakau River. The corridor passes a number of iconic lakes between Springfield and Little River, including Lake Lyndon, Lake Ellesmere and Lake Forsyth, which are situated amongst rural landscape.

There are many streams and major river corridors crossing the road corridor, concentrated in the Southern Alps and Banks Peninsula. Heavy rain often results in minor slips and rockfalls in the vicinity of water courses and occasionally water volumes exceed crossflow capacity provided by culverts and pipes, resulting in on-going maintenance issues and costs.

Noise, vibration and air quality

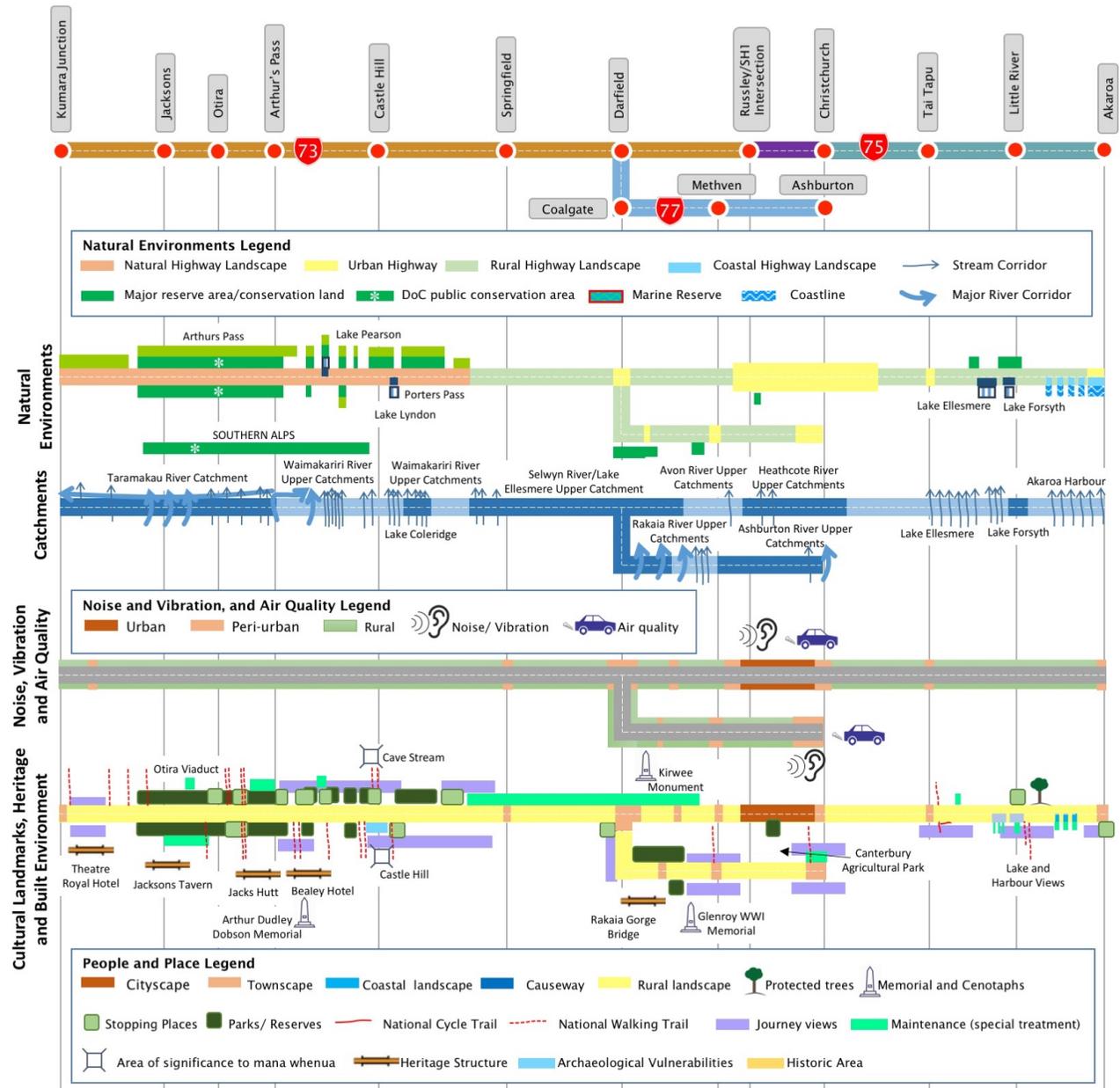
Residential development abuts the corridor within the townships of Kumara, Springfield, Darfield and West Melton on SH73, Tai Tapu and Akaroa on SH75 and Methven and Ashburton on SH77. Noise and vibration and air quality issues are experienced in Christchurch and Ashburton.

Cultural landmarks, heritage and built environment

The scenery of the corridor creates vitality and attractiveness to journeys, with a range of urban and rural areas, areas of cityscape, townscape, coastal landscape, and parks/reserves. The Southern Alps section of the corridor has a high concentration of cultural and heritage features, such as the Arthur Dudley Dobson Memorial, Jacks Hutt and Bealey Hotel in Arthur's Pass, and Jacksons Historic Hotel in Jacksons.

There are regular scenic views throughout highlighted in Figure 14 on Cultural Landscape, Heritage and Built Environment by the Journey Views graphic, however stopping places are particularly restricted on Banks Peninsula, potentially causing problems for drivers being distracted and having limited opportunities to stop.

Figure 15 – People, places and environment



Pressures

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

- **Topography** - the undulating road over regular hills and alongside steep edges provides for challenging road conditions, particularly in wet weather conditions. The natural and rural highway landscapes provide a sense of freedom and enjoyment for drivers, with low vehicle volumes and winding roads that may encourage some to take a more comfortable driving trajectory, i.e. cutting corners and taking racing lines;
- **Changing weather patterns** - higher temperatures and more intensive rainfall patterns could increase the risk of erosion, subsidence and degradation of rocks, soils and slopes within and alongside the corridor, particularly in already susceptible sections (Southern Alps and Banks Peninsula). The frequency and intensity of flooding could also increase;
- **Ecology** - ecological connectivity across the corridor between habitat areas is an outcome increasingly sought by councils and DoC to assist in biodiversity maintenance and improvement, and will need to be considered in vegetation management programs, including pest plant management in the Southern Alps, particularly around Otira.
- **Traffic growth** - as the number of vehicle movements' increase along the corridor, the need to manage impacts will increase. Receptors (people/buildings) closest to the state highway mainly on Yaldhurst Road (SH73) and Halswell Road (SH75) are more likely to be potentially impacted, nominally within 40m of the state highway for vibration, and within 100m for air quality and noise. Mitigation can include separation of the state highway from receptors, maintaining free-flowing traffic and appropriate road surface conditions. In some cases, special pavements and/or barriers, such as walls or bunds, are used to mitigate noise.
- **Management** - the complex range of cultural heritage places and landmarks are subject to incremental damage through both corridor management activities and environmental changes.
- **Relationships** - acknowledgement of iwi/mana whenua relationships are increasing along with their input to the management of heritage assets and landscapes. The number of features and locations of importance to iwi along the corridor is expected to increase and these will need to be considered in corridor management and development opportunities.

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:

- **Topography** - further investment to minimise and improve winding sections of the corridor, forward visibility and surface conditions where possible.
- **Changing weather patterns** - need to manage increasingly variable and extreme weather events to ensure corridor availability. This may require engineering controls and the use of vegetation, including expenditure on drainage, water storage, rock netting and retaining walls particularly in highly exposed areas, such as coastal sections (Banks Peninsula) and the Southern Alps.
- **Pest control** - greater emphasis on pest control and eradication is likely in the future, requiring bait stations and traps in easily accessible areas, requiring collaboration with charities, volunteers and other groups.
- **Noise controls** - Support and incentives are likely for development of infrastructure and technology limiting noise, vibration and air quality issues. Support for local and central government incentives for new technologies along with legal restrictions on noisy activities will help meet these requirements.
- **Tourism growth** - the West Coast (Westland) is keen to promote cycle tourism, with the West Coast Wilderness Trail proving popular with visitors. Additional trails are likely to appear in future adding pressure to the natural environment, cultural landmarks, heritage and the built environment. Increased parking pressure on the corridor, particularly SH73 and SH77, including parking on the roadside where off-street parking is unavailable, or fully used is likely to continue and increase in future;
- **Vehicle changes and electric infrastructure** - control measures and supporting infrastructure including charging facilities for electric vehicles at stopping places and popular attractions, as well as freight electrification require consideration. Increased use of electric vehicles will likely reduce noise, vibration and air quality issues.
- **Amenity value** - there are opportunities to improve the user experience along the corridor with stopping places, cafes and services, landmarks and tourist attractions, acknowledging local interests and heritage. Some of these may require management plans with ongoing compliance obligations, such as in Christchurch City, the West Coast, or Ashburton. Additional investigations, consultation for supporting infrastructure and management of the impacts on these features may also be required.

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 398 km of road network which reflects 3.5% nationally. The total value of the assets along the corridor is \$486M (excluding ITS, and, heritage and green assets).

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

Asset condition and performance summary

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

Figure 16 – Corridor asset base



Figure 17 - Asset condition and performance



Asset condition and performance

Surface skid resistance

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

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

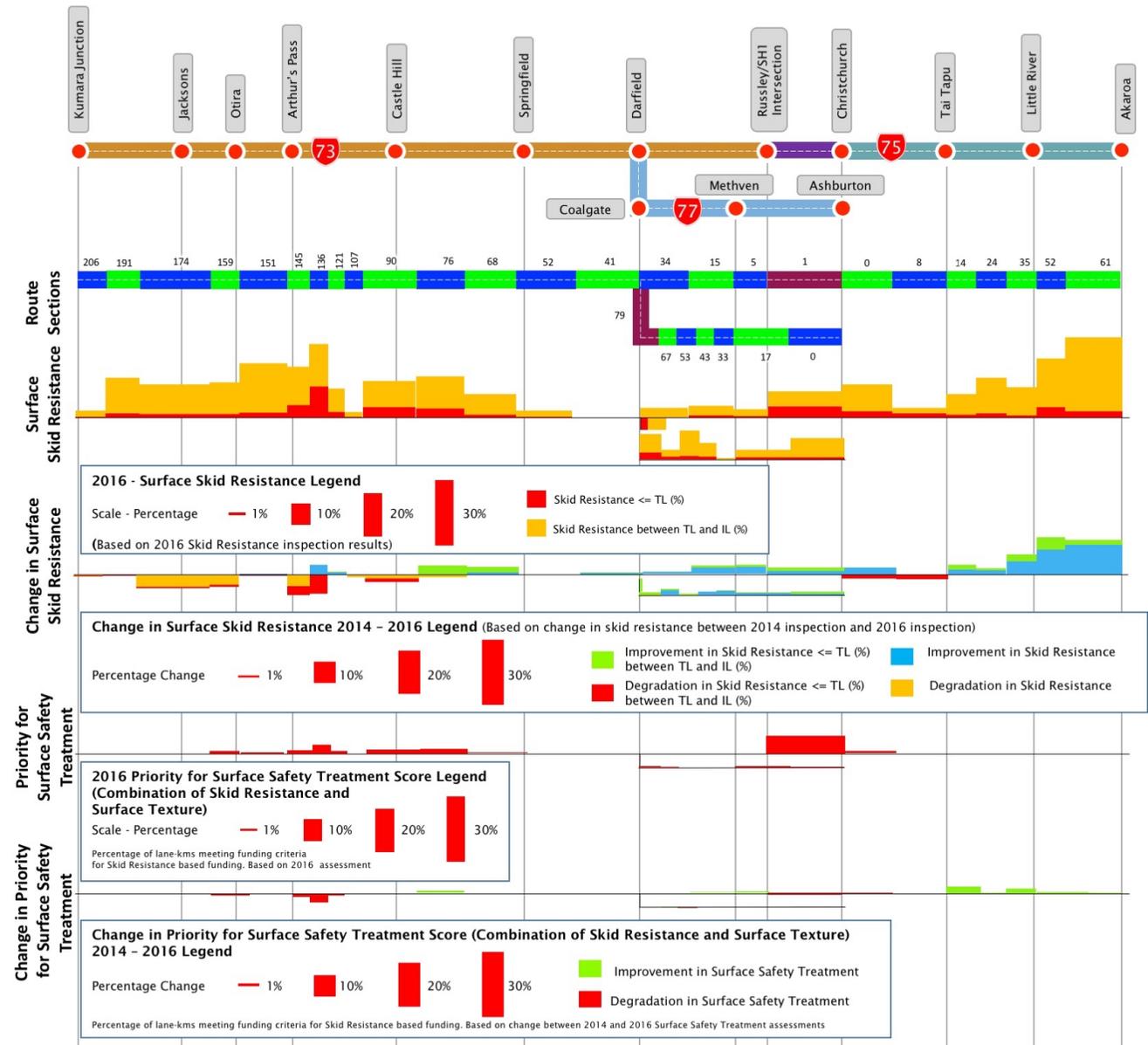
Two sections of SH73, RS136 and RS145 through the Arthur's Pass area have shown a marked increase in the amount of skid resistance below the threshold limit over the last 3 years. These sections also show significant levels of surface skid resistance within the Investigation Limits as well as sections SH75/52 and SH75/61 between Little River and Akaroa, despite having shown a marked improvement in both levels of surface skid resistance over the last three years.

Priority for surface safety treatment

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

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

Figure 18 – Asset condition



A low percentage (0.57 %) of the corridor achieved Skid Assessment Length that qualifies for funding. This equates to only 4.5 lane-km of the 786 total lane-km of the corridor. The section with the highest priority qualifying for funding is SH73/1 through Upper Riccarton.

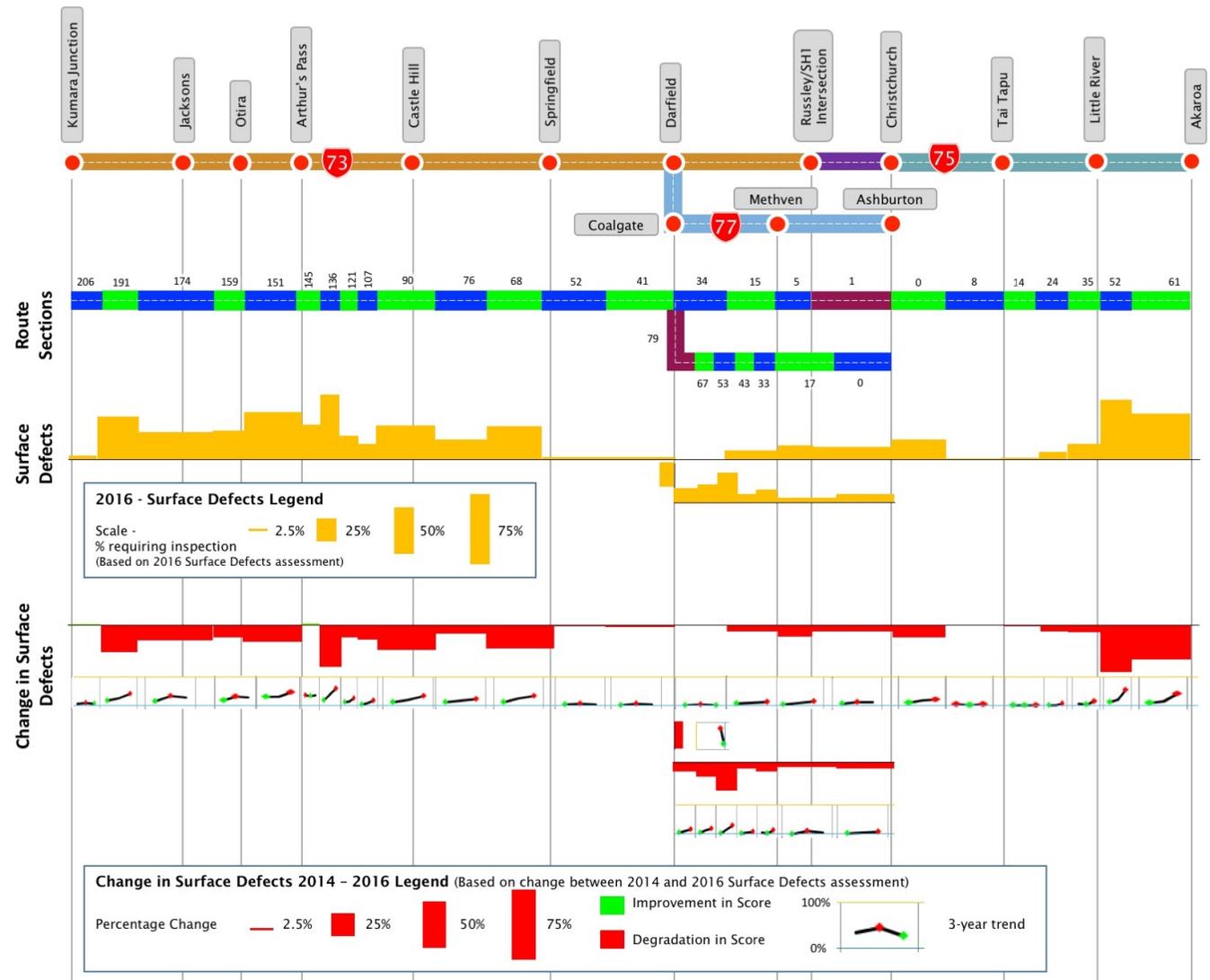
Surface defects

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, 21.6% of the corridor achieves a score above which inspection is required. Sections with significant lengths of surface requiring inspection include: SH73/136 south of Arthur's Pass, and, SH75/52 and SH75/61 between Little River and Akaroa. 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.

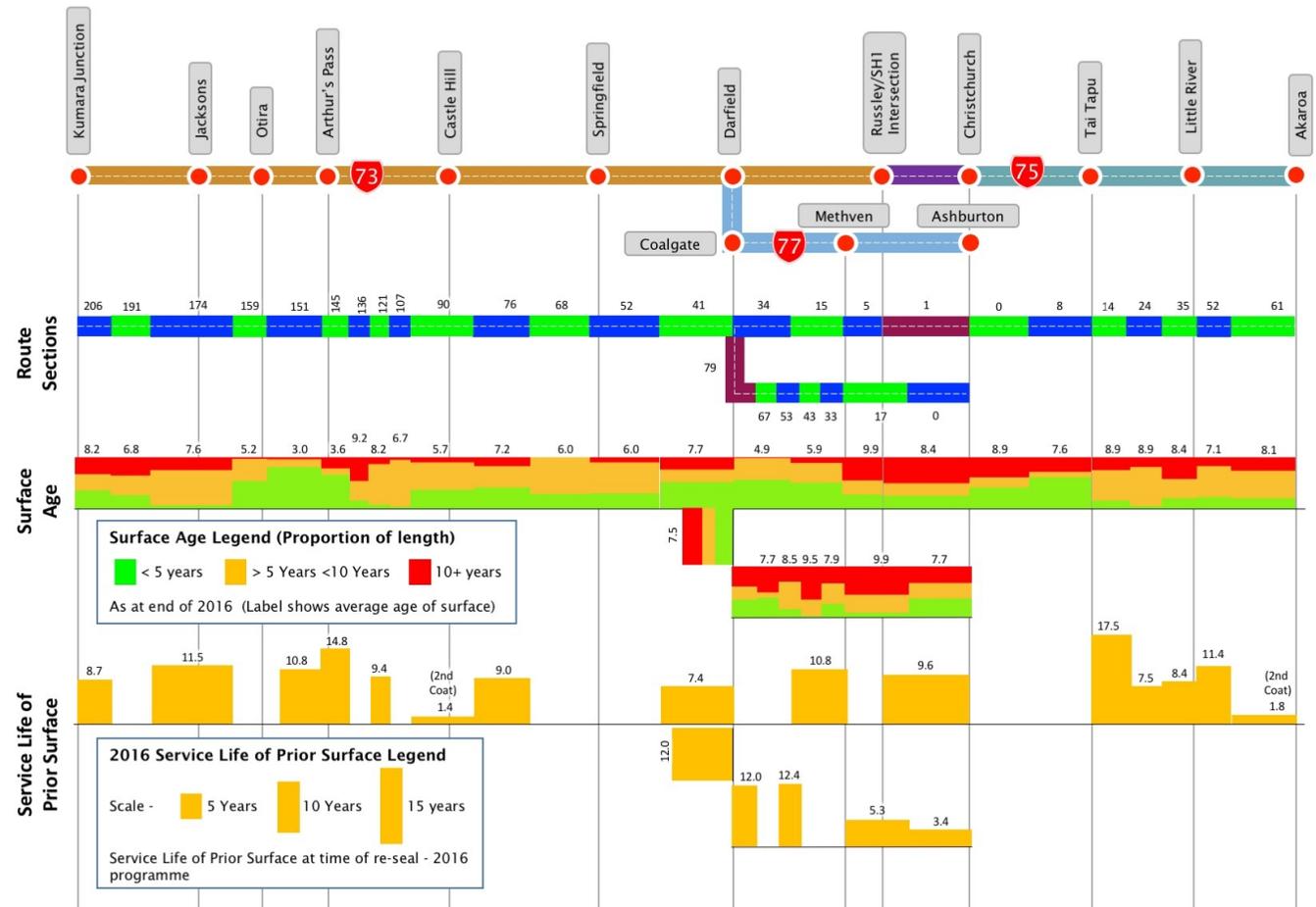
The sections of corridor with the oldest age profile are SH73/5 west of SH1, SH73/136 south of Arthur's Pass, and, SH77/17 south of Methven.

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 a service life of 9.6 years, with sections SH73/145 north of Arthur's Pass, SH75/14 south of Tai Tapu, SH77/53 through Windwhistle, and, SH77/79 west of Darfield achieving a service life in excess of 12 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 SH73/145 north of Arthur's Pass, and SH73/159 and SH73/174 between Otira and Taipo River.

Proportion of travel on smooth roads

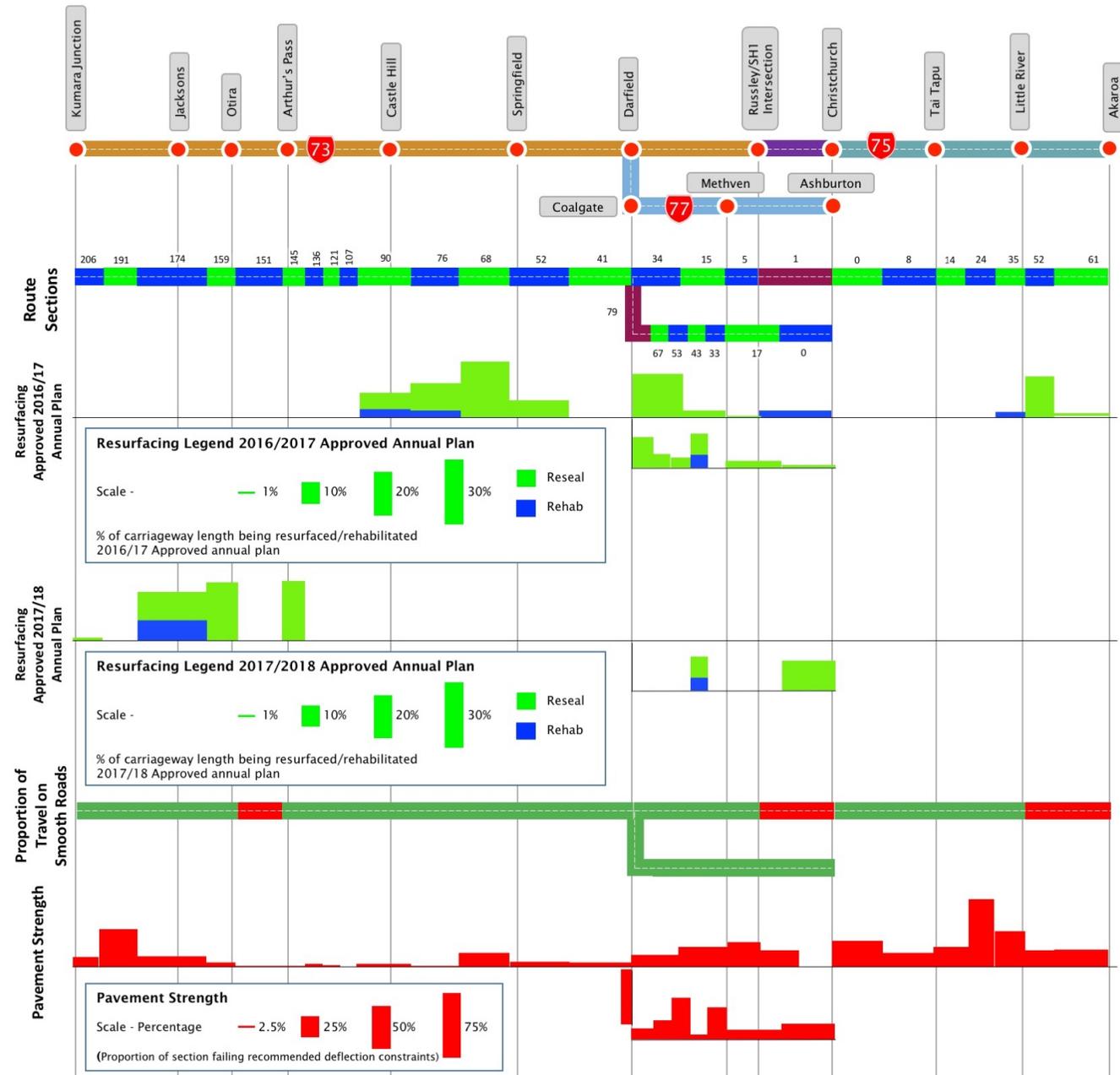
The infographic shows whether the route section passes the ONRC standard for Proportion of Travel on Smooth Roads (Smooth Travel Exposure). 97% is the ONRC target for proportion of travel on smooth roads. The infographic simply shows whether the route section achieves this level or not.

Pavement strength

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

The sections of corridor with the highest proportion of pavement failing to meet the deflection constraints occur at SH73/191 through the Taramakau River Valley, SH75/24 and SH75/35 between Motukarara and Little River, SH77/33 north of Methven, and, SH77/53 through Windwhistle.

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:

- **Land Use and Growth:** Rapid growth around Halswell is creating additional demand for direct access to the highway.
- **Freight Demand:** The style and demand of freight movement between West and east Coasts is greater than the original design of these pavements, when the heavy movement happened on rail and long vehicles could not physically fit through the passes. Maintenance and structural needs are high on the pavements through the SH73 passes.
- **Akaroa Cruise Ship Activity:** Cruise ships are visiting Akaroa rather than the currently unavailable Lyttelton berth. This creates an additional demand on SH75 to accommodate previously absent full-size cruise buses and extra tourist demand for access to Canterbury and Christchurch from Banks Peninsula. These users have a different Level of service expectation than would usually be provided, both in terms of ride roughness and in terms of travel time reliability. Subject to snow and ice on Hilltop. (only two routes in/out – SH and Port Levy road). Geologically unstable, some flooding, limited cell coverage from Taitapu to Little River, disappears until Hilltop and then returns for Akaroa. Narrow alignment, takes a hammering from the heavy tourer buses/vehicles.
- **Roughness:** a feature of this corridor is the rough ride transitioning from road to and across bridges and culverts. This roughness is an appropriate LOS for the ONRC classification, but is inconsistent with road user expectations.
- **Winter maintenance:** Winter maintenance regimes apply to the Porter's Pass, Otira, Arthur's Pass. These measures can increase surface roughness from grading or vehicle chains, reduce overall surface life and increase travel times due to the need for reduced travel speeds.
- **Road Width:** Much of this corridor has very narrow alignments, which are generally manageable while opposing traffic volumes are low. SH77 has seen significant rutting and shoulder damage occurring since a growth in dairy, with passing tankers running their outside wheels on the grass and causing pavement and shoulder damage.

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:

- **Next steps for the pavement between Darfield and Porters Pass.** The existing pavement was not designed for the current heavy vehicle loads, is of limited depth and showing signs of distress. It will soon need more maintenance with consequential disruption to traffic, unless a renewal can be justified.
- **Growth projections for Halswell** indicate a tripling of household numbers by 2030 with an additional need for supporting services and infrastructure.



Otira viaduct

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	\$5,473	\$5,971	\$8,690
	Renewals	\$6,934	\$7,732	\$11,125
	Improvements	\$1,696	\$2,763	\$0
Reliability and Efficiency	Maintenance and Operations	\$3,286	\$3,576	\$5,386
	Renewals	\$679	\$507	\$742
	Improvements	\$13,799	\$3,865	\$0
Safety	Maintenance and Operations	\$4,181	\$4,444	\$6,504
	Renewals	\$1,512	\$1,707	\$2,505
	Improvements	\$5,357	\$6,231	\$0
People, places and Environment	Maintenance and Operations	\$1,122	\$1,254	\$1,788
	Renewals	\$94	\$59	\$89
	Improvements	\$0	\$0	\$0
Total		\$44,133	\$38,111	\$36,830

Figure 22 - Corridor investment

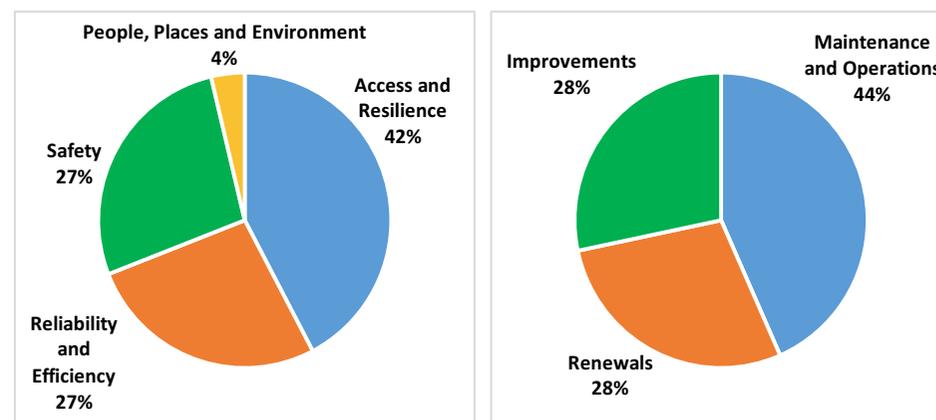


Table 2 - Summary investment by work category (\$000)

Outcome	Work Category	2018-2021	2021-2024	2024-2028
Access and Resilience	111 Sealed Pavement Maintenance	\$762	\$878	\$1,216
	112 Unsealed Roads	\$0	\$0	\$0
	113 Drainage Maintenance	\$397	\$423	\$636
	114 Structures Maintenance	\$1,142	\$1,196	\$1,769
	121 Environmental Maintenance	\$1,568	\$1,743	\$2,473
	122 Traffic Services Maintenance	\$20	\$39	\$57
	124 Cycle Path Maintenance	\$11	\$6	\$9
	151 Network & Asset Management	\$1,263	\$1,353	\$2,031
	161 Property	\$311	\$332	\$499
	211 Unsealed Road Metalling	\$0	\$0	\$0
	212 Sealed Road Resurfacing (excl. surface skid resistance)	\$3,781	\$4,190	\$5,640
	213 Drainage Renewals	\$212	\$230	\$345
	214 Pavement Rehabilitation	\$1,915	\$2,367	\$3,830
	215 Structures Component Replacements	\$982	\$889	\$1,223
Reliability and Efficiency	222 Traffic Services Renewals	\$44	\$57	\$86
	321 - 341 Improvements	\$1,696	\$2,763	\$0
	121 Environmental Maintenance	\$805	\$870	\$1,233
	123 Operational Traffic Management	\$1,959	\$2,170	\$3,355
	151 Network & Asset Management	\$465	\$475	\$708
	161 Property	\$57	\$60	\$91
	222 Traffic Services Renewals	\$679	\$507	\$742
321 - 341 Improvements	\$13,799	\$3,865	\$0	

Outcome	Work Category	2018-2021	2021-2024	2024-2028
Safety	111 Sealed Pavement Maintenance	\$851	\$951	\$1,316
	112 Unsealed Roads	\$0	\$0	\$0
	113 Drainage Maintenance	\$163	\$186	\$275
	114 Structures Maintenance	\$137	\$164	\$235
	121 Environmental Maintenance	\$94	\$116	\$174
	122 Traffic Services Maintenance	\$1,918	\$2,053	\$3,040
	124 Cycle Path Maintenance	\$7	\$2	\$3
	151 Network & Asset Management	\$879	\$827	\$1,242
	161 Property	\$133	\$146	\$219
	212 Surface Skid Resistance	\$1,183	\$1,282	\$1,925
	214 Pavement Rehabilitation	\$10	\$21	\$32
	215 Structures Component Replacements	\$114	\$129	\$194
	222 Traffic Services Renewals	\$204	\$275	\$353
	321 - 341 Improvements	\$5,357	\$6,231	\$0
People, places and Environment	111 Sealed Pavement Maintenance	\$51	\$57	\$86
	121 Environmental Maintenance	\$902	\$1,018	\$1,433
	151 Network & Asset Management	\$135	\$144	\$216
	161 Property	\$33	\$35	\$53
	221 Environmental Renewals	\$94	\$59	\$89
321 - 341 Improvements	\$0	\$0	\$0	
	Total	\$44,133	\$38,111	\$36,830

To be confirmed through the RLTP

Investing in access and resilience

Operations and maintenance

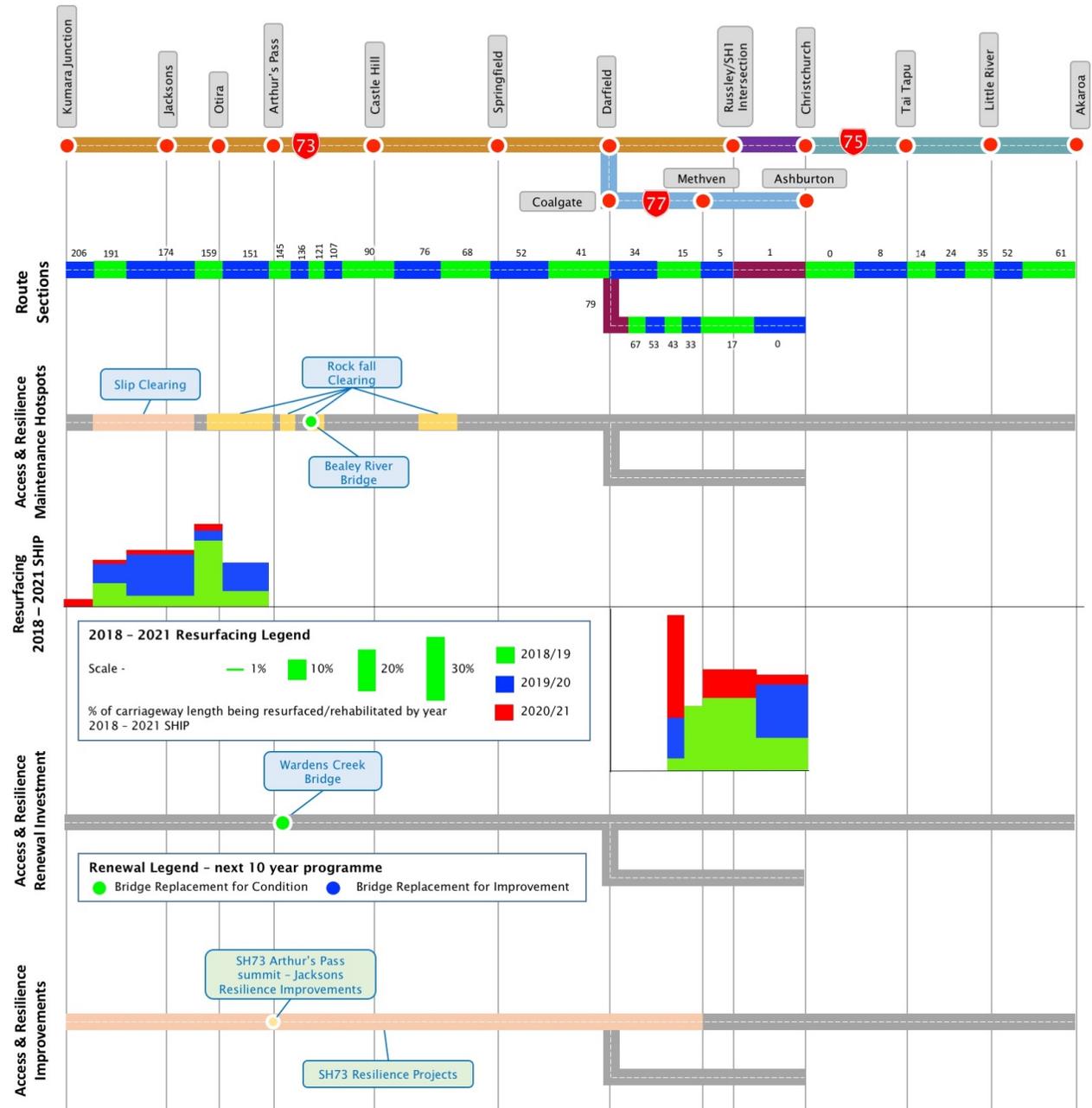
The main areas of investment to provide and preserve access and resilience are drainage maintenance, sealed road surfacing and structural component replacements and vegetation control. A key focus is to realign the base preservation quantities toward increased preventative maintenance and to slow pavement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

Maintenance hot spots

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

- **Rockfall:** multiple sites that require regular clearing, including:
 - The 16km length between SH73/121 and SH73/136, including Waimakariri Bluffs, Paddys Bend & Cornishman’s Rise.
 - The 10km length including Klondyke Corner and Mingha Bluff SH73/136 to SH73/145.
 - The 16 km length between SH73/68 and SH73/76, including Porter’s Pass, The Deviation, and Kowai Bluffs.
- **Slips:** Slips requiring regular clearing occur through the Taramakau River valley section of the corridor
- **Bealey River Bridge:** An 80 year old, 265m long single lane bridge. Is a critical asset at the head of the Waimakariri River.
- **Wind Closures:** - extreme wind requires closure of SH73 and part of SH77.

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: SH77/0 and SH77/17 between Ashburton and Methven, and, SH77/43 west of Rakaia River.

Structure Renewal

The renewal investment infographic shows the planned bridge replacements along the corridor. One bridge is planned for replacement due to asset condition, at an estimated cost of \$0.7M.

The Akaroa, SH75 Seawalls are to be replaced over the next three years to avoid loss of the carriageway.



Winter maintenance truck

Improvements

Planned

There are no currently planned access and resilience related improvements underway on this corridor.

Draft Regional Land Transport Programme considered for the SHIP

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

Table 3- Draft regional programme considered for SHIP

Project	Funding Status	Description
SH73 Resilience Project		Proposed resilience improvements at locations along the SH73.
SH73 Arthur's Pass summit - Jacksons Resilience Improvements		Resilience improvements on SH73. Shows Red rating in ONRC LoS Performance for Resilience within CMP.

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.

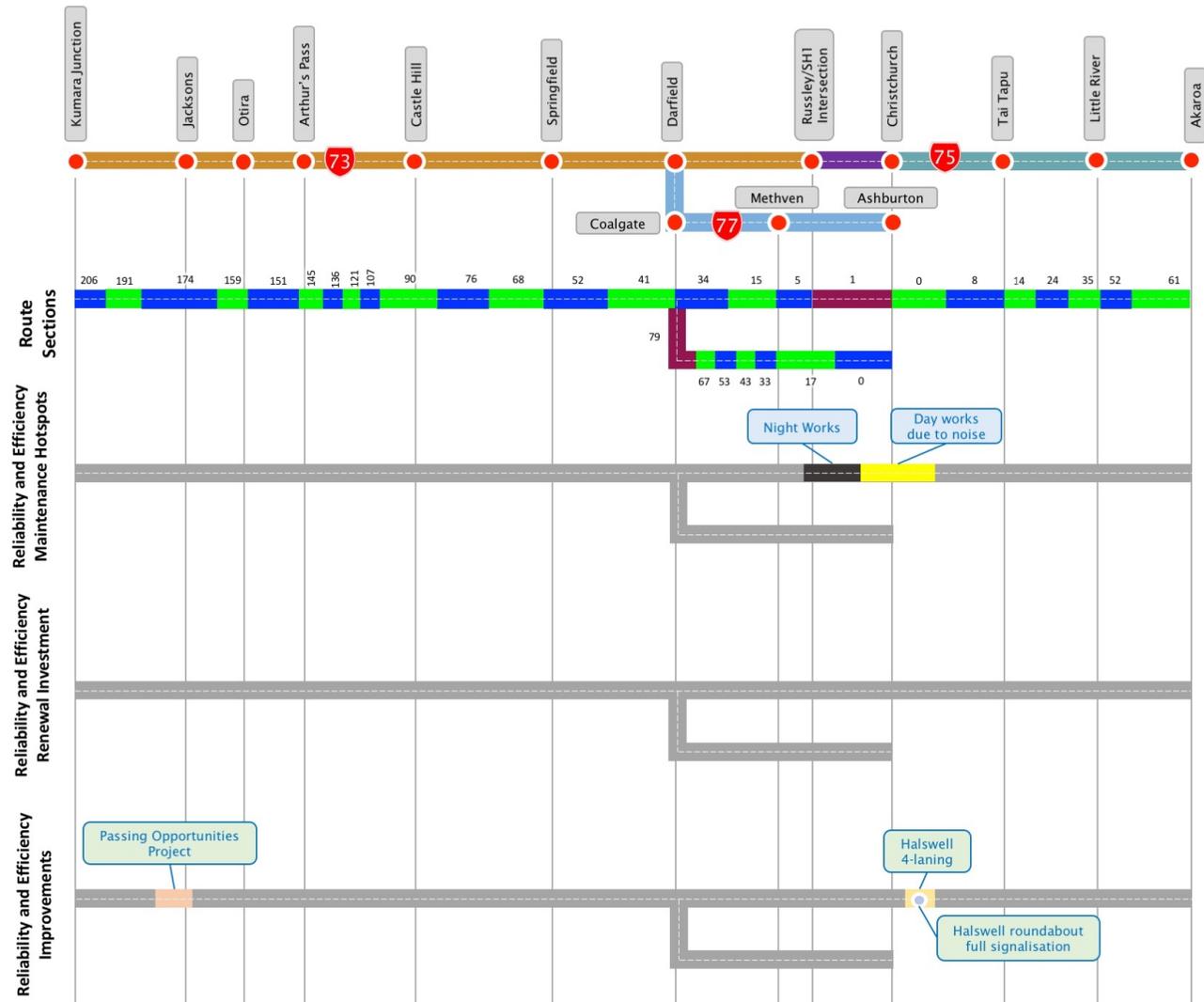
The Christchurch end is managed through CTOC and can be subject to general urban environment and commuter delays.

Maintenance hot spots

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

- Hours of Works:** Yaldhurst Road is limited to night works, but Russley Road to Halswell is an area of residential noise effect and is limited to daylight outside of peak periods.

Figure 24 – Reliability and efficiency investment



Renewals

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



SH43 winter travel needs to be well planned with weather information accessible

Improvements

Planned

There are no currently planned reliability and efficiency related improvements underway on this corridor.

Draft Regional Land Transport Programme considered for the SHIP

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

Table 4- Draft regional programme considered for SHIP

Project	Funding Status	Description
Halswell roundabout full signalisation		Proposed full signalisation of Halswell Junction roundabout to address unbalanced traffic flows and delays to public transport especially in the AM peak.
Halswell Rd 4-Laning		4-laning of SH75 Halswell Road (Dunbars to Curletts) and PT Priority facilities.
SH73 passing opportunities improvement		Construct new Passing Lanes.

Investing in safety

Operations and maintenance

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

This corridor is characterised by narrow, winding and steep alignments, that present a significant safety risk and provide difficult manoeuvring for long and large vehicles, but are generally minimised by the low opposing traffic volumes.

Maintenance hot spots

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

- **Debris:** attention to rockfall sites, and general debris, particularly on high popularity Motorcycle routes, such as SH77.

Gap programme indicator

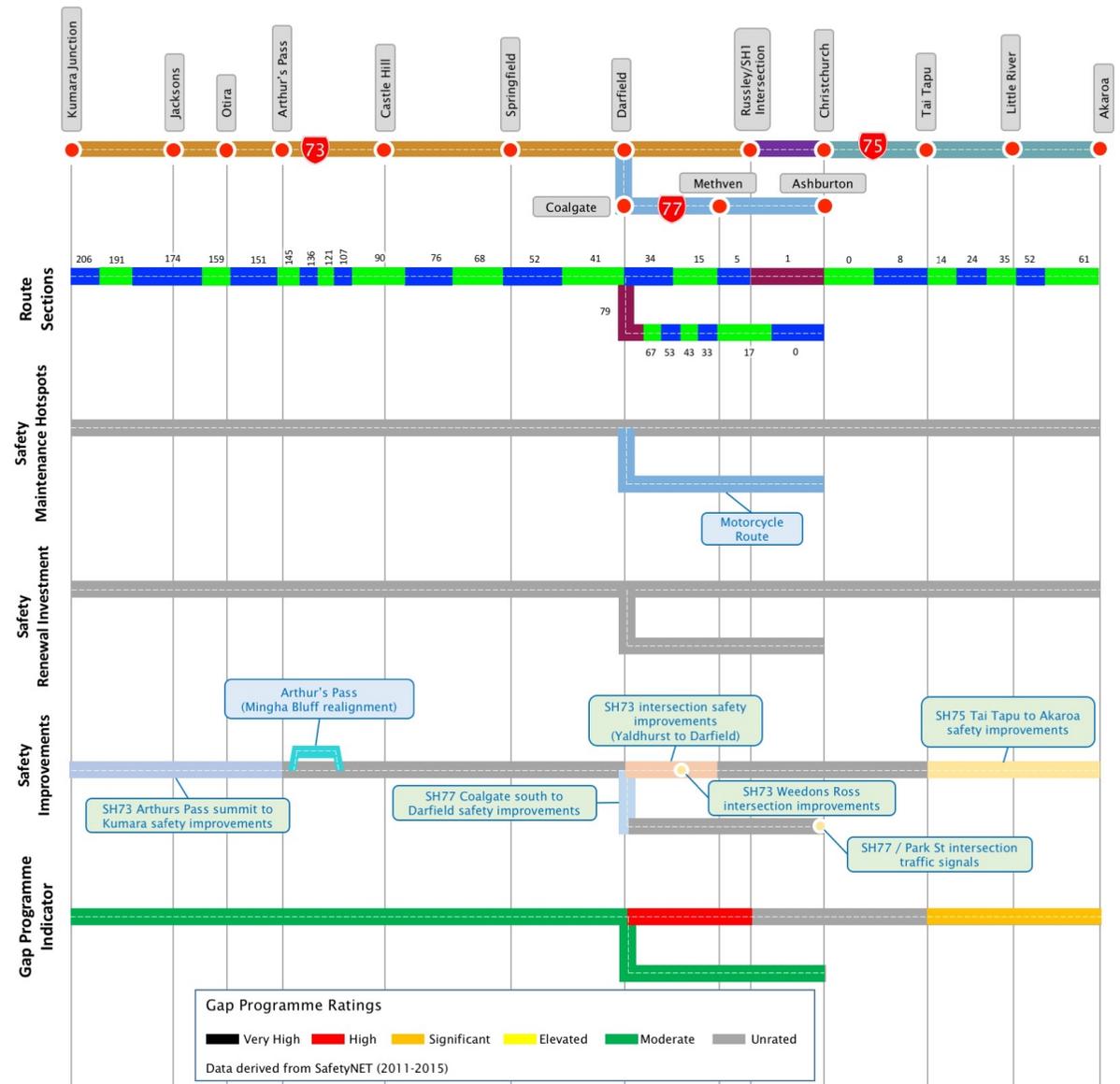
The potential for reducing fatal and serious injuries across the corridor has been assessed under the Gap programme. The Gap programme looks at the collective risk rating, likely level of intervention and the potential reduction in death and serious injury that may be achieved to determine a possible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

There is a high potential for reducing fatal and serious injury crashes between Darfield and Russley/SH1 intersection and significant potential in the section between Tai Tapu and Akaroa through targeted improvements.

Between Kumara Junction and Darfield, and on SH77, there is a moderate potential for reducing injuries through targeted, low cost, high coverage improvements.

The unrated segments are either areas where 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/>

SH73- Arthur's Pass (Mingha Bluff realignment)

Description: State Highway 73 (SH73) is the primary and most direct transport link between Christchurch and the West Coast. The highway provides a strategic link not only to the towns of Greymouth, Hokitika and Westport but to the entire West Coast and the tourism sector. The section of road also sits within the Arthur's Pass National Park and allows easy access to the Park's alpine natural, historic and scenic character. This realignment project aims to improve safety and reliability while minimising environmental impacts on Arthurs Pass National Park. Construction started in May 2015 and the project is expected to be finished by early 2018.



Work to realign Mingha Bluff near Arthurs Pass on State Highway 73 between Christchurch and the West Coast

Draft Regional Land Transport Programme considered for the SHIP

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

Table 5- Draft regional programme considered for SHIP

Project	Funding Status	Description
SH73 intersection safety improvements (Yaldhurst to Darfield)		Improvements to address crashes at intersections along the SH73 between Yaldhurst to Darfield.
SH73 Weedons Ross intersection improvements		Proposed intersection improvements to address safety and reliability problems.
SH77 / Park St intersection traffic signal		Signals at SH77/Park St intersection.
Safety Gap analysis – SH75: Tai Tapu to Akaroa		Safety gap improvements identified for the SH75.
SH73 Arthurs Pass summit – Kumara safety improvements		Corridor improvements to reduce crash risk. Would need to be done in conjunction with Journey Time Reliability improvements to be fully effective.
SH75 Tai Tapu – Akaroa safety improvements		Corridor improvements to reduce crash risk. Would need to be done in conjunction with Journey Time Reliability improvements to be fully effective.
SH77 Coalgate south – Darfield safety improvements		Corridor improvements to reduce crash risk. Would need to be done in conjunction with Journey Time Reliability improvements to be fully effective.

Investing in people, places and environment

Operations and maintenance

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

Maintenance hot spots

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

- **Special Maintenance:** National Park areas such as Arthurs Pass are special maintenance areas.
- **Extreme Environment:** The corridor has alpine passes and extreme weather conditions that limit the hours and seasons available for maintenance and improvement. Surfacing in the alpine passes cannot be allowed to deteriorate in Winter as road repairs cannot be achieved in the harsh conditions.

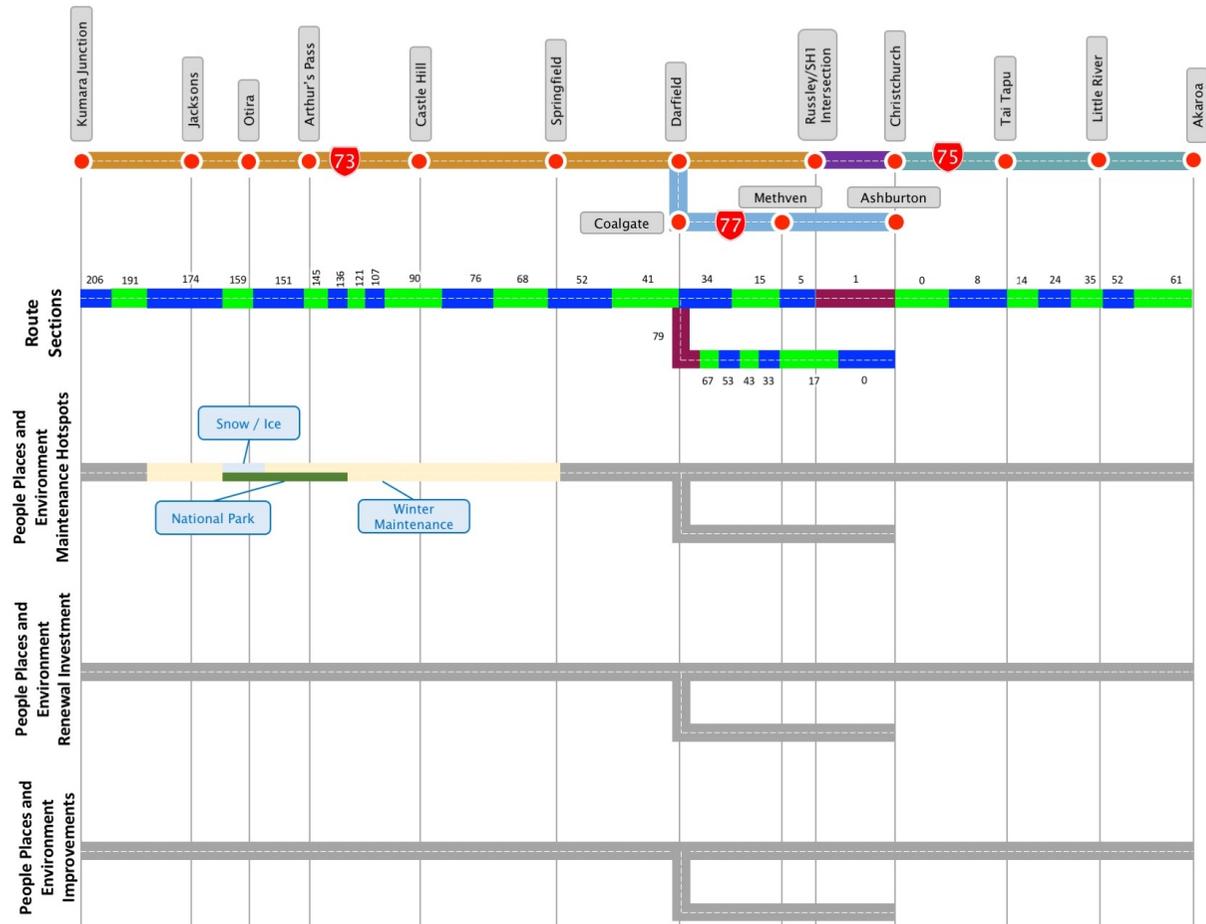
Renewals

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

Improvements

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

Figure 26 – People, places and environment investment



Investment pressures

Access and resilience

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

- **Changing weather patterns:** greater investment in management of increased variable and extreme weather events to ensure corridor availability. This may require engineering controls and the use of vegetation, including expenditure on drainage, water storage, rock netting and retaining walls particularly in highly exposed areas, such as coastal sections (Banks Peninsula) and the Southern Alps.
- **Hazards:** A large number of hazards exist along this route that can impact effective travel, including ice, snow, snow bombs, rockfall, landslides, slips, river scour and washouts and hazardous or fallen trees.
- **Winter Maintenance** regimes apply between Jacksons and Springfield for management of snow and ice and maintaining maximum safe accessibility. There is a special requirement that the contractor retain a large digger/loader at Otira Viaduct to aid in road clearing and towing of heavy vehicles when friction is lost or slipperiness is excessive.
- **Resources:** The main approach to maintenance is to respond to events and incidents as they occur, but this requires adequate resourcing and distribution of these resources.



Reliability and efficiency

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

- **Maintenance access:** limited access opportunities for maintenance works along with the topography of sections of the corridor (Southern Alps and Banks Peninsula) dictate that more robust treatments are required to ensure a continuity of service. This heightened risk is reflected in both the choices of treatments and/or management, and in the way that they are applied. Programming full closures of a section, rolling partial closures with much reduced operating speed, noise reducing surfacing, longer life treatments, or the acceptance of less maintenance and lower quality/more faults during the lifecycle may be required. The long distance and lengthy travel times of detours for SH73 mean that works are staged to minimise need for closure. (90% of West Coast freight is exported to Canterbury).
- **Traffic management:** Traffic management levels required have increased to level 2, requiring additional staff and vehicles at an added cost to the maintenance and operation of the corridor. The Kumara races are a regular planned event that impacts SH 75- cars are parked on both sides of road, but little adverse impact as little competing traffic during the Jan 6 Jan, holiday period.
- **Winter Maintenance:** a staged approach to winter closures is resource intense, but aims to minimise disruption to regular corridor users and maintain access to areas on SH77 such as Mount Hutt Ski field and the associated accommodation and support services.
- **Variable Messaging Signage:** managed primarily by WTOC with support from CTOC, particularly for Winter or crash closures.
- **Fire risk:** Forest fires burn out and then, following stripping of vegetation there are rockfalls that require ongoing maintenance until the exposed face stabilises. About one significant fire a year.

Safety

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

- **High Friction Surfacing:** The reliance on the use of CMA to assist route availability and safety of users, has led to a greater expectation for its demand which puts pressure on NZTA to provide more reliable access across the Passes.
- **Single Lane bridges:** the narrow, long, single lane bridges require attention to the protection and safety features such as barriers, signage and delineation. Bridges with Timber decks are particularly prone to being slippery.
- **Maintenance:** The tight and winding constrained terrain has steep drops offs, frequent rockfalls, limited passing opportunities and only limited space for recovery post incidents and for regular maintenance and requires extreme care as an operating environment – both safety from the surrounding environment and from corridor traffic.
- **Winter maintenance:** frequent snow patrols and presence on corridor is required to ensure full awareness of users, incidents and risk, particularly given the absence of reliable communication.
- **Access:** the SH73 corridor is the ambulance linkage route between the remote West Coast and Christchurch hospital (and the main thoroughfare for West Coast and commuters). Similarly, the SH75 linkage from Akaroa.

People, places and environment

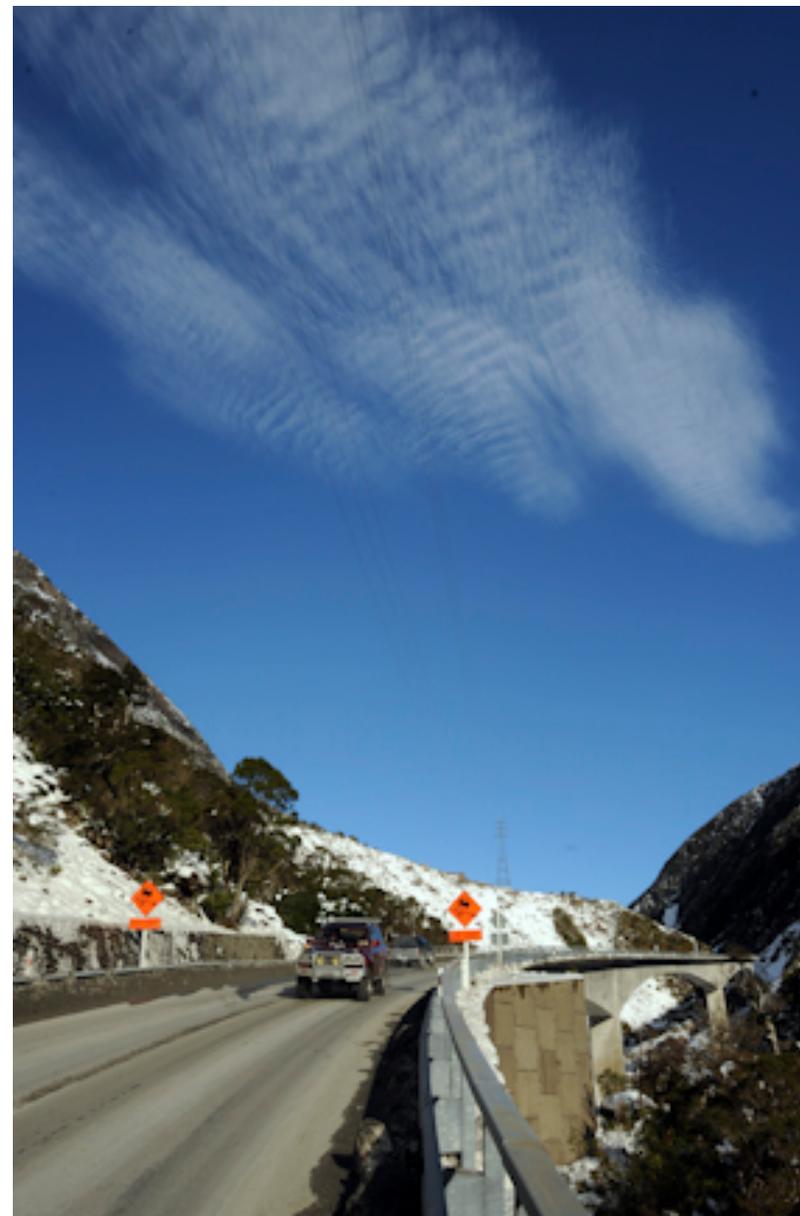
The following concerns excerpt pressure on the investment in **People, places and environment** on the corridor.

- **Replanting:** landscaping and replanting of areas raises issues for maintenance, including cutting plants close to the road and general safety for workers operating near live traffic. Initial costs of planting require balancing with consideration of ongoing maintenance costs, including traffic management and personnel safety with a view on the long-term outcomes.
- **Consequential Opex:** providing premium low noise surfacing's, maintaining noise fences, and a high level of maintenance to traffic islands, medians and garden area. If the correct choices are not initially made at the planning or construction stages to limit such impacts.
- **Sensitive environmental areas:** Much of the SH73 corridor runs through National park. Sensitivities of these areas and requirements of the National Park Management Plans must be considered in the maintenance and operation of this corridor and require an amended approach.
- **Fire Risk:** Maintenance of the boundary to boundary mowing area influences the fire risk in the dry east coast environment. Noting that in some areas the corridor responsibility extends well beyond the sealed carriageway.
- **Cyclists:** Recreational cyclists are present along all of this corridor including the very narrow and winding sections. These volumes are expected to increase with tourist growth
- **Pest Plants:** Tree Lucerne is a pest plant that is managed by mowing. Removal of wilding pines provides both an environmental and safety benefit.

Investment future considerations

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

- **Maintenance burden:** as capital works and safety improvements come on stream, there is a risk of additional maintenance burden from the cumulative costs, either from the unknown maintenance costs associated with new technologies, replacement of sacrificial elements, or simply from underestimation of operational costs. Examples include guardrail and barrier treatments, landscaping and garden areas, or ITS infrastructure as well as escalation of general corridor allocations.
- **Corridor minimum widths:** the low classification routes generally have lower traffic volumes but have a wider mix of users that may in itself justify additional width to provide an appropriate buffer between user groups. Such an improvement would protect and enhance the user experience and New Zealand's reputation as a safe Tourist destination.
- **Slow Moving Vehicle Bays:** reduce the interaction between slowing moving and faster vehicles such as tourists and heavy freight allowing reduced driver frustration, better safety and improved travel times. More slow-moving vehicle bays or passing opportunities would be useful through the alpine passes of SH73 and along SH75.
- **Rest areas and stopping places** are currently topical as the number of tourist users increases along these remote corridors. Seek to enhance the user experience and provide safe gathering places when required, particularly as support to narrow or dangerous road sections.
- **Seal Widths:** portions of SH75 and SH77 do not currently meet the ONRC minimum target seal widths. They have had a change in use with increased heavy traffic, and pavement and shoulder damage. It is expected that volumes will increase further along SH77 as the land use changes embed and more vehicle intensive businesses establish.
- **Rolleston:** West Melton intersection with SH73, the signals currently linking residential and local industrial area are having an increasing effect on both side road and main road flows that will need consideration. An overbridge has been suggested because there is pressure for freight to access the highway.



Arthurs pass during winter

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

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



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