# Napier to Taupo

## CORRIDOR MANAGEMENT PLAN

5

2018-2028

NZ TRANSPORT AGENCY
WAKA KOTAHI

New Zealand Government

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# Executive summary

The Taupo to Napier corridor comprises SH5 from its intersection with SH1 at Taupo, to its intersection with SH2 at Eskdale, just north of Napier. Colloquially, the corridor is known as the Napier-Taupo road.

SH5 provides the only road link between the central North Island and the east coast. It is a lifeline to the Hawke's Bay region from the central and upper North Island. The corridor is classified as Regional throughout its length, and is used by tourists to access major events in Napier and Taupo. It is a key connector for freight providing staple goods to Napier including food and fuel.

The corridor is approximately 123 km long (1.1% of the state highway network). The total value of assets along the corridor is $193M (0.8% of the total national asset value).

The corridor has poor resilience with crashes or winter weather conditions typically closing the road for several hours. Communications along the corridor are poor with dead spots in the critical areas which can result in delays of up to 1 hour before emergency services are on the scene. The corridor provides an alternative route to SH1 when the Desert Road is closed, though it is typically affected by the same weather conditions.

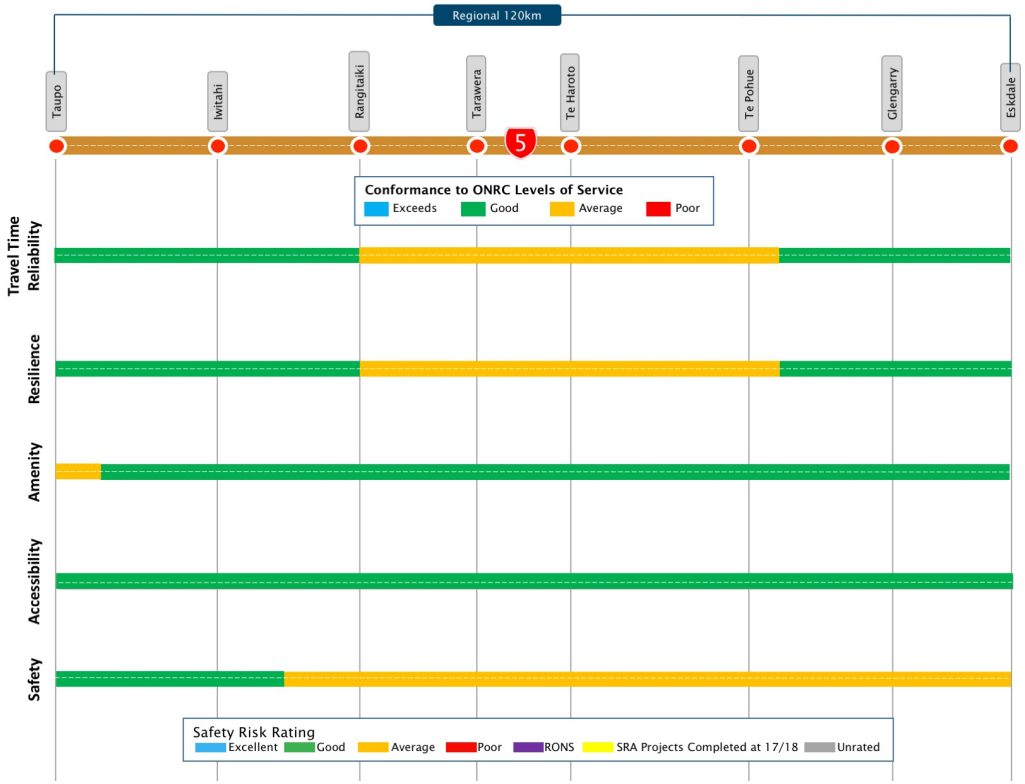
The corridor has low traffic volumes that have reliable journey times and low variability. Short seasonal variations affect reliability on the corridor during holiday periods and at times there are regional events. This can result in queuing on the corridor which is not present at other times. The carriageway configuration is such that limited passing opportunities are provided which during these times can increase driver frustration. Investment in communication to inform drivers ahead of time is a key requirement for this corridor.

The corridor has steep terrain with tight geometric bends which are reduce vehicle speeds and are primarily location for unplanned closures relating to crashes. Unplanned events on the corridor are infrequent, though when they occur are a major disruption to travellers as detour routes are typically longer than the alternative of waiting for the road to be reopened. Detour routes for freight are long adding up to six hours to journeys.

As a 3-star rated corridor, all low-cost options to improve the rating have been undertaken, major infrastructure investment through difficult terrain would be necessary to upgrade the short 2 star sections.

There are limited local activities, which results in most journeys on the corridor travelling the entire length. Facilities to support increased tourism along the route require planning and development.

**Figure 1 - Performance of the corridor against ONRC outcomes**




The priority for investment on the corridor is maintaining the resilience of the route, by ensuring availability. This will include a more proactive approach to winter maintenance, improved safety to offset the disruption from crashes, and improved response to disruptive events. Providing high levels of availability will also ensure a good level of travel time reliability, and journey experience, which could be further enhanced with the addition of better access to real-time travel information.

# Introduction

## Purpose

### What is the corridor management plan?

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

The corridor management plan considers a combination of:

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

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

### Why is it needed?

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

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

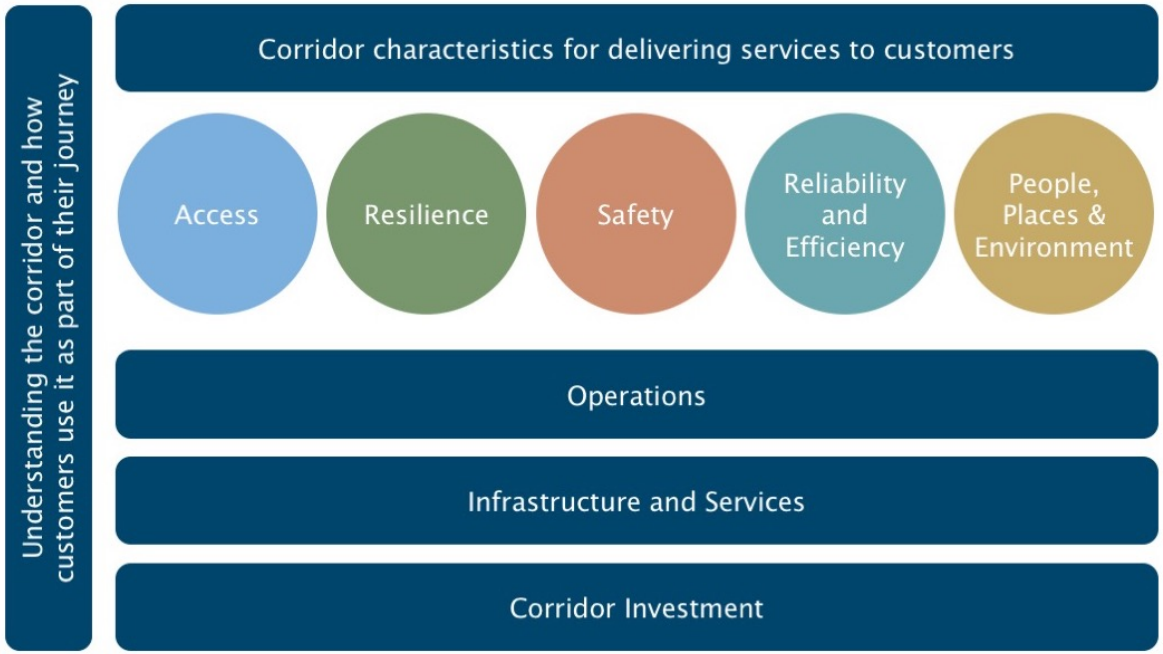
Planning is currently undertaken at the regional level, but typically significant journeys traverse more than one region. By considering the significant customer journeys and destinations, the corridor management plan is a vehicle to engage in regional and inter-regional conversations by focusing on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

### How will we use it?

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

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

**Figure 2 - Corridor management plan framework**



# The corridor at a glance

## Corridor overview

The Taupo to Napier corridor comprises SH5 from its intersection with SH1 at Taupo, to its intersection with SH2 at Eskdale.

SH5 provides the only road link between the central North Island and the east coast. It is a lifeline to the Hawke's Bay region from the central and upper North Island. The corridor is classified as Regional throughout its length, and is used by tourists to access major events in Napier and Taupo. It is a key connector for freight providing staple goods to Napier including food and fuel.

The corridor has poor resilience with crashes or winter weather conditions typically closing the road for several hours. Communications along the corridor are poor with dead spots in the critical areas which can result in delays of up to 1 hour before emergency services are on the scene. The corridor provides an alternative route to SH1 when the Desert Road is closed, though it is typically affected by the same weather conditions.

## The regional economy

The corridor spans both the Waikato and Hawkes Bay Regions. The Waikato is an economically diverse region contributing 8.5% to national GDP. The natural assets of Lake Taupo and the Waikato River provide a strong basis for primary production and energy supply security for large scale processing. Geothermal energy has an economic role in the Taupo District. Taupo is a freight change over location between drivers in the north and those heading south.

The Hawkes' Bay regional economy contributes 2.8% to national GDP primarily through food production, with several large multinational food processing companies based in the region. Opportunities to further apply agri-science research through the primary industry value chain exist.

Two million tonnes of goods are exported pa from Napier Port. The region has significant reliance on primary production and the transport of goods to production facilities is important for the prosperity of Hawke's Bay. The forestry sector forecasts a 4-fold increase. The Port is increasingly a stop for cruise ships with 91,500 passengers forecast for 2017.

Employment in the horticulture and viticulture industry accounts for 6.7% of employment compared to 1.4% for the rest of the country. The dominance of primary industries and a high proportion of unskilled labour in the workforce result in lower median income.

**Figure 3 – Corridor overview**

# Understanding our customers

## Key customers

The key customers utilising the corridor are freight operators, commuters and tourists. 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.

### Commuters

The corridor is the main route and integral to the local network for access to shops, schools, medical centres and workplaces. There are isolated properties along the corridor with Eskdale being the largest settlement. School holidays and long weekends generate additional journeys on the corridor for large national events and the maintenance programme is scheduled to avoid these dates.

#### Insights into commuters:

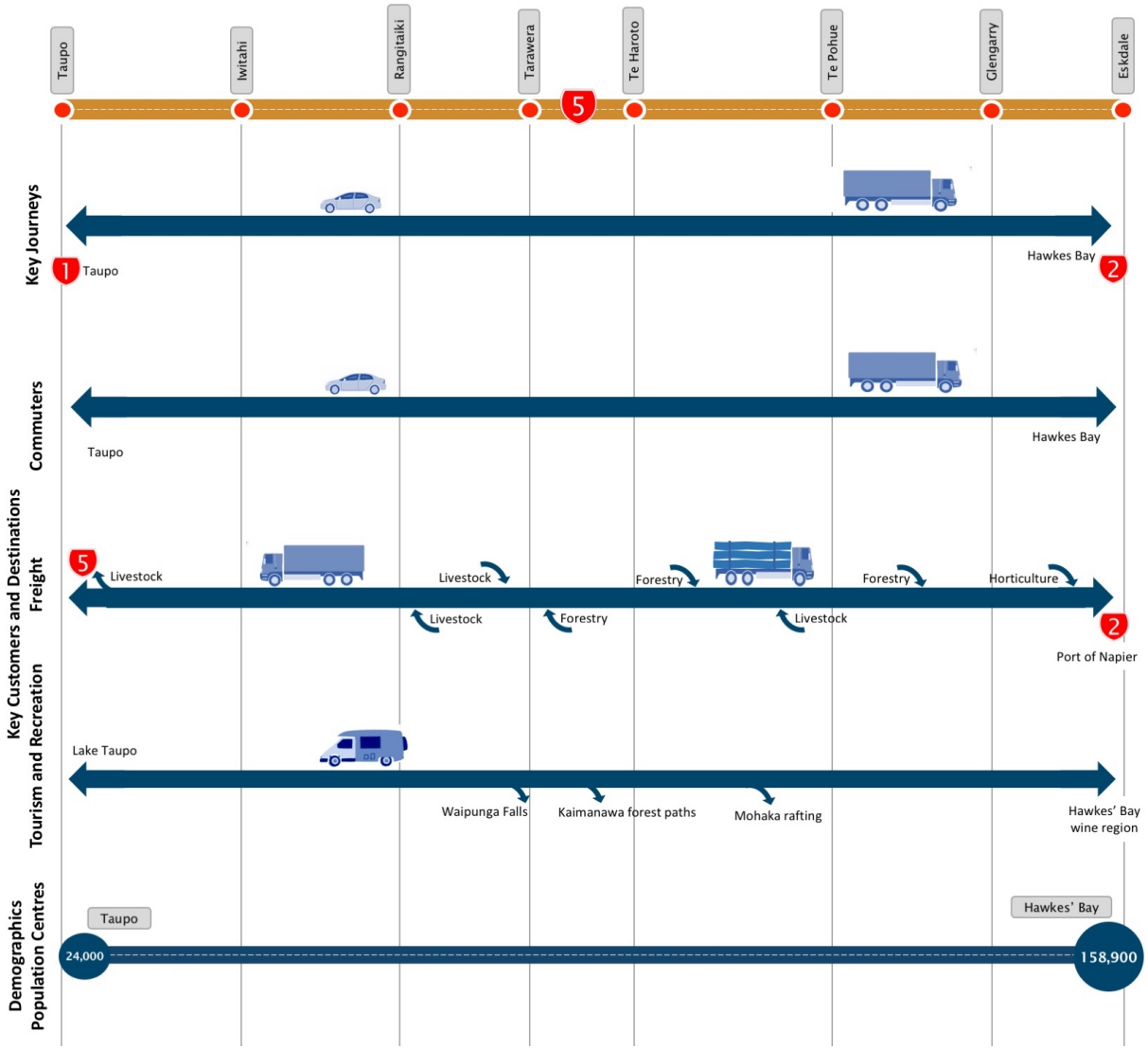
**Road use:** Trips are to local facilities in Napier and Hastings for work, shopping, health and education facilities. Seeking open road with parking at destinations. There is limited commuter traffic at the Taupo end of the corridor.

**Road knowledge:** High level of knowledge of the corridor and adjacent land uses, and alternative routes.

**Pain points:** Closure of the route from unplanned events.

**Locals expect:** Open road every day of the year.

**Figure 4 - Key customers, journeys, and destinations**



## Tourist and recreational users

Tourism contributes $870m to the national economy annually, primarily through domestic visitor spend. There were 1.1 million guest nights collectively in the Taupo District and Hawke's Bay regions in 2016, with 74% domestic visitors.

The corridor forms the primary tourist route connecting Taupo with Hawkes' Bay and further down to Wellington and its ferry routes to the South Island.

### Insights into tourist and recreational users are as follows:

**Road use:** Recreational users around major events in the Hawkes Bay or Taupo, usually in the spring/summer months. This can include horse trucks and camper vans. These users generally either a destination in the Hawkes Bay or are passing through the Hawkes Bay on a longer trip down the east coast; or are heading to Taupo from the Hawkes Bay. Tourists who are not as time constrained often go via Hawkes Bay on a journey between Auckland and Wellington.

**Road knowledge:** Domestic visitors from metropolitan urban areas do not understand the remote nature of the corridor. Regular recreational users to events understand the changing corridor conditions and road environment. International visitors to the region have not typically experienced the rapid changes in road environment or climate that exist on this corridor. Travel times between the main centres can be underestimated by international visitors due to limited knowledge of the road layout and winding roads.

**Pain points:** Traffic during spring / summer events particularly more, larger recreational vehicles on the road can increase driver frustration through steep terrain sections where infrequent passing opportunities exist, and can result in risky overtaking manoeuvers. Limited communications along the route in event of crash or breakdown.

**Tourist and recreational users expect:** Ease getting around the country with regular places to switch drivers safely or to park up and explore or take a break with appropriate facilities to support this.

*"When people don't have a choice of route they value early information to make informed choices"*

## Freight operator

The main distribution for food and other essential items to Napier is along SH5 from Auckland via Taupo. Freight movements include general freight from the adjoining regions to the Napier Port, fuel and food for delivery in Hawkes's Bay, as well as the deliveries to/from the wood processing plant at Eskdale. The freight proportion is stable at about 16% throughout the year with much of this traversing the full corridor length.

*"My time is valuable, if there is a delay I want to know about it"*

### Insights into freight operators are as follows:

**Road use:** General freight, stock and forestry use regularly. Journeys on this corridor are inter-regional, heading to both inland and sea ports for onward distribution.

**Road knowledge:** Knowledge of road conditions is extremely high, verging on technical, confidence in managing difficult conditions is high and drivers anticipate seasonal variations though business efficiency and deadlines can be missed by delays and road closures.

**Pain points:** Road closures in winter months cause delays and impact business efficiency. There are limited opportunities for overtaking on the Tarawera section and passing opposing direction trucks can result in barrier strikes due to the narrow carriageway. Crashes on the corridor can close the road until emergency services have arrived which can be up to an hour or more. No alternative route for HPMVs in event of closure.

**Freight operators expect:** Infrastructure that supports commercial activity. This includes alternative routes that cater for freight trucks safely, consistent carriageway widths, and good visibility. Drivers also desire convenient places to stop and have a rest, access services and facilities. Early road condition information is preferred to enable route planning and meeting 'just-in-time' delivery slots.

# How we deliver services along the corridor

## Transport partners

The land transport system comprises more than State Highways. To provide customers with a reliable and safe journey usually requires the use of two or more transport infrastructure provider's networks. This corridor does not offer a rail alternative, with road the single transport option for freight and for most vehicular trips.

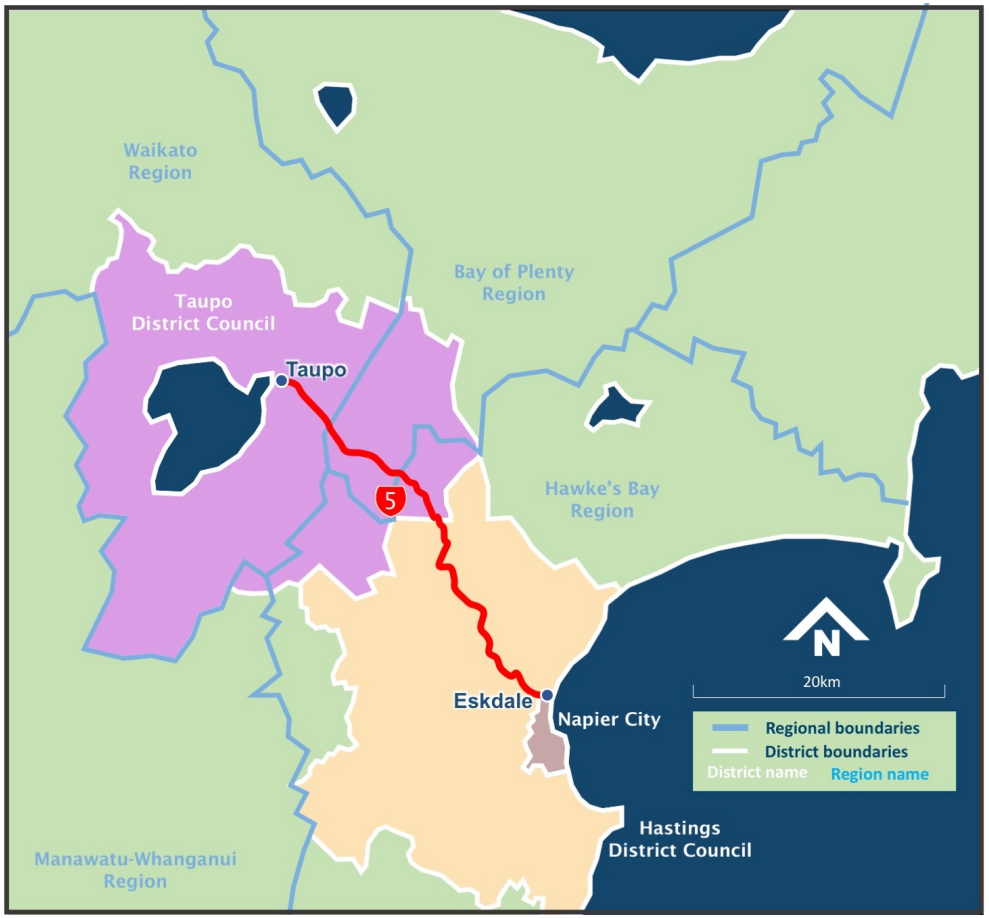
We work with Territorial Local Authorities and regional councils along the corridor shown in Figure 5.

### Collaboration along the corridor

The Waikato and Hawkes' Bay RLTPs cover the SH5 corridor. Part of the corridor runs through the Bay of Plenty region, though for ease of administration the route is looked after by the other two regions.

Stock effluent and toilet facilities along the corridor are provided by our partners at Napier, Hastings and Taupo District Councils.

**Figure 5 - Map of associated local authorities**



## Network Outcomes Contracts approach

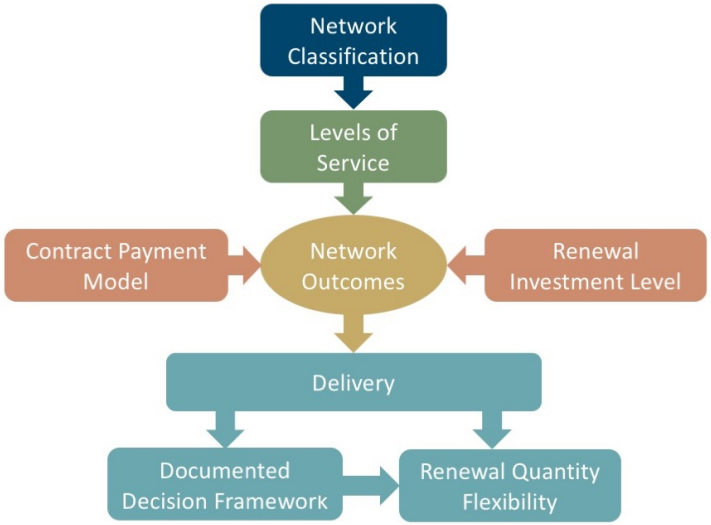
Network Outcome Contracts (NOC) are aimed at improving the effectiveness of service delivery for maintenance and operations of the state highway network. Elements of previous procurement methodologies (PSMC, Hybrid and Traditional models) have been integrated into the NOC contract model which delivers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

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

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

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

**Figure 6 - NOC process**




## Collaborative delivery of services

The Taupo to Napier corridor crosses over two NOC contract areas as discussed below. The boundary of the two contract areas occurs at the regional boundary of the Hawkes Bay and Waikato.

### Hawkes Bay Network Outcomes Contract

- The Hawkes Bay NOC contract is held by Higgins Construction with professional engineering services provided by Beca and GHD. The contract commenced on the 1st April 2016 for a 7-year period with the option based on performance for a further 2 years.

### Central Waikato Network Outcomes Contract

- The Central Waikato NOC contract is held by Downer. The contract commenced on the 2nd March 2015 for a 7-year period with the option based on performance for a further 2 years.

# Drivers for change

The Napier to Taupo corridor caters for variable levels and types of customers and this demand is expected to grow into the future. The drivers for change associated with the corridor are described below.

## Increasing economic activity

Napier Port predicts 50% cumulative growth in combined imports and exports over the next 10 years (2015-2025). Forestry forecasts indicate annual harvests will increase from the current 1.7 million cubic metres to 2 million cubic metres by 2021. With Napier Port a log and woodchip export port, this is expected to lead to a higher number of freight journeys on the network.

A large swing towards containers from conventional bulk shipping is anticipated. Investigation into the access to Napier Port has received Government funding.

There will be significant growth in freight movements across the network. Freight is expected to increase from 20.21 million tonnes in 2012 to 30.72 million tonnes in 2045. This will increase maintenance costs.

New industries based on oil and gas could develop in the region and influence transport needs and the location of new processing industries.

Tourism is expected to grow as access to outdoor recreational areas improve, and new attractions develop.

## Regional growth and development

Hawkes Bay is included in the Regional Growth Programme which is commissioned jointly by the Ministry for Business, Innovation and Employment and the Ministry for Primary Industries, working in partnership with other central government agencies and regional stakeholders, such as businesses, iwi and Māori, economic development agencies and councils.

Hawke's Bay was included in the East Coast Economic Potential Study released in 2014. The study provided an overview of economic development issues and opportunities facing the East Coast study area, which also included Wairoa, Napier and Hastings. The focus was on transport and skills issues for the region. Matariki – Hawke's Bay Regional Economic Development Strategy and Action Plan was subsequently released in July 2016.

One of the strategic directions within that strategy and action plan is to "*lead in the provision of resilient physical, community and business infrastructure"* with a supporting goal being "*to raise to the top quartile of New Zealand regions in regional economic growth and sustain that position long-term".*

Actions where the NZ Transport Agency is the lead or supporting partner in achieving this goal include:

- Improve access to Napier Port to increase regional economic performance
- Support the timely implementation of the key strategic initiatives in the Regional Land Transport Plan.

In addition, there is also an objective in the plan to *leverage the region's natural advantages to optimise the export value of agribusiness and food and beverage manufacturing, further enhancing the premium positioning and value-add of Hawke's Bay produce.*

These strategic directions, goals and objectives will rely on the ongoing development and maintenance of the corridor to facilitate efficient access to processing facilities, export ports, and other parts of the land transport network within the Hawkes Bay region.

# Understanding customer levels of service on the corridor

## Current levels of service performance

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

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

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

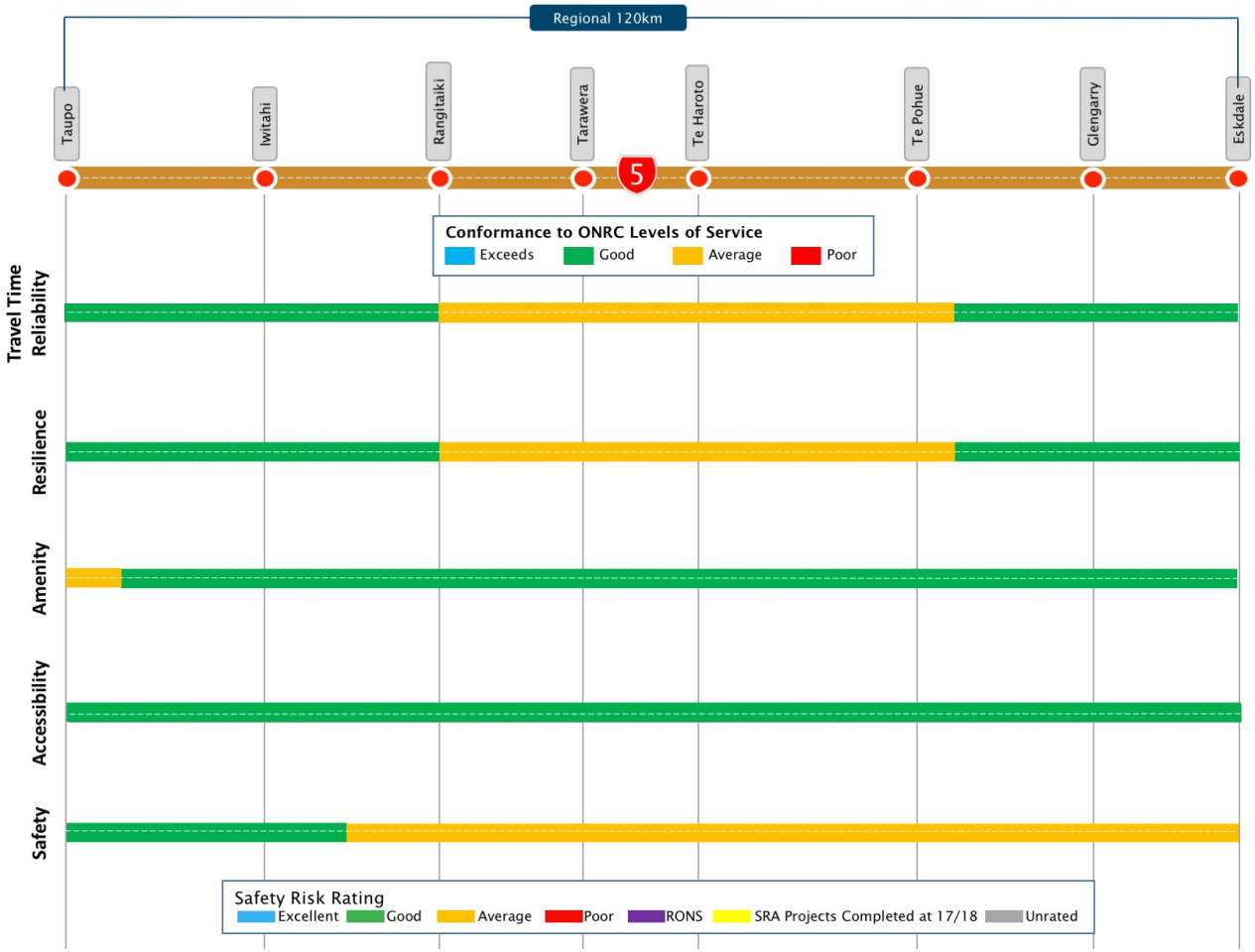
**Road classification**

The corridor from Taupo to Napier is classified as Regional providing access from the Central North Island to SH2 and onwards to Napier Port.

Figure 7 shows how the Taupo to Napier corridor is performing against the ONRC Levels of Service as they relate to the current classifications. Levels of service performance has been determined by workshop participants in the development of this corridor plan. It is not based upon consolidated evidence from the ONRC technical measures.

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 Napier to Taupo corridor is performing against the ONRC Levels of Service, as they relate to each of the three current classifications.

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

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

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

### Travel time reliability

Travel time reliability is generally good throughout the corridor. The route is relatively free flowing throughout the day due to the low traffic volumes and the rural nature of the corridor. Seasonal variations in traffic flow for around 10 days a year associated with major regional events reduce reliability in travel time in both directions. The middle section from Rangitaiki to Te Pohue is also subject to disruption from snow and ice occasionally during winter.

### Resilience

SH5 has a medium level of resilience risk between Rangitaiki and Te Pohue. Should road closures be in place along the corridor there is no local viable alternative route for heavy vehicles or HPMVs. No rail alternative exists and heavy vehicles 'park up' until the corridor is re-opened. The high elevation of this section of the corridor also makes it vulnerable to closures due to snow and ice. Cross winds also impact high sided and towing vehicles.

Flooding occurs at several locations along the route, primarily at the eastern end of the corridor, however the corridor generally remains open when flooding occurs.

### Amenity

The corridor provides a natural landscape along much of its length, with views at numerous points on the highway. Litter and illegal dumping along the first 10 km from the Taupo (western) end of the corridor, detract from the visual amenity of the corridor.

### Accessibility

Large scale agricultural land use results in limited access fronting most of the corridor, increasing at Eskdale where property density increases towards Napier. There are no impediments to corridor access from local roads or through rural settlements along the corridor.

### Safety

Significant sections of SH5 meet the target KiwiRAP star rating of 3. The topography constrains the remaining sections of the corridor increasing from a 2-star rating without significant capital investment. The 2 and 3-star KiwiRAP rating denotes there are some major road deficiencies.

There is a lack of maintenance around some private property access points which are routinely followed up by regional staff. There are no immediate Safe Road projects proposed on this corridor.

There is one section with high personal risk between Te Haroto and Te Pohue.

## Improving the customer experience

In responding to Customer Levels of Service it is important to acknowledge that significant improvements to the corridor are planned or underway as part of safer roads alliance and ongoing discrete NZ Transport Agency NZTA capital works programme, although these projects remain some years away (years 7 to 10).

## Access

### Carriageway configuration

The corridor consists primarily of two lane opposing carriageway with minimal passing opportunities. The long straights between Taupo and Rangitaiki provide informal overtaking opportunities with good visibility. Between Tarawera and Glengarry the carriageway configuration is two lane opposing with formal passing lanes provided where geography allows.

### Speed limits

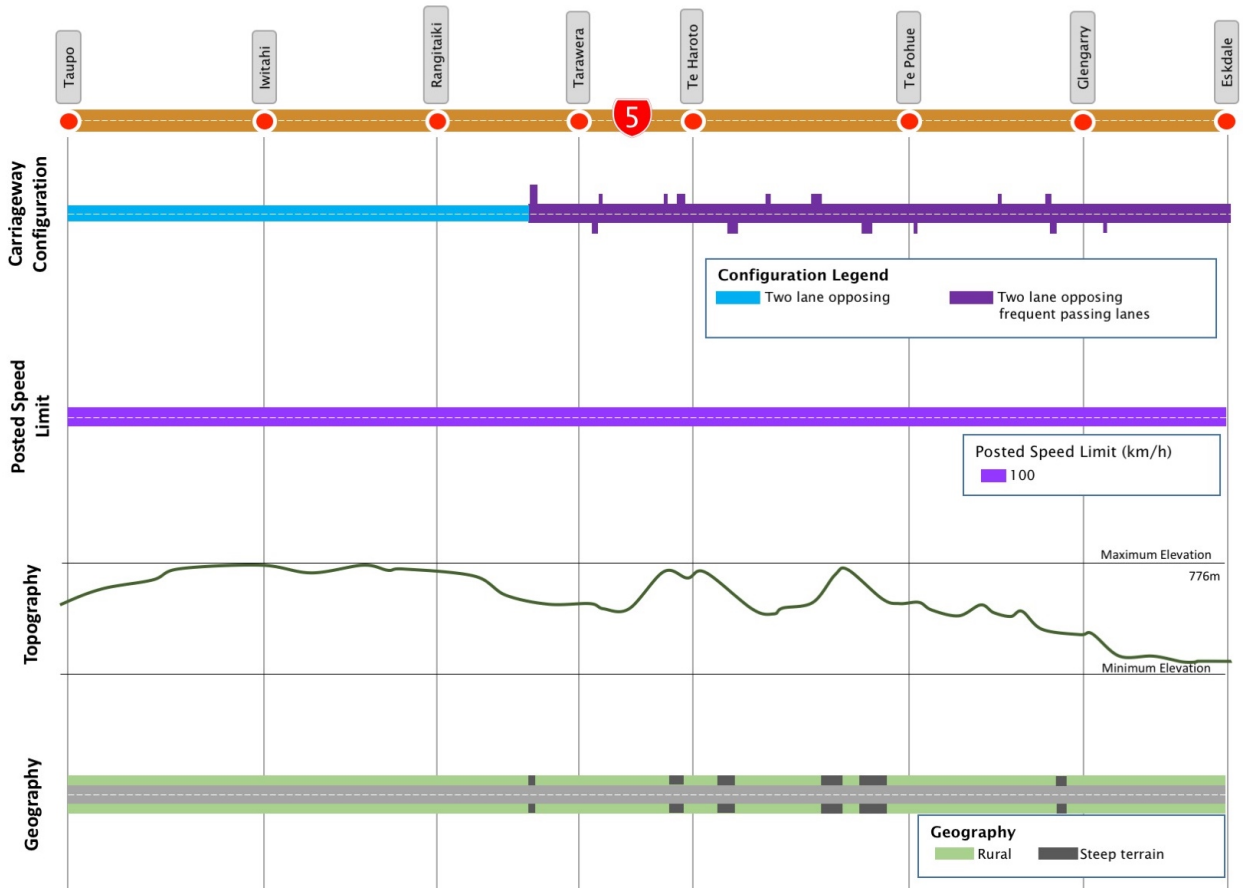
The route is posted at 100kph throughout its length.

Safe and appropriate speeds from Rangitaiki to Glengarry are lower than the posted speed limit.

### Topography/geography

The topography of the corridor is gentle undulation from Taupo to Tarawera where the terrain becomes steeper and windy. This windy section is a feature of the corridor. There are out of context curves through the Tarawera to Eskdale section with high cross winds on open sections and steep downhill sections which trucks traverse in a low gear.

**Figure 8 - Corridor characteristics**



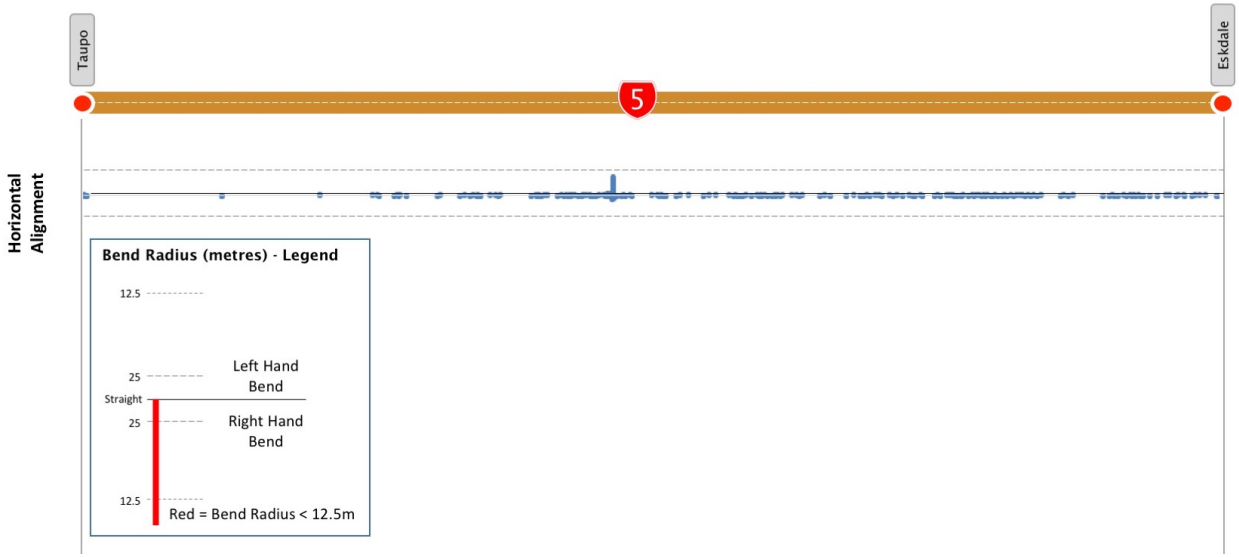
### Horizontal alignment

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

The corridor contains a regular occurrence of larger radius curves, except for the Rangitaiki straights east of Taupo. The corridor has no harper bends with a radius below 25m.

**SH Fitzgerald Glade is picturesque and scenic, but constrained.**

**Figure 9 - Horizontal alignment**



### Volumes

Traffic volumes are low along the corridor with no significant variation. However, there is a strong heavy vehicle presence throughout the year, 16% of vehicles. Additional capacity is provided between Tarawera and Glengarry with several passing lanes.

### HPMV routes

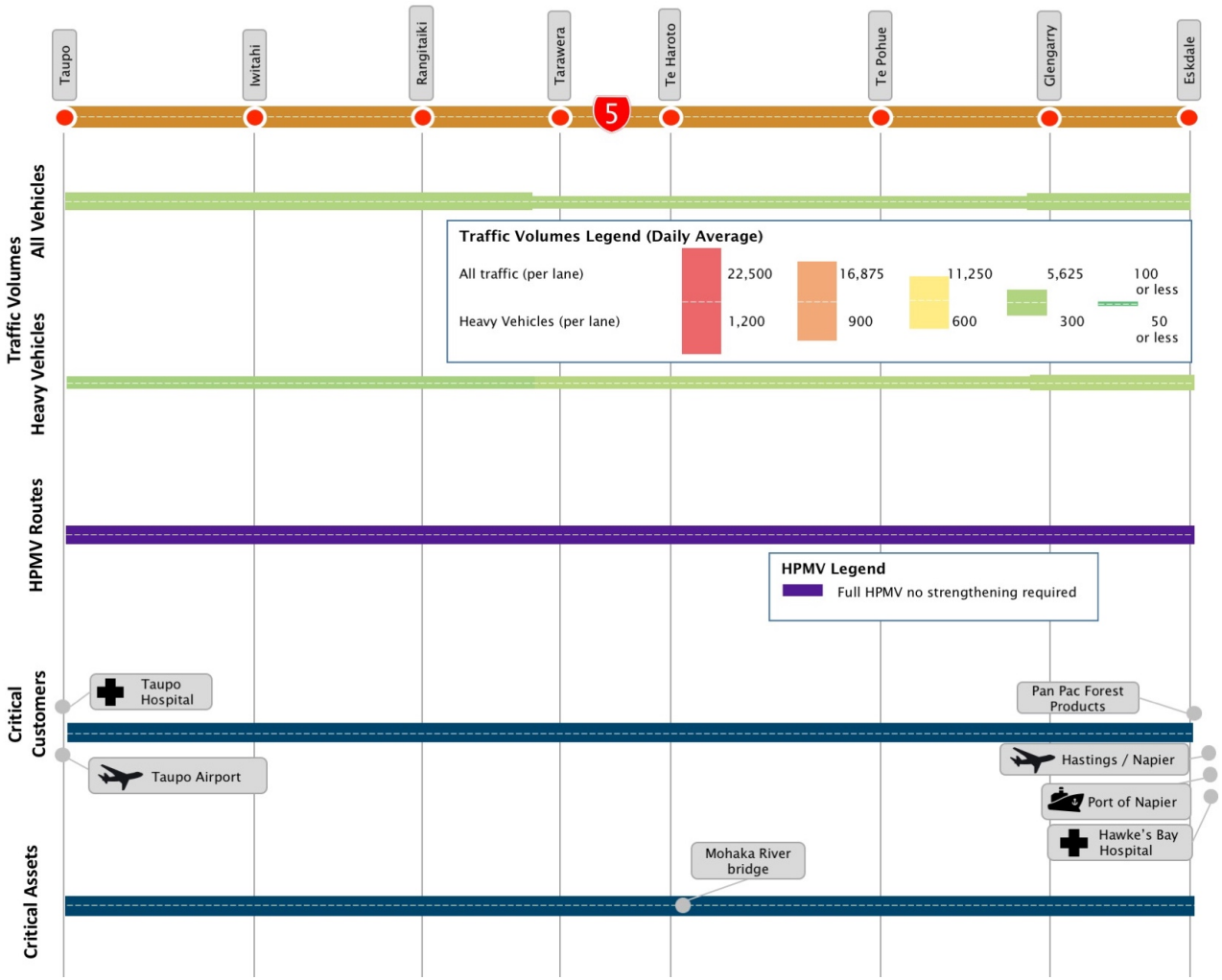
Vehicle restrictions, such as speeds across bridges were removed from this corridor, due to poor enforceability.  The corridor is suitable for 62 tonnes HPMV along its entire length. There is no alternative HPMV route. A weigh in motion station close to the eastern end of the corridor enables monitoring of weight for heavy vehicles accessing the corridor.

### Critical customers and assets

The corridor provides access to critical customers in the urban areas at each end of the corridor. These include the airports, Napier Port, and Pan Pac - a forestry products manufacturer located on SH2 in Eskdale which operates 24/7, requiring a continual supply of logs.

The Mohaka River bridge is the only critical asset on the route. It is of steel construction and a unique design with acknowledged inherent weaknesses. Ongoing monitoring is required of its condition and the impact of HPMV across it.

**Figure 10 - Corridor capacity**



## Pressures

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

- **Holiday traffic peaks:** The corridor experiences heavy traffic volumes for around 10 days each year, corresponding with major events in Napier and Taupo, generally held over long weekends. This results in slow moving traffic along the corridor.
- **Mohaka bridge critical asset:** Failure of the bridge would result in road closure for several months. The gorge it spans is deep, and temporary alternatives would require working with adjacent land owners and significant works to develop a suitable alternative within the corridor.
- **Safety barriers adjacent to narrow carriageway:** Through the steep section of the corridor around tight bends, the installation of safety barriers adjacent to a constrained carriageway has impacted access for heavy vehicles, making the passing of two opposing heavy vehicles difficult. This can increase the incidence of barrier strike, and the associated maintenance response to repair barriers if required.
- **Crashes:** Crashes involving trucks generally block the full width of the corridor and with no alternatives, customers generally wait until the road is cleared. This can also impede emergency vehicle access and access for recovery vehicles which generally require room to manoeuvre.

## Future considerations

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

- **Variable message signs(VMS):** The installation of VMS after Rangitaiki will provide opportunities to keep drivers informed. Information on travel times, areas of limited mobile phone coverage along the route, and weather events will allow drivers to adjust their driving style to road conditions, better manage expectations of travel times and the journey experience and enable informed decision making about the journey.
- **Coordinated response:** Coordinated consideration between capital works teams, Safe Roads Alliance, and maintenance teams in the development and design of solutions for the corridor. This will ensure that safe passage of vehicles is provided for while maintaining customer levels of service, and maintenance budgets are more effectively planned and managed.
- **Planning for critical asset failure:** Develop a plan to enact in the event of a failure of the Mohaka bridge to ensure access to the corridor as quickly as possible. This will include working with adjacent landowners to have agreements in place on how any temporary structure or road network could be constructed, including the potential for use of forestry roads.

## Resilience

The corridor is the only direct route between Napier and Taupo. The corridor traverses forest, open agricultural land and steep terrain. Figure 11 shows that the corridor is susceptible to unplanned events, which affects resilience.

**Vulnerabilities**

The most common unplanned events on the corridor are related to wandering stock, with a high number of maintenance call outs for such events.

Slips occur throughout the corridor from Rangitikei east. Natural weather events present resilience risks which impact the whole corridor when they occur.

The higher elevated sections of the route are susceptible to snow and ice during winter months. Winds are also a hazard to high sided vehicles.

**Alternative routes and diversion lengths**

The alternative routes are significant diversions of over 500km either via Gisborne or via Woodville, with both routes adding around six hours to the journey. Closures on SH5 due to unplanned events are typically no longer than 4 hours, meaning most drivers will sit and wait until the road reopens.

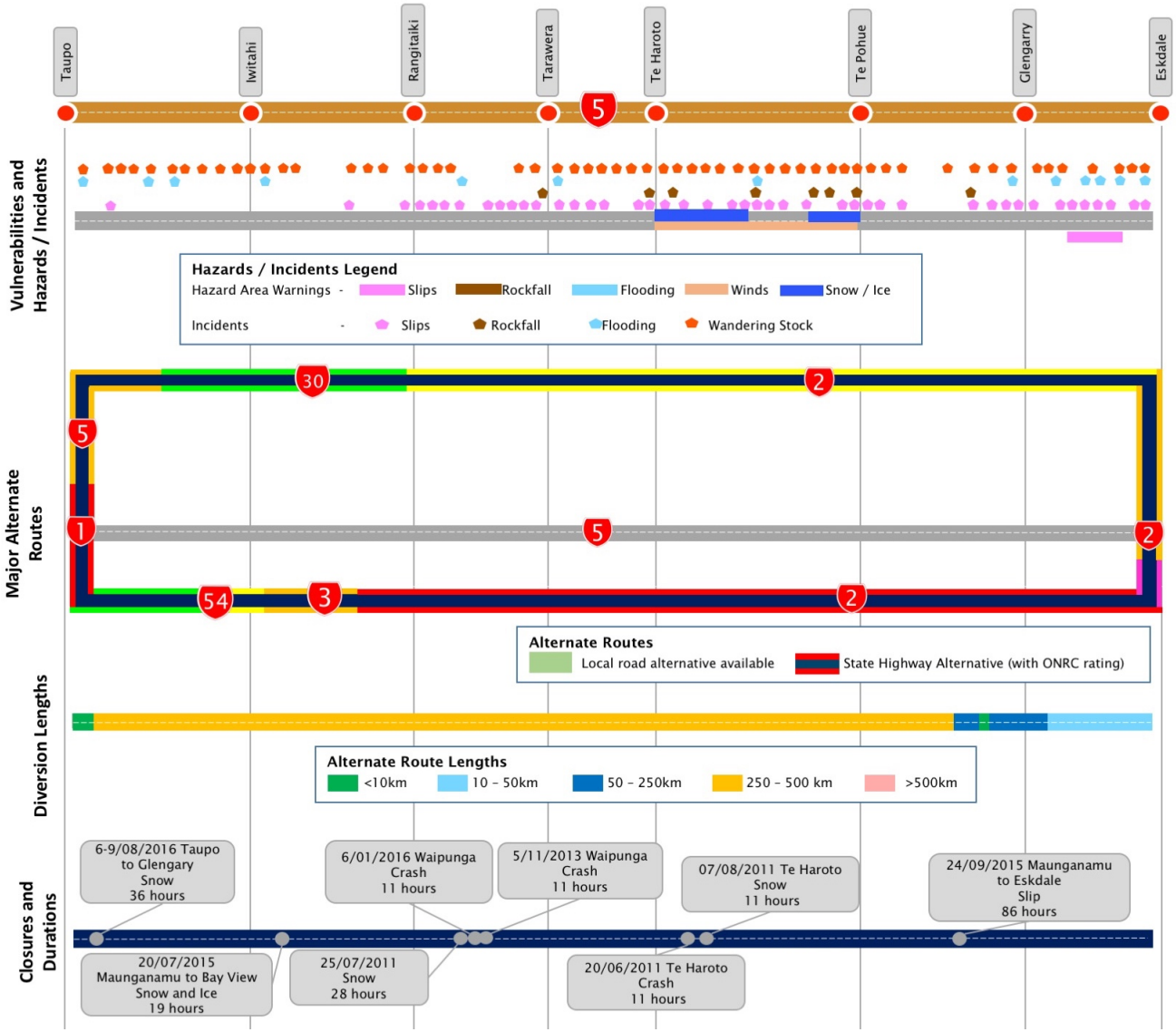
There are local diversion routes along parts of the corridor suitable for light vehicles only and not promoted for SH5 traffic.

**Closures and duration**

The major unplanned road closures and duration of interruption along the corridor in the last 5 years are shown in Figure 11. In 2016, the road was closed for three days due to snow. Two snow events in 2011 also resulted in road closures.

Crashes on the corridor which resulted in closures are around Waipunga, east of Rangitaiki.

**Figure 11 – Resilience**



## Pressures

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

- **Snow, rain and hazards including unstable slopes:** Heavy snow can result in power lines coming down, which then need to be isolated by the power company prior to road crews clearing snow from the road. The installation of safety barriers combined with heavy falls of snow create further pressures for crews clearing the road. Any delay in clearing the snow can lengthen the time the corridor is closed as the volume of snow is too great to remove from the carriageway with safety barriers effectively blocking snow from being cleared away.
- **Lack of alternatives:** The route is integral to the local road network and in many places there are no alternatives for local trips or freight. There is no alternative rail line for freight parallel to this route to use if the road is closed.
- **Limited mobile phone coverage:** The topography around Tarawera results in dead spots. This area is also a high accident rate area making it difficult to get calls to emergency services and maintenance crews enabling quick response to events on the network.
- **Wandering stock:** Call outs to attend to these events are frequent, with maintenance crews routinely communicating with adjacent landowners on fencing matters.

## Future considerations

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

- **Barrier installation:** Review plans of existing and future barrier installation to determine if opportunities for different approaches in snow affected areas is viable and implement findings. This will improve maintenance staff ability to clear snow and debris from the road and open the corridor more quickly after an unplanned event.
- **Response to unplanned closures:** Improvements in the management of unplanned closures by identifying suitable sites for the strategic placement of maintenance equipment and materials close to vulnerable sites to enable a more rapid response, particularly in the winter. Also work with landowners and emergency services to identify designated helicopter landing sites through the steep terrain sections of the corridor to improve emergency response management and recovery times.
- **Enable better response to incidents and customer communications:** Work with telecommunications providers to improve mobile phone coverage along the corridor. Not only will this facilitate more rapid response to events on the corridor, it will also enable improved monitoring and real-time communications to customers about the corridor.
- **Coordinate a fencing programme:** Work with landowners to develop and implement a plan for improved fencing and better stock management. This could include developing of a fencing programme in partnership with other organisations, such as federated farmers and the regional council.

## Reliability and efficiency

**Efficiency**

The corridor performs as expected with reasonable efficiency along its length. Short sections of lower efficiency are identified on steep terrain sections where heavy vehicles travel in low gear.

**Variability**

The corridor has low variability in journey times throughout its route for most the year due to its low traffic volumes.

During long weekends variability can increase particularly between Tarawera and Eskdale due to higher traffic volumes travelling to events in the Hawkes' Bay. The lower number of passing opportunities eastbound to Napier compared to westbound may contribute to this. Horse floats and other slow-moving vehicles do not always pull over when there are opportunities, creating frustrations on a limited number of days for other motorists.

Forestry harvesting periods can also impact variability for those who encounter logging trucks entering the corridor in areas where there are limited passing opportunities.

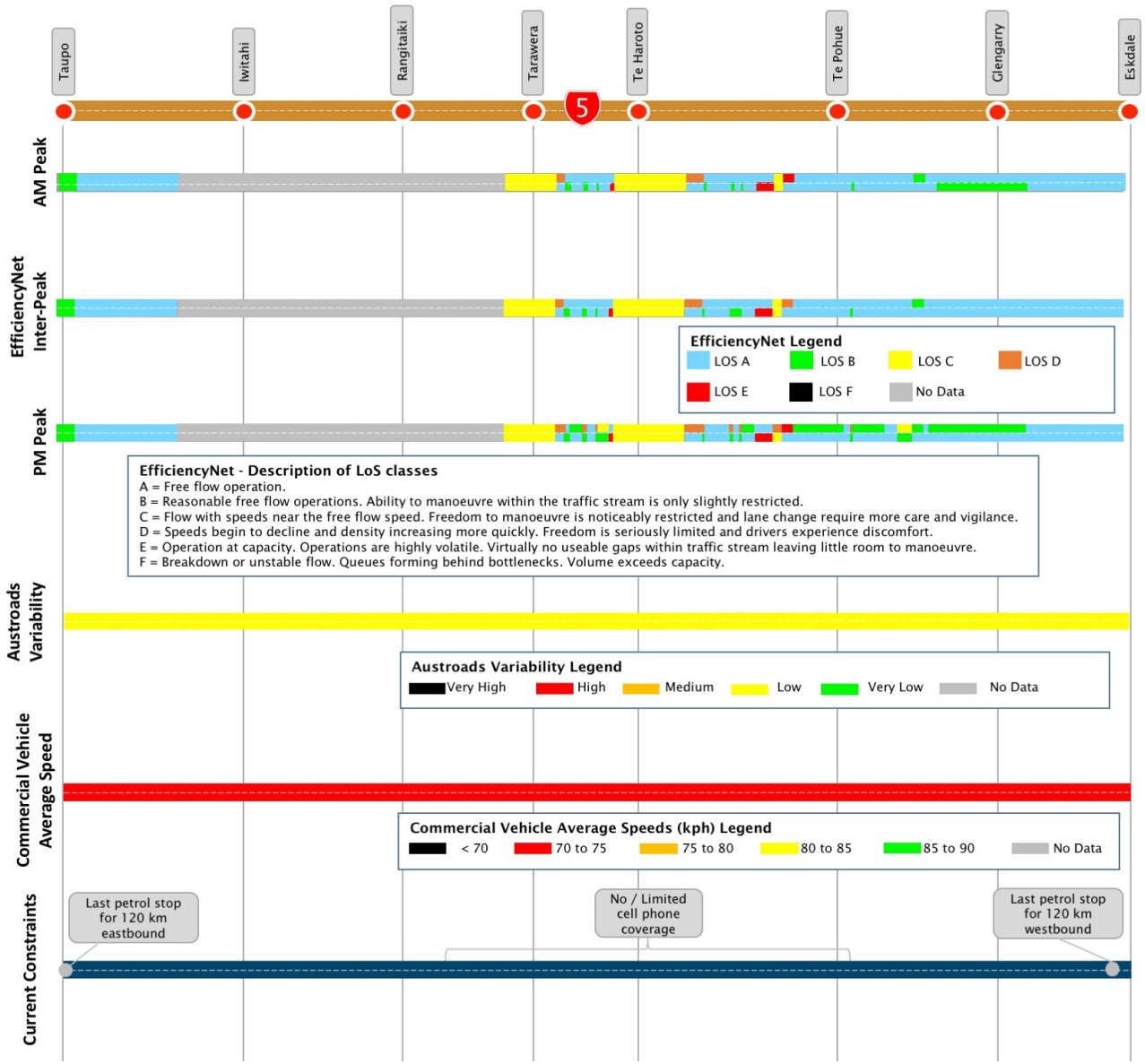
**Commercial vehicle average speed**

Average speeds for commercial vehicles are 70-75 km/h along the entire corridor, primarily due to terrain and road configuration.

**Current constraints**

The major current constraints on the network affecting journey reliability and efficiency are shown in Figure 12. Limited mobile phone coverage along the route east of Rangitaiki through to Te Pohue impacts response times to emergencies or events.

**Figure 12 - Reliability and efficiency**



## Pressures

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

- **Limited overtaking opportunities:** The mix of vehicles along the winding and steep terrain can result in faster vehicles being slowed down by larger longer vehicles. Opportunities to overtake are restricted by the number of passing lanes available as well as the geometry and geography of the corridor.

**Maintaining access on SH5 can be challenging during the winter months and can cause significant interruption to travel plans**

## Future considerations

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

- **Information:** Gather accurate data about corridor use during peak event weekends to improve management of the corridor at these times.
- **Increased volumes associated with events:** Work with emergency services and other stakeholders to develop and implement unplanned closure response plans for those days the corridor experiences high volumes associated with events. This could include the strategic location of first responder and recovery vehicles.
- **Enable communications for journey planning:** Provide accurate information for customers prior to setting out on a journey and throughout the length of the corridor through VMS signs. Information on travel times, areas of limited mobile phone coverage along the route, and weather events will allow drivers to adjust their driving style to road conditions, better manage expectations of travel times and the journey experience and enable informed decision making about the journey.

## Safety

Road safety along the Napier-Taupo road, has a legacy of high loss of life incidents, crashes with six or more deaths are a common feature, with an infamous house bus crash at Mohaka River Bridge in 1995 that killed eight people. These high casualty and fatality incidents create a long-lasting impression that dominate public perception.

**Collective risk**

SH5 is predominantly rated as low or medium-low for collective risk. The only exceptions being between Glengarry and Eskdale where it has a medium risk and between Te Haroto and To Pohue where this is a section of medium-high risk.

**Personal risk**

The only poor performing sections with regard to personal risk are between Eskdale and Glengarry, which has a medium-high rating, and a section of corridor between Te Pohue and Te Haroto which has a high rating.

The remainder of the corridor is rated low except for Te Haroto which is medium-low.

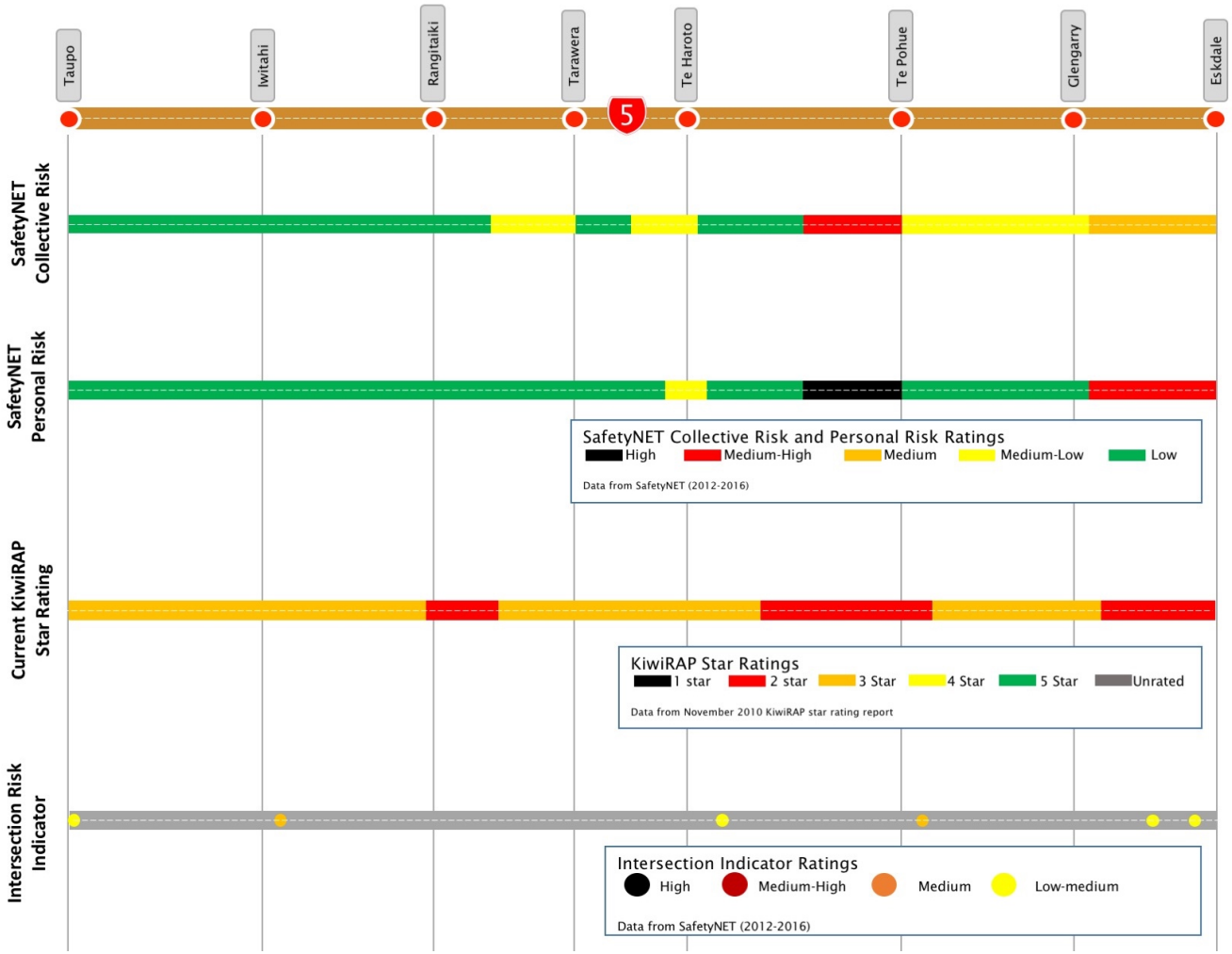
**Star rating**

The corridor achieves a 3-star rating along most sections except from Eskdale to Glengarry, Te Pohue to Te Haroto, and a small segment between Rangitaiki and Tarawera which is 2-star rated.

**Intersection risk indicator**

There are six risk intersections along this corridor, four of which are low-medium and two which are medium risk rated. The risk intersections are typically located near an urban area including Taupo, Iwitahi, Te Haroto, Te Pohue and Eskdale.

**Figure 13 - Safety**



## Pressures

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

- **Limited mobile phone coverage and poor signage:** Limited or no mobile phone coverage at points along the corridor can result in delays in getting emergency response teams to incident sites. Many road signs with emergency phone number details on are located in mobile phone black spots giving customers a false sense of security in remote sections of the corridor.
- **Driver frustration from slow moving vehicles:** High traffic volumes on peak weekends and during long weekends results in a greater number of risk taking manoeuvres, particularly between Tarawera and Eskdale where there can be slower moving traffic along the corridor.
- **Road side features:** The installation of safety barriers through the steep terrain sections adjacent to narrow road lanes results in barrier strikes. This requires additional maintenance costs. Typically, barrier strikes occur where two passing trucks do not have enough road width to pass on the tight curves.

## Future considerations

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

- **Improve all forms of communication to improve response to unplanned events:** This will include working with partners to expand mobile phone coverage, increased information availability immediately after unplanned events, and when known events are occurring.
- **Business case approach:** Consider undertaking a Business Case approach to develop the corridor geometry to align the form of the road with the function.
- **Review speed limits on the corridor to provide for safe and appropriate speeds:** Install signage based on the review findings. This may include earlier warning signs on the entry into the Tarawera section of the corridor so customers are able to adjust expectations (if required), and are travelling at appropriate speeds to navigate the bends.

## People, places and environment

**Natural environment**

The corridor consists of a series of natural landscapes and major conservation reserve land. There are numerous areas of ecological significance adjacent to the corridor which require special treatment. The corridor at the western end leaves the geothermal area of Taupo before passing through major reserve areas and forestry blocks before entering a long stretch of rural highway landscape of open rolling paddocks. The road winds its way through the Ahimanawa Range before entering a further stretch of rural landscape. Conservation land abuts a large length of the corridor.

Due to the elevation of the corridor the catchments are all upper catchments with stream corridors throughout the corridor with only one major river crossing.

**Noise, vibration and air quality**

There are noise and vibration issues in Eskdale related to truck deliveries to the Pan Pac Mill which operates 24/7 365 days a year with 20 truck movements daily.

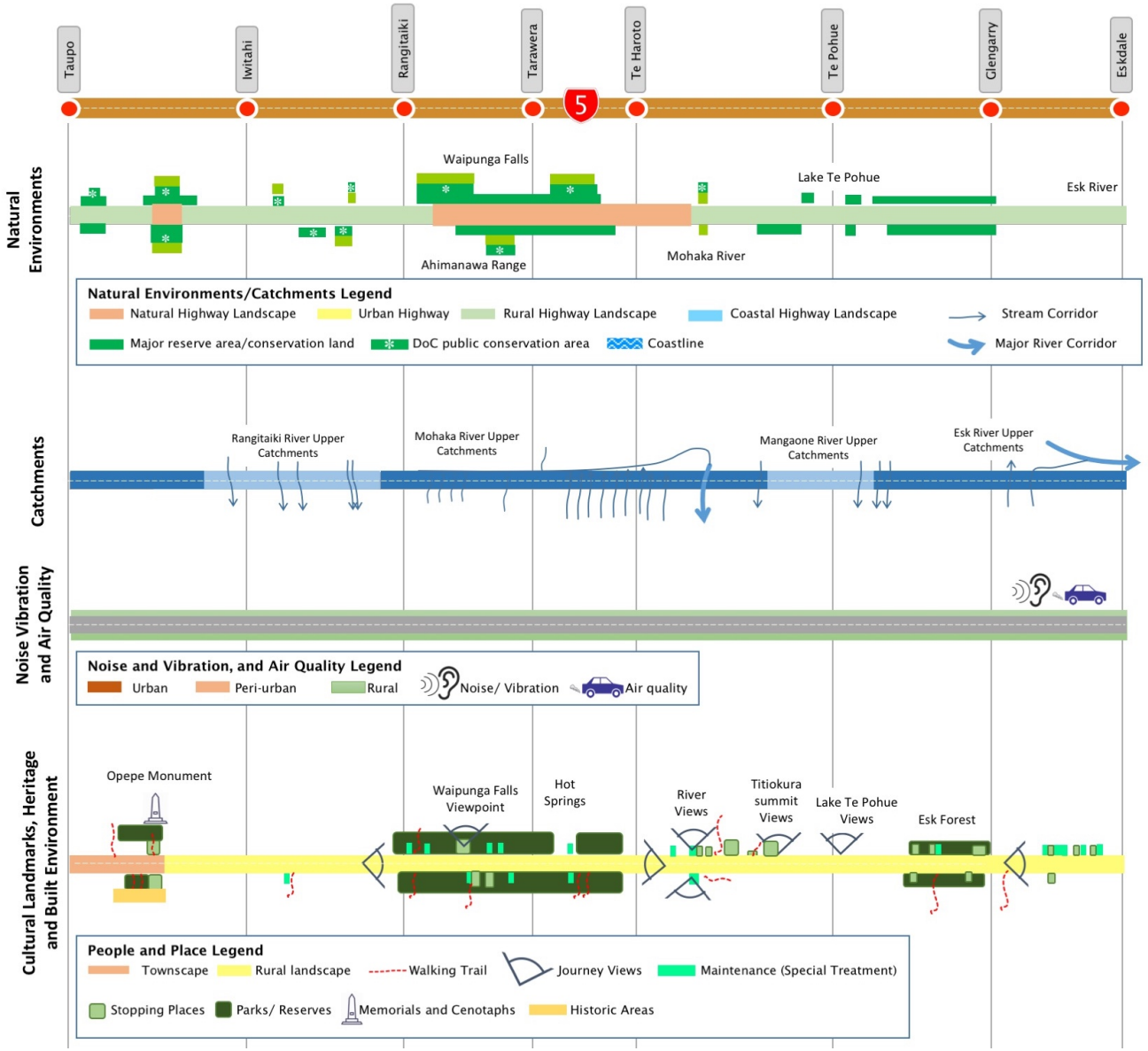
No vibration or air quality issues have been identified along the route.

**Cultural landmarks, heritage and built environment**

The corridor is valued by local Iwi who are seeking to promote the historic story of the corridor. Locally it is known as the Old Cobb & Co historic route. The hot springs at Tarawera are significant. There are many historic sites along the corridor including that of the last major Maori battle, historic water troughs and horse hitching rails.

The high elevation of the corridor provides numerous journey views throughout its length. There are limited facilities for tourists at the stopping areas along the corridor with the main facility provided at Tarawera.

**Figure 14 – People, places and environment**



## Pressures

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

- **Increasing stormwater runoff:** Changes in land use have increased pressure on existing older and undersized culverts in areas increasing flooding.
- **Litter management:** The western end of the corridor near the Taupo urban area has greater litter collection requirements.
- **Special vegetation control measures:** There are numerous maintenance areas that have special treatment requirements need adequate provision for in maintenance contracts.
- **Increasing urban growth in Eskdale:** Should land use intensification occur in Eskdale, this may increase noise and vibration associated complaints as a result of the Pan Pac processing plant.
- **Enhancement of historic cultural values:** Local Iwi wish to work collaboratively to enable the significance of the route to be promoted and enhanced.

## 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:

- **Undertake a review of stopping areas their locations and facilities available:** Develop a strategy in consultation with Iwi and other affected and interested stakeholders, including the Department of Conservation.
- **Tourism and economic development:** Work with local Iwi and supporting organisations to develop plan for how the corridor can support tourism and economic development opportunities as a heritage route.
- **Progressively upgrade stormwater management assets:** to cater for increased stormwater volumes from changes in land use. This will reduce flood events on the corridor and protect the life of the pavement.
- **Strategy for noise and vibration:** Work with the local Council and Pan Pac to develop a strategy for the ongoing operation of the plant and changing land use in a way that manages noise and vibration issues.

# 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 123km of road network which reflects 1.1% nationally. The total value of the assets along the corridor is $194M.

The corridor assets have been divided into eight groups as shown in Figure 15 which directly support the access, reliability and efficiency, safety, resilience and people, places and environment outcomes on the network.

### Asset condition and performance summary

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

**Figure 15 – Corridor asset base**

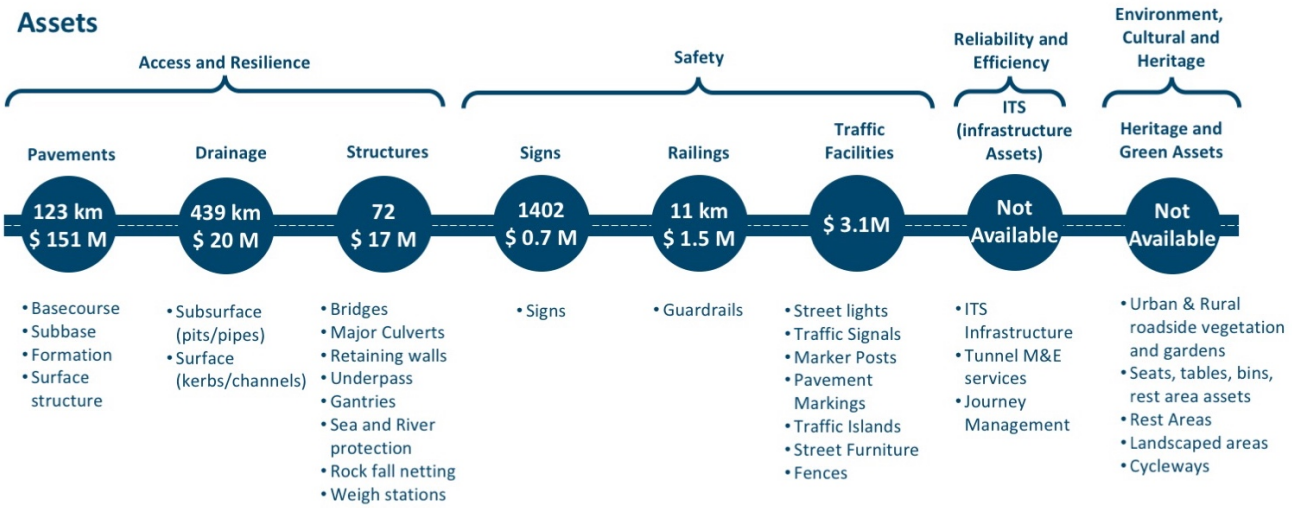
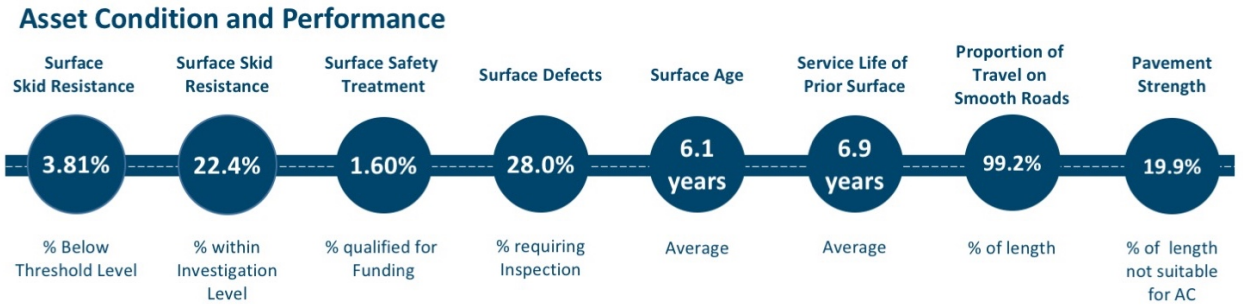



**Figure 16 - Asset condition and performance**



## 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.

As much as 30% of the skid resistance on the corridor south of Tarawera, SH5 RS190 to RS249, is within the investigatory range, between TL and IL. RS 220 has the greatest percentage of surface skid resistance below the threshold level, both for absolute surface skid resistance and for change across the three-year period.

North of Tarawera, RS190 to RS137 the surface skid resistance results show an improvement, whereas to the south there is a continuing degradation in surface skid resistance.

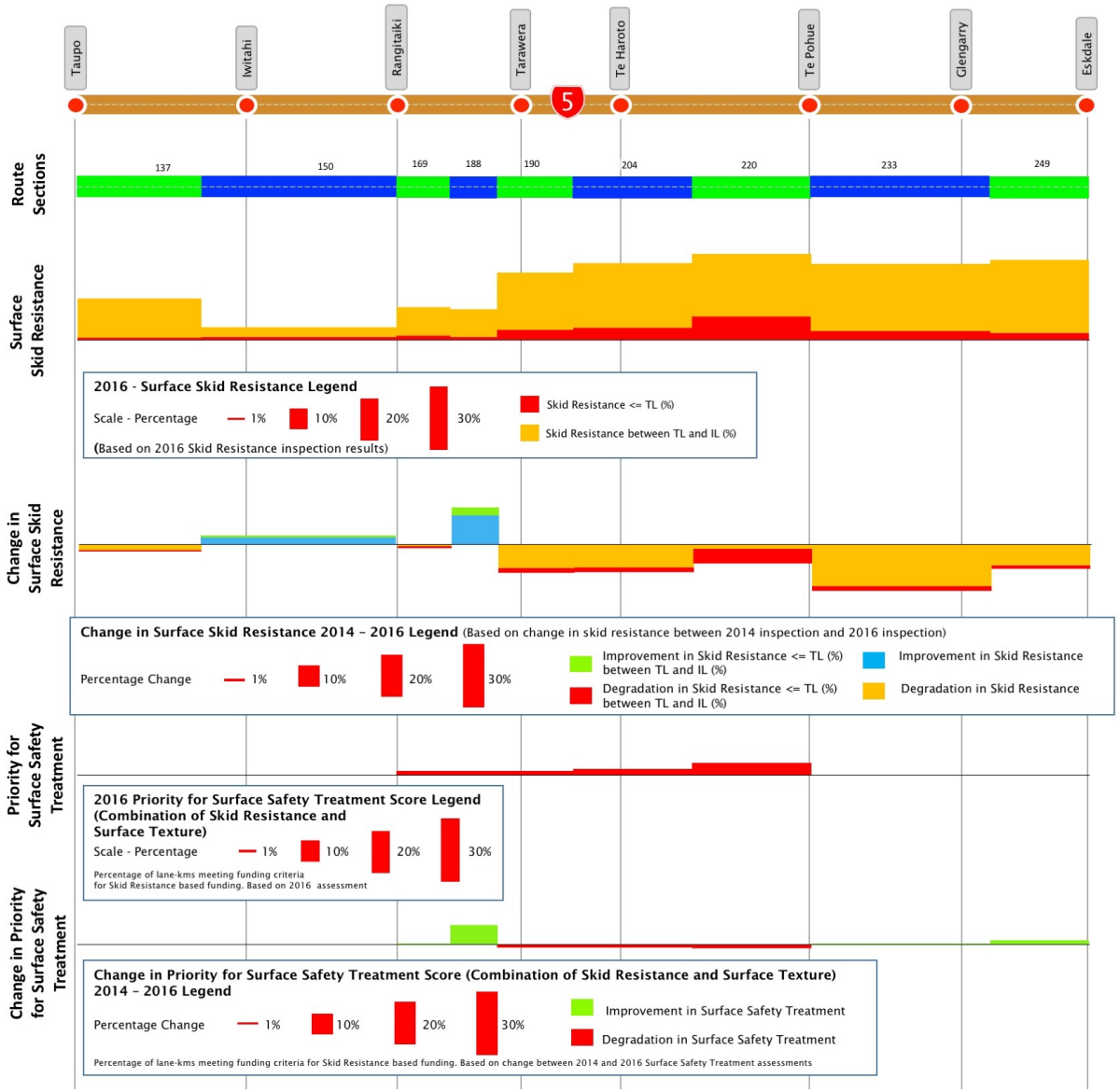
### Priority for surface safety treatment

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.

Just 3.9 lane-km of this relatively short length 244 lane-km corridor qualifies for surface skid resistance based funding. These lengths are related to corridor route sections located between Rangitaiki and Te Pohue, SH5 RS169 to RS220 inclusive. Two sections show an improved priority for surface safety treatment score across the time period, but the remaining RS190 to RS220 show a continued degradation in surface skid resistance.

**Figure 17 - Asset condition 1**



### 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, 28% of the corridor achieves a score above which inspection is required. This is most prevalent in the section east of Rangitaiki and around Tarawera.

### 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.

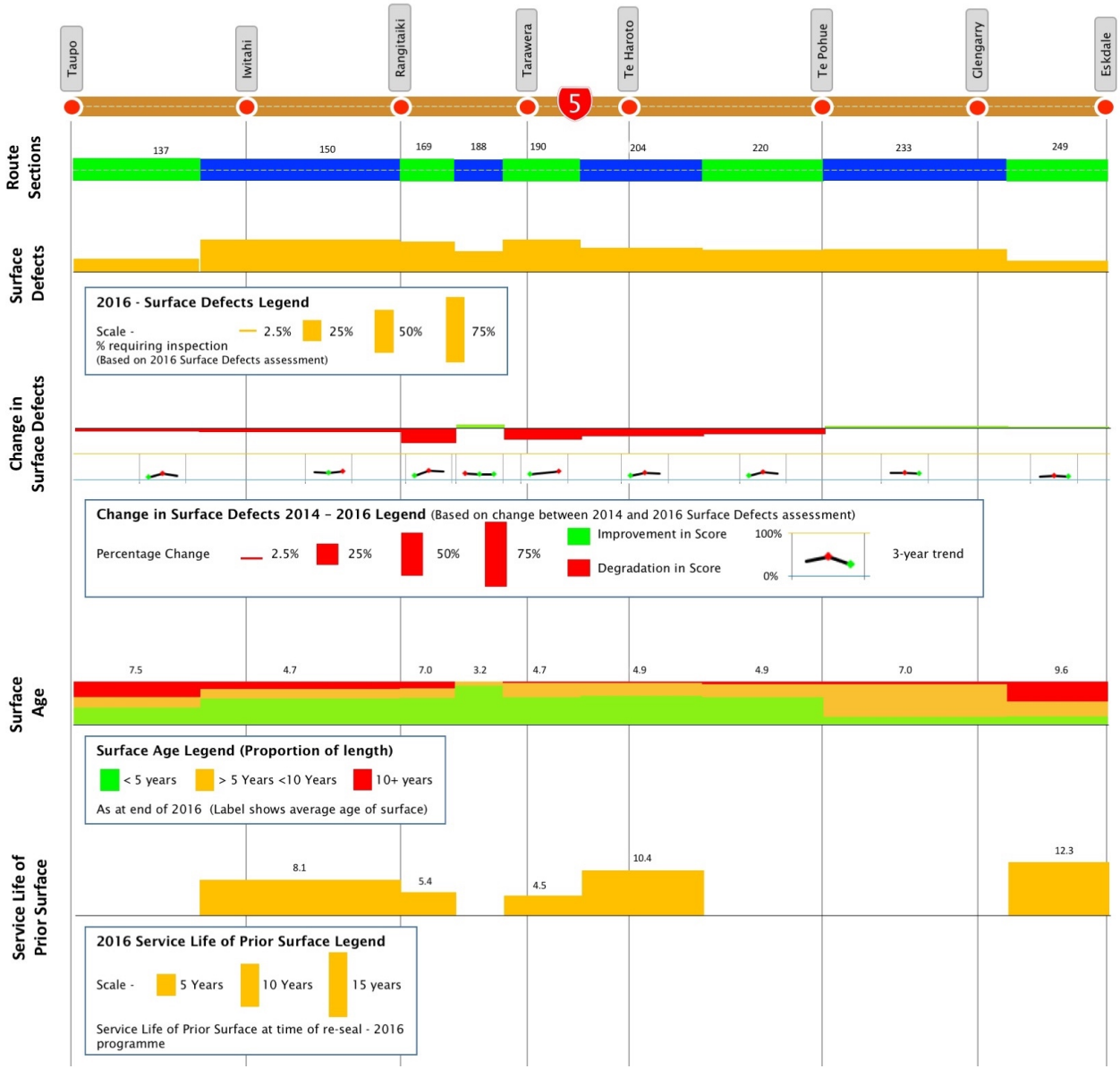
The sections of corridor with the oldest age profile are 5/137 between Taupo and Iwitahi, and RS249 north of Eskdale.

### 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.

Two sections 5/204 and 5/249 achieved an average service life in excess of 10 years.

**Figure 18 – Asset condition 2**



### Resurfacing

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

Major resurfacing works are planned for the section east of Rangitaiki.

### 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 if the route section achieves this level.

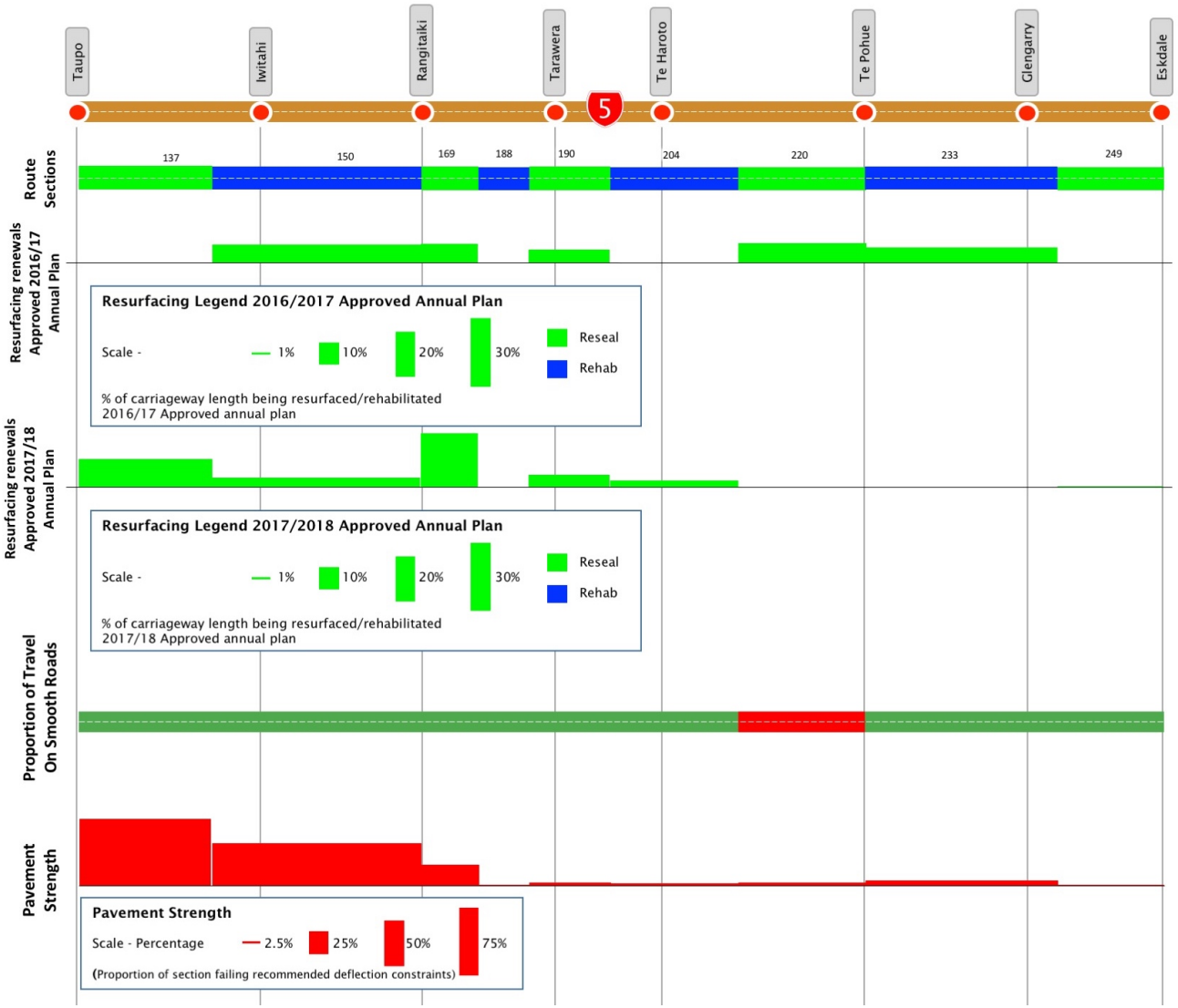
There is only one section of this corridor that fails to meet the ONRC smoothness criteria and that is RS220 which is the section from Mohaka River Bridge at the north end to Te Pohue, although this section was programmed for resurfacing in current year.

### 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 in sections SH5/137 and SH5/150, between Taupo and Rangitaiki.

**Figure 19 – Asset condition 3**



## 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:

- **Roughness:** The rock base and aggregates through this area are historically moisture sensitive, often requiring remediation with removal or overlay options that are more expensive. Dacites in particular are prone to rutting failure. These conditions make it difficult to maintain a good surface.
- **Drainage:** Where there are volcanic subgrades, water ingress is exceptionally damaging with examples of spontaneous trenches opening in the road. Both surface waterproofing and roadside drainage need to be managed to a high level.
- **Surface Lives:** The increase in heavy vehicle loading along the route has resulted in reduced surface lives and poorer condition (both individual vehicle loading and vehicle numbers). Increases primarily in Dairy and Forestry vehicles (stems and whole logs)
- **Terrain:** Mountainous areas are susceptible to extreme weather events and variability.
- **Legacy Issues:** Generous historic treatments have left a legacy of flushing of binder rich pavements that require constant attention to maintain surface skid resistance.
- **Winter maintenance:** can compromise asset condition – speed and style of response to extreme events require trade-offs that compromise surface roughness and traffic facilities. Allocation of cost and risk between contractor and principal can mean the difference of two to three days in reopening the corridor.

## Asset 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:

- **Legacy issues** remain from past pavement management practices. These require ongoing awareness and will require an appropriate response as the sites come due for renewal.
- **Heavy vehicle usage and loadings** will require attention with management of monitoring and compliance.
- **Monitoring regime** may need to be adjusted to increased suit levels of risk as pavements age and more costly interventions become less accessible.
- **Contract structure:** Ensure that contract structure reflects route priorities, clearly allocates risk and identifies desired customer level of service. (Open the route quicker, but damage surface and traffic facilities or take a conservative approach that requires more time and care with less remedial cost and greater delay to route re-opening).

# 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 | $1,640 | $1,783 | $2,684 |
| | Renewals | $2,519 | $3,376 | $3,847 |
| | Improvements | $0 | $0 | $36,600 |
| Reliability and Efficiency | Maintenance and Operations | $552 | $601 | $903 |
| | Renewals | $43 | $41 | $71 |
| | Improvements | $0 | $0 | $0 |
| Safety | Maintenance and Operations | $1,648 | $1,784 | $2,689 |
| | Renewals | $522 | $571 | $853 |
| | Improvements | $0 | $6,940 | $6,000 |
| People, places and Environment | Maintenance and Operations | $339 | $366 | $549 |
| | Renewals | $24 | $9 | $14 |
| | Improvements | $0 | $0 | $0 |
| | **Total** | **$7,287** | **$15,471** | **$54,209** |

**Figure 20 – Corridor investment**

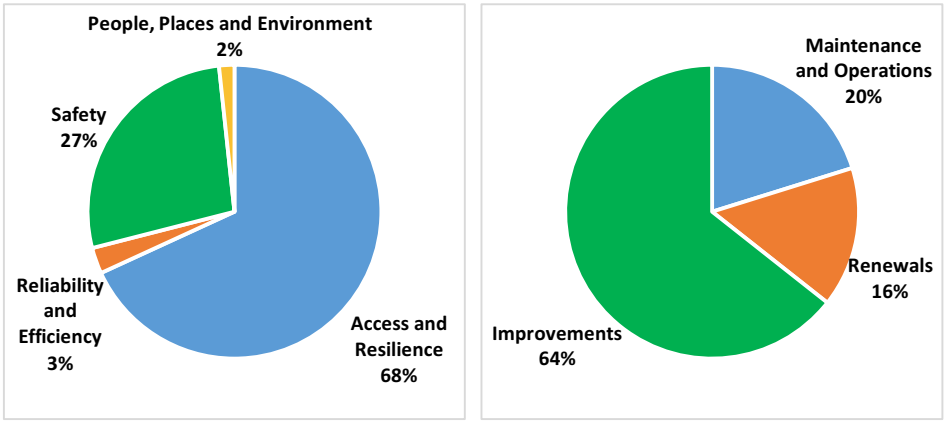


**Table 2 - Summary investment by work category ($000)**

| Outcome | Work Category | | 2018-2021 | 2021-2024 | 2024-2028 |
|---|---|---|---|---|---|
| Access and Resilience | 111 | Sealed Pavement Maintenance | $386 | $436 | $662 |
| | 112 | Unsealed Roads | $29 | $27 | $40 |
| | 113 | Drainage Maintenance | $159 | $148 | $225 |
| | 114 | Structures Maintenance | $233 | $251 | $378 |
| | 121 | Environmental Maintenance | $318 | $347 | $515 |
| | 122 | Traffic Services Maintenance | $7 | $13 | $20 |
| | 124 | Cycle Path Maintenance | $7 | $8 | $12 |
| | 151 | Network & Asset Management | $402 | $444 | $667 |
| | 161 | Property | $99 | $109 | $164 |
| | 211 | Unsealed Road Metalling | $34 | $36 | $54 |
| | 212 | Sealed Road Resurfacing (excl. surface skid resistance) | $1,423 | $2,210 | $1,914 |
| | 213 | Drainage Renewals | $76 | $60 | $90 |
| | 214 | Pavement Rehabilitation | $697 | $787 | $1,366 |
| | 215 | Structures Component Replacements | $276 | $270 | $406 |
| | 222 | Traffic Services Renewals | $14 | $12 | $18 |
| | 321 - 341 | Improvements | $0 | $0 | $36,600 |
| Reliability and Efficiency | 121 | Environmental Maintenance | $126 | $137 | $208 |
| | 123 | Operational Traffic Management | $296 | $323 | $485 |
| | 151 | Network & Asset Management | $112 | $122 | $180 |
| | 161 | Property | $18 | $20 | $30 |
| | 222 | Traffic Services Renewals | $43 | $41 | $71 |
| | 321 - 341 | Improvements | $0 | $0 | $0 |
| Safety | 111 | Sealed Pavement Maintenance | $415 | $465 | $705 |
| | 112 | Unsealed Roads | $28 | $27 | $40 |
| | 113 | Drainage Maintenance | $48 | $50 | $79 |
| | 114 | Structures Maintenance | $108 | $101 | $152 |
| | 121 | Environmental Maintenance | $58 | $67 | $101 |
| | 122 | Traffic Services Maintenance | $628 | $673 | $1,010 |
| | 124 | Cycle Path Maintenance | $0 | $0 | $0 |
| | 151 | Network & Asset Management | $321 | $354 | $530 |
| | 161 | Property | $42 | $48 | $72 |
| | 212 | Surface Skid Resistance | $408 | $443 | $666 |
| | 214 | Pavement Rehabilitation | $0 | $0 | $0 |
| | 215 | Structures Component Replacements | $33 | $38 | $58 |
| | 222 | Traffic Services Renewals | $81 | $89 | $130 |
| | 321 - 341 | Improvements | $0 | $6,940 | $6,000 |
| People, places and Environment | 111 | Sealed Pavement Maintenance | $57 | $61 | $92 |
| | 121 | Environmental Maintenance | $228 | $246 | $369 |
| | 151 | Network & Asset Management | $43 | $47 | $71 |
| | 161 | Property | $11 | $12 | $17 |
| | 221 | Environmental Renewals | $24 | $9 | $14 |
| | 321 - 341 | Improvements | $0 | $0 | $0 |
| | | **Total** | **$7,287** | **$15,471** | **$54,209** |

To be confirmed through RLTP process

# Investing in access and resilience

## Operations and maintenance

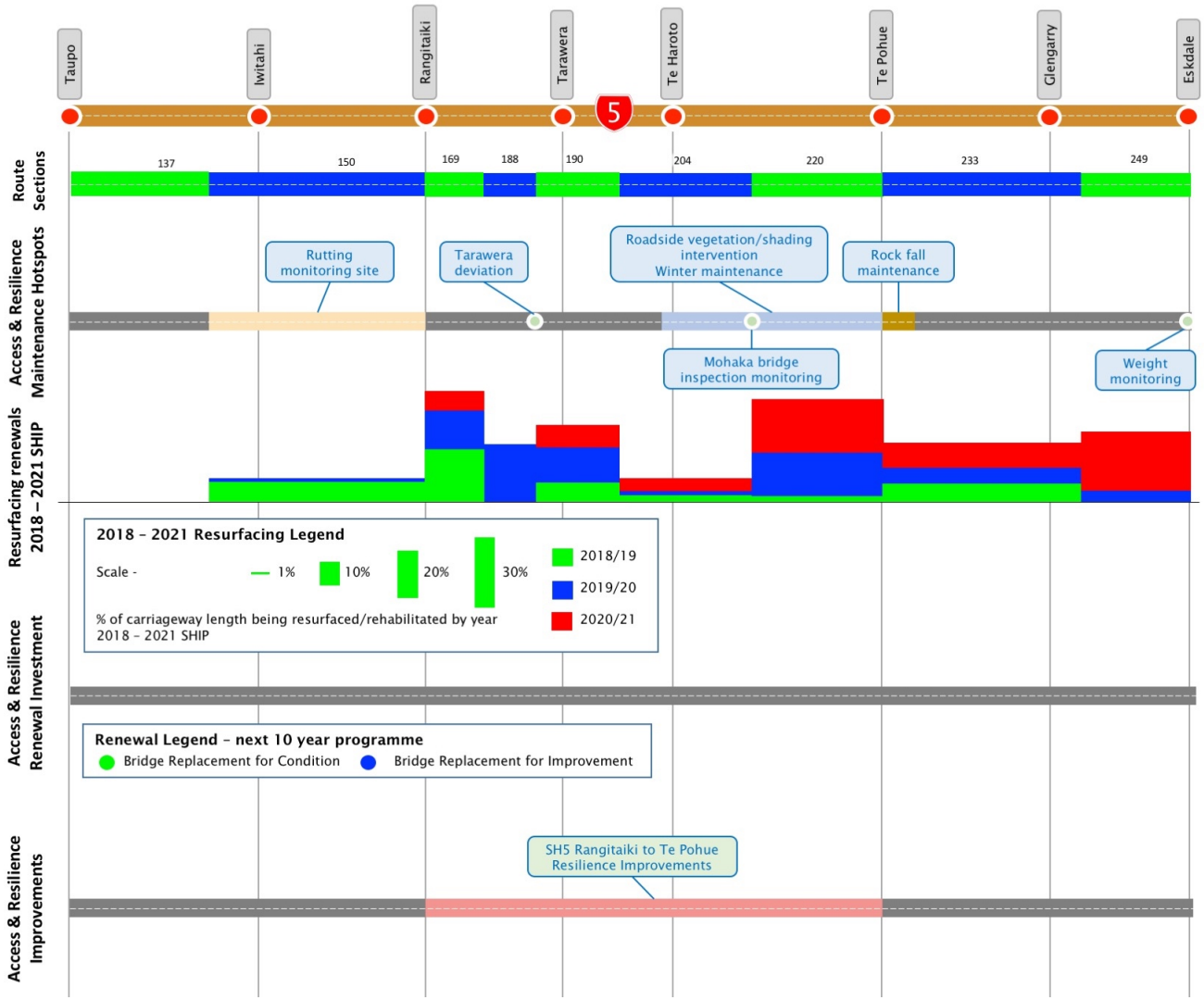
The main areas of investment to provide and preserve access and resilience are drainage maintenance, sealed road surfacing and structural component replacements and vegetation control. A key focus is to realign the base preservation quantities toward increased preventative maintenance and to slow pavement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

**Maintenance hot spots**

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

- **Local dacite** was a permissible M4 product that has since proven inadequate and is no longer in use. Dacite is susceptible to rutting and spontaneous failures if combined with water ingress. Sites where volcanic dacite was used between 1996 and 2005 are closer to Taupo and require monitoring and often more costly interventions and even removal.
- **Winter maintenance:** Alpine areas through the Kaimanawa and Kaweka ranges require additional focus, including CMA application for ice and snow, roadside vegetation control for shading & icing risk.
- **Mohaka river bridge** (north end of RS220) requires specialist monitoring, because it has known design vulnerabilities and is a critical part of the corridor. The bridge crossing is over 200m long and more than 50m above the river. This is both a safety risk when things go wrong and a resilience risk as reinstatement would be costly both in time and money.
- **Slips:** Vulnerable sites throughout corridor as a result of slips – current high focus around Te Haroto and Tarawera deviation.
- **Rockfall** requires ongoing maintenance at Te Pohue

**Figure 21 – 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: 5/169 east of Rangitaiki, 5/190 through Tarawera, and 5/220 north of Te Pohue.

### Structure renewal

The renewal investment infographic shows the planned bridge replacements along the corridor. There are no planned structure replacements for this corridor, although the Mohaka River Bridge has been identified as vulnerable and requires vigilant monitoring of the steel trusses.

**Mohaka River bridge is closely monitored**

## Improvements

### Draft Regional Land Transport Programme considered for the SHIP

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

**Table 3- Draft regional programme considered for SHIP**

| Project | Funding Status | Description |
|---|---|---|
| SH5 Rangitaiki to Te Pohue Resilience Improvements | | Resilience improvements on SH5 between Rangitaiki and Te Pohue as identified in the Taupo to Napier CMP (showing as amber). |

# Investing in reliability and efficiency

## Operations and maintenance

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

**Maintenance hot spots**

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

- **VMS** – Variable message signage provides advice for corridor users and informs route choice in the absence of more real-time communication and information options. There remain opportunities for additional VMS along the route and its alternatives.

  Snow closures are currently infrequent through the Alpine areas, but require an immediate response to ensure ongoing route availability. Historic events have taught that built up snow or ice layers further complicate and delay route accessibility.

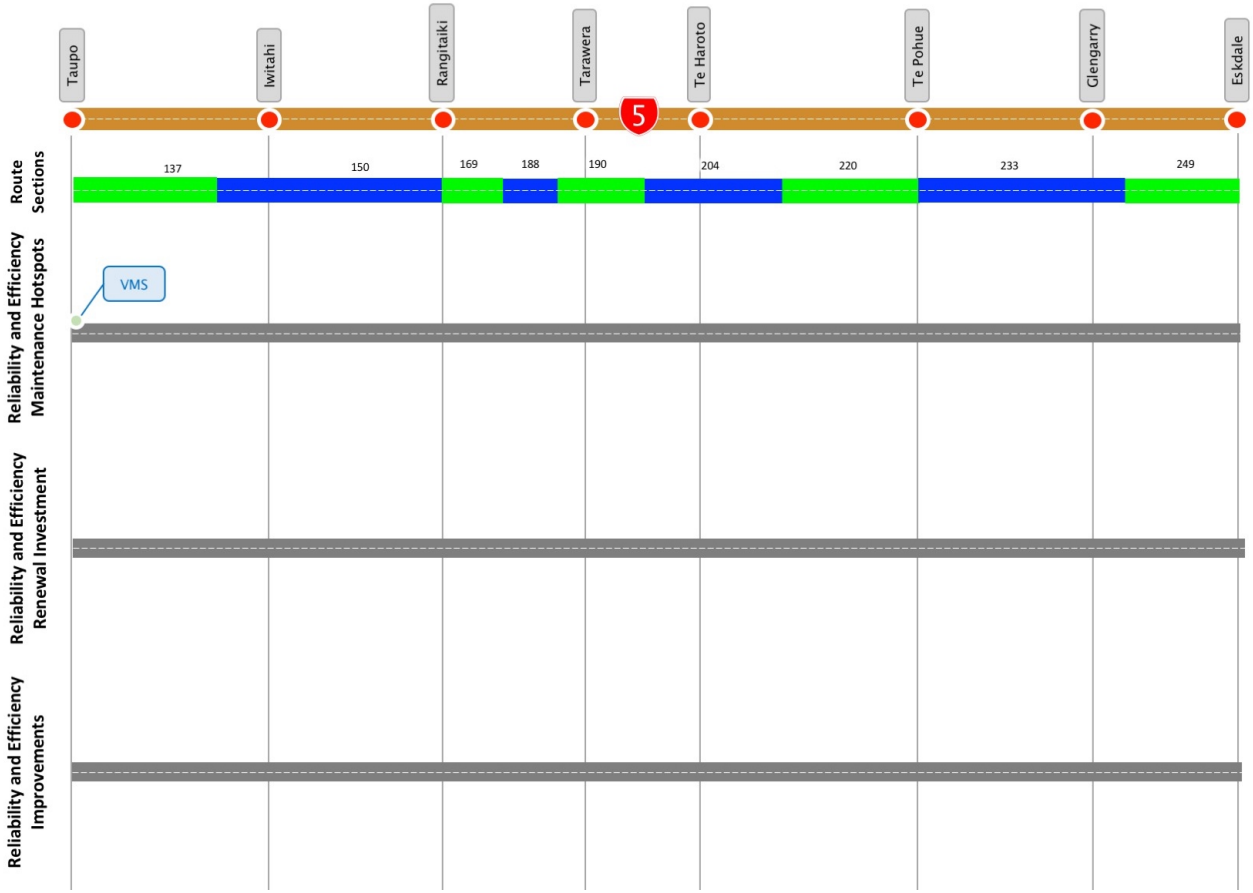
## Renewals

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

## Improvements

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

**Figure 22 – Reliability and efficiency investment**



# Investing in safety

## Operations and maintenance

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

### Maintenance hot spots

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

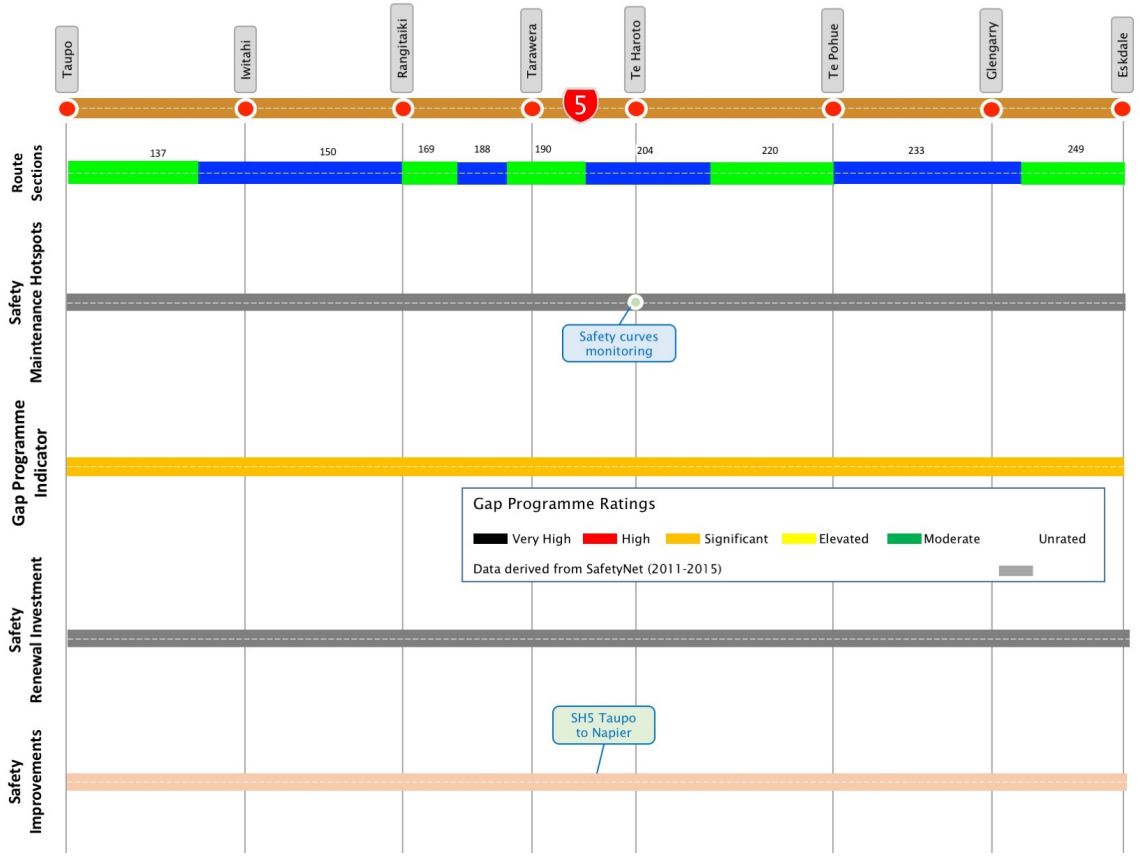
- **Barrier strike:** The guardrail barrier through the curves at Te Haroto is struck regularly and was recently extended. This site is regularly monitored for strike. Guardrail installations require attention to ensure that they do not create a different crash hazard once installed – identified risks include safe working zones, vehicle standing areas, motorcycle safety.

### 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 significant potential along the entire SH5 corridor to reduce fatal and serious injuries through the implementation of targeted, low-medium cost improvements along the corridor. A safety improvements project for this corridor is indicated for between years 7 and 10 of the current programme.

**Figure 23 – Safety investment**



## Renewals

Renewals aimed at supporting safety on this corridor are achieved through business as usual activities. They tend to revolve around maintaining good quality surfaces and traffic facilities safety and include guardrail replacement, extension and retrofitting as guided by Safe Roads and vehicle damage.

## Improvements

### Draft Regional Land Transport Programme considered for the SHIP

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

**Table 4- Draft regional programme considered for SHIP**

| Project | Funding Status | Description |
|---|---|---|
| SH5 Taupo to Napier Safety Improvements | | Safety improvements on SH5 between Taupo and Napier as identified in the National Safety Roads and Roadsides Programme, NSRRP Review which indicates action in Years 7 to 10. |

# 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:

- **Maintenance of rest areas,** particularly the at picturesque Waipunga Falls, where rubbish dumping is inconsistent with the amenity value of the area. (although this is no longer state highway, due to the remoteness it continues to be maintained by the NOC provider).
- **Litter:** Roadside litter maintenance is required through the Esk valley.

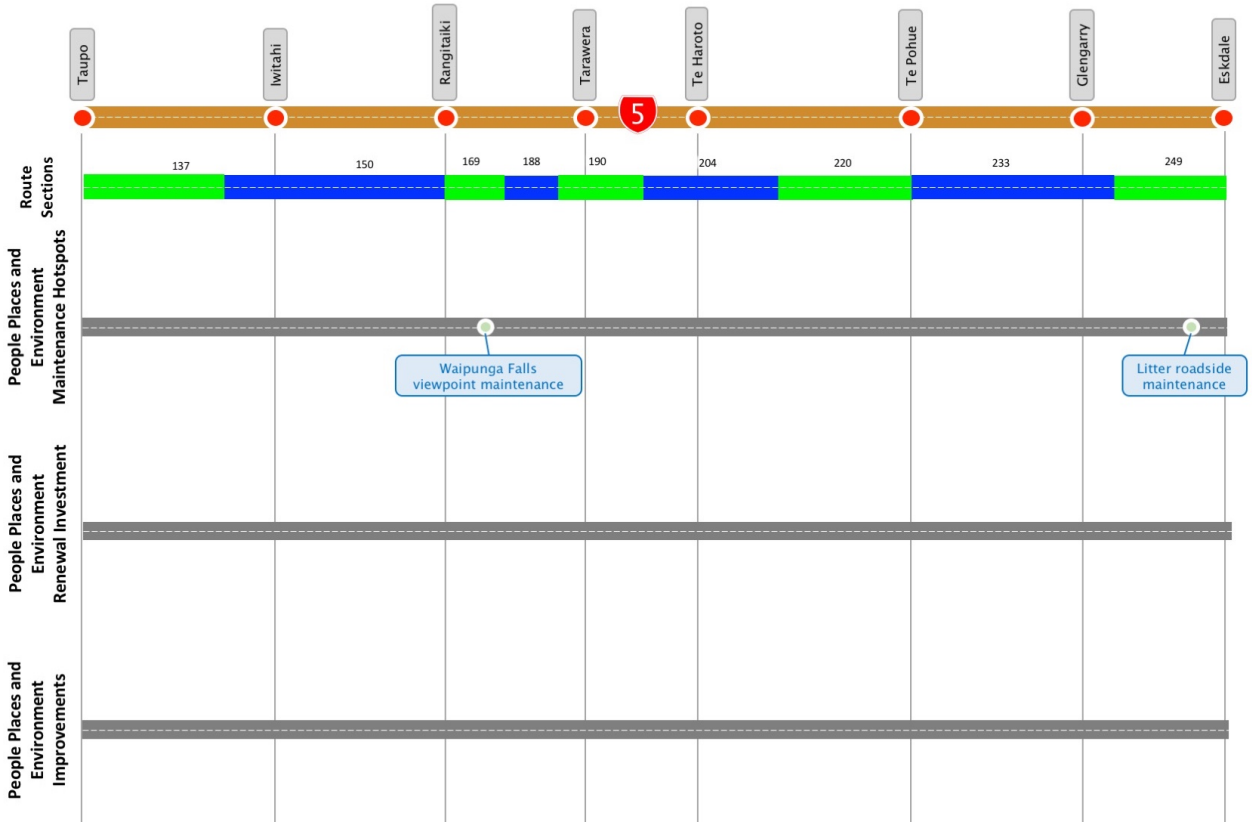
## Renewals

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 24 – 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.

- **Major areas of investment focus** on addressing customer levels of service for roughness and rutting, which is increasing; water cutting and heavy maintenance, where NPVs are unachievable due to low volumes; and asset growth, as a result of widening from safety improvement initiatives. Maintaining skid resistance and road holding properties requires use of more costly treatments and the current product applied is a single source supply.
- **Winter Maintenance:** The corridor traverses harsh alpine areas that produce rapid and extreme weather changes. Weather monitoring, network observation, proactive intervention and good communication are fundamental to maintaining a safe and accessible route. Environmental maintenance spending on this corridor focusses on mitigating the risks that arise from winter conditions and keeping the Napier-Taupo highway open. There is a low tolerance for overhanging trees or cables that fail under ice and snow loading during extreme events, because they restrict route access.
- **Proactive intervention** along this corridor is a priority as few improvements are planned or justified. Effective proactive maintenance relies on an understanding that the winter risks being avoided pose a real threat to loss of income and to loss of life.
- **Regular route patrols** allow heightened awareness to mitigate vulnerable and high-risk areas as well as high risk factors, such as communication black out areas, slip prone or poor quality soils, ice or snow and improved response to vehicle incidents. There is heightened awareness of Fire as the forest areas either side of the corridor mature and the fire risk is increased.

### Reliability and efficiency

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

- **Communication is limited** for both the travelling public and those working along the SH5 route. Because the route is remote and communication is poor, regular patrols and advice about corridor conditions are fundamental to its operation ensuring both route efficiency and safety.
- **Guardrail through narrow areas** of this corridor limits site protection options for working on or near the road and may require closure for basic maintenance, resulting in greater travel time or reduced reliability. Regular guardrail strikes, increase maintenance costs. Motor Cycle strikes are a recent and growing concern.

### Safety

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

- **Unsafe roadsides:** The corridor has unforgiving high-risk features such as narrow formation, steep and long drop offs. The effects of such crashes can be exacerbated by remoteness, low traffic volumes and limited communication. Many of the crashes along this corridor can be attributed to people making mistakes and then paying a high price. Safety responses, where they can be justified, include guardrail retrofitting. ATP installations are noted to reduce runoff road crashes by 30% and are a solution that can be achieved at low cost. A recent increased incidence of motorcycle fatalities will need investigating to ensure minimal adverse effect from roadside features such as guardrail. Motorcycle under-run protection may be required.
- **Loss of control crashes** are a feature of this corridor. Retaining adequate skid resistance is a challenge because of the quality of aggregates available and because of the multiple demands made on the surfacing. Recent localised widening works through Safe Roads will provide additional recovery area.
- **Intersection sight distances** have been identified as inadequate for current vehicle speeds and designs and present a high crash risk. The relatively low volumes mean that upgrades cannot be readily justified.
- **Safety improvement additions** such as guardrail can have operational implications, which need to be considered in their design and installation. This needs to be considered in the context of a route that requires regular maintenance and pro-active interventions such as for ice and snow.

### People, places and environment

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

- **Mana whenua:** There is a cultural element to the corridor that requires sensitive treatment. Local Iwi have sites of significance along the corridor, but these are not openly or consistently discussed.
- **Noise levels:** ATP was installed through the Esk Valley as a measure to support improved road safety. However, this treatment was removed due to unacceptable noise levels for residents of the valley.

## Investment future considerations

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

- **Criticality of route:** The route is the most direct and effective for time critical freight servicing the Hawkes Bay from further north. Route delays are generally from either extreme weather and environmental issues or from crashes. Safety improvements could be accelerated to reduce crash severity and improve consistency or route accessibility.
- **Variable message signs(VMS):** The installation of VMS after Rangitaiki will provide opportunities to keep drivers informed. Information on travel times, areas of limited mobile phone coverage along the route, and weather events will allow drivers to adjust their driving style to road conditions, better manage expectations of travel times and the journey experience and enable informed decision making about the journey.
- **Coordinated response:** Coordinated consideration between capital works teams, Safe Roads, and maintenance teams in the development and design of solutions for the corridor. This will ensure that safe passage of vehicles is provided for while maintaining customer levels of service, and maintenance budgets are more effectively planned and managed.
- **Barrier installation:** Review plans of existing and future barrier installation to determine if opportunities for different approaches in snow affected areas is viable and implement findings. This will improve maintenance staff ability to clear snow and debris from the road and open the corridor more quickly after an unplanned event.
- **Response to unplanned closures:** Improvements in the management of unplanned closures by identifying suitable sites for the strategic placement of maintenance equipment and materials close to vulnerable sites to enable a more rapid response, particularly in the winter. Also work with landowners and emergency services to identify designated helicopter landing sites through the steep terrain sections of the corridor to improve emergency response management and recovery times.
- **Enable better response to incidents and customer communications:** Work with telecommunications providers to improve mobile phone coverage along the corridor. Not only will this facilitate more rapid response to events on the corridor, it will also enable improved monitoring and real-time communications to customers about the corridor.
- **Coordinate a fencing programme:** Work with landowners to develop and implement a plan for improved fencing and better stock management. This could include developing of a fencing programme in partnership with other organisations, such as federated farmers and the regional council.
- **Review speed limits on the corridor to provide for safe and appropriate speeds:** Install signage based on the review findings. This may include earlier warning signs on the entry into the Tarawera section of the corridor so customers are able to adjust expectations (if required), and are travelling at appropriate speeds to navigate the bends.
- **Undertake a review of stopping areas their locations and facilities available:** Develop a strategy in consultation with Iwi and other affected and interested stakeholders, including the Department of Conservation.
- **Tourism and economic development:** Work with local Iwi and supporting organisations to develop plan for how the corridor can support tourism and economic development opportunities as a heritage route.
- **Progressively upgrade stormwater management assets:** to cater for increased stormwater volumes from changes in land use. This will reduce flood events on the corridor and protect the life of the pavement.
- **Strategy for noise and vibration:** Work with the local Council and Pan Pac to develop a strategy for the ongoing operation of the plant and changing land use in a way that manages noise and vibration issues.
- **Legacy issues** remain from past pavement management practices. These require ongoing awareness and will require an appropriate response as the sites come due for renewal.
- **Contract structure:** Ensure that contract structure reflects route priorities, clearly allocates risk and identifies desired customer level of service. (Open the route quicker, but damage surface and traffic facilities or take a conservative approach that requires more time and care with less remedial cost and greater delay to route re-opening).

# Appendix A – Information sources

| Section | Infographic | Information Source | Date |
|---|---|---|---|
| Introduction | Corridor Overview Map | The Road Efficiency Group<br>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<br>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<br>ONRC -right-road-right-value-right-time-combined-poster.pdf<br>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<br><br>NZTA Projects web page:<br>https://www.nzta.govt.nz/projects/<br><br>NZTA Safe Roads web page:<br>https://www.nzta.govt.nz/safety/our-vision-vision-of-a-safe-road-system/safe-roads/<br><br>Submitted Regional SHIP programmes | 2017 |
| Access | ONRC classification | The Road Efficiency Group<br>https://www.nzta.govt.nz/roads-and-rail/road-efficiency-group/onrc/ | 2013 |
| | Carriageway configuration | Network Manager and Regional Staff<br>Corridor drive-over<br>Highway information Sheets | 2016 |
| | Posted speed limit | NZTA – MapHub<br>Speed Limits on NZ Road Network | 2016 |
| | Topography | Elevations derived from Google Earth™ | 2016 |
| | Geography | Network Manager and Regional Staff<br>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<br>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<br>Hazard Incidents and Area Warnings | 2016 |
| | Major Alternate Routes | Network Manager and Regional Staff<br>Desktop analysis<br>Corridor drive-over | 2016 |
| | Diversion Lengths | NZTA<br>StateHighways.pptx<br>Diversion Routes | Unknown |
| | Closures | NZTA<br>2011-2015_Treis_incidents_by_region.xlsx | 2015 |
| Reliability and efficiency | Efficiency | NZTA – MapHub<br>EfficiencyNet | 2016 |

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

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

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

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