Whangarei to Kaitaia

CORRIDOR MANAGEMENT PLAN

1 10 11

2018-2028

NZ TRANSPORT AGENCY
WAKA KOTAHI

New Zealand Government

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Executive summary

The Whangarei to Kaitaia corridor comprises SH1, SH10, and SH11. The corridor stretches across the Far North and Whangarei Districts, within the Northland Region, connecting Northland's largest city Whangarei, located in the south of the corridor, with Awanui and Cape Reinga in the north.

SH1 travels north from Whangarei via Kawakawa, Ohaeawai, and Mangamuka, to Awanui and beyond to Cape Reinga, travelling through the centre of Northland. At Kawakawa, SH11 intersects with SH1 lopping through the coastal communities of Opua and Paihia in the Bay of Islands before joining SH10 at Oromahoe. SH10 travels the eastern side of Northland from Pakaraka, up through Kerikeri and Kaeo to the communities in and around Doubtless Bay before connecting with SH1 at Awanui.

The corridor is approximately 399 km long (3.5% of the state highway network). The total value of assets along the corridor is $575M (2.5% of the total national asset value).

This corridor serves as the main connection between Whangarei and the communities located further north. It plays a vital role in enabling the economy of the Northland region to function. In particular the key logging, agricultural, dairy, and tourism industries within the northern parts of the region rely heavily on the corridor for the movement of goods and people. SH10 in particular is expected to come under increasing pressure from tourism as the cruise ship industry in the Bay of Islands continues to grow. SH1, on the northern part of the corridor, is the only access route to Cape Reinga and the communities in that part of Northland.

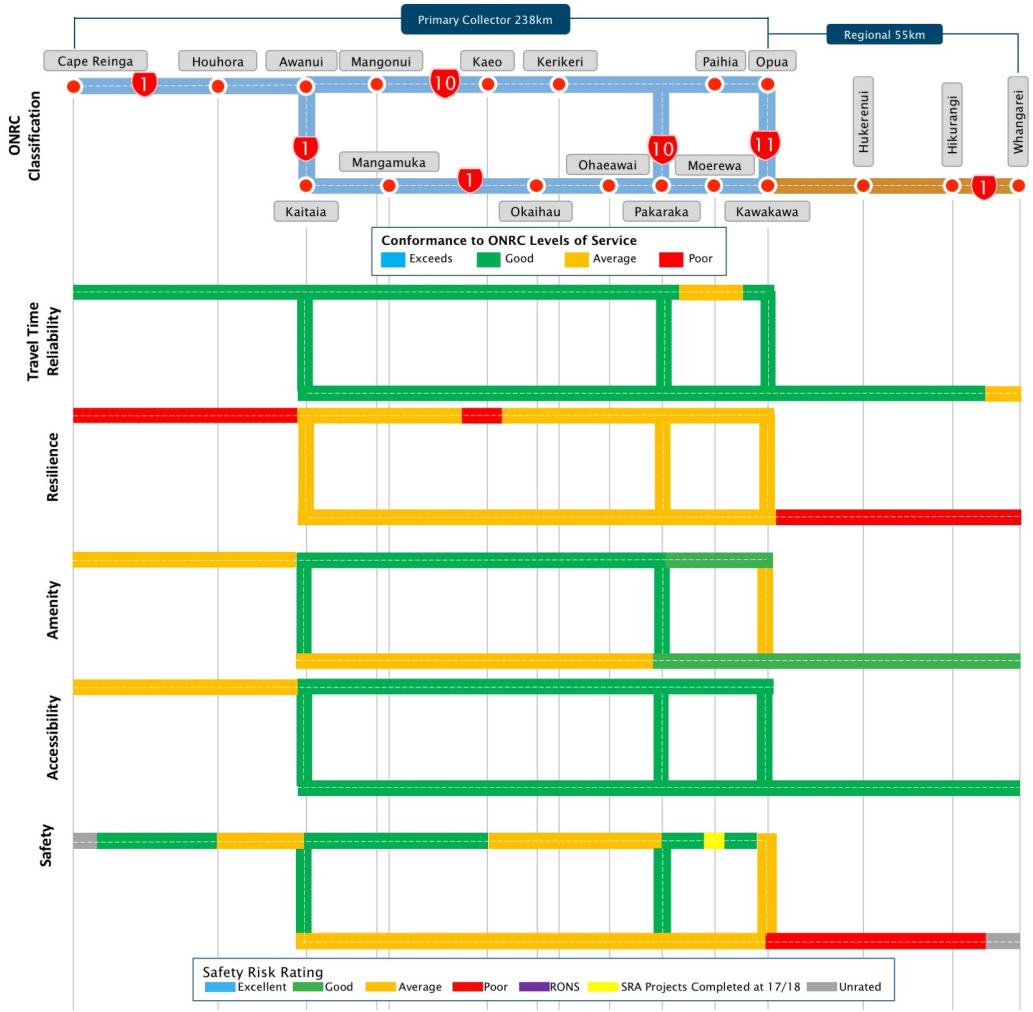
Tourism contributed an estimated $128 million to regional GDP in 2013 and the corridor plays a key role in supporting tourism growth as part of the Twin Coast discovery route. There are plans to develop and promote the route as part of a round-trip that incorporates the various visitor offerings and products on both coasts and up to Cape Rēinga.

Customers along this corridor are a combination of daily commuters and local traffic for shorter trips closer to urban centres, and tourists and freight for longer trips. Non-visitors and freight customers along this corridor tend to be well-informed, have an expectation of continuous service, but accept that the quality of service may vary according to overall demand.

As activity increases on the corridor, customer safety and travel time reliability will continue to become more important. Issues associated with flooding and crashes closing the road have significant impacts on the corridor. The challenging terrain through the Mangamukas, tight bends and one lane bridges along with a lack of overtaking lanes along the corridor make an unforgiving road environment where fatal and serious injuries continue to be a concern.

Infrastructure upgrades, implementation of safety solutions, timely advice of disruption and improved communication are essential components to managing and maintaining an effective service.

Figure 1 - Performance of the corridor against ONRC outcomes



A number of improvements including replacement of one lane bridges at Taipa and Kaeo, and the Akerama curves realignment are already underway to improve safety and efficiency of the corridor. Despite this investment, the resilience of the corridor still needs to be improved.

Introduction

Purpose

What is the corridor management plan?

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

The corridor management plan considers a combination of:

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

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

Why is it needed?

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

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

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

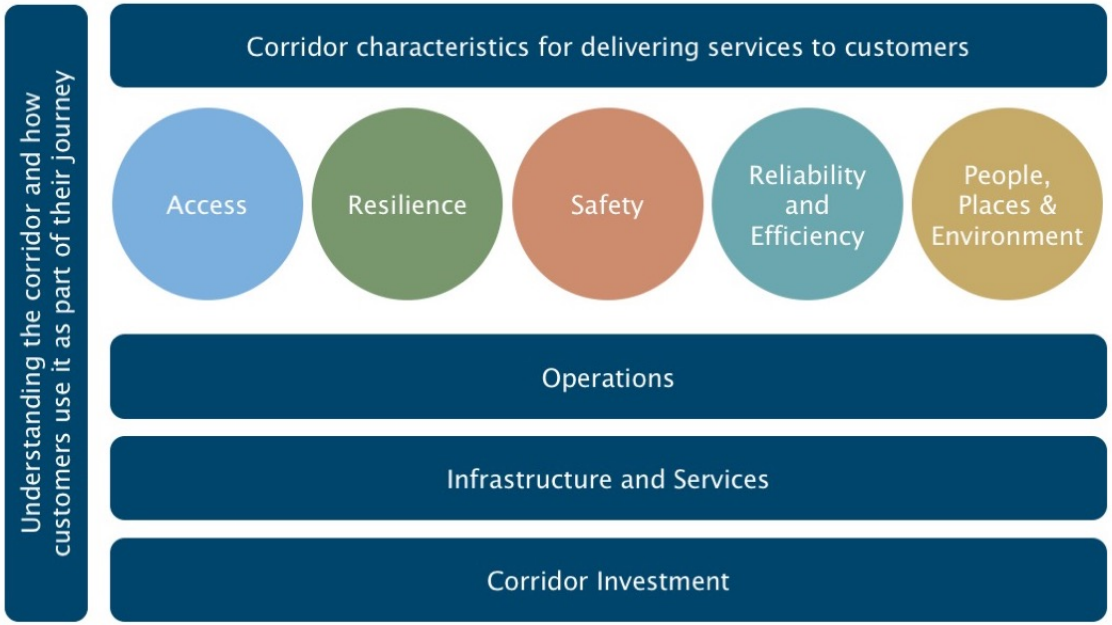
How will we use it?

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

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

It is envisaged that the Corridor Management Plan will be updated as required.

Figure 2 - Corridor management plan framework



The corridor at a glance

Corridor overview

The Whangarei to Kaitaia corridor comprises SH1, SH10, and SH11. The corridor stretches across the Far North and Whangarei Districts, within the Northland Region, connecting Northland's largest city Whangarei, located in the south of the corridor, with Awanui and Cape Reinga in the north.

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This corridor serves as the main connection between Whangarei and the communities located further north. It plays a vital role in enabling the economy of the Northland region to function. In particular the key logging, agricultural, dairy, and tourism industries within the northern parts of the region rely heavily on the corridor for the movement of goods and people.

The corridor provides access to the region's two main airports in Whangarei and Kerikeri (Bay of Islands airport) as well as onwards via SH1 to the region's main seaport, Northport, located at Marsden Point. SH1 provides further links north from Awanui to Cape Reinga, and south to Auckland and to the rest of New Zealand.

The regional economy

Northland is a regional economy that has been underperforming relative to other New Zealand regions and relative to its resource base. It has a population of just over 150,000 people and is one of the most economically deprived areas of the country. While 20% of New Zealand's population is in the lowest quartile of the deprivation index, the equivalent measure for Northland is 39%.

The regional economy was impacted by the Global Financial Crisis through a significant drop in tourism, and is vulnerable to significant climatic events - both severe storms and drought conditions. The Far North has a strong focus on primary production. Whangarei is the region's main urban and servicing centre with a higher concentration of manufacturing and service industries.

Northland's economy accounts for 2.5% of New Zealand's Gross Domestic Product (GDP). Nominal GDP in the region increased by 2.6% per annum on average over the past five years, compared to the national average of 4.1%. The unemployment rate in Northland is three percentage points above the national rate and nominal GDP per capita is 32% below the national average. These economic indicators are closely affected by the quality of the transport network, as the availability of safe and reliable transport drives the success of the economy.

With almost all goods and services moved by road, the transport network (and the state highway network in particular) are a critical component of the region's economy. This importance is confirmed in a number of the regional economic action plans within which transport is identified as a key enabler for improved economic performance.

Figure 3 – Corridor overview

Understanding our customers

Key customers

The key customers who use the corridor are diverse, and utilise a range of transport modes. Different customers have different needs, expectations, and personal circumstances for using the transport system. Therefore, what customers value from the transport network needs to be understood in the context of who they are. Whangarei is the largest city with the greatest number of jobs and therefore caters for the greatest number of commuter needs in the corridor.

Daily commuter

Travelling by car is almost exclusively the mode of choice for commuters along the entire corridor. Whangarei is the largest city and has the greatest number of commuters. A small number of Whangarei commuters use existing suburban bus services into the city area from northern suburbs. Elsewhere in the corridor, there are no real public transport services for commuting, however a small number of people will walk or cycle to more local work places.

Insights into daily commuter users:

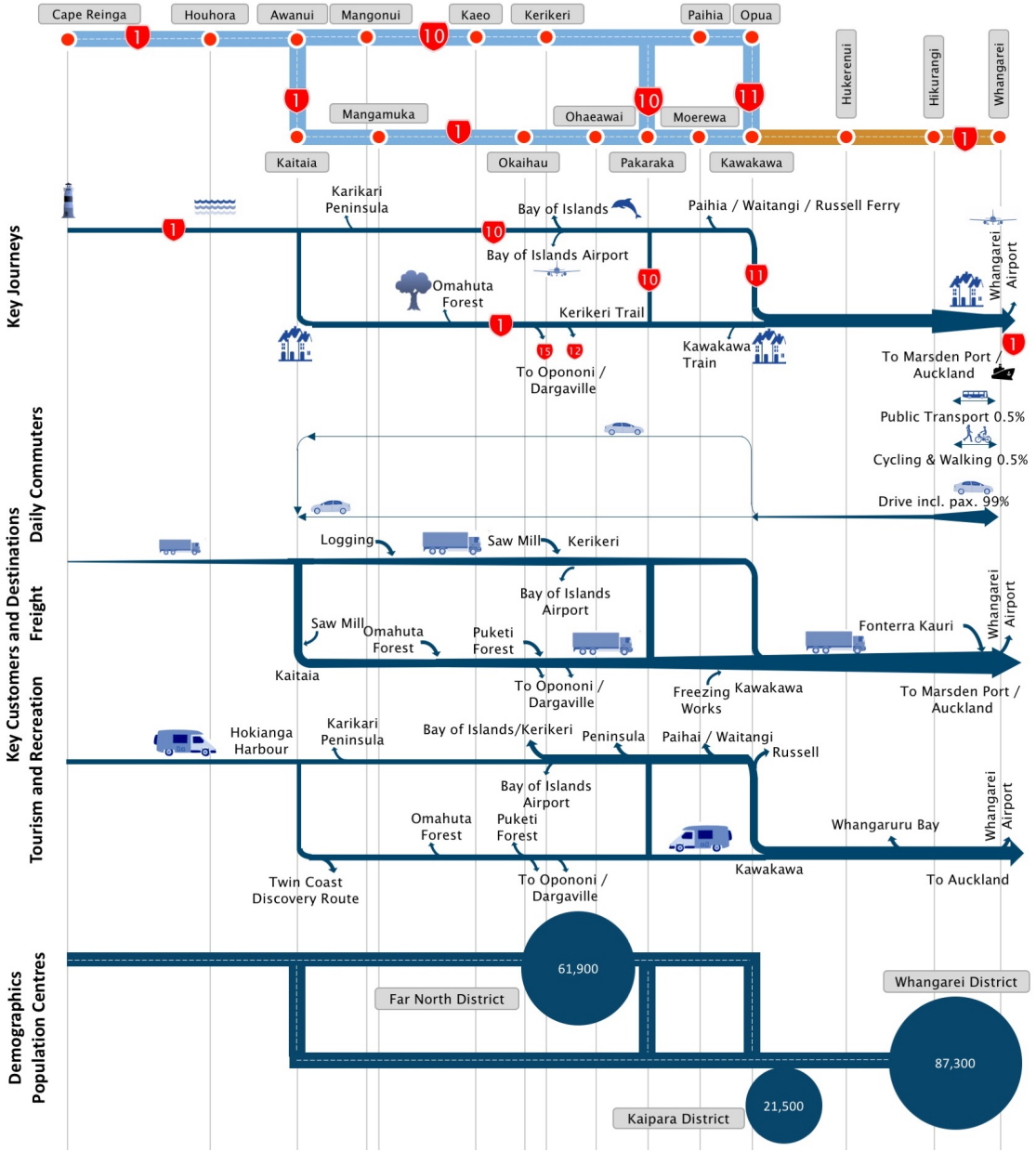
Road use: Commuters have limited choices besides road based options when accessing employment in the corridor.

Road knowledge: Commuters are familiar with the main routes into cities and towns, or travel by public transport. There are limited alternative routes however journey times are relatively predictable considering the low flows on these routes.

Pain points: The main commuter pain points are in Whangarei. Key intersections with SH1 at Kamo Road, Central Avenue and SH14/Maunu Road experience congestion in the AM/PM Peak periods, which impact both private vehicle and public transport occupants.

Daily commuters expect: Predicable journeys at peak times, accurate and up to date information about traffic (peak and off peak), weather, road conditions and hazards. Focus should also be given to the accommodation of high volumes of tourists during peak holiday periods with clear and safe alternative routes or information about closures.

Figure 4 - Key customers, journeys, and destinations



Tourist and recreational users

Tourism is the third largest sector of the Northland economy with 1.7 million guest nights recorded in 2014. The Northland region has a number of significant tourism and natural attractions including the Bay of Islands and Cape Reinga.

The corridor forms the northern part of the Twin Coast Discovery Highway connecting Auckland with Kaitaia via Whangarei. This is a key tourist route for fly/drive international tourist arriving into Auckland Airport or the port. There is a high tourism and recreational peak demand during the holiday peak periods, including cyclists and motorcyclists on recreational trips.

Insights into tourist and recreational users are as follows:

Road use: A high number of recreational drivers use the route during weekend and public holidays as well as summer season school holiday periods. There are a high number of international users of the corridor driving at all times. The route from Whangarei to Cape Reinga via SH10 is the primary tourism route.

Road knowledge: Many international visitors have limited experience of New Zealand roads and conditions, and tend to be focused on the landscape and their destination (roads are a means to an end). Travel times can be underestimated, there is limited or no knowledge of places on the journey where the road narrows or becomes winding. Domestic recreational users are more familiar with the road and anticipated travel times.

Pain points: Weekend and holiday traffic can be particularly busy especially around key tourist centres such as Paihia, Kawakawa and Kerikeri. The one-lane bridges on SH10 become congested and temporary signals are deployed during peak summer periods. There is also congestion on the route through Whangarei for tourists during peak summer holiday periods and long weekends.

Tourist and recreational users expect: Predictable and safe journeys with clear signage for journey distance and time on key tourism routes and destinations, accurate and up to date information about traffic, weather, road conditions and hazards. Quality rest areas and locations to park near known vistas or tourist spots are also highly sought after by tourists.

"Safety and travel time reliability are valued more highly than travel time savings"

Freight operator

The state highway network is a critical component of the economic performance of the Northland region. Road based freight accounts for almost all goods and services. The main industries are forestry and dairy, particularly within the rural areas of the corridor. Many of these goods and products journey to key transport hubs within the Northland region and processing sites across the rest of the Upper North Island and beyond. A proportion of international and domestic freight is processed at Northport which is just to the south of the corridor.

"We want to know the road is open and the travel time predictable"

Insights into freight operators are as follows:

Road use: Both SH10 and SH1 are used by freight operators to move goods. Availability and reliability of these routes is important. Travel time reliability is also a critical desire of the freight industry. Whilst most long-haul journeys are undertaken at night when traffic flows are lower, due to the time critical nature of produce and other perishables, this can vary by operator. It should be noted that SH15 is the preferred route for forestry trucks.

Road knowledge: Knowledge of the road is extremely high with freight operators confident in understanding the network and managing difficult conditions.

Pain points: The corridor is susceptible to closure due to unplanned events resulting from weather events or crashes. Alternative heavy transport routes are limited along the corridor and tend to be longer affecting delivery times and therefore business operations. The gradients of the Mangamuka range on SH1 are such that speeds drop significantly and the cost of operation for freight vehicles increases. There are no alternative routes in the event of incidence occurring on SH1 across the northern peninsula from Awanui to Cape Reinga. Availability and reliability of this route is critical to freight operators and the Northland economy in general, such is the reliance on state highways for these critical movements.

Freight operators expect: Availability of the route is the primary expectation of freight operators. Reliability of travel time is also important, followed by accurate and up to date information about traffic, weather, road conditions and hazards. Quality rest areas and parking for large vehicles in town centres is also valued. HPMV operators require information about which routes are available for HPMVs.

How we deliver services along the corridor

Transport partners

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

We work closely with the Territorial Land Authorities and regional council (Northland Regional Council) along the corridor shown in Figure 5.

Collaboration along the corridor

The Transport Agency is a member of the recently formed Northland Transport Alliance which formally brings the Transport Agency together with the local and regional authorities to deliver a one network approach to transport across the northland region.

Northern transport alliance

The three Northland District Councils - Kaipara, Whangarei and Far North, as well as the Northland Regional Council and the Transport Agency, formed the Northland Transportation Alliance (NTA) on 1 July 2016.

The aim of the alliance is to empower a One Network approach and make State Highways, regional, and local roads more resilient, more connected and safer for the communities of Northland as they get to work, school and play.

Traffic Operation Centres (TOC)

Traffic Operation Centres are the 'conduit' services in place nationwide to communicate activities/events on the transport network to the users of the SH network and wider stakeholders (e.g. emergency services and NOC suppliers providing emergency response), and monitor and report SH incident response in the online TREIS system. ATOC (Auckland) covers the entire corridor.

Figure 5 - Map of associated local authorities

Network Outcomes Contracts approach

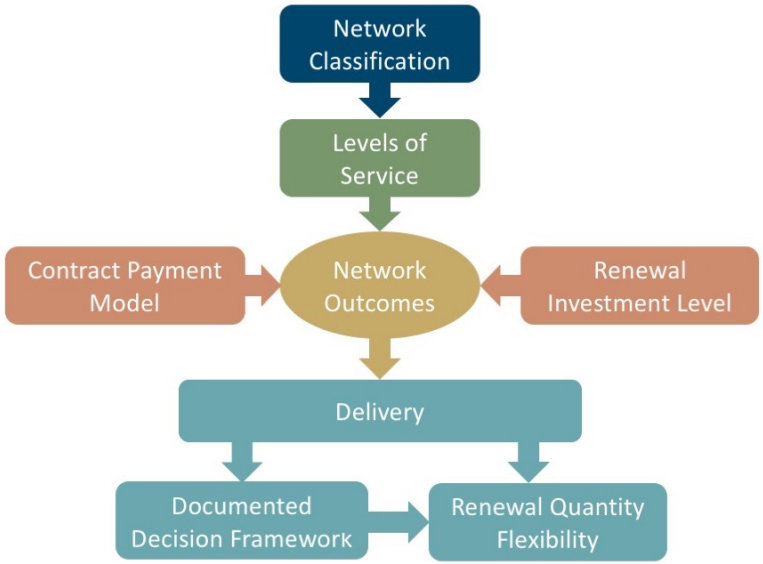
Network Outcome Contracts (NOC) are aimed at improving the effectiveness of service delivery for maintenance and operations of the state highway network. Elements of previous procurement methodologies (PSMC, Hybrid and Traditional models) have been integrated into the NOC contract model which delivers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

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

The contract process for the NOC is shown below:

Figure 6 - NOC Process



Collaborative delivery of services

This corridor is within the Northland NOC contract area, which extends from Warkworth to the top of Cape Reinga.

Northland Network Outcomes Contract

The Northland NOC contract is undertaken by Fulton Hogan. The contract was awarded in July 2015 for a 7-year period, with the option for a further 2 years based on performance.

This contract is supported by the following specialist maintenance contracts:

- **Traffic signal maintenance northland:** Curry Electrical through the Whangarei District Council contract which was awarded in 2015 and has a 3+1+1 contract term.
- **Traffic monitoring sites:** Agfirst was awarded this contract in July 2016 and has a 3+2+2 contract term.
- **Regional bridge and structures:** Opus was awarded this contract in 2015 for a 3+1+1 term.
- **Electrical supply:** Genesis and Meridian are the two suppliers of electricity for the NZ Transport Agency along the route.

Drivers for change

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

Whangarei urban area development

Whangarei District Council (WDC) is currently undertaking a review of the city-wide transport strategy that will identify the transport needs for the next 30 years together with the priorities for implementation. WDC is undertaking this review through a business case approach and the Transport Agency is involved in the development of this strategy. Population growth is occurring outside of the city centre and the strategy is exploring ways of meeting the needs of this growth.

Northport is also an important piece of infrastructure for the Northland region with a total throughput growth of 33% forecast over the next 25 years. There is considerable opportunity for more freight to use Northport. Improved transport infrastructure is a recognised factor in realising this opportunity.

Increased economic activity

There are a significant number of trips associated with cruise ships that arrive in the Bay of Islands and Auckland, with visitors on these cruise ships completing day tours through Northland. As the number of cruise ships visiting the Bay of Islands increases, it is expected there will be more coach-led day trips placing increasing pressure on SH10 and SH11.

Economic activity in Ngawha, just east of Kaikohe on SH12, is expected to result in increased traffic volumes in the corridor. Top Energy plan to expand the existing power station, which in turn will enable the development of a potential new saw mill. In addition, the inmate capacity of the Ngawha Prison is being increased. This economic activity could increase demand on the SH1 section of the corridor.

Whangarei and Kaitaia are the two largest settlements in Northland, and as such there is considerable movement of goods, services, and people between the centres. The towns have strong links for goods and services, as well as primary produce freight for the rest of New Zealand and beyond.

Kaitaia is the last major settlement on SH1 and second largest in the Far North Region after Kerikeri (on SH10), as such the town provides significant services for a large area of the region. Depending on the journey purpose, the journey between these two cities can occur on either SH10 or SH1. Heavy vehicles make a higher percentage of total traffic volumes on these two routes compared to other parts of the road network in Northland. Increased growth in the Northland region will result in an increase of the flow of goods and services between these two areas.

Northland regional growth programme

The Tai Tokerau Northland Economic Action Plan (NEAP) was an all of government economic development plan released in February 2016 to guide a series of projects and initiatives aimed at stimulating and transforming the Northland region's economy. The NEAP collates these projects into four common work streams, being:

- **Enablers**: bringing Northland's transport, digital infrastructure, skills and capabilities, and water resources to a standard that creates an enabling environment for economic development in Northland
- **Land & water**: To identify and develop opportunities for more productive use of land and water resources across a range of primary industry sectors
- **Visitor industry**: to reduce the impact of seasonality, improve product dispersal across the region and enhance tourism promotion
- **Specialised manufacturing and services**: to support the development of new innovation and specialised manufacturing and service sectors.

The need to improve logistics and transport infrastructure is a key work area within the Enablers stream. The latest NZ social deprivation index shows that Northland is one of the most socially deprived areas in New Zealand and this impacts on the transport environment as well, with an older vehicle fleet and poor driver choices such as a higher proportion of alcohol related accidents and driver licensing challenges (large number of unlicensed drivers).

Improved transport not only supports increased economic prosperity of Northland, but also enhances the socio-economic characteristics of the 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.

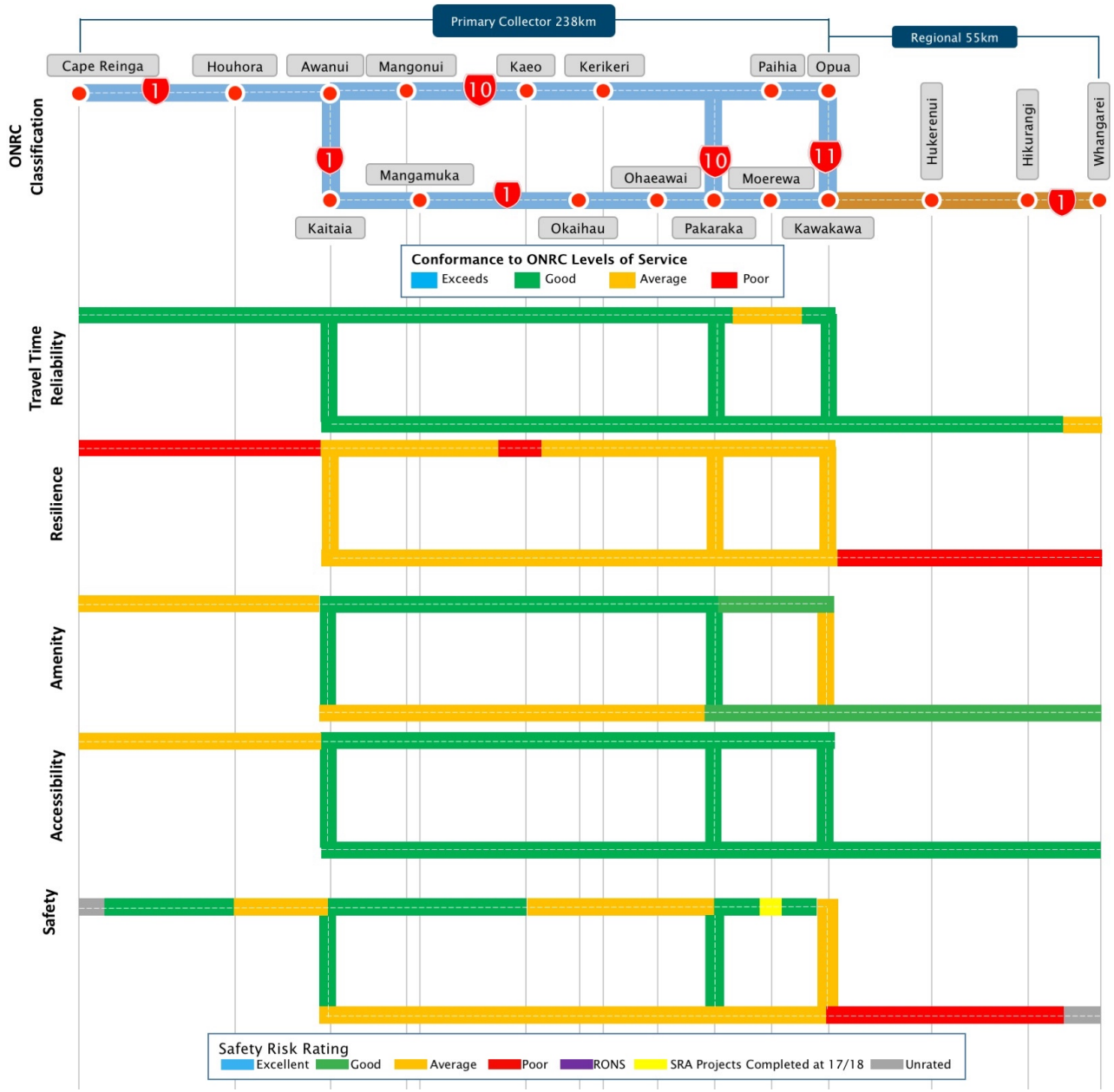
Road classification

The corridor from Whangarei to Kawakawa is classified as Regional as it acts as the key tourist and commerce link between the city and the upper parts of Northland.

The remainder of the corridor is classified as a Primary Collector as it serves as the key route for regionally and locally significant destinations and forms part of the significant scenic Twin Coast Discovery route.

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 Whangarei to Kaitaia corridor is currently performing against the ONRC Levels of Service expected for the relevant classification of each section.

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 across the corridor. There are some small variations in travel time for commuters on the north approaches to Whangarei via SH1 during peak periods. Additionally, there are also some variations around Paihia, Kawakawa and Kerikeri during holiday peak periods as demand increases significantly compared to typical demand.

Resilience

The section of the corridor between Whangarei and Kawakawa has a high level of resilience risk due to the lack of a viable alternatives and frequent weather-related events which can close the network for extended periods.

Flooding regularly causes SH1, SH10 and SH11 to be closed to vehicles. In some instances, all roads can be closed during the same event, isolating areas. The worst of these events in the last two years closed both SH1 and SH10 for over a week causing major disruption to the region's economic performance. In addition, supermarkets ran out of food, and service stations out of fuel. These are significant social impacts as a result of poor resilience in the transport network. There are viable alternatives to the section of SH1 north of Kawakawa, however these routes are still susceptible to long term closures from landslips. Resilience is poor on SH1 between Awanui and Cape Reinga, where no alternative routes are available for the communities residing along the route.

The corridor is ranked low in priority as part of the State Highway Network Resilience National Programme Business Case. However, the Tai Tokerau Northland Economic Action Plan and Northland economic indicators point to the need for increased investment in road infrastructure, including investment targeting resilience, in order to support economic growth. This is particularly true if Northport growth forecasts are realised, and there are increased heavy vehicle volumes on the road network.

Amenity

The amenity of the corridor is relatively consistent. The sections of SH1 and SH11 have varied and discernible roughness due to deferred maintenance and the geological conditions of the corridor. SH10 has a consistent and higher level of amenity than both SH1 and SH11 respectively. This is predominantly due to the quality of the road pavement surface.

Despite the quality of the road surface, the corridor generally provides a positive experience with townships providing regular stopping opportunities and amenities.

Accessibility

The corridor shows general conformity with what is expected of a Primary Collector route. Whilst there are a number of local accesses, particularly within town centres on the corridor, this is to be expected. The corridor caters to 50Max vehicles, however there are a number of bridges within the corridor that do not have sufficient strength for HPMV vehicles.

Safety

There are sections along the route where the safety level of service is poor, and the KiwiRAP star rating is below the desired rating for the road classification.

As well as localised safety issues, there are also a number of socio-economic factors effecting safety outcomes in the area where education and behaviour change interventions are required. Pressures on the corridor include the presence of out of context curves, road side hazards and increased volumes of tourist and visitor traffic.

Personal risk along SH1 is high between Awanui and Pakaraka. There are numerous high personal and collective risk sections along the corridor between Cape Reinga and Whangarei. KiwiRAP Star rating along the corridor is either 2 or 3-star, this rating denotes major deficiencies in some road features.

Between Kaeo and Pakaraka and around Mangamuka, there is a high potential to reduce fatal and serious injuries. Targeted medium-high cost improvements along these sections will benefit the safety rating.

Improving the customer experience

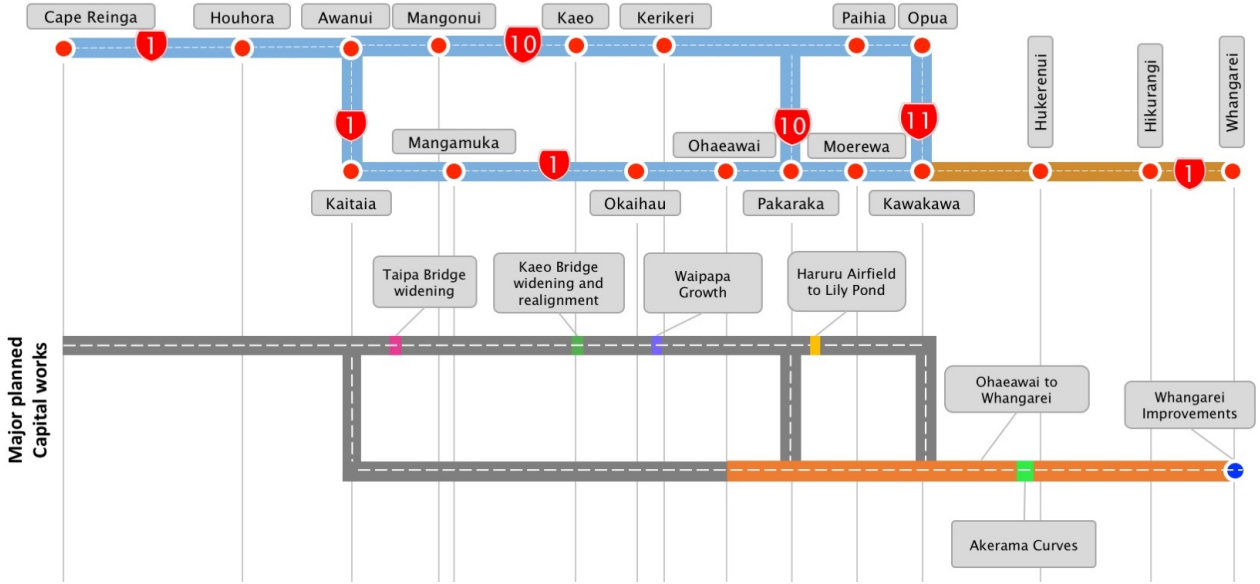
In responding to Customer Levels of Service it is important to acknowledge that significant improvements to the corridor are planned or underway. Figure 8 shows the planned improvements in the corridor.

When completed, the planned improvements on the corridor will result in the removal of all but one single lane bridge across the entire corridor and safer movement of vehicles at critical intersections. This will improve the efficiency of the corridor, and lead to improved reliability of journey times for road users.

There are localised safety improvements at known accident locations to improve the safety of the network for all users. This includes the improvement of SH1 near Akerama Road, called the "Akerama Curves" project. Planned improvements are discussed in greater detail later in this document.

Growth in the region has necessitated improvements to the network at Waipapa to improve safety and facilitate growth

Figure 8 – Significant corridor planned improvements



Access

Carriageway configuration

The carriage configuration is consistent throughout the corridor. The carriageway is typically one lane in each direction with few formal passing lanes. These passing lanes are typically on the uphill direction of hills throughout the corridor.

Speed limits

The corridor generally has a posted speed limited of 100km/hr, with sections through some of the smaller towns and rural communities along the route dropping to 70km/hr. There are 50km/hr speed limits in Kaitaia, Awanui, Kaeo, Paihia, Kawakawa and Whangarei. Kaeo and Pukenui (north of Awanui) are also subject to a 50km/hr speed limit. Safety considerations due to the topography result in an 80km/hr speed limit on SH11 on the southern side of Paihia, and also near Kerikeri.

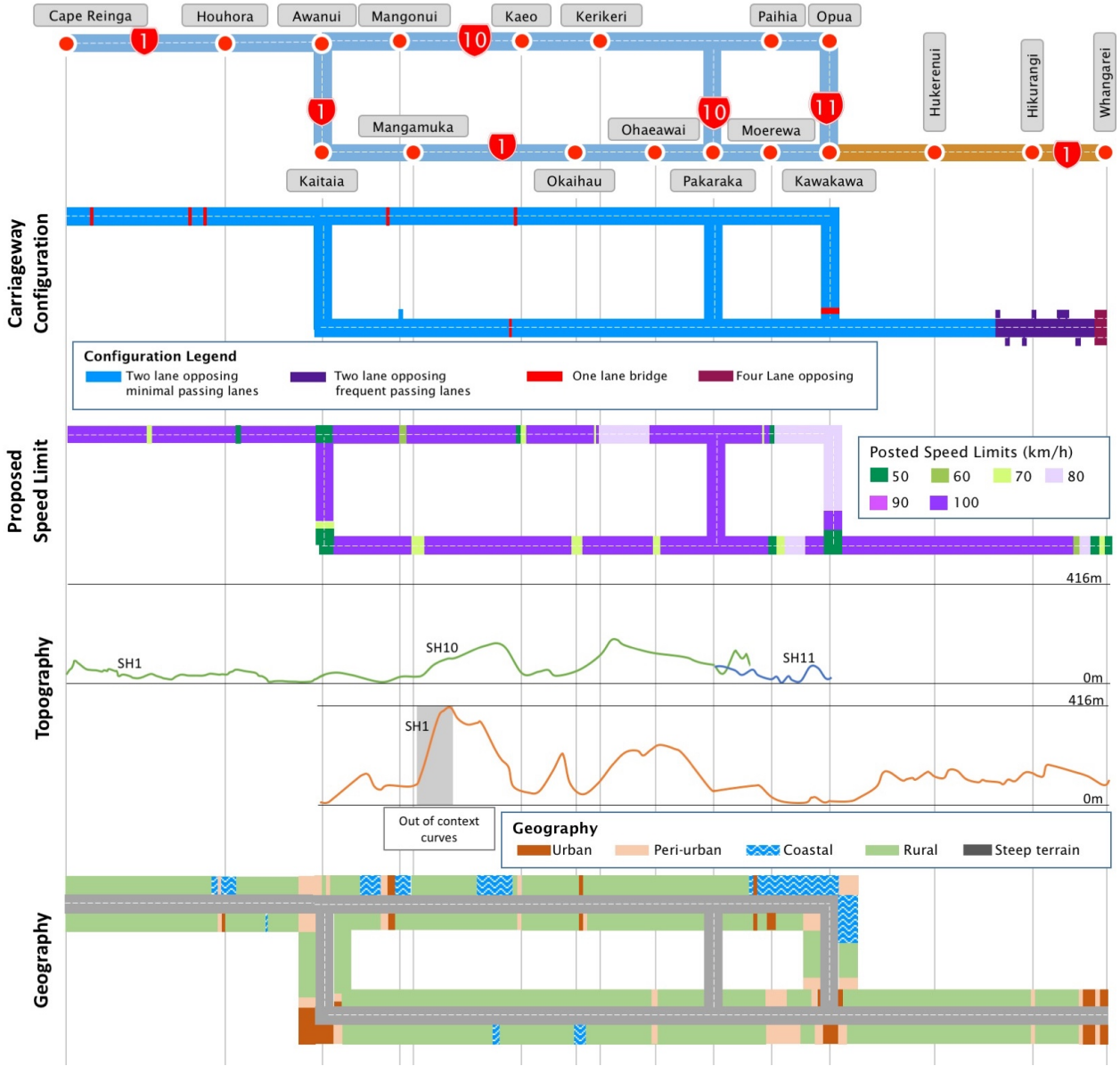
Topography/geography

The corridor is predominantly rural in nature and undulating with sections of steeper hilly terrain. Sections of SH1, SH11 and SH10 follow a coastal route.

The most significant topography in the corridor is through the Mangamukas on SH1 south of Kaitaia. The corridor section north of Awanui is relatively flat as it approaches the top of the North Island at Cape Reinga.

The geology in the area is poor in a number of areas making construction and maintenance of the roads more challenging, with the ground susceptible to movement.

Figure 9 - Corridor characteristics



Horizontal alignment

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

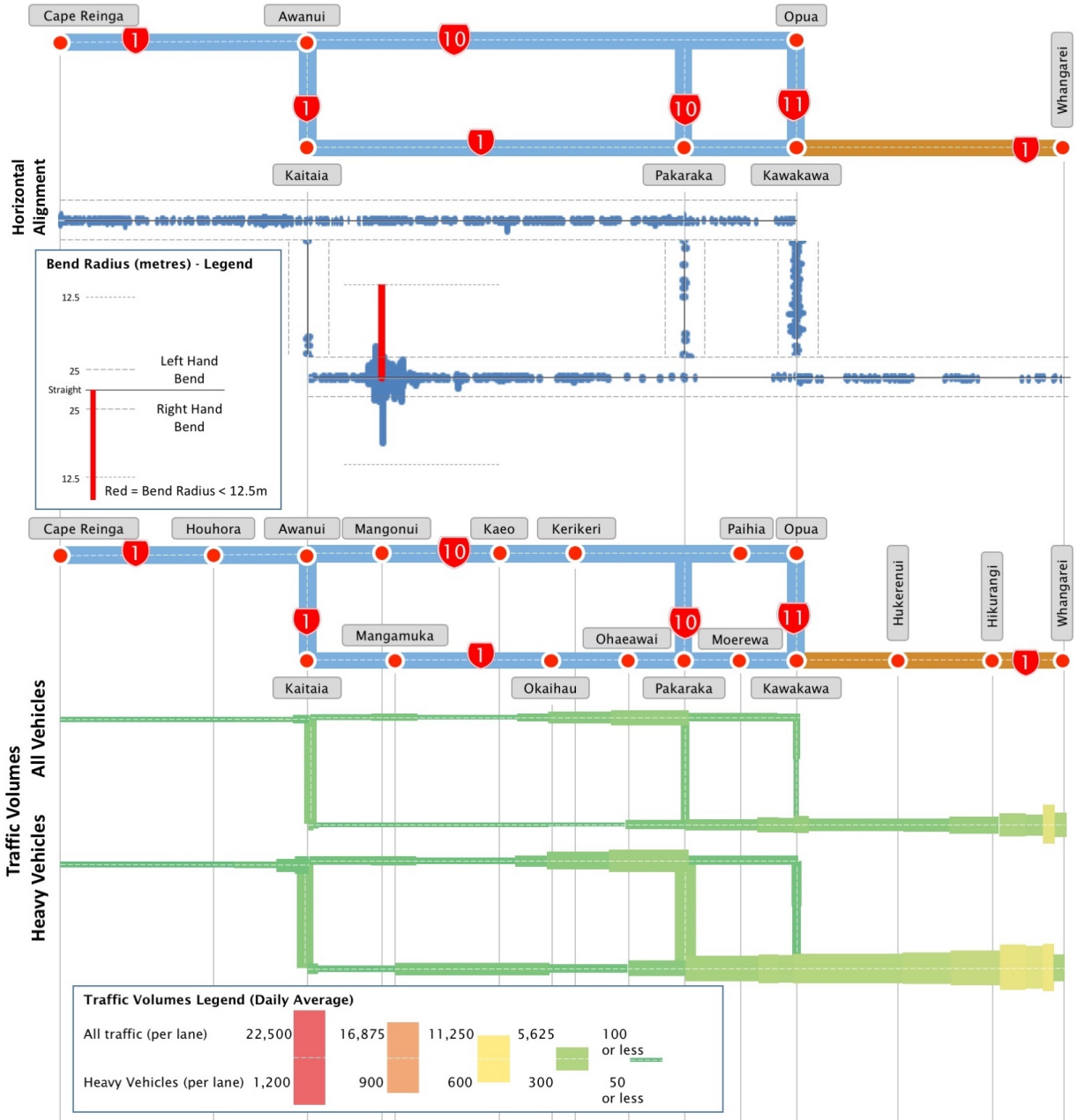
The Mangamukas contain a number of tight curves with a radius under 25m, including one severe bend with a radius below 12.5m.

Volumes

As would be expected, traffic volumes are heaviest in the corridor closest to Whangarei. Heavy vehicle volumes are at their highest nearest to Whangarei, with SH1 taking a greater share of heavy vehicle traffic volumes. There is also an increase in traffic near Kaitaia.

There is a high percentage of heavy vehicles along the corridor and particularly SH1 south of the SH1/SH10 intersection, highlighting the importance of SH1 in the area for the movement of goods and services.

Figure 10 – Horizontal alignment and traffic volumes



HPMV routes

SH1 between Whangarei and Hikurangi is the only section of the entire corridor that has HPMV potential once bridge strengthening is undertaken. The remainder of the route is available to 50Max vehicles, but is not available for HPMV.

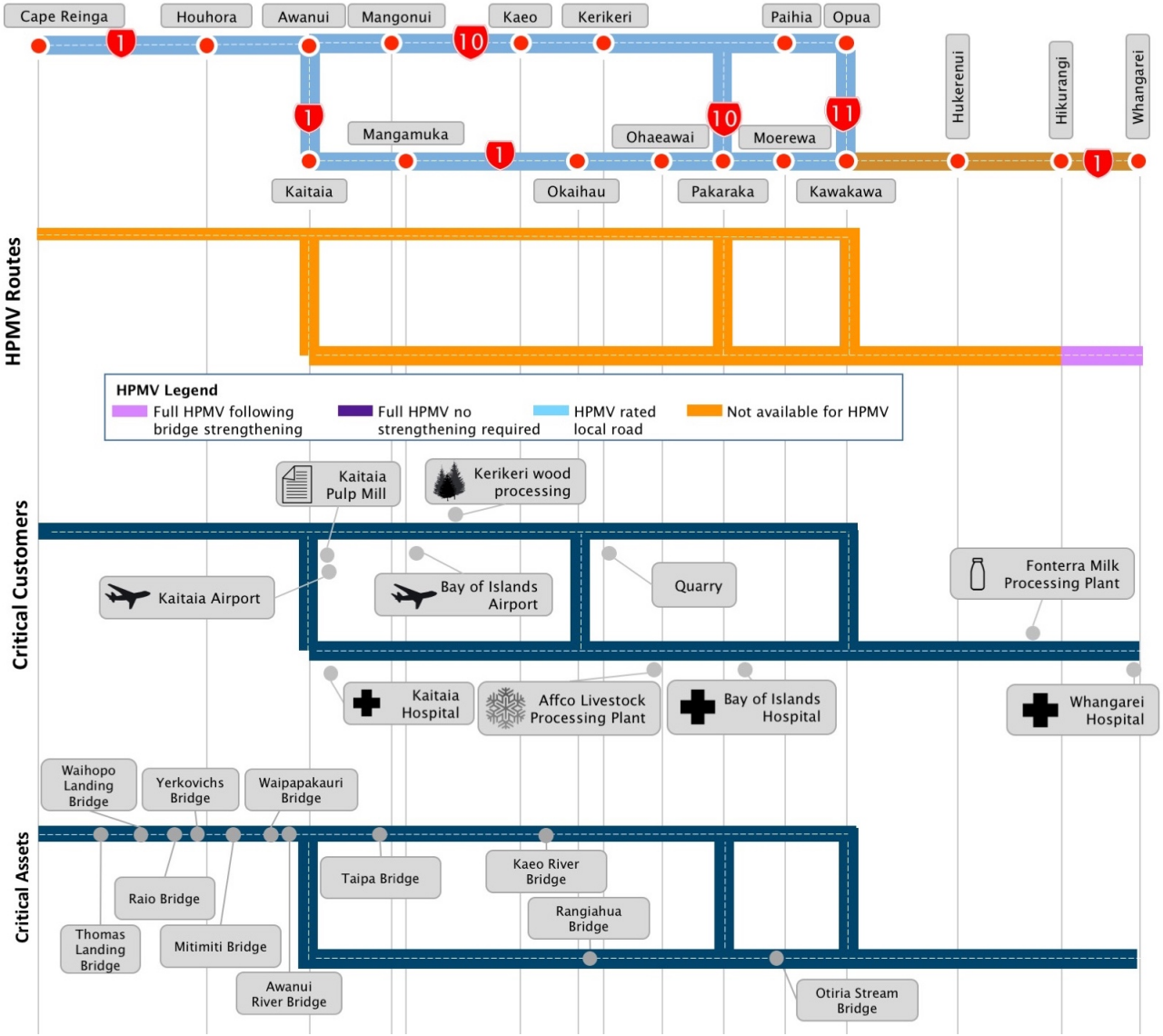
Critical customers and assets

There are a number of critical customers adjacent or close to the corridor who rely on the corridor being available at all times, and are vulnerable to having short term interruptions. These customers include the airports at Kaitaia and Kerikeri, the Kaitaia and Bay of Islands hospitals and the Fonterra Kauri dairy factory.

There are also a number of critical assets of road infrastructure along the corridor that require enhanced maintenance focus that would significantly disrupt services along the corridor if they were to fail. An example of this is the retaining walls through the Mangamukas which are susceptible to failure due to the ground conditions in the area.

The Taipa bridge is a critical asset which is programmed for improvements to enhance access for pedestrians and cyclists

Figure 11 – HPMV routes, critical customers and assets



Pressures

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

- **Town-centre friction:** Increased activity in and around the town centres along the route are causing continued conflicts between the through traffic in this area and the customers accessing these towns. This is particularly evident in Kaitaia, Paihia and Kawakawa.
- **Road closures:** The topography and ground conditions in the corridor area means that the corridor is susceptible to closures and a high maintenance burden which creates increased disruption to customers as a result of a higher number of road closures for maintenance.
- **Seasonal traffic congestion:** During holiday periods the congestion on the network around holiday destinations such as Paihia and the one-way bridges on SH10 creates increased delays and requires temporary traffic management and monitoring in these areas.

Flooding can make the corridor inaccessible

Future considerations

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

- **Improving asset resilience:** Maintaining and developing a quality asset with greater resilience, longer life and lower maintenance.
- **Electric vehicle infrastructure:** Increase in the electric vehicle fleet requires investment in suitable and conveniently placed charging points, such as at frequented tourist destinations like Paihia, Kerikeri, and Kawakawa.
- **Tsunami threat:** The threat in coastal areas along SH10 and SH1, particularly at locations with low lying coastal roads, such as Mangonui and Paihia, is an increasing threat and road levels may need to be raised. It should be noted that for significant threats mitigation cannot realistically be achieved.

Resilience

The corridor is in effect the 'spine' of the road network in Northland, as the main route linking Northland with Whangarei and the rest of the country via SH1. There are however important parts of this network that have a significant resilience risk profile. This includes the Mangamuka range area on SH1 and SH1 and SH11 near Kawakawa.

There are alternative routes available, but these options are usually time consuming particularly for heavy vehicles. The section north of Awanui is the only viable route for those looking to access Cape Reinga and the intermediate settlements.

Vulnerabilities

The corridor is susceptible to flooding for a significant proportion of its length, particularly through the coastal areas. The most vulnerable areas include Kaeo, Horeke, SH1 south of Kawakawa and at Whakapara. In some instances these events have closed the route for days.

There is also a susceptibility to slips and rockfall through the steeper areas of topography during wet weather events. These events are scattered around the corridor, with particular areas of susceptibility on SH1 at the Mangamukas, SH10 hear Kaeo and SH11 near Opua.

Alternative routes and diversion lengths

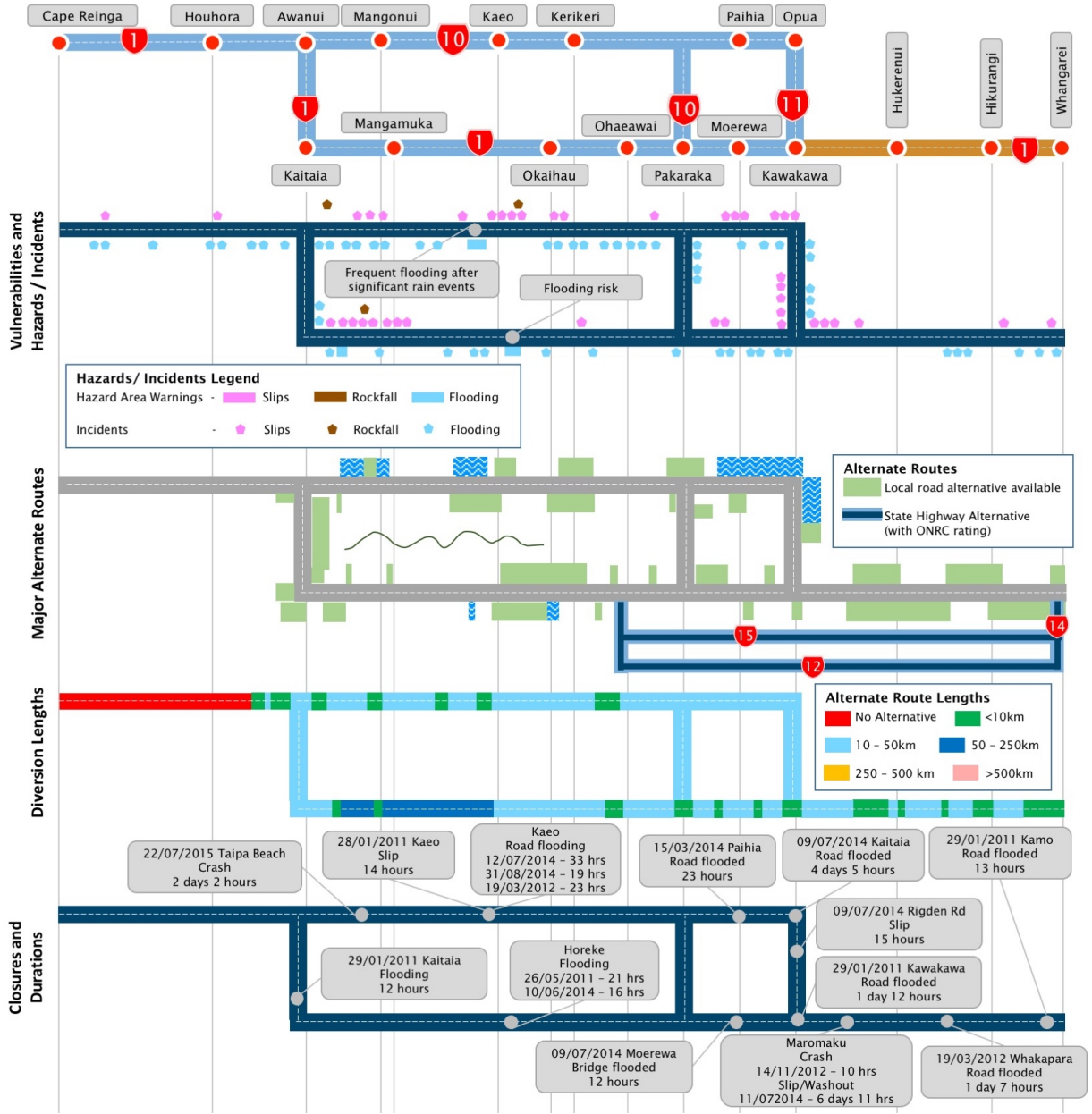
The majority of the corridor has a number of alternative local routes which result in a diversion length typically less than 50km. However, the majority of the routes are not appropriate for all heavy vehicles, particularly HPMV and are also subject to closure from extreme weather events at the same time as the highway.

The stretch of SH1 over the Mangamukas has the worst alternative route availability with the alternative route being greater than 50km, and SH1 north of Awanui has no alternative routes.

Closures and duration

The major unplanned road closures and duration of interruption along the corridor in the last 5 years are shown in Figure 12. These range from a few hours to over six days.

Figure 12 – Resilience



Pressures

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

- **Flooding and storm surge/high tides:** The corridor is susceptible to large weather events, reducing the resilience within the corridor area and also between Northland and the rest of the country. This is particularly the case for SH1 just south of Kawakawa where there are limited and lengthy alternatives (that are also susceptible to flooding at the same time), with Kaeo also susceptible to flooding. Coastal sections of SH10 and SH11 are particularly susceptible to storm surges and king tides along coastal sections.
- **Topography and geology:** Weather events that result in flooding can also result in slips (both under and over) as a result of the terrain, that close the corridor partially or completely. This is particularly an issue in the Mangamukas, on SH10 south of Kaeo and on SH11 near Opua, and results in increased delays. The over slips can typically be dealt with promptly, however under slips often result in longer delays and more complex repairs due to the retaining walls or other structures required.
- **Lack of industrial storage space:** Just in time delivery arrangements and lack of warehousing within Northland restricts the supplies to communities during closures, and makes re-opening the road more critical.
- **Sub-standard alternative routes:** Alternative routes are of poor quality and are often unsealed, increasing safety risks when used. Temporary traffic management of these routes can be limited and is costly.
- **Lack of mobile telephone communications:** Limited or no coverage on parts of the Northland network can delay emergency services response.
- **Limited corridor redundancy:** There are sections of the corridor, such as just south of Kawakawa on SH1, where flooding risks are significant and SH1 is susceptible to closures during flood events. The corridor is also susceptible to long term failure due to the proximity of SH1 to waterways that flood regularly.
- **Availability of appropriate material:** The long distances and travel times for acquiring high quality and high performing materials, which are typically located in Auckland, place restrictions on the intervention options that can be used during road maintenance and construction. This is most noticeable in the isolated and higher-risk areas of Northland, such as SH10 and SH1 in the Far North. Due to these limitations, the cost and logistics of implementing certain options are difficult and therefore less attractive.

Future considerations

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

- **Road widening and realignment:** Measures such as widening to reduce the impact of disruptive events, such that traffic might be able to use one lane of the road. The relocation of roads further from current streams, rivers, and coastal areas to reduce the risk of erosion at that occurs at these locations would increase resilience.
- **Raising road levels:** The threat in coastal areas along SH10 and SH1, particularly at locations with low lying coastal roads, such as Mangonui and Paihia, is an increasing threat and road levels may need to be raised. It should be noted that for significant threats mitigation cannot realistically be achieved.
- **Development of viable alternative routes:** Both SH1 and SH10 rely on each other as alternative routes, however, increasingly large weather events are affecting both routes. Investment is needed to ensure that at least one of these key routes remains open in such events, or further alternatives are available. In other areas, there are a number of alternative routes available to customers, however they often need local knowledge to use. Some routes are also not 'friendly' to heavy vehicles. Access to, and information about the alternative routes could be improved through a programme of investment, such as identifying appropriate alternative routes, implementing improvements, and communicating routes to freight operators.
- **Increased use of technology:** The ability to know when an incident has occurred and to advise road users of such incidences, is an area that could be enhanced to assist in dealing with disruptions as they arise. The use of permanent VMS signs at key locations along the corridor will enable delays and incidents to be communicated quicker allowing customers to make decisions about journeys.

Reliability and efficiency

Efficiency

Overall the corridor comfortably carries traffic within capacity constraints. There are however a few areas of congestion around townships. Kerikeri and Paihia in particular are congested throughout the day and during peak times as through traffic and local traffic compete for road space.

During summer peak holiday periods this congestion worsens considerably with lengthy delays at some intersections near Kaitaia, Paihia, Kerikeri and Kawakawa. This is exacerbated when cruise ships come into the Bay of Islands, with the number increasing each year. Movements at the intersections of SH1 and SH11 at Kawakawa and at the SH1/SH10 intersection at Pakaraka can experience lengthy delays during these peak periods.

Variability

There is a lack of data for this corridor in regard to travel time variability. Observations indicate that the variability is acceptable given the level of demand on the corridor. However, the high proportion of heavy vehicles and tourist traffic does affect the variability.

Commercial vehicle average speed

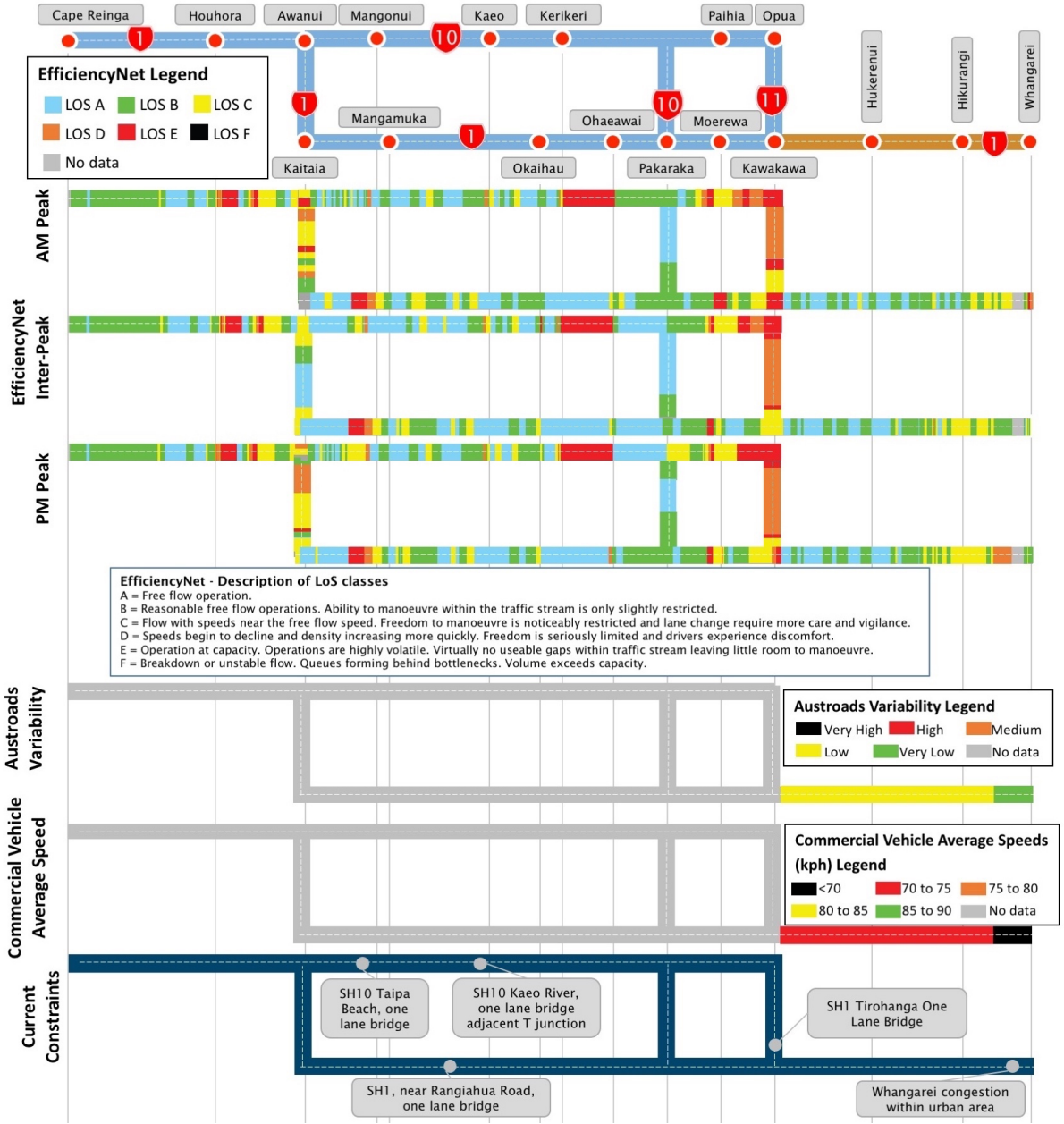
Average speeds for commercial vehicles on SH1 are relatively low for SH1 between Whangarei and Kawakawa, achieving only 70-75km/hr. Average speed slows even further closer to Whangarei.

There is no data elsewhere in the corridor, however anecdotal evidence of speeds elsewhere on the network indicate a similar level of speed for commercial vehicles, with considerably lower speeds on SH1 over the Mangamuka ranges south of Kaitaia.

Current constraints

The major current constraints on the network affecting journey reliability and efficiency are shown in Figure 13. These predominantly relate to the one-way bridges across the network on SH10 and SH11.

Figure 13 - Reliability and efficiency



Pressures

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

- **Delays to through traffic:** Towns and cities along the corridor typically have speed restrictions associated with them which results in delays to through traffic. There is also increased conflict between through traffic and traffic in the towns. This is creating a reduction in efficiency along the corridor, particularly in locations such as Kawakawa and Paihia.
- **Seasonal congestion in town centres:** During summer holiday periods the influx of tourists into the region creates spikes in demand at key locations, including Paihia, Kawakawa and Kerikeri. This creates increased congestion in peak periods and queuing on the main streets of these towns.
- **Topography and road geometry:** Commercial and heavy vehicles are a significant portion of the trips in the region and their efficiency and cost of travel is affected when there is congestion or slower speeds. The gradients on some of the hilly section of the corridor, such as the Mangamukas, further reduces the speeds of heavy vehicles and this impacts on the reliability and efficiency of other vehicles on the corridor.

The responsive traffic lights at the pedestrian crossing on Paihia's waterfront are designed to provide a better balance between pedestrian safety and traffic moving through the town centre

Future considerations

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

- **Fast response to incidents:** Being able to respond quickly and efficiently to incidents on the network is important to maintaining a reliable and efficient journey for customers. This requires a higher level of response from emergency services, maintenance crews and requires better provision of information to travellers, in order to return network function or provide options to travellers. It may also require the strategic location of plant and equipment close to vulnerable areas of the corridor for a more efficient response to events.
- **Increased information for motorists to inform decision making:** This corridor has the benefit of both SH1 and SH10 being available to customers between Kawakawa and Kaitaia. Better information could inform customer travel choices. Tourists in particular often travel a loop from Paihia to Cape Reinga. Increased information could help to manage the flow of customers to spread the demand, particularly during summer peak periods.
- **Intersection upgrades to cater for demand:** As the transport demand increases across the corridor a number of significant intersections will require upgrading to provide for the safe and efficient movement of customers and their goods. This includes the intersection of SH1 and SH11 at Kawakawa, a number of intersections in Kaitaia, the intersection of SH1 and SH10 at Awanui and the intersection of SH1 and SH10 at Pakaraka.
- **Improved passing opportunities and slow vehicle lanes**: Investment in passing and slow vehicle lanes, and replacement of single lane bridges will improve the operation and experience for all customers.

Safety

Collective risk

Although collective risk along the corridor is varied there are large segments of high or medium-high collective risk, particularly between Kaeo and the SH10/SH11 intersection, Ohaeawai to near Hukerenui, SH1 south of Awanui and around Hikurangi.

Personal risk

Between Cape Reinga and Awanui, personal risk varies between low and high. On SH1 between Awanui and Pakaraka via Kaitaia, the corridor is high risk with only two small segments of medium risk. On SH10 between Awanui and Paihia there is a low risk rating, although it is high again around Paihia.

From Moerewa to Whangarei, the risk level varies between low to medium-high.

Star rating

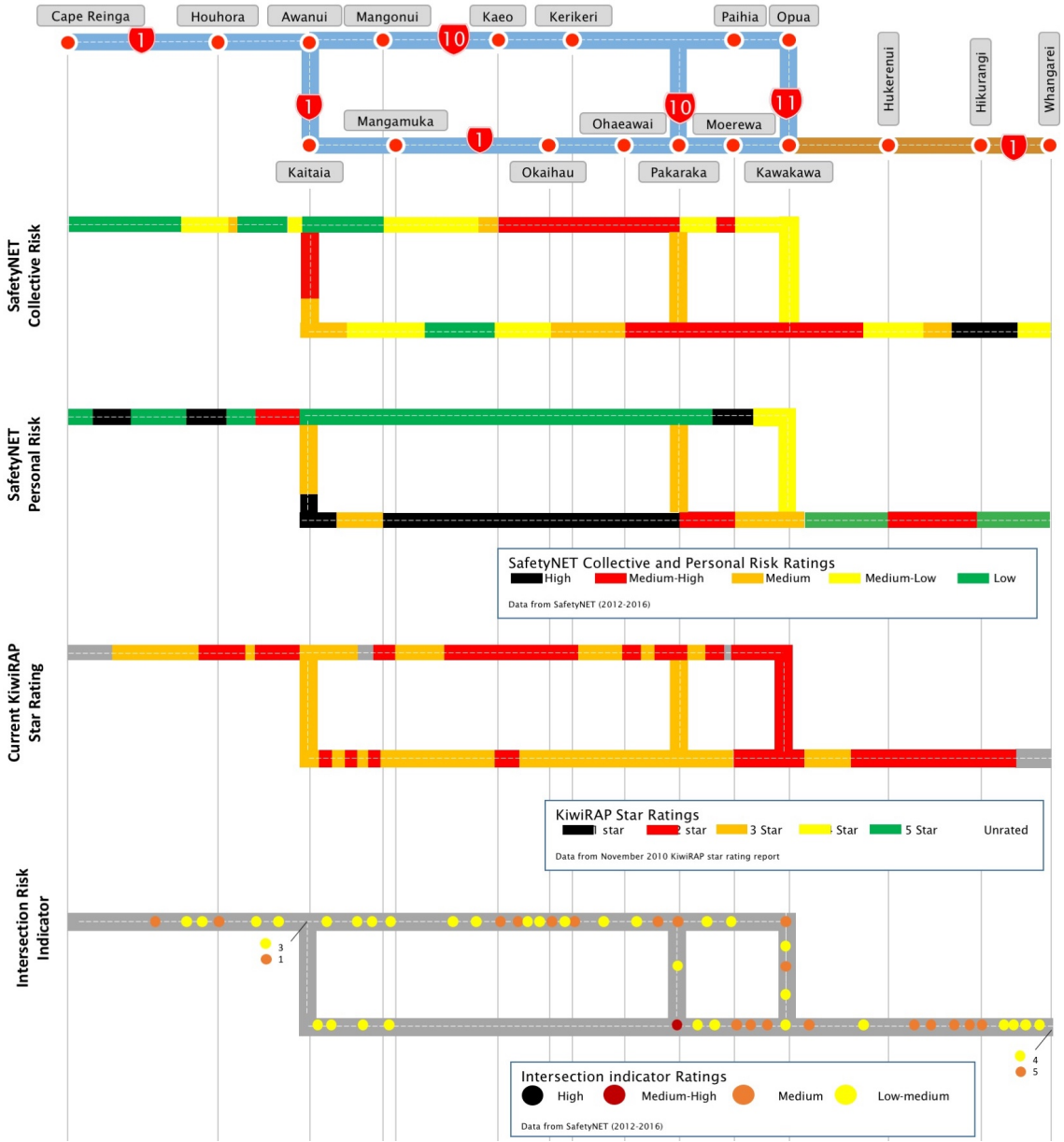
The corridor has a 2 or 3-star rating with some parts of the corridor being unrated.

The Regional road portion of the corridor has a target 3-star equivalent or better rating. The current star rating falls below the ONRC target with large sections being rated 2-star.

Intersection risk indicators

There are no high-risk intersections along the corridor. There are medium risk intersections located along SH1, SH10, and SH11. There is one medium-high risk intersection at Pakaraka.

Figure 14 – Safety



Pressures

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

- **Tourism and visitor traffic:** Increased volumes of tourist and visitor traffic, coupled with long driving distances and varying levels of driver experience leads to increased safety risks and incidents during summer months.
- **Road side hazards:** Road side hazards are creating potential safety issues along the majority of the route.
- **High-risk curves:** The geometric alignment due to the topography of the corridor creates out of context curves on some hilly sections (such as the Mangamukas) with increased safety risks.
- **Surface skid resistance burdens:** There are three sites actively managed for surface skid resistance, being Lemons Hill, Turntable Hill and Mangamukas.

Unsuitable diversion routes for heavy vehicles create safety hazards for other road users.

Future considerations

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

- **Intersection improvements:** Improvement to intersections along the route where the different state highways intersect with one another. This includes the intersection of SH1 and SH11 at Kawakawa, the intersection of SH1 and SH10 at Awanui and the intersection of SH1 and SH10 at Pakaraka.
- **Alternative pavement materials:** The degradation of pavement surfaces places a burden on SCRIM management. Investigation into alternative pavement materials which provide an improved balance between cost and benefit may be warranted.
- **Safety improvement programme.** Continued implementation of the current programme of safety improvements along the corridor. This should also include improved line marking and signage near problematic curves designed to align and equip drivers to navigate the curves safely.

People, places and environment

Natural environment

There are a number of standout natural environmental features along the corridor and the visual character of the corridor provides attractive journeys for customers. This includes the coastal sections along SH10 and SH11 at locations such as Doubtless Bay, Mangonui Harbour and the Bay of Islands, as well as north on SH1 by Houhoura Harbour. The views along this section of the corridor are exceptional, and are characteristic of the Northland experience.

There are a number of areas of Conservation land along SH10, SH11 and SH1 north of Kawakawa, and SH1 near Cape Regina. These include the Mangonui, Opua, Omahuta and Maungataniwha forests. These areas have high environmental value, and place restrictions on road development and maintenance due to the environmental sensitivities.

Flora and fauna are not unique and generally reflective of the wider Northland area.

Noise, vibration and air quality

Noise, vibration, and air quality sensitive areas are not generally issues along the corridor. There is only one existing issue on the corridor, located at Ohaeawai where noise and vibration monitoring is being undertaken.

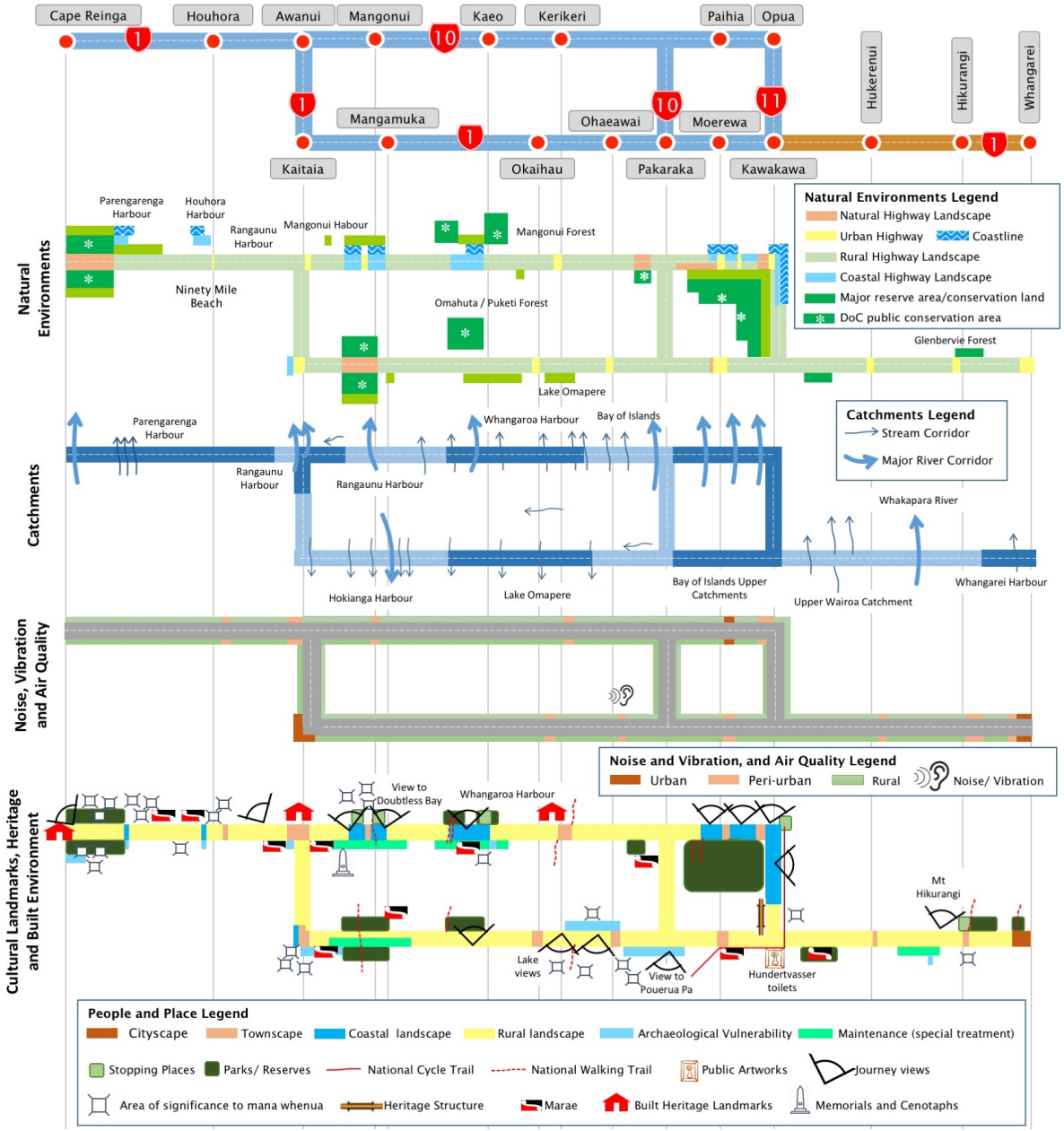
Cultural landmarks, heritage and built environment

The corridor provides access to wider regional facilities such as the Bay of Islands (from Paihia), and various locations along the eastern coast that are significant tourism destinations. Waitangi and the surrounding area is a highly significant cultural heritage destination.

The Kawakawa township has recognised built environment value with the Hundertwasser toilets, other buildings renovated in a similar style, and the heritage railway.

Cape Reinga features a unique built heritage landmark and tourist experience. There are a number of marae and culturally important sites along the corridor.

Figure 15 – People, places and environment



Pressures

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

- **Increasing frequency of severe weather events:** More intense rainfall and storms could increase the risk of erosion, rock fall, and slips in the corridor. This is particularly relevant to the coastal areas and also the areas of steeper gradients such as the Mangamukas. Active management of this risk will be required, including the strengthening of retaining structures and the use of vegetation to reduce the risk of over slips.
- **Stormwater management and inundation:** Flooding resulting from increased rainfall intensity events is an increasingly common issue and causing considerable disruption to customers and damage to the environment and the state highway infrastructure. SH10 has areas of the route near the coast and flooding occurs regularly (like in Kaeo). SH1 south of Kawakawa and SH11 south of Opua run parallel to the local rivers and coastal waterways that flood regularly and are eroding the structure of the state highway. It is anticipated that more effort will be required to protect the state highway structure from these waterways and also from flooding and disruption of the state highway.
- **Inappropriate stopping:** The views along SH11 and SH10 are exceptional and there are limited safe stopping places. Many therefore miss the opportunity whilst others simply stop in an unsafe location and risk their and other customers lives. The Twin Coast Discovery PBC is anticipated to help address this issue.
- **Proximity of sensitive cultural heritage and landmarks:** There are many cultural heritage places and landmarks located in close proximity to the corridor and are subject to increasing potential damage through both corridor management and environmental changes. Some of these places and landmarks may require or additional investigations and management of impacts.

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:

- **Increased investment in areas of environmental value:** Corridor maintenance and development potential through areas of high environmental value, including potential Conservation areas requires consideration. This may result in extensive engagement, costly environmental management, mitigation measures, and tighter controls.
- **Relationships with Iwi/Mana whenua:** Acknowledgement of iwi/mana whenua relationships is increasing along the corridor with their input to the management of heritage assets and landscapes actively occurring. The number of features and locations along the corridor of importance to iwi is expected to increase and these will need to be considered in corridor management and development activities.
- **Cultural and historical protection:** Increasing recognition of sites for cultural and historic importance, particularly relating to tourism economic drivers, could result in a need for enhanced protection of these sites and locations.

Mangamuka Summit Rest Area Fly Tipping is an increasing problem

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 399 km of road network which reflects 3.5% nationally. The total value of the assets along the corridor is $575M (excluding ITS, and, heritage and green assets).

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

Asset condition and performance summary

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

Figure 16 – Corridor asset base

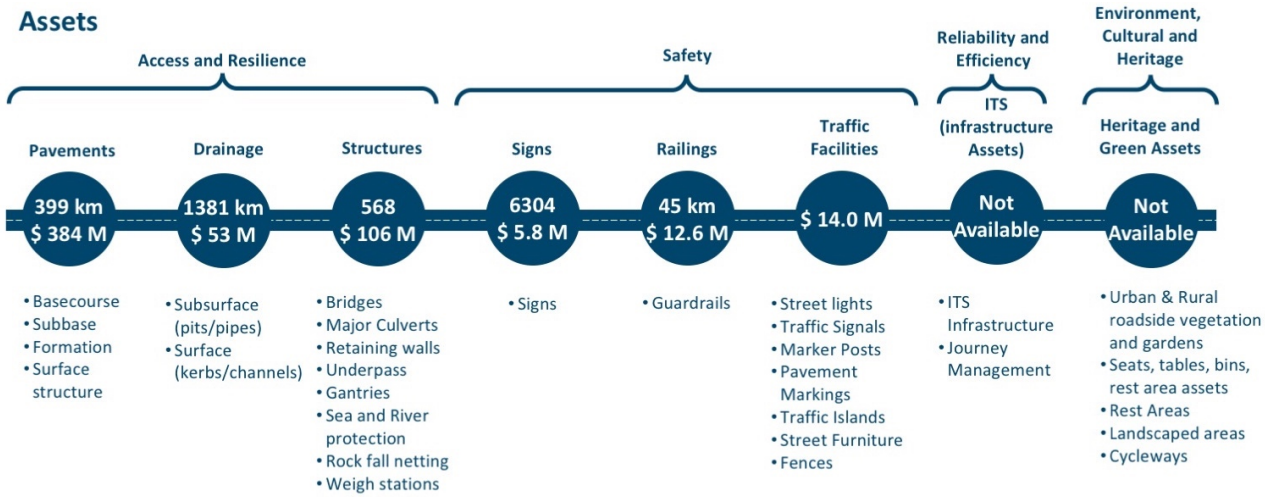
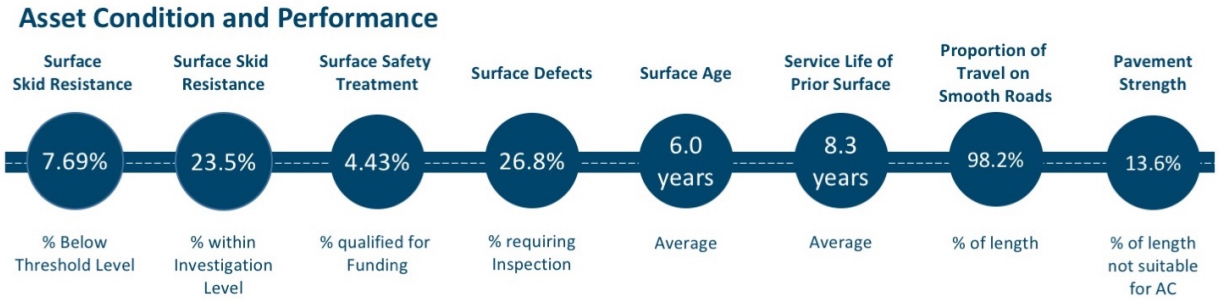


Figure 17 - Summary asset condition and performance



Asset condition and performance

Surface Skid Resistance

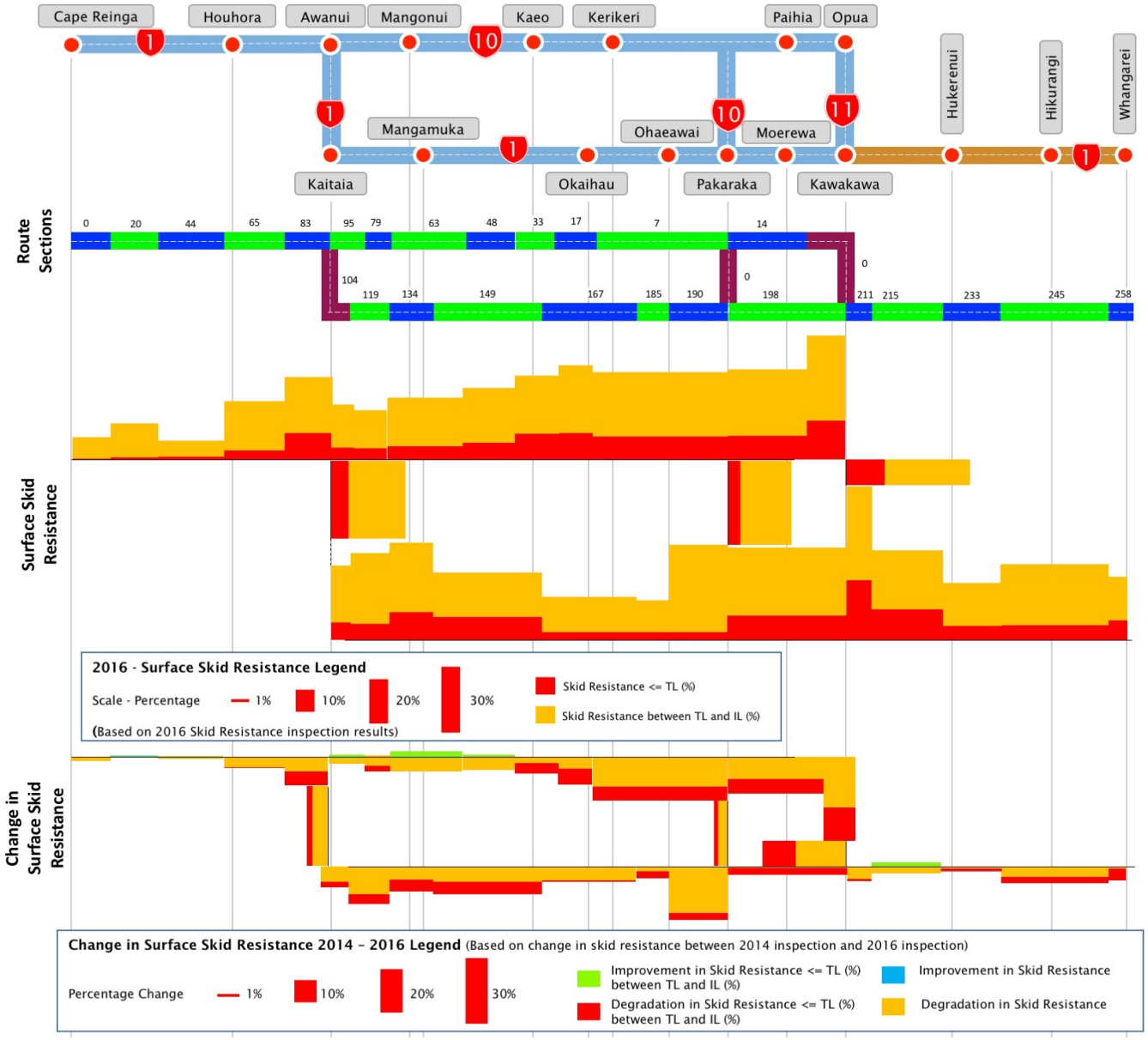
The infographic shows the proportion of the Route Section, as a percentage, that falls within the two levels of either threshold limit or investigation level. The change in Surface Skid Resistance infographic shows the change in the levels from the 2014 survey to the 2016 survey, as either an improvement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

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

Except for SH1 north of Ngataki the portions of surface skid resistance below the threshold limit and within the investigatory range are consistently high. As such, at 9.1%, this corridor has the highest proportion of surface skid resistance below the Threshold Limit compared to all other corridors.

Except for a couple of isolated areas surface skid resistance performance showed significant degradation across most of the corridor.

Figure 18 – Asset condition



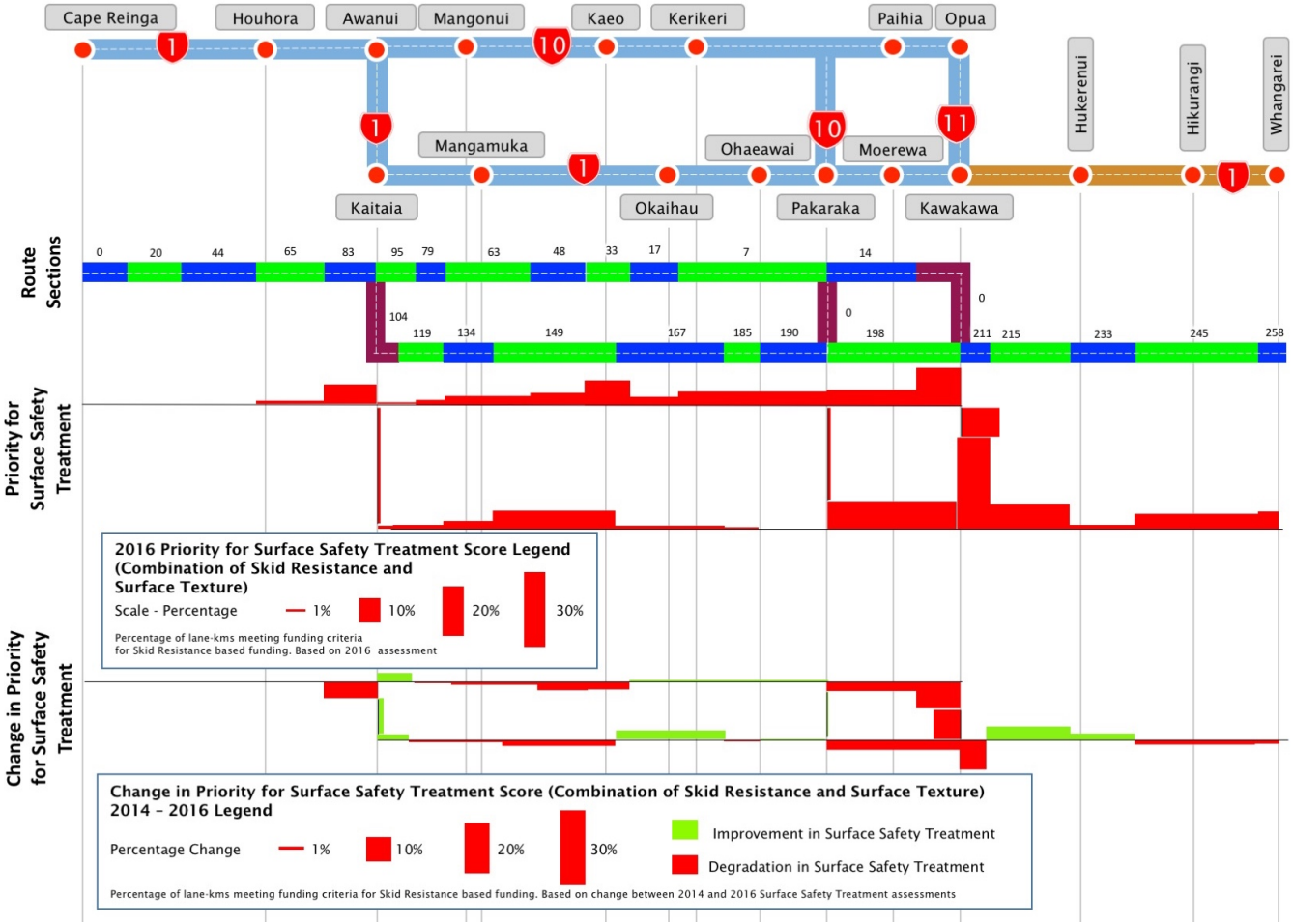
Priority for Surface Safety Treatment

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.

Surface skid resistance funding is justified for 35km, just over 4.43%, of this corridor. Sections with the highest priority for surface safety treatment score qualifying for funding are: 1N/198, 1N/211, and 1N/215 between Pakaraka and Hukerenui, and 11/0 between Kawakawa and Opua.

Figure 19 - Asset condition 2



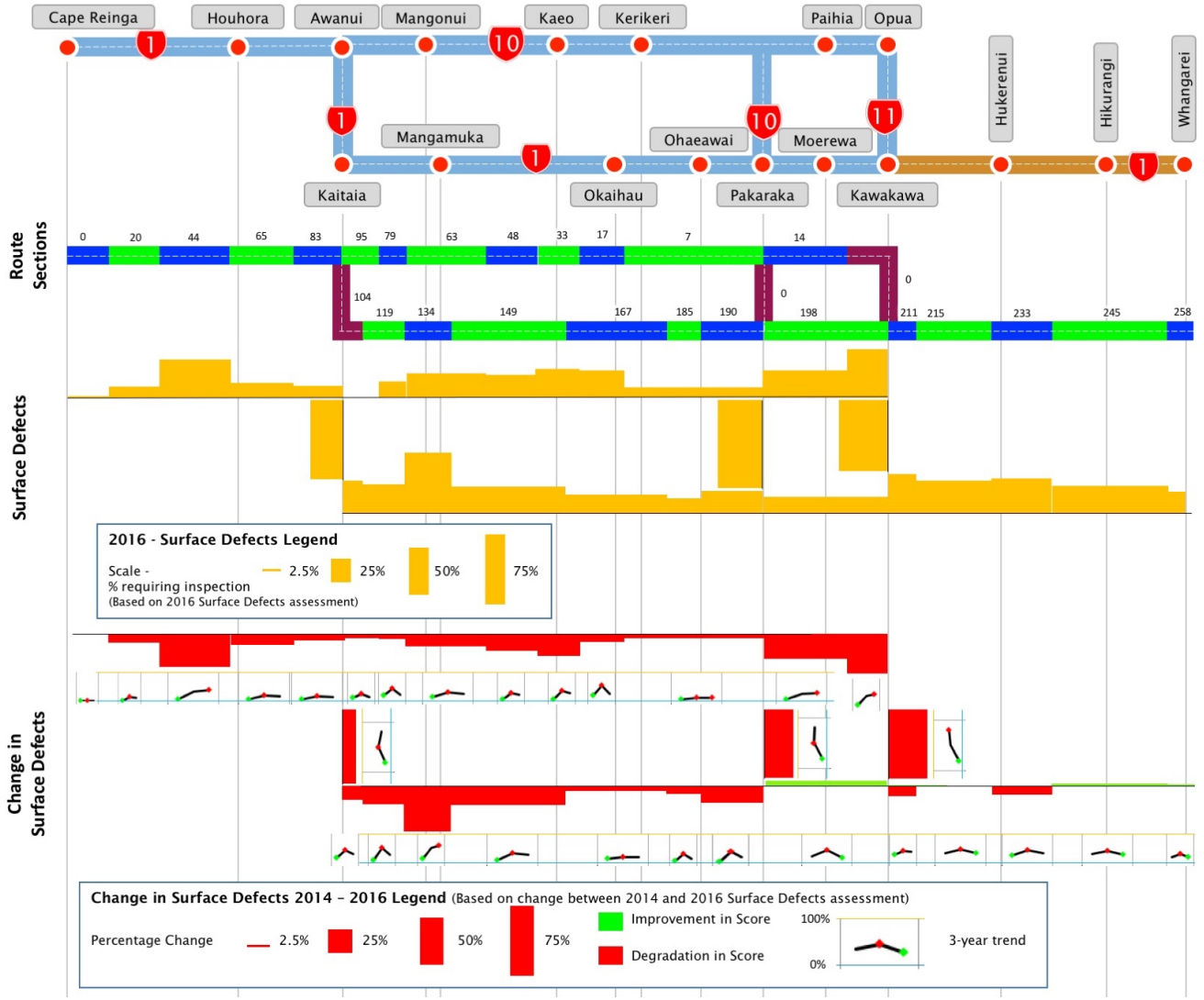
Surface Defects

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

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

Overall, 26.8% of the corridor achieves a score above which inspection is required. Sections with significant lengths of surface requiring inspection include: 1N/44 through Ngataki, 1/134 through Mangamuka, 10/0 between Pakaraka and Oromahoe, and, 11/0 Between Kawakawa and Opua.

Figure 20 – Asset condition 3



Surface Age

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

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

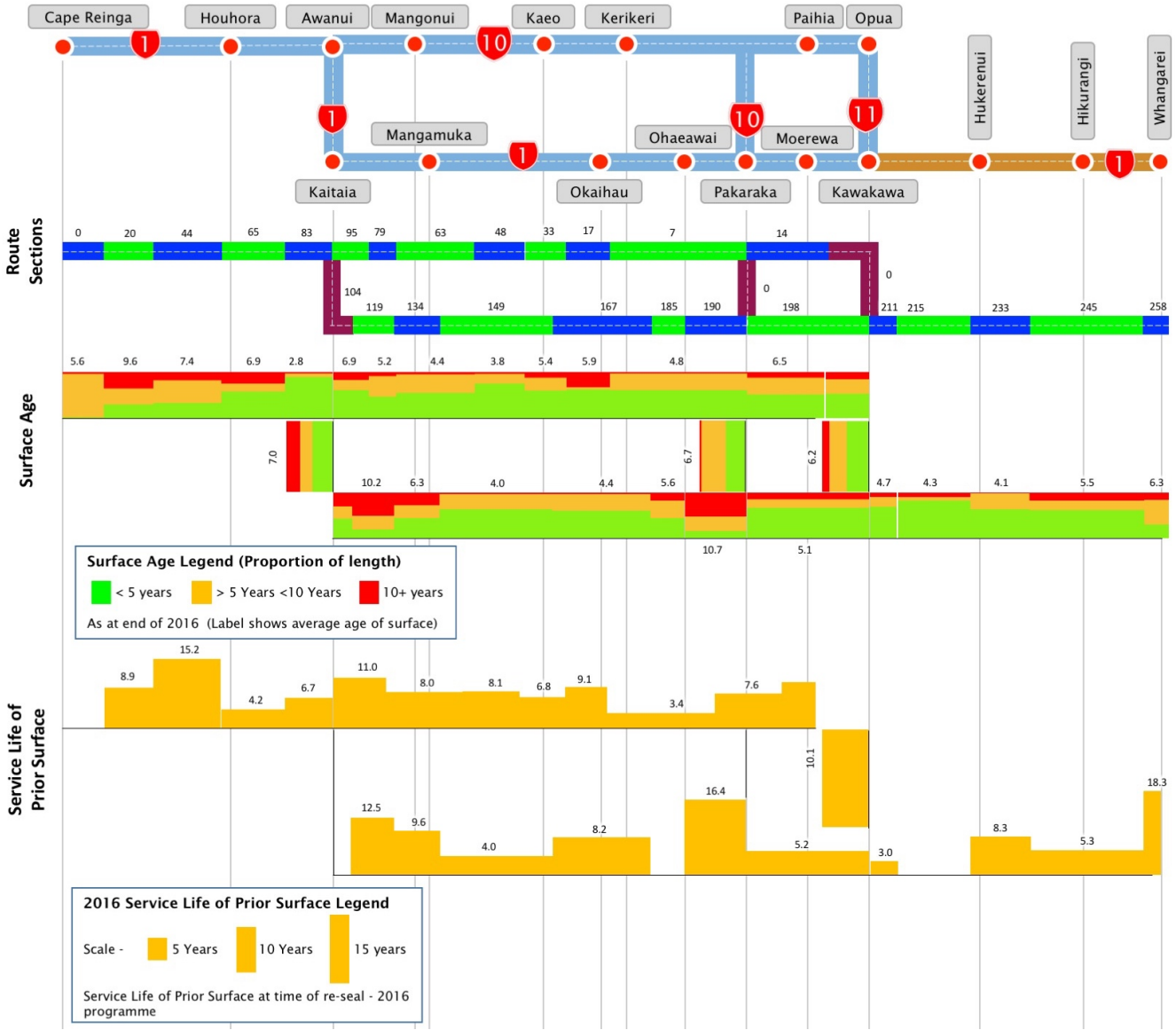
The sections of corridor with the oldest age profile are 1N/104 through Kaitaia and 1N/190 south of Ohaeawai.

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.

Five sections, 1N/44 through Ngataki, 1N/119 south of Kaitaia, 1N/190 south of Ohaeawai, 1N/258 in Whangarei, and, 11/0 between Kawakawa and Opua achieved a service life in excess of 10 years.

Figure 21 – Asset condition 4



Resurfacing

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

The major resurfacing works are planned for sections 1N/44 through Ngataki, 1N/104 through Kaitaia, 10/0 North of Pakaraka, 1N198 between Kawakawa and Pakaraka, and 1N/245 through Hukerenui.

Proportion of Travel on Smooth Roads

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

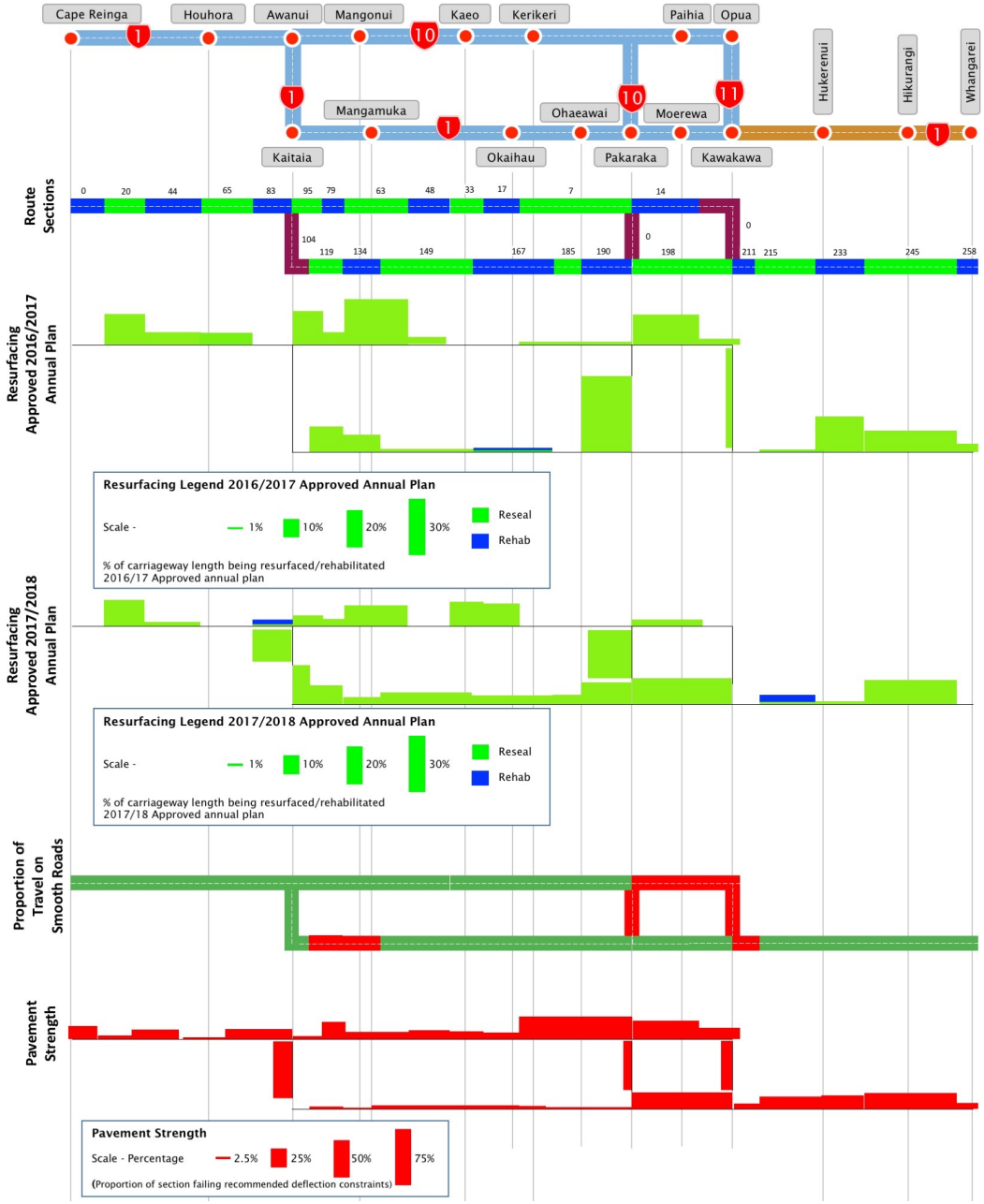
Sections of corridor with poor proportions of travel on smooth roads are SH11, SH10/0 north of Pakaraka, and SH1N/119 and SH1N/134 between Mangamuka and Kaitaia.

Pavement strength

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

The sections of corridor with the highest proportion of pavement failing to meet the deflection constraints occur at SH1N/104 between Awanui and Kaitaia, SH1N/198 between Pakaraka and Kawakawa, SH1N/245 through Hikurangi, and, SH10/7 South of Kerikeri.

Figure 22 – Asset condition 5



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:

- **Kawakawa to Whangarei:** This section of corridor requires higher levels of maintenance than the corridor north of Kawakawa, due to higher traffic volumes.
- **SH11 Kawakawa to Paihia:** – there is a need to ensure lane delineation on this section of corridor due to its high volume of tourist traffic.
- **Poor pavement base:** Much of the route is based on the original road alignment with no formal investigation of geotechnical aspects of the pavement base. This may cause future issues with the underlying base having not been fully prepared.
- **Poor aggregate:** Surface aggregate is of poor quality and susceptible to moisture. When the aggregate gets wet it degrades rapidly. In future, aggregate may have to be imported form out of region to ensure adequate surface lives.
- **Drainage:** Drainage issues exist throughout the corridor, with many flood-prone areas need targeted ongoing maintenance requirements to ensure access is maintained and the pavement is protected.
- **Surface skid resistance:** Surface skid resistance is a priority for surface safety treatment. This is a real issue on this corridor, and surface treatments are not keeping pace with the deterioration of pavement surfaces.
- **Asphalt:** – it is a 3-hour transport from Asphalt plants which then requires reheating. This has a detrimental effect on the quality of the product when laid. There is a need to ensure enough work to justify a mobile plant being bought into the region.
- **Holiday season:** There are additional operational and maintenance pressures during holiday seasons due to the significant increase in traffic during these periods.

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:

Asphalt: An improved supply of Asphalt, i.e. a plant closer to site, may be required if asphalt based treatments are to be more commonly used.

Use of emulsions: This may solve a lot of the issues with bitumen transportation, and could result in extending the construction season.

Drainage: - Seek to carry out improvement as part of NOC contract works, clearing outfalls and ditches.

Flooding closes the corridor

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 determine 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	$7,525	$8,395	$13,049
	Renewals	$13,480	$11,548	$18,280
	Improvements	$72,130	$49,900	$17,000
Reliability and Efficiency	Maintenance and Operations	$4,131	$4,285	$6,455
	Renewals	$318	$363	$508
	Improvements	$0	$0	$0
Safety	Maintenance and Operations	$6,734	$7,506	$11,730
	Renewals	$4,353	$5,084	$7,838
	Improvements	$41,000	$57,431	$34,920
People, places and Environment	Maintenance and Operations	$1,787	$1,677	$2,556
	Renewals	$250	$487	$648
	Improvements	$0	$0	$0
	Total	**$151,708**	**$146,676**	**$112,983**

Figure 23 – Corridor investment

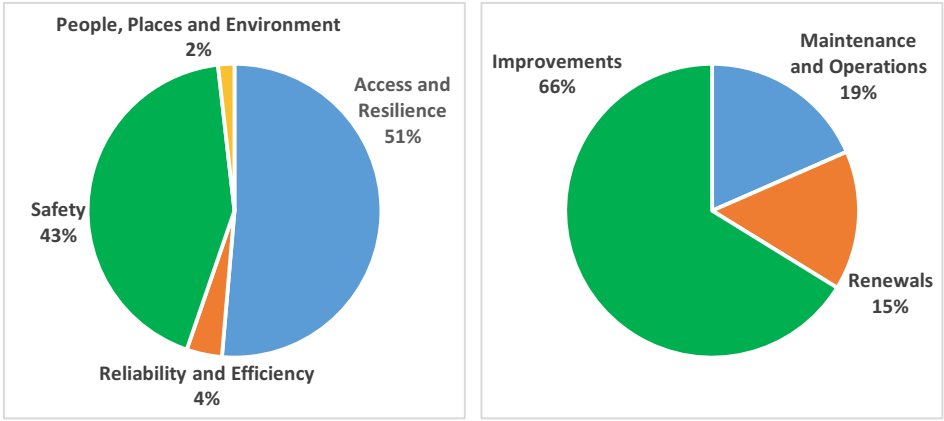


Table 2 - Summary investment by work category ($000)

Outcome	Work Category		2018-2021	2021-2024	2024-2027
Access and Resilience	111	Sealed Pavement Maintenance	$1,987	$2,605	$4,271
	112	Unsealed Roads	$0	$0	$0
	113	Drainage Maintenance	$333	$474	$738
	114	Structures Maintenance	$1,057	$1,153	$1,785
	121	Environmental Maintenance	$1,205	$1,301	$1,953
	122	Traffic Services Maintenance	$47	$57	$88
	124	Cycle Path Maintenance	$7	$7	$11
	151	Network & Asset Management	$2,359	$2,290	$3,440
	161	Property	$529	$508	$763
	211	Unsealed Road Metalling	$7	$7	$11
	212	Sealed Road Resurfacing (excl. surface skid resistance)	$7,551	$4,951	$9,461
	213	Drainage Renewals	$785	$456	$585
	214	Pavement Rehabilitation	$3,618	$4,499	$5,810
	215	Structures Component Replacements	$1,359	$1,519	$2,247
	222	Traffic Services Renewals	$160	$115	$165
	321 - 341	Improvements	$72,130	$49,900	$17,000
Reliability and Efficiency	121	Environmental Maintenance	$1,073	$1,151	$1,729
	123	Operational Traffic Management	$2,034	$2,151	$3,252
	151	Network & Asset Management	$928	$891	$1,336
	161	Property	$97	$92	$138
	221	Environmental Renewals	$318	$363	$508
	321 - 341	Improvements	$0	$0	$0
Safety	111	Sealed Pavement Maintenance	$2,242	$2,982	$4,828
	112	Unsealed Roads	$13	$13	$20
	113	Drainage Maintenance	$384	$227	$346
	114	Structures Maintenance	$249	$279	$425
	121	Environmental Maintenance	$107	$137	$206
	122	Traffic Services Maintenance	$2,257	$2,353	$3,535
	124	Cycle Path Maintenance	$0	$0	$0
	151	Network & Asset Management	$1,257	$1,292	$2,036
	161	Property	$226	$223	$334
	212	Surface Skid Resistance	$3,350	$3,566	$5,357
	214	Pavement Rehabilitation	$16	$32	$49
	215	Structures Component Replacements	$212	$790	$1,193
	222	Traffic Services Renewals	$775	$695	$1,240
	321 - 341	Improvements	$41,000	$57,431	$34,920
People, places and Environment	111	Sealed Pavement Maintenance	$414	$281	$460
	121	Environmental Maintenance	$1,087	$1,122	$1,685
	151	Network & Asset Management	$230	$220	$330
	161	Property	$57	$54	$81
	221	Environmental Renewals	$250	$487	$648
	321 - 341	Improvements	$0	$0	$0
		Total	**$151,708**	**$146,676**	**$112,983**

To be confirmed through the RLTP

Operations and maintenance

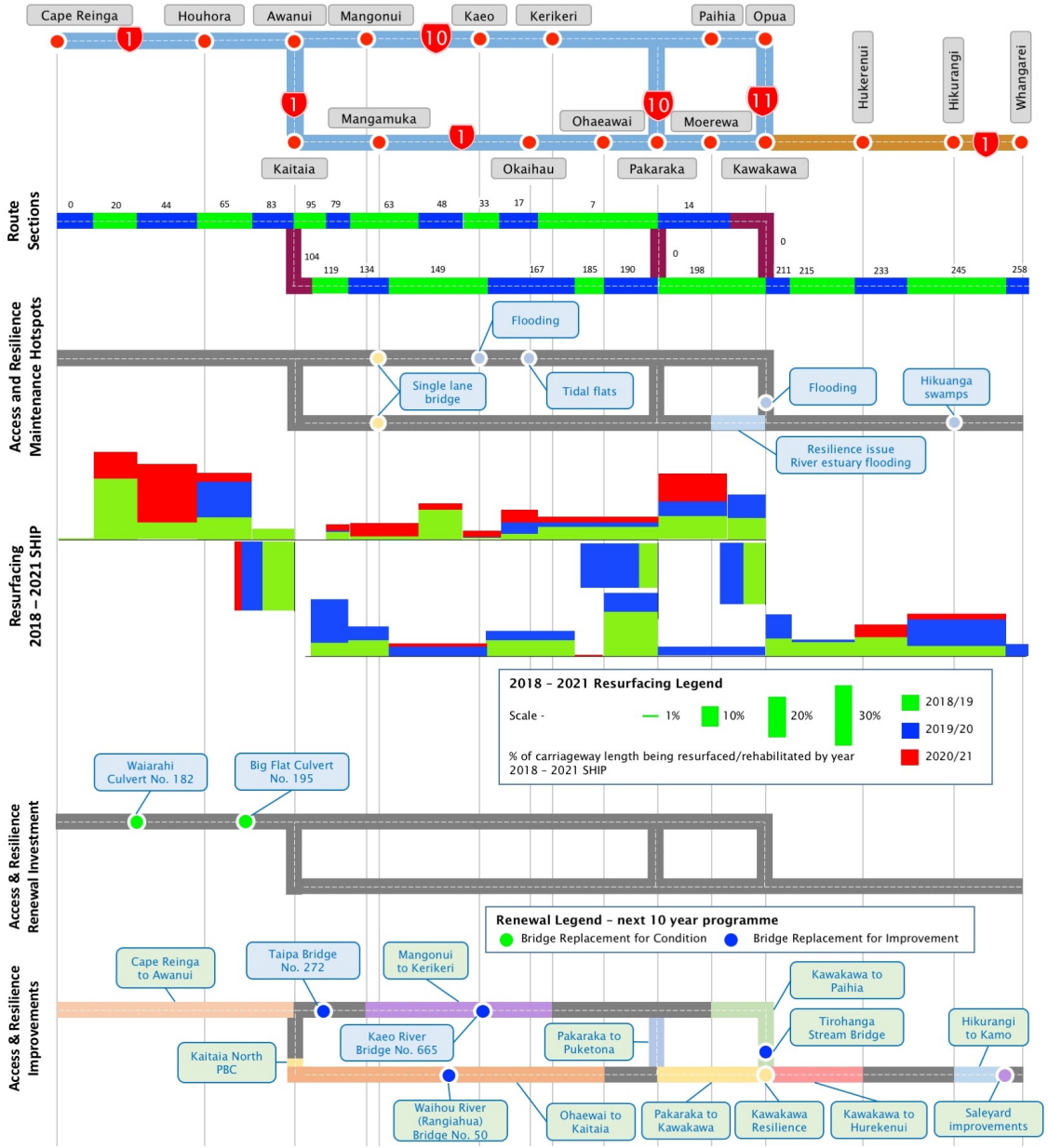
The main areas of investment to provide and preserve access and resilience are drainage maintenance, sealed road surfacing and structural component replacements and vegetation control. A key focus is to realign the base preservation quantities toward increased preventative maintenance and to slow pavement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

Maintenance hot spots

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

- **Mangamukas:** There is a single lane bridge that floods regularly.
- **Cape Reianga to Awanui:** This is the only route in and out of this area and so has a high importance for resilience as residents would be completely cut-off if access to the corridor was lost.
- **SH10:** There are number of resilience issues relating to single lane bridges and flooding along SH10.
- **SH11:** – Over-slips, one-lane bridges, and tidal effects that damage seal are issues affecting the corridor between Kawakawa and Paihia.
- **Kawakawa to Moerewa:** There is a resilience issue associated with river and estuary flooding in this section of corridor. At Moerewa river flooding can cut the township off completely.
- **Hikurangi:** In this section, there is a swampy surrounding area that floods occasionally, having an impact on pavement moisture.

Figure 24 – 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: 1N/20, 1N/44 and 1N/65 between Te Hapua Road and Waiharara, 1N/104 through Kaitaia, 1N/190 south of Ohaeawai, 10/0 north of Pakaraka, and, 11/14 north of Paihia,

Structure Renewal

The renewal investment infographic shows the planned bridge replacements along the corridor. Two culverts are planned for replacement due to asset condition, at a total estimated cost of $0.9M.

Improvements

Structure Improvement

Four bridges are scheduled to be replaced for improvements reasons, at an estimated cost of $26M.

Planned

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

SH10 – Taipa Bridge

Description: The existing bridge has limited provision for pedestrians and does not provide for cyclists, both of whom are important components of the tourist economy. Improving facilities for people who enjoy walking and cycling, and highlighting Taipa's appeal as a popular swimming and fishing destination would encourage more visitors and contribute to the local economy. A new bridge would also provide the local community with safer, more reliable travel options.

SH10 – Kaeo Bridge

Description: Improvements are underway on the safety and resilience of Northland roads. The NZ Transport Agency (on behalf of the NZ Government), the Northland Regional Council and other partners are working together to get the job done and to help ensure the growth of Northland. The existing bridge will be replaced by a new, two-lane bridge and the road layout will be changed. The new road will be a smooth curve and the intersection at one end of the bridge will be upgraded, making it safer with a clear view of approaching traffic.

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
SH1 Kaitaia North PBC		Unplanned business and industrial growth in this location is leading to safety and operational problems on SH1
SH1 Saleyards improvements		Safety and efficiency improvements to address poor alignment, out of context curves and deficiency at intersections.
SH1 Rangiahua bridge (Resilience issue)		Improvements to SH1 to address resilience (flooding) problems including upgrading of existing one-way bridge
SH11– Tirohanga Stream Bridge		SH11 corridor and bridge improvements to address resilience and safety on this key tourism route.
SH1 Cape Reinga to Awanui		Resilience improvements on SH1 to address flooding problems
Kawakawa to Paihia		Resilience improvements on SH11 to address flooding
SH1 Pakaraka to SH10 Puketona		Resilience improvements to SH10 to address flooding
SH1 Pakaraka to SH1 Kawakawa		Resilience improvements to SH1 to address flooding
SH10 Mangonui to Kerikeri		Resilience improvements to SH10 to address flooding
Ohaeawai to Kaitaia (SH1)		Resilience improvements to SH1 to address flooding
Hikurangi to Kamo (SH1)		Resilience improvements to SH1 to address flooding
Kawakawa Resilience		Resilience improvements to SH1 to address flooding
SH1 - Kawakawa to Hukerenui		Resilience improvements to SH1 to address flooding

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

No reliability and efficiency related maintenance hotspots were identified for the corridor.

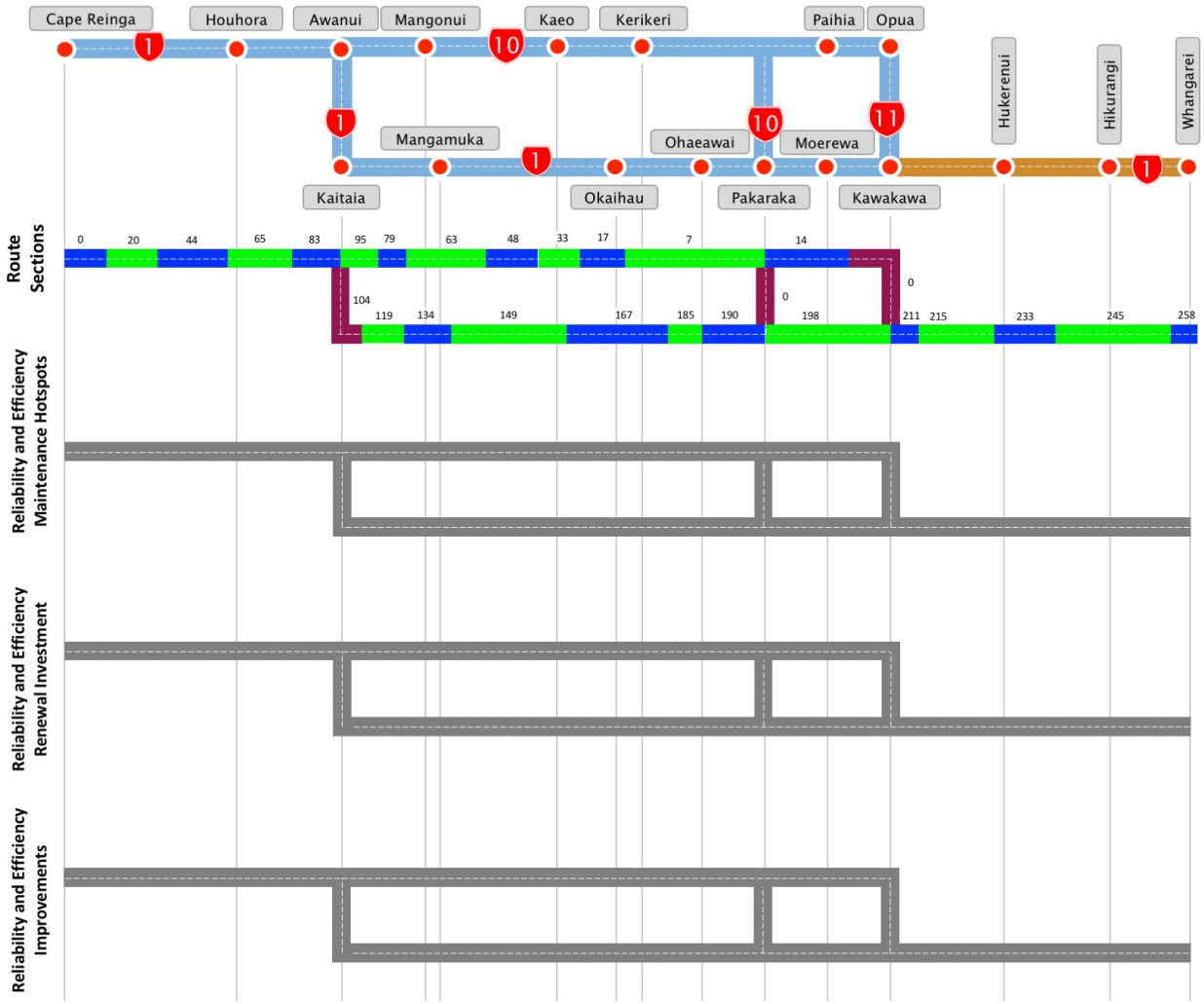
Renewals

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 25 – Reliability and efficiency investment



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:

- **SH11:** Road edge safety barriers are causing a maintenance pressure in terms of replacement following barrier strikes and access to the area behind the barriers. On this section of corridor, the formation width is the major contributing factor to crashes.

Gap programme indicators

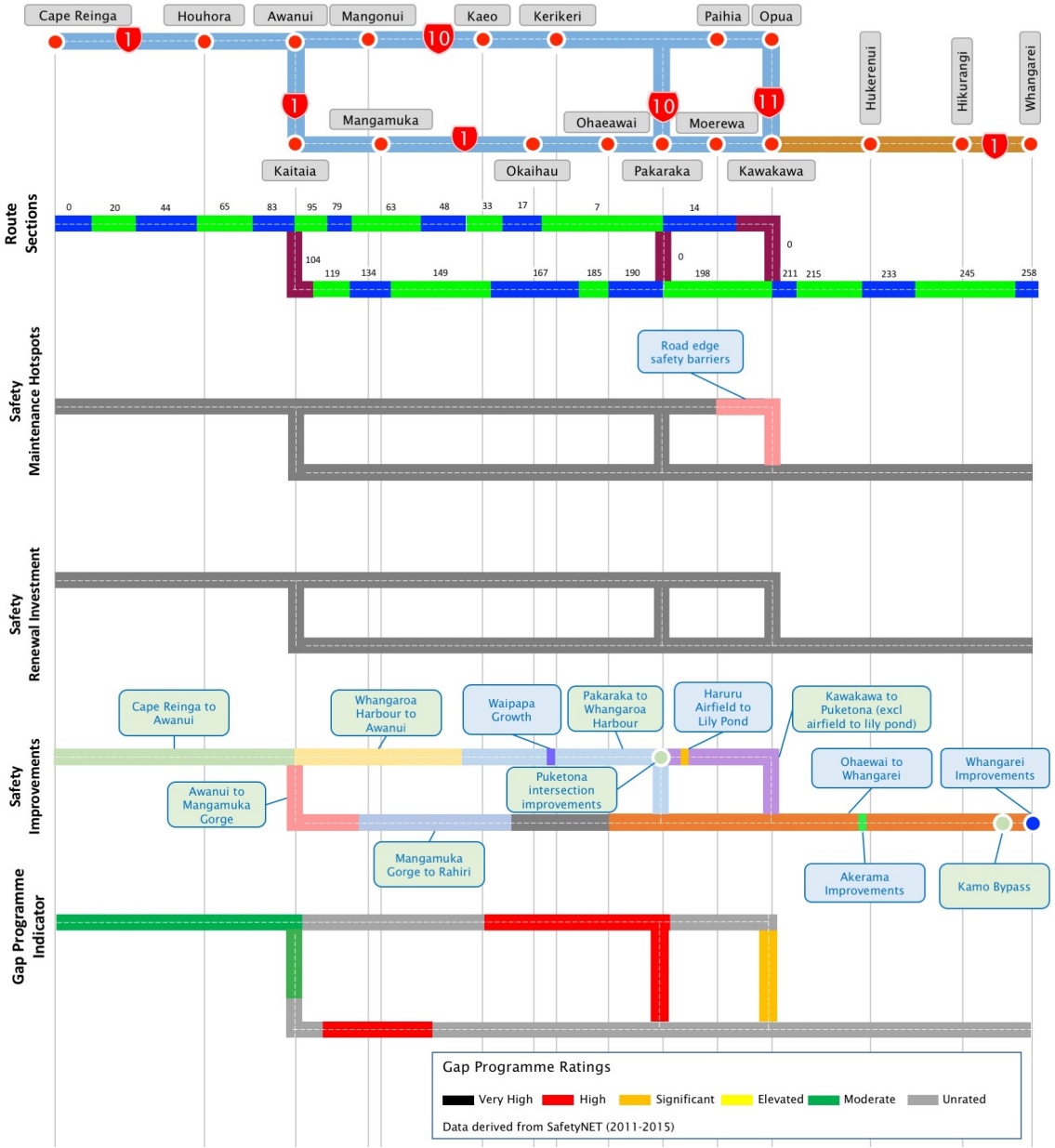
The potential for reducing fatal and serious injuries across the corridor has been assessed under the Gap programme. The Gap programme looks at the collective risk rating, likely level of intervention and the potential reduction in death and serious injury that may be achieved to determine a possible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

Between Kaeo and Pakaraka and around Mangamuka, there is a high potential to reduce fatal and serious injuries with targeted, medium-high cost improvements.

Along SH1 from Cape Reinga to the northern approaches of Kaitaia, there is a moderate potential to reduce fatal and serious injuries with the application of low cost, high coverage improvements.

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

Figure 26 – Safety investment



Renewals

There are no safety related renewals planned for the corridor.

Improvements

Planned

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

SH1N – Akerama Improvements

Description: The Akerama Improvements Project covers a section of State Highway 1 near Hukerenui, 35km north of Whangarei, from Barnes Road to Rusk Road. More passing lanes are being built and tight corners are being removed as part of the safety improvement work.

SH1N – Ohaeawai to Whangarei

Description: Development of a Programme Business Case has commenced. This will identify clear, standalone safety improvement opportunities for the long term. When/if identified then more detailed investigation works will commence.

SH10 – Waipapa Growth

Description: Both Waipapa and Kerikeri are growing at a rapid rate with Waipapa providing commercial facilities for the surrounding area. The Transport Agency is working with the Far North District Council and iwi to address transport constraints in the area.

SH11 – Airfield to Lily Pond

Description: Installation of wire rope barriers from Hurunui Airfield to the Lily Pond Bridge in area where there is risk of run-off-road crashes

SH1 – Whangarei improvements

Description: A combination of 6 projects along SH1 through Whangarei to provide a 4-lane highway between Selwyn avenue and Tarewa road. This will improve major intersections by removing bottlenecks and congestion while improving traffic flow and safety.

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
SH11 Puketona Intersection improvements	New	Intersection improvements to improve safety on key tourism route
SH10 Pakaraka (SH1) to Whangaroa Harbour		Safety Gap Analysis work undertaken across the country to determine the safety improvements that would be necessary
SH1N Awanui to Mangamuka Gorge		Safety Gap Analysis work undertaken across the country to determine the safety improvements that would be necessary
SH11 Kawakawa to Puketona (excl. Airfield to Lily Pond section)		Safety Gap Analysis work undertaken across the country to determine the safety improvements that would be necessary
SH1N Mangamuka Gorge to Rahiri		Safety Gap Analysis work undertaken across the country to determine the safety improvements that would be necessary
SH10 Whangaroa Harbour to Awanui		Safety Gap Analysis work undertaken across the country to determine the safety improvements that would be necessary
SH1 Kamo Bypass		Safety Gap Analysis work undertaken across the country to determine the safety improvements that would be necessary
SH1N Cape Reinga to Awanui		Safety Gap Analysis work undertaken across the country to determine the safety improvements that would be necessary

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:

- **Litter:** Litter is a particular issue on SH10 and SH11, especially in the high tourist area of Bay of Islands.
- **Rest Areas:** Maintaining rest and stopping areas to a high standard to maintain their aesthetic value for tourists is an ongoing maintenance investment requirement across the corridor.

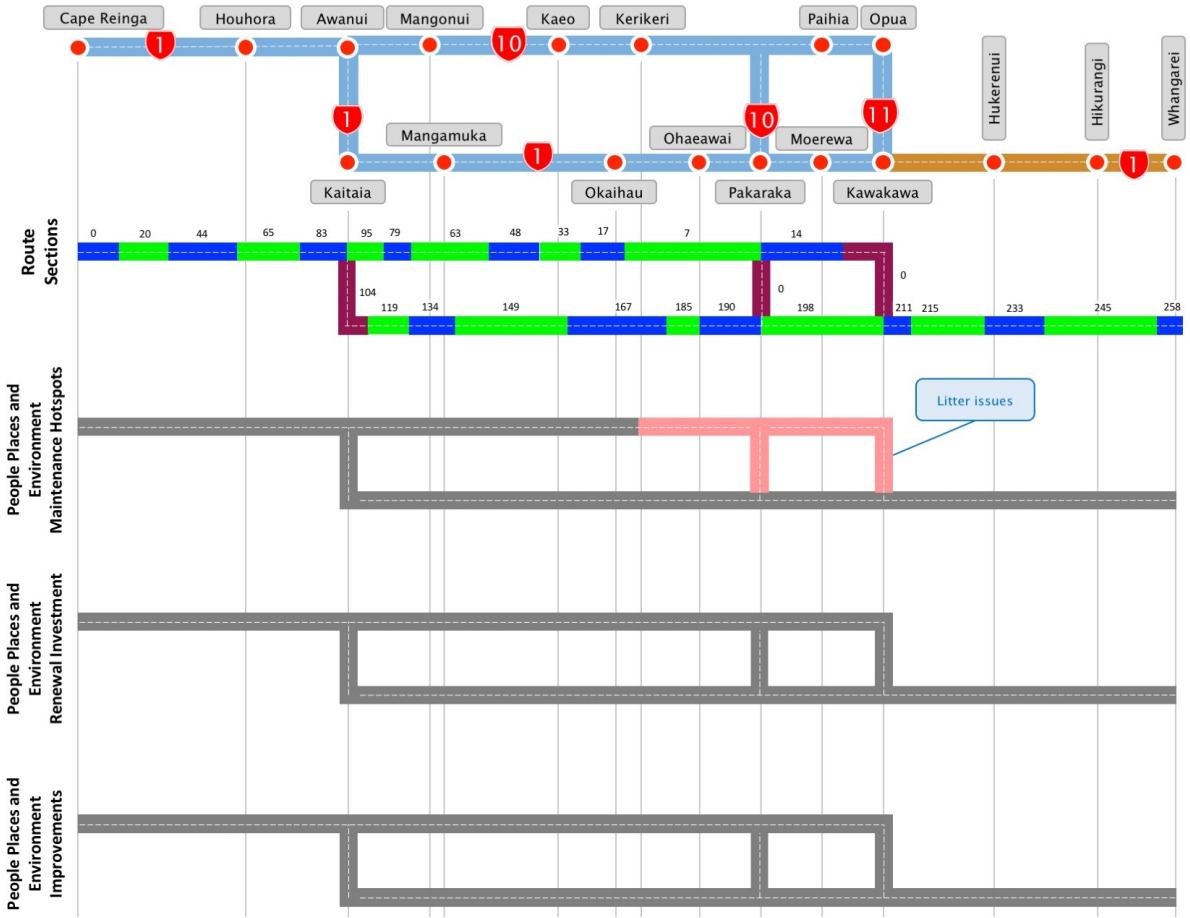
Renewals

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 27 – 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.

- **Effective response coverage:** Because of the size of the corridor, the contractor operates several depots, located at:
  - Kaitaia
  - Whangarei
  - Wellsford, and,
  - Waipoua Forest (Environmental)
- **River levels:** There is a new initiative to use Regional Council river level gauges to predict road flooding levels that could impact the corridor.
- **Flood monitoring:** Vulnerable flooding sites are checked 3-monthly to ensure drains and culverts are kept clear of debris and

Reliability and efficiency

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

- **Impact on travellers:** The maintenance approach to ensure reliability and efficiency is to reduce the length of treatments and so limit the impact on the travelling public.
- **Whangarei to Kawakawa:** This section of the corridor is a key economic route and given priority. There are however other viable alternatives should this section suffer from closure.

Safety

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

- **Socio-economic effects:** This corridor serves a lower socio-economic area, and this means high levels of driving with no driver's license, no Warrant of fitness, and inadequately maintained vehicles. This leads to higher accident rates and a continued high investment in safety.

People, places and environment

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

- **Tourist attractions in Kawakawa:** The Hundertwasser rest rooms, and, the excursion train through the main street of Kawakawa are problematic in that during the summer high tourist season, tourists accessing these facilities can cause access, safety, and efficiency issues for customers.
- **Access to Cape Reinga:** The northern part of the corridor between Awanui and Cape Reinga is the only access route to the very popular Cape Reinga lighthouse.
- **Partnering with community:** There is an increasing interest from the various communities adjacent to the corridor in partnering with the Transport Agency to invest in people, places and environment related installations.

Investment future considerations

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

- **Road widening and realignment:** Measures such as widening to reduce the impact of disruptive events, such that traffic might be able to use one lane of the road, or even support contraflow on high volume sections of corridor. The relocation of roads further from current streams, rivers, and the raising of road levels in coastal areas to reduce the risk of erosion and tidal ingress that occurs at these locations would increase resilience.
- **Fast response to incidents:** Being able to respond quickly and efficiently to incidents on the network is important to maintaining a reliable and efficient journey for customers. The ability to know when an incident has occurred and to advise road users of such incidences, is an area that could be enhanced to assist in dealing with disruptions as they arise. The use of permanent VMS signs at key locations along the corridor will enable delays and incidents to be communicated quicker allowing customers to make decisions about journeys. It may also require the strategic location of plant and equipment close to vulnerable areas of the corridor for a more efficient response to events.
- **Alternative pavement materials:** The degradation of pavement surfaces places a burden on surface skid resistance management. Investigation into alternative pavement materials which provide an improved balance between cost and benefit may be warranted.
- **Intersection upgrades to cater for demand:** As the transport demand increases across the corridor a number of significant intersections will require upgrading to provide for the safe and efficient movement of customers and their goods. This includes the intersection of SH1 and SH11 at Kawakawa, a number of intersections in Kaitaia, the intersection of SH1 and SH10 at Awanui and the intersection of SH1 and SH10 at Pakaraka.
- **Increased investment in areas of environmental value:** Corridor maintenance and development potential through areas of high environmental value, including potential Conservation areas requires consideration. This may result in extensive engagement, costly environmental management, mitigation measures, and tighter controls.
- **Relationships with Iwi/Mana whenua:** Acknowledgement of iwi/mana whenua relationships is increasing along the corridor with their input to the management of heritage assets and landscapes actively occurring. The number of features and locations along the corridor of importance to iwi is expected to increase and these will need to be considered in corridor management and development activities.
- **Electric vehicle infrastructure:** Increase in the electric vehicle fleet requires investment in suitable and conveniently placed charging points, such as at frequented tourist destinations like Paihia, Kerikeri, and Kawakawa.

Appendix A – Information sources

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

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

Section	Infographic	Information Source	Date
	Closures	NZTA 2011-2015_Treis_incidents_by_region.xlsx	2015
Reliability and efficiency	Efficiency	NZTA – MapHub EfficiencyNet	2016
	Variability	NZTA / Beca Dwg No. GIS-3391515-500-4 Network Performance - Attachments.pdf March 2012 eRUC Commercial Vehicle Data – State Highway Austroads Variability Assessment	2012
	Commercial Vehicle Average Speed	NZTA / Beca Dwg No. GIS-3391515-500-5 Network Performance - Attachments.pdf March 2012 eRUC Commercial Vehicle Data – State Highway Average Speeds	2012
	Current Constraints	Network Manager and Regional Staff Corridor drive-over	2016
Safety	KiwiRAP Collective Risk	https://nzta.abley.com/SafetyNET_2017 SafetyNET	2016
	KiwiRAP Personal Risk	https://nzta.abley.com/SafetyNET_2017/ SafetyNET	2016
	KiwiRAP Star Rating	http://www.kiwirap.org.nz From 2010 KiwiRAP star rating report.	2010
	Intersection Risk Indicator	https://nzta.abley.com/SafetyNET_2017/ SafetyNET	2016
	Gap Programme Rating	https://nzta.abley.com/SafetyNET_2017/ SafetyNET	2015
Environment Culture and Heritage	Natural Environment	NZTA - Environment and Urban Design Team	2016
	People and Place: Journeys	NZTA - Environment and Urban Design Team	2016
	People and Place: Landmarks and Heritage Places	NZTA - Environment and Urban Design Team	2016
	Noise and Vibration	NZTA - Environment and Urban Design Team	2016
	Drainage Catchments	NZTA - Environment and Urban Design Team	2016
Understanding the Infrastructure Assets			
Overview	Corridor Asset Base	NZTA_ 2017 Values by Corridor.xlsx 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			
	Maintenance Hot Spots	Network Manager and Regional Staff	2017

Section	Infographic	Information Source	Date
Investing in access and resilience	Resurfacing 2018 - 2021	Resurface data derived from forward works programme	
	Renewal Investment	National Bridge Replacement Programme National bridge replacement programme 2017 LCMP data.xlsx	
	Improvements	Network Manager and Regional Staff NZTA Projects web page: https://www.nzta.govt.nz/projects/ Submitted Regional SHIP programmes	
Investing in reliability and efficiency	Maintenance Hot Spots	Network Manager and Regional Staff	2017
	Renewal Investment		
	Improvements	Network Manager and Regional Staff NZTA Projects web page: https://www.nzta.govt.nz/projects/ Submitted Regional SHIP programmes	
Investing in safety	Maintenance Hot Spots	Network Manager and Regional Staff	2017
	Renewal Investment		
	Improvements	Network Manager and Regional Staff NZTA Projects web page: https://www.nzta.govt.nz/projects/ NZTA Safe Roads web page: https://www.nzta.govt.nz/safety/our-vision-vision-of-a-safe-road-system/safe-roads/ Submitted Regional SHIP programmes	
Investing in people places and environment	Maintenance Hot Spots	Network Manager and Regional Staff	2017
	Renewal Investment		

Section	Infographic	Information Source	Date
	Improvements	Network Manager and Regional Staff NZTA Projects web page: https://www.nzta.govt.nz/projects/ Submitted Regional SHIP programmes	

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

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

NZ TRANSPORT AGENCY
WAKA KOTAHI

New Zealand Government