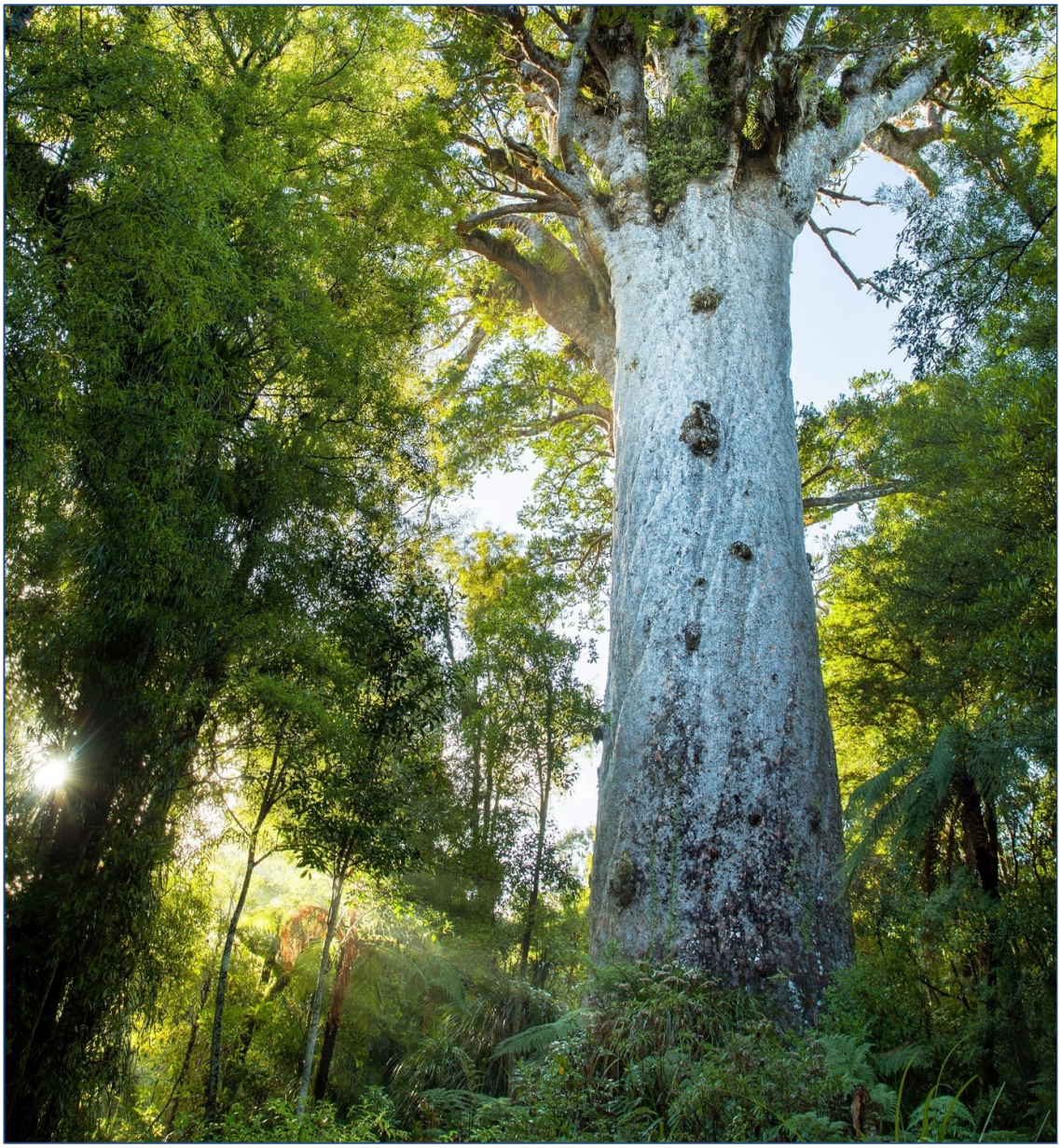
Northland Passing and Overtaking Opportunities

Single Stage Business Case

NZ TRANSPORT AGENCY

November 2019

VERSION 5



WAKA KOTAHI NZ TRANSPORT AGENCY / PROVINCIAL GROWTH FUND TUAWHENUA / Twin Coast Discovery

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APPROVAL

PREPARED BY	REVIEWED BY	ENDORSED BY	ENDORSED BY

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GLOSSARY OF TERMS

ABBREVIATION	TERM
BCR	*Benefit-Cost Ratio*
CLoS	*Customer Level of Service*
CRS	*Crash Reduction Study*
DSI	*Death & Serious Injury*
EEM	*Economic Evaluation Manual*
GDP	*Gross Domestic Product*
GPS	*Government Policy Statement (on Land Transport) 2018*
HCV	*Heavy Commercial Vehicle*
HNO	*Highways and Network Operations*
KPI	*Key Performance Indicator*
NLTP	*National Land Transport Programme*
NoR	*Notice of Requirement*
PBC	*Programme Business Case*
P&I	*Planning and Investment*
PL	*Passing Lane*
PPM	*NZ Transport Agency's Planning Policy Manual*
PT	*Public Transport*
PV	*Present Value*
RAMM	*Road Assessment and Maintenance Management*
RMA	*Resource Management Act*
SSBC	*Single Stage Business Case*
SH(#)	*State Highway (number)*
SVB	*Slow Vehicle Bay*
TCDR	*Twin Coast Discovery Route*
VOC	*Vehicle Operating Costs*
WEBs	*Wider Economic Benefits*

EXECUTIVE SUMMARY

OVERVIEW

Context

The** 'Northland Passing and Overtaking Opportunities Single Stage Business Case (SSBC)' **progresses one of the Twin Coast Discovery Route (TCDR) Programme Business Case (PBC) key recommendations – improving the provision of passing and overtaking opportunities as a means of improving a customer's experience when travelling across Northland.

Over recent years the combination of a high number of freight vehicles, tour coaches, campervans and unfamiliar drivers (who may drive slower) has seen a growing number of conflicts between slower and faster vehicles. This coupled with Northland's challenging terrain has meant that there are often infrequent opportunities for safe overtaking, meaning journeys are taking longer or people are taking overtaking risks. There is, therefore, a systemic need for safe locations where slower vehicles can pull-over, or be passed, by other vehicles.

Project Extent

The project extent covers the full Northland state highway network, aside from the full length of SH11 and the section of SH12 between Rawene and Katui Road. Improvements to these corridors are being considered as part of other business cases. The project extent also includes other Northland local roads which are part of the Twin Coast Discovery Highway.

An important consideration is that SH15 is likely to become an ever more important inland freight route. Declared a State Highway in May 2015, SH15 traverses through a relatively low trafficked and flat region of Northland with few towns along the way, making it better suited for freight vehicles.

Consultation

The development of the programme was the outcome of an extensive stakeholder engagement process which took the form of one-on-one meetings, wider group workshops, technical challenge sessions, consultation with other business case teams and feedback from local hapū. The vast size of the project extent, covering the whole of the Northland region, meant that it was imperative to make the most out of local knowledge. The overarching approach to the business case was to allow stakeholders in the first instance to tell us what the issues and opportunities are, not the other way around.

PROBLEMS

A review of previous studies, stakeholder workshops, background research and site investigations have allowed for a comprehensive identification of the key issues. The agreed Problem Statements are:

1. **Safety**: ***A lack of formal passing opportunities and poor sight distances (due to the winding terrain) raise the temptation for drivers to perform unsafe passing manoeuvres, which increases the likeliness of overtaking related deaths and serious injuries (DSIs) (25%).***
2. **Customer Level of Service**: ***Increasing numbers of trucks, unfamiliar drivers and campervans are conflicting with faster moving cars. This adds stress and risk to all road users, which increases travel time and reduces customer level of service (75%).***

Both Problem Statements No.1 and No.2 link back to Problem No.2 from the TCDR PBC which focuses on Customer Levels of Service (CLoS).

In terms of safety it is important to recognise that overtaking is a root cause in only 4.9% of all crashes in Northland that result in death or serious injury. Whilst this business case has identified that there are strong economic benefits to be made from investment in passing and overtaking lanes (and in doing so will help reduce injuries and crashes), there are other alternative measures that could also go a long way to solving the safety problem. Going forward, the overarching safety strategy for Northland should consider overtaking opportunities along with other 'softer' measures such as Safer Speed Zones and improved signage. Along SH1 south of Kawakawa, where there is a good provision of passing lanes, improved signage could be the most effective means of reducing overtaking crashes.

The overtaking problem won't be addressed by only providing more passing lanes. Speed management initiatives, wayfinding (so people know when a passing opportunity is coming up), and driver education will also be vital. The NZ Transport Agency already works collaboratively with other government agencies in Northland to fund and support community-driven projects that target speed management. How these solutions can support safer access and egress of sites of significance to hapū along the state highway network should also be considered alongside potential infrastructure solutions.

INVESTMENT OBJECTIVES

Figure 1 shows, as an Investment Logic Map (ILM), how the Investment Objectives were developed.

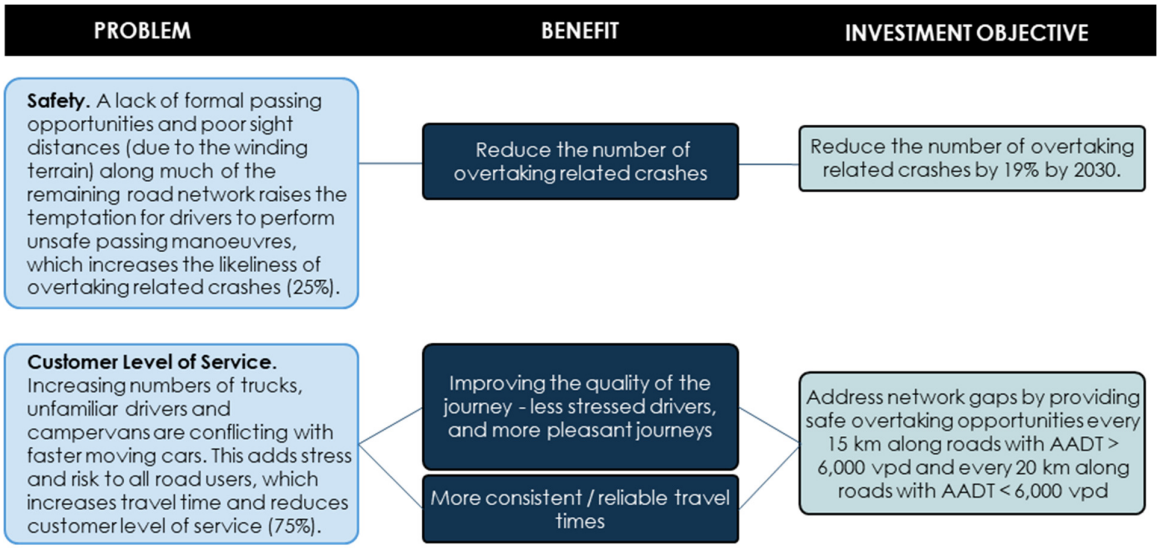


Figure 1: Passing Opportunities – Investment Logic Mapping

The agreed Investment Objectives for this SSBC are:

1. ***Reduce the number of overtaking crashes by 19% by 2030[1].***
2. ***Address network gaps by providing safe overtaking opportunities every 15km along roads with annualised average daily traffic (AADT) > 6,000 vehicles per day (vpd) and every 20km along roads with AADT < 6,000 vpd[2].***

Benefits of Investment

The benefits of investment would be:

- **Safety.** ***Reduction in the number of overtaking related crashes.***
- **Customer Level of Service.** ***Consistent and reliable travel times particularly along routes with high volumes of slow vehicles to improve the quality of the journey.***

DO NOTHING / DO MINIMUM

Northland will experience continued economic growth over the coming years, which consequently will see an increase in both light and heavy traffic volumes. If a 'Do Nothing' approach is taken the following negative impacts can be expected:

- ***Heavy vehicle volumes are likely to increase which will increase the number of slow vehicles on the network. Furthermore, general traffic is expected to grow, which will see more faster vehicles on the road. If additional safe passing opportunities are not provided there may be an increase in accidents resulting from injudicious passing manoeuvres.***

[1] *This aligns with the targets identified within the TCDR PBC.*
[2] *The 6,000 vpd threshold for the second Investment Objective is in line with the NZ Transport Agency's 'High-Risk Rural Guide', which outlined that beyond this point the risk of drivers colliding with oncoming vehicles is notably higher. The spacings are in line with AustRoads design standards.*

- ***An increase in tourism is anticipated. The drivers of tourist vehicles are generally slower moving, particularly campervans, and a lack of passing opportunities could lead to an increase in crashes as frustrated drivers have a lower risk threshold.***
- ***The indirect effect of an increase in incidents is that parts of the network will increasingly become sterilised through closures whilst investigations are carried out. This will have a wider economic impact on the Northland region as commercial and recreational traffic is delayed.***

The Do Minimum approach addresses the most notable safety issues at existing passing lanes. To this end, two sites are recommended for passing lane extensions and two for conversion to slow vehicle bays. The Do Minimum would also include improvements to signage to make drivers better aware of upcoming safe passing opportunities (captured as part of the Northland Wayfinding Implementation Plan) and wider driver education measures.

OPTION DEVELOPMENT

The identification of the short-list was determined through the following process:

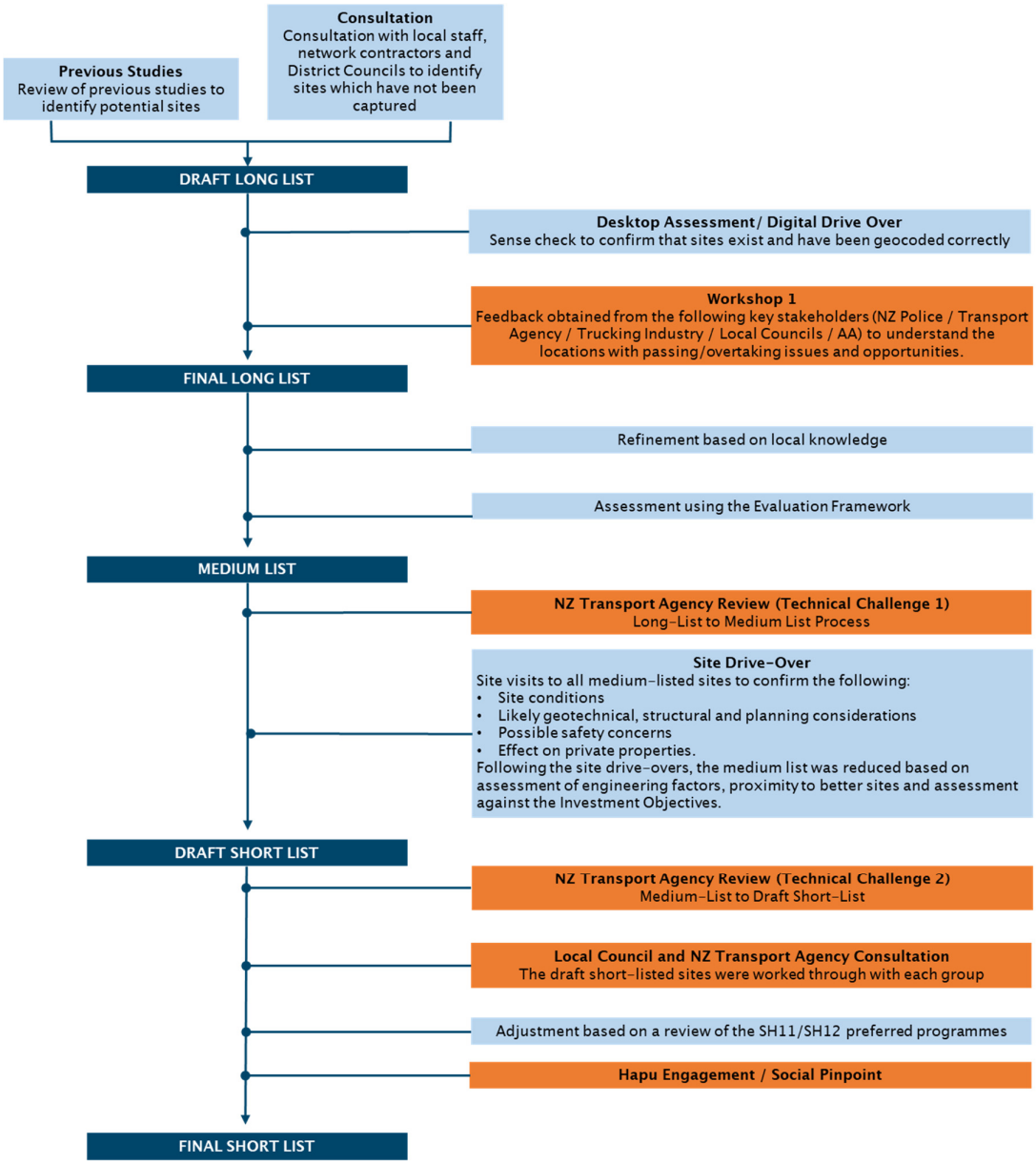


Figure 2: Long-List to Short-List Process

The outcome of this process was the identification of an agreed short list that was revised as necessary following consultation with local authorities, hapū and the local community (via social pinpoint).

PROGRAMME DEVELOPMENT

Four distinct programmes were developed by the project team based around the general themes of the agreed Problems, Investment Objectives and feedback from stakeholders. These were:

- **Programme 1: Safety.** ***Included 12 sites which each saw at least one crash within a 5 km downstream section over the last 10 years.***
- **Programme 2: Network Gaps.** ***28 sites strategically located so that formal passing opportunities are provided every 20 km on roads with AADT< 6,000 vehicles per day (vpd) and every 15 km on roads with AADT > 6,000 vpd.***
- **Programme 3: Customer Level of Service.** ***8 sites selected based on whether they were located on sections where average speed of a truck was less than 60kph.***
- **Programme 4: Stakeholders.** ***11 sites selected based on specific feedback from stakeholders.***

An evaluation of these programmes took the form of a multi-criteria assessment (MCA) and follow-up Technical Challenge workshop. The initial scores were informed by the individual assessments of each site included in the various packages, and then a holistic review of how the overall programme would score against the MCA criteria[3]. Weightings were agreed during the workshop and then applied to reflect bias towards cultural, economic, social, environmental or Investment Objective aspects.

The overall programme scores, according to the weighting theme, are shown as Figure 3. The lower the score, the better the result / the higher the benefits.

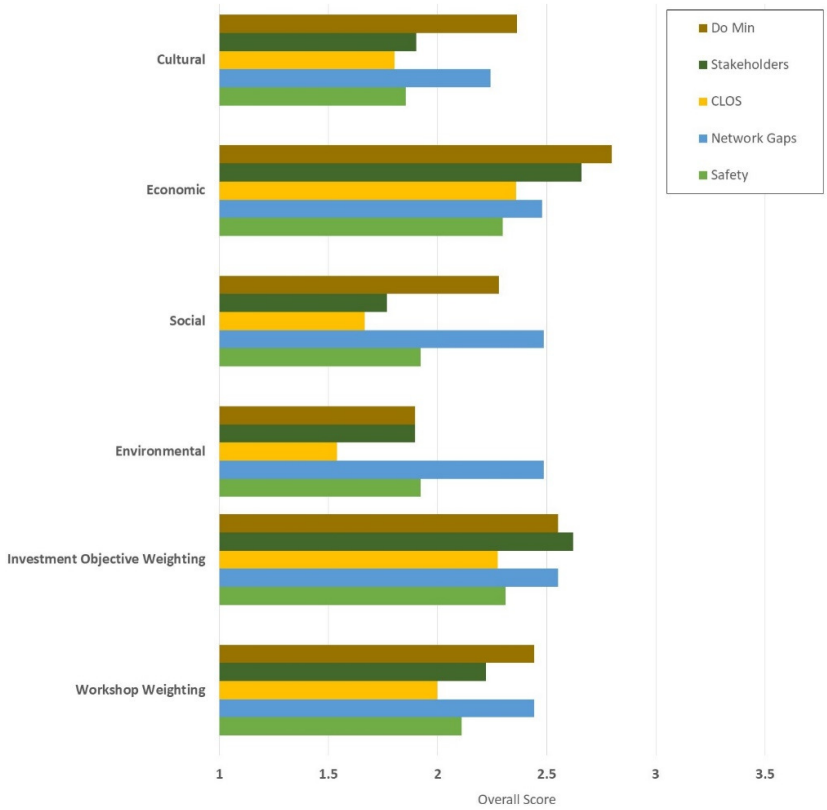


Figure 3: Programme Scores

[3] *Safety, Network Gaps, Engineering Degree of Difficulty, Value for Money, Treaty Partners, Strategy Alignment, Property / Land Use Impacts, Environmental Effects and Stakeholders*

The MCA process established that whilst Programme 3 (CLoS) would provide a good basis for the overall programme, there is a need to better align with both Programme 1 (Safety) and Programme 4 (Stakeholders) which also scored well. There is also a need to address network gaps (Programme 3).

RECOMMENDED PROGRAMME

The recommended programme was formed through the following process:

- ***Including all sites from Programme 3 (CLoS).***
- ***Adding in sites from Programme 1 (Safety), which were not within Programme 3 (CLoS) and where there had been more than one recorded crash 5km downstream of the site over the last 10 years.***
- ***Removing sites where the safety problem could be addressed through another means; specifically:***
  - ***SH1, south of Kawakawa. There are existing passing lanes near this site, and signage alerting drivers to the presence of these upcoming passing lane would be an effective solution.***
  - ***SH10, east of Taipa. A speed limit reduction is currently being consulted upon, which would better address the safety problem between Awanui and Taipa.***
- ***Removing sites which do not present value for money based on low derived economic benefit.***
- ***Amending the specific locations of sites (but retaining the same general geographic area), or type of facility, in response to the Road Safety Audit. See Appendix E for further details.***

Figure 4 shows the recommended programme, including the 'Do Minimum' (short term) projects.

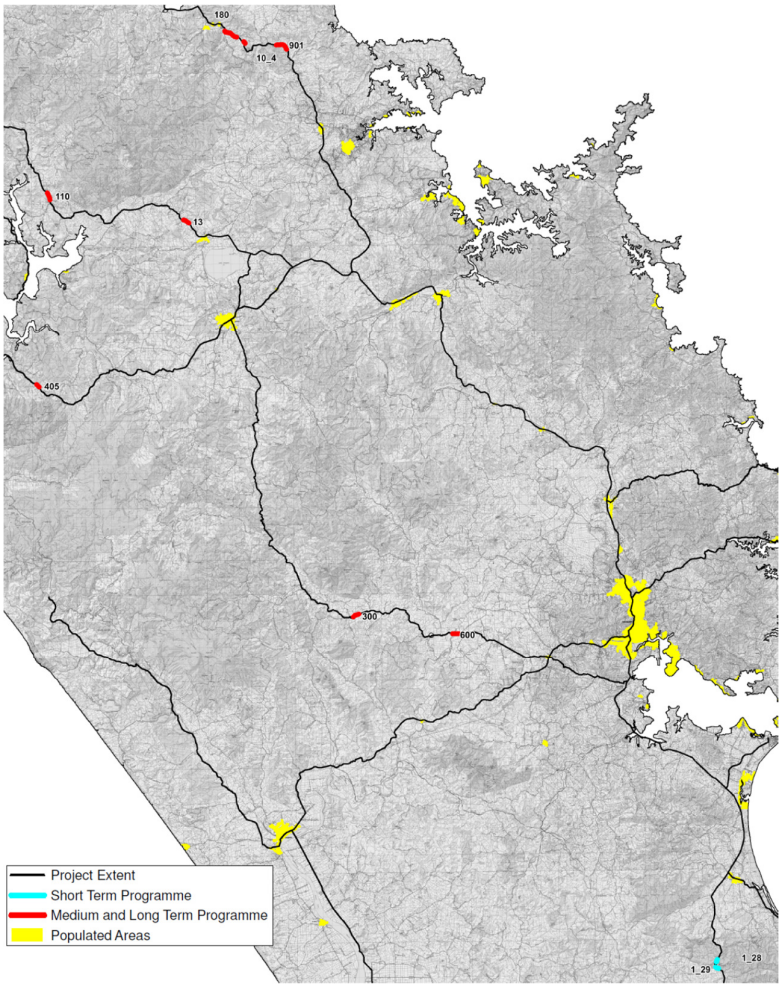


Figure 4: Recommended Programme

The NZ Transport Agency would be the owners of all assets that are on state highways.

PROGRAMME ASSESSMENT

Alignment vs Investment Objectives

Table 1 shows the extent to which the recommended programme aligns with the Investment Objectives.

Table 1: Programme Investment Objective Alignment

INVESTMENT OBJECTIVE	ASSESSMENT	COMMENT
1: Reduce the number of overtaking crashes by 19% by 2030.	*GOOD*	*The economic evaluation methodology is based on a recognised research report and considers the cumulative benefits of passing lanes in series capturing combined safety, travel time and driver frustration benefits. The nature of the methodology means that it is difficult to ascertain the separate benefits, and therefore quantify the number of crashes that would be saved.* *Notwithstanding, the recent AustRoads research report (AP-R596-19) by Espada et al. titled 'Passing Lanes: Safety and Performance' published in January 2019 outlined that the before-and-after crash analysis where a passing lane was implemented yielded the following average change in number of crashes:* • *Within the passing lane: 19% reduction in injury crashes* • *2km before the passing lane: 18% reduction in injury crashes* • *5km after the passing lane: 10% reduction in injury crashes* • *For the entire route: 16% reduction in of 16% of injury crashes.* *These are the average results, noting that in some cases passing lanes were seen to potentially have a neutral or even negative benefit. Going forward each individual site should be assessed on a case-by-case basis to ensure that safety benefits can be guaranteed.* **Considering this research, there can be good confidence that the recommended programme would deliver upon the Investment Objective.**
2: Address network gaps by providing safe overtaking opportunities every 15km along roads with AADT > 6,000vpd and every 20km along roads with AADT < 6,000vpd.	*GOOD*	*The recommended programme delivers a good level of network coverage based on the Investment Objective (which is informed by AustRoads standards).* *Gaps still remain such as the northern part of SH15 and SH12 – however the volumes along these roads (typically < 1,000 vpd) are such that investment in passing lanes is not currently justifiable.* *The other main gap is along SH10 between Awanui and Kaeo (eastbound) – however a slower speed limit is being considered for much of this route and there are several small towns along the route which in themselves provide passing opportunities.* **Considering the above, it can be said that the recommended programme aligns well with this Investment Objective.**

Overall it is considered that the recommended programme aligns well with the overarching Investment Objectives of the project.

Economics

The economic evaluation of the programme has identified the following 40-year net present values:

- ***Benefit = $22.5m***
- ***Cost = $9.1m***

The cost benefit appraisal shows that the recommended option results in a BCR of 2.49, with sensitivity analysis undertaken showing a BCR range of 2.12 to 2.67.

The BCR without the wider economic benefits (i.e. tourism) would be 0.72.

Whilst the overall BCR for the project is relatively strong, the recommended programme does not necessarily represent the optimal value for money proposition. For instance, the BCR could be made stronger by removing certain sites which either derive lower benefit or are relatively expensive.

In a similar regard, some sites on the short-list could be brought back into the final programme based on their potentially higher economic value, acknowledging that those sites may not necessarily align as well with the overarching Investment Objectives or may have higher implementability challenges. Going

forward, each site on the recommended programme should be evaluated on a case-by-case basis to better understand the potential travel time/CLoS benefits.

Programming

The short-term programme focuses around improvements to existing passing lanes, as these would have fewer implementability challenges (such as property purchase).

Sites along SH15 align strongly with stakeholder feedback as they are located along Northland's key freight, which is expected to see an increase in heavy vehicle traffic. For this reason, both sites on SH15 have been accorded a higher priority and have been included as part of the medium-term programme. All other new passing opportunities have been included on the long-term programme

Investment Assessment Framework

Table 2 shows the recommended programme assessment against the Investment Assessment Framework.

Table 2: Investment Assessment Framework for the Recommended Programme

GPS PRIORITY	ASSESSMENT	COMMENT
Safety - a safe transport system free of death and serious injury	*HIGH*	• *The recommended programme will address safety issues affecting communities subject to medium safety risk, and Safer Journeys of medium concern.* • *Northland is identified in the Communities at Risk Register as being at high risk for rural road loss of control and/or head-on (speed zones >70km/hr)*
Access to opportunities, enables transport choice and access, and is resilient -Thriving regions	*HIGH*	• *The recommended programme will address a gap in an approved RED programme in a high priority RED[4] region.* • *Northland is identified as a RED area by the NZ Transport Agency. The Twin Coast Discovery PBC was developed, in part, to enable opportunities in Northland.*
Environment - Reduce adverse effects on the climate, local environment and public health	*MEDIUM*	• *There will be scope within the recommended programme to allow for improved infrastructure facilities relating to water drainage and quality; such as constructing or formalising swales.*

Overall the results alignment indicates that there is a* High *alignment with the GPS. It is noted that there is a medium alignment with the environment, however given that the Investment Objectives of the project relate to Safety and CLoS, the corresponding GPS priorities are considered the most relevant to the rating.

Based on a* High *results alignment combined with a* Low *Cost-Benefit Appraisal, the priority order for the project would be* 5 *based on the IAF prioritisation order.

SUMMARY

This SSBC progresses one of the TCDR PBC key recommendations – improving the provision of passing and overtaking opportunities. It is one of seven business cases which are being undertaken in parallel that have a common goal of increasing visitor spend and reducing DSIs across Northland.

The key function of this SSBC is to identify where investment in passing and overtaking provisions would be best directed. The SSBC establishes this through the form of a recommended programme that, if enacted, would be expected to deliver good economic benefits and align well with both the Investment Objectives and Investment Assessment Framework.

A final programme will be comprised of various treatments from the recommended programmes of the individual business cases. During the development of this final programme, the relative costs and benefits of separate interventions will be compared, with consideration given to which would go furthest to addressing the overarching TCDR PBC Investment Objectives.

[4] *Regional Economic Development*

Recommendation

Of all the DSIs that have occurred recently on Northland's roads, overtaking was a root cause in only 4.9% of crashes in Northland. As such, an immediate comprehensive rollout of passing and overtaking opportunities is not justified.

Rather, the best value for money solution is likely to be gained by a programme that leads with education and signage complemented by individual passing lanes to address localised safety issues, notable network gaps and where there are high differentials between vehicle speeds.

Generally, the benefit realisation of each individual passing lane would need to be explored further during the next stage (pre-implementation and detailed design) as would the interactions with potential speed management programmes.

PART A: THE CASE FOR THE PROJECT

1. INTRODUCTION

This report presents the investment story for the** 'Northland Passing and Overtaking Opportunities Single Stage Business Case (SSBC)'. **This SSBC is one of seven business cases being developed by the NZ Transport Agency in Northland as an outcome of the Twin Coast Discovery Route (TCDR) Programme Business Case (PBC).

The development of these seven business cases (and the identified programmes) reflect a whole-of-Government approach to investment in Northland with projects that align with and reflect the intentions of the** Government Policy Statement on Land Transport (2018/19-2027/28), **the** Te Tai Tokerau Economic Action Plan **and the intentions of the Provincial Growth Fund (PGF).

This SSBC progresses one of the TCDR PBC key recommendations – improving the provision of passing and overtaking opportunities as a means of improving the customer experience when travelling across Northland. Given that there are seven business case programmes which contribute to meeting the strategic objectives of the TCDR PBC, the recommended programme of this SSBC must be timed appropriately such that the collective benefits are achieved with a high value for money outcome.

1.1 OVERVIEW

Generally, there are two key economic drivers for the Northland – tourism and the rural economy.

Known as the 'winterless North', Northland attracts visitors with its sub-tropical climate, expanses of white sandy beaches, beautiful harbours, rich Māori heritage and natural wonders. Tourism in Northland accounts to $1 billion annually and it is therefore a major economic industry for the region. It also means that the state highways are used by a high number of tour buses and campervans.

Northland's economy is also underpinned by its rural economy with dairying, horticulture, marine engineering and forestry being key activities. Around two million tonnes of freight move between Northland and Auckland annually, which means that the state highways, and to a lesser extent local roads, are being used by an ever-growing number of heavy vehicles making long distance trips. The transport network is therefore a key enabler for economic growth in Northland.

However, the combination of a high number of freight vehicles, tour coaches, campervans and unfamiliar drivers (who may be driving slower) across wide expanses of the network, results in conflicts between slower and faster vehicles. The challenging terrain and a scarcity of passing and pull-over facilities means that there are often infrequent opportunities for safe overtaking, which leads to either journeys taking longer or people overtaking in unsafe locations. There is therefore a systemic need for safe locations where slower vehicles (tourists and heavy vehicles) can pull-over to let others pass.

1.2 NORTHLAND PASSING AND OVERTAKING SSBC

The NZ Transport Agency have already undertaken steps to better understand the existing passing and overtaking opportunities along key Northland journeys through the TCDR PBC. A key outcome identified was that additional passing and overtaking opportunities were needed in order to address existing network issues, and to support growth. Identified measures also included wider shoulders designed to support the needs of commercial operators such as tourist coaches and heavy haulage vehicles.

In line with the strategic objectives of the PBC, the purpose of this SSBC is to improve safety and Customer Level of Service (CLoS) across the TCDR and pursue an agreed, and thoroughly assessed, package of interventions that will address the core problems[5]. The primary benefits of investment would be improvements to safety, travel time, vehicle operating costs and tourism.

One of the key recommendations of the TCDR PBC was to develop this SSBC. This SSBC sets out a plan of where investment in passing and overtaking opportunities should be targeted.

The recommended option does not simply focus on one long-term solution, but rather on a package of individual treatments that can be commenced (i.e. start design) over the short (0-2 years), medium (2-5 years) or long (+5 years) term. The nature of the business case process means that 'early deliverables' can be identified quickly and by nature of being easily implementable (i.e. low cost, low risk) they can be accelerated through to the pre-implementation and construction stages.

[5] *Customer LOS is about what the customer actually experiences in the delivery of services.*

The successful delivery of this business case is expected to result in the following outcomes:

- ***Improved passing opportunities along the study routes;***
- ***Improved road safety and a reduced number of overtaking crashes along the study routes; and***
- ***Improved customer experience of travel along Northland state highways.***

1.3 PROJECT EXTENT

The project extent includes all Northland state highways (SH), excluding the full length of SH11 and the part of SH12 from Rawene to Katui Road (as improvements to these corridors are being considered as part of other business cases – see the next page). The project extent, shown as Figure 5, also includes other Northland local roads which are considered to part of the Twin Coast Discovery Highway[6].

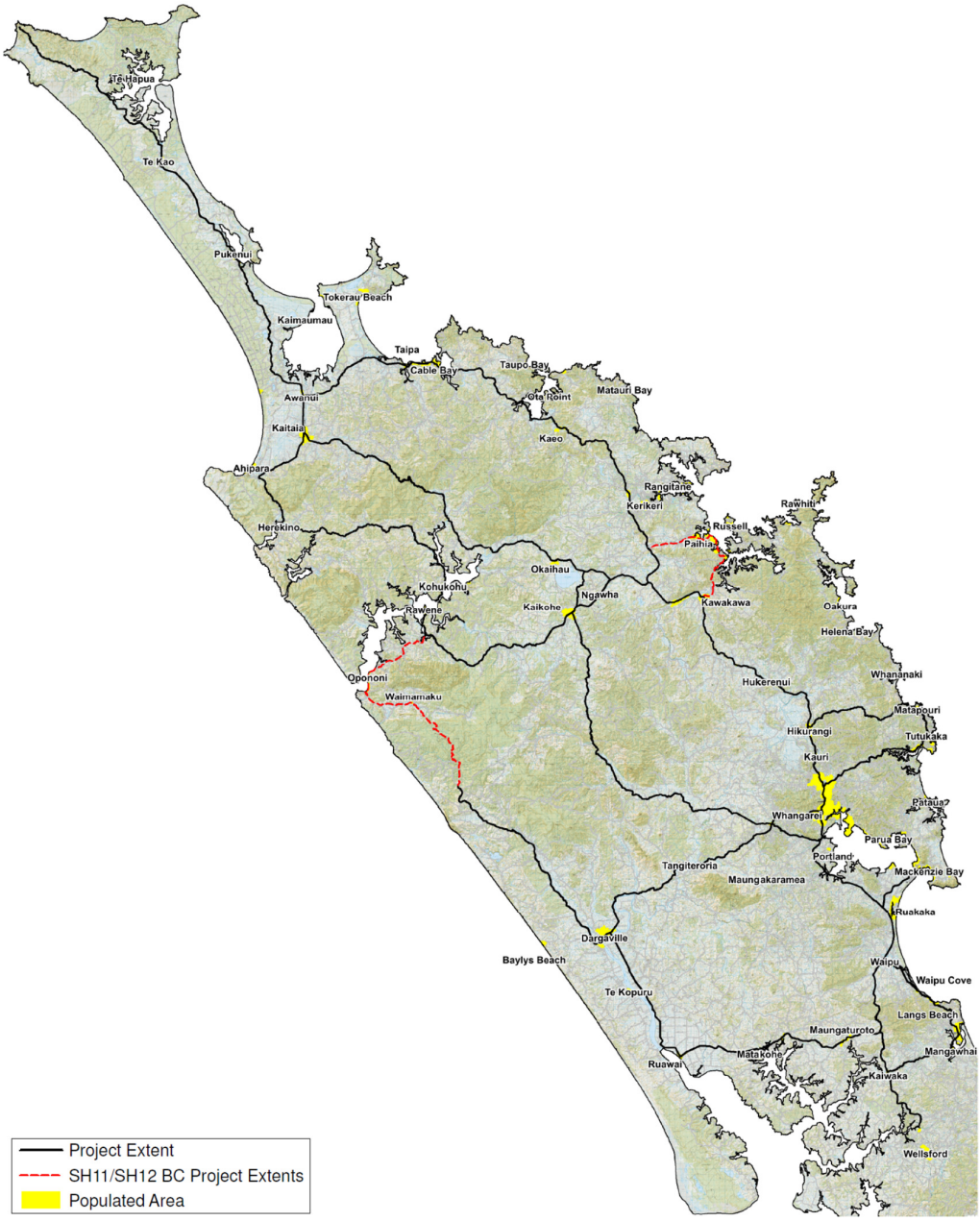


Figure 5: Project Extent

[6] *As per the Twin Coast Discovery Highway PBC (Figure 19), excluding byways*

1.4 PROJECT INTERACTIONS

This SSBC is not a new standalone project, but rather builds upon previous work and the outcomes of the Twin Coast Discovery Route PBC. It considers the outputs as part of its option development and assessment process. This SSBC has interdependencies with, and has taken into consideration how best to work with, the:

- **Northland Rest Areas SSBC.** ***This business case was developed in parallel with the Northland Passing and Overtaking Opportunities SSBC, including shared communications, workshops and delivery timeframes. The project extents were also identical. Rest areas also provide passing opportunities as they encourage drivers, including those of slower vehicles, to pull-over and stop. This then allows faster vehicles to pass.***
- **Northland Wayfinding Implementation Plan.** ***The Wayfinding Implementation Plan developed options for improved Signage, Digital Wayfinding and Local knowledge / information. The major link to this SSBC is the role signage plays in maximising potential use of passing lanes (i.e. getting people to wait for a safe passing facility before attempting an overtaking manoeuvre), as well as providing greater homogeneity in the level of service of the TCDR.***
- **SH11 Kawakawa to SH10 Puketona SSBC.** ***This business case focuses on the 30km stretch of SH11 from the SH1 intersection at Kawakawa to the SH10 intersection at Puketona. The NZ Transport Agency has been working with key stakeholders to identify options to improve safety and resilience along this corridor and to identify opportunities for economic growth.***
- **SH12 Rawene to Katui Road SSBC.** ***This business case focuses specifically on developing and refining investment options for the SH12 corridor between Rawene and Katui Road. Two passing opportunities have been identified along this section of SH12.***
- **Northland Integrated Cycling Implementation Plan.** ***This business case focuses on evaluating potential cycle routes and enhancing existing infrastructure for cyclists. It also looks at improvements to the Pou Herenga Tai (Twin Coast) cycle trail.***
- **Northland Township Plans.** ***This project looks at improving safety, access and amenity for eight townships served by state highways. Those townships are Kaikohe, Dargaville, Rawene, Kohukohu, Awanui, Morewa, Horeke and Kawakawa.***
- **State Highway 10 Waipapa Corridor Improvements.** ***Growth in the region has necessitated improvements to the network at Waipapa in order to improve safety and facilitate growth. A new roundabout is a key feature of the project.***

Figure 6 shows the interactions between this SSBC, recent studies and other parallel Business Cases.

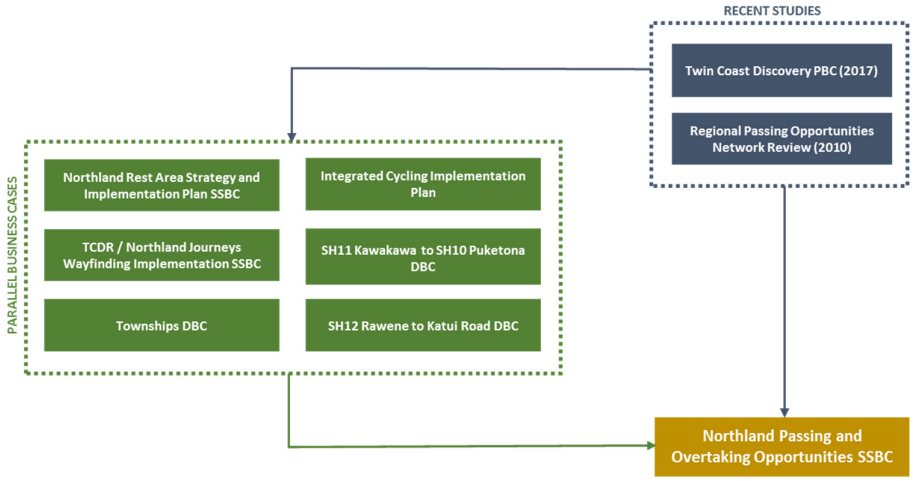


Figure 6: Interaction with Other Projects and Recent Studies

Whilst the projects have interdependencies, there is only a low risk that the potential outcomes of other business cases significantly impacting on the recommended programme for this SSBC. Nonetheless, care has been taken (particularly with the SH11 and SH12 business cases) to take a holistic network approach to ensure alignment between the various programmes – i.e. to avoid a situation where two passing facilities are proposed within close proximity to each other because the project interface is located in between.

Appendix A1 ***sets out the investment partners for all business cases.***

1.5 SSBC PROCESS

Figure 7 sets out the key steps taken to identify a recommended programme. The process involved workshops (green boxes), technical assessment (blue boxes), community consultation (orange boxes), agreement on key aspects (red boxes) and external project influences (grey boxes).

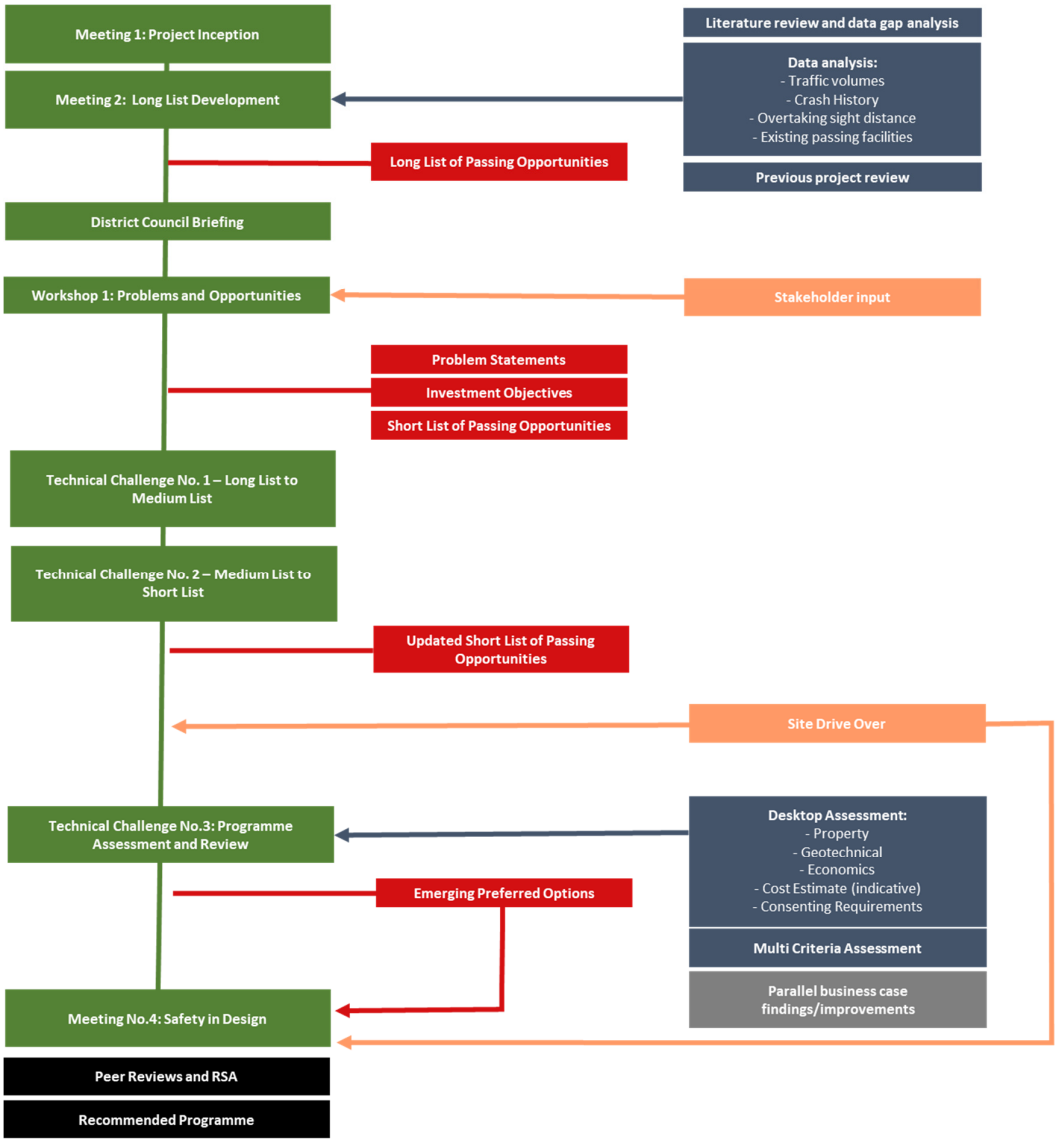


Figure 7: SSBC Process

1.6 KEY CONSIDERATIONS

The focus of this SSBC is on reducing overtaking related crashes, acknowledging that there may be wider safety benefits related to reduced driver frustration if a comprehensive network of overtaking opportunities is provided.

The key considerations, ascertained from feedback from stakeholders and a literature review, are:

- ***Overtaking and head-on type crashes are significant issues.***
- ***Slow vehicle lanes are not always used by trucks as it can be difficult to merge back.***
- ***Some existing passing lanes that are poorly designed (e.g. on hilly terrain with tight curves) and some have speed cameras regularly placed on them. This means that users are not encouraged to***

use them or overtake slowly (e.g. a 100kph car trying to overtake a 90kph truck) which can frustrate other following drivers.

- ***Improving driver decisions by providing information about the frequency and location of passing lanes will reduce erratic behaviour.***
- ***Platooning behind a slower moving vehicle causes driver frustration, even if the speed differential is only small.***
- ***Shifting more freight vehicles from SH1 to the inland freight route (SH15) will relieve some pressure on SH1.***
- ***The best solution to improving safety and customer levels of service is not always an infrastructure solution. Improving driver education (e.g. through social media marketing) and signage strategies (so people know when safe passing opportunities are coming up) are likely, in many cases, to be more cost-effective solutions.***
    - ***The quality of existing signage and proposals to improve signage have been captured generally as part of the Northland Wayfinding Implementation Plan.***
- ***The NZ Transport Agency already works collaboratively with other government agencies and stakeholders in Northland to fund and support community-driven projects that target driver behaviours, including speed management.***

1.7 PASSING AND OVERTAKING FACILITIES

Passing and overtaking facilities may take one of the following forms:

- **Passing Lane.** ***An additional lane provided where a faster moving vehicle pulls into the right-hand lane to pass slower moving vehicles.***
- **Slow vehicle lane.** ***An additional lane provided where a slower vehicle pulls into the left-hand lane to allow fast moving vehicles to pass. Often located on steeper vertical alignments where some vehicles, such as trucks, travel slower.***
- **Pull-over / marked shoulder.** ***Widened seal area provided where a slow-moving vehicle can move completely out of the live lane to let faster moving traffic pass.***
- **Intersection treatment.** ***The provision of a right turn pocket, or wider shoulders at intersections can provide an adequate means for through-traffic to safely pass vehicles waiting to turn.***

Figure 8 provides photographs of the various types of passing and overtaking facility.

Passing Lane

Slow Vehicle Bay

Marked Shoulder

Intersection Treatment

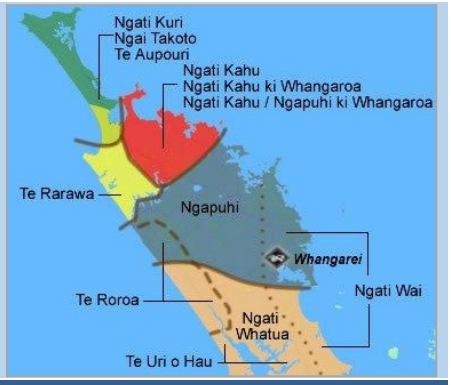
Figure 8: Examples of Passing and Overtaking Facilities

2. STAKEHOLDER ENGAGEMENT

2.1 KEY STAKEHOLDERS

Table 3 provides a summary of the key stakeholders who have a vested interest in the outcomes of the Northland Overtaking and Passing Opportunities SSBC.

Table 3: Partners and Key Stakeholders

ORGANISATION	ROLE
INVESTMENT PARTNERS	
NZ Transport Agency	*The Transport Agency is the road controlling authority for the State Highway network, are a funder of land transport activities and provide access to and regulation of land transport.*
Northland Inc.	*The Regional Economic Development Agency for Northland encompassing the Regional Tourism Organisation and central government's Regional Business Partner (RBP) Network.*
Land owners	*Land owners would be engaged as part of the pre-implementation stage (if funding is approved).*
TREATY PARTNERS	
Local hapū	*There are nine Iwi tribal boundaries in Northland[7].* *The NZ Transport Agency has duties and obligations to the parties to the Treaty of Waitangi. Māori language, culture, stories and traditions are strong in Northland.* 
STAKEHOLDERS	
Ministry of Business, Innovation and Employment	*The PGF is administered by the Provincial Development Unit, part of the Ministry of Business, Innovation, and Employment.*
Northland Transportation Alliance (NTA)[8]	*The NTA is a collaborative arrangement of Kaipara District Council, Whangārei District Council, Far North District Council, Northland Regional Council and the NZ Transport Agency. The aim of this group is to share resources and deliver better, more cost-effective and 'joined-up' transport options for all Northlanders.[9] Councils are also a road controlling authority and would be responsible for the maintenance of passing opportunities developed on local roads.*
NZ Police	*New Zealand Police is working with the community to make New Zealand safe. The key areas of interest for the NZ Police are speed and enforcement.*
New Zealand Motor Caravan Association	*The NZMCA is a membership-based organisation representing the interests of private motor caravan owners in New Zealand.*
New Zealand Automobile Association (AA)	*The AA works with the government, industry and media. They advocate and work on policy that focuses on protecting the freedom of choice and rights of drivers[10].*
National Road Carriers Association	*National Road Carriers provides professional support for those who choose to make a living in the road transport industry, through advocacy, representation and advice.*
Northland Freight Group	*Another freight industry body focused on the Northland network.*

[7] *Te Puni Kokiri, Te Kahui Mangai*
[8] *Northland Regional Council, Far North District Council, Kaipara District Council, and Whangārei District Council.*
[9] *https://www.fndc.govt.nz/services/roads-and-stormwater*
[10] *https://www.aa.co.nz/drivers/speaking-up-for-drivers/*

Other stakeholders that have an interest in this SSBC include:

- ***Heritage New Zealand***
- ***Cycling NZ / Cycling Advocates Network***
- ***Northland Road Safety Group***
- ***Heavy Haulage Association NZ***
- ***Road Transport NZ***
- ***Bus and Coach Association***
- ***Tourism Industry Association***
- ***Rental Vehicle Association***
- ***Local businesses directly affected***
- ***Individual Freight Operators***

WORKSHOPS AND MEETINGS

The following key project workshops and meetings have helped to shape this SSBC:

Meetings

- **Meeting No.1: Project Inception.** ***The purpose of this meeting (22nd January 2019) was to clarify the scope of the project, agree the programme for delivery and key deliverables, outline the parallel workstreams and to discuss the main tasks going forward.***
- **Meeting No.2: Long List Development.** ***The purpose of this meeting (25 February 2019) was to present the wider project team with the literature and background review, data gap analysis, the process for identifying the long list and to discuss approaches for programme development.***

Workshops

- **Workshop 1: Problems and Opportunities.** ***This workshop (16 April 2019) included representatives from the wider stakeholder group, including the trucking industry, NZ Police, bus operators, the AA and NTA. The purpose was to confirm the overarching problems and benefits associated with current overtaking and passing provisions, develop Problem Statements, identify potential options and discuss the draft evaluation criteria.***

Technical Challenges

- **Technical Challenge No.1 – Long List to Medium List.** ***This challenge session (18 June 2019) focused around the long list to medium list process, the suitability of the medium list and whether there are potential gaps or opportunities. A discussion was also held around possible programmes that could be developed from the medium list. Following this session, the short list was updated prior to the site drive-overs.***
- **Technical Challenge No.2 – Medium List to Short List.** ***The first aspect of this session (26 July 2019) was to seek agreement around the wording and weightings for the Problem Statements and Investment Objectives. The second aspect was to review the medium to short list process and potential programmes of options, along with the methodology for assessing the short list.***
- **Technical Challenge No.3 – Programme Assessment and Review.** ***This challenge session (26th August 2019) focused around the packaging and assessment of various programmes.***

Minutes of meetings are provided as **Appendix A2.**

Other Engagement Activity with Partners

- **Implementation approach with implementation partners.** ***A letter was sent to the Department for Conservation and the three territorial local authorities outlining the implementation approach once the business case is endorsed.***

A copy of the letter template is provided at the end of Appendix A2.

PUBLIC CONSULTATION

Communications and Engagement Plan

Engagement with local authorities, the Department for Conservation, local hapū, Heritage NZ, representatives from the trucking industry and NZ Police was purposely undertaken at strategic points during the development of this SSBC. The concept design for rest areas has been co-designed with stakeholders and partners.

As a Northland-wide business case, it was not practical to hold open days, as occurred with more localised business cases within the programme. On-line engagement was however undertaken with the wider community using the NZ Transport Social Pinpoint mapping tool.

A Communications and Engagement plan has been prepared for the project and is provided as* Appendix A3. *The plan sets out and records the stakeholder communication and engagement activities for the business case and implementation plan. The engagement objectives and outcomes for the project are outlined in Table 4.

Table 4: Engagement Objectives and Outcomes

OBJECTIVE	OUTCOME
Awareness	*Ensure key stakeholders, partners, and communities are aware of the key messages and the timeframes for inputs and outcomes.*
Understanding	*Key stakeholders and hapū partners understand the business case process, including programme deliverable and decision making.*
Behaviour	*Key stakeholders and partners team up with the NZ Transport Agency to deliver the programme in a cohesive and collaborative way.*
Participation	*Stakeholders, partners, and communities are provided with opportunities to participate in decision making processes, where applicable, to inform business case development.*
Reputation	*The NZ Transport Agency delivers robust business cases, engages effectively with stakeholders and is working on behalf of the Government to give effect to transport priorities.*

There could be differences of perception with respect to the proposed implementation plan and staging of delivery.

Engagement Process

While the NZ Transport Agency is the contracting body for this project, many of the interventions identified will be implemented on, or will affect, roads controlled by the three local authorities (i.e. Whangārei, Kaipara and Far North District Councils). It is therefore essential that the outcomes of the project are supported by the local authorities.

The engagement process has followed a co-design process, where a long list of interventions has been progressively shortened whilst additional context and evidence has been developed in consultation with internal NZ Transport Agency staff, partners and key stakeholders.

One-on-One Stakeholder Meetings

The following one-on-one meetings with key stakeholders have also been held:

- **Meeting No.1: District Council Briefing.** ***The purpose of this meeting (13 March 2019) was to brief the Northland Transportation Alliance as to the process and objective of the SSBC and to obtain initial feedback.***
- **Meeting No.2: SH11 SSBC.** ***The purpose of this meeting (20 June 2019) was to understand the emerging preferred option for SH11 and how that might influence this SSBC. It was confirmed that the SH11 team have identified two substandard marked shoulders that should be removed to address safety issues.***
- **Meeting No.3: SH12 SSBC.** ***The SH12 SSBC team noted the following during a meeting held on the 24 June 2019:***
    - ***There are two passing opportunities planned between Waimamaku and Omapere.***
    - ***There is a reduced-speed zone throughout the Waipoua Forest which may have impacts for the section of SH12 covered by this SSBC and the resulting demand for passing lanes once cars come out of the forest.***
    - ***There is a slow vehicle bay planned between Opononi and Rawene.***
- **Meeting No.4: Far North District Council (FNDC).** ***The purpose of the meeting (30th July 2019) was to gain feedback regarding sites included on the draft short list.***
- **Meeting No.5: Whangārei District Council.** ***The purpose of the meeting (31st July 2019) was to gain feedback regarding sites included on the draft short list.***
- ***Meeting with* Kaipara District Council *on the 9th August 2019. The purpose of the meeting was to gain feedback regarding sites included on the draft short list.***

- ***Meeting the* NZ Transport Agency *on the 23rd August 2019. The purpose was to identify all parallel programmes with a safety outcome throughout the network. This meeting was key in identifying several programmes with similar outcomes, most importantly the installation of wire medians south of Whangārei on SH1 and a controlled intersection at the interface of SH1 and SH15 to improve the efficiency of the in-land freight route (SH15). Other relevant programmes discussed included Safer Roads, the ATP programme (rib-line painting of the highway shoulder) and works around resilience routes.***

Hapū Engagement

The project team developed collateral for hapū engagement with project background information and the short-listed options. The material built off previous engagement (e.g. on the townships landscape design framework and work on SH11 and SH12 corridors) and included profiles of each opportunity identified as laying within the areas of strongest interest for each hapū.

Public Consultation

The final shortlist identified in this business case was presented to the public via the NZ Transport Agency's website. Feedback was sought from the community via an email to partners and stakeholders inviting feedback using an on-line map tool, Social Pinpoint. The objective of this engagement was to seek validation of the programme from the community.

During the three-week engagement period, the project team received 276 visits from 89 unique visitors reviewing the shortlists for rest areas[11] and passing opportunities. Of those visitors, 26 comments about passing opportunities and driver behaviour generally were made. Key insights obtained from the feedback were:

- ***13 of the shortlisted sites were supported by respondents, including two identified in Programme 4: Stakeholders and one site in the Recommended Programme***
- ***There was some negative comment about some sites, relating to low traffic volumes and higher needs elsewhere on the network. None of these sites are in the Recommended Programme***
- ***17 neutral comments were received.***

There were two other sites suggested for new passing opportunities, one of these was on a local road and out of scope, the other was discounted by the project before the shortlist was shared with partners and stakeholders due to an existing programme being developed by the Transport Agency to address traffic congestion between Whangārei and Kaiwaka.

As responses may depend on the type of road user, people were asked to about the type of vehicle they typically use to travel through Northland, noting that people could choose more than one option):

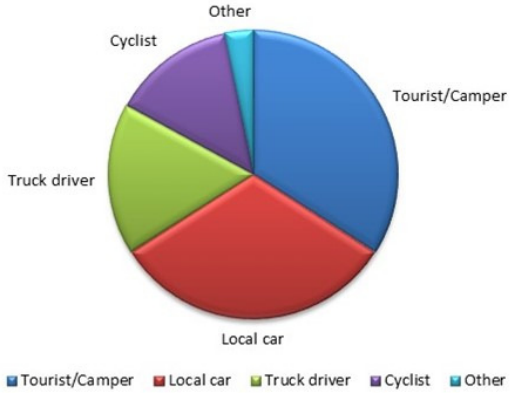


Figure 9: Breakdown of Road Users Surveyed

[11] *Details of the rest areas work is outlined in that business case.*

3. RELEVANT STUDIES

***This section provides relevant information from existing studies and strategies. These have been used to inform the direction of the business case and ultimately to understand the strategic alignment of the recommended programme. An overview of the overarching national and regional government strategies is provided within* Appendix A4.**

3.1 TWIN COAST DISCOVERY ROUTE PBC

The NZ Transport Agency in partnership with Northland Inc and key regional and government stakeholders developed an overarching PBC which aimed to improve the economic performance of Northland. The TCDR and its seven key Northland Journeys were the focus of the PBC, with the aim of encouraging both international and domestic visitors to visit new places, try new experiences and to stay longer in Northland.

Two key problems identified by the TCDR PBC, and relevant to this SSBC were:

1. ***The destination appeal of Northland's visitor industry is focused in a few locations and only in a few months of the year which is a lost economic opportunity for all of Northland (60%).***
2. ***Variability in CLoS on the TCDR and key Northland Journeys fails to meet the resilience, safety and road amenity expectations of all users (40%).***

Where possible, the Problem Statements of this SSBC have been linked back to those identified within the original TCDR PBC. The key problem relevant to this SSBC is Problem No.2 which relates to CLoS.

The PBC also outlined that CLoS tended to deteriorate the further to the north and west a road user travelled in Northland with respect to the elements shown in Figure 10, with the quality and quantity of passing opportunities diminishing.

Figure 10: TCDR Transport CLoS[12]

The PBC outlined that it was important that options are prioritised where they:

- ***Support the visitor industry – tourists will get to their destinations with less stress and have an overall better experience. To some extent, this indirectly could mean that they spend more time and money in Northland.***
- ***Are on key tourist routes – both existing and proposed.***
- ***Address safety blackspots.***
- ***Maintain or enhance a key resilience route.***

Investment Objectives

The TCDR Investment Objectives are:

- ***Increase visitor spend on key Northland journeys by 30% by 2030.***
- ***Increase visitor spend and numbers on the TCDR and key Northland journeys outside of peak periods by 30% by 2030.***
- ***No full closures without viable alternatives (of less than 2 hours) for all vehicles on the TCDR and key Northland journeys by 2030.***
- ***Reduce the number of deaths and serious injuries to achieve at least a medium collective and personal risk rating.***
    - ***The desired outcome of this Investment Objective is a 19% reduction in DSIs.***

[12] *TCDR PBC*

The Problem Statements and Investment Objectives identified as part of this SSBC have been integrated with those identified by the TCDR PBC (see Problem Statements chapter).

3.2 NORTHLAND JOURNEYS AND TWIN COAST DISCOVERY HIGHWAY REVITALISATION (TCDHR)

The Northland Journeys and Twin Coast Discovery Highway Revitalisation (TCDHR) project was completed in 2018 and funded by Northland Regional Council. The aim of the project was to increase the economic contribution of tourism by $20 million per annum from 2020 onwards.

Northland Inc has been leading the non-infrastructure development of the TCDR and its revitalisation as a series of compelling Northland Journeys including new routes and new ways to travel these routes. The report on revitalisation of the TCDR outlined how Northland could benefit not only by promoting distinctive sub-regions but also by expanding the 800km touring route from one highway into a set of byways encouraging visitors to explore more of the sub-regions. These byways or journeys are between 50km and 150km in length.

As discussed in the TCDR PBC, CLoS is identified as a problem and there is a need to ensure that the Northland Journeys meet the resilience, safety, and road amenity expectations of all users. The provision of appropriately placed safe passing opportunities will improve capacity and assist in providing a better CLoS along Northland Journeys.

3.3 TAI TOKERAU ECONOMIC ACTION PLAN

The Tai Tokerau Northland Economic Action Plan (TTNEAP) is strongly linked to the TCDR Programme Business Case and has been developed in partnership with Northland Inc and key regional and government stakeholders. The TTNEAP identified a range of short to medium term realistic opportunities that will assist in increasing investment, employment and incomes in the region.

This SSBC is one of the projects included within the implementation plan of the NEAP.

3.4 REGIONAL PASSING OPPORTUNITIES NETWORK REVIEW

In 2010 there was a review of Northland's passing and overtaking provisions, which identified possible opportunities for inclusion in the Regional Long Term Plan (RLTP). The review considered the freight and tourism routes, proportion of HCVs (especially on mountainous terrain) and demand. Prioritisation grades were also assigned.

The options identified as part of this 2010 review were used as an input into the initial long list for this SSBC. The results of the review can be found in **Appendix A5.**

3.5 SPEED LIMIT STRATEGY

The NZ Transport Agency is currently identifying state highways where lower speed limits could materially make a difference in reducing DSIs. In the Northland region, sections of three state highways have currently been identified for potential speed limit reductions (from 100 kph); namely:

- ***SH1 Kawakawa to Moerewa (3km);***
- ***SH11 Puketona to Haruru Falls (13km); and***
- ***SH10 Awanui to Taipa (10km).***

As part of the review process, the NZ Transport Agency will be undertaking public consultation and actively seeking input from the affected communities as well as local government partners and other key stakeholders. To ensure a cohesive approach, passing lanes have not been recommended on any sections of the network where potentially there could be a future speed limit reduction.

Note that the decision-making framework for passing and overtaking opportunities is currently under development by the NZ Transport Agency. The recommended programme identified through this SSBC will be further reviewed and aligned to the framework.

3.6 NORTHLAND CORRIDOR MANAGEMENT PLANS

Corridor Management Plans (CMPs) are living documents and describe the customer service delivery story for a specific state highway corridor, as measured against the One Network Road Classification (ONRC) performance framework. Each corridor management plan considers a combination of:

- ***Pressures on the system that result in increased demand or a reduction in levels of service;***
- ***The current state of the system and how it is performing; and***
- ***The NZ Transport Agency's responses.***

The relevant CMPs are:

- **Whangārei to Kaitaia CMP.** ***This covers SH1, SH10, and SH11 where the key problem was identified as being safety along certain sections.***
- **Northland Primary Collectors CMP.** ***This covers SH12, SH14 and SH15. Travel time reliability, amenities and accessibility were identified as being moderate to acceptable, however the average safety score (KiwiRAP rating of 2-3 stars) for most of the route was relatively poor.***
- **Auckland to Whangārei CMP.** ***This covers SH1 and SH16. Travel time reliability and accessibility was identified as being generally good, and the amenity levels were high for tourists and locals. Safety scores were typically identified as being above average.***

The following major capital projects outlined within the CMPs are considered of relevance to this SSBC, noting that the CMPs were developed prior to 2018 GPS:

- ***Removal of all but one single lane bridge across the entire corridor.***
- ***Akerama Curves. Passing lanes completed where the vertical alignment has been improved[13].***
- ***Matakohe realignment and one lane bridges upgrade (completed).***
- ***SH1 Dome Valley Safety Improvements. Treatments involve widening to provide side barrier treatments along the corridor (started).***
- ***SH1 – Brynderwyn Hills. Realignment of the existing road to improve safety to the north face of the SH1 Brynderwyn Hills (completed).***
- ***SH1 – Loop Rd North. Improvements to the SH1 and Loop Road intersection to improve safety and efficiency for inland freight traffic on SH15 (started).***

3.7 COMMUNITIES AT RISK REGISTER

The Communities at Risk Register[14] has been developed by the NZ Transport Agency to identify communities of road users that are over-represented in terms of road safety risk. The register highlights personal risk to road users by ranking communities by local authority area based on the Safer Journeys areas of concern. The register outlines that Northland has experienced comparatively poor safety results in various areas of road safety over the past five years – particularly in relation to speed (high rating).

3.8 PASSING LANE RESEARCH

Visitor Driver Project (2014)

The NZ Transport Agency-led** 'Visitor Driver Project (2014)' **undertook driver intercept surveys to understand user-perceptions of road safety and how the perceived level of safety had impacted (either positively or negatively) their views of the region with respect to a tourism destination. The most commonly made suggestions for improving road safety were:

- ***Overseas visitors: more overtaking opportunities (9.4%) and wider shoulders (8.2%)***
- ***Domestic visitors: more overtaking opportunities (19.0%) and a reduced number of corners (6.3%)***
- ***Local residents: more overtaking opportunities (23.1%) and road design/maintenance (19.2%)***

[13] *https://www.nzta.govt.nz/assets/network/projects/sh1-akerama-improvements/docs/Akerama-update-Nov-17-v4.pdf*
[14] *https://www.nzta.govt.nz/assets/resources/communities-at-risk-register/docs/communities-at-risk-register-2018.pdf*

Improvements to passing and overtaking provision in Northland would align strongly with these identified desires for local residents and domestic tourists.

Operating Characteristics and Economic Evaluation (2014)

The NZ Transport Agency Research Report (RR549)[15] ***titled*** *"Operating characteristics and economic evaluation of 2+1 lanes with or without intelligent transport systems assisted merging"* ***was published in May 2014. The research project, applicable to New Zealand's state highways, established the economic optimisation principles and influential factors which affect the characteristics and operation of passing lane treatments in series at moderate to higher volumes across various terrains.***

This research project involved a comprehensive literature review in relation to New Zealand passing lanes, international 2+1 roadways and a range of related subject matters. Through consideration of the findings, an assessment and design activity were undertaken to propose a 'New Zealand 2+1 roadway design standard' incorporating international best practice combined with the experience of existing 'tried and tested' New Zealand standards. The proposed design and international findings were subsequently interrogated to establish the likely safety characteristics for 2+1 roadways in the New Zealand context.

A comprehensive data collection process was undertaken at three existing passing lane locations which featured the specific traffic characteristics and network topographies necessary to obtain a range of vehicle/driver behaviours. This was then supported by other international research. Traffic models representing the survey sites were subsequently developed, with core, common parameters identified for use in a 'generic' model which was used to model the range of variables so their outputs could be processed into economic benefits. The results include a series of contour plots for a given terrain, AADT range and HCV composition. The contour plots identify BCR ranges for the given passing lane length and spacing combinations, with the optimum combination clearly identified.

A sample of the length/spacing contour charts (from the research paper) is provided as Figure 11.

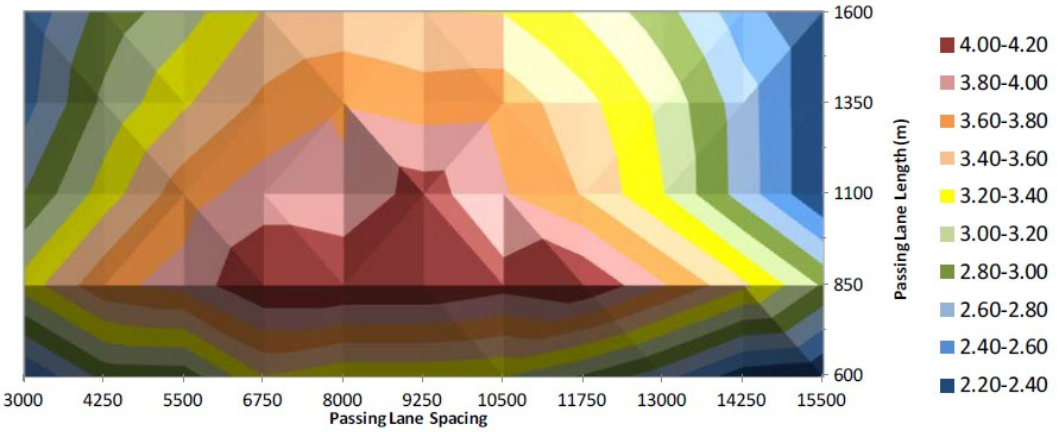


Figure 11: BCR for flat/rolling terrain, AADT 10,000vpd, medium heavy vehicle percentage (RR549)

This research has been used as part of the economic evaluation for this SSBC.

AustRoads Guide to Road Design Part 3: Geometric Design (2016)

The guidance provides direction in respect to the factors that should be considered when assessing passing opportunities across an area, including traffic volumes, percentage of slow vehicles and the availability of adequate overtaking sight distance.

Table 5 outlines the volume thresholds for when passing lanes would normally be justified.

[15] *P Kirby, B Wilmshurst (Traffic Design Group), and G Koorey (University of Canterbury)*

Table 5: Thresholds for Passing Lanes (AustRoads)

OVERTAKING OPPORTUNITIES IN THE PRECEDING 5KM		CURRENT YEAR DESIGN VOLUME (AADT)		
DESCRIPTION	% OF LENGTH PROVIDING OVERTAKING	% OF SLOW VEHICLES		
		5	10	20
Excellent	70-100	5,670	5,000	4,330
Good	30-70	4,330	3,670	3,330
Moderate	10-30	3,130	2,800	2,470
Occasional	5-10	2,270	2,000	1,730
Restricted	0-5	1,530	1,330	1,130
Very Restricted	0	930	800	670

Guidance is given with respect to the factors that should be considered when assessing the need for climbing lanes (uphill passing lanes, also referred to as crawler lanes or slow vehicle bays). This type of treatment should be considered where:

- ***Truck speeds fall to 40kph or less;***
- ***Long grades over 8% occur;***
- ***There is a high frequency of accidents attributable to the effects of slow-moving trucks; and***
- ***Heavy vehicles enter the traffic stream on the uphill.***

Table 6 indicates the volume thresholds for when climbing lanes would normally be justified.

Table 6: Thresholds for Climbing Lanes (AustRoads)

OVERTAKING OPPORTUNITIES IN THE PRECEDING 5KM		CURRENT YEAR DESIGN VOLUME (AADT)		
DESCRIPTION	% OF LENGTH PROVIDING OVERTAKING	% OF SLOW VEHICLES		
		5	10	20
Excellent	70-100	4,500	4,000	3,500
Good	30-70	3,500	3,000	2,600
Moderate	10-30	2,500	2,200	2,000
Occasional	5-10	1,800	1,600	1,400
Restricted	0-5	1,200	1,000	900
Very Restricted	0	700	600	500

These guidelines were used as part of the long list assessment process.

Passing Lanes: Safety and Performance

An AustRoads research report titled** 'Passing Lanes: Safety and Performance (2019)' **assessed the role passing lanes play with respect to road safety, journey time and user experience. The research concluded that passing lanes have both a perceived safety benefit and provide an actual reduction in crashes and improvements to the operation of the road. This research is relevant to this SSBC as it involves research from both Australia and New Zealand.

The research project involved a literature review, a safety analysis of before-and-after crashes, journey time analysis and road user experience analysis. It was found that an increased density of passing lanes encouraged motorists to perform passing manoeuvres in a passing lane "**...**nearly 80% of overtaking is inside the passing lane, when 20% of the route length is a passing lane."

It was also found that drivers who overtook in a passing lane did so with a smaller speed differential than those who overtook outside a passing lane (a lower speed differential is considered safer). Furthermore, it was found that the overtaking gap (i.e. the space between the lead vehicle and the following vehicle at the time of overtaking) is smaller when the overtaking is executed outside of a passing lane (i.e. tailgating).

The before-and-after crash analysis where a passing lane was implemented yielded the following average change in number of crashes:

- ***Within the passing lane section: reduction of 19% of injury crashes;***
- ***2km before the passing lane: reduction of 18% of injury crashes;***
- ***5km after the passing lane: reduction of 10% of injury crashes; and***
- ***For the entire route: reduction of 16% of injury crashes.***

The research found that motorists feel safer when overtaking using a passing lane compared to using the opposing lane. Motorists were also asked if an advisory sign giving advanced warning of a passing facility influences their decision to refrain from passing until in the passing lane; 83% of New Zealand respondents (and 88% of Australian respondents) said they would wait. This shows that signage is an important part of passing lane facilities.

3.9 WHANGĀREI TO WELLSFORD PROJECT

In October 2018, the NZ Transport Agency released plans for the Whangārei to Wellsford transport corridor which focuses around improving safety and resilience in the short and medium term as well as planning now for future population growth[16].

The NZ Transport Agency confirmed that they will deliver short term safety improvements in three sections (roadside barriers, median barriers, centre line widening and improved road marking):

- ***North. Whangārei and Port Marsden Highway (SH15).***
- ***Central. Port Marsden to the base of the Brynderwyn Hills.***
- ***South. SH1/12 Brynderwyn Hills to SH1 Wellsford.***

At the same time, the NZ Transport Agency will future-proof for potential four laning in the future, with the designation of the necessary land. However, the construction timing and the form of the new route will be dependent on growth and on the prioritisation of projects across the country. Any four laning will not however be progressed before 2030.

The recommended programme has looked to ensure that there would be no potential conflict between any proposed passing lanes (as an outcome of this SSBC) and wider safety improvements.

3.10 ONE ROAD NETWORK CLASSIFICATION

The One Network Road Classification (ONRC)[17] allows all roads in New Zealand to be classified using the same criteria and metrics. Criteria include traffic volumes, heavy vehicle percentages, the size of the places the road connects, the number of buses. Within the project area there is a range of road categories. South of Whangārei SH1 and SH15 are classified as 'National', whilst north of Whangārei to SH11 these are classified as 'Regional'. Most of the other state highways are Primary Collectors. The local roads considered are a combination of primarily Arterial, Primary Collector, and Secondary Collector roads.

As part of ONRC, the NZ Transport Agency has also developed fit for purpose provisional CLoS[18] outcomes for each road category. This means for each road category and for each classification, there is a corresponding target.

In terms of passing opportunities, the most relevant categories are travel time reliability, optimal speeds, and safety. National state highways typically provide most road users with consistent travel times, with some exceptions. They also often have higher optimal speeds depending on assessed risk, and a high KiwiRAP (3 or 4-star) standard. Passing lanes improve the consistency of travel times by reducing the time spent following slower vehicles, they can improve optimal speeds, and are a factor in the derivation of KiwiRAP star rating (they help improve the rating).

The expected travel times on Secondary Collectors typically vary as a result of other road users (all modes), travel speeds also vary depending on the assessed level of risk, and there are variable road standards and alignment. Ultimately, in terms of passing facilities, this would likely mean a lower frequency of facilities as compared with higher rated classifications such as National.

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[16] *https://www.nzta.govt.nz/projects/connecting-northland/Whangārei-to-te-hana/*
[17] *https://www.nzta.govt.nz/roads-and-rail/road-efficiency-group/projects/onrc*
[18] *https://www.nzta.govt.nz/assets/Road-Efficiency-Group-2/docs/customer-levels-of-service.pdf*

4. LITERATURE REVIEW

A review of relevant industry standards/guidelines, previous reports, background documents and previous work was undertaken at the beginning of the project. The review included both New Zealand and overseas standards / studies. The literature review provided a means of establishing an evaluation framework against which the long list of options has been assessed.

The industry standards, guidance and research documents that has been reviewed are:

1. ***NZ Transport Agency Passing Lane Research Paper (2011).***
2. ***NZ Transport Agency Planning Policy Manual (2007).***
3. ***NZ Transport Agency Research Report 549 - Operating characteristics and economic evaluation of 2+1 lanes with or without intelligent transport systems assisted merging (2014).***
4. ***Austroads Guide to Road Design Part 3: Geometric Design (2016).***
5. ***Passing & Overtaking on New Zealand Two Lane State Highways: Policy to Practice (2008).***
6. ***Tai Tokerau Northland Economic Action Plan (2016).***
7. ***Northland Corridor Management Plans (CMP).***
8. ***Otaki to north of Levin RoNS: North of Levin Passing Lanes (2016).***
9. ***Desert Road to Levin Corridor Strategy Passing Lane Summary Report (2014).***
10. ***SH1 Piarere to Waiouru Passing Lane Assessment.***
11. ***Katoomba to Dubbo (A32) Draft Corridor Strategy (2015).***

The full literature review is provided as* Appendix A6*, whilst Table 7 outlines the key findings and the proposed assessment approach for various criteria. The information has been used to develop the evaluation framework, which ultimately is used to inform the site assessment.

Table 7: Literature Review

<table>
<tr><th>CRITERIA</th><th>LITERATURE REVIEW FINDINGS</th></tr>
<tr><td>Safety</td><td>AADTs, under-length passing lanes, and poor advanced sight distances to intersections are key factors which influence the safety risk of passing lanes. Intersections located along the untreated side of the passing lanes (including within the 'before' and 'after' zones) and multiple intersections such as crossroads or closely spaced staggered T-junctions also cause safety issues at passing lanes.</td></tr>
<tr><td>Treatment Types</td><td>The NZ Transport Agency RR 549 and the Austroads Guide to Road Design Part 3 are suitable for the purpose of the assessment as they are recent and are applicable to a New Zealand context.
Key considerations are gradients, AADT, sight distance availability, per cent of slow vehicles and overtaking crashes. Table 7 and Table 8 of this SSBC will be used to justify various treatments.</td></tr>
<tr><td>Passing Lane Length</td><td>The desirable length of the passing lanes will be determined based on Austroads guidance:
<table>
<tr><th rowspan="2">OPERATING SPEED (KM/H)</th><th colspan="2">OVERTAKING LANE LENGTHS (EXCLUDING TAPER LENGTHS) (M)</th></tr>
<tr><th>MINIMUM</th><th>DESIRABLE</th></tr>
<tr><td>80</td><td>400</td><td>650</td></tr>
<tr><td>90</td><td>475</td><td>775</td></tr>
<tr><td>100</td><td>550</td><td>950</td></tr>
<tr><td>110</td><td>620</td><td>1070</td></tr>
</table></td></tr>
<tr><td>Design</td><td>Where a passing lane is located on an uphill grade, the merge area should be located beyond the crests of the grade.
Passing lanes should be located so they do not either start or terminate where traffic conflicts may occurs.
Minimum width of the passing lane, through traffic lane & opposing traffic lane to be 3.5m.
Key pavement marking for passing lanes include no overtaking lines, edge lines, diverge tapers, merge tapers, lane lines, diverge line, delineation of the merge area (wider merge taper, edge marker posts etc.) and traffic signs.</td></tr>
</table>

5. CONTEXT

5.1 TOURISM

Northland's visitor industry has the sixth highest total visitor nights stayed in the country.

Domestic tourists account for approximately 70% of the total visitor spend. The large dependence on the visitor industry sector also results in a strong seasonality with the peak economic generation occurring over the summer 'high' period. Figure 12 illustrates the seasonal variation of visitor nights for the period 2010-2018 in Northland. The graph also highlights the difference in visitor numbers on the east and west coasts of Northland.

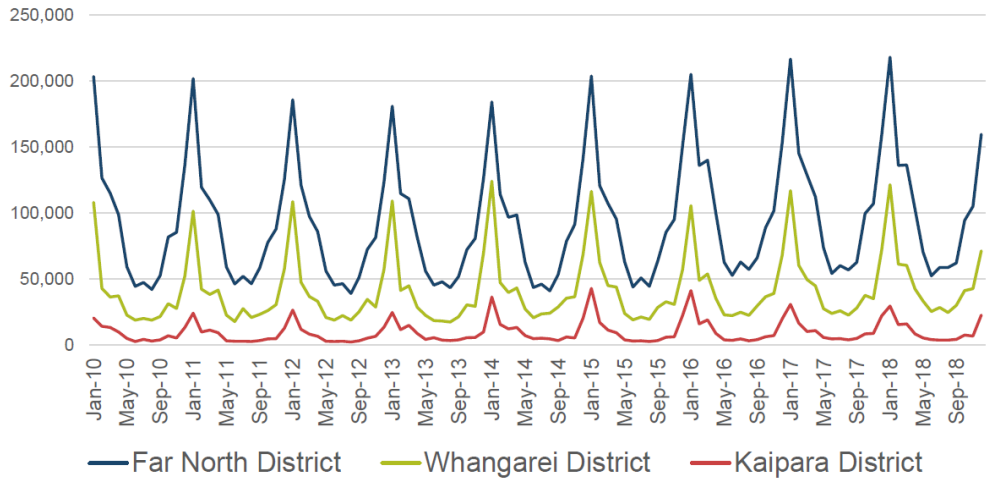


Figure 12: Seasonal Variability of Visitor Nights in Northland (2010-2018)[19]

Expanding the availability of attractions and experiences provides an opportunity to spread economic benefits across a larger proportion of the year. The easier it is for visitors to access and identify attractions and amenities in Northland, the more likely they are to spend time and money.

Passing and overtaking opportunities play a role in making the customer journey experience better, not only by improving journey travel times but by reducing stress on drivers of both slow vehicles, and those wishing to pass. There would be a natural correlation between the number of tourists visiting Northland and the number of campervans (and unfamiliar drivers) on the road. As more tourists start to explore the west coast, the greater the need becomes to provide more safe overtaking opportunities.

The influence of tourism growth on CloS would be on both state highways and local roads across the network.

5.2 TRANSPORT NETWORK

The key traffic and freight routes in Northland comprise of SH1 linking Whangārei to Kaitaia (to the north) and Auckland (to the south) and SH12 linking Kaikohe and Dargaville. These routes are supported by SH14 between Dargaville and Whangārei, SH10 between Pakaraka and Kaitaia, SH15 from Kaikohe to Whangārei and SH15 (Port Marsden Highway).

Figure 13 provides a map which shows the Annual Average Daily Traffic (AADT) and percentage of heavy commercial vehicles (HCV) along with Northland's key freight route[20]. Of note are the high proportions of HCVs along the SH15 inland route (25%, albeit very low AADT) and SH14 (16%).

[19] *Statistics NZ*
[20] *30 Year Transport Strategy for Northland (2010), Map 8*

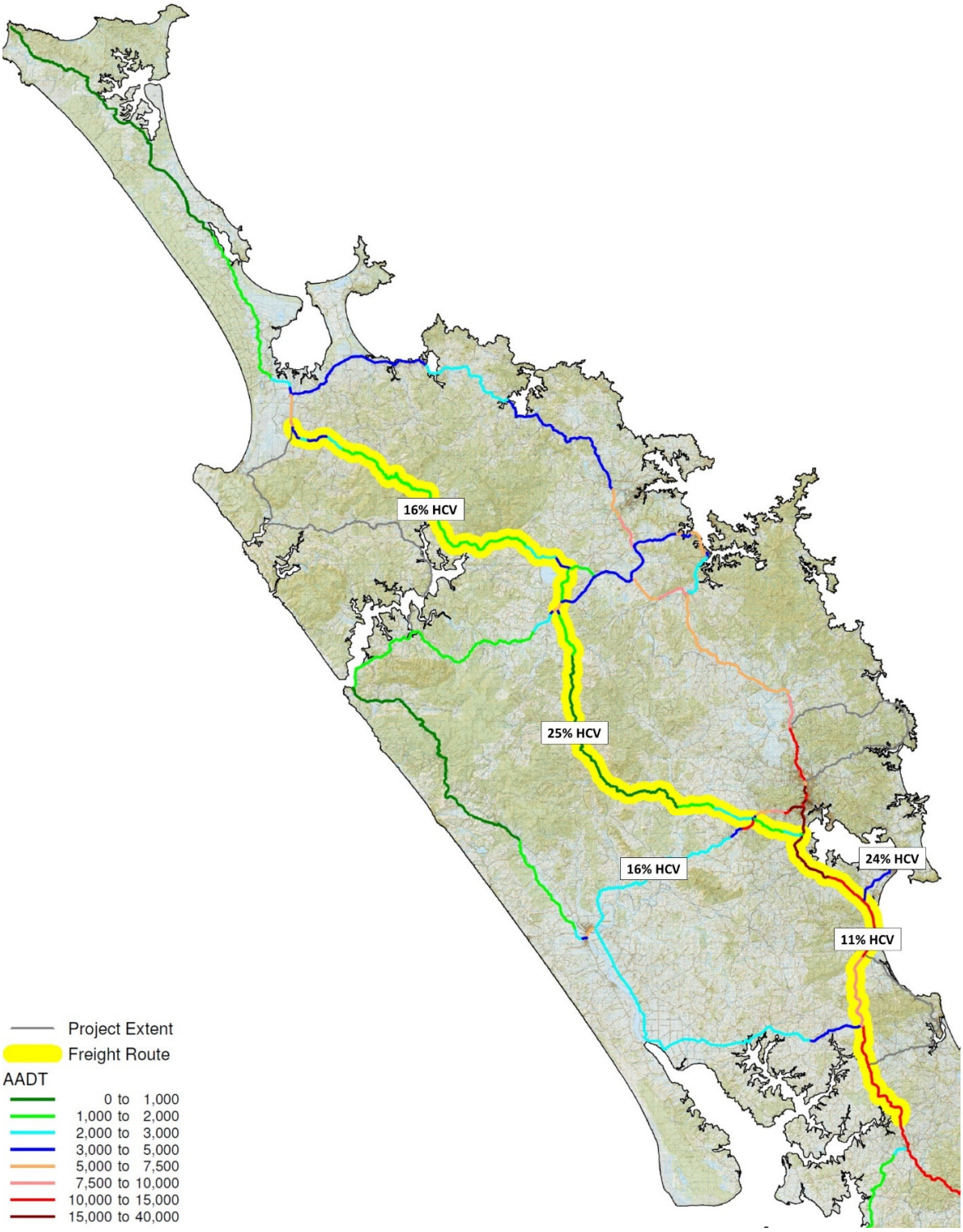


Figure 13: Northland AADTs and HCV Percentage

The completion of the Puhoi to Warkworth** 'Road of National Significance' **in 2021 will help reduce congestion and safety issues for visitors travelling to Northland from Auckland and make travel towards Northland more comfortable. To some extent this project will help reduce impatience by reducing stress and travel times.

The typical traffic volumes along state highways within the project area are presented in Table 8. The data shows that there has been strong growth between 2013 and 2017, except for on SH1 near Kaitaia.

Table 8: Annual Average Daily Traffic[21]

STATE HIGHWAY	2013	2014	2015	2016	2017	% GROWTH
SH1 – Ruakaka	10,000	10,200	10,900	11,800	12,700	5
SH1 – Kawakawa	5,900	6,000	6,500	7,000	7,200	5
SH1 – Kaitaia	5,000	5,000	5,000	4,400	4,400	-3
SH1 – Te Hapū	200	200	300	300	400	8
SH10	3,500	3,600	3,900	4,100	4,500	5
SH12	1,700	1,800	1,900	1,900	2,000	4
SH14	2,500	2,600	2,700	2,900	3,100	4
SH15	-	-	-	2,500	2,700	5

Not only has there been strong growth across most of the count sites, there has also been strong population growth in parts of Northland; especially the south-eastern section[22]. On-going employment growth is anticipated to be strongest in this area too. Conversely, there has been some population and employment decrease on the west coast.

Freight

Northland's road network carries about 7% of all national road freight. Although traffic volumes on some roads are relatively low, freight vehicles can result in a reduced travel experience for other road users and lead to concerns about safety. This is particularly problematic when the highway is closed for maintenance and traffic is diverted along alternative routes. The geographic distribution of key industries and their transport connections are shown in Figure 14.

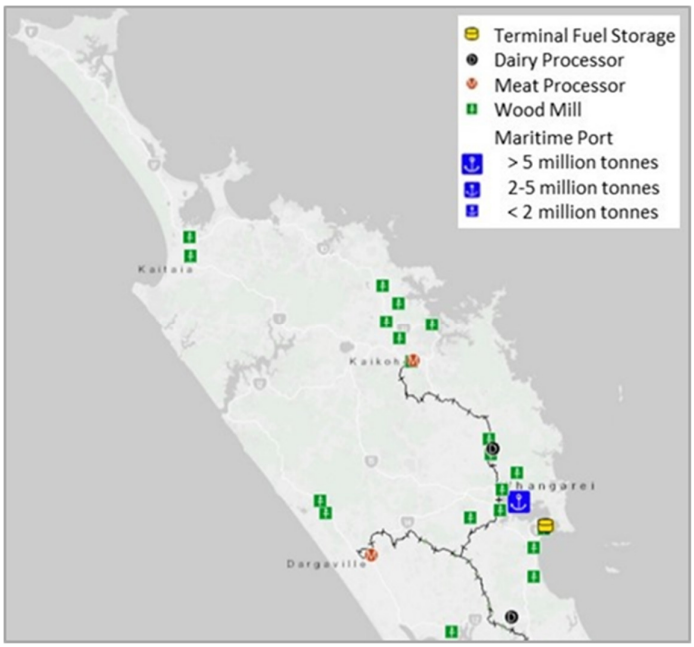


Figure 14: Key Industries and Transport Connections[23]

The growth of the rural economy, covering the dairying, horticulture, marine, engineering and forestry industries, plays a role in how well the road network performs and its effects upon CloS. Simply - as the rural economy grows, the more heavy vehicle traffic there will be on the roads. Consequently, drivers of faster vehicles will more frequently find themselves waiting behind slower vehicles. The influence of an

[21] *NZ Transport Agency. Note, no data is available for State Highway 15 before 2016 as the*
[22] *Census data*
[23] *NZTA MapHub*

increase in freight traffic will generally only be focused on key freight routes of the state highways, rather than on local roads.

The key port in Northland is at Port Marsden. There are 10 harbours in the region, two of which are on the west coast - Kaipara Harbour and Hokianga Harbour. Estimated export value in 2017 for the Northland economy was $2.57 billion[24].

5.3 EXISTING PASSING OPPORTUNITIES

Figure 15 identifies the locations of the existing passing lanes within Northland, along with areas where overtaking is possible due to the availability of good sight distances[25]. The map also identifies the main populated areas (in yellow), which present some opportunities for passing as slower vehicles pull-over because vehicles are destined for that location or drivers are stopping to rest.

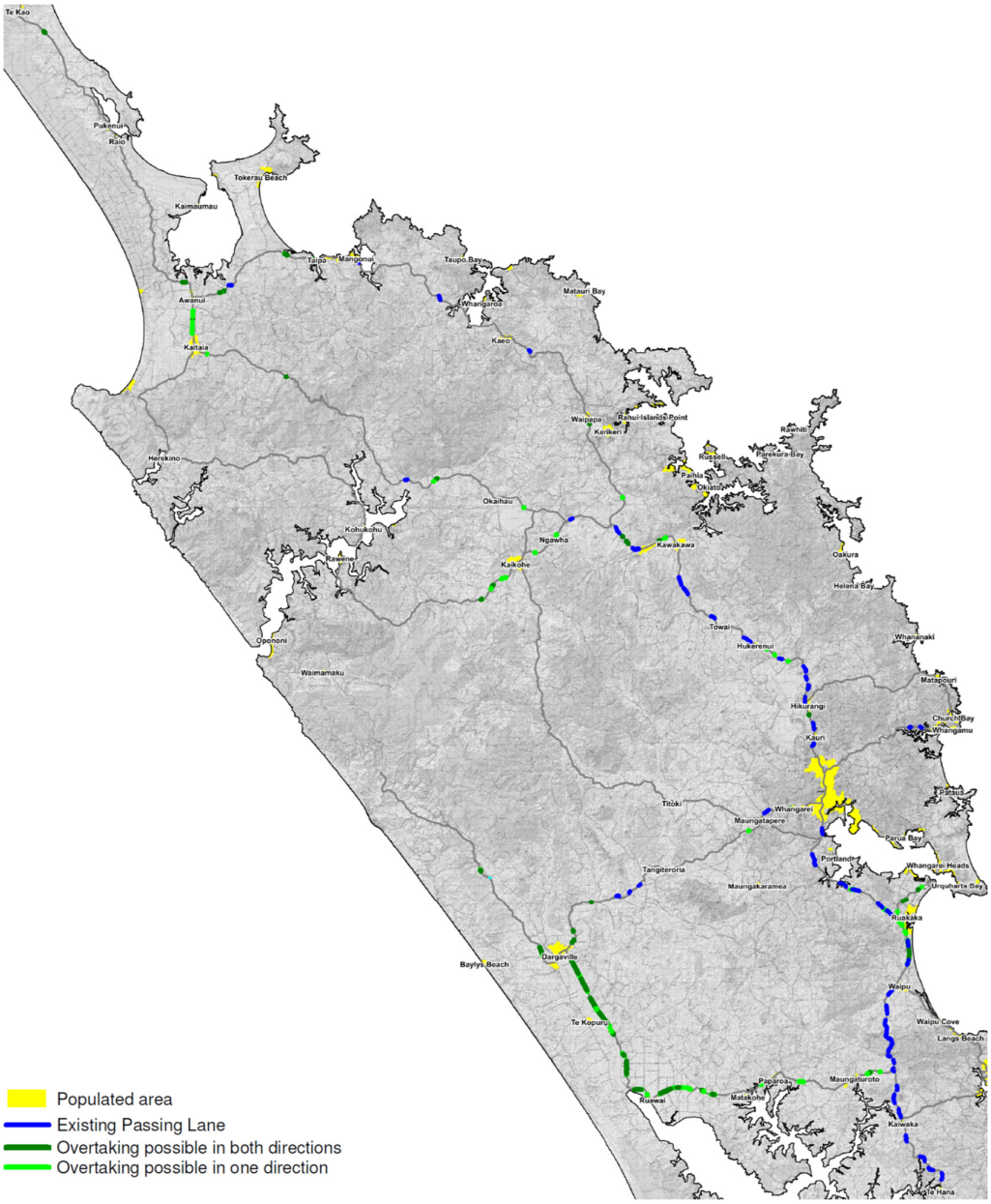


Figure 15: Existing Passing Opportunities[26]

[24] ***https://whangareinz.com/media/documentsReports/Invest-in-Tai-Tokerau-Northland-New-Zealand-2018.pdf***

[25] Data derived from the KiwiRAP Analysis Tool

[26] ***On SH10, SH11 and SH14, convention is that the increasing direction is away from Auckland (northbound /westbound) and decreasing is towards Auckland (southbound / eastbound). On the other state highways (SH1, SH12 and SH15), increasing direction is towards Auckland (southbound/eastbound), and decreasing direction is away from Auckland (northbound / westbound).***

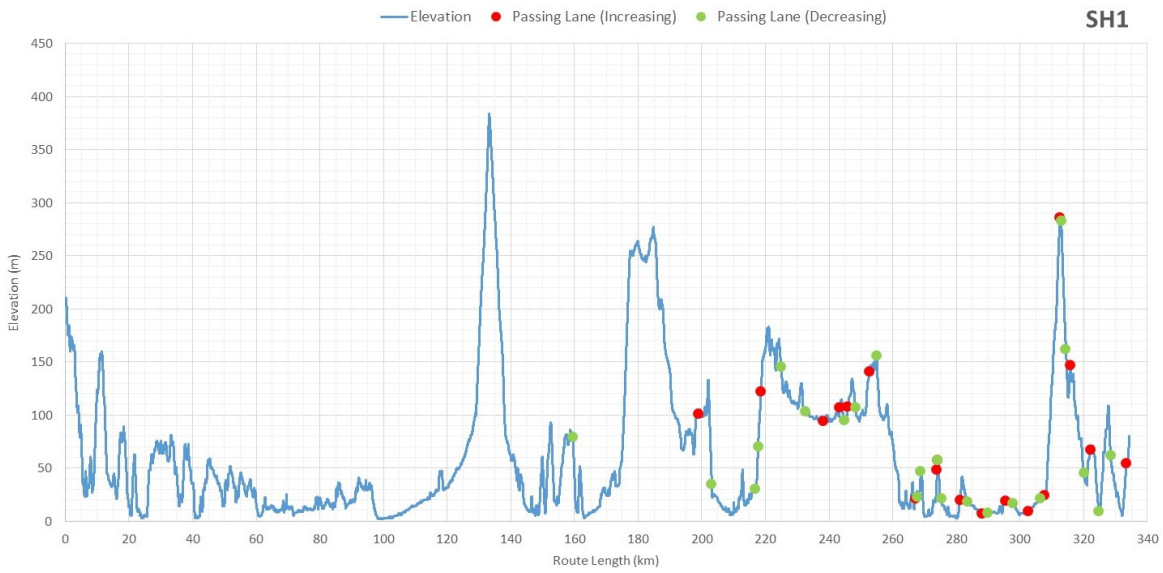
Most of the current passing lane provisions are concentrated along SH1 between Wellsford and Pakaraka, which reflects where the highest traffic volumes are. Additional passing lanes are located on SH10 and SH14, however there are no passing lanes along SH12, SH15 or on any local roads. Long straight sections, appropriate for overtaking, are provided along much of the southern part of SH12.

5.4 ENVIRONMENT

Northland is dominated by a landscape of irregular ranges and lowlands. This landscape has been largely created by volcanic activity over a long period. The topography creates two effects:

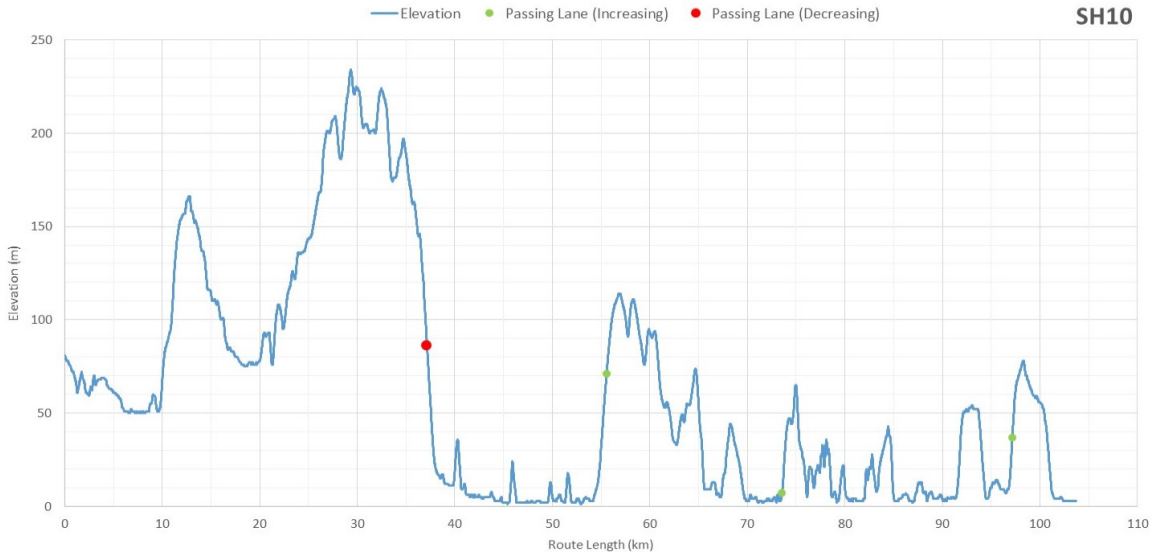
- ***Drivers need to concentrate harder, which adds stress and fatigue.***
- ***There are long distances with few straight sections that provide enough sight distance to make overtaking (without formal facilities) safe.***

For context, the locations of passing lanes along SH1 and SH10 in respect to the topography are shown graphically as Figure 16 and Figure 17 respectively. The graphs help to show whether the passing lanes are located on an incline, and the proximity to the next nearest passing lane (by direction).



0km = Cape Reinga, 197km = Pakaraka, 260km = Whangārei, 340km = Te Hana

Figure 16: SH1 Topography and Passing Lane Locations



0km = Pakaraka, 104km = Awanui

Figure 17: SH10 Topography and Passing Lane Locations

5.5 SAFETY

KiwiRAP measures Collective Risk and Personal Risk. Collective Risk is a measure of the total number of crashes that result in fatal or serious injuries per kilometre of road but does not consider the traffic volume. Personal Risk, however, considers traffic volumes and is a measure of the risk each person has when travelling on a section of a State Highway.

Nationwide, the trend for Personal Risk has been a progressive improvement with a greater proportion of the rural State Highway network now measuring in the lower Personal Risk bands (e.g. 48% in the period 2012-2016 compared with 26% in the period 2002-2006). However, for rural state highways that have posted speed limits of 80kph or higher in Northland (and Auckland), only 37% are considered low to low-medium risk[27].

Figure 18 shows the Personal Risk rating for Northland.

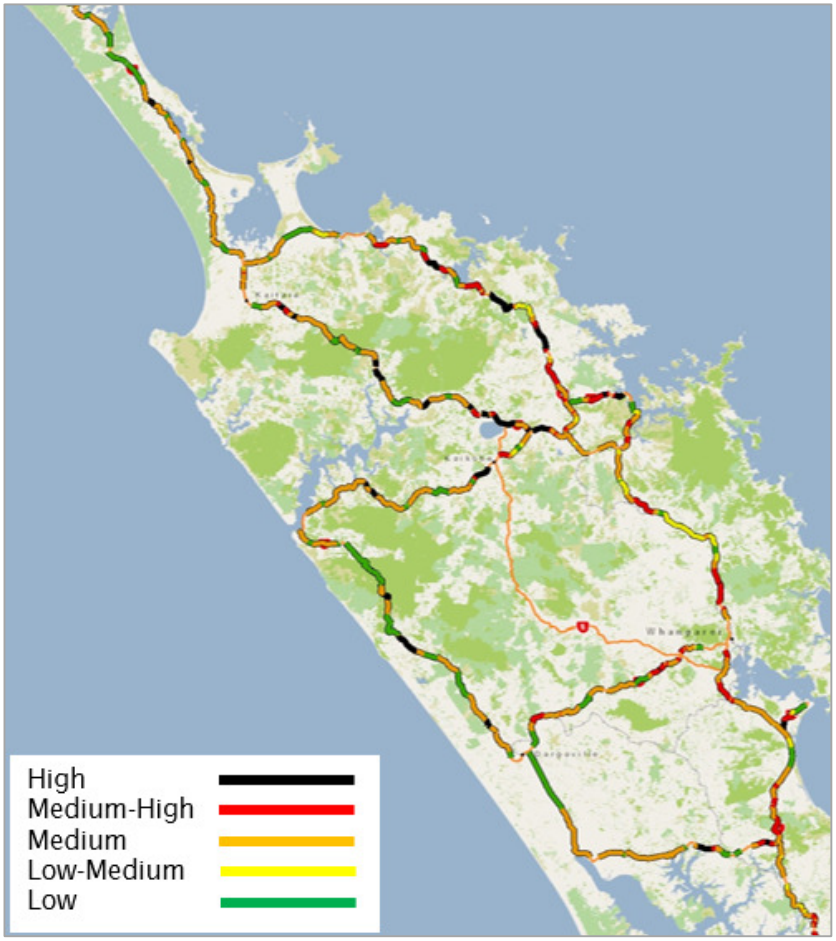


Figure 18: Personal Risk Rating[28]

The medium-high to high rated areas of Northland are located on SH10, SH1 (north of Pakaraka), and parts of SH12. These highways all have relatively low traffic volumes and varying topography.

Providing more safe locations for faster vehicles to overtake slower vehicles will reduce the likeliness of an overtaking related crash. In turn this would improve the Collective and Personal Risk ratings along the sections of road where improvements have been proposed.

[27] *http://www.kiwirap.org.nz/pdf/KiwiRAP%202018%20compressed.pdf*
[28] *SafetyNet*

5.6 RESILIENCE

As set out in Figure 19, most of the road closure events since 2014 in Northland have been related to crashes. Fifty crashes have been recorded in the NZ Transport Agency's TREIS[29]. These crashes resulted in an average closure time of about 3.5 hours each. However, closures due to crashes had a much shorter average duration on SH1, with an average of just over three hours per crash.

Flooding was the most common natural event to close state highways with an average closure duration of 31.4hrs. Trees falling across highways occur somewhat frequently too, but tend to result in delays rather than closures, however the one closure due to a fallen tree did close the state highway for nearly 20 hours. That incident was on SH12, about 40km north of Dargaville.

A summary of the road closure data is presented in Figure 19.

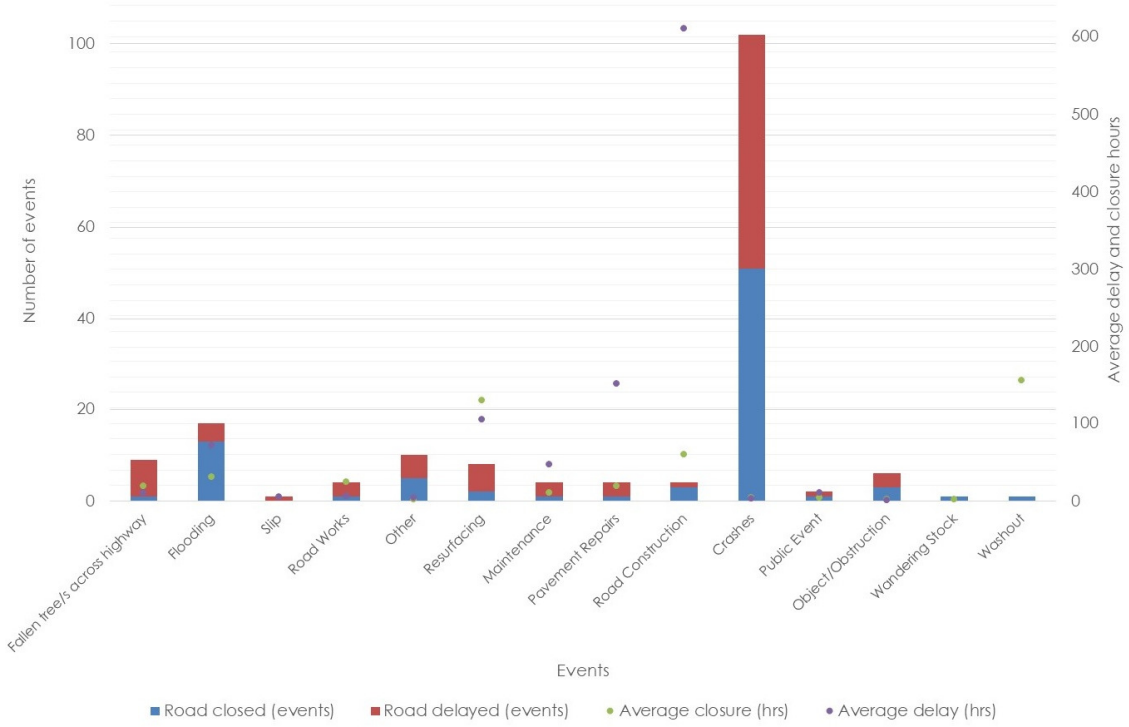


Figure 19: 2014-2018 (2019 inclusive) TREIS Closure and Delay Data

[29] The purpose of this dataset is to record disruptions on NZ roads.

6. PROBLEM STATEMENTS

This section outlines the Problem Statements for this SSBC and how they were collaboratively developed amongst the stakeholder group.

6.1 TWIN COAST DISCOVERY PBC

This SSBC stems from the TCDR PBC, which was intended to be an investment map for various options that would holistically provide the greatest benefit to the region.

The Problem Statements of the TCDR PBC were:

- **Problem 1***: The destination appeal of Northland's visitor industry is focused in a few locations and only at some times of the year, which is a lost economic opportunity for Northland (60%).*
- **Problem 2***: Variability in the customer level of service of the Twin Coast Discovery Highway and key Northland Journeys fails to meet the resilience, safety and road amenity expectations of all users (40%).*

The Investment Objectives of the TCDR PBC were:

- **IO1***: Increase visitor numbers and spend on key Northland journeys by 30% by 2030.*
- **IO2***: Increase visitor spend and numbers on the TCDR and key Northland journeys outside of peak periods by 30% by 2030.*
- **IO3***: No full closures without viable alternatives (of less than 2 hours) for all vehicles on TCDR and key Northland journeys by 2030.*
- **IO4***: Reduce the number of deaths and serious injuries on TDCR and key Northland journeys by 19% to achieve at least a medium collective risk and personal risk rating by 2030.*

Generally, the Investment Objectives of the TCDR focus around visitor numbers, CLoS and safety.

6.2 PASSING AND OVERTAKING OPPORTUNITIES

A review of previous studies, stakeholder workshops, background research and site investigations have allowed for a comprehensive identification of the key issues for passing and overtaking.

This understanding was built upon through stakeholder inputs during Workshop No.1, where the main causes, effects and consequences for problems were identified. Stakeholders identified an interrelationship between the key problem themes which has meant that the effects and consequences also predominately related to either safety or customer experience.

This information has been used as the building blocks for following agreed Problem Statements:

1. **Safety**: *A lack of formal passing opportunities and poor sight distances (due to the winding terrain) raise the temptation for drivers to perform unsafe passing manoeuvres, which increases the likeliness of overtaking related DSIs* (25%).
2. **Customer Level of Service**: *Increasing numbers of trucks, unfamiliar drivers and campervans are conflicting with faster moving cars. This adds stress and risk to all road users, which increases travel time and reduces customer level of service* (75%).

Both Problem Statements No.1 and No.2 link back to Problem No.2 from the TCDR PBC which focuses on Customer Levels of Service (CLoS).

The process for deriving the Problem Statements is provided as Figure 20.

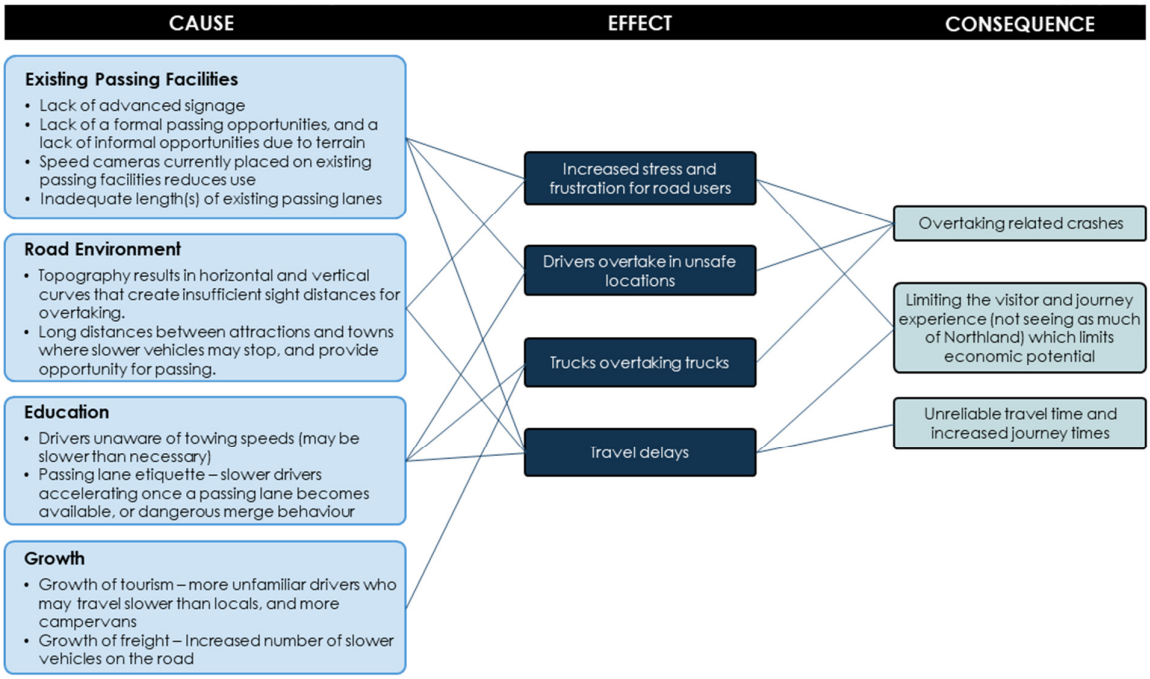


Figure 20: Passing Opportunities – Problem Statement Development

NZ Transport Agency data shows that overtaking, as a root cause, can be attributed to only 4.9% of crashes that resulted in a DSI on the Northland state highways. During the Technical Challenge 2 it was agreed that addressing CLoS is likely to provide more benefits, and there is an inter-relationship between driver comfort and safety (risks caused by driver frustration). On this basis, Problem Statement No.2 was given a higher weighting and Problem Statement No.1 has been reworded to relate to all overtaking related crashes, rather than only DSIs.

7. PROBLEM 1: SAFETY

This section provides the evidence base which substantiates the 'safety' problem (25% weighting), with information structured in the following manner:

- *The* **cause** *of the problem – what are the main causes which contribute to the problem?*
- *The* **effect** *of the problem – to road users, ease of access, commercial activity, the surrounding environment etc.*
- *The* **consequence** *of the problem – what are the health, environmental and economic effects created by the problem?*

7.1 OVERVIEW

Improving road safety is a key objective of this project which aligns closely with the GPS and other regional and local government policies. The increased focus on a 'Safe System' and 'Road to Zero' approach where reducing the number of crashes is important but also is improving the road environment so that mistakes do not result in DSIs, highlights the importance of improving safety.

Table 9 provides a summary of the key causes, consequences and effects of the core **safety** *problem, as identified by the wider stakeholder group.*

Table 9: Safety Problem – Key Causes, Consequences and Effects

A LACK OF FORMAL PASSING OPPORTUNITIES AND POOR SIGHT DISTANCES (DUE TO THE WINDING TERRAIN) RAISE THE TEMPTATION FOR DRIVERS TO PERFORM UNSAFE PASSING MANOEUVRES, WHICH INCREASES THE LIKELINESS OF OVERTAKING RELATED DSI	
Cause	• *Lack of formal passing facilities* • *Insufficient overtaking sight distance* • *Substandard existing facilities (including some accesses on some passing lanes)* • *Traffic growth* • *Poor signage and road markings* • *Carriageway cross section (narrow lane widths / lack of shoulders)*
Effects	• *Increased stress and frustration for road users* • *Drivers overtake in unsafe locations* • *Trucks passing trucks*
Consequences	• *Overtaking related DSI crashes* • *Increased number of road closures caused by a crash* • *Limiting the visitor and journey experience*

7.2 CAUSES

Lack of Formal Passing Facilities

As most of Northland's State Highway network currently consists of single lanes of traffic in each direction, drivers wishing to overtake can only do so at existing passing lanes, by utilising the opposing traffic lane or waiting for slower vehicles to pull-over. An absence of formal passing lanes or insufficient forward visibility (due to the horizontal and vertical alignment) means that less than 20% of Northland's State Highway network currently provides safe opportunities for overtaking. The fewer the number of safe overtaking opportunities, the more likely a driver of a faster vehicle will get frustrated and potentially take a risky manoeuvre to pass the slower vehicle.

Table 10 provides a comparison of the existing passing lanes against the minimum number of passing lanes and Slow Vehicle Bays (SVB) required along each corridor[30]*. This has been computed based on the Austroads*[31] *methodology using the AADT, heavy vehicle volumes and the percentages of road length with adequate overtaking sight distance.*

[30] Austroads Guide to Road Design Part 3: Geometric Design, Table 9.1
[31] Austroads Guide to Road Design Part 3: Geometric Design, Table 9.1

Table 10: Summary of the Existing Passing Facilities vs. Required Passing Lanes (PL)[32]

ROAD	TOTAL LENGTH (KM)	MAX AADT	PLS WARRANTED[33]	NUMBER OF PLS REQUIRED[34]	EXISTING NUMBER OF PLS		SVB'S WARRANTED[35]	EXISTING NUMBER OF SVBS	
					INC[36]	DEC[19]		INC[19]	DEC[19]
SH1	339	28,000	Yes	16	16	20	0	2	339
SH10	104	9,000	Yes	5	2	1	1	0	104
SH12 (north)	46	7,500	Yes	1	0	0	0	0	46
SH12 (South)	122	6,000	Yes	5	0	0	0	0	122
SH14	55	22,000	Yes	2	0	1	1	2	55
SH15	91	3,000	Not assessed	4	0	0	0	0	91
SH15 (Port Marsden)	8.6	5,000	Yes	0	0	0	0	0	8.6
Mangawhai Heads Loop	40	3,000	Not assessed	1	0	0	0	0	40
Tutukaka Coast Loop	60	3,000	Not assessed	2	0	0	0	0	60
Kaitaia to Rawene	80	3,000	Not assessed	3	0	0	0	0	80

As set out in Table 10, based on the available traffic volumes and the percentage length with overtaking data, passing lanes are needed on SH1, SH10, SH12 SH14 and SH15 (Port Marsden). However, only SH1 currently provides the minimum number of passing lanes required (as per the standards). For all other corridors, the quantity of passing lanes does not meet the AustRoads minimum standards.

SH14 has the most SVBs, which is likely to be due to the mountainous gradients along most of this corrido and high freight movements. However, all these SVB's are located within a single 5km section.

Substandard Passing Facilities

Substandard passing lanes also contribute to safety issues. The two key factors to consider when evaluating the suitability of passing lane length are (1) the speed environment and (2) the spacing between passing lanes. Table 11 provides a summary of the existing passing lane facilities in terms of their lengths and spacing. Note that routes with no passing lane facilities have been excluded.

Table 11: Summary of the Existing Passing Lane (PL) Facilities

SH	TOTAL LENGTH (KM)	EXISTING NUMBER OF PLS		UNDER-LENGTH PLS[37]		SUBSTANDARD SPACING[38]		MAXIMUM SPACING (KM)		MINIMUM LENGTH (M)	
		INC[39]	DEC[24]	INC[24]	DEC[24]	INC[24]	DEC[24]	INC[24]	DEC[24]	INC[24]	DEC[24]
SH1	339	16	20	3	7	1	1	30	19	375	333
SH10	104	2	1	2	1	2	1	55	66	612	297
SH14	55	0	1	-	0	-	1	-	44	-	679

[32] Due to the absence of sight distance data along SH15, Mangawhai Heads Loop, Tutukaka Coast Loop and Kaitaia to Rawene link, the need for passing lanes and slow vehicle bays along these roads could not be assessed at this stage.
[33] Calculated in line with Austroads Guide to Road Design Part 3: Geometric Design, Table 9.1
[34] Based on a minimum passing lane spacing of 20 km in line with Austroads Guide to Road Design Part 3: Geometric Design
[35] Computed as per Austroads Guide to Road Design Part 3: Geometric Design, Table 9.1
[36] On SH10, SH11 and SH14, increasing direction is northbound/westbound and decreasing is southbound / eastbound. On SH1, SH12 and SH15, increasing direction southbound/eastbound and decreasing direction is northbound / westbound.
[37] Austroads Guide to Road Design Part 3: Geometric Design, Table 9.2
[38] Based on a desirable passing lane spacing of 15 km
[39] On SH10, SH11 and SH14, increasing direction is northbound/westbound and decreasing is southbound / eastbound. On SH1, SH12 and SH15, increasing direction southbound/eastbound and decreasing direction is northbound / westbound.

As set out in Table 11, approximately 30% of the existing passing lanes on SH1 do not currently meet the minimum passing lane lengths. The shortest passing lanes were measured to be approximately half of the minimum passing lane length (620m) recommended for a 110kph operating speed.

Figure 21 identifies the locations (in red) of the under-length passing lanes.

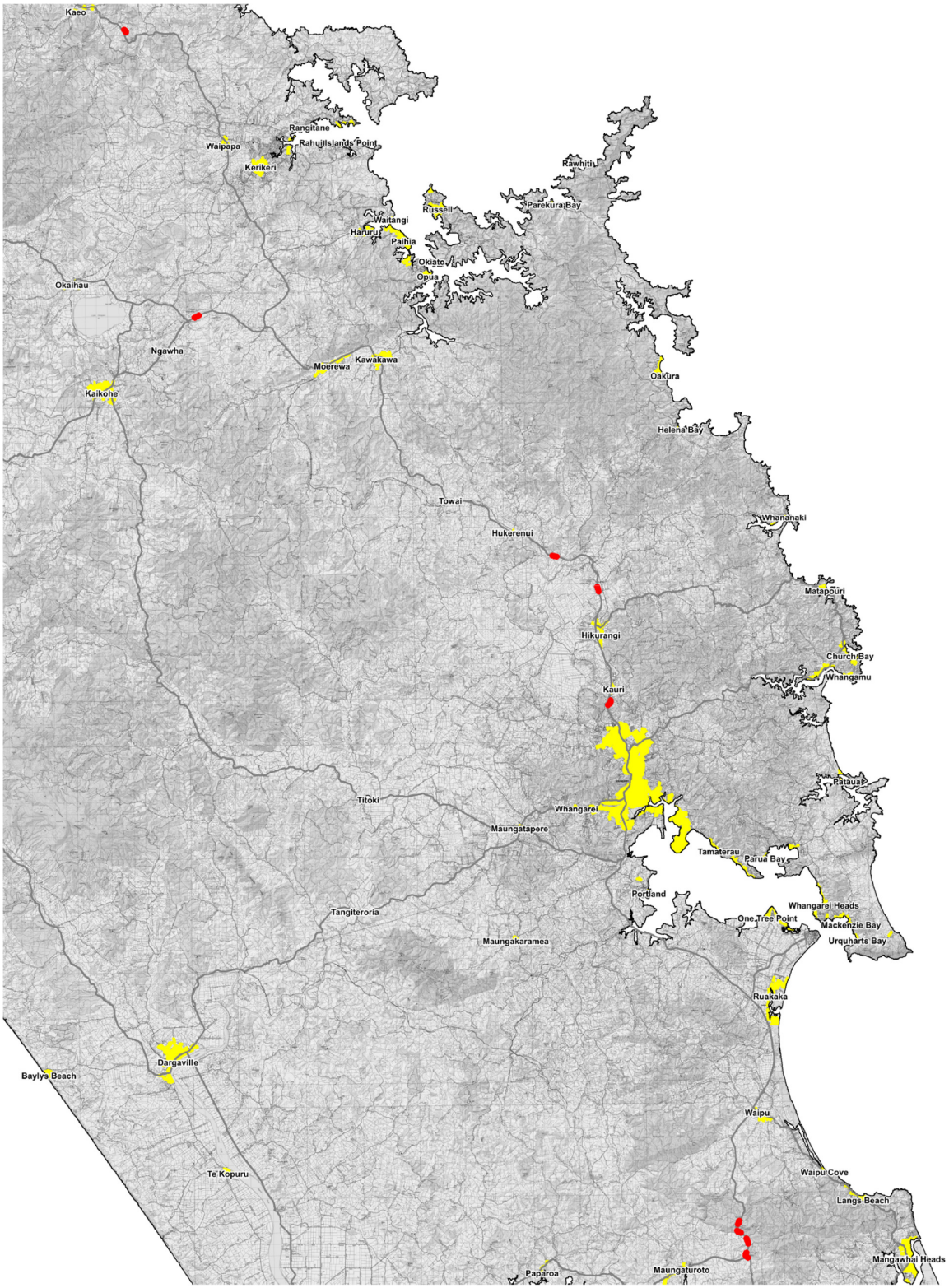


Figure 21: Locations of Under-Length Passing Lanes

Most of the existing passing lanes on SH1 are spaced at desirable distances (i.e. at 15km spacing or less). However, six passing lanes on SH1 are currently located at spacings ranging from 19 km – 30 km. This presents a gap, which may be desirable to address given its importance as a freight and tourist route. The passing lanes located on SH10 and SH14 are all located at substandard spacings due generally to a low number of provisions.

Insufficient Overtaking Sight Distance

The overtaking sight distance is defined as the distance required for a driver of a vehicle to safely overtake a slow vehicle without interfering with the speed of an oncoming vehicle[40]. For example, in a 110kph operating speed environment, for a large vehicle (e.g. a semi-trailer or road train) to overtake another large vehicle, a sight distance of 1.07km – 1.31km is required.

Figure 22[41] provides a breakdown of the existing overtaking opportunities, based on the available site distances, for each state highway corridor within the project area[42].

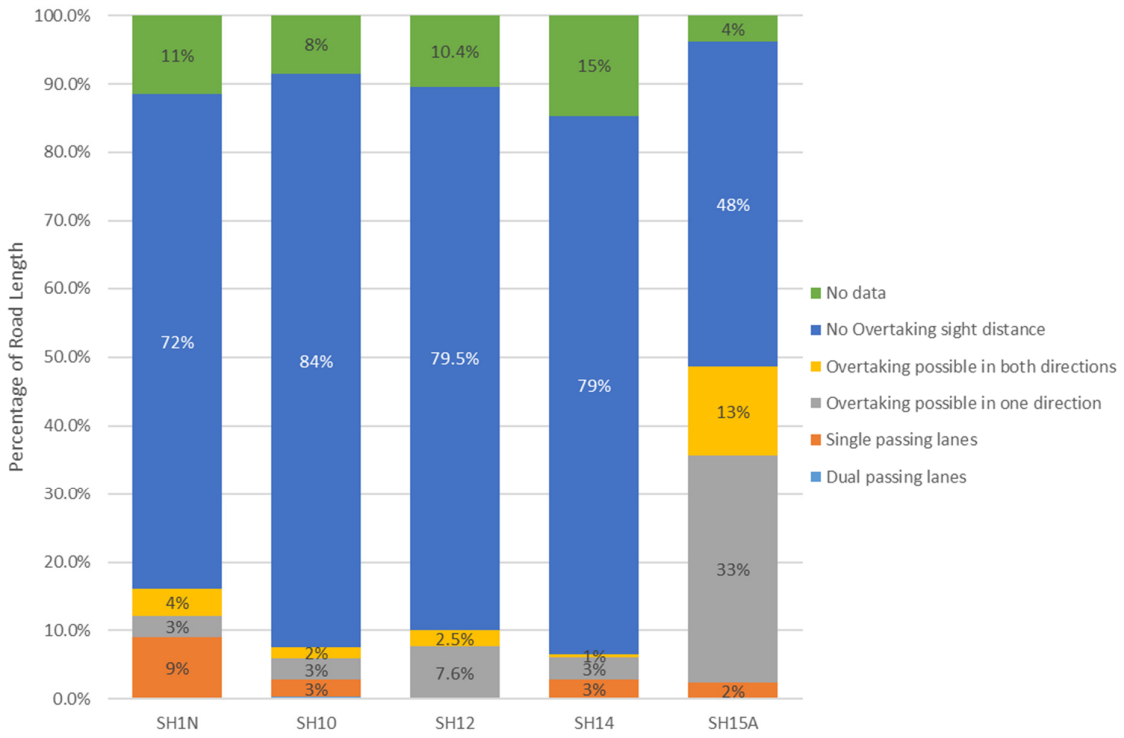


Figure 22: Extent of Current Overtaking Opportunities

The graph identifies that the main issues, in terms of infrequency of available overtaking opportunities, are along SH14, SH10 and SH12 (a reflection of the topography).

At present, where there is insufficient forward visibility due to the vertical alignment of the road, no-passing restrictions have been implemented through the installation of double yellow centre lines. Aside from SH15 near Port Marsden, all other state highways within Northland currently have no-passing restrictions across more than 70% of their length, with only 8% -17% of the route providing passing facilities or adequate overtaking sight distance in at least one direction. This highlights the need for improved passing opportunities, particularly along SH1 and SH10 which currently carry high volumes of traffic (up to 8,000vpd – 15,000vpd depending on the season).

Approximately 49% of SH15 east of SH1, 16% of SH1, 8% of SH10 and 6% of SH14 currently provides safe overtaking opportunities at least in one direction. The southern section of SH12 provides more overtaking opportunities than the northern section of SH12, with approximately 17% of this section providing overtaking opportunities in at least one direction, in comparison to the 2.4% of the northern section.

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[40] Austroads Guide to Road Design Part 3: Geometric Design
[41] Data extracted from KiwiRAP Analysis Tool
[42] Due to the absence of overtaking sight distance data for SH15, an assessment of the overtaking sight distance availability for this corridor has not been undertaken.

Traffic and Freight Growth

The Northland population was estimated to be 175,400 at June 2017 and is predicted to increase to 188,600 people by 2028[43] due to general population and employment growth. For context the population of Northland 20 years ago was 143,000 people[44].

Similarly, the total number of visitors to the area is also expected to grow at an annual rate of approximately 2.5% with the distance travelled by visitors along Northland rising by 34 million kilometres between 2016 and 2023[45]. This expected growth in population and visitors will likely correspond to an equivalent rise in light vehicle traffic. Over the last five-year general traffic growth is in the order of around 4-5% per annum, aside from SH1 near Kaitaia which saw slightly negative growth.

In addition to the increase in population, freight movements within Northland are forecasted to increase by almost 40% by 2042[46]. Given that most of the freight within Northland is transported via road, with rail only carrying approximately 2% of the freight[47], this represents growth in the heavy commercial vehicle movements on the Northland road network. SH15 is likely to become an ever more important freight route, unless investment in freight rail improvements is prioritised – noting that HCV percentage along this inland corridor is already close to 25%.

Increasing traffic volumes are likely to exacerbate any existing overtaking issues as more visitors and freight traffic means more slow vehicles and a higher occurrence of drivers of faster vehicles getting frustrated.

Poor Signage

The effectiveness of formal passing facilities is dependent upon driver awareness and use of these facilities. This is particularly applicable to drivers who are unfamiliar with the Northland road network and the locations of passing facilities. Anecdotally poor signage is an issue identified at several existing passing facilities which is a possible contributing factor to the overtaking issues.

Signage at passing facilities informs drivers of the presence of the facility, and advance signage encourages drivers to wait until they reach a formal passing facility to overtake slow vehicles. This prevents drivers from making unnecessary overtaking manoeuvres at unsafe locations. Similarly, adequate warning signs to alert drivers of the passing lane termination also ensures that drivers merge at the end of the passing facility safely.

The location of this signage is crucial in conveying the intended message to drivers, as signage provided at less than ideal locations could be just as ineffective as not providing signage. For an example a slow vehicle bay sign provided within the slow vehicle bay (instead of at the start) will result in much of this facility not being utilised as intended. General driver education (i.e. encouraging slow vehicles to pull-over) would also play a role in maximising the proper use of existing facilities.

Research

The Austroads Research Report (AP-R596-19) into passing lane safety and performance identified that 80% of the respondents to a survey reported that the advisory sign would influence their decision to overtake on the passing lane. This indicates the effectiveness of advisory signage and how they are an important component of passing lane operation.

Cross-Section

Most of Northland's state highway network currently consists of a single lane of traffic in each direction with narrow traffic lane widths and limited sealed shoulder areas. This means that slow vehicles are unable to pull-over to let others pass, and drivers wishing to overtake slow vehicles are required to do so by fully utilising the opposing traffic lane. This increases the exposure of any overtaking drivers to oncoming traffic and increases the risk of potential collisions. This problem is particularly noticeable in the Far North with high numbers of cyclists undertaking bike packing tours such as the Tour Aotearoa. We also heard from hapū that many of their significant sites (such as marae and urupa) are accessed from the state highways and accessing these sites from the highway safely requires slowing of traffic[48].

Notwithstanding the above, it is acknowledged that is difficult to achieve wider lanes without fully widening the road corridor. The cross-section problem is likely to be a wider national, and not only a Northland, problem.

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[43] *Northland Long Term Plan 2018 - 2028*
[44] *https://figure.nz/chart/qYPFtR1JzsKFLy4b-rkQVd4XhQWpFfVu0*
[45] *Northland Regional Land Transport Strategy*
[46] *National Freight Demand Study, 2014*
[47] *Northland Regional Land Transport Strategy*
[48] This matter has not been addressed in this business case further however it will be recommended for further investigation in a subsequent project.

7.3 EFFECTS

Increased Stress and Frustration for Road Users

Drivers waiting behind a slower moving vehicle are termed as "platooning", with the subsequent CLoS impact estimated using two pseudo-measures: per cent time spent following (PTSF) and average travel speed. Research undertaken both in New Zealand and internationally found that as PTSF increases, in combination with a lack of overtaking opportunities, drivers become frustrated. In turn, drivers tend to accept a higher level of risk when executing overtaking manoeuvres using the opposing lane by accepting smaller gaps and expressing more aggressive behaviours.

Thrush (1996)[49] outlined that even a 5% delay to travel time can cause erratic and risky overtaking on even low volume roads (500vph). More recent research by Austroads (2019), found if PTSF was greater than 30-40%, then the driver would perceive the delay to be unacceptable and lower their risk threshold. It was also reported that passing lanes can have a significant reduction on PTSF (i.e. >10%).

The actual time lost whilst platooning is commonly less than the perceived time lost. However, drivers perceive a reduced CLoS as they are unable to travel at a free speed and then wish to overtake.

Research

Previous studies[50] have identified that motorists recognise the benefits of passing lanes, with platooning behind slow vehicles was identified by motorists as a major source of delays and frustration.

User perception surveys also identified that motorists recognise the safety benefits of passing lanes and feel safer overtaking on the passing lane rather than using the opposing lane outside of the passing lane. Thereby, most motorists would use passing lanes when overtaking.

Drivers Overtake in Unsafe Locations

Insufficient passing provisions can lead to frustrated drivers overtaking slow vehicles at unsafe locations. The effect is further exacerbated by Northland's winding topography, as locals will typically be aware of where there is potential to overtake and will want to take the opportunity if they know it is the last opportunity for a while. This is true even if their overall delay is relatively small.

Trucks Overtaking Other Trucks

Inadequate passing opportunities can also result in truck drivers choosing to overtake other heavy vehicles travelling at slow speeds. For the freight industry time is money, and getting stuck behind a slower truck directly impacts profits. As truck drivers will require a longer sight distance than light vehicles to overtake other heavy vehicles, safe opportunities to do so are rarer. In addition, due to the low speeds at which heavy vehicles generally negotiate uphill sections, the exposure to oncoming traffic and the risk of a potential collision with another heavy vehicle overtaking on an incline is high.

This effect was raised during Workshop No.1 by the wider stakeholder group. Whilst the evidence for this effect at this stage is mostly anecdotal, it is still a notable effect.

7.4 CONSEQUENCES

Overtaking Related Crashes

The consequence of the insufficient overtaking sight distance and passing lane facilities are reflected in the five-year (2014 – 2018) crash history which indicates that a total of 107 overtaking crashes were recorded across the project area. Of these, nine crashes resulted in deaths, 14 in serious injuries and 23 in minor injuries.

Table 12 provides a breakdown of the overtaking crash history, whilst Figure 23 shows a heat map of the overtaking related crashes.

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[49] ***Thrush, MJ 1996, Assessing passing opportunities, research report no. 60, Transit New Zealand.***
[50] AR-R596-1 Passing Lanes Safety and Performance, 2019 (Section 6)

Table 12: Summary of Overtaking Crash History

ROAD	LENGTH (KM)	AADT RANGE	FATAL	SERIOUS	MINOR	NON-INJURY	TOTAL
SH1	339	1,000 - 15,000	4	8	14	42	68
SH10	104	3,000 – 8,000	2	3	4	9	18
SH12	122	1,000 – 3,000	0	1	0	3	4
SH14	55	2,000 – 3,000	1	1	2	4	8
SH15	91	1,000 – 3,000	2	0	0	0	2
SH15 (Port Marsden)	8.6	3,000 – 5,000	0	0	0	0	0
Mangawhai Heads Loop	40	1,000 – 3,000	0	1	3	1	5
Tutukaka Coast Loop	60	1,000 – 3,000	0	0	0	0	0
Kaitaia to Rawene	80	1,000 – 3,000	0	0	0	3	3

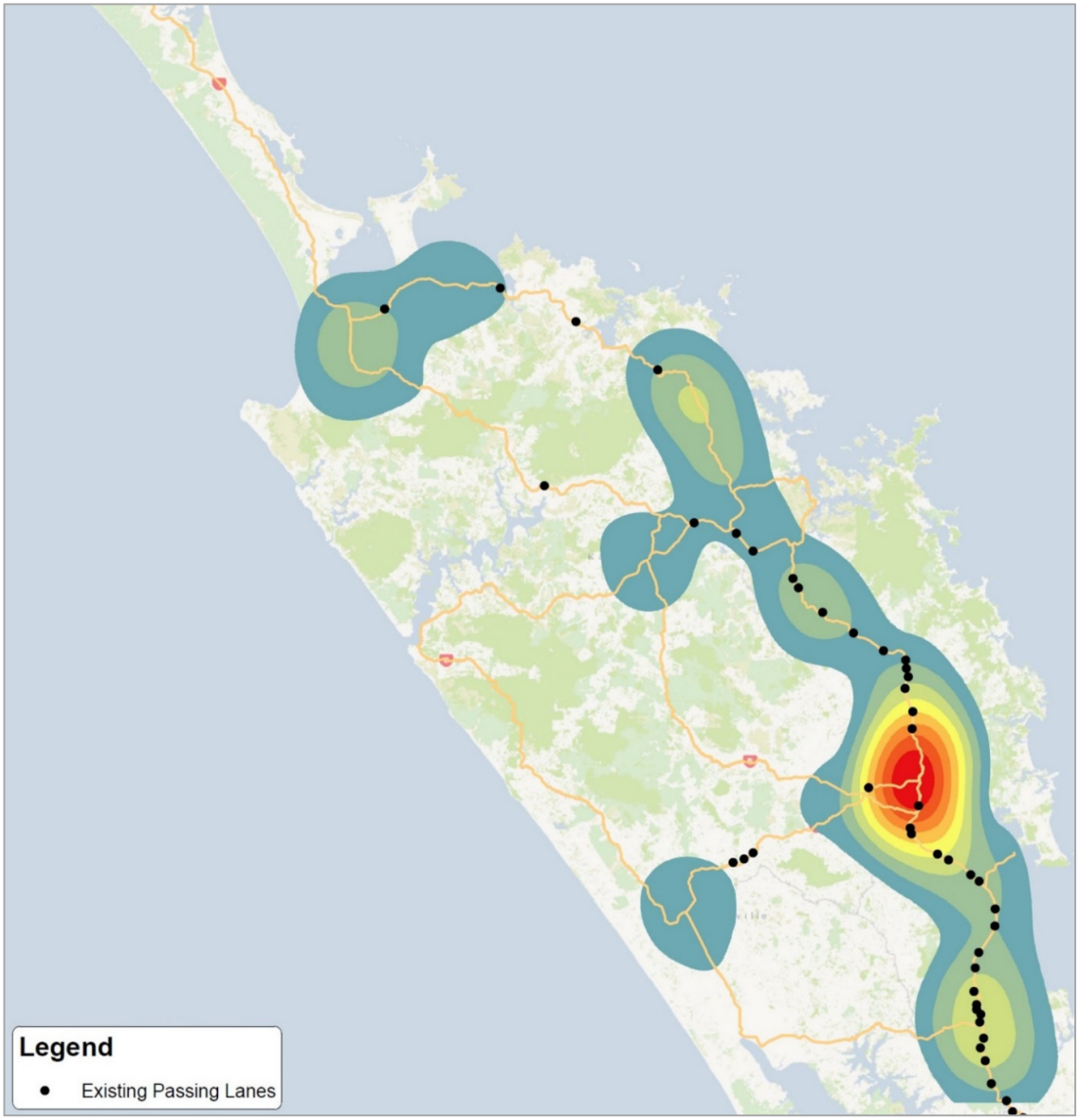

Figure 23: Overtaking Crashes Heatmap

A total of 23 death and serious injury overtaking crashes have been recorded within the project area. Over half of these DSI's occurred along SH1. Of the remaining crashes, most were recorded along SH10, whilst some were recorded on SH12, SH14, SH15 and the local road loops.

Aside from SH14 and the Mangawhai Heads Loop, there is a correlation between the traffic volumes and crashes. This highlights the potential increase in overtaking crashes that could occur as traffic volumes rise (if no new passing or overtaking facilities are provided).

Investment Objective No.4 of the TCDR PBC was a 19% reduction in the number of deaths and serious injuries on the TCDR by 2030. However, reducing the number of overtaking related crashes will go some way to achieve this objective, noting that overtaking was only a cause in 4.9% of all Northland crashes[51].

Crashes at Under-Length Passing Lanes

The locations and nature of crashes at under-length passing lanes are shown in Figure 24.

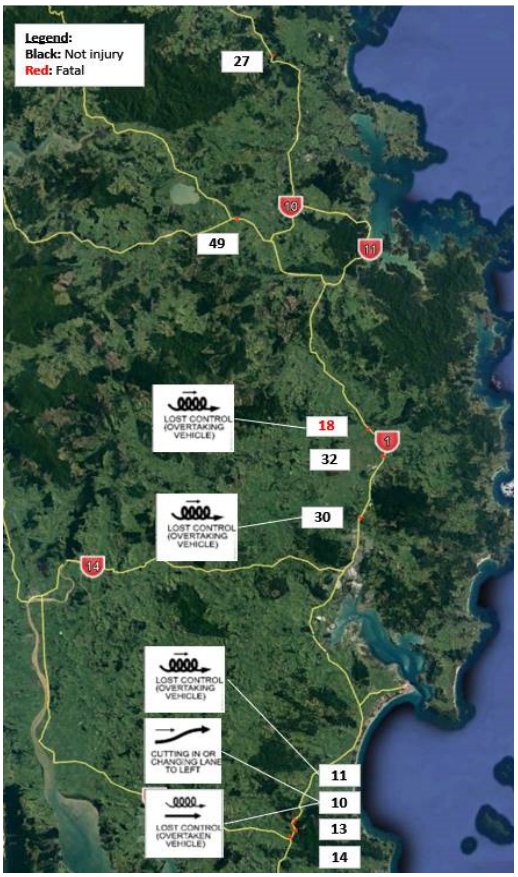

Figure 24: Crashes on Under-Length Passing Lanes (2008-2018)

Crashes on Sections with Few Passing Opportunities

Comparison of the existing passing facilities and overtaking crash data indicated a correlation between the lack of passing facilities and crash issues (2014-2018) at the following locations:

- **SH1, between SH10 (Awanui) and Perry Road**: ***A 51km long section with no passing facilities in either direction. Eight overtaking crashes consisting of one fatal crash, one serious injury crash, two minor injury crashes and four non-injury crashes. Five of these crashes involved a southbound vehicle overtaking, with the remaining three crashes involving a northbound vehicle.***
- **SH1, between east of Huapara Road and approximately 7km east of SH11**: ***This is an approximately 19km long section with no southbound passing lanes. A fatal crash involving a southbound vehicle was recorded within this section.***
- **SH10, between Whangaroa Road and SH1**: ***A 55km – 66km long section with no passing facilities in either direction. Six overtaking crashes consisting of two fatal crashes, two serious***

[51] *Statistic provided by the NZ Transport Agency during Technical Challenge No.3.*

injury crashes and two minor injury crashes were recorded. The fatal crash involved a southbound vehicle overtaking, whilst the two serious crashes involved a northbound vehicle.

- **SH10, between Colonel Mould Drive and SH1**: ***A 22km long section with no passing facilities in either direction. One serious injury crash, two minor injury crashes and five non injury crashes were recorded. Of these, one minor injury crash and two non-injury crashes involved a southbound vehicle, whilst all other crashes involved northbound vehicles.***
- **SH1, between SH12 and SH14**: ***A 54km section with four under-length passing lanes. Total of 3 non-injury overtaking crashes have been recorded over last 10 years.***
- **SH1, between SH14 and SH11**: ***A 55km long section the includes three under-length passing lanes. There have been two overtaking crashes recorded from 2008 0- 2018, one fatal crash involving a southbound vehicle and one non injury crash were recorded here.***

Head-On Type Crashes

The NZ Transport Agency's *'High Risk Rural Guide (HRRRG)'*[52] ***identifies that "...*** *At above about 6,000 vehicles per day, there are typically more people killed or seriously injured in head-on crashes than in run-off-road crashes."* ***One of the main explanations is that on roads with 6,000 vpd drivers that lose control over the centreline are more likely to crash into an oncoming vehicle than running off the road.***

Currently, parts of SH1 and SH10 have traffic volumes in excess of 6,000 vpd. Predicted traffic growth is likely to result in a greater amount of the network being in-excess of 6,000 vpd, on both SH1 and SH10, but also SH15 east of SH1, towards Port Marsden.

The HRRRG also states that, of the three main rural road crash[53] ***types that occur in New Zealand, head-on crashes result (proportionally) in the most casualties - typically in 1.6 casualties, compared to 1.2 for run-off-road crashes and 1.3 for intersection crashes.***

Roads where there are more than 6,000 vehicles per day are likely to see a higher proportion of head-on crashes and more fatalities. This volume threshold has been considered as part of the development of the Investment Objectives.

Road Closures Caused by Overtaking Related Crashes

2010-2016 unplanned (i.e. not scheduled road maintenance) road closure data presented in the TCDR PBC[54] ***indicated that the majority of the road closures were due to crashes (79%), as shown in Figure 25.***

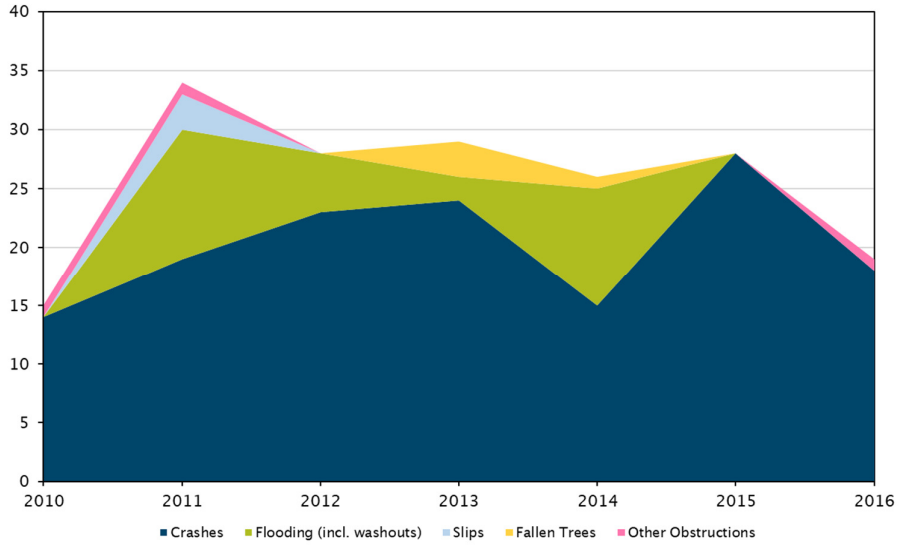

Figure 25: Full Road Closures (2010 to 2016)

The graph shows that the trend of crashes requiring road closures has been increasing.

[52] *HRRRG Information stated in this sub section originates from https://www.nzta.govt.nz/assets/resources/high-risk-rural-roads-guide/docs/high-risk-rural-roads-guide.pdf (pages 19-20)*
[53] *Intersection, run-off-road, and head-on crashes.*
[54] *TCDR PBC, Figure 39 (Page 64)*

However, when road closures of longer than 24 hours duration are looked at in isolation, most of these were not crash related. Therefore, crashes are the most common resilience event, but also tend to have the least impact (in terms of hours closed). Regardless, all major closures have in common the following potential socio-economic impacts[55]:

- ***Direct response and recovery costs of infrastructure.***
- ***Additional road user costs such as increased travel times for drivers. This also might include an assessment of driver elasticity (whether a driver decides to take the trip because of the closure and the resultant loss of benefits).***
- ***Community isolation – effects such as the number of residents affected, frequency and duration of closures, availability of alternate routes and effects on the visitor potential of the area.***
- ***Indirect economic impacts from activities dependent on access and transportation.***

Impacts to Visitors and the Journey Experience

Northland's economy has a large dependence on the visitor industry which encompasses both domestic and overseas visitors. As part of the Twin Coast Revitalisation Project, byways were developed to encourage visitors to invest time in multiple journeys with the intention of encouraging repeat visits to Northland. The region is also somewhat unique in that, when overseas tourists land at Auckland International Airport, they must make a conscious decision to go to Northland i.e. to "turn north versus turn south". As noted in the TCDR PBC, Northland therefore requires a distinct destination appeal to attract visitors to stray against the dominant flow.

However, drivers who become frustrated due to platooning, drivers who are made to feel unsafe through risky passing manoeuvres and visitors who are delayed by, or witness overtaking crashes will all have a reduced positive experience in Northland. The main consequence of this outcome is that a visitor's experience will be less valued than it otherwise could have been which will reduce visitor satisfaction and destination loyalty (intention to return and likelihood to encourage others to travel to Northland).

Fewer visitors to the region leads to a lost economic opportunity.

7.5 SUMMARY

In terms of safety it is important to recognise that overtaking is a root cause in only 4.9% of all crashes in Northland that result in DSIs. Whilst this SSBC has identified that there are strong economic benefits to be made from investment in passing and overtaking lanes (and in doing so would help reduce injuries and crashes), there are other alternative measures that could also go a long way to solving the safety problem.

Going forward the overarching safety strategy for Northland should consider overtaking opportunities along with other 'softer' measures such as Safer Speed Zones and improved signage. In particular, along SH1 south of Kawakawa, where there is already a good provision of passing lanes, improved signage could be the most effective means of reducing overtaking crashes.

[55] *Land Transport New Zealand (2005) Research Report 276*

8. PROBLEM 2: CUSTOMER LOS

8.1 CAUSES

Customer Level of Service (CLoS) considers several measures (e.g. safety, amenity, resilience, travel time reliability, optimal speeds, accessibility) which all contribute to the overall journey experience. A well planned and maintained network provides the right level of transport infrastructure where it is needed. In Northland, the number of heavy vehicles and unfamiliar drivers, combined with the topography and existing passing facilities, increases travel times and reduces CLoS for drivers delayed by slower vehicles but unwilling to risk an overtaking manoeuvre.

Table 13 provides a summary of the key causes, consequences and effects of the CLoS *problem, as identified by the wider stakeholder group.*

Table 13: CLoS Problem – Key Causes, Consequences and Effects

INCREASING NUMBERS OF TRUCKS, UNFAMILIAR DRIVERS AND CAMPERVANS ARE CONFLICTING WITH FASTER MOVING CARS. THIS ADDS STRESS AND RISK TO ALL ROAD USERS, WHICH INCREASES TRAVEL TIME AND REDUCES CUSTOMER LEVEL OF SERVICE	
Cause	• *High proportions of slow vehicles.* • *Hilly and winding topography.* • *Lack of formal passing opportunities.*
Effects	• *Unreliable travel times and increased journey times.* • *Drivers not travelling at optimal speed and reducing driver comfort.*
Consequences	• *Increased travel times for visitors and locals.* • *Increased public perception of the routes with high heavy vehicles as being less efficient.* • *Changes in travel patterns with routes with lower slow vehicle volumes attracting more traffic.*

High Proportion of Slow Vehicles

As most of the freight within Northland is transported via the state highway network, most corridors currently carry relatively high proportions of heavy vehicles. Due to the heavy loads that the freight trucks carry, uphill road gradients are particularly challenging for these vehicles.

Table 14 provides a summary of the heavy vehicle volumes recorded along the state highways in 2017.

Table 14: Heavy Vehicle Volumes along the State Highways

STATE HIGHWAY	TOTAL LENGTH (KM)	AADT RANGE (VPD)	HEAVY VEHICLE RANGE (VPD)[56]
SH1	339	1,000 - 15,000	100 -1800
SH10	104	3,000 – 8,000	200 – 600
SH12	122	1,000 – 3,000	100 – 400
SH14	55	2,000 – 3,000	300 – 900
SH15	91	1,000 – 3,000	150 - 600
SH15 (Port Marsden)	8.6	3,000 – 5,000	900[57]

Domestic and international tourist drivers who are unfamiliar with the Northland roads are also likely to contribute to the slow traffic as are likely to travel slower than most familiar drivers. These also include vehicles, such as campervans, which would also find uphill road gradients challenging.

[56] NZ Transport Agency Traffic Counts
[57] Based on one count location only.

Hilly and Winding Topography

In terms of topography, apart from SH15 east of SH1, approximately 27% -33% of all roads within the project network are in areas that have mixed rolling and mountainous gradients. This situation can often be challenging for heavy vehicles.

Figure 26 provides a representation of the topography of each State Highway[58].

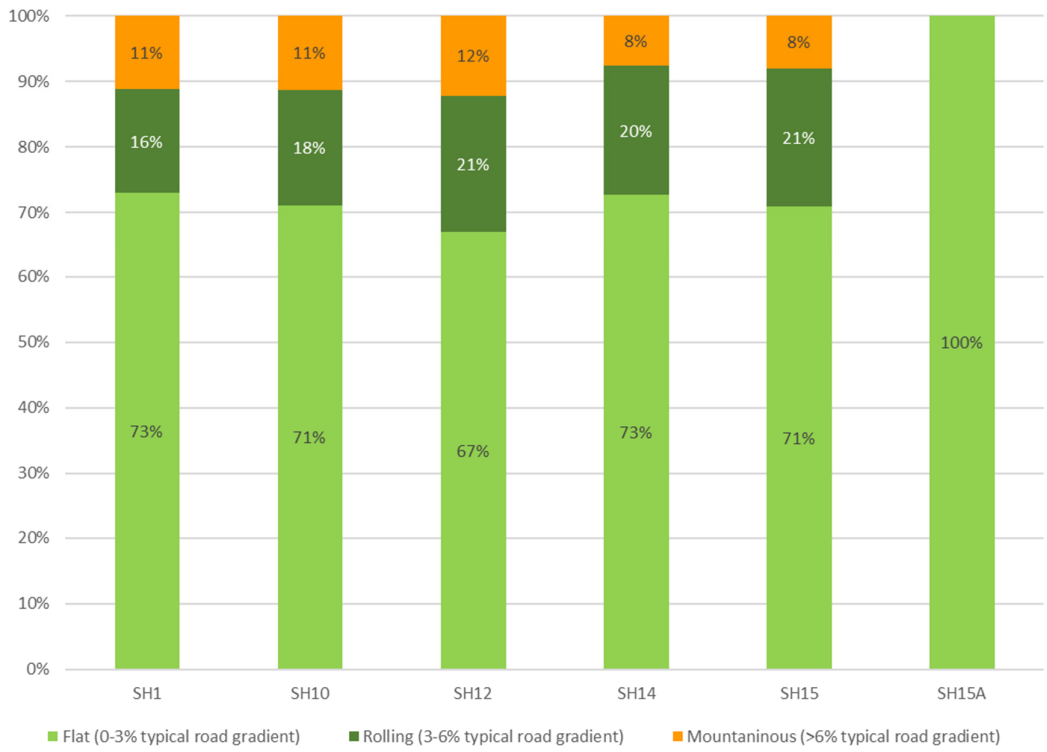

Figure 26: Current Topography along Study Routes

Lack of Formal Passing Facilities

Information relating to a lack of formal passing facilities was presented within Chapter 7 as part of the discussion around the Safety problem. The cause also relates to the CloS problem as a lack of passing lanes has a direct effect upon travel times – the fewer opportunities the pass, the longer a driver may be stuck waiting behind a slower vehicle.

8.2 EFFECTS

Unreliable Travel Times and Increased Journey Times

Drivers who are delayed by slow vehicles are likely to spend more time on the road than they would have under free-flowing traffic conditions. The likelihood of this increases on sections with high volumes of slow/heavy vehicles and challenging topography.

Figure 27 shows the average travel speeds for heavy vehicles across Northland (derived from TomTom where data was available). The map highlights the sections where heavy vehicles travel slowest (yellow, orange and red areas) and consequently where drivers of following faster vehicles may get frustrated or tempted to overtake in an unsafe location.

[58] KAT Data. Not available for local roads.

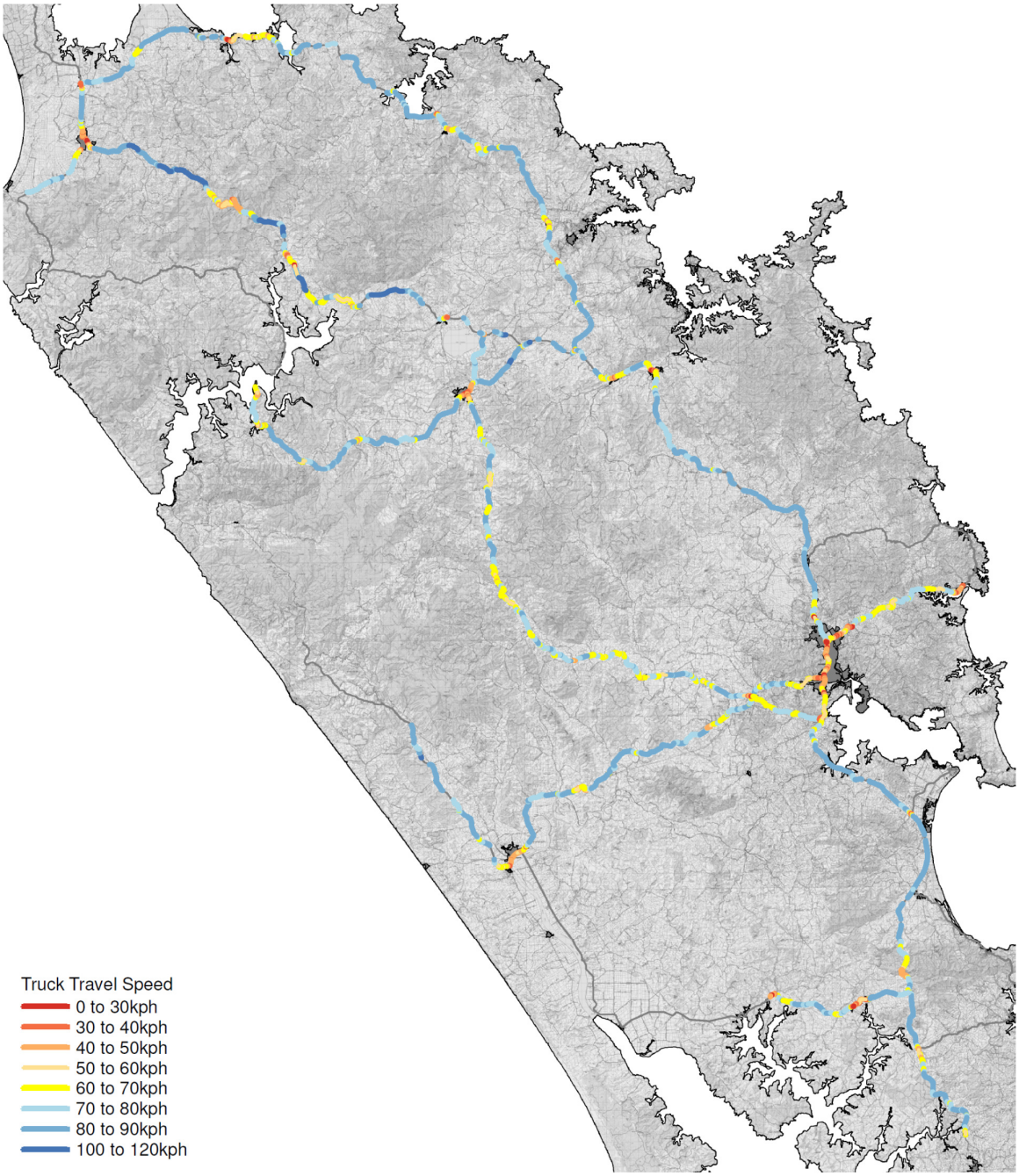

Figure 27: Heavy Vehicle – Average Travel Speeds

Average speed is a pseudo-measure of the effect of 'platooning' caused by slow vehicles. As shown in the above figure, the sections where the average truck speed is notably lower than the posted speed limits (typically 100kph) are:

- ***The majority of SH15 which operates at 80kph or below with the sections at Nukutawhiti and Tautoro operating mostly at an average speed of 50kph – 70kph.***
- ***SH1 near Mangamuka summit which operate at an average speed of 40kph – 60kph.***
- ***SH1 east of Mangamuka Road which operate at an average speed of 30kph – 60kph.***
- ***SH1 west of Rangiahua Road which operate at an average speed of 50kph – 60kph.***
- ***SH1 north of SH12 near Brynderwyns which operate at an average speed of 40kph – 80kph.***
- ***SH14 west of Paradise Road which operate at an average speed of 50kph – 70kph.***

Furthermore, in regard to the benefit of passing lanes upon travel time and reliability, the Austroads Research Report (AP-R596-19) into passing lane safety and performance identified that:

- ***An improvement of 10% in per cent time spent following is approximately equivalent to a benefit of $3.5 to $4.9 per 100 vehicle-km.***
- ***Past research on the impact of passing lanes on journey time indicated a +2 to +3 km/h improvement in travel speed and reduction of per cent time spent following of 10%.***

Drivers not travelling at optimal speed and reducing driver comfort

Vehicles appearing to travel slower than the optimal road speed (notably tourists who may be driving slower to enjoy the journey or are more cautious of the road conditions) can often frustrate following vehicles. This reduces the journey experience for both slower vehicle driver, who may be either tailgated or feel under pressure to pull-over or increase speed, and the faster vehicle driver.

8.3 CONSEQUENCES

The key consequences are:

- ***Reduced driver comfort – stress related to finding safe overtaking opportunities and generally being in the vehicle longer. This leads to a reduced journey experience and frustration which can lead to a temptation to take risks and overtake in unsafe places.***
- ***Increased travel times for visitors and locals. This will be further exacerbated with the predicated growth in freight and general traffic within Northland. This effect increases the likeliness of conflict between slower and faster moving vehicles.***
- ***Increased public perception that routes with high heavy vehicles are slower. This places pressure on other routes or discourages people from exploring the other parts of Northland where safe passing opportunities are less frequent.***
- ***Changes in travel patterns with routes with lower slow vehicle volumes attracting more traffic.***

8.4 SUMMARY

Generally, there is strong evidence to suggest that a lack of passing and overtaking opportunities away from SH1 (south of Kawakawa) is having a detrimental effect to CLoS. This effect is likely to worsen as traffic grows.

However, this is not to say that introducing new passing and overtaking opportunities would be the sole solution to this problem. Improvements to wayfinding and signage (so people who how close the next passing opportunity is) and rest areas (so people can stop in a nice location if they are feeling frustrated) forms part of an overall solution.

9. INVESTMENT OBJECTIVES

9.1 BENEFITS OF INVESTMENT

The benefits of investment were identified during the facilitated workshop and further developed by the project team after consideration of the problem statements and benefits:

- **Safety.** ***Reduce number of overtaking related crashes by providing improved more frequent passing opportunities for drivers to use and discourage drivers from carrying out passing manoeuvres at unsafe locations.***
- **Customer Level of Service.** ***Provide consistent and reliable travel times particularly along routes with high slow vehicles to improve the quality of journey.***

9.2 INVESTMENT LOGIC MAP

Figure 28 provides an Investment Logic Map (ILM) which shows the development of the Investment Objectives for the Northland Passing and Overtaking Opportunities Business Case. The ILM was developed by the project team, and agreed during Workshop No.2.

Reducing the number of DSIs was a common benefit identified within both the TCDR PBC and through the stakeholder engagement undertaken for the Passing Opportunities SSBC. However, reducing travel time was a benefit that was not specifically brought through as an Investment Objective in the TCDR PBC, but was one identified (albeit with lower importance) by stakeholders for this SSBC.

To ensure a consistent approach, the benefit of improved CLoS (through travel time improvements) was brought forward as an opportunity that could be created by improving passing opportunities.

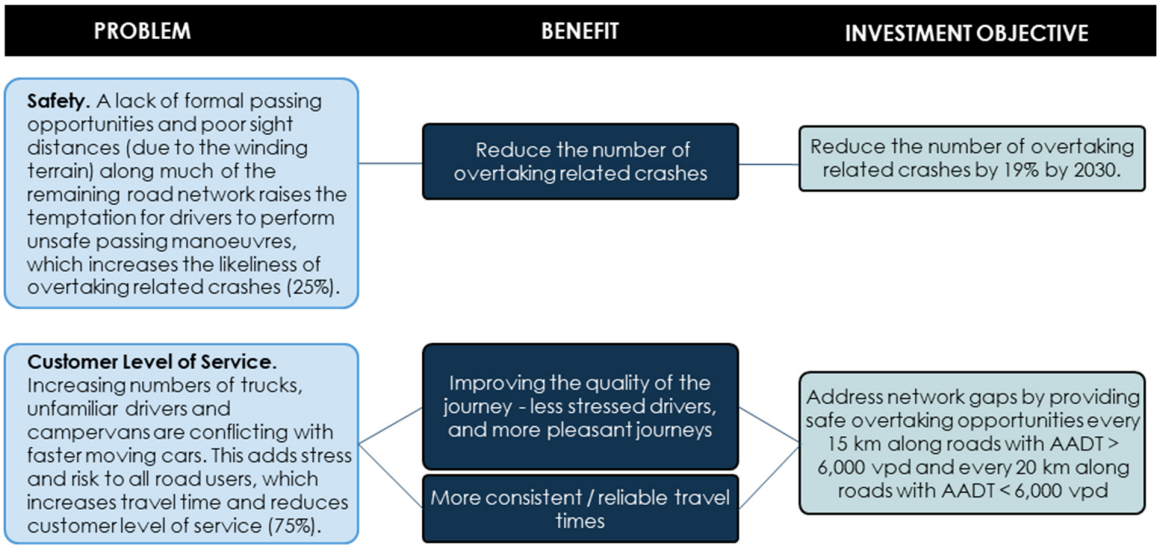

Figure 28: Passing Opportunities – Investment Logic Mapping

The alignment of the Problems and Investment Objectives against national, regional and local policies is presented within **Appendix A4.**

The Investment Objectives are:

1. ***Reduce the number of overtaking crashes by 19% by 2030.***
2. ***Address network gaps by providing safe overtaking opportunities every 15km along roads with AADT > 6,000 vpd and every 20km along roads with AADT < 6,000 vpd.***

The target for Investment Objective No.1 reflects the TCDR PBC target for an overall reduction in DSIs by 19% and is also consistent with a target for fatigue related crash reduction within the Northland Rest Areas SSBC. It is recognised that overtaking manoeuvres only account for a small fraction (4.9%) of the

overall DSIs, and therefore in this regard, the absolute reduction in the number of DSIs may be relatively small. The weightings of the problems – 75% for 'CLoS' vs 25% for 'Safety' reflects this.

For Investment Objective No.2 the 6,000 vpd threshold is in line with the NZ Transport Agency's 'High-Risk Rural Guide', which outlined that beyond this point the risk of drivers colliding with oncoming vehicles is notably higher.

9.3 KEY PERFORMANCE INDICATORS

Key Performance Indicators (KPIs) are outlined in Table 15. The purpose of the table is to provide further clarity around what benefits investment would provide.

Table 15: Key Performance Indicators

KPI	MEASURE	BASELINE	EXPECTED RESULT AND TARGET	REPORTING DATES
Safety	*The number of overtaking crashes an DSIs*	*107 overtaking crashes between 2014-2018. Of these crashes, 9 resulted in fatality, 14 in serious injuries and 23 in minor injuries.*	*19% reduction in fatigue related crashes and DSIs by 2030 (or post full programme implementation). This assumes that the Wayfinding Strategy is also implemented.*	*Annual monitoring of crash data during and post construction*
Network gaps	*The frequency of passing lanes and overtaking opportunities. Target = every 15 to 20km.*	*See network gaps map in* Appendix A7.	*A network where safe passing opportunities provided every 15-20km in each direction, with any remaining gaps justified based on low traffic volumes, presence of towns or safety treatments (such as Safer Speed Zones) which negate the need for passing lanes.*	*Post implementation*
Journey times and travel time reliability	*Recorded journey times and travel time reliability along key routes such as key freight corridors such as SH15.*	*TomTom data can be extracted for all state highways, broken down into 500m segment. The current average travel time along SH15*[59] *is 1 hour 15 minutes for trucks and 1 hour 12 minutes for cars. Baseline travel time reliability data is saved in* Appendix A8.	*There would always be some variability as to how much saving each individual vehicle would receive – as it reflects a person's total journey length and how long they were waiting behind a slow vehicle. Notwithstanding, generally a two or three minute saving for the aforementioned SH15 route could be a good initial benchmark.*	*Post implementation*
Visitors staying longer and travel further	*Proportion of visitor nights spent on the west coast. Passing lanes form part of an overall package of measures (e.g. Township Plans) that intend to meet this objective.*	*Visitor proportions on the west coast account for around 20% of all visitor nights in the region.*	*Increase visitor spend and numbers on the west coast and key Northland journeys by 30%. This is a TCDR PBC Objective.*	*Annual monitoring of visitor nights and / or post implementation study. Potential GPS tracking survey of campervans.*

The KPIs were agreed upon by the wider project team as part of the business case review process.

[59] SH1/SH15 intersection (near Otaika) to Kaikohe.

9.4 DO NOTHING / STATUS QUO

Northland is expected to experience an increase in economic growth over the coming years. With this will come an increase in traffic volumes. If a 'Do Nothing' approach is taken the following negative impacts can be expected;

- ***Heavy vehicle volumes are likely to increase which in turn will increase the number of slow vehicles on the network. If additional passing opportunities are not realised, then there is potential for an increase in accidents resulting from injudicious passing manoeuvres.***
- ***An increase in tourism is anticipated as a result of economic growth. This will lead to an increase in tourist vehicles in the Northland area. The drivers of tourist vehicles are generally slower moving, particularly camper vans, and fewer passing opportunities could lead to an increase in accidents.***
- ***There will generally be an increase in traffic volumes in the area and therefore an increase in the risk of general traffic meeting slower moving vehicles, as noted above. This could result in an increase in the occurrence of incidents, resulting in more accidents and delay.***
- ***The indirect effect of an increase in incidents is that parts of the network will increasingly become sterilised through closures whilst investigations are carried out. This will have a wider economic impact on the Northland region as commercial and recreational traffic is delayed and unable to reach their planned destination (or forced to take lengthy detours).***

10. OPPORTUNITIES & CONSTRAINTS

10.1 OPPORTUNITIES

Opportunities are areas where it is possible to do something else positive at the same time as addressing the identified problems. In this instance, the development of passing and overtaking opportunities may present a chance to undertake other minor safety improvements at the same time.

Table 16 provides detailed descriptions of these opportunities, which were considered as part of the option development process.

Table 16: Potential Opportunities

OPPORTUNITY	DESCRIPTION
Addressing existing roading issues	*As significant physical work is required to widen carriageways when implementing passing lanes, this provides the opportunity to improve drainage, stability and roadside risk at known areas with issues through design.*
Undertake planned maintenance activities	*The construction of passing opportunities will require long sections of the network to be placed under temporary traffic management. This will present an opportunity to undertake planned maintenance adjacent to the sites, therefore reducing maintenance costs and disruption to the travelling public.*
Other projects	*There are currently some other projects that are underway in Northland which are seeking to improve tourism, safety and town centres. These are SH11 SSBC, SH12 SSBC, Rest Areas SSBC, Integrated Cycling Implementation Plan, Route Wayfinding Signage, Township Plans, and Waipapa Roundabout. This provides an opportunity to combine proposed passing opportunities with improvements proposed within these projects when implementing them.*

10.2 CONSTRAINTS

The following section sets out the various constraints identified in the scope of the project area. This information has been used to inform option development.

Table 17: Project Constraints

CONSTRAINT CATEGORY	CONSTRAINT IDENTIFICATION
Cultural and Historic Heritage	*As Northland has many sites of significance to hapū and Māori land, passing facilities proposed at or near such sites require careful consideration of Māori cultural values and require the approval of hapū.* *In addition, passing facilities proposed at or near hapū land, heritage sites and archaeological sites will also require planning consents and permission from relevant authorities (e.g. Heritage NZ, district council).*
Natural Environment	*Due to Northland's mountainous topography, most of the state highway network within Northland consists of vertical and horizontal curves. This creates challenges when installing passing lanes, as retaining structures against drops and cutting back banks may be required. This could increase costs associated with new passing lanes proposed at such locations and may prevent the installation of these passing lanes if the cost of construction becomes prohibitively high.* *Site visits confirmed that most of the potential locations for new or improved passing opportunities would require road widening.*
Property	*As the new passing lanes proposed within the Northland State Highway Network are retrofitted facilities, carriageway widening is likely to be required at most of these locations. Where the current NZTA-owned road reserve has insufficient space to accommodate the road widening, acquisition of private land will be needed. This may be challenging near town centres and shopping areas, where properties are likely to be located close to the road.*
Utilities	*Underground and overhead utility services are a common constraint associated with road upgrades, including the construction of passing facilities. As the carriageway widening required to facilitate new passing lanes and SVBs could conflict with the utility services currently present along the state highways, relocation of these services may need to be undertaken as part of the passing facility construction.*

CONSTRAINT CATEGORY	CONSTRAINT IDENTIFICATION
	In addition, there are large drainage ditches adjacent to a large majority of state highways and local roads in Northland. Whilst these are necessary to ensure the effective discharge of stormwater, they would need to be addressed for most of the new passing facilities.
Planning Constraints	*The planning constraints which could impact on the implementation of the new passing facilities mainly consist of the following.* • *Area subject to flooding (and impact of climate change),* • *Area subject to instability,* • *Area subject to coastal hazards,* • *Area where kiwi and other protected species are known to be located (much of Northland),* • *Area identified as outstanding natural features,* • *Area identified as outstanding landscape,* • *Area identified where registered archaeological sites are located,* • *Sites significant to Māori, much of Northland* • *MPI customary area,* • *Land subject to Treaty of Waitangi settlement claims, and* • *Land not in NZ Transport Agency's designation and zone applying to land if not in NZ Transport Agency designation.*

PART B(I): OPTION DEVELOPMENT

11. OPTIONS DEVELOPMENT

The process of getting from the long list to a short list was both methodical and flexible, premised on extensive stakeholder engagement to make the best use of local knowledge. A review of previous studies, a literature review and a desktop analysis were the starting points. Stakeholders were engaged at key points along the way via workshops and one-on-one meetings.

As the project progressed, and more information came to light, even if the short listing stage had begun this did not preclude sites being added back into the long list. Generally, the extensive consultation process meant that the team could ensure that few, if any, potential opportunities would be missed. Document version control was used to manage the process and ensure transparency of decision making. An overview of the process is provided as Figure 29.

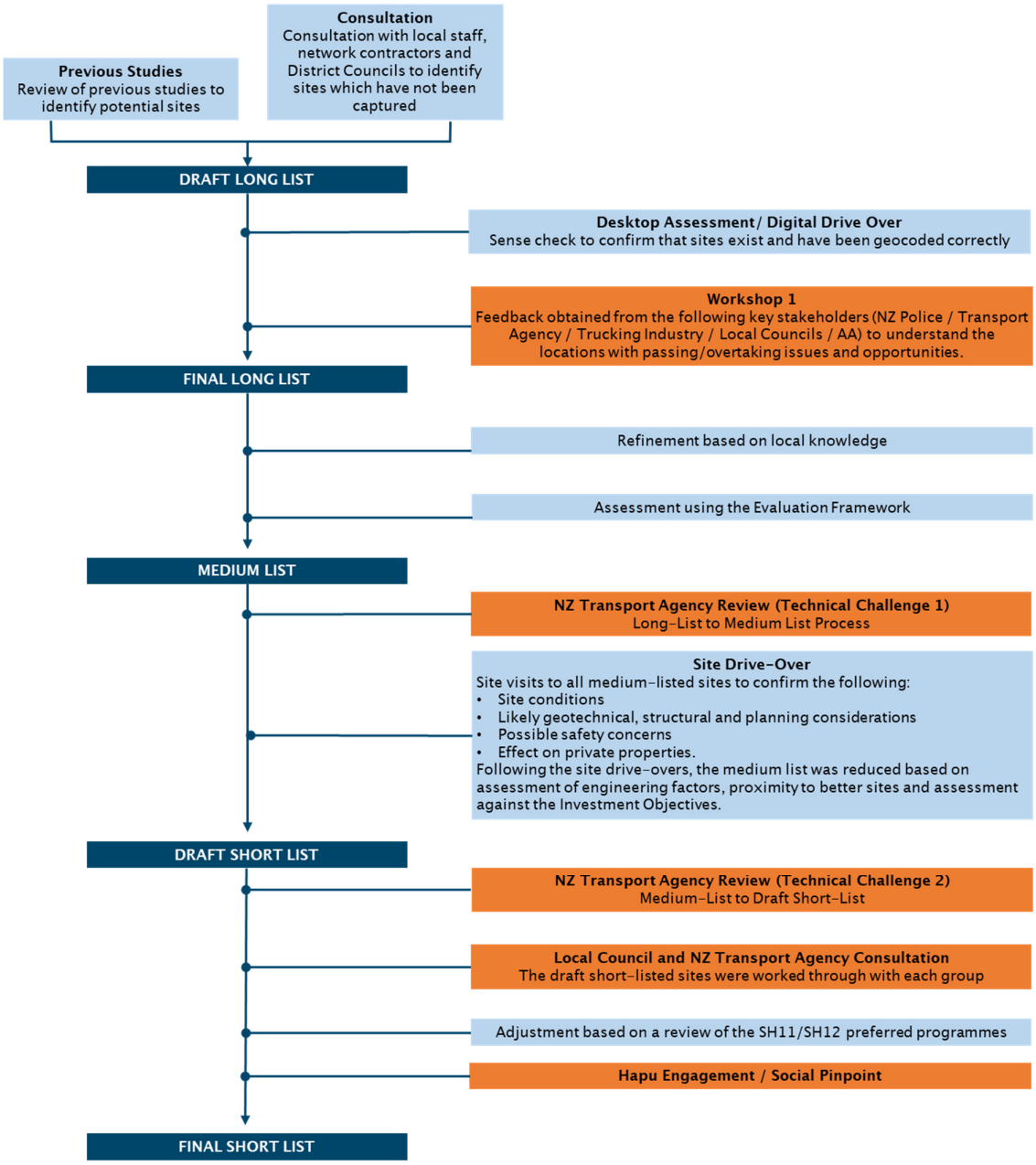

Figure 29: Long List to Short List Process

11.1 LONG LIST

The long list included a total of 114 sites which consisted of a mixture of formal and informal passing opportunities. These sites were identified from previous studies, inputs from key stakeholders, desktop reviews and network drive-overs. Figure 30 shows the long list of sites.

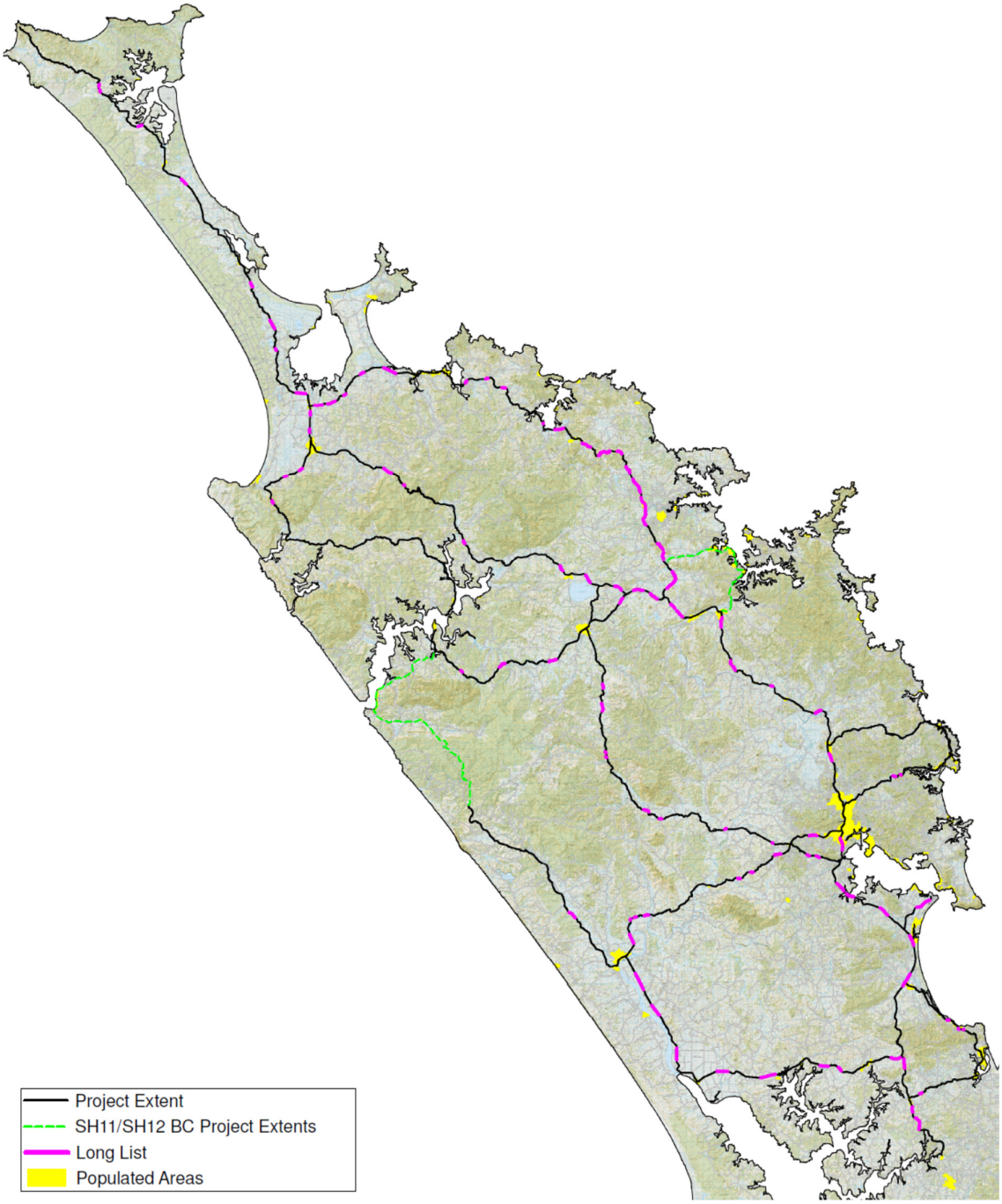

Figure 30: Passing and Overtaking Opportunities - Long List

***A full list of all long-list sites is provided as* Appendix B1.**

Evaluation Framework

An evaluation framework was developed as a means of assessing the long list of sites. The criteria were developed based on the literature review and was presented to the key stakeholders at Workshop No. 1. The feedback received indicated that the stakeholders agreed with the draft evaluation criteria.

A breakdown of the criteria and the corresponding KPIs is outlined within Table 18.

Table 18: Evaluation Framework

CRITERIA		DETAILS
Primary Criteria	The need for passing lanes.	Austroads Guide to Road Design Part 3, Table 9.1.
	Proximity to other passing lanes.	Distance to adjacent passing lanes exceeds 15 km or is below 5 km.
	Topography/vertical geometry of the road.	Road gradients outlined in the PPM: • Flat 0-3% typical road gradient • Rolling 3-6% typical road gradient • Mountainous >6% typical road gradient
	Located near crash clusters.	Overtaking crashes extracted from CAS.
	Minimum passing lane length can be achieved.	Austroads Guide to Road Design Part 3, Table 9.2.
Secondary Criteria	Contained within the road reserve.	District Council GIS road reserve boundaries.
	AADT.	RAMM data.
	Percentage of HV.	> 5% is considered above average
	Direction split of AADT.	Opposing traffic volume significantly exceeds the traffic volumes in the direction of the passing lane.
	Travel speeds.	85th percentile speeds below the posted speed limit at long sections.
	Traffic headway.	A four second headway threshold to identify whether a vehicle is travelling freely.
	Proximity to intersections.	Intersection located within the passing lane or merge/diverge area.
	Proximity to one-way bridge.	One-way bridge located within proposed passing lane (including merge/diverge area)
	Large banks / steep drop offs.	Large banks or steep drop offs where passing lane is proposed.
	Forward sight distance.	Sight distance near merge area meets AustRoads Guide to Road Design Part 3.
	Potential cost.	Low (<$100k), Medium (<$500l), High (>$500k) The need for land acquisition.
	Potential timing.	Short term (0-24 months), medium term (2-5 years), long term (5+ years)

The primary criteria were used to refine the long list of options to reach the medium list, whilst the secondary criteria were used as part of the medium to short list process.

11.2 MEDIUM LIST

A desktop-based assessment using the primary criteria of the evaluation framework saw the long list of 114 sites reduced to a total of 59 sites. To provide further confidence that the right sites were selected, and to provide a means of reducing the list further (i.e. medium to short list), a site drive-over of all remaining sites was undertaken[60].

[60] As most of the passing opportunities sites were located on roads with a single lane of traffic in each direction and narrow shoulders, this meant that, in line with NZ Transport Agency safety policy, in many cases teams were unable to get out and undertake detailed investigations. Drive-over videos were, however, captured and have been used for reference.

The project drive-overs allowed the project team to better understand the site conditions and how well each site would meet the overarching Investment Objectives. The drive-overs also enabled the team to gain a more holistic understanding of the driving conditions, the availability of overtaking opportunities and the need for new ones.

Data captured included:

- ***Existing road condition (e.g. sealed shoulder, unsealed shoulder, roadside drop-offs, cliffs, banks, topography, private properties affected etc.)***
- ***Potential for carriageway widening.***
- ***Condition of the existing seal.***
- ***Whether land take is likely to be required.***
- ***Whether the minimum passing lane length can be achieved.***
- ***Geotechnical considerations.***
- ***The need for new retaining structures or changes to existing retaining structures.***
- ***Possible flooding concerns.***
- ***Effect on utility services.***
- ***Changes required to stormwater drainage and treatment.***

The site drive-overs indicated that the majority of the passing improvement sites have similar characteristics and constraints. These included the need for carriageway widening, the need for land take and geotechnical and structural investigations. Given that most passing opportunity sites has similar constraints, few were able to be discounted purely using the drive-over findings.

Medium List to Short List

Internal project team post-drive over meetings were held, and a review of the findings allowed for some sites to be discounted. Moreover, during the site drive-overs, some new sites were identified and added to the short list. The main reasons for discounting sites during the medium-to-short list process were:

- **Alignment against the Investment Objectives.** ***An evaluation of the sites against the project Investment Objectives specifically, to what level would a passing opportunity help reduce the number of overtaking related crashes. This was based on several factors outlined within the evaluation framework, including a review of crash history data and the proximity of alternative safe passing locations.***
- **Review of Travel Speed Data.** ***Review of travel time data to confirm the parts of the network where truck travel speeds were particularly slow. This helped to identify where drivers of faster vehicles may get frustrated and tempted to overtake in unsafe places.***
- **Site Assessments.** ***A review of each site was undertaken by the project team, with sites discounted on the following basis:***
    - **No notable crash history,** ***whereby a new passing opportunity would help solve any existing issue.***
    - ***A site located close to an existing passing facility and did not address a network gap.***
    - ***A site located close to another site which was a better alternative due to crash history or the network gap it addresses.***
    - ***Sites where the only treatment could be minor improvement measures which are unlikely to be effective in addressing overtaking issues and could be undertaken as part of NZ Transport Agency maintenance work (e.g. signage improvements, vegetation control, bus stop upgrade and remarking right turn bays).***
    - ***A site did not warrant a passing facility based on the AADT, percent overtaking opportunity and topography.***

The rationale for discounting sites is provided within **Appendix B2.**

An overarching assessment of the short-list is provided as **Appendix B3.**

The individual site assessment forms are saved as **Appendix B4.**

11.3 NON-INFRASTRUCTURE OPTIONS

Whilst this business case is focused specifically on passing and overtaking opportunities, i.e. physical infrastructure interventions, it is important to consider other 'softer' measures which can help meet the Investment Objectives. These would include (but not limited to):

- ***Safer speed zones.***
- ***Tourist and truck driver education (i.e. encouraging slow vehicle drivers to make use of any safe pull-over facilities).***
- ***Improved signing – to help people better plan journeys and raise awareness of the presence of upcoming safe passing opportunities.***
- ***Improved road marking – in conjunction with improved signing, assessment of the existing road markings in advance of existing passing opportunities would help people make better decisions.***
- ***Behavioural safety – such as behavioural Safety campaigns to address behavioural safety issues, such as the wearing of seatbelts and speed awareness would have a positive impact.***
- ***Vegetation clearance - safe passing manoeuvres require drivers to be able to see enough of the road ahead to make a judgement on whether it is safe to overtake. Vegetation clearance could be undertaken as part of cyclic maintenance activities to help ensure driver sight lines are as clear as possible.***
- ***Highway shoulder improvements and signage for access to important sites adjoining the state highway network.***

Moving forward, the NZ Transport Agency will look to establish how best the address specific network issues which may take the form of new/upgrade passing lanes (identified by this SSBC) along with some (or all) of the above education, speed reduction and sight clearance initiatives.

Community Safety Campaigns

Within Northland there has been significant activity and collaboration in relation to the use of evidence-based approaches to improve safety. This has included support community initiatives to reduce speeds through local communities, as can be seen from Figure 29.

Figure 31: Speed Reduction Initiative[61]

[61] *Representatives from Hokianga Health, Far North REAP, NZ Fire Service, Opononi Area School, St Johns Ambulance, Te Runanga O Whaingaroa Photo provided by Le'Vaillant Photography*

Through our engagement, we heard about a number of locations and intersections where such campaigns could be quickly deployed to improve safety and driver behaviours generally. Perhaps most notably:

- ***Paparoa – When state highway traffic north is diverted through Paparoa the town suffers from excessive speeds and erratic behaviour***
- ***Waipu Turn-off on SH1 –the median barrier is seen to be encouraging erratic behaviour by vehicles trying to sneak into Waipu Road rather than waiting for a safe opportunity to cross.***
- ***Maungatapere – in a semi-rural community SH14 and SH15 intersect. This site is the subject of a Transport Agency investigation aligned to inland freight network improvements.***

11.4 DO MINIMUM

The Do Minimum for the recommended programme would be to address the following existing passing lanes which have less than standard lengths and are considered to present safety issues.

Table 19: Do Minimum – Address Existing Passing Lane Issues

ROAD	CRASH HISTORY	RECOMMENDATION	RATIONALE
SH10 (ID: 10_4)	No crashes within the PL. One minor injury crash within 5km radius downstream.	Extend meet the minimum PL length of 620m.	The only passing lane currently provided in the northbound direction. Located roughly midway, past a lengthy section of the state highway with no formal passing facilities.
SH1 (ID: 1_28)	No crashes recorded within the passing lane. One minor injury crash northbound within 5km radius.	Convert to a slow vehicle bay.	This area was raised by stakeholders as having short passing lanes. Located on an incline with banks and drop offs which will contribute to high costs if this was to be extended meet the minimum passing lane length. Located near other northbound passing lanes.
SH1 (ID:1_29)	Only one non injury crash located within the passing lane. 1 minor injury northbound crash within the 5 km downstream area.		

The Do Minimum would also include improvements to signage to make drivers better aware of upcoming safe passing opportunities (captured as part of the Northland Wayfinding Implementation Plan) and other of the aforementioned 'non-infrastructure' measures. The optimal combination of physical and non-physical infrastructure measures would be undertaken on a site-by-site basis.

By nature, the Do Minimum would be a cheaper alternative in terms of over capital investment. It does not necessarily however represent the most value for money proposition.

Other Considerations

If the full programme is not progressed then there are some, albeit limited, opportunities to make smaller, less costly improvements to the physical infrastructure.

Consideration could be given to implementing less than standard passing lanes. These treatments would have to be carefully considered to ensure it is safe to implement but would reduce the cost of implementation. However, that there would be a corresponding reduction in the benefits. Alternatively, sites identified for passing lanes could be downgraded to lesser treatments such as marked shoulders. Again, this would reduce the costs but there would be a corresponding trade-off in benefits.

Included within the Do Minimum approach is funding for on-going community issues to address speed issues in local areas. This will help to address concerns about speeding vehicles raised by stakeholders throughout Northland and can also be used to address other safety issues, such as compliance with seatbelt requirements, driver fatigue management and driving impairment caused by alcohol and other drugs – the most significant factor in the Northland DSI statistics.

11.5 FINAL SHORT LIST

Incorporating Feedback

The draft short list was presented during Technical Challenge Workshop No.2. Following on, any feedback was incorporated as necessary (see workshop minutes in* Appendix A2*) and the revised short lists were presented to local authorities, DOC, local hapū, Northland Inc, Heritage NZ, and the members of the regional NZ Transport Agency team (based in Whangārei).

The feedback, presented within* Appendix B5*, has provided the project team with stronger confidence that the recommended programme will have buy-in from key investment partners and stakeholders.

Alignment with Other Business Cases

As the short-listing process progressed it was important to keep sight of how the overall network of passing and overtaking opportunities may look. In terms of passing and overtaking opportunities the following projects were included on the SH11 and SH12 programmes:

- **SH11.** ***No overtaking or passing opportunities proposed.***
- **SH12 Omanaia Bridge - Karuhiruhi Road.** ***A 500m uphill slow vehicle lane. 'Higher projected traffic volumes north of Opononi and predicted increases in tourist traffic necessitate a need to provide passing opportunities in this location'.***
- **SH12 Waiotemarama – Waimamaku.** ***1.2km passing lane. Justification for passing lanes relates to creating a consistent passing strategy along the TCDR. Within this section of the corridor, there are limited opportunities to pass slower vehicles due to the surrounding terrain.***

Final Short List

Table 20 provides the final short list of sites, with the locations shown as Figure 32.

Table 20: Final Short List

ROAD	OWNER	ID	TREATMENT	DIRECTION	LENGTH
SH1	NZ Transport Agency	13	Slow Vehicle Bay	Southbound	0.3 km
		16	Marked shoulder	Eastbound	0.5 km
		17	Slow Vehicle Bay	Southbound	0.3 km
		110	Slow Vehicle Bay	Southbound	0.3 km
		113	Passing Lane	Southbound	1.2 km
		143	Marked shoulder	Northbound & Southbound	1.6 km
		182	Passing Lane	Northbound	1.2 km
		191	Passing Lane	Eastbound	1.2 km
SH10		162[62]	Passing Lane	Southbound	1.2 km
		58	Passing Lane	Eastbound	1.2 km
		61	Slow Vehicle Bay	Eastbound	0.3 km
		145	Passing Lane	Southbound	1.2 km
		177	Passing Lane	Southbound	1.2 km
		180	Passing Lane	Northbound	1.2 km
		210	Passing Lane	Southbound	1.2 km
		215	Marked shoulder	North-East	0.5 km
SH12		226	Passing lane	Southbound	1.2 km
		231	Passing Lane	Westbound	0.9 km
		233	Passing Lane	Eastbound	1.2 km

[62] Post RSA the location of this site was updated (but general area retained), with a new ID (No. 901).

ROAD	OWNER	ID	TREATMENT	DIRECTION	LENGTH
		406	Passing Lane	South-West	1.0 km
		401	Passing Lane	Eastbound	0.8 km
		403	Slow Vehicle Bay	South-West	0.3 km
		405	Slow Vehicle Bay	Eastbound	0.3 km
SH14		135	Passing Lane	Westbound	1.16 km
		208	Marked shoulder	Westbound	0.73 km
SH15		300	Slow Vehicle Bay	Eastbound	0.30 km
		600	Passing Lane	Westbound	0.75 m
SH15 (Port Marsden)		28	Passing Lane	Westbound	1.2 km
Cove Road	Local Authorities	603	Slow Vehicle Bay	Westbound	0.6 km
Ngunguru Road		37[63]	Passing Lane	Eastbound	1.2 km
		601	Passing Lane	Westbound	1.3 km
Kaitaia to Awaroa Road		801	SVB	Eastbound	0.65 km
		802	SVB	Westbound	0.40 km

[63] Post RSA the location of this site was updated (but general area retained), with a new ID (No. 900).

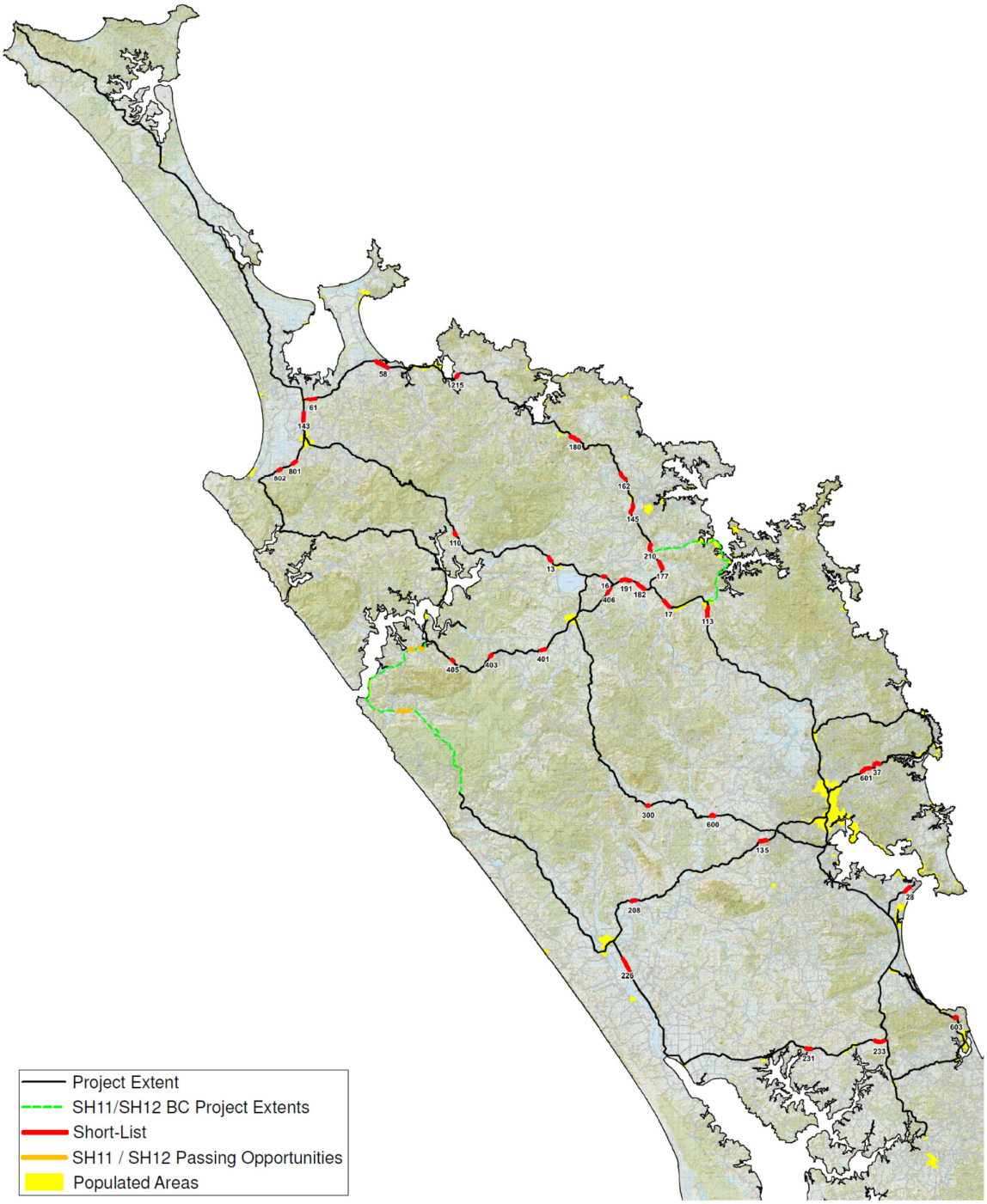

Figure 32: Passing Opportunities – Final Short List

PART B(II): PROGRAMME DEVELOPMENT

12. MULTI-CRITERIA ASSESSMENT

The purpose of the multi-criteria assessment (MCA) was to first establish any significant risks associated with the development of individual sites, and the second was to provide a means of evaluating potential programmes of options.

MCA Criteria

The MCA criteria was adapted from the NZ Transport Agency's 'Multi Criteria Analysis for Transport Business Cases Guidance Document' (February 2017). The criteria used reflected either the key benefits being sought (i.e. alignment with Investment Objectives), or the aspects which correspond to the main project risks. The draft criteria were presented for initial feedback during Technical Challenge No.2. A summary of the criteria is provided within Table 21.

Table 21: MCA Criteria

GROUP	CRITERIA	CONSIDERATIONS
Investment Objectives	Safety	Reducing the number of fatigue related crashes by 19% by 2030.
	Network Gaps	Reduce gaps in the network of passing and overtaking provisions as a means of improving CLoS.
Implementability	Engineering degree of difficulty	How straightforward is it to implement?
	Value for money	Construction plus future maintenance costs
Assessment of Effects	Treaty Partners	Assessed by local Treaty Partners
	Strategy alignment	Considering council, DOC, and Heritage NZ strategies
	Property / land use impacts	Is land acquisition required? Is the site located near sensitive land?
	Environmental Effects	To what extent does the option impact on the natural environment as described in the ESR screen?
	Stakeholders	How acceptable/desirable is the option to councils, local hapū, and communities?

An overarching objective of the MCA process is that it not only focuses on key risks, but also around the benefits and opportunities presented by investing in various sites/programmes.

Scoring

Table 22 presents the scoring scale that was used for the MCA. In simple terms, the lower the score the better the option – i.e. higher the benefit or lower the cost/risk.

Table 22: MCA Scoring

SCORE	DEFINITION
1	The option presents few difficulties on the basis of the criterion being evaluated and may provide significant benefits in terms.
2	The option presents only minor aspects of difficulty on the basis of the criterion being evaluated and may provide some benefits.
3	The option presents some aspects or reasonable difficulty in terms of the criterion being evaluated and problems cannot be avoided. There are few apparent benefits.
4	The options include clear aspects of difficulty in term of the criterion being evaluated, and very few perceived benefits.
5	The options include significant difficulties or problems in terms of the criterion being evaluated and no apparent benefits.

The original long listed sites were scored against the Investment Objectives, and then during the medium to short list process any sites with significant technical challenges that would be uneconomical to address were discounted. This means that all sites within the short list would to some extent support the Investment Objectives, which allowed the MCA to focus on the benefits of collective programmes of options, rather than the merits of individual site upgrades.

12.1 SITE ASSESSMENT

A two-stage MCA was undertaken. The first phase could be considered more of a 'site assessment', where each individual site was evaluated against the agreed MCA criteria. The purpose was to better understand the benefits and risk associated with developing each site – which then provided a steer for establishing various programmes. Various technical specialists (transport engineering / environmental / planning) provided the evaluation and scoring for the criteria which matched their areas of expertise.

Appendix B6 ***provides a breakdown of the individual scores.***

12.2 PROGRAMME DEVELOPMENT

The second MCA phase involved developing and assessing four distinct programmes which are in line with the general themes of the agreed Problems, Investment Objectives and feedback from stakeholders. The feedback from the stakeholders provided confidence that the potential passing lane opportunities have been identified in in the right locations. An overview of these programmes is provided below whilst **Appendix B6** ***provides maps which identify which specific sites are included on each programme.***

Programme 1: Safety

A total of 12 sites were included in the 'Safety' programme. These sites were selected based on a review of the last ten years of crash data and whether an overtaking crash had occurred on, or 5km downstream, of a proposed passing or overtaking opportunity (considering directions of travel).

Programme 2: Network Gaps

A total of 28 sites were included on the 'Network Gaps' programme. The intention of this programme is to fully address network gaps in line with the Investment Objective (based on AustRoads) standards that it is desirable to provide formal passing opportunities every 20km on roads with AADT<6,000 vpd and every 15km on roads with AADT > 6,000 vpd.

Programme 3: Customer Level of Service

A total of eight sites were included of the 'Customer Level of Service' programme. These sites were selected based upon a review of heavy vehicle travel time data (TomTom), and whether they were located on sections where average travel speed was less than 60kph.

Programme 4: Stakeholders

A total of 11 sites were included on the 'Stakeholders' programme. These sites correspond with the 'high priorities' as identified by representatives of the councils, the trucking industry, other key stakeholders and the local NZ Transport Agency safety team. Prior engagement with iwi when consultation was being undertaken for the new SH15 also provided some insight as to where suitable places for new passing lanes would be.

In addition to the above, **Programme 5** ***would reflect the final recommended programme and*** **Programme 6** ***represents the Do Minimum (addressing existing passing lane issues).***

12.3 MCA

Initial Scoring

The MCA scores for overall programmes were derived initially from the individual site assessment scores (which used the same criteria). The scores were then sense checked by taking a holistic look at how the overall programmes would score. As such, the overall programme score was not necessarily simply an average of the individual scores but rather would take into consideration how many sites were included in each package (for example – the more sites, the higher the overall environmental impact) and how the overall distribution of sites would address network gaps.

Workshop Scoring

***Technical Challenge No.3 was held on the 26th August 2019. During this workshop the initial MCA scores of the various programmes were presented and as used as starting point for discussion. The minutes of the meeting are provided within* Appendix A2.**

Whilst there was general agreement during the workshop with most of the pre-scoring from the technical specialists, some of the scores were modified following discussions. Changes in score were robustly discussed amongst the workshop attendees, who sometimes would offer a point of consideration from their field of expertise that may not have been considered by the technical specialist. All scoring achieved consensus.

Key feedback was:

- ***Environmental effects should at some stage take account of whole of life effects (i.e. emissions from vehicles). Society is moving away from "environmental effects" being associated with just construction. Environment should also consider social/human health impacts such as community severance and the cumulative effects of construction.***
- ***Taking an average score approach in the evaluation of stakeholder feedback resulted in a highly variable result and a ranking approach was deemed more appropriate for this criteria.***
- ***Undertaking sensitivity analysis to test results under different scenarios will improve the reliability of results and inform programme design improvements.***

The final set of agreed scores[64] are provided as Table 23.

Table 23: Workshop MCA Scores

CATEGORY	CRITERIA	SCORE					
		01 - Safety	02 - Network Gaps	03 - CLOS	04 - Stakeholders	05 - Final	06 - Do Min
Investment Objectives	Safety	2	2	3	3	2	4
	Network Gaps	2	1	3	3	2	4
Implementability	Engineering degree of difficulty	3	3	3	3	3	1
	Value for money	3	4	2	3	2	3
Assessment of Effects	Treaty Partners[65]	1	1	1	1	1	1
	Strategy alignment	2	2	2	2	2	3
	Property / land use impacts	2	3	1	2	2	1
	Environmental Effects	2	3	1	2	2	1
	Stakeholders	2	3	2	1	2	4

Weightings

In order to compare the programmes against each other, it was first necessary to identify and agree weightings amongst the project team which reflected the relative importance of the various criteria. These are referred to as the 'Workshop Weightings'. To then understand the sensitivity of the overall score, and relative ranking of programmes, further weightings were established to reflect bias towards cultural, economic, social, environmental or Investment Objective aspects.

[64] *Scores for the 'Do Minimum' option (i.e. extending existing passing lanes) were produced post workshop.*
[65] *These scores should be provided by Treaty Partners. A consistent score of 1 has been used for each programme based on prior consultation and ESR screen identifying no major cultural issues with development of any site.*

Table 24 outlines the weightings for the sensitivity tests. The importance of the criteria was scaled using a 1 (low importance) to 10 (high importance) system, and then apportioned into percentages.

Table 24: MCA Weightings

CATEGORY	CRITERIA	WEIGHTING					
		WORKSHOP	INVETSMENT OBJECTIVES	ENVIRONMENT	SOCIAL	ECONOMIC	CULTURAL
Investment Objectives	*Safety*	*10*	*10*	*2*	*2*	*10*	*7*
	Network Gaps	*10*	*10*	*2*	*2*	*10*	*2*
Implementability	*Engineering degree of difficulty*	*10*	*10*	*2*	*2*	*7*	*2*
	Value for money	*10*	*10*	*2*	*2*	*10*	*2*
Assessment of Effects	*Treaty Partners*	*10*	*2*	*7*	*7*	*2*	*10*
	Strategy alignment	*10*	*2*	*2*	*2*	*2*	*2*
	Property / land use impacts	*10*	*10*	*7*	*5*	*5*	*2*
	Environmental Effects	*10*	*2*	*10*	*7*	*2*	*7*
	Stakeholders	*10*	*2*	*5*	*10*	*2*	*7*

Programme Scores

The overall programme scores, according to the weighting theme, are shown as Figure 33. The lower the score, the better the result.

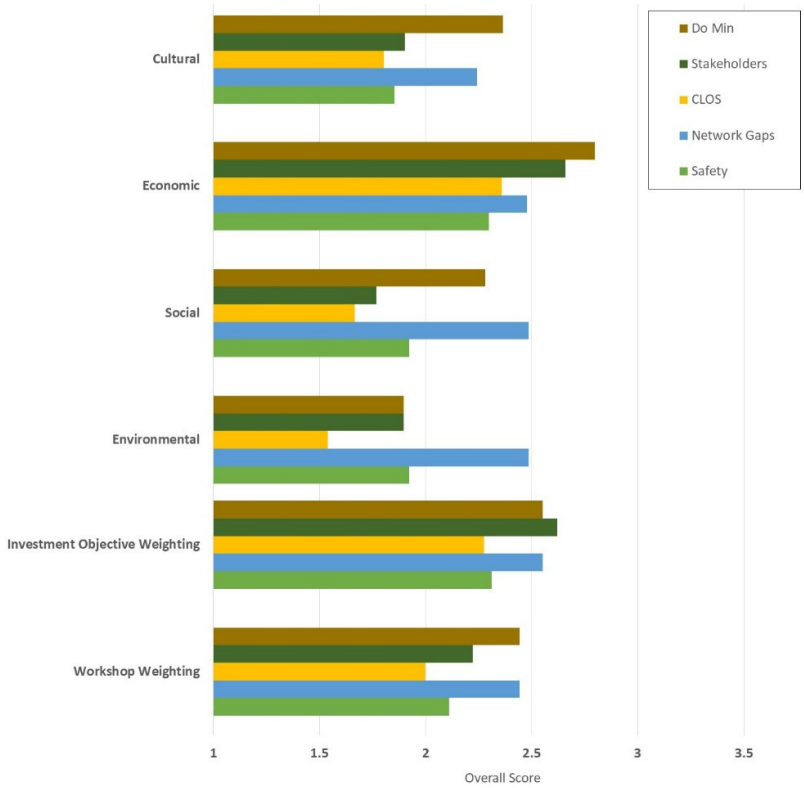

Figure 33: Programme Scores

Overall* Programme 3 (CLoS) *ranked as the best option based on the 'Workshop', 'Investment Objectives', 'Environment', 'Social' and 'Cultural' weightings. Programme 1 (Safety) ranked highest under the 'Economic' weightings.

Notwithstanding the above, generally the difference between the scores for the various programmes was relatively marginal (perhaps aside from Programme 2 – Network Gaps). As such, the MCA process on its own did not identify a clearly optimal programme but did establish that the programmes were all notably better than a 'Do Minimum' option.

12.4 DRAFT PROGRAMME

The MCA process established that whilst Programme 3 (CLoS) would provide a good basis for the overall programme, there is a need to align with Programme 1 (Safety) and Programme 4 (Stakeholders) which also scored well. There is also a need to consider the need to pull network gaps.

To this end, a draft programme was formed through the following process:

- ***Including all sites from Programme 3 (CLoS).***
- ***Adding in sites from Programme 1 (safety), which were not within Programme 3 (CLoS) and where there had been more than one crash 5km downstream of the site within the last 10 years.***
- ***Adding in sites which appeared on multiple programmes.***
- ***Removing sites where the safety problem could be addressed through another means:***
  - ***SH1, south of Kawakawa (ID: 113). There are other existing passing lanes near this site, and signage alerting drivers as the presence of these upcoming passing lane is an appropriately effective solution.***
  - ***SH10, east of Taipa (ID: 58). A speed limit reduction lane is currently being consulted upon, which would better address the safety problem between Awanui and Taipa.***
- ***Based on an initial economic evaluation, removing any sites which do not present value for money based on low derived benefit. Only one site was removed on this basis:***
  - ***SH1 between Kaitaia and Awanui (ID: 143). The proximity of the towns (8km), which both have slower speed zones (50kph) means that negligible benefits would be gained. Furthermore, the flat and straight nature of the section means that good sight distances are provided meaning it already functions as an informal overtaking opportunity.***

The nature of the programme development means that it aligns strongly with the Investment Objectives, stakeholder desires and addresses notable network gaps. The scoring for the final programme, provided within Table 25 was based on a review of the site assessment scoring and relative scores for the other programmes.

Table 25: Draft MCA Programme Score

	Safety	Network Gaps	Engineering Degree of Difficulty	Value for Money	Treaty Partners	Strategy Alignment	Property / Land Use	Environment	Community / Stakeholders
Final Programme	2	2	3	2	1	2	2	2	2

The overall score for the programme varied between 1.8 and 2.1 depending on the weighting scale used. When compared against the original programmes, the final programme scores better than all alternatives for all weighting's scales aside from environment/social (which is a factor of the number of sites in the programme).

13. PROGRAMME

13.1 DEVELOPMENT OF FINAL PROGRAMME

The focus of the draft programme (from the MCA) was to establish, using the short-listed sites as a focal point, the general areas (+/- 5km of the short-listed site) where a new or improved passing opportunity would be most desirable. However, at this stage of the process only a high-level appraisal of each short-listed site had been undertaken. This meant that to develop a final programme a more thorough review of the site, and other potential opportunities in the general area, was required. This involved establishing:

- ***Whether a new passing opportunity located at short-listed site would be safe and implementable (i.e. no significant road realignment or property acquisition required).***
- ***Whether there is a better alternative located nearby.***

The outcome of the process, which was informed by a Road Safety Audit of the draft programme (Appendix D2) and consultation with the NZ Transport Agency's Road Safety Engineer, was an amendment to the locations of some sites. In other cases, due to implementability issues and an absence of viable alternatives, some of the locations needed to be removed from the final programme.

The specific reasons for removing certain sites from the programme were:

- ***Site 1_7 was removed from the programme because it was agreed amongst the project team that the disadvantage of closing the stockpile area would outweigh the benefit of extending the passing lane by 60m to meet Austroads standards.***
- ***Site 145 was removed from the programme because, whilst the general area (between SH10/SH11 and Kerikeri) would benefit from a new passing opportunity, the only feasible location was 2km south of Waipapa. Furthermore, there is potential for a speed management programme and for the town itself to grow over the medium to long term. As such, a site located relatively close on the approach to Waipapa leaves an element of doubt as to whether it presents a solid investment opportunity for Northland.***
- ***Site 37 and 601 were removed from the programme because of implementability issues. An extensive review of other potential opportunities along Ngunguru Road was undertaken, but no feasible, safe or cost effective solutions could be identified.***

Other key differences between the draft and final programme were:

- ***Site 600 – widened shoulders, rather than a full passing lane. This change was made because the challenging road geometry would make a new passing lane potentially unsafe.***

Appendix E ***provides a memo which outlines why the locations of each specific site was chosen.***

Table 26 summarises the differences between the draft and final programmes.

Table 26: Draft vs Final Programme

ID	DRAFT		FINAL	
	LOCATION	TREATMENT	LOCATION	TREATMENT
1_7	RP215/11.44 to RP 215/10.89	Extend PL	Removed from Programme	
1_28	RP303/11.82 to RP 303/ 11.495	Convert to SVB	No change	
1_29	RP303/13.15 to RP303/12.75	Convert to SVB	No change	
13	RP167/10.5 to RP167/0.0	SVB	RP 167/10.56 to RP167/10.89	SVB
110	RP149/4.1 to RP149/4.5	SVB	RP 149/7.70 to RP149/7.99	SVB
10_4	RP33/4.39 to RP 33/4.1	Extend PL	No change	
162/901	RP17/6.9 to RP17/8.5 (ID:162)	PL	RP17/14.96 to RP17/14.23 (ID:901)	PL
145	RP17/0.3 to RP17/1.3	PL	Removed from Programme	
180	RP33/5.4 to RP33/7.0	PL	RP33/5.46 to RP33/6.51	PL

ID	DRAFT		FINAL	
	LOCATION	TREATMENT	LOCATION	TREATMENT
405	RP33/6.3 to RP33/6.7	SVB	RP33/6.72 to RP33/6.47	SVB
300	RP44/9.4 to 44/9.7	SVB	RP54/0.73 to RP54/1.13	SVB
600	RP 54/13.55 to RP 54/14.3	PL	RP69/0.39 to RP54/15.13	Wide shoulders
37	11.9 km west of Te Maika Road	New PL	Removed from Programme	
601	13.3 km west of Te Maika Road	New PL	Removed from Programme	

13.2 TIMEFRAMES

The rationale behind identifying the timeframes for each individual project was:

- *Constructing new passing/overtaking opportunities would not be possible within a 0-2 year timeframe due to technical assessment, design, consultation, land take, and consenting requirements.*
- *The early implementation programme includes only projects which involve either extending existing passing lanes or converting some to slow vehicle bays (i.e. no corridor widening).*
- *Consideration of the relative benefits of costs for individual sites. Higher benefit sites have been included within the medium term programme.*

Notwithstanding the above, each site is distinct in terms of their technical difficulty, cost, environmental / cultural implications and general priority for stakeholders. As such, an adaptive approach should be taken going forward which means that some 'medium term' projects could be reprogrammed as 'long term' projects, or vice-versa.

13.3 RECOMMENDED PROGRAMME

The recommended programme is outlined within Table 27 along with the P50 cost estimates.

Table 27: Recommended Programme

ROAD	ID	LOCATION	NEW	TREATMENT	DIRECTION	COST	PROGRAMME	OWNER
SH1	1_28	RP303/11.82 to RP 303/ 11.495	Existing	Convert to SVB	Northbound	$0.07m	Short Term	NZ Transport Agency
SH1	1_29	RP303/13.15 to RP303/12.75	Existing	Convert to SVB	Northbound	$0.06m	Short Term	
SH1	13	RP 167/10.56 to RP167/10.89	New	SVB	Southbound	$1.54m	Long Term	
SH1	110	RP 149/7.70 to RP149/7.99	New	SVB	Southbound	$1.74m	Long Term	
SH10	10_4	RP33/4.39 to RP 33/4.1	Existing	Extend PL	Southbound	$0.72m	Long Term[66]	
SH10	901	RP 17/14.96 to RP17/14.23	New	PL	Southbound	$2.36m	Long Term	
SH10	180	RP33/5.46 to RP33/6.51	New	PL	Northbound	$2.27m	Long Term	
SH12	405	RP33/6.72 to RP33/6.47	New	SVB	Eastbound	$1.17m	Long Term	
SH15	300	RP54/0.73 to RP54/1.13	New	SVB	Eastbound	$1.94m	Medium Term	
SH15	600	RP69/0.39 to RP54/15.13	New	Widened shoulders	Westbound	$1.25m	Medium Term	

SVB = Slow Vehicle Bay; PL = Passing Lane

[66] Included as a long-term project due to relative low benefits and higher cost which precludes it from being implementable within 0-2 years.

The total cost (2019 $ value) of the programme is $13.1m.

The 40-year net present value (NPV), which considers when each passing lane would be implemented, of construction for the full programme is $7.8m. A further $1.3m (40-year NPV) would be required for maintenance. The total 40-year NPV cost of the programme is therefore $9.1m.

The final recommended programme is shown as Figure 34.

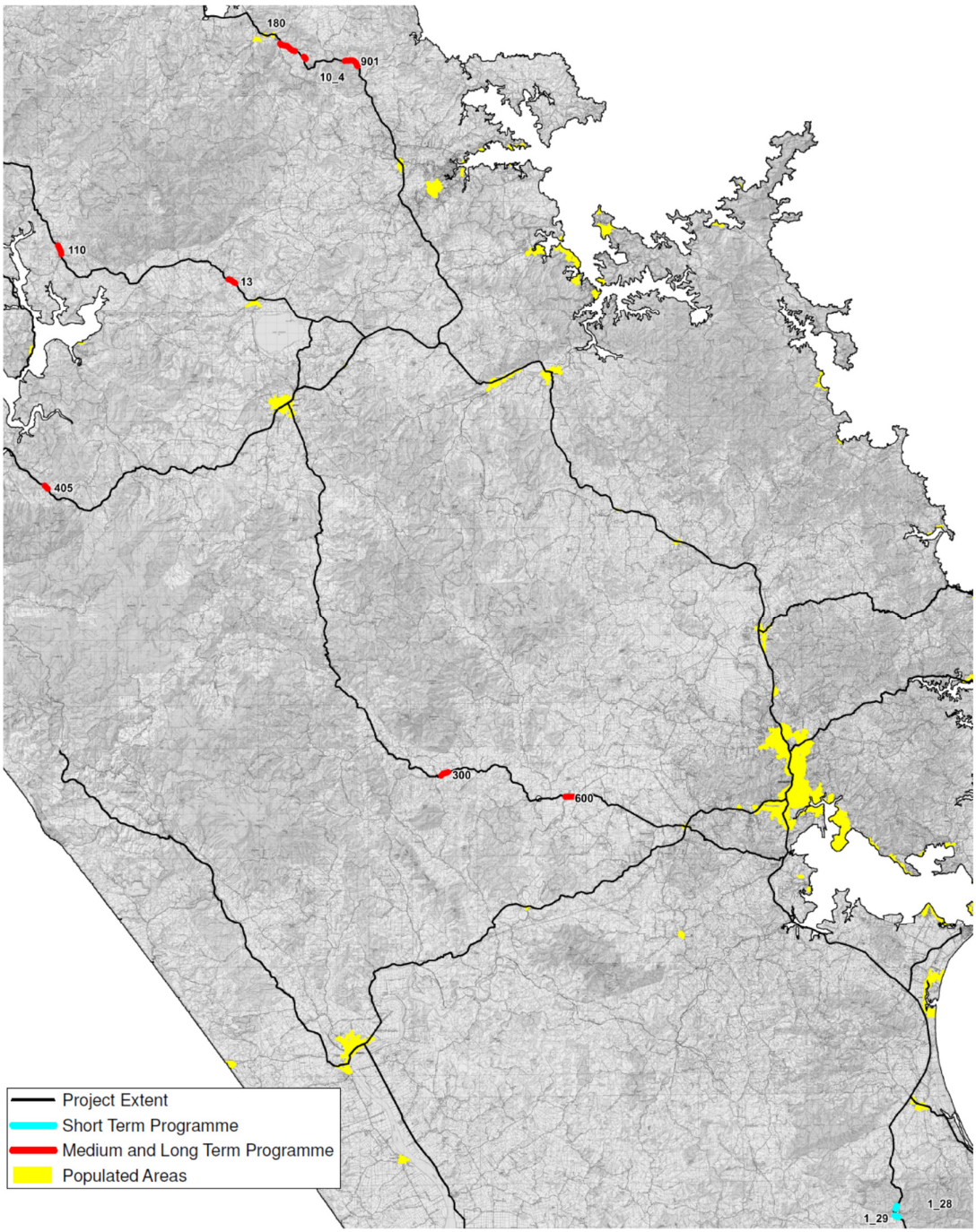

Figure 34: Recommended Programme

The NZ Transport Agency would be the owners of all state highway assets.

Note that there is an interdependency between the proposal for Site 901 and the Northland Rest Areas SSBC – this is because an existing rest area would need to be relocated approximately 200m south in order to safely accommodate the new passing lane. This has been taken into consideration as part of the cost estimates.

PART C: PROGRAMME ASSESSMENT

14. PROGRAMME ASSESSMENT

This section outlines the extent to which the recommended programme:

- ***Meets the Investment Objectives.***
- ***Allows for the potential realisation of benefits.***
- ***Aligns with the Investment Assessment Framework.***
- ***Aligns with the PGF Funding Assessment.***

14.1 INVESTMENT OBJECTIVES

Table 28 shows how the full programme of interventions will align with the Investment Objectives:

1. ***Reduce the number of overtaking crashes by 19% by 2030.***
2. ***Address network gaps by providing safe overtaking opportunities every 15km along roads with AADT > 6,000 vpd and every 20km along roads with AADT < 6,000 vpd.***

Table 28: Recommended Programme Investment Objective Alignment

INVESTMENT OBJECTIVE	ASSESSMENT	COMMENT
1: Reduce the number of overtaking crashes by 19% by 2030.	*GOOD*	*The economic evaluation methodology is based on a recognised research report and considers the cumulative benefits of passing lanes in series capturing combined safety, travel time and driver frustration benefits. The nature of the methodology means that it is difficult to ascertain the separate benefits, and therefore quantify the number of crashes that would be saved.* *Notwithstanding the recent AustRoads research report (AP-R596-19) by Espada et al. titled 'Passing Lanes: Safety and Performance' published in January 2019 outlined that the before-and-after crash analysis where a passing lane was implemented yielded the following average change in number of crashes:* • *Within the passing lane: 19 % reduction in injury crashes* • *2km before the passing lane: 18% reduction in injury crashes* • *5km after the passing lane: 10% reduction in injury crashes* • *For the entire route: 16% reduction in of 16% of injury crashes.* *These are the average results, noting that in some cases passing lanes were seen to potentially have a neutral or even negative benefit. Going forward each individual site should be assessed on a case-by-case basis to ensure that safety benefits can be guaranteed.* **Considering this research, there can be good confidence that the recommended programme would deliver upon the Investment Objective.**
2: Address network gaps by providing safe overtaking opportunities every 15km along roads with AADT > 6,000 vpd and every 20k along roads with AADT < 6,000 vpd.	*GOOD*	*Figure 35 and Figure 36 show the extent to which the recommended programme addresses this Investment Objective.* *It shows that, when considering existing passing lanes and areas where overtaking is possible on both sides that the programme delivers a good level of network coverage. Gaps still remain also the northern part of SH15 and SH12 – however the volumes along these roads (typically < 1,000 vpd) are such that investment in passing lanes is not current justifiable.* *The other main gap is along SH10 between Awanui and Kaeo (eastbound) – however a slower speed limit is being considered for much of this route and there are a number of small towns along the route which in themselves provide passing opportunity (as people stop as they are destined for the town, or stop for a rest).* **Considering the above, it can be said that the recommended programme aligns well with this Investment Objective.**

Overall it is considered that the recommended programme aligns well with the overarching Investment Objectives of the project.

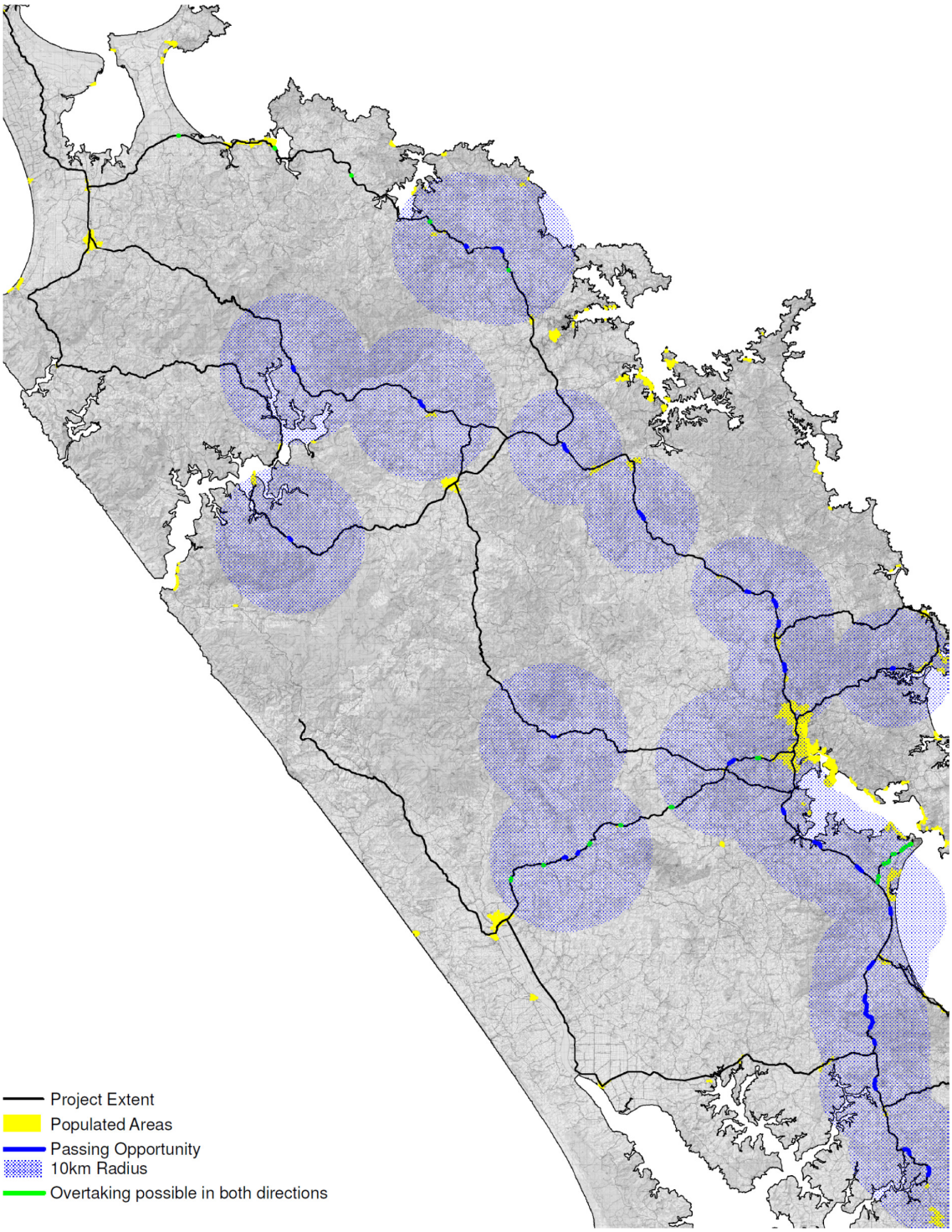

Figure 35: Recommended Programme – Addressing Eastbound/Southbound Network Gaps

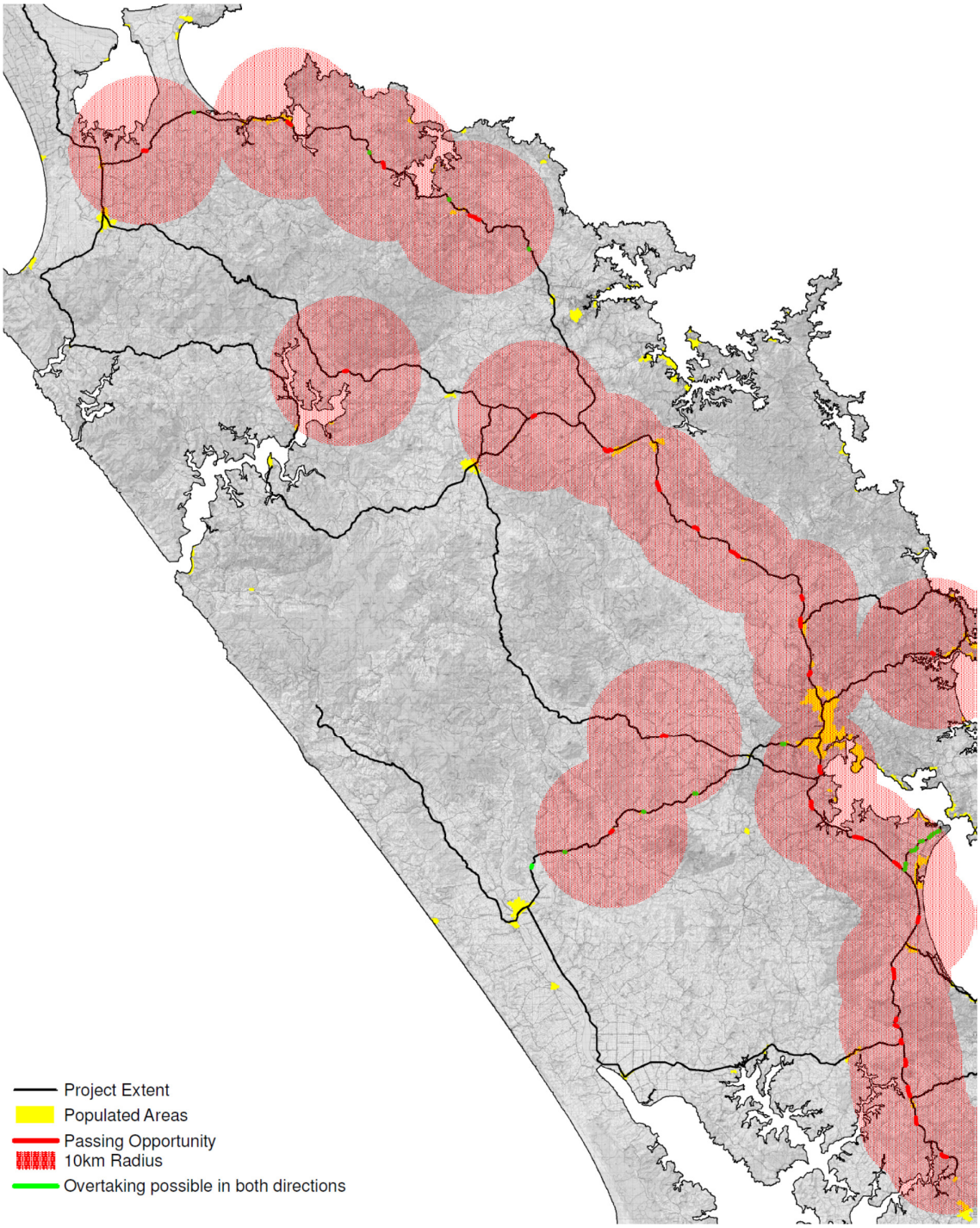

Figure 36: Recommended Programme – Addressing Westbound/Northbound Network Gaps

14.2 ASSESSMENT PROFILE

The National Land Transport Fund (NLTF) is the primary funding mechanism for Crown investment in the land transport system. The National Land Transport Programme (NLTP), reviewed and updated every three years in line with the release of the Government Policy Statement on land transport (GPS), identifies the activities likely to be funded by the NLTF.

Land transport activities which fit the criteria for funding from the NLTF, are assessed and prioritised against competing national priorities, to determine eligibility for funding. Activities with sufficiently high priority are included in the NLTP.

The framework, presented in Figure 37, consists of a business case review and a two-factor assessment - Results Alignment and Cost-Benefit Appraisal. The purpose of this process is to assess the significance of the problem relative to the goals and outcomes of the Government Policy Statement on Land Transport (GPS) 2018.

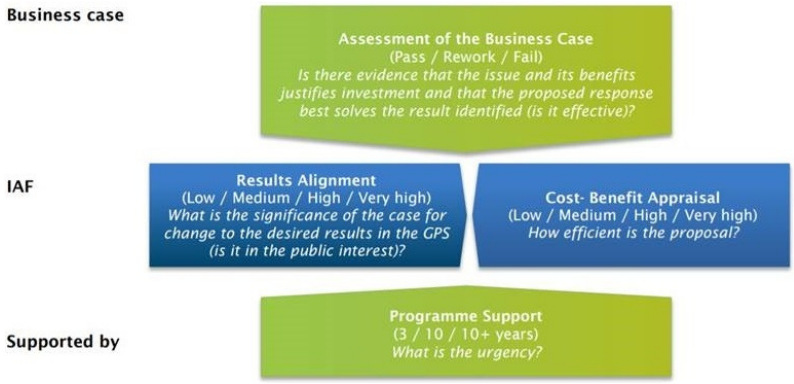

Figure 37: Investment Assessment Framework, 2018-21 NLTP

Results Alignment

Table 29 provides the assessment criteria, and Table 30 provides the project assessment.

Table 29: Results Alignment as defined by the 2018-21 Investment Assessment Framework

GPS PRIORITY	LOW	MEDIUM	HIGH	VERY HIGH
Safety	*Continuous programmes: a higher level of service than required* *Improvements: a gap in required levels of service*	*Continuous programmes: a fit-for-purpose level of service* *Improvements: an identified gap of some significance in required levels of services*	*Continuous programmes: a gap in existing levels of service* *Improvements: a significant gap in a targeted regional or national context*	*Directly link to specific priority results sought in the GPS*
Access – thriving regions				
Access – liveable cities				
Environment				

Table 30: Investment Assessment Framework Assessment for the Recommended Programme

GPS PRIORITY	ASSESSMENT	COMMENT
Safety - a safe transport system free of death and serious injury	*HIGH*	• *The recommended programme will address safety issues affecting communities subject to medium safety risk, and Safer Journeys of medium concern.* • *Northland is identified in the Communities at Risk Register as being at high risk for rural road loss of control and/or head-on (speed zones >70km/hr).* • *The programme will save 19% of DSIs.*
Access to opportunities, enables transport choice and access, and is resilient -Thriving regions	*HIGH*	• *The recommended programme will address a gap in an approved RED programme in a high priority RED region.* • *Northland is identified as a RED area by the NZ Transport Agency. The Twin Coast Discovery PBC was developed, in part, to enable opportunities in Northland.*

GPS PRIORITY	ASSESSMENT	COMMENT
Environment - Reduce adverse effects on the climate, local environment and public health	MEDIUM	• There will be scope within the recommended programme to allow for improved infrastructure facilities relating to water drainage and quality; such as constructing or formalising swales.

Overall the results alignment indicates that there is a **High** *alignment with the GPS. It is noted that there is a medium alignment with the environment, however given that the Investment Objectives of the project relate to Safety and CLoS, the corresponding GPS priorities are considered the most relevant to the rating.*

Cost Benefit Appraisal

The cost benefit appraisal shows that the recommended option results in a BCR of **2.49**, *with sensitivity analysis undertaken showing a BCR range of* **2.12 to 2.67**. *The BCR was most sensitive to changes in construction cost and the travel time/safety benefit derived from new passing lanes.*

Overall Assessment Profile

The recommended programme has been assessed against the NLTP Investment Assessment Framework (IAF). The assessment indicates that the recommended programme has a **high** *results alignment and a low BCR (excluding Wider Economic Benefits), indicating that the recommended programme will potentially be included in the NLTP.*

The priority order for the project would be **5** *based on the IAF prioritisation order (refer to Table 31).*

Table 31: Prioritisation for Improvement Categories

RESULTS ALIGNMENT	COST BENEFIT APPRAISAL	PRIORITY ORDER
Very High	L/M/H/VH	1
L/M/H	Very high (BCR 10+)	2
High	High (BCR 5-9.9)	3
High	Medium (BCR 3-4.9)	4
Medium	High (BCR 5-9.9)	4
High	Low (BCR 1-2.9)	5
Medium	Medium (BCR 3-4.9)	5
Medium	Low (BCR 1-2.9)	6
Low	High (BCR 5-9.9)	7
Low	Medium (BCR 3-4.9)	8
Low	Low (BCR 1-2.9)	Exclude

14.3 PROVINCIAL GROWTH FUNDING ASSESSMENT

In February 2018, the Government announced the Provincial Growth Fund (PGF) to support growth in regional New Zealand. The PGF, administered by the Provincial Development Unit (PDU), aims to enhance economic development opportunities in the regions, create sustainable jobs, contribute to community and Maori well-being, lift potential productivity and help to meet New Zealand's climate change targets.

While the NLTP is the primary funding mechanism for land transport activities, the PGF provides the opportunity to support regional transport projects by:

- *Enabling a greater number of projects to be supported;*
- *Providing a source of funding for local authorities that face significant difficulty in meeting local share requirements;*

- ***Bringing forward projects that are strategically important to a region's productivity potential and which are outside the NLTP funding criteria, or which are unable to be funded in a sufficiently timely way through the NLTP; and***
- ***Providing a source of funding for projects that do not secure funding through the NLTF, but which meet the Government's objectives for the Fund.***

PGF applications must demonstrate that the proposal will help achieve the following PGF objectives:

- ***Creating jobs, leading to sustainable economic growth.***
- ***Increasing social inclusion and participation,***
- ***Enabling Maori to realise aspirations in all aspects of the economy.***
- ***Encouraging environmental sustainability and helping New Zealand to meet climate change commitments alongside productive use of land, water and other resources.***
- ***Improving resilience, particularly of critical infrastructure, and by diversifying the New Zealand economy.***

Table 32 presents an indicative PGF funding assessment for the whole programme. The scoring scale is: Yes (Y), Somewhat (S) or No (N).

Table 32: PGF Funding Assessment

PGF OBJECTIVE	RECOMMENDED PROGRAMME	COMMENT
PGF Objective 1 – Jobs.	*S*	*The implementation of the project will result in construction opportunities.*
PGF Objective 2 – Social Inclusion.	*S*	*The programme will improve connectivity between settlements and journey times.*
PGF Objective 3 – Māori aspirations.	*N*	*No significant impact (neither benefit nor disbenefit).*
PGF Objective 4 – Sustainability.	*N*	*No significant impact.*
PGF Objective 5 – Resilience.	*Y*	*It is anticipated that the programme will reduce closure incidence by reducing crashes and widening seal to allow for temporary measures which maintains some movements.*
Lift productivity of a region or regions.	*S*	*The TCDR PBC report included the upgrade as passing and overtaking opportunities as part of an overall package aimed at increasing the tourism potential of Northland.*
Create additional value and avoid duplicating existing efforts.	*Y*	*The programme is being, and is likely to continue to be, managed by the NZ Transport Agency with visibility across the other TCDR projects*
Have a link to the regional priorities and be supported by stakeholders.	*Y*	*The programme is the product of the TCDR PBC and has been subject to stakeholder feedback at workshops.*
Be well managed, well governed and have appropriate trade-offs between risk and reward.	*TBC*	*TBC*

The recommended programme has been assessed against the PGF criteria. This assessment is indicative ***only and is intended to assist in progressing funding options. The assessment indicates that the recommended programme may have good alignment against the PGF criteria. Any applications for PGF funding will be subject to the Provincial Development Unit (PDU) application assessment processes.***

15. ECONOMICS

This section presents an overview of the economic analysis for the project.

For new passing lanes the benefits have been derived in accordance with the NZ Transport Agency's Research Report 549[67] (provided as* Appendix B8*), whilst the Economic Evaluation Manual (EEM) full procedures have been used for deriving benefits for extending the under-length existing passing lanes (Do Minimum). A 40-year analysis period and a 6% discount rate has been used.

The recommended programme has been compared against the Do Nothing, which would be to continue with the current maintenance programme for existing passing lanes.

***The benefit-cost-ratio (BCR) of the project is* 2.49.**

15.1 METHODOLOGY

Generally, economic benefits of passing lanes are obtained in three ways:

- ***Travel time benefit: when light vehicles have opportunities to overtake slower (often heavy) vehicles, especially on the mountainous areas, and travel time savings downstream of the passing lane(s).***
- ***Safety benefit: passing facilities reduce the likeliness of overtaking, head-on and rear-end type crashes as they provide safer overtaking opportunities.***
- ***Reductions in driver frustration from less time spent following slower vehicles.***

Vehicle Operating Costs (VOC) are generally a disbenefit due to factors like fuel use increasing as light vehicles can travel faster along a route (e.g. increasing from an average speed around 80kph to an average speed around 90kph).

Different methodologies for calculating benefits were undertaken depending on the overtaking facility. The different approaches are outlined in the following sections.

New Passing Lanes

Given most of proposed passing lanes within this programme are in what is considered mountainous area (average gradient ≥ 2%), the *Appendix A: Option evaluation process in Research Report 549* ***is considered fit-for-purpose. This process has been developed to calculate an economic evaluation benefit-to-cost ratio (BCR) based on detailed microsimulation traffic modelling to establish the relationship between economic efficiency and passing lane characteristics. Factors considered include passing lane length, space between adjacent passing lanes, AADT, terrain, traffic growth and HCV percentage.***

The Research Report 549 process also considers all abovementioned benefits as a combined package. The step by step approach is described as below:

- ***Develop traffic subsections: the study network is divided into subsections with the length ranging between 6 - 25 km depending on the homogeneities in terrain, rural / urban areas, speed limit and traffic demands.***
- ***Once the subsections have been identified, the key characteristics for each subsection are identified (gradient/terrain, AADT range and Heavy Vehicle %). Table A.2 from Research Report 549 is then used to identify the appropriate contour plot from section A7.1. The contour plots enable an estimate of the subsection Passing Lane BCR ranges based on passing lane length and spacing between passing lanes.***

[67] *This Research Report was focused towards 2+1 Arrangements (a 3-lane road section with passing lanes in alternative directions) and ITS assisted merging. To support the research, extensive microsimulation modelling was carried out covering a range of NZ State Highway environments and conditions. This modelling was used, somewhat subsequently to the 2+1 / ITS aspects, to develop a robust and comprehensive subsection economic passing lane method. The method for economic analysis in RR549, supersedes the EEM A7 methodology which dates from older research when more robust microsimulation modelling was not practical. Particularly for analysing sub-sections containing a number of passing lanes.*

Table 33: Table A2 from Research Report 549

Terrain	AADT	Heavy Vehicle %	Growth Rate	Plot
Flat / Rolling Terrain: Average gradient is <1%, maximum gradients around 4% (see EEM A7.5)	5,000 (4,000 - 7,500vpd)	Low 10 - 17%	0.0 -1.2% Lights, 0 - 5% Heavies	A.1.1
		Med 17 - 23.5%		A.1.2
		High 23.5 -30%		A.1.3
	10,000 (7,500 - 12,500vpd)	Low 8 - 13%	0.0 -1.2% Lights, 0 - 5% Heavies	A.2.1
		Med 13 - 17.5%		A.2.2
		High 17.5 - 22.5%		A.2.3
	15,000 (12,500 - 17,500vpd)	Low 8 - 12%	0 - 2% Lights, 0 - 5% Heavies	A.3.1
		Med 12 - 16%		A.3.2
		High 16 - 20%		A.3.3
	20,000 (17,500 - 22,500vpd)	Low 8 - 12%	0 - 3% Lights, 0 - 4% Heavies	A.4.1
		Med 12 - 16%		A.4.2
		High 16 - 20%		A.4.3
	25,000 (22,500 - 27,500vpd)	Low 6 - 9.5%	0 - 2% Lights, 0 - 4% Heavies	A.5.1
		Med 9.5 - 13%		A.5.2
		High 13 - 17%		A.5.3
Mountainous Terrain: Average gradient may vary, likely to be around 2-4%. More notably maximum gradient >6% (see EEM A7.5)	5,000 (2,500 - 7,500vpd)	Low 10 - 17%	0.0 -1.2% Lights, 0 - 5% Heavies	A.6.1
		Med 17 - 23.5%		A.6.2
		High 23.5 -30%		A.6.3
	10,000 (7,500 - 12,500vpd)	Low 8 - 13%	0.0 -1.2% Lights, 0 - 5% Heavies	A.7.1
		Med 13 - 17.5%		A.7.2
		High 17.5 - 22.5%		A.7.3
	15,000 (12,500 - 17,500vpd)	Low 8 - 12%	0 - 2% Lights, 0 - 5% Heavies	A.8.1
		Med 12 - 16%		A.8.2
		High 16 - 20%		A.8.3

- ***Locate the passing lanes within the subsection. The subsection, when identified, is exported to GIS based software for length and spacing measurements. This data will be fed to contour plot for obtaining the initial BCR range.***
- ***Finalise the subsection benefit-cost ratio: the BCR range estimated in RR549 was calculated based on a construction cost of $1.0m per kilometre 2012 value, this value is $1.42m in 2019 monetary value as per the following equation:***
- ***2019 value = $1.0m * (1 + (2019 - 2012) * 6%) = $1.42m***
- ***Finalise BCR for subsection: the initial BCR (taking the mid-point of range) is factored by the actual site construction and maintenance cost per kilometre of passing lane, this is given in the formula below from RR549:***
- ***Final BCR = average BCR * (actual cost per km / $1.42m)***

Extending of Under-Length Passing Lanes

There is one existing passing lane that have been included in the recommended programme to be extended in order to meet AustRoads design standards. There are a further two which are proposed to be converted to slow vehicle bays.

These improvements would bring about some safety benefits, but they would be relatively negligible when compared to the scale of benefit for new passing lanes. As such, these benefits have not been calculated, but the costs have been included as part of the overall BCR.

15.2 BENEFITS

The economic analysis has considered the* travel time, safety, driver frustration and tourism *benefits of the programme.

Tourism

The wider economic benefits of the Twin Coast Discovery Route programme were evaluated by Richard Paling Consultants, using a top down approach as a means of allocating tourism-related benefits across the full range of Northland Business Cases.

The analysis, provided as* Appendix B8*, looked at the combined impacts of the proposed scheme elements in terms of broadening the areas benefitting from tourism and extending the tourist season away from the key summer months. The total allocation of discounted benefits, assuming no growth in benefits beyond 2030, was $640m. The combined allocation to the Wayfinding, Rest Areas and Passing Opportunities Business Case was $122m, disaggregated as per Table 34.

Table 34: Possible Wider Economic Benefits for Wayfinding, Passing Opportunities & Rest Areas[68]

BUSINESS CASE	PER CENT OF TOTAL FOR GROUP	INCREASED ANNUAL TOURIST EXP ($M)	INCREASED ANNUAL GDP ($M)	TOTAL DISCOUNTED GDP OVER 40 YEARS ($M NPV)
Wayfinding	*62%*	*5.4*	*3.9*	*90*
Passing places	*19%*	*1.0*	*0.8*	*16*
Rest areas	*19%*	*1.0*	*0.8*	*16*
Total	*100%*	*7.4*	*5.3*	*122*

The recommended programme would deliver a comprehensive network of passing and overtaking opportunities that meet a wide range of stakeholder expectations. As such, for the purpose of the economic analysis the identified full 40-year NPV* tourism benefit of $16m *has been applied.

Travel Time and VOC / Safety / Driver Frustration

The economic analysis, derived from the NZ Transport Agency's Research Report 549 has identified the following breakdown of benefits (40-year NPV):

- ***Travel Time and VOC = $3.3m***
- ***Safety = $2.6m***
- ***Frustration = $0.6m***
- **Total = $6.5m**

The individual sites which deliver the highest benefits are located on SH10 and SH15. In general terms, the reason for this is because of their spacing between towns (where there are typically speed limit reductions) is such that more travel time benefit can be derived.

These sites align with stakeholder desires are located along the key freight route which is expected to see an increase in heavy vehicle traffic. For these reasons, both sites have been accorded a higher priority and have been included as part of the medium term programme.

Other lower benefit sites have been included on the long term programme. Going forward, each of those sites should be evaluated on a case-by-case basis to better understand the potential travel time/CLoS benefits.

Wider Economic Benefits

The recommended programme can also be expected to deliver several strong wider economic benefits, which have been collectively identified across the seven Northland Business Cases; namely:

- ***Tourism benefits (described earlier).***
- ***Connectivity benefits. These benefits reflect the greater interactions that are possible between communities if travel costs particularly travel times are reduced.***

[68] *Table 8.1 of Richard Paling Consulting Report*

One specific WEB for this SSBC would be that a less stressful driving conditions could attract new truck drivers to join the workforce.

15.3 COSTS

The total 40-year NPV cost of the recommended programme is $9.1m, including capital and maintenance costs. A breakdown of the construction costs per site were provided as Table 27.

The maintenance costs have been based on the average expenditure on the Northland state highways over the last five years. A per km per lane value of $6,800 was derived using this data and applied as an annual maintenance cost for the purpose of the economics.

The P50/P95 cost estimates are provided within Appendix B9.

15.4 BCR

The economic evaluation has identified:

- ***Benefits (40 Year NPV):***
  - ***Tourism = $16.0m***
  - ***Travel Time and VOC / Safety / Driver Frustration = $6.5m***
  - ***Total = $22.5m***
- ***Costs (40 Year NPV):***
  - ***Construction and design = $7.8m***
  - ***Maintenance = $1.3m***
  - ***Total = $9.1m***

The benefit-to-cost ratio (BCR) of the programme is 2.49.

The BCR without the wider economic benefits (i.e. tourism) would be 0.72.

15.5 SENSITIVITY ANALYSIS

Several sensitivity tests have been undertaken to provide a likely BCR range for the project. The sensitivity analysis has focused around changes to the following key variables:

- ***The economic discount rates.***
- ***Increased or decreased project cost[69].***
- ***Lower travel time/VOC/safety/driver frustration benefit.***

Table 35 provides the economic sensitivity analysis.

Table 35: Sensitivity Analysis

VARIABLE	VARIANCE	UPPER	BASE	LOWER	BCR RANGE
Discount Rate	*+/- 2%*	*8%*	*6%*	*4%*	*2.35 - 2.67*
Construction Costs	*+ 20%*	*+20%*	*0%*	*0%*	*2.12*
Travel Time / VOC / Safety / Driver Frustration	*-50%*	*0%*	*0%*	*-50%*	*2.13*
Tourism benefits	*-20%*	*-20%*	*0%*	*0%*	*2.13*

The analysis has shown the BCR is most sensitive to cost variances.

[69] One of the main risks is relation to the cost depends upon supplier competitiveness, potential need for land take, geotechnical risks and the final pavement requirements.

PART D: CONCEPT DESIGN

16. DESIGN PHILOSOPHY

A Design Philosophy Statement (DPS) has been produced for the SSBC, included as* Appendix C1. *This document outlines the standards, guidelines and key criteria that have been used for the development of concept designs for this SSBC. The main salient points are included here for ease of reference.

16.1 THE SAFE SYSTEM APPROACH

The Safe System approach to road safety management is based on the principle that our life and health should not be compromised by our need to travel. No level of death or serious injury is acceptable in our road transport network.

Safe systems are designed with the human being at its centre, taking human fallibility and vulnerability into account. The goal of safe systems is to ensure that these mistakes do not lead to a crash; or, if a crash does occur, it is sufficiently controlled to not cause a death or a life-changing injury. The Transport Agency, in embracing this approach, developed the Safer Journeys strategy and has the vision of a *"a safe road system increasingly free of death and serious injury"*.

To help ensure the Safe Systems approach is adopted as part of the concept passing lane designs, the following standards and guidelines have been referenced:

- ***Safer Journeys for motorcycling on New Zealand roads, NZ Transport Agency, 2nd edition December 2016.***
- ***The NZ Transport Agency Technical Memorandum TM-2503 Guidelines for Edge Protection and Medians on Dual Carriageway Roads, incorporating a Safe System Philosophy, NZ Transport Agency, March 2013.***
- ***Safe system guidelines for RoNS (TM2503) May 2012.***
- ***AustRoads Guides to Traffic Management and Road Design.***
- ***AustRoads Rural Road Design.***

16.2 GEOMETRIC AND TRAFFIC DESIGN

Guidelines

The following guidelines have been used to inform the geometric design:

- ***NZ Transport Agency State Highway Geometric Design Manual (draft)***
- ***AustRoads Guide to Road Design – Part 3: Geometric Design***
- ***AustRoads Guide to Road Design – Part 4: Intersections and Crossings***
- ***AustRoads Guide to Road Design – Part 4A: Unsignalised and Signalised Intersections***
- ***Traffic Control Devices Manual & Manual of Traffic Signs and Markings (MOTSAM) Parts I, II and III (2010)***
- ***NZ Transport Agency Bridge Manual (SP/M/022)***
- ***LTSA RTS 18 – New Zealand On-road Tracking Curves for Heavy Motor Vehicles (2007)***
- ***Local Authority Guidelines***

Road Classification

The following initial assumptions have been applied for the design of Passing and Overtaking Opportunities.

- **State Highways.** ***Road classifications under NZ Transport Agency's ONRC is used for design of Passing and Overtaking Opportunities on state highways.***
- **Local Roads.** ***All local roads are to retain their existing classification where applicable.***

- **Over-Dimension Routes.** ***The passing lanes on Over-Dimension Vehicle routes are designed in accordance with the following documents:***
  - ***NZ Transport Agency's Over-Dimension Vehicle Route Maps***
  - ***NZ Transport Agency Road Design Specifications for Over-Dimension Loads, Version 6, May 2016***
  - ***NZ Heavy Haulage Association Roading Design Specification for Over-Dimension Loads Revision 4***

Design Speeds

The Ministry of Transport (MoT) conducts annual speed surveys at randomly selected sites in both 100km/h speed limit areas and main urban 50km/h areas around New Zealand. The speed surveys are designed to monitor changes in free speeds of vehicles. As per the latest MoT speed survey data, the 85th percentile open road car speed for Northland is 100km/h. Therefore, typically for each site, as a starting point a design speed of 100km/h has been adopted for design of Northland Passing and overtaking opportunities.

Design Vehicles

The design vehicle is an RTS 18m long quad rear axle semi-trailer.

Mainline Geometry

The geometry provided depends upon the design speed and is based on the draft State Highway Geometric Design Manual (SHGDM) and AustRoads Guide to Road Design, Part 3: Geometric Design guidelines. Generally:

- **Horizontal Alignment.** ***The layouts of the proposed passing lanes and slow vehicle bays are designed as per the AustRoads Guide to Road Design Part 3: Geometric Design, Section 5 - SHGDM and MOTSAM Part 2: Markings.***
- **Vertical Alignment.** ***The typical cross section philosophy for Passing and Overtaking Opportunities is based on the draft SHGDM and AustRoads Guide to Road Design, Part 3: Geometric Design. The designs for Passing and Overtaking Opportunities have followed the levels at the existing centreline of the road relatively closely.***

Lane and Shoulder Widths

3.5 m wide lane widths are recommended for passing lanes and slow vehicle bays. This is considered appropriated due to the expected usage of those lanes by heavy vehicles. Site 143 on SH1 is proposed to have marked shoulders on both sides for passing and overtaking. A width of 3.0 m has been used for these shoulders to allow a passenger vehicle to stop clear of the traffic lanes and provides an additional clearance to passing traffic as recommended in section '*4.3 Shoulders - AustRoads Part 3: Geometric Design****'.***

A minimum sealed shoulder of 1.5 m has been adopted for the design. The proposed sealed shoulder widths will tie into existing.

Batter Slopes

A batter slopes of 1:4 on embankments and 1:3 in cuttings have been adopted as per section 6.5 – SHGDM. However, there are likely to be several locations where new retaining walls are needed to accommodate the widening.

Clear Zones

Where practicable, a clear zone width has been adopted for design as per Section 6.5 – SHGDM.

Vehicular Access to Adjacent Properties

All adjacent properties with vehicle crossings onto state highways at the proposed Passing and Overtaking sites will retain vehicle access. Existing vehicle crossings might need to be rebuilt and relocated due to the widening of the carriageway. This will require some accommodation work within the adjacent properties to provide a smooth tie-in. This work will be subject to negotiation and consultation with property owners to reach agreement on the works required in each property.

Traffic Signs and Road Markings

The traffic signs and road markings for Passing and Overtaking sites are designed in accordance with the following documents:

- ***Manual of Traffic Signs and Markings (NZ Transport Agency)***
- ***NZ Transport Agency's Traffic Control Devices (TCD) Manual***
- ***RTS 5 - Guidelines for rural road marking and delineation***

16.3 SERVICES AND UTILITIES

Information on utilities within the study sites have been assessed using a desktop assessment from the information gathered from site visits and utility owners. As the designs progress a better understanding of the utilities in the area and extent of impact will be gained. Some existing over ground and underground services at the sites are;

- ***Telecommunication;***
- ***Underground and overhead power lines;***
- ***Gas;***
- ***Stormwater; and***
- ***Wastewater.***

16.4 ITEMS TO BE DEVELOPED

Future versions of the DPS may include:

- ***Structures;***
- ***Roadside barriers;***
- ***Street lighting;***
- ***Property requirements;***
- ***Urban and landscape design;***
- ***Pavement and surfacing;***
- ***Stormwater;***
- ***Resource consenting;***
- ***Social and Environmental considerations;***
- ***Communication and consultation; and***
- ***Construction methodology.***

17. RISK REVIEW

17.1 UNCERTAINTY LOG

The general uncertainty log for the project is provided as Table 36.

Table 36: General Uncertainty Log

FACTOR	TIME	UNCERTAINTY	PROGRAMME IMPACT	COMMENTS
CONNECTIONS WITH OTHER PROGRAMMES				
Significant upgrade of intersection of SH1/SH11 at Kawakawa	Coming years	More than likely	A significant intersection upgrade is planned that will support journeys to the west coast.	This is a project under the SH11 SSBC which can link with SCRIM and Resilience if co-ordinated.
Upgrade of intersection of SH1 and SH15	Completion end of 2020	Certain	Construction of a roundabout to assist turning movements, particularly right turn movement from SH15 to SH1.	
Safe Network Programme SH1 Moerewa to Kawakawa	Coming years	Likely	Speed management study	
Safe Network Programme SH1 Whāngārei to Wellsford	Late 2019	Likely	SH1 south of Whangārei is scheduled to receive a range of safety treatments, such as a wire rope barrier installation.	Sites 163 and 193 were removed from the programme.
Safe Network Programme SH10 Awanui to Taipa	Coming years	Likely	SH10 Awanui to Kaingaroa received positive initial comments from the Stakeholder Engagement	
Safe Network Programme SH11 Haruru to Puketona	Coming years	Likely	Speed management study	
Safe Network Programme SH12 Dargaville to Tokatoka	Coming years	Likely	This project will see rumble strips applied to edge and centrelines along the entire route over three seasons.	
SH12 Matakohe	Current	Certain	Completed construction for two one-lane bridge upgrades and a highway realignment occurring on SH12 near Matakohe.	This is likely to impact community expectations for passing opportunities and this opportunity may no longer be viable as traffic flows improve without the disruption of a one-lane bridge.
CONNECTIONS WITH PROJECTS THAT ARE NOT FUNDING DEPENDANT				
Kaipara Kickstart	Coming years	Reasonably foreseeable	A road improvement programme aligning with agricultural vehicle demands and the renewal of aging wharf infrastructure along the Kaipara and Wairoa rivers has been approved by the Provincial Growth Fund. This work is expected to foster local economic development initiatives such as adventure kayaking and tourism water	This programme includes several projects, some of which are already funded while others are conditional on the outcome of an investigation phase or on future funding. Funding approved to date includes that for 50 MAX/HPMV network improvements but the prioritisation of specific structures may be

FACTOR	TIME	UNCERTAINTY	PROGRAMME IMPACT	COMMENTS
			taxi services that could make the Ruawai, Matakohe, Tokatoka and Kaiwaka sites more valuable rest area sites, if private investment occurs in the future as a result of these enabling works.	influenced by the funding status of other initiatives.
OTHER				
Land-owner resistance	Coming years	Reasonably foreseeable	Most of the sites will have some impact on adjacent landowners. Either land acquisition or alterations to private accesses will be required.	
Marsden Port expansion	Coming years	Hypothetical	Expansion of the Port would accelerate growth in heavy vehicle freight and may bring back potential passing lane options along SH15 (towards the Port).	
ENVIRONMENT				
Flooding from adjacent rivers	Coming years	Reasonably foreseeable	Site 37 is adjacent to Waitangi river and is within a flooding hazard area. Site 143 is adjacent to Awanui river and is within a flooding hazard area. Site 145 is adjacent to Kerikeri river and is within a flooding hazard area.	Projects may require controlled activity consents. Special consent conditions could be imposed.
Contaminated material	Current	Reasonably foreseeable	Sites 162, 113 and 601 have been identified as contaminated sites.	Proposed activity may not comply with the permitted activity requirements under the National Environmental Standards (NES). The projects may require Detailed Site Investigations (DSI)

17.2 RISKS

General

The sites identified are adjacent to private property. Although engineering solutions can be implemented to minimise the amount of additional land required, these would be out of character and expensive to maintain. It is assumed, therefore, that standard embankments will be used unless significant advantages can be achieved by steeper slopes. In particular, land adjacent to sites 145 and 300 could pose a particular problem

A desktop investigation has been carried out to identify any significant risks and has been used to inform the concept designs. There is a risk, therefore, that localised geotechnical issues may be present that would need to be addressed in a future stage of the design.

For the purposes of providing concept designs across the region, it has been assumed that all stormwater can be directed to existing infrastructure. No allowance has been made for site-specific stormwater treatments over and above standard practice.

Utility information has been gathered for the sites and assessed against the concept designs. Individual utility providers have not been approached for their comments on how each design will impact their apparatus. Costs for relocation or undergrounding existing power poles have been provided based upon past experience. In particular sites 145, 180 and 600 are adjacent to power poles that will be affected by the passing opportunity.

Due to the inherent safety issues of collecting topographical data, site-specific surveys have not been carried out. Existing data from a variety of sources has been used, as well as information taken from the site drive-overs, to build up a picture of the scope of works required. This has been of sufficient detail to determine the likely horizontal geometry but without detailed design stage accurate data, it has not been possible to check the vertical geometry for compliance with the relevant standards. However, from the information available most sites would appear to have sufficient scope to overcome any deficiencies in geometry should they be identified.

Safety in Design

***The Safety in Design risk register is provided as* Appendix C2.**

Planning

A planning review of the relevant district and regional plan provisions will be undertaken in the next stage to identify the consents required for each of the sites in the recommended programme. Existing designations may be extended for those sites immediately abutting state highways that are wholly within the road corridor and district plan matters will be addressed by way of outline plan of works applications. For sites encroaching on private land and/or where regional consents are triggered on designated land, resource consents will be required.

There is also the option of preparing a consenting strategy that will advise on the best approach to be undertaken to successfully procure the necessary consents. It is here that the relevant specialists for the consenting process can be identified, such as archaeologists to undertake any necessary investigations and assist with obtaining archaeological authorities.

17.3 ASSUMPTIONS

The concept designs have been carried out based upon the design standards available at the time. Should these change, then it is recommended that the solutions be reassessed. Although Departures from Standards have not been identified, it is assumed that these would be allowable with appropriate assurance.

18. TECHNICAL ASSESSMENTS

18.1 ENVIRONMENT

To gain an understanding of the environmental effects of the proposed passing opportunities, a planning assessment has been undertaken for the short listed passing opportunities. This assessment focused on hazards, natural environment, cultural and historic heritage, land use, infrastructure and land ownership. Table 37 provides a summary of the assessment findings.

Table 37: Summary of Planning Assessment

FEATURE	SUMMARY OF FINDINGS
Hazards	• *16 sites are located within flood susceptible land or flood hazards. These sites are ID17, ID58, ID61, ID113, ID143, ID145, ID177, ID180, ID182, ID210, ID401, ID403, ID405, ID801, ID208 and ID226).* • *Five sites (ID58, ID162, ID406, ID 231 and ID 233 are located at or near contaminated sites.* • *Three sites (ID180, ID401 and ID603) are located within erosion prone land.* • *No known hazards at eight sites (ID13, ID16, ID110, ID191, ID 215, ID 802, ID135 and ID600).*
Natural environment	• *Five sites (ID 58, ID182, ID 603, ID135 and ID601) are located near or at Outstanding Natural Features/Landscapes.* • *Four sites (ID58, ID 162, ID182 and ID403) are located near or at a Wetland.* • *One site (ID58) is in a costal environment with high natural character.*
Cultural Historic heritage	• *Three sites (ID16, ID 61 and ID 191) located at or near sites that are significant to Maori.* • *Two sites site (ID182 and ID406) are located near a historic site.* • *One site (ID191) is located near an archaeological site.* • *One site (ID233) is located near a heritage resource.*
Land use	• *Four sites (ID208, ID226, ID231 and ID233) are located within Rural Zone.* • *One site (ID603) is located within Rural Harbour Zone.* • *Apart from the aforementioned sites, all other sites are located within Rural Production Zone and near residential dwellings.* • *Three sites (ID61, ID180 and ID215) are also located within General Coastal Zone, whilst site ID 58 is located within Coastal Zone.*
Infrastructure	• *Two sites are near wastewater pipeline and/or water supply pipeline.* • *One site (ID208) is located adjacent to a railway line.*
Land ownership	• *Three sites* [redacted] *are located within* [redacted] • *One site (ID802) is located within* [redacted] • *The land ownership of the other sites unknown at present.*

Given the location of the passing lanes and the potential impact that works may have on the features in the existing environment as set out in Table 36, input from a range of technical experts is needed to confirm the effects likely to be created and whether it is possible to avoid these effects. The technical assessment can also assist in scoping the nature of specific mitigations that will need to be included in any consent application. It is expected that the planning assessment will be able to be completed to confirm what regional resource consents would be required. It is assumed that the Transport Agency will use its Requiring Authority power to designate the land as the works are located beside state highways.

The greatest risk to the programme is likely to be related to effects triggering the need for notification. The technical assessments and the planning assessment will inform the consenting strategy which, will identify the most effective statutory method for delivering each of the passing lanes in terms of efficiency and risk. The technical assessments will assist to confirm the level of risk and will guide the mitigation of risks related to the impacts on the environment in each location. It is noted that the consenting strategy will also include the Heritage New Zealand Pouhere Taonga Act 2014.

18.2 GEOTECHNICAL

Preliminary Geotechnical Assessments have been carried out on the new passing lane sites included within the recommended programme. The assessments included:

- ***Desktop study to establish the likely stratigraphy of the area and specific areas of geotechnical interest that may impact on the proposed works.***
- ***Preparation of a recommended schedule of geotechnical testing to be executed as part of Pre-Implementation investigations.***
- ***Preparation of a Preliminary Geotechnical appraisal report including the recommended schedule of geotechnical testing. Please refer to* Appendix C3 *for the Geotechnical Appraisal Report.***

Preliminary Risk Assessment

The preliminary risk assessment for sites included on the recommended programme is provided as Table 38. The scoring scales for 'expected/preliminary ground conditions', 'geotechnical requirements' and 'anticipated level of geotechnical input' are provided as Table 39, Table 40 and Table 41 respectively.

Table 38: Preliminary Risk Assessment

ID	ROAD	GROUND CONDITIONS		GEOTECHNICAL REQUIREMENTS		RISK RATING	
13	01N	3	• Predominantly Mangakahia Complex (Northland Allochthon) sandstone. • Possible Kerikeri basalt rock to the south of the site. • Existing pond at top of cut.	3	• Small to moderate cuts and embankment construction (<1 to 5m).	6	Moderate
110	01N	4	• Predominantly Mangakahia Complex (Northland Allochthon) sandstone. • Evidence of instability in existing slopes and saturated ground. • Possible poorly consolidated alluvial material near culvert and stream.	4	• Fill embankment (<1 to 3m). • Possible retaining wall	8	High
901	10	1	• Kerikeri Volcanic Group basalt and tuff.	2	• Small cuts <1.5m and embankments (retaining walls).	3	Very Low
180	10	2	• Predominately Tauranga Group alluvium through the valley. Mangakahia Complex (Northland Allochthon) in ridges. Te Kuiti sandstone to the north. May be highly variable.	2	• Embankments or wall (<1 to 2m).	4	Low
300	15	3	• Tauranga Group alluvium, likely poorly consolidated alluvial soils near waterway. Possibly Northland Allochthon. Possible existing gabion wall at western end	4	• Small to moderate retaining walls and embankments. • Modification of existing gabion retaining wall.	7	Moderate
405	12	3	• Karioitahi Group and potentially soft soils.	3	• Moderate cuts in east, moderate retaining wall in north (~2 to 4m).	6	Moderate
600	15	2	• Kerikeri Volcanic Group basalt and tuff with possibility of Wairakau volcanic breccia up north. Possible soft alluvial soils.	3	• Fill wall or embankments. Retaining walls (~1 to 2m)	5	Low

For moderate and high-risk sites, further assessment would be required:

- ***Hand auger or CPT investigation;***
- ***Moderate retaining wall or embankment design;***
- ***Minor to moderate cut slope assessment; and***
- ***Assessment of poor ground conditions.***

The cost estimates have taken into considered the potential geotechnical requirements outlined above.

Table 39: Expected Ground Conditions – Scoring Scale

VALUE	EXPECTED / PRELIMINARY GROUND CONDITIONS
1	Good/competent ground
2	Varies/uncertain
3	Poor (soft, Northern Allochthon, slips, steep)
4	Requires significant modification, replacement or improvement

Table 40: Geotechnical Requirements – Scoring Scale

VALUE	GEOTECHNICAL REQUIREMENTS
1	Negligible
2	Consideration required in investigation and design
3	Minor geotechnical input or structures required
4	Major geotechnical input or structures required

Table 41: Anticipated Level of Geotechnical Input (Subjective Risk Rating) – Scoring Scale

RISK VALUE	SUBJECTIVE RISK RATING	ANTICIPATED LEVEL OF GEOTECHNICAL INPUT
1-4	Low	• Minimal geotechnical input required. • Further geotechnical desktop investigation or limited investigation may be required.
4-8	Low to Moderate	• Limited site investigation likely required. • Minor retaining wall, cut slope or embankment design.
8-12	Moderate	• Geotechnical design and investigation required. • Hand auger or CPT investigation, moderate retaining wall or embankment design, minor to moderate cut slope assessment. Assessment of poor ground conditions.
12-16	High	• Significant geotechnical design and investigation required. • Borehole or CPT investigation, moderate to large retaining wall or embankment design, slope stability analysis. Assessment of poor ground conditions and/or ground improvement requirements.

PART E: READINESS AND ASSURANCE

19. COMMERICAL CASE

19.1 NEXT STAGE

This SSBC has followed a consistent streamlined (risk-based) approach that has been used for the other parallel business cases (i.e. SH11 SSBC, SH12 SSBC. Rest Areas SSBC, Wayfinding SSBC, Integrated Cycling Implementation Plan and Township Plans). The primary objective was to identify a short list of desirable passing opportunity treatments and seek stakeholder buy-in around the recommended short (0-2 year), medium (3-5 year) and long term (5+ year) investment programmes. Design for this SSBC was limited to a 'concept level' for the medium and long term projects.

The recommended investment programme will be examined and adjusted once all business cases have been completed, with projects being assessed and prioritised across the wider programme. This final decision around the programmes will be informed by the environmental screen, resourcing, consenting strategy and geotechnical investigations.

Pre-Implementation and Detailed Design

Once the scheme designs have been finalised (including peer reviews) the next stage is pre-implementation and detailed design. This phase will focus on (i) refining the design to avoid effects; and, (ii) developing appropriate mitigation measures to manage any environmental effects.

The following considerations will shape and inform the final strategy:

- **Technical Risks.** ***Issues that require further consideration during the technical investigations, concepts for and decisions about structural form, detailed design, consultation and resource consent applications.***
- **Procurement Approach.** ***The recommended programme may influence the procurement approach adopted to deliver the detailed design.***
- **Need for, and extent of, land acquisition.** ***The design for passing facilities will look to avoid any land acquisition, but in some cases, there may be some encroachment over property boundaries. It may be possible to amend designs to avoid any land purchase.***

RMA Application

Leading up to lodgement of RMA applications the process would likely follow:

- ***Consultation on proposed mitigation and design with landowners and stakeholders.***
- ***Confirm / finalise the project design.***
- ***Finalise assessment of effects.***
- ***Finalise land requirement plans.***
- ***Review property strategy (developing land purchase / entry agreement as necessary).***
- ***Finalise RMA lodgement documentation in consultation with relevant authorities.***

The proposed approach enables whole of project mitigation discussions to occur, which enables the development of complementary and efficient mitigation methods to be adopted. Equally, this allows design and construction flexibility issues to be considered. Thus, transparent communications across the partners involved in implementation should be maintained when making decisions about design and mitigation. The risk register will focus on managing both consenting and construction risks.

19.2 COMMUNICATIONS AND ENGAGEMENT

Initial engagement with hapū and key stakeholders has been undertaken. The NZ Transport Agency should develop a stakeholder engagement plan which will provide the basis for coordinating on-going consultation and communications with affected landowners and stakeholders. The plan should leverage off the existing governance arrangements in place in Northland.

The consultation phase should be developed in tandem with a property consultant, to enable effective integration of any property issues with the RMA consenting phase.

Private Property Impacts

The scope of this SSBC excludes engagement with private land-owners but outlined the potential need for land acquisition in future stages of the project, should funding be secured. Partners and stakeholders identified several locations which were independent of their land ownership status.

19.3 RISK ALLOCATION

The key risk types that could delay the project are:

- **Technical risks** ***where effects either lead to significant design change or cause significant cost escalation (by introducing or increasing the scope of mitigation).***
- **Programme risks** ***caused by, for example, discussions with affected parties and stakeholders, staff resourcing, or hearings and appeal processes.***
- **Property effects** ***type issues which cause either design change or cost escalation (by introducing or increasing the scope of mitigation).***
- **Reputation risks** ***caused by strong local opposition to project.***

Table 42 outlines how these risks will be managed.

Table 42: Commercial Management Risk

RISK	MANAGEMENT APPROACH
Technical	*Robust technical reviews and robust submissions for statutory approvals*
Programme	*Careful programme management against realistic deliverables*
Property	*Early engagement with potentially affected landowners*
Reputational	*Ensure pro-active and regular stakeholders, treaty partners and public communications*

19.4 CONTRACT MANAGEMENT

The contract for the scheme and detailed design is likely to extend to lodgement of RMA applications and include provision for the successful consultancy team to then supply services and resources for the phases up to granting of consent.

The RMA consenting phase will likely focus on maintaining levels of constructability and design flexibility to better enable subsequent procurement decision making.

19.5 PROCUREMENT OF IMPLEMENTATION PHASE

Selecting a delivery model for the detailed design and construction (pre-implementation and implantation phases) requires careful consideration of the activities involved and the capability and capacity of resources to deliver them.

Given the size, complexity and risk profile of the next phases, it is recommended that either a staged delivery model or a design and build model are considered. A brief description and comparison between the benefits and disbenefits of these models is outlined in Table 43.

Table 43: Delivery Model Options

DELIVERY MODEL	DESCRIPTION	BENEFITS	DISBENEFITS
Staged	• *Delivery through two separate contracts:* • *Detailed Design and construction monitoring* • *Construction phase* • *Supplier selected using price / quality assessments.* • *Lump sum or schedule of prices.*	• *A high degree of purchaser control is possible.* • *Greater and earlier certainty over final outputs and costs possible.* • *Contract management is simplified as decisions*	• *Separation of designer and builder may not encourage innovation.* • *Ongoing and significant involvement of the purchaser in project management.*

DELIVERY MODEL	DESCRIPTION	BENEFITS	DISBENEFITS
	• *Roles well defined and understood. The purchaser is more able to control the scope. Risk largely managed by the purchaser.*	*are solely made by the purchaser.* • *Transaction costs for both supplier and the purchaser are reduced.*	• *Less coordination between the design and construction phases.* • *Design errors may be costly to fix.*
Design Build	• *Delivery through a single supplier to complete all detailed design and construction.* • *Includes options to:* • *Design and construct* • *Design, novate and construct* • *Lump sum with one price to the supplier for the delivery of outputs.* • *Risk transferred to the supplier. Purchaser less involved in design and construction.*	• *Quicker start times and potentially completion times can be achieved with earlier construction.* • *Purchaser can focus on outcomes via a concept design* • *Outputs can be clearly defined, technical and financial.* • *Purchaser needs less design resource.* • *Overlapping design and construction increases the potential for innovation.*	• *Proposal preparation costs for potential suppliers can be high which may be reflected in price.* • *Risks may increase around design quality, outcomes and cost.* • *Standards must be clearly defined.* • *Greater supplier exposure to risk that may increase the price.* • *Post contract award variation may increase costs.* • *May reduce flexibility.* • *The number of potential suppliers may be reduced because of the requirement to accept greater risk.* • *Additional resources may be required for contract management.*

20. MANAGEMENT CASE

This section provides the management case for this SSBC. Note that the NZ Transport Agency would be the leading party for all projects, as they are all on the state highway network.

20.1 DELIVERY PLAN

It is proposed that each of the projects will undertake the following tasks:

1. ***Procure scheme and detailed design stage services, including:***
    a. ***Detailed design;***
    b. ***Land acquisition; and***
    c. ***Resource consent application.***
2. ***Procure construction services.***
3. ***Construction.***
4. ***Benefits realisation, operation and maintenance.***

20.2 ASSURANCE & ACCEPTANCE

A Road Safety Audit (provided as* Appendix D2*) and review of the economics has been undertaken for this SSBC, and the SSBC has been updated accordingly.

Going forward the project design should be subject to the normal project review processes with no specific unusual engineering or operational considerations prevailing. The reviews would include:

- ***Lighting design peer review (if relevant); and***
- ***Road safety audit (for the scheme/detailed design).***

The Project design will be subject to the normal project review processes with no specific unusual engineering or operational considerations prevailing. With regards to post consenting decision making, formal construction funding acceptance would take place in the normal way for each of the project lead organisations. This process will occur after consenting.

Key aspects of the project are local hapū interests and landownership, which are likely to require the existing relationships to continue to be strengthened in preparation for the consenting and then construction stages. This element of the Project is potentially complex and accordingly discussions about how this aspect is handled will be required.

***The independent peer review of this SSBC is provided as* Appendix D1.**

RMA and Other Statutory Documentation

The RMA documentation, to be produced during the next stage, will be reviewed by the following parties:

- ***Legislative issue documentation***
- ***The cultural and natural environmental issues and management documentation will be reviewed by the following parties:***
    - ***Safe & Sustainable Transport Team as appropriate to review technical reports and advise on their alignment with relevant policy, guides, specifications and standards.***
    - ***Legal review***
    - ***Planning and Investment review.***

Project Management review of any proposed conditions to ensure that constructability is not compromised and to retain flexibility for ensuing phases. The post RMA consenting implementation process (specimen and detailed, and construction) has not been determined. It is anticipated that these ensuing phases will be subject to normal quality assurance processes.

20.3 COST MANAGEMENT

The project design includes mitigation and design risk factors that are already allowed for in the current concept-level project cost. The environmental effects assessment together with topographic and geotechnical investigations will help provide certainty around the scope of any further mitigation needed. The risk register will be maintained and if required, the cost estimate revised.

20.4 CHANGE CONTROL

Senior decision making will likely be required for this Project at the following stages:

Table 44: Senior Decision Makers

STAGE	WHO	DESCRIPTION
RMA consent documentation including final designs	*Will depend on project initiative lead*	*Approval to lodge final design, and proposed conditions of consent including the mitigation package.*
Property Strategy (in parallel with approval of RMA consent documentation)		*Approval of proposed approach to handling property acquisition and approach to managing RMA risks.*
Designation Decision		*Approval of designation decision including conditions*

20.5 ISSUES MANAGEMENT

Issues are proposed to be managed through the risk register process, with the top risks reported monthly. Going forward, issues that have potential strategic implications or may create precedents should be escalated within the relevant project initiative lead organisation, as per normal process.

The project will continue to adhere with the NZ Transport Agency's best practice principles.

There are potential environmental issues in relation to Kauri Die-back that would need to be discussed with DOC as a means of developing an effective environmental management plan.

20.6 POST IMPLEMENTATION MONITORING

Once the project is completed it is expected that post implementation monitoring assessment / benefits realisation will be undertaken. This assessment will measure how well the project overall has delivered on its objectives. This is to be undertaken by each relevant project initiative lead organisation.

Overtaking crash data can be collated using NZ Transport Agency's crash analysis system (CAS), whilst speed data can be derived from sources such as TomTom. A repeat of the visitor survey which informed the Great Kiwi Road Trips study is another potential means of understanding the extent to which passing opportunities have helped actively boost tourism across Northland.

21. FINANCIAL CASE

This section includes a summary of the financial impacts and effects of the proposed project. Funding options and potential revenues are also considered.

21.1 PROJECT DELIVERY

Project delivery costs at this stage are based on a concept level design for the early and medium-term rest area treatments. The assessments have been informed by desktop environmental, geotechnical and topographical considerations, along with a site assessment.

A summary of the expected costs for project delivery are provided below:

- ***Early implementation measures to commence mid-2020 over a period of 18-24 months.***
- ***Property costs (based on aerial photos without input of a property consultant).***
- ***Design costs including consultancy fees and NZ Transport Agency managed costs.***
- ***Construction costs.***

21.2 FUNDING OPTIONS

The National Land Transport Fund (NLTF) is the primary funding source, which is administered by the NZ Transport Agency and funds transport projects which have been identified in the NLTP. The other potential funding source is the PGF.

At this stage it cannot be assumed that funding is available from any source. The NZ Transport Agency have also not made a commitment to manage any of the infrastructure on local roads.

NLTF Funding

The NLTF is the primary mechanism for Crown investment in the New Zealand land transport system. The National Land Transport Programme (NLTP), reviewed and updated every three years in line with the release of the GPS 2018, identifies the projects to be funded by the NLTF. Land transport activities which fit the criteria for funding from the NLTF, are assessed and prioritised against competing national priorities, to determine eligibility for funding. Activities with sufficiently high priority are included in the NLTP.

If approved, the project could be eligible for NLTP funding from the NZ Transport Agency as it achieves a medium results alignment. However, this is subject to an assessment against other national priorities at the time of the funding application.

Generally, the project aligns with the Government's focus on providing increased access to economic and social opportunities and a transport system that is a safe system.

Provincial Growth Fund

The PGF is a Government fund established to stimulate economic growth within regional New Zealand. The PGF is administered by the Provincial Development Unit, part of the Ministry of Business, Innovation, and Employment.

Whilst the NLTP is the primary source for land transport initiatives, if a project can generate additional benefits for regional development, the PGF could be accessed. In this instance, the PGF could accelerate the progression of the project (if not sufficiently prioritised in the NLTP) where it is considered strategically important to Northland. Alternatively, it may act as a source of funding if this project cannot secure funding via the NLTP and it meets the Government's criteria and objectives for the PGF.

Assessment

There are criteria that a project is assessed against in a PGF application; namely projects must:

- ***Lift the productivity of a region or regions***
- ***Contribute to the PGF objectives:***

  - ***Creating jobs, leading to sustainable economic growth***
  - ***Increasing social inclusion and participation***
  - ***Enabling Māori to realise aspirations in all aspects of the economy***
  - ***Encouraging environmental sustainability and helping New Zealand meet climate change commitments alongside productive use of land, water and other resources***
- ***Improving resilience, particularly of critical infrastructure, and by diversifying our economy***
- ***Create additional value and avoid duplicating existing efforts***
- ***Have a link to the regional priorities and be supported by stakeholders, and***
- ***Be well managed, well-governed and have appropriate trade-offs between risk and reward***

21.3 ON-GOING MAINTENANCE

The proposed works will result in new assets and therefore a corresponding change to the ongoing maintenance and operation. Most of the new on-going maintenance costs will be a result of the new widened paved areas, and drainage facilities. New associated signage and line markings may also require maintenance additional to what is already undertaken.